

For discussion  
on 19 December 2001

PWSC(2001-02)87

## ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

**Head 704 – DRAINAGE**  
**Environmental Protection – Sewerage and sewage treatment**  
**203DS – North District sewerage**

Members are invited to recommend to Finance  
Committee –

- (a) the upgrading of part of **203DS** entitled “North District sewerage, stage 1 phases 1B and 2A” to Category A at an estimated cost of \$125.1 million in money-of-the-day prices; and
- (b) the retention of the remainder of **203DS** in Category B.

### **PROBLEM**

Domestic sewage from unsewered areas in the North District contributes to water pollution in Deep Bay.

### **PROPOSAL**

2. The Director of Drainage Services, with the support of the Secretary for the Environment and Food, proposes to upgrade part of **203DS** to Category A at an estimated cost of \$125.1 million in money-of-the-day (MOD) prices for implementing the North District sewerage, stage 1 phases 1B and 2A works.

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## PROJECT SCOPE AND NATURE

3. The part of the project we now propose to upgrade to Category A covers works along Sha Tau Kok Road and at eight unsewered areas in the North District mentioned in (b) below. A location plan is at Enclosure 1. The scope of the works comprises the construction of –

- (a) about 3.0 kilometres (km) of sewers and associated branch sewers, ranging from 300 millimetres (mm) to 675 mm in diameter, along Sha Tau Kok Road from Luen Wo Hui to Man Uk Pin;
- (b) about 6.2 km of sewers, ranging from 150 mm to 500 mm in diameter for eight villages, namely, Tsung Pak Long, Tai Tau Leng, Yin Kong, Hang Tau, Kai Leng, Ng Uk Tsuen, So Kwun Po, and Fan Leng Lau;
- (c) eight sewage pumping stations – six along Sha Tau Kok Road, one in Tsung Pak Long Tsuen and one in Hang Tau; and
- (d) about 1 km of rising mains, ranging from 100 mm to 400 mm in diameter, in association with the construction of the eight sewage pumping stations mentioned in (c) above.

We plan to start the proposed works in April 2002 for completion in December 2004, to be followed by minor house connection works.

4. The remainder of **203DS** for retention in Category B comprises –

- (a) construction of stage 1 phases 2B and 2C sewerage works; and
- (b) construction of stage 2 sewerage works.

## JUSTIFICATION

5. At present, domestic sewage from unsewered areas in the North District is partially treated by private treatment facilities before discharging into Deep Bay via stormwater drains and streams. Most of these treatment facilities are septic tanks and soakaway systems in village houses. The effectiveness of

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these facilities in removing pollutants depends on their size<sup>1</sup>, whether they are located in areas where the ground conditions are suitable for the soakaway systems to work properly<sup>2</sup>, and whether the systems are properly maintained. Sewage discharged from these unsewered areas is a source of pollution in Deep Bay.

6. As a long-term measure to address the water pollution problem in the North District catchment, we included **203DS** in the Public Works Programme in October 1994.

7. Works under **203DS** were divided into two stages covering 74 unsewered areas within the North District catchment. The project includes constructing public sewers and pumping stations in stages to convey sewage flows from these unsewered areas into existing sewerage systems in the North District. It also provides small-scale sewage treatment plants for on-site treatment in unsewered areas situated at remote locations. **Stage 1** covers the extension of the existing sewerage network to the eastern and western parts of the North District catchment and village sewerage works in 38 unsewered areas. Stage 1 is sub-divided into phases 1A, 1B, 2A, 2B and 2C. Phase 1A of Stage 1 is under construction and is scheduled for completion in March 2002. **Stage 2** covers the extension of the sewerage network to the southern and north-eastern parts of the catchment and village sewerage works in the remaining 36 unsewered areas.

8. We now propose to upgrade part of **203DS** to Category A as North District sewerage stage 1 phases 1B and 2A works. The proposed sewers along Sha Tau Kok Road are required to serve a projected population of 28 000 by 2011. In addition, about 6.2 km of village sewers are required for collecting sewage generated by about 14 000 people in the eight unsewered areas mentioned in paragraph 3(b) above to the public sewerage network. Due to the topography of some unsewered areas covered by the project **203DS**, we will need to construct eight sewage pumping stations to uplift the sewage to be collected from these areas

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<sup>1</sup> Undersized septic tanks or soakaway systems would affect the pollutant removal efficiency of a system and may even lead to an overflow of effluent.

