CHAPTER 1

Environment Bureau
Home Affairs Bureau
Environmental Protection Department
Leisure and Cultural Services Department
Architectural Services Department
Home Affairs Department

Management of restored landfills

Audit Commission
Hong Kong
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This audit review was carried out under a set of guidelines tabled in the Provisional Legislative Council by the Chairman of the Public Accounts Committee on 11 February 1998. The guidelines were agreed between the Public Accounts Committee and the Director of Audit and accepted by the Government of the Hong Kong Special Administrative Region.

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MANAGEMENT OF RESTORED LANDFILLS

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MANAGEMENT OF RESTORED LANDFILLS

Executive Summary

1. Today, there are 16 landfill sites in Hong Kong, of which 3 large strategic landfills are operating and used for final waste disposal and 13 relatively small landfills (commissioned during 1960 to 1988) were closed between 1975 and 1996. According to the Environmental Protection Department (EPD), the 13 closed landfills were not designed with contemporary environmental standards as imposed on the current 3 strategic landfills, and these 13 closed landfills demand dedicated and effective efforts of restoration over a very long aftercare period (30 years or more). Since the landfilled waste is continuously undergoing biodegradation and generating landfill gas and leachate, they present environmental and safety hazards to the surrounding areas, and the landfills are subject to differential ground settlement during the process. Restoration of the 13 closed landfills (which were not installed with proper leachate and landfill gas management system at the time when they were in operation) comprises two stages: (a) Stage 1: Restoration works which include construction and installation of restoration facilities; and (b) Stage 2: Aftercare work which would commence after completion of restoration works to ensure that the landfill is maintained in a safe condition and is environmentally acceptable for appropriate future beneficial uses (i.e. afteruse of restored landfills).

2. The EPD has used a design-build-operate (DBO) form of contract for the restoration and management of the 13 closed landfills. Under the DBO contract arrangement, a contractor is responsible for the design and construction of restoration facilities (e.g. leachate treatment plant (LTP) and landfill gas flaring plant (LGP)) and the aftercare of a landfill for 30 years after completion of the restoration facilities. The EPD awarded 5 DBO contracts (hereinafter referred to as "landfill restoration contracts") through open tendering to 2 contractors during 1996 to 2004. The EPD's contractors completed the construction and installation of restoration facilities at the 13 landfills between 1997 and 2006 at a total capital cost of $1,317.7 million and such facilities have been commissioned. The total actual operating cost of the aftercare work was $67.9 million in 2016-17.

3. The 13 restored landfills occupy a total area of 320 hectare (ha) (equivalent to over 15 times the size of the Victoria Park). According to the EPD, in light of the many development restrictions (e.g. differential ground settlement) at restored landfills, recreational use (e.g. public parks and sitting-out areas) is considered the most suitable afteruse option at these landfills. The EPD has indicated that, except for areas occupied by restoration facilities required for aftercare work, all the remaining areas would in principle be available for afteruse as long as the nature of afteruse projects could fulfil the specified conditions and constraints at the remaining area. As of February 2018, the current and planned afteruse at the 13 restored landfills occupied a total area of about 113 ha (35% of 320 ha). The development of afteruse projects at restored landfills is implemented by the Government or non-governmental bodies.

4. The Audit Commission (Audit) has recently conducted a review to examine the Government's efforts in the management of restored landfills.

Aftercare of restored landfills

5. The EPD's landfill restoration contractors need to comply with the statutory requirements stipulated under the relevant environmental legislations (e.g. Water Pollution Control Ordinance (WPCO) — Cap. 358) and the contractual requirements in various major environmental parameters (e.g. total nitrogen level of leachate discharge) as stipulated in the landfill restoration contracts. According to the EPD, in the past 5 years from 2013 to 2017, of the 13 restored landfills, only the landfill restoration contractor (i.e. Contractor A) of the Pillar Point Valley Landfill (PPVL) in Tuen Mun District had since December 2015 failed to meet the statutory requirements under the WPCO and the contractual requirements. Audit selected the PPVL in Tuen Mun District as a case study for examination of the EPD's monitoring of contractors' aftercare work at restored landfills. In August 2004, the EPD entered into a landfill restoration contract with Contractor A for the design and construction of restoration facilities at PPVL and the aftercare of the landfill for 30 years after completion of the restoration facilities. In July 2006, the construction works of restoration facilities at PPVL were completed and the aftercare work commenced in the same month. The actual capital cost for the design and construction of the restoration facilities at PPVL was $199.2 million. In 2016-17, the actual operating cost of the aftercare work was $10.7 million (paras. 2.4, 2.6 and 2.7).

6. ***Long period of non-compliances with statutory and contractual requirements.*** From January to April 2016, the EPD received complaints on suspected malpractice of Contractor A in the operation of some restoration facilities at PPVL. The EPD's subsequent investigations found that: (a) between May 2016 and July 2017, Contractor A had contravened various statutory requirements of the licence issued by the EPD under the WPCO for the PPVL, and Contractor A was convicted and fined a total of $208,000 for 21 offences under the WPCO; and (b) between December 2015 and November 2017, Contractor A had committed various non-compliances with the contractual requirements, and up to November 2017, payments totalling about $7.7 million had been deducted from Contractor A (paras. 2.8, 2.11 and 2.13).

7. ***Need to ensure compliance with statutory and contractual requirements.*** In June 2016, in light of complaints received from January to April 2016, the EPD completed a review on the robustness of environmental monitoring practices at the EPD's waste facilities (hereinafter referred to as "2016 EPD Review"), including restored landfills. The 2016 EPD Review recommended, among others, the installation of advanced equipment (e.g. upgrading data monitoring systems and installing surveillance cameras) at PPVL and 4 other restored landfills installed with both LTP and LGP with a view to automating the monitoring work and detecting cases of non-compliance in a more timely manner. Audit found that, as of March 2018: (a) the installation dates of certain advanced equipment items were later than the target dates as set in the 2016 EPD Review, and the data monitoring systems at 2 restored landfills installed with both LTP and LGP had not yet been upgraded. The EPD needs to expedite the progress of installing such equipment; and (b) apart from these 2 landfills (where the data monitoring systems were yet to be upgraded), there were 3 other landfills for which the EPD considered it unnecessary to upgrade the data monitoring systems for their LTP and/or LGP. Before automated data monitoring systems are in place, the EPD needs to strengthen its monitoring actions on the landfill restoration contractors' compliance with the statutory and contractual requirements and the related record-keeping requirements (paras. 2.14 and 2.20 to 2.25).

8. ***Need to improve Leachate Treatment Plant at Pillar Point Valley Landfill.*** In early 2016, the EPD found that the LTP at PPVL was not functioning properly and could not treat leachate in an efficient manner. Subsequently, the EPD instructed Contractor A to carry out overhaul works for the LTP to remedy the problem. Between May 2016 and January 2017, owing to the LTP overhaul works at PPVL and the forecast increase of leachate inflow in the wet season, the EPD instructed Contractor A to suspend the LTP operation and arrange direct transfer of

leachate by vehicles to the Government's other facilities for off-site treatment. Moreover, between July and November 2017, mainly due to very heavy rainfall, the leachate inflow at PPVL far exceeded the LTP treatment capacity and reached the alert level of leachate storage tanks. As a result, with the EPD's consent, Contractor A directly transferred leachate by vehicles from PPVL to the Government's other facility for off-site treatment. In February 2018, a hydrogeological survey for PPVL was completed, which recommended mitigation measures (including installation of groundwater pumps) to resolve the leachate inflow/overflow problem. The EPD needs to take measures to ensure early implementation of mitigation measures (paras. 2.26, 2.30 and 2.31).

9. ***Scope for improving demerit point system.*** The 5 landfill restoration contracts adopt a demerit point system for the deduction of monthly payments from the related contractor for specified non-compliances with contractual requirements. Audit notes that while the 5 contracts require contractors to comply with the requirements of any licences issued under the WPCO, apart from total nitrogen limit, the demerit point system does not cover other non-compliances with the licence requirements under the WPCO, including cases where the stipulated maximum daily discharge limit of leachate is exceeded and the 24-hour notification requirement is not observed. The EPD needs to review the feasibility of incorporating non-compliances with the relevant statutory environmental requirements in the demerit point system of a landfill restoration contract in future (paras. 2.12, 2.33, 2.35 and 2.37).

Development of government recreational facilities at restored landfills

10. Since the early 2000s, the Government has planned/implemented projects for developing recreational facilities (parks and gardens) at 7 restored landfills. Audit noted that the implementation of 5 of these projects was that one project's development progress was slow (still at preliminary planning stage) and four projects had increases in costs and the actual project completion dates were later than the original target completion dates. Audit selected three projects (namely, Kwai Chung Park at Gin Drinkers Bay Landfill, Wan Po Road Pet Garden at Tseung Kwan O Stage I Landfill and Jordan Valley Park at Jordan Valley Landfill) as case studies with a view to identifying room for improvement, focusing on issues relating to development of government facilities at restored landfills. In these case studies, Audit notes that the special nature of restored landfills (including differential ground settlement, potential landfill gas hazards and buried restoration facilities (e.g. leachate and landfill gas

pipes)) warrants more attention and actions of departments and non-governmental bodies in developing facilities there. Such actions include ascertaining technical feasibility of proposed developments and up-to-date site conditions for design work before tendering, and allowing sufficient time for seeking the EPD's advice on design and layout plans before inviting tenders (paras. 1.10, 3.2, 3.3, 3.7, 3.28, 3.37, 3.47 and 3.57).

11. ***Kwai Chung Park: Need to expedite actions to develop the Park.*** The slow progress in developing the Kwai Chung Park (covering an area of about 25.5 ha) had been covered in Report No. 60 of the Director of Audit of March 2013. The Leisure and Cultural Services Department (LCSD) has agreed with the audit recommendations. However, Audit's follow-up review revealed that the development progress of the Park was still less than satisfactory. In 2013, a committee under the Kwai Tsing District Council endorsed the LCSD's proposed project scope of the Park (including a golf driving range with 30 golf driving bays). In May 2014, the Home Affairs Bureau (HAB) issued a Project Definition Statement for the Park to the Architectural Services Department (ArchSD) for the latter to prepare a Technical Feasibility Statement in order to confirm the technical feasibility of the proposed project and facilitate bidding for the necessary government resources for implementing the proposed works. In July 2014, the ArchSD informed the HAB and the LCSD that the site could not physically accommodate the proposed golf driving range, and requested the HAB to revise the Project Definition Statement by removing the proposed golf driving range from the project scope of the Park. With commitment to take forward this project, the Kwai Chung Park was included in the Policy Address of January 2017 as one of the 26 projects in the five-year plan for sports and recreation facilities targeted to be launched in or before 2022. In September 2017, the District Council endorsed the LCSD's proposal to develop the Kwai Chung Park by two stages. As of February 2018, 17 years had elapsed since the completion of restoration facilities by the EPD in September 2000, the HAB had not revised the Project Definition Statement of May 2014 for the ArchSD to prepare a Technical Feasibility Statement for the Kwai Chung Park (paras. 3.4 to 3.7, 3.10, 3.12 and 3.15).

12. ***Wan Po Road Pet Garden.*** In 2007, a working group under the Sai Kung District Council proposed to develop a 1.2-ha pet garden at Tseung Kwan O Stage I Landfill. The LCSD was the lead department to work with the Sai Kung District Council in implementing the project. The Home Affairs Department (HAD) appointed a term consultant to provide consultancy services for the project (para. 3.22). Audit found that:

(a) ***Need to ascertain up-to-date site conditions before tendering.*** In April 2009, a consultant of the HAD engaged a land surveyor to conduct a topographical survey at the works site. In December 2010, the LCSD awarded the works contract to a contractor at $15.1 million. From January to March 2011, the works contractor conducted another topographical survey and found that the actual site levels were significantly lower than those shown on the contract drawings. In August 2011, the HAD's consultant provided the revised design drawings to the works contractor, who resumed the works in the same month. As a result, the contractor was entitled to an extension of time for 3.5 months and an additional cost of $1.1 million was incurred for the works arising from the above re-design. According to the HAD, the continuous ground settlement at the project site was unusual, and in hindsight, the extent of design revisions during the construction stage could have been reduced if the HAD's consultant had conducted another topographical survey to ascertain the site levels before tendering for the works (paras. 3.22, 3.26, 3.27 and 3.30); and

(b) ***Need to enhance the accuracy in estimating project cost and time allowed for tender stage.*** In March 2010, the HAD's consultant estimated that the tender price for the works contract was $11.7 million and the HAD invited tenders for the contract. In April 2010, seven tenders were received and the prices of the returned tenders ranged from $15.1 million to $23.5 million, exceeding the pre-tender estimate by 29% to 101%. According to the HAD, regarding the under-estimation of tender price, the Pet Garden project was a pilot project under which no separate quantity surveyor was engaged to offer advice on the cost estimate provided by the HAD's consultant. Moreover, Audit noted that the feasibility study by the HAD's consultant had only allowed 3 months for the tender stage which would normally take 6 months to complete, leading to under-estimation of 3 months for the tender stage (paras. 3.30 and 3.31).

13. ***Jordan Valley Park: Need to allow sufficient time to consult EPD before inviting tenders***. In November 2005, the EPD requested the ArchSD to provide the detailed design and layout plans of the Jordan Valley Park Project for its comments when available. The ArchSD issued the tender document (which included the design and layout plans of 13 blocks of buildings and a model car circuit) in mid-August 2007 and awarded the works contract to a contractor at $137.7 million in December 2007. According to the ArchSD, due to time constraint, the ArchSD could

only consult the EPD of the design and layout plans after issuing tender documents in mid-August 2007. In the event, in May 2008, the ArchSD revised the design, including raising the external ground level of the 13 blocks of buildings with imported fill. The revision of the design had resulted in variation works of $9.4 million (paras. 3.46 to 3.50).

Monitoring of non-governmental bodies' afteruse facilities at restored landfills

14. With delegated authority from the Lands Department under the Land (Miscellaneous Provisions) Ordinance (Cap. 28), the EPD grants land licences to applicants (mainly non-governmental organisations and National Sports Associations) to develop and operate recreational facilities at restored landfills. As of December 2017, the EPD had granted five land licences to five licensees for developing and operating recreational facilities at 4 restored landfills (as two land licences were issued for one landfill) on a self-financing basis for use by the general public and/or members of the licensees in order to better utilise the vacant land at restored landfills (paras. 4.2 and 4.3).

15. ***Non-compliances with conditions of land licences.*** As of December 2017, 3 licensees had opened their facilities for use while 2 licensees had not completed the development of facilities, with delays of 6 and 15 months respectively when compared with the corresponding target completion dates as stipulated in the related land licences. Furthermore, the land licence for a facility opened for use (bicycle motocross (BMX) park) requires the licensee to operate a high-quality facility and maximise the facility utilisation. However, there were complaints on the poor quality and lack of maintenance of the BMX park, and the main track of the park was closed for maintenance for over one year from October 2016 to December 2017. According to the EPD, given the diversified nature of afteruse facilities, it did not have the expertise and capacity to ensure that a licensee would operate a high-quality facility and maximise the facility utilisation. There is scope for the EPD to seek the assistance and support of the relevant bureaux and departments (e.g. HAB and LCSD) in monitoring the licensees' compliance with licence conditions (paras. 4.3, 4.5 and 4.8 to 4.10).

16. ***Scope for improving conditions of land licences.*** Audit notes that some land licences contain conditions that are qualitative in nature, including operation of a high-quality facility, the need to maximise the facility utilisation, promotion and strengthening the development of relevant sports activities, and provision of intensive sports training to the community. However, quantitative/objective measures are not specified in these conditions, rendering it difficult for the EPD to assess whether the licensees meet such conditions (para. 4.12).

17. ***Need to formulate guidelines on the circumstances for requesting licensees to submit audited financial information.*** Under the land licences, for two licensees who had opened their afteruse facilities for use, upon the EPD's written request, they shall submit to the EPD the audited financial statements on their operation and maintenance of the facilities. However, Audit noted that the EPD had not requested the two licensees to submit audited financial statements (paras. 4.15 and 4.16).

18. ***Delays in implementing Restored Landfill Revitalisation Funding Scheme (Funding Scheme).*** In his Policy Address of January 2014, the Chief Executive announced that the Government had earmarked $1 billion to launch the Funding Scheme to provide funding for developing recreational, environmental or other community facilities on restored landfill sites. One of the objectives of the Funding Scheme is to expedite the development of gainful use at restored landfills so that the community can benefit from them at the earliest opportunity. According to the EPD, the Funding Scheme covers 7 restored landfills with applications to be invited in three batches. In June 2014, the EPD informed the Legislative Council of a tentative action timetable for taking forward 10 key actions (e.g. inviting preliminary proposals and granting approval-in-principle) under Batch 1 (covering 3 restored landfills) of the Funding Scheme. Audit noted that, as of December 2017, while 4 key actions had been completed, the other 6 key actions had yet to be completed. In particular, no in-principle approval had been granted to applicants as of December 2017, giving rise to the longest delay of 28 months. Furthermore, the EPD originally planned to invite applications under Batch 2 (covering the other 4 restored landfills) and Batch 3 (covering any landfills unallocated from Batches 1 and 2) in the second quarter of 2016 and the first quarter of 2017 respectively. However, as of December 2017, the EPD was still processing the applications under Batch 1 of the Funding Scheme, and applications under Batches 2 and 3 had not been invited (paras. 4.22 and 4.25 to 4.28).

Audit recommendations

19. **Audit recommendations are made in the respective sections of this Audit Report. Only the key ones are highlighted in this Executive Summary. Audit has *recommended* that the Government should:**

Aftercare of restored landfills

(a) **expedite the progress of installing the advanced equipment at restored landfills as recommended by the 2016 EPD Review, and keep under review the operation of the installed equipment to assess their effectiveness in monitoring of contractors' aftercare work (para. 2.42(a));**

(b) **before automated data monitoring systems are in place, ensure that the contractors properly maintain the site records, and strengthen monitoring actions on the contractors' compliance with the statutory and contractual requirements and the related record-keeping requirements (para. 2.42(b));**

(c) **take measures to ensure early implementation of mitigation measures to resolve the leachate inflow/outflow problem at PPVL (para. 2.42(d));**

(d) **review the feasibility of incorporating non-compliances with the relevant statutory environmental requirements in the demerit point system of a landfill restoration contract in future (para. 2.42(g));**

Development of government recreational facilities at restored landfills

(e) **expedite the revision of the Project Definition Statement of the Kwai Chung Park and issue it to the ArchSD for preparing a Technical Feasibility Statement for the project (para. 3.18(b));**

(f) **when implementing works projects at works sites susceptible to ground settlement (e.g. restored landfills) in future, take measures to ascertain up-to-date site conditions for design work before tendering (para. 3.38(a));**

(g) **when implementing works projects (including those at restored landfills) in future, take measures to enhance the accuracy in estimating the project cost and time allowed for tender stage (para. 3.38(b));**

(h) **conduct a review on the unusual ground settlement of the project site of Wan Po Road Pet Garden with a view to identifying whether other areas of the Tseung Kwan O Stage I Landfill have such settlement problem and ascertaining whether such settlement would lead to any adverse impacts on the EPD's restoration facilities and aftercare work (para. 3.39);**

(i) **when implementing works projects at restored landfills (with specific construction requirements and restrictions) in future, allow sufficient time for seeking the EPD's advice on design and layout plans before inviting tenders (para. 3.58(a));**

Monitoring of non-governmental bodies' afteruse facilities at restored landfills

(j) **keep under review the licensees' development progress of afteruse facilities with a view to completing the afteruse facilities in a timely manner (para. 4.19(a));**

(k) **take measures to monitor the licensees' compliance with licence conditions, including seeking the assistance and support of the relevant bureaux and departments if necessary (para. 4.19(b));**

(l) **explore the feasibility of incorporating quantitative/objective measures (e.g. Key Performance Indicators) in land licences when issuing or renewing licences in future (para. 4.19(d));**

(m) **formulate guidelines on the circumstances for requesting licensees to submit audited financial information for monitoring their operations and financial viability (para. 4.19(e)); and**

(n) **make additional efforts in implementing the Restored Landfill Revitalisation Funding Scheme with a view to achieving the objective of expediting the development of gainful use at restored landfills so that the community can benefit from them at the earliest opportunity (para. 4.36).**

Response from the Government

20. The Government agrees with the audit recommendations.

PART 1: INTRODUCTION

1.1 This PART describes the background to the audit and outlines the audit objectives and scope.

Background

1.2 In Hong Kong, landfilling has been the major approach for waste disposal for decades. Before the 1990s, the relatively small landfills near main urban areas had generally served the territory well, but they had been filled up and closed due to the rapid economic development. In the 1990s, the Government constructed 3 large strategic landfills (Note 1) for waste disposal purpose. Today, there are 16 landfill sites in Hong Kong, of which:

(a) the 3 large strategic landfills are operating and used for final waste disposal. The 3 landfills occupy a total area of some 280 hectares (ha — Note 2); and

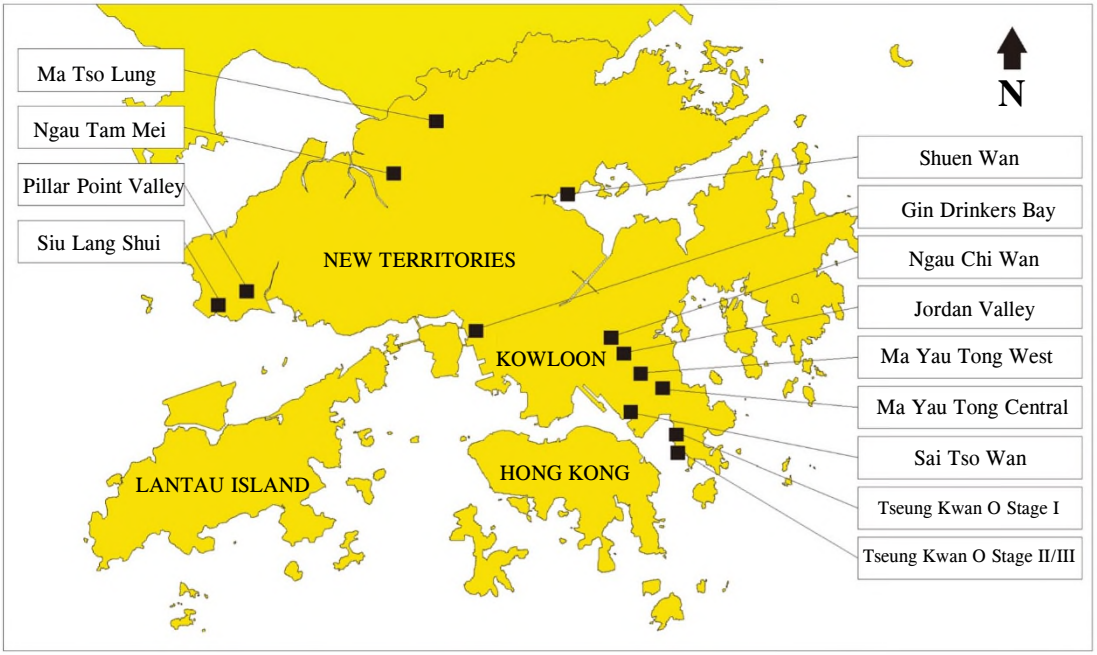
(b) the remaining 13 landfills, commissioned during 1960 to 1988 and operated by the former Civil Engineering Department (now the Civil Engineering and Development Department), were closed between 1975 and 1996 (see Appendix A). These closed landfills occupy a total area of 320 ha (equivalent to over 15 times the size of the Victoria Park). Figure 1 shows their locations.

