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Territory Development
Department, Hong Kong

新界東拓展處
NEW TERRITORIES EAST
DEVELOPMENT OFFICE

Sha Tin Newtown Stage II
Road D15 Linking Lok Shun Path & Tai Po Road

ENVIRONMENTAL IMPACT ASSESSMENT

FINAL REPORT

March 1997

MAUNSELL CONSULTANTS ASIA LTD

in association with

Consultants in Environmental Sciences (Asia) Ltd
Hassell Ltd

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CONTENTS

CONTENTS (Cont'd)

List of Tables

List of Figures

Appendices

Appendix 1A - Summary of Construction Dust Emission Calculations and Schematic Diagram of Modelled Dust Sources

Appendix 1B - Sample FDM model input and output files

Appendix 1C - Predicted Worst-case 1-hour Average and 24-hour Average TSP Concentration at Selected Air Quality Sensitive Receivers

Appendix 1D- Summary of Road Links, Traffic Flow and Emission Rate, and Schematic Diagram of Modelled Road Links

Appendix 1E- Sample CALINE 4 model input and output files

Appendix 1F- Predicted Worst-case 1-hour Average NO2 Concentration at Selected Air Quality Sensitive Receivers

Appendix 2 - Plant Species Occurring Within Study Area

Appendix 3 - Summary of Landscape Impacts

Appendix 4 - Proposed Planting Mixes

1. INTRODUCTION

1.1 Background

1.1.1 Maunsell Consultants Asia Ltd (MCAL) in association with Consultants in Environmental Sciences (Asia) Ltd and Hassell Ltd have been commissioned by New Territories East Development Office of the Territory Development Department to undertake an Environmental Impact Assessment of the proposed District Road D15 in Sha Tin.

1.1.2 The proposed Road D15 linking Lok Shun Path and Tai Po Road, is aim to provide an alternative link between Lok Lo Ha Area (in Planning Area 43 and 44) and Tai Po Road so as to relieve traffic congestion at the present access via Fo Tan Road.

1.1.3 The boundary of the Study Area for the EIA is defined by a distance of 300 metres from the proposed road alignment except that, for visual assessment, the Study Area is extended to 500 metres from the proposed road alignment but include sensitive receivers beyond this distance if required. The proposed road alignment and EIA Study Area is indicated in Figure 1.1.

1.2 Study Objectives

1.2.1 The purpose of this EIA Study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the proposed project and all related activities taking place concurrently.

1.2.2 The proposed roadworks are located between industrial and village developments, and pass through a woodland area. The ecology of the wooded area will be affected by the road and associated slopeworks. The sensitive village receivers adjacent to the proposed alignment will be sensitive to air quality impacts. In this respect, the representative of Lok Lo Ha village has formally objected to the road improvements works, including *'fung shui'* aspects of the works.

Hence the specific environmental impacts that will be addressed by the study include:

- Noise impacts
- Air quality impacts
- Ecological impacts
- Landscape and visual impacts
- Requirements of an EM&A Manual

1.3 Report Structure

1.3.1 Following this Introduction, Section 2 describes the proposed project and the anticipated activities during construction and operation stages.

1.3.2 Sections 3, 4, 5 and 6 respectively present the impact assessments of noise, air quality, ecology and landscape/visual issues. Mitigation measures for the identified impacts are proposed together with a discussion on likely residual impacts.

1.3.3 Section 7 highlights the scope and requirements of Environmental Monitoring and Audit for the proposed project.

1.3.4 Finally, Section 8 provides a summary of the findings and recommendations on mitigation measures and conclusions for the EIA.

2. PROJECT DESCRIPTION

2.1 Project Description & Programme

2.1.1 The project was initiated by Transport Department in 1993, with the intention of providing an alternative link between Fo Tan Area and the external Trunk Roads such as Tai Po Road. It is considered that such a link will alleviate the traffic congestion at Fo Tan Industrial Area and Fo Tan Interchange, provide an alternative vehicular access in case of emergencies, and possibly reduce the travelling time to/from Fo Tan Area.

The link is about 0.5km long, extending from the existing roundabout at Lok Shun Path to the Elevated Access Road at the northern extremity of the KCRC Development over the Ho Tung Lau Depot (Royal Ascot). As this access road joins the Old Tai Po Road some 300 metres further north, a direct link between Old Tai Po Road and Lok Shun Path will be available at the completion of this Project.

2.1.2 Program

The construction of Road D15 is anticipated to commence in early 1998 for a period of 24 months.

2.1.3 Road Alignment and Key Engineering Features

The Road D15 extension will take the form of a 7.3m wide, 2-lane single carriageway, with the provision of a 2.75m footpath beside it. The existing roundabout at Lok Shun Path will also be widened in conjunction with the project, and the existing access for the carpark and refuse collection point (RCP) beneath the Lok Shun Path Bridge will be maintained.

A new system of footpath/cycle track will also be constructed beside the KCR tracks, in accordance with the current planning layout for Area 44 of Sha Tin.

As indicated in Figure 1.1, the road alignment passes through the southeastern verge of Lok Lo Ha Village, turns north and ascends the existing slopes, before it leads and descends to join the existing elevated access road beside Royal Ascot. Since hilly terrain with high spots and steep valleys are encountered, slope cuttings and bridge structures become inevitable. Three bridges and a few cuttings are proposed.

Bridge A is a 3 span bridge about 100m long, approximately 6 metres above the existing ground level while Bridge B spans across a natural valley and connects to slope cuttings at both ends. Bridge C is about 50 metres long and possibly a 2 span bridge connected to the Royal Ascot elevated access road.

Some retaining walls will also be constructed in association with the above. Landscaping works will be implemented on the formed slopes to enhance the outlook of these slopes.

2.2 Activities During Construction

Only nominal construction activities for earthworks, drainage works, roadworks, retaining walls and bridge structure will be anticipated.

Piling will be required to support the three proposed bridges, and the piling type/layout is subject to detailed design. For this Study, percussive piling techniques are assumed.

Site access will be limited to both ends of the project boundary, i.e., from Lok Shun Path roundabout and from Royal Ascot elevated access road.

2.3 Activities During Operation

No particular requirements on maintenance is anticipated, apart from the nominal maintenance work undertaken by respective Government agencies/departments.

3 NOISE IMPACT ASSESSMENT

3.1 Identification of Noise Sensitive Receivers

3.1.1 The identification of representatives noise sensitive receivers (NSRs) was carried out as a desktop exercise at the initial stage, followed by site verification at each selected location. The NSRs selected are mainly from residential areas in Lok Lo Ha's 'V' Zone and Royal Ascot.

3.1.2 The procedure adopted follows the Hong Kong Planning Standards and Guidelines (HKPSG). Representative NSRs within 300 metres from the road widening works were identified. The locations of the NSRs are indicated in Figure 3.1. Table 3.1 gives a description of facades involved. Existing low-rise properties (i.e. one and two-storey structures) located below the proposed bridge structures along the alignment at Lok Lo Ha were not considered as NSRs as the resultant noise impact arising from the project is considered to be insignificant.

3.1.3 It is understood that there are no other noise sensitive developments that will be built within the Study Area in the future although pockets of residential developments may still occur within Lok Lo Ha Village. However the worst locations closest to the roadway have been considered in this Study. There is also no identifiable NSR on the northern end of the Study Area, as the dwellings are out of view from the proposed road alignment.

Table 3.1 : Representatives Noise Sensitive Receivers

Noise Receiver Identification		Description
F1	Ficus Garden	16-storey residential block
F2	Haywood Villa	5-storey residential apartments
F3 to F17	Lok Lo Ha Village	3-storey village housing
F18 to F23	Royal Ascot	high-rise residential apartments
F24 to F25	Lok Lo Ha Village	inner village housing on hillside
F26	Jubilee Garden - Block 6	38-storey residential block

3.2 Assessment Criteria

3.2.1 Construction Noise

3.2.1.1 Noise generated by construction activities comes under the control of Noise Control Ordinance (NCO) enacted in 1988. Specific criteria and procedures for noise impact assessment during construction are set out in two Technical Memoranda associated with the Ordinance; i.e. the *Technical Memorandum on Noise from Construction Noise other than Percussive Piling* and the *Technical Memorandum on Noise from Percussive Piling.*

3.2.1.2 The procedures require the use of quiet machinery by permitting longer working hours if the noise levels are acceptable in relation to the local conditions. In other words, noise emission from a particular site must comply with the acceptable noise levels (ANL's) during the restricted periods and contractors are required to obtain a Construction Noise Permit (CNP) to carry out works involving powered mechanical equipment (PME) and Prescribed Construction Works. The restricted periods include night time (i.e. 1900 hours - 0700 hours), Sunday and public holiday.

3.2.1.3 For CNP considerations, the applicable noise limits depend upon the existing noise environment the NSR is located which is reflected in an Area Sensitivity Rating (ASR). An ASR of 'B' is assigned for the study area which comprises of mainly low density and isolated high-rise developments. Therefore the ANL for the daytime and evening during holidays is 65 dB(A) and all days during the night time is 50 dB(A).

3.2.1.4 In addition, the NCO requires that hand-held percussive breakers over 10 kg and air compressors comply with noise emission standards by bearing the official Noise Emission Labels.

3.2.1.5 There is no statutory control on construction noise (other than percussive piling) over the daytime (i.e. between 0700 hours - 1900 hours) on normal weekdays. However, EPD's Practice Note for Professions Persons PN 2/93 sets a non-statutory daytime noise limit of 75 dB(A) L_{eq} (30 min) at residential dwellings and 70 dB(A) L_{eq} (30 min) at facades of schools or 65 dB(A) L_{eq} (30 min) during examinations.

3.2.2 Operation Noise

3.2.2.1 Table 3.2 highlights the traffic noise limits as stipulated in the HKPSG. The standards apply to opened-window environment in the peak hour in terms of L_{10}.

Table 3.2 HKPSG Road Traffic Noise Limits

Use	Noise Limit dB(A)
Residential dwellings	70
Offices	70
Educational institutions including kindergarten & nurseries	65
Hospitals, clinics and homes for the aged	55

3.2.2.2 The operation stage assessment covers the road traffic noise generated by the new road link. The assessment methodology follows those given in the Calculation of Road Traffic Noise, DoT/UK 1988 and the guidelines included in the HKPSG Chapter 9, Environment. For NSRs adversely affected by the increase in traffic noise, direct technical mitigation measures will be provided to satisfy the HKPSG standards.

3.2.2.3 Where all practicable direct technical remedies fail to reduce the traffic noise levels to meet HKPSG noise limits, indirect technical remedies (ITR), namely provision of building insulation and air-conditioners, should be used to mitigate the residual noise in accordance with the ExCo directive. A NSR is eligible for ITR if the following criteria are met:

(i) the combined maximum traffic noise level expected from the altered highway together with other traffic in the vicinity must be above 70 dB(A)L_{10} 1-hour;

(ii) the relevant noise level is at least 1.0 dB(A) more than the prevailing traffic noise level before the road works;

(iii) the contribution to the increase in the relevant noise level from the altered highway must be at least 1.0 dB(A).

3.3 Baseline Noise Measurements

3.3.1 As most of the identified NSRs are located north of Lok Shun Path and away from the existing roadways, traffic noise is not a major contributor to the ambient noise environment. Hence, the baseline noise measurements were confined to those NSRs closest to existing roadway.

3.3.2 The noise measurements were carried out during the morning peak period from 0730 to 0930 hours on a weekday.

3.3.3 Noise measurements were made at 1 metre from the external facade of the selected NSR. Noise parameters in L_{10}(1 hour) and L_{90}(1 hour) were measured.

3.3.4 The dominant noise sources measured are traffic noise and intermittent train noise from the KCRC railway. However for the Village Chief's house located at the end of Lok Shun Path, construction activities across the road at Royal Ascot is the major contributor to the background noise. It should be pointed out that existing traffic flow is very light at the northern end of Lok Shun Path where the 'U-turn' facility mainly caters for taxis and mini-buses. The results of the baseline noise measurements are summarised in Table 3.3.

Table 3.3 : Baseline Noise Measurement Results

	Facade Noise Level in dB(A)	
	L_{10}(1 hour)	L_{90}(1 hour)
Haywood Garden off Lok Lam Road	63.6	61.3
Lok Lo Ha Village Chief's House at end of Lok Shun Path	64.7	62.8
Podium of Jubilee Garden Shopping Centre[a]	71.0	66.5

Note:- (a) dominant traffic noise from Tai Po Road

3.4 Impact Assessment - Construction Phase

3.4.1 Major Works

3.4.1.1 The major works involved in the road construction project include:

- Reconstruction of existing roundabout at Lok Shun Path with improved access to the RCP and carpark underneath the bridge structure,
- Construction of three bridges. Bridge foundations are expected to be on piles employing percussive piling techniques,
- Slope cutting and retaining wall construction

3.4.1.2 It has been assumed that normal daytime hours (7 am - 7 pm) of working would by adopted by the contractor six days a week. Night time work and work during Sundays and public holidays are not anticipated.

3.4.1.3 Where practicable, quietened equipment shall be used in all construction work. This involves the use of silencers, mufflers, acoustic linings and hydraulic powered system.

3.4.2 Construction Activities

Haul Roads Construction

3.4.2.1 Haul roads will be formed at the onset from both ends along the proposed road alignment to provide access to the bridge sites. The activities involved and the equipment required are listed in Table 3.4 below.

Table 3.4 Equipment List for Haul Roads Construction

Operation	Equipment Type	Number	SWL dB(A) per piece
Roadway levelling	Grader Bulldozer	1 1	113 115
Laying of sub-base material	Dumptruck Roller	1 1	117 108

Bridge Construction

3.4.2.2 Of the three bridges to be built, Bridge A is the longest with a span of approximately 100 metres. Precast concrete piles would form the piers' foundation and percussive piling techniques is to be employed. The other bridge structure shall be cast in-situ. Table 3.5 below indicates the list of equipment likely to be used.

Table 3.5 Equipment List for Bridge Construction

Operation	Equipment Type	Number	SWL dB(A) per piece
Precast concrete pile placement	Drop hammer driving concrete pile	1	116
Pile capping	Excavator Backhoe Earth-moving truck Mobile diesel crane Compressor (silenced) Bar bender/cutter (electric) Concrete mixer truck Vibratory poker Handheld pneumatic breaker	1 1 1 1 1 1 1 2 1	112 112 117 112 100 90 109 113 110
Pier and Abutment construction	Mobile diesel crane Compressor (silenced) Bar bender/cutter Concrete mixer truck Vibratory poker Concrete pump truck Excavator Dumptruck	1 1 1 1 2 1 1 1	112 100 90 109 113 109 112 117
In-situ Superstructure Construction	Mobile diesel crane Compressor (silenced) Winch (pneumatic) Concrete mixer truck Concrete pump truck Vibratory pokers	2 2 2 2 1 2	112 100 110 109 109 113

Retaining Wall Construction

3.4.2.3 Towards the northern end of the proposed road, retaining walls should be required to shore up the slope cuttings. At the critical location between Bridge B and Bridge C, a retaining wall of 7 metres high is proposed. The construction activities shall involve ground excavation, placement of reinforced concrete and backfilling. Table 3.6 provides the list of equipment required.

Table 3.6 Equipment List for Retaining Wall Construction

Operation	Equipment Type	Number	SWL dB(A) per piece
Ground excavation	Excavator/loader Dumptruck Compressor (silenced) Bar bender	1 1 1 1	112 117 100 90
Concreting	Concrete mixer truck Concrete pump Water pump (petrol) Vibratory poker	1 1 1 1	109 109 103 113
Backfilling	Dumptruck Excavator/loader Vibratory roller	1 1 1	117 112 108

Drainage

3.4.2.4 Drainage will be installed along the new road sections. Drainage trenches will be excavated. Precast concrete channels will be installed along both sides of the road. The equipment for the task is listed in Table 3.7.

Table 3.7 Equipment List for Drainage Works

Operation	Equipment Type	Number	SWL dB(A) per piece
Trench excavation	Excavator Dumptruck	1 1	112 117
Channel placement	Mobile diesel crane	1	112
Backfilling	Backhoe	1	112

Pavement Construction

3.4.2.5 Pavement construction will be along the haul road formed at the initial stage which shall follow the proposed road alignment. The equipment required for the task is given in Table 3.8.

Table 3.8 Equipment List for Pavement Construction

Operation	Equipment Type	Number	SWL dB(A) per piece
Roadway levelling	Grader Bulldozer	1 1	113 115
Laying of sub-base material	Dumptruck Roller	1 1	117 108
Kerbing	Concrete mixer truck Concrete saw	1 1	109 115
Laying new surface	Compressor Asphalt paver Roller	1 1 1	100 109 108

Construction of Stairways

3.4.2.6 There are two stairways to be provided in addition to the footpaths and cycle track. As the proposed road alignment stays above ground for most of its sections, the stairways provide connection to the village dwellings below. Excavation and concreting will be the main activities involved.

Minor Works and Low Noise Activities

3.4.2.7 The remaining minor works will involve the use of low noise equipment. The works comprise of road markings and signing, street lighting, installation of noise barriers, fencing and landscaping.

3.4.3 Impact Assessment

3.4.3.1 The assessment of construction noise impacts is based on the work activities as described in Section 3.4.2. Noise impact on NSR is confined to a distance of 300 metres from the construction noise sources. Table 3.9 summarises the assessment results.

3.4.3.2 It can be seen that road construction activities and the associated drainage works have the greatest impact on the identified NSRs. This is primarily due to the close proximity of the dwellings to the construction activities. Noise levels of up to 87.8 dB(A) has been calculated for Facade F11, which lies about 10 metres from the roadway. This is also true for Facade F25.

3.4.3.3 Other facades at Lok Lo Ha Village are also expected to experience high construction noise exceeding the daytime limit of 75 dB(A).

Table 3.9 Predicted Construction Noise Impacts

CONSTRUCTION ACTIVITY		FACADE NOISE LEVEL (Leq (30 mins)dB(A))@																								
		F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	F21	F22	F23	F24	F25
HAUL ROAD CONSTRUCTION																										
- unmitigated		65.3	72.6	78.4	81.3	86.8	77.2	82.9	76.8	73.8	85.7	87.1	79.0	77.4	75.4	81.0	81.4	83.0	79.0	81.0	80.4	78.0	79.6	81.9	81.1	84.4
- with barrier		na	na	68.4	71.3	76.8	67.2	72.9	66.8	na	75.7	77.1	69.0	67.4	65.4	71.0	71.4	73.0	69.0	71.0	70.4	68.0	69.6	71.9	71.1	74.4
PAVEMENT CONSTRUCTION																										
- unmitigated		63.8	71.0	76.8	79.8	85.3	75.7	81.4	75.3	72.3	84.1	85.5	77.4	75.9	73.9	79.4	79.8	81.5	77.5	79.5	78.8	76.5	78.1	80.3	79.6	82.8
- with barrier		na	na	66.8	69.8	75.3	65.7	71.4	65.3	na	74.1	75.5	67.4	65.9	na	69.4	69.8	71.5	67.5	69.5	68.8	66.5	68.1	70.3	69.6	72.8
ROAD DRAINAGE																										
- unmitigated		66.0	73.2	79.1	82.0	87.5	77.9	83.6	77.5	74.5	86.1	87.8	79.7	78.1	76.1	81.7	82.1	83.7	79.7	81.7	81.0	78.7	80.3	82.6	81.8	85.1
- with barrer		na	na	69.1	72.0	77.5	67.9	73.6	67.5	na	76.1	77.8	69.7	68.1	66.1	71.7	72.1	73.7	69.7	71.7	71.0	68.7	70.3	72.6	71.8	75.1
RETAINING WALL																										
- Ground excavation	- unmitigated	-	-	64.0	64.8	67.0	66.1	-	-	-	66.1	66.3	65.1	64.6	63.9	65.2	65.8	-	68.3	70.7	66.7	65.1	64.9	66.5	73.5	79.8
	- with barrier			na	na	na	na				na	na	na	na	na	na	na		na	na	na	na	na	na	na	69.8
- Concreting	- unmitigated	-	-	61.6	62.4	64.6	63.7	-	-	-	63.6	63.9	62.7	62.2	61.5	62.8	63.3	-	65.8	68.2	64.3	62.7	62.5	64.1	71.1	77.4
	- with barrier			na	na	na	na				na	na	na	na	na	na	na		na	na	na	na	na	na	na	67.4
- Backfilling	- unmitigated	-	-	64.4	65.2	67.4	66.5	-	-	-	66.4	66.7	65.5	65.0	64.3	65.6	66.2	-	68.7	71.1	67.1	65.5	65.3	66.9	73.9	80.2
	- with barrier			na	na	na	na				na	na	na	na	na	na	na		na	na	na	na	na	na	na	70.2
BRIDGE CONSTRUCTION																										
- Piling	- unmitigated	-	-	66.6	68.3	73.7	70.1	65.4	65.3	64.9	71.3	71.9	68.6	67.5	66.1	69.1	70.3	65.3	77.5	79.5	73.4	69.6	69.2	73.0	76.6	71.3
	- with barrier			na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	67.5	69.5	na	na	na	na	66.6	na
- Pile capping	- unmitigated	-	-	69.8	71.4	76.8	73.3	68.6	68.5	68.1	74.4	75.1	71.7	70.6	69.2	72.2	73.5	68.5	80.7	82.7	76.6	72.7	72.4	76.1	79.7	74.5
	- with barrier			na	na	66.8	na	na	na	na	na	65.1	na	na	na	na	na	na	70.7	72.7	66.6	na	na	66.1	69.7	na
- Pier and Abutment	- unmitigated	-	-	68.1	69.8	75.2	71.6	66.9	66.8	66.4	72.8	73.4	70.0	68.9	67.6	70.5	71.8	66.8	79.0	81.0	74.9	71.1	70.7	74.5	78.1	72.8
	- with barrier			na	na	65.2	na	na	na	na	na	na	na	na	na	na	na	na	69.0	71.0	na	na	na	na	68.1	na
- Superstructure (Formwork)	- unmitigated	-	-	67.9	69.6	75.0	71.4	66.8	66.6	66.2	72.6	73.2	69.9	68.8	67.4	70.4	71.6	66.6	78.8	80.8	74.7	70.9	70.5	74.3	77.9	72.7
	- with barrier			na	na	65.0	na	na	na	na	na	na	na	na	na	na	na	na	68.8	70.8	na	na	na	na	67.9	na
- Superstructure (Concreting)	- unmitigated	-	-	68.7	70.3	75.8	72.2	67.5	67.4	67.0	73.3	74.0	70.6	69.5	68.1	71.1	72.4	67.4	79.6	81.6	75.5	71.7	71.3	75.0	78.6	73.4
	- with barrier			na	na	65.8	na	na	na	na	na	na	na	na	na	na	na	na	69.6	71.6	65.5	na	na	65.0	68.6	na
STAIRWAY CONSTRUCTION																										
- Ground excavation	- unmitigated	-	67.0	78.2	82.0	77.4	76.7	77.6	75.4	73.4	81.5	80.0	79.7	78.1	75.5	81.7	81.8	77.4	72.1	75.6	75.7	78.7	80.3	76.7	81.8	85.1
	- with barrier.		na	68.2	72.0	67.4	66.7	67.6	65.4	na	71.5	70.0	69.7	68.1	65.5	71.7	71.8	67.4	na	65.6	65.7	68.7	70.3	66.7	71.8	75.1
- Concreting	- unmitigated	-	64.6	75.8	79.6	75.0	74.3	75.2	73.0	70.9	79.1	77.6	77.2	75.7	73.1	79.2	79.4	75.0	69.7	67.1	73.3	76.3	77.9	74.3	66.2	64.0
	- with barrier		na	65.8	69.6	65.0	na	65.2	na	na	69.1	67.6	67.2	65.7	na	69.2	69.4	65.0	na	na	na	66.3	67.9	na	na	na

Note : - na - not applicable

3.4.3.4 Noise arising from bridge construction will exceed the daytime limit for facades at Royal Ascot.

3.4.3.5 Facade F25 is likely to experience significant noise impact from retaining wall and stairway construction which exceed the daytime noise limit.

3.4.3.6 Facade F26 at Jubilee Garden exceeds 300 metres from the nearest roadwork area at the roundabout and hence the construction noise impact is expected to be insignificant.

3.4.4 Noise Control Measures during Construction Phase

3.4.4.1 The following noise control measures are recommended to mitigate the noise impact :

(i) All construction work are restricted to 0700 - 1900 hours on weekdays and Saturdays.

(ii) Temporary purposed-built barriers should be installed along the roadworks boundary fronting the NSRs at the onset of construction to screen the anticipated high construction noise. Such barrier is assumed to provide a reduction of 10 dB(A) in noise levels in accordance with the *Technical Memorandum on Noise from Construction Work.* The noise barriers are to remain throughout the construction period.

From Table 3.9, it is noted that the daytime noise level at Facades F5, F10, F11 and F25 will be marginally exceeded the established standard for a short period of time for construction activities such as road and drainage construction. However, the anticipated noise levels shown in Table 3.9 only represent the worst case analysis. Since the said construction activities are mobile in nature and will be followed a construction programme, the noise levels are expected to be within the established guideline if the following additional measures are to be applied.

(i) Quietened equipment for the construction work should be employed.

(ii) The number of equipment, procedure and sequence of construction should be arranged in such a way that the noise levels generated from the plants are kept to a minimum.

3.5 Impact Assessment - Operation Phase

3.5.1 Future Traffic Flow Projections

3.5.1.1 The Study Brief requires the calculation of operation traffic noise to be based on the peak hour traffic projection for the appropriate design year within a period of 15 years after the opening of Road D15.

3.5.1.2 For this assessment, the 2011 AM Peak Hour traffic projection has been adopted as the worst case scenario in terms of traffic flow on Road D15. In this connection reference is made to the TIA report of Ho Tung Lau Phase II Development. The Transport Department has been consulted on the use of the traffic flow projections in the report prior to the commencement of this Study.

3.5.1.3 The traffic flow projections of Road D15 used in the traffic noise impact assessment are shown in Table 3.10.

Table 3.10 : 2011 AM Peak Hour Traffic Projections of Road D15

Parameter	Northbound	Southbound
Peak Hour Flow (veh/hr)	400	850
Percent Heavy Vehicles[a]	35%	22%
Design Speed (km/hr)	50	50

Note:- a. Heavy vehicle defined by weight greater than 1,525 kg.
b. Road surface is asphalt concrete with no friction course

3.5.2 Impact Assessment

3.5.2.1 *Ficus Garden:* Traffic noise levels of 69 dB(A) are predicted at the fifth floor facade of the building. This level that rises above the road structure of Lok King Street received the highest traffic noise. However, the HKPSG's noise limit is not expected to be exceeded and therefore noise mitigation measure will not be necessary.

3.5.2.2 *Haywood Villa:* This low-rise residential block overlooking Lok Shun Path is expected to experience noise levels of 70 dB(A) at the top floor. Hence, no noise mitigation measures would be required.

3.5.2.3 *Royal Ascot:* All the noise sensitive facades are calculated to have noise levels within the HKPSG's limit of 70 dB(A) except for facade F19. The critical facade to Road D15 is facade F19 with a predicted noise levels of 71 dB(A). Hence, noise mitigation measures would be required for the said facade.

3.5.2.4 *Lok Lo Ha Village*: The NSRs most affected by traffic noise from Road D15 will be those in the vicinity of the roundabout. The cluttered residential developments are fully exposed to traffic noise with the road at ground level. Worst affected facades are F10 and F11, located approximately 10 metres from the roadway. Predicted noise levels calculated for the top floors are in the order of 74 dB(A).

For facade F25 located further up the northern slope of the village, noise levels of up to 79 dB(A) are predicted at the upper floor. This facade is about 7 metres from the roadway.

3.5.2.5 *Jubilee Garden:* The calculated noise levels of 74 dB(A) at facade F26 exceeds the HKPSG noise limits. However, the increase in traffic noise is attributable to the increase in traffic flow on the existing road (i.e. Lok King Street) fronting the NSR. Therefore, any direct mitigation works at the proposed new road is not expected to be able to reduce the overall noise levels at facade F26.

3.5.3 Proposed Mitigation Measures

3.5.3.1 Table 3.11 summarises the noise assessment results. It is noted that seven noise sensitive facades would require noise mitigation.

3.5.3.2 Facade F17 would require a vertical noise barrier of 1.5 metre high running 50 metres along the road edge to the roundabout. With the noise barrier, the noise levels at the critical facade is expected to be reduced to 69 dB(A).

3.5.3.3 The newly developed village housing on the western edge of the roundabout is found to require a 2-metre high barrier running 90 metres along the road edge. There would be a break in the barrier at the ramp for the cycle track as indicated in Figure 3.2.

3.5.3.4 Facade F19 would require a vertical noise barrier of 3 metre high on the parapet of bridge A along the southbound carriageway of Road D15. With the proposed noise barrier, the anticipated noise levels at the critical facade is expected to be reduced to 70 dB(A). The extension of proposed noise barrier is shown in Figure 3.2.

3.5.3.5 Further upstream at Facade F25, a 3.5-metre high barrier would be required. The length of the barrier is estimated to be 30 metres.

Table 3.11 Assessment of Noise Mitigation Measures

REPRESENTATIVE NOISE SENSITIVE FACADES	NOISE LEVEL WITHOUT MITIGATION MEASURE dB(A) L_{10} (1-hr)	PROPOSED NOISE MITIGATION MEASURE	NOISE LEVEL WITH MITIGATION MEASURE dB(A), L_{10} (1-hr)
F1	69	Not required	-
F2	70	Not Required	-
F3	67	Not Required	-
F4	71	2 m Vertical Barrier, 90 metres long	69
F5	67	Not Required	-
F6	69	Not Required	-
F7	67	Not Required	-
F8	66	Not Required	-
F9	63	Not Required	-
F10	74	2 m Vertical Barrier, 90 metres long	69
F11	74	2 m Vertical Barrier, 90 metres long	68
F12	65	Not Required	-
F13	66	Not Required	-
F14	64	Not Required	-
F15	70	Not Required	-
F16	71	2 m Vertical Barrier, 90 metres long	67
F17	73	1.5 m Vertical Barrier, 50 metres long	69
F18	68	Not Required	-
F19	71	3 m Vertical Barrier, 80 metres long	70
F20	67	Not Required	-
F21	65	Not Required	-
F22	68	Not Required	-
F23	69	Not Required	-
F24	68	Not Required	-
F25	79	3.5 m Vertical Barrier, 30 metres long	68
F26	74	Not Applicable	*

Note

* Please refer to Section 3.5.2.5

4 AIR QUALITY

4.1 Legislation and Guidelines

The Air Pollution Control Ordinance (Cap. 311, 1983) provides powers for controlling air pollutants from stationary and mobile sources, including fugitive dust emissions from construction sites. It encompasses a number of Air Quality Objectives (AQOs). Currently AQOs stipulate concentrations for a variety of pollutants, of which carbon monoxide (CO), nitrogen dioxide (NO_2), respirable suspended particulates (RSP) and total suspended particulates (TSP) are relevant to this Study. The AQOs are listed in Table 4.1.

