RAPID TRANSIT REVIEW

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LIGHT RAIL COMES TO TUEN MUN

1981

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Light Rail Director, Tuen Mun project

TEN YEARS AGO Tuen Mun in Hong Kong's New Territories was a fishing village. Today it has a population of 260,000 which will rise to 400,000 by 1996. Another new town, Tin Shui Wai is under construction, initially to house 40,000 people, while nearby lies the established but still developing town of Yuen Long which has a population of about 62,000. The towns are being developed by the government to provide housing for the growing population on Hong Kong Island and Kowloon, and the overall plan includes a light rail transit system, the Tuen Mun LRT.

The LRT is being built, and will be operated by, the Kowloon-Canton Railway Corporation (KCRC), a government-owned corporation which, among other things, also runs the heavy railway from Kowloon to the border with mainland China.

In August 1985 KCRC awarded the contract to design, build, and put Phase 1 of the LRT system into operation by August 1988 to the Leighton-MTA consortium, a joint venture between Leighton Contractors (Asia) and the Metropolitan Transit Authority of Victoria, Australia. KCRC has engaged Transurb Freeman Fox, and Scott Wilson Kirkpatrick to control quality and to act as 'engineer' under the contract.

Phase 1 consists of 23km of double track at grade, with 41 stops, three termini/interchanges, and a depot. Ridership of between 250,000 and 300,000 passengers a day, with a peak hour factor of 15%, is expected in 1989.

The 70 Phase 1 vehicles are being supplied by Comeng, Australia, with propulsion equipment by AEG, control equipment by Siemens, braking equipment by Knorr, and bogies by Duewag, all from the Federal Republic of Germany. Air-conditioning is being supplied by Sigma, Australia, and the doors by Stone Peters, Britain.

The vehicle body is stainless steel. Each vehicle is 20m long, 2.65m wide and weighs about 27 tonnes. There are three outside sliding doors on one side only. Normally the vehicle is single-end driven, but can be driven in reverse from a rear console for shunting or in an emergency. Two LRVs can be coupled for multiple operation.

The bogies are monomotor drive. Primary suspension is chevron rubber and secondary suspension is air bag. Wheels are resilient cushioned. One-fifth of the vehicles are equipped with flange lubricators to reduce even further wheel wear, rail wear, and noise.

The maximum design speed is 80km/h. Maximum acceleration is 1.3m/s^2. Service deceleration is also 1.3m/s^2 but can be above 2.6m/s^2 in an emergency. Each motor is driven by a separate SCR chopper with GTO commutation. Regenerative braking can be from top speed down to about 7km/h and can be blended to resistive braking if the line is not receptive. The electric brake is supplemented by pneumatic braking at slow speed or failure of the electric brake.

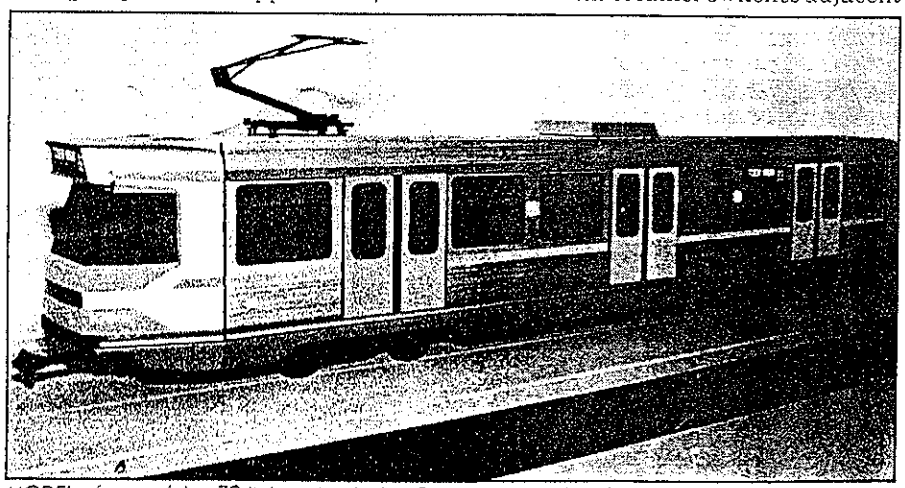
The magnetic track brake and sanding will be activated in case of an emergency brake application, and sanding will apply in wheel slip-slide conditions. The propulsion and pneumatic brake system are real-time controlled by their own microprocessors, which also have fault monitoring and storage capability.

