For discussion **FCR(2002-03)32**
on 12 July 2002

ITEM FOR FINANCE COMMITTEE

CAPITAL WORKS RESERVE FUND
HEAD 708 - CAPITAL SUBVENTIONS AND MAJOR SYSTEMS AND EQUIPMENT
Transport Department
New Subhead "Replacement of the Traffic Control and Surveillance System in Cross-Harbour Tunnel"

Members are invited to approve a new commitment of $112 million for replacing the existing Traffic Control and Surveillance System in Cross-Harbour Tunnel.

PROBLEM

The existing traffic control and surveillance system (TCSS) in Cross-Harbour Tunnel (CHT) is reaching the end of its serviceable life. The maintenance of the system is now getting increasingly difficult. We need a modern TCSS to ensure safe, reliable, cost-effective and efficient tunnel operation.

PROPOSAL

2. We propose to replace the existing TCSS with a fully computerised and integrated TCSS at an estimated cost of $112 million.

JUSTIFICATION

3. The existing TCSS in CHT was installed when the tunnel opened in 1972. Although the system is properly maintained and is rendering a reliable service, the Director of Electrical and Mechanical Services (DEMS) considers that the core components of the existing system are reaching the end of their

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serviceable life. It is also getting increasingly difficult to purchase spare parts to maintain the obsolete TCSS equipment. The cost of maintenance of the system is expected to become substantially higher when more and more components become obsolete and have to be specially ordered from the suppliers.

4. Designed some 30 years ago, the existing TCSS relies totally on manual operation. A modern TCSS, however, will have a lot of automatic and computerised systems to enhance traffic control and surveillance functions. We propose to replace the existing TCSS in CHT with a modern TCSS to ensure the continued provision of a safe, reliable, cost-effective and efficient system to control and monitor the tunnel traffic. This will bring the facilities and equipment of the tunnel in line with the modern TCSS of other existing tunnels in the territory. The new system provides important features such as variable message signs, automatic incident detection systems (AIDS), over-height alarm and computerised traffic plan systems. Details of the proposed TCSS equipment and their features as compared with the existing TCSS are shown at Enclosure 1.

Encl. 1

5. We also take this opportunity to install a new environmental monitoring system which is a standard equipment in new tunnels to measure the environmental parameters as required by the Environmental Protection Department and to replace the emergency telephone system which is approaching the end of its economic life.

Main Features of the Proposed System

6. Full Variable Message Signs (FVMS) will be erected on gantries at strategic locations of the main approach roads to provide traffic information on the tunnel to motorists so that they can take alternative routes in case of congestion or tunnel closure. FVMS are capable of displaying real-time bilingual messages on journey time, congestion information, suggested alternate route, general traffic information and even graphical information. For secondary approach roads, Limited Variable Message Signs (LVMS) will be installed to display critical traffic information (e.g. Tunnel Closed/Congested) to tunnel users. Proposed locations of the new FVMS and LVMS are shown at Enclosure 2. As suggested by some Members of the Legislative Council Panel on Transport during past discussion on ways to enhance the dissemination of real-time tunnel traffic information to motorists, we will install FVMS at strategic locations of the main approach roads to CHT on both sides of the harbour covering Chatham Road South, Chatham Road North, Princess Margaret Road, Island Eastern Corridor and Gloucester Road. The tunnel tubes and their approach roads will also be equipped with traffic signs and lane signals which are brighter, more reliable and require less maintenance.

Encl. 2

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7. At present, there is no AIDS installed in CHT. AIDS monitors the statistical parameters of the traffic flow, e.g. average speed and headway between vehicles, based on which the system can detect whether it is likely that an incident has happened within the tunnel tube. It will relieve the control room staff from fatigue arising from continuous monitoring of the CCTV monitors. We will take this opportunity to install an AIDS in the tunnel to assist operators to detect traffic incidents and reduce the risk of secondary accidents. The vehicle detectors will be of the overhead type to allow maintenance to be carried out without affecting normal traffic.

8. The new TCSS will be fully computerised using state-of-art technology and designed as a single integrated system. For example, under the new system when an over-height alarm is raised, the camera of the nearby closed circuit television (CCTV) system will automatically pan to the incident site. The response to incident including mobilisation of recovery vehicles will thus be enhanced.

