For discussion **FCR(2016-17)47**
on 17 June 2016

ITEM FOR FINANCE COMMITTEE

CAPITAL WORKS RESERVE FUND
HEAD 710 – COMPUTERISATION
New Subhead "Upgrading of the Transport Information System of the Transport Department"

CAPITAL WORKS RESERVE FUND
HEAD 708 – CAPITAL SUBVENTIONS AND MAJOR SYSTEMS AND EQUIPMENT
New Subhead "Installation of Traffic Detectors"

CAPITAL WORKS RESERVE FUND
HEAD 708 – CAPITAL SUBVENTIONS AND MAJOR SYSTEMS AND EQUIPMENT
New Subhead "Relocation of Transport Department's Operation Centres to the West Kowloon Government Offices"

HEAD 186 – TRANSPORT DEPARTMENT
Subhead 700 General non-recurrent
New Item "Relocation of Transport Department's Operation Centres to the West Kowloon Government Offices"

Members are invited to approve four new commitments for the Transport Department (TD) –

(a) $74,000,000 under Capital Works Reserve Fund (CWRF) Head 710 for the upgrading of the Transport Information System of TD;

(b) $194,000,000 under CWRF Head 708 for the installation of traffic detectors;

/(c) …..

(c) $73,254,000 under CWRF Head 708 for the relocation of TD's operation centres to the West Kowloon Government Offices (WKGO); and

(d) $56,049,000 under Head 186 TD Subhead 700 of the General Revenue Account for the relocation of TD's operation centres to WKGO.

PROBLEM

There is a need to enhance the Intelligent Transport Systems infrastructure of Hong Kong to meet the community's growing needs in respect of transport efficiency through the application of information technology. To this end, TD needs to upgrade its Transport Information System (TIS) to extend its service life, and to install additional traffic detectors along strategic routes to enable the collection of more comprehensive information on the real-time traffic conditions. TD also needs to co-locate some of its operation centres to achieve efficiency in traffic control and management.

PROPOSAL

2. The Commissioner for Transport, with the support of the Secretary for Transport and Housing, proposes to –

(a) upgrade TD's existing TIS to extend its service life and enhance the system performance (as supported by the Government Chief Information Officer) at an estimated cost of $74,000,000;

(b) install traffic detectors along some of the strategic routes at an estimated cost of $194,000,000; and

(c) relocate the three Area Traffic Control Centres in Harbour Building, Immigration Tower (IT) and Kowloon Government Offices, the Emergency Transport Coordination Centre and the Traffic Control and Surveillance Systems Centre in IT to WKGO at an estimated cost of $129,303,000 (comprising $73,254,000 under CWRF Head 708 and $56,049,000 under Head 186 TD Subhead 700).

/3. …..

3. Major details and financial implications of the above proposals are at Enclosures 1 to 3.

Encls. 1 to 3

Transport and Housing Bureau
June 2016

Upgrading of the Transport Information System of the Transport Department ($74,000,000)

BACKGROUND

Launched in 2008, the Transport Information System (TIS) is a major system of the Transport Department (TD) which serves as a centralised data warehouse that enables the processing, analysing and sharing of traffic and transport data by the staff of TD. It has several business functional modules, including management of traffic improvement schemes, managing public transport services, and traffic accident blacksite identification, etc.

2. Some of the TIS services are available to the public in various forms, including the HKeTransport[1], the HKeRouting[2] and the Road Traffic Information Service (RTIS)[3]. These services provide transport and road traffic information to the public, enabling public transport passengers or motorists to plan their journeys in advance. On average, the annual usage of these services has increased by about 700% since their first launch and their total usage was about 8.1 million times in 2015. The TIS also creates, updates and maintains the Intelligent Road Network Packages (IRNP)[4], which is the vital spatial data infrastructure for supporting the driving route searching function of HKeRouting. The IRNP is also open to academics for research purpose and the private sector for development of value added services[5].

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1 Hong Kong eTransport provides public transport route searching service and produces results based on users' preference on shortest journey time, lowest fare or least number of transfers.

2 Hong Kong eRouting provides driving route searching service and produces results based on users' preference on shortest driving distance, shortest travel time or lowest toll.

3 RTIS provides real-time traffic information to the public, including special traffic news, real-time closed-circuit television traffic condition images, estimated journey time of the three cross-harbour tunnels and estimated traffic speed at major roads, so as to facilitate their journey planning to avoid congestion.

4 IRNP is a dataset on up-to-date traffic directions, turning restrictions at road junctions and stopping restrictions, etc. in geographic information system (GIS) format.

5 IRNP is provided to the public at a charge, with sample dataset available for academics at concessionary price.

JUSTIFICATION

3. The hardware and software of the TIS, which were developed more than eight years ago, are becoming outdated and many spare parts are unavailable, rendering maintenance of the system more difficult. The ten-year maintenance contract of the existing TIS will expire in July 2018. With unavailable spare parts for the aged hardware, system failures may become more frequent. Moreover, some vendors may not provide up-to-date security patches for the outdated software, rendering the TIS vulnerable to threats of cyber-attacks. As a result, the reliability and availability of the TIS will be at stake.

4. Apart from maintenance difficulty, the current TIS was designed and developed mainly for processing and disseminating traffic data which are static in nature. In the Big Data era[6], there is a growing need for efficient processing of a vast amount of real-time traffic and transport data (such as traffic speed and traffic flow) for analysing and predicting traffic conditions and better traffic management. The present system infrastructure cannot cope with the increasing demand for better services. For instance, it cannot provide real-time prediction of traffic condition through rapid analysis of massive traffic data to assist motorists in making decision on alternative routing to avoid congested areas/roads.

5. With a view to exploring opportunities to enhance the services by deployment of technology, TD completed an Information Systems Strategy Study and a Technical Review on System Infrastructure for the TIS in early 2015. Based on findings of the studies, it is concluded that the design approach of the existing TIS is still applicable and there is no need to redevelop the whole system[7]. Timely upgrading and replacement of the aged hardware and software is, nevertheless, necessary in order that the system's service life can be extended for another ten years. The studies also recommend upgrading the system with enhanced functions and features to ensure the continuity of the public and internal services supported by the TIS, and to meet rising needs to cater for Big Data analysis.

6. It is of utmost importance to maintain an effective and efficient TIS to enable the provision of traffic and transport services to the public. With the support of the Government Chief Information Officer, we propose to upgrade the TIS at an estimated cost of $74,000,000 to extend its service life and enhance the system performance.

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6 Big Data is a broad term for large or complex datasets which, after analysis using advanced techniques, can reveal much more useful information than that obtained from traditional datasets.

