

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

### **HEAD 704 – DRAINAGE**

#### **Environmental Protection – Sewerage and sewage treatment**

**230DS – Outlying Islands sewerage stage 1 phase 1 part 2 – Yung Shue Wan sewerage, sewage treatment works and outfall**

**234DS – Outlying Islands sewerage stage 1 phase 2 – Sok Kwu Wan sewage collection, treatment and disposal facilities**

Members are invited to recommend to Finance Committee –

- (a) the upgrading of **230DS** to Category A at an estimated cost of \$288.3 million in money-of-the-day (MOD) prices for the provision of sewerage, sewage treatment and disposal facilities at Yung Shue Wan, Lamma Island; and
- (b) the upgrading of **234DS** to Category A at an estimated cost of \$256.4 million in MOD prices for the provision of sewerage, sewage treatment and disposal facilities at Sok Kwu Wan, Lamma Island.

### **PROBLEM**

There are no public sewerage, sewage treatment and disposal facilities at Yung Shue Wan (YSW) and Sok Kwu Wan (SKW), Lamma Island.

**/PROPOSAL .....**

**PROPOSAL**

2. The Director of Drainage Services, with the support of the Secretary for the Environment, proposes to upgrade the following projects to Category A –

		<b>Estimated cost (in MOD prices)</b>
(a)	<b>230DS</b> Outlying Islands sewerage stage 1 phase 1 part 2 – Yung Shue Wan sewerage, sewage treatment works and outfall	\$288.3 million
(b)	<b>234DS</b> Outlying Islands sewerage stage 1 phase 2 – Sok Kwu Wan sewage collection, treatment and disposal facilities	\$256.4 million

**PROJECT SCOPE AND NATURE**

3. The scope of **230DS** and **234DS** comprises –

Sewage Collection Facilities

- (a) provision of about 3.3 kilometres (km) of sewers in six villages of YSW, namely Po Wah Yuen, Sha Po New Village, Tai Yuen New Village, Kam Shan Terrace, Sha Po Old Village and Ko Long, together with the associated geotechnical works along the proposed sewer alignments;
- (b) provision of about 1.8 km of sewers in two villages of SKW, namely Chung Mei and Sok Kwu Wan, together with the associated geotechnical works along the proposed sewer alignments;

Sewage Treatment Facilities

- (c) provision of two secondary sewage treatment works (STWs) with treatment capacities of 2 850 and 1 430 cubic metres per day at YSW and SKW respectively, together with the associated sludge treatment and odour control facilities as well as the slope stabilisation works for the two STW sites;

/(d) .....

- (d) provision of two submarine outfalls of lengths 500 metres (m) and 750 m at YSW and SKW respectively; and
- (e) provision of two pumping stations and two twin rising mains with a total length of about 1 km at SKW.

4. We plan to start the construction works in January 2008 for completion in July 2010. A plan showing the proposed works is at Enclosure 1.

### JUSTIFICATION

5. At present, Lamma Island is unsewered and sewage from village houses is discharged into nearby water bodies after treatment by private treatment facilities, such as septic tanks and soakaway systems. These private treatment facilities in general are not effective in removing pollutants due to their close proximity to watercourses<sup>1</sup> and inadequate maintenance<sup>2</sup>. Their discharge is a source of pollution to nearby watercourses and receiving waters.

6. Projects **230DS** and **234DS** will provide proper sewage collection, treatment and disposal facilities capable of handling the sewage arising from an estimated population of 5 300 at YSW and 2 100 at SKW, together with the flow from local commercial activities and visitors. Under **230DS** and **234DS**, sewage from YSW and SKW will be collected by sewers to the proposed STWs for secondary treatment with nutrient removal before disposal. The characteristics of raw sewage and treated effluent in terms of Biochemical Oxygen Demand (BOD), Suspended Solids (SS), Nitrogen and *E. Coli* of the proposed STWs are given in Enclosure 2. On completion, the water quality of the nearby watercourses and receiving waters of Lamma Island will improve.

