FINAL REPORT

Environmental Protection Department

Scoping Study for Providing Direct Technical Remedies on Existing Flyovers : *Final Report*

26 June 1997

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For and on behalf of ERM-Hong Kong, Ltd

Approved by: FREEMAN CHEUNG

Signed: [signature]

Position: Technical Director

Date: 26 June 1997

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1 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

In January 1994, the Government issued its second review of the 1989 White Paper *Pollution in Hong Kong: A Time to Act*. The review identified adverse traffic noise arising from existing roads as an important environmental issue facing the Territory.

As a consequence of the White Paper Review, the Government commissioned a two-stage study to assess the feasibility of reducing traffic noise from existing roads using direct technical remedies. Stage 1 of the study identified the roads in the Territory which are associated with traffic noise problems, and recommended measures for mitigation. The Stage 1 report, *A Scoping Study for Providing Retro-active Road Traffic Noise Mitigation Measures*, was prepared by ENPAC Limited for EPD in December 1995. The Stage 2 study was commissioned in June 1996 to assess the engineering feasibilities of the recommendations made in Stage 1.

Flyovers were specifically excluded from both of these studies. Since the majority of flyovers are located in densely populated areas and sit above other roads, independent structures for flyovers were at the time considered impractical. The Highways Department (HyD) therefore advised that all direct technical remedies were to be independent of flyovers.

Direct technical remedies to mitigate traffic noise from flyovers now appear more feasible, given the latest engineering know-how. In view of this, ERM Hong Kong was commissioned in October 1996 to undertake a separate review, *Scoping Study for Providing Direct Technical Remedies on Existing Flyovers*. Similar to the review of existing roads described above, this scoping study will be followed by a Stage 2 Study to assess the engineering feasibilities of applying direct technical remedies to flyovers.

This report presents the Stage 1 *Scoping Study for Providing Direct Technical Remedies on Existing Flyovers*.

1.2 SCOPE OF THE STUDY

The scope of this Stage 1 Study is defined in the *Tender for Provision of Service for Scoping Study for Providing Direct Technical Remedies on Existing Flyovers*. The specific requirements (listed in *Appendix III* of the Tender document, *Special Conditions of Contract*) are:

(i) To develop a set of criteria for the selection of existing noisy flyovers on a Territory-wide basis.

(ii) To select noisy flyovers based on the outcome of (i).

(iii) To evaluate noise impact on Noise Sensitive Receivers (NSRs) brought about by road traffic along the selected flyovers through:

- predicting prevailing traffic noise using relevant traffic data issued by the Transport Department or actual traffic count; or

- conducting site surveys and taking field measurements.

(iv) To contact and liaise with relevant Government departments which have concerns in the development of direct technical remedies on existing flyovers. These departments include, but are not limited to, the Fire Services Department (FSD), Highways Department (HyD) and Transport Department (TD).

(v) To identify and assess the practical direct technical remedies which are available for the amelioration of traffic noise from the flyovers identified in (ii).

(vi) To identify and evaluate constraints for providing the recommended direct technical measures, such as fire fighting operation, access for emergency appliances, and the safety of road users.

(vii) To recommend selected flyovers with priority on which practicable direct technical remedies can be provided. The recommendations should include:

- the form of the direct technical remedies;
- cost estimates of the remedies; and
- the likely noise reduction and number of dwellings benefited with the measures in place.

(viii) To prepare a time table for the incorporation of the recommended measures in (vi).

(ix) To identify and recommend further site investigation, surveys and study necessary to fulfil the objectives to the requirements of this Study.

1.3 *STRUCTURE OF THE REPORT*

The remainder of this Report is arranged as follows:

- *Section 2* describes the methodology adopted for the Study;
- *Section 3* describes the criteria used to coarse screen all flyovers within the Territory and lists the flyovers selected for further investigation within this Study;
- *Section 4* describes the direct technical remedies considered in the Study, and evaluates their suitability and effectiveness;
- *Section 5* provides an account of the traffic noise impact assessments conducted for the flyovers, and describes the results of these assessments;
- *Section 6* evaluates the effectiveness of the direct technical remedies;
- *Section 7* presents the recommendations of the Study; and
- *Section 8* presents the overall conclusions of the Study.

2 METHODOLOGY

2.1 OVERALL APPROACH

Data on all of the flyovers within the Territory have been collected for analysis in the Study. The selection of suitable flyovers for consideration with direct technical measures has been divided into three major steps:

- the coarse screening of all flyovers in the Territory to identify a list of flyover candidates that are suitable for further consideration with regard to the provision of direct technical remedies;
- the assessment of the design and installation constraints of each mitigation measure needed to satisfy the requirements of various Government departments; and
- the prediction of noise levels at the worst affected NSRs.

The results of these three steps of the selection process have been used to prepare a list of recommended flyovers to which direct technical measures could be applied to bring environmental improvements to nearby NSRs. In each case, the recommendations include:

- the optimal form of the direct technical remedies;
- cost estimates for the remedies; and
- the likely noise reduction and number of dwellings to be benefited with the measures in place.

Finally, a timetable for the incorporation of the recommendation measures has been prepared, and this is supported with recommendations for further site surveys and investigations which should be undertaken prior to implementation.

The Technical Approach adopted for this Study is summarised in *Figure 2.1a*. The key tasks which have been undertaken in order to complete the review are discussed in the following sections.

2.2 TECHNICAL APPROACH

Seven key tasks have been completed in accordance with the specifications in the *Special Conditions of Contract*.

2.2.1 *Task 1 - Coarse screening of Noisy Flyovers*

A total of 48 flyovers on Hong Kong Island and 140 flyovers throughout Kowloon and the New Territories have been considered during this coarse screening process. These flyovers have been identified by inspection of 1:5000 scale survey maps. All of these flyovers are listed in *Annex A* and their locations are shown in *Figures A1 to A14*.

Each flyover has been individually reviewed using a multi-factor coarse

screening process. The purpose of this screening process is to generate a shorter list of flyover candidates from the complete list of existing flyovers in the Territory. The three criteria used in this screening process were:

- ***The location of the flyover:*** Flyovers which are located within Central Business Districts (CBDs) and industrial areas were screened out of the review as commercial and industrial developments are not considered as NSRs.

- ***The use of noise mitigation measures:*** Flyovers which have already been provided with direct technical remedies to reduce noise levels were screened out of the review.

- ***The completion of an Environmental Impact Assessment (EIA):*** Road traffic noise is a key environmental aspect of a new flyover, and is investigated during an EIA. For flyovers with an EIA conducted before construction or with a proposed EIA to be conducted in 1997, mitigation measures would have been identified/installed as necessary or would be assessed respectively and consideration in this study would represent a duplication of effort. Flyovers which have been, or will in 1997 be, subject to an EIA have therefore excluded from further consideration.

All flyovers which meet any of the three criteria above have been excluded from further consideration to enable the better utilisation of resources and efforts for this study.

2.2.2 *Task 2 - Assessment of Government Constraints for Direct Technical Remedies*

Direct technical remedies have been considered in respect of the special requirements of various interested Government departments for the purposes of fire fighting, access for emergency appliances and road safety. These factors may apply constraints to the physical form and implementation of the measures.

Site visits were conducted to collect the required details to assess the physical layout of the site and implications on the constraints. Where the necessary requirements could not be satisfied, consideration for the implementation of direct technical remedies on these heavily constrained flyovers would not lead to fruitful outcome and therefore they have been excluded from recommendation for such remedies.

2.2.3 *Task 3 - The Prediction of Noise Levels At the Nearest NSR*

In order to establish whether the shortlisted flyovers are likely causes of adverse traffic noise problem, noise levels have been predicted at their nearest NSRs using *Calculation of Road Traffic Noise* (CRTN) procedures published by the UK Department of Transport. Predicted noise levels have then been compared to two criteria to establish whether the flyover is likely to cause adverse conditions at the nearest NSR:

- The predictions have been compared to other noise sources in the vicinity. Where the traffic noise contribution from other nearby sources (such as neighbouring at-grade roads) are comparable to or dominate the noise arising from the flyover, mitigation measures on the flyover would not be effective. It has therefore not been necessary to include these instances for further consideration.

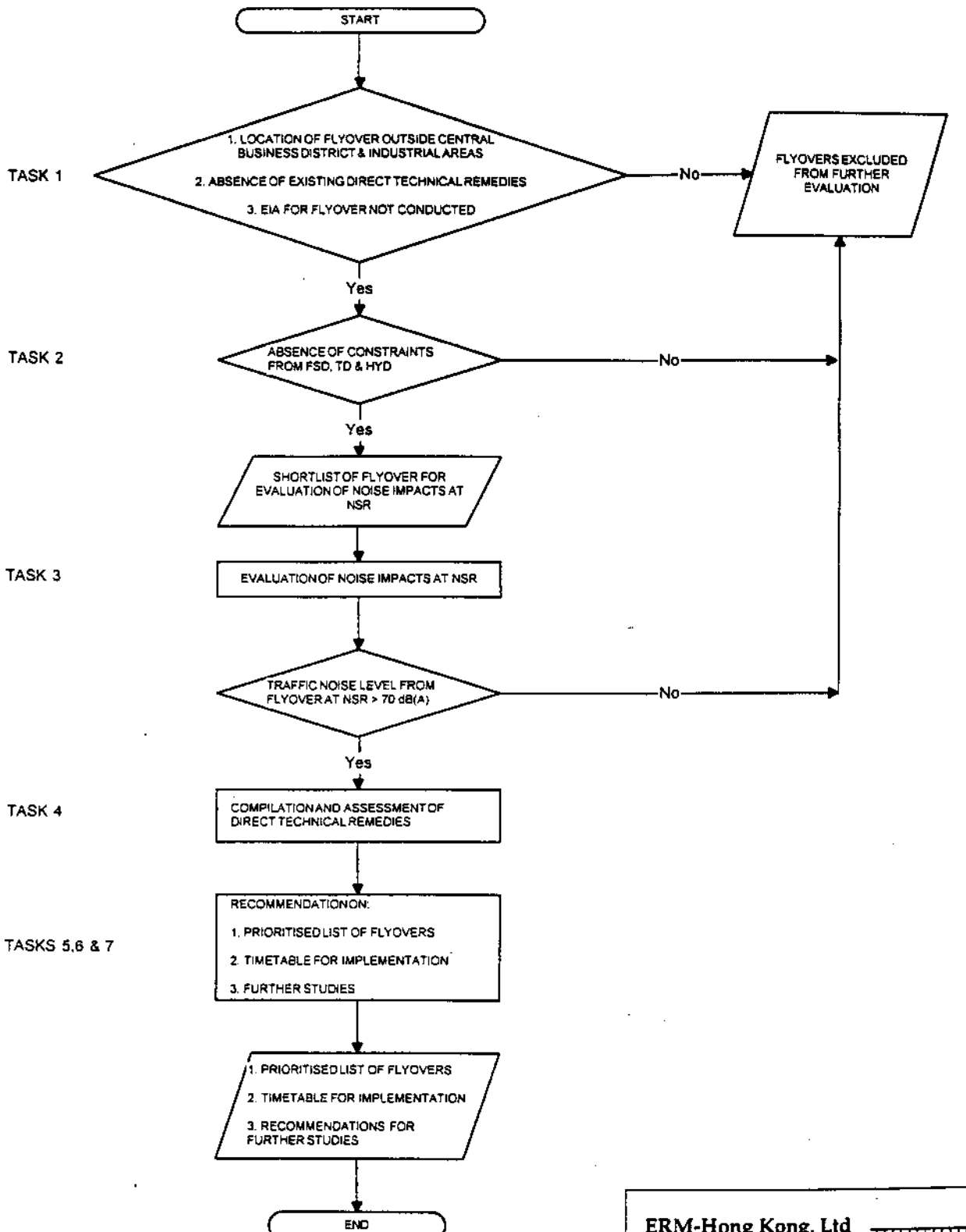

FIGURE 2.1a - TECHNICAL APPROACH OF THE STUDY

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- The predicted noise level from each flyover has been compared to the *Hong Kong Planning Standard and Guidelines* (HKPSG) criteria. Where the predicted levels at the NSR are less than the HKPSG criteria, the situation is considered acceptable and the flyover has not been put forward for consideration with regard to implementation of direct technical remedies. At present there are no standing policies to redress traffic noise from existing roads. For the evaluation of noise impacts at existing sensitive receivers, it is considered appropriate to adopt road traffic noise criteria similar to those stipulated in the HKPSG, which require that the noise level $L_{10, \text{peak hour}}$ at the external façade due to road traffic should not exceed 70dB(A) for domestic premises.

In accordance with the technical requirements of this study, NSRs in the Study refers to all existing domestic premises including temporary housing accommodation. Courts of law, hotels and education institutions are not included as NSRs in this Study since they are either fully air-conditioned for the former two types of uses or being included in the Territory-wide Noise Abatement Measures of Schools projects for the latter.

2.2.4 *Task 4 - The Assessment of Direct Technical Remedies*

The potential direct technical measures for noise mitigation have been identified and their effectiveness assessed in terms of their effectiveness of noise reduction. The measures considered included vertical barriers, cantilevered barriers, semi-enclosures and full enclosures.

Where the flyover is suitable for treatment, the effectiveness of direct technical remedies has been assessed using CRTN. It was anticipated that in some areas it might not be possible to provide sufficient mitigation to achieve the HKPSG standard. In these cases, the number of dwellings to benefit from the remedies and the resultant reduction in noise level will be employed to prioritise the selected flyovers.

Detailed noise modelling that may be required in the engineering design of these structures is beyond the scope of the present Stage 1 Scoping Study. Where necessary, these have been recommended for the Stage 2 Study.

2.2.5 *Task 5 - The Compilation of a List of Recommended Flyovers for Treatment*

Based upon the coarse screening process, the constraints on direct technical remedies and their effectiveness, a list of flyovers which should be considered for treatment has been complied.

The list of recommended flyovers includes three factors:

- the optimal form of the direct technical remedies;
- cost estimates for the remedies; and
- the likely noise reduction and number of dwellings to be benefited with the measures in place.

The direct technical remedies appropriate for the shortlist of flyover candidates have been costed on the basis of experience gained from environmental assessment studies previously conducted for roadworks projects.

The likely levels of noise reduction was established in *Task* 3 above. The approximate number of dwellings to benefit from the proposed remedial measures was estimated or observed from site visits, allowing the flyover candidates to be ranked on a *'cost per dB per dwelling'* basis. This provides a clear indication of the most suitable candidates for future consideration in the Stage 2 Study in terms of cost-effectiveness.

2.2.6 *Task 6 - Programme for Implementation*

A programme has been prepared to enable the optimum implementation of the recommended remedial measures on the basis of effectiveness.

2.2.7 *Task 7 - Recommendations for Further Studies*

The findings of each task in the study, and the prioritised list of flyovers, have identified areas where more focused studies and site investigations would be prudent or necessary. Recommendations regarding the engineering and environmental feasibility of the remedial measures have been identified for consideration in future studies.

3 COARSE SCREENING OF FLYOVERS CANDIDATES

This section describes the identification of flyovers which throughout the Territory are considered as potential sources of adverse levels of traffic noise.

A total of 48 flyovers on Hong Kong Island and 140 flyovers throughout Kowloon and the New Territories were considered during this coarse screening process. All of these flyovers are listed in *Annex A*.

3.1 THE SELECTION CRITERIA

The three criteria which were used to select flyovers for further consideration were:

- ***The location of the flyover:*** Flyovers which are located within Central Business Districts (CBDs) and industrial areas were screened out of the review as commercial and industrial developments are not considered as NSRs.

- ***The use of noise mitigation measures:*** Flyovers which have already been provided with direct technical remedies to reduce noise levels were screened out of the review.

- ***The completion of an Environmental Impact Assessment (EIA):*** Road traffic noise is a key environmental aspect of a new flyover, and is investigated during an EIA. Where mitigation measures are identified as necessary, they are incorporated into the design and construction of the flyover. Flyovers which have been, or will in 1997 be, subject to an EIA were therefore excluded from further consideration.

These three selection criteria were applied to each of the 188 flyovers in the entire Hong Kong Territory. The results of this initial coarse selection process are described below.

3.2 HONG KONG ISLAND

A total of 48 flyovers on Hong Kong Island were subject to the three selection criteria described above. Of these, 18 did not meet the initial criteria. It was therefore not necessary to include these flyovers in the remainder of the study to enable the better utilisation of resources and efforts. These 18 flyovers, and the reasons for their omission, are listed in *Table 3.2a*. A list of completed and current EIA studies covering those flyovers mentioned in *Table 3.2a* is shown in *Table 3.2b*.

Table 3.2a ***Hong Kong Island Flyovers - Coarse Screening***

Flyover reference and name		Flyover within a CBD or an industrial area?	NSRs have not been identified in the vicinity ?	Flyover with existing noise mitigation measures?	Flyover already subject to an EIA prior to completion?	Flyover with an EIA proposed during 1997?
H6	Connaught Road West (Gilman St. to Sutherland St.)	✓	✓			
H7	Pier Road	✓	✓			
H10	Harcourt Road	✓	✓			
H11	Garden Road	✓	✓			
H12	Justice Drive	✓	✓		✓	
H13	Fenwick Pier Street	✓	✓		✓	
H14	Arsenal Street	✓	✓			
H19	Wong Nai Chung Road		✓			
H20	Tonnochy Road	✓	✓			
H25	IEC (Victoria Park Road to Oil Street)					✓
H28	IEC (Branch to Java Road)					✓
H29	IEC (Tai Koo Shing to Hing Man Street)					✓
H36	Fung Ha Road			✓		
H39	Nam Fung Road & Wong Chuk Hang Road Junction		✓			
H40	Ocean Park Road		✓			
H42	Hung Hing Road		✓			
H44	Tin Wan Praya Road	✓	✓			
H47	Western Park Road	✓	✓			

Table 3.2b ***Flyovers considered under other EIA studies***

Flyover reference and name		Completed or current EIA Study
H12	Justice Drive	EIA for Design and Construction of Justice Drive Extension
H13	Fenwick Pier Street	EIA for Design and Construction of Justice Drive Extension
H25	IEC (Victoria Park Road to Oil Street)	Central - Wanchai Bypass and Island Eastern Corridor Link
H28	IEC (Branch to Java Road)	Investigation of Improvement to Island Eastern Corridor Section between North Point Interchange and Sai Wan Ho
H29	IEC (Tai Koo Shing to Hing Man Street)	Investigation of Improvement to Island Eastern Corridor Section between North Point Interchange and Sai Wan Ho

The remaining 30 flyovers on Hong Kong Island as listed below, were considered as potential sources of adverse traffic noise impacts. The constraints on applying direct technical remedies to these flyovers (arising from safety considerations of the Government) are considered in *Section 4*.

- H1 Hill Road - Pok Fu Lam Road to Connaught Road West;
- H2 Bonham Road - near HKU;
- H3 Conduit Road - to Robinson Road, near Woodland Gardens;
- H4 Robinson Road - next to Canossa Hospital;
- H5 Robinson Road - over Magazine Gap Road;
- H8 Upper Albert Road - over Albany Road;
- H9 Cotton Tree Drive - near St. Joseph's College;
- H15 Fleming Road - between Gloucester Road and Jaffe Road;
- H16 Canal Road - over Morrision Hill Road;
- H17 Canal Road - above Canal Road East;
- H18 Canal Road - above Canal Road West;
- H21 Marsh Road - nest to Wan Chai Sports Ground;
- H22 Gloucester Road - turning from Victoria Road to Causeway Bay;
- H23 Gloucester Road - near Moreton Terrace;
- H24 Tsing Fung Street - King's Road to Victoria Park Road;
- H26 IEC - Oil Street to Tin Chui Street;
- H27 IEC - branch to King's Road;
- H30 IEC - Tai On Street to Hoi Keung Street;
- H31 IEC - branch to Nam On Street;
- H32 IEC - branch to Chai Wan Road;
- H33 IEC - Tung Hei Road to A Kung Nam Village Road;
- H34 IEC - Heng Fa Chuen;
- H35 Shun Tai Road;
- H37 Aberdeen Main Road to Aberdeen Praya Road;
- H38 Wong Chuk Hang Road - near HK School of Motoring;
- H41 Ap Lei Chau Bridge;
- H43 Stubbs Road - over Wong Nai Chung Gap Road;
- H45 Repulse Bay Road - adjacent to Eucliff and above South Bay Road;
- H46a Chi Fu Road - Pok Fu Lam Road to Chi Fu Road; and
- H46b Chi Fu Road - Chi Fu Road to Pok Fu Lam Road.

3.3 KOWLOON AND THE NEW TERRITORIES

A total of 140 flyovers throughout Kowloon and the New Territories were subject to the three coarse screening selection criteria. Of these, 56 did not meet the initial criteria. It was therefore not necessary to include these flyovers in the remainder of the study to enable the better utilisation of resources and efforts. These 56 flyovers, and the reasons for their omission from the study, are listed in *Table 3.3a*. A list of completed and current EIA studies covering those flyovers mentioned in *Table 3.3a* is shown in *Table 3.3b*.

Table 3.3a *Kowloon and New Territories Flyovers - Coarse Screening*

Flyover reference and name		Flyover within a CBD or an industrial area?	NSRs have been not identified in the vicinity?	Flyover with existing noise mitigation measures?	Flyover already subject to an EIA prior to completion?	Flyover with an EIA proposed during 1997?
K1a	Ching Cheung Road (near Mei Foo Sun Chuen)				✓	
K1b	Ching Cheung Road (near So Uk Estate)				✓	
K6	Lung Cheung Road (near Chak On Estate)				✓	
K7a	Lung Cheung Road (near Beacon Heights)				✓	
K7b	Lung Cheung Road (near Choi Hung Estate)				✓	
K19	Canton Road (near Kowloon Park)	✓	✓			
K20	Kowloon Park Drive	✓	✓			
K21	Cheong Wan Road		✓			
K25	Pui Ching Road		✓			
K29	Ma Tau Chung Road		✓			
K33	Prince Edward Road East (near San Po Kong)	✓	✓			
K35	Prince Edward Road East (King Hong St. to Concorde Rd.)	✓	✓			
K36	Tate's Cairn Tunnel Network (Sheung Yuen Leng)				✓	
K37	Tate's Cairn Tunnel Network (near Pik Hoi House, Choi Hung Estate)			✓	✓	

Flyover reference and name		Flyover within a CBD or an industrial area?	NSRs have been not identified in the vicinity?	Flyover with existing noise mitigation measures?	Flyover already subject to an EIA prior to completion?	Flyover with an EIA proposed during 1997?
K38	Tate's Cairn Tunnel Network (near Richland Gardens)			✓	✓	
K44	New Clear Water Bay Road		✓			
K46	Kai Fuk Road	✓	✓			
K49	Kai Cheung Road		✓			
K50	Kwun Tong Bypass (near Richland Gardens)			✓	✓	
K51	Kwun Tong Bypass (above Kai Fuk Road)	✓	✓		✓	
K52	Kwun Tong Bypass (along Hoi Bun Road)	✓	✓		✓	
K55	Kwun Tong Bypass (to Lam Tin Station)				✓	
K59	Lion Rock Tunnel Road (link to Waterloo Road)		✓			
NT1	Po Shek Wu Road				✓	
NT2	Fanling Highway (near Tai Tau Leng and Choi Po Court)				✓	
NT8	Tolo Highway (near Classical Gardens and Ma Wo)				✓	
NT12	Tolo Highway (overpass adjacent to University Station)		✓		✓	
NT13	UR T6 (link to Tolo Highway)		✓		✓	
NT20	Sand Martin Bridge		✓			
NT21	Fo Tan Road					✓
NT22	Lok King Street		✓			
NT26	Banyan Bridge		✓			
NT30	Sha Tin Wai Road				✓	

Flyover reference and name		Flyover within a CBD or an industrial area?	NSRs have been not identified in the vicinity?	Flyover with existing noise mitigation measures?	Flyover already subject to an EIA prior to completion?	Flyover with an EIA proposed during 1997?
NT31	Tate's Cairn Highway (to Sha Tin Wai Road)				✓	
NT32a	Shing Mun Tunnel Road (to Tai Po Road Tai Wai)				✓	
NT32b	Shing Mun Tunnel Road (to Tai Po Road Sha Tin)				✓	
NT33	Tai Po Road - Tai Wai				✓	
NT36	Sha Tin Road (near Pok Hong Est.)			✓		
NT44	Hung Tin Road	✓	✓			
NT45	Yuen Long Highway (near To Yuen Wai and over Castle Peak Road)			✓		
NT50	Tuen Mun Road (near Siu Hong Court)		✓			
NT51	Lung Mun Road	✓	✓			
NT52	Wong Chu Road (over nullah)				✓	
NT53	Wong Chu Road (beside Yau Oi Estate)				✓	
NT54	Hoi Wong Road (over nullah)		✓			
NT55	Hoi Wong Road (over Wong Chu Road)				✓	
NT57	Tsing Hoi CIR (to Chi Lok Garden)				✓	
NT58	Tsing Hoi CIR (to Mount Parker Lodge)				✓	
NT61	Tuen Mun Road (Chai Wan Kok)	✓	✓			
NT63	Tsuen Wan Road (near Kwai Chung Park)	✓	✓			
NT66	Texaco Road	✓	✓			

Flyover reference and name		Flyover within a CBD or an industrial area?	NSRs have been not identified in the vicinity?	Flyover with existing noise mitigation measures?	Flyover already subject to an EIA prior to completion?	Flyover with an EIA proposed during 1997?
NT67	Wing Kei Road (over Tsuen Wan Road)	✓	✓			
NT68	Kwai Chung road (to Cheong Wing Road)	✓	✓			
NT70	Castle Peak Road (near Kwai Hing Estate)	✓	✓			
NT72	Tsing Yi Bridge (south)	✓	✓			
NT73	Lai King Hill Road Network (Lai King Terrace)		✓			

Table 3.3b ***Flyovers considered under other EIA studies***

Flyover reference and name		Completed or current EIA study
K1a	Ching Cheung Road (near Mei Foo Sun Chuen)	Lung Cheung Road and Ching Cheung Road Improvement
K1b	Ching Cheung Road (near So Uk Estate)	Lung Cheung Road and Ching Cheung Road Improvement
K6	Lung Cheung Road (near Chak On Estate)	Lung Cheung Road and Ching Cheung Road Improvement
K7a	Lung Cheung Road (near Beacon Heights)	Lung Cheung Road and Ching Cheung Road Improvement
K7b	Lung Cheung Road (near Choi Hung Estate)	EIA for Lung Cheung Road Flyover
K36	Tate's Cairn Tunnel Network (Sheung Yuen Long)	Tate's Cairn Tunnel EIA Study
K37	Tate's Cairn Tunnel Network (near Pik Hoi House, Choi Hung Estate)	Tate's Cairn Tunnel EIA Study
K38	Tate's Cairn Tunnel Network (near Richland Garden)	Tate's Cairn Tunnel EIA Study

Flyover reference and name		Completed or current EIA study
K50	Kwun Tong Bypass (near Richland Gardens)	Kwun Tong Bypass EIA Study
K51	Kwun Tong Bypass (above Kai Fuk Road)	Kwun Tong Bypass EIA Study
K52	Kwun Tong Bypass (along Hoi Bun Road)	Kwun Tong Bypass EIA Study
K55	Kwun Tong Bypass (to Lam Tin Station)	Kwun Tong Bypass EIA Study
NT1	Po Shek Wu Road	Noise Impact Assessment for 24 Hour Opening of Border Crossings
NT2	Fanling Highway (near Tai Tau Leng and Choi Po Court)	Noise Impact Assessment for 24 Hour Opening of Border Crossings
NT8	Tolo Highway (near Classical Gardens and Ma Wo)	Noise Impact Assessment for 24 Hour Opening of Border Crossings
NT12	Tolo Highway (overpass adjacent to University Station)	Widening of Tolo Highway and Traffic Surveillance and Information System
NT13	UR T6 (link to Tolo Highway)	Widening of Tolo Highway and Traffic Surveillance and Information System
NT21	Fo Tan Road	Widening of Fo Tan Road and other Related Improvement Measures in Fo Tan
NT30	Sha Tin Wai Road	Tate's Cairn Tunnel EIA Study
NT31	Tate's Cairn Highway (to Sha Tin Wai Road)	Tate's Cairn Tunnel EIA Study
NT32a	Shing Mun Tunnel Road (to Tai Po Road Tai Wai)	Shing Mun Tunnel EIA
NT32b	Shing Mun Tunnel Road (to Tai Po Road Sha Tin)	Shing Mun Tunnel EIA
NT33	Tai Po Road - Tai Wai	Shing Mun Tunnel EIA
NT52	Wong Chu Road (over nullah)	EIA Study on Reclamation and Serving of Tuen Mun Area 38 for Special Industries - Improvement to Roads & Junctions within Tuen Mun
NT53	Wong Chu Road (beside Yau Oi Estate)	EIA Study on Reclamation and Serving of Tuen Mun Area 38 for Special Industries - Improvement to Roads & Junctions within Tuen Mun
NT55	Hoi Wong Road (over Wong Chu Road)	EIA Study on Reclamation and Serving of Tuen Mun Area 38 for Special Industries - Improvement to Roads & Junctions within Tuen Mun

Flyover reference and name		Completed or current EIA study
NT57	Tsing Hoi CIR (to Chi Lok Garden)	EIA Study on Reclamation and Serving of Tuen Mun Area 38 for Special Industries - Improvement to Roads & Junctions within Tuen Mun
NT58	Tsing Hoi CIR (to Mount Parker Lodge)	EIA Study on Reclamation and Serving of Tuen Mun Area 38 for Special Industries - Improvement to Roads & Junctions within Tuen Mun

The remaining 84 flyovers in Kowloon and the New Territories as listed below, were considered as potentially adverse sources of traffic noise. The constraints on applying direct technical remedies to these flyovers (arising from safety considerations of the Government) are considered in *Section 4*.

- K2 Kwai Chung Road - near Mei Foo Sun Chuen;
- K3 West Kowloon Corridor - near Lai Chi Kok THA;
- K4 West Kowloon Corridor - between Willow Street & Tong Mi Road (near Nam Cheong Estate);
- K5 West Kowloon Corridor - Tai Kok Tsui Road to Cherry Street;
- K8 Lung Ping Road - near Beacon Heights;
- K9 Waterloo Road - between Ede Road and Suffolk Road;
- K10 Waterloo Road - over Prince Edward Road;
- K11 Waterloo Road - over Argyle Street;
- K12a Prince Edward Road West - Lai Chi Kok Road & Yuen Ngan Street;
- K12b Prince Edward Road West - over at-grade Prince Edward Road West;
- K13 Boundary Street - Maple Street to Sai Yee Street;
- K14 Boundary Street - College Road up to Prince Edward Road West;
- K15 Argyle Street - on top of at-grade Argyle Street;
- K16 Argyle Street - near Olympic Park;
- K17 Gascoigne Road - to Ferry Street;
- K18 Chatham Road South - beneath Wylie court;
- K22 East Kowloon Corridor - above Chatham Road and Kowloon City Road;
- K23 San Ma Tau Street - to vehicular ferry pier;
- K24 Fat Kwong Street - above Man Yue Street;
- K26 Dyer Ave;
- K27 Princess Margaret Road - to Waterloo Road over Argyle Street;
- K28 Hong Chong Road - over KCR to Hong Chong Road;
- K30 Chuk Yuen Road - Lung Yin Road;
- K31 Fung Mo Street - near Wang Tau Hom Estate;
- K32 Po Kong Village Road - near Lung Poon Court;
- K34 Prince Edward Road East - Choi Hung Estate;
- K39 Wai Yip Street - access road to Telford Garden;
- K40 Ngau Tau Kok Road - Kai Cheung Road to Ngau Tau Kok Road;
- K41 Ngau Tau Kok Road - near Ngau Tau Kok Upper Estate;
- K42a Shun Lee Tsuen Road - near Shun Lee Estate;
- K42b Shun Lee Tsuen Road - near Shun Tin Estate;
- K43 Lee On Road;
- K45 Ferry Street - over Tong Mei Road;
- K47 Siu Yip Street - from Telford Garden to Tai Yip Street;
- K48 Kwun Tong Road - near Kai Tai Court;
- K53 Kwun Tong Bypass - near Laguna City;
- K54 Kwun Tong Bypass - parallel to Wang Kwong Road;
- K56 Tseung Kwan O Road - near Tsui Ping South Estate;

- K57 Lin Tak Road;
- K58 Sceneway Road;
- NT3 Pak Wo Road - over Fanling Highway and next to Tai Ping Estate;
- NT4 So Kwun Po Road Network - link to Fanling Highway;
- NT5 Jockey Club Road - adjacent to Wo Hop Shek;
- NT6 Tai Po Tai Wo Road - near Kam Shek San Tsuen;
- NT7 Po Heung Street - over Lam Tsuen River;
- NT9 Tai Po Road Yuen Chau Tsai - near Wang Fuk Court;
- NT10 Tai Po Road Yuen Chau Tsai - link to Tolo Highway;
- NT11 Yuen Shan Road - join Tolo Highway;
- NT14 Tsun King Road;
- NT15 Ma On Shan Road Network;
- NT16 Sai Sha Road - link to Hang Tak Street;
- NT17 Hang Tak Street;
- NT18 Tai Po Road Sha Tin - near Hilton Centre;
- NT19 Sha Tin Rural Committee Road;
- NT23 Sha Tin Road - near KCRC House;
- NT24 Sha Tin Road - near Sha Tin Wai;
- NT25 Sha Tin Road - near City One Shatin;
- NT27 Tai Chung Kiu Road - near Ravana Garden;
- NT28 Sha Tin Wai Road - near Chap Wai Kon New Village;
- NT29 Shek Mun Roundabout;
- NT34 Lion Rock Tunnel Road - over Shing Mun River;
- NT35 Lion Rock Tunnel Road - near Hung Mui Kuk;
- NT37 Hung Mui Kuk Road;
- NT38 Tseung Kwan O Road - near Hong Sing Garden;
- NT39 Tai Po Road Tai Wo - near Hong Lok Yuen;
- NT40 Hong Lok Yuen Road;
- NT41 San Tin Road;
- NT42 Ling Tin Road;
- NT43 Long Yip Street & Yuen Long On Street;
- NT46 Tsing Tin Road;
- NT47 Castle Peak Road - San Hui Section;
- NT48 Pui To Road - over nullah and San Fa Estate;
- NT49 Pui To Road - over Tuen Mun Road;
- NT56 Tuen Hing Road;
- NT59 Tuen Mun Road - Castle Peak Bay to Siu Lam;
- NT60 Tuen Mun Road - Sham Tseng Section;
- NT62 Tsuen Wan Road - Tuen Mun Road to Tsing Tsuen Road;
- NT64 Tai Ho Road;
- NT65 Texaco Road North - near Shek Wai Kok Estate;
- NT69 Kwai Chung Road - near Kwai Fong Estate;
- NT71 Tsing Tsuen Road - to Tsing Yi Bridge
- NT74 Lai King Hill Road Network - next to Kwai Fong Garden;
- NT75 Ching Cheung Road - near Ching Lai Court; and
- NT76 Wah Tai Road - near Lai Yiu Estate.

4 DIRECT TECHNICAL REMEDIES

This section describes the five types of direct technical remedy which have been included in the study. In addition, the consultation with Government to identify constraints and special requirements which apply to the flyovers are summarised.

4.1 DIRECT TECHNICAL REMEDIES

Direct technical remedies which are considered in the Study are:

- vertical roadside barrier;
- cantilevered barrier;
- semi-enclosure; and
- full enclosure.

In general, barriers and enclosures are classified under two main categories, reflective and absorptive. Common types of reflective materials include plexi-glass, pre-cast concrete sections and steel/aluminium panels; and types of absorptive materials include durisol acoustic panels (pre-cast soft wood aggregate/portland cement), aluminium sandwich/mineral wool acoustic panels and coustone (resin bonded granite aggregate). It has been considered that the choice of materials will depend on the existing noise environment and other constraints and requirements for each specific case.

It is considered that central barriers must be installed in combination with roadside barriers to provide effective noise reduction, the amount of fine-tuning required for a roadside & central barrier combination is considered more appropriate for the Stage 2 Study. Therefore, the application of central barriers will be recommended in the Stage 2 Study.

Sample configurations of generic direct technical remedies on existing flyovers are illustrated in *Figures 4.1a* to *4.1e*. The characteristics and selected application examples of these generic direct technical remedies are summarised in *Table 4.1a*.

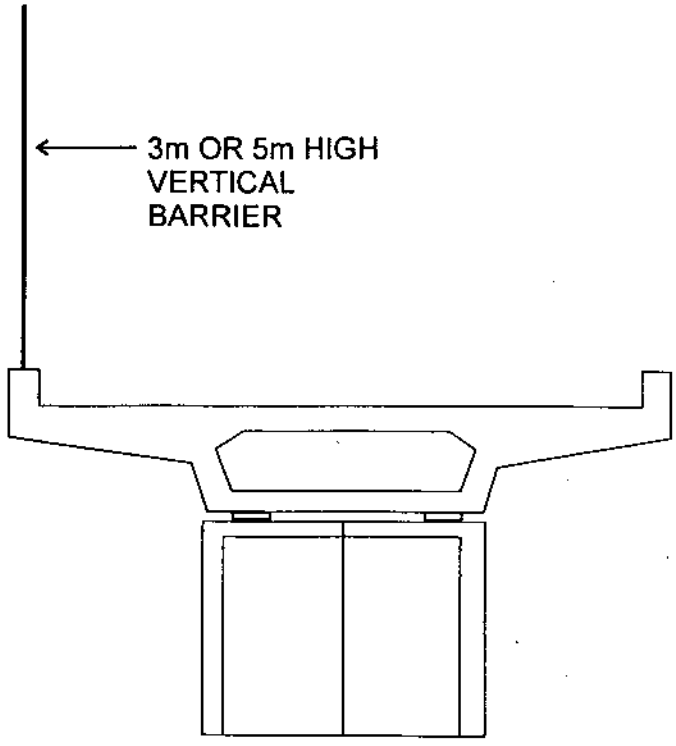
Table 4.1a ***Summary of Characteristics and Application of Generic Direct Technical Remedies for Road Traffic Noise***

Description of Remedy	Characteristics	Application
Vertical roadside barrier (*Figure 4.1a*)	• simplest form of noise screening structure • effective in protecting low-level sensitive receivers • can be installed on one side or both sides of carriageway	• Route 5 - Shatin approach near Mei Lam Estate
Cantilevered barrier (*Figure 4.1b*)	• effective in protecting low to mid-floor sensitive receivers • can be installed on one side or both sides of carriageway	• West Kowloon Expressway - near Lai King
Central barrier (*Figure 4.1c*)	• vertical barrier installed located in the central reserve of dual carriageway • effective for protecting low to mid floor sensitive receivers from wide dual carriageways	• West Kowloon Expressway - near Mei Foo Sun Chuen and Nam Cheong Estate
Semi-enclosure (*Figure 4.1d*)	• effective in protecting high-rise sensitive receivers	• Tate's Cairn Tunnel approach at Choi Hung Estate and Richland Gardens
Full enclosure (*Figure 4.1e*)	• effective in protecting high-rise sensitive receivers located on both sides of carriageway	• Wong Chu Road proposed in the EIA Study on Reclamation and Servicing of Tuen Mun Area 38 for Special Industries - Improvements to Roads & Junctions within Tuen Mun

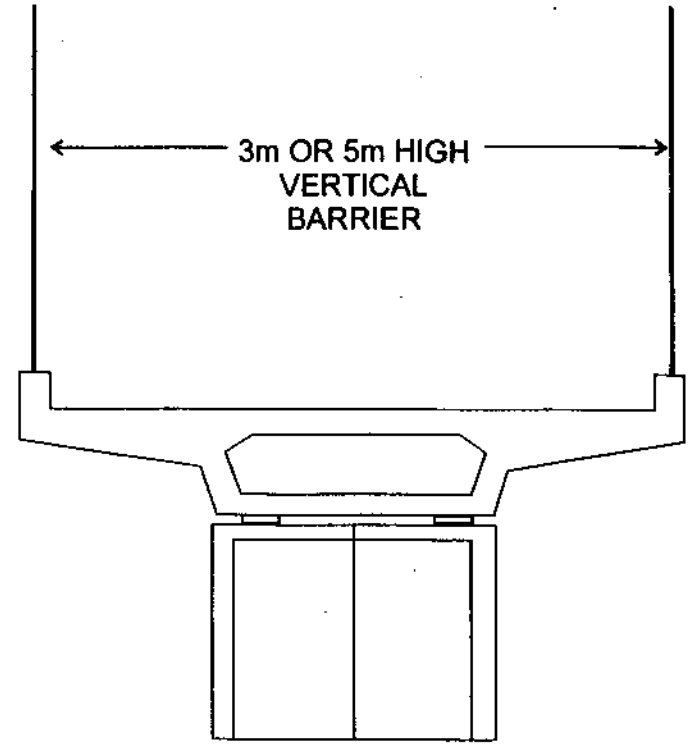
4.2 CONSTRAINTS FOR IMPLEMENTATION

Based on ERM's previous experience in traffic noise assessment and comments from HyD obtained during the consultation for this Study, dead loading and wind loading are the key factors governing the size of the barrier. In designing the bridge or separate structure to carry high noise barriers, structural members increase in size substantially. It is therefore considered that 5m high cantilevered noise barriers are the highest realistic barriers that would be feasible for flyovers in engineering terms. For the purpose of this Study, the safety constraints and noise benefits of 3-m high roadside barrier, which is the mean barrier height between a typical flyover parapet wall (1m) and the highest realistic barrier (5m), 5-m cantilevered barrier, semi-enclosure and full enclosure have been considered.

As indicated in *Section 2.1*, it is possible that the implementation of direct technical remedies on certain flyovers would lead to the violation of safety requirements of FSD, TD and HyD. Knowledge on some of these constraints and special requirements, has been gained from ERM's previous experience in traffic noise assessment. A list of the known constraints, or special requirements, of the



VERTICAL ROADSIDE BARRIER



VERTICAL ROADSIDE BARRIER ON
BOTH SIDES OF CARRIAGEWAY

FIGURE 4.1a - GENERIC DIRECT TECHNICAL REMEDIES FOR ROAD TRAFFIC NOISE ON FLYOVERS - VERTICAL BARRIERS

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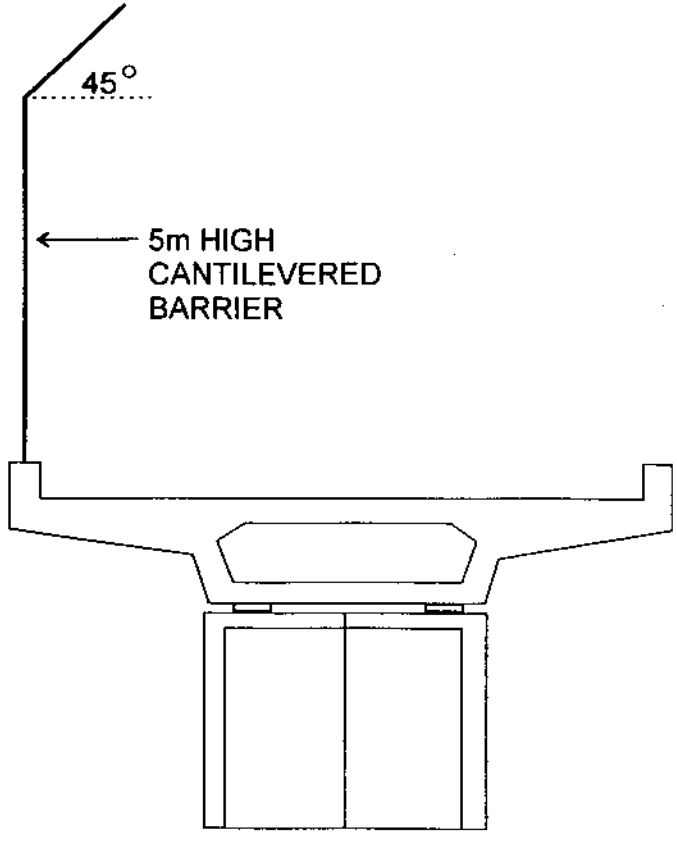
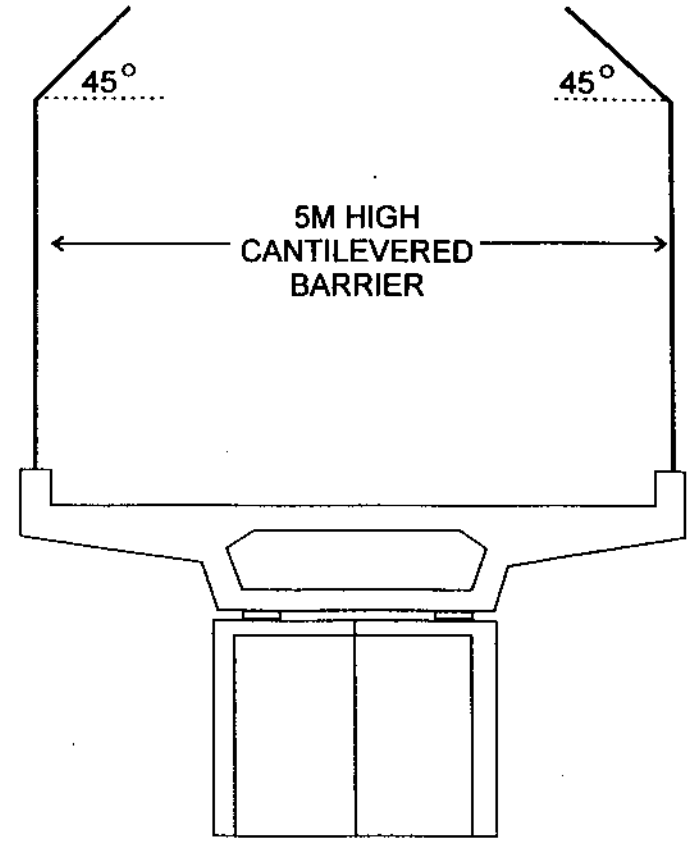


CANTILEVERED BARRIER



CANTILEVERED BARRIER ON BOTH
SIDES OF CARRIAGEWAY

FIGURE 4.1b - GENERIC DIRECT TECHNICAL REMEDIES FOR ROAD TRAFFIC NOISE ON FLYOVERS - CANTILEVERED BARRIERS

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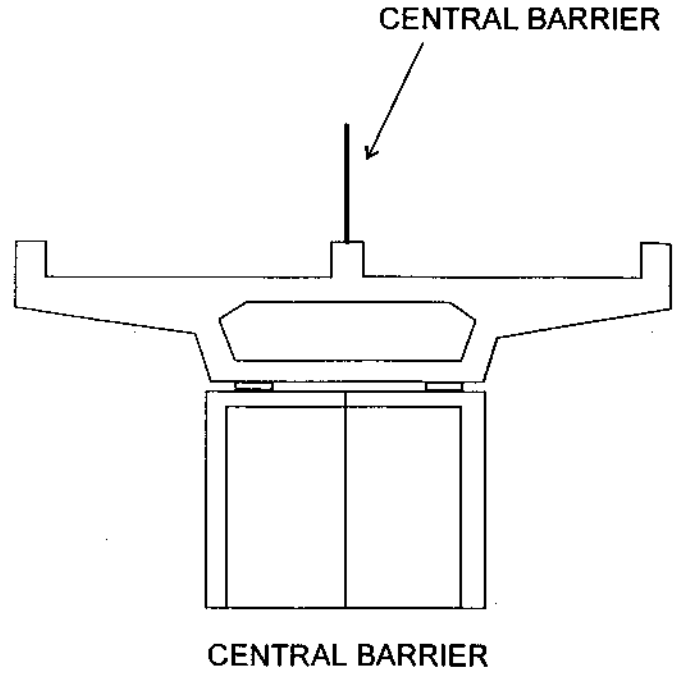

FIGURE 4.1c - GENERIC DIRECT TECHNICAL REMEDIES FOR ROAD TRAFFIC NOISE ON FLYOVERS - CENTRAL BARRIER

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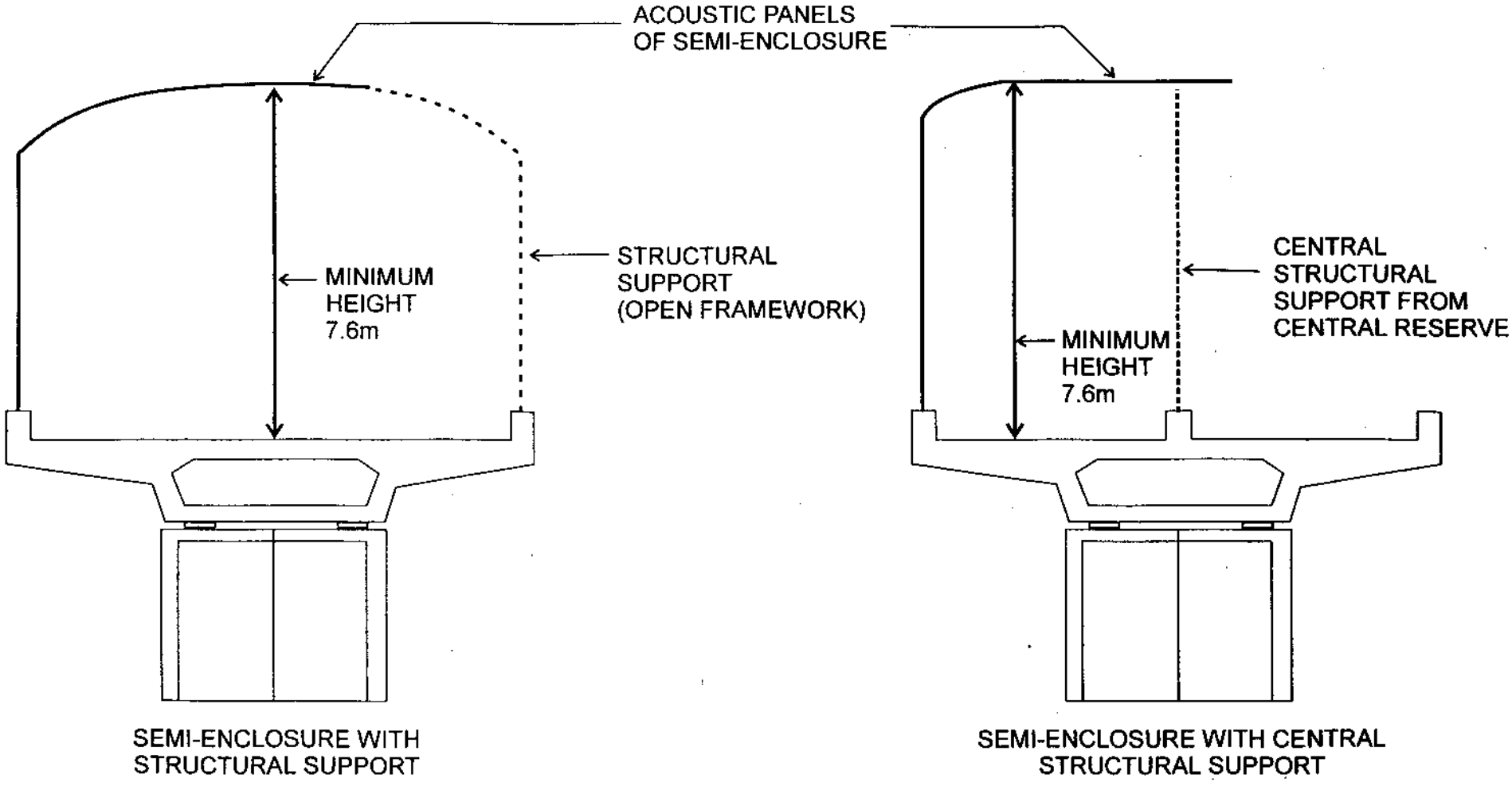

FIGURE 4.1d - GENERIC DIRECT TECHNICAL REMEDIES FOR ROAD TRAFFIC NOISE ON FLYOVERS - SEMI-ENCLOSURE

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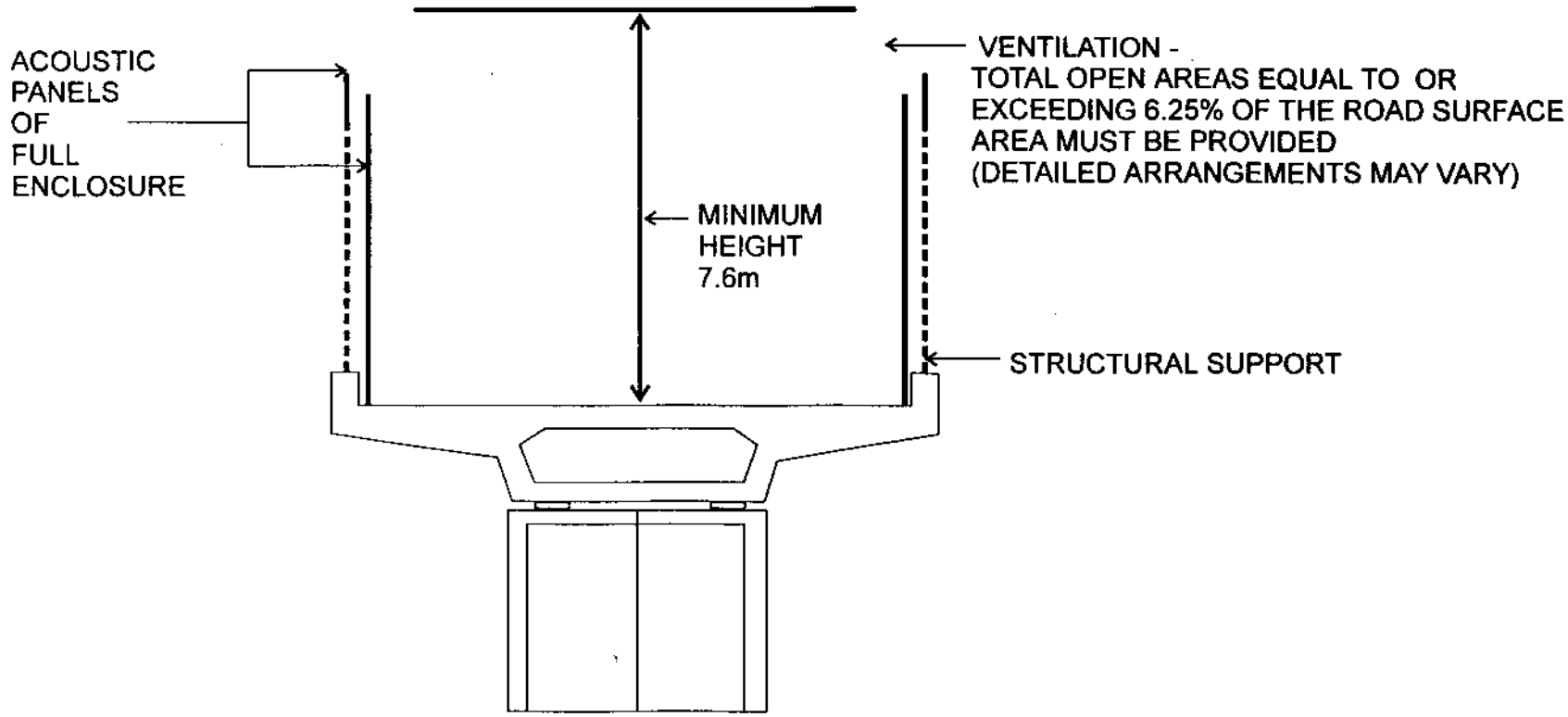

FULL ENCLOSURE WITH SIDE
OPENING FOR VENTILATION

FIGURE 4.1e - GENERIC DIRECT TECHNICAL REMEDIES FOR ROAD TRAFFIC NOISE ON FLYOVERS - FULL ENCLOSURE

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relevant Government departments is presented in *Table 4.2a*.

