For discussion **PWSC(2006-07)36**
on 25 October 2006

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 709 – WATERWORKS
Water Supplies – Combined fresh/salt water supply
182WC – Replacement and rehabilitation of water mains, stage 2

Members are invited to recommend to Finance Committee the upgrading of the remainder of **182WC** to Category A at an estimated cost of $3,156.6 million in money-of-the-day prices for implementation of the works in stage 2 of the territory-wide water mains replacement and rehabilitation programme.

PROBLEM

Ageing fresh and salt water mains throughout the territory are prone to frequent bursts and leaks, disrupting water supplies and traffic flow and causing inconvenience to the public. 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 an acceptable level of service.

PROPOSAL

2. The Director of Water Supplies, with the support of the Secretary for the Environment, Transport and Works, proposes to upgrade the remainder of **182WC** to Category A at an estimated cost of $3,156.6 million in money-of-the-day (MOD) prices for implementation of the works in stage 2 of the territory-wide water mains replacement and rehabilitation programme.

/PROJECT…..

PROJECT SCOPE AND NATURE

3. The full scope of works under **182WC** comprises the replacement and rehabilitation of approximately 753 kilometres (km) of fresh water mains, salt water mains and raw water mains, scattered in various districts throughout the territory. The remaining works under **182WC** that we now propose to upgrade to Category A comprise the replacement and rehabilitation of –

(a) about 670 km of fresh water mains ranging from 20 millimetres (mm) to 1 500 mm in diameter including associated service pipes and connections;

(b) about 80 km of salt water mains ranging from 25 mm to 800 mm in diameter including associated service pipes and connections; and

(c) about 3 km of raw water mains ranging from 1 200 mm to 2 300 mm in diameter.

4. The locations of the proposed works are at Enclosure 1. Details of typical water mains replacement and rehabilitation works proposed are at Enclosure 2.

5. We plan to commence the proposed works in January 2007 for completion in June 2011.

JUSTIFICATION

6. Hong Kong's fresh water and salt water supplies are provided through a network of about 7 400 km of water mains. Most of these water mains are underground. About 45% of the water mains were laid more than 30 years ago. They are approaching the end of their service life and have become increasingly difficult and costly to maintain.

7. With more water mains approaching the end of their service life, we are experiencing an increasing number of main bursts causing inconvenience to the public. As the previous way of carrying out small scale replacement works on a local basis was no longer effective, we engaged consultants in February 1996 to carry out an Underground Asset Management Study 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 aged water mains in stages to prevent further deterioration of the water supply network.

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8. The whole replacement and rehabilitation programme was originally scheduled for completion by 2020. To bring about earlier improvement to the supply system and minimise inconvenience to the public due to frequent main bursts, we have advanced the completion of the whole replacement and rehabilitation programme to 2015. We will continue to review the programme taking account of prevailing constraints and the residual service life of the water mains to be replaced with a view to completing the works within a shorter time frame before 2015.

9. To meet the compressed project programme, we need to start the proposed works as set out in paragraph 3 above in January 2007. Due to insufficient in-house staffing resources, we plan to engage consultants to supervise part of the proposed works.

10. Where beneficial and practicable, rehabilitation[1] by trenchless methods rather than traditional replacement methods will be adopted, as the former techniques generally require less excavation and reduce environmental impacts and disturbance to traffic.

FINANCIAL IMPLICATIONS

11. We estimate the cost of the proposed works to be $3,156.6 million in MOD prices (see paragraph 12 below), made up as follows –

		$ million	
(a)	Water mains replacement by		1,872.9
	(i) conventional method	1,833.8	
	(ii) trenchless methods[2]	39.1	
(b)	Water mains rehabilitation by trenchless methods		575.4
(c)	Environmental mitigation measures		24.6

/d…..

