

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 705 – CIVIL ENGINEERING Environmental Protection – Refuse Disposal 172DR – Organic waste treatment facilities phase 1

Members are invited to recommend to the Finance Committee the upgrading of **172DR** to Category A at an estimated cost of \$1,532.8 million in money-of-the-day prices for the design and construction of the organic waste treatment facilities phase 1.

PROBLEM

The current practice of disposing of food waste at landfills is neither sustainable nor environmentally desirable. We need to develop modern facilities to recycle source separated food waste.

PROPOSAL

2. The Director of Environmental Protection, with the support of the Secretary for the Environment, proposes to upgrade **172DR** to Category A at an estimated cost of \$1,532.8 million in money-of-the-day (MOD) prices for the design and construction of the organic waste treatment facilities (OWTF) phase 1.

/PROJECT

PROJECT SCOPE AND NATURE

3. The project site is located at Siu Ho Wan in North Lantau and occupies an area of approximately 2.2 hectares. The proposed scope of works under **172DR** comprises –

- (a) design and construction of OWTF phase 1 with a capacity of 200 tonnes per day;
- (b) design and construction of associated architectural, building, civil and landscape works;
- (c) design and construction of heat recovery, power generation and surplus electricity export facilities; and
- (d) provision of pollution control and environmental monitoring facilities.

— A plan showing the location of the OWTF phase 1 and a conceptual layout plan showing the proposed works are at Enclosure 1 and 2 respectively.

4. Subject to the funding approval of the Finance Committee (FC), we plan to commence the proposed works in June 2014 and commission the OWTF phase 1 before end 2016.

JUSTIFICATION

5. Among the some 9 300 tonnes of municipal solid waste disposed of at landfills every day, about 3 337 tonnes (36%) are food waste, of which some 809 tonnes are generated from commercial and industrial (C&I) sources such as restaurants, hotels, wet markets, food production and processing industries. In recent years, the amount of food waste arising from the C&I sectors has increased steadily. The amount generated in 2012 was more than twice than that in 2002.

6. The current practice of disposing of biodegradable food waste at landfills is not sustainable and is environmentally undesirable as it depletes the limited landfill space, generates leachate and greenhouse gas that require further mitigation measures to deal with and squanders the useful organic contents.

7. The Government has adopted a multi-pronged approach to tackle Hong Kong's food waste problem, with main focus on avoidance of food waste generation and reduction at source. In "Hong Kong : Blueprint for Sustainable Use of Resources 2013-2022" (the Blueprint) unveiled by us in May 2013, the Administration maps out a comprehensive strategy, targets, policies and action plans for waste management for the coming 10 years with a view to tackling the waste crisis in Hong Kong. In February 2014, we unveiled "A Food Waste & Yard Waste Plan for Hong Kong 2014-2022" (the Plan), which is a companion document to the Blueprint that maps out a comprehensive strategy, targets, policies and action plans for the management of food waste and yard waste in the coming years. The Plan outlines the Administration's target of reducing food waste disposal to landfills by 40% in 2022 and maps out four strategies to tackle food waste, namely reduction at source, reuse and donation, recyclable collection, and turning food waste into energy. OWTF phase 1, which is targeted to be commissioned in 2016, is a key project under the Plan.

8. Over the past years, the Government has initiated and supported various programmes and educational campaigns to promote food waste reduction, source separation and recycling in different sectors and districts. Some of our recent actions include community food waste reduction and recycling projects supported by the Environment and Conservation Fund, the Food Waste Recycling Partnership Scheme, the Food Waste Recycling Projects in Housing Estates and the District Food Waste Reduction Programmes.

9. To further strengthen the promotion of food waste reduction, the Government has set up the Food Wise Hong Kong Steering Committee chaired by the Secretary for the Environment in December 2012 to implement the Food Wise Hong Kong Campaign. It is a territory-wide food waste reduction campaign that aims to galvanise the community, from individuals to households to C&I operators, to avoid and reduce food waste.