9. There is no computerised traffic plan system in the existing TCSS of CHT. Tunnel operators have to manually switch on and off different button arrays to change the traffic signs and signals and other field equipment for implementing different tunnel traffic plans. With the new TCSS, a number of pre-programmed traffic plans will be developed and stored in a new traffic management computer. When there is a need to change the tunnel traffic plan, operators can select and execute the appropriate pre-programmed traffic plan. The computer system helps control the change of traffic signs, signals and other field equipment as well as check against any conflict amongst the signs and signals. This greatly increases the efficiency and reliability in traffic control and safety of the tunnel.

Implementation Programme

10. We plan to start the project in the third quarter of 2002, and the project will take about 41 months to complete. A work programme is at Enclosure 3. The first 19 months are for preparatory works inclusive of detailed investigation, system design, specification preparation and tendering. The latter 22 months are for system installation, testing and commissioning.

Encl. 3

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11. We will plan and implement the project with minimal traffic impact to the tunnel as far as possible. There will be proper temporary traffic management measures to facilitate equipment installation. For equipment installation and testing within the tunnel tubes, works will only be carried out at night in the closed tube when the tunnel is operating under the one-tube-two-way mode for normal maintenance.

FINANCIAL IMPLICATIONS

12. We estimate the capital cost of the project to be $112 million, made up as follows –

			$ million
(a)	Electronic, electrical and mechanical equipment installation		78.9
	(i) signs, signals and other field equipment	28.0	
	(ii) automatic incident detection system	6.4	
	(iii) computer hardware and software	15.0	
	(iv) data communication system	6.0	
	(v) environmental monitoring system	8.0	
	(vi) emergency telephone system	3.5	
	(vii) uninterruptible power supply	2.0	
	(viii) cables, accessories and spares	2.0	
	(ix) testing, commissioning, training and documentation	7.0	
	(x) dismantlement and disposal of replaced equipment	1.0	
(b)	Related installation and works		14.0
	(i) cable ducts	1.7	
	(ii) mountings for gantry signs	1.8	
	(iii) mountings for roadside signs and signal	1.5	
	(iv) civil, builder and building service works and contract preliminaries	9.0	
(c)	Project management charges by Electrical and Mechanical Services Trading Fund (EMSTF)		9.8
(d)	Contingency [10% of (a) to (b)]		9.3
	Total		112.0

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13. As regards paragraph 12(a), the cost of $78.9 million is for the dismantling and removal of the existing TCSS equipment and the supply, installation, testing and commissioning of a new system comprising variable message signs, traffic lights, lane signals and remote control signs, automatic incident detection devices, various traffic signs, signals and field equipment (e.g. over-height detectors), computer hardware and software, a data communication network, an environmental monitoring system, an emergency telephone system, as well as the associated cabling works.

14. As regards paragraph 12(b), the cost of $14 million is for the related civil, builder and building services works such as cable ducting, erecting gantries and mountings for signs and signals, building equipment room, engagement of civil and traffic engineering consultants, and contract preliminaries.

15. As regards paragraph 12(c), the cost of $9.8 million is for the EMSTF's engineering consultancy services. DEMS will undertake the whole project which includes feasibility study, definition of requirements, preparation of project programme and estimates, design, tendering, site inspection, installation supervision, testing and commissioning, as well as monitoring defect rectification during the defect liability period. In the light of the Enhanced Productivity Programme, the EMSTF has rationalised its costs and offered a reduced price of $9.8 million, which is about 10.5% of the estimated project cost. We consider the fees charged by EMSTF reasonable.

16. Subject to approval, we will phase the expenditure as follows –

Year	**$ million**
2002 – 2003	8
2003 – 2004	22
2004 – 2005	34
2005 – 2006	48
Total	112

17. Similar to the present arrangement, the additional recurrent expenditure for the new system estimated at $0.2 million per annum will be added to the overall management fees payable to the tunnel contractor for the management, operation, and maintenance of the tunnel.

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18. We shall award the contract on a lump-sum fixed price basis and intend to engage EMSD as our project manager. The CHT is the most heavily utilised tunnel and provides a strategic link to the rest of Hong Kong. It is hence essential that safe and smooth operation of the tunnel be maintained at all times. As the agent responsible for the monitoring of the maintenance of the CHT systems and equipment, EMSD has full knowledge of the operational requirements of the TCSS at the CHT. EMSD would hence be a more efficient and effective project manager for this TCSS replacement project than a private consultancy firm, which had not been involved in maintenance of the TCSS at CHT. Also, given that TD does not have any in-house expertise to oversee the performance of the consultancy firm, even if one is employed, TD would have to pay a separate sum to EMSD for their service to manage and monitor the works of the consultant. In view of the strategic importance of CHT, we consider that it is in the best interest of the public for EMSD, who is a reliable and incumbent monitoring agent of the TCSS and other systems of CHT, to undertake the project to ensure smooth and prompt implementation.