The LRV uses a static converter to provide power for the air-compressor, air-conditioning, lighting, and battery charging. The air-conditioning is of split-type with the noisier condensing unit on the underframe and the evaporating unit on the roof to suit the environmental requirements in Hong Kong. The saloon temperature is controlled according to the outside temperature.

TRACKWORK

Henry Boot Far East is designing and installing 46km of trackwork, including 37km on ballast and 9km paved. Paved sections are laid where street running is involved and at the 57 at-grade highway crossings.

As far as possible we wanted equipment to be compatible with KCR main line operations, so track on ballast consists of UIC54 rail in normal and wear-resistant grades, on type F27 precast concrete sleepers, attached with Pandrol clips. Rails are continuously welded with breather switches adjacent



MODEL of one of the 70 light rail vehicles Comeng is building for Tuen Mun.

to curves. A geotextile membrane separates the ballast from the formation, which has a cross-grade of 1 in 40 to filter drains.

In paved track, either UIC54 with guard rails or Ri60 rail is embedded in a resilient insulating medium set in troughs in a reinforced concrete slab. This provides high track-to-earth resistance by having the rail in contact with the insulating medium only to minimise traction return current losses from creepage and leakage.

Switch and crossing design differs between ballasted and paved track, following railway practice on ballast and continental tramway practice in paved areas. Crossing angles vary from 1 in 2.5 to 1 in 6.

The fixed power equipment is being designed and supplied by Hawker Siddeley Power Engineering, and the overhead line system is being designed and supplied by Balfour Beatty Power Construction, both of Britain.

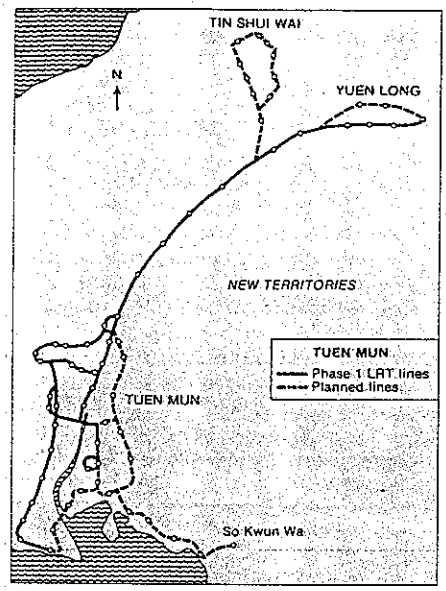
Power is supplied by two infeed substations from China Light and Power (CLP) — one in Tuen Mun and the other at Yuen Long. The input supply to the two primary substations is at 132kV 50Hz, which is transformed to 11kV through 35MVA transformers and then distributed to the 11 rectifier stations by the LRT's own network.

The vehicles are supplied by the overhead line with 750V dc which is fed via the 10 rectifier stations distributed along the LRT route and one in the depot. A low voltage system, connected to the auxiliary transformer at each rectifier station, provides a small power supply to each LRT stop.

An interesting feature of Balfour Beatty's computer-designed overhead power supply system is that the tensioning weights—each one a solid piece of lead—are located unobtrusively *inside* the cylindrical support poles. There are two reasons for this: one is the increasing concern being shown in the Hong Kong area for a more aesthetic environment, and hiding the weights inside the poles eliminates an unsightly stack of metal; the other is the need to protect the weights from the effects of typhoons to which the area is prone.

Communications and control equipment is being supplied by Cable and Wireless, Britain, using Plessey, Britain, for the vehicle control system. Powernetics, Britain, is supplying Cable and Wireless with equipment for both the Tuen Mun project and the Kowloon Canton Railway's mainline radio project. Equipment consists of 42 systems of 3kVA uninterruptible power supplies designed for trackside requirements, and 190 dc-dc converters for trainborne communications systems between drivers and the signalling centre. The converters are derived from a design used by British Rail (BR).

LRT vehicles will run mainly on segregated rights-of-way but there are junctions with road traffic. Each



PHASE ONE consists of 23km of double track with 41 stops and three interchanges.

junction is individually controlled to give priority to the LRT vehicle.

