Highways Department
Major Works Project Management Office

Feasibility Study for Castle Peak Road Improvements

between Ka Loon Tsuen and Yau Kom Tau

FINAL REPORT
VOLUME 3

ENVIRONMENTAL IMPACT ASSESSMENT

December 1996

MAUNSELL CONSULTANTS ASIA LTD

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Report No. 97294/R38

FINAL REPORT
VOLUME 3

ENVIRONMENTAL IMPACT ASSESSMENT

December 1996

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FEASIBILITY STUDY FOR CASTLE PEAK ROAD IMPROVEMENT
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CLIENT NAME	Highways Department - Major Works Project Management Office		
PROJECT NAME	Feasibility Study for Castle Peak Road Improvements	PROJECT No	
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		12	Fig 12.3	Replaced		
		14	127-141	Replaced		
		Annex 1	Text	Deleted		

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1 INTRODUCTION

1.1 Background to the Study

1.1.1 The Tuen Mun and Tsuen Wan areas have been experiencing intensive residential, commercial and industrial development over recent years. Increased pressure on the road infrastructure has led to the recent letting of contracts to widen sections of Tuen Mun Road and for the construction of the Country Park Section of Route 3. The latter will ultimately remove traffic originating from Yuen Long and destined for the southern metropolitan areas from Tuen Mun Road, thus enhancing strategic communications between the western New Territories and Kowloon.

1.1.2 There has been much recent residential development along Castle Peak Road between Tsing Lung Tau and Yau Kom Tau, where lowrise residential properties have given way to highrise, high density complexes and new areas have been zoned for residential development, putting increasing pressure on this section of Castle Peak Road.

1.1.3 The existing Castle Peak Road is characterised by substandard geometry and frequent entry/egress points offering insufficient visibility. As a result of this, the Government has decided that, in order to enhance the level of service for the increasing number of users, the road needs to be improved to cope with traffic growth predicted by the year 2011. This Agreement examines the feasibility of widening and, where necessary, realigning an 8-km length of Castle Peak Road between Ka Loon Tsuen and Area 2, Tsuen Wan. The existing two-way single carriageway will be widened to a dual-two lane carriageway to cope with the increased Castle Peak Road traffic as well as overspill traffic in the event of an accident on Tuen Mun Road.

1.1.4 While there is little development to the west of Tsing Lung Tau, the Study Brief extends the study area westward to Ka Loon Tsuen. This is the terminal point of a previous upgrading of the western part of this route to a 10-m wide single carriageway.

1.1.5 The proposed improvements covered under this Agreement extend the improvements to Castle Peak Road from So Kwun Tan to Siu Lam (west of the present study area), construction of which will commence in early 1997.

1.1.6 Following submission of the Final Report and consideration of its recommendations, the Brief anticipates that the improvements will be implemented in two stages: first between Area 2 and Sham Tseng, and second between Sham Tseng and Ka Loon Tsuen. The planned construction dates are from late 1999 to late 2002 and early 2000 to late 2002 respectively.

1.1.7 The recommended improvements to the alignment are shown in Figure 1.1.

1.2 Structure of the Report

1.2.1 In Chapters 2 to 4, the report identifies Sensitive Receivers (SRs) within the study area, defines environmental parameters and features likely to be affected by the proposed project, and sets out the criteria and methodology on which noise, air quality, water quality, and ecology assessments are based. The assumed existing and planned traffic flows on which the noise and air quality assessments are based are provided in Chapter 5.

1.2.2 Chapter 6 contains a summary of noise and air quality monitoring results obtained from a baseline monitoring programme conducted for this study.

1.2.3 Predicted construction and operation phase impacts are provided in Chapters 7 and 8 (noise impacts), 9 and 10 (air quality impacts), 11 (ecological impacts), and 12 (water quality impacts). Solid waste generation and control, and conservation measures, are discussed in Chapter 13. A landscape and visual impact assessment is provided in Chapter 14.

1.2.4 The EIA Final Report discusses impacts of the recommended alignment option only. Provisional alignments that were considered at intermediate stages of the project, including the Sham Tseng Bypass (a possible long-term alignment option), are not discussed in this report. These provisional alignments were individually considered at an early stage of the study, and were assessed according to engineering, environmental, land and traffic criteria. The results of the assessment have been reported in detail in the Interim Report of this study, and are not repeated in this EIA Report.

1.2.5 Environmental monitoring programmes that are required to provide a more detailed baseline profile of existing environmental conditions, and to monitor impacts and compliance during the construction and operation of the project, are provided in a separate document in Appendix 3A. Environmental audit requirements for compliance and post-project audit are also included in the Appendix. The material provided in Appendix 3A is preliminary, reflecting the current feasibility stage of this study. A more detailed Environmental Monitoring and Audit Manual should be prepared at the detailed design stage of the study as an integral part of the detailed EIA.

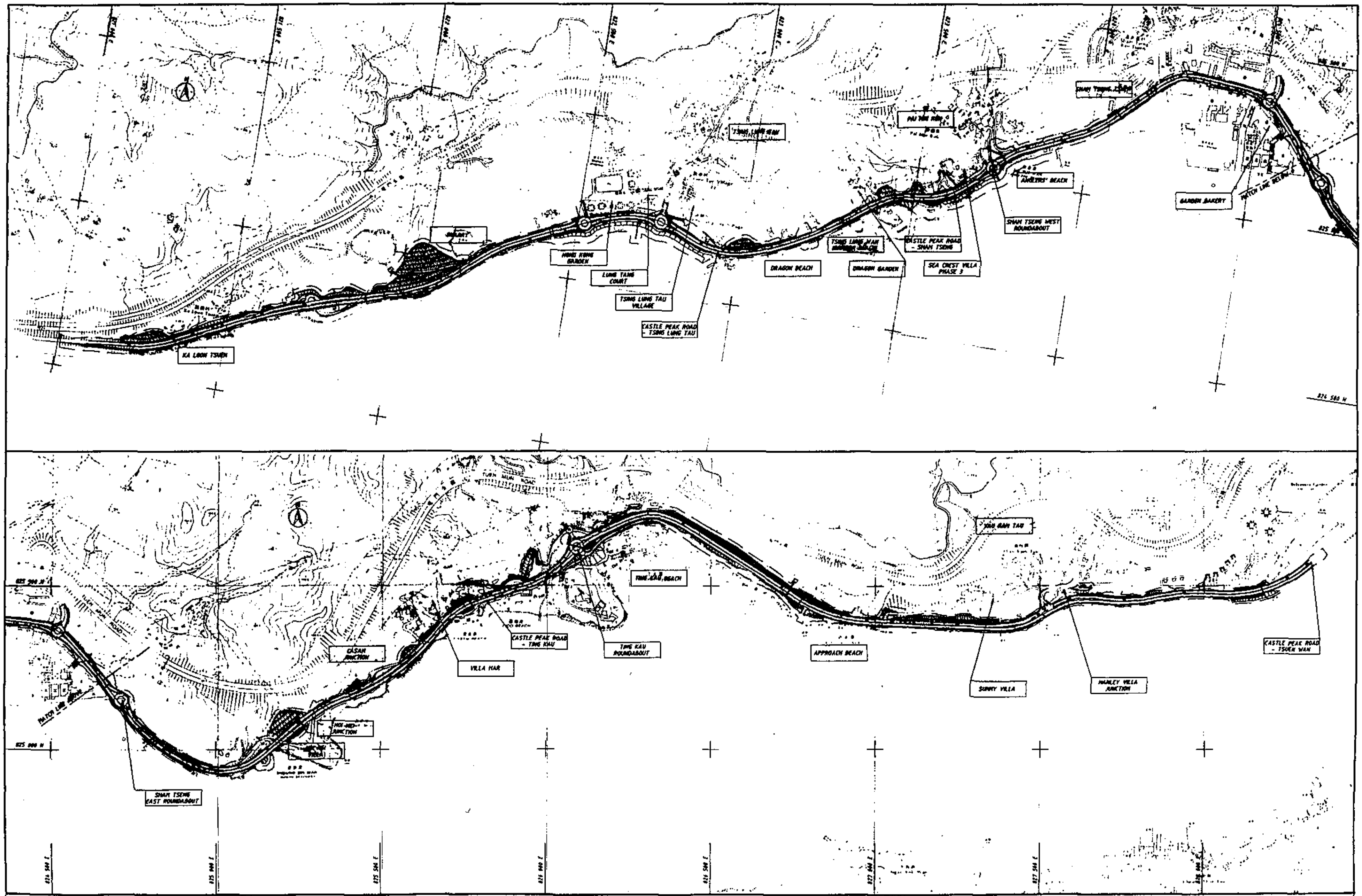


FIGURE 1.1 - KEY PLAN

2 IDENTIFICATION OF SENSITIVE RECEIVERS

2.1 Existing and Planned Sensitive Receivers: Noise, Air Quality and Water Quality

2.1.1 Sensitive receivers along the existing Castle Peak Road alignment for air quality, noise and water quality impacts have been identified in accordance with the definitions given in the HKPSG. These receivers are shown in Figures 2.1 to 2.10, and are summarised in Tables 2.1 to 2.3. The Tables and Figures also show the NSR identification numbers for representative NSRs used in the noise impact assessment. A separate system of identification has been adopted for the air quality assessment, as outlined in Annexe F and Figures F-1 to F-3.

2.1.2 In addition to the receivers shown, the proposed Sham Tseng Further Reclamation off Lido Garden, which will be developed for residential and other sensitive uses, is considered a future sensitive receiver.

Table 2.1 Environmentally Sensitive Landuses (Ka Loon Tsuen to Tsing Lung Tau)

SR ID	SR Identification	Sensitive to **A**ir Quality, **N**oise, and/or **W**ater Quality:			Comments
		A	N	W	
1	Ka Loon Tsuen	✓	✓		1-2 storey village dwellings
	Bayside Villas	✓	✓		19 residential units (under construction)
	Lot 623B (Residence)	✓	✓		single residence
	Dragon View*				2-3 storey single residence
3	Grand Bay Villas	✓	✓		12 2-storey houses
4	Hong Kong Garden	✓	✓		20-storey residential towers
5	Hong Kong Garden	✓	✓		23-storey residential towers
6	Hong Kong Garden	✓	✓		25-storey residential towers
7	Hong Kong Garden	✓	✓		5-storey residential blocks
	Hong Kong Garden	✓	✓		12-storey residential towers
8	Hong Kong Garden	✓	✓		20-storey residential towers
	Hong Kong Garden	✓			3-storey commercial block
9	Hong Kong Garden	✓	✓		20-storey residential towers
	Hong Kong Garden	✓	✓		18-storey residential towers
10	Lung Tang Court	✓	✓		10-storey residential block
11	Yuen Tun Village	✓	✓		1-3 storey village dwellings
	Upper Yuen Tun Village	✓	✓		2-3 storey village dwellings
12	Tsing Lung Tau Village	✓	✓		1-3 storey village dwellings with some ground-level commercial use
40	Dragon Villa and Villa Alfa Vista	✓	✓		2-storey single residence and seven 3-storey apartments

NOTE: * to be resumed under the preferred alignment on which this assessment is based
Receiver locations shown in Figures 2.1 to 2.3.

Table 2.2 Environmentally Sensitive Landuses (Tsing Lung Tau to Hoi Mei Beach)

SR ID	SR Identification	Sensitive to Air Quality, Noise, and/or Water Quality: A	N	W	Comments
13	Sea Crest Villa Phase 4	✓	✓		3 29-storey residential towers on 6-storey podium
14	Dragon Ville Residence	✓	✓		2-storey residence and 3 existing houses to be redeveloped as 4 lowrise houses
	Valerie's Court	✓	✓		single residential unit
	Dragon Garden	✓	✓		private residential compound/mausoleum
	Lot 99 (Residence)	✓	✓		2-storey residence, to be redeveloped as 3 2-storey single houses (under construction)
15	Sea Crest Villas Phase 3	✓	✓		15-1 to 15-4: 29-storey residential towers on 7-storey podium
15	Sea Crest Villas Phase 2	✓	✓		15-5 and 15-6: 29-storey residential towers on 6-storey podium
16 17	Lido Gardens	✓	✓		38-storey residential towers on low podium with tennis courts
41	Sea Crest Villas Phase 1	✓	✓		29-storey residential towers on 6-storey podium
18	Sham Tseng Tsuen	✓	✓		village dwellings
	Pai Min Kok	✓	✓		village dwellings
	Angler's Beach	✓		✓	gazetted beach (temporarily closed)
19	Sham Tseng	✓	✓		commercial/residential/school
42	San Miguel Brewery	✓	✓		42-1 and 42-2: CDA site
42	Garden Bakery	✓	✓		42-3 and 42-4: CDA site
20	Rhine Gardens	✓	✓		38-storey residential towers on low podium
	Highrise residential	✓	✓		(site clearance under way)
	Sham Tseng Tung Tsuen	✓	✓		village dwellings
21	Pink and Golden Villas	✓	✓		8 2-storey residential units
22	Homi Villa	✓			1-storey residence being redeveloped as viewing site for airport bridge
	Gemini Beach	✓		✓	gazetted beach
	Hoi Mei Beach	✓		✓	gazetted beach
23	Lot 403 (Residence)	✓	✓		single-storey residence

NOTE: Receiver locations shown in Figures 2.3 to 2.6. The planned Lido Further Reclamation, accommodating residential, school and open space uses, is also considered as a sensitive landuse.

Table 2.3 Environmentally Sensitive Landuses (Hoi Mei Beach to Yau Kom Tau)

SR ID	SR Identification	Sensitive to Air Quality, Noise, and/or Water Quality: A	N	W	Comments
24-27	Residences	✓	✓		beach and luxury homes, mostly 1- and 2-storey: includes Vista del Mar (24), Villa Mar, Lot 417 (26A, to be redeveloped), Edinburgh Villa (26, 4 storeys), Lot 414 (26B), Riviera Apts (25, 4 storeys), Lido Green Houses A and B (27), Upper Lido Gardens (27A), Ng Gardens (derelict), La Casetta (27C)
28	Ting Kau Village	✓	✓		2- and 3-storey village dwellings
	Ting Kau Beach	✓		✓	gazetted beach and playground
	Casam and Lido Beaches	✓		✓	gazetted beaches
29	Residences	✓	✓		2- and 3-storey dwellings
	Ting Kau Playground	✓			beachside playground
30	Approach Beach	✓	✓	✓	gazetted beach with bathing sheds
31	Sunny Villas	✓	✓		3 15-storey residential blocks
31-2	Keymount Lodge	✓	✓		15-storey residential block
43	Lot 322	✓	✓		30+ storey highrise residential (under construction)
33, 38	Hanley Villa	✓	✓		33-1, 33-2, 38-4: 31-storey highrise towers on 3-storey podium/carpark
33-3	Fung Chik Sen Villa (Lot 259) and Lot 357	✓	✓		2- and 3-storey detached residences
35	Greenview Terrace	✓	✓		2 15-storey residential blocks on 9-storey podium
36, 37	Blossom Terrace	✓	✓		residential blocks, to be redeveloped into 2 highrise towers
	Bayview Garden	✓	✓		multi-block highrise residential
44	Lot 356	✓	✓		highrise residential/hotel tower (under construction)
	Lot 360 (Longbeach Gardens)	✓	✓		highrise residential (site clearance currently under way)
	Lot 223	✓	✓		single lowrise residence

NOTE: Receiver locations shown in Figures 2.7 to 2.10.

2.1.3 There are several gazetted bathing beaches along the stretch of coast affected by the proposed road improvements.

- Angler's Beach
- Gemini Beach
- Ho Mei Wan Beach

- Casam Beach
- Lido Beach
- Ting Kau Beach
- Approach Beach

2.1.4 The primary concern for safeguarding water quality at these locations is the presence of pollutants which pose a risk to health, such as bacteria and other pathogens. Aesthetic factors should also be maintained at the highest possible level of quality in order to protect the amenity value of such areas. These factors include low water turbidity, absence of surface oil and floating refuse.

2.1.5 For several years the quality of water at the gazetted beaches has been classified as 'very poor' or 'barely acceptable'. Angler's Beach is presently under a closure order due to unacceptable water quality. Improvement to the quality of such waters is imperative and therefore discharges into the area are likely to be closely controlled.

2.1.6 Other uses of the coastal waters which are sensitive to pollution include seawater intakes (for flushing and cooling), fishing and mariculture. Although the coastal waters around Tuen Mun are used occasionally for fishing, the area is not heavily fished and the waters do not support notable stocks. There is a mariculture site at Ma Wan which is stocked with fish fry. Normal road runoff, because of the large diluting effect, is unlikely to affect water quality to such an extent that fish stocks or fish fry at Ma Wan would be affected.

2.1.7 There are no existing seawater intakes within the affected area.

2.2 Sensitive Receivers: Ecology

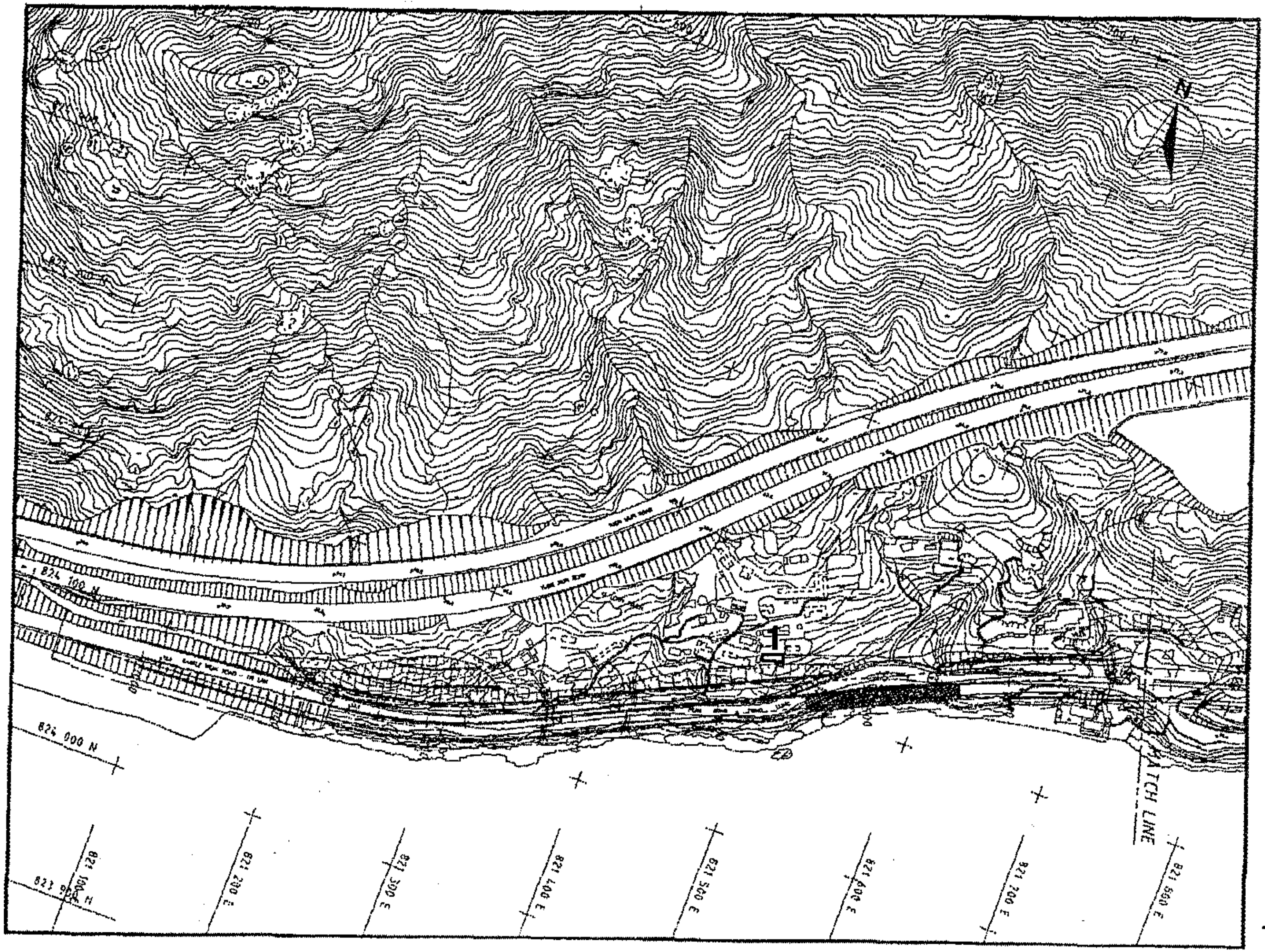
2.2.1 Sensitive receivers for ecological impact or ecologically sensitive areas are, in general, habitats which are of conservation importance based on their support of plant or animal communities or populations which are relatively rare or are protected by local and/or international regulations. For this project woodlands and natural shorelines were designated as sensitive receivers of ecological impacts, as recommended in HKPSG. To assess potential impacts on woodlands, focused studies were conducted on two secondary forest sites, one near Dragon View residence (east of Ka Loon Tsuen) and the second east of Ting Kau. Natural shorelines were investigated during field studies and through review of relevant studies.

2.3 Sensitive Receivers: Landscape and Visual Impact

2.3.1 Visually sensitive receivers are in general properties, recreational facilities and users within the area which will be affected by a degree of visual impact from the proposed development. The degree of severity of visual impact relates to the changes arising from the development to individual receiver groups views of the landscape.

2.3.2 Landscape impacts are judged by the effect upon the physical characteristics or components forming the landscape. For the basis of this assessment they are evaluated in relation to landform, vegetation and cultural/designated areas.

2.3.3 The impacts at this preliminary design stage have been broadly assessed on the basis of the proposed engineering alignments. Through the course of the detailed design stage of the scheme a more accurate evaluation of the impacts will be fully realised.



LEGEND

— Representative NSR

Figure 2.1 Sensitive Receivers: Ka Loon Tsuen

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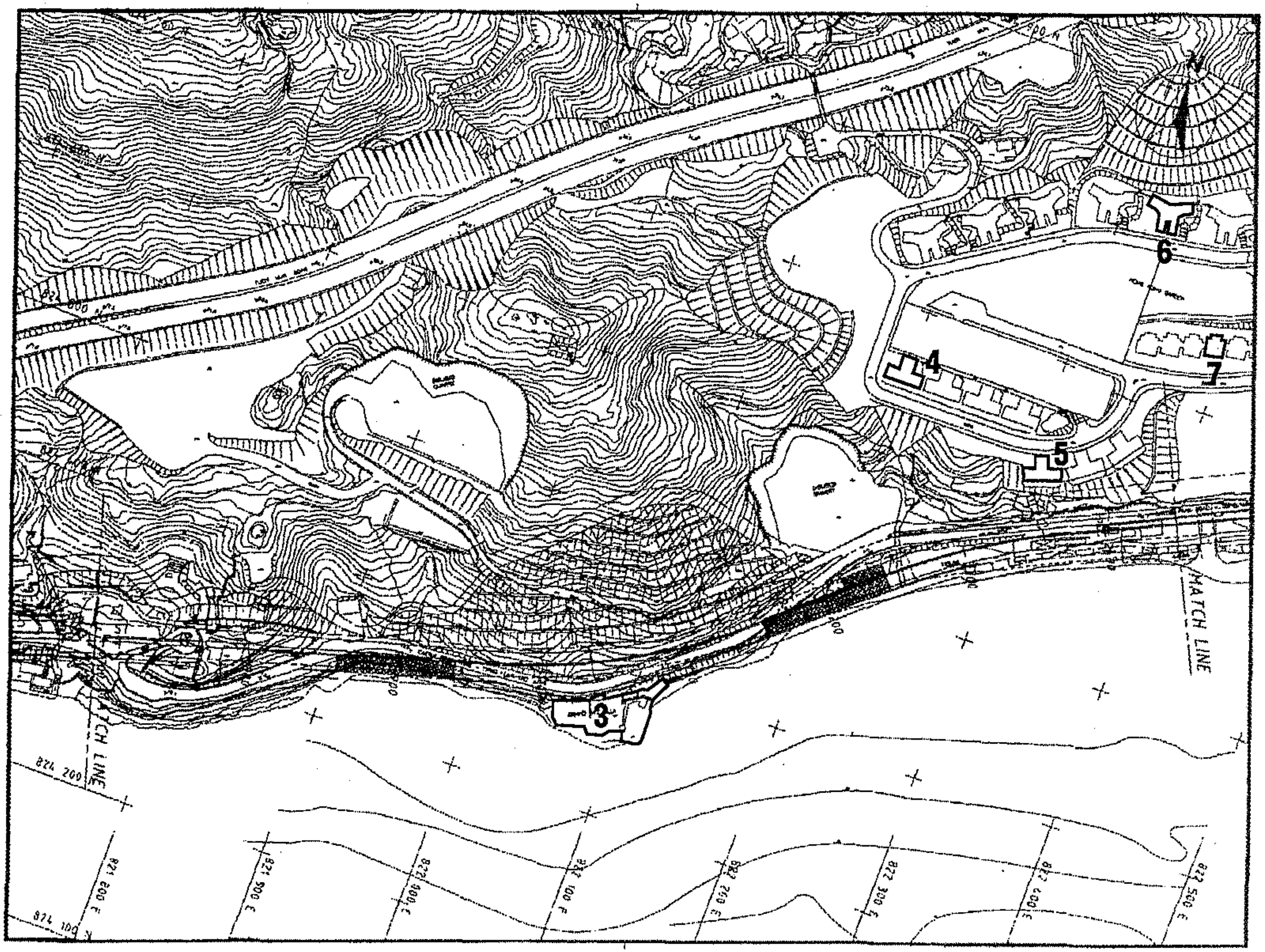

LEGEND

— Representative NSR

Figure 2.2 Sensitive Receivers: Grand Bay

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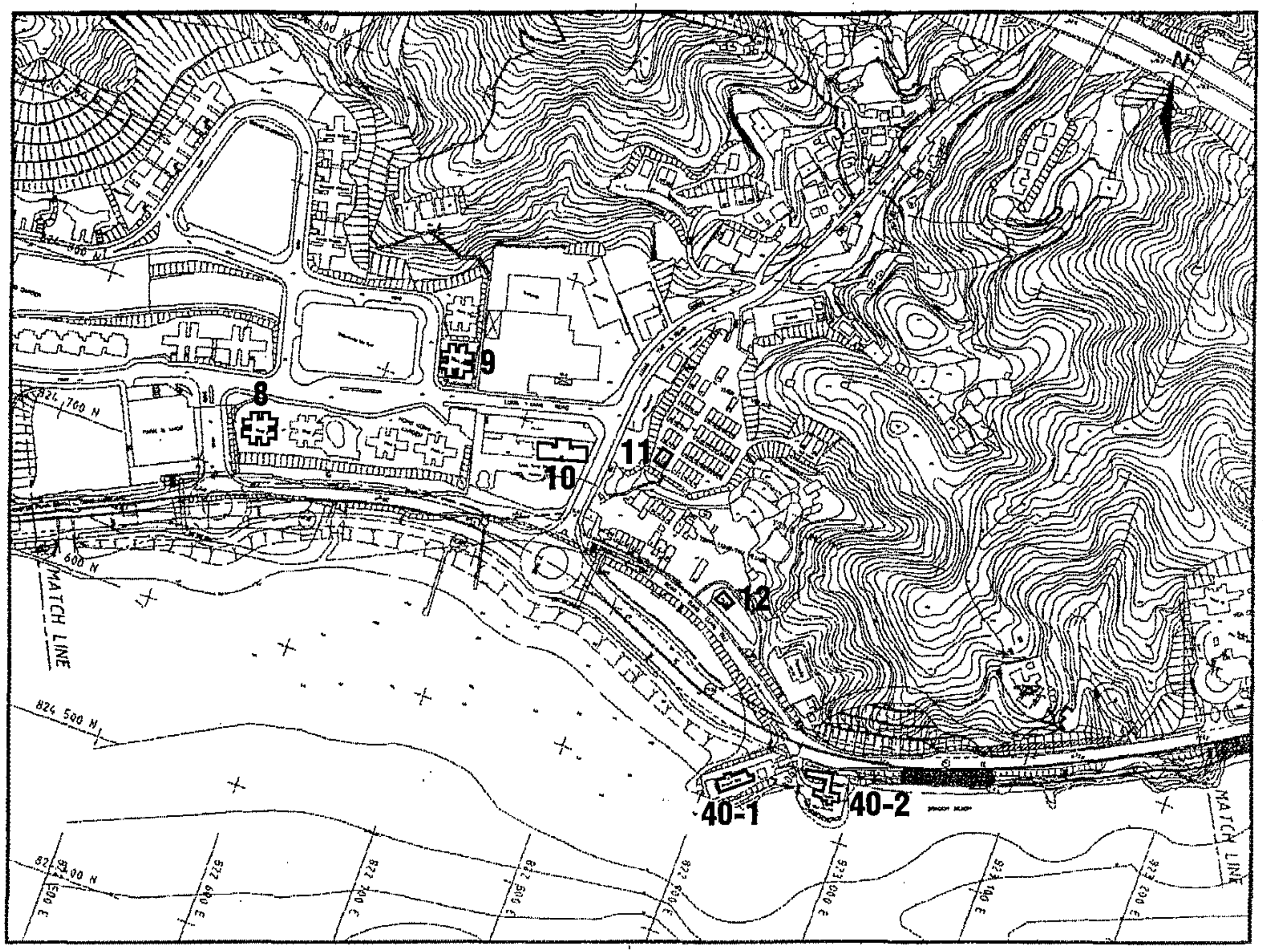

Figure 2.3 Sensitive Receivers: Tsing Lung Tau

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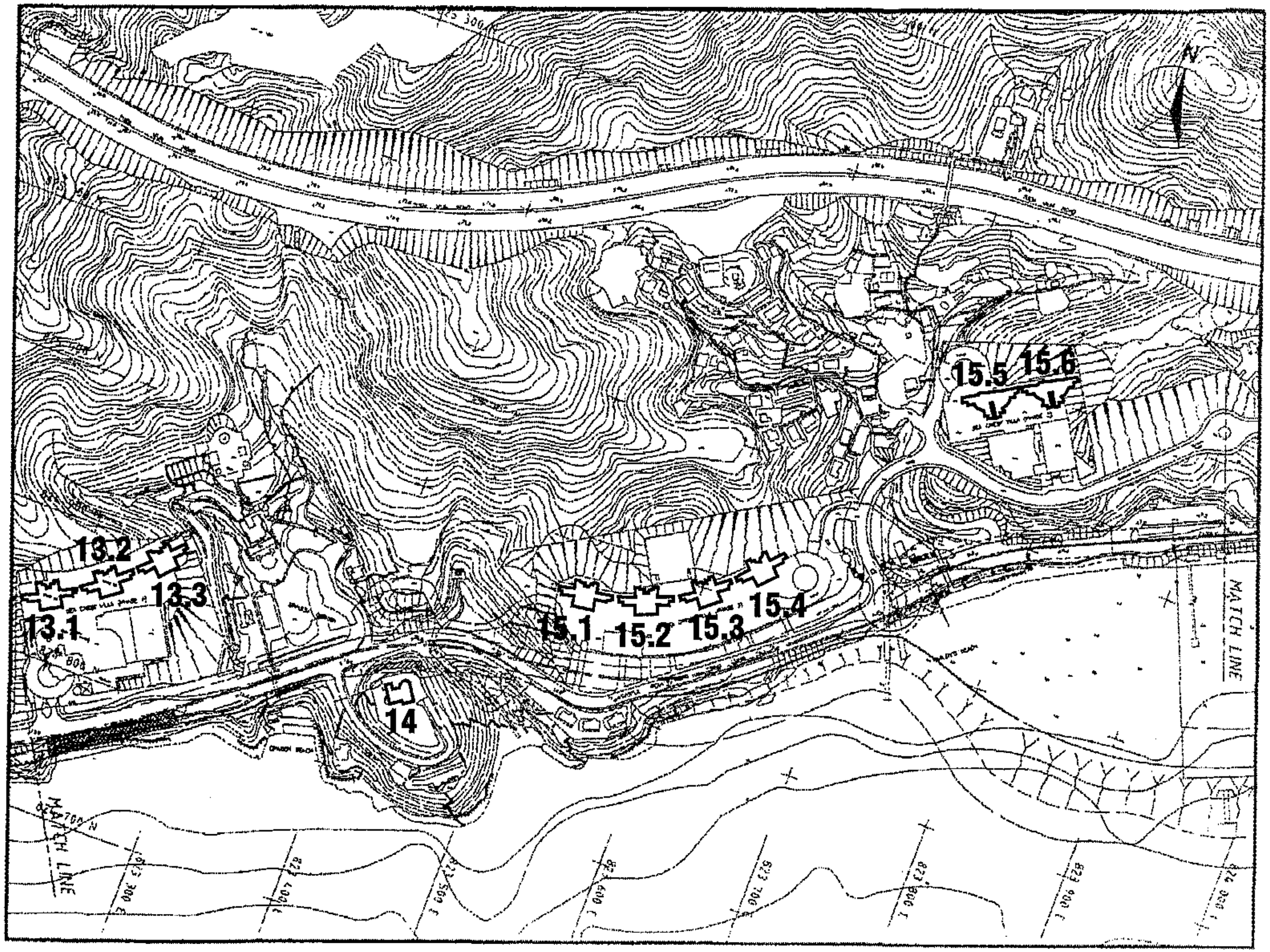

LEGEND

— Representative NSR

Figure 2.4 Sensitive Receivers: Angler's Beach

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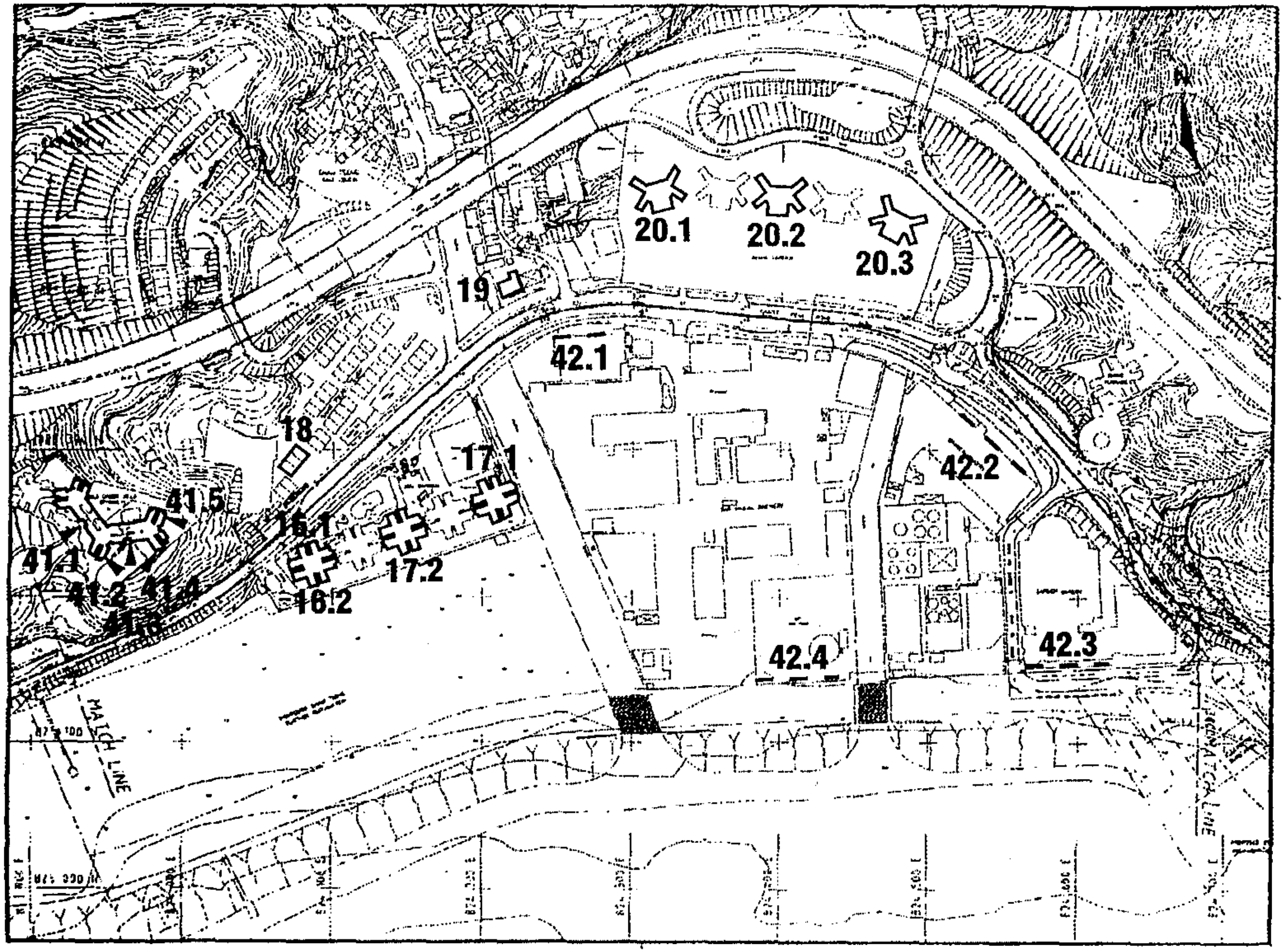

Figure 2.5 Sensitive Receivers: Sham Tseng

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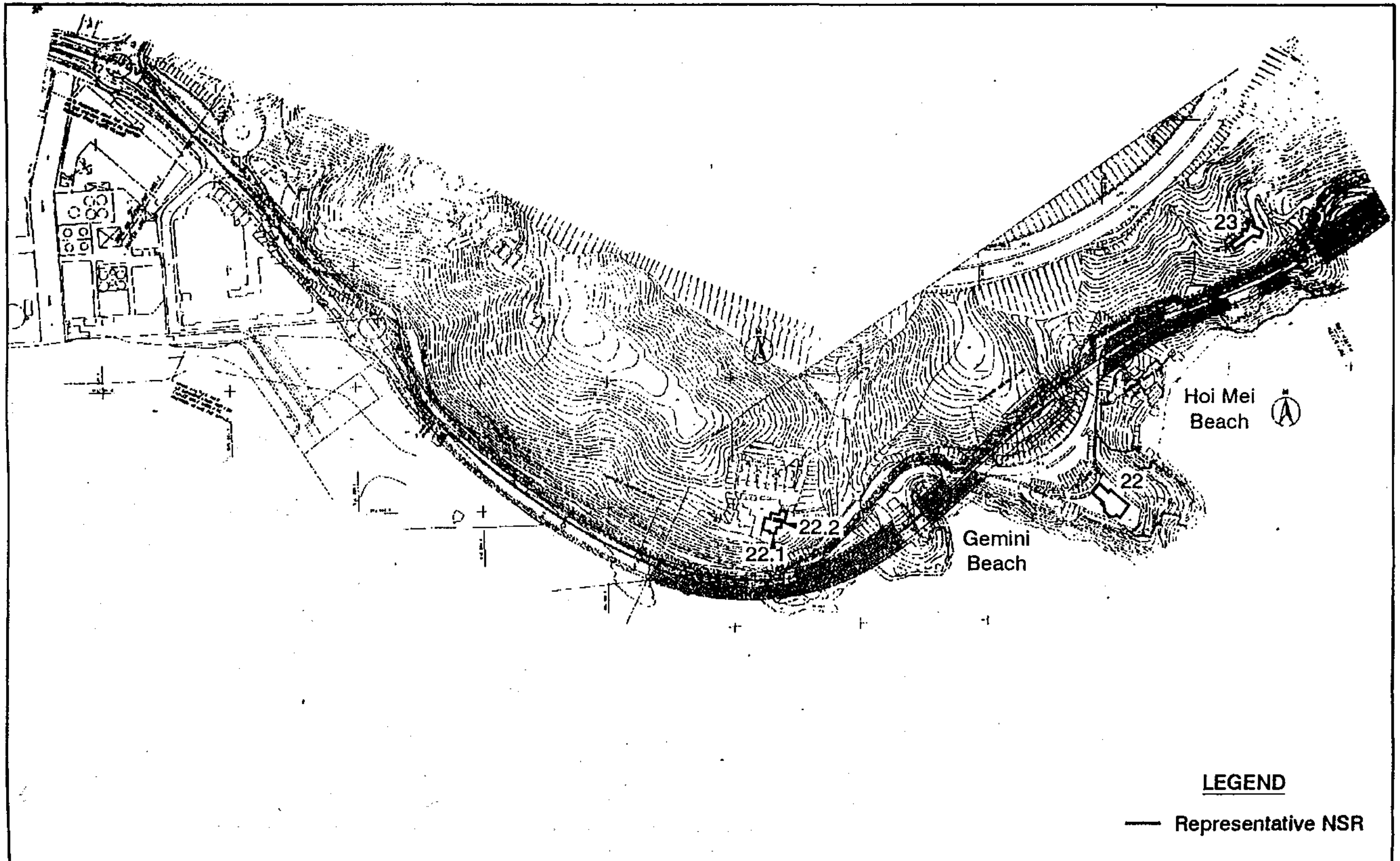

Figure 2.6 Sensitive Receivers: Gemini

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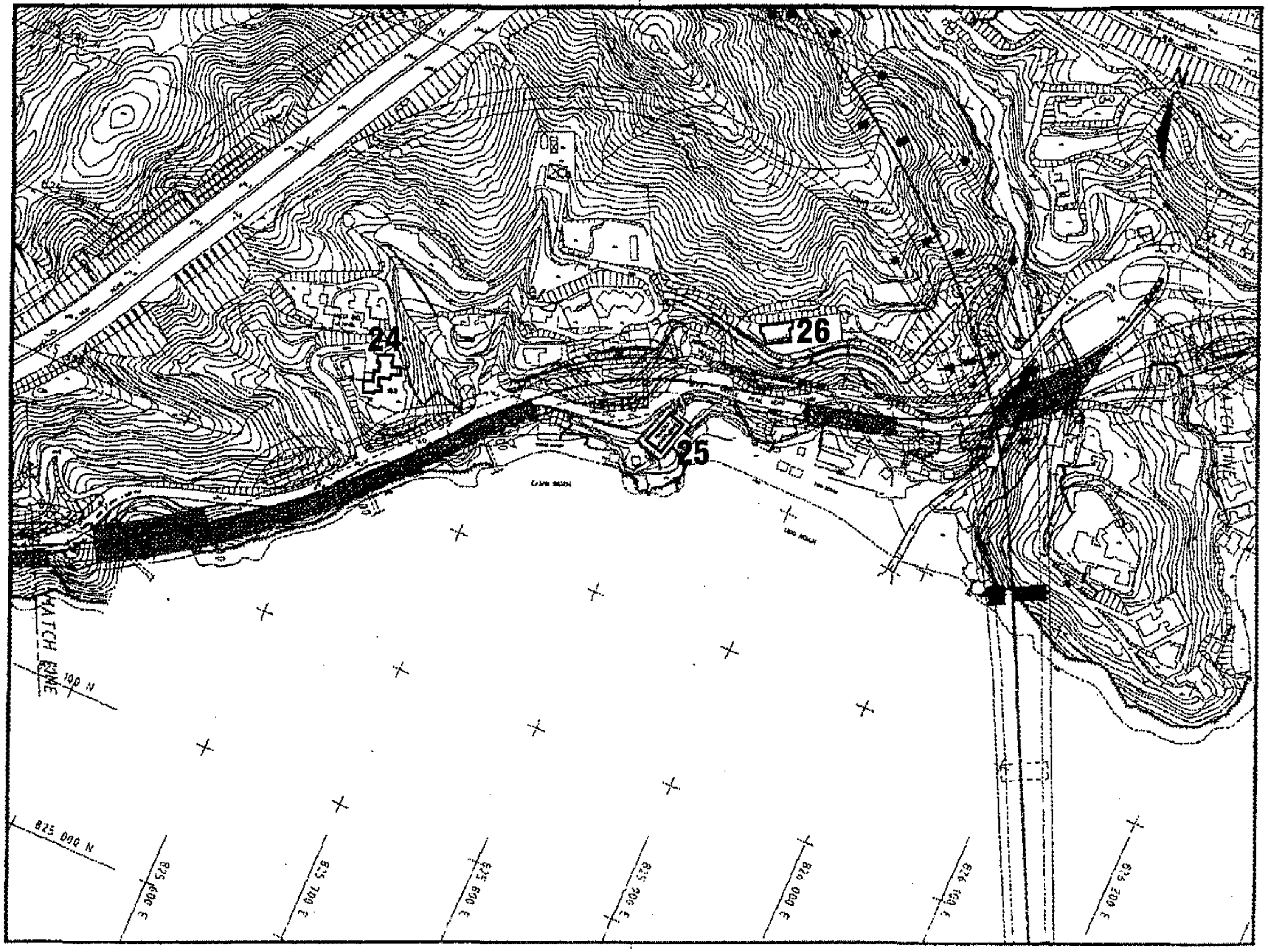

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— Representative NSR

Figure 2.7 Sensitive Receivers: Lido Beach

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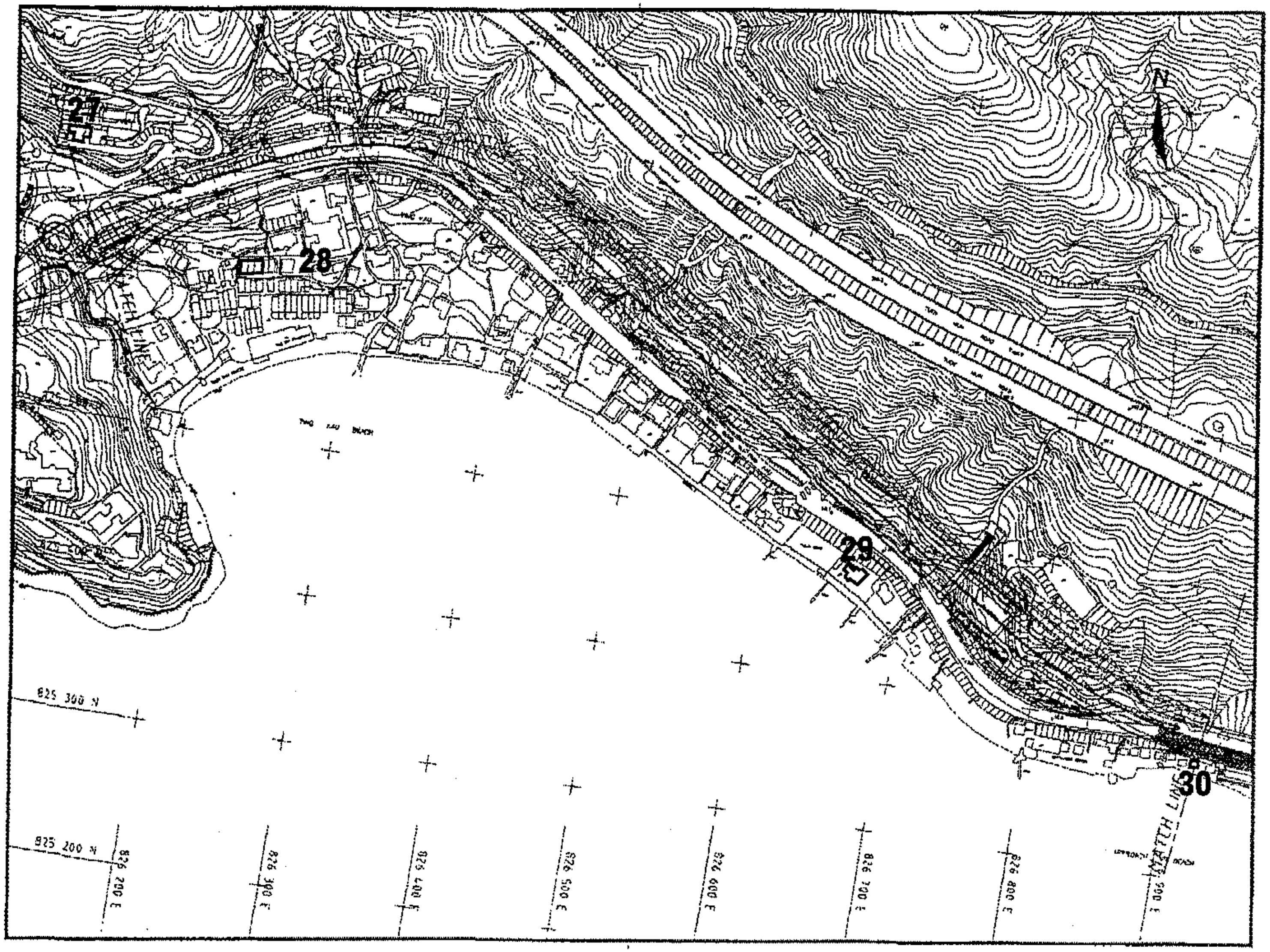

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— Representative NSR

Figure 2.8 Sensitive Receivers: Ting Kau

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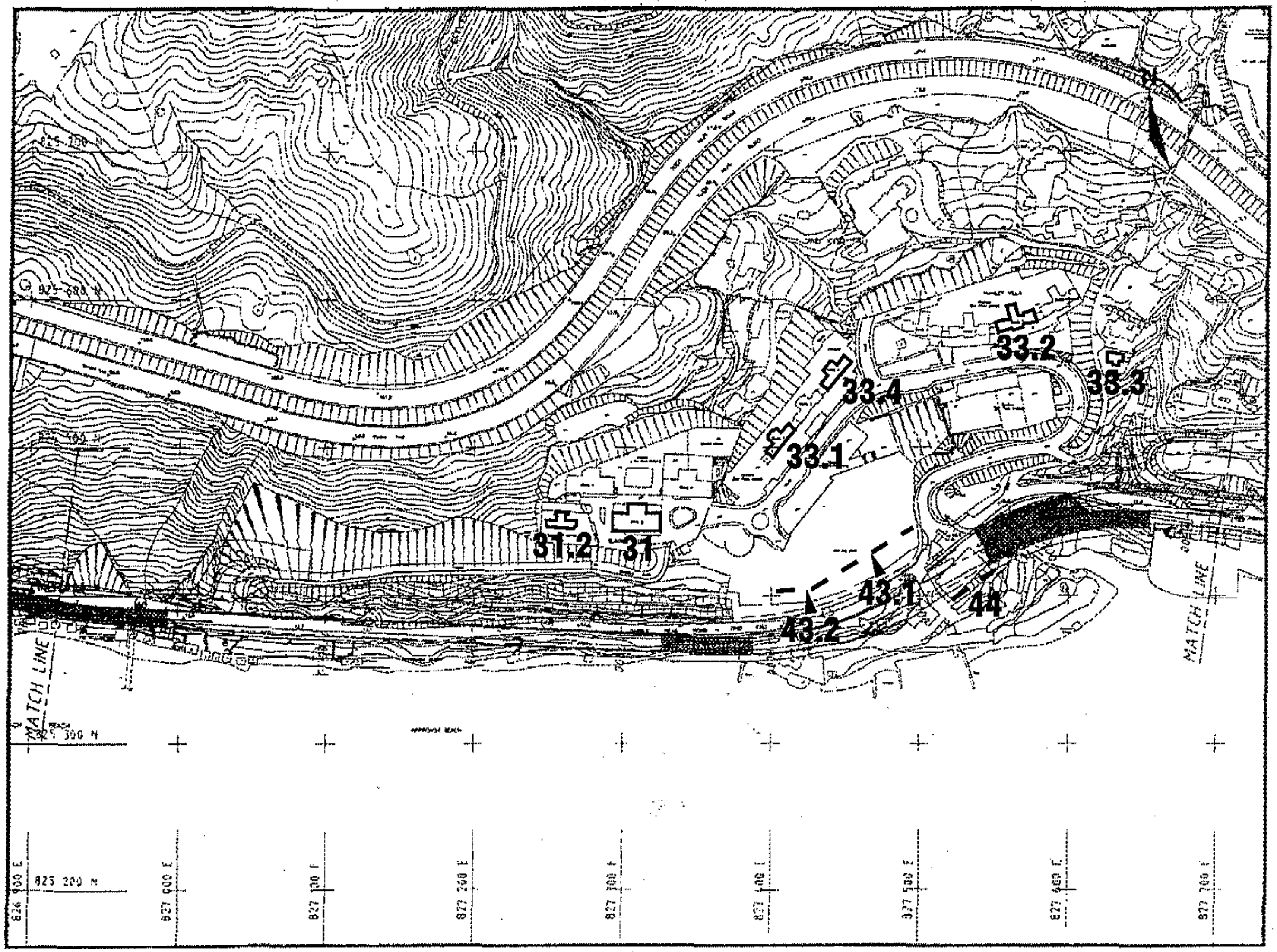

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— Representative NSR

Figure 2.9 Sensitive Receivers: Yau Kom Tau

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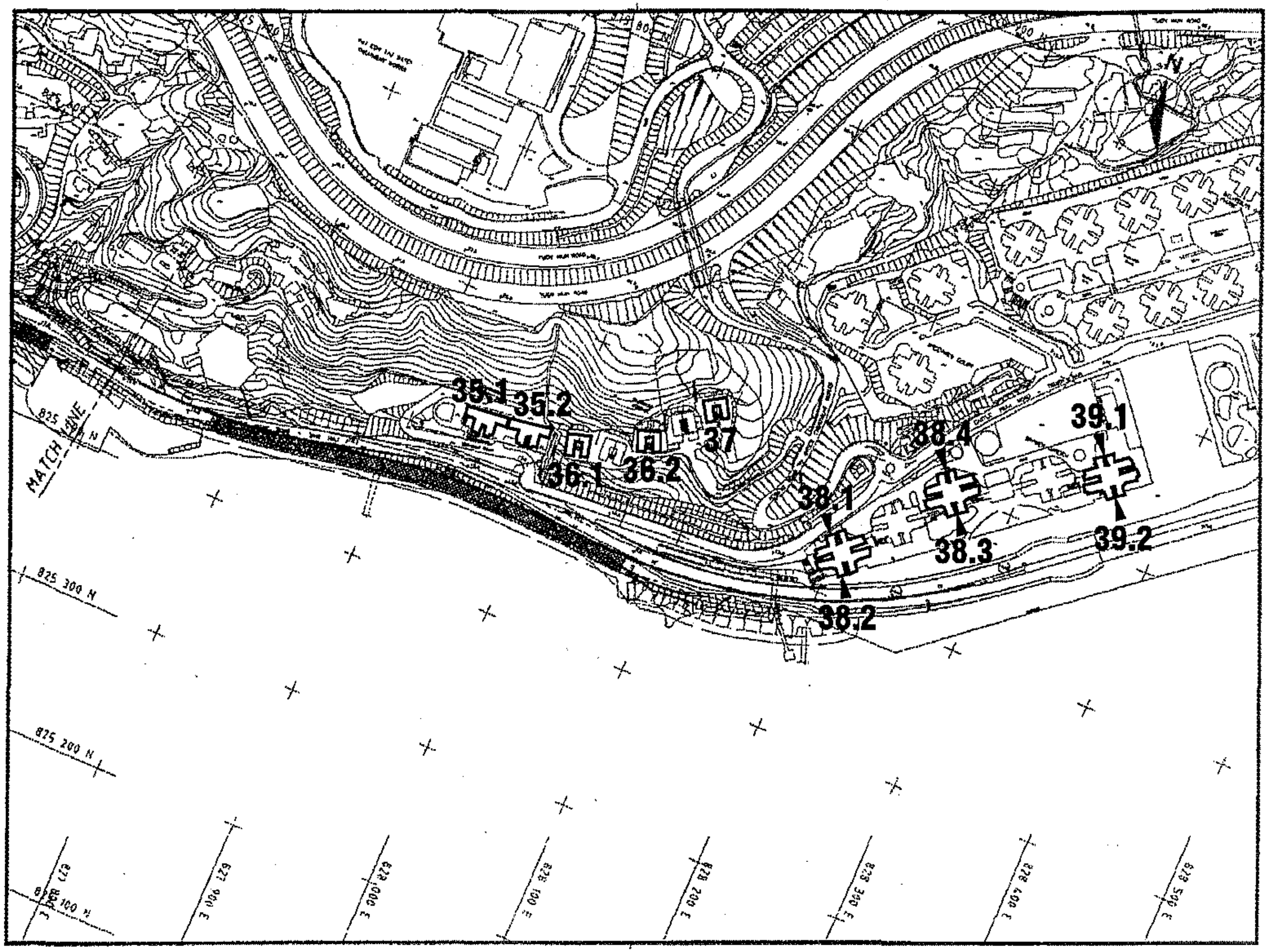

LEGEND

— Representative NSR

Figure 2.10 Sensitive Receivers: Tsuen Wan

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3 ASSESSMENT CRITERIA

3.1 Introduction

3.1.1 The Air Pollution Control Ordinance defines statutory ambient air quality objectives (AQOs), the Noise Control Ordinance (NCO) defines construction and fixed noise limits, and the Water Pollution Control Ordinance (WPCO) defines statutory water quality objectives. Non-statutory criteria, such as the Hong Kong Planning Standards and Guidelines, are also adopted as outlined below.

3.2 Noise Assessment (Operational Noise)

3.2.1 The Hong Kong Planning Standards and Guidelines (HKPSG) recommend that road traffic noise not exceed the following standards:

Table 3.1 Hong Kong Planning Standards and Guidelines: Road Traffic Noise

Use	Road Traffic Noise dB(A)
Domestic premises	70
Offices	70
Educational institutions including kindergartens and nurseries	65
Hospitals, clinics, convalescences and homes for the aged	55

Notes:
- The above standards apply to uses which rely on opened windows for ventilation.
- Facade noise levels in terms of L_{10} (peak hour)

3.2.2 Due to the greatly enhanced capacity of the improved road, the future Castle Peak Road has been considered a "new road" that replaces the old (existing) road in all areas except Sham Tseng. In Sham Tseng, the existing dual-2 carriageway will not be further widened, and is therefore considered to be neither a new nor improved road.

3.2.3 For NSRs affected by noise from the new road, direct noise mitigation will be provided to satisfy the noise limits contained in the HKPSG as far as practicable. Indirect technical remedies will be provided to tackle the residual noise impact subject to the approval of the ExCo. For planned noise sensitive development, suitable mitigation measures to be incorporated in the project are identified for further development in the detailed design.

3.2.4 If, after implementation of direct technical remedies, any facades remain that are still exposed to predicted noise levels exceeding the HKPSG maximum, their eligibility for compensation (for appropriate glazing and air conditioning) will be determined by applying the criteria listed in Section 4.3 (viii), Appendix C of the Brief:

(a) the predicted overall noise level from the new road, together with other traffic noise in the vicinity, must not be less than the HKPSG criterion, i.e., 70 dB(A) L_{10} (1 hr); and

(b) the predicted noise level, after implementation of direct technical remedies, is at least 1.0 dB(A) more than the prevailing (in this case, 1994) noise level, i.e., the total traffic noise level existing before the works to construct the road were commenced; and

(c) the contribution to the increase in the noise level from the new road must be at least 1.0 dB(A).

3.3 Noise Assessment (Construction Noise)

3.3.1 The Noise Control Ordinance (NCO) provides for the control of construction noise. Assessment procedures and standards are set out in two Technical Memoranda associated with the Ordinance: the *Technical Memorandum on Noise from Construction Work other than Percussive Piling* and the *Technical Memorandum on Noise from Percussive Piling*.

3.3.2 Under the existing provisions, there is no legal restriction on noise generated by construction activities (other than percussive piling) between the hours of 07.00 and 19.00 on normal weekdays. However, EPD's Practice Note for Professions Persons PN 2/93 sets a non-statutory daytime noise limit of 75 dB(A) L_{eq} (30 min) at the facades of dwellings, and 70 dB(A) at the facades of schools (65 dB(A) during examinations).

3.3.3 Outside the hours of 07.00 to 19.00, the NCO applies, and contractors are required to obtain a Construction Noise Permit to carry on works involving powered mechanical equipment. The applicable noise limits depend upon the existing noise environment in which a NSR is located, reflected in an Area Sensitivity Rating (ASR). The study area mostly comprises low density villages and isolated high-rise developments, which are assigned an ASR of "A". However, the area around Sham Tseng is characterized by a mix of commercial, industrial, and residential uses, for which an ASR of "B" is more appropriate. Similarly, the eastern end of the alignment near Tsuen Wan Area 2 is at the edge of Tsuen Wan, and is thus assigned an ASR of "B", appropriate for an urban area.

Table 3.2 Construction Noise: Acceptable Noise Limits

Time Period	Acceptable Noise Level dB(A)	
	ASR = A	ASR = B
All days during the evening (19.00-23.00), and general holidays during the daytime and evening (07.00-23.00)	60	65
All days during the night-time (23.00-07.00)	45	50

3.3.4 Applications for Construction Noise Permits (CNP) will be assessed by the Noise Control Authority. The CNP is a statutory document issued under the Noise Control Ordinance, and may include conditions, such as permitted hours of operation, type and number of equipment items allowed to be used, and noise control measures to be adopted, which must be observed.

3.3.5 In addition, the NCO requires that hand-held percussive breakers over 10 kg and air compressors bear Noise Emission Labels, certifying that they comply with noise emission standards.

3.3.6 Percussive piling is subject to controls during the daytime, and is prohibited between 19.00 and 07.00 on normal weekdays and all day on public holidays (including Sunday). Permitted hours of piling depend on the noise levels as received at the worst-affected NSRs. The Acceptable Noise Levels (ANLs) for piling is 85 dB(A), based on the assumption that the NSRs have windows and no central air conditioning. The permitted hours of piling are shown in the following Table:

Table 3.3 Construction Noise: Permitted Hours of Operation for Piling

Amount by which noise from piling exceeds the ANL	Permitted hours of operation on any day not being a general holiday
More than 10 dB(A)	08.00 - 09.00 and 12.30 - 13.30 and 17.00 - 18.00
1 to 10 dB(A)	08.00 - 09.30 and 12.00 - 14.00 and 16.30 - 18.00
No exceedance	07.00 - 19.00

3.3.7 A Construction Noise Permit is required for percussive piling.

3.4 Air Quality Assessment (Construction Phase)

3.4.1 For construction dust, EPD's maximum acceptable TSP level in air over a one-hour period is 500 μg/m^3 (see Note 5 to Table 3.4 below). The maximum acceptable TSP concentration averaged over a 24-hour period is 260 μg/m^3, as defined in the AQOs.

3.5 Air Quality Assessment (Operation Phase)

3.5.1 The Air Pollution Control Ordinance (Cap. 311, 1983) provides powers for controlling air pollutants from a variety of stationary and mobile sources and encompasses a number of Air Quality Objectives (AQO). Currently AQOs stipulate concentrations for a range of pollutants, of which carbon monoxide (CO), nitrogen dioxide (NO_2), respirable suspended particulates (RSP) and total suspended particulates (TSP) are relevant to this Study. The AQOs are listed in Table 3.4.

Table 3.4 Hong Kong Air Quality Objectives

Parameter	Maximum Average Concentration (μgm^{-3})[1]			
	1-Hour[2]	8-Hour[3]	24-Hour[3]	Annual[4]
CO	30000	10000	-----	-----
NO_2	300	-----	150	80
RSP	-----	-----	180	55
TSP	500[5]	-----	260	80

1 Measured at 298 K and 101.325 kPa.
2 Not to be exceeded more than three times per year.
3 Not to be exceeded more than once per year.
4 Arithmetic mean.
5 Not an AQO. However, in addition to the established legislative controls, it is generally accepted that an hourly average TSP concentration of 500 μgm^{-3} should not be exceeded.

3.6 Water Quality Assessment (Construction Phase)

3.6.1 The principal legislation for planning against water pollution is the Water Pollution Control Ordinance (WPCO), which allows for the gazetting of Water Control Zones (WCZ) within which the discharge of liquid effluent and the deposit of matter directly into water bodies or into drains is controlled[1]. The existing alignment of Castle Peak Road is adjacent to the coast between Tuen Mun and Tsuen Wan. The project area (between Ka

[1] Water Pollution Control Ordinance, Chapter 358, 1990 [Government Printer, Hong Kong]

Loon Tsuen and Area 2, Tsuen Wan) lies within the North West Water Control Zone and the Western Buffer Water Control Zone. Water Quality Objectives, declared for each Water Control Zone (WCZ), are shown in the following two tables:

Table 3.5 Water Quality Objectives for Marine Waters of Northwestern WCZ

Parameter	Objective	Part(s) of Zone
E. coli	annual geometric mean not to exceed 610 / 100 mL	secondary contact recreation subzones
Dissolved Oxygen within 2 m of bottom	not less than 2 mg/L for 90% samples	marine waters
Depth averaged Dissolved Oxygen	not less than 4 mg/L for 90% samples	marine waters
pH value	within the range 6.5 to 8.5; change due to waste discharge not to exceed 0.2	marine waters except bathing beach subzones
Salinity	change due to waste discharge not to exceed 10% of natural ambient level	whole zone
Temperature change	change due to waste discharge not to exceed 2°C	whole zone
Suspended solids	waste discharge not to raise the natural ambient level by 30%, nor cause the accumulation of suspended solids which may adversely affect aquatic communities	marine waters
Toxicants	not to be present at levels producing significant toxic effect	whole zone
Un-ionized ammonia	annual mean not to exceed 0.021 mg/L	whole zone
Nutrients	not to be present in quantities that cause excessive algal growth annual mean depth average inorganic nitrogen not to exceed 0.5 mg/L	marine waters marine waters (except Castle Peak subzone)

Table 3.6 Water Quality Objectives for Marine Waters of Western WCZ

Parameter	Objective	Part(s) of Zone
E. coli	annual geometric mean not to exceed 610 / 100 mL	secondary contact recreation subzones; fish culture subzone
Dissolved Oxygen within 2 m of bottom	not less than 2 mg/L for 90% samples	marine waters
Depth averaged Dissolved Oxygen	not less than 4 mg/L for 90% samples	marine waters except fish culture subzones
	not less than 5 mg/L for 90% samples	fish culture subzones
pH value	within the range 6.5 to 8.5; change due to waste discharge not to exceed 0.2	marine waters except bathing beach subzones
Salinity	change due to waste discharge not to exceed 10% of natural ambient level	whole zone
Temperature change	change due to waste discharge not to exceed 2°C	whole zone
Suspended solids	waste discharge not to raise the natural ambient level by 30%, nor cause the accumulation of suspended solids which may adversely affect aquatic communities	marine waters
Toxicants	not to be present at levels producing significant toxic effect	whole zone
Un-ionized ammonia	annual mean not to exceed 0.021 mg/L	whole zone
Nutrients	not to be present in quantities that cause excessive algal growth	marine waters
	annual mean depth average inorganic nitrogen not to exceed 0.4 mg/L	marine waters

3.6.2 The standards for effluent (including polluted stormwater such as road runoff) discharged into WCZs are shown in Table 3.7.

Table 3.7 Standards for Effluents Discharged Into Inshore Waters of Northwestern and Western Buffer WCZs

Flow rate (m^3/day) / Determinand	≤10	>10 and ≤200	>200 and ≤400	>400 and ≤600	>600 and ≤800	>800 and ≤1000	>1000 and ≤1500	>1500 and ≤2000	>2000 and ≤3000	>3000 and ≤4000	>4000 and ≤5000	>5000 and ≤6000
pH (pH units)	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9
Temperature (°C)	40	40	40	40	40	40	40	40	40	40	40	40
Colour (lovibond units) (25mm cell length)	1	1	1	1	1	1	1	1	1	1	1	1
Suspended solids	50	30	30	30	30	30	30	30	30	30	30	30
BOD	50	20	20	20	20	20	20	20	20	20	20	20
COD	100	80	80	80	80	80	80	80	80	80	80	80
Oil & Grease	30	20	20	20	20	20	20	20	20	20	20	10
Iron	15	10	10	7	5	4	3	2	1	1	0.8	0.6
Boron	5	4	3	2	2	1.5	1.1	0.8	0.5	0.4	0.3	0.2
Barium	5	4	3	2	2	1.5	1.1	0.8	0.5	0.4	0.3	0.2
Mercury	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Other toxic metals individually	1	1	0.8	0.7	0.5	0.4	0.3	0.2	0.15	0.1	0.1	0.1
Total toxic metals	2	2	1.6	1.4	1	0.8	0.6	0.4	0.3	0.2	0.1	0.1
Cyanide	0.2	0.1	0.1	0.1	0.1	0.1	0.05	0.05	0.03	0.02	0.02	0.01
Phenols	0.5	0.5	0.5	0.3	0.25	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Sulphide	5	5	5	5	5	5	2.5	2.5	1.5	1	1	0.5
Total residual chlorine	1	1	1	1	1	1	1	1	1	1	1	1
Total nitrogen	100	100	80	80	80	80	50	50	50	50	50	30
Total phosphorus	10	10	8	8	8	8	5	5	5	5	5	5
Surfactants (total)	20	15	15	15	15	15	10	10	10	10	10	10
E. coli (count/100 ml)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

NOTES: All units in mg/L unless otherwise stated.
All figures are upper limits unless otherwise indicated.
Source: EPD's *Technical Memorandum on Effluent Standard* (Table 10a)

3.6.3 At bathing beaches, permissible standards for effluent must be consistent with the Bathing Beach Water Quality Objectives (which set standards for the indicator bacterium, *Escherischia coli*). The HKPSG states that no discharge outlet should be located within 100 m of the boundaries of any bathing beach. In addition, Section 9.1 of the *Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters* states that no new effluent will be permitted within 100 m of the boundaries of a gazetted beach in any direction, including rivers, streams and stormwater drains.

3.6.4 The HKPSG recognises roads as a potentially polluting use. Excavation of fill and other construction phase activities are also recognised as potentially polluting uses. The main concern is pollution caused by silt, oil and floating refuse while work is in progress, in addition to long term effects of the new road and associated reclamation on drainage, siltation and pollution from road runoff. The HKPSG states that care should be taken in planning and implementing the works to avoid, minimise or ameliorate the occurrence of these adverse effects on water bodies, particularly in areas already suffering some degree of pollution, where there is a risk that any additional environmental stress will result in adverse ecological changes, and in areas used for contact recreation, such as bathing beaches. The standards for effluent (including potentially polluted stormwater such as road runoff) discharged into WCZs are shown in Table 3.7 above.

3.7 Water Quality Assessment (Operational Phase)

The Water Quality Objectives stated above apply to operational phase impacts, when long-term effects on drainage, siltation and pollution are of concern.

3.8 Ecology

3.8.1 Criteria for evaluating the conservation value of each habitat include the following:

- Chapter 10 (Landscape and Conservation), Hong Kong Planning Standards and Guidelines (HKPSG), which addresses the importance of woodlands (natural, plantation, and fungshui) as well as natural coastal shorelines as a priority for conservation;

- the Animals and Plants (Protection of Endangered Species) Ordinance (Cap. 187) which lists rare and endangered plants and animals;

- Forestry Regulations (Cap. 96) for protected plant species;

- the Wild Animal Protection Ordinance (Cap. 170) (excluding fish and marine invertebrates) which protects wild animals by prohibiting the disturbance, taking of removal of animals and/or their nests or eggs; and

- maturity, diversity and species composition of woodland.

3.9 Construction Waste

3.9.1 The principal legislation controlling waste materials in Hong Kong is the Waste Disposal Ordinance [Cap.354] (WDO). Enacted in 1980, this ordinance generally encompasses all stages of the complex waste management chain from the place of arising the final disposal point.

3.9.2 Under the WDO, a number of provisions for dealing with certain types of waste are also available. They include the Waste Disposal (Chemical Waste) (General) Regulation under the WDO, relevant to the project. Enacted in 1992, it has provided control on all aspects of chemical waste disposal. This includes storage, collection, transport, treatment and final disposal.

3.9.3 Another existing ordinance pertaining to hazardous materials is the Dangerous Goods Ordinance [Cap 295], Laws of H.K. (DGO). This ordinance provides for the definition of dangerous goods by category and controls of their storage and transport.

3.9.4 Guidelines which provide additional information on compliance with regulations are:

- *Waste Disposal Plan for Hong Kong* (December 1989), Planning, Environment and Lands Branch Government Secretariat.

- *Environmental Guidelines for Planning in Hong Kong* (1990), Hong Kong Planning and Standards Guidelines, Hong Kong Government.

3.9.5 Dredging and dumping for land formation is controlled under the Dumping at Sea Act (1974) (Overseas Territories) Order 1975, which provides for the control of marine dumping by means of a licence.

3.9.6 The Works Branch of the Government Secretariat has released a Technical Circular (No 22/92) on *Marine Disposal of Dredged Mud*, in which the procedures for assessing disposal options for dredged marine spoil are specified. Heavy metals concentrations in the marine mud are determined and submitted to EPD as part of a sediment quality report. The results are then compared with a set of contamination criteria which indicate the dredging and disposal requirements for different classes of spoil. Table 3.8 illustrates these guideline criteria. It is only necessary for the criterion for one element to be exceeded for a sediment to be put into a particular class.

Table 3.8 Classification of Sediments by Metals Content (mgkg^{-1} dry weight)

	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Class A	0.0-0.9	0-49	0-54	0.0-0.7	0-34	0-64	1-140
Class B	1.0-1.4	50-79	55-64	0.8-0.9	35-39	65-74	150-190
Class C	1.5 or more	80 or more	65 or more	1.0 or more	40 or more	75 or more	200 or more

3.9.7 Sediments are grouped into three classifications (A, B and C) depending on the level of metal contamination. Class A spoil is regarded as uncontaminated or as mildly contaminated material. For this class, no restrictions will be required during dredging, transportation and disposal beyond those normally applied to ensure compliance with relevant Water Quality Objects or to protect sensitive receptors near the dredging and subsequent disposal areas.

3.9.8 Sediment falling within Class B is treated as moderately contaminated spoil and special care is required during dredging and transportation of such material.

3.9.9 Spoil in Class C is considered heavily contaminated. Special dredging and transportation procedures should be adopted. Sediments of this type can not be dumped in gazetted marine disposal grounds and should be disposed off at a special borrow pit.

3.10 Landscape and Visual Assessment

3.10.1 The requirement to address the landscape and visual impact of the proposals has been undertaken as part of the necessity to address visual issues within the environmental review and assessment process.

3.10.2 Evaluation guidelines are addressed in the EPD Advice Note (2/92) *'Application of the Environmental Impact Assessment Process to Major Private Sector Projects'* and Chapter 10 (Landscape and Conservation) of the Hong Kong Planning Standards and Guidelines which outlines criteria to be considered when planning in a rural environment.

4 ASSESSMENT METHODOLOGY

4.1 Operation Phase Noise

4.1.1 Traffic noise is predicted using the methodology provided in the UK DOT *Calculation of Road Traffic Noise (CRTN)*, 1988, and is based on projected morning peak-hour flows in the year 2011.

4.1.2 Operation-phase impact calculations are normally based on the worst traffic projections within 15 years of the opening of the improved road. As the road project will be completed in early 2003, this EIA should therefore be based on the worst traffic projections up to 2016. However, planning data and hence traffic projections are available only up to year 2011. Agreement was therefore previously reached to base this study on the worst-case year up to 2011. Among the horizon years examined by the transport consultants, 2011 will be the worst case in terms of traffic projections.

4.1.3 Traffic flows on which the assessment is based are provided in Section 5 below and in Annexe D.

4.2 Construction Phase Noise

4.2.1 The methodology outlined in the *Technical Memorandum on Noise from Construction Works other than Percussive Piling* has been used for the assessment of construction noise.

4.2.2 The portions of the linear site closest to the representative NSRs have been chosen as notional source positions. All items of powered mechanical equipment (PME) are assumed to be located at this notional source position. Equipment sound power levels have been taken from Table 3 of the *Technical Memorandum* and, where more detailed or appropriate information was available, from the British Standard BS5228 (*Noise control on construction and open sites)*. The noise impact assessment was undertaken for equipment considered to be in the line of sight of the NSRs. A facade correction of +3 dB(A) has been applied. In accordance with the *Technical Memorandum*, 100% utilization of equipment is assumed over a 5-minute period.

4.2.3 A possible construction methodology has been proposed by the engineering consultant, and is outlined below in Section 7. It should be stressed that this is a *possible* scenario only. The actual construction methods will be determined by the contractor performing the work. The construction noise impact assessment results are therefore provisional, and will require confirmation when a more detailed construction programme is available.

4.2.4 Cumulative noise impacts from concurrent construction operations, such as the Route 3 project, have not been considered in this assessment. Contributions from these and other nearby construction sites should be considered when a more detailed construction noise impact assessment, based on the contractor's preferred working method, is available.

4.3 Construction Phase Air Quality

4.3.1 The major potential air quality impact during the construction phase of the Project will result from dust arising from the excavation and filling activities related with the road construction work. Vehicle and plant exhaust emissions from the site are not considered to constitute a significant source of air pollutants. In order to assess the potential dust impact on the sensitive receivers, dust emissions from the construction sites and plant during the most work intensive period were modelled.

Emissions Calculations

4.3.2 Emission points for dust release from the road construction work during the highest dust generation period included the following:

- Drilling for blast charges
- Blasting
- Loading and unloading of construction material
- Plant vehicles travel on unpaved site roads
- Bulldozing overburden
- Wind erosion of stockpiles and open site
- Rock crushing
- Concrete batching

4.3.3 The prediction of dust emissions was based on typical values and emission factors from USEPA *Compilation of Air Pollutant Emission Factors* (AP-42). Silt contents for rock and soft spoil were taken as 1.6 percent and 6.9 percent respectively, which are the geometric means for crushed limestone in stone quarrying and processing and overburden in Western surface coal mining from AP-42. Moisture contents for rock and soft spoil were taken as 1.5 percent and 35 percent respectively, which are the averages provided by the Engineer. In this assessment, it was assumed that 30 percent of the excavation material would be composed of rock and will require blasting. Unpaved site road surface material silt content was taken as 5.0 percent, based on the results of a particle size analysis of samples of typical site road surface material.

4.3.4 For rock excavation, major or minor blasting may be required. Crawler drilling will be required for major blasting and hand drilling will be required for minor blasting where crawler drill access would not be feasible. The blasting volume for major and minor blasting were taken as 6500 and 1250 cubic metres per blast respectively, which are the averages provided by the Engineer. In this assessment, it was assumed that two third of the rock excavation will require major blasting and one third will require minor blasting. Working hours would be from 7am to 7pm.

4.3.5 In this assessment, dust suppression measures and estimated mitigation efficiencies have been incorporated into the dust emission calculations. Dust generated from blasting was estimated to be reduced by 30 percent by pre-watering of the dropping surfaces of the blasted material. A 50 percent reduction of the dust generated from wind erosion and vehicle movements on dusty roads would result from twice daily watering as from AP-42. Dust generated from concrete batching was estimated to be reduced by 70 percent by collecting the dust through a fabric filter.

4.3.6 The calculations of the dust emission factors for different dust generation activities at the excavation area and filling area are tabulated in Table CASTCON1.XLS (Annexe F). The predicted dust emissions generated from different construction activities with the adoption of dust suppression measures were calculated and are tabulated in Table 4.1 below.

Table 4.1 Predicted Dust Emissions During the Construction Phase of the Project

Activity	TSP (kg day^{-1})
Excavation Area	
Blasting	63.9
Drilling	0.6
Loading and unloading of material	2.2
Plant vehicles on unpaved site roads	98.0
Wind erosion of stockpiles and open site	6.7
Filling Area	
Loading and unloading of material	0.7
Bulldozing of overburden	11.2
Plant vehicles on unpaved site roads	68.6
Wind erosion of stockpiles and open site	3.7
Rock Crushing	
Primary crushing	7.1
Concrete Batching Plant	
Concrete batching	10.5

Dispersion Modelling

4.3.7 The dispersion of TSP was modelling using the CES developed AAQuIRE (Ambient Air Quality in Regional Environments) system. AAQuIRE performs multiple runs of the

USEPA approved Fugitive Dust Model (FDM) to assess potential dust impacts from the construction activities. Modelling was undertaken to establish TSP concentrations at the selected sensitive receivers for 1-hour, 24-hour and annual average time periods. Surface roughness of the terrain in the study area was taken as 1 metre in the FDM model.

4.3.8 Sequential hourly data for wind speed and direction from the Shell Tsing Yi Installation meteorological station were combined with surface observations from the Royal Observatory Headquarters to obtain the best available hourly sequential data set for years 1990 to 1992. Dispersion modelling was undertaken for 120 predefined separate meteorological categories. At each receptor point the 1-hour average concentration for TSP was predicted for each of the categories. The 120 meteorological categories were then compared with each sequential hourly meteorological data set to produce time sequenced hourly pollutant concentrations. These sequential hourly concentrations allowed maximum 1-hour, 24-hour and annual averages to be generated at each receiver based on real meteorological data, rather than relying on the simplistic 'worst-case' approach. This approach has been used successfully on many other projects such as Lantau Port Development, Sha Tin Trunk Road T3 and Port Passenger Line Tuen Mun.

4.3.9 In view of the fact that prediction of the background dust level in the future is not possible, the 95 percentile of the baseline 24-hour average TSP monitoring results, 105 μgm^{-3}, was added to the 1-hour and 24-hour average modelling results to represent the background dust level in the area during the future construction period.

4.3.10 Sample FDM model input and output files are included in Annexe F of this report.

Selected Sensitive Receivers

4.3.11 The same set of sensitive receivers was used for both the construction and operation phase air quality assessments (see 4.4.11 and 4.4.12 below).

4.3.12 A schematic diagram of the locations of dust emission sources and selected sensitive receivers is shown in Figure F.4 (Annexe F).

4.4 Operation Phase Air Quality

4.4.1 Impacts during the operation phase of the improved Castle Peak Road may result from vehicle emissions arising from the traffic on the road network in the study area. The traffic forecast provided by the traffic consultant include traffic flow from year 2003 (expected first year of operation of the improved road) to year 2011. Based on the result of the emission calculation for the road section with the highest impact at the sensitive receivers, year 2011 will be the worst year from the first year the improved road in operation to year 2011. Assessment was therefore undertaken for the worst year, that is, year 2011 only.

Emissions Calculations

4.4.2 The projected peak hour traffic flows for the year 2011, provided by the traffic consultant and included in Annexe A, were used in the operation phase impact assessment. The traffic composition provided by the traffic consultant is categorised into car, goods vehicle and public transport. "Goods vehicles" were further broken down into light goods vehicles and heavy goods vehicles, in accordance with the statistics of the traffic count conducted by the traffic consultant in 1994 at different sections of the existing Castle Peak Road. Similarly, public transport was further broken down into public light buses and franchised buses. For the "car" category, 90 percent private car (petrol) and 10 percent taxi (diesel) were assumed. For the purpose of this assessment, forecasted year 2011 traffic flows and compositions were taken as year 2001 data for conservative predictions.

4.4.3 Carbon monoxide (CO), nitrogen oxides (NO_x) and respirable suspended particulates (RSP) are the traffic pollutants of major concern, their emission factors were taken from *Fleet Average Emission Factors - EURO2 Model* provided by the Environmental Protection Department (EPD) for years 2001 and 2011. No speed correction or other adjustments were made. A 20 percent NO_x to NO_2 conversion factor was assumed, as normally adopted for such assessment. The emission factors for CO, NO_x and RSP for years 2001 and 2011 are tabulated in Table 4.2 below.

4.4.4 Petrol vehicles contribute more CO, while diesel-powered vehicles (particularly the heavy goods vehicles) generate more NO_x and particulates. Current emission controls will mean that emissions from petrol vehicles will be reduced as a result of more vehicles being fitted with catalytic convertors. In view of the lower composite emission rates of RSP and the high statutory limit of CO, the key air quality issue is considered to be NO_2. The majority of air quality studies undertaken in Hong Kong, and the monitoring programme undertaken by EPD, indicate this to be the case. For this reason, this assessment concentrates on potential future NO_2 concentrations arising from the proposed road network.

Table 4.2 Vehicle Fleet Average Emission Factors for Years 2001 and 2011

Vehicle Type	Average Percentage[1]	Emission Factor (g km^{-1} $vehicle^{-1}$)					
		CO		NO_x		RSP	
		Year 2001	Year 2011	Year 2001	Year 2011	Year 2001	Year 2011
Car / Taxi	71	12.961	12.248	1.431	1.267	0.061	0.061
Public Light Bus	7	1.089	1.089	1.861	1.782	0.409	0.352
Bus	3	9.010	9.017	11.27	8.578	1.350	0.894
Heavy Goods Vehicle	12	8.395	8.410	9.599	7.061	1.071	0.566
Light Goods Vehicle	7	1.119	1.122	1.975	1.803	0.486	0.361
Composite Emission Factor		10.635	10.131	2.775	2.255	0.275	0.188
Ratio of Yr2001/Yr 2011		1.05		1.23		1.46	

1 Average percentage of traffic composition for Castle Peak Road improvements with on-line improvements.

Dispersion Modelling

4.4.5 The dispersion of NO_x was modelled using USEPA approved CALINE4 model. In the dispersion modelling, meteorological conditions of wind speed 1 ms^{-1}, Pasquill stability class D, mixing height of 500 metres, horizontal wind direction standard deviation of 12 degrees and worst-case wind direction were considered to represent worst-case 1-hour average conditions. Air quality modelling results are considered to be conservative.

4.4.6 Due to the inability of the CALINE4 model to handle large difference in road elevations, Tuen Mun Road, with elevation difference with Castle Peak Road ranges from 20 metres to more than 80 metres, was not included in the model. In order to incorporate the air quality impact resulting from Tuen Mun Road traffic pollutants, a background NO_2 concentration was estimated. The 95th percentile of the baseline 1-hour average NO_2 monitoring results, 117.7 $\mu g\ m^{-3}$, was taken as an indication of the 1-hour average NO_2 background concentration in the area for future years.

4.4.7 In addition, dispersion modelling was undertaken to predict the air quality impacts with the possible installation of noise barriers and semi-enclosure along the Castle Peak Road. The extent of noise barriers and semi-enclosure is shown in Figure F.5 (Annexe F).

4.4.8 In view of the fact that the CALINE4 model is incapable of simulating the effect of noise barriers, a conservative approach was taken to simulate the effect of recommended barriers. It was assumed that, with the installation of noise barriers, traffic pollutants would be emitted from the top of the noise barriers. The road section with noise barrier constructed was simulated as elevated road with "fill" option in CALINE4 model. The elevation of the road section was taken as the height of the nose barrier. The width of mixing zone was taken as the actual road width due to physical obstruction of the barrier walls. For noise-barriers with height less than 0.8 metre, in view of the uplifting effect of hot vehicle exhaust, no adjustment was made in the model.

4.4.9 The proposed semi-enclosure will be closed at the top and on the landward side. No air quality sensitive receiver was identified at the seaward side of the semi-enclosure. Worst-case impact was considered by assuming portal emissions from the semi-enclosure. It was assumed that traffic within the semi-enclosure would generate a profile of pollutant emissions along the road section immediately outside the ends of the semi-enclosure. Owing to the physical obstruction on cross-wind dispersion towards the sensitive receivers on the landward side, no pollutant was assumed to be emitted from the side and the top of the semi-enclosure. NO_2 emissions from the semi-enclosure portals were predicted assuming volume sources behaviour in accordance with the recommendations in *1991 Permanent International Association of Road Congress Report* (1991 PIARC Report). Dispersion of portal emissions was simulated using USEPA approved ISCST model. A 20 percent NO_x to NO_2 conversion was assumed for portal emissions. The predicted 1-hour average NO_2 concentrations from the ISCST model were then added to those predicted by the CALINE4 model to produce the cumulative predictions. No forced ventilation system was assumed for the semi-enclosed road section.

4.4.10 Sample CALINE4 and ISCST model input and output files are included in Annexe F of this report.

Selected Sensitive Receivers

4.4.11 A comprehensive survey was conducted on June 1995 to identify the representative sensitive receivers along the proposed Castle Peak Road alignment. The representative air quality sensitive receivers adopted for the purposes of this assessment are the same for both the construction and operation phases.

4.4.12 Forty four receivers were identified and thirty six receivers are the existing buildings located along Castle Peak Road (between Ka Loon Tsuen and Area 2 Tsuen Wan). The height used for the analysis was 1.5 metres above the lowest residential floor level of the buildings, this being the average height of human breathing zone. As traffic impacts are higher at lower level, this represents a worst-case situation. In addition to the existing receivers, eight future receptor points were identified which represent future sensitive receivers of the development of the future Lido Reclamation and the possible redevelopment of the existing San Miguel Brewery, Garden Bakery, and Union Carbide plant. For future sensitive receivers facing the improved Castle Peak Road, setback distances of 5, 10 and 15 metres, in additional to 20 metres, were considered in the operation phase assessment.

4.4.13 A schematic diagram of the locations of the modelled road links and selected sensitive receivers is shown in Figure F.5 (Annexe F).

4.5 Ecology

Flora

4.5.1 Field observations and surveys were conducted between February and June 1995. The objectives were to describe existing habitats, to perform a vegetation inventory and to locate any protected or endangered species. A species list was made, identifying species relative abundance in each habitat (common, occasional or rare). Focused studies were carried out at 2 woodland sites (Fig. 11.1; 11.4). The circumferences of major tree species were measured at the woodland immediately west of Dragon View. At another woodland site on a hillslope east of Ting Kau, point-centre quarter method was employed to record and measure species with diameter at breast height (dbh) over 2 cm along a 30 m line transect. Plant species occurring in the understorey were also recorded.

4.5.2 Habitats were mapped based on field surveys and aerial photos dated November 1994. Potential habitat loss was estimated by the grid method based on the preferred alignment as shown on maps numbered 97294/R/001-015 and the alternative alignment as shown on maps numbered 97294/RA/001-006. Impacts of construction on ecological resources and mitigation proposals were discussed based on a dual-2 carriageway alignment, and a single wide carriageway west of Hong Kong Gardens.

4.5.3 Conservation significance was assessed based on the types of existing habitats. In general, woodland, especially old fung shui woods and late successional secondary forest were considered to be of high conservation significance because they had the most complex structure, highest biomass and biodiversity. These forests play the most important role in the terrestrial ecosystem. On the other hand, the establishment of woodland requires a much longer time than other vegetation types such as shrubland and grassland. It is always difficult, if not impossible, to restore the attributes of the original patch of woodland (i.e. species composition, canopy structure) after they are destroyed. Since many rare plant species are only preserved in old fung shui woods and relic woodlands in Hong Kong, they are potentially of higher conservation value as gene banks and are more important habitats for local fauna than low-succession stages of vegetation and plantations. Vegetation types at other seral stages (e.g. fernland, grassland, shrubland) are also important habitats for wildlife, but they were ranked lower in significance than woodland because they are common in Hong Kong and they re-establish readily after disturbance.

Intertidal and Freshwater Fauna

4.5.4 Literature review of relevant recent EIA documents, scientific literature and Government publications was supplemented by qualitative intertidal shore surveys carried out between February and June 1995. Stream courses crossed by the alignment were also qualitatively surveyed during this period.

Avifauna

4.5.5 Field surveys were conducted along the alignment on 1 and 2 May 1995. Birds seen or heard on or within 50 m of the proposed project area were recorded. Birds recorded during May and June were breeding species, as the survey period fell between the spring and autumn migration periods.

Other Vertebrates

4.5.6 Reptiles, amphibians and mammals were recorded on the study area when observed during other surveys. Because of the historic and currently high levels of human disturbance along the proposed alignment, no specific inventories were conducted for these vertebrate groups.

4.6 Visual Impact

4.6.1 Visually sensitive receivers have been assessed throughout the route corresponding to those identified within the Environmentally Sensitive Landuses Table.

4.6.2 The classification of rankings is based upon an assessment of the quality of the landscape without the proposed improvements scheme and that which would result if the proposed improvements were constructed. This will determine whether the proposed improvements scheme causes a deterioration in visual amenity, or an improvement. The rankings have been determined according to the following scale;

4.6.3 *Severe Visual Impact* - Where the scheme would cause a significant deterioration in the existing view including visual obstruction.

4.6.4 *Moderate Visual Impact* - Where the scheme would cause a noticeable deterioration in the existing view but no visual obstruction.

4.6.5 *Slight Visual Impact* - Where the scheme would cause a barely perceptible deterioration to the existing view.

4.6.6 The identification of sensitive receivers and the severity of the visual impacts relating to each has been assessed without mitigation proposals implemented. Changes during the construction and operational phases of the proposed improvements have been noted together with the effect of mitigation measures which aim to reduce the severity of visual impacts. An assessment of individual visually sensitive receivers has been tabulated and is contained within Annex H together with a figure illustrating the extent of the visual envelope from within which views of the road alignment exist.

4.7 Landscape Impact

4.7.1 A landscape assessment has been undertaken with the preparation of Landscape Constraints drawings produced for the Interim Report. These have been used to identify any absolute constraints within the landscape context of the area in order to advise at the preferred alignment route selection stage.

4.7.2 No absolute constraints were identified through the collection of the base line data.

4.7.3 The assessment has been made on the basis of an evaluation of the existing elements using subjective judgments to determine the value and significance of features taking into account both positive and negative elements in the landscape as well as factual information.

4.7.4 An assessment of the proposed improvements to the alignment within the landscape context of the area has been made and is recorded within sections relating to Chainage.

4.7.5 The assessment of each section is based upon the evaluation of the following elements within the landscape context;

4.7.6 *Landform* - An indication of the important existing characteristics relating to the landform within the study area.

4.7.7 *Vegetation* - Existing vegetation of a significant nature which contributes to the overall landscape character but is not necessarily of any rare ecological value. This may make a significant contribution to screening /framing existing views.

4.7.8 *Cultural/Designated Areas* - Elements which form part of the overall landscape character, buildings of interest e.g. temples, houses/gardens and designated areas within planning legislation of noted value. e.g. Green Belt, Special planning zones.

4.8 Landscape Mitigation Objectives

4.8.1 In order to provide effective mitigation to both the landscape and visual impacts arising from the proposed improvements, detailed design of both the structural elements and the surrounding landscape setting and after use of the reclamation areas has been considered.

4.8.2 The parameters for a landscape framework which must be provided for areas of proposed reclamation have been defined and must be implemented at an early stage of the proposals in order that a structured route is provided forming a linear parkway / promenade and vegetative link along the coast line.

4.8.3 The objectives for the mitigation proposals are set out as follows;

4.8.4 The provision of semi mature roadside planting to all verge areas, re-aligned junctions and access roads along the route;

4.8.5 Co-ordination of all earthworks with planting to slopes and berms wherever appropriate;

4.8.6 Provision of a landscape framework and infrastructure planting to all areas of reclamation and re-provisioned recreation;

4.8.7 The development of an open space linear parkway / promenade to the coastline; and

4.8.8 Co-ordination of finishes and sensitive detailing to all structural elements such as retaining walls, viaducts, bridges and noise barriers.

4.8.9 All mitigation proposals are as detailed on Drawings contained in Annex I.

5 TRAFFIC FLOWS

5.1 Existing Traffic Flows

5.1.1 The existing noise levels have been obtained by calculation, based on existing (1994) traffic volumes obtained by counts. The morning peak hour counts have been used. Assumed traffic speeds are 50 kph along existing Castle Peak Road and 70 kph along Tuen Mun Road.

5.1.2 The assumed traffic flows, in terms of vehicles and proportion of heavy vehicles in the peak morning hour, are shown in the following table. The section descriptions are as follows:

A Castle Peak Road between western end of study area and entrance to Hong Kong Garden;
B Castle Peak Road between entrance to Hong Kong Garden and access to Pai Min Kok village and neighbouring highrise developments;
C Castle Peak Road between access to Pai Min Kok village and connection to Tuen Mun Road at Sham Tseng;
D Castle Peak Road between connection to Tuen Mun Road and western end of Ting Kau village;
E Castle Peak Road between western end of Ting Kau village and access to Sunny Villas and new highrise;
F Castle Peak Road between access to Sunny Villas and eastern end of study area;
G Tuen Mun Road west of connection with Castle Peak Road at Sham Tseng;
H Tuen Mun Road east of connection with Castle Peak Road at Sham Tseng.

Table 5.1 Assumed Prevailing Traffic Flows on Castle Peak Road and Tuen Mun Road

1994 Morning Peak Hour Traffic[1]							
Section & Road	Flow (veh/hr)			Section & Road	Flow (veh/hr)		
Castle Peak Road (A)	E/b	377	60%	Castle Peak Road (E)	E/b	710	46%
	W/b	253	67%		W/b	141	76%
Castle Peak Road (B)	E/b	665	41%	Castle Peak Road (F)	E/b	840	41%
	W/b	124	62%		W/b	206	61%
Castle Peak Road (C)	E/b	1137	34%	Tuen Mun Road (G)	E/b	4157	50%
	W/b	410	54%		W/b	2512	58%
Castle Peak Road (D)	E/b	587	24%	Tuen Mun Road (H)	E/b	4835	43%
	W/b	180	77%		W/b	2678	57%

5.1.3 Heavy vehicles have been assumed to include PLB's, buses, coaches, heavy goods vehicles, container vehicles, and light goods vehicles (though it should be noted that unladen light goods vehicles generally weigh around the criterion 1525 kg). This leaves only cars and taxis as non-heavy vehicles.

5.1.4 The totalled counts (in terms of PCUs) have been reviewed by Transport Department in Working Paper T2, *Traffic Model Validation.*

5.1.5 Recent discussions with the Highways Department NT Maintenance Division reveal that, aside from slip roads, Tuen Mun Road is paved along its entire length with friction course.

5.2 Future Traffic Flows

5.2.1 The traffic noise and air quality assessments are based on projected morning peak hour traffic flows for the year 2011, provided by the transport consultant. These assumed flows are presented in Annexe A. A discussion of the assumptions underlying the traffic projections is provided in Working Paper T1, *Traffic Model Development,* released earlier in this study. As with all predictions, there is a degree of uncertainty associated with the traffic flow predictions for year 2011. This uncertainty is not addressed in this EIA, and is not considered in the calculated environmental impacts that are based on the traffic prediction.

5.2.2 Impervious road surfacing has been assumed on the improved Castle Peak Road. On Tuen Mun Road, a pervious macadam (friction course) paving surface has been assumed.

5.2.3 A speed of 70 kph has been assumed over both Tuen Mun Road and the improved Castle Peak Road in year 2011.

6 BASELINE ENVIRONMENTAL MONITORING

6.1 Noise Monitoring

6.1.1 A baseline profile of the existing conditions was obtained by monitoring prevailing noise levels in March 1995. Noise level meters complied with IECP 651:1979 (Type 1) and 804:1985 (Type 1). Weekday morning peak hour noise was monitored to obtain $L_{10\ (1\text{-hour})}$, $L_{eq\ (1\text{-hour})}$, and $L_{90\ (1\text{-hour})}$ noise levels at the following four locations:

1. Hong Kong Gardens (facade noise level at ground floor of commercial building, facing Castle Peak Road);
2. Sea Crest Villas Phase 4 (facade noise level at podium, facing Castle Peak Road);
3. carpark near Lido Beach (freefield measurement at ground level);
4. private residential development near eastern end of study area (facade noise level at podium, facing Castle Peak Road).

Monitoring locations 1-3 are shown in Figures B-1 to B-3 in Annexe B. Monitoring location 4 is not shown, since permission to set up noise monitoring equipment at the site was granted on the understanding that the location not be named.

6.1.2 Results of the baseline noise monitoring programme are shown in the following Table:

Table 6.1 Results of Baseline Noise Monitoring Programme

Station	Day and Date	Time	Monitoring Results (dB(A))		
			$L_{10\ (1\text{-hour})}$	$L_{eq\ (1\text{-hour})}$	$L_{90\ (1\text{-hour})}$
Hong Kong Gardens	Wednesday, 15 Mar 1995	8.00-9.00 am	73.1	69.6	61.6
		9.00-10.00 am	73.6	69.5	60.6
Sea Crest Villas Phase 4	Friday, 10 Mar 1995	8.00-9.00 am	66.1	63.8	59.1
		9.00-10.00 am	65.6	62.9	57.1
Carpark near Lido Beach	Thursday, 9 Mar 1995	8.00-9.00 am	66.1	64.2	61.6
		9.00-10.00 am	65.1	63.4	61.1
Residential podium near eastern end of study area	Friday, 3 Mar 1995	7.32-8.32 am	74.6	70.7	58.1
		8.32-9.32 am	74.1	71.1	59.1

6.1.3 In addition to the above noise levels monitored for this Assignment, information on noise levels at Pink Villas is available from the EIA conducted for Route 3. Spot noise measurements carried out at the side of Castle Peak Road opposite Pink Villa during the daytime produced the following results:

Table 6.2 Reported Noise Monitoring Results at Pink Villas

Location	Monitoring Results (dB(A))		
	$L_{10\,(5\,min)}$	$L_{eq\,(5\,min)}$	$L_{90\,(5\,min)}$
Pink Villas	75	71	56

NOTE: Reported in Table 3.2, *Route 3 Country Park Section Preliminary Design Stage 2: TLT & YLA EIA (Conveyor System Supplementary Paper)*. Date and time of measurements not reported.

6.1.4 Comparison of monitored and calculated traffic noise levels are shown in the following table. The monitored values are based on March 1995 traffic flows, while the calculated values are based on 1994 traffic counts.

Table 6.3 Comparison of Monitored and Calculated Morning Peak Hour Traffic Noise Levels

Station	$L_{10\,(1\text{-}hour)}$ Noise Levels (dB(A))		
	Monitored (1995)	Calculated (1994)	Difference
Hong Kong Gardens (comparison between commercial block and Block 1 (SR-8))	73.1	72.8	-0.3 (0.4%)
	73.6		-0.8 (1.1%)
Sea Crest Villas Phase 4 (comparison with SR 13-3)	66.1	66.0	-0.1 (0.2%)
	65.6		+0.4 (0.6%)
Residential podium near eastern end of study area	74.6	73.5	-1.1 (1.5%)
	74.1		-0.6 (0.8%)

NOTE: Comparison of noise levels at the Lido Beach carpark and at the roadside near Pink Villas is not possible, since noise levels at these two monitoring locations have not been modelled.

6.1.5 Comparison of monitored and calculated results shows reasonable agreement, particularly given the possible differences in the traffic flows underlying the values.

6.2 Air Quality Monitoring

6.2.1 A two-week programme of NO_x, TSP and RSP monitoring was undertaken in May 1995, in order to establish background levels of these pollutants.

6.2.2 A full report on the monitoring programme is provided in Annexe G to this report, and summarised in this section.

NO_x Monitoring

6.2.3 The programme of NOx monitoring was undertaken to establish approximate existing pollutant levels at a background site close to the proposed Castle Peak Road development.

6.2.4 The NOx analyser was located outdoors in a weatherproof box on the 7th floor podium of Sea Crest Villas Phase IV. The location overlooked Castle Peak Road and faced out to the sea.

6.2.5 454 hours of data were recovered from the NOx analyser between 1st and 30th May 1995. Measured concentrations of NO and NO_2 were typical of those of an urban background site. The median of hourly averaged concentrations for NOx, NO and NO_2 were 51ppb, 23ppb and 26ppb respectively. The highest hourly averaged NOx and NO_2 concentrations measured at this site were 248ppb and 93ppb respectively.

6.2.6 A comparison is made in Table 6.4 between Hong Kong AQOs and the monitoring results.

Table 6.4 Comparison of NO_2 Concentrations with Air Quality Guidelines

Standard Source	Regulatory Value and Averaging Time		Measured Value
Hong Kong AQO	157ppb	1-hour	93ppb
Hong Kong AQO	80ppb	24-hour	55ppb
Hong Kong AQO	42ppb	annual	28ppb*

* Mean over monitoring period.

6.2.7 Comparison of the data with that collect at the EPD fixed air monitoring network stations during 1991 indicates that pollutant concentrations were typical of those of an urban background site with moderate pollutant levels. Measured levels of NO_2 were lower than those measured at the Tsuen Wan monitoring station during 1991.

6.2.8 The mean diurnal cycles of NOx were indicative of a site where the dominant source of pollutants is motor vehicles. Morning and late evening peaks in NO, NO_2, and NOx concentrations are visible, corresponding to commuting patterns. The measured NO_2:NOx ratios suggest that the dominant sources of NOx were reasonably close to the monitoring site, as expected for an urban area.

TSP and RSP Monitoring

6.2.9 Baseline monitoring for Total Suspended Particulates (TSP) and Respirable Suspended Particulates (RSP) was conducted at the podium of Sea Crest Villas Phase IV in May 1995.

6.2.10 The baseline air monitoring results are summarized in Table 6.5 and are shown in Figures G.1 and G.2. No exceedances of the AQOs were recorded. The means of the 24-hour average TSP and RSP levels are below 60 µg m^{-3}, which are well within the 24-hour average AQOs for TSP (260 µg m^{-3}) and RSP (180 µg m^{-3}). These indicate a relatively low background dust level at the Sea Crest Villas.

Table 6.5 Baseline 24-hour Average TSP and RSP Levels at the Sea Crest Villas

Date	TSP (µgm^{-3})	RSP (µgm^{-3})
2/05/95	38	--
3/05/95	46	34
4/05/95	21	35
15/05/95	128	105
16/05/95	63	45
17/05/95	96	72
18/05/95	38	46
19/05/95	29	33
20/05/95	42	35
22/05/95	54	39
23/05/95	46	39
24/05/95	88	60
25/05/95	39	31
26/05/95	34	26
27/05/95	30	26
Arithmetic Mean	53	45

7 NOISE IMPACT (CONSTRUCTION PHASE)

7.1 Introduction

7.1.1 Construction is expected to last for about 3 years. The improvement works will be split into two contracts: the western half (from Ka Loon Tsuen to Sham Tseng) and the eastern half (eastern part of Sham Tseng to Area 2, Tsuen Wan).

7.1.2 The construction works will entail construction of both at-grade and elevated roads. In addition, drainage along the ground level roads will be installed. Extensive excavation works and earthworks will be required, as well as a small amount of new reclamation.

7.1.3 The construction methodology, programme and equipment lists will be determined by the contractors responsible for the construction of the improved road. A possible methodology, proposed by Maunsell Consultants and outlined below and in Annexe H, has been used as the basis for the construction-phase noise impacts. This methodology, and its resulting programme and equipment lists, are tentative only. A further construction-phase impact assessment will be necessary at a later stage of the project if the construction methodology or schedule changes.

7.1.4 The need for limited night-time work is anticipated if structural elements are precast. It will be necessary to transport and place precast elements at night, since the transportation and placement will require road or lane closures that would disrupt daytime traffic.

7.1.5 The worksyard locations and activities will be decided by the Contractors. The yards are expected to accommodate the following activities:

(i) site offices and storage;
(ii) concrete batching and precasting of structural elements.

Along this linear site, "satellite" site offices and compounds are considered likely. However, these "satellites" are not expected to accommodate any noisy activities.

7.2 Construction Phase: Methodology and Equipment

7.2.1 Two worksyards will be established. For the western contract, the worksyard has been assumed to be located at the present Ting Kau Bridge compound (in the former carpark above Ting Kau Beach, immediately east of the Route 3 bridge piers). For the eastern contract, the worksyard is expected to be located in the disused quarry immediately west of Hong Kong Gardens. Anticipated equipment needs are outlined in the following table:

Table 7.1 Construction Equipment (Worksyard)

Construction Equipment: Works Yard (Storage Area and Prefabrication Yard)			
Task and Equipment	No.	SWL dB(A) per pc.	Source
Storage Area			
Mobile diesel crane	2	112	CNP 048
Lorry	2	112	CNP 141
Prefabrication Yard			
Crane (mobile diesel)	2	112	CNP 048
Compressor (silenced)	2	100	CNP 002
Winch (pneumatic)	2	110	CNP 261
Concrete mixer truck	2	109	CNP 044
Concrete pump	1	109	CNP 047
Vibratory pokers	2	113	CNP 170
Concrete batching			
Batching plant	1	108	CNP 022

Removal of Existing Road

7.2.2 The existing road surfaces will be removed prior to widening and improvements.

Table 7.2 Construction Equipment (Road Removal)

Construction Equipment: Removal of Existing Road Surface			
Task and Equipment	No.	SWL dB(A) per pc.	Source
Breaking existing surface			
Breaker (excavator-mounted, pneumatic or hydraulic)	1	122	CNP 027/028
Breakers (silenced hand-held pneumatic)	3	110	CNP 026
Removal of broken surface			
Backhoe *or* Crane lorry	1 *or* 1	112 *or* 116	CNP 081 *or* BS 5228, Table 9
Scarifying for overlay			
Surface planer	1	111	CNP 184
Lorry	1	112	CNP 141

Elevated Sections

7.2.3 Elevated road may be built on precast reinforced concrete decking supported by reinforced concrete columns founded on piles.

7.2.4 *Piling:* Bored or percussive piling is expected along the elevated alignment at all column locations. Several piling rigs, located at adjacent column sites, can be expected to be operating at a single time.

Table 7.3 Construction Equipment (Piling)

Construction Equipment: Bored Piles			
Task and Equipment	No.	SWL dB(A) per pc	Source
Bored Piles			
Large diameter bored piling rig (oscillator or grab-and-chisel)	1	115	CNP 164/165
Concreting (Bored Piles)			
Concrete mixer truck	1	109	CNP 044
Concrete pump	1	109	CNP 047
Water pump (petrol)	1	103	CNP 282
Percussive Piles			
Drop hammer driving concrete pile *or* Diesel hammer driving pre-stressed concrete pile	1 *or* 1	116 *or* 128	N/A

7.2.5 *Pile Caps:* Pile cap construction will proceed as soon as piling work is completed. Work involves excavating for the caps, fixing reinforcements, concreting and backfilling.