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[1] Rehabilitation methods are generally classified as trenchless methods (sometimes referred to as 'minimum dig' or 'reduced dig' methods). In these techniques, a new pipe is launched from a 'launching pit' and travels along the existing pipe route to a 'receiving pit' without opening up the road surface for the whole length of the pipe.

[2] Water main replacement by trenchless methods refers to the use of pipe jacking, 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.

		$ million		
(d)	Consultants' fees for		249.2	
	(i) contract administration	6.2		
	(ii) site supervision	243.0		
(e)	Contingencies		272.1	
	Sub-total		2,994.2	(in September 2006 prices)
(f)	Provision for price adjustment		162.4	
	Total		3,156.6	(in MOD prices)

A breakdown of the estimates for the consultants' fees by man-months is at Enclosure 3.

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

Year	**$ million (Sept 2006)**	**Price adjustment factor**	**$ million (MOD)**
2006 – 2007	2.0	1.00000	2.0
2007 – 2008	261.3	1.01250	264.6
2008 – 2009	465.7	1.02769	478.6
2009 – 2010	768.4	1.04310	801.5
2010 – 2011	783.7	1.05875	829.7
2011 – 2012	459.0	1.08257	496.9
2012 – 2013	202.9	1.10964	225.1
2013 – 2014	51.2	1.13738	58.2
	2,994.2		3,156.6

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13. We have derived the MOD estimate on the basis of the Government's latest forecast of trend rate of change in the prices of public sector building and construction output for the period from 2006 to 2014. We will implement the mainlaying works as re-measurement contracts because the quantities of works are subject to variation during construction to suit the actual underground conditions. The contracts will provide for price adjustment as the contract periods will exceed 21 months.

14. The proposed works will not give rise to additional recurrent expenditure.

15. The project by itself would lead to an increase in production cost of water by 1.2% in real terms by 2014[3].

PUBLIC CONSULTATION

16. We consulted all 18 District Councils between September 2005 and June 2006 on the proposed works under their respective boundaries. A table summarising the consultations is at Enclosure 4. All of them supported the proposed works. In response to some District Councils' concerns about traffic and environmental impacts arising from the proposed works, we will incorporate adequate mitigation measures in the relevant works contracts. We will monitor implementation of these measures and the interfacing of works where practicable, and keep the relevant District Councils informed of progress during the construction period.

17. We consulted the Legislative Council Panel on Planning, Lands and Works on 25 January 2005 regarding the part-upgrading of **182WC** to Category A as **184WC** for engaging consultants to carry out investigation and detailed design of the proposed works. On 18 July 2006, we circulated to the Panel an information paper on the proposed works under **182WC**. Members had no objection to the proposal on both occasions.

/**ENVIRONMENTAL**……

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[3] The increase in production cost of water is calculated at the present price level and on the assumption that the water demand remains static during the period from 2007 to 2014.

ENVIRONMENTAL IMPLICATIONS

18. This is not a designated project under Environmental Impact Assessment Ordinance (Cap. 499). We completed environmental reviews which concluded that the proposed works would have no long-term adverse environmental impact. We will control short term impacts caused by the construction works through the implementation of standard pollution control measures. We have included about $24.6 million (in September 2006 prices) in the project estimate for implementation of these mitigation measures.

19. We have considered the alignments of the proposed water mains in the planning and design stages to reduce the generation of construction and demolition (C&D) materials where possible. In addition, we will require the contractors to reuse inert C&D materials (e.g. reuse of excavated soil as filling material) on site or in other suitable construction sites as far as possible, in order to minimise the disposal of C&D materials to public fill reception facilities[4]. We will encourage the contractors to maximise the use of recycled or recyclable C&D materials, as well as the use of non-timber formwork to further minimise the generation of construction waste.

20. We will also require the contractors to submit waste management plans (WMP) for approval. The WMP 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 WMP. We will control the disposal of public fill and C&D waste to public fill reception facilities and landfills respectively through a trip-ticket system. We will require the contractors to separate public fill from C&D waste for disposal at appropriate facilities. We will record the disposal, reuse and recycling of C&D materials for monitoring purposes.

