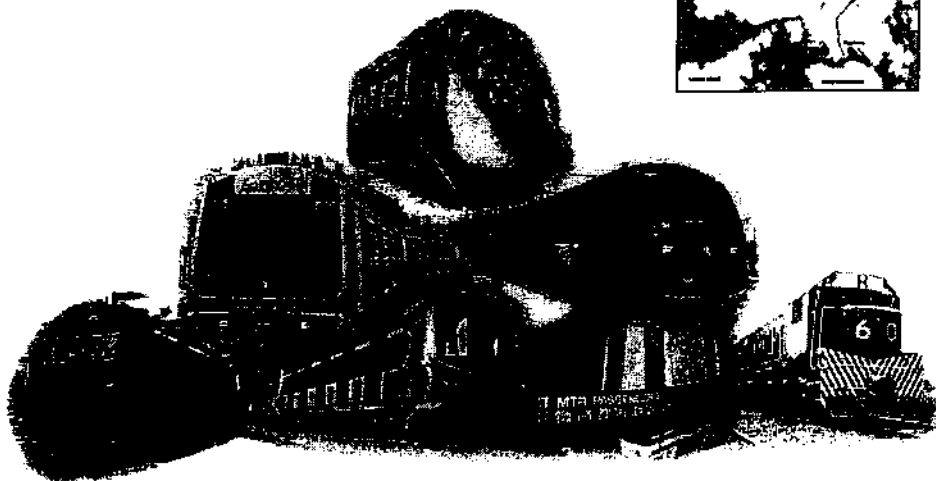
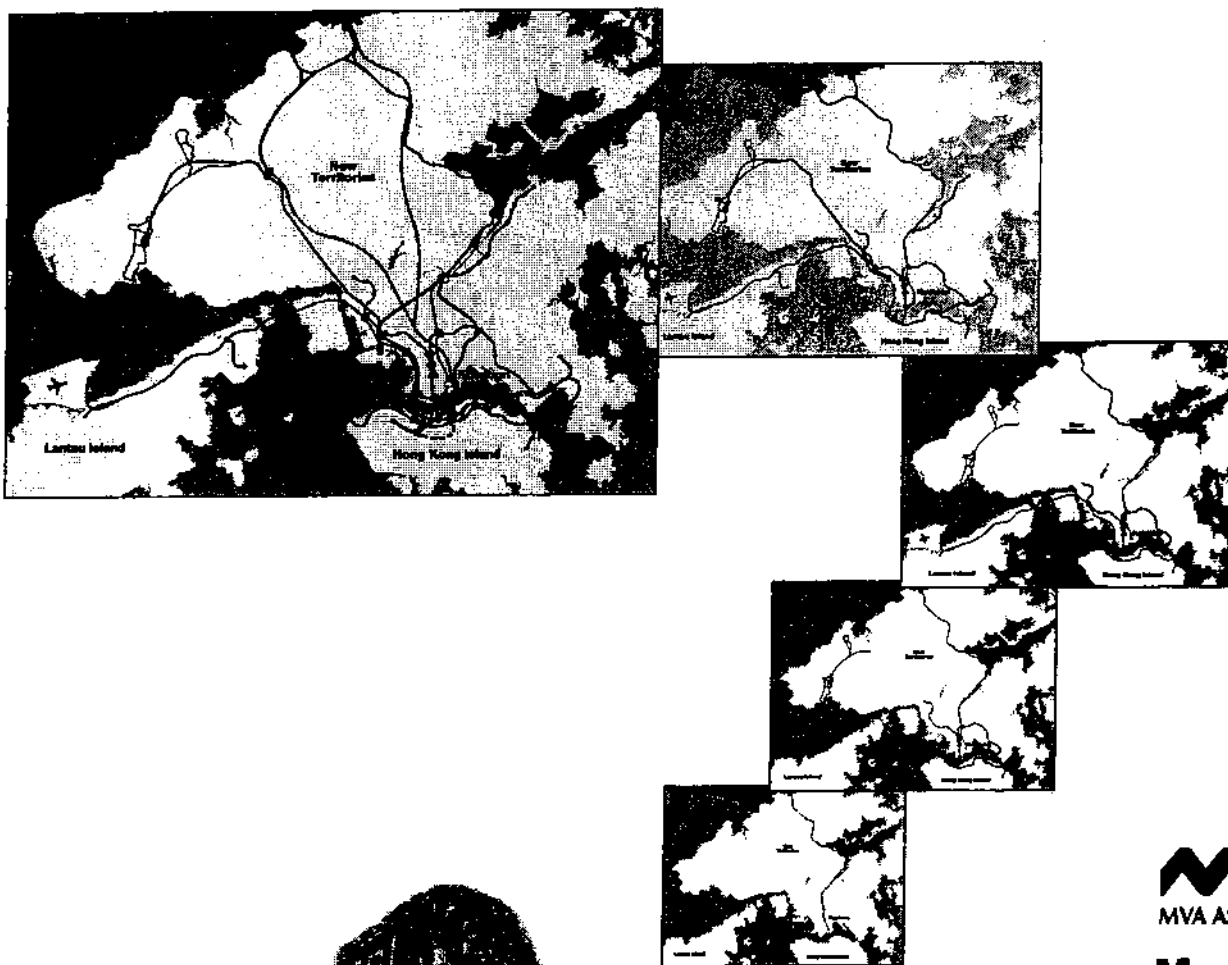


The Rationale for the Development of New Railways



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4. THE RATIONALE FOR THE DEVELOPMENT OF NEW RAILWAYS

4.1 Introduction

4.1.1 In this section the methodology employed by the RDS-2 Study in the identification and selection of new railway infrastructure is described and the key planning factors, which have informed the Study, are examined. Against this broad rationale, the identification of a maximum range of new railway network components is outlined and the refinement of these components through patronage forecasting and the application of absolute environmental constraints is described.

4.2 The 'Top Down, Bottom Up' Approach

4.2.1 The methodology employed by the RDS-2 Study comprised two separate, but fully integrated, areas of investigation. At the Territory-wide, strategic level, the focus of investigation was long term and sought to ensure that various strategic growth scenarios could be accommodated by the scale and geographical location of the future rail network. This Top Down focus was supplemented by a detailed analysis of the current network with the intent of identifying opportunities and requirements for maximising the network's efficiency whilst addressing key areas of capacity constraint. Described as a "Top Down, Bottom Up" approach, the integration of the findings of these two areas of investigation ensured that the Study would be driven by Hong Kong's longer-term strategic needs, whilst ensuring that the current network evolved to accommodate short and interim term capacity needs and that it was prepared for the longer term developments, which would put greater numbers of passengers onto the network.

4.2.2 The Top Down approach, which focused on the strategic development of new railways in Hong Kong, comprised an assessment of the longer term network requirements using 2016 population projections, and predicted geographical distribution of employment and residence data arising from the Planning Department. In parallel with this, the Bottom Up approach comprised an assessment of the loading situations of the existing railway networks such that bottlenecks could be identified and thereby measures proposed for relieving these existing areas of congestion and providing avenues for demand related expansion.

4.2.3 These two approaches combined long term strategic network planning with short-term capacity relief needs for new railway development and included the investigation and analysis of the key variables affecting transport supply and demand as well as the additional strategic rail links or infrastructure necessary regardless of long term strategy.

4.2.4 The main NDS work stream initially focussed on the longer term (Top Down) perspective, using the Scenario and Network assessment studies, which comprised examinations into the potential for railway development in a number of broad corridors. These corridors were subsequently investigated using a number of scenarios containing assumptions and key input variables in order to determine an in-depth understanding of the potential needs for different rail links and service types under a range of possible future conditions.

