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7. LAND CONTAMINATION

7.1 Introduction

7.1.1 This section identifies and assesses the potential land contamination impact due to historical and current land uses within the Project Area including its associated works (the Assessment). The Assessment was undertaken in accordance with the criteria set out in *Annex 19 of the EIAO-TM*.

7.2 Statutory Requirements and Evaluation Criteria

7.2.1 The following EPD's guiding documents are referenced for this land contamination assessment:

- *Annex 19 of the Technical Memorandum on Environmental Impact Assessment Process* (Annex 19 of EIAO-TM);
- *Guidance Note for Contaminated Land Assessment and Remediation* (the RBRGs Guidance Note);
- *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management* (the RBRGs Guidance Manual); and
- *Practice Guide for Investigation and Remediation of Contaminated La*nd (the Practice Guide).

7.2.2 The following legislation, documents and guidelines may cover or have some bearing upon the assessment of contamination and the handling, treatment and disposal of contaminated materials for this Project:

- *Dangerous Goods Ordinance* (Cap 295);
- *Water Pollution Control Ordinance* (WPCO) (Cap 358);
- *Waste Disposal Ordinance* (WDO) (Cap 354);
- *Waste Disposal (Chemical Waste) (General) Regulation* (Cap 354C); and
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*.

7.3 Description of the Proposed Project

7.3.1 The Project comprises the improvement works to tributary sections TKL04 and TKL05 of Ping Yuen River (River Ganges) in Ta Kwu Ling as illustrated in **Figure 7.1**. The Project Area comprises:

(i). Improvement works, including river widening and deepening, construction of embankments / floodwall, construction of bank gradient and bank design, and revitalizing water bodies, to tributary sections of Ping Yuen River (River Ganges)

- TKL04 (about 1.4km long, 5-9m width, 3-3.5m average depth);
- TKL05 (about 2.1km long, 10-21m width, 3 -3.5m average depth); and

(ii). Associated drainage facilities, including:

- Drainage improvement works at Ping Yeung Village (about 1050m long);

- Construction of road drainage system at Ping Che Road (about 1150m long); and
- Re-provision of vehicular crossing and footbridges.

7.4 Future Land Use

7.4.1 In accordance with Section 2 of the RBRGs Guidance Manual, the Project Area's future land use and the appropriate set of RBRGs corresponding to the land use scenarios should be determined prior to the site appraisal. The Hong Kong RBRGs are developed for four different post-restoration land use scenarios, namely urban residential, rural residential, industrial, and public parks.

7.4.2 The Project involves drainage improvement works. The future land uses in the Project Area comprises various public drainage utilities, including drainage channels, u-channels, drain pipes and vehicular crossing and footbridges. According to Section 2.2.2 and Section 3.1 of the RBRGs Guidance Manual, the RBRGs conceptual site model under "Industrial" land use scenario shall be adopted for public utilities.

7.5 Assessment Methodology

7.5.1 In accordance with the Annex 19 of EIAO-TM, this Assessment shall give consideration to historical land uses which have the potential to cause or have caused land contamination. Such uses include, but are not limited to, the following:

(i) oil installations including oil depots and petrol filling stations

(ii) gas works

(iii) power plants

(iv) shipyards/boatyards

(v) chemical manufacturing/processing plants

(vi) steel mills/metal workshops

(vii) car repairing and dismantling workshops

(viii) dumping ground and landfill

7.5.2 If the above land uses are identified, the applicant shall submit, as part of the EIA report, a Contamination Assessment Plan (CAP) to the Director for endorsement prior to conducting a contamination assessment of the site(s).

7.5.3 The assessment of potential land contamination impact within the Project Area was conducted by undertaking:

- A desktop study to review the current and historical land use information from Lands Department (LandsD) and publicly available information;
- A site walkover to identify the current land uses;
- A proposed SI programme, including soil and groundwater sampling and testing at proposed sampling locations; and
- Review of potential contamination sources and possible remediation methods.

7.6 Historical and Current Land Uses of Project Area

Historical Land Uses

7.6.1 Review of past land uses of the entire Project Area were conducted by reviewing the aerial photographs in the years of 1982, 1994, 2004, 2008 and 2020. The aerial photographs were obtained from the Surveys and Mapping Office of the Lands Department. A summary of the historical land uses is provided in **Table 7.1**. The referenced aerial photographs are attached in **Appendix 7.1**.