Typical road-receiver configurations, taking into account the list of known constraints, are presented graphically in *Figures 4.2a* to *4.2d*. Examples of some of these constraints are shown in *Figure 4.2e* to *4.2g*.

Table 4.2a ***List of Constraints / Special Requirements Related to Direct Technical Remedies for Road Traffic Noise on Existing Flyovers***

Direct Technical Remedy	Known Constraints/Special Requirements	Government Department Concerned
Cantilevered noise barrier/noise barrier	The distance between the kerbline and the surface of a noise barrier on a flyover must comply with requirements in Tables 26 and 27 of HyD's *Structures Design Manual* and the *Transport Planning & Design Manual* (TPDM).	HyD
Central reserve noise barrier	The provision of emergency crossing/openings is required for the central barrier.	FSD
Noise barrier	The minimum clearance between wall and road kerb should comply with requirements in HyD's *Structures Design Manual* and the TPDM.	TD & HyD
Noise barrier, full/semi- enclosure	Visibility splays and sight lines at road junction must comply with the requirements in Chapters 3 & 4 of the TPDM. A minimum sight line of 70m is required for junctions or a curved section with a speed limit of 50 kph, and a minimum sight line of 125m for a speed limit of 70kph.	TD & HyD
Noise barrier, full/semi- enclosure	If a flyover is considered to be the only access to the building facade, installation of noise barrier or enclosure is not preferred.	FSD
Noise barrier, full/semi- enclosure	The design of any barriers and enclosures has to be approved by the *Advisory Committee on the Appearance of Bridges and Associated Structures* (ACABAS).	HyD
Noise barrier, full/semi- enclosure	Structures and materials of direct technical remedies should have fire resisting capability.	FSD
Full enclosure	Openings for natural ventilation with an open area equal to or exceeding 6.25% of the road surface area must be provided.	FSD
Full Enclosure	Length of full enclosure with natural ventilation should be less than 230m.	FSD
Full/semi-enclosure	The minimum height of a full or semi-enclosure should not be less than 7.6 m to allow for the provision of overhead signage and emergency recovery of vehicles.	FSD & HyD
Full/semi- enclosure	Under the circumstances whereby fire at the nearby building could be tackled from both ground level and from the elevated road, full or semi-enclosure could not be installed (PWDTC No 31/73) *(see Figure 4.2d)*	FSD

A Working Paper/Consultation Paper presenting the selection criteria for this Study and specific operational requirements of relevant Government departments that include FSD, TD and HyD (as indicated in *Table 4.2a*) was issued on 19 December 1996 for review by these Government departments.

Views and comments from each of the departments were received in January 1997. The greatest concern was voiced by HyD concerning structural engineering implications that would arise from the implementation of direct technical remedies. As HyD indicated, most of the existing flyovers are not designed to take up additional dead and wind loads imposed by noise barriers or enclosures erected directly on the them, it is therefore most likely that independent structures would have to be provided to support the barriers or enclosures at ground level. In addition, an alternative means to cater for the additional loadings brought about by mitigation measures would be to strengthen the structure of the existing flyovers, subject to the detailed engineering design and the fulfilment of other indispensable constraints. Although the concerns of HyD are justified, it would be more appropriate to take these into consideration during the following Stage 2 Study.

The concerns of TD were related to road safety in terms of clearance, sightline distance and provisions for other roadside facilities (eg road signage, emergency telephones and CCTV, etc) whilst FSD's major concerns were on the clearance between building facade and flyover and the provision of sufficient smoke ventilation if enclosures were used. It is anticipated that sufficient considerations would be given to these requirements during the detailed design of the direct technical remedies to be carried out separately in the Stage 2 Study that follows.

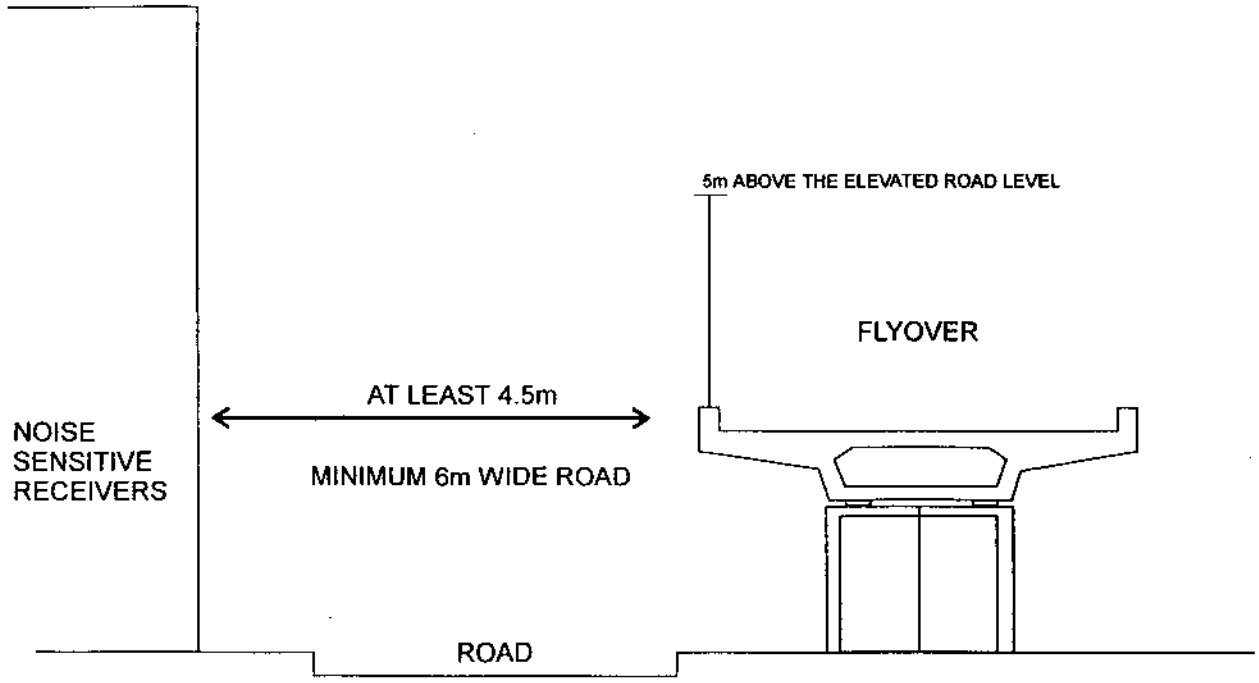
A copy of the views from the Governments departments consulted and the corresponding responses from ERM is presented in *Annex B*.

Subsequent to a review of the list of constraints presented in *Table 4.2a* and the concerns expressed by HyD, FSD and TD during the above consultation, it is considered that some of the known constraints/special requirements could be overcome by detailed engineering design. However, insurmountable constraints still exist and these are listed as follows:

- insufficient clearance between flyover & NSRs;
- sight line safety;
- obstruct fire fighting operations; and
- insufficient space for barrier structure support.

4.3 *HONG KONG ISLAND*

As discussed in *Section* 3.2, 30 flyovers on Hong Kong Island were identified as being suitable for further consideration in the study. Of these, 14 are found to be seriously constrained by special requirements such as those described above, such that direct technical remedies can not be installed. Details of these constraints are presented in *Annex A*. These 14 flyovers, which have not been considered further in the Study, are listed in *Table 4.3a*. It should be noted that insufficient clearance or space for structural support, as indicated in the last column of *Table 4.3a*, is always due to the presence of other insurmountable constraints (e.g. supports erected on/beside the at-grade road underneath a flyover could violate traffic safety, fire-fighting and emergency access requirements, etc). Further details are also presented in *Annex A*.



DIRECT TECHNICAL REMEDIES SUCH AS BARRIER AND NOISE ENCLOSURE ON THE FLYOUER IS CONSIDERED FEASIBLE

- FLYOVER IS NOT THE ONLY ACCESS TO BUILDING FACADES
- CLEARANCE BETWEEN THE OUTER EDGE OF THE FLYOVER STRUCTURE AND BUILDING FACADE IS GREATER THAN 4.5m
- FIRE FIGHTING OPERATIONS WOULD NOT BE OBSTRUCTED BY THE ERECTION OF NOISE BARRIER OR NOISE ENCLOSURE

FIGURE 4.2a - TYPICAL ROAD - RECEIVER CONFIGURATION (EXAMPLE ONE)

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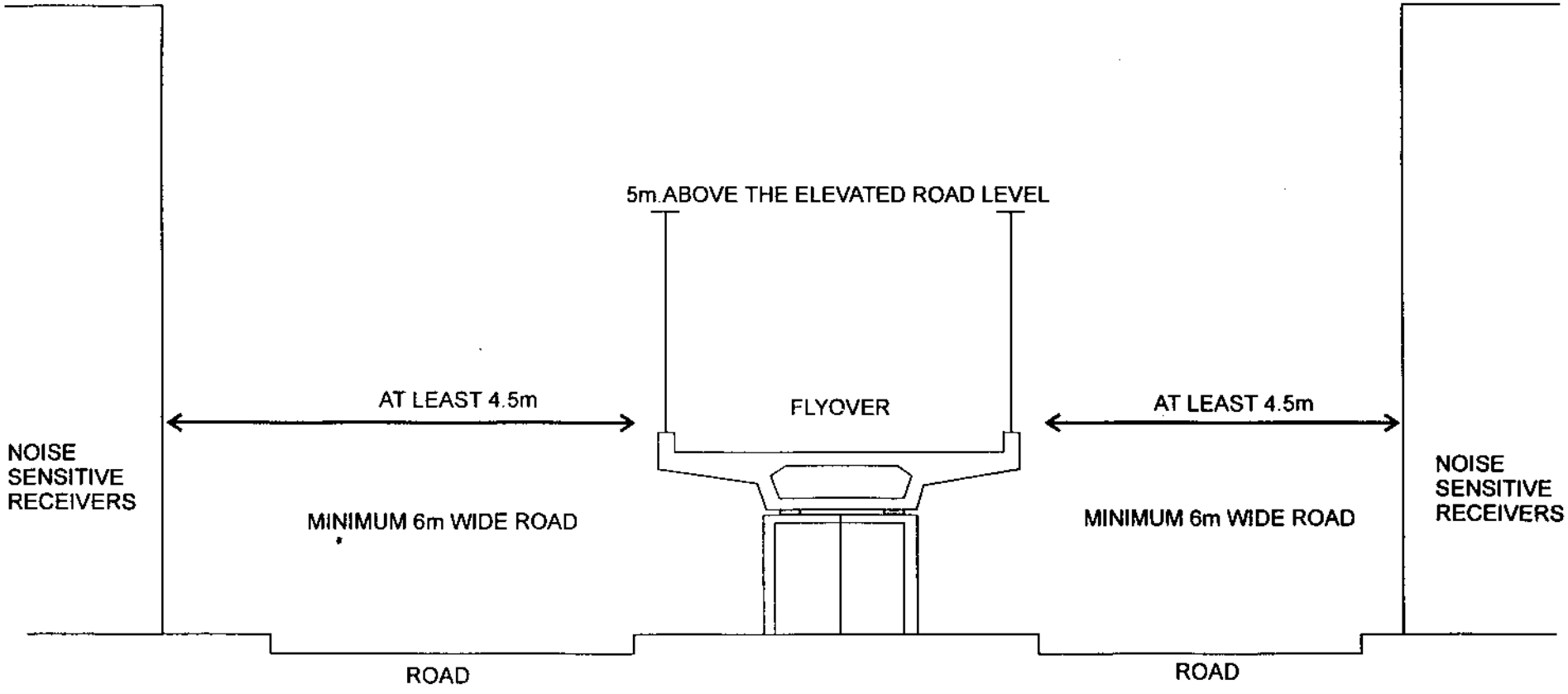

DIRECT TECHNICAL REMEDIES SUCH AS BARRIER AND NOISE ENCLOSURE ON THE FLYOVER IS CONSIDERED FEASIBLE

- FLYOVER IS NOT THE ONLY ACCESS TO BOTH BUILDING FACADES
- CLEARANCE BETWEEN THE OUTER EDGE OF THE FLYOVER AND BUILDING FACADES IS GREATER THAN 4.5m
- FIRE FIGHTING OPERATIONS WOULD NOT BE OBSTRUCTED BY THE ERECTION OF NOISE BARRIER OR NOISE ENCLOSURE

FIGURE 4.2b - TYPICAL ROAD - RECEIVER CONFIGURATION (EXAMPLE TWO)

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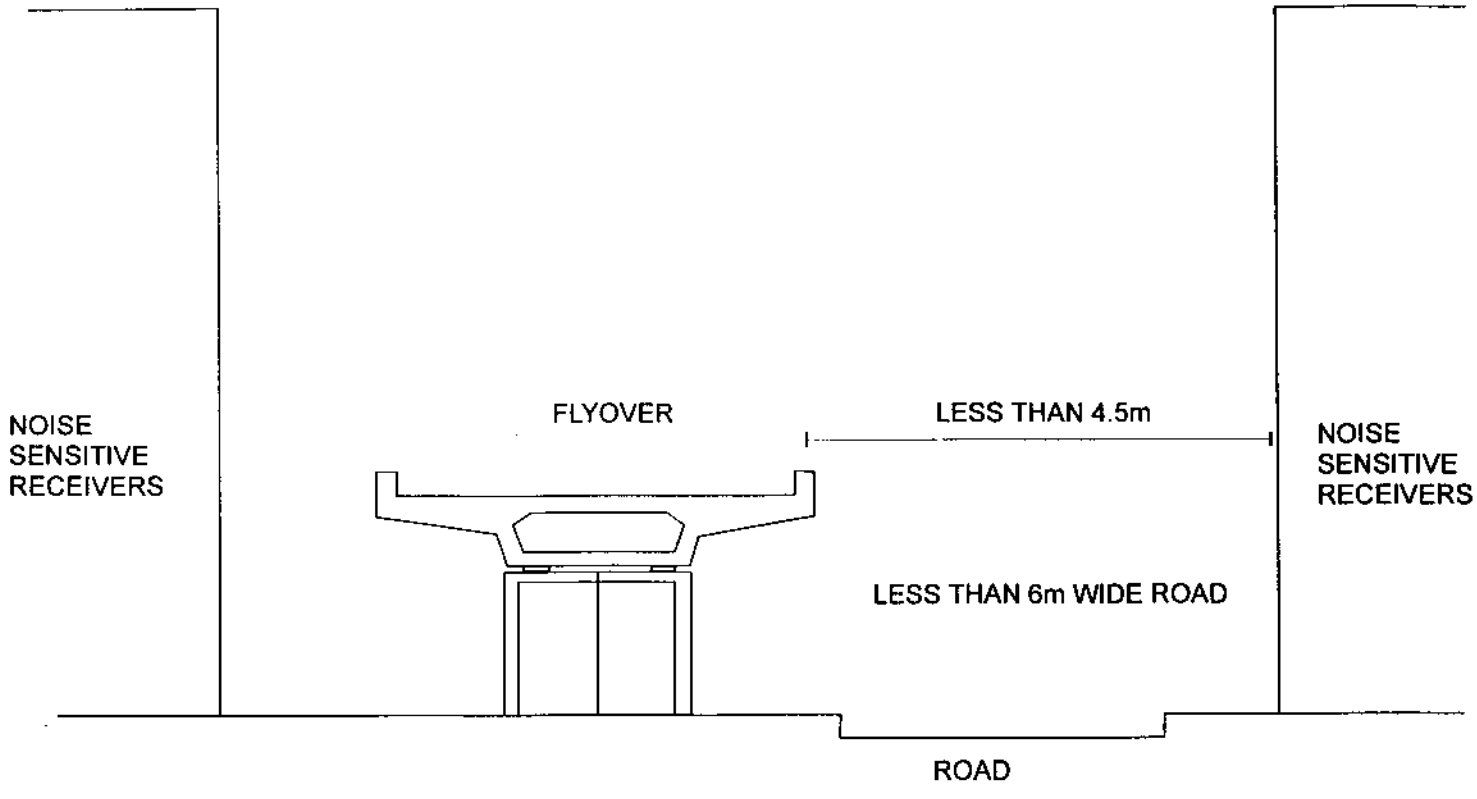

NOISE BARRIER ERECTED ALONG THE LEFT HAND CARRIAGE WAY, OR SEMI OR FULL ENCLOSURE IS NOT CONSIDERED FEASIBLE

- FIRE FIGHTING OPERATIONS FROM THE FLYOVER FOR THE LEFT HAND SIDE BUILDING WOULD BE OBSTRUCTED BY THE ERECTION OF NOISE ENCLOSURE OR NOISE BARRIER ALONG THE LEFT HAND CARRIAGEWAY

FIGURE 4.2c - TYPICAL ROAD - RECEIVER CONFIGURATION (EXAMPLE THREE)

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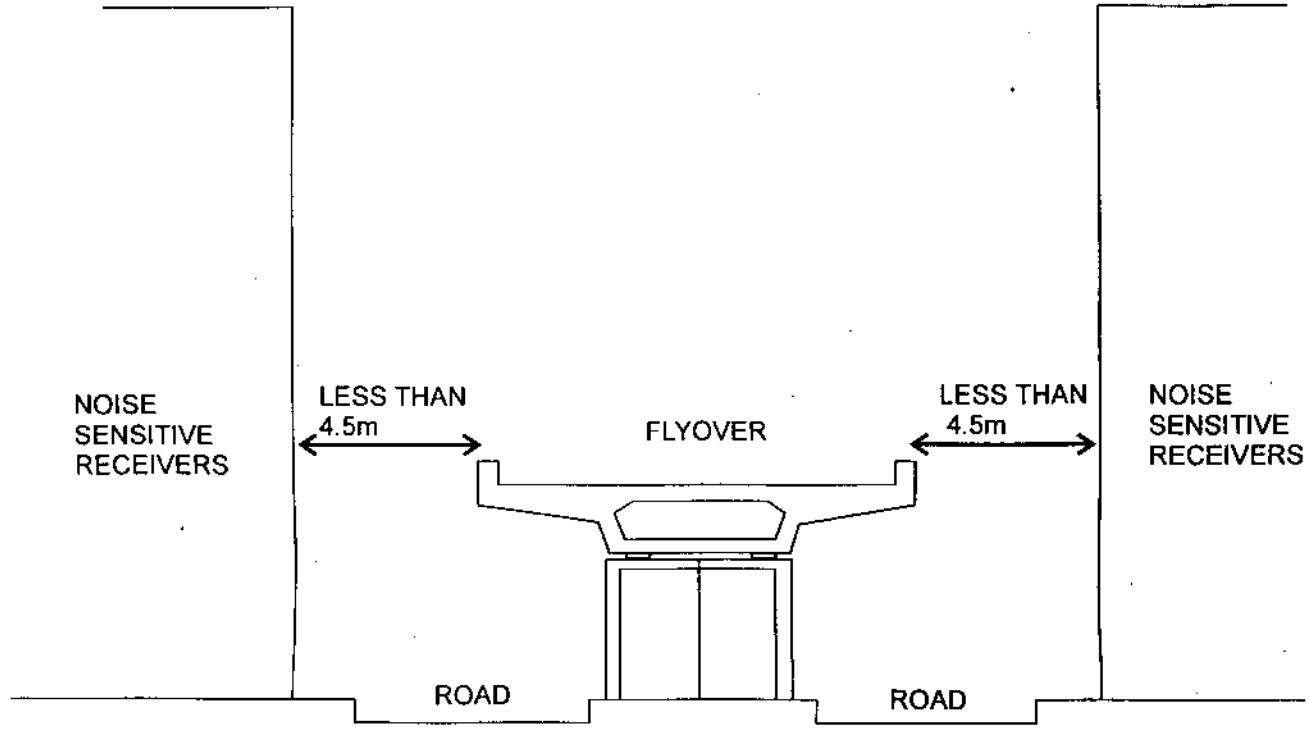

NOISE BARRIER ON EITHER SIDE OF THE HIGHWAY, SEMI OR FULL ENCLOSURE ARE NOT CONSIDERED FEASIBLE

- INSUFFICIENT CLEARANCE BETWEEN FLYOVER AND BUILDING FOR ACCESS TO HIGER FLOORS OF BUILDING FACADE FROM THE AT-GRADE ROAD DURING FIRE FIGHTING OPERATIONS
- FIRE FIGHTING OPERATIONS AT HIGHERS FLOORS WOULD ALSO BE OBSTRUCTED BY THE ERECTION OF NOISE BARRIER OR NOISE ENCLOSURE ON FLYOVER

FIGURE 4.2d - TYPICAL ROAD - RECEIVER CONFIGURATION (EXAMPLE FOUR)

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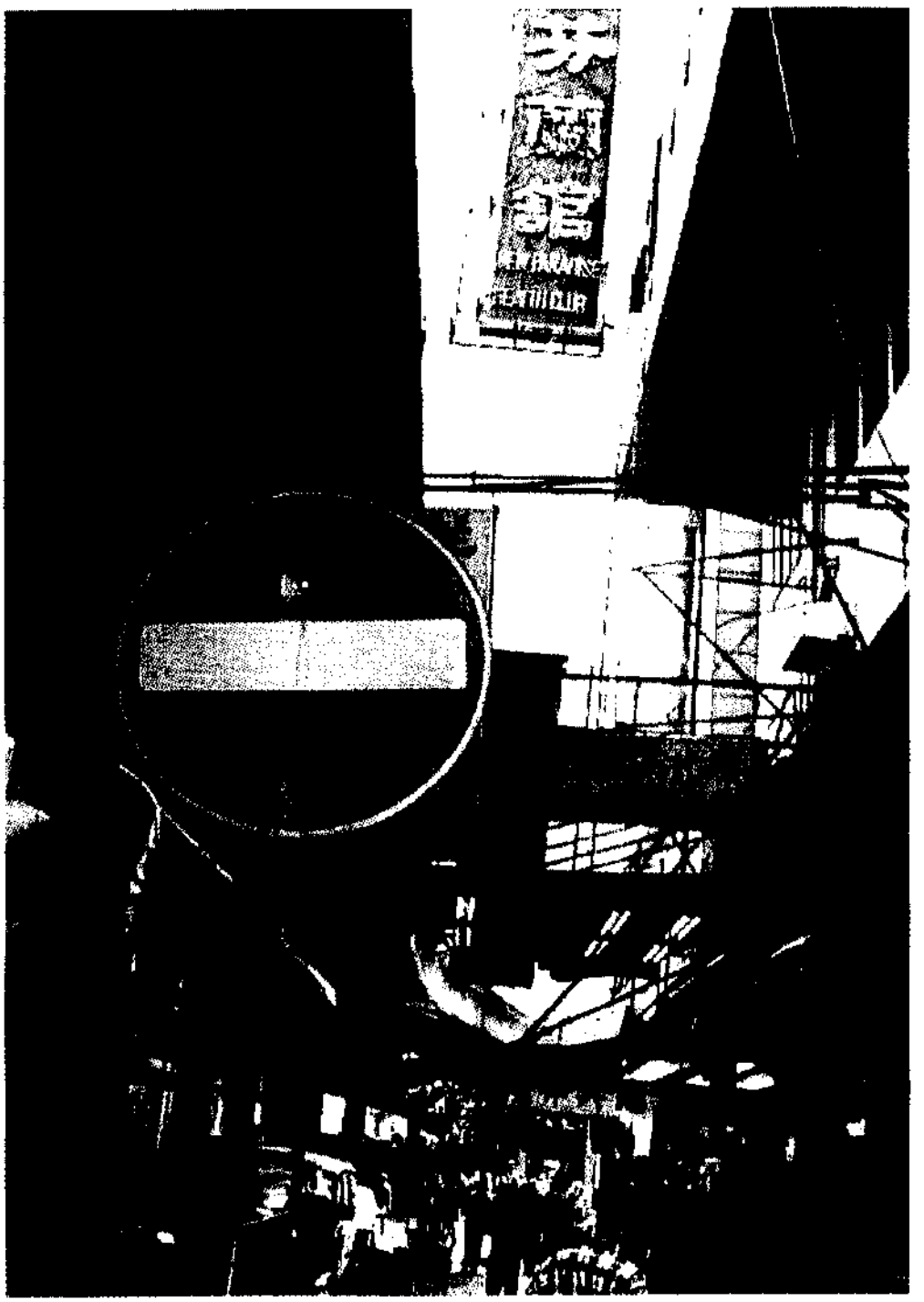

FIGURE 4.2e - CLEARANCE BETWEEN THE OUTER EDGE OF THE ELEVATED ROAD AND THE BUILDING LESS THAN 4.5m- FERRY STREET

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FIGURE 4.2f - THE DISTANCE BETWEEN THE KERBLINE AND THE SURFACE OF A NOISE BARRIER ON A FLYOVER LESS THAN 0.46m - ARGYLE STREET

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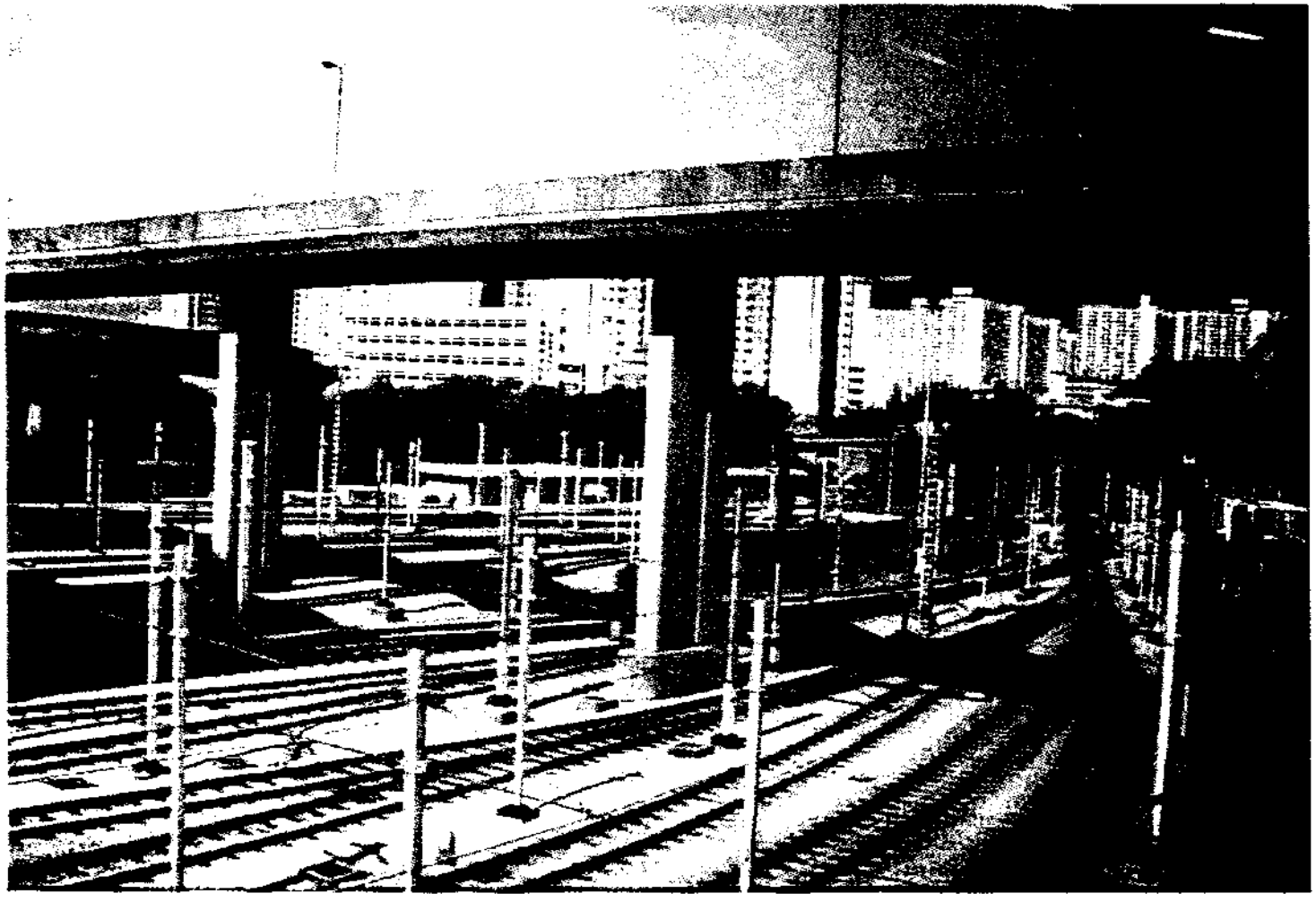

FIGURE 4.2g - STRUCTURALLY INFEASIBLE OVER THE MTRC RAILWAY - K40 NGAU TAU KOK ROAD

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Table 4.3a ***Hong Kong Island Flyovers with Insurmountable Constraints or Special Requirements***

Flyovers Candidates		Insufficient clearance between flyover & NSRs (FSD)	Sight line safety (TD)	Obstruct fire fighting operations (FSD)	Insufficient space for barrier structure support (HyD)
H1	Hill Road	✓	✓		✓
H2	Bonham Road				✓
H3	Conduit Road		✓		
H4	Robinson Road (next to Canossa Hospital)	✓	✓		
H15	Fleming Road				✓
H17	Canal Road (above Canal Road East)			✓	
H18	Canal Road (above Canal Road West)			✓	
H21	Marsh Road			✓	
H24	Tsing Fung Street	✓		✓	✓
H30	IEC (Tai On St. to Hoi Keung St.)	✓			
H31	IEC (Branch to Nam On St.)	✓			✓
H32	IEC (Branch to Chai Wan Road)	✓			
H33	IEC (Tung Hei Rd. to A Kung Ngam Village Rd.)	✓			✓
H35	Shun Tai Road		✓		

After consideration of the special requirements, 16 flyovers as listed below, on Hong Kong Island remain suitable candidates for further investigation. The impacts that these flyovers may have on nearby NSRs are discussed in *Section 5*.

- H5 Robinson Road - over Magazine Gap Road;
- H8 Upper Albert Road - over Albany Road;
- H9 Cotton Tree Drive - near St. Joseph's College;
- H16 Canal Road - over Morrision Hill Road;
- H22 Gloucester Road - turning from Victoria Road to Causeway Bay;
- H23 Gloucester Road - near Moreton Terrace;
- H26 IEC - Oil Street to Tin Chui Street;
- H27 IEC - branch to King's Road;
- H34 IEC - near Heng Fa Chuen;
- H37 Aberdeen Main Road - Aberdeen Main Road to Aberdeen Praya Road;
- H38 Wong Chuk Hang Road - near HK School of Motoring;
- H41 Ap Lei Chau Bridge;

- H43 Stubbs Road - over Wong Ngan Chung Road;
- H45 Repulse Bay Road - above South Bay Road;
- H46a Chi Fu Road - Pok Fu Lam Road to Chi Fu Road; and
- H46b Chi Fu Road - Chi Fu Road to Pok Fu Lam Road.

4.4 KOWLOON AND THE NEW TERRITORIES

As discussed in *Section* 3.3, 84 flyovers in Kowloon and the New Territories were identified as being suitable for further consideration in the study. Of these, 19 are found to be seriously constrained by special requirements, such that direct technical remedies cannot be installed. Details of these constraints are presented in *Annex A*. These 19 flyovers, which have not been considered further in the Study, are listed in *Table 4.4a*. It should be noted that insufficient clearance or space for structural support, as indicated in the last column of *Table 4.4a*, is always due to the presence of other insurmountable constraints (e.g. supports erected on/beside the at-grade road underneath a flyover could violate traffic safety, fire-fighting and emergency access requirements, etc). Further details are also presented in *Annex A*.

Table 4.4a ***Kowloon and New Territories Flyovers with Insurmountable Constraints or Special Requirements***

Flyovers		Insufficient clearance between flyover & NSRs (FSD)	Sight line safety (TD)	Obstruct fire fighting operations (FSD)	Insufficient space for barrier structure support (HyD)
K5	West Kowloon Corridor (Tai Kok Tsui Rd to Cherry St)			✓	✓
K11	Waterloo Road (over Argyle Street)				✓
K12a	Prince Edward Road West (Lai Chi Kok Rd. - Yuen Ngan St.)	✓			✓
K12b	Prince Edward Road West (Prince Edward Rd. West)	✓			✓
K13	Boundary Street (Maple Street to Sai Yee Street)	✓			
K15	Argyle Street (above at grade Argyle Street)				✓
K17	Gascoigne Road (to Ferry Street)	✓			
K22	East Kowloon Corridor (above Chatham Rd. and Kowloon City Rd.)	✓		✓	
K23	San Ma Tau Street		✓		
K24	Fat Kwong Street	✓			
K27	Princess Margaret Road (to Waterloo Road, over Argyle Street)				✓
K28	Hong Chong Road				✓

Flyovers		Insufficient clearance between flyover & NSRs (FSD)	Sight line safety (TD)	Obstruct fire fighting operations (FSD)	Insufficient space for barrier structure support (HyD)
K40	Ngau Tau Kok Road (Kai Cheung Road to Ngau Tau Kok Road)				✓
K45	Ferry Street (over Tong Mei Road)			✓	✓
K47	Siu Yip Street				✓
NT19	Sha Tin Rural Committee Road				✓
NT37	Hung Mui Kuk Road	✓			
NT43	Long Yip Street & Yuen Long On Lok Road			✓	
NT64	Tai Ho Road	✓			

After consideration of the special requirements, 65 flyovers as listed below, in Kowloon and the New Territories remain suitable candidates for further investigation. The impacts that these flyovers may have on nearby NSRs are discussed in *Section 5*.

- K2 Kwai Chung Road - Mei Foo Sun Chuen;
- K3 West Kowloon Corridor - near Lai Chi Kok;
- K4 West Kowloon Corridor - between Willow Street & Tong Mi Road (near Nam Cheong Estate);
- K8 Lung Ping Road - near Beacon Heights;
- K9 Waterloo Road - between Ede Road and Suffolk Road;
- K10 Waterloo Road - over Prince Edward Road;
- K14 Boundary Road - College Road up to Prince Road West;
- K16 Argyle Street - near Olympic Park;
- K18 Chatham Road South - beneath Wylie Court;
- K26 Dyer Ave;
- K30 Chuk Yuen Road - Lung Yin Road;
- K31 Fung Mo Street;
- K32 Po Kong Village Road;
- K34 Prince Edward Road East - near Choi Hung Estate;
- K39 Wai Yip Street - access road to Telford Garden;
- K41 Ngau Tau Kok Road - near Ngau Tau Kok Upper Estate;
- K42a Shun Lee Tsuen Road - near Shun Lee Estate;
- K42b Shun Lee Tsuen Road - near Shun Tin Estate;
- K43 Lee On Road;
- K48 Kwun Tong Road - near Kai Tai Court;
- K53 Kwun Tong Bypass - near Laguna City;
- K54 Kwun Tong Bypass - parallel to Wang Kwong Road;
- K56 Tseung Kwan O Road - near Tsui Ping South Estate;
- K57 Lin Tak Road;
- K58 Sceneway Road;
- NT3 Pak Wo Road - over Fanling Highway and next to Tai Ping Estate;
- NT4 So Kwun Po Road Network - link to Fanling Highway;

- NT5 Jockey Club Road - adjacent to Wo Hop Shek;
- NT6 Tai Po Tai Wo Road - near Kam Shek San Tsuen;
- NT7 Po Heung Street - over Lam Tsuen River;
- NT9 Tai Po Road Yuen Chau Tsai - near Wang Fuk Court;
- NT10 Tai Po Road Yuen Chau Tsai - link to Tolo Highway;
- NT11 Yuen Shan Road - join Tlo Highway;
- NT14 Tsun King Road;
- NT15 Ma On Shan Road Network;
- NT16 Sai Sha Road - link to Hang Tak Street;
- NT17 Hang Tak Street;
- NT18 Tai Po Road Sha Tin - near Hilton Centre;
- NT23 Sha Tin Road - near KCRC House;
- NT24 Sha Tin Road - near Sha Tin Wai;
- NT25 Sha Tin Road - near City One Shatin;
- NT27 Tai Chung Kiu Road - near Ravana Garden;
- NT28 Sha Tin Wai Road - near Chap Wai Kon New Village;
- NT29 Shek Mun Roundabout;
- NT34 Lion Rock Tunnel Road - over Shing Mun River;
- NT35 Lion Rock Tunnel Road - near Hung Mui Kuk;
- NT38 Tseung Kwan O Road - near Hong Sing Garden;
- NT39 Tai Po Road Tai Wo - near Hong Lok Yuen;
- NT40 Hong Lok Yuen Road;
- NT41 San Tin Road;
- NT42 Ling Tin Road;
- NT46 Tsing Tin Road;
- NT47 Castle Peak Road - San Hui Section;
- NT48 Pui To Road - over nullah and San Fa Estate;
- NT49 Pui To Road - over Tuen Mun Road;
- NT56 Tuen Hing Road;
- NT59 Tuen Mun Road - Castle Peak Bay to Siu Lam;
- NT60 Tuen Mun Road - Sham Tseng Section;
- NT62 Tsuen Wan Road - Tuen Mun Road to Tsing Tsuen Road;
- NT65 Texaco Road North - near Shek Wai Kok Estate;
- NT69 Kwai Chung Road - near Kwai Fong Estate;
- NT71 Tsing Tsuen Road - to Tsing Yi Bridge
- NT74 Lai King Hill Road Network - next to Kwai Fong Garden;
- NT75 Ching Cheung Road - near Ching Lai Court; and
- NT76 Wah Tai Road - near Lai Yiu Estate.

5 EVALUATION OF NOISE IMPACT

This section describes the assessment of noise levels arising from each flyover at each NSR.

Two factors have been considered in order to establish whether the selected flyovers are likely causes of adverse traffic noise problem. Firstly, the likely noise levels arising from each flyover has been compared to other sources of road traffic noise in the vicinity. Where the flyover is shown to be the dominant source of road traffic noise in the vicinity, the predicted noise level at the nearest NSR has been assessed.

5.1 PREDICTION OF NOISE LEVELS

The approximate traffic noise levels arising from each flyover have been predicted on the basis of traffic flow data published by the Transport Department (TD) in the latest edition of the *Annual Traffic Census*, ie 1995 edition. Where 1995 data was not available, an actual traffic count was undertaken. Otherwise, 1995 data from the TD was used.

For those traffic counting stations where only Annual Average Daily Traffic (AADT) flows were available, the nominal peak hour traffic flow was calculated by applying a conversion factor (K factor) obtained from the core stations within the same traffic counting station group or area to the traffic counting station. By a similar principle, the percentage of heavy vehicles recorded at these core stations was used.

Predicted traffic noise levels arising from each flyover have been compared to other road traffic noise sources in the vicinity. Where the traffic noise contribution from other nearby sources (such as neighbouring at-grade roads) are comparable to or dominate the noise arising from the flyover, mitigation measures on the flyover would not be effective. It has therefore not been necessary to include these instances for further consideration.

5.2 PREDICTED LEVELS AT THE NEAREST NSR

Representative NSRs have been identified for each of the flyovers under consideration. The separation distance between each flyover candidate and NSRs has also been identified. The predicted traffic noise levels (described above) at the nearest NSR have been assessed to establish whether the flyover can be described as a significant environmental impact at the NSR.

At present there are no standing policies to redress traffic noise from existing roads. For the evaluation of noise impacts at existing sensitive receivers, it is considered appropriate to adopt road traffic noise criteria similar to those stipulated in the *Hong Kong Planning Standards and Guidelines* (HKPSG), which require that the noise level $L_{10, \text{peak hour}}$ at the external façade due to road traffic should not exceed 70dB(A) for domestic premises. Cases in which traffic noise levels from the flyover are lower than 70dB(A) at sensitive receivers have therefore been omitted from further consideration.

5.3 *HONG KONG ISLAND*

Taking into account the government constraints and special requirements, 16 flyovers are considered 'noisy' which can be treated with direct technical remedies. However, with the at-grade road traffic also taken into account, 13 flyovers were found to be less dominant sources of noise at the respective NSRs. Facade noise calculations for each concerned flyovers are presented in *Annex* C. The NSR would therefore not benefit from application of direct technical measures to these flyovers, and they have hence been dismissed from further consideration. The 13 abandoned flyovers are listed below:

- H5 Robinson Road - over Magazine Gap Road;
- H8 Upper Albert Road - over Albany Road;
- H9 Cotton Tree Drive - near St. Joseph's College;
- H16 Canal Road - over Morrision Hill Road;
- H22 Gloucester Road - turning from Victoria Road to Causeway Bay;
- H23 Gloucester Road - near Moreton Terrace;
- H27 IEC - branch to King's Road;
- H37 Aberdeen Main Road - Aberdeen Main Road to Aberdeen Praya Road;
- H38 Wong Chuk Hang Road - near HK School of Motoring;
- H43 Stubbs Road - over Wong Ngan Chung Road;
- H45 Repulse Bay Road - above South Bay Road;
- H46a Chi Fu Road - Pok Fu Lam Road to Chi Fu Road; and
- H46b Chi Fu Road - Chi Fu Road to Pok Fu Lam Road.

The three remaining flyovers on Hong Kong Island were considered as adverse sources of road traffic noise which do not have constraints or specific requirement for direct technical remedies. These flyovers are:

- H26 IEC - from Oil Street to Tin Chui Street; and
- H34 IEC - near Heng Fa Chuen.
- H41 Ap Lei Chau Bridge;

The benefits of applying direct technical remedies to these flyovers are discussed in *Section 6*.

5.4 *KOWLOON AND THE NEW TERRITORIES*

Taking into account the government constraints and special requirements, 65 flyovers are considered 'noisy' which can be treated with direct technical remedies. However, further to site survey, 23 flyovers were found to be on an embankment, or nearby NSRs already within the shadow zone of the flyover (ie the elevation of the NSRs are lower than the flyover). With the at-grade road traffic also taken into account, 34 of the 42 flyovers were found to be less dominant sources of noise at the representative NSRs. Facade noise calculations for each concerned flyovers are presented in *Annex* C. The NSR would therefore not benefit from application of direct technical measures to these flyovers, and they were hence dismissed from further consideration. The 57 flyovers excluded from further assessment are listed below:

- K3 West Kowloon Corridor - near Lai Chi Kok;
- K8 Lung Ping Road - near Beacon Heights;
- K9 Waterloo Road - between Ede Road and Suffolk Road;

- K10 Waterloo Road - over Prince Edward Road;
- K14 Boundary Road - College Road up to Prince Road West;
- K16 Argyle Street - near Olympic Park;
- K18 Chatham Road South - beneath Wylie Court;
- K26 Dyer Ave;
- K30 Chuk Yuen Road - Lung Yin Road;
- K31 Fung Mo Street;
- K32 Po Kong Village Road;
- K34 Prince Edward Road East - near Choi Hung Estate;
- K39 Wai Yip Street - access road to Telford Garden;
- K41 Ngau Tau Kok Road - near Ngau Tau Kok Upper Estate;
- K42a Shun Lee Tsuen Road - near Shun Lee Estate;
- K42b Shun Lee Tsuen Road - near Shun Tin Estate;
- K43 Lee On Road;
- K48 Kwun Tong Road - near Kai Tai Court;
- K54 Kwun Tong Bypass - parallel to Wang Kwong Road;
- K57 Lin Tak Road;
- K58 Sceneway Road;
- NT3 Pak Wo Road - over Fanling Highway and next to Tai Ping Estate;
- NT4 So Kwun Po Road Network - link to Fanling Highway;
- NT5 Jockey Club Road - adjacent to Wo Hop Shek;
- NT6 Tai Po Tai Wo Road - near Kam Shek San Tsuen;
- NT7 Po Heung Street - over Lam Tsuen River;
- NT9 Tai Po Road Yuen Chau Tsai - near Wang Fuk Court;
- NT10 Tai Po Road Yuen Chau Tsai - link to Tolo Highway;
- NT11 Yuen Shan Road - join Tlo Highway;
- NT14 Tsun King Road;
- NT15 Ma On Shan Road Network;
- NT16 Sai Sha Road - link to Hang Tak Street;
- NT17 Hang Tak Street;
- NT18 Tai Po Road Sha Tin - near Hilton Centre;
- NT23 Sha Tin Road - near KCRC House;
- NT24 Sha Tin Road - near Sha Tin Wai;
- NT27 Tai Chung Kiu Road - near Ravana Garden;
- NT28 Sha Tin Wai Road - near Chap Wai Kon New Village;
- NT29 Shek Mun Roundabout;
- NT34 Lion Rock Tunnel Road - over Shing Mun River;
- NT35 Lion Rock Tunnel Road - near Hung Mui Kuk;
- NT38 Tseung Kwan O Road - near Hong Sing Garden;
- NT39 Tai Po Road Tai Wo - near Hong Lok Yuen;
- NT40 Hong Lok Yuen Road;
- NT41 San Tin Road;
- NT42 Ling Tin Road;
- NT46 Tsing Tin Road;
- NT47 Castle Peak Road - San Hui Section;
- NT48 Pui To Road - over nullah and San Fa Estate;
- NT49 Pui To Road - over Tuen Mun Road;
- NT56 Tuen Hing Road;
- NT59 Tuen Mun Road - Castle Peak Bay to Siu Lam;
- NT60 Tuen Mun Road - Sham Tseng Section;
- NT65 Texaco Road North - near Shek Wai Kok Estate;
- NT74 Lai King Hill Road Network - next to Kwai Fong Garden;
- NT75 Ching Cheung Road - near Ching Lai Court; and
- NT76 Wah Tai Road - near Lai Yiu Estate.

The remaining 8 flyovers in Kowloon and the New Territories were considered as adverse sources of road traffic noise which do not have constraints or specific requirement for direct technical remedies. These flyovers are:

- K2 Kwai Chung Road - near Mei Foo Sun Chuen;
- K4 West Kowloon Corridor - between Willow Street & Tong Mi Road (near Nam Cheong Estate);
- K53 Kwun Tong Bypass - near Laguna City;
- K56 Tseung Kwan O Road - near Tsui Ping South Estate;
- NT25 Sha Tin Road - near City One Shatin;
- NT62 Tsuen Wan Road - near Clague Garden Estate;
- NT69 Kwai Chung Road - near Kwai Fong Estate; and
- NT71 Tsing Tsuen Road - near Riviera Gardens and Cheung On Estate.

The benefits of applying direct technical remedies to these flyovers are discussed in *Section 6*.

After three levels of flyovers screening, a total number of 11 out of 188 flyovers have been selected for further assessment of direct technical remedies. A summary of excluded flyovers in Hong Kong Territories is shown in *Annex A*.

6 THE EFFECTIVENESS OF THE DIRECT TECHNICAL REMEDIES

This section describes the assessment of the effectiveness of the proposed direct technical remedies.

6.1 ASSESSING THE EFFECTIVENESS OF DIRECT TECHNICAL REMEDIES

A total of 11 flyovers were shortlisted as presented below. The effectiveness of different direct technical remedies have been assessed. The concerned flyovers and nearby at-grade roads were divided up into road segments. A road layout defines the road width, surface type, traffic conditions and the height and location of roadside noise barriers. The segmentation process was carried out in accordance with the CRTN procedures and the noise models were built using the *HFANoise* traffic noise model which fully implements CRTN procedures and methodologies. Traffic noise impacts were assessed against the $L_{10, \text{peak hour}}$ 70 dB(A) limit.

Elevation of the flyovers and concerned NSRs have been determined by reference to 1:5000 survey maps and site survey. All other site-specific conditions such as angle of view, road gradient, nearby dominant at-grade road and features that could add noise screening were included in the modelling process. The effectiveness of direct technical remedies such as 3m noise barriers, 5m cantilevered barrier, semi-enclosure and full enclosure has been assessed using the traffic noise model. For the purpose of this assessment, the horizontal length of the direct technical remedies was determined by assuming the proposed direct technical remedies need to provide noise screening for a minimum angle of view of 135° measured from each NSR. Extent of the proposed direct technical remedies are shown in *Figure 6.1a* to *6.1j*. Details of the exact direct technical remedies configurations and arrangements will be considered during the following Stage 2 study.

