Highways Department
Western Harbour Link Office

Agreement No. CE 27/92

ROUTE 3
COUNTRY PARK SECTION
AND TING KAU BRIDGE

PRELIMINARY DESIGN STAGE 2

Country Park Section -
Tai Lam Tunnel and Yuen Long Approach Road

Volume 3B
Environmental Assessment - Appendices

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Volume 3B Environmental Assessment - Appendices

March 1994

APPENDICES

PART I

A4 Air Quality

A5 Noise

A8 Landscape and Visual

A9 Landscaping/Rehabilitation

A11 Ecology

AIR QUALITY

APPENDIX A4

A4.1 CALINE4 MODEL INPUT :

TRAFFIC FLOWS FOR YEARS 2001 AND 2011

Morning peak-hour traffic flows for years 2001 and 2011 have been predicted and are shown below. The flows on Route 3 CPS, its slip roads and connecting roads are from information supplied by Transport Department; flows on Tuen Mun Road assume saturated conditions on that road. Transport Department predictions have been converted from PCUs/hour to vehicles/hour using a factor of 1.65.

A uniform traffic mix has been assumed on all roads: motorcycles (1%), passenger cars (12%), taxis (7%), light goods vehicles (25%), medium goods vehicles (44%), heavy goods vehicles (6%), coaches (1%), light buses (1%), and franchised buses (3%). All vehicles are assumed to have diesel engines with the exception of passenger cars and motorcycles, which are assumed to have petrol engines.

Traffic flow predictions are provided in Table A4.1.

TABLE A4.1 MORNING PEAK HOUR TRAFFIC FLOWS: 2001 AND 2011

ROAD SEGMENT	Veh/Hour	
	2001	2011
Tai Lam Tunnel Northbound	1630	3890
Tai Lam Tunnel Southbound	1960	4200
Road YL3b Eastbound	1600	2500
Road YL3b Westbound	1100	1940
Slip Road: YL3b onto Route 3 Northbound	1520	1520
Slip Road: Route 3 onto YL3b Southbound	1520	2850
Slip Road: Northbound Route 3 onto Kam Tin Road	340	1490
Slip Road: Kam Tin Road onto Route 3 Southbound	240	900
Kam Tin Road Eastbound	1260	1520
Kam Tin Road Westbound	1330	2430
Route 3 (over Kam Tin Road) Northbound	1710	3360
Route 3 (over Kam Tim Road) Southbound	1650	3660
Castle Peak Road - Ngau Tam Mei Northbound	360	1320
Castle Peak Road - Ngau Tam Mei Southbound	480	1080

A4.2 FUGITIVE DUST MODEL

CONSTRUCTION DUST IMPACT ASSESSMENT

A4.2.1 In order to obtain a prediction of future construction dust levels, many assumptions and simplifications have been made concerning the physical conditions and timing of activities on the site. The intention of this modelling exercise is not to obtain an accurate estimate of future construction dust levels. Rather, it is to estimate the possible severity of future dust problems and determine if particular sensitive areas are likely to be particularly badly affected by dust. The results of the modelling may be used to target mitigation measures and monitoring activities implemented during construction.

The US EPA publication *Compilation of Air Pollutant Emission Factors (AP-42)* has been used to obtain emission factors for heavy construction operations, and aggregate handling and stockpiling, concrete batching, and stone crushing. The following factors have been used in the present assessment:

A4.2.2 *Aggregate Handling*

$0.110166 \bullet U$ kg/day, where U = mean wind speed (m/s), based on:

- particle size ≤ 30 μm
- 1.6% silt content of aggregate, based on Table 11.2.3-1 in *AP-42* (mean value for stone processing)
- drop height of 2 m
- 0.7% moisture content of aggregate, based on Table 11.2.3-1 in *AP-42* (mean value for stone processing)
- 7.6 m^3 dumping device capacity, based on Table 11.2.3-3, using the maximum value in the given range

Assumes one batch drop of 125 Mg per day.

A4.2.3 *Aggregate Storage*

$0.001773 \bullet f$ kg/day, where f = percent of time that wind speed exceeds 5.4 m/s at mean pile height, based on:

- 1.6% silt content of aggregate, based on Table 11.2.3-1 in *AP-42* (mean value for stone processing)
- 50 days per year with precipitation of 0.254 mm or more
- pile covers approximately 1 ha

A4.2.4 *Heavy Construction Operations*

An emission of 1.2 tons per acre per month is assumed, though the actual emission rate is dependent on the silt and moisture contents of the soil.

A4.2.5 *Concrete Batching (Uncontrolled)*

An emission rate of 0.12 kg/m^3 of concrete has been assumed, along with an assumed daily production of approximately 1000 m^3 of concrete.

A4.2.6 *Stone Crushing*

An emission rate of 0.14 kg/Mg of stone has been assumed, based on two assumptions:

- dry material,
- dust particles ≤ 30 μm.

A capacity of 40000 Mg/day is assumed.

A4.3 GUIDELINES FOR DUST MONITORING

A4.3.1 EPD has devised a set of dust monitoring and audit guidelines to ensure that its dust monitoring requirements are understood and met. EPD's guidelines are summarised below.

A4.3.2 *Monitoring Methodology*

Standard high volume sampling method should be used to obtain the mass concentration of TSP (total suspended particulates) in ambient air.

A4.3.3 *Monitoring Equipment*

High Volume Sampler (HVS): The HVS should be equipped with an electronic mass flow controller and calibrated against a traceable standard at regular intervals.

A direct reading dust meter capable of achieving a comparable results as that obtained by HVS may be used for the 1-hour sampling. The dust meter should be regularly calibrated against a primary standard.

Wind Data Monitoring Equipment: Equipment should be set up in a non-sheltered location near dust monitoring locations to obtain wind speed and wind direction. The wind sensor should be installed on a mast 10 m above ground. Data should be stored in a data logger, and processed at least once a month. Wind direction should be divided into 16 sectors of 22.5 degrees each. Equipment should be calibrated at least every six months.

A4.3.4 *Selection of Monitoring Site*

Locations should be agreed upon with the Engineer in consultation with EPD as necessary during the EIA stage. In selecting sites, the following criteria should be considered:

- location should be at the site boundary or close to major dust emitters;
- location should be close to sensitive receivers;
- prevailing meteorological conditions should be considered.

A4.3.5 *Positioning of Sampler*

When positioning the sampler, the following points should be noted:

- Samplers should be placed at least 2 m apart.
- There must be an unrestricted airflow around the sampler:

- If a sampler is placed near an obstruction, the height of the obstruction above the sampler must be determined. The sampler should then be placed at a distance of at least twice this height from the obstruction.

- A minimum of 2 m separation is required between a rooftop sampler and a wall, parapet, or other rooftop structure.

- Sampler should not be placed near an incinerator or furnace flue.

A4.3.6 *Data Collection*

A comprehensive set of field details should be recorded on the field data sheet, including temperature, pressure, weather conditions, elapsed-time meter reading for the starting and finishing times of the sampler, identification and weight of the filter paper, site activities, and any other relevant information.

The flow rate of the sampler before and after the sampling exercise with the filter in position should be verified to be constant. The flow rates should be recorded in the data sheet.

A4.3.7 *Laboratory Measurement and Analysis of Filter Paper*

8" by 10" filter paper should be used, and labelled prior to sampling. The paper should be conditioned in a humidity-controlled chamber for over 24 hours and weighed prior to use. After sampling, the laden filter should be kept in a sealed plastic bag for transport to the laboratory. In the lab, the filter paper should be reconditioned in the humidity-controlled chamber, and weighed using a regularly-calibrated electronic balance accurate to 0.1 mg.

A4.3.8 *Reporting and Responsibilities*

The monitoring team should report directly to the Engineer.

An Environmental Monitoring and Audit (EM&A) Manual should be prepared and submitted to EPD within the month that the contract is offered.

Monthly monitoring reports should be prepared and submitted to EPD before the 10th day of the following month.

All exceedances of air quality standards, along with information on remediation measures, should be included in the monthly monitoring report.

Monitoring Requirements

Requirements for Baseline, Impact, and Non-compliance monitoring are provided in the main text.

A4.3.9 *Quality Control*

"Custody Transfer Documents" should be used to ensure that a chain of custody exists from the point of sampling to the final disposal of samples. At each point in the chain, one person is responsible for the sample until the custody transfer document is signed by someone else, who then assumes responsibility. In this way, the integrity of the samples can be ensured.

All equipment calibration and recalibration exercises should be documented.

Each measurement report should be checked and signed by the operator, a second staff member, and a senior before it is issued.

Data input into the database should be checked against field records prior to being sent to the Officer responsible for the audit. In case of unresolved discrepancies, the data should be flagged to indicate that it may be unreliable.

A4.3.10 *Action Plans*

Action plans are provided in the main text.

A4.3.11 *Contingency Plans*

Contingency plans for the following kinds of problems should be worked out in advance, and included in the contract. An allowance for operating additional monitoring sites or increasing the numbers of equipment should be included in budget calculations.

- Delay in setting up monitoring sites or equipment, obtaining power supply, or laboratory facilities
- Failure or theft of equipment
- Adverse weather conditions
- Prolonged absence of key personnel

A4.4 DUST SUPPRESSION MEASURES : CONTRACT CLAUSES

Sample contract clauses to ensure the use of dust suppression measures at the site are provided below:

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

b) The Contractor shall at his own cost and to the satisfaction of the Engineer install effective dust suppression equipment and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensistive receiver the concentration of air-borne dust shall not exceed 0.5 milligrams per cubic meter, at standard temperature (25°C) and pressure (1.0 per bar) averaged over one hour, and 0.26 milligrams per cubic metre, at standard temperature (25°C) and pressure (1.0 bar) averaged over 24 hours.

c) In the process of material handling, any material which has the potential to create dust (with the exception of cement) shall be treated with water or wetting agent sprays.

d) Where dust-generating materials are being discharged to a vehicle from a conveying system at a fixed transfer point, a three-sided roofed enclosure with flexible curtain across the entry shall be provided. Exhaust should be provided for this enclosure and vented to a fabric filter system.

e) Any vehicle used for moving materials with an open load-carrying area, and having the potential to create dust, shall have 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. The tarpaulin shall be properly secured and shall extend at least 300mm over the edges of the side and tail boards.

f) Stockpiles of sand and aggregate greater than 20m$_3$ shall be enclosed on three sides, with walls extending above the pile and 2 metres beyond the front of the pile. In addition, water sprays shall be provided and used, both to dampen stored materials and when receiving raw material.

g) The Contractor shall frequently clean and water the site to minimize the fugitive dust emissions.

h) The Contractor shall restrict all motorized vehicles to a maximum speed of 8 km per hour and confine haulage and delivery vehicles to designated roadways inside the site. Areas of roadway longer than

100 m where movement of motorized vehicles exceeds 100 vehicular movements/day, or as directed by the Engineer, shall be furnished with a flexible pavement surfacing.

i) Wheel washing facilities shall be installed and used by all vehicles leaving the site. No earth, mud, debris, dust and the like shall be deposited on public roads. Water in the wheel cleaning facility shall be changed at frequent intervals and sediments shall be removed regularly. The Contractor shall submit details of proposals for the wheel cleaning facilities to the Engineer prior to construction of the facility. The wheel washing facility shall be usable prior to the start of any earthworks excavation activity on the site. The Contractor shall also provide a hard-surfaced road between the washing facility and the public road.

j) Conveyor belts shall be fitted with windboards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimize emission of dust. All conveyors carrying materials which have the potential to create dust shall be totally enclosed and fitted with belt cleaners.

k) Cement or pulverised fuel ash 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 such that in the event of the hopper approaching an overfull condition, an audible alarm will operate, and after 1 minute the pneumatic line to the filling tanker will close.

l) All air vents on cement silos shall be fitted with fabric filters provided with either shaking or pulse-air cleaning mechanisms. The fabric filter area shall be determined using the air to cloth ratio (0.01-0.03 m/s) or the filtering velocity.

m) Weigh hoppers shall be vented to a suitable filter.

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

o) Dry mix batching should be done inside a total enclosure, with exhaust to a fabric filter.

p) All cement and concrete trucks are to be effectively washed down after loading and prior to leaving the worksite.

q) The Contractor shall provide and operate high volume air samplers and associated equipment and shelters in accordance with the USA standard Title 40, Code of Federal Regulations, Chapter 1 (part 50), Appendix B. Sampling shall be carried out 1 day in every 6 days at ten sampling points on the Site boundary for such periods and in a manner as instructed by the Engineer. The samplers, equipment and

shelters shall be constructed so as to be transferable between sampling points to enable monitoring of "dust in air" levels at any sampling point required by the Engineer. The Contractor shall provide all necessary protection fences and the like at sampling points. Testing and analysis of sampled materials shall be carried out by a laboratory approved by the Engineer.

r) The Contractor's attention is drawn to the Air Pollution Control Ordinance and it's subsidiary legislation.

A4.5 POLLUTION ISOPLETHS

ALIGNMENT AND VENTILATION STACKS

Isopleths are derived from the CALINE4 and ISC Models. Pollution contours that have been modelled are listed below, and are grouped as follows:

Pollutant	Year	Open Alignment	Tunnel Ventilation Tower
NO_2	2001	Figure A4.5.1	*South Tower:* Figure A4.5.2 *North Tower:* Figure A4.5.3
	2011	Figure A4.5.4	*South Tower:* Figures A4.4.5 - A4.5.8 *North Tower:* Figures A4.5.9 - A4.5.12
RSP	2001	Figure A4.5.13	*South Tower:* Figure A4.5.14 *North Tower:* Figure A4.5.15
	2011	Figure A4.5.16	*South Tower:* Figures A4.5.17 - A4.5.20 *North Tower:* Figures A4.5.21 - A4.5.24
CO	2001	(not assessed)	*South Tower:* Figure A4.5.25 *North Tower:* Figure A4.5.26
	2011	(not assessed)	*South Tower:* Figures A4.5.27 - A4.5.30 *North Tower:* Figures A4.5.31 - A4.5.34

The figures included in this Appendix are as follows:

A4.5.1	Hourly NO_2 Concentrations at Ground Level (2001)
A4.5.2	Hourly NO_2 Concentrations at 109.5 mPD (2001): South Ventilation Tower
A4.5.3	Hourly NO_2 Concentrations at 78 mPD (2001): North Ventilation Tower
A4.5.4	Hourly NO_2 Concentrations at Ground Level (2011)
A4.5.5	Hourly NO_2 Concentrations at 104.5 mPD (2011): South Ventilation Tower
A4.5.6	Hourly NO_2 Concentrations at 109.5 mPD (2011): South Ventilation Tower
A4.5.7	Hourly NO_2 Concentrations at 114.5 mPD (2011): South Ventilation Tower
A4.5.8	Hourly NO_2 Concentrations at 124.5 mPD (2011): South Ventilation Tower
A4.5.9	Hourly NO_2 Concentrations at 73 mPD (2011): North Ventilation Tower
A4.5.10	Hourly NO_2 Concentrations at 78 mPD (2011): North Ventilation Tower
A4.5.11	Hourly NO_2 Concentrations at 89 mPD (2011): North Ventilation Tower
A4.5.12	Hourly NO_2 Concentrations at 93 mPD (2011): North Ventilation Tower
A4.5.13	Hourly RSP Concentrations at Ground Level (2001)
A4.5.14	Hourly RSP Concentrations at 109.5 mPD (2001): South Ventilation Tower
A4.5.15	Hourly RSP Concentrations at 78 mPD (2001): North Ventilation Tower
A4.5.16	Hourly RSP Concentrations at Ground Level (2011)
A4.5.17	Hourly RSP Concentrations at 104.5 mPD (2011): South Ventilation Tower
A4.5.18	Hourly RSP Concentrations at 109.5 mPD (2011): South Ventilation Tower

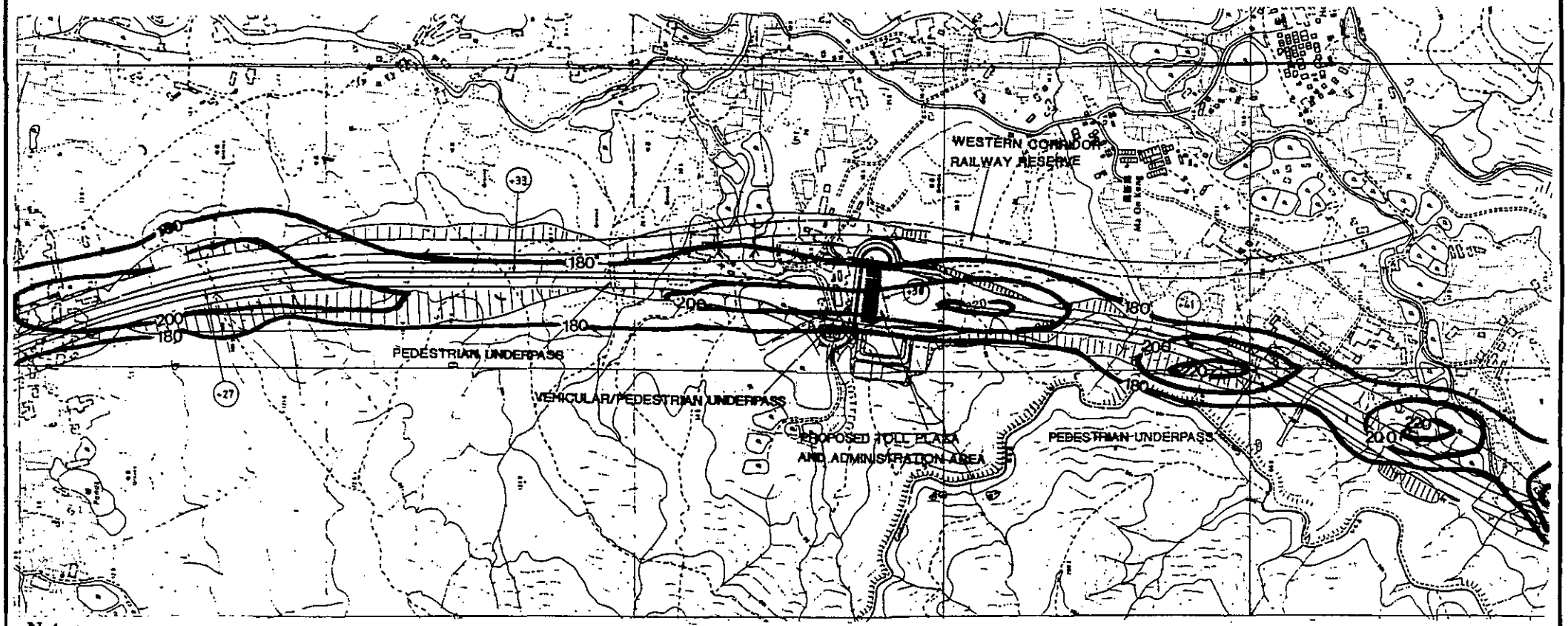
A4.6 POLLUTION ISOPLETHS :

CONSTRUCTION DUST

Construction dust has been obtained using the Fugitive Dust Model. Input assumptions are listed in Appendix A4.2 below. The results of the Model calculations have been plotted as below:

A4.6.1 Hourly Concentrations of Construction Dust (TSP) at Ground Level

A4.6.2 24-hour Concentrations of Construction Dust (TSP) at Ground Level



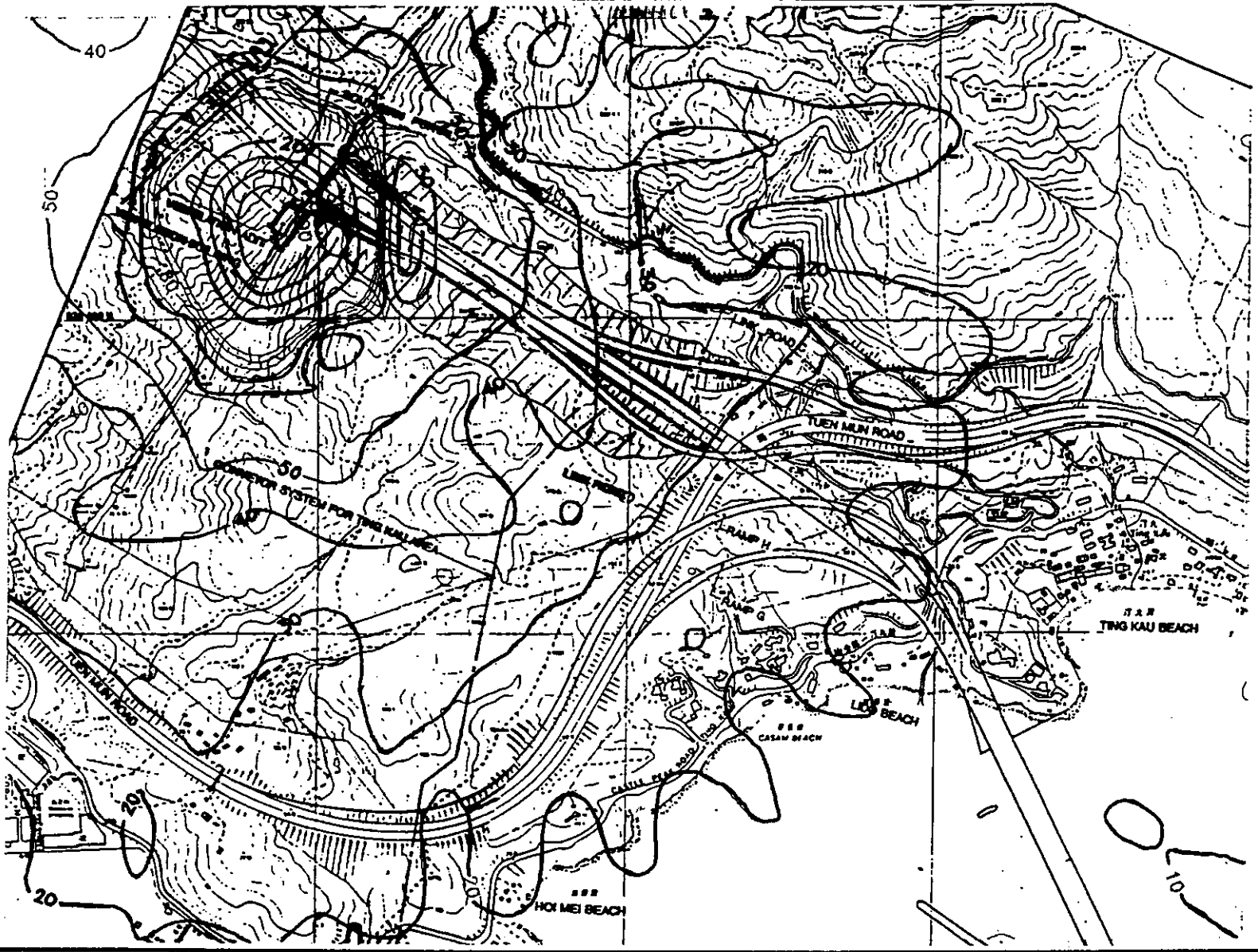
Notes:

1. Shows hourly ground level pollution concentrations due to 2001 morning peak hour traffic on major roads in the Study Area

2. Includes background pollution concentrations, but not contribution from tunnel ventilation.

3. Units = $\mu g/m^3$

FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT GROUND LEVEL (2001)**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. 058000	Fig No. A4.5.1
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT 109.5mPD 2001: SOUTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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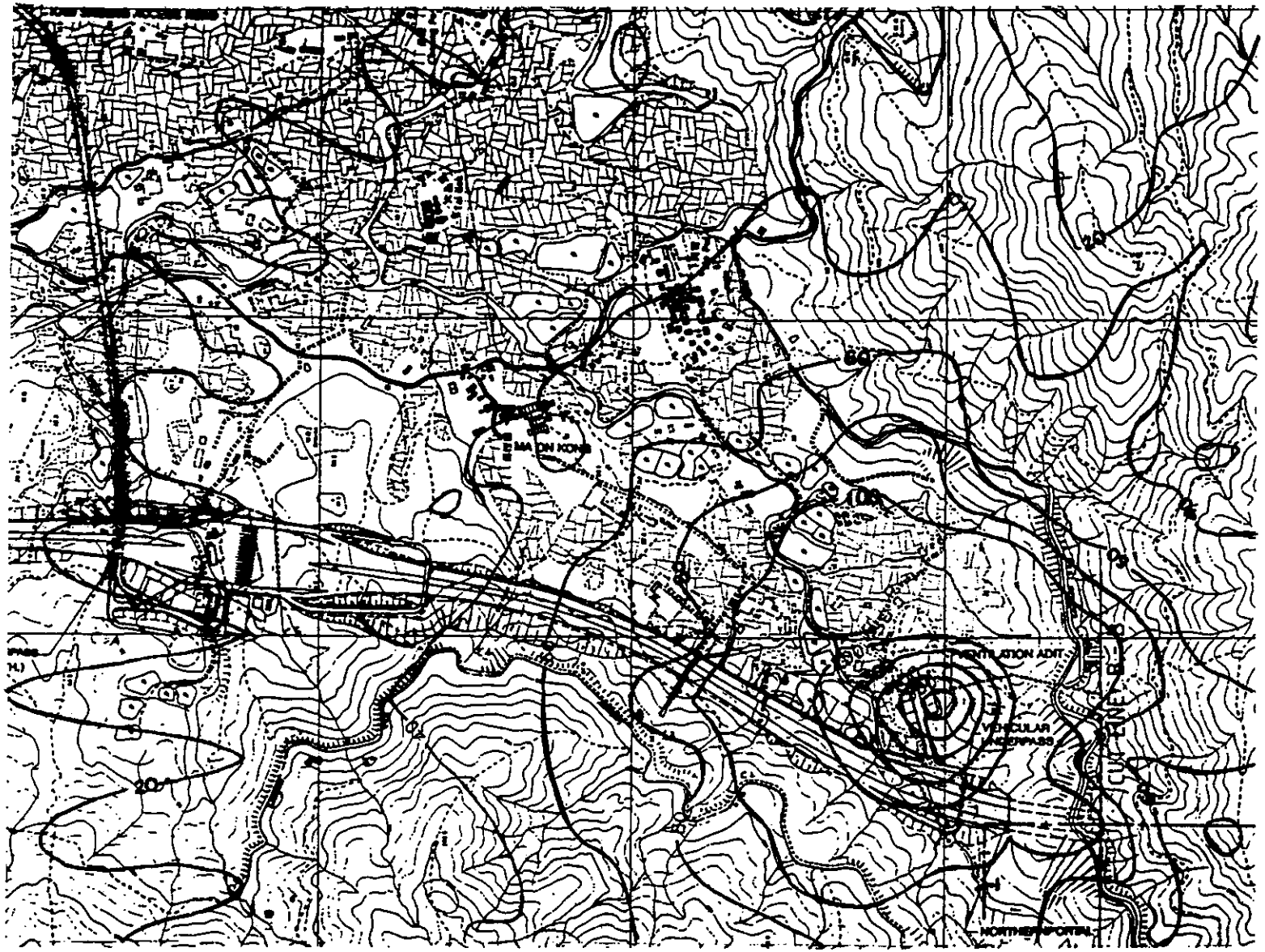
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT 78mPD (2001): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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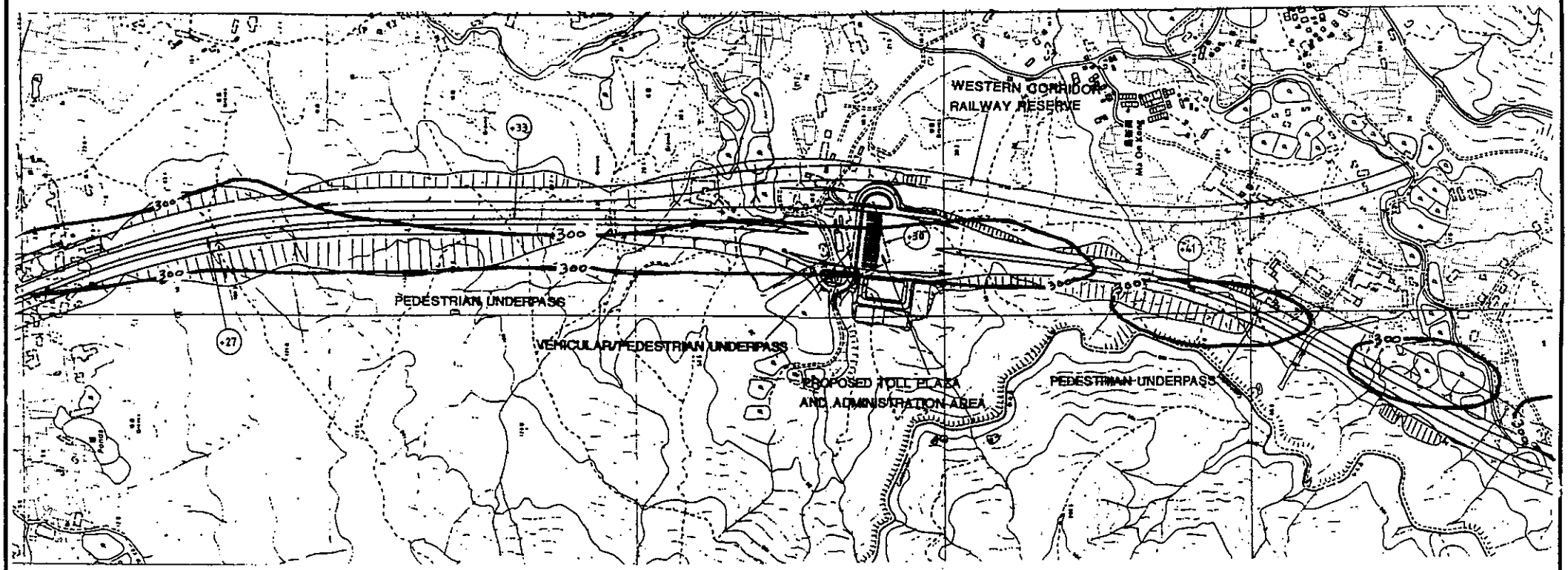

Notes:

1. Shows hourly ground level pollution concentrations due to 2011 morning peak hour traffic on major roads in the Study Area

2. Includes background pollution concentrations, but not contribution from tunnel ventilation.

3. Units = $\mu g/m^3$

FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT GROUND LEVEL (2011)**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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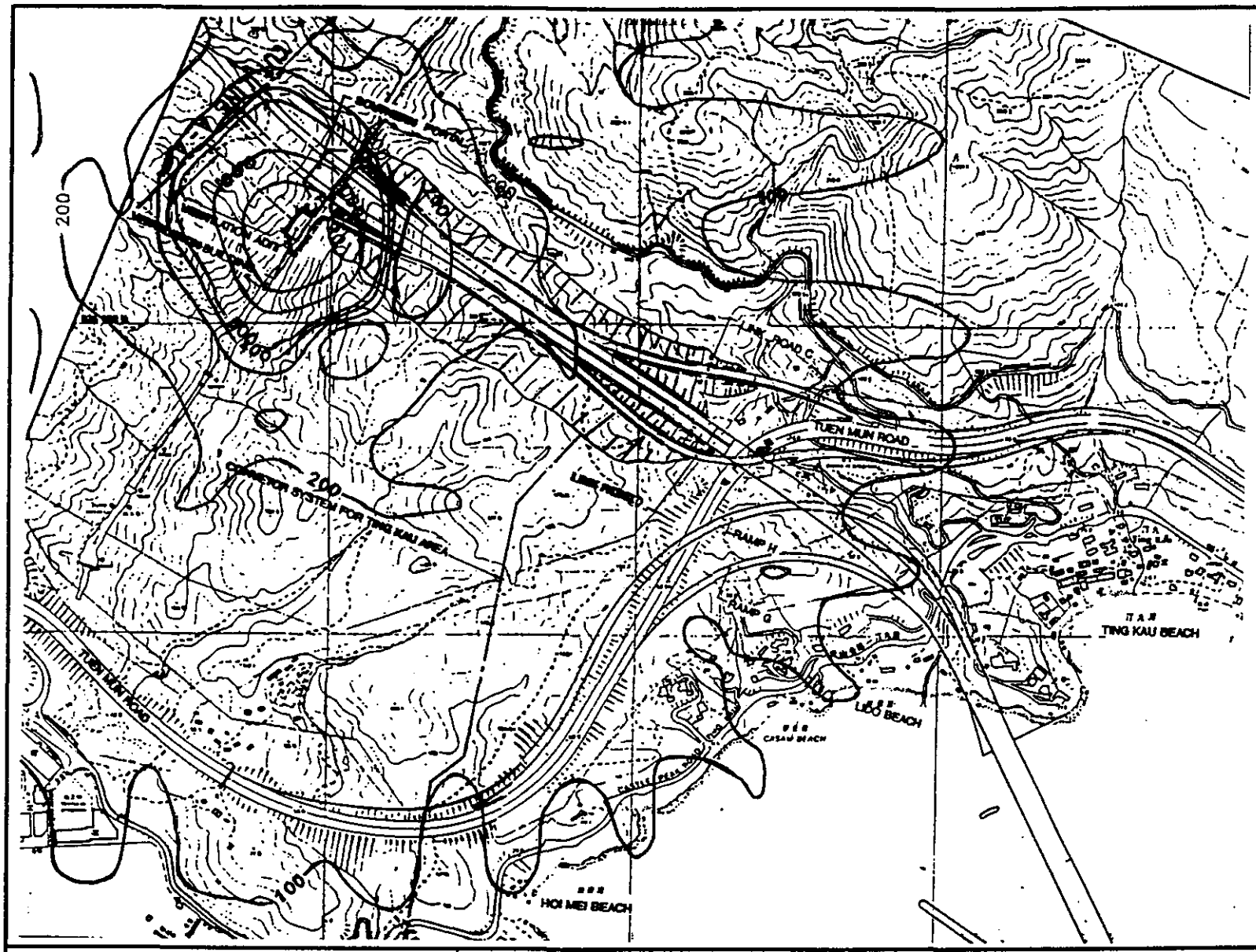
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT 104.5mPD (2011): SOUTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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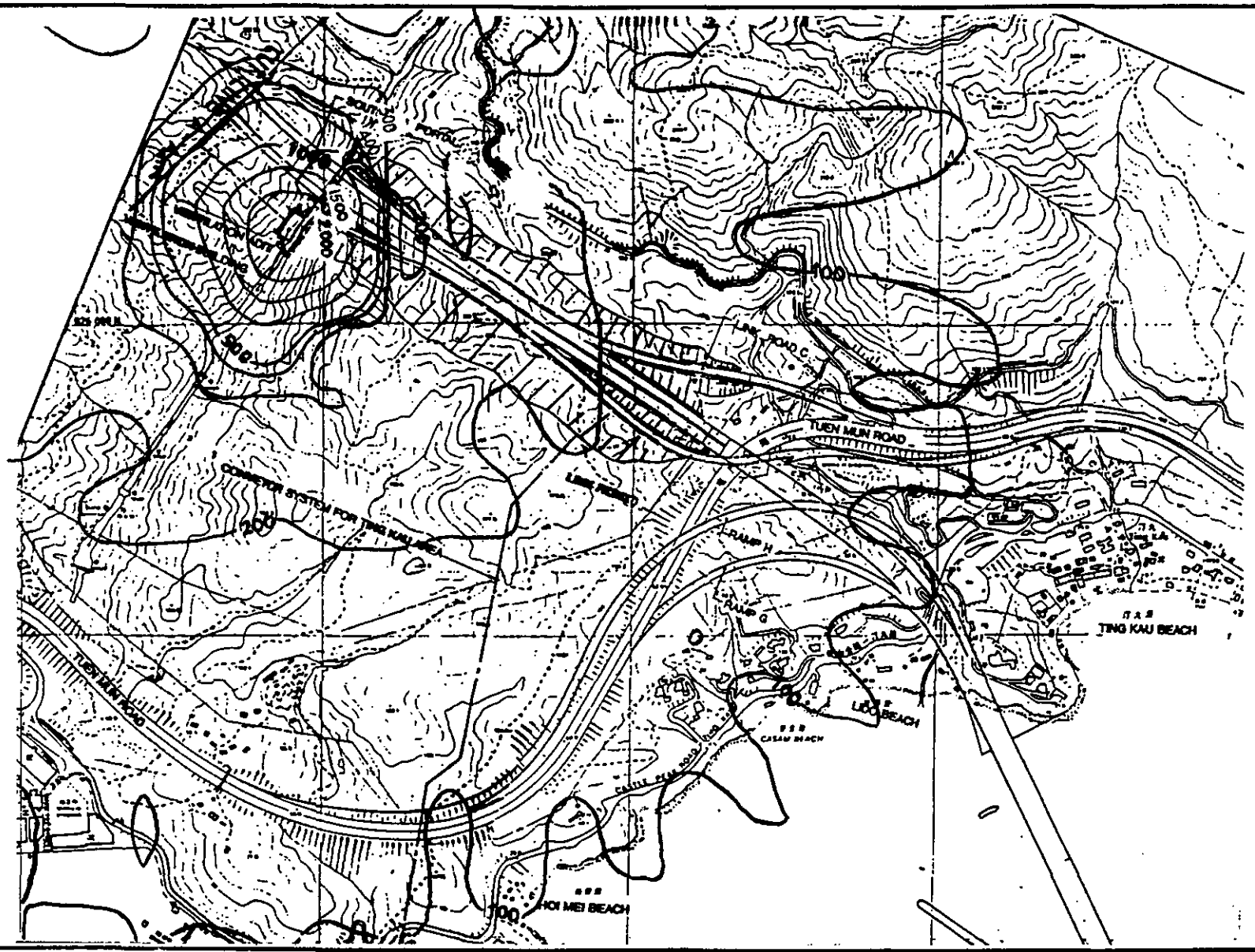
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT 109.5mPD (2011): SOUTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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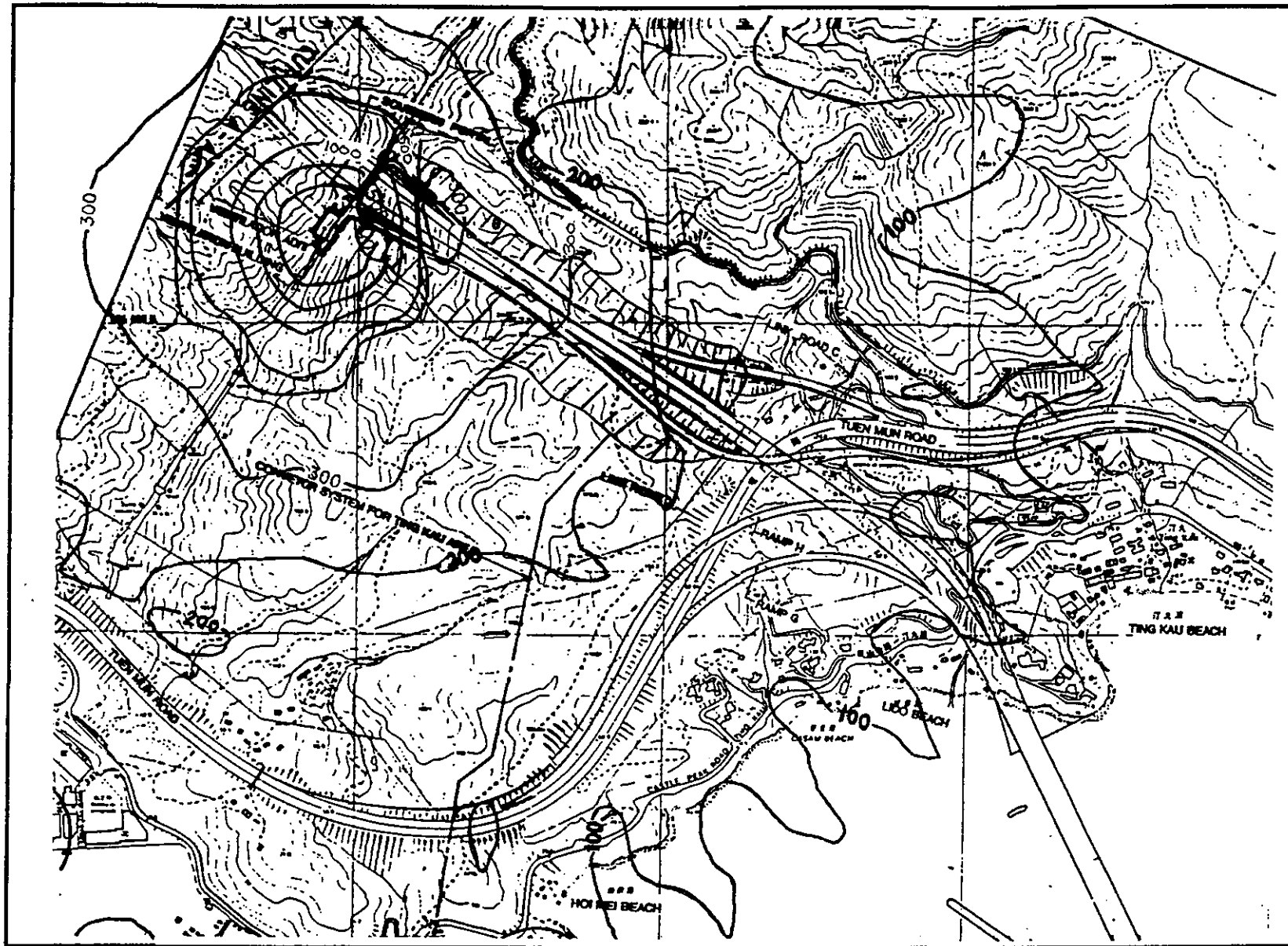


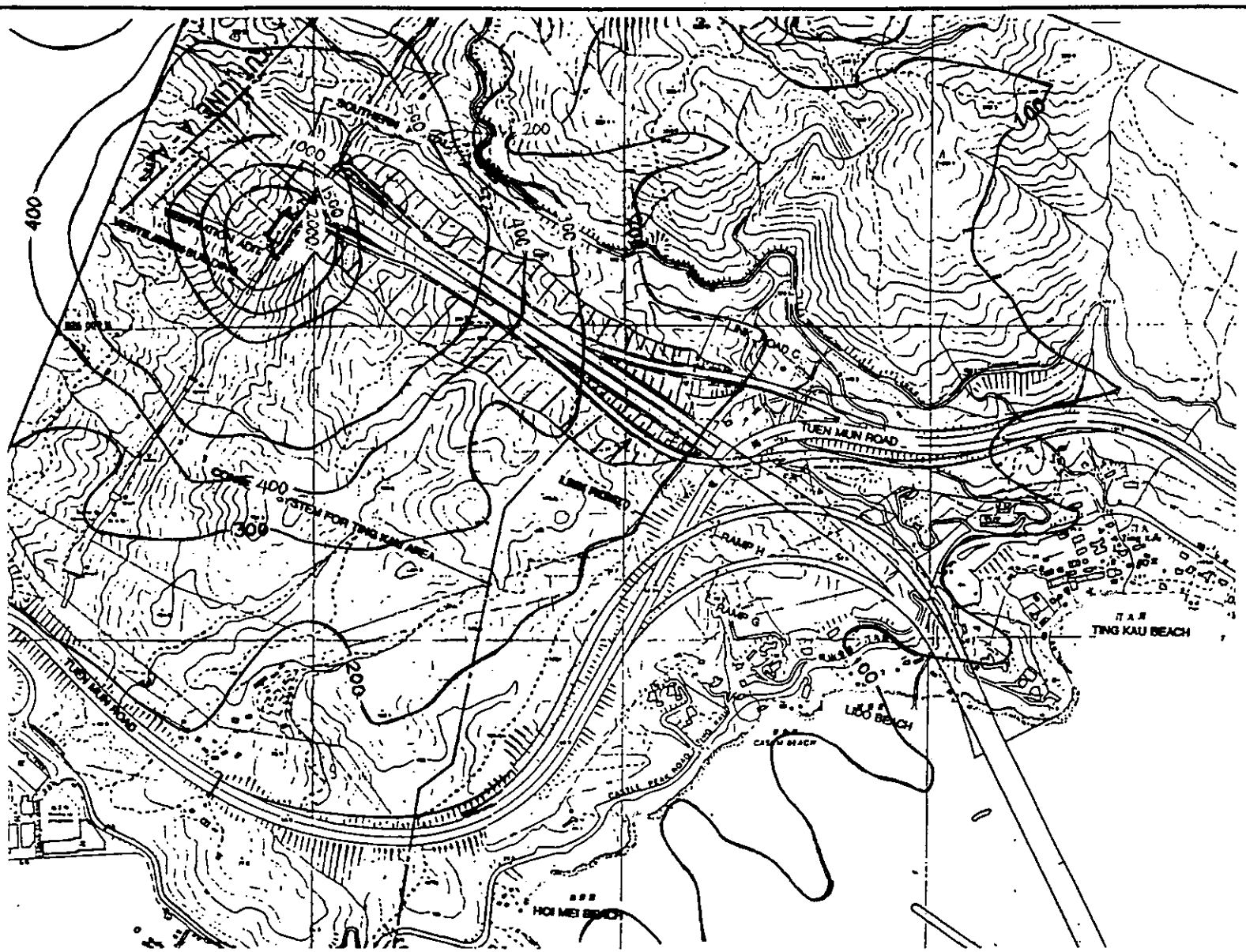
FREEMAN FOX MAUNSELL

Drg. Title :