Table 7.1 Summary of Historical Land Uses

Project Area / Concerned Area	Date Began / Period	Description
Project Area (Except the Concerned Area)	1980s to present	Based on review of historical aerial photograph from year 1982 indicated that the land where the Project Area (Except the Concerned Area) located was used as farmland, vegetation, road, existing drainage facilities and village houses.
Area A	1980s	Based on review of historical aerial photo from year 1982 indicated that Area A was a farmland.
	Early 1990s to present	Based on review of historical aerial photo from year 1994, 2004 and 2008, the Area has become as a contractor storage yard until present.
Area B1	1980s	Based on review of historical aerial photograph from year 1982 indicated that the land where the Area located was used as a farmland.
	Early 1990s to present	Based on review of historical aerial photos from year 1994, 2004 and 2008, the Area has become an open storage area since 1994 until present.
Area B2	1980s	Based on review of historical aerial photograph from year 1982 indicated that the land where the Area located was a farmland.
	Early 1990s to present	Based on review of historical aerial photo from year 1994, 2004 and 2008, temporary office buildings and warehouse structures were gradually built on Area B2 from early 1990s until present.

7.6.2 Based on the review of past land uses of the entire Project Area, three (3) suspected

contaminative sites (hereafter referred to as 'Concerned Area') within and in the vicinity of the Project Area were identified, including a Container Yard (Area A), an Open Storage Area (Area B1), and Temporary Office Buildings and Warehouse Structures (Area B2). The location of the three (3) Concerned Areas are shown in **Figure 7.1**.

Current Land Uses

7.6.3 Site walkover was first conducted on 26 October 2018 at the time of Project Profile preparation to identify the potential land use & site conditions within the Project Area. The latest site walk over was conducted in November 2021 to review the updated condition. AAs the Area A, B1 and B2 were still in operation and not accessible for site walkover and interview with the current land users at the time of EIA, site observation could only be made at the peripheral of the Area A, B1 and B2. In addition, interview with the current land users could not be arranged at the time of EIA preparation, therefore site walkover checklists could not be completed. Once the Concerned Areas will be handed over to DSD for development, the future project proponent's land contamination specialist shall prepare the site walkover checklist for submission once the sites will be accessible.

7.6.4 Further request was made in 4th quarter 2020 for asking permission to enter Concerned Area for follow-up site inspection. However, permission could not be obtained from the site owners as the Area A, B1 and B2 were still in operation.

7.6.5 Therefore, the latest site conditions of the Area A, B1 and B2 was obtained by reviewing the latest aerial photos in year 2020 available from the Surveys and Mapping Office of the Lands Department. Site observations and findings from review of 2020 aerial photos were summarised in **Table 7.2**. **Appendix 7.2** presents the selected site walkover photos.

Table 7.2 Summary of Current Land Uses

Project Area / Concerned Area	Current Land Uses	Description
Project Area (Except the Concerned Area)	Farmland, vegetation, road, existing drainage facilities and village houses	Based on review of historical aerial photograph from year 1982 indicated that the land where the Project Area (Except the Concerned Area) located was used as farmland, vegetation, road, existing drainage facilities and village houses.
Area A	Contractor Storage Yard	Review of latest aerial photo taken in 2020 indicated that the Area A was occupied by a contractor storage yard and it is appeared that the goods stored onsite potentially include drums, containers, and miscellaneous equipment. According to the Chemical Waste Producers (CWPs) records from EPD, Area A has been occupied by a contractor namely Triangular Force Construction Engineering Limited.

Project Area / Concerned Area	Current Land Uses	Description
Area B1	Open Storage Area / Waste Electric & Metal Products Recycler	Review of latest aerial photo taken in 2020 showed that the boundary of Area B1 was an open storage area with small sheds along the tree canopy. According to the CWPs records from EPD, Area B1 has been occupied by a waste electric & metal products recycler namely Ping Nam Trading LTD. These electronic wastes stored onsite may possess a potential land contamination impact.
Area B2	Temporary Office Buildings and Warehouse	Review of latest aerial photo taken in 2020 showed that the Area B2 has been occupied by temporary office buildings and warehouses. No signs of industrial activities were noted.

7.7 Potential Land Contamination Hotspots

7.7.1 Among the three (3) Concerned Area (i.e. Area A, B1 and B2) identified in the site appraisal, all are located within the Project Area and are considered to have the potential of land contamination impact to the development.

7.7.2 A CAP, including site appraisal and site investigation plan (SI Plan) of the Area A, B1 and B2, was prepared as part of the EIA report (**Appendix 7.3**).

Area A: Contractor Storage Yard

7.7.3 Review of aerial photo taken in 2020 indicated showed that the entire Area A are used as a container contractor storage yard. According to the CWPs records from EPD, Area A has been occupied by a contractor namely Triangular Force Construction Engineering Limited. Based on review of historical aerial photos, it is appeared that the Contractor Storage Yard has been storing drums, containers, and miscellaneous equipment since early 1990s.