<sup>2</sup> Soakaway systems operate by allowing the effluent to percolate through the gravel whereby pollutants would be removed in a natural manner. However, if a system is located in an area where the underground water table is high, it cannot function properly.

to the existing public sewers. The 1 km of rising mains is required for conveying sewage lifted from these eight sewage pumping stations to the public sewerage system. To avoid repeated road opening works<sup>3</sup>, we have thoroughly examined whether the proposed works could be implemented alongside with other scheduled road works programmes under the public works programme. In this regard, we will entrust to Highways Department the construction of about 300 metres of rising mains along Hang Tau Road in conjunction with a road widening project, namely, "RPIS Rural Improvement Works, Package 5 Project ND040 : Improvement of Access Road at Hang Tau, Sheung Shui" which will commence in end 2002 for completion by April 2004.

9. The sewage collected under the project will be conveyed to the existing Shek Wu Hui sewage treatment works for secondary treatment<sup>4</sup> before discharge into Deep Bay. Upon completion of the works, we will be able to improve the water quality of Deep Bay by giving proper treatment to 9 900 cubic metres (m<sup>3</sup>) of sewage per day by 2011.

## FINANCIAL IMPLICATIONS

10. We estimate the capital cost of the proposed works to be \$125.1 million in MOD prices (see paragraph 11 below), made up as follows –

	<b>\$ million</b>	
(a) Sewers and rising mains	41.7	
(b) Sewage pumping stations	49.2	
(i) civil works	32.9	
(ii) electrical & mechanical works	16.3	
(c) Rising mains at Hang Tau entrusted to Highways Department for construction	2.0	
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<sup>3</sup> We have comprehensive guidelines to control and co-ordinate the road opening works at the same location. For example, a road will not be allowed to be excavated within one year after re-surfacing and five years after re-construction, except for special circumstances.

<sup>4</sup> For secondary treatment, the sewage is purified by means of biological treatment processes after the sewage has undergone primary treatment, which entails screening, removal of grit and a sedimentation process. The organic matter in the settled sewage is decomposed by micro-organisms in the biological treatment process.

		<b>\$ million</b>	
(d)	Environmental mitigation measures	6.6	
(e)	Consultants' fees for	13.8	
	(i) contract administration	1.4	
	(ii) site supervision	12.4	
(f)	Contingency	11.0	
	Sub-total	124.3	(in September 2001 prices)
(g)	Provision for price adjustment	0.8	
	Total	125.1	(in MOD prices)

— A breakdown of the estimates for the consultants' fees by man-months is at Enclosure 2.

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

<b>Year</b>	<b>\$ million (Sept 2001)</b>	<b>Price adjustment factor</b>	<b>\$ million (MOD)</b>
2002 – 2003	18.6	0.99700	18.5
2003 – 2004	51.3	1.00398	51.5
2004 – 2005	46.2	1.01101	46.7
2005 – 2006	5.2	1.01808	5.3
2006 – 2007	3.0	1.02521	3.1
	124.3		125.1

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12. We have derived the MOD estimate on the basis of the Government's latest forecast of trend labour and construction prices for the period 2002 to 2007. We will tender the proposed civil works as a standard re-measurement contract because of the uncertainties of the existence and location of underground utilities such as electricity cables, telephone cables, storm-water drains and water pipes. The contract will provide for price adjustments because the contract period will exceed 21 months. We will tender the electrical and mechanical works of the pumping stations under a fixed-price lump-sum contract because we can clearly define the scope of the relevant works.

13. We estimate the annual recurrent expenditure for maintenance works to be \$3.2 million.

14. Based on the current level of expenditure on operation and maintenance of sewerage facilities, the proposed works by itself would lead to an increase in the recurrent cost of providing sewage services by about 0.23%. This will need to be taken into account in determining sewage charges.