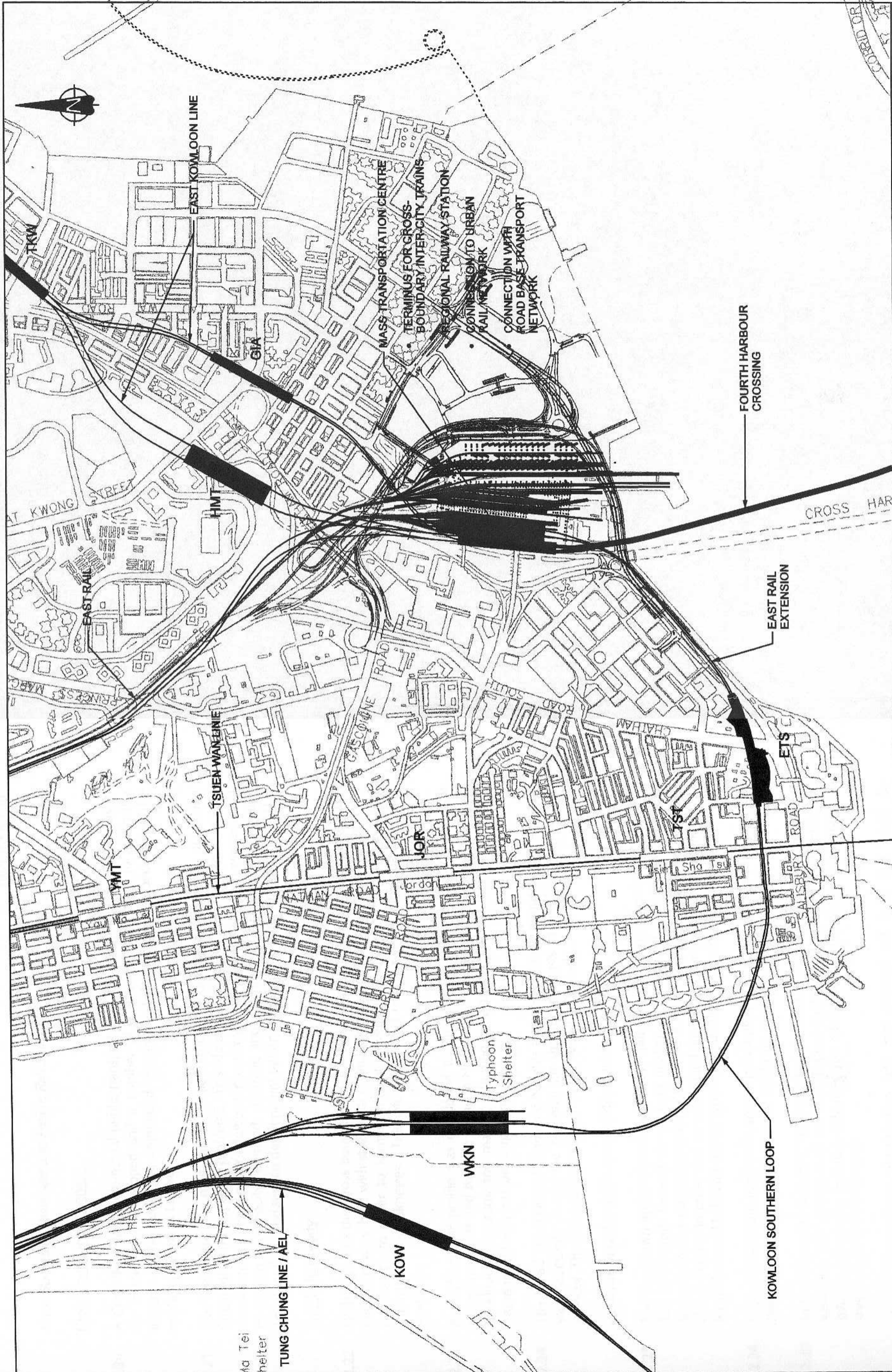
- 4.2.5 In parallel with the above, the Bottom Up approach focussed on the network constraints, and the identification of urgent measures and additional strategic links or facilities (e.g. stations, interchanges) that are required regardless of the long term strategy output. The Bottom Up approach comprised the in-depth assessment of specialist topics including the Fourth Harbour Crossing, key strategic infrastructure such as the Mass Transportation Centre, the boundary crossing and a Port/Rail line (for freight movements).
- 4.2.6 A key component of the Bottom Up aspect of the study was the undertaking of the Topical Studies. The studies involved investigations into a number of specific issues that had critical bearing on the formulation of the railway network development options and that allowed more detailed railway planning to be undertaken.
- 4.2.7 As outlined in Section 1.4, these Topical Studies comprised the following:
- The Network Constraints Study (NCS)*
- 4.2.8 This NCS focussed on the identification of existing and anticipated bottlenecks in the existing railway network with a view to making recommendations on relief measures that are required in the short and medium term.
- 4.2.9 The assessment of network constraints focussed on the period up to the year 2006. In outline, the study comprised building up a data base of the operating capacities of existing and committed rail line and passenger facilities. Against this data, the key limiting factors were reviewed and the capacity shortfalls identified. Subsequently, additional rail links were proposed in order to overcome the identified capacity shortfalls and thereby maintain the effective network operations. The input relating to the nature and extent of any environmental impacts was provided by the SEA Team to enhance the identification of any preferred links.
- 4.2.10 In addition to the identification of any additional links required to overcome any shortfalls in the predicted operating capacities, the NCS also identified the short term measures required to enhance network capacity/efficiency, and thereby relieve predicted passenger congestion. Such short-term schemes generally fell into the following categories:
- rail fare incentives to adjust passenger demands;
 - demand balancing between alternative rail routes; and
 - station capacity enhancement.
- 4.2.11 With the identification of the preferred additional links and short-term schemes, a broad implementation plan was developed to set out the tentative timing of implementing the respective schemes, and the steps required to achieve the target completion dates.
- 4.2.12 The findings from the NCS were fed into the NDS to ensure that the NDS developed and selected a conceptual network that incorporated the proposed rail links identified in the NCS.

Fourth Rail Harbour Crossing (FHC)

- 4.2.13 In order to draw upon the findings of previous work that had been undertaken, and to identify at an early stage any constraints or opportunities, the first task of the FHC study was to review information contained in previous studies and proposals compiled by Government and the two railway corporations, and to review town planning information contained in the Outline Development Plans, Outline Zoning Plans and Layout Plans.
- 4.2.14 From the above information, broad options were developed with reference to the different combinations of rail extension from Kowloon to Hong Kong Island, and the most desirable schemes (based on relative construction difficulty, environmental impact and number of operable interchanges afforded) were selected for network testing. Desirable schemes needed to be able to be constructed without any major risk of interrupting the operating railways during construction, and needed to provide at least two interchange points at each side of the harbour (to attract use and maximise relief and flexibility to the network).
- 4.2.15 Feasible options were identified with reference to constraints posed by existing infrastructure, geotechnical, marine, environmental and reclamation issues, and these were investigated to determine the preferred option alignments.
- 4.2.16 The preferred options were further evaluated and recommendations made in relation to service patterns, construction methodology, operational requirements, together with economic and financial evaluations. As a result of these investigations, the preferred options were selected, and carried forward for further assessment in the Network Development Study.

Mass Transportation Centre (MTC)

- 4.2.17 Following the identification of the functional requirements of the MTC (e.g. capacity), potential sites were identified, and town planning proposals were reviewed to identify any land-use constraints or opportunities at the potential locations.
- 4.2.18 The sites were evaluated to consider accessibility, land area, compatibility with surrounding existing and planned land-uses and the nature and extent of any potential environmental impacts. In addition, the potential sites were assessed in relation to rail operation requirements, transport services and engineering and environmental aspects and costs. The favoured sites were carried forward for further assessment in conjunction with the associated Network Development, FHC and Cross Boundary Studies.
- 4.2.19 Passenger/revenue forecasts were prepared using the Study's Cross Boundary and domestic transport model, operational and land-use requirements were evaluated, as well as the identification of suitable construction methodology, and an evaluation of costs. Based on the multi-disciplinary evaluation, an assessment was made regarding the need for a MTC, and recommendations were made regarding the possible timing, location and associated infrastructure. With consideration of all the factors, it was resolved that the MTC should be located at Hung Hom. Figure 4.1 shows the location of the proposed MTC.



Highways Department Railway Development Office		SCALE	1:11000	CDR REF	CT186/100500/1.DGN
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				REVISION/FIGURE NO.	4.1

THE SECOND RAILWAY DEVELOPMENT STUDY
MASS TRANSPORTATION CENTRE (MTC AT HUNG HOM)



*Cross Boundary Passenger and Freight Rail Study*Cross Boundary Passenger

- 4.2.20 A Cross Boundary multi-modal public transport model was developed. The inputs to the model were developed and a number of tests were undertaken to assess the impacts of the additional committed crossing at Lok Ma Chau, especially on the existing crossing at Lo Wu.
- 4.2.21 The Cross Boundary multi-modal public transport model was then used to determine future network capacity problems. This data was used for the identification and development of options for additional boundary crossings, each of which was assessed in relation to capacity, demand, planning and environmental constraints, 'Through Train' services, and service development option including the requirements for a MTC.

Freight Rail Study

- 4.2.22 With regard to the Cross Boundary Freight Study, a data review was undertaken and interviews were held with stakeholders (including transport service providers and their customers), in order to identify market drivers and rail's current potential future strengths and weaknesses. This information was used for developing possible future scenarios.
- 4.2.23 A freight sector profile was developed to provide a clear summary of the freight transport market and the role of rail in Hong Kong. This analysis provided a basis for developing scenarios and making informed judgements on key factors influencing future freight volumes and cargo types.
- 4.2.24 The broad financial and economic benefits and costs of the various freight scenarios were assessed, as was the potential for sharing the costs of freight and passenger services. This information was fed into the overall NDS study.

Application of Multi-Dimensional Approach to the NDS

- 4.2.25 The Top Down approach was the primary influence on the development of the NDS. The initial work focused on a broad analysis of a range of different Development Scenarios and a comprehensive rail network. A range of other input assumptions was also examined in order that an understanding could be gained of the potential needs for different rail links and service types under a range of possible future scenarios.
- 4.2.26 In parallel with this early work, the outputs from the Topical Studies, and in particular that focusing only on FHC, played a significant role in the development process.
- 4.2.27 In developing the Domestic Network Options, the Top Down and Bottom Up streams were brought together, with the FHC Topical Study providing a focus for linking the two. In considering potential schemes, the NDS took a multi-dimensional approach that comprised the following:
- Infrastructure: investigation into the physical rail links that could be constructed, and their connection points to the existing/committed rail network.

- Services: the pattern of rail operations over the new rail infrastructure, and how they could integrate with existing/committed services.
- Planning issues: the location of future developments, housing population, services and jobs are likely to be influenced by the evolving rail network.
- Environmental issues: the consideration of environmental issues during the network development with the aim of avoiding or minimising the potential environmental impact.

4.2.28 The influence of the SEA component of the Study is considered in further detail below

Integration of the SEA into the 'Top Down, Bottom Up' Approach

4.2.29 The SEA Study objective was to integrate the consideration of environmental factors into the formulation of the various railway development options, and, through the application of strategic impact assessment, to avoid potential environmental constraints. To this end, the outputs of the SEA supplemented the assessments undertaken by the Top Down and Bottom Up approaches by feeding an environmental component into the decision making process. In particular, for the Top Down approach, baseline environmental data collated during the study period was used during the Corridor Assessment and Network Assessment stages to ensure that identified environmental resources were avoided. Similarly, environmental issues were considered within the Topical Studies as a means of ensuring that the Bottom Up approach also included an environmental component.

4.2.30 The implementation of the Top Down, Bottom Up approach ensured that the findings of these two separate, but equally important, areas of investigation were integrated into the overall Study. This ensured that both Hong Kong's longer-term strategic needs were addressed whilst also ensuring that the short and interim term capacity needs of the current network were evaluated and addressed, such that they could accommodate any future longer term rail developments and their associated increases in the passengers.

4.3 Planning Horizon for Hong Kong's Transportation Needs

4.3.1 The overall objective of the RDS-2 study was the formulation of a development option for the development of new railways to serve the transportation needs of the Hong Kong SAR over the next 20 years.

4.3.2 The first Railway Development Study (RDS-1) was completed in 1993 and was based on Territory population projections to the year 2011. However, the results of the 1996 Bi-Census revealed that the Territory's population was higher than anticipated, at 6.2 million, and that therefore, the long term planning assumptions that had been used in RDS-1 required substantial upward adjustment. In May 1998, based on the 1996 Bi-Census results, the Planning Department produced its first official range of land use forecasts for the year 2016. These were used as the starting point for the construction of alternative growth scenarios for RDS-2, and the resultant alternative population projections for the year 2016 were used for the Top Down approach adopted in the NDS Study.

