

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

Head 704 – DRAINAGE

Environmental Protection - Sewerage and sewage treatment

353DS – Outlying Islands sewerage, stage 2 – upgrading of Mui Wo village sewerage phase 2 and Mui Wo sewage treatment works

Members are invited to recommend to Finance
Committee –

- (a) the upgrading of part of **353DS**, entitled “Upgrading of Mui Wo sewage treatment works and sewerage at Mui Wo town centre and Wang Tong”, to Category A at an estimated cost of \$967.2 million in money-of-the-day prices; and
- (b) the retention of the remainder of **353DS** in Category B, retitled as “Outlying Islands sewerage, stage 2 – extension of sewerage system to other unsewered villages in Mui Wo”.

PROBLEM

Sewage from unsewered areas in Mui Wo is a source of water pollution to the nearby streams and the receiving waters of Silver Mine Bay.

/PROPOSAL

PROPOSAL

2. The Director of Drainage Services, with the support of the Secretary for the Environment, proposes to upgrade part of **353DS** to Category A at an estimated cost of \$967.2 million in money-of-the-day (MOD) prices for upgrading the existing Mui Wo sewage treatment works (STW) and implementing sewerage works in Mui Wo town centre, Wang Tong and Yue Kwong Chuen.

PROJECT SCOPE AND NATURE

3. The part of **353DS** that we propose to upgrade to Category A comprises –

- (a) upgrading of the existing Mui Wo STW to a capacity of 3 700 cubic metres (m³) per day;
- (b) upgrading of about 2.0 kilometres (km) of existing gravity trunk sewers with larger pipes ranging from 300 millimetres (mm) to 750 mm in diameter in Mui Wo town centre;
- (c) construction of about 2.9 km of sewers ranging from 150 mm to 250 mm in diameter for two unsewered areas in Mui Wo, namely Wang Tong and Yue Kwong Chuen; and
- (d) ancillary works.

A site plan showing the proposed works is at Enclosure 1.

4. Subject to the funding approval of the Finance Committee, we plan to commence the proposed works in June 2012 for completion in August 2017.

5. We will retain the remainder of **353DS** in Category B, which involves laying of about 7.4 km of sewers in ten other unsewered areas and construction of a sewage pumping station within Mui Wo. Planning and design of the relevant works are in progress. Funding for the remainder of **353DS** will be sought at a later stage after completion of the design and preparatory works.

/JUSTIFICATION

JUSTIFICATION

6. The existing service area of public sewerage in Mui Wo is limited to the town centre, Chung Hau and the coastal area of Silver Mine Bay up to Tung Wan Tau. Other village areas in the hinterland are unsewered. Sewage from these village areas is often treated and disposed of by means of private on-site treatment facilities (such as septic tanks and soakaway (STS) systems). These facilities are however often ineffective in removing pollutants due to their proximity to watercourses¹ or inadequate maintenance². Sewage from these unsewered areas has been identified as a source of water pollution to the nearby streams as well as the receiving waters of Silver Mine Bay. The discharge also affects the water quality of the Silver Mine Bay Beach.

7. In view of the above, public sewerage should be made available at these unsewered areas as a long-term measure to better protect the water quality of Silver Mine Bay. We have formulated a programme under the Outlying Islands Sewerage Master Plan to expand the sewerage infrastructure in Mui Wo in phases. The proposed works are the first phase expansion which involves the laying of 2.9 km of sewers in the two unsewered areas, Wang Tong and Yue Kwong Chuen. Sewage from these two areas will be collected and conveyed to the Mui Wo STW for proper treatment and disposal upon completion of the village sewerage works proposed above.

8. Based on the village properties survey results and the potential village house development information within the Wang Tong and Yue Kwong Chuen areas obtained in October 2009 and in March 2009 respectively, the proposed sewerage facilities for Wang Tong and Yue Kwong Chuen mentioned in paragraph 7 above will be able to serve some 282 village houses comprising about 131 existing houses, seven planned houses and 144 potential houses³.

/9.

¹ STS systems operate by allowing the effluent to percolate through gravels whereby pollutants are removed in a natural manner. However, if a STS system is located in an area where the ground water table is high, such as an area in proximity to watercourses, it will not function properly due to ineffective percolation.

² Inadequate maintenance of STS systems would affect their pollutant removal efficiency and might even lead to overflow of effluent.