HOURLY NO_2 CONCENTRATIONS AT 114.5mPD (2011): SOUTH VENTILATION TOWER

Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**

Scale : N.T.S.	Job No. 058000	Fig No. A4.5.7
Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT 124.5mPD (2011): SOUTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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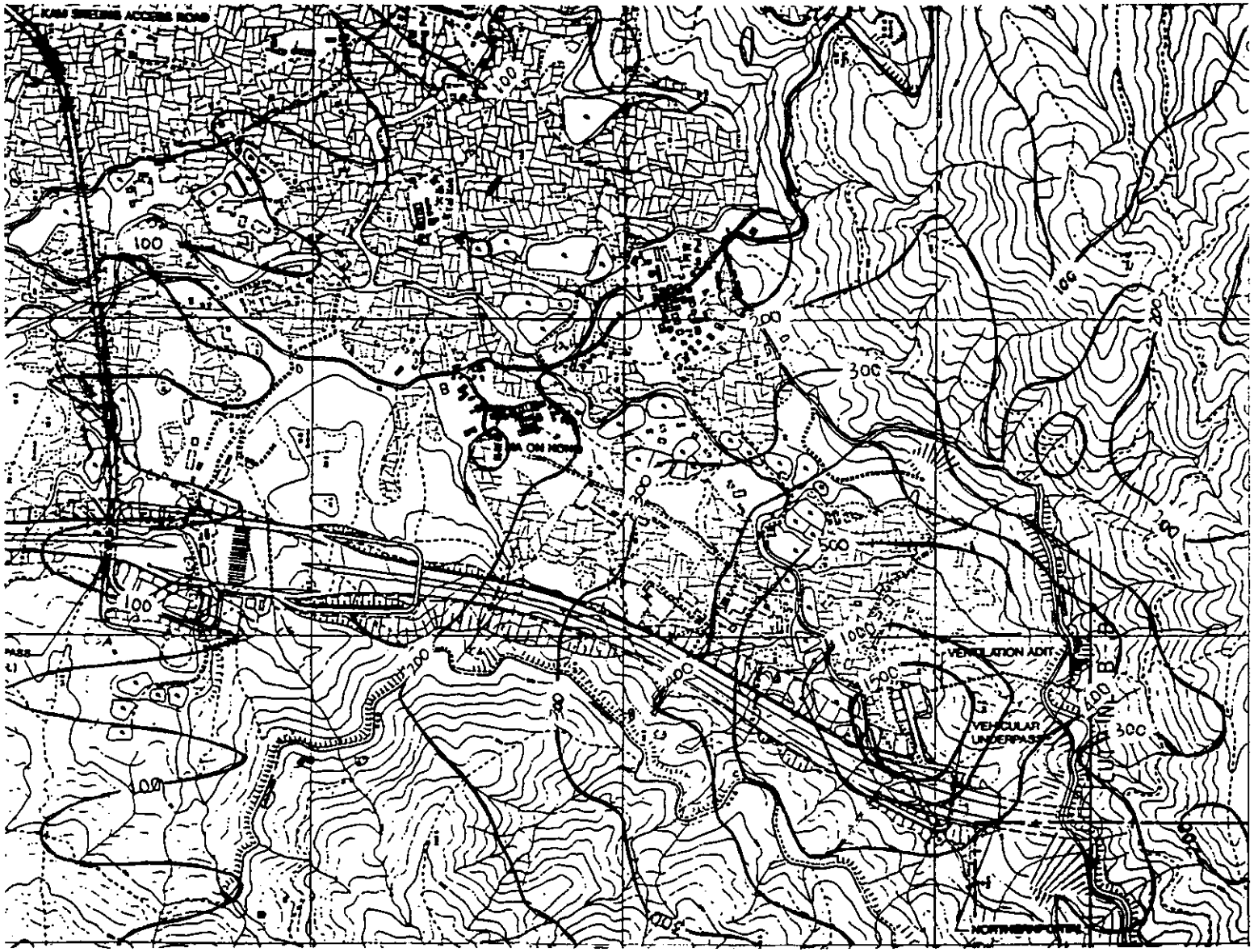
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT 73mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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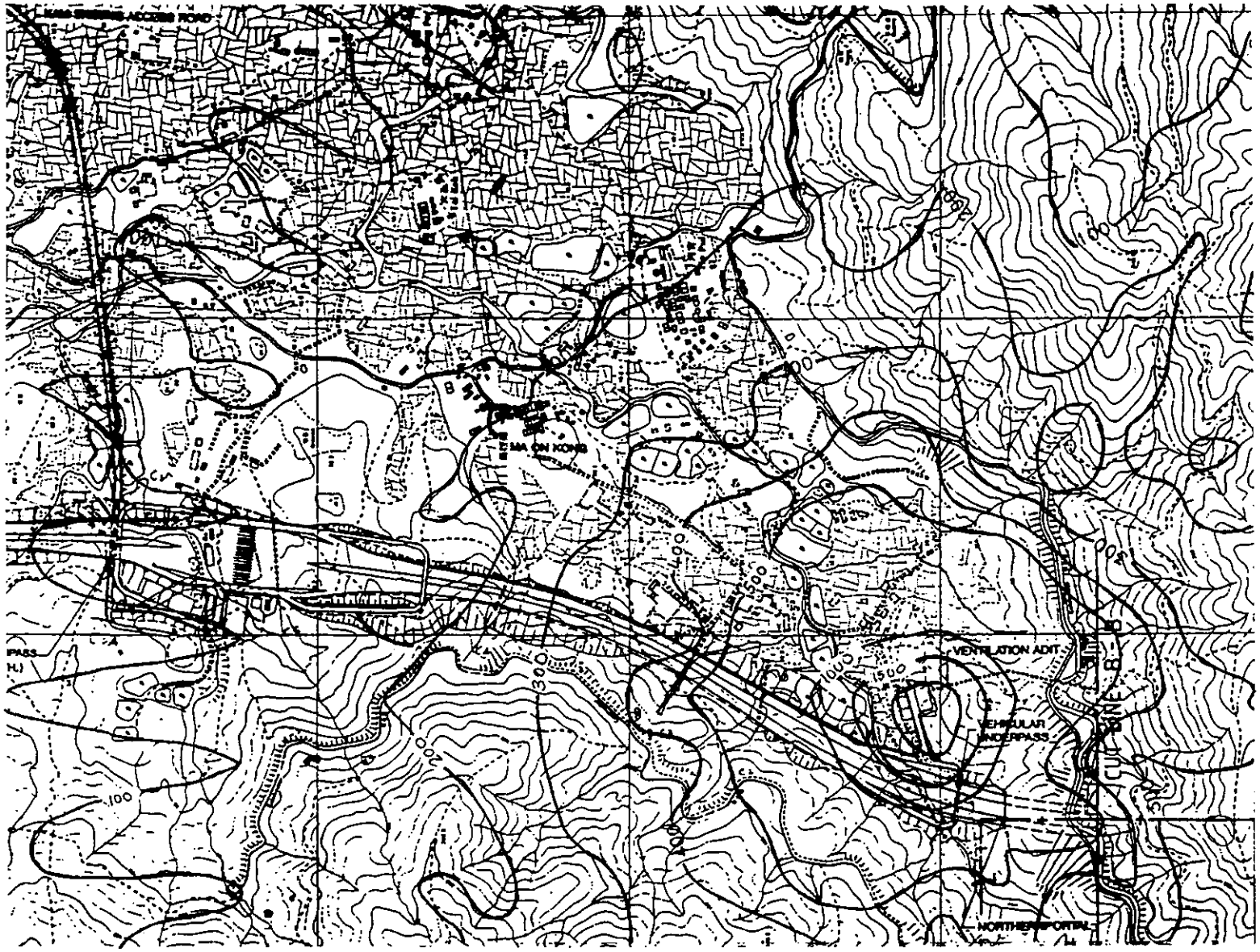
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT 78mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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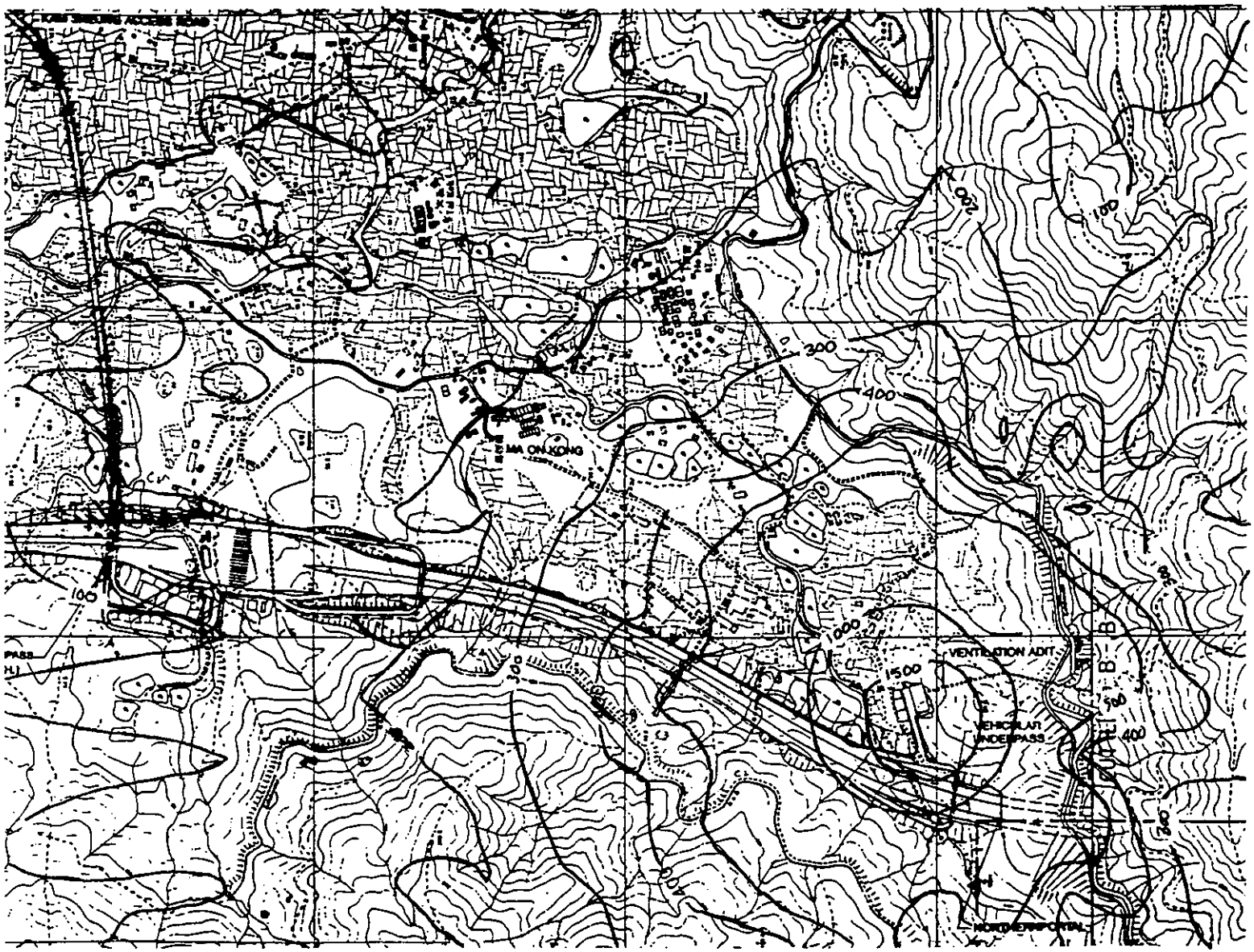

FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT 89mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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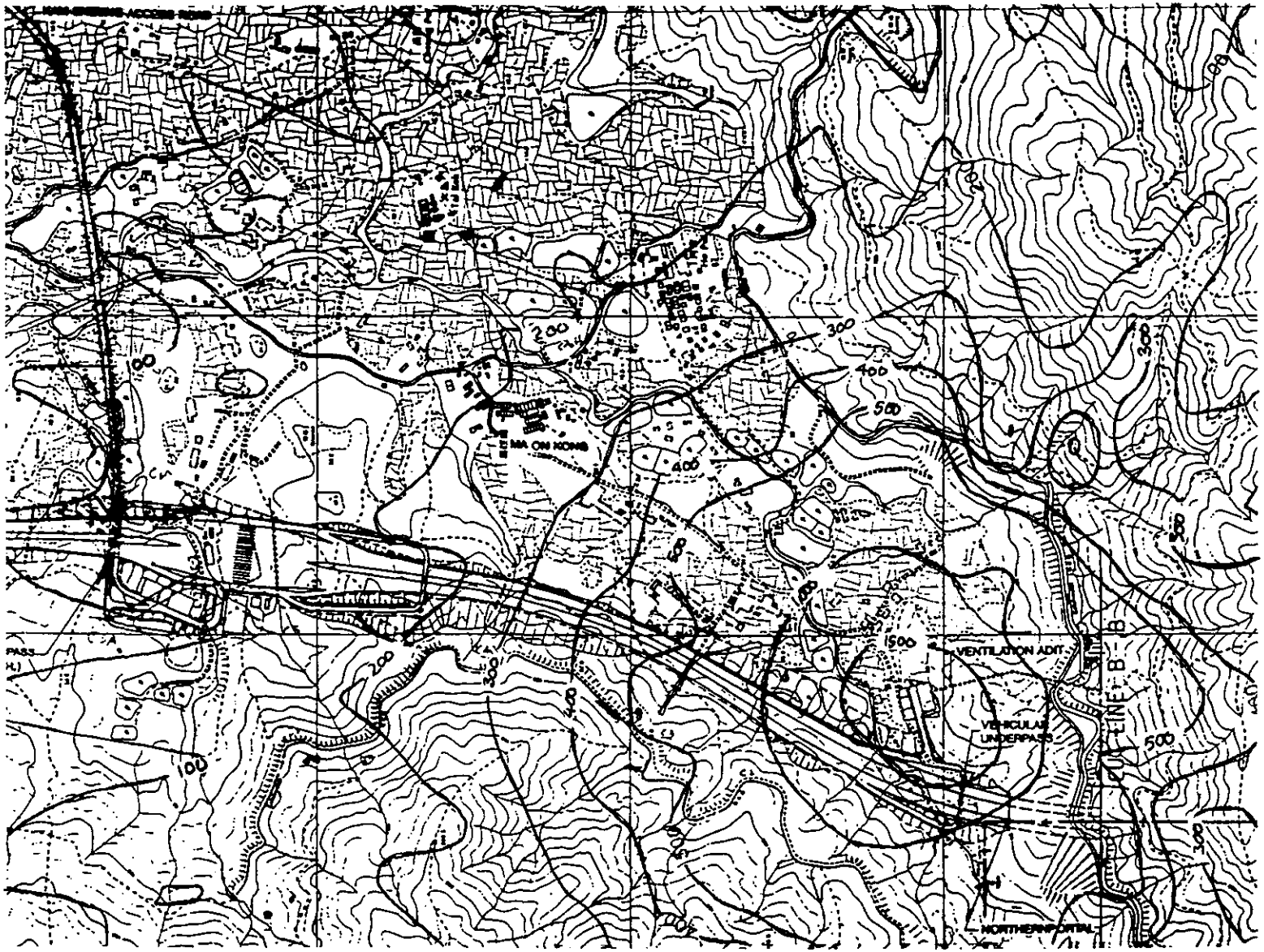

FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY NO_2 CONCENTRATIONS AT 93mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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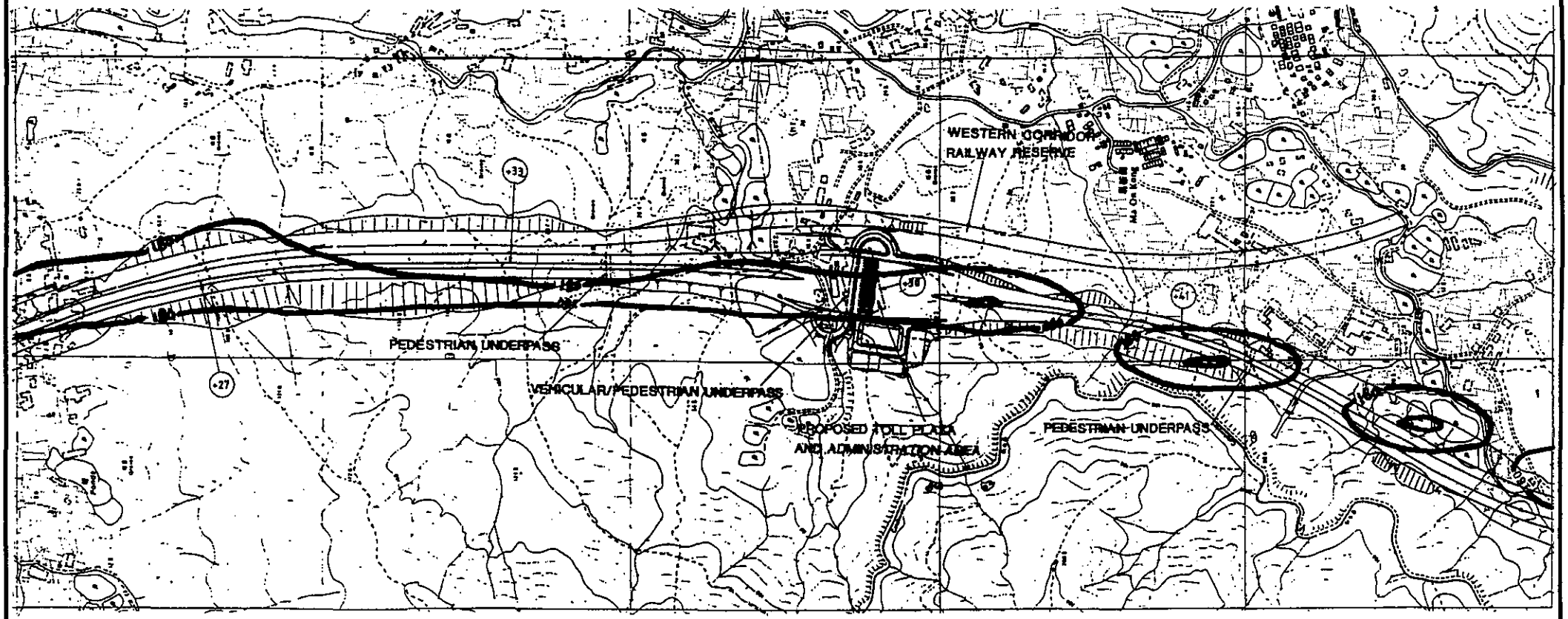

Notes:

1. Shows hourly ground level pollution concentrations due to 2001 morning peak hour traffic on major roads in the Study Area

2. Includes background pollution concentrations, but not contribution from tunnel ventilation.

3. Units = $\mu g/m^3$

FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY RSP CONCENTRATIONS AT GROUND LEVEL (2001)**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
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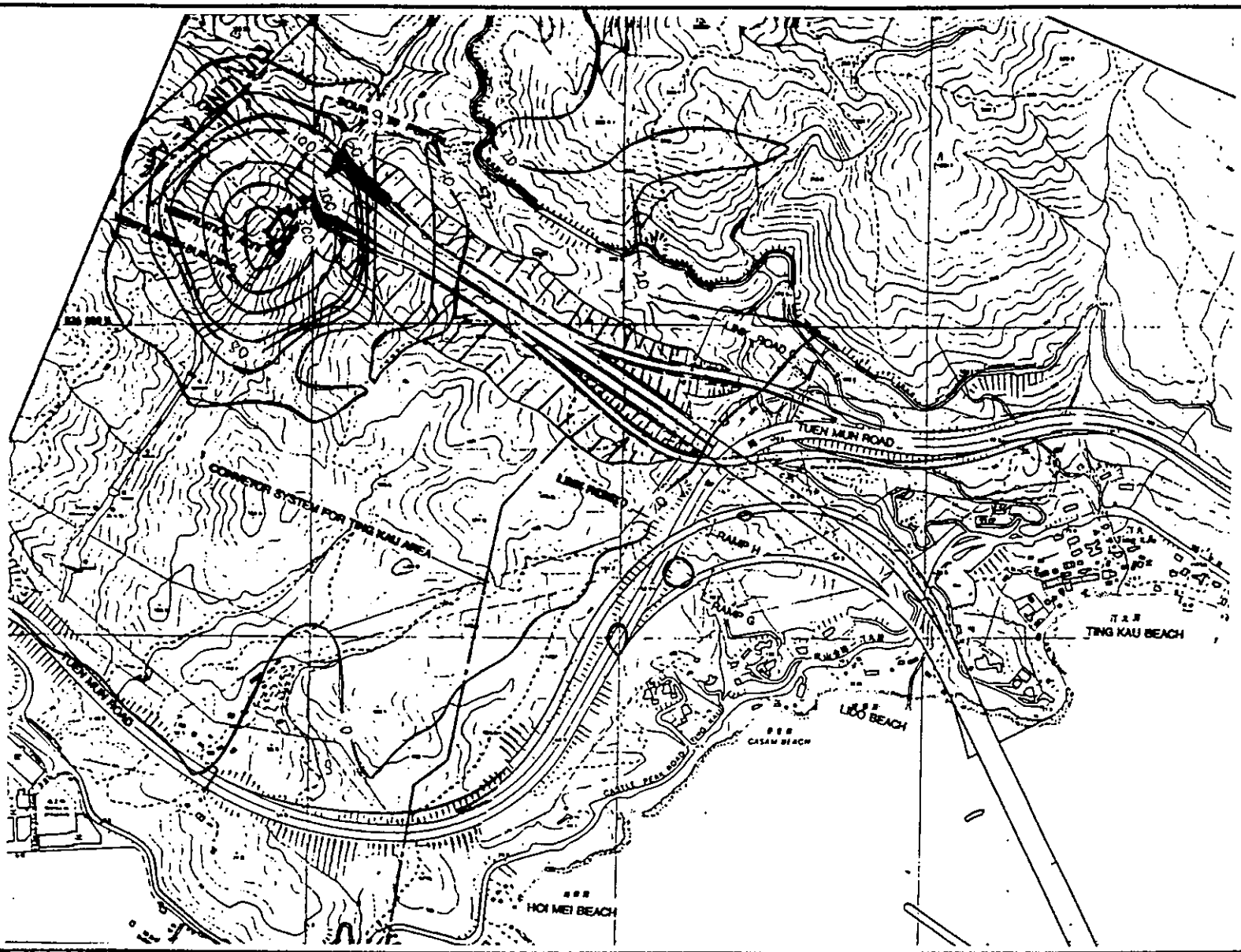


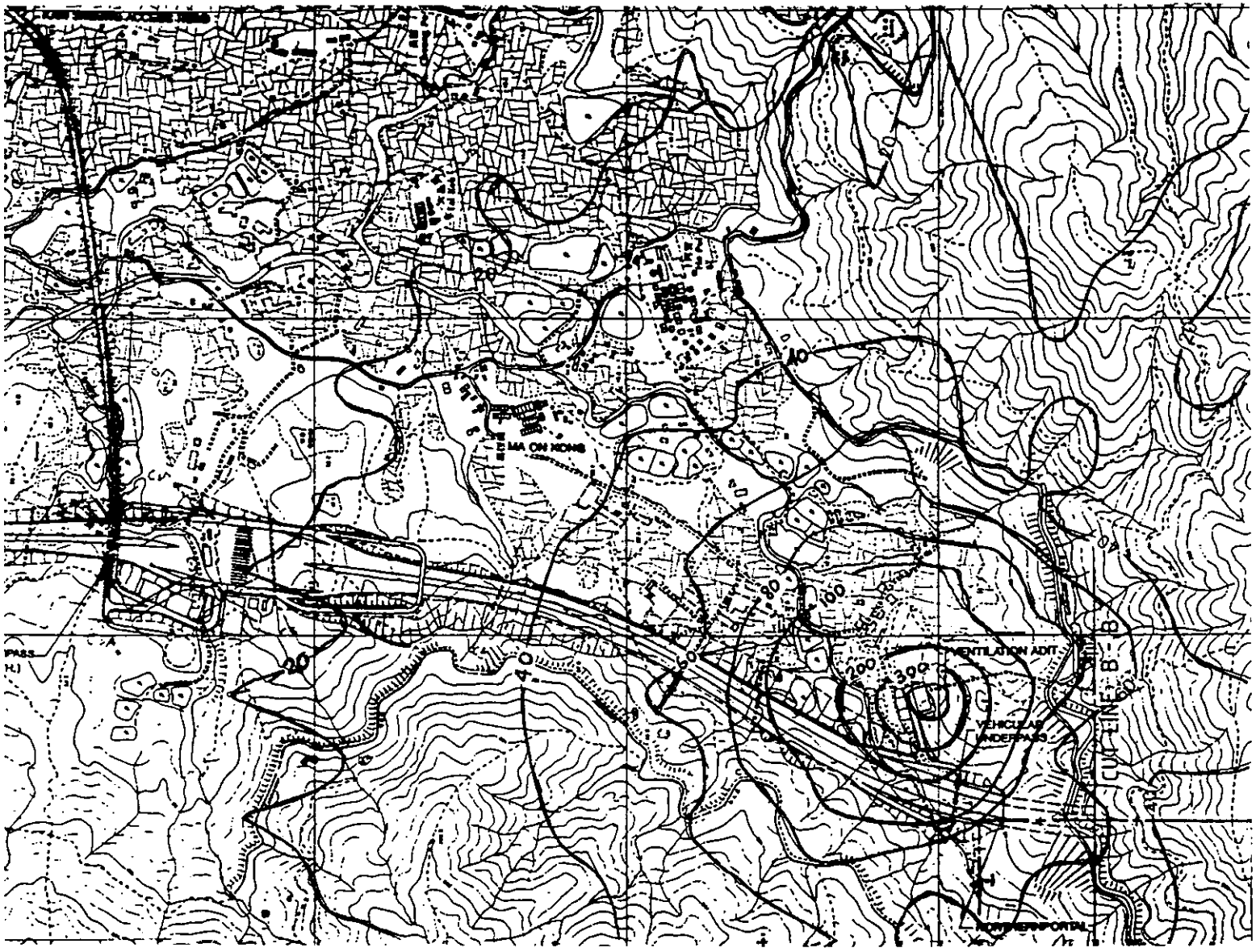
FREEMAN FOX MAUNSELL

Drg. Title :

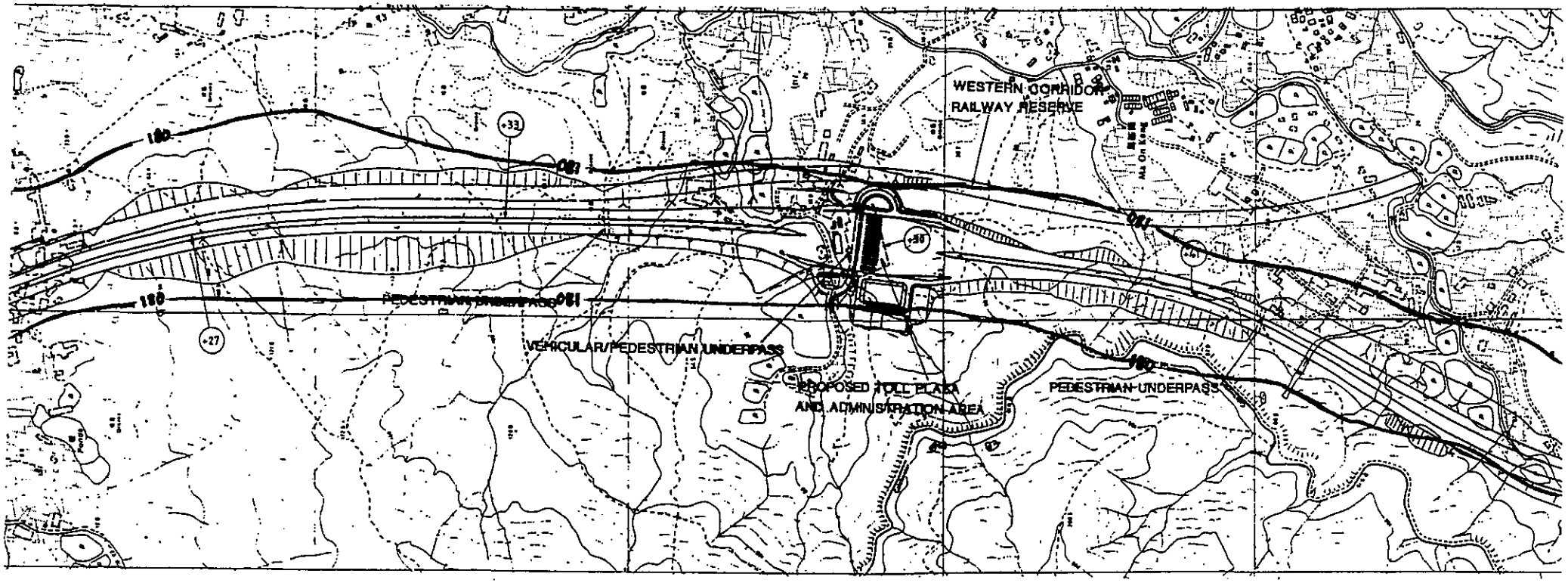
HOURLY RSP CONCENTRATIONS AT 109.5mPD (2001): SOUTH VENTILATION TOWER

Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**

Scale : N.T.S.	Job No. 058000	Fig No. A4.5.14
Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY RSP CONCENTRATIONS AT 78mPD (2001): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.15**
		Date : October 1993		



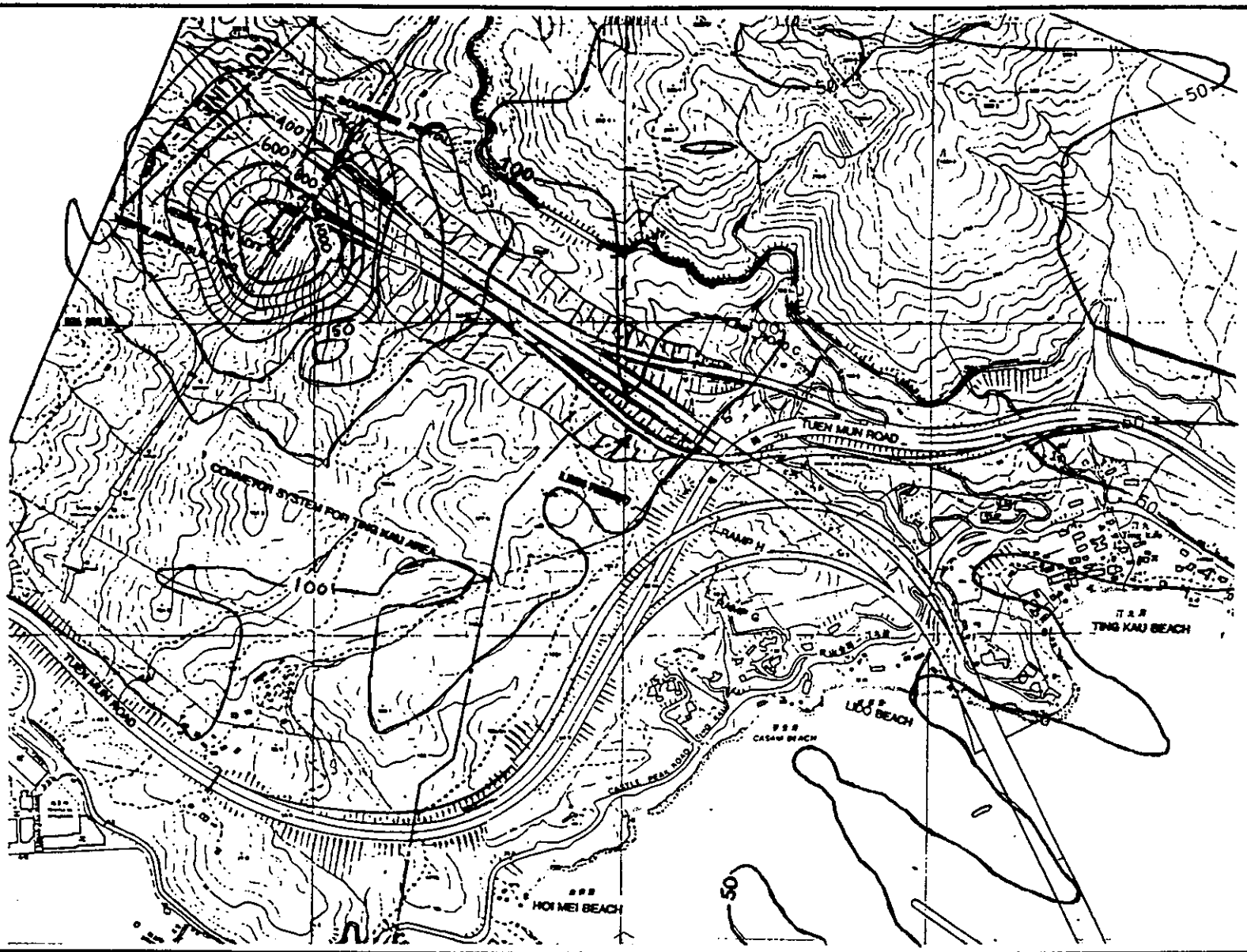
Notes:

1. Shows hourly ground level pollution concentrations due to 2011 morning peak hour traffic on major roads in the Study Area

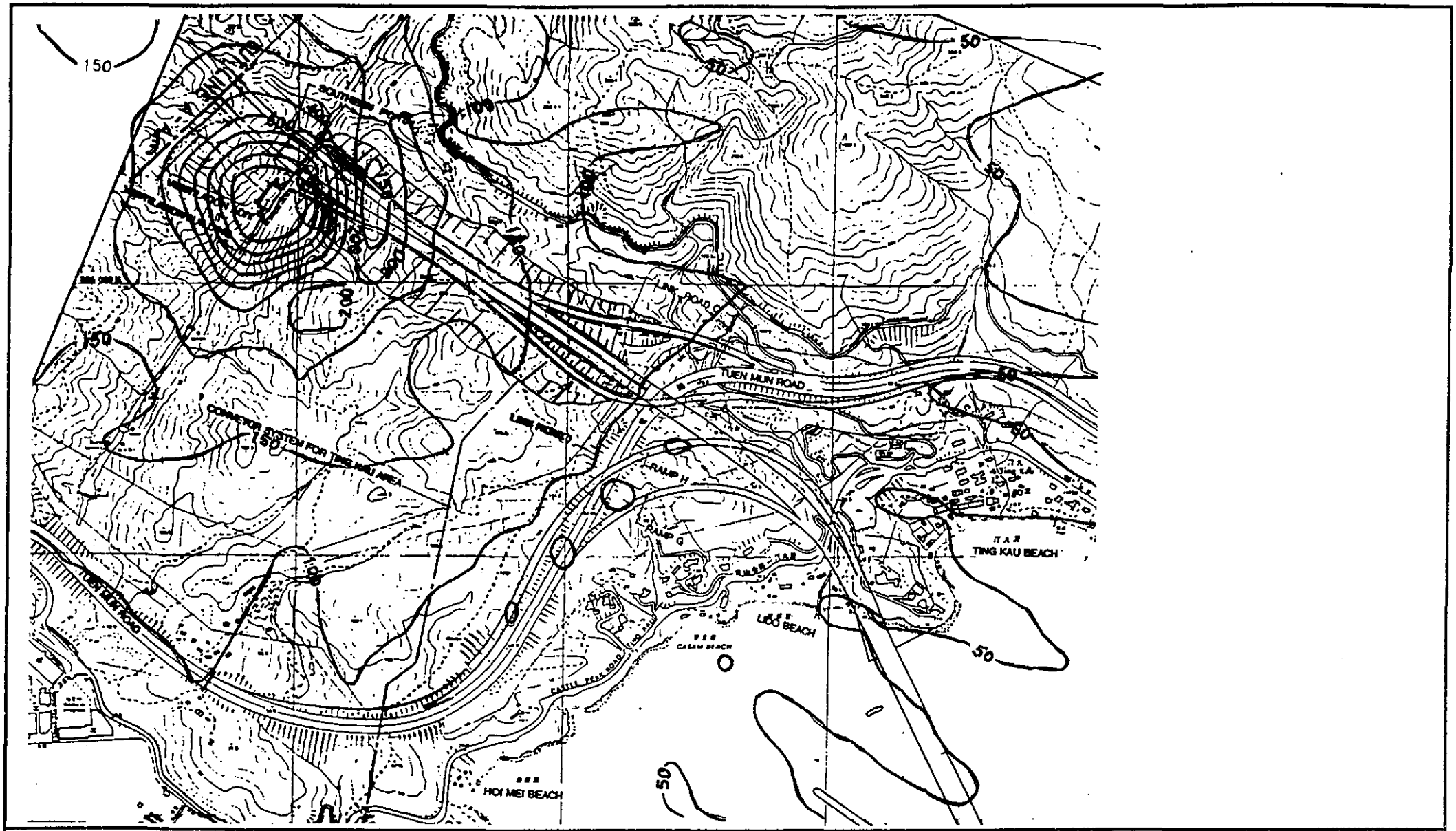
2. Includes background pollution concentrations, but not contribution from tunnel ventilation.