- 4.3.3 The principal areas of potential residential increase, compared to the 1996 Bi-Census data were assumed as follows:
- Eastern District of Hong Kong Island
 - West Kowloon Reclamation, Kai Tak and adjacent reclamation, and East Kowloon foothills
 - Tseung Kwan O New town expansion
 - Expansion of Tuen Mun, Tin Shui Wai and Yuen Long
 - Kwu Tung North, expansion of Sheung Shui and Fanling
 - Tung Chung and Tai Ho on Lantau
 - dispersed suburban developments
- 4.3.4 Within the NENT & NWNT Studies, Kwu Tung North, Fanling North and Hung Shui Kiu have been identified as SGAs for development to be completed by 2011. These developments will accommodate populations of approximately 100,000, 80,000 and 160,000 respectively.
- 4.3.5 In the longer term (i.e. beyond 2011), to accommodate additional population, the NENT & NWNT Studies identified potential SGAs at Kwu Tung South, Ping Kong, Lung Yuet Tau, Ping Che/Ta Kwu Ling, Ngau Tam Mei/San Tin, Hung Shui Kiu North, Kam Tin/Au Tau. The ultimate selection of these potential SGAs is subject to further study.
- 4.3.6 Whilst significant population increases are expected in the New Territories, employment forecasts predict that workplaces will remain concentrated in the broad "harbour area" of Hong Kong island and Kowloon. Therefore, the principal feature of commuter flows will be to and from the existing urban areas.
- 4.3.7 The current baseline for the study has assumed the completion of the following committed rail schemes:
- the Tseung Kwan O Line;
 - the Quarry Bay Relief Scheme;
 - West Rail Phase I;
 - the Ma On Shan Extension to East Rail;
 - the East Rail Extension to Tsim Sha Tsui; and
 - the East Rail Spur Line from Sheung Shui to Lok Ma Chau.
- 4.3.8 Each of these schemes is programmed for completion between 2001 and 2004.
- 4.3.9 Whilst the NDS Study has taken the study timeframe to be from the present day to the year 2016, it is acknowledged that the data assumed in the planning scenarios is not definitive and that the scale and location of population and employment (as well as related demographic, social and economic composition) can affect the predicted rail passenger flows. For this reason, a comprehensive analysis of alternative scenarios has been undertaken. Any changes to the distribution of the projected populations could have an effect on the proposed rail system.

4.4 Identifying the Initial Comprehensive Network

4.4.1 The aim of the NDS was to provide a comprehensive evaluation of the identified railway network development options. During the course of the study, the attractiveness of each the possible schemes has been assessed in order to identify a 'preferred network', which comprises:

- packages of short term measures designed to relieve existing or predicted congestion "bottlenecks" or to allow the opening up of new development areas;
- a new round of priority projects to be phased in after the completion of the current RDS-1 priority projects; and
- longer term projects linked to growth in railway ridership within the SAR, within the sub-region and across the SAR/Mainland China boundary.

4.4.2 The first phase of this process was the identification of the 'initial comprehensive network'. This comprised a network of future schemes, which was derived through adding conceptual railways to the existing and committed network. These conceptual railways included a number of the lower priority schemes carried forward from RDS-1 as well as entirely new railway lines, which were identified on the basis of the population projections up to the year 2016.

4.4.3 As well as identifying possible new lines for domestic passenger services, the identification of potential future rail lines also included Inter-City and freight service routes, although, in most cases, it was assumed that such services would share routes with those for domestic passenger services.

4.4.4 The key features of the initial comprehensive network included four broad corridors containing several alternative alignments. However, it was generally expected that where the demands in a given corridor were sufficient to warrant consideration of a railway line, only one of the alternatives through the corridor would be considered. The four broad corridors comprise:

North-East New Territories (NENT) to Kowloon

- north of Tai Wai, two possible higher speed 'relief' alignments to the existing East Rail, two alignments through new development areas in Tolo Harbour and Plover Cove;
- south of Tai Wai, one route connecting to Diamond Hill, and several alternative alignments, and interchange alternatives, connecting to the western corridor at Mei Foo or Yen Chow Street; and
- a new rail corridor to Sha Tau Kok.

North-West New Territories (NWNT) to Lantau, Kowloon and Hong Kong

- new links between the urban areas and Lantau, provided either via the Green Island Link or via an additional link between Tsing Yi and Lantau;

- between Lantau and the NWNT, three alternative corridors connecting to key centres in the NWNT, plus an extension from Tung Chung through the airport to Tuen Mun and possibly beyond; and
- between the urban area and NWNT, through extensions of existing MTR lines from Tsuen Wan or Tsing Yi.

North-East New Territories to North-West New Territories

- a northern corridor featuring three alternative alignments linking Kam Tim with Lok Ma Chau and Sheung Shui; and
- a southern corridor through the Lam Tsuen Valley linking Kam Tin and Tai Po.

Urban

- in Kowloon, the inclusion of long-standing proposals for an East Kowloon Line; extension of the committed West Rail to West Kowloon; and completion of the southern loop linking East Rail to West Rail;
- new east-west alignments serving urban Kowloon, the SE Kowloon Reclamation, and Kwun Tong; and
- various options for a Fourth Harbour Crossing, including crossing from Hung Hom, Yau Ma Tei and West Kowloon to the North Shore of Hong Kong Island; on Hong Kong Island, the inclusion of long standing proposals for a North Island Line, and an extension of the present Island Line westwards to Green Island, together with various proposals for links to South Hong Kong Island.

4.4.5 The key features of the initial comprehensive network are shown in Figure 4.2, while Figure 4.3 shows the rail corridors outlined above.

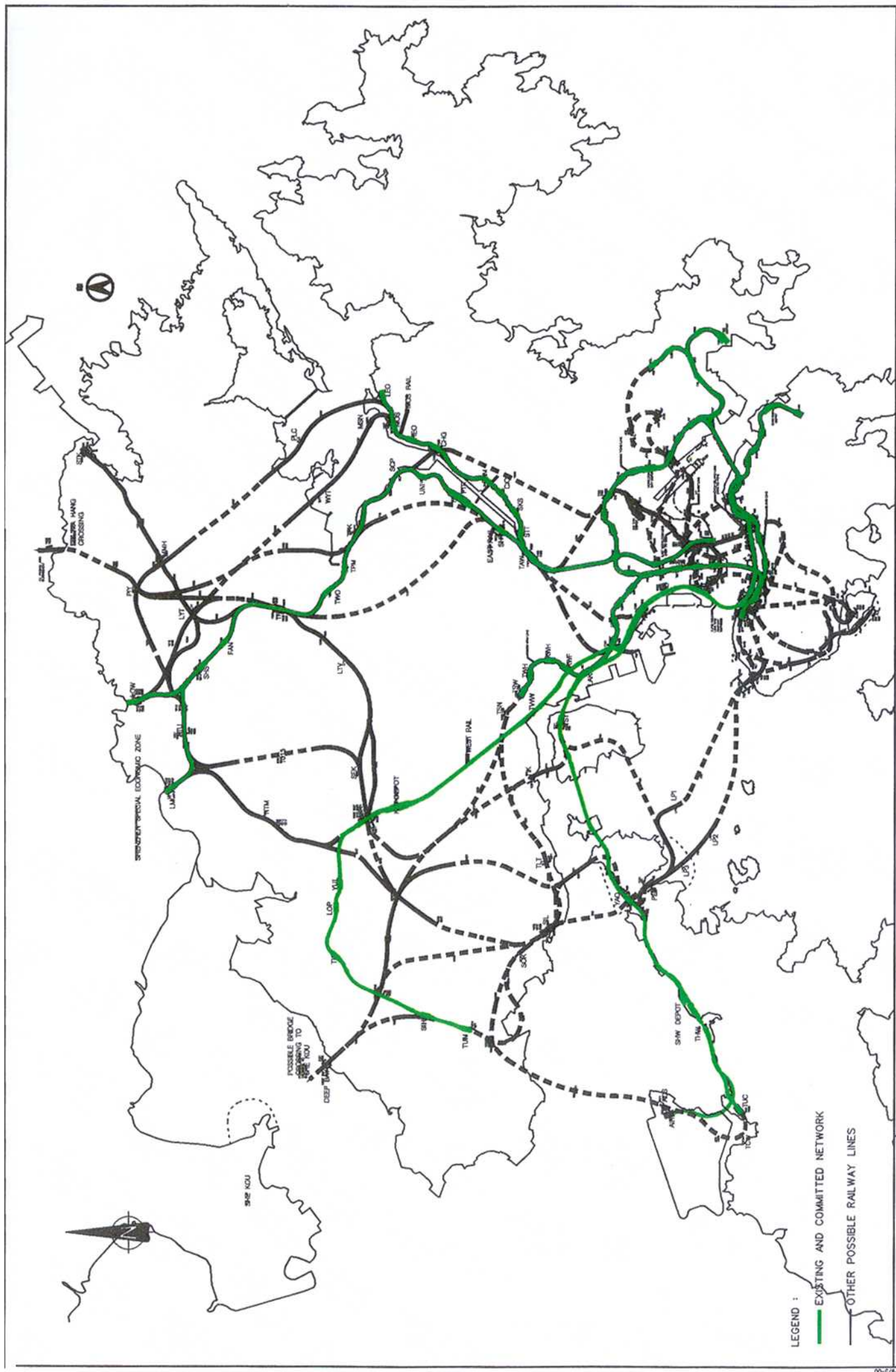
4.5 Patronage Forecasting

4.5.1 The NDS Study employed three time-periods as a basis for assessment; these are from the present date to 2006, to 2011 and to 2016. The year 2006 is assumed as the base date, 2016 the end date of the study and 2011 an intermediate date.

4.5.2 As a 'base-case', the 2006 existing and committed network was tested at each of the above time periods to ascertain where improvements to the system may be required and to assist in the financial and economic evaluations of the domestic options. The broad results of this testing are summarised below:

4.5.3 In 2006, the currently committed rail schemes are programmed to be completed. Between 1996 and 2006, rail⁽¹⁾ ridership demand (daily trips) are forecast to increase from 3.1 million to 5.1 million; this corresponds to an increase in rail's share of the total public transport trips from 31% to 39% over the same period. Predictions for 2006 have demonstrated that the most urgent need in terms of network development is relief for the Tsuen Wan Line in the Nathan Road Corridor, for East Rail between Tai Wai and Kowloon Tong, and additional capacity along the north shore of Hong Kong Island.

⁽¹⁾ In this context defined as MTRC and KCRC heavy rail (i.e. excluding LRT).

