

**For discussion
on 24 March 2015**

Legislative Council Panel on Development

**357WF – Design and Construction for
First Stage of Desalination Plant at Tseung Kwan O –
Investigation Study Review, Design and Site Investigation**

PURPOSE

This paper seeks Members' support on the proposal to upgrade part of **357WF**, entitled "Design and Construction for First Stage of Desalination Plant at Tseung Kwan O" (the Project) to Category A at an estimated cost of \$154.6 million in money-of-the-day (MOD) prices to carry out review and design and associated site investigation works for the first stage of the proposed desalination plant at Tseung Kwan O (TKO).

PROJECT SCOPE

2. The part of **357WF** which we propose to upgrade to Category A comprises -
 - (a) review on the findings of the planning and investigation study (the P&I study) of the proposed desalination plant and carry out further environmental and traffic impact assessments, geotechnical, drainage and hydraulic assessments;
 - (b) preparation of design¹ for the proposed works of the Project as described below² –
 - (i) construction of the seawater treatment components for the first stage

¹ We intend to implement the works for the first stage of the proposed desalination plant via a 'Design and Build' or 'Design-Build-Operate' approach in which the contractor will be responsible for the detailed design of the proposed works. The design to be produced from the proposed consultancy for the review and design will be used to establish the project requirements and as a reference for detailed design.

² In addition to the proposed works described in items (i) to (iv) of paragraph 2(b), the Project comprises associated water main laying works for conveying the fresh water produced at the desalination plant to existing fresh water service reservoirs. The review and detailed design for this part of the proposed works of the Project will be carried out by in-house resources and are not included in the part of **357WF** proposed to be upgraded to Category A.

of the proposed desalination plant with a water production capacity at 135 000 cubic metres (m³) per day and associated facilities³, with provision for future expansion to the ultimate water production capacity up to 270 000 m³ per day when necessary;

(ii) formation of a 10-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;

(iii) construction of the intake and outfall facilities of the proposed desalination plant with capacities catering for the ultimate water production capacity at 270 000 m³ per day; and

(iv) associated works including engineering, environmental mitigation works and landscaping works;

(c) associated site investigation works and supervision; and

(d) preparation of tender documents and tender assessment for the proposed works of the Project as described in items (i) to (iv) of paragraph 2(b) above.

3. A location plan of the Project and a process diagram on the seawater desalination process are at **Enclosure 1** and **Enclosure 2** respectively.

4. Subject to funding approval of the Finance Committee (FC), we plan to engage consultants to carry out the review and design and associated site investigation works in late 2015 for completion in the latter half of 2017.

5. We will retain the remainder of **357WF** in Category B, which comprises the construction of the proposed works for the Project. We will seek funding for the remainder of **357WF** at a later stage.

JUSTIFICATION

6. The fresh water resources in Hong Kong comes from the yield collected from local gathering ground and raw water imported from Dongjiang (DJ) in Guangdong (GD) Province. A reliable fresh water supply is of paramount importance in sustaining Hong Kong's development and economic growth. However, our fresh water resources are facing various challenges, including increasing water demand arising from population and economic growth, fluctuating local yield, climate change, as well as keen competition for DJ water resource due to the rapid economic development in the Pearl River Delta Region.

³ The associated facilities include administration building, laboratory and maintenance workshop etc. which are common facilities for the first stage as well as the ultimate stage of the proposed desalination plant.

7. The total quantity of water abstracted from DJ for water supply is increasing every year and has nearly reached the amount that can be extracted from the river for consumption under a drought with return period of 1 in 20 years. In a more severe drought with return period of 1 in 100 years, the water resources available in DJ as well as the yield collected from the local water gathering ground will be affected and may not be able to meet the water demand of Hong Kong after 2020. Moreover, climate change will bring about extremely dry weather at more frequent intervals and increase the likelihood of consecutive droughts. To safeguard water security in Hong Kong, we need to develop the alternative water resource by seawater desalination which is not susceptible to climate change.

8. A 10-hectare site in TKO Area 137 has been reserved for the construction of a desalination plant of medium size. We have commenced the P&I study for the proposed desalination plant, which has been largely completed. The P&I study confirmed that TKO Area 137 is a suitable location for siting the proposed desalination plant in terms of the quality of nearby seawater and its close proximity to a strategic water supply network. The use of the reverse osmosis technology⁴ for the proposed desalination plant has also been proved technically feasible with an estimated unit water production cost at about \$12 to 13 per m³⁵ which is in comparable order with the range of unit cost for producing fresh water by seawater desalination using reverse osmosis technology overseas.