3. Units = $\mu g/m^3$

FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY RSP CONCENTRATIONS AT GROUND LEVEL (2011)**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. 058000	Fig No. A4.5.16
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY RSP CONCENTRATIONS AT 104.5mPD (2011): SOUTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.17**
		Date : October 1993		



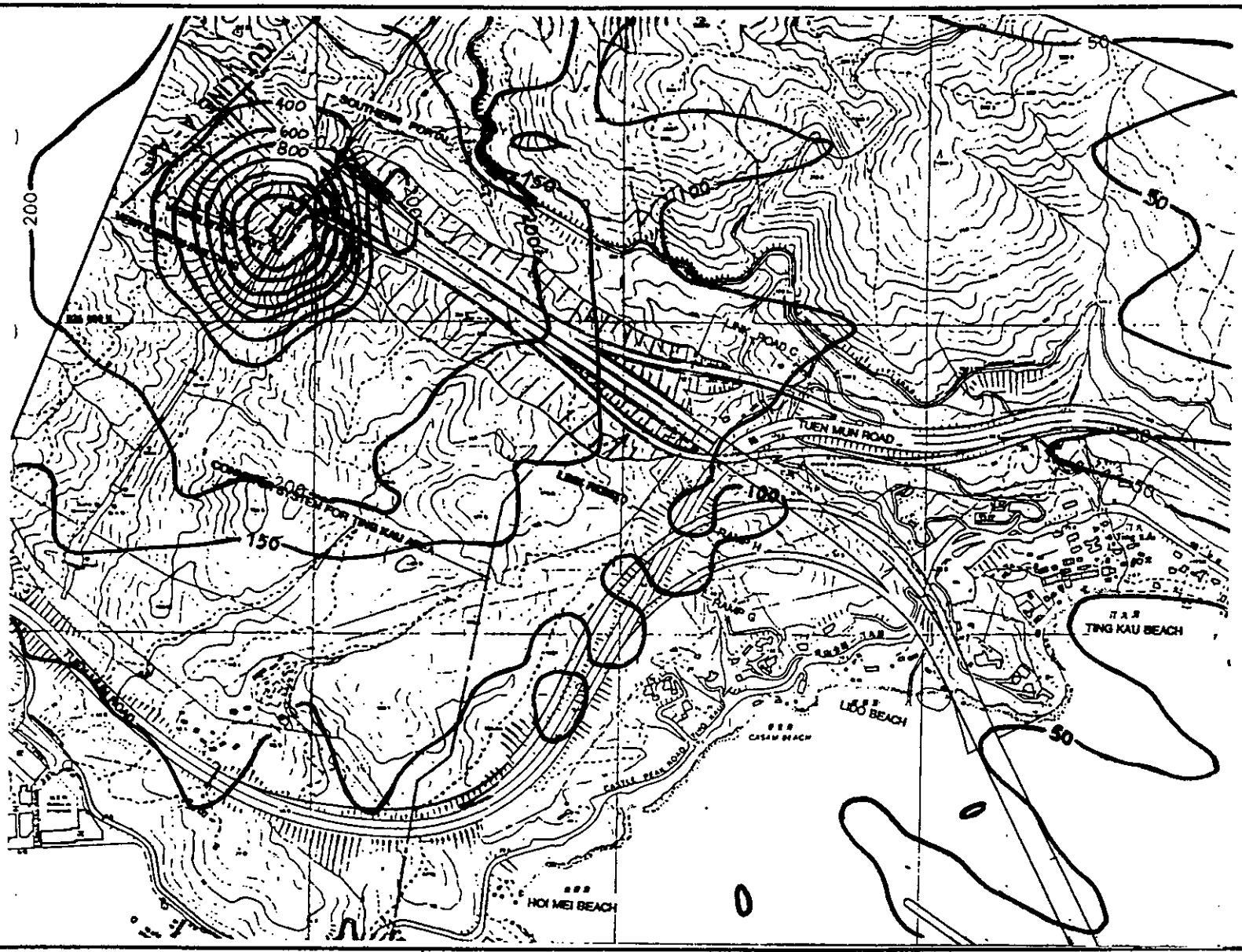
FREEMAN FOX MAUNSELL

Drg. Title :

HOURLY RSP CONCENTRATIONS AT 109.5mPD (2011): SOUTH VENTILATION TOWER

Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**

Scale : N.T.S.	Job No. 058000	Fig No. A4.5.18
Date : October 1993		



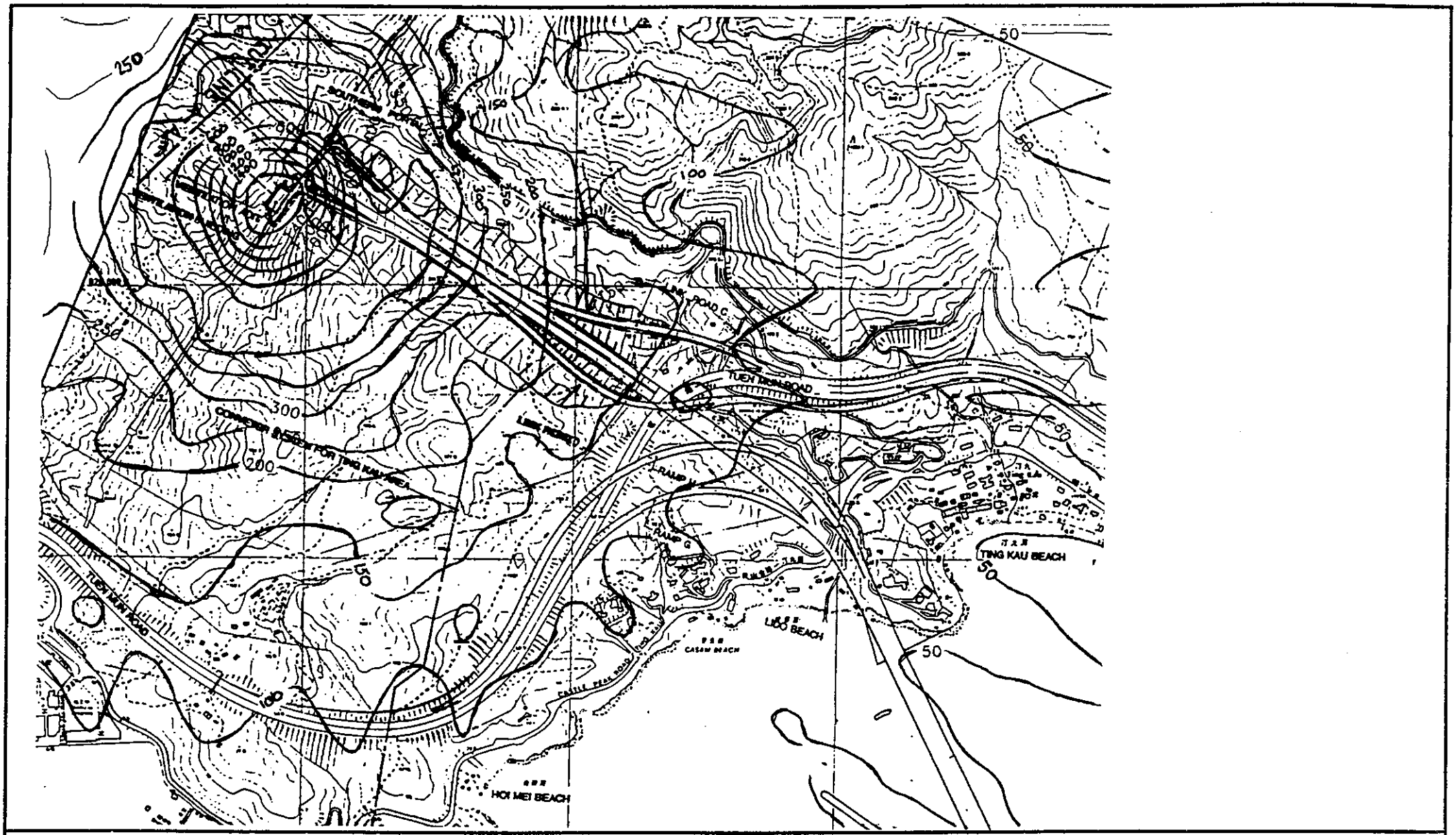
FREEMAN FOX MAUNSELL

Drg. Title :

HOURLY RSP CONCENTRATIONS AT 114.5mPD (2011): SOUTH VENTILATION TOWER

Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**

Scale : N.T.S.	Job No. 058000	Fig No. A4.5.19
Date : October 1993		



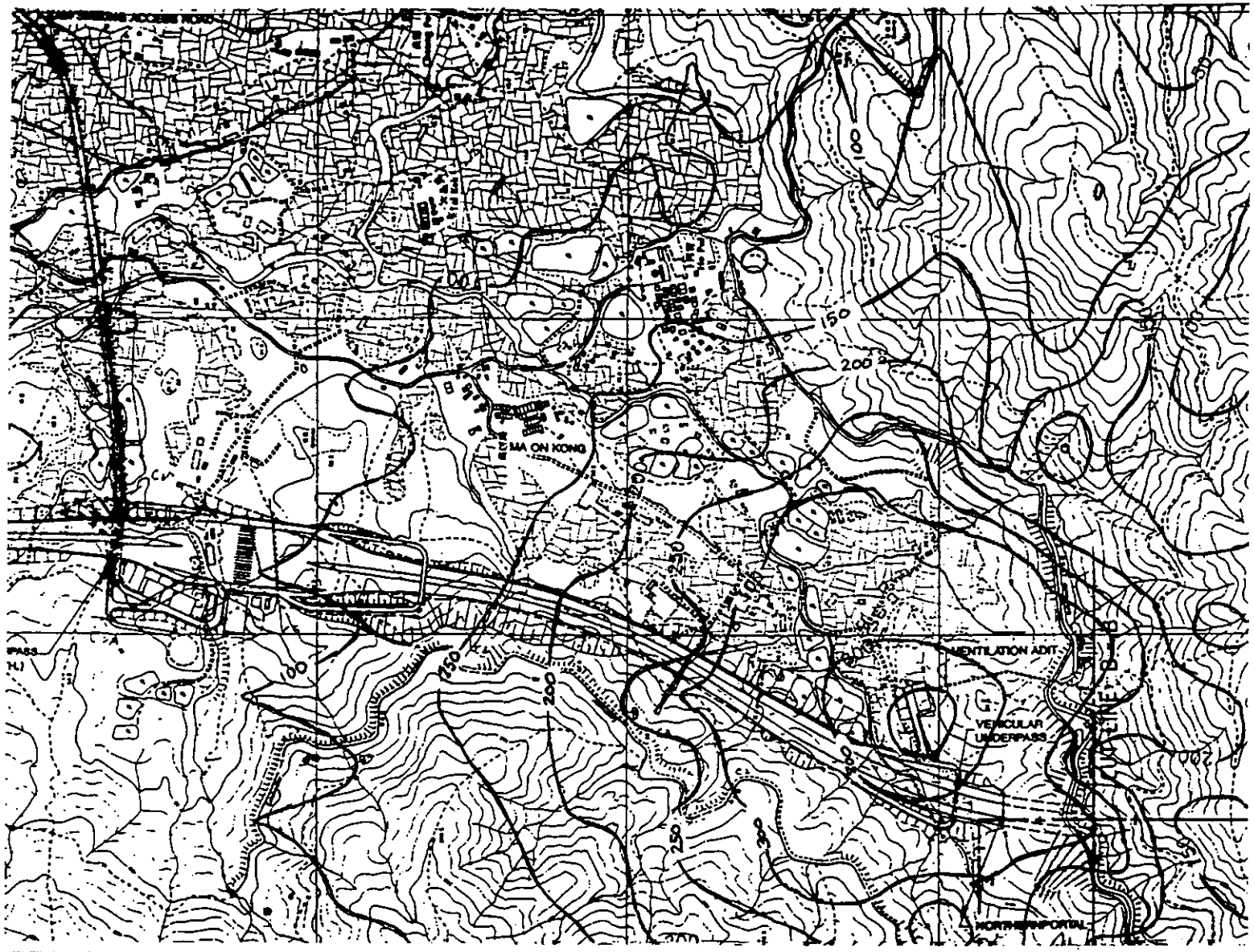
FREEMAN FOX MAUNSELL

Drg. Title :

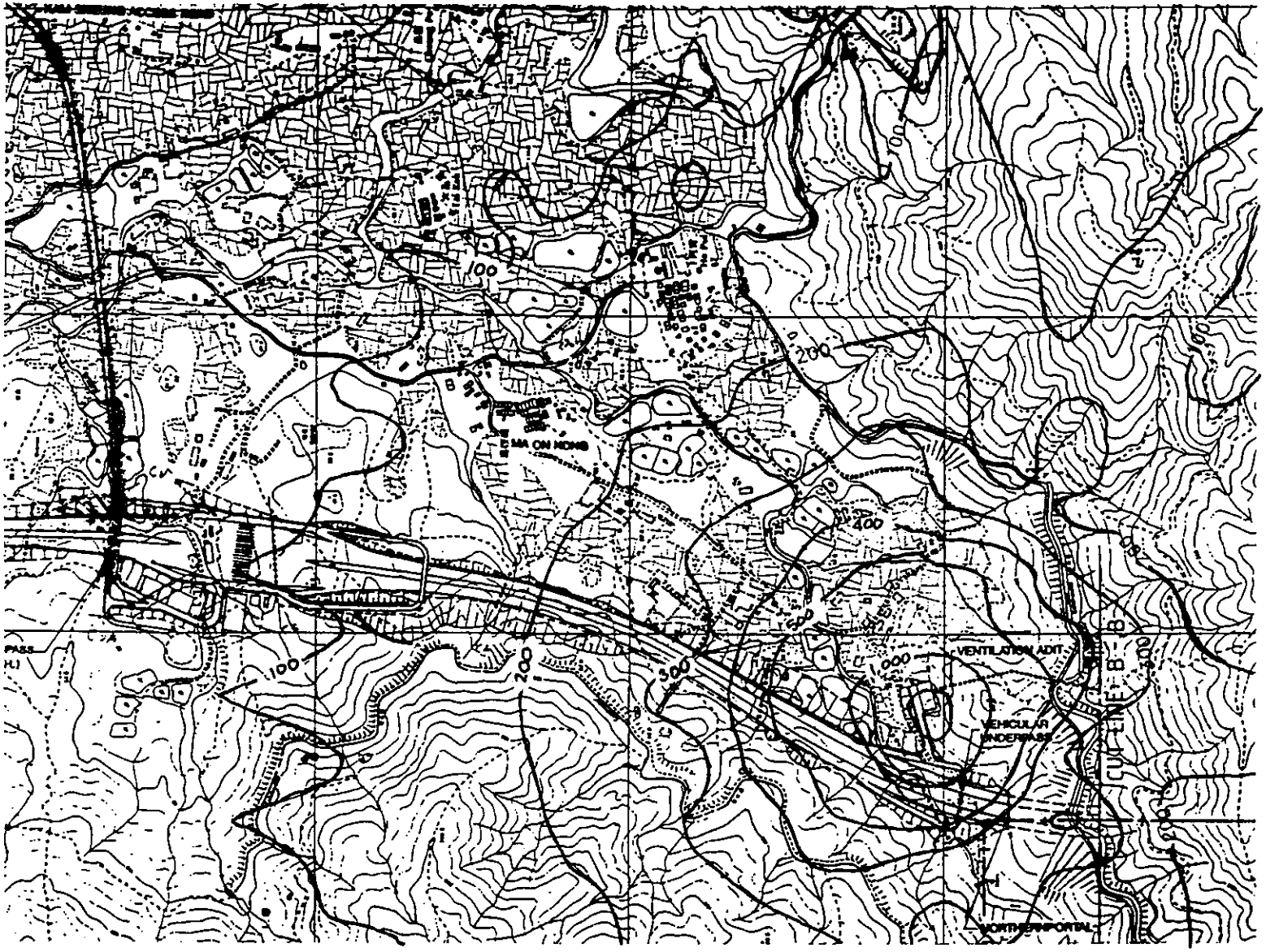
HOURLY RSP CONCENTRATIONS AT 124.5mPD (2011): SOUTH VENTILATION TOWER

Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**

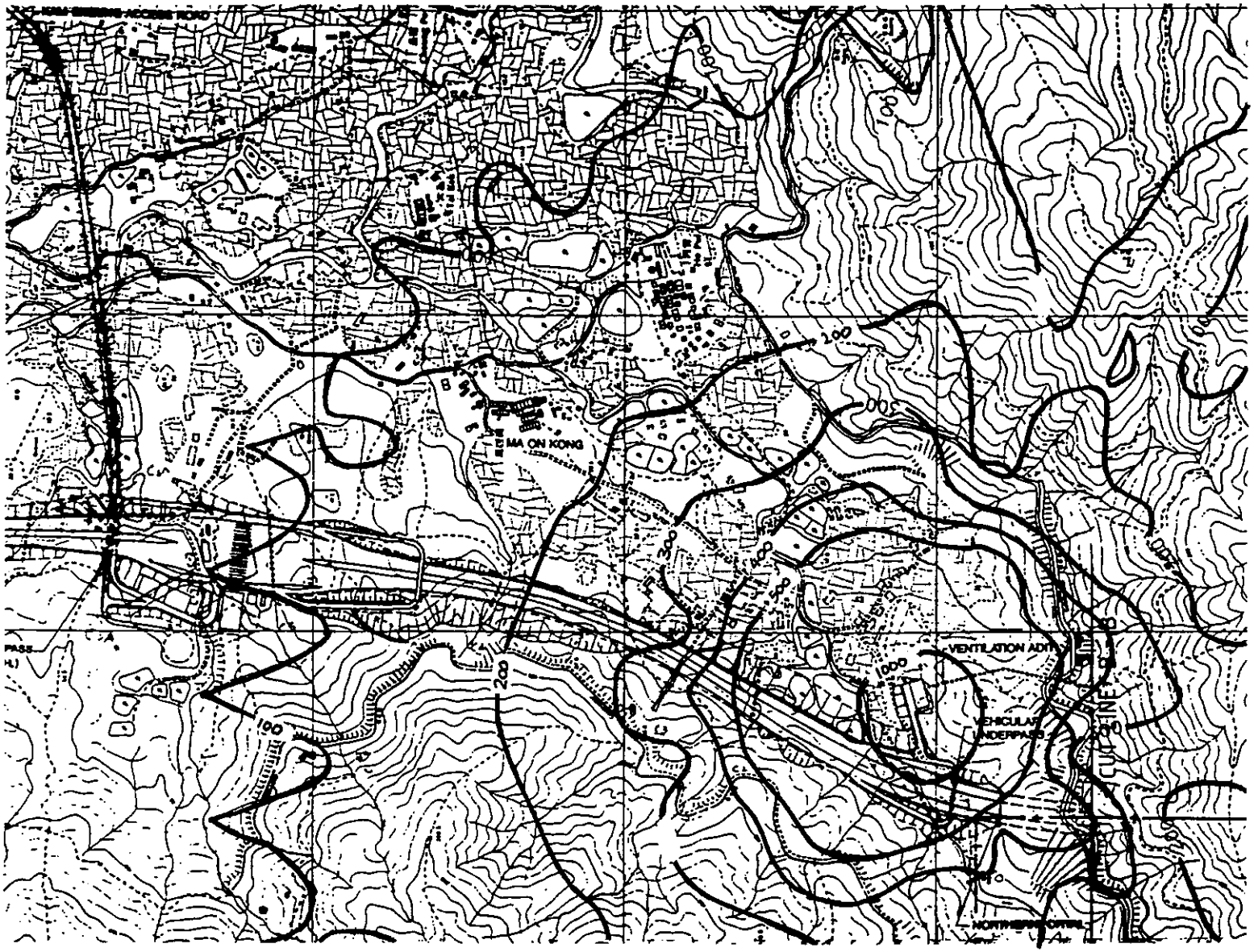
Scale : N.T.S.	Job No. 058000	Fig No. A4.5.20
Date : October 1993		



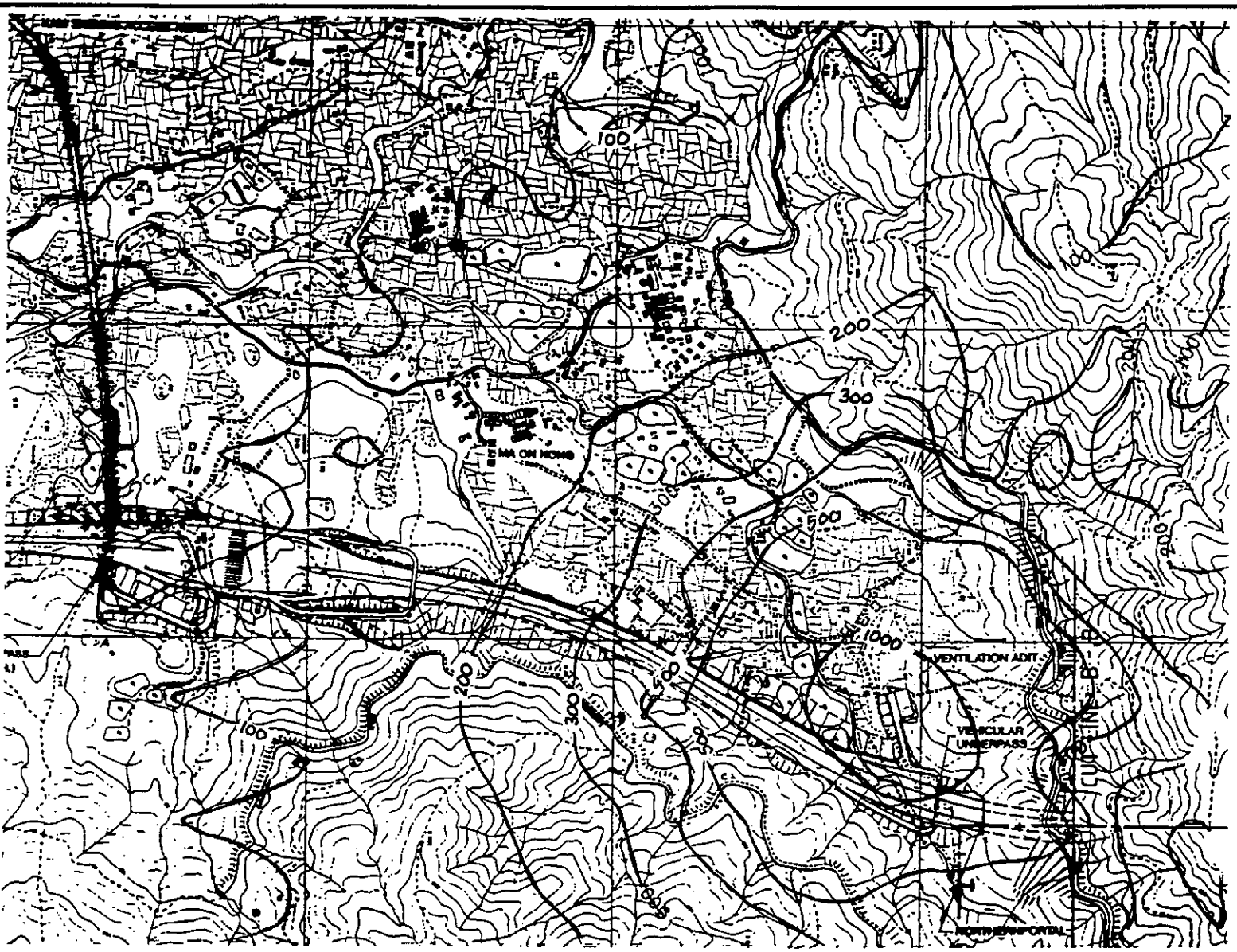
FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY RSP CONCENTRATIONS AT 73mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.21**
		Date : October 1993		



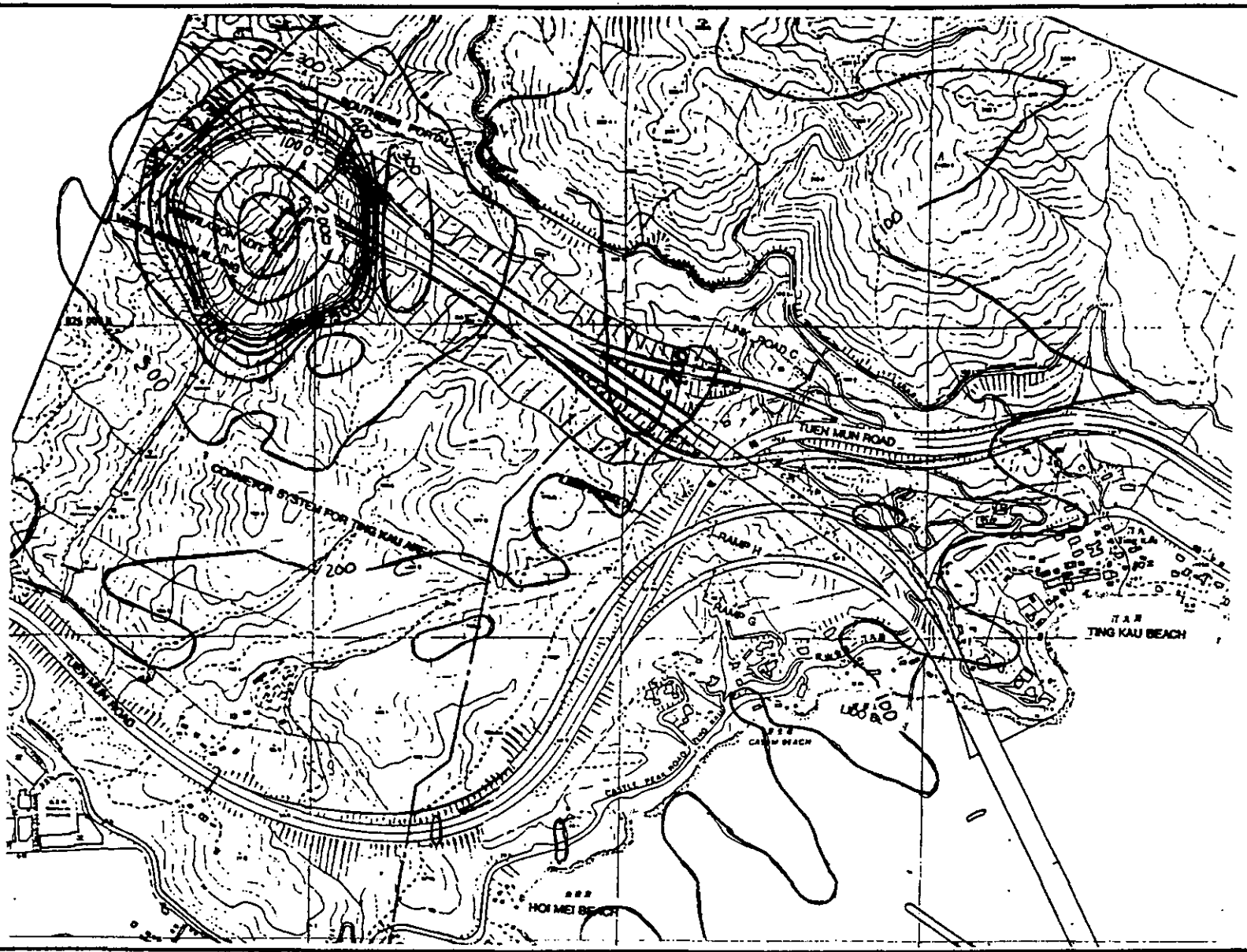
FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY RSP CONCENTRATIONS AT 78mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.22**
		Date : October 1993		



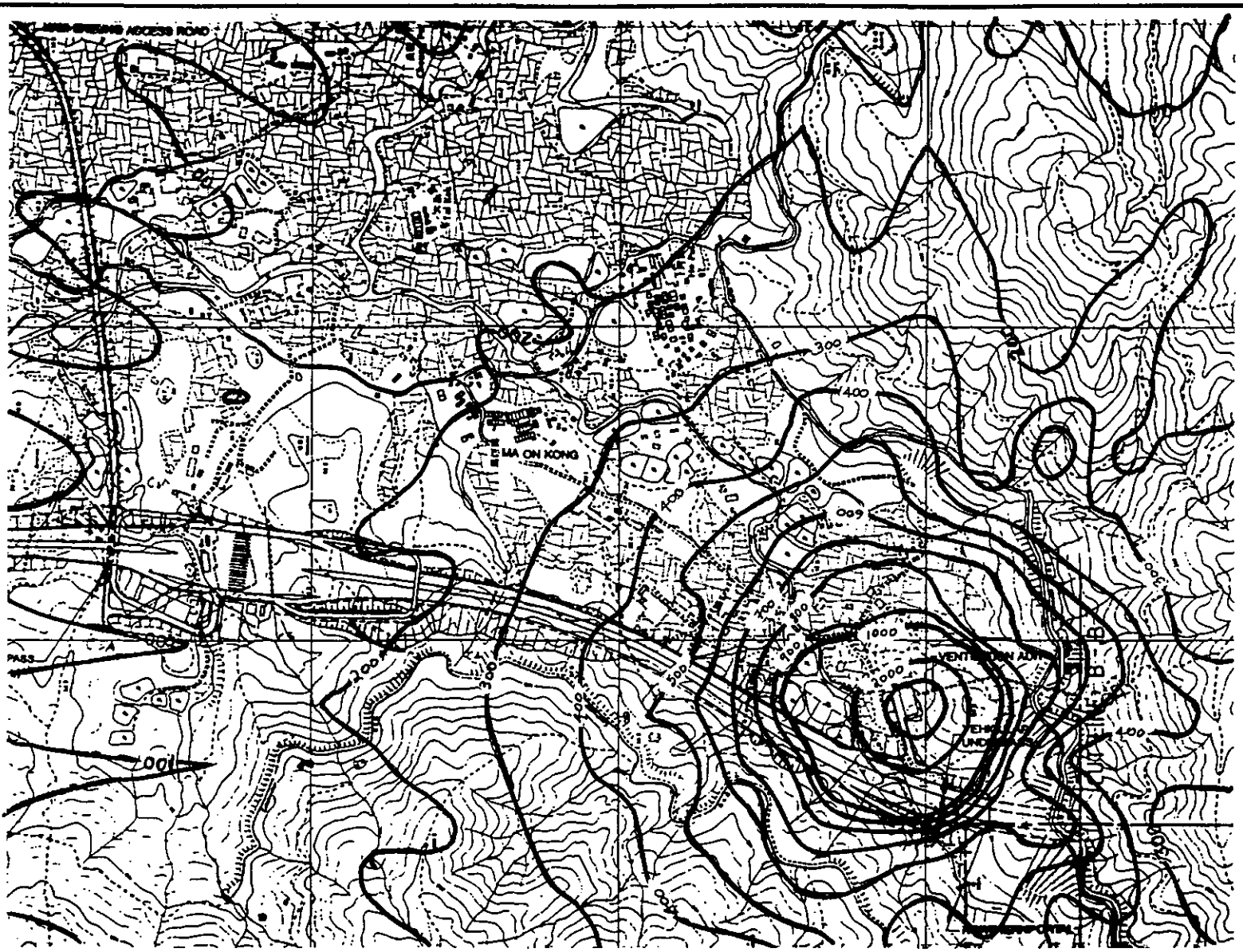
FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY P.SP CONCENTRATIONS AT 89mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.23**
		Date : October 1993		



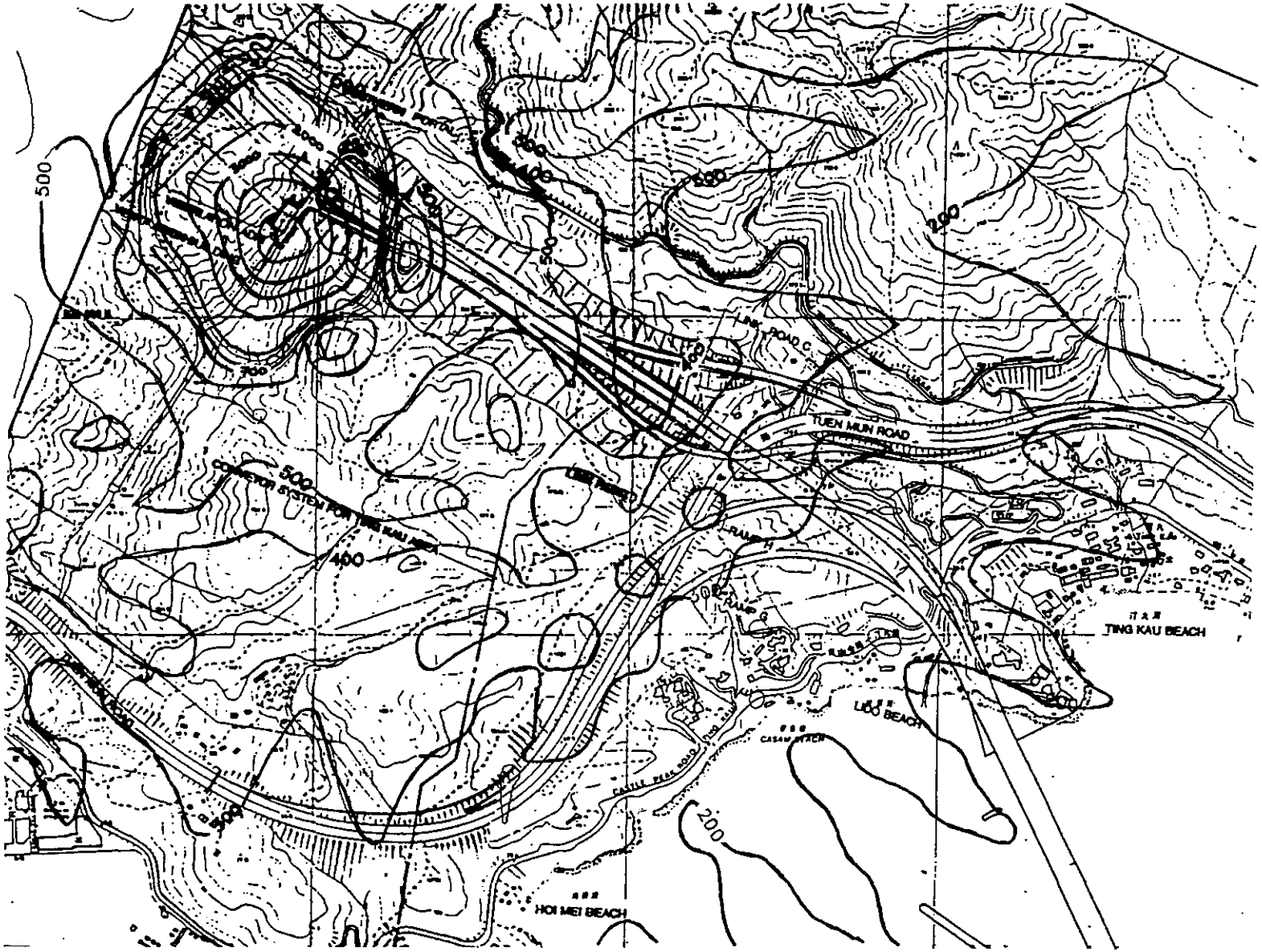
FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY RSP CONCENTRATIONS AT 93mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.24**
		Date : October 1993		



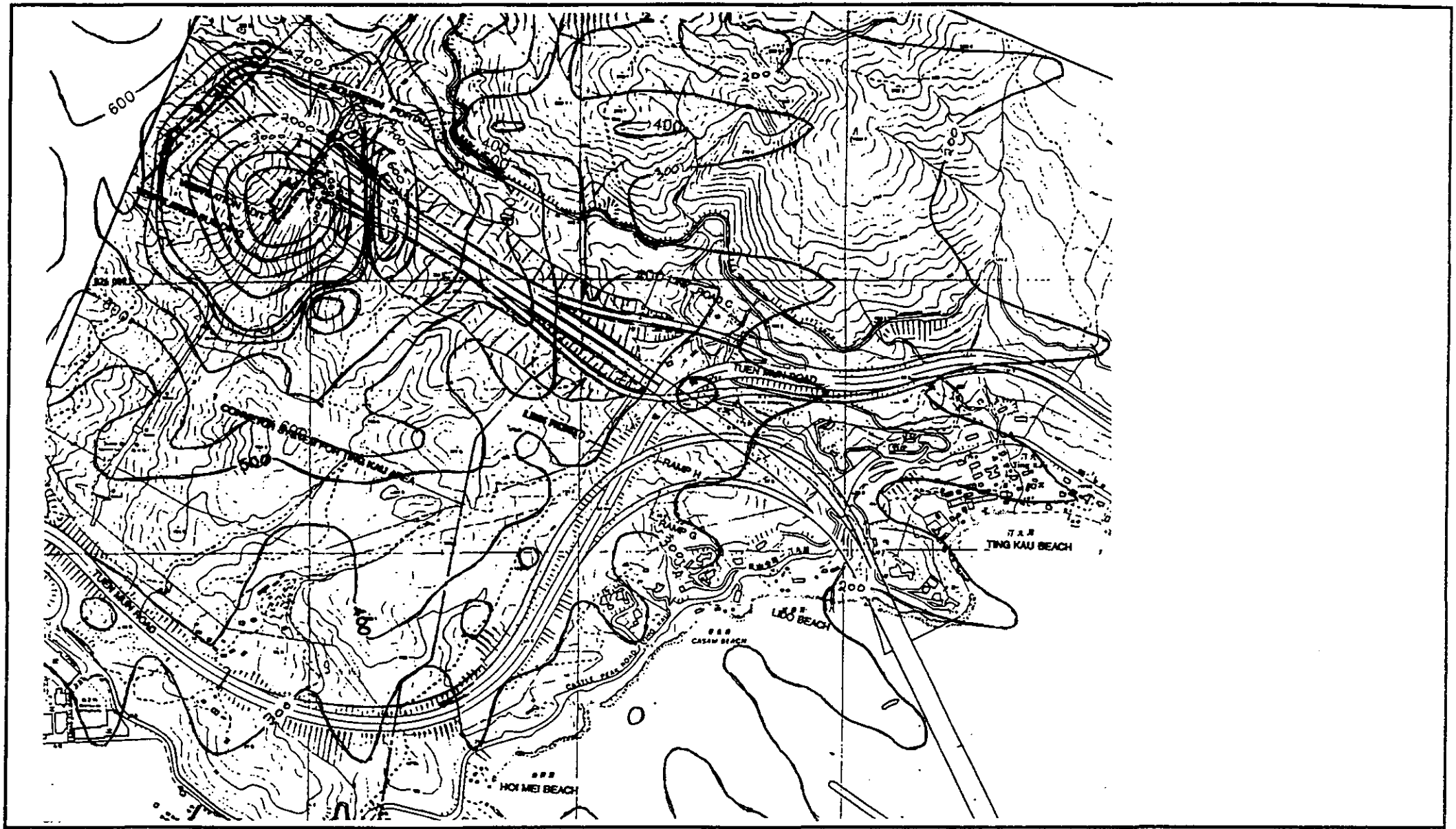
FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY CO CONCENTRATIONS AT 109.5mPD 2001: SOUTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.25**
		Date : October 1993		



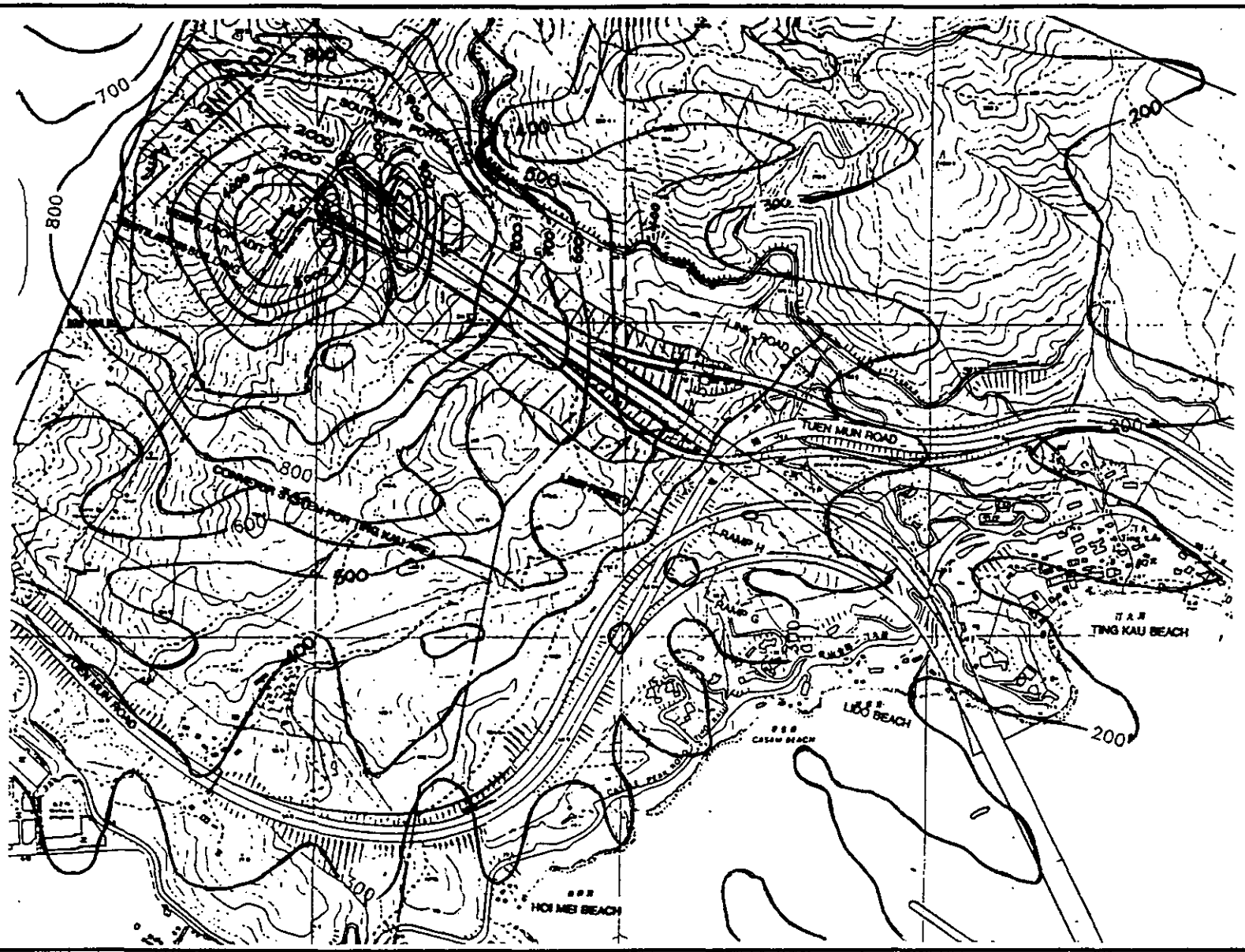
FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY CO CONCENTRATIONS AT 78mPD (2001): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.26**
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY CO CONCENTRATIONS AT 104.5mPD (2011): SOUTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.27**
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY CO CONCENTRATIONS AT 109.5mPD (2011): SOUTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.28**
		Date : October 1993		



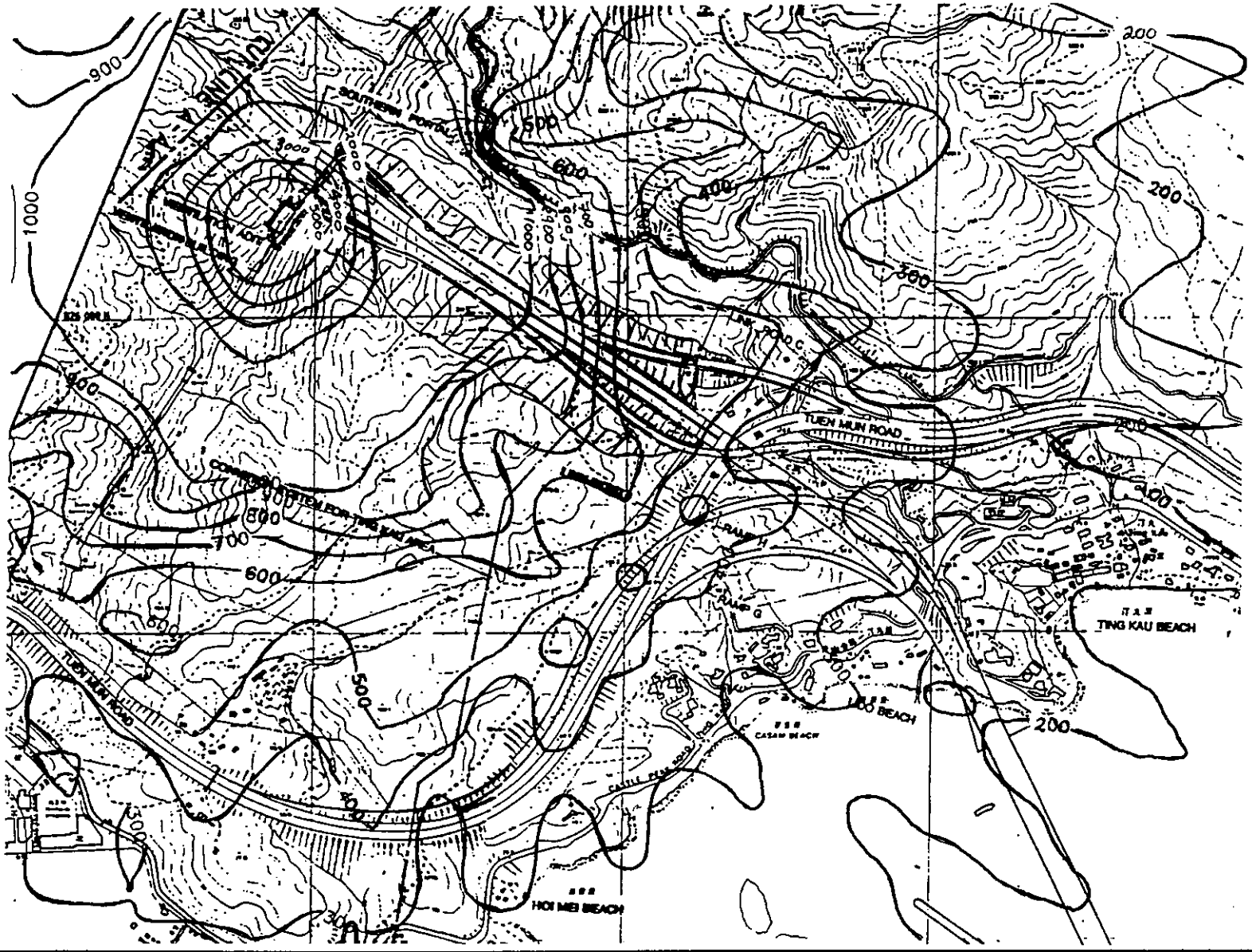
FREEMAN FOX MAUNSELL

Drg. Title :

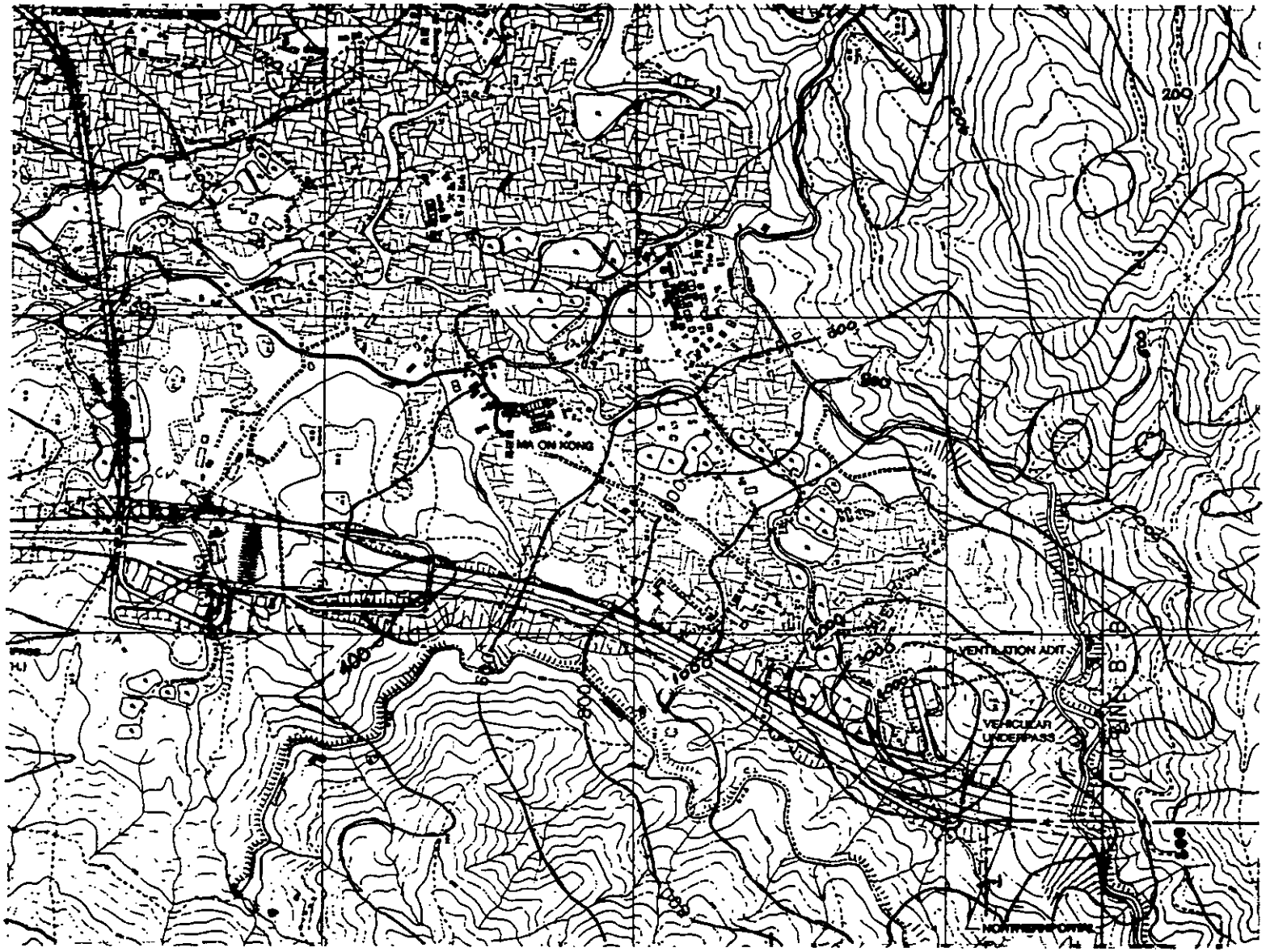
HOURLY CO CONCENTRATIONS AT 114.5mPD (2011): SOUTH VENTILATION TOWER

Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**

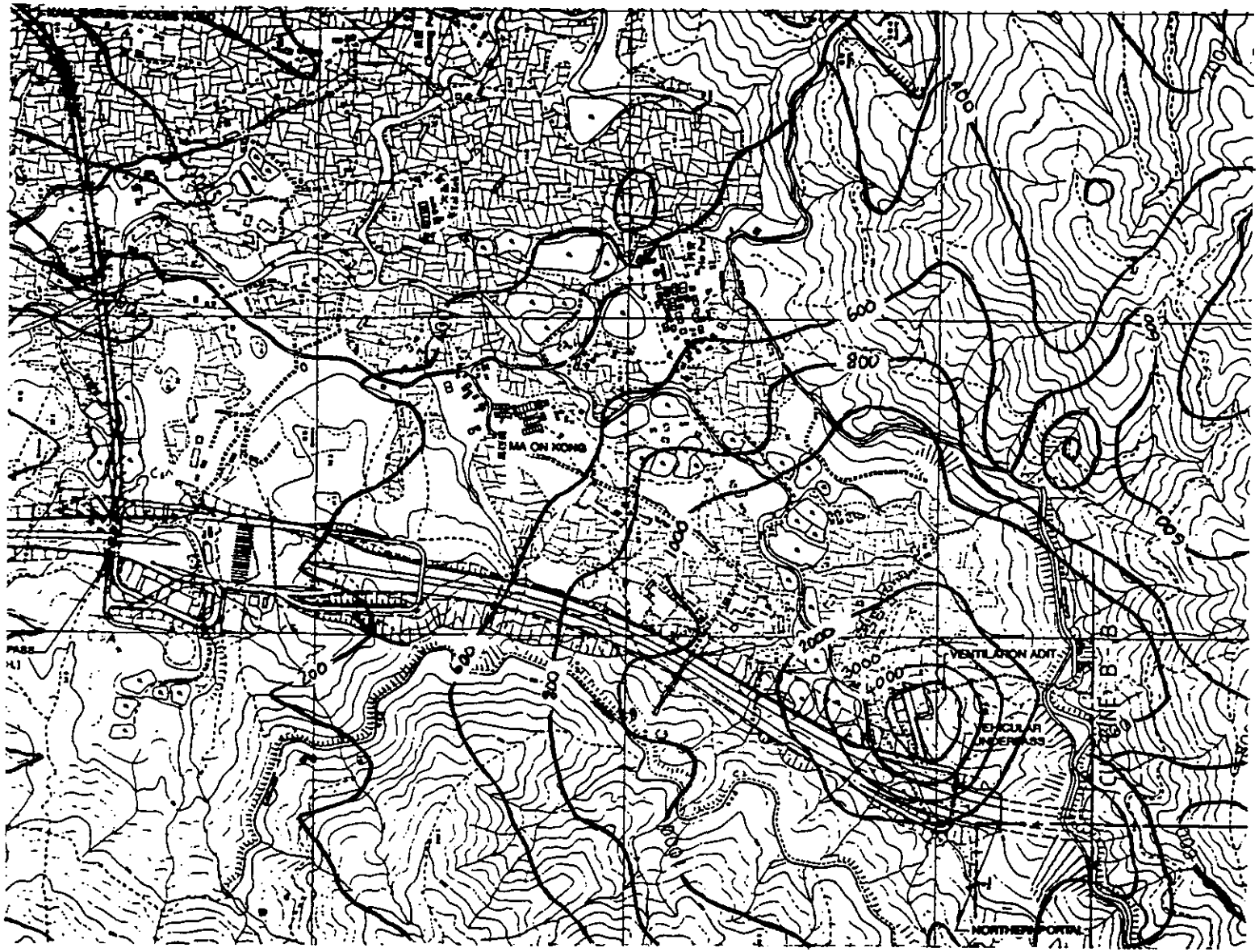
Scale : N.T.S.	Job No. 058000	Fig No. A4.5.29
Date : October 1993		



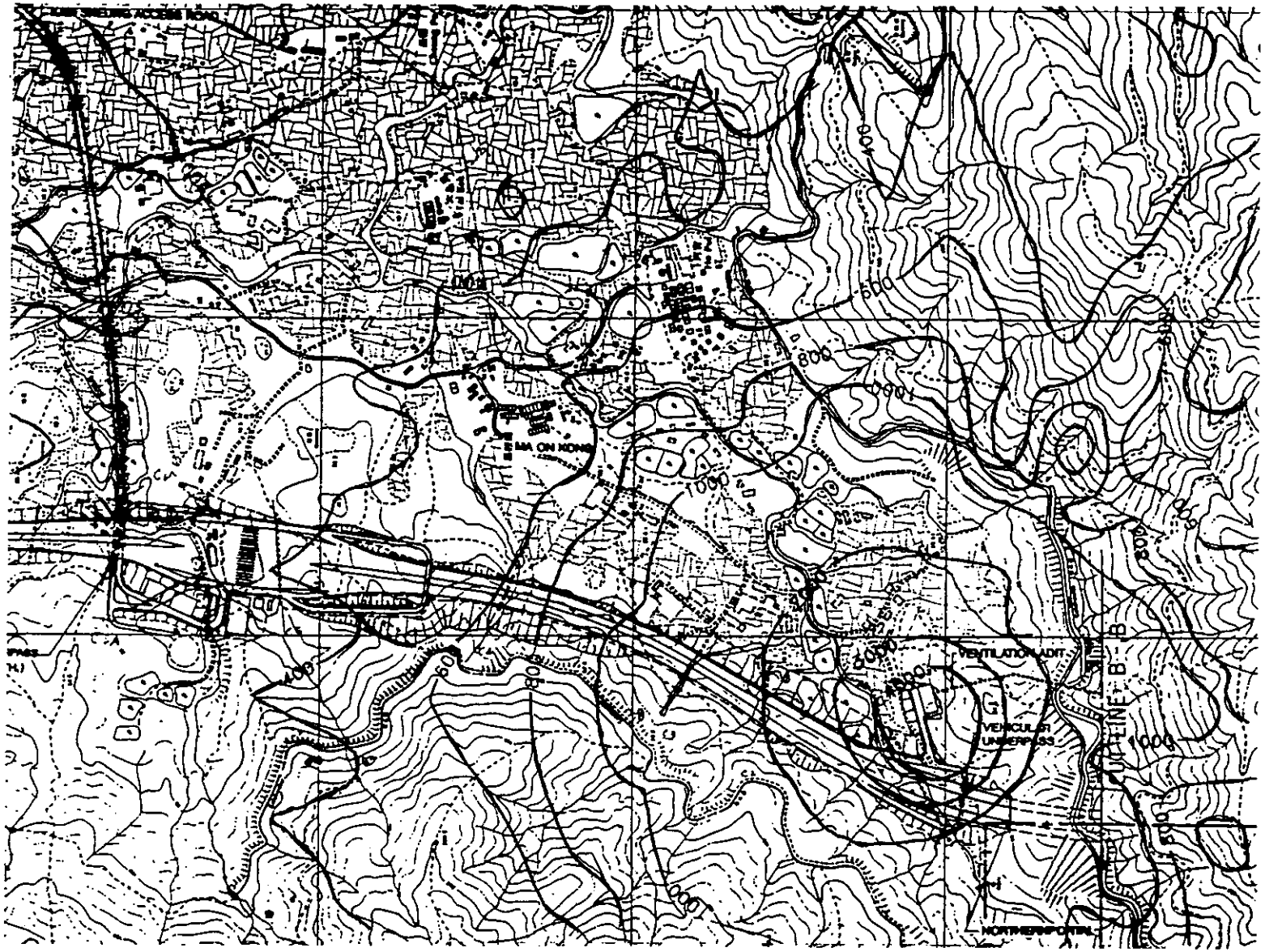
FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY CO CONCENTRATIONS AT 124.5mPD (2011): SOUTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.30**
		Date : October 1993		



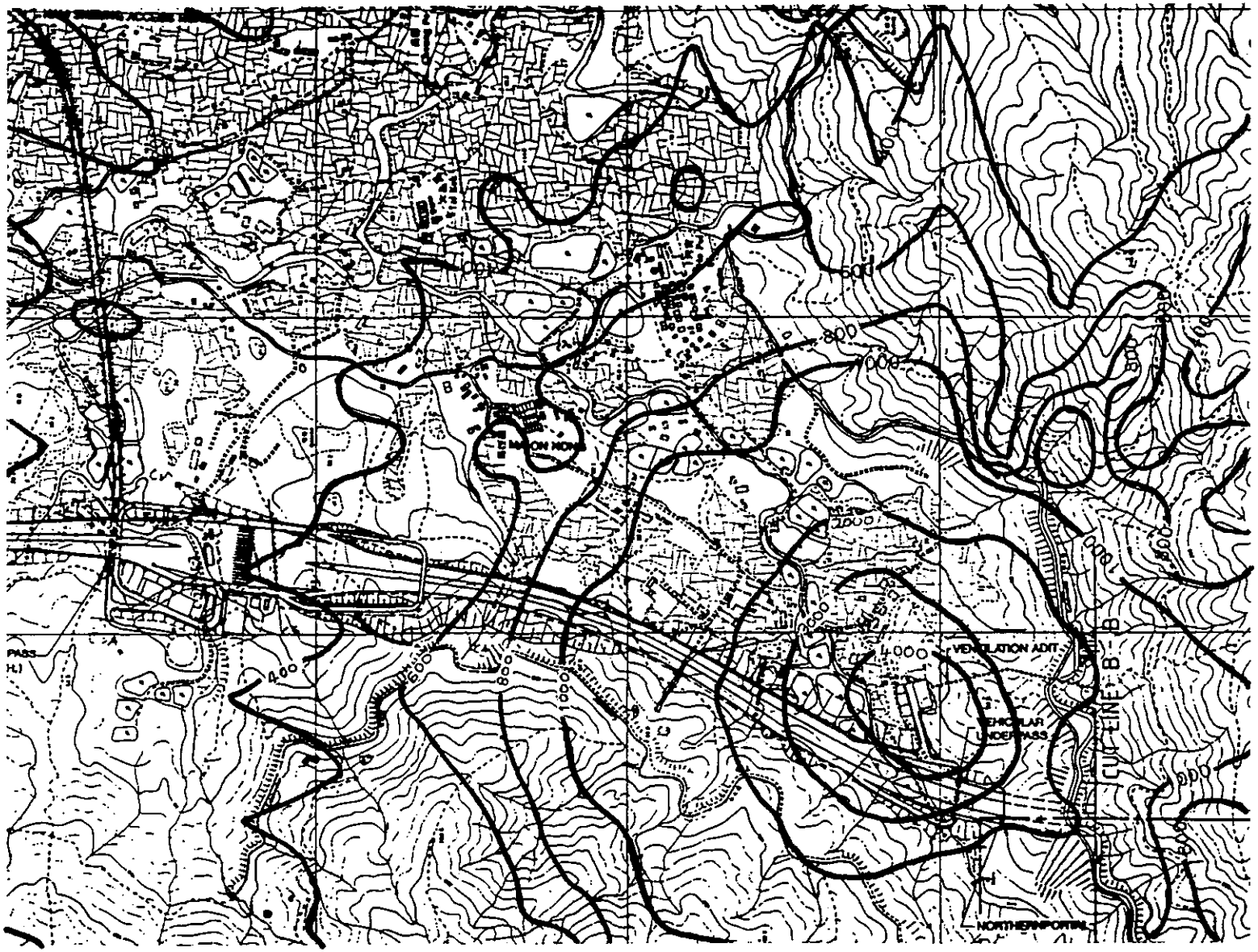
FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY CO CONCENTRATIONS AT 73mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.31**
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY CO CONCENTRATIONS AT 78mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.32**
		Date : October 1993		



FREEMAN FOX MAUNSELL	Drg. Title : **HOURLY CO CONCENTRATIONS AT 89mPD (2011): NORTH VENTILATION TOWER**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale : N.T.S.	Job No. **058000**	Fig No. **A4.5.33**
		Date : October 1993		



FREEMAN FOX MAUNSELL

Drg. Title :

HOURLY CO CONCENTRATIONS AT 93mPD (2011): NORTH VENTILATION TOWER

Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**

Scale : N.T.S.	Job No. 058000	Fig No. A4.5.34
Date : October 1993		

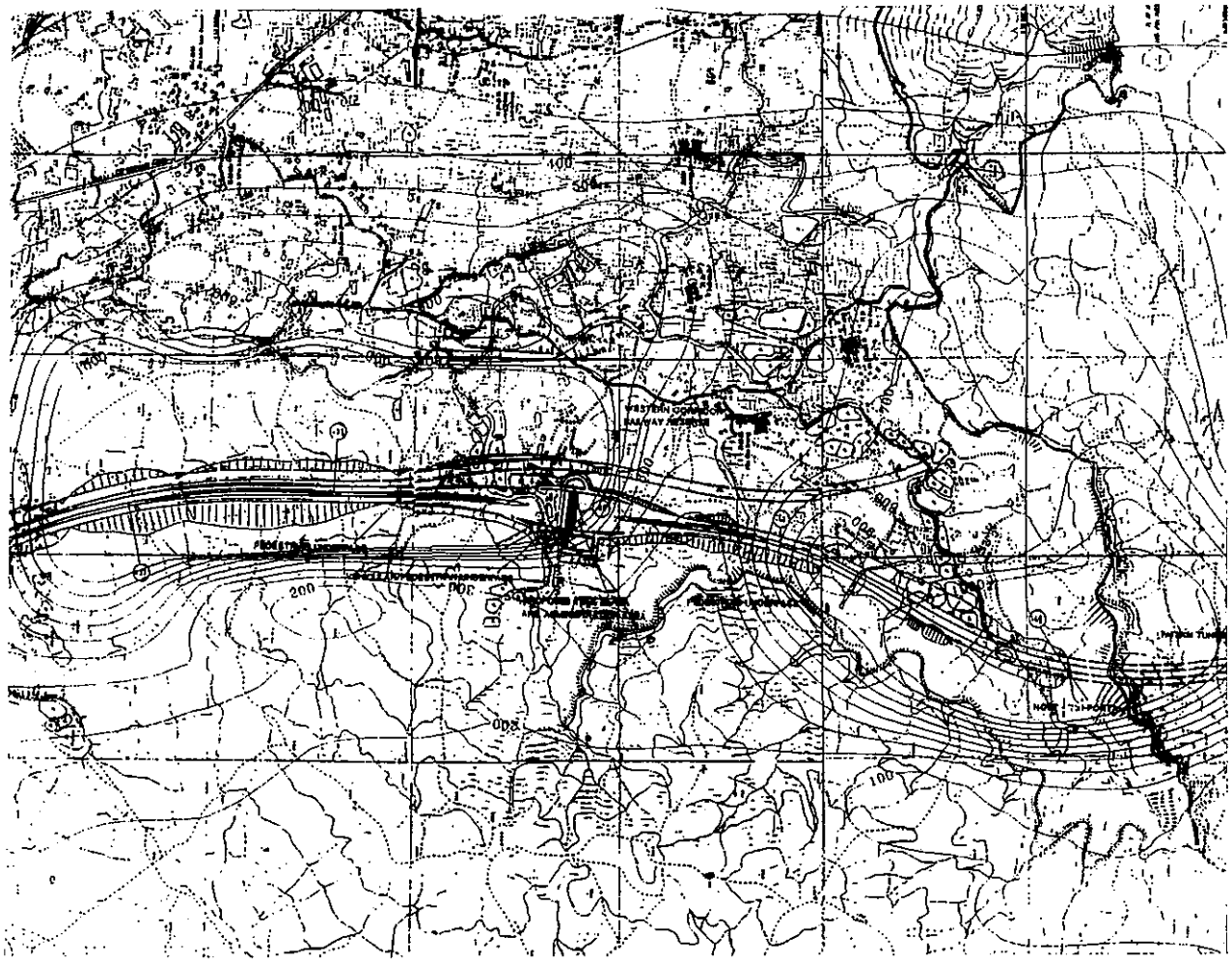
A4.6 POLLUTION ISOPLETHS :

CONSTRUCTION DUST

Construction dust has been obtained using the Fugitive Dust Model. Input assumptions are listed in Appendix A4.2 below. The results of the Model calculations have been plotted as below:

A4.6.1 Hourly Concentrations of Construction Dust (TSP) at Ground Level

A4.6.2 24-hour Concentrations of Construction Dust (TSP) at Ground Level



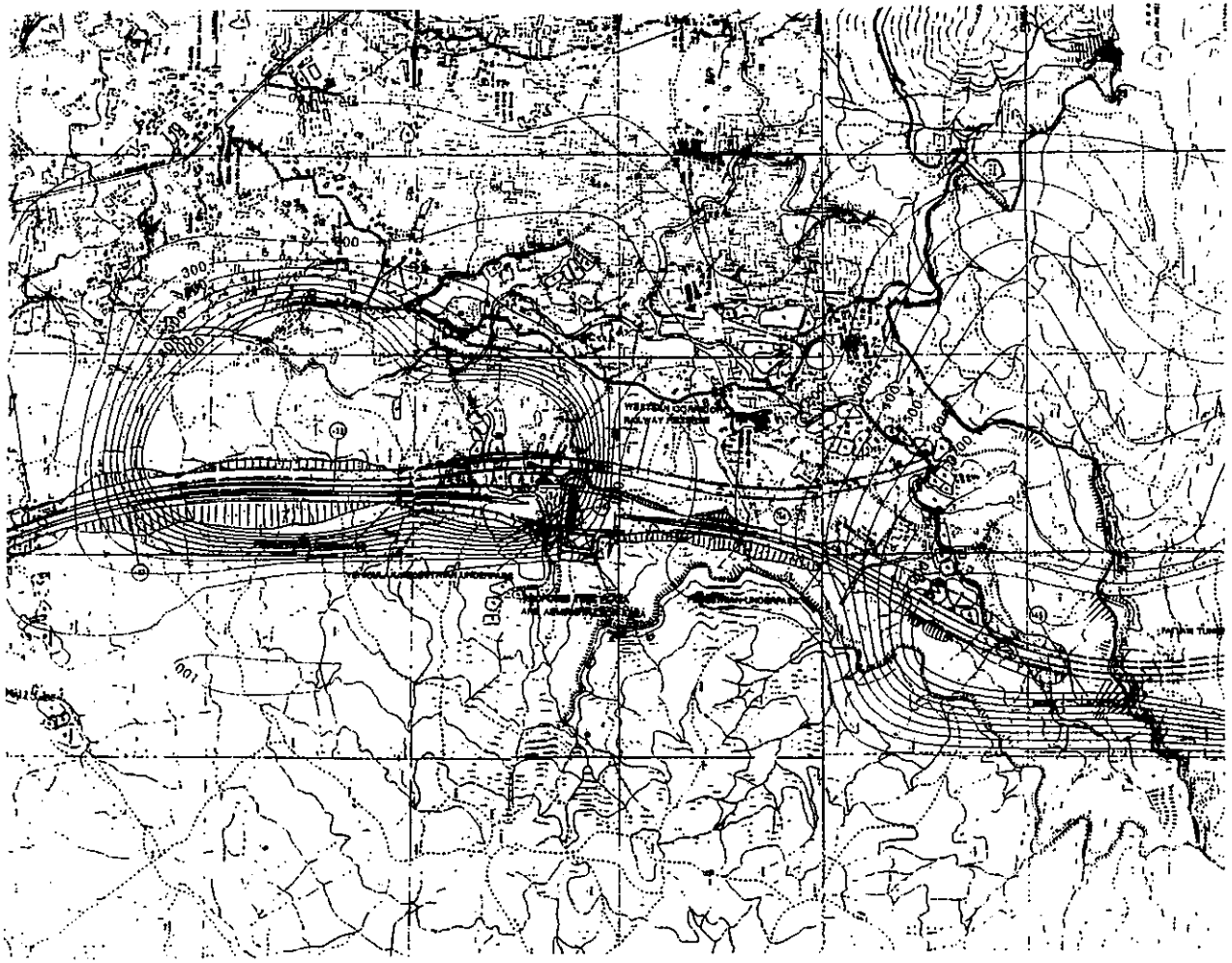
Notes:

1. Shows hourly pollution concentrations at ground level, assuming simultaneous construction activity along the entire alignment.

2. Does not include background pollution concentration.

3. Units $\mu g/m^3$

FREEMAN FOX MAUNSELL	Drg. Title : HOURLY CONCENTRATIONS OF CONSTRUCTION DUST (TSP) AT GROUND LEVEL	Job Title : ROUTE 3 : COUNTRY PARK SECTION EIA		
		Scale : NTS Date : July 1993	Job No. 058000	Fig No. A4.6.1



Notes:

1. Shows 24-hour pollution concentrations at ground level, assuming 24-hour simultaneous construction activity along the entire alignment.

2. Does not include background pollution concentration.

3. Units $\mu g/m^3$

FREEMAN FOX MAUNSELL	Drg. Title : 24-HOUR CONCENTRATIONS OF CONSTRUCTION DUST (TSP) AT GROUND LEVEL	Job Title : ROUTE 3 : COUNTRY PARK SECTION EIA		
		Scale : NTS Date : July 1993	Job No. 058000	Fig No. A4.6.2

NOISE

APPENDIX A5

A5.1

BACKGROUND NOISE LEVELS - KAM TIN VALLEY

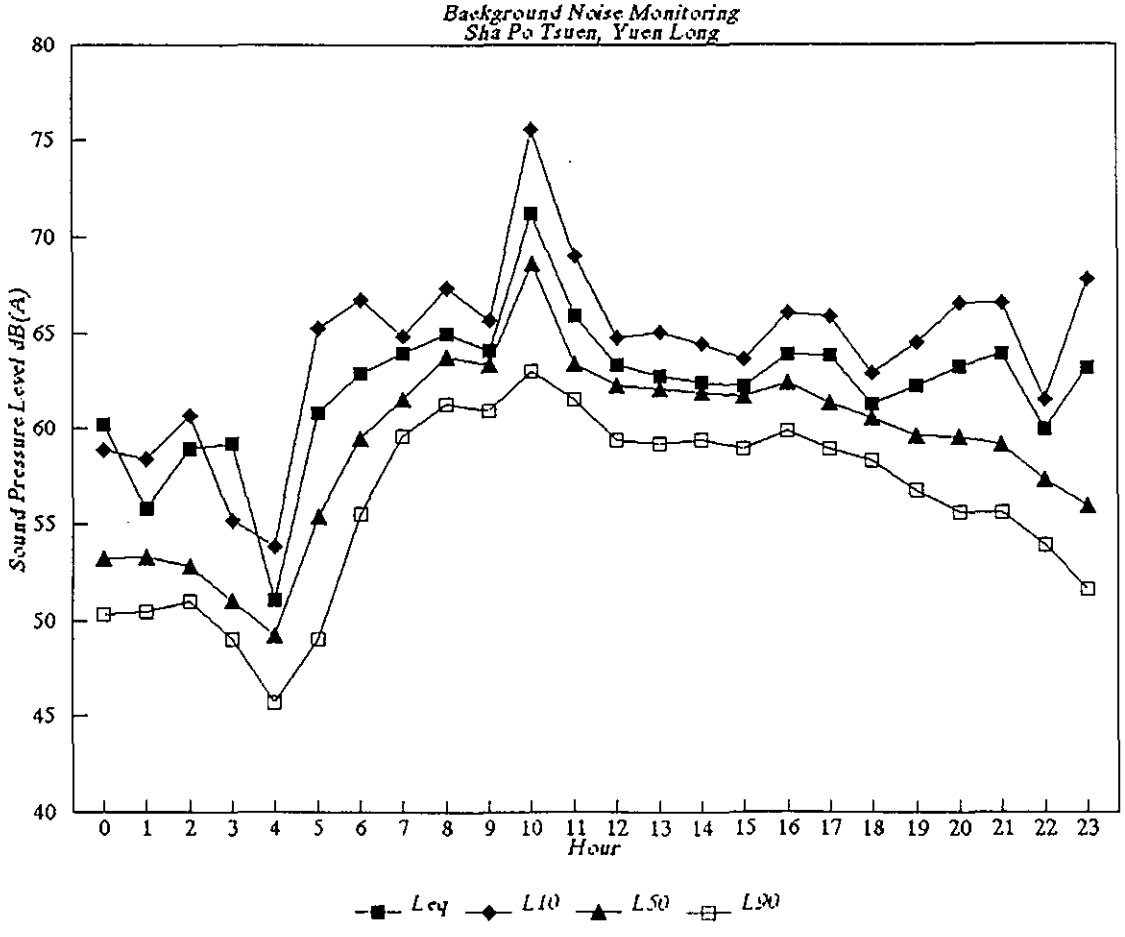
Project : Route 3 (Yuen Long)

Background Noise Monitoring

Location : Sha Po Tsuen (YL1)

Date : 21–22 June 1993

Hour	Leq	L10	L50	L90
0	60.2	58.9	53.2	50.3
1	55.8	58.4	53.3	50.4
2	58.9	60.7	52.8	51.0
3	59.2	55.2	51.0	49.0
4	51.1	53.8	49.2	45.7
5	60.8	65.3	55.4	49.0
6	62.9	66.8	59.4	55.5
7	64.0	64.9	61.6	59.6
8	65.0	67.3	63.8	61.3
9	64.1	65.7	63.4	61.0
10	71.2	75.6	68.7	63.1
11	65.9	69.1	63.5	61.6
12	63.4	64.8	62.3	59.4
13	62.7	65.1	62.1	59.2
14	62.4	64.5	61.9	59.4
15	62.2	63.7	61.7	58.9
16	63.9	66.1	62.5	59.9
17	63.9	65.9	61.4	58.9
18	61.3	62.9	60.6	58.3
19	62.2	64.6	59.6	56.7
20	63.2	66.6	59.5	55.6
21	63.9	66.6	59.1	55.6
22	59.9	61.5	57.3	53.9
23	63.2	67.8	55.9	51.6



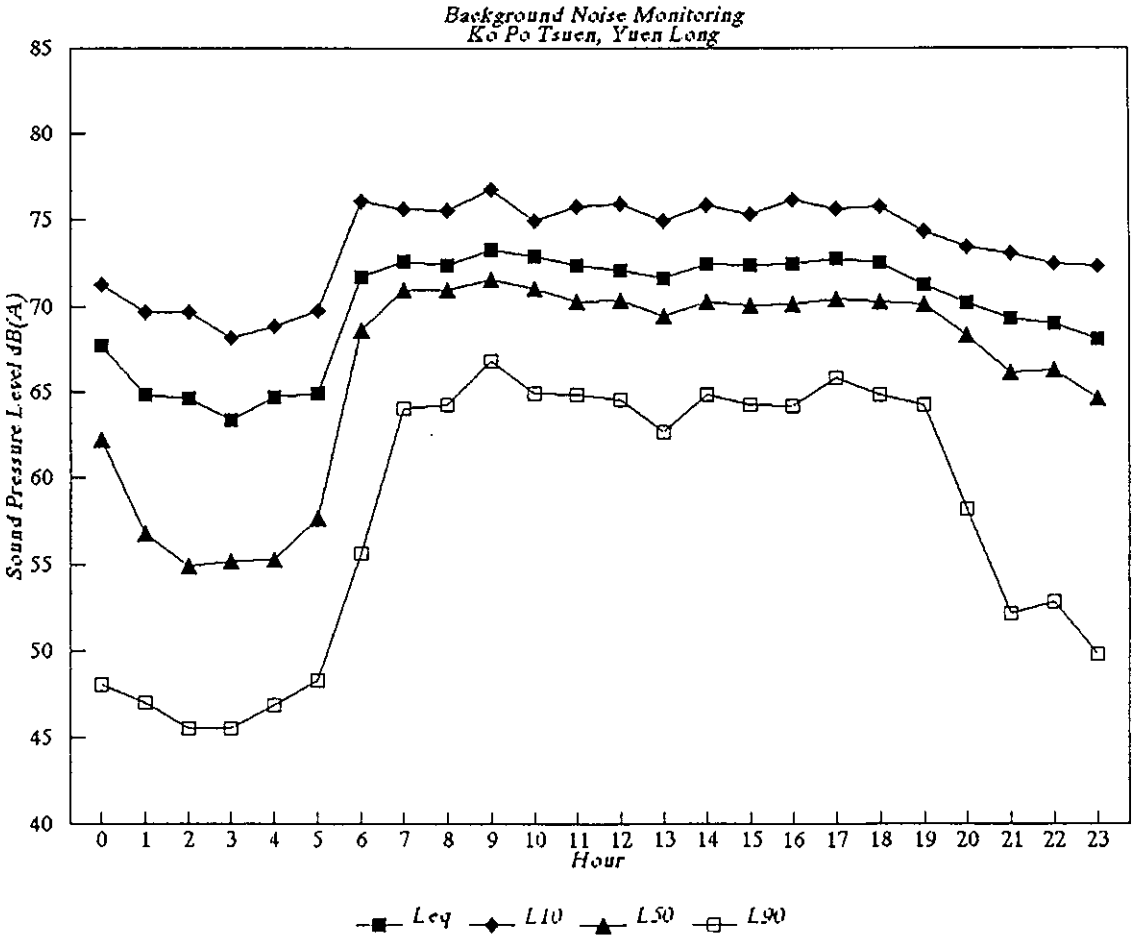
Project : Route 3 (yuen Long)

Background Noise Monitoring

Location : Ko Po Tsuen (YL2)

Date : 22–23 June 1993

Hour	Leq	L10	L50	L90
0	67.8	71.3	62.3	48.1
1	64.9	69.7	56.8	47.0
2	64.7	69.7	54.9	45.5
3	63.3	68.2	55.2	45.5
4	64.7	68.9	55.3	46.8
5	64.9	69.8	57.7	48.3
6	71.7	76.1	68.7	55.7
7	72.6	75.7	71.0	64.1
8	72.4	75.6	71.0	64.3
9	73.3	76.8	71.6	66.9
10	73.0	75.0	71.1	65.0
11	72.4	75.8	70.3	64.9
12	72.1	76.0	70.4	64.6
13	71.6	75.0	69.5	62.7
14	72.4	75.9	70.3	64.9
15	72.4	75.3	70.1	64.3
16	72.5	76.2	70.2	64.1
17	72.8	75.6	70.5	65.9
18	72.6	75.8	70.3	64.9
19	71.2	74.4	70.2	64.3
20	70.2	73.5	68.3	58.3
21	69.3	73.1	66.2	52.1
22	69.0	72.5	66.3	52.8
23	68.1	72.3	64.7	49.8



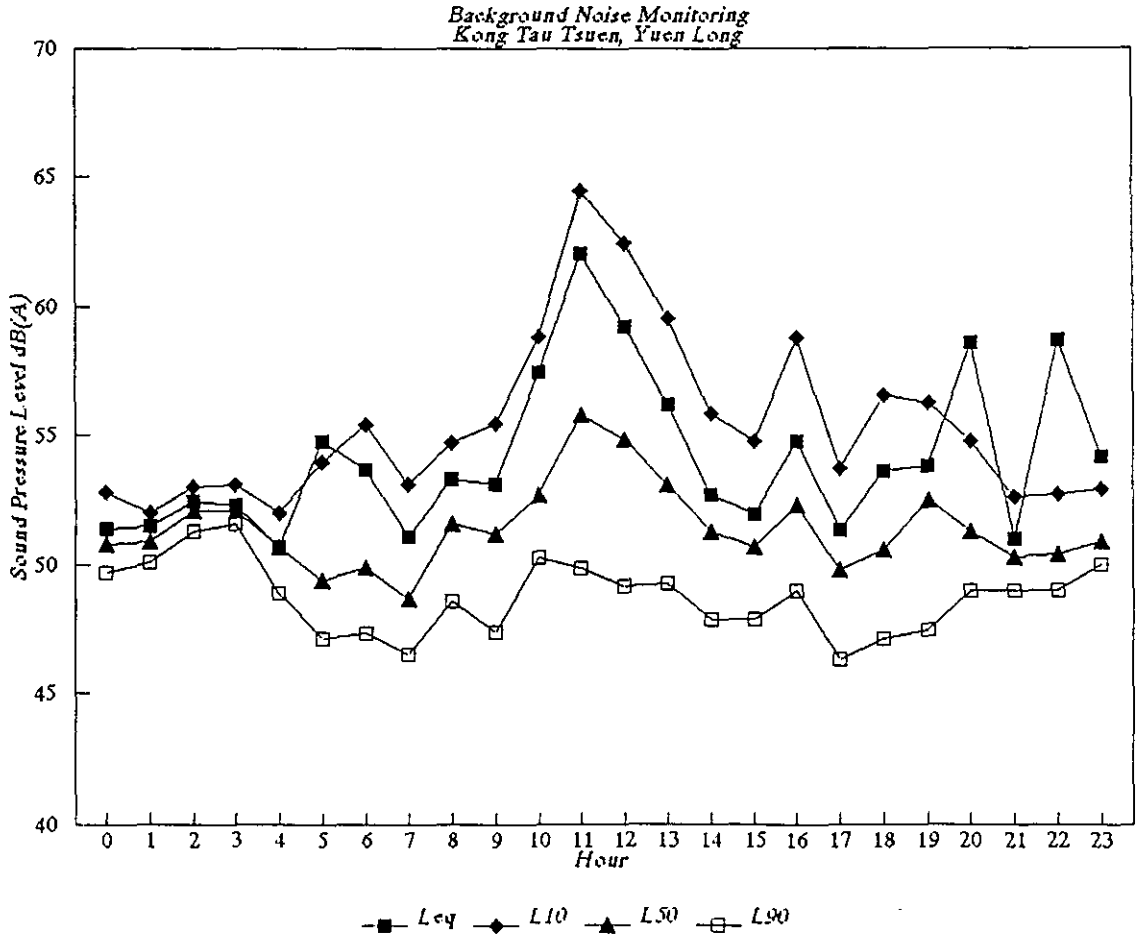
Project : Route 3 (Yuen Long)

Background Noise Monitoring

Location : Kong Tau Tsuen (Yuen Long 3)

Date : 30 June – 1 July 1993

Hour	Leq	L10	L50	L90
0	51.4	52.8	50.8	49.7
1	51.5	52.0	50.9	50.1
2	52.4	53.0	52.1	51.3
3	52.3	53.1	52.1	51.6
4	50.7	52.0	50.7	48.9
5	54.8	54.0	49.4	47.1
6	53.6	55.4	49.9	47.3
7	51.1	53.1	48.7	46.5
8	53.3	54.7	51.6	48.6
9	53.1	55.5	51.2	47.4
10	57.5	58.9	52.7	50.3
11	62.1	64.5	55.8	49.9
12	59.2	62.4	54.9	49.2
13	56.2	59.6	53.1	49.3
14	52.7	55.9	51.3	47.9
15	51.9	54.8	50.7	47.9
16	54.8	58.8	52.3	49.0
17	51.3	53.7	49.8	46.3
18	53.6	56.6	50.6	47.1
19	53.8	56.3	52.5	47.5
20	58.6	54.8	51.3	49.0
21	51.0	52.6	50.3	49.0
22	58.7	52.7	50.4	49.0
23	54.2	52.9	50.9	50.0



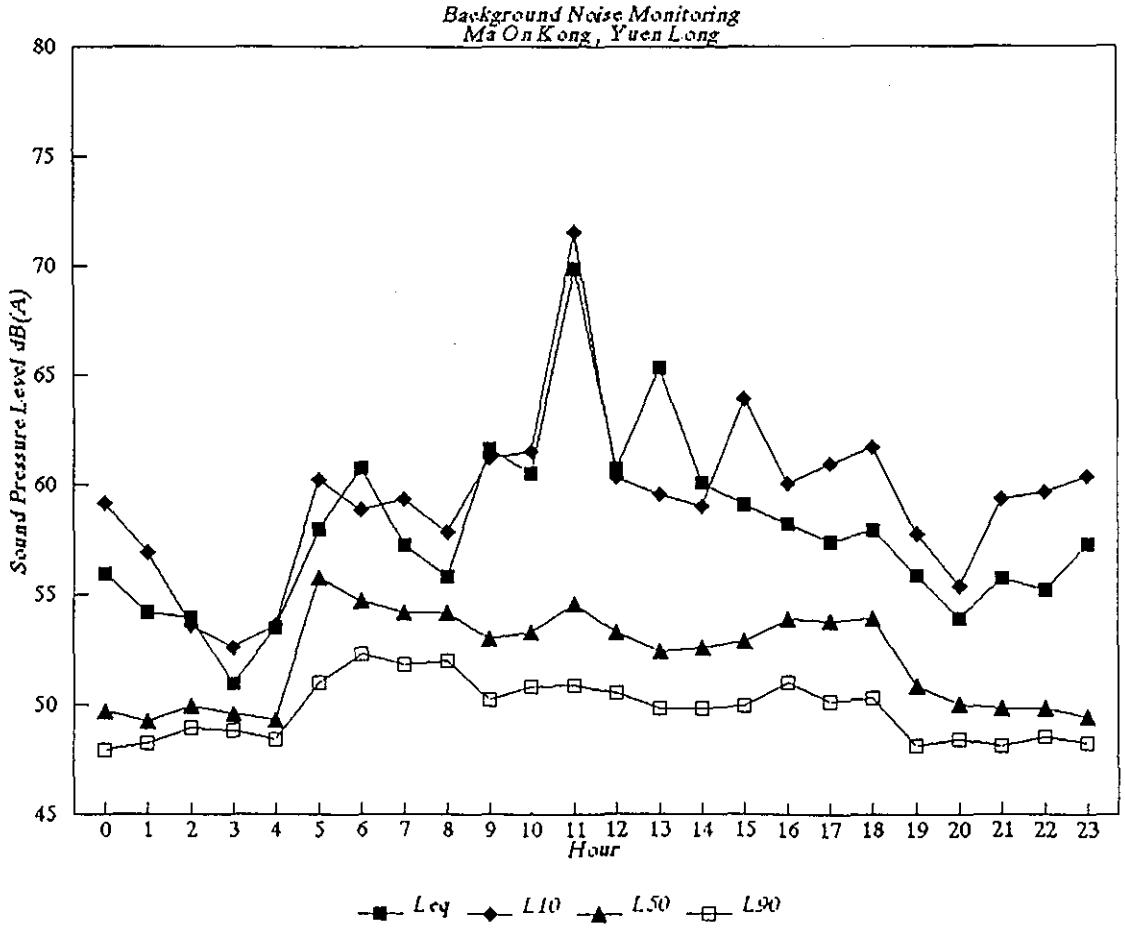
Project : Route 3 (Yuen Long)

Background Noise Monitoring

Location : Ma On Kong, YL4

Date : 1–2 July 1993

Hour	Leq	L10	L50	L90
0	56.0	59.2	49.7	47.9
1	54.2	56.9	49.2	48.2
2	54.0	53.6	49.9	48.9
3	50.9	52.6	49.6	48.8
4	53.5	53.6	49.3	48.4
5	58.0	60.3	55.8	51.0
6	60.8	58.9	54.7	52.3
7	57.3	59.4	54.2	51.8
8	55.9	57.9	54.2	52.0
9	61.7	61.3	53.0	50.2
10	60.5	61.6	53.3	50.8
11	69.9	71.6	54.6	50.9
12	60.8	60.3	53.3	50.5
13	65.4	59.6	52.4	49.8
14	60.1	59.1	52.6	49.8
15	59.1	64.0	52.9	49.9
16	58.3	60.1	53.9	51.0
17	57.4	60.9	53.8	50.1
18	58.0	61.7	53.9	50.3
19	55.9	57.8	50.8	48.1
20	53.9	55.4	50.0	48.4
21	55.8	59.4	49.8	48.1
22	55.2	59.7	49.8	48.5
23	57.3	60.4	49.4	48.2



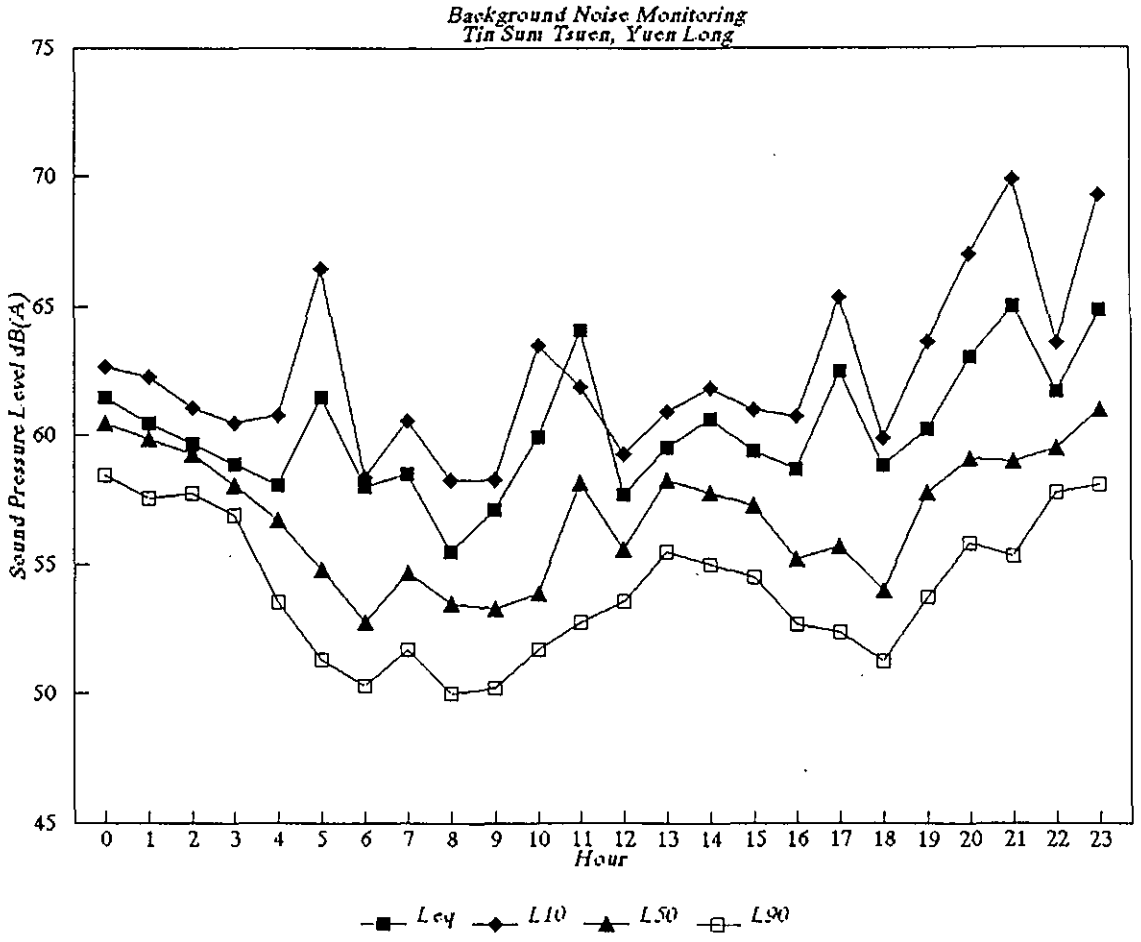
Project : Route 3 (Yuen Long)

Background Noise Monitoring

Location : Tin Sum Tsuen(YL5)

Date : 2–3 July 1993

Hour	Leq	L10	L50	L90
0	61.5	62.7	60.5	58.5
1	60.5	62.3	59.9	57.6
2	59.6	61.1	59.3	57.8
3	58.9	60.5	58.1	56.9
4	58.1	60.8	56.7	53.5
5	61.5	66.5	54.8	51.3
6	58.0	58.4	52.8	50.3
7	58.5	60.6	54.7	51.7
8	55.5	58.3	53.5	50.0
9	57.1	58.3	53.3	50.2
10	59.9	63.5	53.9	51.7
11	64.1	61.9	58.2	52.8
12	57.7	59.3	55.6	53.6
13	59.5	60.9	58.3	55.5
14	60.6	61.8	57.8	55.0
15	59.4	61.0	57.3	54.5
16	58.7	60.7	55.2	52.7
17	62.5	65.4	55.7	52.4
18	58.8	59.9	54.0	51.3
19	60.2	63.6	57.8	53.7
20	63.0	67.0	59.1	55.8
21	65.0	69.9	59.0	55.3
22	61.7	63.6	59.5	57.8
23	64.9	69.3	61.0	58.1



A5.2

SAMPLE CONSTRUCTION NOISE CALCULATION

A5.2 SAMPLE CONSTRUCTION NOISE CALCULATION

Calculation based upon the *method for mobile plant on haul roads* or *in similar situations where they will take regular well defined routes*, from British Standard 5228: Part 1 : 1984.