10. Notwithstanding the efforts for food waste avoidance and reduction, suitable and adequate food waste treatment and recycling facilities are necessary to treat and recycle food waste that cannot be avoided. In light of the fact that Hong Kong generates a very large amount of food waste each day, and that food waste in general decomposes quickly and is not suitable for compaction at refuse transfer stations for long-haul transport, the most suitable method to recycle food waste is to create a network of recycling plants. This approach enables food waste to be transported quickly from population centres to the facilities that are not too far away thereby reducing potential nuisance. We have set out in the Plan that Hong Kong, among other things, needs to build a network of around five to six OWTFs with a total recycling capacity of about 1 300 to 1 500 tonnes per day. This network is essential for achieving the target of reduction.

11. Given its substantial amount of food waste generation and better space provisions, food waste from the C&I establishments is the priority in our planning for promoting source separation, collection and treatment. Since 2010, we have launched a trial scheme with participation of over 120 restaurants and food producing enterprises to gain experience in food waste separation and collection for recycling in a pilot composting plant in Kowloon Bay. With the experience, guidelines on food waste avoidance, separation and collection for C&I establishments have been prepared and promulgated to the industries. The OWTF phase 1 with a design capacity of 200 tonnes per day is planned to receive and treat source separated food waste from the C&I sectors.

12. We have reviewed many types of technology for treating food waste to assess their suitability for Hong Kong. To meet Hong Kong's need for energy, our policy is to treat the city's collected food waste to produce energy using anaerobic digestion as the core technology. The OWTF phase 1 will adopt anaerobic digestion¹ and composting technologies to recycle food waste into biogas² and about 7 000 tonnes of compost³ each year.

13. The biogas will be used to generate electricity and apart from the internal use of OWTF phase 1, we estimate that about 14 million kWh of surplus electricity, which is equivalent to the power consumption by some 3 000 households, can be exported each year⁴. The decrease in use of fossil fuel for electricity generation together with the reduced amount of organic waste landfilled would prevent the emission of some 25 000 tonnes of greenhouse gas each year.

14. The diversion of some 73 000 tonnes of food waste from landfills per year could save up to \$13.9 million of landfill disposal cost⁵ each year.

/FINANCIAL

¹ Anaerobic digestion is a series of processes in which microorganisms break down biodegradable material in the absence of oxygen.

² Biogas is a renewable energy and can be used to generate electricity and heat energy, or as a natural gas substitute.

³ Compost is organic matter that has been decomposed and recycled as fertilizer or soil amendment.

⁴ We plan to export part of the surplus electricity to the nearby government facilities and part to the existing power grid. We have studied and confirmed the technical feasibility and cost-effectiveness of electricity export in the feasibility study. We have also explored with a power company the viability of connecting OWTF Phase 1 to the existing grid and found it feasible for the Government to pursue this matter further.

⁵ This estimate is based on an estimated average unit cost of \$191 per tonne for disposal at landfills in 2013-14, which has taken into account the cost for developing, operating and restoring the landfills after they are filled and the aftercare required, but does not include the land opportunity cost for existing landfill sites, nor the cost to provide new landfills when the existing ones are filled.

FINANCIAL IMPLICATIONS

15. We estimate the capital cost of the proposed works to be \$1,532.8 million in MOD prices⁶ (please see paragraph 16 below), broken down as follows—

		\$ million
(a)	Site formation, geotechnical, drainage and civil works	131.1
(b)	Architectural, building and landscape works	447.5
(c)	Organic waste treatment facilities	330.1
	(i) Waste receiving system ⁷	88.1
	(ii) Pre-treatment system ⁸	53.2
	(iii) Anaerobic digestion system ⁹	64.2
	(iv) Composting system ¹⁰	23.0
	(v) Biogas cleaning and storage system ¹¹	23.1
	(vi) Associated electrical, control and instrument installations	78.5
		/(d)

⁶ Compared to the initial project estimate shown in the paper for Panel on Environmental Affairs in 2010, the latest project estimate is based on the recent open and competitive tender initiated in 2013 and has reflected the latest market price for the construction of this facility under the current market conditions including price increase and the more exact requirements identified in the feasibility study completed in 2011 for reliable and effective operation of this new facility which is the first of its kind in Hong Kong. The initial estimate at \$489 million was an indicative figure based on an initial broad-brush scheme, comprising provision for basic plant and equipment for anaerobic digestion and composting (estimated at \$250 million) and basic civil engineering and building works (estimated at \$239 million).