LRT vehicle traffic signals are controlled from the adjacent road traffic controller. LRT point signals are controlled by the presence of the vehicle although this control may be over-ridden by driver command. An LRT vehicle will cross a road junction by making an automatic request to the road traffic controller and LRT track equipment.

The track is equipped with separate vehicle identification loops between rails to initiate traffic signal and point signal "request" and "cancel" commands. There is no interlocking between the track point switching controller and the road traffic signal controller.

The LRT vehicle is equipped with a transponder. When it passes over the traffic request loop and point request loop, the LRV sends its identification to the track side computer at the nearest stop. The computer then makes the request for LRT vehicle right-of-way to the road traffic controller, switching the point switch to the right position and sending the LRV identification back to the central computer at the control centre for location, identification, and further processing. After a safety period the road traffic controller will give right-of-way to the LRT vehicle.

When the LRT vehicle passes, the cancel loop resets the previous request. The traffic controller then restores the service, and the point switch will wait for the next LRT vehicle instruction.

The control room will be able to communicate by radio with each driver and by public address to passengers in the vehicles and at the stops.

Fare collection vending machines are being supplied by Autelca, Switzerland. Central control, fault indication, data acquisition and reporting is being designed and supplied by Cable and Wireless. The fare-collection system will have no gates, turnstiles, or ticket collectors at stops. A passenger will purchase a ticket for the journey at a ticket vending machine at the stop immediately before boarding the vehicle. Ticket inspection will be made by roving inspectors.

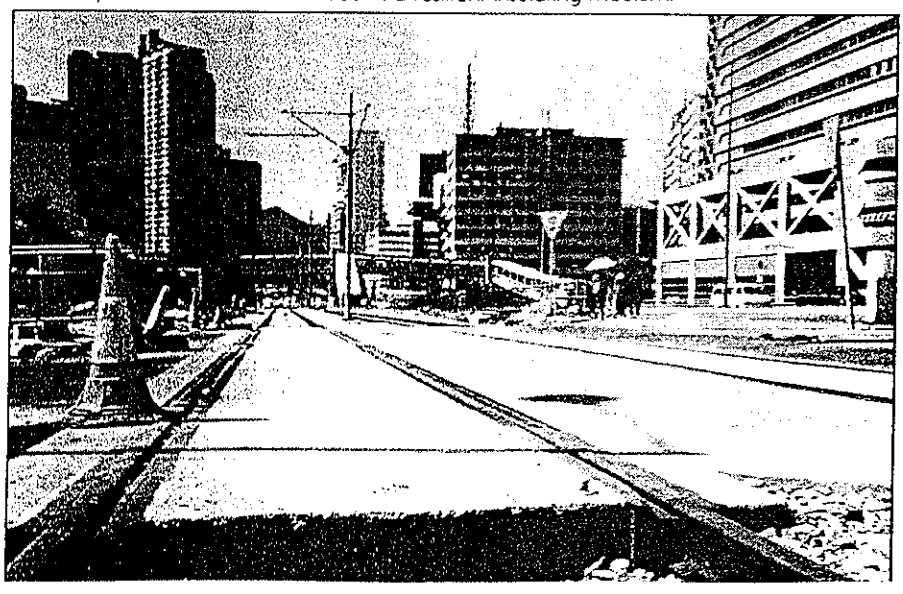
Whilst the automatic ticket vending machines can sell single and multiple-journey tickets, with payment either in cash or by deduction from common stored value tickets, off-platform season tickets will be heavily marketed. These will be available at commercial outlets in the region. All the ticket vending machines will provide change.

ZONAL FARES

The fare structure will be zonal, with probably five zones for Phase 1. A common fare will apply for travel within one zone and between two adjacent zones, and there will be free transfer from one route to another within the same fare zone. There will be reduced fares for children and students.