A-weighted equivalent continuous sound pressure level at receiver location,

$L_{Aeq} = L_{WA}-33 + 10\log_{10}V-10\log_{10}d +$ relection - screening

where :

L_{WA}	=	sound power level of plant
Q	=	number of vehicles per hour
V	=	average vehicle speed (km/hr)
d	=	distance of receiving position from centre of haul road (in m)

From the *Technical Memorandum on Noise from Construction Work other than Percussive Piling*, sound power level of a lorry = 112 dB(A).

Q = 20 lorries per hour,

Assume average vehicle speed is 30 km/hr,

Haul road will be 6.75 metres wide, consider an assessment position one metre from edge, therefore d = 4.375 m.

Assume we have a building at 2 metres from access road edge. Facade correction given by *Technical Memorandum on Noise from Construction Work other than Percussive Piling* is 3 dB(A).

neglect screening,

Thus $L_{Aeq} = L_{WA}-33+10\log_{10}Q-10\log_{10}d$ + reflection

$= 112 -33+10\log_{10}(20)-10\log_{10}(30)-10\log_{10}(4.375) + 3$

$=$ **73.8 dB(A)**

A5.3

CONSTRUCTION NOISE PLANT SCHEDULE

Construction Noise Assessment - Zone: N2
Plant Schedule

Date : 22 June 1993

Identification	EQUIPMENT		PEAK USAGE (Maximum number of items at one time) (Three Month Periods)															
Code	Description	SPL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CNP 001	Air compressor, silenced, 75 dB(A) at 7m	100	3	3	3	3	3	3	3	3	3	3	3	3				
CNP 004	Asphalt paver	108										2	2	2				
CNP 023	Breaker, hand-held (pneumatic)	117							2	2	2	2	2	2				
CNP 027	Breaker, excavator mounted (pneumatic)	122	3	3	3	3	3	3	3	3	3	3	3	3				
CNP 030	Bulldozer	115	6	6	6	6	6	6	6	6	1	1	1	1				
CNP 044	Concrete lorry mixer	109						2	2	2	3	3	3	3				
CNP 048	Crane, mobile/barge mounted (diesel)	112						1	1	1	1	1	1	1				
CNP 066	Dumper	106							3	3	3	3	3	3				
CNP 067	Dump truck	117		6	6	6	6	6										
CNP 081	Excavator/loader, wheeled/tracked	112	4	4	4	4	4	4	4	4	2	2	2	2				
CNP 141	Lorry	112	10	10	10	10	10	10	10	10	6	6	6	6				
CNP 170	Poker, vibratory, hand-held	95						3	3	3	3	3	3	3				
CNP 181	Rock drill, crawler mounted (pneumatic)	128		3	3	3	3	3	3									
CNP 183	Rock drill, hand-held (pneumatic)	116		6	6	6	6	6	6	6	6	6						
CNP 185	Road roller	108									2	2	2	2				
CNP 186	Roller, vibratory	108					2	2	2	2								
CNP 282	Water pump (petrol)	103	3	3	3	3	3	3	3	3	3							

A5.4

CALCULATION SHEETS

ROUTE 3 - COUNTRY PARKS SECTION
OCTOBER 1993

NOISE SENSITIVE RECEIVER:1 contributions from zone N
CONSTRUCTION PERIOD: 7 where plant is assumed to be
NO MITIGATION divided into three clusters.

CLUSTER 1 - EXCAV.	SWL	DIST	SCREEN.	REFL.	NO.	dB(A)
CNP 002 SIL. COMPR.	100	255	0	3	1	46.9
CNP 023 HAND HELD PNE	117	225	0	3	1	65.0
CNP 027 BRKER, EXC. M	122	225	0	3	1	70.0
CNP 030 BULLDOZER	115	225	0	3	2	66.0
CNP 048 MBL DSL CRANE	112	225	0	3	1	60.0
CNP 066 DUMPER	106	225	0	3	1	54.0
CNP 081 EXCAVATOR	112	225	0	3	2	63.0
CNP 141 LORRY	112	225	0	3	4	66.0
CNP 181 RK DRL CRWL M	128	225	0	3	2	79.0
CNP 183 RK DL HND HLD	116	225	0	3	3	68.7
CNP 282 WATER PUMP(P	103	225	0	3	2	54.0

TOTAL FROM N2 CLUSTER 1.						80.4
CLUSTER 2 - FILL						
CNP 002 SIL. COMPR.	100	1800	0	3	1	29.9
CNP 030 BULLDOZER	115	1800	0	3	2	47.9
CNP 044 CONCRETE LOR	109	1800	0	3	2	41.9
CNP 066 DUMPER	106	1800	0	3	1	35.9
CNP 141 LORRY	112	1800	0	3	3	46.7
CNP 170 VIBR PKR, HND	95	1800	0	3	3	29.7
CNP 186 RLLR VIBR.	108	1800	0	3	2	40.9

TOTAL FROM N2 CLUSTER 2.						51.5
CLUSTER 3 - EXCAVATION						
CNP 002 SIL. COMPR.	100	1000	0	3	1	35.0
CNP 023 HAND HELD PNE	117	1000	0	3	1	52.0
CNP 027 BRKER, EXC. M	122	1000	0	3	1	57.0
CNP 030 BULLDOZER	115	1000	0	3	2	53.0
CNP 066 DUMPER	106	1000	0	3	1	41.0
CNP 081 EXCAVATOR	112	1000	0	3	1	47.0
CNP 141 LORRY	112	1000	0	3	3	51.8
CNP 181 RK DRL CRWL M	128	1000	0	3	1	63.0
CNP 183 RK DL HND HLD	116	1000	0	3	3	55.8
CNP 282 WATER PUMP(P	103	1000	0	3	1	38.0

TOTAL FROM N2 CLUSTER 3.						65.4
TOTAL CONSTRUCTION NOISE LEVEL @ NSR1						80.6

ROUTE 3 - COUNTRY PARKS SECTION
OCTOBER 1993

NOISE SENSITIVE RECEIVER:2 contributions from zone N
CONSTRUCTION PERIOD: 7 where plant is assumed to be
NO MITIGATION divided into three clusters.

CLUSTER 1 - EXCAV.	SWL	DIST	SCREEN.	REFL.	NO.	dB(A)
CNP 002 SIL. COMPR.	100	1800	0	3	1	29.9
CNP 023 HAND HELD PNE	117	1800	0	3	1	46.9
CNP 027 BRKER, EXC. M	122	1800	0	3	1	51.9
CNP 030 BULLDOZER	115	1800	0	3	2	47.9
CNP 048 MBL DSL CRANE	112	1800	0	3	1	41.9
CNP 066 DUMPER	106	1800	0	3	1	35.9
CNP 081 EXCAVATOR	112	1800	0	3	2	44.9
CNP 141 LORRY	112	1800	0	3	4	47.9
CNP 181 RK DRL CRWL M	128	1800	0	3	2	60.9
CNP 183 RK DL HND HLD	116	1800	0	3	3	50.7
CNP 282 WATER PUMP(P	103	1800	0	3	2	35.9

TOTAL FROM N2 CLUSTER 1.						62.4
CLUSTER 2 - FILL						
CNP 002 SIL. COMPR.	100	70	0	3	1	58.1
CNP 030 BULLDOZER	115	70	0	3	2	76.1
CNP 044 CONCRETE LOR	109	70	0	3	2	70.1
CNP 066 DUMPER	106	70	0	3	1	64.1
CNP 141 LORRY	112	70	0	3	3	74.9
CNP 170 VIBR PKR, HND	95	70	0	3	3	57.9
CNP 186 RLLR VIBR.	108	70	0	3	2	69.1

TOTAL FROM N2 CLUSTER 2.						79.7
CLUSTER 3 - EXCAVATION						
CNP 002 SIL. COMPR.	100	1000	0	3	1	35.0
CNP 023 HAND HELD PNE	117	1000	0	3	1	52.0
CNP 027 BRKER, EXC. M	122	1000	0	3	1	57.0
CNP 030 BULLDOZER	115	1000	0	3	2	53.0
CNP 066 DUMPER	106	1000	0	3	1	41.0
CNP 081 EXCAVATOR	112	1000	0	3	1	47.0
CNP 141 LORRY	112	1000	0	3	3	51.8
CNP 181 RK DRL CRWL M	128	1000	0	3	1	63.0
CNP 183 RK DL HND HLD	116	1000	0	3	3	55.8
CNP 282 WATER PUMP(P	103	1000	0	3	1	38.0

TOTAL FROM N2 CLUSTER 3.						65.4
TOTAL CONSTRUCTION NOISE LEVEL @ NSR2						80.0

ROUTE 3 - COUNTRY PARKS SECTION
OCTOBER 1993

NOISE SENSITIVE RECEIVER:1 contributions from zone N
CONSTRUCTION PERIOD: 7 where plant is assumed to be
WITH MITIGATION divided into three clusters.

CLUSTER 1 - EXCAV.	SWL	DIST	SCREEN.	REFL.	NO.	dB(A)
CNP 002 SIL. COMPR.	100	225	0	3	1	48.0
CNP 023 HAND HELD PNE	117	225	-10	3	1	55.0
CNP 027 BRKER, EXC. M	122	225	-10	3	1	60.0
CNP 030 BULLDOZER	115	225	0	3	2	66.0
CNP 048 MBL DSL CRANE	112	225	0	3	1	60.0
CNP 066 DUMPER	106	225	0	3	1	54.0
CNP 081 EXCAVATOR	112	225	0	3	2	63.0
CNP 141 LORRY	112	225	0	3	4	66.0
CNP 181 RK DRL CRWL M	128	225	-10	3	2	69.0
CNP 183 RK DL HND HLD	116	225	-10	3	3	58.7
CNP 282 WATER PUMP(P	103	225	0	3	2	54.0

TOTAL FROM N2 CLUSTER 1.						73.3
CLUSTER 2 - FILL						
CNP 002 SIL. COMPR.	100	1800	0	3	1	29.9
CNP 030 BULLDOZER	115	1800	0	3	2	47.9
CNP 044 CONCRETE LOR	109	1800	0	3	2	41.9
CNP 066 DUMPER	106	1800	0	3	1	35.9
CNP 141 LORRY	112	1800	0	3	3	46.7
CNP 170 VIBR PKR, HND	95	1800	0	3	3	29.7
CNP 186 RLLR VIBR.	108	1800	0	3	2	40.9

TOTAL FROM N2 CLUSTER 2.						51.5
CLUSTER 3 - EXCAVATION						
CNP 002 SIL. COMPR.	100	1000	0	3	1	35.0
CNP 023 HAND HELD PNE	117	1000	0	3	1	52.0
CNP 027 BRKER, EXC. M	122	1000	0	3	1	57.0
CNP 030 BULLDOZER	115	1000	0	3	2	53.0
CNP 066 DUMPER	106	1000	0	3	1	41.0
CNP 081 EXCAVATOR	112	1000	0	3	1	47.0
CNP 141 LORRY	112	1000	0	3	3	51.8
CNP 181 RK DRL CRWL M	128	1000	0	3	1	63.0
CNP 183 RK DL HND HLD	116	1000	0	3	3	55.8
CNP 282 WATER PUMP(P	103	1000	0	3	1	38.0

TOTAL FROM N2 CLUSTER 3.						65.4
TOTAL CONSTRUCTION NOISE LEVEL @ NSR1						74.0

A5.5

SPECIFICATIONS AND NOISE FIGURES FOR THE NORTHERN TUNNEL VENT BUILDING

ROUTE 3. NORTHERN TUNNELL VENTILATION BUILDING, NOISE IMPACT ASSESSMENT.
OCTOBER 1993
EXHAUST FANS

FREQ. (HZ)	63	125	250	500	1000	2000	4000	8000
FAN SWL	119	125	126	124	121	116	110	104
16 No.	12	12	12	12	12	12	12	12
DISTANCE CORRECTION (distance = 120m, hemisperical radiation)	-49	-49	-49	-49	-49	-49	-49	-49
DIRECTIVITY CORRn (DISCHARGE VERTICALLY)	-3	-3	-3	-9	-9	-14	-14	-14
3 METRE LONG 30% FREE AREA RECTANGULAR SILENCER insertion loss (dB)	-11	-22	-40	-50	-50	-50	-50	-39
A-WEIGHTING	-26	-16	-9	-3	0	1	1	-1
Lp @ NSR	42	47	37	25	25	16	10	13

NOISE LEVEL 48.6 dB(A)

A5.6

ROAD TRAFFIC NOISE CALCULATIONS FOR NSR1

receiver: NSR1 X: 4842.2 Y: 702.8 H: 25.0 terrain elevation: 23.0
begin angle: 180.0 end angle: 5.0 floor height: 2.8 floor No.: 1 land usage:

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angle	km/miles	L10 18h	Geometry E_{SI}	Geometry h	dist. loss	Screening A	Screening B	Screening C	Screening D	Z	h_{eff}	screen loss	View angle w	View angle D_w	Groundabsorption G	Groundabsorption h_m	Groundabsorption D_B	Atten D_D	Ref. loss	Level L10 18h
		dB(A)	m	m		m					m	dB(A)		dB(A)		m	dB(A)	dB(A)	dB(A)	dB(A)
187.5	-9999999795	84.3 -3.0	5.5	29.0	0.8	930.4	703.22300.8	667.9	0.65	23.4	30.0	0.2	-30.7	-	-	-	-	-	24.4	-
187.5	-9999999795	84.3 -3.0	171.4	26.8	-11.1	930.4	46.01457.1	487.4	6.61	23.8	25.5	0.2	-29.0	-	-	-	-	-	18.7	-
187.5	-9999999795	84.3 -3.0	144.4	30.6	-10.4	930.4	20.51346.0	409.3	14.23	21.1	29.9	0.1	-33.9	-	-	-	-	-	10.1	-
188.5	-9999999795	84.3 -3.0	171.4	24.8	-11.1	945.9	90.81684.7	651.9	3.90	25.2	23.7	0.4	-26.6	-	-	-	-	-	22.9	-
188.5	-9999999795	84.3 -3.0	32.8	28.4	-4.3	945.9	219.01815.4	651.9	1.40	23.2	28.4	0.2	-29.7	-	-	-	-	-	21.9	-
188.5	-9999999795	84.3 -3.0	341.2	22.6	-14.1	945.9	78.71671.2	651.9	5.26	27.3	24.0	0.6	-24.7	-	-	-	-	-	21.5	-
188.5	-9999999795	84.3 -3.0	144.4	31.5	-10.4	945.9	229.81174.7	-	1.06	19.8	15.6	1.0	-22.6	-	-	-	-	-	35.7	-
188.5	-9999999795	84.3 -3.0	144.2	26.8	-10.4	945.9	32.91439.1	470.1	9.90	23.8	27.8	0.2	-29.7	-	-	-	-	-	16.4	-
189.5	-9999999795	84.3 -3.0	144.2	24.8	-10.4	1485.3	219.31706.1	16.6	15.19	75.2	30.0	0.3	-27.4	-	-	-	-	-	16.5	-
189.5	-9999999795	84.3 -3.0	313.9	22.4	-13.7	1485.3	194.01677.9	16.6	18.10	77.3	30.0	0.7	-24.3	-	-	-	-	-	16.3	-
189.5	-9999999795	84.3 -3.0	552.8	19.1	-16.2	1485.3	335.41825.6	16.6	11.79	79.9	28.4	0.4	-27.0	-	-	-	-	-	12.7	-
189.5	-9999999795	84.3 -3.0	341.2	20.6	-14.1	1485.3	326.41816.7	16.6	11.70	78.6	28.4	0.6	-24.5	-	-	-	-	-	17.4	-
189.5	-9999999795	84.3 -3.0	144.4	32.9	-10.4	955.6	88.81042.4	-	1.95	17.7	18.1	0.8	-23.5	-	-	-	-	-	32.3	-
189.5	-9999999795	84.3 -3.0	158.1	33.4	-10.8	955.6	85.81039.5	-	1.91	17.2	18.0	0.2	-29.7	-	-	-	-	-	25.9	-
189.5	-9999999795	84.3 -3.0	171.6	31.2	-11.1	955.6	265.51220.1	-	0.98	20.2	15.3	0.8	-23.3	-	-	-	-	-	34.5	-
189.5	-9999999795	84.3 -3.0	32.8	29.9	-4.4	955.6	142.21096.1	-	1.74	20.7	17.6	0.2	-30.6	-	-	-	-	-	31.7	-
190.5	-9999999795	84.3 -3.0	313.9	20.4	-13.7	1466.9	348.51838.4	34.2	11.13	78.8	28.1	0.5	-25.8	-	-	-	-	-	16.6	-
190.5	-9999999795	84.3 -3.0	552.8	17.4	-16.2	1466.9	437.41928.7	34.2	9.78	80.9	27.2	1.0	-22.6	-	-	-	-	-	18.4	-
190.5	-9999999795	84.3 -3.0	525.6	18.8	-15.9	1466.9	346.71836.2	34.2	11.55	80.0	28.3	0.5	-25.3	-	-	-	-	-	14.8	-
190.5	-9999999795	84.3 -3.0	158.1	33.1	-10.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.9	-
190.5	-9999999795	84.3 -3.0	171.6	32.5	-11.1	959.0	139.41096.9	-	1.41	18.5	16.7	1.0	-22.6	-	-	-	-	-	33.9	-
191.5	-9999999795	84.3 -3.0	737.2	15.4	-17.4	1134.6	472.11963.1	366.5	10.09	82.3	27.8	0.1	-35.4	-	-	-	-	-	3.7	-
191.5	-9999999795	84.3 -3.0	764.5	14.6	-17.6	1134.6	542.32034.2	366.5	9.23	82.7	27.2	0.8	-23.6	-	-	-	-	-	16.0	-
191.5	-9999999795	84.3 -3.0	552.8	15.8	-16.2	1134.6	552.52044.7	366.5	8.92	81.7	27.4	0.2	-29.3	-	-	-	-	-	11.5	-
191.5	-9999999795	84.3 -3.0	525.6	16.8	-15.9	1134.6	455.71946.7	366.5	10.12	81.3	28.2	0.9	-22.8	-	-	-	-	-	17.4	-
191.5	-9999999795	84.3 -3.0	158.1	32.6	-10.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.9	-

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angle	km/miles	L10 18h dB(A)	Geometry E_{SI} m	Geometry h m	dist. loss	Screening A m	Screening B m	Screening C m	Screening D m	Z	h_{eff} m	screen loss	View angle w	View angle D_w dB(A)	Groundabsorption G	Groundabsorption h_m m	Groundabsorption D_B dB(A)	Atten D_D dB(A)	Ref. loss dB(A)	Level L10 18h dB(A)	
191.5	-9999999795	84.3 -3.0	171.6	33.3	-11.1	962.6	38.1	996.6	-	4.14	17.0	21.8	0.3	-27.4	-	-	-	-	-	24.0	-
191.5	-9999999795	84.3 -3.0	185.4	33.3	-11.5	962.6	39.1	997.7	-	4.02	17.0	21.6	0.7	-24.3	-	-	-	-	-	27.0	-
192.5	-9999999795	84.3 -3.0	737.2	14.1	-17.4	1097.2	557.6	2049.6	403.9	9.19	83.0	27.2	1.0	-22.6	-	-	-	-	-	17.1	-
192.5	-9999999795	84.3 -3.0	764.5	12.6	-17.6	1097.2	631.2	2123.8	403.9	8.61	83.8	26.8	0.8	-23.3	-	-	-	-	-	16.7	-
192.5	-9999999795	84.3 -3.0	1065.5	11.5	-19.0	1097.2	642.1	2134.6	403.9	8.66	84.5	26.5	0.2	-30.7	-	-	-	-	-	8.1	-
192.5	-9999999795	84.3 -3.0	228.5	32.0	-12.4	-	-	-	-	-0.00	-	-	0.1	-33.3	-	-	-	-	-	33.6	-
192.5	-9999999795	84.3 -3.0	158.1	32.2	-10.8	-	-	-	-	-0.00	-	-	0.9	-22.9	-	-	-	-	-	45.6	-
192.5	-9999999795	84.3 -3.0	185.4	32.9	-11.5	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.3	-
193.5	-9999999795	84.3 -3.0	1038.2	11.4	-18.9	1081.1	651.8	2144.8	420.6	8.62	84.5	26.5	0.5	-25.6	-	-	-	-	-	13.3	-
193.5	-9999999795	84.3 -3.0	1065.5	11.2	-19.0	1081.1	706.9	2200.3	420.6	8.17	84.4	26.2	1.0	-22.6	-	-	-	-	-	16.6	-
193.5	-9999999795	84.3 -3.0	737.2	12.2	-17.4	1081.1	651.6	2144.7	420.6	8.51	84.0	26.8	0.5	-25.5	-	-	-	-	-	14.6	-
193.5	-9999999795	84.3 -3.0	228.5	31.9	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
193.5	-9999999795	84.3 -3.0	185.4	32.5	-11.5	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.3	-
194.5	-9999999795	84.3 -3.0	1038.2	11.0	-18.9	1097.7	719.3	2213.7	404.8	8.05	84.5	26.1	1.0	-22.6	-	-	-	-	-	16.8	-
194.5	-9999999795	84.3 -3.0	1065.5	10.7	-19.0	1097.7	776.1	2270.9	404.8	7.67	84.4	25.8	0.7	-23.9	-	-	-	-	-	15.6	-
194.5	-9999999795	84.3 -3.0	1283.7	10.5	-19.8	1097.7	779.9	2274.7	404.8	7.67	84.5	25.6	0.3	-28.2	-	-	-	-	-	10.7	-
194.5	-9999999795	84.3 -3.0	228.5	31.7	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
194.5	-9999999795	84.3 -3.0	255.7	32.0	-12.8	696.4	94.4	790.9	-	0.00	0.0	5.0	0.1	-30.8	-	-	-	-	-	35.6	-
194.5	-9999999795	84.3 -3.0	185.4	32.1	-11.5	-	-	-	-	-0.00	-	-	0.9	-23.3	-	-	-	-	-	44.6	-
195.5	-9999999795	84.3 -3.0	1038.2	10.6	-18.9	1115.2	791.6	2287.8	388.6	7.55	84.5	25.7	0.3	-27.6	-	-	-	-	-	12.2	-
195.5	-9999999795	84.3 -3.0	1283.7	10.7	-19.8	1115.2	837.0	2333.5	388.6	7.26	84.2	25.3	1.0	-22.6	-	-	-	-	-	16.7	-
195.5	-9999999795	84.3 -3.0	1256.5	10.6	-19.7	1115.2	788.4	2284.6	388.6	7.56	84.5	25.5	0.7	-24.2	-	-	-	-	-	14.8	-
195.5	-9999999795	84.3 -3.0	228.5	31.6	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
195.5	-9999999795	84.3 -3.0	255.7	31.9	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
196.5	-9999999795	84.3 -3.0	1256.5	10.9	-19.7	1117.2	847.7	2346.0	388.4	7.18	84.1	25.2	1.0	-22.6	-	-	-	-	-	16.8	-
196.5	-9999999795	84.3 -3.0	1283.7	11.0	-19.8	1117.2	897.7	2396.3	388.4	6.90	83.8	25.0	1.0	-22.6	-	-	-	-	-	17.0	-
196.5	-9999999795	84.3 -3.0	228.5	31.5	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
196.5	-9999999795	84.3 -3.0	255.7	31.7	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
197.5	-9999999795	84.3 -3.0	1256.5	11.2	-19.7	1117.9	910.7	2411.6	389.9	6.82	83.6	24.9	1.0	-22.6	-	-	-	-	-	17.1	-
197.5	-9999999795	84.3 -3.0	1283.7	11.3	-19.8	1117.9	962.1	2463.3	389.9	6.57	83.3	24.7	1.0	-22.6	-	-	-	-	-	17.3	-
197.5	-9999999795	84.3 -3.0	228.5	31.3	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-

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angle	km/miles	L10 18h dB(A)	Geometry E_{SI} m	Geometry h m	dist. loss	Screening A m	Screening B m	Screening C m	Screening D m	Z	h_{eff} m	screen loss dB(A)	View angle W	View angle D_W dB(A)	Groundabsorption G	Groundabsorption h_m m	Groundabsorption D_B dB(A)	Atten D_D dB(A)	Ref. loss dB(A)	Level L10 18h dB(A)	
197.5	-9999999795	84.3 -3.0	255.7	31.6	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
198.5	-9999999795	84.3 -3.0	1256.5	11.5	-19.7	1077.7	977.72481.8	433.0		6.59	83.2	24.7	1.0	-22.6	-	-	-	-	-	17.3	-
198.5	-9999999795	84.3 -3.0	1283.7	11.7	-19.8	1077.7	1030.72534.9	433.0		6.37	82.9	24.5	1.0	-22.6	-	-	-	-	-	17.5	-
198.5	-9999999795	84.3 -3.0	228.5	31.2	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
198.5	-9999999795	84.3 -3.0	255.7	31.5	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
199.5	-9999999795	84.3 -3.0	1256.5	11.9	-19.7	1244.4	1221.72556.9	104.9		14.10	131.9	29.5	1.0	-22.6	-	-	-	-	-	12.6	-
199.5	-9999999795	84.3 -3.0	1283.7	12.0	-19.8	1244.4	1276.22611.7	104.9		13.74	131.7	29.3	1.0	-22.6	-	-	-	-	-	12.7	-
199.5	-9999999795	84.3 -3.0	228.5	31.1	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
199.5	-9999999795	84.3 -3.0	255.7	31.4	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
200.5	-9999999795	84.3 -3.0	1256.5	12.2	-19.7	1258.7	1279.22637.6	113.4		13.63	131.6	29.2	1.0	-22.6	-	-	-	-	-	12.8	-
200.5	-9999999795	84.3 -3.0	1283.7	12.4	-19.8	1258.7	1335.32694.1	113.4		13.30	131.4	29.1	1.0	-22.6	-	-	-	-	-	12.9	-
200.5	-9999999795	84.3 -3.0	228.5	31.0	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
200.5	-9999999795	84.3 -3.0	255.7	31.3	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
201.5	-9999999795	84.3 -3.0	1256.5	12.6	-19.7	1273.6	327.72724.4	1136.3		13.20	131.3	29.0	1.0	-22.6	-	-	-	-	-	13.0	-
201.5	-9999999795	84.3 -3.0	1283.7	12.8	-19.8	1273.6	1399.62782.8	122.4		12.86	131.1	28.8	1.0	-22.6	-	-	-	-	-	13.1	-
201.5	-9999999795	84.3 -3.0	228.5	30.9	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
201.5	-9999999795	84.3 -3.0	255.7	31.2	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
202.5	-9999999795	84.3 -3.0	1256.5	13.1	-19.7	1289.4	1415.02818.0	126.3		12.69	131.0	28.7	1.0	-22.6	-	-	-	-	-	13.3	-
202.5	-9999999795	84.3 -3.0	1283.7	13.3	-19.8	1289.4	1475.12878.4	126.3		12.40	130.7	28.6	1.0	-22.6	-	-	-	-	-	13.4	-
202.5	-9999999795	84.3 -3.0	228.5	30.8	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
202.5	-9999999795	84.3 -3.0	255.7	31.1	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
203.5	-9999999795	84.3 -3.0	1256.5	13.5	-19.7	1305.9	1523.92919.1	101.5		12.10	130.5	28.4	1.0	-22.6	-	-	-	-	-	13.6	-
203.5	-9999999795	84.3 -3.0	1283.7	13.7	-19.8	1305.9	1586.12981.7	101.5		11.84	130.3	28.3	1.0	-22.6	-	-	-	-	-	13.6	-
203.5	-9999999795	84.3 -3.0	228.5	30.8	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
203.5	-9999999795	84.3 -3.0	255.7	31.0	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
204.5	-9999999795	84.3 -3.0	1256.5	14.0	-19.7	1417.2	1622.93028.8	-		11.21	130.1	28.0	1.0	-22.6	-	-	-	-	-	14.1	-
204.5	-9999999795	84.3 -3.0	1283.7	14.2	-19.8	1417.2	1687.53093.7	-		10.97	129.9	27.8	1.0	-22.6	-	-	-	-	-	14.1	-
204.5	-9999999795	84.3 -3.0	228.5	30.7	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
204.5	-9999999795	84.3 -3.0	255.7	30.9	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
205.5	-9999999795	84.3 -3.0	1256.5	14.4	-19.7	463.0	705.13148.0	1981.0		1.01	33.2	16.3	0.5	-26.0	-	-	-	-	-	22.3	-
205.5	-9999999795	84.3 -3.0	1283.7	14.5	-19.8	463.0	772.43215.5	1981.0		0.93	33.0	16.0	0.1	-32.6	-	-	-	-	-	15.9	-

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angle	km/miles	L10 18h	Geometry			Screening							View angle		Groundabsorption			Atten	Ref.	Level	L10 18h
			E_{SI}	h	dist. loss	A	B	C	D	Z	h_{eff}	screen loss	W	D_W	G	h_m	D_B	D_D	loss		
		dB(A)	m	m		m					m	dB(A)		dB(A)		m	dB(A)	dB(A)	dB(A)	dB(A)	
205.5	-9999999795	84.3 -3.0	228.5	30.6	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
205.5	-9999999795	84.3 -3.0	255.7	30.8	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
206.5	-9999999795	84.3 -3.0	255.7	30.7	-12.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	43.9	-
206.5	-9999999795	84.3 -3.0	228.5	30.5	-12.4	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.4	-
207.5	-9999999795	84.3 -3.0	255.7	30.7	-12.8	438.7	58.5	497.2	-	0.00	0.2	5.0	1.0	-22.6	-	-	-	-	-	43.9	-
207.5	-9999999795	84.3 -3.0	244.7	30.6	-12.6	-	-	-	-	-0.00	-	-	0.7	-23.9	-	-	-	-	-	42.7	-
207.5	-9999999795	84.3 -3.0	228.5	30.5	-12.4	-	-	-	-	-0.00	-	-	0.3	-28.3	-	-	-	-	-	38.6	-
208.5	-9999999795	84.3 -3.0	255.7	30.6	-12.8	428.3	56.0	484.3	-	0.00	0.5	5.1	1.0	-22.6	-	-	-	-	-	43.8	-
208.5	-9999999795	84.3 -3.0	244.7	30.8	-12.6	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.1	-
209.5	-9999999795	84.3 -3.0	255.7	30.5	-12.8	418.5	53.7	472.2	-	0.01	0.8	6.0	1.0	-22.6	-	-	-	-	-	43.0	-
209.5	-9999999795	84.3 -3.0	244.7	31.0	-12.6	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.1	-
210.5	-9999999795	84.3 -3.0	272.0	30.6	-13.1	409.3	52.0	461.2	-	0.01	0.9	6.3	1.0	-22.7	-	-	-	-	-	42.1	-
210.5	-9999999795	84.3 -3.0	255.7	30.5	-12.8	409.3	51.5	460.8	-	0.01	1.0	6.5	0.0	-36.1	-	-	-	-	-	28.8	-
210.5	-9999999795	84.3 -3.0	244.7	31.3	-12.6	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.1	-
211.5	-9999999795	84.3 -3.0	272.0	30.9	-13.1	400.6	50.8	451.4	-	0.01	0.9	6.3	1.0	-22.6	-	-	-	-	-	42.3	-
211.5	-9999999795	84.3 -3.0	244.7	31.5	-12.6	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.1	-
212.5	-9999999795	84.3 -3.0	272.0	31.1	-13.1	392.3	49.8	442.1	-	0.01	0.9	6.4	1.0	-22.6	-	-	-	-	-	42.3	-
212.5	-9999999795	84.3 -3.0	244.7	31.7	-12.6	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.1	-
213.5	-9999999795	84.3 -3.0	272.0	31.3	-13.1	384.6	48.8	433.4	-	0.01	0.9	6.4	1.0	-22.6	-	-	-	-	-	42.3	-
213.5	-9999999795	84.3 -3.0	244.7	31.9	-12.6	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.1	-
214.5	-9999999795	84.3 -3.0	272.0	31.5	-13.1	377.2	47.9	425.1	-	0.01	0.9	6.4	1.0	-22.6	-	-	-	-	-	42.3	-
214.5	-9999999795	84.3 -3.0	244.7	32.1	-12.6	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.1	-
215.5	-9999999795	84.3 -3.0	272.0	31.7	-13.1	370.2	47.0	417.2	-	0.01	0.9	6.4	1.0	-22.6	-	-	-	-	-	42.2	-
215.5	-9999999795	84.3 -3.0	244.7	32.3	-12.6	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.1	-
216.5	-9999999795	84.3 -3.0	272.0	31.9	-13.1	321.8	88.4	409.8	-	0.48	8.2	13.0	1.0	-22.6	-	-	-	-	-	35.6	-
216.5	-9999999795	84.3 -3.0	244.7	32.4	-12.6	321.8	49.7	370.9	-	0.60	7.2	13.7	1.0	-22.6	-	-	-	-	-	35.4	-
217.5	-9999999795	84.3 -3.0	272.0	32.1	-13.1	316.0	87.3	402.7	-	0.65	9.4	14.0	1.0	-22.6	-	-	-	-	-	34.7	-
217.5	-9999999795	84.3 -3.0	244.7	32.6	-12.6	316.0	49.3	364.5	-	0.83	8.4	14.8	1.0	-22.6	-	-	-	-	-	34.3	-
218.5	-9999999795	84.3 -3.0	272.0	32.3	-13.1	311.7	84.9	396.0	-	0.65	9.3	13.9	1.0	-22.6	-	-	-	-	-	34.7	-
218.5	-9999999795	84.3 -3.0	244.7	32.8	-12.6	311.7	47.6	358.4	-	0.83	8.2	14.7	1.0	-22.6	-	-	-	-	-	34.3	-
219.5	-9999999795	84.3 -3.0	272.0	32.5	-13.1	306.2	83.9	389.6	-	0.56	8.6	13.5	1.0	-22.6	-	-	-	-	-	35.2	-

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angle	km/miles	L10 18h	Geometry			Screening							View angle		Groundabsorption				Atten	Ref.	Level	L10 18h
			E_{SI}	h	dist. loss	A	B	C	D	Z	h_{eff}	screen loss	W	D_W	G	h_m	D_B	D_D	loss		
		dB(A)	m	m		m					m	dB(A)		dB(A)		m	dB(A)	dB(A)	dB(A)	dB(A)	
219.5	-9999999795	84.3 -3.0	244.7	32.9	-12.6	306.2	47.1	352.7	-	0.70	7.5	14.2	1.0	-22.6	-	-	-	-	-	34.9	-
220.5	-9999999795	84.3 -3.0	272.0	32.6	-13.1	300.6	83.4	383.5	-	0.46	7.7	12.9	1.0	-22.6	-	-	-	-	-	35.8	-
220.5	-9999999795	84.3 -3.0	244.7	33.1	-12.6	300.6	47.1	347.2	-	0.55	6.7	13.4	1.0	-22.6	-	-	-	-	-	35.7	-
221.5	-9999999795	84.3 -3.0	272.0	32.8	-13.1	295.4	82.7	377.8	-	0.37	6.9	12.3	1.0	-22.6	-	-	-	-	-	36.4	-
221.5	-9999999795	84.3 -3.0	244.7	33.2	-12.6	295.4	47.0	342.0	-	0.43	5.9	12.7	1.0	-22.6	-	-	-	-	-	36.4	-
222.5	-9999999795	84.3 -3.0	272.0	33.0	-13.1	292.7	79.9	372.3	-	0.33	6.4	12.0	1.0	-22.6	-	-	-	-	-	36.7	-
222.5	-9999999795	84.3 -3.0	244.7	33.4	-12.6	292.7	44.7	337.0	-	0.38	5.4	12.3	1.0	-22.6	-	-	-	-	-	36.7	-
223.5	-9999999795	84.3 -3.0	272.0	33.1	-13.1	290.1	77.3	367.1	-	0.29	6.0	11.7	1.0	-22.6	-	-	-	-	-	37.0	-
223.5	-9999999795	84.3 -3.0	244.7	33.5	-12.6	290.1	42.5	332.3	-	0.33	4.9	12.0	1.0	-22.6	-	-	-	-	-	37.1	-
224.5	-9999999795	84.3 -3.0	272.0	33.3	-13.1	287.7	74.7	362.1	-	0.26	5.5	11.3	1.0	-22.6	-	-	-	-	-	37.3	-
224.5	-9999999795	84.3 -3.0	244.7	33.7	-12.6	287.7	40.4	327.8	-	0.28	4.5	11.6	1.0	-22.6	-	-	-	-	-	37.5	-
225.5	-9999999795	84.3 -3.0	272.0	33.4	-13.1	285.3	72.3	357.4	-	0.22	5.1	11.0	1.0	-22.6	-	-	-	-	-	37.6	-
225.5	-9999999795	84.3 -3.0	244.7	33.8	-12.6	285.3	38.5	323.5	-	0.24	4.0	11.2	1.0	-22.6	-	-	-	-	-	37.9	-
226.5	-9999999795	84.3 -3.0	272.0	33.6	-13.1	283.1	70.0	352.9	-	0.19	4.6	10.7	1.0	-22.6	-	-	-	-	-	38.0	-
226.5	-9999999795	84.3 -3.0	244.7	33.9	-12.6	283.1	36.6	319.5	-	0.20	3.6	10.7	1.0	-22.6	-	-	-	-	-	38.3	-
227.5	-9999999795	84.3 -3.0	272.0	33.7	-13.1	281.0	67.8	348.6	-	0.16	4.2	10.3	1.0	-22.6	-	-	-	-	-	38.4	-
227.5	-9999999795	84.3 -3.0	244.7	34.1	-12.6	281.0	34.7	315.6	-	0.16	3.1	10.3	1.0	-22.6	-	-	-	-	-	38.8	-
228.5	-9999999795	84.3 -3.0	272.0	33.8	-13.1	279.1	65.6	344.6	-	0.14	3.8	10.0	1.0	-22.6	-	-	-	-	-	38.7	-
228.5	-9999999795	84.3 -3.0	244.7	34.2	-12.6	279.1	32.9	311.9	-	0.13	2.8	9.9	1.0	-22.6	-	-	-	-	-	39.2	-
229.5	-9999999795	84.3 -3.0	272.0	34.0	-13.1	277.5	63.3	340.7	-	0.13	3.7	9.9	1.0	-22.6	-	-	-	-	-	38.8	-
229.5	-9999999795	84.3 -3.0	244.7	34.3	-12.6	277.5	31.0	308.4	-	0.12	2.6	9.8	1.0	-22.6	-	-	-	-	-	39.3	-
230.5	-9999999795	84.3 -3.0	272.0	34.1	-13.1	276.0	61.1	337.0	-	0.13	3.5	9.8	1.0	-22.6	-	-	-	-	-	38.9	-
230.5	-9999999795	84.3 -3.0	244.7	34.4	-12.6	276.0	29.2	305.1	-	0.12	2.5	9.6	1.0	-22.6	-	-	-	-	-	39.5	-
231.5	-9999999795	84.3 -3.0	272.0	34.2	-13.1	274.6	59.0	333.5	-	0.12	3.4	9.7	1.0	-22.6	-	-	-	-	-	39.0	-
231.5	-9999999795	84.3 -3.0	244.7	34.5	-12.6	274.6	27.4	301.9	-	0.11	2.3	9.5	1.0	-22.6	-	-	-	-	-	39.6	-
232.5	-9999999795	84.3 -3.0	272.0	34.4	-13.1	273.3	57.0	330.2	-	0.11	3.3	9.6	1.0	-22.6	-	-	-	-	-	39.1	-
232.5	-9999999795	84.3 -3.0	244.7	34.6	-12.6	273.3	25.7	298.9	-	0.10	2.2	9.4	1.0	-22.6	-	-	-	-	-	39.7	-
233.5	-9999999795	84.3 -3.0	272.0	34.5	-13.1	272.0	55.1	327.0	-	0.10	3.0	9.4	1.0	-22.6	-	-	-	-	-	39.3	-
233.5	-9999999795	84.3 -3.0	244.7	34.8	-12.6	272.0	24.1	296.1	-	0.09	2.0	9.1	1.0	-22.6	-	-	-	-	-	40.0	-
234.5	-9999999795	84.3 -3.0	272.0	34.6	-13.1	270.1	53.9	324.0	-	0.05	2.1	8.1	1.0	-22.6	-	-	-	-	-	40.5	-
234.5	-9999999795	84.3 -3.0	244.7	34.9	-12.6	270.1	23.2	293.3	-	0.02	1.0	7.2	1.0	-22.6	-	-	-	-	-	41.8	-