Table 7.4 Construction Equipment (Pile Caps)

Construction Equipment: Pile Caps			
Task and Equipment	No.	SWL dB(A) per pc.	Source
Ground Excavation			
Excavator	1	112	CNP 081
Backhoe	1	112	CNP 081
Earth-moving trucks	1	117	CNP 067
Reinforcement			
Crane (mobile diesel)	1	112	CNP 048
Compressor (silenced)	1	100	CNP 002
Bar bender/cutter (electric)	1	90	CNP 021
Concreting			
Concrete mixer truck	1	109	CNP 044
Vibratory poker	2	113	CNP 170
Handheld pneumatic breaker	1	110	CNP 026
Backfilling			
Roller	1	108	CNP 185/186

7.2.6 *Column Construction:* Columns will be built to support the road structure. Work will involve fixing the reinforcement, erecting formwork, and pouring concrete.

Table 7.5 Construction Equipment (Column Construction)

Construction Equipment: Column Construction			
Task and Equipment	No.	SWL dB(A) per pc.	Source
Reinforcement			
Crane (mobile diesel)	1	112	CNP 048
Compressor (silenced)	1	100	CNP 002
Bar bender/cutter (electric)	1	90	CNP 021
Concreting			
Concrete mixer truck	1	109	CNP 044
Vibratory poker	2	113	CNP 170
Concrete pump truck	1	109	CNP 047

7.2.7 *Superstructure Construction:* In-situ works require that formwork must first be built. Reinforcement will then be placed, and concrete will be delivered by mixer truck and placed using a concrete pump. If prefabricated components are used, they will be transported by lorry to the site, then positioned with cranes and post-tensioned using quiet hydraulic jacks.

Table 7.6 Construction Equipment (In-situ Superstructure Construction)

Construction Equipment: In-Situ Superstructure Construction			
Task and Equipment	No.	SWL dB(A) per pc.	Source
Formwork and Reinforcement			
Crane (mobile diesel)	2	112	CNP 048
Compressor (silenced)	2	100	CNP 002
Winch (pneumatic)	2	110	CNP 261
Concreting			
Concrete mixer truck	2	109	CNP 044
Concrete pump truck	1	109	CNP 047
Vibratory pokers	2	113	CNP 170

Table 7.7 Construction Equipment (Placement of Prefabricated Superstructure)

Construction Equipment: Prefabricated Superstructure Placement			
Task and Equipment	No.	SWL dB(A) per pc.	Source
Lorry	1	112	CNP 141
Cranes (mobile diesel)	2	112	CNP 048

7.2.8 Elevated road structures will be finished with waterproofing and a macadam paving surface.

Table 7.8 Construction Equipment (Surfacing)

Construction Equipment: Surfacing			
Task and Equipment	No.	SWL dB(A) per pc.	Source
Compressor (silenced)	1	100	CNP 002
Asphalt paver	1	109	CNP 004
Road roller	1	108	CNP 185

<u>At-Grade Roads</u>

7.2.9 *Drainage:* Drainage will be installed along new road sections. Establishment of drainage culverts will require excavation of the drainage trench alongside the road. Precast concrete pipes will be lowered into the trench.

Table 7.9 Construction Equipment (Drainage)

Construction Equipment: Drainage			
Task and Equipment	No.	SWL dB(A) per pc.	Source
Excavation of trench			
Excavator	1	112	CNP 081
Dumptruck	1	117	CNP 067
Placement of pipe			
Mobile diesel crane	1	112	CNP 048
Backfilling			
Backhoe	1	112	CNP 081

7.2.10 *Retaining Walls:* Along certain segments, retaining walls will be required. Ground excavation will be followed by placement of reinforced concrete and backfilling. Depending on local conditions, it may be necessary to first drive sheet piles, followed by ground excavation, placement of steel struts, placement of reinforced concrete, backfilling, and removal of sheet piles.

Table 7.10 Construction Equipment (Sheet Piling)

Construction Equipment: Percussive Driving of Sheet Piles			
Task and Equipment	No.	SWL dB(A) per pc.	Source
Insertion			
Drop hammer driving sheet steel pile *or* Diesel hammer driving sheet steel pile	1 *or* 1	129 *or* 132	*Technical Memorandum on Noise from Percussive Piling*
Extraction			
Electric vibratory extractor	1	125	BS 5228, Table 8, Item 22

Table 7.11 Construction Equipment (Retaining Walls)

Construction Equipment: Retaining Walls			
Task and Equipment	No.	SWL dB(A) per pc	Source
Ground excavation			
Excavator/loader	1	112	CNP 081
Dumptruck	1	117	CNP 067
Compressor (silenced)	1	100	CNP 002
Bar bender	1	90	CNP 021
Concreting			
Concrete mixer truck	1	109	CNP 044
Concrete pump	1	109	CNP 047
Water pump (petrol)	1	103	CNP 282
Vibratory pokers	1	113	CNP 170
Backfilling			
Dumptruck	1	117	CNP 067
Excavator/loader	1	112	CNP 081
Vibratory roller	1	108	CNP 186

7.2.11 *Road construction:* At-grade asphalt roads will be laid.

Table 7.12 Construction Equipment (Road Construction)

Construction Equipment: Road Construction			
Task and Equipment	No.	SWL dB(A) per pc	Source
Levelling of new road			
Grader	1	113	CNP 104
Bulldozer	1	115	CNP 030
Laying base and sub-base			
Dumptruck	1	117	CNP 067
Roller	1	108	CNP 185
Kerbing			
Concrete mixer truck	1	109	CNP 044
Concrete saw	1	115	CNP 203
Laying new surface			
Asphalt spreader with chipper	1	114	BS 5228, Table 11
Road roller	1	108	CNP 185

7.3 Construction Noise Mitigation Measures

7.3.1 Possible noise mitigation measures include the use of silencers, mufflers, and acoustic linings; scheduling of activities; provision of alternative quietened plant; and erection of sound barriers, shields, or acoustic sheds.

Use of silencers, mufflers, acoustic linings, or provision of quietened plant

7.3.2 The most effective mitigation measure is to control noise at its source. In the case of powered mechanical equipment, this involves either selecting silenced equipment, or reducing the transmission of noise using distance attenuation, mufflers, silencers, or acoustic enclosures.

(a) Noisy equipment and activities should be sited by the Contractor as far from sensitive receivers as is practical.

(b) Noisy plant or processes should be replaced by quieter alternatives where possible. For example, pneumatic concrete breakers can be silenced with mufflers and bit dampers, or can be replaced with electric hydraulic breakers. (Hand-held breakers should comply with the standards specified in EEC Technical Directive 84/537, and portable compressors shall comply with the standards specified in EEC Technical Directive 84/533.) If appropriate, a concrete cruncher (hydraulically-powered jaws) may be used; the cruncher emits a sound power level about 20 dB(A) lower than that of an electric breaker. Silenced diesel and gasoline generators and power units, as well as silenced and super-silenced air compressors, can be readily obtained. Manual operations are generally quietest, but may not be feasible given the scale of the anticipated road improvement works.

(c) Idle equipment should be turned off or throttled down, and the number of operating items should be minimised. All PME should be properly maintained and used no more often than is necessary.

(d) The power units of non-electric stationary plant and earth-moving plant can be quietened by vibration isolation and partial or full acoustic enclosures for individual noise-generating components.

(e) Construction plant should be properly maintained and operated. Construction equipment often has silencing measures built in or added on, e.g., bulldozer silencers, compressor panels, and mufflers. Silencing measures should be properly maintained and utilised.

Temporary noise barriers

7.3.3 Temporary noise barriers or earth embankment may be used to screen specific receivers. The following mobile enclosures can be considered:

(a) Where sufficient space is available, a mobile acoustic enclosure may be used. The barrier material should have a mass per unit of surface area of at least 7 kg/m^2, and should have acoustic lining. Such enclosures, if properly installed, can give a noise attenuation of up to 20 dB(A).

(b) Temporary noise barriers or earth embankment may be used to screen specific receivers. Free-standing acoustic panels can be positioned to screen sensitive facades. Barrier material should have a mass per unit surface area in excess of 7 kg/m^2; alternatively, sandbags may be used to form a temporary screen. It should be noted that some sound will pass around the ends of a short barrier. In order to minimise this occurrence, the length of the barrier should be about five times its height, or the barrier should be curved around the noise source. The minimum height of the barrier should be such that no part of the noise source is visible from the NSR.

7.3.4 In siting the barrier, care should be taken to avoid reflecting noise to NSR positions behind the barrier. The barrier should be as close as possible to the noise source, and there should be no gaps or openings in it.

7.3.5 Barriers may be particularly effective in reducing noise emanating from the fixed plant in the works yard. Since much of the space within the yard is expected to be used for storage, it may be possible to position the smaller area devoted to the working PME as far as possible from sensitive receivers and effectively shield it. Containers/offices on the site can be stacked and positioned so as to shield sensitive receivers from noise. Alternatively, a temporary canopy structure may be devised to reduce exposure to items of fixed PME.

Scheduling of construction activities

7.3.6 Sensitive scheduling of construction activities can reduce the duration and severity of exposure to construction noise.

(a) Noisy activities can be scheduled to minimise exposure of nearby NSRs to high levels of construction noise. For example, noisy activities can be scheduled for midday, or at times coinciding with periods of high background noise (such as during peak traffic hours). Prolonged operation of noisy equipment close to dwellings should be avoided.

(b) Construction activities can be planned so that parallel operation of several sets of equipment close to a given receiver is avoided.

(c) Limited hours of use for powered mechanical equipment are recommended; a ten-hour period from 8.00 a.m. to 6.00 p.m. is suggested. Hours of use could be further restricted by the Resident Engineer if sufficient and justifiable complaints from affected residents are received.

7.3.7 Evaluation of the effectiveness of these measures at a given receiver requires a knowledge of the planned construction schedule, which is not available at this stage. Estimates of the noise reductions capable are provided below:

Stationary and Earth-moving Plant

7.3.8 These pieces of equipment include compressors, concrete pumps, excavators, bulldozers, loaders, and dumptrucks. Noise reduction can be achieved through proper maintenance of the exhaust system, and through exhaust silencers. Additionally, engine noise is amenable to reduction through isolation of vibrating engine components, installation of partial or full acoustic enclosures of noise-generating components, and damping of vibrating panels. U.S. tests have shown that partial or full enclosures can achieve noise reductions of 10 and 25 dB(A) respectively. In the "mitigated" assessment scenario that follows, a 10 dB(A) reduction for concrete pumps, excavators, bulldozers, loaders, and dumptrucks has been assumed.

7.3.9 Super-silenced compressors incorporate acoustic casing linings, mufflers, and anti-vibration mounts to isolate the engine and compressor unit for the chassis. A reduction of 5 dB(A) can be achieved with the use of a super-silenced compressor relative to a silenced compressor. This reduction has been assumed in the "mitigated" assessment scenario that follows.

Barrier

7.3.10 A purpose-built mobile noise barrier, located close to the noise source, can be fabricated to protect sensitive receivers. Effective barriers are typically lined on the noise-generating side with a noise-absorbing material. Assuming that the barrier has no gaps, and that it blocks the line of sight between noise generator and noise receiver, reductions of 5 to 10 dB(A) can be achieved. In accordance with the *Technical Memorandum on Noise from Construction Work*, a reduction of 10 dB(A) has been assumed the following "mitigated" assessment.

7.3.11 Though not effective in reducing noise levels, the establishment of good community relations can be of great assistance to both the contractors and affected receivers. Residents of the communities along the improved road alignment should be notified in advance of planned operations, and informed of progress. Notification of blasting operations is particularly important. If necessary, a liaison body can be established to bring together representatives of the affected communities, the government, and the contractors. In addition, residents may be provided with a telephone number for the Resident Engineer's office, where they may register complaints concerning excessive noise. If justified, the Resident Engineer may authorise noisy operations to cease or to be conducted at more restricted hours.

7.3.12 The Contractor should specify his construction methodology and equipment (including methods of use), together with proposed measures for limiting construction noise, prior to the start of construction. Information on the types and models of silenced equipment and acoustic treatment for unsilenced equipment should be included.

7.3.13 A programme of construction noise monitoring should be implemented to ensure that construction noise levels do not exceed recommended or statutory levels. The monitoring equipment and methodology should comply with the *Technical Memorandum on Noise from Construction work other than Percussive Piling* issued under Section 9 of the Noise Control Ordinance.

7.3.14 While it is not feasible to dictate the methods of construction to be employed by the contractor, noise control requirements can be incorporated in the tender/contract documents, specifying the noise standards to be met and requirements for noise monitoring on the site. Sample specification clauses for construction noise control and monitoring are included in Annexe C of this report.

7.4 Construction Phase Impacts

7.4.1 Predicted construction noise impacts, including the effects of mitigation measures, are shown in the following tables. Due to the 8-km length of the eventual site and the large numbers of sensitive receivers along it, noise levels at graduated distances are provided for most construction activities. At the notional worksyard locations, however, specific distances and NSRs are identified.

Table 7.13 Predicted Noise Impacts (Works Yard)

NSR	Source-Receiver Distance and Highest Facade Noise Level due to Activity in Worksyard		
	Distance (m)	Facade Noise Level dB(A)[1]	
		Daytime	Evening/ Night-time[3]
Western Worksyard[2]			
SR-3	175	62.9	56.9 (46.9)
SR-4	75	80.2 (77.2)	74.3 (64.3)
SR-5	110	76.9 (73.9)	70.9 (60.9)
Eastern Worksyard[2]			
Nearest NSR	100	77.7 (74.7)	71.8 (61.8)
SR-26	210	71.3	65.3 (55.3)
SR-27	100	77.7 (74.7)	71.8 (61.8)

NOTES: [1] Figures in parentheses show mitigated noise level assuming the use of quietened equipment. Quietening measures and assumed reductions are described Section 7.3.2 above.
[2] Equipment lists on which the predictions are based are shown above in Table 7.1.
[3] Evening/night-time works restricted to movement of precast structural elements, using equipment shown in Table 7.7 above. Mitigation entrails use of silenced equipment.

7.4.2 Table 7.13 shows that the use of quietened equipment in the worksyards will be necessary to keep noise levels at the closest sensitive facades to 75 dB(A) during the daytime. Even with the use of quietened equipment, however, noise from the western worksyard may still exceed the daytime limit of 75 dB(A) at SR-4 (representing Woodland Heights, Venus Heights, Unicorn Heights and Triumphant Heights at Hong Kong Gardens). To further mitigate at these NSRs, site offices and storage piles may be positioned as a noise barrier at the eastern part of the site to shield the noise from the worksyard. Alternatively, stationary activities such as prefabrication and concrete batching may be shielded by purpose-built barriers. If adequate barriers are provided, an additional noise reduction of 10 dB(A) at Hong Kong Gardens NSRs can be expected, further reducing mitigated noise levels at SR-4 from 77.2 dB(A) to 67.2 dB(A), within the daytime noise limits of 75 dB(A).

7.4.3 The NCO states that Acceptable Noise Level (ANL) during the evening is 65 dB(A) (ASR "B"). Table 7.13 shows that the use of quietened equipment in the worksyards during the evening and night-time (when prefabricated elements are being loaded and moved) will be necessary to achieve this noise level. During the night-time, when the ANL drops to 50 dB(A), quietened operations in the workyard are expected to exceed NCO limits. The presence of barriers would reduce facade noise levels by a further 10 dB(A), but this further reduction would still result in anticipated exceedances of the NCO at SR-4 (54.3 dB(A)), SR-5 (50.9 dB(A)), and SR-27 (51.8 dB(A)). Consequently, loading of prefabricated elements may have to be restricted to daytime and evening hours.

7.4.4 Predicted noise levels at graduated distances, as provided in the following tables, may be related to specific NSRs by referencing the following typical distances between NSRs and the works boundary.

Table 7.14 Indicative Source-Receiver Distances during Construction

NSR		Typical source-receiver distances	Construction works to which NSR will be exposed			
			A	B	C	D
1	Ka Loon Tsuen and Bayside Villas	2-60m	✓	✓	✓	✓
3	Grand Bay Villas	6-10m			✓	✓
4	Hong Kong Garden	60-100m	✓	✓	✓	✓
5	Hong Kong Garden	20-40m	✓	✓	✓	✓
6	Hong Kong Garden	200m			✓	
7	Hong Kong Garden	90-100m			✓	
8	Hong Kong Garden	5-20m			✓	
9	Hong Kong Garden	80-120m			✓	
10	Lung Tang Court	10-30m			✓	
11	Yuen Tun Village	50-100m			✓	
12	Tsing Lung Tau Village	2-50m			✓	
40	Dragon Villa/Villa Alfa Vista	5-10m			✓	✓
13	Seacrest Villas Phase 4	50-90m	✓	✓	✓	✓
14	Dragon Ville	5-10m			✓	
15	Seacrest Villas Phases 2 and 3	5-70m			✓	✓
41	Seacrest Villas Phase 4	15-90m			✓	✓
21	Pink and Golden Villas	20-60m	✓	✓	✓	
23	Ting Kau	2-20m	✓	✓	✓	✓

NSRs in Sham Tseng (NSRs 16-20 and 42) are not included in the table because no improvement works will be conducted in Sham Tseng.

Construction Types:
- A piling, pile caps, and column construction (Tables 7.16, 7.17, 7.18, 7.19 refer)
- B superstructure construction (elevated sections) (Tables 7.20, 7.21 refer)
- C at-grade roadworks (Tables 7.15, 7.22, 7.23, 7.27 refer)
- D construction of retaining walls (Table 7.26 refers)

Table 7.14 (cont) Indicative Source-Receiver Distances during Construction

NSR		Typical source-receiver distances (m)	Construction works to which NSR will be exposed			
			A	B	C	D
24	Ting Kau	20-90m	✓	✓	✓	✓
25	Riviera Apartments	2-20m	✓	✓	✓	✓
26	Ting Kau	2-70m	✓	✓	✓	✓
27	Ting Kau	2-70m			✓	✓
28	Ting Kau Village	2-100m			✓	✓
29	Casam/Lido Beach	5-25m			✓	✓
30	Casam/Lido Beach	5-25m	✓	✓	✓	
31	Sunny Villas and Keymount Lodge	30-60m	✓	✓	✓	✓
43	Lot 322	10m	✓	✓	✓	✓
33	Hanley Villa	90-100m	✓	✓	✓	✓
35	Greenview Terrace	15-25m	✓	✓	✓	✓
36 37	Blossom Terrace	20-90m	✓	✓	✓	✓
44	Lot 356	5-20m	✓	✓	✓	✓

Construction Types:
A piling, pile caps, and column construction (Tables 7.16, 7.17, 7.18, 7.19 refer)
B superstructure construction (elevated sections) (Tables 7.20, 7.21 refer)
C at-grade roadworks (Tables 7.15, 7.22, 7.23, 7.27 refer)
D construction of retaining walls (Table 7.26 refers)

Table 7.15 Predicted Noise Impacts (Road Removal)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Breaking existing surface					
Unmitigated	91	88	83	79	77
Equipment reduction: mounted breaker only	91	87	83	78	77
Equipment reduction: hand-held breakers only	83	80	75	71	69
Mounted breaker with barrier	81	77	73	68	67
Hand-held breakers with barrier	73	70	65	61	59
Removal of broken surface (Backhoe)					
Unmitigated	81	77	73	68	67
Quietened equipment	71	67	63	58	57
Removal of broken surface (Crane lorry)					
Unmitigated	85	81	77	72	71
With barrier	75	71	67	62	61
Scarifying for overlay					
Unmitigated	83	80	75	71	69
With barrier	73	70	65	61	59

7.4.5 When the existing surface is broken, predicted noise levels are high due to the use of a mounted breaker, which generates high noise levels. Predictions indicate that the use of a mounted breaker alone may not be possible without exceeding the daytime construction noise guideline of 75 dB(A) at NSRs closer than about 40 m (assuming use of a barrier). The use of hand-held breakers is expected to be subject to fewer restrictions.

7.4.6 Removal of the broken surface by backhoe or crane lorry will require the presence of a temporary noise barrier or quietened equipment to remain within the 75 dB(A) daytime construction noise limit.

7.4.7 Scarifying for overlay is a noisy process that is expected to result in exceedances of the daytime noise limit at facades within about 50 m. Due to the mobile nature of this activity, barriers cannot be used. The activity is mobile; consequently, the duration of the noise exposure is expected to be brief.

Table 7.16 Predicted Noise Impacts (Piling)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Bored Piles					
Unmitigated	84	80	76	71	70
With barrier	74	70	66	61	60
Concreting					
Unmitigated	81	78	73	69	67
With barrier	71	68	63	59	57
With quietened equipment	79	75	71	67	65
Percussive Piling					
Drop hammer (unmitigated)	85	81	77	72	71
Diesel hammer (unmitigated)	97	93	89	84	83

7.4.8 If bored piles are used, barriers may be required to reduce the noise level at facades within about 60 m to 75 dB(A).

7.4.9 During concreting, these barriers may be retained or, if the nearest NSR facade is more than 30 m away, a quietened concrete pump truck may be used instead. Either measure would reduce anticipated construction noise to 75 dB(A) or less.

7.4.10 During percussive piling, the following restrictions of the hours of operation may be expected:

Table 7.17 Hours of Operation (Percussive Piling)

Piling Method	Distance to Nearest NSR Facade	Permitted Hours of Operation (non-holidays only)
Drop Hammer driving concrete pile	20 m	08.00 - 09.30 and 12.00 - 14.00 and 16.30 - 18.00
	30 m to 100 m	07.00 - 19.00
Diesel Hammer driving prestressed concrete pile	20 m	08.00 - 09.00 and 12.30 - 13.30 and 17.00 - 18.00
	30 to 50 m	08.00 - 09.30 and 12.00 - 14.00 and 16.30 - 18.00
	80 m to 100 m	07.00 - 19.00

Table 7.18 Predicted Noise Impacts (Pile Caps)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Ground Excavation					
Unmitigated	88	84	80	76	74
With quietened equipment	78	74	70	66	64
With quietened equipment and barrier	68	64	60	56	54
Reinforcement					
Unmitigated	81	77	73	69	67
With quietened equipment (compressor only)	81	77	73	69	67
With barrier or quietened crane	71	67	63	59	57
Concreting					
Unmitigated	86	83	78	74	72
Reduced equipment: breakers only	79	75	71	66	65
Reduced equipment: mixer truck and vibrators only	85	82	77	73	71
Breakers only with barrier	69	65	61	56	55
Mixer truck and vibrators only with barrier	75	72	67	63	61
Backfilling					
Unmitigated	77	73	69	64	63
With barrier	67	63	59	54	53

7.4.11 During ground excavation, the use of quietened equipment is generally expected to be sufficient to reduce construction noise to 75 dB(A) or less at facades over 30 m away. For facades closer than 30 m, a temporary noise barrier may be required as well.

7.4.12 During reinforcement fixing, the use of a super-silenced compressor would be expected to have a negligible effect, since the contribution of the compressor to the overall noise level is slight. To reduce noise levels at facades within about 50 m of the works to 75 dB(A) or less, a barrier at the mobile crane (or a silenced crane, if available) will be required.

7.4.13 During concreting, equipment used during a pour (concrete mixer trucks and vibratory pokers) would require a barrier if noise levels of 75 dB(A) or less were to be achieved at 20 m. Similarly, if set concrete required breaking within about 30 m of a sensitive facade, barriers would be required to reduce the noise levels to 75 dB(A).

7.4.14 During backfilling, it is likely that a barrier would be required if the nearest sensitive facade was within about 20 m of the PME.

Table 7.19 Predicted Noise Impacts (Column Construction)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Reinforcement					
Unmitigated	81	77	73	69	67
With quietened equipment (compressor only)	81	77	73	69	67
With barrier or quietened crane	71	67	63	59	57
Concreting					
Unmitigated	86	82	78	74	72
With quietened equipment (pump truck)	85	82	77	73	71
With quietened equipment and barrier	75	72	68	64	62

7.4.15 During reinforcement fixing, the use of a super-silenced compressor would be expected to have a negligible effect, since the contribution of the compressor to the overall noise level is slight. To reduce noise levels at facades within about 50 m of the works to 75 dB(A) or less, a barrier at the mobile crane (or a silenced crane, if available) will be required.

7.4.16 During concreting, it may be necessary to employ quietened equipment where available, and install temporary barriers to keep noise levels at sensitive facades within about 20 m to 75 dB(A).

Table 7.20 Predicted Noise Impacts (In-situ Superstructure Construction)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Formwork and Reinforcement					
Unmitigated	86	82	78	74	72
With quietened compressor	86	82	78	74	72
Equipment reduction: one of each piece of PME	83	79	75	71	69
Equipment reduction and barriers	73	69	65	61	59
Concreting					
Unmitigated	87	83	79	75	73
With quietened equipment (pump truck)	86	83	78	74	72
With quietened equipment and reduced equipment (one of each piece of PME)	83	80	75	71	69
As above, with barriers	73	70	65	61	59

7.4.17 During placement of formwork and reinforcement, the need for mitigation is anticipated if sensitive facades are within about 70 m of the activity. The use of a super silenced compressor has a negligible effect, since it does not contribute significantly to the overall anticipated noise level. To achieve a noise level of 75 dB(A) at about 50 m, it may be necessary to reduce equipment numbers operating at one time to one each of cranes, compressors and winches. To achieve a noise level of 75 dB(A) at 20 m, it may be necessary to reduce equipment numbers and use temporary noise barriers.

7.4.18 During concreting, noise levels may exceed 75 dB(A) at NSR facades within about 80 m of the activity, due to the requirement for greater numbers of equipment. A combination of quietened equipment, reduced numbers of PME, and barriers may be necessary to reduce noise levels to 75 dB(A) at facades 20 m away.

Table 7.21 Predicted Noise Impacts (Placement of Prefabricated Superstructure)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Unmitigated	85	82	77	73	71
With quietened equipment (lorries and cranes)	75	72	67	63	61
With quietened equipment and barriers	65	62	57	53	51

7.4.19 This activity is expected to take place during the evening hours only, due to safety and logistical requirements. Consequently, a Construction Noise Permit must be obtained, and its conditions (including the Acceptable Noise Level) observed. Assuming the NSRs have an Area Sensitivity Rating (ASR) of "B", evening placement of precast elements is expected to require the use of quietened equipment and barriers.

Table 7.22 Predicted Noise Impacts (Surfacing)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Unmitigated	80	77	72	68	66
With quietened compressor	80	77	72	68	66
Reduced equipment: asphalt paver and compressor only	78	75	70	66	64

7.4.20 For receivers within about 40 m, mitigation is expected to be required. The use of a super silenced compressor achieves a negligible noise reduction, since the compressor contributes little to the overall noise level. If the asphalt paver and road roller are not used concurrently, facade noise levels are expected to be below 75 dB(A) at 30 m. If it is possible to further quieten the paver and road roller by partial engine enclosure, further reductions capable of reducing facade noise levels to 75 dB(A) at 20 m may be possible; if not, noise levels exceeding the 75 dB(A) guideline may be experienced for a short duration at a small number of NSRs during this mobile activity.

Table 7.23 Predicted Noise Impacts (Drainage)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Excavation of trench					
Unmitigated	87	83	79	75	73
With quietened equipment	77	73	69	65	63
With quietened equipment and barriers	67	63	59	55	53
Placement of pipe					
Unmitigated	81	77	73	68	67
With quietened equipment (crane)	71	67	63	58	57

7.4.21 During trench excavation, noise levels exceeding 75 dB(A) may be experienced at NSR facades within about 80 m of the activity. If quietened equipment is used, facades 30 m away would be expected to experience noise levels of 75 dB(A) or less. To achieve the 75 dB(A) daytime requirement at facades 20 m from the activity, quietened equipment would have to be supplemented with temporary barriers.

7.4.22 Placement of pipe is not expected to generate noise levels over 75 dB(A) at sensitive facades over about 40 m from the activity. For sensitive facades within 40 m, the daytime noise limit of 75 dB(A) can be achieved with the use of quietened equipment.

Table 7.24 Predicted Noise Impacts (Sheet Piling)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Insertion of Sheet Piling					
Drop hammer (unmitigated)	98	94	90	85	84
Diesel hammer (unmitigated)	101	97	93	88	87
Extraction of Sheet Piling					
Unmitigated	94	90	86	81	80
With barrier	84	80	76	71	70

7.4.23 The insertion of sheet piles entails the use of percussive piling equipment. Consequently, a Construction Noise Permit will be required. The hours of operation during which the percussive piling equipment may be used will likely be restricted as shown in the following table:

Table 7.25 Hours of Operation (Percussive Piling)

Piling Method	Distance to Nearest NSR Facade	Permitted Hours of Operation (non-holidays only)
Drop hammer driving sheet steel pile	20 m	08.00 - 09.00 and 12.30 - 13.30 and 17.00 - 18.00
	30 to 80 m	08.00 - 09.30 and 12.00 - 14.00 and 16.30 - 18.00
	100 m	07.00 - 19.00
Diesel Hammer driving sheet steel pile	20 to 30 m	08.00 - 09.00 and 12.30 - 13.30 and 17.00 - 18.00
	50 to 100 m	08.00 - 09.30 and 12.00 - 14.00 and 16.30 - 18.00

7.4.24 Extraction of the sheet piles requires use of a vibratory extractor, which generates a high sound power level. Consequently, the need for a temporary barrier may be necessary to reduce noise at facades about 50 m away to 75 dB(A). NSR facades within 50 m of the extractor may be exposed to noise levels exceeding 75 dB(A) during operation of the extractor. The contractor may be required to determine the sound power level of his equipment and whether it can be reduced to permit the 75 dB(A) noise limit to be achieved at nearby NSRs.

Table 7.26 Predicted Noise Impacts (Retaining Walls)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Ground excavation					
Unmitigated	87	83	79	75	73
With quietened equipment	77	73	69	65	63
With quietened equipment and barrier	67	63	59	55	53
Concreting					
Unmitigated	84	81	76	72	70
With barriers	74	71	66	62	60
Backfilling					
Unmitigated	87	84	79	75	73
With quietened equipment	80	76	72	68	66
With quietened equipment and barriers	70	66	62	58	56

7.4.25 The PME required for ground excavation can be expected to generate a facade noise level of 75 dB(A) at a distance of 80 m. To reduce this noise level, quietened equipment may be used. If the barrier effect of temporary purpose-built barriers or the retaining wall itself is considered, the 75dB(A) daytime noise limit should be achievable 20 m from the notional PME source position.

7.4.26 The natural barrier effect of the retaining wall is also expected to reduce the noise of concreting to 75 dB(A) or below at NSRs 20 m from the site.

7.4.27 Backfilling entails the use of a dumptruck and excavator, which generate high noise levels. Quietened equipment, in combination with the natural barrier effect of the retaining wall, are expected to reduce the facade noise level to 75 dB(A) or less at NSR facades 20 m from the notional source position.

Table 7.27 Predicted Noise Impacts (Road Construction)

Task and Mitigation	Facade Noise Level (dB(A)) at:				
	20 m	30 m	50 m	80 m	100 m
Levelling of new road					
Unmitigated	86	82	78	74	72
With quietened equipment (grader and bulldozer)	76	72	68	64	62
Laying base and sub-base					
Unmitigated	86	83	78	74	72
With quietened equipment (dumptruck and roller)	76	73	68	64	62
Kerbing					
Unmitigated	85	81	77	72	71
Equipment reduction: mixer truck only	78	74	70	65	64
Equipment reduction: saw only	84	80	76	71	70
Mixer truck and barrier	68	64	60	55	54
Saw and barrier	74	70	66	61	60
Laying new surface					
Unmitigated	84	80	76	71	70
Equipment reduction: spreader only	83	79	75	70	69
Equipment reduction: roller only	77	73	69	64	63

7.4.28 During levelling of the new road, concurrent use of the bulldozer and grader may result in noise levels over 75 dB(A) at facades within about 80 m of the alignment. If quietened equipment is employed, the 75 dB(A) daytime noise limit may be achievable at facades within about 25 m of the alignment. Closer facades may be briefly exposed to noise levels of about 76 dB(A) for brief periods during this mobile activity.

7.4.29 During laying of the base and sub-base, concurrent use of the dumptruck and roller may result in noise levels over 75 dB(A) at facades within about 80 m of the alignment. If quietened equipment is employed, the 75 dB(A) daytime noise limit may be achievable at facades within about 25 m of the alignment. Closer facades may be briefly exposed to noise levels of about 76 dB(A) for brief periods during this mobile activity.

7.4.30 Noise generated during kerb formation by a concrete mixer truck may be mitigated to 75 dB(A) at a distance of 20 m with the use of a temporary noise barrier. The barrier will also be necessary for noise reduction during use of the concrete saw.

7.4.31 Laying of the new surface will require use of an asphalt spreader with chipper and a road roller. If these two pieces of equipment are not used concurrently, the 75 dB(A) daytime noise guideline may be achievable at 50 m (during use of the asphalt spreader) and 30 m (during use of the road roller). For sensitive facades within these distances, higher noise levels may be experienced for a short time during this mobile activity.

7.5 Conclusions

7.5.1 The need for mitigation measures is anticipated as shown in the following table. All activities are assumed to be carried out during daytime hours only (17.00 to 19.00 hours) with the exception of placement of precast structural elements.

Table 7.28 Summary of Need for Noise Mitigation Measures during Construction

Activity	Mitigation Required at	
	< 50 m	< 100 m
Road Removal: breaking existing surface	yes	yes
Road Removal: removal of existing surface	no	no
Road Removal: scarifying for overlay	no	no
Piling: bored piling	yes	no
Piling: concreting	no	no
Pile Caps: ground excavation	yes	no
Pile Caps: reinforcement	no	no
Pile Caps: concreting	yes	no
Pile Caps: backfilling	no	no
Column Construction: reinforcement	no	no
Column Construction: concreting	yes	no
In-situ superstructure construction: formwork	yes	no
In-situ superstructure construction: concreting	yes	no
Placement of prefabricated superstructure*	yes	yes
Road Surfacing	no	no
Drainage: excavation of trench	yes	no
Drainage: placement of pipe	no	no
Sheet piling: extraction	yes	yes
Retaining Walls: ground excavation	yes	no
Retaining Walls: concreting	yes	no
Retaining Walls: backfilling	yes	no
Road Construction: levelling of new road	yes	no
Road Construction: laying base and sub-base	yes	no
Road Construction: kerbing	yes	no
Road Construction: laying new surface	yes	no

* Evening activity, subject to more stringent noise limits and requiring Construction Noise Permit.

8 TRAFFIC NOISE IMPACT (OPERATION PHASE)

8.1 Introduction

8.1.1 There are presently a large number of Noise Sensitive Receivers (NSRs), both existing and under construction, along Castle Peak Road. Several constraints, including topography and the existing shoreline, have limited the options for aligning the improved road. For this reason, predicted traffic noise impacts are significant and will require extensive mitigation.

8.1.2 The assessment assumes that Castle Peak Road is widened to a dual-2 carriageway throughout the study area except in Sham Tseng, where the alignment is already a dual-2 carriageway. Traffic management measures will be implemented to handle the increased traffic in Sham Tseng.

8.1.3 Traffic noise predictions are provided in Annexe D, and are discussed below.

8.2 Mitigation Measures

Barriers

8.2.1 Mitigation has been considered and is discussed below.

8.2.2 Structural loadings resulting from unobstructed typhoon winds off the sea require that barriers 3m and higher have very deep foundations or wide footings, and wide bases. As height increases, foundations become progressively deeper and more difficult to construct. For example, 5-m barriers would require foundation depths of at least 3 m. For this reason, unlimited barrier heights have not been considered. Barrier heights of 0.8 m (standard concrete profile barrier), 3 m, 5 m and 7 m have been modelled during the course of this study, but are not reported in detail in this EIA.

8.2.3 The design and implementation of noise barriers should comply with Highways Department's *Structures Design Manual for Highways and Railways* (Section 18.6):

> The prior agreement of the Chief Highway Engineer/Structures shall be obtained at an early stage in the design of a project for incorporating any noise mitigation measures on highway structures. Noise barriers may be incorporated on highway structures provided full justification for the need for such and the advantages of such over other alternative noise mitigation arrangements are given. The design and detailing of the barriers shall be such that they are relatively maintenance free, easy to clean and detachable in accordance in Clause 18.3. The panels shall be adequately fixed or anchored to the supporting frames so that they will not come loose and fall out of the structure in case of collision impact.

8.2.4 Barriers must not impair access to buildings by Fire Services appliances. An appliance must be able to reach within 30 m unimpeded distance of dwellings of 3 storeys or less, and must have immediate access to highrises. Where barriers obstruct existing fire hydrants, additional fire hydrants may be required (Fire Services requirements are specified in Sections 8.3 and 8.4). Barriers must be built of fire resistant materials. A resistant period of 2 hours was required for materials used on the recent Route 5 project.

8.2.5 Where NSRs are present opposite a proposed barrier, the barrier should be provided with an absorptive finish to reduce reflection of noise.

8.2.6 Noise barriers should not conflict with waterworks installations.

Full and Partial Enclosures

8.2.7 Full enclosures (enclosed top and sides) and partial enclosures (at least one side open) have been considered in this study. However, their engineering practicability (in particular, adequate space and ground conditions required for stable foundations) is not assured and must be confirmed in subsequent stages of the project.

8.2.8 Enclosures must comply with Table 3.3.5.1 of the Transport Planning and Design Manual (Volume 2). This table states sight distances that must be provided on the approaches to and through junctions, accesses, weaving sections and points of vehicular and pedestrian conflict. For a design speed of 70 kph, a sight distance of 125 m is desirable, and may not be less than 95 m.

8.2.9 Enclosures must not interfere with firefighting operations, and should not block direct emergency vehicular access to properties. A Fire Services appliance must be able to reach within 30 m unimpeded distance of dwellings of 3 storeys or less, and must have immediate access to highrises. FSD requirements rule out the use of a full enclosure near Hanley Villa, and result in the need for additional fire hydrants, FSD radio telephone communications system, and fire services installations at other locations. Fire Services requirements are specified in Sections 8.3 and 8.4.

8.2.10 The prior approval of the Chief Highway Engineer/Structures to the use of noise covers or noise enclosures should be obtained at an early stage in the design, where special considerations indicate that such provision is inevitable in order to protect the nearby existing development from noise impacts, or if the development potential of adjacent proposed developments is of utmost importance and would not be able to proceed without the noise covers, even when all viable alternative noise mitigation measures have been adopted.

8.2.11 Air within enclosures will be contaminated by vehicle pollutants. In the case of a full enclosure, vitiated air will be exhausted through the ventilation stack (with forced ventilation) or the portals. Similarly, pollutant dispersion will be constrained by partial enclosures. Consequently, if full or partial enclosures are determined to be feasible at later design stages, their air quality impacts will have to be considered prior to commitment.

8.2.12 Noise enclosures should not conflict with waterworks installations.

Friction Course

8.2.13 Friction course provides a surface capable of reducing traffic noise by about 3.5 dB(A) relative to the basic noise level calculated in the CRTN methodology.

8.2.14 Highways Department considers that friction course is not suitable for Castle Peak Road. Major requirements for the road pavement are that it must be durable and resist traffic loading effects over its life. At the moment, there is no durable friction course material available in the market which is suitable for local road conditions. The frequent stopping and braking of vehicles along Castle Peak Road, resulting from the presence of run-ins and junctions, would lead to rapid deterioration of the friction course. Maintenance problems would result in high maintenance costs and frequent maintenance works that would disrupt traffic and would be a nuisance to local residents. Consequently, bituminous wearing course material is recommended along this part of Castle Peak Road.

8.2.15 Use of friction course over only part of the roadway width (to permit recessed "run-in" lanes to be paved with impervious asphalt) is not considered practicable due to maintenance problems. The drainage path of the water inside the friction course material would be stopped by the recess lane, resulting in failure of the friction course material at the interface area.

8.2.16 Highways Department and EPD are currently conducting trials of modified friction course mixes on local roads to determine whether a more durable and effective low-noise surface can be obtained. The findings of the trials are expected to be available in mid 1997. Therefore, the results of the testing may be established before the completion of works along Castle Peak Road. If a more durable mix is proven for use in Hong Kong, it may be considered at future stages of the project as an effective mitigation measure.

Indirect Technical Remedies

8.2.17 Mitigation at the receiver would normally take the form of appropriate glazing (in line with the recommendations in Appendix 4.4, "Suitable Window Types for Noise Insulation", of the HKPSG Environmental Guidelines) and air conditioning at affected sensitive facades.

Mitigation Strategies

8.2.18 Two mitigation strategies have been formulated in this Study.

8.2.19 The first mitigation strategy, contained in Annexe J, outlines the measures required to meet HKPSG standards at as many NSRs as possible. This involves full or partial enclosures along most of the alignment. On the basis of existing information, preliminary engineering assessments of the feasibility of the first mitigation strategy have been made and are presented in Table J1. In most cases, extensive barriers and enclosures are considered infeasible. However, more detailed site information will become available during subsequent design stages of the project, which may indicate that mitigation measures currently considered infeasible are possible. If this is the case, then all or part of the first mitigation strategy may be further considered.

8.2.20 Where enclosures are found to be feasible on engineering grounds, feasibility on air quality grounds must also be determined. The overall feasibility of a full or partial enclosure will thus be a function of both the engineering and environmental aspects. In order to avoid abortive work, air quality implications have been assessed only for road enclosures that are part of the recommended mitigation strategy identified in the following paragraph.

8.2.21 The second mitigation strategy is limited to mitigation measures that are considered actually feasible at this stage of the project. This strategy is shown in Figures 8.1 to 8.8, and summarised in Table 8.2.

8.3 Traffic Noise Impact Assessment

Ka Loon Tsuen

8.3.1 *Noise impact and possible noise mitigation measures:* Traffic noise levels are expected to exceed the HKPSG standards at the remaining village houses in Ka Loon Tsuen (represented by SR-1), most of which are on a steep slope overlooking the road. Roadside barriers up to 3 m have little effect on noise levels at higher elevations. Noise reductions are achieved with higher barriers, but barriers up to 7 m fail to reduce the noise to HKPSG standards. A cantilevered barrier over the eastbound carriageway, or a partial enclosure over the eastbound and westbound carriageways (open on the seaward side) from Ch 1200 to Ch 1700, is predicted to reduce traffic noise at Ka Loon Tsuen to below HKPSG standards. However, high barriers and enclosures are deemed technically infeasible at this stage, since the piles required for the structures would entail resumption of properties (refer to Table J1).

8.3.2 *Recommended noise mitigation measures:* Mitigation at the receiver is considered to be the most effective form of mitigation for Ka Loon Tsuen and Bayside Villas.

8.3.3 *Considerations for subsequent studies:* If an enclosure from Ch 1200-1700 is considered feasible at a later stage, it may require the installation of additional fire hydrants, a FSD radio telephone communication system and fire services installations. Bus-stops at Ka Loon Tsuen may have to be reprovisioned to avoid placing them within the enclosure.

Grand Bay

8.3.4 *Noise impact and possible noise mitigation measures:* This lowrise development is represented by SR-3. Though the new alignment removes the road from its present proximity to this NSR, future traffic noise levels are still expected to exceed the HKPSG criterion. A continuous 5-m or 7-m barrier would be expected to achieve the HKPSG standard at all storeys. However, the problems with a barrier at this site are:

(a) To permit adequate sight-lines for vehicles entering and exiting the bus bay in front of Grand Bay Villas (see Drg. 97294/R/002 in Volume 5 (Drawings)), the barrier must be located around the back of the bus bay, not along the main alignment.

(b) The barrier must include a wide gap (to accommodate one incoming and one outgoing vehicle) allowing access to Grand Bay Villas. This would entail a gap of about 7-8 m in the 40-45 m frontage of Grand Bay Villas (i.e., about 20 percent of the frontage). Such a wide gap would greatly compromise the effectiveness of an expensive 4- to 5-m high barrier. In addition, this high barrier would be only about 5 to 10 m from the facade of Grand Bay Villas, which would have a great visual impact on the residents of the Villas.

(c) An overlapping barrier will eliminate the problems associated with an access gap, but the overlap must be wide enough to allow two vehicles to pass. Such a wide overlap will require narrowing the bus bay and/or removing part of the Grand Bay Villas carpark, neither of which is considered acceptable.

Despite these problems, a barrier (either straight or overlapping) is desirable, and the next stage of the study should examine whether the technical constraints can be overcome to provide direct technical remedies to this NSR.

8.3.5 *Recommended noise mitigation measures:* Mitigation at the receiver is considered to be the most effective form of mitigation for Grand Bay Villas.

Tsing Lung Tau and Angler's Beach

8.3.6 *Noise impact and possible noise mitigation measures:* At Hong Kong Gardens, blocks adjacent to Castle Peak Road shield those behind from traffic noise. Thus, the NSRs represented by SR-4 (Woodland Heights, Venus Heights, Unicorn Heights, and Triumphant Heights), SR-6 (Peony Heights, Orchid Heights, Nelly Heights, Manhattan Heights, Lincoln Heights, Kingston Heights, Hoover Heights, Grenville Heights, Fontana Heights, Estoril Heights, Dominion Heights, and Carmel Heights), SR-7 (unnamed 4-storey blocks) and SR-9 (Blocks 5 and 6) are not expected to be exposed to traffic noise levels exceeding the HKPSG standards.

8.3.7 Blocks adjacent to the improved roadway are expected to be exposed to noise levels exceeding HKPSG standards. These blocks include those represented by SR-5 (Savoy Heights, Regent Heights, Queens Heights) and SR-8 (Blocks 1 to 4). Calculations show that 0.8-m and 3-m barriers have no effect on facade traffic noise at Hong Kong Gardens; 5-m and 7-m barriers would result in some reduction of traffic noise at the lowermost storeys, but not below HKPSG standards. A partial enclosure covering eastbound and westbound carriageways (open on the seaward side), with a break for the access to Hong Kong Gardens, would reduce traffic noise levels at these NSR facades to below the HKPSG standard. However, a partial enclosure is not considered feasible at this stage due to the need for access gaps and to the safety risks for eastbound drivers exiting the enclosure near a roundabout.

8.3.8 Lung Tang Court, represented by SR-10, is also expected to be exposed to noise levels exceeding HKPSG standards. Five-metre barriers are predicted to reduce traffic noise to HKPSG limits at lower levels of this NSR, and are consequently recommended.

8.3.9 The front row of housing in Yuen Tun Village (represented by SRs 11 and 12) is presently not affected by traffic noise exceeding HKPSG standards, but is expected to be exposed to noise exceeding these standards with the improvement of the road. Barriers of 3.5 m are expected to be capable of reducing traffic noise to below HKPSG standards at these NSRs, and are consequently recommended.

8.3.10 Dragon Villa and Villa Alfa Vista (represented by NSRs 40-1 and 40-2) currently experience traffic noise levels exceeding HKPSG standards, and these levels are expected to increase in 2011. Barriers up to 3 m will have no effect on the top storeys of Villa Alfa Vista. A cantilevered barrier along the westbound carriageway is expected to be capable of reducing noise at these NSRs to the HKPSG standard. However, its foundation requirements render it infeasible at this stage, and it would have a severe visual impact by blocking the seaview of lowrise houses at Tsing Lung Tau and Yuen Tun Villages.

8.3.11 *Recommended noise mitigation measures:* A 5-m barrier along the eastbound carriageway, extending from approximately Ch 2700 to Lung Yue Road (Figures 8.1 and 8.2) is recommended to shield the midrise Lung Tang Court. A 3.5-m barrier along the eastbound carriageway, extending from Lung Yue Road to about Ch. 3000 (Figures 8.1 and 8.3), to protect the low-rise NSRs at Tsing Lung Tau Village, is also recommended. If barriers are installed, existing fire hydrants may have to be relocated and/or additional fire hydrants may be required. For NSRs still exposed to noise levels exceeding the HKPSG standard, indirect technical remedies are recommended for eligible facades.

8.3.12 *Considerations for subsequent studies:* During subsequent design stages, the actual road geometry and space constraints will be determined. If space constraints and sight-line requirements permit, partial enclosures over eastbound and westbound carriageways (open on the seaward side) of 500 m (extending from Ch 2250 to Ch 2750, with a break for access to Hong Kong Gardens) and 200 m (extending from Ch 2850 to Ch 3050) may also be considered. With this option, additional fire hydrants, a FSD radio telephone communication system and fire services installations may also have to be provided. Bus-stops near Tsing Lung Tau village and Dragon Villa may have to be reprovisioned to avoid placing them within the enclosure.

<u>Dragon and Angler's Beaches</u>

8.3.13 *Noise impact and possible noise mitigation measures:* At highrise Sea Crest Villas Phase IV (represented by SRs 13-1 to 13-3), future traffic noise levels are expected to exceed HKPSG standards except at lower-level facades of Blocks 12 and 13, which are shielded from Castle Peak Road by a podium. Block 11 is not completely shielded by the podium. Roadside barriers of 0.8 m and 3 m have little effect at Blocks 12 and 13. A 3-m barrier from Ch 3400 to Ch 3530 shields the bottom storeys of Block 11, but compromises Fire Services access to the adjacent property (opposite No. 37 Castle Peak Road) and is therefore considered infeasible. A cantilevered barrier along the eastbound carriageway in front of the development would be expected the shield all facades in this development, but is considered infeasible at this stage of the study due to land constraints (refer to Table J1). In addition, the need for gaps to provide access to roadside developments would compromise the effectiveness of the costly cantilevered structure.

8.3.14 At the 29-storey Sea Crest Villas Phase III (represented by SRs 15-1 to 15-4), future traffic noise levels are expected to exceed HKPSG standards except at the lower-level facades of the three western towers, which are shielded from Castle Peak Road by a podium. Barriers of 0.8 m have no effect. Barriers up to 7 m would protect some lower-storey facades, but would have virtually no effect above the tenth storey. A 350-m partial enclosure covering the eastbound and westbound carriageways (open on the seaward side) would shield all Phase III facades facing Castle Peak Road from noise levels over HKPSG limits. However, a partial enclosure is considered infeasible at this stage of the study due to land constraints and road safety considerations (refer to Table J1).

8.3.15 *Recommended noise mitigation measures:* For NSRs exposed to noise levels exceeding the HKPSG standard, indirect technical remedies are recommended for eligible facades.

8.3.16 *Considerations for subsequent studies:* During subsequent design stages, the actual road geometry and space constraints will be determined. If space constraints and sight-line requirements permit, partial enclosures of 200 m (extending from Ch 3250 to Ch 3450) and 350 m (Ch. 3500 to Ch. 3850) may also be considered. With this option, additional fire hydrants and a FSD radio telephone communication system may also have to be provided. Bus-stops near Sea Crest Villas Phase III may have to be reprovisioned to avoid placing them within the enclosure.

<u>Sham Tseng</u>

8.3.17 *Noise impact and possible noise mitigation measures:* Facades at Sea Crest Villa Phase II (SRs 15-5 and 15-6) currently experience traffic noise levels within HKPSG standards. Facades above the tenth storey may experience traffic noise levels slightly over the HKPSG standards in 2011. Vertical barriers would not be capable of reducing traffic noise at these upper elevations.

8.3.18 The podium at Sea Crest Villa Phase I (SR 41-1 to 41-5) affords protection to a number of bottom-storey facades. However, at the fifth storey, podium shielding has diminished, and HKPSG exceedances are expected at most exposed facades. Barriers up to 7 m have a minimal effect (less than 0.5 dB(A)) above the fifth storey, and fail to reduce facade noise to the HKPSG maximum at and above this level. HKPSG standards may be met with an enclosure.

8.3.19 At Lido Gardens, southern facades facing the sea are not expected to experience traffic noise levels exceeding the HKPSG maximum. Northern facades facing the existing alignment (SRs 16-1 and 17-1), which currently experience traffic noise levels greatly exceeding HKPSG standards, will continue to experience high traffic noise levels.

Barriers up to 7 m high reduce traffic noise at the bottom few residential storeys to below the HKPSG maximum. At the fifth storey, roadside barriers up to 7 m high are capable of providing noise reduction, but not to HKPSG standards. An enclosure would provide the shielding required to reduce facade noise levels to HKPSG standards.

8.3.20 In Sham Tseng Village (representative SRs 18 and 19), exposed facades facing the existing alignment currently experience, and will continue to experience, traffic noise levels greatly exceeding HKPSG standards. Barriers reduce traffic noise at the upper storeys in the Sham Tseng Tsuen Village Area, but a barrier height of over 3m is necessary to shield the upper levels in closest NSRs. If barriers are installed, additional fire hydrants would be required. The barrier must not block the direct emergency vehicular entrance to Sham Tseng Tsuen near the nullah.

8.3.21 At Rhine Gardens (represented by SR 20-1 to 20-3), existing traffic noise levels at southern facades greatly exceed the HKPSG criterion. Future traffic noise levels will continue to do so, and barriers up to 7 m fail to provide adequate shielding capable of reducing noise to HKPSG standards. An enclosure would provide the shielding required to reduce facade noise levels to HKPSG standards.

8.3.22 At the CDA sites occupying the present San Miguel Brewery (SRs 42-1 to 42-4), Garden Bakery, and Union Carbide grounds, future noise levels are expected to exceed HKPSG criteria at the site boundary adjacent to Castle Peak Road. No plans are available for the proposed developments (if any) at these sites[1], so traffic noise levels at actual facades are not predicted. Roadside barriers are likely to be ineffective at CDA facades if the facades are highrise. A full enclosure would bring facade noise levels at higher elevations to HKPSG standards. As an additional measure, future sensitive developments at the CDA sites could incorporate self-protecting features such as podiums or other noise-tolerant uses close to the roadway, barriers on podiums, or an interior layout that orients non-sensitive facades to the northern site perimeter.

8.3.23 In conclusion, the close proximity of highrise receivers to both sides of the existing alignment in Sham Tseng restricts the opportunities for noise mitigation. Barriers are generally unable to reduce traffic noise to HKPSG standards at elevations higher than the bottom one or two storeys, and are thus not considered an effective form of mitigation. A full enclosure through the town would be capable of reducing facade noise levels to HKPSG standards. However, it is not considered feasible given space limitations, sight-line requirements, and road access requirements. Similarly, a barrier along the eastbound carriageway in the village would shield sensitive facades in Sham Tseng Tsuen (SR 18), but would in practice be compromised by the need to provide a break maintaining direct emergency vehicular entrance to Sham Tseng Tsuen near the nullah (as required by FSD). Further, objections to the barrier may be lodged by commercial operators at the ground floor of the protected buildings, whose shops will no longer be visible from the roadway.

[1] Subsequent to the completion of modelling for this EIA and issue of the first Draft Final Report, the CDA proposal for the Union Carbide and San Miguel Brewery sites were approved by the Town Planning Board.

8.3.24 *Recommended noise mitigation measures:* While it is desirable to implement direct technical remedies along this road section, constraints outlined in the preceeding paragraph render direct technical remedies infeasible. Alternatively, facades that are subject to noise levels exceeding the HKPSG criterion may be mitigated through indirect technical remedies unless they fail to meet the criteria outlined in Section 3.2 above. One of these criteria specifies that indirect mitigation measures are appropriate only for sensitive facades affected by the noise from new roads. Since the existing roadway is dual-2 through Sham Tseng and is not expected to be further widened, it is considered to be neither a new nor an improved road. Consequently, indirect technical remedies are not considered applicable in the Sham Tseng area.

8.3.25 *Considerations for subsequent studies:* The possibility of incorporating mitigation measures within the new CDA and Further Reclamation developments may be examined.

<u>Gemini</u>

8.3.26 *Noise impact and possible noise mitigation measures:* Pink Villas (SRs 21-1 and 21-2) will be partly protected by topography from Castle Peak Road noise. However, at upper storeys, traffic noise levels are expected to exceed the HKPSG maximum. A partial enclosure over the eastbound and westbound carriageways (open on the seaward side) would shield sensitive western facades at Pink Villas, but is considered infeasible since its foundations, and the structure itself, will require removal of part of the headland due to land constraints. It was agreed earlier in the study that this headland was an absolute constraint and should be preserved. A cantilevered barrier cannot be installed along this part of the alignment for the same reason.

8.3.27 A cantilevered barrier along the eastbound carriageway would shield eastern facades of three units from traffic noise over the HKPSG standard. The cantilevered barrier would have to be constructed largely on a viaduct, which would require significant strengthening to deal with wind loading. While a cost-effectiveness study for mitigation measures is beyond the scope of this study, such a cantilevered barrier is likely to be considered impractical in terms of its costs, considering the small number of receivers it benefits.

8.3.28 *Recommended noise mitigation measures:* Mitigation at sensitive facades should be considered for eligible NSRs.

<u>Lido Beach</u>

8.3.29 *Noise impact and possible noise mitigation measures:* A significant number of lowrise NSRs, mostly detached single homes (SRs 23 to 26), are currently exposed to varying traffic noise levels, some of which exceed HKPSG standards. Future traffic noise levels are expected to exceed HKPSG standards at facades exposed to the improved road. Sensitive facades north of the improved alignment are on a steep slope overlooking the road. Barriers up to 7 m fail to reduce traffic noise to within the HKPSG standard, and would in practice be compromised by the need to provide frequent breaks for access at Ch. 5800 (eastbound carriageway), Ch. 5950 (eastbound carriageway), Ch. 6000 (eastbound carriageway), Ch. 6100 (eastbound carriageway), Ch. 6150 (westbound carriageway) and Ch. 6250 (eastbound and westbound carriageways). A partial enclosure over the eastbound and westbound carriageways (open on the seaward side or incorporating a 3-m barrier on the seaward side), extending from Ch. 6000 to Ch. 6400, would be capable of reducing traffic noise at these NSRs to within HKPSG standards. However, an enclosure would in practice require the same access-point breaks as the barrier, which would compromise its effectiveness. Further, an enclosure has significant safety risks for drivers along this stretch of the alignment (refer to Table J1).

8.3.30 With the exception of Riviera Apartments (SR 25), sensitive facades south of the improved alignment are on ground significantly lower than the road. The standard viaduct structure is expected to provide shielding to these low-level NSRs.

8.3.31 At Riviera Apartments, a barrier along the westbound carriageway is not considered practicable for the following reasons:

(a) To permit adequate sight-lines for vehicles entering and exiting the bus bay adjacent to Riviera Apartments, the barrier must be located around the back of the bus bay, not along the main alignment.

(b) The access point to Riviera Apartments is an elevated driveway, which will join the road at the junction of the new alignment and the bus bay, on a curve. The sight-line requirements of such a 3-way junction will be paramount, and will mean that a large gap of about 20 m is required in the barrier immediately adjacent to the northern corner of Riviera Apartments. This gap will leave two of the building's four facades unprotected.

(c) Space around the bus bay is extremely constrained. For example, there is only about 8 m between the edge of the bus bay and the facade of Riviera Apartments. It will be very difficult to install a barrier in the highly constrained area. The bus bay itself cannot be reduced in size since it must accommodate not only a KMB bus-stop, but also a drop-off point for taxis and minibuses, and limited parking for Casam and Lido Beaches.

8.3.32 *Recommended noise mitigation measures:* Mitigation at sensitive facades should be considered for eligible NSRs.

<u>Ting Kau</u>

8.3.33 *Noise impact and possible noise mitigation measures:* At the western end of this area (near the Route 3 Ting Kau Bridge), the situation is expected to be similar to that at Lido and Casam Beaches. A significant number of lowrise NSRs north of the alignment, mostly detached single homes (SR 27), are currently exposed to varying traffic noise levels, some of which exceed HKPSG standards. Future traffic noise levels are expected to exceed HKPSG standards at facades exposed to the improved road. Sensitive facades north of the improved alignment are on a steep slope overlooking the road, and barriers up to 7 m fail to reduce traffic noise at all facades to within the HKPSG standard. A partial enclosure over the eastbound and westbound carriageways (open on the seaward side) from Ch. 6650 (immediately east of the roundabout) to Ch. 6850 is predicted to reduce traffic noise levels to below HKPSG standards. However, an enclosure is not considered feasible at this stage of the study due to multiple land constraints and road safety considerations (refer to Table J1).

8.3.34 Sensitive facades south of the improved alignment (SRs 28, 29, and 30) are on ground significantly lower than the road. Toward the western end of the area, no mitigation is required. Further west, mitigation is required, but can be achieved with a standard 0.8-m concrete profile barrier along with westbound carriageway from Ch. 6700 to Ch 7350. The concrete profile barrier will be installed for safety reasons as well.

8.3.35 *Recommended noise mitigation measures:* A 0.8-m concrete profile barrier along the westbound carriageway (Figures 8.4a and 8.4b) would reduce traffic noise to below the HKPSG criterion at facades of NSRs south of the alignment. Mitigation at sensitive facades may be considered for eligible NSRs north of the road.

8.3.36 *Considerations for subsequent studies:* If space constraints permit, an enclosure of 150 m (from Ch. 6700 to Ch. 6850) may be considered. With this option, additional fire hydrants, a FSD radio telephone communication system, and possibly fire services installations may also have to be provided.

8.3.37 An alternative alignment at Ting Kau has been proposed to minimize landtake through the adjacent area of secondary woodland. The alignment between Ch 6900 and Ch 7250 has been modified to avoid loss of woodland by shifting the westbound carriageway as close to the existing Castle Peak Road alignment as possible, and raising the eastbound carriageway as far as possible and shifting it as close to the westbound carriageway as possible. This realignment results in slight increases of 0.2 to 0.6 dB(A) in facade noise levels at NSRs immediately adjacent to the revised alignment. With the 0.8-m concrete profile barriers in place (as required for road safety), exceedances of the HKPSG limit are not expected with either the original or revised proposed alignment.

<u>*Yau Kom Tau*</u>

8.3.38 *Noise impact and possible noise mitigation measures:* Sunny Villa and Keymount Lodge (SRs 31 and 31-2), located on a hill overlooking Castle Peak Road, do not currently experience traffic noise impacts exceeding HKPSG standards. However, with increased future traffic flows, facade noise levels at Keymount Lodge and Sunny Villa (Block 2) are expected to increase by about 4 dB(A), resulting in exceedances of these standards. The bottom one or two storeys of both blocks benefit from topographic shielding, and are not expected to be exposed to facade noise levels exceeding HKPSG standards. A 7-m retaining wall along the eastbound carriageway (formed by amending the slope cutting) is expected to reduce traffic noise levels to slightly over the HKPSG maximum at the remaining facades.

8.3.39 At Hanley Villa (SRs 33-1, 33-2 and 33-4), future noise levels are expected to exceed HKPSG levels at exposed southern facades. The existing carpark and the Good Harvest development currently under construction (SR 43-1 and 43-2) act as barriers to some facades. Supplementing these existing barriers with 7-m roadside barriers would be expected to reduce traffic noise below 70 dB(A) up to the fifth storey; above the fifth storey, 7-m barriers would reduce traffic noise levels, but not to below the HKPSG maximum. A partial enclosure over the eastbound carriageway reduces traffic noise to HKPSG standards only below the tenth storey. Fire Services Department have earlier indicated that an enclosure over both carriageways along this section of the alignment would conflict with their requirements. A full or partial enclosure would result in unacceptable safety risks for drivers approaching and negotiating the staggered signalised junction outside Hanley Villas.

8.3.40 Two developments are currently under construction: the highrise residential development at TWTL 322, and the hotel development at Lot 356. Barriers (vertical or cantilevered) or a partial enclosure over only one carriageway are unlikely to be effective above the lower storeys.

8.3.41 At Hanley Villa and the new highrise developments under construction, it is important to note that the effectiveness of any barrier or enclosure would be compromised by the need to provide a wide break at the signalised junction between Ch. 8100 and Ch. 8200.

8.3.42 Fung Chik Sen Villa (SR 33-3) and the small number of lowrise NSRs surrounding it do not currently experience traffic noise levels exceeding HKPSG standards. These NSRs will be partly shielded by a 7- to 10-m retaining wall from Ch. 8250 to Ch. 8450 after widening of Castle Peak Road, which will keep facade noise levels within HKPSG standards.

8.3.43 *Recommended noise mitigation measures:* Amending the slope cutting to form a 7-m retaining wall (Figures 8.5 and 8.6) is recommended in front of Keymount Lodge and Sunny Villa. Mitigation at the receiver may be considered for facades still affected by noise over HKPSG standards at these developments, at Hanley Villa and the new highrise developments.

8.3.44 Review of lease conditions for Lots TWTL 322 and 356 and DD 354 indicates:

- Lease for TWTL 322 states that "[t]he Grantee shall comply with and observe all Ordinances, bye-laws, regulations and rules for the time being in force in Hong Kong governing the control of any form of pollution, including air, noise, water and waste pollution, and for the protection of the environment." This lease condition does not appear to require HKPSG compliance.

- Lease for TWTL Lot 356 (300-room hotel) does not mention environmental or pollution control requirements under Special Conditions.

- Lease for DD 354 Lot 265 ("Blossom Terrace") is on the old schedule and is not available for review. This lot is designated for 20 flats, which is similar to its present level of development. Consequently, the noise assessment for future development is not expected to vary greatly from that for the existing development.

8.3.45 *Considerations for subsequent studies:* It may prove feasible to increase the height of the retaining wall/barrier in front of Keymount Lodge, depending on slope formation requirements. If a higher retaining wall is practicable, it should be considered to increase the number of directly-mitigated facades at Keymount Lodge and Sunny Villa. If a high barrier or partial enclosure is desired for protection of lower levels elsewhere along this section, it may be considered at a future design stage subject to the availability of adequate space and the sight-line requirements. With this option, additional fire hydrants may be required. Direct emergency vehicular entrance to Hanley Villas at the existing location, and other entrances for all highrise developments in the area, should be maintained. Bus-stops near the Hanley Villas access may have to be reprovisioned to avoid placing them within an enclosure.

<u>*Tsuen Wan*</u>

8.3.46 *Noise impact and possible noise mitigation measures:* Greenview Terrace (SRs 35-1 and 35-2) is currently exposed to traffic noise levels exceeding HKPSG standards, and is expected to remain so in the future. Due to the position of this midrise NSR overlooking Castle Peak Road, barriers up to 7 m have no effect, and a partial enclosure over the eastbound carriageway cannot reduce traffic noise to HKPSG standards. However, a partial enclosure over the eastbound and westbound carriageways (open on the seaward side) from about Ch. 8480 to 8690 would reduce traffic noise levels at this NSR to within HKPSG standards.

8.3.47 Blossom Terrace (SRs 36-1, 36-2, and 37) is a lowrise development, but is scheduled for redevelopment. Plans for the new site layout are not yet available. If sensitive facades are set back from the southern edge of the site, topography may be capable of shielding the lower storeys of new structures. Upper storeys are not likely to benefit from topography or roadside barriers, but could benefit from the partial enclosure over the eastbound and westbound carriageways described in the preceeding paragraph.

8.3.48 At Bayview Gardens (SRs 38 and 39), facades facing Castle Peak Road are expected to be exposed to traffic noise levels exceeding HKPSG standards in 2011. A 7-m barrier would achieve compliance with the HKPSG at a very limited number of first-storey receivers, but would not achieve compliance at higher storeys. An enclosure would be expected to reduce traffic noise significantly, but would have to extend well past the study boundaries in order to be effective at most facades within the development.

8.3.49 *Recommended noise mitigation measures:* A partial enclosure open on the seaward side over the eastbound and westbound carriageways from about Ch 8480 to Ch 8690 (Figures 8.7 and 8.8) is recommended to shield sensitive facades at Greenview Terrace. With this option, additional fire hydrants and a FSD radio telephone communication system should also be provided. For facades still exposed to traffic noise over the HKPSG standard, mitigation at the receiver is recommended.

Conclusions

8.3.50 A first mitigation strategy outlined in Annexe J utilises barriers up to 7 m, cantilevered barriers, and enclosures to obtain HKPSG compliance where possible. However, a preliminary engineering assessment of these mitigation measures indicates that many of them are infeasible. Due to the highrise character of most NSRs along the alignment, the only effective mitigation measures are high barriers or road enclosures. These kinds of structures are generally infeasible for the following reasons:

1. inadequate space along this highly constrained alignment for the large foundations required for mitigation structures;

2. unacceptable safety risks for drivers, resulting from:

   (a) visual obstruction to traffic entering or exiting Castle Peak Road at the numerous access points,

   (b) unavoidable placement of enclosures close to junctions.

8.3.51 A second mitigation strategy assumes only those measures that are considered feasible at this stage of the study. This recommended strategy is summarised in Table 8.1. Locations of recommended barriers are shown in Figures 8.1 to 8.8. This barrier strategy would leave large numbers of facades that would require mitigation at the receiver, mostly at highrise buildings that fail to benefit from roadside barriers. Facades that are still subject to residual noise levels exceeding the HKPSG criterion after mitigation will be tested against the three CRTN criteria for eligibility for indirect technical remedies.

Table 8.1 Mitigation Strategy 2: Summary of Recommended Noise Mitigation Measures

Representative NSR and Unmitigated 2011 Facade Noise Level		Recommended Mitigation Measures		Residual Noise Impact: Number of Units Eligible for Compensation for Indirect Technical Remedies
NSR ID (Location)	dB(A)	Measure	Remarks	
SR 1 (Ka Loon Tsuen and Bayside Villa)	76.8	indirect technical remedies	effective direct technical remedies infeasible to construct	56
SR 3 (Grand Bay Villa)	78.7	indirect technical remedies	effective barrier infeasible to construct; access gap would reduce effectiveness of barrier	0
SR 4 (Hong Kong Gardens)	69.2	none required	meets HKPSG standards	0
SR 5 (Hong Kong Gardens)	76.0	indirect technical remedies	effective direct technical remedies infeasible to construct	140
SR 6 (Hong Kong Gardens)	64.5	none required	meets HKPSG standards	0
SR 7 (Hong Kong Gardens)	68.4	none required	meets HKPSG standards	0
SR 8 (Hong Kong Gardens)	77.3	indirect technical remedies	effective direct technical remedies infeasible due to road safety	320
SR 9 (Hong Kong Gardens)	68.2	none required	meets HKPSG standards	0
SR 10 (Lung Tang Court)	74.4	5-m barrier (eastbound carriageway): Figs 8.1 and 8.2	shields lower levels of Lung Tang Court	32
SR 11/12 (Yuen Tun and Tsing Lung Tau)	75.1	3.5-m barrier (eastbound carriageway): Figs 8.1 and 8.3	shields about 20 village houses	0

Table 8.1 Mitigation Strategy 2: Summary of Recommended Noise Mitigation Measures (continued)

Representative NSR and Unmitigated 2011 Facade Noise Level		Recommended Mitigation Measures		Residual Noise Impact: Number of Units Eligible for Compensation for Indirect Technical Remedies
NSR ID (Location)	dB(A)	Measure	Remarks	
SR 13 (all) (Seacrest Villas IV)	72.0 to 72.2	indirect technical remedies	effective direct technical remedies infeasible due to firefighting requirements	320
SR 14 (Dragonville)	79.0	indirect technical remedies	effective direct technical remedies infeasible due to space constraints	1
SR 15 (all) (Seacrest Villas II and III)	74.6 to 75.4 (SCV III) 71.7 to 71.8 (SCV II)	indirect technical remedies	effective direct technical remedies infeasible due to land constraints and safety	660
SR 16-1 SR 17-1 (north facades, Lido Gardens)	81.3 76.9	no mitigation	no improvements to existing alignment planned; no space for direct technical remedies, no eligibility for compensation for indirect technical remedies	0
SR 16-2 SR 17-2 (south facades, Lido Gardens)	67.1 63.8	no mitigation required	meets HKPSG standards	0
SR 18 (Sham Tseng village)	79.5	no mitigation	effective direct technical remedies infeasible due to severe space constraints; existing alignment not to be improved, so no eligibility for compensation for indirect technical remedies	0

Table 8.1 Mitigation Strategy 2: Summary of Recommended Noise Mitigation Measures (continued)

Representative NSR and Unmitigated 2011 Facade Noise Level		Recommended Mitigation Measures		Residual Noise Impact: Number of Units Eligible for Compensation for Indirect Technical Remedies
NSR ID (Location)	dB(A)	Measure	Remarks	
SR 19 (Sham Tseng village)	81.0	no mitigation	effective direct technical remedies infeasible due to severe space constraints; existing alignment not to be improved, so no eligibility for compensation for indirect technical remedies	0
SR 20 (all) (Rhine Gardens)	75.5 to 75.9	no mitigation	effective direct technical remedies infeasible due to severe space constraints; existing alignment not to be improved, so no eligibility for compensation for indirect technical remedies	0
SR 21 (all) (Pink and Golden Villas)	74.6 and 75.9	indirect technical remedies	enclosure required to shield southwest facades is infeasible due to land constraints; enclosure required to shield southeast facades is impractical due to its high cost relative to small degree of mitigation achieved	4
SR 22 (Homi Villa)	N/A	no longer a sensitive use	converted to Visitors Centre	0
SR 23-26 (Casam Beach)	up to 77.2	indirect technical remedies	effective direct technical remedies infeasible due to road safety and presence of numerous access points	40
SR 27 (western Ting Kau Beach)	75.3	indirect technical remedies	effective direct technical remedies infeasible due to land constraints and road safety	4

Table 8.1 Mitigation Strategy 2: Summary of Recommended Noise Mitigation Measures (continued)

Representative NSR and Unmitigated 2011 Facade Noise Level		Recommended Mitigation Measures		Residual Noise Impact: Number of Units Eligible for Compensation for Indirect Technical Remedies
NSR ID (Location)	dB(A)	Measure	Remarks	
SR 28 (Ting Kau village)	66.4	no mitigation required	meets HKPSG standards	0
SR 29/30 (eastern Ting Kau Beach)	72.6	0.8 m barrier (westbound carriageway): Figs 8.4a and 8.4b	shields about 25 units	0
SR 31 (all) (Keymount Lodge and Sunny Villas) SR 33 (all) (Hanley Villas and lowrise residential) SR 43/44 (highrise residential and hotel under construction)	73.2 72.4 81.6	indirect technical remedies	7-m retaining wall (Figs 8.5 and 8.6) shields lowest 10 storeys at Keymount Lodge & Sunny Villa; 7- to 10-m retaining wall protects lowrise NSRs represented by Fung Chik Sen Villa; road enclosure infeasible to construct and adversely affects road safety due to presence of staggered junction	560
SR 35 (all) (Greenview Terrace) SR 36/37 (Blossom Terrace)	76.8	partial enclosure over eastbound and westbound carriageways: Figs 8.7 and 8.8	protects all levels of Greenview Terrace	0 (exclusive of units in Blossom Terrace, to be redeveloped)
SR 38/39 (Bayview Garden)	80.6	no mitigation	represents about 760 south-facing facades facing exceedances of HKPSG standard, but development is beyond project limit; no road improvements planned	0
SR 40 (all) (Dragon Villa and Villa Alfa Vista)	79.4	indirect technical remedies	effective direct technical remedies infeasible due to land constraints and structural stability	8

Table 8.1 Mitigation Strategy 2: Summary of Recommended Noise Mitigation Measures (continued)

Representative NSR and Unmitigated 2011 Facade Noise Level		Recommended Mitigation Measures		Residual Noise Impact: Number of Units Eligible for Compensation for Indirect Technical Remedies
NSR ID (Location)	dB(A)	Measure	Remarks	
SR 41 (all) Seacrest Villas	up to 74.1	no mitigation	effective direct technical remedies infeasible due to severe space constraints	50
SR 42.1/2 (north facades, CDA sites)	up to 81.6	no mitigation	effective direct technical remedies infeasible due to severe space constraints; existing alignment not to be improved, so no eligibility for compensation for indirect technical remedies	0
SR 42.3/4 (southern site boundary, CDA and Sham Tseng Further Reclamation)	up to 68.5	mitigation not required	meets HKPSG standards	0

8.3.52 The approximate number of existing flats (based on preliminary flat counts) expected to be eligible for compensation for indirect technical remedies is shown in the following table:

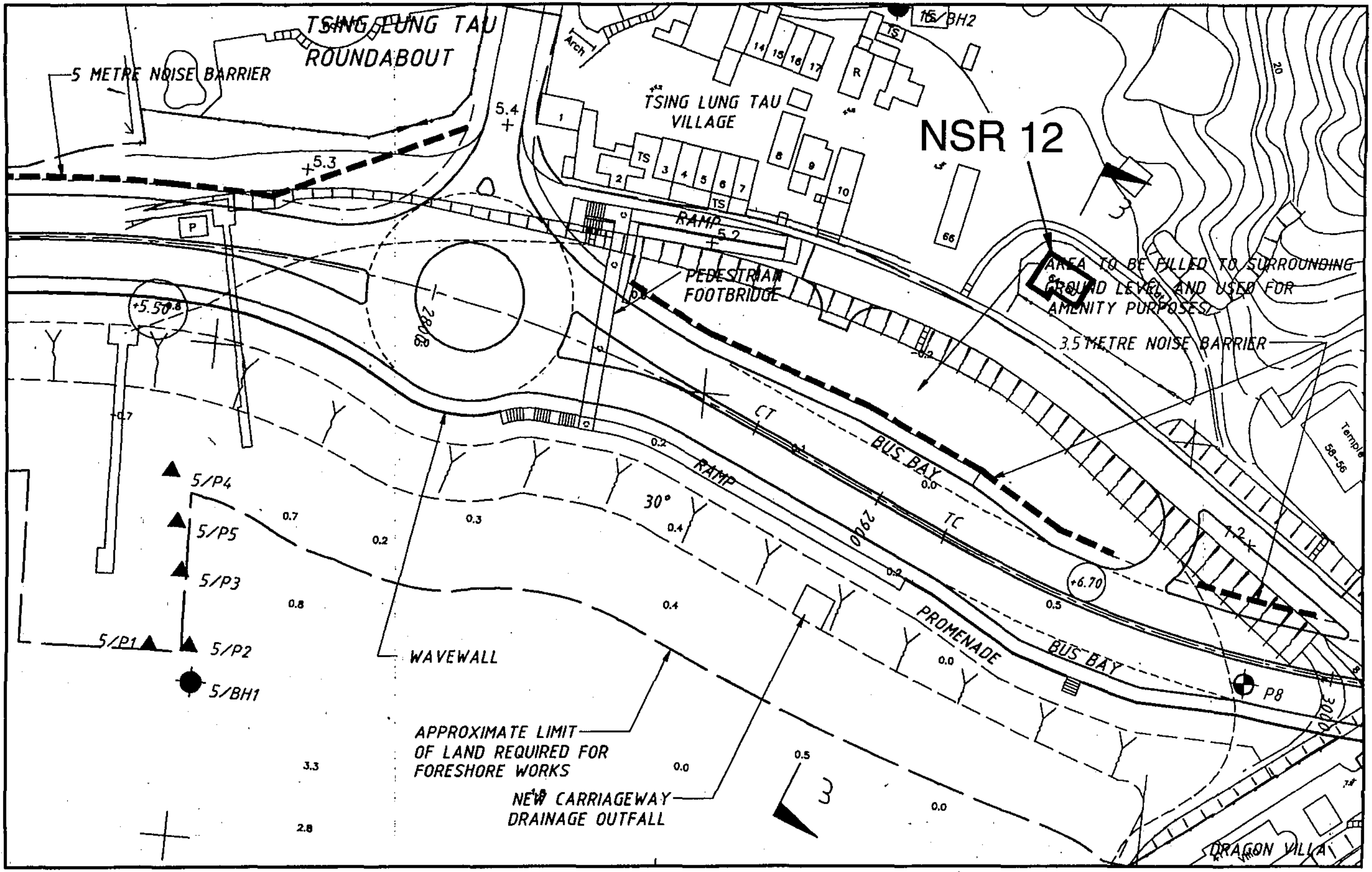
Table 8.2 Existing Flats Eligible for to be Considered for Indirect Technical Remedies

Approximate Number of Flats[1] Eligible to be Considered for Indirect Technical Remedies	
No mitigation	Recommended Mitigation Scenario 2[2]
2540	2320

[1] Includes currently existing flats and flats in buildings under construction.
[2] Described in Table 8.1 above. Extent of measures (barriers and enclosures) shown in Figures 8.1 to 8.8. Noise modelling results shown in Annexe D.

8.3.53 The total number of dwellings considered in this study was about 7200. Of these, approximately 4900 are expected to be exposed to traffic noise levels exceeding HKPSG standards in year 2011 in the absence of mitigation. This number would be reduced to about 4800 if the recommended mitigation package (direct technical rememdies) is implemented. The small reduction is a reflection of two main factors: the contribution of Tuen Mun Road (particularly at upper storeys in highrise developments) and the already high noise levels from Castle Peak Road traffic, which will increase in almost all cases.

8.3.54 The costs of the recommended mitigation scenario are included in the study's Engineering Report. The estimated cost of the mitigation package, including indirect technical remedies, is $35 million, based in part on provision of acoustic insulation for 2320 flats in the form of air conditioners and replacement windows.



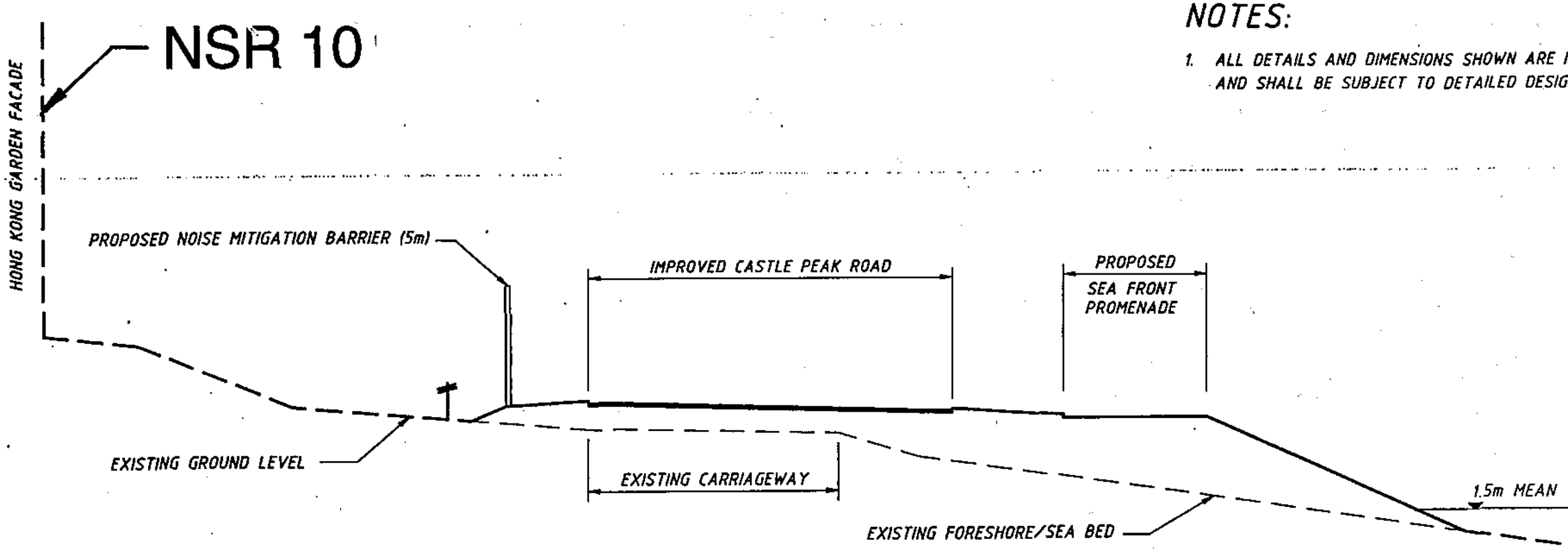
5m BARRIER AT LUNG TANG COURT

3.5m BARRIER AT TSING LUNG TAU VILLAGE

FIGURE 8.1

NOTES:

1. ALL DETAILS AND DIMENSIONS SHOWN ARE INDICATIVE ONLY AND SHALL BE SUBJECT TO DETAILED DESIGN.



CROSS SECTION INDICATING NOISE MITIGATION
FOR HONG KONG GARDEN & LUNG TANG COURT
(CH. 2700)

HIGHWAYS DEPARTMENT
MAJOR WORKS PROJECT MANAGEMENT OFFICE

FEASIBILITY STUDY FOR CASTLE PEAK ROAD IMPROVEMENT AREA 2 TO KA LOON TSUEN, TSUEN WAN

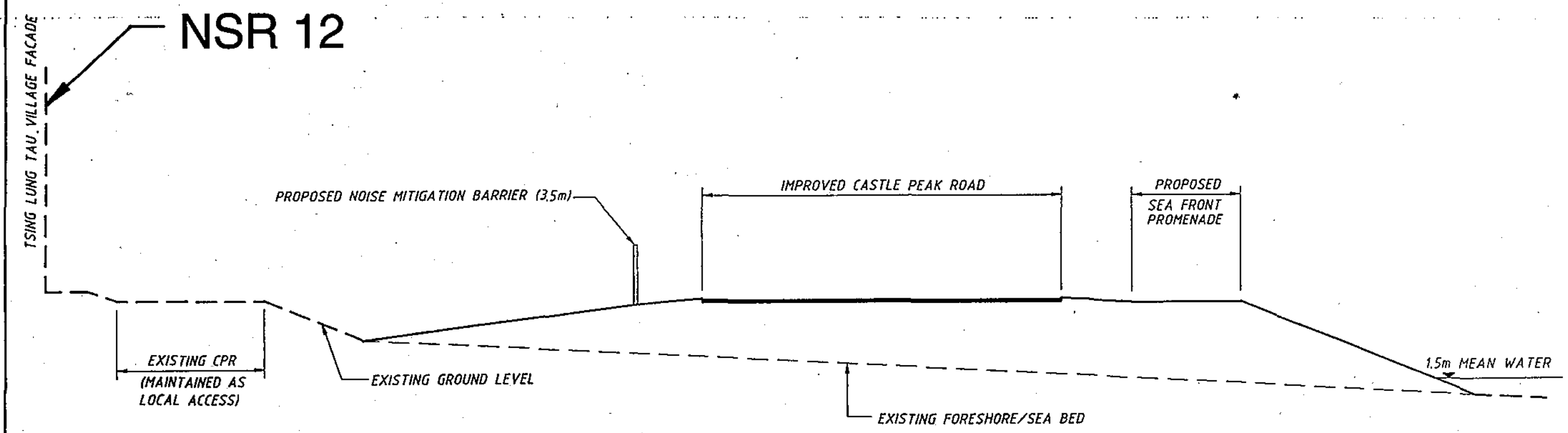
NOISE MITIGATION PROPOSALS
HONG KONG GARDEN/
LUNG TANG COURT

MAUNSELL CONSULTANTS ASIA LTD.

DRG.NO. FIGURE 8.2

NOTES:

1. ALL DETAILS AND DIMENSIONS SHOWN ARE INDICATIVE ONLY AND SHALL BE SUBJECT TO DETAILED DESIGN.



CROSS SECTION INDICATING NOISE MITIGATION FOR TSING LUNG TAU VILLAGE (CH. 2865)

SCALE 1:200

HIGHWAYS DEPARTMENT
MAJOR WORKS PROJECT MANAGEMENT OFFICE

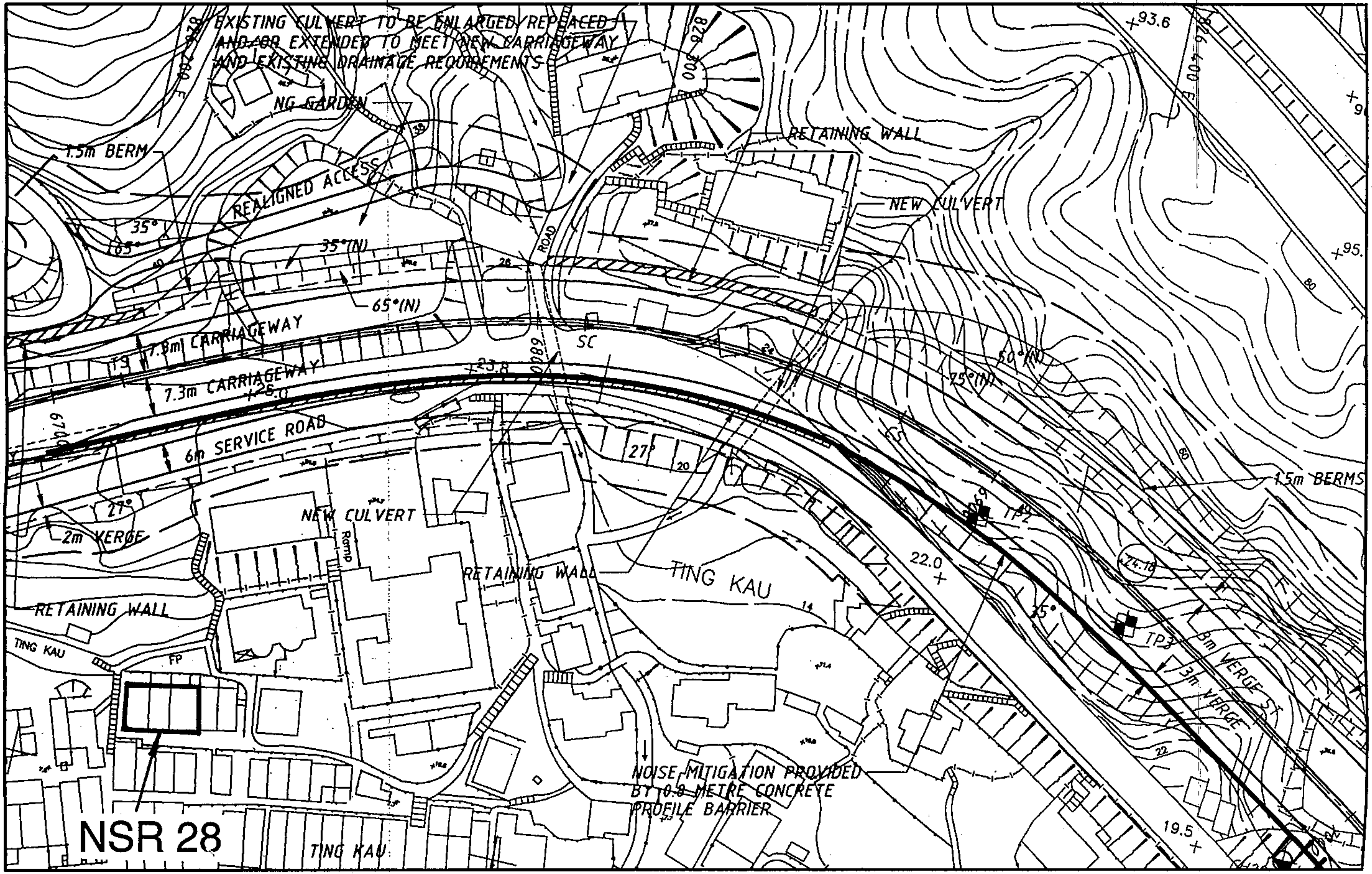
FEASIBILITY STUDY FOR CASTLE PEAK ROAD IMPROVEMENT AREA 2 TO KA LOOK TSUEN, TSUEN WAN

NOISE MITIGATION PROPOSALS
TSING LUNG TAU VILLAGE

MAUNSELL CONSULTANTS ASIA LTD.

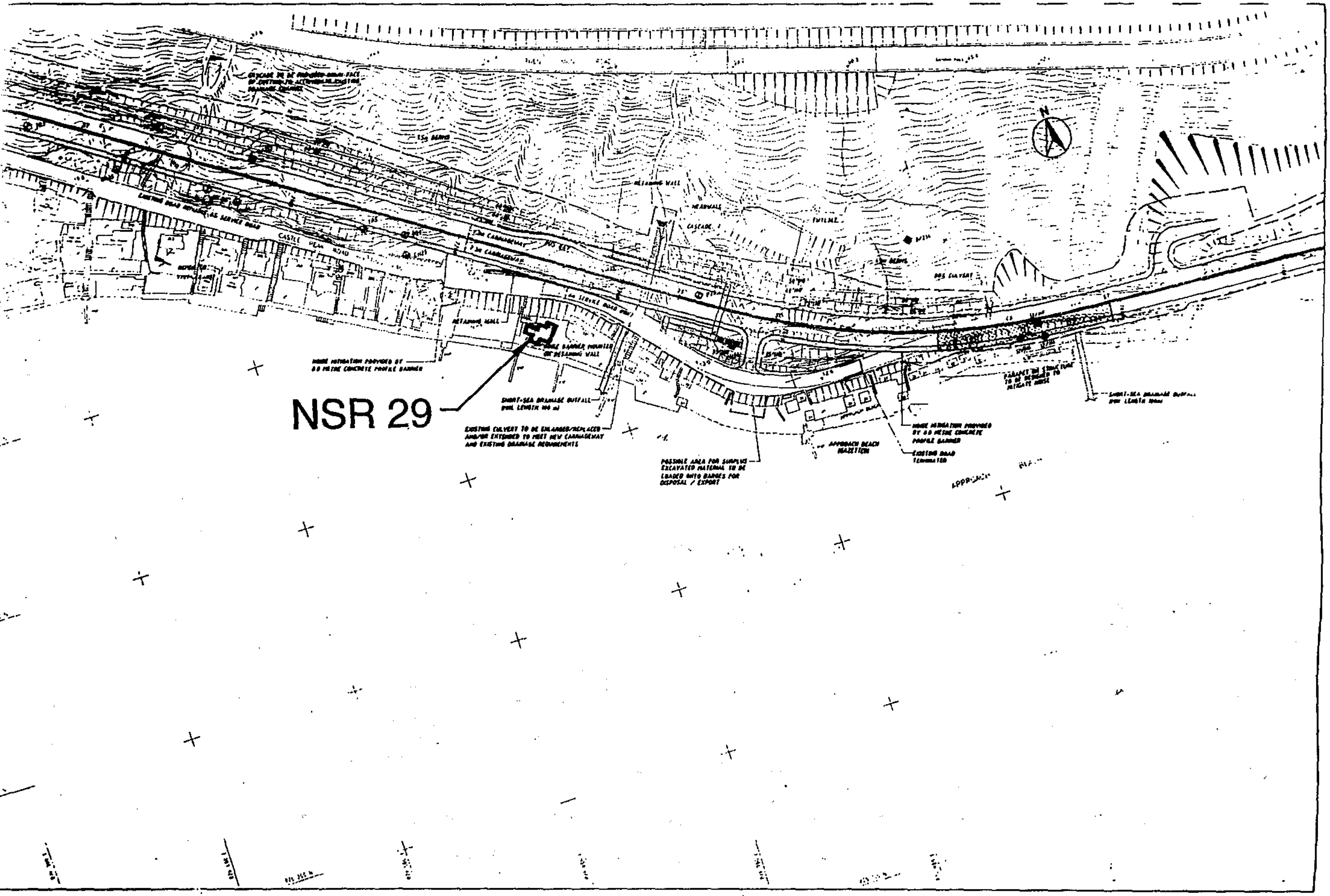
DRG.NO. FIGURE 8.3

SCALE AS SHOWN



0.8 BARRIER AT TING KAU (WESTERN END)

FIGURE 2.4a


NSR 29
RETAINING WALL
CASTLE PEAK ROAD
NOISE MITIGATION PROVIDED BY 5.0 METRE CONCRETE PROFILE BARRIER
SHORT-SEA DRAINAGE OUTFALL
EXISTING CULVERT TO BE ENLARGED/REPLACED AND/OR EXTENDED TO MEET NEW CARRIAGEWAY AND EXISTING DRAINAGE REQUIREMENTS
POSSIBLE AREA FOR SURPLUS EXCAVATED MATERIAL TO BE LOADED ONTO BARGES FOR DISPOSAL / EXPORT
APPROACH BEACH
EXISTING ROAD TERMINATED
CASCADE
HEADWALL
TWINE

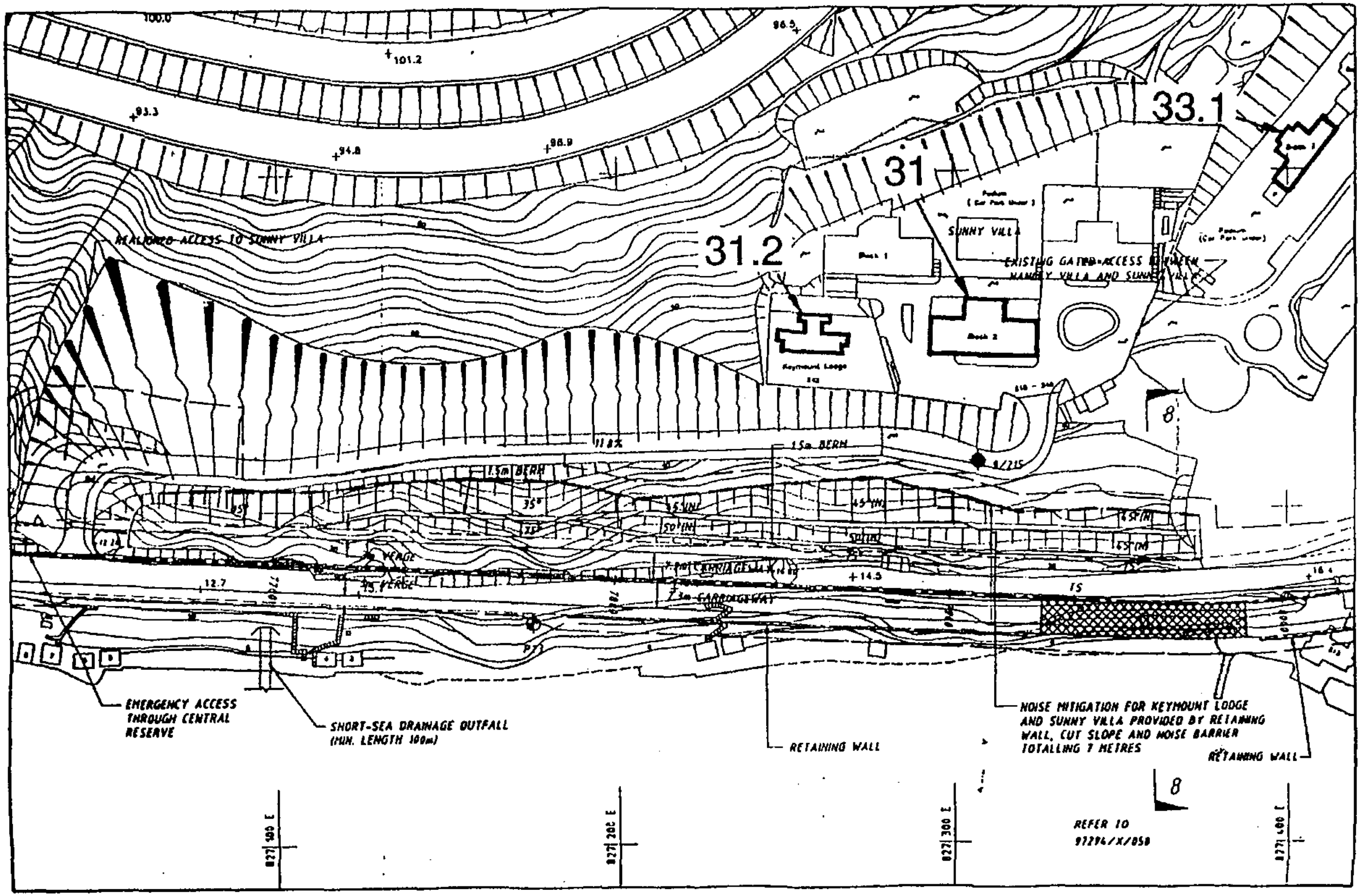
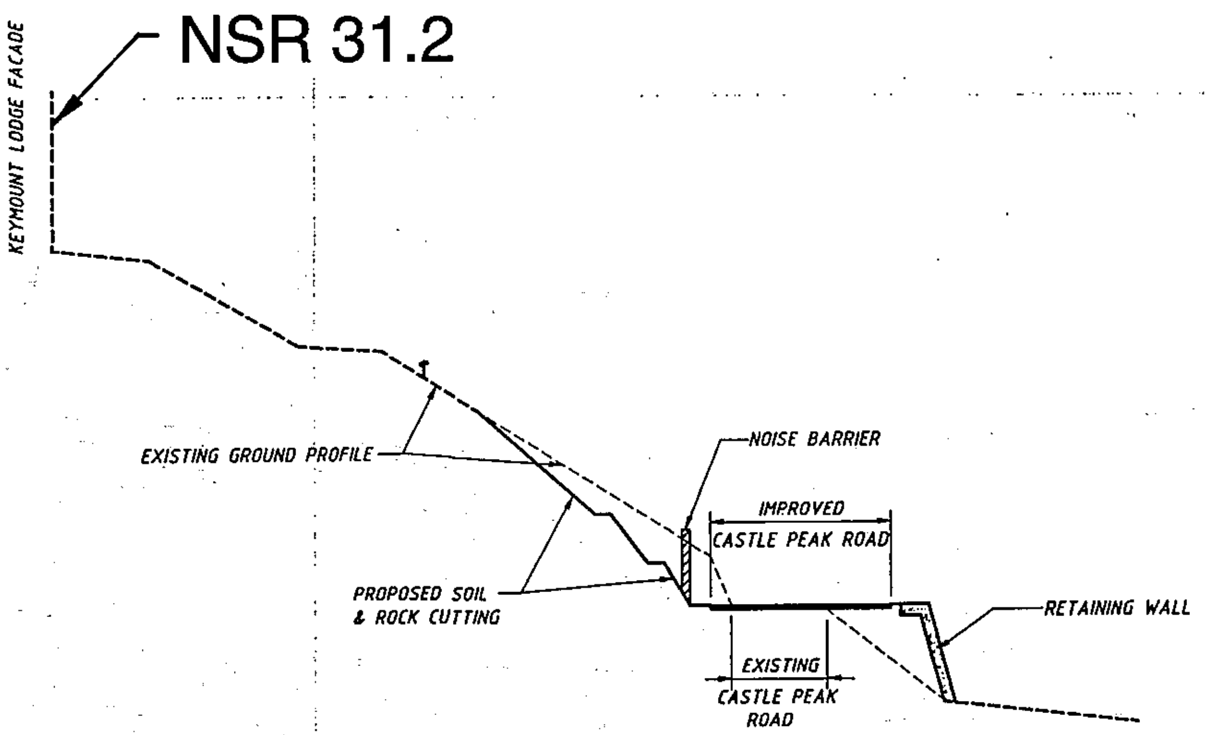


Figure 8.5 Barrier Totalling 7m at Keymount Lodge and Sunny Villa

Consultants in Environmental Sciences (Asia) Ltd

NOTES:

1. ALL DETAILS AND DIMENSIONS SHOWN ARE INDICATIVE ONLY AND SHALL BE SUBJECT TO DETAILED DESIGN.



CROSS SECTION INDICATING NOISE MITIGATION
FOR KEYMOUNT LODGE
(CH. 8570)

HIGHWAYS DEPARTMENT
MAJOR WORKS PROJECT MANAGEMENT OFFICE

FEASIBILITY STUDY FOR CASTLE PEAK ROAD IMPROVEMENT AREA 2 TO KA LOOK TSUEN, TSUEN WAN

NOISE MITIGATION PROPOSALS
KEYMOUNT LODGE

MAUNSELL CONSULTANTS ASIA LTD.

TAM

DRG.NO. FIGURE 8.6

AS SHOWN

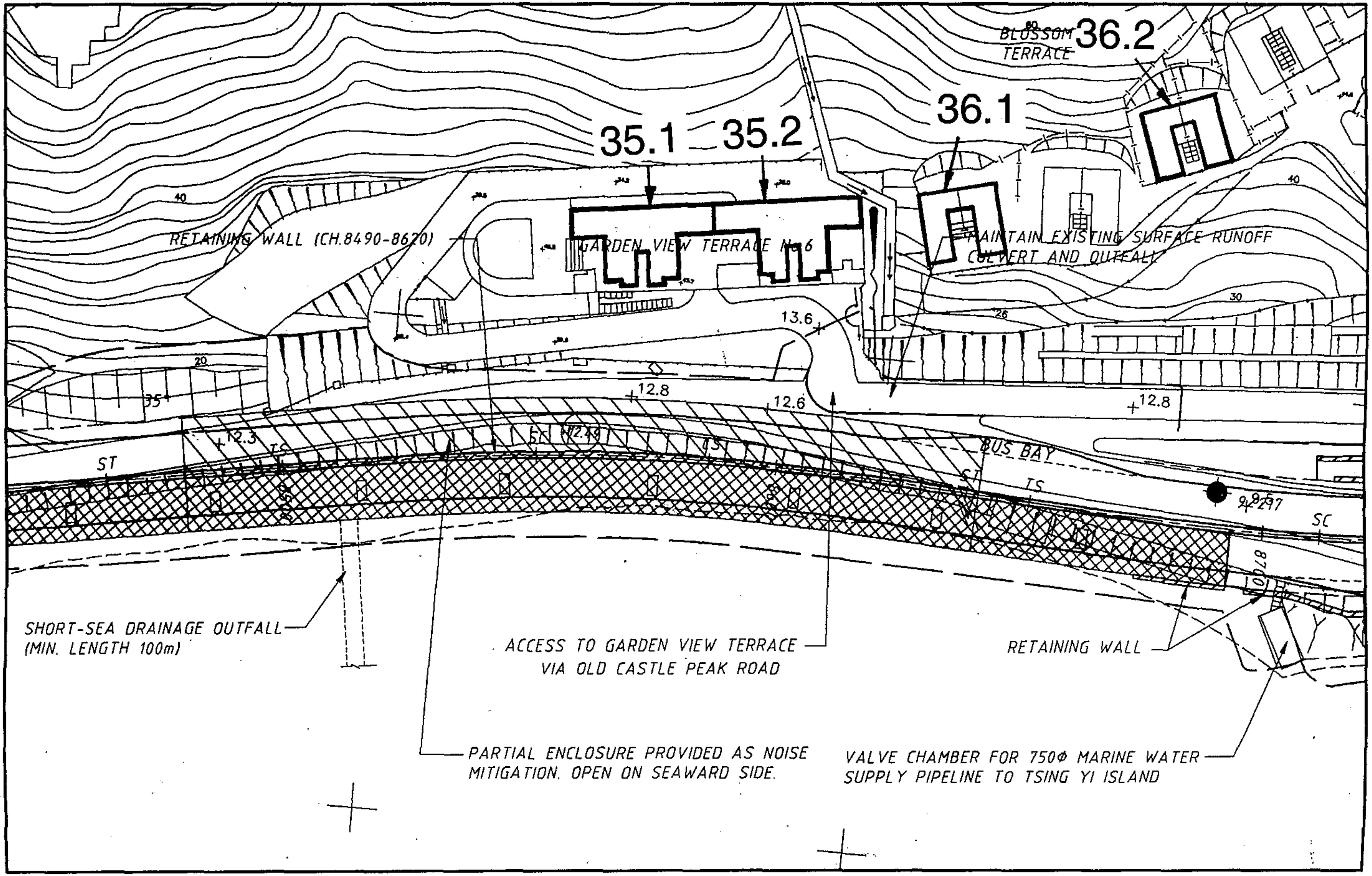
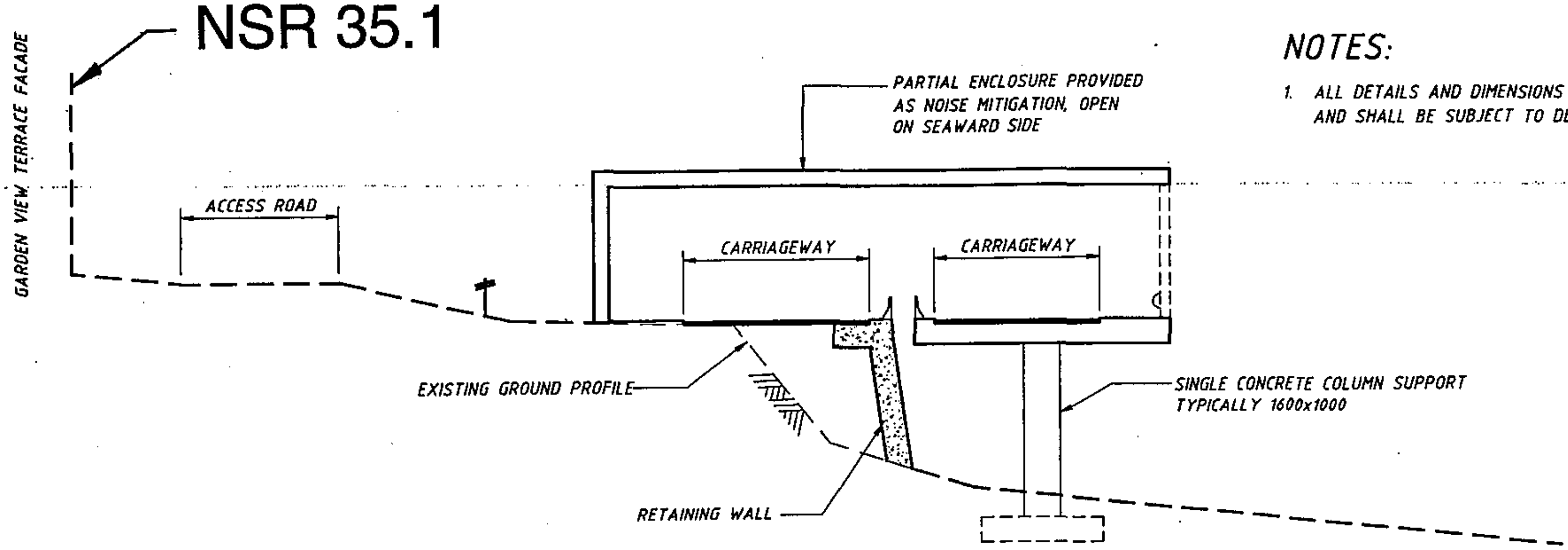


FIGURE 8.7

PARTIAL ENCLOSURE (OPEN ON SEAWARD SIDE) AT GARDEN VIEW TERRACE



NOTES:

1. ALL DETAILS AND DIMENSIONS SHOWN ARE INDICATIVE ONLY AND SHALL BE SUBJECT TO DETAILED DESIGN.

CROSS SECTION INDICATING NOISE MITIGATION
FOR GARDEN VIEW TERRACE
(CH. 8570)

HIGHWAYS DEPARTMENT
MAJOR WORKS PROJECT MANAGEMENT OFFICE

FEASIBILITY STUDY FOR CASTLE PEAK ROAD IMPROVEMENT AREA 2 TO KA LOON TSUEN, TSUEN WAN

NOISE MITIGATION PROPOSALS
GARDEN VIEW TERRACE

MAUNSELL CONSULTANTS ASIA LTD.

