

## **ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE**

### **HEAD 709 – WATERWORKS**

#### **Water Supplies – Combined fresh/salt water supply**

#### **90WC – Replacement and rehabilitation of water mains, stage 1 phase 1**

Members are invited to recommend to Finance Committee the upgrading of the remaining part of **90WC**, entitled “Replacement and rehabilitation of water mains, stage 1 phase 1”, to Category A at an estimated cost of \$2,063.4 million in money-of-the-day prices.

### **PROBLEM**

Ageing fresh and salt water mains throughout the territory are prone to frequent bursts and leaks. We need to replace and rehabilitate water mains approaching the end of their service life to improve the condition of the water supply network and to maintain a reasonable level of service to consumers.

### **PROPOSAL**

2. The Director of Water Supplies (DWS), with the support of the Secretary for the Environment, Transport and Works, proposes to upgrade the remaining part of **90WC** to Category A at an estimated cost of \$2,063.4 million in money-of-the-day (MOD) prices for implementation of the remaining works in stage 1 phase 1 of the replacement and rehabilitation programme.

**/PROJECT.....**

## PROJECT SCOPE AND NATURE

3. The original scope of **90WC** comprised the replacement and rehabilitation of approximately 246 kilometres (km) of fresh water mains and 104 km of salt water mains. The Finance Committee has previously approved the upgrading of parts of **90WC** to Category A as **95WC**, **175WC**, **177WC** and **179WC** for implementing the early phases of the works (see paragraphs 20 to 23 below). The remaining scope of works under **90WC** we now propose to upgrade to Category A comprises the replacement and rehabilitation of approximately 213 km of fresh water mains and 95 km of salt water mains and the associated service pipes throughout the territory.

4. We plan to start the proposed works in June 2003 for completion by 2008. The construction period includes allowance for laying associated service pipes and completing service connections to households. The sites covered under **90WC** are located throughout the territory, as marked on the maps at Enclosure 1. Details of the typical water main replacement and rehabilitation works proposed are shown at Enclosure 2.

## JUSTIFICATION

5. Hong Kong's fresh water and salt water supplies are provided through a network of 6 800 km of water mains. About 97% of the network is underground. The major part of the network that is above ground is the water main from Muk Wu Pumping Station to Tai Po Tau Pumping Station which runs parallel to the Kowloon Canton Railway track. The remaining part is in the remote areas. About 45% of the water mains were laid some 30 years ago as part of the development of urban areas and new towns. These water mains are approaching the end of their service life and have become increasingly difficult and costly to maintain.

6. We carried out an Underground Asset Management Study (the Study) in 1997 to develop a comprehensive and cost-effective management plan for the water supply network. The Study recommended the replacement and rehabilitation of some 3 000 km of ageing water mains in stages over 20 years to prevent further deterioration of the water supply network. We estimate that the number of pipe failures per year will be reduced from the 2001 level of 23 500 (1 900 bursts and 21 600 leaks) to 15 000 (1 000 bursts and 14 000 leaks) upon completion of the recommended 20-year programme. Over the same period, the

/loss.....

loss of fresh water will be reduced from 220 million to 180 million cubic metres (m<sup>3</sup>) per year. This represents an improvement in the leakage rate of the water mains from the current level of 25% to 15% in 20 years' time. Otherwise, the water supply system would continue to deteriorate. If no action is taken, we believe the number of pipe failures per year would increase to 40 000 with annual loss of 630 million m<sup>3</sup> of fresh water in the same period.

7. We have substantially completed the detailed design for the remaining works of 90WC and therefore propose to proceed with the construction of the works.

**FINANCIAL IMPLICATIONS**

8. We estimate the capital cost of the works to be \$2,063.4 million in MOD prices (see paragraph 9 below), made up as follows –

	<b>\$ million</b>
(a) Water main replacement by	1,013.9
(i) traditional mainlaying method	930.5
(ii) trenchless construction method <sup>1</sup>	83.4
(b) Water main rehabilitation	787.5
(c) Environmental mitigation measures	19.5
(d) Consultants' fees for	217.3
(i) contract administration	6.7
(ii) site supervision	210.6
(e) Contingencies	180.0
	180.0

/Sub-total.....