6.2 PREDICTED NOISE LEVELS

Unmitigated and mitigated noise levels for the representative NSRs at each concerned flyovers have been predicted for the first floor (4.2m above ground), mid level and top floor level (based on 2.8m per floor level). The predicted noise levels with and without direct technical remedies are presented in *Annex D*.

- H26 IEC - from Oil Street to Tin Chui Street;
- H34 IEC - near Heng Fa Chuen;
- H41 Ap Lei Chau Bridge;
- K2 Kwai Chung Road - near Mei Foo Sun Chuen;
- K4 West Kowloon Corridor - between Willow Street & Tong Mi Road (near Nam Cheong Estate);
- K53 Kwun Tong Bypass - near Laguna City;
- K56 Tseung Kwan O Road - near Tsui Ping South Estate;
- NT25 Sha Tin Road - near City One Shatin;
- NT62 Tsuen Wan Road - near Clague Garden Estate;
- NT69 Kwai Chung Road - near Kwai Fong Estate; and
- NT71 Tsing Tsuen Road - near Riviera Gardens.

Graphical presentation of the findings of this Study in the form of photographs and sketches are shown in *Figure 6.1k to 6.1u* to provide an illustration of the

surrounding environment of the flyovers and the corresponding recommended remedial measures.

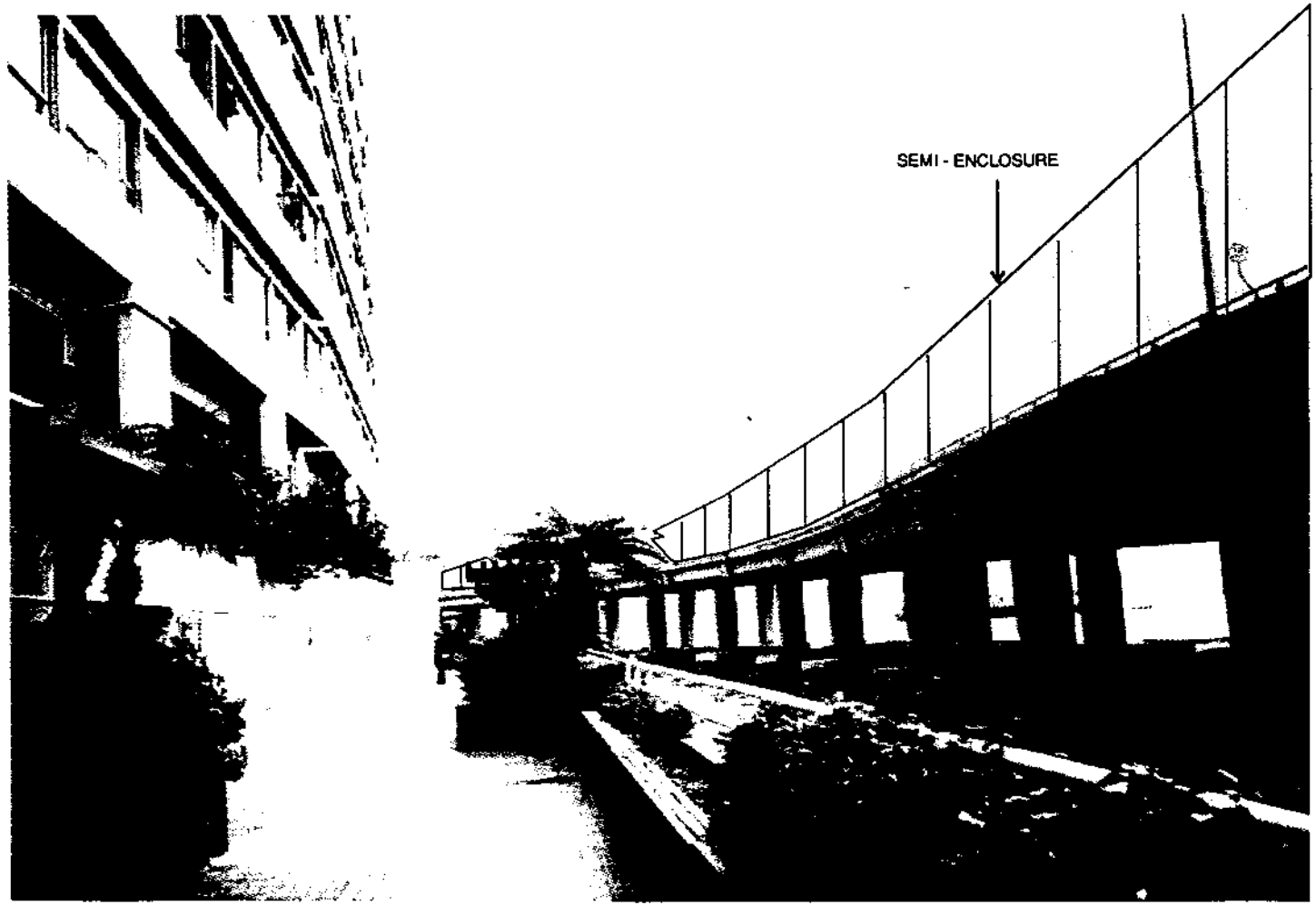

FIGURE 6.1a - DIRECT TECHNICAL REMEDIES PROPOSED ON FLYOVER H26 - IEC (PROVIDENT CENTRE)

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

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FIGURE 6.1b - DIRECT TECHNICAL REMEDIES PROPOSED ON FLYOVER H34 - IEC (HENG FA CHUEN)

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

FIGURE 6.1c - DIRECT TECHNICAL REMEDIES PROPOSED ON FLYOVER K53 - KWUN TONG BYPASS (LAGUNA CITY)

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon

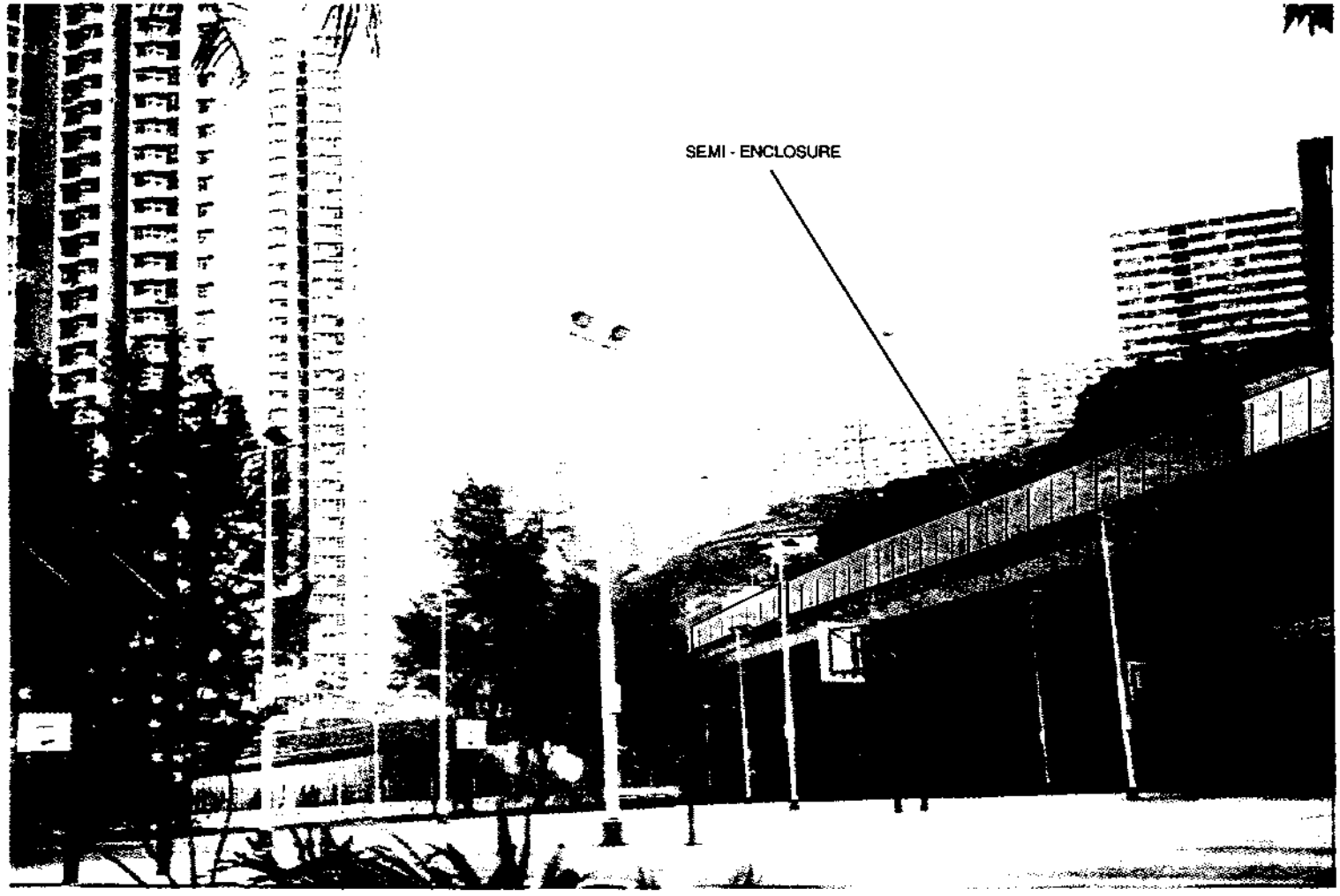


FIGURE 6.1d - DIRECT TECHNICAL REMEDIES PROPOSED ON FLYOVER K56 - TSEUNG KWAN O ROAD (TSUI PING ESTATE (SOUTH))

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

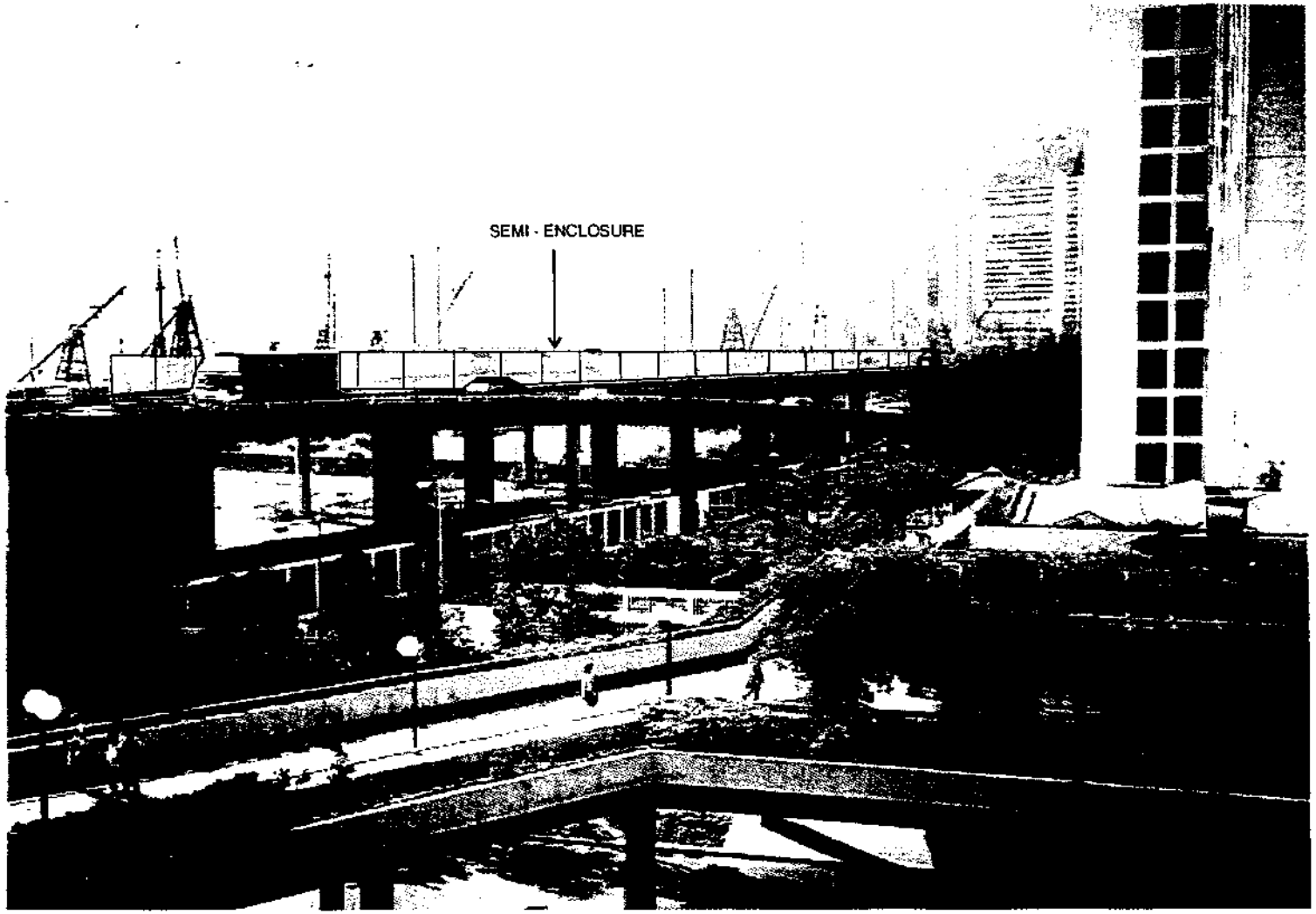


FIGURE 6.1e - DIRECT TECHNICAL REMEDIES PROPOSED ON FLYOVER NT62 - TSUEN WAN ROAD

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

FIGURE 6.1f - DIRECT TECHNICAL REMEDIES PROPOSED ON FLYOVER NT69 - KWAI CHUNG ROAD - KWAI FONG

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

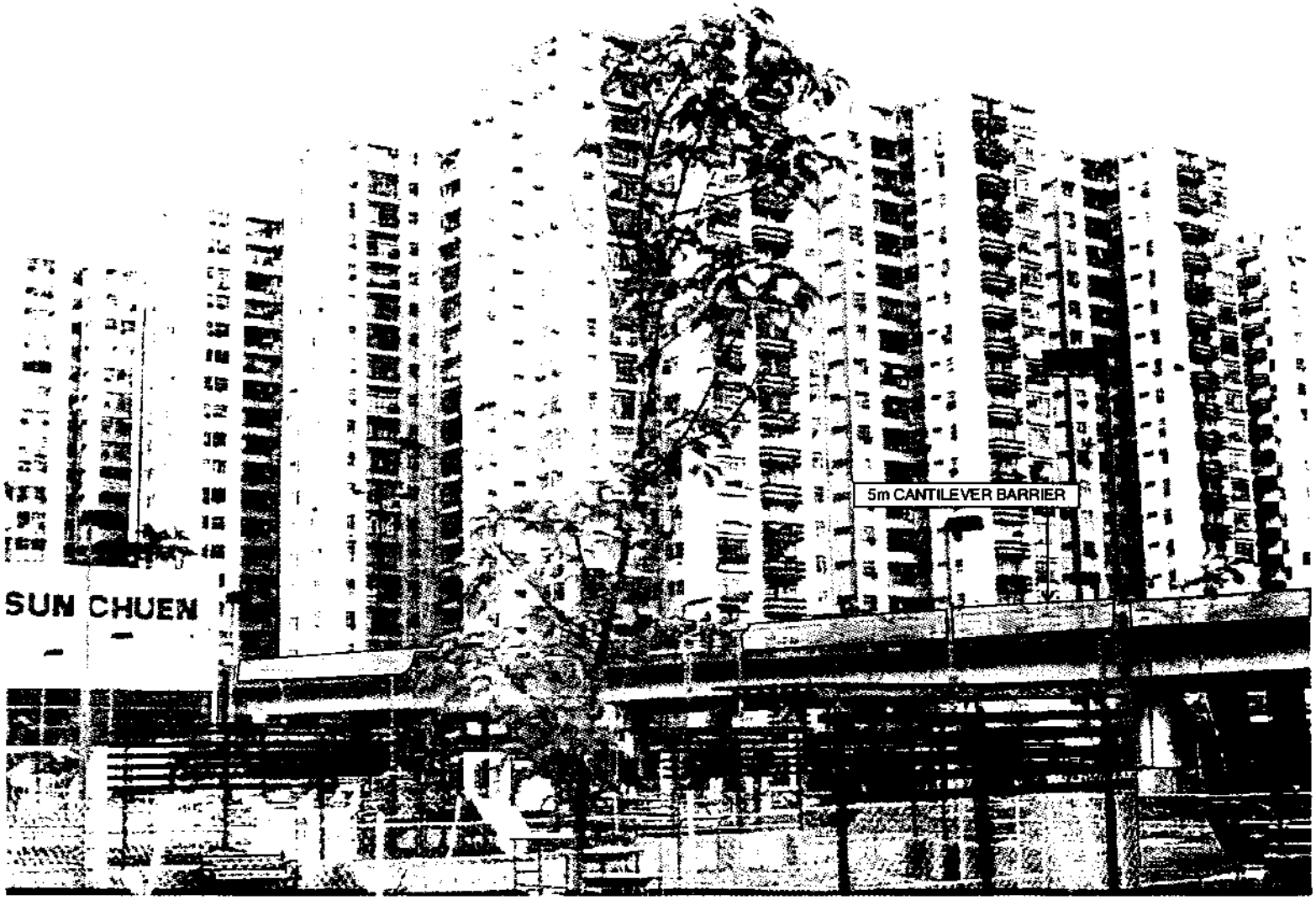


FIGURE 6.1g - DIRECT TECHNICAL REMEDIES PROPOSED ON FLYOVER K2 - KWAI CHUNG ROAD (MEI FOO SUN CHUEN)

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

FIGURE 6.1h - DIRECT TECHNICAL REMEDIES PROPOSED ON FLYOVER K4 - WEST KOWLOON CORRIDOR

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

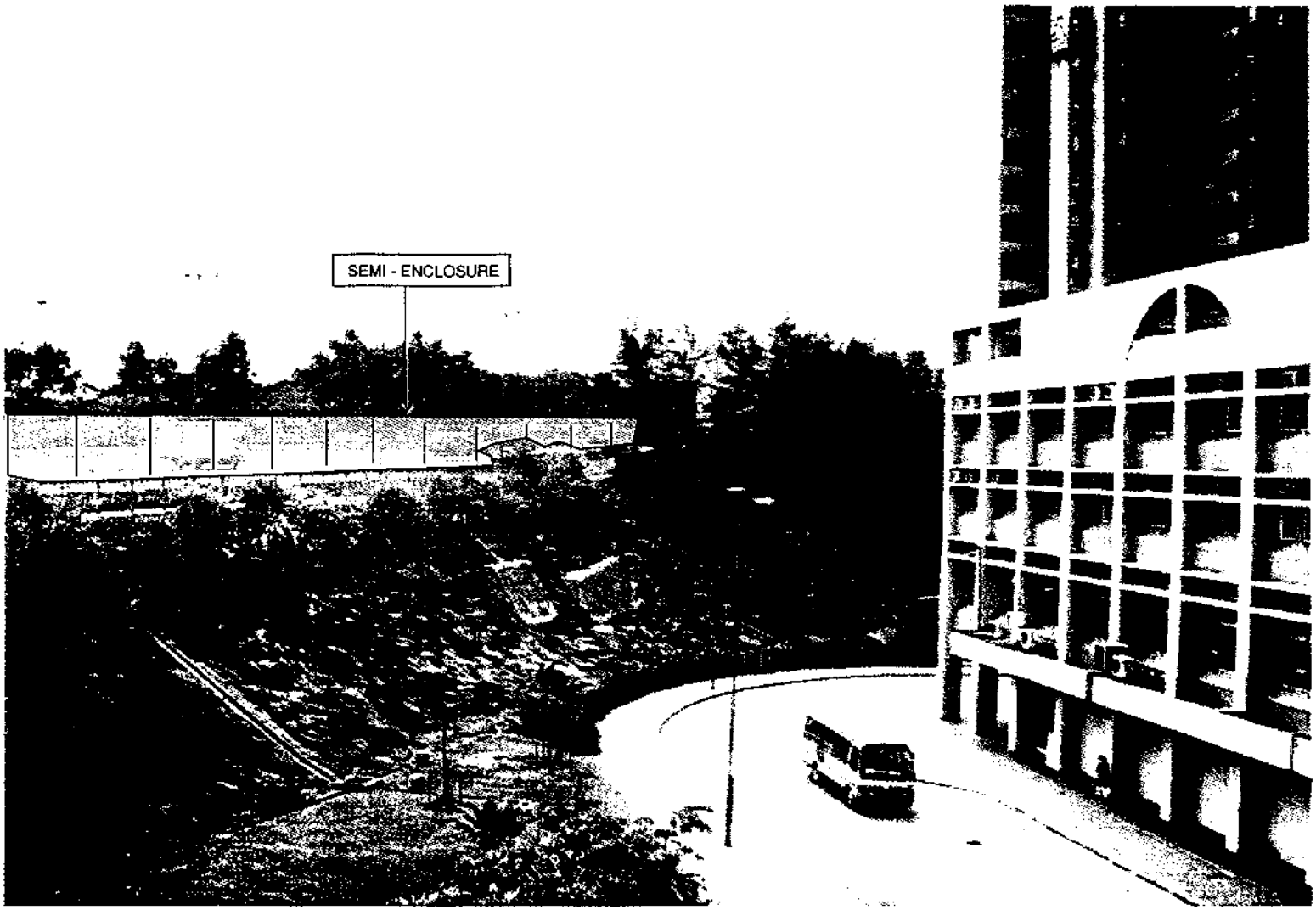


FIGURE6.1i - DIRECT TECHNICAL REMEDIES PROPOSED ON FLYOVER NT 71 - TSING TSUEN ROAD

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

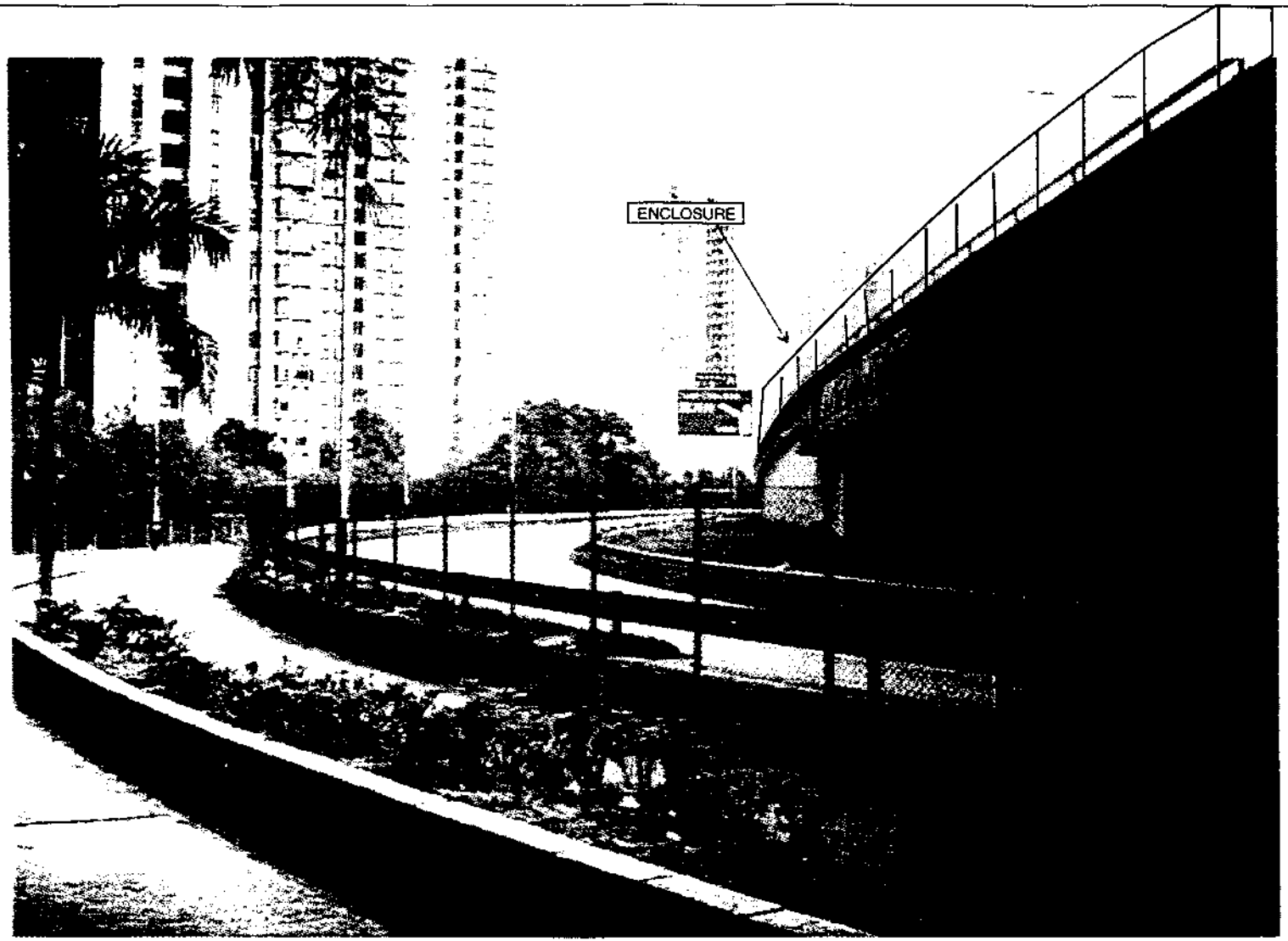


FIGURE 6.1j - DIRECT TECHNICAL REMEDIES PROPOSED ON FLYOVER NT25 - SHA TIN ROAD

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

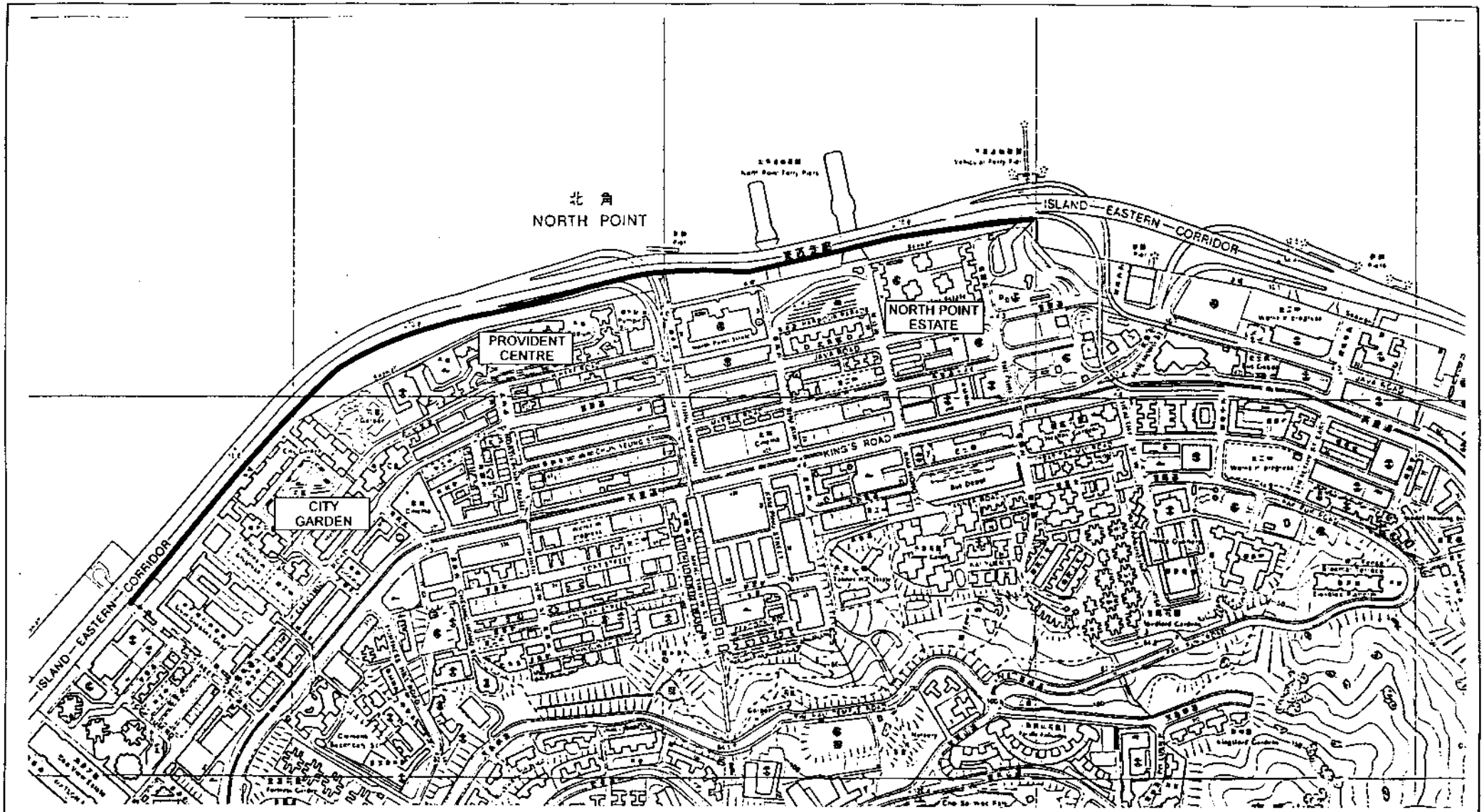


FIGURE 6.1k - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - H26 IEC (OIL ST TO TIN CHIU ST)

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

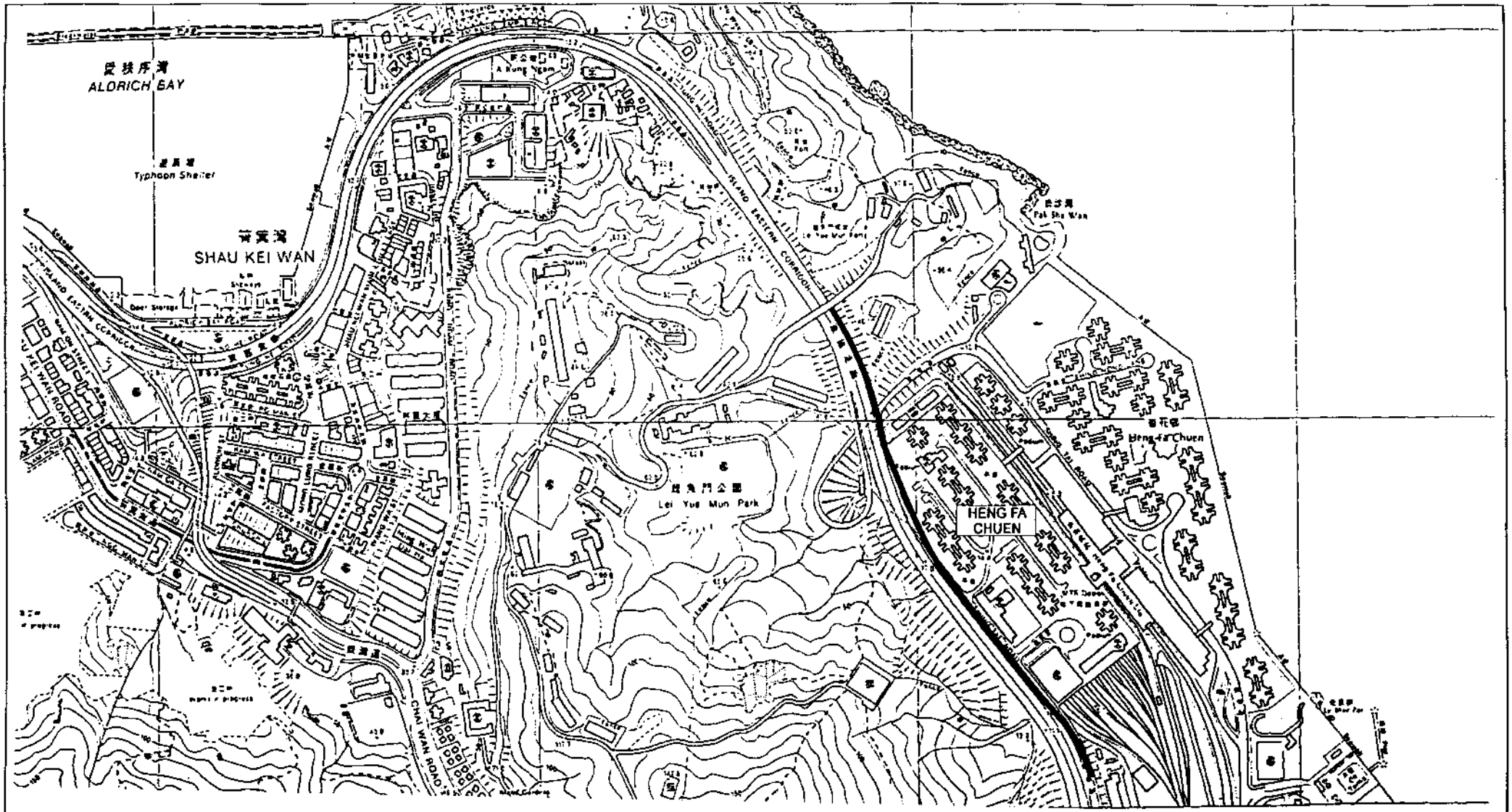
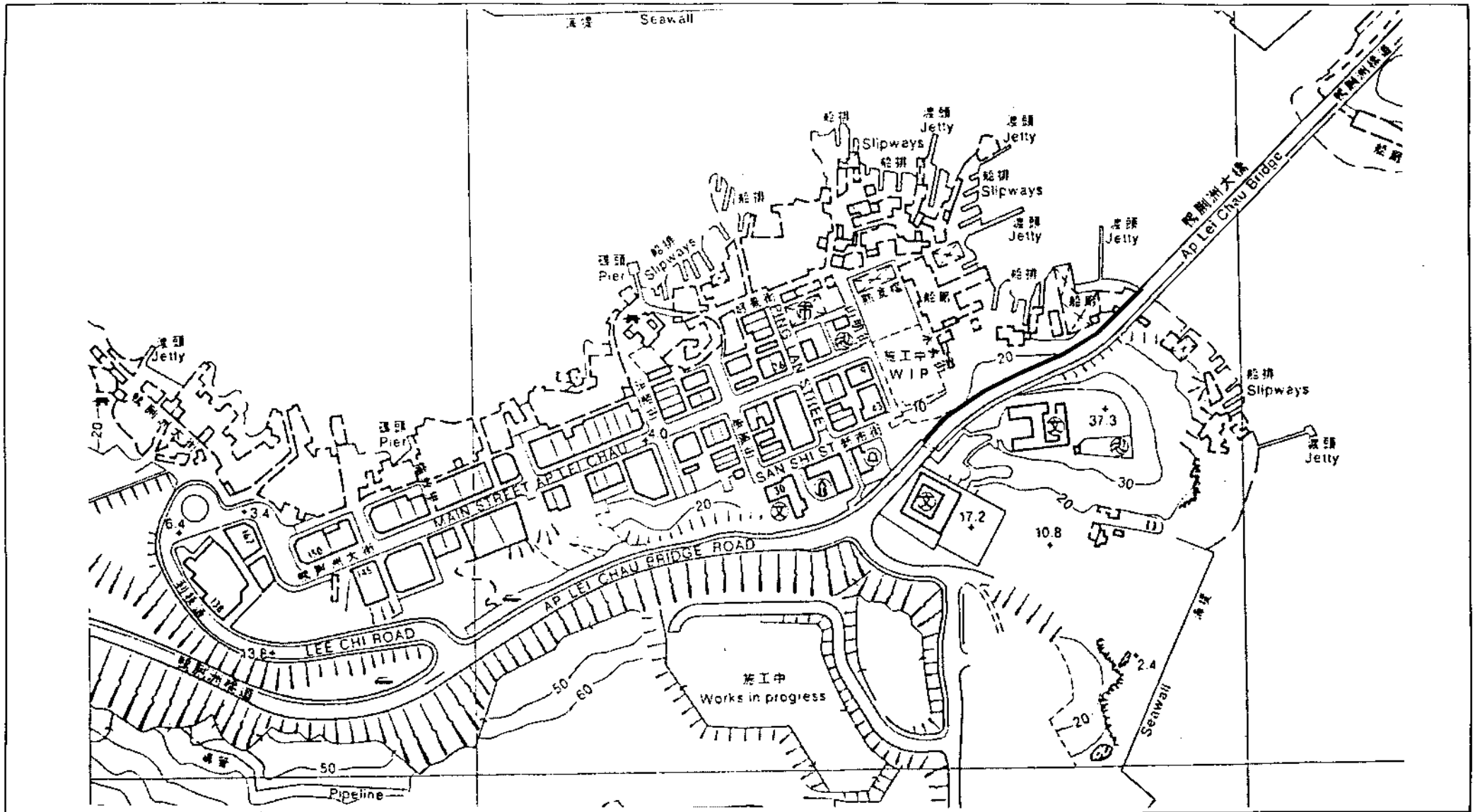


FIGURE 6.11 - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - H34 IEC (HENG FA CHUEN)

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road



KEY

EXTENT OF DIRECT TECHNICAL REMEDIES REQUIRE

FIGURE 6.1m - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - H41 AP LEI CHAU BRIDGE

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

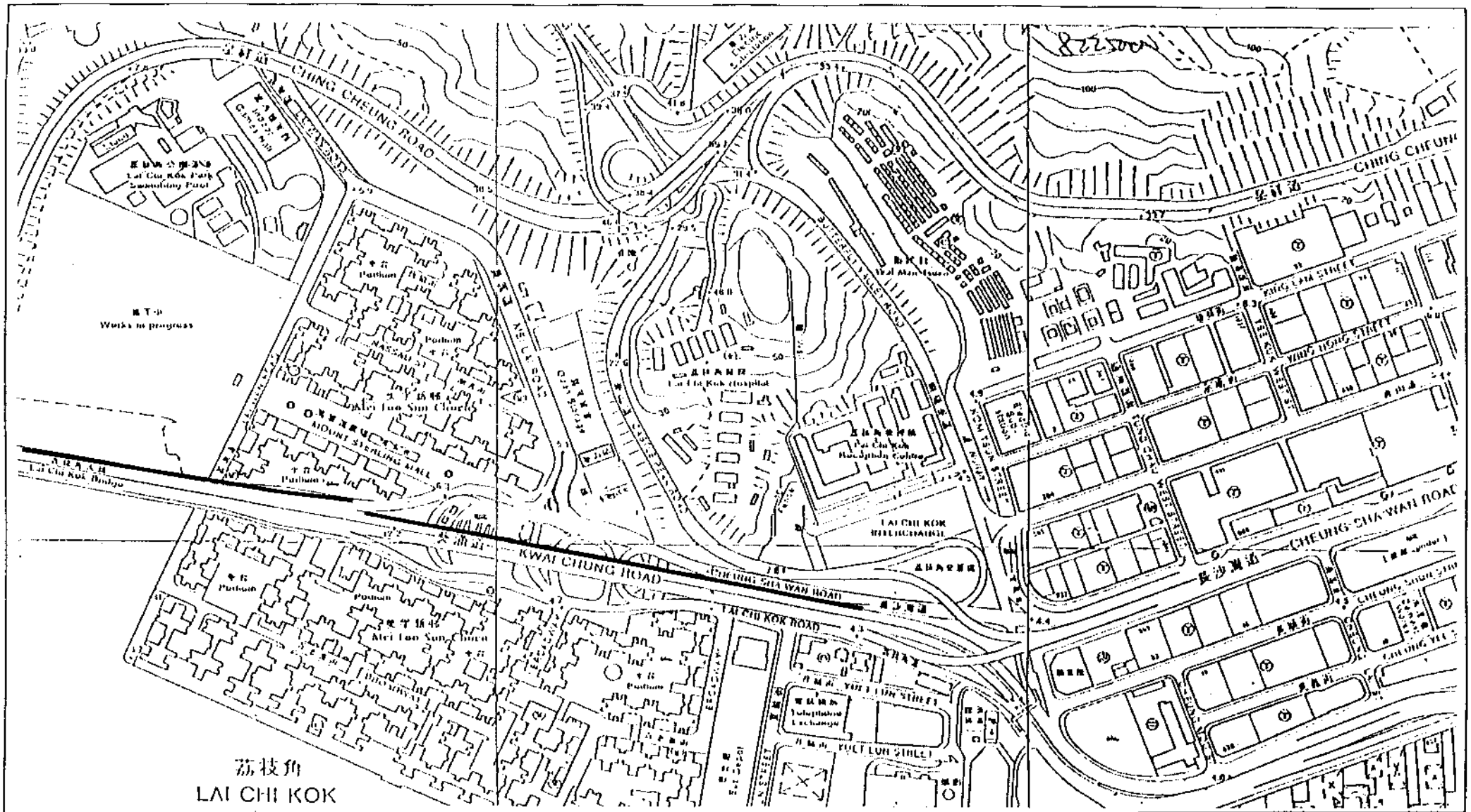
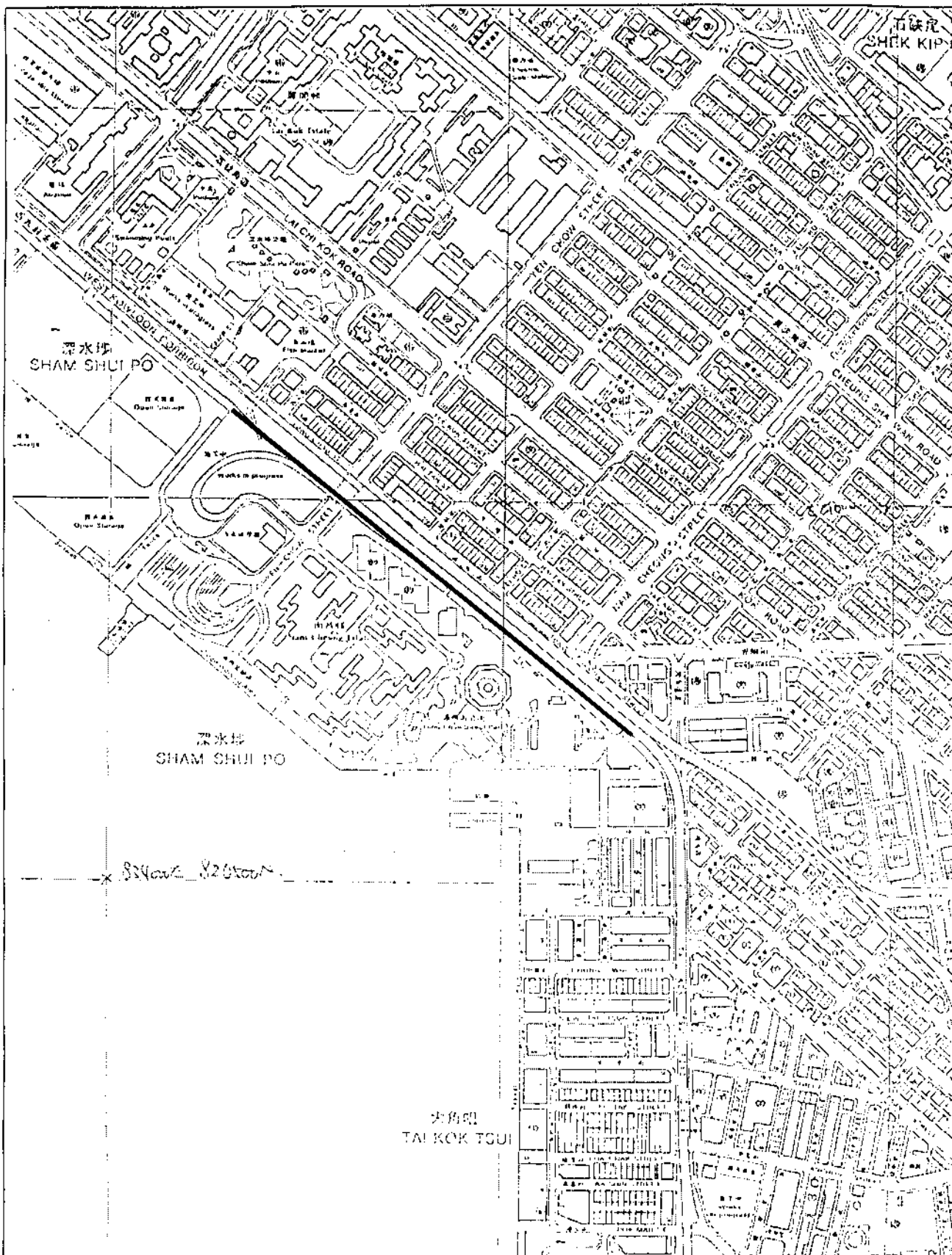


FIGURE 6.1n - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - K2 (KWAI CHUNG ROAD)

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road



KEY

EXTENT OF DIRECT TECHNICAL REMEDIES REQUIRE

FIGURE 6.1o - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - K4 (WEST KOWLOON CORRIDOR)

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

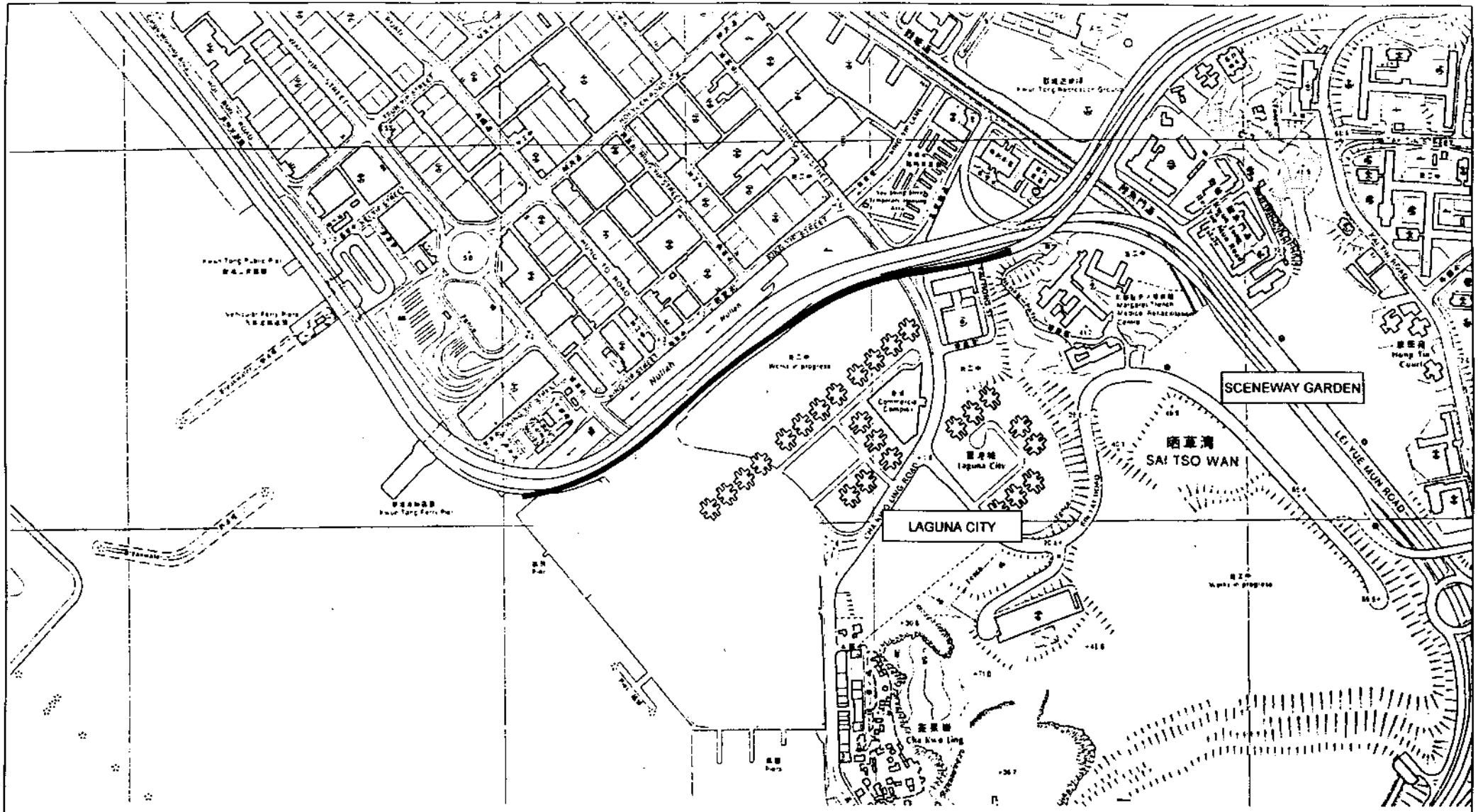


FIGURE 6.1p - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - K53 KWUN TONG BYPASS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

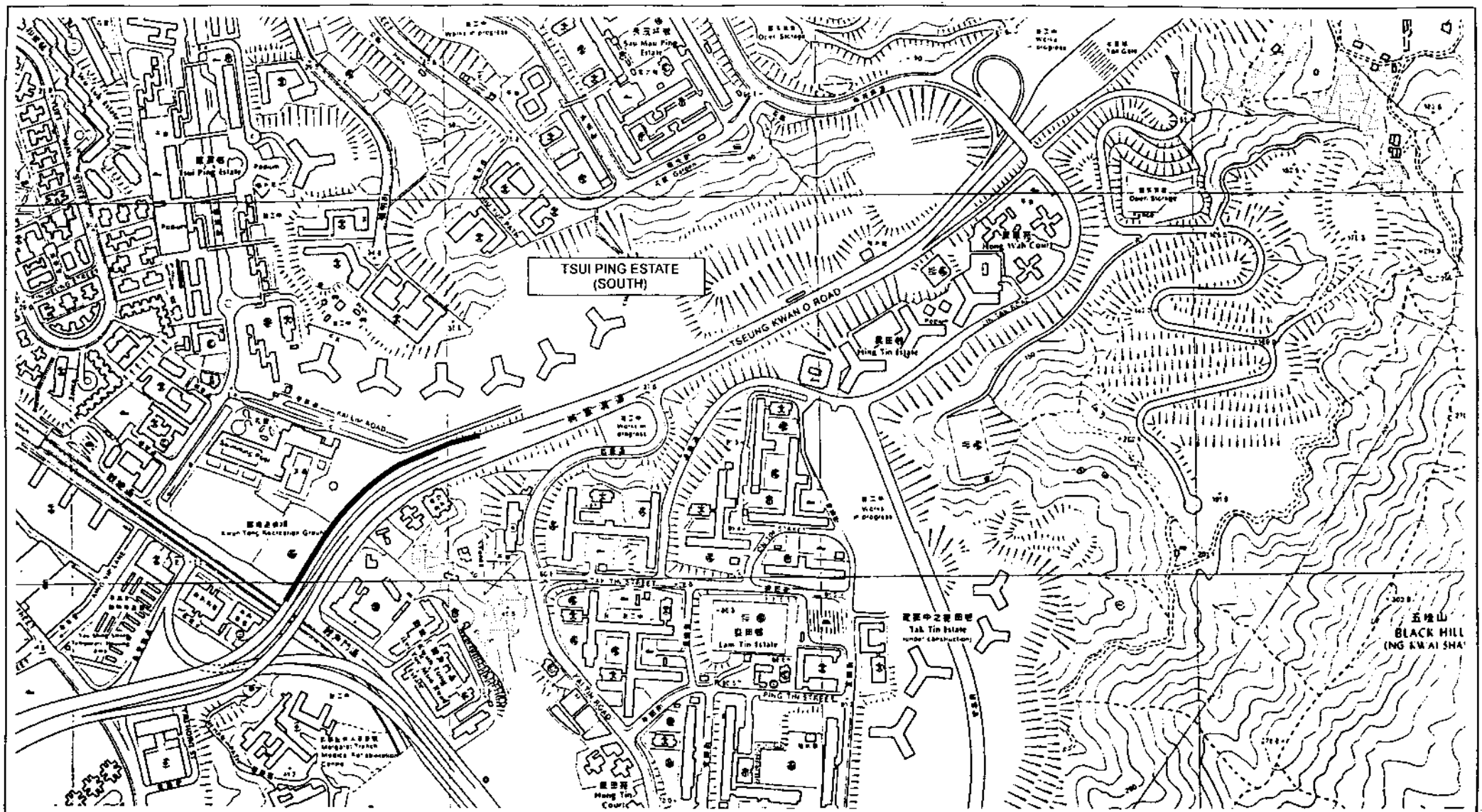


FIGURE 6.1q - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - K56 TSEUNG KWAN O ROAD

