

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 709 – WATERWORKS

Water Supplies – Fresh water supplies

357WF – Design and construction for first stage of desalination plant at Tseung Kwan O

Members are invited to recommend to the Finance Committee the upgrading of the remainder of **357WF** to Category A at an estimated cost of \$7,727.5 million in money-of-the-day (MOD) prices.

PROBLEM

We need to develop a strategic alternative water resource by seawater desalination to cope with the impact of climate change to safeguard the water security in Hong Kong under extreme dry weather brought about by climate change.

PROPOSAL

2. The Director of Water Supplies, with the support of the Secretary for Development, proposes to upgrade the remainder of **357WF** to Category A at an estimated cost of \$7,727.5 million in MOD prices for carrying out the design and construction of the first stage of desalination plant at Tseung Kwan O (TKO) (the Project).

PROJECT SCOPE AND NATURE

3. The scope of the proposed works of the Project comprises -
- (a) construction of the seawater treatment components for the first stage of the proposed desalination plant with a water production capacity at 135 000 cubic metres (m³) per day and with provision for future expansion to the ultimate water production capacity at 270 000 m³ per day when necessary, and associated facilities¹;
 - (b) formation of an eight-hectare site in TKO Area 137 for the construction of the proposed desalination plant and associated facilities with the ultimate water production capacity at 270 000 m³ per day;
 - (c) construction of the intake and outfall facilities of the proposed desalination plant to cater for the ultimate water production capacity of the proposed desalination plant at 270 000 m³ per day; and
 - (d) associated works including engineering, environmental mitigation works and landscaping works.
4. The location of the proposed desalination plant is shown on the plan at Enclosure 1.
5. Subject to funding approval of the Finance Committee (FC), we plan to commence the proposed works in the second quarter of 2019 for completion in the fourth quarter of 2022. In order to meet the tight programme, we invited tenders in May 2018 to enable early commencement of the proposed works. The tender will only be awarded after obtaining FC's funding approval.

/JUSTIFICATION

¹ The associated facilities include administration building, laboratory, maintenance workshop, etc. which are common facilities for the first stage and the ultimate stage of the proposed desalination plant.

JUSTIFICATION

6. A reliable fresh water supply is of paramount importance in sustaining Hong Kong's development and economic growth. However, our fresh water resources, which come from the yield collected from local gathering ground and raw water imported from Dongjiang (DJ) in Guangdong Province, are both susceptible to climate change. That aside, the reliability of fresh water supply to Hong Kong is also facing other challenges such as increasing water demand arising from population and economic growth and keen demand for DJ water resource due to the rapid economic development in the Pearl River Delta Region.

7. With the increasing water demand and the extreme dry weather that could be brought about by climate change, we need to develop the strategic alternative water resource by seawater desalination which is not susceptible to climate change to safeguard water security in Hong Kong.

8. We propose to construct a medium-sized desalination plant on an eight-hectare site reserved in TKO Area 137. The planning and investigation study for the proposed desalination plant confirmed that TKO Area 137 is a suitable location for siting the proposed desalination plant in terms of the quality of nearby seawater. The use of the reverse osmosis technology² for the proposed desalination plant has also been proved technically feasible with an estimated unit water production cost at about \$13 per m³ at 2018 price level³.

/FINANCIAL

² Reverse osmosis has become a mature technology and has been used in many overseas desalination plants in recent years. According to the International Desalination Association, there are over 17 000 desalination plants worldwide with a total water production capacity of more than 80 million m³ per day and reverse osmosis technology accounts for approximately 60 per cent of the installed capacity. The number of desalination plants using reverse osmosis technology is on the increase.

³ The estimated unit production cost of the proposed desalination plant in Hong Kong covers energy cost, capital cost, treatment cost, distribution cost and customer service cost. The unit cost for producing fresh water by seawater desalination using reverse osmosis technology overseas ranges from around \$3/m³ to around \$50/m³ (at 2018 price level) according to the International Desalination Association. The unit water production costs in Hong Kong and other countries cannot be compared directly as they are affected by various factors such as energy cost, seawater quality and temperature, intake arrangement, environmental measures, financing details, specific details of the water purchase agreement, etc.

FINANCIAL IMPLICATIONS

9. We estimate the cost of the proposed works to be \$7,727.5 million in MOD prices (see paragraph 11 below), broken down as follows –

	\$ million (in MOD prices)
(a) Design and construction of the first stage of desalination plant at TKO	6,141.8
(i) civil works	3,378.0
(ii) electrical and mechanical works	2,763.8
(b) Environmental mitigation measures	58.2
(c) Consultants' fees for	148.1
(i) contract administration	101.5
(ii) management of resident site staff (RSS)	46.6
(d) Remuneration of RSS	676.9
(e) Contingencies	702.5
Total	<u>7,727.5</u>

10. We propose to engage consultants to undertake contract administration and site supervision of the proposed works. A detailed breakdown of the estimates for the consultants' fees and RSS costs by man-months is at Enclosure 2.