³ The 144 potential village houses are houses that may be developed on vacant lands which are adjacent to the proposed sewer alignment. There is currently no development programme for these houses, which is subject to landowners' will and Lands Department's approval. In the event that some of these potential houses are not built, the abortive cost is not expected to be significant because, according to the designed sewer alignment, the proposed sewers will in any case need to pass through the vacant lands to serve the existing and planned houses.

9. The sewerage infrastructure in Mui Wo was built in the late 1980s to handle sewage from its existing service area. In other words, both the Mui Wo STW and the trunk sewers in the town centre do not possess spare capacity to cope with the additional sewage flow from the areas to be sewered under our current programme. In addition, the volume of sewage is expected to increase in the longer term in tandem with the projected growth in population and visitors. The extension of village sewerage in Mui Wo should therefore be complemented by comprehensive upgrading of the existing sewerage infrastructure.

10. In drawing up the specifications of the proposed upgrading works, our objective is to ensure that the sewerage infrastructure in Mui Wo will be capable of supporting not only the proposed expansion of village sewerage under the current proposal but also the long-term potential sewerage need of the entire service area⁴. The proposed upgrading works comprise the replacement of about 2.0 km of existing gravity trunk sewers in the town centre by larger pipes, ranging from 300 mm to 750 mm in diameter, along the same alignment. We will also expand the Mui Wo STW, which employs secondary treatment with disinfection facilities, from its current daily capacity of 1 190 m³ to a daily capacity of 3 700 m³. With the increase in plant scale, the existing oxidation ditch⁵ in the STW will be replaced by a membrane bioreactor system⁶ with a view to optimising space requirement and treatment efficiency. The quality of treated effluent will be subject to the same standard for secondary treatment being applied to the existing Mui Wo STW⁷. Opportunity is also taken to fit the STW with deodourising facilities to minimise potential odour nuisances to the neighbourhood. Greening and landscaping works will be carried out for the STW to blend in with the surrounding environment. An artist's impression of the proposed greening and landscaping works is at Enclosure 2.

/FINANCIAL

⁴ The residential population in Mui Wo is 5 600 in 2011. The design capacity of the proposed upgrading works is based on a projected residential population of 8 250 for Mui Wo (inclusive of all areas to be sewered under the full scope of **353DS**) by 2031. The projected growth in visitor numbers to be brought about by the Mui Wo Facelift project proposed under the Revised Concept Plan for Lantau has also been taken into account.

⁵ An oxidation ditch consists of a ring-shaped channel equipped with mechanical aeration and mixing devices. After undergoing screening and degritting procedures, the effluent is combined with the suspended activated sludge in the channel for biological treatment.

⁶ In a membrane bioreactor system, the effluent is also treated by means of mixing with activated sludge. However, comparing with an oxidation ditch, a membrane bioreactor system supports the use of more concentrated activated sludge for attaining an expedited aeration process. The subsequent separation of effluent and solids is also carried out more efficiently with the use of highly specialised membranes. It will thus require less space to treat each unit volume of sewage.

⁷ At present, the treated effluent from Mui Wo STW shall consist of not more than 30 milligrams per litre (mg/L) of total suspended solids and 20 mg/L of biochemical oxygen demand.

FINANCIAL IMPLICATIONS

11. We estimate the cost of the proposed works to be \$967.2 million in MOD prices (please see paragraph 12 below), broken down as follows –

		\$ million	
(a)	Upgrading of Mui Wo STW	610.9	
	(i) civil engineering works	319.9	
	(ii) electrical and mechanical works	291.0	
(b)	Construction of	41.3	
	(i) gravity trunk sewers in Mui Wo town centre	34.0	
	(ii) sewers in Wang Tong and Yue Kwong Chuen	7.3	
(c)	Ancillary works	1.0	
(d)	Environmental mitigation measures	5.6	
(e)	Consultants' fees for	5.9	
	(i) contract administration	2.6	
	(ii) management of resident site staff	3.3	
(f)	Remuneration of resident site staff	79.9	
(g)	Contingencies	65.9	
	Sub-total	810.5	(in September 2011 prices)
(h)	Provision for price adjustment	156.7	
	Total	967.2	(in MOD prices)

/A

— A breakdown of the estimates for the consultants' fees and resident site staff costs by man-months is at Enclosure 3.