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angle	km/miles	L10 18h dB(A)	Geometry E_{SI} m	Geometry h m	dist. loss	Screening A m	Screening B m	Screening C m	Screening D m	Z	screen loss m	D_Z dB(A)	View angle W	View angle D_W dB(A)	Groundabsorption G	Groundabsorption h_m m	D_B dB(A)	Atten D_D dB(A)	Ref. loss dB(A)	Level L10 18h dB(A)	
235.5	-9999999795	84.3 -3.0	272.0	34.7	-13.1	268.3	36.2	321.2	16.7	0.01	1.1	7.7	1.0	-22.6	-	-	-	-	-	41.0	-
235.5	-9999999795	84.3 -3.0	244.7	35.0	-12.6	268.3	22.4	290.7	-	0.00	0.0	5.0	1.0	-22.6	-	-	-	-	-	44.1	-
236.5	-9999999795	84.3 -3.0	272.0	34.8	-13.1	282.6	35.9	318.4	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	42.0	-
236.5	-9999999795	84.3 -3.0	244.7	35.1	-12.6	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.1	-
237.5	-9999999795	84.3 -3.0	272.0	35.0	-13.1	280.3	35.6	315.9	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	42.0	-
237.5	-9999999795	84.3 -3.0	244.7	35.2	-12.6	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.1	-
238.5	-9999999795	84.3 -3.0	272.0	35.1	-13.1	262.8	35.3	313.4	15.3	0.02	1.1	7.7	1.0	-22.6	-	-	-	-	-	40.9	-
238.5	-9999999795	84.3 -3.0	244.7	35.3	-12.6	262.8	20.9	283.8	-	0.00	0.0	5.0	1.0	-22.6	-	-	-	-	-	44.1	-
239.5	-9999999795	84.3 -3.0	272.0	35.2	-13.1	261.1	50.1	311.1	-	0.04	1.8	7.9	1.0	-22.6	-	-	-	-	-	40.7	-
239.5	-9999999795	84.3 -3.0	244.7	35.4	-12.6	261.1	20.6	281.7	-	0.02	0.8	6.8	1.0	-22.6	-	-	-	-	-	42.3	-
240.5	-9999999795	84.3 -3.0	272.0	35.3	-13.1	259.3	49.7	309.0	-	0.07	2.5	8.8	1.0	-22.6	-	-	-	-	-	39.8	-
240.5	-9999999795	84.3 -3.0	244.7	35.5	-12.6	259.3	20.4	279.7	-	0.05	1.4	8.3	0.6	-24.7	-	-	-	-	-	38.7	-
240.5	-9999999795	84.3 -3.0	247.9	35.5	-12.7	259.3	20.4	279.7	-	0.05	1.4	8.2	0.4	-26.7	-	-	-	-	-	36.7	-
241.5	-9999999795	84.3 -3.0	272.0	35.4	-13.1	257.6	49.4	306.9	-	0.10	2.8	9.3	1.0	-22.6	-	-	-	-	-	39.4	-
241.5	-9999999795	84.3 -3.0	247.9	35.6	-12.7	257.6	20.5	278.0	-	0.08	1.7	8.9	1.0	-22.6	-	-	-	-	-	40.1	-
242.5	-9999999795	84.3 -3.0	275.1	35.5	-13.2	256.0	49.1	305.0	-	0.12	3.1	9.7	0.6	-24.8	-	-	-	-	-	36.7	-
242.5	-9999999795	84.3 -3.0	272.0	35.5	-13.1	256.0	49.1	305.0	-	0.12	3.2	9.7	0.4	-26.6	-	-	-	-	-	34.9	-
242.5	-9999999795	84.3 -3.0	247.9	35.7	-12.7	256.0	20.6	276.4	-	0.11	2.0	9.5	1.0	-22.6	-	-	-	-	-	39.5	-
243.5	-9999999795	84.3 -3.0	275.1	35.7	-13.2	254.5	49.1	303.4	-	0.15	3.5	10.1	1.0	-22.6	-	-	-	-	-	38.5	-
243.5	-9999999795	84.3 -3.0	247.9	35.9	-12.7	254.5	20.7	275.0	-	0.14	2.3	10.1	1.0	-22.6	-	-	-	-	-	39.0	-
244.5	-9999999795	84.3 -3.0	275.1	35.8	-13.2	253.0	49.0	301.9	-	0.17	3.8	10.4	1.0	-22.6	-	-	-	-	-	38.1	-
244.5	-9999999795	84.3 -3.0	247.9	36.0	-12.7	253.0	20.8	273.6	-	0.18	2.7	10.6	1.0	-22.6	-	-	-	-	-	38.5	-
245.5	-9999999795	84.3 -3.0	275.1	35.9	-13.2	251.6	49.0	300.5	-	0.20	4.0	10.8	1.0	-22.6	-	-	-	-	-	37.8	-
245.5	-9999999795	84.3 -3.0	247.9	36.1	-12.7	251.6	20.9	272.3	-	0.22	2.9	11.0	1.0	-22.6	-	-	-	-	-	38.0	-
246.5	-9999999795	84.3 -3.0	275.1	36.1	-13.2	250.3	49.1	299.1	-	0.22	4.3	11.0	1.0	-22.6	-	-	-	-	-	37.6	-
246.5	-9999999795	84.3 -3.0	247.9	36.2	-12.7	250.3	21.1	271.1	-	0.26	3.2	11.4	1.0	-22.6	-	-	-	-	-	37.6	-
247.5	-9999999795	84.3 -3.0	275.1	36.2	-13.2	249.1	49.1	297.9	-	0.25	4.5	11.3	1.0	-22.6	-	-	-	-	-	37.3	-
247.5	-9999999795	84.3 -3.0	247.9	36.4	-12.7	249.1	21.3	270.0	-	0.30	3.4	11.7	1.0	-22.6	-	-	-	-	-	37.3	-
248.5	-9999999795	84.3 -3.0	275.1	36.3	-13.2	247.9	49.2	296.8	-	0.28	4.8	11.5	1.0	-22.6	-	-	-	-	-	37.0	-
248.5	-9999999795	84.3 -3.0	247.9	36.5	-12.7	247.9	21.4	269.0	-	0.34	3.7	12.1	1.0	-22.6	-	-	-	-	-	37.0	-
249.5	-9999999795	84.3 -3.0	275.1	36.5	-13.2	246.9	49.3	295.8	-	0.30	5.0	11.8	1.0	-22.6	-	-	-	-	-	36.8	-

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angle	km/miles	L10 18h dB(A)	Geometry E_{SI} m	Geometry h m	dist. loss	Screening A m	Screening B m	Screening C m	Screening D m	Z	h_{eff} m	screen loss dB(A)	View angle w	View angle D_w dB(A)	Groundabsorption G	Groundabsorption h_m m	Groundabsorption D_B dB(A)	Atten D_D dB(A)	Ref. loss dB(A)	Level L10 18h dB(A)
249.5	-9999999795	84.3 -3.0	247.9	36.6	-12.7	246.9	21.6	268.1	-	0.38	3.9	12.4	1.0	-22.6	-	-	-	-	-	36.6 -
250.5	-9999999795	84.3 -3.0	275.1	36.6	-13.2	245.9	49.3	294.9	-	0.33	5.2	12.0	1.0	-22.6	-	-	-	-	-	36.6 -
250.5	-9999999795	84.3 -3.0	247.9	36.7	-12.7	245.9	21.8	267.3	-	0.43	4.1	12.7	1.0	-22.6	-	-	-	-	-	36.3 -
251.5	-9999999795	84.3 -3.0	275.1	36.7	-13.2	244.6	49.9	294.1	-	0.37	5.5	12.3	1.0	-22.6	-	-	-	-	-	36.3 -
251.5	-9999999795	84.3 -3.0	247.9	36.8	-12.7	244.6	22.5	266.6	-	0.48	4.4	13.0	1.0	-22.6	-	-	-	-	-	36.0 -
252.5	-9999999795	84.3 -3.0	275.1	36.9	-13.2	243.1	50.7	293.4	-	0.41	5.9	12.6	1.0	-22.6	-	-	-	-	-	36.0 -
252.5	-9999999795	84.3 -3.0	247.9	36.9	-12.7	243.1	23.3	265.9	-	0.54	4.8	13.4	1.0	-22.6	-	-	-	-	-	35.6 -
253.5	-9999999795	84.3 -3.0	275.1	37.0	-13.2	241.8	51.4	292.8	-	0.45	6.2	12.9	1.0	-22.6	-	-	-	-	-	35.7 -
253.5	-9999999795	84.3 -3.0	247.9	37.1	-12.7	241.8	24.2	265.4	-	0.60	5.1	13.7	1.0	-22.6	-	-	-	-	-	35.3 -
254.5	-9999999795	84.3 -3.0	275.1	37.1	-13.2	240.5	52.2	292.2	-	0.50	6.5	13.1	1.0	-22.6	-	-	-	-	-	35.5 -
254.5	-9999999795	84.3 -3.0	247.9	37.2	-12.7	240.5	25.0	264.9	-	0.66	5.4	14.0	1.0	-22.6	-	-	-	-	-	35.0 -
255.5	-9999999795	84.3 -3.0	275.1	37.2	-13.2	239.3	53.0	291.8	-	0.54	6.8	13.4	1.0	-22.6	-	-	-	-	-	35.2 -
255.5	-9999999795	84.3 -3.0	247.9	37.3	-12.7	239.3	25.8	264.5	-	0.72	5.8	14.3	1.0	-22.6	-	-	-	-	-	34.7 -
256.5	-9999999795	84.3 -3.0	275.1	37.4	-13.2	238.3	53.7	291.4	-	0.60	7.2	13.7	1.0	-22.6	-	-	-	-	-	34.9 -
256.5	-9999999795	84.3 -3.0	247.9	37.4	-12.7	238.3	26.6	264.1	-	0.80	6.1	14.6	1.0	-22.6	-	-	-	-	-	34.4 -
257.5	-9999999795	84.3 -3.0	275.1	37.5	-13.2	237.5	54.3	291.1	-	0.66	7.6	14.0	1.0	-22.6	-	-	-	-	-	34.6 -
257.5	-9999999795	84.3 -3.0	247.9	37.5	-12.7	237.5	27.3	263.9	-	0.89	6.5	15.0	1.0	-22.6	-	-	-	-	-	34.1 -
258.5	-9999999795	84.3 -3.0	275.1	37.6	-13.2	236.7	55.0	291.0	-	0.72	8.0	14.3	1.0	-22.6	-	-	-	-	-	34.3 -
258.5	-9999999795	84.3 -3.0	247.9	37.6	-12.7	236.7	28.0	263.7	-	0.98	6.9	15.3	1.0	-22.6	-	-	-	-	-	33.7 -
259.5	-9999999795	84.3 -3.0	275.1	37.8	-13.2	236.0	55.7	290.9	-	0.79	8.4	14.6	1.0	-22.6	-	-	-	-	-	34.0 -
259.5	-9999999795	84.3 -3.0	247.9	37.7	-12.7	236.0	28.7	263.7	-	1.07	7.3	15.6	1.0	-22.6	-	-	-	-	-	33.4 -
260.5	-9999999795	84.3 -3.0	275.1	37.9	-13.2	236.0	55.7	290.9	-	0.82	8.6	14.7	1.0	-22.6	-	-	-	-	-	33.9 -
260.5	-9999999795	84.3 -3.0	247.9	37.9	-12.7	236.0	28.8	263.7	-	1.12	7.5	15.8	1.0	-22.6	-	-	-	-	-	33.2 -
261.5	-9999999795	84.3 -3.0	275.1	38.0	-13.2	237.0	54.7	291.0	-	0.80	8.4	14.6	1.0	-22.6	-	-	-	-	-	34.0 -
261.5	-9999999795	84.3 -3.0	247.9	38.0	-12.7	237.0	27.8	263.7	-	1.11	7.4	15.8	1.0	-22.6	-	-	-	-	-	33.3 -
262.5	-9999999795	84.3 -3.0	275.1	38.1	-13.2	238.2	53.8	291.1	-	0.78	8.3	14.6	1.0	-22.6	-	-	-	-	-	34.0 -
262.5	-9999999795	84.3 -3.0	247.9	38.1	-12.7	238.2	26.8	263.9	-	1.10	7.2	15.7	1.0	-22.6	-	-	-	-	-	33.3 -
263.5	-9999999795	84.3 -3.0	275.1	38.3	-13.2	239.4	52.7	291.4	-	0.74	8.0	14.4	1.0	-22.6	-	-	-	-	-	34.2 -
263.5	-9999999795	84.3 -3.0	247.9	38.2	-12.7	239.4	25.8	264.1	-	1.05	6.9	15.6	1.0	-22.6	-	-	-	-	-	33.5 -
264.5	-9999999795	84.3 -3.0	275.1	38.4	-13.2	240.8	51.6	291.8	-	0.62	7.2	13.8	1.0	-22.6	-	-	-	-	-	34.8 -
264.5	-9999999795	84.3 -3.0	247.9	38.3	-12.7	240.8	24.5	264.5	-	0.86	6.1	14.9	1.0	-22.6	-	-	-	-	-	34.2 -

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angle	km/miles	L10 18h dB(A)	Geometry E_{SI} m	Geometry h m	dist. loss	Screening A m	Screening B m	Screening C m	Screening D	Z	h_{eff} m	screen loss dB(A)	View angle w	View angle D_w dB(A)	Groundabsorption G	Groundabsorption h_m m	Groundabsorption D_B dB(A)	Atten D_D dB(A)	Ref. loss dB(A)	Level L10 18h dB(A)	
265.5	-9999999795	84.3 -3.0	275.1	38.5	-13.2	242.3	50.4	292.2	-	0.50	6.4	13.1	1.0	-22.6	-	-	-	-	-	35.5	-
265.5	-9999999795	84.3 -3.0	247.9	38.4	-12.7	242.3	23.2	264.9	-	0.69	5.4	14.1	1.0	-22.6	-	-	-	-	-	34.9	-
266.5	-9999999795	84.3 -3.0	275.1	38.7	-13.2	243.9	49.2	292.7	-	0.39	5.6	12.4	1.0	-22.6	-	-	-	-	-	36.2	-
266.5	-9999999795	84.3 -3.0	247.9	38.5	-12.7	243.9	21.9	265.3	-	0.52	4.6	13.3	1.0	-22.6	-	-	-	-	-	35.8	-
267.5	-9999999795	84.3 -3.0	275.1	38.8	-13.2	245.3	48.4	293.4	-	0.29	4.9	11.7	1.0	-22.6	-	-	-	-	-	36.9	-
267.5	-9999999795	84.3 -3.0	247.9	38.7	-12.7	245.3	21.0	265.9	-	0.38	3.8	12.3	1.0	-22.6	-	-	-	-	-	36.7	-
268.5	-9999999795	84.3 -3.0	275.1	38.9	-13.2	246.7	47.6	294.1	-	0.21	4.1	10.9	1.0	-22.6	-	-	-	-	-	37.7	-
268.5	-9999999795	84.3 -3.0	247.9	38.8	-12.7	246.7	20.1	266.6	-	0.25	3.0	11.3	1.0	-22.6	-	-	-	-	-	37.8	-
269.5	-9999999795	84.3 -3.0	275.1	39.0	-13.2	248.3	46.8	294.9	-	0.14	3.3	10.0	1.0	-22.6	-	-	-	-	-	38.6	-
269.5	-9999999795	84.3 -3.0	247.9	38.9	-12.7	248.3	19.2	267.3	-	0.14	2.3	10.0	1.0	-22.6	-	-	-	-	-	39.0	-
270.5	-9999999795	84.3 -3.0	275.1	39.2	-13.2	250.2	45.7	295.8	-	0.09	2.6	9.1	1.0	-22.6	-	-	-	-	-	39.5	-
270.5	-9999999795	84.3 -3.0	247.9	39.0	-12.7	250.2	18.0	268.1	-	0.07	1.5	8.7	1.0	-22.6	-	-	-	-	-	40.3	-
271.5	-9999999795	84.3 -3.0	275.1	39.3	-13.2	252.4	44.5	296.8	-	0.05	1.9	8.1	1.0	-22.6	-	-	-	-	-	40.4	-
271.5	-9999999795	84.3 -3.0	247.9	39.1	-12.7	252.4	16.7	269.0	-	0.02	0.8	7.1	1.0	-22.6	-	-	-	-	-	41.9	-
272.5	-9999999795	84.3 -3.0	275.1	39.4	-13.2	254.7	43.2	297.9	-	0.02	1.2	7.0	1.0	-22.6	-	-	-	-	-	41.6	-
272.5	-9999999795	84.3 -3.0	247.9	39.2	-12.7	254.7	15.3	270.0	-	0.00	0.1	5.0	1.0	-22.6	-	-	-	-	-	44.0	-
273.5	-9999999795	84.3 -3.0	275.1	39.6	-13.2	265.8	33.3	299.1	-	0.01	0.9	6.7	1.0	-22.6	-	-	-	-	-	41.9	-
273.5	-9999999795	84.3 -3.0	247.9	39.4	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
274.5	-9999999795	84.3 -3.0	275.1	39.7	-13.2	267.0	33.4	300.4	-	0.01	0.9	6.7	1.0	-22.6	-	-	-	-	-	41.9	-
274.5	-9999999795	84.3 -3.0	247.9	39.5	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
275.5	-9999999795	84.3 -3.0	275.1	39.8	-13.2	268.2	33.6	301.8	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	41.9	-
275.5	-9999999795	84.3 -3.0	247.9	39.6	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
276.5	-9999999795	84.3 -3.0	275.1	40.0	-13.2	269.6	33.8	303.3	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	41.9	-
276.5	-9999999795	84.3 -3.0	247.9	39.7	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
277.5	-9999999795	84.3 -3.0	275.1	40.1	-13.2	271.0	33.9	304.9	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	42.0	-
277.5	-9999999795	84.3 -3.0	247.9	39.9	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
278.5	-9999999795	84.3 -3.0	275.1	40.3	-13.2	272.5	34.1	306.7	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	42.0	-
278.5	-9999999795	84.3 -3.0	247.9	40.0	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
279.5	-9999999795	84.3 -3.0	275.1	40.4	-13.2	274.2	34.3	308.5	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	42.0	-
279.5	-9999999795	84.3 -3.0	247.9	40.1	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
280.5	-9999999795	84.3 -3.0	275.1	40.6	-13.2	275.9	34.6	310.5	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	42.0	-

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angle	km/miles	L10 18h dB(A)	Geometry E_{SI} m	Geometry h m	dist. loss	Screening A m	Screening B m	Screening C m	Screening D m	Z	h_{eff} m	screen loss dB(A)	View angle W	View angle D_W dB(A)	Groundabsorption G	Groundabsorption h_m m	Groundabsorption D_B dB(A)	Atten D_D dB(A)	Ref. loss dB(A)	Level L10 18h dB(A)	
280.5	-9999999795	84.3 -3.0	247.9	40.2	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
281.5	-9999999795	84.3 -3.0	275.1	40.7	-13.2	277.8	34.8	312.5	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	42.0	-
281.5	-9999999795	84.3 -3.0	247.9	40.4	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
282.5	-9999999795	84.3 -3.0	275.1	40.8	-13.2	279.7	35.0	314.7	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	42.0	-
282.5	-9999999795	84.3 -3.0	247.9	40.5	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
283.5	-9999999795	84.3 -3.0	275.1	41.0	-13.2	281.8	35.3	317.1	-	0.01	0.9	6.6	1.0	-22.6	-	-	-	-	-	42.0	-
283.5	-9999999795	84.3 -3.0	247.9	40.6	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
284.5	-9999999795	84.3 -3.0	275.1	41.1	-13.2	284.0	35.6	319.5	-	0.01	0.8	6.5	1.0	-22.6	-	-	-	-	-	42.0	-
284.5	-9999999795	84.3 -3.0	247.9	40.8	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
285.5	-9999999795	84.3 -3.0	275.1	41.3	-13.2	286.3	35.9	322.1	-	0.01	0.8	6.5	1.0	-22.6	-	-	-	-	-	42.1	-
285.5	-9999999795	84.3 -3.0	247.9	40.9	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
286.5	-9999999795	84.3 -3.0	275.1	41.4	-13.2	288.7	36.2	324.9	-	0.01	0.9	6.6	0.7	-23.8	-	-	-	-	-	40.7	-
286.5	-9999999795	84.3 -3.0	234.0	41.5	-12.5	288.7	35.7	324.4	-	0.01	0.8	6.4	0.3	-28.5	-	-	-	-	-	37.0	-
286.5	-9999999795	84.3 -3.0	247.9	41.0	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
287.5	-9999999795	84.3 -3.0	234.0	41.5	-12.5	291.3	37.9	329.2	-	0.01	1.0	6.8	1.0	-22.6	-	-	-	-	-	42.5	-
287.5	-9999999795	84.3 -3.0	247.9	41.2	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
288.5	-9999999795	84.3 -3.0	234.0	41.6	-12.5	294.0	40.3	334.3	-	0.02	1.2	7.1	1.0	-22.6	-	-	-	-	-	42.2	-
288.5	-9999999795	84.3 -3.0	247.9	41.3	-12.7	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	44.0	-
289.5	-9999999795	84.3 -3.0	234.0	41.6	-12.5	296.9	42.8	339.6	-	0.03	1.4	7.4	1.0	-22.6	-	-	-	-	-	41.9	-
289.5	-9999999795	84.3 -3.0	247.9	41.5	-12.7	-	-	-	-	-0.00	-	-	0.6	-24.8	-	-	-	-	-	41.8	-
289.5	-9999999795	84.3 -3.0	206.8	41.5	-11.9	-	-	-	-	-0.01	-	-	0.4	-26.5	-	-	-	-	-	40.9	-
290.5	-9999999795	84.3 -3.0	234.0	41.7	-12.5	300.5	44.7	345.2	-	0.03	1.5	7.5	1.0	-22.6	-	-	-	-	-	41.8	-
290.5	-9999999795	84.3 -3.0	206.8	41.5	-11.9	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.8	-
291.5	-9999999795	84.3 -3.0	234.0	41.7	-12.5	305.6	45.5	351.1	-	0.03	1.5	7.5	1.0	-22.6	-	-	-	-	-	41.8	-
291.5	-9999999795	84.3 -3.0	206.8	41.6	-11.9	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.8	-
292.5	-9999999795	84.3 -3.0	234.0	41.8	-12.5	311.0	46.3	357.3	-	0.03	1.5	7.5	1.0	-22.6	-	-	-	-	-	41.8	-
292.5	-9999999795	84.3 -3.0	206.8	41.6	-11.9	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.8	-
293.5	-9999999795	84.3 -3.0	234.0	41.8	-12.5	316.7	47.2	363.8	-	0.03	1.5	7.5	1.0	-22.6	-	-	-	-	-	41.8	-
293.5	-9999999795	84.3 -3.0	206.8	41.7	-11.9	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.8	-
294.5	-9999999795	84.3 -3.0	234.0	41.9	-12.5	322.7	48.1	370.7	-	0.03	1.5	7.4	1.0	-22.6	-	-	-	-	-	41.8	-
294.5	-9999999795	84.3 -3.0	206.8	41.7	-11.9	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.8	-

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angle	km/miles	L10 18h dB(A)	Geometry E_{SI} m	h m	dist. loss	Screening A m	B	C	D	Z	h_{eff} m	screen loss dB(A)	View angle W	D_W dB(A)	Groundabsorption G	h_m m	D_B dB(A)	Atten D_D dB(A)	Ref. loss dB(A)	Level L10 18h dB(A)	
295.5	-9999999795	84.3 -3.0	234.0	41.9	-12.5	329.0	49.0	378.0	-	0.03	1.5	7.4	1.0	-22.6	-	-	-	-	-	41.9	-
295.5	-9999999795	84.3 -3.0	206.8	41.8	-11.9	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.8	-
296.5	-9999999795	84.3 -3.0	234.0	42.0	-12.5	326.7	59.1	385.7	-	0.04	1.9	7.8	1.0	-22.6	-	-	-	-	-	41.4	-
296.5	-9999999795	84.3 -3.0	206.8	41.8	-11.9	326.7	17.0	343.6	-	0.00	0.3	5.4	1.0	-22.6	-	-	-	-	-	44.4	-
297.5	-9999999795	84.3 -3.0	234.0	42.1	-12.5	330.5	63.4	393.8	-	0.11	3.5	9.6	1.0	-22.6	-	-	-	-	-	39.7	-
297.5	-9999999795	84.3 -3.0	206.8	41.9	-11.9	330.5	20.5	350.9	-	0.10	1.9	9.3	1.0	-22.6	-	-	-	-	-	40.5	-
298.5	-9999999795	84.3 -3.0	234.0	42.1	-12.5	335.9	66.8	402.4	-	0.20	4.7	10.8	1.0	-22.6	-	-	-	-	-	38.5	-
298.5	-9999999795	84.3 -3.0	206.8	41.9	-11.9	335.9	22.9	358.6	-	0.23	3.1	11.1	1.0	-22.6	-	-	-	-	-	38.7	-
299.5	-9999999795	84.3 -3.0	234.0	42.2	-12.5	342.9	68.8	411.6	-	0.19	4.7	10.7	1.0	-22.6	-	-	-	-	-	38.6	-
299.5	-9999999795	84.3 -3.0	206.8	42.0	-11.9	342.9	24.0	366.7	-	0.22	3.1	11.0	1.0	-22.6	-	-	-	-	-	38.8	-
300.5	-9999999795	84.3 -3.0	234.0	42.3	-12.5	350.4	71.0	421.3	-	0.18	4.6	10.6	1.0	-22.6	-	-	-	-	-	38.7	-
300.5	-9999999795	84.3 -3.0	206.8	42.1	-11.9	350.4	25.1	375.3	-	0.20	3.1	10.8	1.0	-22.6	-	-	-	-	-	39.0	-
301.5	-9999999795	84.3 -3.0	234.0	42.3	-12.5	358.3	73.3	431.5	-	0.12	3.8	9.6	1.0	-22.6	-	-	-	-	-	39.6	-
301.5	-9999999795	84.3 -3.0	206.8	42.1	-11.9	358.3	26.3	384.5	-	0.10	2.2	9.3	1.0	-22.6	-	-	-	-	-	40.5	-
302.5	-9999999795	84.3 -3.0	234.0	42.4	-12.5	385.1	57.4	442.5	-	0.02	1.5	7.2	1.0	-22.6	-	-	-	-	-	42.1	-
302.5	-9999999795	84.3 -3.0	206.8	42.2	-11.9	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.8	-
303.5	-9999999795	84.3 -3.0	186.7	42.5	-11.5	395.3	59.2	454.4	-	0.02	1.5	7.2	0.6	-25.0	-	-	-	-	-	40.6	-
303.5	-9999999795	84.3 -3.0	234.0	42.5	-12.5	395.3	58.9	454.1	-	0.02	1.5	7.2	0.4	-26.2	-	-	-	-	-	38.4	-
303.5	-9999999795	84.3 -3.0	206.8	42.3	-11.9	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.8	-
304.5	-9999999795	84.3 -3.0	186.7	42.6	-11.5	406.1	64.9	471.0	-	0.02	1.6	7.3	1.0	-22.6	-	-	-	-	-	42.9	-
304.5	-9999999795	84.3 -3.0	206.8	42.3	-11.9	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.8	-
305.5	-9999999795	84.3 -3.0	186.7	42.7	-11.5	417.6	71.4	489.0	-	0.03	1.8	7.4	1.0	-22.6	-	-	-	-	-	42.8	-
305.5	-9999999795	84.3 -3.0	206.8	42.4	-11.9	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.8	-
306.5	-9999999795	84.3 -3.0	186.7	42.7	-11.5	430.0	78.6	508.5	-	0.03	1.9	7.5	1.0	-22.6	-	-	-	-	-	42.7	-
306.5	-9999999795	84.3 -3.0	206.8	42.5	-11.9	-	-	-	-	-0.00	-	-	0.5	-25.4	-	-	-	-	-	41.9	-
306.5	-9999999795	84.3 -3.0	159.5	42.5	-10.8	-	-	-	-	-0.00	-	-	0.5	-25.7	-	-	-	-	-	42.8	-
307.5	-9999999795	84.3 -3.0	186.7	42.8	-11.5	445.2	84.8	529.9	-	0.03	2.0	7.5	1.0	-22.6	-	-	-	-	-	42.7	-
307.5	-9999999795	84.3 -3.0	159.5	42.6	-10.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.9	-
308.5	-9999999795	84.3 -3.0	186.7	42.9	-11.5	464.8	88.6	553.4	-	0.03	2.0	7.5	1.0	-22.6	-	-	-	-	-	42.7	-
308.5	-9999999795	84.3 -3.0	159.5	42.7	-10.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.9	-
309.5	-9999999795	84.3 -3.0	186.7	43.1	-11.5	486.5	92.7	579.2	-	0.03	2.0	7.4	1.0	-22.6	-	-	-	-	-	42.8	-

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angle	km/miles	L10 18h dB(A)	Geometry E_{SI} m	Geometry h m	D_E	Screening A m	Screening B m	Screening C m	Screening D m	Z	h_{eff} m	D_z dB(A)	View angle w	View angle D_w dB(A)	Groundabsorption G	Groundabsorption h_m m	Groundabsorption D_B dB(A)	Atten D_D dB(A)	Ref. loss dB(A)	Level L10 18h dB(A)
309.5	-9999999795	84.3 -3.0	159.5	42.8	-10.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.9 -
310.5	-9999999795	84.3 -3.0	186.7	43.2	-11.5	510.5	97.3	607.7	-	0.03	2.0	7.4	1.0	-22.6	-	-	-	-	-	42.8 -
310.5	-9999999795	84.3 -3.0	159.5	42.9	-10.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.9 -
311.5	-9999999795	84.3 -3.0	186.7	43.3	-11.5	537.1	102.3	639.4	-	0.02	2.0	7.3	1.0	-22.6	-	-	-	-	-	42.9 -
311.5	-9999999795	84.3 -3.0	159.5	43.0	-10.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.9 -
312.5	-9999999795	84.3 -3.0	244.0	43.5	-12.6	566.8	110.5	677.2	-	0.02	2.1	7.3	0.2	-28.9	-	-	-	-	-	35.5 -
312.5	-9999999795	84.3 -3.0	186.7	43.4	-11.5	566.8	108.0	674.8	-	0.02	2.1	7.3	0.8	-23.7	-	-	-	-	-	41.8 -
312.5	-9999999795	84.3 -3.0	159.5	43.1	-10.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.9 -
313.5	-9999999795	84.3 -3.0	244.0	43.6	-12.6	600.2	106.9	707.1	-	0.02	1.9	7.1	1.0	-22.6	-	-	-	-	-	42.0 -
313.5	-9999999795	84.3 -3.0	159.5	43.3	-10.8	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	45.9 -
314.5	-9999999795	84.3 -3.0	244.0	43.7	-12.6	638.0	101.9	739.9	-	0.02	1.7	6.9	1.0	-22.6	-	-	-	-	-	42.2 -
314.5	-9999999795	84.3 -3.0	216.7	43.5	-12.1	638.0	24.2	662.2	-	0.00	0.0	5.0	0.1	-35.1	-	-	-	-	-	32.1 -
314.5	-9999999795	84.3 -3.0	159.5	43.4	-10.8	-	-	-	-	-0.00	-	-	0.9	-22.8	-	-	-	-	-	45.6 -
315.5	-9999999795	84.3 -3.0	244.0	43.9	-12.6	679.3	96.8	776.2	-	0.01	1.5	6.7	1.0	-22.6	-	-	-	-	-	42.4 -
315.5	-9999999795	84.3 -3.0	216.7	43.6	-12.1	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.6 -
316.5	-9999999795	84.3 -3.0	244.0	44.0	-12.6	714.6	101.9	816.4	-	0.01	1.5	6.6	1.0	-22.6	-	-	-	-	-	42.5 -
316.5	-9999999795	84.3 -3.0	216.7	43.7	-12.1	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.6 -
317.5	-9999999795	84.3 -3.0	244.0	44.2	-12.6	753.9	107.5	861.4	-	0.01	1.5	6.6	1.0	-22.6	-	-	-	-	-	42.5 -
317.5	-9999999795	84.3 -3.0	216.7	43.9	-12.1	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.6 -
318.5	-9999999795	84.3 -3.0	432.9	44.5	-15.1	798.1	121.2	919.3	-	0.01	1.6	6.6	0.2	-29.3	-	-	-	-	-	33.3 -
318.5	-9999999795	84.3 -3.0	244.0	44.4	-12.6	798.1	113.8	911.9	-	0.01	1.5	6.6	0.8	-23.6	-	-	-	-	-	41.5 -
318.5	-9999999795	84.3 -3.0	216.7	44.1	-12.1	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.6 -
319.5	-9999999795	84.3 -3.0	432.9	44.7	-15.1	848.1	101.0	949.1	-	0.01	1.1	6.0	1.0	-22.6	-	-	-	-	-	40.6 -
319.5	-9999999795	84.3 -3.0	216.7	44.3	-12.1	-	-	-	-	-0.00	-	-	1.0	-22.6	-	-	-	-	-	44.6 -
320.5	-9999999795	84.3 -3.0	432.9	45.1	-15.1	905.1	76.1	981.2	-	0.00	0.4	4.8	1.0	-22.6	-	-	-	-	-	41.8 -
320.5	-9999999795	84.3 -3.0	216.7	44.5	-12.1	-	-	-	-	-0.00	-	-	0.4	-26.9	-	-	-	-	-	40.3 -
320.5	-9999999795	84.3 -3.0	405.7	44.6	-14.8	-	-	-	-	-0.00	-	-	0.6	-24.6	-	-	-	-	-	39.9 -
321.5	-9999999795	84.3 -3.0	432.9	45.4	-15.1	942.6	73.3	1015.8	-	0.00	0.4	4.9	0.6	-24.7	-	-	-	-	-	39.6 -
321.5	-9999999795	84.3 -3.0	405.7	44.9	-14.8	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	41.9 -
322.5	-9999999795	84.3 -3.0	405.7	45.3	-14.8	-	-	-	-	-0.01	-	-	1.0	-22.6	-	-	-	-	-	41.9 -
323.5	-9999999795	84.3 -3.0	405.7	45.5	-14.8	-	-	-	-	-2.00	-	-	0.1	-32.6	1.0	1.0	10.2	-	-	26.7 -

Result for receiver NSR1			
source	file number	legel in dB(A) day	night
road	41	66.2	-

Sum of all segments = 66.2

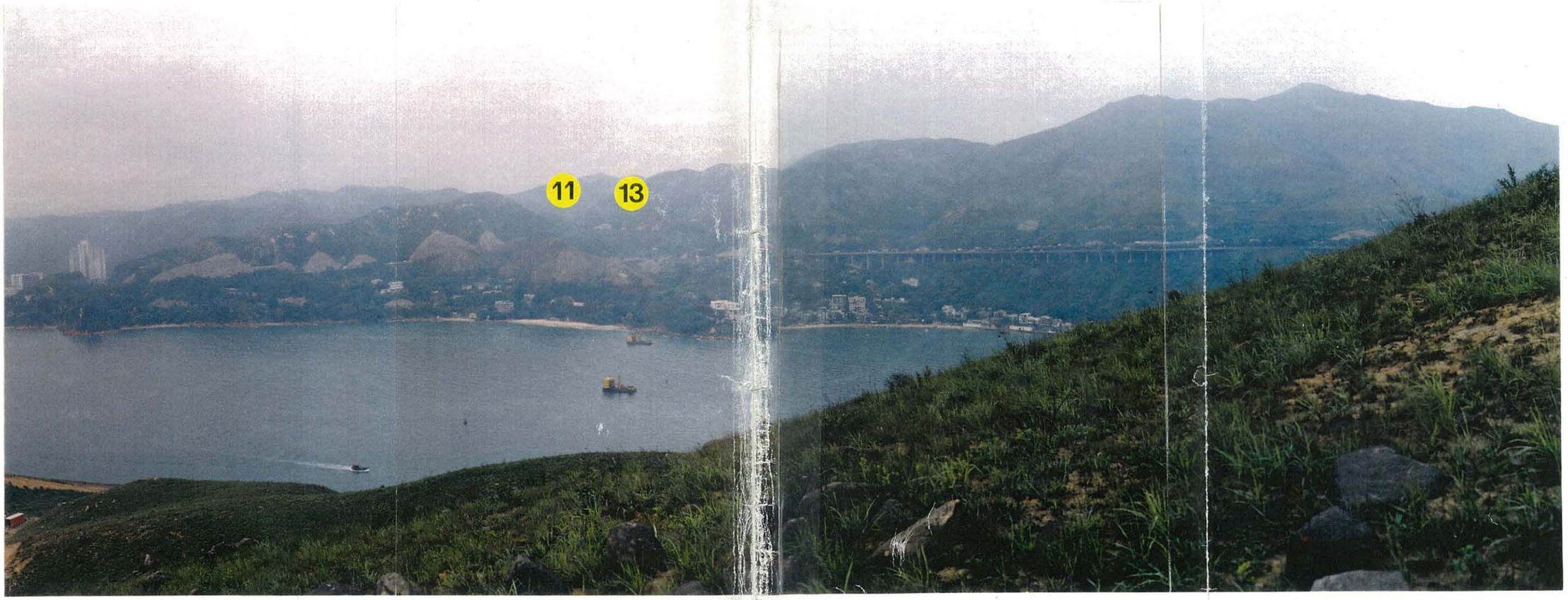
Facade reflection + 2.5

Total noise level @ NSR1 = 68.7 dB(A)

LANDSCAPE AND VISUAL

APPENDIX A8

(11) V-SHAPED VALLEY (13) STEEP HILL SLOPE
WITH COASTAL ASPECT

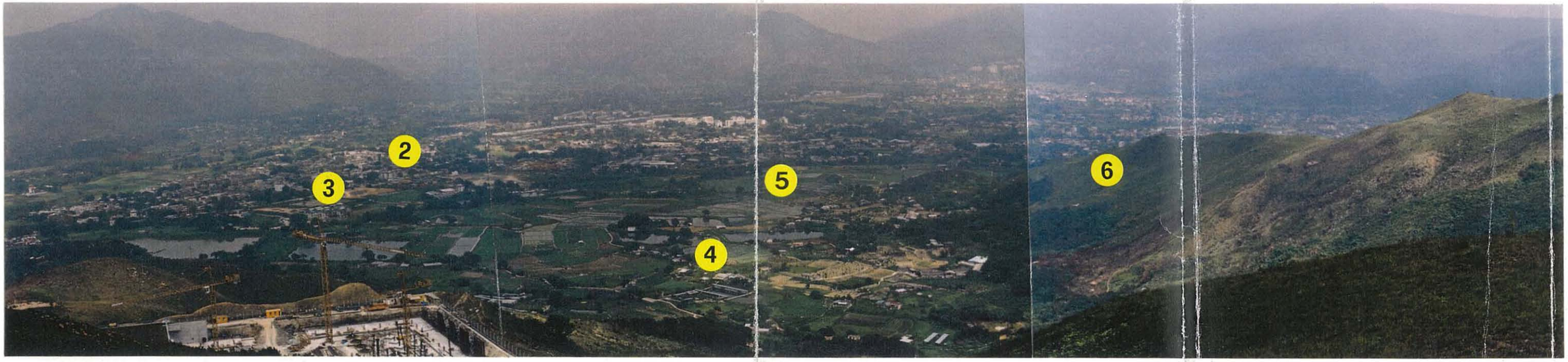


FREEMAN FOX MAUNSELL	Photo Title : Landscape Character Areas South of Tunnel	Job Title : ROUTE 3 : COUNTRY PARK SECTION EIA		
		Scale : Date : July 1993	Job No. 058000	Photo. No: A8.1.1

(4) ALLUVIAL PLAIN - TRADITIONAL VILLAGES

(2) ALLUVIAL PLAIN - URBAN FRINGE (5) FLAT BOTTOMED VALLEY (6) ROUNDED LOW HILLS

(3) ALLUVIAL PLAIN - MODERN VILLAGES



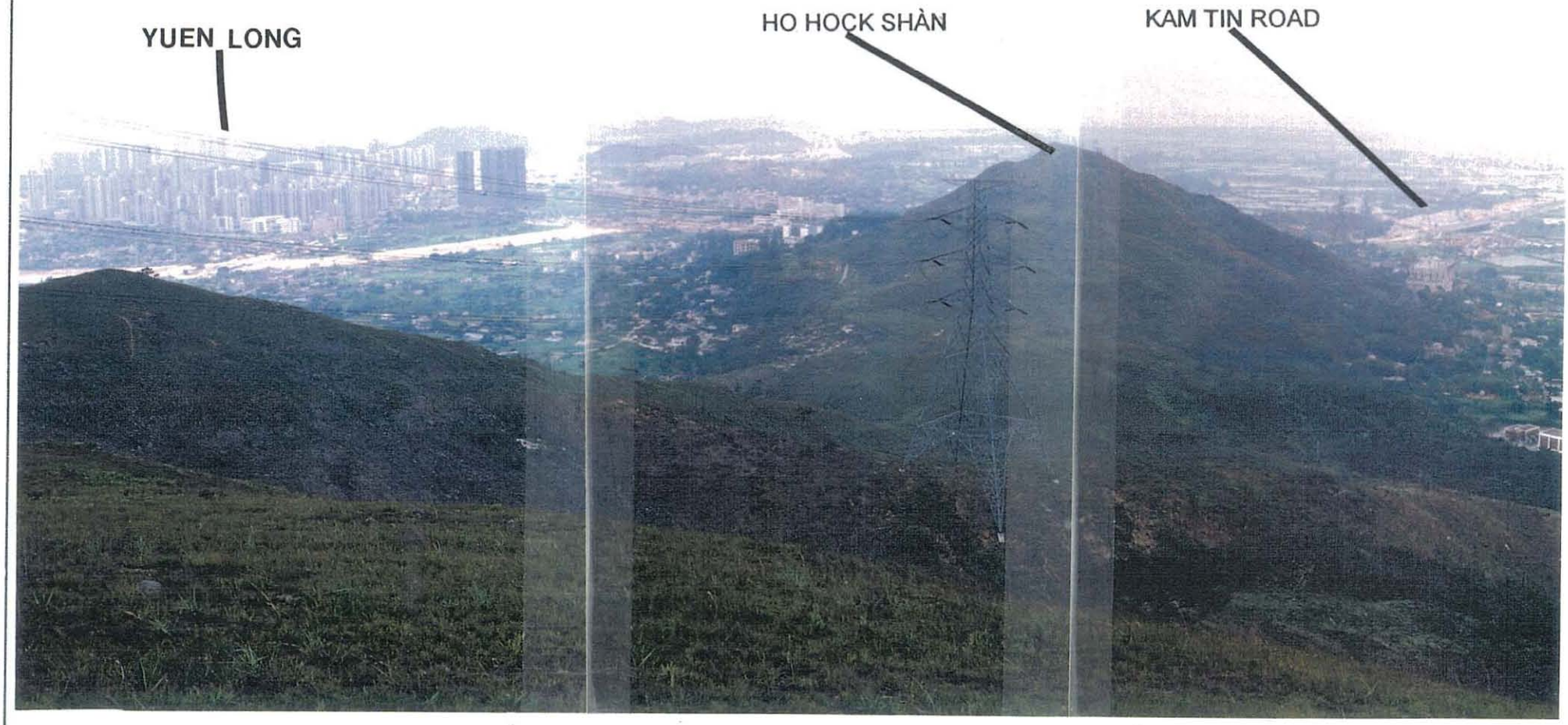
FREEMAN FOX MAUNSELL	Photo Title : Landscape Character Areas North of Tunnel	Job Title : ROUTE 3 : COUNTRY PARK SECTION EIA	
		Scale : Date : July 1993	Job No. 058000
			Photo. No: A8.1.2

Note:
Proposed road aligment would cause significatt landscape impact through proposed cuttings to the rounded hills on the left, and the embankment across the V. shaped valley (centre). Tunnel entrance positioned on right hand side of V. shaped valley.

FREEMAN FOX MAUNSELL	Photo Title : Southern Tunnel Portal and Approach	Job Title : ROUTE 3 : COUNTRY PARK SECTION EIA		
		Scale :	Job No. 058000	Photo. No: A8.1.3
		Date : July 1993		

Note:
The proposed route tunnel emerges at the point indicated and proceeds across the valley before continuing along the hillslope in the foreground on embankments.