7 Redevelopment of the whole system is estimated to cost about $140 million.

7. The upgrading of the TIS will bring about the following benefits –

(a) Better service to the public

The upgraded TIS will adopt the latest technology to minimise service disruption and system downtime in order to enhance the system's reliability and availability. It will also provide better integration of the HKeTransport, HKeRouting and RTIS applications, so that more useful and personalised traffic information can be effectively and efficiently provided to the public.

Existing applications will be further enhanced for speedy dissemination of real-time traffic information to the public. The upgraded TIS will also provide improved system capabilities and processing power to facilitate development of more innovative applications. For instance, by analysing Big Data collected from various sources, real-time traffic and transport information highly relevant to individual's travel needs and location can quickly filter, so that personalised traveller information service can be provided to commuters.

(b) Better support to TD's operations

The upgraded TIS will be able to cope with the increasing demands not only from the public but also for improvements of TD's internal operation efficiency. It enables TD to carry out efficient collection and analysis of a vast amount of real-time data (including traffic flows, traffic speeds, traffic and transport incidents information, etc.) for better traffic and transport management. It can also provide better support for the use of mobile devices during field work, so that collection and updating of traffic and transport data can be done quickly and effectively. Further, the traffic and transport data in various forms (including texts, images, videos, etc.) can be processed in a much more efficient manner.

(c) Better spatial data visualisation and sharing

The latest GIS tool will be used to provide a visualisation of spatial data for better analysis to support traffic-related decision making. For instance, visualisation and analysis of real-time and historical traffic data (such as traffic speeds and flows for roads in an area) can facilitate the review of transport demand and the design of traffic improvement schemes. The upgraded TIS will also provide a better traffic and transport spatial data infrastructure, including real-time and historical data from road detectors and other channels, for sharing among government departments and other organisations. It

will create an environment conducive to developing value-added services relating to smart mobility by the private sector.

(d) Better system security

Timely replacement of the ageing hardware and software will ensure the continuity of the TIS in providing reliable traffic and transport information services to the public, including special traffic news, traffic snapshot images, traffic speed map and journey time indicators. It also ensures that up-to-date security patches can be applied to safeguard the TIS.

FINANCIAL IMPLICATIONS

Capital expenditure

8. It is estimated that the upgrading work will incur a total capital expenditure of $74,000,000. The detailed breakdown is as follows –

		$'000
(a)	Hardware	15,365
(b)	Software	14,362
(c)	Communication Network	1,440
(d)	Implementation Services	35,332
(e)	Site Preparation	200
(f)	Contract Staff	3,777
(g)	Contingency	3,524
	Total	**74,000**

9. On paragraph 8(a) above, the estimate of $15,365,000 is for computer hardware costs including servers, Storage Area Network and backup tape solution, network equipment, etc.

10. On paragraph 8(b) above, the estimate of $14,362,000 is for software licence costs for servers (web, application and database), including operating systems, application and web server software, database management system, report server software, system administration and monitoring software, etc.

11. On paragraph 8(c) above, the estimate of $1,440,000 is for subscription of required additional network bandwidth and the initial configuration.

12. On paragraph 8(d) above, the estimate of $35,332,000 is for the acquisition of service from an external service provider for project implementation, including overall project management, design and setup, system and programme migration, data conversion, user acceptance tests (UAT) support, etc.

13. On paragraph 8(e) above, the estimate of $200,000 is for the site preparation work in the existing Primary Data Centre, Secondary Data Centre, and Development and UAT site.

14. On paragraph 8(f) above, the estimate of $3,777,000 is for the contract staff costs for assisting in various implementation tasks.

15. On paragraph 8(g) above, the estimate of $3,524,000 represents a 5% contingency on the items set out in paragraph 8(a) to (f).

16. The estimated cash flow is as follows –

Financial Year	**$'000**
2016-17	600
2017-18	22,200
2018-19	43,900
2019-20	7,300
Total	**74,000**

Other non-recurrent expenditure

17. A project team will be set up in TD for implementation of the upgrading of the TIS, including tendering, project management, support for system analysis and design, conducting UAT, etc. The project team will entail a total non-recurrent staff cost of about $5,874,000 from 2016-17 to 2018-19. The cost will be absorbed from within existing resources.

Recurrent expenditure

18. The on-going maintenance and support of the upgraded system will require an estimated recurrent cost of $10,530,000 from 2020-21 onwards. The relevant recurrent costs will be met from within existing resources. In addition, the staff in TD supporting the existing system will be redeployed to operate the upgraded system, hence no additional recurrent staff cost will incur.

Cost and Benefit Analysis

19. If the upgrading of the TIS could not be approved and the Government had to sustain the existing system, $10,610,000 will be incurred per annum for maintenance and operational costs. These costs would be avoided if the TIS is upgraded. The detailed cost and benefit analysis for the upgrading of TIS is at **Annex**.

IMPLEMENTATION PLAN

20. We plan to start the implementation of the upgrading of TIS as soon as funding is approved for completion by mid 2018, to tie in with the expiry of the current ten-year maintenance contract. The proposed implementation plan is set out below –

	Activity	**Target Completion Date**
(a)	Preparation of tender documents and invitation of tender	July 2016
(b)	Tender evaluation and contract award	January 2017
(c)	Project implementation	
	(i) System design	June 2017
	(ii) System implementation and UAT	March 2018
	(iii) System live-run	July 2018

PUBLIC CONSULTATION

21. We consulted the Legislative Council Panel on Transport on the proposal on 29 February 2016. Members in general supported the proposal. In response to Members' request, supplementary information has been provided to the Panel.

Annex

Cost and Benefit Analysis
Upgrading of the Transport Information System of the Transport Department

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	Total
						($'000)					
Cost of the proposal											
Capital Expenditure	600	22,200	43,900	7,300	-	-	-	-	-	-	74,000
Non-recurrent Staff cost	1,711	2,736	1,427	-	-	-	-	-	-	-	5,874
Sub-total	2,311	24,936	45,327	7,300	-	-	-	-	-	-	79,874
Recurrent Expenditure	-	-	2,815	9,285	9,285	9,285	9,285	9,285	9,285	9,285	67,810
Recurrent Staff cost	-	-	726	1,141	1,245	1,245	1,245	1,245	1,245	1,245	9,337
Sub-total	-	-	3,541	10,426	10,530	10,530	10,530	10,530	10,530	10,530	77,147
(A) Total Cost	**2,311**	**24,936**	**48,868**	**17,726**	**10,530**	**10,530**	**10,530**	**10,530**	**10,530**	**10,530**	**157,021**
Savings and cost avoidance											
Recurrent Expenditure	-	-	7,433	9,365	9,365	9,365	9,365	9,365	9,365	9,365	72,988
Recurrent Staff cost for existing operation	-	-	726	1,141	1,245	1,245	1,245	1,245	1,245	1,245	9,337
Sub-total	-	-	8,159	10,506	10,610	10,610	10,610	10,610	10,610	10,610	82,325
(B) Total Savings	**-**	**-**	**8,159**	**10,506**	**10,610**	**10,610**	**10,610**	**10,610**	**10,610**	**10,610**	**82,325**
Net cost (-) / Net savings (+) (C)=(B)–(A)	**-2,311**	**-24,936**	**-40,709**	**-7,220**	**80**	**80**	**80**	**80**	**80**	**80**	**-74,696**
Net Cumulative Cost / Savings	**-2,311**	**-27,247**	**-67,956**	**-75,176**	**-75,096**	**-75,016**	**-74,936**	**-74,856**	**-74,776**	**-74,696**	

