

8 Land Contamination

8.1 Legislation, Standards and Guidelines

8.1.1 General

8.1.1.1 The relevant legislation, standards and guidelines applicable to the present study for the assessment of land contamination include:

- Annex 19 of the Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO), Guidelines for Assessment of Impact Assessment Process (TM-EIA), Guidelines for Assessment of Impact On Sites of Cultural Heritage and Other Impacts (Section 3: Potential Contaminated Land Issues), Environmental Protection Department (EPD), 1997;
- Guidance Note for Contaminated Land Assessment and Remediation, EPD, 2007;
- Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management, EPD, 2007;
- Practice Guide for Investigation and Remediation of Contaminated Land, EPD, 2011; and
- Pesticides Ordinance (PO) (Cap. 133) and subsidiary Regulations.

8.1.2 Environmental Impact Assessment Ordinance (EIAO) (Cap. 499), Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO)

8.1.2.1 Under Annex 19 of the TM-EIAO, a number of potentially contaminating historical and present landuses should be considered, including oil installations, gas works, metal workshops, car repair and dismantling workshops, which have the potential to cause or have caused land contamination. Nevertheless, any other potential contaminating activities/ installations/ facilities within the boundary of the Project and the works of the Project should be identified and considered based on professional judgement.

8.1.3 Guidance Note for Contamination Land Assessment and Remediation

8.1.3.1 In accordance with EPD's *Guidance Note for Contamination Land Assessment and Remediation*, a contamination assessment evaluation should:

- Provide a clear and detailed account of the present landuse and the relevant past land history, in relation to possible land contamination;
- Identify areas of potential contamination and associated impacts, risks or hazards; and
- Submit a plan to evaluate the actual contamination conditions for soil and/or groundwater, if required.

8.1.4 Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management

8.1.4.1 The Guidance Manual introduces the risk based approach in land contamination assessment and presents instructions for comparison of soil and groundwater data to the RBRGs for 54 chemicals of concern commonly found in Hong Kong. The RBRGs were derived to suit Hong Kong conditions by following the international practice of adopting a risk-based methodology for contaminated land assessment and remediation and were designed to protect the health of people who could potentially be exposed to land impacted by chemicals under four broad post restoration landuse categories. The RBRGs also serve as the remediation targets if remediation is necessary. The RBRGs for soil and groundwater are given in **Table 8.1** and **Table 8.2** respectively.

Table 8.1 RBRGs for soil & soil saturation limit

Chemical	Risk-Based Remediation Goals (RBRGs) for Soil				Soil Saturation Limit (C_{sat}) (mg/kg)
	Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	
VOCs					
Acetone	9,590	4,260	10,000*	10,000*	***
Benzene	0.704	0.279	9.21	42.2	336
Bromodichloromethane	0.317	0.129	2.85	13.40	1,030
2-Butanone	10,000*	10,000*	10,000*	10,000*	***
Chloroform	0.132	0.0529	1.54	253	1,100
Ethylbenzene	709	298	8,240	10,000	138
Methyl tert-Butyl Ether	6.88	2.80	70.1	505	2,380
Methylene Chloride	1.30	0.529	13.9	128	921
Styrene	3,220	1,540	10,000*	10,000*	497
Tetrachloroethene	0.101	0.0444	0.777	1.84	97.1
Toluene	1,440	705	10,000*	10,000*	235
Trichloroethene	0.523	0.211	5.68	69.4	488
Xylenes (Total)	95.0	36.8	1,230	10,000*	150
SVOCs					
Acenaphthene	3,510	3,280	10,000*	10,000*	60.2
Acenaphthylene	2,340	1,510	10,000*	10,000*	19.8
Anthracene	10,000*	10,000*	10,000*	10,000*	2.56
Benzo(a)anthracene	12.0	11.4	91.8	38.3	