Table 4.1 Hong Kong Air Quality Objectives

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

1 Measured at 298 K and 101.325 kPa.
2 Not to be exceeded more than three times per year.
3 Not to be exceeded more than once per year.
4 Arithmetic mean.
5 Not an AQO. However, it is generally accepted that an hourly average TSP concentration of 500 μgm^{-3} should not be exceeded. Such a control limit is particularly relevant to construction work and has been imposed on a number of construction projects in Hong Kong in the form of contract clauses.

4.2 Selected Air Quality Sensitive Receivers

Twenty-six representative air quality sensitive receivers were selected for this assessment and are listed in Table 4.2. They are existing buildings located in the proximity of the proposed road alignment. The receiver heights considered in this analysis were 1.5, 5, 10 and 15 metres above local ground level, 1.5 metres being the average height of human breathing zone. Locations of the selected air quality sensitive receivers and the proposed road alignment are shown in Figure 4.1.

Table 4.2 Selected Air Quality Sensitive Receivers

Receiver	Location	Description
1	Haywood Villa	5-storey residential buildings
2-18	Lok Lo Ha Village	Single to 3-storey village houses
19-26	Royal Ascot	High-rise residential buildings

4.3 Methodology

4.3.1 Construction Phase

The major potential air quality impact during the construction phase of the project will result from dust generated during road construction and during cut and fill operations. Vehicle and plant exhaust emissions from the site are not considered to constitute a significant source of air pollutants.

Emissions Calculations

Emission points for dust release from the construction activities will include the following:

- bulldozing construction material and overburden;
- grading of embankment;
- loading and unloading of construction material;
- plant vehicles travel on unpaved site roads; and
- wind erosion of stockpiles and open site.

On-site concrete batching and rock crushing are not anticipated.

The prediction of dust emissions was based on typical values and emission factors from Supplement F of USEPA *Compilation of Air Pollutant Emission Factors* (AP-42) (4th Edition, 1993). The emission factor for general construction activities taken from AP-42 was used to incorporate all the general road construction activities within the site, including bulldozing, grading, loading and unloading of materials, plant vehicles travel on unpaved site roads and wind erosion. As stated in AP-42, the emission factor for general construction activities has incorporated a large portion of the emissions resulting from traffic over temporary roads within the construction site. Assuming that only general road construction activities will be involved in the road construction, the emission factor for general construction activities is considered representative.

In this assessment, it was assumed that a maximum of 30 percent of the site area would be actively operated at any one time during the construction period. A 12-hour working day was assumed for road construction activities.

Dispersion Modelling

Dispersion modelling was undertaken using multiple runs of USEPA approved Fugitive Dust Model (FDM) to assess potential dust impacts from the construction activities. Modelling was undertaken to establish worst-case 1-hour average and 24-hour average TSP concentrations at the selected air quality sensitive receivers at 1.5, 5, 10 and 15 metres above local ground level. Surface roughness was taken as 2 metres in the FDM model to represent the hilly terrain and high-rise buildings in the proximity of the study area. Mixing height was assumed to be 500 metres and the height of emission was taken as local ground level.

The dispersion modelling was undertaken for 360 predefined separate meteorological conditions in order to ascertain the worst-case impact. Wind directions were taken at 10 degree increments. The model was tested with 2 atmospheric stability classes (B and D), and 5 wind speeds of 1 ms^{-1}, 2 ms^{-1}, 4 ms^{-1}, 6 ms^{-1} and 8 ms^{-1}. The 1-hour average TSP concentrations were predicted for each of the meteorological conditions at each of the selected air quality sensitive receivers. The worst-case 1-hour average TSP concentration was ascertained at each air quality sensitive receivers for these 360 meteorological conditions.

Conservative predictions of the worst-case 24-hour average TSP concentrations were undertaken by assuming worst-case 1-hour average TSP concentrations for the twelve working hours and apparently no dust emissions for other time of the day. It is noted that wind erosion of stockpiles and open site may occur during non-operating hours. Nevertheless, with proper covering of fine aggregate stockpiles, wind erosion during non-operating hours is considered minimum and emissions from wind erosion, if any, during non-operating hours were reasonably accounted by the conservative estimate of dust emissions during operating hours.

For the purpose of this assessment, future background TSP concentration of 87 μgm^{-3} was estimated based on annual average TSP concentration recorded at EPD's Tai Po Air Quality Monitoring Station for year 1992. The estimated future background TSP concentration was added to the modelling results to predict the cumulative dust impacts at the air quality sensitive receivers.

Details of the dispersion modelling, including a schematic location plan of the selected air quality sensitive receivers and the modelled dust sources, and calculation of the emission rates are listed in Appendix 1A. Sample input and output files of the FDM model are included in Appendix 1B.

4.3.2 Operational Phase

Air quality impacts during the operational phase of the project may result from vehicle emissions arising from traffic on the new road network as well as on existing roads. To assess the potential impact, year 2011 AM peak hour traffic flow and vehicle mix predicted by the traffic consultant for the new road network were used for the assessment.

Emission Calculations

The composition of the vehicle fleet of the proposed Road D15 for year 2011 provided by the traffic consultants was used. The composition was broken down into cars/taxis and other vehicles only. Emission factors for CO, NO_x and RSP were taken from the *Fleet Average Emission Factors - EURO2 Model* provided by EPD for year 2011. Conservative assessment was undertaken by taking the air pollutants emission rates of other vehicles as heavy goods vehicles and cars/taxis as private cars (petrol cars for CO and NO_x emission calculations, diesel cars for RSP emission calculations) respectively. The composite emission factors are summarised in Table 4.3. No speed correction or other adjustments were made. 20% of NO_x was assumed to be NO_2, as normally adopted for such assessment.

Table 4.3 Composite Vehicle Emission Factors

Road	2011 AM Peak Flow (vehicle hr^{-1})	Vehicle Type	Proportion	Emission Factor (g km^{-1} $vehicle^{-1}$)		
				CO	NO_x	RSP
Road D15 Northbound	401	Cars / taxis	63%	13.51	1.32	0.28
		Other vehicles	37%	8.41	7.06	0.57
		Composite emission factor[1]		11.62	3.44	0.39
Road D15 Southbound	851	Cars / taxis	78%	13.51	1.32	0.28
		Other vehicles	22%	8.41	7.06	0.57
		Composite emission factor[1]		12.39	2.58	0.34

1 Composite emission factor is the average vehicle emission factor for a certain vehicle type composition on a road. For example, for Road D15 northbound, composite CO emission factor is equal to 63% x 13.51 + 37% x 8.41 = 11.62 g km^{-1} $vehicle^{-1}$.

Petrol vehicles contribute more carbon monoxide, while heavy diesel-powered vehicles emit more nitrogen oxides and particulates. Current emission controls will reduce emissions from petrol vehicles as more vehicles will be fitted with catalytic convertors. In this assessment, RSP has considerably lower composite emission rates when compared with NO_2 (20% of NO_x) (see Table 4.3), and CO has considerably higher statutory limits (see Table 4.1). NO_2 is therefore the key parameter of concern. If the predicted NO_2 levels comply with the AQOs, it is likely that both RSP and CO would also comply with their respective AQOs. The majority of air quality studies undertaken in Hong Kong and the monitoring undertaken by EPD indicate this to be the case. This assessment therefore focused on predicting future NO_2 concentrations arising from the road network.

Dispersion Modelling

Dispersion modelling was undertaken using USEPA approved CALINE4 dispersion model. Worst-case meteorological condition of atmospheric stability class D and wind speed of 1 ms^{-1} were used in the analysis together with the worst-case wind angle option of the CALINE4 model. A wind direction standard deviation of 18° was employed in this assessment. Modelling was undertaken to establish worst-case 1-hour average NO_2 concentrations at the selected air quality sensitive receivers at 1.5, 5, 10 and 15 metres above local ground level.

Proposal on noise mitigation measures such as partial or total enclosure or barrier along the road alignment was not anticipated. No assessment was undertaken to consider the effect of noise mitigation measures on dispersion of air pollutants in this study.

For the purpose of this assessment, future background NO_2 concentration of 40 μgm^{-3} was estimated based on annual average NO_2 concentration recorded at EPD's Tai Po Air Quality Monitoring Station for year 1992. The estimated future background NO_2 concentration was added to the modelling results to predict the cumulative impacts at the air quality sensitive receivers.

Details of the dispersion modelling, including a schematic location plan of the selected air quality sensitive receivers and the modelled road links are included in Appendix 1D. Sample input and output files of the CALINE4 model are included in Appendix 1E.

4.4 Predicted Impacts

4.4.1 Construction Phase

Worst-case 1-hour average and 24-hour average TSP concentrations were predicted at different heights at each of the selected air quality sensitive receivers. The highest predicted worst-case TSP concentrations among the sensitive receivers are tabulated in Table 4.4 below. Estimated future background concentration of TSP was included in all the calculations. Detailed modelling results for each of the selected air quality sensitive receivers are included in Appendix 1C. Predicted worst-case 1-hour average TSP concentration contour plot at the worst affected receiver height of 1.5m above local ground is shown in Figure 4.2. The highest predicted worst-case 1-hour average and 24-hour average TSP concentrations are 69% and 83% of the guideline level and the AQO respectively. Exceedance of the guideline level or the AQO for TSP would therefore not be expected at the selected air quality sensitive receivers.

Table 4.4 Highest Predicted Worst-case 1-hour Average and 24-hour Average TSP Concentrations (Background Concentration Included)

Receiver height above ground	Highest predicted 1-hour average TSP concentration (μgm^{-3})	% guideline level	Highest predicted 24-hour average TSP concentration (μgm^{-3})	% AQO
1.5 m	345 (Receiver 12)	69	216 (Receiver 12)	83
5 m	216 (Receiver 15)	43	151 (Receiver 15)	58
10 m	139 (Receiver 15)	28	113 (Receiver 15)	43
15 m	116 (Receiver 1)	23	102 (Receiver 1)	39

4.4.2 Operational Phase

Worst-case 1-hour average NO_2 concentrations were predicted at different heights at each of the selected air quality sensitive receivers. The highest predicted worst-case NO_2 concentrations among the sensitive receivers are tabulated in Table 4.5 below. Estimated future background concentration of NO_2 was included in all the calculations. Detailed modelling results for each of the selected air quality sensitive receivers are included in Appendix 1F. Predicted worst-case 1-hour average NO_2 concentration contour plot at different receiver heights namely 1.5, 5, 10 and 15 metres above ground level are shown in Figures 4.3, 4.4, 4.5 and 4.6 respectively. The highest predicted worst-case 1-hour average NO_2 concentration is 46% of the AQO. Exceedance of the AQO for NO_2 would therefore not be expected at the selected air quality sensitive receivers.

Table 4.5 Highest Predicted Worst-case 1-hour Average NO_2 Concentrations (Background Concentration Included)

Receiver height above ground	Highest predicted worst-case 1-hour average NO_2 concentration	% AQO
1.5 m	137 (Receiver 12)	46
5 m	108 (Receiver 12)	36
10 m	81 (Receiver 12)	27
15 m	67 (Receiver 13)	22

4.5 Conclusions

Modelling results showed that the highest predicted worst-case 1-hour average and 24-hour average TSP concentrations at the selected air quality sensitive receivers during the construction phase are 345 μgm^{-3} and 216 μgm^{-3} respectively. These are 69% and 83% of the respective guideline level and AQO for TSP. During the operational phase, the highest predicted worst-case 1-hour average NO_2 concentration is 137 μgm^{-3}, which is 46% of the AQO for NO_2. Exceedance of the guideline level and the statutory Air Quality Objectives during both construction and operational phases of the project is not expected.

In order to further reduce the impact from the construction activities during the construction phase, the following measures are recommended :

(i) Effective dust suppression equipment and other measures should be installed to ensure the concentration of air borne dust at the site boundary and any nearby sensitive receiver is within the established standard.

(ii) The construction site should be monitered to minimise the fugitive dust emission. Wheel washing facilities should be installed and used by all vehicles leaving the construction site.

(iii) All motorized vehicles should be restricted to a maximum speed of 8 km per hour. Haulage and delivery vehicles should be confined to designated roadway inside the site.

(iv) In the process of material handling, any material which has the potential to create dust should be treated with water or sprayed with wetting agent.

5 ECOLOGY

5.1 Assessment Methodology

The scope of work for the Ecology Impact Assessment is defined in the Brief.

Field surveys to establish the existing ecological conditions of the project site were conducted during May 1996. Analysis of maps, and site survey were undertaken to provide a description of the physical environmental background and a habitat characterisation. Botanical surveys were conducted by walking the study site to develop a species list with a non-quantitative estimate of relative abundance (common, locally common, rare). Local abundance was compared with Territory-wide and regional abundance estimates to determine which species are of conservation importance based on relative rarity. Attention was given to the location and identification of species that are rare, endangered, or protected under local regulation or international convention. The importance of each habitat identified was evaluated based on habitat maturity, community composition, and regional occurrence and distribution.

Site surveys for avifauna were conducted during morning hours by walking over areas to be affected by the proposed Project and recording birds heard or seen by species, abundance, and habitat. Searches were conducted for nests, roosts, colonial nest or roost sites, perches, and other habitats or habitat components of importance to resident or migratory birds.

Surveys for reptiles, amphibians, and mammals were conducted incidental to surveys for birds and vegetation. Searches were made for scats, burrows, trails, dens, or other important habitat features.

Potential impacts were identified where possible of any direct/indirect and onsite/offsite impacts that could potentially lead to destruction, displacement or adverse effects on flora and fauna (including loss of shelter or food, reduced species diversity, loss of breeding grounds, species extraction, loss of carrying capacity). Evaluation was made of the impacts and proposals suggested for mitigation measures.

5.2 Legislation and Guidelines

The Hong Kong Government legislation and guidelines relevant to ecological assessment include the following:

- The Country Parks Ordinance (Cap.208) protects flora and fauna within the Country Parks.
- The Forests and Countryside Ordinance (Cap. 96), which protects both natural and planted forests.
- The Forestry Regulations, which provide for protection of specified local wild plant species.

- The Wild Animals Protection Ordinance (Cap. 170), which provides for protection of listed species of wild animals (excluding fish and marine invertebrates) by prohibiting hunting and prohibiting the disturbance, taking or removal of protected animals and/or their nests or eggs.
- The Animals and Plants (Protection of Endangered Species) Ordinance (Cap. 187) restricts import, export and possession of endangered species.
- Sites of Special Scientific Interest (SSSI) are identified by AFD. Site falling within statutory plans and zoned as SSSI receive planning protection under the Town Planning Ordinance.

5.3 Existing Conditions and Baseline Information

5.3.1 Introduction

The overall study area is small (approx. 2.6 ha). The project site is on the outer fringe of Sha Tin, adjacent to the KCRC Ho Yung Lau Workshop and Lok Shun Path, and bounded on the northern side by Lok Lo Ha village. The whole area is highly disturbed by human activities.

5.3.2 Habitats/Vegetation

A habitat map is shown in Figure 5A and 5B, and includes habitats in the immediate surroundings. The area of each habitat type within the project site boundary is given in Table 5.1.

Table 5.1 Habitat Types Within Project Site Boundary

Habitat Type	approx. area (ha)	Proportion of Study Area
Low Density Urban	1.74	66%
Woodland	0.39	15%
Horticulture	0.16	6%
Marsh	0.10	4%
Shrubland	0.24	9%

A total of 92 plant taxa, belonging to 19 families and 82 genera, were recorded within the study area (Appendix 2). Of these, 25 taxa, belonging to 19 families and 24 genera, were exotics. Most of the species found are common in degraded areas in Hong Kong.

High Density Urban

The area adjacent to and out side of the project boundary to the south is high density urban. It contains the KCRC Workshops and is all built upon or concrete hard standing. It is of no ecological value.

Low Density Urban

The majority of the project site and the surrounding area has been classified as low density urban. It is a village type environment with low rise housing interspersed with small, fragmented patches of vegetation and areas of hard concrete standing. There are also small sitting out areas with soft landscaping. The habitat was considered to be of low ecological value due to the levels of disturbance.

There is a specimen of *Ficus elastica* in the village noted on the engineering drawings as an area of Fung Shui value. The tree is unusual because of its considerable size. It is multi-stemmed, with approximately 15 stems greater than 100 mm dbh, several of which have been cut. The spread of the tree is approximately 22 m. *Ficus elastica* is an introduced species and produces no figs in Hong Kong.

Woodland

The dominant species in the main area of woodland were *Schefflera octophylla* and *Schima superba*, with frequent *Cratoxylum ligustrinum* and *Sapium discolor*. Also present were *Celtis sinensis, Ficus microcarpa, Ficus hispida* and *Abarema lucida*. The woodland was open in structure with a low canopy. Several of the tree species present often grow in well-lit conditions. This factor combined with the immaturity of the individuals suggests that the woodland has not been established for a long period of time.

A second area of 'woodland' comprises a very small copse in the village area. This contains the *Ficus elastica* mentioned above and also occurs with *Bauhinia* spp. and *Mangifera indica*. This area is highly disturbed with much rubbish.

Shrubland

The common species in shrubland were *Litsea rotundifolia, Rhaphiolepis indica* and *Clerodendrum cyrtophyllum*. Climbing plant species such *Ipomoea cairica, Buettneria asper* and *Pueraria lobata* were also common in these areas of degraded vegetation.

The woodland and shrubland consist of a mixture of common native plants which are frequently found in degraded areas. The habitat provides fruit and nectar sources in addition to sites for tree or shrub nesting animals. However due to its small area, and fragmentation from other habitats in addition to the already high levels of human disturbance the woodland and scrub are considered of low ecological value.

Marsh

There is a small, low lying, marshy area of disturbed habitat including tall grass, climbers and opportunistic species (*Pueraria lobata, Ipomoea cairica, Miscanthus floribundsinensis*). This is of poor habitat quality.

Freshwater Stream

Within the project site boundary the stream has been lined with concrete and channelised. Further upstream the stream retains its natural rock bed substrate. Water flow is low (approx. 100 mm deep at time of survey), and in the village area is eutrophic and odorous. The stream is culverted downstream of Lok Shun Path and at the point of culverting effluent containing detergent is discharged into the stream. No instream fauna were found with the exception of *Chironomous* sp. However Odonata were observed hawking along the riparian corridor. The quality of the stream habitat was better further upstream of the study area, however the length within the project site boundary was degraded due to channelisation.

Horticultural

Most of the agricultural fields and orchards were abandoned. The common orchard species were Longan (*Dimocarpus longan*), Banana (*Musa paradisiaca*), and *Citrus maxima.*

5.3.3 Terrestrial Fauna

Avifauna

Birds recorded on the survey area were all species commonly found in hillside village environments in Hong Kong. Fourteen species were recorded representing 11 bird families. Avifauna was not diverse nor abundant. This may have been partially due to disturbance caused by construction works underway at the time of survey at the KCRC Workshop and also due to general human disturbance associated with the village. There were no remaining extensive tracts of undisturbed habitat on the survey area. Habitats supporting the greatest numbers and diversity of birds were the woodland and orchards.

No nests, perches, or colonial nest or roost sites were located on the survey area. The most important feeding habitats were the orchard and woodland.

Table 5.2 Avifauna Recorded at Project Site (May 1996)

Common Name	Species	Abundanc	Status
Spotted Dove	Streptopelia chinensis	i	R
Tree Sparrow	Passer montanus	ii	R
Crested Bulbul	Pycononotus jocosus	iii	R
Chinese Bulbul	Pycnonotus sinensis	i	R
Red-vented Bulbul	Pycononotus aurigaster	i	R
Magpie Robin	Copsychus saularis	i	R
Yellow-bellied	Prinia flaviventris	i	R
Common Tailorbird	Orthotomus sutorius	ii	R
Blackfaced Laughing Thrush	Garrulux perspicillatus	i	R
Black Drongo	Dicrurus macrocercus	i	SV
Magpie	Pica pica	i	R
Jungle Crow	Corvus macrorhynchus	i	R
Black-Necked Starling	Sturnus nigricollis	i	R
Masked Bunting	Emberiza spodocephala	i	WV

NB: Abundance: i 1-5 birds Status: R resident
ii 6-10 birds WV winter visitor
iii 11-20 birds SV summer visitor

Reptiles and Amphibians

The only reptile recorded on the site was the Long-Tailed Skink *(Mabuya longicaudata)*. It was seen in the shrubland area to the north of the site. It is a widespread and common species. Although amphibians were not recorded on the survey area, they would be expected to occur along the freshwater stream.

Mammals

No mammals were recorded on the survey site. There were no scats, burrows, trails, or other indications that mammals inhabited the area. The survey area would not be expected to support wild mammals due to the highly fragmented nature of remnant habitats and the generally high levels of human disturbance.

Invertebrates

Odonata (dragonfly/damselfly) and Lepidoptera (butterfly) observed were identified. Odonata species comprised *Orthetrum pruinosum* and *Ischnura senegalensis* which were of frequent abundance in the stream area. Lepidoptera occurred mainly around the stream and marshy area. Species included *Pieris canidia* common white butterfly, *Papilio polytes* common mormon, and *Delias aglaja* common black jezebel. *Chironomous* sp. were also seen in the stream bed.

Protected Species

With the exception of wild birds no protected species were found in the project site area or the immediate surroundings

5.3.4 Protected Areas

The study area does not contain any area protected for nature conservation value such as Sites of Special Scientific Interest, Country Parks, Special Areas, areas of restricted access under Sixth Schedule of the Wild Animals Protection Ordinance (Cap. 170).

The closest such site to the study area, Tai Po Kau Nature Reserve is 2 km away. It was designated as a Special Area, of 460 ha in 1977. Due to the considerable distance from the study area, significant impacts are not anticipated upon the Nature Reserve.

5.4 Impact Assessment

5.4.1 Habitats/Vegetation

All the habitats found in the project area were of poor degraded habitat quality. They are considered to be of low ecological value and the habitat loss would not be a significant impact.

The area of woodland that falls within the project site boundary is approximately 0.39 ha. The road alignment will also bisect the remaining woodland area that falls outside the project site boundary. However, the woodland is a small isolated fragment, that appears to be relatively immature and of low species diversity.

Approximately 0.24 ha of shrubland, 0.16 ha of horticultural area and 0.1 ha of marsh area will be lost. These habitats are impoverished and highly disturbed.

The stream length within the project site boundary is 40 m. The stream quality at this point is poor due to channelisation. No works area anticipated to the stream, however it is adjacent to the contractors work's area. It is recommended that the stream bank top has a temporary barrier to prevent accidental dumping/spillage of materials into the stream course during construction.

The large specimen of *Ficus elastica* is of interest due to its considerable size. The tree is not in the direct path of the alignment and with care its integrity could be maintained. It is recommended that the tree be cordoned off during construction works to minimise any potential damage.

5.4.2 Fauna

Impacts to avifauna will result from loss of upland woodland habitat and orchard habitats and therefore foraging and potential nesting habitat for avifauna. This would impact birds which feed on insects (prinias and magpie robins), and fruits (bulbuls), and tree or shrub nesters. All the species recorded on the survey area are common and widely distributed throughout the Territory.

The Long-Tailed Skink was recorded in shrubland habitat at the north side of the project site. This area of open scrub will not be lost due to the project, and other scrub habitat is available in the vicinity. The Long-Tailed Skink is common and widespread in Hong Kong, therefore the impact of increased disturbance in the immediate area would not be significant on the species on a local or Territorial scale.

Due to the small size of the project area and the high levels of existing human activity, the area is not likely to be important habitat for wild mammals. The impact of the project on mammalian fauna is expected to be insignificant.

Invertebrate fauna such as Odonata and Lepidoptera were found mainly in the stream area. This habitat will not be lost therefore the impact is expected to be insignificant.

5.5 Mitigation & Habitat Enhancement Measures

As the stream is adjacent to the contractors work's area, it is recommended that the stream bank top has a temporary barrier to prevent accidental dumping/spillage of materials into the stream course during construction.

It is also recommended that the large specimen of *Ficus elastica* tree be cordoned off during construction works to minimise any potential damage.

There is a proposed planting scheme as detailed in Section 6.10.4 and Appendix 4 of the report. The proposed scheme will provide mitigation for the loss of woodland by providing native species of vegetation to the disturbed hillside.

6. LANDSCAPE AND VISUAL IMPACT ASSESSMENT

The Landscape and Visual Assessment seeks to identify the Landscape and Visual Impact of the proposed development up on the existing landscape, and based on the impact assessment findings, propose appropriate mitigation measures.

The study methodology for undertaking the assessment is identified below.

6.1 Methodology

Landscape Assessment

6.1.1 The landscape assessment for this project has been carried out in the following stages :

6.1.2 Existing Landscape Character : The existing landscape character of the site is established by assessing the natural elements on site, and identifying landscape units in terms of its physical elements :

e.g.
- Landform and Vegetation and its Man Made and Cultural Elements:

e.g.
- Landscape History
- Landuse
- Built Forms
- Elements of Cultural Significance

The Value of the existing landscape type is classified as

- High Landscape Value
- Moderate Landscape Value
- Low Landscape Value

Higher Value Landscapes being more sensitive to change or impact.

The assessment of the importance and value of the existing landscape character and features is then made in terms of :

- Distinctiveness
- Scenic Value
- Special Interest

and based on Professional Subjective Judgement.

Refer to Landscape Character and Value Plan. Figure 6.1.

6.1.3 Based on the above findings, the potential impacts to the existing landscape area identified, i.e., the extent of changes in or loss of the physical fabric or character of the existing site incurred as a direct result of the proposed road scheme.

Impacts may be positive or negative and are classified as :

- Severe Negative / Positive Impact
- Moderate Negative / Positive Impact
- Slight Negative / Positive Impact

6.1.4 Principles for appropriate Mitigation Measures are then established as methods of mitigating negative impacts of the proposed scheme through re-establishment planting / slope stabilisation etc. In order to best integrate the proposed road with its surrounding landscape.

Visual Assessment

6.1.5 In order to carry out the Visual Assessment, a visual envelope plan was established, clearly mapping the extent of visibility to and from the site of the proposed road.

The extent of the Visual envelope is defined by physical elements such as :

- Topography
- Screen Vegetation
- Built Elements

6.1.6 Within the boundaries of the Visual Envelope, all Visually Sensitive Receivers (V.S.R.) area identified, and numbered for reference. These include :

- Residential Properties
- Public Buildings

which will potentially be visually affected by the road scheme.

6.1.7 Classification of Visual Impact to V.S.R.'s is based up on the extent of change to their existing views caused by the scheme. Visual Impacts may be negative or beneficial, and are classified as :

- Severe adverse / Beneficial Impact
- Moderate adverse / Beneficial Impact
- Slight adverse / Beneficial Impact

Evaluation and assessment of the Visual Impact is based on subjective professional judgement.

6.1.8 Visual Mitigation Proposals are established in order to ameliorate the negative visual impacts of the scheme. These methods may include :

- Screen and Structure planting
- Earth Mounding
- Off Site Planting, etc.

in order to help integrate the proposed road with its surroundings.

6.2 General Description of Existing Landscape and Visual Character

(Refer to Existing Site Photographs, Appendix 3).

6.2.1 Along the length of the study area, the predominant components which form the overall landscape character are the imposing structure of the K.C.R.C., "Royal Ascot" housing development podium to the southern edge, and the steep woodland slopes to the north.

6.2.2 Set between these two conflicting landscape types, the study area generally maintains its original rural village character despite the noise and visual intrusion of the adjacent structures.

6.2.3 The topography of the study area is that of steep and densely vegetated slopes which form the setting for small low rise housing amongst the established native broadleaf woodland. Many of the houses are buffered against the K.C.R.C. development by the surrounding vegetation, however the village of Lok Lo Ha is subject to direct views due to their terraced layout on the hillside.

6.2.4 At the lower edges of the village adjacent to the K.C.R.C., the land comprises overgrown marshland or wasteground, with intermittent ornamental planting and garden areas.

6.2.5 For the Purpose of this study, three sections of the study area have been identified and assessed separately. The site is divided as follows:

- Chainage Pt. 100m to 300m
- Chainage Pt. 300m to Lok Shun Path
- Existing Footpath adjacent to K.C.R.C. line

6.3 Chainage Pt. 100m to 300m

Landscape Assessment

Existing Landscape Character and Value

(Refer to Figure 6.1)

6.3.1 Between chainage Pts. 100m to 300m, the landscape of the study area is that of dense native Broadleaf Woodland, with dense shrub understorey upon steep and hilly terrain.

To the North East of Chainage point 100m, a cluster of small residential village houses overlook the site of the proposed elevated road. Towards chainage area 300m a few small village houses are scattered throughout the dense woodland.

6.3.2 The landscape value of the woodland within the context of this site is high, not only for its natural value but high scenic quality, forming a dense buffer between properties set in the woodland and the K.C.R.C. / high rise housing development to the south.

Landscape Impacts

(Refer to Figure 6.2)

6.3.3 At chainage area 100m, the proposed road will be elevated in structure and will link with a recently constructed road, elevated upon the podium level of the Royal Ascot Housing Development to the South of the site.

The proposed road will take its route directly up and around the hillside and will result in notable disruption to the existing established woodland and undisturbed terrain of this section.

6.3.4 The proposed level of the road as it travels westward through the hillside, necessitates the construction of a 7m high retaining wall and associated slope cutting. In addition, 8m length engineered slopes of a 1:5 gradient will be required at either side of the road. The northern cut slope will be broken by a 1m width berm. A 30m length, 4m high noise barrier is also proposed to this edge of the road. The retaining structure, cut slopes and noise barrier constitute severe Landscape impacts within the proposed area, resulting in the loss of natural woodland and disruption to existing topography.

6.3.5 The formation of these slopes will result in the loss of property (V.S.R. no. 10 - Refer to Plan 6.4) and existing footpath access to other small dwellings. The re-aligned footpath along the top edge of the cut slope will require substantial buffer planting to screen the road below. These cut slopes will dramatically alter the profile of the existing topography and will require rapid establishing, indigenous re-planting proposals to ensure the road and slopes sit comfortably within the existing landscape.

6.3.6 The Landscape Impact of the proposed road within this section is severe.

6.3.7 A table summarising Landscape Impacts is contained in Appendix 3.

6.4 Chainage Pt. 100m to 300m

Visual Assessment

Existing Visual Envelope

6.4.1 The extent of the Visual Envelope within this section is defined by the nature of the steep topography and dense woodland to the North, and the built mass of the K.C.R.C. / Royal Ascot Housing Development to the south.

(Refer to Figure 6.4)

6.4.2 Visually Sensitive Receivers within this area are the small shack houses (V.S.R. Nos. 1 & 2) north of the site which directly overlook the study route and residential properties (V.S.R. Nos. 3 & 4) set high on the hillside in Hon Tung Lau, with elevated views to the site.

Other V.S.R.'s are the small residential properties (Nos. 6-11) set within the woodland upon the slopes. The nature and clarity of their views to the proposed route vary due to the surrounding dense vegetation. The High Rise properties of the Royal Ascot Housing Development and Podium grounds (V.S.R. No. 40) will also be subject to views towards the proposed road, although the dense canopy of the woodland forms a strong screen to the route as it exists.

Visual Impact

(Refer to Figure 6.4)

6.4.3 The extension of the elevated road from podium to hillside will cause additional visual impact to the small village houses adjacent to the footpath (V.S.R. Nos. 1 & 2), and will be highly visible from properties high on the hillside (V.S.R. Nos. 3 & 4). When seen in context with their present view of the K.C.R. and high rise housing development, the effect will be adversely intrusive but moderate.