⁷ Item (c)(i) is for the design, construction and installation of the food waste receiving system. The works involve the provision of waste reception, monitoring, measurement, storage and feeding, and vehicle registration and washing facilities.

⁸ Item (c)(ii) is for the design, construction and installation of the food waste pre-treatment system. The works involve the provision of conveying, screening and grit removal, metal separation, shredding, crushing and mixing equipment.

⁹ Item (c)(iii) is for the design, construction and installation of the anaerobic digestion system. The works involve the provision of anaerobic digesters, dewatering system, pressure relief safety device, biogas sampling facilities, pumps and pipe-works.

¹⁰ Item (c)(iv) is for the design, construction and installation of the composting system. The works involve the provision of mixing drums, composting tunnels, maturation area, final screen, and storage and bagging facilities.

¹¹ Item (c)(v) is for the design, construction and installation of the biogas cleaning and storage system. The works involve the provision of biogas cleaning facilities, biogas storage tanks and standby flaring gas units.

		\$ million	
(d)	Ancillary works and facilities ¹²	62.5	
(e)	Waste water treatment system	48.0	
(f)	Heat recovery, power generation and surplus electricity export systems	99.6	
(g)	Pollution control and environmental monitoring facilities	41.5	
(h)	Mitigation measures and environmental monitoring and audit (EM&A) for construction works	12.1	
(i)	Consultants' fees for	24.1	
	(i) contract administration	19.4	
	(ii) management of resident site staff	2.3	
	(iii) operational performance reviews	2.4	
(j)	Remuneration of resident site staff	16.7	
(k)	Contingencies	<u>121.3</u>	
	Sub-total	1,334.5	(in September 2013 prices)
(l)	Provision for price adjustment	<u>198.3</u>	
	Total	<u>1,532.8</u>	(in MOD prices)

We propose to engage consultants to undertake contract administration for the proposed works, and carry out operational performance reviews for 12 months upon completion of the construction. A detailed breakdown of the estimates for consultants' fees and resident site staff costs by man-months is at Enclosure 3.

/16.

¹² Item (d) is for the design and construction of ancillary works and facilities. The works involve the provision of temporary office and site accommodation, temporary roads, maintenance workshop and utility yard during construction.

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

Year	\$ million (Sept 2013)	Price adjustment factor	\$ million (MOD)
2014 – 2015	200.0	1.05450	210.9
2015 – 2016	605.0	1.11777	676.3
2016 – 2017	273.0	1.18484	323.5
2017 – 2018	256.5	1.25593	322.1
	<hr/> 1,334.5 <hr/>		<hr/> 1,532.8 <hr/>

17. 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 2014 to 2018. We plan to implement the proposed works and the follow-on operation of the OWTF phase 1 under a Design-Build-and-Operate (DBO) contract arrangement. The capital cost of \$1,532.8 million will cover the design and build elements of the contract while the operation will be funded under the General Revenue Account. The contractual operation period will be 15 years. The DBO contract will provide for price adjustments for the entire contract period including the operation period.

18. We estimate that the annual recurrent expenditure arising from the proposed works to be about \$72.4 million. The fees and charges implication arising from the project will be considered in the context of waste charging discussion.

/PUBLIC

PUBLIC CONSULTATION

19. The OWTF phase 1 site straddles two District Councils, the Tsuen Wan District Council (TWDC) and the Islands District Council (IsDC). We consulted the TWDC on 26 January 2010 and the IsDC on 8 February 2010 on the findings of the Environmental Impact Assessment (EIA) study for OWTF phase 1. In response to the concern expressed by a few IsDC members on road safety issues, we explained that we had assessed the cumulative traffic impact on the local road network and concluded that the additional traffic caused by the proposed project would be insignificant. The two District Councils supported the proposal.