Note 1: *The three operating strategic landfills are Southeast New Territories Landfill in Tai Chik Sha of Sai Kung District, Northeast New Territories Landfill in Ta Kwu Ling of North District and West New Territories Landfill in Nim Wan of Tuen Mun District. They were constructed in 1993 and 1994, and commissioned between 1993 and 1995.*

Note 2: *A hectare (or 10,000 square metres) of land is approximately the size of a standard football pitch.*

Figure 1

Locations of 13 closed landfills



Source: *EPD records*

1.3 Landfills, whether operating or closed, produce landfill gas and leachate (Note 3) as products of refuse decomposition. Landfill gas is malodorous and potentially asphyxiating, flammable and explosive. Leachate is highly polluting and, if not properly controlled, may seriously contaminate water bodies due to direct discharge of leachate.

1.4 Municipal solid waste, when disposed of at landfills, does not exhibit homogeneous geotechnical properties, as it is subject to continuing biological decomposition process. This results in differential ground settlement of the landfill surface which may lead to slope instability problems.

Note 3: *Leachate is the liquid that has percolated through solid waste. It is generated by the moisture content in the waste, decomposition of waste, and rainwater infiltration into the waste mass.*

1.5 Refuse decomposition in a landfill is a slow process which may take a long time before a landfill is fully restored (Note 4). Landfills will continue to produce landfill gas and leachate and be subject to differential ground settlement during the refuse decomposition process.

1.6 In view of the problems envisaged, the "White Paper: Pollution in Hong Kong — A Time to Act" issued in June 1989 set out the policy objective of formulating a programme for the comprehensive restoration of closed landfill sites (Note 5). The landfill restoration programme initiative and target were promulgated in the 1995 Policy Address. According to the Environmental Protection Department (EPD), the 13 closed landfills were not designed with contemporary environmental standards as imposed on the current three strategic landfills. After closure of the 13 landfills, the former Civil Engineering Department handed over the landfills to the EPD for carrying out restoration works and aftercare work in order to control and mitigate environmental impacts, and to enable the restored landfills for safe future beneficial use (i.e. afteruse of restored landfills). Since the merging of the Environment Bureau (ENB — Note 6) and the EPD in 2007, they are responsible for the policy matters on management of landfills, the implementation of the restoration programme, and the monitoring of the aftercare and afteruse of restored landfills. Figure 2 shows the key elements in the Government's management of restored landfills.

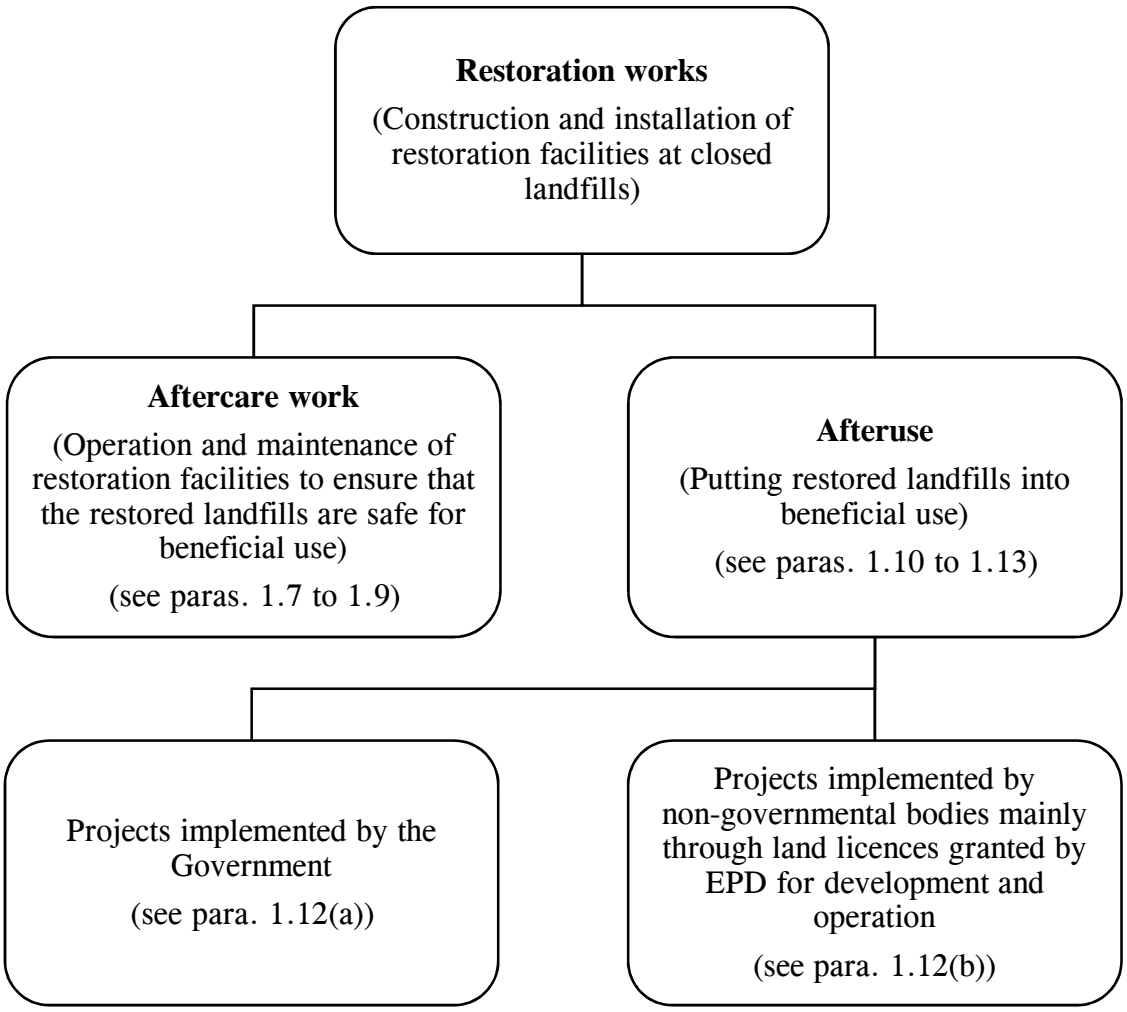
Note 4: *According to the Environmental Protection Department, a "restored landfill" refers to a closed landfill installed with appropriate restoration facilities (see para. 1.7(a)), and a "fully restored landfill" refers to a restored landfill where aftercare work is no longer required (see para. 1.7(b)).*

Note 5: *According to the White Paper, the long-term waste disposal strategy was based on the construction of three very large operating landfills (see para. 1.2(a)). These landfills would be designed and operated to minimise their environmental impacts not only during their operating life but also after their closure. According to the Environmental Protection Department, these landfills have been installed with landfill gas and leachate management systems.*

Note 6: *In July 2007, the ENB was formed to take over the policy responsibility for environmental matters. Before July 2007, the policy responsibility had been taken up by the then Environment, Transport and Works Bureau (July 2002 to June 2007), the then Environment and Food Bureau (January 2000 to June 2002), the then Planning, Environment and Lands Bureau (July 1997 to December 1999) and the then Planning, Environment and Lands Branch (before July 1997).*

Figure 2

Key elements in the Government's management of restored landfills



Source: *EPD records*

Aftercare of restored landfills

1.7 Restoration of all the 13 closed landfills is essential as they were not installed with proper leachate and landfill gas management systems at the time when they were in operation. The restoration comprises the following two stages:

(a) ***Stage 1: Restoration works.*** These include construction and installation of restoration facilities, including:

(i) leachate management systems to extract, collect, treat and dispose of leachate;

(ii) landfill gas management systems to control gas emission and prevent off-site gas migration;

(iii) engineered capping layers (with low permeability) and surface water drainage system to reduce infiltration of rain water into the waste mass, thereby reducing the amount of leachate generated; and

(iv) improvements to slope stability, landscaping of landfill sites and other ancillary engineering works; and

(b) ***Stage 2: Aftercare work.*** After completion of restoration works, the aftercare work would commence until the landfill is fully restored to ensure that the landfill is maintained in a safe condition and is environmentally acceptable for appropriate future land uses. The aftercare work includes:

(i) operation and maintenance of leachate management systems;

(ii) operation and maintenance of landfill gas management systems;

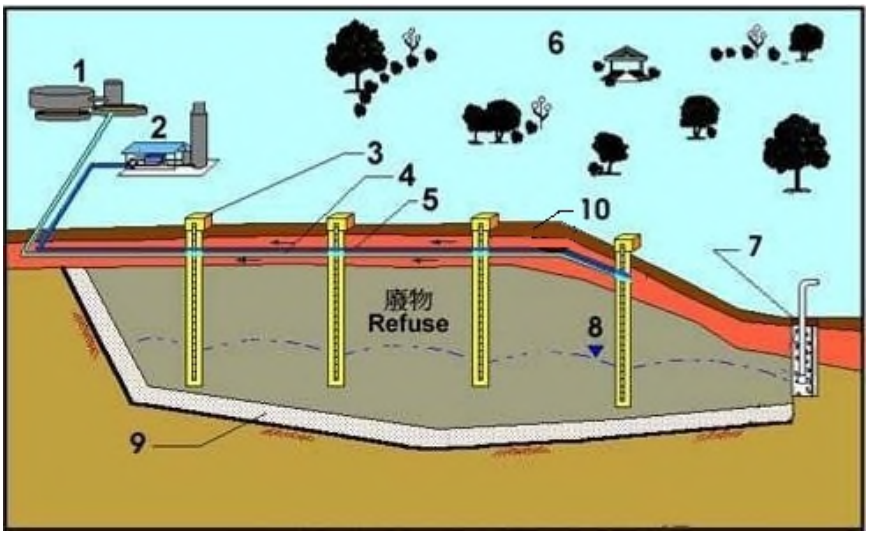
(iii) environmental monitoring and auditing; and

(iv) maintenance of landscape and site infrastructures.

Figure 3 shows the typical layout of a restored landfill.

Figure 3

Typical layout of a restored landfill



Legend:
1. Leachate treatment plant
2. Landfill gas utilisation plant and/or flaring plant
3. Leachate/Gas extraction well
4. Leachate pipe
5. Landfill gas pipe
6. Recreational or other beneficial use
7. Gas venting trench
8. Leachate level
9. Drainage layer
10. Capping system

Source: *EPD records*

1.8 The EPD has used a design-build-operate (DBO) form of contract for the restoration and management of the 13 closed landfills. Under the DBO contract arrangement, a contractor is responsible for the design and construction of restoration facilities and the aftercare of a landfill for 30 years after completion of the restoration facilities (Note 7). The EPD awarded 5 DBO contracts (hereinafter referred to as "landfill restoration contracts") through open tendering to 2 contractors during 1996 to 2004. The EPD's contractors completed the construction and installation of restoration facilities at the 13 landfills between 1997 and 2006 at a total capital cost of $1,317.7 million and such facilities have been commissioned. The total actual operating cost of the aftercare work was $67.9 million in 2016-17. Details of landfill restoration contracts and restoration works are shown in Appendix B.

1.9 According to the EPD:

(a) unlike other works projects of the Government, the 13 closed landfills demand dedicated and effective efforts of restoration over a very long aftercare period (30 years or more). Since the landfilled waste is continuously undergoing biodegradation and generating landfill gas and leachate, they present environmental and safety hazards to the surrounding areas;

(b) in view of the above, the EPD has adopted the DBO contract arrangement in managing the 13 closed landfills' restoration works and aftercare work, and engaged qualified specialist contractors with relevant expertise, knowledge and experience in carrying out the restoration works and aftercare work. Adopting the 30-year DBO contract arrangement imposes continuous liability on a single party and ensures continued commitment to the aftercare work throughout the entire aftercare period, and the contractor is responsible for developing, constructing, operating and maintaining the restored landfills at acceptable environmental and safety standards throughout the contract period; and

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Note 7: *According to the information submitted to the Legislative Council when seeking funding approval for the DBO contracts, the Government would carry out an environmental review for each restored landfill every five years to determine whether the post-completion aftercare work should continue. As specified in the landfill restoration contracts, the EPD has the right to terminate the contracts provided that the EPD gives the contractors sufficient advance notice (i.e. notice of 9 or 12 months according to individual contracts).*

(c) consideration to terminate the contracts (see Note 7 to para. 1.8) should not and cannot be taken lightly, which should take into account a host of factors including potential legal, social and financial implications. Among other impacts, it would be extremely costly to the Government and the community at large, and have grave implications on the day-to-day life of the general public, in case there is a change of contractors for taking up the aftercare work of restored landfills.

Afteruse of restored landfills

1.10 Before the full restoration of a closed landfill which may take at least 30 years, the EPD, through the aftercare work, will continue to ensure that the restored landfills are maintained in a safe condition and they are environmentally acceptable for beneficial use. According to the EPD:

(a) restored landfills are very different from any ordinary piece of land and there are many restrictions on the afteruse of restored landfills in terms of site constraints, differential ground settlement over restored landfills, potential landfill gas hazards, and possible interfacing issues between restored landfills and afteruse developments. For example, restored landfills cannot accommodate excessive loading in order to avoid damage to restoration facilities, and excavation at landfill surface for construction of basements or piles is not allowed as this may cause damage to the buried restoration facilities (e.g. leachate and landfill gas pipes) or unnecessarily expose the landfilled waste. A landfill gas hazard assessment is also required before planning afteruse developments at restored landfills; and

(b) development of afteruse projects is a very challenging and difficult task since there are numerous development constraints and technical difficulties for the project proponents to overcome before the afteruse projects can be turned into beneficial use without affecting the aftercare work of restored landfills. In light of these constraints, revitalisation of restored landfills for recreational use (e.g. public parks and sitting-out areas) is the most suitable option.

1.11 The 13 restored landfills occupy a total area of 320 ha. According to the EPD, except for areas occupied by restoration facilities required for aftercare work, all the remaining areas would in principle be available for afteruse as long as the nature of afteruse projects could fulfil the specified conditions and constraints at the remaining area (Note 8). Details of the areas and afteruse of the 13 restored landfills as provided by the EPD to the Audit Commission (Audit) are given in Table 1 and Appendix C.

Note 8: *According to the EPD, in general, flat area of a restored landfill is considered readily available and suitable for afteruse development, while slopes render difficulties to afteruse project proponents as they have to deal with technical risk management and administrative issues, such as implementing slope stabilisation measures and conducting natural terrain hazard assessment and/or slope failure analysis.*

Table 1

Areas and afteruse of 13 restored landfills
(February 2018)

Restored landfill	Total area (a) (ha)	Status of current and planned afteruse (Approximate area in ha) (b)	Remaining area after deducting afteruse area in (b) (Notes 1 and 2) (c) (ha)
1. Tseung Kwan O Stage I	68	(i) Football training centre under construction (12.5 ha)	54.2
		(ii) Wan Po Road Pet Garden and car park opened (1.3 ha)	
2. Pillar Point Valley	65	Temporary shooting range opened (0.2 ha)	64.8 (also see Note 1(c))
3. Shuen Wan	55	Golf course under planning (50 ha), including temporary golf driving range opened (15.6 ha)	5.0
4. Tseung Kwan O Stage II/III	42	Temporary training field of unmanned aerial vehicles for land survey purpose by Civil Engineering and Development Department which had not carried out any development works (8.9 ha)	33.1
5. Gin Drinkers Bay	29	(i) Kwai Chung Park under planning (25.5 ha — including facilities in (ii) and (iii) below)	3.5
		(ii) Temporary cricket grounds under construction (4.5 ha)	
		(iii) Bicycle motocross (BMX) park opened (3.9 ha)	
6. Siu Lang Shui	12	No afteruse identified	12.0 (also see Note 1(c))
7. Jordan Valley	11	Jordan Valley Park opened (5 ha)	6.0
8. Ma Yau Tong Central	11	Ma Yau Tong Central Sitting-out Area opened (0.1 ha)	10.9
9. Sai Tso Wan	9	Sai Tso Wan Recreation Ground opened (3 ha)	6.0
10. Ngau Chi Wan	8	Ngau Chi Wan Park opened (4 ha)	4.0
11. Ma Yau Tong West	6	Ma Yau Tong West Sitting-out Area opened (0.1 ha)	5.9
12. Ma Tso Lung	2	Campsite opened (2 ha) under a Lands Department's short-term tenancy	0.0
13. Ngau Tam Mei	2	No afteruse identified	2.0
Total	320	112.6	207.4

Legend: Restored landfills included under the Restored Landfill Revitalisation Funding Scheme (see para. 1.13)
Projects implemented/to be implemented by the Government
Projects implemented/to be implemented by non-governmental bodies

Source: *EPD records*

Table 1 (Cont'd)

Note 1: *According to the EPD, the remaining areas in column (c) include:*

(a) those reserved for the Restored Landfill Revitalisation Funding Scheme (12.9 ha — see Table 7 in para. 4.25);

(b) those occupied by the EPD's and landfill restoration contractors' site offices, restoration facilities, access roads, trees and landscaping features; and

(c) other specified uses (including 22.8 ha of the Tsing Shan Firing Range located within the Pillar Point Valley Landfill and 2.3 ha of the Siu Lang Shui Landfill designated as a Site of Special Scientific Interest for over-wintering of butterflies).

Note 2: *The EPD does not carry out surveys on the areas occupied by the items in Note 1(b) above (i.e. EPD's and landfill restoration contractors' site offices, restoration facilities, access roads, trees and landscaping features) as the EPD considers that there is no operational need to do so. As a result, the EPD does not maintain detailed breakdown on the areas occupied by each of these items at each restored landfill.*

Remarks: *More details on the land areas for afteruse of restored landfills are shown in Appendix C.*

1.12 While the EPD's contractors are responsible for the aftercare work of the 13 restored landfills (see para. 1.8), the development of afteruse projects at restored landfills is implemented through the following two channels:

(a) ***Public works projects planned/implemented by the Government.*** Since the early 2000s, the Government has planned/implemented projects for developing recreational facilities at 7 restored landfills (see items 1(ii), 5(i) and 7 to 11 of Table 1 in para. 1.11) under the Capital Works Reserve Fund (CWRF — Note 9). These projects relate to the development of parks and gardens for the Leisure and Cultural Services Department (LCSD) which is responsible for the management of the completed facilities upon their commissioning. A total capital cost of $443.3 million was incurred on such projects. The LCSD is under the policy direction of the Home Affairs Bureau (HAB) which is responsible for policy matters on the development of sports and recreation. The Architectural Services Department (ArchSD) is responsible for the design and construction of public recreational projects on two restored landfills (see items 7 and 10 of Table 1 in para. 1.11 and

Note 9: *The CWRF was established with effect from April 1982 by a resolution of the Legislative Council in January 1982 for financing public works projects and acquisition of land.*

Table 4 in para. 3.2 for details). Under the District Minor Works Programme (Note 10), the Home Affairs Department (HAD) is also responsible for the design and construction of minor public recreational projects on three restored landfills (see items 1(ii), 8 and 11 of Table 1 in para. 1.11 and Table 4 in para. 3.2 for details); and

(b) ***Projects implemented by non-governmental bodies.*** The EPD has allowed non-governmental bodies (e.g. non-profit-making organisations or National Sports Associations) to develop and operate 5 afteruse projects under a self-financing arrangement at restored landfills for recreational purpose (see items 1(i), 2, 3, 5(ii) and 5(iii) of Table 1 in para. 1.11) through the grant of land licences. The EPD monitors the performance of licensees according to the licence conditions. For the afteruse project at Ma Tso Lung Landfill (see item 12 of Table 1 in para. 1.11), it is operated under a Lands Department's short-term tenancy (see Note 4 to Appendix C).

Restored Landfill Revitalisation Funding Scheme

1.13 The 2014 Policy Address announced that the Government had earmarked $1 billion to set up the Restored Landfill Revitalisation Funding Scheme (hereinafter referred to as "Funding Scheme") to expedite the development of recreational facilities or other innovative proposals. According to the EPD, six (see items 3, 5, 7, 9, 10, 12 of Table 1 in para. 1.11) of the 13 restored landfills have been developed for public use or reserved for conservation or other uses. As a result, the Funding Scheme covers the remaining seven restored landfills (see Table 1 in para. 1.11). The EPD is responsible for providing secretariat support for the Funding Scheme.

Note 10: *In 2007, the Government introduced the District Minor Works Programme to implement district-based works projects to improve local facilities, living environment and hygienic conditions in the territory. The Programme is funded by a dedicated block vote under the CWRF and the cost of each project is limited to $30 million.*

Responsible divisions of EPD

1.14 The Environmental Infrastructure Division (EI Division) of the EPD is responsible for managing the performance of landfill restoration contractors, carrying out regular environmental monitoring activities, monitoring the afteruse at restored landfills and administering the Funding Scheme. The Environmental Compliance Division (EC Division) of the EPD is responsible for ensuring compliance with various environmental legislations, and would refer non-compliance cases to the EPD's Central Prosecution Unit for taking further legal action. Appendix D shows an extract of the organisation chart of the EPD.

Audit review

1.15 In October 2017, Audit commenced a review to examine the Government's efforts in the management of restored landfills. The review focuses on the following areas:

(a) aftercare of restored landfills (PART 2);

(b) development of government recreational facilities at restored landfills (PART 3); and

(c) monitoring of non-governmental bodies' afteruse facilities at restored landfills (PART 4).

Audit has found room for improvement in the above areas, and has made a number of recommendations to address the issues.

Acknowledgement

1.16 Audit would like to acknowledge with gratitude the full cooperation of the staff of the ENB, the HAB, the EPD, the LCSD, the ArchSD and the HAD during the course of the audit review.

PART 2: AFTERCARE OF RESTORED LANDFILLS

2.1 This PART examines the EPD's monitoring of the contractors' aftercare work at restored landfills.

Restoration facilities installed at restored landfills

2.2 The restoration facilities installed at restored landfills mainly include the following:

(a) ***Leachate management system.*** The system generally includes extraction wells and leachate pipes for carrying leachate from the waste mass within a landfill site to a leachate treatment plant (LTP — see Photograph 1) for treatment before discharging the treated leachate into nearby public sewers (Note 11). During the treatment process, aqueous ammonia (which is irritating and corrosive in nature) is removed from the leachate in the LTP. Some restored landfills with less leachate generation are not installed with an LTP, and the leachate from such landfills is transported by the pertinent contractor to the LTP at another restored landfill managed under the same landfill restoration contract for treatment; and

(b) ***Landfill gas management system.*** The system generally includes landfill gas extraction wells, monitoring wells and pipes for carrying landfill gas from underground of a landfill site to a landfill gas flaring plant (LGP) and/or utilisation plant (see Photograph 2). The LGP generates heat energy for the leachate treatment process at the LTP and for on-site power supply as far as possible through combustion of the landfill gas, while the landfill gas utilisation plant processes landfill gas for beneficial use. The remaining landfill gas is flared for safety reasons, preventing it from emission to the atmosphere. Some restored landfills with landfill gas of lower methane content are installed with passive gas venting system to directly disperse the landfill gas to the atmosphere.