Chemical	Risk-Based Remediation Goals (RBRGs) for Soil				Soil Saturation Limit (C _{sat}) (mg/kg)
	Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	
Benzo(a)pyrene	1.20	1.14	9.18	3.83	
Benzo(b)fluoranthene	9.88	10.1	17.8	20.4	
Benzo(g,h,i)perylene	1,800	1,710	10,000*	5,740	
Benzo(k)fluoranthene	120	114	918	383	
Bis-(2-Ethylhexyl)phthalate	30.0	28.0	91.8	94.2	
Chrysene	871	919	1,140	1,540	
Dibenzo(a,h)anthracene	1.20	1.14	9.18	3.83	
Fluoranthene	2,400	2,270	10,000*	7,620	
Fluorene	2,380	2,250	10,000*	7,450	54.7
Hexachlorobenzene	0.243	0.220	0.582	0.713	
Indeno(1,2,3-cd)pyrene	12.0	11.4	91.8	38.3	
Naphthalene	182	85.6	453	914	125
Phenanthrene	10,000*	10,000*	10,000*	10,000*	28.0
Phenol	10,000*	10,000*	10,000*	10,000*	7,260
Pyrene	1,800	1,710	10,000*	5,720	
Metals					
Antimony	29.5	29.1	261	97.9	
Arsenic	22.1	21.8	196	73.5	
Barium	10,000*	10,000*	10,000*	10,000*	
Cadmium	73.8	72.8	653	245	
Chromium III	10,000*	10,000*	10,000*	10,000*	
Chromium VI	221	218	1,960	735	
Cobalt	1,480	1,460	10,000*	4,900	
Copper	2,950	2,910	10,000*	9,790	
Lead	258	255	2,290	857	
Manganese	10,000*	10,000*	10,000*	10,000*	
Mercury	11.0	6.52	38.4	45.6	
Molybdenum	369	364	3,260	1,220	
Nickel	1,480	1,460	10,000*	4,900	
Tin	10,000*	10,000*	10,000*	10,000*	
Zinc	10,000*	10,000*	10,000*	10,000*	
Dioxins / PCBs					
Dioxins (I-TEQ)	0.001	0.001	0.005	0.001	
PCBs	0.236	0.226	0.748	0.756	
Petroleum Carbon Ranges					
C6 - C8	1,410	545	10,000*	10,000*	1,000
C9 - C16	2,240	1,330	10,000*	10,000*	3,000
C17 - C35	10,000*	10,000*	10,000*	10,000*	5,000
Other Inorganic Compounds					
Cyanide, free	1,480	1,460	10,000*	4,900	
Organometallics					
TBTO	22.1	21.8	196	73.5	

Notes:

- [1] For Dioxins, the cleanup levels in USEPA Office of Solid Waste and Emergency Response (OSWER) Directive of 1998 have been adopted. The OSWER Directive value of 1 ppb for residential use has been applied to the scenarios of "Urban Residential", "Rural Residential", and "Public Parks", while the low end of the range of values for industrial, 5 ppb, has been applied to the scenario of "industrial".
- [2] Soil saturation limits for petroleum carbon ranges taken from the Canada-Wide Standards for Petroleum Hydrocarbons in Soil, CCME 2000.
- [3] * indicates a 'ceiling limit' concentration.
- [4] *** indicates that the Csat value exceeds the 'ceiling limit' therefore the RBRG applies.

Table 8.2 RBRGs for groundwater and solubility limit

Chemical	Risk-Based Remediation Goals (RBRGs) for Groundwater			Solubility Limit (mg/L)
	Urban Residential (mg/L)	Rural Residential (mg/L)	Industrial (mg/L)	
VOCs				
Acetone	10,000*	10,000*	10,000*	***
Benzene	3.86	1.49	54.0	1,750
Bromodichloromethane	2.22	0.871	26.2	6,740
2-Butanone	10,000*	10,000*	10,000*	***
Chloroform	0.956	0.382	11.3	7,920
Ethylbenzene	1,020	391	10,000*	169
Methyl tert-Butyl Ether	153	61.1	1,810	***
Methylene Chloride	19.0	7.59	224	***
Styrene	3,020	1,160	10,000*	310
Tetrachloroethene	0.250	0.0996	2.95	200
Toluene	5,110	1,970	10,000*	526
Trichloroethene	1.21	0.481	14.2	1,100
Xylenes (Total)	112	43.3	1,570	175
SVOCs				
Acenaphthene	10,000	7,090	10,000*	4.24
Acenaphthylene	1,410	542	10,000*	3.93
Anthracene	10,000*	10,000*	10,000*	0.0434
Benzo(a)anthracene				
Benzo(a)pyrene				
Benzo(b)fluoranthene	0.539	0.203	7.53	0.0015
Benzo(g,h,i)perylene				
Benzo(k)fluoranthene				
Bis-(2-Ethylhexyl)phthalate				
Chrysene	58.1	21.9	812	0.0016
Dibenzo(a,h)anthracene				
Fluoranthene	10,000*	10,000*	10,000*	0.206
Fluorene	10,000*	10,000*	10,000*	1.98
Hexachlorobenzene	0.0589	0.0234	0.695	6.20
Indeno(1,2,3-cd)pyrene				
Naphthalene	61.7	23.7	862	31.0
Phenanthrene	10,000*	10,000*	10,000*	1.00