20. We consulted the Legislative Council Panel on Environmental Affairs (the Panel) on 22 November 2010 on the project. Members raised no objection to the proposed OWTF phase 1. We consulted the Panel on the project cost estimate on 13 March 2014. The Panel raised no objection to the submission of the funding proposal to the Public Works Subcommittee by the Administration. Supplementary information, including an indicative breakdown of the initial cost estimate presented to the Panel in 2010; power generation estimate; and the estimated recurrent expenditure, was provided to the Panel on 21 March 2014.

ENVIRONMENTAL IMPLICATIONS

21. **172DR** is a designated project under the EIA Ordinance and an environmental permit (EP) is required for its construction and operation. The EIA report was approved under the EIA Ordinance on 24 February 2010. The EIA report concluded that, with the implementation of the recommended mitigation measures, the project would comply with the established standards stipulated under the EIA Ordinance. The Director of Environmental Protection issued the EP for the project on 21 June 2010 and amended the EP on 18 March and 21 May 2013 to incorporate site boundary and layout changes. We estimate the cost of implementing the environmental mitigation measures including EM&A for construction works to be \$12.1 million. We have included this cost in the overall project estimate.

22. During 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 quiet construction plant to reduce noise generation, water-spraying to reduce dust emission and proper pre-treatment of site run-off. We will also carry out close site inspections to ensure that these recommended mitigation measures and good site practices are properly implemented.

23. At the design and construction stage, we will require the contractor to take measures such as adopting foundation design with minimum excavation to reduce the generation of construction waste where possible. We will require the contractor to reuse inert construction waste (e.g. excavated soil and demolished concrete) on site or in other suitable construction sites as far as possible, in order to minimize the disposal of inert construction waste to public fill reception facilities¹³. In addition, we will encourage the contractor to maximize the use of recycled/recyclable inert construction waste, and the use of non-timber formwork to further reduce the generation of construction waste.

24. We will also 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 to public fill reception facilities and landfills respectively through a trip-ticket system.

25. To minimize the risk to construction workers and operational staff of the OWTF phase 1 due to the transport, storage and use of chlorine associated with the operation of the Siu Ho Wan Water Treatment Works (SHWWTW) in the vicinity of the site, we will require the contractor to construct and maintain, during the construction and operation of the project, a solid fence of three metres high along the boundary facing the SHWWTW as shown in Enclosure 2.

26. We estimate that the project will generate in total about 16 200 tonnes of construction waste. Of these, we will reuse about 2 600 tonnes (16%) of inert construction waste on site and deliver 12 000 tonnes (74%) of inert construction waste to public fill reception facilities for subsequent reuse. We will dispose of the remaining 1 600 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 \$524,000 for this project (based on a unit charge rate of \$27 per tonne for disposal at public fill reception facilities and \$125 per tonne at landfills as stipulated in the Waste Disposal (Charge for Disposal of Construction Waste) Regulation).

/HERITAGE

¹³ 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 license issued by the Director of Civil Engineering and Development.

HERITAGE IMPLICATIONS

27. The proposed project will not affect any heritage site, i.e. all declared monuments, proposed monuments, graded historic sites/buildings, sites of archaeological interest and Government historic sites identified by the Antiquities and Monuments Office.

LAND ACQUISITION

28. The project does not require any land acquisition.

BACKGROUND INFORMATION

29. The “Policy Framework for the Management of Municipal Solid Waste (2005-2014)” published by the EPD in 2005 proposed that biodegradable materials such as food waste from C&I establishments could be separated at source for biological treatment to produce renewable energy and compost products.

30. In the 2009 Policy Address, the Government announced the intention to develop recycling facilities to process and recycle food waste generated by the C&I sectors. In the 2014 Policy Address, the Government reaffirmed the pledge to provide modern facilities in stages to convert organic waste into energy and other useful products.

31. To prepare for the development of large-scale modern OWTF, we engaged consultants in June 2006 to develop and operate a pilot composting plant in Kowloon Bay to assess the feasibility of and acquire local experience on biological treatment and recycling of source separated biodegradable waste collected from C&I establishments. The total cost of the pilot study is about \$13.61 million. We charged this amount to block allocation **Subhead 5101DX** “Environmental works, studies and investigations for items in Category D of the Public Works Programme”.