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

Year	\$ million (September 2011)	Price adjustment factor	\$ million (MOD)
2012 – 2013	73.8	1.05325	77.7
2013 – 2014	177.6	1.11118	197.3
2014 – 2015	203.5	1.17229	238.6
2015 – 2016	189.6	1.23677	234.5
2016 – 2017	135.2	1.30479	176.4
2017 – 2018	27.3	1.37656	37.6
2018 – 2019	3.5	1.45227	5.1
	<hr/> 810.5 <hr/>		<hr/> 967.2 <hr/>

13. We have derived the MOD estimate on the basis of the Government's latest set of assumptions on the trend rate of change in the prices of public sector building and construction output for the period from 2012 to 2019. We will deliver the works under a combined civil engineering works and electrical and mechanical works contract. We will deliver the civil engineering works on re-measurement basis because of the uncertain underground conditions that may affect the alignments of the sewers. We will deliver the electrical and mechanical works on lump-sum basis as the scope of works can be well defined. The contract will provide for price adjustments in respect of the civil engineering works.

/14.

14. We estimate the additional annual recurrent expenditure arising from the proposed works to be \$16.3 million. The recurrent expenditure attributable to sewage charges has been taken into account in determining the sewage charges for the years 2008-09 to 2017-18 stipulated in the Sewage Services (Sewage Charge) Regulation (Cap. 463A) and the recurrent expenditure attributable to trade effluent surcharges will be taken into account in reviewing the trade effluent surcharge rates in future.

PUBLIC CONSULTATION

15. We consulted the Mui Wo Rural Committee on 6 May 2008 and 9 October 2008 as well as the Tourism, Agriculture, Fisheries and Environmental Hygiene Committee under the Islands District Council on 19 January 2009. Both Committees supported the proposed works.

16. We gazetted the proposed works in Wang Tong and Yue Kwong Chuen in accordance with the Water Pollution Control (Sewerage) Regulation in August 2009 under a single scheme and received three objections to the proposed land resumption area. After several meetings with the objectors and considering their grounds of objections, we slightly adjusted the scheme boundary and all the objectors have withdrawn their objections unconditionally upon gazettal of the amendment scheme. As all the objections have been resolved, the Director of Environmental Protection authorised the proposed works in March 2011.

17. We consulted the Legislative Council Panel on Environmental Affairs on 27 February 2012 on the proposed works. Members raised no objection to the proposed works.

ENVIRONMENTAL IMPLICATIONS

18. This is not a designated project under the Environmental Impact Assessment Ordinance (Cap. 499). We completed the Preliminary Environmental Review in February 2010 for the proposed works, which concludes that they would not have long-term adverse environmental impacts upon implementation of appropriate mitigation measures.

19. For short-term environmental impacts during construction, we will control noise, dust and site run-off to levels within the established standards and guidelines through implementation of environmental mitigation measures, such as the use of silenced construction equipment and noise barriers to reduce noise generation, water-spraying to reduce emission of fugitive dust, and proper treatment of site run-off before discharge. We will also carry out regular site inspections to ensure that these recommended mitigation measures and good site practices will be properly implemented on site. We have included in paragraph 11(d) above a sum of \$5.6 million (in September 2011 prices) in the project estimates for implementing these environmental mitigation measures.

20. At the planning and design stages, we have considered ways to reduce the generation of construction waste where possible. For example, in addition to the need for meeting hydraulic and traffic requirements, we have designed the alignment of the proposed sewerage works in such a manner that excavation and demolition of existing structures will be minimised. In addition, we will require the contractor to reuse inert construction waste (e.g. excavated soil) on site or in other suitable construction sites as far as possible, in order to minimise the disposal of inert construction waste at public fill reception facilities⁸. We will encourage the contractor to maximise the use of recycled/recyclable inert construction waste, as well as the use of non-timber formwork to further reduce the generation of construction waste.

21. At the construction stage, we will require the contractor to submit for approval a plan setting out the waste management measures, which will include appropriate mitigation means 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 at public fill reception facilities and landfills respectively through a trip-ticket system.

/22.

⁸ Public fill reception facilities are specified in Schedule 4 of 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.