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

Year	\$ million (MOD)
2019 – 2020	717.5
2020 – 2021	1,275.7
2021 – 2022	1,734.6
2022 – 2023	1,698.9
2023 – 2024	1,056.8
2024 – 2025	732.7
2025 – 2026	511.3
	<hr style="width: 100%; border: 0.5px solid black;"/> 7,727.5 <hr style="width: 100%; border: 0.5px solid black;"/>

12. We have derived the MOD estimates 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 2019 to 2026. We plan to implement the proposed works and the follow-on operation of the proposed desalination plant under a Design–Build–Operate (DBO) contract arrangement. The capital cost of \$7,727.5 million will cover the design and build elements of the DBO contract while the operation of the desalination plant will be funded under the General Revenue Account. The contractual operation period will be 10 years with the provision for extension by five years the maximum. The DBO contract will provide for price adjustment during the design and build stages, and inflationary adjustment throughout the operation stage.

13. We estimate the additional annual recurrent expenditure arising from the proposed desalination plant to be \$316.0 million.

14. The proposed works will lead to an increase in total annual expenditure on waterworks operation by 4.85% in real terms by 2026⁴.

/PUBLIC

⁴ The increase in expenditure is calculated at the 2018-19 price level and on the assumption that the water demand remains static and all other factors remain constant during the period from 2018 to 2026.

PUBLIC CONSULTATION

15. We consulted the Sai Kung District Council on 6 January 2015 and 5 July 2016. Members supported the Project in principle.

16. We consulted the Legislative Council Panel on Development on 24 April 2018 and Members generally supported the proposal.

ENVIRONMENTAL IMPLICATIONS

17. The Project is a designated project (DP) under Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance (Cap. 499) which requires an environmental permit (EP) for its construction and operation. The Director of Environmental Protection approved the EIA report in November 2015 and issued an EP for the construction and operation of the Project in December 2015. With the implementation of the recommended mitigation measures and an environmental monitoring and audit programme, the approved EIA report concluded that the Project will not cause any adverse environmental impacts. We shall implement these measures which include deployment of silt curtains during marine works and pollution control measures during construction. The pollution control measures include frequent watering of site, provision of wheel washing facilities, covering of materials on trucks, use of silenced construction plant, temporary noise barriers and acoustic enclosures for noisy construction activities. We have included in paragraph 9(b) above a sum of \$58.2 million (in MOD prices) in the project estimate for the implementation of necessary environmental mitigation measures.

18. At the planning and design stages, we have considered the design of the proposed works to reduce generation of construction waste where possible. In addition, we will require the contractor to reuse inert construction waste (e.g. demolished concrete and excavated soil and rock) on site or in other suitable construction sites as far as possible, in order to minimise the disposal of inert construction waste to public fill reception facilities⁵. We will encourage the contractor to maximise the use of recycled or recyclable inert construction waste, and the use of non-timber formwork to further reduce generation of construction waste.

/19.

⁵ Public fill reception facilities are specified in Schedule 4 of the Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N). Disposal of inert construction waste in public fill reception facilities requires a licence issued by the Director of Civil Engineering and Development.

19. 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 and non-inert construction waste at public fill reception facilities and landfills respectively through a trip-ticket system.

20. We estimate that the proposed works will generate in total 235 184 tonnes of construction waste. Of these, we will reuse 3 192 tonnes (1%) of inert construction waste on site and deliver 192 566 tonnes (82%) of inert construction waste to public fill reception facilities for subsequent reuse. We will dispose of the remaining 39 426 tonnes (17%) of non-inert construction waste at landfills. The total cost for disposal of construction waste at public fill reception facilities and landfill sites is estimated to be \$21.6 million for the proposed works (based on a unit charge rate of \$71 per tonne for disposal at public fill reception facilities and \$200 per tonne at landfills as stipulated in the Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N)).

HERITAGE IMPLICATIONS

21. The proposed works will not affect any heritage site, i.e. all declared monuments, proposed monuments, graded historic sites or buildings, sites of archaeological interest and government historic sites identified by the Antiquities and Monuments Office.

LAND ACQUISITION

22. The Project does not involve resumption of private land.

TRAFFIC IMPLICATIONS

23. We have carried out a Traffic Impact Assessment (TIA) for the Project. The TIA concluded that the Project would not cause any significant impact on the traffic.