FREEMAN FOX MAUNSELL	Photo Title : **Northern Tunnel Portal and Approach**	Job Title : **ROUTE 3 : COUNTRY PARK SECTION EIA**		
		Scale :	Job No. 058000	Photo. No: A8.1.4
		Date : July 1993		

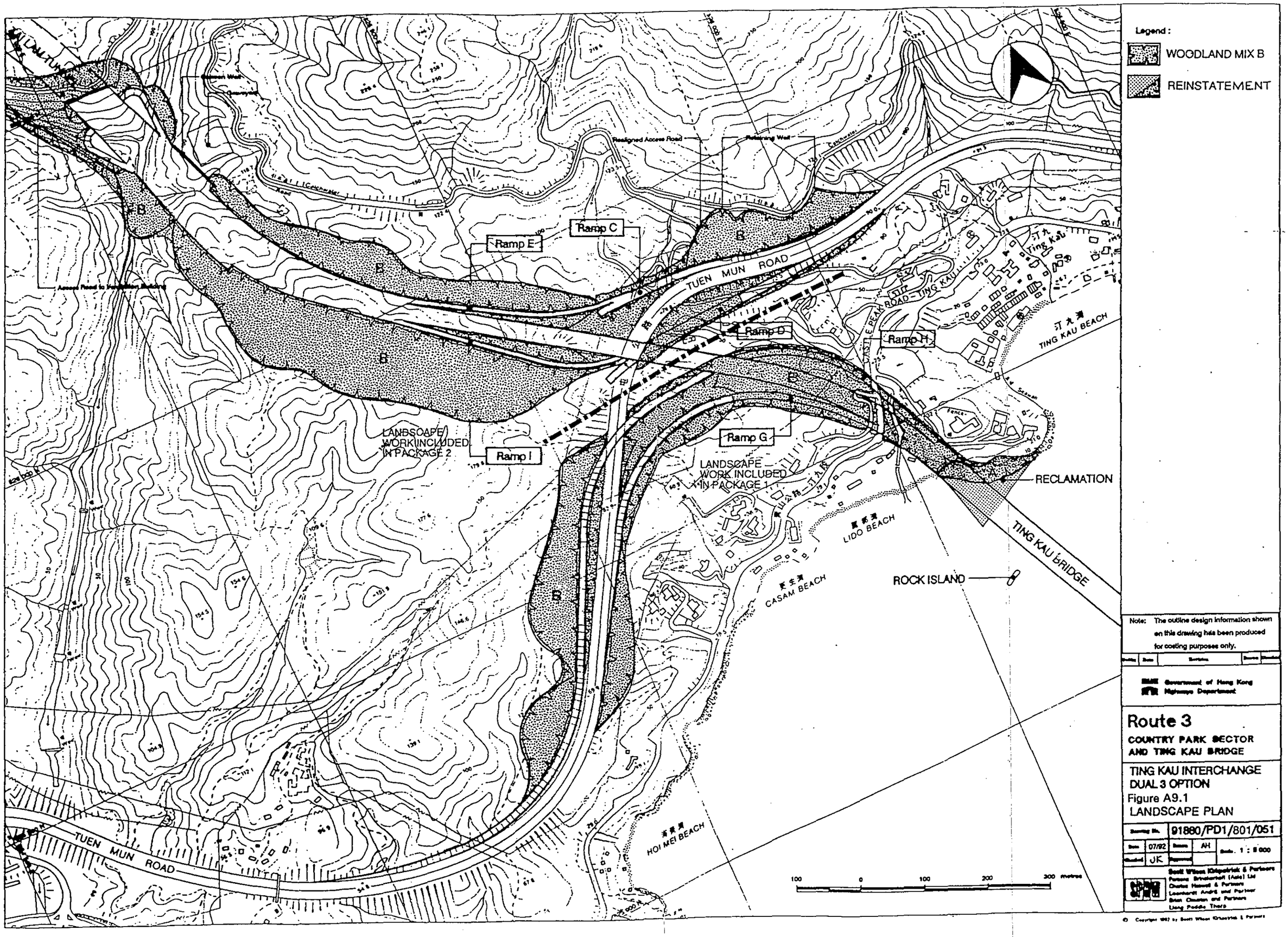


Note:
Major elongated grade seperated intersection proposed at this point with links to Yuen Long Bypass to the left of the photo and Castle Peak Road to the right .

FREEMAN FOX MAUNSELL	Photo Title : Yuen Long Intersection	Job Title : ROUTE 3 : COUNTRY PARK SECTION EIA		
		Scale :	Job No. 058000	Photo. No: A8.1.5
		Date : July 1993		

LANDSCAPING/REHABILITATION

APPENDIX A9



Note: The outline design information shown on this drawing has been produced for costing purposes only.

Government of Hong Kong
Highways Department

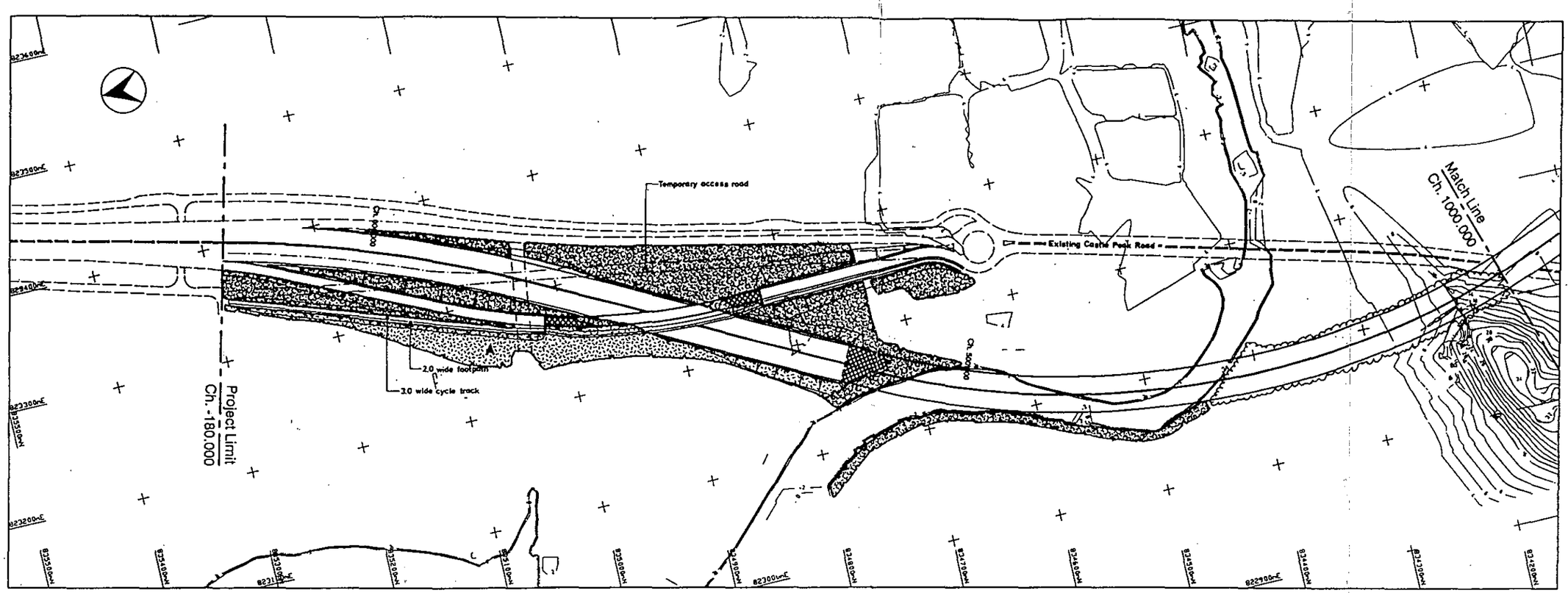
Route 3

COUNTRY PARK SECTOR AND TING KAU BRIDGE

TING KAU INTERCHANGE
DUAL 3 OPTION
Figure A9.1
LANDSCAPE PLAN

Drawing No.	91880/PD1/801/051
Date 07/92	Drawn AH
Checked JK	Approved
	Scale 1 : 5 000

Scott Wilson Kirkpatrick & Partners
Partners Brinkerhoff (Asia) Ltd
Charles Haswell & Partners
Leonhardt Andrä und Partner
Brian Clouston and Partners
Liang Peddle Thorp



Notes :

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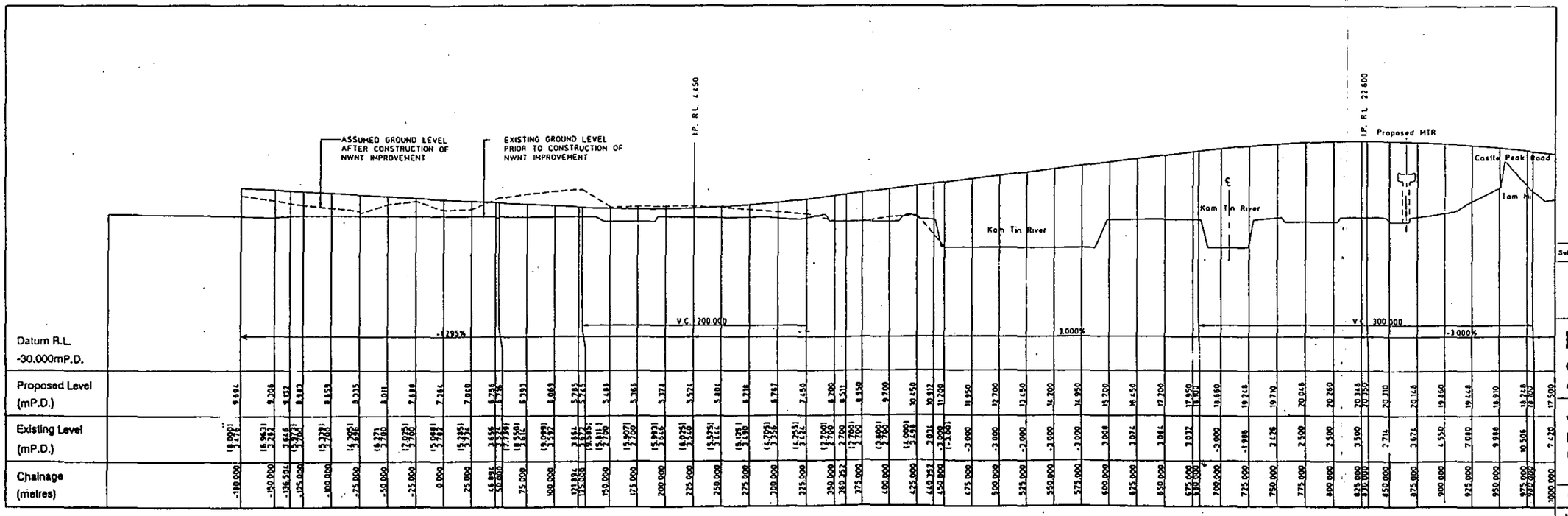
2. Coordinates are related to Hong Kong Metric Grid (1980).
3. Dimensions are in metres unless otherwise shown.
4. Levels are in metres and refer to Principal Datum (P.D.).
5. Original ground levels shown are approximate only. Ground features omitted.
6. Cut slopes and fill slopes are at 1 on 1.5 and 1 on 2.0 respectively unless otherwise shown.
7. Interchange geometry supplied by Highways Department.

Legend :

- Highway
- Bridge / Viaduct
- Tunnel
- Cut Slope
- Fill Slope
- Retaining Wall
- WOODLAND MIX A
- WOODLAND MIX B
- SHRUB MIX
- HYDROSEED WITH GRASS AND TREE SEED
- BERM PLANTING
- ROADSIDE PLANTING
- MEDIAN PLANTING
- REINSTATEMENT
- HARDSURFACING



NOTE . THE BRACKETED VALUES RELATE TO ASSUMED EXISTING GROUND LEVEL AFTER CONSTRUCTION OF NWNT IMPROVEMENT

Note: The outline design information shown on this drawing has been produced for costing purposes only.

Suffix	Date	Revision	Drawn	Checked

Government of Hong Kong
Highways Department

Route 3

COUNTRY PARK SECTOR AND TING KAU BRIDGE

YL3 - PLAN AND PROFILE
DUAL 3 OPTION
(SHEET 1 OF 6)
LANDSCAPE PLANS

Drawing No.	91880/PD1/801/101
Date	07/92
Drawn	AH
Checked	JE
Approved	
Scale	Hori. 1 : 2 000 Vert. 1 : 500

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Parsons Brinckerhoff (Asia) Ltd
Charles Haswell & Partners
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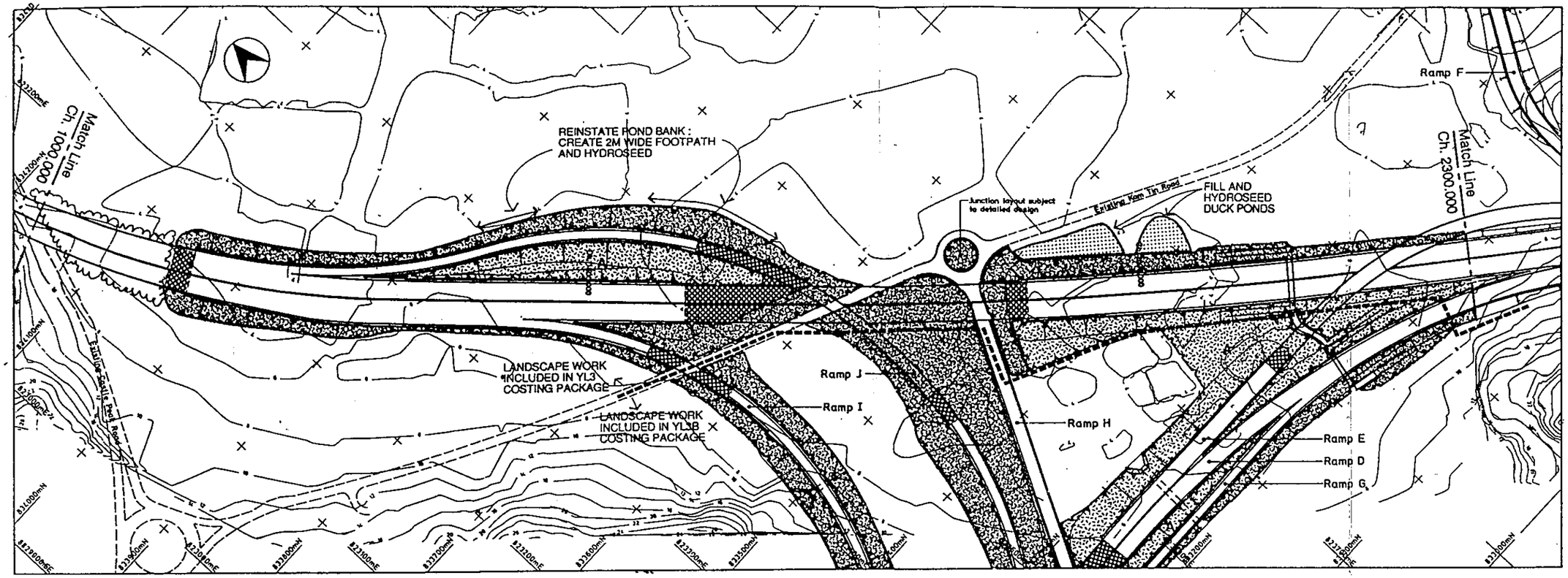
Brian Clouston and Partners
Liang Peddle Thorp



Notes :

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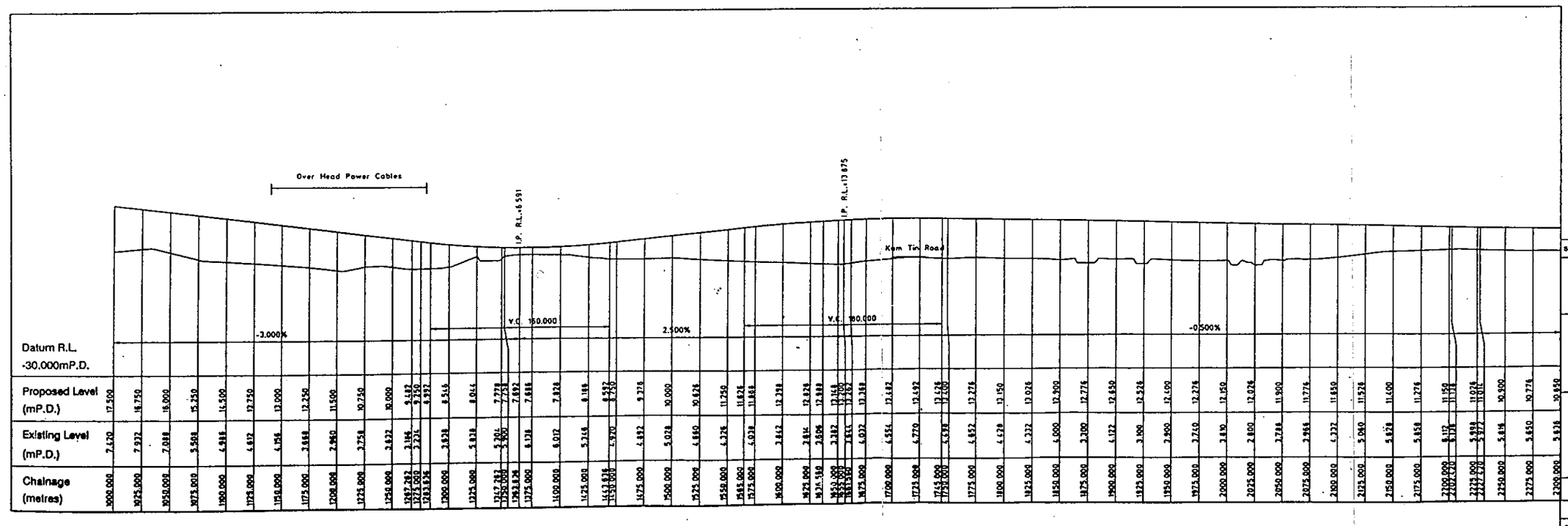
3. Dimensions are in metres unless otherwise shown.
4. Levels are in metres and refer to Principal Datum (P.D.).
5. Original ground levels shown are approximate only. Ground features omitted.
6. Cut slopes and fill slopes are at 1 on 1.5 and 1 on 2.0 respectively unless otherwise shown.
7. Interchange geometry supplied by Highways Department.

Legend :

- Highway
- Bridge / Viaduct
- Tunnel
- Cut Slope
- Fill Slope
- Retaining Wall
- WOODLAND MIX A
- WOODLAND MIX B
- SHRUB MIX
- HYDROSEED WITH GRASS AND TREE SEED
- BERM PLANTING
- ROADSIDE PLANTING
- MEDIAN PLANTING
- REINSTATEMENT
- HARDSURFACING



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Suffix	Date	Revision	Drawn	Checked

Government of Hong Kong
Highways Department

Route 3

COUNTRY PARK SECTOR AND TING KAU BRIDGE

YL3 - PLAN AND PROFILE
DUAL 3 OPTION
(SHEET 2 OF 6)
LANDSCAPE PLANS

Drawing No.	91880/PD1/801/102				
Date	07/92	Drawn	OW	Scale	Hori. 1 : 2 000 Vert. 1 : 500
Checked	JK	Approved			

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Parsons Brinckerhoff (Asia) Ltd
Charles Haswell & Partners
Leonhardt Andrä und Partner
Brian Clouston and Partners
Lieng Peddle Thorp

SWK AutoCAD D:\91880\P\ 422-03 19920601M27 Plot Scale 1:2000

Ramp F

Junction layout subject to detailed design

Access road to Kam Tin Road

Ramp E

Match Line Ch. 2300.000

Ramp D

REINSTATE POND EDGE

FILL AND HYDROSEED DUCK PONDS

Match Line Ch. 3600.000

For details of Toll Plaza and Administration Building Area see drg. no. 91880/PD1/101/201

Notes :

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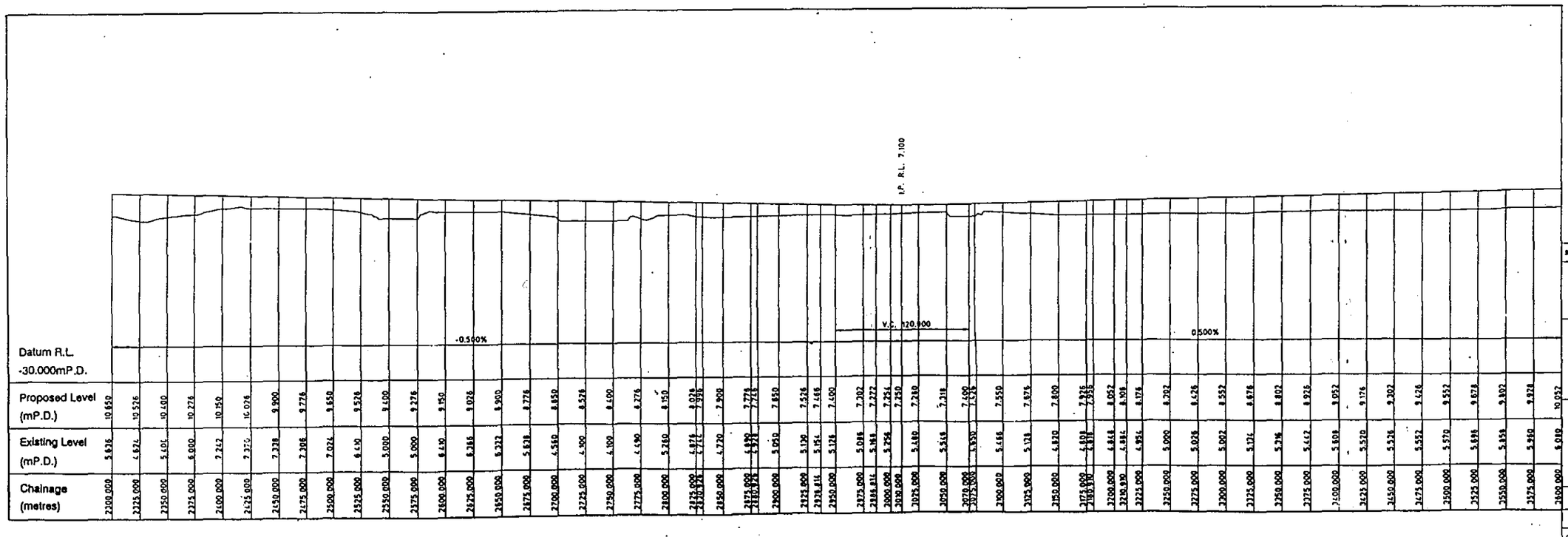
2. Coordinates are related to Hong Kong Metric Grid (1980).
3. Dimensions are in metres unless otherwise shown.
4. Levels are in metres and refer to Principal Datum (P.D.).
5. Original ground levels shown are approximate only. Ground features omitted.
6. Cut slopes and fill slopes are at 1 on 1.5 and 1 on 2.0 respectively unless otherwise shown.
7. Interchange geometry supplied by Highways Department.

Legend :

- Highway
- Bridge / Viaduct
- Tunnel
- Cut Slope
- Fill Slope
- Retaining Wall
- WOODLAND MIX A
- WOODLAND MIX B
- SHRUB MIX
- HYDROSEED WITH GRASS AND TREE SEED
- BERM PLANTING
- ROADSIDE PLANTING
- MEDIAN PLANTING
- REINSTATEMENT
- HARDSURFACING



Note: The outline design information shown on this drawing has been produced for costing purposes only.

Suffix	Date	Revision	Drawn	Checked

Government of Hong Kong
Highways Department

Route 3
COUNTRY PARK SECTOR AND TING KAU BRIDGE

YL3 - PLAN AND PROFILE
DUAL 3 OPTION
(SHEET 3 OF 6)
LANDSCAPE PLANS

Drawing No.	91880/PD1/801/103				
Date	07/92	Drawn	CW	Scale	Hori. 1 : 2 000 Vert. 1 : 500
Checked	UK	Approved			

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Parsons Brinckerhoff (Asia) Ltd
Charles Haswell & Partners
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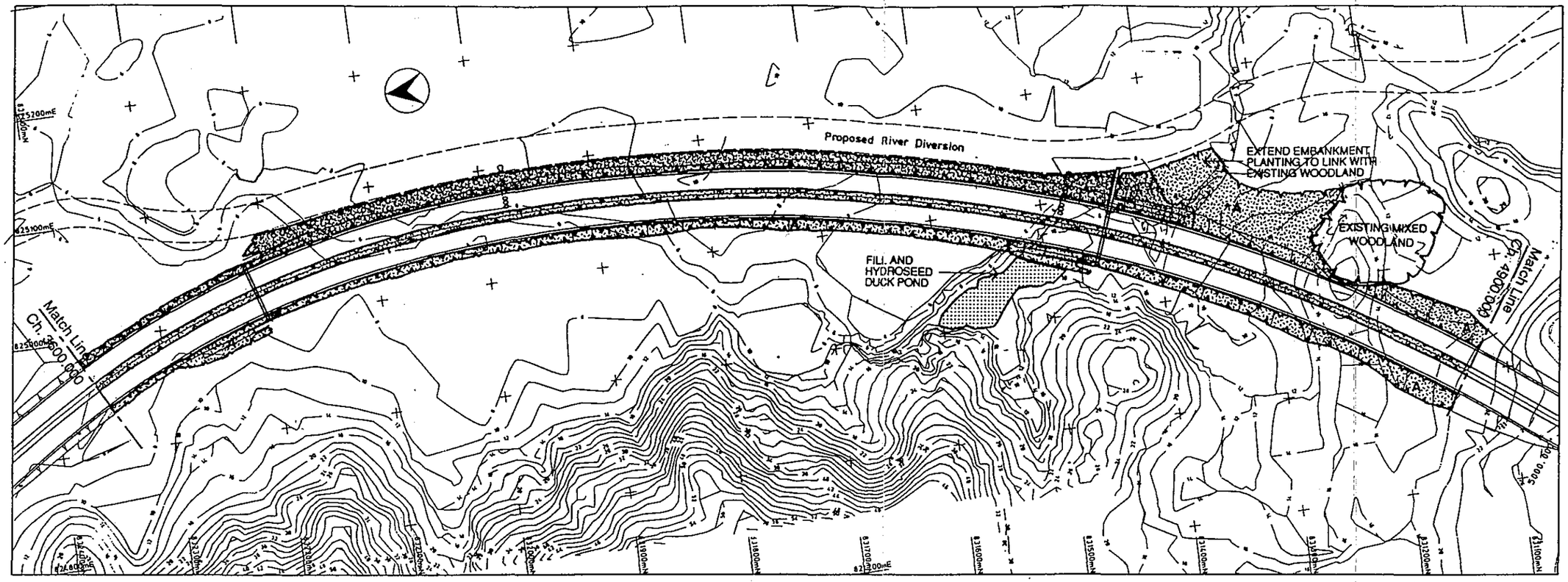
Brian Clouston and Partners
Liang Paddle, Thorp



Notes :

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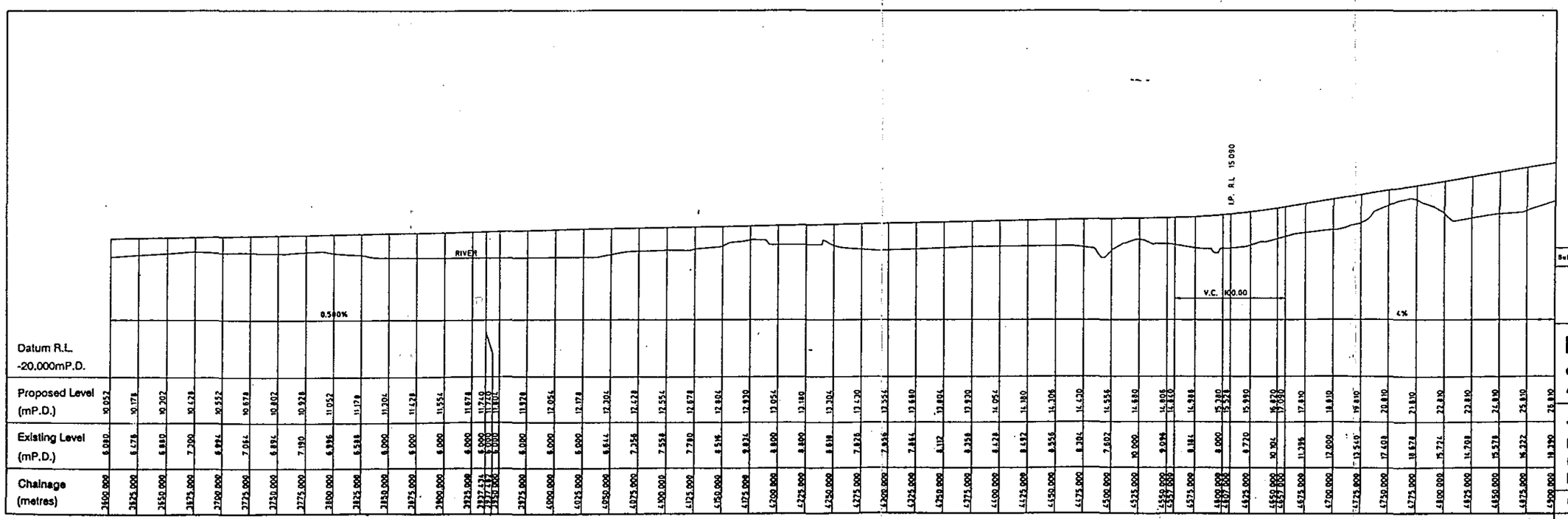
2. Coordinates are related to Hong Kong Metric Grid (1980).
3. Dimensions are in metres unless otherwise shown.
4. Levels are in metres and refer to Principal Datum (P.D.).
5. Original ground levels shown are approximate only. Ground features omitted.
6. Cut slopes and fill slopes are at 1 on 1.5 and 1 on 2.0 respectively unless otherwise shown.

Legend :

- Highway
- Bridge / Viaduct
- Tunnel
- Cut Slope
- Fill Slope
- Retaining Wall

- WOODLAND MIX A
- WOODLAND MIX B
- SHRUB MIX
- HYDROSEED WITH GRASS AND TREE SEED
- BERM PLANTING
- ROADSIDE PLANTING
- MEDIAN PLANTING
- REINSTATEMENT
- HARDSURFACING



Note: The outline design information shown on this drawing has been produced for costing purposes only.

Suffix	Date	Revision	Drawn	Checked

Government of Hong Kong
Highways Department

Route 3

COUNTRY PARK SECTOR AND TING KAU BRIDGE

YL3 - PLAN AND PROFILE
DUAL 3 OPTION
(SHEET 4 OF 6)
LANDSCAPE PLANS

Drawing No.	91880/PD1/801/104				
Date	07/92	Drawn	OW	Scale	Hori. 1 : 2 000 Vert. 1 : 500
Checked	VF	Approved			

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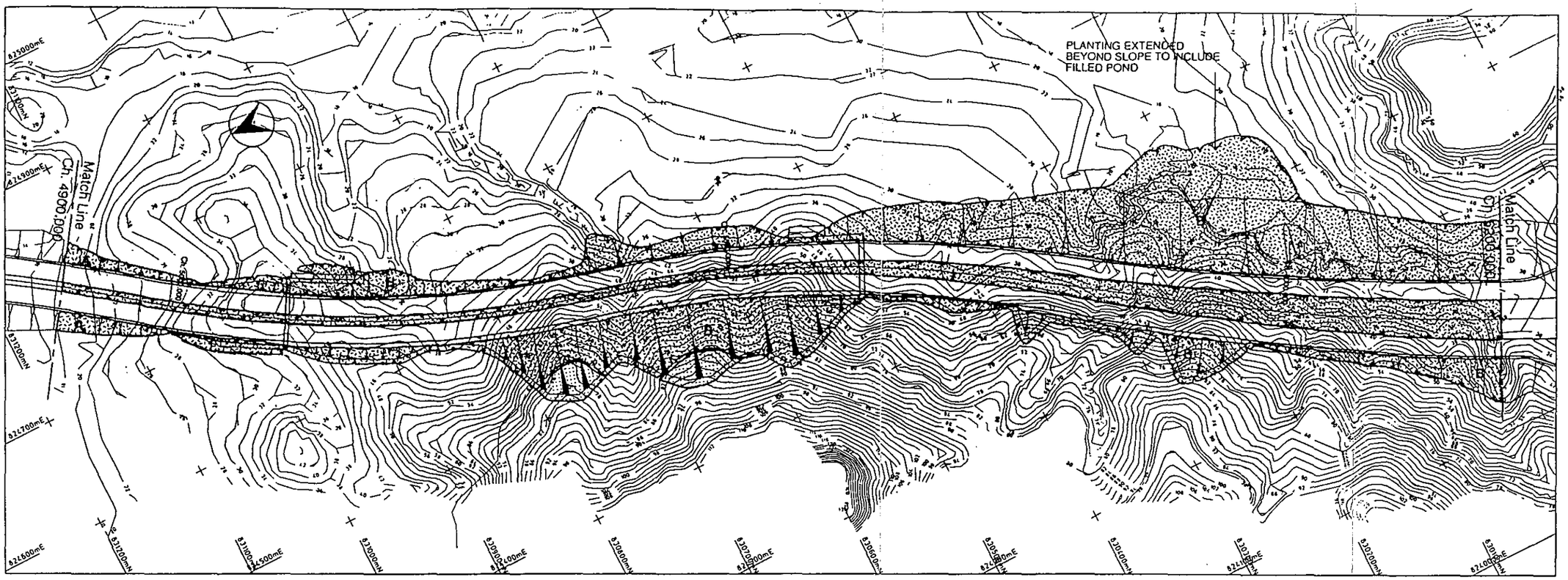
Brian Clouston and Partners
Liang Peddle Thorp

3WK AutoCAD D:\8M880\P1\424-DJ04 1992080814S5 Plot Scale 1:2000



Notes :

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2. Coordinates are related to Hong Kong Metric Grid (1980).
3. Dimensions are in metres unless otherwise shown.
4. Levels are in metres and refer to Principal Datum (P.D.).
5. Original ground levels shown are approximate only. Ground features omitted.
6. Cut slopes and fill slopes are at 1 on 1.5 and 1 on 2.0 respectively unless otherwise shown.

Legend :

- Highway
- Bridge / Viaduct
- Tunnel
- Cut Slope
- Fill Slope
- Retaining Wall
- A — WOODLAND MIX A
- B — WOODLAND MIX B
- SHRUB MIX
- HYDROSEED WITH GRASS AND TREE SEED
- BERM PLANTING
- ROADSIDE PLANTING
- MEDIAN PLANTING
- REINSTATEMENT
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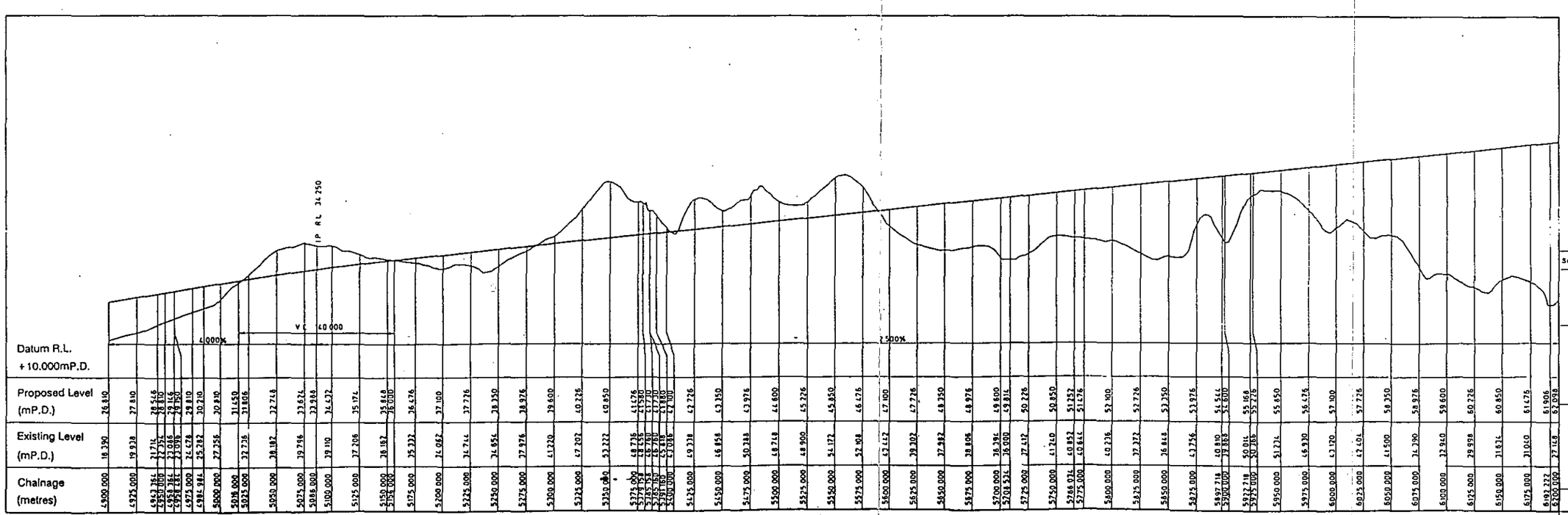

Datum R.L. +10.000mP.D.	Proposed Level (mP.D.)	Existing Level (mP.D.)	Chainage (metres)
	26.810	18.390	4900.000
	27.810	19.938	4925.000
	28.566	21.714	4943.284
	28.810	22.357	4950.000
	29.146	23.046	4958.284
	29.350	23.506	4963.284
	29.810	24.474	4975.000
	30.210	25.282	4985.284
	30.810	27.356	5000.000
	31.450	29.110	5018.000
	31.806	32.726	5025.000
	32.718	38.182	5050.000
	33.674	39.756	5075.000
	34.572	39.110	5098.000
	35.172	37.708	5125.000
	35.448	38.182	5150.000
	36.010	38.182	5158.000
	36.476	35.332	5175.000
	37.100	31.982	5200.000
	37.726	34.744	5225.000
	38.350	34.456	5250.000
	38.976	37.976	5275.000
	39.600	41.720	5300.000
	40.226	47.202	5325.000
	40.850	52.222	5350.000
	41.476	48.726	5375.000
	41.730	48.768	5385.784
	41.880	48.768	5398.784
	42.000	45.318	5410.000
	42.726	49.338	5425.000
	43.350	46.858	5450.000
	43.976	50.388	5475.000
	44.600	48.718	5500.000
	45.226	48.900	5525.000
	45.850	54.172	5550.000
	46.476	52.908	5575.000
	47.100	43.422	5600.000
	47.726	39.302	5625.000
	48.350	37.382	5650.000
	48.976	38.806	5675.000
	49.600	38.396	5700.000
	49.816	36.000	5704.526
	50.226	37.612	5725.000
	50.850	41.740	5750.000
	51.252	40.852	5768.024
	51.676	40.644	5775.000
	52.100	40.236	5800.000
	52.726	37.322	5825.000
	53.350	36.848	5850.000
	53.976	43.756	5875.000
	54.541	49.910	5887.718
	54.600	49.383	5900.000
	55.168	50.011	5922.718
	55.276	50.388	5925.000
	55.450	51.274	5950.000
	56.076	46.320	5975.000
	57.100	43.120	6000.000
	57.726	42.404	6025.000
	58.350	41.500	6050.000
	58.976	36.780	6075.000
	59.600	32.940	6100.000
	60.226	29.958	6125.000
	60.850	31.832	6150.000
	61.476	31.010	6175.000
	61.906	27.168	6192.272
	62.398	27.168	6200.000

Note: The outline design information shown on this drawing has been produced for costing purposes only.

Suffix	Date	Revision	Drawn	Checked

Government of Hong Kong
Highways Department

Route 3

COUNTRY PARK SECTOR AND TING KAU BRIDGE

YL3 - PLAN AND PROFILE
DUAL 3 OPTION
(SHEET 5 OF 6)
LANDSCAPE PLANS

Drawing No.	91880/PD1/801/105				
Date	03/92	Drawn	AH	Scale	Hori 1 : 2 000
Checked	JKC	Approved			Vert 1 : 500

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Parsons Brinckerhoff (Asia) Ltd
Charles Haswell & Partners
Leonhardt Andrä und Partner
Brian Clouston and Partners
Liang Paddle Thorp

ECOLOGY

APPENDIX A11

A11.1 BUTTERFLY SPECIES RECORDED FROM HO PUI

Parnara guttata
Pelopidas mathias
Graphium sarpedon
Graphium doson
Graphium agamemnon
Graphium antiphates
Papilio xuthus
Papilio demoleus
Papilio helenus
Papilio polytes
Papilio memnon
Papilio protenor
Papilio bianor
Papilio paris
Delias hyparete
Delias pasithoe
Pieris canidia
Catopsilia pyranthe
Eurema hecabe
Spindasis syama
Remelana jangala
Heliophorus epicles
Nacaduba kuravaldeopsis similis
Jamides bochus
Catochrysops strabo
Lampides boeticus
Castalius rosimon
Zizeeria maha
Zizeeria karsandra
Zizina otis
Neopithecops zalmora
Acytolepis puspa
Euchrysops cnejus
Chilades lajus
Zemeros flegyas
Abisara echerius
Mycalesis mineus
Ypthima baldus
Faunis eumeus
Charaxes bernardus
Ariadne ariadne
Cupha erymanthis
Precis almana
Precis atlites
Precis orithya
Neptis hylas
Athyma perius
Hestina assimilis
Parantica aglea
Danaus genutia
Euploea midamus
Euploea core

A11.2 PLANT SPECIES RECOMMENDED FOR USE IN LANDSCAPING

Bambusa tuldoides
Celtis sinensis
Cinnamomum camphora
Ficus microcarpa
Ficus superba
Ilex rotunda
Ligustrum sinense
Macaranga tanarius
Malvaviscus arboreus var. penduliflorus
Melia azedarach
Sapium discolor
Sapium sebiferum
Trema orientalis

APPENDIX A11.3

ROUTE 3 ALIGNMENT THROUGH TAI LAM COUNTRY PARK ECOLOGICAL ASSESSMENT

1. INTRODUCTION

The initial alignment for Route 3 from the northern portal to Au Tau followed the Kam Tin River valley. The alternative, and preferred alignment shifts some 2km of roadway from the Kam Tin River valley to the low hills immediately to the west. This shift will require roughly 200m of roadway to cross a portion of Tai Lam Country Park, and affect approximately 1.8ha of the Country Park as a result. The portion of the Country Park to be lost to the road alignment is hereafter referred to as the "affected area".

Tunneling through the ridge beneath the Country Park was considered in an attempt to reduce potential impacts on ecological resources due to the construction of the roadway. However, it was concluded that potential impacts to Tai Lam Country Park would have been much the same as for a surface alignment, due to the excavation required for construction of the southern tunnel portal. This option was also found to be impracticable on technical reasons and was therefore not developed further.

Whereas much of Tai Lam Country Park is forested with mature closed canopy species, the northern extent of the Park is characterized by more open forests, shrublands, grass-fernlands, and rock outcrops. Many of the ridgelines in this area are bare of vegetation, and some are eroded. The percentage of vegetative cover typically increases with decreasing elevation, and the lower slopes are often vegetated with mixed shrub-forests or tall shrubland. These habitats are interspersed with cover of grasses or ferns.

The Country Park boundary is located near the foot of the slopes. Agricultural villages lie downslope from the Park boundary. Near the proposed Route 3 crossing of the Country Park there are poultry and vegetable farms. There are also many small, light industrial firms mixed with residences. Readers are referred to the draft EIA report for the Route 3 Country Park Section, Preliminary Design Stage 2 for details of the flora and fauna to be found in this area.

Visitor use of the north-central portion of the Country Park is less frequent than in the eastern, southern, and western portions where road access is better for both public and private transport. Visitor facilities including maintained trails and interpretive centres are also more numerous in the latter areas of the Park, as are visitor attractions such as Tai Lam Ching Reservoir.

2. AFFECTED AREA OF TAI LAM COUNTRY PARK

2.1 Introduction

An ecological survey of the Route 3 alignment from the north tunnel portal to Yuen Long undertaken at night on 26 May, and during daylight on 13 March, 15 April, 5 May, and 27 May 1993. Results of that survey were reported in Section 11 of the Country Park Environmental Impact Assessment: Preliminary Design Stage 2 dated July 1993.

A separate survey was undertaken on 6 October 1993 to assess ecological resources in the affected area. The survey was conducted on foot, and the affected area was photographed. Searches were conducted for nest sites, burrows, scats, or other sign which would have indicated use by wildlife. Trees were identified on site, and specimens of grass and shrub species were collected for identification. Although there was no engineering survey to accurately locate the position of the alignment and cut slopes, the general locations of both were estimated from 1:1000 topographic maps of the site on which the proposed alignment and Country Park boundary were drawn.