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<sup>1</sup> Trenchless method refers to the use of micro-tunnelling or boring techniques to construct underground pipelines without opening up the road surface for the whole length of the pipelines. We will adopt trenchless methods for mainlaying works in areas with serious traffic and environmental problems.

	<b>\$ million</b>	
Sub-total	2,218.2	(in September 2002 prices)
(f) Provision for price adjustment	(154.8)	
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Total	2,063.4	(in MOD prices)
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A breakdown of the estimates for the consultants' fees by man-months is at Enclosure 3.

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

<b>Year</b>	<b>\$ million (Sept 2002)</b>	<b>Price adjustment factor</b>	<b>\$ million (MOD)</b>
2003 – 2004	30.0	0.94300	28.3
2004 – 2005	173.9	0.93003	161.7
2005 – 2006	310.1	0.93003	288.4
2006 – 2007	354.5	0.93003	329.7
2007 – 2008	490.2	0.93003	455.9
2008 – 2009	483.1	0.93003	449.3
2009 – 2010	376.4	0.93003	350.1
	<hr/>		<hr/>
	2,218.2		2,063.4
	<hr/>		<hr/>

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10. We have derived the MOD estimate on the basis of the Government's latest forecast of trend labour and construction prices for the period 2003 to 2010. We will implement the mainlaying works under about 12 re-measurement contracts because the quantities involved may vary with the actual ground conditions. To obtain more information about underground utilities in particular, we have carried out a comprehensive review of utility record drawings. In addition, we have conducted extensive utility surveys comprising investigation pits/trenches to identify possible conflicts with existing utilities so as to determine the most practical alignment of the replacement and rehabilitation water mains during the design stage. We will also require contractors to carry out trial pits/trenches to confirm the actual alignment of existing utilities prior to the commencement of the works. The contracts will provide for price adjustment as the contract periods will exceed 21 months.

11. The proposed works are not likely to give rise to additional recurrent expenditure. Although there will be some reduction in the maintenance cost for the replaced and rehabilitated water mains, there will not be any reduction in the overall maintenance cost of the water supply network in the territory at the moment due to increase in maintenance cost of the remaining part of the network resulting from further deterioration of those water mains.

12. The project by itself would lead to an increase in production cost of water by 0.67% in real terms by 2010<sup>2</sup>.

## **PUBLIC CONSULTATION**

13. We consulted the 18 District Councils from March to July in 2002. All the Councils supported implementation of the works. A table showing details of the consultations with various District Councils is at Enclosure 4. In view of some District Councils' concern about the traffic and environmental impacts arising from the proposed waterworks, we will implement adequate traffic mitigation and environmental mitigation measures under the relevant works contracts. We will also monitor implementation of these mitigation measures and the interfacing of works where practicable, and will keep the relevant District Councils informed during the project period.

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<sup>2</sup> The increase in production cost of water is calculated on the assumption that the demand remains static during the period from 2003 to 2010 and the amount of government subsidy to the waterworks operations is to be contained at the present level.

14. We consulted the LegCo Panel on Planning, Lands and Works on 13 May 1999. Members had no adverse comments on the project.

## ENVIRONMENTAL IMPLICATIONS

15. DWS completed Preliminary Environmental Review (PER) in December 1997. The PER concluded that the works would have no long-term environmental impact. The Director of Environmental Protection vetted the PERs and agreed that an Environmental Impact Assessment would not be necessary. We will control noise, dust and site run-off during construction through the implementation of mitigation measures<sup>3</sup> in the relevant contracts. We have included \$19.5 million (in September 2002 prices) for implementation of these mitigation measures in the project estimate and will incorporate these requirements in the works contracts for implementation.