6.4.4 As the route of the proposed road moves into the hillside, the road will be a highly visible elevated structure, over 12m above the existing level. As it sweeps around the hillside, it will remain notably visible from the Royal Ascot Podium garden, associated housing, and the footpath alongside the K.C.R.C., all of which will suffer moderate adverse visual impact.

6.4.5 The provision of an approximate 40m length and 7m height, retaining wall to the northern edge of the proposed road will also require cutting of the retained slope. At this point, the road will no longer be elevated, and the visual impact of the retaining wall will be moderate due to the screening effect of dense existing, and reinstatement woodland planting on either side of the road. There are few visual receivers in this vicinity. (Refer to "Visual Envelope Plan" Fig. 6.3).

6.4.6 The proposed engineered cutting of the existing slopes will open up direct views of the road from the onlooking 'Royal Ascot' housing development. The cut slopes will have a substantially adverse effect, disturbing the overall visual character of the established woodland. The severe topographical disturbance will result in significant visual deterioration in slope profile which may be reduced by appropriate planting treatments.

6.4.7 The proposed introduction of a 30m length, 4m high noise barrier to the edge of the road will constitute moderate visual intrusion to the small woodland houses and create a considerably more hostile environment than at present.

6.4.8 The proposed footpath at the northern edge of the cut slope will have open views to the K.C.R.C. and housing development and the proposed road.

A table summarising visual impacts to visually Sensitive Receivers is contained in Appendix 3.

6.5 Chainage Pt. 300m to Lok Shun Path

Landscape Assessment

Existing Landscape Character and Value

(Refer to Figure 6.1)

6.5.1 From Ch 300m, the South West portion of the study area changes in character. At this end of the site, there are fewer individual houses, and properties are found clustered in groups upon the hillside. (Refer to Figure 6.1B).

6.5.2 As the study route falls gradually towards the communal village of Lok Lo Ha, the vegetation comprises native woodland interspersed with stands of exotic trees and ornamental fruit trees planted typically by the villagers, potentially for their Fung Shui value. The landscape character is more varied within this section, incorporating semi-rural village land and properties of moderate landscape and scenic value.

6.5.3 Located just outside of the proposed road alignment is a significant tree - *Ficus elastica* of substantial height and spread, supported by a massive buttress and root stands of approximately 6m width. The tree is of high landscape and Fung Shui Value.

6.5.4 At the base of the village, the land is marshy due to slope water run-off and vegetation is sparse and sporadic. The majority of the land adjacent to the study area is waste ground or cultivation ground of low landscape and scenic value

6.5.5 There is a small shrine located at the edge of the village, surrounded by dense mature trees. Culturally this is of moderate landscape value.

Landscape Impact

(Refer to Figure 6.2)

6.5.6 The proposed steps at chainage 300m are required to provide access to the footpath above the cut slopes of the road. These steps and the adjacent road will result in loss of properties (V.S.R. No's. 13, 16 & 19), three small properties of low historic or cultural value set within the woodland. The elevated structure of the road at this section and the proposed 4m high vertical noise barrier, will significantly affect the character of this area in terms of modification of landform, loss of property and the intrusion of the structures themselves. The Landscape Impact here will be severe.

6.5.7 The significant *Ficus elastica* will be directly adjacent to the elevated road structure and should be protected from disturbance to its roots and general form, to ensure its survival during construction and operation.

6.5.8 The road will pass through the next section of the study area with moderate adverse impact upon the existing landscape character. The surrounding properties will suffer further disruption to their environment, but in view of the massive structures currently overlooking the village, future hardworks and planting proposals associated with the new road will be of slight beneficial impact to their environment.

6.5.9 There will be no disturbance to the shrine, and the construction of the road, footpath and cycle track will result only in the loss of marsh and wasteland of low landscape value. A small overgrown public 'garden' area will be lost, which can be reproved together with improved planting schemes beneath the elevated sections of the road. The landscape impacts within the village section will be slight.

6.5.10 The proposals for the adjacent cycletracks and footpaths, together with associated steps will be an improvement to the existing landscape around the base of the village. Appropriate hard landscape treatment of these paths and tree planting associated with the road and paths will significantly improve the existing landscape disorder.

A table summarising Landscape Impacts is contained in Appendix 3.

6.6 Chainage Pt. 300m to Lok Shun Path

Visual Assessment

Existing Visual Envelope

6.6.1 The visual Envelope within this village section is defined by the extent of the housing terraced upon the hillside North East of the study route. The K.C.R.C. and the High Rise 'Royal Ascot Housing Development define the visual boundary to the south.

(Refer to Figure 6.3)

6.6.2 The Main Visually Sensitive Receivers within this area are the houses of Lok Lo Ha Village (V.S.R. 25) which hold elevated views over the site, village houses at the base of the slope (V.S.R.'s 26-40), small properties within the woodland (V.S.R. 13 to 24) and the High Rise Royal Ascot Housing (V.S.R. No. 40).

Visual Impact

(Refer to Figure 6.4)

6.6.3 The overall visual impact of this elevated portion of the road development will be significant, due to the large number of sensitive receivers which are subject to direct views of the site, some properties being directly adjacent or below the proposed alignment.

6.6.4 V.S.R.'s 13 to 24, (within the woodland) will suffer severe visual intrusion from the introduction of a 4m high Vertical Noise Barrier, 30m length of steps and elevated road structure.

6.6.5 Lok Lo Ha Village and V.S.R.'s 26-40 will suffer adverse visual impact from the proposals, with a more urban visual environment being created by the introduction of further noise barriers adjacent to the village edge. However, the visual intrusion is no more hostile than their existing views of the K.C.R.C. and podium, and is considered Moderate Adverse.

6.6.6 V.S.R. No's 34 to 37 will have direct views onto the turning area and contractors works area which will result in moderate visual impact during the construction phase. However, in the long term, these properties will stand to benefit from improved footpath provisions and planting proposals, as the existing land surrounding the property is currently sparsely vegetated, and of low visual quality.

6.6.7 The 'Royal Ascot' Housing (V.S.R. No. 40) will suffer a moderate adverse impact upon their present views.

A table summarising visual impacts to visually Sensitive Receivers is contained in Appendix 3.

6.7 Existing Footpath Adjacent to K.C.R.C. Site

Landscape Assessment

Existing Landscape Character and Value

6.7.1 The existing footpath directly adjacent to the K.C.R.C. site is of low landscape and scenic value. The concrete path is approximately 2m wide and is not buffered in any way from the neighbouring rail lines, separated only by severe vertical steel railings. The landscape value of the footpath is low.

To the northern edge of the pathway, the base of the slope provides a fringe of dense vegetation, comprising native woodland, banana trees and a semi-mature bamboo grove of moderate landscape value.

6.7.2 There are a few low rise rural properties alongside the path, some with extensive gardens and cultivation areas.

6.7.3 The extent of the footpath runs from chainage 100m at the start of the study area along the southern edge of the site, and enters the network of small access pathways at Lok Lo Ha village, where it runs beside the low landscape value marsh areas and scrub land to the edges of the housing area.

Landscape Impacts

6.7.4 The route of the proposed 3m wide cycle track along the southern edge of the site will result in the loss of the existing footpath, and minor encroachment northwards into the existing vegetation alongside the path. In order to provide a level cycle track, one set of steps will be lost, resulting in a 20m length of cut slope and a 45m length of filled slope to allow stepped access to adjacent property and pathways. Part of the semi-mature bamboo grove will be lost.

6.7.5 The impact of these modifications will be slight. The existing landscape character will benefit from an improved access route, and land is then available at the southern edge of the cyclepath for screen planting to the K.C.R.C. tracks.

6.7.6 The cycletrack will pass beneath the proposed elevated road structure and into the village of Lok Lo Ha, alongside a 2.75m footpath. The proposed levels necessitate the construction of 3 sets of steps to reproved access to the village. These proposals will result in the loss of a few mature fruit trees, but mainly low value scrub and marsh ground. With improved structure planting and appropriate finishes treatment to the footpaths and structures, the impact to the landscape will be Moderate Beneficial.

6.8 Visual Assessment

Existing Visual Envelope

Existing Footpath Adjacent to K.C.R.C. Site

6.8.1 The visual envelope of the existing footpath is defined to the north by the dense Woodland, and to the South by the K.C.R. line. As the footpath passes through the village there are clear views north to the terrace housing.

Visual Impact

6.8.2 The visual impact of the proposed cycletrack and associated structural work will be slight. The visual quality of the existing footpath is low and can only be improved by the proposed upgrading works. Visually Sensitive Receivers nos. 5 and 18 will receive slight beneficial impact from the improvements.

6.9 Conclusions of Landscape and Visual Impacts

6.9.1 Due to the relatively undisturbed, well established nature of the woodland slopes, the proposed corridor of the road will significantly affect the landscape character of the woodland area of the site. There will be considerable disturbance to established vegetation and existing topography. Within the Woodland section, the impact of the road will be severe.

6.9.2 The road corridor, being mainly an elevated structure, will be highly visible throughout the village area.

However, when viewed within the general context of the expansive podium structure adjacent to the village area, overall, the road will have a relatively minor impact upon the site although opportunities for mitigation through planting are scarce, and the overall visual impact of the road and elevated structure will be moderate adverse. The impact to the landscape is in general slight, as the existing landscape is of low value.

6.10 Landscape Mitigation Measures

General

Refer to Figures 6.5 A - B.

6.10.1 The route is currently contained within the topography to the north and the built mass to the south, and to a great extent screened from view from all but the village of Lok Lo Ha directly within the site vicinity. The proposals to run the road through the hillside at a level lower than the general lay of the land would result in a detrimental disturbance to the existing landscape form.

6.10.2 Re-instatement and structure planting proposals, together with a co-ordinated approach to finishes on structural, hard elements and noise barriers, along the route, would allow the potential to develop a visually improved network of footpath and cycle tracks linking to established routes.

6.10.3 The visually intrusive K.C.R.C. and "Royal Ascot" housing development can potentially be screened with a vegetation buffer created between the proposed footpath and cycletrack along its edge. Semi-ornamental tree and shrub planting along the verges and beneath the elevated sections of the proposed road will help soften the impact of the road upon the properties of the village.

The cut slopes can be planted using re-instatement planting techniques of hydroseeding together with indigenous woodland mix planting to create rapid establishment, and only employing the use of tunam or shotcreted surfaces as a last resort.

6.10.4 Planting Proposals

The planting approach can be broadly divided into the following categories, with the overall objective to provide or restore a naturalistic edge to the road corridor which will soften the effect of the alignment within the landscape.

- Revegetation of engineered slopes and lost vegetation with native species to restore disturbed hillside areas in keeping with the surrounding character.
- Implementation of semi-ornamental planting within the village and footpath area of the proposed route to provide an improved screen between the village and the K.C.R.C, and roadway.
- Reprovision of amenity planting beneath the elevated structure to compensate for lost of amenity land.
- Reprovision of sitting out area will be located to the west of the roundabout as shown in Figure 6.5B. The size of the seating area will be subjected to detail design.

Details of the proposed planting mixes are in Appendix 4.

7. ENVIRONMENTAL MONITORING & AUDITING REQUIREMENTS

7.1 General

7.1.1 Monitoring and auditing procedures are required as a check during the construction and operation of a development that the specified control criteria and standards are being complied with. This EIA Study has highlighted potential environmental impacts associated with the project and identified possible mitigation measures. However, the assumptions used in the assessment may differ from actual conditions arising from different work methods employed by the contractor and therefore environmental monitoring would be necessary to confirm that the required standards and criteria are being met.

7.1.2 Auditing defines methods and procedures to ensure that the required monitoring exercise is effectively carried out and that the monitoring will identify any adverse impacts. Auditing also covers procedures to be followed in the event that the criteria or standards are breached.

7.1.3 A standalone Environmental Monitoring and Audit (EM&A) Manual will be produced for this particular construction project. The intention of this EM&A Manual is to guide the set up of an EM&A Programme to ensure compliance with the Environmental Impact Assessment (EIA) Study recommendations, to assess the effectiveness of the recommend mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme of the construction of Road D15 linking Lok Shun Path and Tai Po Road. It aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the construction works.

7.2 Environmental Monitoring

7.2.1 Monitoring shall focus on construction noise which is assessed to have significant impact on sensitive receivers. Monitoring of air quality during construction is also important although predicted TSP levels are within AQO limits.

7.2.2 Monitoring of traffic noise and pollutants during the operation phase are not considered to be essential as the predicted impacts are low with the recommended noise mitigation measures.

7.3 Monitoring/Auditing Requirements of Construction Noise and Air Quality

7.3.1 The scope of monitoring and auditing of construction noise and air quality should include the following aspects:

(i) Parameters

Noise levels shall be measured in terms of A-weighted equivalent continuous sound pressure level L_{eq}. Air quality measurements for TSP shall be in terms of average concentration levels over one hour or 24 hours in units of μgm^{-3}.

(ii) Monitoring Equipment

Noise monitoring equipment shall be those specified in the Technical Memorandum issued under the NCO whereas high volume air samplers and associated equipment shall be used for TSP measurements.

(iii) Monitoring Locations

Monitoring locations should be close to sensitive receivers and site boundary and free from local obstructions or shelters.

(iv) Baseline Monitoring

Baseline monitoring shall be carried out prior to the commencement of construction works. The baseline monitoring shall be carried out daily for a period of at least two weeks.

(v) Impact Monitoring

Noise measurements in L_{eq} (30 min) shall be carried out for time period between 0700-1900 hours during normal weekdays. Frequency shall depend on the scale of construction activities. However air quality monitoring shall be undertaken at a frequency of not less than one 24-hour measurement per six days at each monitoring station.

When the recorded levels are significantly greater than the baseline levels or in the case of non-compliance with the relevant standards and criteria, more frequent monitoring shall be undertaken. The additional monitoring shall be continued until the recorded levels are rectified or proved to be irrelevant to the construction activities.

(vi) Auditing Procedures

Event and action plans shall be developed for non-compliance situations as monitored during the construction phase. The performance of the proposed mitigation measures shall also be reviewed.

8. SUMMARY AND CONCLUSIONS

8.1 Objective

The main objective of this EIA Study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the proposed Road D15.

8.2 Noise Impact

Significant impact during construction phase is predicted and that substantial noise mitigation would be required to counter excessive construction noise for facades close to the roadway. Besides the use of quietened equipment for the construction, temporary noise barriers are proposed for noise screening.

During operation phase, significant impact of traffic noise is confined to facades closest to the roadway. Vertical noise barriers are proposed to mitigate traffic noise to levels complying with the HKPSG limits.

8.3 Air Quality Impact

It is predicted that the statutory Air Quality Objectives (AQO) will not be exceeded during both construction and operation stages. For the construction phase, the maximum 1-hour and 24-hour average TSP concentrations at the worst affected sensitive receptor are 69% and 83% of the respective guideline levels of AQO. During the operation phase, the predicted maximum NO_2 concentration at the worst affected sensitive receptor is found to be 46% of the AQO. Hence the air quality impact for this proposed project is considered to be acceptable. However, good dust control practice should still be followed during the construction phase.

8.4 Ecology Impact

The impact of the proposed project on the habitat is considered to be insignificant. The predicted loss of woodland, scrubland, horticultural area marsh are confined to small areas. All are low in species diversity which are common and widespread within the Territory. However, a large Ficus elastica has been identified as worthy for conservation.

8.5 Landscape and Visual Impacts

The road corridor, being mainly on elevated structures, will be highly visible throughout the village section of the site. However, when viewed within the general context of the expansive podium structure adjacent to the study area, overall, the road will have a relatively minor impact upon the site and may benefit and improve the existing village area through landscape mitigation proposals.

Landscape proposals include revegetation of engineered slopes and semi-ornamental planting within village, footpath areas, verges and beneath elevated sections to help soften the visual impact of the road.

8.6 Conclusions

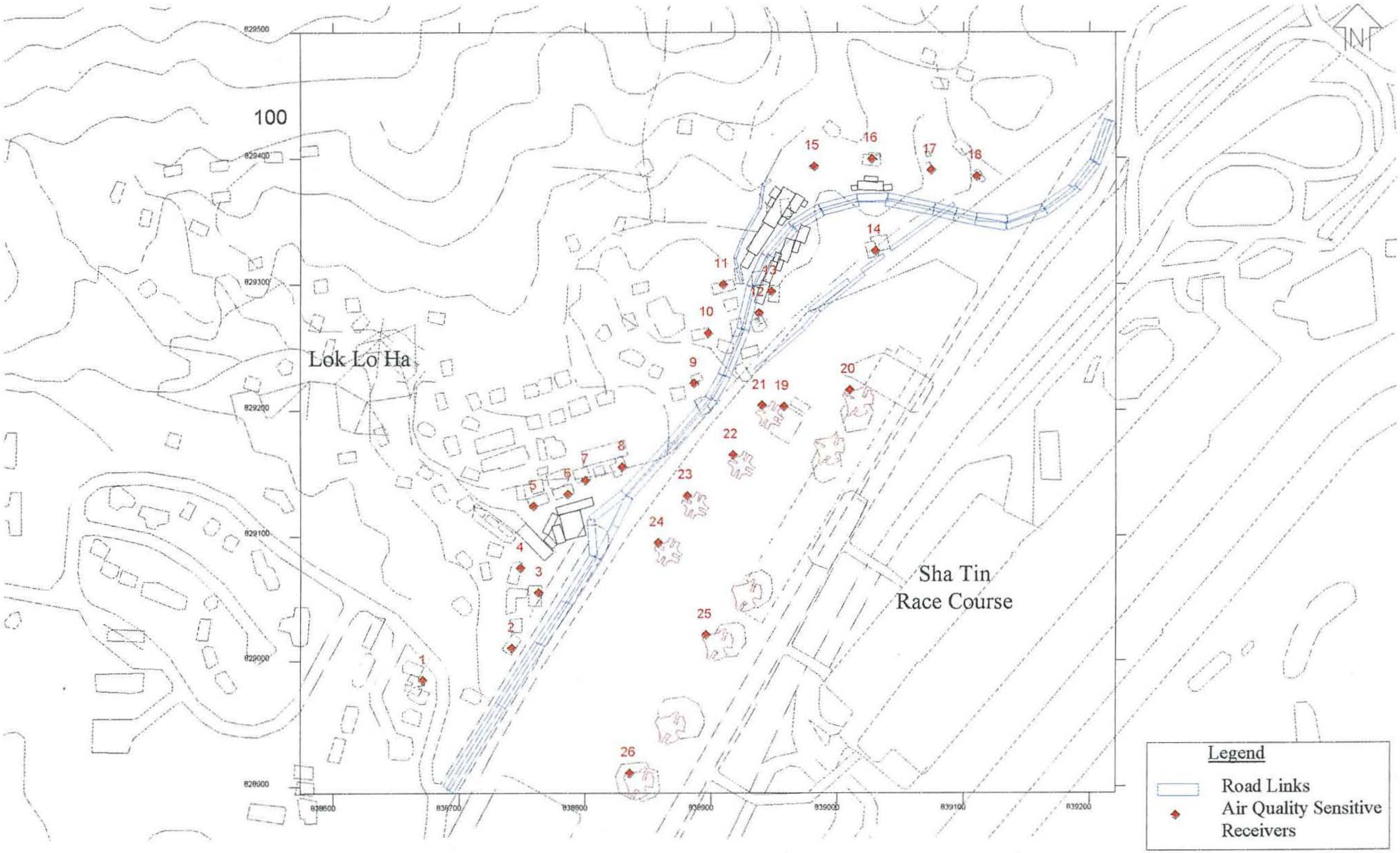
Overall, the potential environmental impacts of the proposed project is not considered to be significant. With the implementation of the proposed mitigation measures, the environmental impacts should be brought down to the established environmental guidelines and standards. Monitoring of noise and air quality during construction is proposed as part of Environmental Monitoring and Auditing requirements of the proposed project.

Figures

Appendices

Appendix 1

Road D-15 Construction		
Haul road area (sq.m)	5821	
Cut and fill area (sq. m)	3858	
Total construction area (sq.m)	9679	
Description	TSP	Remarks
Road Construction Area, Including Cut & Fill Operations		
Mitigation efficiency (%)	50	*estimated mitigation efficiency of twice daily watering with complete coverage*
Percentage active operating area (%)	30	*estimated*
Emission factor (kg/day/sq.m)	1.5519E-03	***emission rate of general construction activities from AP-42*
Emission from haul road area (kg/day)	9	*calculated as in AP-42*
Emission from cut and fill area (kg/day)	6	*calculated as in AP-42*
Total emission (kg/day)	15	*calculated as in AP-42*
Emission (g/sq.m/s)	3.5925E-05	*calculated*
Remarks:		
* Extracted from S 11.2.4.4, AP-42 Vol 1, Control Methods of Heavy Construction Operations		
** Extracted from S 11.2.4.3, AP-42 Vol 1, Emission Factor of Heavy Construction Operations		



ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT

SCHEMATIC DIAGRAM OF THE SELECTED AIR QUALITY SENSITIVE RECEIVERS AND THE MODELLED DUST SOURCES DURING CONSTRUCTION PHASE

Maunsell
茂盛(亞洲)工程顧問有限公司

JOB NO. 63094/02

APPENDIX: 1A

Appendix 1B

Sample FDM model input file

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Road D-15 Construction (revised)
 1 1 2 1 1 1 3 1 1 1 1 1 0 2
 85   104   5   360
60.       200.      1.        2.5       10
1.25      3.75      7.5       12.5      20.
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838741.6   829010.8   1.5
838763.2   829055.5   1.5
838748.3   829075.2   1.5
838758.9   829124.3   1.5
838786.3   829133.9   1.5
838800.2   829145.1   1.5
838829.2   829155.3   1.5
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838897.6   829261.6   1.5
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838748.3   829075.2   5.0
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838786.3   829133.9   5.0
838800.2   829145.1   5.0
838829.2   829155.3   5.0
838886.3   829221.5   5.0
838897.6   829261.6   5.0
838909.4   829300.0   5.0
838937.9   829277.4   5.0
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839110.9   829385.4   5.0
838957.6   829203.2   5.0
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838940.2   829204.1   5.0
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838880.8   829132.8   5.0
838858.2   829095.1   5.0
838896.0   829021.5   5.0
838835.7   828911.2   5.0
838671.2   828985.0   10.0
838741.6   829010.8   10.0
838763.2   829055.5   10.0
838748.3   829075.2   10.0
838758.9   829124.3   10.0
838786.3   829133.9   10.0
838800.2   829145.1   10.0
838829.2   829155.3   10.0
838886.3   829221.5   10.0
838897.6   829261.6   10.0
838909.4   829300.0   10.0
838937.9   829277.4   10.0
```

```
838947.7    829294.6    10.0
839030.5    829326.7    10.0
838981.5    829393.5    10.0
839027.8    829399.4    10.0
839074.9    829390.2    10.0
839110.9    829385.4    10.0
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13 3.5925E-05    838778.5  829101.9  14.5      7.0       0.0     -72.3
13 3.5925E-05    838789.6  829109.0  20.9      17.0      0.0     -76.9
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13 3.5925E-05    838938.5  829335.8  25.3      9.7       0.0     56.2
13 3.5925E-05    838953.2  829360.7  32.1      11.1      0.0     58.7
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13 3.5925E-05    838972.3  829339.6  13.0      7.8       0.0     70.8
13 3.5925E-05    839013.2  829376.3  4.6       3.9       0.0     5.3
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2.0	0.0	4	500.0	298.0
2.0	10.0	4	500.0	298.0
2.0	20.0	4	500.0	298.0
2.0	30.0	4	500.0	298.0
2.0	40.0	4	500.0	298.0
2.0	50.0	4	500.0	298.0
2.0	60.0	4	500.0	298.0
2.0	70.0	4	500.0	298.0
2.0	80.0	4	500.0	298.0

2.0	90.0	4	500.0	298.0
2.0	100.0	4	500.0	298.0
2.0	110.0	4	500.0	298.0
2.0	120.0	4	500.0	298.0
2.0	130.0	4	500.0	298.0
2.0	140.0	4	500.0	298.0
2.0	150.0	4	500.0	298.0
2.0	160.0	4	500.0	298.0
2.0	170.0	4	500.0	298.0
2.0	180.0	4	500.0	298.0
2.0	190.0	4	500.0	298.0
2.0	200.0	4	500.0	298.0
2.0	210.0	4	500.0	298.0
2.0	220.0	4	500.0	298.0
2.0	230.0	4	500.0	298.0
2.0	240.0	4	500.0	298.0
2.0	250.0	4	500.0	298.0
2.0	260.0	4	500.0	298.0
2.0	270.0	4	500.0	298.0
2.0	280.0	4	500.0	298.0
2.0	290.0	4	500.0	298.0
2.0	300.0	4	500.0	298.0
2.0	310.0	4	500.0	298.0
2.0	320.0	4	500.0	298.0
2.0	330.0	4	500.0	298.0
2.0	340.0	4	500.0	298.0
2.0	350.0	4	500.0	298.0
4.0	0.0	4	500.0	298.0
4.0	10.0	4	500.0	298.0
4.0	20.0	4	500.0	298.0
4.0	30.0	4	500.0	298.0
4.0	40.0	4	500.0	298.0
4.0	50.0	4	500.0	298.0
4.0	60.0	4	500.0	298.0
4.0	70.0	4	500.0	298.0
4.0	80.0	4	500.0	298.0
4.0	90.0	4	500.0	298.0
4.0	100.0	4	500.0	298.0
4.0	110.0	4	500.0	298.0
4.0	120.0	4	500.0	298.0
4.0	130.0	4	500.0	298.0
4.0	140.0	4	500.0	298.0
4.0	150.0	4	500.0	298.0
4.0	160.0	4	500.0	298.0
4.0	170.0	4	500.0	298.0
4.0	180.0	4	500.0	298.0
4.0	190.0	4	500.0	298.0
4.0	200.0	4	500.0	298.0
4.0	210.0	4	500.0	298.0
4.0	220.0	4	500.0	298.0
4.0	230.0	4	500.0	298.0
4.0	240.0	4	500.0	298.0
4.0	250.0	4	500.0	298.0
4.0	260.0	4	500.0	298.0
4.0	270.0	4	500.0	298.0
4.0	280.0	4	500.0	298.0
4.0	290.0	4	500.0	298.0
4.0	300.0	4	500.0	298.0
4.0	310.0	4	500.0	298.0
4.0	320.0	4	500.0	298.0
4.0	330.0	4	500.0	298.0
4.0	340.0	4	500.0	298.0
4.0	350.0	4	500.0	298.0
6.0	0.0	4	500.0	298.0
6.0	10.0	4	500.0	298.0
6.0	20.0	4	500.0	298.0
6.0	30.0	4	500.0	298.0
6.0	40.0	4	500.0	298.0
6.0	50.0	4	500.0	298.0
6.0	60.0	4	500.0	298.0

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6.0      70.0     4     500.0 298.0
6.0      80.0     4     500.0 298.0
6.0      90.0     4     500.0 298.0
6.0      100.0    4     500.0 298.0
6.0      110.0    4     500.0 298.0
6.0      120.0    4     500.0 298.0
6.0      130.0    4     500.0 298.0
6.0      140.0    4     500.0 298.0
6.0      150.0    4     500.0 298.0
6.0      160.0    4     500.0 298.0
6.0      170.0    4     500.0 298.0
6.0      180.0    4     500.0 298.0
6.0      190.0    4     500.0 298.0
6.0      200.0    4     500.0 298.0
6.0      210.0    4     500.0 298.0
6.0      220.0    4     500.0 298.0
6.0      230.0    4     500.0 298.0
6.0      240.0    4     500.0 298.0
6.0      250.0    4     500.0 298.0
6.0      260.0    4     500.0 298.0
6.0      270.0    4     500.0 298.0
6.0      280.0    4     500.0 298.0
6.0      290.0    4     500.0 298.0
6.0      300.0    4     500.0 298.0
6.0      310.0    4     500.0 298.0
6.0      320.0    4     500.0 298.0
6.0      330.0    4     500.0 298.0
6.0      340.0    4     500.0 298.0
6.0      350.0    4     500.0 298.0
8.0      0.0      4     500.0 298.0
8.0      10.0     4     500.0 298.0
8.0      20.0     4     500.0 298.0
8.0      30.0     4     500.0 298.0
8.0      40.0     4     500.0 298.0
8.0      50.0     4     500.0 298.0
8.0      60.0     4     500.0 298.0
8.0      70.0     4     500.0 298.0
8.0      80.0     4     500.0 298.0
8.0      90.0     4     500.0 298.0
8.0      100.0    4     500.0 298.0
8.0      110.0    4     500.0 298.0
8.0      120.0    4     500.0 298.0
8.0      130.0    4     500.0 298.0
8.0      140.0    4     500.0 298.0
8.0      150.0    4     500.0 298.0
8.0      160.0    4     500.0 298.0
8.0      170.0    4     500.0 298.0
8.0      180.0    4     500.0 298.0
8.0      190.0    4     500.0 298.0
8.0      200.0    4     500.0 298.0
8.0      210.0    4     500.0 298.0
8.0      220.0    4     500.0 298.0
8.0      230.0    4     500.0 298.0
8.0      240.0    4     500.0 298.0
8.0      250.0    4     500.0 298.0
8.0      260.0    4     500.0 298.0
8.0      270.0    4     500.0 298.0
8.0      280.0    4     500.0 298.0
8.0      290.0    4     500.0 298.0
8.0      300.0    4     500.0 298.0
8.0      310.0    4     500.0 298.0
8.0      320.0    4     500.0 298.0
8.0      330.0    4     500.0 298.0
8.0      340.0    4     500.0 298.0
8.0      350.0    4     500.0 298.0
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                 FUGITIVE DUST MODEL (FDM)
                 VERSION 95279
                 OCT, 1995
       DATE AT START OF RUN: 01/23/97   TIME AT START OF RUN: 09:52:21.24

  RUN TITLE:
       Road D-15 Construction (revised)

       INPUT FILE NAME: constnew.IN
       OUTPUT FILE NAME: constnew.OUT
       PLOT OUTPUT WRITTEN TO FILE NAME: constnew.DAT

       CONVERGENCE OPTION 1=OFF, 2=ON                      1
       MET OPTION SWITCH, 1=CARDS, 2=PREPROCESSED          1
       PLOT FILE OUTPUT, 1=NO, 2=YES                       2
       MET DATA PRINT SWITCH, 1=NO, 2=YES                  1
       POST-PROCESSOR OUTPUT, 1=NO, 2=YES                  1
       DEP. VEL./GRAV. SETL. VEL., 1=DEFAULT, 2=USER       1
       PRINT 1-HOUR AVERAGE CONCEN, 1=NO, 2=YES            3
       PRINT 3-HOUR AVERAGE CONCEN, 1=NO, 2=YES            1
       PRINT 8-HOUR AVERAGE CONCEN, 1=NO, 2=YES            1
       PRINT 24-HOUR AVERAGE CONCEN, 1=NO, 2=YES           1
       PRINT LONG-TERM AVERAGE CONCEN, 1=NO, 2=YES         1
       BYPASS RAMMET CALMS RECOGNITION, 1=NO, 2=YES        1
       READ HOURLY EMISSION RATES, 1=NO, 2=YES             0
       NUMBER OF SOURCES PROCESSED                        85
       NUMBER OF RECEPTORS PROCESSED                     104
       NUMBER OF PARTICLE SIZE CLASSES                     5
       NUMBER OF HOURS OF MET DATA PROCESSED             360
       LENGTH IN MINUTES OF 1-HOUR OF MET DATA           60.
       ROUGHNESS LENGTH IN CM                         200.00
       SCALING FACTOR FOR SOURCE AND RECPTORS         1.0000
       PARTICLE DENSITY IN G/CM**3                      2.50
       ANEMOMETER HEIGHT IN M                          10.00