TAM

DRG.NO. FIGURE 8.8

AS SHOWN

MILLIMETRES

9 AIR QUALITY IMPACTS (CONSTRUCTION PHASE)

9.1 Impacts of Road Construction Works

9.1.1 Predicted maximum 1-hour, maximum 24-hour and annual average TSP concentrations at the selected sensitive receivers are tabulated in Table CON3YSUM.XLS (Annexe F).

9.1.2 The highest predicted 1-hour, 24-hour and annual average TSP concentrations are 481 μgm^{-3}, 224 μgm^{-3} and 29μgm^{-3} respectively at receivers A28 (Ting Kau) in close proximity to a filling area. Based on the modelling results, with the adoption of the dust mitigation measures considered in the dust emission calculations, no exceedance of the TSP 1-hour average guideline level and the AQO for TSP at any selected air quality sensitive receivers would be expected.

10 AIR QUALITY IMPACTS (OPERATION PHASE)

10.1 Impacts of Future Road Traffic

10.1.1 Predicted maximum 1-hour average NO_2 concentrations at the selected air quality sensitive receivers, with the installation of the proposed noise barriers and semi-enclosure, for year 2011 are tabulated in Table 604_GSUM.XLS (Annexe F). The assessment is based on predicted traffic flow figures provided by the transport consultant. Traffic is expected to move at varying link speeds, some of which may be quite low (less than 10 kph). Queueing is not predicted along this section of Castle Peak Road.

10.1.2 The highest predicted 1-hour average NO_2 concentrations for year 2011, with estimated background concentration of 117.7 μgm^{-3}, is 263 μgm^{-3} at Receiver A15 (Sham Tseng Tsuen Village).

10.1.3 Based on the modelling results, and using conservative modelling parameters, no exceedances of the one-hour average NO_2 AQO at the selected sensitive receivers for year 2011 are predicted.

10.1.4 Predicted maximum 1-hour average NO_2 concentration contours (not including the estimated background concentration) in Sham Tseng area at 1.5 metres above local ground level are shown in Figure 10.1.

96504

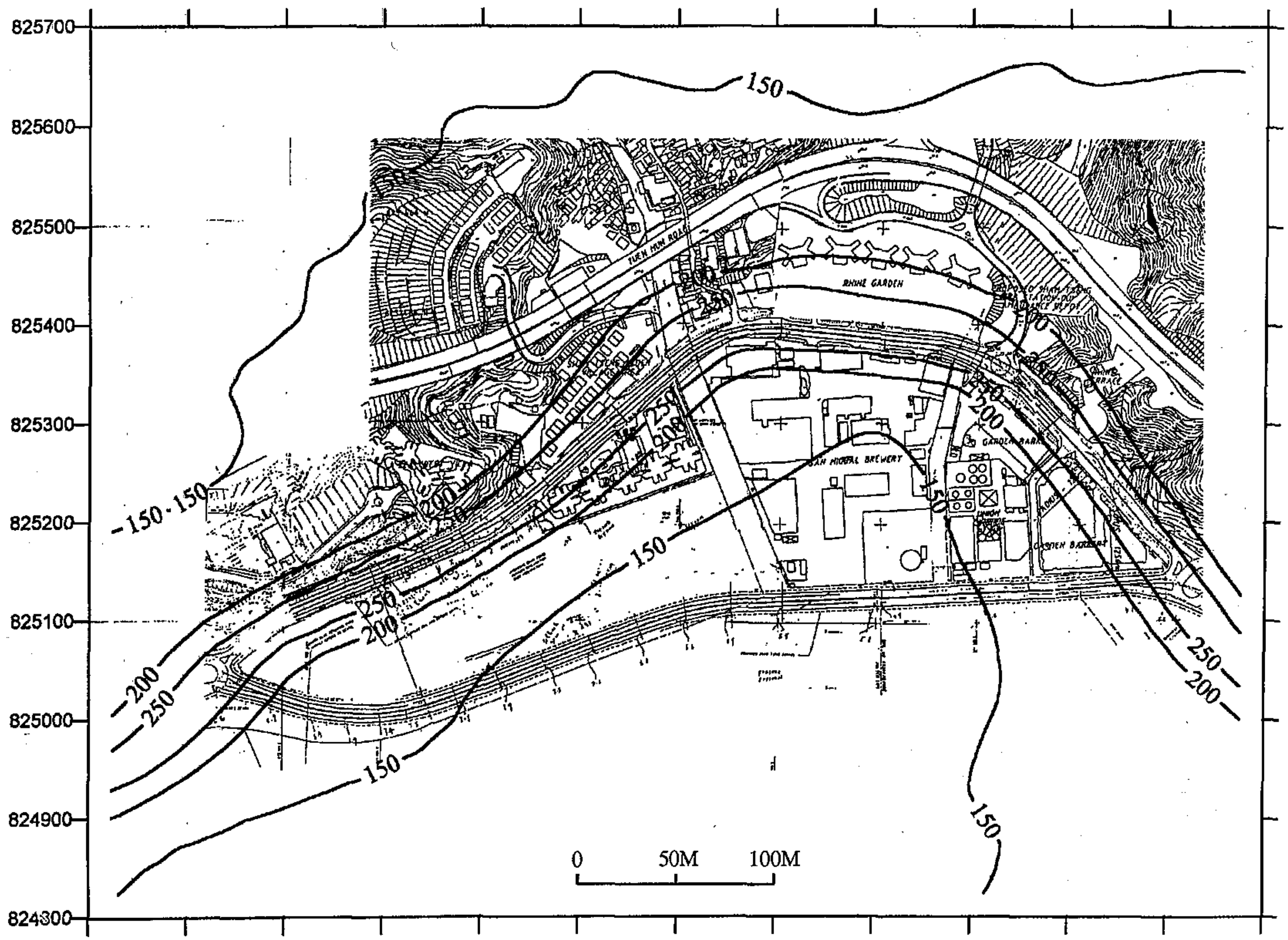


Figure 10.1 Predicted 1-Hour Average NO_2 Contour ($\mu g/m^3$) for Yr 2011 at Height 1.5m above Local Ground (Sham Tseng Section Only, with Barrier Option)

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11 ECOLOGY IMPACT

11.1 Existing Environment and Ecological Resource

__Terrestrial Flora__

General Environment

11.1.1 The whole study area was extensively disturbed by human activities. Major habitats along the alignment were woodlands (including semi-natural and natural secondary forests), shrubland, grassland, roadside plantation, garden planting (fruit trees in orchards and ornamental plants in gardens), backshore vegetation, and eroded/disturbed area (see Figures 11.1-11.4). A total of 156 species were recorded (Table 11.1).

Endangered and protected species

11.1.2 No flora or fauna protected under local regulations or international conventions were recorded, except for birds which are all protected under Hong Kong ordinance.

Woodland

11.1.3 All woodlands along the alignment were secondary and developed either from previous plantations (e.g. on the seaward side) or from shrublands (e.g. upland woodlands on the landward side). No mature woodland or fungshui wood was observed.

11.1.4 Of the 66 tree species recorded, 29 were components of the woodland habitat. 30 trees are exotics and most of the trees were individual roadside plantations or garden species. Where the canopy of the plantation trees was closed and understorey species established, mixed woodlands consisting of both planted species and native species were formed. Mixed woodlands on the seaward side along the existing alignment were narrow with a width of about 3 m to 5 m, and their development is constrained by the existing alignment and the proximity of the coast.

11.1.5 Two focused studies were conducted in woods at Dragon View and Ting Kau. The woodland at Dragon View was ravine type of about 0.13 ha, situated along a small ravine with runoff along a channelized drainage. Both sides of the ravine were well planted with a few patches of bamboos, *Casuarina equisetifolia*, and *Acacia confusa*. The dominant species in this ravine forest were riparian species such as *Sterculia lanceolata* and *Ficus fistulosa* (Table 11.2). The woodland structure was more complex with vigorous understorey, which provided a diverse habitat for invasion of the shade tolerant plant species and other animals. The most abundant species in the understorey were *Alocasia macrorrhiza, Alpinia japonica* and *Psychotria rubra*. This ravine woodland was well protected and not common along the existing road alignment.

11.1.6 Another secondary woodland occupied about 9.5 ha on the hillslope above Castle Peak Road near Ting Kau. It was a young stage of lowland secondary forest which had recently developed from shrubland. The dominant species were small sized, native and widespread pioneer trees including *Cratoxylum cochinchinense, Liquidambar formosana,* and *Phyllanthus emblica* (Table 11.3). Tree density was 268 per 0.1 ha, computed based on point-centre quarter sampling method[1]. The canopy structure was relatively simple. The understorey was poor which consisted of only a few saplings or young individuals of canopy species such as *Litsea glutinosa, Microcos paniculata*, and *Aporusa dioica.* There were some grass and shrub species such as *Psychotria rubra* and *Microstegium ciliatum* in the bigger canopy gaps. Without disturbance, this secondary vegetation will be developing progressively into mature woodland. Because most of the natural habitats within the study area were disturbed and fragmented, this natural woodland is relatively of higher ecological value.

Shrubland

11.1.7 The shrublands were dominated by *Gordonia axillaris, Cratoxylum cochinchinense, Litsea rotundifolia, Brucea javanica* and *Rhus* spp. All these shrublands had developed from grasslands under protection from fires, as evidenced by the presence of some intermediate stages between grasslands and typical shrublands.

Grassland

11.1.8 Compared with woodland and shrubland, distribution of grassland habitat was quite scattered. Grassland was mainly maintained by fires or disturbances. The major species in grassland were *Panicum maximum, Miscanthus floridulus* and *Neyraudia arundinacea.* In the absence of fire and other disturbance, grasslands would develop into shrublands.

---

[1] Point-centred quarter method is one of the distance methods used for sampling a plant community. Ramdom points along a line are selected, and distance of the nearest plant from the random point at each quarter is tallied, and dbh of the plant measured. The following parameters are computed:

1. density (per ha) = 10,000/[2·(average distance)^2], distance in meters
2. relative density of species A = [(no of trees of A encountered)·(density for all trees)]/[no of all trees encountered]
3. cover of species A = (relative density of species A)·(average basal area of species A)
4. relative cover (%) of species A = [(cover of species A)/(cover of all species)]·100%
5. frequency of species A = (no of points that contain at least one individual of A)/(total no of points)
6. relative frequency of species A = [(frequency of species A)/(frequency of all species)]·100%
7. importance value = (relative density) + (relative cover) + (relative frequency), to maximum value of 300

For details see Barbour, MG *et al*, *Terrestrial Plant Ecology (Second Ed.)* (California: The Benjamin Cummings Publishing Co Inc., 1987), and Cottam G. and JT Curtis, *The use of distance measures in phytosociological sampling* (1956, Ecology 37: 451-460).

Table 11.1 Plant Species Recorded along Castle Peak Road from Ka Loon Tsuen to Tsuen Wan, June 1995

Species	Habitat Type						
	Form	Wood	Shrub	Grass	Shore	Road	Garden
*Bambusa vulgaris var. striata**	B	+					+
*Bougainvillea glabra**	C			+			++
*Caesalpinia nuga**	C		+			+	
Cansjera rheedii	C		+	+++		+++	
Celastrus hindsii	C	+	+			+	
Dalbergia benthamii	C	+	++			++	
Dalbergia hancei	C	+	++	++		++	
Diploclisia glaucescens	C	+	++	++		+++	
Gnetum montanum	C	++	+++	+		++	+
*Mikania micrantha**	C	++	+++	+++		+++	+++
Morinda umbellata	C	+	+			+	+
Paederia scandens	C	++	++	+	++	+++	++
*Parthenocissus himalayana**	C					+++	+
Passiflora foeta	C		+			+	+
Pueraria lobata	C		++	++		+++	+
Smilax china	C	+	++	+		++	
Strophanthus divaricatus	C		++			++	
Strychnos umbellata	C		+			++	
Tetracera asiatica	C	++	++			++	
Dicranopteris linearis	F			++		+	
Lygodium japonicum	F	++	+++	++		++	+
Lygodium dichotomum	F		+			+	
Pteris semipinnata	F	+				+	
Cynodon dactylon	G						++
Microstegium ciliatum	G	++	++	++		++	
Miscanthus floridulus	G	+++	++		++		+
Neyraudia arundinacea	G		++	+++		++	+
Panicum brevifolium	G					+	
*Panicum maximum**	G		+	+++		+++	++
Pennisetum alopecuroides	G					++	
Pennisetum purpureum	G			+		+	
Pogonatherum crinitum	G					+	
*Rhynchelytrum repens**	G					++	+
Sporobolus fertilis	G					+	
Thysanolaena maxima	G			+		+	
Achyranthes aspera	H					++	+
Alocasia macrorrhiza	H	++			+	+	+
Alpinia sp.	H	+			+		
Amaranthus viridis	H					+	+
Bidens pilosa	H			+		++	
Chrysanthemum indicum	H					+	+
Emilia sonchifolia	H					+	+
Hedyotis auricularia	H					++	+
*Mirabilis jalapa**	H						+
Musa sp.	H						+
Oxalis corniculata	H					+	
Oxalis corymbosa	H					+	
Pluchea indica	H			+		+	
*Praxelis clematidea**	H					++	+
*Rhoeo discolor**	H						+
Solanum americanatum	H					+	+

Table 11.1 Plant Species Recorded along Castle Peak Road from Ka Loon Tsuen to Tsuen Wan, June 1995 (Cont'd)

Species	Habitats Type						
	Form	Wood	Shrub	Grass	Shore	Road	Garden
Sonchus oleraceus	H					+	
Tridax procumbens	H					+	
*Wedelia chinensis**	H					++	++
Youngia japonica	H					++	+
*Allamanda neriifolia**	S						+
Atalantia buxifolia	S	++	++			++	+
Berchemia lineata	S		++			+++	
Breynia fruticosa	S		+			+	
Bridelia tomentosa	S	+++	+++	++		+++	+
Brucea javanica	S	++	+++			+	
*Calliandra haematocephala**	S						+
Callicarpa macrophylla	S		+			+	
Clerodendrum viscosum	S		+				
*Codiaeum variegatum var. pictum**	S						+
Daphniphyllum calycinum	S	+	+			+	
Desmodium heterocarpon	S					+	
Diospyros vaccinioides	S	+	+			+	
*Duranta repens**	S						+
Ficus hirta	S	+				+	
Ficus variolosa	S	+	+			+	
Gardenia jasminoides	S		+			+	
Gendarussa vulgaris	S						+
Gordonia axillaris	S		+++				
*Hamelia patens**	S						+
*Hibiscus rosa-sinensis**	S						+
Ilex pubescens	S		++			+	
Lantana camara	S	++	+++	++	+	+++	+
Ligustrum sinensis	S		+			+	
Litsea rotundifolia	S	++	++			++	
*Manihot esculenta**	S					+	
*Malvaviscus arborus var. penduliferus**	S			+			+
Melastoma sanguineum	S	+	++			++	
Oreocnide frutescens	S					+	
Pandanus tectorius	S	++	+		++		
Phoenix hanceana	S	+					
Phyllanthus cochinchinensis	S	+	+			+	
Phyllanthus emblica	S	+	++			+	
*Pittosporum tobira**	S						+
Psychotria rubra	S	+++	+			++	
Rhaphiolepis indica	S	+	+			+	
Rhus chinensis	S	+	+++			++	
Rhus hypoleuca	S		++			+	
Sageretia theezans	S	++	+++	+		+++	
Stachytarpheta jamaicensis	S					+	
*Acacia confusa**	T	+++			+	++	+
Acronychia pedunculata	T	++	+			++	
*Albizia lebbeck**	T	++				+++	
*Aleurites moluccana**	T	+				+	
*Amygdalus persica**	T						+
Aporusa dioica	T	++	+			++	
Artocarpus hypargyrea	T			+		+	
*Bauhinia variegata var. candida**	T					+	+

Table 11.1 Plant Species Recorded along Castle Peak Road from Ka Loon Tsuen to Tsuen Wan, June 1995 (Cont'd)

Species	Habitat Type						
	Form	Wood	Shrub	Grass	Shore	Road	Garden
*Cassia surattensis**	T					+	+
*Casuarina equisetifolia**	T	+			+	+	+
Cerbera manghas	T				++		+
Celtis philippensis	T	+				++	
Celtis sinensis	T	++	+		+	++	
Choerospondias axillaris	T	+				+	
Cinnamomum camphora	T	+				++	+
Citrus sp.	T						+
*Clausena lansium**	T						+
Cratoxylum cochinchinese	T	+++	++	+		++	
*Cupressus funebris**	T						+
*Delonix regia**	T	+				+	+
*Dimocarpus longan**	T	+				++	+
*Eriobotrya japonica**	T						+
*Eucalyptus citriodora**	T					+	
*Eucalyptus robusta**	T					+	+
*Eucalyptus terecticornis**	T					+	
Evodia meliaefolia	T	+				+	
*Ficus elastica**	T					+	+
Ficus fistulosa	T	++					
Ficus hispida	T	+	+			++	
Ficus microcarpa	T	++				++	+
Ficus virens var. sublanceolata	T	+				+	+
Ficus variegata	T	+			+	+	+
Glochidion hirsutum	T		+			+	
*Gossampinus malabarica**	T					+	+
Grevillea sp.	T						+
Hibiscus tiliaceus	T				++		
Ilex rotunda	T					+	
*Jacaranda acutifolia**	T					+	
*Lephorstemon conferta**	T					+	
*Leucaena leucocephala**	T		++	+	+	++	
Litsea cubeba	T						+
Litsea glutinosa	T	+++	++	+	+	+++	+
Macaranga tanarius	T	++	+		+++	++	
Machilus leptophylla	T					+	
*Mangifera indica**	T					+	+
*Melaleuca quinquenervia**	T					+	
*Melia azedarach**	T					++	+
*Michelia alba**	T						+
Microcos paniculata	T	+	+		+	++	
Ormosia emarginata	T		+			+	
*Plumeria rubra var acutifolia**	T						+
*Psidium guajava**	T						+
Rhus succedanea	T	++	++	+		++	
Sapindus mukorossi	T					+	
Sapium discolor	T	+	+			+	
Sapium sebiferum	T					+	
Schefflera octophylla	T	++	++			++	
Scolopia chinensis	T		+			+	
Sterculia lanceolata	T	++	+		+	++	+
*Syzygium jambos**	T	+				++	+

Table 11.1 Plant Species Recorded along Castle Peak Road from Ka Loon Tsuen to Tsuen Wan, June 1995 (Cont'd)

Species	Form	Habitat Type					
		Wood	Shrub	Grass	Shore	Road	Garden
*Thuja orientalis**	T						+
Tipouchina sp.*	T						+
Trema orientalis	T	+	+			+	
Viburnum odoratissimum	T					+	
Vitex quinata	T					+	
Zanthoxylum avicennae	T	+	+			++	
Notes: Form: B=bamboo; C=climber; F=fern; G=grass; H=herb; S=shrub; T=tree; *=exotic species.							
Relative abundance: +++ = common, ++ = occasional; + = locally rare							

Table 11.2 Results of Focused Study at Woodland west of Dragon View, June 1995

Species	Number of Individuals (Maximum No. of Trunks)	Range of dbh[1] (cm)	Total Basal Area (m^2)
Ficus fistulosa	5 (5)	4.14-19.89	1.88
Sterculia lanceolata	4 (1)	5.73-13.69	0.26
Ficus microcarpa	1 (1)	12.57	0.12
*Aleurites moluccana**	1 (1)	11.14	0.10
*Casuarina equisetifolia**	1 (1)	44.72	1.57

[1] dbh = diameter at breast height

Table 11.3 Results of Point-centre Quarter Survey at Woodland east of Ting Kau, June 1995

Species	Relative Density (%)	Relative Dominance (%)	Relative Frequency (%)	Importance Value[1]
Craxtoxylon cochinchinense	41.67	36.97	37.50	116.13
Liquidambar formosana	4.17	34.82	6.25	45.23
Aporusa dioica	12.50	4.19	18.75	35.44
Phyllanthus emblica	12.50	12.75	6.25	31.50
Antidesma paniculatum	8.33	8.85	6.25	23.43
Microcos paniculata	8.33	1.54	6.25	16.12
Bridelia tomentosa	4.17	0.49	6.25	10.91
Litsea glutinosa	4.17	0.41	6.25	10.82
Psychotria rubra	4.17	0.31	6.25	10.73

1 Importance value does not have a unit, but ranges from 0 to 300.

Backshore vegetation

11.1.9 Besides the above terrestrial vegetation, there were also a few small scattered patches of natural backshore vegetation along the rocky coast, dominated by *Hibiscus tiliaceus, Cerbera manghas, Macaranga tanarius, Padanus tectorius,* and *Clerodendrum inerme.* Trees, including natives and exotics were also planted along the backshores of Angler's Beach (Table 11.4).

Table 11.4 Species and Number of Major Plants at Angler Beach

Species	Habit	Number/Occurrence
*Albizia lebbeck**	tree	9
Bridelia tomentosa	tree	1
*Casuarina equisetifolia**	tree	5
Celtis sinensis	tree	4
Cynodon dactylon	grass	locally common
*Duranta repens**	shrub	2
Ficus microcarpa	tree	2
*Hibiscus rosa-sinensis**	shrub	2
Hibiscus tiliaceus	tree	9
Litsea glutinosa	tree	3
Thespesia populnea	tree	1
*Thevetia peruviana**	tree	27

* exotic species

Plantations

11.1.10 The existing Castle Peak Road was planted with trees following its completion. Plantations mainly consisted of exotic species, such as *Acacia confusa* and *Albizia lebbeck* along the roadsides and hillslopes, ornamental plants in private gardens like *Hibiscus rosa-sinensis* and *Codiaeum variegatum*, and fruit trees in orchards such as *Dimocarpus longan* and *Clausena lansium*. In the absence of disturbance, a considerable number of plantations had been invaded by native species. Some of plantation areas have even become mixed woodlands consisting of both planted species and native species. Most of these plantations were simple in structure and fragmented in distribution. However, in the absence of constraints and disturbance, plantations could develop into secondary forest by invasion of native species.

Aquatic Fauna

Beach

11.1.11 The fauna of sand beaches such as Angler's Beach along the Castle Peak Road shoreline is typically low in diversity, although the abundance of certain bivalves (e.g. *Donax* sp.) may be high sub-tidally. Typically, the ghost-crabs (Ocypode) are found burrowing in the sand, but otherwise few other animals are present (Morton and Morton 1983). The beaches in the area are often bordered on either side by boulders, with boulders also common along the top of the beach. Due to this, species lists from such beaches tend to include many boulder/rocky shore species.

Boulder Shore

11.1.12 Boulder shore is very common in Hong Kong, with predictable faunal community composition depending on the degree of exposure of the shoreline to factors such as wave action. The boulder shore along the Castle Peak Road coast is a typical example of a sheltered rocky shore.

11.1.13 The results of previous field surveys of beach and boulder shore surveys on the Castle Peak Road coast are presented in Table 11.5, set against the fauna common to sheltered boulder shores described in Morton and Morton 1983. Crustaceans and Molluscs were the dominant phyla, with gastropods the dominant class. Barnacles were also well represented lower down the shore, with all 3 expected species present.

Table 11.5 Comparison of the Number of Species Recorded from the Study Sites

Species present from the study sites are recorded against the list on the left. The species list on the left is the common fauna and flora found on sheltered boulder shores in Hong Kong (Morton and Morton, 1983). (+ = present) Source : Binnie 1995. Table is continued on next page.

Species	Studied Sites				
	Tsing Yi Pylon Site	Ting Kau Beach	Ting Kau Pylon Site	Lido Beach	Casam Beach
(Algal Flora) Phylum chlorophyta					
Ectocarpus rhodochorto-noides		+	+	+	+
Enteromorpha compressa					
Petalonia fascia		+	+	+	+
Scytosiphon lomentaria					
Ulva conglobata					
Ulva lactuca					
Fauna Phylum Annelida Class Polychaeta					
Hydroides elegans		+	+	+	+
Pomatoleios kraussic					
Sabellastarte indica		+			
Spirobis formaminosus					
Phylum Arthoropoda Subphylum Crustacea Class Cirripedia					
Balanus amphitrite		+	+	+	+
Pollicipes mitella		+	+	+	+
Tetraclita squamosa		+	+	+	+
Class Malacostrata Order Amphipoda					
Stegocephalus inflatus	+	+	+	+	+
Species A.	+	+	+	+	+
Order Isopoda					
Ligia exotica	+	+	+		
Order Decapoda					
Cyclograpsus intermedius					
Epixanthus frontalis					
Hemigrapsus sanguineus	+	+	+		
Gaetice depressus	+	+		+	+
Metopograpsus messor	+				+
Parasesarma picta	+	+	+	+	
Sphaerozius nitidus					
Thalamita picta					

Species	Studied Sites				
	Tsing Yi Pylon Site	Ting Kau Beach	Ting Kau Pylon Site	Lido Beach	Casam Beach
Phylum Echinodermata					
Class Holothuroidea					
Holothuria leucospilota					
Polycheira refescens					
Phylum Mollusca Class Bivalvia					
Barbatia virescens					
Brachiodontes atratus					
Pseudocharna retroversa					
Saccostrea cucullata			+	+	+
Septifer bilocularis					
Septifer virgatus					
Class Gastropoda					
Liophura japonica		+	+		
Littorina brevicula					
Littorina scabra					
Lunella coronata					
Monodonta australis		+	+		
Morula margaritifera					
Morula musiva					
Nodilittorina millegrana	+	+	+	+	+
Nodilittorina pyramidalis		+	+	+	+
Notoacmedea coninna					+
Patteloida pygmaea	+	+	+	+	+
Planaxis sulcatus	+	+	+	+	+
Siphonaria atra	+	+	+	+	+
Thais clavigera					
Phylum Cnidaria Class Anthozoan					
Haliplanella luciae		+	+	+	+
Phylum Chordata Class Pisces					
Species A.			+		
Total	11	21	22	17	17

Subtidal

11.1.14 The abundance and diversity of sub-tidal communities occurring in the area are at present heavily influenced by anthropogenic impacts to water and sediment quality, through both organic and inorganic inputs.

Sediment Quality

11.1.15 In 1990, the EPD figures for the particle size distribution of sediments from Rambler Channel and North Lantau suggested that the sub-tidal sediments offshore from Angler's Beach and Sham Tseng contained a low percentage of particles below 63um (silt) (EPD 1991). Since 1990 the composition of the top layer of the substrate in this area has changed due to dredging and disposal work in the area, and is now approximately 80% silt, as opposed to less than 20% silt in 1990 (EPD 1994a) (Table 11.6). This will have led to corresponding changes in the infaunal macrobenthos of the sediments, with a probable decrease in diversity and/or biomass due to the difficult nature of silt for colonisation (Shin 1988).

Table 11.6 Sediment Quality in Rambler Channel/Lantau North

Parameter	Chai Wan Kok	Lantau North
Particle Size (% below 63um)	60-80	>80
Total Organic Carbon (% w/w)	0.7-1.0	1.0-1.3
Eh (mV)	>250	150-200
Total Nitrogen (mg/Kg dry solids)	300-500	<300
Total phosphorous (mg/kg dry solids)	250-300	<200
PCB (ug/kg dry solids) (1990)	>200	<50
Polycyclic aromatic hydrocarbons (ug/kg dry solids) (1990)	>200	<50
Chromium (mg/kg dry solids)	>80	<25
Copper (mg/kg dry solids)	>65	20-65
Zinc (mg/kg dry solids)	<200	<75
Nickel (mg/kg dry solid)s	>40	<20
Lead (mg/kg dry solids)	65-75	<35
Mercury (mg/kg dry solids)	0.08-0.11	0.05-0.08

Sediment Classification:
Within Class A Limits (clean to lightly contaminated)
Exceeds Class B Limits (medium level of contamination)
Exceeds Class C Limits (heavily contaminated)

Source:EPD, 1994a (except where stated)

Water Quality

11.1.16 Water quality at Angler's Beach declined in 1993/94 to such an extent that the beach was closed for swimming in 1994. The beach is second last to Rocky Bay in the ranking of Hong Kong's gazetted beaches based on the results of bacteriological water quality monitoring, and continuing deterioration of water quality has been observed. The main pollution sources are from squatters and overflow from some malfunctioning soakaway systems (EPD 1994b).

11.1.17 EPD marine water quality monitoring stations in the general area of the project include North Lantau (NM1), West Tsing Yi (WM4) and Rambler Channel (VM14). Selected parameters are shown in Table 11.7.

Table 11.7 Selected Marine Water Quality Parameters in the Vicinity of the Project (EPD 1994a)

Parameter	Rambler Channel (VM14)	Lantau North (NM1)	Tsing Yi Island West (WM4)
D.O. (% Satn.): Surface	73 (59-93)	102 (85-117)	90 (71-103)
Bottom	66 (48-87)	81 (76-90)	82 (60-93)
pH	8.2 (8.0-8.2)	8.2 (8.2-8.4)	8.2 (8.0-8.4)
S.S.(mg/l)	9.1 (3.2-23.0)	19.4 (4.5-48.7)	10.8 (3.2-22.7)
BOD_5(mg/l)	0.8 (0.7-1.2)	0.7 (0.4-1.9)	0.5 (0.2-1.6)
Inorganic Nitrogen (mg/l)	0.49 (0.26-0.72)	0.47 (0.31-0.58)	0.34 (0.17-0.53)
Total Nitrogen (mg/l)	0.85 (0.43-1.21)	0.75 (0.47-1.23)	0.67 (0.35-0.94)
PO4-P (mg/l)	0.05 (0.03-0.09)	0.04 (0.02-0.06)	0.04 (0.02-0.13)
Total P (mg/l)	0.11 (0.05-0.22)	0.09 (0.05-0.14)	0.08 (0.04-0.16)
Chlorophyll -a (ug/l)	0.61 (0.37-1.03)	0.53 (0.30-0.93)	0.61 (0.37-1.30)
E.coli (no./100ml)	1280 (270-5100)	90 (29-340)	134 (19-970)

11.1.18 On the whole these figures comply with the Water Quality Objectives for the respective Water Control Zones (EPD 1993). The main problems are high *E.coli* counts in Rambler Channel, reflecting high organic inputs, and high turbidity in the North Lantau waters.

Infaunal macrobenthos

11.1.19 The shallow water (6-7m) infaunal macrobenthos of eleven Hong Kong beaches with similar fine sandy sediments was investigated by Shin, 1988. Sham Tseng and Anglers Beach were not included in the above study. However, since both of these beaches had fine sandy sediments, and as sediment characteristics determine to a large extent the species composition of the benthic community (Ong Che and Morton 1991), similar communities were likely to be present during the study period (February to June, 1995) in the shallow sub-tidal at Sham Tseng and Anglers Beach (Annexe E).

11.1.20 Species typical of sediments containing >90% silt-clay and also of transitional silt/sand sediments are shown in Table 11.8. The increasingly poor water quality in the vicinity of Angler's Beach and Sham Tseng (EPD 1994b) indicates that the communities to be found there will display reduced diversity and possibly an abundance of opportunistic species, a pattern common in areas of high organic pollution (Pearson and Rosenberg 1978).

Table 11.8 Infaunal Macrobenthic Species Typical of Silt-Clay and Transitional Silt-Sand Sediments (Ong Che and Morton 1991)

Polychaeta	
	Aglaophamus toloensis
	Nephtys polybranchia
	Sternapsis scutata
	Lanice conchilega
	Prionospio saccifera
	Paraprionospio pinnata
Echinodermata	
	Protankyra bidentata
	Acaudina molpadiodes
	Schizaster lacunosus
	Lovenia elongata
Bivalvia	
	Theora lata
	Merisca sp.
Echiura	
	Veremolpa scabra
	Thalassema sabinum

Freshwater Ecology

11.1.21 No freshwater habitats of note were recorded during field surveys. Several stream beds running below the current Castle Peak Road alignment were either seasonal in nature and dry at the time of surveying or already highly disturbed by culverting and previous/current projects such as the construction of the Route 3 Haul Road at Ting Kau.

Avifauna

11.1.22 The alignment of the proposed project consisted entirely of areas which have been altered by infrastructural, industrial, commercial, and residential construction projects. The resulting habitats were either cultivated plantations of fruit-bearing or decorative vegetation amongst buildings, or were small plots of secondary vegetation which has re-colonized some sites following earlier disturbance. There were no large stands of undisturbed woodland, wetland, or other habitats which would attract and support avifauna on seasonal or year-round bases, and which, if lost, would result in significant degradation of the existing Territorial biodiversity. That is to say that the highly disturbed habitats along the proposed alignment do not now, and are unlikely in the near future, to support avian species or communities which would justify application of financial or other resources for conservation management.

11.1.23 Continuous disturbance due to operation of Castle Peak Road and human occupation of both sides of the road over much of its length combine with the current and historic construction disturbances to further reduce the importance of habitats along the alignment to avifauna.

11.1.24 As a consequence of the above agents, the avifauna recorded during field surveys on the project alignment consisted of common species which are widely distributed throughout Hong Kong and are neither rare nor of restricted distribution. Twenty-four species representing 18 families were recorded during field surveys (Table 11.9).

11.1.25 All species except the Little Egret were recorded on upland habitats. Village orchards and relatively mature stands of secondary woodlands supported most birds, although upland shrub habitats on steep slopes above Castle Peak Road also supported good numbers of common species such as bulbuls. The Little Egret was observed foraging along a sandy portion of the coastline near Sham Tseng.

Table 11.9 Birds Recorded on the Castle Peak Road Widening Alignment during May and June 1995

Common Name (Latin Name)	Status
Little Egret (*Egretta garzetta*)	R
Black-eared Kite (*Milvus lineatus*)	R
Spotted Dove (*Streptopelia chinensis*)	R
Rufous Turtle Dove (*Streptopelia orientalis*)	PM/WV
Large Hawk Cuckoo (*Cuculus sparverioides*)	SV
Indian Cuckoo (*Cuculus micropterus*)	SV
Koel (*Eudynamis scolopacea*)	R
House Swift (*Apus nipalensis*)	R
Barn Swallow (*Hirundo rustica*)	SV
Tree Sparrow (*Passer montanus*)	R
Crested Bulbul (*Pycnonotus jocosus*)	R
Chinese Bulbul (*Pycnonotus sinensis*)	R
Red-vented Bulbul (*Pycnonotus aurigaster*)	R
Magpie Robin (*Copsychus saularis*)	R
Yellow-bellied Prinia (*Prinia flaviventris*)	R
Plain Prinia (*Prinia inornata*)	R
Common Tailorbird (*Orthotomus sutorius*)	R
Black-faced Laughing-thrush (*Garrulax perspicillatus*)	R
Great Tit (*Parus major*)	R
Japanese White-eye (*Zosterops japonica*)	R
Black Drongo (*Dicrurus macrocercus*)	SV
Magpie (*Pica pica*)	R
Crested Myna (*Acridotheres cristatellus*)	R
White-backed Munia (*Lonchura striata*)	R
Key to symbols: R = resident SV = summer visitor PM = passage migrant WV = winter visitor	

Other Vertebrates

11.1.26 No other vertebrates were recorded along the proposed alignment during field studies in May or June 1995. As discussed in paragraphs 11.1.22 and 11.1.23, the high levels of disturbance of habitats along the alignment would militate against occupation of the area by larger terrestrial vertebrates. Habitats upslope of the proposed alignment (near Tuen Mun Road) supported more dense vegetation than did areas along Castle Peak Road. Such areas were also relatively distant from sources of human disturbance. The combined influence of these factors would be expected to result in higher wildlife habitat quality nearer Tuen Mun Road, upslope of the proposed Castle Peak Road alignment. These areas would be unaffected by direct disturbance of the proposed project.

11.2 Potential Impacts

11.2.1 Impacts of construction on ecological resources and mitigation proposals are discussed based on a dual-2 carriageway alignment and on an alternative single wide carriageway west of Hong Kong Gardens.

Terrestrial Flora

11.2.2 Potential habitat loss was estimated based on the preferred alignment, i.e. a dual-2 carriageway alignment (Table 11.10).

Table 11.10 Estimated Habitat Loss along Castle Peak Road due to Construction

Habitat	Estimated Loss (ha)
Shrubland	2.64
Natural woodland	2.83
Plantation woodland	5.86
Grassland	1.02
Total disturbance	12.35

11.2.3 The estimated habitat loss includes loss due to main construction facilities (except reclamation, which will not affect terrestrial habitat). It does not include the temporary loss due to disturbance within the work area, the boundary of which is not shown on current maps. However, the construction site boundaries are expected to extend 1.5 m to 3 m on both sides of the new alignment (the smaller figure only if there are topographical constraints or property boundaries), and up to 5 m from the edge of cut slopes. Habitat loss including areas within the construction boundary can be computed upon the completion of detailed design of the road.

11.2.4 The main construction activities in the study area include:

- excavation
- fill/embankment
- reclamation
- structure.

A tentative construction programme is shown in Annexe H of this volume.

11.2.5 Excavation works will mainly take place on landward slopes along the proposed new road. Fill/embankment works as well as structures will be carried out on the seaward side of the proposed alignment. Therefore, the potential impact on the study area will be permanent loss of flora, fauna, and their habitats due to excavations and filling activities.

Habitat loss and/or disturbance will be temporary where the alignment is placed on structures. Reclamation will have little impact on terrestrial flora.

11.2.6 The extent of the main construction activities will be the same for the wide single carriageway alignment option west of Hong Kong Garden.

11.2.7 As a result of the patchiness and disturbed nature of the habitats, most vegetation or habitat losses are not considered significant in terms of conservation and ecological values.

Aquatic Fauna

11.2.8 Where the proposed road widening is to the seaward side of the existing road, potential intertidal impacts are limited to the loss of boulder and sand shoreline, depending on the construction options proposed, i.e. using structures, fill or reclamation to support the road. Potential sub-tidal impacts arise from the construction of a fill embankment at Tsing Lung Tau Beach.

11.2.9 The length of shoreline to be affected by seaward widening, shoreline type and the proposed method of supporting the road is shown in Table 11.11.

Support Structures:

11.2.10 Access to the seashore will be inhibited where structures are used to support seaward widening of the road, although it is anticipated that there will be no permanent impacts to the intertidal ecology of the areas concerned. Although the taller backshore vegetation will be lost, the nature of the rocky intertidal should remain unchanged.

Fill Support:

11.2.11 Areas of seaward fill slopes will negatively impact the upper part of the shoreline. From the Preliminary Programme shown in Annexe H (and further described in Volume 1 of this Study), a total of approximately 280 metres of rocky shore and 180 metres of rock/sand shoreline will be impacted, although not all areas will be affected to the same extent. The greatest degree of intrusion of the fill into the intertidal zone will occur in areas designated WF05 and EF01 in Annexe H. However, the overall ecological impact to the intertidal areas of these works is expected to be small.

Reclamation:

11.2.12 Reclamation is proposed along two stretches of road approximately 250m in length. At Tung Lung Tau, reclamation will occupy approximately 0.7ha of sandy intertidal, running from the shoreline in front of Lung Tang Court, across the beach in front of Tsing Lung Tau Village to the headland on which Dragon Villa is situated (designated WO1R in the Annexe H construction schedule). Only about 25 metres of Angler's Beach would be affected. While ecological diversity of such beaches is low, the former site is currently used as a mooring site for small rental fishing craft, and as such is of some amenity value.

Table 11.11 Approximate Length of Shoreline/Shoreline Type Affected by Castle Peak Road Widening

	Rocky Shore		Sand Shore	
Support Type	Ref. No.*	Metres	Ref. No.*	Metres
Fill	WF01 WF07 (part) (Angler's) WF02 WF05 EF01 EF06	27 30 25 40 ~100 60	WF03-WF04	~180
Total		**~282**		**~180**
Structures	WO1W (part) WO5W E1W (part) E4W (part)	30 20 37 20	WO2W WO3W WO4W (Dragon) WO6W (Angler's) E1W (part) (Gemini) E2W (Gemini) E9W	35 37 30 20 15 15 100
Total		**~107**		**~252**
Reclamation	-	-	WO1R	0.7ha
Total				0.7ha

* *refer to construction programme in Annexe H*

11.2.13 The road improvements will encroach upon Angler's Beach to a minor extent. Loss will be confined to the most western part. Actual ecological impacts will be minimal.

Freshwater Fauna

11.2.14 No significant impacts to freshwater fauna are expected to occur as a result of this project.

Avifauna

11.2.15 No nests, roost sites, or other intensive use areas were recorded on the study area. Impacts to avifauna from the proposed project would consist primarily of loss of foraging and escape or cover habitats. Habitats to be lost would consist mainly of secondary vegetation on formerly disturbed areas or plantations. The impacts of these habitat losses are considered to be of minimal significance given the nature to the pre-disturbance bird communities and the potential for restoration of disturbed habitats using species of similar or greater ecological value for birds.

Other Vertebrates

11.2.16 No significant impacts are predicted for reptiles, amphibians, or mammals.

11.3 Impact Avoidance and Mitigation Measures

Terrestrial Flora

11.3.1 There are many constraints of improving the existing Castle Peak Road alignment because of its narrowness and severity topographically. Alternative alignment options will not result in significance difference in habitat loss. For example, shifting of the alignment seaward west of Grand Bay Villa (Option 2A described in the Interim Report) will avoid the loss of 0.13 ha of the ravine type woodland west of Dragon View, but it will result in loss of 0.14 ha mixed woodland (see Table 11.12 for species composition of the mixed woodland along this segment) and possible loss of an ungazetted beach as well as natural shorelines. Shifting of the alignment landward at Dragon Beach (Option 3D described in the Interim Report) will avoid the loss of 0.06 ha mixed woodland but will require a greater extent of cutting on the landward side. Because of the patchiness and highly disturbed nature of the habitats, losses of vegetation or habitats are mostly not considered significant in terms of conservation and ecological values.

Table 11.12 Species Occuring on the Seaward Side Mixed Woodland west of Grand Bay Villa

Species	Form	Relative Abundance	Species	Form	Relative Abundance
Caesalpinia nuga	C	+	*Psychotria rubra*	S	+
Cansjera rheedii	C	+	*Rhaphiolepis indica*	S	+
Passiflora foetida	C	+	*Gordonia axillaris*	S	++
Strophanthus divaricatus	C	++	*Lantana camara*	S	++
Oploclisia glaucescens	C	+++	*Ligustrum sinensis*	S	++
Mikania micrantha	C	+++	*Litsea rotundifolia*	S	++
Lygodium japonicum	F	+++	*Bridelia tomentosa*	S	+++
Cynodon dactylon	G	++	*Rhus hypoleuca*	S	+++
Miscanthus floridulus	G	++	*Sageretia theezans*	S	+++
Neyraudia arundinacea	G	++	*Acronychia pedunculata*	T	+
Pennisetum purpureum	G	++	*Bauhinia variegata var. candida**	T	+
Rhynchelytrum repens	G	++	*Ficus variegata*	T	+
Panicum maximum	G	+++	*Macaranga tanarius*	T	+
Praxelis clematidea	H	+	*Melaleuca quinquenervia*	T	+
*Rhoeo discolor**	H	+	*Melia azedarah*	T	+
*Wedelia chinensis**	H	+	*Sapium discolor*	T	+
Bidens pilosa	H	++	*Scolopia chinensis*	T	+
Chrysanthemum indicum	H	++	*Sterculia lanceolata*	T	+
Sonchus oleraceus	H	++	*Casuarina equisetifolia**	T	++
Tridax procumbens	H	++	*Cerbera manghas*	T	++
Pluchea indica	H	+++	*Dimocarpus longan**	T	++
Solanum nigrum	H	+++	*Hibiscus tiliaceus*	T	++
Brucea javanica		+	*Lophostemon conferta*	T	++
*Calliandra haematocephala**	S	+	*Microcos paniculata*	T	++
Gardenia jasminoides	S	+	*Schefflera octophylla*	T	++
*Hamelia patens**	S	+	*Acacia confusa*	T	+++
*Hibiscus rosa-sinensis**	S	+	*Celtis sinensis*	T	+++
Ilex pubescens	S	+	*Cratoxylum cochinchinese*	T	+++
Melastoma sanguineum	S	+	*Ficus microcarpa*	T	+++
Pandanus tectorius	S	+	*Leucaena leucocephala*	T	+++
Phyllanthus emblica	S	+	*Litsea glutinosa*	T	+++
*Pittosporum tobira**	S	+	*Rhus succedanea*	T	+++

* exotic species

11.3.2 The most significant loss of secondary woodland occurs in the Ting Kau segment (about 2.7 ha of young secondary forest). The woodland is of a very early successional stage and supports common pioneer species. However, in the absence of disturbance it would develop into mature woodland over 15-30 years. The requirement for cutting on this hillslope could be slightly reduced by a design change to an elevated split-level carriageway (Option 8C as described in the Interim Report). This option would entail construction of retaining walls to allow shifting of the alignment toward the existing road. As a result, loss of woodland would be reduced by approximately 0.21 ha on the north side of the alignment, though it would be increased by 0.07 ha close to the existing road (Fig. 11.5). Therefore, the elevated split-level carriageway would result in a net reduction of 0.14 ha (1.6 percent of the original total) in woodland loss. However, this option was not chosen by the alignment scoring process because of the greater relative weighting assigned to other key issues.

11.3.3 Many large roadside trees along the proposed alignment are isolated, and of limited ecological value. However, to the extent possible, such trees should be retained for their visual and landscape value.

11.3.4 It is important to contain construction works within the minimum possible land area to avoid unnecessary habitat destruction. Newly formed slopes should follow the natural contours as possible to recreate habitats for revegetation.

11.3.5 Loss of woodland may be mitigated by revegetation. In particular, three areas are available on site for tree planting: Opposite Grand Bay Villas, between Sea Crest Villas Phases 3 and 4, and at Homi Villa. A total of 2.45 ha can be available for revegetation. Native indigenous species (see Table 11.1) which provide cover and forage value for wildlife should be selected for revegetation efforts. Riparian species such as *Sterculia lanceolata* and *Ficus fistulosa* should be planted at more mesic sites, e.g., downstream at Ting Kau to mitigate the loss of ravine type woodland.

Intertidal and Freshwater Fauna

11.3.6 The construction of viaducts and other support structures should be carried out to minimise damage and disturbance to the physical structure of the rocky shoreline affected by the project.

11.3.7 Replacement of proposed areas of fill support on the stretches of seaward widening with viaduct structures will reduce the potential impacts to the natural shoreline.

11.3.8 No potential significant impacts are expected to freshwater fauna.

Avifauna

11.3.9 Restoration of habitats disturbed during construction using vegetation as recommended in paragraphs 11.3.1 to 11.3.5 would provide foraging, escape, and nesting cover for avifauna following completion of the project. Protection of coastal areas by construction of the highway on structures would ensure retention of the existing coastline to the extent possible, thereby avoiding impacts of habitat loss for species which use the coastline (Little Egret and other water birds).

11.4 Residual Impacts

11.4.1 Potential impacts of the road improvements include:

- loss of 2.64 ha of shrubland, 2.83 ha of natural woodland, and 5.86 ha of plantation woodland. A total of 2.45 ha on site is available for compensatory planting, which constitutes mitigation measures for woodland loss.
- loss of 0.39 km of rocky shoreline and 0.29 km of sandy shoreline, and
- loss of 0.7 ha of intertidal area. This is not considered a significant residual ecological impact due to the degraded nature of water quality and marine benthic communities in the area.

11.4.2 These impacts are based on the currently proposed alignment, and may change with refinement of the alignment in subsequent stages of the project.

11.4.3 Predicted impacts of the project could be avoided to some extent through project design which would preserve coastal habitats. Habitat loss impacts could be mitigated by restoration of vegetative cover on disturbed areas using vegetation of documented utility to wildlife.

11.4.4 Based on the potential for impact avoidance and mitigation together with the disturbed nature of the existing site, it is not predicted that the project would result in residual ecological impacts that would cause long-term degradation of Hong Kong's biodiversity.

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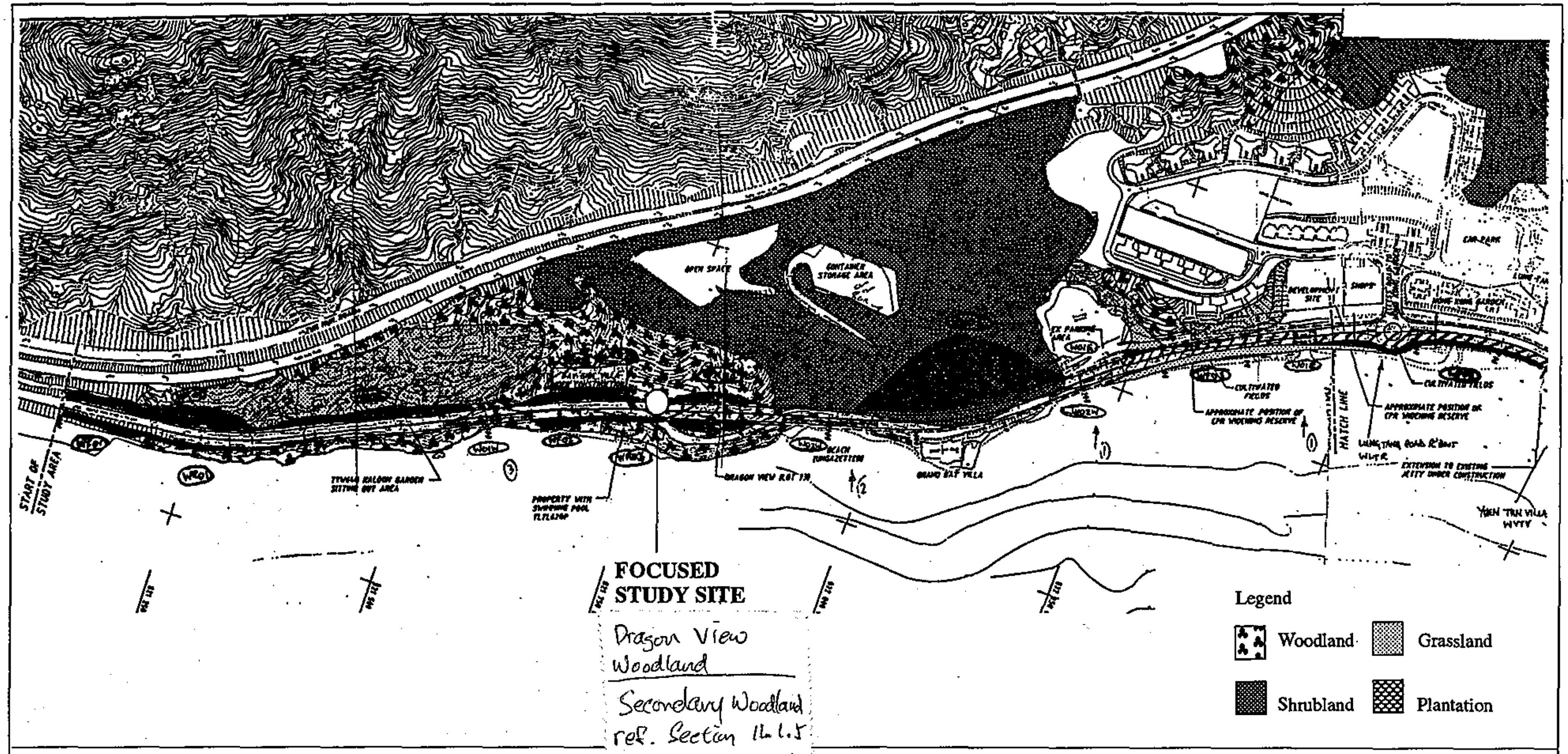

Fig. 11.1 **Habitat Map, south of Tuen Mun Road between Ka Loon Tsuen to Tsuen Wan, for Castle Peak Road Improvement Project, June 1995.**

Extract from
EIA - 103/BC
District 7

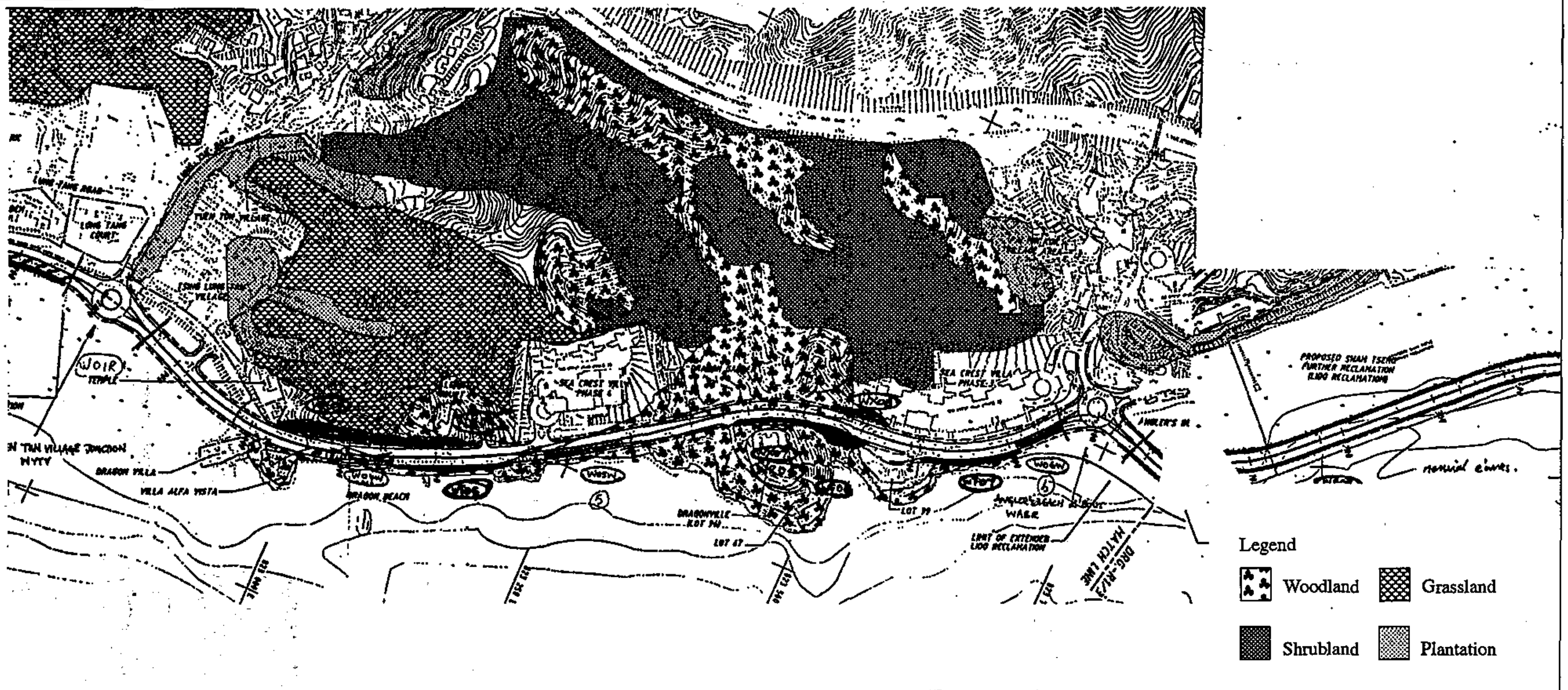

Fig. 11.2 **Habitat Map, south of Tuen Mun Road from Ka Loon Tsuen to Tsuen Wan for Castle Peak Road Improvement Project, June 1995.**

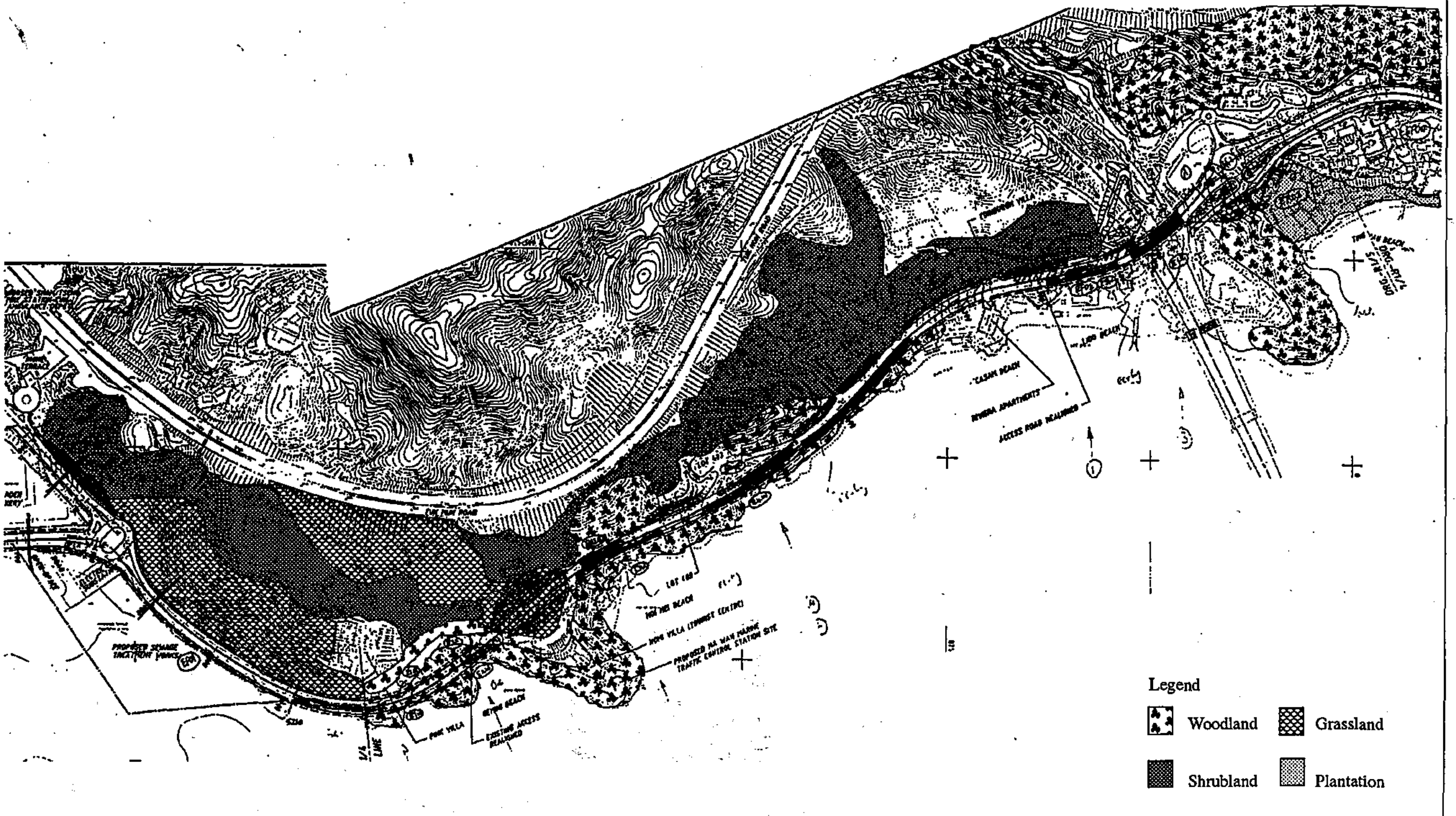

Fig. 11.3 Habitat Map, south of Tuen Mun Road from Ka Loon Tsuen to Tsuen Wan, for Castle Peak Road Improvement Project, June 1995.

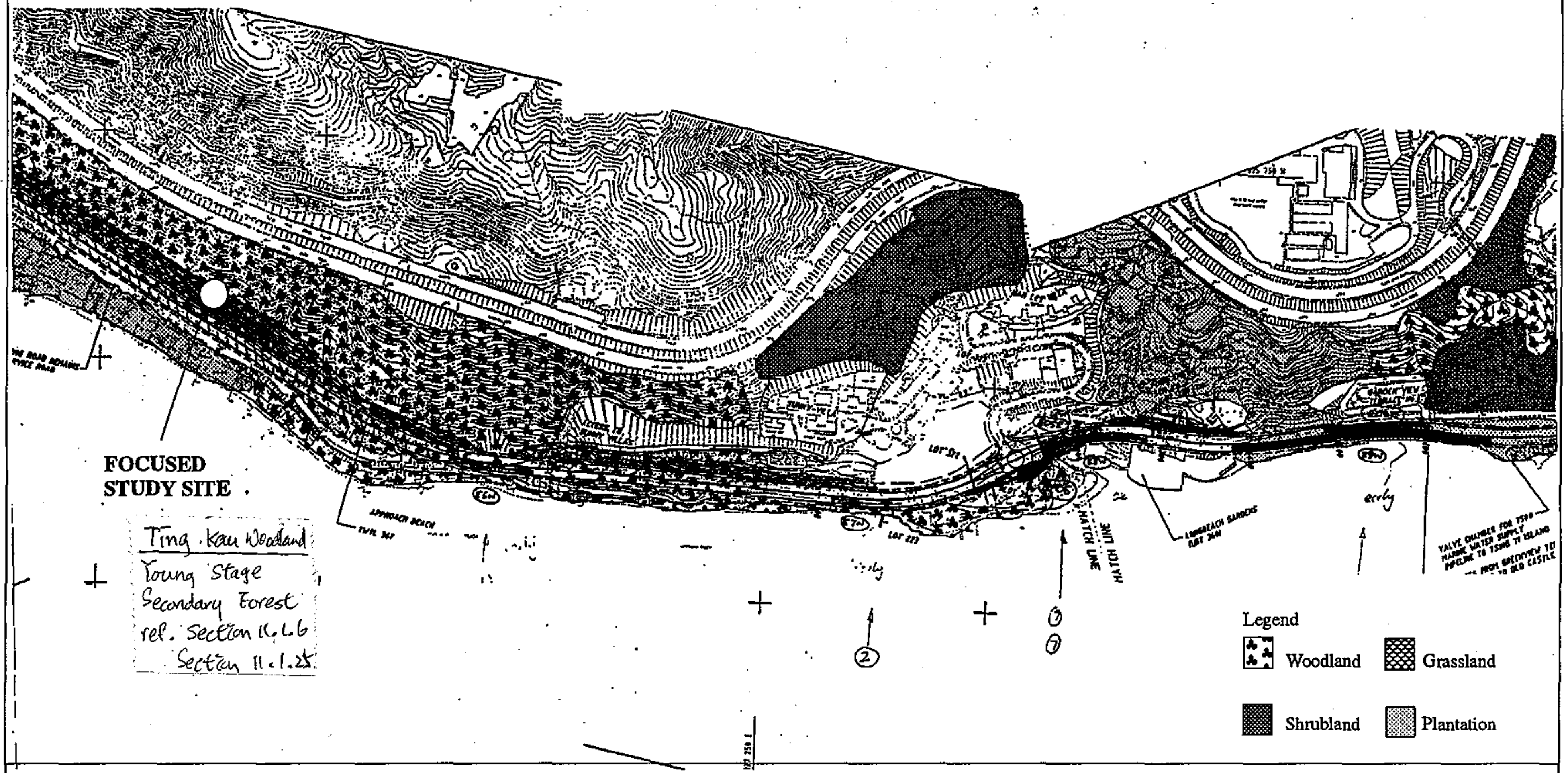

Fig. 11.4 **Habitat Map, south of Tuen Mun Road from Ka Loon Tsuen to Tsuen Wan, for Castle Peak Road Improvement Project, June 1995.**

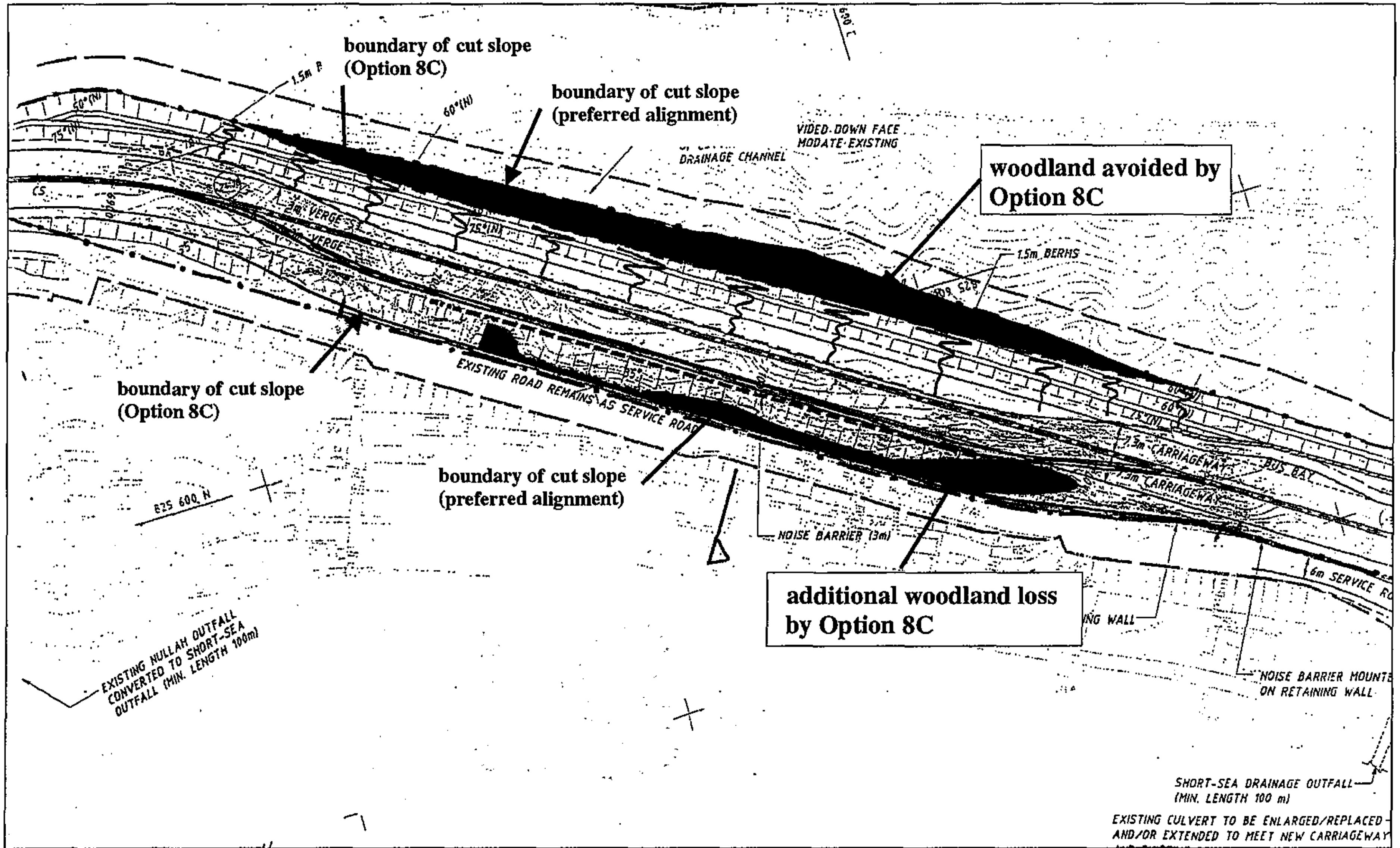

Fig. 11.5 **Relationships between the preferred alignment, Option 8C and the secondary woodland at Ting Kau Section.**

12 WATER QUALITY IMPACT

12.1 Construction Phase Impacts

12.1.1 This section deals generally with the anticipated water quality impacts associated with construction of the improved road.

12.1.2 Changes to the alignment of the road will involve construction works such as cut and fill, minor reclamation, and new road surfacing. In addition, any proposed works areas operating during the construction phase may have a requirement for effluent discharge. Potential construction impacts will be dependent on:

- extent and final shape of minor reclamation
- extent of works in subtidal and intertidal areas (including seawall, piling, and bridge or viaduct construction)
- alteration to watercourses including diversion or culverting
- extent of cutting and filling
- size and location of construction works areas
- size of workforce and arrangements made for toilet and canteen facilities
- measures taken to prevent and reduce potential pollution impacts resulting from accidental spillage.

12.1.3 The potential for contamination of the coastal zone during this period arises mainly from suspended solids contained in runoff from exposed areas (especially reclamation and steep, freshly cut slopes), together with oils and other chemicals resulting from spills in active works areas, particularly from fuel storage sites. Effluent from site facilities, such as toilets and canteens, could also be polluting if appropriate measures are not taken with respect to treatment and discharge.

12.1.4 If the potential for impacts is adequately addressed, then actual residual impacts after adoption of standard mitigating measures should in general be low. Impacts can be avoided by programming the works outside the bathing season.

12.1.5 Minor reclamation will be required in two areas. approximately 12,000 m^2 at Tsing Lung Tau (Figures 12.1 and 12.2), and approximately 1,900 m^2 at Sham Tseng (Figure 12.3). Both reclamations are narrow. At Tsing Lung Tau, the maximum width will be about 60m in very shallow water (above 0 mPD). At Sham Tseng, the maximum width is about 20m in similarly shallow water, and will slightly affect the existing gazetted beach (Angler's Beach). However, only 25 m length of sandy beach will be affected.

12.1.6 These minor reclamations at Sham Tseng and Tsing Lung Tau will not require dredging, since they are in very shallow water. The works will require filling of the foreshore and design stage so that alteration to the existing stream courses and the extent of culverting can be minimised.

12.2.5 Contaminant levels in road and urban area runoff have been measured in several studies [1,2,3,4]. The concentrations of certain pollutants are provided in Table 12.1, with the higher range of values reported from the 'first-flush' event. Pollutant concentrations typically decline rapidly during a rainstorm event. These values should be treated cautiously, however, as they apply to European conditions and were also measured prior to the widespread introduction of unleaded fuel and exhaust emission controls.

Table 12.1 Reported Pollution Concentrations in Urban Stormwater

Parameter	Pollution concentrations reported by:			
	Carleton (1990)	Ellis (1989)	Perry (1989)	Marsalek (1990)
	urban runoff	highway runoff	urban runoff	urban runoff
BOD	47 mg/l	12 - 32 mg/l	-----	-----
COD	132 mg/l	128 - 171 mg/l	36 - 575 mg/l	-----
Suspended Solids	141 mg/l	28 - 1178 mg/l	<15 - 3600 mg/l	-----
Oil	-----	-----	6 - 23 mg/l	-----
Lead	-----	0.15 - 2.9 mg/l	0.1 - 8.0 mg/l	0.1460 mg/l
Zinc	-----	-----	0.1 - 3.4 mg/l	0.4900 mg/l
Copper	-----	-----	<0.003 - 0.04 mg/l	0.0015 mg/l
Cadmium	-----	-----	0.007 - 0.03 mg/l	0.0030 mg/l
Chromium	-----	-----	0.002 - 0.08 mg/l	-----
PAH	-----	0.36 - 6.0 µg/l	-----	6.9500 µg/l

12.2.6 Equivalent figures for the Hong Kong situation are not available, but are likely to be of the same order because of the use of diesel and leaded fuels. Concentrations may,

[1] Carleton, M.G., Comparison of overflows from separate and combined sewers -- quantity and quality. *Water Sci Technol.*, 22 (10/11), 31-38, 1990.

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[4] Perry, R. Concentration of pollutants in urban runoff. Pers. Comm.

12.3.2 Works close to gazetted bathing beaches shall be carried out outside the designated bathing season. The minor reclamations at Sham Tseng and Tsing Lung Tau should preferably be formed behind a sealed seawall and the method of fill placement should be managed to reduce formation of suspended sediment plumes.

Operation Phase

12.3.3 There are few preventative measures that can be taken to reduce the concentration of trace contaminants in highway runoff. Mitigation must depend on treatment of runoff. Even though the short-term effect on local water quality may be insignificant, the potential for long term effects and the possibility of accidents involving polluting materials makes the use of pollution control mechanisms imperative.

12.3.4 There is insufficient space for provision of settlement basins to collect drainage from road gullies, because of the location of the road adjacent to the coast and the generally hilly nature of the landscape. Therefore drainage from road surfaces should be directed through oil interceptors, which should discharge away from sensitive areas such as bathing beaches. Such oil/water separators will also allow suspended sediment to settle and must therefore be of sufficient size to accommodate storm events. Maintenance of the interceptors, including periodic condition checks and emptying of oil and sludge, is essential to maintain an adequate retention time. Additional protection can be gained by the use of oil absorbent media to trap oil and grease on entry to, or exit from, the drainage system. Special precautions for the correct disposal of all intercepted material will be required. It is unlikely that a dedicated water treatment facility would be required, but careful consideration should be given to the likely volumes of runoff arising during the first phases of a storm event. Peaks in concentrations of pollutants will be reduced by frequent cleansing of roads and roadside gullies.

12 WATER QUALITY IMPACT

12.1 Construction Phase Impacts

12.1.1 This section deals generally with the anticipated water quality impacts associated with construction of the improved road.

12.1.2 Changes to the alignment of the road will involve construction works such as cut and fill, minor reclamation, and new road surfacing. In addition, any proposed works areas operating during the construction phase may have a requirement for effluent discharge. Potential construction impacts will be dependent on:

- extent and final shape of minor reclamation
- extent of works in subtidal and intertidal areas (including seawall, piling, and bridge or viaduct construction)
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- measures taken to prevent and reduce potential pollution impacts resulting from accidental spillage.

12.1.3 The potential for contamination of the coastal zone during this period arises mainly from suspended solids contained in runoff from exposed areas (especially reclamation and steep, freshly cut slopes), together with oils and other chemicals resulting from spills in active works areas, particularly from fuel storage sites. Effluent from site facilities, such as toilets and canteens, could also be polluting if appropriate measures are not taken with respect to treatment and discharge.

12.1.4 If the potential for impacts is adequately addressed, then actual residual impacts after adoption of standard mitigating measures should in general be low. Impacts can be avoided by programming the works outside the bathing season.

12.1.5 Minor reclamation will be required in two areas, approximately 12,000 m^2 at Tsing Lung Tau (Figures 12.1 and 12.2), and approximately 1,900 m^2 at Sham Tseng (Figure 12.3). Both reclamations are narrow. At Tsing Lung Tau, the maximum width will be about 60m in very shallow water (above 0 mPD). At Sham Tseng, the maximum width is about 20m in similarly shallow water, and will slightly affect the existing gazetted beach (Angler's Beach). However, only 25 m length of sandy beach will be affected.

12.1.6 These minor reclamations at Sham Tseng and Tsing Lung Tau will not require dredging, since they are in very shallow water. The works will require filling of the foreshore and consolidation of the filled area using wick drains or surcharge. The reclamation is consequently not expected to result in substantial impacts.

12.1.7 The nearest mariculture zone at Ma Wan is 1.5 km distant from potential areas of reclamation. In addition, strong tidal flows separate the works areas from Ma Wan. These tidal flows would disperse suspended sediment parallel to the coastline towards Tuen Mun to the west and towards Tsuen Wan to the east, so the probability of any suspended sediment affecting the mariculture zone is considered to be very low.

12.1.8 The potential for cumulative impacts in the region has not been evaluated, but it is considered that the strong tidal flows between the NW New Territories and North Lantau would result in negligible cumulative effect from works currently in progress on North Lantau and elsewhere in the area.

12.2 Operational Phase Impacts

12.2.1 As the basic alignment of the improved road will, for much of its length, follow the route of the existing Castle Peak Road, the wider carriageway will result in a small amount of additional surface water run-off. The impact of this additional volume is expected to be negligible considering that most run-off will discharge directly to the sea.

12.2.2 As a result of road widening, there are some stretches of the route which will require cutting into hillsides and formation of embankments. Run-off from such areas where they comprise of exposed soil before stabilisation, may result in elevated suspended solids and turbidity in the water column. This is likely to be of little consequence in the coastal waters adjacent to the proposed route, except in areas alongside gazetted bathing beaches. Roadside drainage should therefore be directed to discharge away from such areas.

12.2.3 The potential for contamination of the coastal waters arises mainly from storm runoff across the paved surfaces of the new road. Such runoff, particularly in the first flush following a prolonged dry period, would contain several different contaminants resulting from fuel combustion, as well as eroded brake linings and tyre deposits and discarded refuse. In addition, the road is likely to be used for transport of a variety of materials, some of which may be polluting. The potential for spills, and their subsequent containment, should be allowed for in the design of pollution control mechanisms.

12.2.4 As the proposed road lies close to the coast, it is unlikely that any serious contamination of surface water courses would occur. There are few such watercourses crossed by the road, and any spills would be carried rapidly to the coastal waters. It is unlikely that any beneficial uses of such watercourses (such as water abstraction) would be affected. It also appears unlikely that any stream diversions will be required, although culverting may need to be considered. The need for such measures should be reviewed carefully at the detailed design stage so that alteration to the existing stream courses and the extent of culverting can be minimised.

12.2.5 Contaminant levels in road and urban area runoff have been measured in several studies [1,2,3,4]. The concentrations of certain pollutants are provided in Table 12.1, with the higher range of values reported from the 'first-flush' event. Pollutant concentrations typically decline rapidly during a rainstorm event. These values should be treated cautiously, however, as they apply to European conditions and were also measured prior to the widespread introduction of unleaded fuel and exhaust emission controls.

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[3] Marsalek, J. Evaluation of pollutant loads from urban non-point sources. *Water Sci Technol.*, 22 (10/11), 23-30, 1990.

[4] Perry, R. Concentration of pollutants in urban runoff. Pers. Comm.

however, be lower on average because of the intense rainfall events experienced during the rainy season.

12.2.7 The figures indicate that a number of pollutants may exist in road runoff at significant levels. Comparison of the values in Tables 3.5, 3.6, 3.7 and 12.1 indicate that objectives set at the point of discharge may be breached for suspended solids, oils, and some metals. Allowing for the large volume of water in this region and the vigorous tidal mixing, there should not, under normal circumstances, be any problems with meeting the water quality objectives. In the case of accidents, however, and for the protection of the local environment (particularly close to sensitive uses such as bathing beaches), there will be a need to install pollution control equipment such as sediment traps and oil interceptors.

12.2.8 In general, operational impacts are likely to be minimal provided appropriate pollution control mechanisms are installed to protect sensitive receivers such as gazetted bathing beaches from pollution contained in run-off and as a result of spills following road accidents.

12.2.9 The two areas of reclamation at Sham Tseng (approx. 1,900 m^2) and at Tsing Lung Tau (approx. 12,000 m^2) will be unlikely to cause any measurable impact on flows and water quality in the area. This is because the reclamations are very narrow, are constructed in very shallow water (above the low-water mark), and do not extend far from the existing coastline. Indeed, the reclamation at Tsing Lung Tau may result in slightly improved water quality due to the smoothing of the coastline at this location and the partial filling in of the embayment adjacent to Dragon Villa.

12.2.10 It is anticipated that water quality would be largely unaffected by the minor reclamation, which do not produce any areas of reduced dispersion and do not introduce any additional effluent discharge points.

12.3 Mitigation

Construction Phase

12.3.1 All active working areas should be bunded to retain storm water with sufficient retention time to ensure that suspended solids are not discharged from the site in concentrations above those specified in the Technical Memorandum for the relevant WCZ. All fuel storage areas should be bunded to 110% of capacity and drainage directed to an oil interceptor. Separate treatment facilities may be required for effluent from site offices, toilets (unless chemical toilets are used, which is the current preference of EPD) and canteens. Consent from EPD will be required for any proposed discharge, which shall not be within 100 metres of any bathing beach. The recommendations of EPD's ProPECC Paper PN 1/94 (Construction Site Drainage) should be adopted.

12.3.2 Works close to gazetted bathing beaches shall be carried out outside the designated bathing season. The minor reclamations at Sham Tseng and Tsing Lung Tau should preferably be formed behind a sealed seawall and the method of fill placement should be managed to reduce formation of suspended sediment plumes.

Operation Phase

12.3.3 There are few preventative measures that can be taken to reduce the concentration of trace contaminants in highway runoff. Mitigation must depend on treatment of runoff. Even though the short-term effect on local water quality may be insignificant, the potential for long term effects and the possibility of accidents involving polluting materials makes the use of pollution control mechanisms imperative.

12.3.4 There is insufficient space for provision of settlement basins to collect drainage from road gullies, because of the location of the road adjacent to the coast and the generally hilly nature of the landscape. Therefore drainage from road surfaces should be directed through oil interceptors, which should discharge away from sensitive areas such as bathing beaches. Such oil/water separators will also allow suspended sediment to settle and must therefore be of sufficient size to accommodate storm events. Maintenance of the interceptors, including periodic condition checks and emptying of oil and sludge, is essential to maintain an adequate retention time. Additional protection can be gained by the use of oil absorbent media to trap oil and grease on entry to, or exit from, the drainage system. Special precautions for the correct disposal of all intercepted material will be required. It is unlikely that a dedicated water treatment facility would be required, but careful consideration should be given to the likely volumes of runoff arising during the first phases of a storm event. Peaks in concentrations of pollutants will be reduced by frequent cleansing of roads and roadside gullies.

12.4 Conclusions

Construction

12.4.1 Changes to the alignment of the road will involve construction works, including cut and fill and surfacing. In addition, any proposed works areas operating during the construction phase may have a requirement for effluent discharge. The potential for contamination of the coastal zone during this period arises mainly from suspended solids contained in runoff from exposed areas, especially steep, freshly cut slopes, together with oils and other chemicals resulting from spills in active works areas, particularly from fuel storage sites, and with effluent from site facilities, such as toilets and canteens.

12.4.2 Works active in the sub-tidal such as reclamation would potentially have the worst impacts. Bridges requiring piling would have some impact. Viaducts in the nearshore and foreshore areas would have less impact, and entirely land-based options would have least impact as controls are presumed to be more effective.

Operation

12.4.3 Following construction and site restoration, the potential for contamination of the coastal waters arises mainly from storm runoff across the paved surfaces of the new road. Such runoff, particularly in the first flush following a prolonged dry period, would contain several different contaminants resulting from fuel combustion, as well as eroded brake linings and tyre deposits and discarded refuse. In addition, the road is likely to be used for transport of a variety of materials, some of which may be polluting. The potential for spills, and their subsequent containment, should be allowed for in the design of pollution control mechanisms.

12.4.4 A preliminary assessment indicates that a number of pollutants may exist in road runoff at significant levels. Objectives set at the point of discharge may be breached for suspended solids, oils, and some metals. Allowing for the large volume of water in this region, and the vigorous tidal mixing, there should not, under normal circumstances, be any problems with meeting the water quality objectives. In the case of accidents, however, and for the protection of the local environment (particularly close to sensitive uses such as bathing beaches), there will be a need to install pollution control equipment such as sediment traps and oil interceptors.

12.4.5 As the proposed road lies close to the coast, it is unlikely that any serious contamination of surface water courses will occur.

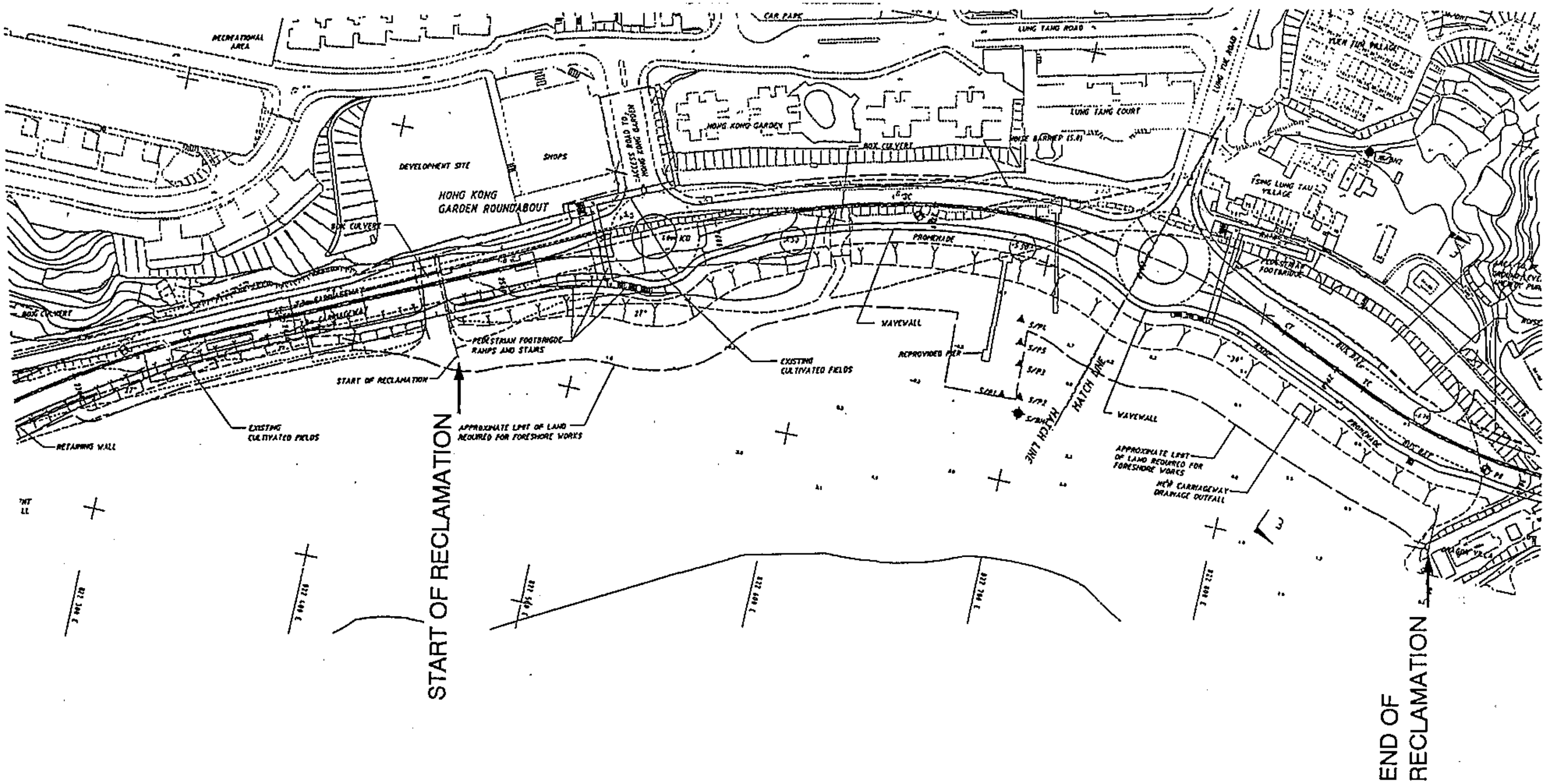

Figure 12.1 Reclamation at Tsing Lung Tau

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Source: Volume 5, Drgs 97204/RF/003 and 004 (Preferred Alignment: Engineering Details)

NOTES:

1. ALL DETAILS AND DIMENSIONS SHOWN ARE INDICATIVE ONLY AND SHALL BE SUBJECT TO DETAILED DESIGN.
2. CENTRAL RESERVE AND VERGE WIDTHS MAY VARY IN ACCORDANCE WITH SPECIFIC DESIGN REQUIREMENTS. INFILL PLANTING BETWEEN BARRIERS ARE SUBJECT TO LANDSCAPE DESIGN.
3. SIDE SLOPES AND BERM DIMENSIONS ARE SUBJECT TO GEOTECHNICAL DESIGN.

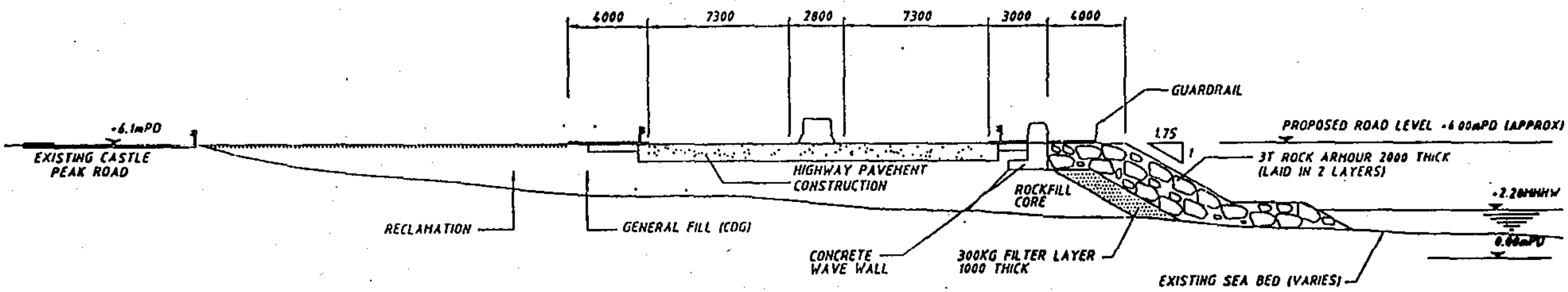

Figure 12.2 Cross Section of Reclamation at Tsing Lung Tau

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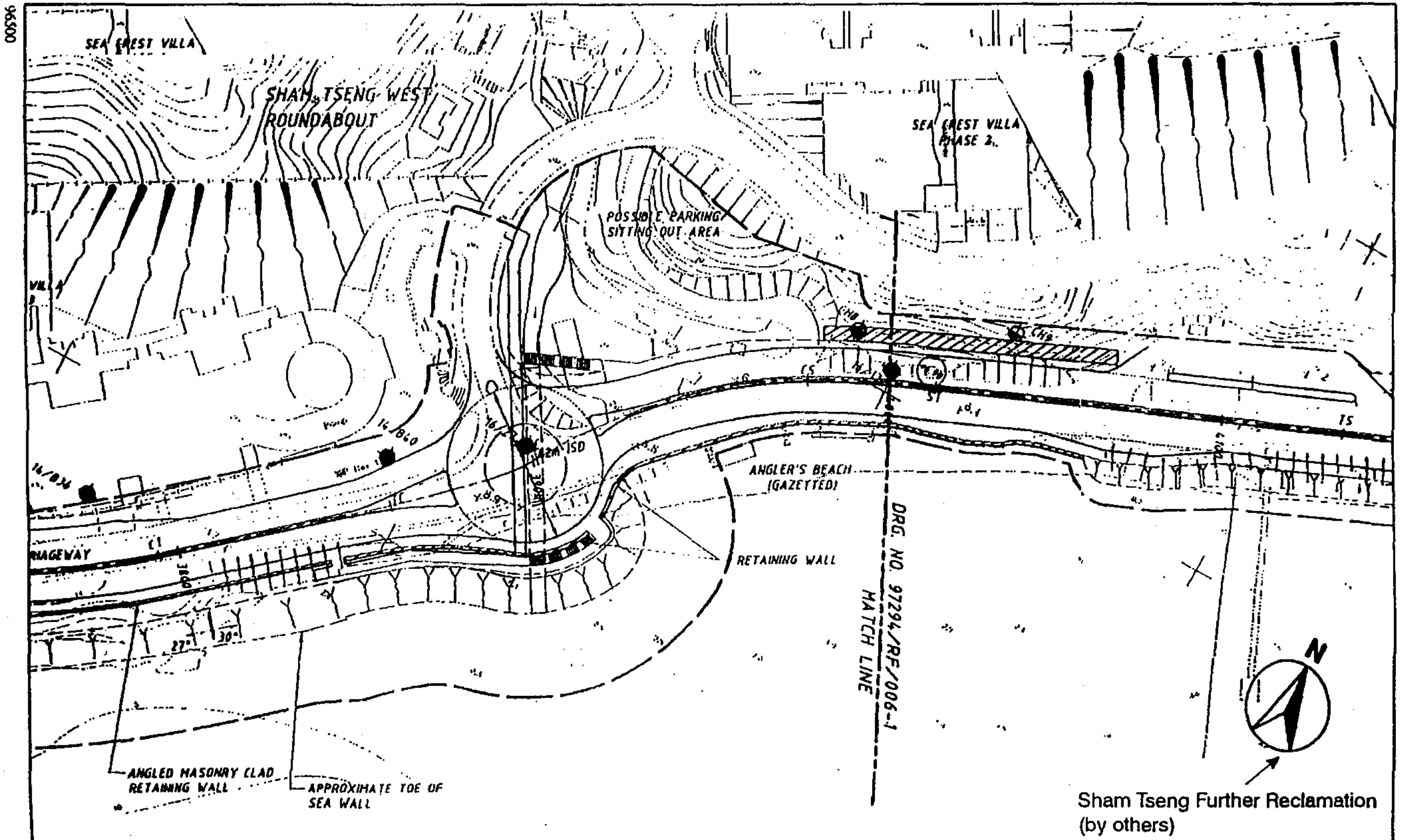

Figure 12.3 Reclamation at Sham Tseng (Angler's Beach)

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13 SOLID WASTE AND CONSERVATION

13.1 Introduction

13.1.1 Construction work will be carried out at two major locations: the Eastern Half (from Ka Loon Tsuen to eastern Sham Tseng) and the Western Half (eastern Sham Tseng to Area 2 in Tsuen Wan). At the Eastern Half, the work will involve the installation of access roads, construction of temporary structures (including offices and stores), and setting up and commissioning crusher and batching facilities. At the Western Half, similar work will be carried out. In addition, a reclamation will be required at Tsing Lung Tau.

13.1.2 After completion of the route, the general road operation is not expected to generate refuse, human waste or chemical waste. Thus the following section discusses only the waste management issue during the construction phase.

13.1.3 A preliminary construction programme, showing the major works with construction codes (beginning with initials "E" and "W") used in the following discussion, is shown in Annexe H.

13.2 Waste Generation and Handling During Construction Phase

13.2.1 Construction activities will result in the generation of various types of wastes including:

- hard and soft spoil derived from site clearance and excavation for foundation works
- waste derived from construction materials and processes
- general refuse from workforce
- plant and equipment maintenance.

Waste from Site Clearance and Excavation

13.2.2 Hard and soft spoil, consisting of vegetation, rock, clay, gravel, sand, soil and hard surface material, will be produced from the excavation of cuttings. Substantial cutting and excavation would be required along the route alignments for both Eastern and Western Half sections. Proposed locations of excavations are listed in Table 13.1

13.2.3 It is envisaged that a larger volume of spoil will be generated from the Eastern Half than from the Western Half. In the former, most of the spoil will be derived from the large excavation at *Ch 6850-7950 (EX06 to EX08)*. It is estimated that approximately 0.95M m^3 and 0.3M m^3 of spoil will be generated from the Eastern and Western Half respectively. Altogether, there would be approximately 1.2 Mm^3 of spoil generated from the sites.

Table 13.1 Locations of Excavation

Eastern Half		Western Half	
Activity Code	Location	Activity Code	Location
EX01	Excavation (Sham Tseng)	WX01	Excavation 1100 - 1220
EX02	Excavation 5470 - 5600	WX02	Excavation 1280 - 1480
EX03	Excavation 5720 - 5800	WX03	Excavation 1550 - 1660
EX04	Excavation 5930 - 6080	WX04	Excavation 1670 - 1880
EX05	Excavation 6130 - 6240	WX05	Excavation 1890 - 2190
EX06	Excavation 6250 - 6330	WX06	Excavation 3020 - 3120
EX07	Excavation 6360 - 6450	WX07	Excavation 3520 - 3580
EX08	Excavation 6800 - 7520	WX08	Excavation 3600 - 3660
EX09	Excavation 7600 - 7980		
EX10	Excavation 8260 - 8500		

NOTE: Activity codes are as designated in preliminary construction programme in Annexe H.

13.2.4 A large quantity of fill will be required, thus the excavated spoil can be re-used on sites. These sites include the works yard (EF03 in the construction programme in Annexe H) in the Eastern Half and the reclamations (W01R and W02R in the construction programme in Annexe H) in the Western Half. Details of fill requirements are listed in Table 13.2. It is estimated that a total of 0.86M m^3 of surplus spoil will be generated from the Eastern Half and 0.24M m^3 of import fill will be required. Thus it is recommended to re-use spoil excavated from the Eastern Half. The balance of surplus spoil of approximately 0.6M m^3 will require off-site disposal. Currently, it has been proposed that the surplus spoil would be transported by a conveyor to a jetty at the shore, and then barged out. If possible, depending on the time of the project, the surplus spoil may be used for the Sham Tseng Reclamation.

Table 13.2 Fill Requirements

Eastern Half		Western Half	
Activity Code	Location	Activity Code	Location
EF01	Fill 4800 - 5195	WF01	Fill 1000 -1220
EF02	Fill 6320 - 6380	WF02	Fill 1550 - 1690
EF03	Fill 6520 - 6700	WF03	Fill 2250 - 2460
EF04	Fill 6710 - 6820	WF04	Fill 2470 - 2740
EF05	Fill 8800 - 8920	WF05	Fill 3140 - 3270
		WF06	Fill 3580 - 3650
		WF07	Fill 3710 - 3800
		WF08	Fill 4120 - 4400
		W01R	Reclamation 2740 - 2980
		W02R	Reclamation 3800 - 4120
		W03R	Reclamation 4400 - 4800

NOTE: Activity codes are as designated in preliminary construction programme in Annexe H.

Waste from Construction Material and Process

13.2.5 Waste will arise from a number of different activities carried out by the contractor during construction and maintenance activities; these may include:

- wood from framework
- bitumen
- cement and grout from on site concrete activities.

13.2.6 The generation rate of this waste depends on the contractors' material consumption rates, which are difficult to predict at this stage of the project.

Workforce Waste

13.2.7 Throughout the period of construction, the workforce will generate general refuse, including food scraps, paper, and empty containers. The waste generation rate will be determined by the number of staff on site at one time, which is subject to the contractors' own arrangements. With reference to a public-collected waste load factor of 0.9 kg/cd, stated in the Waste Disposal Plan (1989), and assuming that the workforce is present on site for one shift only, a load factor of 0.2 kg/cd can be used for predicting refuse generation.

13.2.8 In addition to this refuse, human waste will be generated on the construction sites by the workforce.

Maintenance Waste

13.2.9 Construction plant and equipment will require regular maintenance and servicing, which will require the use of chemical substances such as cleaning fluids, solvents, lubrication oil, and fuel. Thus chemical waste will be generated on site. It is anticipated that this waste will mainly arise at the worksyard, where equipment storage and maintenance facilities are located. The generation rate is difficult to predict and depend on the contractors' consumption requirements. Some of the chemical substances, such as fuel and lubrication oil, are dangerous goods. Thus proper material and waste storage and handling must be adopted at those major work sites.

13.3 Mitigation Measures and Recommendations

Waste Disposal

13.3.1 Overall, it is recommended that the different categories of wastes should be segregated, stored, transported and disposed of separately in accordance with EPD's required procedures.

13.3.2 It will be the contractors' responsibility to dispose of excavated spoil and construction wastes. The contractors should make use of excavated spoil as much as possible to minimise off-site fill material requirements and disposal of spoil. The excavated material would be landbased, containing rock, gravel, sand, clay, soil and hard surface material. Water content should be less than 30 percent. In addition, the excavation will take place along the existing route alignment. Land contamination caused by previous landuses, such as industrial practise, is unlikely to occur. Thus it is considered that the excavated surplus spoil can either be dumped at a public dump site or landfill.

13.3.3 For chemical and maintenance wastes, the contractors should register with EPD as chemical waste producers. The registered producer should engage the services of a waste collector who should have a licence granted by EPD for the collection or removal of chemical wastes. Chemical wastes should be delivered to a licensed waste disposal facility that is capable of disposing such chemical wastes. Refuse and human waste should also be collected by licensed collectors.

Chemical Material and Other Waste Storage

13.3.4 Chemical material storage areas should be bunded, constructed of impervious materials, and have the capacity to contain 120 percent of the total volume of the containers. The area should be enclosed on at least three sides by a wall, partition or fence with a height of not less than two metres or the total height of stacked containers, whichever is less. Leakage, spill or discharge can be contained more effectively in these specially prepared areas. Indoor storage areas must have sufficient ventilation to prevent the build-up of fumes, and must be capable of evacuating the space in the event of an accidental release. Outdoor storage areas must be covered with a canopy or contain provisions for the safe removal of rainwater. In both cases, storage areas must not be connected to the foul or stormwater sewer system.

13.3.5 Dangerous materials as defined under the Dangerous Goods Ordinance (DGO), including fuel, oil and lubricants, should be stored and properly labelled on site in accordance with the requirements in the DGO. If transportation of hazardous materials is necessary, the contractor should ensure that hazardous materials, chemical wastes and fuel are packed or stored in containers or vessels of suitable design and construction to prevent leakage, spillage or escape.

13.3.6 The contractor should undertake at all times to prevent the uncontrolled disposal of hazardous materials and chemical waste into the air, soil, surface waters, groundwaters and coastal waters.

13.3.7 Refuse containers such as open skips should be provided at every worksite for use by the workforce.

13.3.8 Human waste should be discharged into septic tanks provided by the contractors and be removed regularly by a hygiene services company.

14 LANDSCAPE AND VISUAL ASSESSMENT

14.1 Ka Loon Tsuen Area Chainage 1000 - 1700

Existing Landscape Character

14.1.1 As is the predominant topography along the length of the study area, the characteristics of the landscape within the section are of steep vegetated slopes on the landward and seaward sides of the existing road with periodic open views towards Tsing Yi. The route is lined with vegetation, particularly mature trees surrounding Ka Loon Tsuen and falls within a designated Landscape Protection area.

Impact on Landscape Character

14.1.2 The construction of a retaining wall to the westbound carriageway bounding the seaward slope will not cause the loss of any mature vegetation, it will however create an intrusion into the existing natural rock edge to the sea and interrupt the overall character of the landscape.

14.1.3 In order to provide a carriageway of adequate Dual two width this will necessitate a cut slope of 35° and 75° broken by a 1 metre width berm. The extent of this cut will run from chainage 1100 to 1650 adjacent to the eastbound carriageway with an extensive area cut 35 metres into the hillside towards Tuen Mun Road over a length of 120m from Chainage 1100. This will result in a severe impact on the existing landscape, loss of vegetation and general reshaping of the topography of the area. Adjacent to the verge, the toe of the slope at a 75° angle will comprise of exposed rock which only enables very limited, if any, planting proposals to soften the impact.

14.1.4 Adjacent to Ka Loon Tsuen Village which is zoned as Green Belt though not classified as a Village Area, a small seating area is lost, reprovision of this area at an alternative location maintaining access from the village is proposed.

14.1.5 A 100m length of viaduct from chainage 1474 to 1574 will extend the carriageway seaward and result in the loss of mature vegetation, the proposed structure affecting the overall aspect of the coastline edge.

14.1.6 The retaining wall which requires a 800mm height parapet to ameliorate noise levels to the property located adjacent to Lot 62RP will cause significant impact to the rear facade of the property facing Castle Peak Road, together with the removal of existing vegetation.

14.1.7 Bay Side Villa which is currently under-construction will remain relatively unaffected as the planned road alignment was taken into consideration during the construction of this development. The entrance to the property will be realigned and adjacent slopes to the road edge will be cut back with the overall landscape character altered at the beginning of an extensive cut slope immediately adjacent to the access. There will be an inevitable loss of some shrub vegetation.

Visual Impact

14.1.8 The overall visual impact of this section of the route within the visual envelope is severe. Visually sensitive receivers within this section comprise Ka Loon Tusen Village, Bayside Villas and Lot 62RP. Ka Loon Tsuen Village will be subject to moderate visual impact with potential views to the westbound carriageway heightened particularly in the area of the proposed viaduct. The loss of vegetation and disturbance to the topography within the area will heighten disturbance in the short term but mitigation proposals and reinstatement planting would ameliorate problems in the long term.

14.1.9 Lot 62RP will also be subject to slight visual impact, since this low rise dwelling has a seaward aspect and will not view directly onto the road improvements.

14.1.10 Bayside Villa will be subject to moderate visual impact due to the loss of mature screening vegetation mitigation proposals and reinstatement planting would ameliorate problems in the long term, however the disturbance to topography to the east of the development is significant.

14.2 Grand Bay Area Chainage 1700 - 2450

Landscape Character

14.2.1 Steep vegetated slopes on both sides of the existing road are the dominant feature within this section with a more open aspect to the eastern end of the section. Grand Bay Villa and the area to the west is within a designated Landscape Protection Area.

Impact on Landscape Character

14.2.2 Significant cut slopes with 1.5m berms will have a severe impact on the landscape character of this section. The resulting loss of vegetation and reshaping of the slopes adjacent to the eastbound carriageway will totally alter the existing topography.

14.2.3 The construction of a 95m length of viaduct over the seaward slope adjacent to the ungazetted beach at Grand Bay will cause severe disruption to the topography and the removal of existing mature vegetation. To the east of Grand Bay Villas, an additional 70m length of viaduct will cause further disturbance to the vegetation and topography, particularly encroaching onto the beach area.

Visual Impact

14.2.4 The overall visual impact of this section of the route within the visual envelope is severe. With approximately eighty percent of the northern slopes to the alignment cut back removing existing vegetation, the route will be notably more visible within the area.

14.2.5 The remaining property of Grand Bay Villa consists of twelve 2-storey houses. These will suffer severe visual impact along their landward aspect, as they look directly onto a 90m height cut slope. Since the realignment of the carriageway moves further north leaving land in front of the development, there is an opportunity for mitigation works to reduce the long term impact.

14.3 Tsing Lung Tau Area Chainage 2450 - 3300

Landscape Character

14.3.1 Topography within this section is less severe than other areas, with gently sloping vegetated slopes on landward and seaward sides of the road and small stretches of beach.

14.3.2 There are small pockets of semi-mature vegetation and predominantly open seaward views particularly at Hong Kong Garden, over existing cultivated fields. The cultivated fields lie within a designated pocket of Green Belt and land north of the existing road between Villa Alfa Vista and Sea Crest Villas is within a designated Landscape Protection Area.

Impact on Landscape Character

14.3.3 The carriageway in this section extends seaward on areas of reclamation which will cause the loss of mature trees at the road boundary adjacent to the cultivated fields. Within one 100 metre section adjacent to the existing temple a significant cut slope of 35 metres is formed. This will result in the loss of hillside vegetation.

14.3.4 The general landscape character has already undergone much development in this area with the construction of Hong Kong Garden and other development sites, the development of the proposed alignment will continue to have a significant impact on the overall landscape character/context.

14.3.5 With two proposed new roundabout junctions which include extensive pedestrian footbridges and the construction of a promenade adjacent to the westbound seaward carriageway, there is the potential for the development of a creative approach at detailed design stage to the newly defined access routes within the area.

14.3.6 The erection of noise barriers within areas adjacent to Hong Kong Garden, Lung Tang Court and Yuen Tun Village will cause a noticeable deterioration to the overall character of the area, unless successfully integrated within the detailed design.

14.3.7 To the east of Dragon Villa and Villa Alfa Vista significant lengths of retaining wall, viaduct, and cut slope will alter the landward and seaward character of the landscape with the removal of significant existing mature vegetation.

Visual Impact

14.3.8 The overall visual impact of this section of the route within the visual envelope is moderate with a noticeable deterioration in the views towards Hong Kong Garden and the creation of two new roundabouts and areas of reclamation.

14.3.9 Visually sensitive receivers in this section comprise of Hong Kong Garden Development, Lung Tang Court, Upper Yuen Tun Village, Yuen Tun and Tsing Lun Villages, Dragon Villa, Villa Alfa Vista and Valerie's Court.

14.3.10 The Hong Kong Garden Development will be subject to moderate visual intrusion within the short term construction.

14.3.11 Lung Tang Court and Tsing Lung Tau Village will be subject to moderate visual impact and Upper Yuen Tun Village will be subject to moderate visual impact due to the height and extent of the proposed noise barriers and the realignment of the entrance junction and access with a roundabout.

14.3.12 Villa Alfa Vista will be subject to severe visual impact to landward views, though its' seaward aspect will remain unaffected.

14.3.13 Dragon Villa will be subject to slight visual intrusion in the short term construction provided that as many of the existing trees are retained on this promontory as possible.

14.3.14 Valeries Court will be subject to slight visual impact as the westbound carriageway extends further seaward and will be in a more direct view of the property, where previously the road alignment was more hidden by topography.

14.4 Anglers Beach Area Chainage 3300 - 4150

Landscape Character

14.4.1 Predominantly mature vegetation surrounds the residential properties and grounds of Dragon Garden and Dragonville. Anglers Beach runs adjacent to the roadside within this section, a gazetted beach with easy pedestrian access from the road. The land north of the existing road is within a designed Landscape Protection Area and an area east of Dragonville is within a pocket of Green Belt.

Impact on Landscape Character

14.4.2 The construction of a viaduct on the westbound carriageway adjacent to Sea Crest Villa Phase 4 will continue to encroach upon the coastline removing existing vegetation and altering the profile of the coastline.

14.4.3 The proposed alignment then cuts into an extensive area of mature vegetation adjacent to Dragonville (Lot 96) the provision of a significant area of cut slope and a 30m length of retaining wall will result in significant disturbance to the existing vegetation and landscape character of this attractive section of the route.

14.4.4 A 110m length of retaining wall adjacent to Sea Crest Villa Phase 3 along the westbound carriageway to the seaward aspect of the alignment will also cause significant disturbance and disruption to existing mature vegetation.

Visual Impact

14.4.5 The overall visual impact of this section of the route within the visual envelope is severe with a noticeable deterioration in views for residents of Sea Crest Villas and views from within the visual envelope at Ma Wan and Tsing Yi particularly towards Anglers Beach at Sham Tseng.

14.4.6 Visually sensitive receivers within this area comprise Dragonville, Sea Crest Villa Phases 2, 3 and 4, Dragon Garden, Lot 99, Pai Min Kok Village and Angler's Beach.

14.4.7 Sea Crest Villa Phase 3 and 4 and Dragon Garden will be subject to moderate visual impact due to the loss of screening and framing vegetation beside the existing road.