Installation of Traffic Detectors
($194,000,000)

BACKGROUND

The Government endeavours to provide a safe, efficient, reliable and environmentally friendly transport system which meets the economic, social and recreational needs of the community. One of the policy initiatives is to make good use of technology to enhance transport efficiency. Installation of traffic detectors to collect real-time traffic data is one of the key measures to implement this policy initiative.

2. Currently, traffic detectors are installed as part of a Traffic Control and Surveillance System (TCSS)[1]. TCSS helps monitor and manage traffic to improve road safety and efficiency. Currently not all the strategic routes in Hong Kong are equipped with TCSS. TCSSs are usually installed as part of the road projects when new strategic routes are built or when existing routes are reconstructed[2].

3. In addition to TCSS, traffic detectors are installed along the parts of strategic routes covered by Journey Time Indication Systems[3] and Speed Map Panels[4]. These traffic detectors, together with those for TCSS, cover only about 45% of the strategic routes in Hong Kong.

4. It is increasingly common for overseas jurisdictions to deploy advanced technology for traffic monitoring and management. By installing extensive traffic detectors on main and important roads to continuously collect real-time traffic data, transport authorities can more effectively monitor and manage road traffic and provide more information to commuters for route or modal choices. For instance, in the United Kingdom, detectors are installed on

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1 TCSS comprises closed circuit televisions (CCTV) cameras, vehicle detectors, variable speed limit signs, lane control signals and variable message signs installed on highways and bridges with central computer facilities to help monitor and control traffic flows.

2 TCSSs have been installed in the following locations: the Aberdeen Tunnel, the Cross Harbour Tunnel, the Eastern Harbour Crossing, the Kai Tak Tunnel, the Lion Rock Tunnel, the Shing Mun Tunnels, the Tai Lam Tunnel, the Tate's Cairn Tunnel, the Tseung Kwan O Tunnel, the Western Harbour Crossing, the Shenzhen Western Corridor, the Tolo Highway between Sha Tin and Tai Po near Hong Lok Yuen, the Tsing Ma Control Area and the Tsing Sha Control Area. TCSSs will also be installed at the Central Wanchai Bypass and the Tolo Highway between Tai Po near Hong Lok Yuen and Fanling.

3 Journey Time Indication Systems provide the estimated journey times of different cross harbour routes.

4 Speed Map Panels provide the traffic conditions and estimated journey times of different routes from the New Territories towards Kowloon.

motorways and most of the trunk roads, normally at intervals of 500 metres, to collect data on traffic flows, speed and travel times.

5. The Financial Secretary announced in the 2016-17 Budget that $200 million would be allocated to install additional traffic detectors along some strategic routes to provide the public with more real-time traffic information and enhance transport efficiency (the project). The locations of the proposed installation of 400 sets of traffic detectors are shown in **Annex A**.

JUSTIFICATION

6. Currently, only about 45% (230 kilometres (km) out of 500 km[5] road sections) of the strategic routes in Hong Kong are installed with traffic detectors. A complete picture of the traffic conditions along the entire strategic route network is hence not available. This has constrained the Transport Department (TD)'s capability in handling traffic incidents as well as traffic management. Specifically, early action cannot be taken to minimise the adverse impact caused by traffic congestion and to disseminate latest traffic information to commuters in an effective and efficient way.

7. After completion of the project, the coverage of traffic detectors along strategic routes in Hong Kong will be increased to about 80%[6] (i.e. 400 km out of 500 km), bringing about the following benefits –

(a) <u>More efficient response to traffic incidents on strategic routes</u>

TD is developing the Traffic and Incident Management System (TIMS) to enhance the efficiency of traffic and incident management. The project will provide more real-time traffic information to TIMS. TD staff as well as other relevant departments (e.g. the Police) will then be able to know the actual traffic conditions and the occurrence of incidents on strategic routes more efficiently. Prompt actions can be taken in response to different traffic conditions and traffic incidents for better traffic incident management.

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[5] The total length of strategic routes in Hong Kong is about 250 km. There are two traffic bounds on strategic routes. Since traffic detectors are required for both bounds, the total length of road sections requiring traffic detectors to be installed is 500 km.

[6] Further expansion of detector installation will be considered after completion of the project.

(b) Provision of more real-time traffic information to the public

TD has been disseminating real-time traffic information through electronic platforms, such as websites and mobile applications. After additional traffic detectors have been installed under the project, more real-time traffic information will be disseminated through these electronic platforms. Commuters will be able to obtain the latest information on traffic conditions through various channels to make informed route choices and avoid congested routes.

TD has uploaded datasets containing real-time traffic information on the Government's public information portal "data.gov.hk" so that interested parties can use the datasets to develop mobile applications for wider use by the public. With the additional detectors proposed to be installed, the coverage of such information can be enhanced, facilitating the development of more innovative applications relevant to commuter's travel needs and locations.

(c) Building up Big Data[7] for transport in Hong Kong

Upon completion of the project, the data collected from both the new and existing traffic detectors will be combined to form a near-complete picture of the traffic conditions of strategic routes. As these data are collected round the clock, such large dataset can be analysed using Big Data Analytics to uncover traffic patterns and trends, which are useful for various applications such as prediction of traffic queues, transport planning and management, etc. TD will also make available these large datasets subject to Big Data Analysis for use by academics for transport research, as well as by other interested parties to develop innovative applications.

FINANCIAL IMPLICATIONS

Capital expenditure

8. It is estimated that the proposed installation of traffic detectors will incur a total capital expenditure of $194,000,000[8]. The breakdown is as follows –

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[7] Big Data is a broad term for large or complex datasets which, following analysis using advanced techniques, can reveal much more useful information than that can be obtained from traditional datasets.

[8] Out of the $200 million set aside for installation of traffic detectors as announced in the Budget, $194,000,000 will be for the capital expenditure and the remaining $6,000,000 will be for one-off non-recurrent expenditure (see paragraph 16).