### FINANCIAL IMPLICATIONS

7. We estimate the capital costs of **230DS** and **234DS** to be \$288.3 million and \$256.4 million respectively in MOD prices (see paragraph 8 below), made up as follows –

/(a) .....

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<sup>1</sup> Soakaway systems operate by allowing the effluent to percolate through the soil so that pollutants would be removed in a natural manner. However, if a system is located in an area where the underground water table is high such as an area in close proximity to watercourses, it cannot function properly.

<sup>2</sup> Inadequate maintenance of septic tanks or soakaway systems would affect their pollutant removal efficiency and may even lead to overflow of effluent.

	\$ million	\$ million	
	230DS	234DS	
(a) Construction of sewers of about 3.3 km at YSW and 1.8 km at SKW	41.2	29.1	
(b) Design and construction of	174.3	163.7	
(i) sewage treatment works	101.6	68.9	
(ii) submarine outfall	72.7	76.7	
(iii) sewage pumping stations	N.A.	18.1	
(c) Consultants' fees for	36.3	30.9	
(i) contract administration	1.4	1.2	
(ii) site supervision	34.2	29.1	
(iii) environmental monitoring and audit	0.7	0.6	
(d) Environmental mitigation measures	5.3	4.9	
(e) Contingencies	23.8	21.1	
Sub-total	280.9	249.7	(in September 2007 prices)
(f) Provision for price adjustment	7.4	6.7	
Total	288.3	256.4	(in MOD prices)

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

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

Year	\$ million (Sept 2007)		Price adjustment factor	\$ million (MOD)	
	230DS	234DS		230DS	234DS
2007 – 2008	0.3	0.3	1.00000	0.3	0.3
2008 – 2009	44.1	39.0	1.00750	44.4	39.3
2009 – 2010	96.8	79.9	1.01758	98.5	81.3
2010 – 2011	80.9	78.0	1.02775	83.1	80.2
2011 – 2012	25.8	23.5	1.03803	26.8	24.4
2012 – 2013	19.0	18.0	1.05619	20.1	19.0
2013 – 2014	14.0	11.0	1.07732	15.1	11.9
	280.9	249.7		288.3	256.4

9. We have derived the MOD estimate on the basis of the Government's latest forecast of the trend rate of change in the prices of the public sector building and construction output for the period from 2007 to 2014. We will implement the works under two contracts. We will adopt a conventional construction contract to construct the proposed sewage collection facilities at the unsewered areas and villages in YSW and SKW. We will adopt a design-build-operate (DBO) contract to design, construct and operate the proposed sewage treatment works, submarine outfalls, pumping stations and rising mains at YSW and SKW. The DBO procurement approach will allow flexibility for the contractor to optimise the work schedule in the design and construction stages, and to achieve reasonable construction and operation costs of the sewage treatment facilities. Both the construction and DBO contracts will provide for price adjustments because their contract periods will exceed 21 months.

10. We estimate the annual recurrent expenditure arising from the proposed works to be about \$5 million for **230DS** and \$3 million for **234DS**.

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11. Based on the current level of expenditure on operation and day-to-day maintenance of sewerage facilities, the proposed works will lead to an increase in the recurrent cost of providing sewage services by about 0.45%. This has been taken into account in determining future sewage charges.

## **PUBLIC CONSULTATION**

12. We consulted the Islands District Council, the Lamma Island (South) Rural Committee and the Lamma Island (North) Rural Committee on 24 April 2006, 22 June 2006 and 15 September 2006 respectively. We also consulted the then Lamma Area Committee, and the local mariculturist and fisherman groups on 22 February 2006 and 17 August 2006 respectively. They all supported the implementation of the proposed works.