32. In August 2008, we engaged consultants to carry out the feasibility study, environmental impact assessment and tendering exercise for the project. The total estimated cost is about \$13.62 million. We charged this amount to block allocation **Subhead 5101DX** “Environmental works, studies and investigations for items in Category D of the Public Works Programme”.

33. We upgraded **172DR** to Category B in September 2007. We obtained the approval of the Secretary for the Environment in August 2010 to initiate parallel tendering before fund was secured for the project.

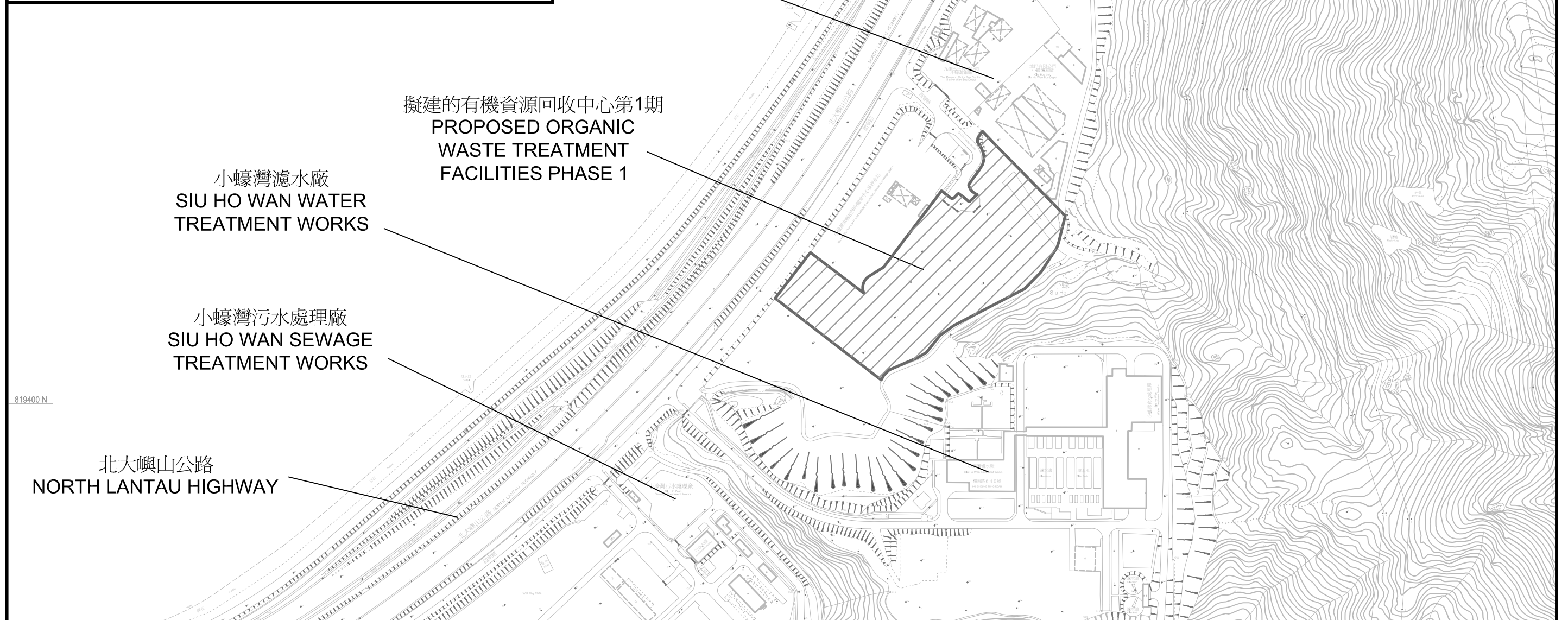
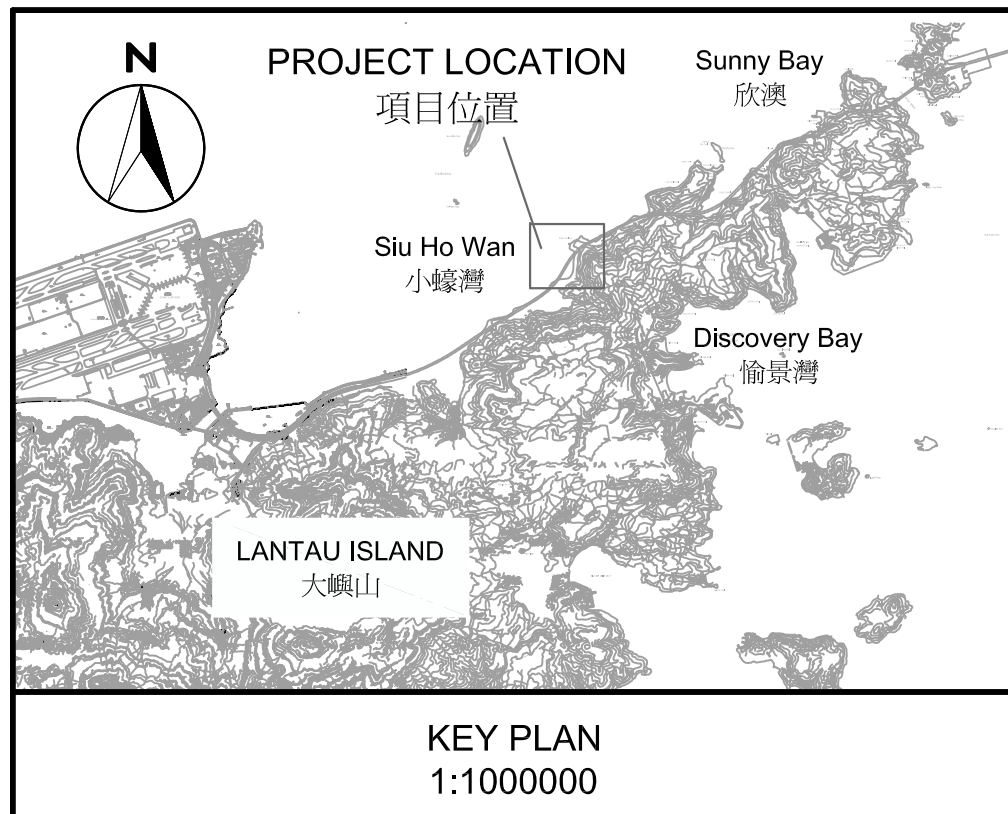
34. Of the 15 trees within the project boundary, three trees will be preserved. The proposed project will involve the removal of 12 trees, including 11 trees to be felled and one tree to be replanted within the project site (subject to finalization of design). All trees to be removed are not important trees¹⁴. We will require the contractor to incorporate planting proposals as part of the project.