       GENERAL PARTICLE SIZE CLASS INFORMATION

                                  GRAV.                FRACTION
         PARTICLE        CHAR.  SETTLING  DEPOSITION    IN EACH
             SIZE         DIA.  VELOCITY    VELOCITY       SIZE
            CLASS         (UM)   (M/SEC)     (M/SEC)      CLASS
            -----  -----------  --------  ----------   --------
                1    1.2500000        **          **     0.0262
                2    3.7500000        **          **     0.0678
                3    7.5000000        **          **     0.1704
                4   12.5000000        **          **     0.1536
                5   20.0000000        **          **     0.5820
       ----------
       ** COMPUTED BY FDM
1
       RECEPTOR COORDINATES (X,Y,Z)

(838671., 828985.,  2.) (838742., 829011.,  2.) (838763., 829056.,  2.)
(838748., 829075.,  2.) (838759., 829124.,  2.) (838786., 829134.,  2.)
(838800., 829145.,  2.) (838829., 829155.,  2.) (838886., 829222.,  2.)
(838898., 829262.,  2.) (838909., 829300.,  2.) (838938., 829277.,  2.)
(838948., 829295.,  2.) (839031., 829327.,  2.) (838982., 829394.,  2.)
(839028., 829399.,  2.) (839075., 829390.,  2.) (839111., 829385.,  2.)
(838958., 829203.,  2.) (839010., 829216.,  2.) (838940., 829204.,  2.)
(838917., 829165.,  2.) (838881., 829133.,  2.) (838858., 829095.,  2.)
(838896., 829022.,  2.) (838836., 828911.,  2.) (838671., 828985.,  5.)
(838742., 829011.,  5.) (838763., 829056.,  5.) (838748., 829075.,  5.)
(838759., 829124.,  5.) (838786., 829134.,  5.) (838800., 829145.,  5.)
(838829., 829155.,  5.) (838886., 829222.,  5.) (838898., 829262.,  5.)
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(838909., 829300.,  5.) (838938., 829277.,  5.) (838948., 829295.,  5.)
(839031., 829327.,  5.) (838982., 829394.,  5.) (839028., 829399.,  5.)
(839075., 829390.,  5.) (839111., 829385.,  5.) (838958., 829203.,  5.)
(839010., 829216.,  5.) (838940., 829204.,  5.) (838917., 829165.,  5.)
(838881., 829133.,  5.) (838858., 829095.,  5.) (838896., 829022.,  5.)
(838836., 828911.,  5.) (838671., 828985., 10.) (838742., 829011., 10.)
(838763., 829056., 10.) (838748., 829075., 10.) (838759., 829124., 10.)
(838786., 829134., 10.) (838800., 829145., 10.) (838829., 829155., 10.)
(838886., 829222., 10.) (838898., 829262., 10.) (838909., 829300., 10.)
(838938., 829277., 10.) (838948., 829295., 10.) (839031., 829327., 10.)
(838982., 829394., 10.) (839028., 829399., 10.) (839075., 829390., 10.)
(839111., 829385., 10.) (838958., 829203., 10.) (839010., 829216., 10.)
(838940., 829204., 10.) (838917., 829165., 10.) (838881., 829133., 10.)
(838858., 829095., 10.) (838896., 829022., 10.) (838836., 828911., 10.)
(838671., 828985., 10.) (838742., 829011., 15.) (838763., 829056., 15.)
(838748., 829075., 15.) (838759., 829124., 15.) (838786., 829134., 15.)
(838800., 829145., 15.) (838829., 829155., 15.) (838886., 829222., 15.)
(838898., 829262., 15.) (838909., 829300., 15.) (838938., 829277., 15.)
(838948., 829295., 15.) (839031., 829327., 15.) (838982., 829394., 15.)
(839028., 829399., 15.) (839075., 829390., 15.) (839111., 829385., 15.)
(838958., 829203., 15.) (839010., 829216., 15.) (838940., 829204., 15.)
(838917., 829165., 15.) (838881., 829133., 15.) (838858., 829095., 15.)
(838896., 829022., 15.) (838836., 828911., 15.) (
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SOURCE INFORMATION

TYPE	ENTERED EMIS. RATE (G/SEC, G/SEC/M OR G/SEC/M**2)	TOTAL EMISSION RATE (G/SEC)	WIND SPEED FAC.	X1 (M)	Y1 (M)	X2 (M)	Y2 (M)	HEIGHT (M)	WIDTH (M)
2	0.000125740	0.00988	0.000	838690.	828899.	838732.	828965.	0.50	3.50
2	0.000125740	0.00726	0.000	838732.	828965.	838762.	829014.	0.50	3.50
2	0.000125740	0.00496	0.000	838762.	829014.	838784.	829047.	0.50	3.50
2	0.000125740	0.00542	0.000	838784.	829047.	838806.	829084.	0.50	3.50
2	0.000125740	0.00372	0.000	838806.	829084.	838804.	829113.	0.50	3.50
2	0.000125740	0.00418	0.000	838804.	829113.	838830.	829134.	0.50	3.50
2	0.000125740	0.00687	0.000	838830.	829134.	838867.	829174.	0.50	3.50
2	0.000125740	0.00583	0.000	838867.	829174.	838898.	829209.	0.50	3.50
2	0.000125740	0.00269	0.000	838898.	829209.	838908.	829228.	0.50	3.50
2	0.000125740	0.00497	0.000	838908.	829228.	838923.	829265.	0.50	3.50
2	0.000125740	0.00435	0.000	838923.	829265.	838931.	829298.	0.50	3.50
2	0.000125740	0.00339	0.000	838931.	829298.	838942.	829323.	0.50	3.50
2	0.000125740	0.00393	0.000	838942.	829323.	838963.	829346.	0.50	3.50
2	0.000125740	0.00340	0.000	838963.	829346.	838986.	829360.	0.50	3.50
2	0.000125740	0.00388	0.000	838986.	829360.	839016.	829368.	0.50	3.50
2	0.000125740	0.00306	0.000	839016.	829368.	839040.	829369.	0.50	3.50
2	0.000125740	0.00475	0.000	839040.	829369.	839077.	829361.	0.50	3.50
2	0.000125740	0.00225	0.000	839077.	829361.	839094.	829357.	0.50	3.50
2	0.000125740	0.00206	0.000	839094.	829357.	839110.	829353.	0.50	3.50
2	0.000125740	0.00311	0.000	839110.	829353.	839135.	829351.	0.50	3.50
2	0.000125740	0.00376	0.000	839135.	829351.	839163.	829360.	0.50	3.50
2	0.000125740	0.00348	0.000	839163.	829360.	839186.	829376.	0.50	3.50
2	0.000125740	0.00338	0.000	839186.	829376.	839203.	829397.	0.50	3.50
2	0.000125740	0.00435	0.000	839203.	829397.	839215.	829429.	0.50	3.50
2	0.000125740	0.00451	0.000	839218.	829429.	839205.	829395.	0.50	3.50
2	0.000125740	0.00306	0.000	839205.	829395.	839190.	829376.	0.50	3.50
2	0.000125740	0.00395	0.000	839190.	829376.	839166.	829357.	0.50	3.50
2	0.000125740	0.00425	0.000	839166.	829357.	839134.	829345.	0.50	3.50
2	0.000125740	0.00313	0.000	839134.	829345.	839109.	829349.	0.50	3.50
2	0.000125740	0.00216	0.000	839109.	829349.	839092.	829353.	0.50	3.50
2	0.000125740	0.00215	0.000	839092.	829353.	839076.	829357.	0.50	3.50
2	0.000125740	0.00481	0.000	839076.	829357.	839038.	829365.	0.50	3.50
2	0.000125740	0.00274	0.000	839038.	829365.	839017.	829365.	0.50	3.50
2	0.000125740	0.00369	0.000	839017.	829365.	838988.	829357.	0.50	3.50
2	0.000125740	0.00323	0.000	838988.	829357.	838966.	829344.	0.50	3.50
2	0.000125740	0.00364	0.000	838966.	829344.	838947.	829322.	0.50	3.50
2	0.000125740	0.00339	0.000	838947.	829322.	838936.	829298.	0.50	3.50
2	0.000125740	0.00442	0.000	838936.	829298.	838927.	829264.	0.50	3.50

2	0.000125740	0.00500	0.000	838927.	829264.	838912.	829227.	0.50	3.50
2	0.000125740	0.00266	0.000	838912.	829227.	838902.	829208.	0.50	3.50
2	0.000125740	0.00571	0.000	838902.	829208.	838873.	829174.	0.50	3.50
2	0.000125740	0.00716	0.000	838873.	829174.	838835.	829131.	0.50	3.50
2	0.000125740	0.00324	0.000	838835.	829131.	838824.	829108.	0.50	3.50
2	0.000125740	0.00366	0.000	838824.	829108.	838810.	829082.	0.50	3.50
2	0.000125740	0.00533	0.000	838810.	829082.	838787.	829046.	0.50	3.50
2	0.000125740	0.00501	0.000	838787.	829046.	838765.	829013.	0.50	3.50
2	0.000125740	0.00737	0.000	838765.	829013.	838734.	828964.	0.50	3.50
2	0.000125740	0.00995	0.000	838734.	828964.	838693.	828896.	0.50	3.50
2	0.000107770	0.00537	0.000	838935.	829232.	838973.	829264.	0.50	3.00
2	0.000107770	0.00209	0.000	838973.	829264.	838986.	829279.	0.50	3.00
2	0.000107770	0.00491	0.000	838986.	829279.	839021.	829308.	0.50	3.00
2	0.000143700	0.00563	0.000	838978.	829279.	839009.	829303.	0.50	4.00
2	0.000107770	0.00232	0.000	839019.	829310.	839037.	829323.	0.50	3.00
2	0.000107770	0.00666	0.000	839042.	829327.	839093.	829363.	0.50	3.00
2	0.000071849	0.00149	0.000	838924.	829300.	838918.	829320.	0.50	2.00
2	0.000071849	0.00120	0.000	838918.	829320.	838924.	829336.	0.50	2.00
2	0.000071849	0.00201	0.000	838924.	829336.	838938.	829360.	0.50	2.00
2	0.000071849	0.00128	0.000	838938.	829360.	838941.	829378.	0.50	2.00
2	0.000071849	0.00057	0.000	838941.	829378.	838947.	829383.	0.50	2.00
3	0.000035925	0.00198	0.000	838772.	829095.	10.	6.	0.50	-45.80
3	0.000035925	0.00346	0.000	838772.	829110.	18.	6.	0.50	62.30
3	0.000035925	0.00365	0.000	838779.	829102.	15.	7.	0.50	-72.30
3	0.000035925	0.01276	0.000	838790.	829109.	21.	17.	0.50	-76.90
3	0.000035925	0.00691	0.000	838792.	829124.	30.	7.	0.50	15.80
3	0.000035925	0.00297	0.000	838929.	829319.	13.	7.	0.50	59.70
3	0.000035925	0.00882	0.000	838939.	829336.	25.	10.	0.50	56.20
3	0.000035925	0.01280	0.000	838953.	829361.	32.	11.	0.50	58.70
3	0.000035925	0.00113	0.000	838947.	829365.	8.	4.	0.50	62.90
3	0.000035925	0.00206	0.000	838951.	829372.	9.	7.	0.50	55.40
3	0.000035925	0.00111	0.000	838956.	829350.	7.	4.	0.50	56.60
3	0.000035925	0.00161	0.000	838960.	829356.	7.	6.	0.50	56.50
3	0.000035925	0.00377	0.000	838967.	829364.	14.	8.	0.50	57.00
3	0.000035925	0.00067	0.000	838973.	829364.	5.	4.	0.50	54.70
3	0.000035925	0.00442	0.000	838940.	829294.	18.	7.	0.50	71.60
3	0.000035925	0.00369	0.000	838947.	829310.	17.	6.	0.50	67.40
3	0.000035925	0.00124	0.000	838952.	829321.	7.	5.	0.50	68.90
3	0.000035925	0.00139	0.000	838954.	829315.	9.	5.	0.50	70.60
3	0.000035925	0.00495	0.000	838960.	829327.	18.	8.	0.50	70.40
3	0.000035925	0.00160	0.000	838967.	829330.	9.	5.	0.50	71.90
3	0.000035925	0.00364	0.000	838972.	829340.	13.	8.	0.50	70.80
3	0.000035925	0.00064	0.000	839013.	829376.	5.	4.	0.50	5.30
3	0.000035925	0.00520	0.000	839026.	829378.	7.	20.	0.50	83.00
3	0.000035925	0.00164	0.000	839026.	829383.	4.	10.	0.50	83.60
3	0.000035925	0.00117	0.000	839040.	829376.	5.	7.	0.50	-84.30
3	0.000035925	0.01173	0.000	838760.	829095.	32.	10.	0.50	-45.80

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TOTAL EMISSIONS 0.34767E+00 GRAMS/SEC

SHORT DISTANCE (5,000 M) MASS CONSERVATION CORRECTION FACTORS USED

1

TOP 50 TABLE FOR 1 HOUR AVERAGES

RANK	RECEPTOR	X-COORDINATE	Y-COORDINATE	ENDING HOUR	CONCENTRATION	DEPOSITION
1	12	838937.9	829277.4	181	258.2047	6.4582
2	12	838937.9	829277.4	182	258.1332	6.4366
3	13	838947.7	829294.6	181	250.1841	6.2707
4	13	838947.7	829294.6	216	244.8843	6.1500
5	6	838786.3	829133.9	199	234.4225	5.8828
6	13	838947.7	829294.6	182	230.2931	5.7600
7	13	838947.7	829294.6	215	229.8745	5.7843
8	6	838786.3	829133.9	200	227.5577	5.7006
9	12	838937.9	829277.4	216	220.3462	5.5278

10	6	838786.3	829133.9	198	220.1391	5.5333
11	12	838937.9	829277.4	183	218.1821	5.4216
12	13	838947.7	829294.6	214	205.9721	5.1907
13	6	838786.3	829133.9	201	205.6106	5.1480
14	6	838786.3	829133.9	197	200.8051	5.0536
15	11	838909.4	829300.0	186	194.2046	4.8008
16	11	838909.4	829300.0	187	191.4006	4.7269
17	13	838947.7	829294.6	183	189.4277	4.7261
18	4	838748.3	829075.2	186	189.2481	4.6530
19	4	838748.3	829075.2	185	187.2320	4.6129
20	15	838981.5	829393.5	202	186.3010	4.5540
21	13	838947.7	829294.6	213	185.5506	4.6780
22	7	838800.2	829145.1	201	176.8505	4.4002
23	6	838786.3	829133.9	196	173.0243	4.3578
24	11	838909.4	829300.0	188	172.0475	4.2519
25	15	838981.5	829393.5	201	171.5897	4.1931
26	12	838937.9	829277.4	215	171.2003	4.3066
27	11	838909.4	829300.0	185	170.0704	4.2090
28	7	838800.2	829145.1	200	169.9541	4.2314
29	15	838981.5	829393.5	203	165.6641	4.0643
30	13	838947.7	829294.6	212	164.3074	4.1441
31	5	838758.9	829124.3	193	162.6262	4.0902
32	6	838786.3	829133.9	202	161.7030	4.0507
33	4	838748.3	829075.2	187	159.7869	3.9366
34	5	838758.9	829124.3	192	159.7194	4.0155
35	7	838800.2	829145.1	202	156.5515	3.8962
36	13	838947.7	829294.6	211	155.2120	3.9125
37	5	838758.9	829124.3	194	154.7428	3.8909
38	13	838947.7	829294.6	204	154.3987	3.8432
39	12	838937.9	829277.4	184	153.9403	3.8067
40	13	838947.7	829294.6	205	151.5415	3.8046
41	4	838748.3	829075.2	184	149.5920	3.7054
42	11	838909.4	829300.0	189	147.8051	3.6654
43	7	838800.2	829145.1	199	146.0989	3.6451
44	6	838786.3	829133.9	195	145.3731	3.6646
45	13	838947.7	829294.6	206	144.8746	3.6516
46	13	838947.7	829294.6	207	143.0000	3.6061
47	13	838947.7	829294.6	203	142.1077	3.5024
48	5	838758.9	829124.3	191	141.2264	3.5448
49	5	838758.9	829124.3	195	140.7634	3.5371
50	13	838947.7	829294.6	210	140.1037	3.5316

1

HIGHEST AND SECOND HIGHEST VALUES FOR 1 HOUR AVERAGES

RECEPTOR	X-COORDINATE	Y-COORDINATE	HIGHEST VALUE	ENDING HOUR	DEPOSITION	SECOND HIGH	ENDING HOUR	DEPOSTION
1	838671.2	828985.0	36.5007	186.	0.8122	33.1341	185.	0.7305
2	838741.6	829010.8	79.7621	186.	1.9199	78.6408	185.	1.8554
3	838763.2	829055.5	110.8853	183.	2.7148	107.5703	184.	2.5953
4	838748.3	829075.2	189.2481	186.	4.6530	187.2320	185.	4.6129
5	838758.9	829124.3	162.6262	193.	4.0902	159.7194	192.	4.0155
6	838786.3	829133.9	234.4225	199.	5.8828	227.5577	200.	5.7006
7	838800.2	829145.1	176.8505	201.	4.4002	169.9541	200.	4.2314
8	838829.2	829155.3	104.4930	202.	2.5500	100.1032	203.	2.4421
9	838886.3	829221.5	98.9512	186.	2.3909	95.4075	185.	2.2822
10	838897.6	829261.6	119.4516	186.	2.8924	117.2457	185.	2.8309
11	838909.4	829300.0	194.2046	186.	4.8008	191.4006	187.	4.7269
12	838937.9	829277.4	258.2047	181.	6.4582	258.1332	182.	6.4366
13	838947.7	829294.6	250.1841	181.	6.2707	244.8843	216.	6.1500
14	839030.5	829326.7	88.6988	203.	2.1601	81.7723	202.	2.0168
15	838981.5	829393.5	186.3010	202.	4.5540	171.5897	201.	4.1931
16	839027.8	829399.4	138.3071	202.	3.3763	136.8759	201.	3.3885
17	839074.9	829390.2	111.0297	205.	2.6680	105.7823	206.	2.5475
18	839110.9	829385.4	91.3522	205.	2.1778	87.4643	204.	2.1002
19	838957.6	829203.2	68.1540	216.	1.6227	66.9163	181.	1.5839
20	839010.2	829216.3	55.1709	214.	1.2980	53.9971	215.	1.2680

Appendix 1B

Sample FDM model output file

21	838940.2	829204.1	79.0334	181.	1.8903	75.3558	182.	1.7939
22	838917.2	829164.8	56.6598	182.	1.3210	55.9678	181.	1.3233
23	838880.8	829132.8	66.2873	207.	1.6020	63.1162	206.	1.5147
24	838858.2	829095.1	80.2232	209.	1.9615	74.9890	208.	1.8317
25	838896.0	829021.5	29.7495	212.	0.6903	29.2413	211.	0.6791
26	838835.7	828911.2	21.8062	215.	0.4933	21.6191	216.	0.4835
27	838671.2	828985.0	36.4055	186.	0.8093	33.4820	185.	0.7389
28	838741.6	829010.8	64.5068	185.	1.4896	61.1713	184.	1.4083
29	838763.2	829055.5	80.7401	184.	1.9001	76.7052	183.	1.8288
30	838748.3	829075.2	108.9483	186.	2.5802	101.9287	185.	2.4125
31	838758.9	829124.3	70.2532	192.	1.7070	69.8690	193.	1.6976
32	838786.3	829133.9	78.4366	200.	1.8836	75.3699	199.	1.8138
33	838800.2	829145.1	93.6642	201.	2.2523	86.6870	200.	2.0839
34	838829.2	829155.3	75.0435	202.	1.7884	74.2104	203.	1.7724
35	838886.3	829221.5	75.9254	185.	1.7792	71.5803	186.	1.6835
36	838897.6	829261.6	92.8457	185.	2.2007	90.7589	186.	2.1506
37	838909.4	829300.0	116.0017	186.	2.7835	112.5730	187.	2.6941
38	838937.9	829277.4	114.0593	182.	2.7481	106.2309	183.	2.5539
39	838947.7	829294.6	105.4633	182.	2.5521	100.5005	181.	2.4331
40	839030.5	829326.7	65.9186	209.	1.5711	64.0329	210.	1.5289
41	838981.5	829393.5	128.5403	202.	3.0568	118.9879	201.	2.8303
42	839027.8	829399.4	92.4963	203.	2.1676	88.5125	204.	2.0788
43	839074.9	829390.2	86.1099	205.	2.0230	83.0954	206.	1.9608
44	839110.9	829385.4	73.0040	205.	1.7026	71.4168	206.	1.6653
45	838957.6	829203.2	58.1816	181.	1.3591	57.8277	216.	1.3566
46	839010.2	829216.3	49.9762	214.	1.1651	49.1936	215.	1.1452
47	838940.2	829204.1	64.5897	181.	1.5174	62.8420	182.	1.4710
48	838917.2	829164.8	51.7578	182.	1.1952	48.6027	181.	1.1335
49	838880.8	829132.8	53.0726	207.	1.2609	52.7218	206.	1.2469
50	838858.2	829095.1	60.0857	209.	1.4406	56.7175	208.	1.3592
51	838896.0	829021.5	28.2615	212.	0.6528	27.7194	211.	0.6407
52	838835.7	828911.2	21.7151	216.	0.4862	21.5950	215.	0.4883
53	838671.2	828985.0	29.1290	186.	0.6282	27.5049	185.	0.5900
54	838741.6	829010.8	39.5135	184.	0.8716	38.6298	185.	0.8492
55	838763.2	829055.5	39.4720	185.	0.8712	38.2530	184.	0.8499
56	838748.3	829075.2	41.5197	186.	0.9206	37.5148	185.	0.8284
57	838758.9	829124.3	30.5881	14.	0.8714	30.2862	13.	0.8628
58	838786.3	829133.9	29.7530	19.	0.8451	29.3680	20.	0.8340
59	838800.2	829145.1	31.0412	20.	0.8814	30.7457	21.	0.8729
60	838829.2	829155.3	33.0596	186.	0.7286	32.9827	185.	0.7236
61	838886.3	829221.5	42.6013	185.	0.9550	40.7449	184.	0.9145
62	838897.6	829261.6	46.5456	185.	1.0553	43.6763	186.	0.9866
63	838909.4	829300.0	40.8533	186.	0.9309	40.8345	7.	1.1564
64	838937.9	829277.4	36.2119	3.	1.0258	35.9113	183.	0.8224
65	838947.7	829294.6	36.8830	2.	1.0484	36.8704	1.	1.0490
66	839030.5	829326.7	32.4504	209.	0.7426	30.7225	208.	0.7021
67	838981.5	829393.5	52.1576	202.	1.1705	49.0415	201.	1.1030
68	839027.8	829399.4	48.3430	203.	1.0777	48.2724	204.	1.0838
69	839074.9	829390.2	44.6054	205.	0.9967	42.4404	206.	0.9554
70	839110.9	829385.4	41.9513	206.	0.9358	40.1769	205.	0.8905
71	838957.6	829203.2	35.6603	181.	0.8012	33.7590	216.	0.7606
72	839010.2	829216.3	32.1413	214.	0.7229	32.0348	215.	0.7197
73	838940.2	829204.1	36.9328	182.	0.8296	36.3891	181.	0.8195
74	838917.2	829164.8	34.8117	182.	0.7749	32.6368	183.	0.7233
75	838880.8	829132.8	33.7062	183.	0.7442	29.5440	184.	0.6481
76	838858.2	829095.1	29.2985	183.	0.6418	26.2292	184.	0.5698
77	838896.0	829021.5	20.0718	212.	0.4495	19.5834	211.	0.4387
78	838835.7	828911.2	17.6188	216.	0.3841	16.9723	215.	0.3732
79	838671.2	828985.0	29.1290	186.	0.6282	27.5049	185.	0.5900
80	838741.6	829010.8	23.9564	184.	0.5070	23.3770	185.	0.4921
81	838763.2	829055.5	21.9047	185.	0.4606	19.7779	4.	0.5507
82	838748.3	829075.2	20.9746	186.	0.4413	19.6886	6.	0.5480
83	838758.9	829124.3	18.2335	186.	0.3807	16.7055	187.	0.3510
84	838786.3	829133.9	19.9960	186.	0.4205	17.8308	185.	0.3741
85	838800.2	829145.1	20.6750	186.	0.4361	19.0898	185.	0.4020
86	838829.2	829155.3	22.3126	185.	0.4734	20.7089	186.	0.4394
87	838886.3	829221.5	23.1804	185.	0.5004	22.4468	184.	0.4860
88	838897.6	829261.6	22.5131	6.	0.6280	22.0409	7.	0.6151
89	838909.4	829300.0	25.2316	7.	0.7066	24.6175	6.	0.6896
90	838937.9	829277.4	22.7461	3.	0.6379	22.5712	4.	0.6323

91	838947.7	829294.6	20.7653	3.	0.5834	20.4777	2.	0.5761
92	839030.5	829326.7	20.9647	27.	0.5854	20.6085	28.	0.5763
93	838981.5	829393.5	26.0868	21.	0.7289	26.0577	22.	0.7282
94	839027.8	829399.4	25.9202	203.	0.5530	24.2392	204.	0.5213
95	839074.9	829390.2	23.9674	205.	0.5143	22.7475	204.	0.4828
96	839110.9	829385.4	23.7677	206.	0.5102	23.1715	205.	0.4928
97	838957.6	829203.2	19.6063	181.	0.4252	17.9031	182.	0.3877
98	839010.2	829216.3	17.8424	215.	0.3872	17.6358	214.	0.3830
99	838940.2	829204.1	20.1981	182.	0.4378	19.0566	181.	0.4138
100	838917.2	829164.8	21.2897	182.	0.4580	21.0686	183.	0.4520
101	838880.8	829132.8	21.7315	183.	0.4635	20.2979	184.	0.4312
102	838858.2	829095.1	19.9908	183.	0.4235	19.1075	184.	0.4026
103	838896.0	829021.5	14.4418	182.	0.3002	12.8251	181.	0.2689
104	838835.7	828911.2	13.1175	181.	0.2744	13.0949	216.	0.2778

```
DATE AT END OF RUN: 01/23/97   TIME AT END OF RUN: 10:00:39.41
ELAPSED TIME FOR THIS RUN:     0.49817E+03 SECONDS
OR      0 HOURS   8 MINUTES    18.17 SECONDS
```

Predicted Worst-case 1-hour Average and 24-hour Average TSP Concentration (μg/m3) at Selected Air Quality Sensitive Receivers

Receiver	Receiver location		Worst-case 1-hour average TSP concentration (μg/m3) at different heights above ground				Worst-case 24-hour average TSP concentration (μg/m3) at different heights above ground			
	x-co	y-co	1.5m	5m	10m	15m	1.5m	5m	10m	15m
1	838671	828985	124	123	116	116	105	105	102	102
2	838742	829011	167	152	127	111	127	119	107	99
3	838763	829056	198	168	126	109	142	127	107	98
4	838748	829075	276	196	129	108	182	141	108	97
5	838759	829124	250	157	118	105	168	122	102	96
6	838786	829134	321	165	117	107	204	126	102	97
7	838800	829145	264	181	118	108	175	134	103	97
8	838829	829155	191	162	120	109	139	125	104	98
9	838886	829222	186	163	130	110	136	125	108	99
10	838898	829262	206	180	134	110	147	133	110	98
11	838909	829300	281	203	128	112	184	145	107	100
12	838938	829277	345	201	123	110	216	144	105	98
13	838948	829295	337	192	124	108	212	140	105	97
14	839031	829327	176	153	119	108	131	120	103	97
15	838982	829394	273	216	139	113	180	151	113	100
16	839028	829399	225	179	135	113	156	133	111	100
17	839075	829390	198	173	132	111	143	130	109	99
18	839111	829385	178	160	129	111	133	124	108	99
19	838958	829203	155	145	123	107	121	116	105	97
20	839010	829216	142	137	119	105	115	112	103	96
21	838940	829204	166	152	124	107	127	119	105	97
22	838917	829165	144	139	122	108	115	113	104	98
23	838881	829133	153	140	121	109	120	114	104	98
24	838858	829095	167	147	116	107	127	117	102	97
25	838896	829022	117	115	107	101	102	101	97	94
26	838836	828911	109	109	105	100	98	98	96	94
		Sub-max:	345	216	139	116	216	151	113	102

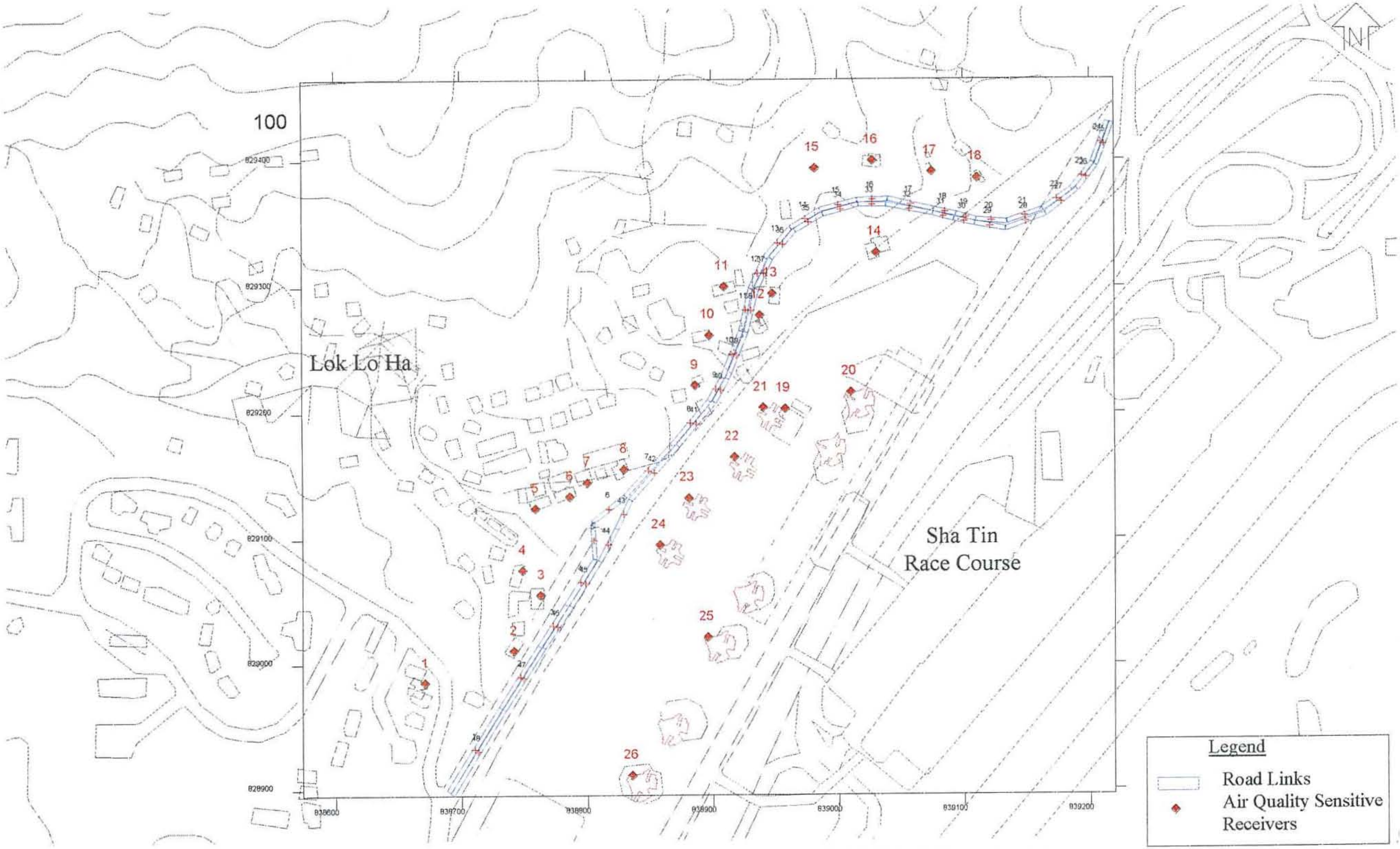
Highest 1-hour average: 345 μg/m3 Highest 24-hour average: 216 μg/m3

Remarks: All calculations have included 87 μg/m3 as future background (annual average TSP concentration at EPD Tai Po Monitoring Station, 1992).

