

**For discussion
on 29 January 2004**

Legislative Council Panel on Environmental Affairs

PWP Item 5162DR – Restoration of Five Urban Landfills – post-completion environmental monitoring work

Purpose

This paper briefs Members on the Administration's proposal to submit PWP Item **5162DR** "Restoration of Five Urban Landfills – post-completion environmental monitoring work" to the Public Works Subcommittee for upgrading to Category A the continuation of the post-completion environmental monitoring work at five urban landfills for a further period of seven years (from May 2005 to May 2012) at an estimated cost of \$79.1 million in money-of-the-day (MOD) prices.

Background

2. All landfills produce landfill gas and leachate¹. Landfill gas, which is a product of refuse decomposition, is malodorous and potentially asphyxiating, flammable and explosive. Leachate is highly polluting and, if not properly controlled, may result in serious contamination of water bodies due to infiltration or direct discharge of leachate.

3. Municipal solid waste, when disposed of at landfills, does not exhibit homogenous geotechnical properties, as it is subject to a continuing biological degradation process. This will result in differential settlement of the landfill's surface and may lead to slope instability problems. We therefore need to monitor and improve slope stability at landfills. For some landfills, we also need to stabilise the natural slopes adjacent to the top platform of landfills to prevent possible boulder falls or soil debris flows.

4. The five urban landfills, namely the Jordan Valley Landfill, Ma Yau Tong Central Landfill, Ma Yau Tong West Landfill, Sai Tso Wan Landfill and Ngau Chi Wan Landfill, are located in Kwun Tong and Wong Tai Sin areas. A site plan of the landfills is provided at Annex. The landfills

¹ "Leachate" is the water, which has permeated through the waste mass.

were closed between late 1977 and early 1990. To minimise the adverse environmental impacts and to put the land to productive use, we sought and obtained funding approval from the Finance Committee (FC) in 1995 to fully restore the closed landfills under PWP item **5155DR**. Paper PWSC(95-96)15 is relevant. **5155DR** covered the construction of the restoration facilities² as well as seven years' post-completion work to maintain the facilities and monitor the landfill gas migration and leachate pollution.

5. In approving funding for **5155DR**, the FC agreed that we should carry out an environmental review every five years, starting from the commencement of the environmental monitoring work, to determine if the landfill sites have been completely restored and if further monitoring is needed. If further monitoring work is required, funding approval from FC would have to be sought again.

6. In May 1998, the construction of the restoration facilities was completed, and the post-completion environmental monitoring work commenced³. In March 2003, the construction of a multi-purpose grass pitch for soccer and baseball at the Sai Tso Wan Landfill commenced. The grass pitch is planned to be opened in mid-2004.

7. The first seven years' environmental monitoring work at the five urban landfills, costing about \$147 million, involved landfill gas and leachate management, site maintenance work as well as about 17,000 annual measurements of landfill gas, 3,300 annual measurements on leachate quality, and 4,400 annual measurements on groundwater and surface water quality.

8. In late 2002, the Environmental Protection Department (EPD) carried out an environmental review of the five urban landfill sites as requested by the FC. The review was completed in December 2003. It confirmed that further monitoring work at the landfills is necessary. Although the amount of landfill gas and pollution level of leachate generated

² The restoration facilities include (a) landfill gas management systems to control gas emission and prevent off-site gas migration; (b) a leachate management system at the Jordan Valley landfill to extract, collect, treat and dispose of the leachate, together with facilities at the other four landfills to collect leachate for transfer to the Jordan Valley Landfill; (c) an engineered capping layer (with low permeability) and a surface water drainage system to reduce infiltration of rain water into the waste mass thereby reducing the amount of leachate to be treated; and (d) improvements to the slope stability and landscaping of the landfill site and other ancillary engineering works.

³ Funding was sought for the first seven years' post-completion environmental monitoring work up to May 2005.

have considerably reduced since 1998, they are still of significant quantity and require continuous control and treatment.⁴ Also, site settlement is expected to continue and regular maintenance work will be required to maintain the surface drainage, slopes and internal roads. Hence, it is necessary to continue on-site monitoring to ensure that the sites pose no threat to the safety of the public and have minimal adverse environmental impacts, and that the future grass pitch at the Sai Tso Wan Landfill could operate in a safe environment.