9. We therefore propose to carry out the review and design and associated site investigation works for the first stage of the proposed desalination plant for commencement of its operation in 2020. Due to the highly specialised nature of the proposed review and design as well as the lack of adequate in-house resources, we propose to engage consultants to conduct the proposed review and design and supervision of the associated site investigation works.

FINANCIAL IMPLICATIONS

10. We estimate the cost of the proposed review and design and associated site investigation works to be \$154.6 million in MOD prices, made up as follows –

⁴ Reverses osmosis has become a mature technology and is used in most of 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 80 000 000 m³ per day and reverse osmosis accounts for approximately 60 per cent of installed capacity. The number of seawater reverse osmosis desalination plant is on the increase.

⁵ The unit cost for producing fresh water by seawater desalination using reverse osmosis technology overseas ranges from \$4.1 to \$23.7 /m³ (at 2010 price level) according to the International Desalination Association.

		\$ million	
(a)	Consultants' fees for	109.5	
	(i) review on the findings of the P&I study and carry out further environmental and traffic impact assessments, geotechnical drainage and hydraulic assessments	21.1	
	(ii) preparation of design for the proposed works of the Project	54.9	
	(iii) preparation of tender documents and assessment of tenders for the proposed works of the Project	33.4	
	(iv) management of resident site staff for site investigation works	0.1	
(b)	Remuneration of resident site staff for site investigation works	3.4	
(c)	Site investigation works	11.7	
(d)	Contingencies	12.4	
	Sub-total	<u>137.0</u>	(in September 2014 prices)
(e)	Provision for price adjustment	<u>17.6</u>	
	Total	<u>154.6</u>	(in MOD prices)

PUBLIC CONSULTATION

11. We consulted the Sai Kung District Council on 6 January 2015 on the proposed review and design and associated site investigation works. Members generally supported the proposal and some members urged for its early implementation. We will maintain close liaison with the concerned parties during the proposed design.

ENVIRONMENTAL IMPLICATIONS

12. The proposed review and design and associated site investigation works

are not designated projects under the Environmental Impact Assessment (EIA) Ordinance (Cap. 499). They will not cause any adverse environmental impacts. We will implement suitable mitigation measures to control short-term environmental impacts arising from the site investigation works.

13. The proposed site investigation works will only generate very little construction waste. We will require the consultants to fully consider measures to minimize the generation of construction waste and to reuse or recycle construction waste as much as possible in the future implementation of the Project.

14. The proposed desalination plant is a designated project under Schedule 2 of the EIA Ordinance and an environmental permit is required for the construction and operation of the desalination plant. We are carrying out an EIA study to address the potential environmental impacts from the construction and operation of the desalination plant. We will submit an EIA report to the Environmental Protection Department for approval under the EIA Ordinance and will follow the statutory procedures of making the EIA report available for comments by the public and the Advisory Council on the Environment.

HERITAGE IMPLICATIONS

15. The proposed review and design and associated site investigation 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 Antiquities and Monuments Office.

LAND ACQUISITION

16. The proposed review and design and associated site investigation works will not require any land acquisition.

BACKGROUND

17. In 2007, we completed a pilot study on development of desalination facilities in Hong Kong (the pilot study). The total cost of the pilot study was about \$13.9 million. We charged this amount to block allocation **Subhead 9100WX** "Waterworks, studies and investigations for items in Category D of the Public Works Programme". The pilot study included the operation of pilot desalination plant in Ap Lei Chau and Tuen Mun which confirmed the technical feasibility of seawater desalination using reverse osmosis under local conditions for producing potable water complying with the World Health Organisation guidelines for drinking water quality. A subsequent review with reference to the findings of the pilot study recommended that TKO Area 137 might be a suitable location for the proposed desalination plant. Since then, we have kept track of the latest development in desalination technology

for taking forward further detailed study of the initiative.

18. On 8 June 2012, FC approved upgrading **345WF** “Planning and Investigation Study of Desalination Plant at TKO” to Category A with an approved project estimate of \$34.3 million in MOD prices. In December 2012, we engaged consultants to commence a P&I study for the proposed desalination plant in TKO Area 137. The study scope comprises 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.

