

1. INTRODUCTION

1.1 Preamble

- 1.1.1 The need for Route 16 was established in the Updating of the Second Comprehensive Transport Study to overcome anticipated traffic problems at the Lion Rock Tunnel, Tate's Cairn Tunnel and Tai Po Road, and has been committed in the Sha Tin Outline Zoning Plan (S/ST/6). The Route 16 will connect the Lai Wan Interchange in West Kowloon to the future Trunk Road T3 and Che Kung Miu Road in Sha Tin.
- 1.1.2 In April 1997, the Route 16 Study Team led by Scott Wilson (Hong Kong) Ltd and Parsons Brinckerhoff (Asia) Ltd was commissioned to carry out the Route 16 Investigation Assignment to produce a technically sound and optimum preliminary design for the Dual-3 lane tunnel scheme. The route alignment was designated as the Conforming Alignment. An Environmental Impact Assessment (EIA) was carried out by ERM Hong Kong Ltd during the Investigation Assignment to ensure the environmental acceptability of the Conforming Alignment. The *Route 16 from West Kowloon to Sha Tin - Investigation Assignment: EIA Study, Final Assessment Report (Jan 1998)* was endorsed by the Government and the EIA subcommittee of the Advisory Council on the Environment in February 1998. In addition, the Shum Shui Po District Board and the Sha Tin District Board were consulted regarding the findings of the EIA report on 15 January and 27 March 1998 respectively. The EIA report is formally logged under the Environmental Impact Assessment Ordinance register (reference number: EIA-135/BC).
- 1.1.3 The recently completed Detailed Feasibility Study for Route 9 between Tsing Yi and Cheung Sha Wan recommended that a direct connection between Route 9 and Route 16 should be provided in order to provide a direct route between the New Airport and the New Territories East, and to simplify the at-grade movement on Lai Wan Interchange. In order to meet the traffic demand of the design year and to accommodate the merging and diverging movement for traffic from the direct connection and those from the Lai Wan Interchange, the proposed Dual-2 lane Lai Chi Kok Viaduct (LCKV) of the Conforming Alignment is required to be widened to Dual-3 lane for most of its length to meet traffic operation standards.
- 1.1.4 As a consequence of such widening, the traffic from/to the slip roads connecting Ching Cheung Road would be required to merge/diverge to/from the mainline traffic within the tunnel section if the Conforming Alignment were to be maintained. Such traffic movement within tunnel section was considered undesirable from traffic safety considerations. It is therefore necessary to undertake further investigation to allow merging/diverging movement to take place on an open road section to meet road safety standards.
- 1.1.5 Early in the Investigation Assignment, the Route 16 Study Team had come up with an Alternative Alignment option (see *Figure 1.1a*) for the West Kowloon end, which had benefits in traffic operation and reduced construction cost and programme. However, due to programming difficulties in meeting the scheduled road completion date in 2004, the option was dropped from further consideration at that time. The new connection with Route 9 requirement has provided an opportunity for Highways Department to commission the Study Team to investigate further the Alternative Alignment option which would alleviate the road safety and traffic operation problems.
- 1.1.6 In October 1998, an application for an EIA study brief under section 5(1) of the Environmental Impact Assessment Ordinance (EIAO) was submitted to Environmental Protection Department, together with a Project Profile (No. PP-031/1998), for the Route 16 Alternative Alignment. Pursuant to section 5(7)(a) of the EIAO, a study brief (ESB-021/1998) was issued by the Director of Environmental Protection (the Director).

- 1.1.7 The current Route 16 Alternative Alignment EIA study is required as a result of major design changes in the West Kowloon section as presented in Section 1.2, based on preliminary design by the engineering team. The purpose of this EIA study is to provide information on the nature and extent of the environmental impacts arising from the construction and operation of the proposed changes.
- 1.1.8 The project name of this Project has been renamed to Route 9 between Cheung Sha Wan and Sha Tin. However as the name Route 16 has already registered under the EIAO in the current Study Brief, the name of this project would remain as Route 16 throughout this report. On the other hand, the name Route 9, used in this Report, only refers to the section of Route 9 between Tsing Yi and Cheung Sha Wan.