16. At the planning and design stages, we have given due consideration to designing the levels and alignments for the proposed water mains to reduce the generation of construction and demolition (C&D) materials. We will require the contractors to submit waste management plans (WMPs) for approval. The WMPs will include appropriate mitigation measures to avoid, reduce, reuse and recycle C&D materials. We will ensure that the day-to-day operations on site comply with the approved WMPs. We will require the contractors to reuse the excavated material as filling material on site or on other construction sites as far as possible to minimise the disposal of public fill to public filling facilities. To further minimise the generation of C&D materials, we will encourage the contractors to use non-timber formwork and recyclable material for temporary works. We will control the disposal of public fill and C&D waste to designated public filling facilities and landfills respectively through a trip-ticket system and will record the disposal, reuse and recycling of C&D materials for monitoring purposes. We will require the contractors to separate public fill from C&D waste for disposal at appropriate facilities. We estimate that the proposed works will generate about 155 000 m<sup>3</sup> of C&D materials. Of these, we will reuse about 101 000 m<sup>3</sup> (65.2%) on site,

/52 000.....

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<sup>3</sup> The standard pollution control measures include wheel washing facilities and de-silting traps, the use of silenced plant and other procedures as recommended in Environmental Protection Department's recommended pollution control clauses.

52 000 m<sup>3</sup> (33.5%) as fill in public filling areas<sup>4</sup> and dispose of 2 000 m<sup>3</sup> (1.3%) at landfills. The notional cost of accommodating C&D waste at landfill sites is estimated to be \$250,000 for this project (based on a notional unit cost<sup>5</sup> of \$125/m<sup>3</sup>).

## LAND ACQUISITION

17. The proposed works do not require land acquisition.

## BACKGROUND INFORMATION

### 90WC – Stage 1 phase 1

18. We upgraded **90WC** to Category B in October 1998.

19. To bring about early improvement to the system, we implemented the works under **90WC** in two sub-phases, i.e. phase 1A and phase 1B –

- (a) phase 1A comprises the replacement and rehabilitation of approximately 26 km of fresh water mains in Yuen Long, Sheung Shui, Fanling, Tai Po and Sha Tin areas and 4 km of salt water mains in Tai Po and Sha Tin areas. DWS used in-house resources to carry out detailed design and supervision of site investigations and construction works for this phase of works; and
- (b) phase 1B comprises the replacement or rehabilitation of approximately 220 km of fresh water mains and 100 km of salt water mains throughout the territory. The proposed works described in paragraph 3 above are the

/remaining.....

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<sup>4</sup> A public filling area is a designated part of a development project that accepts public fill for reclamation purposes. Disposal of public fill in a public filling area requires a licence issued by the Director of Civil Engineering.

<sup>5</sup> This estimate has taken into account the cost for developing, operating and restoring the landfills after they are filled and the aftercare required. It does not include the land opportunity cost for existing landfill sites (which is estimated at \$90/m<sup>3</sup>), nor the cost to provide new landfills (which are likely to be more expensive) when the existing ones are filled. The notional cost is for reference only and does not form part of this project estimate.

remaining parts under phase 1B. DWS engaged consultants to carry out site investigations, various impact assessments and supervise construction for this phase of works.

20. In November 1999, the Finance Committee approved the upgrading of part of **90WC** to Category A as **95WC** entitled “Replacement and rehabilitation of water mains, stage 1 phase 1B – investigation” at an estimated cost of \$66.3 million in MOD prices for engaging consultants to carry out site investigations and various impact assessments for the phase 1B works. The consultants have completed the investigations and impact assessments.

21. In November 2000, the Finance Committee approved the upgrading of part of **90WC** to Category A as **175WC** entitled “Replacement and rehabilitation of water mains, stage 1 phase 1 (part 1) – works in Sheung Shui, Tai Po, Sha Tin and Mong Kok” at an estimated cost of \$115.3 million in MOD prices for the construction of parts of phase 1A and phase 1B works. Works commenced in December 2000 for completion by the end of 2005.

22. In March 2001, the Finance Committee approved the upgrading of part of **90WC** to Category A as **177WC** entitled “Replacement and rehabilitation of water mains, stage 1 phase 1B – detailed design and advance works” at an estimated cost of \$69.8 million in MOD prices for engaging consultants to carry out detailed design, site investigations and supplementary impact assessments for the phase 1B works and for implementing the replacement works in North Point under phase 1B. Detailed design has been completed. Works in North Point commenced in August 2001 for completion by the end of 2003.