21. We estimate that the project will generate about 984 100 tonnes of C&D materials. Of these, we will reuse about 404 200 tonnes (41.1%) on site and deliver 569 700 tonnes (57.9%) to public fill reception facilities for subsequent reuse and dispose of 10 200 tonnes (1%) at landfills. The total cost for accommodating C&D materials at public fill reception facilities and landfill

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[4] Public fill reception facilities are specified in Schedule 4 of the Waste Disposal (Charges for Disposal of Construction Waste) Regulation. Disposal of public fill in public fill reception facilities requires a licence issued by the Director of Civil Engineering and Development.

sites is estimated to be $16.7 million for this project (based on a unit cost of $27/tonne for disposal at public fill reception facilities and $125/tonne[5] at landfills).

TRAFFIC IMPACTS

22. We have carried out traffic impact assessments which concluded that the proposed works would not cause unacceptable traffic impact. We will implement temporary traffic arrangements to minimise impacts on traffic during construction. Furthermore, we will use trenchless methods whenever practicable for works along busy roads, e.g. Nathan Road and Queensway. We will also establish traffic management liaison groups comprising representatives from relevant Government departments to examine the temporary traffic arrangements before implementation.

LAND ACQUISITION

23. The proposed works do not require any land acquisition.

BACKGROUND INFORMATION

24. We upgraded **182WC** to Category B in September 2004.

25. In March 2005, we upgraded part of **182WC** to Category A as **184WC** entitled "Replacement and rehabilitation of water mains, stage 2 – investigation and detailed design" at a cost estimate of $52.9 million for engagement of consultants to carry out investigation and detailed design of the proposed works. The consultancies commenced in June 2005 and will be completed in May 2007.

26. We have substantially completed the detailed design of the proposed works under **182WC** and plan to start construction in January 2007 for completion in June 2011.

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[5] 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^3$), nor the cost to provide new landfills (which is likely to be more expensive) when the existing ones are filled.

27. We will continue planning and designing the remaining stages 3 and 4 of the water mains replacement and rehabilitation programme with a view to completing the entire works programme before 2015 making reference to the experience gained in the first two stages.

28. The proposed works will not involve any tree removal or planting proposal.

29. We estimate that the proposed works will create about 1 080 jobs (880 for labourers and another 200 for professional/technical staff) providing a total employment of 48 500 man-months.