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

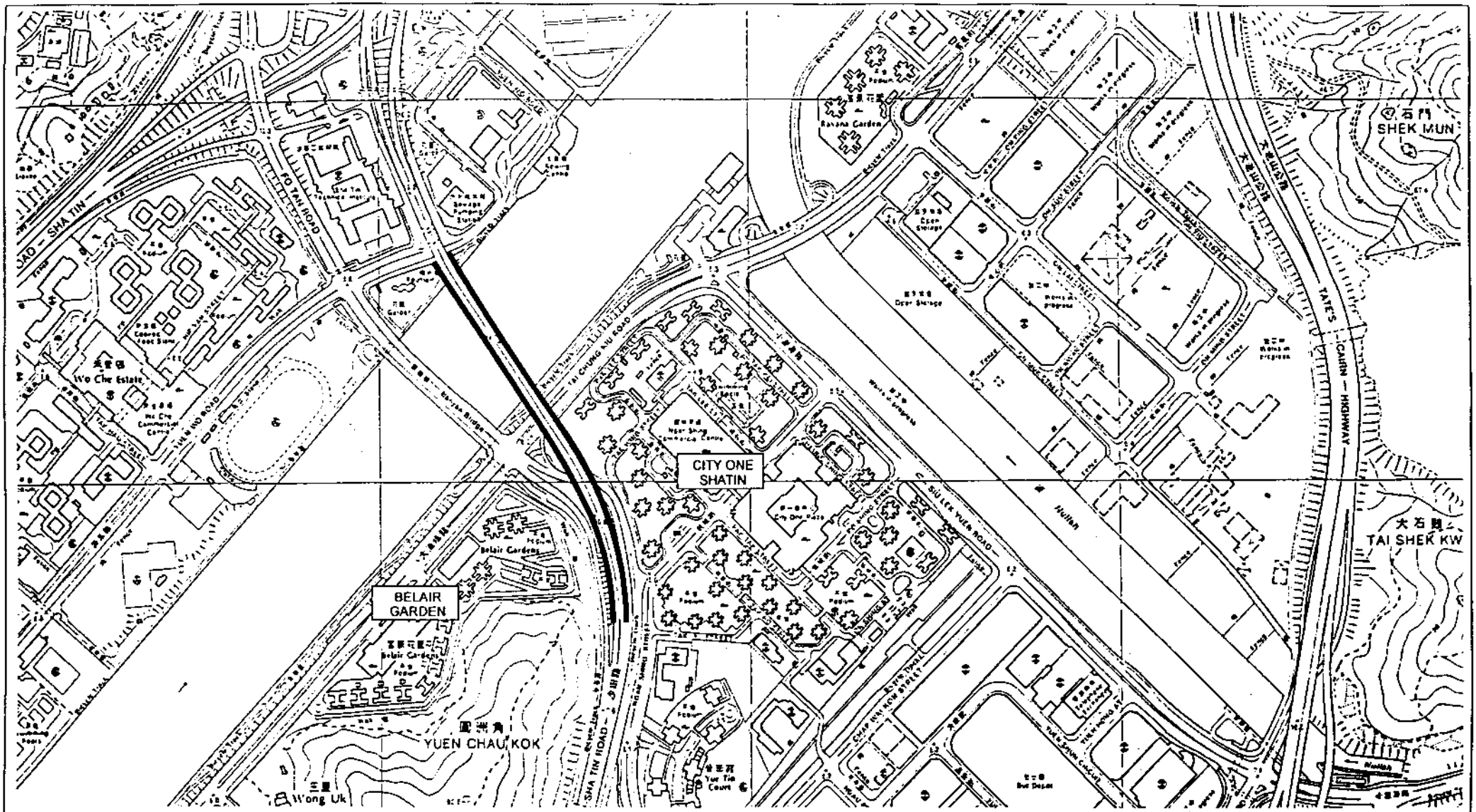
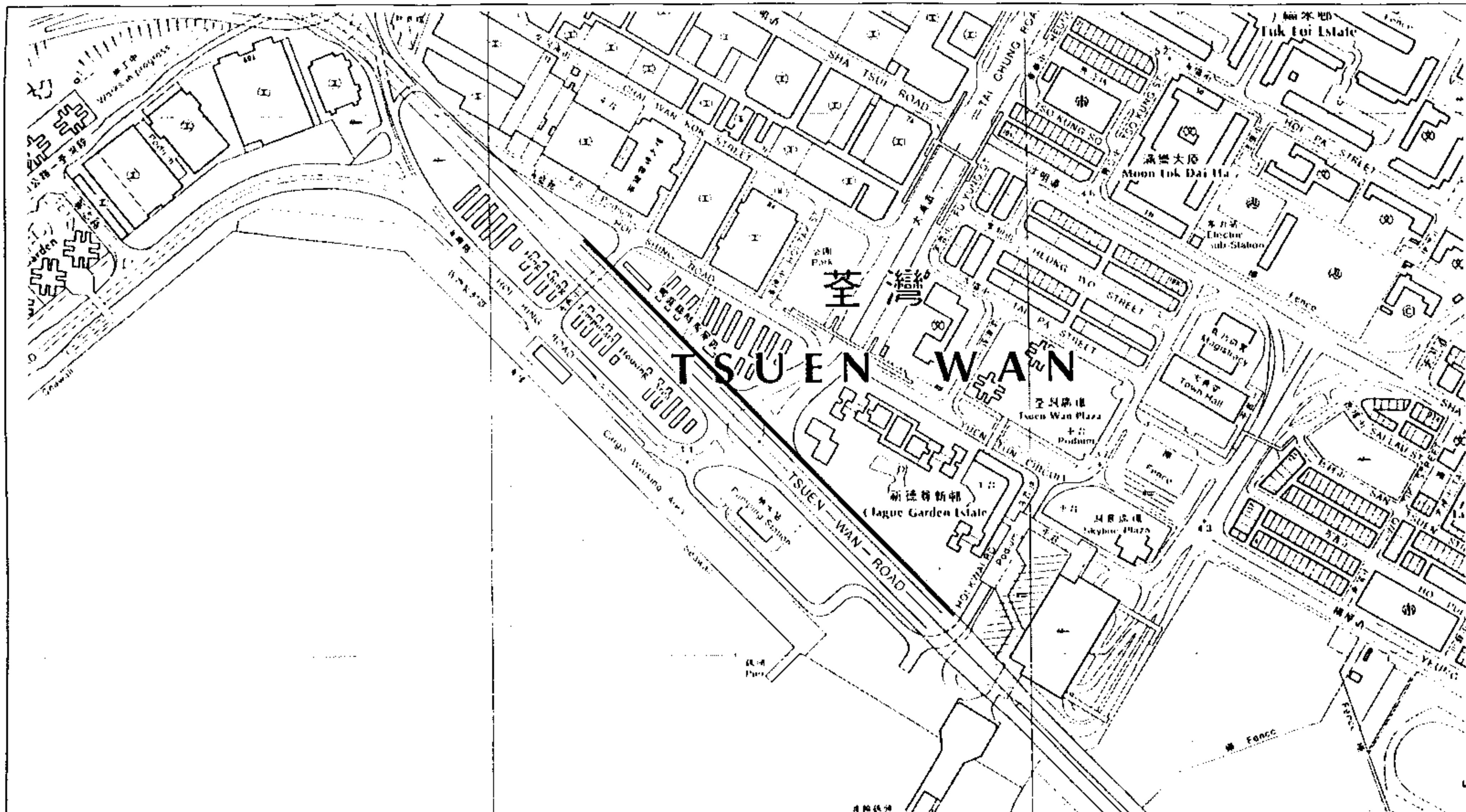


FIGURE 6.1r - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - NT25 SHA TIN ROAD

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road



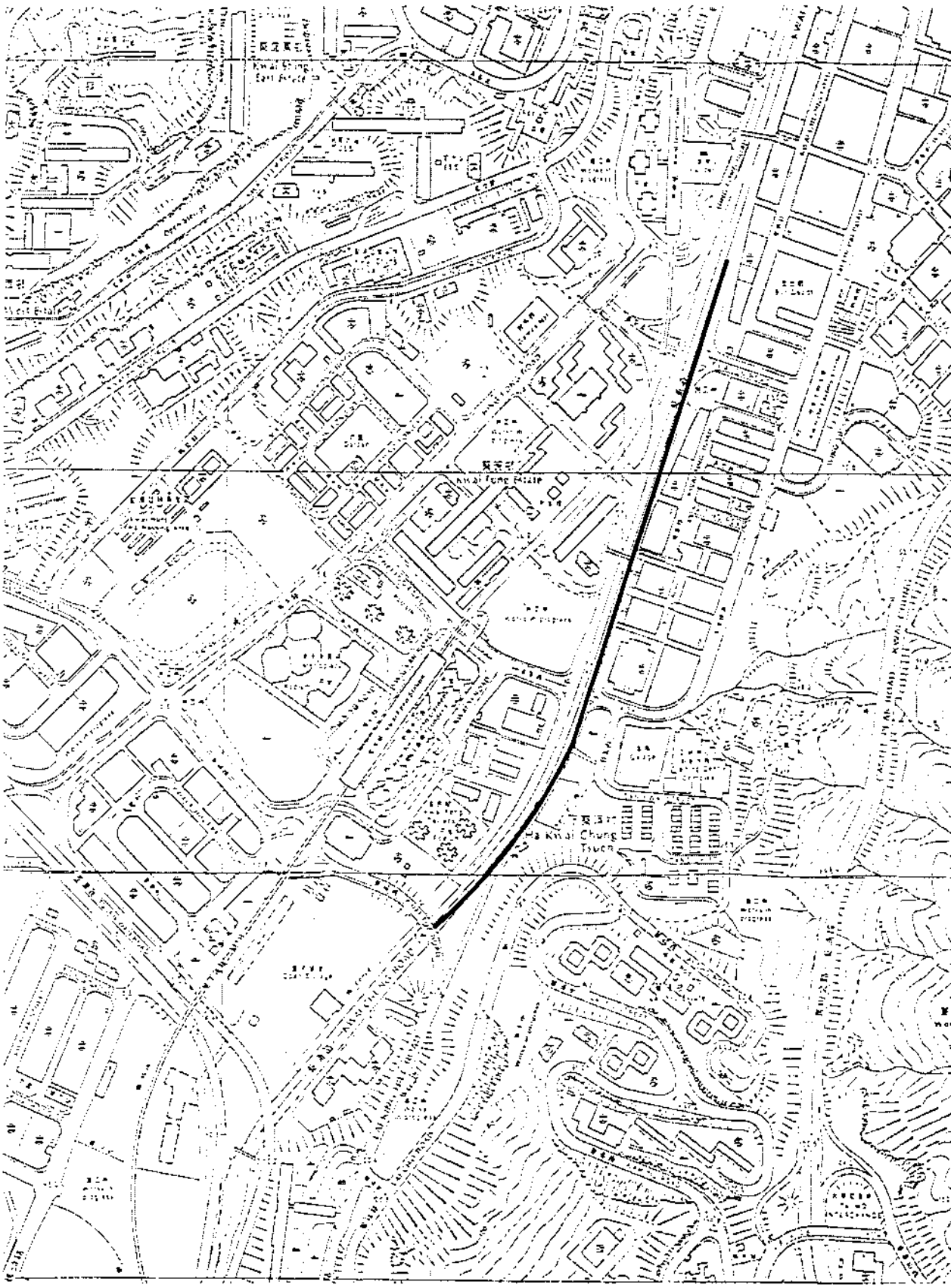
KEY

EXTENT OF DIRECT TECHNICAL REMEDIES REQUIRE

FIGURE 6.1s - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - NT62 (TSUEN WAN ROAD)

ERM-Hong Kong, Ltd

6th Floor
Hecny Tower
9 Chatham Road



KEY

EXTENT OF DIRECT TECHNICAL REMEDIES REQUIRE

FIGURE 6.1t - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - NT69 (KWAI CHUNG ROAD)

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

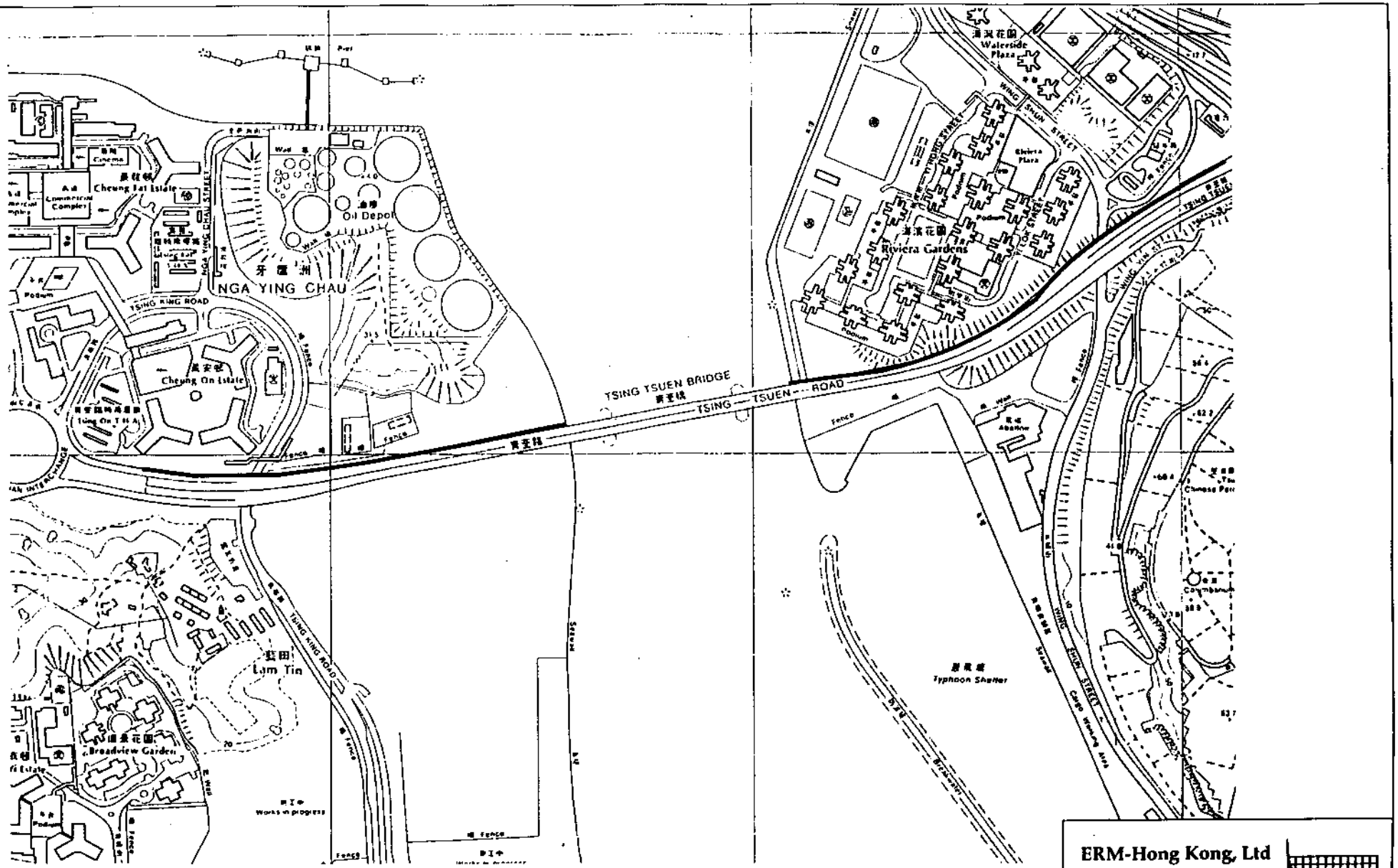


FIGURE 6.1u - CONCEPTUAL ARRANGMENT OF NOISE MITIGATION MEASURES - NT 71 TSING TSUEN ROAD

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road

7.1 PRIORITISED LIST OF FLYOVERS

The noise benefits of each types of direct technical remedies have been assessed for the shortlisted flyovers in *Section 6*. However, in some cases the HKPSG standards are not expected to be satisfied. The number of dwellings benefited has been calculated to give a clear indication of the most effective candidates. Site survey has been carried out for each of the shortlisted flyovers to estimate the number of dwellings benefited from each type of direct technical remedies.

The noise reduction effectiveness of each direct technical remedy has been estimated based on the noise reduction at receivers. The cost of the direct technical remedies has been based on data from previous EIA studies, *Reclamation and Servicing of Tuen Mun Area 38 for Special Industries - Improvement to Roads and Junctions within Tuen Mun Environmental Impact Assessment*, carried out by ERM. The unit costs are presented in *Table 7.1a*, the evaluation of cost are shown in *Annex E*. However, a detailed cost estimate on the noise mitigation measures is recommended in the Stage 2 Study.

Table 7.1a *Unit Costs for Direct Technical Remedies*

Type	Description	Cost/linear meter (HK$/meter)
3m High Noise Barriers	"Plexiglass" screen R C Plinth Steelwork	173,479.00
5m High Cantilever Noise Barriers	"Plexiglass" screen R C Plinth Steelwork	187,075.00
Semi-enclosure	"Plexiglass" sheet Steel Reinforcement	224,188.00
Full-enclosure	"Plexiglass" sheet Steel Reinforcement	224,820.00

Note : 15 percent for Preliminary & General Items have been included in the cost estimation.

To prioritise the shortlisted flyovers candidates, a cost-effectiveness factor C has been used, where C is define as:

$$C = \frac{Number\ of\ dwellings\ protected\ x\ dB(A)\ Noise\ reduction}{Cost\ of\ implementation}$$

Assuming the cost of implementation remains constant for the same category of direct technical remedies, a higher value of C would represent a more effective solution in terms of noise protection provided for more dwellings and larger degree of noise reduction. Using the C values, the types of direct technical remedies recommended for each flyover and the prioritized list of implementation have been selected. *Table 7.1b* presents the prioritized list. Details of the calculations are shown in *Annex F*.

Table 7.1b ***Prioritization of Direct Technical Remedies***

Priority	Flyover		Direct Technical Remedies Recommended	Cost Effective Factor (C)	Cost Implementation (HK$) in million
1	NT71	Tsing Tuen Road - near Riviera Gardens & Cheung On Estate	semi-enclosure	114.4	224
2	K2	Kwai Chung Road - near Mei Foo Sun Chuen	5 m cantilevered barrier	76.5	122
3	K4	West Kowloon Corridor - between Willow Street & Tong Mi Road	3 m barrier	70.4	130
4	NT62	Tsuen Wan Road - near Clague Garden Estate	semi-enclosure	69.9	95
5	K53	Kwun Tong Bypass - near Laguna City	5 m cantilevered barrier	69.3	131
6	NT25	Sha Tin Road - near City One Garden	enclosure	62.8	112
7	H26	IEC - Oil Street to Tin Chiu Street	semi-enclosure	61.5	336
8	H34	IEC - near Heng Fa Chuen	semi-enclosure	58.0	90
9	K56	Tseung Kwan O Road - near Tsui Ping South Estate	semi-enclosure	54.5	81
10	NT69	Kwai Chung Road - near Kwai Fong Estate	semi-enclosure	36.7	224
11	H41	Ap Lei Chau Bridge	3 m barrier	8.0	30

7.2 *Requirements for Further Studies*

A progressively extensive set of direct technical remedies for the affected NSRs have been investigated for eleven short-listed candidate flyovers. On the basis of the above cost-effectiveness analysis, semi-enclosure are recommended for H26, H34, K56, NT25, NT62, NT69 and NT71, 5 m high cantilever barrier for K2 and K53, and 3 m high barrier for H41 and K4.

Apart from considering the concerns of various Government Departments, it is recommended that further considerations (other than discussed in *Section 4.2*)

should be given to air quality and ventilation, public and traffic disruption, loss of sunlight, visual impact, maintenance and structural impacts during the detailed engineering design of direct technical remedies in the Stage 2 Study. The following constraints need to be further considered in providing direct technical remedies on the structures of existing flyovers :

(i) Air quality

The air quality for lower floor residents of buildings adjacent to a flyover with a noise barrier or enclosure need to be examined.

(ii) Loss of road space

The independent support for direct technical remedies structures will occupy road space at ground level thereby reducing traffic lanes and affecting road capacities.

(iii) Traffic disruption

For road safety, the construction and subsequent recurrent maintenance and cleansing of noise barriers and enclosure would necessitate lane closures and affect traffic flow. The recurrent maintenance and cleansing of the soffit of an enclosure would necessitate the closure of the carriageway.

(iv) Loss of sunlight

Loss of sunlight to lower floor residents of buildings adjoining the direct technical remedies.

(v) Visual impact

The overall appearance of the flyover. Advice may have to be sought from the Advisory Committee on the Appearance of Bridges and Associates Structures (ACABAS).

(vi) Maintenance

Availability of replacement parts for proprietary noise mitigating products.

(vii) Structural impact

Structure loading on the direct technical remedies structures.

A total of 188 flyovers have been identified in the entire Hong Kong Territory for this scoping study and have been reviewed using a multi-factor coarse screening process. Taking into account the location of flyovers, government constraints, special requirements and at-grade road traffic, 11 flyovers were shortlisted and recommended for the detailed noise assessment.

The effectiveness of direct technical remedies such as 3m noise barriers, 5m cantilevered barrier, semi-enclosure and full enclosure has been assessed using the traffic noise model. The cost-effectiveness of each direct technical remedies has been elevated based on the noise reduction at the nearest NSRs. A cost effectiveness factor C has been used to prioritise the types of direct technical remedies recommended for each flyover and the prioritized list of implementation. Assuming the cost of implementation remains constant for the same category of direct technical remedies, a higher value of C would represent a more effective solution in terms of noise protection for more dwellings and larger degree of noise reduction.

Annex A

List of Flyovers

	Flyover Name	Flyover Description	Residential Potentially Affected	Reason for excluding	Detailed Assessment Requirement
H1	Hill Rd.	Pok Fu Lam Rd to Connaught Rd W	Hill View Garden & Res/Com Bldgs along Hill Road	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m. + Sight line is less than 70 m for the curved road with a speed limit of 50 kph	No
H2	Bonham Rd.	near HKU	Res/Com bldgs along Bonham Rd.	The distance bet the kerbline and the surface of a noise barrier on a flyover less than 0.46m	No
H3	Conduit Road	to Robinson Rd, near Woodland Garden	Wooland Garden	Sight line is less than 70 m for the curved road with a speed limit of 50 kph	No
H4	Robinson Rd.	next to Canossa Hospital	The Albany, Robinson Garden & Regal Crest	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m. + Sight line is less than 70 m for the curved road with a speed limit of 50 kph	No
H5	Robinson Rd	over Magazine Gap Rd.	Robinson Garden Apartment	Not effective (due to traffic on at grade Robinson Rd)	No
H6	West Connaught Rd.	Gilman St. to Sutherland St.	Res/Com Bldgs along the road	Mainly Commercial Building	No
H7	Pier Rd.	opposite to Hang Seng Bank HQ	Nil	CBD	No
H8	Upper Albert Rd.	over Albany Rd.	Shue Fuk Building	Not effective (due to traffic on at grade Glenealy Rd)	No
H9	Cotton Tree Drive	near St. Joseph's College	Kennedy Heights	Not effective (due to traffic on at grade Kennedy Rd)	No
H10	Harcourt Rd.	Bank of americal tower to admiralty center	Nil	CBD	No
H11	Garden Rd.	Fairmont House to bank of china tower	Nil	CBD	No

H12	Justice Rd.	Harcourt garden to Marriott hotel	Nil	EIA will be conducted	No
H13	Fenwick Pier St.	near Academy for Performing Arts	Nil	EIA will be conducted	No
H14	Arsenal St	connect to Gloucestor Rd.	Nil	No NSR around	No
H15	Fleming Rd.	between Gloucester Rd. and Jaffe Rd.	Res/Com bldgs along Fleming Rd.	The distance bet the kerbline and the surface of a noise barrier on a flyover less than 0.46m	No
H16	Canal Road	over Morrision Hill Road	One residential block	Not effective (due to traffic on at grade Morrison Hill Road)	No
H17	Canal Road	Above Canal Road E	Res/Com bldg along the road	Fire Fighting at the nearby building from both at grade and flyover is required	No
H18	Canal Road	above Canal Road W	Res/Com bldg along the road	Fire Fighting at the nearby building from both at grade and flyover is required	No
H19	Wong Nai Chung Rd.	adjacent to Happy Valley	Nil	No NSR around	No
H20	Tonnochy Rd.	next to Wan Chai sports ground	Nil	No NSR around	No
H21	Marsh Rd.	next to Wan Chai sports ground	Res/Com bldg along the Marsh Rd.	Fire Fighting at the nearby building from both at grade and flyover is required	No
H22	Gloucester Rd.	turning from Victoria Road to Causeway Bay	Wan King House	Not effective due to traffic on at grade Causeway Road	No
H23	Gloucester Rd	near Moreton Terr	Residential along Causeway Road	Not effective due to traffic on at grade Causeway Road	No
H24	Tsing Fung Street	King's Rd to Victoria Park Rd.	Res/Com along Tsing Fung Street	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m. + Fire Fighting at the nearby building from both at grade and flyover is required	No
H25	IEC	Victoria Park Road to Oil Street	Harbour Height, City Garden	EIA will be conducted	No

H26	IEC	Oil Street to Tin Chui Street	City Garden, Prodivent Garden, North Point Estate	N/A	Yes
H27	IEC	Branch to King's Rd.	Healthy Garden and Healthy Village	Not effective (due to traffic on King's Road)	No
H28	IEC	Branch to Java Rd.	Nil	EIA will be conducted	No
H29	IEC	Taikoo Shing to Hing Man St.	along IEC from Taikoo Shing to Hing Man St.	EIA will be conducted	No
H30	IEC	Tai On St. to Hoi Keung St.	Felicity Garden	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m.	No
H31	IEC	Branch to Nam On Street	Private Residential	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m.	No
H32	IEC	Branch to Chai Wan Road	Private Residential	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m.	No
H33	IEC	Tung Hei Road to A Kung Ngam Village Road	Private Residential	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m.	No
H34	IEC	Heng Fa Chuen	Heng Fa Chuen	N/A	Yes
H35	Shun Tai Rd.	Chai Wan	Tsui Wan Est., Hospital staff Quarter	Sight line is less than 70 m for the curved road with a speed limit of 50 kph	No
H36	Fung Ha Rd.	Eastern Section	Fung Wai Estate	EIA conducted	No
H37	Aberdeen Main Rd	Aberdeen Main Rd. to Aberdeen Praya Rd.	Res/Com Bldgs along Aberdeen Main Road	Not effective (due to at grade Aberdeen Main Rd)	No
H38	Wong Chuk Hang Rd.	near HK School of Motoring	Wong Chuk Hang San Wai	Noise level from flyover below 70 dB(A)	No

H39	Nam Fung Rd & Wong Chuk Hang Rd Junction		Nil	No NSR around	No
H40	Ocean Park Rd	Ocean Park Rd to Wong Chuk Hang Rd.	Nil	No NSR around	No
H41	Ap Lei Chau Bridge		Residential buildings on Ap Lei Chau	N/A	Yes
H42	Hung Hing Road		Nil	No NSR around	No
H43	Stubbs Rd	over Wong Ngan Chung Road	private residential	Not effective due to traffic on at grade Wong Nai Chung Road	No
H44	Tin Wan Praya Rd.	over Aberdeen Praya Rd.	Nil	No NSR around	No
H45	Repulse Bay Rd.	adjacent to Eucliff and above South Bay Rd	The Repulse Bay and Residentials nearby	Not effective (due to traffic on at grade Repulse Bay Rd)	No
H46a	Chi Fu Road	Pok Fu Lam Rd to Chi Fu Rd	Chi Fu Fa Yuen	Noise level from flyover below 70 dB(A)	No
H46b	Chi Fu Road	Chi Fu Rd to Pok Fu Lam Rd	Chi Fu Fa Yuen	Noise level from flyover below 70 dB(A)	No
H47	Western Park Road	Sai Ying Pun		No NSR around	No

	Flyover Name	Flyover Description	Residential Potentially Affected	Reason for excluding	Detailed Assessment Requirement
K1a	Ching Cheung Road	near Mei Foo Sun Cheun	Mei Foo Sun Chuen	EIA conducted	No
K1b	Ching Cheung Road	near So Uk Estate	Prince Margaret Hospital Quarter	EIA conducted	No
K2	Kwai Chung Road		Mei Foo Sun Chuen	N/A	Yes
K3	West Kowloon Corridor	near Lai Chi Kok THA	Lai Chi Kok THA	Low-rise nature of the NSR in the shadow zone of the flyover	No
K4	West Kowloon Corridor	between Tonkin St & Willow St (nr Nam Cheong Estate)	Nam Cheong Estate	N/A	Yes
K5	West Kowloon Corridor	Tai Kok Tsui Rd. to Cherry St.	Residential along Tai Kok Tsui Rd	Fire fighting at the nearby building from both at grade road and flyover is required	No
K6	Lung Cheung Road	near Chak On Estate	Chak On Estate	EIA conducted	No
K7a	Lung Cheung Road	near Beacon Heights	Beacon Heights Blk.19	EIA conducted	No
K7b	Lung Cheung Road	near Choi Hung Estate	Choi Hung Estate	EIA conducted	No
K8	Lung Ping Road	near Beacon Heights	Beacon Heights	Not effective (due to traffic on at grade Lung Cheung Rd)	No
K9	Waterloo Road	between Ede Rd and Suffolk Rd	low to medium rise	Not effective due to the traffic on at grade Waterloo Road and low-rise nature of the NSR	No
K10	Waterloo Road	over Prince Edward Rd	Helena Garden	Not effective due to the traffic on at grade Waterloo Road	No
K11	Waterloo Road	over Argyle Street	Residential along Waterloo Rd	The distance between the kerbline and the surface of a noise barrier on a flyover less than 0.46 m	No

K12a	Prince Edward Rd. West	Lai Chi Kok Rd - Yuen Ngan St	Resid/commec. along Prince Edward W and Lai Chi Kok Rd Junction	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m	No
K12b	Prince Edward Rd. West	Prince Edward Rd. West	Resid/commec. along Prince Edward W and Lai Chi Kok Rd Junction	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m	No
K13	Boundary Street	Maple St. - Sai Yee St.	Resid/commec. along J. of Cheung Sha Wan Rd and Boundary St	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m	No
K14	Boundary Street	College Rd - up to Prince Rd W	Resid bet. College Rd and Gramplan RD	Not effective (due to traffic on at grade Boundary Street and Prince Edward Rd West)	No
K15	Argyle Street	On top of Argyle Street	Mandarin Court, Nam's Buildings	The distance between the kerbline and the surface of a noise barrier on a flyover less than 0.46 m	No
K16	Argyle St	near Olympic Park	Chun Seen Mai Chuen	Not effective (due to traffic on at grade Argyle St)	No
K17	Gascogne Road	to Ferry Street	building along	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m	No
K18	Chatham Road South	Beneath Wylie Court	Wylie Court	Not effective due to traffic on Hong Chong Road	No
K19	Canton Road	near Kowloon Park	Nil	No NSR around	No
K20	Kowloon Park Drive		Nil	No NSR around	No
K21	Cheong Wan Road	Kowloon Station	Nil	No NSR around	No

K22	East Kowloon Corridor	above Chatham Rd and Kowloon City Rd	High density Resid along EKC	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m + Fire frighting at the nearby building from both at grade and flyover is required	No
K23	San Ma Tau St.	To Vehicular Ferry Pier	Wyler Garden	Sight line is less than 70 m for junctions or a curved section with a speed limit of 50 kph	No
K24	Fat Kwong Street	above Man Yue St.	Ka Wai Chuen	A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m	No
K25	Pui Ching Road	to Fat Kwong St	Nil	No NSR around	No
K26	Dyer Ave		Hung Hom Estate	Not effective (due to traffic on at grade Dyer Avenue and Hung Hom Road)	No
K27	Princess Margaret Road	to Waterloo Road over Argyle Street	Nearby Building	The distance between the kerbline and the surface of a noise barrier on a flyover less than 0.46 m	No
K28	Hong Chong Rd	over KCRC railway to Hong Chong Rd	Wylie Court	Insufficient space - Over the railway	No
K29	Ma Tau Chung Road	near Olympic	open space	No NSR around	No
K30	Chuk Yuen Road - Lung Yin Road		Tin Ma Court	Not effective (due to traffic on at grade Lung Cheung Rd)	No
K31	Fung Mo Street		Wang Tau Hom Estate	Not effective (due to traffic on at grade Lung Cheung Road and Fung Mo Street)	No

K32	Po Kong Village Road		Lung Poon Court	Not effective (due to traffic on at grade Lung Cheung Rd)	No
K33	Prince Edward Road East	near San Po Kong (to Choi Hung Rd.)	Nil	No NSR found	No
K34	Prince Edward Road East	Choi Hung Estate	Choi Hung Estate	Not effective (due to traffic on at grade Prince Edward Road)	No
K35	Prince Edward Road East	King Hong St. to Concorde Rd.	Nil	No NSR around	No
K36	Tate's Cairn Tunnel Network	Sheung Yuen Leng	Choi Hung Estate	EIA conducted	No
K37	Tate's Cairn Tunnel Network	near Pik Hoi House Choi Hung Est	Choi Hung Estate	Noise Mitigation has been incorporated	No
K38	Tate's Cairn Tunnel Network	near Richland Gardens	Choi Hung Estate	Noise Mitigation has been incorporated	No
K39	Wai Yip St	Access road to Telford Garden	Telford Gardens	Private Access Road	No
K40	Ngau Tau Kok Rd	Kai Cheung Rd to Ngau Tau Kok Rd	Telford Gardens	Over MTRC railway	No
K41	Ngau Tau Kok Rd	near Ngau Tau Kok Upper Estate	Ngau Tau Kok Estate	Not effective due to traffic on Ngau Tau Kok and Kwun Tong Rd	No
K42a	Shun Lee Tsuen Road	near Shun Lee Estate	Shun Lee Estate	Not effective (due to traffic on at grade New Clear Water Bay Rd)	No
K42b	Shun Lee Tsuen Road	near Shun Tin Estate	Shun Tin Estate	Embankment Road	No
K43	Lee On Road		Shun Lee Estate	Not effective (due to traffic on at grade New Clear Water Bay Rd)	No
K44	New Clear Water Bay	Between Choi Wan Est & Shun Lee Est	Shun Lee Estate	No NSR around	No
K45	Ferry Street	over Tong Mei Road	building on both side	Fire fighting at the nearby building from both at grade road and flyover is required + Sight line is less than 70 m for junctions or a curved section with a speed limit of 50 kph	No
K46	Kai Fuk Road	Kai Fuk Rd to Kwun Tong Rd	Nil	No NSR found	No

K47	Siu Yip St.	from Telford Garden to Tai Yip St.	Telford Garden	Insufficient space	No
K48	Kwun Tong Road	Kai Tai Court	Kai Yiu THA, Kai Yip Est., Kai Tai Court & Kai Wo THA	Not effective (due to traffic on at grade Kwun Tong Rd)	No
K49	Kai Cheung Road	near International Trademart	Nil (section near Telford is regard as Ngau Tau Kok Rd)	No NSR around	No
K50	Kwun Tong Bypass	near Richland Gardens	Richland Gardens	Enclosure incorporated & EIA conducted	No
K51	Kwun Tong Bypass	above Kai Fuk Road	Nil	No NSR around & EIA conducted	No
K52	Kwun Tong Bypass	along Hoi Bun Road	Nil	No NSR around & EIA conducted	No
K53	Kwun Tong Bypass	near Laguna City	Laguna City	N/A	Yes
K54	Kwun Tong Bypass	parallel to Wang Kwong Rd	Kai Lok THA	Low-rise nature of the NSR in a shadow zone of the flyover	No
K55	Kwun Tong Bypass	connect to Lam Tin Station	Kwun Tong Estate	EIA conducted	No
K56	Tseung Kwan O Road	Tsui Ping South Estate	Tsui Ping South Estate	N/A	Yes
K57	Lin Tak Road		Lam Tin Est	Not effective due to the topography of the flyover	No
K58	Sceneway Road	Sceneway Garden	Sceneway Garden	Private Access Road	No
K59	Lion Rock Tunnel Road	link to Waterloo Rd	Nil	No NSR found	No

	Flyover Name	Flyover Description	Residential Potentially Affected	Reason for excluding	Detailed Assessment Requirement
NT1	Po Shek Wu Rd.	over the KCR railway and join to Choi Yuen Rd.	Nil	No NSR around	No
NT2	Fanling Highway	near Tai Tau Leng and Choi Po Court	Tai Tau Leng	Barrier Installed	No
NT3	Pak Wo Rd	over Fanling Highway and next to Tai Ping Est	Tai Ping Estate	Not effective (due to traffic on Fanling Highway)	No
NT4	So Kwun Po Rd Network	link to Fanling Highway	Venniza Garden	Not effective (due to traffic on Fanling Highway)	No
NT5	Jockey Club Rd	adjacent to Wo Hop Shek	Tin Sam THA	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT6	Tai Po Tai Wo Rd	near Kam Shek San Tsuen	Kam Shek San Tsuen	Embankment road	No
NT7	Po Heung St	over Lam Tsuen River and join Tai Po Tai Wo Rd	Tai Po Centre and private residential	Not effective (due to traffic on Tai Po Tai Wo Road)	No
NT8	Tolo Highway	near Classical Gardens and Ma Wo	Classical Gardens	EIA conducted	No
NT9	Tai Po Rd Yuen Chau Tsai	near Wang Fuk Court and link too Tai Po Rd Tai Po Kau	Wang Fuk Court	Not effective (due to traffic on Tolo Highway)	No
NT10	Tai Po Rd. Yuen Chau Tsai	link to Tolo Highway	Wang Fuk Court	Not effective (due to traffic on Tolo Highway)	No
NT11	Yuen Shan Rd.	join Tolo Highway	Wang Fuk Court	Embankment	No
NT12	University Station	over Tolo Highway and near Sha Tin Hoi	Nil	No NSR around	No
NT13	UR T6	link to Tolo Highway and next to Sha Tin STWs and Marine Police North Division Base	Nil	No NSR around	No
NT14	Tsun King Rd	over Tai Po Rd and near Royal Ascot	Royal Ascot	Private Access Road	No
NT15	Ma On Shan Rd Network		Chevalier Garden	Noise level below 70dB(A) at nearest NSR	No
NT16	Sai Sha Road	link to Hang Tak St	Shing On T.H.A.	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT17	Hang Tak St	over branch of Shing Mun River and near Chevalier Garden	Chevalier Garden	Not effective due to traffic on at grade Ma On Shan Road Network	No

NT18	Tai Po Road - Sha Tin	near Hilton Centre	Lai Chi Yuen	scattered villages in rural area	No
NT19	Sha Tin Rural Committee Rd	over Tai Po Rd Sha Tin and near Lek Yuen Estate	Lek Yuen Estate	Over KCRC railway	No
NT20	Sand Martin Bridge	over Shing Mun River and join Tai Chung Kiu Rd	Nil	No NSR around	No
NT21	Fo Tan Rd	over Fo Tan Nullah and Tai Po Rd Sha Tin and T-I College	Wo Che Estate	EIA will be conducted	No
NT22	Lok King St	over Fo Tan Nullah	Nil	No NSR around	No
NT23	Sha Tin Road	Near KCRC House and link to Sha Tin Rd	Jockey Club Quarters	Not effective (dur to traffic on Tai Po Road - Sha Tin Section)	No
NT24	Sha Tin Road	near Sah Tin Wai	Sha Tin Wai	Embankment road	No
NT25	Sha Tin Road	near City One Shatin	City One Shatin	N/A	Yes
NT26	Banyan Bridge	over Shing Mun River and next to Sha Tin Rd	Nil	No NSR around	No
NT27	Tai Chung Kiu Rd	near Ravana Garden	Ravana Garden	Not effective (due to traffic on at grade Tai Chung Kiu Rd)	No
NT28	Sha Tin Wai Rd	near Chap Wai Kon New Village	Chap Wai Kon New Villa	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT29	Shek Mun Roundabout	near Pictorial Garden	Pictorial Garden	Not effective due to traffic on Tate's Carin Highway	No
NT30	Sha Tin Wai Rd	from Sha Tin Wai New village to Chap Wai Kon	Sha Tin Wai New Village	EIA conducted	No
NT31	Tate's Cairn Highway	connect to Sha Tin Wai Rd from Tai Shek Kwu	Siu Lek Yuen	EIA conducted	No
NT32a	Shing Mun Tunnel Rd	connect to Tai Po Rd Tai Wai	Mei Lam Estate	EIA conducted	No
NT32b	Shing Mun Tunnel Rd	connect to Tai Po Rd Shatin	Mei Lam Est	EIA conducted	No
NT33	Tai Po Rd Tai Wai	Shung Ho Rd to Mei Tin Rd	Mei Lam Est	EIA conducted	No
NT34	Lion Rock Tunnel Rd	over Shing Mun River	Sha Tin Tau THA	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT35	Lion Rock Tunnel Rd	near Hung Mui Kuk and Worldwide Garden	Worldwide Garden	Not effective (due to traffic on at grade Lion Rock Tunnel Road)	No
NT36	Sha Tin Road	from Tse Uk Village to Fung Shing Court	Pok Hong Est	Barrier installed	No

NT37	Hung Mui Kuk Road	near King Tin Court	olden Lion Garden	A minimum clearance bet the outer edge of the building to the flyover is less than 4.5m	No
NT38	Tseung Kwan O Road	near Hong Sing Garden	Hong Sing Garden	Embankment road	No
NT39	Tai Po Rd Tai Wo	near Hong Lok Yuen	Wai Tau Tsuen	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT40	Hong Lok Yuen Rd	in Hong Lok Yuen	Hong Lok Yuen	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT41	San Tin Road	near Fairview Park and Man Yuen Chuen	Chuk uen Tsuen	scattered villages in rural area	No
NT42	Long Tin Rd	beside Yuen Long Park	Long Bin T.H.A.	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT43	Long Yip St & Yuen Long On St	near Sun Yuen Long Plaze	Sun Yuen Long Plaza	Fire fighting at the nearby building from both at-grade road and flyover is required	No
NT44	Hung Tin Rd	over Castle Peak Rd - Hung Shui Kiu	Nil	No NSR around	No
NT45	Yuen Long Highway	near To Yuen Wai and over Castle Peak Rd	To Yuen Wai	Barrier Installed	No
NT46	Tsing Tin Road	near Kin Sang Estate	Kin Sang Estate	Embankment road	No
NT47	Castle Peak Road - San Hui	near Ling Nam		Not effective (due to traffic on at grade San Hui Rd)	No
NT48	Pui To Rd	over Nullah and near San Fa Est	San Fat Est	Not effective (due to traffic on at grade Pui To Rd)	No
NT49	Pui To Rd	over Tuen Mun Rd	Kam Wah Garden	Not effective (due to traffic on at grade Tuen Fat and Tuen Hi Rd)	No
NT50	Tuen Mun Rd	near Siu Hong Court	Nil	No NSR around	No
NT51	Lung Mun Rd	connect to Wong Chu Rd	Nil	No NSR around	No
NT52	Wong Chu Rd	over Nullah	Yau Oi Estate	EIA conducted	No
NT53	Wong Chu Road	beside Yau Oi Estate and over Tuen Mun Heung Sze Wui Rd	Yau Oi Estate	EIA conducted	No
NT54	Hoi Wong Rd	over Nullah	Nil	No NSR around	No

NT55	Hoi Wong Rd.	over Wong Chu Rd	Yau Oi Estate	EIA conducted	No
NT56	Tuen Hing Rd	over Tuen Mun Road	Sun Shing	Not effective (due to traffic on Tuen Mun Road)	No
NT57	Tsing Hoi CIR	Wong Chu Rd to Chi Lok Garden	Chi Lok Garden	EIA conducted	No
NT58	Tsing Hoi CIR	Wong Chu Rd to Mount Parker Lodge	Mount Parker Lodge	EIA conducted	No
NT59	Tuen Mun Road	Castle Peak Rd. Castle Peak Bay to Siu Lam	Elegant Villa	Embankment road	No
NT60	Tuen Mun Road	Sham Tseng Section	Rhine Garden	Embankment road	No
NT61	Tuen Mun Rd	to Castle Peak Rd and near Chai Wan Kok	Nil	No NSR around	No
NT62	Tsuen Wan Road	Tuen Mun Rd to Tsing Tsuen Rd	Clague Garden Estate	N/A	Yes
NT63	Tsuen Wan Rd	near Kwai Chung Park	Lai King Estate	No NSR around	No
NT64	Tai Ho Rd	over Castle Peak Rd Tsuen Wan	nearby building	A minimum clearance bet the outer edge of the building to the flyover is less than 4.5 m	No
NT65	Texaco Road North	Shek Wai Kok Est to Tsuen Wan	nearby village	Embankment road	No
NT66	Texaco Rd	near Tai Wo Hau Estate	Nil	No NSR found	No
NT67	Wing Kei Rd	over Tsuen Wan Rd	Nil	No NSR found	No
NT68	Kwai Chung Rd	to Cheong Wing Rd	Kwai Hing Estate	No NSR found	No
NT69	Kwai Chung Rd	near Kwai Fong Estate	Kwai Fong Estate	N/A	Yes
NT70	Castle Peak Rd	near Kwai Hing Est	Nil	No NSR around	No
NT71	Tsing Tsuen Road	To Tsing Yi Bridge	Riviera Garden & Cheun	N/A	Yes
NT72	Tsing Yi Bridge	near Cheung Ching Estate	Cheung Ching Estate	No NSR around	No
NT73	Lai King Hill Rd Network	over Kwai Chung Rd	Lai King Terrace	No NSR around	No
NT74	Lai King Hill Rd Network	over Kwai Chung Rd and next to Kwai Fong Garden	Kwai Fong Garden	Not effective (due to traffic on Kwai Chung Rd)	No
NT75	Ching Cheung Road	near Ching Lai Court	Ching Lai Court	Embankment road	No
NT76	Wah Tai Rd.	near Lai Yiu Estate	Lai Yiu Estate	Not effective (due to traffic on Castle Peak Rd)	No