BACKGROUND INFORMATION

24. We upgraded **357WF** to Category B in September 2014.

25. On 8 June 2012, we upgraded **345WF** “Planning and investigation study of desalination plant at TKO” to Category A with an Approved Project Estimate (APE) of \$34.3 million in MOD prices. In December 2012, we engaged consultants to commence a planning and investigation study for the proposed desalination plant in TKO Area 137. The study scope comprised detailed investigation of the feasibility and cost-effectiveness, preliminary design, formulation of the implementation strategy and programme, and impact assessments for the proposed desalination plant. We completed the study in 2015.

26. On 26 June 2015, we upgraded part of **357WF** to Category A as **359WF** “Design and construction for first stage of desalination plant at TKO – investigation study review, design and site investigation” at an APE of \$154.5 million in MOD prices. In November 2015, we engaged consultants to carry out the investigation study review, design and associated site investigation works for the first stage of the proposed desalination plant. The consultants completed the investigation study review, site investigation works and a reference design⁶ for the first stage of the proposed desalination plant in 2017.

27. On 13 October 2017, we upgraded part of **357WF** to Category A as **364WF** “Design and construction for first stage of desalination plant at TKO – mainlaying” at an APE of \$720.5 million in MOD prices for laying of about 10 kilometres of fresh water mains for connecting the proposed desalination plant to the existing TKO Fresh Water Primary Service Reservoir. The mainlaying works commenced in November 2017 and will be completed by April 2022.

28. A 0.79 hectare of mixed woodland with low to moderate ecological value will be affected by the proposed works. With the implementation of the recommended mitigation measures in the approved EIA report, no adverse residual impact is expected. The relevant government guidelines on tree preservation will also be observed.

/29.

⁶ Under the DBO contract, the contractor will be responsible for the detailed design of the proposed works. The reference design completed by the consultants is used to establish the project requirements and will be used as a reference by the contractor for the detailed design.

29. We estimate that the proposed works will create about 1 630 jobs (1 300 for labourer and 330 for professional or technical staff) providing a total employment of 46 400 man-months.

Development Bureau
April 2019



845 000 E

846 000 E

847 000 E

848 000 E

將軍澳工業邨
TSEUNG KWAN O INDUSTRIAL ESTATE

816 000 N

815 000 N

814 000 N

將軍澳第137區
TSEUNG KWAN O AREA 137

佛堂澳
FAT TONG O

海底進水管道
SUBMARINE INTAKE PIPELINE

大廟灣
JOSS HOUSE BAY
(TAI MIU WAN)

擬建將軍澳海水化淡廠
PROPOSED TSEUNG KWAN O
DESALINATION PLANT

海底排水管道
SUBMARINE OUTFALL PIPELINE

鐵簕洲
TIT CHAM CHAU



九龍
KOWLOON

西貢
SAI KUNG

擬建將軍澳海水化淡廠
PROPOSED TSEUNG KWAN O
DESALINATION PLANT

香港島
HONG KONG ISLAND

東龍洲
TUNG LUNG CHAU

全景圖
KEY PLAN

849 000 E

工務計劃項目第357WF號-將軍澳海水化淡廠第一階段設計及建造
P.W.P. ITEM NO. 357WF - DESIGN AND CONSTRUCTION FOR
FIRST STAGE OF DESALINATION PLANT AT TSEUNG KWAN O



水務署
Water Supplies Department

草圖編號
SKETCH NO.

SK 52008 / 13

附件一
Enclosure 1

Enclosure 2 to PWSC(2019-20)2

357WF – Design and construction for first stage of desalination plant at Tseung Kwan O

Breakdown of the estimates for consultants' fees and RSS costs (in September 2018 prices)

		Estimated man- months	Average MPS* salary point	Multiplier (Note 1)	Estimated fee (\$ million)
(a) Consultants' fees for contract administration (Note 2)	Professional	-	-	-	76.4
	Technical	-	-	-	8.9
				Sub-total	85.3#
(b) RSS costs (Note 3)	Professional	1 549	38	1.6	203.2
	Technical	8 813	14	1.6	405.0
				Sub-total	608.2
Comprising –					
(i) Consultants' fees for management of RSS				39.2#	
(ii) Remuneration of RSS				569.0#	
				Total	693.5

*MPS = Master Pay Scale

Notes

1. A multiplier of 1.6 is applied to the average MPS salary point to estimate the cost of RSS supplied by the consultants (as at now, MPS point 38 = \$81,975 per month and MPS point 14 = \$28,725 per month.).
2. The consultants' staff cost for contract administration is calculated in accordance with the existing consultancy agreement for the design and construction of the project. The construction phase of the assignment will only be executed subject to FC's approval to upgrade **357WF** to Category A.
3. The actual man-months and costs will only be known after completion of the construction works.

Remarks

The figures in this Enclosure are shown in constant prices to correlate with the MPS salary point of the same year. The figures marked with # are shown in money-of-the-day prices in paragraph 9.