Note 11: *The treated leachate would be conveyed to a Drainage Services Department's facility for further treatment before discharge to a nearby water body (e.g. marine water).*

Photograph 1

A leachate treatment plant at Pillar Point Valley Landfill

Source: EPD records

Photograph 2

A landfill gas flaring and utilisation plant at Shuen Wan Landfill

Source: EPD records

2.3 Table 2 shows the key restoration facilities installed at the 13 restored landfills.

Table 2

Key restoration facilities installed at 13 restored landfills

Restored landfill	Contractor	Landfill restoration contract	With LTP (Note 1)	With LGP (Note 2)
1. Tseung Kwan O Stage I	A	A1	No	Yes
2. Tseung Kwan O Stage II/III			Yes	Yes
3. Gin Drinkers Bay		A2	Yes	Yes
4. Ma Tso Lung			No	No
5. Ngau Tam Mei			No	No
6. Siu Lang Shui			No	No
7. Pillar Point Valley		A3	Yes	Yes
8. Shuen Wan	B	B1	No (Note 3)	Yes (Note 3)
9. Ngau Chi Wan		B2	No	No
10. Jordan Valley			Yes	Yes
11. Ma Yau Tong Central			Yes (Note 4)	Yes
12. Ma Yau Tong West			No	No
13. Sai Tso Wan			No	Yes

Source: *EPD records*

Note 1: *For restored landfills without an LTP (except for Shuen Wan Landfill — see Note 3 below), the pertinent contractors transport the leachate produced from these landfills to the LTP installed at another restored landfill managed under the same landfill restoration contract for treatment.*

Note 2: *An LGP and/or a passive gas venting system installed at restored landfills facilitates the dispersion of landfill gas to the atmosphere to ensure safety.*

Note 3: *Leachate from the Shuen Wan Landfill is collected and delivered to the adjacent Drainage Services Department's Tai Po Sewage Treatment Works for treatment. Contractor B has also reached an agreement with a gas supply company to sell and deliver the landfill gas to its nearby gas production plant for generation of energy.*

Note 4: *According to the EPD, the LTP at Ma Yau Tong Central Landfill only operates during the wet season (typically from June to October of a year) due to the increase in leachate generation. During the dry season (typically from November of a year to May next year), the leachate from the Ma Yau Tong Central Landfill is delivered to the LTP at Jordan Valley Landfill for treatment.*

EPD's monitoring of contractors' aftercare work

2.4 After completion of construction and installation of the restoration facilities at restored landfills, the EPD's contractors are responsible for their aftercare work (see para. 1.8). The contractors need to comply with the statutory requirements stipulated under the relevant environmental legislations (e.g. Water Pollution Control Ordinance (WPCO) — Cap. 358) (Note 12). The landfill restoration contracts also stipulate requirements for compliance by contractors in various major environmental parameters (e.g. total nitrogen level of leachate discharge (which is same as the statutory limits under the WPCO) and landfill gas emission limits).

2.5 According to the EPD, its two separate divisions (see Appendix D) are responsible for monitoring the performance of contractors independently in complying with the relevant statutory and contractual requirements:

(a) ***Environmental Compliance Division.*** The EC Division of the EPD is responsible for conducting investigations and taking samples for testing and checking against the relevant statutory requirements, and the Division would refer warranted cases to the EPD's Central Prosecution Unit for initiating prosecution actions. For example, regarding the quality of treated leachate discharge from an LTP, the EC Division would collect leachate discharge samples for testing by the Government Laboratory (Note 13), and would refer the case to the Central Prosecution Unit for further action (e.g. laying of summons and acting as the EPD's representative in courts) if the leachate discharge quality contravenes the requirements stipulated in a licence issued by the EPD under the WPCO; and

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Note 12: *The WPCO stipulates the water quality that should be achieved and maintained to promote the conservation and best use of waters in Hong Kong in the public interest. Under the WPCO, the EPD may grant a licence to a person stipulating conditions on various aspects, including a limit of a characteristic or constituent (e.g. flow rate and total nitrogen level) of a discharge to a water body, and the requirements on notifying the EPD of any emergency affecting compliance with the licence.*

Note 13: *Under the WPCO, a certificate of analysis of a sample signed by the Government Chemist may be tendered as evidence in any proceeding under the Ordinance.*

(b) ***Environmental Infrastructure Division.*** The EI Division of the EPD is responsible for overall contract management and monitoring the performance of contractors, including the checking of contractors' operating data, taking of environmental samples for testing, monitoring of condition of restoration facilities and administration of landfill restoration contracts. For example, regarding the quality of treated leachate discharge from an LTP, the EI Division would collect leachate discharge samples for testing by a private accredited laboratory, and would take actions (e.g. deduction of monthly contract payment) against a contractor if the leachate discharge quality contravenes the contract requirements.

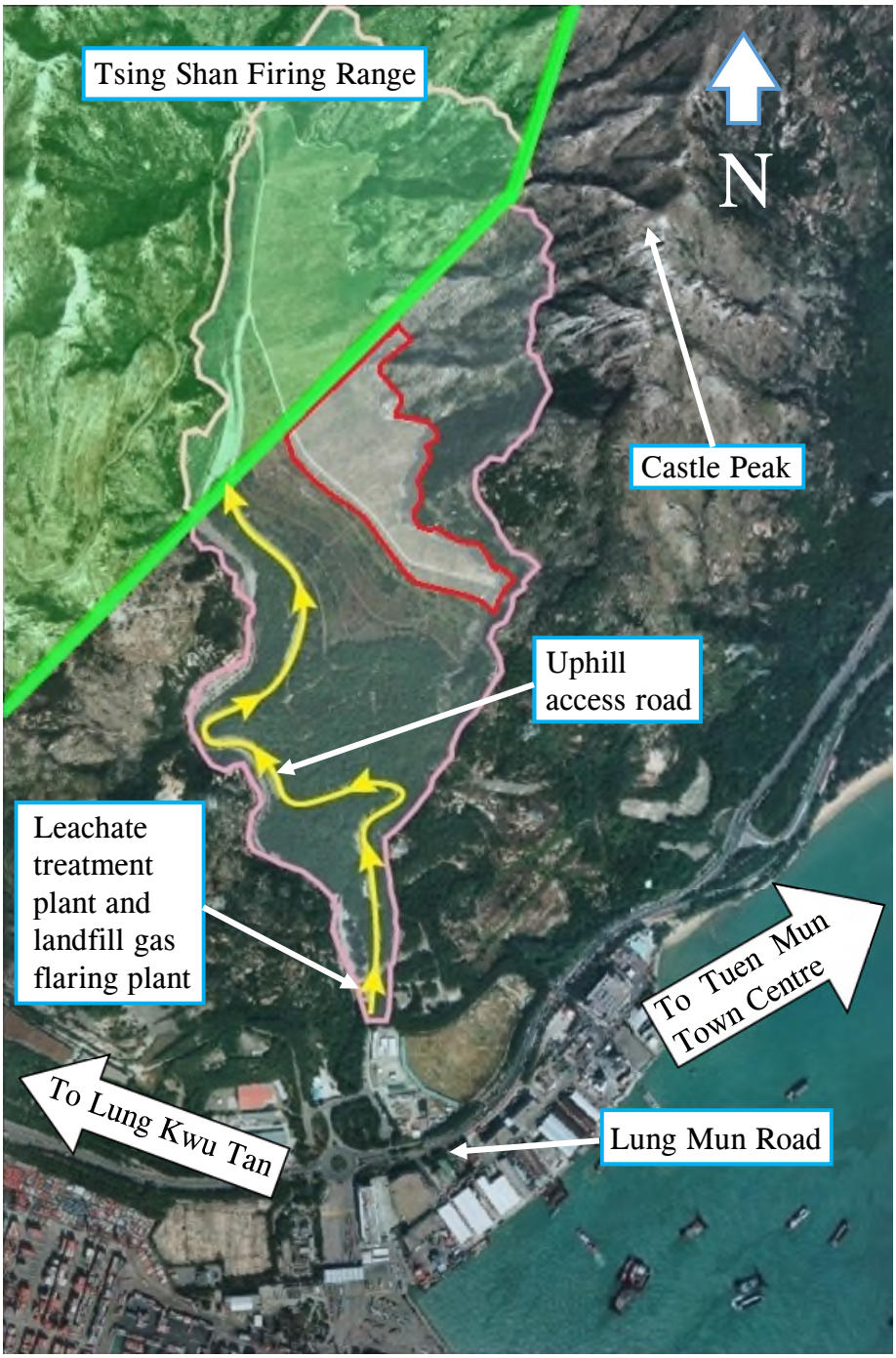
Pillar Point Valley Landfill

2.6 According to the EPD, in the past 5 years from 2013 to 2017, of the 13 restored landfills, only the landfill restoration contractor (i.e. Contractor A) of the Pillar Point Valley Landfill (PPVL — see Figure 4) in Tuen Mun District had since December 2015 failed to meet the statutory requirements under the WPCO and the contractual requirements. Also, the design leachate treatment capacity of the LTP at the PPVL is the highest among all the 5 LTPs of restored landfills due to its unique geological condition (Note 14). Audit selected the PPVL as a case study for examination of the EPD's monitoring of contractors' aftercare work at restored landfills.

Note 14: *The design leachate treatment capacity of the LTP at PPVL, Tseung Kwan O Stage II/III Landfill, Gin Drinkers Bay Landfill, Ma Yau Tong Central Landfill and Jordan Valley Landfill is 2,600, 1,440, 480, 350 and 250 cubic metres per day respectively. According to the EPD, the PPVL is situated at the lower part of a large natural catchment to the west of Castle Peak and has various water pathways along the landfill boundary, leading to a large amount of groundwater ingress into the landfill waste mass that ends up as leachate. As a result, an LTP with a high leachate treatment capacity has been designed for the PPVL.*

Figure 4

Pillar Point Valley Landfill



Legend:
- Pillar Point Valley Landfill (65 ha)
- Tsing Shan Firing Range (22.8 ha within landfill site)
- Area (4.5 ha) available for application under Restored Landfill Revitalisation Funding Scheme (see Table 7 in para. 4.25)

Source: *EPD records*

Aftercare of restored landfills

2.7 The PPVL was operated by the former Civil Engineering Department between 1983 and 1996. Upon cessation as a waste disposal site (a total of 11 million tonnes of wastes were disposed of at the site), the PPVL was allocated to the EPD for management. In July 2003, the Finance Committee (FC) of the Legislative Council (LegCo) approved funding of $441.3 million (Note 15) for the restoration of the PPVL. In August 2004, the EPD entered into a landfill restoration contract (i.e. Contract A3) with Contractor A for the design and construction of restoration facilities at PPVL and the aftercare of the landfill for 30 years after completion of the restoration facilities. In July 2006, the construction works of restoration facilities at PPVL were completed and the aftercare work commenced in the same month. Since July 2016, 0.2 ha of the PPVL has been used as a temporary shooting range (see Table 5 in para. 4.3). The actual capital cost for the design and construction of the restoration facilities at PPVL was $199.2 million (Note 16). In 2016-17, the actual operating cost of the aftercare work was $10.7 million (see Note 2 to Appendix B).

Note 15: *The approved funding of $441.3 million was mainly for the design and construction cost of restoration facilities at $348.1 million and the cost of the related post-commissioning aftercare work for 7 years at $83.3 million. According to the FC paper seeking funding approval, the Government would conduct a review after 5 years of commissioning the aftercare work to determine the necessity for further aftercare of the PPVL. After commissioning the restoration facilities in 2006, the EPD completed the first environmental review in 2011 and commenced the second review in 2017 (not yet completed as of January 2018). With more operational experience gained in landfill management, the Government considered that the expenditure of aftercare work was more akin to a recurrent commitment rather than a works project in nature. Since 2011, the EPD has sought funding from the General Revenue Account instead of the CWRF to continue with the aftercare work of the 13 restored landfills.*

Note 16: *The actual capital cost for the design and construction of restoration facilities of $199.2 million was lower than the related estimated cost of $348.1 million (see Note 15). According to the EPD:*

(a) Contractor A is also the contractor of Contract A2 where similar restoration facilities had been constructed and the landfills under Contract A2 are not far away from the PPVL (which Contractor A could benefit from sharing of resources); and

(b) these might enable Contractor A to offer a competitive tender price for Contract A3 based on the experience gained from Contract A2.

Long period of non-compliances with statutory and contractual requirements

2.8 From January to April 2016, the EPD received complaints on suspected malpractice of Contractor A in the operation of some restoration facilities at PPVL. The issues under complaints included:

(a) the landfill gas treatment system had been operated at a temperature below the contractual requirements; and

(b) substandard leachate had been discharged to a foul sewer (Note 17).

2.9 The EPD conducted investigations on the complaints received and reviewed the environmental monitoring system, including:

(a) investigations conducted by the EPD's EC Division on the alleged contravention with statutory requirements (see para. 2.11);

(b) investigations conducted by the EPD's EI Division on the alleged non-compliances with contractual requirements (see paras. 2.12 and 2.13); and

(c) a review on the robustness of environmental monitoring practices at the EPD's waste facilities (hereinafter referred to as "2016 EPD Review" — see paras. 2.14 and 2.15).

Note 17: *The two issues in paragraph 2.8 were substantiated by the EPD's subsequent investigations. Other issues under complaints included discharge of untreated leachate through an overflow pipe to a nearby stream, disclosure of identities of complainants to Contractor A and pre-notification to Contractor A before inspection by the EPD. The EPD's subsequent investigations found that these allegations were not substantiated.*

In May 2017, the EPD also issued a press release and a summary report on its investigation results on its website (Note 18).

2.10 The EPD's investigations found that between December 2015 and November 2017, Contractor A had various non-compliances with the statutory and contractual requirements in operating the LTP and LGP at the PPVL. A chronology of key events relating to Contractor A's non-compliances with the statutory and contractual requirements is shown at Appendix E.

2.11 ***Statutory requirements.*** Investigations (arising from the complaints) conducted by the EPD's EC Division found that, between May 2016 and July 2017, Contractor A had contravened various statutory requirements of the licence issued by the EPD under the WPCO (Note 19) for the PPVL. The EPD subsequently initiated prosecutions on Contractor A. In May 2017 and February 2018, Contractor A was convicted and fined a total of $208,000 for 21 offences under the WPCO on the basis of the EC Division's findings, as follows:

(a) $100,000 were fined for 10 offences (i.e. a fine of $10,000 for each offence) in 10 days in May 2016 for exceeding the stipulated maximum daily discharge limit of leachate (Note 20);

Note 18: *In December 2016, in response to an enquiry of a LegCo Member, the ENB undertook to release the investigation results after a court verdict had been given about prosecution cases on Contractor A for violations of the WPCO in order not to affect the concerned case. The EPD issued the results in May 2017 after the court had given its verdict in the same month.*

Note 19: *A person who contravenes any conditions of a licence issued under the WPCO commits an offence and, on conviction, is liable to a fine of $200,000 and to imprisonment for 6 months.*

Note 20: *In May 2016, the licence stipulated that the daily leachate discharge to a nearby public sewer should not exceed 894 and 2,600 cubic metres per day during dry season (from November of a year to May next year) and wet season (from June to October of a year) respectively. In November 2017, Contractor A submitted an application to the EPD for increasing the dry-season leachate discharge limit to 990 cubic metres per day with a view to reducing the leachate volume in leachate storage tanks and the associated risk of leachate overflow. In December 2017, the EPD approved Contractor A's application.*

(b) $20,000 were fined for 2 offences (i.e. a fine of $10,000 for each offence) in 2 days in May 2016 for failing to notify the EPD within 24 hours of incidents where the leachate discharge exceeded the maximum daily limit in (a) above; and

(c) $88,000 were fined for 9 offences (i.e. a fine of $10,000 for each of 8 offences and a fine of $8,000 for the remaining offence) in 9 days during the period from June 2016 to July 2017 for exceeding the stipulated total nitrogen level in treated leachate discharge (Note 21).

2.12 ***Contractual requirements.*** Under Contract A3, Contractor A shall submit a monthly statement showing the value of aftercare work carried out in that month, and the EPD shall make payment to the contractor after adjusting for any sum which the EPD is entitled to deduct payment if the EPD considers that Contractor A has failed to comply with the contractual requirements. For specified types of non-compliances, Contract A3 sets out a demerit point system for the deduction of monthly payments from Contractor A, as follows:

(a) the demerit point system specifies the number of points to be deducted for each specified type of non-compliance, subject to a maximum deduction limit for different specified types of non-compliance during a monthly period (Note 22); and

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Note 21: *The licence stipulates that the total nitrogen level in treated leachate discharge shall not exceed 200 and 100 milligrams per litre during dry season and wet season respectively.*

Note 22: *For example, if the total nitrogen level of a leachate discharge sample exceeds the related limit stipulated under the contract, 1 point would be deducted for each non-compliance case subject to a maximum deduction limit of 3 points during a monthly period. The maximum number of points to be deducted for all non-compliance cases in a month is 35.*

(b) the actual amount of monthly payment to be deducted would be calculated based on the total number of deducted points in accordance with a formula stipulated under the contract (Note 23).

2.13 The investigations (arising from the complaints) conducted by the EPD's EI Division found various non-compliances with Contract A3's requirements between December 2015 and November 2017. Up to November 2017, payments totalling about $7.7 million had been deducted from Contractor A on the basis of EI Division's findings, as follows:

(a) $7,203,100 for non-compliances with the required treatment capacity of the LTP (Note 24) in 347 days during the period from May 2016 to November 2017;

(b) $227,300 for exceeding the total nitrogen level in treated leachate discharge (Note 25) in 20 days during the period from June 2016 to August 2017; and

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Note 23: *Under Contract A3, in calculating the amount of monthly payment to be deducted, the formula takes into account the original amount of contract payment, the total demerit points deducted and price adjustment factors. In general, the more the demerit points are accumulated, the higher the deduction of contract payment will be.*

Note 24: *According to the EPD, the design treatment capacity was 2,600 cubic metres per day. Due to operational problems of the LTP at the PPVL and heavy rain during wet seasons (see paras. 2.26 and 2.30), the LTP could not fulfil the treatment capacity required under Contract A3. Monthly payments had been deducted from Contractor A after taking into account the proportion of the monthly payment attributable to the LTP operation and the number of days on which the LTP failed to meet the required treatment capacity in a month.*

Note 25: *Contract A3 requires Contractor A to comply with the requirements of any licences issued under the WPCO (including the limit of total nitrogen level in treated leachate discharge stipulated in the WPCO licence — see Note 21 to para. 2.11(c)). Monthly payments had been deducted from Contractor A under the demerit point system.*

(c) $221,400 for non-compliances with the LGP operating-temperature requirement (Note 26) in 28 days during the period from December 2015 to March 2016.

2016 EPD Review

2.14 In June 2016, in light of complaints received from January to April 2016 (see para. 2.8), the EPD completed a review on the robustness of environmental monitoring practices at its waste facilities (2016 EPD Review), including restored landfills (Note 27). For restoration facilities at restored landfills, the 2016 EPD Review aimed to identify and assess high-risk areas in the process of monitoring contractors that are susceptible to malpractice, and recommended the related enhancement measures, including the installation of advanced equipment with a view to automating the monitoring work and detecting cases of non-compliance in a more timely manner.

2.15 According to the EPD:

(a) prior to the 2016 EPD Review, the EPD had monitored contractors' performance on their aftercare work at restored landfills with slimmer on-site staff (Note 28), where assessment of contractors' performance was largely based on regular sampling results (Note 29), daily visual inspections

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Note 26: *Contract A3 stipulates that the operating temperature of the LGP shall be maintained within the range of 1,000 to 1,200 degrees Celsius. According to the EPD, the temperature requirement aims to break down the impurities in landfill gas and to provide sufficient energy for operating the LTP through combustion of landfill gas. Monthly payments had been deducted from Contractor A under the demerit point system.*

Note 27: *Other facilities under review included three operating strategic landfills (see para. 1.2(a)), refuse transfer stations and special waste treatment facilities.*

Note 28: *Prior to the 2016 EPD Review, for each landfill restoration contract, the EPD had deployed 1 Senior Environmental Protection Inspector and 1 to 3 Environmental Protection Inspectors for monitoring the contractor's aftercare work.*

Note 29: *For example, prior to the 2016 EPD Review, the EPD's frequency of collecting treated leachate discharge samples for testing varied among different restored landfills, ranging from weekly to quarterly intervals.*

during daytime on weekdays and manual checking of contractors' operating data;

(b) subsequent to and arising from the 2016 EPD Review, the EPD has implemented a number of measures to strengthen its on-site monitoring work of contractors' aftercare work at restored landfills, including installing advanced equipment at PPVL and other restored landfills installed with LTP and LGP, conducting daily and weekend surprise checks (Note 30), adopting irregular inspection patterns and locating new sampling points for leachate discharge; and

(c) before installation of the advanced equipment as recommended by the 2016 EPD Review, the EPD has monitored contractors' compliance with the contractual requirements mainly through the following means:

(i) carrying out regular inspections and completing the daily operation checklists by EPD site monitoring staff for cross-checking the monitoring results reported in the contractors' aftercare monthly reports (which provide information including monitoring data on leachate discharge, landfill gas and ground settlement); and

(ii) reviewing the aftercare monthly reports submitted by contractors.

Monitoring of EPD contractors' aftercare work

2.16 Against the above background, Audit examination has found that there is room for improvement in the EPD's monitoring of contractors' aftercare work of restored landfills, as follows:

(a) need to ensure compliance with statutory and contractual requirements (see paras. 2.17 to 2.25);

Note 30: *Subsequent to the 2016 EPD Review, the EPD employed 1 contract staff to lead 2 Environmental Protection Inspectors for conducting weekend surprise checks at restored landfills.*

(b) need to strengthen monitoring of overhaul works of restoration facilities (see paras. 2.26 to 2.29);

(c) need to improve LTP at PPVL (see paras. 2.30 to 2.32);

(d) scope for improving demerit point system (see paras. 2.33 to 2.37); and

(e) scope for improving security measures at restored landfills (see paras. 2.38 to 2.41).

Need to ensure compliance with statutory and contractual requirements

2.17 The landfill restoration contractors are required to comply with various statutory and contractual requirements. The EPD's investigations found Contractor A's non-compliance with such requirements (see paras. 2.11 and 2.13). Audit has found room for improvement in ensuring contractors' compliance with statutory and contractual requirements (see paras. 2.18 to 2.25).

2.18 The 5 landfill restoration contracts stipulate, among others, that:

(a) the operating temperature of an LGP shall be maintained within a range. According to the EPD, the LGP operating-temperature requirement is contingent on the design submission by the related contractors with certification by an independent consultant. The temperature requirement aims to break down the impurities in landfill gas (Note 31). For example, for the PPVL, the operating-temperature range is from 1,000 to 1,200 degrees Celsius; and

(b) site records (e.g. daily log sheets) shall be properly stored and be available for the EPD's inspection upon request, and all relevant information should be clearly and systematically recorded in the documents.

Note 31: *Apart from the operating temperature of an LGP, the landfill restoration contracts also stipulate requirements on several aspects such as methane level of landfill gas emission on the ground surface and time of landfill gas combustion.*

2.19 ***Information in log sheets and aftercare reports.*** Audit noted that, in light of complaints received on the PPVL, the EPD's investigations in mid-2016 revealed that the LGP operating temperature as indicated in daily log sheets recorded by the staff of Contractor A had been below 1,000 degrees Celsius on 28 days during the period from December 2015 to March 2016 (see para. 2.13(c)), and these incidents had not been mentioned in the related aftercare monthly reports submitted to the EPD (Note 32). In mid-2016, in view of the above investigation results, the EPD further requested Contractor A to provide daily log sheets covering 973 days from January 2013 to August 2015 for checking purpose. However, Contractor A later informed the EPD that the daily log sheets for 299 (31% of 973) days were missing and 1 daily log sheet was found undated.