		$'000
(a)	Detailed design and supervision during construction	12,000
(b)	Procurement of traffic detectors	48,000
(c)	Provision of central computer system	23,000
(d)	Provision of power and data communication	19,000
(e)	Associated civil and electrical and mechanical works	75,000
(f)	Contingency	17,000
	Total	**194,000**

9. On paragraph 8(a) above, the estimate of $12,000,000 is for the engagement of consultancy service to carry out the detailed design and supervision of site works during construction stage.

10. On paragraph 8(b) above, the estimate of $48,000,000 is for the procurement of about 400 sets of traffic detectors to be installed along part of strategic routes for collection of real-time traffic data including traffic flow, speed, journey time, etc.

11. On paragraph 8(c) above, the estimate of $23,000,000 is for the procurement and development of the central computer system for data processing, control and monitoring, and data fusion with the existing traffic detectors.

12. On paragraph 8(d) above, the estimate of $19,000,000 is for the provision of power supply and communication network for transfer of data from field equipment to the central computer system.

13. On paragraph 8(e) above, the estimate of $75,000,000 is for the associated civil works and electrical and mechanical works for the installation of the traffic detectors including mounting poles, roadside cabinets, cable ducts, etc.

14. On paragraph 8(f) above, the estimate of $17,000,000 represents a contingency of about 10% on paragraph 8(a) to (e).

15. The estimated cash flow is as follows –

Financial Year	$'000
2016-17	500
2017-18	3,500
2018-19	20,000
2019-20	65,000
2020-21	65,000
2021-22	35,000
2022-23	5,000
Total	**194,000**

Other non-recurrent expenditure

16. The installation of traffic detectors will entail a total non-recurrent staff cost of about $6,000,000 for a period of three years from 2016-17 to 2018-19 for delivering the project during the early stage, including detailed design, tendering and the initial stage of contract implementation. We have included sufficient provision in the 2016-17 Estimates to meet such cost and will reflect the resources required in the Estimates of the relevant years.

17. The workload at the later stage of the contract implementation would be reviewed upon completion of the detailed design and staff resources to administer the implementation works will be worked out in due course.

Recurrent expenditure

18. The on-going maintenance and support of the proposed traffic detectors will require an estimated recurrent cost of $10,382,000 from 2022-23 onwards. The recurrent cost will cover hardware and software, communication and power supply, as well as management fee for maintenance.

19. The operation of the proposed traffic detectors will be undertaken by the relevant TD staff as part of their work. No additional recurrent staff cost will be incurred.

Cost and Benefit Analysis

20. The annual recurrent expenditure arising from the maintenance of the traffic detectors will be $10,382,000 from 2022-23 onwards. The installation of detectors on some of the strategic routes will bring about significant economic benefits in terms of reducing the response time to traffic incidents and travel time with the provision of more real-time traffic information to the public. We estimate that the annual economic benefits will be $10,490,000 in 2021-22 and will increase to $104,901,000 in 2025-26. It is estimated that there will be net benefit starting from 2022-23 and the net benefit will increase to $94,519,000 in 2025-26. The detailed cost and benefit analysis for the installation of traffic detectors is at **Annex B**.

IMPLEMENTATION PLAN

21. We plan to start the engagement of consultancy service in the detailed design of the project in late 2016 for completion by October 2017. The site installation and implementation works are targeted to commence in 2018 for completion in 2020. The proposed implementation plan is set out below –

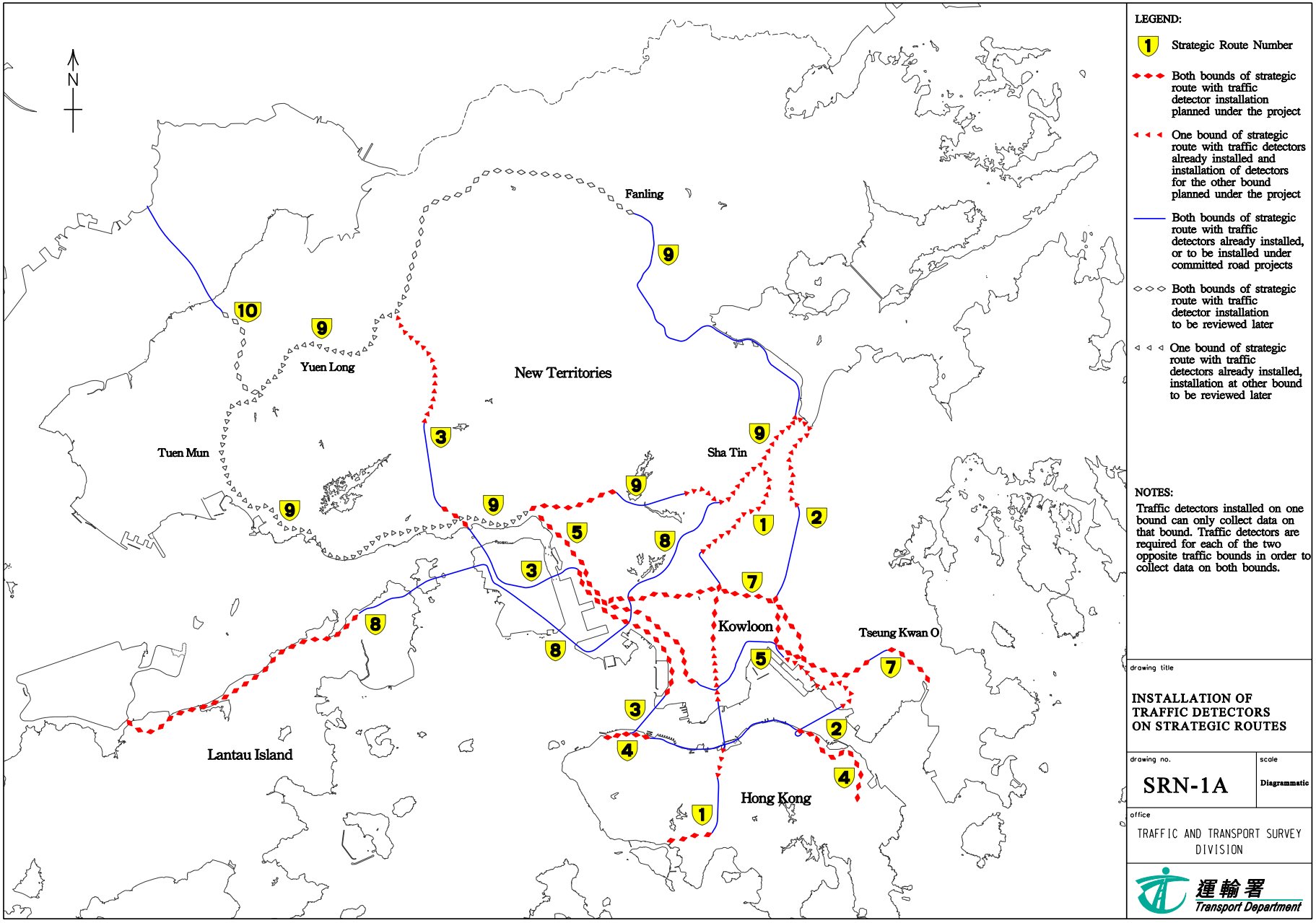
	Activity	**Target Completion Date**
(a)	Preparation of consultancy brief	August 2016
(b)	Selection of consultants	November 2016
(c)	Detailed design and preparation of tender documents	October 2017
(d)	Tendering for the installation work	Within 2018
(e)	Commissioning of first phase detectors	December 2019
(f)	Commissioning of all detectors	December 2020