22. We estimate that the proposed works will generate in total about 84 800 tonnes of construction waste. Of these, we will reuse about 32 900 tonnes (39%) of inert construction waste on site and deliver 43 300 tonnes (51%) of inert construction waste to public fill reception facilities for subsequent reuse. We will dispose of the remaining 8 600 tonnes (10%) of non-inert construction waste at landfills. The total cost for accommodating construction waste at public fill reception facilities and landfill sites is estimated to be about \$2.2 million for this project (based on a unit cost of \$27 per tonne for disposal at public fill reception facilities and \$125 per tonne⁹ at landfills.)

HERITAGE IMPLICATIONS

23. The Mang Tong Site of Archaeological Interest will be affected by the proposed village sewerage works at Wang Tong. In this regard, we conducted both the Preliminary Environmental Review and Cultural Heritage Impact Assessment for the proposed works, which have recommended mitigation measure in the form of an archaeological watching brief to be conducted by a qualified archaeologist during the construction phase. We will implement the recommended mitigation measure accordingly. In addition, since the Yuen's Mansion and associated buildings (Grade 2 Historic Buildings) are located in the vicinity of the works area, adequate mitigation measures will also be implemented to ensure no adverse impact on these historic buildings during the construction phase.

LAND ACQUISITION

24. We have reviewed the design of the proposed works to minimise the extent of land acquisition. We will resume a total of 22 private agricultural lots (about 1 449.1 square metres (m²)) for carrying out the proposed works. The land resumption and clearance will not affect any households or domestic structures. We will charge the cost of land resumption and clearance estimated at \$6.72 million to **Head 701 – Land Acquisition**. A breakdown of the land resumption and clearance costs is at Enclosure 4.

/BACKGROUND

⁹ 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 m³), nor the cost to provide new landfills (which is likely to be more expensive) when the existing ones are filled.

BACKGROUND INFORMATION

25. In November 2006, we upgraded **353DS** to Category B for implementation of Mui Wo sewerage works and Mui Wo STW upgrading recommended under the Outlying Islands Sewerage Master Plan Stage 2 Review Study. In September 2007, we engaged consultants to carry out investigation and design for implementing long-term water pollution abatement works in the Silver Mine Bay Catchment at an estimated cost of \$11.2 million in MOD prices. We charged this amount to block allocation **Subhead 4100DX** “Drainage works, studies and investigations for items in Category D of the Public Works Programme”. We have substantially completed the detailed design of the proposed works mentioned in paragraph 3 above.