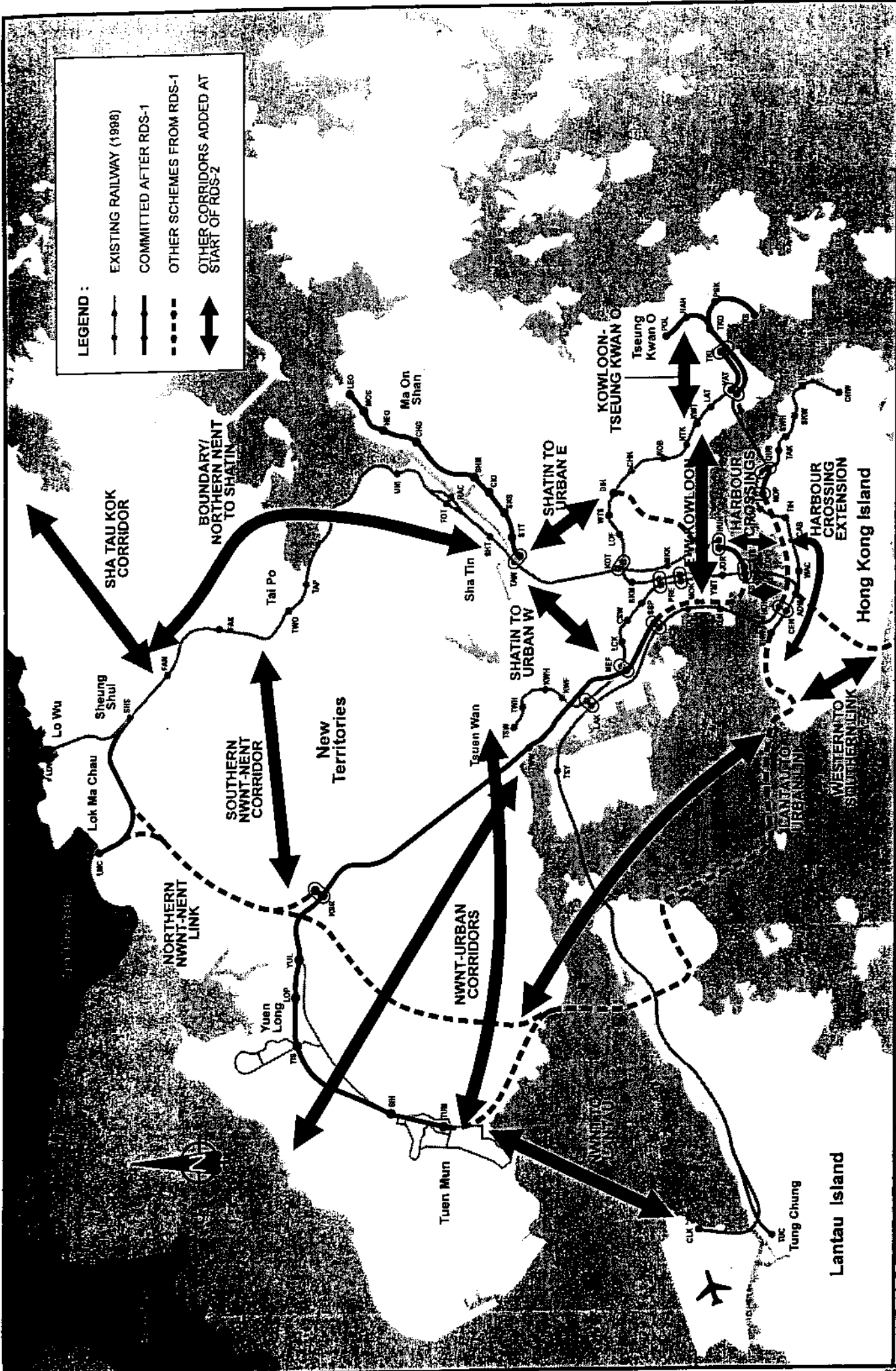


LEGEND :

- EXISTING AND COMMITTED NETWORK
- - - - - OTHER POSSIBLE RAILWAY LINES

THE SECOND RAILWAY DEVELOPMENT STUDY
INITIAL COMPREHENSIVE NETWORK

		Highways Department	
		Railway Development Office	
SCALE	N.T.S.	DWG NO.	CTR-1
DESIGNED	CFA	DATE	MAY 00
DRAWN	YTC	PROJECT NO.	4.2
		REV	



LEGEND :

- EXISTING RAILWAY (1988)
- COMMITTED AFTER RDS-1
- - - OTHER SCHEMES FROM RDS-1
- ⇄ OTHER CORRIDORS ADDED AT START OF RDS-2

MVA		Highways Department Railway Development Office	
SCALE	DESIGNED	DRAWN	DATE
	CPA	LLH	MAY 00
			REP
			4.3

THE SECOND RAILWAY DEVELOPMENT STUDY

DEVELOPMENT OF INITIAL COMPREHENSIVE NETWORK

MVA Maunsell
MVA ASIA LIMITED

- 4.5.4 Without any further network expansion rail trips demand is predicted to increase from 5.1 million in 2006 to 5.7 million in 2011. Rail's share of the total public transport trips is predicted to remain the same level between 2006 and 2011. The forecasts for this period highlight the need for a Fourth Harbour Crossing (FHC) and a new North Island Line (NIL) and Second Shatin to Kowloon Link to cater for the demand and to enable rail to retain and increase its share of public transport trips.
- 4.5.5 By 2016, rail trips demand is forecast to increase to 6.2 million. This correlates to a slight decrease (to 38%) in rail's share of the total public transport trips. This is partly due to the projected increased populations in 2016 in new areas, many of which are not served by the existing or committed rail network.
- 4.5.6 In the base-case scenario where the background population increases but there is no expansion of the rail system, the proportion of the network operating close to, or above, capacity increases.
- 4.6 Scope of Stage 1 Assessments**
- 4.6.1 During Stage 1 of the Study, a transport assessment was undertaken to determine the levels of demand and the overall transport performance of a possible "initial comprehensive network". This assessment comprised model runs that provided a "snapshot" for the year 2016 under a range of possible planning scenarios.
- 4.6.2 The other key assumptions used during this initial testing of the network performance were:
- a highway network programme based on Government plans available at the time, (covering only the period up to 2011 as the highway network beyond this was under study by CTS-3);
 - a "bullish" economic growth rate made prior to the economic downturn;
 - a range of car fleet sizes between 618,000 and 942,000 by 2016;
 - full port development; and
 - integrated rail fares to avoid the forecasts being influenced by whether new schemes are operated by KCRC or MTRC.
- 4.6.3 It can now be seen that these initial assumptions were optimistic. However, as the main purpose of the analysis of the "initial comprehensive network" was to examine which schemes were likely to be worthy of further examination, it is not considered that these assumptions significantly altered the findings since, schemes attracting low or modest patronage under the assumed scenarios would generally be expected to have an even poorer performance if tested under the subsequent set of assumptions used in the RDS-2 Study.
- 4.6.4 In addition to the transport assessment, 'non-transport' issues associated with the schemes were also examined. These included the following:
- Planning: including an assessment of compatibility with strategic planning objectives; consistency with local planning intentions; development potential at stations; and land use impacts.

- **Property:** a broad assessment of potential market-driven opportunities in the light of physical and technical constraints around proposed stations.
- **Environment:** a screening of the network against identified strategic environmental constraints, i.e. those which Government has defined as having strategic value through statutory or procedural protection (discussed further in Sections 4.7 and 4.8).
- **Engineering:** an overview of the "buildability" of each route option, by identifying geological and alignment requirements together with associated reclamation and associated infrastructure, where appropriate.

4.6.5 The application of the strategic environmental assessment component of the Study to Stage 1 is discussed in Sections 4.7 and 4.8, and the key findings from the main study's corridor assessment work is presented in Section 4.9.

4.7 Absolute Environmental Constraints

Overview

4.7.1 One of the objectives of the SEA was to identify the presence of environmental constraints such that these could be considered in the formulation and development of the various rail development options, and, through the application of strategic impact assessment, these resources could be avoided. This 'conflict avoidance' approach aimed to avoid the more traditional reliance on the identification of conflicts (during for example the EIA Stage), and the subsequent specification of mitigation measures. To ensure that this process was effective, it was necessary to identify any conflicts at the earliest possible stage of the development process.

4.7.2 To this end, the Initial Evaluation Report (IER) of the SEA compared the proposed initial comprehensive network against the environmental resources protected by statute which were considered as "absolute constraints" for the proposed new railway developments.

4.7.3 The SEA Team reviewed current Hong Kong environmental legislation to determine the range of requirements with which new railways will need to comply. A key piece of legislation in this review was the Environmental Impact Assessment Ordinance (EIAO) and the associated Technical Memorandum (TM) which outline the range of issues to be addressed in the assessment of environmental impacts arising from new developments. The range of issues to be addressed within a project EIA are as follows:

- Air Quality;
- Hazard to Life;
- Noise Impact;
- Water Pollution;
- Waste Management Implications;
- Ecological Impact;
- Fisheries Impact;
- Landscape and Visual Impact;
- Impact on Sites of Cultural Heritage; and
- Contaminated Land Issues.

- 4.7.4 Clearly, the SEA must seek to identify and avoid potential unacceptable impacts as defined within the Technical Memorandum to the extent possible given the level of detail at which the assessment has been undertaken. However, the measures that a proponent may adopt, during the planning and design stages of a new railway, to meet the requirements of the Ordinance and other relevant legislation may not be predetermined nor prescribed by the SEA as such mitigation measures will be developed on the basis of more detailed engineering and environmental baseline information and will be informed by Corporate decisions on operational, financial and programme considerations.
- 4.7.5 For example, the Noise Control Ordinance requires new railways to achieve a defined acoustic performance; for the purposes of the SEA it is assumed that the detailed, project-specific planning and design of a new railway will achieve the necessary performance through the determination of a range of route alignment, rolling stock, operational, timetabling, trackform and shield attenuation variables. Therefore, at a strategic level, the SEA Study has not considered the direct noise impacts of new railway developments.
- 4.7.6 Each of the key EIAO impact categories was reviewed and the basis for the strategic assessment was determined. In determining the level at which particular issues should be assessed, the following issues were considered:
- the existing statutory requirements for assessing, controlling or mitigating environmental impacts;
 - the extent to which strategic intervention in the development of new railways can be justified over the defined requirements of existing legislation;
 - the existing strategic value that is assigned to environmental resources;
 - the utility of appropriate environmental effects (both positive and negative) as strategic assessment indicators; and
 - the critical strategic issues that have arisen during the EIA's of recent railway developments in Hong Kong.
- 4.7.7 In applying these considerations to the range of environmental issues associated with a new railway development option, the SEA Study Team understand that there is a need to look beyond traditional assessment procedures to encompass methodologies that may lead to the identification of strategic environmental benefits (and disbenefits) of new railway developments, which have previously not been considered within the narrow confines of the project EIA process.