Proposal

9. We propose to continue with the environmental monitoring work at the Urban Landfills for a further period of seven years (from May 2005 to May 2012).

10. The environmental monitoring work comprises –

- (a) operation and maintenance of the landfill gas management systems to control gas emission and to prevent off-site gas migration;
- (b) operation and maintenance of the leachate management system to control surface and groundwater infiltration into the landfills and to extract, collect, treat and dispose of the landfill leachate;
- (c) environmental monitoring and auditing; and
- (d) maintenance of landscape and site infrastructures.

11. The environmental monitoring work for closed landfills may last for more than two decades (could be up to 30 years). We propose to continue the carrying out of an environmental review every five years to determine if the monitoring work should continue. We will continue with

⁴ For example, the landfill gas generation rate of the five urban landfills has reduced from 50-400 cubic metres per hour (m³/hour) in 1998 to 40-260 m³/hour in 2003. The methane content in the landfill gas is between 16% - 44%, compared with 18% - 55% in 1998. Such volume of landfill gas and methane content levels still require monitoring as the landfills could only be considered as fully restored from the perspective of landfill gas safety when the methane content is reduced to 1%. For the leachate, the concentration level of total nitrogen has reduced from about 200-1200 milligrams per litre (mg/l) to around 55-710 mg/l between 1998 and 2003. However, except for the Ngau Chi Wan Landfill, the current total nitrogen content of the other four landfills still exceeds the acceptable discharge standard of 200 mg/l stipulated in the Technical Memorandum of the Water Pollution Control Ordinance for discharge to Government sewers.

the existing 30-year “design-build-and-operate” (DBO) contract to ensure that continuous liability is borne by the contractor. As specified in the contract, we have the right to terminate the contract or amend the coverage of the contract provided that we give the contractor sufficient advance notice.

Financial Implications

12. We estimate that the cost of the environmental monitoring work for seven years from May 2005 to May 2012 would be \$79.1 million in MOD prices, made up as follows: –

| | \$ million | |
|---|-------------------|-------------------------------|
| (a) Operation & maintenance of Landfill gas management systems | 11.3 | |
| (b) Operation & maintenance of leachate management systems | 21.7 | |
| (c) Environmental monitoring and audit | 17.5 | |
| (d) Landscape maintenance | 5.0 | |
| (e) Maintenance of site infrastructure | 23.1 | |
| (f) Contingencies | 3.0 | |
| Sub-total | 81.6 | (in September 2003 prices) |
| (g) Provision for price adjustment | (2.5) | |
| Total | 79.1 | (MOD prices) |

13. We estimate that the annual recurrent expenditure will be about \$0.73 million.

14. We estimate that the project will continue to provide 43 existing jobs (32 professional/technical staff and 11 labourers).

Public Consultation

15. The Kwun Tong District Council (KTDC) and the Wong Tai Sin District Council (WTSDC) supported the restoration works for the five urban landfills. We briefed the KTDC and WTSDC respectively in September 2002 and September 2003 on the progress of the monitoring work.

Environmental Implications

16. We completed in 1992 an Initial Environmental Impact Assessment, covering both the restoration and post-completion environmental monitoring work, as part of the feasibility study for the restoration works of the urban landfills. The study indicated that the restoration and monitoring works would ensure proper control of the emission and off-site migration of landfill gas and leachate. The works would ameliorate the environmental impacts of the landfills and enable the landfill sites to be put to beneficial use.