14.4.8 The retained existing mature vegetation which surrounds Dragonville will protect its landward views to the scheme and will therefore be subject to slight visual impact. Proposals for a retaining wall and shotcrete surface treatment to slope areas adjacent to the carriageway will cause slight visual impact to the property from a landward perspective.

14.4.9 Lot 99 will be level with the new alignment and will be subject to moderate visual impact from the proposed 35° slope and loss of existing vegetation opposite on the northern boundary. However the new alignment places the carriageway further away from the Lot providing an opportunity for long term mitigation measures.

14.4.10 Sea Crest Villa Phase 2 and Pai Min Kok Village Area are set back above the proposed alignment and are subject to slight visual impact.

14.5 Sham Tseng Chainage 4150 - 4900

Impact on Landscape Character

14.5.1 The general widening of the road will result in the loss of some visually significant mature roadside trees and cause a high degree of pedestrian severance.

14.5.2 Slopes of 80° are required below Sea Crest Villa Phase 1 to accommodation the proposed bus bays, causing a loss of vegetation adjacent to the northern boundary within the area and a severe disturbance to the landscape.

14.5.3 The on-line improvements will require a roundabout below Rhine Gardens and a further roundabout at the eastern end of the section. The eastern roundabout is considerably smaller than the one required for the bypass option and does not therefore require such extensive engineering works to the existing vegetated slopes. Nevertheless some slopes of 75° and 35° with 1.5m wide berms between are required which will result in loss of existing vegetation and disruption to the existing topography.

Visual Impact

14.5.4 The overall visual impact of this section of the route within the visual envelope is slight.

14.5.5 The visual impact on all visually sensitive receivers in this section will be slight since there will be a barely perceptible deterioration to the existing views. The visual impact on sections one to four with this on-line option will remain the same in the short-term. Mitigation opportunities would however be increased and the overall visual impact subsequently reduced.

14.6 Gemini Area Chainage 4900 - 5800

Existing Landscape Character

14.6.1 The Landscape is characterised by its dramatic topography, attractive rocky headlands and steep well vegetated slopes, falling away to areas of sandy beach. The most significant features are the wooded slopes adjacent to the proposed sewerage treatment works area; the wooded and rocky ridgeline rising from the headland at Homi Villa; and the attractive shoreline around Gemini and Hoi Mei Beaches. The significant ridge north of the existing road at Homi Villa is within a designated Landscape Protection Area and Gemini Beaches are within a pocket of designated Green Belt.

Impact on Landscape Character

14.6.2 The proposed reclamation area for the Ting Kau and Sham Tseng sewerage Scheme, will support the seaward extension to the proposed improvements to Castle Peak Road carriageway for the initial 300 metres of carriageway within this section.

14.6.3 From Chainage 5200 to 5480 the construction of a viaduct along the west bound carriageway will cause severe disruption and removal of existing mature vegetation. The appearance of the natural coastline within this area will be dramatically affected as the carriageway is moved seaward against the existing topography of this section.

14.6.4 From this extensive length of viaduct the carriageway cuts through a headland slope resulting in the creation of a 60 metres cut slope of four 40° sections separated by 1.5m width berms to the north and a cut slope of 10 metres to the south at an angle of 65°. The ultimate effect on the immediate coastline landscape is negligible as the realignment is partially screened whilst cutting through the headland, however, the disturbance caused by the extensive cutting to the existing headland slope and vegetation is severe.

14.6.5 A further 120 metres length of viaduct set back 25 metres from the coastal edge will disturb existing mature vegetation and an area of reformed slope where soil nailing is proposed will affect an existing semi-mature pine plantation.

Visual Impact

14.6.6 The overall visual impact of this section of the route within the visual envelope is moderate, the one area where a cut slope is necessary will be slightly concealed by the alternations taking place on the existing headland of Homi Villa.

14.6.7 Visually sensitive receivers for this section comprise Pink Villas, Gemini Beach, Homi Villa, Hoi Mei Beach and a single storey residence, Lot 403.

14.6.8 Pink Villas and Lot 403 are both low rise residential units enclosed by existing mature vegetation with restricted views of the current road alignment as it runs broadly with the existing topographical nature of the headland.

14.6.9 The proposed alteration to the alignment enlarges the carriageway moving it further south and against the existing topographical nature of the area moving it into the visual envelope of each property. The visual impact to these two properties will therefore be moderate. Homi Villa is being redeveloped as a viewing site for the airport bridge and as such will not be the subject of visual intrusion.

14.6.10 The two existing gazetted beaches within this section, Gemini and Hoi Mei with both be subject to severe visual impact. Both are directly affected by proposed viaducts and will suffer the removal of existing mature vegetation which will cause a significant deterioration in the existing views within each beach area.

14.7 Lido Beach Area Chainage 5800 - 6600

Existing Character

14.7.1 Low rise residences within this section are set into steep wooded slopes on both sides of the existing road. The most significant existing features are the mature roadside trees at Cassam and Lido Beaches. The area is currently becoming dominated by Ting Kau Bridge and other transport infrastructure projects. The land north of the existing road is within a designated Landscape Protection Area and the headland to the west of Ting Kau is within a pocket of Green Belt.

Impact on Landscape Character

14.7.2 The proposed construction of a 320m length of westbound carriageway on viaduct will destroy a significantly attractive coastline with mature vegetation causing a severe landscape impact. This existing coastline area forms the backdrop to Cassam Beach a gazetted beach of good quality within the area.

14.7.3 The scopes adjacent to the route of the eastbound carriageway within this section are affected through the reshaping of areas with two engineering solutions. The extensive use of cut slopes with 1.5m berms will destroy existing mature vegetation within the area and alter the topographical nature of the existing roadside aspect severely. The second engineering solution is the construction of retaining walls and shotcrete slopes adjacent to the eastbound carriageway which will also result in the removal of existing mature vegetation. Three access routes within the area will require realignment and consequently will affect existing vegetation and topography.

Visual Impact

14.7.4 The overall visual impact of proposals within this area of the route and the visual envelope is moderate.

14.7.5 Visually sensitive receivers within the area include Cassam and Lido gazetted beaches and eleven private residences. Cassam Beach will be particularly adversely affected with the encroachment of the proposed viaduct to the slope directly to the rear of the beach and along the coastline to the west which is in direct view of the area.

14.7.6 Lido Beach will also be subject to severe visual impact with the encroachment of the carriageway south onto the coastline. This area is already dominated by the construction of Tin Kau Bridge north viaduct.

14.7.7 All private residences within the area will be subject to visual impact from the Castle Peak Road improvement proposals. The development of Tin Kau Bridge and its associated northern viaduct will also contribute to the overall changing development and visual intrusion of structures within the area.

14.7.8 Vista del Mar and Villa Mar are currently screened by mature vegetation. Where this is removed to accommodate areas of cut slope, views will be opened to the residencies and a noticeable visual deterioration will occur. These residencies will therefore suffer a moderate visual impact.

14.7.9 Lot 417 is currently programmed for redevelopment and as such the visual impact to this property has not been included within this assessment.

14.7.10 Edinburgh Villa currently enveloped by mature vegetation will be subject to a moderate visual impact with a noticeable deterioration in the existing view. The construction of proposed gravity retaining walls and a cut slope to either side of the entrance will necessitate the removal of existing vegetation and disrupt the enclosed nature of the property.

14.7.11 The access road to Lot 414 will be required to be realigned resulting in the loss of surrounding vegetation therefore the visual impact will be moderate.

14.7.12 Riviera Apartments will have views along the severely disrupted coastline and will be subject to moderate visual impact.

14.8 Ting Kau Area Chainage 6600 - 7500

Existing Character

14.8.1 The landscape of this section is characterised by undulating wooded hillsides which slope steeply down to a long narrow stretch of sandy beach fringed by low rise residences and mature trees. The entire section is within a designated Landscape Protection Area.

Impact on Landscape Character

14.8.2 The proposal to construct a roundabout junction to maintain access to Ting Kau Village and a number of private residential properties will cause the loss of an area of significant mature vegetation south of the existing alignment. The proposed realignment cuts into the existing hillside creating a new network of access roads which will disturb existing vegetation and encroach upon land to the seaward boundary.

14.8.3 To the east of this area the proposals incorporate two sections of retaining wall and extensive cut slope berm treatment 500m length to the northern boundary of the eastbound carriageway. The initial 75° cut slope along this length will have an exposed rock surface to the finish. These engineering treatments will severely disrupt the undulating topography and will remove significant areas of hillside vegetation.

Visual Impact

14.8.4 The overall visual impact to this area within the visual envelope will be severe with unobstructed views to the wooded hillside which will be dramatically affected by the creation of a 500m long cut slope.

14.8.5 The extensive works associated with the realignment of access roads north of Ting Kau Village will result in existing screening being lost and other views being opened up by associated engineering works. The visually sensitive receivers of Lido Green Houses, Upper Lido Gardens, Ng Gardens and La Casetta will be subject to moderate visual impact. Ting Kau Village is subject to severe visual impact.

14.9 Yau Kom Tau Area Chainage 7500 - 8300

Existing Character

14.9.1 The landscape character of this section is dominated by modern high rise residential development located within well vegetated steep slopes. The most significant features within the landscape are the vegetated river outlet and the mature roadside vegetation adjacent to Approach Beach.

Impact on Landscape Character

14.9.2 To the east of this area the westbound carriageway cuts into the landward hillside requiring slopes of 35°, 65° and 75° with a 1.5m wide berm to be formed. The cut slope of 75° will be formed of exposed existing rock which will redefine the landscape character of the area.

14.9.3 The construction of a 140m length of retaining wall is followed to the east by a 65m section of viaduct and 95m of additional retaining wall which will severely disrupt the existing coastline.

14.9.4 The exposed realignment to the access to Hanley Villa will result in the loss of existing mature vegetation and severely disrupt the existing topography.

Visual Impact

14.9.5 The overall visual impact within this area of the alignment and the visual envelope is moderate with clear views from Tsing Yi towards the hillside which will suffer some loss in vegetation with the proposed cuttings.

14.9.6 The length of cutting which will provide an exposed rock edge to this area will also cause a slight visual impact.

14.9.7 Visually sensitive receivers within the area include Sunny Villas, Keymount Lodge, Lot 322 and Lot 356.

14.9.8 Sunny Villas, Keymount Lodge and Lot 322 are located on platforms above the new alignment and will be subject to only slight visual impact due the position of the westbound carriageway increasing the amount of road seen in their field of vision.

14.9.9 Lot 356 will be in view of a retaining wall to its west and the realigned access to Hanley Villa to the east which will both cause a noticeable deterioration in the existing view and will therefore be subject to moderate visual impact.

14.10 Tsuen Wan Area Chainage 8300 - 8900

Existing Character

14.10.1 The landscape character of this section is dominated by high rise development, (both commercial and residential) engineered slopes and structures with some extensive sea views towards Tsing Yi Island.

Impact on Landscape Character

14.10.2 The engineering structures proposed within this area are significant in scale involving a 17m length of retaining wall, a short stretch of a 35° cut slope as the alignment cuts into the existing hillside and a length of viaduct of over 300m as the alignment swings out over the sea below Garden View Terrace.

Visual Impact

14.10.3 The overall visual impact within this area of the alignment and visual envelope will be slight.

14.10.4 The visually sensitive receivers of Hanley Villa, Garden View Terrace, Blossom Terrace, Fung Chick Sen Villa and Lot 357 are located on platforms high above the proposed alignment. Since their views are already dominated by built structures it is considered that the scheme will have a slight visual impact on these developments. The retaining wall and viaduct structure in view of Lot 360 would cause a noticeable deterioration in their existing view, this Lot is therefore subject to moderate visual impact.

14.11 Conclusion of Landscape and Visual Impacts

Topographical constraints are significant throughout the entire route corridor of Castle Peak road. As a result, whatever the scale of any alterations to the existing alignment are there will be considerable disturbance to areas of hillside and coastline.

The impact of the realigned route on the Landscape and Visual context of the route corridor is severe.

14.12 Illumination

14.12.1 The proposed improvement to lighting provision throughout the road corridor will result in nocturnal visual intrusion throughout the zone of visual influence. Visually sensitive receivers within the visual envelope and notably within the immediate vicinity of the road corridor may suffer glare from the proximity and orientation of the light source. More distant receivers would suffer intrusion from an increased ambient lighting level through the road corridor and its associated traffic.

14.13 Landscape Mitigation Measures

General

14.13.1 The route is currently contained within the topography of the area, running within the landscape context and to a great extent screened from view. The proposals to realign and widen the route cause the road to deviate from the existing lay of the land and the consequence of moving the road seaward and landward through dramatic topography is a severe disturbance to the landscape.

14.13.2 Together with planting proposals and co-ordinated finishes to structural elements along the route, there is also potential to develop both a promenade link and a network of open space for pedestrians and cyclists within the area. This creates a linear recreational element along this attractive area of coastline which would be seen from the new gateway to Hong Kong.

Planting Proposals

14.13.3 The planting approach can be broadly divided into four categories of planting with the overall objective to restore a naturalistic edge to the road corridor which will ameliorate the affect of the new alignment within the landscape.

14.13.4 The planting approach has been divided into the following areas along the route; revegetation of slopes with native species to restore disturbed hillside areas in keeping with the surrounding character avoiding the use of tunam or shotcreted surfaces wherever possible;

- 'off-site' planting works necessary to ameliorate the effects of landscape and visual impact and which will provide an infrastructure to all areas of reclamation;
- implementation of semi-ornamental planting within the more urban areas of the route providing a co-ordinated streetscape and interface with proposed new road side junctions; and
- central reservation and verge planting containing appropriate species to enhance the view from the road and soften the overall appearance of the route;

This extensive proposals are detailed on figures within annex I of this document.

14.13.5 This approach has then been detailed through species selection into indicative planting mixes;

Indicative Species List

(I) ***Woodland Mix Planting*** - Native Species Mix to Hydroseeded Slopes - Native Species Planting

Botanical Name	Size (mm)	Spacing (mm)	Qty %
Whip Trees			
Acacia confusa (Nurse species)	600 - 900	1500	10%
Albizia lebbek	600 - 900	1500	10%
Cinnamomum camphora	600 - 900	1500	15%
Ficus microcarpa	600 - 900	1500	15%
Sapium discolor	600 - 900	1500	15%
Sterculia lanceolata	600 - 900	1500	15%
Shrubs			
Ilex asprella	600 - 900	1500	10%
Psychotria rubra	600 - 900	1500	10%

(II) ***Light Standard Tree Planting***

Planted randomly throughout the woodland mix planting outlined above;

Botanical Name	Size (mm)	Spacing (mm)
Light Standard Trees		
Albizia lebbek	1750	3000
Ficus microcarpa	1750	3000
Sterculia lanceolata	1750	3000

(III) ***Native Species Shrub Planting***

Botanical Name	Size (mm)	Spacing (mm)	Qty %
Brucea javanica	600 - 900	750	25%
Gordonia axillaris	600 - 900	750	25%
Ligustrum sinense	600 - 900	750	15%
Litsea rotundifolia	600 - 900	750	25%
Rhaphiolepis indica	600 - 900	750	25%

(IV) ***Light Standard Tree Planting***

Planted randomly throughout the woodland mix planting outlined above;

Botanical Name	Size (mm)	Spacing (mm)
Schefflera octoplylla	1750	3000
Sapium discolor	1750	3000

(V) Heavy Standard Tree Planting / Ornamental Shrub Planting

Botanical Name	Size (mm)	Spacing (mm)
Aleurites moluccana	3500	5000
Bauhinia purpurea	3500	5000
Cassia siamea	3500	5000
Cinnamomum camphora	3500	5000
Delonix regia	3500	5000
Ficus microcarpa	3500	5000
Melia azederach	3500	5000
Michelia alba	3500	5000
Shrub		
Aglaia odorata	500 x 500	500
Barleria cristata	500 x 500	500
Duranta repens	500 x 500	500
Ervatamia diviracata	500 x 500	500
Gardenia jasminoides	500 x 500	500
Hibicus spp.	750 x 500	500
Melastoma sanguineum	750 x 500	500
Jasminum indica	300 x 300	300
Lagerstroemia indica	750 x 500	500
Pittosporum tobira	500 x 500	500
Rhododendron spp.	500 x 500	500
Tecoma stans	750 x 500	500
Thunbergia erecta	750 x 500	500

Standard Treatment to Structures

14.13.6 In order to provide effective mitigation to both the landscape and visual impacts arising from the proposed route alignment, detailed design of all structural elements within the road corridor must be undertaken.

14.13.7 Within the overall scheme proposals there are a number of structural elements which will require detailed co-ordination.

14.13.8 The finishes to all retaining walls, viaducts, bridges and noise barriers must be co-ordinated within the road corridor and planting details used where appropriate to soften the hard edges to structures.

15 CONCLUSIONS

15.1 Construction Phase Noise

15.1.1 Construction is expected to last for about 3 years. The improvement works will be split into two contracts: the western half (from Ka Loon Tsuen to Sham Tseng) and the eastern half (eastern part of Sham Tseng to Area 2, Tsuen Wan). The construction works will entail construction of both at-grade and elevated roads. Drainage along the ground level roads will be installed. Extensive excavation works and earthworks will be required, as well as a small amount of new reclamation. The construction methodology, programme and equipment lists will be determined by the contractors responsible for the construction of the improved road. Limited night-time works are expected.

15.1.2 Because of the close proximity of sensitive receivers to Castle Peak Road, exceedances of EPD's recommended maximum for construction noise are expected. Consequently, the need for extensive construction-phase noise mitigation measures is anticipated. Measures may be incorporated in construction contracts, and include practices such as use of quietened equipment, enclosures, and temporary noise barriers.

15.2 Operation Phase Noise

15.2.1 There are presently a large number of Noise Sensitive Receivers (NSRs), both existing and under construction, along Castle Peak Road. Several constraints, including topography and the existing shoreline, have limited the options for aligning the improved road. For this reason, predicted traffic noise impacts are significant and will require extensive mitigation.

15.2.2 Traffic noise levels along Castle Peak Road already frequently exceed the recommended Hong Kong Planning Standards and Guidelines (HKPSG) maximum of 70 dB(A) L_{10} during the morning peak hour. Improvements to the road will increase the level of traffic noise, resulting in an increased number of flats exposed to traffic noise exceeding the HKPSG guidelines.

15.2.3 Due to the highrise character of most Noise Sensitive Receivers along the alignment, the only effective mitigation measures are high barriers or road enclosures. However, these kinds of structures are generally infeasible for the following reasons:

1. inadequate space along this highly constrained alignment for the large foundations required for mitigation structures;

2. unacceptable safety risks for drivers, resulting from visual obstruction to traffic entering or exiting Castle Peak Road at the numerous access points, and unavoidable placement of enclosures close to junctions,

3. conflicts with firefighting requirements.

15.2.4 Consequently, achievement of the HKPSG noise limits using direct technical remedies (such as roadside barriers and enclosures) is impractical along much of the alignment. The recommended noise mitigation package includes a limited number of feasible barriers and a partial enclosure, complemented with extensive use of indirect technical remedies (appropriate glazing and air conditioning at affected facades).

15.2.5 The approximate number of existing flats (based on preliminary flat counts) expected to be eligible for compensation for indirect technical remedies is 2320 flats. The estimated cost of the recommended mitigation package is over $35 million.

15.3 Construction Phase Air Quality

15.3.1 Construction phase dust modelling was based on the assumption of commonly-accepted dust suppression measures: pre-watering of dropping surfaces (blasted materials only), twice-daily watering of excavated surfaces and dusty roads, and use of a fabric filter at the concrete batching plant. With the adoption of these dust mitigation measures, modelling indicates that no exceedances of the TSP (Total Suspended Particulates) one-hour average guideline level and the Air Quality Objectives for TSP at any selected air quality sensitive receivers is expected.

15.4 Operation Phase Air Quality

15.4.1 Based on conservative modelling parameters, no exceedances of the one-hour average NO_2 AQO at the selected sensitive receivers for year 2011 are predicted.

15.5 Construction Phase Water Quality

15.5.1 The potential for contamination of the coastal zone during this period arises mainly from suspended solids contained in runoff from exposed areas, especially steep, freshly cut slopes, together with oils and other chemicals from active works areas, and effluent from site facilities.

15.5.2 Small reclamations at Sham Tseng and Tsing Lung Tau will be in very shallow water and will not extend far from the existing coastline. Depending on the method of construction employed, these reclamations are not expected to result in substantial impacts.

15.5.3 If the potential for impacts is adequately addressed, then actual residual impacts after adoption of standard mitigating measures should be low. The possible exception is dredging in close proximity to bathing beaches. Impacts can be avoided by programming the works outside the bathing season. If this is not possible, then all available measures should be employed to reduce the dispersion of silt to the bathing areas.

15.6 Operation Phase Water Quality

15.6.1 Following construction and site restoration, the potential for contamination of the coastal waters arises mainly from storm runoff across the paved surfaces of the new road. In addition, the road is likely to be used for transport of a variety of materials, some of which will be hazardous or generally polluting.

15.6.2 In general, operational impacts are likely to be minimal provided appropriate pollution control mechanisms (such as oil interceptors) are installed to protect sensitive receivers such as gazetted bathing beaches from pollution contained in run-off and spills following road accidents.

15.7 Ecology

15.7.1 Field surveys along the proposed alignment and literature review of relevant documents were performed between February and June 1995 to investigate the ecological resources and to assess the conservation value of the area. The entire study area was extensively disturbed by human activities. Major habitats included woodland, shrubland, grassland, plantations (roadside and garden), sandy and rocky shores. No flora or fauna protected under local regulations or international conventions were recorded.

15.7.2 Potential impacts of the road widening include loss of 8.27 ha of woodland and 2.64 ha of shrubland, loss of 0.39 km of rocky shoreline and 0.43 km of sandy shoreline, and loss of 0.7 ha of intertidal area. The most significant impact will be loss of about 2.7 ha of secondary woodland in the Ting Kau segment. Impacts on fauna are of minimal ecological significance due to the disturbed nature of the site and low species diversity.

15.7.3 The narrow and steep topography of the site creates constraints for alternative alignments and hence for impact avoidance. Compensatory woodland replanting using native indigenous species is recommended at three possible areas (totalling 2.45 ha) on site to mitigate impacts of woodland loss. Impacts on natural shoreline should be alleviated by using viaduct structures rather than fill support throughout the stretch of seaward widening. A permanent loss of 0.7 ha of seabed will constitute residual impact of the project. This is not considered a significant residual ecological impact due to the degraded nature of water quality and marine benthic communities in the area.

15.8 Solid Waste

15.8.1 It is recommended that different categories of wastes should be segregated, stored, transported and disposed of separately in accordance with EPD's required procedures.

15.8.2 The contractors should make use of excavated spoil as much as possible to minimise off-site fill material requirements and disposal of spoil.

15.8.3 After completion of the route, the general road operation is not expected to generate refuse, human waste or chemical waste.

15.9 Landscape Impacts

Construction Phase

15.9.1 As the predominant landscape character of the study area is that of steep vegetated / rocky slopes, mature vegetation and beach coastline, the construction works will generate severe impact to the existing landscape character. The extensive engineering works required for the cutting of slopes and exposed rock faces, encroachment of construction works areas onto beaches, and temporary slope stabilisation methods will collectively incur detrimental change in the existing landscape character. Most notable impacts will be the extensive work to slope profile at Rhine Gardens area, and modification works to coastline and vegetation at Grand Bay and Cassam beaches. The felling of significant areas of established woodland vegetation will also occur during the construction phase, resulting in severe disturbance to existing landscape character, notably at Tin Kau Village.

Operation Phase

15.9.2 Loss of established vegetation and general alteration to the existing profile of the topography of the site will incur long term adverse impact to the existing landscape character of the site. Proposed methods of retaining slopes using shortcrete or retaining walls will have a detrimental effect on the character of the topography and the significant loss of woodland vegetation will require extensive mitigation works in order to ameliorate the long term impacts.

15.9.3 The encroachment of viaduct structures upon, and destruction of natural coastline and beach areas will have a detrimental impact upon the quality and amenity landscape value of the beach and coastline areas, notably Cassam Beach.

15.9.4 The introduction of noise barriers within some sections of the route will cause moderate to severe impact to the character of the affected areas and will notably cause a severe change to the Lido Beach area.

15.9.5 A mitigation strategy comprising detailed planting proposals and sensitive hardworks / finishes treatment will contribute to restoring a naturalistic edge to the road corridor and restore disturbed hillside areas inkeeping with the existing character.

15.10 Visual Impacts

Construction Phase

15.10.1 Due to the high number of visually sensitive receivers, i.e., housing development sites within close proximity to the study route, the impact, and disruption to the existing views will be high. At construction stage, the extensive engineering works and cutting of slopes will have detrimental impact on existing views of wooded hillside, and the felling of mature vegetation, will open up further views from residential areas to the construction route, notably in Tin Kau Village, where the fill site will also generate high levels of dust. Construction works associated with proposed viaducts will encroach upon coastline and beach areas which will incur a significant deterioration of visual quality, notably the coastline area of Cassam Beach. In general, the construction works associated with the proposed improvements will incur short term visual intrusion to all areas where visually sensitive receivers have been identified.

Operation Phase

15.10.2 The loss of mature vegetative screens will increase direct visual intrusion to the road corridor for many of the residential sensitive receivers, notably Bayside Villa, Sea Crest Villa, private residences at Cassam / Lido beaches and Ting Kau Village. The closer proximity of the proposed carriageways will also restrict the area available for visual mitigation measures.

15.10.3 The introduction of noise barriers within some sections of the route will cause moderate to severe impact to the visual character of the affected area, and will notably cause severe visual intrusion to the Lido Beach area.

15.10.4 The modifications to landscape character, such as slope cutting, loss of mature woodland vegetation and damage to coastal areas will subsequently cause some moderate to severe deterioration of existing views of the landscape.

15.10.5 Mitigation measures are required to visually enhance the affected areas through re-planting and re-establishment works, cosmetic landscape treatment to cut slopes, and sensitive use of finishes and materials for noise barriers, footbridges, etc.

ANNEXE A

2011 TRAFFIC FLOW PREDICTIONS

ANNEXE A

2011 TRAFFIC FLOW PREDICTIONS

A1 Traffic flows predictions have been supplied by the Transport Consultant for this Study.

A2 As with all predictions, there is a degree of uncertainty associated with the traffic flow predictions for year 2011. However, this level of uncertainty is not addressed in this EIA, and is not considered in the predicted environmental impacts that are based on the traffic prediction.

A3 The traffic predictions in this appendix are based on the assumption that Castle Peak Road is widened to a dual-2 carriageway throughout the study area except in Sham Tseng, where the existing dual-2 carriageway is unimproved.

96504: Castle Peak Road (Traffic Flows of 7/96)
Year 2011 traffic figures (Vehicles per hour)

Based on MVA fax of 2 August 1996 (Gary Hunter):
Table 3a (2011 AM Peak -- Scenario B Online)

Road Section	Direction	PT	GV	PV	Total	% heavy
	PCU factor:	*1.75*	*1.75*	*1.00*		
Ka Loon Tsuen to Bayside Villas	E/b	75	257	573	906	36.7%
	W/b	75	278	759	1113	31.8%
Bayside Villas to HK Gdns	E/b	75	257	573	906	36.7%
	W/b	75	278	759	1113	31.8%
HK Gdns to Tsing Lung Tau	E/b	81	261	733	1075	31.8%
	W/b	81	283	797	1161	31.4%
TLT to Seacrest Villas IV	E/b	93	274	899	1265	28.9%
	W/b	104	295	897	1296	30.8%
SCV IV to Dragon Gdn	E/b	93	275	961	1329	27.7%
	W/b	104	295	897	1296	30.8%
Dragon Gdn to SCV I-III	E/b	98	276	992	1366	27.4%
	W/b	104	295	897	1296	30.8%
SCV I-III to Lido Recl	E/b	115	279	1068	1462	27.0%
	W/b	115	301	904	1320	31.5%
Lido Recl to Lido Gdn	E/b	115	323	1480	1919	22.9%
	W/b	115	343	1119	1577	29.1%
Lido Gdn to Sham Tseng Tsuen R	E/b	115	323	1490	1929	22.8%
	W/b	115	346	1064	1525	30.2%
Sham Tseng Tsuen Rd to San Mig	E/b	115	321	1490	1927	22.7%
	W/b	115	346	1064	1525	30.2%
San Mig to Rhine Gdn	E/b	135	321	1490	1947	23.5%
	W/b	135	346	982	1463	32.9%
Rhine Gdn to TMR Link Rd	E/b	135	320	1523	1978	23.0%
	W/b	135	346	982	1463	32.9%
TMR Link Rd to Sham Tsz St	E/b	118	258	1024	1400	26.9%
	W/b	118	343	879	1340	34.4%
Sham Tsz St to Sham Tseng Bypas	E/b	118	258	1024	1400	26.9%
	W/b	118	346	848	1312	35.4%
Bypass: West end to Lido Recl	E/b	0	0	0	0	#DIV/0!
	W/b	0	0	0	0	#DIV/0!
Bypass: Lido Recl to San Mig	E/b	0	0	0	0	#DIV/0!
	W/b	0	0	0	0	#DIV/0!
Bypass: San Mig to Sham Tsz St	E/b	0	0	0	0	#DIV/0!
	W/b	0	0	0	0	#DIV/0!
Bypass: Sham Tsz St to West end	E/b	0	0	0	0	#DIV/0!
	W/b	0	0	0	0	#DIV/0!
Sham Tseng Bypass to Ting Kau	E/b	118	260	961	1339	28.2%
	W/b	118	347	760	1225	38.0%
Ting Kau to Sunny Villa	E/b	106	262	923	1292	28.5%
	W/b	106	350	662	1118	40.8%
Sunny Villa to Hanley Villa	E/b	106	265	972	1343	27.6%

96504: Castle Peak Road (Traffic Flows of 7/96)
Year 2011 traffic figures (Vehicles per hour)

Based on MVA fax of 2 August 1996 (Gary Hunter):
Table 3a (2011 AM Peak -- Scenario B Online)

Road Section	Direction	PT	GV	PV	Total	% heavy
	PCU factor:	*1.75*	*1.75*	*1.00*		
	W/b	106	351	686	1144	40.0%
Hanley Villa to East end of schem	E/b	106	275	1199	1580	24.1%
	W/b	106	362	804	1272	36.8%
TMR-CPR Link Rd	N/b	49	171	776	996	22.1%
	S/b	49	113	379	540	29.8%
TMR west of Sham Tseng	E/b	280	1807	2914	5001	41.7%
	W/b	280	1676	1322	3278	59.7%
TMR: Sham Tseng to Rte 3	E/b	326	1865	3304	5494	39.9%
	W/b	326	1673	1315	3313	60.3%
TMR: Rte 3 to Tsuen Wan	E/b	383	2929	1944	5255	63.0%
	W/b	383	2845	1149	4377	73.7%

ANNEXE B

BASELINE NOISE MONITORING PROGRAMME

ANNEXE B

BASELINE NOISE MONITORING PROGRAMME

B1 Noise Monitoring Results

B1.1 A baseline profile of the existing conditions was obtained by monitoring prevailing noise levels in March 1995. Weekday morning peak hour noise was monitored to obtain $L_{10\,(1\text{-hour})}$, $L_{eq\,(1\text{-hour})}$, and $L_{90\,(1\text{-hour})}$ noise levels at the following four locations:

1. Hong Kong Gardens (facade noise level at ground floor of commercial building, facing Castle Peak Road);
2. Sea Crest Villas Phase 4 (facade noise level at podium, facing Castle Peak Road);
3. carpark near Lido Beach (freefield measurement at ground level);
4. private residential development near eastern end of study area (facade noise level at podium, facing Castle Peak Road).

Monitoring locations 1-3 are shown in Figures B-1 to B-3. Monitoring location 4 is not shown, since permission to set up noise monitoring equipment at the site was granted on the understanding that the location not be named.

B1.2 Results of the baseline noise monitoring programme are provided in Section 6.1 above.

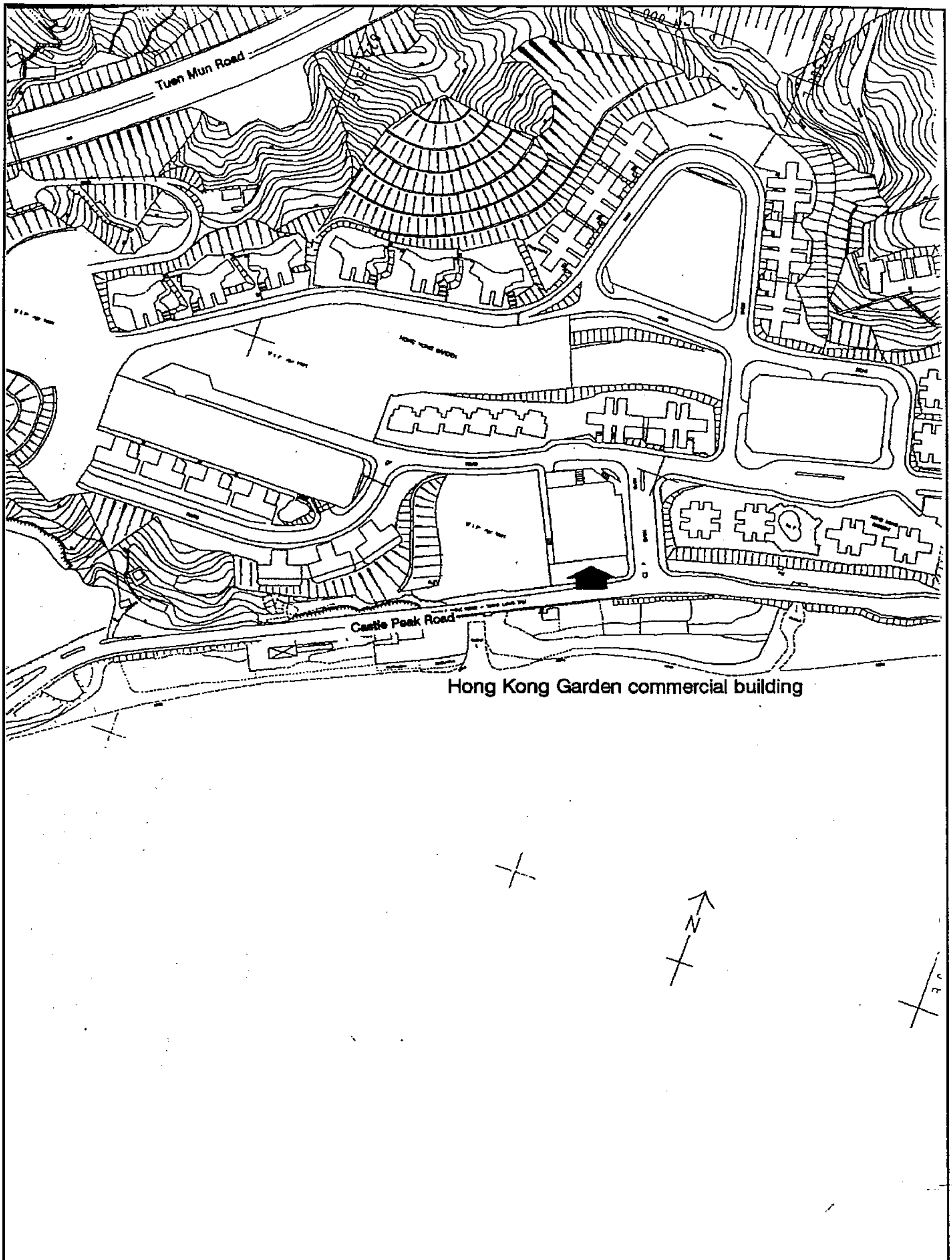

Figure B-1 Location of Baseline Noise Monitoring Station 1

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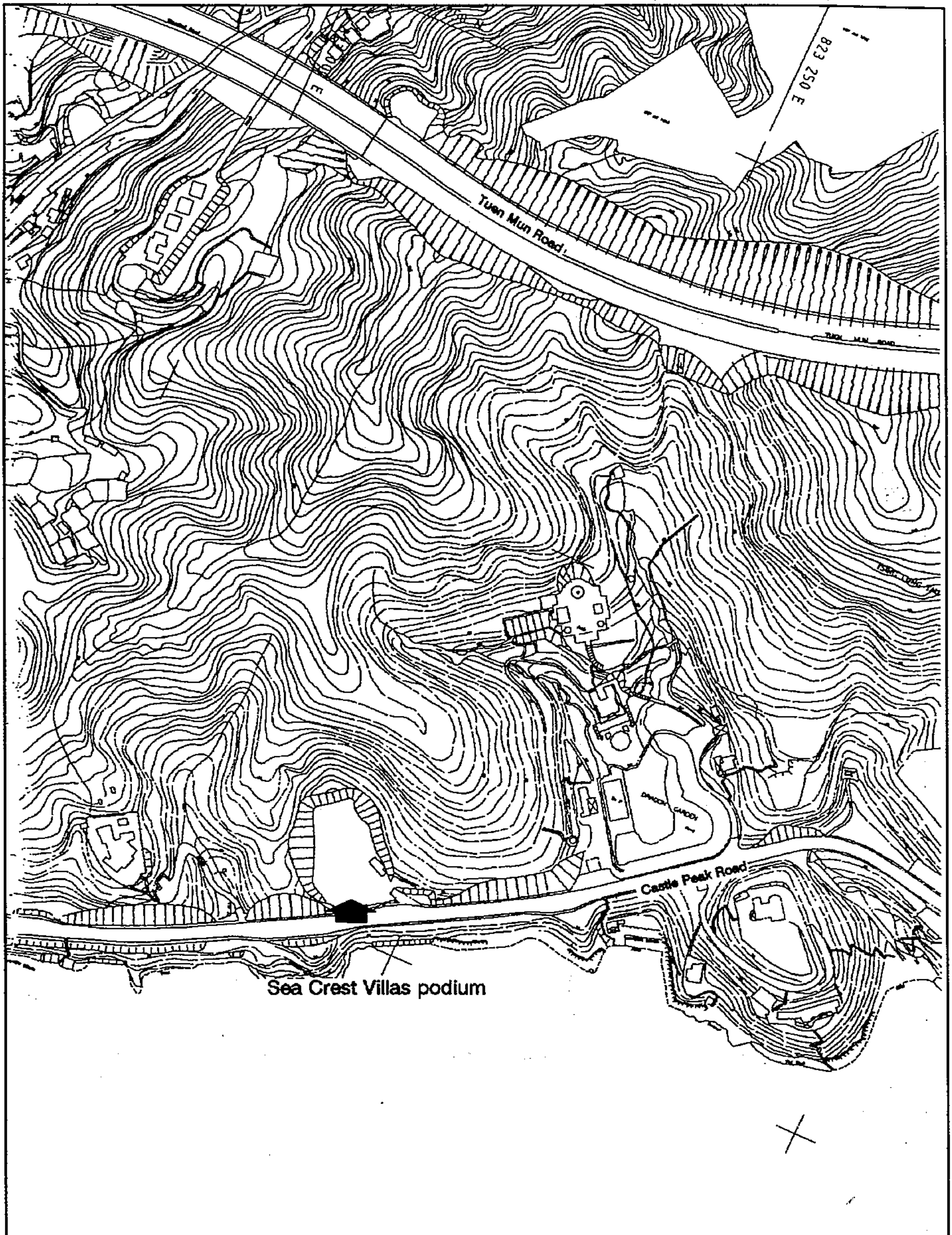

Figure B-2 Location of Baseline Noise Monitoring Station 2

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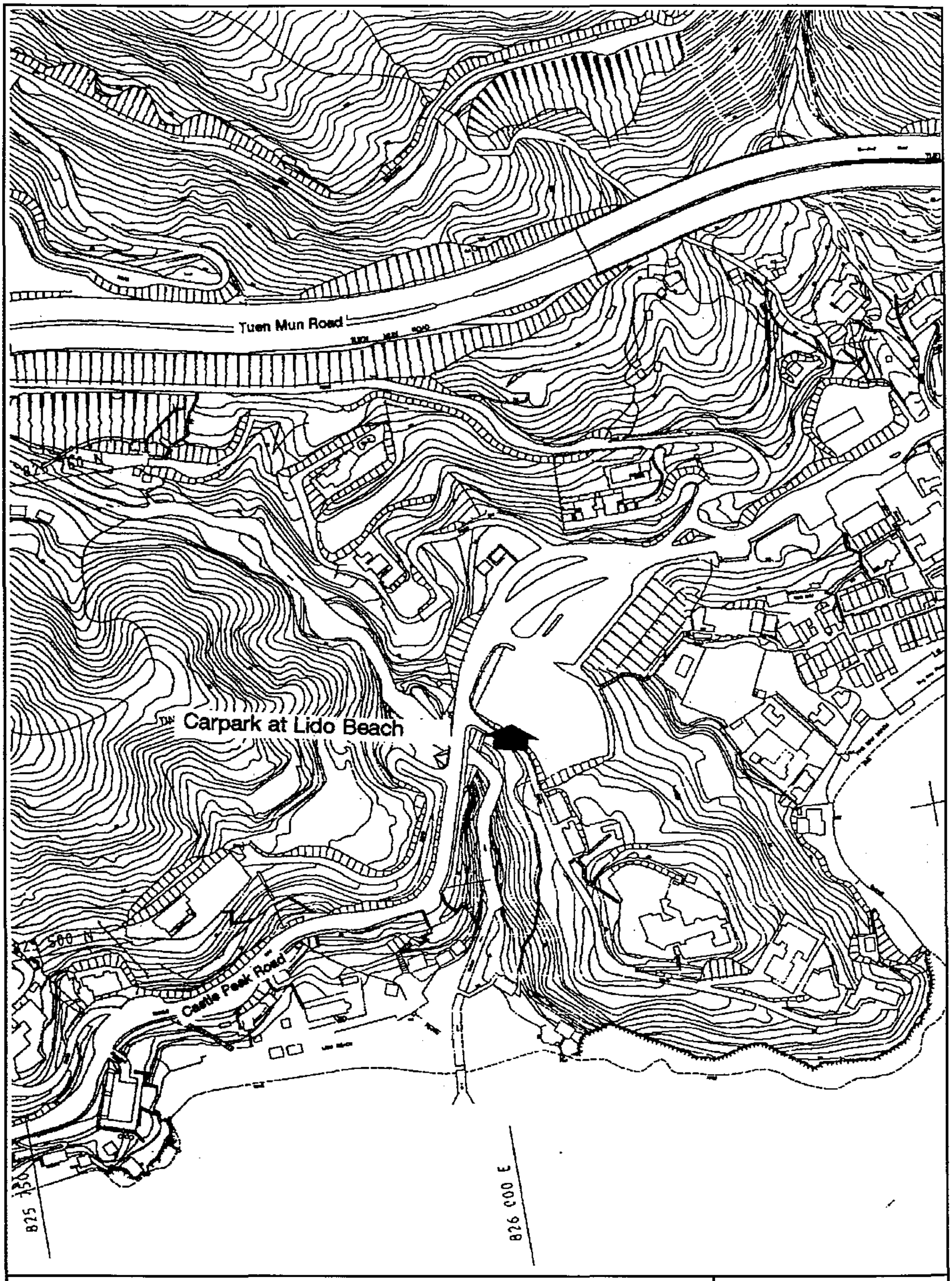

Figure B-3 Location of Baseline Noise Monitoring Station 3

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ANNEXE C

SAMPLE SPECIFICATION CLAUSES FOR ENVIRONMENTAL PROTECTION

ANNEXE C

SAMPLE SPECIFICATION CLAUSES FOR ENVIRONMENTAL PROTECTION

C1. Avoidance of Nuisance

(i) The Contractor shall be responsible for ensuring that no earth, rock or debris is deposited on public or private rights of way as a result of his operations, including any deposits arising from the movement of plant or vehicles. The Contractor shall provide a vehicle cleaning facility at the exits from the works areas where excavated material is hauled, to the approval of the Engineer and to the requirements of the Commissioner of Police.

(ii) The Contractor shall ensure that existing stream courses and drains within and adjacent to works areas are kept safe and free from any debris and any excavated materials arising from the Works. The Contractor shall ensure that chemicals and concrete agitator washings are not deposited in watercourses.

(iii) Water and waste products arising on works areas shall be collected, removed from works areas via a suitable and properly designed temporary drainage system and disposed of at a location and in a manner that will cause neither pollution nor nuisance.

(iv) The Contractor shall construct, maintain, remove and reinstate as necessary temporary drainage works and take all other precautions necessary for the avoidance of damage by flooding and silt washed down from the Works. He shall also provide adequate precautions to ensure that no spill or debris of any kind is allowed to be pushed, washed down, fall or be deposited on land or the seabed adjacent to works areas.

(v) In the event of any spoil or debris from construction works being deposited on adjacent land or seabed or any silt washed down to any area, then such spoil, debris or material and silt shall be immediately removed and the affected land or seabed and areas restored to their natural state by the Contractor to the satisfaction of the Engineer.

AIR QUALITY

C2. General Requirements

(i) The Contractor shall undertake measures to prevent dust nuisance as a result of his activities. Any air pollution control system installed shall be operated whenever the plant is in operation.

(ii) The Contractor shall not install any furnace, boiler or other similar plant or equipment using any fuel that may produce air pollutants without the prior written consent of the Director of Environmental Protection (DEP) pursuant to the Air Pollution Control Ordinance.

(iii) The Contractor shall not burn debris or other materials on the works areas.

(iv) The Contractor shall implement dust suppression measures which shall include, but not be limited, to the following:

(a) Stockpiles of sand and aggregate greater than 20 m^3 for use in concrete manufacture shall be enclosed on three sides, with walls extending above the pile and 2 m beyond the front of the pile.

(b) Effective water sprays shall be used during the delivery and handling of all raw sand and aggregate, and other similar materials, when dust is likely to be created and to dampen stored materials during dry and windy weather.

(c) Areas where there is a regular movement of vehicles shall have all-weather surfaces to a standard agreed with the Engineer and be kept clear of loose surface material.

(d) If used, conveyor belts shall be fitted with windboards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimise dust emission. Conveyors carrying materials which have the potential to create dust shall be totally enclosed and fitted with belt cleaners.

(e) Cement and other such fine grained material delivered in bulk shall be stored in closed silos fitted with a high level alarm indicator. The high level alarm indicators shall be interlocked with the filling line so that in the event of the hopper approaching an overfull condition, an audible alarm will operate and the pneumatic line to the filling tanker will close.

(f) Air vents on cement silos shall be fitted with suitable fabric filters provided with either shaking or pulse-air cleaning mechanisms. The fabric filter area shall be determined using an air-cloth ration (filtering velocity) of 0.01 - 0.03 m/s.

(g) Weigh hoppers shall be vented to a suitable filter.

(h) The filter bags in the cement silo dust collector must be thoroughly shaken after cement is blown into the silo to ensure adequate dust collection for subsequent loading.

(i) The provision of adequate dust suppression plant including water bowsers with spray bars or means of applying surface chemical treatment, the details of which shall be submitted to and approved by the Engineer.

(j) Areas of reclamation shall be completed, including final compaction, as quickly as possible consistent with good practice to limit the creation of wind blown dust.

(k) Unless otherwise approved by the Engineer, the Contractor shall restrict all motorised vehicles on the work areas to a maximum speed appropriate to the quality of the haul roads and confine haulage and delivery vehicles to designed roadways inside the work areas.

(l) If applicable, the Contractor shall arrange blasting techniques so as to minimise dust generation.

In addition to these standard dust control measures, the proposed control measures contained in the forthcoming Air Pollution Control (Construction Dust) Regulations should be noted.

(v) At any concrete batching plant or crushing plant being operated on the work areas the following additional conditions shall be complied with:

(a) Where dusty materials are being discharged to vehicles from a conveying system at a fixed transfer point, a three-sided roofed enclosure with a flexible curtain across the entry shall be provided. Exhaust fans shall be provided for this enclosure and vented through a suitable fabric filter system.

(b) Any vehicle with an open load carrying area used for moving potentially dust producing materials shall properly fitting side and tail boards. Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin in good condition. The tarpaulin shall be properly secured and shall extend at least 300 mm over the edgers of the side and tail boards.

(c) The Contractor shall frequently clean and water and concrete batching plant and ancillary areas in minimise any dust emissions.

(d) Dry mix batching shall be carried out in a totally enclosed area with exhaust to suitable fabric filters.

Concrete batching or crushing plants may be required to obtain specified processes licences from EPD.

C3. Operating Mineral Works (Crushing Plants) on Work Areas

The Contractor will not be allowed to operate Mineral Works (Crushing Plant) on the works areas.

C4. Monitoring of Dust (TSP) Levels

General Requirements

(i) The Contractor shall carry out the Works in such a manner as to minimise dust emissions during execution of the Works.

(ii) The Engineer may require equipment intended to be used on the Works to be made available for inspection and approval to ensure that it is suitable for the project.

(iii) The Contractor shall devise and arrange methods of working to minimise dust emissions, and shall provide experienced personnel with suitable training to ensure that these methods are implemented.

(iv) Before the commencement of the Works, the Contractor shall submit to the Engineer the proposed methods of working.

(v) After commencement of the Works if the equipment or work methods are believed by the Engineer to be causing serious air pollution impacts, remedial proposals shall be drawn up by the Contractor and, once approved by the engineer, implemented. In developing these remedial measures, the Contractor shall inspect and review all dust sources that may be contributing to the pollution impacts. Where such remedial measures include the use of additional or alternative equipment such equipment shall not be sued on the Works until approved the Engineer. Where remedial measures include maintenance or modification of previously approved equipment such equipment shall not be used on the Works until such maintenance or modification is completed and the adequacy of the maintenance or modification is demonstrated to the satisfaction of the Engineer.

(vi) If the Engineer finds that approved remedial measures are not being implemented and that serious impacts persist, he may direct the Contractor to cease related parts of the Works until the measures are implemented. No claims by the Contractor shall be entertained in connection with such a direction.

(vii) The Contractor shall provide two high volume air samplers and associated equipment and consumables and shelters in accordance with Part 50 of Chapter 1, Appendix B of Title 40 of the Code of Federal Regulations of the USA within one week of the commencement of the Works. The samples, equipment and shelters shall be constructed so as to be transferable between monitoring stations.

(viii) The Contractor shall construct suitable access, at each monitoring station in areas to be directed by the Engineer. Alternative locations may be necessary if difficulties arise in obtaining access, or if the locations become unsuitable.

The exact location and direction of the monitoring equipment at each monitoring station shall be agreed with the Engineer. Monitoring stations points shall be free from local obstructions or sheltering, subject to practical consideration.

(ix) the dust (TSP) levels will be measured by the "High Volume method for total suspended particulars" as described by the United States Environmental Protection Agency in 40 CFR Part 50.

(x) The Engineer will carry out baseline monitoring prior to the commencement of major construction works to determine and agree with the Contractor ambient dust (TSP) levels at each specified monitoring station. The baseline monitoring will be carried out for a period of at least two weeks, with measurements to be taken every day at each monitoring station.

(xi) Impact monitoring during the course of the Works will normally by undertaken at any one or more of the monitoring stations. The contractor will be responsible for the data; however, because of conflict of interest, the monitoring and processing work should be done by others, such as a consultant, rather than by the contractor itself. Data should be submitted to the Engineer for approval.

(xii) Should the impact monitoring record dust levels which are indicative of a deteriorating situation so that closer monitoring is reasonably indicated, then the Engineer may instruct the Contractor to undertake daily impact monitoring at any one or more of the monitoring stations until the results indicate an improving and acceptable level of air quality.

C5. Action on Construction Dust (TSP) Levels

(i) A systematic and objective Action Plan, which is linked to Trigger, Action and Target levels as stipulated in the EM&A Manual, should be strictly followed.

(ii) Where the Engineer determines that the recorded dust (TSP) level is significantly greater than the levels established in the baseline survey, the Engineer will direct the Contractor to take effective remedial measures including, but not limited to, reviewing dust source and modifying working procedures.

(iii) The Contractor shall inform the Engineer of all steps taken. Written reports and proposals for action shall be passed to the Engineer by the Contractor whenever the Engineer determines that air quality monitoring shows that the recorded dust (TSP) level is significantly greater than the levels established in the baseline survey of breaching the Air Quality Objectives, or accepted guidelines.

(iv) If the Engineer finds that approved remedial measures are not being implemented and that serious impacts persist, he may direct the Contractor to cease related parts of the Works until the measures are implemented. No claims by the Contractor shall be entertained in connection with such a direction.

WATER POLLUTION CONTROL AND WATER QUALITY MONITORING

C6. General Requirements

(i) The Contractor shall carry out the Works in such a manner as to minimise adverse impacts on the water quality during the execution of the Works. In particular he shall arrange his method of working to minimise the effects on the water quality within the works areas, adjacent to the works areas, on the transport routes to and from the works areas and at the loading, and dumping areas.

(ii) If marine plant is used on the Works, it shall be inspected by the Engineer to ensure that the plant is suitable for the project and can be operated to achieve the water quality requirements (WQRs) detailed in Clause 8 of this appendix. The Contractor shall provide facilities to the Engineer for inspecting or checking such vessels and shall not use such vessels or plant for the Works without the approval of the Engineer. The Engineer may require the Contractor to carry out trials of any plant or vessels to prove their suitability.

(iii) The Contractor shall devise and arrange methods of working to minimise water pollution and to meet the WQRs and shall provide experienced personnel with suitable training to ensure that these methods are implemented.

(iv) Before the commencement of the Works, the Contractor shall submit to the Engineer the proposed methods of working.

(v) After commencement of the Works, if the plant or work methods are believed by the Engineer to be causing serious water pollution impacts, the Contractor shall proposed remedial measures which may include, but not be limited to, the pollution avoidance measures outlined in clause 10 of this appendix. Where such remedial measures include the use of additional or alternative plant such plant shall not be sued on the Works until approved by the Engineer. Where remedial measures include maintenance or modification of previously approved plant, such plant shall not be used on the Works until such maintenance or modification is completed and the adequacy of the maintenance or modification is demonstrated to the satisfaction of the Engineer.

(vi) If the Engineer finds that approved remedial measures are not being implemented and that serious impacts persist, he may direct the Contractor to cease related parts of the Works until the measured are implemented. No claims by the Contractor shall be entertained in connection with such a direction.

C7. Definitions

(i) For use in this contract only, the following definition is used:-

(a) unsuitable material - material taken from the area of the Works. (including borrow areas), which is unsuitable for use as fill material. The material may include builders debris, spoil and hard material dumped by others.

C8. Water Quality Requirements - Applicable if there is to be Reclamation Formation as part of the Works

The Contractor shall minimise adverse impacts resulting from the dumping operations on water quality. To achieve these requirements the Contractor shall design and implement methods of working that:-

(a) minimise loss of material during transport of fill material;

(b) prevent discharge of fill material except at approved locations;

(c) prevent the avoidable reduction, due to the Works, of the dissolved oxygen content of the water adjacent to the Works;

C9. Water Quality Monitoring Equipment - Applicable if there is to be Reclamation Formation as part of the Works

(i) The Contractor shall provide the following equipment within one week of the commencement of the Contract:-

(a) Dissolved oxygen and temperature measuring equipment

The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and be operable from a DC power source. It shall be capable of measuring:-

* a dissolved oxygen level in the range of 0-20 mg/L and 0-200% saturation; and

* a temperature of 0-45 degree Celsius

It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 30 m in length. Sufficient stocks of spare electrodes and cable shall be maintained for replacement where necessary. (YSI model 58 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or similar approved).

(b) Turbidity Measurement Instrument

A portable, weatherproof turbidity-measuring instrument complete with cable, sensor and comprehensive operation manuals. The equipment shall be operable from a DC power source. It shall have a photoelectric sensor capable of measuring turbidity between 0-100 NTU and be complete with a cable at least 30 m long. (Partech Turbidmeter Model 7000 3RP mark 2 or similar approved).

(c) Suspended Solids Sampling Equipment

A 12 volt DC powered peristaltic pump equipped with a Tygon tubing of at least 30 m length.

(d) Thermometer

A laboratory standard certified mercury thermometer with an accuracy of at least 0.5 degree Celsius.

(e) Water Depth Detector

A portable, battery-operated echo sounder. This unit can either be handheld or affixed to the bottom of the work boat if the same vessel is to be used throughout the monitoring programme. (Seafarer 700 or similar approved).

(f) 12V batteries and 200V/12V Battery charger.

(ii) Monitoring instrument shall be checked, calibrated and certified by an approved accredited laboratory before use on the Works and subsequently re-calibrated at 3-month intervals throughout all stages of the water quality monitoring. Response of sensors an electrodes should be checked with certified standard solutions before each use. The turbidity meter shall be calibrated to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in mg/L).

C10. General Procedures for the Avoidance of Polluting During Transporting, and Dumping

(i) The Contractors' equipment shall be designed and maintained to minimise the risk of silt and other contaminants being released into the water column or deposited in other than designated locations.

(ii) Pollution avoidance measures shall include but are not limited to the following:-

(a) mechanical grabs shall be designed and maintained to avoid spillage and shall seal tightly while being lifted;

(b) vessels shall be sized so that adequate clearance is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash;

(c) pipe leakages are to be repaired promptly and plant is not to be operated with leaking pipes;

(d) the marine works shall cause no visible foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the work areas or dumping grounds;

(e) barges shall be fitted with tight fitting seals to their bottom openings to prevent leakage of material;

(f) excess material shall be cleaned from the decks and exposed fittings of barges before the vessel is moved;

The engineer may monitor vessels transporting material to ensure that no dumping outside the approved location takes place and that loss of material does not take place during transportation. The Contractor shall provide all reasonable assistance to the Engineer for these purposes.

(3) The Contractor shall ensure that material is disposed of at the approved locations. He will be required to ensure accurate positioning of vessels before discharge and will be required to submit and agree proposals with the Engineer for positional control at disposal sites. Disposal in designated marine dumping grounds shall be in accordance with conditions of a licence issued by the DEP under the Dumping at Sea Act (Overseas Territories) Order 1975. Floatable and certain contaminated material (as defined by DEP) will not be acceptable at marine dumping grounds and will require other method of disposal.

C11. Removal of Waste Material

(i) Notwithstanding the provisions of the GCC the Contractor shall not permit any sewage, waste water or effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the works areas onto any adjoining land or allow any waste matter or refuse to be deposited anywhere within the works areas or onto any adjoining land and shall have all such matter removed from the works areas.

(ii) The Contractor shall be responsible for temporary training, diverting or conducting of open streams or drains intercepted by any works and for reinstating these to their original courses on completion of the Works.

(iii) The Contractor shall submit any proposed stream course and nullah temporary diversions to the Engineer for agreement one month prior to such diversion works being commenced. Diversions shall be constructed to allow the water flow to discharge without overflow, erosion or washout. The area through which the temporary diversion is no longer required.

(iv) The Contractor shall segregate inert construction waste material suitable for reclamation or land formation and shall dispose of such material at a public dumping area(s).

(v) Non-inert construction waste material deemed unsuitable for reclamation or land formation and other waste material shall be disposed of at a public landfill.

(vi) The Contractor's attention is drawn to the Waste Disposal Ordinance, the Public Health and Municipal Services Ordinance and the Water Pollution Control Ordinance.

C12. Discharge into Sewers and Drains

(i) The Contractor shall not discharge directly or indirectly (by runoff) or cause or permit or suffer to be discharged into any public sewer, storm-water drain, channel, stream-course or sea, any effluent or foul or contaminated water or cooling or hot water without the prior consent of the relevant Authority who may require the Contractor to provide, operate and maintain at the Contractor's own expense, within the premises or otherwise, suitable works for the treatment and disposal of such effluent or foul or contaminated or cooling or hot water.

(ii) If any office, site canteen or toilet facilities is erected, foul water effluent shall, subject to paragraph 12(i) above, be directed to a foul sewer or to a sewage treatment facility.

(iii) The Contractor's attention is drawn to the Buildings Ordinance, the Water Pollution Control Ordinance and the Technical Memorandum `Standard for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters."

NOISE POLLUTION CONTROL

C13. General Requirements

(i) The Contractor shall consider noise as an environmental constraint in his planning and execution of the Works.

(ii) The Contractor shall take all necessary measures to ensure that the operation of mechanical equipment and construction processes on or off the works areas will not cause any unnecessary and excessive noise which may disturb any occupant of any nearby dwellings, schools, hospitals, or premises with similar sensitivity to noise. The Contractor shall submit to the Engineer for his consent details of the

Contractor's equipment including methods of use and construction operations together with proposed measures for limiting noise therefrom which shall include, inter alia, the use of silencers, mufflers, acoustic linings or shields, or acoustic sheds (this will apply in particular to the tunnel portals) or screens and shall be based upon the best reasonable practice. Information on the types and models of silenced equipment and acoustic treatment for unsilenced equipment shall be included. The contractor shall use such measures and shall maintain plant and silencing equipment in good condition so as to minimise the noise emission during construction works.

(iii) Hand-held breakers used by the Contractor shall comply with the standards specified in EEC Technical Directive 84/537, and portable compressors shall comply with the standards specified in EEC Technical Directive 84/533.

(iv) The Engineer may require equipment intended to be used on the works to be made available for inspection and approval to ensure that it is suitable for the project.

(v) The Contractor shall devise and arrange methods of working to minimise noise impacts, and shall provide experienced personnel with suitable training to ensure that these methods are implemented.

(vi) Before the commencement of the Works the Contractor shall submit to the Engineer the proposed methods of working.

(vii) After commencement of the Works if the equipment or work methods are believed by the Engineer to be causing serious noise pollution impacts, the equipment or work methods shall be inspected and remedial proposals drawn up by the Contractor and once approved by the Engineer, implemented. In developing these remedial measures, the Contractor shall review all construction noise sources that may be contributing to the pollution impacts, and propose changes to scheduling of activities, installation of plant soundproofing, provision of alternative plant, erection of sound barriers around part of the works areas or the location of construction noise sources, or any other measures that may be effective in reducing noise. Where such remedial measures include the use of additional or alternative equipment, such equipment shall not be used on the Works until approved by the Engineer. Where remedial measures include maintenance or modification of previously approved equipment such equipment shall not be used on the Works until such maintenance or modification is completed and the adequacy of the maintenance or modification is demonstrated to the satisfaction of the Engineer.

(viii) If the Engineer finds that approved remedial measures are not being implemented and that serious impacts persist, he may direct the Contractor to cease related parts of the Works until the measures are implemented. No claims by the Contractor shall be entertained in connection with such a direction.

C14. Permitted Noise Levels

(i) In the event that the Contractor intends to carry out works of a type and during periods ("the Restricted Periods") to which Section 6 of the Noise Control Ordinance applies, the Contractor shall apply for and obtain a Construction Noise Permit and thereafter shall comply with the conditions which may be imposed in relation thereto.

(ii) Work will be permitted during "the Restricted Periods" subject to:

(a) the Contractor complying with its obligations under paragraph 13 above.

(b) the Contractor making an application for an obtaining a Construction Noise Permit in due time and in due form; and

(c) The contractor not causing the cancellation or adverse variation of such Construction Noise Permit as may be issued by reason of the generation of noise in excess of the limits set out in Technical memorandum on Noise from Construction Work for the identified NSRs.

C15. Noise Monitoring and Compliance Audit Reporting

(i) Monitoring equipment and methodology shall comply with the Technical Memorandum on Noise from Construction work other than Percussive Piling , issued under section 9 of the Noise Control Ordinance. Monitoring will be carried out throughout the construction period by the Contractor under the supervision of the Engineer. The data will be provided to the Engineer on a regular basis, or as requested.

(ii) A monthly summary of monitoring data will be prepared by the Engineer. This will include an interpretation of the significance of the monitoring results. The monthly summary shall also identify any additional mitigation measures taken by the Contractor as a result. A copy of the summary report shall be made available for inspection by the Director of Environmental Protection at his request and by the Contractor.

(iii) the Contractor shall provide within one week of the commencement of the Contract at least one portable sound level meter complying with International electrotechnical Commission Publications 651 : 1979 (Type 1) and 804 : 1985 (Type 1) (Bruel & Kjaer Type 2221 or similar approved) complete with tripods. These meters will be used by the Contractor or Engineer for noise monitoring, and should be regularly calibrated to ensure accuracy and consistency.

(iv) The Engineer will, prior to commencement of major construction works, carry out baseline monitoring to determine baseline noise levels. The baseline monitoring will be carried out for a period of at least one week, with measurements to be taken every day at locations and to a schedule determined by the Engineer. From these measurements baseline noise levels (L_{eq} (5 min)) will be calculated. The target level for maximum construction noise levels will be 5 dB(A) above the measured background.

ANNEXE D

TRAFFIC NOISE MODELLING RESULTS

ANNEXE D

TRAFFIC NOISE MODELLING RESULTS

D1 Introduction

D1.1 Traffic noise impacts have been based on predicted 2011 traffic flows shown in Annexe A, and additional assumptions and flows stated in Section 5 of the main EIA text.

D1.2 Traffic noise has been calculated using the UK DOT methodology provided in the 1988 *Calculation of Road Traffic Noise (CRTN)*, using Soundplan software. The road network, topographical barriers, and buildings assumed in the model are shown in Figures D-1 and D-2, along with the NSR identification numbers corresponding to NSRs identified in Tables 2.1 to 2.3.

D1.3 The assessment assumes that Castle Peak Road is widened to a dual-2 carriageway throughout the study area (except in Sham Tseng, where no improvements are assumed).

D1.4 Results of traffic noise modelling are presented in the following spreadsheets, which show predicted noise levels for the unmitigated scenario and the recommended mitigation scenario.

\..\96500\drafts\final\annexes.fin

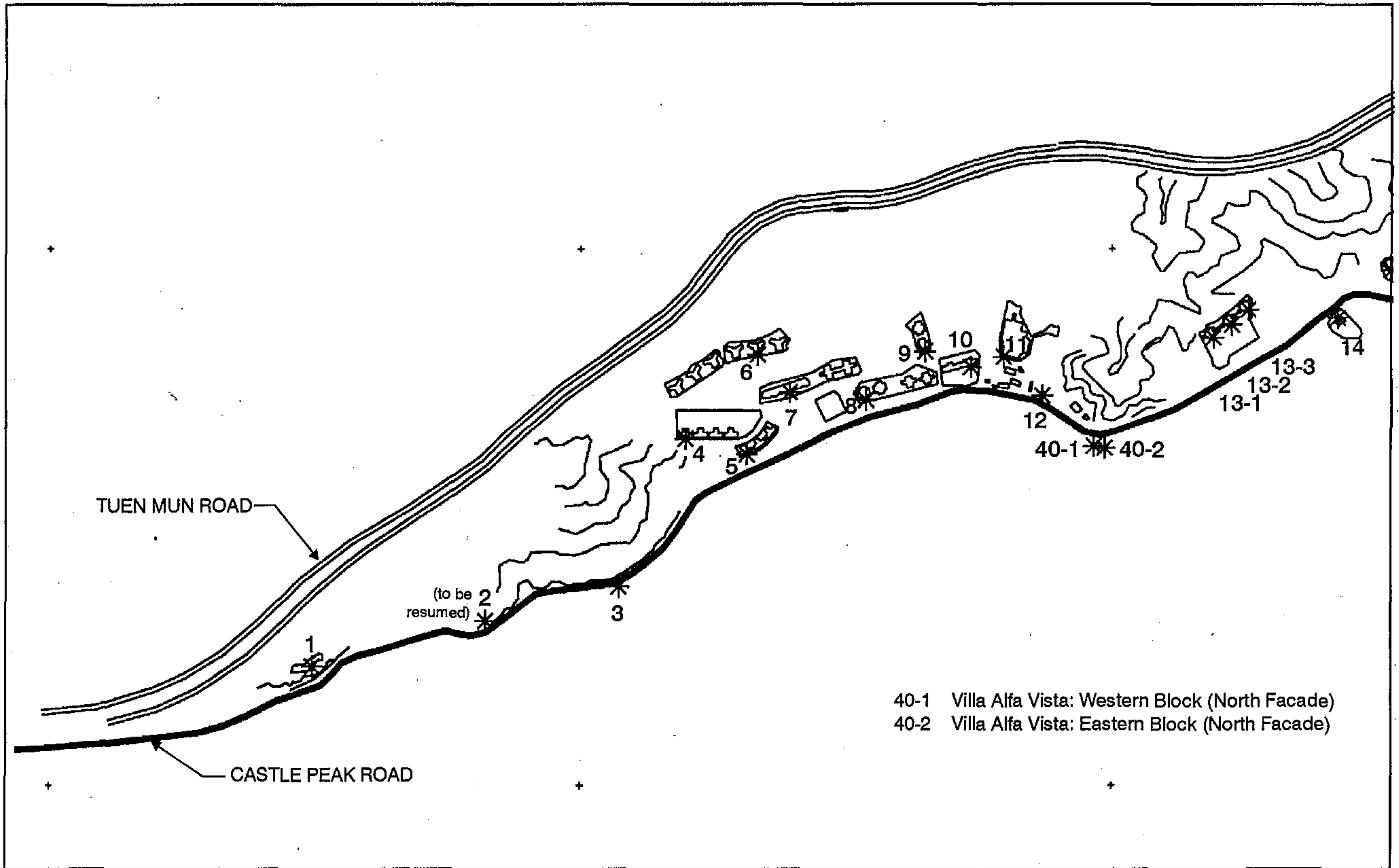
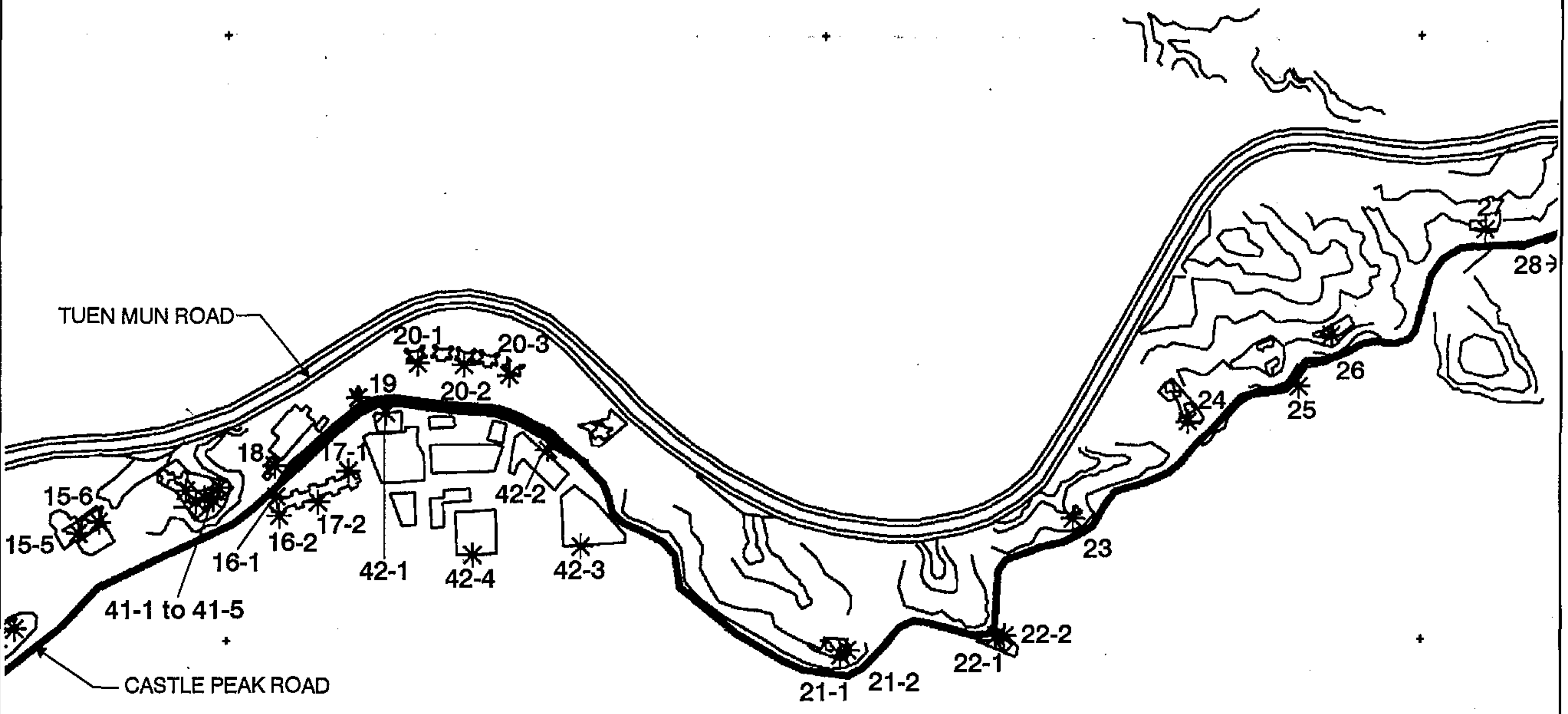


Figure D-1(a) Existing Scenario (West)



21-1	Pink Villas Southwestern Facade	41-1	Seacrest Villas Block 2: Southwest Facade
21-2	Pink Villas Southeastern Facade	41-2	Seacrest Villas Block 3: Southeast Facade
22-1	Homi Villa Southwestern Facade	41-3	Seacrest Villas Block 3: South Facade
22-2	Homi Villa Southeastern Facade	41-4	Seacrest Villas Block 4: Southwest Facade
		41-5	Seacrest Villas Block 4: Southeast Facade

Figure D-1(b) Existing Scenario (Middle)

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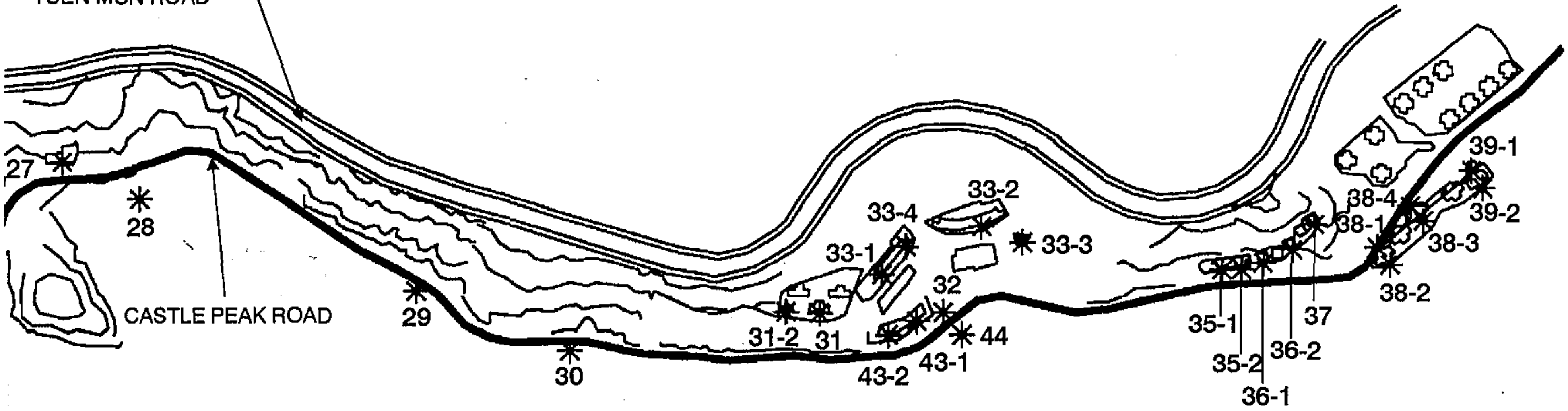

Figure D-1(c) Existing Scenario (East)

CONSULTANTS IN ENVIRONMENTAL SCIENCES (ASIA) LTD

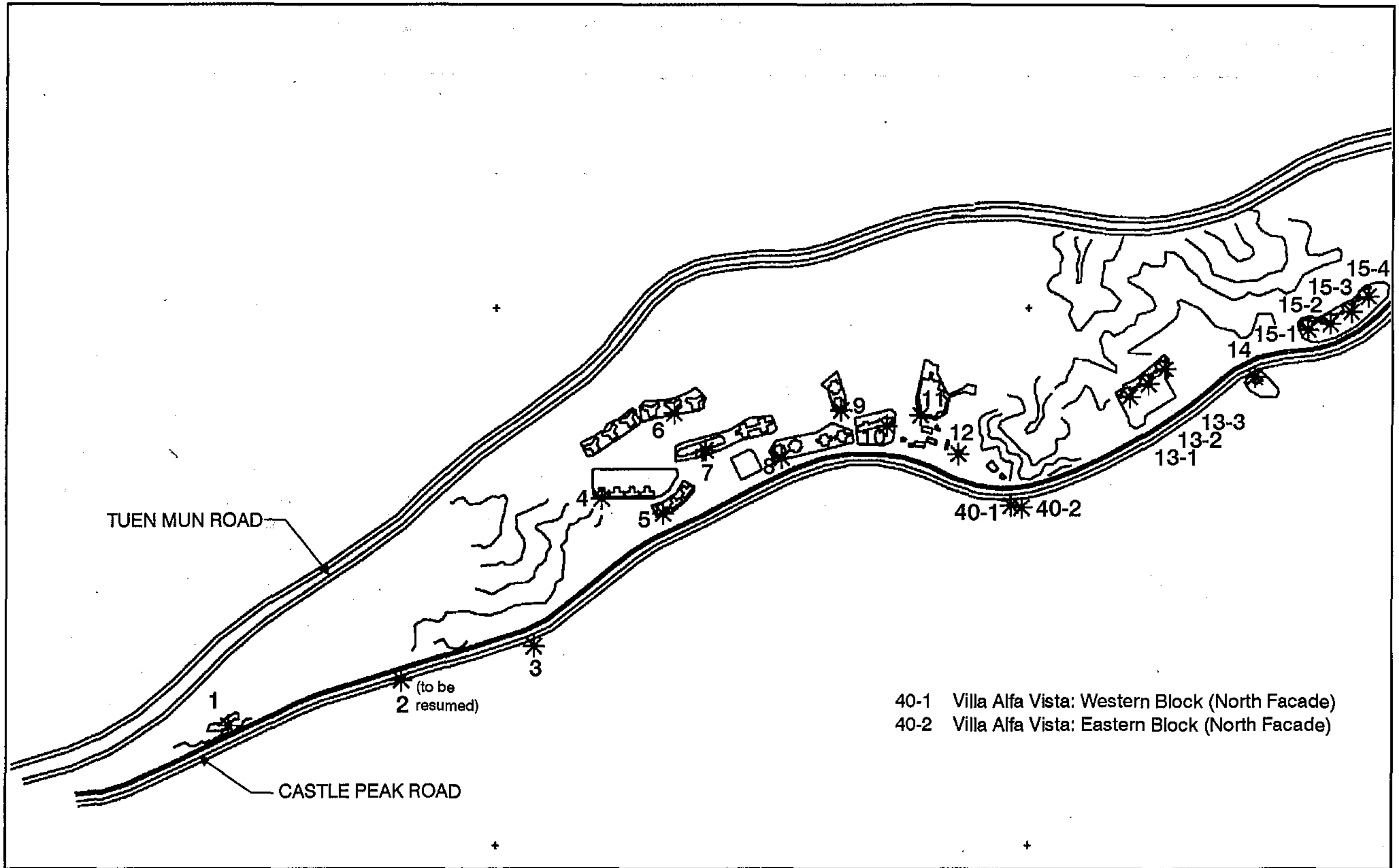

Figure D-2(a) 2011 Scenario (West)

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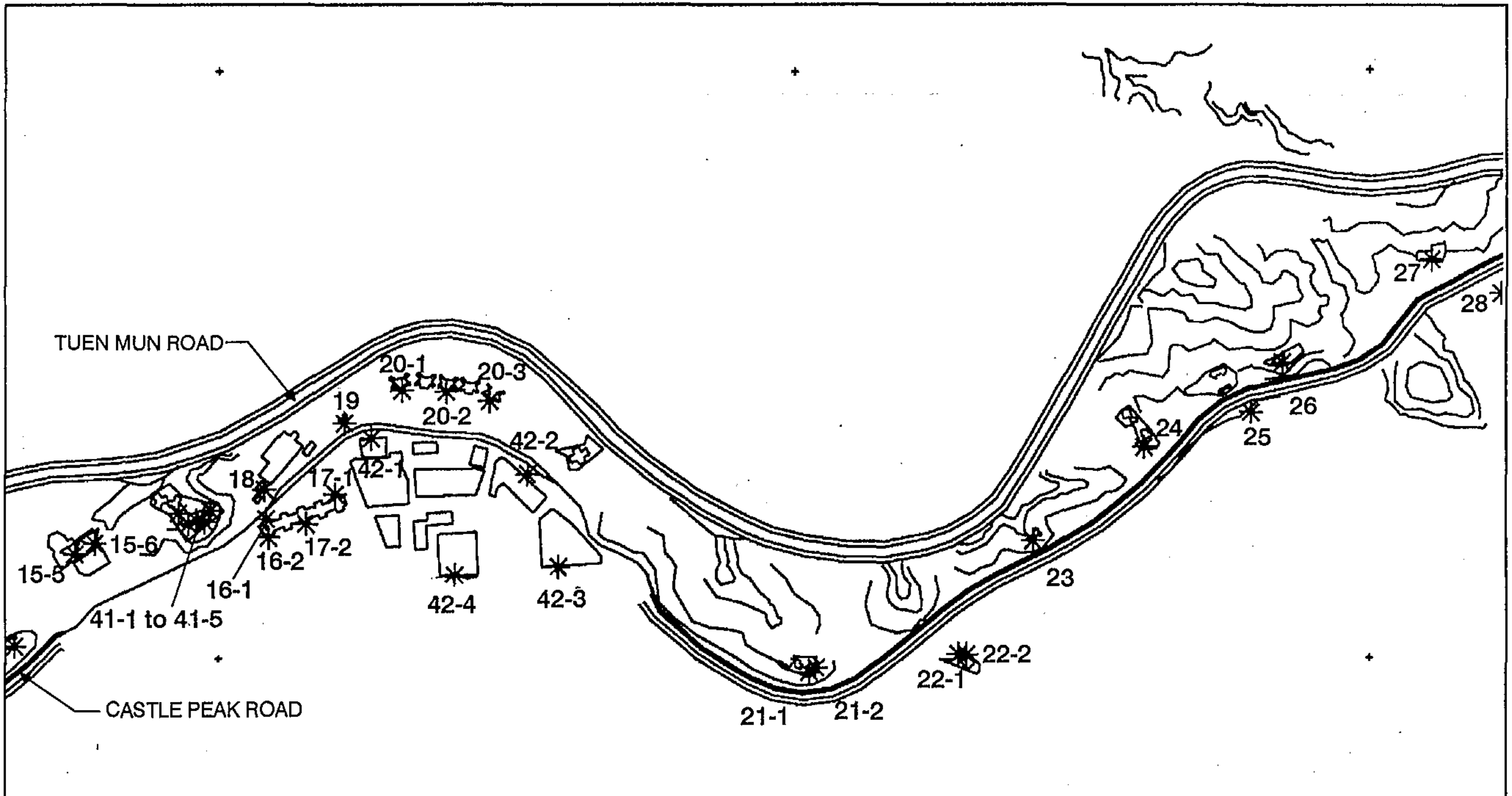

21-1 Pink Villas Southwestern Facade
21-2 Pink Villas Southeastern Facade
22-1 Homi Villa Southwestern Facade
22-2 Homi Villa Southeastern Facade

41-1 Seacrest Villas Block 2: Southwest Facade
41-2 Seacrest Villas Block 3: Southeast Facade
41-3 Seacrest Villas Block 3: South Facade
41-4 Seacrest Villas Block 4: Southwest Facade
41-5 Seacrest Villas Block 4: Southeast Facade

Figure D-2(b) 2011 Scenario (Middle)

Consultants in Environmental Sciences (Asia) Ltd

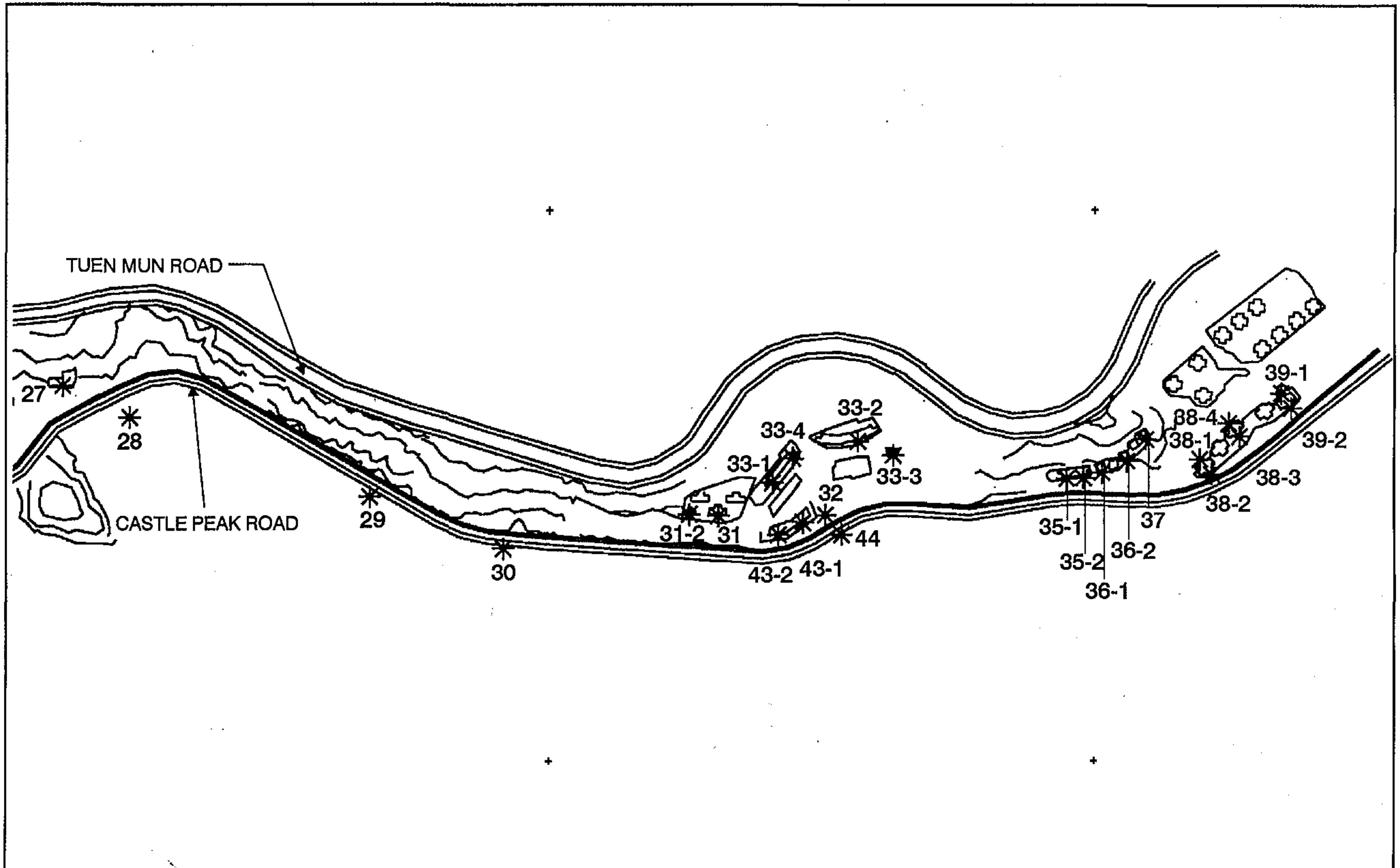

Figure D-2(c) 2011 Scenario (East)

96504 Castle Peak Road (Traffic Flows of 7/96)
Online Option

1. Existing Castle Peak Roa 3. Improved online C
2. Tuen Mun Road 4. Tuen Mun Road fo

			Existing (1994)			Unmitigated 2011		
NSR	Floor	H (m)	1	2	Total	3	4	Total
SR1A	G	30.6	72.3	48.9	72.3	77.6	50.5	77.6
SR1A	1	33.6	72.2	49.1	72.2	77.4	50.8	77.4
SR1A	2	36.6	72.1	49.2	72.1	77.2	50.9	77.2
SR1	G	25.2	69.9	49.1	70.0	73.8	50.6	73.8
SR1	1	28.2	73.0	49.1	73.1	76.8	50.6	76.8
SR3	G	11.2	71.1	58.1	71.3	76.0	58.1	76.1
SR3	1	14.2	78.9	58.1	78.9	78.3	58.1	78.3
SR3	2	17.2	78.5	57.9	78.6	78.7	58.3	78.7
SR4	1	27.2	60.2	39.0	60.3	65.5	39.6	65.5
SR4	5	38.4	62.7	40.2	62.8	67.7	40.9	67.7
SR4	10	52.4	63.6	42.6	63.6	69.0	43.2	69.0
SR4	15	66.4	64.2	52.9	64.6	69.1	54.0	69.2
SR4	20	80.4	64.6	54.9	65.1	68.9	55.6	69.0
SR5	1	27.2	72.8	40.8	72.8	76.0	42.4	76.0
SR5	5	38.4	72.1	45.3	72.1	75.5	47.2	75.5
SR5	10	52.4	71.2	47.8	71.2	74.8	49.5	74.8
SR5	15	66.4	70.4	53.3	70.5	74.1	54.0	74.1
SR5	20	80.4	69.8	55.5	70.0	73.6	56.1	73.7
SR5	23	88.8	69.5	56.0	69.7	73.3	56.6	73.4
SR6	1	33.2	49.6	35.4	49.8	54.1	36.0	54.2
SR6	5	44.4	54.9	35.5	54.9	60.7	36.1	60.7
SR6	10	58.4	58.7	35.6	58.7	62.9	36.2	63.0
SR6	15	72.4	58.9	36.1	59.0	63.4	36.7	63.4
SR6	20	86.4	59.2	38.5	59.2	64.1	39.1	64.1
SR6	25	100.4	60.0	44.0	60.2	64.5	44.6	64.5
SR7	1	16.2	63.5	34.5	63.5	67.5	35.5	67.5
SR7	2	19	63.7	34.7	63.7	67.7	35.7	67.7
SR7	3	21.8	63.9	34.8	64.0	68.2	35.8	68.2
SR7	4	24.6	64.0	34.9	64.0	68.2	35.9	68.2
SR7	5	27.4	64.2	35.1	64.2	68.4	36.1	68.4
SR8	1	13.2	72.8	32.6	72.8	77.3	33.5	77.3
SR8	5	24.4	72.4	33.2	72.4	76.9	34.2	76.9
SR8	10	38.4	71.6	34.8	71.6	76.0	35.9	76.0
SR8	15	52.4	70.7	37.6	70.7	75.2	38.9	75.2
SR8	20	66.4	70.0	42.7	70.0	74.4	44.6	74.4
SR9	1	14.9	57.5	35.0	57.6	64.1	36.1	64.1
SR9	5	26.1	60.7	36.5	60.7	65.6	37.7	65.6
SR9	10	40.1	60.7	38.9	60.7	65.4	40.0	65.5
SR9	15	54.1	61.7	43.5	61.8	67.1	44.8	67.1
SR9	20	68.1	62.8	48.5	62.9	68.2	49.9	68.2
SR10	1	10.2	69.6	32.5	69.6	72.9	33.5	72.9
SR10	3	15.8	70.7	33.0	70.7	74.4	34.1	74.4
SR10	7	27	71.0	34.3	71.0	74.4	35.3	74.4
SR10	10	35.4	70.7	35.3	70.7	74.2	36.4	74.2
SR11	G	17.7	67.1	44.0	67.1	72.1	45.1	72.1
SR11	1	20.7	68.0	44.2	68.0	72.3	45.2	72.3
SR12	G	6.1	74.4	45.0	74.4	72.2	45.9	72.2
SR12	1	9.1	76.5	47.4	76.5	74.0	48.4	74.0
SR12	2	12.1	76.6	47.7	76.6	75.1	48.7	75.1
SR13-1	1	49.9	56.3	54.0	58.3	61.7	55.2	62.6
SR13-2	1	49.9	59.1	54.0	60.3	63.9	55.1	64.4
SR13-3	1	49.9	65.8	52.2	66.0	70.8	53.4	70.9
SR13-1	5	61.1	63.2	54.5	63.8	67.9	55.7	68.2
SR13-2	5	61.1	62.9	54.6	63.5	67.6	55.8	67.9
SR13-3	5	61.1	65.9	53.2	66.1	70.8	54.5	70.9
SR13-1	10	75.1	64.3	54.8	64.8	69.0	56.0	69.2
SR13-2	10	75.1	64.3	55.0	64.8	68.9	56.2	69.1
SR13-3	10	75.1	65.9	54.9	66.2	70.7	56.2	70.8
SR13-1	15	89.1	67.0	55.5	67.3	71.6	56.6	71.8
SR13-2	15	89.1	67.4	55.3	67.6	72.0	56.5	72.1
SR13-3	15	89.1	66.3	57.4	66.8	71.2	58.4	71.5
SR13-1	20	103.1	67.0	56.5	67.4	72.0	57.7	72.2
SR13-2	20	103.1	67.3	56.6	67.7	72.1	57.7	72.2
SR13-3	20	103.1	67.0	59.0	67.6	71.7	59.8	72.0
SR13-1	25	117.1	67.3	57.5	67.8	71.8	58.6	72.0
SR13-2	25	117.1	67.1	57.6	67.5	71.8	58.7	72.0
SR13-3	25	117.1	66.8	62.4	68.2	71.6	63.2	72.2

96504 Castle Peak Road (Traffic Flows of 7/96)
Online Option

1. Existing Castle Peak Roa 3. Improved online C
2. Tuen Mun Road 4. Tuen Mun Road fo

			Existing (1994)			Unmitigated 2011		
NSR	Floor	H (m)	1	2	Total	3	4	Total
SR13-1	30	131.1	67.1	57.7	67.6	71.8	58.9	72.0
SR13-2	30	131.1	67.0	58.3	67.6	71.7	59.3	71.9
SR13-3	30	131.1	66.7	62.9	68.2	71.3	63.6	72.0
SR14	G.	31.2	62.2	51.9	62.6	67.3	52.6	67.5
SR14	1	34.2	71.9	52.4	71.9	79.0	53.1	79.0
SR15-1	1	36.2	66.2	31.7	66.2	70.5	32.3	70.5
SR15-2	1	36.2	57.9	52.8	59.0	63.8	53.9	64.2
SR15-3	1	36.2	52.5	55.4	57.2	58.8	56.3	60.8
SR15-4	1	36.2	58.2	55.8	60.1	62.0	56.7	63.1
SR15-1	5	47.4	69.6	33.8	69.6	74.4	34.4	74.4
SR15-2	5	47.4	67.7	53.3	67.9	70.3	54.4	70.5
SR15-3	5	47.4	63.4	56.1	64.2	64.8	57.1	65.5
SR15-4	5	47.4	64.7	56.4	65.3	67.1	57.4	67.5
SR15-1	10	61.4	69.6	45.4	69.6	75.4	46.0	75.4
SR15-2	10	61.4	69.3	53.9	69.4	74.6	55.2	74.7
SR15-3	10	61.4	70.4	56.5	70.6	73.1	57.5	73.2
SR15-4	10	61.4	69.9	56.8	70.1	73.1	57.8	73.2
SR15-1	15	75.4	69.4	44.6	69.4	75.1	45.2	75.1
SR15-2	15	75.4	69.7	54.6	69.8	75.1	56.0	75.2
SR15-3	15	75.4	69.9	57.1	70.1	75.0	58.2	75.1
SR15-4	15	75.4	70.0	57.5	70.2	74.5	58.6	74.6
SR15-1	20	89.4	69.0	44.9	69.0	74.5	45.5	74.5
SR15-2	20	89.4	69.1	54.9	69.3	74.7	56.2	74.7
SR15-3	20	89.4	69.4	57.5	69.7	74.5	58.6	74.6
SR15-4	20	89.4	69.4	57.9	69.7	74.2	59.0	74.3
SR15-1	25	103.4	68.5	47.8	68.5	74.0	48.4	74.0
SR15-2	25	103.4	68.6	56.0	68.9	74.1	57.1	74.2
SR15-3	25	103.4	68.9	58.6	69.3	74.0	59.6	74.1
SR15-4	25	103.4	69.0	58.9	69.4	73.7	59.9	73.9
SR15-1	30	117.4	68.0	51.7	68.1	73.5	52.3	73.5
SR15-2	30	117.4	68.2	56.5	68.5	73.6	57.7	73.7
SR15-3	30	117.4	68.4	59.2	68.9	73.5	60.2	73.7
SR15-4	30	117.4	68.5	59.7	69.1	73.3	60.7	73.5
SR15-5	1	58.2	62.8	48.5	63.0	66.0	49.4	66.1
SR15-6	1	58.2	65.0	45.5	65.0	68.5	46.1	68.5
SR15-5	5	69.4	65.9	48.4	66.0	69.4	49.3	69.4
SR15-6	5	69.4	66.2	45.8	66.2	69.5	46.4	69.5
SR15-5	10	83.4	68.5	50.3	68.5	71.7	51.2	71.7
SR15-6	10	83.4	68.6	48.6	68.6	71.7	49.3	71.8
SR15-5	15	97.4	68.2	51.5	68.3	71.4	52.3	71.5
SR15-6	15	97.4	68.4	49.8	68.5	71.5	50.6	71.5
SR15-5	20	111.4	68.1	53.0	68.2	71.2	53.8	71.3
SR15-6	20	111.4	68.2	51.6	68.3	71.2	52.4	71.3
SR15-5	25	125.4	67.8	55.8	68.1	71.0	57.1	71.1
SR15-6	25	125.4	67.9	54.9	68.1	71.0	56.2	71.1
SR15-5	30	139.4	67.5	57.7	68.0	70.7	58.8	71.0
SR15-6	30	139.4	67.8	56.9	68.1	70.8	58.0	71.0
SR16-1	1	9.2	80.0	61.8	80.1	81.3	62.7	81.3
SR16-2	1	9.2	62.2	53.7	62.7	64.1	54.7	64.6
SR17-1	1	9.2	71.5	62.0	72.0	73.2	62.7	73.6
SR17-2	1	9.2	54.6	49.9	55.9	58.4	50.9	59.1
SR16-1	5	20.4	78.3	68.2	78.7	80.6	69.0	80.9
SR16-2	5	20.4	63.6	55.8	64.2	66.5	56.7	66.9
SR17-1	5	20.4	72.7	70.8	74.8	74.6	71.5	76.3
SR17-2	5	20.4	56.0	54.7	58.4	60.3	55.7	61.6
SR16-1	10	34.4	76.1	71.7	77.5	78.7	72.4	79.7
SR16-2	10	34.4	63.1	59.4	64.6	66.2	60.0	67.1
SR17-1	10	34.4	72.5	71.7	75.2	74.4	72.4	76.5
SR17-2	10	34.4	56.7	59.4	61.3	61.3	60.1	63.8
SR16-1	15	48.4	74.6	72.9	76.8	77.3	73.6	78.9
SR16-2	15	48.4	62.5	59.4	64.2	65.7	60.2	66.8
SR17-1	15	48.4	72.2	72.8	75.5	74.0	73.5	76.8
SR17-2	15	48.4	56.7	59.2	61.1	61.4	60.0	63.7
SR16-1	20	62.4	73.4	73.1	76.3	76.2	73.8	78.2
SR16-2	20	62.4	62.0	60.7	64.4	65.3	61.6	66.9
SR17-1	20	62.4	72.0	73.1	75.6	74.0	73.8	76.9
SR17-2	20	62.4	56.8	60.6	62.1	61.4	61.5	64.4
SR16-1	25	76.4	72.5	73.2	75.9	75.3	73.9	77.7

96504 Castle Peak Road (Traffic Flows of 7/96)
Online Option

			1. Existing Castle Peak Roa			3. Improved online C		
			2. Tuen Mun Road			4. Tuen Mun Road fo		
			Existing (1994)			Unmitigated 2011		
NSR	Floor	H (m)	1	2	Total	3	4	Total
SR16-2	25	76.4	61.5	61.1	64.3	65.0	62.0	66.7
SR17-1	25	76.4	71.8	73.1	75.5	73.8	73.8	76.8
SR17-2	25	76.4	57.2	61.1	62.6	61.7	62.0	64.8
SR16-1	30	90.4	71.8	73.3	75.6	74.7	73.9	77.3
SR16-2	30	90.4	61.3	61.7	64.5	64.7	62.6	66.8
SR17-1	30	90.4	71.4	73.2	75.4	73.5	73.9	76.7
SR17-2	30	90.4	57.5	61.6	63.0	62.1	62.4	65.3
SR16-1	35	104.4	71.2	73.2	75.3	74.1	73.9	77.0
SR16-2	35	104.4	61.1	62.6	64.9	64.8	63.4	67.1
SR17-1	35	104.4	71.1	73.1	75.2	73.3	73.8	76.5
SR17-2	35	104.4	57.9	62.3	63.7	62.6	63.1	65.9
SR16-1	38	112.8	70.9	73.3	75.3	73.7	74.0	76.9
SR16-2	38	112.8	60.9	62.7	64.9	64.8	63.5	67.2
SR17-1	38	112.8	70.9	73.0	75.1	73.0	73.7	76.4
SR17-2	38	112.8	58.2	62.4	63.8	62.9	63.3	66.1
SR18	G	6.2	75.9	49.8	75.9	76.0	50.6	76.1
SR19	G	6.2	77.4	54.0	77.4	80.3	55.0	80.3
SR18	1	9.2	77.3	51.3	77.3	79.5	52.1	79.5
SR19	1	9.2	78.2	53.8	78.2	80.9	54.8	81.0
SR20-1	1	19.7	65.7	67.2	69.5	68.0	67.9	71.0
SR20-2	1	19.7	58.2	67.6	68.1	63.6	68.3	69.6
SR20-3	1	19.7	61.3	66.2	67.4	67.5	66.8	70.2
SR20-1	5	30.9	68.2	68.4	71.3	71.0	69.2	73.2
SR20-2	5	30.9	65.5	68.3	70.1	68.7	69.0	71.9
SR20-3	5	30.9	66.4	66.5	69.5	70.4	67.2	72.1
SR20-1	10	44.9	71.4	68.8	73.3	73.2	69.6	74.7
SR20-2	10	44.9	69.4	69.8	72.6	72.4	70.5	74.6
SR20-3	10	44.9	71.0	68.6	72.9	73.1	69.2	74.6
SR20-1	15	58.9	71.0	69.0	73.1	74.4	69.7	75.7
SR20-2	15	58.9	70.8	69.9	73.4	74.3	70.6	75.9
SR20-3	15	58.9	70.7	68.6	72.8	74.3	69.3	75.5
SR20-1	20	72.9	70.5	68.8	72.8	74.0	69.6	75.3
SR20-2	20	72.9	70.4	69.9	73.2	73.9	70.6	75.6
SR20-3	20	72.9	70.3	68.6	72.5	73.9	69.3	75.2
SR20-1	25	86.9	70.0	68.8	72.5	73.5	69.5	74.9
SR20-2	25	86.9	70.0	69.9	72.9	73.5	70.5	75.3
SR20-3	25	86.9	69.8	68.6	72.3	73.4	69.3	74.8
SR20-1	30	100.9	69.6	68.6	72.2	73.0	69.3	74.6
SR20-2	30	100.9	69.6	69.7	72.7	73.0	70.4	74.9
SR20-3	30	100.9	69.4	68.5	72.0	72.9	69.1	74.5
SR20-1	35	114.9	69.2	68.7	72.0	72.6	69.4	74.3
SR20-2	35	114.9	69.2	69.7	72.5	72.6	70.4	74.7
SR20-3	35	114.9	69.0	68.5	71.8	72.5	69.2	74.2
SR21-1	G	41.2	55.1	52.5	57.0	60.6	53.1	61.3
SR21-2	G	41.2	62.3	59.9	64.2	68.3	61.3	69.1
SR21-1	1	44.2	57.2	52.5	58.5	68.8	53.2	68.9
SR21-2	1	44.2	67.9	60.2	68.6	72.9	61.7	73.2
SR21-1	2	47.2	67.3	52.5	67.5	75.8	53.1	75.9
SR21-2	2	47.2	69.4	60.5	70.0	74.4	61.9	74.6
SR22-1	G	41.2	75.0	60.4	75.2	75.0	61.5	75.2
SR22-2	G	41.2	66.0	61.8	67.4	71.5	63.3	72.1
SR22-1	1	44.2	74.5	61.1	74.7	75.2	62.2	75.5
SR22-2	1	44.2	67.9	62.1	68.9	72.9	63.7	73.4
SR23	G	51.2	68.0	57.5	68.3	75.7	59.7	75.8
SR23	1	54.2	68.8	57.7	69.1	76.5	59.9	76.6
SR29	G	7.3	63.1	54.0	63.6	67.1	56.5	67.4
SR29	1	10.3	66.6	54.0	66.9	72.5	56.4	72.6
SR30	G	6.2	63.9	55.0	64.4	66.1	57.4	66.6
SR30	1	9.2	68.4	55.5	68.7	70.4	57.9	70.6
SR31	1	54.2	53.9	49.5	55.3	57.7	50.2	58.4
SR31-2	1	54.2	62.2	49.2	62.4	61.7	50.0	62.0
SR31	5	65.4	69.4	50.1	69.5	73.2	50.8	73.2
SR31-2	5	65.4	69.5	50.2	69.6	73.1	51.0	73.1
SR31	10	79.4	69.2	50.6	69.3	73.1	51.3	73.1
SR31-2	10	79.4	69.2	50.3	69.2	73.0	51.1	73.1
SR31	15	93.4	68.9	51.5	69.0	72.9	52.2	72.9
SR31-2	15	93.4	68.9	51.6	69.0	73.0	52.3	73.0
SR32	1	24.2	76.0	32.2	76.0	78.8	34.0	78.8

96504 Castle Peak Road (Traffic Flows of 7/96)
Online Option

1. Existing Castle Peak Roa 3. Improved online C
2. Tuen Mun Road 4. Tuen Mun Road fo

			Existing (1994)			Unmitigated 2011		
NSR	Floor	H (m)	1	2	Total	3	4	Total
SR32	5	35.4	75.2	32.3	75.2	78.3	34.2	78.3
SR32	10	49.4	73.9	32.4	73.9	77.3	34.4	77.3
SR32	15	63.4	72.7	32.5	72.7	76.3	34.5	76.3
SR32	20	77.4	71.9	32.6	71.9	75.5	34.6	75.5
SR32	25	91.4	71.1	32.9	71.1	74.8	34.8	74.8
SR32	30	105.4	70.4	37.9	70.4	74.2	39.3	74.2
SR33-1	1	57.2	62.4	62.1	65.3	66.7	64.2	68.6
SR33-4	1	57.2	63.3	63.4	66.4	67.6	65.4	69.6
SR33-2	1	54.2	62.5	58.8	64.1	67.0	60.7	67.9
SR33-1	5	68.4	64.1	62.9	66.5	67.6	65.0	69.5
SR33-4	5	68.4	63.8	64.4	67.1	68.0	66.5	70.4
SR33-2	5	65.4	65.0	63.0	67.1	69.8	64.9	71.0
SR33-1	10	82.4	64.8	64.4	67.6	68.3	66.7	70.6
SR33-4	10	82.4	64.2	65.9	68.1	68.3	68.3	71.3
SR33-2	10	79.4	66.2	66.5	69.4	70.1	69.0	72.6
SR33-1	15	96.4	64.6	65.1	67.9	68.5	67.5	71.0
SR33-4	15	96.4	64.7	66.3	68.6	68.4	68.7	71.6
SR33-2	15	93.4	66.4	66.8	69.6	70.2	69.3	72.8
SR33-1	20	110.4	64.3	65.3	67.9	68.3	67.7	71.0
SR33-4	20	110.4	64.6	66.3	68.6	68.5	68.8	71.6
SR33-2	20	107.4	66.2	66.7	69.5	70.1	69.1	72.7
SR33-1	25	124.4	64.5	65.3	67.9	68.2	67.6	71.0
SR33-4	25	124.4	64.3	66.3	68.4	68.4	68.7	71.6
SR33-2	25	121.4	66.1	66.5	69.3	70.0	69.0	72.5
SR33-1	28	132.8	64.3	65.2	67.8	68.1	67.6	70.9
SR33-4	28	132.8	64.2	66.3	68.4	68.3	68.7	71.5
SR33-2	28	129.8	66.0	66.4	69.2	69.9	68.9	72.5
SR33-3	G	46.2	60.8	56.1	62.1	66.8	57.8	67.3
SR33-3	1	49.2	67.9	56.1	68.2	72.1	57.8	72.3
SR33-3	2	52.2	67.9	56.1	68.2	72.2	57.9	72.3
SR33-3	3	55.2	67.9	56.1	68.2	72.2	57.9	72.4
SR33-3	4	58.2	67.9	56.2	68.2	72.2	57.9	72.3
SR35-1	1	47.9	73.3	40.3	73.3	76.8	40.8	76.8
SR35-2	1	47.9	73.5	36.4	73.5	76.8	37.2	76.8
SR35-1	5	59.1	72.4	40.3	72.4	76.1	40.9	76.1
SR35-2	5	59.1	72.6	37.5	72.6	76.1	38.3	76.1
SR35-1	10	73.1	71.5	40.3	71.5	75.4	40.9	75.4
SR35-2	10	73.1	71.7	38.4	71.7	75.4	39.2	75.4
SR35-1	15	81.5	71.0	40.3	71.0	75.0	40.9	75.0
SR35-2	15	81.5	71.3	38.7	71.3	75.0	39.4	75.0
SR36-1	G	45.8	66.3	31.0	66.3	72.9	32.2	72.9
SR36-2	G	45.8	68.8	2.5	68.8	72.3	2.5	72.3
SR37	G	45.8	51.0	2.5	51.0	53.2	2.5	53.2
SR36-1	1	48.8	72.7	31.2	72.7	75.9	32.4	75.9
SR36-2	1	48.8	70.0	2.5	70.0	73.1	2.5	73.1
SR37	1	48.8	52.5	2.5	52.5	55.8	2.5	55.8
SR36-1	2	51.8	72.6	31.2	72.6	75.7	32.4	75.7
SR36-2	2	51.8	69.9	2.5	69.9	73.0	2.5	73.0
SR37	2	51.8	53.6	2.5	53.6	58.2	2.5	58.2
SR38-1	1	17.5	78.8	52.4	78.8	68.8	54.8	68.9
SR38-2	1	17.5	2.5	2.5	5.5	80.6	2.5	80.6
SR38-3	1	17.5	18.8	2.5	18.9	73.2	2.5	73.2
SR38-4	1	17.5	79.2	54.1	79.2	58.6	56.5	60.7
SR39-1	1	17.5	71.2	58.6	71.4	35.3	60.7	60.7
SR39-2	1	17.5	2.5	2.5	5.5	78.8	2.5	78.8
SR38-1	5	28.7	74.8	56.7	74.9	68.8	59.1	69.2
SR38-2	5	28.7	2.5	2.5	5.5	79.2	2.5	79.2
SR38-3	5	28.7	18.0	2.5	18.2	76.0	2.5	76.0
SR38-4	5	28.7	77.0	61.1	77.1	59.0	63.0	64.5
SR39-1	5	28.7	71.8	60.6	72.1	36.1	62.6	62.7
SR39-2	5	28.7	2.5	2.5	5.5	78.0	2.5	78.0
SR38-1	10	42.7	72.8	64.0	73.3	68.5	66.0	70.4
SR38-2	10	42.7	2.5	2.5	5.5	77.8	2.5	77.8
SR38-3	10	42.7	16.8	2.5	17.0	75.5	2.5	75.5
SR38-4	10	42.7	74.8	63.8	75.1	59.0	66.1	66.9
SR39-1	10	42.7	71.4	61.9	71.8	37.6	64.1	64.1
SR39-2	10	42.7	2.5	2.5	5.5	77.0	2.5	77.0
SR38-1	15	56.7	71.6	68.4	73.3	68.5	70.8	72.8