Strategic Consideration of Environmental Issues

- 4.7.8 Whilst the EIA Ordinance and its associated Technical Memorandum contain details of the issues that are to be considered during the assessment of environmental impacts from new developments, it was necessary to determine the means by which such issues may be given strategic consideration during the identification, evaluation and determination of new railway developments.

- 4.7.9 In the sub-sections that follow, the findings of the review into the means by which the environmental issues associated with the EIA Ordinance have been given strategic consideration are briefly presented.

Air Quality

- 4.7.10 The localised implications of construction activities on air quality are controlled through the statutory provisions of the Air Pollution Control Ordinance (APCO) and the predictive process required by the EIAO. It was not, therefore, considered appropriate to include construction air quality impacts in the strategic evaluation of alternative rail development scenarios and alignment options.
- 4.7.11 Similarly, it was not considered appropriate to evaluate the strategic implications of direct operational air quality impacts as these are considered negligible and are well within the statutory requirements of the APCO.
- 4.7.12 The strategic evaluation of power sector emissions associated with the provision of electricity to new railway developments is discussed later with reference to greenhouse gas emissions.

Hazard to Life

- 4.7.13 The assessment of hazardous installations and facilities is a clearly defined activity undertaken as part of the route selection and the associated project EIA stage.
- 4.7.14 It was also recognised that the development of areas adjacent to hazardous facilities posed a potential risk to residents and passengers alike and therefore, Hazard to Life was addressed within the SEA through the application of the following principles:
- i. Above-ground stations, ventilation intakes for below-ground sections and any station-related commercial or residential development should, as far as reasonably practicable, avoid the Consultation Zone of PHIs. This advice also applies to the track alignment itself, however past studies have shown that this is less critical from a risk perspective and therefore some relaxation may be acceptable. In addition to the PHIs, this guidance should also be applied to the area within approximately 1 km of the Government Kowloon Bay Dock which is used for the unloading of chlorine containers.
 - ii. Above-ground stations, ventilation intakes for below ground stations and any station-related commercial or residential development should not be located in the vicinity of major DG transport routes as far as reasonably practicable. This includes routes such as Tsing Yi Road, Lung Cheung Road, Wai Yip Street, Ching Cheung Road, Tsuen Wan Road, Castle Peak Road, Tuen Mun Road, Tai Po Road and Tolo Highway. To provide guidance on the minimum safe separation distance, the aforementioned developments should not be located within approximately 250 metres of major chlorine transport routes and, preferably, beyond 500 metres (chlorine represents the worst case of the various DGs which are transported along these roads). The separation distances quoted are based on the approximate extent of the 10^{-6} and 10^{-7} per year individual risk contours for the routes of most concern.

- iii. Aboveground sections of railway and any station-related commercial or residential development should not be placed within approximately 60 metres of the Towngas high pressure transmission network (based on the hazard range for the worst case release, after consideration of individual risk levels).

Noise Impact

- 4.7.15 At a strategic level the noise implications of new railways are not considered significant. This is because the Noise Control Ordinance requires new railways to achieve a defined acoustic performance through the use of direct (at source) noise mitigation measures such as route alignment, rolling stock specification, timetabling, trackform and use of noise barriers/enclosures etc. Before an Environmental Permit can be issued, a new railway will have to demonstrate, as part of an EIA submission, that adequate measures have been developed to meet the required noise specification. For the purposes of the SEA it has been assumed that the detailed, project-specific planning and design of a new railway will achieve the necessary performance through the determination of a range of appropriate measures. Therefore, at a strategic level, the SEA Study has not considered the direct noise impacts of new railway developments.

Water Pollution

- 4.7.16 Water quality issues associated with the development of new railways are typically relatively localised and not considered to be of strategic environmental importance.
- 4.7.17 Although some of the railway development options involved reclamation or marine crossings, it was known that reclamations were not favoured, and experience in immersed tube implementation in Hong Kong, had not led to severe impacts. Reclamation and immersed tube implementation are also commonly the focus of environmental studies which involved these options and is subject to rigorous study and modelling at these stages.
- 4.7.18 It was therefore considered that potential water quality impacts are not of strategic importance in the context of the RDS-2 Study.

Waste Management

- 4.7.19 The waste management implications of new railways were not considered to be of strategic importance and were therefore not considered in the RDS-2 study.

Ecology

- 4.7.20 The SEA Study Team determined that absolute constraints will apply to the development of new railway infrastructure within areas which are statutorily protected for ecological reasons. As part of the preparation of the Environmental Baseline Paper, baseline information on ecological resources was gathered and collated for indicative alignment comparison purposes and reference during the future rail development process.

Fisheries

- 4.7.21 The SEA Study Team determined that absolute constraint on the development of new railway infrastructure will apply within areas that are statutorily protected (i.e. Fish Culture Zones).

Landscape and Visual Impacts

- 4.7.22 Unlike other disciplines examined, definitive areas of high landscape and visual value are not statutorily designated in Hong Kong, although the requirement for landscape and visual assessment and guidelines for an appropriate methodology and criteria for assessment are provided in the EIAOTM. Whilst there is currently no system specifically for the protection of areas of landscape importance, sites designated for other reasons (e.g. Conservation Zones; including SSSIs, Country Parks, Green Belts, Coastal Protection Areas and Conservation Areas) may be considered to indirectly extend protection to area of landscape value. However, such designations are not made solely on the grounds of landscape value, and they do not, therefore, provide a coherent framework for the protection of such resources.
- 4.7.23 The sensitivity of particular landscape elements is based upon the existing character of the area and its ability to accommodate change as assessed by objective professional judgement. The nature of the development and sensitivity of the receptors are also crucial factors. Due to the built-up nature of Hong Kong's urban areas, the public are often considered to be 'de-sensitised' to visual impacts. However, it is imperative that visual impacts are properly addressed to avoid unreasonable impacts. Construction impacts are inevitable, although relatively short lived, and in the most part, operational stage impacts can, with sensitive planning and design, be successfully mitigated by applying specific landscape treatments to mask discrete impacts.
- 4.7.24 As landscape and visual assessments are a statutory requirement of the project EIA and the value of specific landscape resources is not overtly recognised through statutory means in Hong Kong, landscape and visual impacts were not considered in the Study as absolute constraints since they were not afforded strategic importance. However, during the preparation of the Environmental Baseline Paper, baseline information on landscape and visual resources was gathered and collated for indicative alignment comparison purposes and reference during the future rail development process.

Heritage and Cultural Issues

- 4.7.25 The SEA applied an absolute constraint on the development of new railway infrastructure in the vicinity of heritage resources that are statutorily protected.

Contaminated Land

- 4.7.26 Land contamination is an issue that is now regulated in Hong Kong under the EIA Ordinance and related guidelines. Potential land contamination impacts can be the result of a range of historical site activities involving a number of activities and potentially contaminating substances. The potential impacts from these operations are generally localised and should therefore be reviewed in relation to the evaluation of the proposed alignment options.

- 4.7.27 Land contamination impacts from the operation of a railway were generally considered negligible as long as good management practice are followed. Therefore, land contamination impacts were not considered to be of strategic importance and were therefore not considered in the RDS-2 study.

Greenhouse Gases

- 4.7.28 The dominant air pollutants emitted by road transport in Hong Kong are generally NO_x and RSP. However, CO₂ is probably the most dominant of all power generation emissions. Since CO₂ is classified as an official greenhouse gas, an assessment of greenhouse gas emissions from power generation in relation to rail operations was considered an important area of study that would provide insight into rail-related air pollutant emissions. Such information has not, to date, been included in policy decision-making on transportation infrastructure.
- 4.7.29 As it was envisioned that the differences in CO₂ emissions between the various rail options would be very little (since the Study's emphasis is more on the spatial distribution of the rail network rather than the number of stations or the amount of electricity consumed), it was therefore resolved to focus the assessment upon the quantification of the CO₂ emissions for future projected years, rather than to compare of the different rail network options.
- 4.7.30 A methodology for the evaluation of the road-rail modal shift implications of CO₂ emissions was therefore developed, with the intention that the findings would assist in the environmental justification of new rail development over road-based transportation options.

Summary Environmental Constraints

- 4.7.31 In order to ensure that the identified environmental constraints are avoided, it was necessary to constantly review the options and proposals as they were developed to ensure that any potential conflicts were identified and addressed at the earliest opportunity.
- 4.7.32 However, since the significance of each of the identified environmental issues to the development of new railways varies, it was resolved that specific environmental issues should be assigned and considered at specific stages of the strategic development process.
- 4.7.33 The absolute environmental constraints that were required to be considered at the earliest stage, Corridor Evaluation, were those identified as being statutorily protected. These comprised statutorily protected ecological resources and fisheries (i.e. Fish Culture Zones). More precisely, the absolute constraints comprised:
- existing and potential Country Parks and Special Areas;
 - existing and potential Marine Parks and Marine Reserves;
 - Fish Culture Zones;
 - RAMSAR sites;
 - Sites of Special Scientific Interest (SSSI's), and
 - Sites of Cultural Heritage (Declared Monuments).

4.7.34 In addition to the absolute environmental constraints, other environmental issues were identified as requiring consideration during subsequent stages of the strategic development process.

4.8 Results of the Environmental Screening of the Network

4.8.1 As stated in the preceding section, the avoidance of environmental resources at the early stages of the SEA provided a means by which the new railway proposals could be initially justified in an environmental sense, although they would be subject to further, more detailed investigation as the Study progressed and prior to Government permitting through the application of project-specific EIA.

4.8.2 Following the identification of the initial comprehensive network, the broad corridors that were identified through this process were evaluated with regard to the absolute strategic environmental constraints. The aim of this assessment was not to provide a comprehensive evaluation of each of the schemes, but to identify any 'fatal flaws' that may exist in some of the schemes.