Appendix 1D

Summary of the Link Coordinates, Traffic Flow, and Emission Rate

Link ID	Location	Link Coordinates (Mid-Point)		Traffic Flow (veh/hr)	Emission Rate (g/mile/veh)
		X-co	Y-co		
1	D-15 NE/B	838710.7	828931.8	401	1.102
2	D-15 NE/B	838746.9	828989.6	401	1.102
3	D-15 NE/B	838772.9	829030.6	401	1.102
4	D-15 NE/B	838794.9	829065.5	401	1.102
5	D-15 NE/B	838805.3	829098.6	401	1.102
6	D-15 NE/B	838817.4	829123.6	401	1.102
7	D-15 NE/B	838848.9	829154.1	401	1.102
8	D-15 NE/B	838882.5	829191.8	401	1.102
9	D-15 NE/B	838903	829218.6	401	1.102
10	D-15 NE/B	838915.7	829246.1	401	1.102
11	D-15 NE/B	838926.9	829281.4	401	1.102
12	D-15 NE/B	838936.5	829310.4	401	1.102
13	D-15 NE/B	838952.4	829334.4	401	1.102
14	D-15 NE/B	838974.2	829353.3	401	1.102
15	D-15 NE/B	839000.6	829364.3	401	1.102
16	D-15 NE/B	839027.6	829368.5	401	1.102
17	D-15 NE/B	839058.3	829364.8	401	1.102
18	D-15 NE/B	839085.4	829358.8	401	1.102
19	D-15 NE/B	839102.1	829354.6	401	1.102
20	D-15 NE/B	839122.4	829351.6	401	1.102
21	D-15 NE/B	839148.9	829355.5	401	1.102
22	D-15 NE/B	839174.4	829368.2	401	1.102
23	D-15 NE/B	839194.4	829386.4	401	1.102
24	D-15 NE/B	839208.8	829413.1	401	1.102
25	D-15 SW/B	839211.6	829411.7	851	0.824
26	D-15 SW/B	839197.9	829385.3	851	0.824
27	D-15 SW/B	839177.9	829366.1	851	0.824
28	D-15 SW/B	839149.6	829350.8	851	0.824
29	D-15 SW/B	839121.4	829347.2	851	0.824
30	D-15 SW/B	839100.8	829351.1	851	0.824
31	D-15 SW/B	839084.1	829355	851	0.824
32	D-15 SW/B	839057.1	829360.9	851	0.824
33	D-15 SW/B	839027.4	829364.6	851	0.824
34	D-15 SW/B	839002.3	829360.8	851	0.824
35	D-15 SW/B	838977	829350.6	851	0.824
36	D-15 SW/B	838956.4	829333.1	851	0.824
37	D-15 SW/B	838941.3	829310	851	0.824
38	D-15 SW/B	838931.3	829280.8	851	0.824
39	D-15 SW/B	838919.6	829245.3	851	0.824
40	D-15 SW/B	838907	829217.6	851	0.824
41	D-15 SW/B	838887.3	829191	851	0.824
42	D-15 SW/B	838853.6	829152.4	851	0.824
43	D-15 SW/B	838829.1	829119.6	851	0.824
44	D-15 SW/B	838816.8	829095.1	851	0.824
45	D-15 SW/B	838798.8	829064.3	851	0.824
46	D-15 SW/B	838776.4	829029.8	851	0.824
47	D-15 SW/B	838749.7	828988.4	851	0.824
48	D-15 SW/B	838713.3	828929.9	851	0.824



ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT SCHEMATIC DIAGRAM OF THE SELECTED AIR QUALITY SENSITIVE RECEIVERS AND THE MODELLED ROAD LINKS DURING OPERATIONAL PHASE	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO. 63094/02	APPENDIX: 1D

Appendix 1E

Sample CALINE4 model input file


```
D-15 Vehicular Emission Assessment
4Nitrogen Dioxide
  100.0000   1.0000     .0000     .0000  104   48   1.0000  0  0 0.0
838671.2   828985.0   1.5
838741.6   829010.8   1.5
838763.2   829055.5   1.5
838748.3   829075.2   1.5
838758.9   829124.3   1.5
838786.3   829133.9   1.5
838800.2   829145.1   1.5
838829.2   829155.3   1.5
838886.3   829221.5   1.5
838897.6   829261.6   1.5
838909.4   829300.0   1.5
838937.9   829277.4   1.5
838947.7   829294.6   1.5
839030.5   829326.7   1.5
838981.5   829393.5   1.5
839027.8   829399.4   1.5
839074.9   829390.2   1.5
839110.9   829385.4   1.5
838957.6   829203.2   1.5
839010.2   829216.3   1.5
838940.2   829204.1   1.5
838917.2   829164.8   1.5
838880.8   829132.8   1.5
838858.2   829095.1   1.5
838896.0   829021.5   1.5
838835.7   828911.2   1.5
838671.2   828985.0   5.0
838741.6   829010.8   5.0
838763.2   829055.5   5.0
838748.3   829075.2   5.0
838758.9   829124.3   5.0
838786.3   829133.9   5.0
838800.2   829145.1   5.0
838829.2   829155.3   5.0
838886.3   829221.5   5.0
838897.6   829261.6   5.0
838909.4   829300.0   5.0
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838947.7   829294.6   5.0
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838957.6   829203.2   5.0
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838917.2   829164.8   5.0
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838896.0   829021.5   5.0
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838741.6   829010.8   10.0
838763.2   829055.5   10.0
838748.3   829075.2   10.0
838758.9   829124.3   10.0
838786.3   829133.9   10.0
838800.2   829145.1   10.0
838829.2   829155.3   10.0
838886.3   829221.5   10.0
838897.6   829261.6   10.0
838909.4   829300.0   10.0
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838947.7   829294.6   10.0
839030.5   829326.7   10.0
838981.5   829393.5   10.0
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839110.9   829385.4   10.0
838957.6   829203.2   10.0
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838896.0   829021.5   10.0
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838671.2   828985.0   10.0
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838763.2   829055.5   15.0
838748.3   829075.2   15.0
838758.9   829124.3   15.0
838786.3   829133.9   15.0
838800.2   829145.1   15.0
838829.2   829155.3   15.0
838886.3   829221.5   15.0
838897.6   829261.6   15.0
838909.4   829300.0   15.0
838937.9   829277.4   15.0
838947.7   829294.6   15.0
839030.5   829326.7   15.0
838981.5   829393.5   15.0
839027.8   829399.4   15.0
839074.9   829390.2   15.0
839110.9   829385.4   15.0
838957.6   829203.2   15.0
839010.2   829216.3   15.0
838940.2   829204.1   15.0
838917.2   829164.8   15.0
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 1  838787.4  829046.4  838765.4  829013.1  0.00   9.5    0.00    0.00  0
 1  838765.4  829013.1  838734.0  828963.6  0.00   9.5    0.00    0.00  0
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Sample CALINE4 model input file


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0.00 1.00 4 500.00 18.00  0.00 25.000
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Appendix 1E

Sample CALINE4 model output file

```
          CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                   JUNE 1989 VERSION
                   PAGE   1

              JOB: D-15 Vehicular Emission Assessment
              RUN: NO2              (WORST CASE ANGLE)
        POLLUTANT: Nitrogen Dioxide
        (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

   I.  SITE VARIABLES

        U=   1.0 M/S             Z0= 100. CM           ALT=      0. (M)
      BRG= WORST CASE            VD=   .0 CM/S
     CLAS=     4 (D)             VS=   .0 CM/S
     MIXH=  500. M              AMB=   .0 PPM
    SIGTH=   18. DEGREES       TEMP= 25.0 DEGREE (C)


  II.  LINK VARIABLES
```

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
AA. LINK AA	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AB. LINK AB	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AC. LINK AC	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AD. LINK AD	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AE. LINK AE	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AF. LINK AF	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AG. LINK AG	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AH. LINK AH	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AI. LINK AI	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AJ. LINK AJ	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AK. LINK AK	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AL. LINK AL	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AM. LINK AM	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AN. LINK AN	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AO. LINK AO	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AP. LINK AP	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AQ. LINK AQ	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AR. LINK AR	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AS. LINK AS	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AT. LINK AT	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AU. LINK AU	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AV. LINK AV	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AW. LINK AW	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AX. LINK AX	*****	*****	*****	*****	AG	401	1.1	.0	9.5
AY. LINK AY	*****	*****	*****	*****	AG	851	.8	.0	9.5
AZ. LINK AZ	*****	*****	*****	*****	AG	851	.8	.0	9.5
BA. LINK BA	*****	*****	*****	*****	AG	851	.8	.0	9.5
BB. LINK BB	*****	*****	*****	*****	AG	851	.8	.0	9.5
BC. LINK BC	*****	*****	*****	*****	AG	851	.8	.0	9.5
BD. LINK BD	*****	*****	*****	*****	AG	851	.8	.0	9.5
BE. LINK BE	*****	*****	*****	*****	AG	851	.8	.0	9.5
BF. LINK BF	*****	*****	*****	*****	AG	851	.8	.0	9.5
BG. LINK BG	*****	*****	*****	*****	AG	851	.8	.0	9.5
BH. LINK BH	*****	*****	*****	*****	AG	851	.8	.0	9.5
BI. LINK BI	*****	*****	*****	*****	AG	851	.8	.0	9.5
BJ. LINK BJ	*****	*****	*****	*****	AG	851	.8	.0	9.5
BK. LINK BK	*****	*****	*****	*****	AG	851	.8	.0	9.5
BL. LINK BL	*****	*****	*****	*****	AG	851	.8	.0	9.5
BM. LINK BM	*****	*****	*****	*****	AG	851	.8	.0	9.5
BN. LINK BN	*****	*****	*****	*****	AG	851	.8	.0	9.5
BO. LINK BO	*****	*****	*****	*****	AG	851	.8	.0	9.5
BP. LINK BP	*****	*****	*****	*****	AG	851	.8	.0	9.5
BQ. LINK BQ	*****	*****	*****	*****	AG	851	.8	.0	9.5
BR. LINK BR	*****	*****	*****	*****	AG	851	.8	.0	9.5
BS. LINK BS	*****	*****	*****	*****	AG	851	.8	.0	9.5
BT. LINK BT	*****	*****	*****	*****	AG	851	.8	.0	9.5
BU. LINK BU	*****	*****	*****	*****	AG	851	.8	.0	9.5

```
BV. LINK BV      * ***** ***** ***** ***** *  AG    851    .8     .0   9.5

III.  RECEPTOR LOCATIONS

             *    COORDINATES (M)
   RECEPTOR  *     X       Y      Z
-------------*---------------------
 1. RECPT   1 * 838671 828985   1.5
 2. RECPT   2 * 838742 829011   1.5
 3. RECPT   3 * 838763 829056   1.5
 4. RECPT   4 * 838748 829075   1.5
 5. RECPT   5 * 838759 829124   1.5
 6. RECPT   6 * 838786 829134   1.5
 7. RECPT   7 * 838800 829145   1.5
 8. RECPT   8 * 838829 829155   1.5
 9. RECPT   9 * 838886 829222   1.5
10. RECPT  10 * 838898 829262   1.5
11. RECPT  11 * 838909 829300   1.5
12. RECPT  12 * 838938 829277   1.5
13. RECPT  13 * 838948 829295   1.5
14. RECPT  14 * 839031 829327   1.5
15. RECPT  15 * 838982 829394   1.5
16. RECPT  16 * 839028 829399   1.5
17. RECPT  17 * 839075 829390   1.5
18. RECPT  18 * 839111 829385   1.5
19. RECPT  19 * 838958 829203   1.5
20. RECPT  20 * 839010 829216   1.5
21. RECPT  21 * 838940 829204   1.5
22. RECPT  22 * 838917 829165   1.5
23. RECPT  23 * 838881 829133   1.5
24. RECPT  24 * 838858 829095   1.5
25. RECPT  25 * 838896 829022   1.5
26. RECPT  26 * 838836 828911   1.5
27. RECPT  27 * 838671 828985   5.0
28. RECPT  28 * 838742 829011   5.0
29. RECPT  29 * 838763 829056   5.0
30. RECPT  30 * 838748 829075   5.0
31. RECPT  31 * 838759 829124   5.0
32. RECPT  32 * 838786 829134   5.0
33. RECPT  33 * 838800 829145   5.0
34. RECPT  34 * 838829 829155   5.0
35. RECPT  35 * 838886 829222   5.0
36. RECPT  36 * 838898 829262   5.0
37. RECPT  37 * 838909 829300   5.0
38. RECPT  38 * 838938 829277   5.0
39. RECPT  39 * 838948 829295   5.0
40. RECPT  40 * 839031 829327   5.0
41. RECPT  41 * 838982 829394   5.0
42. RECPT  42 * 839028 829399   5.0
43. RECPT  43 * 839075 829390   5.0
44. RECPT  44 * 839111 829385   5.0
45. RECPT  45 * 838958 829203   5.0
46. RECPT  46 * 839010 829216   5.0
47. RECPT  47 * 838940 829204   5.0
48. RECPT  48 * 838917 829165   5.0
49. RECPT  49 * 838881 829133   5.0
50. RECPT  50 * 838858 829095   5.0
51. RECPT  51 * 838896 829022   5.0
52. RECPT  52 * 838836 828911   5.0
53. RECPT  53 * 838671 828985  10.0
54. RECPT  54 * 838742 829011  10.0
55. RECPT  55 * 838763 829056  10.0
56. RECPT  56 * 838748 829075  10.0
57. RECPT  57 * 838759 829124  10.0
58. RECPT  58 * 838786 829134  10.0
59. RECPT  59 * 838800 829145  10.0
60. RECPT  60 * 838829 829155  10.0
61. RECPT  61 * 838886 829222  10.0
62. RECPT  62 * 838898 829262  10.0
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63.	RECPT 63	*	838909	829300	10.0
64.	RECPT 64	*	838938	829277	10.0
65.	RECPT 65	*	838948	829295	10.0
66.	RECPT 66	*	839031	829327	10.0
67.	RECPT 67	*	838982	829394	10.0
68.	RECPT 68	*	839028	829399	10.0
69.	RECPT 69	*	839075	829390	10.0
70.	RECPT 70	*	839111	829385	10.0
71.	RECPT 71	*	838958	829203	10.0
72.	RECPT 72	*	839010	829216	10.0
73.	RECPT 73	*	838940	829204	10.0
74.	RECPT 74	*	838917	829165	10.0
75.	RECPT 75	*	838881	829133	10.0
76.	RECPT 76	*	838858	829095	10.0
77.	RECPT 77	*	838896	829022	10.0
78.	RECPT 78	*	838836	828911	10.0
79.	RECPT 79	*	838671	828985	10.0
80.	RECPT 80	*	838742	829011	15.0
81.	RECPT 81	*	838763	829056	15.0
82.	RECPT 82	*	838748	829075	15.0
83.	RECPT 83	*	838759	829124	15.0
84.	RECPT 84	*	838786	829134	15.0
85.	RECPT 85	*	838800	829145	15.0
86.	RECPT 86	*	838829	829155	15.0
87.	RECPT 87	*	838886	829222	15.0
88.	RECPT 88	*	838898	829262	15.0
89.	RECPT 89	*	838909	829300	15.0
90.	RECPT 90	*	838938	829277	15.0
91.	RECPT 91	*	838948	829295	15.0
92.	RECPT 92	*	839031	829327	15.0
93.	RECPT 93	*	838982	829394	15.0
94.	RECPT 94	*	839028	829399	15.0
95.	RECPT 95	*	839075	829390	15.0
96.	RECPT 96	*	839111	829385	15.0
97.	RECPT 97	*	838958	829203	15.0
98.	RECPT 98	*	839010	829216	15.0
99.	RECPT 99	*	838940	829204	15.0
100.	RECPT 100	*	838917	829165	15.0
101.	RECPT 101	*	838881	829133	15.0
102.	RECPT 102	*	838858	829095	15.0
103.	RECPT 103	*	838896	829022	15.0
104.	RECPT 104	*	838836	828911	15.0

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) AA	AB	AC	AD	AE	AF	AG	AH
1. RECPT 1	51.	21.5	.0	.2	1.2	1.6	1.0	.8	1.0	.6
2. RECPT 2	47.	48.9	.0	.1	9.0	5.0	1.4	.8	1.1	.7
3. RECPT 3	47.	41.8	.0	.0	.0	3.7	4.5	2.5	2.5	1.3
4. RECPT 4	53.	30.2	.0	.0	.0	.1	2.5	3.3	2.9	1.4
5. RECPT 5	60.	22.5	.0	.0	.0	.0	.0	.4	2.7	2.2
6. RECPT 6	60.	27.9	.0	.0	.0	.0	.0	.1	4.5	3.0
7. RECPT 7	175.	30.3	.0	.2	.8	3.9	7.4	4.2	.0	.0
8. RECPT 8	196.	49.6	.8	1.2	1.5	3.3	4.1	12.0	1.9	.0
9. RECPT 9	203.	46.2	.7	.7	.7	1.1	.9	1.2	6.1	8.8
10. RECPT 10	51.	44.2	.0	.0	.0	.0	.0	.0	.0	.0
11. RECPT 11	64.	52.0	.0	.0	.0	.0	.0	.0	.0	.0
12. RECPT 12	216.	96.6	.7	.7	.6	.8	.7	.9	2.3	3.4
13. RECPT 13	217.	68.2	.7	.6	.5	.7	.6	.8	1.9	2.5
14. RECPT 14	69.	29.2	.0	.0	.0	.0	.0	.0	.0	.0
15. RECPT 15	204.	45.6	.4	.4	.3	.4	.3	.4	.9	1.1
16. RECPT 16	218.	49.9	.4	.4	.3	.4	.3	.4	.8	.9
17. RECPT 17	235.	44.8	.1	.1	.1	.1	.1	.2	.4	.4
18. RECPT 18	237.	38.0	.1	.1	.1	.1	.1	.2	.5	.6
19. RECPT 19	250.	20.5	.0	.0	.1	.2	.4	.9	3.1	3.3
20. RECPT 20	249.	13.9	.0	.1	.1	.3	.4	.8	1.9	1.6

21.	RECPT 21	*	244.	*	26.5	*	.0	.1	.1	.3	.6	1.2	4.0	4.0
22.	RECPT 22	*	359.	*	27.1	*	.0	.0	.0	.0	.0	.0	.0	.3
23.	RECPT 23	*	14.	*	31.9	*	.0	.0	.0	.0	.0	.0	.0	4.4
24.	RECPT 24	*	16.	*	26.9	*	.0	.0	.0	.0	.0	.0	1.9	3.5
25.	RECPT 25	*	2.	*	12.5	*	.0	.0	.0	.0	.0	.0	.5	1.4
26.	RECPT 26	*	3.	*	11.3	*	.0	.0	.0	.5	.5	.7	1.2	.7
27.	RECPT 27	*	51.	*	21.0	*	.0	.2	1.1	1.6	1.0	.8	1.0	.6
28.	RECPT 28	*	46.	*	44.3	*	.0	.1	6.7	4.7	1.4	.9	1.2	.8
29.	RECPT 29	*	46.	*	39.2	*	.0	.0	.0	2.7	4.1	2.5	2.5	1.3
30.	RECPT 30	*	53.	*	29.1	*	.0	.0	.0	.1	2.2	3.1	2.8	1.4
31.	RECPT 31	*	60.	*	21.9	*	.0	.0	.0	.0	.0	.3	2.6	2.1
32.	RECPT 32	*	59.	*	26.6	*	.0	.0	.0	.0	.0	.1	3.8	2.9
33.	RECPT 33	*	59.	*	27.7	*	.0	.0	.0	.0	.0	.0	3.0	3.6
34.	RECPT 34	*	198.	*	42.8	*	1.0	1.3	1.6	3.3	3.9	9.0	.7	.0
35.	RECPT 35	*	205.	*	41.6	*	.8	.8	.8	1.2	1.0	1.4	5.8	6.2
36.	RECPT 36	*	50.	*	39.3	*	.0	.0	.0	.0	.0	.0	.0	.0
37.	RECPT 37	*	63.	*	45.1	*	.0	.0	.0	.0	.0	.0	.0	.0
38.	RECPT 38	*	215.	*	67.6	*	.8	.7	.6	.8	.7	.9	2.2	3.3
39.	RECPT 39	*	215.	*	57.5	*	.7	.7	.6	.7	.6	.8	1.8	2.5
40.	RECPT 40	*	69.	*	27.4	*	.0	.0	.0	.0	.0	.0	.0	.0
41.	RECPT 41	*	204.	*	42.6	*	.4	.4	.3	.4	.3	.4	.9	1.1
42.	RECPT 42	*	218.	*	45.9	*	.4	.4	.3	.4	.3	.4	.8	.9
43.	RECPT 43	*	235.	*	40.2	*	.1	.1	.1	.1	.1	.2	.4	.4
44.	RECPT 44	*	237.	*	34.5	*	.1	.1	.1	.1	.1	.2	.5	.5
45.	RECPT 45	*	250.	*	19.3	*	.0	.0	.1	.2	.4	.9	3.0	3.1
46.	RECPT 46	*	249.	*	13.5	*	.0	.1	.1	.3	.4	.8	1.8	1.6
47.	RECPT 47	*	244.	*	24.7	*	.0	.1	.1	.3	.5	1.2	3.8	3.6
48.	RECPT 48	*	359.	*	25.2	*	.0	.0	.0	.0	.0	.0	.0	.2
49.	RECPT 49	*	15.	*	30.0	*	.0	.0	.0	.0	.0	.0	.0	3.7
50.	RECPT 50	*	17.	*	25.7	*	.0	.0	.0	.0	.0	.0	1.5	3.3
51.	RECPT 51	*	2.	*	12.2	*	.0	.0	.0	.0	.0	.0	.5	1.3
52.	RECPT 52	*	5.	*	11.1	*	.0	.0	.0	.3	.4	.5	1.1	.7
53.	RECPT 53	*	50.	*	19.8	*	.0	.1	.9	1.4	.9	.8	1.0	.6
54.	RECPT 54	*	43.	*	35.0	*	.0	.0	2.8	3.6	1.4	1.0	1.4	.9
55.	RECPT 55	*	44.	*	32.6	*	.0	.0	.0	1.2	2.9	2.2	2.4	1.3
56.	RECPT 56	*	52.	*	25.9	*	.0	.0	.0	.0	1.5	2.5	2.5	1.3
57.	RECPT 57	*	59.	*	19.9	*	.0	.0	.0	.0	.0	.2	2.0	1.8
58.	RECPT 58	*	57.	*	23.3	*	.0	.0	.0	.0	.0	.0	2.4	2.4
59.	RECPT 59	*	57.	*	23.9	*	.0	.0	.0	.0	.0	.0	1.7	2.9
60.	RECPT 60	*	200.	*	29.9	*	1.1	1.4	1.6	2.8	2.9	3.7	.1	.0
61.	RECPT 61	*	207.	*	32.0	*	.9	.9	.8	1.2	1.0	1.4	4.5	2.6
62.	RECPT 62	*	49.	*	28.2	*	.0	.0	.0	.0	.0	.0	.0	.0
63.	RECPT 63	*	63.	*	30.9	*	.0	.0	.0	.0	.0	.0	.0	.0
64.	RECPT 64	*	213.	*	40.7	*	.8	.7	.6	.8	.6	.8	1.9	2.8
65.	RECPT 65	*	213.	*	39.6	*	.7	.7	.5	.7	.6	.7	1.7	2.3
66.	RECPT 66	*	70.	*	22.3	*	.0	.0	.0	.0	.0	.0	.0	.0
67.	RECPT 67	*	205.	*	35.0	*	.4	.4	.3	.4	.3	.4	.9	1.0
68.	RECPT 68	*	218.	*	36.1	*	.4	.4	.3	.4	.3	.4	.8	.8
69.	RECPT 69	*	236.	*	29.4	*	.0	.1	.1	.1	.1	.2	.3	.4
70.	RECPT 70	*	247.	*	26.5	*	.0	.0	.0	.0	.0	.0	.1	.1
71.	RECPT 71	*	240.	*	16.7	*	.1	.2	.3	.7	.8	1.1	2.4	.9
72.	RECPT 72	*	247.	*	12.4	*	.1	.1	.2	.4	.5	.8	1.7	1.2
73.	RECPT 73	*	236.	*	20.4	*	.2	.3	.4	.8	.9	1.3	2.9	1.2
74.	RECPT 74	*	4.	*	20.4	*	.0	.0	.0	.0	.0	.0	.0	.0
75.	RECPT 75	*	16.	*	24.9	*	.0	.0	.0	.0	.0	.0	.0	2.5
76.	RECPT 76	*	18.	*	22.4	*	.0	.0	.0	.0	.0	.0	1.0	2.7
77.	RECPT 77	*	3.	*	11.5	*	.0	.0	.0	.0	.0	.0	.4	1.1
78.	RECPT 78	*	7.	*	10.6	*	.0	.0	.0	.2	.2	.4	1.0	.7
79.	RECPT 79	*	50.	*	19.8	*	.0	.1	.9	1.4	.9	.8	1.0	.6
80.	RECPT 80	*	41.	*	26.9	*	.0	.0	.9	2.3	1.2	1.0	1.3	.9
81.	RECPT 81	*	43.	*	25.7	*	.0	.0	.0	.4	1.6	1.6	2.0	1.2
82.	RECPT 82	*	51.	*	21.9	*	.0	.0	.0	.0	.8	1.7	2.0	1.2
83.	RECPT 83	*	57.	*	17.4	*	.0	.0	.0	.0	.0	.1	1.2	1.4
84.	RECPT 84	*	55.	*	19.4	*	.0	.0	.0	.0	.0	.0	1.2	1.8
85.	RECPT 85	*	54.	*	19.7	*	.0	.0	.0	.0	.0	.0	.7	1.9
86.	RECPT 86	*	49.	*	21.8	*	.0	.0	.0	.0	.0	.0	.3	2.3
87.	RECPT 87	*	209.	*	23.5	*	.9	.9	.8	1.1	.9	1.2	2.9	.8
88.	RECPT 88	*	204.	*	19.9	*	.7	.7	.6	.8	.6	.9	2.2	1.6
89.	RECPT 89	*	63.	*	19.8	*	.0	.0	.0	.0	.0	.0	.0	.0
90.	RECPT 90	*	213.	*	27.1	*	.7	.7	.6	.7	.6	.7	1.7	2.1

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 91. RECPT  91 *  213. *  27.3 *   .7    .6    .5    .7    .5    .6   1.5   1.8
 92. RECPT  92 *   71. *  16.4 *   .0    .0    .0    .0    .0    .0    .0    .0
 93. RECPT  93 *  206. *  27.0 *   .4    .4    .3    .4    .3    .4    .8    .9
 94. RECPT  94 *  218. *  26.7 *   .4    .4    .3    .4    .3    .4    .7    .8
 95. RECPT  95 *  230. *  20.0 *   .2    .2    .2    .2    .2    .3    .5    .6
 96. RECPT  96 *  248. *  18.7 *   .0    .0    .0    .0    .0    .0    .1    .1
 97. RECPT  97 *  237. *  14.0 *   .2    .4    .4    .7    .7    .9   1.6    .4
 98. RECPT  98 *  242. *  11.0 *   .2    .3    .3    .6    .5    .7   1.2    .6
 99. RECPT  99 *  232. *  16.4 *   .4    .5    .5    .9    .8   1.0   1.8    .4
100. RECPT 100 *    6. *  15.2 *   .0    .0    .0    .0    .0    .0    .0    .0
101. RECPT 101 *   18. *  19.1 *   .0    .0    .0    .0    .0    .0    .0   1.2
102. RECPT 102 *   20. *  18.4 *   .0    .0    .0    .0    .0    .0    .5   1.9
103. RECPT 103 *    4. *  10.4 *   .0    .0    .0    .0    .0    .0    .2    .9
104. RECPT 104 *    8. *   9.8 *   .0    .0    .0    .1    .2    .3    .9    .7

RUN ENDED
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Predicted Worst-case 1-hour Average NO2 Concentration (µg/m3) at Selected Air Quality Sensitive Receivers

Receiver	Receiver location		Worst-case 1-hour average NO2 concentration (µg/m3) at different heights above ground							
			1.5m		5m		10m		15m	
	x-co	y-co	concentration	worst-case wind angle	concentration	worst-case wind angle	concentration	worst-case wind angle	concentration	worst-case wind angle
1	838671	828985	62	51	61	51	60	50	60	50
2	838742	829011	89	47	84	46	75	43	67	41
3	838763	829056	82	47	79	46	73	44	66	43
4	838748	829075	70	53	69	53	66	52	62	51
5	838759	829124	63	60	62	60	60	59	57	57
6	838786	829134	68	60	67	59	63	57	59	55
7	838800	829145	70	175	68	59	64	57	60	54
8	838829	829155	90	196	83	198	70	200	62	49
9	838886	829222	86	203	82	205	72	207	64	209
10	838898	829262	84	51	79	50	68	49	60	204
11	838909	829300	92	64	85	63	71	63	60	63
12	838938	829277	137	216	108	215	81	213	67	213
13	838948	829295	108	217	98	215	80	213	67	213
14	839031	829327	69	69	67	69	62	70	56	71
15	838982	829394	86	204	83	204	75	205	67	206
16	839028	829399	90	218	86	218	76	218	67	218
17	839075	829390	85	235	80	235	69	236	60	230
18	839111	829385	78	237	75	237	67	247	59	248
19	838958	829203	61	250	59	250	57	240	54	237
20	839010	829216	54	249	54	249	52	247	50	242
21	838940	829204	67	244	65	244	60	236	50	232
22	838917	829165	67	359	65	359	60	4	48	6
23	838881	829133	72	14	70	15	65	16	49	18
24	838858	829095	67	16	66	17	62	18	50	20
25	838896	829022	53	2	52	2	52	3	51	4
26	838836	828911	51	3	51	5	51	7	57	8

Highest 1-hour average: 137 µg/m3

AQO %: 46

Remarks: All calculations have included 40µg/m3 as future background (annual average NO2 concentration at EPD Tai Po Monitoring Station at 1992).