Environment, Transport and Works Bureau
October 2006

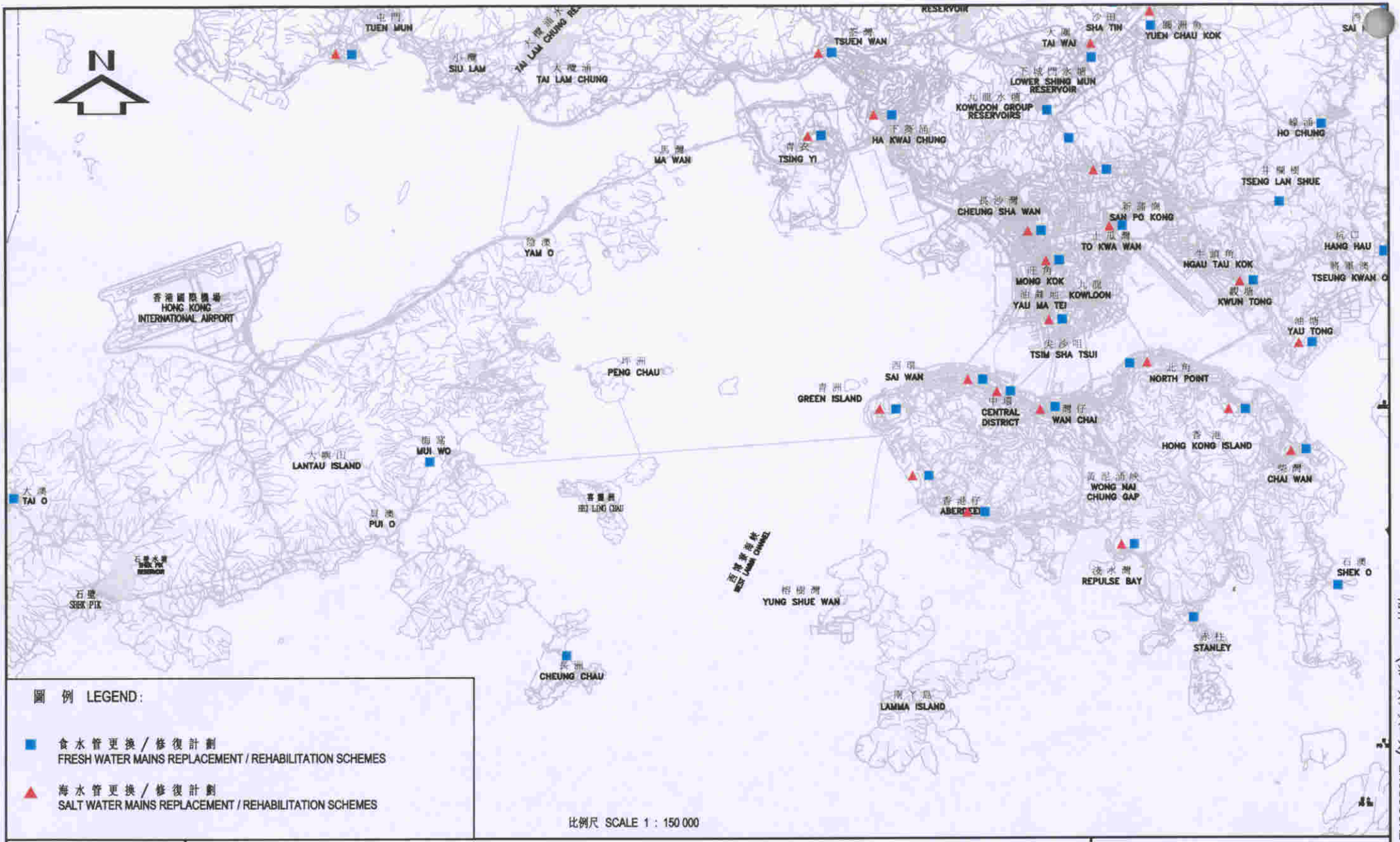


圖 例 LEGEND:

■ 食水管更換／修復計劃
FRESH WATER MAINS REPLACEMENT / REHABILITATION SCHEMES

▲ 海水管更換／修復計劃
SALT WATER MAINS REPLACEMENT / REHABILITATION SCHEMES

比例尺 SCALE 1 : 150 000

核准 APPROVED

總工程師/顧問工程管理 CE / CM

30 / 6 / 2006

工務計劃項目 182WC ------ 更換及修復水管工程第 2 階段
(圖一一香港，九龍及離島區)
P.W.P. NO. 182WC — REPLACEMENT AND REHABILITATION OF WATER MAINS, STAGE 2
(SHEET 1 - HONG KONG, KOWLOON & ISLANDS)

(甲級工程)
(CAT 'A' Submission)

水務署
WATER SUPPLIES DEPT.