4.8.3 As identified in Section 4.4, the initial comprehensive network comprised four broad geographical corridors which comprised the following:

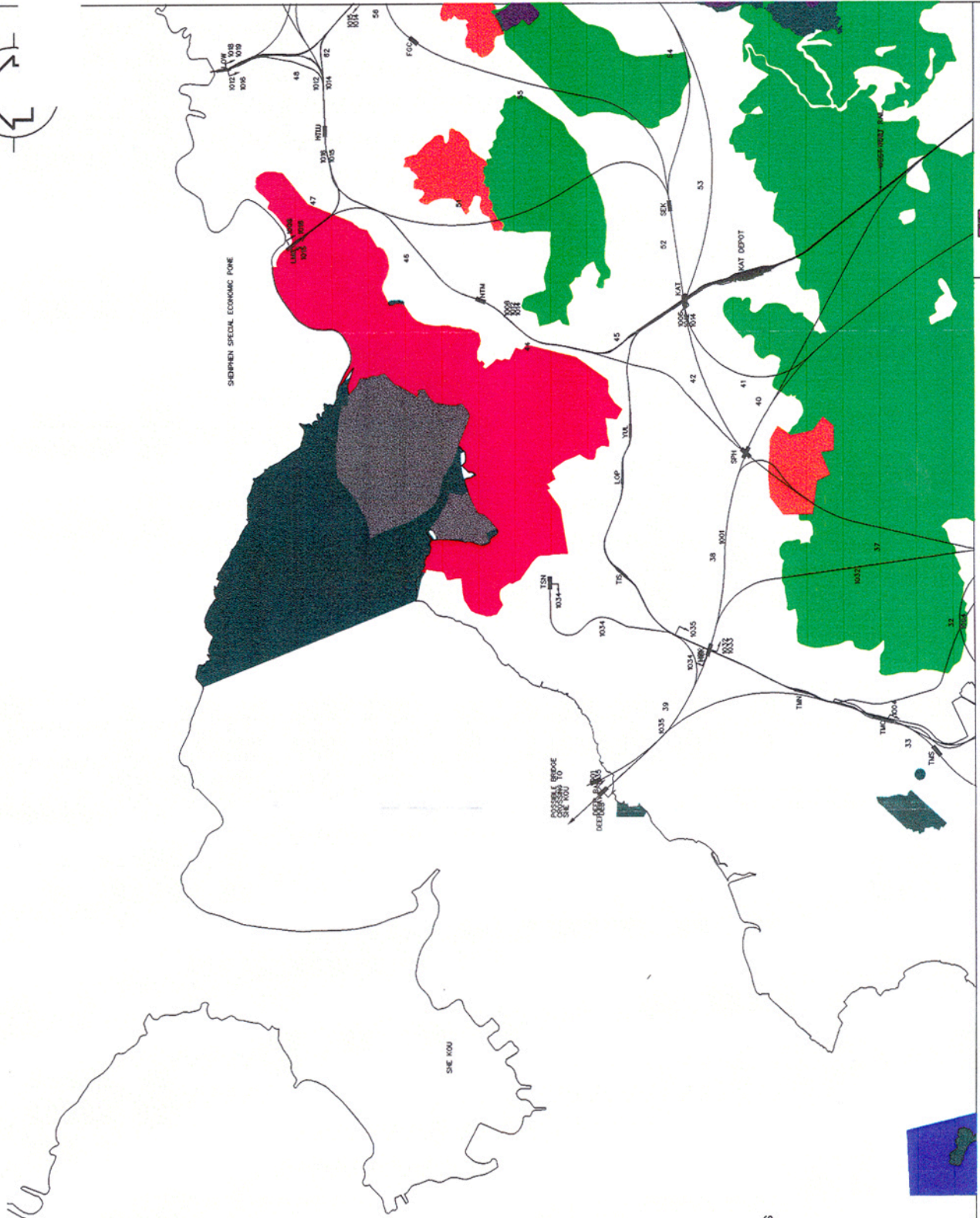
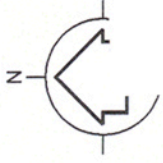
- North-East New Territories (NENT) to Kowloon;
- North-West New Territories (NWNT) to Lantau, Kowloon and Hong Kong Island;
- North-West New Territories to the North-East New Territories; and
- Urban.



4.8.4 These geographical corridors only represented broad boundaries within which more detailed rail alignments would be developed should the corridor be retained for future study.

4.8.5 The environmental evaluation of the schemes focussed on the identification of key conflicts with the strategic resources identified in Section 4.7, these being those resources or areas which the Government had identified as having strategic value. Strategic value being defined as the level of protection Government had sought to apply to each resource as a means of conservation.

4.8.6 The baseline information regarding these absolute constraints were mapped and are presented in Figures 4.4, 4.5 and 4.6 (and for the Declared Monuments, in Figures D1 to D4 of Annex D). The constraints map provided a means of "sieving" the potential schemes to identify key environmental issues of conflict.


4.8.7 In addition, potential environmental concerns were also noted during the corridor assessment, although these were identified as issues to be addressed at the route alignment assessment stage. Other potential concerns included reclamation proposals, agricultural and rehabilitations areas and other administratively managed ecological resources.



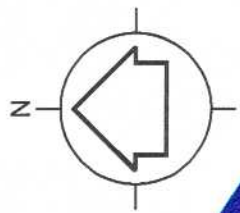
-  FISH CULTURE ZONES
-  WETLAND CONSERVATION AREA
-  WETLAND BUFFER AREA
-  Existing Country Parks
-  Potential Sites for Country Parks
-  Restricted Areas
-  Special Areas
-  SSSIs
-  Designated Marine Parks & Reserves

THE SECOND RAILWAY DEVELOPMENT STUDY

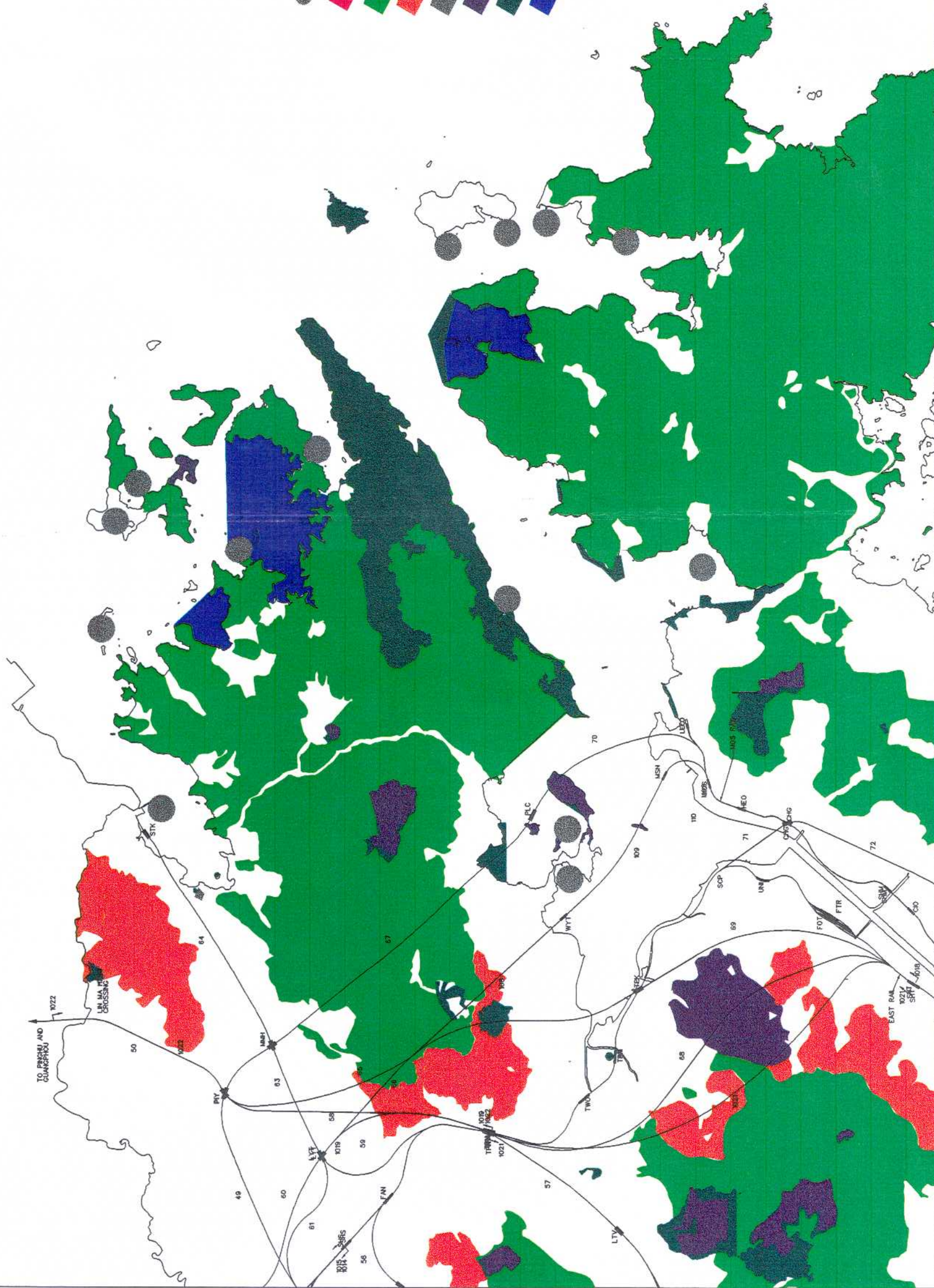
ABSOLUTE ENVIRONMENTAL CONSTRAINTS

 **Highways Department**
Railway Development Office

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- FISH CULTURE ZONES**
- WETLAND BUFFER AREA
 - Existing Country Parks
 - Potential Sites for Country Parks
 - Restricted Areas
 - Special Areas
 - SSSIs
 - Designated Marine Parks & Reserves