Chemical	Risk-Based Remediation Goals (RBRGs) for Groundwater			Solubility Limit (mg/L)
	Urban Residential (mg/L)	Rural Residential (mg/L)	Industrial (mg/L)	
Phenol				
Pyrene	10,000*	10,000*	10,000*	0.135
Metals				
Antimony				
Arsenic				
Barium				
Cadmium				
Chromium III				
Chromium VI				
Cobalt				
Copper				
Lead				
Manganese				
Mercury	0.486	0.184	6.79	
Molybdenum				
Nickel				
Tin				
Zinc				
Dioxins / PCBs				
Dioxins (I-TEQ)				
PCBs	0.433	0.171	5.11	0.031
Petroleum Carbon Ranges				
C6 - C8	82.2	31.7	1,150	5.23
C9 - C16	714	276	9,980	2.80
C17 - C35	12.8	4.93	178	2.80
Other Inorganic Compounds				
Cyanide, free				
Organometallics				
TBTO				

Notes:

- [1] Blank indicates that RBRG could not be calculated because the toxicity or physical/chemical values were unavailable, or the condition of Henry's Law Constant > 0.00001 was not met for the inhalation pathway.
- [2] Water solubilities for Petroleum Carbon Range aliphatic C9-C16 and greater than C16 generally are considered to be effectively zero and therefore the aromatic solubility for C9-C16 is used.
- [3] * indicates a 'ceiling limit' concentration.
- [4] *** indicates that the solubility limit exceeds the 'ceiling limit' therefore the RBRG applies.

8.1.5 Practice Guide for Investigation and Remediation of Contaminated Land

8.1.5.1 The EPD's *Practice Guide for Investigation and Remediation of Contaminated Land* includes a summary of the general steps of a contamination assessment study, which include site appraisal, site investigation and remediation.

8.2 The Project

8.2.1.1 The latest layout of the proposed golf course is provided in **Figure 2.1. Section 2.5** of the EIA presents more details on the proposed development scheme of the golf course.

8.2.1.2 The construction works will only involve minor excavation. In addition, the proposed ancillary facilities and box culvert will not be constructed on the capping layer of the Shuen Wan Landfill. Furthermore, protective measures will be implemented for the landfill modification works involved as addressed in **Section 2**. Therefore, it is expected that the construction works will not cause any land contamination issues at the Project Site.

Provision of Option for Staff Quarters and Overnight Accommodations

8.2.1.3 As discussed in **Section 2**, in order to allow for more flexible uses and development of the Project to suit contemporary circumstances and operational requirements, the provision for staff quarters and overnight accommodations have been duly considered. As stated in **Section 2**, the original development scenario with neither staff quarters nor overnight accommodations is categorized as Scenario 1, while the additional development scenario with both staff quarters and overnight accommodations is categorized as Scenario 2. For land contamination assessment, the worse scenario will be presented. Since the assessment criteria are more stringent for development which involves residential accommodations under Scenario 2 as compared to Scenario 1 (details refer to **Section 8.8**), Scenario 2 will be presented.

8.3 Description of the Environment

8.3.1 Previous Environment

8.3.1.1 The Project Site was once part of the Tolo Harbour before 1970s. Since the beginning of 1970s, the Shuen Wan Landfill was then progressively reclaimed at the Project Site. The landfill commenced its operation in Year 1973 and ceased operation in Year 1995. Subsequent to the closure of the landfill site, restoration works were implemented.