19. The above proposal will have no impact on toll charges of the tunnel.

BACKGROUND INFORMATION

20. In general, TCSS is installed in a tunnel and along its approaches for the safe and efficient operation of tunnels and real-time monitoring of tunnel traffic. There are two kinds of facilities in a TCSS. The traffic control facilities are designed to guide the motorists through the tunnel safely and efficiently. The traffic surveillance facilities monitor the traffic in the tunnel area. Both facilities are linked to the control centre to allow the tunnel operator to observe and monitor the actual tunnel condition at all times and act promptly if there are incidents.

21. We consulted the Traffic and Transport Committees of the Wan Chai, Kowloon City and Yau Tsim Mong District Councils on the proposal earlier this year. Members strongly supported the proposal and urged for its early implementation.

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22. We consulted the Legislative Council Panel on Transport on 28 June 2002 on this proposal. Members generally supported the proposal and some urged the Administration to expedite the implementation programme by compressing the time required for the traffic and civil engineering study and system engineering study as far as possible. The Administration's original implementation programme (as spelt out in LC Paper No. CB(1)2085/01-02(03)), which lasts for about 50 months, has been reviewed accordingly. Having regard to the various advance preparatory works required for the project, we have compressed the programme as far as possible and reduced the time required by about nine months. The revised programme is at Enclosure 3. Some Members also requested that the location of some VMSs be reviewed so that motorists can be given earlier warning about the tunnel traffic condition while others asked about the rationale for commissioning the EMSTF, instead of a consultancy firm in the private sector, to undertake this project. We have taken on board Members' suggestions and incorporated in Enclosure 2 the revised location of the VMSs. Our rationale for commissioning EMSTF is as set out in paragraph 18 above.

Environment, Transport and Works Bureau
July 2002

Major features of the proposed traffic control and surveillance system (TCSS) in Cross Harbour Tunnel

In general, a TCSS is installed in a tunnel and along its approaches to ensure safe and efficient operation of the tunnel and real-time monitoring of tunnel traffic. There are two major categories of facilities in a TCSS. The traffic control facilities are designed to guide the motorists through the tunnel safely and efficiently. The traffic surveillance facilities allow the tunnel operator to observe and monitor the actual traffic condition in the tunnel area at all times and act promptly in response to incidents.

(i) Traffic Control Facilities

Item	New System	Existing System
1) Full Variable Message Sign (FVMS) (Mounted on gantries in major approach roads to the tunnel to display bilingual traffic messages and graphical information to tunnel users.)	A number of light emitting diode (LED) type variable message signs will be erected on major tunnel approach roads to disseminate real-time bilingual message to motorists for their timely action.	No such provision.
2) Limited Variable Message Sign (LVMS) (Includes Tunnel Closed/Congested signs and advisory/ warning/ regulatory signs to effect traffic management schemes.)	Variable message signs to be installed can display additional pre-set messages, e.g. "Tunnel Congested".	Most are light-box type, which can only display limited pre-set information and may be difficult to read in daytime.
3) Traffic Light Signal (Installed on approach roads to regulate traffic entering the tunnel and stop over-height vehicles.)	Brighter maintenance-free LED type signal will be installed.	Conventional lamp bulb type.

Item	New System	Existing System
4) Gantry Lane-use Signal (Installed at tunnel approach roads for control of traffic especially during lane or tube closure.)	Brighter maintenance-free LED type signal will be installed.	Non-standard fibre optic signs. These are aged and difficult to read in daytime.
5) Tunnel Lane Control Signal (Installed throughout the tunnel tubes for lane control.)	Brighter maintenance-free LED type signal will be installed.	The existing signals are aged and difficult to read in daytime.

(ii) Traffic Surveillance Facilities

Item	New System	Existing System
1) Automatic Incident Detection System (AIDS) (Monitors the statistical traffic parameters collected from detection stations to determine whether an incident has happened.)	AIDS will be installed to enhance road safety and improve operational efficiency.	No such provision.
2) Over-height Vehicle Detection System (Installed at approach roads to detect vehicles that exceed the permitted height prior to their entering the tunnel.)	Reliable detectors of latest technology will be installed.	Aged system with reducing reliability.