96504 Castle Peak Road (Traffic Flows of 7/96)
Online Option

1. Existing Castle Peak Roa 3. Improved online C
2. Tuen Mun Road 4. Tuen Mun Road fo

			Existing (1994)			Unmitigated 2011		
NSR	Floor	H (m)	1	2	Total	3	4	Total
SR38-2	15	56.7	2.5	2.5	5.5	76.6	2.5	76.6
SR38-3	15	56.7	15.8	2.5	16.0	74.9	2.5	74.9
SR38-4	15	56.7	73.3	64.9	73.9	58.9	67.3	67.9
SR39-1	15	56.7	70.8	62.3	71.4	39.1	64.6	64.6
SR39-2	15	56.7	2.5	2.5	5.5	76.1	2.5	76.1
SR38-1	20	70.7	70.8	69.7	73.3	68.1	72.1	73.5
SR38-2	20	70.7	2.5	2.5	5.5	75.7	2.5	75.7
SR38-3	20	70.7	14.8	2.5	15.1	74.3	2.5	74.3
SR38-4	20	70.7	72.2	67.7	73.5	60.9	70.0	70.5
SR39-1	20	70.7	70.3	62.9	71.0	50.7	65.3	65.4
SR39-2	20	70.7	2.5	2.5	5.5	75.3	2.5	75.3
SR38-1	25	84.7	69.9	70.2	73.1	67.7	72.5	73.8
SR38-2	25	84.7	2.5	2.5	5.5	74.9	2.5	74.9
SR38-3	25	84.7	14.0	2.5	14.3	73.7	2.5	73.7
SR38-4	25	84.7	71.4	68.5	73.2	62.7	70.8	71.4
SR39-1	25	84.7	69.7	63.8	70.7	53.3	66.3	66.5
SR39-2	25	84.7	2.5	2.5	5.5	74.6	2.5	74.6
SR38-1	30	98.7	69.5	70.5	73.0	67.3	72.8	73.9
SR38-2	30	98.7	2.5	2.5	5.5	74.3	2.5	74.3
SR38-3	30	98.7	13.4	2.5	13.7	73.2	2.5	73.2
SR38-4	30	98.7	70.7	68.8	72.9	63.1	71.1	71.7
SR39-1	30	98.7	69.2	64.1	70.4	57.3	66.6	67.1
SR39-2	30	98.7	2.5	2.5	5.5	74.0	2.5	74.0
SR24	G	43.2	60.2	57.6	62.1	67.1	59.5	67.8
SR25	G	11.2	63.6	51.3	63.8	66.9	52.1	67.0
SR26	G	46.2	59.2	52.2	60.0	63.9	54.3	64.4
SR24	1	46.2	67.5	57.8	67.9	72.4	59.7	72.6
SR25	1	14.2	67.0	53.5	67.2	69.1	54.4	69.3
SR26	1	49.2	65.3	52.8	65.5	72.0	55.1	72.1
SR24	2	49.2	67.6	58.0	68.1	72.7	60.0	72.9
SR25	2	17.2	75.8	52.2	75.8	75.1	53.0	75.1
SR26	2	52.2	67.3	60.4	68.1	73.8	62.5	74.1
SR24	3	52.2	67.9	58.2	68.4	73.8	60.1	74.0
SR25	3	20.2	77.2	52.5	77.2	77.2	53.3	77.2
SR26	3	55.2	67.5	61.6	68.5	74.5	63.7	74.8
SR27	G	51.2	63.4	58.1	64.5	69.4	59.7	69.9
SR28	G	6.2	58.9	54.6	60.3	60.8	57.0	62.3
SR27	1	54.2	72.3	59.0	72.5	74.4	60.7	74.5
SR28	1	9.2	61.4	55.1	62.3	62.0	57.4	63.3
SR27	2	57.2	73,1	59.3	73.3	75.2	60.8	75.3
SR28	2	12.2	62.8	55.5	63.6	63.4	57.9	64.5
SR27	3	60.2	72.9	59.5	73.1	75.1	61.0	75.2
SR28	3	15.2	64.3	56.0	64.9	65.7	58.3	66.4
SR40-1	G	9.1	72.4	56.9	72.6	77.3	57.8	77.4
SR40-2	G	9.1	71.5	56.8	71.7	75.7	57.6	75.8
SR40-1	1	12.1	74.2	57.3	74.3	79.2	58.1	79.2
SR40-2	1	12.1	73.2	57.3	73.3	77.9	58.1	77.9
SR40-1	2	15.1	74.6	57.8	74.7	79.4	58.6	79.4
SR40-2	2	15.1	73.9	57.7	74.0	78.4	58.5	78.4
SR40-1	3	18.1	74.5	58.5	74.6	79.2	59.3	79.3
SR40-2	3	18.1	74.0	58.4	74.1	78.4	59.2	78.5
SR40-1	4	21.1	74.3	59.1	74.4	79.0	59.9	79.1
SR40-2	4	21.1	73.8	59.0	74.0	78.3	59.8	78.3
SR41-1	1	54.2	60.6	65.7	66.9	63.9	66.4	68.3
SR41-2	1	54.2	51.3	41.8	51.8	56.6	42.6	56.7
SR41-3	1	54.2	55.2	33.6	55.2	59.8	34.3	59.8
SR41-4	1	54.2	56.2	43.4	56.4	59.7	44.1	59.8
SR41-5	1	54.2	58.7	66.5	67.2	62.1	67.3	68.5
SR41-1	5	65.4	65.6	66.1	68.8	68.7	66.7	70.8
SR41-2	5	65.4	54.8	41.7	55.0	59.5	42.5	59.6
SR41-3	5	65.4	66.1	33.6	66.1	67.3	34.3	67.3
SR41-4	5	65.4	69.6	43.5	69.6	71.5	44.2	71.5
SR41-5	5	65.4	70.3	66.5	71.8	71.3	67.3	72.8
SR41-1	10	79.4	66.1	66.4	69.3	69.3	67.1	71.3
SR41-2	10	79.4	69.1	41.6	69.2	71.3	42.4	71.3
SR41-3	10	79.4	69.9	33.6	69.9	72.3	34.3	72.3
SR41-4	10	79.4	69.4	45.7	69.4	72.1	46.4	72.1
SR41-5	10	79.4	70.0	66.3	71.5	73.1	67.1	74.1

96504 Castle Peak Road (Traffic Flows of 7/96)
Online Option

1. Existing Castle Peak Roa 3. Improved online C
2. Tuen Mun Road 4. Tuen Mun Road fo

			Existing (1994)			Unmitigated 2011		
NSR	Floor	H (m)	1	2	Total	3	4	Total
SR41-1	15	93.4	65.9	66.9	69.4	69.0	67.6	71.4
SR41-2	15	93.4	69.0	41.6	69.0	71.9	42.4	71.9
SR41-3	15	93.4	69.6	33.6	69.6	72.6	34.3	72.6
SR41-4	15	93.4	68.8	47.2	68.9	71.8	47.7	71.8
SR41-5	15	93.4	69.6	66.2	71.2	72.7	67.0	73.7
SR41-1	20	107.4	65.5	67.1	69.4	68.7	67.8	71.3
SR41-2	20	107.4	68.6	42.7	68.6	71.6	43.5	71.6
SR41-3	20	107.4	69.2	33.6	69.2	72.2	34.3	72.2
SR41-4	20	107.4	68.3	47.1	68.4	71.4	47.7	71.4
SR41-5	20	107.4	69.2	66.2	71.0	72.3	67.0	73.4
SR41-1	25	121.4	65.2	67.2	69.3	68.4	67.9	71.2
SR41-2	25	121.4	68.1	42.7	68.2	71.3	43.4	71.3
SR41-3	25	121.4	68.7	33.5	68.7	71.8	34.2	71.8
SR41-4	25	121.4	67.9	47.0	67.9	71.0	47.6	71.0
SR41-5	25	121.4	68.8	66.2	70.7	71.9	67.0	73.1
SR41-1	30	135.4	64.9	67.2	69.2	68.1	67.9	71.0
SR41-2	30	135.4	67.8	56.3	68.1	70.9	56.9	71.1
SR41-3	30	135.4	68.3	34.8	68.3	71.5	35.5	71.5
SR41-4	30	135.4	67.5	47.0	67.5	70.6	47.6	70.7
SR41-5	30	135.4	68.5	66.5	70.6	71.5	67.4	72.9
SR42-1	1	9.2	77.3	62.7	77.4	81.5	63.5	81.6
SR42-2	1	9.2	76.4	58.7	76.5	79.7	59.4	79.7
SR42-3	1	9.2	60.0	37.7	60.0	67.5	38.3	67.5
SR42-4	1	9.2	56.5	36.2	56.5	62.4	36.8	62.4
SR42-1	5	20.4	76.7	71.5	77.9	80.5	72.3	81.1
SR42-2	5	20.4	75.7	61.1	75.8	79.5	61.9	79.6
SR42-3	5	20.4	61.2	42.7	61.2	68.5	43.3	68.5
SR42-4	5	20.4	57.5	37.8	57.5	63.6	38.4	63.6
SR42-1	10	34.4	75.4	73.6	77.6	79.0	74.2	80.2
SR42-2	10	34.4	74.1	66.9	74.8	78.2	67.7	78.6
SR42-3	10	34.4	61.2	44.8	61.3	68.4	45.3	68.4
SR42-4	10	34.4	57.9	41.5	58.0	64.0	41.9	64.0
SR42-1	15	48.4	74.2	74.4	77.3	77.7	75.1	79.6
SR42-2	15	48.4	72.8	71.8	75.3	77.0	72.5	78.3
SR42-3	15	48.4	61.0	45.6	61.2	68.1	46.1	68.1
SR42-4	15	48.4	58.0	46.0	58.2	64.1	46.5	64.1
SR42-1	20	62.4	73.2	74.5	76.9	76.6	75.2	79.0
SR42-2	20	62.4	71.8	73.2	75.6	76.0	73.9	78.1
SR42-3	20	62.4	60.8	47.1	61.0	67.8	47.6	67.9
SR42-4	20	62.4	58.0	46.9	58.3	64.1	47.4	64.2
SR42-1	25	76.4	72.3	74.4	76.5	75.8	75.1	78.5
SR42-2	25	76.4	70.9	73.6	75.5	75.2	74.3	77.8
SR42-3	25	76.4	60.6	48.0	60.8	67.5	48.5	67.5
SR42-4	25	76.4	58.0	47.8	58.4	64.0	48.3	64.2
SR42-1	30	90.4	71.6	74.2	76.1	75.1	75.0	78.0
SR42-2	30	90.4	70.2	73.7	75.3	74.5	74.4	77.5
SR42-3	30	90.4	60.3	48.9	60.6	67.2	49.4	67.2
SR42-4	30	90.4	58.0	49.2	58.5	64.1	49.8	64.2
SR43-1	1	38.2	72.3	60.2	72.5	75.3	62.0	75.5
SR43-2	1	38.2	62.5	34.9	62.5	67.0	35.4	67.0
SR43-1	5	49.4	73.0	61.4	73.3	76.4	63.2	76.6
SR43-2	5	49.4	73.5	39.8	73.5	77.3	40.3	77.3
SR43-1	10	63.4	72.5	63.0	72.9	75.9	65.2	76.2
SR43-2	10	63.4	72.6	40.7	72.6	76.5	41.3	76.5
SR43-1	15	77.4	71.7	63.8	72.4	75.2	66.1	75.7
SR43-2	15	77.4	71.9	40.8	71.9	75.7	41.3	75.7
SR43-1	20	91.4	71.1	64.8	72.0	74.5	67.2	75.2
SR43-2	20	91.4	71.2	40.8	71.2	75.0	41.3	75.0
SR43-1	25	105.4	70.5	65.5	71.7	73.9	67.9	74.9
SR43-2	25	105.4	70.5	40.8	70.6	74.4	41.3	74.4
SR43-1	30	119.4	69.9	65.6	71.3	73.4	68.0	74.5
SR43-2	30	119.4	70.0	40.8	70.0	73.9	41.3	73.9
SR44	1	9.2	61.9	60.0	64.0	62.5	61.9	65.2
SR44	5	20.4	74.0	63.1	74.3	81.5	64.9	81.6
SR44	10	34.4	74.7	64.3	75.1	80.3	66.2	80.5
SR44	15	48.4	73.8	65.4	74.4	78.7	67.3	79.0
SR44	20	62.4	72.8	66.6	73.8	77.4	68.7	78.0
SR44	25	76.4	72.0	67.3	73.3	76.4	69.5	77.2

Agreement CE 39/94 (Improvements to Castle Peak Road)
Traffic Noise Modelling Results (Mitigated)
1/10/96

		FACADE NOISE LEVELS dB(A)		
		Final	Old	Existing
NSR	Floor	2011	2011	1994
SR1	G	73.8	50.6	70.0
SR1	1	76.8	50.6	73.1
SR3	G	76.1	58.1	71.3
SR3	1	78.3	58.1	78.9
SR3	2	78.7	58.3	78.6
SR4	1	65.5	39.6	60.3
SR4	5	67.7	40.9	62.8
SR4	10	69.0	43.2	63.6
SR4	15	69.2	54.0	64.6
SR4	20	69.0	55.6	65.1
SR5	1	76.0	42.4	72.8
SR5	5	75.5	47.2	72.1
SR5	10	74.8	49.5	71.2
SR5	15	74.1	54.0	70.5
SR5	20	73.7	56.1	70.0
SR5	23	73.4	56.6	69.7
SR6	1	54.2	36.0	49.8
SR6	5	60.7	36.1	54.9
SR6	10	63.0	36.2	58.7
SR6	15	63.4	36.7	59.0
SR6	20	64.1	39.1	59.2
SR6	25	64.5	44.6	60.2
SR7	1	67.5	35.5	63.5
SR7	2	67.7	35.7	63.7
SR7	3	68.2	35.8	64.0
SR7	4	68.2	35.9	64.0
SR7	5	68.4	36.1	64.2
SR8	1	77.3	33.5	72.8
SR8	5	76.9	34.2	72.4
SR8	10	76.0	35.9	71.6
SR8	15	75.2	38.9	70.7
SR8	20	74.4	44.6	70.0
SR9	1	58.1	36.1	57.6
SR9	5	61.3	37.7	60.7
SR9	10	63.7	40.0	60.7
SR9	15	66.1	44.8	61.8
SR9	20	67.9	49.9	62.9
SR10	1	68.6	33.5	69.6
SR10	3	71.0	34.1	70.7
SR10	7	73.3	35.3	71.0
SR10	10	73.3	36.4	70.7
SR11	G	68.7	45.1	67.1
SR11	1	69.2	45.2	68.0
SR12	G	66.9	46.0	74.4
SR12	1	68.7	48.4	76.5
SR12	2	70.3	48.7	76.6
SR13-1	1	62.6	55.2	58.3
SR13-2	1	64.4	55.1	60.3
SR13-3	1	70.9	53.4	66.0
SR13-1	5	68.2	55.7	63.8
SR13-2	5	67.9	55.8	63.5
SR13-3	5	70.9	54.5	66.1
SR13-1	10	69.2	56.0	64.8
SR13-2	10	69.1	56.2	64.8
SR13-3	10	70.8	56.2	66.2

Agreement CE 39/94 (Improvements to Castle Peak Road)
Traffic Noise Modelling Results (Mitigated)
1/10/96

		FACADE NOISE LEVELS dB(A)		
		Final	Old	Existing
NSR	Floor	2011	2011	1994
SR13-1	15	71.8	56.6	67.3
SR13-2	15	72.1	56.5	67.6
SR13-3	15	71.5	58.4	66.8
SR13-1	20	72.1	57.7	67.4
SR13-2	20	72.2	57.7	67.7
SR13-3	20	72.0	59.8	67.6
SR13-1	25	72.0	58.6	67.8
SR13-2	25	72.0	58.7	67.5
SR13-3	25	72.1	63.2	68.2
SR13-1	30	72.0	58.9	67.6
SR13-2	30	71.9	59.3	67.6
SR13-3	30	72.0	63.6	68.2
SR14	G.	67.5	52.6	62.6
SR14	1	79.0	53.1	71.9
SR15-1	1	70.5	32.3	66.2
SR15-2	1	64.2	53.9	59.0
SR15-3	1	60.8	56.3	57.2
SR15-4	1	63.1	56.7	60.1
SR15-1	5	74.4	34.4	69.6
SR15-2	5	70.5	54.4	67.9
SR15-3	5	65.5	57.1	64.2
SR15-4	5	67.5	57.4	65.3
SR15-1	10	75.4	46.0	69.6
SR15-2	10	74.7	55.2	69.4
SR15-3	10	73.2	57.5	70.6
SR15-4	10	73.2	57.8	70.1
SR15-1	15	75.1	45.2	69.4
SR15-2	15	75.2	56.0	69.8
SR15-3	15	75.1	58.2	70.1
SR15-4	15	74.6	58.6	70.2
SR15-1	20	74.5	45.5	69.0
SR15-2	20	74.7	56.2	69.3
SR15-3	20	74.6	58.6	69.7
SR15-4	20	74.3	59.0	69.7
SR15-1	25	74.0	48.4	68.5
SR15-2	25	74.2	57.1	68.9
SR15-3	25	74.1	59.6	69.3
SR15-4	25	73.9	59.9	69.4
SR15-1	30	73.5	52.3	68.1
SR15-2	30	73.7	57.7	68.5
SR15-3	30	73.7	60.2	68.9
SR15-4	30	73.5	60.7	69.1
SR15-5	1	66.1	49.4	63.0
SR15-6	1	68.5	46.1	65.0
SR15-5	5	69.4	49.3	66.0
SR15-6	5	69.5	46.4	66.2
SR15-5	10	71.7	51.2	68.5
SR15-6	10	71.8	49.3	68.6
SR15-5	15	71.5	52.3	68.3
SR15-6	15	71.5	50.6	68.5
SR15-5	20	71.3	53.8	68.2
SR15-6	20	71.3	52.4	68.3
SR15-5	25	71.1	57.1	68.1
SR15-6	25	71.1	56.2	68.1
SR15-5	30	71.0	58.8	68.0

Agreement CE 39/94 (Improvements to Castle Peak Road)
Traffic Noise Modelling Results (Mitigated)
1/10/96

		FACADE NOISE LEVELS dB(A)		
		Final	Old	Existing
NSR	Floor	2011	2011	1994
SR15-6	30	71.0	58.0	68.1
SR16-1	1	81.3	62.7	80.1
SR16-2	1	64.6	54.7	62.7
SR17-1	1	73.6	62.7	72.0
SR17-2	1	59.1	50.9	55.9
SR16-1	5	80.9	69.0	78.7
SR16-2	5	66.9	56.7	64.2
SR17-1	5	76.3	71.5	74.8
SR17-2	5	61.6	55.7	58.4
SR16-1	10	79.7	72.4	77.5
SR16-2	10	67.1	60.0	64.6
SR17-1	10	76.5	72.4	75.2
SR17-2	10	63.8	60.1	61.3
SR16-1	15	78.9	73.6	76.8
SR16-2	15	66.8	60.2	64.2
SR17-1	15	76.8	73.5	75.5
SR17-2	15	63.7	60.0	61.1
SR16-1	20	78.2	73.8	76.3
SR16-2	20	66.9	61.6	64.4
SR17-1	20	76.9	73.8	75.6
SR17-2	20	64.4	61.5	62.1
SR16-1	25	77.7	73.9	75.9
SR16-2	25	66.7	62.0	64.3
SR17-1	25	76.8	73.8	75.5
SR17-2	25	64.8	62.0	62.6
SR16-1	30	77.3	73.9	75.6
SR16-2	30	66.8	62.6	64.5
SR17-1	30	76.7	73.9	75.4
SR17-2	30	65.3	62.4	63.0
SR16-1	35	77.0	73.9	75.3
SR16-2	35	67.1	63.4	64.9
SR17-1	35	76.5	73.8	75.2
SR17-2	35	65.9	63.1	63.7
SR16-1	38	76.9	74.0	75.3
SR16-2	38	67.2	63.5	64.9
SR17-1	38	76.4	73.7	75.1
SR17-2	38	66.1	63.3	63.8
SR18	G	76.1	50.6	75.9
SR19	G	80.3	55.0	77.4
SR18	1	79.5	52.1	77.3
SR19	1	81.0	54.8	78.2
SR20-1	1	71.0	67.9	69.5
SR20-2	1	69.6	68.3	68.1
SR20-3	1	70.2	66.8	67.4
SR20-1	5	73.2	69.2	71.3
SR20-2	5	71.9	69.0	70.1
SR20-3	5	72.1	67.2	69.5
SR20-1	10	74.7	69.6	73.3
SR20-2	10	74.6	70.5	72.6
SR20-3	10	74.6	69.2	72.9
SR20-1	15	75.7	69.7	73.1
SR20-2	15	75.9	70.6	73.4
SR20-3	15	75.5	69.3	72.8
SR20-1	20	75.3	69.6	72.8
SR20-2	20	75.6	70.6	73.2

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		FACADE NOISE LEVELS dB(A)		
		Final	Old	Existing
NSR	Floor	2011	2011	1994
SR20-3	20	75.2	69.3	72.5
SR20-1	25	74.9	69.5	72.5
SR20-2	25	75.3	70.5	72.9
SR20-3	25	74.8	69.3	72.3
SR20-1	30	74.6	69.3	72.2
SR20-2	30	74.9	70.4	72.7
SR20-3	30	74.5	69.1	72.0
SR20-1	35	74.3	69.4	72.0
SR20-2	35	74.7	70.4	72.5
SR20-3	35	74.2	69.2	71.8
SR21-1	G	61.3	53.1	57.0
SR21-2	G	69.1	61.3	64.2
SR21-1	1	69.2	53.2	58.5
SR21-2	1	73.2	61.7	68.6
SR21-1	2	75.9	53.1	67.5
SR21-2	2	74.6	61.9	70.0
SR22-1	G	75.2	61.5	75.2
SR22-2	G	72.1	63.3	67.4
SR22-1	1	75.4	62.2	74.7
SR22-2	1	73.3	63.7	68.9
SR23	G	75.8	59.7	68.3
SR23	1	76.6	59.9	69.1
SR29	G	66.4	56.5	63.6
SR29	1	69.1	56.4	66.9
SR30	G	66.1	57.8	64.4
SR30	1	69.7	57.9	68.7
SR31	1	58.0	50.2	55.3
SR31-2	1	61.6	50.0	62.4
SR31	5	71.0	50.8	69.5
SR31-2	5	71.2	51.0	69.6
SR31	10	70.9	51.3	69.3
SR31-2	10	70.9	51.1	69.2
SR31	15	70.9	52.2	69.0
SR31-2	15	71.1	52.3	69.0
SR32	1	78.8	34.0	76.0
SR32	5	78.2	34.2	75.2
SR32	10	77.2	34.4	73.9
SR32	15	76.3	34.5	72.7
SR32	20	75.4	34.6	71.9
SR32	25	74.7	34.8	71.1
SR32	30	74.1	39.3	70.4
SR33-1	1	68.1	64.2	65.3
SR33-4	1	68.9	65.4	66.4
SR33-2	1	64.1	60.7	64.1
SR33-1	5	68.9	65.0	66.5
SR33-4	5	69.8	66.5	67.1
SR33-2	5	69.3	64.9	67.1
SR33-1	10	70.1	66.7	67.6
SR33-4	10	70.8	68.3	68.1
SR33-2	10	72.0	69.0	69.4
SR33-1	15	70.5	67.5	67.9
SR33-4	15	71.0	68.7	68.6
SR33-2	15	72.1	69.3	69.6
SR33-1	20	70.5	67.7	67.9
SR33-4	20	71.2	68.8	68.6

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		FACADE NOISE LEVELS dB(A)		
		Final	Old	Existing
NSR	Floor	2011	2011	1994
SR33-2	20	72.0	69.1	69.5
SR33-1	25	70.4	67.6	67.9
SR33-4	25	71.3	68.7	68.4
SR33-2	25	71.8	69.0	69.3
SR33-1	28	70.4	67.6	67.8
SR33-4	28	71.2	68.7	68.4
SR33-2	28	71.8	68.9	69.2
SR33-3	G	66.3	57.8	62.1
SR33-3	1	68.8	57.8	68.2
SR33-3	2	68.8	57.9	68.2
SR33-3	3	68.8	57.9	68.2
SR33-3	4	69.1	57.9	68.2
SR35-1	1	69.2	40.8	73.3
SR35-2	1	69.3	37.2	73.5
SR35-1	5	68.9	40.9	72.4
SR35-2	5	68.9	38.3	72.6
SR35-1	10	68.3	40.9	71.5
SR35-2	10	68.4	39.2	71.7
SR35-1	15	68.1	40.9	71.0
SR35-2	15	68.3	39.4	71.3
SR36-1	G	69.8	32.2	66.3
SR36-2	G	70.6	2.5	68.8
SR37	G	51.6	2.5	51.0
SR36-1	1	70.0	32.4	72.7
SR36-2	1	70.5	2.5	70.0
SR37	1	54.5	2.5	52.5
SR36-1	2	69.9	32.4	72.6
SR36-2	2	70.5	2.5	69.9
SR37	2	57.4	2.5	53.6
SR38-1	1	66.5	54.8	78.8
SR38-2	1	80.6	2.5	5.5
SR38-3	1	73.2	2.5	18.9
SR38-4	1	58.3	56.5	79.2
SR39-1	1	60.7	60.7	71.4
SR39-2	1	78.8	2.5	5.5
SR38-1	5	67.1	59.1	74.9
SR38-2	5	79.2	2.5	5.5
SR38-3	5	76.0	2.5	18.2
SR38-4	5	63.5	63.0	77.1
SR39-1	5	62.7	62.6	72.1
SR39-2	5	78.0	2.5	5.5
SR38-1	10	69.0	66.0	73.3
SR38-2	10	77.8	2.5	5.5
SR38-3	10	75.5	2.5	17.0
SR38-4	10	66.4	66.1	75.1
SR39-1	10	64.1	64.1	71.8
SR39-2	10	77.0	2.5	5.5
SR38-1	15	72.0	70.8	73.3
SR38-2	15	76.6	2.5	5.5
SR38-3	15	74.9	2.5	16.0
SR38-4	15	67.5	67.3	73.9
SR39-1	15	64.6	64.6	71.4
SR39-2	15	76.1	2.5	5.5
SR38-1	20	73.0	72.1	73.3
SR38-2	20	75.7	2.5	5.5

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		FACADE NOISE LEVELS dB(A)		
		Final	Old	Existing
NSR	Floor	2011	2011	1994
SR38-3	20	74.3	2.5	15.1
SR38-4	20	70.1	70.0	73.5
SR39-1	20	65.4	65.3	71.0
SR39-2	20	75.3	2.5	5.5
SR38-1	25	73.3	72.5	73.1
SR38-2	25	74.9	2.5	5.5
SR38-3	25	73.7	2.5	14.3
SR38-4	25	71.0	70.8	73.2
SR39-1	25	66.4	66.3	70.7
SR39-2	25	74.6	2.5	5.5
SR38-1	30	73.4	72.8	73.0
SR38-2	30	74.3	2.5	5.5
SR38-3	30	73.2	2.5	13.7
SR38-4	30	71.3	71.1	72.9
SR39-1	30	66.9	66.6	70.4
SR39-2	30	74.0	2.5	5.5
SR24	G	67.8	59.5	62.1
SR25	G	67.0	52.1	63.8
SR26	G	64.3	54.3	60.0
SR24	1	72.6	59.7	67.9
SR25	1	69.3	54.4	67.2
SR26	1	72.1	55.1	65.5
SR24	2	72.9	60.0	68.1
SR25	2	75.1	53.0	75.8
SR26	2	74.1	62.5	68.1
SR24	3	74.0	60.1	68.4
SR25	3	77.2	53.3	77.2
SR26	3	74.8	63.7	68.5
SR27	G	69.9	59.7	64.5
SR28	G	61.7	57.0	60.3
SR27	1	74.5	60.7	72.5
SR28	1	62.6	57.4	62.3
SR27	2	75.3	60.8	73.3
SR28	2	63.7	57.9	63.6
SR27	3	75.2	61.0	73.1
SR28	3	64.9	58.4	64.9
SR40-1	G	77.4	57.8	72.6
SR40-2	G	75.8	57.6	71.7
SR40-1	1	79.2	58.1	74.3
SR40-2	1	77.9	58.1	73.3
SR40-1	2	79.4	58.6	74.7
SR40-2	2	78.4	58.5	74.0
SR40-1	3	79.3	59.3	74.6
SR40-2	3	78.5	59.2	74.1
SR40-1	4	79.1	59.9	74.4
SR40-2	4	78.3	59.8	74.0
SR41-1	1	68.3	66.4	66.9
SR41-2	1	56.7	42.6	51.8
SR41-3	1	59.8	34.3	55.2
SR41-4	1	59.8	44.1	56.4
SR41-5	1	68.5	67.3	67.2
SR41-1	5	70.8	66.7	68.8
SR41-2	5	59.6	42.5	55.0
SR41-3	5	67.3	34.3	66.1
SR41-4	5	71.5	44.2	69.6

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Traffic Noise Modelling Results (Mitigated)
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		FACADE NOISE LEVELS dB(A)		
		Final	Old	Existing
NSR	Floor	2011	2011	1994
SR41-5	5	72.8	67.3	71.8
SR41-1	10	71.3	67.1	69.3
SR41-2	10	71.3	42.4	69.2
SR41-3	10	72.3	34.3	69.9
SR41-4	10	72.1	46.4	69.4
SR41-5	10	74.1	67.1	71.5
SR41-1	15	71.4	67.6	69.4
SR41-2	15	71.9	42.4	69.0
SR41-3	15	72.6	34.3	69.6
SR41-4	15	71.8	47.7	68.9
SR41-5	15	73.7	67.0	71.2
SR41-1	20	71.3	67.8	69.4
SR41-2	20	71.6	43.5	68.6
SR41-3	20	72.2	34.3	69.2
SR41-4	20	71.4	47.7	68.4
SR41-5	20	73.4	67.0	71.0
SR41-1	25	71.2	67.9	69.3
SR41-2	25	71.3	43.4	68.2
SR41-3	25	71.8	34.2	68.7
SR41-4	25	71.0	47.6	67.9
SR41-5	25	73.1	67.0	70.7
SR41-1	30	71.0	67.9	69.2
SR41-2	30	71.1	56.9	68.1
SR41-3	30	71.5	35.5	68.3
SR41-4	30	70.7	47.6	67.5
SR41-5	30	72.9	67.4	70.6
SR42-1	1	81.6	63.5	77.4
SR42-2	1	79.7	59.4	76.5
SR42-3	1	67.5	38.3	60.0
SR42-4	1	62.4	36.8	56.5
SR42-1	5	81.1	72.3	77.9
SR42-2	5	79.6	61.9	75.8
SR42-3	5	68.5	43.3	61.2
SR42-4	5	63.6	38.4	57.5
SR42-1	10	80.2	74.2	77.6
SR42-2	10	78.6	67.7	74.8
SR42-3	10	68.4	45.3	61.3
SR42-4	10	64.0	41.9	58.0
SR42-1	15	79.6	75.1	77.3
SR42-2	15	78.3	72.5	75.3
SR42-3	15	68.1	46.1	61.2
SR42-4	15	64.1	46.5	58.2
SR42-1	20	79.0	75.2	76.9
SR42-2	20	78.1	73.9	75.6
SR42-3	20	67.9	47.6	61.0
SR42-4	20	64.2	47.4	58.3
SR42-1	25	78.5	75.1	76.5
SR42-2	25	77.8	74.3	75.5
SR42-3	25	67.5	48.5	60.8
SR42-4	25	64.2	48.3	58.4
SR42-1	30	78.0	75.0	76.1
SR42-2	30	77.5	74.4	75.3
SR42-3	30	67.2	49.4	60.6
SR42-4	30	64.2	49.8	58.5
SR43-1	1	75.4	62.0	72.5

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		FACADE NOISE LEVELS dB(A)		
		Final	Old	Existing
NSR	Floor	2011	2011	1994
SR43-2	1	66.5	35.4	62.5
SR43-1	5	76.5	63.2	73.3
SR43-2	5	77.0	40.3	73.5
SR43-1	10	76.2	65.2	72.9
SR43-2	10	76.2	41.3	72.6
SR43-1	15	75.6	66.1	72.4
SR43-2	15	75.6	41.3	71.9
SR43-1	20	75.2	67.2	72.0
SR43-2	20	74.9	41.3	71.2
SR43-1	25	74.8	67.9	71.7
SR43-2	25	74.3	41.3	70.6
SR43-1	30	74.4	68.0	71.3
SR43-2	30	73.8	41.3	70.0
SR44	1	65.2	61.9	64.0
SR44	5	81.6	64.9	74.3
SR44	10	80.4	66.2	75.1
SR44	15	79.0	67.3	74.4
SR44	20	77.9	68.7	73.8
SR44	25	77.1	69.5	73.3

ANNEXE E

SPECIES OF INFAUNA RECORDED FROM BEACH SEDIMENTS IN HK

ANNEXE E

SPECIES OF INFAUNA RECORDED FROM BEACH SEDIMENTS IN HONG KONG

Nemertean:
Nemertean sp.

Polychaetes:
Phyllodocid sp.
Micropodarke dubia Hessle
Sigambra tentaculata (Treadwell)
Typosyllis sp.
Nereid sp.
Aglaophamus sp.
Glycera sp.
Goniada sp.
Bhawania sp.
Onuphis eremita Audouin & M. Edwards
Onuphis sp.
Lumbrineris sp.
Schistomeringos sp.
Aonides sp.
Minuspio sp.
Magelona sp.
Chaetozone setosa Malmgren
Tharyx sp.
Cirratulus sp.

Sipunculids:
Golgingia sp.
Sipunculid sp. A
Sipunculid sp. B

Tanaids:
Leptognathia sp.
Tanaid sp.

Isopod:
Isopod sp.

Cumacean:
Bodotria sp.

Amphipods:
Platyschnopus sp.
Ameplisca sp.
Byblis sp.
Urothoe sp.
Lysianassid sp.
Amphithoe sp.
Phoxocephalid sp.
Ophelina acuminata (Rathke)
Sternaspis scutata (Ranzani)
Clymenella sp.
Lanice conchilega (Pallas)
Terebellides stroemi Sars

Decapods:
Pagurid sp. A
Pagurid sp. B
Grapsid sp.
Leucosia sp.
Thalamita sp.
Philyra sp.

Bivalves:
Musculus sp.
Modiolus sp.
Cardiid sp. A
Cardiid sp. B
Tellinides sp.
Tellinid sp.
Dexamine sp.
Amphilochid sp.

Ophiuroid:
Amphioplus sp.

Holothuroid:
Cucumaria sp.

Protochordate:
Branchiostoma belcheri (Gray)

Pisces:
Goby sp. A
Goby sp. B

ANNEXE F

AIR QUALITY MODELLING RESULTS

ANNEXE F

AIR QUALITY MODELLING RESULTS

F1 Detailed modelling particulars, including sample model input and output files, are provided in this Annexe. Complete details of modelling methodology are provided in Sections 4.3 (Construction Phase) and 4.4 (Operation Phase) of the main text. The conclusions of the air quality impact assessment are stated in Chapters 9 (Construction Phase) and 10 (Operation Phase). A list of the Annexe contents is provided in the following table.

F2 Figures F-1 to F-3 show the locations of representative sensitive receivers for the air quality assessment.

Description	Reference included in this annexe
Construction Phase	
Dust emission calculations	Table CASTCON1.XLS
Schematic diagram of the locations of dust emission sources and selected sensitive receivers	Figure F.4
Sample FDM input files (worst-case meteorological conditions for receiver A28)	File CONST3AY.IN (dust sources 1-100) File CONST3BY.IN (dust sources 101-200) File CONST3CY.IN (dust sources 201-297)
Sample FDM output files (worst-case meteorological conditions for receiver A28)	File CONST3AY.OUT File CONST3BY.OUT File CONST3CY.OUT
Predicted maximum 1-hour, 24-hour and annual average TSP concentrations (μgm^{-3}) at selected sensitive receivers	Table CON3YSUM.XLS
Operation Phase	
Schematic diagram of the locations of modelled road links and selected sensitive receivers	Figure F.5
Sample CALINE4 input files (worst-case meteorological conditions for receiver A34)	File 654_E.DAT
Sample ISCST input files (worst-case meteorological conditions for receiver A34)	File 654_PE.DAT
Sample CALINE4 output file (worst-case meteorological conditions for receiver A34)	File 654_E.LST
Sample ISCST input files (worst-case meteorological conditions for receiver A34)	File 654_PE.LST
Predicted maximum 1-hour average NO_2 concentrations (μgm^{-3}) at selected sensitive receivers for 2011	Table 604_GSUM.XLS

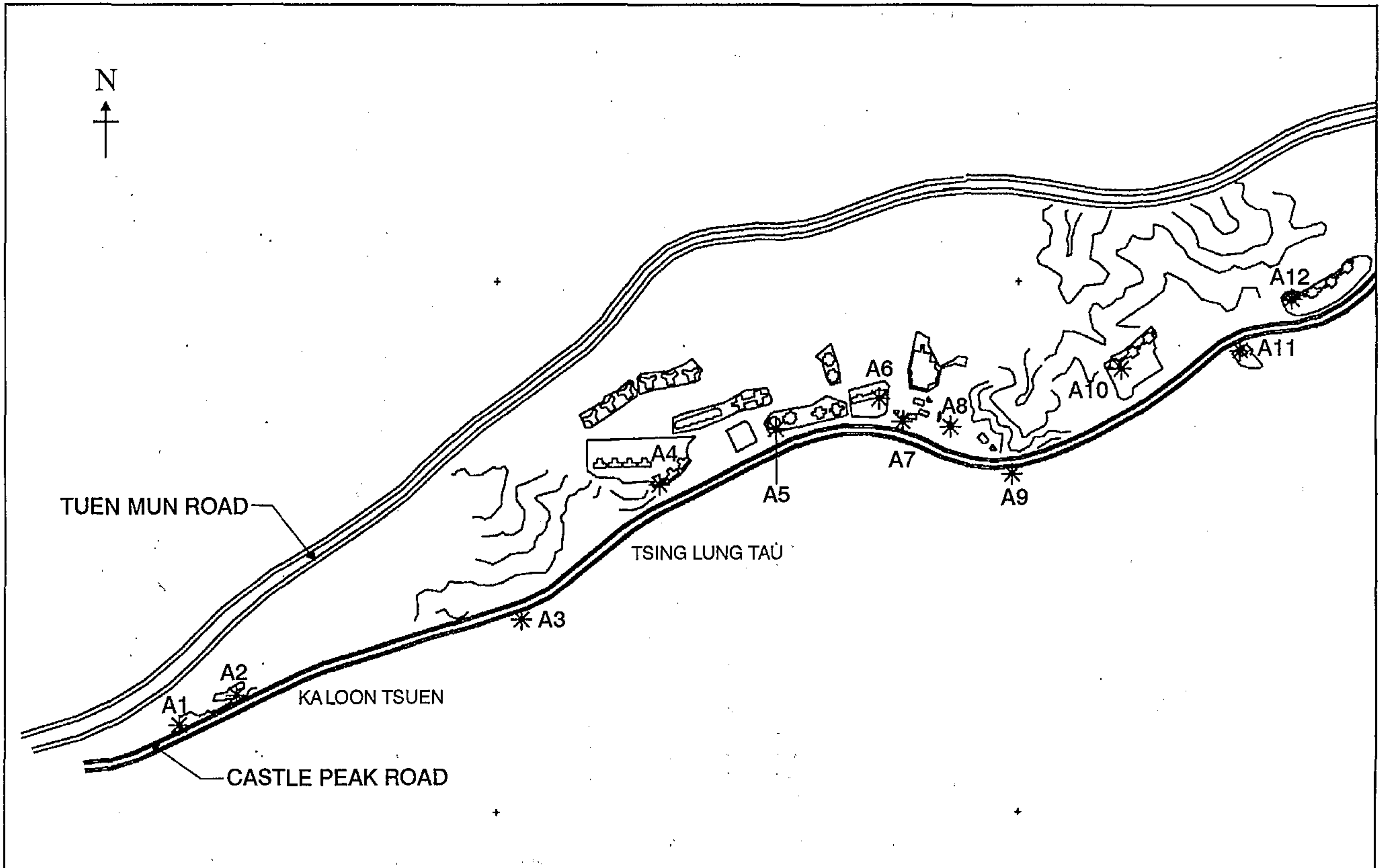

Figure F-1 Locations of Air Quality Sensitive Receivers (Map 1 of 3)

CONSULTANTS IN ENVIRONMENTAL SCIENCES (ASIA) LTD

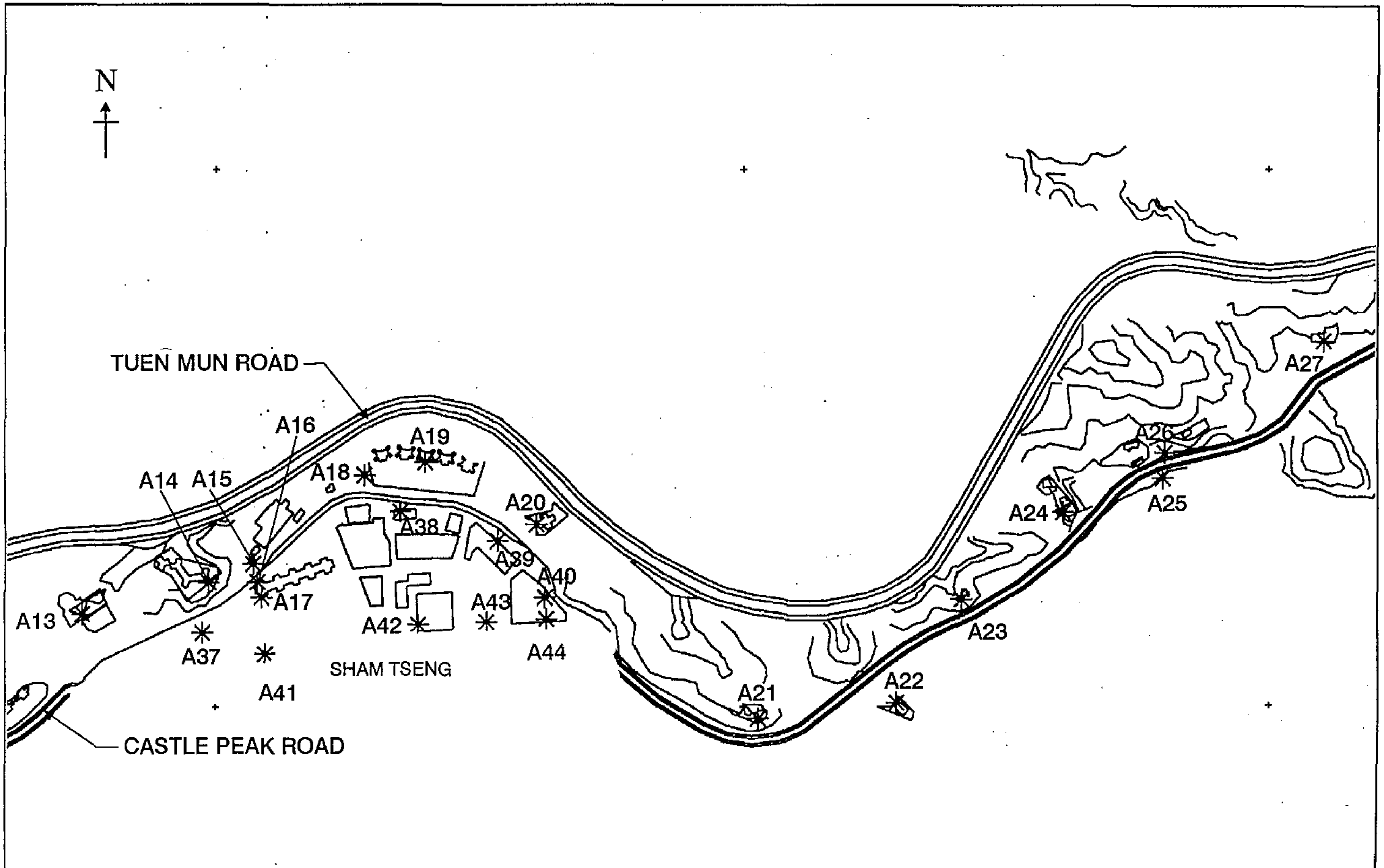

Figure F-2 Locations of Air Quality Sensitive Receivers (Map 2 of 3)

CONSULTANTS IN ENVIRONMENTAL SCIENCES (ASIA) LTD

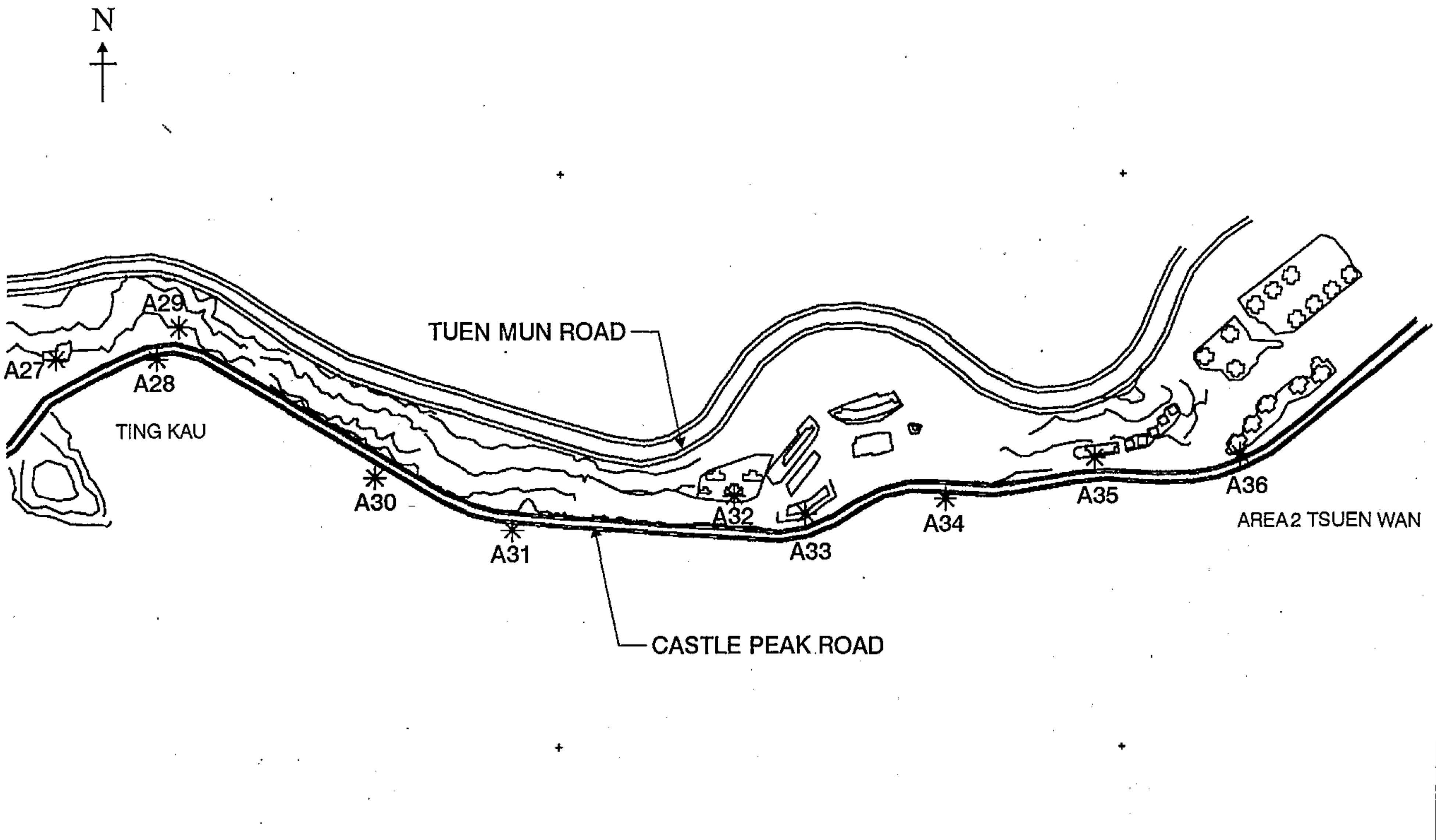

Figure F-3 Locations of Air Quality Sensitive Receivers (Map 3 of 3)

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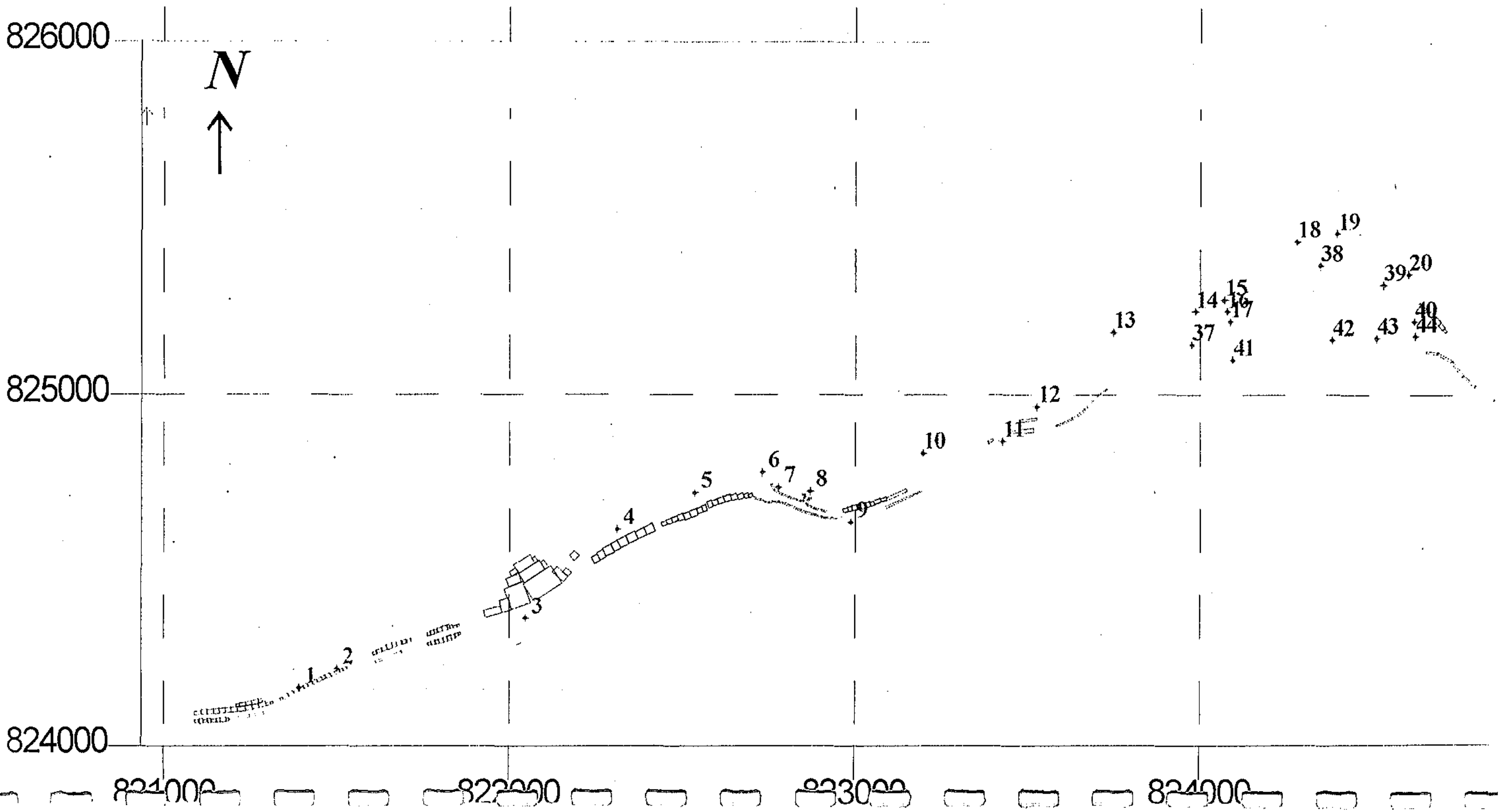
Castle Peak Road Improvement - Dust emission calculations			
	Total excavation area (sq.m)	56506	
	Total fill/reclamation area (sq.m)	31330	
	Concrete batching plant area (sq.m)	800	
Item	Description	TSP	Remarks
Excavation Area			
1	Blasting (Major)		
	Number of blast per year	28	*estimated from annual rock excavation rate*
	Volume of rock per blast (cu.m)	6500	*average from Engineer*
	Average Depth of drill hole (m)	15	*from Engineer*
	Area of blast face (sq.m)	433	*calculated*
	Moisture content (%)	2	*average from Engineer*
	Mitigation efficiency (%)	30	*estimated mitigation efficiency of pre-watering of dropping surfaces*
	Mass dust per blast (kg)	63	*calculated as in AP-42*
	E (kg/day)	4.86	*calculated*
2	Blasting (Minor)		
	Number of blast per year	73	*estimated from annual rock excavation rate*
	Volume of rock per blast (cu.m)	1250	*average from Engineer*
	Average Depth of drill hole (m)	5	*from Engineer*
	Area of blast face (sq.m)	250	*calculated*
	Moisture content (%)	2	*average from Engineer*
	Mitigation efficiency (%)	30	*estimated mitigation efficiency of pre-watering of dropping surfaces*
	Mass dust per blast (kg)	295	*calculated as in AP-42*
	E (kg/day)	59.01	*calculated*
3	Drilling (for major blasting)		
	E (kg/Mg)	4.0000E-04	*from AP-42, wet quarry drilling, unfractured stone*
	Volume of material processed per year (cu.m)	182000	*estimated from annual rock excavation rate*
	E (kg/day)	0.42	*calculated as in AP-42*
4	Drilling (for minor blasting)		
	E (kg/Mg)	4.0000E-04	*from AP-42, wet quarry drilling, unfractured stone*
	Volume of material processed per year (cu.m)	91250	*estimated from annual rock excavation rate*
	E (kg/day)	0.21	*calculated as in AP-42*
5	Load from excavator to haul truck		
	Particle size multiplier	0.73	*from AP-42*
	Soft spoil silt content (%)	6.9	*from AP-42, Western surface coal mining, overburden*
	Rock silt content (%)	1.6	*from AP-42, stone quarrying and processing*
	Average wind speed (m/s)	3.36	*from SHL 1990-1992 wind data*
	Drop height (m)	4.5	*average from Engineer*
	Soft spoil moisture content (%)	20	*average from Engineer*
	Rock moisture content (%)	2	*average from Engineer*
	Shovel capacity	2	*from Engineer*
	Percentage rock (%)	30	*estimated*
	E (kg/Mg)	4.1868E-04	*calculated as in AP-42*
	Volume of material processed per day (cu.m)	3500	*average from Engineer*
	E (kg/day)	2.20	*calculated*
6	Haul truck on unpaved site road		
	Particle size multiplier	0.8	*from AP-42*
	Silt content of road surface material (%)	5	*estimated*
	Mean vehicle speed (km/hr)	25	*average from Engineer*
	Mean vehicle weight (Mg)	24	*from Engineer*
	Mean number of wheel	6	*from Engineer*
	Number of days with >= 0.254 mm	120	*from RO statistics*
	Mitigation efficiency (%)	50	*estimated mitigation efficiency of twice daily watering*
	E (kg/VKT)	0.5599	*calculated as in AP-42*
	Average trip distance - to and fro (km)	0.5	*estimated*
	Number of vehicle trip per day	350	*estimated*
	E (kg/day)	97.98	*calculated*
7	Site erosion		
	Silt content (%)	6.9	*from AP-42, Western surface coal mining, overburden*
	Number of day with >=0.25mm rainfall	120	*from RO statistics*
	Percentage time with > 5.4 m/s wind speed (	13.03	*from SHL 1990-1992 wind data*

	Percentage active operating area (%)	30	*from Engineer*
	Mitigation efficiency (%)	50	*estimated mitigation efficiency of twice daily watering*
	E (kg/day/hectare)	1.1873	*calculated as in AP-42*
	E (kg/day)	6.71	*calculated*
Fill/Raclamation Area			
8	**Dropping from haul trucks onto fill area**		
	Particle size multiplier	0.73	*from AP-42*
	Soft spoil silt content (%)	6.9	*from AP-42, Western surface coal mining, overburden*
	Rock silt content (%)	1.6	*from AP-42, stone quarrying and processing*
	Average wind speed (m/s)	3.36	*from SHL 1990-1992 wind data*
	Drop height (m)	2	*average from Engineer*
	Soft spoil moisture content (%)	20	*average from Engineer*
	Rock moisture content (%)	2	*average from Engineer*
	Shovel capacity	2	*from Engineer*
	Percentage rock (%)	30	*estimated*
	E (kg/Mg)	1.8608E-04	*calculated as in AP-42*
	Volume of material processed per day (cu.m)	2450	*average from Engineer*
	E (kg/day)	0.68	*calculated*
9	**Bulldozing material**		
	Number of dozer	4	*from Engineer*
	Soft spoil silt content (%)	6.9	*from AP-42, Western surface coal mining, overburden*
	Soft spoil moisture content (%)	20	*average from Engineer*
	Rock silt content (%)	1.6	*from AP-42, stone quarrying and processing*
	Rock moisture content (%)	2	*from Engineer, Blasted Rock*
	Percentage rock (%)	30	*average from Engineer*
	Percentage of time bulldozing (%)	50	*from Engineer*
	Mitigation efficiency (%)	50	*estimated mitigation efficiency of twice daily watering*
	E (kg/hr)	0.93	*calculated as in AP-42*
	Number of working hour	12	*from Engineer*
	E (kg/day)	11.20	*calculated*
10	**Haul truck on unpaved site road**		
	Particle size multiplier	0.8	*from AP-42*
	Silt content of road surface material (%)	5	*estimated*
	Mean vehicle speed (km/hr)	25	*average from Engineer*
	Mean vehicle weight (Mg)	24	*from Engineer*
	Mean number of wheel	6	*from Engineer*
	Number of days with >= 0.254 mm	120	*from RO statistics*
	Mitigation efficiency (%)	50	*estimated mitigation efficiency of twice daily watering*
	E (kg/VKT)	0.5599	*calculated as in AP-42*
	Average trip distance - to and fro (km)	0.5	*estimated*
	No. of vehicle trip per day	245	*estimated*
	E (kg/day)	68.59	*calculated*
11	**Site erosion**		
	Silt content (%)	6.9	*from AP-42, Western surface coal mining, overburden*
	Number of day with >=0.25mm rainfall	120	*from RO statistics*
	Percentage time with > 5.4 m/s wind speed (	13.03	*from SHL 1990-1992 wind data*
	Percentage active operating area (%)	30	*from Engineer*
	Mitigation efficiency (%)	50	*estimated mitigation efficiency of twice daily watering*
	E (kg/day/hectare)	1.1873	*calculated as in AP-42*
	E (kg/day)	3.72	*calculated*
Crushing of Rock			
12	**Primary crushing**		
	E (kg/Mg)	9.0000E-03	*from AP-42*
	Percentage of rock need crushing (%)	50	*estimated*
	Volume of material processed per year (cu.m)	136625	*from Engineer*
	E (kg/day)	7.07	*calculated*
Concrete Batching			
13	**Concrete batching**		
	Mitigation efficiency (%)	70	*estimated mitigation efficiency of collecting dust through fabric filter*
	E (kg/Mg)	1.5000E-02	*from AP-42*
	Volume of material processed per day (cu.m)	350	*average from Engineer*
	E (kg/day)	10.50	*calculated*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825000
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821000
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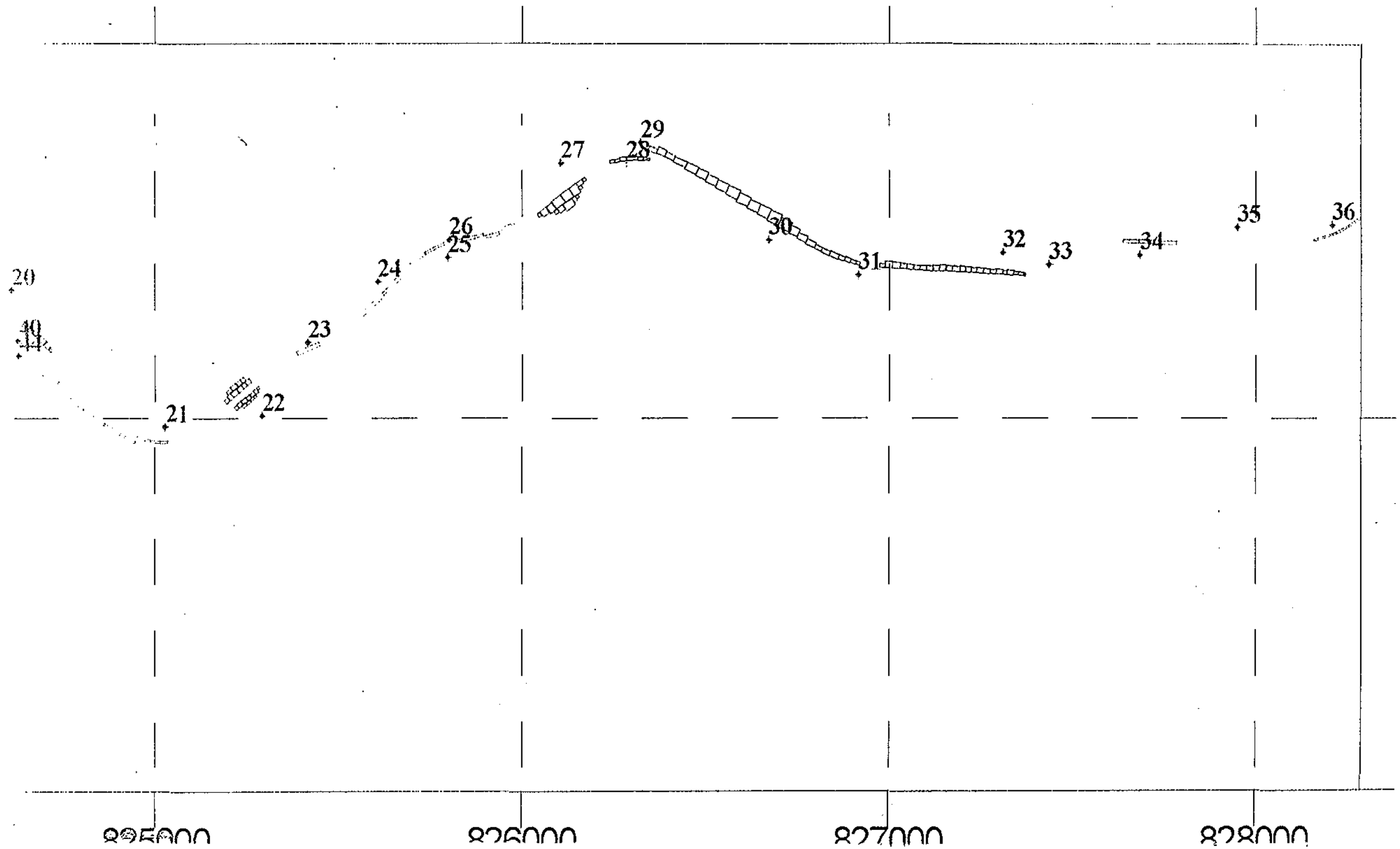
Figure F-4 (b)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35
36
825000
826000
827000
828000

```
Castle Peak Road Construction (dust sources 1-100)
 1 1 2 1 1 1 2 1 1 1 1
100  44   5    1
60.       100.      1.        2.5
1.25      3.75      7.5       12.5      20.
0.0262    0.0678    0.1704    0.1536    0.5820
821392.0  824166.0  3.5
821502.0  824222.0  10.7
822048.0  824364.0  1.5
822312.0  824618.0  18.1
822536.0  824722.0  5.3
822732.0  824780.0  1.5
822778.0  824737.0  1.5
822870.0  824726.0  1.5
822988.0  824638.0  1.5
823198.0  824834.0  31.5
823428.0  824868.0  13.4
823528.0  824966.0  16.1
823748.0  825175.0  49.1
823986.0  825234.0  43.4
824070.0  825268.0  1.5
824078.0  825234.0  5.5
824087.0  825206.0  5.5
824282.0  825434.0  1.8
824398.0  825458.0  11.5
824608.0  825342.0  39.8
825028.0  824977.0  20.0
825291.0  825007.0  1.5
825416.0  825202.0  23.0
825608.0  825364.0  23.6
825798.0  825428.0  1.5
825802.0  825475.0  9.0
826106.0  825680.0  15.6
826285.0  825680.0  1.5
826324.0  825735.0  19.5
826672.0  825474.0  1.5
826916.0  825382.0  1.5
827310.0  825442.0  36.2
827436.0  825410.0  21.5
827684.0  825436.0  11.5
827950.0  825508.0  34.1
828210.0  825514.0  14.8
823975.5  825140.0  11.5
824350.4  825366.2  11.5
824534.5  825311.5  11.5
824624.5  825205.8  11.5
824093.5  825098.6  11.5
824384.9  825154.7  11.5
824514.4  825160.4  11.5
824627.3  825165.5  11.5
 2 2.5077E-04       822758.2  824746.2  822765.7  824730.1  0.0       4.0
 2 2.5077E-04       822766.5  824729.3  822788.9  824716.5  0.0       4.0
 2 2.5077E-04       822789.2  824716.3  822807.2  824709.5  0.0       4.0
 2 2.5077E-04       822807.2  824709.4  822843.0  824696.7  0.0       4.0
 2 2.5077E-04       822843.1  824696.5  822850.3  824698.1  0.0       4.0
 2 2.5077E-04       822850.5  824697.8  822855.8  824709.1  0.0       4.0
 2 2.5077E-04       822855.8  824709.1  822855.0  824713.6  0.0       4.0
 2 2.5077E-04       822854.8  824713.7  822845.4  824718.8  0.0       4.0
 2 2.5077E-04       822874.5  824704.4  822867.2  824704.1  0.0       4.0
 2 2.5077E-04       822867.0  824704.0  822859.8  824691.2  0.0       4.0
 2 2.5077E-04       822859.6  824690.8  822863.2  824684.3  0.0       4.0
 2 2.5077E-04       822863.3  824684.2  822883.5  824676.1  0.0       4.0
 2 2.5077E-04       822883.8  824675.9  822917.7  824667.8  0.0       4.0
 2 2.5077E-04       822703.2  824708.9  822726.7  824701.3  0.0       4.0
 2 2.5077E-04       822726.6  824701.3  822741.4  824694.6  0.0       4.0
 2 2.5077E-04       822741.4  824694.3  822751.1  824692.4  0.0       4.0
 2 2.5077E-04       822751.4  824692.1  822762.5  824695.7  0.0       4.0
 2 2.5077E-04       822762.3  824695.6  822779.2  824695.2  0.0       4.0
 2 2.5077E-04       822779.3  824695.0  822798.3  824690.0  0.0       4.0
 2 2.5077E-04       822798.3  824689.7  822844.7  824669.7  0.0       4.0
 2 2.5077E-04       822845.0  824669.4  822903.1  824651.3  0.0       4.0
 2 2.5077E-04       822903.3  824650.1  822948.1  824646.5  0.0       4.0
 2 2.5077E-04       823667.8  824958.9  823703.7  824998.8  0.0       4.0
 2 2.5077E-04       823703.7  824999.2  823730.3  825015.2  0.0       4.0
 2 2.5077E-04       823730.4  825015.4  823774.8  825008.2  0.0       4.0
 2 2.5077E-04       824309.5  825130.8  824600.6  825146.4  0.0       4.0
 2 2.5077E-04       824310.8  825110.0  824602.3  825123.9  0.0       4.0
 3 6.2692E-05       821096.5  824069.1  12.7      8.0       0.0       5.4
 3 6.2692E-05       821109.6  824070.1  9.0       13.1      0.0       5.4
 3 6.2692E-05       821121.8  824070.2  11.1      7.4       0.0       5.4
 3 6.2692E-05       821133.6  824071.1  8.2       12.1      0.0       5.4
 3 6.2692E-05       821146.7  824071.2  13.3      8.4       0.0       5.4
 3 6.2692E-05       821160.0  824072.5  9.6       10.4      0.0       5.4
 3 6.2692E-05       821173.4  824073.6  16.0      10.3      0.0       5.4
 3 6.2692E-05       821185.7  824073.8  7.6       8.1       0.0       5.4
 2 3.7615E-04       821192.4  824076.0  821250.9  824083.7  0.0       6.0
 2 3.7615E-04       821251.3  824084.1  821291.1  824093.1  0.0       6.0
 2 3.7615E-04       821615.4  824239.5  821689.8  824267.7  0.0       6.0
 2 3.7615E-04       821689.0  824268.4  821765.0  824291.6  0.0       6.0
 3 6.2692E-05       822249.8  824532.3  19.4      19.8      0.0       26.1
 3 6.2692E-05       822266.1  824543.5  19.7      23.7      0.0       26.1
 3 6.2692E-05       822286.2  824556.7  27.8      25.6      0.0       26.1
 3 6.2692E-05       822307.3  824568.9  22.4      23.8      0.0       26.1
 3 6.2692E-05       822329.0  824580.3  26.2      24.4      0.0       26.1
 3 6.2692E-05       822354.6  824593.6  28.5      25.1      0.0       26.1
 3 6.2692E-05       822360.4  824605.2  27.7      23.0      0.0       26.1
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3	6.2692E-05	822405.4	824617.1	25.9	23.2	0.0	26.1
3	6.2692E-05	822447.4	824634.4	15.1	11.5	0.0	20.4
3	6.2692E-05	822462.6	824640.3	16.3	13.2	0.0	20.4
3	6.2692E-05	822478.8	824647.0	17.4	13.1	0.0	20.4
3	6.2692E-05	822496.1	824651.9	17.6	17.2	0.0	20.4
3	6.2692E-05	822513.6	824655.9	20.5	18.8	0.0	20.4
3	6.2692E-05	822533.0	824663.8	20.5	19.2	0.0	20.4
3	6.2692E-05	822550.6	824671.8	16.4	15.6	0.0	20.4
3	6.2692E-05	822564.2	824677.7	11.4	17.4	0.0	20.4
3	6.2692E-05	822579.7	824689.1	14.3	17.7	0.0	20.4
3	6.2692E-05	822595.0	824693.9	15.1	15.2	0.0	20.4
3	6.2692E-05	822611.8	824700.1	19.2	16.6	0.0	20.4
3	6.2692E-05	822630.6	824705.4	20.2	17.1	0.0	20.4
3	6.2692E-05	822650.0	824709.2	17.6	16.1	0.0	20.4
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3	6.2692E-05	822697.3	824713.3	12.7	10.0	0.0	20.4
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2	7.5230E-04	823476.1	824895.4	823516.7	824899.1	0.0	12.0
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2	2.5077E-04	823602.0	824918.5	823631.1	824932.0	0.0	4.0
2	2.5077E-04	823631.3	824932.0	823666.2	824955.8	0.0	4.0
2	2.5077E-04	823755.3	825035.1	823781.6	825025.5	0.0	4.0
2	2.5077E-04	823780.9	825025.2	823824.6	825011.8	0.0	4.0
2	2.5077E-04	823824.8	825010.9	823879.8	825007.6	0.0	4.0
2	2.5077E-04	823880.0	825007.3	823917.4	825011.1	0.0	4.0
2	2.5077E-04	823917.8	825010.9	823959.9	825022.3	0.0	4.0
2	2.5077E-04	823959.8	825022.4	824026.3	825051.4	0.0	4.0
2	2.5077E-04	824026.5	825051.4	824102.1	825081.5	0.0	4.0
2	2.5077E-04	824102.4	825080.5	824167.5	825106.7	0.0	4.0
2	2.5077E-04	824167.3	825107.2	824223.2	825120.9	0.0	4.0
2	2.5077E-04	824223.1	825120.8	824309.3	825129.9	0.0	4.0
2	2.5077E-04	823774.3	825006.8	823802.5	824997.7	0.0	4.0
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2	2.5077E-04	823843.1	824990.0	823873.2	824989.3	0.0	4.0
2	2.5077E-04	823873.3	824988.1	823917.9	824991.3	0.0	4.0
2	2.5077E-04	823918.0	824991.1	823964.4	825003.3	0.0	4.0
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2	2.5077E-04	824021.1	825026.7	824107.3	825062.0	0.0	4.0
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2	2.5077E-04	824224.3	825101.2	824310.5	825110.2	0.0	4.0
2	3.7615E-04	824619.6	825124.4	824660.0	825120.9	0.0	6.0
2	3.7615E-04	824659.9	825120.9	824693.4	825116.4	0.0	6.0
2	3.7615E-04	824692.9	825116.8	824734.5	825095.4	0.0	6.0
2	3.7615E-04	824734.9	825094.4	824768.3	825052.8	0.0	6.0
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2	3.7615E-04	824861.1	824983.4	824945.7	824933.7	0.0	6.0
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2	3.7615E-04	824988.4	824937.7	825015.5	824935.4	0.0	6.0
2	3.7615E-04	825015.4	824934.9	825036.2	824936.4	0.0	6.0
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1.0	30.0	4	500.0	298.0			

```
Castle Peak Road Construction (dust sources 101-200)
 1 1 2 1 1 1 2 1 1 1 1
100  44   5    1
60.        100.       1.         2.5
1.25       3.75       7.5        12.5       20.
0.0262     0.0678     0.1704     0.1536     0.5820
821392.0  824166.0  3.5
821502.0  824222.0  10.7
822048.0  824364.0  1.5
822312.0  824618.0  18.1
822536.0  824722.0  5.3
822732.0  824780.0  1.5
822778.0  824737.0  1.5
822870.0  824726.0  1.5
822988.0  824638.0  1.5
823198.0  824834.0  31.5
823428.0  824868.0  13.4
823528.0  824966.0  16.1
823748.0  825175.0  49.1
823986.0  825234.0  43.4
824070.0  825268.0  1.5
824078.0  825234.0  5.5
824087.0  825206.0  5.5
824282.0  825434.0  1.8
824398.0  825458.0  11.5
824608.0  825342.0  39.8
825028.0  824977.0  20.0
825291.0  825007.0  1.5
825416.0  825202.0  23.0
825608.0  825364.0  23.6
825798.0  825428.0  1.5
825802.0  825475.0  9.0
826106.0  825680.0  15.6
826285.0  825680.0  1.5
826324.0  825735.0  19.5
826672.0  825474.0  1.5
826916.0  825382.0  1.5
827310.0  825442.0  36.2
827436.0  825410.0  21.5
827684.0  825436.0  11.5
827950.0  825508.0  34.1
828210.0  825514.0  14.8
823975.5  825140.0  11.5
824350.4  825366.2  11.5
824534.5  825311.5  11.5
824624.5  825205.8  11.5
824093.5  825098.6  11.5
824384.9  825154.7  11.5
824514.4  825160.4  11.5
824627.3  825165.5  11.5
 3 6.2692E-05         826061.0  825548.2  17.5        16.7        0.0         35.0
 3 6.2692E-05         826078.9  825558.2  19.1        22.6        0.0         35.0
 3 6.2692E-05         826098.3  825574.4  29.3        25.1        0.0         35.0
 3 6.2692E-05         826123.0  825592.2  27.1        25.5        0.0         35.0
 3 6.2692E-05         826143.7  825606.0  20.8        27.5        0.0         35.0
 3 6.2692E-05         826157.9  825624.3  17.9        11.6        0.0         35.0
 3 6.2692E-05         826159.5  825613.3  9.7         8.5         0.0         35.0
 3 6.2692E-05         826169.8  825634.1  9.0         9.2         0.0         35.0
 3 6.2692E-05         826093.9  825548.7  11.0        9.5         0.0         35.0
 3 6.2692E-05         826107.0  825556.7  16.4        15.4        0.0         35.0
 3 6.2692E-05         826128.4  825567.5  28.3        19.8        0.0         35.0
 3 6.2692E-05         826144.2  825581.7  11.4        12.8        0.0         35.0
 3 6.2692E-05         826150.2  825589.2  6.9         7.9         0.0         35.0
 3 6.2692E-05         826246.0  825683.0  12.5        7.5         0.0         9.5
 3 6.2692E-05         826260.0  825685.0  16.2        7.5         0.0         9.5
 3 6.2692E-05         826275.0  825689.0  16.2        10.0        0.0         9.5
 3 6.2692E-05         826300.0  825691.0  31.2        10.0        0.0         2.5
 3 6.2692E-05         826323.0  825690.0  16.2        8.7         0.0         2.5
 3 6.2692E-05         826335.0  825690.0  10.0        7.5         0.0         2.5
 3 6.2692E-05         826345.0  825688.0  8.7         5.0         0.0         2.5
 2 2.5077E-04         828159.4  825474.1  828220.0  825493.9  0.0         4.0
 2 2.5077E-04         828219.9  825493.9  828256.0  825511.2  0.0         4.0
 2 2.5077E-04         828255.6  825511.3  828288.8  825533.4  0.0         4.0
 3 7.0703E-05         824643.8  825252.2  7.2         13.5        0.0         41.7
 3 7.0703E-05         824652.5  825244.8  7.5         11.2        0.0         41.7
 3 7.0703E-05         824662.1  825235.5  8.4         15.3        0.0         41.7
 3 7.0703E-05         824676.2  825223.0  11.0        22.7        0.0         41.7
 3 7.0703E-05         824691.8  825208.1  13.6        22.3        0.0         41.7
 3 7.0703E-05         824705.1  825193.5  11.5        17.5        0.0         41.7
 3 7.0703E-05         824714.1  825181.7  6.0         12.1        0.0         41.7
 3 7.0703E-05         821335.4  824130.5  7.6         6.2         0.0         37.4
 3 7.0703E-05         821342.3  824133.6  7.4         6.5         0.0         37.4
 3 7.0703E-05         821354.5  824139.2  17.4        8.5         0.0         37.4
 3 7.0703E-05         821370.2  824147.6  18.4        8.8         0.0         37.4
 3 7.0703E-05         821385.2  824155.5  15.7        7.8         0.0         37.4
 3 7.0703E-05         821400.6  824162.2  16.8        7.8         0.0         37.4
 3 7.0703E-05         821412.0  824169.9  14.0        9.5         0.0         37.4
 3 7.0703E-05         821425.4  824175.5  15.0        9.0         0.0         37.4
 3 7.0703E-05         821438.7  824181.8  14.0        9.1         0.0         37.4
 3 7.0703E-05         821452.6  824188.2  15.3        9.0         0.0         37.4
 3 7.0703E-05         821464.7  824193.6  12.8        8.8         0.0         37.4
 3 7.0703E-05         821477.2  824199.7  14.5        10.0        0.0         37.4
 3 7.0703E-05         821491.1  824206.2  14.0        9.9         0.0         37.4
 3 7.0703E-05         821503.5  824212.4  13.8        9.6         0.0         37.4
 3 7.0703E-05         821514.8  824217.2  11.4        7.4         0.0         37.4
 3 7.0703E-05         821525.5  824221.6  12.6        6.5         0.0         37.4
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3	7.0703E-05	821538.8	824227.1	15.2	6.7	0.0	37.4
2	7.0703E-04	825388.0	825171.5	825447.9	825197.7	0.0	10.0
2	7.0703E-04	825564.6	825275.0	825614.1	825321.9	0.0	10.0
2	7.0703E-04	825621.7	825330.7	825666.3	825375.2	0.0	10.0
2	4.2422E-04	825698.3	825409.3	825735.8	825438.1	0.0	6.0
2	4.2422E-04	825736.3	825439.0	825790.9	825465.8	0.0	6.0
2	4.9492E-04	825829.2	825472.6	825895.7	825486.8	0.0	7.0
2	2.8281E-04	825942.3	825501.3	825978.8	825517.7	0.0	4.0
3	7.0703E-05	826357.2	825714.0	12.3	24.1	0.0	65.4
3	7.0703E-05	826391.5	825708.5	18.1	24.1	0.0	65.4
3	7.0703E-05	826404.0	825696.6	15.9	26.2	0.0	65.4
3	7.0703E-05	826432.0	825681.4	16.4	37.8	0.0	65.4
3	7.0703E-05	826462.9	825664.2	20.4	35.4	0.0	65.4
3	7.0703E-05	826491.0	825648.5	22.5	31.5	0.0	65.4
3	7.0703E-05	826517.7	825631.5	21.5	31.0	0.0	65.4
3	7.0703E-05	826545.3	825615.3	23.0	32.8	0.0	65.4
3	7.0703E-05	826575.2	825599.1	26.2	35.2	0.0	65.4
3	7.0703E-05	826603.9	825580.6	26.6	34.7	0.0	65.4
3	7.0703E-05	826631.5	825563.3	26.0	32.0	0.0	65.4
3	7.0703E-05	826659.6	825548.2	28.1	31.0	0.0	65.4
3	7.0703E-05	826657.2	825532.9	30.7	33.1	0.0	65.4
3	7.0703E-05	826716.8	825514.3	27.7	31.8	0.0	65.4
3	7.0703E-05	826741.1	825497.3	21.8	26.4	0.0	65.4
3	7.0703E-05	826763.4	825480.2	17.2	26.9	0.0	65.4
3	7.0703E-05	826786.7	825465.2	14.7	26.1	0.0	65.4
3	7.0703E-05	826807.4	825452.8	12.3	20.9	0.0	65.4
3	7.0703E-05	826827.7	825443.0	12.1	24.6	0.0	65.4
3	7.0703E-05	826850.7	825433.7	13.2	25.2	0.0	65.4
3	7.0703E-05	826870.7	825426.4	12.7	18.6	0.0	65.4
3	7.0703E-05	826887.2	825421.8	12.7	16.4	0.0	65.4
3	7.0703E-05	826902.4	825415.9	10.3	15.1	0.0	65.4
3	7.0703E-05	826914.8	825412.0	8.3	11.4	0.0	65.4
3	7.0703E-05	826981.3	825407.9	10.3	14.4	0.0	86.3
3	7.0703E-05	826999.0	825410.1	16.6	19.6	0.0	86.3
3	7.0703E-05	827019.5	825408.7	16.5	22.6	0.0	86.3
3	7.0703E-05	827039.5	825406.5	12.5	18.7	0.0	86.3
3	7.0703E-05	827057.8	825404.3	12.2	18.0	0.0	86.3
3	7.0703E-05	827074.9	825402.3	11.4	18.1	0.0	86.3
3	7.0703E-05	827092.3	825401.6	11.4	17.8	0.0	86.3
3	7.0703E-05	827111.0	825400.6	12.1	18.3	0.0	86.3
3	7.0703E-05	827128.2	825400.6	13.9	18.4	0.0	86.3
3	7.0703E-05	827146.5	825400.8	15.6	16.0	0.0	86.3
3	7.0703E-05	827164.6	825399.1	14.6	16.3	0.0	86.3
3	7.0703E-05	827182.6	825398.3	14.3	20.0	0.0	86.3
3	7.0703E-05	827200.4	825397.8	15.2	15.0	0.0	86.3
3	7.0703E-05	827215.9	825396.9	15.3	14.5	0.0	86.3
3	7.0703E-05	827231.6	825395.3	13.7	14.7	0.0	86.3
3	7.0703E-05	827247.7	825394.1	14.2	18.6	0.0	86.3
3	7.0703E-05	827266.8	825392.4	14.1	17.7	0.0	86.3
3	7.0703E-05	827283.6	825392.0	11.4	17.7	0.0	86.3
3	7.0703E-05	827300.9	825391.6	13.5	17.8	0.0	86.3
3	7.0703E-05	827316.2	825388.6	9.8	11.2	0.0	86.3
3	7.0703E-05	827330.4	825389.2	13.0	17.4	0.0	86.3
3	7.0703E-05	827346.2	825386.7	8.0	13.8	0.0	86.3
1.0	30.0	4	500.0	298.0			

File: CONST3CY.IN

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Castle Peak Road Construction (dust sources 201-297)
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97   44   5    1
60.        100.       1.         2.5
1.25       3.75       7.5        12.5       20.
0.0262     0.0678     0.1704     0.1536     0.5820
821392.0  824166.0  3.5
821502.0  824222.0  10.7
822048.0  824364.0  1.5
822312.0  824618.0  18.1
822536.0  824722.0  5.3
822732.0  824780.0  1.5
822778.0  824737.0  1.5
822870.0  824726.0  1.5
822988.0  824638.0  1.5
823198.0  824834.0  31.5
823428.0  824868.0  13.4
823528.0  824966.0  16.1
823748.0  825175.0  49.1
823986.0  825234.0  43.4
824070.0  825268.0  1.5
824078.0  825234.0  5.5
824087.0  825206.0  5.5
824282.0  825434.0  1.8
824398.0  825458.0  11.5
824608.0  825342.0  39.8
825028.0  824977.0  20.0
825291.0  825007.0  1.5
825416.0  825202.0  23.0
825608.0  825364.0  23.6
825798.0  825428.0  1.5
825802.0  825475.0  9.0
826106.0  825680.0  15.6
826285.0  825680.0  1.5
826324.0  825735.0  19.5
826672.0  825474.0  1.5
826916.0  825382.0  1.5
827310.0  825442.0  36.2
827436.0  825410.0  21.5
827684.0  825436.0  11.5
827950.0  825508.0  34.1
828210.0  825514.0  14.8
823975.5  825140.0  11.5
824350.4  825366.2  11.5
824534.5  825311.5  11.5
824624.5  825205.8  11.5
824093.5  825098.6  11.5
824384.9  825154.7  11.5
824514.4  825160.4  11.5
824627.3  825165.5  11.5
 3 7.0703E-05         827359.9  825385.0  8.5        13.8       0.0        86.3
 3 7.0703E-05         827369.6  825382.9  7.0        4.7        0.0        86.3
 2 5.6562E-04         827638.4  825471.2  827681.0   825470.2   0.0        8.0
 2 5.6562E-04         827681.9  825470.2  827723.5   825469.6   0.0        8.0
 2 5.6562E-04         827724.0  825468.7  827783.7   825466.9   0.0        8.0
 3 7.0703E-05         821099.7  824093.2  20.5       11.4       0.0        4.7
 3 7.0703E-05         821119.4  824096.2  17.8       14.4       0.0        4.7
 3 7.0703E-05         821136.7  824097.2  18.5       12.3       0.0        4.7
 3 7.0703E-05         821154.8  824098.9  16.3       14.5       0.0        4.7
 3 7.0703E-05         821171.3  824100.3  16.6       13.9       0.0        4.7
 3 7.0703E-05         821188.2  824101.7  17.2       13.4       0.0        4.7
 3 7.0703E-05         821205.2  824103.4  17.6       13.4       0.0        4.7
 3 7.0703E-05         821226.3  824104.9  23.2       12.2       0.0        4.7
 3 7.0703E-05         821248.0  824108.4  20.9       13.1       0.0        8.9
 3 7.0703E-05         821267.5  824111.4  20.0       11.5       0.0        9.5
 3 7.0703E-05         821286.7  824116.8  22.1       12.7       0.0        15.4
 3 7.0703E-05         821304.3  824120.3  13.2       8.5        0.0        20.6
 3 7.0703E-05         821314.2  824122.2  7.5        5.0        0.0        18.1
 3 7.0703E-05         821216.1  824115.9  10.5       8.1        0.0        4.0
 3 7.0703E-05         821229.5  824118.5  17.0       10.6       0.0        4.0
 3 7.0703E-05         821247.3  824121.2  17.8       11.1       0.0        11.5
 3 7.0703E-05         821266.8  824125.0  20.4       11.6       0.0        16.0
 3 7.0703E-05         821281.0  824128.1  10.8       8.1        0.0        21.0
 3 7.0703E-05         825196.0  825046.8  13.1       10.7       0.0        37.4
 3 7.0703E-05         825204.1  825056.1  13.3       14.8       0.0        37.4
 3 7.0703E-05         825217.1  825067.7  20.2       14.8       0.0        37.4
 3 7.0703E-05         825231.7  825078.5  16.9       13.1       0.0        37.4
 3 7.0703E-05         825242.3  825087.5  12.0       12.6       0.0        37.4
 3 7.0703E-05         825253.7  825096.5  15.7       12.1       0.0        37.4
 3 7.0703E-05         825202.5  825071.0  16.2       9.9        0.0        37.4
 3 7.0703E-05         825215.0  825082.8  17.9       13.3       0.0        37.4
 3 7.0703E-05         825228.7  825093.1  15.8       12.6       0.0        37.4
 3 7.0703E-05         825239.4  825101.3  12.4       11.1       0.0        37.4
 3 7.0703E-05         825221.8  825028.4  9.6        10.1       0.0        37.4
 3 7.0703E-05         825231.0  825036.7  14.4       12.2       0.0        37.4
 3 7.0703E-05         825243.2  825046.1  14.6       11.3       0.0        37.4
 3 7.0703E-05         825254.3  825054.3  13.3       10.8       1.0        37.4
 3 7.0703E-05         825265.6  825063.5  13.8       11.5       2.0        37.4
 3 7.0703E-05         825274.6  825071.9  11.4       11.9       3.0        37.4
 3 7.0703E-05         825280.1  825079.5  6.8        7.1        4.0        37.4
 3 7.0703E-05         825243.1  825035.1  12.0       8.9        0.0        37.4
 3 7.0703E-05         825253.6  825041.6  13.1       6.5        0.0        37.4
 3 7.0703E-05         825263.6  825050.5  12.0       7.3        0.0        37.4
 3 7.0703E-05         825271.3  825057.8  8.9        5.6        0.0        37.4
 3 7.0703E-05         821612.9  824264.1  12.4       8.1        0.0        18.9
 3 7.0703E-05         821625.0  824271.0  15.9       11.2       0.0        18.9
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 3 7.0703E-05        821640.1  824277.0  16.7       11.4       0.0        18.9
 3 7.0703E-05        821655.3  824283.8  15.6       13.5       0.0        18.9
 3 7.0703E-05        821669.2  824287.8  13.7       12.3       0.0        18.9
 3 7.0703E-05        821683.1  824293.0  14.2       12.2       0.0        18.9
 3 7.0703E-05        821697.8  824296.9  13.9       10.6       0.0        18.9
 3 7.0703E-05        821710.8  824299.8  12.6       8.9        0.0        18.9
 3 7.0703E-05        821769.1  824318.3  9.4        8.5        0.0        15.3
 3 7.0703E-05        821778.4  824322.5  11.4       10.0       0.0        15.3
 3 7.0703E-05        821788.6  824326.1  10.1       10.4       0.0        15.3
 3 7.0703E-05        821800.0  824330.4  14.4       13.0       0.0        15.3
 3 7.0703E-05        821814.6  824334.7  16.2       13.7       0.0        15.3
 3 7.0703E-05        821825.3  824338.2  8.3        10.6       0.0        15.3
 3 7.0703E-05        821833.8  824338.9  7.1        8.5        0.0        15.3
 3 7.0703E-05        821843.9  824339.8  10.4       4.8        0.0        15.3
 3 7.0703E-05        821853.4  824342.3  7.9        4.8        0.0        15.3
 3 7.0703E-05        821770.7  824291.0  8.2        7.5        0.0        15.3
 3 7.0703E-05        821780.5  824292.7  10.9       10.1       0.0        15.3
 3 7.0703E-05        821792.3  824295.9  10.5       11.5       0.0        15.3
 3 7.0703E-05        821804.5  824299.2  12.8       12.5       0.0        15.3
 3 7.0703E-05        821816.2  824303.2  12.8       13.2       0.0        15.3
 3 7.0703E-05        821827.8  824306.9  11.6       14.7       0.0        15.3
 3 7.0703E-05        821838.6  824310.4  10.9       11.6       0.0        15.3
 3 7.0703E-05        821849.7  824315.9  10.4       8.3        0.0        15.3
 3 7.0703E-05        821857.6  824319.0  6.2        6.4        0.0        15.3
 3 7.0703E-05        821953.7  824382.7  50.4       19.3       0.0        15.6
 3 7.0703E-05        821989.8  824400.8  27.1       35.0       0.0        14.8
 3 7.0703E-05        822024.9  824427.5  57.0       62.8       0.0        20.5
 3 7.0703E-05        822097.8  824462.2  95.4       58.9       0.0        32.7
 3 7.0703E-05        822149.3  824488.7  20.9       42.4       0.0        48.3
 3 7.0703E-05        822168.8  824493.8  16.1       19.3       0.0        48.2
 3 7.0703E-05        822014.2  824471.5  39.6       25.5       0.0        21.8
 3 7.0703E-05        822066.9  824496.2  70.5       30.7       0.0        32.9
 3 7.0703E-05        822103.5  824516.1  11.7       24.5       0.0        31.6
 3 7.0703E-05        822014.4  824494.9  21.0       15.1       0.0        31.7
 3 7.0703E-05        822045.3  824518.4  55.5       29.5       0.0        32.4
 3 7.0703E-05        822076.2  824530.1  9.7        15.2       0.0        32.8
 3 7.0703E-05        822973.0  824672.9  14.2       10.4       0.0        6.4
 3 7.0703E-05        822985.9  824676.2  12.2       12.7       0.0        7.3
 3 7.0703E-05        822999.0  824678.9  13.6       14.9       0.0        8.2
 3 7.0703E-05        823011.8  824681.6  12.0       14.8       0.0        8.9
 3 7.0703E-05        823025.3  824683.8  15.1       13.9       0.0        12.6
 3 7.0703E-05        823039.0  824688.2  12.7       14.4       0.0        20.9
 3 7.0703E-05        823049.4  824690.4  11.3       11.6       0.0        15.7
 3 7.0703E-05        823064.9  824696.5  20.8       11.8       0.0        20.7
 3 7.0703E-05        823082.4  824702.5  18.0       9.8        0.0        22.2
 2 5.6562E-04        823092.6  824703.2  823149.0   824730.0   0.0        8.0
 2 4.9492E-04        823386.8  824863.6  823400.3   824870.8   0.0        7.0
 2 4.9492E-04        823450.9  824893.0  823475.2   824897.7   0.0        7.0
 2 4.9492E-04        823478.4  824925.2  823528.0   824931.2   0.0        7.0
 3 3.0382E-04        822187.8  824541.5  20.0       20.0       0.0        46.0
 3 3.0382E-04        826080.5  825559.2  20.0       20.0       0.0        40.4
1.0       30.0              4  500.0     298.0
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                FUGITIVE DUST MODEL (FDM)
                VERSION 90121
                MAY, 1990

     RUN TITLE:
          Castle Peak Road Construction (dust sources 1-100)

          INPUT FILE NAME:  const3ay.IN
          OUTPUT FILE NAME:  const3ay.OUT
          PLOT OUTPUT WRITTEN TO FILE NAME:  const3ay.DAT


          CONVERGENCE OPTION 1=OFF, 2=ON                     1
          MET OPTION SWITCH, 1=CARDS, 2=PREPROCESSED         1
          PLOT FILE OUTPUT, 1=NO, 2=YES                      2
          MET DATA PRINT SWITCH, 1=NO, 2=YES                 1
          POST-PROCESSOR OUTPUT, 1=NO, 2=YES                 1
          DEP. VEL./GRAV. SETL. VEL., 1=DEFAULT, 2=USER      1
          PRINT 1-HOUR AVERAGE CONCEN, 1=NO, 2=YES           2
          PRINT 3-HOUR AVERAGE CONCEN, 1=NO, 2=YES           1
          PRINT 8-HOUR AVERAGE CONCEN, 1=NO, 2=YES           1
          PRINT 24-HOUR AVERAGE CONCEN, 1=NO, 2=YES          1
          PRINT LONG-TERM AVERAGE CONCEN, 1=NO, 2=YES        1
          NUMBER OF SOURCES PROCESSED                      100
          NUMBER OF RECEPTORS PROCESSED                     44
          NUMBER OF PARTICLE SIZE CLASSES                    5
          NUMBER OF HOURS OF MET DATA PROCESSED              1
          LENGTH IN MINUTES OF 1-HOUR OF MET DATA          60.
          ROUGHNESS LENGTH IN CM                        100.00
          SCALING FACTOR FOR SOURCE AND RECPTORS        1.0000
          PARTICLE DENSITY IN G/CM**3                     2.50
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GENERAL PARTICLE SIZE CLASS INFORMATION

PARTICLE SIZE CLASS	CHAR. DIA. (UM)	GRAV. SETTLING VELOCITY (M/SEC)	DEPOSITION VELOCITY (M/SEC)	FRACTION IN EACH SIZE CLASS
1	1.2500000	**	**	0.0262
2	3.7500000	**	**	0.0678
3	7.5000000	**	**	0.1704
4	12.5000000	**	**	0.1536
5	20.0000000	**	**	0.5820

** COMPUTED BY FDM

1

RECEPTOR COORDINATES (X,Y,Z)

```
(821392., 824166.,  4.)  (821502., 824222., 11.)  (822048., 824364.,  2.)
(822312., 824618., 18.)  (822536., 824722.,  5.)  (822732., 824780.,  2.)
(822778., 824737.,  2.)  (822870., 824726.,  2.)  (822988., 824638.,  2.)
(823198., 824834., 32.)  (823428., 824868., 13.)  (823528., 824966., 16.)
(823748., 825175., 49.)  (823986., 825234., 43.)  (824070., 825268.,  2.)
(824078., 825234.,  6.)  (824087., 825206.,  6.)  (824282., 825434.,  2.)
(824398., 825458., 12.)  (824608., 825342., 40.)  (825028., 824977., 20.)
(825291., 825007.,  2.)  (825416., 825202., 23.)  (825608., 825364., 24.)
(825798., 825428.,  2.)  (825802., 825475.,  9.)  (826106., 825680., 16.)
(826285., 825680.,  2.)  (826324., 825735., 20.)  (826672., 825474.,  2.)
(826916., 825382.,  2.)  (827310., 825442., 36.)  (827436., 825410., 22.)
(827684., 825436., 12.)  (827950., 825508., 34.)  (828210., 825514., 15.)
(823976., 825140., 12.)  (824350., 825366., 12.)  (824535., 825312., 12.)
(824625., 825206., 12.)  (824094., 825099., 12.)  (824385., 825155., 12.)
(824514., 825160., 12.)  (824627., 825166., 12.)  (
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1

SOURCE INFORMATION

TYPE	ENTERED EMIS. RATE (G/SEC, G/SEC/M OR G/SEC/M**2)	TOTAL EMISSION RATE (G/SEC)	WIND SPEED FAC.	X1 (M)	Y1 (M)	X2 (M)	Y2 (M)	HEIGHT (M)	WIDTH (M)
2	0.000250770	0.00445	0.000	822758.	824746.	822766.	824730.	0.50	4.00
2	0.000250770	0.00647	0.000	822767.	824729.	822789.	824717.	0.50	4.00
2	0.000250770	0.00483	0.000	822789.	824716.	822807.	824710.	0.50	4.00
2	0.000250770	0.00953	0.000	822807.	824709.	822843.	824697.	0.50	4.00
2	0.000250770	0.00185	0.000	822843.	824697.	822850.	824698.	0.50	4.00
2	0.000250770	0.00313	0.000	822851.	824698.	822856.	824709.	0.50	4.00
2	0.000250770	0.00115	0.000	822856.	824709.	822855.	824714.	0.50	4.00
2	0.000250770	0.00269	0.000	822855.	824714.	822845.	824719.	0.50	4.00
2	0.000250770	0.00183	0.000	822875.	824704.	822867.	824704.	0.50	4.00
2	0.000250770	0.00368	0.000	822867.	824704.	822860.	824691.	0.50	4.00
2	0.000250770	0.00186	0.000	822860.	824691.	822863.	824684.	0.50	4.00
2	0.000250770	0.00545	0.000	822863.	824684.	822884.	824676.	0.50	4.00
2	0.000250770	0.00873	0.000	822884.	824676.	822918.	824668.	0.50	4.00
2	0.000250770	0.00619	0.000	822703.	824709.	822727.	824701.	0.50	4.00
2	0.000250770	0.00406	0.000	822727.	824701.	822741.	824695.	0.50	4.00
2	0.000250770	0.00249	0.000	822741.	824694.	822751.	824692.	0.50	4.00
2	0.000250770	0.00293	0.000	822751.	824692.	822763.	824696.	0.50	4.00
2	0.000250770	0.00423	0.000	822762.	824696.	822779.	824695.	0.50	4.00

2	0.000250770	0.00493	0.000	822779.	824695.	822798.	824690.	0.50	4.00
2	0.000250770	0.01266	0.000	822798.	824690.	822845.	824670.	0.50	4.00
2	0.000250770	0.01526	0.000	822845.	824669.	822903.	824651.	0.50	4.00
2	0.000250770	0.01127	0.000	822903.	824650.	822948.	824647.	0.50	4.00
2	0.000250770	0.01346	0.000	823668.	824959.	823704.	824999.	0.50	4.00
2	0.000250770	0.00779	0.000	823704.	824999.	823730.	825015.	0.50	4.00
2	0.000250770	0.01129	0.000	823730.	825015.	823775.	825008.	0.50	4.00
2	0.000250770	0.07311	0.000	824310.	825131.	824601.	825146.	0.50	4.00
2	0.000250770	0.07318	0.000	824311.	825110.	824602.	825124.	0.50	4.00
3	0.000062692	0.00637	0.000	821097.	824069.	13.	8.	0.50	5.40
3	0.000062692	0.00739	0.000	821110.	824070.	9.	13.	0.50	5.40
3	0.000062692	0.00515	0.000	821122.	824070.	11.	7.	0.50	5.40
3	0.000062692	0.00622	0.000	821134.	824071.	8.	12.	0.50	5.40
3	0.000062692	0.00700	0.000	821147.	824071.	13.	8.	0.50	5.40
3	0.000062692	0.00626	0.000	821160.	824073.	10.	10.	0.50	5.40
3	0.000062692	0.01033	0.000	821173.	824074.	16.	10.	0.50	5.40
3	0.000062692	0.00386	0.000	821186.	824074.	8.	8.	0.50	5.40
2	0.000376150	0.02219	0.000	821192.	824076.	821251.	824084.	0.50	6.00
2	0.000376150	0.01535	0.000	821251.	824084.	821291.	824093.	0.50	6.00
2	0.000376150	0.02994	0.000	821615.	824240.	821690.	824268.	0.50	6.00
2	0.000376150	0.02990	0.000	821689.	824268.	821765.	824292.	0.50	6.00
3	0.000062692	0.02408	0.000	822250.	824532.	19.	20.	0.50	26.10
3	0.000062692	0.02927	0.000	822266.	824544.	20.	24.	0.50	26.10
3	0.000062692	0.04462	0.000	822286.	824557.	28.	26.	0.50	26.10
3	0.000062692	0.03342	0.000	822307.	824569.	22.	24.	0.50	26.10
3	0.000062692	0.04008	0.000	822329.	824580.	26.	24.	0.50	26.10
3	0.000062692	0.04485	0.000	822355.	824594.	29.	25.	0.50	26.10
3	0.000062692	0.03994	0.000	822380.	824605.	28.	23.	0.50	26.10
3	0.000062692	0.03767	0.000	822405.	824617.	26.	23.	0.50	26.10
3	0.000062692	0.01089	0.000	822447.	824634.	15.	12.	0.50	20.40
3	0.000062692	0.01349	0.000	822463.	824640.	16.	13.	0.50	20.40
3	0.000062692	0.01429	0.000	822479.	824647.	17.	13.	0.50	20.40
3	0.000062692	0.01898	0.000	822496.	824652.	18.	17.	0.50	20.40
3	0.000062692	0.02416	0.000	822514.	824656.	21.	19.	0.50	20.40
3	0.000062692	0.02468	0.000	822533.	824664.	21.	19.	0.50	20.40
3	0.000062692	0.01604	0.000	822551.	824672.	16.	16.	0.50	20.40
3	0.000062692	0.01244	0.000	822564.	824678.	11.	17.	0.50	20.40
3	0.000062692	0.01587	0.000	822580.	824689.	14.	18.	0.50	20.40
3	0.000062692	0.01439	0.000	822595.	824694.	15.	15.	0.50	20.40
3	0.000062692	0.01998	0.000	822612.	824700.	19.	17.	0.50	20.40
3	0.000062692	0.02166	0.000	822631.	824705.	20.	17.	0.50	20.40
3	0.000062692	0.01776	0.000	822650.	824709.	18.	16.	0.50	20.40
3	0.000062692	0.01605	0.000	822669.	824711.	17.	15.	0.50	20.40
3	0.000062692	0.00903	0.000	822686.	824713.	12.	12.	0.50	20.40
3	0.000062692	0.00796	0.000	822697.	824713.	13.	10.	0.50	20.40
2	0.000313460	0.03608	0.000	823089.	824679.	823194.	824726.	0.50	5.00
2	0.000752300	0.03065	0.000	823476.	824895.	823517.	824899.	0.50	12.00
2	0.000250770	0.00504	0.000	823583.	824912.	823602.	824919.	0.50	4.00
2	0.000250770	0.00805	0.000	823602.	824919.	823631.	824932.	0.50	4.00
2	0.000250770	0.01059	0.000	823631.	824932.	823666.	824956.	0.50	4.00
2	0.000250770	0.00703	0.000	823755.	825035.	823782.	825026.	0.50	4.00
2	0.000250770	0.01147	0.000	823781.	825025.	823825.	825012.	0.50	4.00
2	0.000250770	0.01382	0.000	823825.	825011.	823880.	825008.	0.50	4.00
2	0.000250770	0.00942	0.000	823880.	825007.	823917.	825011.	0.50	4.00
2	0.000250770	0.01093	0.000	823918.	825011.	823960.	825022.	0.50	4.00
2	0.000250770	0.01819	0.000	823960.	825022.	824026.	825051.	0.50	4.00
2	0.000250770	0.02041	0.000	824027.	825051.	824102.	825082.	0.50	4.00
2	0.000250770	0.01760	0.000	824102.	825081.	824168.	825107.	0.50	4.00
2	0.000250770	0.01443	0.000	824167.	825107.	824223.	825121.	0.50	4.00
2	0.000250770	0.02173	0.000	824223.	825121.	824309.	825130.	0.50	4.00
2	0.000250770	0.00743	0.000	823774.	825007.	823803.	824998.	0.50	4.00
2	0.000250770	0.01052	0.000	823803.	824997.	823844.	824990.	0.50	4.00
2	0.000250770	0.00754	0.000	823843.	824990.	823873.	824989.	0.50	4.00
2	0.000250770	0.01120	0.000	823873.	824988.	823918.	824991.	0.50	4.00
2	0.000250770	0.01202	0.000	823918.	824991.	823964.	825003.	0.50	4.00
2	0.000250770	0.01530	0.000	823965.	825003.	824021.	825027.	0.50	4.00
2	0.000250770	0.02336	0.000	824021.	825027.	824107.	825062.	0.50	4.00
2	0.000250770	0.02006	0.000	824107.	825062.	824182.	825090.	0.50	4.00
2	0.000250770	0.01107	0.000	824182.	825090.	824225.	825101.	0.50	4.00
2	0.000250770	0.02173	0.000	824224.	825101.	824311.	825110.	0.50	4.00
2	0.000376150	0.01524	0.000	824620.	825124.	824660.	825121.	0.50	6.00
2	0.000376150	0.01271	0.000	824660.	825121.	824693.	825116.	0.50	6.00
2	0.000376150	0.01761	0.000	824693.	825117.	824735.	825095.	0.50	6.00
2	0.000376150	0.02007	0.000	824735.	825094.	824768.	825053.	0.50	6.00
2	0.000376150	0.01706	0.000	824769.	825053.	824803.	825024.	0.50	6.00
2	0.000376150	0.02584	0.000	824804.	825022.	824861.	824984.	0.50	6.00
2	0.000376150	0.03689	0.000	824861.	824983.	824946.	824934.	0.50	6.00
2	0.000376150	0.01441	0.000	824952.	824949.	824989.	824938.	0.50	6.00
2	0.000376150	0.01024	0.000	824988.	824938.	825016.	824935.	0.50	6.00
2	0.000376150	0.00785	0.000	825015.	824935.	825036.	824936.	0.50	6.00
2	0.000501540	0.01910	0.000	825901.	825482.	825938.	825491.	0.50	8.00
3	0.000062692	0.00565	0.000	826047.	825542.	9.	10.	0.50	35.00

TOTAL EMISSIONS 1.57843

1

1 HOUR AVERAGE FOR HOUR ENDING 1

CONCENTRATIONS IN MICROGRAMS/M**3

(821392.,	824166.,	0.019)	(821502.,	824222.,	0.015)	(822048.,	824364.,	5.919)
(822312.,	824618.,	0.001)	(822536.,	824722.,	0.000)	(822732.,	824780.,	0.000)
(822778.,	824737.,	0.000)	(822870.,	824726.,	0.000)	(822988.,	824638.,	0.221)
(823198.,	824834.,	0.000)	(823428.,	824868.,	0.152)	(823528.,	824966.,	0.000)
(823748.,	825175.,	0.000)	(823986.,	825234.,	0.000)	(824070.,	825268.,	0.000)
(824078.,	825234.,	0.000)	(824087.,	825206.,	0.000)	(824282.,	825434.,	0.000)
(824398.,	825458.,	0.000)	(824608.,	825342.,	0.000)	(825028.,	824977.,	0.005)
(825291.,	825007.,	0.064)	(825416.,	825202.,	0.015)	(825608.,	825364.,	0.003)

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 (825798., 825428.,      0.351)  (825802., 825475.,      0.000)  (826106., 825680.,      0.000)
 (826285., 825680.,      0.000)  (826324., 825735.,      0.000)  (826672., 825474.,      0.000)
 (826916., 825382.,      0.000)  (827310., 825442.,      0.000)  (827436., 825410.,      0.000)
 (827684., 825436.,      0.000)  (827950., 825508.,      0.000)  (828210., 825514.,      0.000)
 (823976., 825140.,      0.000)  (824350., 825366.,      0.000)  (824535., 825312.,      0.000)
 (824625., 825206.,      0.000)  (824094., 825099.,      0.001)  (824385., 825155.,      0.000)
 (824514., 825160.,      0.000)  (824627., 825166.,      0.000)  (
1
              1 HOUR AVERAGE FOR HOUR ENDING      1
                    DEPOSITION RATE IN MICROGRAMS/M**2/SEC

 (821392., 824166.,**********)  (821502., 824222.,**********)  (822048., 824364.,**********)
 (822312., 824618.,**********)  (822536., 824722.,**********)  (822732., 824780.,**********)
 (822778., 824737.,**********)  (822870., 824726.,**********)  (822988., 824638.,**********)
 (823198., 824834.,**********)  (823428., 824868.,**********)  (823528., 824966.,**********)
 (823748., 825175.,**********)  (823986., 825234.,**********)  (824070., 825268.,**********)
 (824078., 825234.,**********)  (824087., 825206.,**********)  (824282., 825434.,**********)
 (824398., 825458.,**********)  (824608., 825342.,**********)  (825028., 824977.,**********)
 (825291., 825007.,**********)  (825416., 825202.,**********)  (825608., 825364.,**********)
 (825798., 825428.,**********)  (825802., 825475.,**********)  (826106., 825680.,**********)
 (826285., 825680.,**********)  (826324., 825735.,**********)  (826672., 825474.,**********)
 (826916., 825382.,**********)  (827310., 825442.,**********)  (827436., 825410.,**********)
 (827684., 825436.,**********)  (827950., 825508.,**********)  (828210., 825514.,**********)
 (823976., 825140.,**********)  (824350., 825366.,**********)  (824535., 825312.,**********)
 (824625., 825206.,**********)  (824094., 825099.,**********)  (824385., 825155.,**********)
 (824514., 825160.,**********)  (824627., 825166.,**********)  (
****** NOTE: FOR RECEPTORS WITH Z UNEQUAL 0, DEPOSITION IS SET TO 999999.999
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1

FUGITIVE DUST MODEL (FDM)
VERSION 90121
MAY, 1990

RUN TITLE:
Castle Peak Road Construction (dust sources 101-200)

INPUT FILE NAME: const3by.IN
OUTPUT FILE NAME: const3by.OUT
PLOT OUTPUT WRITTEN TO FILE NAME: const3by.DAT

CONVERGENCE OPTION 1=OFF, 2=ON	1
MET OPTION SWITCH, 1=CARDS, 2=PREPROCESSED	1
PLOT FILE OUTPUT, 1=NO, 2=YES	2
MET DATA PRINT SWITCH, 1=NO, 2=YES	1
POST-PROCESSOR OUTPUT, 1=NO, 2=YES	1
DEP. VEL./GRAV. SETL. VEL., 1=DEFAULT, 2=USER	1
PRINT 1-HOUR AVERAGE CONCEN, 1=NO, 2=YES	2
PRINT 3-HOUR AVERAGE CONCEN, 1=NO, 2=YES	1
PRINT 8-HOUR AVERAGE CONCEN, 1=NO, 2=YES	1
PRINT 24-HOUR AVERAGE CONCEN, 1=NO, 2=YES	1
PRINT LONG-TERM AVERAGE CONCEN, 1=NO, 2=YES	1
NUMBER OF SOURCES PROCESSED	100
NUMBER OF RECEPTORS PROCESSED	44
NUMBER OF PARTICLE SIZE CLASSES	5
NUMBER OF HOURS OF MET DATA PROCESSED	1
LENGTH IN MINUTES OF 1-HOUR OF MET DATA	60.
ROUGHNESS LENGTH IN CM	100.00
SCALING FACTOR FOR SOURCE AND RECPTORS	1.0000
PARTICLE DENSITY IN G/CM**3	2.50

GENERAL PARTICLE SIZE CLASS INFORMATION

PARTICLE SIZE CLASS	CHAR. DIA. (UM)	GRAV. SETTLING VELOCITY (M/SEC)	DEPOSITION VELOCITY (M/SEC)	FRACTION IN EACH SIZE CLASS
1	1.2500000	**	**	0.0262
2	3.7500000	**	**	0.0678
3	7.5000000	**	**	0.1704
4	12.5000000	**	**	0.1536
5	20.0000000	**	**	0.5820

** COMPUTED BY FDM

1

RECEPTOR COORDINATES (X,Y,Z)