The affected area contains both southerly and easterly slopes ranging from 22 to 118 m in elevation. There are several grave sites outside the Park boundary, downslope from the affected area. There are no aquatic habitats on the affected area.

2.2 Description of Flora

The primary habitat types found on the affected area are grassland, consisting of species such as *Arundinella setosa, Cymbopogon* spp. and *Gahnia tristis*, rock outcrop with sparse shrubs and few trees (*Pinus* spp.). These habitats are not of particular conservation significance as they are maintained by frequent burning of the hillside due to fires probably started at the nearby grave sites. No rare or endangered species of plant was recorded in the area. One species of plant protected under current legislation was found elsewhere along the proposed course of Route 3, *Rhododendron simsii*, protected under Forestry Regulation, (Cap.96, Section 3). This species was not recorded in the affected area.

The low grassland and rock outcrop habitats provide little cover or potential for wildlife foraging. Due to the southerly and easterly slope aspects and the sparse vegetative cover resulting from frequent fires, the site is quite dry and inhospitable to wildlife. Therefore, it is unlikely that the site harbours wildlife which would be of conservation interest or protected by local regulations or international conventions.

Within the Country Park immediately east of and downslope from the proposed alignment is an open stand of *Pinus* spp. woodland with open tall shrub understorey. This habitat is of greater ecological utility than the grassland or rock outcrop which would be disturbed by the road alignment. It provides some cover and potential nest sites for tree or shrub nesting birds. This habitat lies outside the works boundary, therefore it should not be directly affected by construction or operation of the roadway.

Within the country park to the west of the proposed alignment lies an area of relatively dense woodland with a dense shrub understorey. The dominant overstory tree species is *Pinus* spp. The western cut slope for the roadway would come within 50m of this habitat. Because the wooded area lies outside the works limit, there should be no direct impact to this habitat.

2.3 Description of Fauna

There were no burrows, nest sites, or other sign of current wildlife use of the affected area. The rock outcrops on the affected area are too small to provide cliff nesting or important perching habitat for birds of prey, although the low grassland may provide potential foraging habitat due to the absence of vegetative overstory. No birds of prey were recorded using the site at the time of the survey. No scats, scent marks, or other indication of mammal use of the affected area was recorded. However, it is likely that some rodents occupy the site or adjacent areas to be undisturbed by the roadway.

2.4 Existing Nature Conservation Areas

The principal conservation site near the affected area is the Ho Pui Site of Special Scientific Interest (SSSI). The SSSI was designated to protect a grove of trees near the village of Ho Pui which supports a breeding colony of herons and egrets. These birds typically forage on lowland or wetland habitats such as those found in the agricultural areas alongside the Kam Tin River. The birds roost and nest in the egretry. Because the affected area does not support wetland habitats which would be preferred by egrets or herons for foraging, there would likely be no indirect impact on the SSSI due to the proposed road construction or operation within the Country Park.

2.5 Potential Impacts of the Roadway Construction and Operation

The affected area does not support vegetation or wildlife protected by Hong Kong regulation or international convention. Further, it does not support habitats which would be important to preservation of the nearest ecological conservation area, the Ho Pui SSSI. Conversely, by routing the roadway through an upland site away from the Kam Tin River valley floor, loss of habitat which is important to survival of birds at the Ho Pui SSSI (agricultural and other wetland) is avoided. For these reasons, potential direct impacts due to habitat loss are considered minimal.

Other potential direct impacts on surrounding Country Park areas from construction and operation of the road are adverse affects of dust and noise, reduction of air quality due to vehicle emissions, and potential hydrologic impacts on surface or ground water flows downslope of the affected area. Potential impacts from these sources are described for the entire alignment in Section 11 of the Country Park Environmental Impact Assessment: Preliminary Design Stage 2 dated July 1993. Of these sources of potential impact, the most likely to adversely affect the Country Park area surrounding the proposed alignment are dust, vehicle emissions, and hydrologic impacts.

Dust would be generated during the construction process. Vehicle emissions would be generated to a greater extent during the operation phase. A small portion of the Country Park would be located east (downslope) of the highway. This area may be subjected to a reduction in availability of surface or ground water flows due to the highway alignment.

There are many examples of highway construction and operation near or at the boundary of Country Parks in Hong Kong (Tuen Mun Road, Route Twisk, Bride's Pool Road). Successful retention or restoration of vegetation along such roadways demonstrates that potential direct impacts from these sources on Country Park ecological resources can be mitigated and is considered to be insignificant.

Indirect impacts of the project on the Country Park may include an ecological gain due to construction of a fire barrier between several grave sites at the foot of the slope and the Country Park shrublands or woodlands upslope above the roadway. This gain may be substantial in that it could reduce fire frequency in the Country Park. This would have the benefit of reducing losses of shrub and woodland habitats, thereby promoting natural regeneration.

Visitor access to Tai Lam Country Park may be facilitated by construction of the proposed Route 3 project, but that portion of the roadway through the Park would not increase visitor access because no secondary roads or turn-outs are to be provided. Similarly, because no established or maintained hiking trails or roads to the Park would be blocked by construction of the highway, there will be little or no reduction in visitor access to the Park. For these reasons it is concluded that there will be no additional impacts on the Country Park due to visitor access via the roadway through the affected area.

2.6 Mitigation Measures

Care should be exercised to ensure that the slope cutting operation during road construction does not disturb woodland and shrubland habitat immediately east (downslope) or west of the affected area. In both cases the vegetation cover is more dense and diverse than that found on the affected area. These areas should be identified using reflective tape or other highly visible marker, and construction crews should be advised to keep equipment outside the marked sites.

Standard construction site management practice to minimize dust generation should be employed. This would include watering of haul roads, covering of spoil piles, and washing of haul trucks.

Revegetation of cut slopes and other disturbance sites in the affected area should be accomplished using native species of documented value to wildlife such as those listed by Corlett (1992).

Surveys should be conducted prior to construction on the affected area to locate any burrows or nests built after the October 1993 surveys. Should nests or burrows be located, disturbance or relocation should take place only under authorization of a permit obtained from Agriculture and Fisheries Department.

2.7 Conclusion

This assessment indicates that the affected area and the grassland or rock outcrop habitats to be disturbed are not of major ecological significance. The Country Park areas supporting habitats which offer greatest potential for wildlife use (woodland and shrubland) are largely preserved, while those habitats offering least potential for wildlife use (grassland and rock outcrop) will be disturbed. In addition, disturbance of the affected area will not diminish availability of habitats required by wildlife species for which conservation measures are currently in force (egrets and herons at the Ho Pui SSSI).

References Cited

Corlett, R T. 1993. Plants attractive to frugiverous birds in Hong Kong. H. K. Nat. Hist. Soc. no. 19:115-116.

APPENDICES

PART II

A17 Air Quality

A18 Noise

AIR QUALITY

APPENDIX A17

A17.1 CALINE4 MODEL INPUT

TRAFFIC FLOWS FOR YEAR 2011

Morning peak-hour traffic flows for year 2011 have been predicted and are shown below in Table A17.1. The flows on Route 3 CPS, its slip roads and connecting roads are from information supplied by Transport Department. Transport Department predictions have been converted from PCUs/hour to vehicles/hour using a factor of 1.65.

A uniform traffic mix has been assumed on all roads: motorcycles (1%), passenger cards (12%), taxis (7%), light goods vehicles (25%), medium goods vehicles (44%), heavy goods vehicles (6%), coaches (1%), light buses (1%), and franchised buses (3%). All vehicles are assumed to have diesel engines with the exception of passenger cars and motorcycles, which are assumed to have petrol engines.

TABLE A17.1 MORNING PEAK HOUR TRAFFIC FLOWS: 2011

ROAD SEGMENT	Vehicles/Hour
	2011
Tai Lam Tunnel (Northbound)	3890
Tai Lam Tunnel (Southbound)	4200
Link Road I (from Kam Tin Road)	290
Link Road J (to Kam Tin Road)	880
Route 3 south of northern alternative alignment (Northbound)	3020
Route 3 south of northern alternative alignment (Southbound)	3910
Kam Tin Road (Eastbound)	920
Kam Tin Road (Westbound)	1820
Castle Peak Road - Yuen Long (Eastbound)	2100
Castle Peak Road - Yuen Long (Westbound)	3100
Castle Peak Road - Tam Mei (Northbound)	1180
Castle Peak Road - Tam Mei (Southbound)	1280
Northern Alternative Alignment (next to Small Traders New Village) (Northbound)	3430
Northern Alternative Alignment (next to Small Traders New Village) (Southbound)	2350
Slip Road: Northern alternative alignment onto Route 3 northbound onto northern alternative alignment	1410
Slip Road: Northern alternative alignment onto Route 3 southbound	1840
Slip Road: Route 3 southbound onto northern alternative alignment	1380
Slip Road: Route 3 northbound onto northern alternative alignment	970
Route 3 over Kam Tin River (Northbound)	2040
Route 3 over Kam Tin River (Southbound)	2080
Route 3 north of Au Tau Interchange slip roads (Northbound)	3460
Route 3 north of Au Tau Interchange slip roads (Southbound)	3460

NOISE

APPENDIX A18

A18.1

PREVAILING NOISE LEVEL ESTIMATION

A18.1 PREVAILING NOISE LEVEL ESTIMATION

The traffic data for the existing roads in the study area (Kam Tin Road and Castle Peak Road), extracted from Annual Traffic Census 1992, has been used. Based on these figures the traffic flow on existing road network for the year 1994 (prior to construction of Route 3 CPS) has been predicted and is presented in this Appendix.

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Route 3 Northern Link
Existing (1992) Traffic

Source: 1992 ATC supplied by Axis in fax of 18 Nov 1993

Castle Peak Road (Yuen Long)
(Core Stn. 5019)

Annual Growth (1973-1992):	44000 vehicles
	19 years
	2316 veh/yr (AADT)
Assume that proportion over peak hour remains the same.	
AADT in 1992:	58900 veh (Mon-Fri)
Add 2 yrs vehs:	4632 veh
Total AADT (1994):	63532 veh (estimated)
K =	6.6%(given in ATC)
Therefore	4193 vehicles in peak hour (2-way) in '94
Directional Split:	
D =	51.8%W/b
Therefore	2172 W/b
	2021 E/b
Proportion of heavy veh (AM peak):	50.3 %

Castle Peak Road (Tam Mi)
(Core Stn. 5016)

Annual Growth (1973-1992):	28000 vehicles
	19 years
	1474 veh/yr (AADT)
Assume that proportion over peak hour remains the same.	
AADT in 1992:	32510 veh (Mon-Fri)
Add 2 yrs vehs:	2947 veh
Total AADT (1994):	35457 veh (estimated)
K =	6.6%(given in ATC)
Therefore	2340 vehicles in peak hour (2-way) in '94
Directional Split:	
D =	51.9%S/b
Therefore	1215 S/b
	1126 N/b
Proportion of heavy veh (AM peak):	58.5 %

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Route 3 Northern Link
Existing (1992) Traffic

Kam Tin Road
(Station 6051)

Annual Growth: not available. Using growth rate from
nearby sections of Castle Peak Road, the rate over the
past year is about: 5.3%(AADT)
Assume that proportion over peak hour remains the same.
AADT in 1992: 23700 veh (Mon-Fri)
Add 2 yrs vehs: 26195 veh 1994 AADT (estimated)

K = 6.6%(assume same as for Castle Peak Road)
Therefore 1729 vehicles in peak hour (2-way) in '94

Directional Split (assume same as for Castle Peak Road)
D = 51.9%N/b
Therefore 897 N/b
832 E/b

Proportion of heavy veh (AM peak) -- assume same
as for Castle Peak Road Yuen Long: 50.3 %

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A18.2

APPLICATION OF THE EXCO CRITERIA

A18.2 APPLICATION OF THE ExCo CRITERIA

Five different scenarios have been modelled and assessed; unmitigated Route 3 CPS alignment and provision of 1, 2, 3 or 4m barrier respectively. The results are shown in Figure 18.13.

The ExCo criteria, points 2 and 3, have been applied and on basis of this mitigation measures, in form of barriers and/or receiver mitigation, are recommended. The recommendations are presented in Chapter 18 Volume 3A.

CASTLE PEAK ROAD
NORTHERN LINK

APPLICATION OF EXCO CRITERIA

R19	R19	77.1	75.5	1.6	74.6	73.5	3.6
R20	R20	84.3	80.2	4.1	72.9	84.0	0.?
R21	R21	72.3	69.6	2.7	67.1	70.8	1.5
R22	R22	72.4	69.1	3.3	67.9	70.5	1.9
R23	R23	74.4	69.0	5.4	67.9	73.3	1.1
R26	R26	70.9	68.1	2.8	64.7	69.7	1.2
X1S	R25	78.2	73.2	5.0	68.9	77.7	0.5
X2	R24	76.6	72.1	4.5	69.5	75.6	1.0
X3N	R27	71.5	68.8	2.7	68.0	69.0	2.5
X4N	R28	79.1	75.2	3.9	71.0	78.4	0.7
X5N	R30	77.9	75.7	2.2	70.0	77.1	0.8
X5W	R29	83.4	81.0	2.4	61.8	83.4	0.0
X6NE	R31	79.0	78.3	0.7	73.3	77.7	1.3
X6SW	R32	82.8	79.3	3.5	59.0	82.8	0.0
X7E	R33	73.9	70.9	3.0	69.2	72.1	1.8
X8S1	R34	71.6	70.3	1.3	69.9	66.6	5.0
X9 - 6	R35 - 6	67.9	44.9	23.0	67.9	46.9	21.0
X9 - 4	R35 - 4	75.1	65.9	9.2	74.2	67.8	7.3
X9 - 8	R35 - 8	75.8	65.9	9.9	75.0	67.8	8.0
X10	R36	68.9	67.5	1.4	66.5	65.1	3.8
X11	R37	70.1	68.2	1.9	68.5	65.0	5.1
X12E	R38	69.3	67.6	1.7	68.9	59.1	10.2
A1	R1	76.8	74.4	2.4	70.5	75.7	1.1
A2	R2	76.0	73.5	2.5	69.7	74.8	1.2
A3	R3	71.5	67.5	4.0	66.3	70.0	1.5
A4	R4	76.8	74.0	2.8	64.4	76.5	0.3
A5	R5	69.6	61.4	8.2	68.5	59.3	10.3
A6	R13	70.1	64.3	5.8	68.2	65.6	4.5
A7	R16	70.4	65.7	4.7	67.5	67.3	3.1
A8	R18	74.4	69.7	4.7	72.2	70.5	3.9
A9	R39	75.5	70.5	5.0	74.6	68.1	7.4
A10	R40	69.3	65.8	3.5	68.3	62.6	6.7
A11	R41	73.6	72.3	1.3	71.1	70.1	3.5
A12	R42	73.0	70.3	2.7	69.2	70.7	2.3
A13	R43	75.0	72.0	3.0	70.5	73.1	1.9

CASTLE PEAK ROAD
NORTHERN LINK

APPLICATION OF EXCO CRITERIA

Uses results dated: 25 Nov for 2011 scenario
19 Nov for 1994 scenario

ExCo Criteria: Column

1 The predicted overall noise level from the new or improved road, together with other traffic noise in the vicinity, must not be less than the HKPSG criteria; C

2 the predicted noise level is at least 1.0 dB(A) more than the prevailing noise level, i.e., the total traffic noise level existing before the works to construct the road were commenced; E

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

Note:
criterion 2 Predicted noise level: year 2011
Prevailing noise level: year 1994

Column Number:		C	D	E	G	H	I
Scenario: Unmitigated					2011	2011	2011
Rec ID (DOE-88)	Rec ID (Report)	2011 Predicted Noise Level (Total) dB(A)	1994 Est'ed Noise Level (Total) dB(A)	Difference dB(A)	Rte 3 Noise Level dB(A)	Existing Roads: Noise Level dB(A)	Route 3: Contribution to Overall Nse Level dB(A)
R6	R6	77.6	72.8	4.8	75.0	74.1	3.5
R7	R7	74.2	70.5	3.7	68.1	73.0	1.2
R8	R8	70.1	64.8	5.3	68.9	63.8	6.3
R9	R9	73.3	71.0	2.3	71.2	69.1	4.2
R10	R10	73.1	70.7	2.4	70.2	69.9	3.2
R11	R11	71.4	69.4	2.0	67.8	68.9	2.5
R12	R12	71.0	68.5	2.5	70.4	61.8	9.2
R14	R14	75.9	72.2	3.7	69.6	74.7	1.2
R15	R15	82.5	79.8	2.7	67.8	82.3	0.2
R17	R17	71.4	63.4	8.0	70.3	64.9	6.5

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CASTLE PEAK ROAD
NORTHERN LINK

APPLICATION OF EXCO CRITERIA

Column Number:		C	D	E	G	H	I
Scenario: Mitigated with 1 m barrier					2011	2011	2011
Rec ID (DOE-88)	Rec ID (Report)	2011 Predicted Noise Level (Total) dB(A)	1994 Est'ed Noise Level (Total) dB(A)	Difference dB(A)	Rte 3 Noise Level dB(A)	Existing Roads: Noise Level dB(A)	Route 3: Contribution to Overall Nse Level dB(A)
R6	R6	76.4	72.8	3.6	72.5	74.1	2.3
R7	R7	74.1	70.5	3.6	67.6	73.0	1.1
R8	R8	69.8	64.8	5.0	68.6	63.8	6.0
R9	R9	73.0	71.0	2.0	70.7	69.1	3.9
R10	R10	72.7	70.7	2.0	69.5	69.9	2.8
R11	R11	71.1	69.4	1.7	67.1	68.9	2.2
R12	R12	70.4	68.5	1.9	69.8	61.8	8.6
R14	R14	75.7	72.2	3.5	68.8	74.7	1.0
R15	R15	82.4	79.8	2.6	67.1	82.3	0.1
R17	R17	70.9	63.4	7.5	69.7	64.9	6.0

CASTLE PEAK ROAD
NORTHERN LINK

APPLICATION OF EXCO CRITERIA

R20	R20	84.3	80.2	4.1	72.3	84.0	0.3
R21	R21	72.3	69.6	2.7	67.1	70.8	1.5
R22	R22	72.4	69.1	3.3	67.8	70.5	1.9
R23	R23	74.3	69.0	5.3	67.5	73.3	1.0
R26	R26	70.8	68.1	2.7	64.4	69.7	1.1
X1S	R25	78.2	73.2	5.0	68.4	77.7	0.5
X2	R24	76.5	72.1	4.4	69.1	75.6	0.9
X3N	R27	71.6	68.8	2.8	67.5	69.0	2.6
X4N	R28	79.1	75.2	3.9	70.7	78.4	0.7
X5N	R30	77.9	75.7	2.2	69.8	77.1	0.8
X5M	R29	83.4	81.0	2.4	61.3	83.4	0.0
X6NE	R31	78.9	78.3	0.6	72.7	77.7	1.2
X6SW	R32	82.8	79.3	3.5	58.9	82.8	0.0
X7E	R33	74.7	70.9	3.8	69.0	72.1	2.6
X8SI	R34	71.3	70.3	1.0	69.6	66.6	4.7
X9 - 6	R35 - 6	67.3	44.9	22.4	67.3	46.9	20.4
X9 - 4	R35 - 4	74.4	65.9	8.5	73.3	67.8	6.6
X9 - 8	R35 - 8	75.7	65.9	9.8	74.9	67.8	7.9
X10	R36	68.8	67.5	1.3	66.3	65.1	3.7
X11	R37	69.6	68.2	1.4	67.7	65.0	4.6
X12E	R38	69.1	67.6	1.5	68.6	59.1	10.0
A1	R1	76.8	74.4	2.4	70.3	75.7	1.1
A2	R2	75.9	73.5	2.4	69.5	74.8	1.1
A3	R3	71.4	67.5	3.9	65.8	70.0	1.4
A4	R4	76.7	74.0	2.7	63.8	76.5	0.2
A5	R5	68.7	61.4	7.3	68.2	59.3	9.4
A6	R13	69.8	64.3	5.5	67.8	65.6	4.2
A7	R16	70.2	65.7	4.5	67.1	67.3	2.9
A8	R18	74.4	69.7	4.7	72.2	70.5	3.9
A9	R39	75.3	70.5	4.8	74.4	68.1	7.2
A10	R40	68.9	65.8	3.1	67.8	62.6	6.3
A11	R41	73.4	72.3	1.1	70.6	70.1	3.3
A12	R42	72.7	70.3	2.4	68.6	70.7	2.0
A13	R43	74.8	72.0	2.8	69.9	73.1	1.7

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CASTLE PEAK ROAD
NORTHERN LINK

APPLICATION OF EXCO CRITERIA

Column Number:		C	D	E	G	H	I
Scenario: Mitigated with 2 m barrier					2011	2011	2011
Rec ID (DOE-88)	Rec ID (Report)	2011 Predicted Noise Level (Total) dB(A)	1994 Est'ed Noise Level (Total) dB(A)	Difference dB(A)	Rte 3 Noise Level dB(A)	Existing Roads: Noise Level dB(A)	Route 3: Contribution to Overall Nse Level dB(A)
R6	R6	75.8	72.8	3.0	71.0	74.1	1.7
R7	R7	73.7	70.5	3.2	65.3	73.0	0.7
R8	R8	68.9	64.8	4.1	67.3	63.8	5.1
R9	R9	71.6	71.0	0.6	68.1	69.1	2.5
R10	R10	71.5	70.7	0.8	66.8	69.9	1.6
R11	R11	70.2	69.4	0.8	64.6	68.9	1.3
R12	R12	68.6	68.5	0.1	67.7	61.8	6.8
R14	R14	75.3	72.2	3.1	66.8	74.7	0.6
R15	R15	82.4	79.8	2.6	66.3	82.3	0.1
R17	R17	70.2	63.4	6.8	68.9	64.9	5.3

FILENAME: C:\BACKUPS\RTE3CPS\EXCO.WK1 (p. 6, printed 26-Nov-93)

CASTLE PEAK ROAD
NORTHERN LINK

APPLICATION OF EXCO CRITERIA

R20	R20	84.2	80.2	4.0	71	84.0	0.2
R21	R21	72.4	69.6	2.8	67.4	70.8	1.6
R22	R22	72.3	69.1	3.2	67.7	70.5	1.8
R23	R23	74.0	69.0	5.0	66	73.3	0.7
R26	R26	70.7	68.1	2.6	63.7	69.7	1.0
X1S	R25	78.0	73.2	4.8	66.5	77.7	0.3
X2	R24	76.2	72.1	4.1	67.6	75.6	0.6
X3N	R27	70.8	68.8	2.8	65.3	69.0	1.8
X4N	R28	78.9	75.2	3.7	69.3	78.4	0.5
X5N	R30	77.8	75.7	2.1	69.1	77.1	0.7
X5W	R29	83.4	81.0	2.4	60.0	83.4	0.0
X6NE	R31	78.5	78.3	0.2	70.5	77.7	0.8
X6SW	R32	82.8	79.3	3.5	57.5	82.8	0.0
X7E	R33	74.5	70.9	3.6	68.3	72.1	2.4
X8S1	R34	70.7	70.3	0.4	68.7	66.6	4.1
X9 - 6	R35 - 6	65.5	44.9	20.6	65.4	46.9	18.6
X9 - 4	R35 - 4	72.1	65.9	6.2	70.1	67.8	4.3
X9 - 8	R35 - 8	75.1	65.9	9.2	74.2	67.8	7.3
X10	R36	68.0	67.5	0.5	65.0	65.1	2.9
X11	R37	68.7	68.2	0.5	66.2	65.0	3.7
X12E	R38	68.2	67.6	0.6	67.7	59.1	9.1
A1	R1	76.7	74.4	2.3	69.8	75.7	1.0
A2	R2	75.8	73.5	2.3	69.1	74.8	1.0
A3	R3	71.0	67.5	3.5	63.9	70.0	1.0
A4	R4	76.6	74.0	2.6	51.7	76.5	0.1
A5	R5	68.4	61.4	7.0	66.9	59.3	9.1
A6	R13	69.3	64.3	5.0	66.8	65.6	3.7
A7	R16	69.8	65.7	4.1	66.1	67.3	2.5
A8	R18	74.4	69.7	4.7	72.2	70.5	3.9
A9	R39	74.4	70.5	3.9	73.3	68.1	6.3
A10	R40	67.4	65.8	1.6	65.7	62.6	4.8
A11	R41	72.4	72.3	0.1	68.6	70.1	2.3
A12	R42	71.9	70.3	1.6	66.1	70.7	1.2
A13	R43	74.2	72.0	2.2	67.6	73.1	1.1

FILENAME: C:\BACKUPS\RTE3CPS\EXCO.WK1 (p. 7, printed 26-Nov-93)

CASTLE PEAK ROAD
NORTHERN LINK

APPLICATION OF EXCO CRITERIA

Column Number:		C	D	E	G	H	I
Scenario: Mitigated with 3 m barrier					2011	2011	2011
Rec ID (DOE-88)	Rec ID (Report)	2011 Predicted Noise Level (Total) dB(A)	1994 Est'ed Noise Level (Total) dB(A)	Difference dB(A)	Rte 3 Noise Level dB(A)	Existing Roads: Noise Level dB(A)	Route 3: Contribution to Overall Nse Level dB(A)
R6	R6	75.0	72.8	2.2	68.1	74.1	0.9
R7	R7	73.5	70.5	3.0	63.5	73.0	0.5
R8	R8	68.2	64.8	3.4	66.3	63.8	4.4
R9	R9	70.7	71.0	-0.3	66.1	69.1	1.6
R10	R10	70.9	70.7	0.2	64.7	69.9	1.0
R11	R11	69.7	69.4	0.3	62.6	68.9	0.8
R12	R12	67.3	68.5	-1.2	66.2	61.8	5.5
R14	R14	75.1	72.2	2.9	65.2	74.7	0.4
R15	R15	82.4	79.8	2.6	65.4	82.3	0.1
R17	R17	69.5	63.4	6.1	58.0	64.9	4.6

FILENAME: C:\BACKUPS\RTE3CPS\EXCO.WK1 (p. 8, printed 26-Nov-93)

CASTLE PEAK ROAD
NORTHERN LINK

APPLICATION OF EXCO CRITERIA

R20	R20	84.2	80.2	4.0	70.1	84.0	0.2
R21	R21	72.4	69.6	2.8	67.4	70.8	1.6
R22	R22	72.3	69.1	3.2	67.7	70.5	1.8
R23	R23	73.9	69.0	4.9	64.9	73.3	0.6
R26	R26	70.6	68.1	2.5	63.3	69.7	0.9
X1S	R25	77.9	73.2	4.7	65.2	77.7	0.2
X2	R24	76.1	72.1	4.0	66.7	75.6	0.5
X3N	R27	70.4	68.8	1.6	63.6	69.0	1.4
X4N	R28	78.8	75.2	3.6	68.4	78.4	0.4
X5N	R30	77.8	75.7	2.1	68.6	77.1	0.7
X5W	R29	83.4	81.0	2.4	58.9	83.4	0.0
X6NE	R31	78.1	78.3	-0.2	68.9	77.7	0.4
X6SW	R32	82.8	79.3	3.5	56.7	82.8	0.0
X7E	R33	74.4	70.9	3.5	68.0	72.1	2.3
X8S1	R34	70.2	70.3	-0.1	68.0	66.6	3.6
X9 - 6	R35 - 6	64.0	44.9	19.1	63.9	46.9	17.1
X9 - 4	R35 - 4	71.1	65.9	5.2	68.5	67.8	3.3
X9 - 8	R35 - 8	73.4	65.9	7.5	72.1	67.8	5.6
X10	R36	67.4	67.5	-0.1	64.0	65.1	2.3
X11	R37	68.0	68.2	-0.2	65.0	65.0	3.0
X12E	R38	67.6	67.6	0.0	67.1	59.1	8.5
A1	R1	76.6	74.4	2.2	69.5	75.7	0.9
A2	R2	75.8	73.5	2.3	68.8	74.8	1.0
A3	R3	70.7	67.5	3.2	62.4	70.0	0.7
A4	R4	76.6	74.0	2.6	59.9	76.5	0.1
A5	R5	67.0	61.4	5.6	66.2	59.3	7.7
A6	R13	68.8	64.3	4.5	66.0	65.6	3.2
A7	R16	69.4	65.7	3.7	65.2	67.3	2.1
A8	R18	74.4	69.7	4.7	72.2	70.5	3.9
A9	R39	74.0	70.5	3.5	72.7	68.1	5.9
A10	R40	66.5	65.8	0.7	64.5	62.6	3.9
A11	R41	71.7	72.3	-0.6	66.9	70.1	1.6
A12	R42	71.5	70.3	1.2	64.5	70.7	0.8
A13	R43	73.9	72.0	1.9	66.2	73.1	0.8

FILENAME: C:\BACKUPS\RTE3CPS\EXCO.WK1 (p. 9, printed 26-Nov-93)

CASTLE PEAK ROAD
NORTHERN LINK

APPLICATION OF EXCO CRITERIA

Column Number:		C	D	E	G	H	I
Scenario: Mitigated with 4 m barrier					2011	2011	2011
Rec ID (DOE-88)	Rec ID (Report)	2011 Predicted Noise Level (Total) dB(A)	1994 Est'ed Noise Level (Total) dB(A)	Differ-ence dB(A)	Rte 3 Noise Level dB(A)	Existing Roads: Noise Level dB(A)	Route 3: Contri-bution to Over-all Nse Level dB(A)
R6	R6	74.7	72.8	1.9	66.3	74.1	0.6
R7	R7	73.3	70.5	2.8	61.9	73.0	0.3
R8	R8	67.6	64.8	2.8	65.4	63.8	3.8
R9	R9	70.2	71.0	-0.8	64.4	69.1	1.1
R10	R10	70.5	70.7	-0.2	63.0	69.9	0.6
R11	R11	69.4	69.4	0.0	61.1	68.9	0.5
R12	R12	66.3	68.5	-2.2	65.0	61.8	4.5
R14	R14	75.0	72.2	2.8	64.4	74.7	0.3
R15	R15	82.4	79.8	2.6	64.7	82.3	0.1
R17	R17	68.8	63.4	5.4	66.9	64.9	3.9

FILENAME: C:\BACKUPS\RTE3CPS\EXCO.WK1 (p. 10, printed 26-Nov-93)

CASTLE PEAK ROAD
NORTHERN LINK

APPLICATION OF EXCO CRITERIA

R20	R20	84.2	80.2	4.0	69.6	84.0	0.2
R21	R21	72.4	69.6	2.8	67.3	70.8	1.6
R22	R22	72.3	69.1	3.2	67.7	70.5	1.8
R23	R23	73.8	69.0	4.8	64.2	73.3	0.5
R26	R26	70.6	68.1	2.5	63.1	69.7	0.9
X1S	R25	77.9	73.2	4.7	64.3	77.7	0.2
X2	R24	76.1	72.1	4.0	66.2	75.6	0.5
X3N	R27	70.1	68.8	1.3	62.2	69.0	1.1
X4N	R28	78.8	75.2	3.6	67.8	78.4	0.4
X5N	R30	77.7	75.7	2.0	68.2	77.1	0.6
X5N	R29	83.4	81.0	2.4	58.0	83.4	0.0
X6NE	R31	78.0	78.3	-0.3	67.5	77.7	0.3
X6SW	R32	82.8	79.3	3.5	56.2	82.8	0.0
X7E	R33	74.4	70.9	3.5	67.8	72.1	2.3
X8S1	R34	69.7	70.3	-0.6	67.3	66.6	3.1
X9 - 6	R35 - 6	63.0	44.9	18.1	62.9	46.9	16.1
X9 - 4	R35 - 3	70.5	65.9	4.6	67.2	67.8	2.7
X9 - 8	R35 - 8	71.6	65.9	5.7	69.3	67.8	3.8
X10	R36	67.0	67.5	-0.5	63.1	65.1	1.9
X11	R37	67.5	68.2	-0.7	64.0	65.0	2.5
X12E	R38	67.2	67.6	-0.4	66.7	59.1	8.1
A1	R1	76.5	74.4	2.1	69.0	75.7	0.8
A2	R2	75.7	73.5	2.2	68.2	74.8	0.9
A3	R3	70.5	67.5	3.0	61.1	70.0	0.5
A4	R4	76.6	74.0	2.6	58.4	76.5	0.1
A5	R5	66.1	61.4	4.7	65.1	59.3	6.8
A6	R13	68.2	64.3	3.9	65.2	65.6	2.6
A7	R16	69.2	65.7	3.5	64.6	67.3	1.9
A8	R18	74.4	69.7	4.7	72.2	70.5	3.9
A9	R39	73.7	70.5	3.2	72.4	68.1	5.6
A10	R40	66.1	65.8	0.3	63.7	62.6	3.5
A11	R41	71.2	72.3	-1.1	65.5	70.1	1.1
A12	R42	71.2	70.3	0.9	63.2	70.7	0.5
A13	R43	73.7	72.0	1.7	65.1	73.1	0.6

Using the barrier configurations provided earlier, the following receivers are adequately protected according to ExCo criteria:

TABLE A18.2 REQUIRED BARRIER HEIGHT

Receiver Identification	Barrier height required to avoid compensation on basis of ExCo criteria			
	0.8m or 1.0m	2.0m	3.0m	4.0m
R1			x	
R2				x
R3			x	
R4	x			
R5	x			
R6			x	
R7		x		
R8	x			
R9		x		
R10		x		
R11		x		
R12	x			
R13	x			
R14		x		
R15	x			
R16	x			
R17			x	
R18				•
R20	x			
R21				•
R22				•
R23		x		
R24	x			
R25	x			
R26			x	
R27			x	
R28	x			
R29	x			
R30	x			

TABLE A18.2 REQUIRED BARRIER HEIGHT (cont'd)

Receiver Identification	Barrier height required to avoid compensation on basis of ExCo criteria			
	0.8m or 1.0m	2.0m	3.0m	4.0m
R31	x			
R32	x			
R33				•
R34		x		
R35 Ground 4th Storey Top Storey	x			 • •
R36	x			
R37	x			
R38	x			
R39				•
R40	x			
R41		x		
R42			x	
R43			x	

Note: x - Required barrier height to protect the receiver such that compensation is not required.

• - A 4m barrier is not sufficient to protect the receiver.

A18.3

TRAFFIC FIGURES FOR YEAR 2011

A18.3 TRAFFIC FLOWS FOR YEAR 2011

Morning peak-hour traffic flows for year 2011 have been predicted and are shown below. The flows on Route 3 CPS, its slip roads and connecting roads are from information supplied by Transport Department. Transport Department predictions have been converted from PUCs/hour to vehicles/hour using a factor of 1.65.

TABLE 18.3 MORNING PEAK HOUR TRAFFIC FLOWS: 2011

ROAD SEGMENT	Vehicles/Hour
	2011
Tai Lam Tunnel (Northbound)	3890
Tai Lam Tunnel (Southbound)	4200
Link Road G (from Kam Tin Road)	290
Link Road H (to Kam Tin Road)	880
Route 3 CPS south of northern alternative alignment (Northbound)	3020
Route 3 CPS south of northern alternative alignment (Southbound)	3910
Kam Tin Road (Eastbound)	920
Kam Tin Road (Westbound)	1820
Castle Peak Road - Yuen Long (Eastbound)	2100
Castle Peak Road - Yuen Long (Westbound)	3100
Castle Peak Road - Tam Mei (Northbound)	1180
Castle Peak Road - Tam Mei (Southbound)	1280
Northern Alternative Alignment (next to Small Traders New Village) (Northbound)	3430
Northern Alternative Alignment (next to Small Traders New Village) (Southbound)	2350
Slip Road: Northern alternative alignment onto Route 3 northbound onto northern alternative alignment	1410
Slip Road: Northern alternative alignment onto Route 3 southbound	1840
Slip Road: Route 3 CPS southbound onto northern alternative alignment	1380
Slip Road: Route 3 CPS northbound onto northern alternative alignment	970
Route 3 CPS over Kam Tin River (Northbound)	2040
Route 3 CPS over Kam Tin River (Southbound)	2080
Route 3 CPS north of Au Tau Interchange slip roads (Northbound)	3460
Route 3 CPS north of Au Tau Interchange slip roads (Southbound)	3460

A18.4

CONSTRUCTION NOISE ASSESSMENT - PLANT SCHEDULE

CONSTRUCTION NOISE ASSESSMENT - ZONE : Z
PLANT SCHEDULE

File Name: ZoneZ
Date: 29th June 1993

EQUIPMENT			PEAK USAGE (Maximum number of items at one time) (Three Month Periods)															
Identification Code	Description	SPL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CNP 002	Air compressor, silenced, 75 dB(A) at 7 m	110						0.5	0.5	0.5	0.5	0.5	0.5	0.5				
CNP 004	Asphalt paver	109										1	1	1				
CNP 023	Breaker, Hand-held (pneumatic)	117						1	1	1	1	1	1	1				
CNP 030	Bulldozer	115	1.5	1.5	1.5	1.5	1.5	1.5	1.5									
CNP 044	Concrete lorry mixer	109	0.5	0.5	0.5	0.5	0.5	1	1	1	1	1	1	1				
CNP 048	Crane, mobile/barge mounted (diesel)	112	1	1	1	1	1	1	1	1	1	1	1	1				
CNP 066	Dumper	106	1	1	1	1	1	1	1	1	1	1	1	1				
CNP 067	Dump truck	117	1.5	1.5	1.5	1.5	1.5	1.5										
CNP 081	Excavator/loader, wheeled/tracked	112	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1	1	0.5	0.5	0.5				
CNP 104	Grader	113	1	1	1	1	1	1	1	0.5	0.5	0.5						
CNP 141	Lorry	112	3	3	3	3	3	3	3	3	3	3	3	3				
CNP 170	Poler, vibratory, hand-held	113				1	1	1	2	2	2	2	1	1				
CNP 185	Road roller	108										1	1	1				
CNP 186	Roller, vibratory	108				1.5	1.5	1.5	1.5	1.5	1.5	1	1	1				
CNP 201	Saw, circular, wood	108				1	1	1	1	1	1	1	1	1				
CNP 204	Scraper	119	1	1	1	1	1	1										
CNP 222	Tractor	118	1	1	1	1	1	1	1	1	1	1	1	1				
CNP 282	Water pump (petrol)	103	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 283	Water pump, submersible (electric)	85	2	2	2	2	2	2	2									

Filename : Zone T
Date : 29th June 1993

CONSTRUCTION NOISE ASSESSMENT – ZONE : T
PLANT SCHEDULE

EQUIPMENT			PEAK USAGE (Maximum nomber of Items at one time) (Three Month Periods)															
Identification Code	Description	SPL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CNP 002	Air compressor, silenced, 75 dB(A) at 7 m	110	2	2	2													
CNP 021	Bar bender and cutter (electric)	90	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 027	Breaker, excavator mounted (pneumatic)	122	1	1	1	1	1	1	1	1	1	1	1	1				
CNP 044	Concrete lorry mixer	109		6	6	6	6	6	6	6	6	6	6	6				
CNP 047	Concrete pump, stationary/lorry mounted	109					2	2	2	2	2	2	2					
CNP 048	Crane, mobile/barge mounted (diesel)	112	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 050	Compactor, vibratory	105	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 066	Dumper	106	3	3	3	3	3	3	3	3	3	3	3	3				
CNP 081	Excavator/loader, wheeled/tracked	112	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 101	Generator, standard	108	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 141	Lorry	112	6	6	6	4	2	2	2	2	2	2	2	2				
CNP 161	Paint line marker	90										1	1	1				
CNP 164	Piling, large diameter bored, grab and chisel	115	2	2	2													
CNP 170	Poker, vibratory, hand-held	113				6	10	12	12	12	12	12	12	6				
CNP 171	Planer, wood, hand-held (electric)	117	1	1	1	1	1	1	1	1	1	1	1	1				
CNP 185	Road roller	108										2	2	2				
CNP 186	Roller, vibratory	108							2	2	2							
CNP 202	Saw, chain, hand-held	114			2	2	2	2	2	2	2	2						
CNP 282	Water pump (petrol)	103	2	2	2	2	2	2	2	2	2	2	2	2				

Filename : Zone V
Date : 29th June 1993

CONSTRUCTION NOISE ASSESSMENT – ZONE : V
PLANT SCHEDULE

EQUIPMENT			PEAK USAGE (Maximum nomber of Items at one time) (Three Month Periods)															
Identification Code	Description	SPL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CNP 002	Air compressor, silenced, 75 dB(A) at 7 m	110						1	1	1	1	1	1	1				
CNP 004	Asphalt paver	109										2	2	2				
CNP 023	Breaker, hand-held (pneumatic)	117						2	2	2	2	2	2	2				
CNP 030	Bulldozer	115	3	3	3	3	3	3	3									
CNP 044	Concrete lorry mixer	109	1	1	1	1	1	2	2	2	2	2	2	2				
CNP 048	Crane, mobile/barge mounted (diesel)	112	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 066	Dumper	106	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 067	Dump truck	117	3	3	3	3	3	3										
CNP 081	Excavator/loader, wheeled/tracked	112	3	3	3	3	3	3	3	2	2	1	1	1				
CNP 104	Grader	113	2	2	2	2	2	2	2	1	1	1						
CNP 141	Lorry	112	6	6	6	6	6	6	6	6	6	6	6	6				
CNP 170	Poker, vibratory, hand-held	113				2	2	2	4	4	4	4	2	2				
CNP 185	Road roller	108										2	2	2				
CNP 186	Roller, vibratory	108				3	3	3	3	3	3	2	2	2				
CNP 201	Saw, circular, wood	108				2	2	2	2	2	2	2	2	2				
CNP 204	Scraper	119	2	2	2	2	2	2										
CNP 222	Tractor	118	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 282	Water pump (petrol)	103	4	4	4	4	4	4	4	4	4	4	4	4				
CNP 283	Water pump, submersible (electric)	85	4	4	4	4	4	4	4									

Filename : Zone X
Date : 29th June 1993

CONSTRUCTION NOISE ASSESSMENT – ZONE : X
PLANT SCHEDULE

EQUIPMENT			PEAK USAGE (Maximum nomber of Items at one time) (Three Month Periods)															
Identification Code	Description	SPL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CNP 002	Air compressor, silenced, 75 dB(A) at 7 m	110						1	1	1	1	1	1	1				
CNP 004	Asphalt paver	109										2	2	2				
CNP 023	Breaker, hand–held (pneumatic)	117						2	2	2	2	2	2	2				
CNP 030	Bulldozer	115	3	3	3	3	3	3	3									
CNP 044	Concrete lorry mixer	109	1	1	1	1	1	2	2	2	2	2	2	2				
CNP 048	Crane, mobile/barge mounted (diesel)	112	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 066	Dumper	106	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 067	Dump truck	117	3	3	3	3	3	3										
CNP 081	Excavator/loader, wheeled/tracked	112	3	3	3	3	3	3	3	2	2	1	1	1				
CNP 104	Grader	113	2	2	2	2	2	2	2	1	1	1						
CNP 141	Lorry	112	6	6	6	6	6	6	6	6	6	6	6	6				
CNP 170	Poker, vibratory, hand–held	113				2	2	2	4	4	4	4	2	2				
CNP 185	Road roller	108										2	2	2				
CNP 186	Roller, vibratory	108				3	3	3	3	3	3	2	2	2				
CNP 201	Saw, circular, wood	108				2	2	2	2	2	2	2	2	2				
CNP 204	Scraper	119	2	2	2	2	2	2										
CNP 222	Tractor	118	2	2	2	2	2	2	2	2	2	2	2	2				
CNP 282	Water pump (petrol)	103	4	4	4	4	4	4	4	4	4	4	4	4				
CNP 283	Water pump, submersible (electric)	85	4	4	4	4	4	4	4									