Workshop equipment is supplied by Brown and Root Vickers, Britain, and Metropolitan Transit Authority (MTA) of Victoria, with MTA integrating the overall design and layout. The depot is designed for the stabling, cleaning, and maintenance of a fleet of 143 vehicles

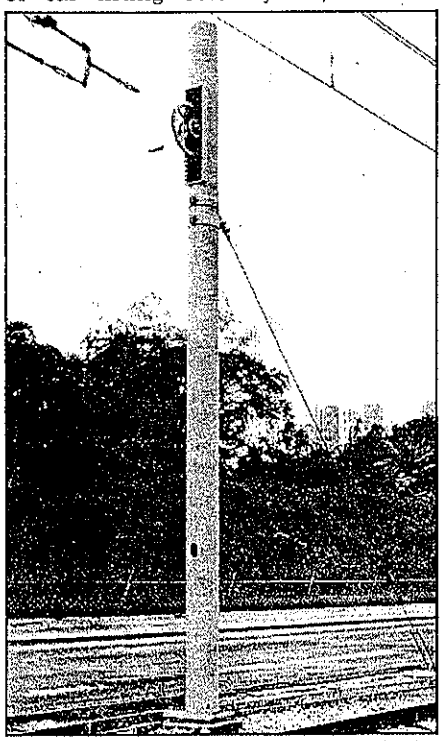
RAILS in paved track are embedded in a resilient insulating medium.



and a number of auxiliary vehicles used for maintenance purposes. There will be 17 tracks for stabling purposes and three more with 1.5m-deep pits for LRV servicing and inspection.

Vehicles due for major inspection and overhaul will be brought into the workshop by a traverser. Facilities include a bogie repair shop, wheelset repair shop, motor repair shop, shop for couplers, brakes and compressed air system, battery shop, machine shop, air-conditioning equipment shop and electronic workshop.

There will also be a body workshop with an underfloor wheel lathe, manufactured by Hegenscheidt, Federal Republic of Germany, door repair shop and an area for scheduled and unscheduled repair of car bodies. The workshop is also equipped with two sets of overhead travelling cranes, two sets of car lifting screw jacks, and all



TENSIONING WEIGHTS are located inside the cylindrical support poles.

necessary jigs, tools and testing instruments. Smith Brothers and Webb, Britain, is supplying a uni-directional, four-brush, detergent train wash system with water recycling capability.

The permanent way and overhead line equipment will be repaired in a separate workshop which is accessible from a special siding.

Of the 41 stops, two will have convenient interchange with road transport and three will have turn-round loops for terminating routes. All platforms are high level to match LRV floor height and so enable stepless transfer for passengers. Each stop will be equipped with a simple shelter for weather protection. A ramp is being provided to each platform to afford access for handicapped passengers.

The KCRC LRT has been developed taking into consideration the system operated by MTA in Melbourne, Australia. Leighton-MTA consortium has set up a project management team to coordinate the design of the LRT with MTA and subcontractors of the system. This approach has ensured that MTA operational experience and knowledge can be totally integrated in the KCRC LRT. Operations procedures manuals will be produced by MTA to ensure that the total integration of the complete system can be achieved.

Property development to house a total of 25,000 people is taking place above the two interchanges and the depot stabling area. This is being done in joint venture with professional property developers.

Phase 1 of the LRT will go into operation in August 1988. Design is proceeding on three further links of the original LRT system with a total track length of 5km. Design has also started on a new link which will form a bypass around Yuen Long high street and serve a new estate, housing 35,000 people, and the nearby industrial estate. The entire system is expected to be in service by the mid 1990s. Further vehicles may need to be ordered in 1988.

In response to public pressure, a study has been submitted to the Hong Kong government of an LRT line which will link the light rail system to the heavy rail systems in urban and eastern Kowloon. The government will decide by December 1987 how this demand is to be met. IRJ

IL Y A dix ans, Tuen Mun, dans les Nouveaux Territoires de Hong Kong, était un village de pêcheurs. Aujourd'hui il y a 260 000 habitants. D'autres développements de logements sont en cours dans les régions voisines pour soulager la pression imposée à l'île de Hong Kong et Kowloon. Un nouveau système de métro léger dans la région fait partie du développement d'ensemble.

La première phase du système de Tuen Mun comprend 23 km de voies doubles avec 41 stations, trois terminaux/gares d'échange et un dépôt. Le système qui doit être mis en service au mois d'août 1988 va être exploité avec soixante-dix véhicules.

L'Entrepreneur principal est le consortium australien Leighton-MTA. Les véhicules sont fournis par la société Comeng, Australie, avec une contribution considérable de sociétés de la République Fédérale Allemande. Les sociétés britanniques se partagent une grande part des travaux de voies, alimentation de courant, caténaires, communications, contrôle et équipement d'atelier.