(iii) Control Centre Facilities

Item	New System	Existing System
1) Traffic Management Computer (Controls and monitors the various traffic control and surveillance facilities, alerts tunnel operators by alarms, implements traffic plans and provides the human-machine interface. It is the core component of the TCSS.)	Traffic management computer will be provided to improve the traffic control and surveillance capability for efficient and error-free operation.	No such provision.
2) Control Console (Houses all control panels and computer terminals of the system to facilitate the operation of the control and surveillance facilities.)	All the control panels and computer terminals would be housed on a single console to facilitate operation.	Composed of control panels of different sub-systems installed at different periods.
3) Wall Map (Gives the tunnel operators an overview of the traffic conditions and operating status of the tunnel. The CCTV monitors and large display units are assembled on a roadmap background for showing the real-time control status of the tunnel.)	Large display units would be installed to show the real-time aspect and status of the traffic signs and signals on a roadmap background to enhance the efficiency of surveillance.	No such provision. Currently, only black/white CCTV monitors are provided.

Tentative Locations of Full Variable Messages Signs (FVMS) and Limited Variable Message Signs (LVMS)

	FVMS	LVMS
Hong Kong side approach roads		
Gloucester Road		
● E/B near Fenwick St	(a)	
● E/B near Wan Chai Sports Ground		(b)
● W/B near Percival Street		(c)
● N/B near Kingston Street		(d)
Island Eastern Corridor W/B near Watson Road	(e)	
Fleming Road N/B near Gloucester Road		(f)
Marsh Road S/B near Hung Hing Road		(g)
Morrison Hill Road N/B near Queen's Road East		(h)
Canal Road Flyover N/B near Gloucester Road		(i)
Kowloon side approach roads		
Chatham Road South		
● N/B near Chatham Court	(j)	
● N/B near Hong Chong Road		(k)
Chatham Road North		
● S/B near Fat Kwong Street	(l)	
● S/B near Wuhu Street		(m)
Waterloo Road		
● S/B near St George's Mansion	(n)	
Princess Margaret Road		
● S/B near Hong Chong Road		(o)

Note –

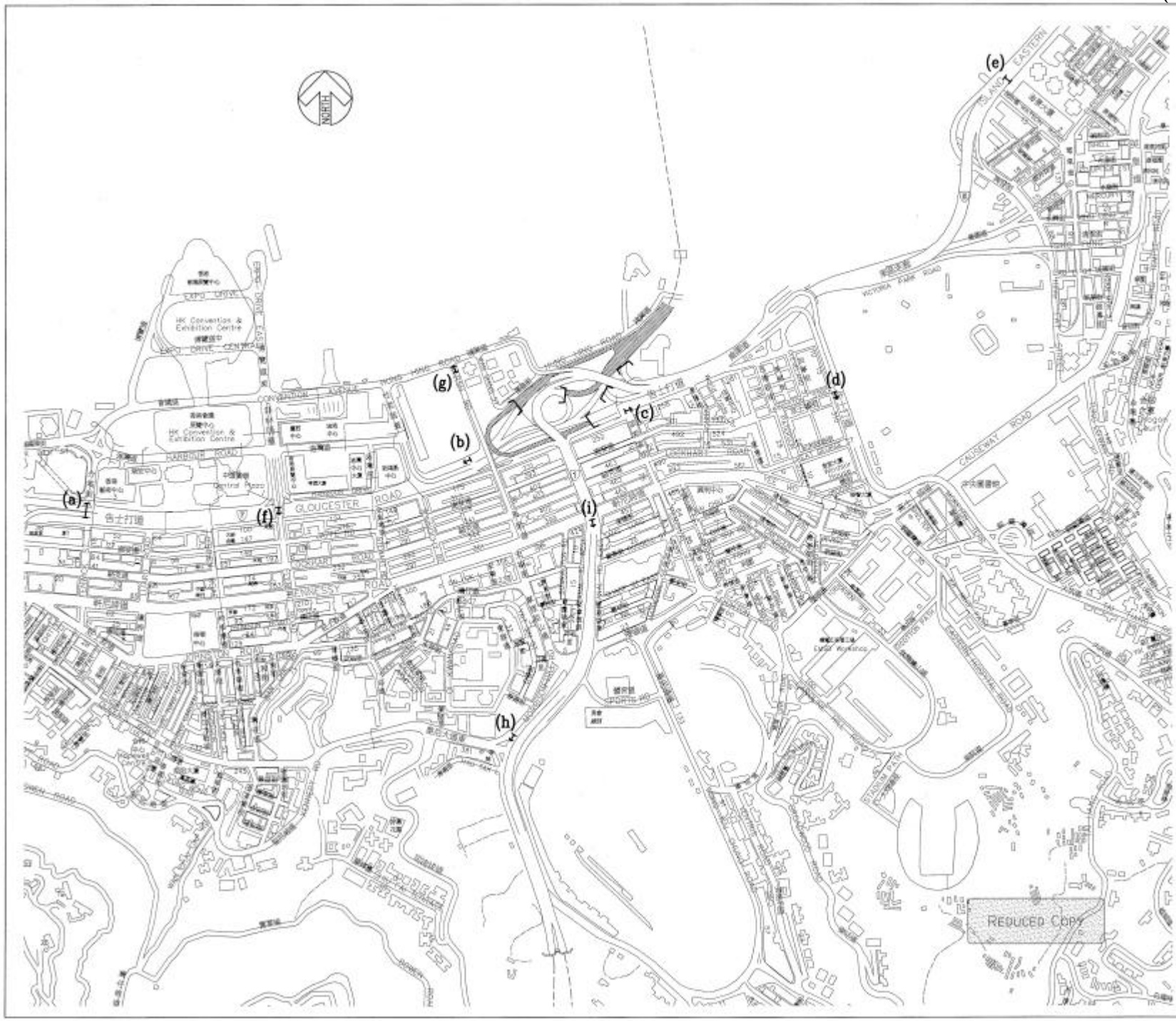
(i) The FVMS will be placed at strategic locations where motorists will be able to choose other cross-harbour routes upon reading the messages displayed on the FVMS.