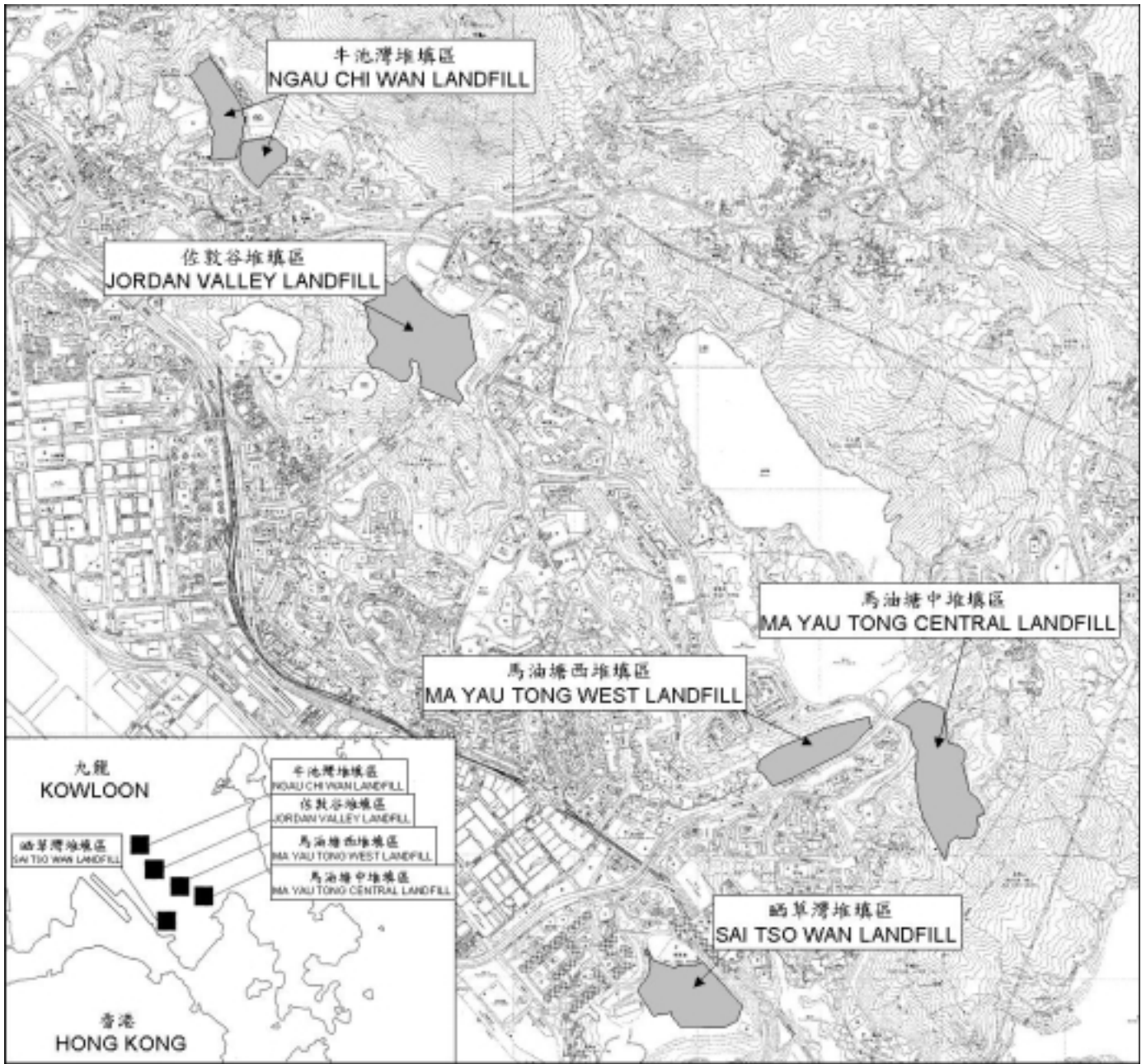
17. During the contract period, we will withhold payments to the contractor if there is any non-compliance with the required environmental standards.

18. We have given due consideration to the need to minimize the generation of construction and demolition (C&D) materials, and to reuse and recycle such materials wherever practicable. We will encourage the contractor to use non-timber formwork and recyclable materials for temporary works. We will control the disposal of C&D waste to landfills or other appropriate reception facilities through a trip ticket system and will record the disposal, reuse and recycling of C&D materials. We estimate that the project will generate about 500 m³ of C&D materials. We would reuse about 360 m³ (72%) on site, recycle or reuse 130 m³ (26%) as fill materials, and dispose of 10 m³ (2%), most of which is non-inert waste, at landfills.

Advice Sought

19. Members are invited to note our proposal of upgrading **5162DR** for consideration by the Public Works Subcommittee in February 2004 with a view to seeking funding approval by the Finance Committee in March 2004.

Environment, Transport and Works Bureau
January 2004



URBAN LANDFILLS LOCATION PLAN

市區堆填區位置圖