7.7.4 Based on available sources, no contaminative land use can be confirmed based on the current land uses, however, the possibility of historical land contamination cannot be ruled out. Nevertheless, SI is recommended to verify the ground condition as a conservative approach.

Area B1: Open Storage Area / Waste Electric & Metal Products Recycler

7.7.5 Review of aerial photo taken in 2020 showed that the boundary of Area B1 was an open storage area with small sheds along the tree canopy. According to the CWPs records from EPD, Area B1 has been occupied by a waste electric & metal products recycler namely Ping Nam Trading LTD. These electronic wastes stored onsite may possess a potential land contamination impact. SI is recommended to assess the ground condition of the electronic and metal waste storage areas.

Area B2: Temporary Office Buildings and Warehouse

7.7.6 Review of aerial photo taken in 2020 showed that the Area B2 were used as a temporary office buildings and warehouse. Based on review of historical aerial photos, there is no significant change of the land use since early 1990s. No signs of industrial activities were noted.

7.7.7 Based on available sources, no contaminative land use can be confirmed based on the current land uses, however, the possibility of historical land contamination cannot be ruled out. Nevertheless, SI is recommended to verify the ground condition as a conservative approach.

7.8 Site Investigation Programme

7.8.1 A SI plan was proposed in the CAP provided in **Appendix 7.3** to assess the potential contamination in the Area A, B1 and B2. Details of the proposed SI plan are summarised in **Table 7.3.** The proposed sampling locations are presented in **Figure 7.2**.

7.8.2 As these potential contamination areas were still in operation and not accessible to carry our SI works, further works including site appraisal and submission of supplementary CAP(s) shall be carried out by future project proponent to confirm whether the following SI locations will be still valid to reflect the land conditions. Details of the re-appraisal procedures are discussed in **Section 7.11** of this EIA and in the enclosed CAP in **Appendix 7.3**.

Table 7.3 Summary of SI Programme

Potentially Contaminated Area	Size within the Project Area	Sampling Grid Size	Sampling Location ID	Proposed Coordinates[(a)]	Soil Sampling Depths (m bgl)	Groundwater Sampling Depths (m bgl)	RBRGs Land Use Scenario	Proposed Testing Parameters
Area A: Contractor Storage Yard	128m^2	6m x 6m	BH1	E: 833589.40 N: 843825.62	For each sampling location, manual excavation of Inspection Pit (0-1.5 m bgl): • To collect disturbed sample at 0.5 m bgl Rotary Drilling of boreholes (1.5-7.0 m bgl): • Continuous drilling and retrieving of soil materials for visual inspection at every 1m from the bottom of inspection pit to a maximum depth of 7 m bgl or 2 m below static groundwater level, whichever shallower.	For each sampling location, collect one (1) groundwater sample at static groundwater level.	Industrial	Metals [(b)], PCRs [(c)], VOCs [(d)], SVOCs [(e)]
			BH2	E: 833595.08 N: 843819.94				
			BH3	E: 833601.17 N: 843813.98				
Area B1: Open Storage Area / Waste Electric & Metal Products Recycler	383m^2	13m x 13m	BH4	E: 833565.93 N: 843691.95				
			BH5	E: 833568.59 N: 843683.24				
			BH6	E: 833570.53 N: 843674.03				
Area B2: Temporary Office Buildings and Warehouse	674m^2	13m x 13m	BH7	E: 833548.66 N: 843689.50				
			BH8	E: 833535.11 N: 843689.43				
			BH9	E: 833547.79 N: 843675.46				
			BH10	E: 833537.47 N: 843675.33				

					• To collect undisturbed soil samples at 3.0 m and 4.0 m bgl			

Notes:

m bgl = meter below ground level.

(a) By experience, the exact sampling locations will be determined by on-site land contamination specialist and subject to adjustment due to site-specific conditions/ constraints (e.g. presence of underground utilities, foundations, insufficient headroom, spaces occupied by vehicles, etc) during the actual SI.

(b) Metals: For soil: Antimony, Arsenic, Barium, Cadmium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Tin, Zinc, Mercury, Chromium (III) and Chromium (VI); For groundwater: Mercury

(c) PCRs: C6 – C8, C9 – C16 and C17 – C35

(d) VOCs: For soil and groundwater: Acetone, Benzene, Bromodichloromethane, 2-Butanone, Chloroform, Ethylbenzene, Methyl tert-Butyl Ether, Methylene Chloride, Styrene, Tetrachloroethene, Toluene, Trichloroethene and Xylenes (Total)

(e) SVOCs : For soil: Acenaphthene, Acenphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, bis-(2-Ethylhexyl)phthalate, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Hexachlorobenzene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Phenol, and Pyrene; For groundwater: Acenaphthene, Acenphthylene, Anthracene, Benzo(b)fluoranthene, Chrysene, Fluoranthene, Fluorene, Hexachlorobenzene, Naphthalene, Phenanthrene, and Pyrene