13. We gazetted the proposed works at YSW under **230DS** under the Foreshore and Sea-bed (Reclamation) Ordinance (FS(R)O) and the Water Pollution Control (Sewerage) Regulation (WPC(S)R) on 14 August 1998 and 10 August 2001 respectively. We did not receive any objection. The scheme was authorised under FS(R)O and WPC(S)R on 30 October 1998 and 1 November 2001 respectively.

14. We gazetted the proposed works at SKW under **234DS** under FS(R)O and WPC(S)R on 27 October 2006 and 2 March 2007 respectively. We did not receive any objection. The scheme was authorised under FS(R)O and WPC(S)R on 18 January 2007 and 15 May 2007 respectively.

15. We consulted the Legislative Council Panel on Environmental Affairs on 25 June 2007 on the proposed works. Members raised no objection to our plan to submit the funding proposals to the Public Works Subcommittee.

## **ENVIRONMENTAL IMPLICATIONS**

16. The projects **230DS** and **234DS** will improve the local water quality of Lamma Island. Both projects are designated projects under the Environmental Impact Assessment (EIA) Ordinance. In June 2007, we have obtained the environmental permits for the construction and operation of the projects. The EIA reports concluded that the environmental impact of the projects can be controlled to within the criteria established under the EIAO and the Technical Memorandum on the EIA Process. We shall implement the measures recommended in the EIA reports. We will install deodorisation facilities in the proposed sewage treatment works and pumping stations to combat the potential odour problem. During

/construction .....

construction, we will control noise, dust and site run-off to levels within established standards and guidelines through the implementation of mitigation measures, such as the use of temporary noise barriers and quieter construction equipment, frequent water-spraying on site, and strict control over the diversion of site run-off. We will also carry out regular site inspections to ensure that these recommended mitigation measures and good site practices would be properly implemented. We have included \$10.2 million (in September 2007 prices) in the overall project estimate for implementation of environmental mitigation measures.

17. We have considered ways to reduce the generation of construction waste where possible. For example, excavation for structures will be minimised as far as practicable. We will require the contractor to reuse inert construction waste (e.g. excavated soil) on site or at other suitable construction sites as far as possible, in order to minimise the disposal of inert construction waste at public fill reception facilities<sup>3</sup>. We will encourage the contractor to maximise the use of recycled or recyclable inert construction waste, as well as the use of non-timber formwork to further minimise the generation of construction waste.

18. We will also require the contractor to submit for approval a plan setting out the waste management measures, which will include appropriate mitigation means (e.g. allocation of an area for waste segregation) to avoid, reduce, reuse and recycle inert construction waste. We will ensure that the day-to-day operations on site comply with the approved plan. We will require the contractor to separate the inert portion from non-inert construction waste on site for disposal at appropriate facilities. We will control the disposal of inert construction waste and non-inert construction waste to public fill reception facilities and landfills respectively through a trip-ticket system.

19. We estimate that the projects will generate the following construction waste –

	230DS		234DS	
	tonnes	%	tonnes	%
Inert construction waste reused / recycled on site	4 000	25.3	3 200	10.7
Inert construction waste to public fill reception facilities for subsequent reuse	7 700	48.7	23 900	79.9

/Non-inert .....

<sup>3</sup> Public fill reception facilities are specified in Schedule 4 of the Waste Disposal (Charges for Disposal of Construction Waste) Regulation. Disposal of inert construction waste in public fill reception facilities requires a licence issued by the Director of Civil Engineering and Development.

	<b>230DS</b>		<b>234DS</b>	
	<b>tonnes</b>	<b>%</b>	<b>tonnes</b>	<b>%</b>
Non-inert construction waste to landfills	4 100	26.0	2 800	9.4
Total construction waste generated	15 800	100.0	29 900	100.0

The total cost of accommodating construction waste at public fill reception facilities and landfill sites is estimated to be \$720,400 for **230DS** and \$995,300 for **234DS** (based on a unit cost of \$27/tonne for disposal at public fill reception facilities and \$125/tonne<sup>4</sup> at landfills).