草圖編號 SKETCH NO. SK 62006 / 025 / 001

REF. 626-025.DWG

附件 — (第一頁，共二頁) ENCLOSURE 1 (SHEET 1 OF 2)

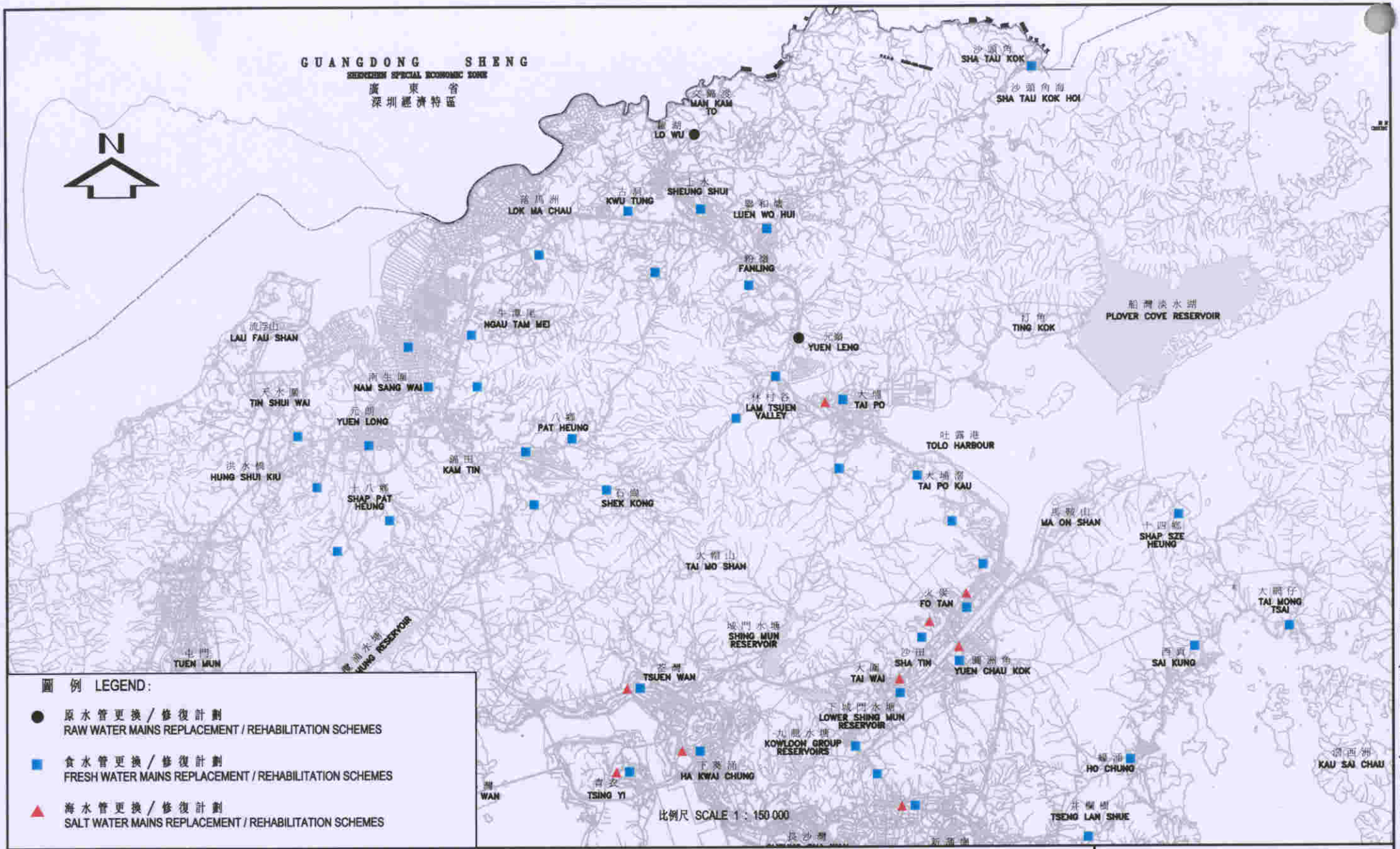


圖 例 LEGEND :

- 原水管更換 / 修復計劃
  RAW WATER MAINS REPLACEMENT / REHABILITATION SCHEMES
- 食水管更換 / 修復計劃
  FRESH WATER MAINS REPLACEMENT / REHABILITATION SCHEMES
- 海水管更換 / 修復計劃
  SALT WATER MAINS REPLACEMENT / REHABILITATION SCHEMES