(ii) E/B – eastbound

(iii) W/B – westbound

(iv) S/B – southbound

(v) N/B – northbound



NOTES:

LEGEND:

- PROPOSED LOCATION OF FULL VMS
- PROPOSED LOCATION OF LIMITED VMS
- TUNNEL CONTROLLED AREA

no.	date	description	initial
B	JUL 2002	LOCATION OF "a" and "e" REVISED	EE/P5/3
A	JUL 2002	NAMING ON VMS ADDED	SIGNED SPE/5

REVISION

drawn C.S. CHAN JUN, 2002

checked Y.C. YEUNG JUN, 2002

approved

SIGNED

Project Engineer : C.Y.HO, JOSEPH (EE/P5/3) 13.06.2002
Signature Date

contract no. N.A.

file no. EPP-8518

project no. E/PP/8518

contract

CROSS HARBOUR TUNNEL TCSS

drawing title

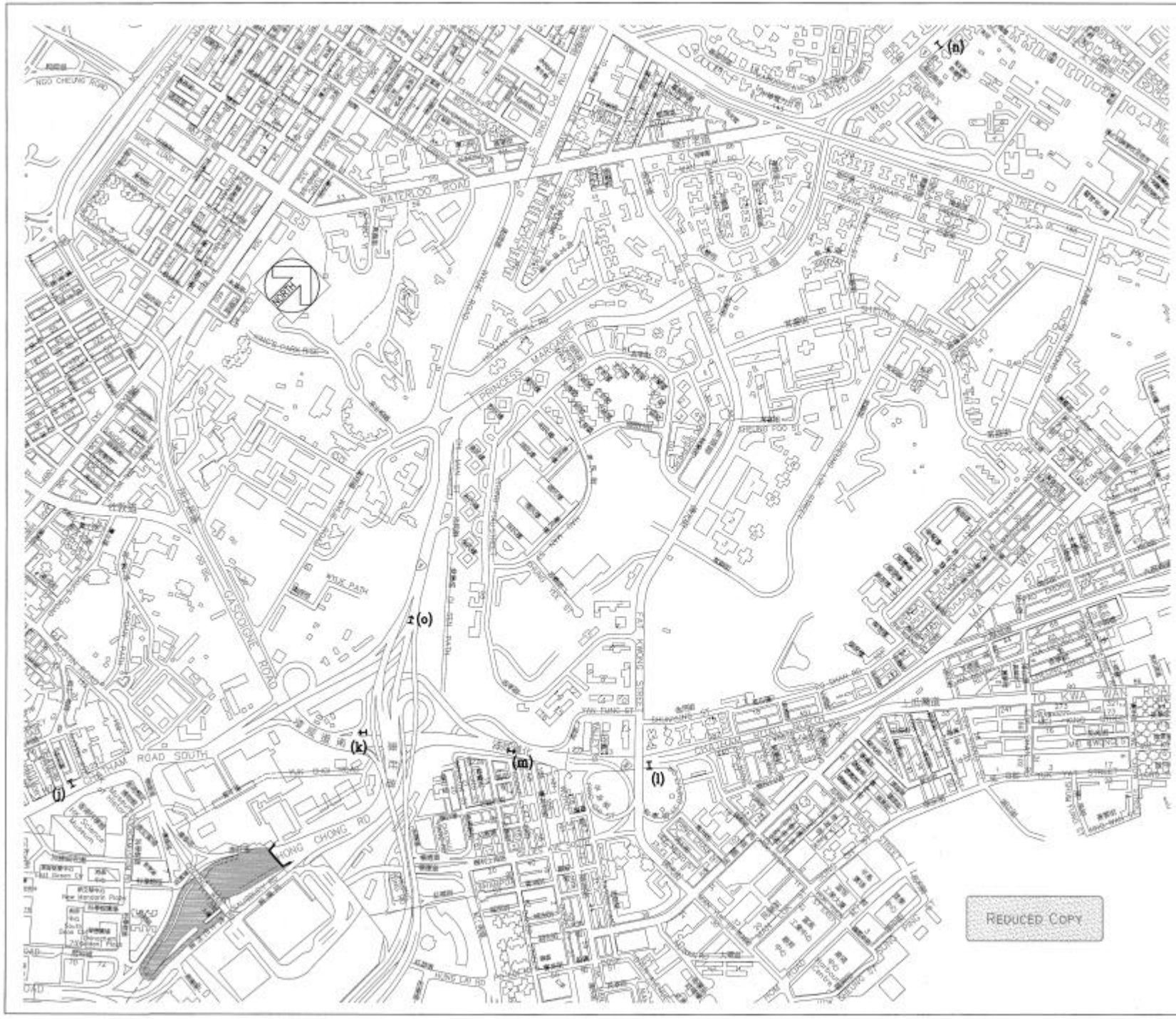
TENTATIVE LOCATIONS OF THE FULL VMS AND LVMS FOR CROSS HARBOUR TUNNEL AT SOUTH PORTAL AREA

drawing no. EL(A3)-11367/1

scale 1:8000

PROJECT DIVISION
ENGINEERING SERVICES BRANCH 1

ELECTRICAL AND MECHANICAL SERVICES DEPARTMENT
GOVERNMENT OF THE HKSAR



NOTES:

LEGEND:

- PROPOSED LOCATION OF FULL VMS
- PROPOSED LOCATION OF LIMITED VMS
- TUNNEL CONTROLLED AREA

no.	date	description	initial
B	JUL 2002	LOCATION OF "n" AND "l" REVISED	EE/P5/3
A	JUL 2002	NAMING ON VMS ADDED	SIGNED SPE/5

REVISION

drawn C.S. CHAN JUN, 2002