23. In November 2001, the Finance Committee approved the upgrading of part of **90WC** to Category A as **179WC** entitled “Replacement and rehabilitation of water mains, stage 1 phase 1 (part 2) – works in Yuen Long, Fanling, Kowloon City, Wong Tai Sin and Sham Shui Po” to Category A at an estimated cost of \$117.5 million in MOD prices for construction of the final part of phase 1A in Yuen Long and Fanling and part of phase 1B works. Works commenced in February 2002 for completion in 2005.



24. The scope of works under **175WC**, **177WC** and **179WC** comprised the replacement and rehabilitation of approximately 26 km of fresh water mains and 4 km of salt water mains under phase 1A and 7 km of fresh water mains and 5 km of salt water mains under phase 1B.

**Other stages**

25. We included stage 1 phase 2 of Water Supply Department's 20-year water mains replacement and rehabilitation programme in Category B in October 2000 as **174WC** entitled "Replacement and rehabilitation of water mains, stage 1 phase 2". In March 2001, the Finance Committee approved the upgrading of part of **174WC** to Category A as **178WC** entitled "Replacement and rehabilitation of water mains, stage 1 phase 2 – investigation" at an estimated cost of \$21.6 million in MOD prices for engaging consultants to carry out site investigations and impact assessments for the stage 1 phase 2 works. The consultants will complete the investigations and impact assessments in February 2003. We will then proceed with detailed design of the stage 1 phase 2 works.

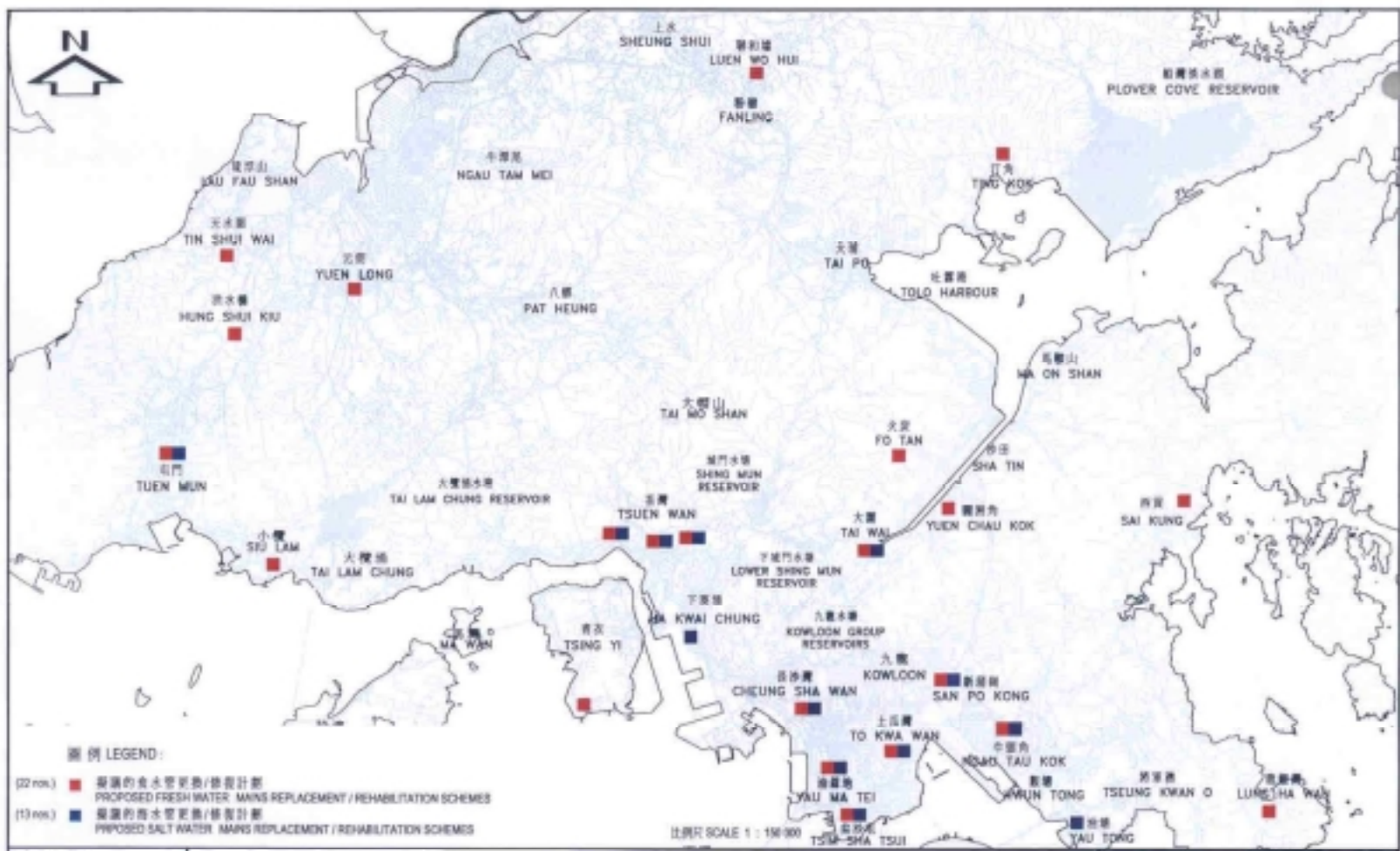
26. We will continue planning on other stages of the improvement works for the water supply network with a view to completing the entire replacement and rehabilitation programme in 20 years' time.