1.2 Alignment Consideration

- 1.2.1 From Lai Wan Interchange to south of Ching Cheung Road, Route 16 takes the form of an elevated viaduct, following the existing Butterfly Valley Road and the road D3 in the West Kowloon reclamation area. As Cheung Sha Wan is a built up and congested area, the choice of another corridor for Route 16 connecting the same destinations was not possible, taking into consideration safety standards in the geometric layout for the route.
- 1.2.2 After crossing Ching Cheung Road at high level, the current alternative alignment runs for a limited length on an open roadway along the Butterfly Valley, and is considered an option involving less cut and fill. The viaduct cannot join immediately with a tunnel for various reasons. Firstly, sufficient length of open carriageway for the mainline has to be maintained to allow connection of slip roads with Ching Cheung Road. Further upstream, an additional section of open carriageway has to be reserved for providing the tunnel cross over, which is essential for the tunnel operation, in particular in single tube operation during the closure of one tube for routine maintenance. Beyond that point, there is no further requirement of Route 16 to be on open road, and theoretically, the tunnel section can commence to achieve minimal environmental impact. However, this is subject to the following engineering constraints. *Figures 2.1c, e & f* illustrate the traffic operation requirements and design constraints.
- a) The tunnel portal has to be located well "inside" the slope face, to be formed at a point where there is sufficient depth of rock cover to maintain a stable portal structure, and to allow tunnel excavation to commence in a stable and safe condition.
 - b) The above could theoretically be achieved at an earlier point by lowering the road profile so that the road will hit the slope face earlier. However, this is restricted by the level at which Route 16 crosses Ching Cheung Road, and will pose problem to the diversion of the existing flow discharge stream of the Kowloon Byewash Reservoir, which has to cross underneath the route.
 - c) Although lowering in carriageway level will involve a shorter section of cutting on the valley slope, the affected section will need to be cut to a greater extent due to the increase in height of the cut slope.
 - d) Swinging the alignment to the east side of the valley will encroach into the lot boundary of the Caldecott Road Government Quarters, the Sir Robert Black College of Education, Tai Po Road Water Treatment Works, and the Service Reservoir. Constructing a tunnel underneath these building compounds is likely to affect their foundations.
 - e) Swinging the alignment to enter into a tunnel at the western side of the valley can be achieved technically. However, this will involve forming a portal at an oblique angle instead of normal to the slope face, which is undesirable. Alternatively, a sharp bend will have to be introduced to the road alignment, which cannot be designed to achieve the geometric design requirements and standards for the route. Furthermore, this will bring

the Route 16 alignment closer to the Kowloon Byewash Reservoir, and will likely increase the impact of the tunnel construction on the reservoir and dam.

1.2.3 The current scheme has been developed with environmental input incorporated to minimize the potential impact. Notwithstanding the above, refinement of the current alignment and layout will be explored during the Review Stage of the Design & Construct Assignment at the next stage to further reduce environmental impact and to improve tunnel operation when more detailed geotechnical information is available.

1.3 Alternative Alignment: Key Changes

1.3.1 The main differences between the Alternative and the Conforming Alignment are the new portal location, with a new section of open road running along Butterfly Valley, widening of the Lai Chi Kok Viaduct from Dual-2 to Dual-3 lane, direct connection with Route 9, higher elevation of the mainline, different slip road connections to Ching Cheung Road and Castle Peak Road and reduced scale of the ventilation scheme.

1.3.2 Beyond the Eagle's Nest Tunnel, there are no differences (including traffic projections) between the Conforming Alignment and Alternative Alignment. Hence assessment for the Sha Tin Section is excluded from the present EIA study. For details of predicted results, required mitigation measures and residual impacts for the Sha Tin section (including Toll Plaza) of the alignment, reference can be made to the previous EIA report (EIAO register reference number: EIA-135/BC). The general layout of the Conforming and Alternative Alignment is shown in *Figure 1.1a*.