THE SECOND RAILWAY DEVELOPMENT STUDY

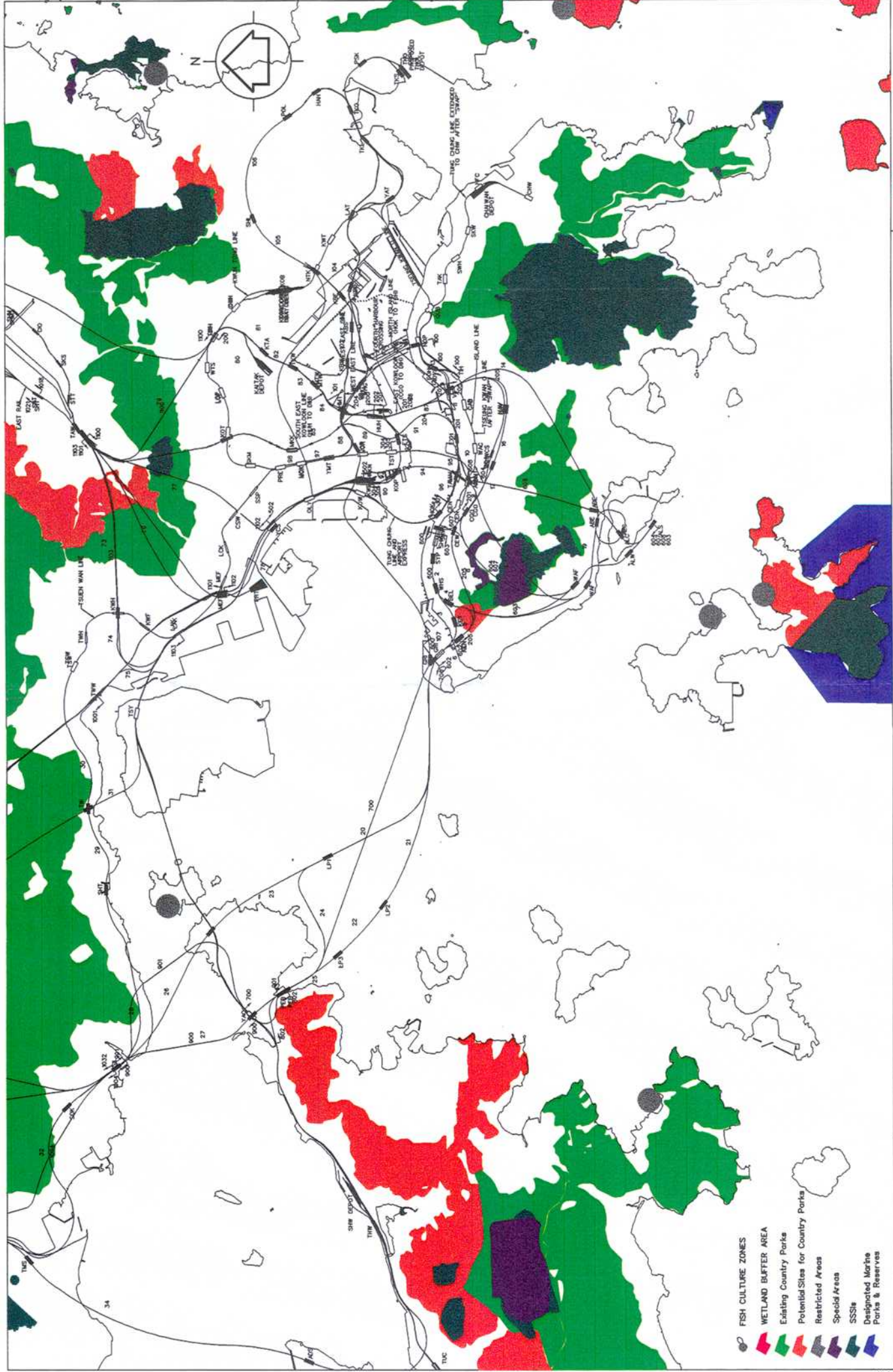
ABSOLUTE ENVIRONMENTAL CONSTRAINTS



MVA ASIA LIMITED

Highways Department
Railway Development Office

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- FISH CULTURE ZONES
- WETLAND BUFFER AREA
- Existing Country Parks
- Potential Sites for Country Parks
- Restricted Areas
- Special Areas
- SSSIs
- Designated Marine Parks & Reserves

THE SECOND RAILWAY DEVELOPMENT STUDY
 ABSOLUTE ENVIRONMENTAL CONSTRAINTS

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- 4.8.8 Each scheme in the initial comprehensive network was evaluated for conflicts with the mapped environmental constraints, and any schemes that were seen as having fatal flaws in relation to their conflicts with the strategic environmental resources were rejected. All other schemes were retained for further development and environmental evaluation.
- 4.8.9 A full analysis of this 'sieving process' was presented in the SEA Initial Evaluation Report (IER). Whilst it is not the intention of this report to reproduce all the findings of the IER, the key findings are presented below.

Schemes with 'Fatal Flaws'

- 4.8.10 Within the North-East New Territories to Kowloon Corridor, and in particular the 'Northern to Shatin' corridor, the following schemes were identified as having fatal flaws and were therefore rejected.

Lung Yeuk Tau (LYT) to Ma On Shan (MOS)

- 4.8.11 This corridor was proposed to pass in tunnel under the proposed extension to the Pat Sing Leng Country Park to Wong Yue Tan (WYT).
- 4.8.12 The Yim Tin Tsai headland is a SSSI which is also an active egretty. The Yim Tin Tsai and Yim Tin Tsai (East) Fish Culture Zones are located on either side of the Yim Tin Tsai headland. East of Yim Tin Tsai headland is the Yim Tin Tsai and Ma Shi Chau SSSI. The Tolo Channel (Northern Coast) SSSI is also located to the south of the Yim Tin Tsai headland.
- 4.8.13 WYT and Ma On Shan North (MSN) stations were to be located on new reclamation. Reclamation at WYT may have affected the feeding egrets of Shuen Wan and Sam Mun Tsai Egrettries (both SSSIs).
- 4.8.14 As this broad corridor did not meet the acceptance criteria established for the strategic environmental evaluation of potential corridors it was rejected.

Kwu Tung (KTU) to MOS

- 4.8.15 The corridor from Kwu Tung (KTU) was proposed to pass through the Ping Yeung agricultural area to Ping Yeung (PIY) and then proceed in tunnel under the Pat Sing Leng Country Park to Plover Cover (PLC). There was also a possibility that MMH station may lie within the Ma Mei Ha Agricultural area. PLC station was to be located on reclamation. The reclamation at PLC may impact the feeding egrettries of Shuen Wan and Sam Mun Tsai.
- 4.8.16 The Yim Tin Tsai headland is a SSSI which is also an active egretty. The Yim Tin Tsai (East) Fish Culture Zone may have been affected by the proposed corridor. East of Yim Tin Tsai headland is the Yim Tin Tsai and Ma Shi Chau SSSI. The Ting Kok Mangrove SSSI may also have be affected.
- 4.8.17 As this broad corridor did not meet the acceptance criteria established for the strategic environmental evaluation of potential corridors it was rejected.

- 4.8.18 Within the 'Northern Internal' corridor of the North-East New Territories to Kowloon broad geographical Corridor, the following schemes were identified as having fatal flaws and were therefore rejected.

KTU to Sha Tau Kok (STK)

- 4.8.19 Ma Mei Ha (MMH) station was proposed to potentially lie within the Ma Mei Ha Agricultural area. Leaving MMH station, the corridor was proposed to bisect the Ma Mei Ha Agricultural area. There may have also been impacts to the Yim Tso Ha Egretty and the A Chau SSSIs, the mangrove stand near Yim Tso Ha Egretty and to the Sha Tau Kok fish culture zone.
- 4.8.20 As this broad corridor did not meet the acceptance criteria established for the strategic environmental evaluation of potential corridors it was rejected.

STK to TPN

- 4.8.21 MMH station was proposed to potentially lie within the Ma Mei Ha Agricultural area. Leaving MMH station, the corridor was proposed to bisect the Ma Mei Ha Agricultural area. There may have also been impacts to the Yim Tso Ha Egretty and the A Chau SSSIs, the mangrove stand near Yim Tso Ha Egretty and to the Sha Tau Kok fish culture zone.
- 4.8.22 As this broad corridor did not meet the acceptance criteria established for the strategic environmental evaluation of potential corridors it was rejected.

Summary

- 4.8.23 The findings of the initial environmental corridor screening process resulted in the rejection of the four schemes detailed above. The rejected schemes comprised those in NENT across Tolo Harbour and Plover Cove, and the proposed Sha Tau Kok railway corridor. All other schemes were retained for further study, including a fuller assessment of environmental issues as well as further investigation of those issues which have been identified as a result of the screening exercise.

4.9 Key Findings of Corridor Assessment

- 4.9.1 As outlined in Section 4.6, in addition to the environmental component, the Stage 1 corridor assessment process also included a transport assessment of the corridors, and consideration of the issues associated with planning, property and engineering feasibility.
- 4.9.2 This section summaries, by corridor, the key findings of the corridor assessment stage for all of the disciplines under consideration.

Boundary to NENT and Kowloon

- 4.9.3 This corridor was split into three sub-corridors namely from the boundary/northern NENT to Shatin; from Shatin to the urban area; and a new rail corridor to Sha Tau Kok.

- 4.9.4 The links from the boundary/northern NENT and Shatin were conceived as forming a bypass line for East Rail which could be used for Cross Boundary and domestic services. Four initial alignments were identified, two linking to Ma On Shan and requiring partial reclamation of Tolo Harbour with the others following an inland alignment and intersecting with the existing East Rail in the Tai Po area. Closer to the boundary alignment options to access Lo Wu and a new crossing at Pinghu were identified.
- 4.9.5 The corridor assessment concluded that the Tolo Harbour alignments should be rejected on environmental and planning grounds, with the inward alignments being retained along with the various options to access the boundary. The initial traffic forecasts indicated that such lines would be longer term and be dependent on further development in the NENT and Cross Boundary, as East Rail could cope with the projected demands even under the highest planning scenario.
- 4.9.6 Between Shatin and the urban area the links considered were to the eastern side of Kowloon (i.e. the long-standing scheme from Tai Wai to Diamond Hill, and a direct link from Chevalier Garden on MOSL to Diamond Hill); and to the west side of Kowloon, possibly in association with a Port Rail Line (PRL) to Kwai Chung. As all routes were underground, the environmental/planning impacts were considered minimal. All routes were retained for further study, although the link from Chevalier Garden became largely redundant as this would have formed a continuation of the dropped Tolo Harbour routes further north.
- 4.9.7 Within the NENT, rail alignments were identified in the Sha Tau Kok corridor, with possible connections to East Rail, the proposed NENT to Shatin lines, and across to Kwu Tung. However, these links were rejected at the corridor assessment stage as it was considered undesirable to develop the corridor due to its high landscape value, and that development of the area was not part of strategic planning objectives.