PUBLIC CONSULTATION

22. We consulted the Legislative Council Panel on Transport on the proposal on 23 May 2016. Members in general supported the proposal. In response to Members' request, supplementary information has been provided to the Panel.

Annex A

Locations of the Proposed Installation of Traffic Detectors



Annex B

Cost and Benefit Analysis
Installation of Traffic Detectors

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	Total
						($'000)					
Cost of the proposal											
Capital Expenditure	500	3,500	20,000	65,000	65,000	35,000	5,000	-	-	-	194,000
Non-recurrent Staff cost	2,000	2,000	2,000	-	-	-	-	-	-	-	6,000
Sub-total	2,500	5,500	22,000	65,000	65,000	35,000	5,000	-	-	-	200,000
Recurrent Expenditure	-	-	-	-	-	-	10,382	10,382	10,382	10,382	41,528
Sub-total	-	-	-	-	-	-	10,382	10,382	10,382	10,382	41,528
(A) Total Cost	**2,500**	**5,500**	**22,000**	**65,000**	**65,000**	**35,000**	**15,382**	**10,382**	**10,382**	**10,382**	**241,528**
Savings and cost avoidance											
Real-time Traffic Information to travellers	-	-	-	-	-	8,848	26,545	53,090	70,787	88,484	247,754
Incident Duration Reduction	-	-	-	-	-	1,642	4,925	9,850	13,134	16,417	45,968
Sub-total	-	-	-	-	-	10,490	31,470	62,940	83,921	104,901	293,722
(B) Total Savings	-	-	-	-	-	**10,490**	**31,470**	**62,940**	**83,921**	**104,901**	**293,722**
Net cost (-) / Net savings (+) (C)=(B)–(A)	**-2,500**	**-5,500**	**-22,000**	**-65,000**	**-65,000**	**-24,510**	**16,088**	**52,558**	**73,539**	**94,519**	**52,194**
Net Cumulative Cost / Savings	**-2,500**	**-8,000**	**-30,000**	**-95,000**	**-160,000**	**-184,510**	**-168,422**	**-115,864**	**-42,325**	**52,194**	

Relocation of Transport Department's Operation Centres to the West Kowloon Government Offices ($129,303,000)

BACKGROUND

On 5 June 2015, the Finance Committee approved the West Kowloon Government Offices (WKGO) construction project which will provide accommodation for, amongst others, the three Area Traffic Control Centres (ATCCs) now housed in Harbour Building (HB), Immigration Tower (IT) and Kowloon Government Offices (KGO). The location plan of WKGO and the existing operation centres are shown in **Annex A**.

2. The Area Traffic Control (ATC) system uses a central computer to co-ordinate the operations of on-street traffic signals on a regional basis. It aims at providing a series of green signals for vehicles passing through various signalised junctions, so as to achieve smooth traffic flow by minimising stops and delays of vehicles at traffic signals. The ATC system also allows the Transport Department (TD)'s staff at the ATCCs to monitor and adjust on-street traffic signals timing in real time having regard to the traffic conditions, particularly to alleviate traffic congestion arising from major traffic incidents. Currently, there are four ATC systems for different parts of Hong Kong, to which some 1 800 signalised junctions throughout the territory are connected –

(a) Hong Kong Island ATC system;

(b) Kowloon, Tsuen Wan, Sha Tin, Tseung Kwan O ATC system;

(c) Tai Po & North Districts ATC system; and

(d) Tuen Mun & Yuen Long ATC system.

These four ATC systems are located in the three aforementioned ATCCs[1], where traffic signals are monitored and controlled by TD's staff in real time.

3. The Emergency Transport Coordination Centre (ETCC) in IT co-ordinates the actions and responses of different government departments and public transport operators in emergency situations and during major events which

[1] Hong Kong Island ATC system is located in the ATCC in HB. The Kowloon, Tsuen Wan, Sha Tin, Tseung Kwan O ATC system is located in the ATCC in KGO. The Tai Po & North Districts ATC system and the Tuen Mun & Yuen Long ATC system are located in the ATCC in IT.

have significant traffic implications, to ensure smooth traffic flow and adequate public relief measures. ETCC also disseminates traffic and incident information to the public through the media to minimise the traffic impact of an incident. The ETCC is manned by TD's staff round the clock to handle traffic incidents and events which have traffic implications. The Traffic and Incident Management System (being developed), which is a computerised system to facilitate traffic and transport incident management and dissemination of real-time traffic and transport information to the public, will be commissioned later in 2016 to support the work of ETCC staff, and is a critical system of TD.

4. The Traffic Control and Surveillance Systems Centre (TCSSC) in IT manages the Traffic Control and Surveillance Systems (TCSS) installed at strategic roads and bridges which have no on-site control centres[2]. These TCSS comprise closed circuit televisions (CCTV) cameras, vehicle detectors, variable speed limit signs (VSLS), lane control signals (LCS) and variable message signs (VMS) installed on highways and bridges with central computer facilities to help monitor and control traffic flows. When there is a road incident, TCSS can facilitate TD or the management, operation and maintenance (MOM) contractor of tunnel / bridge / tolled road to identify it through CCTV. They will then activate changes of appropriate LCS to indicate closure of traffic lanes, adjust VSLS to reduce speed limits and disseminate traffic information through VMS to alert motorists at the upstream. Upon clearance of the incident, TD or the MOM contractor concerned will resume all LCS, VSLS and VMS to their normal states. Currently, the TCSS on the Shenzhen Bay Bridge and the Tolo and Fanling Highways (section between Ma Liu Shui and Tai Hang) are not managed by any MOM contractor and are managed by the TCSSC. In the future the TCSSC will also operate the TCSS that will be installed at the Hong Kong Link Road connecting the Hong Kong-Zhuhai-Macao Bridge with the Hong Kong Boundary Crossing Facilities.