## LAND ACQUISITION

20. We have to resume about 79.4 square metres (m<sup>2</sup>) and 460.3 m<sup>2</sup> of private agricultural land for **230DS** and **234DS** respectively. The land acquisition and clearance do not affect any household. The costs of the land acquisition and clearance for **230DS** and **234DS** are about \$0.2 million and \$1.4 million respectively. The cost of land acquisition and clearance will be charged to **Head 701 - Land Acquisition**.

## BACKGROUND INFORMATION

21. In 1994, we completed the Sewerage Master Plan Study under **146DS** “Outlying Islands Sewerage Master Plan Study – consultants’ fees and investigations” and recommended, inter alia, sewage collection, treatment and disposal works to be implemented at YSW and SKW of Lamma Island.

22. In October 2004, we upgraded **230DS** and **234DS** to Category B. In November 2005, we commissioned a consultancy to carry out the design, prepare the contract documentation and assist in the tendering process for **230DS** and **234DS**, at an estimated cost of \$4.2 million. We charged the amount to block allocation Subhead **4100DX** “Drainage works, studies and investigations for items in Category D of the Public Works Programme”.

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<sup>4</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 is likely to be more expensive) when the existing ones are filled.



23. Of the 378 trees within the boundary of the projects, 344 trees will be preserved. The proposed works will involve the removal of 34 common trees including 33 trees to be felled and one tree to be replanted within the project site. No important trees<sup>5</sup> will be affected during the implementation of the projects. We will incorporate planting proposals as part of the projects, including an estimated quantity of 33 trees.

24. We estimate that the proposed works will create the following job opportunities -

	<b>Professional / Technical staff</b>	<b>Labourer</b>	<b>Total</b>	<b>Estimated total man-months</b>
<b>230DS</b>	30	120	150	4 050
<b>234DS</b>	28	117	145	3 950