```
(821392., 824166.,  4.)  (821502., 824222., 11.)  (822048., 824364.,  2.)
(822312., 824618., 18.)  (822536., 824722.,  5.)  (822732., 824780.,  2.)
(822778., 824737.,  2.)  (822870., 824726.,  2.)  (822988., 824638.,  2.)
(823198., 824834., 32.)  (823428., 824868., 13.)  (823528., 824966., 16.)
(823748., 825175., 49.)  (823986., 825234., 43.)  (824070., 825268.,  2.)
(824078., 825234.,  6.)  (824087., 825206.,  6.)  (824282., 825434.,  2.)
(824398., 825458., 12.)  (824608., 825342., 40.)  (825028., 824977., 20.)
(825291., 825007.,  2.)  (825416., 825202., 23.)  (825608., 825364., 24.)
(825798., 825428.,  2.)  (825802., 825475.,  9.)  (826106., 825680., 16.)
(826285., 825680.,  2.)  (826324., 825735., 20.)  (826672., 825474.,  2.)
(826916., 825382.,  2.)  (827310., 825442., 36.)  (827436., 825410., 22.)
(827684., 825436., 12.)  (827950., 825508., 34.)  (828210., 825514., 15.)
(823976., 825140., 12.)  (824350., 825366., 12.)  (824535., 825312., 12.)
(824625., 825206., 12.)  (824094., 825099., 12.)  (824385., 825155., 12.)
(824514., 825160., 12.)  (824627., 825166., 12.)  (
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1

SOURCE INFORMATION

TYPE	ENTERED EMIS. RATE (G/SEC, G/SEC/M OR G/SEC/M**2)	TOTAL EMISSION RATE (G/SEC)	WIND SPEED FAC.	X1 (M)	Y1 (M)	X2 (M)	Y2 (M)	HEIGHT (M)	WIDTH (M)
3	0.000062692	0.01832	0.000	826061.	825548.	18.	17.	0.50	35.00
3	0.000062692	0.02706	0.000	826079.	825558.	19.	23.	0.50	35.00
3	0.000062692	0.04611	0.000	826098.	825574.	29.	25.	0.50	35.00
3	0.000062692	0.04332	0.000	826123.	825592.	27.	26.	0.50	35.00
3	0.000062692	0.03586	0.000	826144.	825606.	21.	28.	0.50	35.00
3	0.000062692	0.01302	0.000	826158.	825624.	18.	12.	0.50	35.00
3	0.000062692	0.00517	0.000	826160.	825613.	10.	9.	0.50	35.00
3	0.000062692	0.00519	0.000	826170.	825634.	9.	9.	0.50	35.00
3	0.000062692	0.00655	0.000	826094.	825549.	11.	10.	0.50	35.00
3	0.000062692	0.01583	0.000	826107.	825557.	16.	15.	0.50	35.00
3	0.000062692	0.03513	0.000	826128.	825568.	28.	20.	0.50	35.00
3	0.000062692	0.00915	0.000	826144.	825582.	11.	13.	0.50	35.00
3	0.000062692	0.00342	0.000	826150.	825589.	7.	8.	0.50	35.00
3	0.000062692	0.00588	0.000	826246.	825683.	13.	8.	0.50	9.50
3	0.000062692	0.00762	0.000	826260.	825685.	16.	8.	0.50	9.50
3	0.000062692	0.01016	0.000	826275.	825689.	16.	10.	0.50	9.50
3	0.000062692	0.01956	0.000	826300.	825691.	31.	10.	0.50	2.50
3	0.000062692	0.00884	0.000	826323.	825690.	16.	9.	0.50	2.50

3	0.000062692	0.00470	0.000	826335.	825690.	10.	8.	0.50	2.50
3	0.000062692	0.00273	0.000	826345.	825688.	9.	5.	0.50	2.50
2	0.000250770	0.01599	0.000	828159.	825474.	828220.	825494.	0.50	4.00
2	0.000250770	0.01005	0.000	828220.	825494.	828256.	825511.	0.50	4.00
2	0.000250770	0.00999	0.000	828256.	825511.	828289.	825533.	0.50	4.00
3	0.000070703	0.00687	0.000	824644.	825252.	7.	14.	0.50	41.70
3	0.000070703	0.00594	0.000	824653.	825245.	8.	11.	0.50	41.70
3	0.000070703	0.00909	0.000	824662.	825236.	8.	15.	0.50	41.70
3	0.000070703	0.01765	0.000	824676.	825223.	11.	23.	0.50	41.70
3	0.000070703	0.02144	0.000	824692.	825208.	14.	22.	0.50	41.70
3	0.000070703	0.01423	0.000	824705.	825194.	12.	18.	0.50	41.70
3	0.000070703	0.00513	0.000	824714.	825182.	6.	12.	0.50	41.70
3	0.000070703	0.00333	0.000	821335.	824131.	8.	6.	0.50	37.40
3	0.000070703	0.00340	0.000	821342.	824134.	7.	7.	0.50	37.40
3	0.000070703	0.01046	0.000	821355.	824139.	17.	9.	0.50	37.40
3	0.000070703	0.01145	0.000	821370.	824148.	18.	9.	0.50	37.40
3	0.000070703	0.00866	0.000	821385.	824156.	16.	8.	0.50	37.40
3	0.000070703	0.00926	0.000	821401.	824162.	17.	8.	0.50	37.40
3	0.000070703	0.00940	0.000	821412.	824170.	14.	10.	0.50	37.40
3	0.000070703	0.00954	0.000	821425.	824176.	15.	9.	0.50	37.40
3	0.000070703	0.00901	0.000	821439.	824182.	14.	9.	0.50	37.40
3	0.000070703	0.00974	0.000	821453.	824188.	15.	9.	0.50	37.40
3	0.000070703	0.00796	0.000	821465.	824194.	13.	9.	0.50	37.40
3	0.000070703	0.01025	0.000	821477.	824200.	15.	10.	0.50	37.40
3	0.000070703	0.00980	0.000	821491.	824206.	14.	10.	0.50	37.40
3	0.000070703	0.00937	0.000	821504.	824212.	14.	10.	0.50	37.40
3	0.000070703	0.00596	0.000	821515.	824217.	11.	7.	0.50	37.40
3	0.000070703	0.00579	0.000	821526.	824222.	13.	7.	0.50	37.40
3	0.000070703	0.00720	0.000	821539.	824227.	15.	7.	0.50	37.40
2	0.000707030	0.04621	0.000	825388.	825172.	825448.	825198.	0.50	10.00
2	0.000707030	0.04820	0.000	825565.	825275.	825614.	825322.	0.50	10.00
2	0.000707030	0.04456	0.000	825622.	825331.	825666.	825375.	0.50	10.00
2	0.000424220	0.02006	0.000	825698.	825409.	825736.	825438.	0.50	6.00
2	0.000424220	0.02579	0.000	825736.	825439.	825791.	825466.	0.50	6.00
2	0.000494920	0.03365	0.000	825829.	825473.	825896.	825487.	0.50	7.00
2	0.000282810	0.01131	0.000	825942.	825501.	825979.	825518.	0.50	4.00
3	0.000070703	0.02096	0.000	826357.	825714.	12.	24.	0.50	65.40
3	0.000070703	0.03084	0.000	826382.	825709.	18.	24.	0.50	65.40
3	0.000070703	0.02945	0.000	826404.	825697.	16.	26.	0.50	65.40
3	0.000070703	0.04383	0.000	826432.	825681.	16.	38.	0.50	65.40
3	0.000070703	0.05106	0.000	826463.	825664.	20.	35.	0.50	65.40
3	0.000070703	0.05011	0.000	826491.	825649.	23.	32.	0.50	65.40
3	0.000070703	0.04712	0.000	826518.	825632.	22.	31.	0.50	65.40
3	0.000070703	0.05334	0.000	826545.	825615.	23.	33.	0.50	65.40
3	0.000070703	0.06521	0.000	826575.	825599.	26.	35.	0.50	65.40
3	0.000070703	0.06526	0.000	826604.	825581.	27.	35.	0.50	65.40
3	0.000070703	0.05882	0.000	826632.	825563.	26.	32.	0.50	65.40
3	0.000070703	0.06159	0.000	826660.	825548.	28.	31.	0.50	65.40
3	0.000070703	0.07185	0.000	826687.	825533.	31.	33.	0.50	65.40
3	0.000070703	0.06228	0.000	826717.	825514.	28.	32.	0.50	65.40
3	0.000070703	0.04069	0.000	826741.	825497.	22.	26.	0.50	65.40
3	0.000070703	0.03271	0.000	826763.	825480.	17.	27.	0.50	65.40
3	0.000070703	0.02713	0.000	826787.	825465.	15.	26.	0.50	65.40
3	0.000070703	0.01818	0.000	826807.	825453.	12.	21.	0.50	65.40
3	0.000070703	0.02105	0.000	826828.	825443.	12.	25.	0.50	65.40
3	0.000070703	0.02352	0.000	826851.	825434.	13.	25.	0.50	65.40
3	0.000070703	0.01670	0.000	826871.	825426.	13.	19.	0.50	65.40
3	0.000070703	0.01473	0.000	826887.	825422.	13.	16.	0.50	65.40
3	0.000070703	0.01100	0.000	826902.	825416.	10.	15.	0.50	65.40
3	0.000070703	0.00669	0.000	826915.	825412.	8.	11.	0.50	65.40
3	0.000070703	0.01049	0.000	826981.	825408.	10.	14.	0.50	86.30
3	0.000070703	0.02300	0.000	826999.	825410.	17.	20.	0.50	86.30
3	0.000070703	0.02637	0.000	827020.	825409.	17.	23.	0.50	86.30
3	0.000070703	0.01653	0.000	827040.	825407.	13.	19.	0.50	86.30
3	0.000070703	0.01553	0.000	827058.	825404.	12.	18.	0.50	86.30
3	0.000070703	0.01459	0.000	827075.	825402.	11.	18.	0.50	86.30
3	0.000070703	0.01435	0.000	827092.	825402.	11.	18.	0.50	86.30
3	0.000070703	0.01566	0.000	827111.	825401.	12.	18.	0.50	86.30
3	0.000070703	0.01808	0.000	827128.	825401.	14.	18.	0.50	86.30
3	0.000070703	0.01765	0.000	827147.	825401.	16.	16.	0.50	86.30
3	0.000070703	0.01683	0.000	827165.	825399.	15.	16.	0.50	86.30
3	0.000070703	0.02022	0.000	827183.	825398.	14.	20.	0.50	86.30
3	0.000070703	0.01612	0.000	827200.	825398.	15.	15.	0.50	86.30
3	0.000070703	0.01569	0.000	827216.	825397.	15.	15.	0.50	86.30
3	0.000070703	0.01424	0.000	827232.	825395.	14.	15.	0.50	86.30
3	0.000070703	0.01867	0.000	827248.	825394.	14.	19.	0.50	86.30
3	0.000070703	0.01765	0.000	827267.	825392.	14.	18.	0.50	86.30
3	0.000070703	0.01427	0.000	827284.	825392.	11.	18.	0.50	86.30
3	0.000070703	0.01699	0.000	827301.	825392.	14.	18.	0.50	86.30
3	0.000070703	0.00776	0.000	827316.	825389.	10.	11.	0.50	86.30
3	0.000070703	0.01599	0.000	827330.	825389.	13.	17.	0.50	86.30
3	0.000070703	0.00781	0.000	827346.	825387.	8.	14.	0.50	86.30
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TOTAL EMISSIONS		2.08892							

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1 HOUR AVERAGE FOR HOUR ENDING 1
CONCENTRATIONS IN MICROGRAMS/M**3

(821392.,	824166.,	0.135)	(821502.,	824222.,	0.000)	(822048.,	824364.,	0.000)
(822312.,	824618.,	0.000)	(822536.,	824722.,	0.000)	(822732.,	824780.,	0.000)
(822778.,	824737.,	0.000)	(822870.,	824726.,	0.000)	(822988.,	824638.,	0.000)
(823198.,	824834.,	0.000)	(823428.,	824868.,	0.000)	(823528.,	824966.,	0.000)
(823748.,	825175.,	0.000)	(823986.,	825234.,	0.000)	(824070.,	825268.,	0.000)
(824078.,	825234.,	0.000)	(824087.,	825206.,	0.000)	(824282.,	825434.,	0.000)
(824398.,	825458.,	0.000)	(824608.,	825342.,	0.000)	(825028.,	824977.,	0.192)
(825291.,	825007.,	13.770)	(825416.,	825202.,	0.786)	(825608.,	825364.,	0.137)

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 (825798., 825428.,     27.807)  (825802., 825475.,      0.032)  (826106., 825680.,      0.000)
 (826285., 825680.,    376.313)  (826324., 825735.,      0.000)  (826672., 825474.,     20.954)
 (826916., 825382.,      0.060)  (827310., 825442.,      0.000)  (827436., 825410.,      0.000)
 (827684., 825436.,      0.000)  (827950., 825508.,      0.000)  (828210., 825514.,      0.000)
 (823976., 825140.,      0.000)  (824350., 825366.,      0.000)  (824535., 825312.,      0.000)
 (824625., 825206.,      2.990)  (824094., 825099.,      0.000)  (824385., 825155.,      0.002)
 (824514., 825160.,      0.482)  (824627., 825166.,     12.327)  (
1
              1 HOUR AVERAGE FOR HOUR ENDING      1
                    DEPOSITION RATE IN MICROGRAMS/M**2/SEC

 (821392., 824166.,**********)  (821502., 824222.,**********)  (822048., 824364.,**********)
 (822312., 824618.,**********)  (822536., 824722.,**********)  (822732., 824780.,**********)
 (822778., 824737.,**********)  (822870., 824726.,**********)  (822988., 824638.,**********)
 (823198., 824834.,**********)  (823428., 824868.,**********)  (823528., 824966.,**********)
 (823748., 825175.,**********)  (823986., 825234.,**********)  (824070., 825268.,**********)
 (824078., 825234.,**********)  (824087., 825206.,**********)  (824282., 825434.,**********)
 (824398., 825458.,**********)  (824608., 825342.,**********)  (825028., 824977.,**********)
 (825291., 825007.,**********)  (825416., 825202.,**********)  (825608., 825364.,**********)
 (825798., 825428.,**********)  (825802., 825475.,**********)  (826106., 825680.,**********)
 (826285., 825680.,**********)  (826324., 825735.,**********)  (826672., 825474.,**********)
 (826916., 825382.,**********)  (827310., 825442.,**********)  (827436., 825410.,**********)
 (827684., 825436.,**********)  (827950., 825508.,**********)  (828210., 825514.,**********)
 (823976., 825140.,**********)  (824350., 825366.,**********)  (824535., 825312.,**********)
 (824625., 825206.,**********)  (824094., 825099.,**********)  (824385., 825155.,**********)
 (824514., 825160.,**********)  (824627., 825166.,**********)  (
****** NOTE: FOR RECEPTORS WITH Z UNEQUAL 0, DEPOSITION IS SET TO 999999.999
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                FUGITIVE DUST MODEL (FDM)
                VERSION 90121
                MAY, 1990

    RUN TITLE:
         Castle Peak Road Construction (dust sources 201-297)

         INPUT FILE NAME:  const3cy.IN
         OUTPUT FILE NAME:  const3cy.OUT
         PLOT OUTPUT WRITTEN TO FILE NAME:  const3cy.DAT


         CONVERGENCE OPTION 1=OFF, 2=ON                        1
         MET OPTION SWITCH, 1=CARDS, 2=PREPROCESSED            1
         PLOT FILE OUTPUT, 1=NO, 2=YES                         2
         MET DATA PRINT SWITCH, 1=NO, 2=YES                    1
         POST-PROCESSOR OUTPUT, 1=NO, 2=YES                    1
         DEP. VEL./GRAV. SETL. VEL., 1=DEFAULT, 2=USER         1
         PRINT 1-HOUR AVERAGE CONCEN, 1=NO, 2=YES              2
         PRINT 3-HOUR AVERAGE CONCEN, 1=NO, 2=YES              1
         PRINT 8-HOUR AVERAGE CONCEN, 1=NO, 2=YES              1
         PRINT 24-HOUR AVERAGE CONCEN, 1=NO, 2=YES             1
         PRINT LONG-TERM AVERAGE CONCEN, 1=NO, 2=YES           1
         NUMBER OF SOURCES PROCESSED                          97
         NUMBER OF RECEPTORS PROCESSED                        44
         NUMBER OF PARTICLE SIZE CLASSES                       5
         NUMBER OF HOURS OF MET DATA PROCESSED                 1
         LENGTH IN MINUTES OF 1-HOUR OF MET DATA             60.
         ROUGHNESS LENGTH IN CM                           100.00
         SCALING FACTOR FOR SOURCE AND RECPTORS           1.0000
         PARTICLE DENSITY IN G/CM**3                        2.50
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GENERAL PARTICLE SIZE CLASS INFORMATION

PARTICLE SIZE CLASS	CHAR. DIA. (UM)	GRAV. SETTLING VELOCITY (M/SEC)	DEPOSITION VELOCITY (M/SEC)	FRACTION IN EACH SIZE CLASS
1	1.2500000	**	**	0.0262
2	3.7500000	**	**	0.0678
3	7.5000000	**	**	0.1704
4	12.5000000	**	**	0.1536
5	20.0000000	**	**	0.5820

** COMPUTED BY FDM

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RECEPTOR COORDINATES (X,Y,Z)

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(821392., 824166.,  4.)  (821502., 824222., 11.)  (822048., 824364.,  2.)
(822312., 824618., 18.)  (822536., 824722.,  5.)  (822732., 824780.,  2.)
(822778., 824737.,  2.)  (822870., 824726.,  2.)  (822988., 824638.,  2.)
(823198., 824834., 32.)  (823428., 824868., 13.)  (823528., 824966., 16.)
(823748., 825175., 49.)  (823986., 825234., 43.)  (824070., 825268.,  2.)
(824078., 825234.,  6.)  (824087., 825206.,  6.)  (824282., 825434.,  2.)
(824398., 825458., 12.)  (824608., 825342., 40.)  (825028., 824977., 20.)
(825291., 825007.,  2.)  (825416., 825202., 23.)  (825608., 825364., 24.)
(825798., 825428.,  2.)  (825802., 825475.,  9.)  (826106., 825680., 16.)
(826285., 825680.,  2.)  (826324., 825735., 20.)  (826672., 825474.,  2.)
(826916., 825382.,  2.)  (827310., 825442., 36.)  (827436., 825410., 22.)
(827684., 825436., 12.)  (827950., 825508., 34.)  (828210., 825514., 15.)
(823976., 825140., 12.)  (824350., 825366., 12.)  (824535., 825312., 12.)
(824625., 825206., 12.)  (824094., 825099., 12.)  (824385., 825155., 12.)
(824514., 825160., 12.)  (824627., 825166., 12.)  (
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SOURCE INFORMATION

TYPE	ENTERED EMIS. RATE (G/SEC, G/SEC/M OR G/SEC/M**2)	TOTAL EMISSION RATE (G/SEC)	WIND SPEED FAC.	X1 (M)	Y1 (M)	X2 (M)	Y2 (M)	HEIGHT (M)	WIDTH (M)
3	0.000070703	0.00829	0.000	827360.	825385.	9.	14.	0.50	86.30
3	0.000070703	0.00233	0.000	827370.	825383.	7.	5.	0.50	86.30
2	0.000565620	0.02412	0.000	827638.	825471.	827681.	825470.	0.50	8.00
2	0.000565620	0.02355	0.000	827682.	825470.	827724.	825470.	0.50	8.00
2	0.000565620	0.03378	0.000	827724.	825469.	827784.	825467.	0.50	8.00
3	0.000070703	0.01652	0.000	821100.	824093.	21.	11.	0.50	4.70
3	0.000070703	0.01812	0.000	821119.	824096.	18.	14.	0.50	4.70
3	0.000070703	0.01609	0.000	821137.	824097.	19.	12.	0.50	4.70
3	0.000070703	0.01671	0.000	821155.	824099.	16.	15.	0.50	4.70
3	0.000070703	0.01631	0.000	821171.	824100.	17.	14.	0.50	4.70
3	0.000070703	0.01630	0.000	821188.	824102.	17.	13.	0.50	4.70
3	0.000070703	0.01667	0.000	821205.	824103.	18.	13.	0.50	4.70
3	0.000070703	0.02001	0.000	821226.	824105.	23.	12.	0.50	4.70
3	0.000070703	0.01936	0.000	821248.	824108.	21.	13.	0.50	8.90
3	0.000070703	0.01626	0.000	821268.	824111.	20.	12.	0.50	9.50
3	0.000070703	0.01984	0.000	821287.	824117.	22.	13.	0.50	15.40
3	0.000070703	0.00793	0.000	821304.	824120.	13.	9.	0.50	20.60
3	0.000070703	0.00265	0.000	821314.	824122.	8.	5.	0.50	18.10

3	0.000070703	0.00601	0.000	821216.	824116.	11.	8.	0.50	4.00
3	0.000070703	0.01274	0.000	821230.	824119.	17.	11.	0.50	4.00
3	0.000070703	0.01397	0.000	821247.	824121.	18.	11.	0.50	11.50
3	0.000070703	0.01673	0.000	821267.	824125.	20.	12.	0.50	16.00
3	0.000070703	0.00619	0.000	821281.	824128.	11.	8.	0.50	21.00
3	0.000070703	0.00991	0.000	825196.	825047.	13.	11.	0.50	37.40
3	0.000070703	0.01392	0.000	825204.	825056.	13.	15.	0.50	37.40
3	0.000070703	0.02114	0.000	825217.	825068.	20.	15.	0.50	37.40
3	0.000070703	0.01565	0.000	825232.	825079.	17.	13.	0.50	37.40
3	0.000070703	0.01069	0.000	825242.	825088.	12.	13.	0.50	37.40
3	0.000070703	0.01343	0.000	825254.	825097.	16.	12.	0.50	37.40
3	0.000070703	0.01134	0.000	825203.	825071.	16.	10.	0.50	37.40
3	0.000070703	0.01683	0.000	825215.	825083.	18.	13.	0.50	37.40
3	0.000070703	0.01408	0.000	825229.	825093.	16.	13.	0.50	37.40
3	0.000070703	0.00973	0.000	825239.	825101.	12.	11.	0.50	37.40
3	0.000070703	0.00686	0.000	825222.	825028.	10.	10.	0.50	37.40
3	0.000070703	0.01242	0.000	825231.	825037.	14.	12.	0.50	37.40
3	0.000070703	0.01166	0.000	825243.	825046.	15.	11.	0.50	37.40
3	0.000070703	0.01016	0.000	825254.	825054.	13.	11.	1.00	37.40
3	0.000070703	0.01122	0.000	825266.	825064.	14.	12.	2.00	37.40
3	0.000070703	0.00959	0.000	825275.	825072.	11.	12.	3.00	37.40
3	0.000070703	0.00341	0.000	825280.	825080.	7.	7.	4.00	37.40
3	0.000070703	0.00755	0.000	825243.	825035.	12.	9.	0.50	37.40
3	0.000070703	0.00602	0.000	825254.	825042.	13.	7.	0.50	37.40
3	0.000070703	0.00619	0.000	825264.	825051.	12.	7.	0.50	37.40
3	0.000070703	0.00352	0.000	825271.	825058.	9.	6.	0.50	37.40
3	0.000070703	0.00710	0.000	821613.	824264.	12.	8.	0.50	18.90
3	0.000070703	0.01259	0.000	821625.	824271.	16.	11.	0.50	18.90
3	0.000070703	0.01346	0.000	821640.	824277.	17.	11.	0.50	18.90
3	0.000070703	0.01489	0.000	821655.	824284.	16.	14.	0.50	18.90
3	0.000070703	0.01191	0.000	821669.	824288.	14.	12.	0.50	18.90
3	0.000070703	0.01225	0.000	821683.	824293.	14.	12.	0.50	18.90
3	0.000070703	0.01042	0.000	821698.	824297.	14.	11.	0.50	18.90
3	0.000070703	0.00793	0.000	821711.	824300.	13.	9.	0.50	18.90
3	0.000070703	0.00565	0.000	821769.	824318.	9.	9.	0.50	15.30
3	0.000070703	0.00806	0.000	821778.	824323.	11.	10.	0.50	15.30
3	0.000070703	0.00743	0.000	821789.	824326.	10.	10.	0.50	15.30
3	0.000070703	0.01324	0.000	821800.	824330.	14.	13.	0.50	15.30
3	0.000070703	0.01569	0.000	821815.	824335.	16.	14.	0.50	15.30
3	0.000070703	0.00622	0.000	821825.	824338.	8.	11.	0.50	15.30
3	0.000070703	0.00427	0.000	821834.	824339.	7.	9.	0.50	15.30
3	0.000070703	0.00353	0.000	821844.	824340.	10.	5.	0.50	15.30
3	0.000070703	0.00268	0.000	821853.	824342.	8.	5.	0.50	15.30
3	0.000070703	0.00435	0.000	821771.	824291.	8.	8.	0.50	15.30
3	0.000070703	0.00778	0.000	821781.	824293.	11.	10.	0.50	15.30
3	0.000070703	0.00854	0.000	821792.	824296.	11.	12.	0.50	15.30
3	0.000070703	0.01131	0.000	821805.	824299.	13.	13.	0.50	15.30
3	0.000070703	0.01195	0.000	821816.	824303.	13.	13.	0.50	15.30
3	0.000070703	0.01206	0.000	821828.	824307.	12.	15.	0.50	15.30
3	0.000070703	0.00894	0.000	821839.	824310.	11.	12.	0.50	15.30
3	0.000070703	0.00610	0.000	821850.	824316.	10.	8.	0.50	15.30
3	0.000070703	0.00281	0.000	821858.	824319.	6.	6.	0.50	15.30
3	0.000070703	0.06877	0.000	821954.	824383.	50.	19.	0.50	15.60
3	0.000070703	0.06706	0.000	821990.	824401.	27.	35.	0.50	14.80
3	0.000070703	0.25309	0.000	822025.	824428.	57.	63.	0.50	20.50
3	0.000070703	0.39728	0.000	822098.	824462.	95.	59.	0.50	32.70
3	0.000070703	0.06265	0.000	822149.	824489.	21.	42.	0.50	48.30
3	0.000070703	0.02197	0.000	822169.	824494.	16.	19.	0.50	48.20
3	0.000070703	0.07140	0.000	822014.	824472.	40.	26.	0.50	21.80
3	0.000070703	0.15303	0.000	822067.	824496.	71.	31.	0.50	32.90
3	0.000070703	0.02027	0.000	822104.	824516.	12.	25.	0.50	31.60
3	0.000070703	0.02242	0.000	822014.	824495.	21.	15.	0.50	31.70
3	0.000070703	0.11576	0.000	822045.	824518.	56.	30.	0.50	32.40
3	0.000070703	0.01042	0.000	822076.	824530.	10.	15.	0.50	32.80
3	0.000070703	0.01044	0.000	822973.	824673.	14.	10.	0.50	6.40
3	0.000070703	0.01095	0.000	822986.	824676.	12.	13.	0.50	7.30
3	0.000070703	0.01433	0.000	822999.	824679.	14.	15.	0.50	8.20
3	0.000070703	0.01256	0.000	823012.	824682.	12.	15.	0.50	8.90
3	0.000070703	0.01484	0.000	823025.	824684.	15.	14.	0.50	12.60
3	0.000070703	0.01293	0.000	823039.	824688.	13.	14.	0.50	20.90
3	0.000070703	0.00927	0.000	823049.	824690.	11.	12.	0.50	15.70
3	0.000070703	0.01735	0.000	823065.	824697.	21.	12.	0.50	20.70
3	0.000070703	0.01247	0.000	823082.	824703.	18.	10.	0.50	22.20
2	0.000565620	0.03531	0.000	823093.	824703.	823149.	824730.	0.50	8.00
2	0.000494920	0.00757	0.000	823387.	824864.	823400.	824871.	0.50	7.00
2	0.000494920	0.01225	0.000	823451.	824893.	823475.	824898.	0.50	7.00
2	0.000494920	0.02474	0.000	823478.	824925.	823528.	824931.	0.50	7.00
3	0.000303820	0.12153	0.000	822188.	824542.	20.	20.	0.50	46.00
3	0.000303820	0.12153	0.000	826081.	825559.	20.	20.	0.50	40.40

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TOTAL EMISSIONS 2.50916

1

1 HOUR AVERAGE FOR HOUR ENDING 1
CONCENTRATIONS IN MICROGRAMS/M**3

```
(821392., 824166.,     0.215)  (821502., 824222.,     0.307)  (822048., 824364.,   161.973)
(822312., 824618.,     0.000)  (822536., 824722.,     0.000)  (822732., 824780.,     0.000)
(822778., 824737.,     0.000)  (822870., 824726.,     0.000)  (822988., 824638.,    14.843)
(823198., 824834.,     0.000)  (823428., 824868.,     2.232)  (823528., 824966.,     0.000)
(823748., 825175.,     0.000)  (823986., 825234.,     0.000)  (824070., 825268.,     0.000)
(824078., 825234.,     0.000)  (824087., 825206.,     0.000)  (824282., 825434.,     0.000)
(824398., 825458.,     0.000)  (824608., 825342.,     0.000)  (825028., 824977.,     0.647)
(825291., 825007.,     0.161)  (825416., 825202.,     0.039)  (825608., 825364.,     0.012)
(825798., 825428.,     0.115)  (825802., 825475.,     0.004)  (826106., 825680.,     0.000)
(826285., 825680.,     0.000)  (826324., 825735.,     0.000)  (826672., 825474.,     0.000)
(826916., 825382.,     0.000)  (827310., 825442.,     0.000)  (827436., 825410.,     0.000)
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 (827684., 825436.,     2.285)  (827950., 825508.,     0.000)  (828210., 825514.,     0.000)
 (823976., 825140.,     0.000)  (824350., 825366.,     0.000)  (824535., 825312.,     0.000)
 (824625., 825206.,     0.000)  (824094., 825099.,     0.000)  (824385., 825155.,     0.000)
 (824514., 825160.,     0.000)  (824627., 825166.,     0.000)  (
1
              1 HOUR AVERAGE FOR HOUR ENDING      1
                    DEPOSITION RATE IN MICROGRAMS/M**2/SEC

 (821392., 824166.,**********)  (821502., 824222.,**********)  (822048., 824364.,**********)
 (822312., 824618.,**********)  (822536., 824722.,**********)  (822732., 824780.,**********)
 (822778., 824737.,**********)  (822870., 824726.,**********)  (822988., 824638.,**********)
 (823198., 824834.,**********)  (823428., 824868.,**********)  (823528., 824966.,**********)
 (823748., 825175.,**********)  (823986., 825234.,**********)  (824070., 825268.,**********)
 (824078., 825234.,**********)  (824087., 825206.,**********)  (824282., 825434.,**********)
 (824398., 825458.,**********)  (824608., 825342.,**********)  (825028., 824977.,**********)
 (825291., 825007.,**********)  (825416., 825202.,**********)  (825608., 825364.,**********)
 (825798., 825428.,**********)  (825802., 825475.,**********)  (826106., 825680.,**********)
 (826285., 825680.,**********)  (826324., 825735.,**********)  (826672., 825474.,**********)
 (826916., 825382.,**********)  (827310., 825442.,**********)  (827436., 825410.,**********)
 (827684., 825436.,**********)  (827950., 825508.,**********)  (828210., 825514.,**********)
 (823976., 825140.,**********)  (824350., 825366.,**********)  (824535., 825312.,**********)
 (824625., 825206.,**********)  (824094., 825099.,**********)  (824385., 825155.,**********)
 (824514., 825160.,**********)  (824627., 825166.,**********)  (
 ****** NOTE: FOR RECEPTORS WITH Z UNEQUAL 0, DEPOSITION IS SET TO 999999.999
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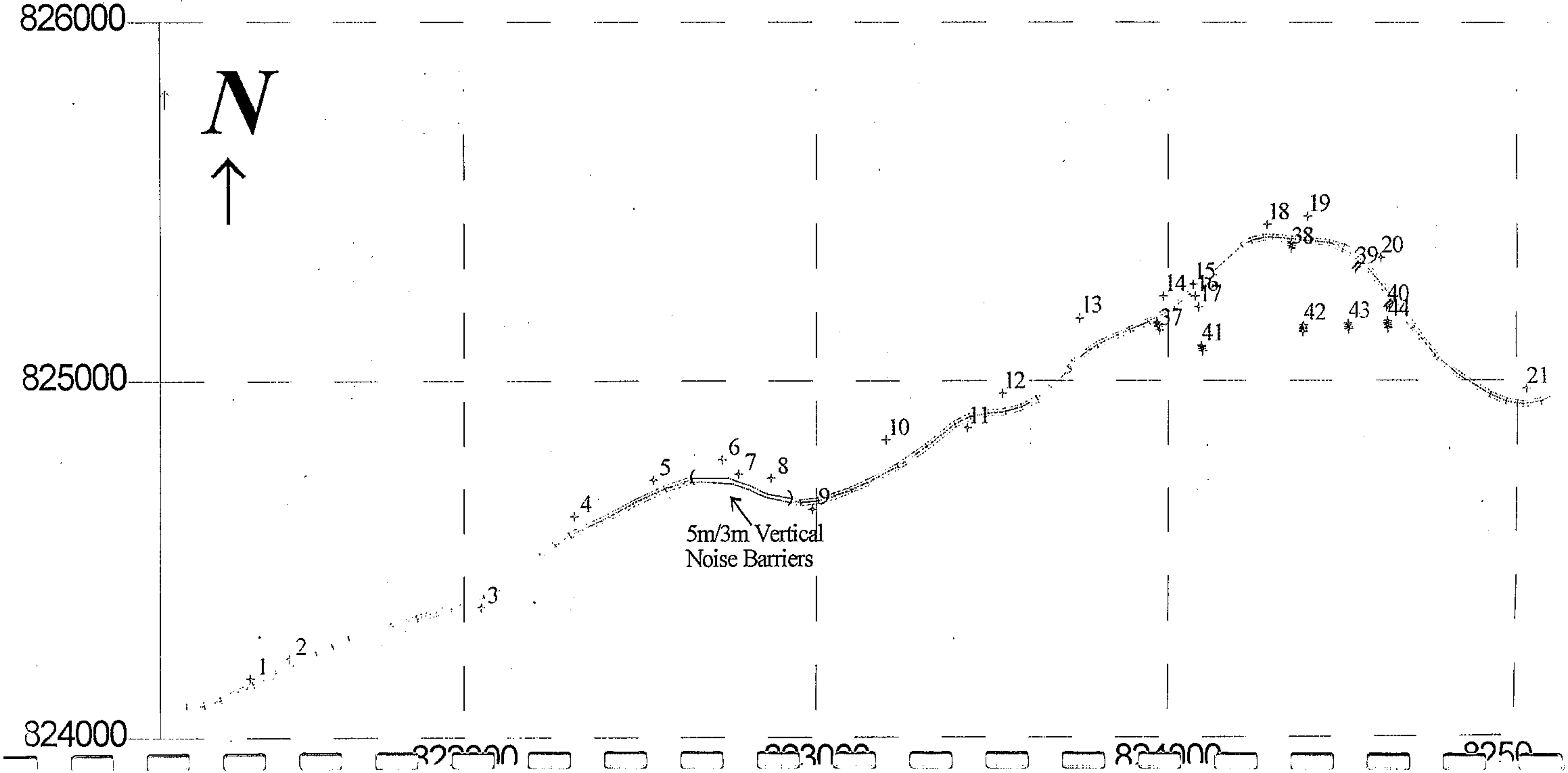
ASR ID	Location	X	Y	*Height above road level (m)	**Max 1-hr average TSP (ug/cu.m)	**Max 24-hr average TSP (ug/cu.m)	Max annual average TSP (ug/cu.m)
A1	Ka Loon Tsuen	821392.0	824166.0	3.5	185	134	3
A2	Ka Loon Tsuen	821502.0	824222.0	10.7	188	135	3
A3	Grand Bay Villa	822048.0	824364.0	1.5	295	178	10
A4	Hong Kong Garden	822312.0	824618.0	18.1	291	148	8
A5	Hong Kong Garden	822536.0	824722.0	5.3	222	132	7
A6	Lung Tang Court	822732.0	824780.0	1.5	208	128	7
A7	Tsing Lung Tau Village	822778.0	824737.0	1.5	263	150	18
A8	Tsing Lung Tau Village	822870.0	824726.0	1.5	268	145	12
A9	Villa Alfa Vista	822988.0	824638.0	1.5	193	124	3
A10	Sea Crest Villa Phase 4	823198.0	824834.0	31.5	138	113	1
A11	Dragonville	823428.0	824868.0	13.4	130	114	1
A12	Sea Crest Villa Phase 3	823528.0	824966.0	16.1	129	115	2
A13	Sea Crest Villa Phase 2	823748.0	825175.0	49.1	120	109	1
A14	Sea Crest Villa Phase 1	823986.0	825234.0	43.4	118	110	1
A15	Sham Tseng Tsuen Village	824070.0	825268.0	1.5	125	112	3
A16	Lido Garden	824078.0	825234.0	5.5	129	113	4
A17	Lido Garden	824087.0	825206.0	5.5	133	115	4
A18	Chan Kee Restaurant	824282.0	825434.0	1.8	119	110	2
A19	Rhine Garden	824398.0	825458.0	11.5	118	109	2
A20	Rhine Terrace	824608.0	825342.0	39.8	130	112	2
A21	Pink Villa	825028.0	824977.0	20.0	153	122	1
A22	Homi Villa	825291.0	825007.0	1.5	163	124	4
A23	Lot 403	825416.0	825202.0	23.0	143	114	1
A24	Vista Del Mar	825608.0	825364.0	23.6	129	114	1
A25	Riviera Apartments	825798.0	825428.0	1.5	198	135	6
A26	Edinburgh Villa	825802.0	825475.0	9.0	167	128	4
A27	Ting Kau	826106.0	825680.0	15.6	256	156	15
A28	Ting Kau	826285.0	825680.0	1.5	481	224	29
A29	Ting Kau	826324.0	825735.0	19.5	230	143	12
A30	Ting Kau	826672.0	825474.0	1.5	191	138	9
A31	Ting Kau	826916.0	825382.0	1.5	210	138	6
A32	Sunny Villa	827310.0	825442.0	36.2	161	120	3
A33	New building under construction (lot 322)	827436.0	825410.0	21.5	184	121	1
A34	Longbeach Gardens	827684.0	825436.0	11.5	138	112	1
A35	Garden View Terrace No.6	827950.0	825508.0	34.1	126	109	0
A36	Bayview Garden	828210.0	825514.0	14.8	123	109	0
A37	Future receptor (Lido Reclamation)	823975.5	825140.0	11.5	136	117	4
A38	Future receptor (existing San Migual Brewery plant)	824350.4	825366.2	11.5	122	111	2
A39	Future receptor (existing Garden Bakery plant)	824534.5	825311.5	11.5	133	114	3
A40	Future receptor (existing Garden Bakery plant)	824624.5	825205.8	11.5	137	115	4
A41	Future receptor (Lido Reclamation)	824093.5	825098.6	11.5	154	123	4
A42	Future receptor (existing San Migual Brewery plant)	824384.9	825154.7	11.5	143	119	4
A43	Future receptor (existing Union Carbide plant)	824514.4	825160.4	11.5	133	116	4
A44	Future receptor (existing Garden Bakery plant)	824627.3	825165.5	11.5	135	114	4
			HIGHEST		481	224	29

** The heights used for the assessment were 1.5 metres above the lowest residential floor level.*
*** Including estimated background TSP concentration of 105 ug/cu.m.*

Figure F-5 (a)


826000
N
825000
824000
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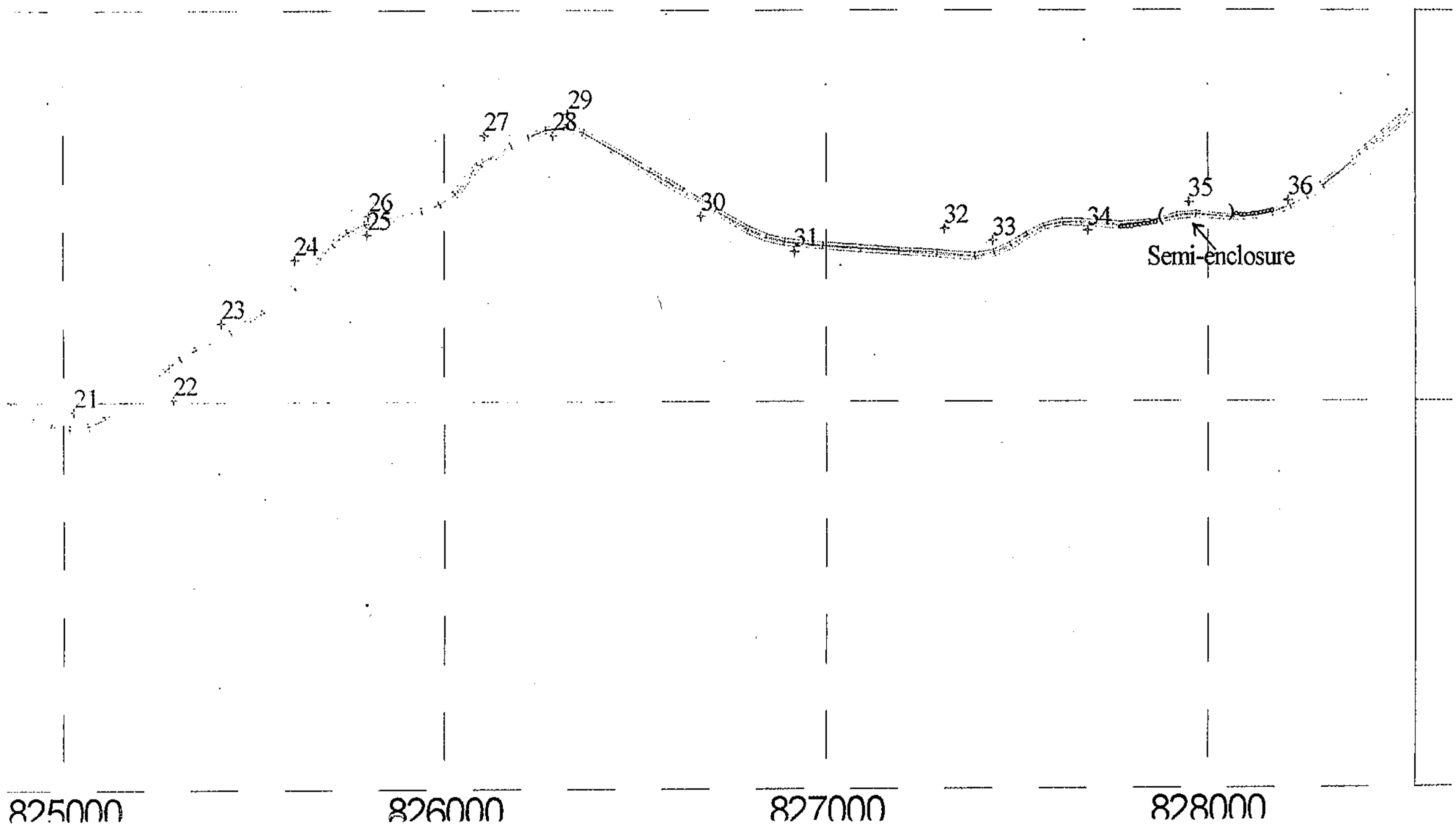
43
44
5m/3m Vertical
Noise Barriers

Figure F-5 (b)



21
22
23
24
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29
30
31
32
33
34
35
36
Semi-enclosure
825000
826000
827000
828000

File: 654_E.DAT

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Castle Peak Rd O/L Improvem (ASR 34 at 11.5m above Gd), with Barrier, East End
4Nitrogen Dioxide
100.00   1.00    .00    .00    1  200   1.00   0   0    .0
827684.0 825436.0     11.5
3    822813.0   824702.8   822858.8   824679.8  3.00   7.00    0.00E+00    0.00E+00   0
3    822858.8   824679.8   822931.6   824666.3  3.00   7.00    0.00E+00    0.00E+00   0
1    822931.6   824666.3   822953.7   824660.5  0.00  13.00    0.00E+00    0.00E+00   0
1    822953.7   824660.5   823003.9   824665.7  0.00  13.00    0.00E+00    0.00E+00   0
1    823003.9   824665.7   823049.1   824678.9  0.00  13.00    0.00E+00    0.00E+00   0
1    823049.1   824678.9   823096.4   824696.1  0.00  13.00    0.00E+00    0.00E+00   0
1    823096.4   824696.1   823141.6   824716.5  0.00  13.00    0.00E+00    0.00E+00   0
1    823141.6   824716.5   823229.3   824763.4  0.00  13.00    0.00E+00    0.00E+00   0
1    823229.3   824763.4   823311.4   824819.0  0.00  13.00    0.00E+00    0.00E+00   0
1    823311.4   824819.0   823390.1   824882.3  0.00  13.00    0.00E+00    0.00E+00   0
1    823390.1   824882.3   823435.4   824904.4  0.00  13.00    0.00E+00    0.00E+00   0
1    823435.4   824904.4   823486.7   824914.1  0.00  13.00    0.00E+00    0.00E+00   0
1    823486.7   824914.1   823535.9   824918.0  0.00  13.00    0.00E+00    0.00E+00   0
1    823535.9   824918.0   823581.6   824931.0  0.00  13.00    0.00E+00    0.00E+00   0
1    823581.6   824931.0   823624.9   824953.5  0.00  13.00    0.00E+00    0.00E+00   0
1    823624.9   824953.5   823664.1   824983.4  0.00  13.00    0.00E+00    0.00E+00   0
1    823664.1   824983.4   823717.1   825036.3  0.00  13.00    0.00E+00    0.00E+00   0
1    823717.1   825036.3   823728.5   825054.3  0.00  13.00    0.00E+00    0.00E+00   0
1    823728.5   825054.3   823768.3   825086.1  0.00  13.00    0.00E+00    0.00E+00   0
1    823768.3   825086.1   823797.1   825103.5  0.00  13.00    0.00E+00    0.00E+00   0
1    823797.1   825103.5   823888.6   825145.2  0.00  13.00    0.00E+00    0.00E+00   0
1    823888.6   825145.2   823940.7   825167.3  0.00  13.00    0.00E+00    0.00E+00   0
1    823940.7   825167.3   823978.8   825186.4  0.00  13.00    0.00E+00    0.00E+00   0
1    823978.8   825186.4   824030.0   825219.7  0.00  13.00    0.00E+00    0.00E+00   0
1    824030.0   825219.7   824058.3   825243.5  0.00  13.00    0.00E+00    0.00E+00   0
1    824058.3   825243.5   824131.6   825311.2  0.00  13.00    0.00E+00    0.00E+00   0
1    824131.6   825311.2   824206.5   825377.4  0.00  13.00    0.00E+00    0.00E+00   0
1    824206.5   825377.4   824234.2   825392.4  0.00  13.00    0.00E+00    0.00E+00   0
1    824234.2   825392.4   824270.7   825401.9  0.00  13.00    0.00E+00    0.00E+00   0
1    824270.7   825401.9   824299.3   825402.6  0.00  13.00    0.00E+00    0.00E+00   0
1    824299.3   825402.6   824404.3   825392.5  0.00  13.00    0.00E+00    0.00E+00   0
1    824404.3   825392.5   824460.7   825387.2  0.00  13.00    0.00E+00    0.00E+00   0
1    824460.7   825387.2   824504.4   825374.3  0.00  13.00    0.00E+00    0.00E+00   0
1    824504.4   825374.3   824536.9   825357.5  0.00  13.00    0.00E+00    0.00E+00   0
1    824536.9   825357.5   824580.9   825307.8  0.00  13.00    0.00E+00    0.00E+00   0
1    824580.9   825307.8   824645.9   825231.5  0.00  13.00    0.00E+00    0.00E+00   0
1    824645.9   825231.5   824706.5   825152.7  0.00  13.00    0.00E+00    0.00E+00   0
1    824706.5   825152.7   824732.3   825115.7  0.00  13.00    0.00E+00    0.00E+00   0
1    824732.3   825115.7   824767.1   825074.6  0.00  13.00    0.00E+00    0.00E+00   0
1    824767.1   825074.6   824777.7   825066.0  0.00  13.00    0.00E+00    0.00E+00   0
1    824777.7   825066.0   824839.2   825015.8  0.00  13.00    0.00E+00    0.00E+00   0
1    824839.2   825015.8   824923.9   824965.1  0.00  13.00    0.00E+00    0.00E+00   0
1    824923.9   824965.1   824969.3   824945.6  0.00  13.00    0.00E+00    0.00E+00   0
1    824969.3   824945.6   825016.7   824938.7  0.00  13.00    0.00E+00    0.00E+00   0
1    825016.7   824938.7   825066.4   824945.0  0.00  13.00    0.00E+00    0.00E+00   0
1    825066.4   824945.0   825109.1   824963.5  0.00  13.00    0.00E+00    0.00E+00   0
1    825109.1   824963.5   825187.8   825024.5  0.00  13.00    0.00E+00    0.00E+00   0
1    825187.8   825024.5   825265.4   825085.5  0.00  13.00    0.00E+00    0.00E+00   0
1    825265.4   825085.5   825306.2   825115.1  0.00  13.00    0.00E+00    0.00E+00   0
1    825306.2   825115.1   825349.0   825139.4  0.00  13.00    0.00E+00    0.00E+00   0
1    825349.0   825139.4   825440.4   825182.6  0.00  13.00    0.00E+00    0.00E+00   0
1    825440.4   825182.6   825525.4   825233.1  0.00  13.00    0.00E+00    0.00E+00   0
1    825525.4   825233.1   825603.3   825295.3  0.00  13.00    0.00E+00    0.00E+00   0
1    825603.3   825295.3   825672.4   825366.9  0.00  13.00    0.00E+00    0.00E+00   0
1    825672.4   825366.9   825704.6   825405.8  0.00  13.00    0.00E+00    0.00E+00   0
1    825704.6   825405.8   825745.2   825437.1  0.00  13.00    0.00E+00    0.00E+00   0
1    825745.2   825437.1   825791.1   825457.7  0.00  13.00    0.00E+00    0.00E+00   0
1    825791.1   825457.7   825841.5   825470.2  0.00  13.00    0.00E+00    0.00E+00   0
1    825841.5   825470.2   825939.5   825491.3  0.00  13.00    0.00E+00    0.00E+00   0
1    825939.5   825491.3   825985.9   825507.3  0.00  13.00    0.00E+00    0.00E+00   0
1    825985.9   825507.3   826025.8   825533.8  0.00  13.00    0.00E+00    0.00E+00   0
1    826025.8   825533.8   826085.9   825608.9  0.00  13.00    0.00E+00    0.00E+00   0
1    826085.9   825608.9   826174.0   825656.9  0.00  13.00    0.00E+00    0.00E+00   0
1    826174.0   825656.9   826219.1   825678.9  0.00  13.00    0.00E+00    0.00E+00   0
1    826219.1   825678.9   826266.4   825698.5  0.00  13.00    0.00E+00    0.00E+00   0
1    826266.4   825698.5   826317.1   825704.3  0.00  13.00    0.00E+00    0.00E+00   0
1    826317.1   825704.3   826365.8   825690.6  0.00  13.00    0.00E+00    0.00E+00   0
1    826365.8   825690.6   826453.5   825642.0  0.00  13.00    0.00E+00    0.00E+00   0
1    826453.5   825642.0   826539.9   825591.9  0.00  13.00    0.00E+00    0.00E+00   0
1    826539.9   825591.9   826627.0   825542.2  0.00  13.00    0.00E+00    0.00E+00   0
1    826627.0   825542.2   826712.8   825491.5  0.00  13.00    0.00E+00    0.00E+00   0
1    826712.8   825491.5   826798.0   825442.7  0.00  13.00    0.00E+00    0.00E+00   0
1    826798.0   825442.7   826843.8   825424.3  0.00  13.00    0.00E+00    0.00E+00   0
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1    826891.1   825411.6   826992.1   825402.2  0.00  13.00    0.00E+00    0.00E+00   0
1    826992.1   825402.2   827091.4   825395.6  0.00  13.00    0.00E+00    0.00E+00   0
1    827091.4   825395.6   827190.0   825388.0  0.00  13.00    0.00E+00    0.00E+00   0
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1    827291.2   825382.9   827389.8   825374.6  0.00  13.00    0.00E+00    0.00E+00   0
1    827389.8   825374.6   827438.3   825382.5  0.00  13.00    0.00E+00    0.00E+00   0
1    827438.3   825382.5   827482.5   825402.8  0.00  13.00    0.00E+00    0.00E+00   0
1    827482.5   825402.8   827524.8   825428.5  0.00  13.00    0.00E+00    0.00E+00   0
1    827524.8   825428.5   827569.2   825450.6  0.00  13.00    0.00E+00    0.00E+00   0
1    827569.2   825450.6   827618.4   825462.4  0.00  13.00    0.00E+00    0.00E+00   0
1    827618.4   825462.4   827670.5   825462.3  0.00  13.00    0.00E+00    0.00E+00   0
1    827670.5   825462.3   827770.5   825455.5  0.00  13.00    0.00E+00    0.00E+00   0
1    827770.5   825455.5   827867.4   825461.1  0.00  13.00    0.00E+00    0.00E+00   0
1    827867.4   825461.1   827918.7   825478.6  0.00  13.00    0.00E+00    0.00E+00   0
1    827918.7   825478.6   827969.5   825482.3  0.00  13.00    0.00E+00    0.00E+00   0
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1	827969.5	825482.3	828067.4	825471.6	0.00	13.00	0.00E+00	0.00E+00	0
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1	828117.8	825478.8	828166.1	825486.7	0.00	13.00	0.00E+00	0.00E+00	0
1	828166.1	825486.7	828214.1	825502.7	0.00	13.00	0.00E+00	0.00E+00	0
1	828214.1	825502.7	828257.5	825524.8	0.00	13.00	0.00E+00	0.00E+00	0
1	828257.5	825524.8	828298.6	825554.3	0.00	13.00	0.00E+00	0.00E+00	0
1	828298.6	825554.3	828336.3	825582.9	0.00	13.00	0.00E+00	0.00E+00	0
1	828336.3	825582.9	828412.4	825649.0	0.00	13.00	0.00E+00	0.00E+00	0
1	828412.4	825649.0	828525.4	825742.3	0.00	13.00	0.00E+00	0.00E+00	0
1	828542.7	825734.4	828420.4	825638.2	0.00	13.00	0.00E+00	0.00E+00	0
1	828420.4	825638.2	828342.2	825576.5	0.00	13.00	0.00E+00	0.00E+00	0
1	828342.2	825576.5	828303.8	825546.0	0.00	13.00	0.00E+00	0.00E+00	0
1	828303.8	825546.0	828263.2	825515.7	0.00	13.00	0.00E+00	0.00E+00	0
1	828263.2	825515.7	828217.6	825493.7	0.00	13.00	0.00E+00	0.00E+00	0
1	828217.6	825493.7	828168.8	825476.1	0.00	13.00	0.00E+00	0.00E+00	0
1	828168.8	825476.1	828119.0	825468.0	0.00	13.00	0.00E+00	0.00E+00	0
1	828119.0	825468.0	828067.0	825466.0	0.00	13.00	0.00E+00	0.00E+00	0
1	828067.0	825466.0	827968.9	825472.3	0.00	13.00	0.00E+00	0.00E+00	0
1	827968.9	825472.3	827919.5	825467.9	0.00	13.00	0.00E+00	0.00E+00	0
1	827919.5	825467.9	827869.4	825459.8	0.00	13.00	0.00E+00	0.00E+00	0
1	827869.4	825459.5	827770.1	825444.1	0.00	13.00	0.00E+00	0.00E+00	0
1	827770.1	825444.1	827668.6	825451.2	0.00	13.00	0.00E+00	0.00E+00	0
1	827668.6	825451.2	827620.4	825452.4	0.00	13.00	0.00E+00	0.00E+00	0
1	827620.4	825452.4	827572.9	825442.4	0.00	13.00	0.00E+00	0.00E+00	0
1	827572.9	825442.4	827530.1	825420.1	0.00	13.00	0.00E+00	0.00E+00	0
1	827530.1	825420.1	827487.4	825393.1	0.00	13.00	0.00E+00	0.00E+00	0
1	827487.4	825393.1	827441.0	825372.8	0.00	13.00	0.00E+00	0.00E+00	0
1	827441.0	825372.8	827390.8	825365.2	0.00	13.00	0.00E+00	0.00E+00	0
1	827390.8	825365.2	827290.6	825371.7	0.00	13.00	0.00E+00	0.00E+00	0
1	827290.6	825371.7	827190.2	825378.5	0.00	13.00	0.00E+00	0.00E+00	0
1	827190.2	825378.5	827090.5	825384.7	0.00	13.00	0.00E+00	0.00E+00	0
1	827090.5	825384.7	826991.3	825391.6	0.00	13.00	0.00E+00	0.00E+00	0
1	826991.3	825391.6	826889.3	825401.5	0.00	13.00	0.00E+00	0.00E+00	0
1	826889.3	825401.5	826839.2	825413.1	0.00	13.00	0.00E+00	0.00E+00	0
1	826839.2	825413.1	826792.9	825433.2	0.00	13.00	0.00E+00	0.00E+00	0
1	826792.9	825433.2	826708.4	825483.3	0.00	13.00	0.00E+00	0.00E+00	0
1	826708.4	825483.3	826621.8	825533.3	0.00	13.00	0.00E+00	0.00E+00	0
1	826621.8	825533.3	826535.2	825583.2	0.00	13.00	0.00E+00	0.00E+00	0
1	826535.2	825583.2	826449.4	825633.4	0.00	13.00	0.00E+00	0.00E+00	0
1	826449.4	825633.4	826362.6	825682.4	0.00	13.00	0.00E+00	0.00E+00	0
1	826362.6	825682.4	826315.0	825694.3	0.00	13.00	0.00E+00	0.00E+00	0
1	826315.0	825694.3	826268.2	825688.6	0.00	13.00	0.00E+00	0.00E+00	0
1	826268.2	825688.6	826222.9	825670.0	0.00	13.00	0.00E+00	0.00E+00	0
1	826222.9	825670.0	826178.3	825647.3	0.00	13.00	0.00E+00	0.00E+00	0
1	826178.3	825647.3	826096.1	825603.6	0.00	13.00	0.00E+00	0.00E+00	0
1	826096.1	825603.6	826032.7	825525.7	0.00	13.00	0.00E+00	0.00E+00	0
1	826032.7	825525.7	825990.5	825500.0	0.00	13.00	0.00E+00	0.00E+00	0
1	825990.5	825500.0	825942.4	825481.3	0.00	13.00	0.00E+00	0.00E+00	0
1	825942.4	825481.3	825843.5	825459.1	0.00	13.00	0.00E+00	0.00E+00	0
1	825843.5	825459.1	825794.7	825448.7	0.00	13.00	0.00E+00	0.00E+00	0
1	825794.7	825448.7	825750.2	825429.0	0.00	13.00	0.00E+00	0.00E+00	0
1	825750.2	825429.0	825712.1	825398.8	0.00	13.00	0.00E+00	0.00E+00	0
1	825712.1	825398.8	825680.2	825361.4	0.00	13.00	0.00E+00	0.00E+00	0
1	825680.2	825361.4	825611.0	825288.3	0.00	13.00	0.00E+00	0.00E+00	0
1	825611.0	825288.3	825532.2	825225.6	0.00	13.00	0.00E+00	0.00E+00	0
1	825532.2	825225.6	825445.0	825174.2	0.00	13.00	0.00E+00	0.00E+00	0
1	825445.0	825174.2	825353.2	825131.3	0.00	13.00	0.00E+00	0.00E+00	0
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1	825311.8	825106.3	825271.6	825078.7	0.00	13.00	0.00E+00	0.00E+00	0
1	825271.6	825078.7	825193.6	825016.4	0.00	13.00	0.00E+00	0.00E+00	0
1	825193.6	825016.4	825114.6	824955.2	0.00	13.00	0.00E+00	0.00E+00	0
1	825114.6	824955.2	825069.5	824935.0	0.00	13.00	0.00E+00	0.00E+00	0
1	825069.5	824935.0	825017.1	824928.8	0.00	13.00	0.00E+00	0.00E+00	0
1	825017.1	824928.8	824966.7	824936.6	0.00	13.00	0.00E+00	0.00E+00	0
1	824966.7	824936.6	824919.5	824956.7	0.00	13.00	0.00E+00	0.00E+00	0
1	824919.5	824956.7	824833.8	825009.0	0.00	13.00	0.00E+00	0.00E+00	0
1	824833.8	825009.0	824771.0	825059.2	0.00	13.00	0.00E+00	0.00E+00	0
1	824771.0	825059.2	824762.0	825067.5	0.00	11.00	0.00E+00	0.00E+00	0
1	824762.0	825067.5	824734.1	825099.3	0.00	13.00	0.00E+00	0.00E+00	0
1	824734.1	825099.3	824697.8	825145.8	0.00	13.00	0.00E+00	0.00E+00	0
1	824697.8	825145.8	824639.0	825226.1	0.00	13.00	0.00E+00	0.00E+00	0
1	824639.0	825226.1	824573.9	825302.2	0.00	13.00	0.00E+00	0.00E+00	0
1	824573.9	825302.2	824539.2	825340.0	0.00	13.00	0.00E+00	0.00E+00	0
1	824539.2	825340.0	824498.1	825361.2	0.00	13.00	0.00E+00	0.00E+00	0
1	824498.1	825361.2	824460.3	825377.3	0.00	13.00	0.00E+00	0.00E+00	0
1	824460.3	825377.3	824403.8	825382.9	0.00	13.00	0.00E+00	0.00E+00	0
1	824403.8	825382.9	824299.2	825392.9	0.00	13.00	0.00E+00	0.00E+00	0
1	824299.2	825392.9	824272.3	825392.2	0.00	13.00	0.00E+00	0.00E+00	0
1	824272.3	825392.2	824238.8	825384.4	0.00	13.00	0.00E+00	0.00E+00	0
1	824238.8	825384.4	824212.8	825370.4	0.00	13.00	0.00E+00	0.00E+00	0
1	824212.8	825370.4	824138.2	825305.1	0.00	13.00	0.00E+00	0.00E+00	0
1	824138.2	825305.1	824065.4	825236.8	0.00	13.00	0.00E+00	0.00E+00	0
1	824065.4	825236.8	824020.5	825200.5	0.00	13.00	0.00E+00	0.00E+00	0
1	824020.5	825200.5	823982.9	825178.7	0.00	13.00	0.00E+00	0.00E+00	0
1	823982.9	825178.7	823947.4	825159.9	0.00	13.00	0.00E+00	0.00E+00	0
1	823947.4	825159.9	823892.3	825136.9	0.00	13.00	0.00E+00	0.00E+00	0
1	823892.3	825136.9	823800.5	825095.3	0.00	13.00	0.00E+00	0.00E+00	0
1	823800.5	825095.3	823780.3	825084.1	0.00	13.00	0.00E+00	0.00E+00	0
1	823780.3	825084.1	823759.1	825068.5	0.00	13.00	0.00E+00	0.00E+00	0
1	823759.1	825068.5	823725.6	825030.1	0.00	13.00	0.00E+00	0.00E+00	0
1	823725.6	825030.1	823721.0	825024.4	0.00	7.00	0.00E+00	0.00E+00	0
1	823721.0	825024.4	823712.8	825018.5	0.00	9.00	0.00E+00	0.00E+00	0
1	823712.8	825018.5	823671.5	824976.0	0.00	13.00	0.00E+00	0.00E+00	0

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1     823585.8     824921.8     823537.5     824908.9   0.00   13.00      0.00E+00       0.00E+00     0
1     823537.5     824908.9     823487.2     824904.6   0.00   13.00      0.00E+00       0.00E+00     0
1     823487.2     824904.6     823438.3     824894.7   0.00   13.00      0.00E+00       0.00E+00     0
1     823438.3     824894.7     823394.6     824874.4   0.00   13.00      0.00E+00       0.00E+00     0
1     823394.6     824874.4     823317.1     824811.8   0.00   13.00      0.00E+00       0.00E+00     0
1     823317.1     824811.8     823233.7     824754.8   0.00   13.00      0.00E+00       0.00E+00     0
1     823233.7     824754.8     823146.1     824707.9   0.00   13.00      0.00E+00       0.00E+00     0
1     823146.1     824707.9     823099.4     824687.6   0.00   13.00      0.00E+00       0.00E+00     0
1     823099.4     824687.6     823053.0     824669.5   0.00   13.00      0.00E+00       0.00E+00     0
1     823053.0     824669.5     823006.0     824656.3   0.00   13.00      0.00E+00       0.00E+00     0
1     823006.0     824656.3     822954.5     824651.2   0.00   13.00      0.00E+00       0.00E+00     0
1     822954.5     824651.2     822928.0     824654.0   0.00   13.00      0.00E+00       0.00E+00     0
3     822928.0     824654.0     822854.4     824671.1   3.00    7.00      0.00E+00       0.00E+00     0
3     822854.4     824671.1     822809.0     824692.2   3.00    7.00      0.00E+00       0.00E+00     0
3     822809.0     824692.2     822762.6     824708.0   3.00    7.00      0.00E+00       0.00E+00     0
3     822762.6     824708.0     822745.0     824710.0   3.00    7.00      0.00E+00       0.00E+00     0
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File: 654_E.DAT

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File: 654_E.DAT

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File: **654_E.DAT**

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File: 654_E.DAT

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File: 654_E.LST

```
CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE   1

     JOB: Castle Peak Rd O/L Improvem (ASR 34 at 1
     RUN: NO2
 POLLUTANT: Nitrogen Dioxide
 (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

I.  SITE VARIABLES

    U=   1.0 M/S            Z0= 100. CM          ALT=     0. (M)
  BRG=  81.0 DEGREES        VD=   .0 CM/S
 CLAS=    4  (D)            VS=   .0 CM/S
 MIXH=  500. M             AMB=   .0 PPM
SIGTH=   12. DEGREES      TEMP= 25.0 DEGREE (C)

II.  LINK VARIABLES
```

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
AA. LINK AA	*****	*****	*****	*****	FL	1265	.6	3.0	7.0
AB. LINK AB	*****	*****	*****	*****	FL	1265	.6	3.0	7.0
AC. LINK AC	*****	*****	*****	*****	AG	1265	.6	.0	13.0
AD. LINK AD	*****	*****	*****	*****	AG	1265	.6	.0	13.0
AE. LINK AE	*****	*****	*****	*****	AG	1265	.6	.0	13.0
AF. LINK AF	*****	*****	*****	*****	AG	1265	.6	.0	13.0
AG. LINK AG	*****	*****	*****	*****	AG	1265	.6	.0	13.0
AH. LINK AH	*****	*****	*****	*****	AG	1265	.6	.0	13.0
AI. LINK AI	*****	*****	*****	*****	AG	1329	.6	.0	13.0
AJ. LINK AJ	*****	*****	*****	*****	AG	1329	.6	.0	13.0
AK. LINK AK	*****	*****	*****	*****	AG	1366	.6	.0	13.0
AL. LINK AL	*****	*****	*****	*****	AG	1366	.6	.0	13.0
AM. LINK AM	*****	*****	*****	*****	AG	1366	.6	.0	13.0
AN. LINK AN	*****	*****	*****	*****	AG	1366	.6	.0	13.0
AO. LINK AO	*****	*****	*****	*****	AG	1366	.6	.0	13.0
AP. LINK AP	*****	*****	*****	*****	AG	1366	.6	.0	13.0
AQ. LINK AQ	*****	*****	*****	*****	AG	1366	.6	.0	13.0
AR. LINK AR	*****	*****	*****	*****	AG	1366	.6	.0	13.0
AS. LINK AS	*****	*****	*****	*****	AG	1462	.7	.0	13.0
AT. LINK AT	*****	*****	*****	*****	AG	1462	.7	.0	13.0
AU. LINK AU	*****	*****	*****	*****	AG	1462	.7	.0	13.0
AV. LINK AV	*****	*****	*****	*****	AG	1919	.6	.0	13.0
AW. LINK AW	*****	*****	*****	*****	AG	1919	.6	.0	13.0
AX. LINK AX	*****	*****	*****	*****	AG	1919	.6	.0	13.0
AY. LINK AY	*****	*****	*****	*****	AG	1919	.6	.0	13.0
AZ. LINK AZ	*****	*****	*****	*****	AG	1929	.6	.0	13.0
BA. LINK BA	*****	*****	*****	*****	AG	1929	.6	.0	13.0
BB. LINK BB	*****	*****	*****	*****	AG	1927	.6	.0	13.0
BC. LINK BC	*****	*****	*****	*****	AG	1947	.6	.0	13.0
BD. LINK BD	*****	*****	*****	*****	AG	1947	.6	.0	13.0
BE. LINK BE	*****	*****	*****	*****	AG	1978	.8	.0	13.0
BF. LINK BF	*****	*****	*****	*****	AG	1978	.8	.0	13.0
BG. LINK BG	*****	*****	*****	*****	AG	1978	.8	.0	13.0
BH. LINK BH	*****	*****	*****	*****	AG	1400	.8	.0	13.0
BI. LINK BI	*****	*****	*****	*****	AG	1400	.8	.0	13.0
BJ. LINK BJ	*****	*****	*****	*****	AG	1400	.8	.0	13.0
BK. LINK BK	*****	*****	*****	*****	AG	1400	.8	.0	13.0
BL. LINK BL	*****	*****	*****	*****	AG	1400	.8	.0	13.0
BM. LINK BM	*****	*****	*****	*****	AG	1400	.8	.0	13.0
BN. LINK BN	*****	*****	*****	*****	AG	1400	.8	.0	13.0
BO. LINK BO	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BP. LINK BP	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BQ. LINK BQ	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BR. LINK BR	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BS. LINK BS	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BT. LINK BT	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BU. LINK BU	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BV. LINK BV	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BW. LINK BW	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BX. LINK BX	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BY. LINK BY	*****	*****	*****	*****	AG	1339	.8	.0	13.0
BZ. LINK BZ	*****	*****	*****	*****	AG	1339	.8	.0	13.0
CA. LINK CA	*****	*****	*****	*****	AG	1339	.8	.0	13.0
CB. LINK CB	*****	*****	*****	*****	AG	1339	.8	.0	13.0
CC. LINK CC	*****	*****	*****	*****	AG	1339	.8	.0	13.0
CD. LINK CD	*****	*****	*****	*****	AG	1339	.8	.0	13.0
CE. LINK CE	*****	*****	*****	*****	AG	1339	.8	.0	13.0
CF. LINK CF	*****	*****	*****	*****	AG	1339	.6	.0	13.0
CG. LINK CG	*****	*****	*****	*****	AG	1339	.6	.0	13.0
CH. LINK CH	*****	*****	*****	*****	AG	1339	.6	.0	13.0
CI. LINK CI	*****	*****	*****	*****	AG	1339	.6	.0	13.0
CJ. LINK CJ	*****	*****	*****	*****	AG	1339	.6	.0	13.0
CK. LINK CK	*****	*****	*****	*****	AG	1339	.6	.0	13.0
CL. LINK CL	*****	*****	*****	*****	AG	1292	.6	.0	13.0

File: 654_E.LST

CM. LINK CM	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CN. LINK CN	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CO. LINK CO	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CP. LINK CP	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CQ. LINK CQ	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CR. LINK CR	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CS. LINK CS	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CT. LINK CT	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CU. LINK CU	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CV. LINK CV	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CW. LINK CW	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CX. LINK CX	* ***** ***** ***** ***** *	AG	1292	.6	.0	13.0
CY. LINK CY	* ***** ***** ***** ***** *	AG	1343	.6	.0	13.0
CZ. LINK CZ	* ***** ***** ***** ***** *	AG	1343	.6	.0	13.0
DA. LINK DA	* ***** ***** ***** ***** *	AG	1343	.7	.0	13.0
DB. LINK DB	* ***** ***** ***** ***** *	AG	1343	.7	.0	13.0
DC. LINK DC	* ***** ***** ***** ***** *	AG	1343	.7	.0	13.0
DD. LINK DD	* ***** ***** ***** ***** *	AG	1343	.7	.0	13.0
DE. LINK DE	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DF. LINK DF	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DG. LINK DG	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DH. LINK DH	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DI. LINK DI	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DJ. LINK DJ	* ***** ***** ***** ***** *	AG	1	.4	.0	13.0
DK. LINK DK	* ***** ***** ***** ***** *	AG	1	.4	.0	13.0
DL. LINK DL	* ***** ***** ***** ***** *	AG	1	.4	.0	13.0
DM. LINK DM	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DN. LINK DN	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DO. LINK DO	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DP. LINK DP	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DQ. LINK DQ	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DR. LINK DR	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DS. LINK DS	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DT. LINK DT	* ***** ***** ***** ***** *	AG	1580	.6	.0	13.0
DU. LINK DU	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
DV. LINK DV	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
DW. LINK DW	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
DX. LINK DX	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
DY. LINK DY	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
DZ. LINK DZ	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
EA. LINK EA	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
EB. LINK EB	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
EC. LINK EC	* ***** ***** ***** ***** *	AG	1	.4	.0	13.0
ED. LINK ED	* ***** ***** ***** ***** *	AG	1	.4	.0	13.0
EE. LINK EE	* ***** ***** ***** ***** *	AG	1	.4	.0	13.0
EF. LINK EF	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
EG. LINK EG	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
EH. LINK EH	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
EI. LINK EI	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
EJ. LINK EJ	* ***** ***** ***** ***** *	AG	1272	.7	.0	13.0
EK. LINK EK	* ***** ***** ***** ***** *	AG	1144	.7	.0	13.0
EL. LINK EL	* ***** ***** ***** ***** *	AG	1144	.7	.0	13.0
EM. LINK EM	* ***** ***** ***** ***** *	AG	1144	.7	.0	13.0
EN. LINK EN	* ***** ***** ***** ***** *	AG	1144	.7	.0	13.0
EO. LINK EO	* ***** ***** ***** ***** *	AG	1144	.7	.0	13.0
EP. LINK EP	* ***** ***** ***** ***** *	AG	1144	.7	.0	13.0
EQ. LINK EQ	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
ER. LINK ER	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
ES. LINK ES	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
ET. LINK ET	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
EU. LINK EU	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
EV. LINK EV	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
EW. LINK EW	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
EX. LINK EX	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
EY. LINK EY	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
EZ. LINK EZ	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
FA. LINK FA	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
FB. LINK FB	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
FC. LINK FC	* ***** ***** ***** ***** *	AG	1118	.9	.0	13.0
FD. LINK FD	* ***** ***** ***** ***** *	AG	1225	.8	.0	13.0
FE. LINK FE	* ***** ***** ***** ***** *	AG	1225	.8	.0	13.0
FF. LINK FF	* ***** ***** ***** ***** *	AG	1225	.8	.0	13.0
FG. LINK FG	* ***** ***** ***** ***** *	AG	1225	.8	.0	13.0
FH. LINK FH	* ***** ***** ***** ***** *	AG	1225	.8	.0	13.0
FI. LINK FI	* ***** ***** ***** ***** *	AG	1225	.8	.0	13.0
FJ. LINK FJ	* ***** ***** ***** ***** *	AG	1225	.8	.0	13.0
FK. LINK FK	* ***** ***** ***** ***** *	AG	1225	.8	.0	13.0
FL. LINK FL	* ***** ***** ***** ***** *	AG	1225	.8	.0	13.0
FM. LINK FM	* ***** ***** ***** ***** *	AG	1225	.8	.0	13.0
FN. LINK FN	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FO. LINK FO	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FP. LINK FP	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FQ. LINK FQ	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FR. LINK FR	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FS. LINK FS	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FT. LINK FT	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FU. LINK FU	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FV. LINK FV	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FW. LINK FW	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FX. LINK FX	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FY. LINK FY	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
FZ. LINK FZ	* ***** ***** ***** ***** *	AG	1225	.9	.0	13.0
GA. LINK GA	* ***** ***** ***** ***** *	AG	1400	.7	.0	11.0

File: 654_E.LST

GB. LINK GB	* ***** ***** ***** ***** *	AG	1400	.7	.0	13.0
GC. LINK GC	* ***** ***** ***** ***** *	AG	1400	.7	.0	13.0
GD. LINK GD	* ***** ***** ***** ***** *	AG	1400	.7	.0	13.0
GE. LINK GE	* ***** ***** ***** ***** *	AG	1400	.7	.0	13.0
GF. LINK GF	* ***** ***** ***** ***** *	AG	1340	.8	.0	13.0
GG. LINK GG	* ***** ***** ***** ***** *	AG	1340	.8	.0	13.0
GH. LINK GH	* ***** ***** ***** ***** *	AG	1340	.8	.0	13.0
GI. LINK GI	* ***** ***** ***** ***** *	AG	1340	.8	.0	13.0
GJ. LINK GJ	* ***** ***** ***** ***** *	AG	1340	.8	.0	13.0
GK. LINK GK	* ***** ***** ***** ***** *	AG	1463	.8	.0	13.0
GL. LINK GL	* ***** ***** ***** ***** *	AG	1463	.7	.0	13.0
GM. LINK GM	* ***** ***** ***** ***** *	AG	1525	.7	.0	13.0
GN. LINK GN	* ***** ***** ***** ***** *	AG	1525	.7	.0	13.0
GO. LINK GO	* ***** ***** ***** ***** *	AG	1525	.7	.0	13.0
GP. LINK GP	* ***** ***** ***** ***** *	AG	1577	.7	.0	13.0
GQ. LINK GQ	* ***** ***** ***** ***** *	AG	1577	.7	.0	13.0
GR. LINK GR	* ***** ***** ***** ***** *	AG	1577	.7	.0	13.0
GS. LINK GS	* ***** ***** ***** ***** *	AG	1577	.7	.0	13.0
GT. LINK GT	* ***** ***** ***** ***** *	AG	1320	.7	.0	13.0
GU. LINK GU	* ***** ***** ***** ***** *	AG	1320	.7	.0	13.0
GV. LINK GV	* ***** ***** ***** ***** *	AG	1320	.7	.0	13.0
GW. LINK GW	* ***** ***** ***** ***** *	AG	1320	.7	.0	13.0
GX. LINK GX	* ***** ***** ***** ***** *	AG	1296	.8	.0	7.0
GY. LINK GY	* ***** ***** ***** ***** *	AG	1296	.8	.0	9.0
GZ. LINK GZ	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HA. LINK HA	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HB. LINK HB	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HC. LINK HC	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HD. LINK HD	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HE. LINK HE	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HF. LINK HF	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HG. LINK HG	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HH. LINK HH	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HI. LINK HI	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HJ. LINK HJ	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HK. LINK HK	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HL. LINK HL	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HM. LINK HM	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HN. LINK HN	* ***** ***** ***** ***** *	AG	1296	.8	.0	13.0
HO. LINK HO	* ***** ***** ***** ***** *	FL	1296	.8	3.0	7.0
HP. LINK HP	* ***** ***** ***** ***** *	FL	1296	.8	3.0	7.0
HQ. LINK HQ	* ***** ***** ***** ***** *	FL	1296	.8	3.0	7.0
HR. LINK HR	* ***** ***** ***** ***** *	FL	1161	.9	3.0	7.0

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. RECPT 1	827684	825436	11.5

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

RECEPTOR	PRED CONC (PPM)	CONC/LINK (PPM) AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1. RECPT 1	57.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

1

RUN ENDED ON AT

File: 654_PE.DAT

```
Portal Emission for Castle Peak Road-O/L Improvem (ASR 34 at 11.5m above Gd)
 1 1 1 0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 2 3 1 1 0 1 2 1 1 2 2 2 1
    20     0     0     1     0     0     1     1
  827684.0  825436.0  0.000000  11.50000
  10.00000  1.540000  3.090000  5.140000  8.230000  10.80000
1000000.0.000000(GRAMS/SEC) (MICROGRAMS/CUBIC METER)
    110 000.004588 828074 8254780.00005.00004.65004.65000.00000.00000.00000.0000
    210 000.004588 828086 8254770.00005.00004.65004.65000.00000.00000.00000.0000
    310 000.004588 828095 8254760.00005.00004.65004.65000.00000.00000.00000.0000
    410 000.004588 828107 8254770.00005.00004.65004.65000.00000.00000.00000.0000
    510 000.004588 828117 8254790.00005.00004.65004.65000.00000.00000.00000.0000
    610 000.002294 828127 8254790.00005.00004.65004.65000.00000.00000.00000.0000
    710 000.002294 828136 8254810.00005.00004.65004.65000.00000.00000.00000.0000
    810 000.002294 828145 8254830.00005.00004.65004.65000.00000.00000.00000.0000
    910 000.002294 828157 8254850.00005.00004.65004.65000.00000.00000.00000.0000
   1010 000.002294 828165 8254870.00005.00004.65004.65000.00000.00000.00000.0000
   1110 000.004165 827862 8254580.00005.00004.65004.65000.00000.00000.00000.0000
   1210 000.004165 827853 8254560.00005.00004.65004.65000.00000.00000.00000.0000
   1310 000.004165 827843 8254540.00005.00004.65004.65000.00000.00000.00000.0000
   1410 000.004165 827832 8254530.00005.00004.65004.65000.00000.00000.00000.0000
   1510 000.004165 827822 8254500.00005.00004.65004.65000.00000.00000.00000.0000
   1610 000.002082 827810 8254500.00005.00004.65004.65000.00000.00000.00000.0000
   1710 000.002082 827800 8254470.00005.00004.65004.65000.00000.00000.00000.0000
   1810 000.002082 827790 8254470.00005.00004.65004.65000.00000.00000.00000.0000
   1910 000.002082 827780 8254460.00005.00004.65004.65000.00000.00000.00000.0000
   2010 000.002082 827770 8254450.00005.00004.65004.65000.00000.00000.00000.0000
       1261.00001.000000500.0000298.00000.000000       40.0000000.000000
```

File: 654_PE.LST

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1              ISCST - (DATED 90346)

               IBM-PC VERSION (2.05)
               (C) COPYRIGHT 1990, TRINITY CONSULTANTS, INC.
               SERIAL NUMBER 5792 SOLD TO C.E.S.
               RUN BEGAN ON 08-21-96 AT 14:39:22

1
          *** Portal Emission for Castle Peak Road O/L Improvem (ASR 34 at ***

 CALCULATE (CONCENTRATION=1,DEPOSITION=2)                              ISW(1) =  1
 RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)               ISW(2) =  1
 DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)                      ISW(3) =  1
 TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)                              ISW(4) =  0
 CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)                         ISW(5) =  0
 LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)                      ISW(6) =  1

 COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)
 WITH THE FOLLOWING TIME PERIODS:
   HOURLY (YES=1,NO=0)                                                 ISW(7) =  1
   2-HOUR (YES=1,NO=0)                                                 ISW(8) =  0
   3-HOUR (YES=1,NO=0)                                                 ISW(9) =  0
   4-HOUR (YES=1,NO=0)                                                ISW(10) =  0
   6-HOUR (YES=1,NO=0)                                                ISW(11) =  0
   8-HOUR (YES=1,NO=0)                                                ISW(12) =  0
   12-HOUR (YES=1,NO=0)                                               ISW(13) =  0
   24-HOUR (YES=1,NO=0)                                               ISW(14) =  0
 PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)                                  ISW(15) =  0

 PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE
 SPECIFIED BY ISW(7) THROUGH ISW(14):
   DAILY TABLES (YES=1,NO=0)                                          ISW(16) =  0
   HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)                       ISW(17) =  1
   MAXIMUM 50 TABLES (YES=1,NO=0)                                     ISW(18) =  0
 METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)            ISW(19) =  2
 RURAL-URBAN OPTION (RU.=0,UR. MODE 1=1,UR. MODE 2=2,UR. MODE 3=3)    ISW(20) =  3
 WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)            ISW(21) =  1
 VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)     ISW(22) =  1
 SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)                    ISW(23) =  0
 PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)                ISW(24) =  1
 PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)          ISW(25) =  2
 PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1,NO=2)                ISW(26) =  1
 CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1,NO=2)              ISW(27) =  2
 REG. DEFAULT OPTION CHOSEN (YES=1,NO=2)                              ISW(28) =  2
 TYPE OF POLLUTANT TO BE MODELLED (1=SO2,2=OTHER)                     ISW(29) =  2
 DEBUG OPTION CHOSEN (YES=1,NO=2)                                     ISW(30) =  2
 ABOVE GROUND (FLAGPOLE) RECEPTORS USED (YES=1,NO=0)                  ISW(31) =  1

 NUMBER OF INPUT SOURCES                                              NSOURC =  20
 NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)                             NGROUP =  0
 TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)                 IPERD =  0
 NUMBER OF X (RANGE) GRID VALUES                                      NXPNTS =  0
 NUMBER OF Y (THETA) GRID VALUES                                      NYPNTS =  0
 NUMBER OF DISCRETE RECEPTORS                                         NXWYPT =  1
 NUMBER OF HOURS PER DAY IN METEOROLOGICAL DATA                       NHOURS =  1
 NUMBER OF DAYS OF METEOROLOGICAL DATA                                 NDAYS =  1
 SOURCE EMISSION RATE UNITS CONVERSION FACTOR                             TK =.10000E+07
 HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED                     ZR =  10.00  METERS
 LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA                             IMET =  5
 ALLOCATED DATA STORAGE                                                LIMIT = 43500 WORDS
 REQUIRED DATA STORAGE FOR THIS PROBLEM RUN                            MIMIT =  5750 WORDS
1
          *** Portal Emission for Castle Peak Road O/L Improvem (ASR 34 at ***


          *** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
                                (METERS/SEC)

                    1.54,   3.09,   5.14,   8.23,  10.80,


                        *** WIND PROFILE EXPONENTS ***
```

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
B	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
C	.20000E+00	.20000E+00	.20000E+00	.20000E+00	.20000E+00	.20000E+00
D	.25000E+00	.25000E+00	.25000E+00	.25000E+00	.25000E+00	.25000E+00
E	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00
F	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00

File: 654_PE.LST

C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

*** X,Y COORDINATES OF DISCRETE RECEPTORS ***
(METERS)

(827684.0, 825436.0), (

1

*** Portal Emission for Castle Peak Road O/L Improvem (ASR 34 at ***

* ABOVE GROUND RECEPTOR HEIGHTS IN METERS *
* FOR THE DISCRETE RECEPTOR POINTS *

- X -	- Y -	HGT.	- X -	- Y -	HGT.	- X -	- Y -	HGT.
827684.0	825436.0	11.50000						

1

*** Portal Emission for Castle Peak Road O/L Improvem (ASR 34 at ***

*** SOURCE DATA ***

SOURCE NUMBER	TYPE	WAKE	NUMBER PART. CATS.	EMISSION RATE TYPE=0,1 (GRAMS/SEC) TYPE=2 (GRAMS/SEC) *PER METER**2	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	HEIGHT (METERS)	TEMP. TYPE=0 (DEG.K); VERT.DIM TYPE=1 (METERS)	EXIT VEL. TYPE=0 (M/SEC); HORZ.DIM TYPE=1,2 (METERS)	DIAMETER TYPE=0 (METERS)	BLDG. HEIGHT TYPE=0 (METERS)	BLDG. LENGTH TYPE=0 (METERS)	BLDG. WIDTH TYPE=0 (METERS)
1	1	0	0	.45880E-02	828074.0	825478.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
2	1	0	0	.45880E-02	828086.0	825477.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
3	1	0	0	.45880E-02	828095.0	825476.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
4	1	0	0	.45880E-02	828107.0	825477.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
5	1	0	0	.45880E-02	828117.0	825479.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
6	1	0	0	.22940E-02	828127.0	825479.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
7	1	0	0	.22940E-02	828138.0	825481.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
8	1	0	0	.22940E-02	828148.0	825483.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
9	1	0	0	.22940E-02	828157.0	825485.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
10	1	0	0	.22940E-02	828168.0	825487.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
11	1	0	0	.41650E-02	827862.0	825458.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
12	1	0	0	.41650E-02	827853.0	825456.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
13	1	0	0	.41650E-02	827843.0	825454.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
14	1	0	0	.41650E-02	827832.0	825453.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
15	1	0	0	.41650E-02	827822.0	825450.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
16	1	0	0	.20820E-02	827810.0	825450.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
17	1	0	0	.20820E-02	827800.0	825447.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
18	1	0	0	.20820E-02	827790.0	825447.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
19	1	0	0	.20820E-02	827780.0	825446.0	.0	5.00	4.65	4.65	.00	.00	.00	.00
20	1	0	0	.20820E-02	827770.0	825445.0	.0	5.00	4.65	4.65	.00	.00	.00	.00

1

HIGH
1-HR
SGROUP#

1

*** Portal Emission for Castle Peak Road O/L Improvem (ASR 34 at ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- X -	- Y -	CON.	(DAY,HOUR)	- X -	- Y -	CON.	(DAY,HOUR)
827684.0	825436.0	16.68166	(1, 1)				

1

2ND
HIGH
1-HR
SGROUP#

1

*** Portal Emission for Castle Peak Road O/L Improvem (ASR 34 at ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- X -	- Y -	CON.	(DAY,HOUR)	- X -	- Y -	CON.	(DAY,HOUR)
827684.0	825436.0	.00000	(0, 0)				

RUN ENDED ON 08-21-96 AT 14:39:22

ASR ID	Location	X	Y	Distance from road kerb (m)	*Height above road level (m)	Worst wind angle (deg. from N)	**Max 1-hr average NO2 for year 2011 (µg/cu.m)
A1	Ka Loon Tsuen	821392.0	824166.0	9	3.5	73	217
A2	Ka Loon Tsuen	821502.0	824222.0	16	10.7	74	198
A3	Grand Bay Villa	822048.0	824364.0	15	1.5	49	216
A4	Hong Kong Garden	822312.0	824618.0	29	18.1	79	170
A5	Hong Kong Garden	822536.0	824722.0	29	5.3	95	186
A6	Lung Tang Court	822732.0	824780.0	57	1.5	241	182
A7	Tsing Lung Tau Village	822778.0	824737.0	19	1.5	252	203
A8	Tsing Lung Tau Village	822870.0	824726.0	42	1.5	258	173
A9	Villa Alfa Vista	822988.0	824638.0	12	1.5	61	251
A10	Sea Crest Villa Phase 4	823198.0	824834.0	77	31.5	75	152
A11	Dragonville	823428.0	824868.0	17	13.4	62	188
A12	Sea Crest Villa Phase 3	823528.0	824966.0	35	16.1	236	170
A13	Sea Crest Villa Phase 2	823748.0	825175.0	87	49.1	79	136
A14	Sea Crest Villa Phase 1	823986.0	825234.0	31	43.4	236	142
A15	Sham Tseng Tsuen Village	824070.0	825268.0	7	1.5	64	263
A16	Lido Garden	824078.0	825234.0	5	5.5	244	258
A17	Lido Garden	824087.0	825206.0	31	5.5	252	186
A18	Chan Kee Restaurant	824282.0	825434.0	22	1.8	229	229
A19	Rhine Garden	824398.0	825458.0	62	11.5	239	193
A20	Rhine Terrace	824608.0	825342.0	40	39.8	280	136
A21	Pink Villa	825028.0	824977.0	34	20.0	65	162
A22	Homi Villa	825291.0	825007.0	56	1.5	262	172
A23	Lot 403	825416.0	825202.0	23	23.0	231	159
A24	Vista Del Mar	825608.0	825364.0	38	23.6	67	163
A25	Riviera Apartments	825798.0	825428.0	14	1.5	61	204
A26	Edinburgh Villa	825802.0	825475.0	11	9.0	230	229
A27	Ting Kau	826106.0	825680.0	36	15.6	98	159
A28	Ting Kau	826285.0	825680.0	19	1.5	261	197
A29	Ting Kau	826324.0	825735.0	16	19.5	239	180
A30	Ting Kau	826672.0	825474.0	28	1.5	101	198
A31	Ting Kau	826916.0	825382.0	6	1.5	299	232
A32	Sunny Villa	827310.0	825442.0	61	36.2	264	142
A33	New building under construction (lot 322)	827436.0	825410.0	18	21.5	80	163
A34	Longbeach Gardens	827684.0	825436.0	12	11.5	81	192
A35	Garden View Terrace No.6	827950.0	825508.0	26	34.1	259	154
A36	Bayview Garden	828210.0	825514.0	8	14.8	259	170
A37	Future receptor (Lido Reclamation)	823975.5	825140.0	20	11.5	41	177
	ASR A37 with 15m setback from road kerb	823971.9	825150.8	15	11.5	45	190
	ASR A37 with 10m setback from road kerb	823970.3	825155.5	10	11.5	47	197
	ASR A37 with 5m setback from road kerb	823968.7	825160.3	5	11.5	49	203
A38	Future receptor (existing San Migual Brewery plant)	824350.4	825366.2	20	11.5	82	169
	ASR A38 with 15m setback from road kerb	824350.9	825370.1	15	11.5	84	174
	ASR A38 with 10m setback from road kerb	824351.6	825375.1	10	11.5	86	181
	ASR A38 with 5m setback from road kerb	824352.2	825380.0	5	11.5	88	188
A39	Future receptor (existing Garden Bakery plant)	824534.5	825311.5	20	11.5	129	180
	ASR A39 with 15m setback from road kerb	824538.1	825315.7	15	11.5	131	186
	ASR A39 with 10m setback from road kerb	824541.4	825319.5	10	11.5	132	193
	ASR A39 with 5m setback from road kerb	824544.6	825323.3	5	11.5	133	200
A40	Future receptor (existing Garden Bakery plant)	824624.5	825205.8	20	11.5	129	185
	ASR A40 with 15m setback from road kerb	824628.7	825209.4	15	11.5	130	189
	ASR A40 with 10m setback from road kerb	824632.5	825212.7	10	11.5	132	194
	ASR A40 with 5m setback from road kerb	824636.2	825216.0	5	11.5	134	198
A41	Future receptor (Lido Reclamation)	824093.5	825098.6	20	11.5	253	146
A42	Future receptor (existing San Migual Brewery plant)	824384.9	825154.7	20	11.5	104	140
A43	Future receptor (existing Union Carbide plant)	824514.4	825180.4	20	11.5	110	149
A44	Future receptor (existing Garden Bakery plant)	824627.3	825165.5	20	11.5	121	172
				HIGHEST			263

** The heights used for the assessment were 1.5 metres above the lowest residential floor level.*
*** Including estimated background NO2 concentration of 117.7 µg/cu.m.*

ANNEXE G

BASELINE AIR QUALITY MONITORING PROGRAMME

ANNEXE G

BASELINE AIR QUALITY MONITORING PROGRAMME

EXECUTIVE SUMMARY

A baseline air quality monitoring study was undertaken to determine the existing and background pollutant levels for the purposes of evaluating the cumulative air quality impacts of a road improvement scheme. Accordingly a programme of NOx monitoring was undertaken to establish approximate existing pollutant levels at a background site close to the proposed Castle Peak road development. The monitoring results will be combined with modelling predictions to obtain an indication of future cumulative pollution levels.

Measured concentrations of NO and NO_2 are typical of those of an urban background site. The median of hourly averaged concentrations for NOx, NO and NO_2 were 51ppb, 23ppb and 26ppb respectively. The highest hourly averaged NOx and NO_2 concentrations measured at this site were 248ppb and 93ppb respectively.

There were no exceedences of any air quality standards during the monitoring period. It should however be noted that the monitoring was undertaken for a short period of time during May, which for a number of reasons, is not usually a period of extreme pollutant concentrations.

G1 NOx: INTRODUCTION

G1.1 Preamble

A baseline air quality monitoring study was undertaken to determine the existing and background pollutant levels for the purposes of evaluating the cumulative air quality impacts of a road improvement scheme. Accordingly a programme of NOx monitoring was undertaken to establish approximate existing pollutant levels at a background site close to the proposed Castle Peak road development. The monitoring results will be combined with modelling predictions to obtain an indication of future cumulative pollution levels.

G1.2 Study Scope

The study concentrated on oxides of nitrogen (NOx). These pollutants are of particular interest because of their impact on local and regional air quality. A brief discussion of their sources follows.

G1.2.1 Oxides of Nitrogen

There are several oxides of nitrogen, some of which do not contribute significantly to urban air pollution. The most important of these compounds with respect to urban air pollution are Nitric Oxide (NO) and Nitrogen Dioxide (NO_2), which are referred to collectively as NOx.

NOx are formed at high temperature during combustion processes, such as those that occur in the internal combustion engine, jet engines and heating plants, from the thermal oxidation of nitrogen present in the air or nitrogenous compounds present in the fuel or material being burned. Natural NOx sources include electrical storms and natural fires. However background concentrations resulting from these sources are very low in comparison to those found in suburban and urban locations. In urban areas the majority of NOx usually originates from motor vehicles.

NO is the oxide of nitrogen emitted to the atmosphere in the greatest quantities. Although NO is relatively innocuous, it is easily oxidised to NO_2, which has been shown to have an adverse impact on health. Its main effect is on the respiratory system, with young children and asthmatics being the groups most at risk (QUARG, 1993).

The principal mechanisms for the conversion of NO to NO_2 are:

1. Oxidation by O_3

2. Oxidation by O_2 in the presence of high NO concentrations.

Air Quality Objectives (AQOs) for NO_2 have been established by the Hong Kong Government. There are also air quality guidelines recommended by the World Health Organisation. Hong Kong AQOs and WHO air quality guidelines are listed in Table G.1.

Table G.1 Nitrogen Dioxide Standards

Value	Averaging Period	Type of Standard	Source
400μgm^{-3} (210ppb)	1 hour	Health Protection guide value.	WHO
150μgm^{-3} (80ppb)	24 hours		
300μgm^{-3} (157ppb)	1 hour	Air Quality Objective.	Hong Kong
150μgm^{-3} (80ppb)	24 Hours	Air Quality Objective.	
80μgm^{-3} (42ppb)	1 Year	Air Quality Objective.	

* The main values quoted are in the original units from the source documents and are given first, with converted values given in brackets. The conversion factors used are based on a temperature of 293°K and a pressure of 101.3kPa.

G2 NOx: METHODOLOGY

G2.1 Site Location

The Horiba NOx analyser was located outside, in a weatherproof box, on a podium, on the 7th floor of a residential development. The site was considered appropriate for the measurement of background levels of NO_2. The sample intake was sited at a height of 120cm from the podium floor. The location overlooked Castle Peak Road and faced out to the sea.

G2.2 NOx Instrumentation

Samples were drawn into the NOx monitor via a 5m Polytetrafluoroethene (PTFE) sample line. All fittings that came into contact with the sample gas stream were Polytetrafluoroethene (PTFE) or stainless steel. The instruments conforms to EC directive specifications for the monitoring of NO_2.

G2.3 Calibration

After the NOx monitor had stabilized, it was calibrated using a purafil/activated carbon filter to provide a zero and a Distillers MG specialist calibration gas (8088F) to provide a span. Spans of 527ppb were set for NO and NOx. The calibration gas was cross compared with a standard at the UK Atmospheric Chemistry Research Unit (Silwood Park) and is traceable to international standards. Re-calibration was carried out at two weekly intervals. There was insignificant instrumental drift during the monitoring period.

G2.4 NOx Data Collection and Processing

Outputs from the instruments were linked to a Squirrel 1200 series data logger (Grant Instruments). The 4-20mA outputs from the NOx analyser were recorded every two minutes and corrected against calibration of the logger. Logged data was then processed using CES in-house software. The CES software calculates hourly averages and span factors that allow for compensation of instrument signal drift between subsequent calibrations. The time presented for hourly averaged concentrations was taken as the last minute in the hourly averaging period. The data was processed using documented quality control procedures at all steps including the removal of over/under range values and spike removal.

G3 NOx RESULTS

G3.1 Data Recovery

454 hours of data were recovered from the NOx analyser between 1st and 30th May 1995. This data was successfully processed and the results follow.

G3.2 NOx Pollutant Concentrations

The statistical distribution of most air pollutants is generally positively skewed with a large number of relatively low values and occasional very high peak concentrations. Under such conditions it is often inadequate to express the results in terms of mean concentrations and it is common to express the results in terms of the percentiles instead. The results of this air quality programme are expressed in terms of these statistics, where appropriate, throughout this study.

G3.2.1 Oxides of Nitrogen

A statistical summary of NOx concentrations is given in the following table G.2. Time series plots are provided below. Measured concentrations of NO and NO_2 are typical of those of an urban background site.

Table G.2 NOx Monitoring: Summary Statistics

Parameter	Hourly Averages (ppb)		NO_2:NO_x	24-hour Average (ppb)
	NO_x	NO_2		NO_2
Mean	57.69	28.19	0.49	28.17
S.D.	34.74	16.56	0.14	9.31
Skew	1.16	0.82	-0.29	0.88
Kurtosis	1.87	0.45	1.25	0.52
min	2.51	0.01	0.00	13.79
2 %ile	12.39	2.25	0.17	14.63
5 %ile	15.72	5.63	0.27	15.34
10 %ile	20.63	8.97	0.33	17.69
25 %ile	31.22	16.39	0.41	21.56
median	50.54	26.15	0.49	26.27
75 %ile	74.46	36.27	0.58	33.83
90 %ile	109.41	51.92	0.66	39.04
95 %ile	126.46	62.62	0.69	48.69
98 %ile	143.64	67.11	0.76	53.59
max	247.78	92.69	0.98	54.50

Concentrations of NOx are influenced by numerous factors. The most significant of these are wind speed, wind direction and distance from the pollutant sources. In the case of NO_2, which is principally considered to be a secondary pollutant, atmospheric chemistry is also important.

NO is the predominant oxide of nitrogen emitted from motor vehicles and is oxidised rapidly to NO_2 in the presence of ozone. The timescale for this reaction is of the order of minutes, but it is usually ozone limited in urban air and therefore NO is typically not completely converted to NO_2. In addition there is a competing reaction in which NO_2 is photolysed by sunlight back to NO. For these reasons the NO_2:NOx ratios very close to a source are typically about 0.1 as there would have been insufficient time for the reaction with ozone. Conversely in remote locations, the NO_2:NOx ratio can reach 0.85 or more.

The median NO_2:NOx ratio at the monitoring site was 0.49, which is typical of an urban background site. The ratio suggests some local sources of NO during monitoring. Plots of the mean diurnal variation for NOx, presented below, show a variation in NOx levels and NO_2:NOx ratios throughout the day. It can be seen that in the morning there was a sudden increase in the concentration of NO and a subsequent fall in the NO_2:NOx ratio. This morning period corresponds to the peak commuting time suggesting that the most significant source of NOx is motor vehicles. NO_2 followed a similar profile to NO and NOx.

The occurrence of slightly elevated NOx levels during the night may be attributed to the diurnal cycle of wind speed. Unfortunately, meteorological data was not available during monitoring, but wind speed is generally highest during mid-afternoon and lowest at night. During conditions of low wind speed there is limited dispersion and a build up of pollutants may occur.

G3.3 Comparison with NO_2 Air Quality Guidelines

As already discussed in section 1.2.1, NO_2 is the subject of an AQO in Hong Kong. A comparison is made, below in Table G.3, between Hong Kong AQOs, WHO guidelines and the monitoring results.