8.3.2 Existing Environment

8.3.2.1 The Project Site has been served as a 145-bay golf driving range for public use since Year 1999 after completion of the restoration works at the Shuen Wan Landfill Site. EPD has been operating the management system for landfill gas and leachate system.

8.3.2.2 There are a number of landuses including industrial (e.g. Tai Po Industrial Estate (TPIE)) and residential developments (e.g. Fortune Garden, Casa Marina, etc.) as well as natural terrain in the vicinity of the Project.

8.4 Assessment Methodology

8.4.1 Overview

8.4.1.1 The land contamination assessment has been conducted according to the following procedures. Each of these procedures listed below are further discussed in the following sections.

- Desktop review of the site history; and
- Conduct site survey to identify any potentially contaminated areas.

8.4.2 Desktop Review

8.4.2.1 For the purpose of conducting the desktop review, the best available relevant information in the public domain is collected. This information includes the following that would illustrate the features of the area within the boundary of the Project and the works of the Project as well as any changes in landuse over the previous decades. The following have been reviewed:

- Selected historical aerial photographs between 1973 and 2017;
- Hong Kong Geological Survey Map that provides information on geology of the area within and in the vicinity of the boundary of the Project and the works of the Project;
- Outline Zoning Plans that show the latest landuses of the area within and in the vicinity of the boundary of the Project and the works of the Project;
- Geotechnical Review for Restored Shuen Wan Landfill - Final Geotechnical Assessment Report (April 2011); and
- Any relevant EIAs (i.e. Tai Po Sewage Treatment Works – Stage V – Final EIA Report (AEIAR-081/2004)) and environmental Site Investigations (SIs) undertaken in, or nearby, the boundary of the Project and the works of the Project.

8.4.3 Site Survey

8.4.3.1 Site surveys were conducted in December 2017 and November 2018 to ground truth the findings of the desktop review and to identify any other landuses within the boundary of the Project and the works of the Project which may have potential to cause land contamination. Possible contaminants, if any, would be identified in accordance with EPD's *Practice Guide for Investigation and Remediation of Contaminated Land*.

8.5 Desktop Review

8.5.1 Aerial Photographs and Historical Landuse

8.5.1.1 Selected historical aerial photographs between 1973 and 2017 of the area within the boundary of the Project and the works of the Project have been reviewed in order to ascertain any historical landuse with the potential for land contamination. The findings of the selected historical aerial photographs of the area are summarized in **Table 8.3** and the aerial photographs are given in **Appendix 8.1**.

Table 8.3 Summary of historical aerial photos for the area within the boundary of the Project and the works of the Project

Year	Description
1973	<ul style="list-style-type: none"> A small part of the Shuen Wan Landfill was reclaimed within the boundary of the Project and the works of the Project at the northwest tip and was under operation. The rest of the area within the boundary of the Project and the works of the Project was part of the Tolo Harbour and was yet to be reclaimed.
1981	<ul style="list-style-type: none"> The northwestern part of the Shuen Wan Landfill was reclaimed within the boundary of the Project and the works of the Project and was under operation. The rest of the area within the boundary of the Project and the works of the Project was part of the Tolo Harbour and was yet to be reclaimed. Part of the TPIE was reclaimed to the west of the boundary of the Project and the works of the Project. Tai Po Sewage Treatment Works (TPSTW) was constructed and under operation at the TPIE to the west of the boundary of the Project and the works of the Project.
1993	<ul style="list-style-type: none"> The whole Shuen Wan Landfill was reclaimed within the boundary of the Project and the works of the Project and was under operation. Few small structures were observed within the boundary of the Project and the works of the Project at the northern end. The whole TPIE was reclaimed to the west of the boundary of the Project and the works of the Project. TPSTW was expanded and under operation at the TPIE to the west of the boundary of the Project and the works of the Project.
1998	<ul style="list-style-type: none"> The Shuen Wan Landfill was closed and was being restored. Most of the northwestern part of the area within the boundary of the Project and the works of the Project were covered with grass

Year	Description
	<p>and trees.</p> <ul style="list-style-type: none"> • TPSTW was further expanded and under operation at the TPIE to the west of the boundary of the Project and the works of the Project. • Features including Tai Po Waterfront Park (TPWP) were observed at the TPIE to the southwest of the boundary of the Project and the works of the Project.
2008	<ul style="list-style-type: none"> • Most of the area within the boundary of the Project and the works of the Project were covered with grass and trees. • Structures including golf driving bay were observed at the central area within the boundary of the Project and the works of the Project. • No significant change in historical land use was observed as compared with Year 1998 in the vicinity of the boundary of the Project and the works of the Project.
2017	<ul style="list-style-type: none"> • No significant change in historical land use was observed as compared with Year 2008 within and in the vicinity of the boundary of the Project and the works of the Project.