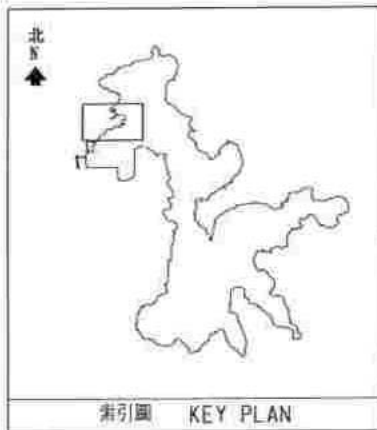
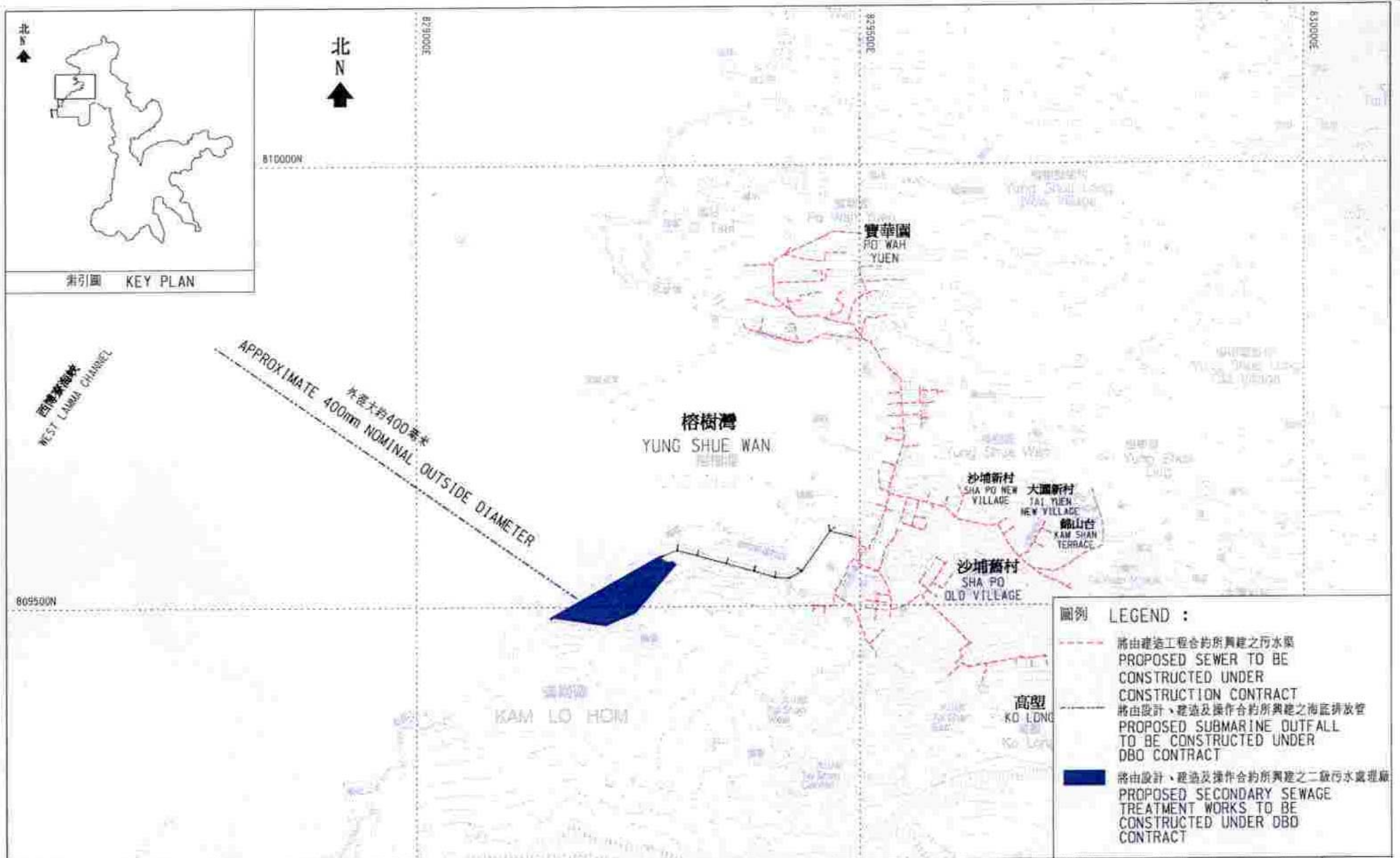
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Environment Bureau  
October 2007

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<sup>5</sup> “Important trees” refer to trees in the Register of Old and Valuable Trees, or any other trees that meet one or more of the following criteria –

- trees over 100 years old;
- trees of cultural, historical or memorable significance e.g. Fung Shui trees, trees as landmark of monastery or heritage monument, and trees in memory of important persons or event;
- trees of precious or rare species;
- trees of outstanding form (taking account of overall tree sizes, shape and any special features) e.g. trees with curtain like aerial roots, trees growing in unusual habitat; or
- trees with trunk diameter equal or exceeding 1.0 m (measured at 1.3 m above ground level), or with height/canopy spread equal or exceeding 25 m.