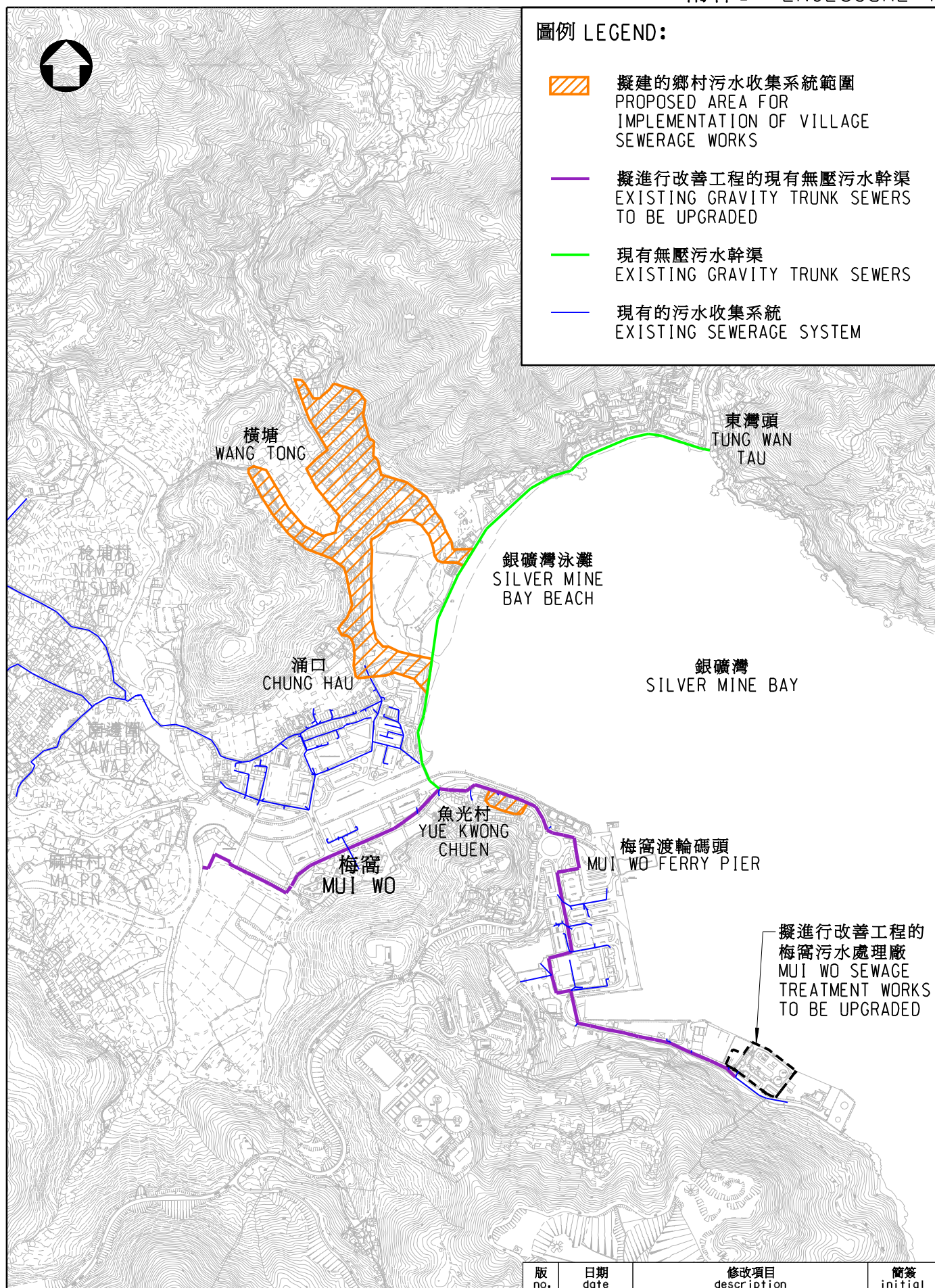
26. Of the 126 trees within the project boundary, 112 trees will be preserved. The proposed works will involve the removal of 14 trees including ten trees to be felled and four trees to be transplanted within the project site. All trees to be removed are not important trees¹⁰. We will incorporate planting proposals as part of the project, including planting of 29 trees.

27. We estimate that the proposed works will create about 176 jobs (142 for labourers and another 34 for professional/technical staff), providing a total employment of 8 340 man-months.





Environment Bureau
April 2012

¹⁰ “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 –


- (a) trees of 100 years old or above;
- (b) 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;
- (c) trees of precious or rare species;
- (d) 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
- (e) 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:


-  擬建的鄉村污水收集系統範圍
PROPOSED AREA FOR IMPLEMENTATION OF VILLAGE SEWERAGE WORKS
-  擬進行改善工程的現有無壓污水幹渠
EXISTING GRAVITY TRUNK SEWERS TO BE UPGRADED
-  現有無壓污水幹渠
EXISTING GRAVITY TRUNK SEWERS
-  現有的污水收集系統
EXISTING SEWERAGE SYSTEM

擬進行改善工程的
梅窩污水處理廠
MUI WO SEWAGE
TREATMENT WORKS
TO BE UPGRADED

版 no.		日期 date	修改項目 description	簡簽 initial
圖則名稱 drawing title		日期 date	圖則編號 drawing no.	比例 scale
工務計劃項目第353DS號		28 DEC 2011	DCM/2011/167	N.T.S.
-離島污水收集系統第2階段 梅窩鄉村污水收集系統第2期及梅窩污水處理廠改善工程		日期 date	保留版權 COPYRIGHT RESERVED	
PWP ITEM No.353DS		28 DEC 2011	 香港特別行政區政府渠務署 DRAINAGE SERVICES DEPARTMENT GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION	
-OUTLYING ISLANDS SEWERAGE STAGE 2		日期 date		
-UPGRADING OF MUI WO VILLAGE SEWERAGE PHASE 2 AND MUI WO SEWAGE TREATMENT WORKS		28 DEC 2011		
部門 office				
繪畫 drawn		W. Y. HUI	顧問工程管理部 CONSULTANTS MANAGEMENT DIVISION	
核對 checked		W. M. LEUNG		
批核 approved		W. Y. CHAN		