8.5.2 Site Geology

8.5.2.1 The area within the boundary of the Project and the works of the Project belongs to the previous Shuen Wan Landfill. It was originally part of the Tolo Harbour and was formed through land reclamation. With reference to the Geotechnical Review for Restored Shuen Wan Landfill - Final Geotechnical Assessment Report in April 2011, the site is covered with 16.5m to 43m thick fill/ waste with the bottom level ranging from +9.96 to -14.61mPD. On top of the waste is a 2.5m to 3.5m thick capping layer of fill materials comprising silty sand to coarse sand with gravel and cobbles. The waste typically consists of plastic bags, wood and clothes whereas the waste matrix is typically described as silty sand with some gravels. The waste mass also contains interim covers comprising silt, sand and cobbles.

8.5.2.2 Marine deposits lie below the fill materials with a thickness up to 6m; the base of the stratum is at -6.47 to -14.22mPD. Below the marine deposits is an alluvium layer up to approximately 3.8m thick and the base is located at -7.62 to -20.94mPD.

8.6 Site Survey

8.6.1.1 Site surveys were conducted in December 2017 and November 2018 to ground truth the findings of the desktop review and to identify any other landuses within the boundary of the Project and the works of the Project which may have potential to cause land contamination. Possible contaminants, if any, would be identified in accordance with EPD's *Practice Guide for Investigation and Remediation of Contaminated Land*.

- 8.6.1.2** Photo records of the site survey are given in **Figure 8.1**. The site walkover checklist is given in **Appendix 8.2**.
- 8.6.1.3** Photos taken include those for entrance (photo 1), vacant grassland (photo 2), access roads (photos 3, 12, 13 and 15), open car parking (photo 3), golf driving bays (photos 4, 5, 8 and 9), canteen and reception area (photo 6), reception/ shop and office area (photo 7), storage/ workshop area (photo 10), golf practice green area with sand bunker (photo 11), wastewater storage and treatment facilities (photo 13), gas monitoring probes (photo 15) as well as leachate pumping chambers (photos 14 and 16).
- 8.6.1.4** Vehicle (i.e. golf cart) repairing activities involving replacement of components such as wheels and tires were observed at the storage/ workshop area (photo 10). As advised by the operator of the current Golf Driving Range, only electric golf carts were being used at the Golf Driving Range, and thus eliminated the chance of release of fuels during the repairing activities from contaminating the land. In addition, major vehicle repairing activities, such as dismantle of vehicle and equipment fuelling, would be carried out at maintenance workshop outside the boundary of the Project and the works of the Project. Furthermore, the whole area is concrete-paved with no observable cracks. Therefore, the land contamination potential due to the vehicle repairing activities is low.
- 8.6.1.5** A generator were observed at the storage/ workshop area (photo 10). As advised by the operator of the current Golf Driving Range, the generator would only be used during emergency situation, and it had not been used since its installation. In addition, the generator was placed on concrete-paved ground with no observable cracks. Therefore, the land contamination potential due to the emergency generator is unlikely.
- 8.6.1.6** Golfing equipment, trolleys, golf cart components including wheels and batteries as well as small amount of cleaning solvent were also observed at the storage/ workshop area (photo 10). Nevertheless, the whole area is concrete-paved with no observable cracks. In addition, the cleaning solvent was stored in cabinet on concrete-paved area. Furthermore, there are no reported accidents of spillage and leakage within the boundary of the Project and the works of the Project (refer to **Section 8.7**). Therefore, the land contamination potential due to the storage of golfing equipment, trolleys, car components and cleaning solvent at the storage/ workshop area is unlikely.
- 8.6.1.7** Due to privacy reason, the operator of the current Golf Driving Range refused to let us take detail site photos at the storage/ workshop area to confirm the above findings. Project proponent (PP) is thus recommended to conduct further land contamination assessment at the storage/ workshop area (refer to **Figure 8.1c**) at later stage of the Project after the area within the boundary of the Project and the works of the Project is handed over to the PP. Further land contamination