Table G.3 Comparison of NO_2 Concentrations with Air Quality Guidelines

Standard Source	Regulatory Value or Guideline	Measured Value
Hong Kong Government AQO	157ppb as an hourly average.	93ppb
Hong Kong Government AQO	80ppb as a 24 hour average.	55ppb
Hong Kong Government AQO	42ppb as an annual average.	28ppb*
WHO	210ppb as an hourly average.	93ppb
WHO	80ppb as a 24 hour average.	55ppb

* Mean over monitoring period.

G4 DISCUSSION OF NOx MONITORING RESULTS

Comparison of the data with that collect at the EPD fixed air monitoring network stations during 1991 indicates that pollutant concentrations were typical of those of an urban background site with moderate pollutant levels. Measured levels of NO_2 were lower than those measured at the Tsuen Wan monitoring station during 1991.

The mean diurnal cycles of NOx were indicative of a site where the dominant source of pollutants is motor vehicles. Morning and late evening peaks in NO, NO_2, and NOx concentrations are visible, corresponding to commuting patterns. The measured NO_2:NOx ratios suggest that the dominant sources of NOx were reasonably close to the monitoring site, as expected for an urban area.

There were no exceedences of any air quality standards during the monitoring period. It should however be noted that the monitoring was undertaken for a short period of time during May, which for a number of reasons, is not usually a period of extreme pollutant concentrations.

There are two types of episode in which pollutant levels may be enhanced. During the winter, stable atmospheric conditions, associated with anticyclonic weather and persistent nocturnal temperature inversions, encourage the build up of NOx, CO and PM_{10}. In addition, the very high NO concentrations attained may result in the formation of high concentrations of NO_2. The second type of episode occurs during the hot, sunny conditions associated with summer anticyclonic weather. Under these conditions O_3 and possibly NO_2 concentrations may be enhanced following increased photochemical activity.

During May, when the monitoring was undertaken, persistent temperature inversions, which are important for pollutant build up, are rare because of the increased day length and solar radiation levels. In addition the monitoring was not within the period when the photochemical activity required for summer episodes is greatest.

The conversion of NO to NO_2 is strongly dependent upon the concentration of oxidants, especially O_3, present in the atmosphere. The monitoring data suggest that NOx concentrations were at a level where, given sufficient oxidant, guideline concentrations may be exceeded. Summary O_3 data from a nearby monitoring site, at Tsuen Wan, were available for the period 1989-1991. The Tsuen Wan monitoring station is on the fourth floor of a building in an urban location. The maximum 1 and 24 hour mean concentrations were 90ppb and 34ppb respectively. The annual mean concentrations at this site were 8ppb, 8ppb and 7ppb for 1989, 1990 and 1991 respectively. It appears that whilst NOx concentrations are sufficient for exceedence of the guidelines the O_3 concentrations may not be high enough to allow significant conversion to NO_2. It should however be noted that large spatial variations in O_3 are to be expected in urban areas in view of its rapid rate of reaction with NO. Therefore, even though Tsuen Wan is the nearest O_3 monitoring site to that used by CES, it is uncertain whether O_3 concentrations are representative of those at the CES monitoring site.

G5 CONCLUSIONS OF NOx BASELINE MONITORING PROGRAMME

- The maximum 1 and 24 hour average level of NO_2 recorded during monitoring was 93ppb and 55ppb respectively.

- Concentrations of NOx were typical of those of an urban background site.

- The dominant source of NOx at the monitoring site was motor vehicles on the surrounding road network.

- There were no exceedences of Hong Kong AQOs or WHO guidelines for NO_2 during the monitoring period.

G6 TSP AND RSP BASELINE MONITORING RESULTS

Baseline monitoring for Total Suspended Particulates (TSP) and Respirable Suspended Particulates (RSP) was conducted at the podium of Sea Crest Villas Phase IV in May 1995. TSP and RSP levels were monitored using a Partisol Model 2000 air sampler and a GMW Model GS2310 air sampler respectively. Fourteen 24-hour average TSP and RSP readings were recorded.

The baseline air monitoring results are summarized in Table G.4 and are shown in Figures G1 and G2. No exceedances of the AQOs were recorded. The means of the 24-hour average TSP and RSP levels were below 60 $\mu g\ m^{-3}$, which are well within the 24-hour average AQOs for TSP (260 $\mu g\ m^{-3}$) and RSP (180 $\mu g\ m^{-3}$). These indicate a relatively low background dust level at Sea Crest Villas.

Table G.4 Baseline 24-hour Average TSP and RSP Levels

Date	TSP (μgm^{-3})	RSP (μgm^{-3})
2/05/95	38	--
3/05/95	46	34
4/05/95	21	35
15/05/95	128	105
16/05/95	63	45
17/05/95	96	72
18/05/95	38	46
19/05/95	29	33
20/05/95	42	35
22/05/95	54	39
23/05/95	46	39
24/05/95	88	60
25/05/95	39	31
26/05/95	34	26
27/05/95	30	26
Arithmetic Mean	53	45
Geometric Mean	47	41

G7 REFERENCES

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G8 GLOSSARY

Abbreviations

AQO	Air Quality Objective
EC	European Community
EUN	Enhanced Urban Network
hv	Solar radiation
M	An energy adsorbing molecule
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOx	Oxides of nitrogen
$O^{\cdot}$	Oxygen radical
O_2	Oxygen molecule
O_3	Ozone
ppb	parts per billion
ppm	parts per million
PTFE	Polytetrafluoroethene
QUARG	Quality of Urban Air Review Group
UKPORG	United Kingdom Photochemical Oxidants Review Group
WHO	World Health Organisation
μgm^{-3}	microgram per cubic metre

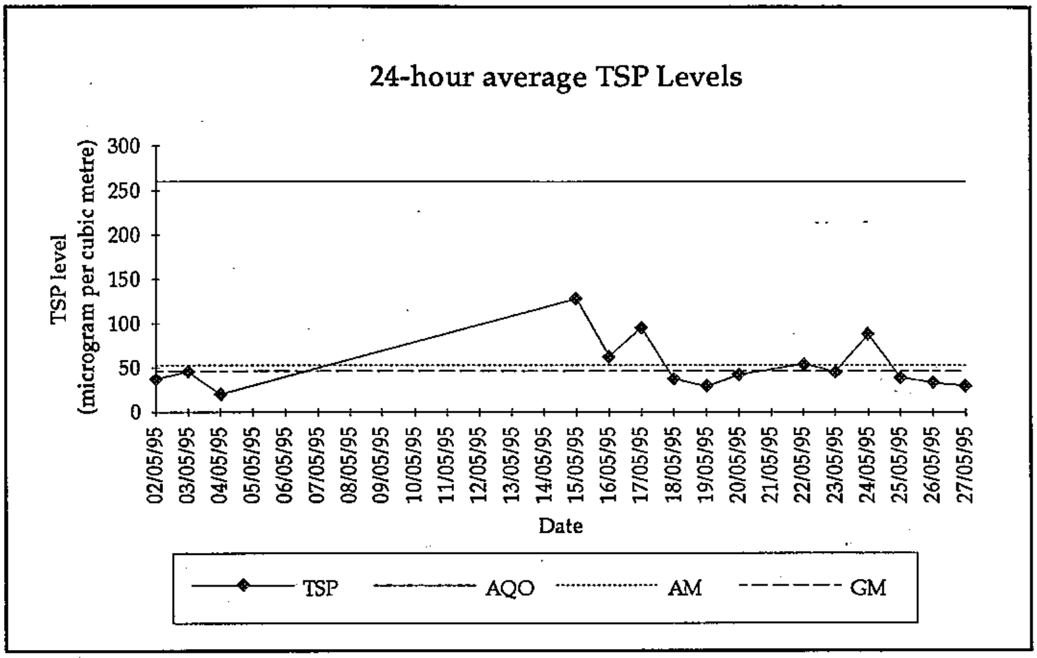


Figure G1 Baseline 24-hour average TSP levels at the Sea Crest Villas

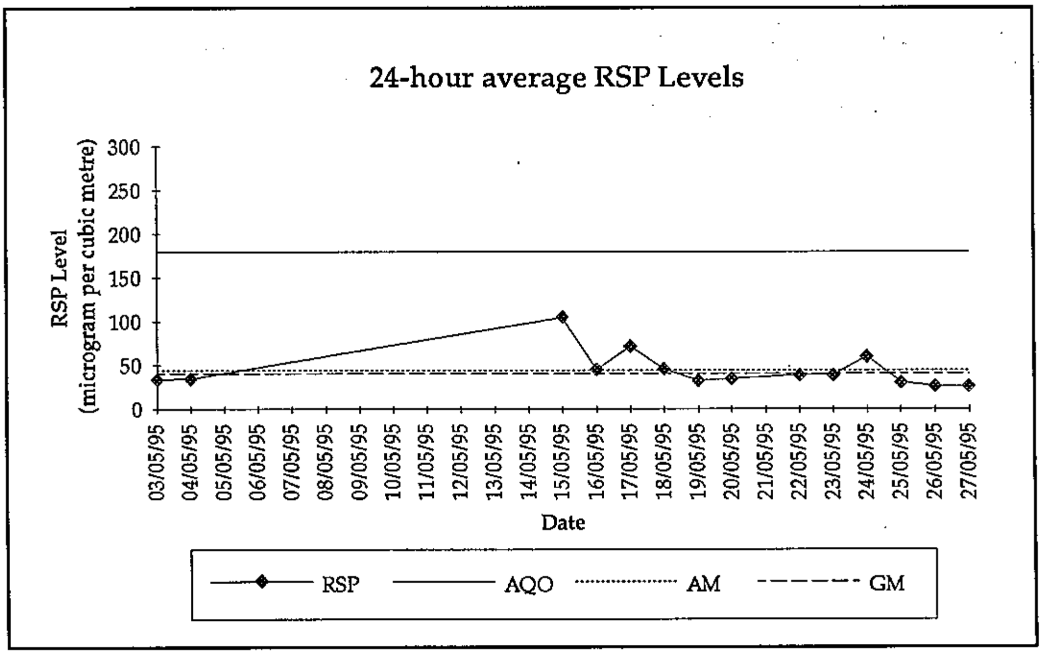
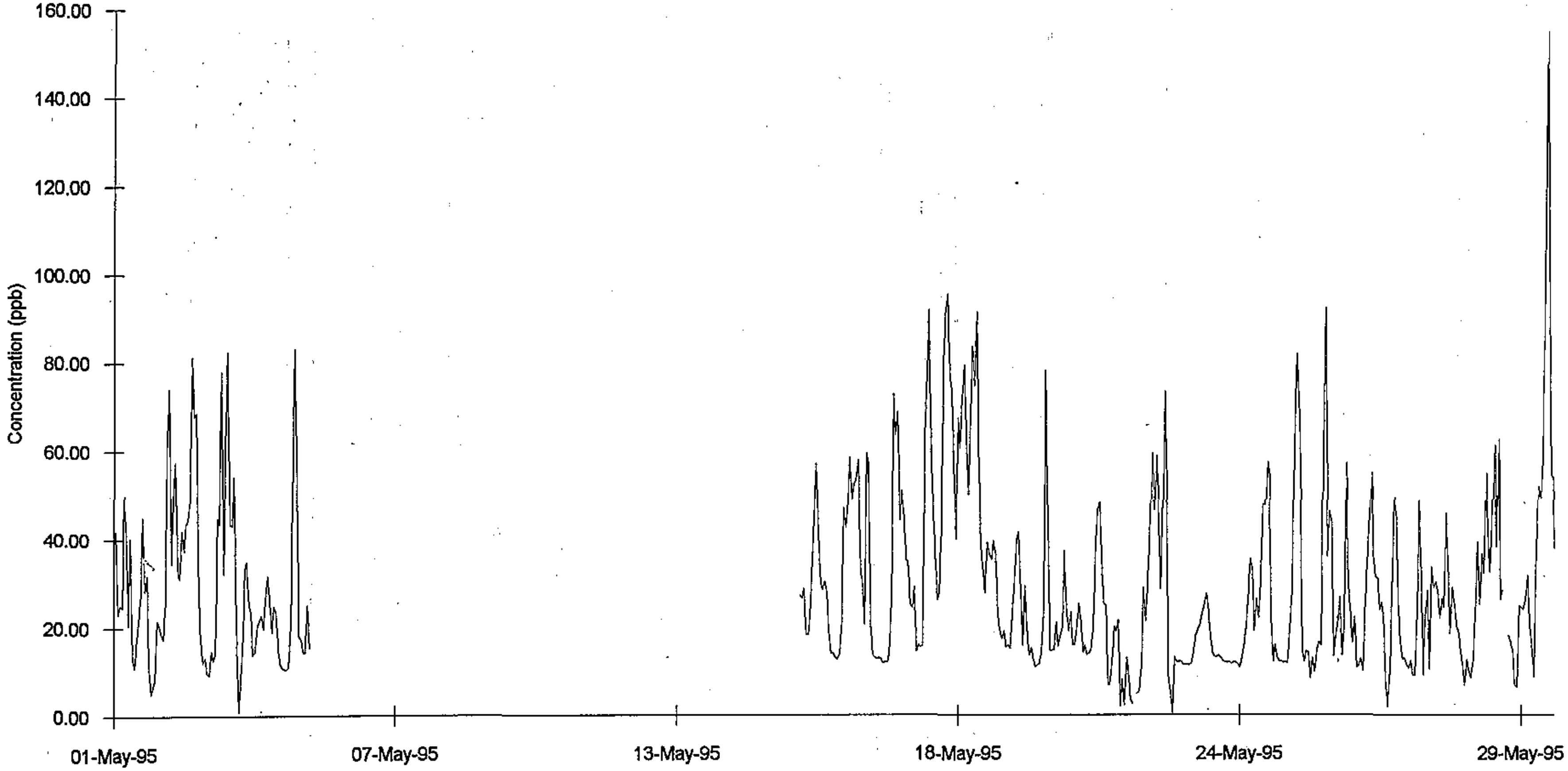


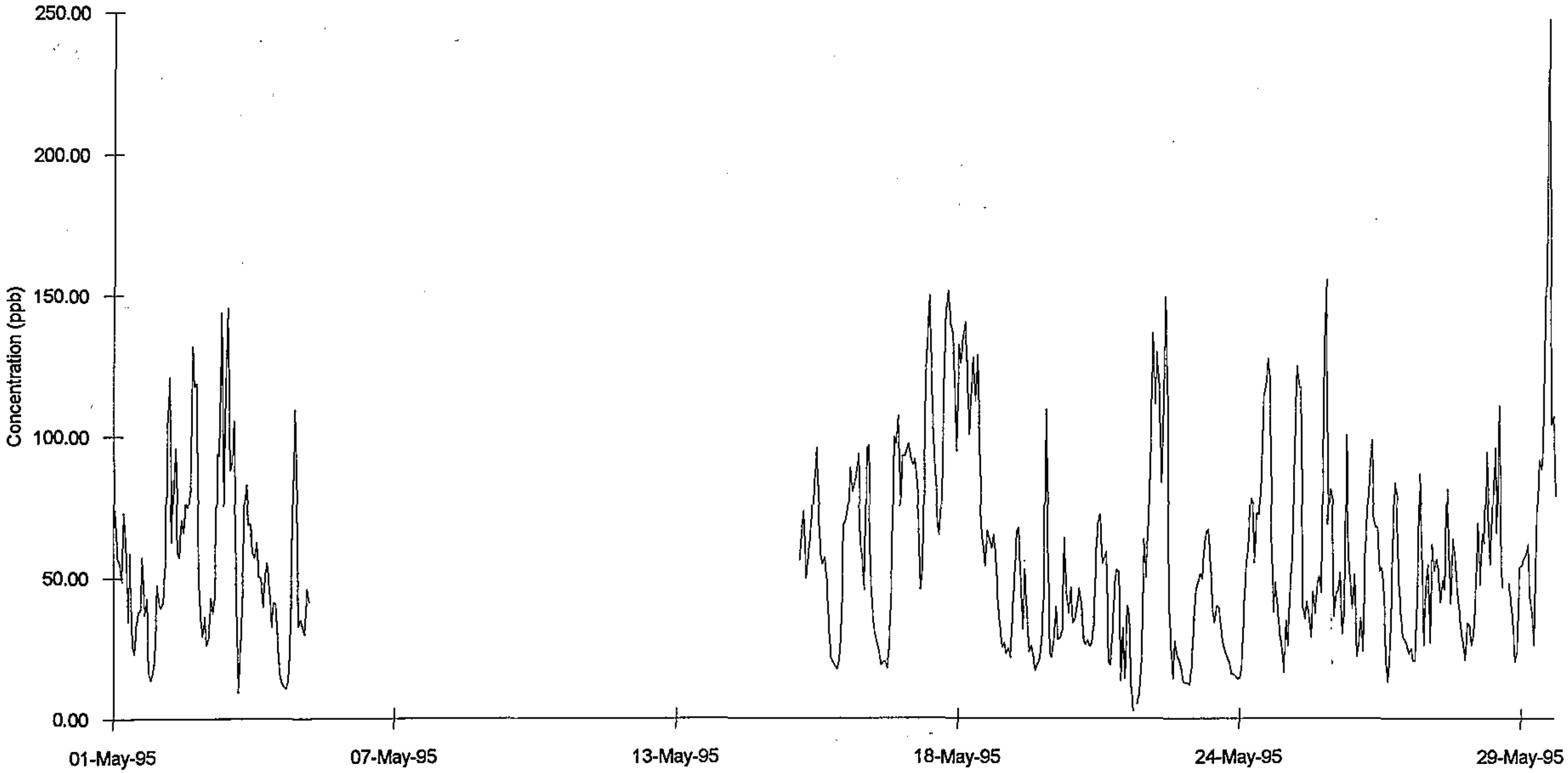
Figure G2 Baseline 24-hour RSP levels at the Sea Crest Villas

Annexe G

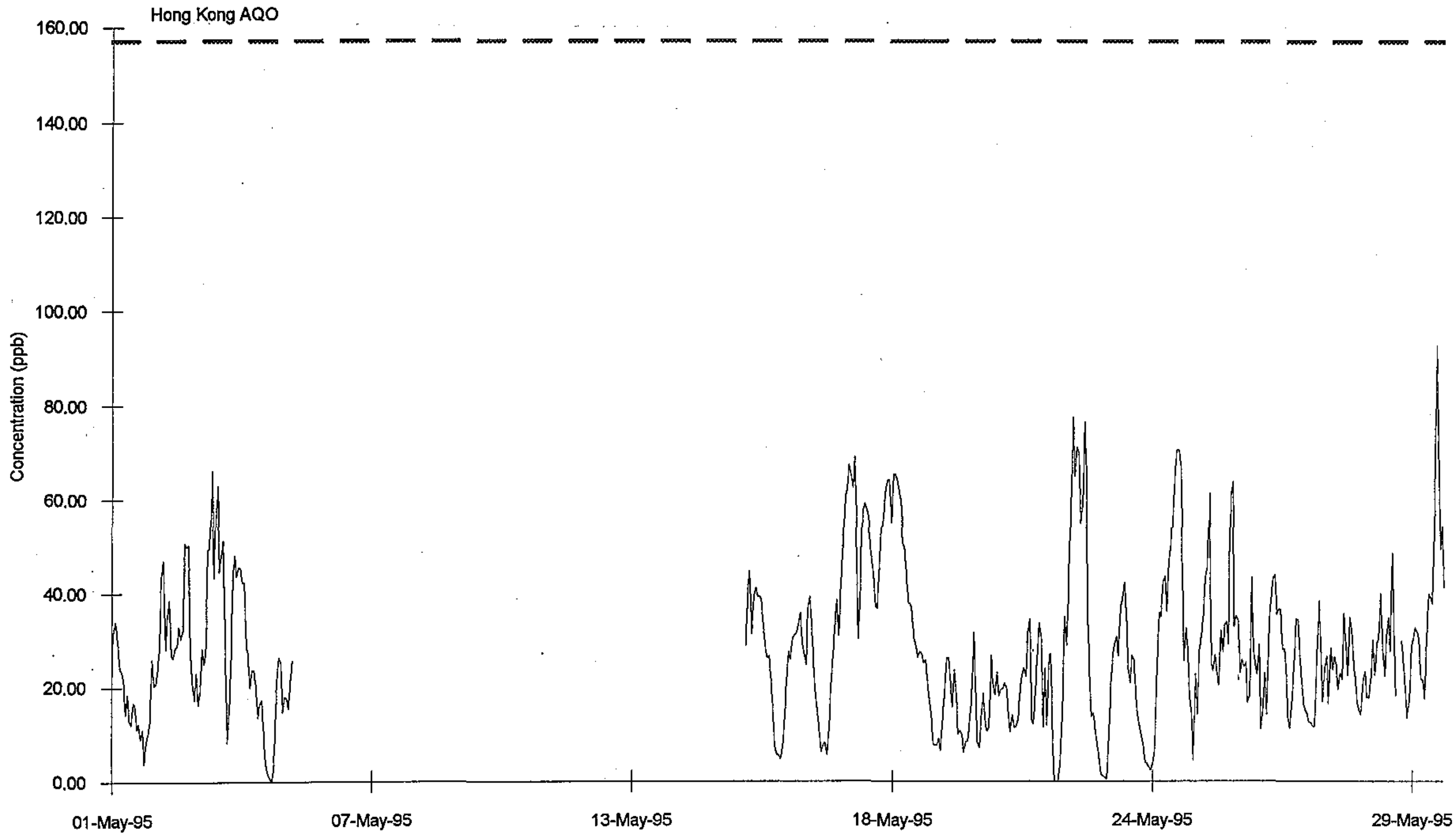
Nitric Oxide (Hourly Average)

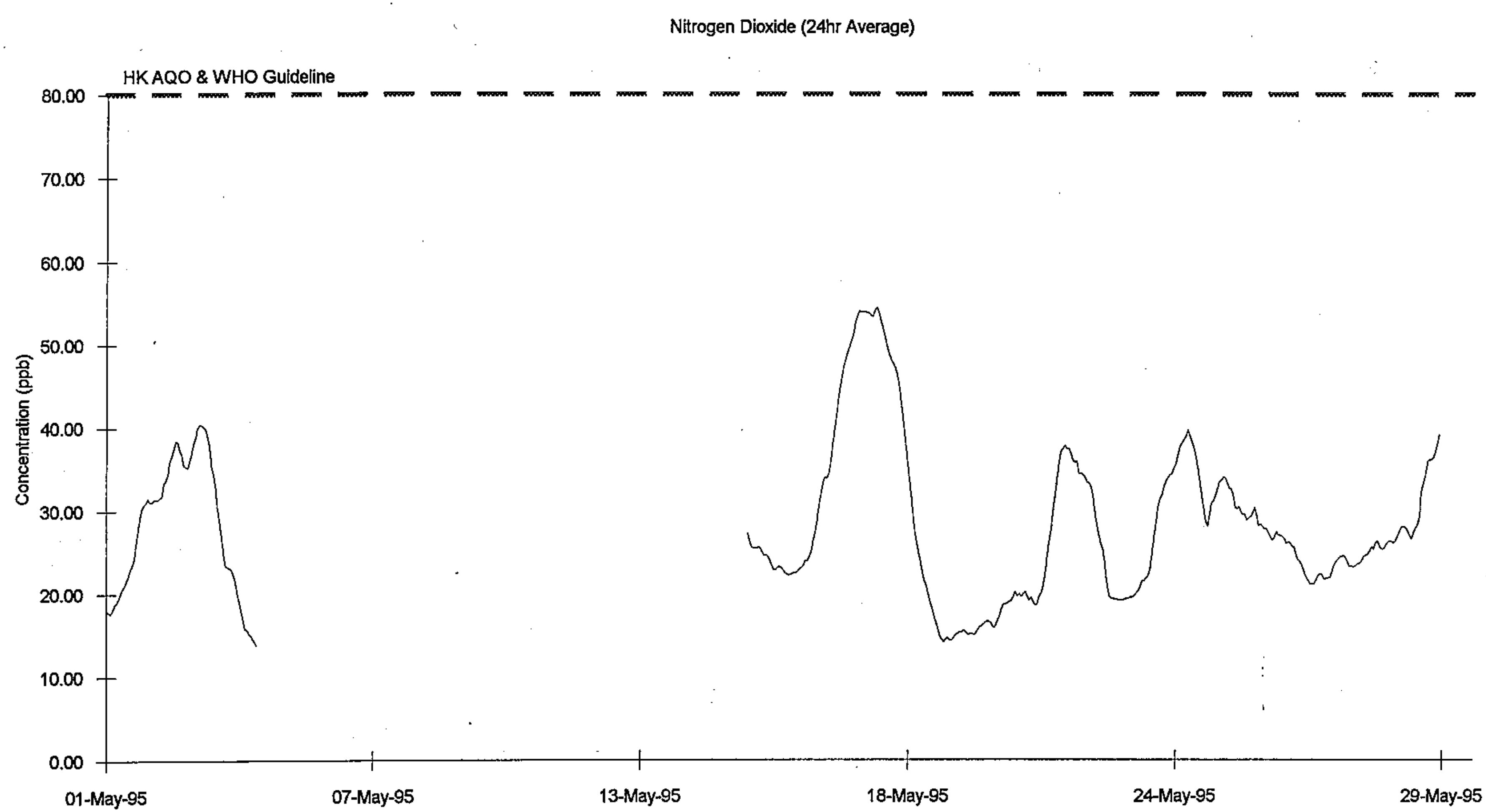


Oxides of Nitrogen (Hourly Average)

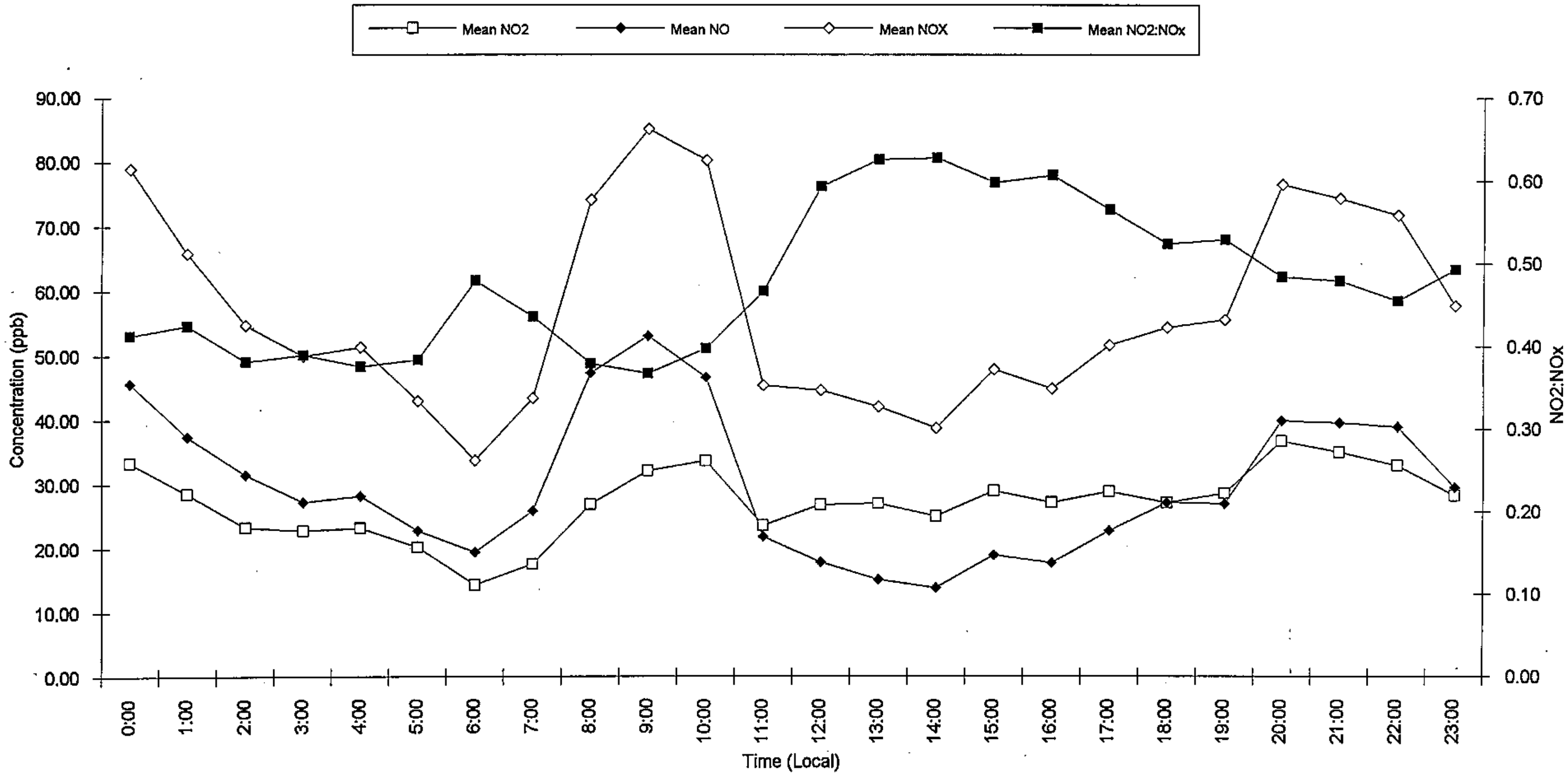


Nitrogen Dioxide (Hourly Average)




Nitrogen Dioxide (24hr Average)
HK AQO & WHO Guideline
Concentration (ppb)
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
01-May-95
07-May-95
13-May-95
18-May-95
24-May-95
29-May-95

Mean Diurnal Variation



ANNEXE H

PRELIMINARY CONSTRUCTION PROGRAMME

ANNEXE H

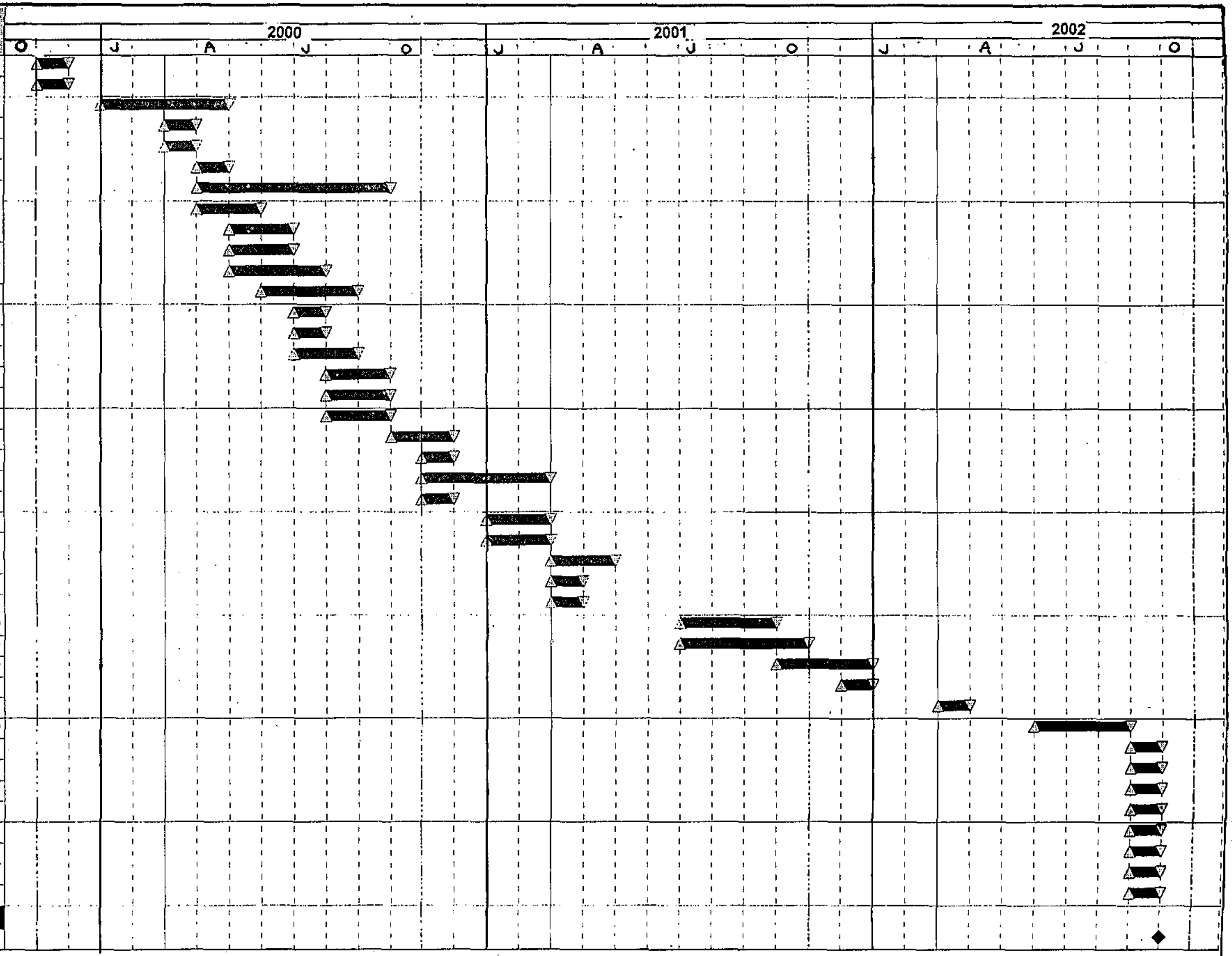
PRELIMINARY CONSTRUCTION PROGRAMME

H1 The construction methodology, programme and equipment lists will be determined by the contractors responsible for the construction of the improved road. A possible programme, proposed by Maunsell Consultants and outlined on the following pages, has been used as the basis for the construction-phase impacts. This methodology, and its resulting programme and equipment lists, are a possible scenario only. Further details of the programme are contained in Volume 1 ("Engineering Assessment") of this Study.

H2 Construction is expected to last for about 3 years. The improvement works will be split into two contracts: the western half (from Ka Loon Tsuen to Sham Tseng) and the eastern half (Sham Tseng to Area 2, Tsuen Wan). On the following schedules, all construction tasks associated with the western contract begin with the initial "W", while all tasks associated with the eastern contract begin with the initial "E".

H3 The construction works will entail construction of both at-grade and elevated roads. In addition, drainage along the ground level roads will be installed. Extensive excavation works and earthworks will be required, as well as a small amount of new reclamation. The need for dredging is not anticipated.

Activity ID	Activity Description	Orig Dur
EW03	WB Cway 5405-5430	1
EW24	WB Cway 7990-8080	1
EEGB	Sham Tseng Link R'bout	4
EE06	EB Cway 5480-5600	1
EW06	WB Cway 5495-5600	1
EE20	EB Cway 7600-7830	1
EEST	Sham Tseng East R'Bout	6
EW01	WB Cway 5000-5195	2
EE09	EB Cway 5685-5815	2
EE17	EB Cway 6670-6850	2
EW21	WB Cway 7590-7830	3
EE01	EB Cway 5000-5195	3
EE19	EB Cway 7510-7600	1
EE24	EB Cway 8290-8400	1
EW18	WB Cway 6670-6850	2
EW22	WB Cway 7830-7930	2
EW26	WB Cway 8275-8395	2
EW27	WB Cway 8695-8970	2
EE21	EB Cway 7830-8080	2
EE12	EB Cway 6140-6230	1
EE13	EB Cway 6230-6450	4
EW12	WB Cway 6150-6230	1
EE18	EB Cway 6850-7510	2
EW19	WB Cway 6850-7470	2
EW13	WB Cway 6230-6320	2
EW15	WB Cway 6380-6450	1
EW20	WB Cway 7470-7490	1
EE11	EB Cway 5900-6140	3
EW10	WB Cway 5785-5815	4
EE25	EB Cway 8400-8970	3
EW09	WB Cway 5735-5755	1
EE23	EB Cway 8230-8290	1
EETK	Ting Kau R'Bout	3
EE02	EB Cway 5195-5315	1
EE05	EB Cway 5460-5480	1
EE07	EB Cway 5600-5625	1
EE15	EB Cway 6520-6540	1
EW05	WB Cway 5480-5495	1
EW07	WB Cway 5600-5620	1
EW11	WB Cway 6130-6150	1
EW17	WB Cway 6520-6540	1
Completion Date		
ECD1	Completion	0



Early Bar

Critical Activity

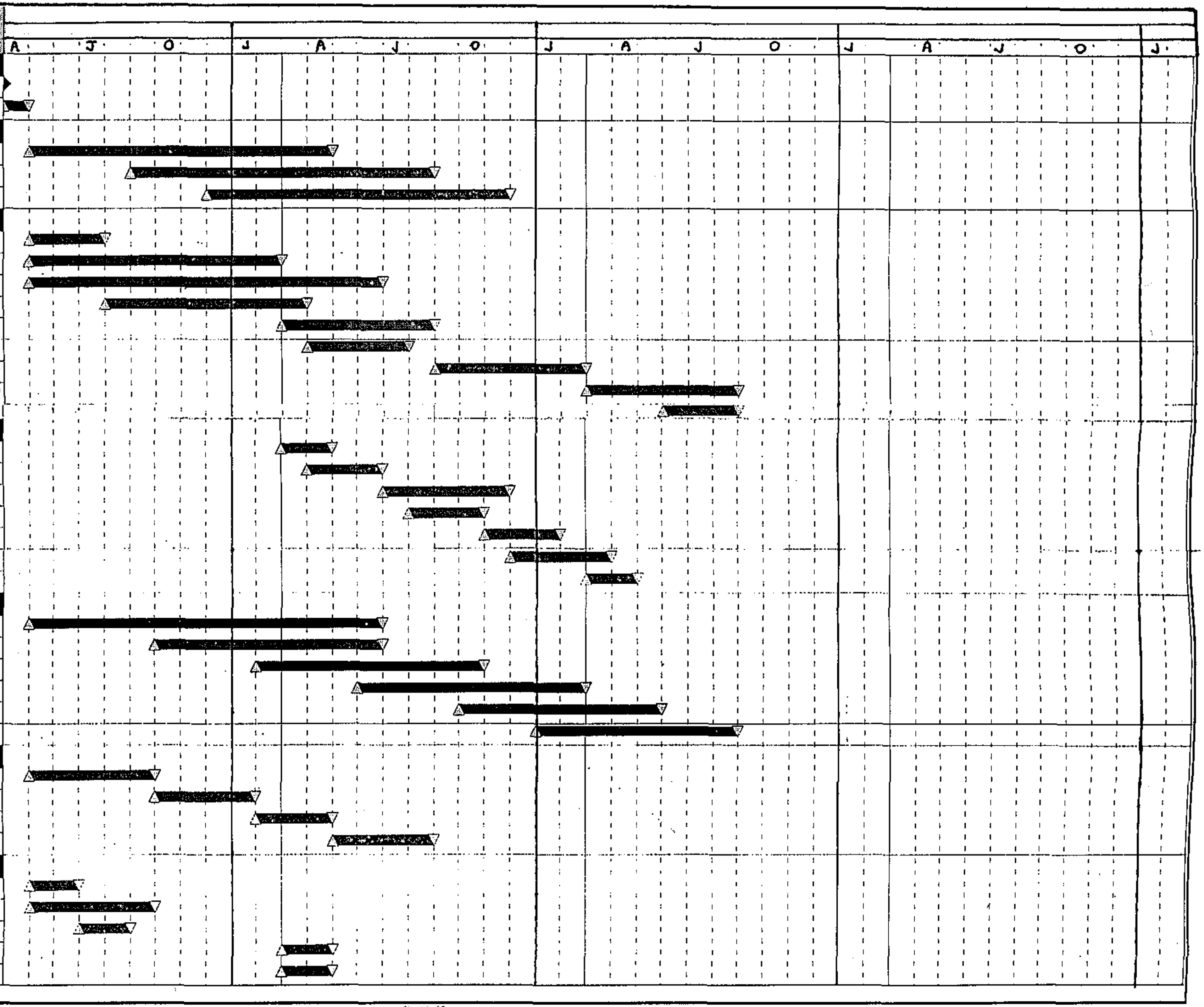
(c) Primavera Systems, Inc.

ECPR

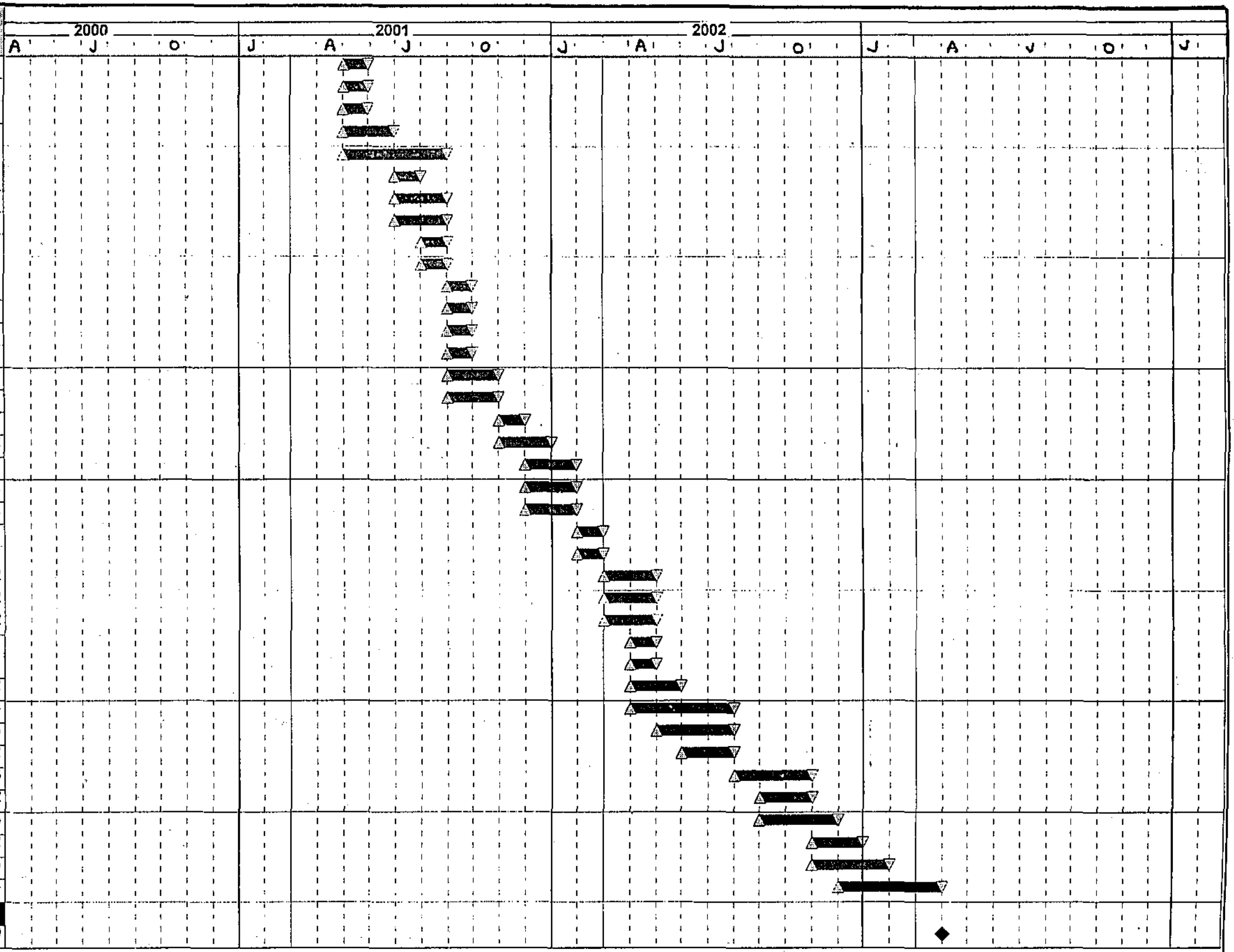
Sheet 2 of 2

Preferred Alignment
Construction Programme
East Section Ch. 4800-8970

Activity ID	Activity Description	Orig Dur
Site Establishment		
ECC1	Commence Contract	0
WS01	Establish Site	1
Reclamation		
W01R	Reclaim. 2740-2980	12
W03R	Reclaim. 4400-4800	12
W02R	Reclaim. 3800-4120	12
Excavation		
WX07	Exc. 3520-3580	3
WX04	Exc. 1670-1880	10
WX05	Exc. 1890-2190	14
WX06	Exc. 3020-3120	8
WX03	Exc. 1550-1660	6
WX08	Exc. 3600-3660	4
WX01	Exc. 1100-1280	6
WX02	Exc. 1280-1480	6
WX09	Exc. 4150-4270	
Fill		
WF02	Fill 1550-1690	2
WF05	Fill 3140-3270	3
WF03	Fill 2250-2460	5
WF06	Fill 3580-3650	3
WF07	Fill 3710-3800	3
WF04	Fill 2470-2740	4
WF01	Fill 1000-1220	2
Structure		
W03W	WB Via 2155-2245	14
W01E	EB Via 2215-2245	9
W02W	WB Via 1860-1940	9
W01W	WB Via 1460-1565	9
W04W	WB Via 3090-3150	8
W05W	WB Via 3305-3395	8
Retaining Wall		
WR01	RW 1000-1220	5
WR02	RW 1600-1690	4
WR04	RW 3530-3570	3
WR03	RW 3140-3230	4
C'way / Junction		
WE13	EB Cway 3395-3530	2
WABR	Anglers Beach Rbout	5
WW15	WB Cway 3395-3550	2
WE04	EB Cway 1670-1860	2
WW04	WB Cway 1700-1830	2



Activity ID	Activity Description	Orig Dur
WE11	EB Cway 2860-3000	1
WW05	WB Cway 1830-1860	1
WW12	WB Cway 2860-3020	1
WW03	WB Cway 1565-1700	2
WYTV	Lung Tang R'bout	4
WW07	WB Cway 1970-2100	1
WE06	EB Cway 1940-2155	2
WW14	WB Cway 3150-3305	2
WE15	EB Cway 3620-3740	1
WW18	WB Cway 3640-3720	1
WE07	EB Cway 2155-2215	1
WW06	WB Cway 1940-1970	1
WW08	WB Cway 2100-2155	1
WW19	WB Cway 3720-3740	1
WE18	EB Cway 4500-4800	2
WW22	WB Cway 4500-4800	2
WW16	WB Cway 3550-3620	1
WE05	EB Cway 1860-1940	2
WE08	EB Cway 2245-2460	2
WE14	EB Cway 3530-3620	2
WW09	WB Cway 2245-2460	2
WW17	WB Cway 3620-3640	1
WW20	WB Cway 3740-3860	1
WE16	EB Cway 3740-3860	2
WE17	EB Cway 3920-4500	2
WW21	WB Cway 3920-4500	2
WE09	EB Cway 2460-2530	1
WW10	WB Cway 2460-2530	1
WW11	WB Cway 2630-2720	2
WLTR	Hong Kong Garden R'bout	4
WW01	WB Cway 1000-1250	3
WE10	EB Cway 2630-2720	2
WE01	EB Cway 1000-1370	3
WE02	EB Cway 1370-1460	2
WW13	WB Cway 3020-3090	3
WW02	WB Cway 1250-1460	2
WE03	EB Cway 1460-1670	3
WE12	EB Cway 3000-3395	4
Completion Date		
ECD1	Completion	0



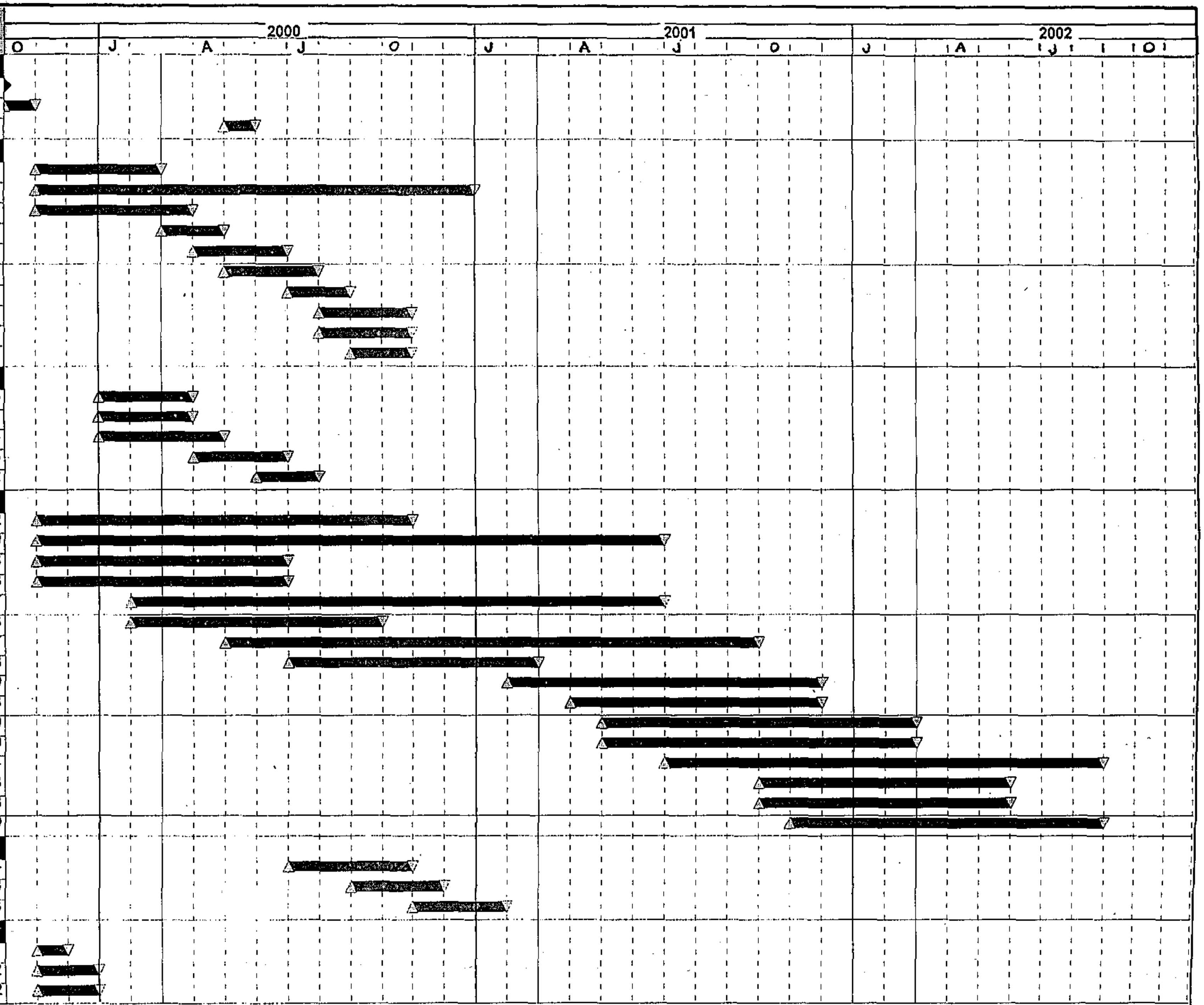
Early Bar
Critical Activity

WCPR

Preferred Alignment
Construction Programme
West Section Ch. 1000-4800

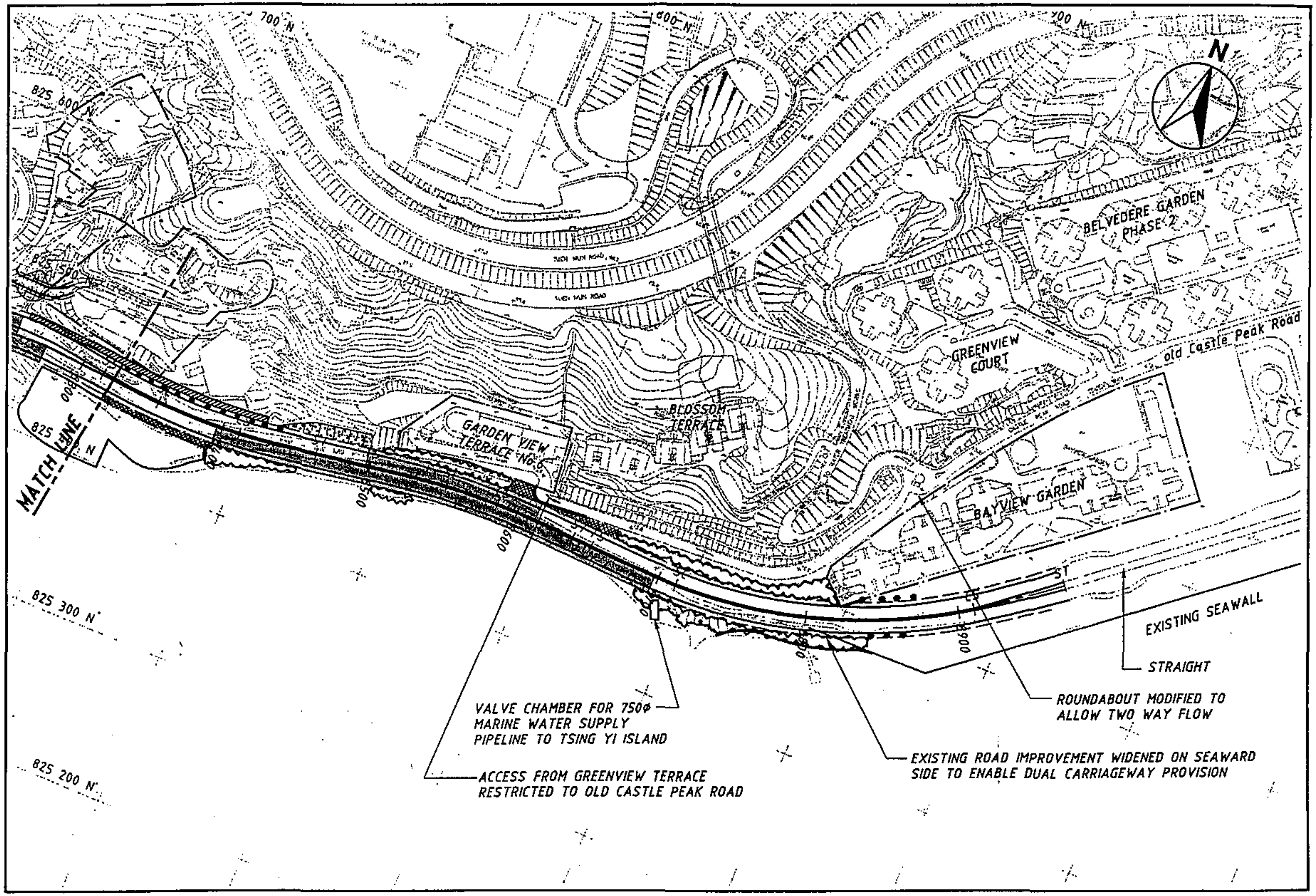
Sheet 2 of 2

Activity ID	Activity Description	Orig Dur
Site Establishment		
ECC1	Commence Contract	0
ES01	Establish Site Phase 1	1
ES02	Establish Site Phase 2	1
Excavation		
EX02	Exc. 5470-5600	4
EX08	Exc. 6800-7520	14
EX09	Exc. 7600-7980	5
EX03	Exc. 5720-5800	2
EX10	Exc. 8260-8500	3
EX04	Exc. 5930-6080	3
EX07	Exc. 6360-6450	2
EX05	Exc. 6130- 6240	3
EX06	Exc. 6250-6330	3
EX01	Exc. Sham Tseng	2
Fill		
EF01	Fill 5100E-5195	3
EF02	Fill 6320-6380	3
EF03	Fill 6520-6700	4
EF04	Fill 6710-6820	3
EF05	Fill 8800-8920	2
Structure		
E01B	Ting Kau Br 6450-6520	12
E05W	WB Via 5815-6130	20
E06W	WB Via 6320-6380	8
E07W	WB Via 7490-7590	8
E04E	EB Via 5815-5900	17
E08W	WB Via 7930-7990	8
E10W	WB Via 8395-8695	17
E04W	WB Via 5755-5785	8
E03W	WB Via 5620-5735	10
E03E	EB Via 5625-5685	8
E05E	EB Via 8160-8230	10
E09W	WB Via 8160-8275	10
E01W	WB Via 5195-5405	14
E02E	EB Via 5430-5460	8
E02W	WB Via 5430-5480	8
E01E	EB Via 5315-5405	10
Retaining Wall		
ER03	RW 8260-8430	4
ER02	RW 6360-6450	3
ER01	RW 6250-6330	3
C'way / Junction		
EE03	EB Cway 5405-5430	1
EEHV	Hanley Villa Junct	2
EERT	Rhine Terrace Junct	2



ANNEXE I

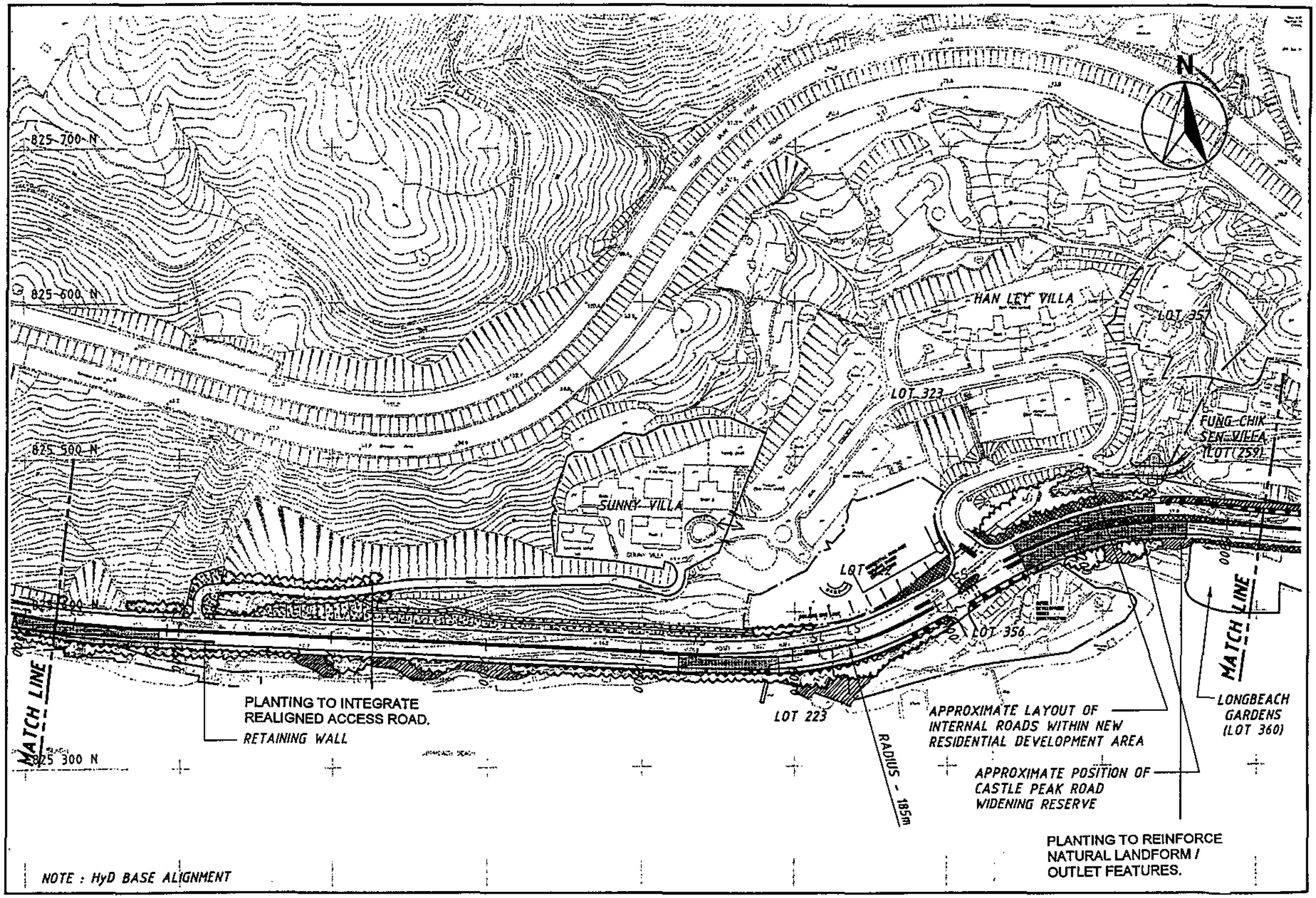
LANDSCAPE AND VISUAL IMPACTS



E B C HASSELL

CHAINAGE 8300 - 8900 - PREFERRED OPTION

TSUEN WAN



EBC HASSELL

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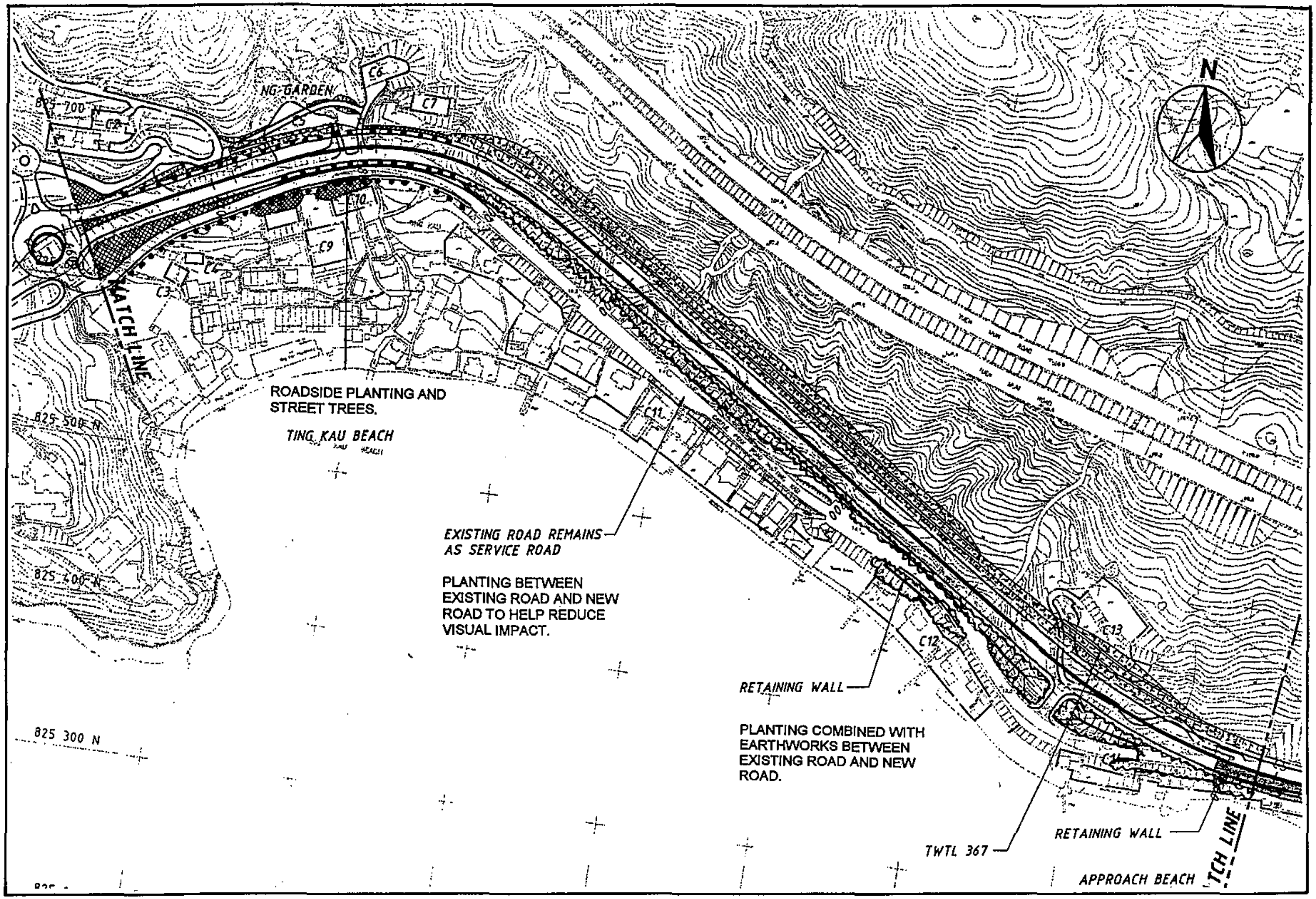
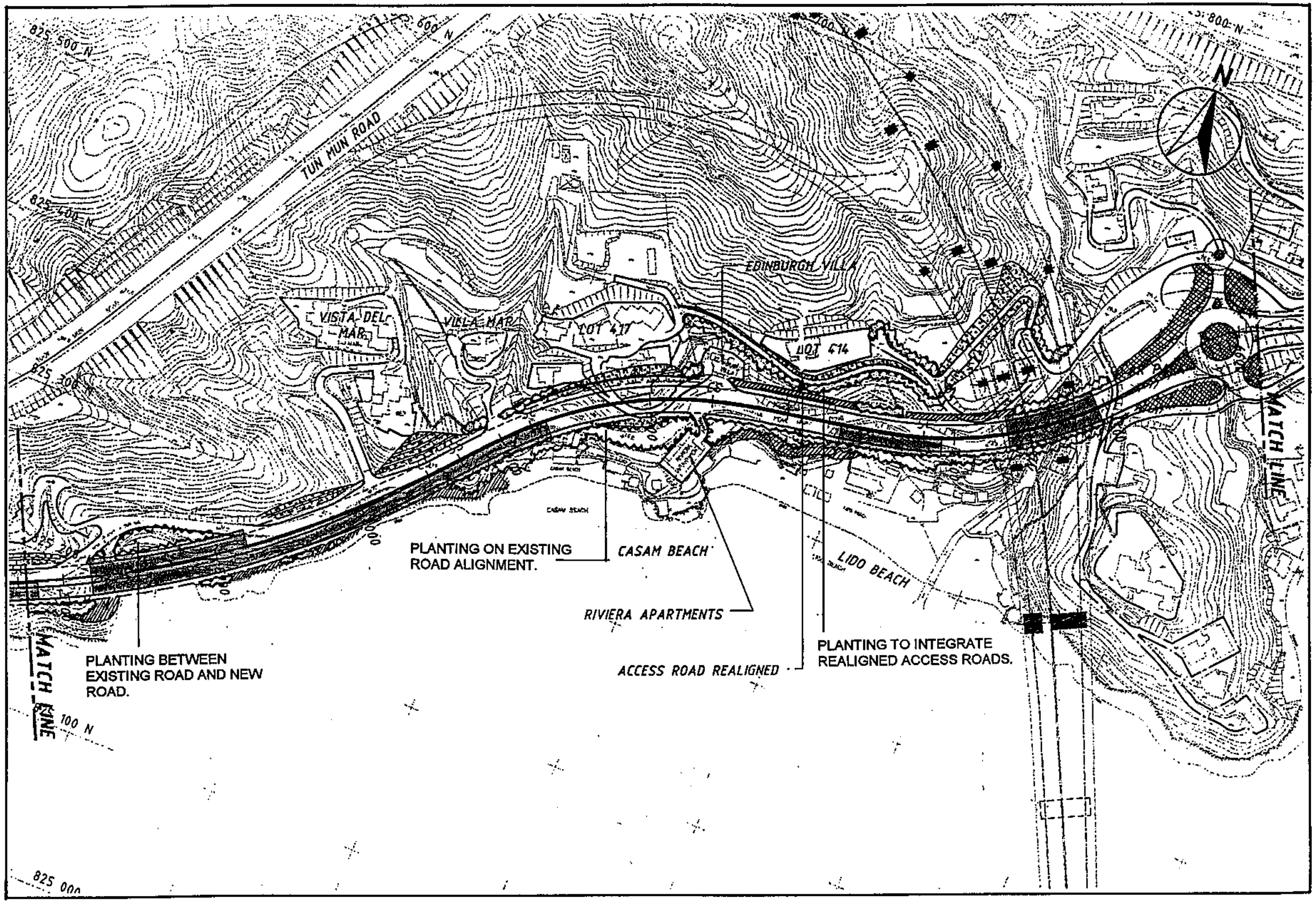
YAU KOM TAU



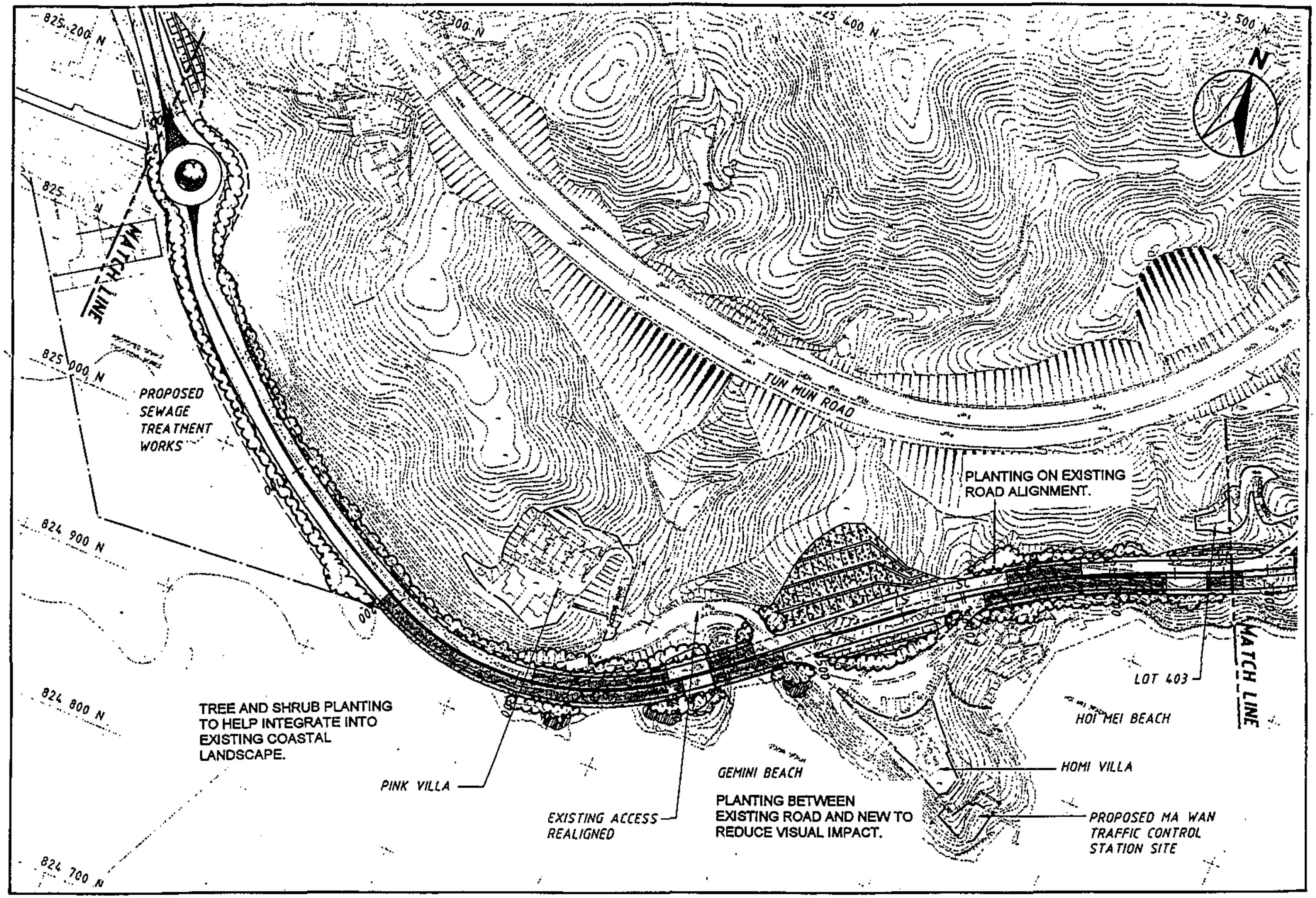
E B C HASSELL

CHAINAGE 6600 - 7500 - PREFERRED OPTION
TING KAU



EBC HASSELL

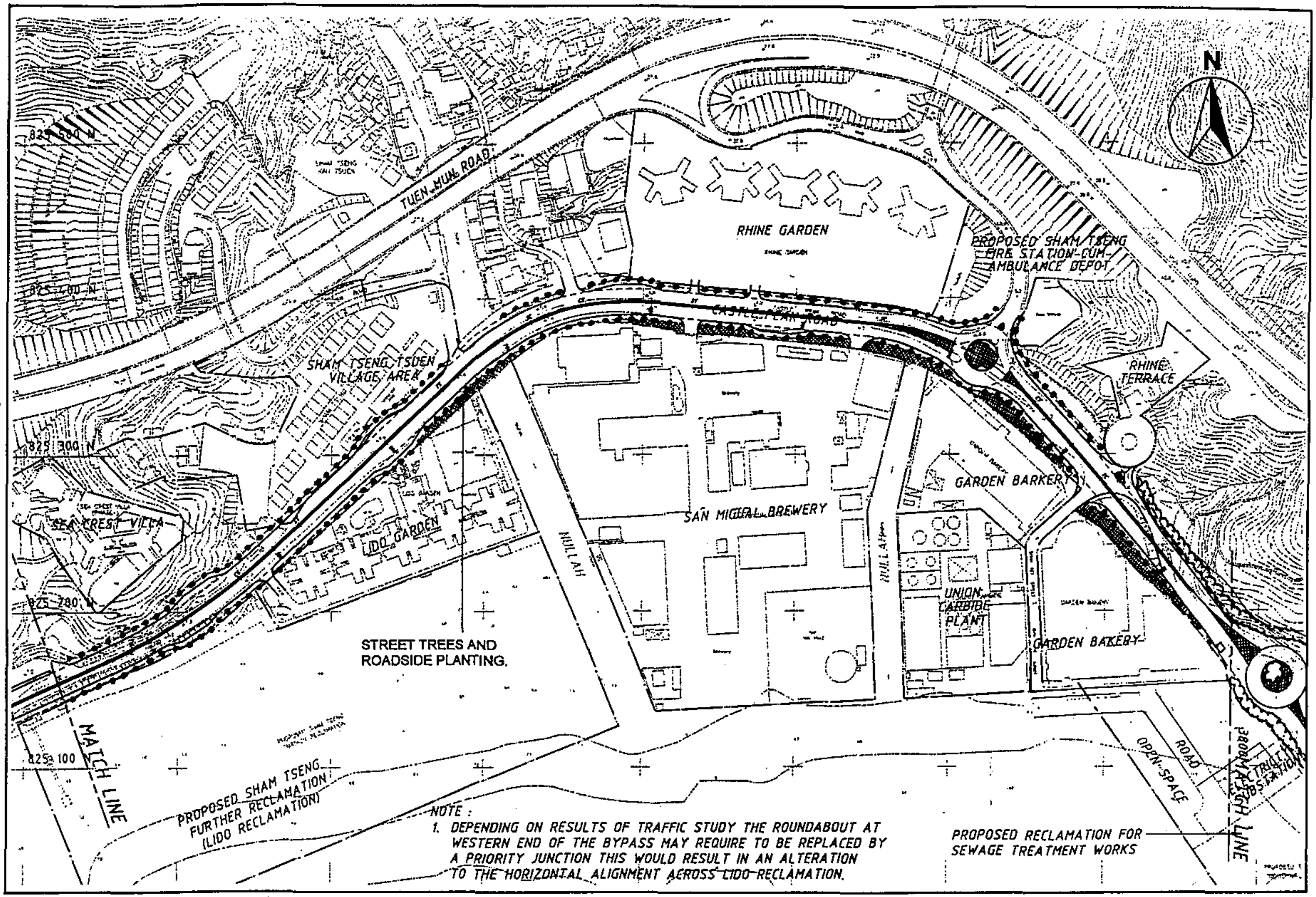
CHAINAGE 5800 - 6600 - PREFERRED OPTION
LIDO BEACH



EBC HASSELL

CHAINAGE 4900 - 5800 - PREFERRED OPTION

GEMINI



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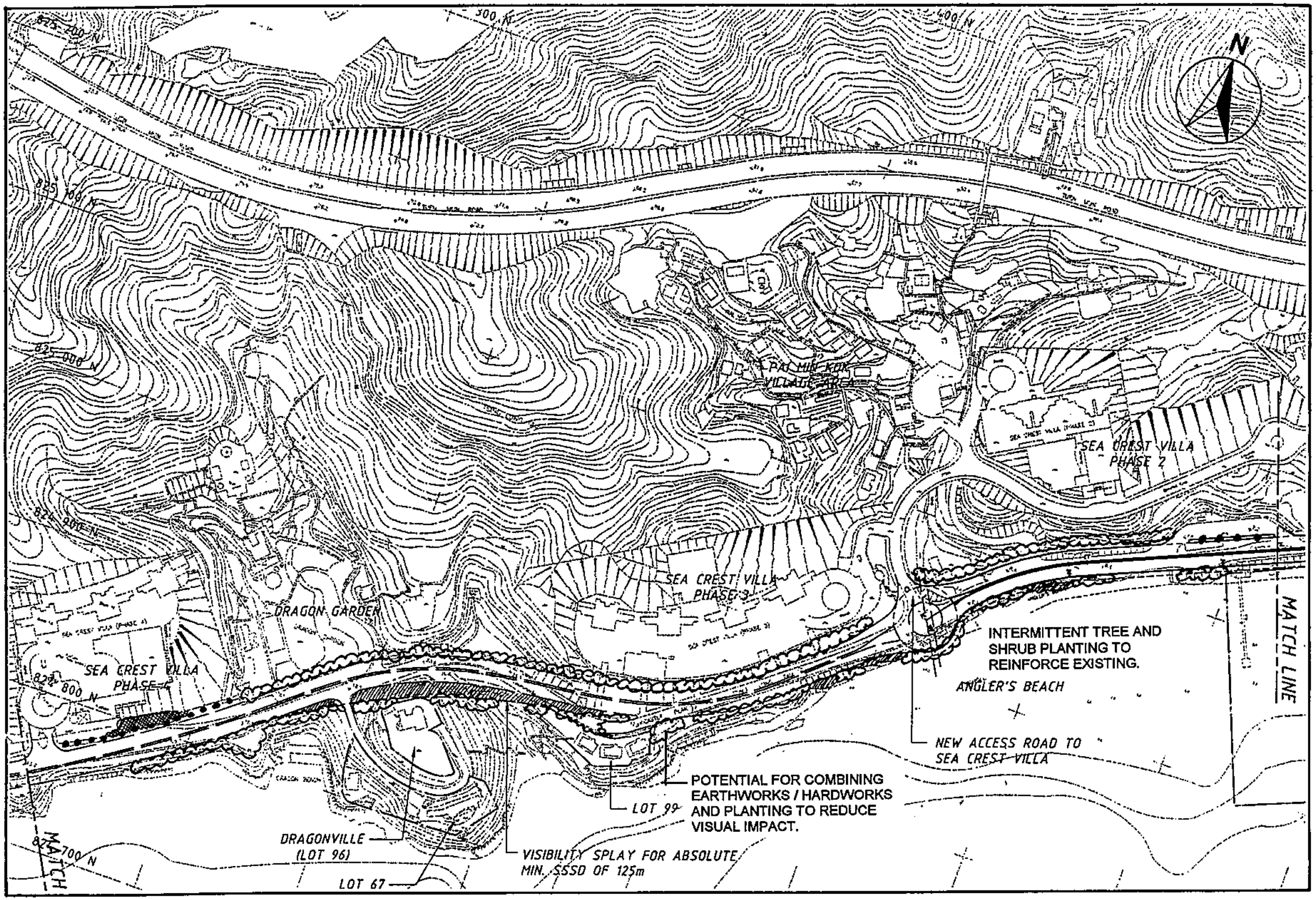
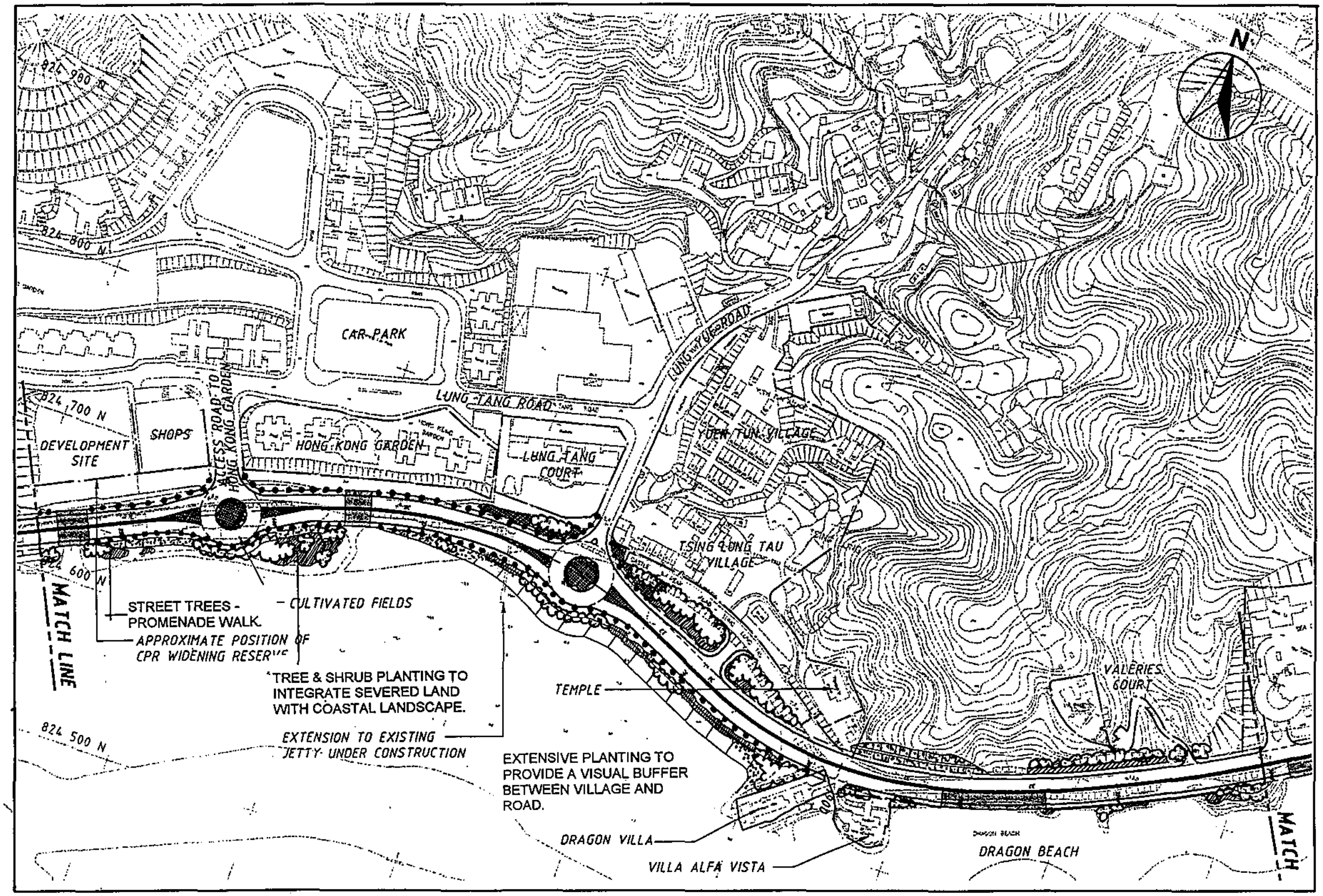
CHAINAGE 4150 - 4900 - PREFERRED OPTION
SHAM TSENG



EBC HASSELL

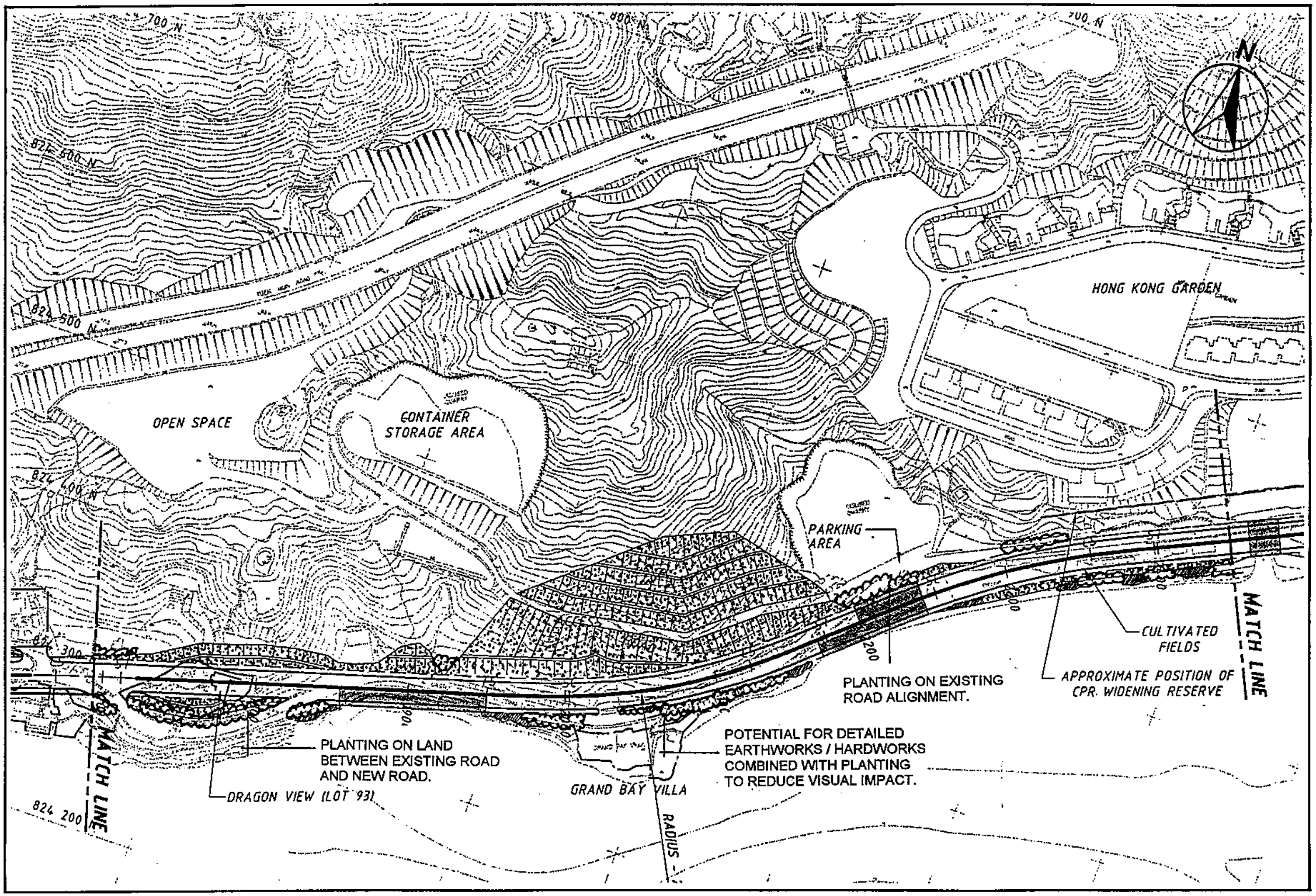
CHAINAGE 3300-4150 - PREFERRED OPTION
ANGLER'S BEACH



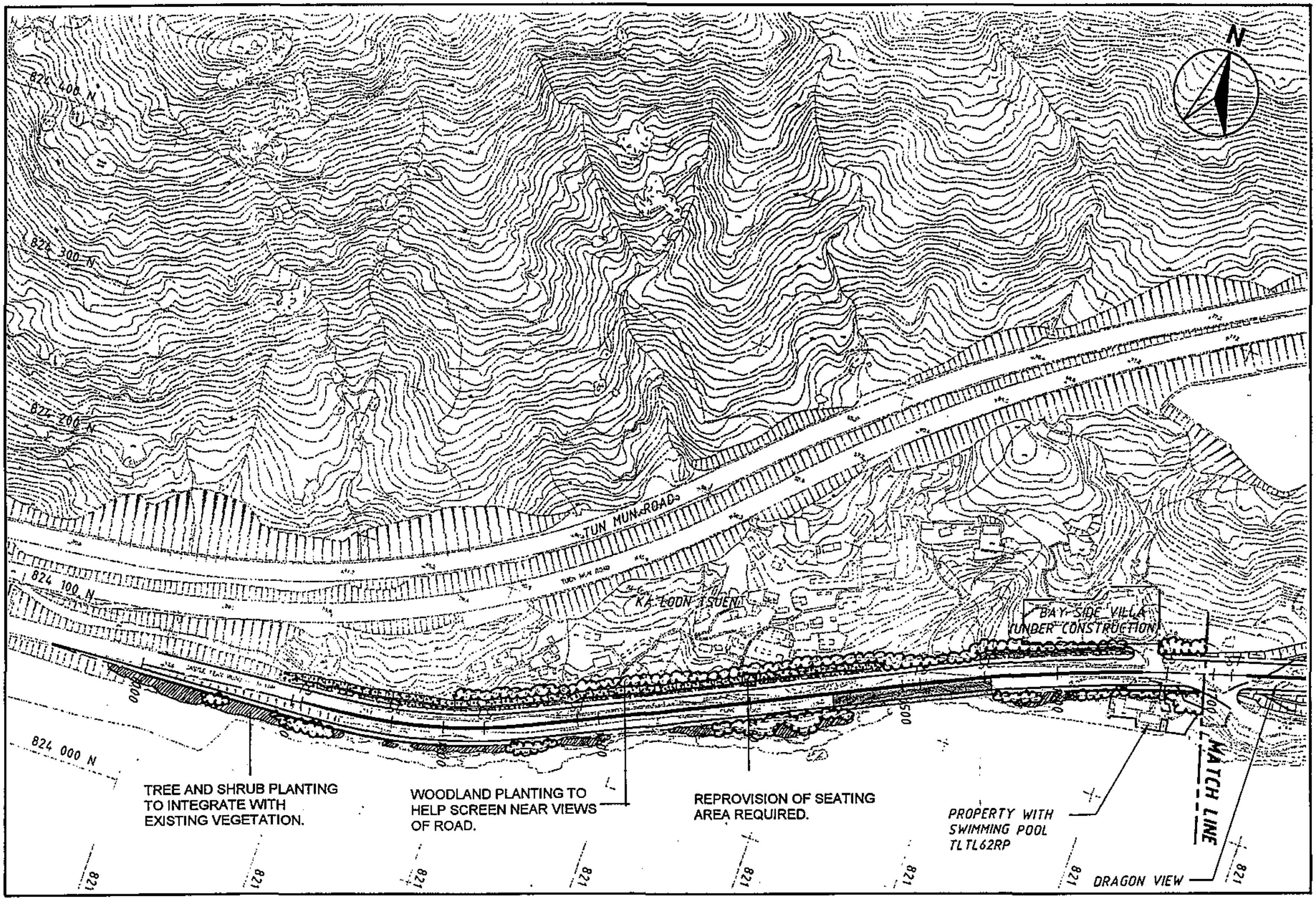
EBC HASSELL

CHAINAGE 2450 - 3300 - PREFERRED OPTION

TSING LUNG TAU



CHAINAGE 1700 - 2450 - PREFERRED OPTION
GRAND BAY



EBC HASSELL

CHAINAGE 1000 - 1700 - PREFERRED OPTION
KA LOON TSUEN

LEGEND

NATIVE WOODLAND PLANTING ON HYDROSEEDED SLOPES

NATIVE TREE AND SHRUB PLANTING

NATIVE SHRUB PLANTING

AVENUE / STREET TREE PLANTING

ORNAMENTAL TREE AND SHRUB PLANTING

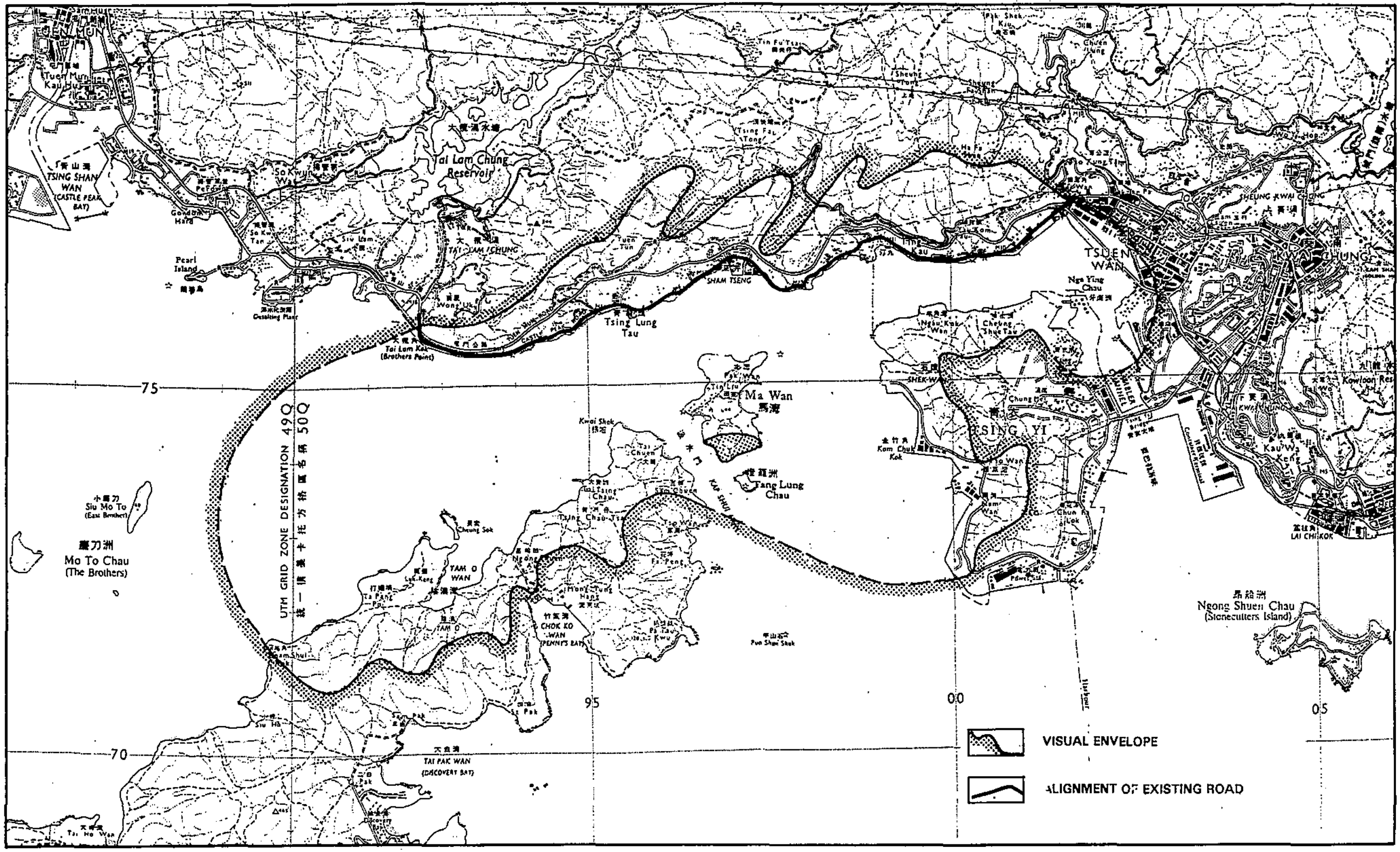
NOTES:

1. CENTRAL RESERVATION PLANTING WILL BE IMPLEMENTED SELECTING HARDY LOW MAINTENANCE SPECIES AND INSTALLED WITH A DRIP LINE IRRIGATION SYSTEM.

2. NOISE BARRIERS - THE LOCATION, SIZE AND DESIGN OF THE PROPOSED NOISE BARRIERS WILL AFFECT THE AMOUNT OF LAND AVAILABLE FOR PLANTING

EBC HASSELL

LEGEND



VISUAL ENVELOPE

ANNEXE J

MITIGATION STRATEGY TO ACHIEVE HKPSG COMPLIANCE

ANNEXE J

MITIGATION STRATEGY TO ACHIEVE HKPSG COMPLIANCE

J1 This mitigation strategy outlines the measures required to meet HKPSG standards at as many NSRs as possible. This involves full or partial enclosures along most of the alignment. On the basis of existing information, preliminary engineering assessments of the feasibility of the first mitigation strategy have been made and are presented in Table J1. In most cases, extensive barriers and enclosures are considered infeasible. However, more detailed site information will become available during subsequent design stages of the project, which may indicate that mitigation measures currently considered infeasible are possible. If this is the case, then all or part of the first mitigation strategy may be further considered.

J2 Where enclosures are found to be feasible on engineering grounds, feasibility on air quality grounds must also be determined. The overall feasibility of a full or partial enclosure will thus be a function of both the engineering and environmental aspects. In order to avoid abortive work, air quality implications have been assessed only for road enclosures that are part of the recommended mitigation strategy identified in the following paragraph.

J3 A second mitigation strategy, limited to mitigation measures that are considered actually feasible at this stage of the project, is provided in Section 8 of the main EIA report.

Table J1 Mitigation Scenario to Achieve HKPSG Standards

NSR Reference Area	Minimum mitigation capable of achieving 70 dB(A)	Preliminary qualitative engineering assessment of mitigation measure
Ka Loon Tsuen and Bayside Villa	cantilevered barrier along eastbound carriageway, or partial enclosure	Infeasible to construct: a) piles (required for support) would require resumption of additional properties b) two-way traffic could not be maintained during piling, since diversion is not possible
Grand Bay	5-m or 7-m barrier along westbound carriageway	Access requirements for Grand Bay Villas would entail a large gap that would compromise the effectiveness of the barrier. High barrier would have unfavourable visual impact on Grand Bay Villa residents.
H K Gardens (west of access)	Partial Enclosure covering eastbound and westbound carriageways (open on seaward side)	Infeasible due to road safety: a) enclosure is not possible west of Ch 2350 due to presence of access point b) unacceptable safety risk placing enclosure close to roundabout, particularly for eastbound drivers c) bus bay by E/b carriageway would have to be reprovisioned
HK Gardens (east of access) and Lung Tang Ct	5-m barrier along eastbound carriageway	Feasible (subject to detailed design)
Tsing Lung Tau Village, Dragon Villa and Villa Alfa Vista	3.5-m barrier along eastbound carriageway (for Tsing Lung Tau Village); cantilevered barrier along westbound carriageway (for Dragon Villa and Villa Alfa Vista)	<u>3.5-m barrier</u>: Feasible, but entails significant visual intrusion (blocks sea view for some villagers). <u>Cantilevered barrier</u>: Infeasible to construct and maintain: a) piled foundation would provide insufficient lateral stability at ground level under wind loading b) spread footing would require substantial additional reclamation c) more severe blocking of seaview at lowrise villages (Tsing Lung Tau and Yuen Tun)

NSR Reference Area	Minimum mitigation capable of achieving 70 dB(A)	Preliminary qualitative engineering assessment of mitigation measure
Seacrest Villa IV, Dragon Garden and Dragonville	cantilevered barrier along eastbound carriageway	Infeasible due to land constraints: a) road would have to be shifted seaward to allow foundations, but alignment constrained on seaward side by topography b) proposed structure would have to be doubled in length c) breaks required for access to Seacrest Villas IV and Valerie's/Rosalind's Court would compromise effectiveness of costly barrier d) absolute land constraints around Dragon Garden and Dragonville do not allow any room for required foundations e) firefighting access to Dragon Garden
Sham Tseng	Full enclosure over eastbound and westbound carriageways; barrier over 3m along the eastbound carriageway between Ch. 500 and Ch. 700 to shield Sham Tseng Tsuen	Infeasible due to land constraints, road safety, fire safety, and local commercial considerations: a) no room for extensive foundations b) unacceptable safety risk for entering/exiting drivers and through drivers at residential and commercial access points c) anticipated objection from FSD d) anticipated objection from operators of ground-level businesses
Seacrest Villa III	Partial Enclosure over eastbound and westbound carriageways (open seaward side)	Infeasible due to land constraints and road safety: a) no room at E/b carriageway for foundations b) unacceptable safety risk placing enclosure close to roundabout, particularly for E/b drivers c) unacceptable safety risk for W/b drivers entering and exiting the bus bay/layby
Pink Villa	Partial Enclosure over eastbound and westbound carriageways (open seaward side) and cantilevered barrier along eastbound carriageway	<u>Enclosure:</u> Infeasible due to land constraints: a) topographic and alignment constraints due to curve. Construction would require removal of headland, which was identified as undesirable at earlier stages of the study. <u>Cantilevered Barrier:</u> Would require substantial strengthening of structure to support its weight and wind loading. Consequently, likely to be considered impractical in terms of costs, considering the small degree of mitigation achieved.

NSR Reference Area	Minimum mitigation capable of achieving 70 dB(A)	Preliminary qualitative engineering assessment of mitigation measure
Casam and Lido Beaches (beach houses)	Partial Enclosure over eastbound and westbound carriageways (open seaward side or with 3m barrier on seaward side)	Infeasible due to road safety: a) presence of numerous residential access points would put entering/exiting drivers and through drivers at risk b) presence of bus bays outside the structure would put entering/exiting drivers and through drivers at risk In addition, presence of numerous access points would compromise effectiveness of costly structure.
Ting Kau (beach houses and village)	Partial Enclosure over eastbound and westbound carriageways (open seaward side)	Infeasible due to land constraints and road safety: a) alignment is constrained by the position of the roundabout, by adjacent properties immediately to the north and south, by the presence of existing roads, by the need to provide a service road, by the steep topography, by the need to reduce the impact on the amenity woodland, and by the alignment geometry available. These constraints result in insufficient space available to locate the foundations necessary to construct an enclosure of both eastbound and westbound carriageways b) unacceptable safety risk placing enclosure close to roundabout, particularly for westbound drivers
Ting Kau Beach (beach houses)	0.8 m barrier along westbound carriageway	Feasible.
Keymount Lodge, Sunny Villa	7-m retaining wall along the eastbound carriageway (formed by amending the slope cutting)	Feasible.
Hanley Villa and highrises under construction	Enclosure over eastbound and westbound carriageways	Full enclosure interferes with FSD requirements. Partial enclosure (acceptable to FSD) is infeasible due to road safety: a) unacceptable safety risk placing enclosure close to junction with multiple accesses, particularly for eastbound drivers rounding 185-m radius curveNSR Reference

NSR Reference Area	Minimum mitigation capable of achieving 70 dB(A)	Preliminary qualitative engineering assessment of mitigation measure
Fung Chik Sen Villa	7- to 10-m retaining wall from Ch. 8250 to Ch. 8450 (after widening of Castle Peak Road) will keep facade noise levels within HKPSG standards	(required to achieve alignment)
Greenview (Garden View) Terrace	Partial Enclosure over eastbound and westbound carriageways (open seaward side) from Ch. 8480 to 8690	Feasible. Will require reprovisioning of bus bays.

ANNEXE K

COMMENTS AND RESPONSES ON DRAFT VERSIONS OF EIA REPORT

Agreement No. CE94
Feasibility Study for Castle Peak Road Improvement between Area 2 and Ka Loon Tsuen, Tsuen Wan
Comments on Second Draft Final EIA Report

From: **Agriculture & Fisheries Dept**
Ref: **(75) in AF DVL 14/53 III**
Date: **7 November 1996**

	COMMENTS	RESPONSES
4.5.1	Line 5: The location of focused survey was not shown on Fig. 11.2.	The location is shown in Figure 11.1. Text has been changed.
	Line 6: Which woodland was surveyed? Was it at Dragon Villa or Dragon View?	Dragon View woodland was surveyed. Text has been changed.
11.1.6	Line 4-5: Two dominated species of plants mentioned (*Litsea glutinosa* and *Microcos paniculata*) did not seem to have high relative dominance values as shown in Table 11.3. It appeared that the text and data did not tally. Any explanation from the consultant please?	Text has been updated to correspond with Table 11.3.
	What would be the meaning of 'Importance value'?	Importance value is defined as the sum of relative cover, relative density, and relative frequency. It refers to the relative contribution of a species to the entire community.
11.1.19	The first and second statements of this paragraph did not seem to be closely related.	The first statement states the source of information in Annexe E, and the second statement explains why that source can be applied to the study area.
11.3.5	Given that the availability of land was already one of the constraints, therefore, it should be clarified whether it would be feasible and practical for the project proponent to implement the mitigation measure of revegetation as part and partial work of the project by adopting a ratio of 3:1 (area of trees to be planted to area of woodland lost).	It cannot be determined until the detailed design stage whether land is a constraint for on-site mitigation. If so, then off-site mitigation will be proposed. (See also consultant's responses to AFD's previous comments with Ref. No. (34) in AFDVL 14/53 II.)
14.13.3	It was mentioned that there were "four categories of planting". However, only three instead of four approaches were shown in paragraph 14.13.4. Please clarify what would be the fourth approach.	Noted. Text has been amended to read "the Planting approach can be broadly divided three categories of planting".
14.13.4	No details of the planting proposal could be found in annex H.	Noted. The details are included in Annex I, not Annex H. The relevant text has been amended.
14.13.5	The term "Indicator Species" and its application in this case should be elaborated.	The "Indicative Sspecies" list suggests typical plant species mixes to be used within the planting approach.
15.7.3	See comment on para. 11.3.5 above. The implication of the residual impact on loss of 0.7 ha of seabed should be stated in the conclusions.	Noted. Text has been changed.

Table 11.2	Column 4: Would it be (m^2)?	Yes. Table has been amended.
Table 11.3	Unit should be given to all the numerical values.	Noted. Table has been amended.
Table 11.10	Unit should be given to the "Estimated Loss".	Noted. Table has been amended.

From: District Lands Office, Tsuen Wan
Ref: (3) in DLO/TW 3/650/93 V
Date: 7 November 1995

I would like to inform you that I have no comment on the EIA Report and the Monitoring and Audit Manual.	Noted.

From: Director of Civil Engineering
Ref: GCP 1/10/477 IV
Date: 5 November 1996

The Civil Engineering Department has no comment on the captioned report and manual.	Noted.

From: Highways Department
Ref: ( ) in HYD MWPMO 365TH/FES X
Date: 5 November 1996

I note that my earlier comments on the revised draft EIA final report have been incorporated. As such, I have no further comment to offer.	Noted.

From: Commissioner of Police (CSP Traffic)
Ref: (14) in CP/T/TMB 216/141/1 Pt.1
Date: 29 October 1996

Please be advised that I have no comments to make in respect to the Final Report (Final Review) Volume 3: EIA and Appendix 3A: Preliminary Environmental Monitoring & Audit Manual.	Noted.

From: Regional Services Department
Ref: (68) in RSD 1/TW 752/91 III
Date: 5 November 1995

I refer to CE/MW(NT), HyD's memo ref. ( ) in HYD MWPMO 365TH/EIA II dated 24.10.96 and wish to offer no comments on the EIA Report.	Noted.

From: Planning Department
Ref: (43) in PD/TW S/TT/9 IX
Date: 7 November 1996

(a)	*Figure 1.1 - "Key Plan"*	
i	To amend the title of the plan from "Key Plan" to "Preferred Alignment".	Not agreed; the plan indicates the plan of area under study, and is a Key Plan and not a plan of the preferred alignment.
ii	To delete the phrase "Bypass Replaced by On-line Option" from the panel of the Plan, since the <u>On-line Option is the preferred alignment</u> accepted by government departments concerned.	The wording is the correct wording as an amendment to the drawing. For the final report, the title block will be revised.

iii	The proposed Sham Tseng East roundabout together with the proposed slip road along the southern boundary of the Garden Bakery will jeopardise the planned "Open Space" zone designated on the statutory Tsuen Wan West OZP No. S/TWW/6. The "Open Space" zone is required by the Town Planning Board and the Tsuen Wan District Board as "Environmental Buffer" for the planned Sham Tseng Sewage Treatment Works. To replace the "Environmental Buffer" with an additional noise source is not acceptable. In fact, the proposed slip road is not essential for the implementation of the On-line Improvement option, since access to the Union Carbide and Garden Bakery "CDA" is at present via the existing Sham Tze Street which will be improved under the redevelopment of the Union Carbide Depot. In order to avoid the conflict with the "Open Space" zone, the slip road should be deleted and the roundabout could be relocated to Homi Villa. The distance between the major residential developments in Sham Tseng area and Homi Villa is still within the design range of 1.5 km to 2.0 km in accordance with the requirement of the subject study.	The road linking the Sham Tseng East Roundabout with Sham Tsz Street is required to facilitate the local traffic circulation, but as directed at the Working Group Meeting on 13 November it will be deleted from the figure. The alternative to the Sham Tseng East Roundabout at Homi Villa was studied and it was concluded that such an arrangement failed to provide an adequate level of service to access properties to the east of the Sham Tseng Central Roundabout. There were, in addition, adverse impacts of a roundabout near Homi Villa and hence such an arrangement is not recommended. As agreed at the Working Group Meeting on 13 November, the Sham Tseng East Roundabout will be retained and adjusted in location to minimise the impact the improved Castle Peak Road has on the site indicated on OZP No S/TWW/6 for the open space.
(b)	*Para 1.1.2, Lines 4 to 5 - Background to the Study*	
	To delete "Current planning policy indicates that ... Castle Peak Road". Except for the "CDA" zones in Sham Tseng, it is not the planning intention of this office to encourage high rise, high density residential development/redevelop-ment in the Tsuen Wan West area, due to infrastructural and environmental constraints and design considerations. The planning intention of the study area could be referred to the statutory Tsuen Wan West OZP No. S/TWW/6.	Noted. Text has been changed to delete reference to current planning policy.
(c)	*Para 4.6.6, Lines 5 to 6 - Visual Impact*	
	Annex H which outlines the "Preliminary Construction Programme" does not contains "the assessment of individual visually sensitive receivers" as mentioned in para 4.6.6.	Noted. The assessment is outlined in Annex I, not Annex H. The relevant text has been amended.
(d)	*Para 4.8.2, Line 1 - Landscape Mitigation Objectives*	
	To delete "reprovisioning of Angler's Beach", since the preferred alignment "On-line Improvement Option" will not encroach upon the Angler"s Beach.	Noted. The "reprovisioning of Anglers Beach" has been deleted.
(e)	*Para 8.3.22, Lines 4 to 5 & Footnote No.1 - Traffic Noise Impact at Sham Tseng*	
	In addition to the planning approval for redevelopment of the Union Carbide "CDA", the planning application for redevelopment of the San Miguel Brewery "CDA" was approved by the Town Planning Board on 28.6.96.	Noted. Text has been amended.
(f)	*Para 14.4.5 - Impact on Landscape Character at Angler's Beach*	

	To delete the whole paragraph, since the feasibility study for Sham Tseng Further Reclamation commissioned by CED has not taken into account the Sham Tseng Bypass and the associated roundabout mentioned in the text. It is not appropriate for the subject EIA to assume reprovisioning of the Angler's Beach, since this will pre-empt the findings of the EIA for the Sham Tseng Further Reclamation.	Noted.
(g)	*Para 14.5.3 - Impact on Landscape Character at Sham Tseng*	
	To delete the whole paragraph, taking into account the landuse and environmental implications of the Sham Tseng East roundabout mentioned in paragraph (a)iii above.	Noted. The text has been amended to state that the general landscape character of Sham Tseng will suffer moderate adverse impact from the proposed alignment.
(h)	*Section 15 - Conclusion*	
	A conclusion on the landscape and visual impact assessment should be included in this section.	Noted. A conclusion will be included.
(i)	*Annexe I - Landscape and Visual Impact*	
	My previous comments on the landscape and visual impacts of the Sham Tseng Bypass (para (b) of my previous letter dated 14.2.96) remain valid.	Noted.
(j)	*Annexe K - Ecology and Traffic Noise Impact of the Sham Tseng Bypass*	
i	It is mentioned in para K2.2.3 [should be K2.2.2] that "Construction of the Bypass would lead to the total loss of Angler's Beach in its present form." While the sentence "The Bypass option actually avoids direct encroachment on Angler's Beach, hence the small figure of 25m for direct impacts to this area." in para 2.2.5 appears in conflict with the previous description.	The Bypass option as described in para. K2.2.5 will avoid direct encroachment on Angler's Beach. However, also as described in para K2.2.5, indirect impacts including construction of the solid fill embankment will impound the beach and affects the whole intertidal areas of the seabed. Para K2.2.2 refers to loss due to the abovementioned *indirect* impact.
ii	Para K3.2.3, Lines 5 to 9 - Please refer to para (e) above regarding my comments on Footnote No.1. Please clarify what is the EIA being carried out by Government for assessment of the San Miguel Brewery "CDA".	Since the planning application for redevelopment of the San Miguel Brewery CDA has now been approved by the Town Planning Board, reference to the San Miguel CDA EIA has been deleted from the text and footnote 1 amended.
iii	Taking into account the adverse landuse and environmental impacts of the Sham Tseng Bypass, and its significant adverse impacts on the approved developments such as San Miguel and Union Carbide "CDA", I would like to reiterate the position of this office of not supporting the Bypass Option.	Noted.