## **PUBLIC CONSULTATION**

15. We consulted the Environmental and Development Committee of the then Provisional North District Board and the North District Council respectively in November 1998 and June 2001 on the proposed stage 1 phases 1B and 2A works. They supported implementation of the proposed works.

16. We consulted the Legislative Council Panel on Environmental Affairs on the proposed works on 26 November 2001. Members noted that we would submit the project proposal to the Public Works Subcommittee for discussion on 19 December 2001.

## **ENVIRONMENTAL IMPLICATIONS**

17. We completed an Environmental Review (ER) for the North District Sewerage Master Plan Study in 1994. The ER concluded that the proposed works would not cause adverse environmental impact and no Environmental Impact Assessment is required. For short-term impact during construction, we will control noise, dust and site run-off within established standards and guidelines through implementation of mitigation measures, such as the use of temporary noise barriers and silenced construction plant to reduce noise generation, water-spraying to reduce emission of fugitive dust and strict control on diversion of sewage flows in the works contracts.

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18. We estimate the cost of implementing the environmental mitigation measures to be \$6.6 million. We have included this in the overall project estimate.

19. At the planning and design stages, we have taken due consideration of the need to minimise the generation of construction and demolition (C&D) materials when designing the level and layout of the proposed works. We will require the contractor to submit a waste management plan (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 designated public filling facilities and landfills respectively through a trip-ticket system. We will require the contractor 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. We estimate that the project will generate about 27 000 m<sup>3</sup> of C&D materials. Of these, we will reuse about 14 500 m<sup>3</sup> (54%) on site, 9 500 m<sup>3</sup> (35%) as fill in public filling areas<sup>5</sup>, and dispose of 3 000 m<sup>3</sup> (11%) at landfills. The notional cost of accommodating C&D waste at landfill sites is estimated to be \$375,000 for this project (based on a notional unit cost<sup>6</sup> of \$125/m<sup>3</sup>).

## LAND ACQUISITION

20. The stage 1 phase 1B works require land resumption. The land resumption and clearance cost for the project is estimated at \$7.1 million and will be charged to **Head 701** - Land Acquisition. All the statutory procedures for resuming the required land have been completed in accordance with the Water Pollution Control (Sewerage) Regulation. The stage 1 phase 2A works do not require land resumption.

**/BACKGROUND .....**

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<sup>5</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>6</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 per/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 estimate is for reference only and does not form part of this project estimate.

**BACKGROUND INFORMATION**

21. We completed a comprehensive study of the sewerage system in the North District under **113DS** "North District sewerage master plan - consultants' fees and investigations" in August 1994. We upgraded **203DS** to Category B in October 1994 to implement the sewerage works recommended under the study in two stages. The implementation plan and the scope of the various stages and phases under **203DS** are summarised at Enclosure 3.

22. We have deployed in-house resources to conduct detailed design for the stage 1 phase 1 works. In December 1998, we engaged consultants to carry out detailed design for the stage 1 phase 2 works and the necessary investigations. The consultancy was funded under block allocation **Subhead 4100DX** "Drainage works, studies and investigations for items in Category D of the Public Works Programme".

23. In December 1998, we upgraded part of **203DS** to Category A as **219DS** "North District sewerage, stage 1 phase 1A". We started the works in November 1999 for completion in March 2002.

24. We have substantially completed the design of the stage 1 phases 1B and 2A works. We plan to start the stage 1 phase 1B works in April 2002 for completion in August 2004 and the stage 1 phase 2A works in July 2002 for completion in December 2004. After the completion of the above works, the Environmental Protection Department will serve notice to request villagers to carry out the final house connection works under the Water Pollution Control Ordinance.

25. With the exception of the proposed sewer along Sha Tau Kok Road, the works would mostly be implemented in rural areas and traffic impact will be minimal. We have completed the traffic impact assessment for the proposed sewer along Sha Tau Kok Road and formulated feasible temporary traffic management schemes for the construction works. During the execution of works, we will maintain road access as far as possible and display notice boards on site to explain the reason for the temporary traffic arrangements and the proposed completion date of the concerned section of works. In addition, telephone hotlines will be set up for the public to make enquiries or lodge complaints.