2.20 ***Installation of advanced equipment.*** As mentioned in paragraph 2.14, the EPD conducted the 2016 EPD Review in light of complaints received. The 2016 EPD Review recommended, among others, the installation of advanced equipment at PPVL and other restored landfills installed with LTPs with a view to automating the monitoring work and detecting cases of non-compliance in a more timely manner. According to the EPD, the 2016 EPD Review focused on the installation of advanced equipment at 5 restored landfills installed with both LTP and LGP (see Table 2 in para. 2.3). As the recommended advanced equipment items are not included in the landfill restoration contracts, the cost of procuring and installing such equipment would be borne by the EPD. The recommended advanced equipment included:

(a) ***Data monitoring system.*** The system would transmit operating data (e.g. operating temperature, time of combustion and flow rate of leachate discharge) of an LGP/LTP at a restored landfill to the EPD's site office for real-time monitoring;

(b) ***Automatic sampling device and on-line analyser.*** These equipment items would collect leachate discharge samples at frequent intervals and continuously analyse the quality of leachate discharge in order to enable EPD staff to monitor the LTP performance; and

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Note 32: *In August 2016, the EPD referred the case to the Hong Kong Police Force for further investigation on whether inaccurate data or false statements had been deliberately provided to the EPD. According to the EPD, the Hong Kong Police Force had completed the investigation, and the result was that, after seeking legal advice, there was no adequate evidence to initiate prosecution arising from this investigation.*

(c) ***Surveillance camera.*** The device would prevent theft and vandalism, and to act as a deterrent against possible malpractices and potential illegal activities (e.g. physical tampering or manipulation of operating data) in the operation of restoration facilities.

In April 2017, the data monitoring system of the LTP and LGP at PPVL was upgraded for transmitting the related operating data to EPD site office for real-time monitoring, obviating the need for cross-checking site records (e.g. daily log sheets) with aftercare monthly reports.

2.21 ***Installation progress of advanced equipment.*** As of March 2018, the installation dates of certain advanced equipment items (Note 33) were later than the target dates as set in the 2016 EPD Review, and some other equipment items had not yet been installed (see Table 3).

Note 33: *For the 3 restored landfills (namely Tseung Kwan O Stage I Landfill, Shuen Wan Landfill and Sai Tso Wan Landfill — see Table 2 in para. 2.3) installed only with an LGP, the EPD considered that the LGP design at these restored landfills was simpler than those installed at the other 5 restored landfills where LTPs had also been installed. Therefore the EPD had given priority to enhance the environmental monitoring systems at the 5 landfills installed with both LTP and LGP.*

Table 3

Installation progress of advanced equipment at 5 restored landfills installed with both LTP and LGP (March 2018)

Advanced equipment	Target date in 2016 EPD Review	Actual installation date	Target date in 2016 EPD Review	Actual installation date			
		Pillar Point Valley Landfill (Contract A3)		Tseung Kwan O Stage II/III Landfill (Contract A1)	Gin Drinkers Bay Landfill (Contract A2)	Jordan Valley Landfill (Contract B2)	Ma Yau Tong Central Landfill (Contract B2)
1. Reviewing and upgrading data monitoring system	3rd quarter of 2016	Apr 2017	End 2016	(Note 1)		Completed in Jan 2018 and already in-use	Completed in Jan 2018 for LGP and upgrading considered not necessary for LTP (Note 2)
2. Reviewing and installing automatic sampling device/ on-line analyser	1st quarter of 2017	Quotation exercise in progress	No target date	Quotation exercise in progress	Quotation exercise in progress	Already in-use	Completed in Jan 2018 and already in-use
3. Installing surveillance camera	3rd quarter of 2016	May 2016	3rd quarter of 2016	Dec 2016	Dec 2016	Considered unnecessary by EPD (Note 3)	Completed in Jan 2018 and already in-use

Legend: Shaded boxes indicate that, as of March 2018, advanced equipment had not yet been installed or the installation dates were later than the target installation dates as recommended in the 2016 EPD Review.

Source: Audit analysis of EPD records

Table 3 (Cont'd)

Note 1: In March 2018, the EPD informed Audit that, subject to satisfactory performance of the new data monitoring system installed at the PPVL, Contractor A would conduct a feasibility study to examine the compatibility of the data monitoring system with the existing LTPs before upgrading them at the Tseung Kwan O Stage II/III Landfill and Gin Drinkers Bay Landfill.

Note 2: In December 2017, the EPD informed Audit that the LTP at Ma Yau Tong Central Landfill would only be used in the wet season and it would not be economical to install the data monitoring system, and the EPD considered that installation of surveillance cameras would serve the purpose of strengthening the monitoring of the operating data.

Note 3: In December 2017, the EPD informed Audit that the LTP at Jordan Valley Landfill adopted biological methods for treatment of leachate and the related landfill restoration contract did not stipulate requirements on the operating temperature of the LTP, and therefore the installation of surveillance cameras was considered unnecessary.

2.22 Regarding the progress of installing advanced equipment at the restored landfills with LTP and LGP, in March 2018, the EPD informed Audit that:

(a) the existing LTPs installed at restored landfills were proprietary-built some 20 years ago, and all instrumentations and data logging systems were analogue-based; and

(b) to allow real-time monitoring, a considerable amount of time is required to identify the appropriate type of advanced equipment in order to ensure the compatibility of advanced equipment with the existing LTPs before the procurement of such equipment.

2.23 ***Some landfills without upgraded data monitoring systems.*** For the 8 restored landfills installed with LTP and/or LGP (see items 1, 2, 3, 7, 8, 10, 11 and 13 of Table 2 in para. 2.3), as of March 2018, the data monitoring systems at PPVL and Jordan Valley Landfill (the 2 landfills are installed with both LTP and LGP) had been upgraded. According to the EPD, the data monitoring system for Sai Tso Wan Landfill (installed only with an LGP — see Note 33 to para. 2.21) was upgraded in January 2018 for monitoring the flaring temperature of the LGP and the landfill gas flowrate. For the remaining 5 restored landfills, as of March 2018, Audit noted that the data monitoring systems at 2 restored landfills are yet to be upgraded by the EPD and the upgrading of systems for 3 restored landfills were considered not necessary, as follows:

Data monitoring systems yet to be upgraded

(a) 2 restored landfills installed with both LTP and LGP where the data monitoring systems were yet to be upgraded (i.e. Tseung Kwan O Stage II/III Landfill and Gin Drinkers Bay Landfill — see Table 3 in para. 2.21);

Upgrading of data monitoring systems considered not necessary

(b) 1 restored landfill (Ma Yau Tong Central Landfill) installed with both LTP and LGP where upgrading of the data monitoring system at LTP was considered not necessary by the EPD (see Note 2 to Table 3 in para. 2.21); and

(c) 2 restored landfills (Tseung Kwan O Stage I Landfill and Shuen Wan Landfill) installed only with LGP where upgrading of data monitoring system was considered not necessary by the EPD (Note 34).

2.24 Given that the installation of advanced equipment at selected restored landfills as recommended by the 2016 EPD Review is to automate the EPD's monitoring work and to detect cases of non-compliance in a more timely manner, Audit considers that the EPD needs to expedite the progress of installing such advanced equipment. The EPD also needs to keep under review the operation of the installed equipment to assess their effectiveness in monitoring of contractors' aftercare work.

Note 34: *According to the EPD, the existing monitoring equipment at the two restored landfills could meet the monitoring need, as follows:*

(a) for Tseung Kwan O Stage I Landfill, the LGP operates between 8 a.m. and 4 p.m. everyday under the monitoring of EPD on-site staff, who would also conduct surprise checks during non-office hours and public holidays. The EPD would review the need for installing additional monitoring system when necessary; and

(b) for Shuen Wan Landfill, the landfill gas was delivered to a nearby gas production plant of a gas supply company (see Note 3 to Table 2 in para. 2.3), and the LGP would only be operated in case of maintenance or inspection of the gas production plant.

2.25 For the 5 restored landfills (see para. 2.23 (a) to (c)) where the upgrading of related data monitoring systems are yet to be completed or considered not necessary, site records (e.g. daily log sheets — see para. 2.18(b)) would remain an important means for the EPD to monitor the contractors' compliance with the statutory and contractual requirements. In Audit's view, before automated data monitoring systems are in place, the EPD needs to ensure that the contractors properly maintain the site records, and strengthen its monitoring actions (e.g. strengthening the EPD's surprise inspections) on contractors' compliance with the statutory and contractual requirements and the related record-keeping requirements.

Need to strengthen monitoring of overhaul works of restoration facilities

2.26 In early 2016, the EPD found that the LTP at PPVL was not functioning properly and could not treat leachate in an efficient manner. Subsequently, the EPD instructed Contractor A to carry out overhaul works for the LTP to remedy the problem. In May 2016, in view of the proposed overhaul works and the forecast increase of leachate inflow in the forthcoming wet season, the EPD instructed Contractor A to suspend the LTP operation and arrange direct transfer of leachate by vehicles to the LTP of the EPD's West New Territories Landfill and to the Drainage Services Department (DSD)'s Pillar Point Sewage Treatment Works for off-site treatment (Note 35). In November 2016, Contractor A commenced the LTP overhaul works at his own cost. In January 2017, the overhaul works were completed and the LTP resumed operation. The above leachate transfer arrangement then ceased, with a total of about 366,000 cubic metres of leachate transferred and resulted in the deduction of $5,155,000 from Contractor A for non-compliances with the required treatment capacity of the LTP (see para. 2.13(a)).

Note 35: *Under normal circumstances, leachate generated from a restored landfill would be firstly treated by an LTP to reduce the pollutant concentrations to within the limits stipulated under the related licence issued under the WPCO before discharging the treated leachate to a nearby public sewer, and the treated leachate would be conveyed to a DSD facility for further treatment before discharge to a nearby water body. According to the EPD, the heavy rain in May 2016 caused the leachate storage tanks at PPVL reaching the alert level and it took some time to transfer the leachate from PPVL to elsewhere. Contractor A discharged leachate into a nearby public sewer to avoid overflow of the leachate storage tanks, and this resulted in the leachate discharge volume in 10 days in May 2016 exceeding the maximum daily discharge limit stipulated in the licence issued under the WPCO (see para. 2.11(a)).*

2.27 After the completion of overhaul works in January 2017, in April 2017, Contractor A found that an exhaust gas pipe duct of the LTP had been dislocated, resulting in loss of heat energy transmitted to the LTP and affecting the LTP's treatment performance. According to the EPD, while the leachate transfer arrangement was mainly caused by a series of heavy rainstorms in July 2017 (see para. 2.30), the dislocation of exhaust gas pipe duct was also one of the reasons causing the transfer of leachate from the PPVL to the DSD's Pillar Point Sewage Treatment Works from July to November 2017.

2.28 In March 2018, the EPD informed Audit that:

(a) upon the discovery of the dislocated exhaust gas pipe duct, Contractor A implemented temporary measures in August 2017 to keep the LTP in operation. As the rectification works of the exhaust gas pipe duct were carried out in parallel with the scheduled maintenance period of the LTP, this had not caused additional downtime of the LTP; and

(b) teething problems for overhaul works would commonly occur during the early stage of testing, and such a defect was not unreasonable and regarded as part of the repair and maintenance works in many other electrical and mechanical works projects.

2.29 While noting the EPD's explanation above, to minimise overhaul works' problems in future, Audit considers that the EPD needs to strengthen monitoring of contractors' overhaul works of restoration facilities.

Need to improve leachate treatment plant at Pillar Point Valley Landfill

2.30 According to the EPD, in July 2017, due to very heavy rainfall (Note 36) and the pipe-dislocation problem of the LTP overhaul works (see para. 2.27), the leachate inflow at PPVL far exceeded the LTP treatment capacity and reached the alert level of leachate storage tanks. In the same month, Contractor A proposed and obtained the EPD's consent to directly transfer leachate by vehicles from PPVL to the DSD's Pillar Point Sewage Treatment Works for off-site treatment. The transfer arrangement ceased in November 2017, with a total of about 134,000 cubic metres of leachate transferred. The above leachate transfer arrangement in 2017 had resulted in deduction of $2,048,100 from Contractor A for non-compliances with the required treatment capacity of the LTP (see para. 2.13(a)).

2.31 Audit noted that, in mid-2017, Contractor A engaged a consultant to conduct a hydrogeological survey for PPVL to propose mitigation measures with a view to resolving the leachate inflow (due to unique geological condition — see Note 14 to para. 2.6) and overflow problem, including reviewing the need to construct additional groundwater pumps or leachate storage tanks. In February 2018, the survey was completed and recommended mitigation measures to resolve the problem (including installation of groundwater pumps). In Audit's view, the EPD needs to take measures to ensure early implementation of mitigation measures to resolve the leachate inflow/overflow problem at PPVL.

2.32 Furthermore, in October 2017, Contractor A informed the EPD that the higher concentration of impurities in the leachate at PPVL had led to deterioration in the quality of pre-treated leachate, and this consequently affected the LTP treatment efficiency and resulted in frequent shutdown of the LTP for maintenance. In November 2017, Contractor A installed a pre-treatment system at upstream of the LTP with a view to mitigating the problem. In Audit's view, the EPD needs to monitor the effectiveness of the leachate pre-treatment system for improving the LTP treatment efficiency at PPVL.

Note 36: *According to the EPD, based on the records of the Hong Kong Observatory, the total rainfall in July 2017 was 570 millimetres, which was 51% above the average monthly rainfall figure of 376.5 millimetres from 1981 to 2010.*

Scope for improving demerit point system

2.33 The existing demerit point system under the 5 landfill restoration contracts includes a provision for deducting points if the total nitrogen level of a leachate discharge sample exceeds the related limit stipulated under the contract. The related contractual limit is the same as that stipulated in the licence issued under the WPCO.

2.34 Audit notes that, for Contract A3:

(a) between June 2016 and July 2017, there were 9 days during which offences had been committed by Contractor A for exceeding the total nitrogen level in treated leachate discharge (see para. 2.11(c));

(b) for 7 of the 9 days, the EI Division collected leachate samples separately and delivered the samples to a private accredited laboratory for testing. The laboratory test results showed that the total nitrogen level in the treated leachate discharge exceeded the required limit, and the EI Division took action to deduct payment from Contractor A (see para. 2.13(b)); and

(c) for the other 2 days, although the Court ruled that Contractor A had exceeded the total nitrogen level (i.e. also exceeding the contractual limit which is the same as the limit stipulated in the licence issued under the WPCO — see Note 21 to para. 2.11(c)), the EPD's EI Division had not taken contractual action to deduct points under the demerit point system and deduct contract payment from Contractor A.

2.35 Audit also notes that while the 5 landfill restoration contracts require contractors to comply with the requirements of any licences issued under the WPCO, apart from total nitrogen limit, the demerit point system does not cover other non-compliances with the licence requirements under the WPCO, including cases where the stipulated maximum daily discharge limit of leachate is exceeded (see para. 2.11(a)) and the 24-hour notification requirement is not observed (see para. 2.11(b)).

2.36 In response to Audit's enquiry, in March 2018, the EPD informed Audit that:

(a) the EI Division had assessed a contractor's performance in 12 aspects (Note 37) on a regular basis and had reflected Contractor A's extent of compliance with environmental law and regulations in the related half-yearly performance reports (Note 38). A contractor's performance report would be taken into account when considering the award of further contracts to the same contractor in future;

(b) any amendments to existing contracts would require mutual agreement between the EPD and its contractors, and unilateral decision might lead to potential litigation; and

(c) the EPD considered it inappropriate and unfair to introduce such "double penalty system" into existing landfill restoration contracts but it can consider reviewing this for future contracts in consultation with relevant government tendering boards.

2.37 In Audit's view, the EPD needs to conduct a review on whether a landfill restoration contractor's conviction results can be used as evidence for deducting points under the demerit point system and deducting contract payments from the contractor in future contracts. Furthermore, since the contractor's non-compliance with the relevant statutory environmental requirements is an important issue in assessing its performance, Audit considers that the EPD needs to review the feasibility of incorporating non-compliances with the relevant statutory environmental requirements in the demerit point system of a landfill restoration contract in future.

Note 37: *The 12 aspects are: (1) workmanship; (2) operation; (3) landfill aftercare; (4) environmental monitoring and pollution control; (5) progress; (6) site safety; (7) organisation; (8) general obligations; (9) industry awareness; (10) resources; (11) design; and (12) attendance to emergency. There are different sub-aspects under each aspect, and each aspect/sub-aspect is given 1 of the 5 ratings, namely "Very Good", "Good", "Satisfactory", "Poor" or "Very Poor", and an overall performance rating is given for the performance report.*

Note 38: *Under the "environmental monitoring and pollution control" aspect, there is a sub-aspect called "compliance with environmental laws and regulations". While a "Good" rating was given for this sub-aspect for the half-yearly period from January to June 2016, a "Satisfactory" rating was given for the half-yearly period from July to December 2016. A "Poor" rating was given for the "environmental monitoring and pollution control" aspect for both half-yearly periods.*

Scope for improving security measures at restored landfills

2.38 Under the 5 landfill restoration contracts, the contractors are required to maintain all facilities (e.g. warning signs and fencing) at restored landfills in good condition, including:

(a) warning notices shall be erected and maintained at appropriate locations; and

(b) fencing shall be erected and maintained to define the boundary of a landfill site and to prevent trespassers from entering the site.

2.39 Audit staff conducted site visits to three restored landfills (namely Ma Yau Tong Central Landfill in Kwun Tong District, Siu Lang Shui Landfill in Tuen Mun District and Tseung Kwan O Stage I Landfill in Sai Kung District) from November 2017 to January 2018, and found that there was scope for improving security measures at restored landfills. For example, suspected trespassers were observed at Ma Yau Tong Central Landfill (see Photograph 3) and Tseung Kwan O Stage I Landfill.

Photograph 3

Suspected trespassers and damaged fencing at Ma Yau Tong Central Landfill

Source: Photograph taken by Audit staff on 10 December 2017

2.40 During January to March 2018, the EPD informed Audit that:

(a) the total length of the boundary of the 3 restored landfills (i.e. Siu Lang Shui Landfill, Ma Yau Tong Central Landfill and Tseung Kwan O Stage I Landfill) was about 7.2 kilometres. Some spots at the landfills were vulnerable and susceptible to damage due to fallen trees during adverse weather and vandalism by trespassers;

(b) unauthorised entry into a restored landfill by trespassers was a security and safety issue that might jeopardise the trespassers' personal safety and cause damage to restoration facilities, and there would also be a liability issue in case of personal injuries; and

(c) landfill restoration contractors had been carrying out on-going maintenance and repair works of fencing within a reasonable time, erecting warning signs and reporting vandalism cases to the Hong Kong Police Force. For the Ma Yau Tong Central Landfill as shown in Photograph 3 of paragraph 2.39, in view of the frequent trespassing and fencing damage at that landfill, both the EPD and Contractor B had been actively taking follow-up actions to prevent recurrence of trespassing and repair the damaged fencing.

2.41 As trespassing of restored landfills is a security and safety issue (see para. 2.40(b)), the EPD needs to consider taking further measures to improve security at restored landfills.

Audit recommendations

2.42 **Audit has *recommended* that the Director of Environmental Protection should:**

(a) **expedite the progress of installing the advanced equipment at restored landfills as recommended by the 2016 EPD Review, and keep under review the operation of the installed equipment to assess their effectiveness in monitoring of contractors' aftercare work;**

(b) **before automated data monitoring systems are in place, ensure that the contractors properly maintain the site records, and strengthen the**

EPD's monitoring actions on the contractors' compliance with the statutory and contractual requirements and the related record-keeping requirements;

(c) **strengthen monitoring of contractors' overhaul works of restoration facilities;**

(d) **take measures to ensure early implementation of mitigation measures to resolve the leachate inflow/overflow problem at PPVL;**

(e) **monitor the effectiveness of the leachate pre-treatment system for improving the LTP treatment efficiency at PPVL;**

(f) **conduct a review on whether a landfill restoration contractor's conviction results can be used as evidence for deducting points under the demerit point system and deducting contract payments from the contractor in future contracts;**

(g) **review the feasibility of incorporating non-compliances with the relevant statutory environmental requirements in the demerit point system of a landfill restoration contract in future; and**

(h) **consider taking further measures to improve security at restored landfills.**

Response from the Government

2.43 The Director of Environmental Protection agrees with the audit recommendations. He has said that the EPD will closely monitor:

(a) the contractors' site records and compliance with the statutory and contractual requirements; and

(b) the effectiveness of the on-going mitigation measures undertaken at PPVL, including the effectiveness of the leachate pre-treatment system for improving the LTP treatment efficiency.

PART 3: DEVELOPMENT OF GOVERNMENT RECREATIONAL FACILITIES AT RESTORED LANDFILLS

3.1 This PART examines the development of government recreational facilities at restored landfills. Three development projects (see para. 3.3) were selected for examination with a view to identifying room for improvement, focusing on issues relating to development of government recreational facilities at restored landfills.

Government recreational facilities at restored landfills

3.2 According to the EPD, there are restrictions on the beneficial use of restored landfills (e.g. excessive loading should be avoided due to ground settlement problem), and they are considered more suitable for recreational use. Since the early 2000s, the Government has planned/implemented projects for developing recreational facilities at 7 restored landfills (see Table 4 and their photographs in paras. 3.4, 3.24, 3.45 and Appendix F for details). These projects relate to the development of parks and gardens for the LCSD (Note 39) which is responsible for the management of the completed facilities upon their commissioning (Note 40).

Note 39: *According to the EPD, generally speaking: (a) the Lands Department has allocated the concerned piece of land to the EPD for the landfill restoration works and aftercare work, where the EPD would sub-allocate to the LCSD during the construction and operation periods of the recreational facilities; and (b) the above sub-allocation arrangement can be extended until the landfill aftercare work is completed, and thereafter, the LCSD can make direct applications to the Lands Department for the land allocation of the site.*

Note 40: *In 2013, Audit conducted a review to examine the LCSD's development and management of parks and gardens, including inspection, monitoring, repair and maintenance of such facilities. The results of the review were included in Chapter 4 of Report No. 60 of the Director of Audit of March 2013. Audit made a number of recommendations to address the identified improvement areas, and the LCSD has agreed to implement all the audit recommendations.*

Table 4

Government recreational projects at restored landfills (as of December 2017)

Restored landfill	Recreational project	Area of facility (ha)	Works agent	Original Approved Project Estimate (APE) (Note 1) (Actual expenditure) ($ million)	Increase in cost ($ million)	Original target project completion date (Note 1) (Actual completion date)	Actual completion later than original target completion date by (month)
Under preliminary planning by HAB and LCSD							
1. Gin Drinkers Bay	Kwai Chung Park	25.5	(Note 2)	Still at preliminary planning stage despite completion of restoration facilities by EPD in September 2000			
Works completed and facility open for use by general public							
2. Tseung Kwan O Stage I	Wan Po Road Pet Garden (1.2 ha) and adjacent car park (0.1 ha)	1.3	HAD	12.8 (25.6)	12.8	Sep 2010 (Feb 2013)	29
3. Jordan Valley	Jordan Valley Park	6.3 (Note 3)	ArchSD	179.6 (192.1)	12.5	Dec 2009 (Mar 2010)	3
4. Sai Tso Wan	Sai Tso Wan Recreation Ground	3.0	EPD	39.9 (46.4)	6.5	Nov 2002 (Feb 2004)	15 (Note 4)
5. Ma Yau Tong West	Ma Yau Tong West Sitting-out Area	0.1	HAD	3.9 (5.1)	1.2	Oct 2010 (Sep 2011)	11
6. Ma Yau Tong Central	Ma Yau Tong Central Sitting-out Area	0.1	HAD	6.2 (4.6)	Nil	Jul 2011 (Nov 2010)	Nil
7. Ngau Chi Wan	Ngau Chi Wan Park	4.0	ArchSD	199.4 (169.5)	Nil	Mar 2010 (Feb 2010)	Nil
			Total	441.8 (443.3)			

Source: Audit analysis of ArchSD, EPD and HAD records

Table 4 (Cont'd)

Note 1: According to the HAD, there were six stages in construction: (i) feasibility study; (ii) preliminary design; (iii) detailed design; (iv) contract documentation and tendering; (v) construction; and (vi) post-construction service. The original APE and target project completion date are based on the following sources:

(a) for items 3, 4 and 7: papers submitted to LegCo for seeking funding approval after the detailed design stage;

(b) for item 2: papers submitted by the LCSD and the EPD to their senior management/the HAB for seeking funding approval after the feasibility study stage. If there are more than one funding approval papers, the information contained in the first paper is shown in the Table; and

(c) for items 5 and 6: papers submitted by the LCSD to its senior management for seeking funding approval after the feasibility study stage. If there are more than one funding approval papers, the information contained in the first paper is shown in the Table.