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

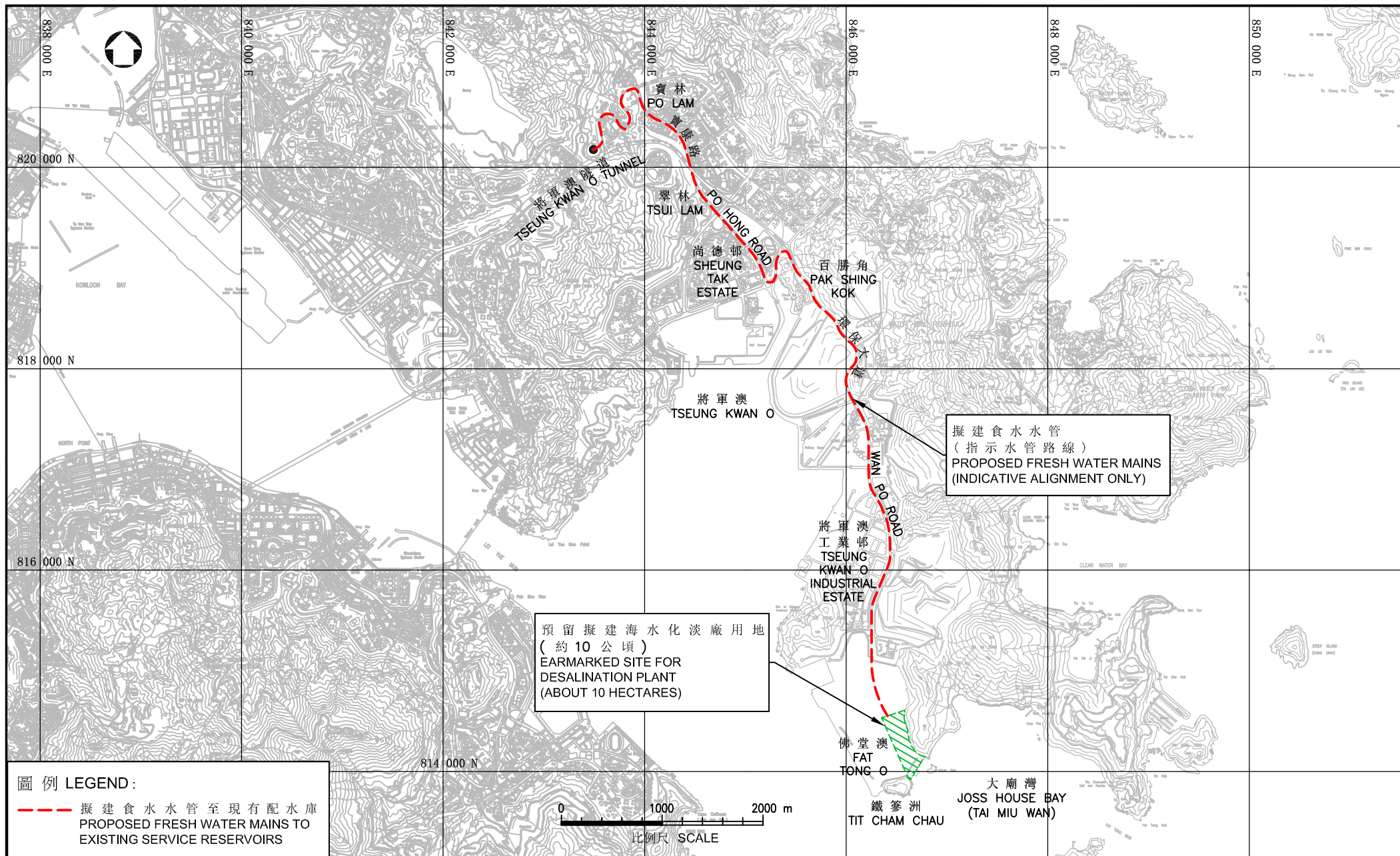
20. The proposed review and design and associated site investigation works will not involve any tree removal or planting proposals. We will take into consideration the need for tree preservation during the site investigation works if necessary. We will incorporate tree planting proposal in the construction phase of the Project.

21. We estimate that the proposed review and design and associated site investigation works will create about 50 jobs (6 for labourer and another 44 for professional/technical staff) providing a total employment of 1 040 man-months.

WAY FORWARD

22. We plan to seek the support of the Public Works Sub-committee for the proposed upgrading part of **357WF** to Category A with a view to seeking funding approval from the FC subsequently.