assessment should include site re-appraisal, submission of Land Contamination Review (LCR) or Contamination Assessment Plan (CAP), SI and submission of Contamination Assessment Report (CAR), if necessary. If land contamination is confirmed, a Remediation Action Plan (RAP) should be submitted to formulate viable remedial measures. Possible remediation methods include air sparging, biopile, stabilisation / solidification, thermal desorption, etc. The contaminated land should then be remediated according to the approved RAP, and a Remediation Report (RR) should be submitted to demonstrate the land has been remediated adequately.

8.6.1.8 No other potential contaminated issues including stressed vegetation and transformer/ power generator (except for the emergency generator identified at the storage/ workshop area) were identified during the site surveys. In addition, it was confirmed by the operator of the current Golf Driving Range that pesticides/ herbicides had not been applied on the area within the boundary of the Project and the works of the Project.

8.7 Other Relevant Information

8.7.1 Fire Services Department

8.7.1.1 Fire Services Department (FSD) has been contacted in December 2017 for:

- The records of Dangerous Goods License(s); and
- The reported accidents of spillage/leakage within the boundary of the Project and the works of the Project.

8.7.1.2 Based on the latest information provided by FSD in June 2018, neither records of dangerous goods license nor incidents of spillage/ leakage of dangerous goods were found within the boundary of the Project and the works of the Project. Copy of FSD's correspondence is provided in **Appendix 8.3**.

8.7.2 Environmental Protection Department

8.7.2.1 EPD has been contacted in December 2017 for:

- The records of Chemical Waste Producers Registration; and
- The reported accidents of spillage/leakage within the boundary of the Project and the works of the Project.

8.7.2.2 Based on the information provided by EPD in December 2017, there are no registered Chemical Waste Producers and no chemical spillage/ leakage records in the past five years within the boundary of the Project and the works of the Project. Copy of EPD's correspondence is provided in **Appendix 8.3**.

8.8 Future Landuses

- 8.8.1.1** The RBRGs have developed four different post-restoration landuses, namely "Urban Residential", "Rural Residential", "Industrial" and "Public Parks", to reflect the actual settings which people could be exposed to contaminated soil or groundwater. Definitions of post-restoration landuses are given in EPD's *Guidance Note for Contaminated Land Assessment and Remediation and Guidance Manual for RBRGs*.
- 8.8.1.2** The Project comprises mainly construction and operation of golf course and its ancillary facilities at the Shuen Wan Restored Landfill. Therefore, its landuses are appropriate to be categorized as "open space" and "low-rise residential development in rural area", which corresponds to RBRG landuses of "Public Park" and "Rural Residential".
- 8.8.1.3** As mentioned in **Section 8.6**, site re-appraisal at the storage/ workshop area (refer to **Figure 8.1c**) is recommended at later stage of the Project after the area within the boundary of the Project and the works of the Project is handed over to the PP. The PP's appointed consultant should revisit the area to assess the latest site condition and confirm the above findings. LCR or CAP would be prepared to present supplementary information such as latest site conditions, locations of hotspots, sampling strategy and testing protocol, if necessary. In case SI and sampling works are required, the RBRGs for "Rural Residential" will be adopted as conservative assessment, since it is the more stringent set of RBRGs as compared to the RBRGs for "Public Park".

8.9 Potential for Future Land Contamination

- 8.9.1.1** In accordance with EPD's *Practice Guide for Investigation and Remediation of Contaminated Land*, golf course is regarded as a potential contaminated usage. The potential future sources of contamination include application of agrochemicals (fertilizer, pesticides and herbicides) for maintaining the golf course as well as accidental chemical spillage.
- 8.9.1.2** All pesticides used on the golf course must be registered under the PO and be used by person with valid Pesticides Permit. The application, handling and storage of pesticides should follow AFCD's *Code of Practice for the Safe and Efficient Use of Pesticides on Sports Turf*, *A Guide to Labelling of Pesticide* and *Safety Guidelines for Storage of Pesticides* respectively, and the disposal of pesticides should follow the Waste Disposal (Chemical Waste) (General) Regulation as well as EPD's *A Guide to the Chemical Waste Control Scheme*.

