

2. PROJECT DESCRIPTION

2.1 Introduction

Route 10 together with Route 7, the Deep Bay Link and the Shenzhen Western Corridor will form the strategic Western Highway between Hong Kong Island and Shekou in Shenzhen. Route 10 consists of two major parts; the section between Hong Kong and Lantau, Route 10 (HKLL); and the section between North Lantau and the Yuen Long Highway, Route 10 (NLYLH). These sections are illustrated on *Figure 1.1*.

Route 10 (NLYLH) will provide the security of a second road link to Lantau and the airport. It will facilitate the movements of cross boundary traffic and increased traffic emanating from new developments in the NWNT. It is forecast that a large number of trips will be generated between NWNT and Lantau associated with the Airport, Tung Chung New Town and possible new tourist areas or a new port. Route 10 (NLYLH) needs to be commissioned by 2007 in accordance with the pledged programme to accommodate these vehicle movements. It should be noted that a comparison of traffic forecasts for full Lantau Ports against half Lantau Ports plus international theme park developments has been undertaken in the Northshore Lantau Development Feasibility Study which concluded that changes in traffic forecasts are insignificant.

If Route 10 (NLYLH) were to be delayed, the existing highway networks would not be able to handle the number of new traffic trips generated in the catchment area. Consequently, severe traffic congestion, air pollution and noise nuisance would result in the North Lantau, Tuen Mun, So Kwun Wat and Yuen Long areas.

Since the Route 10 (NLYLH) alignment at Yuen Long is dependent on the result of the Crosslinks Further Study, which reported in June 1999, the Route 10 (NLYLH) project has been divided into two sections, Southern and Northern, to ensure that the programme for the Tsing Lung Bridge is not compromised. The Southern Section starts on north Lantau with a toll plaza at Fa Peng and extends to the So Kwun Wat valley, with intermediate connections to Tuen Mun Highway at So Kwun Tan and Siu Lam. The Northern Section is from So Kwun Wat to Yuen Long Highway, the current proposed interchange being at Lam Tei.

This Report covers the Southern Section only; the Northern Section will be reported on separately. It is particularly pertinent to note that all sections of Route 10 will be subject to the requirements of the EIAO. The cumulative impacts of the scheme will be addressed in the forthcoming EIA for the Northern Section and also under the EIA for the Hong Kong to Lantau Link.

2.2 Background

The background to the Project is set down in Section 1.

The Assignment is to review the findings of the Sham Tseng Link Study, to optimise the alignment and form of crossing proposed under that Study, to establish more accurately land requirements, and to investigate the environmental, marine, drainage, traffic and other impacts on the areas affected by the road alignment.

2.3 Route Alignment (Southern Section)

2.3.1 Feasibility Study Alignment (FSA)

The FSA connected to the Chok Ko Wan Link Road at Pa Tau Kwu and passed the eastern coastline at grade near Tso Wan at its southern limit where a toll plaza was proposed. The alignment then passed over two bridges before entering a 600 m tunnel. After leaving the tunnel, the alignment passed over the North Lantau Highway to connect with the Tsing Lung Bridge at Kwai Shek.

From the Tsing Lung Bridge, the FSA entered the Tai Lam Chung Tunnel and emerged 100m north of Tai Lam Chung Village, downstream of the Tai Lam Chung Reservoir's main dam. The alignment crossed the valley on structure at an elevation of +10m above the valley floor. The alignment then entered a 400m Siu Lam Tunnel to emerge at Siu Lam. It then curved north to So Kwun Wat. The So Kwun Wat Link provided east and west connections from the main alignment at So Kwun Wat to Tuen Mun Road. A design speed of 85 kph was adopted for the main line.

The review of the FSA carried out under this Assignment identified a number of key issues that had an adverse impact on the construction and operation phases. These included:

- the North Lantau Highway (NLH) would place excessive constraints on the construction of the FSA;
- stringent site safety procedures together with lane closures on the NLH would be required for the excavation and construction of North Lantau tunnel;
- difficult ground conditions where the FSA crossed over the Airport Railway would constrain construction;
- resumption of the Tso Wan and Fa Peng villages would be required;
- the toll plaza at Tso Wan would require a substantial retained fill structure, which would visually dominate the landscape and be expensive; and
- the route conflicted with the Towngas pipeline at Tai Lam Chung, which cannot be shut down to facilitate a diversion.