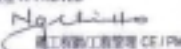
**Job opportunities**

27. We estimate that the project will create some 440 new jobs comprising 80 professional/technical staff and 360 labourers, totalling 27 000 man-months.

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Environment, Transport and Works Bureau  
April 2003



核准 APPROVED  
  
 總工程師/工務管理 CE/PM  
 27/12/2002

工務計劃項目 90 WC — 更換及修復水管工程第 1 階段第 1 期  
 (第一—九龍及新界區)  
 P.W.P. NO. 90WC — REPLACEMENT AND REHABILITATION OF WATER MAINS, STAGE 1 PHASE 1  
 [ SHEET 1 - KOWLOON AND NEW TERRITORIES ]

水務署  
 WATER SUPPLIES DEPT.  
 草圖編號 SK 62002 / 189 / 001  
 SKETCH NO.

附件一(第一頁)共三頁 ENCLOSURE 1 (SHEET 1 OF 3)



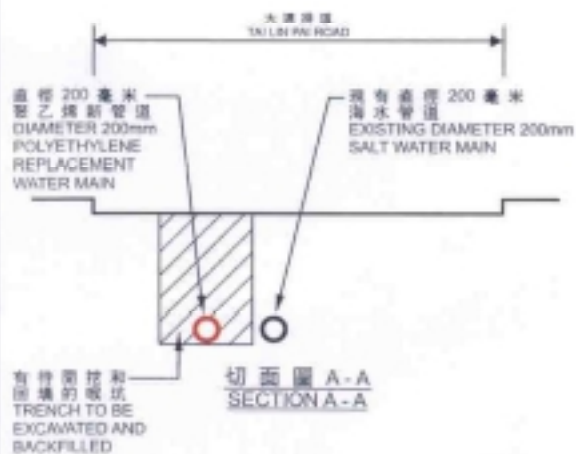




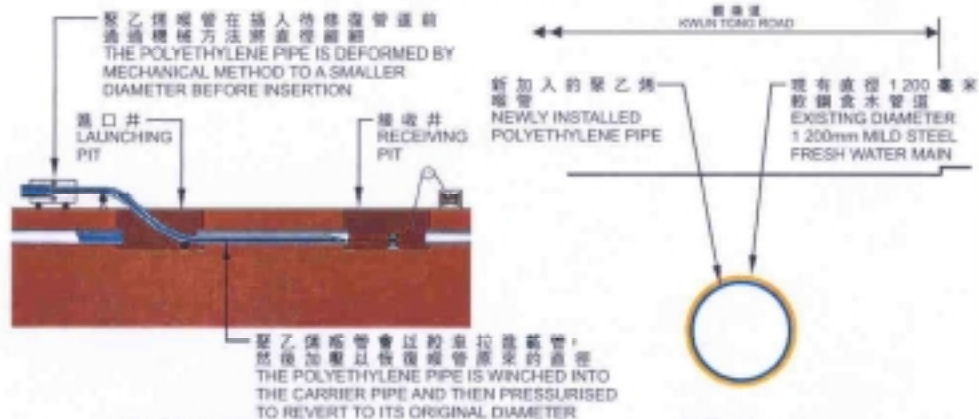
地盤平面圖 - 更換水管  
SITE PLAN - WATER MAIN REPLACEMENT  
比例尺 SCALE 1 : 10 000