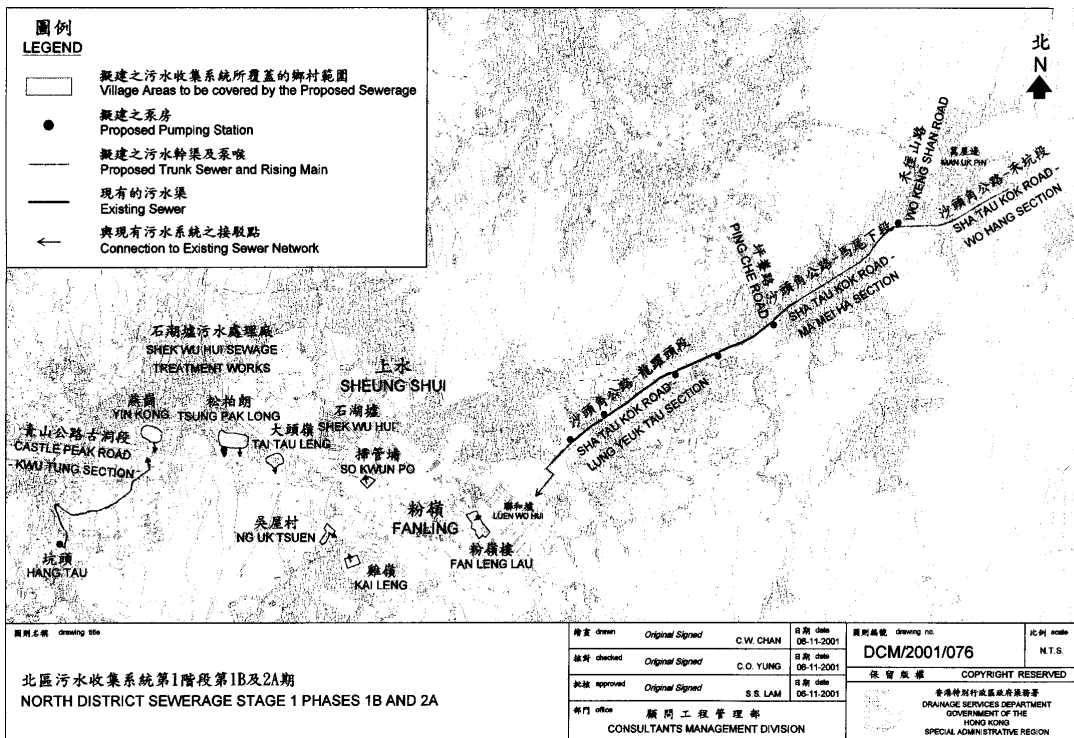
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26. We estimate that the stage 1 phases 1B and 2A works will create some 105 jobs comprising 20 professional/technical staff and 85 labourers, totalling 2 300 man-months.

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Environment and Food Bureau  
December 2001



## 203DS – North District sewerage

## Breakdown of the consultants' fees

Consultants' staff costs			Estimated man- months	Average MPS* salary point	Multiplier <sup>(Note 1)</sup>	Estimated fee (\$ million)
(a)	Contract administration <sup>(Note 2)</sup>	Professional	7.5	-	-	1.1
		Technical	6.5	-	-	0.3
(b)	Site supervision by resident site staff of the consultants <sup>(Note 3)</sup>	Professional	40.0	38	1.7	4.1
		Technical	250.0	14	1.7	8.3
<b>Total consultants' staff costs</b>						13.8

\* MPS = Master Pay Scale

## Notes

1. A multiplier of 2.4 is applied to the average MPS point to estimate the full staff costs including the consultants' overheads and profit, as the staff will be employed in the consultants' offices. A multiplier of 1.7 is applied in the case of resident site staff supplied by the consultants. (As at 1.4.2001, MPS pt. 38 = \$60,395 per month and MPS pt. 14 = \$19,510 per month).
2. The consultants' staff cost for contract administration is calculated in accordance with the consultancy agreement which the Director of Drainage Services has agreed with the consultants undertaking the design and construction of the project **203DS**.
3. The consultants' staff cost for site supervision is based on estimates prepared by the Director of Drainage Services. We will only know the actual man-months and actual costs after the completion of the construction works.