The Brief for this Assignment requires an examination of the possible variations to the FSA alignment.

2.3.2 Preferred Alternative Alignment (PAA)

A Preferred Alternative Alignment (PAA) (illustrated on *Figure 1.2*) has been developed taking account of the key issues identified above and with the express intention of improving the performance of the route. The environmental perspective is considered to be an important aspect of this development. Various environmental protection measures were specifically incorporated into the design process including avoiding dredging where possible, limiting reclamation and loss of natural coastline, and minimising noise and air quality impacts on sensitive receivers.

North Lantau

The PAA consists of a coastal route running from Tso Wan to Kwai Shek, passing under the Kap Shui Mun Bridge. A toll plaza is proposed in the area between Tso Wan and Fa Peng.

The alignment does not encroach upon village land, thereby avoiding resumption, while minimising, as far as is practicable, constraints on future developments. It also reduces the impacts on the environment by reducing the extent of reclamation. Other advantages include: the removal of construction interfaces, and therefore risk, with NLH; a reduction in spoil generation and disposal due to the deletion of the tunnel section; and the maintenance of the natural embayments at Fa Peng and Tso Wan.

Against these are the landscape and visual impacts on Ng Kwu Leng and the natural shoreline, and the need to provide environmental mitigation measures to protect the residential population at Fa Peng and Tso Wan.

Tsing Lung Bridge

The Tsing Lung Bridge spans the Ma Wan Channel between the Kwai Shek headland and Tsing Lung Tau. Its northern tower is located 50m west of the FSA, within the shallow waters of an embayment, outside the main tidal flows. Water quality impacts and marine impacts are therefore reduced as compared to the FSA.

Tsing Lung Tau to Siu Lam

From the Tsing Lung Bridge, the alignment follows the same route in plan as the FSA but emerges at a higher elevation (about +47 mPD) after leaving the Tai Lam Chung Tunnel. This is beneficial in shielding receivers from noise and for dispersing vehicle emissions. The modification also gives the following benefits:

- the horizontal realignment of the Tai Lam Chung Tunnel southern portal avoids areas of fill and gives the least risk option for tunnelling under Tuen Mun Road;
- the gradient of Tai Lam Chung Tunnel has been reduced and vehicle exhaust emissions are reduced;
- the total tunnel length is reduced by 300m thereby reducing waste arisings and disposal issues; and
- there are reduced noise impact in the Tai Lam Chung valley.

Siu Lam to So Kwun Wat

In Siu Lam, the alignment runs in open cut and connects to the Siu Lam viaduct. The alignment then curves to the north to an interchange with the link roads to Tuen Mun Road at So Kwun Wat. The FSA's tunnel option at Siu Lam would be advantageous in terms of land resumption, ecology and landscape/visual, but the cutting option offers clear advantages over the tunnel in terms of cost, construction risk, geology, and operation and maintenance. Mitigation measures have been recommended to offset the adverse visual impacts of the cutting with long term landscaping proposed.

From the interchange at So Kwun Wat Route 10 (NLYLH) Southern Section is connected to the Tuen Mun Road by the So Kwun Wat Link Road, which runs along the hillside north of So Kwun Wat village. The Siu Lam Link Road runs from the interchange southward along the western slopes of the Siu Lam valley to connect Route 10 (NLYLH) Northern Section to Tuen Mun Road. The benefits of this alignment when compared with the FSA include reduced travel distances, reduced social and environmental disturbance, a greater separation between the noise source and sensitive receivers, and minimum impacts on the So Kwun Wat valley.

2.4 Key Changes to the Feasibility Study Alignment

The main differences between the FSA and PAA in terms of environmental performance are presented in *Table 2.1* below:

Table 2.1 Main Differences Between FSA and PAA

	Preferred Alternative Alignment	Feasibility Study Alignment
Noise	North Lantau Noise levels up to 80 dB(A) are expected at the receivers. The village houses are low rise and it is likely that noise barriers upto 8m would be required to protect the villagers.	On Lantau Island, the villages at Fa Peng and Tso Wan were resumed and no sensitive receivers were identified. Thus no noise impact assessments were conducted.
	Tsing Lung Tau Vehicles using bridge will cause noise impacts at sensitive receivers including and Hong Kong Garden.	Noise barrier proposed inverted L, 5m high
	Tai Lam Chung to So Kwun Wat Higher elevation of alignment improves noise shadow zone and initial modelling has shown that noise barriers may not be required for NSRs that are located below the alignment.	Noise problems as alignment is lower and barriers proposed.
Air Quality	North Lantau Air sensitive receivers are located more than 100m from the alignment which should provide sufficient setback. In general, none of the alternatives examined are expected to create adverse air quality impacts at the ASRs.	The villages of Fa Peng and Tso Wan were to be resumed and no sensitive receivers were identified. The adverse air quality impacts on the ASRs, therefore, were not expected.
	Tsing Lung Tau Air quality issues being considered in detail, major improvements made especially with respect to lower gradients of road in tunnel and thus reduced vehicle emissions.	AQO's expected to be exceeded due to vehicle flow, mix and tunnel gradients.

	Preferred Alternative Alignment	Feasibility Study Alignment
	Tai Lam Chung to So Kwun Wat Alignment on higher elevation than FS which was in the valley and better dispersion of pollution expected.	
Water Quality	North Lantau Provision of a route through Tso Wan would affect the villagers but, unlike the FS proposal where the route was at +40mPD, the alternative at +10mPD would allow the way of life within the village to be preserved. Underpasses to be provided, until port construction takes place, to give local access. It has been noted, through site visits, that a new jetty is currently being constructed at the eastern headland of the bay. This facility to be relocated.	No assessments were undertaken but it may be surmised that minimal water quality impact expected as the extent of infill in the Fa Peng bay is relatively small. Impacts on small local stream courses are possible.
	Water quality impacts associated with the construction phase would be relatively similar for all three alignments considered for the PAA. A drained, not dredged, reclamation will be provided for the Toll Plaza to minimise the extent of dredging required and which will reduce water quality impacts and disposal requirements. Once operational the far field effects would be very similar. Impacts on small local stream courses are anticipated but could be controlled through good site practice.	
	Tsing Lung Bridge Land formation required to found northern tower of Tsing Lung Bridge. No dredging is required in this area. Impacts expected to be able to mitigated to acceptable levels. Reduction in cross sectional area of marine water <1.5% which is acceptable both in terms of near and far field water quality.	Assessments undertaken considered water quality impacts were acceptable. Reduction in cross sectional area of marine water 3.5%.

	Preferred Alternative Alignment	Feasibility Study Alignment
Ecology	<p>North Lantau The terrestrial habitats along the alternative alignments are mainly shrub. A range of coastal habitat and small patches of lowland woodland have been identified along the coast, this habitat and woodland may be lost with the implementation of the project. Most of the species identified are common, widespread, and typical to the habitat type where they were recorded. However, five rare species of conservation interest, namely <i>Vitis balansaeana</i>, <i>Fimbristylis complanata</i>, <i>Diplarcum caricinum</i>, <i>Phymatodes scolopendria</i> and <i>Amorphophallus sp</i> have been identified along the alignment. The former two are new records to Hong Kong and not listed in the Checklist of Hong Kong plants.</p> <p>Transplant of these rare species and woodland replanting would be required to compensate for the habitat loss. There is little difference between the three alternative alignments considered for the PAA.</p>	<p>Several rare or protected plant species were recorded in different habitat types along the whole alignment, particularly the coastal habitat on Lantau Island. The alignment is tunneled and the required land take would be minimized. Potential habitat loss is therefore less than the alternative alignments.</p>
	<p>Tai Lam Chung to So Kwun Wat No rare or protected plant species identified in this section.</p>	
Hazard	<p>Alignment passes through consultation zone of Tai Lam Chung Prechlorination House, however, risks are identified as acceptable.</p>	<p>Risks identified as acceptable.</p>
Fisheries	<p>The alignment runs along the northeastern coast of Lantau Island between Fa Peng and Kwai Shek. Some parts of this stretch of coastline have been affected through the reclamation for the landing point of the Kap Shui Mun bridge. The remaining areas are natural coastline. This coastline consists of a mixture of gently sloping boulder shores interspersed with sandy shores at Fa Peng, Tso Wan, and Kwai Shek, and Tsing Lung Tau.</p>	<p>Minimal impact on fisheries as the FS alignment infilled only on small part of the Fa Peng Bay.</p>

	Preferred Alternative Alignment	Feasibility Study Alignment
	The small reclamations would impact the existing coastal habitats of North Lantau. Impacts to fisheries resources are most likely to occur at the Ma Wan Fish Culture Zone located on the west side of Ma Wan Island. Any impacts to culture fisheries are most likely to occur through perturbations to water quality. The impact of the Alternative Alignments A and B are broadly similar except for minor local effects. The impact of the Alternative Alignment C is likely to be more severe.	