FIGURE A1 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

FIGURE A2 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

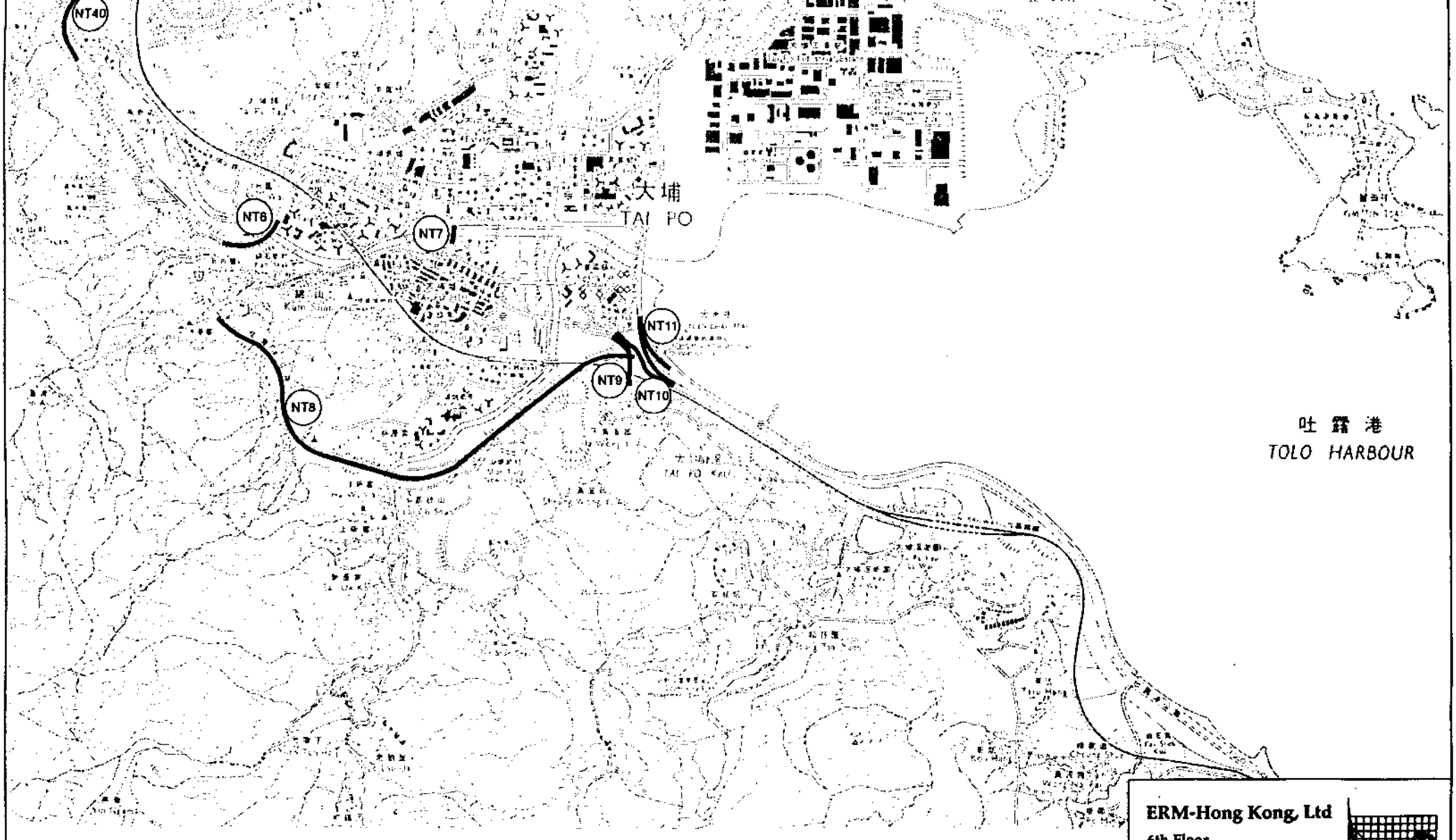


FIGURE A3 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

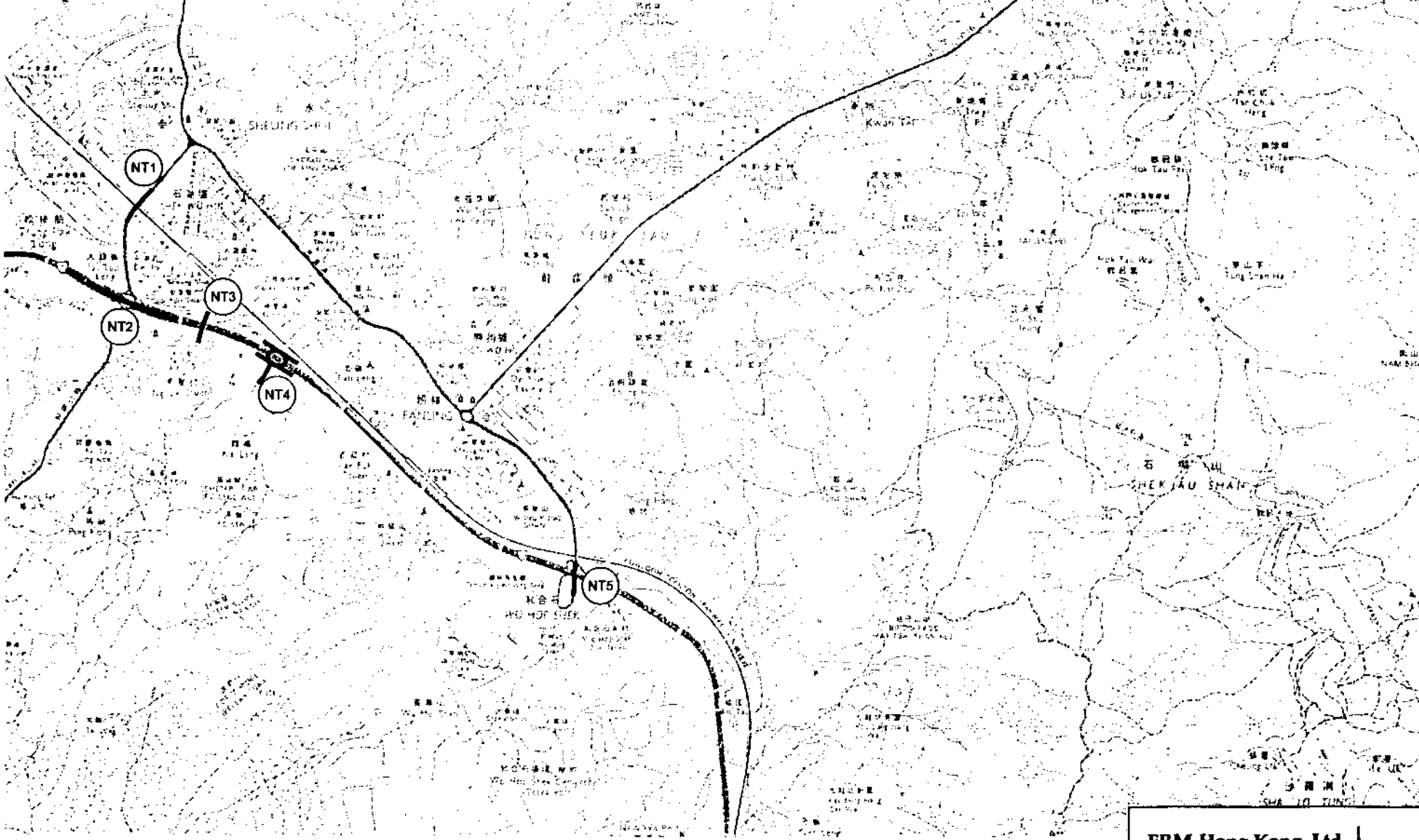


FIGURE A4 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

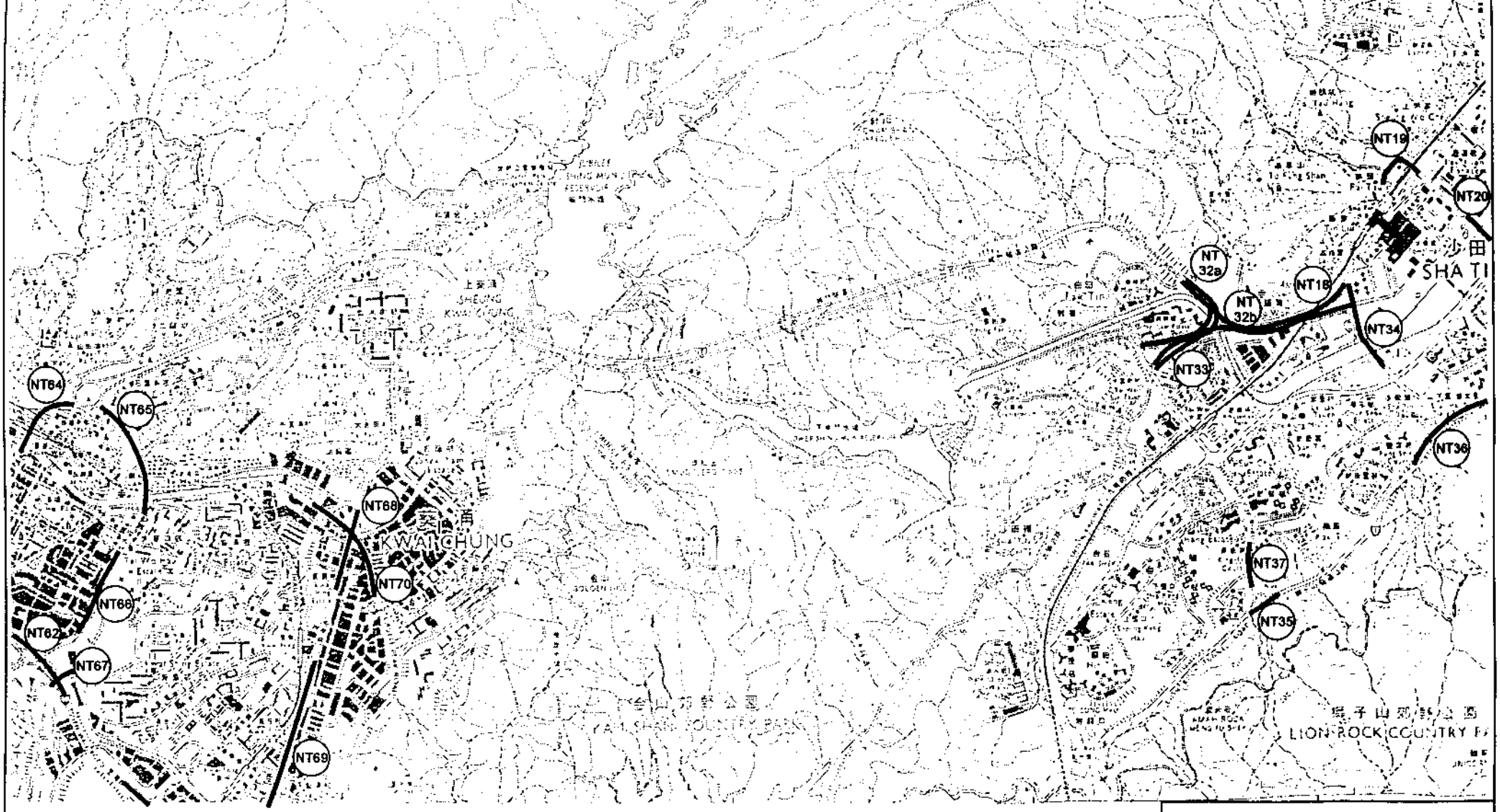


FIGURE A5 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

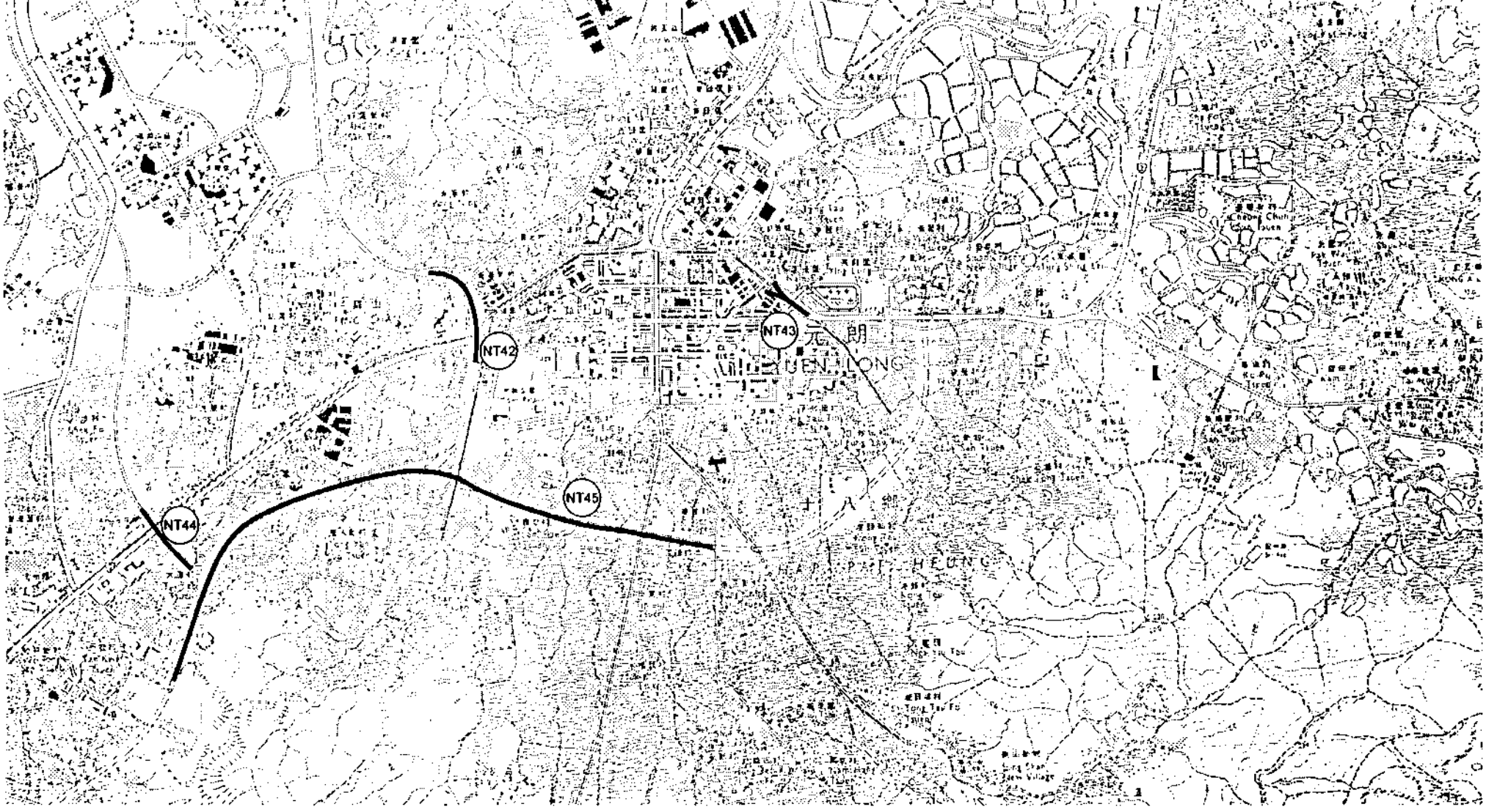


FIGURE A6 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

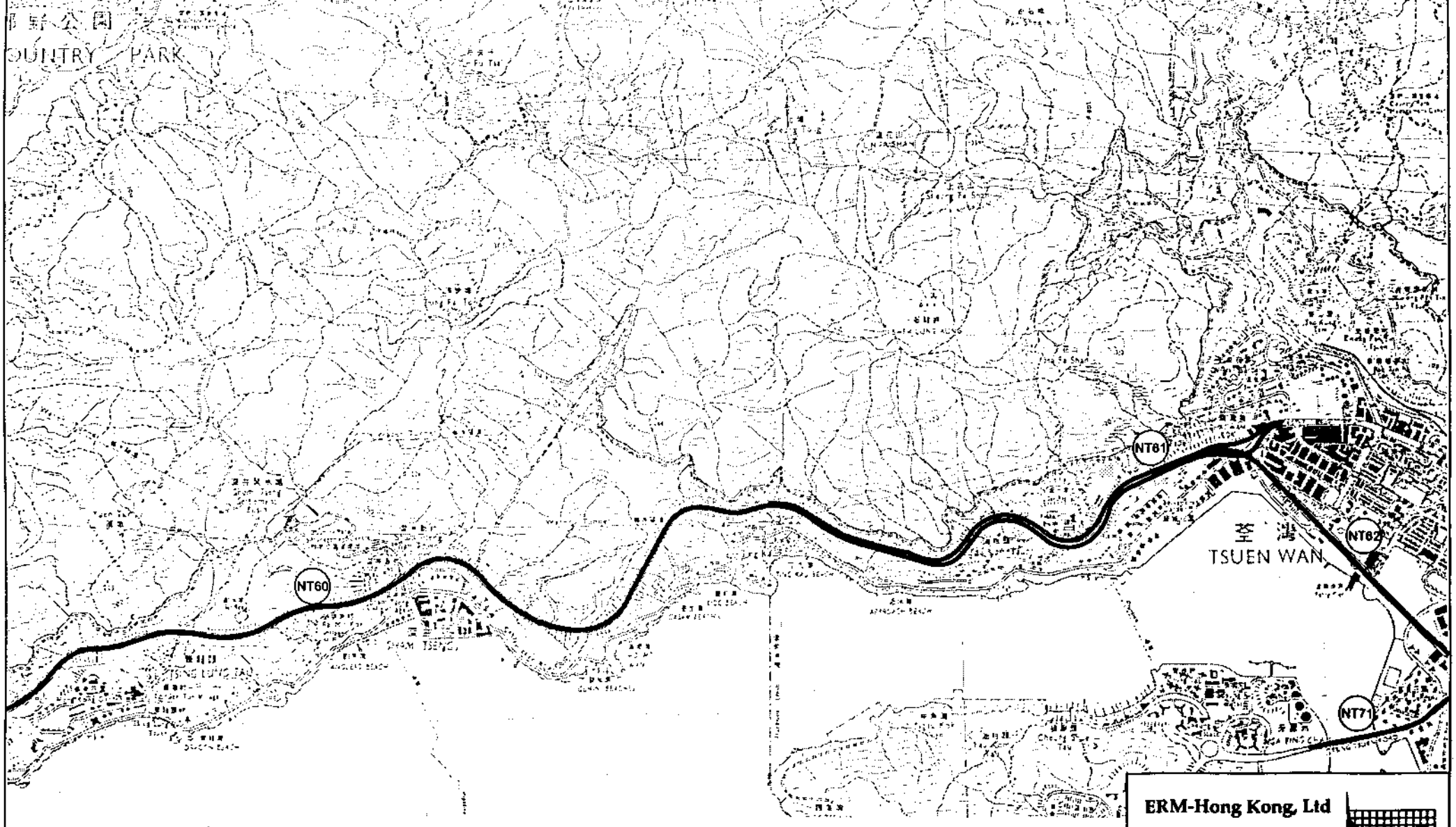


FIGURE A7 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

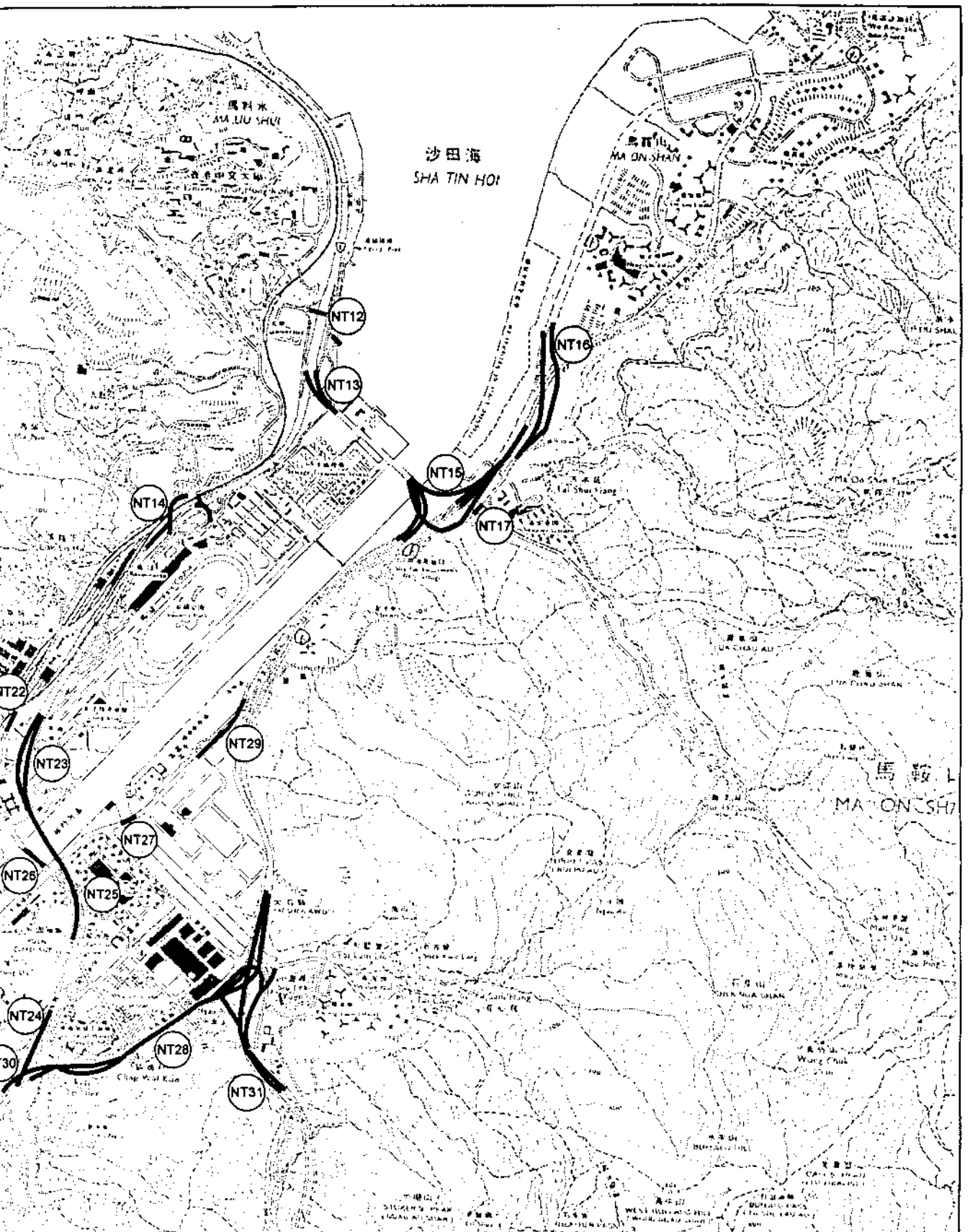


FIGURE A8 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

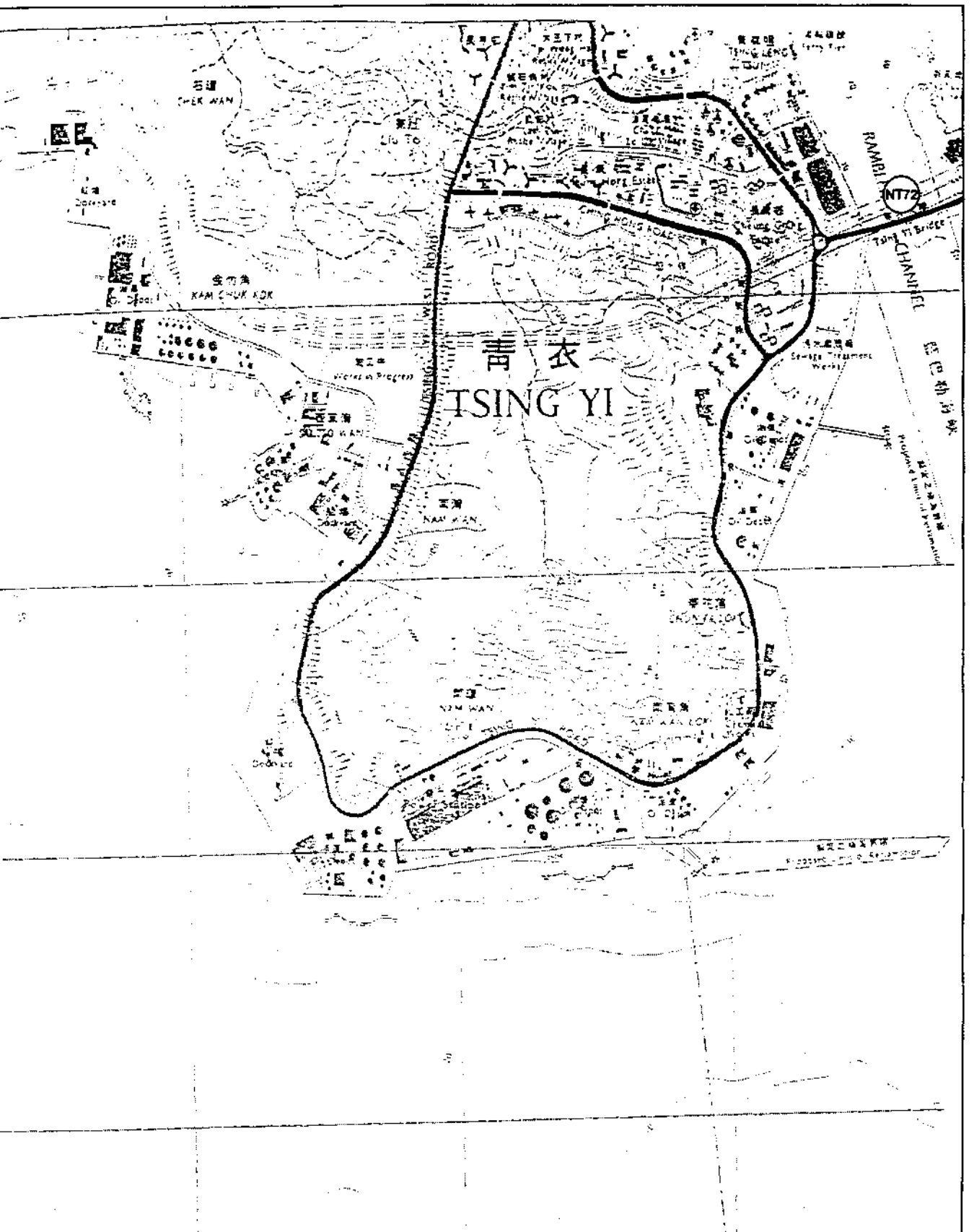


FIGURE A9 - LOCATION OF FLYOVER

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

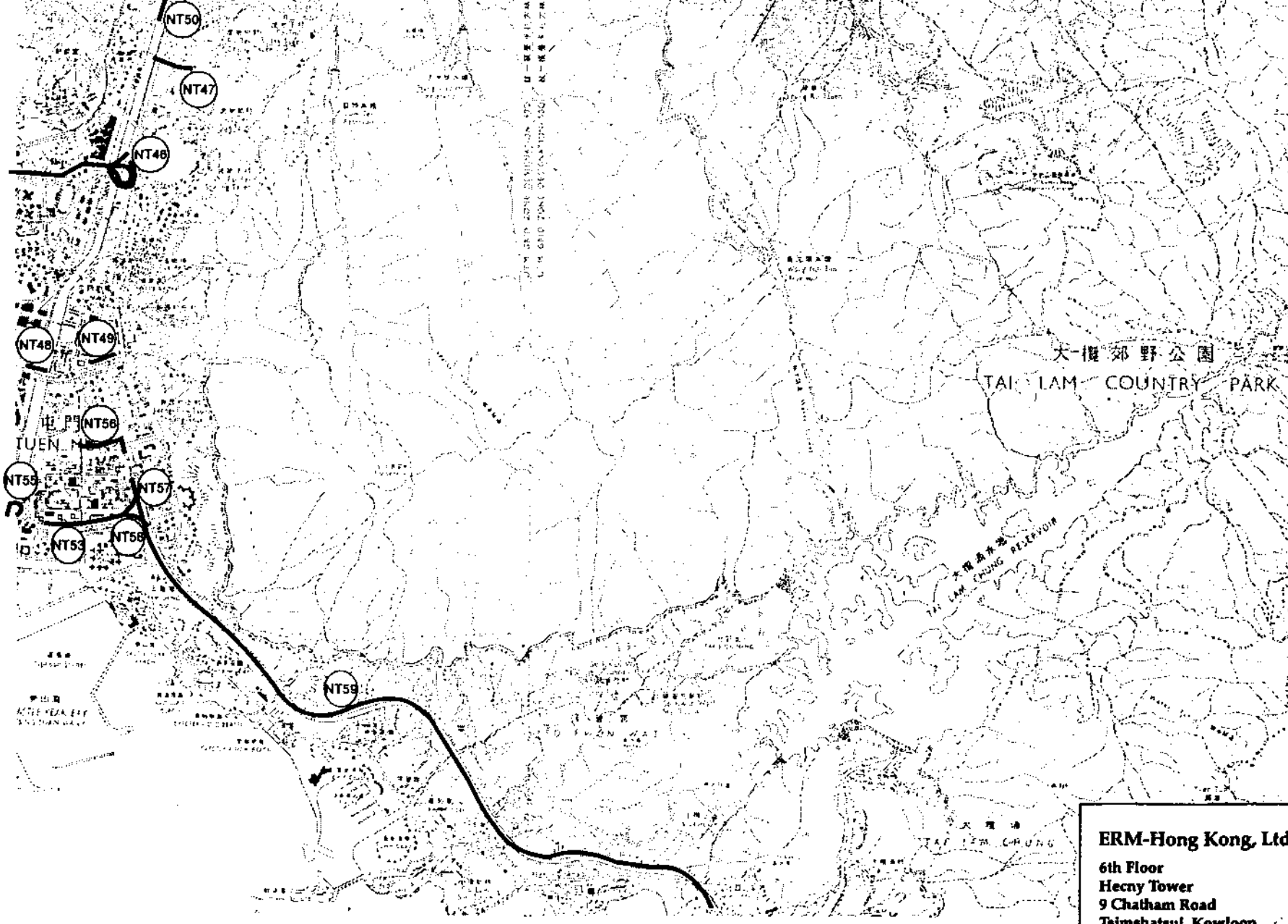


FIGURE A10 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

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FIGURE A11 - LOCATION OF FLYOVER

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

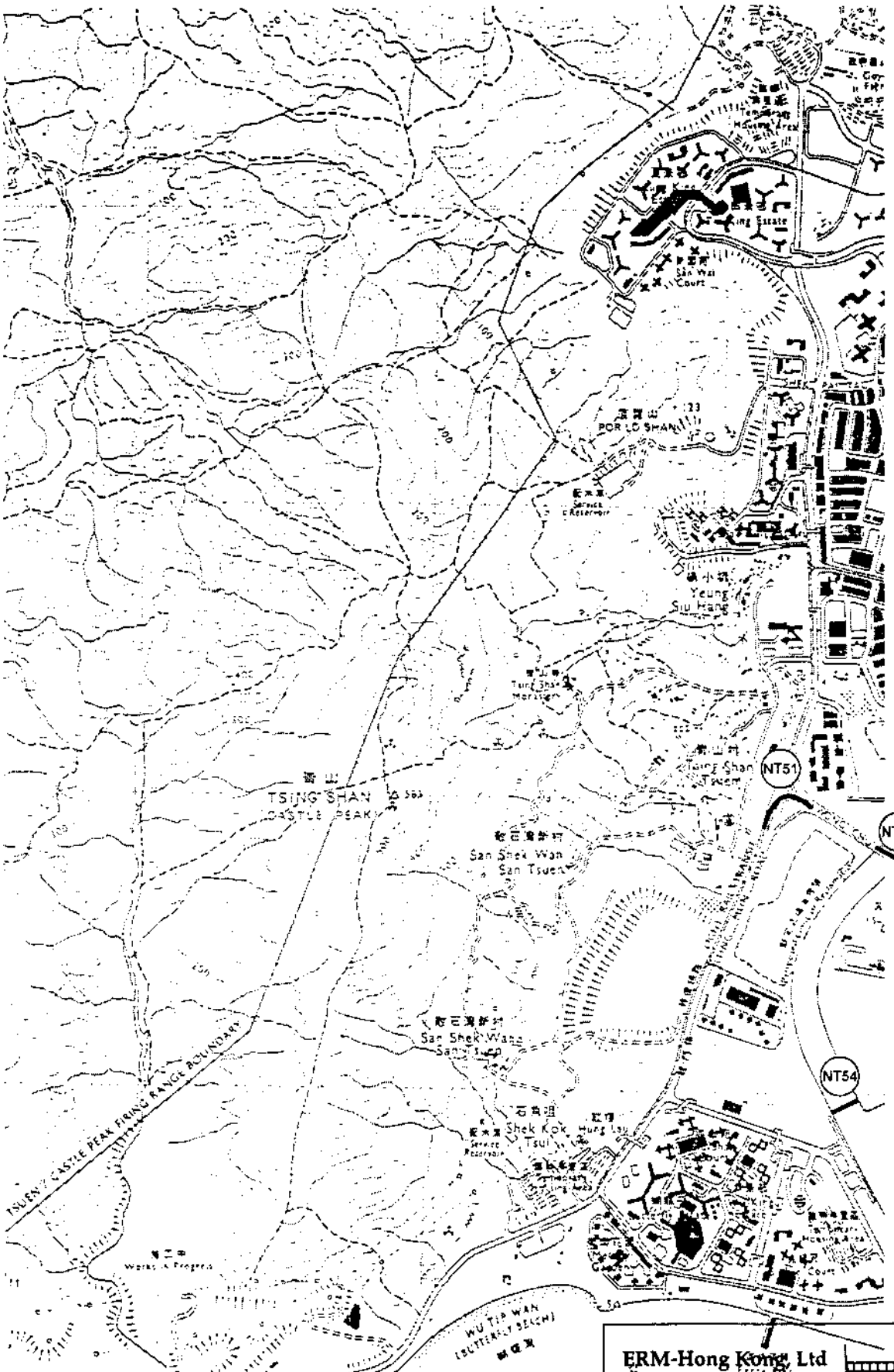

FIGURE A12 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

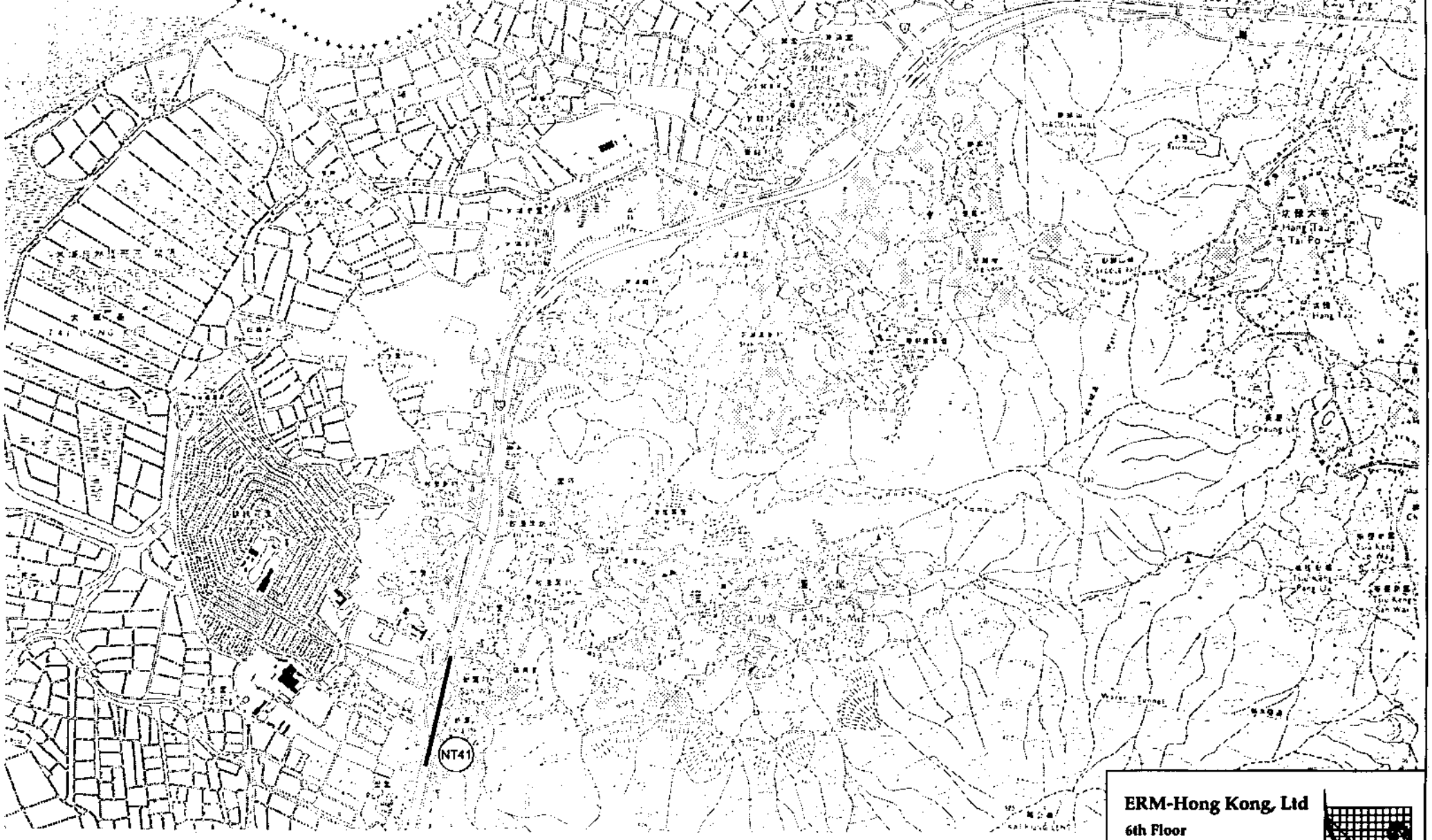

FIGURE A13 - LOCATION OF FLYOVER

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

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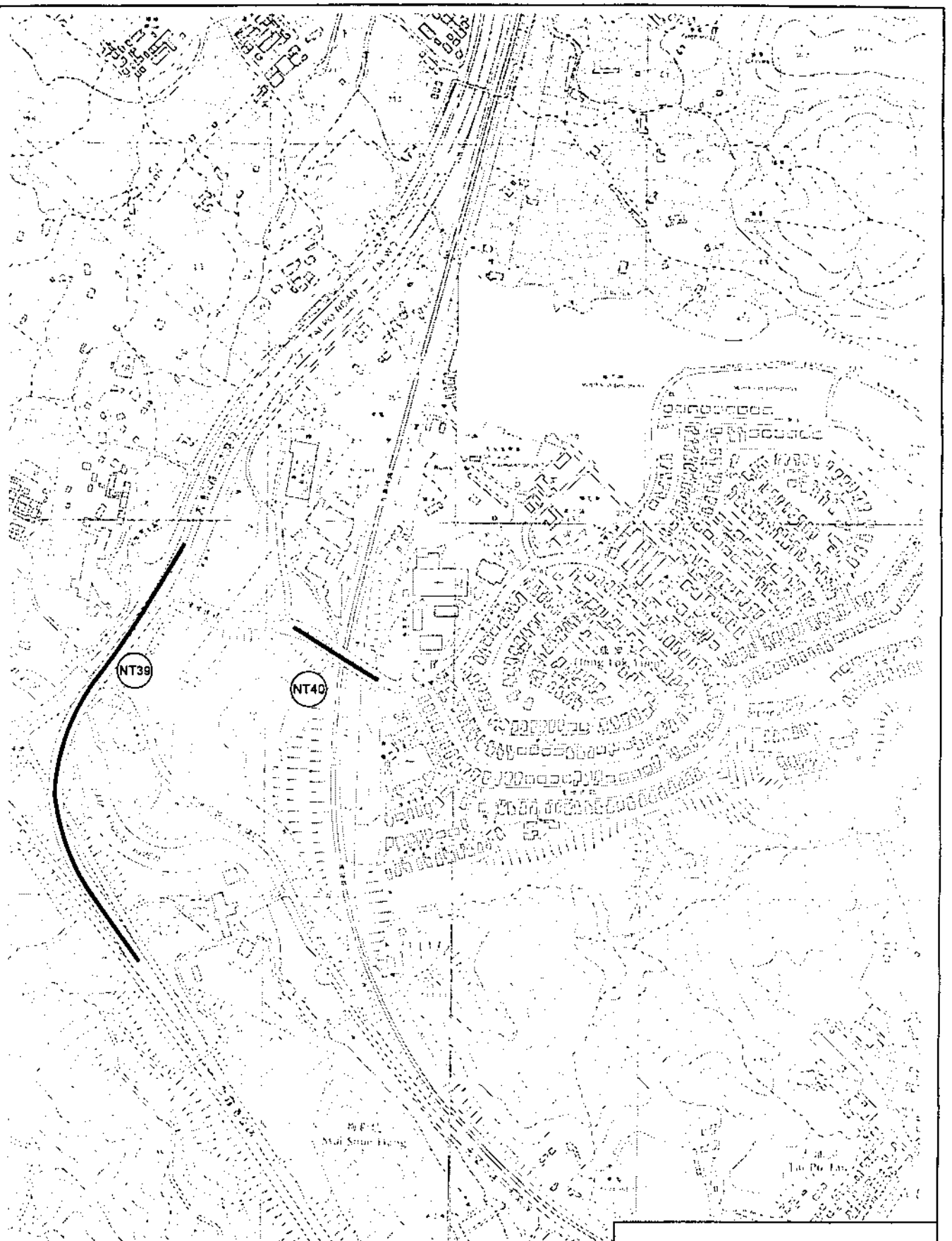

FIGURE A14 - LOCATION OF FLYOVERS

ERM-Hong Kong, Ltd
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Hong Kong

ERM

Annex B

Response to Comments on Working Paper

message

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E-mail : jp@ermhk.com

To	Mr T K Lee Regional Highway Engineer/Hong Kong, HyD
Copied to	Mr Maurice Yeung, EPD Noise Policy Group
From	Jon Pyke
Ref/Project no.	C1570\53168\CONSULT
Subject	Scoping Study for Providing Direct Technical Remedies on Existing Flyovers - Comments on Working Paper
Date	28 January 1997

ERM

Dear Mr Lee,

Thank you very much for your letter of 17 January 1997 [( ) in HH63/50(CE)] concerning HyD's comments on the Working Paper for the captioned study. We would like to take this opportunity to briefly address some of the points raised in your letter.

Your concerns on the structural considerations for erecting noise barriers or enclosures on existing flyovers are justified. We have already checked with EPD on the structural issue prior to commencement of this scoping study. It was confirmed that structural considerations would be included for the investigations to be conducted separately at a later stage and short-listing of flyover candidates within this stage will be based solely on factors including the prevailing noise environment, fire fighting and road safety. The output of this scoping stage will form the basis for the second stage of the study, in which each flyover short-listed in this scoping stage will be subject to further investigation, taking into account all factors including engineering and structural ones, and the suitability and the most appropriate form of direct technical remedy will be determined.

The other constraints raised on p. 2 of your letter (i.e. air quality, road space, size of enclosure, loss of sunlight, and visual impact) will depend, to a very large extent, on the final design of the direct technical remedies. Your concerns are noted but they would be more appropriately addressed during the second stage of the study.

In the last paragraph of your letter, you have indicated the discrepancy between HyD's record and the estimate figure quoted in the Working Paper. We would like to clarify that the figure was based on a preliminary estimate of 'noisy' flyovers. In order to allow us to ascertain that all flyover candidates are included in this scoping exercise, we would be most grateful if you could provide a copy of your complete record on existing flyovers and an indication on the definition

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message

currently used by HyD for 'flyover'. Your prompt response is very much appreciated.

Thank you for your assistance.

Best regards,

JRPyke

Jon Pyke

HIGHWAYS DEPARTMENT
HIGHWAYS (HONG KONG) REGION
8/F & 9/F, HENNESSY CENTRE,
500 HENNESSY ROAD, HONG KONG.

URGENT BY FAX
2316 7919

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興利中心八樓及九樓

本署檔號 OUR REF. ( ) in HH 63/50 (CE)
來函檔號 YOUR REF. 2895 8448
電 話 TELEPHONE
圖文傳真 FAX NO. 2576 6244

17 January 1997

Environmental Resources Management Hong Kong
6/F, Hency Tower,
9, Chatham Road,
Tsim Sha Tsui,
Kowloon.

(Attn: Mr. John Pyke)

Dear Sir,

Scoping Study for providing
Direct Technical Remedies on Existing Flyovers

I refer to DEP's memo ref. ( ) in EP 42/T6/01 Annex I dated 20.12.96 enclosing a copy of your working paper on the captioned study.

Most of the existing flyover structures are not designed to take up the additional dead and wind loads from noise barriers or enclosures to be erected directly on it. In the scoping study, due consideration should be given to the provision of independent structures for supporting these noise barriers/enclosures at ground level. There is therefore a question of whether road space is available between the flyovers and the adjacent buildings to accommodate this requirement. In fact, you are requested to elaborate on the 6th line of the last para. on page 1 of the working paper - "However, direct technical remedies on flyovers do not appear to be implementable given the latest engineering know-how." Without this information, our efforts in reviewing the practicability of reducing the adverse noise impacts brought about by traffic on existing flyovers may be wasted.

In this respect, I also wish to clarify that the existing section of Kwai Chung Road Flyover adjacent to Mei Foo is structurally infeasible to support the addition of a noise enclosure. The loading of the proposed noise cover at Mei Foo will not be transferred to the existing flyover structure. This of course requires a considerable ground level area to accommodate the foundations and columns of the noise cover.

With regard to Table 5a of the working paper, the following constraints need to be considered in providing direct technical remedies on the structures of existing flyovers:

(i) Air quality

For full enclosure, forced ventilation may need to be incorporated to cater for the situation when traffic inside the enclosure comes to a standstill. The air quality for lower floor residents of buildings adjacent to a flyover with a noise barrier or enclosure need to be examined.

(ii) Road space

The independent support for noise mitigation structures will occupy road space at ground level thereby reducing traffic lanes and affecting road capacities.

(iii) Size of enclosure

Necessity for lighting and ventilation inside an enclosure would affect its size and headroom.

(iv) Loss of sunlight

Loss of sunlight to lower floor residents of buildings adjoining the noise mitigation structures.

(v) Visual impact

The overall aesthetic view of the flyover.

Current record indicates that the total number of existing flyovers is 689. Please clarify how you arrive at a figure of only 110 as depicted in para. 3 of the working paper.

This serves as a co-ordinated reply for HyD

Yours faithfully,

(T.K. Lee)
for Regional Highway Engineer/Hong Kong

Facsimile message

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E-mail : jp@ermhk.com

To	Mr Cheung Wai-wah Fire Services Department
Copied to	Mr Maurice Yeung, EPD Noise Policy Group
From	Jon Pyke
Ref/Project no.	C1570\53197\CONSULT
Subject	Scoping Study for Providing Direct Technical Remedies on Existing Flyovers - Comments on Working Paper
Date	28 January 1997

ERM

Dear Mr Cheung,

Thank you very much for your letter of 6 January 1997 [ref. (20) in FSD 4/130/94] detailing FSD's comments on the Working Paper for the captioned study. As the project is progressing within a very tight schedule, we do not anticipate the issuing of a revised Working Paper. However, your comments are noted and will be taken into account, where appropriate, during the preparation of the Final Report.

In response to the information requested in the last paragraph of your letter, we have copied the relevant sections of PWDTC No. 31/75 for your reference. In addition, we would like to clarify that the detailed design of the direct technical remedies will only be generated during the second stage of the study, which is beyond the scope of the present scoping study and will be tendered separately. However, we would incorporate your request as one of the recommendations of the Final Report.

Best regards,

JRPyke

Destination fax number *2311 0066*

Fire Fighting

11. For a height from ground level to 16'-6" above the elevated road level a minimum horizontal clearance of 15 ft. between elevated road structures and adjacent property should be aimed for as a minimum standard, but each case should be considered on its merits. Any balconies, etc. which protrudes into this clear distance zone will have to be removed, but balconies above the specified zone (i.e. elevated road level plus 16'-6") can remain. It is noted that it may be necessary to resume and demolish buildings or parts of buildings in order to achieve this standard.

12. Facilities for fire fighting purposes in the form of fire hydrants should be provided on the structure, and D. of F.S. will state his requirements for individual cases (normally every 300 feet).

13. Some form of emergency traffic control by traffic lights should be incorporated in the scheme where in the opinion of the Commissioner for Transport after consultation with D. of F.S., C.P. and C.E.T.E. this is considered to be practicable.

14. Drainage connections from the elevated structure should be connected direct to the main drainage system and not to ground level surface channels.

15. Subject to height of elevated highways above the lower road or ground level remaining within reach of the Fire Services Department ladders, i.e. 20 ft., the physical communication between the lower and upper roadways could be achieved by means of the Fire Services Department's own ladders.

16. In view of the limited length and type of elevated road structures so far envisaged in Hong Kong, the need for emergency telephone equipment does not arise. If, however, elevated road structure becomes widespread and extensive, then such equipment will be required for summoning the services of the police, fire appliances and ambulances in the event of an emergency.

Note :- The D. of F.S. will require certain specialised "Snorkel" equipment to facilitate fire fighting within confined spaces and will establish a drill for dual attendance of appliances to any incident in the vicinity of elevated road structures, whereby the fire can be tackled from both ground level and from the elevated structure. In order to operate this drill, the D. of F.S. will also require additional personnel and appliances.

International Standards

17. The only standards to be found that specifically cover this subject are those of the American Association of State Highway Officials, which recommends a minimum clearance of 15'-0" for single level elevated structures and 20'-0" for two-level structures.

消　防　處
香港九龍尖沙咀康莊道1號
消防總部大廈

FIRE SERVICES DEPARTMENT
FIRE SERVICES HEADQUARTERS BUILDING,
No. 1 Hong Chong Road,
Tsim Sha Tsui East, Kowloon,
Hong Kong

本處檔號 OUR REF.: (20) in FSD 4/130/94
來函檔號 YOUR REF.: C1570\50805-1\CONSULT
電報掛號 TELEX: 39607 HKFSD HX
圖文傳真 FAX: 852-2311 0066
852-2368 9744
(24 小時 HOURS)
電　話 TEL NO.: 2733 7888

Mr. Jon Pyke
Senior Consultant
Environmental Resources
Management Hong Kong
6/F, Hency Tower
9 Chatham Road
Kowloon

Dear Sir,

Working Paper/Consultation Paper
Scoping Study for Providing Direct Technical Remedies on Existing Flyovers

With reference to the memo from DEP of 20 December 1996 and the Working Paper/Consultation Paper attached thereto, please be informed that I have the following comments :-

Figure	Comment
4e	In case of fire, the smoke and hot gases will go up to the highest point of the enclosure. According to your preliminary design of 6.25% open area, it will form a pocket to trap the smoke in-stead of ventilating such to open air. Therefore, the open areas must be located above the vertical acoustic panels (please see appendix I).
5a	– The minimum width of 6 m vehicular road should be indicated on the sketch (please see appendix II).
	– The horizontal clearance between the outer edge of the flyover structure and building facade should be at least 4.5 m instead of 4.6 m (please see appendix II).

/...(2)

Figure	Comment
	– A minimum of 4.5 m clearance between the building facade and the outer edge of 5 m above the elevated road level must be maintained (please see appendix II).
5b	----- ditto ----- (please see appendix III)

As regards the 2.4 m clearance (PWDTC No. 31/73) shown in Table 5a, I should be grateful if you would provide such information and relevant sketch to this office in order to clarify the configuration and the location of these balconies. Also, please incorporate my comments made in para. 1 into your detailed design of remedies for road traffic noise on existing flyovers.