JUSTIFICATION

5. We propose to relocate the existing ATCCs, ETCC and TCSSC to the new co-located operation centre in WKGO, with a back-up centre for the ATCCs to be set up in HB. In addition, a unified interface will be provided for accessing all four ATC systems upon relocation. New equipment will be provided at the co-located operation centres to enhance the capability of the various systems in handling traffic management. Telecommunication lines will also be redirected.

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[2] On-site control centres are premises located at or near strategic roads and bridges equipped with TCSS, and provided with personnel to perform TCSS operations. For example, the Tsing Sha Control Area in Route 8 is equipped with TCSS and has an on-site control centre to operate the TCSS.

Relocation of Operation Centres

6. As all TD's offices are required to be vacated from IT and move into WKGO upon the latter's completion, at the very least is for the Tai Po & North District and the Tuen Mun & Yuen Long ATC systems, the ETCC and the TCSSC (which are now located in IT) to be relocated to WKGO. It would enable staff and other resources to be used more efficiently and facilitate more effective overall monitoring of the entire territory's traffic situation and handling of cross-district traffic incidents if the other operation centres, now located in HB and KGO, are to be accommodated in WKGO as well.

7. The relocation of the four systems in ATCCs, one system in ETCC and three systems in TCSSC to the new co-located centre in WKGO involves dismantling, relocating and assembling sophisticated computer systems and telecommunication equipment. The relocation project is complex and requires a high level of expertise and accuracy in its planning, design and coordination because eight traffic control systems are involved. In particular, as these systems are crucial in assisting TD's work on traffic management, their relocation has to be properly arranged to minimise disruption to services. Specialist consultants will thus be employed to carry out the planning, design, tendering, and supervision of the associated re-location work.

8. In addition, some 700 CCTV cameras are currently installed at major road junctions and strategic road sections to capture real-time traffic images. These CCTV cameras are connected to several discrete CCTV systems operated by different user interfaces, depending on the time at which the cameras were procured. The CCTV systems are in turn connected to the ATCCs, ETCC and TCSSC, providing real-time traffic images to TD's staff at these centres to perform traffic management duties such as traffic monitoring, adjustment of traffic signals, incident handling and information dissemination, etc. Upon relocation of the operation centres to WKGO, these discrete CCTV systems will be aligned and connected to a centralised CCTV system under a unified user interface to facilitate the functioning of the various operation centres at the WKGO.

Unified Interface for ATC Systems

9. Due to different brands and implementation times of the four ATC systems[3], their system software and hardware are different and have different user interfaces. TD staff operating one ATC system have to undergo training in order

[3] Hong Kong Island ATC system was implemented in 2006; Kowloon, Tsuen Wan, Sha Tin, Tseung Kwan O ATC system in 2012; Tuen Mun & Yuen Long ATC system in 2009; and Tai Po & North Districts ATC system in 2005 which is now being renewed. Two brands of ATC system are currently employed.

that they can also operate the other ATC systems. As staff familiar with one ATC system cannot be readily deployed to operate another ATC system they are unfamiliar with, compromising on the efficiency in utilising staff resources.

10. Upon relocation of the three ATCCs to WKGO, a unified graphical user interface (GUI)[4] for accessing all the four ATC systems will be developed to achieve efficiency gains through sharing of the operation resources. To materialise a unified GUI, the software and hardware of ATC systems of the same brand will be aligned to the same version / capability. The unified GUI will be capable of accessing different brands of the ATC system to facilitate operations. Operators will be trained to operate the unified GUI instead of separately trained to operate individual ATC systems. A smaller number of categories of software / hardware in the ATC systems will also reduce maintenance overheads. Hence, manpower and other resources can be more efficiently and flexibly deployed to meet the fluctuating workload of ATC system operations, including deploying more staff for particular districts to deal with major events and traffic-related incidents.

Back-up Centre for ATCCs

11. At present, the three ATCCs operating respectively in HB, KGO and IT provide backup functions for each other. In the event that one of the ATCCs cannot be accessed, commands for operating traffic signals and CCTV images can be made available at other ATCCs.

12. Upon relocation of the ATCCs to WKGO, an off-site backup centre in HB will have to be set up to provide enhanced recovery functions of the equipment in the event of serious incidents in WKGo preventing its normal operation. If WKGO is not accessible with all ATC systems remaining intact, TD staff can operate the ATC systems at the backup centre in HB. In the event of very serious incidents causing damage to the ATC systems equipment in WKGO, the equipment in the backup centre will allow limited ATC systems operation, e.g. 200 critical signal junctions, to be resumed in the shortest possible. The archives stored in the backup centre will allow complete recovery of the ATC systems when the damage of the computer equipment in WKGO has been repaired. We consider HB the most suitable location for the backup centre because the existing facilities on Hong Kong Island ATCC could be re-used as far as possible.

13. As regards the ETCC and TCSSC, their off-site backup centres currently located at the Mong Kok Government Offices will continue to serve the purpose.

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[4] A GUI is an interface appearing on the computer screen, which allows users to interact with the system through graphical icons. Upon relocation, although there will still be four separate ATC systems, integration of the operating systems, traffic control application software and system hardware will be done so that a unified user interface can be provided.

Provision of New Equipment and Redirection of Telecommunication Lines

14. The existing equipment and facilities at the ATCCs in the HB, IT and KGO, including video walls, uninterruptible power supply (UPS), operator terminals and ancillary equipment, were acquired under different projects at various times over the past decades. Most of them will have been operated for ten to 13 years by the time of relocation. While we shall re-use serviceable equipment as much as practicable[5], new video walls and equipment ancillary to the video walls will need to be set up in WKGO.

15. Upon relocating the operation centres to WKGO, all the existing telecommunication lines connecting the on-street traffic signal controllers and CCTV cameras on Hong Kong Island (HKI) have to be extended across the harbour to WKGO. In order to reduce telecommunication costs, a telecommunication hub on HKI is required for termination and concentration of the existing ATC and CCTV telecommunication lines on HKI before transmitting to WKGO[6]. HB is considered the most suitable location for providing the telecommunication hub function as all the existing ATC and CCTV telecommunication lines on HKI already terminate at HB. Hence, the proposed off-site backup centre for the ATCCs in HB will also serve as the telecommunication hub of the ATC and CCTV cameras on HKI.

Measures to Ensure and Facilitate Smooth Relocation

16. To facilitate the smooth relocation of the operation centres, TD plans to, subject to further study, separate the eight computer systems and telecommunication equipment at the existing operation centres into components, and make use of backup and spare system components to facilitate the relocation. Where necessary, additional equipment and telecommunication links between the existing centres and the new co-located centre at WKGO will be acquired. During the relocation, TD will transport the components carefully one by one, and reconnect each of them. Each of the components will be fully tested before re-commissioning. The process will be repeated until all the components at the existing centres are transported and re-connected at WKGO.