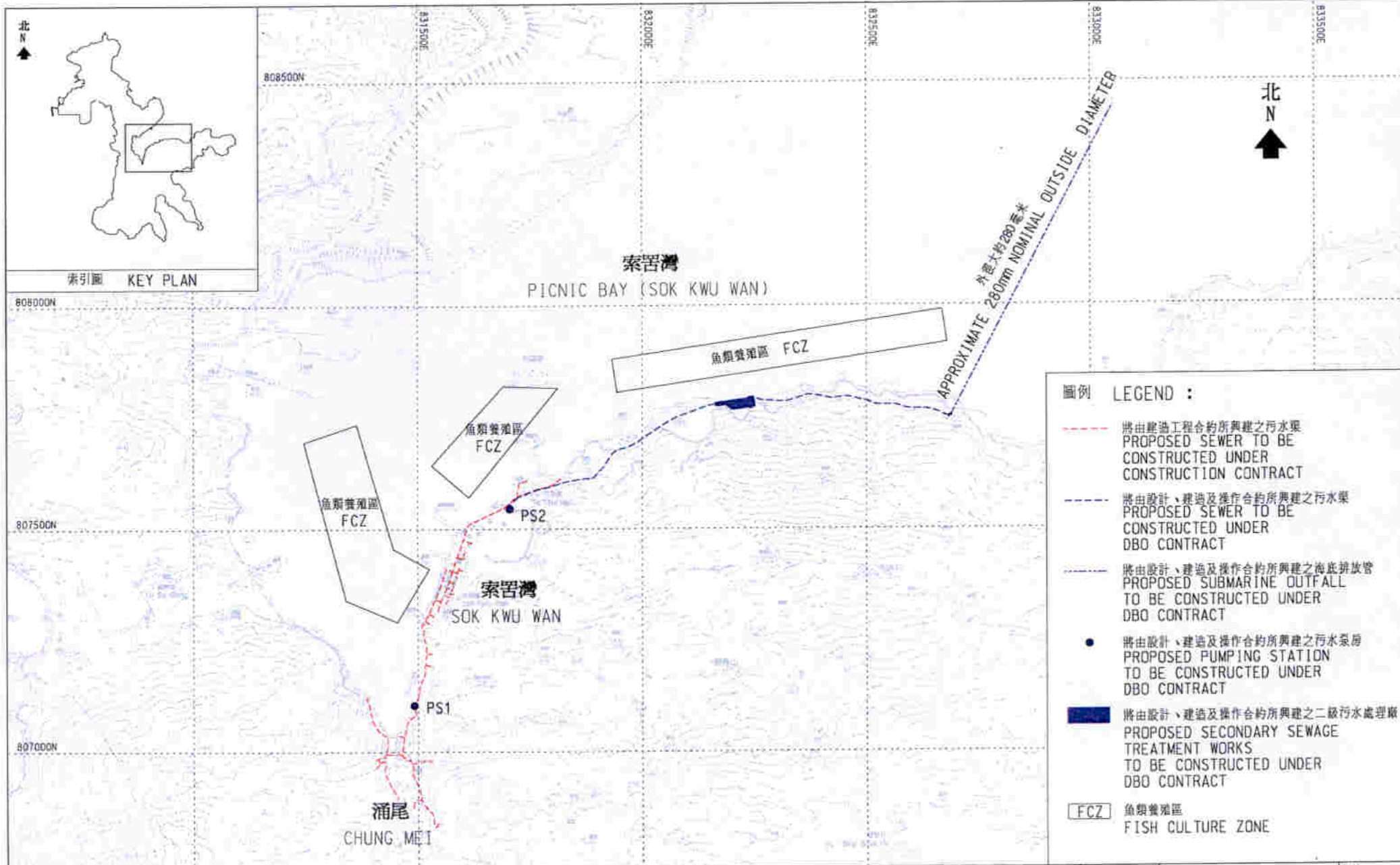
圖例 LEGEND :	
	將由建造工程合約所興建之污水渠 PROPOSED SEWER TO BE CONSTRUCTED UNDER CONSTRUCTION CONTRACT
	將由設計、建造及操作合約所興建之海底排放管 PROPOSED SUBMARINE OUTFALL TO BE CONSTRUCTED UNDER DBO CONTRACT
	將由設計、建造及操作合約所興建之二級污水處理廠 PROPOSED SECONDARY SEWAGE TREATMENT WORKS TO BE CONSTRUCTED UNDER DBO CONTRACT