NWNT to Lantau and Urban

- 4.9.8 This comprised corridors between NWNT, Lantau and the Urban area. All were corridors which would provide a second railway to the NWNT after West Rail, and alternative Cross Boundary routes.
- 4.9.9 Between NWNT and Lantau the alignments considered included the long-standing Outer Western Corridor (OWC) scheme linking either Tuen Mun or routes via Shep Pat Heung to a crossing linking to Lantau in the Yam O area. Also a link from Tuen Mun to Chek Lap Kok was considered. All links offered the potential to increase accessibility to the NWNT and to open up new areas for development, as well as possibly a new boundary crossing via Deep Bay and the Shenzhen Western Corridor. The initial traffic forecasts suggested that even under the highest demand scenario, possible lines between NWNT and Lantau would attract only modest patronage, though the indications were that West Rail may ultimately require relief if fares were similar to those charged on the MTR system or bus competition in the corridor was limited.

- 4.9.10 Other alignments were studied linking these same areas in the NWNT with the existing urban area MTR lines at Tsuen Wan or Tsing Yi. Even under the highest planning scenarios such lines were only seen as being likely to attract modest patronage, particularly the alignments along the coastal corridor from Tuen Mun as this is a physically constrained area for potential development. For this reason, and the high cost of such a route, this alignment was rejected from further consideration. The northern alignments via Shep Pat Heung would depend on the development of an SGA there, which is not part of current plans. The alignments were not attractive on operational grounds as the extension of the existing MTR lines to serve the NWNT would feed more passengers into already heavily-used parts of the urban rail network and furthermore the number of stops would make the journeys uncompetitive with West Rail and express buses. Such extensions were therefore not carried forward for further consideration.
- 4.9.11 The main alignment considered between Lantau and urban area was the original RDS-1 OWC route via Penny's Bay and the then-proposed Lantau Port to Green Island. The initial tests on the OWC indicated that its development would be dependent on significant additional development in this part of Lantau, and also in the NWNT. However, these plans have since changed with the commitment to construct a theme park in this area of Lantau and the plans for the Green Island reclamation being in doubt.
- 4.9.12 Although the OWC corridor (both sections i.e. NWNT/Lantau and Lantau/Urban) remain open for further investigation, the initial forecasts confirmed that they would be highly development-dependent and as such would be unlikely to feature as priority schemes in RDS-2. Furthermore, the changes of development plan on north-shore Lantau means future studies of the alignment could be further west, and possibly incorporate the Tuen Mun to Chek Lap Kok link.

NWNT to NENT

- 4.9.13 The alignments considered in this corridor were the Northern Links between Kam Tin and Lok Ma Chau/Sheung Shui, as studied by RDS-1, together with variants in this corridor and examination of a corridor further south linking Kam Tin to the Tai Po area via the Lam Tsuen Valley.
- 4.9.14 Initial tests showed that even under the highest development scenario, there would be insufficient demand to support two east-west lines linking the NWNT and NENT. Furthermore, the commitment to construct the Lok Ma Chau Spur Line and the proposed development of SGAs in the Northern New Territories favoured the Northern Links as the preferred east-west line. The Northern Links complements the Spur Line by completing the east-west line between Kam Tin and Sheung Shui (of which the Spur Line already forms the first part), feeding Cross Boundary passengers from the Western New Territories to the second boundary rail crossing at Lok Ma Chau and in this way helping to relieve the pressure at Lo Wu.

- 4.9.15 The Northern Links also complements the now approved SGA at Kwu Tung and the proposed SGAs at San Tin, Ngau Tam Mei and Au Tau, all of which lie on the alignment of, and can be served by stations the Northern Links. The Northern Links will support the development of these SGAs by providing direct access to the HKSAR rail network and will in turn derive additional ridership and revenue from these areas which, together with the additional Cross Boundary patronage, will enhance the overall viability of the scheme.
- 4.9.16 There are no SGAs proposed along the alternative east-west alignments, apart from at Kam Tin itself which can be equally well served by the Northern Links.
- 4.9.17 For the above reasons the Northern Links was retained for further study as a potential scheme in the overall railway network and the alternative east-west alignments were discarded.

Kowloon

- 4.9.18 The links considered were the East Kowloon Line (EKL), East-West Lines across Kowloon, the extension of West Rail southwards to West Kowloon and the Kowloon Southern Loop (KSL) providing a link between East Rail and West Rail.
- 4.9.19 All except the East-West Kowloon lines have been carried forward as integral schemes for the network relief and development. The alignment of, and demand for an east-west urban link is entirely dependent on the outcome of additional study of South East Kowloon, though it may have a useful role in relieving existing lines serving East Kowloon and Tseung Kwan O. Nonetheless, initial tests indicated relatively low demand even under the original South East Kowloon development and reclamation proposals. The scheme was therefore retained as a longer-term possibility but is unlikely to be justified as a pure relief line and is dependent on the outcome of the ongoing South East Kowloon development study, extent of future reclamation of Kowloon Bay and future development plans.

Hong Kong Island

- 4.9.20 These focused on the alignments from RDS-1, namely North Island Line (NIL), West Island Line (WIL) and South Island Line (SIL). Other possible alignments serving the Western and Southern corridors, as well as means of linking them together, were also identified in the initial comprehensive network.
- 4.9.21 The initial tests confirmed the key role of the NIL in relieving the forecast pressure on congested parts of the existing rail network, whilst the WIL and particularly SIL schemes attracted modest demand. For WIL, the alternative alignments are the ISL extension or a FHC extension. Whilst patronage demands can only justify a single alignment, both have merits depending on the remainder of the core network, especially formation of FHC, so both options were retained.
- 4.9.22 For the SIL, initial tests indicated that links from or via Kennedy Town (possibly as an extension of the WIL) attracted very little patronage compared to links from Central and/or Causeway Bay. Therefore the Kennedy Town options were discarded.
- 4.9.23 Table 4.1 provides a summary of the Corridor Assessment findings for each of the corridors under consideration.

Table 4.1 Summary of Corridor Assessment

Main Corridor	Sub-Corridors/Alignments	Comments
Boundary to NENT and Kowloon	Boundary/Northern NENT to Shatin	<ul style="list-style-type: none"> Alignments via Tai Po retained as possible long term scheme. Schemes via Tolo Harbour rejected on environmental/planning grounds. Links from Tai Wai to E and W Kowloon retained as Component Scheme. Links from MOS to E Kowloon redundant. Rejected for environmental/planning reasons.
	Shatin to Urban	<ul style="list-style-type: none"> Coastal alignments rejected due to limited development potential and high costs. Other alignments connecting into existing urban lines rejected as these would overload.
NWNT to Lantau and Urban	Sha Tau Kok	<ul style="list-style-type: none"> OWC options retained as possible long term scheme but dependent on development and Cross Boundary demands.
	NWNT to Tsuen Wan/Tsing Yi	<ul style="list-style-type: none"> OWC corridor retained but ultimately depends on significant additional development on Lantau and in NWNT.
NWNT to NENT	NWNT to Lantau	<ul style="list-style-type: none"> Favoured alignment as SGA's served and links in with committed Lok Ma Chau spur line.
	Lantau to Urban	<ul style="list-style-type: none"> Rejected as demand insufficient to support 2 NENT-NWNT lines, particularly as southern alignments do not serve SGA's.
Kowloon	Northern Links	<ul style="list-style-type: none"> Retained as Component Scheme. Retained as Component Scheme.
	Southern alignments	<ul style="list-style-type: none"> Retained as possible long-term scheme, but dependent on development in SE Kowloon and other areas.
Hong Kong Island	EKL	<ul style="list-style-type: none"> Retained as Component scheme
	WR extension to WKN/Kowloon Southern Loop	<ul style="list-style-type: none"> Two possible alignments, but only one likely to be justified. Dependent on Green Island decisions.
Hong Kong Island	East-West Kowloon links	<ul style="list-style-type: none"> Longer term scheme with several possible alignments. Links between South Island and to Kennedy Town rejected.
	NIL	
	WIL	
	SIL	

4.10 Main Study Outputs from Stage 1

- 4.10.1 Due to the importance of the FHC in relieving the three existing cross harbour rail crossings after the opening of the committed rail schemes, its investigation was given separate consideration within a Topical Study which investigated the options available for this link in parallel with the Stage 1 corridor assessment work.
- 4.10.2 Many options for the FHC were considered including:
- extensions of the following lines across the harbour from Kowloon:
 - West Rail
 - East Rail
 - Kwun Tong Line
 - East Kowloon Line
 - with potential landfalls on Hong Kong Island at:
 - Tamar
 - Wanchai North
 - Victoria Park
- 4.10.3 The options were screened using a process very similar to that carried out under the corridor assessment work of the main study; this included an evaluation against the following criteria:
- engineering feasibility;
 - system usage and network performance;
 - planning and property;
 - environmental; and
 - economic and financial.
- 4.10.4 On the basis of this evaluation the extensions of West Rail and the Kwun Tong Line were rejected and the extensions of ER and EKL were retained for further study.
- 4.10.5 The main reasons for rejecting the West Rail extension were:
- The extension closely paralleled the TCL, leaving it significantly under-utilised and therefore providing little relief to the EHC.
 - Uncertainties related to the Kowloon Point Reclamation which could delay the implementation of this option.
 - The interchange with the ISL at ADM would be inconvenient.
 - Low passenger demand leading to poor economic and financial returns.

- 4.10.6 Extending the KTL across the harbour was rejected for the following reasons:
- Problems associated with constructing the alignment through the site of the Hong Kong Polytechnic University and the approaches to the Cross Harbour Tunnel.
 - Hung Hom station would have to be a three-way interchange between the KTL, ER and EKL and would be difficult to construct with sufficient capacity for the expected levels of demand.
 - The EKL would be left as a shuttle between DIH and HUH which would be unattractive to passengers therefore resulting in poor economic and financial returns.
- 4.10.7 The FHC Topical study recommended that there should be a link from Hung Hom to a landfall at either Wanchai North or Victoria Park by either an extension of the existing East Rail or an extension of the future East Kowloon Line. On Hong Kong Island, the alignment could route directly to Central from the landfall at Wan Chai North or run via Victoria Park, Leighton Hill, and Wan Chai South to Central.
- 4.10.8 The options for the FHC had a significant influence on the future development of the railway network in Kowloon, potentially affecting the following schemes:
- East Kowloon Line (EKL)
 - Kowloon Southern Loop (KSL)
 - Tai Wai to Diamond Hill Link (TDL)
- 4.10.9 Due to the importance of the FHC to the further development of the rail development options, the decision concerning the choice of the FHC was left open and development options built around different FHC options were carried forward for further consideration during Stage 2 of the Study.