17. During the relocation, the operations at the existing centres will not be affected. Existing backup centres and/or backup systems will be activated as a contingency measure. In addition, there are local traffic signal controllers to

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[5] For instance, the existing UPS in HB and video walls in IT will be refurbished and re-used in the HB backup centre.

[6] Currently, traffic signal controllers and some CCTV cameras on HKI are connected point-to-point to the Hong Kong Island ATCC in HB. Upon relocation, instead of moving all individual ends of telecommunication lines now connecting to HB to WKGO directly, we will keep the ends in HB, gather the data before relaying them to WKGO via high speed data lines.

operate traffic signals. While the ATC systems coordinated traffic signals to provide a series of green signals at signalised junctions, the local controllers could operate properly without the ATC systems because the signal sequence is programmed and stored in the controllers. There is hence no need to deploy extra manpower in various districts to handle emergency situations during the relocation. If situation warrants (e.g. during the relocation of the most critical components), TD may step up the ETCC operation.

FINANCIAL IMPLICATIONS

18. It is estimated that the proposal will incur a one-off expenditure of $129,303,000, comprising the capital expenditure of $73,254,000 under Capital Works Reserve Fund (CWRF) Head 708 – Capital Subventions and Major Systems and Equipment and the non-recurrent expenditure of $56,049,000 under Head 186 TD Subhead 700 General non-recurrent.

Capital expenditure

19. The capital expenditure of $73,254,000 under CWRF Head 708 is mainly for acquisition of equipment and systems, with breakdown as follows –

	$'000
(a) Alignment and integration of ATC systems and CCTV systems	18,948
(b) Provision of video walls and ancillary equipment at WKGO	23,004
(c) Establishment of a backup centre and telecommunication hub in HB	16,187
(d) Project management	9,302
(e) Contingency	5,813
Total	**73,254**

20. On paragraph 19(a) above, the estimate of $18,948,000 is for the following items –

(i) alignment and integration of the operating systems, traffic control application software and system hardware of the four ATC systems. Latest version available in the industry for all four ATC systems will be adopted so that a unified user interface can be provided; and

(ii) alignment and integration of various CCTV systems to a new centralised CCTV system with a unified user interface.

21. On paragraph 19(b) above, the estimate of $23,004,000 is for the provision of unified video walls, UPS for various systems in the operation centres, and operator terminals amongst other ancillary equipment required in the WKGO operation centre.

22. On paragraph 19(c) above, the estimate of $16,187,000 is for establishment of the back-up centre and telecommunication hub in HB.

23. On paragraph 19(d) above, the estimate of $9,302,000 is for the project management cost for the integration of ATC and CCTV systems in WKGO amongst other ancillary works including the provision of unified video wall displays in WKGO, and setting up the backup centre in HB. Related costs will include the expenses for employment of specialist consultants for preparing tender documents, overseeing the tending process, undertaking contract management, supervising the upgrading and installation works, and testing and commissioning the new systems in the operation centers in WKGO, and the bckup centre in HB.

24. On paragraph 19(e) above, the estimate of $5,813,000 represents a 10% contingency on the items set out in paragraph 19(a) to (c).

25. The estimated cash flow is as follows –

Financial Year	**$'000**
2016-17	190
2017-18	951
2018-19	951
2019-20	33,320
2020-21	37,842
Total	**73,254**

Other non-recurrent expenditure

26. The one-off non-recurrent expenditure of $56,049,000 under Head 186 Subhead 700 is mainly for relocation of equipment and re-direction of telecommunication lines, with breakdown as follows –

	$'000
(a) Relocate equipment in TD's operation centres to WKGO	39,014
(b) Re-direct telecommunication lines	5,470
(c) Project management	7,117
(d) Contingency	4,448
Total	**56,049**

27. On paragraph 26(a) above, the estimate of $39,014,000 is for dismantling, transporting, reconnecting, testing and commissioning of all related equipment, including various generations/types of ATC and CCTV systems in the three existing ATCCs in HB, KGO and IT, and the existing ETCC and TCSSC in IT for traffic signals control at WKGO.

28. On paragraph 26(b) above, the estimate of $5,470,000 is for re-direction of telecommunication lines for connecting the on-street traffic signal controllers, CCTV cameras and other field equipment from the three existing ATCCs in HB, KGO and IT, and the existing ETCC and TCSSC in IT to WKGO.

29. On paragraph 26(c) above, the estimate of $7,117,000 is for meeting the project management cost, which includes employment of specialist consultants for preparing tender documents, overseeing the tendering process, undertaking contract management, supervising the relocation and installation works, and testing and commissioning the relocated systems in the operation centres.

30. On paragraph 26(d) above, the estimate of $4,448,000 represents a 10% contingency on the items set out in paragraph 26(a) to (b).

31. The estimated cash flow is as follows –

Financial Year	$'000
2016-17	160
2017-18	800
2018-19	800
2019-20	25,392
2020-21	28,897
Total	**56,049**

Recurrent expenditure

32. The estimated annual recurrent expenditure for maintaining the relocated and integrated systems in WKGO will be $88,350,000, which is $3,950,000 higher than that of the existing systems due to the need to maintain a back-up centre in HB. The annual recurrent expenditure will be absorbed by TD.

Cost and Benefit Analysis

33. The relocation of the operation centres to WKGO will bring about the following cost savings –

(a) realisable savings of $86,220,000 per annum, including $1,820,000 in accommodation cost arising from the release of floor space at HB, IT and KGO, and $84,400,000 in equipment operation and maintenance cost due to integration of ATCC system equipment; and

(b) notional recurrent savings of $2,180,000 in staff effort as a result of improved operational efficiency for manning the ATCC.

A cost and benefit analysis for the proposal is at **Annex B**.