核准 APPROVED

總工程師/顧問工程管理 CE / CM

30 / 6 / 2006

工務計劃項目 182WC ------ 更換及修復水管工程第 2 階段
(圖二一新界區)
P.W.P. NO. 182WC — REPLACEMENT AND REHABILITATION OF WATER MAINS, STAGE 2
(SHEET 2 - NEW TERRITORIES)

(甲級工程)
(CAT 'A' Submission)

水務署
WATER SUPPLIES DEPT.

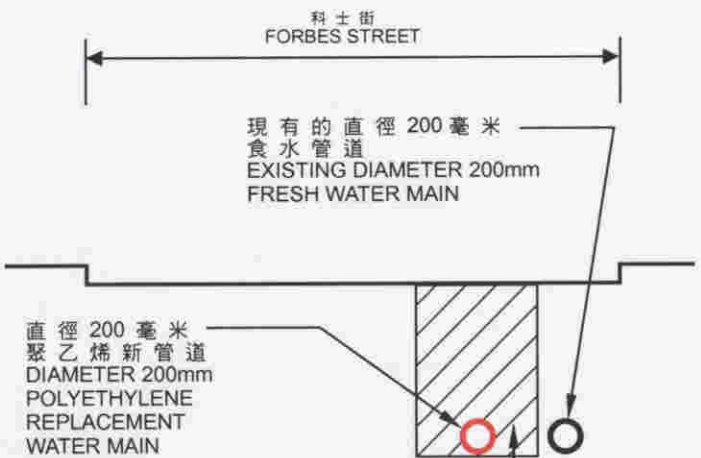
草圖編號 SKETCH NO. SK 62006 / 025 / 002

REF. 626-025.DWG

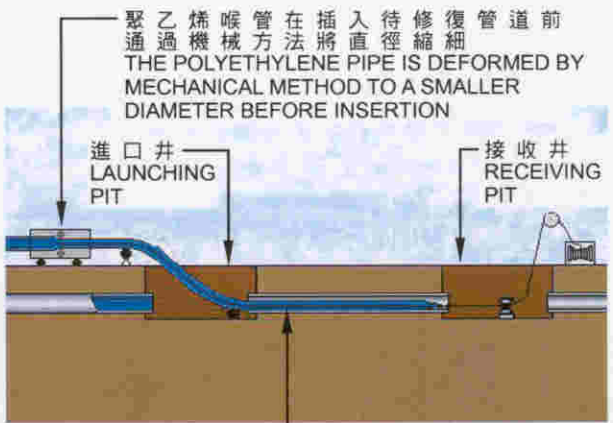
附件 一 (第二頁, 共二頁) ENCLOSURE 1 (SHEET 2 OF 2)

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

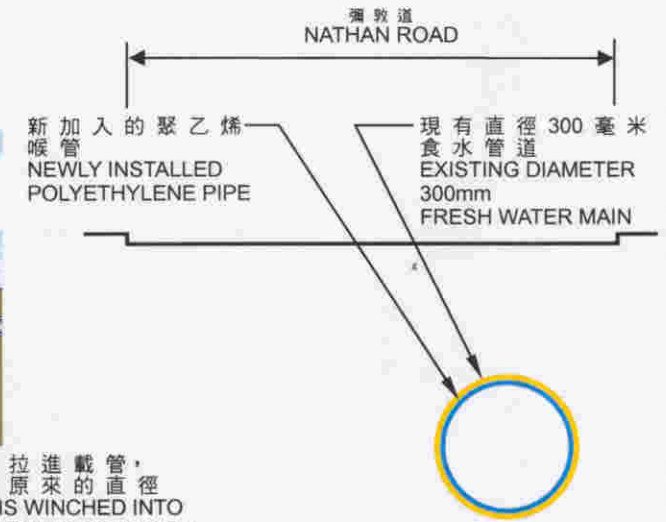
地盤平面圖－修復水管
SITE PLAN - WATER MAIN REHABILITATION
比例尺 SCALE 1 : 1 000