Note 2: In February 2018, the ArchSD informed Audit that it had provided technical advice to the LCSD on the Kwai Chung Park project and had not yet become the works agent for the project.

Note 3: According to the EPD, 5 ha of the Jordan Valley Park is located within the Jordan Valley Landfill (see item 7 of Table 1 in para. 1.11) and 1.3 ha is outside the landfill.

Note 4: According to the EPD:

(a) the Sai Tso Wan project was the first project for developing the afteruse facilities at a closed restored landfill. No similar rates or contracts could be compared during the preparation of the paper submitted to LegCo. The tender prices of the returned tenders received in June 2002 had exceeded the original APE. In February 2003, the Financial Services and the Treasury Bureau approved the increase of APE from $39.9 million to $46.5 million;

(b) the actual project completion date being later than the original target completion date was mainly due to the longer-than-expected time for conducting prequalification/tender invitations and evaluation for engaging a contractor for the recreational project. The construction works completed in February 2004 was one month ahead of the target completion date of March 2004 stipulated under the relevant contract; and

(c) in 2014, the EPD handed over the management responsibility of the Sai Tso Wan Recreation Ground to the LCSD.

3.3 As shown in Table 4, the implementation of 5 government recreational projects at restored landfills (i.e. items 1 to 5) was that one project's development progress was slow (still at preliminary planning stage) and four projects had increases in costs and the actual project completion dates were later than the original target completion dates. Audit selected three projects as case studies with a view to identifying room for improvement, focusing on issues relating to development of government facilities at restored landfills, as follows:

(a) development of Kwai Chung Park (paras. 3.4 to 3.21);

(b) construction of Wan Po Road Pet Garden (paras. 3.22 to 3.43); and

(c) construction of Jordan Valley Park (paras. 3.44 to 3.59).

Development of Kwai Chung Park

3.4 The Kwai Chung Park, covering an area of about 25.5 ha (including 4.5 ha allocated for temporary cricket grounds under construction and 3.9 ha for a BMX park completed in 2009 — see item 5 of Table 1 in para. 1.11), is located inside the Gin Drinkers Bay Landfill in Kwai Tsing District. Phase I development of the Park with basic facilities (Note 41) was completed in 1989 (see Photograph 4). Owing to potential landfill gas problems revealed in 1992, the Park had not been formally opened to the public since then. In 1999, the Park was handed over to the EPD for carrying out landfill restoration works. In January 2000, the LCSD took over the Kwai Chung Park development project from the former Regional Services Department. In September 2000, the EPD completed the restoration works and commenced the aftercare work. Up to December 2017, the project was still at preliminary planning stage. According to the LCSD, there were various technical difficulties and obstacles encountered in development of the huge landfill site surrounded with slopes, which had imposed constraints and restrictions on planning and preliminary design work.

Note 41: *The basic facilities constructed under Phase I development of Kwai Chung Park included access roads, footpath, lighting facilities and an administration office with construction cost of $21.3 million.*

Photograph 4

Kwai Chung Park site (not yet opened for public use)

Source: ArchSD records

3.5 The slow progress in developing the Kwai Chung Park had been covered in Chapter 4 (Development and management of parks and gardens) of Report No. 60 of the Director of Audit of March 2013. The LCSD has agreed with the audit recommendations of devising an action plan for future development of the Park with a view to putting into gainful use as soon as practicable, and exploring alternative sources of funding for the future development of the site. However, Audit's follow-up review revealed that the development progress of the Park was still less than satisfactory (see paras. 3.6 to 3.21). A chronology of key events in developing the Park is shown at Appendix G.

Need to expedite actions to develop Kwai Chung Park

3.6 As reported in the Audit Report of March 2013 (see para. 3.5), the LCSD put on hold the planning work for the development of Kwai Chung Park in 2010 (see item 15 of Appendix G). Audit's follow-up review found that, in 2013, in response to the Kwai Tsing District Council members' concerns about the development of the Kwai Chung Park, the LCSD proposed to a committee under the District Council the project scope of the Park (including a golf driving range with

30 golf driving bays), and the committee endorsed the LCSD's proposed project scope.

3.7 In May 2014, the HAB issued a Project Definition Statement (Note 42) for the Kwai Chung Park to the ArchSD for the latter to prepare a Technical Feasibility Statement in order to confirm the technical feasibility of the proposed project. In July 2014, the ArchSD informed the HAB and the LCSD that:

(a) the site could not physically accommodate the proposed golf driving range owing to the existence of numerous restoration facilities (e.g. landfill gas and leachate collection pipes and wells) over the site;

(b) any structure higher than one storey could not be constructed on the site because of limited load bearing capacity and differential ground settlement problems;

(c) a landfill gas hazard assessment (Note 43) should be conducted to evaluate the potential hazard that landfill gas might pose to the Park; and

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Note 42: *According to Financial Circular No. 4/2012 "Requirement for Project Definition Statement and Technical Feasibility Statement for Capital Works Projects" issued in July 2012:*

(a) the responsible policy bureau should prepare a Project Definition Statement;

(b) a works department should submit a Technical Feasibility Statement of a proposed capital works project to the Development Bureau for approval within four months from the receipt of a Project Definition Statement from the responsible policy bureau; and

(c) the responsible policy bureau should submit bids for the necessary resources for implementing the proposed works project under the Government's Capital Works Resource Allocation Exercise by providing the Financial Services and the Treasury Bureau with an approved Technical Feasibility Statement.

Note 43: *According to the EPD, for any development located within 250 metres around a landfill site, the project proponent should conduct a landfill gas hazard assessment in accordance with the EPD's landfill gas hazard assessment guidance notes to assess the potential landfill gas hazards and recommend appropriate protection and mitigation measures during the design, construction and operation stages.*

(d) the HAB should arrange funding for carrying out the landfill gas hazard assessment (see (c) above) and also revise the Project Definition Statement by removing the proposed golf driving range from the project scope of the Park.

3.8 In September 2014, the ArchSD advised the LCSD that the estimated cost for carrying out a landfill gas hazard assessment for the Kwai Chung Park was $0.6 million. In January 2015, the EPD informed the LCSD that, for similar past projects, preliminary landfill gas hazard assessments were carried out before preparing the Technical Feasibility Statement. In the same month, the LCSD informed the HAB that it was unable to arrange funding (Note 44) for the assessment due to the very stringent financial position. According to the LCSD, it tried to seek the required funding from the HAB but in vain.

3.9 In November 2016, in response to concerns of the Kwai Tsing District Council's members on the opening of the Park, the LCSD informed the District Council of the ArchSD's views of July 2014 that the site could not physically accommodate the proposed golf driving range owing to the existence of numerous restoration facilities over the site (see para. 3.7(a)). At the same meeting, the District Council passed a motion requesting the responsible bureaux/departments to deliberate and study the re-opening of the Kwai Chung Park to the public in a safe condition and to develop and optimise all the basic facilities of the Park as soon as possible in order to increase the greening areas and open spaces in Kwai Tsing District. The District Council also set up a working group to oversee the development of the Park.

3.10 With commitment to take forward this project, the Kwai Chung Park was included in the Policy Address of January 2017 as one of the 26 projects in the five-year plan for sports and recreation facilities targeted to be launched in or before 2022. After a site visit by the Kwai Tsing District Council's working group in mid-January 2017, the LCSD consulted the working group on the revised project scope in February and April 2017 respectively. In May 2017, the ArchSD informed the LCSD that a landfill gas hazard assessment for the Park (see para. 3.7(c) and (d)) could not proceed without the instruction and funding from the project proponent, and expressed concerns on whether the project could be launched according to the

Note 44: *In March 2018, the LCSD informed Audit that the cost for the technical assessment was normally not required to be borne by the LCSD.*

five-year plan. In the same month, the LCSD sought the HAB's support on the preliminary project scope for the ArchSD to carry out the assessment with funding to be allocated from the LCSD.

3.11 In June 2017, upon the HAB's request, the LCSD sought clarification from the EPD and the ArchSD on the "order of precedence" for carrying out the landfill gas hazard assessment and preparing the Technical Feasibility Statement for the project. The EPD had no objection if the Technical Feasibility Statement would include a commitment in carrying out the hazard assessment at detailed planning stage. In the same month, the ArchSD informed the LCSD that:

(a) it would have no objection if a commitment would be included in the Technical Feasibility Statement to carry out the landfill gas hazard assessment at a more detailed planning stage later; and

(b) the scope, design and construction of the project would be subject to the findings and any mitigation measures to be proposed by the landfill gas hazard assessment. If significant changes were required, there would be adverse time and cost implications to the project.

3.12 In September 2017, with support of the Kwai Tsing District Council's working group (see para. 3.9), the District Council endorsed the LCSD's proposal to develop the Kwai Chung Park by two stages:

(a) ***Stage 1 development.*** The development (mainly involving jogging trails and pet garden facilities) would cover areas of about 17.1 ha (excluding a total area of 8.4 ha occupied by the temporary cricket grounds (4.5 ha) and the BMX park (3.9 ha)). The golf driving range proposed in 2013 (see para. 3.6) had been dropped. This approach would enable the Park to be opened for public use as early as possible; and

(b) ***Stage 2 development.*** After works commencement for Stage 1 development, the LCSD would proceed with the planning work for the remaining area of 8.4 ha of the Park occupied by the temporary cricket grounds and the BMX park.

3.13 Based on the proposed revised project scope supported by the Kwai Tsing District Council at a meeting in September 2017, the LCSD issued a draft revised Project Definition Statement in September 2017 (with further information submitted in October 2017) to the ArchSD for preliminary comments. According to the LCSD, between October and December 2017, it worked with the EPD to provide supplementary information requested by the ArchSD. In December 2017 and mid-February 2018, the ArchSD provided comments on the draft revised Project Definition Statement.

3.14 In March 2018, the LCSD informed Audit that:

(a) the most critical factor that determined the progress of development of the Kwai Chung Park would be competition for resources and the competing priorities among large number of capital projects under planning. All along, the LCSD continued to press ahead with the planning work for the Park to the extent possible under the prevailing mechanism. Consultation with the Kwai Tsing District Council's working group (see para. 3.9) had been conducted throughout the process in order to put forward the project;

(b) in order to put the Park into gainful use as early as practicable, about 4.5 ha in the upper platform of the Park was allocated to Licensee A (see Table 5 in para. 4.3) in March 2016 for developing temporary cricket grounds. It was expected that the cricket grounds would be opened for use in the second quarter of 2018 after completion of construction works. Upon commissioning, some time slots would also be available for booking by organisations such as schools, sports associations and district-based organisations for promoting and development of the sport of cricket, particularly at the community level;

(c) in implementing capital works projects under the LCSD's purview, it had all along relied on the professional and technical advice from relevant works department (e.g. the ArchSD) as the technical advisor and works agent at various stages till completion of the projects; and

(d) since the Audit Report of March 2013 (see para. 3.5), the LCSD had stepped up efforts to follow up the audit recommendations by devising an action plan for future development of the Park with a view to putting into gainful use as soon as practicable, and exploring alternatives for the future development of the site. Despite the technical difficulties encountered in

developing the huge landfill site surrounded by slopes, the LCSD had worked out different plans including:

(i) allocation of part of the site for developing temporary cricket grounds to put the site into gainful use while planning development of other facilities;

(ii) revision of the project scope in collaboration with the ArchSD and the EPD having regard to the site constraints and views of the Kwai Tsing District Council, and adoption of a phased approach to develop the Park with a view to speeding up the process; and

(iii) inclusion of the Park in the five-year plan for sports and recreation facilities as announced in the Policy Address of January 2017 (see para. 3.10) to demonstrate the Government's commitment in taking forward the project.

3.15 Seventeen years had elapsed since the completion of restoration facilities by the EPD in September 2000. Audit noted that, as of February 2018, the HAB had not revised the Project Definition Statement of May 2014 (see para. 3.7(d)) for the ArchSD to prepare a Technical Feasibility Statement for the Kwai Chung Park. The development of the Park was still at preliminary planning stage.

3.16 As of February 2018, except that the BMX park of 3.9 ha had been opened for public use (see para. 3.4), 21.6 ha (85% of the total 25.5-ha area) covered by the Kwai Chung Park site had not been opened for public use for over 17 years since the completion of restoration facilities by the EPD in September 2000.

3.17 The slow progress in developing the Kwai Chung Park is unsatisfactory. The Government needs to expedite actions to develop the Park.

Audit recommendations

3.18 **Audit has *recommended* that the Government should expedite actions to develop the Kwai Chung Park, including:**

(a) **the Director of Leisure and Cultural Services should complete the revision of the project scope for the Kwai Chung Park as early as possible;**

(b) **the Secretary for Home Affairs should expedite the revision of the Project Definition Statement of the Kwai Chung Park and issue it to the Director of Architectural Services for preparing a Technical Feasibility Statement for the project; and**

(c) **the Director of Architectural Services should, upon receipt of the revised Project Definition Statement for the Kwai Chung Park, complete the Technical Feasibility Statement in a timely manner.**

Response from the Government

3.19 The Director of Leisure and Cultural Services agrees with the audit recommendation in paragraph 3.18(a).

3.20 The Secretary for Home Affairs agrees with the audit recommendation in paragraph 3.18(b). He has said that the HAB will expedite the development of the Kwai Chung Park. After receiving information of the revised project scope from the LCSD, the HAB will revise the Project Definition Statement and request the ArchSD to prepare a Technical Feasibility Statement for the project.

3.21 The Director of Architectural Services agrees with the audit recommendation in paragraph 3.18(c).

Construction of Wan Po Road Pet Garden

3.22 In 2007, a working group under the Sai Kung District Council proposed to develop a 1.2-ha pet garden at Tseung Kwan O Stage I Landfill near Wan Po Road (hereinafter referred to as "Pet Garden") under the District Minor Works Programme (see para. 1.12(a)). The project scope included a grass ground cover together with a hard-paved area for pet activities, pet latrines and sitting-out areas, and a car park (of 0.1 ha) adjacent to the Pet Garden was also planned. According to the LCSD, it was the lead department to work with the Sai Kung District Council in implementing

the project and took into account the views of the District Council to meet the local community needs in determining the scope of projects under the District Minor Works Programme. The HAD (through its Works Section) appointed a term consultant (Consultant A) in January 2008 under a term consultancy (awarded in February 2007 after conducting an open expression-of-interest and shortlisting exercise) to provide consultancy services for the feasibility study, design, tendering, site supervision and contract administration for this project.

3.23 In November 2008, Consultant A informed a committee of the Sai Kung District Council that, based on the feasibility study conducted, the estimated cost of the Pet Garden project (excluding the car park) was $11 million (Note 45) and the construction works would commence in November 2009 with a works period of 10 months (i.e. target works completion in September 2010). The committee endorsed the proposed project estimate and construction schedule. In April 2009, under delegated authority from the FC of LegCo, the LCSD approved funding of $11 million (i.e. the APE) for the Pet Garden project (excluding the car park) under a block vote for the District Minor Works Programme (Note 46). The funding approval paper stated that the Government planned to start construction works in November 2009 for completion in September 2010. The funding for constructing the adjacent car park would be provided by the EPD under another block vote of the CWRF, subject to a ceiling of $1.8 million.

3.24 In the event, in December 2010 (Note 47), the LCSD awarded a works contract (Contract C) to a contractor (Contractor C) for the construction of the Pet Garden and an adjacent car park serving the Pet Garden under the supervision of

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Note 45: *The $11 million comprised $9.6 million for construction of the Pet Garden, $0.7 million for consultancy fee, $0.4 million for site supervision fee and $0.3 million for landfill gas hazard assessment.*

Note 46: *Before July 2012, the cost of each project under the Programme was limited to $21 million, and with the FC's approval, the cost ceiling has been increased to $30 million since July 2012. Under delegated authority from the FC, the funding approval limit for the Permanent Secretary for Home Affairs was $21 million (before July 2012) or $30 million (since July 2012) for each project, and that for the Director of Leisure and Cultural Services was $14 million (before July 2012) or $20 million (since July 2012) for each project.*

Note 47: *In December 2010, the LCSD issued the letter of acceptance to Contractor C and the works contract was signed in January 2011.*

Consultant A (Note 48). In February 2013, the construction works were completed at a total cost of $25.6 million, 29 months later than the original target completion date of September 2010 and $12.8 million (or 100%) higher than the original APE of $12.8 million (Note 49). In June 2013, the Pet Garden was opened for use by the general public (see Photograph 5).

Photograph 5

Wan Po Road Pet Garden

Source: EPD records

Note 48: *There was a delay of 14 months in awarding the contract, comparing the actual date of December 2010 against the target date of October 2009. According to the HAD, it was mainly due to: (a) a delay in inviting tenders of 7 months from August 2009 to March 2010 due to revision in design; (b) under-estimation of 3 months for tender stage. The consultant's feasibility study had only allowed 3 months for the tender stage which would normally take 6 months; and (c) a delay of 2.5 to 3 months due to additional procedures to apply for extra funding from the HAB and the Sai Kung District Council.*

Note 49: *The total increase of APE by $12.8 million, from $12.8 million to $25.6 million, was approved by the HAB as follows:*

(a) increase of $3.8 million in November 2010;
(b) increase of $6.2 million in February 2013; and
(c) increase of $2.8 million in November 2013.

3.25 Audit examination has found room for improvement in the construction of the Pet Garden in the following areas:

(a) need to ascertain up-to-date site conditions before tendering (paras. 3.26 to 3.29);

(b) need to enhance the accuracy in estimating project cost and time allowed for tender stage (paras. 3.30 to 3.32);

(c) additional works requirements after works commencement (paras. 3.33 to 3.35); and

(d) need to share lessons learnt from construction of the Pet Garden (paras. 3.36 and 3.37).

Need to ascertain up-to-date site conditions before tendering

3.26 Audit noted that there was slow progress of Consultant A in finalising the works design for the project and major changes were made to the works design during construction stage due to change in actual site levels as compared with the survey data from Consultant A's topographical survey conducted before tendering in April 2009. The salient points are as follows:

Design and tender stage

(a) in 2007, the EPD provided topographical information of the related landfill area to Consultant A for reference and reminded him to conduct an updated topographical survey (Note 50) to ascertain the actual site conditions for carrying out the design and works, as the site had undergone and would continue to undergo ground settlement in a differential manner. According to the HAD, Consultant A commenced its design work mainly based on the EPD's records and drawings before obtaining funding approval for the project;

Note 50: *A topographical survey mainly involves measurement of actual site levels and site area, and identification of existing utilities within the site.*

(b) in April 2009, Consultant A engaged a land surveyor to conduct the topographical survey at $9,000 after obtaining funding approval for the project (see para. 3.23). According to the HAD, the survey found that the actual site levels were different from records provided by the EPD in 2007, and the differences were considerable (e.g. the site level difference was 0.7 metre at one of the surveyed points);

(c) in August 2009, Consultant A informed the EPD that a drainage pipe was not correctly reflected in an EPD's drainage layout plan provided by the EPD in May 2009 (Note 51). According to the HAD, the EPD provided updated drawings to Consultant A in August 2009;

(d) in October 2009, the HAD issued a letter to Consultant A urging him to submit the tender documents with a view to meeting the target works commencement date of November 2009;

(e) in January 2010, Consultant A submitted to the HAD a revised footpath design layout and indicated that revisions were required to suit the site topographical condition. In the same month, the HAD issued a letter to Consultant A indicating that the topographical condition should have been verified at an early stage to meet the works programme, and significant revisions of the design layout at such a late stage were disappointing;

Construction stage after contract award

(f) after awarding the contract in December 2010, from January to March 2011, Contractor C conducted the topographical survey and found that the actual site levels were significantly lower than those shown on the contract drawings (Note 52);

Note 51: *According to the EPD, it informed Consultant A in September 2009 that the drainage pipe was already shown on another layout plan provided to Consultant A by the EPD in May 2009.*

Note 52: *According to Contract C, Contractor C shall conduct a topographical survey to check the accuracy of site levels shown on the contract drawings and notify Consultant A immediately of any inaccurate levels before carrying out any earthworks on site.*

(g) in March 2011, Contractor C informed Consultant A of the above survey results and requested the consultant to resolve the design to enable the commencement of works. In June 2011, the HAD issued a letter to Consultant A urging for submission of revised design drawings and expressed grave concern on whether the works could be timely completed on the scheduled contractual completion date of September 2011, and the late design revisions might further hinder the works progress; and

(h) in August 2011, Consultant A provided the revised design drawings to Contractor C, who resumed the works in the same month. In September 2011, Contractor C submitted claims for extension of time for awaiting Consultant A's revised design drawings. According to Consultant A's assessment, Contractor C was entitled to an extension of time for 3.5 months. According to the HAD, based on Consultant A's assessment, an additional cost of $1.1 million was incurred from the works arising from the above re-design.

3.27 In March 2018, the HAD informed Audit that:

(a) Consultant A's original works design at the early design stage was based on the EPD's records and drawings (see para. 3.26(a)). The delay in contract award (see Note 48 to para. 3.24) was caused by design revisions due to substantial site settlement (see para. 3.26(b)) and updated information on the drainage system provided by the EPD (see para. 3.26(c)). As a result, Consultant A had to make major changes to the works design to suit the actual site levels (e.g. adding stairs and ramps to connect different site levels at two of the garden entrances, and re-designing drainage layout and retaining walls of the boundary fencing);

(b) as a standard practice, for sitting-out area projects (including the Pet Garden) under the District Minor Works Programme, the HAD had been carrying out topographical survey and would continue to do so to identify existing site levels and site features at an early stage for use in the preparation of design proposals;

(c) as a standard practice, consultants were required to carry out topographical survey for all sitting-out area projects before conducting works design and contractors were required to verify all site levels, dimensions or alignments shown on the contract drawings before commencement of works. In the

Pet Garden project, as a further step, Contractor C was required under the contract to submit topographical survey records before commencement of works;

(d) although Consultant A already conducted a topographical survey in April 2009 and revised the works design to suit the as-surveyed site levels, the actual site levels were found to be different when works commenced on site in January 2011; and

(e) according to Contractor C's topographical survey results in March 2011, the difference between the site levels recorded in 2009 and the actual site levels measured in 2011 was substantial (up to 1.59 metres). The continuous ground settlement at the project site was unusual. In hindsight, the extent of design revisions during the construction stage could have been reduced if Consultant A had conducted another topographical survey to ascertain the site levels before tendering for the works (although this would probably cause further delay in the design stage). However, if the works site did continue to settle between the tendering stage and commencement date of site works, which could take about 6 months, there would still be a risk of having to re-design when construction works commenced. In such a scenario, an additional topographical survey before tendering would not reduce the need to re-design in the later stage.