梅窩污水處理廠的綠化及園景美化工程構思圖 Artist's Impression of Greening and Landscaping Works in Mui Wo Sewage Treatment Works



		版 no.	日期 date	修改項目 description	簡簽 initial
圖則名稱 drawing title 工務計劃項目第353DS號 -離島污水收集系統第2階段 梅窩鄉村污水 收集系統第2期及梅窩污水處理廠改善工程 PWP ITEM No.353DS -OUTLYING ISLANDS SEWERAGE STAGE 2 -UPGRADING OF MUI WO VILLAGE SEWERAGE PHASE 2 AND MUI WO SEWAGE TREATMENT WORKS	繪畫 drawn	W. Y. HUI	日期 date 29 FEB 2012	圖則編號 drawing no. DCM/2012/002	比例 scale N.T.S.
	核對 checked	W. M. LEUNG	日期 date 29 FEB 2012	保留版權 COPYRIGHT RESERVED  香港特別行政區政府渠務署 DRAINAGE SERVICES DEPARTMENT GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION	
	批核 approved	W. Y. CHAN	日期 date 29 FEB 2012		
	部門 office 顧問工程管理部 CONSULTANTS MANAGEMENT DIVISION				

353DS – Outlying Islands sewerage, stage 2 – upgrading of Mui Wo village sewerage phase 2 and Mui Wo sewage treatment works

**Breakdown of the estimates for consultants’ fees and resident site staff costs
(in September 2011 prices)**

			Estimated man- months	Average MPS* salary point	Multiplier (Note 1)	Estimated fee (\$ million)
(a)	Consultants’ fees for contract administration (Note 2)	Professional	-	-	-	2.2
		Technical	-	-	-	0.4
					Sub-total	2.6
(b)	Resident site staff costs (Note 3)	Professional	404	38	1.6	40.3
		Technical	1 265	14	1.6	42.9
					Sub-total	83.2
	Comprising –					
	(i) Consultants’ fee for management of resident site staff				3.3	
	(ii) Remuneration of resident site staff				79.9	
					Total	85.8

* MPS = Master Pay Scale

Notes

1. A multiplier of 1.6 is applied to the average MPS salary point to estimate the cost of resident site staff supplied by the consultants. (As at now, MPS salary point 38 = \$62,410 per month and MPS salary point 14 = \$21,175 per month)
2. The consultants’ staff cost for contract administration is calculated in accordance with the existing consultancy agreement for the investigation, design and construction of the project. The construction phase of the assignment will only be executed subject to Finance Committee’s approval to upgrade part of **353DS** to Category A.
3. The actual man-months and actual costs will only be known after completion of the construction works.

353DS – Outlying Islands sewerage, stage 2 – upgrading of Mui Wo village sewerage phase 2 and Mui Wo sewage treatment works

Breakdown of the land resumption and clearance costs

	\$ million	
(I) Estimated resumption cost		5.11
(a) Agricultural land ex-gratia compensation 22 agricultural lots (with a total area of 1 449.1 m ²) will be resumed 1 449.1 m ² x \$3,525 per m ² (Zone C) (see Notes 1 and 2)	5.11	
(II) Estimated clearance cost		0.98
(a) Ex-gratia allowance of crop compensation	0.94	
(b) Ex-gratia allowance for farm structures and miscellaneous permanent improvements to farms	0.02	
(c) Ex-gratia allowance for 'Tun Fu'	0.02	
(III) Interest and contingency payment		0.63
(a) The interest payment on various ex-gratia compensations for private land	0.000027	
(b) Contingency on the above costs	0.63	
	Total	6.72

Notes

- There are four ex-gratia compensation zones, namely Zones A, B, C and D, for land resumption in the New Territories as approved by the Executive Council in 1985 and 1996. The boundaries of these zones are shown on the Zonal Plan for Calculation of Compensation Rates. The land to be resumed in the project **353DS** is agricultural land currently within Zone C.

Enclosure 4 to PWSC(2012-13)6

2. In accordance with G.N. 2128 dated 16 March 2012 on the revised ex-gratia compensation rates for resumed land, the ex-gratia compensation rate of agricultural land for Zone C is 50% of the Basic Rate at \$655 per square foot (or \$7,050 per m²). Hence the ex-gratia compensation rate used for estimating the resumption cost of the 22 lots affected by **353DS** is \$3,525 per m².