切面圖 A-A
SECTION A-A



修復水管圖解
WATER MAIN REHABILITATION
ILLUSTRATION



切面圖 B-B
SECTION B-B

核准 APPROVED
總工程師/顧問工程管理 CE/CM
30 / 6 / 2006

工務計劃項目182WC — 更換及修復水管工程第2階段
更換及修復水管範例
P.W.P. NO. 182WC — REPLACEMENT AND REHABILITATION OF WATER MAINS, STAGE 2
TYPICAL WATER MAIN REPLACEMENT AND REHABILITATION DETAILS
（甲級工程）
(CAT 'A' Submission)

水務署
WATER SUPPLIES DEPT.
草圖編號 SKETCH NO. SK 62006 / 026
REF. 626026.CDR

附件二 ENCLOSURE 2

182WC – Replacement and rehabilitation of water mains, stage 2

Breakdown of estimates for consultants' fees:

Consultants' staff costs		**Estimated man-months**	**Average MPS* salary point**	**Multiplier** (Note 1)	**Estimated fee ($million)**
(a) consultants' fees for works in the construction stage (Note 2)					6.2
(b) site supervision by resident site staff employed by the consultants (Note 3)	Professional	1 030	38	1.6	89.4
	Technical	5 330	14	1.6	153.6
		Total consultants' staff cost			**249.2**

*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. (With effect from 1.1.2005, MPS Pt. 38 = $54,255 per month and MPS Pt. 14 = $18,010 per month).

2. The consultants' fees for works in the construction stage are the actual tendered prices provisionally included in the consultancy agreements for the design and construction of the project. The construction phase of the assignments will only be executed subject to Finance Committee's approval to upgrade the proposed works to Category A.

3. We will only know the actual man-months and actual cost after completion of the construction works.

Enclosure 4 to PWSC(2006-07)36

182WC – Replacement and rehabilitation of water mains, stage 2

Consultations with District Councils

District Council	**Date of Meeting**	**Decision**
Tsuen Wan District Council Environmental and Health Affairs Committee Traffic and Transport Committee	1 September 2005 & 3 November 2005 4 November 2005	Supported
Southern District Council Planning, Works and Housing Committee	24 October 2005	Supported
Central and Western District Council	24 November 2005 & 19 January 2006	Supported
Kwai Tsing District Council Traffic and Transport Committee	16 February 2006	Supported
Tuen Mun District Council Environmental, Hygiene and District Development Committee	17 March 2006	Supported
Yuen Long District Council Town Planning and Development Committee	22 March 2006	Supported
Islands District Council Environment Improvement and Food Hygiene Committee	27 March 2006	Supported
Wan Chai District Council Planning, Transport and Environmental Protection Committee	28 March 2006	Supported
Eastern District Council Works and Development Committee, and Traffic and Transport Committee	21 April 2006	Supported

District Council	**Date of Meeting**	**Decision**
Sai Kung District Council Traffic and Transport Committee	13 April 2006	Supported
Yau Tsim Mong District Council	27 April 2006	Supported
Wong Tai Sin District Council	2 May 2006	Supported
Tai Po District Council Environment, Housing and Works Committee	12 May 2006	Supported
North District Council District Development and Environmental Improvement Committee	15 May 2006	Supported
Kowloon City District Council Traffic and Transport Committee	25 May 2006	Supported
Kwun Tong District Council Traffic and Transport Committee	8 June 2006	Supported
Sham Shui Po District Council Traffic Committee	22 June 2006	Supported
Sha Tin District Council Development and Housing Committee	27 June 2006	Supported