3.28 When implementing works projects at works sites susceptible to ground settlement (e.g. restored landfills) in future, the HAD needs to take measures to ascertain up-to-date site conditions before tendering with a view to minimising the design revision during construction stage.

3.29 In this connection, Audit noted the HAD's concern that the continuous ground settlement at the Pet Garden project site was unusual (see para. 3.27(e)). Audit considers that the EPD, in collaboration with the HAD, needs to conduct a review on the unusual ground settlement of the project site with a view to identifying whether other areas of the Tseung Kwan O Stage I Landfill have such settlement problem and ascertaining whether such settlement would lead to any adverse impacts on the EPD's restoration facilities and aftercare work.

Need to enhance the accuracy in estimating project cost and time allowed for tender stage

3.30 In March 2010, Consultant A estimated that the tender price for Contract C was $11.7 million (Note 53) and the HAD invited tenders for the contract. In April 2010, seven tenders were received and the prices of the returned tenders ranged from $15.1 million to $23.5 million, exceeding the pre-tender estimate by 29% to 101% (Note 54). In October 2010, after completing the tender analysis report in August 2010, the HAD informed the LCSD of the tender results. In November 2010, under delegated authority from the FC, the HAB approved the LCSD's proposal to increase the APE of the project by $3.8 million from $11 million to $14.8 million (Note 55). In December 2010, the LCSD awarded the contract to Contractor C at $15.1 million (Note 56) with scheduled works completion date of September 2011.

3.31 In March 2018, the HAD informed Audit that:

Project cost estimate

(a) regarding the under-estimation of tender price, the Pet Garden project was a pilot project in 2007 under which Consultant A had to provide the project cost estimate and no separate quantity surveyor was engaged to offer independent advice on the consultant's cost estimate. Drawing from the lessons learnt from the project, there was room for improvement where the estimate should be re-visited again by an independent quantity surveyor before issuance of tenders to ensure that any changes in works design had

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Note 53: *The $11.7 million comprised $9.6 million for construction of the Pet Garden and $2.1 million for construction of the adjacent car park.*

Note 54: *According to the tender analysis report, the increase in returned tender price was mainly due to: (a) change in scope of works including addition of concrete footings to suit the existing drainage system; (b) major revision of alignment of walking trail to meet the existing site levels; (c) additional fire service installation; and (d) additional finishing works and provisional items.*

Note 55: *The $14.8 million comprised $13.4 million for construction of the Pet Garden, $0.9 million for consultancy fee, $0.4 million for site supervision fee and $0.1 million for landfill gas hazard assessment.*

Note 56: *The $15.1 million comprised $13.4 million for construction of the Pet Garden (see Note 55) and $1.7 million for construction of the adjacent car park. The funding for constructing the car park was provided by the EPD.*

been duly reflected in the pre-tender estimate in March 2010 (see Note 54 to para. 3.30);

(b) to better estimate project cost, the HAD had put in place the following improvement measures:

(i) since April 2008, all consultancies executed by the HAD under the District Minor Works Programme had included separate quantity surveying consultants to provide comprehensive advice on project cost; and

(ii) in collaboration with the quantity surveying consultants, all term architectural consultants would be required to prepare updated pre-tender estimates before issuance of tenders to ensure that the latest project cost estimates would be reflected in the final design proposals for tendering; and

Time allowed for tender stage

(c) Consultant A's feasibility study had only allowed 3 months for the tender stage which would normally take 6 months to complete, leading to under-estimation of 3 months for the tender stage.

3.32 In Audit's view, when implementing works projects (including those at restored landfills) in future, the HAD needs to enhance the accuracy in estimating the project cost and time allowed for tender stage.

Additional works requirements after works commencement

3.33 According to the HAD, after award of Contract C in December 2010, additional works items were carried out by Contractor C as instructed by Consultant A to suit the revised works design and according to comments offered by the relevant government departments. In the event, Contractor C was granted an extension of time for 4.5 months and the total cost of additional works items was $7.6 million. According to the HAD:

(a) the additional works items included the addition of surveillance cameras, electrical installations, pet latrines, surface channels and covers, plumbing installations, a ramp and protective barrier at the car park, and the modification of gas extraction wells. Out of the additional $7.6 million, $4.4 million were related to adjusting the works design to the actual site conditions (including $1.1 million (see para. 3.26(h)) related to changes in works design arising from ground settlement during the design stage, which was unforeseeable when preparing the works tender documents); and

(b) the remaining $3.2 million were related to additional works items which were originated from discussions with the Sai Kung District Council during the construction stage, or were intended for meeting operational needs or improving the works design. There are practical difficulties to attribute individual additional works items and costs to a specific government department.

3.34 In March 2018, the LCSD and the EPD informed Audit that:

LCSD

(a) restored landfills had complicated site conditions which required expertise in resolving the technical issues. Given the complex site conditions and the potential safety issues associated with using restored landfills as open space, the LCSD relied heavily on the works agent (i.e. the HAD in the Pet Garden project), its term consultants and the contractors as well as other departments concerning technical aspects of the sites (i.e. the EPD in the Pet Garden project) to provide the necessary technical advice and support in implementing the project;

(b) as the Pet Garden project proceeded and more design details became available, appropriate fine-tuning to the works design was required to address public safety and maximise the site utilisation. Therefore, taking into account the latest detailed design, the LCSD fine-tuned the design by revising the toilet design and requesting the provision of an additional dog latrine at about $0.3 million to better utilise the available space for serving the users of the Pet Garden; and

EPD

(c) the EPD had not raised any new requirements or requested any additional works items to be carried out by Contractor C.

3.35 The additional works items of $7.6 million in Contract C accounted for over 50% of the original contract sum of $15.1 million (see para. 3.30). In this connection, Audit noted that, in July 2008, the Development Bureau informed the FC that, for strengthening the financial management and enhancing budgetary control of capital works projects, the Government's objective was to contain the need for changes to user and programme requirements to those that were absolutely essential and necessary to prevent cost overrun due to client-initiated changes. In Audit's view, when implementing works projects (including those at restored landfills) in future, the HAD and the LCSD need to take measures to ensure that all works requirements are incorporated into the tender documents and avoid making changes to works requirements after contract award.

Need to share lessons learnt from construction of the Pet Garden

3.36 In January 2013, the LCSD, as the lead department to work with the Sai Kung District Council in implementing the Pet Garden project, conducted an internal review on the construction process of the project. The key review findings included:

(a) there were specific works requirements at restored landfills, including the maximum allowable loading of afteruse facilities to be developed on site and the need to protect the EPD's restoration facilities from damage during construction; and

(b) owing to the comparatively more complicated nature of works at restored landfills, both Consultant A and Contractor C had difficulties in handling the Pet Garden project. Although the HAD's Works Section (being the project manager) was expected to provide expert advice on the project, the limited resources had hindered it from providing timely assistance and proper technical advice to both Consultant A and Contractor C.

3.37 Audit notes that the development of more afteruse facilities will take place at various restored landfills (e.g. the Kwai Chung Park and development projects funded under the Restored Landfill Revitalisation Funding Scheme in future). In Audit's view, there are merits for the HAD and the LCSD to share the lessons learnt (e.g. conducting experience-sharing sessions) from the construction of the Pet Garden project with the relevant bureaux/departments and non-governmental bodies with a

view to avoiding recurrence of the encountered problems in future afteruse projects at restored landfills.

Audit recommendations

3.38 **Audit has *recommended* that the Director of Home Affairs should:**

(a) **when implementing works projects at works sites susceptible to ground settlement (e.g. restored landfills) in future, take measures to ascertain up-to-date site conditions for design work before tendering;**

(b) **when implementing works projects (including those at restored landfills) in future, take measures to enhance the accuracy in estimating the project cost and time allowed for tender stage; and**

(c) **in collaboration with the departments concerned, share the lessons learnt from the construction of the Wan Po Road Pet Garden project with the relevant bureaux/departments and non-governmental bodies with a view to avoiding recurrence of the encountered problems in future afteruse projects at restored landfills.**

3.39 **Audit has *recommended* that the Director of Environmental Protection should, in collaboration with the Director of Home Affairs, conduct a review on the unusual ground settlement of the project site of Wan Po Road Pet Garden with a view to identifying whether other areas of the Tseung Kwan O Stage I Landfill have such settlement problem and ascertaining whether such settlement would lead to any adverse impacts on the EPD's restoration facilities and aftercare work.**

3.40 **Audit has *recommended* that the Director of Home Affairs and the Director of Leisure and Cultural Services should, when implementing works projects (including those at restored landfills) in future, take measures to ensure that all works requirements are incorporated into the tender documents and avoid making changes to works requirements after contract award.**

Response from the Government

3.41 The Director of Home Affairs agrees with the audit recommendations in paragraphs 3.38(a) and (b), 3.39 and 3.40. She has said that:

(a) for future works projects involving restored landfills or sites susceptible to ground settlement, where time and resources permit, the HAD will recommend its consultants to ascertain up-to-date site conditions before tendering (particularly in situations where ground settlement has already been observed in a topographical survey carried out by a consultant at an early stage and the design stage lasts for a long duration);

(b) to enhance the accuracy in estimating project cost, the HAD will continue to engage separate quantity surveying consultants to provide comprehensive advice on project cost, and require all its term architectural consultants to prepare updated pre-tender estimates in collaboration with the quantity surveying consultants before issuance of tenders. When vetting consultants' feasibility reports, the HAD will also closely examine the time allowed for the tender stage and ensure that the proposed timetable is practical;

(c) the HAD will provide the necessary assistance to the EPD in carrying out the review as recommended in paragraph 3.39 concerning the project site of the Pet Garden project. When carrying out the review, the EPD may approach the LCSD and the ArchSD (i.e. the LCSD's maintenance agent) if prevailing information of the Pet Garden is required;

(d) when implementing works projects in future, the HAD will ensure that all works requirements are incorporated into the tender documents as far as possible and minimise changes to works requirements following contract award; and

(e) regarding the audit recommendation in paragraph 3.38(c), the HAD will be ready to share the lessons learnt from the construction of the Pet Garden project with the relevant bureaux/departments and non-governmental bodies upon referral by the EPD.

3.42 The Director of Environmental Protection agrees with the audit recommendation in paragraph 3.39. He has said that the EPD will consider conducting a review on the ground settlement at Tseung Kwan O Stage I Landfill when a new afteruse project is to be implemented at this site.

3.43 The Director of Leisure and Cultural Services agrees with the audit recommendation in paragraph 3.40. She has said that:

(a) regarding the audit recommendation in paragraph 3.38(c), the LCSD is the client department and heavily relies on the works agent and other departments (see para. 3.34(a)). Thus, the HAD and the EPD may be in a better position to share lessons learned and the LCSD will be ready to render support as appropriate; and

(b) apart from unforeseeable variation works arising from actual site conditions, when implementing works projects (including those at restored landfills) in future, the LCSD will take measures to ensure that all works requirements are incorporated into the tender documents wherever practicable, and avoid making changes to works requirements after contract award.

Construction of Jordan Valley Park

3.44 In his Policy Address of 2005, the Chief Executive of the Hong Kong Special Administrative Region announced that the construction of the Jordon Valley Park (JVP) at the Jordan Valley Landfill would be one of the 25 projects for priority implementation. The LCSD was the client department and the ArchSD was the works agent for the Project.

3.45 During mid-2006 to mid-2007, the ArchSD appointed three consultants for the JVP project, comprising:

(a) a lead consultant for design and construction supervision;

(b) a quantity surveyor for preparation of tender documents and valuing the cost of works; and

(c) a specialist independent checker for reviewing the design and layout plans and, in view of the special nature of this project, checking compliance with the EPD's technical specification for carrying out works on restored landfills.

In July 2007, the FC of LegCo approved the JVP project at an APE of $179.6 million for completion in December 2009. In mid-August 2007, the ArchSD invited tenders for carrying out the construction works. In December 2007 (Note 57), the ArchSD awarded a contract (Note 58) to a contractor (Contractor D) at $137.7 million. In the event, the works were substantially completed in March 2010 (Note 59). The JVP, covering an area of 6.3 ha, was commissioned in August 2010 (see Photograph 6).

Photograph 6

Jordan Valley Park

Source: EPD records

Note 57: *In December 2007, the ArchSD issued the letter of acceptance to Contractor D and the works contract was signed in January 2008.*

Note 58: *It was a lump-sum contract with certain quantities in the Bills of Quantities firm and other quantities provisional (for which measurement is required). Price fluctuation adjustment was not provided in this contract.*

Note 59: *According to ArchSD records, the works were completed in March 2010 (i.e. six months later than the original completion date of September 2009 under the contract) mainly due to extensions of time granted for inclement weather.*

3.46 In June 2013, the Financial Services and the Treasury Bureau approved the ArchSD's request to increase the APE of the JVP project by $14.4 million (Note 60) from $179.6 million to $194 million. In March 2014, the accounts of the JVP project were finalised at $192.1 million. The increase in project cost was mainly due to the increase in contract cost. The actual contract expenditure was $178 million (Note 61), which was $40.3 million higher than the original contract sum of $137.7 million (see para. 3.45). The increase of $40.3 million was due to:

(a) additional works totalled $23.8 million certified by ArchSD's consultants, comprising:

(i) variation works of $9.4 million due to the revisiting of the design of buildings and fence wall footings locating above the capping layer, leachate system, landfill gas system and sub-soil drain system (see Figure 3 in para. 1.7) of the landfill (see paras. 3.47 to 3.57);

(ii) variation works of $7.2 million for compliance with statutory requirements (e.g. fire safety under the Buildings Ordinance (Cap. 123)) and requirements and comments on provision of utilities from other government departments (e.g. Water Supplies Department);

(iii) variation works of $4.8 million requested by the LCSD mainly to improve facilities of the radio-controlled model car racing circuit (hereinafter referred to as "model car circuit") located inside the JVP based on advice of related local professional groups collected on their on-site visits during construction stage (in addition to advice collected during planning stage); and

(iv) additional measures of $2.4 million for taking measures to monitor the extent of ground settlement at the landfill and related works; and

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Note 60: *Under delegated authority from the FC, the Financial Services and the Treasury Bureau is empowered to approve increase of APE of a works project by not more than $15 million.*

Note 61: *The difference between the contract cost of $178 million and the increased APE of $194 million was mainly due to consultancy fee of $8 million.*

(b) claims settled by a settlement agreement of $16.5 million, which mainly related to disputes on valuation for works carried out by Contractor D.

3.47 In November 2005, the EPD informed the LCSD (information also copied to the ArchSD) of the requirements and restrictions applied to restored landfills, including deep excavation was not advised during construction and excavation into the landfill capping would not be allowed. The EPD had also requested the ArchSD to provide detailed design and layout plans for its comments when the plans were available. In July 2006, the ArchSD engaged a consultant for the design and tender preparation for the JVP project, who received the record drawings from the EPD in August 2006 and technical specification in March 2007. In April 2007, with the information provided by the EPD, the consultant completed the detailed design and started preparation of tender drawings. In June 2007, the ArchSD appointed a specialist independent checker for checking compliance with the EPD's technical specification for works on restored landfills (see para. 3.45(c)). According to the ArchSD, due to time constraint, the ArchSD could only consult the EPD of the checker's conclusion on checking the design and layout plans after inviting tenders (Note 62) for the contract in mid-August 2007 (the tender closed in late September 2007).

3.48 ***Blocks of buildings located above capping system.*** On 24 October 2007, after receiving the design and layout plans from the ArchSD, the EPD advised the ArchSD that many aspects of the design had deviated from the design requirements. The ArchSD found that 4 of the 13 blocks of buildings and the model car circuit had been located above the landfill gas pipes and sub-soil drain system (hereinafter referred to as building location issue — Note 63). As a result, the ArchSD requested its consultant to review the overall design with the landfill restoration contractor of the Jordan Valley Landfill (Contractor B). On 27 November 2007, the ArchSD issued a letter urging its consultant to speed up the review. On the same date, based on the tender report submitted by the ArchSD on 13 November 2007, the Permanent Secretary for Financial Services and the Treasury (Treasury) approved, on

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Note 62: *According to the ArchSD, the tender documents had specified that the contractor should not over-excavate the existing landfill surface.*

Note 63: *In March 2018, the ArchSD informed Audit that it could not find any records from the files showing the exact time of identifying the building location issue.*

the recommendation of the Central Tender Board (Note 64), the award of the contract. On 5 December 2007, Contractor B informed the ArchSD that, if the landfill gas system, leachate system and sub-soil drain system had to be relocated, the cost of relocation would be huge. On 11 December 2007, after considering that the building location issue could be resolved at post-contract stage, the ArchSD issued the letter of acceptance and awarded the contract to Contractor D.

3.49 ***Increase of imported fill for raising ground level of buildings and fence wall footings.*** In March 2008, after considering the consultant's revised design, the ArchSD decided that, of the 4 blocks of buildings and the model car circuit with building location issue, 2 blocks would be relocated within the site and the other 2 blocks and the model car circuit would be carried out with modification of the design to suit site conditions (i.e. raising the external ground level of buildings with imported fill). In May 2008, based on the advice from Contractor B, the ArchSD concluded that raising the levels of fence wall footings, the model car circuit and the external ground level of all 13 blocks of buildings with imported fill would be required (the ArchSD informed Audit in March 2018 that this was the most cost-effective solution). In the event, the value of the related modification works was $9.4 million (Note 65). A chronology of key events on the building location issue is shown in Appendix H.

Need to allow sufficient time to consult EPD before inviting tenders

3.50 Audit noted that, in November 2005, the EPD had requested the ArchSD to provide the detailed design and layout plans of the JVP project for its comments when available. In April 2007, the ArchSD's consultant completed the detailed design, which was later certified by the specialist independent checker appointed by the ArchSD in June 2007. In mid-August 2007, the ArchSD issued the tender documents which included the design and layout plans (mainly including the construction of a total of 13 blocks of buildings and the model car circuit on the site)

Note 64: *According to the Stores and Procurement Regulations, works departments should consult the Central Tender Board for awarding a works contract costing over $100 million. The Central Tender Board, chaired by the Permanent Secretary for Financial Services and the Treasury (Treasury), considers and advises the chairperson of the Board on the acceptance of tenders.*

Note 65: *According to the ArchSD, such expenditure would have been incurred irrespective of whether the variation had been included in the tender or was ordered after contract commencement.*

prepared by the ArchSD's consultant and approved by the ArchSD. According to the ArchSD, due to time constraint, the ArchSD could only consult the EPD of the design and layout plans after issuing tender in mid-August 2007. After the close of the tender in September 2007, the ArchSD noted the building location issue and, on 27 November 2007, issued a letter urging the consultant to speed up reviewing the overall design with Contractor B (see para. 3.48). In the event, in May 2008, after award of the contract, the ArchSD revised the design, including raising the external ground level of all 13 blocks of buildings with imported fill (see para. 3.49).

3.51 In February and March 2018, the ArchSD informed Audit that:

(a) projects of this scale would usually take about 16 months to complete the design process and tender documentation. However, as this project had a fast-track programme which needed to be implemented in a very tight timeframe (13 months had instead been taken for the design and tendering, including 2 months for an extra checking of the design by the specialist independent checker), many design development/coordination activities had to be proceeded in parallel;

(b) under this fast-track programme, the ArchSD had exercised appropriate steps in tackling all the constraints encountered, and that close liaison and negotiation with different parties involved had been carried out effectively and efficiently;

(c) there was no precedent case of dealing with a landfill site in a highly compressed timeframe for reference;

(d) in the design process, the ArchSD had reminded its consultant that the design should mitigate any possible conflict due to interfacing of the existing restoration facilities, and the ArchSD and its consultant had closely liaised with the EPD and Contractor B through letters, memorandums, e-mails, meetings and joint site visits; and

(e) the ArchSD had vetted its consultant's design according to its internal vetting mechanism and had engaged a specialist independent checker to check the compliance with the EPD's technical specification for works on the landfill.

3.52 Audit considers that, when implementing works projects at restored landfills (with specific construction requirements and restrictions) in future, the ArchSD needs to allow sufficient time for seeking the EPD's advice on design and layout plans before inviting tenders.

Need to inform Central Tender Board of subsequent substantial design changes

3.53 Audit noted that, before issuing the letter of acceptance to Contractor D on 11 December 2007, the ArchSD had already been aware of the building location issue and that design changes were needed in view that:

(a) after issue of the tender, the ArchSD had requested the consultant to review the design on 4 blocks of buildings and the model car circuit located above existing landfill gas system, leachate system and sub-soil drain system with Contractor B. On 27 November 2007, the ArchSD issued a letter urging the consultant to speed up the review; and

(b) on 5 December 2007, Contractor B based on its review of the ArchSD consultant's design and layout plans, informed the ArchSD that the cost of relocating the underground restoration facilities would be huge (Note 66).

In the event, in May 2008, the ArchSD decided that raising the levels of fence wall footings, the model car circuit and the external ground level of all 13 blocks of buildings with imported fill would be required.

3.54 Audit noted that the ArchSD had not informed the Central Tender Board of the need to change the design as set out in tender documents.

3.55 In February 2018, the ArchSD informed Audit that, in late November 2007, it had internally discussed whether the contract should be awarded or postponed, and in mid-December 2007, considering that possible changes would not be substantial, it

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Note 66: *In February 2018, the ArchSD informed Audit that: (a) from Contractor B's view, the relocation of the underground restoration facilities was only an option; and (b) the ArchSD considered that it was more cost effective and less substantial to modify the footing design and raise the external ground level of buildings with imported fill.*

decided not to postpone the award of the contract after taking into account the following considerations:

(a) the Government would suffer a greater loss if the project were to be re-tendered in view of the rising trend of construction costs; and

(b) it was not possible to resolve all site constraints before contract commencement, especially for a fast-track programme.

3.56 In Audit's view, when substantial subsequent design changes are found after issue of tenders, the ArchSD needs to report the changes and provide suggested course of actions with justifications to the Central Tender Board for consideration.

Need to share lessons learnt from construction of JVP

3.57 Similar to the Pet Garden project, there are merits for the ArchSD to identify the lessons learnt from the construction of the JVP and share them with the relevant bureaux/departments and non-governmental bodies (e.g. through experience-sharing sessions) with a view to enhancing the management of projects at restored landfills in future.

Audit recommendations

3.58 **Audit has *recommended* that the Director of Architectural Services should:**

(a) **when implementing works projects at restored landfills (with specific construction requirements and restrictions) in future, allow sufficient time for seeking the EPD's advice on design and layout plans before inviting tenders;**

(b) **when substantial subsequent design changes are found after issue of tenders, report the changes and provide suggested course of actions with justifications to the Central Tender Board for consideration; and**

(c) **identify the lessons learnt from the construction of the JVP and share them with the relevant bureaux/departments and non-governmental bodies with a view to enhancing the management of projects at restored landfills in future.**

Response from the Government

3.59 The Director of Architectural Services agrees with the audit recommendations. She has said that the ArchSD will identify the lessons learnt for the construction of the JVP and work out an action plan for sharing them with the relevant bureaux/departments and non-governmental bodies.