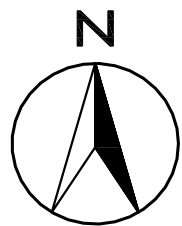
35. We estimate that the design and construction of the proposed works will create about 595 jobs (514 for labourers and another 81 for professional/technical staff) providing a total employment of 10 830 man-months. In addition, we estimate that the operation of the OWTF phase 1 will create 62 permanent jobs (32 labourers and another 30 professional/ technical staff).

Environment Bureau
March 2014

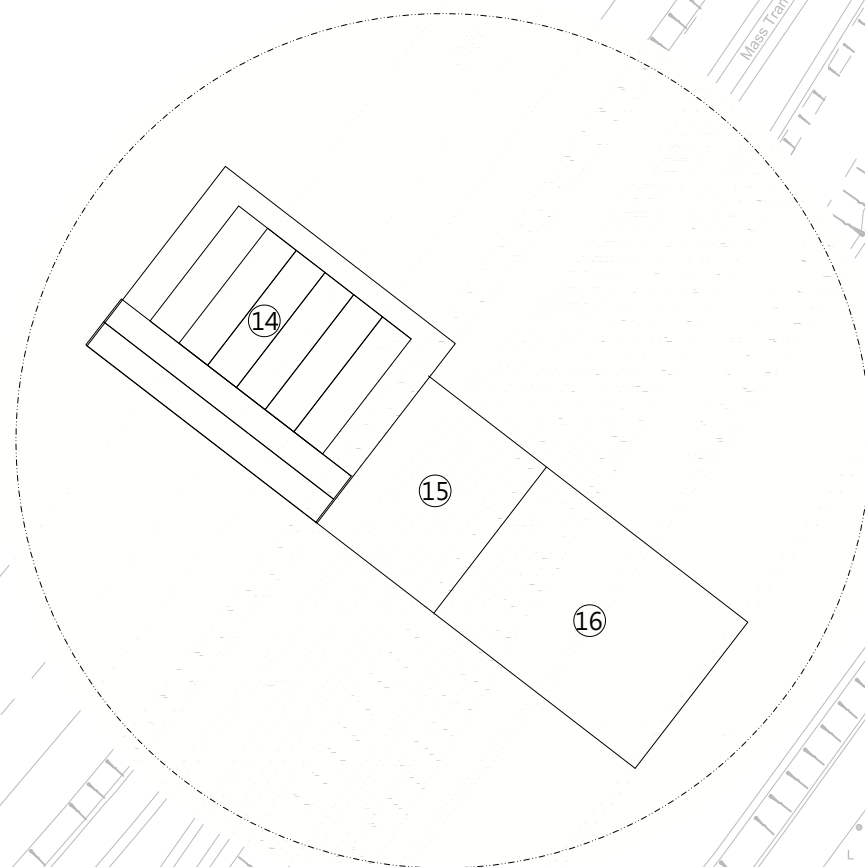
¹⁴ An “important tree” refers to trees in the Register of Old and Valuable Trees, or any other trees that meet one or more of the following criteria –