Yours faithfully,

(CHEUNG Wai-wah)
for Director of Fire Services

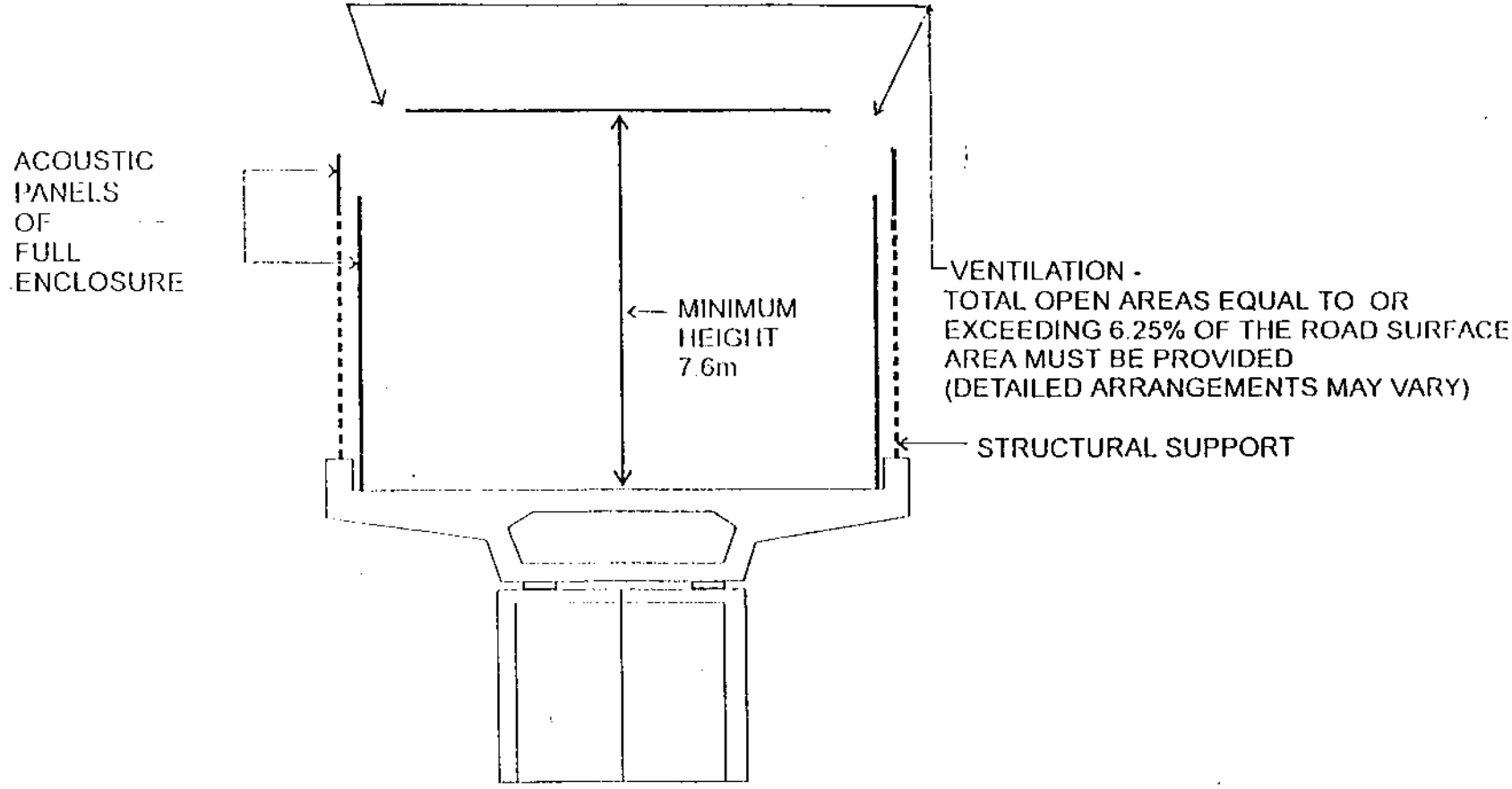

FIGURE 4e - GENERIC DIRECT TECHNICAL REMEDIES FOR ROAD TRAFFIC NOISE ON FLYOVERS - FULL ENCLOSURE

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

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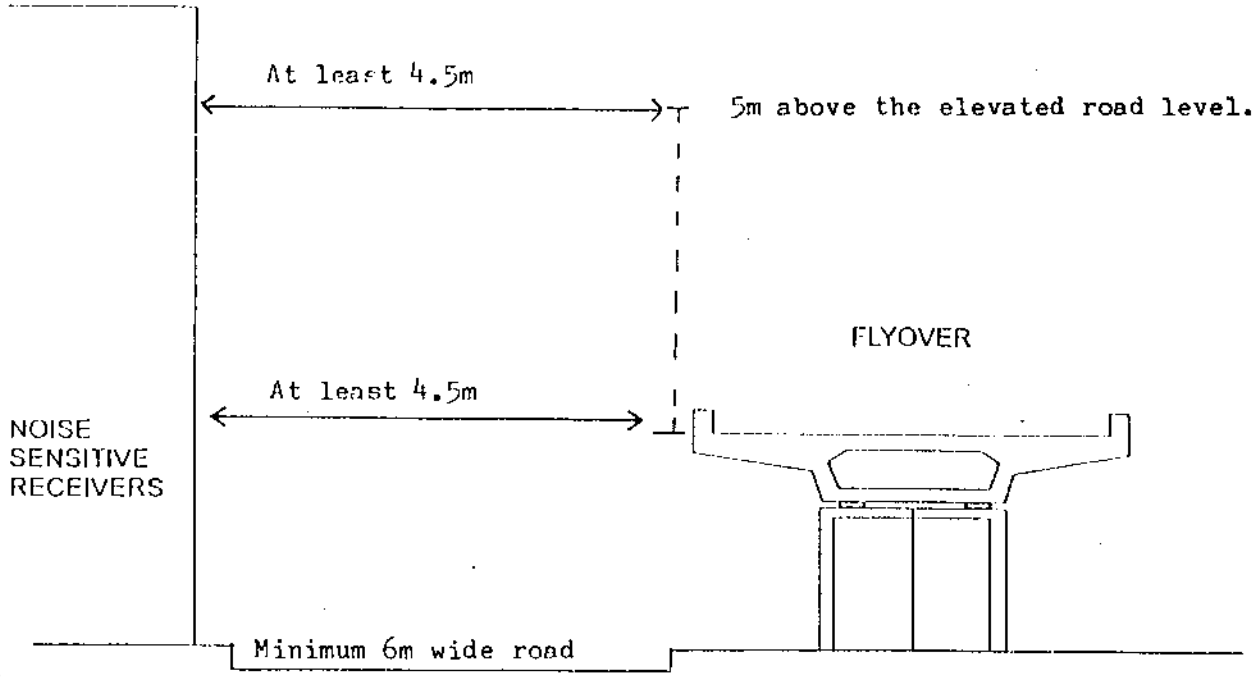


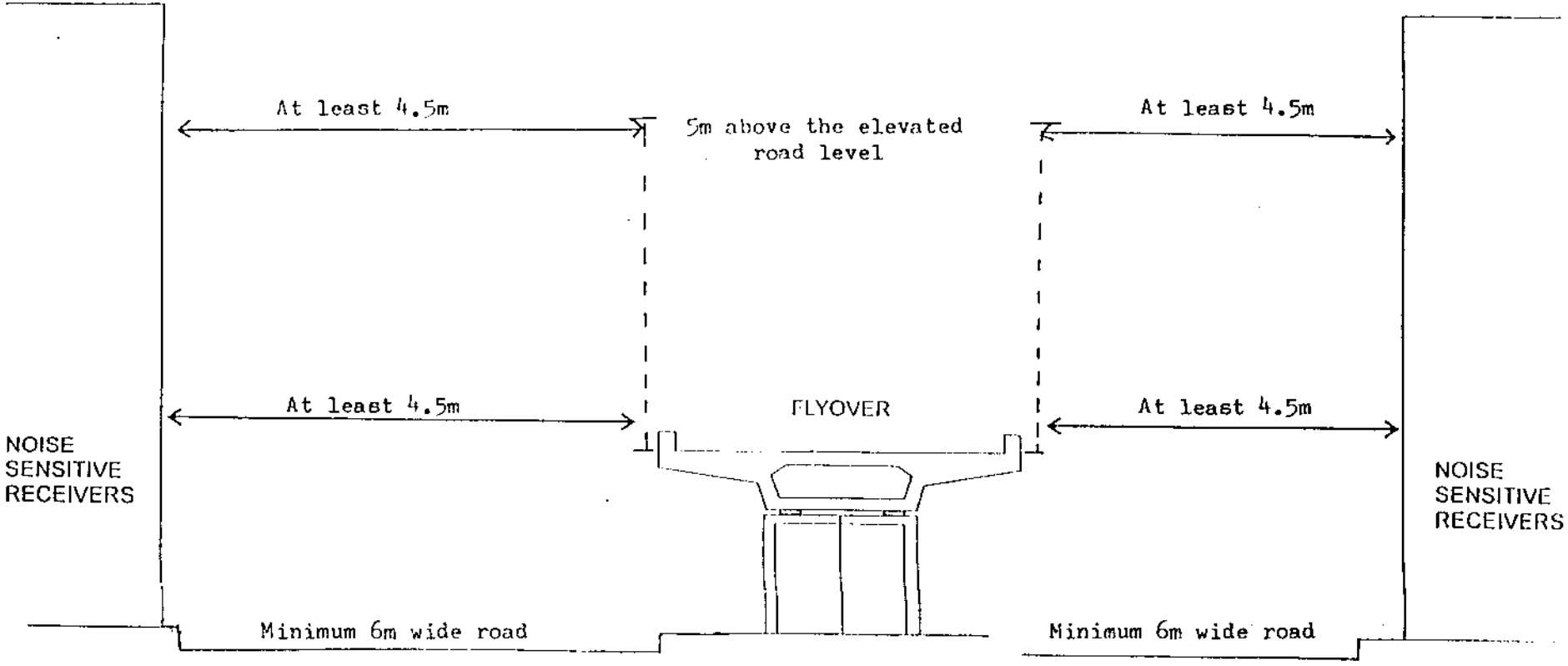
DIRECT TECHNICAL REMEDIES SUCH AS BARRIER AND NOISE ENCLOSURE ON THE FLYOVER IS CONSIDERED FEASIBLE

- FLYOVER IS NOT THE ONLY ACCESS TO BUILDING FACADES
- CLEARANCE BETWEEN THE OUTER EDGE OF THE FLYOVER STRUCTURE AND BUILDING FACADE IS GREATER THAN 4.5m
- FIRE FIGHTING OPERATIONS WOULD NOT BE OBSTRUCTED BY THE ERECTION OF NOISE BARRIER OR NOISE ENCLOSURE

FIGURE 5a - TYPICAL ROAD - RECEIVER CONFIGURATION (EXAMPLE ONE)

ERM-Hong Kong, Ltd
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM



DIRECT TECHNICAL REMEDIES SUCH AS BARRIER AND NOISE ENCLOSURE ON THE FLYOVER IS CONSIDERED FEASIBLE

- FLYOVER IS NOT THE ONLY ACCESS TO BOTH BUILDING FACADES
- CLEARANCE BETWEEN THE OUTER EDGE OF THE FLYOVER AND BUILDING FACADES IS GREATER THAN 4.5m
- FIRE FIGHTING OPERATIONS WOULD NOT BE OBSTRUCTED BY THE ERECTION OF NOISE BARRIER OR NOISE ENCLOSURE

FIGURE 5b - TYPICAL ROAD - RECEIVER CONFIGURATION (EXAMPLE TWO)

ERM-Hong Kong, Ltd
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Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong
ERM

Facsimile message

ERM-Hong Kong, Ltd

6/F Hecny Tower
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Kowloon, Hong Kong
Telephone (852) 2722 9700
Facsimile (852) 2723 5660
http://www.ermhk.com

Direct lines
Telephone : 2722 9706
Facsimile : 2316 7919
E-mail : jp@ermhk.com

To	Mr H L Cheng Transport Department
Copied to	Mr Maurice Yeung, EPD Noise Policy Group
From	Jon Pyke
Ref/Project no.	C1570\53210\CONSULT
Subject	Scoping Study on Providing Direct Technical Remedies on Existing Flyovers - Comments on Working Paper
Date	28 January 1997

ERM

Dear Mr Cheng,

Thank you very much for your letter of 8 January 1997 (RS 181/162) detailing your comments on the Working Paper for the captioned study. Although we do not anticipate the issuing of a revised Working Paper, your comments are noted and will be taken into account, where appropriate, during the preparation of the Final Report.

In response to your comment (e), we would like to clarify that the information was derived from our previous experience on the *Reclamation and Servicing of Tuen Mun Area 38 for Special Industries - Improvement to Roads and Junctions within Tuen Mun: Environmental Impact Assessment Study*. We note that individual cases should be subject to review by TD and this would be included as one of our recommendations for the further investigations to be conducted separately in the second stage of the study when detailed designs of direct technical remedies will be generated. However, your advice on whether there is any commonly adopted minimum height for full/partial acoustic enclosures from TD's perspective would be appreciated. Thank you for your assistance.

Best regards,

JR Pyke

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本署檔號 Our Ref. RS 181/162

來函檔號 Your Ref.

By Fax (2316 7919) & Post

Environmental Resources Management Hong Kong
6/F, Hency Tower
9 Chatham Road
Tsim Sha Tsui
Kowloon

8 January 1997

(Attn. Mr. John Pyke)

Dear Sir,

Scoping Study for Providing
Direct Technical Remedies on Existing Flyovers

I refer to your circulation of the working paper/consultation paper for the captioned study via your letter of 19 December 1996.

My comments on paragraph 5 of the working paper are:-

a) Our requirements on minimum horizontal clearance and sightline distance apply to all types of remedies in general;

b) For minimum horizontal clearance, I suggest rewording the paragraph as "Minimum horizontal clearance between wall and road kerb should be provided as required in Transport Planning & Design manual (TPDM) Volume 2, Chapter 3, Section 3.5.2";

c) For sightline requirements, add ", Volume 2" after "Chapters 3 & 4";

d) The provision of noise barrier should not cause obstruction (including sightline for signs) or access to roadside facilities such as directional signs, emergency telephones, CCTV, etc.; and

e) Whilst I am not sure how the figure of 7.6m for minimum height is arrived at, the design of the barrier fence should cater for the height of the overhead signs of various depth. Therefore, our comments on individual cases are necessary.

Yours faithfully,

(H L Cheng)
for Commissioner for Transport

c.c. DEP (Attn. Mr. Maurice Yeung)

香港灣仔皇后大道東183號合和中心3501室
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Annex C

Calculation of Road Traffic Noise

Road Noise Calculation
HK Island

Flyover ID	H5		H8		H9		H16		H22		H23
Receiver	Robinson Garden Apartment		Shue Fuk Building		Kennedy Heights		Wing Cheung Building		Wan King House		Private Res
Noise Source	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover
	Robinson Road	Robinson Road	Upper Albert Rd.	Glenealy Road	Cotton Tree Drive	Kennedy Road	Canal Road	Morrison Hill Road	Gloucester Road	Causeway Road	Gloucester Road
INPUTS											
Hourly Flow	854	1688	1636	1187	3128	1441	1519	6041	707	2770	707
Av Speed (km/hr)	50	50	50	50	50	50	50	50	50	50	50
%HV	32.7	32.7	22.2	22.2	22.2	22.2	22.2	22.2	18.6	18.6	18.6
Gradient %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Receiver-Carriageway Distance (m)	35.00	35.00	20.00	1.00	30.00	7.00	45.00	3.00	30.00	10.00	45.00
Height of Carriageway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Angle of View (deg.)	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
surface type (imprevious/pervious)	i	i	i	i	i	i	i	i	i	i	i
Barrier (Y/N)	N	N	N	N	N	N	N	N	N	N	N
Height of Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barrier-carriageway Distance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Receiver Height (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OUTPUTS											
Basic Hourly Noise Level dB(A) (Includes speed and %HV correction, also gradient and road surface correction of 1 for imp/bit and speed <75km/hr)	74.02	76.98	75.62	74.22	78.43	75.07	75.29	81.29	71.46	77.39	71.46
Distance Correction:											
Slant Distance (m)	38.50	38.50	23.51	4.53	33.50	10.51	48.50	6.52	33.50	13.51	48.50
Distance Correction dB(A)	-4.55	-4.55	-2.41	4.74	-3.95	1.09	-5.55	3.16	-3.95	0.00	-5.55
Surface correction											
Surface correction	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Calculation of Path Difference:											
Possible Path Difference	0.03	0.03	0.03	0.01	0.03	0.02	0.03	0.02	0.03	0.03	0.03
Path Difference Only if Barrier Exists	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Working out whether receiver is in the illuminated or shadow zone:											
Source Receiver gradient	-0.01	-0.01	-0.02	-0.11	-0.01	-0.05	-0.01	-0.08	-0.01	-0.04	-0.01
Height of Line at Barrier Position	0.45	0.45	0.43	0.11	0.45	0.33	0.46	0.23	0.45	0.37	0.46
Illuminated / Shadow?	I	I	I	I	I	I	I	I	I	I	I
Calculation of barrier attenuation:											
Barrier Atten Illuminated	-2.26	-2.26	-2.33	-3.67	-2.28	-2.60	-2.24	-2.98	-2.28	-2.48	-2.24
Barrier Atten Shadow	-7.65	-7.65	-7.57	-6.19	-7.63	-7.29	-7.67	-6.90	-7.63	-7.41	-7.67
Possible Barrier Attenuation	-2.26	-2.26	-2.33	-3.67	-2.28	-2.60	-2.24	-2.98	-2.28	-2.48	-2.24
Actual Barrier Attenuation based on whether there is a barrier or not	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Angle of View and Facade Corrections:											
View Ange Correction dB(A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Facade correction	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Hourly L10, dB(A)	71.97	74.93	75.71	81.47	76.98	78.65	72.24	86.95	70.01	79.89	68.40
Detail Assessment required?	no		no		no		no		no		no

	H26	H27		H34	H37		H38	H41		H43	
dential	City Garden	Po Shek House		Heng Fa Chuen	Residential Buildings		Wong Chuk Hang San Wai	Residential Buildings		Nichoson	
At grade	Flyover	Flyover	At grade	Flyover	Flyover	At grade	Flyover	Flyover	At grade	Flyover	At grade
Causeway Road	IEC	IEC	King's Road	IEC	Aberdeen Main Rd	Aberdeen Main Road	Wong Chuk Hang Rd.	Ap Lei Chau Bridge	Ap Lei Chau Bridge Road	Stubbs Rd	Wong Nai Chung Road
2770	3667	673	1766	3555	1045	2308	1069	2250	2250	1037	1432
50	70	50	50	70	50	50	50	50	50	50	50
18.6	14.5	22.2	22.2	10	22.2	22.2	22.2	22.2	22.2	22.2	22.2
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	15.00	12.00	5.00	15.00	10.00	5.00	100.00	30.00	35.00	30.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	p	i	i	p	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77.39	79.40	71.76	75.95	78.52	73.67	77.11	73.77	77.00	77.00	73.64	75.04
8.51	18.51	15.51	8.51	18.51	13.51	8.51	103.50	33.50	38.50	33.50	28.50
2.00	-1.37	-0.60	2.00	-1.37	0.00	2.00	-8.85	-3.95	-4.55	-3.95	-3.25
-1	-3.5	-1	-1	-3.5	-1	-1	-1	-1	-1	-1	-1
0.02	0.03	0.03	0.02	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.06	-0.03	-0.03	-0.06	-0.03	-0.04	-0.06	0.00	-0.01	-0.01	-0.01	-0.02
0.29	0.41	0.39	0.29	0.41	0.37	0.29	0.48	0.45	0.45	0.45	0.44
I	I	I	I	I	I	I	I	I	I	I	I
-2.73	-2.39	-2.43	-2.73	-2.39	-2.48	-2.73	-2.20	-2.28	-2.26	-2.28	-2.30
-7.15	-7.51	-7.46	-7.15	-7.51	-7.41	-7.15	-7.72	-7.63	-7.65	-7.63	-7.61
-2.73	-2.39	-2.43	-2.73	-2.39	-2.48	-2.73	-2.20	-2.28	-2.26	-2.28	-2.30
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
81.89	80.53	73.66	80.45	79.65	76.17	81.61	67.42	75.55	74.95	72.19	74.29
	yes	no		yes	no		no	yes		no	

H45		H46a	H46b
Residential Buildings		Chi Fu Fa Yuen	Chi Fu Fa Yuen
Flyover	At grade	Flyover	Flyover
Repulse Bay Rd.	Repluse Bay Road	Chi Fu Road	Chi Fu Road
2056	2056	381	70
50	50	50	50
22.2	22.2	22.2	22.2
0.00	0.00	0.00	0.00
40.00	40.00	25.00	25.00
0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00
i	i	i	i
N	N	N	N
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
76.61	76.61	69.29	61.93
43.50	43.50	28.50	28.50
-5.08	-5.08	-3.25	-3.25
-1	-1	-1	-1
0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00
-0.01	-0.01	-0.02	-0.02
0.46	0.46	0.44	0.44
[	]	[	[
-2.25	-2.25	-2.30	-2.30
-7.66	-7.66	-7.61	-7.61
-2.25	-2.25	-2.30	-2.30
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50
74.03	74.03	68.54	61.18
no		no	no

Road Noise Calculation
Kowloon

Flyover ID	K2		K4	K6		K7a		K7b		K8
Receiver	Mei Foo		Nam Cheong	Chak On Estate		Beacon Heights		Choi Hung Estate		Beacon Hei
Noise Source	Flyover	Flyover	Flyover	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover
	Kwai Chung Road	Cheung Sha Wan Road	West Kowloon Corridor	Lung Cheung Road	Lung Cheung Road	Lung Cheung Raod	Lung Cheung Road	Lung Cheung Road	Lung Cheung Road	Lung Ping Road
INPUTS										
Hourly Flow	8641	3392	5275	4167	4167	5428	4888	5428	4888	2690
Av Speed (km/hr)	70	70	70	50	50	50	50	50	50	50
%HV	37.6	37.6	18.9	22.2	22.2	22.2	22.2	22.2	22.2	22.2
Gradient %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Receiver-Carriageway Distance (m)	15.00	15.00	50.00	70.00	45.00	185.00	15.00	20.00	10.00	10.00
Height of Carriageway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Angle of View (deg.)	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
surface type (imprevious/pervious)	i	i	i	i	i	i	i	i	i	i
Barrier (Y/N)	N	N	N	N	N	N	N	N	N	N
Height of Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barrier-carriageway Distance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Receiver Height (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OUTPUTS										
Basic Hourly Noise Level dB(A) (Includes speed and %HV correction, also gradient and road surface correction of 1 for imp/bit and speed <75km/hr)	85.70	81.64	81.60	79.68	79.68	80.82	80.37	80.82	80.37	77.78
Distance Correction:										
Slant Distance (m)	18.51	18.51	53.50	73.50	48.50	188.50	18.51	23.51	13.51	13.51
Distance Correction dB(A)	-1.37	-1.37	-5.98	-7.36	-5.55	-11.45	-1.37	-2.41	0.00	0.00
Surface correction										
Surface correction	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Calculation of Path Difference:										
Possible Path Difference	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Path Difference Only if Barrier Exists	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Working out whether receiver is in the illuminated or shadow zone:										
Source Receiver gradient	-0.03	-0.03	-0.01	-0.01	-0.01	0.00	-0.03	-0.02	-0.04	-0.04
Height of Line at Barrier Position	0.41	0.41	0.47	0.48	0.46	0.49	0.41	0.43	0.37	0.37
Illuminated / Shadow?	I	I	I	I	I	I	I	I	I	I
Calculation of barrier attenuation:										
Barrier Atten Illuminated	-2.39	-2.39	-2.23	-2.21	-2.24	-2.18	-2.39	-2.33	-2.48	-2.48
Barrier Atten Shadow	-7.51	-7.51	-7.68	-7.71	-7.67	-7.74	-7.51	-7.57	-7.41	-7.41
Possible Barrier Attenuation	-2.39	-2.39	-2.23	-2.21	-2.24	-2.18	-2.39	-2.33	-2.48	-2.48
Actual Barrier Attenuation based on whether there is a barrier or not	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Angle of View and Facade Corrections:										
View Ange Correction dB(A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Facade correction	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Hourly L10, dB(A)	86.83	82.77	78.12	74.82	76.62	71.88	81.50	80.92	82.87	80.27
Detail Assessment required?	yes		yes	no		no		no		no

Road Noise Calculation
Kowloon

	K10		K14		K16			K18		K26		
hts	Private Residential		Private Residential		Chun Seen Mei Chuen			Wylie Court		Bamboo Mansion		
At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	At grade	Flyover	At grade	Flyover	At grade	At grade
Lung Cheung Road	Waterloo Road	Waterloo Road	Boundary Street	Boundary Street	Argyle Street	Argyle Street	Prince Edward Road West	Chatham Road South	Hong Chong Road	Dyer Avenue	Dyer Avenue	Hung Hom Road
4888	6847	6722	1840	2677	2081	2081	2956	2118	9314	126	126	1368
50	50	50	50	50	50	50	50	50	50	50	50	50
22.2	22.2	22.2	22.2	22.2	14.8	14.8	22.2	22.2	22.2	22.2	22.2	22.2
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	20.00	10.00	15.00	5.00	20.00	10.00	50.00	20.00	70.00	10.00	10.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80.37	81.83	81.75	76.13	77.76	75.53	75.53	78.19	76.74	83.17	64.48	64.48	74.84
13.51	23.51	13.51	18.51	8.51	23.51	13.51	53.50	23.51	73.50	13.51	13.51	38.50
0.00	-2.41	0.00	-1.37	2.00	-2.41	0.00	-5.98	-2.41	-7.36	0.00	0.00	-4.55
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.04	-0.02	-0.04	-0.03	-0.06	-0.02	-0.04	-0.01	-0.02	-0.01	-0.04	-0.04	-0.01
0.37	0.43	0.37	0.41	0.29	0.43	0.37	0.47	0.43	0.48	0.37	0.37	0.45
I	I	I	I	I	I	I	I	I	I	I	I	I
-2.48	-2.33	-2.48	-2.39	-2.73	-2.33	-2.48	-2.23	-2.33	-2.21	-2.48	-2.48	-2.26
-7.41	-7.57	-7.41	-7.51	-7.15	-7.57	-7.41	-7.68	-7.57	-7.71	-7.41	-7.41	-7.65
-2.48	-2.33	-2.48	-2.39	-2.73	-2.33	-2.48	-2.23	-2.33	-2.21	-2.48	-2.48	-2.26
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
82.87	81.93	84.25	77.26	82.26	75.62	78.02	74.71	76.83	78.31	66.98	66.98	72.79
	no		no		no			no		no		

K30		K31			K32		K34		K41		K42a	
Tin Ma Court		Wang Tau Hom Estate			Lung Poon Court		Choi Hung Estate		Upper Ngau Tau Kok Est		Shun Lee Tsuen	
Flyover	At grade	Flyover	At grade	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade
Chuk Yuen Road	Lung Cheung Road	Fung Mo Street	Fung Mo Street	Lung Cheung Road	Po Kong Village Road	Lung Cheung Road	Prince Edward Road East	Prince Edward Road East	Ngau Tau Kok Road	Kwun Tong Road	Shun Lee Tsuen Road	New Clear Water Bay Road
1033	4462	2010	2010	4356	899	4647	7721	7721	268	5864	1863	1687
50	50	50	50	50	50	50	50	50	50	50	50	50
22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	35.2	35.2	22.2	22.2
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75.00	25.00	40.00	30.00	140.00	100.00	85.00	35.00	20.00	10.00	45.00	90.00	40.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73.62	79.97	76.51	76.51	79.87	73.02	80.15	82.36	82.36	69.23	82.63	76.18	75.75
78.50	28.50	43.50	33.50	143.50	103.50	88.50	38.50	23.51	13.51	48.50	93.50	43.50
-7.65	-3.25	-5.08	-3.95	-10.27	-8.85	-8.17	-4.55	-2.41	0.00	-5.55	-8.40	-5.08
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.01	-0.02	-0.01	-0.01	0.00	0.00	-0.01	-0.01	-0.02	-0.04	-0.01	-0.01	-0.01
0.48	0.44	0.46	0.45	0.49	0.48	0.48	0.45	0.43	0.37	0.46	0.48	0.46
I	I	I	I	I	I	I	I	I	I	I	I	I
-2.21	-2.30	-2.25	-2.28	-2.19	-2.20	-2.20	-2.26	-2.33	-2.48	-2.24	-2.20	-2.25
-7.71	-7.61	-7.66	-7.63	-7.74	-7.72	-7.72	-7.65	-7.57	-7.41	-7.67	-7.72	-7.66
-2.21	-2.30	-2.25	-2.28	-2.19	-2.20	-2.20	-2.26	-2.33	-2.48	-2.24	-2.20	-2.25
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
68.47	79.23	73.93	75.06	72.10	66.67	74.48	80.30	82.45	71.73	79.58	70.28	73.17
no		no			no		no		no		no	

Road Noise Calculation
Kowloon

K43		K48		K53	K55		K56
Lee On Road		Kai Tak Court		Laguna Cit	Kwun Tong Estate		Tsui Ping S
Flyover	At grade	Flyover	At grade	Flyover	Flyover	At grade	Flyover
Lee On Road	New Clear Water Bay Road	Kwun Tong Road	Kwun Tong Road	Kwun Tong Bypass	Kwun Tong Bypass	Kwun Tong Road	Tseung Kwan O Road
1095	1872	5864	9608	5765	5678	10443	5678
50	50	50	50	70	50	50	50
22.2	22.2	22.2	22.2	34.1	22.2	22.2	34.1
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
85.00	20.00	70.00	50.00	70.00	20.00	10.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73.87	76.20	81.16	83.30	83.64	81.02	83.67	82.39
88.50	23.51	73.50	53.50	73.50	23.51	13.51	38.50
-8.17	-2.41	-7.36	-5.98	-7.36	-2.41	0.00	-4.55
-1	-1	-1	-1	-1	-1	-1	-1
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.01	-0.02	-0.01	-0.01	-0.01	-0.02	-0.04	-0.01
0.48	0.43	0.48	0.47	0.48	0.43	0.37	0.45
I	I	I	I	I	I	I	I
-2.20	-2.33	-2.21	-2.23	-2.21	-2.33	-2.48	-2.26
-7.72	-7.57	-7.71	-7.68	-7.71	-7.57	-7.41	-7.65
-2.20	-2.33	-2.21	-2.23	-2.21	-2.33	-2.48	-2.26
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
68.21	76.29	76.30	79.82	78.78	81.11	86.16	80.33
no		no		yes	no		yes

Road Noise Calculation
NT

Flyover ID	NT3		NT4		NT9		NT10		NT15	NT25
Receiver	Tai Ping Estate		Venniza Garden		Wang Fuk Court		Wang Fuk Court		Chevalier Garden	Sha Tin Road
Noise Source	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	Flyover
	Pak Wo Road	Fanling Highway	So Kwun Po Rd Network	Fanling Highway	Tai Po Road Yuen Chau Tsai	Tolo Highway	Tai Po Road Yuen Chau Tsai	Tolo Highway	Ma On Shan Road	City One
INPUTS										
Hourly Flow	157	5290	2913	5290	937	5709	932	5709	1848	3287
Av Speed (km/hr)	50	50	50	50	50	50	50	50	50	50
%HV	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	30.7	30.7
Gradient %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Receiver-Carriageway Distance (m)	60.00	50.00	105.00	90.00	50.00	140.00	95.00	150.00	200.00	35.00
Height of Carriageway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Angle of View (deg.)	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
surface type (impervious/pervious)	i	i	i	i	i	i	i	i	i	i
Barrier (Y/N)	N	N	N	N	N	N	N	N	N	N
Height of Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barrier-carriageway Distance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Receiver Height (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OUTPUTS										
Basic Hourly Noise Level dB(A) (Includes speed and %HV correction, also gradient and road surface correction of 1 for imp/bit and speed <75km/hr)	65.44	80.71	78.12	80.71	73.20	81.04	73.17	81.04	77.16	79.96
Distance Correction:										
Slant Distance (m)	63.50	53.50	108.50	93.50	53.50	143.50	98.50	153.50	203.50	38.50
Distance Correction dB(A)	-6.72	-5.98	-9.05	-8.40	-5.98	-10.27	-8.63	-10.56	-11.78	-4.55
Surface correction										
Surface correction	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Calculation of Path Difference:										
Possible Path Difference	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Path Difference Only if Barrier Exists	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Working out whether receiver is in the illuminated or shadow zone:										
Source Receiver gradient	-0.01	-0.01	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	-0.01
Height of Line at Barrier Position	0.47	0.47	0.48	0.48	0.47	0.49	0.48	0.49	0.49	0.45
Illuminated / Shadow?	I	I	I	I	I	I	I	I	I	I
Calculation of barrier attenuation:										
Barrier Atten Illuminated	-2.22	-2.23	-2.19	-2.20	-2.23	-2.19	-2.20	-2.18	-2.18	-2.26
Barrier Atten Shadow	-7.70	-7.68	-7.73	-7.72	-7.68	-7.74	-7.72	-7.74	-7.75	-7.65
Possible Barrier Attenuation	-2.22	-2.23	-2.19	-2.20	-2.23	-2.19	-2.20	-2.18	-2.18	-2.26
Actual Barrier Attenuation based on whether there is a barrier or not	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Angle of View and Facade Corrections:										
View Ange Correction dB(A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Facade correction	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Hourly L10, dB(A)	61.21	77.23	71.57	74.81	69.72	73.28	67.04	72.99	67.88	77.91
Detail Assessment required?	no		no		no		no		no	yes

	NT27		NT29		NT35		NT47		NT48		NT49	
	Ravana Garden		Pictorial Garden		Worldwide Garden		Ling Nam		San Fat Estate		Kam Wah Garden	
At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade
	Tai Chung Kiu Road	Tai Chung Kiu Road	Shek Mun Interchange Slip Road	Tate's Cairn Highway	Lion Rock Tunnel Road	Lion Rock Tunnel Road	Castle Peak Road - San Hui	San Hui Road	Pui To Road	Pui To Road	Pui To Road	Tuen Fat Road
2588	3153	3153	564	3796	5894	5894	598	598	1721	1721	1397	4274
50	50	50	50	50	50	50	50	50	50	50	50	50
30.7	41.6	41.6	33	30.7	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70.00	30.00	15.00	75.00	80.00	110.00	20.00	30.00	20.00	30.00	20.00	50.00	30.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78.63	80.51	80.51	72.25	80.29	81.18	81.18	71.25	71.25	75.84	75.84	74.93	79.79
73.50	33.50	18.51	78.50	83.50	113.50	23.51	33.50	23.51	33.50	23.51	53.50	33.50
-7.36	-3.95	-1.37	-7.65	-7.91	-9.25	-2.41	-3.95	-2.41	-3.95	-2.41	-5.98	-3.95
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.01	-0.01	-0.03	-0.01	-0.01	0.00	-0.02	-0.01	-0.02	-0.01	-0.02	-0.01	-0.01
0.48	0.45	0.41	0.48	0.48	0.48	0.43	0.45	0.43	0.45	0.43	0.47	0.45
I	I	I	I	I	I	I	I	I	I	I	I	I
-2.21	-2.28	-2.39	-2.21	-2.21	-2.19	-2.33	-2.28	-2.33	-2.28	-2.33	-2.23	-2.28
-7.71	-7.63	-7.51	-7.71	-7.71	-7.73	-7.57	-7.63	-7.57	-7.63	-7.57	-7.68	-7.63
-2.21	-2.28	-2.39	-2.21	-2.21	-2.19	-2.33	-2.28	-2.33	-2.28	-2.33	-2.23	-2.28
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
73.77	79.07	81.64	67.10	74.88	74.44	81.27	69.80	71.34	74.39	75.93	71.45	78.34
	no		no		no		no		no		no	

NT56		NT62	NT69		NT71				NT73		NT76	
Sun Shing		Clague Garden Estate	Kwai Fong Estate		Riviera Garden		Cheung On Estate		Lai King Terrace		Lai Yiu Estate	
Flyover	At grade	Flyover	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade
Tuen Hing Road	Tuen Mun Road	Tsuen Wan Road	Kwai Chung Road	Kwai Chung Road	Tsing Tsuen Road	Tsuen Wan Road	Tsing Tsuen Road	Tsing King Road	Lai King Hill Rd Network	Kwai Chung Road	Wah Tai Road	Castle Peak Road
1180	4274	7552	1036	518	3487	9624	3487	883	1007	2445	578	2416
50	50	70	50	50	50	50	50	50	50	50	50	50
22.2	22.2	13.2	32.3	32.3	51.2	13.2	51.2	30.3	22.2	22.2	22.2	22.2
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40.00	50.00	15.00	25.00	15.00	25.00	375.00	20.00	5.00	45.00	20.00	90.00	65.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74.20	79.79	82.33	74.82	71.81	81.69	81.89	81.69	73.91	73.51	77.36	71.10	77.31
43.50	53.50	18.51	28.50	18.51	28.50	378.50	23.51	8.51	48.50	23.51	93.50	68.50
-5.08	-5.98	-1.37	-3.25	-1.37	-3.25	-14.48	-2.41	2.00	-5.55	-2.41	-8.40	-7.05
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.02	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.01	-0.01	-0.03	-0.02	-0.03	-0.02	0.00	-0.02	-0.06	-0.01	-0.02	-0.01	-0.01
0.46	0.47	0.41	0.44	0.41	0.44	0.50	0.43	0.29	0.46	0.43	0.48	0.47
1	1	1	1	1	1	1	1	1	1	1	1	1
-2.25	-2.23	-2.39	-2.30	-2.39	-2.30	-2.17	-2.33	-2.73	-2.24	-2.33	-2.20	-2.22
-7.66	-7.68	-7.51	-7.61	-7.51	-7.61	-7.76	-7.57	-7.15	-7.67	-7.57	-7.72	-7.70
-2.25	-2.23	-2.39	-2.30	-2.39	-2.30	-2.17	-2.33	-2.73	-2.24	-2.33	-2.20	-2.22
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
71.62	76.31	83.46	74.07	72.94	80.95	69.91	81.78	78.41	70.45	77.45	65.19	72.76
no		yes	yes		yes		yes		no		no	

Annex D

Detailed Noise Assessment

Flyover	**H34 IEC**												
					Predicted Noise Levels in dB(A)								
Receiver	**Floor**	**Unmitigated** *Flyover*	*At-grade*	*Total*	**With 3 m Barrier** *Flyover*	*At-grade*	*Total*	**With 5 m Barrier + Cantilever** *Flyover*	*At-grade*	*Total*	**Semi-enclosure** *Flyover*	*At-grade*	*Total*
1 Heng Fa Chuen Blk. 15	Low	76.2	0	76.2	63.0	0	63.0	57.8	0	57.8	56.2	0	56.2
	Mid	75.8	0	75.8	69.0	0	69.0	61.0	0	61.0	55.8	0	55.8
	Top	74.8	0	74.8	74.1	0	74.1	65.9	0	65.9	54.8	0	54.8
2 Heng Fa Chuen Blk. 18	Low	76.3	0	76.3	64.8	0	64.8	62.8	0	62.8	56.3	0	56.3
	Mid	75.7	0	75.7	71.8	0	71.8	64.6	0	64.6	55.7	0	55.7
	Top	74.1	0	74.1	74.0	0	74.0	69.3	0	69.3	54.1	0	54 1
3 Heng Fa Chuen Blk. 17	Low	78.5	0	78.5	65.0	0	65.0	60.5	0	60.5	58.5	0	58.5
	Mid	77.7	0	77.7	74.8	0	74.8	64.9	0	64.9	57.7	0	57.7
	Top	76.0	0	76.0	75.9	0	75.9	72.1	0	72.1	56.0	0	56.0
4 Heng Fa Chuen Blk. 16	Low	74.6	0	74.6	63.8	0	63.8	59.9	0	59.9	54.6	0	54.6
	Mid	74.1	0	74.1	68.3	0	68.3	61.9	0	61.9	54.1	0	54.1
	Top	72.8	0	72.8	72.5	0	72.5	65.3	0	65.3	52.8	0	52.8

Flyover	**H26 IEC**												
					Predicted Noise Levels in dB(A)								
Receiver	**Floor**	**Unmitigated** *Flyover*	*At-grade*	*Total*	**With 3 m Barrier** *Flyover*	*At-grade*	*Total*	**With 5 m Barrier + Cantilever** *Flyover*	*At-grade*	*Total*	**Semi-enclosure** *Flyover*	*At-grade*	*Total*
1 City Garden	Low	81.8	0	81.8	62.0	0	62.0	58.3	0	58.3	61.8	0	61.8
	Mid	78.7	0	78.7	78.7	0	78.7	77.8	0	77.8	58.7	0	58.7
	Top	75.2	0	75.2	75.2	0	75.2	75.2	0	75.2	55.2	0	55.2
2 City Garden	Low	76.1	0	76.1	59.8	0	59.8	54.7	0	54.7	56.1	0	56.1
	Mid	75.1	0	75.1	73.4	0	73.4	63.6	0	63.6	55.1	0	55.1
	Top	72.9	0	72.9	72.7	0	72.7	70.9	0	70.9	52.9	0	52.9
3 Provident Centre	Low	79.7	0	79.7	62.0	0	62.0	57.2	0	57.2	59.7	0	59.7
	Mid	78.4	0	78.4	77.6	0	77.6	69.3	0	69.3	58.4	0	58.4
	Top	75.7	0	75.7	75.6	0	75.6	74.7	0	74.7	55.7	0	55.7
4 North Point Estate	Low	78.4	0	78.4	61.0	0	61.0	55.9	0	55.9	58.4	0	58.4
	Mid	78.4	0	78.4	68.1	0	68.1	60.6	0	60.6	58.4	0	58.4
	Top	77.1	0	77.1	76.1	0	76.1	68.1	0	68.1	57.1	0	57.1
5 North Point Estate	Low	80.3	0	80.3	61.5	0	61.5	57.2	0	57.2	60.3	0	60.3
	Mid	80.3	0	80.3	71.6	0	71.6	63.6	0	63.6	60.3	0	60.3
	Top	78.1	0	78.1	77.9	0	77.9	74.5	0	74.5	58.1	0	58.1

Flyover	H41 Ap Lei Chau Bridge												
		Predicted Noise Levels in dB(A)											
Receiver	Floor	Unmitigated			With 3 m Barrier			With 5 m Barrier + Cantilever			Semi-enclosure		
		Flyover	*At-grade*	*Total*	*Flyover*	*At-grade*	*Total*	*Flyover*	*At-grade*	*Total*	*Flyover*	*At-grade*	*Total*
1 Shan Ming Street No.9	Low	69.9	64.3	71.0	60.8	64.3	65.9	60.3	64.3	65.8	60.4	64.3	65.8
	Mid	69.9	64.4	71.0	60.9	64.4	66.0	60.3	64.4	65.8	60.4	64.4	65.9
	Top	70.0	64.8	71.1	61.5	64.8	66.5	60.5	64.8	66.2	60.5	64.8	66.2
2 Shan Ming Street No.43	Low	71.4	68.7	73.3	60.8	68.7	69.4	60.2	68.7	69.3	60.3	68.7	69.3
	Mid	71.4	68.7	73.3	61	68.7	69.4	60.3	68.7	69.3	60.4	68.7	69.3
	Top	71.5	69.0	73.4	61.9	69.0	69.8	60.5	69.0	69.6	60.4	69.0	69.6
3 Shan Ming Street No.43	Low	70.8	72.5	74.7	56.6	72.5	72.6	55.2	72.5	72.6	54.3	72.5	72.6
	Mid	70.9	72.7	74.9	57.1	72.7	72.8	55.4	72.7	72.8	54.3	72.7	72.8
	Top	71.0	73.8	75.6	59.2	73.8	73.9	56.4	73.8	73.9	54.8	73.8	73.9
4 Ping Lan Street	Low	67.6	69.8	71.8	57.5	69.8	70.0	57.0	69.8	70.0	32.2	69.8	69.8
	Mid	67.7	70.3	72.2	57.7	70.3	70.5	57.1	70.3	70.5	33.9	70.3	70.3
	Top	67.9	73.6	74.6	58.9	73.6	73.7	57.7	73.6	73.7	46.0	73.6	73.6
5 San Shi Street	Low	41.8	63.7	63.7	41.3	63.7	63.7	40.5	63.7	63.7	32.6	63.7	63.7
	Mid	43.7	65.2	65.2	43.1	65.2	65.2	42.2	65.2	65.2	34.5	65.2	65.2
	Top	55.1	70.0	70.1	52.4	70.0	70.1	49.7	70.0	70.0	47.1	70.0	70.0
6 San Shi Street	Low	65.3	68.6	70.3	56.1	68.6	68.8	55.7	68.6	68.8	32.8	68.6	68.6
	Mid	65.5	69.2	70.7	56.4	69.2	69.4	55.8	69.2	69.4	34.8	69.2	69.2
	Top	65.7	73.3	74.0	57.5	73.3	73.4	56.5	73.3	73.4	46.8	73.3	73.3

Flyover	K2 Kwai Chung Road									
					Predicted Noise Levels in dB(A)					
Receiver	Floor	Unmitigated *Flyover*	*At-grade*	*Total*	With 3 m Barrier *Flyover*	*At-grade*	*Total*	With 5 m Barrier + Cantilever *Flyover*	*At-grade*	*Total*
1 Mei Foo Sun Chuen Phase 5	Low	69.1	36.4	69.1	56.2	34.7	56.2	51.1	34.7	51.2
- Block 5	Mid	69.2	33.7	69.2	57.5	34.6	57.5	51.9	34.6	52.0
	Top	69.2	33.7	69.2	59.2	37.4	59.2	53.1	37.4	53.2
2 Mei Foo Sun Chuen Phase 5	Low	71.7	36.8	71.7	59.2	36.2	59.2	53.9	36.2	54.0
- Block 2	Mid	71.9	35.2	71.9	61.2	36.1	61.2	55.2	36.1	55.3
	Top	72.0	35.3	72.0	64.4	37.6	64.4	57.2	37.6	57.2
3 Mei Foo Sun Chuen Phase 7	Low	78.1	49.7	78.1	69.3	49.7	69.3	63.3	49.7	63.5
- Block 16	Mid	80.0	49.7	80.0	79.7	49.7	79.7	72.6	49.7	72.6
	Top	81.0	49.7	81.0	78.1	49.7	78.1	77.8	49.7	77.8
4 Mei Foo Sun Chuen Phase 7	Low	81.6	39.1	81.6	77.7	37.0	77.7	69.8	37.0	69.8
- Block 12	Mid	84.4	36.0	84.4	84.4	36.0	84.4	84.3	36.0	84.3
	Top	87.4	37.0	87.4	81.6	39.1	81.6	81.6	39.1	81.6
5 Mei Foo Sun Chuen Phase 7	Low	79.6	63.2	79.7	71.6	64.7	72.4	65.4	64.7	68.1
- Block 12	Mid	81.7	64.2	81.8	81.7	64.2	81.8	78.4	64.2	78.6
	Top	83.3	64.7	83.4	79.6	63.2	79.7	79.6	63.2	79.7
6 Mei Foo Sun Chuen Phase 7	Low	81.0	67.9	81.2	72.2	70.3	74.4	66.1	70.3	71.7
- Block 9	Mid	83.0	69.4	83.2	82.8	69.4	83.0	77.5	69.4	78.1
	Top	84.2	70.3	84.4	81.0	67.9	81.2	80.8	67.9	81.0
7 Mei Foo Sun Chuen Phase 7	Low	79.7	77.6	81.8	72.1	83.5	83.8	65.7	83.5	83.6
- Block 1	Mid	81.6	80.1	83.9	81.5	80.1	83.9	76.5	80.1	81.7
	Top	82.8	83.5	86.2	79.7	77.6	81.8	79.6	77.6	81.7
8 Mei Foo Sun Chuen Phase 6	Low	80.5	75.5	81.7	69.4	80.6	80.9	63.5	80.6	80.7

- Block 40	Mid	81.4	77.5	82.9	76.7	78.7	80.8	68.0	78.7	79.1
	Top	81.8	79.4	83.8	80.1	76.7	81.7	74.4	76.7	78.7
9 Mei Foo Sun Chuen Phase 6	Low	79.2	74.4	80.4	70.4	79.2	79.7	63.5	79.2	79.3
- Block 46	Mid	80.0	76.3	81.5	77.7	77.4	80.6	68.3	77.4	77.9
	Top	80.4	78.2	82.4	79.0	75.4	80.6	75.1	75.4	78.3
10 Mei Foo Sun Chuen Phase 6	Low	72.7	67.6	73.9	63.1	69.5	70.4	56.5	69.5	69.7
- Block 25	Mid	72.9	67.9	74.1	66.4	69.3	71.1	58.2	69.3	69.6
	Top	72.9	68.1	74.1	69.9	69.0	72.5	60.5	69.0	69.6
11 Mei Foo Sun Chuen Phase 6	Low	69.8	64.5	70.9	59.9	66.0	67.0	53.3	66.0	66.2
- Block 9	Mid	69.9	64.6	71.0	62.4	65.9	67.5	54.4	65.9	66.2
	Top	69.9	64.7	71.0	64.9	65.8	68.4	55.9	65.8	66.2

Flyover **K4 West Kowloon Corridor**

Receiver	Floor	Predicted Noise Levels in dB(A)					
		Unmitigated			**With 3 m Barrier**		
		Flyover	*At-grade*	*Total*	*Flyover*	*At-grade*	*Total*
1 Nam Cheong Estate	Low	75.2	64.7	75.6	59.5	49.1	59.9
	Mid	75.2	64.7	75.6	61.9	51.4	62.3
	Top	75.0	64.5	75.4	65.8	55.3	66.2

Note : Direct Technical Remedies could not be incorporated into the residential buildings along Tung Chow Street opposite Nam Cheong Estate due to insuffcient space (FSD)

Flyover	**K53 Kwun Tong Bypass**									
					Predicted Noise Levels in dB(A)					
Receiver	**Floor**	**Unmitigated** *Flyover*	*At-grade*	*Total*	**With 3 m Barrier** *Flyover*	*At-grade*	*Total*	**With 5 m Barrier + Cantilever** *Flyover*	*At-grade*	*Total*
1 Laguna City Blk. 8	Low	76.3	0	76.3	67.0	0	67.0	66.0	0	66.0
	Mid	76.2	0	76.2	68.6	0	68.6	65.9	0	65.9
	Top	75.6	0	75.6	71.9	0	71.9	66.3	0	66.3
2 Laguna City Blk. 1	Low	78.9	0	78.9	65.7	0	65.7	62.9	0	62.9
	Mid	78.5	0	78.5	72.0	0	72.0	65.4	0	65.4
	Top	77.5	0	77.5	76.8	0	76.8	69.3	0	69.3
3 Laguna City Blk. 26	Low	69.8	0	69.8	55.6	0	55.6	50.4	0	50.4
	Mid	69.7	0	69.7	58.0	0	58.0	52.1	0	52.1
	Top	69.5	0	69.5	61.2	0	61.2	54.0	0	54.0

Flyover	K56 Tseung Kwan O Road												
					Predicted Noise Levels in dB(A)								
Receiver	**Floor**	**Unmitigated** *Flyover*	*At-grade*	*Total*	**With 3 m Barrier** *Flyover*	*At-grade*	*Total*	**With 5 m Barrier + Cantilever** *Flyover*	*At-grade*	*Total*	**Semi-enclosure** *Flyover*	*At-grade*	*Total*
1 Tsui Ping Est. S Blk. A & B	Low	74.9	67.4	75.6	59.9	67.4	68.1	54.5	67.4	67.6	54.9	67.4	67.6
	Mid	74.6	67.2	75.3	66.1	67.2	69.7	58.8	67.2	67.8	54.6	67.2	67.4
	Top	73.6	66.3	74.3	72.8	66.3	73.7	63.7	66.3	68.2	53.6	66.3	66.5
2 Tsui Ping Est. S Blk. C	Low	78.0	72.2	83.0	62.2	72.2	72.6	56.8	72.2	72.3	53.4	72.2	72.3
	Mid	76.9	71.8	78.1	74.5	71.8	76.4	68.8	71.8	73.6	56.9	71.8	71.9
	Top	74.9	70.2	76.2	74.8	70.2	76.1	71.9	70.2	74.1	54.9	70.2	70.3
3 Tsui Ping Est. S. Blk. D	Low	78.1	78.8	81.5	71.5	78.8	79.5	71.1	78.8	79.5	58.1	78.8	78.8
	Mid	76.5	78.1	80.4	76.2	78.1	80.3	70.8	78.1	78.8	56.5	78.1	78.1
	Top	73.9	75.6	77.8	74.0	75.6	77.9	73.5	75.6	77.7	53.9	75.6	75.6
4 Tsui Ping Est. S Blk. E & F	Low	73.4	82.5	83.0	71.1	82.5	82.8	71	82.5	82.8	53.4	82.5	82.5
	Mid	71.4	81.7	82.1	71.8	81.7	82.1	69.9	81.7	82.0	51.4	81.7	81.7
	Top	68.7	78.8	79.2	69.4	78.8	79.3	69.3	78.8	79.3	48.7	78.8	78.8

Flyover	NT25 Sha Tin Road												
					Predicted Noise Levels in dB(A)								
Receiver	**Floor**	**Unmitigated** *Flyover*	*At-grade*	*Total*	**With 3 m Barrier** *Flyover*	*At-grade*	*Total*	**With 5 m Barrier + Cantilever** *Flyover*	*At-grade*	*Total*	**Enclosure** *Flyover*	*At-grade*	*Total*
1 City One Shatin Blk. 15	Low	78.9	74.3	80.2	65.4	76.1	76.5	60.6	76.1	76.2	58.9	76.1	76.2
	Mid	77.1	73.7	78.7	79.7	73.7	80.7	72.6	73.7	76.2	57.1	73.7	73.8
	Top	74.5	71.3	76.2	77.4	71.3	78.4	76.5	71.3	77.6	54.5	71.3	71.4
2 City One Shatin Blk. 20	Low	77.1	65.8	77.4	63.9	68.3	69.6	58.3	68.3	68.7	57.1	68.3	68.6
	Mid	75.7	67.6	76.3	77.8	67.6	78.2	68.7	67.6	71.2	55.7	67.6	67.9
	Top	73.4	67.0	74.3	76.4	67.0	76.9	74.6	67.0	75.3	53.4	67.0	67.2
3 City One Shatin Blk. 51	Low	74.6	72.9	76.8	62.3	73.1	73.4	56.7	73.1	73.2	54.6	73.1	73.2
	Mid	73.2	71.6	75.5	75.0	71.6	76.6	66.5	71.6	72.8	53.2	71.6	71.7
	Top	71.1	69.8	73.5	74.1	69.8	75.5	71.7	69.8	73.9	51.1	69.8	69.9
4 Belair Gardens (East Facade)	Low	74.3	69.0	75.4	61.8	69.7	70.4	56.1	69.7	69.9	54.3	69.7	69.8
	Mid	74.0	69.2	75.2	69.1	69.2	72.2	61.1	69.2	69.8	54.0	69.2	69.3
	Top	73.0	68.2	74.2	75.2	68.2	76.0	65.4	68.2	70.0	53.0	68.2	68.3
5 Belair Gardens (North Facade)	Low	73.2	74.2	76.7	60.0	74.5	74.7	54.6	74.5	74.5	53.2	74.5	74.5
	Mid	72.9	73.2	76.1	67.0	73.2	74.1	59.3	73.2	73.4	52.9	73.2	73.2
	Top	72.1	71.3	74.7	73.5	71.3	75.5	63.3	71.3	71.9	52.1	71.3	71.4

Flyover	NT62 Tsuen Wan Road											
		Predicted Noise Levels in dB(A)										
Receiver	**Floor**	**Unmitigated** *Flyover*	*At-grade*	*Total*	**With 3 m Barrier** *Flyover*	*At-grade*	*Total*	**With 5 m Barrier + Cantilever** *Flyover*	*At-grade*	*Total*	**Semi-enclosure** *Flyover*	*At-grade*	*Total*
1 Clague Garden Est.	Low	63.4	73.0	73.5	52.0	73.0	73.0	47.8	73.0	73.0	43.4	73.0	73.0
	Mid	62.2	71.8	72.3	61.2	71.8	72.2	52.3	71.8	71.8	42.2	71.8	71.8
	Top	60.9	70.2	70.7	60.9	70.2	70.7	58.3	70.2	70.5	40.9	70.2	70.2
2 Clague Garden Est.	Low	76.8	73.4	78.4	65.2	73.4	74.0	58.9	73.4	73.6	56.8	73.4	73.5
	Mid	75.0	71.6	76.6	74.7	71.6	76.4	67.7	71.6	73.1	55.0	71.6	71.7
	Top	73.1	69.6	74.7	73.1	69.6	74.7	72.2	69.6	74.1	53.1	69.6	69.7
3 Clague Garden Est.	Low	76.4	66.3	76.8	62.1	66.3	67.7	56.5	66.3	66.7	56.4	66.3	66.7
	Mid	75.6	65.3	76.0	73.0	65.3	73.7	63.1	65.3	67.3	55.6	65.3	65.7
	Top	74.0	63.7	74.4	73.9	63.7	74.3	69.4	63.7	70.4	54.0	63.7	64.1
4 Clague Garden Est.	Low	83.0	67.9	83.1	66.8	67.9	70.4	61.2	67.9	68.7	63.0	67.9	69.1
	Mid	78.4	62.3	78.5	78.4	62.3	78.5	78.0	62.3	78.1	58.4	62.3	63.8
	Top	75.4	59.5	75.5	75.4	59.5	75.5	75.4	59.5	75.5	55.4	59.5	60.9