PART 4: MONITORING OF NON-GOVERNMENTAL BODIES' AFTERUSE FACILITIES AT RESTORED LANDFILLS

4.1 This PART examines the EPD's monitoring of non-governmental bodies' afteruse facilities at restored landfills, focusing on:

(a) monitoring of land licence conditions (paras. 4.2 to 4.20); and

(b) Restored Landfill Revitalisation Funding Scheme (paras. 4.21 to 4.39).

Monitoring of land licence conditions

4.2 With delegated authority from the Lands Department under the Land (Miscellaneous Provisions) Ordinance (Cap. 28), the EPD grants land licences to applicants (mainly non-governmental organisations and National Sports Associations) to develop and operate recreational facilities at restored landfills. Most of the land licences set out the requirements on the development and operation of facilities for compliance by the licensees, including:

Development of facilities

(a) completion dates of facilities;

(b) the need to liaise with utility undertakings for the provision and installation of utilities for the facilities;

Operation of facilities

(c) operation of a high-quality facility on a non-profit-making basis;

(d) submission of audited financial statements to the Government upon request; and

(e) the need to maximise the facility utilisation, promote and strengthen the development of relevant sports activities, and provide intensive sports training to the community.

4.3 As of December 2017, the EPD had granted five land licences to five licensees for developing and operating recreational facilities at 4 restored landfills (as two land licences were issued for Gin Drinkers Bay Landfill). As shown in Table 5, 2 licensees had not yet completed the development of facilities and 3 licensees had opened the facilities for use. According to the EPD, the five licensees provide afteruse facilities on a self-financing basis for use by the general public and/or members of the licensees in order to better utilise the vacant land at restored landfills.

Table 5

Land licences granted by EPD (December 2017)

Restored landfill	Licensee	Facility	Licence area (ha)	Licence start date	Licence expiry date	Duration (year)
(A) Facility not yet completed						
1. Gin Drinkers Bay	Licensee A	Temporary cricket grounds	4.5	23.3.2016	22.3.2019	3
2. Tseung Kwan O Stage I	Licensee B	Football training centre	12.5	6.9.2016	5.9.2026	10
(B) Facility opened for use						
3. Shuen Wan	Licensee C (who is also Contractor B — Note 1)	Temporary golf driving range	15.6	1.10.2003	30.9.2018	15
4. Gin Drinkers Bay	Licensee D	BMX park	3.9	3.7.2008	2.7.2029	21
5. Pillar Point Valley	Licensee E	Temporary shooting range	0.2 (Note 2)	21.7.2016	20.7.2018	2

Source: *EPD records*

Note 1: *According to the EPD, in 1998, Licensee C proposed to develop the Shuen Wan Restored Landfill into a temporary golf driving range on a self-financing basis before the commencement of long-term recreational development at the landfill site. The former Provisional Regional Council and the EPD appointed Licensee C for the design, construction and operation of the facility on a self-financing basis in March 1999. Subsequent to the dissolution of the former Provisional Regional Council in 1999, the LCSD and the EPD continued to monitor the facility operation. Upon the expiry of the above appointment in September 2003, the EPD granted a land licence for the first time to Licensee C and the licence period was two years. The licence was renewed seven times afterwards (extension of one to three years in each renewal) up to September 2018.*

Note 2: *Under the land licence with Licensee E, the licensee was required to construct two temporary shooting ranges (0.2 ha and 0.4 ha respectively). In December 2016, Licensee E informed the EPD that it would not use the 0.4-ha area for any activities.*

Remarks: *According to EPD, it does not maintain information on the construction cost of the facilities, which are borne by the related licensees.*

4.4 Audit examination has found that there is room for improvement in the EPD's monitoring of land licence conditions, as follows:

(a) non-compliances with conditions of land licences (see paras. 4.5 to 4.10);

(b) scope for improving inspection form and conditions of land licences (see paras. 4.11 to 4.14); and

(c) need to formulate guidelines on the circumstances for requesting licensees to submit audited financial information (see paras. 4.15 to 4.18).

Non-compliances with conditions of land licences

4.5 ***Delays in completing facilities.*** The target completion dates for the afteruse facilities were set out in the land licences. As of December 2017, the facilities at two restored landfills had not been completed, with delays of 6 and 15 months respectively (see Table 6).

Table 6

Delays in completing afteruse facilities by licensees (December 2017)

Afteruse facility (Restored landfill)	Target completion date stipulated in land licence	Works status	Delay (Note)
(a) Temporary cricket grounds (at Gin Drinkers Bay)	23.9.2016	Works in progress	15 months
(b) Football training centre (at Tseung Kwan O Stage I)	30.6.2017	Works in progress	6 months

Source: *EPD records*

Note: *The delay is counted up to 31 December 2017.*

4.6 During December 2017 to March 2018, the EPD informed Audit that:

(a) as of December 2017, the development of the temporary cricket grounds (item (a) in Table 6) and the football training centre (item (b) in Table 6) had commenced, and the delay in completion was mainly due to the need to connect the necessary power and water supply for the facilities and more-than-expected time required to provide submissions for meeting the requirements of the relevant statutory authorities (e.g. Buildings Department and Fire Services Department) and obtain their approvals; and

(b) the EPD had been actively monitoring the development progress of afteruse facilities and providing assistance to the licensees within the EPD's capacity and resource availability for completing the afteruse facilities (e.g. approaching the Water Supplies Department to facilitate submission and approval of water-supply applications, according priority in vetting of licensees' design submissions, and actively participating in site coordination meetings).

4.7 While the EPD said that it had been providing assistance to the licensees in completing the afteruse facilities, as of December 2017, the related facilities were still in progress with works delays of 6 and 15 months respectively. In Audit's view, the EPD needs to keep under review the licensees' development progress of afteruse facilities with a view to completing the facilities in a timely manner.

4.8 ***Operation and maintenance of afteruse facilities.*** For the BMX park at Gin Drinkers Bay Landfill, there are two tracks (i.e. main track and development track). The land licence requires the licensee to operate a high-quality BMX facility and maximise the facility utilisation. Audit noted that there were complaints on the poor quality and lack of maintenance of the BMX park. The main track of the BMX park was closed for maintenance for over one year from October 2016 to December 2017. According to the EPD, the long-time closure was owing to difficulties encountered by the licensee in carrying out a tendering exercise and awarding the improvement and maintenance contract for the required repair works.

4.9 In March 2018, the EPD informed Audit that:

(a) it would be a licensee's responsibility (and in his interest) to maintain an afteruse facility up to a standard that meets the users' needs and aspirations; and

(b) given the diversified nature of afteruse facilities, it was beyond the EPD's expertise to maintain the standards and quality of sports facilities or to monitor a licensee to do so. While the EPD could check a licensee's compliance with the licence conditions, it did not have the expertise and capacity to ensure that a licensee would operate a high-quality facility and maximise the facility utilisation.

4.10 While noting the EPD's difficulties in paragraph 4.9, Audit considers it important to ensure that the licensees comply with the licence conditions. In Audit's view, the EPD needs to take measures to monitor the licensees' compliance with licence conditions, including seeking the assistance and support of the relevant bureaux and departments (e.g. the HAB and the LCSD) if necessary.

Scope for improving inspection form and conditions of land licences

4.11 ***Scope for improving inspection form for monitoring licensees' compliance with licence conditions.*** According to the EPD, its site staff have from time to time conducted inspections to monitor licensees' compliance with licence conditions and recorded the results in an inspection form. However, Audit noted that the inspection form was designed mainly for the purpose of environmental monitoring and did not cover specific inspection items related to monitoring of the licensees' compliance with licence conditions (e.g. development progress of afteruse facilities and general maintenance condition of the licence area). There is scope for improvement in this regard.

4.12 ***Scope for improving conditions of land licences.*** Audit notes that some land licences contain conditions that are qualitative in nature, including operation of a high-quality facility, the need to maximise the facility utilisation, promotion and strengthening the development of relevant sports activities, and provision of intensive sports training to the community. However, quantitative/objective measures are not

specified in these conditions, rendering it difficult to assess whether the licensees meet such conditions.

4.13 In March 2018, the EPD informed Audit that:

(a) the setting of quantitative/objective measures might discourage licensees from continuing the provision of afteruse facilities. It was also not appropriate to use utilisation figures as a benchmark. It was preferable to provide such facilities at restored landfills rather than leaving the land vacant; and

(b) as there was no public money involved in the development and operation of afteruse facilities at restored landfills (involving many development constraints), imposing overly demanding criteria would likely deter interest of prospective applicants.

4.14 In Audit's view, in order to facilitate the monitoring of quality of the recreational facilities provided by the licensees, safeguard the interest and safety of the public in using the recreational facilities, and enable the licensees to better understand the licence requirements, the EPD needs to explore the feasibility of incorporating quantitative/objective measures (e.g. Key Performance Indicators) in land licences when issuing or renewing licences in future.

Need to formulate guidelines on the circumstances for requesting licensees to submit audited financial information

4.15 Under the land licences issued by the EPD:

(a) for Licensees B and C, they are required to submit audited financial statements for the operation and maintenance of afteruse facilities (showing the capital cost, recurrent cost, revenue and surplus/deficit) to the HAB (for Licensee B) or the EPD (for Licensee C); and

(b) for Licensees A, D and E, upon the EPD's written request, the licensees shall submit to the EPD the audited financial statements on their operation and maintenance of the afteruse facilities.

4.16 Audit noted that the afteruse facilities were being constructed by Licensees A and B as of December 2017 (see Table 5 in para. 4.3) and there was no requirement under the land licences for them to submit audited financial statements to the Government during the development stage of afteruse facilities. For the 3 licensees in the operation stage, only Licensee C had submitted audited financial statements to the EPD and, according to the EPD, it was satisfied with Licensee C's financial condition. Audit noted that the EPD had not requested Licensees D and E to submit audited financial statements although they had commenced operation of the afteruse facilities.

4.17 In March 2018, the EPD informed Audit that:

(a) unlike Licensee C (which was a private company), the other four licensees were National Sports Associations; and

(b) when these four licensees were carrying out construction works or continuing their normal operation, this would be a proof of their financial viability. Requesting all licensees to submit audited financial statements without a good justification might unnecessarily place a financial burden on the licensees.

4.18 In Audit's view, the EPD needs to formulate guidelines on the circumstances for requesting licensees to submit audited financial information for monitoring their operations and financial viability.

Audit recommendations

4.19 **Audit has *recommended* that the Director of Environmental Protection should:**

(a) **keep under review the licensees' development progress of afteruse facilities with a view to completing the afteruse facilities in a timely manner;**

(b) **take measures to monitor the licensees' compliance with licence conditions, including seeking the assistance and support of the relevant bureaux and departments (e.g. the HAB and the LCSD) if necessary;**

(c) **incorporate in the EPD's inspection form specific inspection items related to monitoring of the licensees' compliance with licence conditions;**

(d) **explore the feasibility of incorporating quantitative/objective measures (e.g. Key Performance Indicators) in land licences when issuing or renewing licences in future; and**

(e) **formulate guidelines on the circumstances for requesting licensees to submit audited financial information for monitoring their operations and financial viability.**

Response from the Government

4.20 The Director of Environmental Protection agrees with the audit recommendations. He has said that the EPD will:

(a) continue its efforts to facilitate and monitor the development progress of afteruse facilities. According to the latest construction progress as of March 2018, the temporary cricket grounds at Gin Drinkers Bay Landfill and the football training centre at Tseung Kwan O Stage I Landfill (see Table 6 in para. 4.5) will be completed in the second quarter of 2018 and opened for public use;

(b) work with the relevant bureaux and departments to monitor the licensees' compliance with licence conditions;

(c) review and update the existing EPD's inspection form for incorporating essential inspection items specific to land licences so as to further enhance the monitoring of the licensees' compliance with the licence conditions; and

(d) consult the relevant bureaux and departments in taking forward the audit recommendations in paragraph 4.19(d) and (e).

Restored Landfill Revitalisation Funding Scheme

4.21 In November 2006, the EPD informed the Landfill Afteruse Policy Group (Note 67) that:

(a) the Landfill Afteruse Working Group previously formed in 1995 did not have a well-defined procedure for inviting parties for developing afteruse facilities at restored landfills, and each case had been treated in ad-hoc manner;

(b) more structured procedures for relevant bureaux/departments in agreeing on the afteruse of landfills and in granting restored landfill sites to appropriate parties were necessary for the smooth implementation of projects for afteruse of landfills in future; and

(c) the EPD would take up the chairmanship of the new Policy Group and indicated that it would prepare a proposal on the procedures in (b) above for discussion by the Policy Group in early 2007.

In December 2010, the EPD prepared a guideline on considering the merits of each application for afteruse of restored landfills (Note 68). In 2014, the Landfill Afteruse Policy Group was dissolved subsequent to the launch of the Restored Landfill Revitalisation Funding Scheme (Funding Scheme).

Note 67: *In November 2006, the EPD formed the Landfill Afteruse Policy Group to coordinate the Government's actions on development of recreational facilities at restored landfills. The Policy Group, chaired by a Deputy Director of the EPD, comprises other members from various government bureaux and departments including the HAB, the Financial Services and the Treasury Bureau, the LCSD, the Planning Department and the Lands Department. This Policy Group replaced the Landfill Afteruse Working Group formed in 1995 by the then Recreation and Culture Branch.*

Note 68: *According to the EPD, an application would be assessed with respect to six criteria: (a) benefit to the community and environment; (b) proposed land use and its compatibility with its vicinity; (c) acceptance of the proposed project to the local community; (d) engineering and environmental feasibility; (e) management capability of the project proponent; and (f) business and financial viability of the project.*

4.22 In his Policy Address of January 2014, the Chief Executive announced that the Government had earmarked $1 billion to launch the Funding Scheme to provide funding for developing recreational, environmental or other community facilities on about 18 ha of restored landfill sites available for similar uses. The objectives of the Funding Scheme are to:

(a) put restored landfills into good and innovative uses;

(b) expedite the development of gainful use at restored landfills so that the community can benefit from them at the earliest opportunity; and

(c) promote active public participation in the development of suitable facilities at the restored landfills.

4.23 Funding support will be provided to applicants who receive in-principle approval by the Secretary for the Environment, as follows:

(a) a capital grant to cover the cost of capital works will be granted to successful applicants, subject to a cap of $100 million per project; and

(b) if justified, a time-limited grant to meet the starting costs and operating deficits (if any) for a maximum of the first two years of operation may be granted to successful applicants, subject to a cap of $5 million per project.

4.24 To take forward the Funding Scheme:

(a) the Secretary for the Environment appointed a Steering Committee (Note 69) in May 2014 to advise him on the operational arrangements of the Scheme, merits of the applications received and the funding support to be granted, as well as to monitor progress of supported applications and other related matters on the Scheme;

Note 69: *The Steering Committee, led by a non-official chairman, comprises 12 non-official members and 5 official members from the HAB, the ArchSD, the EPD, the HAD and the LCSD.*

(b) subject to the satisfaction of the Steering Committee with an applicant's detailed proposals, the Steering Committee would recommend the Secretary for the Environment to grant in-principle approval to the applicant to develop the proposed projects; and

(c) the EPD would provide secretariat support to the Steering Committee and would be responsible for administration of the Scheme, including the processing of applications from non-profit-making organisations or National Sports Associations, issue of land licences to successful applicants and monitoring of the project progress.

Delays in implementing the Funding Scheme

4.25 In May 2014, some members of the Steering Committee suggested that applications for afteruse of the seven restored landfills should be invited in batches so that the operating details of the Funding Scheme could be refined after having gained experience with the implementation of the first batch. In March 2015, the Steering Committee endorsed the EPD's proposal that applications under the Funding Scheme would be invited in three batches (see Table 7).

Table 7

Three batches of restored landfills for inviting applications under the Funding Scheme (February 2018)

Batch	Restored landfill (Entire landfill area — Note 1)	Area (in ha) available for application under Funding Scheme
1	(a) Pillar Point Valley (65 ha)	4.5
	(b) Tseung Kwan O Stage I (68 ha)	2.3
	(c) Ma Yau Tong Central (11 ha)	1.6
2 (Note 2)	(a) Tseung Kwan O Stage II/III (42 ha)	1.5
	(b) Ma Yau Tong West (6 ha)	1.0
	(c) Ngau Tam Mei (2 ha)	1.0
	(d) Siu Lang Shui (12 ha)	1.0
3 (Note 2)	Any landfills unallocated from Batches 1 and 2	As appropriate
	Total	12.9 (Note 3)

Source: *EPD records*

Note 1: *The status of current and planned afteruse of these restored landfills as of February 2018 is shown in Table 1 of paragraph 1.11.*

Note 2: *In March 2018, the EPD informed Audit that the list of restored landfills for application under Batches 2 and 3 of the Funding Scheme would be subject to further discussion and decision of the Steering Committee and the availability of manpower within the EPD.*

Note 3: *According to the EPD:*

(a) the 18 ha of land as mentioned in the Policy Address of 2014 (see para. 4.22) was an estimated figure at that time that would be available for afteruse; and

(b) before the official launching of the Funding Scheme in 2015, the EPD conducted a survey of the actual area available for application under Batch 1 of the Scheme.

4.26 In June 2014, the EPD informed the LegCo Panel on Environmental Affairs (EA Panel) of a tentative action timetable for taking forward the Funding Scheme for Batch 1 (covering 3 restored landfills). However, Audit noted that there was delay in the implementation of Batch 1 (see Table 8 for details). As of December 2017, applications for Batches 2 and 3 had not yet been invited (see para. 4.28).

Table 8

Delays in implementation of Batch 1 of the Funding Scheme

Tentative timeframe submitted to LegCo in June 2014	Key action	Actual completion date	Delay (as of Dec 2017)
Dec 2014 to Apr 2015	(a) To seek FC's approval for non-recurrent funding of $40 million	May 2015	1 month
	(b) To invite preliminary proposals	Nov 2015	7 months
	(c) To conduct briefings and site visits for all interested parties	Nov 2015 to Jan 2016	7 to 9 months
May 2015 to Aug 2015	(d) To conduct vetting and assessment by the Steering Committee	Feb 2017 to Dec 2017	18 to 28 months
	(e) To grant approval-in-principle to successful applicants	Not yet completed as of Dec 2017	28 months (counting up to Dec 2017)
From Sep 2015 onwards (Note)	(f) To conduct detailed planning, architectural, landscape and engineering design by successful applicants	Not yet completed as of Dec 2017	According to the EPD, no specific target dates were set for completing these actions
	(g) To consult relevant District Councils		
	(h) To seek funding approval pursuant to the established arrangements		
	(i) To grant formal approval to successful applicants		
	(j) To implement the projects by successful applicants		

Source: *Audit analysis of EPD records*

Note: *According to the EPD's paper submitted to LegCo EA Panel in June 2014, the actual time required for detailed planning, engineering design and project implementation would depend on the complexity and scale of the proposed project concerned, and some of the less complex and smaller scale projects might proceed faster than the stated timeline.*

4.27 As shown in Table 8, as of December 2017, there were delays in implementing 5 key actions (i.e. items (a) to (e) in Table 8) under the Funding Scheme, ranging from 1 to 28 months. While 4 key actions had been completed, the other 6 key actions (items (e) to (j) in Table 8) had yet to be completed. As of December 2017, the vetting and assessment of applications had been completed and two potential applicants for developing afteruse facilities of two restored landfills (i.e. Ma Yau Tong Central Landfill and Tseung Kwan O Stage I Landfill) had been identified. However, no in-principle approval (see item (e) in Table 8) had been granted as of December 2017, giving rise to the longest delay of 28 months.

4.28 Furthermore, Audit noted that, in March 2015, the Steering Committee endorsed the EPD's proposal that applications for the Funding Scheme under Batches 2 and 3 (see Table 7 in para. 4.25) would be invited in the second quarter of 2016 and the first quarter of 2017 respectively. However, as of December 2017, the EPD was still processing the applications under Batch 1, and applications under Batches 2 and 3 had not been invited.

4.29 In March 2018, the EPD informed Audit that, subsequent to the LegCo EA Panel meeting in June 2014, it was considered desirable to introduce various refinements in the implementation of the Funding Scheme, leading to some deviations from the tentative action timeframe submitted to the EA Panel. According to the EPD, the refinements included:

(a) more detailed documentation (such as a detailed application form, a guide to applications, technical information kits and a dedicated website) was prepared to facilitate the applicants to take due consideration of the site characteristics and the assessment requirements of the applications;

(b) interviews with short-listed applicants were considered necessary during assessment of applications under Batch 1, such that the Steering Committee might seek clarification from close contenders and assess their applications more carefully; and

(c) further engagement with the relevant District Councils (in September 2015 and January 2017) at an early stage of the Funding Scheme was considered necessary, such that views of the local community could be timely considered in the assessment process (i.e. item (d) in Table 8 of para. 4.26).

4.30 In Audit's view, there is a need for the ENB and the EPD to make additional efforts in implementing the Funding Scheme with a view to achieving the objective of expediting the development of gainful use at restored landfills so that the community can benefit from them at the earliest opportunity (see para. 4.22(b)).

Need to conduct review on measures to address development constraints at PPVL

4.31 In January 2017, in the course of vetting applications under the Funding Scheme, the EPD consulted a committee of the Tuen Mun District Council on the seven applications received under the Funding Scheme for afteruse of the area at PPVL (see Figure 4 in para. 2.6). The committee raised concern on the lack of direct access, utilities and infrastructure at PPVL, and suggested the Government to consider providing the above basic infrastructure at PPVL before applications were invited again. At the same committee meeting, the EPD said that the Government was processing the applications for afteruse of the area at PPVL under the Funding Scheme, and in case no application was successful eventually, the Government would consider the committee's suggestions, including operating appropriate projects at PPVL by itself and relocating the existing facilities at other locations to the PPVL in order to vacate the land occupied by such facilities for other uses.

4.32 For the three restored landfills under Batch 1 of the Funding Scheme (see Table 7 in para. 4.25), potential applicants were identified for two restored landfills (see para. 4.27) but not the PPVL. In February 2017, the Steering Committee considered that all applications for afteruse of the area at PPVL could not fully meet the established assessment criteria, and hence no application would be shortlisted for further assessment. The Steering Committee also concurred with the views and suggestions expressed by the Tuen Mun District Council's committee in January 2017 (see para. 4.31). In response, the EPD said that it would review the technical constraints of the PPVL site and consider how best to address the issues concerned for future afteruse of the site. However, as of December 2017, the EPD had not commenced a review for the purpose.

4.33 In March 2018, the EPD informed Audit that it was currently focusing its resources to work on the two afteruse projects at Ma Yau Tong Central Landfill and Tseung Kwan O Stage I Landfill where potential applicants had been identified by the Steering Committee. To facilitate the development of afteruse facilities at the PPVL,

Audit considers that the EPD needs to conduct a review on measures to address the development constraints at PPVL as early as possible.