1.3.3 The proposed Alternative Alignment, in particular the alignment of the opened carriageway and the portal location of the Eagle's Nest Tunnel in Butterfly Valley are carefully selected to meet the need of the direct connection with Route 9, the latest traffic forecast, the traffic operational and safety standards as well as minimising the likely environmental impact. The proposal is considered an optimised solution based on the available geotechnical information (refer to Section 1.2). The benefit and constraints considerations of the Alternative Alignment are summarised in *Table 1.2a*.

Table 1.2a Benefits and Constraints of the Alternative Alignment

Issues	Benefits	Constraints
Construction	<ul style="list-style-type: none"> overall construction period can be reduced by 6 months elimination of blasting constraints on tunnelling under WSD Butterfly Valley Primary Service Reservoir avoid major construction works on high risk slopes along Ching Cheung Road elimination of difficult works for Ching Cheung Road slip road underpass reduce project risks in terms of delay, public disruption and objection 	<ul style="list-style-type: none"> closer proximity to Kowloon Byewash Dam and Tai Po Road FW service reservoir facilities resulting in more restriction during tunnel construction and more stringent design provision to safeguard these WSD facilities drainage impact on existing watercourse in Butterfly Valley and floodway from the Kowloon Byewash Reservoir
Traffic Operations	<ul style="list-style-type: none"> permits the merging/diverging of slip roads provision of a cross-over between the tunnel portal and the slip road 	N/A

Issues	Benefits	Constraints
	<p>connection points so that single tunnel operation could be arranged without closing of the slip roads</p> <ul style="list-style-type: none"> • eliminate major traffic operation problems such as buses & HGVs using middle lane, nearside Kowloon bound lane becoming a dedicated lane to Ching Cheung Road and closure of slip roads during single tube operation • improve traffic safety • maintain a balanced flow capacity across the three lanes • eliminate tunnel widening at the South Portal to accommodate slip road connection 	
Land Requirement	<ul style="list-style-type: none"> • avoid landtake from the LCK Hospital • eliminate the landtake problem at the mid ventilation building site at Tai Po Road, thus avoiding the resumption of the petrol filling station 	<ul style="list-style-type: none"> • new land take in Butterfly Valley and Mui Kong Tsuen
Interfaces		<ul style="list-style-type: none"> • crossing of an existing CLP 400kV overhead power transmission line • crossing of existing or planned water pipes
Environmental	<ul style="list-style-type: none"> • minimise disturbance and nuisance to the LCK hospital • reduced energy consumption due to the reduced scale in the ventilation system as a result of a shorter tunnel length i.e. merit for energy conservation. • reduced air emission from the mid ventilation building due to the shorter tunnel length, hence lower concentration of pollutant would be induced, 	<ul style="list-style-type: none"> • higher risk to the road users since the open section of Route 16 in Butterfly Valley will be subject to hazard due to the close proximity of Tai Po Road Treatment Works and Shek Lei Pui Treatment Works. i.e. Additional chlorine hazard from Tai Po Road and Shek Lei Pui WTW • additional traffic noise and air quality impact from the mainline section along Butterfly Valley. Some residents, on both sides of the open carriageway in Butterfly Valley, previously not affected under the conforming scheme will be affected • additional loss of 3ha of secondary woodland along Butterfly Valley, but the loss will be totally compensated on-site (the "no net loss" condition)

Issues	Benefits	Constraints
Cost	<ul style="list-style-type: none"> overall construction cost saving of approximately HK\$ 500 million due to shortening of tunnel, adoption of a reduced scale ventilation scheme and elimination of difficult construction works for the Ching Cheung Road slip road underpass and Eagle's Nest South Portal reduced O&M cost related to a simpler operation and control philosophy and reduced scale ventilation scheme 	<p>imposed by ACE in the previous submission for the whole Route 16 project from West Kowloon to Sha Tin will be met).</p> <ul style="list-style-type: none"> visual impact of cut slope, embankment and elevated structure replacing the natural landscape along Butterfly Valley additional cost for the provision of additional environmental mitigation measures additional cost associated with the re-routing of a pylon and overhead line additional cost associated with the addition land resumption in Butterfly Valley and Mui Kong Tsuen

1.4 EIA Study Area

1.4.1 The boundary of the Study Area for the purpose of this EIA is 300 m either side and along the full stretch of the proposed alignment (see *Figure 1.3a*). Except in the case of waste management impact, landscape impact, ecological impact and air quality assessment, where the study area is defined by a distance of 500 m from the proposed alignment. All visually sensitive receivers will be assessed where necessary, regardless of the distance from the proposed alignment as part of visual impact assessment.