Flyover	NT69 Kwai Chung Road												
					Predicted Noise Levels in dB(A)								
Receiver	Floor	Unmitigated *Flyover*	*At-grade*	*Total*	With 3 m Barrier *Flyover*	*At-grade*	*Total*	With 5 m Barrier + Cantilever *Flyover*	*At-grade*	*Total*	Semi-enclosure *Flyover*	*At-grade*	*Total*
1 Kwai On House	Low	69.0	66.3	70.9	57.3	67.8	68.2	50.9	67.8	67.9	49.0	66.3	66.4
	Mid	68.7	65.8	70.5	64.4	67.3	69.1	54.7	67.3	67.5	48.7	65.8	65.9
	Top	67.9	64.8	69.6	67.5	66.3	70.0	59.9	66.3	67.2	47.9	64.8	64.9
2 Kwai Tak House	Low	69.9	67.5	71.9	57.2	68.9	69.2	51.1	68.9	69.0	49.9	67.5	67.6
	Mid	69.6	66.9	71.5	64.5	68.3	69.8	55.2	68.3	68.5	49.6	66.9	67.0
	Top	68.7	65.7	70.5	68.4	67.2	70.9	60.5	67.2	68.0	48.7	65.7	65.8
3 Kwai Fong Est Blk. 3	Low	71.0	68.8	73.0	55.4	70.3	70.4	50.3	70.3	70.3	51.0	68.8	68.9
	Mid	70.7	67.9	72.5	61.7	69.4	70.1	54.8	69.4	69.5	50.7	67.9	68.0
	Top	69.6	66.6	71.4	68.6	68.1	71.4	59.9	68.1	68.7	49.6	66.6	66.7
4 Police Quarter	Low	75.1	73.1	77.2	60.8	74.6	74.8	54.9	74.6	74.6	55.1	73.1	73.2
	Mid	73.4	69.9	75.0	72.8	71.4	75.2	64.6	71.4	72.2	53.4	69.9	70.0
	Top	71.1	67.2	72.6	71.0	68.7	73.0	70.0	68.7	72.4	51.1	67.2	67.3
5 Kwai Fong Terrace	Low	73.8	72.5	76.2	61.0	73.7	73.9	54.6	73.7	73.8	53.8	72.5	72.6
	Mid	71.2	68.8	73.2	71.1	70.0	73.6	67.6	69.9	71.9	51.2	68.8	68.9
	Top	68.8	66.2	70.7	68.8	67.3	71.1	68.4	67.3	70.9	48.8	66.2	66.3

Flyover	NT71 Tsing Tsuen Road												
					Predicted Noise Levels in dB(A)								
Receiver	Floor	Unmitigated *Flyover*	*At-grade*	*Total*	With 3 m Barrier *Flyover*	*At-grade*	*Total*	With 5 m Barrier + Cantilever *Flyover*	*At-grade*	*Total*	Semi-enclosure *Flyover*	*At-grade*	*Total*
1 Riviera Gardens	Low	77.3	54.8	77.3	62.6	52.6	63.0	57.4	52.6	58.6	70.1	54.9	70.2
- Hoi Kwun Court	Mid	75.7	54.8	75.7	75.6	55.2	75.6	71.8	55.2	71.9	68.5	54.8	68.7
	Top	73.8	55.4	73.9	73.8	55.8	73.9	73.7	55.8	73.8	66.7	55.5	67.0
2 Riviera Gardens	Low	79.5	65.0	79.7	64.3	62.6	66.5	59.3	62.4	64.1	34.3	65.0	65.0
- Hoi Fung Court	Mid	76.2	65.0	76.5	76.2	65.0	76.5	76.1	65.0	76.4	32.3	65.0	65.0
	Top	73.8	64.9	74.3	73.8	64.9	74.3	73.8	64.9	74.3	32.9	64.9	64.9
3 Riviera Gardens	Low	79.5	67.5	79.8	68.4	65.7	70.3	59.7	65.3	66.4	30.4	67.5	67.5
- Hoi Kwai Court	Mid	76.3	67.5	76.8	76.3	67.5	76.8	76.0	67.5	76.6	29.8	67.5	67.5
	Top	74.0	67.3	74.8	74.0	67.3	74.8	74.0	67.3	74.8	29.9	67.3	67.3
4 Riviera Gardens	Low	75.1	69.6	76.2	61.6	68.8	69.6	56.2	68.4	68.7	29.0	69.6	69.6
- Hoi Yue Court	Mid	74.1	69.4	75.4	73.6	69.4	75.0	65.5	69.4	70.9	28.7	69.4	69.4
	Top	72.7	69.1	74.3	72.7	69.1	74.3	71.7	69.1	73.6	29.7	69.1	69.1
5 Tsing On THA	Low	78.9	71.0	79.6	78.4	70.9	79.1	78.4	70.9	79.1	28.2	71.0	71.0
6 Cheung On Estate	Low	79.6	66.1	79.8	77.7	64.8	77.9	77.6	64.8	77.8	28.9	66.1	66.1
- On Chiu House	Mid	77.1	67.2	77.5	77.1	67.2	77.5	76.8	67.2	77.3	28.3	67.2	67.2
	Top	74.4	65.9	75.0	74.4	65.9	75.0	74.4	65.9	75.0	43.3	68.0	68.0
7 Cheung On Estate	Low	78.5	63.4	78.6	71.1	57.0	71.3	70.3	56.5	70.5	29.5	63.4	63.4
- On Chiu House	Mid	76.6	61.9	76.7	76.5	61.8	76.6	74.4	61.7	74.6	28.9	61.9	61.9
	Top	74.3	60.9	74.5	74.3	61.1	74.5	74.2	61.1	74.4	45.3	67.1	67.1
8 Cheung On Estate	Low	77.7	62.9	77.8	69.4	59.1	69.8	68.4	59.0	68.9	29.7	62.9	62.9
- On Pak House	Mid	76.6	62.4	76.8	76.3	62.3	76.5	71.9	62.2	72.3	29.1	62.4	62.4
	Top	74.5	61.4	74.7	74.5	61.6	74.7	74.3	61.6	74.5	51.8	66.3	66.5
9 Cheung On Estate	Low	77.6	66.8	77.9	68.0	63.0	69.2	66.4	62.9	68.0	30.6	66.8	66.8
- On Pak House	Mid	76.5	65.2	76.8	76.2	65.2	76.5	70.8	65.1	71.8	29.9	65.2	65.2
	Top	74.5	63.4	74.8	74.5	63.7	74.8	74.2	63.6	74.6	58.2	66.6	67.2

10 Cheung On Estat - On Pak House	Low	77.3	68.7	77.9	67.3	65.8	69.6	65.6	65.7	68.7	31.1	68.7	68.7
	Mid	76.0	65.8	76.4	75.9	65.9	76.3	71.2	65.7	72.3	30.3	65.8	65.8
	Top	73.9	63.6	74.3	73.9	63.8	74.3	73.8	63.7	74.2	58.5	66.3	67.0
11 Cheung On Estat - On Pak House	Low	73.1	71.1	75.2	59.6	71.4	71.7	54.6	71.4	71.5	61.4	71.1	71.5
	Mid	72.3	68.7	73.9	71.3	69.0	73.3	62.1	69.0	69.8	60.7	68.7	69.3
	Top	70.5	66.6	72.0	70.5	66.9	72.1	69.7	66.9	71.5	59.1	68.2	68.7
12 Cheung On Estat - On Mei House	Low	72.6	70.1	74.5	59.2	70.4	70.7	54.0	70.4	70.5	61.2	70.1	70.6
	Mid	72.2	68.7	73.8	67.8	69.1	71.5	59.1	69.1	69.5	60.9	68.7	69.4
	Top	71.0	66.8	72.4	70.9	67.2	72.4	66.2	67.2	69.7	59.8	68.7	69.2
13 Cheung On Estat - On Mei House	Low	70.3	71.3	73.8	58.1	71.3	71.5	54.8	71.3	71.4	61.0	71.2	71.6
	Mid	70.2	69.6	72.9	61.8	69.8	70.4	56.4	69.8	70.0	60.9	69.6	70.1
	Top	69.7	67.6	71.8	67.7	67.9	70.8	59.0	67.9	68.4	60.4	69.9	70.4

Annex E

Unit Costs for Direct Technical Remedies

Development of Unit Rates for Noise Mitigation Options

3	Semi Enclosure	Unit Rate (HK$)
	Drainage in structure	265/m
	Excavation	234/m
	Piling	6,000/m
	Formwork	205/m
	Steel Reinforcement	897/m
	Concrete	428/m
	Structural Steel Support	133,117/m
	"Plexiglass" sheet	50,800/m
	Electrical and Mechanical work, including lighting	3,000/m
		194,946/m
	+15% for Preliminary & General Items	29,242/m
		224,188/m

Development of Unit Rates for Noise Mitigation Options

4	Full Enclosures	Unit Rate (HK$)
	Drainage in structure	265/m
	Excavation	234/m
	Piling	6,000/m
	Formwork	205/m
	Steel Reinforcement	897/m
	Concrete	428/m
	Structural Steel Support	133,117/m
	"Plexiglass" sheet	50,800/m
	Electrical and Mechanical work, including lighting	3,000/m
	Ventilation system	550/m
		195,496/m
	+15% for Preliminary & General Items	29,324/m
		224,820/m

Development of Unit Rates for Noise Mitigation Options

1	3m high Noise Barriers	Unit Rate (HK$)
	"Plexiglass" screen	9,900/m
	R C Plinth	2,353/m
	Steelwork	5,481/m
	Structure Steel Support	133,117/m
		150,851/m
	+15% for Preliminary & General Items	22,628/m
		173,479/m

Development of Unit Rates for Noise Mitigation Options

2	5m high Noise Barriers	Unit Rate (HK$)
	"Plexiglass" screen	17,068/m
	R C Plinth	2,620/m
	Steelwork	9,869/m
	Structure Steel Support	133,117/m
		162,674/m
	+15% for Preliminary & General Items	24,401/m
		187,075/m

Annex F

Cost-Effectiveness Analysis

Flyover	H26 IEC												
					Effectiveness Analysis								
Receiver	Floor	With 3 m Barrier *Noise Reduction*	*Dwellings*	*Floors*	*Factor R*	With 5 m Barrier + Cantilever *Noise Reduction*	*Dwellings*	*Floors*	*Factor R*	Semi-enclosure *Noise Reduction*	*Dwellings*	*Floors*	*Factor R*
1 City Garden	Low	19.80	6	8	950	23.50	6	8	1128	20.00	6	8	960
	Mid	0.00	6	8	0	0.90	6	8	43	20.00	6	8	960
	Top	0.00	6	9	0	0.00	6	9	0	20.00	6	9	1080
2 City Garden	Low	16.30	4	8	522	21.40	4	8	685	20.00	4	8	640
	Mid	1.70	4	8	54	11.50	4	8	368	20.00	4	8	640
	Top	0.20	4	9	7	2.00	4	9	72	20.00	4	9	720
3 Provident Centre	Low	17.70	14	8	1982	22.50	14	8	2520	20.00	14	8	2240
	Mid	0.80	14	8	90	9.10	14	8	1019	20.00	14	8	2240
	Top	0.10	14	8	11	1.00	14	8	112	20.00	14	8	2240
4 North Point Estate	Low	17.40	16	4	1114	22.50	16	4	1440	20.00	16	4	1280
	Mid	10.30	16	5	824	17.80	16	5	1424	20.00	16	5	1600
	Top	1.00	16	5	80	9.00	16	5	720	20.00	16	5	1600
5 North Point Estate	Low	18.80	16	4	1203	23.10	16	4	1478	20.00	16	4	1280
	Mid	8.70	16	5	696	16.70	16	5	1336	20.00	16	5	1600
	Top	0.20	16	5	16	3.60	16	5	288	20.00	16	5	1600
				Factor E	**7550**			**Factor E**	**12634**			**Factor E**	**20680**

Flyover	H34 IEC												
					Effectiveness Analysis								
Receiver	Floor	With 3 m Barrier *Noise Reduction*	*Dwellings*	*Floors*	*Factor R*	With 5 m Barrier + Cantilever *Noise Reduction*	*Dwellings*	*Floors*	*Factor R*	Semi-enclosure *Noise Reduction*	*Dwellings*	*Floors*	*Factor R*
1 Heng Fa Chuen Blk. 15	Low	13.20	6	4	317	18.40	6	4	442	20.00	6	4	480
	Mid	6.80	6	4	163	14.80	6	4	355	20.00	6	4	480
	Top	0.70	6	5	21	8.90	6	5	267	20.00	6	5	600
2 Heng Fa Chuen Blk. 18	Low	11.50	4	4	184	13.50	4	4	216	20.00	4	4	320
	Mid	3.90	4	4	62	11.10	4	4	178	20.00	4	4	320
	Top	0.10	4	5	2	4.80	4	5	96	20.00	4	5	400
3 Heng Fa Chuen Blk. 17	Low	13.50	6	4	324	18.00	6	4	432	20.00	6	4	480
	Mid	2.90	6	4	70	12.80	6	4	307	20.00	6	4	480
	Top	0.10	6	5	3	3.90	6	5	117	20.00	6	5	600
4 Heng Fa Chuen Blk. 16	Low	10.80	4	4	173	14.70	4	4	235	20.00	4	4	320
	Mid	5.80	4	4	93	12.20	4	4	195	20.00	4	4	320
	Top	0.30	4	5	6	7.50	4	5	150	20.00	4	5	400
				Factor E	**1418**			**Factor E**	**2990**			**Factor E**	**5200**

Flyover	H41 Ap Lei Chau Bridge												
		Effectiveness Analysis											
Receiver	**Floor**	**With 3 m Barrier** *Noise Reduction*	*Dwellings*	*Floors*	*Factor R*	**With 5 m Barrier + Cantilever** *Noise Reduction*	*Dwellings*	*Floors*	*Factor R*	**Semi-enclosure** *Noise Reduction*	*Dwellings*	*Floors*	*Factor R*
1 Shan Ming Street No.9	Low	5.05	2	3	30	5.20	2	3	31	5.17	2	3	31
	Mid	4.97	2	3	30	5.15	2	3	31	5.12	2	3	31
	Top	4.68	2	4	37	4.97	2	4	40	4.97	2	4	40
2 Shan Ming Street No.43	Low	3.91	4	2	31	3.99	4	2	32	3.98	4	2	32
	Mid	3.89	4	2	31	3.98	4	2	32	3.97	4	2	32
	Top	3.66	4	2	29	3.86	4	2	31	3.88	4	2	31
3 Shan Ming Street No.43	Low	2.13	2	2	9	2.16	2	2	9	2.18	2	2	9
	Mid	2.08	2	2	8	2.12	2	2	8	2.14	2	2	9
	Top	1.68	2	2	7	1.75	2	2	7	1.78	2	2	7
4 Ping Lan Street	Low	1.80	2	2	7	1.83	2	2	7	2.05	2	2	8
	Mid	1.67	2	2	7	1.70	2	2	7	1.90	2	2	8
	Top	0.89	2	2	4	0.92	2	2	4	1.03	2	2	4
5 San Shi Street	Low	1.43	2	2	6	1.45	2	2	6	1.67	2	2	7
	Mid	1.32	2	2	5	1.35	2	2	5	1.54	2	2	6
	Top	0.58	2	2	2	0.61	2	2	2	0.69	2	2	3
6 San Shi Street				**Factor E**	**244**			**Factor E**	**252**			**Factor E**	**256**

Flyover	**K2 Kwai Chung Road**								
				Effectiveness Factor E					
Receiver	**Floor**	**With 3 m Barrier** *Noise Reduction*	*Dwellings*	*Floors*	*Factor E*	**With 5 m Barrier + Cantilever** *Noise Reduction*	*Dwellings*	*Floors*	*Factor E*
2 Mei Foo Sun Chuen Phase 5 - Block 2	Low	12.48	10	7	874	17.73	10	7	1241
	Mid	10.69	10	7	748	16.65	10	7	1165
	Top	7.59	10	7	531	14.75	10	7	1033
3 Mei Foo Sun Chuen Phase 7 - Block 16	Low	8.76	6	7	368	14.62	6	7	614
	Mid	0.30	6	7	13	7.38	6	7	310
	Top	2.90	6	7	122	3.20	6	7	134
4 Mei Foo Sun Chuen Phase 7 - Block 12	Low	3.90	2	7	55	11.80	2	7	165
	Mid	0.00	2	7	0	0.10	2	7	1
	Top	5.80	2	7	81	5.80	2	7	81
5 Mei Foo Sun Chuen Phase 7 - Block 12	Low	7.29	2	7	102	11.62	2	7	163
	Mid	0.00	2	7	0	3.21	2	7	45
	Top	3.66	2	7	51	3.66	2	7	51
6 Mei Foo Sun Chuen Phase 7 - Block 9	Low	6.84	16	7	767	9.51	16	7	1065
	Mid	0.19	16	7	21	5.06	16	7	567
	Top	3.17	16	7	355	3.36	16	7	376
7 Mei Foo Sun Chuen Phase 7 - Block 1	Low	-2.02	2	7	-28	-1.79	2	7	-25
	Mid	0.06	2	7	1	2.25	2	7	32
	Top	4.39	2	7	61	4.45	2	7	62
8 Mei Foo Sun Chuen Phase 6 - Block 40	Low	0.78	12	7	65	1.01	12	7	85
	Mid	2.06	12	7	173	3.83	12	7	322
	Top	2.04	12	7	171	5.06	12	7	425
9 Mei Foo Sun Chuen Phase 6	Low	0.70	7	7	35	1.13	7	7	55

- Block 46	Mid	0.98	7	7	48	3.64	7	7	178
	Top	1.88	7	7	92	4.19	7	7	205
10 Mei Foo Sun Chuen Phase 6	Low	3.47	6	7	146	4.16	6	7	175
- Block 25	Mid	3.00	6	7	126	4.47	6	7	188
	Top	1.66	6	7	70	4.57	6	7	192
11 Mei Foo Sun Chuen Phase 6	Low	3.97	4	7	111	4.70	4	7	131
- Block 9	Mid	3.52	4	7	99	4.83	4	7	135
	Top	2.66	4	7	75	4.82	4	7	135
				Total	5330			Total	9307

Flyover	**K4 West Kowloon Corridor**				
			Effectiveness Factor E		
Receiver	**Floor**	**With 3 m Barrier** *Noise Reducti*	*Dwellings*	*Floors*	*Factor E*
1 Nam Cheong Estate	Low	15.69	48	5	3766
	Mid	13.30	48	5	3192
	Top	9.20	48	5	2208
				Total	9166
Note : Direct Technical Remedies could not be incorporated into the residential buildings along Tung Chow Street opposite Nam Cheong Estate due to insuffcient space (FSD)					

Flyover	**K53 Kwun Tong Bypass**								
					Effectiveness Factor E				
Receiver	**Floor**	**With 3 m Barrier** *Noise Reduction*	*Dwellings*	*Floors*	*Factor E*	**With 5 m Barrier + Cantilever** *Noise Reduction*	*Dwellings*	*Floors*	*Factor E*
1 Laguna City Blk. 8	Low	9.30	15	9	1255	10.30	15	9	1390
	Mid	7.60	15	9	1026	10.30	15	9	1390
	Top	3.70	15	9	499	9.30	15	9	1255
2 Laguna City Blk. 1	Low	13.20	15	9	1782	16.00	15	9	2160
	Mid	6.50	15	9	877	13.10	15	9	1768
	Top	0.70	15	9	94	8.20	15	9	1107
				Total	5535			Total	9072

Flyover	K56 Tseung Kwan O Road												
		Effectiveness Factor E											
Receiver	**Floor**	**With 3 m Barrier** *Noise Reduction*	*Dwellings*	*Floors*	*Factor E*	**With 5 m Barrier + Cantilever** *Noise Reduction*	*Dwellings*	*Floors*	*Factor E*	**Semi-enclosure** *Noise Reduction*	*Dwellings*	*Floors*	*Factor E*
1 Tsui Ping Est. S Blk. F	Low	7.50	6	11	495	7.99	6	11	528	7.97	6	11	526
	Mid	5.63	6	12	405	7.54	6	12	543	7.89	6	12	568
	Top	0.66	6	12	48	6.14	6	12	442	7.81	6	12	563
2 Tsui Ping Est. S Blk. E	Low	10.39	6	11	686	10.68	6	11	705	10.75	6	11	709
	Mid	1.70	6	12	123	4.51	6	12	324	6.13	6	12	441
	Top	0.07	6	12	5	2.02	6	12	146	5.84	6	12	421
3 Tsui Ping Est. S. Blk. C & D	Low	1.93	12	11	255	1.99	12	11	263	2.64	12	11	348
	Mid	0.12	12	12	17	1.54	12	12	222	2.25	12	12	325
	Top	-0.04	12	12	-6	0.16	12	12	23	2.21	12	12	319
4 Tsui Ping Est. S Blk. A & B	Low	0.20	12	11	26	0.21	12	11	27	0.50	12	11	66
	Mid	-0.04	12	12	-5	0.11	12	12	16	0.38	12	12	55
	Top	-0.07	12	12	-10	-0.06	12	12	-8	0.40	12	12	58
				Total	2040			Total	3230			Total	4399

Flyover	NT25 Sha Tin Road												
					Effective Factor E								
Receiver	**Floor**	**With 3 m Barrier** *Noise Reduction*	*Dwellings*	*Floors*	*Factor E*	**With 5 m Barrier + Cantilever** *Noise Reduction*	*Dwellings*	*Floors*	*Factor E*	**enclosure** *Noise Reduction*	*Dwellings*	*Floors*	*Factor E*
1 City One Shatin Blk. 15	Low	3.74	6	10	224	3.97	6	10	238	4.01	6	10	241
	Mid	-1.94	6	10	-116	2.54	6	10	152	4.94	6	10	296
	Top	-2.15	6	10	-129	-1.45	6	10	-87	4.81	6	10	289
2 City One Shatin Blk. 20	Low	7.77	16	10	1242	8.70	16	10	1391	8.79	16	10	1407
	Mid	-1.87	16	10	-299	5.13	16	10	821	8.45	16	10	1353
	Top	-2.58	16	10	-412	-1.00	16	10	-160	7.11	16	10	1138
3 City One Shatin Blk. 51	Low	3.40	10	10	340	3.64	10	10	364	3.68	10	10	368
	Mid	-1.15	10	10	-115	2.71	10	10	271	3.82	10	10	382
	Top	-1.96	10	10	-196	-0.35	10	10	-35	3.65	10	10	365
4 Belair Gardens (East Facade)	Low	5.07	4	10	203	5.54	4	10	222	5.60	4	10	224
	Mid	3.08	4	10	123	5.42	4	10	217	5.91	4	10	237
	Top	-1.75	4	10	-70	4.21	4	10	168	5.91	4	10	237
5 Belair Gardens (North Facade)	Low	2.09	6	10	125	2.19	6	10	132	2.21	6	10	132
	Mid	1.93	6	10	116	2.69	6	10	161	2.82	6	10	169
	Top	-0.82	6	10	-49	2.79	6	10	167	3.38	6	10	203
				Total	986			Total	4024			Total	7040

Flyover	NT62 Tsuen Wan Road												
					Effecctiveness Factor E								
Receiver	Floor	With 3 m Barrier Noise Reduction	Dwellings	Floors	Factor E	With 5 m Barrier + Cantilever Noise Reduction	Dwellings	Floors	Factor E	Semi-enclosure Noise Reduction	Dwellings	Floors	Factor E
1 Clague Garden Est.	Low	0.42	12	12	60	0.44	12	12	63	0.45	12	12	64
	Mid	0.09	12	12	13	0.40	12	12	58	0.45	12	12	64
	Top	0.00	12	12	0	0.21	12	12	30	0.48	12	12	69
2 Clague Garden Est.	Low	4.42	4	12	212	4.88	4	12	234	4.94	4	12	237
	Mid	0.20	4	12	10	3.55	4	12	170	4.94	4	12	237
	Top	0.00	4	12	0	0.60	4	12	29	5.01	4	12	240
3 Clague Garden Est.	Low	9.11	10	12	1093	10.07	10	12	1209	10.08	10	12	1210
	Mid	2.31	10	12	277	8.64	10	12	1037	10.25	10	12	1229
	Top	0.09	10	12	11	3.95	10	12	474	10.25	10	12	1229
4 Clague Garden Est.	Low	12.74	4	12	611	14.39	4	12	691	14.01	4	12	673
	Mid	0.00	4	12	0	0.39	4	12	19	14.72	4	12	707
	Top	0.00	4	12	0	0.00	4	12	0	14.58	4	12	700
				Total	2287			Total	4015			Total	6660

Flyover	NT69 Kwai Chung Road												
					Effectiveness Factor E								
Receiver	Floor	With 3 m Barrier Noise Reduction	Dwellings	Floors	Factor E	With 5 m Barrier + Cantilever Noise Reduction	Dwellings	Floors	Factor E	Semi-enclosure Noise Reduction	Dwellings	Floors	Factor E
1 Kwai On House	Low	2.70	18	8	388	2.98	18	8	429	4.49	18	8	646
	Mid	1.40	18	8	202	2.97	18	8	427	4.61	18	8	664
	Top	-0.32	18	8	-46	2.44	18	8	351	4.74	18	8	683
2 Kwai Tak House	Low	2.69	16	8	344	2.90	16	8	372	4.30	16	8	550
	Mid	1.65	16	8	212	2.96	16	8	379	4.49	16	8	574
	Top	-0.39	16	8	-50	2.42	16	8	310	4.68	16	8	599
3 Kwai Fong Est Blk. 3	Low	2.61	20	8	418	2.70	20	8	433	4.18	20	8	668
	Mid	2.45	20	8	392	2.98	20	8	477	4.55	20	8	728
	Top	0.00	20	8	-1	2.65	20	8	424	4.68	20	8	749
4 Police Quarter	Low	2.45	6	8	117	2.58	6	8	124	4.06	6	8	195
	Mid	-0.16	6	8	-8	2.78	6	8	133	5.01	6	8	240
	Top	-0.43	6	8	-20	0.18	6	8	8	5.28	6	8	253
5 Kwai Fong Terrace	Low	2.28	12	12	329	2.46	12	12	354	3.65	12	12	526
	Mid	-0.42	12	11	-56	1.26	12	11	167	4.30	12	11	567
	Top	-0.42	12	11	-56	-0.19	12	11	-25	4.42	12	11	584
				Total	2166			Total	4362			Total	8227

Flyover	NT71 Tsing Tsuen Road												
					Effectiveness Factor E								
Receiver	Floor	With 3 m Barrier Noise Reduction	Dwellings	Floors	Factor E	With 5 m Barrier + Cantilever Noise Reduction	Dwellings	Floors	Factor E	Semi-enclosure Noise Reduction	Dwellings	Floors	Factor E
1 Riviera Gardens	Low	14.31	12	13	2232	18.68	12	13	2914	7.10	12	13	1107
- Hoi Kwun Court	Mid	0.10	12	13	15	3.84	12	13	599	7.05	12	13	1100
	Top	-0.01	12	13	-1	0.09	12	13	14	6.84	12	13	1068
2 Riviera Gardens	Low	13.11	10	13	1704	15.52	10	13	2018	14.65	10	13	1904
- Hoi Fung Court	Mid	0.00	10	13	0	0.09	10	13	12	11.52	10	13	1497
	Top	0.00	10	13	0	0.00	10	13	0	9.42	10	13	1225
3 Riviera Gardens	Low	9.50	10	13	1235	13.41	10	13	1743	12.26	10	13	1594
- Hoi Kwai Court	Mid	0.00	10	13	0	0.26	10	13	34	9.34	10	13	1214
	Top	0.00	10	13	0	0.00	10	13	0	7.54	10	13	980
4 Riviera Gardens	Low	6.62	5	13	430	7.52	5	13	489	6.58	5	13	428
- Hoi Yue Court	Mid	0.37	5	13	24	4.48	5	13	291	5.97	5	13	388
	Top	0.00	5	13	0	0.67	5	13	44	5.17	5	13	336
5 Tsing On THA	Low	0.44	10	1	4	0.44	10	1	4	8.55	10	1	86
6 Cheung On Estate	Low	1.87	6	11	124	1.97	4	11	87	13.69	6	11	903
- On Chiu House	Mid	0.00	6	11	0	0.27	4	11	12	10.32	6	11	681
	Top	0.00	6	11	0	0.00	4	11	0	6.96	6	11	459
7 Cheung On Estate	Low	7.37	6	11	486	8.15	4	11	359	15.23	6	11	1005
- On Chiu House	Mid	0.10	6	11	7	2.12	4	11	93	14.84	6	11	980
	Top	-0.01	6	11	-1	0.09	4	11	4	7.37	6	11	486
8 Cheung On Estate	Low	8.05	6	11	532	8.97	4	11	395	14.94	6	11	986
- On Pak House	Mid	0.29	6	11	19	4.42	4	11	194	14.36	6	11	948
	Top	-0.01	6	11	-1	0.18	4	11	8	8.26	6	11	545
9 Cheung On Estate	Low	8.75	6	11	578	9.94	4	11	438	11.15	6	11	736
- On Pak House	Mid	0.28	6	11	18	4.98	4	11	219	11.61	6	11	766
	Top	-0.02	6	11	-1	0.26	4	11	12	7.64	6	11	504
10 Cheung On Estate	Low	8.24	6	11	544	9.20	4	11	405	9.16	6	11	605
- On Pak House	Mid	0.08	6	11	5	4.12	4	11	181	10.59	6	11	699
	Top	-0.02	6	11	-1	0.08	4	11	4	7.32	6	11	483
11 Cheung On Estate	Low	3.55	6	11	234	3.73	4	11	164	3.68	6	11	243
- On Pak House	Mid	0.56	6	11	37	4.07	4	11	179	4.53	6	11	299

	Top	-0.09	6	11	-6	0.45	4	11	20	3.28	6	11	216
12 Cheung On Estate - On Mei House	Low	3.82	6	11	252	4.04	4	11	178	3.91	6	11	258
	Mid	2.29	6	11	151	4.29	4	11	189	4.44	6	11	293
	Top	-0.04	6	11	-3	2.66	4	11	117	3.17	6	11	209
13 Cheung On Estate - On Mei House	Low	2.34	6	11	154	2.44	4	11	107	2.24	6	11	148
	Mid	2.48	6	11	164	2.93	4	11	129	2.77	6	11	183
	Top	0.97	6	11	64	3.36	4	11	148	1.42	6	11	94
				Total	9001			Total	11804			Total	25658

Summary of Effectiveness Analysis

Flyover	Direct Technical Remedies	Total Noise Reduction Factor R (No. of dwelling x dB(A) Noise reduction) (ie Effectiveness Factor E)	Length required (m)	Cost per unit length (HK$)	Cost Implementation (HK$) in million	Cost Effective Factor C ($x10^{-6}$)
H26 (IEC - Oil St. to Tin Chiu St.)	3 m barrier	7550	1500	173479	260	29.0
	5 m barrier + Cantilever	12634	1500	187075	281	45.0
	semi-enclosure	20680	1500	224188	336	61.5
H34 (IEC - Heng Fa Chuen)	3 m barrier	1418	400	173479	69	20.4
	5 m barrier + Cantilever	2990	400	187075	75	40.0
	semi-enclosure	5200	400	224188	90	58.0
H41 (Ap Lei Chau Bridge)	3 m barrier	244	175	173479	30	8.0
	5 m barrier + Cantilever	252	175	187075	33	7.7
	semi-enclosure	256	175	224188	39	6.5
K2 (Kwai Chung Road)	3 m barrier	5330	650	173479	113	47.3
	5 m barrier + Cantilever	9307	650	187075	122	78.5
K4 (West Kowloon Corridor)	3 m barrier	9166	750	173479	130	70.4
K53 (Kwun Tong Bypass)	3 m barrier	5535	700	173479	121	45.6
	5 m barrier + Cantilever	9072	700	187075	131	69.3
K56 (Tseng Kwan O Road)	3 m barrier	2040	360	173479	62	32.7
	5 m barrier + Cantilever	3230	360	187075	67	48.0
	semi-enclosure	4399	360	224188	81	54.5
NT25 (Sha Tin Road)	3 m barrier	986	1000	173479	173	5.7
	5 m barrier + Cantilever	4024	1000	187075	187	21.5
	enclosure	7040	500	224188	112	62.8
NT62 (Tsuen Wan Road)	3 m barrier	2287	425	173479	74	31.0
	5 m barrier + Cantilever	4015	425	187075	80	50.5
	semi-enclosure	6660	425	224188	95	69.9
NT69 (Kwai Chung Road)	3 m barrier	2166	1000	173479	173	12.5
	5 m barrier + Cantilever	4362	1000	187075	187	23.3
	semi-enclosure	8227	1000	224188	224	36.7
NT71 (Tsing Tsuen Road)	3 m barrier	9001	1000	173479	173	51.9
	5 m barrier + Cantilever	11804	1000	187075	187	63.1
	semi-enclosure	25658	1000	224188	224	114.4

Annex G

Response to Comments on Draft Final Report

C1570/RTC/57949
13 May 1997

Response to Comments
Scoping Study for Providing Direct Technical Remedies on Existing Flyovers
Draft Final Report

No.	Department	Reference	Comments	Consultants' Response
1	Transport Department 25 March 1997	RS 181/162	Please note that all the proposed direct technical remedies shall be compliance to the Transport Planning and Design Manual i.e. sight line, vertical and horizontal clearance, emergency crossings, public transport stopping activities etc shall not be adversely affected.	Noted. Consideration of the detailed design of direct technical remedies is beyond the scope of this Scoping Study but appropriate recommendations for the inclusion of such consideration during the Stage 2 Study will be made in the Final Report. In developing the proposed mitigation measures, reference has been made to the Transport Planning and Design Manual.
2	Environmental Protection Department 27 March 1997	EP42/T6/1 A1	<u>Section 2</u> <u>Section 2.1</u> (1) In the 1st bullet under the 1st para., I understand from your earlier submissions that the purpose of the coarse screening of flyovers is to identify a list of flyover candidates that are suitable for direct technical remedies but not to identify those flyovers that are likely to cause adverse traffic noise impacts, as noise assessment has not yet (*been*) performed at this step. Please clarify.	Agreed. This bullet will be amended to read '...to identify a list of flyover candidates that are suitable for further consideration with regard to the provision of direct technical remedies...'
			(2) The task nos. shown in Figure 2.1a do not match with that described in Section 2.2. Please amend.	Noted. Amendments will be made to align text with *Figure 2.1a*.

No.	Department	Reference	Comments	Consultants' Response
			Section 2.2.1 (3) The argument pertaining to the purpose of the coarse screening exercise stated in the 2nd para. is not correct. For example, the exclusion of flyovers that are subject to an EIA from subsequent evaluation does not imply that these flyovers would or would not cause adverse noise impact. The exclusion of flyovers in this instance is in fact to avoid duplicating effort as the flyovers have been dealt with in other studies. (Similar comments on the 3rd para. in Section 2.2.1, Sections 3.2 and 3.3, Tables 3.2a and 3.3a)	Noted. Text will be amended.
			Section 2.2.3 (4) To avoid confusion, amend the 2nd sentence of the 1st bullet under the 1st para. to read "Where the traffic noise contribution from other nearby sources....". (Similar comments on the 2nd sentence in the last para. of Section 5.1)	Noted. Text will be amended.
			Section 3 (5) For ease of reference, a list of flyovers selected from coarse screening for further evaluation should be provided at the end of the section.	Noted. A list will be provided.
			Table 3.2a (6) For ease of reference, please provide a list of completed and current EIA studies that cover those flyovers mentioned in the table. (Similar comments on Table 3.3a)	Noted. A list of relevant EIA studies will be provided.
			(7) There are residential developments located close to the Justice Drive flyover. However, the flyover is being under the EIA for "Design and Construction of Justice Drive Extension".	Noted. Noted. This flyover will be excluded.
			(8) The Fenwick Pier Street flyover is being under the EIA for "Design and Construction of Justice Drive Extension".	Noted. This flyover will be excluded.

No.	Department	Reference	Comments	Consultants' Response
			(9) The Wong Nai Chung Road flyover is not located in a CBD or an industrial area. However, there are no residential developments in close proximity to the flyover. You may need to include this circumstance as a selection criterion. Please also review and verify whether there are other flyovers fall under this criterion. (Similar comments on the flyover at Ocean Park Road in this table, and the flyovers at Pui Ching Road, Ma Tau Chung Road, New Clear Water Bay Road, Sand Martin Bridge, Banyan Bridge and Tuen Mun Road near Siu Hong Court in Table 3.3a)	Noted. An additional selection criterion will be included in *Table 3.2a & 3.3a* to reflect where there are no residential developments in close proximity to the flyover. The list of flyovers will also be reviewed under this criterion.
			(10) Please clarify whether H25 should refer to the section of IEC between Victoria Park Road to Oil Street.	Noted and agreed. H25 will be referenced to the section of IEC between Victoria Road to Oil Street.
			(11) I am not aware there is any EIA conducted for the flyover at Fung Ha Road. Please verify. (Similar comments on the flyover at Lung Cheung Road near Choi Hung Estate in Table 3.3a)	We contacted the UA and TA Groups of EPD in November 1996 to confirm whether an EIA had been conducted for a list of existing flyovers identified. Fung Ha Road was identified on our list as a flyover that had already been covered by an EIA and we did not received any negative comment from the UA Group with respect to this entry. In addition, the same section of flyover has been presented in EPD's publication *Screening Structures and Building Designs Against Transportation Noise in Hong Kong* as having noise barrier already installed. Taking the above into account, we would maintain our previous assumption that an assessment has been performed for this flyover. The section of Lung Cheung Road near Choi Hung Estate has been covered by the EIA for Lung Cheung Road Flyover.
			(12) There are residential developments close to the Ap Lei Chau Bridge and it should be subject to further evaluation. (Similar comments on the flyover at Lai King Hill Road Network under Table 3.3a)	Noted. For the Ap Lei Chau Bridge, the nearby NSRs (Wong Chuk Hang THA) are already within the shadow zone of the flyover. However, the noise impacts arising from the section of Ap Lei Chau Bridge to the residential buildings at and around Main Street will be further investigated. The case concerning Lai King Hill Road was a typographical mistake. Reference number for the Lai King Hill Road under *Table 3.3a* should be NT73 and will be amended accordingly.

No.	Department	Reference	Comments	Consultants' Response
			Table 3.3a (13) There are existing noise mitigation measures at Tate's Cairn Tunnel Network (K37 & K38).	Noted. K37 and K38 will be excluded.
			(14) I am not aware there is any noise mitigation measures provided at the Lion Rock Tunnel Road flyover. Please verify.	This is a typographical mistake. There are no residential developments in close proximity to the Lion Rock Tunnel Road flyover. *Table 3.3a* will be amended accordingly.
			(15) The flyovers at Fanling Highway and Po Shek Wu Road have ben covered by the "Noise Impact Assessment for 24 Hour Opening of Border Crossings". Please check and discard other flyovers covered by this study. (Similar comments on the flyover at Tolo highway at Ma Wo in Table 4.4a)	Noted. Relevant flyovers will be excluded.
			(16) Please check and confirm whether the Po Heung Street flyover is located in a CBD or an industrial area.	Noted. Po Heung Street is not considered the dominant noise source in the vicinity.
			(17) Please clarify whether NT23 should refer to Sha Tin Road flyover. Also there are residential developments close to this flyover and it should be subject to further evaluation.	NT23 should refer to the Sha Tin Road flyover. In addition, the dominant noise source affecting the residential developments is Tai Po Road - Sha Tin Section. NT23 will not be considered further in the assessment.
			(18) Exact locations of NT50, NT63 and NT67 should be clearly described in the table.	Noted. Clear descriptions of the flyover locations will be added.
			Section 4 (19) For ease of reference, a list of flyovers selected for further evaluation should be provided at the end of the section.	Noted. A list will be provided.

No.	Department	Reference	Comments	Consultants' Response
			Section 4.1 (20) According to Table 4.1c, central barrier is considered as a generic direct technical remedy. Please clarify (a) whether this type of barrier has been considered in the mitigation evaluation process, and (b) the height(s) of the generic central barrier.	As we understand that central barriers must be installed in combination with roadside barriers to provide effective noise reduction, therefore, they have not been considered in the mitigation evaluation process as a stand-alone mitigation option. For some cases, we are aware that it may be possible to use a combination of roadside and central barriers to provide noise reduction equivalent to that achievable by a higher roadside barrier alone. However, the amount of fine-tuning required for a roadside & central barrier combination is not considered justified for the purpose of this Scoping Study. Assessment to this level of detail is considered more appropriate for the Stage 2 Study, which will take the exact geometry of the mitigation measures into account. The application of central barriers will be recommended in the Stage 2 Study.
			Table 4.1a (21) Central barriers have been proposed in the EIA study for "Development of Areas 3, 30 and 31 of the Development Zone and the Reserve Zone".	Noted. Table will be amended to reflect this. However, we would appreciate EPD's indication on the exact location of the Study Area for the referenced EIA.
			(22) The enclosure erected at the Tate's Cairn Tunnel approach at Richland Gardens is a semi-enclosure. You may consider to quote the full enclosures proposed in the EIA study for "Reclamation and Servicing of Tuen Mun Area 38 for Special Industries - Improvement to Roads and Junctions within Tuen Mun" (i.e. Wong Chu Road) undertaken by your office.	Noted. Table will be amended.
			Section 4.2 (23) 1st para. For clarity, you may need to elaborate why particular barrier heights for various types of barriers are chosen for the study.	Agreed. Elaboration will be provided.

No.	Department	Reference	Comments	Consultants' Response
			(24) 3rd para. Subject to a detailed engineering design and the fulfilment of other indispensable constraints, an alternative mean to cater for the additional loadings brought about by mitigation measures would be to strengthen the structure of the existing flyovers.	Noted. This will be incorporated in the text.
			(25) 4th para. Another major concern of FSD is the clearance between building facade and flyover.	Noted. This will be incorporated in the text.
			(26) In Figure 4.2c, the meaning of the description is not clear. Please clarify.	Noted. The description in *Figure 4.2c* will be clarified.
			(27) In Figure 4.2d, the meaning of the description is not clear. Also "at least 4.5 m" should read "less than 4.5 m". Please clarify.	Noted. Label will be amended to read 'less than 4.5m'.
			(28) Figure 4.2f is not an example of insurmountable constraint as mentioned in the text.	Noted. *Figure 4.2f* is to demonstrate that for flyovers with existing direct technical remedies, these flyovers will not be considered further in the assessment. Text will be amended for clarification.
			(29) There is a typo in the title of Figure 4.2g.	Noted. Title will be amended.
			(30) For the completeness of the section, you may need to add a para. to discuss and summarize all the insurmountable constraints identified from Table 4.2a as well as the concerns expressed by HyD, FSD and TD.	Agreed. The summary already provided in the last four paragraphs will be elaborated to put it into the context of *Table 4.2a*.
			<u>Table 4.3a</u> (31) It is noted that many of the flyovers are probably subject to multiple insurmountable constraints (e.g. the flyovers at Hill Road, Robinson Road, Tsing Fung Street, etc.). Please review and revise as appropriate. (Similar comments on Table 4.4a)	Noted. *Tables 4.3a* and *4.4a* will be reviewed and revised accordingly.

No.	Department	Reference	Comments	Consultants' Response
			(32) In the last column, insufficient clearance/space for structural support is always due to the presence of other insurmountable constraints (e.g. supports erected on/beside the at-grade road underneath a flyover could violate traffic safety, fire-fighting and emergency access requirements, etc.). It is prudent to have these consequences indicated in the table for clarity. (Similar comments on Table 4.4a)	Noted. Clarification will be provided.
			(33) Please clarify the names/nos. of H17, H18 and H33 as they do not match with those indicated in Annex A. (Similar comments on K11, K12a and K12b in Table 4.4a; H5, H22 and H23 under Section 5.3; K4, K10, K30, NT62 and NT71 under Section 5.4)	Noted, The names and numbers of the flyovers will be amended accordingly.
			<u>Section 5</u> (34) It is likely that the section of Tsing Tsuen Road near Cheung On Estate is qualified for further investigation. Please review and, where appropriate, include this flyover section in the noise assessment and mitigation evaluation processes.	Noted. The noise impacts arising from the section of Tsing Tsuen Road to nearby residential developments will be further investigated.
			(35) Information elsewhere indicated that FSD's earlier advice is to agree on noise mitigation measures along the southbound carriageway but not the northbound carriageway of Kwai Chung Road at Mei Foo Sun Chuen. Please review and revise your mitigation provision accordingly. (Similar comments on Figure 6.1m)	Noted. The assessment will be reviewed and revised accordingly.

No.	Department	Reference	Comments	Consultants' Response
			Section 7 (36) Whilst you are required to estimate the costs of the recommended mitigation options for our consideration, it must be very cautious in providing the term "cost-effectiveness". We should at all possible avoid any conclusion drawn by someone by referring to this figure that the measures provided is "not cost-effective". Whether the mitigation measures recommended in the Final Report of this study would be further investigated/implemented depends on the policy direction of the Government rather than "cost-effectiveness". There is always argument of "value of money" and "cost-effective" should not be confined to the simple relationship of "dollar per dwelling". Other effects like social improvement, enhanced quality of living should also be accounted for. In this regard, you may consider to prioritize the selected flyovers in terms of noise performance and extent of dwellings protected/benefited based on perhaps a ranking system. (Similar comments on Section 8 and Annex F)	The Cost-Effectiveness Factor C used in this study has already taken into account the number of dwellings affected, the noise reduction achievable and the cost of implementation. In addition, the adoption of Factor C is in line with the assessment carried out in the previous *Scoping Study for Providing Retroactive Road Traffic Noise Mitigation Measures*. It is therefore suggested that Factor C remain unchanged to ensure continuity between the previous study and the present one.
			(37) The estimated unit costs for semi-enclosure and full enclosure are considered unreasonably low when compared with that of the 3 m and 5 m barriers. In the case of noise enclosures, the provision of structural supports for the noise screening structures or the structural strengthening works for the flyover itself could be very costly. Please review and revise the cost figures as appropriate. (Similar comments on Annex E)	Noted. Based on our understanding of structural support for barriers and enclosures, similar supporting structures are required for 3m/ 5m barriers and enclosures for an existing elevated structure. As shown in the unit cost calculations in *Annex E*, the cost of steel structural support has been included for all types of mitigation measures. The cost of structural support used for the calculations was taken from the cost estimates for the construction of the proposed Wong Chu Road enclosure in Tuen Mun. It is therefore considered that the cost estimates shown in *Table 7.1a* has provided sufficiently realistic estimates of the mitigation costs. As the cost of structural supports varied significantly from an flyover to another, a detailed cost estimation of mitigation is recommended during the Stage 2 Study.

No.	Department	Reference	Comments	Consultants' Response
			Annex A (38) The tables are difficult to follow. Please consider to separate the information related to a particular flyover from one another. (Similar comments on Annex C and Annex F)	Noted. Table formatting will be adjusted.
			(39) A no. of mistakes or discrepancies are found in the tables (e.g. K12a, K12b and NT71). Please check and correct accordingly.	Noted. Amendments will be made where appropriate.
			(40) Please incorporate all relevant comments on the main text into this annex as well.	Noted. Amendments will be made where appropriate.
3	Highways Department 1 April 1997	HH 63/50 III	Section 4.1 Figures 4.1 - 4.2 are misleading. As pointed out before, the noise barriers and the road bridges shall be structurally independent from each others. These figures should therefore be amended to show that the noise barriers are resting on independent structures.	HyD's concerns on the structural considerations for erecting noise barriers or enclosures on existing flyovers are justified. We have already checked with EPD on the structural issue prior to commencement of this scoping study. It was confirmed that structural considerations would be included for the investigations to be conducted separately at a later stage and short-listing of flyover candidates within this stage will be based solely on factors including the prevailing noise environment, fire fighting and road safety. The output of this scoping stage will form the basis for the second stage of the study, in which each flyover short-listed in this scoping stage will be subject to further investigation, taking into account all factors including engineering and structural ones, and the suitability and the most appropriate form of direct technical remedy will be determined. As *Figures 4.1a-e* are included to present different types of direct technical remedies and *Figures 4.2a-d* are included to demonstrate typical road-receiver configurations only, they should not lead to any misunderstanding. Amendments are not considered necessary.

No.	Department	Reference	Comments	Consultants' Response
			Section 4.2 (1) With respect to Table 4.2a, the requirements on horizontal and vertical clearances between the noise barriers and kerbline should comply with Table 26 and 27 of Structures Design Manual of this Department and TPDM V.2 3.5. (PWDTC No. 31/73 is not relevant in this case).	Noted. Table will be amended to show the correct references.
			(2) With respect to the 2nd paragraph on P.15, I opine that the feasibility for the installation of these barriers of ground level should be treated as a prime consideration rather than leaving it to the Stage 2 study.	Investigations related to the engineering feasibility of the provision of direct technical remedies are beyond the scope of this study and it is therefore not possible to fulfil HyD's request at this stage under this study. Please also refer to para 1 of our response to the comment from HyD on Section 4.1.
			Section 4.3 and 4.4 The screening process is too crude and abrupt. In particular, a large number of road bridges were excluded from further study due to inadequate clearance (< 4.5m) from adjacent buildings. I see that further discussions/clarification with FSD should be taken in this respect, bearing in mind that: • these road bridges situating close to adjacent buildings are in fact the "worst" ones from a noise pollution of view. • the clearances between the road bridges and the adjacent buildings are existing values; installation of the noise barriers has not worsen the situation.	The technical approach for the screening process was accepted by EPD during the Inception Stage of this study and is considered sufficient for the purpose of a scoping study. In addition, FSD has not commented on the clearance between road bridges and adjacent buildings. We have therefore taken this to be acceptable to FSD.
			Section 7.1 The simple score system for a cost-effective factor in terms of construction costs only is not acceptable. It should take into account the costs of recurrent maintenance, cleansing and repair for the proposed noise barriers and enclosures, and also indirect costs of traffic delay due to lane closures for noise barriers and complete carriageway closure for semi-enclosures.	Please refer to our response to Comment No. 36 from EPD.

No.	Department	Reference	Comments	Consultants' Response
			Section 7.2 Ref. para. 7.2(ii), the causes of disruption to traffic include not only the loss of road space due to the existence of mitigation measures but also the recurrent need for lane closures to facilitate the maintenance and cleansing of the mitigation measures. It is proposed that the heading of sub-para. 7.2(ii) be amended to "Loss of road space" and the following the sub-para. be added: "(iii) Traffic disruption For road safety, the construction and subsequent recurrent maintenance and cleansing of noise barriers and enclosure would necessitate lane closures and affect traffic flow. The recurrent maintenance and cleansing of the soffit of an enclosure would necessitate the closure of the carriageway."	Agreed. Text will be amended.
			Grammatical/Arithmetic errors P.13: .....would lead to the violation of safety requirements of FSD, TD and HyD. P.9: Should the total number of road bridges not meeting the criteria be 54 (as stipulated in the 2nd and 3rd lines) or 57 (as counted from Table 3.3a)? P17: Should the total number of road bridges passing the screening process be 63 (as calculated 83 - 20 = 63) or 60 (as stipulated in the 3rd last lines)?	Noted. Text will be amended. Numbers will be reviewed. Numbers will be reviewed.