Need to consider formulating guidelines on related party transactions

4.34 According to the LegCo EA Panel paper of June 2014 for the Funding Scheme (see para. 4.26):

(a) approved project should be non-profit-making in nature. Successful applicant will be required to set up a dedicated account for each individual project. Any revenue earned from the project has to be ploughed back to the dedicated account for operation of the project and any surplus, if available, upon completion of the project or on expiry of the land licence, should be returned to the Government where applicable; and

(b) a land licence will be granted by the EPD to the successful applicant (who then becomes "the licensee") to occupy the restored landfill site for a fixed period for the proposed use. The EPD will closely monitor the licensees' operation to ensure their compliance with the terms and conditions set out in the land licence and approval conditions recommended by the Steering Committee. The successful applicant must also comply with procurement requirements stipulated by the EPD and the Steering Committee, who may impose suitable conditions in addition to the general procurement procedures. Upon commissioning of the developed facility, the licensee will be required to submit annual reports with audited accounts for monitoring purpose.

4.35 Audit notes that the EPD has not formulated any guidelines for its officers to assess the reasonableness and appropriateness of related party transactions as disclosed in a licensee's audited accounts. In view that substantial financial support from the Government will be provided to the successful applicant (a maximum capital grant of $100 million per project — see para. 4.23(a)) and the applicant is required to operate on a non-profit-making basis (see para 4.34(a)), the EPD needs to formulate guidelines for its officers to assess whether related party transactions of a licensee under the Funding Scheme are reasonable and appropriate.

Audit recommendations

4.36 **Audit has *recommended* that the Secretary for the Environment and the Director of Environmental Protection should make additional efforts in implementing the Restored Landfill Revitalisation Funding Scheme with a view to achieving the objective of expediting the development of gainful use at restored landfills so that the community can benefit from them at the earliest opportunity**.

4.37 **Audit has *recommended* that the Director of Environmental Protection should**:

(a) **conduct a review on measures to address the development constraints at PPVL as early as possible; and**

(b) **formulate guidelines for EPD officers to assess whether related party transactions of a licensee under the Restored Landfill Revitalisation Funding Scheme are reasonable and appropriate.**

Response from the Government

4.38 The Secretary for the Environment and the Director of Environmental Protection agree with the audit recommendation in paragraph 4.36. They have said that the ENB and the EPD will seek additional resources in order to launch other batches of the Funding Scheme as soon as possible.

4.39 The Director of Environmental Protection agrees with the audit recommendations in paragraph 4.37.

Appendix A
(para. 1.2(b) refers)

Commissioning and closure years of 13 closed landfills

Closed landfill	District	Commissioning year	Total waste received (million tonnes)	Closure year
1. Gin Drinkers Bay	Kwai Tsing	1960	3.50	1979
2. Ngau Tam Mei	Yuen Long	1973	0.15	1975
3. Shuen Wan	Tai Po	1973	15.00	1995
4. Ma Tso Lung	North	1976	0.20	1979
5. Ngau Chi Wan	Wong Tai Sin	1976	0.70	1977
6. Sai Tso Wan	Kwun Tong	1978	1.60	1981
7. Siu Lang Shui	Tuen Mun	1978	1.20	1983
8. Tseung Kwan O Stage I	Sai Kung	1978	15.20	1995
9. Ma Yau Tong West	Kwun Tong	1979	0.60	1981
10. Ma Yau Tong Central	Kwun Tong	1981	1.00	1986
11. Pillar Point Valley	Tuen Mun	1983	11.00	1996
12. Jordan Valley	Kwun Tong	1986	1.50	1990
13. Tseung Kwan O Stage II/III	Sai Kung	1988	12.60	1994
		Total	64.25	

Source: EPD records

Appendix B
(paras. 1.8 and 2.7 refer)

Details of landfill restoration contracts and restoration works

Restored landfill	Contractor	Contract	Contract award date	Restoration works		Actual capital cost ($ million)	Actual operating cost up to 2016-17 ($ million)	Actual operating cost in 2016-17 ($ million)
				start date	completion date			
1. Tseung Kwan O Stage I	Contractor A	Contract A1	May 1997	Jul 1997	Jan 1999	369.3 (Note 1)	296.6 (Note 1)	21.1 (Note 1)
2. Tseung Kwan O Stage II/III								
3. Gin Drinkers Bay		Contract A2	Feb 1999	Mar 1999	Sep 2000	332.2 (Note 1)	268.9 (Note 1)	18.9 (Note 1)
4. Ma Tso Lung					May 2000			
5. Ngau Tam Mei								
6. Siu Lang Shui				Apr 1999				
7. Pillar Point Valley		Contract A3	Aug 2004	Oct 2004	Jul 2006	199.2	140.3	10.7 (Note 2)
8. Shuen Wan	Contractor B	Contract B1	Nov 1996	Dec 1996	Dec 1997	167.7	84.0	4.1
9. Ngau Chi Wan		Contract B2	Feb 1997	Aug 1998	Dec 2000	249.3 (Note 1)	267.6 (Note 1)	13.1 (Note 1)
10. Jordan Valley				Mar 1997	May 1998			
11. Ma Yau Tong Central								
12. Ma Yau Tong West								
13. Sai Tso Wan				Apr 1997				
					Total	1,317.7	1,057.4	67.9

Source: *EPD records*

Note 1: *According to the EPD, breakdown of capital and operating costs for individual landfills is not available, as the capital and operating costs included sharing of staff and overhead costs among different landfills under the same landfill restoration contract.*

Note 2: *In 2016-17, the original operating cost was $16 million and the EPD deducted $5.3 million for Contractor A's non-compliances with requirements of Contract A3. Therefore, a net sum of $10.7 million was paid to Contractor A for the related aftercare work.*

Appendix C
(paras. 1.11 and 1.12(b) refer)

Area information of afteruse of restored landfills (February 2018)

Restored landfill	Area (in ha)			
	Total **(a)**	**Opened for afteruse** **(b)**	**Committed for afteruse but not yet opened** **(c)**	**Remaining (Note 1)** **(d) = (a) – (b) – (c)**
1. Tseung Kwan O Stage I	68.0	1.3	12.5	54.2
2. Pillar Point Valley	65.0	0.2	0.0	64.8
3. Shuen Wan	55.0	15.6	34.4 (Note 2)	5.0
4. Tseung Kwan O Stage II/III	42.0	8.9	0.0	33.1
5. Gin Drinkers Bay	29.0	3.9	21.6 (Note 3)	3.5
6. Siu Lang Shui	12.0	0.0	0.0	12.0
7. Jordan Valley	11.0	5.0	0.0	6.0
8. Ma Yau Tong Central	11.0	0.1	0.0	10.9
9. Sai Tso Wan	9.0	3.0	0.0	6.0
10. Ngau Chi Wan	8.0	4.0	0.0	4.0
11. Ma Yau Tong West	6.0	0.1	0.0	5.9
12. Ma Tso Lung (Note 4)	2.0	2.0	0.0	0.0
13. Ngau Tam Mei	2.0	0.0	0.0	2.0
Total	320.0	44.1	68.5	207.4
		112.6		

Source: *EPD records*

Note 1: According to the EPD, the remaining areas in column (d) include:

(a) those reserved for the Restored Landfill Revitalisation Funding Scheme (12.9 ha — see Table 7 in para. 4.25);

(b) those occupied by the EPD's and landfill restoration contractors' site offices, restoration facilities, access roads, trees and landscaping features; and

(c) other specified uses (including 22.8 ha of the Tsing Shan Firing Range located within the Pillar Point Valley Landfill and 2.3 ha of the Siu Lang Shui Landfill designated as a Site of Special Scientific Interest for over-wintering of butterflies).

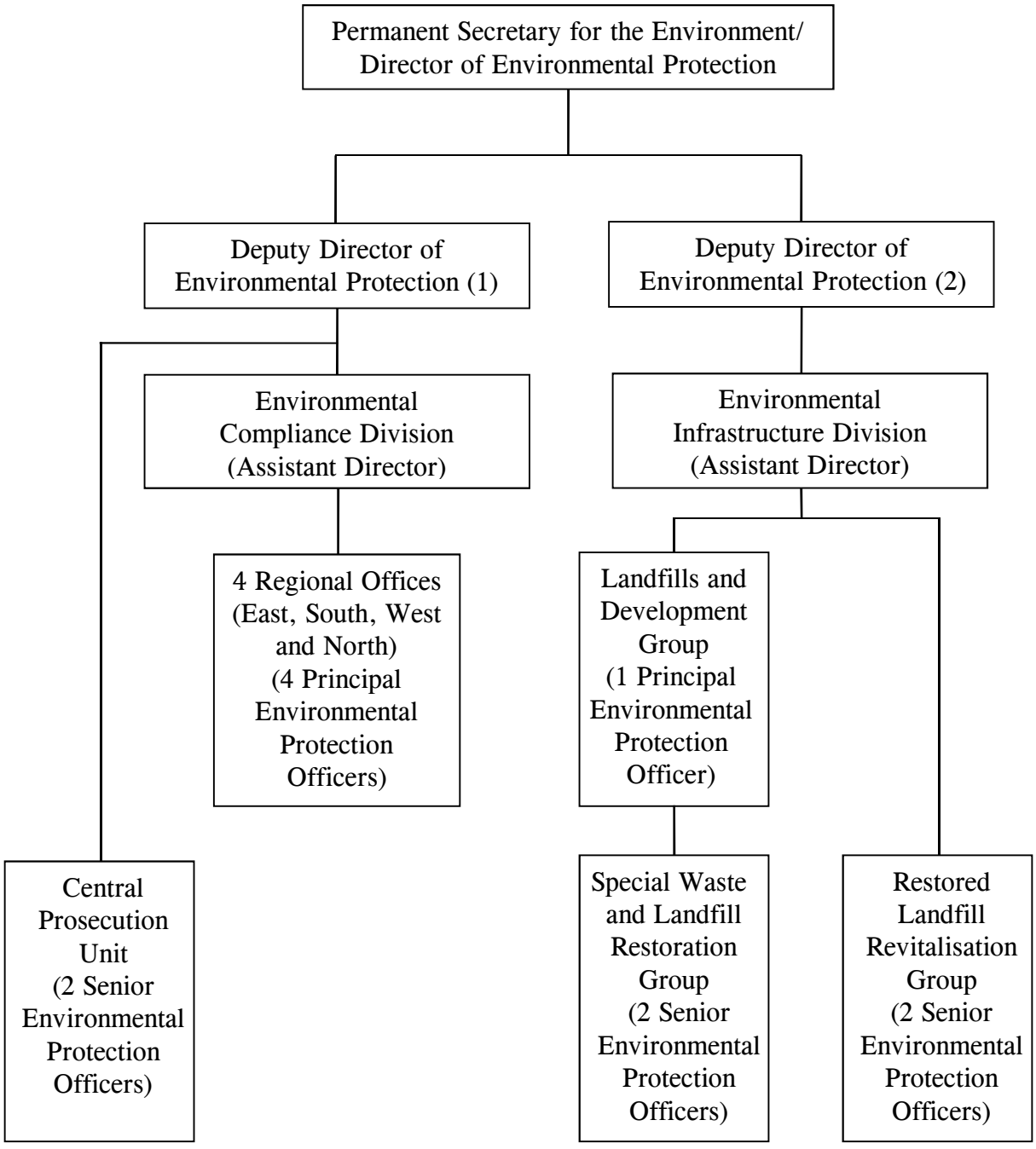
Note 2: An area of 50 ha at Shuen Wan Landfill was earmarked for the Government's implementation of a land exchange scheme for the development of a private golf course, where 15.6 ha of the 50 ha had already been opened as a temporary golf driving range. Therefore, the "area committed for afteruse but not yet opened" was 34.4 (50 minus 15.6) ha.

Note 3: An area of 25.5 ha at Gin Drinkers Bay Landfill was earmarked for development of the Kwai Chung Park, where 3.9 ha of the 25.5 ha had already been opened for the BMX park. Therefore, the "area committed for afteruse but not yet opened" was 21.6 (25.5 minus 3.9) ha.

Note 4: In June 1996, the Lands Department granted the site at Ma Tso Lung Landfill to a non-governmental organisation for operating a campsite, and the organisation was required under the land grant to allow unrestricted access to the Government's officers and its contractors to carry out necessary inspections and works at the site. In March 1999, the EPD commenced construction of restoration facilities at the landfill site. In May 2000, the EPD completed the works and handed over the site to the organisation in August 2000. In April 2010, the renewal of the land grant was not supported as the site fell within the proposed Kwu Tung North New Development Area which would likely be developed in due course. The site was covered by a short-term tenancy commencing from July 2012 until such time the tenancy is terminated (after giving of three months' advance notice either by the Government or the organisation). Under the tenancy, the Government's officers and its contractors are allowed unrestricted access to carry out necessary inspections and works at the site.

Appendix D
(paras. 1.14 and 2.5 refer)

Environmental Protection Department:
Organisation chart (extract)
(December 2017)



Source: EPD records

Appendix E
(para. 2.10 refers)

Key events of Contractor A's non-compliances with statutory and contractual requirements at Pillar Point Valley Landfill (December 2015 to November 2017)

Month	Key event
(a) Dec 2015 to Mar 2016	In light of complaints on suspected malpractice of Contractor A (see para. 2.8), the EPD's investigations found that the LGP at PPVL had operated below the required temperature from December 2015 to March 2016 (non-compliance in 28 days during the period), resulting in deduction of $221,400 from Contractor A (see para. 2.13(c)).
(b) May 2016	(i) In 10 days, Contractor A discharged leachate that exceeded the licensed maximum daily limit, resulting in a fine of $100,000 (see para. 2.11(a)). (ii) In 2 days, Contractor A failed to notify the EPD within 24 hours of incidents where the leachate discharge exceeded the maximum daily limit in (i) above, resulting in a fine of $20,000 (see para. 2.11(b)). (iii) In view of the proposed overhaul works and the forecast increase of leachate inflow in the forthcoming wet season, the EPD instructed Contractor A to suspend the LTP operation and Contractor A arranged the direct transfer of leachate by vehicles to the LTP of the EPD's West New Territories Landfill and to the Drainage Services Department's Pillar Point Sewage Treatment Works for off-site treatment. The leachate transfer arrangement continued until January 2017, resulting in deduction of $5,155,000 from Contractor A (see para. 2.26).
(c) Jun 2016	(i) Contractor A had discharged leachate that exceeded the licensed total nitrogen level until July 2017 (non-compliance in 9 days during the period), resulting in a fine of $88,000 (see para. 2.11(c)). (ii) Contractor A had discharged leachate that exceeded the total nitrogen level required under the contract until August 2017 (non-compliance in 20 days during the period), resulting in deduction of $227,300 from the contractor (see para. 2.13(b)). (iii) The EPD completed a review on the robustness of environmental monitoring practices at its waste facilities (including restored landfills), recommending improvement measures to be implemented (see para. 2.14).
(d) Nov 2016	Contractor A commenced the LTP overhaul works that were completed in January 2017 (see para. 2.26).
(e) Jul to Nov 2017	In July 2017, due to very heavy rainfall and the pipe-dislocation problem of the LTP overhaul works, the leachate inflow at PPVL far exceeded the LTP treatment capacity and reached the alert level of leachate storage tanks. Contractor A obtained EPD's consent to directly transfer leachate by vehicles from PPVL to the Pillar Point Sewage Treatment Works for off-site treatment. The transfer arrangement ceased in November 2017, resulting in deduction of $2,048,100 from Contractor A (see para. 2.30).

Source: EPD records

Appendix F
(para. 3.2 refers)

Photographs of four government recreational facilities at restored landfills

Photograph 7

Sai Tso Wan Recreation Ground

Source: *EPD records*

Photograph 8

Ma Yau Tong West Sitting-out Area

Source: *EPD records*

Photograph 9

Ma Yau Tong Central Sitting-out Area

Source: EPD records

Photograph 10

Ngau Chi Wan Park

Source: EPD records

Appendix G
(paras. 3.5 and 3.6 refer)

Chronology of key events in the development of Kwai Chung Park (1979 to 2017)

Year		Key event
(A) Events reported in Audit Report of March 2013 (see para. 3.5)		
Background		
1979	1.	The Gin Drinkers Bay Landfill was closed.
1980	2.	The site was handed over to the former New Territories Development Department for development.
1989	3.	Phase I development of the site (Kwai Chung Park) was completed. Basic facilities were built (e.g. access road, footpath, lighting facilities and administration office).
1992	4.	The Park was handed over to the former Regional Services Department (Note) for further development.
	5.	Due to potential landfill gas problems, the Park had not been formally opened to the public. Phase II development of the Park was withheld.
1994 to 1998	6.	Airport railway was under construction. The railway went across the Park. Development of the Park was held in abeyance.
1999 and 2000	7.	The Park was handed over to the EPD for carrying out landfill restoration works.
	8.	The EPD completed the restoration works and commenced the aftercare work.
Development responsibility taken over by the LCSD		
2000	9.	The LCSD took over the Phase II development project of the Park.
2001 and 2002	10.	The LCSD explored developing the Park into a football training centre, but found that the proposal did not work due to site constraints.
2003 to 2009	11.	The LCSD explored different development options, including: (a) opening part of the Park facing Tsuen Wan Road to the public; (b) developing a community garden cum sitting-out area in the Park; (c) developing a model car racing track in the Park; (d) developing a multi-purpose lawn in the Park; and (e) developing part of the Park into a leisure ground (including a cycling ground). However, the options could not go ahead due to various reasons.
	12.	Approval was given for developing a BMX park in the Kwai Chung Park site after obtaining funding from a sponsor.

Year	Key event	
2009 and 2010	13.	The LCSD received a proposal to develop cricket pitches at the Kwai Chung Park site on a self-financing basis.
	14.	The proponent withdrew the proposal owing to financial considerations.
2010	15.	The LCSD put on hold the planning work for the development of the Kwai Chung Park. A large part had been left unused.
(B) New events noted in this follow-up audit review		
2013	16.	A committee under the Kwai Tsing District Council endorsed the LCSD's proposed project scope of the Kwai Chung Park (including a golf driving range with 30 golf driving bays).
2014	17.	The HAB issued a Project Definition Statement to the ArchSD for the latter to prepare a Technical Feasibility Statement.
	18.	The ArchSD informed the HAB and the LCSD that the Kwai Chung Park site could not physically accommodate the proposed golf driving range, and requested the HAB to revise the Project Definition Statement.
2016	19.	The Kwai Tsing District Council passed a motion requesting the responsible bureaux/departments to deliberate and study the re-opening of the Kwai Chung Park to the public in a safe condition and to develop and optimise all the basic facilities of the Park as soon as possible in order to increase the greening areas and open spaces in Kwai Tsing District.
2017	20.	In the Policy Address of January 2017, the Kwai Chung Park was included as one of the projects in the five-year plan for sports and recreation facilities.
	21.	The Kwai Tsing District Council endorsed the LCSD's proposal to develop the Kwai Chung Park by two stages.
	22.	The LCSD issued a draft revised Project Definition Statement to the ArchSD for preliminary comments.

Source: *HAB, ArchSD and LCSD records*

Note: *The Regional Services Department was dissolved in 1999. Its functions relating to leisure and cultural services have been taken over by the LCSD since 2000.*

Appendix H
(para. 3.49 refers)

Chronology of key events on building location issue in the development of Jordan Valley Park (November 2005 to May 2008)

	Month	Key event
1.	Nov 2005	The EPD informed the LCSD (information also copied to the ArchSD) of the requirements and restrictions applied to restored landfills, including deep excavation was not advised during construction and excavation into the landfill capping would not be allowed. The EPD also asked the ArchSD to provide the detailed design and layout plans for its comments when available.
2.	Jul 2006	The ArchSD engaged a consultant for the design and tender preparation of the Project. According to the consultancy brief, the consultant had to pay special attention on minimising any possible conflict due to the interfacing of existing restoration facilities.
3.	Aug 2006	The ArchSD's consultant received a copy of the record drawings from the EPD.
4.	Mar 2007	Upon request of the ArchSD's consultant, the ArchSD and its consultant received a copy of the technical specification of the landfill restoration works from the landfill restoration contractor (Contractor B).
5.	Apr 2007	The ArchSD's consultant completed the detailed design.
6.	Jun 2007	After forwarding the draft document for engaging a specialist independent checker to the EPD for comment in March 2007 and receiving the EPD's comment in early April 2007, the ArchSD appointed a specialist independent checker in June 2007 to check compliance with the EPD's technical specification for works on restored landfills.
7.	Aug 2007	After the FC approved the APE for the JVP project in July 2007, the ArchSD invited tenders on 17.8.2007 (with tender documents specifying that the contractor should not over-excavate the existing landfill surface, and the design and layout plans mainly included 13 blocks of buildings (e.g. toilets and a greenhouse) and a model car circuit) for the contract works. The tender closed in late September.
8.	Oct and Nov 2007	On 22.10.2007, the EPD, upon receiving the complete set of tender drawings (some received on 25.9.2007 and others on 18.10.2007) from the ArchSD, passed them to Contractor B. On 24.10.2007, the EPD advised the ArchSD that many aspects of the design had deviated from the design requirements. The ArchSD found that 4 of the 13 blocks of buildings and the model car circuit had been located above the landfill gas pipes and sub-soil drain system (Note 1).

	Month	Key event
8.	Oct and Nov 2007 (Cont'd)	The ArchSD requested its consultant to review the overall design with the landfill restoration contractor of the Jordan Valley Landfill (Contractor B). On 27.11.2007, the ArchSD issued a letter urging its consultant to speed up the review. On the same date, based on the tender report submitted by the ArchSD on 13.11.2007, on the recommendation of the Central Tender Board, the Permanent Secretary for Financial Services and the Treasury (Treasury) approved the award of the contract.
9.	Dec 2007	On 5.12.2007, Contractor B informed the ArchSD that if the landfill gas system, leachate system and sub-soil drain system had to be relocated, the relocation cost would be huge (Note 2). On 11.12.2007, after considering that the building location issue could be resolved at post-contract stage, the ArchSD issued the letter of acceptance to Contractor D.
10.	Mar 2008	After considering the consultant's revised design, the ArchSD decided that, of the buildings and structures with building location issue, 2 would be relocated within the site, and the remaining 2 and the model car circuit would be carried out with modification of the design (e.g. raising the external ground level of building with imported fill).
11.	May 2008	Based on the advice from Contractor B, the ArchSD concluded that raising the levels of fence wall footings, the model car circuit and the external ground level of all 13 blocks of buildings with imported fill would be required (Note 3).

Source: *Audit analysis of ArchSD records*

Note 1: *In March 2018, the ArchSD informed Audit that it could not find any records from the files showing the exact time of identifying the building location issue.*

Note 2: *In February 2018, the ArchSD informed Audit that: (a) from Contractor B's view, the relocation of the underground restoration facilities was only an option; and (b) the ArchSD considered that it was more cost effective and less substantial to modify the footing design and raise the external ground level of buildings with imported fill.*

Note 3: *In March 2018, the ArchSD informed Audit that this was the most cost-effective solution.*

Appendix I

Acronyms and abbreviations

APE	Approved Project Estimate
ArchSD	Architectural Services Department
Audit	Audit Commission
BMX	Bicycle motocross
CWRF	Capital Works Reserve Fund
DBO	Design-build-operate
DSD	Drainage Services Department
EA Panel	Panel on Environmental Affairs
EC Division	Environmental Compliance Division
EI Division	Environmental Infrastructure Division
ENB	Environment Bureau
EPD	Environmental Protection Department
FC	Finance Committee
ha	Hectare
HAB	Home Affairs Bureau
HAD	Home Affairs Department
JVP	Jordan Valley Park
LCSD	Leisure and Cultural Services Department
LegCo	Legislative Council
LGP	Landfill gas flaring plant
LTP	Leachate treatment plant
PPVL	Pillar Point Valley Landfill
WPCO	Water Pollution Control Ordinance