Appendix 2

APPENDIX 2

PLANT SPECIES OCCURRING WITHIN THE STUDY AREA

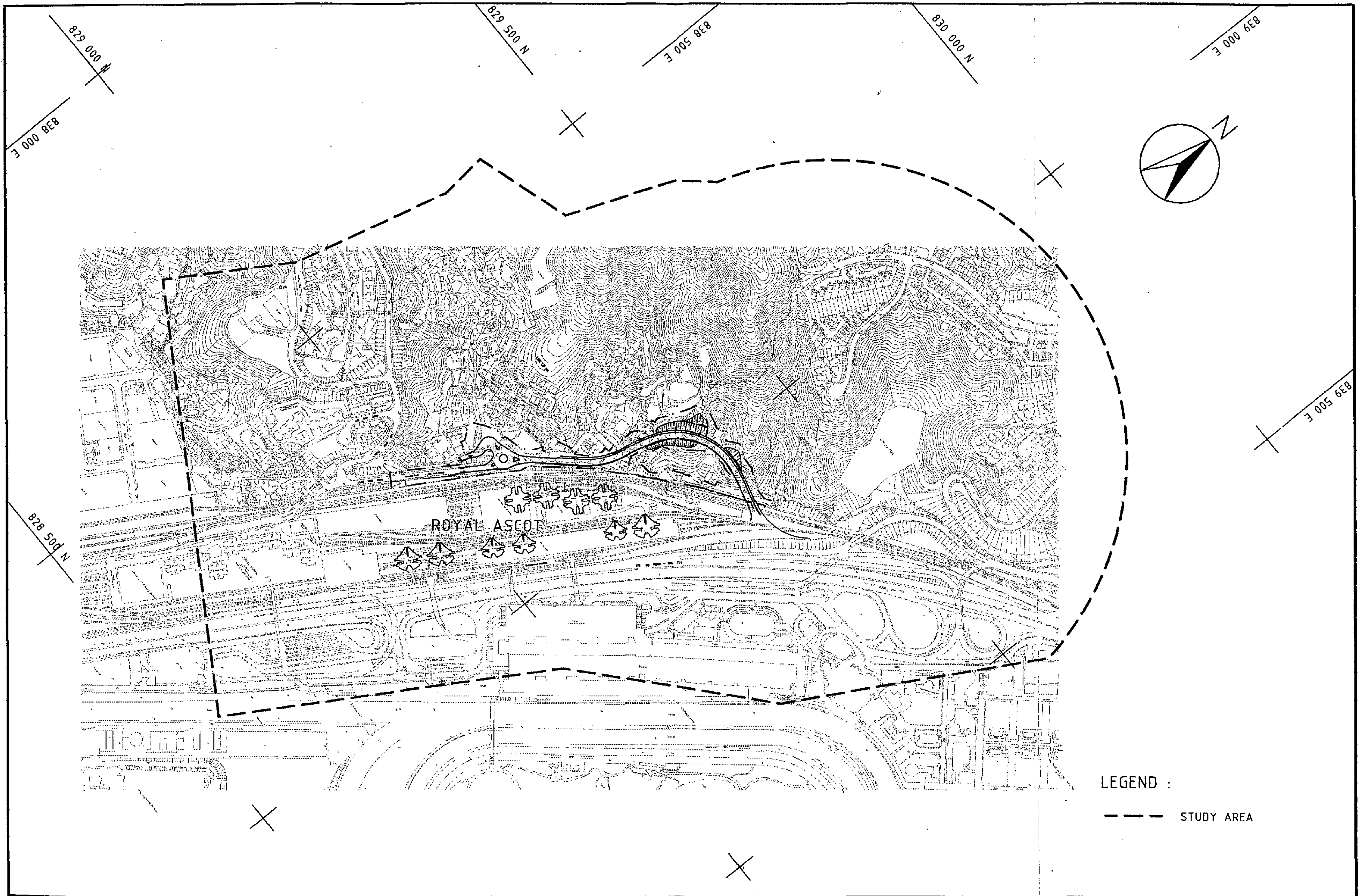
Key: * *Exotic species*
Habit: *T* *tree*
H *herb*
S *shrub*
C *climber*
F *fern*
G *grass*

Family	Name	Habit
Alangiaceae	*Alangium chinense*	T
Amaranthaceae	*Amaranthus viridis*	H
Anacardiaceae	*Mangifera indica**	T
Anacardiaceae	*Rhus succedanea*	T
Annonaceae	*Annona squamosa**	T
Aquifoliaceae	*Ilex asprella*	S
Araceae	*Alocasia macrorrhiza*	H
Araceae	*Colocasia esculens**	H
Araliaceae	*Aralia chinensis*	T
Araliaceae	*Schefflera octophylla*	T
Blechnaceae	*Blechnum orientale*	F
Caesalpiniaceae	*Delonix regia**	T
Caprifoliaceae	*Wikstroemia indica*	S
Caprifoliaceea	*Viburnum odoratissimum*	T
Caricaceae	*Carica papaya**	H
Chloranthaceae	*Sarcandra glabra*	S
Compositae	*Ageratum conyzoides*	H
Compositae	*Bidens pilosa**	H
Compositae	*Conyza canadensis**	H
Compositae	*Emilia sonchifolia*	H
Compositae	*Eupatorium chinense*	H
Compositae	*Gynura bicolor*	H
Compositae	*Mikania micrantha**	C
Compositae	*Sonchus oleraceus*	H
Compositae	*Synedrella nodiflora*	H
Convolvulaceae	*Ipomoea aquatica**	H
Convolvulaceae	*Ipomoea cairica**	C
Crusiferae	*Rorippa indica*	H
Euphorbiaceae	*Aleurites moluccana**	T
Euphorbiaceae	*Aporusa dioica*	T
Guttiferae	*Cratoxylum cochinchinense*	T
Hypericaceae	*Cratoxylum ligustrinum*	T
Lauraceae	*Litsea cubeba*	S
Lauraceae	*Litsea rotundifolia*	S
Lauraceae	*Machilus breviflora*	T
Malvaceae	*Hibiscus tiliaceus*	T

Family	Name	Habit
Euphorbiaceae	*Bischofia javanica*	T
Euphorbiaceae	*Breynia fruticosa*	S
Euphorbiaceae	*Bridelia insularis*	T
Euphorbiaceae	*Macaranga tanarius*	T
Euphorbiaceae	*Mallotus apelta*	S
Euphorbiaceae	*Sapium discolor*	T
Fabaceae	*Abrus mollis*	C
Fabaceae	*Acacia confusa**	T
Fabaceae	*Bauhinia glauca*	C
Fabaceae	*Cassia siamea**	T
Fabaceae	*Dalbergia benthamii*	C
Fabaceae	*Delonix regia**	T
Fabaceae	*Desmodium heterophyllum*	S
Fabaceae	*Mimosa pudica*	S
Fabaceae	*Pueraria lobata*	C
Fabaceae	*Pueraria phaseoloides*	C
Fabaceae	*Sesbania cohinchinensis*	S
Gnetaceae	*Gnetum montanum*	C
Gramineae	*Arundinella nepalensis*	G
Gramineae	*Bambusa spp*	G
Gramineae	*Cynodon dactylon*	G
Gramineae	*Eleusine indica*	G
Gramineae	*Eragrostis atrovirens*	G
Gramineae	*Imperata cylindrica*	G
Gramineae	*Miscanthus floridulus*	G
Gramineae	*Miscanthus sinensis*	G
Gramineae	*Neyraudia arundinacea*	G
Gramineae	*Neyraudia reynaudiana*	G
Gramineae	*Panicum maximum**	G
Gramineae	*Panicum repens*	G

Family	Name	Habit
Melastomataceae	*Melastoma candidum*	S
Melastomataceae	*Melastoma sanguineum*	S
Menispermaceae	*Cocculus orbiculatus*	C
Mimosaceae	*Abarema lucida*	T
Mimosaceae	*Leucaena leucocephala**	T
Moraceae	*Ficus elastica**	T
Moraceae	*Ficus hispida*	T
Moraceae	*Ficus microcarpa*	T
Musaceae	*Musa paradisiaca**	H
Myrtaceae	*Lophostemon confertus**	T
Myrtaceae	*Psidium guajava**	T
Myrtaceae	*Rhodomyrtus tomentosa*	S
Myrtaceae	*Syzygium hancei*	T
Nyctaginaceae	*Bougainvillea glabra**	C
Papilionaceae	*Pterocarpus indicus**	T
Polygonaceae	*Polygonum chinense*	H
Pteridaceae	*Dicranopteris linearis*	F
Rosaceae	*Rhaphiolepis indica*	S
Rutaceae	*Citrus maxima**	T
Rutaceae	*Cleistocalyx operculatus*	T
Schizaeaceae	*Lygodium japonicum*	F
Spindaceae	*Dimocarpus longan**	T
Sterculiaceae	*Sterculia lanceolata*	T
Theaceae	*Schima superba*	T
Ulmaceae	*Celtis sinensis*	T
Verbenaceae	*Lantana camara**	S

Appendix 3

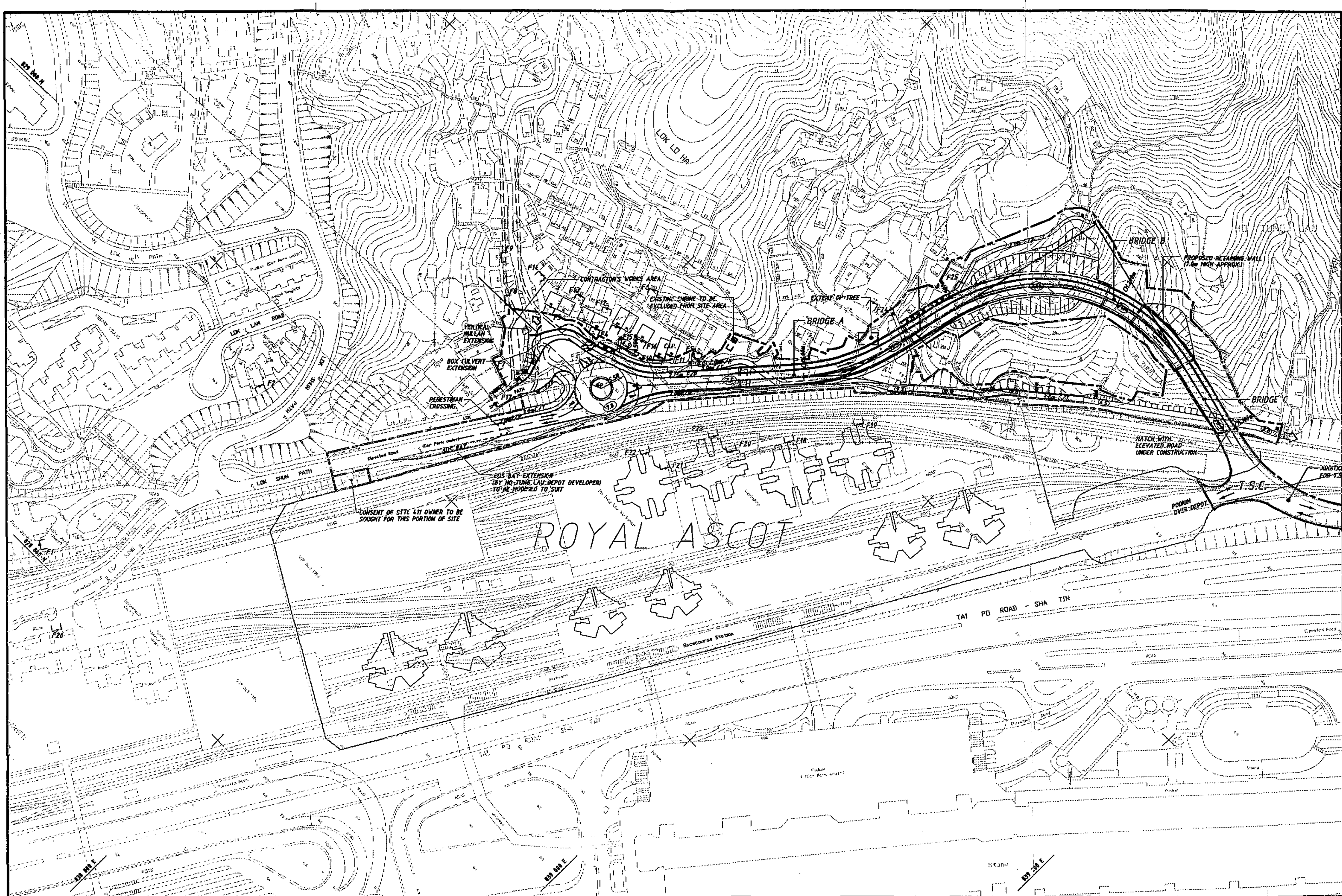


ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT

PROPOSED ROAD ALIGNMENT & STUDY AREA

Maunsell
茂盛(亞洲)工程顧問有限公司

SCALE:	JOB NO.:	FIGURE.:
1:5000	63094	1.1



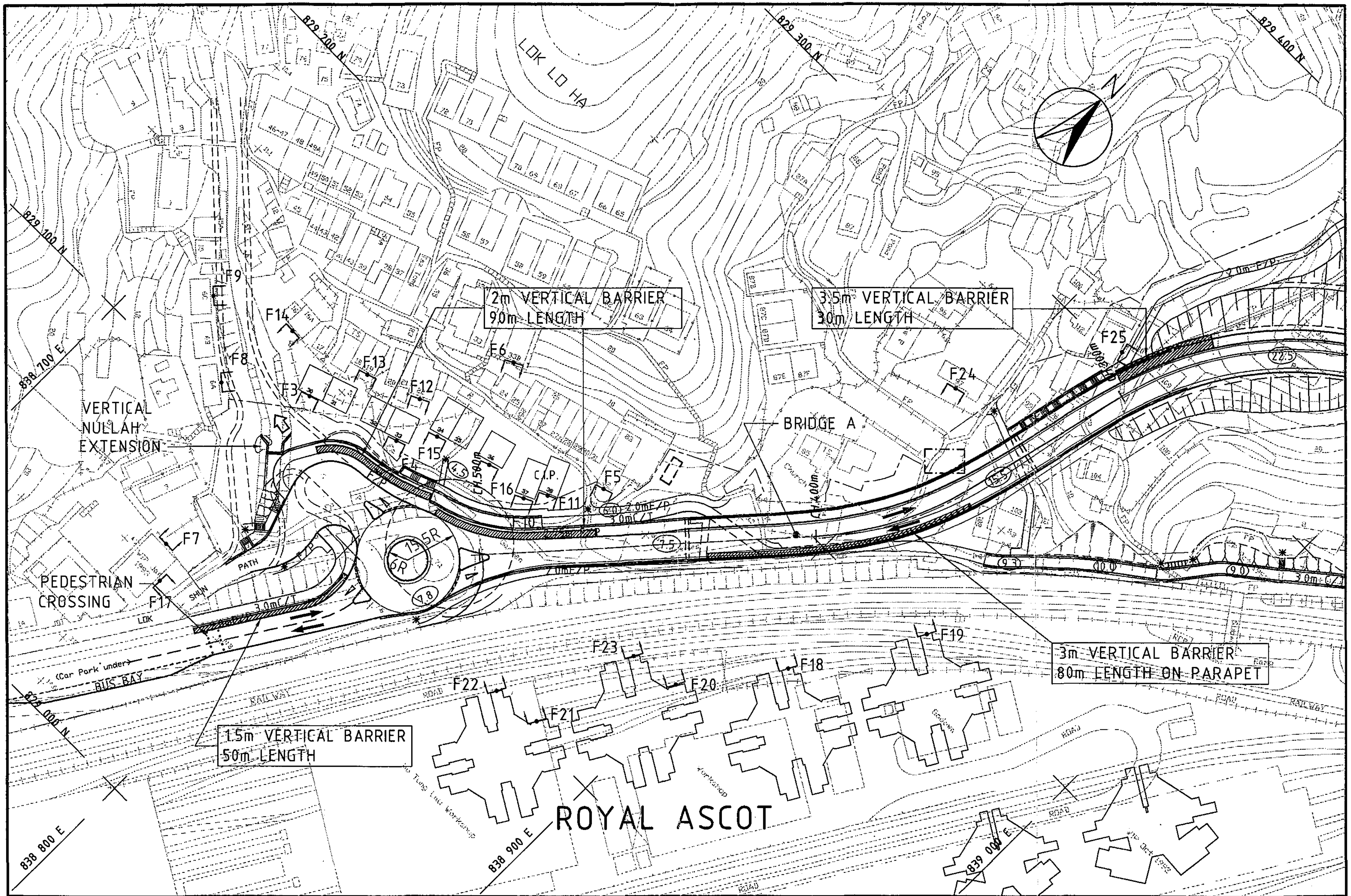
ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT

LOCATION OF REPRESENTATIVE NOISE SENSITIVE RECEIVERS

Maunsell 茂盛(亞洲)工程顧問有限公司

SCALE :	JOB NO.:	FIGURE:
1:2000	63094	3.1

P:\PROJECTS\63094\FIG3-1 12-2-97



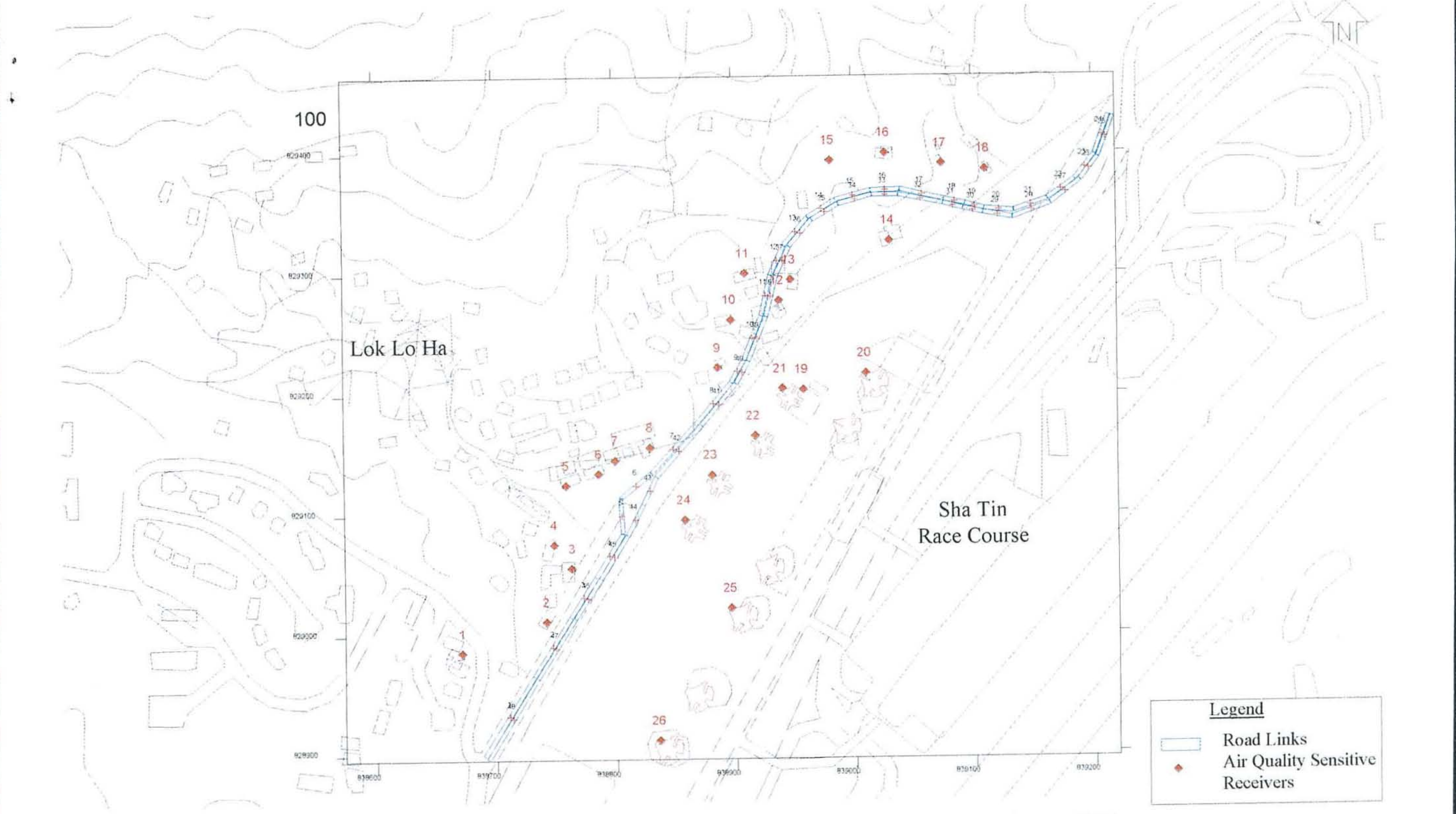
ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT

PROPOSED NOISE MITIGATION MEASURES

Maunsell
茂盛(亞洲)工程顧問有限公司

SCALE:	JOB NO.:	FIGURE.:
1:1000	63094	3.2

FF P:\PROJECTS\SHATIN\63094\FIG3-2.DWG 14-3-97

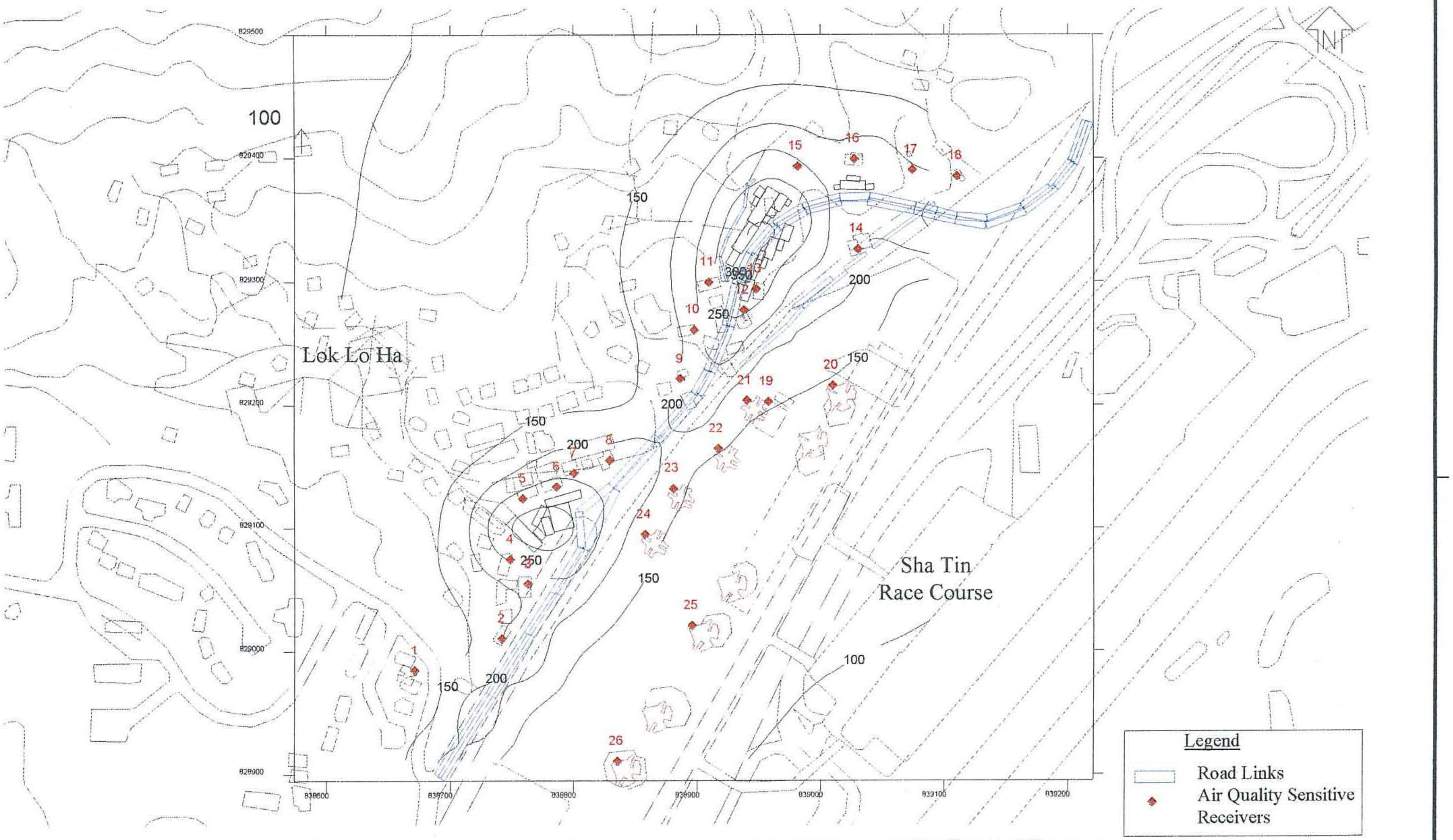


ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT

LOCATION OF SELECTED AIR SENSITIVE RECEPTORS AND PROPOSED ROAD ALIGNMENT

Maunsell
茂盛(亞洲)工程顧問有限公司

JOB NO.	FIGURE:
63094/02	4.1

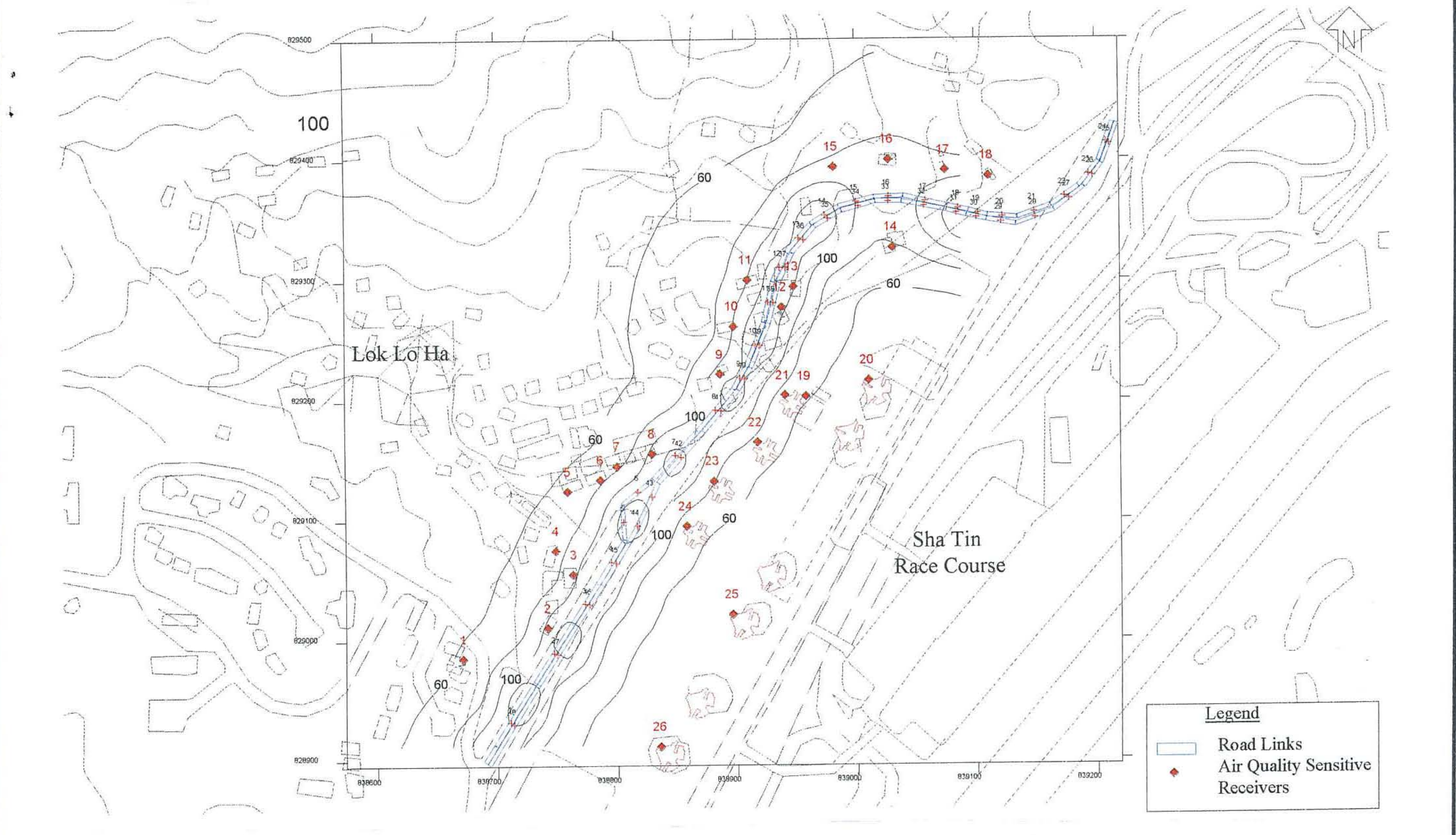


ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT

PREDICTED WORST-CASE 1-HOUR AVERAGE TSP CONCENTRATION CONTOURS ($\mu g/m^3$) AT 1.5m ABOVE GROUND, WITH BACKGROUND CONCENTRATION