IMPLEMENTATION PLAN

34. We plan to start the implementation of the project in the third quarter of 2016 for completion by the third quarter of 2020. The proposed implementation plan is set out below –

Activity	Target Completion Date
(a) Selection and employment of consultants	First quarter 2017
(b) Completion of the review and strategy formulation	Third quarter 2017
(c) Completion of detailed design and preparation of tenders documents	Third quarter 2018
(d) Invitation of tenders	Third quarter 2018
(e) Award of contracts	First quarter 2019
(f) Site installation	Fourth quarter 2019
(g) Changeover and removal	First quarter 2020
(h) Fine-tuning and remaining work	Third quarter 2020

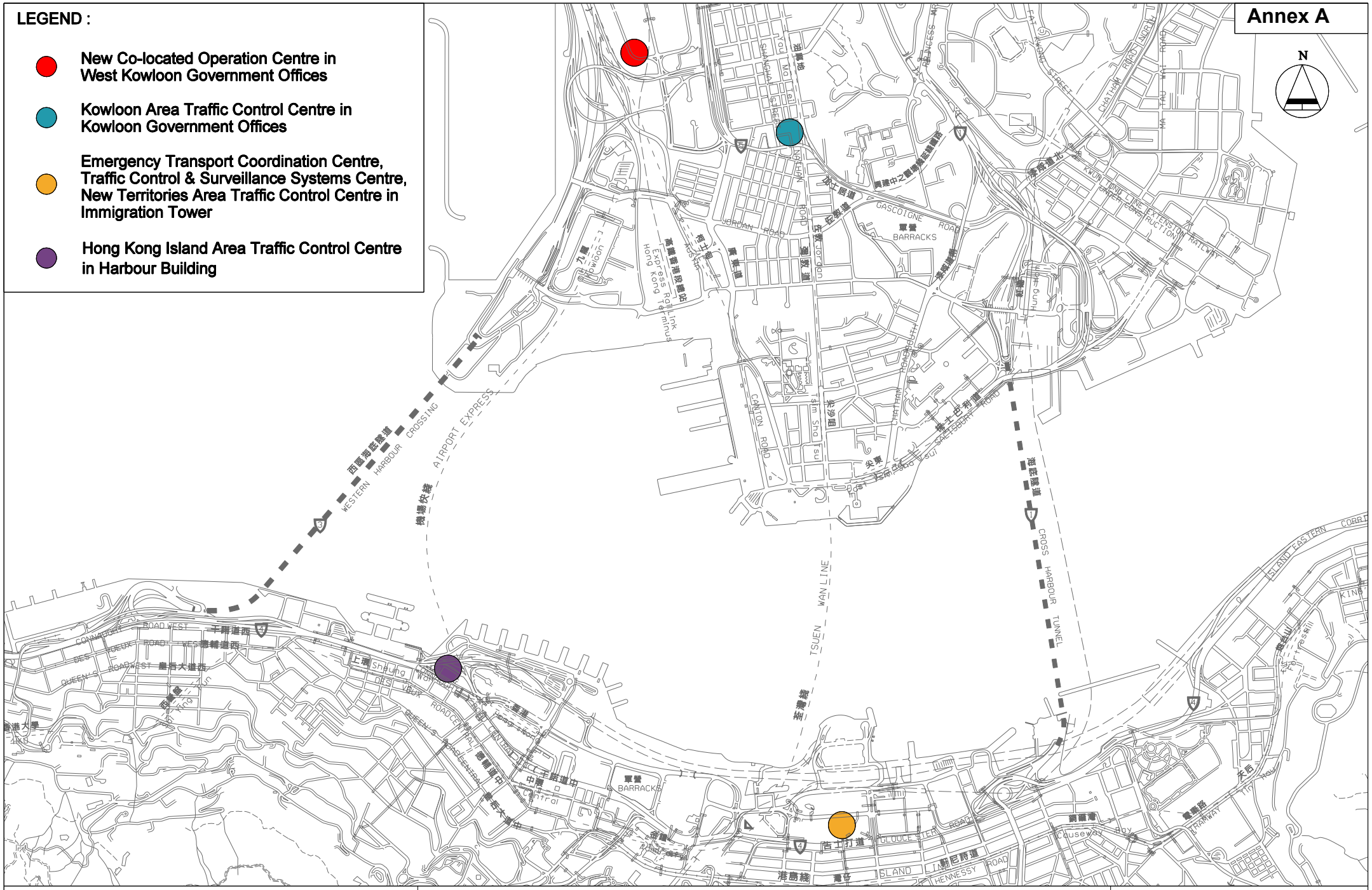
PUBLIC CONSULTATION

35. We consulted the Legislative Council Panel on Transport on the proposal on 23 March 2016. Members in general supported the proposal. In response to Members' request, we have provided information on how to facilitate the smooth relocation and the Cost and Benefit analysis in paragraphs 16 to 17 and 33 of this paper.

Annex A

LEGEND :

- New Co-located Operation Centre in West Kowloon Government Offices
- Kowloon Area Traffic Control Centre in Kowloon Government Offices
- Emergency Transport Coordination Centre, Traffic Control & Surveillance Systems Centre, New Territories Area Traffic Control Centre in Immigration Tower
- Hong Kong Island Area Traffic Control Centre in Harbour Building



The Location Plan of WKGO and the Operation Centres

Enhancement of Intelligent Transport Systems Infrastructure for Hong Kong

運輸署
Transport Department

Annex B

Cost and Benefit Analysis
Relocation of Transport Department's Operation Centres to the West Kowloon Government Offices

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	Total
						($'000)					
Cost of the proposal											
Capital Expenditure	350	1,751	1,751	58,712	66,739	-	-	-	-	-	129,303
Non-recurrent Staff cost	-	-	-	-	-	-	-	-	-	-	-
Sub-total	350	1,751	1,751	58,712	66,739	-	-	-	-	-	129,303
Recurrent Expenditure	-	-	-	-	44,175	88,350	88,350	88,350	88,350	88,350	485,925
Sub-total	0	0	0	0	44,175	88,350	88,350	88,350	88,350	88,350	485,925
(A) Total Cost	**350**	**1,751**	**1,751**	**58,712**	**110,914**	**88,350**	**88,350**	**88,350**	**88,350**	**88,350**	**615,228**
Savings and cost avoidance											
Realisable savings											
Equipment operation and maintenance cost	-	-	-	-	42,200	84,400	84,400	84,400	84,400	84,400	464,200
Accommodation	-	-	-	-	910	1,820	1,820	1,820	1,820	1,820	10,010
Sub-total	-	-	-	-	43,110	86,220	86,220	86,220	86,220	86,220	474,210
Notional recurrent savings											
Manpower	-	-	-	-	-	2,180	2,180	2,180	2,180	2,180	10,900
Sub-total	-	-	-	-	-	2,180	2,180	2,180	2,180	2,180	10,900
(B) Total Savings	**-**	**-**	**-**	**-**	**43,110**	**88,400**	**88,400**	**88,400**	**88,400**	**88,400**	**485,110**
Net cost (-) / Net savings (+) (C)=(B)–(A)	**-350**	**-1,751**	**-1,751**	**-58,712**	**-67,804**	**50**	**50**	**50**	**50**	**50**	**-130,118**
Net Cumulative Cost / Savings	**-350**	**-2,101**	**-3,852**	**-62,564**	**-130,368**	**-130,318**	**-130,268**	**-130,218**	**-130,168**	**-130,118**	