- 8.9.1.3** In case of any chemical spillage, the operator should follow the instruction of the labels and take precautionary measures before handling the spillage. With reference to EPD's *Code of Practice for the Packaging, Labelling and Storage of Chemical Wastes*, in incidents where the spillage may result in significant contamination of an area or risk of pollution, EPD should be informed immediately.
- 8.9.1.4** In order to prevent the agrochemicals from contaminating the land, an Environmental Conscious Turfgrass Management Plan (TMP) would be developed during the detailed design stage. The outline of the TMP is presented in **Section 2.7** of the EIA Report. Details on the application, handling and storage of agrochemicals as well as measures to be carried out in the occurrence of chemical spillage will be provided in the TMP. The TMP will be prepared by the future operator and submitted to EPD as one of the EP conditions.
- 8.9.1.5** The current land use of golf course will not be changed under current arrangement. In the unlikely event that the proposed golf course is decommissioned in future, the Project Proponent will conduct contamination testing to identify and delineate any contamination that may have occurred and, if necessary, propose remediation action to be taken, subject to the agreement of relevant authorities.

8.10 Identification of Potentially Contaminated Sites

- 8.10.1.1** Based on the desktop review findings of selected aerial photos, the information collected during the site survey, from the operator of the current Golf Driving Range as well as EPD and FSD, the storage/workshop area is identified as the only potential contaminated site within the boundary of the Project and the works of the Project. Nevertheless, the whole area is concrete-paved with no observable cracks and major vehicle repairing activities, such as dismantle of vehicle and equipment fuelling, would be carried out at maintenance workshop outside the boundary of the Project and the works of the Project. In addition, the cleaning solvent was stored in cabinet on concrete-paved area. Furthermore, there are no reported accidents of spillage and leakage within the boundary of the Project and the works of the Project. Therefore the land contamination potential at the storage/workshop area is low.
- 8.10.1.2** Due to privacy reason, the operator of the current Golf Driving Range refused to let us take detail site photos at the storage/workshop area to confirm the above findings. PP is thus recommended to conduct further land contamination assessment at the storage/workshop area (refer to **Figure 8.1c**) at later stage of the Project after the area within the boundary of the Project and the works of the Project is handed over to the PP. Further land contamination assessment should include site re-appraisal, submission of LCR or CAP, SI and submission of CAR, if necessary. If land contamination is confirmed, a RAP should be submitted to formulate viable remedial measures. Possible remediation

methods include air sparging, biopile, stabilisation / solidification, thermal desorption, etc. The contaminated land should then be remediated according to the approved RAP, and a RR should be submitted to demonstrate the land has been remediated adequately.

8.11 Conclusion

8.11.1.1 This land contamination assessment examined the potential contaminative landuses within the boundary of the Project and the works of the Project and their potential impacts to future use. The assessment involved desktop review, site survey and identification of potentially contaminated site etc.

8.11.1.2 Based on the desktop review findings of selected aerial photos, the information collected during site survey, from the operator of the current Golf Driving Range as well as EPD and FSD, the storage/workshop area is identified as the only potential contaminated site within the boundary of the Project and the works of the Project. Nevertheless, the land contamination potential at the storage/ workshop area is low.

8.11.1.3 PP is recommended to conduct further land contamination assessment at the storage/ workshop area (refer to **Figure 8.1c**) at later stage of the Project after the area within the boundary of the Project and the works of the Project is handed over to the PP. Further land contamination assessment should include site re-appraisal, submission of LCR or CAP, SI and submission of CAR, if necessary. If land contamination is confirmed, a RAP should be submitted to formulate viable remedial measures. Possible remediation methods include air sparging, biopile, stabilisation / solidification, thermal desorption, etc. The contaminated land should then be remediated according to the approved RAP, and a RR should be submitted to demonstrate the land has been remediated adequately.