Maunsell
茂盛(亞洲)工程顧問有限公司

JOB NO.	FIGURE:
63094/02	4.2



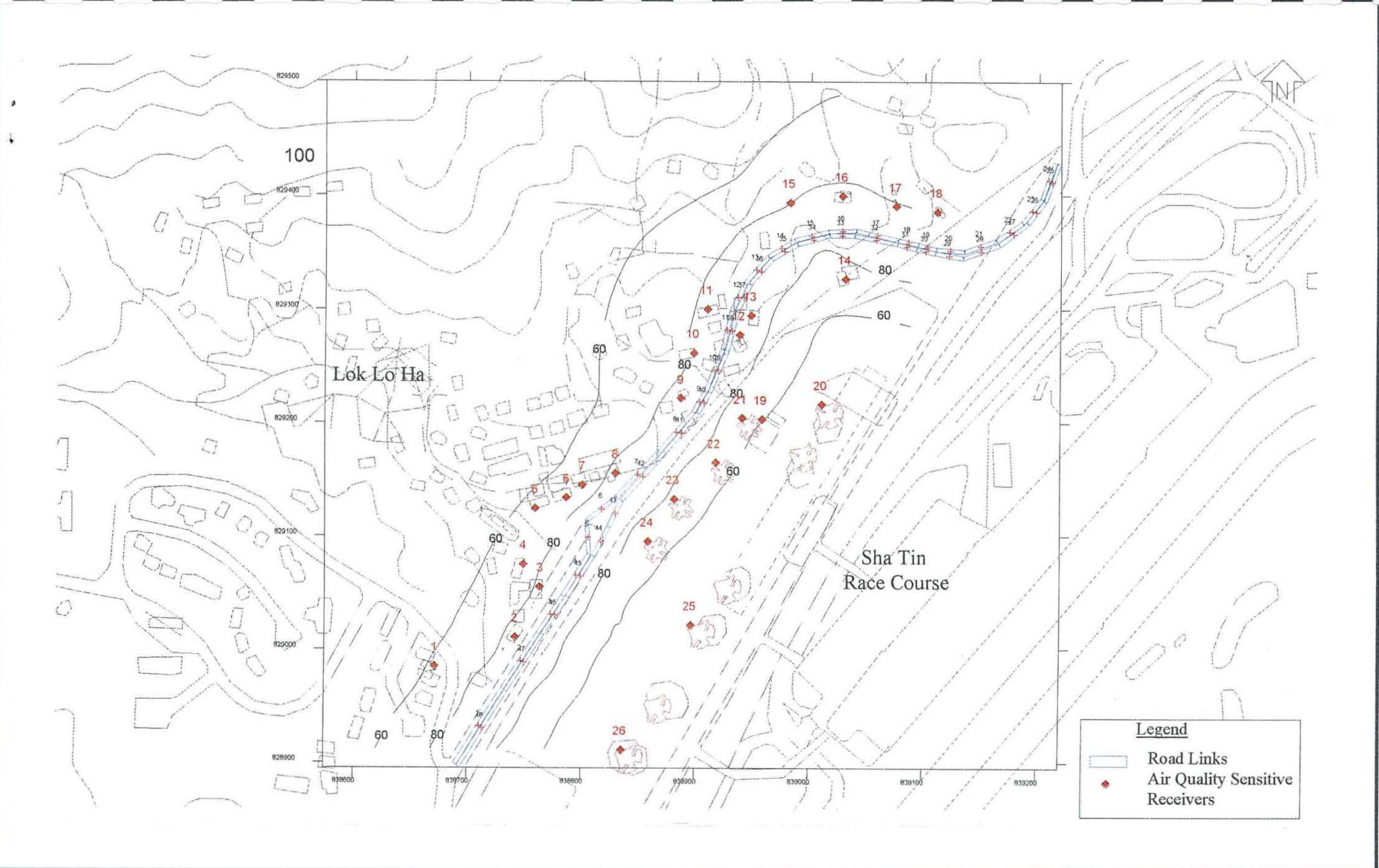
ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT

PREDICTED WORST-CASE 1-HOUR AVERAGE NO_2 CONCENTRATION CONTOURS ($\mu g/m^3$) AT 1.5m ABOVE GROUND, WITH BACKGROUND CONCENTRATION

Maunsell
茂盛(亞洲)工程顧問有限公司

JOB NO. 63094/02

FIGURE: 4.3

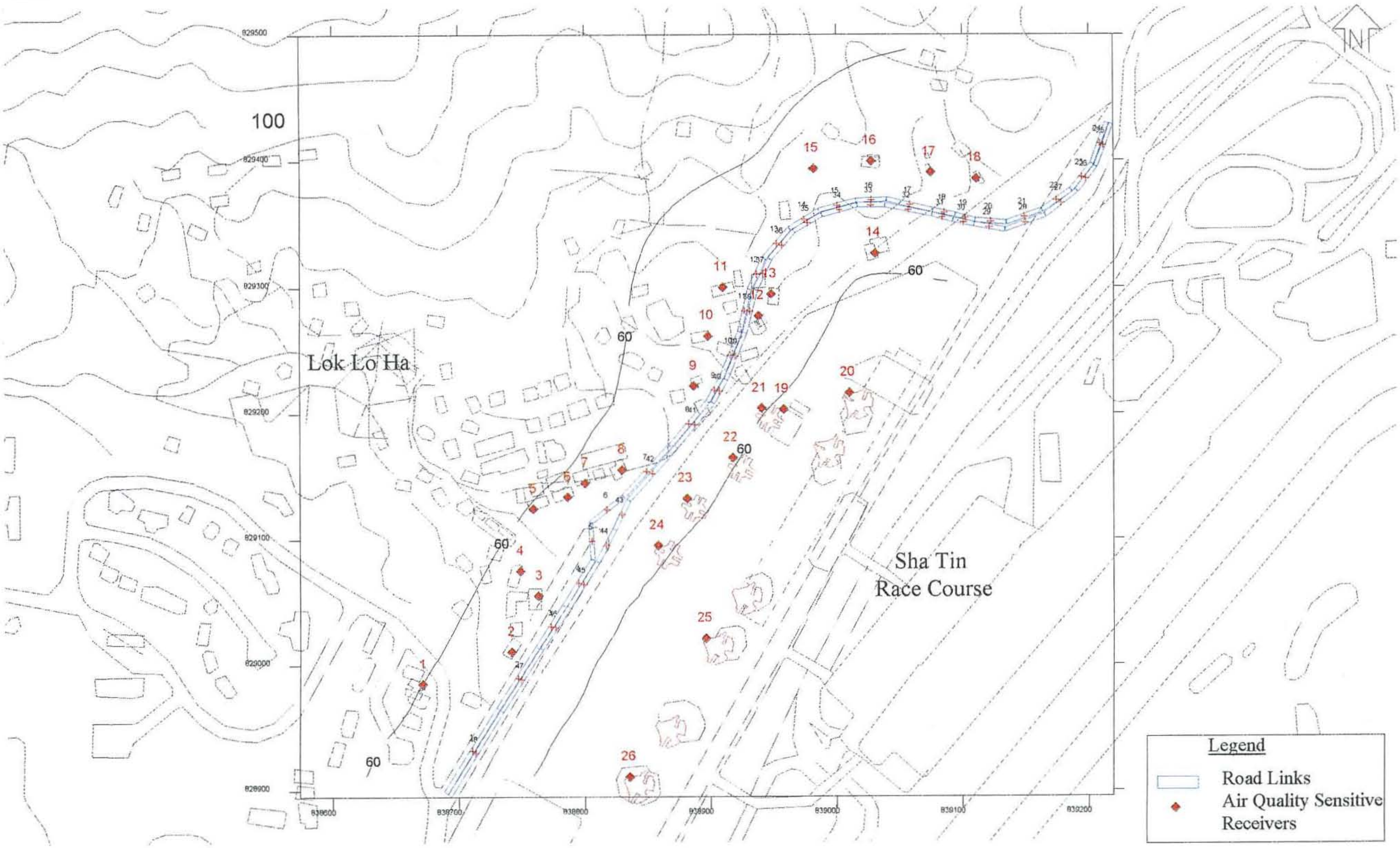


ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT

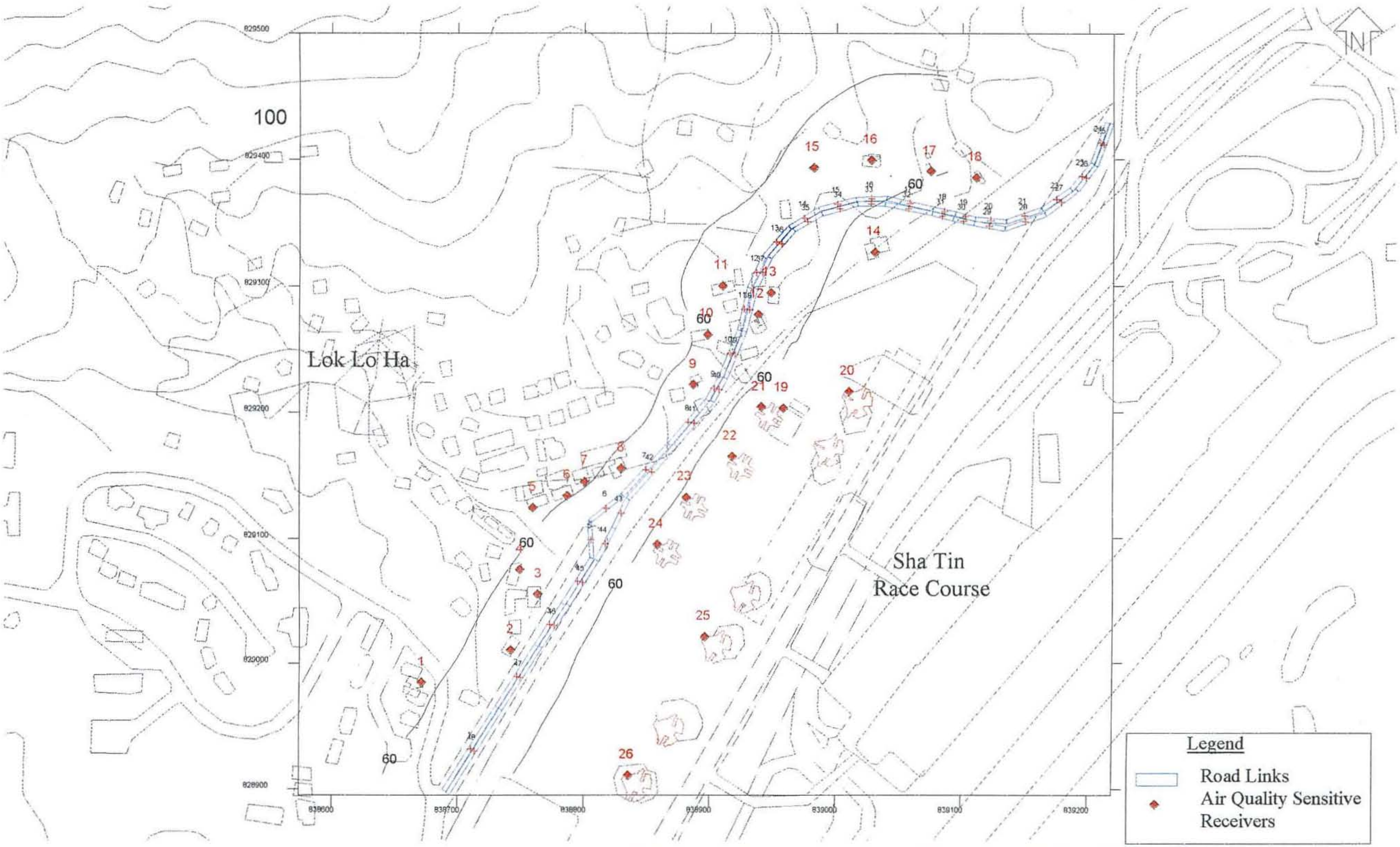
PREDICTED WORST-CASE 1-HOUR AVERAGE NO_2 CONCENTRATION CONTOURS ($\mu g/m^3$) AT 5m ABOVE GROUND, WITH BACKGROUND CONCENTRATION

Maunsell 茂盛(亞洲)工程顧問有限公司

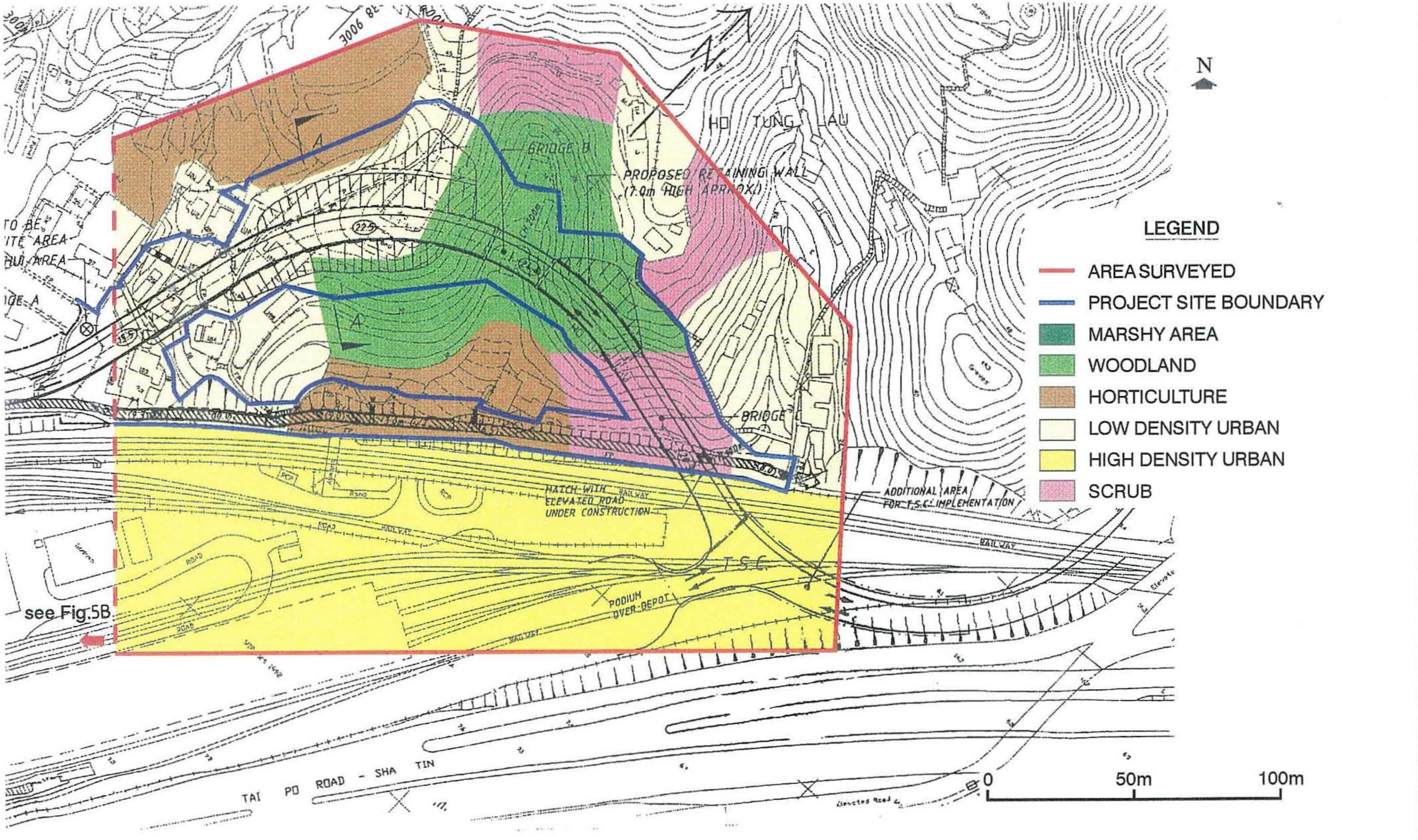
JOB NO.	FIGURE:
63094/02	4.4



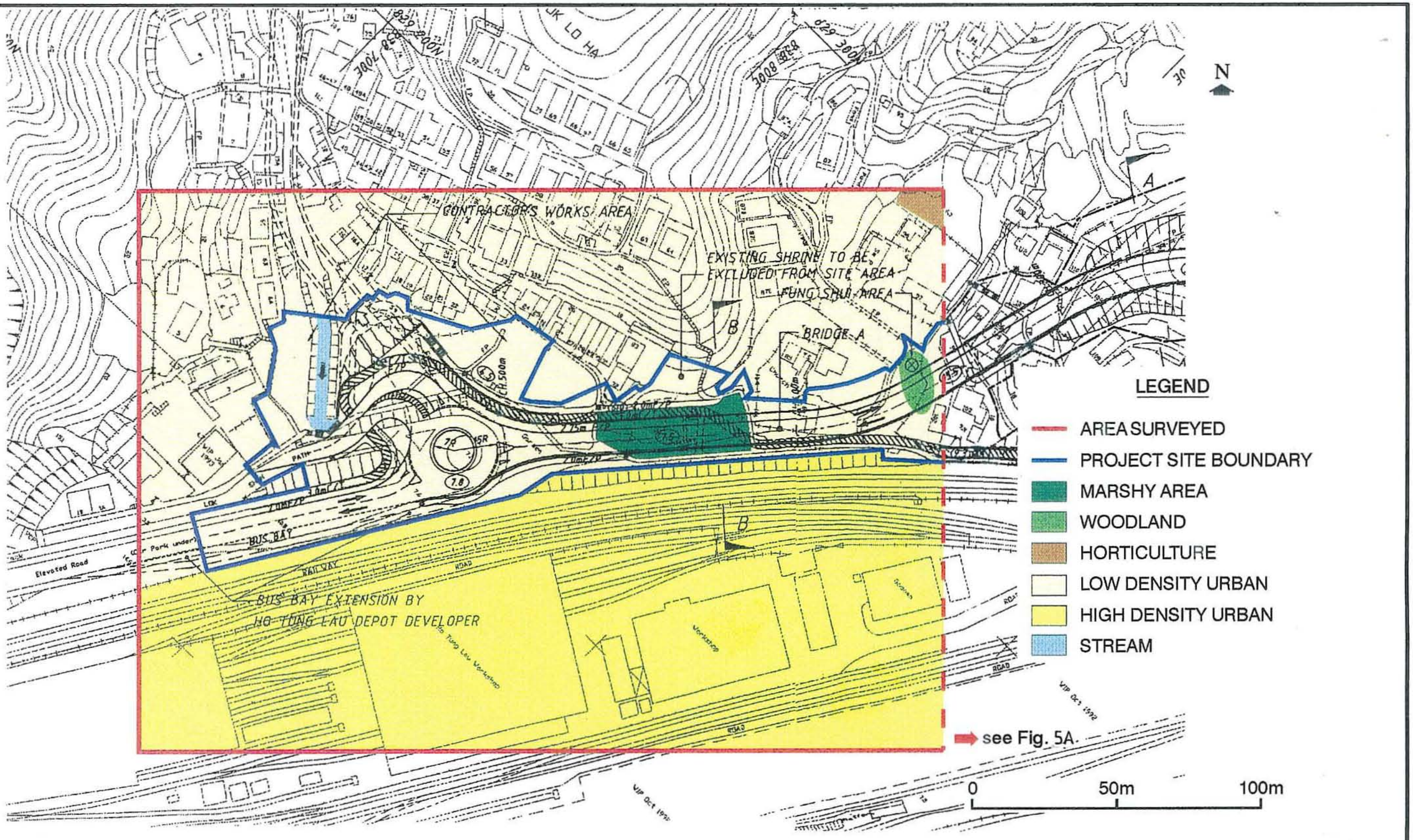
ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT PREDICTED WORST-CASE 1-HOUR AVERAGE NO_2 CONCENTRATION CONTOURS ($\mu g/m^3$) AT 10m ABOVE GROUND, WITH BACKGROUND CONCENTRATION	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO. 63094/02	FIGURE: 4.5



ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT PREDICTED WORST-CASE 1-HOUR AVERAGE NO_2 CONCENTRATION CONTOURS ($\mu g/m^3$) AT 15m ABOVE GROUND, WITH BACKGROUND CONCENTRATION	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO. 63094/02	FIGURE: 4.6



ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ACCESSMENT HABITAT MAP (CHAINAGE 100 - 300)	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO. 63094/02	FIG. FIGURE 5A



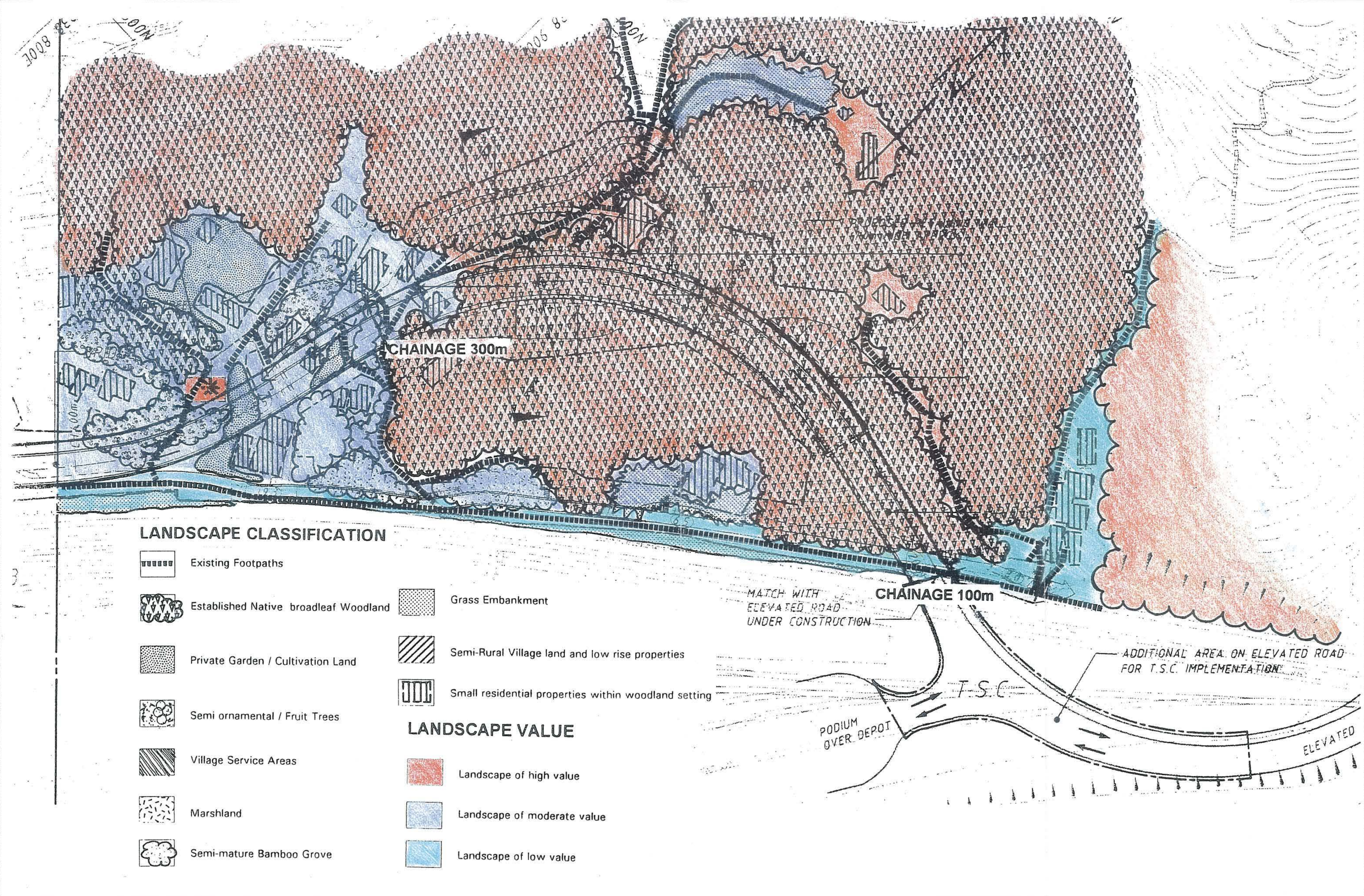
ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ACCESSMENT

HABITAT MAP (CHAINAGE 300 - 500)

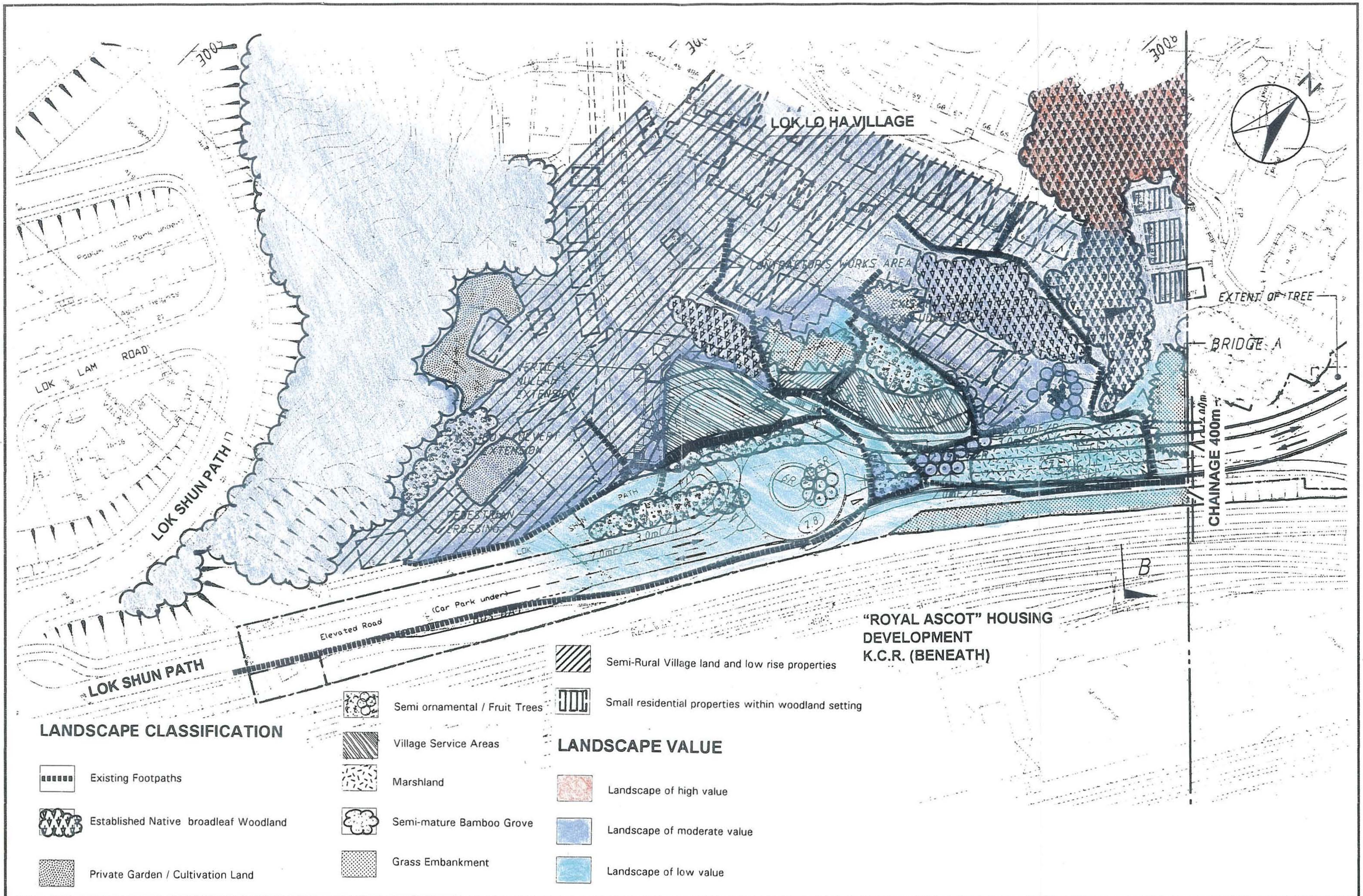
Maunsell
茂盛(亞洲)工程顧問有限公司

JOB NO. 63094/02

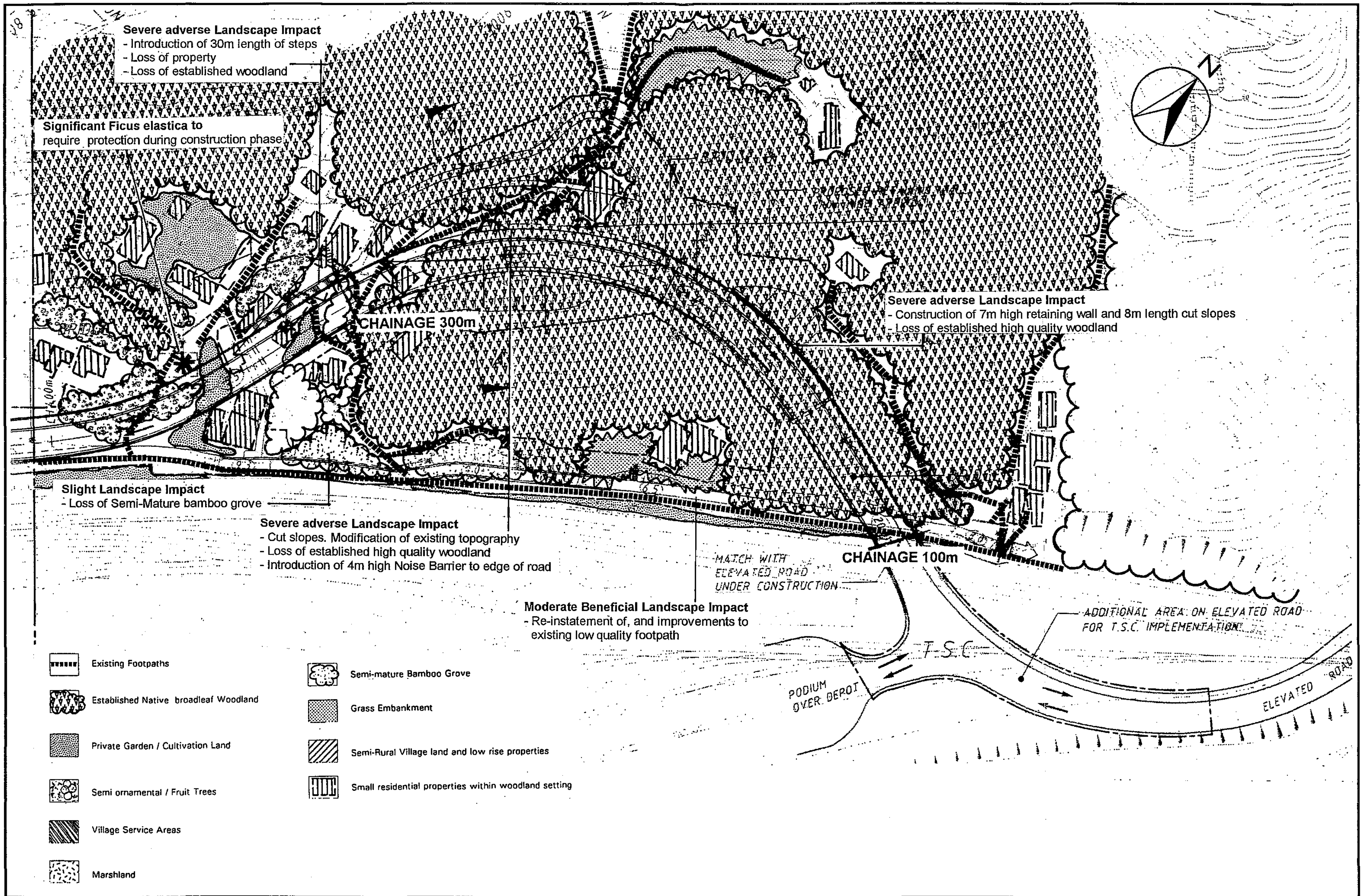
FIG. FIGURE 5B



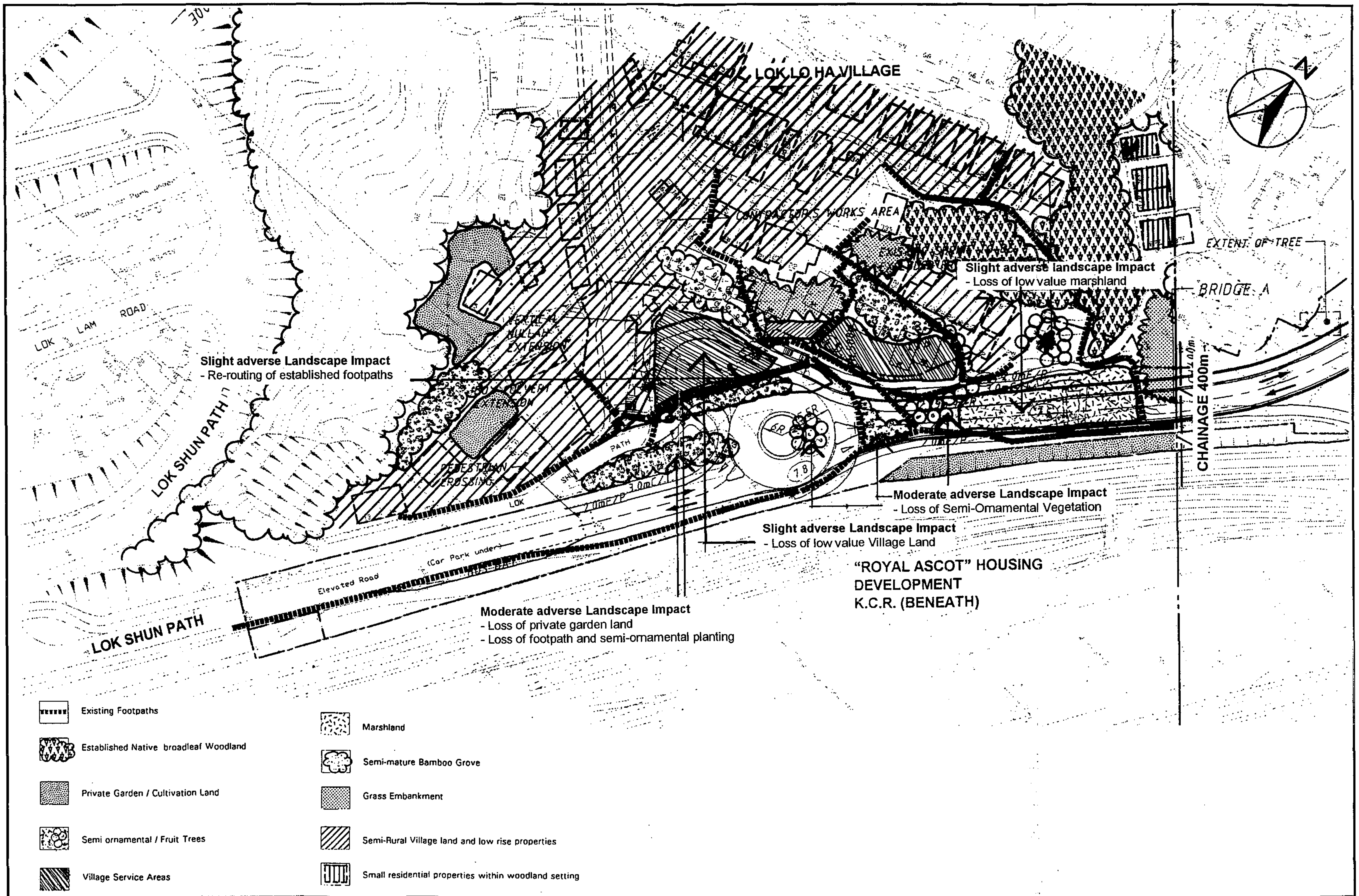
ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT EXISTING LANDSCAPE CHARACTER AND VALUE PLAN	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO.: 63094/02	SCALE : 1:1000	FIGURE: 6.1A