1.4.2 With respect to noise impact assessment, the study area could be reduced accordingly, if the first layer of Noise Sensitive Receivers (NSRs), closer than 300m from the road, provide adequate acoustic shielding to those NSRs located further behind.

1.5 Objective of the EIA

1.5.1 This EIA updates the findings of the previous EIA on the Conforming Alignment, using information from the previous study where appropriate and adding information to address the significant changes in design to fulfill the requirements of the Study Brief (ESB-021/1998) under the EIAO.

1.5.2 The specific objectives for the Study are set out in the Study Brief, as listed below:

- i) to describe the proposed project and associated works together with the requirements for carrying out the proposed project;
- ii) to identify and describe the elements of the community and environment likely to be affected by the proposed project, and/or likely to cause adverse impacts upon the proposed project, including both the natural and man-made environment;
- iii) to identify and quantify emission sources and determine the significance of impacts on sensitive receivers and potential affected uses, including a quantitative risk assessment regarding hazardous materials;

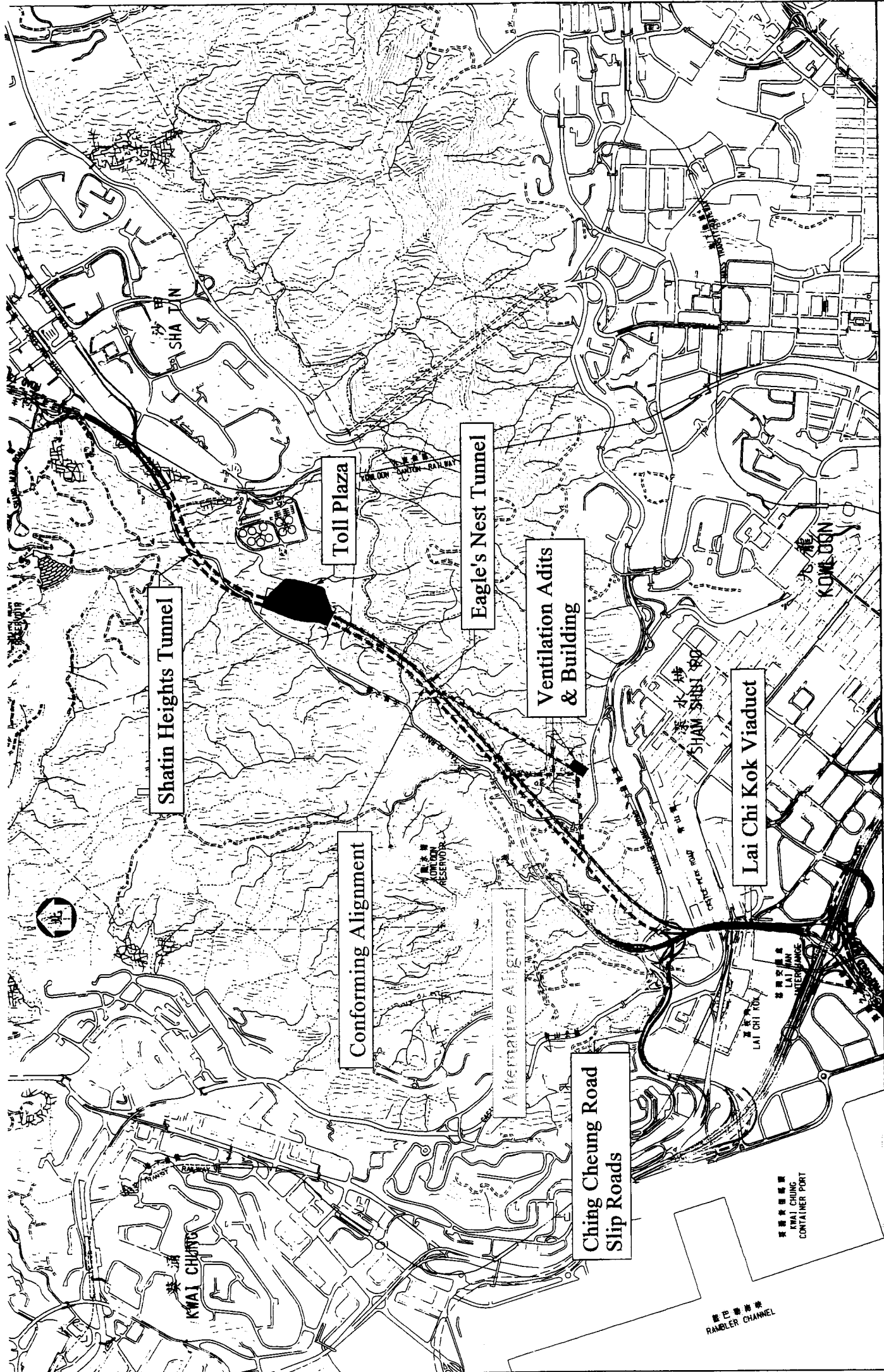
- iv) to identify and quantify any potential losses or damage to flora, fauna and wildlife habitats;
 - v) to identify any potential landscape and visual impacts;
 - vi) to identify any potential impacts to the historical and cultural resources of the historic buildings specified in *Section 3.10* of the study brief, and propose measures to mitigate these impacts;
 - vii) to propose the provision of infrastructure or mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction, operation of the proposed project, and to assess the land take impact arising from implementation of such mitigation measure;
 - viii) to identify, predict and evaluate the residual (ie after practicable mitigation) environmental impacts and cumulative effects expected to arise during the construction and operational phases of the proposed project, in relation to the sensitive receivers and potential affected uses;