- (a) trees of over 100 years old or above;
- (b) trees of cultural, historical or memorable significance e.g. Fung Shui tree, tree as landmark of monastery or heritage monument, and trees in memory of an important person or even;
- (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 metre (m) (measured at 1.3 m above ground level), or with height/ canopy spread equal or exceeding 25 m.





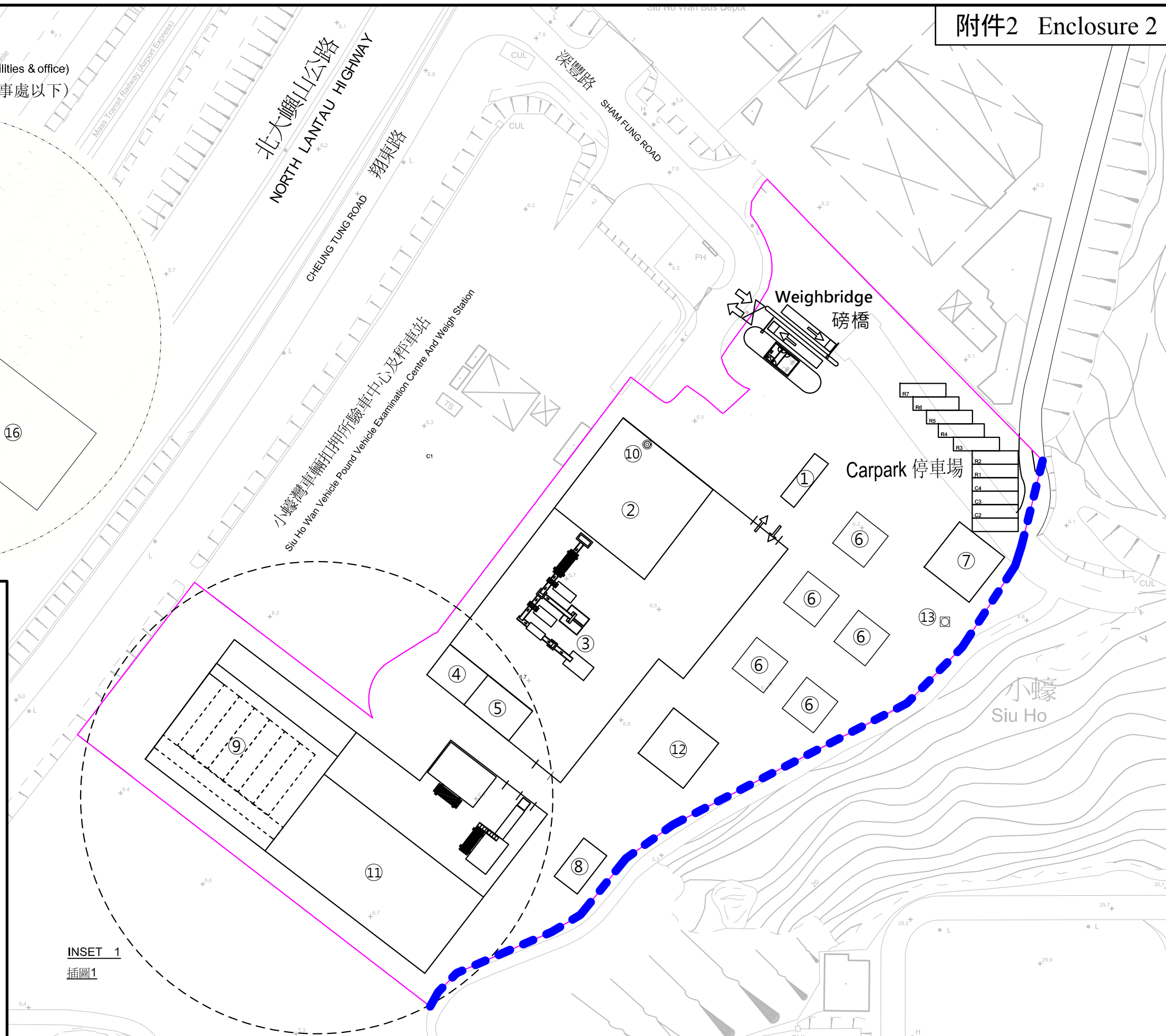
INSET 1 - Ground Floor (under the air pollution control facilities & office)
 插圖1 - 地下 (位於空氣污染控制設施與辦事處以下)