Les travaux d'étude continuent sur des liaisons additionnelles totalisant 5 km et un by-pass autour de la grand-rue d'Yuen Long. L'étude d'une ligne de métro léger destinée à relier le nouveau système aux réseaux de chemins de fer lourds existants dans les régions urbaine et orientale de Kowloon, a été soumise au gouvernement. On compte qu'une décision sera prise au mois de décembre.

VOR ZEHN JAHREN war Tuen Mun im Neuen Territorium von Hongkong noch ein Fischerdorf. Heute weist es eine Bevölkerung von 260.000 auf. Um die Insel Hongkong und Kaulun etwas außer Druck zu setzen, werden in den benachbarten Gebieten Wohnbauprojekte durchgeführt und eine neue Stadtbahnverbindung ist Teil dieses Gesamtprojektes.

Die erste Phase des Tuen Mun Systems umfaßt eine 23km lange, zweispurige Strecke mit 41 Bahnhöfen, drei Endstationen/Übergangsbahnhöfen und ein Depot. Siebzig Fahrzeuge werden auf der Strecke verkehren, die im August 1988 in Betrieb genommen werden soll.

Hauptunternehmer des Projektes ist das australische Konsortium Leighton-MTA. Die Fahrzeuge werden von der australischen Firma Comeng, unterstützt durch mehrere deutsche Firmen, geliefert. Für Gleisarbeiten, Stromversorgung, Kettenfahrleitungen, Kommunikationen, Steuerung und Werkstättenausrüstungen sind in erster Linie britische Firmen zuständig.

Zusätzliche Verbindungsstrecken von insgesamt 5km Länge befinden sich gegenwärtig im Planungsstadium, ebenso eine Umfahrung der Hauptstraße von Yuen Long. Der Regierung wurden Vorstudien zum Projekt einer Stadtbahn Linie, die das neue mit dem bestehenden Hauptbahnsystem im Stadtbezirk und im östlichen Teil von Kaulun verbinden soll, unterbreitet. Eine Entscheidung wird im Dezember erwartet.

HACE DIEZ ANOS Tuen Mun, en los Nuevos Territorios de Hong-Kong, era un pueblo de pescadores. Hoy tiene 260.000 habitantes. En áreas vecinas están surgiendo otras urbanizaciones con el fin de aliviar la congestión de la isla de Hong-Kong y Keulún, y un nuevo sistema de ferrocarril ligero forma parte del plan general.

La Fase 1 del sistema de Tuen Mun consiste en 23 km de doble vía con 41 estaciones, tres terminales y estaciones de cambio, y un parque de material. Setenta vehículos se utilizarán en la red, cuya entrada en servicio está prevista para agosto de 1988.

Los contratistas principales son el consorcio australiano Leighton-MTA. Los vehículos van a ser suministrados por Comeng, de Australia, con bastante aportación de compañías de la República Federal de Alemania. Empresas británicas tienen una fuerte participación en construcción de vía, fuerza eléctrica, catenaria, comunicaciones, mando y control, y equipo de talleres.

Prosigue la labor de proyección relativa a enlaces adicionales que ascienden a un total de 5 km, así como una derivación por la calle mayor de Yuen Long. Ha sido presentado al gobierno un estudio sobre una línea de ferrocarril ligero propuesta para enlazar el nuevo sistema con los de metro y expresos regionales de los sectores urbanos y del este le Keulún. Se espera una decisión en diciembre.

九廣鐵路公司
Kowloon-Canton Railway Corporation
PR/15/85/G/PRD

Press Release
新聞稿

30 April 1985

Text of Speech by Mr P V Quick
Managing Director of the
Kowloon-Canton Railway Corporation
to Rotary Club of Hong Kong

The Western New Territories LRT

Last week the KCR Corporation received bids from all five international consortia who had been prequalified and invited to tender for phase one of the LRT project in the western New Territories. Your Club's invitation for a speech today gives me an opportunity to provide an update on the current situation of this exciting project. The Corporation is now busy evaluating the bids with a view to award the contract in about three months' time as originally scheduled.

The LRT is an integral part of Government's public transport strategy for the western New Territories. Though there will be no direct financial input or guarantees from Government for any loans to be secured for the project, the Government is taking a keen interest in its development and is giving active support in a number of ways.