No.	Department	Reference	Comments	Consultants' Response
4	Fire Services Department 4 April 1997	(30) in FSD 4/130/94	Table 4.2a in Page 14 Please clarify the meaning of "where balconies are 5m or above the elevated roadway, the minimum clearance should not be less than 2.4m (PWDTC No. 31/73)" at the end of sub-section 8. In this connection, additional information with relevant sketches should be depicted and submitted for my further study. Further comment on each mitigation spot will be made when solid information become available.	The criterion relates to the requirements for lighting and ventilation but not to those for fire fighting. This reference will be deleted. Provision of information on the detailed design of the direct technical remedies will be included in the separate Stage 2 Study. Further consideration in this respect within the current study is not appropriate.

Scoping Study for Providing
Direct Technical Remedies on Existing Flyovers

Final Report
Addendum No. 1

This addendum contains the following:

(a) Main Text, pages 11, 30, 32, 33 and 34;

(b) Main Text, Figure 6.1jj;

(c) Annex A, "Flyovers Checklist (Kowloon)", pages 4 and 5;

(d) Annex A, "Flyovers Checklist (NT)", pages 1 to 4;

(e) Annex A, a new page containing notes for Annex A.

(f) Annex C, "Road Noise Calculation, Kowloon", pages 1 to 4;

(g) Annex C, "Road Noise Calculation, NT", pages 1 to 4;

(h) Responses to Comments on Final Report.

Flyover reference and name		Flyover within a CBD or an industrial area?	NSRs have been not identified in the vicinity?	Flyover with existing noise mitigation measures?	Flyover already subject to an EIA prior to completion?	Flyover with an EIA proposed during 1997?
K38	Tate's Cairn Tunnel Network (near Richland Gardens)			✓	✓	
K44	New Clear Water Bay Road		✓			
K46	Kai Fuk Road	✓	✓			
K49	Kai Cheung Road		✓			
K50	Kwun Tong Bypass (near Richland Gardens)			✓	✓	
K51	Kwun Tong Bypass (above Kai Fuk Road)	✓	✓		✓	
K52	Kwun Tong Bypass (along Hoi Bun Road)	✓	✓		✓	
K55	Kwun Tong Bypass (to Lam Tin Station)				✓	
K59	Lion Rock Tunnel Road (link to Waterloo Road)		✓			
NT1	Po Shek Wu Road		✓			
NT2	Fanling Highway (near Tai Tau Leng and Choi Po Court)			✓		
NT8	Tolo Highway (near Classical Gardens and Ma Wo)				✓	
NT12	Tolo Highway (overpass adjacent to University Station)		✓		✓	
NT13	UR T6 (link to Tolo Highway)		✓		✓	
NT20	Sand Martin Bridge		✓			
NT21	Fo Tan Road					✓
NT22	Lok King Street		✓			
NT26	Banyan Bridge		✓			
NT30	Sha Tin Wai Road				✓	

This section describes the assessment of the effectiveness of the proposed direct technical remedies.

6.1 ASSESSING THE EFFECTIVENESS OF DIRECT TECHNICAL REMEDIES

A total of 11 flyovers were shortlisted as presented below. The effectiveness of different direct technical remedies have been assessed. The concerned flyovers and nearby at-grade roads were divided up into road segments. A road layout defines the road width, surface type, traffic conditions and the height and location of roadside noise barriers. The segmentation process was carried out in accordance with the CRTN procedures and the noise models were built using the *HFANoise* traffic noise model which fully implements CRTN procedures and methodologies. Traffic noise impacts were assessed against the $L_{10, \text{peak hour}}$ 70 dB(A) limit.

Elevation of the flyovers and concerned NSRs have been determined by reference to 1:5000 survey maps and site survey. All other site-specific conditions such as angle of view, road gradient, nearby dominant at-grade road and features that could add noise screening were included in the modelling process. The effectiveness of direct technical remedies such as 3m noise barriers, 5m cantilevered barrier, semi-enclosure and full enclosure has been assessed using the traffic noise model. For the purpose of this assessment, the horizontal length of the direct technical remedies was determined by assuming the proposed direct technical remedies need to provide noise screening for a minimum angle of view of 135° measured from each NSR. Extent of the proposed direct technical remedies are shown in *Figure 6.1a* to *6.1j*. Details of the exact direct technical remedies configurations and arrangements will be considered during the following Stage 2 study.

6.2 PREDICTED NOISE LEVELS

Unmitigated and mitigated noise levels for the representative NSRs at each concerned flyovers have been predicted for the first floor (4.2m above ground), mid level and top floor level (based on 2.8m per floor level). The predicted noise levels with and without direct technical remedies are presented in *Annex D*.

- H26 IEC - from Oil Street to Tin Chui Street;
- H34 IEC - near Heng Fa Chuen;
- H41 Ap Lei Chau Bridge;
- K2 Kwai Chung Road - near Mei Foo Sun Chuen;
- K4 West Kowloon Corridor - between Willow Street & Tong Mi Road (near Nam Cheong Estate);
- K53 Kwun Tong Bypass - near Laguna City;
- K56 Tseung Kwan O Road - near Tsui Ping South Estate;
- NT25 Sha Tin Road - near City One Shatin;
- NT62 Tsuen Wan Road - near Clague Garden Estate;
- NT69 Kwai Chung Road - near Kwai Fong Estate; and
- NT71 Tsing Tsuen Road - near Riviera Gardens and Cheung On Estate.

Graphical presentation of the findings of this Study in the form of photographs and sketches are shown in *Figure 6.1jj & 6.1k to 6.1u* to provide an illustration of

7 RECOMMENDATIONS OF THE STUDY

7.1 PRIORITISED LIST OF FLYOVERS

The noise benefits of each types of direct technical remedies have been assessed for the shortlisted flyovers in *Section 6*. However, in some cases the HKPSG standards are not expected to be satisfied. The number of dwellings benefited has been calculated to give a clear indication of the most effective candidates. Site survey has been carried out for each of the shortlisted flyovers to estimate the number of dwellings benefited from each type of direct technical remedies.

The noise reduction effectiveness of each direct technical remedy has been estimated based on the noise reduction at receivers. The cost of the direct technical remedies has been based on data from previous EIA studies, *Reclamation and Servicing of Tuen Mun Area 38 for Special Industries - Improvement to Roads and Junctions within Tuen Mun Environmental Impact Assessment*, carried out by ERM. The unit costs are presented in *Table 7.1a*, the evaluation of cost are shown in *Annex E*. However, a detailed cost estimate on the noise mitigation measures covering both capital costs and recurrent maintenance and cleansing costs is recommended in the Stage 2 Study.

Table 7.1a *Unit Costs for Direct Technical Remedies*

Type	Description	Cost/linear meter (HK$/meter)
3m High Noise Barriers	"Plexiglass" screen R C Plinth Steelwork	173,479.00
5m High Cantilever Noise Barriers	"Plexiglass" screen R C Plinth Steelwork	187,075.00
Semi-enclosure	"Plexiglass" sheet Steel Reinforcement	224,188.00
Full-enclosure	"Plexiglass" sheet Steel Reinforcement	224,820.00

Note : 15 percent for Preliminary & General Items have been included in the cost estimation.

To prioritise the shortlisted flyovers candidates, a cost-effectiveness factor C has been used, where C is define as:

$$C = \frac{Number\ of\ dwellings\ protected\ x\ dB(A)\ Noise\ reduction}{Cost\ of\ implementation}$$

Assuming the cost of implementation remains constant for the same category of direct technical remedies, a higher value of C would represent a more effective solution in terms of noise protection provided for more dwellings and larger degree of noise reduction. Using the C values, the types of direct technical remedies recommended for each flyover and the prioritized list of implementation have been selected. *Table 7.1b* presents the prioritized list. Details of the calculations are shown in *Annex F*.

Table 7.1b *Prioritization of Direct Technical Remedies*

Priority	Flyover		Direct Technical Remedies Recommended	Cost Effective Factor (C) x 10^{-6}	Cost Implementation (HK$) in million
1	NT71	Tsing Tuen Road - near Riviera Gardens & Cheung On Estate	semi-enclosure	114.4	224
2	K2	Kwai Chung Road - near Mei Foo Sun Chuen	5 m cantilevered barrier	76.5	122
3	K4	West Kowloon Corridor - between Willow Street & Tong Mi Road	3 m barrier	70.4	130
4	NT62	Tsuen Wan Road - near Clague Garden Estate	semi-enclosure	69.9	95
5	K53	Kwun Tong Bypass - near Laguna City	5 m cantilevered barrier	69.3	131
6	NT25	Sha Tin Road - near City One Garden	enclosure	62.8	112
7	H26	IEC - Oil Street to Tin Chiu Street	semi-enclosure	61.5	336
8	H34	IEC - near Heng Fa Chuen	semi-enclosure	58.0	90
9	K56	Tseung Kwan O Road - near Tsui Ping South Estate	semi-enclosure	54.5	81
10	NT69	Kwai Chung Road - near Kwai Fong Estate	semi-enclosure	36.7	224
11	H41	Ap Lei Chau Bridge	3 m barrier	8.0	30

7.2 *REQUIREMENTS FOR FURTHER STUDIES*

A progressively extensive set of direct technical remedies for the affected NSRs have been investigated for eleven short-listed candidate flyovers. On the basis of the above cost-effectiveness analysis, semi-enclosure are recommended for H26, H34, K56, NT25, NT62, NT69 and NT71, 5 m high cantilever barrier for K2 and K53, and 3 m high barrier for H41 and K4.

Apart from considering the concerns of various Government Departments, it is recommended that further considerations (other than discussed in *Section* 4.2)

should be given to detailed cost estimation for noise mitigation measures, further investigation of the application of central barriers, air quality and ventilation, public and traffic disruption, loss of sunlight, visual impact, maintenance and structural impacts during the detailed engineering design of direct technical remedies in the Stage 2 Study. The following constraints need to be further considered in providing direct technical remedies on the structures of existing flyovers :

(i) Air quality

The air quality for lower floor residents of buildings adjacent to a flyover with a noise barrier or enclosure need to be examined.

(ii) Loss of road space

The independent support for direct technical remedies structures will occupy road space at ground level thereby reducing traffic lanes and affecting road capacities.

(iii) Traffic disruption

For road safety, the construction and subsequent recurrent maintenance and cleansing of noise barriers and enclosure would necessitate lane closures and affect traffic flow. The recurrent maintenance and cleansing of the soffit of an enclosure would necessitate the closure of the carriageway.

(iv) Loss of sunlight

Loss of sunlight to lower floor residents of buildings adjoining the direct technical remedies.

(v) Visual impact

The overall appearance of the flyover. Advice may have to be sought from the Advisory Committee on the Appearance of Bridges and Associates Structures (ACABAS).

(vi) Maintenance

Availability of replacement parts for proprietary noise mitigating products.

(vii) Structural impact

Structure loading on the direct technical remedies structures.

K32	Po Kong Village Road		Lung Poon Court	Not effective (due to traffic on at grade Lung Cheung Rd)	No
K33	Prince Edward Road East	near San Po Kong (to Choi Hung Rd.)	Nil	No NSR found	No
K34	Prince Edward Road East	Choi Hung Estate	Choi Hung Estate	Not effective (due to traffic on at grade Prince Edward Road)	No
K35	Prince Edward Road East	King Hong St. to Concorde Rd.	Nil	No NSR around	No
K36	Tate's Cairn Tunnel Network	Sheung Yuen Leng	Choi Hung Estate	EIA conducted	No
K37	Tate's Cairn Tunnel Network	near Pik Hoi House Choi Hung Est	Choi Hung Estate	Noise Mitigation has been incorporated	No
K38	Tate's Cairn Tunnel Network	near Richland Gardens	Choi Hung Estate	Noise Mitigation has been incorporated	No
K39	Wai Yip St	Access road to Telford Garden	Telford Gardens	Private Access Road	No
K40	Ngau Tau Kok Rd	Kai Cheung Rd to Ngau Tau Kok Rd	Telford Gardens	Over MTRC railway	No
K41	Ngau Tau Kok Rd	near Ngau Tau Kok Upper Estate	Ngau Tau Kok Estate	Not effective due to traffic on Ngau Tau Kok and Kwun Tong Rd	No
K42a	Shun Lee Tsuen Road	near Shun Lee Estate	Shun Lee Estate	Not effective (due to traffic on at grade New Clear Water Bay Rd)	No
K42b	Shun Lee Tsuen Road	near Shun Tin Estate	Shun Tin Estate	* Embankment Road	No
K43	Lee On Road		Shun Lee Estate	Not effective (due to traffic on at grade New Clear Water Bay Rd)	No
K44	New Clear Water Bay	Between Choi Wan Est & Shun Lee Est	Shun Lee Estate	No NSR around	No
K45	Ferry Street	over Tong Mei Road	building on both side	Fire fighting at the nearby building from both at grade road and flyover is required + A minimum clearance between the outer edge of the building to the flyover is less than 4.5 m	No
K46	Kai Fuk Road	Kai Fuk Rd to Kwun Tong Rd	Nil	No NSR found	No

K47	Siu Yip St.	from Telford Garden to Tai Yip St.	Telford Garden	Insufficient space	No
K48	Kwun Tong Road	Kai Tai Court	Kai Yiu THA, Kai Yip Est., Kai Tai Court & Kai Wo THA	Not effective (due to traffic on at grade Kwun Tong Rd)	No
K49	Kai Cheung Road	near International Trademart	Nil (section near Telford is regard as Ngau Tau Kok Rd)	No NSR around	No
K50	Kwun Tong Bypass	near Richland Gardens	Richland Gardens	Enclosure incorporated & EIA conducted	No
K51	Kwun Tong Bypass	above Kai Fuk Road	Nil	No NSR around & EIA conducted	No
K52	Kwun Tong Bypass	along Hoi Bun Road	Nil	No NSR around & EIA conducted	No
K53	Kwun Tong Bypass	near Laguna City	Laguna City	N/A	Yes
K54	Kwun Tong Bypass	parallel to Wang Kwong Rd	Kai Lok THA	Low-rise nature of the NSR in a shadow zone of the flyover	No
K55	Kwun Tong Bypass	connect to Lam Tin Station	Kwun Tong Estate	EIA conducted	No
K56	Tseung Kwan O Road	Tsui Ping South Estate	Tsui Ping South Estate	N/A	Yes
K57	Lin Tak Road		Lam Tin Est	Not effective due to the topography of the flyover	No
K58	Sceneway Road	Sceneway Garden	Sceneway Garden	Private Access Road	No
K59	Lion Rock Tunnel Road	link to Waterloo Rd	Nil	No NSR found	No

	Flyover Name	Flyover Description	Residential Potentially Affected	Reason for excluding	Detailed Assessment Requirement
NT1	Po Shek Wu Rd.	over the KCR railway and join to Choi Yuen Rd.	Nil	No NSR around	No
NT2	Fanling Highway	near Tai Tau Leng and Choi Po Court	Tai Tau Leng	Barrier Installed	No
NT3	Pak Wo Rd	over Fanling Highway and next to Tai Ping Est	Tai Ping Estate	Not effective (due to traffic on Fanling Highway)	No
NT4	So Kwun Po Rd Network	link to Fanling Highway	Venniza Garden	Not effective (due to traffic on Fanling Highway)	No
NT5	Jockey Club Rd	adjacent to Wo Hop Shek	Tin Sam THA	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT6	Tai Po Tai Wo Rd	near Kam Shek San Tsuen	Kam Shek San Tsuen	Embankment road	No
NT7	Po Heung St	over Lam Tsuen River and join Tai Po Tai Wo Rd	Tai Po Centre and private residential	Not effective (due to traffic on Tai Po Tai Wo Road)	No
NT8	Tolo Highway	near Classical Gardens and Ma Wo	Classical Gardens	EIA conducted	No
NT9	Tai Po Rd Yuen Chau Tsai	near Wang Fuk Court and link too Tai Po Rd Tai Po Kau	Wang Fuk Court	Not effective (due to traffic on Tolo Highway)	No
NT10	Tai Po Rd. Yuen Chau Tsai	link to Tolo Highway	Wang Fuk Court	Not effective (due to traffic on Tolo Highway)	No
NT11	Yuen Shan Rd.	join Tolo Highway	Wang Fuk Court	* Embankment	No
NT12	University Station	over Tolo Highway and near Sha Tin Hoi	Nil	No NSR around	No
NT13	UR T6	link to Tolo Highway and next to Sha Tin STWs and Marine Police North Division Base	Nil	No NSR around	No
NT14	Tsun King Rd	over Tai Po Rd and near Royal Ascot	Royal Ascot	Private Access Road	No
NT15	Ma On Shan Rd Network		Chevalier Garden	Noise level below 70dB(A) at nearest NSR	No
NT16	Sai Sha Road	link to Hang Tak St	Shing On T.H.A.	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT17	Hang Tak St	over branch of Shing Mun River and near Chevalier Garden	Chevalier Garden	Not effective due to traffic on at grade Ma On Shan Road Network	No

NT18	Tai Po Road - Sha Tin	near Hilton Centre	Lai Chi Yuen	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT19	Sha Tin Rural Committee Rd	over Tai Po Rd Sha Tin and near Lek Yuen Estate	Lek Yuen Estate	Over KCRC railway	No
NT20	Sand Martin Bridge	over Shing Mun River and join Tai Chung Kiu Rd	Nil	No NSR around	No
NT21	Fo Tan Rd	over Fo Tan Nullah and Tai Po Rd Sha Tin and T-I College	Wo Che Estate	EIA will be conducted	No
NT22	Lok King St	over Fo Tan Nullah	Nil	No NSR around	No
NT23	Sha Tin Road	Near KCRC House and link to Sha Tin Rd	Jockey Club Quarters	Not effective (dur to traffic on Tai Po Road - Sha Tin Section)	No
NT24	Sha Tin Road	near Sah Tin Wai	Sha Tin Wai	* Embankment road	No
NT25	Sha Tin Road	near City One Shatin	City One Shatin	N/A	Yes
NT26	Banyan Bridge	over Shing Mun River and next to Sha Tin Rd	Nil	No NSR around	No
NT27	Tai Chung Kiu Rd	near Ravana Garden	Ravana Garden	Not effective (due to traffic on at grade Tai Chung Kiu Rd)	No
NT28	Sha Tin Wai Rd	near Chap Wai Kon New Village	Chap Wai Kon New Villa	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT29	Shek Mun Roundabout	near Pictorial Garden	Pictorial Garden	Not effective due to traffic on Tate's Carin Highway	No
NT30	Sha Tin Wai Rd	from Sha Tin Wai New village to Chap Wai Kon	Sha Tin Wai New Village	EIA conducted	No
NT31	Tate's Cairn Highway	connect to Sha Tin Wai Rd from Tai Shek Kwu	Siu Lek Yuen	EIA conducted	No
NT32a	Shing Mun Tunnel Rd	connect to Tai Po Rd Tai Wai	Mei Lam Estate	EIA conducted	No
NT32b	Shing Mun Tunnel Rd	connect to Tai Po Rd Shatin	Mei Lam Est	EIA conducted	No
NT33	Tai Po Rd Tai Wai	Shung Ho Rd to Mei Tin Rd	Mei Lam Est	EIA conducted	No
NT34	Lion Rock Tunnel Rd	over Shing Mun River	Sha Tin Tau THA	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT35	Lion Rock Tunnel Rd	near Hung Mui Kuk and Worldwide Garden	Worldwide Garden	Not effective (due to traffic on at grade Lion Rock Tunnel Road)	No
NT36	Sha Tin Road	from Tse Uk Village to Fung Shing Court	Pok Hong Est	Barrier installed	No

NT37	Hung Mui Kuk Road	near King Tin Court	olden Lion Garden	A minimum clearance bet the outer edge of the building to the flyover is less than 4.5m	No
NT38	Tseung Kwan O Road	near Hong Sing Garden	Hong Sing Garden	Embankment road	No
NT39	Tai Po Rd Tai Wo	near Hong Lok Yuen	Wai Tau Tsuen	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT40	Hong Lok Yuen Rd	in Hong Lok Yuen	Hong Lok Yuen	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT41	San Tin Road	near Fairview Park and Man Yuen Chuen	Chuk Yuen Tsuen	Not effective due to low-rise nature of the NSR in a shadow	No
NT42	Long Tin Rd	beside Yuen Long Park	Long Bin T.H.A.	Not effective due to low-rise nature of the NSR in a shadow zone of the flyover	No
NT43	Long Yip St & Yuen Long On St	near Sun Yuen Long Plaze	Sun Yuen Long Plaza	Fire fighting at the nearby building from both at-grade road and flyover is required	No
NT44	Hung Tin Rd	over Castle Peak Rd - Hung Shui Kiu	Nil	No NSR around	No
NT45	Yuen Long Highway	near To Yuen Wai and over Castle Peak Rd	To Yuen Wai	Barrier Installed	No
NT46	Tsing Tin Road	near Kin Sang Estate	Kin Sang Estate	Embankment road	No
NT47	Castle Peak Road - San Hui	near Ling Nam		Not effective (due to traffic on at grade San Hui Rd)	No
NT48	Pui To Rd	over Nullah and near San Fa Est	San Fat Est	Not effective (due to traffic on at grade Pui To Rd)	No
NT49	Pui To Rd	over Tuen Mun Rd	Kam Wah Garden	Not effective (due to traffic on at grade Tuen Fat and Tuen Hi Rd)	No
NT50	Tuen Mun Rd	near Siu Hong Court	Nil	No NSR around	No
NT51	Lung Mun Rd	connect to Wong Chu Rd	Nil	No NSR around	No
NT52	Wong Chu Rd	over Nullah	Yau Oi Estate	EIA conducted	No
NT53	Wong Chu Road	beside Yau Oi Estate and over Tuen Mun Heung Sze Wui Rd	Yau Oi Estate	EIA conducted	No
NT54	Hoi Wong Rd	over Nullah	Nil	No NSR around	No

NT55	Hoi Wong Rd.	over Wong Chu Rd	Yau Oi Estate	EIA conducted	No
NT56	Tuen Hing Rd	over Tuen Mun Road	Sun Shing	Not effective (due to traffic on Tuen Mun Road)	No
NT57	Tsing Hoi CIR	Wong Chu Rd to Chi Lok Garden	Chi Lok Garden	EIA conducted	No
NT58	Tsing Hoi CIR	Wong Chu Rd to Mount Parker Lodge	Mount Parker Lodge	EIA conducted	No
NT59	Tuen Mun Road	Castle Peak Rd. Castle Peak Bay to Siu Lam	Elegant Villa	Embankment road	No
NT60	Tuen Mun Road	Sham Tseng Section	Rhine Garden	Embankment road	No
NT61	Tuen Mun Rd	to Castle Peak Rd and near Chai Wan Kok	Nil	No NSR around	No
NT62	Tsuen Wan Road	Tuen Mun Rd to Tsing Tsuen Rd	Clague Garden Estate	N/A	Yes
NT63	Tsuen Wan Rd	near Kwai Chung Park	Lai King Estate	No NSR around	No
NT64	Tai Ho Rd	over Castle Peak Rd Tsuen Wan	nearby building	A minimum clearance bet the outer edge of the building to the flyover is less than 4.5 m	No
NT65	Texaco Road North	Shek Wai Kok Est to Tsuen Wan	nearby village	Embankment road	No
NT66	Texaco Rd	near Tai Wo Hau Estate	Nil	No NSR found	No
NT67	Wing Kei Rd	over Tsuen Wan Rd	Nil	No NSR found	No
NT68	Kwai Chung Rd	to Cheong Wing Rd	Kwai Hing Estate	No NSR found	No
NT69	Kwai Chung Rd	near Kwai Fong Estate	Kwai Fong Estate	N/A	Yes
NT70	Castle Peak Rd	near Kwai Hing Est	Nil	No NSR around	No
NT71	Tsing Tsuen Road	To Tsing Yi Bridge	Riviera Garden & Cheun	N/A	Yes
NT72	Tsing Yi Bridge	near Cheung Ching Estate	Cheung Ching Estate	No NSR around	No
NT73	Lai King Hill Rd Network	over Kwai Chung Rd	Lai King Terrace	No NSR around	No
NT74	Lai King Hill Rd Network	over Kwai Chung Rd and next to Kwai Fong Garden	Kwai Fong Garden	Not effective (due to traffic on Kwai Chung Rd)	No
NT75	Ching Cheung Road	near Ching Lai Court	Ching Lai Court	Embankment road	No
NT76	Wah Tai Rd.	near Lai Yiu Estate	Lai Yiu Estate	Not effective (due to traffic on Castle Peak Rd)	No

Notes:

* Elevated roads not constructed on bridge piers are regarded as roads on embankments rather flyovers. To allow better utilisation of resource, these are excluded for further consideration in this study as considerations on direct technical remedies have previously been given for these roads in the *Scoping Study for Providing Retroactive Road Traffic Noise Mitigation Measures on Existing Road*.

Road Noise Calculation
Kowloon

Flyover ID	K2		K4	K6		K7a		K7b		K8
Receiver	Mei Foo Sun Chuen		Nam Cheong Estate	Chak On Estate		Beacon Heights		Choi Hung Estate		Beacon Heights
Noise Source	Flyover	Flyover	Flyover	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover
	Kwai Chung Road	Cheung Sha Wan Road	West Kowloon Corridor	Lung Cheung Road	Lung Cheung Road	Lung Cheung Raod	Lung Cheung Road	Lung Cheung Road	Lung Cheung Road	Lung Ping Road
INPUTS										
Hourly Flow	8641	3392	5275	4167	4167	5428	4888	5428	4888	2690
Av Speed (km/hr)	70	70	70	50	50	50	50	50	50	50
%HV	37.6	37.6	18.9	22.2	22.2	22.2	22.2	22.2	22.2	22.2
Gradient %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Receiver-Carriageway Distance (m)	15.00	15.00	50.00	70.00	45.00	185.00	15.00	20.00	10.00	10.00
Height of Carriageway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Angle of View (deg.)	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
surface type (imprevious/pervious)	i	i	i	i	i	i	i	i	i	i
Barrier (Y/N)	N	N	N	N	N	N	N	N	N	N
Height of Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barrier-carriageway Distance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Receiver Height (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OUTPUTS										
Basic Hourly Noise Level dB(A) (Includes speed and %HV correction, also gradient and road surface correction of 1 for imp/bit and speed <75km/hr)	85.70	81.64	81.60	79.68	79.68	80.82	80.37	80.82	80.37	77.78
Distance Correction:										
Slant Distance (m)	18.51	18.51	53.50	73.50	48.50	188.50	18.51	23.51	13.51	13.51
Distance Correction dB(A)	-1.37	-1.37	-5.98	-7.36	-5.55	-11.45	-1.37	-2.41	0.00	0.00
Surface correction										
Surface correction	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Calculation of Path Difference:										
Possible Path Difference	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Path Difference Only if Barrier Exists	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Working out whether receiver is in the illuminated or shadow zone:										
Source Receiver gradient	-0.03	-0.03	-0.01	-0.01	-0.01	0.00	-0.03	-0.02	-0.04	-0.04
Height of Line at Barrier Position	0.41	0.41	0.47	0.48	0.46	0.49	0.41	0.43	0.37	0.37
Illuminated / Shadow?	I	I	I	I	I	I	I	I	I	I
Calculation of barrier attenuation:										
Barrier Atten Illuminated	-2.39	-2.39	-2.23	-2.21	-2.24	-2.18	-2.39	-2.33	-2.48	-2.48
Barrier Atten Shadow	-7.51	-7.51	-7.68	-7.71	-7.67	-7.74	-7.51	-7.57	-7.41	-7.41
Possible Barrier Attenuation	-2.39	-2.39	-2.23	-2.21	-2.24	-2.18	-2.39	-2.33	-2.48	-2.48
Actual Barrier Attenuation based on whether there is a barrier or not	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Angle of View and Facade Corrections:										
View Ange Correction dB(A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Facade correction	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Hourly L10, dB(A)	86.83	82.77	78.12	74.82	76.62	71.88	81.50	80.92	82.87	80.27
Detail Assessment required?	yes		yes	no		no		no		no

Road Noise Calculation
Kowloon

	K9		K10		K14		K16		K18			K26
	Private Residential		Private Residential		Private Residential		Chun Seen Mei Chuen			Wylie Court		Bamboo Mansion
At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	At grade	Flyover	At grade	Flyover
Lung Cheung Road	Waterloo Raod	Waterloo Road	Waterloo Road	Waterloo Road	Boundary Street	Boundary Street	Argyle Street	Argyle Street	Prince Edward Road West	Chatham Road South	Hong Chong Road	Dyer Avenue
4888	2266	2229	6847	6722	1840	2677	2081	2081	2956	2118	9314	126
50	50	50	50	50	50	50	50	50	50	50	50	50
22.2	22.2	22.2	22.2	22.2	22.2	22.2	14.8	14.8	22.2	22.2	22.2	22.2
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	30.00	15.00	20.00	10.00	15.00	5.00	20.00	10.00	50.00	20.00	70.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80.37	77.03	76.96	81.83	81.75	76.13	77.76	75.53	75.53	78.19	76.74	83.17	64.48
13.51	33.50	18.51	23.51	13.51	18.51	8.51	23.51	13.51	53.50	23.51	73.50	13.51
0.00	-3.95	-1.37	-2.41	0.00	-1.37	2.00	-2.41	0.00	-5.98	-2.41	-7.36	0.00
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.04	-0.01	-0.03	-0.02	-0.04	-0.03	-0.06	-0.02	-0.04	-0.01	-0.02	-0.01	-0.04
0.37	0.45	0.41	0.43	0.37	0.41	0.29	0.43	0.37	0.47	0.43	0.48	0.37
I	I	I	I	I	I	I	I	I	I	I	I	I
-2.48	-2.28	-2.39	-2.33	-2.48	-2.39	-2.73	-2.33	-2.48	-2.23	-2.33	-2.21	-2.48
-7.41	-7.63	-7.51	-7.57	-7.41	-7.51	-7.15	-7.57	-7.41	-7.68	-7.57	-7.71	-7.41
-2.48	-2.28	-2.39	-2.33	-2.48	-2.39	-2.73	-2.33	-2.48	-2.23	-2.33	-2.21	-2.48
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
82.87	75.58	78.09	81.93	84.25	77.26	82.26	75.62	78.02	74.71	76.83	78.31	66.98
	no		no		no		no			no		no

Road Noise Calculation
Kowloon

		K30		K31			K32		K34		K41	
		Tin Ma Court		Wang Tau Hom Estate			Lung Poon Court		Choi Hung Estate		Upper Ngau Tau Kok Est	
At grade	At grade	Flyover	At grade	Flyover	At grade	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade
Dyer Avenue	Hung Hom Road	Chuk Yuen Road	Lung Cheung Road	Fung Mo Street	Fung Mo Street	Lung Cheung Road	Po Kong Village Road	Lung Cheung Road	Prince Edward Road East	Prince Edward Road East	Ngau Tau Kok Road	Kwun Tong Road
126	1368	1033	4462	2010	2010	4356	899	4647	7721	7721	268	5864
50	50	50	50	50	50	50	50	50	50	50	50	50
22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	35.2	35.2
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	35.00	75.00	25.00	40.00	30.00	140.00	100.00	85.00	35.00	20.00	10.00	45.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
64.48	74.84	73.62	79.97	76.51	76.51	79.87	73.02	80.15	82.36	82.36	69.23	82.63
13.51	38.50	78.50	28.50	43.50	33.50	143.50	103.50	88.50	38.50	23.51	13.51	48.50
0.00	-4.55	-7.65	-3.25	-5.08	-3.95	-10.27	-8.85	-8.17	-4.55	-2.41	0.00	-5.55
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.04	-0.01	-0.01	-0.02	-0.01	-0.01	0.00	0.00	-0.01	-0.01	-0.02	-0.04	-0.01
0.37	0.45	0.48	0.44	0.46	0.45	0.49	0.48	0.48	0.45	0.43	0.37	0.46
I	I	I	I	I	I	I	I	I	I	I	I	I
-2.48	-2.26	-2.21	-2.30	-2.25	-2.28	-2.19	-2.20	-2.20	-2.26	-2.33	-2.48	-2.24
-7.41	-7.65	-7.71	-7.61	-7.66	-7.63	-7.74	-7.72	-7.72	-7.65	-7.57	-7.41	-7.67
-2.48	-2.26	-2.21	-2.30	-2.25	-2.28	-2.19	-2.20	-2.20	-2.26	-2.33	-2.48	-2.24
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
66.98	72.79	68.47	79.23	73.93	75.06	72.10	66.67	74.48	80.30	82.45	71.73	79.58
		no		no			no		no		no	

Road Noise Calculation
Kowloon

K42a		K43		K48		K53	K55		K56
Shun Lee Tsuen		Lee On Road		Kai Tak Court		Laguna City	Kwun Tong Estate		Tsui Ping South Estate
Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	Flyover	At grade	Flyover
Shun Lee Tsuen Road	New Clear Water Bay Road	Lee On Road	New Clear Water Bay Road	Kwun Tong Road	Kwun Tong Road	Kwun Tong Bypass	Kwun Tong Bypass	Kwun Tong Road	Tseung Kwan O Road
1863	1687	1095	1872	5864	9608	5765	5678	10443	5678
50	50	50	50	50	50	70	50	50	50
22.2	22.2	22.2	22.2	22.2	22.2	34.1	22.2	22.2	34.1
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90.00	40.00	85.00	20.00	70.00	50.00	70.00	20.00	10.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76.18	75.75	73.87	76.20	81.16	83.30	83.64	81.02	83.67	82.39
93.50	43.50	88.50	23.51	73.50	53.50	73.50	23.51	13.51	38.50
-8.40	-5.08	-8.17	-2.41	-7.36	-5.98	-7.36	-2.41	0.00	-4.55
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01	-0.02	-0.04	-0.01
0.48	0.46	0.48	0.43	0.48	0.47	0.48	0.43	0.37	0.45
1	1	1	1	1	1	1	1	1	1
-2.20	-2.25	-2.20	-2.33	-2.21	-2.23	-2.21	-2.33	-2.48	-2.26
-7.72	-7.66	-7.72	-7.57	-7.71	-7.68	-7.71	-7.57	-7.41	-7.65
-2.20	-2.25	-2.20	-2.33	-2.21	-2.23	-2.21	-2.33	-2.48	-2.26
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
70.28	73.17	68.21	76.29	76.30	79.82	78.78	81.11	86.16	80.33
no		no		no		yes	no		yes

Road Noise Calculation
NT

Flyover ID	NT3		NT4		NT7		NT9		NT10		NT15
Receiver	Tai Ping Estate		Venniza Garden		Private Residential		Wang Fuk Court		Wang Fuk Court		Chevalier Gar
Noise Source	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover
	Pak Wo Road	Fanling Highway	So Kwun Po Rd Network	Fanling Highway	Po Heung Street	Po Heung Street	Tai Po Road Yuen Chau Tsai	Tolo Highway	Tai Po Road Yuen Chau Tsai	Tolo Highway	Ma On Shan R
INPUTS											
Hourly Flow	157	5290	2913	5290	2032	2032	937	5709	932	5709	1848
Av Speed (km/hr)	50	50	50	50	50	50	50	50	50	50	50
%HV	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	30.7
Gradient %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Receiver-Carriageway Distance (m)	60.00	50.00	105.00	90.00	65.00	50.00	50.00	140.00	95.00	150.00	200.00
Height of Carriageway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Angle of View (deg.)	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
surface type (imprevious/pervious)	i	i	i	i	i	i	i	i	i	i	i
Barrier (Y/N)	N	N	N	N	N	N	N	N	N	N	N
Height of Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barrier-carriageway Distance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Receiver Height (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OUTPUTS											
Basic Hourly Noise Level dB(A) (Includes speed and %HV correction, also gradient and road surface correction of 1 for imp/bit and speed <75km/hr)	65.44	80.71	78.12	80.71	76.56	76.56	73.20	81.04	73.17	81.04	77.16
Distance Correction:											
Slant Distance (m)	63.50	53.50	108.50	93.50	68.50	53.50	53.50	143.50	98.50	153.50	203.50
Distance Correction dB(A)	-6.72	-5.98	-9.05	-8.40	-7.05	-5.98	-5.98	-10.27	-8.63	-10.56	-11.78
Surface correction											
Surface correction	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Calculation of Path Difference:											
Possible Path Difference	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Path Difference Only if Barrier Exists	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Working out whether receiver is in the illuminated or shadow zone:											
Source Receiver gradient	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	0.00	-0.01	0.00	0.00
Height of Line at Barrier Position	0.47	0.47	0.48	0.48	0.47	0.47	0.47	0.49	0.48	0.49	0.49
Illuminated / Shadow?	I	I	I	I	I	I	I	I	I	I	I
Calculation of barrier attenuation:											
Barrier Atten Illuminated	-2.22	-2.23	-2.19	-2.20	-2.22	-2.23	-2.23	-2.19	-2.20	-2.18	-2.18
Barrier Atten Shadow	-7.70	-7.68	-7.73	-7.72	-7.70	-7.68	-7.68	-7.74	-7.72	-7.74	-7.75
Possible Barrier Attenuation	-2.22	-2.23	-2.19	-2.20	-2.22	-2.23	-2.23	-2.19	-2.20	-2.18	-2.18
Actual Barrier Attenuation based on whether there is a barrier or not	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Angle of View and Facade Corrections:											
View Ange Correction dB(A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Facade correction	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Hourly L10, dB(A)	61.21	77.23	71.57	74.81	72.00	73.08	69.72	73.28	67.04	72.99	67.88
Detail Assessment required?	no		no		no		no		no		no

Road Noise Calculation
NT

NT17		NT23		NT25		NT27		NT29		NT35
Tai Shui Hang		KCRC Staff Quarter		City One		Ravana Garden		Pictorial Garden		Worldwide Garden
Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover
Hang Tak Street	Ma On Shan Network	Sha Tin Road	Tai Po Road Sha Tin	Sha Tin Road	Sha Tin Road	Tai Chung Kiu Road	Tai Chung Kiu Road	Shek Mun Interchange Slip Road	Tate's Cairn Highway	Lion Rock Tunnel Road
1848	2146	1247	6905	3287	2588	3153	3153	564	3796	5894
50	50	50	50	50	50	50	50	50	50	50
30.7	30.7	30.7	30.7	30.7	30.7	41.6	41.6	33	30.7	22.2
1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
85.00	100.00	80.00	60.00	35.00	70.00	30.00	15.00	75.00	80.00	110.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77.46	77.81	75.75	82.89	79.96	78.63	80.51	80.51	72.25	80.29	81.18
88.50	103.50	83.50	63.50	38.50	73.50	33.50	18.51	78.50	83.50	113.50
-8.17	-8.85	-7.91	-6.72	-4.55	-7.36	-3.95	-1.37	-7.65	-7.91	-9.25
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.03	-0.01	-0.01	0.00
0.48	0.48	0.48	0.47	0.45	0.48	0.45	0.41	0.48	0.48	0.48
I	I	I	I	I	I	I	I	I	I	I
-2.20	-2.20	-2.21	-2.22	-2.26	-2.21	-2.28	-2.39	-2.21	-2.21	-2.19
-7.72	-7.72	-7.71	-7.70	-7.65	-7.71	-7.63	-7.51	-7.71	-7.71	-7.73
-2.20	-2.20	-2.21	-2.22	-2.26	-2.21	-2.28	-2.39	-2.21	-2.21	-2.19
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
71.80	71.47	70.34	78.66	77.91	73.77	79.07	81.64	67.10	74.88	74.44
no		no		yes		no		no		no

Road Noise Calculation
NT

	NT47		NT48		NT49		NT56		NT62	NT69		NT71
	Ling Nam		San Fat Estate		Kam Wah Garden		Sun Shing		Clague Garden Estate	Kwai Fong Estate		Riviera Garden
At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade	Flyover	Flyover	grade	Flyover
Lion Rock Tunnel Road	Castle Peak Road - San Hui	San Hui Road	Pui To Road	Pui To Road	Pui To Road	Tuen Fat Road	Tuen Hing Road	Tuen Mun Road	Tsuen Wan Road	Kwai Chung Road	Kwai Chung Road	Tsing Tsuen Road
5894	598	598	1721	1721	1397	4274	1180	4274	7552	1036	518	3487
50	50	50	50	50	50	50	50	50	70	50	50	50
22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	13.2	32.3	32.3	51.2
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	30.00	20.00	30.00	20.00	50.00	30.00	40.00	50.00	15.00	25.00	15.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i	i	i	i	i	i	i
N	N	N	N	N	N	N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81.18	71.25	71.25	75.84	75.84	74.93	79.79	74.20	79.79	82.33	74.82	71.81	81.69
23.51	33.50	23.51	33.50	23.51	53.50	33.50	43.50	53.50	18.51	28.50	18.51	28.50
-2.41	-3.95	-2.41	-3.95	-2.41	-5.98	-3.95	-5.08	-5.98	-1.37	-3.25	-1.37	-3.25
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.02	-0.01	-0.02	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.03	-0.02
0.43	0.45	0.43	0.45	0.43	0.47	0.45	0.46	0.47	0.41	0.44	0.41	0.44
I	I	I	I	I	I	I	I	I	I	I	I	I
-2.33	-2.28	-2.33	-2.28	-2.33	-2.23	-2.28	-2.25	-2.23	-2.39	-2.30	-2.39	-2.30
-7.57	-7.63	-7.57	-7.63	-7.57	-7.68	-7.63	-7.66	-7.68	-7.51	-7.61	-7.51	-7.61
-2.33	-2.28	-2.33	-2.28	-2.33	-2.23	-2.28	-2.25	-2.23	-2.39	-2.30	-2.39	-2.30
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
81.27	69.80	71.34	74.39	75.93	71.45	78.34	71.62	76.31	83.46	74.07	72.94	80.95
	no		no		no		no		yes	yes		yes

			NT73		NT76	
	Cheung On Estate		Lai King Terrace		Lai Yiu Estate	
At grade	Flyover	At grade	Flyover	At grade	Flyover	At grade
Tsuen Wan Road	Tsing Tsuen Road	Tsing King Road	Lai King Hill Rd Network	Kwai Chung Road	Wah Tai Road	Castle Peak Road
9624	3487	883	1007	2445	578	2416
50	50	50	50	50	50	50
13.2	51.2	30.3	22.2	22.2	22.2	22.2
0.00	0.00	0.00	0.00	0.00	0.00	0.00
375.00	20.00	5.00	45.00	20.00	90.00	65.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
180.00	180.00	180.00	180.00	180.00	180.00	180.00
i	i	i	i	i	i	i
N	N	N	N	N	N	N
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
81.89	81.69	73.91	73.51	77.36	71.10	77.31
378.50	23.51	8.51	48.50	23.51	93.50	68.50
-14.48	-2.41	2.00	-5.55	-2.41	-8.40	-7.05
-1	-1	-1	-1	-1	-1	-1
0.04	0.03	0.02	0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	-0.02	-0.06	-0.01	-0.02	-0.01	-0.01
0.50	0.43	0.29	0.46	0.43	0.48	0.47
I	I	I	I	I	I	I
-2.17	-2.33	-2.73	-2.24	-2.33	-2.20	-2.22
-7.76	-7.57	-7.15	-7.67	-7.57	-7.72	-7.70
-2.17	-2.33	-2.73	-2.24	-2.33	-2.20	-2.22
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.50	2.50	2.50	2.50	2.50	2.50	2.50
69.91	81.78	78.41	70.45	77.45	65.19	72.76
	yes		no		no	

Response to Comments
Scoping Study for Providing Direct Technical Remedies on Existing Flyovers
Final Report

No.	Department	Reference	Comments	Consultants' Response
1	Environmental Protection Department	EP 42/T6/1 A2 dated 16.7.97	Tables 3.2a, 3.2b, 3.3a and 3.3b (a) It is shown in the tables that Fung Ha Road (H36), Sha Tin Road (NT36) and Yuen Long Highway (NT45) are already provided with noise mitigation measures. Please clarify whether EIAs have been performed for these flyovers. If so, you are required to indicate that in Tables 3.2a/3.3a (column 5) and 3.2b/3.3b accordingly. Also refer to my earlier comments on the advanced copy of the Final Report.	We refer to the previous response to comments on DFR, we only could confirm those flyovers are already provided with noise mitigation measures as presented in EPD's publication *Screening Structures and Building Designs Against Transportation Noise in Hong Kong*.
			Section 6.2 (b) Photograph illustrating the recommended mitigation measures for Ap Lei Chau Bridge (H41) is outstanding. (c) Please add "and Cheung On Estate" at the end of the bullet for NT71.	Photograph for Ap Lei Chau Bridge (H41) is provided as *Figure 6.1jj*. Noted. Text amended in relevant page.
			Table 7.1b (d) Description for cost effective factor should read "Cost Effective Factor (C) ($x10^{-6}$)".	Noted. Text amended in relevant page.
			Table 7.2 (e) Recommendations on detailed cost estimate for noise mitigation measures and further investigation of the application of central barriers should be included in this section. Also refer to my earlier comments on the advanced copy of the Final Report.	Noted. The application of central barriers will be investigated in Stage 2 study. Text amended in relevant page.
			Annex A List of Flyovers (f) Reasons for excluding Ferry Street (K45), Po Shek Wu Road (NT1) and Fanling Highway (NT2) from further investigation are different from that indicated in Tables 4.4a and 3.3a. Please clarify.	Noted. Table revised.
			(g) It is indicated that the exclusion of Tai Po Road - Sha Tin (NT18) and Sha Tin Road (NT41) from further investigation is due to "scattered villages in rural area". Please elaborate the rationale(s).	Noted. Table revised.

No.	Department	Reference	Comments	Consultants' Response
			(h) Please provide a note to explain the meaning of "embankment road".	Noted. Footnote amended in the Table.
			Annex C Calculation of Road Traffic Noise (i) Noise calculations for Waterloo Road (K9), Po Heung Street (NT7), Hang Tak Street (NT17) and Sha Tin Road (NT23) are outstanding.	Noted. Table amended.
2	Transport Department, T.E. Division/HK	HR 171/31-01 dated 28.7.97	I have no adverse comment in general on the captioned report from traffic engineering point of view.	Noted.
			However, I would draw your attention to the following during the Stage 2 Study mentioned in Chapter 7 of your report: (a) Designs of the direct technical remedies should not cause reduction of traffic lanes or reduction in road capacities. (b) Traffic impact both during construction and future maintenance of the direct technical remedies should be critically examined.	Comments noted. On Comment (a), it is recommended that the Consultants for the Stage 2 Study should take these requirements into consideration during the Stage 2 Study. On Comment (b), please refer to EPD's memo ref (41) in EP42/T6/1 A1 II of 5.9.97.
3	Transport Department, Traffic Engineering (NTE) Division	NR 181/161-1 dated 25.7.97	In general, I am concerned that the provision of noise barrier and/or enclosures would render the installation of traffic signs and/or traffic aids very difficult, if not impossible, in the future. The provision of such noise mitigation measure should therefore be kept to the absolute minimum. All noise barriers should comply with our TPDM particularly on vertical and horizontal clearances.	TD's concern is noted. It is recommended that the Consultants for the Stage 2 Study should take these requirements into consideration during the Stage 2 Study.

No.	Department	Reference	Comments	Consultants' Response
4	Highways Department	HH 63/50 (DNP & QB) dated 1.8.97	With reference to the 4 nos. "insurmountable constraints" described on p.20, my comments are as follows: i) Insufficient clearance between flyover & NSRs:- I am still not convinced that all flyovers with less than 4.5m clearance (which is an existing value) should be excluded from further investigation. By copy of this letter to D of FS please advise in this respect. ii) Insufficient space for barrier structure support:- We should be concentrating on whether there is adequate room below the flyovers for erection of barriers and if not, why not. In particular, the existing land usage below the flyovers should be specified. (In your Appendix A your reference to "the distance between the kerbline and the barrier on a flyover is less than 0.46m" is not understood. Perhaps you should illustrate with a sketch).	Flyovers with less than 4.5 m horizontal clearance have been excluded as a result of the advice given in FSD's letter ref (20) in FSD 4/130/94 of 6.1.1997. The reasons for excluding flyovers with insufficient space for barrier structure support have been clearly stated in the Flyovers Checklist Tables of Appendix A (e.g. K28 Hong Chong Road Flyover over the KCR line and K40 Ngau Tau Kok Road Flyover over the MTR). The constraint of "the distance between the kerbline and the barrier on a flyover is less than 0.46m" has been consulted in the Working Paper/Consultation Paper of the Study with reference to *Public Works Departmental Technical Circular No 31/73 (PWDTC No 31/73).*
			With reference to para. 7.1, the score system for a cost-effective factor should take into account the costs of recurrent maintenance, cleansing and repair as well as the capital costs of construction. I note that you are suggesting to leave the detailed costs estimate to the Stage 2 Study. However, to allow future reference, it is recommended that the last sentence of para. 7.1 be amended to "However, a detailed cost estimate on the noise mitigation measures covering both capital costs and recurrent maintenance and cleansing costs is recommended in the Stage 2 Study."	Noted. Replacement page with amended text is provided.
5	Fire Services Department	(9) in FSD 4/130/94 II	I have no adverse comment on the captioned report. Since the project is still under study stage, I would reserve my final comments on relevant fire safety provisions upon receipt of detailed design at later stage. Due Fire Services advice/detailed fire safety requirements will be made/formulated upon receipt of detailed design.	Noted. It is recommended that FSD be consulted on the design of direct technical remedies during the detailed design stage.

No.	Department	Reference	Comments	Consultants' Response
6	Transport Department, CTE/NTW	NR 181/161-1 dated 26 August	My comments on the issue is that provision of noise barriers will be accepted only if they will not have adverse effect to the sight-line of motorists/pedestrians. Moreover it should not cause obstruction to traffic signs.	Noted. It is recommended that the Consultants for the Stage 2 Study should take these requirements into consideration during the Stage 2 Study.
7	Transport Department, Traffic Engineering (Kln) Division	KR 146/60-1 dated 25 August	1. On the understanding that this Stage 1 Study only aims at providing a basis for the detailed investigations to be carried out in Stage 2, I have no particular comment on the captioned report and the draft executive summary from the traffic engineering point of view.	Noted.
			2. For both the flyover K2 (Kwai Chung Road - near Mei Foo Sun Chuen) and the flyover K4 (West Kowloon Corridor near Nam Cheong Estate), it appears reasonable that noise barrier, subject to the compliance of all requirements from concerned departments, should be proposed on both sides of the flyover as the existing residential buildings are close to the flyover on both sides.	Subject to FSD's advice, direct mitigation measures have been proposed on one side of the flyovers.
			3. Detailed traffic impact assessment should be included in the Stage 2 Study and this should form the critical factor in determining the feasibility of the proposed technical remedies. In general, reduction of traffic lanes or reduction in road capacities caused by proposed remedies should be examined. Details of the proposed and recommendation in the Stage 2 Study should be forwarded to this department for comments before finalisation.	Comments noted. Please refer to EPD's memo ref (41) in EP42/T6/1 A1 II of 5.9.97.
			4. I suggest that the consultant of the Stage 2 Study, with the assistance of your department, should be responsible for any necessary public consultation including the relevant DBs. Also I assume that the projects for the implementation of the proposed remedies would be processed by your department under your departmental vote.	Please refer to EPD's memo ref (41) in EP42/T6/1 A1 II of 5.9.97.

FIGURE 6.1jj -DIRECT TECHNICAL REMEDIES PROPOSED FLYOVER ON FLYOVER H41 - AP LEI CHAU BRIDGE

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