checked Y.C. YEUNG JUN, 2002

approved

SIGNED

Project Engineer : C.Y.HO, JOSEPH (EE/P5/3) 13.06.2002
Signature Date

contract no. N.A.

file no. EPP-8518

project no. E/PP/8518

contract

CROSS HARBOUR TUNNEL TCSS

drawing title

TENTATIVE LOCATIONS OF THE FULL VMS AND LVMS FOR CROSS HARBOUR TUNNEL AT NORTH PORTAL AREA

drawing no. EL(A3)-11367

scale 1:8000

PROJECT DIVISION
ENGINEERING SERVICES BRANCH 1

ELECTRICAL AND MECHANICAL SERVICES DEPARTMENT
GOVERNMENT OF THE HKSAR

Enclosure 3 to FCR(2002-03)32

Work Programme for Replacement of the Traffic Control and Surveillance System in Cross Harbour Tunnel

	Task Name	Duration (months)	2002				2003				2004				2005				2006			
			1-6		7-12		1-6		7-12		1-6		7-12		1-6		7-12		1-6		7-12	
0	Whole Project	41			■	■	■	■	■	■	■	■	■	■	■	■	■	■				
1	Traffic & Civil Engineering Study	8			■	■	■															
2	System Engineering Study	8				■	■	■														
3	Detailed Design	9					■	■	■													
4	Pre-qualification / Tendering	9							■	■	■											
5	Installation, Testing & Commissioning	22										■	■	■	■	■	■	■				
6	Defects Liability Period Commencement	12																	■	■	■	■