 - ix) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction, operation of the proposed project which are necessary to mitigate these impacts and reduce them to acceptable levels;
 - x) to investigate the extent of side-effects of proposed mitigation measures that may lead to other forms of impacts;
 - xi) to identify constraints associated with the mitigation measures recommended in the study; and
 - xii) to design and specify the environmental monitoring and audit requirements necessary to ensure the implementation and the effectiveness of the environmental protection and pollution control measures adopted.
- 1.5.3 The Project is classified as a Designated Project requiring Environmental Permits (Part 1 of Schedule 2) under the EIAO.

1.6 Structure of the Report

1.6.1 After this introductory section, the remainder of this report is arranged as follows:

- *Section 2* presents a description of the Project, engineering design and traffic forecasts;
- *Section 3* describes the air quality impacts associated with the operation of the Alternative Alignment;
- *Section 4* describes the potential noise impacts associated with the construction and operation of the Alternative Alignment;
- *Section 5* discusses the issues associated with waste management and disposal;
- *Section 6* discusses the water quality impacts associated with the development;
- *Section 7* presents the terrestrial ecological impacts associated with the construction and operation of the development;
- *Section 8* presents the hazards associated with the development;
- *Section 9* presents the landscape and visual impacts associated with the construction and operation of the development;

- *Section 10* presents the heritage impact assessment associated with the construction of the Alternative Alignment.
- *Section 11* discuss the environmental monitoring and audit requirements of the Project; and
- *Section 12* reviews the findings and presents the overall conclusions of this report.

