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8 September 2021

Clerk to Public Works Subcommittee
Legislative Council Secretariat
Legislative Council Complex
1 Legislative Council Road, Central
Hong Kong
(Attn: Ms. Connie Ho)

Dear Ms. Ho,

Public Works Subcommittee of the Legislative Council
West New Territories Landfill Extension
- Supplementary Information

At the meeting of the Public Works Subcommittee of the Legislative Council on 24 March 2021, Members requested the Government to provide supplementary information on the West New Territories Landfill Extension. Government's reply is provided at Enclosure.

Yours sincerely,

(Andy CHAN)

for Director of Environmental Protection

**Public Works Subcommittee of the Legislative Council
West New Territories Landfill Extension**

Follow-up to the Meeting on 24 March 2021

Capital Cost of West New Territories (WENT) Landfill Extension

The capital cost of a landfill project depends on many factors, including the design capacity, geology and geographical conditions, construction method, ancillary facilities required, etc. As the design of each landfill is unique, the site formation works and costs involved may vary significantly. Hong Kong's land resources are scarce. In order to meet the waste disposal needs and minimise the use of land, we will adopt an innovative "deep bowl" design in the proposed WENT Landfill Extension project to suit the local constraints. According to the consultants, no similar landfill design overseas is available for reference and comparison.

The major benefits of the "deep bowl" design include effective utilisation of land resources and minimisation of nuisance to the environment. Apart from the significant reduction in the landfill extension area, the land resources so released can be used to support the long-term development of Hong Kong. In respect of environmental protection, the "deep bowl" design can more effectively control and contain the potential nuisance of odour, dust, wastewater and noise from the extension works and landfill operation, and can also provide visual enhancement to the landfill for blending with the surrounding environment.

Furthermore, with the adoption of the "deep bowl" design, the WENT Landfill Extension project is more cost-effective in terms of both capital cost and landfill capacity per hectare of waste filling area. After being scaled down, the WENT Landfill Extension project would cover about 100 hectares of land, with the waste filling area being reduced to 94 hectares. It is anticipated that about 76 million cubic metres of landfill capacity, or 810 000 cubic metres of landfill capacity per hectare of waste filling area can be provided. This land utilisation rate is higher than those provided by the extension projects of the other two landfills (namely the North East New Territories Landfill and the South East New Territories Landfill). The average landfill capacities per hectare of waste filling area that could be provided by the landfill extension projects are tabled below:

Landfill Extension Project	Average landfill capacity (per hectare of waste filling area)
West New Territories	810 000 cubic metres
North East New Territories	300 000 cubic metres
South East New Territories	180 000 cubic metres

Since the WENT Landfill Extension would adopt the "deep bowl" design to enhance the landfill capacity, the site formation works would involve blasting and excavation works, and thus a relatively high overall capital cost. With respect to the capital cost, though no similar landfill extension project is available for reference and comparison, the cost of the site formation works, being the core works component of the WENT Landfill Extension project, would account for a considerable portion of the overall capital cost. Hence, in estimating the capital cost of the WENT Landfill Extension project, we have made reference to the project design and associated costs of other large

scale public site formation projects with similar works procedures. Appropriate adjustments to account for the specific needs and constraints of the extension works have been made to achieve a more reasonable and realistic estimate. The estimated capital cost of the proposed extension works and its breakdown are as follows:

Item		\$ million (in money-of-the-day prices)
(a)	Design and advance works	319.4
(b)	Basic and supporting facilities	398.7
	(1) Waste reception facilities	101.4
	(2) Water supply and drainage systems	148.6
	(3) Ancillary works and facilities	147.7
	(4) Furniture and equipment	1.0
(c)	Site formation works for waste reception area, landfilling area and related works site	32,319.1
	(1) Site clearance works	92.5
	(2) Blasting, excavation works and related slope stabilisation works	30,558.1
	(3) Fill deposition and compaction works	1,277.2
	(4) Construction of landscaped earth bund	276.0
	(5) Modification of Tsang Kok Stream Outfall	115.3
(d)	Impermeable landfill liner system	1,631.4
(e)	Leachate collection and management system	1,528.4
	(1) Leachate collection system	617.2
	(2) Leachate treatment and pumping system	911.2
(f)	Landfill gas collection and management system	864.1
(g)	Mitigation measures and environmental monitoring and audit for construction works	667.5
(h)	Enhancement to the environment and facilities of the local community	303.5
(i)	Restoration and aftercare facilities	1,202.5
(j)	Consultants' fees for	43.6
	(1) contract administration	17.7
	(2) management of resident site staff	25.9
(k)	Remuneration of resident site staff	974.3
(l)	Contingencies	4,025.3
	Total	44,277.8

Utilisation of Landfill Gas (LFG)

LFG is a renewable energy resource and its utilisation will turn waste into energy and help reduce greenhouse gas emissions to support the carbon reduction initiatives to combat climate change. In landfill daily operation, LFG can be utilised to generate electricity for on-site uses such as waste reception facilities, offices, maintenance workshops, pumping stations, and for providing electricity and thermal energy for leachate treatment facilities.

Based on the past experiences, the amount of LFG generation increases gradually with the total quantity, type and degradation rate of the waste landfilled. Therefore, relatively small amount of LFG would be generated at the initial stage of landfill operation, which is barely sufficient for providing energy to on-site facilities and no surplus LFG can be exported. The amount of LFG generated would then become saturated and stable at a later stage.

To encourage the landfill contractor to recover as much as possible useful resources and turn waste into energy, we would include appropriate clauses in the extension works contract to allow the contractor to sell the surplus LFG and share the associated revenue with the Government. Based on the past experiences, the surplus LFG would normally be sold to local public utilities through tendering or direct negotiation. In view of the uncertainties on the total amount of LFG generated, the energy required for supporting on-site facilities of the landfill, the design and capital cost of the LFG utilisation facilities and the relevant operational cost, etc., we do not have the estimated information on the quality of LFG to be generated from the proposed WENT Landfill Extension project, sale arrangement, price level and revenue at this stage.

Soil and Rocks to be Generated from Extension Works

The site formation works for the proposed WENT Landfill Extension include blasting, excavation, slope stabilisation, landscaped earth bund, etc. It is anticipated that certain amount of excavated materials, including soil and rocks, will be generated from the blasting and excavation processes. We will use some of the soil to cover the waste tipping face on completion of each day's operation to reduce odour emission. Some excavated materials will also be utilised on-site for construction of landscaped earth bund, slope stabilisation, paving of internal haul roads, backfilling of Tsang Kok Stream Outfall to facilitate the connection of two sections of widened Nim Wan Road in the future. Should there be any excess excavated materials, we will consider exporting them to other site formation projects to promote the reuse of these resources. We will also consider to supply the materials to the local market, which can help provide a stable supply and thus the price of aggregates in the local market. This will also generate revenue for the Government.

We anticipate that some of the excavated materials to be generated from the proposed extension works are of high quality granite, which, upon proper treatment, can be used as building materials with market value, such as aggregates for concrete. According to the latest statistical report of May 2021 issued by the Census and Statistics Department, the average wholesale price of aggregates is \$106 per tonne. Since the proposed extension works have yet to commence, we are unable to have a meaningful estimate on the quantity and quality of the excavated materials to be generated from the project. Nevertheless, we would incorporate appropriate clauses in the works contract to allow the contractor to sell the surplus excavated materials and share the associated revenue with the Government. Regarding the financial arrangement, the revenue so generated would be credited to the Treasury but would not make any direct reduction to the capital cost of the project.