Legend

- Site Boundary 工地範圍
- - - Proposed 3m height solid fence 擬建的3米高實心欄
- Site Access 出入口
- 1) Vehicle Washing Facilities 廢物車輛清洗設施
- 2) Waste Reception Area 廢物接收區
- 3) Pretreatment Units 預處理設施
- 4) Workshop 工場
- 5) Dewatering Facilities 脫水設施
- 6) Anaerobic Digesters 厭氧分解缸
- 7) Combined Heat & Power Generators 熱電聯產系統
- 8) Wastewater Treatment System 污水處理系統
- 9) Office 辦事處
- 10) Stack 煙囪
- 11) Air Pollution Control Facilities 空氣污染控制設施
- 12) Gas Buffer Tank 生物氣暫存缸
- 13) Emergency Flare 應急生物氣燃燒設備
- 14) Tunnel Composting Area 堆肥區
- 15) Maturation Area 熟化區
- 16) Compost Storage 堆肥產品儲存倉

INSET 1
 插圖1



172DR – Organic waste treatment facilities phase 1

**Breakdown of the estimates for consultants' fees and resident site staff costs
(in September 2013 prices)**

			Estimated man-months	Average MPS* salary point	Multiplier (Note 1)	Estimated fee (\$ million)
(a)	Consultants’ fees for contract administration (Note 2)	Professional	116	38	2.0	15.6
		Technical	82	14	2.0	3.8
					Sub-total	19.4
(b)	Resident site staff costs (Note 3)	Professional	142	38	1.6	15.3
		Technical	100	14	1.6	3.7
					Sub-total	19.0
Comprising –						
(i)	Consultants’ fees for management of resident site staff					2.3
(ii)	Remuneration of resident site staff					16.7
(c)	Consultants’ fees for operational performance reviews (Note 2)	Professional	14	38	2.0	1.9
		Technical	10	14	2.0	0.5
					Sub-total	2.4
Total						40.8

* MPS = Master Pay Scale

Notes

1. A multiplier of 2.0 is applied to the average MPS point to arrive at the full staff costs, including the consultants' overheads and profit, as the staff will be employed in the consultants' offices. A multiplier of 1.6 is applied to the average MPS point to estimate the cost of resident site staff supplied by the consultants. (As at now, MPS point 38 = \$67,370 per month and MPS point 14 = \$23,285 per month.)
2. The actual man-months and actual fees will only be known after the selection of consultants through the usual competitive lump sum fee bidding system.
3. The actual man-months and actual costs will only be known after completion of the construction works.