Further details of the environmental implications of the FSA and PAA are provided in *Annexes G and H*. Preliminary assessments concluded that the FSA was more acceptable in terms of hazards, ecology and fisheries; while the PAA performed better with respect to noise, air and water quality.

2.5 Construction Activities

Construction is programmed between 2001 and 2007. The preliminary construction programme assumed for the assessment of environmental impacts is shown in *Figure 2.1 (a & b)*. Since at this stage there are uncertainties over the way that individual contractors will programme elements of the work, the programme has adopted a worst case scenario and assumes that certain key activities will be carried out concurrently. Assessed impacts are therefore always conservative.

The Project will be constructed under a number of contract packages. The assumed approximate timescale for these packages is summarised in *Table 2.2* below.

Table 2.2 Construction Contract Packages

Work Element	Work Elements	Approx Timescale
Advance Works	Advance Works for Tsing Lung Bridge which includes the excavation at Kwai Shek:	Q2 2001 - Q1 2002
Major Contracts	(i) Tsing Lung Bridge Viaducts on Lantau Toll Plaza seawalls & reclamation	Q2 2002 - 2007
	(ii) Lantau Toll Plaza	Q1 2005 - 2007
	(iii) Tai Lam Chung Tunnel	Q2 2003 - 2007
	(iv) So Kwun Wat Interchange and Link Road	Q1 2004 - 2007
	(v) Siu Lam Link road	Q1 2005 - 2007

Advance works will be carried out at Kwai Shek to facilitate the construction of the south Tsing Lung Bridge anchorage and tower between April 2001 and March 2002.

Works sites have been proposed in Fa Peng, Kwai Shek, Tsing Lung Tau, Tai Lam Chung and Siu Lam, and their locations are shown in *Figures 2.2 - 2.4*. These work sites are in close proximity to the works areas, with good access and large storage areas.

It is expected that construction works will generally be carried out 12 hours a day. However, for construction of the bridge and tunnel works will need to be carried out 24 hours a day in order to achieve the committed programme.

2.6 Traffic Forecasts

For the purpose of this EIA study, traffic flows for the year 2022 have been forecast for all major roads within 300 m of Route 10 (NLYLH). Projected peak traffic flows and vehicle splits for the roads under consideration are shown in *Table 2.3*. Traffic flows for the year 2001, 2011, 2016 and 2022 have also been forecast and are shown on *Figure 2.5* and in *Annex A*.

Table 2.3 Traffic Flows

Section of Road	Direction	Traffic (veh/Hr)
Route 10 (NLYLH) (Northern Section)	NB/SB	4840/4680
Route 10 (NLYLH) (So Kwun Wat Link)	EB/WB	3260/3420
Tuen Mun Road (West of SKW Link)	NB/SB	4870/4390
Tuen Mun Southern Bypass	NB/SB	4660/4730
Tuen Mun Road (East of SKW Link)	EB/WB	4450/4660
Route 10 (NLYLH) (Southern Section)	NB/SB	5010/4800
Tuen Mun Road	EB/WB	4320/4700
Castle Peak Road	EB/WB	2200/2270
North Lantau Expressway	EB/WB	5180/5150
Route 10 (NLYLH) (North Port Section)	NB/SB	4970/4840
Hong Kong Lantau Link	NB/SB	3520/3500
Lantau Port Distribution Road	NB/SB	2880/3100
Lantau Port Expressway	NB/SB	5170/5030
Siu Lam Link	NB/SB	2210/2130
Tuen Mun Road (West of Siu Lam Link)	WB/EB	4700/4320
Tuen Mun Road (East of Siu Lam Link)	WB/EB	4710/4430
Castle Peak Road (South of Siu Lam Link)	WB/EB	2390/2210
Castle Peak Road (So Kwun Wat Section)	EB/WB	4710/4430
Interchange of Castle Peak Road and Tuen Mun Road		2390/2210
Interchange with So Kwun Wat Link	EB/WB	4670/4550
LR1 and LR2		1730/1640
So Kwun Wat Link West	EB/WB	2390/2210