地盤平面圖 - 修復水管  
SITE PLAN - WATER MAIN REHABILITATION  
比例尺 SCALE 1 : 2 000



切面圖 A-A  
SECTION A-A



切面圖 B-B  
SECTION B-B

修復水管圖解  
WATER MAIN REHABILITATED  
ILLUSTRATION

核准 APPROVED  
Ng Shiu-ta  
總工程師/工程經理 CE/PM  
14/2/2003

(甲類工程)  
(CAT 'A' Submission)

工務計劃項目90WC — 更換及修復水管工程第1階段第1期  
更換及修復水管範例

REPLACEMENT AND REHABILITATION OF WATER MAINS, STAGE 1 PHASE 1  
TYPICAL WATER MAIN REPLACEMENT AND REHABILITATION

水務署  
WATER SUPPLIES DEPT.

草圖編號 SK 62002 / 189 / 004  
SKETCH NO.

## Enclosure 3 to PWSC(2003-04)4

### 90WC – Replacement and rehabilitation of water mains, stage 1 phase 1

#### Breakdown of the estimates for the consultants' fees

Consultants' staff costs		Estimated man-months	Average MPS* salary point	Multiplier (Note 1)	Estimated fee (\$million)
(i) consultants' fees for works in the construction stage (Note 2)					6.7
(ii) site supervision by resident site staff employed by the consultants (Note 3)	Professional	1 113	38	1.6	102.8
	Technical	3 511	14	1.6	107.8
<b>Total consultants' staff cost</b>					<b>217.3</b>

\*MPS = Master Pay Scale

#### Notes

1. A multiplier of 1.6 is applied to the average MPS point to estimate the cost of resident site staff supplied by the consultants. (As at 1.10.2002, MPS Pt. 38 = \$57,730 per month and MPS Pt. 14 = \$19,195 per month).
2. The consultants' fees for works in the construction stage is the actual tendered price provisionally included in the Consultancy Agreements Nos. CE6/2001(W.S), CE7/2001(W.S) and CE8/2001(W.S) for the design and construction of the project.
3. The above figures are based on estimates prepared by the Director of Water Supplies. We will only know the actual man-months for site supervision by resident site staff employed by the consultants when we have appointed the resident site staff.

**90WC – Replacement and rehabilitation of water mains, stage 1 phase 1**

**Consultations with District Councils**

<b>District Council</b>	<b>Date of Meeting</b>	<b>Decision</b>
Central and Western District Council	16 May 2002	Supported
Eastern District Council Works and Development Committee	20 June 2002	Supported
Islands District Council Environmental Improvement and Food Hygiene Committee	25 March 2002	Supported
Kowloon City District Council Traffic and Transport Committee	30 May 2002	Supported
Kwai Tsing District Council Traffic and Transport Committee	2 July 2002	Supported
Kwun Tong District Council Traffic and Transport Committee	4 July 2002	Supported
North District Council District Development and Environment Improvement Committee	21 May 2002	Supported
Sai Kung District Council Traffic and Transport Committee	10 July 2002	Supported
Sha Tin District Council Development and Housing Committee	25 June 2002	Supported
Sham Shui Po District Council Traffic Committee	6 June 2002	Supported
Southern District Council Capital Work Committee	4 March 2002	Supported

<b>District Council</b>	<b>Date of Meeting</b>	<b>Decision</b>
Tai Po District Council Environment and Works Committee	17 May 2002	Supported
Tsuen Wan District Council Environmental and Health Affairs Committee	9 May 2002	Supported
Tuen Mun District Council Environment, Hygiene and District Development Committee	24 May 2002	Supported
Wan Chai District Council Traffic and Transport Committee	30 July 2002	Supported
Wong Tai Sin District Council	25 June 2002	Supported
Yau Tsim Mong District Council	27 June 2002	Supported
Yuen Long District Council Town Planning and Development Committee	15 May 2002	Supported

(Note : All District Councils supported this project to proceed to the construction phase.)