**203DS - North District sewerage  
Cost Estimate, Implementation Plan and Scope of Works**

PWP Item No.	Stage/ phase of works	Scope of works	Start date	Completion date	Approved project estimate (\$ million in MOD prices) / updated cost estimate (\$ million in Sept 2001 prices)	Estimated population of unsewered areas
<b>Stage 1 Phase 1 (covering 4 unsewered areas)<sup>1</sup></b>						
219DS	phase 1A	(a) The construction of a new diversion sewer along Ma Sik Road; and (b) the construction of trunk sewer and associated branch sewers along Castle Peak Road from Pak Shek Au to Choi Po Court and the three pumping stations and rising mains at Kwu Tung <sup>2</sup> , Tsung Pak Long and Tai Tau Leng.	Nov 1999	Mar 2002	124.7 (in MOD prices)	-
*	phase 1B	(a) The construction of the two pumping stations and associated rising mains at Hang Tau and Tsung Pak Long Tsuen; and (b) the provision of village sewerage for four villages, namely Hang Tau, Yin Kong, Tsung Pak Long and Tai Tau Leng.	Apr 2002	Aug 2004	34.9	11 000
<b>Subtotal</b>					159.6	11 000

PWP Item No.	Stage/ phase of works	Scope of works	Start date	Completion date	Approved project estimate (\$ million in MOD prices) / updated cost estimate (\$ million in Sept 2001 prices)	Estimated population of unsewered areas
<b>Stage 1 Phase 2 (covering 34 unsewered areas) <sup>1</sup></b>						
*	phase 2A	(a) The construction of sewer, six pumping stations and associated rising mains along Sha Tau Kok Road from Luen Wo Hui to Man Uk Pin; and (b) the provision of village sewerage for four villages, namely Ng Uk Tsuen, So Kwun Po, Kai Leng and Fan Leng Lau.	Jul 2002	Dec 2004	89.4	3 100
#	phase 2B	(a) The provision of village sewerage for 19 villages in the central and eastern parts of North District; and (b) the investigation of different on-site sewage treatment processes for remote villages.	Sept 2003	Dec 2005	153.6	19 000
#	phase 2C	The provision of village sewerage for 11 villages in the central and eastern parts of North District.	Feb 2004	May 2006	113.6	26 500
<b>Subtotal</b>					356.6	48 600
<b>Stage 1 Total</b>					516.2	59 600

PWP Item No.	Stage/ phase of works	Scope of works	Start date	Completion date	Approved project estimate (\$ million in MOD prices) / updated cost estimate (\$ million in Sept 2001 prices)	Estimated population of unsewered areas
<b>Stage 2 (covering 36 unsewered areas)</b>						
#	Stage 2	(a) The southern trunk sewer and pumping stations; (b) the Pak Hok Lam trunk sewer and pumping stations; (c) the associated village sewerage works for 36 villages; and (d) on-site sewage treatment facilities for remote villages.	Feb 2005	Oct 2009	299.4	20 000
<b><i>Stage 2 Total</i></b>					299.4	20 000
<b><i>Grand Total</i></b>					815.6	79 600

<sup>1</sup> We originally planned to implement sewerage works for seven villages under the stage 1 phase 1B and for 31 villages under stage 1 phase 2. However, because of the interface with the 'Planning and Development Study on North East New Territories' (the Study) commissioned jointly by the Territory Development Department and Planning Department and the objections from the village representative, we have tentatively, with the agreement of EPD, re-scheduled the sewerage works for the concerned three villages from stage 1 phase 1B to stage 1 phase 2 pending the recommendation of the Study and the result of further lobbying with the villagers.

<sup>2</sup> With reference to the Study, Kwu Tung is one of the new development areas under the Study. There will be substantial increase in the planned population in Kwu Tung area. To prevent any abortive sewerage works, reduce interface problems/constraints to the Study and add flexibility for sewerage infrastructure to be constructed for Kwu Tung development, the Study will incorporate sewerage works as part of the infrastructure for the future Kwu Tung development plans.

\* Part of **203DS** we now propose to upgrade to Category A.

# The remainder of **203DS** for retention in Category B.