Government is directly and extensively involved with the physical implementation of the project. It is responsible for the acquisition and formation of all land required for the LRT, including all associated civil engineering works such as footbridges, road works and diversions, new structures to carry the LRT, preparation of the depot and termini sites, etc. The Government will spend some $500 million in the next three years on these preparatory works for the LRT. This will be in addition to the cost of forming track beds and reserves in Tuen Mun, which took place in conjunction with the development of the New Town.

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To ensure that Government activities associated with the project are effectively planned and coordinated with those of the Corporation, a Government/KCRC LRT Liaison Committee was established and has now been working smoothly for several months. The Committee has two sub-groups to advise on transport planning and operations and the co-ordination of civil engineering works, resumptions and necessary clearances.

The five international consortia bidding for the project all have extensive experience in implementating light rail projects. Technically, we have no doubt that whoever wins the contract, the residents in the western New Territories will eventually have a high grade, efficient urban transport system which is second to none.

As the LRT is the only major development project likely to be undertaken by the Corporation in the near future, it is not considered prudent to establish a large, multi-disciplined project team to design, implement and project manage the LRT. Hence, the consortium awarded the contract will be charged with providing project management as well as design and construction expertise. Effective and efficient monitoring by the Corporation of both physical work and quality of workmanship and equipment is essential and this will be done by a small in-house project team headed by our Light Rail Director, with specialist help provided by civil, electrical and mechanical consultants and financial advisers.

An initial scrutiny of the bids showed that competition is very keen and we are confident that phase one can be completed within the original budget. Each consortium has the backing of international banks and financial institutions in providing funding for the project. There is a variety of financing proposals, some of which are very interesting, with packages supported by fixed rate Hong Kong Dollar funds with repayment periods stretching well beyond 1997. I believe this shows great support for the project, and by implication, confidence in the long-term future of Hong Kong. This is all the more encouraging in view of the fact that the KCRC will take full responsibility for the financial commitments for the LRT without a Government guarantee.

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The various stages of tender evaluation, shortlisting and negotiations will take place in the next couple of months prior to a Board decision and formal award of contract. Construction work can then start, probably on the depot site at Area 18 of Tuen Mun close to Butterfly Estate. The rail network will then be progressively developed, starting from the Tuen Mun end where a majority of the reserves have been created, then through to Yuen Long in 1987. 70 light rail vehicles will be required for phase one and the first will be delivered in mid-1987.

Phase one of the LRT, which makes up about two-thirds of the full system at present planned, comprises seven routes on 23 kilometres of double track and 41 stops. The seven routes include four within Tuen Mun and three between the New Town and Yuen Long. We are working on a very tight implementation programme of less than three years. Commissioning tests will commence in early 1988 for opening commercial services in mid-1988.

The Corporation Board have examined the feasibility of property development above the depot and major termini (at Yuen Long and Pier Head in Tuen Mun) and concluded that development above the depot and Yuen Long terminus would not be viable in present market conditions. However, there is the possibility of a mixed commercial/residential development above the Pier Head terminus site and this is now being examined in detail.

Concurrent with the implementation of the project, the Corporation has commenced a comprehensive community relations and publicity programme in the region. As with any other major construction work, people living in and around the western New Territories will be affected by these works, and it is our objective to keep them adequately informed of progress on the system which will serve them in a few years time. The Corporation and its contractor will try and ensure that disruptions during construction will be kept to a minimum.

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We have been holding briefing sessions for the district boards and mutual-aid committee representatives of estates and giving talks to schools in the region. These will continue and increase as the project develops. The Corporation is represented on the Traffic and Transport Committees of the Tuen Mun and Yuen Long district boards, whose views on the project together with those we obtained through public opinion surveys will be fully taken into account. A number of suggestions including naming of stops and provision of ramps at stops for use of the system by the physically handicapped have already been taken on board.

The LRT will form the backbone of the internal public transport system of the western New Territories. I am sure all of you understand the important role transport plays in the well-being of a community. We are certain that the LRT will assist and stimulate growth in the region. Operationally our objective is to make it a user-friendly community system that is simple, convenient and economical to use, yet still provide the benefits of safety, comfort, efficiency and freedom from pollution like a modern mass transit railway.

Unlike the MTR, all work for the LRT will be on the surface. Residents in the region will find it interesting to watch a brand new rail system growing before their eyes, a transport system we believe they and Hong Kong can be proud of.

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