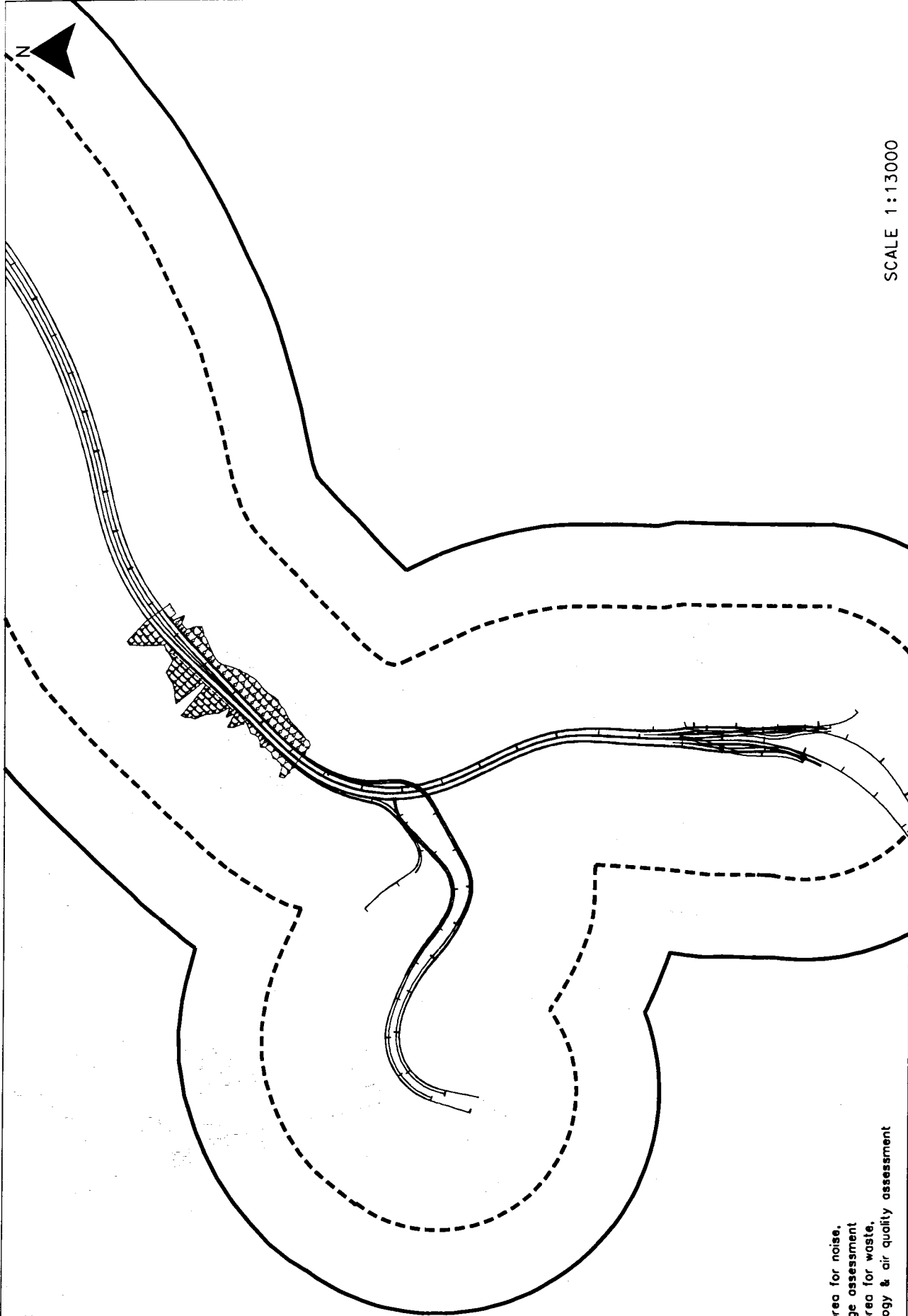


LEGEND

VIADUCT OR AT GRADE ROAD

TUNNEL

FIGURE 1.1a GENERAL LAYOUT PLAN OF ROUTE 16 FROM WEST KOWLOON TO SHATIN



- KEY**
- - - 300m Study area for noise, water & heritage assessment
 - - - 500m Study area for waste, landscape, ecology & air quality assessment

SCALE 1:13000

FIGURE 1.30

STUDY AREA

**Environmental
Resources
Management**