Development Bureau
Water Supplies Department
March 2015



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 -
 勘察研究檢討、設計及工地勘察

P.W.P. ITEM NO. 357WF - DESIGN AND CONSTRUCTION FOR FIRST STAGE OF DESALINATION PLANT
 AT TSEUNG KWAN O - INVESTIGATION STUDY REVIEW, DESIGN AND SITE INVESTIGATION



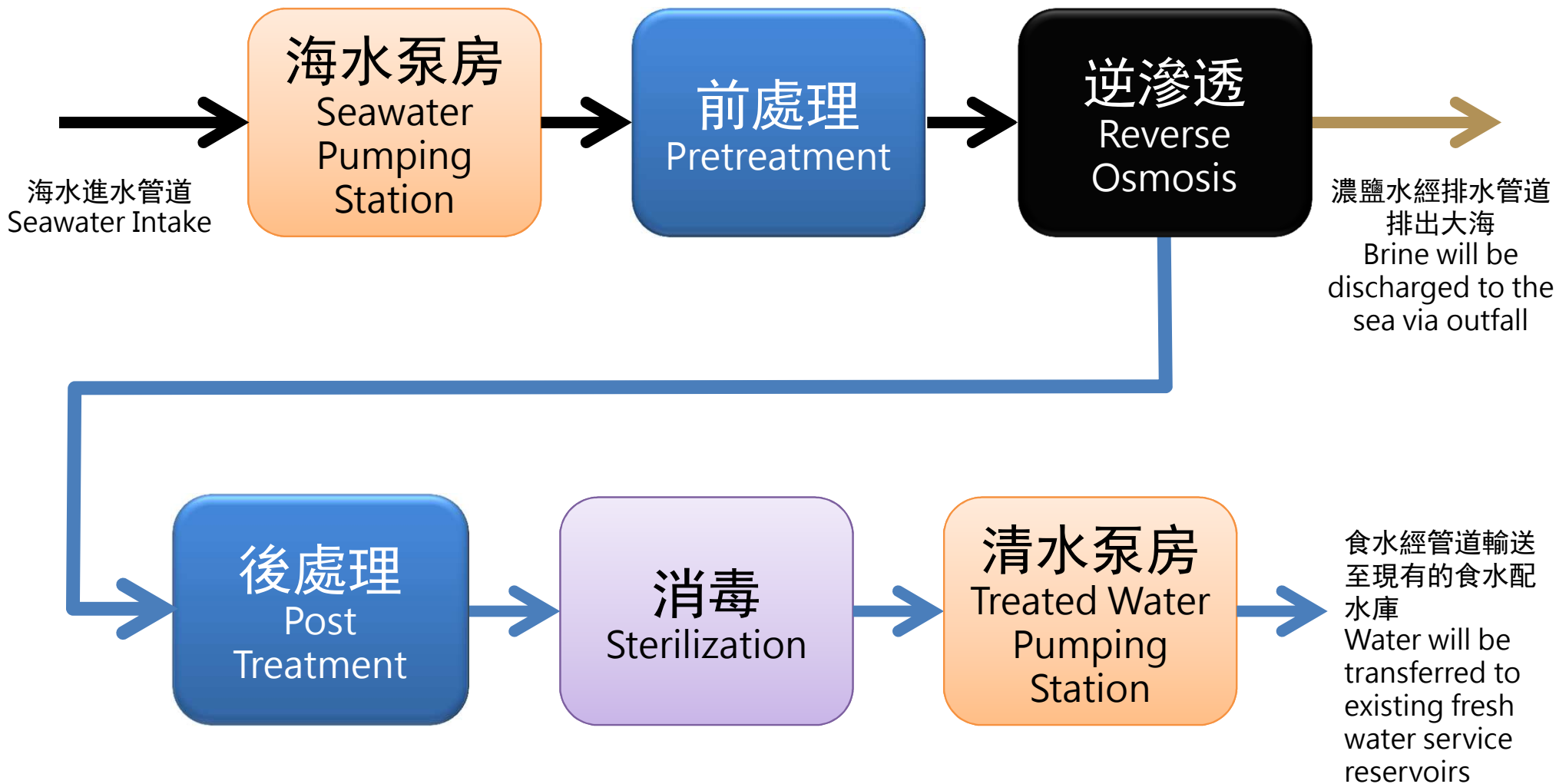
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 Water Supplies Department

草圖編號
 SKETCH NO.

SK 52008 / 3

海水化淡廠處理工藝流程

Treatment Processes in Desalination Plant



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 -
 勘察研究檢討、設計及工地勘察

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SK 52008 / 4