信 Wilson CDM  
 香港 CDM 專業顧問公司

渠務署  
 DRAINAGE  
 SERVICES  
 DEPARTMENT

離島污水收集系統第一階段第一期第二部份  
 榕樹灣污水收集、處理及排放工程  
 OUTLYING ISLANDS SEWERAGE STAGE 1 PHASE 1 PART 2  
 YUNG SHUE WAN SEWERAGE, SEWAGE TREATMENT WORKS AND OUTFALL

SCALE: 1 : 4000	FIGURE NO. 圖則一	FIGURE 1	REV. -
DRAWN: NYH	榕樹灣之擬建污水工程概覽		
CHECKED: JPCW	LAYOUT PLAN OF PROPOSED SEWERAGE WORKS FOR YUNG SHUE WAN		
DATE: 04/07			



**230DS – Outlying Islands sewerage stage 1 phase 1 part 2 – Yung Shue Wan sewerage, sewage treatment works and outfall**

**234DS – Outlying Islands sewerage stage 1 phase 2 – Sok Kwu Wan sewage collection, treatment and disposal facilities**

**Characteristics of raw sewage influent and treated effluent**

Parameter	Raw Sewage Influent (Note 1)	Treated Effluent (Note 1)	
		YSW	SKW
Biochemical Oxygen Demand (BOD)	216 mg/L	20 mg/L	20 mg/L
Total Suspended Solids (SS)	155 mg/L	30 mg/L	30 mg/L
Nitrogen (Note 2)	35 mg/L	12 mg/L	12 mg/L
<i>E. Coli</i> (Note 3)	1 x 10 <sup>7</sup> counts/100 mL	N.A.	100 counts/100 mL

**Notes :**

- 1 The figures in the table are projected values.
2. The Nitrogen figures for raw sewage influent and treated effluent are Total Kjeldahl Nitrogen and Total Nitrogen respectively.
3. (a) The *E. coli* figure for raw sewage influent is the design value and that for treated effluent of SKW is monthly geometric mean.  
  
(b) No *E. coli* figure is specified for the proposed sewage treatment works at YSW which would not require disinfection facilities as the treatment works would achieve the effluent quality required for the receiving water body which does not have fish culture zones.

**Enclosure 3 to PWSC(2007-08)49**

**230DS – Outlying Islands sewerage stage 1 phase 1 part 2 – Yung Shue Wan sewerage, sewage treatment works and outfall**

**234DS – Outlying Islands sewerage stage 1 phase 2 – Sok Kwu Wan sewage collection, treatment and disposal facilities**

**Breakdown of estimates for consultants' fees**

<b>Consultants' staff costs (Note 2)</b>		<b>Estimated man-months</b>		<b>Average MPS* salary point</b>	<b>Multiplier (Note 1)</b>	<b>Estimated Fee (\$million)</b>	
		<b>230DS</b>	<b>234DS</b>			<b>230DS</b>	<b>234DS</b>
(a) Contract administration	Professional	15	13	38	1.6	1.4	1.2
(b) Site supervision by resident site staff of the consultants	Professional	131	114	38	1.6	11.9	10.4
	Technical	740	620	14	1.6	22.3	18.7
(c) Environmental monitoring and audit	Professional	4	3	38	1.6	0.4	0.3
	Technical	10	10	14	1.6	0.3	0.3
<b>Total consultants' fees (Note 2)</b>						36.3	30.9

\* MPS = Master Pay Scale

**Notes**

1. A multiplier of 1.6 is applied to the average MPS salary point to arrive at the full staff costs, including the consultants' overheads and profit, for staff employed in the consultants' offices. MPS points 38 and 14 are used as the average MPS salary points for professionals and technical staff respectively. (As at 1 April 2007, MPS Point 38 = \$56,945 per month and MPS Point 14 = \$18,840 per month).
2. The consultants' fees for contract administration are estimated in accordance with the existing consultancy agreement for the design and construction of **230DS** and **234DS**. We will only know the actual man-months and actual costs for site supervision, environmental monitoring and audit work after completion of the works.