From: Highways Department
Ref: () in HNT 602/TW/1 (VII)
Date: 8 November 1995

I refer to CE/MW(NT), HyD's memo ref. ( ) in HYD MWPMO 365TH/EIA II dated 24.10.96 regarding the EIA Report and Preliminary EM&A Manual. I have no comment on the Final Report (Final Review) Volume 3: Environmental Impact Assessment and Appendix 3A: Preliminary Environmental Monitoring and Audit Manual.	Noted.

From: EPD
Ref: EP 2/N2/30 XVI
Date: 11 November 1995

	I refer to HyD's memo ref HYD MWPMO 365TH/EIA II dated 24.10.96 enclosing the EIA Report and Preliminary EM&A Manual. I have the following comments on the EIA Report. For Noise Impact and AM&A Manual, we will provide our comments separately in due course.	
a)	General: Figure 1.1	
i)	This figure should be included in the Executive Summary for easy reference of the whole study area.	Figure will be included.
ii)	For easy apprehension of the noise mitigation measures, the direct technical remedies in the form of noise barriers and partial enclosures should be indicated in the drawing using different legends respectively. In addition, those sensitive receivers required Indirect Technical Remedy should be highlighted and labelled on the drawing for easy reference with the text in the report. This can allow readers, especially the ACE members, ready to appreciate the measures taken to mitigate the noise impact due to the road.	Due to the size of the study area, a small-scale drawing is required. The scale of this drawing (1:5000 in the EIA report) is too small to allow the mitigation measures to be clearly shown. The mitigation measures are shown in Chapter 8 at 1:1000 scale.
b)	Air Quality	
i)	S 4.4.1: You have reviewed the reason why 2011 is chosen to represent the year with worst traffic emission impact via your facsimile ref 96504/FPL60730.01 dated 30/7/96. Such review/reasoning should be included in the report.	Noted. Text has been amended.
ii)	S 10.1.4: It is said in the first line of the paragraph that the NO_2 concentration contours in Figure 10.1 does not include the estimated background concentration. It appears in Section 10.1.2 that the contour should have already included the background level. If not, there would likely be AQO exceedance at the ASRs. Please clarify.	Figure 10.1 is an outdated figure and will be amended. Amended figure will be provided to EPD for review prior to its inclusion in the Final Report.
iii)	Fig 10.1: The unit of the NO_2 contours should read "$\mu g/m^3$" instead of 'mg/m^3". Please also confirm if "Yr 2001" should read "Yr 2011".	Unit change is noted, and year shown is 2011. Figure will be amended to correct these errors, and provided to EPD for review prior to its inclusion in the Final Report.

From: Highways Department
Ref: HYDT 12/7/41
Date: 12 November 1995

	I have no comment on the sections of the EIA Report and Preliminary EM&A Manual forwarded via memo ref HYD MWPMO 365TH/EIA II dated 24 October 1996 of CE/MW (NT).	Noted.

From: **Regional Services Department**
Ref: **(68) in RSD 1/TW 752/91 III**
Date: **5 November 1995**

	I refer to CE/MW(NT), HyD's memo ref. ( ) in HYD MWPMO 365TH/EIA II dated 24.10.96 and wish to offer no comments on the EIA Report.	Noted.

From: **Water Supplies Department**
Ref: **(2) in WSD 1744/1304/2/96 Pt 1 TJ(2)**
Date: **13 November 1995**

	We refer to the captioned report [EIA Report and Preliminary EM&A Manual] attached to HyD's memo ref ( ) in HYD MWPMO 365TH/EIA II dated 24 October 1966 and would like to comment that the proposed noise barriers, noise enclosures and any other structures mentioned in Sections 7.3.3, 8.2.6 and 8.2.12 should be designed to ensure no conflicts with existing and proposed waterworks. Our SE/MNW(2), Mr CH Ng, should be consulted for agreement if existing waterworks are affected or diversion is unavoidable.	Noted.

From: **Fire Services Department**
Ref: **(59) in FSD 40/7596/93 VI**
Date: **13 November 1995**

	With reference to memo ref. ( ) in HYD MWPMO 365TH/EIA II dated 24.10.96 copied to me among others: Please be informed that I have no specific comment on the captioned Report and Manual [EIA report and Preliminary EM&A Manual] except the following:	
	Talbe 8.1 (EIA Report): Please clarify whether partial enclosure will be erected for SR 35 (all).	The partial enclosure is recommended. Table 8.1 has been revised to clarify the recommendation.

From: **Environmental Protection Department**
Ref: **EP 2/N2/30 XVI**
Date: **15 November 1995**

	Further to my comments on 11.11.96, the followings are my comments on the EM&A Manual.	
S 4.2.1	Please add the following item at the end of this section: *"(c) If the DO meter is not the model with automatic salinity compensation function, on site calibration with the in-situ salinity factor shall be undertaken.*	Text amended.
S 4.5	Please add the sentence *"The interval between two sets of monitoring shall not be less than 36 hours."* at the end of the first paragraph.	Text amended.

From: Highways/Structures Division
Ref: (80) in STR 5/30/49
Date: 15 November 1995

	Comment	Response
	I have no further comments on the above documents [EIA Report and Preliminary EM&A Manual] from highway structures point of view. Please note that comments on other volumes of the Final Report were given to MCAL direct on 6/11/96.	Noted.

From: Tsuen Wan District Office
Ref: (7) in TWD/13/78 VIII (TC 2/95(A) II)
Date: 19 November 1995

	Comment	Response
	I refer to the above reports [EIA Report and Preliminary EM&A Manual] appended to CE/MW(NT), HyD's memo of 24.10.96 and would like to comment on the reprovisioning of the Angler's Beach. As DPO/TKS has correctly pointed out in his memo dated 7.11.96 to you, since the feasibility study for the proposed Sham Tseng Further Reclamation has yet to complete, it is too early to take for granted that the Angler's Beach will be reprovisioned.	Noted.

From: EPD
Ref: EP2/N2/30
Date: 19 November 1995

	Comment	Response
	I refer to the final EIA report (Volume 3) concerning the captioned [Feasibility Study for Castle Peak Road Improvement between Area 2 and Ka Loon Tsuen, Tsuen Wan] and would like to append the following comments:	
S 7.4.4 to 7.4.30	2. It is noted that noise predictions on construction activities with respect to distances are given in these sections. It would be most helpful if predicted noise levels on representative noise sensitive receivers are also given to illustrate the severity of the potential construction noise impact at these NSRs with and without noise mitigation measures.	Noted. A new reference table giving source-receiver distances for the representative NSRs has been provided, so that predicted noise levels with varying mitigation measures can be readily cross-referenced. Provision of tables showing mitigated and unmitigated construction noise levels for eleven main construction tasks at each representative NSR would entail at least 46 additional tables, which would result in an unmanageable amount of detail.
S 8.3.1 to 8.3.50	3. Our comment on 12 June 1996 item 2.1 is still outstanding. The discrepancies between the report and Table J1 are not amended. The text of the report to be cross-checked with the entries of Table J1 and please amend the inconsistencies accordingly.	Discrepancies have been identified and Table J1 amended to be consistent with Chapter 8.

S 8.3.53	4. Our comment on 12 June 1996 item 2.11 is unresolved. The number of dwellings exceeding the HKPSG noise limit with and without direct technical remedies are not reported. These figures are different from the number of dwellings elegible to be considered by the ExCo for indirect technical remedies.	The total number of dwellings considered in the EIA was 7200. Of these, approximately 4900 are expected to be exposed to traffic noise levels exceeding HKSPG standards in year 2011 in the absence of mitigation. This number would be reduced to about 4800 if the recommended mitigation package (direct technical remedies) is implemented. The small number is a reflection of two main factors: the contribution of Tuen Mun Road (particularly at upper storeys in highrise developments) and the already high noise levels from Castle Peak Road traffic, which will increase in almost all cases.
	5. Please consider the following amendments to Table 8.2. Amend the heading to read as "Existing flats eligible to be considered for indirect technical remedies". Amend the first tow of the same table to read as "Approximate number of flats eligible to be considered for indirect technical remedies".	Agreed. Text has been amended.
S 8.3.50	6. As the Greenview Garden is claimed to be outside the study boundary and will not have noise mitigation measure of any kind, it is no point to put down the notes for further study. This paragraph can be deleted.	Agreed. Please note that the NSR discussed in this paragraph is *Bayview* Garden (not Greenview Garden). Text has been amended.
S 8.3.54	7. Our comment on 12 June 1996 item 2.12 is still outstanding. As a completed EIA would be a standalone document readily for public consultation, the estimated cost of direct technical remedies should be included in the subject EIA report.	Agreed. The draft EIA provides a figure of $35 million, though this figure is incorrectly identified as the cost of indirect technical remedies only. In fact, the figure is the estimated cost of the *entire* recommended mitigation package (direct and indirect mitigation). The text has been amended to clarify this.
Figs 8.1 to 8.8	8. Our previous comment on 12 June 1996, item 2.13, is still outstanding.	This comment requests that locations of NSRs should be marked in Figures 8.1 to 8.8 for easy reference. Figures are being amended.
Table 8.1	9. There is an error on the entry for SR 35. The remark is incorrect as a partial enclosure has been proved feasible and recommended to be constructed.	Noted. The table has been amended.

From: Planning Department
Ref: (49) in PD/TW S/TT/9 IX
Date: 23 November 1995

Thank you for your letter of 18.11.96 enclosing the comments and responses to the second draft EIA for the Castle Peak Road Improvement Feasibility Study. My comments on your responses to comments are as follows (using my previous numbering system):

(a) <u>Figure 1.1 - Key Plan</u>

i	Figure 1.1 has in fact indicated the preferred alignment for the Castle Peak Road Improvement, in addition to the study area. It would be necessary for the report to have a plan to specify clearly the preferred alignment for the study.	Figure 1.1 indicates the recommended alignment.

ii	It is not appropriate to specify a previous amendment on the final draft of an EIA. I agree that the phrase "Bypass Replaced by On-Line Option" would be deleted from the plan in the final report as proposed by the consultant.	Noted.
iii	I would like to clarify the decision of the Working Group Meeting on 13.11.96 regarding the Sham Tseng East Roundabout. Instead of accepting the consultants' conclusion that relocation of the Sham Tseng East Roundabout to Homi Villa is not feasible, the meeting agreed that the consultants should further demonstrate the feasibility of accommodating the roundabout at Homi Villa at the landward side. Taking into consideration that the additional time required for the EIA to assess the environmental implication of the relocated roundabout would defer the progress of the study, the meeting also agreed to consultants to adjust the proposed location of the Sham Tseng East Roundabout in order to avoid encroachment upon the "Open Space" zone designated on the OZP.	The decision of the Working Group Meeting on 13.11.96 regarding the Sham Tseng East Roundabout is contained in the Minutes of that meeting.
(d)	Para 4.8.2, Line 1 - Landscape Mitigation Objectives	
	My comment regarding the proposed reprovisioning of the Angler's Beach should be "To delete 'reprovisioning of the Angler's Beach' since a decision on this issue has not yet been arrived at." (Please refer to the replacement page sent to you via my previous letter of 11.11.96.)	Noted.

Agreement No CE 39/94
Improvements to Castle Peak Road
between Ka Loon Tsuen and Area 2, Tsuen Wan

Government comments on the Draft Final Report (EIA) and EM&A Manual, and the Consultants' responses:

COMMENTS	**RESPONSES**
From : Highways NT Region **Ref : () in 602/TW/1 V** **Date : 25 August 1995**	
On the understanding that friction course paving will not be applied to the on-line improvement of Castle Peak Road as noise mitigation measure, I have no objection to the above report and manual.	Noted.
From : HyD (Landscape Architect) **Ref : () in HYD T12/7/41** **Date : 22 August 1995**	
I have no comment on the above report and manual.	Noted.
From : Fire Services Dept **Ref : (22) in FSD 40/7596/93 V** **Date : 17 August1995**	

As regards Figures 8.2 to 8.5, I have no objection in principle to the 3-m barriers, but additional fire hydrant should be provided. Moreover, direct emergency vehicular entrance to Sham Tseng Tsuen near the nullah shall be maintained.

Noted. Text of the DFR has been amended to incorporate these requirements.

From : TD (Traffic Eng'g (NTW) Division)
Ref : () in NR 146/194/C-4
Date : 18 August 1995

I have no adverse comment on your enclosed Draft Final Report Volume 3 nor the EM&A Manual. As para. 5.2 of the report depicted about future traffic flows, I would be pleased if you could distribute each a copy to our Chief Engineer/TTPD and Chief Engineeer/TTSD for their comments.

Noted. We have forwarded copies of Chapter 5 and Annexe A (containing the forecast traffic flows) as requested.

From : Ag and Fisheries Department
Ref : (52) in AFDVL 14/53 II
Date : 17 August1995

My comments on the Draft Final EIA are as follows:

¶11.1.5 & 11.3.1 (Woodland at Dragon View): In Table 11.2 (p. 84), the range of dbh of plants had been shown, however, the consultant should advise whether the table include <u>all</u> plants over 2 cm dbh.

Not all plants over 2 cm dbh were measured. Only major trees were measures (see Section 4.5.1 methodology) because it was a sampling (focussed study).

The last sentence of ¶11.3.1 does not truly reflect the overall situation. It applies to <u>most</u> of the habitats in the project area, but not all (such as those mentioned in ¶11.3.2).

Noted.

¶11.1.6 & 11.3.2 (Secondary Woodland near Ting Kau): The natural woodland (9.5 ha) is found to be of relatively higher ecological value and therefore should be preserved. The consultant indicated the possibility of reducing the impacts by change of design to an elevated split-level carrriageway (Option 8C). Such idea is in line with our view expressed previously and should be pursued.

Noted.

The response from the consultant that *the rationale for the loss of the woodland reduce the cost of the construction of the roadway* is not acceptable from conservation point of view. We have much concern to the significant loss of the woodland which has high ecological value.

The cost of constructing a grade-separated portion of roadway to allow for preservation of woodland near Ting Kau was not considered by the ecology consultant. While we agree that preservation of the woodland would be desirable, neither flora nor fauna were recorded in the wooded areas which indicated that they should be considered ecologically important. The wooded areas are secondary in nature, and consist of species which are common throughout Hong Kong. Construction costs and other non-ecology issues, which were considered in selecting alignments and designs, were beyond the scope of the ecology assessment.

The last sentence of ¶11.3.2 ("However, this option was not chosen by the alignment scoring process based on the greater relative weighting assigned to other key issues.") is not relevant to ecological impact assessment and should not be included in the EIA report.

The sentence was inserted to explain in detail that other environmental or engineering issues were considered when selecting preferred alignments, and that ecological or aesthetic concerns were, in some cases, of secondary importance.

Comment	Response
¶*11.1.8 & 11.2:* Data in Table 11.3 and 11.10 is missing.	Information in these Tables was inadvertently omitted due to a printing error. The missing data was faxed to AFD on 31 August 1995, and the text has been corrected for the Final Report.
The breakdown and location of the 8.41 ha of woodland loss should be provided.	The area affected should be 8.27 ha (corrected in Final Text). Map references (ref Drg. Nos. 94294/R/001-013) for affected woodland areas are:

Sheet No.	Loss of Woodland
001	0.71 ha
002	0.95 ha
003	0.06 ha
004	0.55 ha
005	0.61 ha
006	0.00 ha
007	0.05 ha
008	0.82 ha
009	0.74 ha
010	0.75 ha
011	2.18 ha
012	0.85 ha
013	0.00 ha

Comment	Response
The type, area and location of habitats which will be subject to temporary loss within the works area as mentioned in ¶11.2.2 should also be provided.	Area subject to temporary loss cannot be determined in the feasibility study stage, but will be computed upon the completion of detailed design of the road (see ¶ 11.2.2).
¶11.3.5 (Mitigation Measures): Details on the justification, location, size and cost, elc., of the planting and how it could be implemented and maintained under HyD's contract should be provided in the Final EIA Report.	A discussion of landscaping will be provided in the Final EIA Report. Details of planting, as well as other aspects of the road improvement, will be addressed in the Preliminary and Detailed Design Stages of this project.
A section on ecology should be included in the EM&A Manual.	An ecology monitoring programme may be devised at the Preliminary and Detailed Design States of this project, when the alignment has been finalised.

From : Planning Dept
Ref : (19) in PD/TWS/TT/9
Date : 11 August 1995

Comment	Response
A system comparison of the environmental impact of the bypass and on-line options on the existing and committed developments in Sham Tseng has not been provided. In order to facilitate the Steering Group in assessing the two options, a comparison of the two options in tabular form with appropriate parameters is necessary. A qualitative description of the two options as contained in this EIA would not suffice.	An approximate assessment of the numbers of flats affected by the on-line and bypass options has been carried out. Under the on-line option, an additional 1800 units in Sham Tseng are expected to be eligible for indirect technical remedies for noise mitigation. The ability to mitigate the on-line option is limited by access requirements for the shops/restaurants and other commercial uses along the road. These requirements would compromise the effectiveness of barriers or covers. Pervious surfacing is not acceptable because of maintenance requirements.

¶8.2.13: The consultant's proposal to require the future developer(s) to provide air conditionings in a close-window environment to mitigate the noise generated by the proposed bypass may not be acceptable to EPD. Agreement of EPD on this aspect should be sought.

¶8.2.13 contains a definition of "indirect technical remedies", as requested in an earlier comment by EPD's Noise Policy Group (p.13, Comments and Responses document for Preliminary Draft EIA, dated 4 August 1995). It makes no mention of developers, and contains no proposal to require future developers to provide air conditioning to mitigate bypass noise.

¶8.3.5: Implication on the CDA: The EIA has indicated that the bypass would result in noise levels above the standards as per HKPSG, and that even single-aspect building design within the CDA would not be able to mitigate the noise problem. What is the consultant's recommendation to this problem? It should be emphasized that the bypass is a new road in the area, and that noise to be generated from this new road should be mitigated at source and the responsibility of mitigation noise arising from this new road should not be borne by the owners of the existing CDA sites.

Subsequent to the release of the Draft Final EIA, semi-enclosures over Castle Peak Road have become a possible mitigation measure (contrary to ¶8.2.6, which will be amended). In order to minimise the constraints on the CDA site, a road enclosure along the bypass is now under consideration. This could be in the form of semi-enclosure open along the seaward side to reduce air quality impacts and eliminate ventilation problems. This would appear to be a favourable option in removing noise constraints in Sham Tseng, but would be subject to agreement from the Steering Committee.

¶8.3.5: Implication on the Sham Tseng Further Reclamation: The EIA Report has indicated that the bypass would generate noise levels exceeding HKPSG, affecting an area up to 70 m (unimpeded) on both sides of the new road. This would pose significant environmental constraints on the proposed residential development on the reclamation.

Agreed. The proposed residential development is constrained by both the bypass and on-line options.

It is not correct to allege that the future development of the reclamation is not certain. The Layout Plan for the reclamation has been circulated amongst government departments and EPD is currently carrying out an EIA for the proposed residential site based on this Layout Plan. The EIA should assess the implication of the bypass on the proposed residential development based on this Layout Plan.

Under the bypass option, the present proposed shape of the reclamation would be altered to accommodate the road. The existing Layout Plan, which does not include the bypass, is thus not applicable under the bypass scenario.

A sweeping statement such as "the likely podium structure that will be present at the residential site should be capable of providing screening to sensitive facade above it" is not sufficient as a recommendation from a competent environmental consultant. The consultant should demonstrate whether podium structure could effectively screen off noise generated from the bypass.

The quoted statement is not a recommendation. As is plainly stated in ¶8.3.5, the Consultant has no information on Sham Tseng Further Reclamation other than landuse outlines on a reclamation shape that is not applicable to the bypass option. None of the information essential to an assessment of traffic noise (podium boundaries and heights, and the locations, heights, and orientations of sensitive facades) is available. In the absence of this required information on the future NSRs, the consultant can provide no quantitative assessment of traffic noise other than that which is already provided in Table 8.1.

As in the case of Sea Crest Villa, the consultant has indicated that the existing podiums with additional 3m noise barrier are incapable to screen off noise generated from the bypass. The consultant should elaborate why this would work for the highrise development on the reclamation and not for Sea Crest Villa.

The consultant has not indicated anywhere that 3m noise barriers and podiums would "work for the highrise development on the reclamation". Please see preceding response.

I must emphasize that not all proposed development on the reclamation would have possible podium structure to combat noise.

Agreed. This comment repeats a statement already made in ¶8.3.5.

Would the consultant care to enlighten how could noise be mitigated for other noise-sensitive uses such as schools should the bypass option be adopted?

As stated above in earlier responses to Planning Department's comments, semi-enclosures over Castle Peak Road have become a possible mitigation measure. A semi-enclosure, open along the seaward side to reduce air quality impacts and eliminate ventilation problems, may be proposed for the bypass. This would be subject to agreement from the Steering Group.

From : Noise Policy Group, EPD
Ref : (none)
Date : (none)

Section 8.2

Attention has been given to the discussions of barriers of different heights in the preliminary draft final report, but the Consultants have clearly expressed at the first line of the section that higher barrier cannot be practicable due to the potential structural problems. A pre-determined limit of 3 m high barrier has been promulgated without any in-depth assessment of the practicability of higher barrier at individual location. It is further evident from the Consultants' responses to my comments on Sect. 8.3.2 that they will not consider the application of higher barrier at individual merits since a maximum practical height of 3 m barrier has been assumed in the study. Then, all details and illustrations concerning with higher noise barriers would be for the sake of indication only. However, I would like to reiterate that the application of noise barriers of different heights should be re-considered on iterate that the application of noise barriers of different heights should be re-considered on individual merits and deficiency, a clear cut limitation to 3 m high barrier is not acceptable.

In response to this comment, two mitigation scenarios have now been modelled and discussed.

The first mitigation strategy outlines the measures required to meet HKPSG standards at as many NSRs as possible. This involves enclosures and barriers up to 7 m high. On the basis of existing information, it appears that many of these measures may be infeasible on engineering grounds, due to the very large foundations that they require. More detailed site information will become available during subsequent design stages of the project, which may indicate that barriers over 3 m high and enclosures are feasible. If this is the case, then all or part of the first mitigation strategy may be further considered.

The second mitigation strategy is limited to mitigation measures that are considered actually feasible at this stage of the project: barriers under 3 m high and enclosures along the bypass.

Section 8.2.5, 8.2.6 and 8.2.7

It has been agreed in the Working Group Meeting held on 31.7.95 that study of the application of road enclosures at potential locations would be carried out by the Consultants.

Agreed. The effectiveness of enclosures has been modelled, and a mitigation scenario employing them has been formulated.

Section 8.2.8

(i) The presence of occasion run-ins and junctions along the Castle Peak Road will not rule out the use of friction road surface along the entire route. It can be seen from the survey maps that there are no run-ins or junctions between Ch. 2100 to 2500, Ch. 3600 to 3900 and Ch. 5000 to 5400. Traffic noise levels will be reduced at the Sea Crest Villa, H.K. Garden, Pink & Gold Villas and Homi Villa if friction course road surface were provided on the aforementioned sections of road.

As recorded in the ¶9 of the Notes of the Third EWG Meeting (31.7.95), HyD have stated that "it was undesirable to introduce short sections of friction course at frequent intervals along Castle Peak Road, since an inconsistent surface was potentially distracting to drivers."

Please also note that the most updated engineering details (in Drawing Series 97294/R/001-015, dated 7/95) show that an access track for the container storage area west of Hong Kong Gardens intersects the alignment between Ch. 2200 and Ch. 2300. Between Ch. 3600 and 3900 are a bus bay (eastbound lane) and a bus bay/layby (westbound lane).

(ii) It has been confirmed that the maximum allowable speed of the improved Castle Peak Road will be 70kph. At this design speed, sufficient safety precautions, say layby lanes for run-ins, should have been incorporated in the road design to avoid accident on the slowing down vehicles to get access to the road-side developments while the main stream traffic is at a high speed. Frequent stoppage of the main stream traffic is, then, not anticipated and the adverse effect on the friction course road surface in this respect would have been over exaggerated.	The maintenance problem with respect to friction course centres on both its durability with respect to stop/start traffic, and its interface with other pavement types. Regarding the latter, HyD have written in a memo of 14 August 1995 (ref () in HRD 14/39/94, copied to EPD) that "friction course material should be laid across the whole width of the carriageway. The suggestion by DEP to provide short recess lanes for run-in traffic is not supported because the drainage path of the water inside the friction course material would be stopped by the recess lane which would cause failure of the friction course material at the interface area."
(iii) As mentioned in my previous comments the joint testing programme may come up with a long previous road surface mixes suitable for the application in Hong Kong environments before the commencement of the subject project.	Agreed.
(iv) The reasons, so far, quoted by HyD and the Consultants are too weak to uphold negative reviews to the potential application of the friction course on the entire study alignment. Beside the previous road projects with friction course road surface which I mentioned in the 3rd Working Group Meeting, a most recent EIA study recommended and endorsed by HyD, the application of such road surface on the local roads on the new reclamation with heavy traffic, the Hung Hom South Road and the existing Hung Hom Road. All these are local roads with design speed of 50kph. I, thus, have strong reservation on the HyD's preliminary view denying the use of friction course road surface on the subject road project with a free flow traffic speed of 70kph. The Consultants are requested to review the situation.	The Consultants have been advised by HyD on the suitability of friction course along this stretch of Castle Peak Road. The Consultants have no brief to compare the suitability of friction course at various locations, or to advise whether it is suitable, from an engineering or maintenance viewpoint, in the study area.

Section 8.3.2	
I do not concur with the Consultants' view with respect to the higher barrier might be warranted if the ground conditions and structural requirements permitted at the detailed design stage. It, in fact, should be the other way round, the Consultants should recommend sufficient and effective noise barrier to certain NSRs and the height of the barrier can be modified to suit the ground and structural constrains identified at the later stage.	Agreed. The text has been amended in accordance with the suggested approach.
Sect. 8.3.5	
(i) The report this fails to demonstrate that the bypass option is a more environmentally favourable alternative over the on-line improvement. On the contrary, it will cast additional serious traffic noise impact a the southern ends of the existing and future noise sensitive developments which are now only experiencing traffic noise from the Castle Peak Road and Tuen Mun Road to their north. Particularly, the development potential of the future reclamation and the CDA sites will be highly limited.	Agreed. A full enclosure has now been recommended for the bypass, subject to air quality concerns (currently under investigation).
(ii) Although I share the same view that the effectiveness of the mitigation measures cannot be evaluated in the absence of development plan for CDA sites and the reclamation, a partial road enclosure on the bypass may be an effective means to reduce the potential traffic noise to its minimum.	Agreed. See response to preceeding comment.
Regarding to the Union Carbide CDA site, an application for residential development on this site has been launched to the TPB for approval. Noise mitigation measures on the proposed Bypass should be provided to protected this committed CDA site. The CES consultants may like to contact with the ERM consultants, the acoustic consultants of the Union Carbide CDA site, for the details of the building layout.	CES has spoken with both the planners and environmental consultants (ERM) regarding this site. An enclosure along the bypass has been modelled and is found to be an effective noise mitigation measure.

Sect. 8.3.6

Regarding noise levels at SR21-1, the Consultants may refer to the attached Appendix 1 for information and further follow-up action.

Reconciliation of EPD's and CES's modelling results is currently under way. Please note that the results shown in Appendix 1 are from July 1995. The numbers shown in Appendix 1 were superseded by the results provided in Annexe D of the Draft EIA (August 1995).

Sect. 8.3.9

(i) The preceding comments on Sect. 8.2.8 also applicable to the use of friction road surface as one of the potential noise mitigation measures to SR 33-3.

Noted.

(ii) The text has indicated that the existing carpark and the Good Harvest development will screen the Hanley Villa (SR33-1, 33-2 and 33-4), however, the corresponding figure quoted in the Annexe D do not show this screening effect. Checking up on the assessment would be required.

The carpark and Good Harvest Development are shown in Figures D-1(c) and D-2(c). The carpark is the un-numbered block shown just above and to the right of number 32. The Good Harvest Development is shown as NSRs 43-1 and 43-2.

(iii) The preceding comments on Sect. 8.2.8 also applicable to the use of friction road surface as one of the potential noise mitigation measures to SR 33-8.

Noted.

Sect. 8.3.11

(i) Apparently the first sentence of this section of the preliminary draft report seems to suggest that the report will only consider barriers up to 3 m if they are found effective in traffic noise reduction. It is the rationale behind my previous comment that it would not be the right approach of the study. My comments on the Sect. 8.2.2 above are also applicable here.

Noted. Barriers up to 7 m high and enclosures have now been considered. Please see responses to EPD NPG's comments regarding Section 8.2 and Section 8.2.2 above.

(ii) The preceding comments concerning the friction course, higher barriers and road side enclosures are also applicable to this paragraph. Regarding the lease conditions for developments currently under construction, they may not be drafted to reduce the potential traffic noise stemming from the improved Castle Peak Road, but the existing Castle Peak Road, but the existing Castle Peak Road alignment. Anyway, it is worth to look into the lease of these developments before the consideration of noise mitigation.

Noted. Barriers up to 7 m high and enclosures have now been considered. Please see responses to EPD NPG's comments regarding Section 8.2 and Section 8.2.2 above.

Annex D

(i) The Consultants have mis-understood my previous comments. Given there is no change of traffic flow volume on the road stretches before and after the Sham Tseng Town Centre for the on-line improvement and the bypass options, the traffic noise levels at NSRs along these road sections should remain the same for the two options. However, the results quoted in the Annexe D do not show the case. Errors may exist either the noise models or the inputs data, the Consultants are requested to check their calculations.

As shown in Annexe A, traffic flows (both volume and proportion of heavy vehicles) change significantly for the "on-line" and "bypass" scenarios.

(ii) Spots checks have been carried out on the given lists of noise levels in the Annexe D before giving my previous comments. We found that in addition to the errors on the headings, the quoted noise levels bear errors in both rounding off and the wrongly translation of the CRTN criteria. A thorough review of the rounding off of the quoted noise levels and the criteria of entitlement are warranted.

Headings have been corrected, and revised spreadsheets will be included in the revised Annexe D. The changes cited do not significantly change the results of noise impact assessment.

(iii) Spot check results with respect to the facades concerned are given in the attached Appendix I for the Consultants' reference and cross checking. Please be noted that we have carried out the accuracy spot checks on the basic noise levels of the Bypass option only, but it is not necessarily meant that there is no discrepancy on the on-line improvement noise levels. Nevertheless, if the difference between the Consultants' figures and our findings on the bypass option have been clarified, it will equally apply to the on-line option calculations at same NSRs.	Reconciliation of EPD's and CES's modelling results is currently under way. Please note that the results shown in Appendix 1 are from July 1995. These numbers were superseded by the results provided in Annexe D of the Draft EIA (August 1995).
(iv) Furthermore, spot checks on the effectiveness of the 3 m high noise reduction due to the incorporation of noise barriers at most of the upper storeys are higher than the lower floors. A review on the input parameters of the noise model would be required.	Barriers may appear to have a greater effect at upper levels if lower levels are already shielded (e.g., by embankments or podium structures). As stated above, reconciliation of EPD's and CES's modelling results is currently underway.

From : CED
Ref : (35) in GCP 1/10/477 III
Date : 17 August 1995

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7. Subsection 12.1.5: Besides the consideration of existing sediment contamination, disposal of mud should be in accordance with the procedures laid down in WBTC 22/92.	Noted. This point has been added to existing text.

From : Dir of Regional Services
Ref : (122) in RSD 3/HQ 712/82(7) VI
Date : 22 August 1995

4. DFR Vol 3, EIA Report July 1995

In terms of air quality, our bathing beaches would not be adversely affected (¶9.1.2 and ¶10.1.4). In terms of water quality, the impact would be generally minimal in the operational phase provided that appropriate pollution control mechanisms are installed to protect gazetted bathing beaches. As the amount of dredging and the reclamation extent are not determined, the detailed water quality impacts of the proposed reclamation will be undertaken in the next phase of the EIA. In this regard, we reserve our comments when details of the reclamation and amount of dredging are known and assessed.	Noted.

Agreement No CE 39/94
Improvements to Castle Peak Road
between Ka Loon Tsuen and Area 2, Tsuen Wan

Comments from government departments on proposed noise mitigation scenario, and the Consultants' responses:

COMMENTS	**RESPONSES**
From : EPD NPG **Ref : () in EP 2/N2/30 XII** **Date : 1 February 1996**	
Section 8.3.1.1: Line 8 of the paragraph *"or a partial enclosure fail to..."* contradicts with the subsequent sentence *"A 500m partial enclosure over..."*	Noted. Text changed to delete inconsistency.
A brief note of reasons for the impracticability of a high noise barrier or enclosure should be given at the end of the paragraph.	Text amended to include reference to reasons for impracticability.
"Cantilever barrier" is mentioned in Table J1 for Ka Loon Tsuen, however, it has not been discussed in the section. Would it be a typo error and should it be replaced by "partial enclosure"? Similar to the above, the terminologies used in the Table J1 do not match with those given in the main text for other NSRs. Amendments in this respect are deemed necessary.	Noted. Discrepancies between text and Table J1 have been eliminated.
S. 8.3.1.2: Noise exposure levels at NSRs in the Bayside Villas without mitigation have not been given, then, the effectiveness of the recommended 3m noise barrier that is atop the 6m retaining wall at Ch 1550 to 1650 cannot be evaluated. In the light of the performance effectiveness, the cost-effectiveness of this recommended noise barrier can then be reviewed.	The 3-m barrier at Bayside Villas was capable of bringing future traffic noise below existing levels, but was not capable of reducing it to HKPSG standards. Justification for the barrier is therefore weak. While a cost-effectiveness study for mitigation measures is beyond the scope of this study (consequently, no criteria for cost-effectiveness have been agreed), the 3-m barrier is likely to be considered impractical in terms of costs, considering the small number of receivers (about 6 units) benefitted. Text has been amended to remove the 3-m barrier as a recommended mitigation measure.
S. 8.3.2.1: Where is the attached map for the details of the bus bay as mentioned in Item (a)?	Reference has been changed to the appropriate Drawing in Volume 5 of the Report.
S. 8.3.3.2: Figure J3 shows "full enclosure (open seaward side)". Should it be read as "partial enclosure (open seaward side)"?	Yes. All figures in Annexe J will be omitted from the final EIA.
S 8.3.4.2: The partial enclosure discussed in the section cannot protect NSR 14 as it is at the seaward side of Castle Peak Road.	Noted. Text has been amended.
S 8.3.5.3: A partial enclosure covering both carriageways and open to the seaward side will be effective to reduce traffic noise at the future CDA developments to HKPSG limit. Line 9 of the paragraph concerning with *"a partial enclosure is likely to be ineffective"* may be incorrect.	Agreed. This was a typographical error that has been corrected in the text.

S 8.3.6.1: The materials given in the section are not clear. Firstly, how high is the recommended cantilever barrier? Secondly, which and how many units will be benefitted from such barrier? Ambiguity arises on saying that the eastern facade will be protected, it can be interpreted as the eastern facade of a unit will be protected while the western facade of the same unit will be exposed to excessive traffic noise. The cost effectiveness of the cantilever noise barrier should be reveiwed before adopting as one of the noise mitigation measures.

The cantilevered barrier has a 6-m clearance over the roadway. As stated in the text, such a barrier would shield eastern facades (parts of 3 units) at Pink Villas from traffic noise over the HKPSG standard, at a price of significantly increasing the size and cost of the structure supporting the alignment. Justification for the barrier is therefore weak. While a cost-effectiveness study for mitigation measures is beyond the scope of this study (consequently, no criteria for cost-effectiveness have been agreed), the cantilevered barrier is likely to be considered impractical in terms of costs, considering the small number of receivers benefitted. Text has been amended to remove the csntilevered barrier as a recommended mitigation measure.

S 8.3.7.3: The last paragraph of the section can be deleted.

Noted. Text has been amended.

S 8.3.9.2: Would the partial enclosure mentioned in line 7 be a cantilever noise barrier?

No. The enclosure was modelled as a partial enclosure over the eastbound carriageway, which extends slightly further over the carriageway than does the cantilevered barrier.

S 8.3.9.3: The lease conditions of the planned and committed NSRs along the entire alignment within the study area should be checked whether they should have their own noise mitigation measures against traffic noise from the existing Castle Peak Road. As such, they will not be eligible for indirect technical remedies.

Noted. The lease conditions have been checked, and do not require at-receiver noise mitigation.

S 8.3.9.3: Would the partial enclosure stated in the last sentence be, in fact, a cantilever noise barrier?

Could be. The text has been changed to clarify this situation.

S 8.3.9.6: The new highrise developments may have their own noise mitigation measures, to be confirmed by the consultants.

Agreed. The lease conditions have been checked, and do not require at-receiver noise mitigation.

S 8.3.11 and 8.3.12: In order not to confuse with the "operation scenarios" mentioned in S 8.1.2, I would suggest replacing "scenario" with "strategy" that has been used in S 8.2.20.

Agreed. Text has been changed accordingly.

S 8.3.12: Besides the comment given above, this section may be reworded to read -- "*...Locations of recommended direct technical remedies are shown in Figures 8.1 to 8.11. This mitigation strategy would leave a large number of facades ... from roadside barriers. Facades that are still subject to residual noise levels exceeding the HKPSG criterion after mitigation will be tested against the three CRTN criteria for eligibility for indirect technical remedies.*"

Agreed. Text has been changed accordingly.

Year 2011 traffic noise levels at each identified NSRs after direct tchnical remedies have been given in the Annexe D alongside with the spread sheets for testing against the three CRTN criteria. Except those noise levels at NSRs after mitigation, the rest of data will not be necessary in the current feasibility study as a thorough study for the implementation of indirec ttechnical remedies that should be detailed down to individual flat will be conducted after the completion of the EIA. At this stage an estimate of how many flats are eligible for indirect technical remedies would be good enough for cost estimate.	Noted. The additional information given in Annexe D has been amended to remove reference to CRTN criteria. An estimate of the number of flats eligible for compensation for indirect technical remedies has been made, and is included in the revised text.
Presumably, year 2011 traffic noise levels at the identified NSRs without direct technical remedies, with barriers of various height discussed in the report and with the recommended direct technical remedies will be given in the final report. Furthermore, the number of dwellings exceeding the HKPSG maxima with and without direct technical remedies and the number of dwellings eligible of indirect technical remedies should also be given.	The 2011 traffic noise levels at the identified NSRs with and without direct technical remedies were given in Annexe D of the Draft Final, and will be repeated in the same Annexe in the Final Report. The 2011 traffic noise levels with the recommended barrier strategy will also be given in Annexe D in the revised Final Report. The approximate number of flats eligible for indirect technical remedies under several mitigation strategies is also provided in the main text of the revised Final Report.
Cost estimates for the both direct technical remedies and indirect technical remedies should be given in the report for public consultation at a later stage.	Noted. Cost estimates will be included in the revised Final Report.
S 8.4.1: Regarding to the on-line improvement, it is concurred that assessment would be limited to NSRs in Sham Tseng Town, however, the text should explain the reason behind. It will not be acceptable just quoting *"As previously agreed"* in the document of this nature.	Agreed. Text has been amended to state: *"For the purposes of the noise impact assessment, 2011 traffic projections for the on-line and bypass options do not greatly differ. For this reason, examination of the impacts of the on-line improvements through Sham Tseng is restricted to NSRs in Sham Tseng. Predictions for NSRs outside Sham Tseng will be similar to those provided above in Section 8.3."*
Table 8.1: The unmitigated 2011 facade noise levels at NSRs do not agree with those inputs in Annexe D.	Noted. The results shown in Table 8.1 have been amended to agree with the results shown in Annexe D in the revised Final Report.

From : Fire Services Department
Ref : (14) in FSD 40/7596/93 VI
Date : 10 January 1996

Thank you for your letter of 23.11.1995 and the relevant drawings attached thereto. Having studied the drawings, I have the following comments on the provision of noise barrier along the project area:	
Drg No 97294/R/003: Subsequent to the erection of 5 m noise barrier on roadside, consideration on the relocation of existing hydrant(s) is required.	Noted. Text in ¶8.3.3.6 has been amended to note this point.

Drg. No. 97294/R/004: The emergency access of a dwelling-house namely Dragon Garden (opp. 37 Castle Peak Rd.) will be jeopardised by the erection of the proposed 3 m noise barrier, therefore, relation of this section of noise barrier is required.

Noted. Removing part of the barrier near Dragon Garden would leave a gap in the proposed 3-m barrier, thus compromising its effectiveness. As a result, the reduced barrier and its cost are difficult to justify. In the absence of a cost-effectiveness study for mitigation measures, which is beyond the scope of this study, the 3-m barrier has been removed as a recommended mitigation measure, since it is considered unlikely to be regarded as practical on the basis of its cost, considering the greatly reduced number of receivers it will benefit. Text in ¶8.3.4.1 and ¶8.3.4.3 has been amended.

Furthermore, please be advised that the enclosures, in particular the lengthy enclosure at the seafront of Sham Tseng, will directly affect our operational radio communication. As such, I reserve my right to comment on the provision of adequate/effective radio communication system to be installed inside the enclosures by Highway Department.

Noted. Note is made in the text that additional fire hydrants, a FSD radio telephone communication system and fire services installations would have to be provided in the enclosure at Sham Tseng (¶8.3.5.5), and that additional fire hydrants and a FSD radio telephone communication system should be provided at the enclosure near Greenview Terrace (¶8.3.10.4).

From : Civil Engineering Department
Ref : GCP 1/10/477 III
Date : 15 February 1996

Thank you for your memo referenced and the comments and response to the proposed noise mitigation scenario referenced above. The Civil Engineering Department has no comments on our reponses to the mitigation measures issues raised by EPD's Noise Policy Group and Fire Services Department.

Noted.

From : Planning Department
Ref : (59) in PD/TW S/TT/9
Date : 14 February 1996

My comments on the proposed mitigation measures are as follows:

(a) Visual Impact of the Proposed Cantilevered Barrier: Consideration should be given to avoid blocking the sea view of the Tsing Lung Tau Tsuen and the Yuen Tun Village. Otherwise, it may lead to the objections from villagers on the *fung shui* and sea view issue.

Noted. A visual impact assessment of the final mitigation scenario will be completed to address this issue. Visual impacts can be reduced by using Paraglas or other clear material in the barrier.

(b) <u>Proposed Partial Enclosure along the Sham Tseng Bypass:</u> My comments on the proposed partial enclosure as contained in my previous (29) of the same seried dated 28.11.96[5?] are still valid. A copy of my previous memo is attached for your easy reference.	In response to your comments, MCAL submitted two drawings showing interfaces between the Sham Tseng Further Reclamation Development, the Bypass and the partial noise enclosure (MCAL letter of 4/12/95, ref RJM:lc:97294\10.3\CPRI\897). As stated in the responses to comments on the Preliminary Draft EIA, partial or full road enclosures were not initially considered, in line with Section 18.6 of HyD's *Structures Design Manual for Highways and Railways* (¶8.2.5 of the Preliminary Draft EIA) and previous HyD comments on the Initial Assessment and Key Issues Report, which state that enclosures will not be normally permitted unless other means of mitigation (including glazing and air conditioning) have been exhausted. Subsequent discussion with government departments has expanded the other means of mitigation that are available on this project, including alternative alignments. The traffic noise impact assessment has considered the Sham Tseng Further Reclamation and the CDA sites under both the on-line and bypass options.
The Chief Town Planner/Urban Design and Urban Renewal has the following comments on the conceptual design of the partial enclosed provided by MCAL:	
"Separation of the promenade from the CDA development by the bypass is not desirable. The segregation would reduce utilisation and thus the enjoyment of the promenade by local residents, unless additional open space is included along the promenade to increase the variety of activities that could be taken place on it. This will require further reclamation. Regarding the options for enclosure structure, Option 1 is more acceptable as this would support a connection of open space with the promenade, if the CDA developments would take account of this in the layout design. The enclosure proposals and the landscape treatment attached are, however, too sketchy for a decent visual impact assessment. Also, please note that the aesthetics of the structure will have to be submitted and considered by the Advisory Committee on Appearance of Bridges and Associated Structures (ACABAS)."	Noted.
(c) <u>The Sham Tseng Further Reclamation and the CDAs in Sham Tseng</u>: The Sham Tseng Further Reclamation and the CDAs should be taken into account in the detailed EIA, if the Master Layout Plans of these developments are available, e.g. the development scheme of the Union Carbide CDA.	Noted.

From : Tsuen Wan District Office
Ref : (79) in TWD/13/78 VI (TC 2/95 III)
Date : 15 February 1996

(a) Visual Impact of the Proposed Cantilevered Barrier: I concur with DPO(TW)'s view that the proposed cantilevered barrier would impose a detrimental visual impact on the Hong Kong Garden, the Tsing Lung Tau Tsuen and the Yuen Tun Village. We will be bound to meet with strong objections from the locals there. Besides the negative visual impact, the villagers might also complain about the adverse fung shui effect the barrier would have on their villages.

It is agreed that villagers may perceive that fung shui may be adversely affected by the barrier. However, fung shui has not been considered in the present assessment, since impacts associated with it are impossible to predict.

(b) Future Developments at the CDA Sites: To play safe, the future developments at the CDA sites in Sham Tseng should be given due regard in your detailed EIA study. Developers should be cautioned of the traffic noise impact and should incorporate in their developments self-protecting features as suggested in your revised NIA assessment report.

Noise impacts on the CDA sites have been predicted in ¶8.3.5.3, using representative NSR points SR42-1 to SR42-4.

From : Royal Hong Kong Police
Ref : (17) in CP/T/TMB 216/141 Pt XXV
Date : 22 February 1996

Please be advised that I have no comments to make in respect to your revised text for Chapter 8 (Traffic Noise Impact) of the EIA.

Noted.

From : Highways NT Region
Ref : () in HNT 602/TW/1 VI
Date : 16 February 1996

I have the following comments on the draft Chapter 8 (Traffic Noise Impact) of the EIA:

¶8.2.3:

(a) The consultant should take into account the difficulty in maintaining noise barrier of more than 3m high. Access to and room for the maintenance of noise barrier and its adjacent slope should also be considered.

The Consultant is aware that the maintenance of any such structure is a significant consideration. Due to factors such as location (i.e., proximity to a busy highway and difficult terrain) it is essential that the design of these structures incorporates design features such as shape and materials to minimize future maintenance.

(b) The proposed noise barriers should not interrupt any of the stormwater drainage system for the slopes adjacent to Castle Peak Road.

Noted. Full as-built information will be available to the detailed designers.

(c) In stability design of the noise barriers, it should take into consideration the likelihood of deep trench excavation, e.g. for utilities installation, adjacent to the noise barrier.

Noted. Undermining caused, for example, by adajacent utility installation or maintenance will be considered as a matter of course.

¶8.3.6.1: The paragraph mentions that "a cantilevered barrier cannot be installed along this part of the alignment...". However, in Table 8.1, cantilevered barrier is recommended. Please ask the consultant to clarify this.

The reference in Table 8.1 to the cantilevered barrier was in error, and has been removed.

Table 8.1 (NSR ID SR21): The height of cantilevered barrier, if recommended, should also be specified.

The reference in Table 8.1 to the cantilevered barrier was in error, and has been removed.

COMMENTS	RESPONSES
Table 8.1 (NSR ID SR35): In the version prepared in November 1995, the recommended measure was "indirect technical remedies". Could the consultants elaborate on why it now changes to "partial enclosure".	Indirect technical remedies were initially recommended because no feasible, safe direct technical remedies were identified. In the Environmental Working Group of 15.11.95, it was agreed to consider a road enclosure of limited length, assuming that the existing bus-bay is able to be relocated. (Refer to ¶5 (third bullet point) on the Notes of that Meeting, which state that "it was agreed that a shorter structure at Greenview Terrace could be considered. It was agreed to review the practicability of a shorter semi-enclosure at Greenview Terrace.")

Agreement No CE 39/94
Improvements to Castle Peak Road
between Ka Loon Tsuen and Area 2, Tsuen Wan

Government comments on the Preliminary Draft EIA and the Consultants' responses:

COMMENTS	RESPONSES
From : Tsuen Wan District Office **Ref : (28) in TC2/95 II (TWD/13/78 V)** **Date : 18 July 1995**	
I have no adverse comment on the report.	Noted.
From : HyD District & Maintenance/NT **Ref : () in HNT 602/TW/1 V** **Date : 20 July 1995**	
Please be informed that I have no adverse comment on the Preliminary Draft Final Environmental Assessment Report.	Noted.
From : RHKP Traffic Wing **Ref : (8) in CP/T/TMB 216/141 Pt XXIV** **Date : 22 July 1995**	
I refer to Maunsell's letter dated 12.7.95 and take this opportunity to advise you that I have no comments to make in respect of the captioned report [Preliminary Draft Final Environmental Assessment Report].	Noted.
From : Civil Engineering Department **Ref : GCP 1/10/477 III** **Date : 20 July 1995**	
Thank you for your letter and the associated report. The Civil Engineering Department has no adverse comments on the preliminary Draft Final Environmental Impact Assessment Report of the Castle Peak Road Improvement project. We look forward to receiving the official Draft Report.	Noted.
Please be advised that future correspondence should be addressed to Dr RP Martin, Chief Geotechnical Engineer/Planning.	Noted.

From : Senior Landscape Architect, HyD
Ref : HYDT 12/7/41
Date : 21 July 1995

I have no comment on the preliminary draft Final Environmental Assessment Report and attach the Form confirming acceptance of the Report for your use.

Noted.

From : Planning Dept: Tsuen Wan DPO
Ref : (5) in PD/TW S/TT/9 VI
Date : 21 July 1995

I refer to your letter of 12/7/95 together with the subject EIA Report. My comments on the EIA report are as follows:

Environmental Impacts

Noise Impact, Lido Garden: According to the EIA, despite the diversion of traffic to the Bypass, traffic noise along the existing Castle Peak Road (CPR) will not decrease significantly. The northern facade of the Lido Garden would still be exposed to traffic noise greatly exceeding the HKPSG. The intention of the Bypass to reduce the noise impact along CPR is no longer valid. Instead, the Bypass will create an additional noise source to the southern facade of the Lido Garden which is considered environmentally undesirable.

As shown in Annexe A, predicted 2011 morning peak hour traffic flows with and without the Bypass are:

With Bypass:
1350 veh on CPR
1860 veh on Bypass
(3200 veh total)

Without Bypass:
3000 veh on CPR

Thus, the Bypass is seen to attract about 200 more vehicles during the peak hour, but splits traffic between the CPR and the Bypass. As a result, peak hour traffic along CPR would decrease from the present flow of about 1550 vehicles.

In terms of noise impact:

- Traffic noise levels at facades facing CPR do not greatly change with the Bypass, since traffic flows do not greatly change. Thus, the Bypass does prevent a *deterioration* in future noise levels.
- The Bypass is sufficiently removed from Lido Gardens that facade noise levels due to its traffic are expected to remain just under the HKPSG guideline; thus, the last sentence of the comment may not be strictly correct under the noise criteria adopted for this study.

Noise Impact, Sham Tseng Further Reclamation:
It is noted from the findings of the EIA that the Bypass will generate noise levels exceeding the HKPSG up to 70m from the Bypass. This would have significant impact and constraints on the Sham Tseng Further Reclamation. Unless the proposed Bypass would be self-insulated, additional environmental constraint on the future development sites is not acceptable.

Noted.

Noise Impact, CDA Sites in Sham Tseng: The planning intention of the CAD is to encourage redevelopment of the existing industrial sites to commercial/residential uses. The northern facades of the CDA sites are currently exposed to traffic noise. The Bypass option will create an additional traffic noise source to the southern facades of the future residential developments within the CDA facing the Bypass. According to the EIA, the Bypass option will generate traffic noise exceeding the HKPSG at both the southern and northern facades of the CDA sites. As a result, single-aspect building design would become ineffective as a noise mitigation measure under the Bypass option.

Noted, though the layout of the future CDA sites is not known at this time, and may incorporate an effective barrier (such as a podium structure or commercial uses at the roadside) for sensitive residential facades.

Visual and Landscape Impact: According to the visual and landscape impact assessment of the EIA, the visual impact of the On-line option would be slight, as compared with the Bypass Option which is considered as having moderate implication. As the Sham Tseng Bypass would traverse the southern boundary of the Sham Tseng Further Reclamation and the CDA sites, it is expected that the proposed Bypass would impose a significant visual impact on the visual receivers in the area. According to Para. 14.5.8 of the EIA, the visual impact of the Sham Tseng Bypass on the residential uses on the Sham Tseng Further Reclamation and the CDAs has not been taken into account. As such, I have reservation on the findings of the visual impact assessment for the Bypass Option which is considered as moderate. In this regard, CTA/Arch S.D.'s advice should be sought.

We are awaiting a response from the Visual and Landscape Subconsultant.

Encroachment upon the Gazetted Beaches: It is noted that Segment Nos. 4, 6, and 7 will encroach upon Angler's Beach. Casam Beach and Gemini Beach, which are gazetted beaches in Tsuen Wan West. The Bypass option in particular will result in the displacement of the Angler's Beach. The displacement of gazetted beaches would have to be agreed by departments concerned in particular DRS. The loss of beaches is also not in accordance with the planning intention of preserving the environmental and landscape quality of Tsuen Wan West. The displacement of the Gemini Beach by the proposed Bypass would not be supported, unless mitigation measures which are acceptable to departments concerned could be proposed prior to this option to be further considered. D of M should also be consulted on any further reclamation in the area, in particular the impact on the Ma Wan Channel.

The development of the Castle Peak Road Improvement proposals and the mitigation of impacts are fully discussed in the Volume 1 (Engineering Study) of the Final Report. There will be an impact on Gemini Beach, but the Beach will not be displaced. The other points appear to be procedural and are noted.

The Sham Tseng Bypass Option vs the On-line Option: According to the findings of the EIA, it is obvious that the On-line option is a more environmentally acceptable option. I should be delighted if you could enlighten me on why the Bypass is being considered as the preferred option in the EIA. Unless the EIA could adequately demonstrated that the Bypass will not jeopardise the planned and committed landuses on the Sham Tseng Reclamation, and the CDA sites, I am not prepared to support the Bypass option as the preferred option for the Castle Peak Road Improvement.

The EIA has not identified either Sham Tseng option as a "preferred" option. Since both Sham Tseng options are being carried forward for consideration at a subsequent stage (preliminary design) of the Study, the EIA aims to present the environmental impacts of both options for the consideration of the Steering Group.

Mitigation Measures

Noise Impact: Although noise barriers up to 3 m will be required along the various sections of the CPR to mitigate traffic noise, according to the report, more than 1,700 residential units from various developments facing the improved alignment will required mitigation at the receiving ends. The estimated 1,700 flats exposing to excessive traffic noise has not included the residential developments on the Sham Tseng Further Reclamation and the CDA sites, should the Bypass option be adopted. According to the current policy, mitigation measures should be provided at source. To provide mitigation measures at the receiving ends is not in line with the prevailing policy. In addition, the EIA has not indicated how and what mitigation measures are to be installed in various private development to combat noise generated from CPR. This information is important when the proposal is to be present to the public especially to the DB for consultation.

The number of flats requiring indirect mitigation is 1,700 for the Bypass option only. If the on-line improvements are adopted, the number rises to 2,600 (see ¶8.4.8). This increase of about 900 flats results mostly from the exposure of additional units in Lido Gardens (northern facades) and Rhine Gardens (southern facades) to increased noise from a doubled traffic flow along Castle Peak Road. Neither figure includes flats on the Sham Tseng Further Reclamation or in the CDA sites.

We understand that the present policy, as stated in the HKPSG Environmental Guidelines, is that "[a]coustic insulation is often the 'last resort' in an attempt to abate noise disturbances..." (¶4.3.10). This policy, which formed the basis for this Study's assessment criteria, was previously stated in Sections 3.2.2 and 3.2.3 of the Initial Assessment and Key Issues Report (repeated in Sections 3.2.3 and 3.2.4 of the present Preliminary Draft Final EIA). The HKPSG Environmental Guidelines also acknowledge that "...it is unlikely that [barriers] will have widespread applications in Hong Kong where high-rise buildings require protection" (¶4.3.8). We have modelled noise barriers, and have found that they are not effective along most of the alignment, where high-rises require protection. Other forms of at-source mitigation have also been considered. Friction course was assumed where it is compatible with traffic conditions (along the proposed Bypass). Partial or full road enclosures were not further considered in line with Section 18.6 of HyD's *Structures Design Manual for Highways and Railways* (¶8.2.5 of the Preliminary Draft EIA) and previous HyD comments on the Initial Assessment and Key Issues Report, which state that enclosures will not be normally permitted unless other means of mitigation (including glazing and air conditioning) have been exhausted.

Mitigation at the receiver would normally take the form of appropriate glazing (in line with the recommendations in Appendix 4.4 ("Suitable Window Types for Noise Insulation") of the HKPSG Environmental Guidelines) and air conditioning at affected sensitive facades. Text has been amended to clarify this point.

Planning and Landuse Implication: In addition to the environmental impact associated with the Sham Tseng Bypass, the Bypass Option will also affect the implementation of the Sham Tseng Sewage Treatment Works (STW) and its buffer area which have been incorporated in on the Tsuen Wan OP No. S/TWW/5 gazetted on 28.10.95. Unless the conflict created by the Bypass on planning and landuse issues could be adequately resolved, I would not support the Sham Tseng Bypass as the preferred alignment for the Castle Peak Road Improvement.

The issues are noted but it is believed that since sewage treatment works project is in its early stages of design it should be possible to achieve a satisfactory rearrangement of the reclamation site layout following discussions and agreement between all parties involved in the two projects.

From : Transport Department
Ref : () in NR146/194/C-4
Date : 17 July 1995

I am pleased to advise that I have no adverse comment on para. 5 on traffic ground.

Noted.

From : Water Group, EPD
Ref : (8) in EP2/N2/30 X
Date : 24 July 1995

General

Regarding the preliminary draft final EA report, the following water quality issues are still outstanding despite the fact that they were raised in our comments on the initial assessment and key issues report and further discussed in the meeting on 26 June 1995.

Water quality issues previously raised by EPD have now been further clarified in the text of the report. At this stage of the feasibility study it is not appropriate to carry out detailed studies because further detailed work is programmed.

Section 12.1.3 to 12.1.5

The assessment of construction phase impacts is too brief and general. As the preferred option for route alignment is known (Fig. 2.1 to 2.10), EIA for the route segments (particularly the segments which involve dredging/reclamation or disturbance to beaches) must be specific and detailed in order that effective mitigation measures can be proposed. The construction phase EIA should include at least the following tasks:

(a) On the basis of the preferred alignment, locate the areas requiring dredging/reclamation.

(b) Estimate the quantity of mud to be dredged and the amount of fill.

(c) Estimate the likely amount of contaminated mud and the nature and level of contamination.

(d) Assess the impacts of dredging and reclamation by taking into account the fast tidal flow in the area and the sensitive receivers for the cases with and without mitigation.

(e) Examine the various sources of discharge and polluted runoff and determine if discharging 100m away from the beach boundaries is technically feasible for all the beaches.

The current report is feasibility study of the outline scheme. The purpose was to identify in a relative fashion the most favourable route option and to define likely impacts.

Section 12.2.11 to 12.2.12

These sections should mention the uncertainty of the Sham Tseng further reclamation. Bypass at Sham Tseng is not an option if the reclamation is unacceptable and will not be built.

The uncertainty of the reclamation option at Sham Tseng is noted and the text amended. The potential impacts of this option will be addressed in detail in the next phase.

Section 12.3.1

Note that site runoff, effluent from site offices, toilets and canteens must be discharged licence requirements. Note that our previous comment on the key issues report states clearly that our preference regarding sewage disposal is to use disposal facilities which will result in no discharge such as chemical toilets, stored and hauled away etc.

We note the preferences and requirements of EPD. The text has been amended to reflect the requirements for discharge more than 100 metres from a bathing beach and the preference for use of chemical toilets without local discharge.

Section 12.3.2

It states that any reclamation work must be assessed for its effect on drainage and sedimentation, coastal water current and water quality. The requirements are correct but the work should be done in this EIA (except the Sham Tseng reclamation which is outside the scope) rather than later.

It is not appropriate to conduct such detailed work for this feasibility study. More detailed evaluation will be undertaken, as you suggest, at the next stage.

Section 12.3.3

Even if works are carried out outside the bathing season, similar mitigation measures and precaution must be taken during marine works. If contaminated mud is found, it is a requirement to use sealed grab dredgers.

Noted.

Section 12.3.4

Please explain why there is insufficient space for provision of settlement basins and soakaways. Both sediment traps and oil interceptors are usually required.

The general terrain and the location of the road adjacent to the coast make the siting of large area settlement basins impractical. Soakaways may be a feasible option. The text has been amended.

Section 12.3.5

Note that as above, this section should reflect the uncertainty of the Sham Tseng further reclamation and remind that they bypass option may not be an option at all.

Noted. Text amended.

Section 12.3.8

It mentions here that beach erosion will be avoided if groynes are used. As stated in the WG meeting, any breakwater structures which obstruct flow will be allowed in this sensitive waters of the Ma Wan Channel. given that the new proposed beach will be located further out into the channel, the groynes will likely obstruct water flows. From the water quality perspective, we do not favour reprovisioning the beach here. It is important reflect our concerns in this section.

The use of groynes at this location for stabilisation of beach sand at the reprovisioned Angler's Beach would not affect overall water flow in the shipping channel, which is considerably farther offshore. Text has been amended.

From : AFD
Ref : (34) in AF DVL 14/53 II

Date : 24 July 1995

I note that some of our comments stated in our letter Ref. (69) in AF DVL 14/53 dated 27.3.95 have been taken into account in the Draft Final EIA Report. However, it appeared that not all of our specific comments contained in the annex of the aforesaid letter had been addressed to. I would appreciate if the consultant would provide a separate detailed respond.

The Preliminary Draft Final Report is substantially revised from the Initial Assessment and Key Issues Reports. Most of the comments made by AFD on the Initial Assessment and Key Issues Reports were addressed through revisions made for the Preliminary Draft Final Report. The consultant will be pleased to respond to those comments which are outstanding if AFD will identify them.

<u>Para 11.1.5 & 11.3.1 (Woodland at Dragon View)</u>

As stated, the woodland at Dragon View is well protected and uncommon along the existing Castle Peak Road, hence it should be preserved as far as possible. The project proponent or its consultant should justify himself if the woodland has to be destroyed.

Para. 11.3.1 explained the compromise required to avoid the woodland at Dragon View: loss of a mixed woodland of similar area plus an ungazetted beach. Para. 11.3.5 suggested that on-site mitigation can be performed by planting riparian species such as *Ficus fistolosa* and *Sterculia lanceolata* downstream of the Ting Kau area.

In Table 11.2 (P. 62), the range of dbh, instead of the maximum dbh of all plant species over 2 cm dbh should be shown.

Table 11.2 (P. 62) will be modified as requested (see below).

The composition of the mixed woodland (Para. 11.3.1, P. 74) should also be provided for comparison purpose.

Table 11.13 will be added to show species composition of the seaward side woodland along segment 2 (see below).

<u>Para 11.1.6 & 11.3.2 (Secondary Woodland near Ting Kau)</u>

The natural woodland is relatively of higher ecological value and should be preserved. The consultant's proposal to adopt Option 8C is in line with our view expressed previously. The project proponent should provides relevant strong justification if the woodland or part of it has to be destroyed.

The rationale for loss of the woodland is the cost of construction of the grade-separated section of the roadway.

The consultant should provide the area of woodland lost if the preferred Option 8B is taken.

Para. 11.3.2 stated that the estimated woodland loss for Option 8B is 2.7 ha.

<u>Para 11.1.22 (Avifauna)</u>

All wild birds, no matter they are common or not, are protected in Hong Kong and therefore are of conservation significance. I suggest that the wordings under Para. 11.1.33 and 24 be amended.

Although legal protection may be extended to all wild birds in Hong Kong, "conservation significance" derives from the need for conservation management, which requires application of financial or other resources limited in supply. Because of management resource limitations, we must be selective in assigning conservation priorities. The selection process should be based on ecological parameters determined for each species or community. The purpose of the paragraph was to document that the highly disturbed habitats along the proposed road improvement corridor do not now, and are unlikely in the near future, to support avian species or communities whose ecological parameters would support application of resources for conservation management.

	The wording of the indicated paragraphs will be amended to note the above.
Para 11.3.5 (Mitigation Measures)	
Would the consultant please provide the source to support the statement: ÒACE suggests a ratio of 3:1 for compensatory planting.	In numerous mitigation plans (for example CES 1995, *Route 3 Tai Lam Tunnel & Yuen Long Approach - Southern Section, Final Detailed EIA*, Vol. 1, The Main Line.) restoration of woodland at a ratio of 3 ha planted for each hectare lost has been an accepted guideline. This guideline has frequently been applied by AFD, and was, to the consultant's knowledge, initially developed by AFD. The Advisory Council on the Environment, EIA Subcommittee appears to have accepted this guideline as a *de facto* performance standard for mitigation plans. Therefore, it was recommended by the consultant for use in this case.
As regard off-site mitigation measures, the consultant should provide details on the justification, location, size, and cost, etc. of the plantings and how it could b implemented and maintained under HyD's contract.	Off-site mitigation is recommended only if adequate area is not available on-site for habitat restoration. That determination can only be made at the detailed design stage, at which time details including location, size, and cost will be provided.
The total area of woodland lost stated in this Para. is 8.27 ha, but is 8.41 ha in Table 11.10. Please clarify.	The total loss of woodland stated in Table 11.10 should be 8.27 ha. Text will be amended.
Para 11.4 (Residual impacts)	
Para 11.4.3 contradicts with Para. 11.4.1. The consultant should elaborate that `there will be no residual impact' as stated in Para. 11.4.3.	Para 11.4.3 will be revised to read: "...it is not predicted that the project would result in residual ecological impacts that would cause long-term degradation of Hong Kong's biodiversity.
Habitat Maps	
The habitat maps are too small to be read. Larger maps, preferably in colour, should be given.	Colour habitat maps will be provided. Legends will be added to explain the non-habitat symbols in order to ease interpretation.
From : Fire Services Dept **Ref : (7) in FSD 40/7596/93 V** **Date : 25 July 1995**	
It is noted that adverse effects arising from enclosures as contained in the last sentence of para. 5.4.4 and 5.4.6 of the "Initial Assessment and Key Issues Report" are not incorporated in this Preliminary Draft Final Report. If the use of partial/full enclosures is not going to be pursued, text should be added to this effect. Otherwise, these adverse effects should be incorporated.	As stated in ¶8.2.5, partial and full road enclosures have not been considered, in accordance with Highways Dept's *Structures Design Manual* (S. 18.6).
Despite para. 8.2.4 which states the possible adverse effect on emergency operation, drawing showing location of the proposed barriers should be provided so as to assess such impacts in more details as a result of the proposed barriers.	Noted. Figures to be provided in Draft Final Report.
From : EPD Noise Policy Group **Ref : (11) in EP2/N2/30 X**	

Date : 26 July 1995

Section 2, Table 2.1 to 2.3: The inputs in the columns of "SR ID" given in the Tables 2.1 to 2.3 are confusing, say there are three SR ID 42 (Lot 322?) showing different NSRs, would the Consultants counter-check these tables and ensure that the descriptions will match the locations delineated on figures 2.1 to 2.10.

Clarification is provided in the last column of Tables 2.1 to 2.3 when a single NSR number refers to multiple receivers. The NSR numbering system was expanded over the course of the study; where confusion may result, we have provided clarification in the Tables.

Section 3.3 and 4.2: The material contained in these two sections are for indication only. Applications for Construction Noise Permit (CNP) will be assessed by the Noise Control Authority and conditions specified in the CNPs shall be adhered to if issued.

Noted. Text in Section 3.3 has been amended to include this comment.

Section 7.2: SWL values of the powered mechanical equipment given in Table 7.1 to 7.12 have not been checked, however, the Consultants are responsible for their accuracy and should make reference to the *Technical Memorandum on Noise from Construction Work other than Percussive Piling.*

Noted.

Section 7.2.21: This section contains the same materials given in Sect. 7.2.14. It may be grouped together or be deleted from the text.

Noted and agreed that ¶7.2.21 repeats some of the information in ¶7.2.14. Text will be amended to eliminate the repetition.

Section 8.2.2: The approach taken by the Consultants in assessing the feasibility of applying noise barriers along the intended route is not in the right direction, the study should not be confined to the noise barriers of a maximum height of 3m at the very first beginning. Barriers with different heights should be studied at individual locations and the Consultants may recommend a barrier with suitable height within the practicable range at individual locations for agreement between departments concerned. The height of a particular barrier, however, may be compromised if structural problem is encountered and reported during the circulation of the report. Since different locations may have different technical problems besides the effectiveness of the barrier, the application of noise barriers with different heights should be re-considered on individual merits and deficiencies, a clear cut limitation to 3m high noise barriers is not acceptable.

The assessment is not limited to barriers of 3 m. As stated in ¶8.2.1, barrier heights of 0.8 m, 3 m, 5 m, and 7 m have been assessed. Detailed results of noise calculations for all four barrier heights are shown in Annexe D, and the effectiveness of barriers up to 7 m high is discussed in Section 8 at each receiver area.

As stated in ¶8.2.2, barrier heights over 3 m require large foundations that, along the constrained seaside alignment, would interfere with road drainage, underground services, and continued traffic flow during construction. At the subsequent detailed design stage, further information concerning design requirements and ground conditions may permit barriers over 3 m to be considered. This further information is not available at this feasibility stage. Nevertheless, the effectiveness of barriers up to 7 m has been calculated and has been consistently discussed, so that informed decisions may be made in the future if it is determined that higher barriers can be accommodated. On the basis of the information available at this feasibility stage study, it was considered prudent to limit the practical barrier height to a generally-attainable 3 m, rather than propose barriers of greater height that are not expected to be normally achievable at this site.

Section 8.2.5, 8.2.6 and 8.2.7: It is inappropriate for the Consultants ruling out the consideration of enclosures in the first place before any in-depth study. The HyD's *Structures Design Manual* is an internal guidance for their staff and does not, however, negate the application of enclosures in road project. There have been successful cases for road enclosures being used as noise mitigation measure in road projects in the territories while fulfilling all the requirements from other departments concerned. The road cover at the Tate's Cairn Tunnel Approach Road adjacent to the

In their comments on the Initial Assessment and Key Issues Report, EPD suggested that the Consultant state specific reasons for not adopting certain direct technical remedies. In response to this comment, HyD/Structures Division issued a memo to EPD (ref (31) in STR 5/30/49, dated 16 June 1995, substantially repeated in the Comments and Responses document circulated in May), specifically directing the attention of EPD and the Consultant to Clause No. 18.6 of the Structures Design Manual, and stating that "noise enclosures will not be normally permitted." Clause

Choi Hung Estate is a good example. The Consultants are requested to review the applicability of road enclosure in this project, especially on the locations where highrise buildings would be affected.

18.6 specifies that enclosures will normally only be permitted "where it can be shown that all other noise mitigation measures have been considered objectively together with the EIA findings and exhausted. These other noise mitigation measures include...double glazing (and) air conditioning." The Consultant is not aware of any adverse response to HyD/Structures' memo/comments. Consequent-ly, Clause 18.6 has formed part of the basis for devising the noise mitigation strategy in the Preliminary Draft Final Report.

In addition to the above, Fire Services access and road accident considerations make enclosures and semi-enclosures potentially impracticable. Following discussion with HyD and EPD at the 3rd EWG Meeting (31 July 1995), the Consultant will circulate to FSD, RHKP, Transport Department, and HyD plans showing possible enclosure locations. Where barriers do not interfere with the requirements of these departments, barriers will be considered.

Section 8.2.8: (i) The noise reduction ability of friction course has been well established, a 2.5 dB(A) noise reduction would generally be achieved. In this sense, friction course road surface will be an effective noise mitigation measure. It has been noted that the design speed of the improved Castle Peak Road is 70 kph. Thus, it is not unreasonable to assume that short recess lanes or ample spaces will be provided for the occasional run-ins to get access to road-side developments. These run-ins will not and should not impede and slow down the main stream traffic significantly. With such road feature, friction course road surface may not be deterred in the subject project.

It is agreed that friction course would be an effective noise mitigation measure, and guidance from HyD will be sought on this matter. HyD earlier supplied a letter (ref () in HYD MWPMO 365TH/EIA, dated 27 April 1995) to the Consultant (copied to EPD) with reference to this project, stating that "...friction course materials currently available in the market are not durable if they are used as topping material on local roads. The presence of run-ins and junctions prevent vehicles from sustaining free flow condition. The frequent stopping and braking of vehicles result in the short life of friction course..." The letter points out that friction course on this section of Castle Peak Road is not supported due to the anticipated high maintenance costs and frequent traffic disruption that it would necessitate.

(ii) Moreover, HyD jointly with EPD are currently conducting a programme of testing modified friction course mixes and it is hoped that a more durable and effective low noise road surface design can be sought in the future. The results of the testings may well be established before the commencement of the captioned project and the new low noise road surface should have overcome the maintenance problem and may be found suitable to apply in this road project to maximise the noise reduction at NSRs along its alignment. To this end, the effectiveness of the friction course road surface should also be assessed and the Consultants may like to recommend it as one of the noise mitigation measures for the project.

Please see response to preceding comment. A more durable low-noise pavement will be welcome in the present study area. However, it does not appear to be prudent to base this study on the possible outcome of tests that are currently underway. If a more durable friction course mix is proved in the future, its use may be incorporated in the EIAs for subsequent stages of this study.

Section 8.3: The discussion in this section give an impression that besides the structural difficulties, noise barriers higher than 3 m have been given up due to the reason that the HKPSG noise limit still cannot be met with such barriers in place. We are, in fact, looking for a combination of practical noise mitigation measures to reduce the traffic noise impact as far as practicable to meet the HKPSG noise criteria. Although it has been noted that noise levels at affected NSRs with different barrier heights have been given in the Annexe D, they fail to give an account of the effectiveness margins gained by the higher barriers. A quantified assessment of the additional merits obtained by the additional barrier heights should be given particular location.

This quantified assessment is underway. We will attempt to complete it for inclusion in the Draft EIA, but if this is not possible, we will present the results separately to EPD and include them in the Final EIA.

Section 8.3.1: Would the Consultants clarify that what is the "mitigation at the receiver"? Does it mean the indirect technical remedies in the form of acoustic insulation and air conditioning at the affected dwelling? Please indicate clearly and modify the text accordingly.	Yes. The text has been modified accordingly in para 8.2.10.
Section 8.3.2: The results of Annexe D indicate that the incorporation of a 5 m high noise barrier, which has not been recommended by the Consultants, will bring the traffic noise levels at SR 3 down to 65.7 dB(A L10 (1hr). With the suggested 3 m noise barrier at Ch 1900 to Ch 2100, the NSr SR 3 would still be exposed to traffic noise level of 73.9 dB(A) L10(1 hr). In this sense, would the increase of the barrier height, say to 4 m, would bring the whole building to the context of HKPSG. However, have the Consultants taken into account of the leakage due to the run-in to the Castle Peak Road, from which the effectiveness of the proposed noise barrier will be hampered and the assessment in this respect should be reviewed.	As stated in para. 8.2.2 of the text, and in the responses to preceding comments, a barrier heights over 3 m are not considered feasible at this seaside site at this stage of the study. Further work during the detailed design stage may show that ground conditions and structural requirements permit higher barriers, but a maximum practical height of 3 m has been assumed in this study. As stated in para 8.3.2, "in practice, the effectiveness of any barrier would be severely compromised by the need to provide a break allowing access to [Grand Bay]." During detailed design, it may be possible to explore the possibility of relocating the access points to this and other developments, in order to increase the effectiveness of barriers.
Section 8.3.3: Presumably, SR 11 and SR 12 are the main targets for protection by the proposed 3 m noise barrier between Ch 2700 to Ch 3000. Strictly from the results given in the Annexe D, noise levels at the SR 12 will be brought down to the range from 62 to 66 dB(A)L10(1hr) with the proposed noise barrier. However, the accuracy of the aforesaid results is in doubt as the proposed barrier should leave a opening at the roundabout for the traffic from the Lung Yue Road, hence the effectiveness of the proposed barrier would be reduced. A review of the accuracy of the assessment are deemed necessary.	The text states that the proposed noise barrier is intended to protect the low-rise NSRs at Tsing Lung Tau Village (SR 12). The text also states "[i]t should be noted that the actual effectiveness of the barrier will be compromised by the need to provide non-continuous barrier that will permit access to Lung Yue Road." At detailed design stage, the sightline requirements of the final roundabout design will determine constraints on the barrier height and length. Consequently, a more detailed assessment of the barrier's effectiveness can be determined at the detailed design stage.
Section 8.3.4: The traffic noise at SR 13-1 to 13-3, SR 14, and SR 15-1 to 15-4 are found marginal exceed the HKPSG noise limit, the use of friction course road surface should be considered as an effective noise mitigation measure to bring these NSRs to the context of HKPSG.	Please see response to comment to Section 8.2.8 above.

Section 8.3.5: (i) It should noted that the traffic noise at SR 41-1 would also exceed the HKPSG in addition to the SR 41-5. The main traffic noise impact on the SR 41-1 to 41-5 is coming from the existing Castle Peak Road (CPR) which will not have any improvement work in the bypass option, as such, no mitigation will be considered necessary. Same argument would be applied to the SR 16-1, 17-1, 18. 19, 20-1, 20-2, 20-3, 42-1 and 42-2. In fact, the predicted traffic flow along the existing CPR would be lower if the bypass were in place.	Noted. Text has been changed accordingly.
(ii) The proposed Sham Tseng Bypass will affect the noise sensitive landuses along its alignment, CDA sites occupied by the San Miguel Brewery, Garden Bakery and Union Carbide and developments on the future reclamation adjacent to the Lido Garden are on the list. The development potential of most of these sites will be seriously hampered and limited, for instance, the Union Carbide CDA site is one of them. This site is currently prone to a severe traffic noise impact from Tuen Mun Road and the Castle Peak Road at its north and will also subject to serious traffic noise from the proposed bypass to its south. With the bypass in place, it can be seen that direct noise mitigation measures on the Union Carbide CDA site alone will certainly cannot satisfy the HKPSG noise limit. A similar situation will be encountered by the proposed residential developments on the future reclamation. As such, direct technical noise mitigation on the proposed bypass should also be provided to reduce the traffic noise impact from the bypass as far as practicable and leaving the residual impact to be tackled by the developments along its alignment.	The Consultant agrees with the comment. However, in the absence of any plans for the CDA sites and Sham Tseng Further Reclamation, it is not possible to assess the effectiveness of mitigation measures. These developments may have setbacks, or may incorporate podiums or other non-sensitive facades near the bypass. When further details of the CDA and Sham Tseng Further Reclamation developments are known, an assessment of traffic noise and possible mitigation measures may be made.
(iii) Presumably, the last paragraph of the section is a general remark of the assessment on the Sham Tseng section, however, amendments to this paragraph would be required as the existing Castle Peak Road section at the Sham Tseng Town will have no improvement work.	Agreed. Text has been amended.
Section 8.3.6: Our spot checks on the noise levels given for the SR 21-1 indicates that they are on the high-side in the range of 3.6 to 3.9 dB(A). The maximum noise level at the SR 21-1 is found to be 71.5dB(A)L10(1hr), thus, the assessment and recommendations with respect to SR 21-1 and 21-2 should be reviewed.	This and other calculation discrepancies will be reviewed in consultation with EPD, and amendments made to the text as necessary.

Section 8.3.7: (i) From the results given in the Annexe D the worst residual noise level at the SR25 with a 3m noise barrier in place would be 67.5 dB(A)L10(1hr). However, have the Consultants made any allowance for the opening for the run-in to the development in the calculations?	Due to the orientation of Riviera Apartments, a barrier would be effective at many of the facades even with a break. If a barrier is deemed feasible, it may be necessary at the detailed design stage to assess the possibility of relocating the access to Riviera Apartments to maximise its effectiveness.
(ii) Would the traffic noise impact at SR 24 and 26 be aggravated with the suggested noise barrier between Ch 6000 to 6500? The reverberant effect due to reflection from the noise barrier should also be evaluated.	It has been assumed that barriers would have an absorptive finish where NSRs are present opposite them. Text has been amended to make this point explicit (para 8.2.5).
Section 8.3.8: The target of protection, presumably SR 29, with the 3m noise barrier at Ch 7000 to Ch 7500 should be explicitly written in the text. Similar to SR 25, SR 29 would also be protected by the suggested noise barrier, previous comments given in the preceding Sect. 8.3.7 are also apply to SR 29.	Text has been amended to make the reference to SRs 28, 29 and 30 explicit. It is assumed that the reference to previous comments refers to the presence of gaps in the proposed barrier. These NSRs do not access the existing Castle Peak Road directly, and will not do so in the future, so gaps in the proposed barrier permitting access to the residences are not anticipated.
Section 8.3.9: (i) Traffic noise levels at the SR 31 and 31-2 only marginal exceed the HKPSG noise limit, the use of friction course road surface may be considered.	Please see response to comment on Section 8.2.8 above.
(ii) SR 33-1, 33-2 and 33-4 will be shielded by the Good Harvest development which is in front of them and under construction. However, the noise levels given in the Annexe D with respect to these NSRs have not taken this screening effect into account.	The text states that both "[t]he existing carpark and the Good Harvest development currently under construction (Sr 43-1 and 43-2) act as barriers to some facades" at Hanley Villa. The presence of the Good Harvest development as a barrier in the traffic noise model is also indicated in Figure D-2(c). In the absence of plans showing the podium and main block layout, these features have been estimated on the basis of site visits.
(iii) There is no discussion and noise mitigation recommendations for the Good Harvest development (SR 43-1 and 43-2). It should also be considered in the study.	Agreed. Reference to the Good Harvest development has been included in the paragraph referring to other developments currently under construction.
(iv) Traffic noise levels at SR 33-3 is also found marginal exceed the HKPSG noise limit, consideration of friction course road surface would be warranted.	Please see response to comment on Section 8.2.8 above.
(v) As indicated in the Table 2.3, SR 44 will be a highrise residential/hotel development, however, the text does not given any discussion with respect to this development.	As stated in Table 2.3, SR 44 is Lot 356, which is identified and discussed in the final paragraph of Section 8.3.9.

<u>Section 8.3.11:</u> (i) This section seems to be the conclusion and recommendation for the Section 8.3 "Traffic Noise Assessment of Bypass Option". A brief account of the total number of dwellings will exposed to traffic noise levels above the HKPSG limit without any noise mitigation measures and after the incorporation of the recommended direct technical mitigation should be given. Moreover, it would facilitate our checking-up if the Consultants can mark the recommended barriers on drawings together with the various NSRs under their protection.	Agreed. The numbers of dwellings exposed to traffic noise levels above the HKPSG limit will be provided either in the Draft Final EIA (if time permits before its release) or directly to EPD (and subsequently included in the Final EIA). Maps showing the proposed barriers have been requested by several departments, and will be provided at the Third Environmental Working Group Meeting.
(ii) The assumptions made in the section are subject to queries. It is not the right approach to consider barrier up to 3 m in height where they are predicted to be effective to reduce road traffic as a pre-requisite. Other than the road stretches with high rise buildings, how can the Consultants predict whether a noise barrier which be effective at a particular location or not without going through an in-depth analysis. Furthermore, quantitative evaluations would be required to account for the noise leakages of the suggested barriers from the run-ins for access to the Castle Peak Road from the developments concerned.	The meaning of the second sentence is not clear. With reference to the third sentence, detailed noise modelling has been performed for 0.8 m, 3 m, 5 m, and 7 m barriers. Only the first two barrier heights are considered feasible at this stage of the study (in the absence of detailed information on ground conditions and structural requirements), but detailed calculation results and discussions of 5 m and 7 m barriers have been included so that decisions may be made in the future if barriers of these heights are found feasible. It is submitted that assessments of the gaps in barriers be performed when details of the access point locations are finalised in later stages of the study. The present study has identified access points as potentially compromising the effectiveness of barriers where appropriate.
(iii) Would the quoted 1700 units be those eligible for consideration by the ExCo for indirect technical remedies in the form of insulation and air-conditioners after the application of the recommended direct technical mitigation measures?	Yes.
It is observed that representative NSRs have been used in the assessment to evaluate the severity of the traffic noise impact. However, every qualified dwelling should be counted in estimating the number of dwellings to be considered for indirect technical remedies. For instance, residential towers of Hong Kong Gardens fronting the Castle Peak Road is represented by SR 8 which consists of four blocks. Thus, all the eligible units these four towers should be counted.	This was the method used in arriving at the number of affected flats.

(iv) In essence, the suggestion of unified 3 m noise barriers in various recommended locations is undesirable and unjustified. The study would be incomplete without the investigation of the potential application of the friction course road surface on the individual road section and the ruling the possibility of higher noise barriers and road enclosures at the beginning of the study. Valid conclusions and appropriate noise mitigation recommendations cannot be sought with the results and findings given in the current report. In the light of the above comments, I would advise the Consultants to review the assessment on the entire study area and hence recommend the appropriate mitigation measures to suit particular requirements at different NSR locations. Furthermore, the Consultants should also check the lease conditions of some affected residential developments, which are under construction or planning, whether the traffic noise impact have already been addressed.	It is not certain what is meant by "unified 3 m noise barriers". Road enclosures were not considered on the basis of HyD advice, cited in the response to the comment for Sections 8.2.5, 8.2.6, and 8.2.7 above. Regarding the widespread use of friction course (aside from on the proposed Bypass), please see response to comment on Section 8.2.8 above. Given that this is the initial stage of the study for Castle Peak Road Widening, it is unlikely that lease conditions for developments currently under construction will have been drafted with the anticipated increased traffic resulting from the improvements in mind.
Section 8.4.4: The basic noise level for the ground floor of SR 18 given in Annexe D is incorrect, it should not be 1.3 dB(A) lower than the bypass option.	This and other calculation discrepancies will be reviewed in consultation with EPD, and amendments made to the text as necessary.
Section 8.4.5: Traffic noise predictions on the Rhine Gardens (SRs 20-1 to 20-3) are incorrect, the details can abe referred to the comments on Annexe D (iii). In the light of the amended noise levels, a review on the discussion of this NSR would be required.	This and other calculation discrepancies will be reviewed in consultation with EPD, and amendments made to the text as necessary.
Section 8.4.6: Noise contours at different heights would be helpful to indicate the potential noise impact to the CDA sites.	The inclusion of noise contours will be considered for the Final EIA.
Section 8.4.7: There is no indication of the whereabout of the Ch 500 and Ch 700, at which a 3m noise barrier is suggested. Furthermore, which NSRs are the targets for protection with the said noise barrier? Assessments and discussions should also be given with respect to these NSRs.	Maps showing the proposed on-line improvements (with chainages) were inadvertently omitted from the Preliminary Draft EIA, but have been included in the Draft EIA. Plans showing possible barrier locations will also be included in the Draft EIA. The text has been amended in Section 8.4.7 to clarify the sensitive facades shielded by the proposed barrier.
Section 8.4.8: The comments given in preceding paragraphs for Section 8.3 not concerning the bypass also applicable to this section.	Please see response to comment concerning Section 8.3.
Annexe D: (i) As given in Section 8.1.2, the proposed widening work and the predicted traffic flow the west and east of the Sham Tseng Town will be literally the same with the bypass and on-line improvement options. However, different traffic noise predictions have been spotted for the bypass and on-line scenarios regarding the SR 1 to 15 and 40 to the west and SR 21 to 27 to the east of the Sham Tseng Town.	This and other calculation discrepancies will be reviewed in consultation with EPD, and amendments made to the text as necessary.
(ii) The interpretations of the CRTN criteria in the heading for the "Criteria Tests" are incorrect, they should be equal or greater than [70 dB(A)], [Existing + 1] and [1 dB(A)]. The Consultants may like to make reference from the Sect.3.2.4 at p. 9 of the report. In addition, the rounding off procedures specified in Sect.7 of the CRTN should be noted and adhered to in	The rounding procedures specified in the CRTN have been followed in the calculations reported in Annexe D. The headings for the Criteria Tests are abbreviated to permit them to fit on the page. They are indicative only and do not necessarily represent the calculation criteria used in the spreadsheet. The discrepancies mentioned will be reviewed in consultation with EPD,

the calculations. In the light of the above, spot checks of the results indicates that the following entries are incorrect: Bypass Option SR 15-5 Storey 10, SR 15-6, Storey 10, SR 15-5 Storey 15, SR 15-5 Storey 25, SR 15-5 Storey 30, SR 28 Storey 1, and On-Line Option SR 17-1 Storey 20.	and amendments made to the text as necessary.
(iii) Spot-checks on the given noise levels reveal major discrepancies at the following NSRs:	
(a) noise levels at the lower floors of SR 10, 12, 24, 25 are on the low side as these should be no podium effect.	No podium is present, and no podium effect has been assumed, at these locations. The discrepancies mentioned may arise from the presence of existing perimeter walls (SR 10) and topography (SR 24), and will be reviewed in consultation with EPD.
(b) noise levels at various floors of SR 20-1, 20-2, 20-3 are on the high side, the high podium has not been taken into account in the calculation.	The podium effect has been included in the calculations. The discrepancies mentioned will be reviewed in consultation with EPD.
(c) noise levels at the lower floors of SR 35-1 and 35-2 are on the high side as the podium effect is neglected.	The podium effect has been included in the calculations. The discrepancies mentioned will be reviewed in consultation with EPD.
(d) noise levels at various floors of SR 38-1, 38-4, 39-1 and 33-2 are on the high side as the effect of the friction course road surface on the Tuen Mun Road has not been included.	A revised set of calculations has been produced for inclusion in the Draft EIA, which includes the effect of friction course on Tuen Mun Road.

From : Highways Department
Ref : () in HYD MWPMO 365TH/EIA
Date : 22 July 1995

My comments on the captioned report are as follows:

	Comment	Response
(i)	para 1.1.3 please delete "improve safety, as well as".	Text has been amended.
(ii)	Fig 2.1 to Fig 2.10, titles of these drawings do not correspond to the intended uses. Two sets of numbers, 97294 and Fig 2.1 (sketch) are presented and are confusing. Would you please revise the title and drawing number of this set of drawings.	Rough sketches of Figures 2.1 to 2.10 were provided in the Preliminary Draft EIA as the final versions of these Figures were not yet available. Final versions of these Figures are now complete and will be presented in the Draft EIA.
(iii)	Some sensitive receivers and numbers, e.g., 2 are missing the drawings Fig 2.1 to 2.10 and Table 2.1.	Missing numbers were dropped from the assessment because they were no longer valid. The example provided (SR-2) was Dragon View, which dropped from the assessment because it will be resumed.
(iv)	It will be clearer to state in the main text in either Section 4 or Section 5 that both Bypass option and on line option have been examined.	Text has been amended in Section 5.
(v)	Para 4.2.4: Ting Kau Bridge will be complete in June 1997 and will not constitute any construction noise as far as this project is concerned.	Noted. Text has been amended.
(vi)	Para 4.4.9: An assumption of 20 m setback fro the possible redevelopment sites is excessive. A 20 m setback will greatly reduce the development potential of these sites. Given the high land cost, such setback requirement will be strongly resisted. From Fig. 10.1 to Fig. 10.3, it appear that a set back distance shorter than 20 m can be permitted while the NO2 AQOs will not be exceeded. Would the Consultants please advise on the minimum setback distances for these sites.	Noted. Predictions based on different set-back distances of the future receptors will be provided for consideration.
(vii)	Para 4.4.10: Please add "in Annexe F" at the end of the sentence.	Text has been amended.
(viii)	Para. 4.6.3: Please provide drawing numbers for the figures. Please also delete "Approximate Position of CPR Widening Reserve" in Figures in Annexe H.	We are awaiting a response from the Landscape Subconsultant on this comment.
(ix)	Para 5.2.1: If the uncertainty is dealt with in the Traffic Study section of the Final Report, please spell out. Otherwise, it leaves us with the question not being answered.	We are awaiting a response from the Transport Consultant on this comment.
(x)	Para 8.1.2: There is a printing mistake in the third paragraph.	Text has been corrected to eliminate the mistake.
(xi)	Para 8.2.4: By copy of this letter, would FSD please advise if noise barriers and supporting frames shall have 2 hours fire resistant	We are awaiting FSD's response.

	period.	
(xii)	Para 8.2.2 seems to be inconsistent with para. 8.4.8. If 3 m noise barrier is the recommended direct noise mitigation measure, para 8.2.2 shall be revised to such effect. Further, reasons for not recommending 5-m noise barrier should be given in paragraphs of Section 8.3 and Section 8.4.	Para. 8.2.2 has been amended. It is felt that repeating the information contained in para. 8.2.2 concerning 5-m and 7-m barriers in all subsequent paragraphs of Sections 8.3 and 8.4 would be unnecessarily repetitive.
(xiii)	It will be useful to present the proposed extent of noise barriers in drawings.	Agreed. These drawings will be presented in the Draft EIA.
(xiv)	Para 10.1.2: I suppose a 7-m noise barrier scenario for air quality impact assessment represents the worst case. However, if 7-m noise barriers will not be constructed in any case, the resulting air quality information will be irrelevant. It will be more meaningful if 3-m and 5-m noise barriers scenarios are assessed. The results of this assessment will provide us with additional information such as buffer distances for proposed development.	Noted. The air quality impact of the 3-m and 5-m noise barrier scenarios will be assessed and results will be provided for consideration in the Final EIA.
(xv)	Para 12.2.12: I suppose the Bypass will be built on embankment rather than on piers.	A final assessment will be made once the details of the design have been finalised. if extensive dredging and reclamation are required, the potential impacts on water quality will need through evaluation.
(xvi)	Para 12.3.4: Will the Consultants please advise what the oil absorbent media are. Given the fact that there are continuous bathing beaches in Ting Kau, will the Consultants please advise if it is possible to implement the recommendation that road drains shall discharge away from bathing beaches.	In oils in road run-off are thought to be a potential risk to sensitive areas, including bathing beaches, then commercially available fabric filters could be used. These are designed to be fitted easily to drainage grates on petrol station forecourts in order to provide additional safety measures.
(xvii)	Table LTNOISER.XLS: What does the column "+2.5 Noise" represent?	The 2.5 dB(A) correction is applied to obtain the facade noise measurement, in accordance with the CRTN methodology.

From : EPD
Ref : () in EP2/N2/30 X
Date : 27 July 1995

Please find attached our third set of comments on the above report.	
We would like to highlight some of our concerns on the Environmental Monitoring and Audit aspect in this report:	
(i) The submitted report is an assessment report for a feasibility study. It may be too early to finalise the environmental monitoring and audit (EM&A) before knowing the details of the possible impacts that may be induced by the improvement works on the environment and that will be assessed in detailed EIA if it is decided to proceed; and	Noted.
(ii) The Chapter 15 "Environmental Monitoring and	Noted. The suggested statement has been included in

Audit" of this report can only be considered as a framework for future preparation of the Environmental Monitoring and Audit Manual (EM&AM). The EM&AM should be a separated and self sustained document specifying all the details of monitoring and auditing on this project (including operation phase mitigation measures). The manual should be prepared and submitted for approval prior to the endorsement of the final EIA. A statement should be included in this report to indicate that an EM&AM should be prepared as an integral part of the detailed EIA.	Chapter 1, and in an introduction to the preliminary EM&A Manual (now provided as Appendix 3A).
<u>Comments on Air Aspect</u>	
General: The assessment was based on the assumption that only noise barriers are provided along the route. If alternative noise mitigation measures (e.g., enclosures or semi-enclosures) are recommended, the Consultants are required to re-assess the air quality impacts.	Noted.
Figures 10.1 to 10.4: Larger contour maps should be provided. This should show the scale and the contour for 300 ug/m3 NO2, i.e., the AQO level for hourly NO2.	Noted and will be revised.
<u>Comments on Environmental Monitoring and Audit for Water Quality Impact</u>	
General: The proposed EM&A is considered inadequate. The Consultants should prepare the EM&A based on the impact predictions from the EIA. The EM&A should focus on the detection of possible impacts from the project, serving as an early alarm system for any trend of deterioration of the environment including water quality. It is also considered as essential to include in the EM&A the assessment on the effectiveness of the mitigation measures and evaluation of the accuracy of EIA predictions.	As mentioned in the comments preceding this, the present EM&A document, as part of the feasibility stage study, is only a framework for future preparation of the Environmental Monitoring and Audit Manual (EM&AM). The final EM&AM will be a separate and self-contained document specifying all the details of monitoring and auditing on this project (including operation phase mitigation measures), and will be prepared and submitted for approval prior to the endorsement of the final EIA. A statement has been included in this report to indicate that an EM&A Manual should be prepared as an integral part of the detailed EIA. Given the approximate levels of accuracy of multiple input assumptions, a meaningful evaluation of the accuracy of EIA predictions is not possible.
Section 15.1: A more detailed organisation and the responsibility of the environmental team should be proposed.	Please see response to General comment immediately preceding.
Section 15.4.5: The proposed monitoring stations are ambiguous. It is not mentioned which beaches are concerned of and what are the reasons to require EM&A at the "selected" beaches.	Please see response to General comment above. For example, at this feasibility stage, the construction methods for the varied sections of the alignment are not known. The monitoring locations will depend heavily on what type of construction is planned.
Section 15.4.8: According to the impact predictions in Chapter 12, I query why the monitoring is confined to the measurement of suspended solid, dissolved oxygen and turbidity. The Consultants should reconsider the EM&A and take account the impact predictions from Chapter 12.	Noted and agreed. Revisions to the EM&A will be made in line with the findings of Chapter 12. (These revisions may not be made in time for release of the Draft EIA, but will be incorporated into the Final EIA.)

Section 15.2: Besides baseline monitoring, adoption of control station should also be considered to take account the natural fluctuation of the water quality. The TAT levels shall be formulated based on baseline monitoring and reading from control stations. As reasoned above, TAT levels should not be confined to suspended solids, dissolved oxygen and turbidity.	Noted and agreed. This methodology is currently in use in other monitoring programmes in the territory. Text will be amended.
Section 15.10: The audit requirements are insufficient. Please refer to general comment (iii) above.	Numbering of comments has apparently been altered, since there is no comment numbered (iii). However, if the comment referred to is that headed "General" above, the response to the same applies.
Section 15.13: The report should include the comments and conclusions of the monitoring as well as the implementation status of mitigation measures. Moreover, the forecast of the works programme and monitoring schedule is also essential.	Noted. Text will be amended.

From : Architectural Services Dept
Ref : ASD 10/92051/TEC/HYD/1 (XI)
Date : 28 July 1995

We have no adverse comment on the report. However, please consider our following suggestions:

(i) On the noise control aspect, only one number of sound meter was proposed in your report. We consider that, for such a large project, two meters would be more appropriate so that there could be an immediate stand-by meter for noise measurements in case either one fails.	Agreed. Could the commentator please let us know where this reference is so that it can be changed in line with the comment.
(ii) Regular calibration of the sound meters should be specified in order to ensure accuracy and consistency.	Agreed. Could the commentator please let us know where this reference is so that it can be changed in line with the comment.

From : Water Supplies Department
Ref : (2) in WWO 1/1304/1744/94 III TJ(1)
Date : 21 July 1995

Please ensure that the proposed enclosures and noise barriers, particularly as stated in Section 7 and 8 of the Report, should not have conflict with our existing water mains and installations. Please also refer to our previous comments given in our letter ref. (23) in WWO/M1304/1744/94 II, dated 20 June 1995 and copied among EPD, HyD and MCA.	Noted.
A proposed watermain to be laid along the proposed realigned Castle Peak Road between Sham Tseng and Yau Kom Tau for improving the water transfer facilities is being considered by WSD. Please take this into account in your study and, subject to approval of relevant authorities, entrustment of the proposed mainlaying works to the roadworks contractor will be considered.	Noted.

From : Director of Regional Services
Ref : (93) in RSD 3/HO 712/82(7) VI
Date : 25 July 1995

There are seven gazetted beaches along the coastline between Area 2 and Ka Loon Tsuen. Any reclamation, particularly the large reclamation resulting from the Bypass option in Sham Tseng, must not adversely affect the water quality of the gazetted beaches.	Noted.

Agreement No CE 39/94
Improvements to Castle Peak Road
between Ka Loon Tsuen and Area 2, Tsuen Wan

ADDENDUM TO
COMMENTS AND RESPONSES ON EIA PRELIMINARY DRAFT FINAL REPORT

The following comments on the Preliminary Draft EIA were received after release of the first set of comments and responses on 31 July 1995 and 1 August 1995:

From : District Lands Office (Tsuen Wan and Kwai Tsing)
Ref : (62) in DLO/TW 3/650/93 III
Date : 3 August 1995

Please be advised that I have no comments on the above mentioned Preliminary Draft Final Environmental Assessment Report.	Noted.

From : Drainage Services Dept.
Ref : () in MS 10/5/72
Date : 4 August 1995

I have no comments on the captioned report.	Noted.

In response to EPD's memo of 1 August 95 (ref (25) in EP2/N2/30 X), the following comments were received:

From : HyD NT Region
Ref : () in HNT 602/TW/1 VI
Date : 22 August 1995

I refer to your memo dated 1 August 1995 regarding the Consultant's response to comment on the captioned report:	
In addition to the Consultant's response to EPD Noise Policy Group on Section 8.2.8 (p. 12), I enclose herewith a copy of memo dated 14 August 1995 from our R&D division *[not included in this addendum]* advising that the use of friction course as noise mitigation measure is not supported for the on-line improvement of Castle Peak Road.	Noted.

From : Ag & Fisheries Dept
Ref : (51) in AF DVL 14/53 II
Date : 16 August 1995

I refer to your memo of'1 August 1995. Most of the responses are acceptable, except the followings:

(a) First Paragraph: At the Working Group Meeting held on 31.7.95, the consultant agreed to identify those comments made by AFD which had not been responded to by checking against AFD's letter dated 27.3.95.	The Consultant has since responded to each of the comments made in the 27 March 1995 letter from AFD, in a letter faxed directly to AFD.
(b) Para 11.16 and 11.3.2 (Secondary Woodland near Ting Kau): The response from the consultant that *the rationale for the loss of the woodland reduce the cost of the construction of the roadway* is not acceptable from conservation point of view. We have much concern to the significant loss of the woodland which has high ecological value.	The cost of constructing a grade-separated portion of roadway to allow for preservation of woodland near Ting Kau was not considered by the ecology consultant. While we agree that preservation of the woodland would be desirable, neither flora nor fauna were recorded in the wooded areas which indicated that they should be considered ecologically important. The wooded areas are secondary in nature, and consist of species which are common throughout Hong Kong. Construction costs and other non-ecology issues, which were considered in selecting alignments and designs, were beyond the scope of the ecology assessment.
(c) Para 11.3.5 (Mitigation Measures): Details on the *justification, location, size and cost, etc. of the plantings and how it could be implemented and maintained under HyD's contract* should be provided in the Final EIA Report.	A discussion of landscaping will be provided in the Final EIA Report. Details on planting, as well as on other aspects of the road improvement, will be addressed in the Preliminary and Detailed Design Stages of this project.

From : Planning Department
Ref : (17) in PD/TW S/TT/9
Date : 8 August 1995

As regards the possible noise impact of the proposed bypass on the proposed development within the CDA (p.3 of the consultant's response), the consultant's proposal to incorporate barrier into the podium structure to mitigate the noise generate from the bypass is not acceptable.	The consultant has not proposed to incorporate a barrier into the podium structure of the CDA development. Rather, the consultant has stated that "the layout of the future CDA sites is not known at this time, and may incorporate an effective barrier (such as a podium structure or commercial uses at the roadside) for sensitive residential facades."
In accordance with the Notes of the Tsuen Wan West OZP No.S/TWW/5, the planning intention for the CDA is to phase out the existing industrial uses on the sites and to encourage redevelopment of the area to residential use. Since the EIA has indicated that even single-aspect building design would not be able to mitigate the noise generated by the bypass, the consultants should assess whether barriers to be provided at podium structure of the future development would be able to mitigate the noise problem should the bypass option be adopted.	An assessment of the effectiveness of any mitigation measures, direct or indirect, requires that receiver locations and any podium or barrier locations be known. Since no plans for the CDA site have been approved, this information is not yet available, so no assessment is possible.
As the planning intention of the CDA has been recognised by ExCo and the permitted development intensity has been incorporated into the OZP (i.e., plot ratio of 5 for domestic use), any road proposal that would unduly constraint redevelopment of the CDA would not be supported by Planning Department.	Noted.
I do not agree with the consultant's proposal to carry both the on-line and bypass options forward for further action. In order to avoid abortive work, and to optimise human and financial resources the EIA should identify/recommend a most "environmental friendly" option for the consideration of the Steering Group.	Noted.
As regards the implications of the bypass option of the reclamation in front of Garden Bakery, the landuse proposal on the reclamation is not only subject to the acceptance of the user departments concerned but also the Town Planning Board. Any amendment to the landuse proposal as contained in the Tsuen Wan West OZP would have to be considered and approved by the Town Planning Board. TPB's approval on the change of the landuse proposal as contained in the OZP should not be presumed.	Noted. [This comment appears to be unrelated to earlier consultant responses on the Preliminary Draft EIA.]

I do not consider the DFR of the subject EIA acceptable unless the consultant could come up with realistic and practicable proposals to mitigate the adverse impact of the bypass on the proposed residential developments sites on the Sham Tseng Reclamation and the CDA. In accordance with the current policy, noise arising from all new road projects should be mitigated at source. As such any proposal that would impose undue constraints on the proposed developments on the future reclamation and the CDA site would not be supported from the planning point of view.	Noted. Additional mitigation proposals are now under consideration.

NOTES :

LEGEND

- PROPOSED MAJOR CUT SLOPE
- PROPOSED RECLAMATION
- PROPOSED NOISE BARRIER
- PROPOSED PARTIAL ENCLOSURE
- NOISE SENSITIVE RECEIVERS ELIGIBLE FOR INDIRECT TECHNICAL REMEDIES (ALL LEVELS)
- NOISE SENSITIVE RECEIVERS ELIGIBLE FOR INDIRECT TECHNICAL REMEDIES (UPPER LEVELS ONLY)

no.	date	description

REVISION

drawn	S.H.CHENG	1/97
checked	S.S.WONG	1/97
approved (ORIGINAL SIGNED)	S.Y.HUNG	1/97

SENIOR ENGINEER / NT 1

PWP item no. 365TH & 553TH

feasibility study for project
CASTLE PEAK ROAD IMPROVEMENT BETWEEN KA LOON TSUEN AND YAU KOM TAU, TSUEN WAN

drawing title
OUTLINE PROJECT LAYOUT PLAN

drawing no.	scale
PMH6553/1LP/003	1:10 000

MAJOR WORKS PROJECT MANAGEMENT OFFICE

HIGHWAYS DEPARTMENT HONG KONG