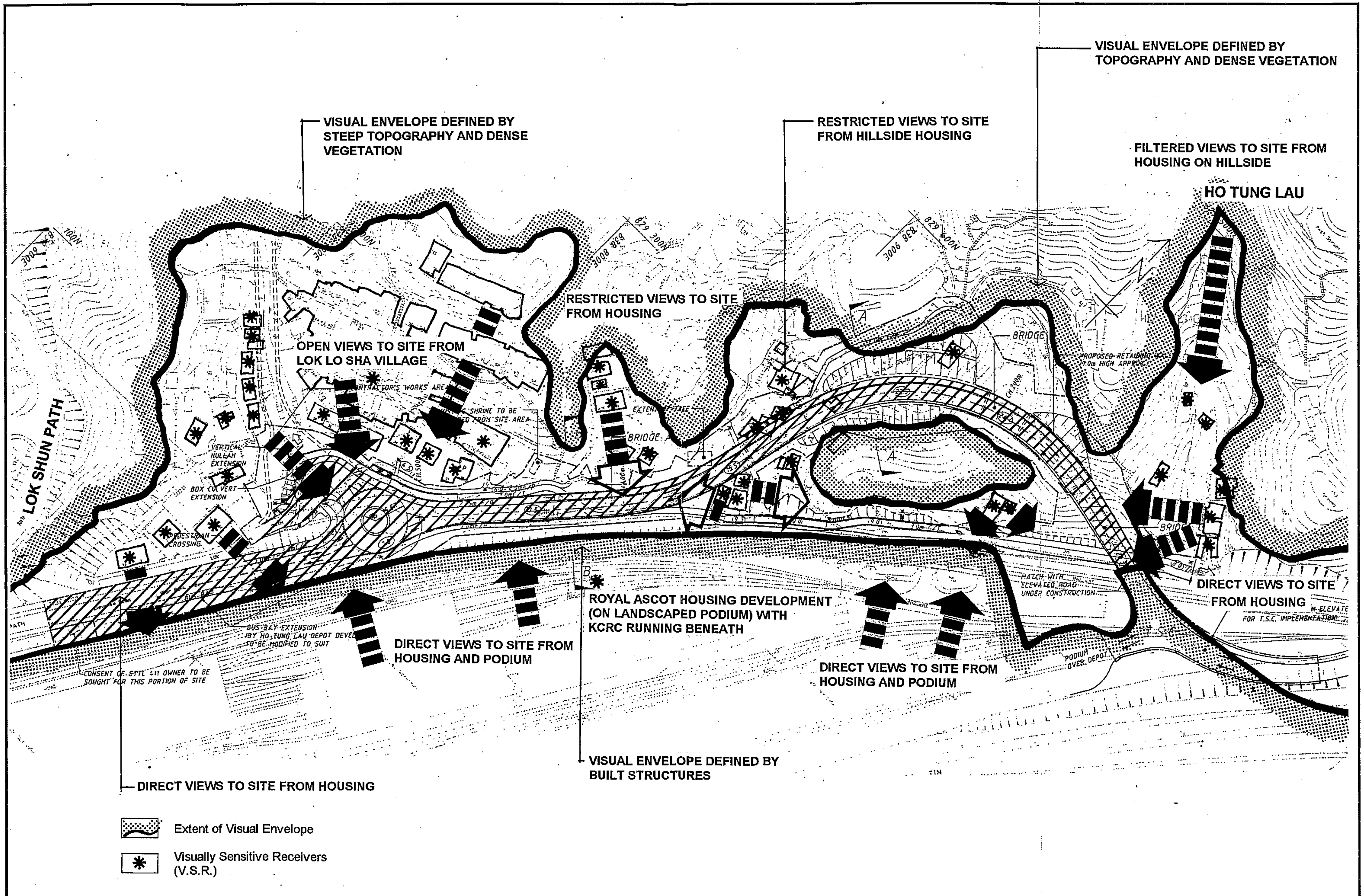
ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT EXISTING LANDSCAPE CHARACTER AND VALUE PLAN	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO.: 63094/02	SCALE : 1:1000	FIGURE: 6.1B



ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT LANDSCAPE IMPACT PLAN	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO.: 63094/02	SCALE : 1:1000	FIGURE: 6.2A



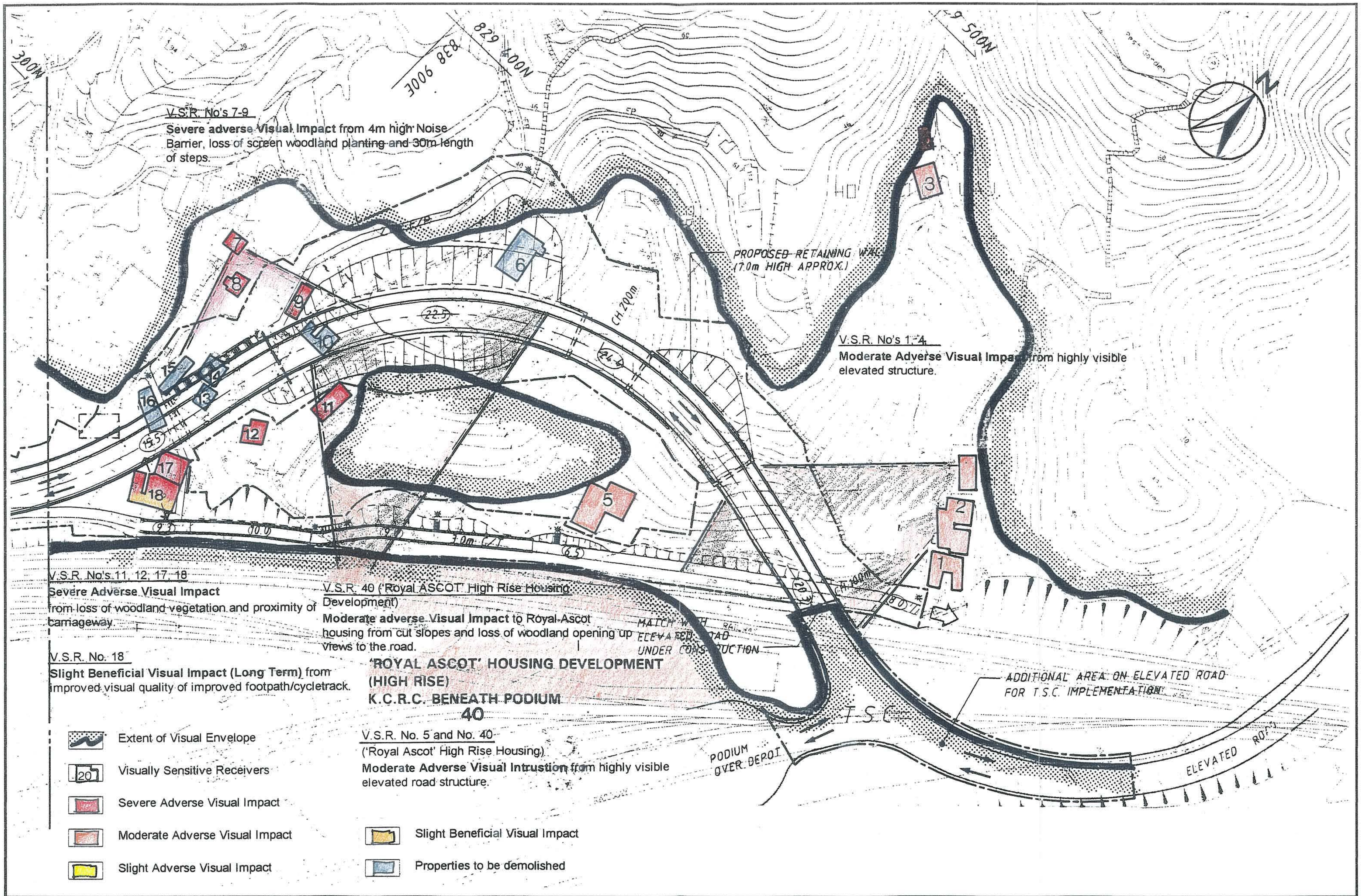
ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT LANDSCAPE IMPACT PLAN	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO.: 63094/02	SCALE : 1:1000	FIGURE: 6.2B



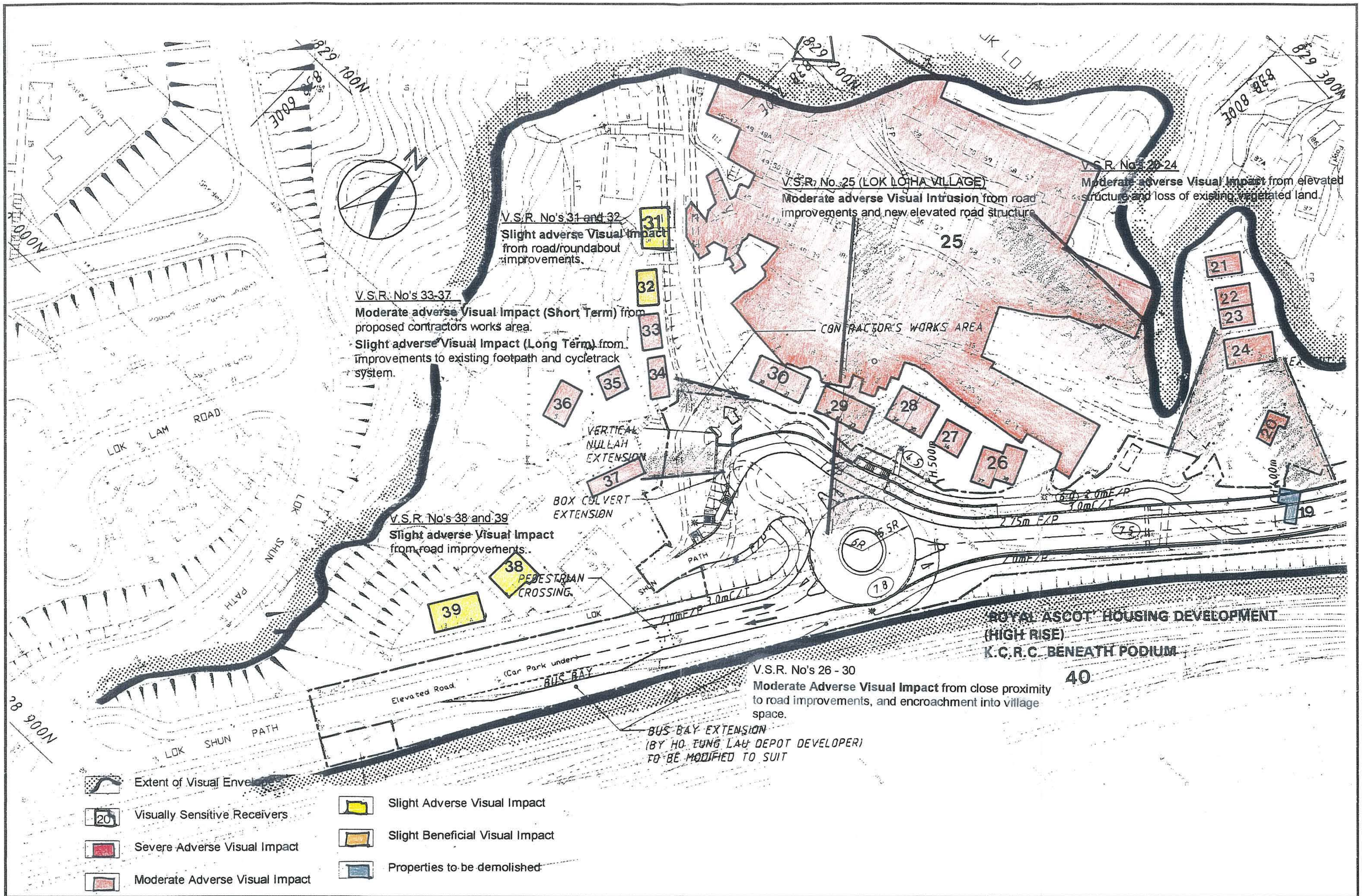
ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT

VISUAL ENVELOPE PLAN

Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO.: 63094/02	SCALE : 1:1000	FIGURE: 6.3



ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT VISUAL IMPACT PLAN	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO.: 63094/02	SCALE : 1:1000	FIGURE: 6.4A

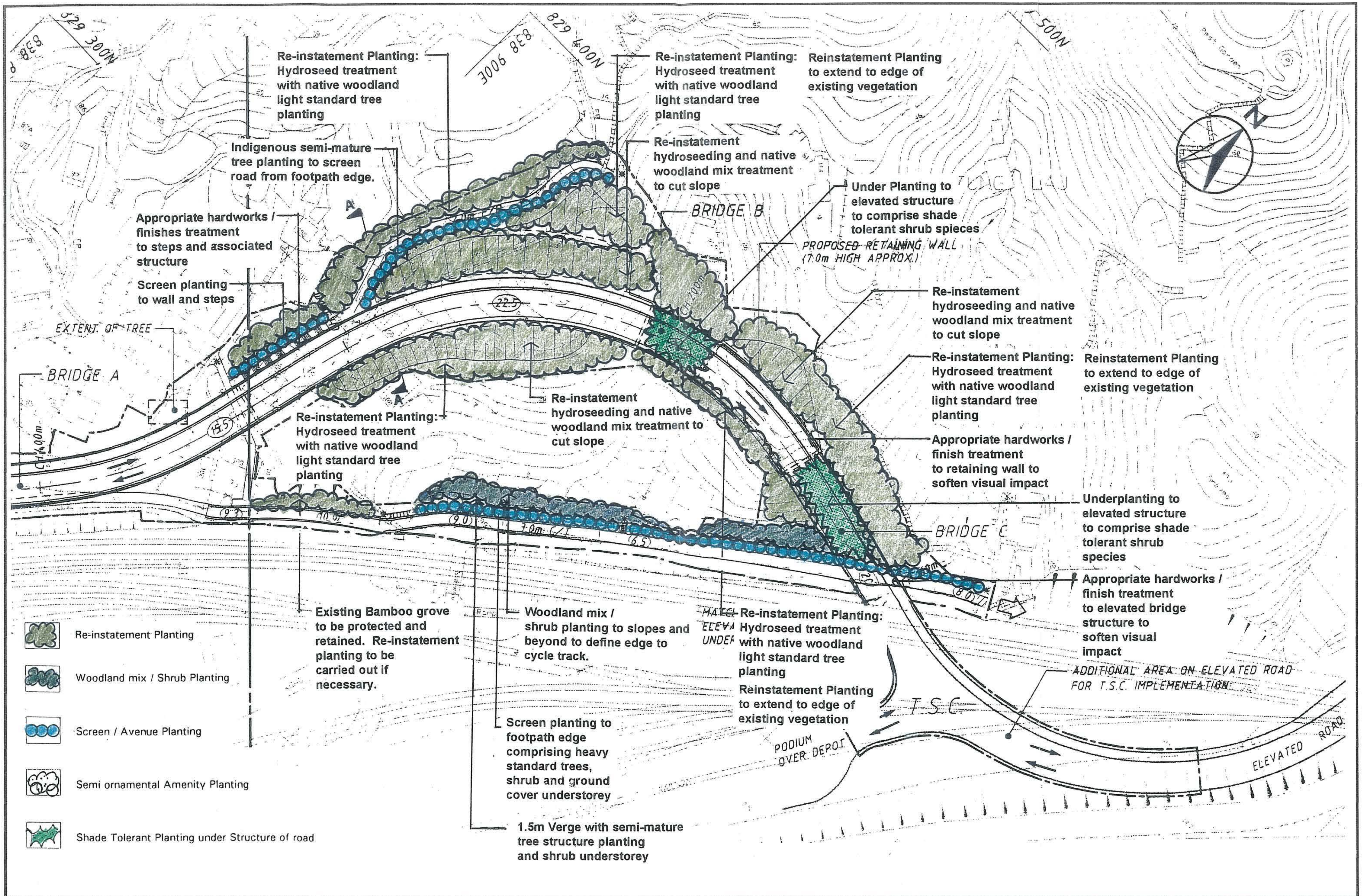


ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT

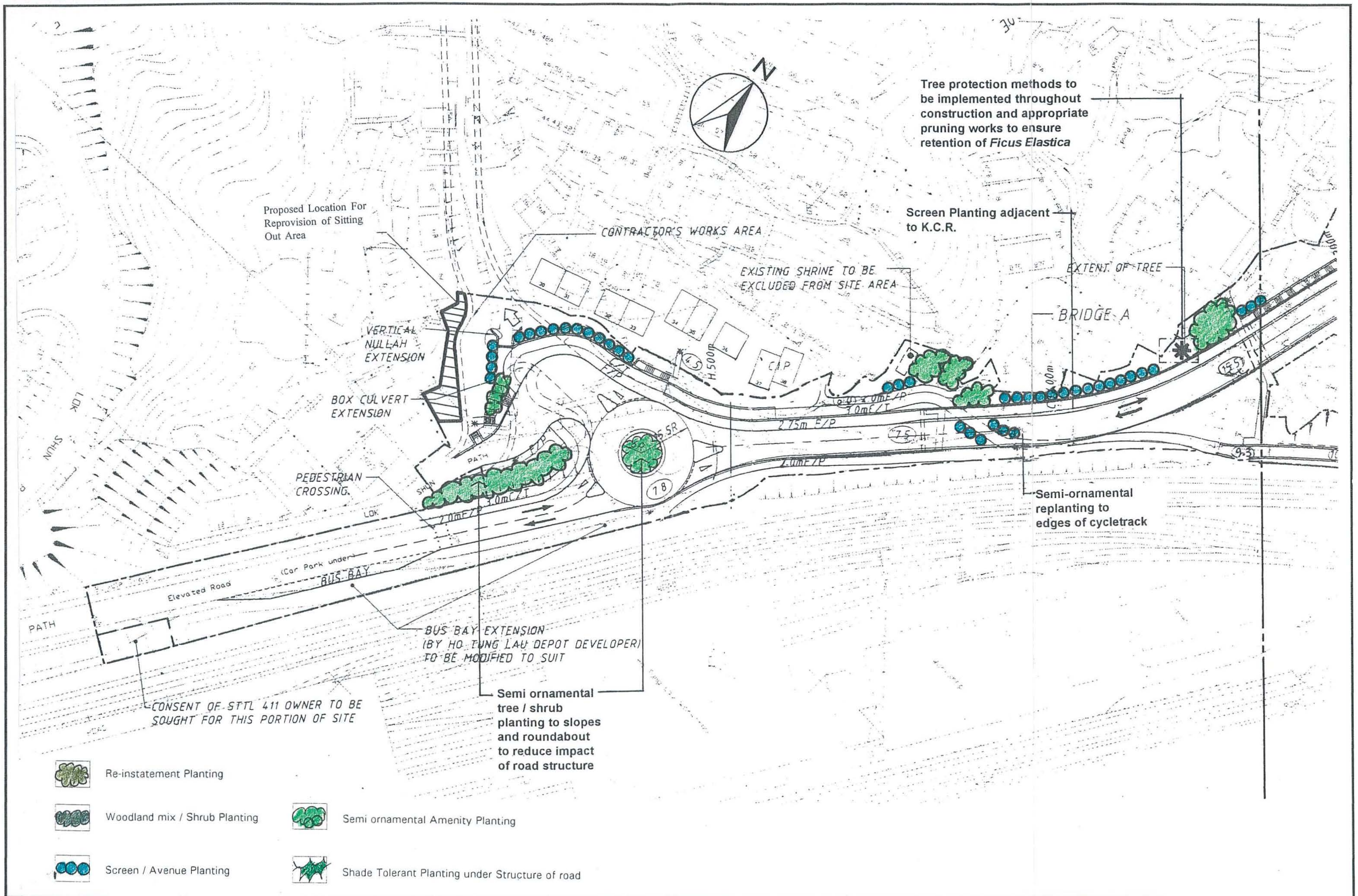
VISUAL IMPACT PLAN

Maunsell
茂盛(亞洲)工程顧問有限公司

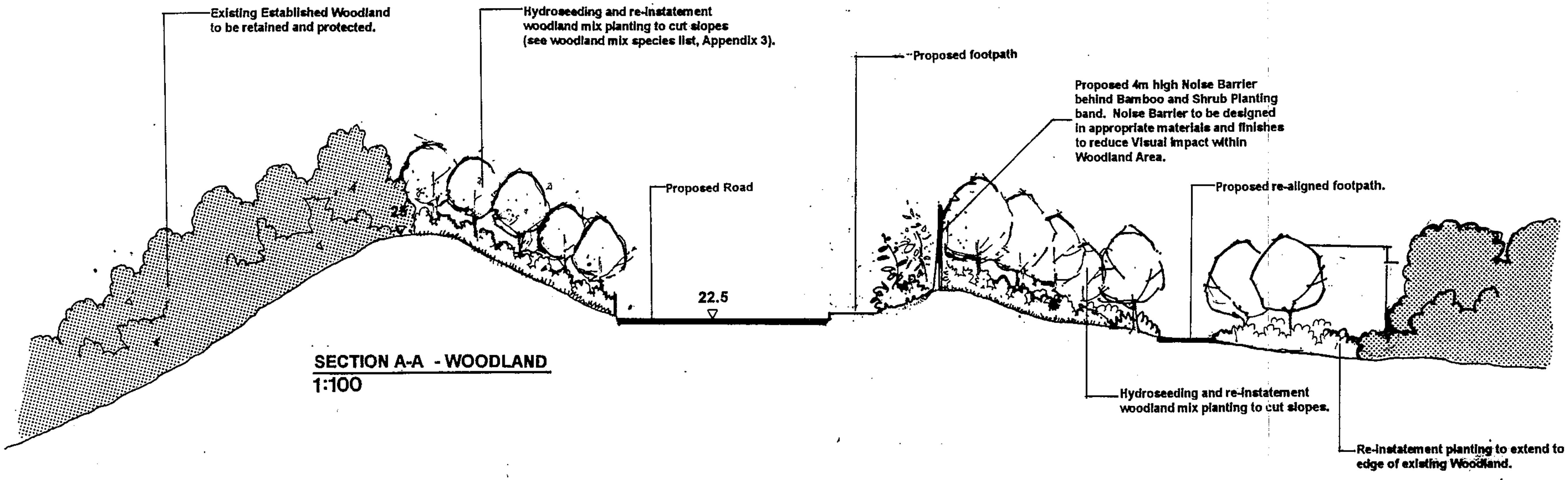
JOB NO.:	SCALE :	FIGURE:
63094/02	1:1000	6.4B



ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT LANDSCAPE MITIGATION PROPOSALS	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO.: 63094/02	SCALE: 1:1000	FIGURE: 6.5A



ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT LANDSCAPE MITIGATION PROPOSALS	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO.: 63094/02	SCALE : 1:1000	FIGURE: 6.5B



SECTION A-A - WOODLAND
1:100

ROAD D15 LINKING LOK SHUN PATH & TAI PO ROAD - ENVIRONMENTAL IMPACT ASSESSMENT LANDSCAPE MITIGATION PROPOSALS - CROSS - SECTION PROFILE	Maunsell 茂盛(亞洲)工程顧問有限公司	JOB NO.: 63094/02	SCALE : 1:1000	FIGURE: 6.5C

Established Broadleaf Woodland Slopes (Chainage 100m to 300m)

Small Residential Property within Woodland

Established Broadleaf Woodland Slopes (Chainage 100m to 300m)

Significant Mature Ficus elastica

APPENDIX 3 EXISTING SITE PHOTOGRAPHS

Low Value Wasteground and Marsh at base of Lok Lo Ha Village

Existing Access Road

Lok Lo Ha Village

Lok Lo Ha Village

'Royal Ascot' Housing Development

Residential Property of Lok Lo Ha Village

Lok Lo Ha Village

Existing Footpath

K.C.R.C. Track Beneath Housing Podium

Existing Footpath

APPENDIX 3 EXISTING SITE PHOTOGRAPHS

(Appendix 3)

EXISTING LANDSCAPE	LANDSCAPE IMPACT SUMMARY

Chainage Pt. 100m to 300m

LANDSCAPE CHARACTER	LANDSCAPE IMPACT	LANDSCAPE IMPACT VALUE
• Established native broadleaf woodland of high landscape	• Loss of woodland area	Severe Adverse
• Steep topography	• Engineering modifications - Cut slopes - Retaining Structures	Severe Adverse
• Property within woodland	• Loss of property	Moderate Adverse

Chainage Pt. 300m to Lok Shun Path

LANDSCAPE CHARACTER	LANDSCAPE IMPACT	LANDSCAPE IMPACT VALUE
• Small residential properties within woodland setting	• Loss of property • Introduction of steps • Modification of terrain • Loss of vegetation	Serve Adverse
• Semi-Rural village land low rise properties, of moderate landscape value	• Loss of village service areas • Loss of semi ornamental planting and garden areas.	
• Marshland of low landscape	• Loss of marshland	Slight Adverse

(Appendix 3)

VISUALLY SENSITIVE RECEIVERS	VISUAL IMPACT SUMMARY

Chainage Area 100m to 300m

VSR	VISUAL IMPACT
V.S.R. No's 1,2 4 Village Properties South of Footpath	**Moderate Adverse**
V.S.R. No's 3,4 Ho Tung Lau	Moderate Adverse
V.S.R. No. 40 Royal Ascot Housing Development	Moderate Adverse
V.S.R. No's 7,8,9 Properties in Woodland Area	Serve Adverse

Chainage Area 300m to Lok Shun Path

VSR	VISUAL IMPACT
V.S.R. No's 12 to 18 Properties in Woodland Area Lot No's. 99-112	Server Adverse
V.S.R. No.40 Royal Ascot Housing Development	Moderate Adverse
V.S.R. No's 20 to 24 Village Properties	Moderate Adverse
V.S.R. No. 25 Lok Lo Ha Village	Moderate Adverse
V.S.R. No's 33 to 37	Moderate Adverse (Short term) Slight Beneficial (Long term)

(Appendix 3)

Footpath adjacent to K.C.R.

VSR	VISUAL IMPACT
V.S.R. No's 5,17,18 Properties directly adjacent to path	Moderate beneficial

Appendix 4

Appendix 4

Proposed Planting Mixes

1. **Indicative Woodland and Planting Mixes**

Botanical Name	**Size (mm)**	**Spacing (mm)**	**Qty %**
Whip Trees			
Abarema incida	900 - 1750	1000	10%
Cinnamomum camphora	900 - 1750	1000	10%
Cratoxylum ligustrinum	900 - 1750	100	10%
Ficus hispida	900 - 1750	1000	10%
Machilus thunbergii	900 - 1750	1000	10%
Sapium discolor	900 - 1750	1000	10%
Schefflera octophylla	900 - 1750	1000	10%

Botanical Name	**Size (mm)**	**Spacing (mm)**	**Qty %**
Bamboo & Shrubs			
Bambusa vulgaris	900 x 3 shoorts	1000	10%
Llex asprella	500 x 500	1000	10%
Ligustrum sinense	500 x 500	1000	10%

Light Standard Trees (Planted randomly throughout woodland mix outlined above)

Botanical Name	**Size (mm)**	**Spacing (mm)**	**Qty %**
Albizia lebbek	1750	3000	
Ficus virens var sublanceolata	1750	3000	
Schima superba	1750	3000	

2. Indicative Ornamental Planting

Botanical Name	**Size (mm)**	**Spacing (mm)**	**Qty %**
Heavy Standard Trees			
Delonix regia	3500 (min)	5000	
Ficus microcarpa	3500 (min)	5000	
Ficus elastica	3500 (min)	5000	
Michelia alba	3500 (min)	3000 - 5000	

Botanical Name	**Size (mm)**	**Spacing (mm)**	**Qty %**
Shrubs & Groundcover			
Duranta repens	750 x 500	750	
Ervatamia diviracata	500 x 500	500	
Gardenia jasminoides	500 x 500	500	
Hymenocallis americana	300 x 300	300	
Jasminum mesnyii	300 x 300	300	
Lantana montevidensis	300 x 300	300	
Liriope spicata	150 x 100	250	
Melastoma candida	500 x 500	500	
Rhododendron spp.	500 x 500	500	