7.9 Evaluation of Land Contamination Impacts

7.9.1 Based on the site appraisal findings, Area A, B1 and B2 were identified with potential land contamination concerns and proposed with a site investigation plan in a CAP as part of the EIA report. The land contamination issues are considered surmountable due to the following reasons:

Small and Simple Operation Scale in the Concerned Area

7.9.2 Based on the site appraisal, these potential contamination hotspots in the Area A, B1 and B2 were used as open storage / waste electric & metal products recycler, container storage, warehouses and temporary offices. These areas are typically used for goods storage with possibly small portion for potential contaminating activities such as chemical handling or storage. Therefore, it is anticipated the extent of land contamination, if any, would be localised.

Chemical of Concerns identified are treatable with existing remediation techniques

7.9.3 Based on the site appraisal, the identified Chemicals of Concerns (COCs) include metals, VOCs, SVOCs and PCRs. Remediation methods that have demonstrated to effectively treat the aforementioned soil and groundwater contaminants include biological treatment and physical / chemical treatment. Details of the treatment methods are provided in *Section 7* of the CAP given in **Appendix 7.3**.

7.9.4 In addition, the soil contaminated with the abovementioned COCs had successfully been remediated in Hong Kong using proven remediation techniques. Notable local remediation projects include the followings:

- Decommissioning of Kai Tak Airport North Apron;
- Decontamination works at the Cheoy Lee Shipyard;
- Reclamation works at North Tsing Yi Shipyard site;
- Decommissioning of Kwai Chung Incinerator; and
- Isolated sites in the Deep Bay Link project.

7.10 Cumulative Impacts

7.10.1 Referring to the latest information provided by DSD on the interfacing projects, the major concurrent projects include sewerage system upgrading works nearby Ping Che Road and drainage improvement works in Ping Yuen River. With the implementation of control measures during construction as presented in the Preliminary Environmental Review Reports of these concurrent projects, no adverse impact is anticipated. Considered the scale and nature of the concurrent projects, no adverse cumulative land contamination impact would be anticipated.

7.11 Recommendation of Further Works

7.11.1 Further works, including site re-appraisal for Project Area after land resumption, submission of supplementary CAP(s), SI works and Contamination Assessment Report (CAR(s)) / Remediation Action Plan (RAP(s)) and if contamination is detected, remediation works and Remediation Report (RR(s)), are recommended to identify the presence, nature and extent of contamination and, if necessary, to remediate the

contaminated soil and groundwater. Any soil/groundwater contamination would be identified and properly treated prior to the development of the Area A, Area B1 and Area B2.

7.11.2 Area A, Area B1 and Area B2 are still in operation could not be accessed for visual inspection at the time of preparing this EIA Report. Although the Project Area, excluding the Concerned Areas, is not identified as potentially contaminated sites during the course of this CAP study, the site is still in use. Change in land use could take place on this site, which may cause potential land contamination. Site re-appraisal for Project Area shall be conducted by future project proponent's land contamination specialists to identify the potential land contamination issues after land resumption.

7.11.3 For Area A, Area B1 and Area B2, the land contamination specialist shall conduct a review of this EIA Report to confirm whether the proposed SI works are still valid and provide fine adjustment of the sampling locations and number of boreholes according to the actual site condition. If new potential sources of contamination will be identified within the Concerned Area and/or Project Area during the re-appraisal, extra sampling points shall be proposed by the future project proponent's land contamination specialist. The land contamination specialist shall also observe and document any potential off-site land contamination impacts during the re-appraisal site walkover.

7.11.4 Site re-appraisal for Project Area shall be conducted by future project proponent's land contamination specialists to identify the potential land contamination issues after land resumption. Supplementary CAP(s) for Project Area shall be prepared by land contamination specialists to document the abovementioned re-appraisal, review the proposed sampling location(s) and outline the proposed sampling arrangement as well as testing parameters. The supplementary CAP(s) shall be submitted to EPD for review and agreement. After the agreement of the supplementary CAP(s) and upon completion of SI, the land contamination specialists shall prepare CAR to present findings of the SI works.

7.11.5 If contamination is confirmed, the CAR will be accompanied by a Remediation Action Plan (RAP). The CAR and RAP will be a combined report for EPD's agreement.

7.11.6 Upon completion of remediation works (if necessary), Remediation Report (RR) will be prepared and submitted to EPD for endorsement prior to commencement of any proposed construction works for subsequent developments.

7.12 Residual Impact Evaluation and Mitigation Measures

7.12.1 The potential land contamination issues are considered surmountable if the soil and groundwater contamination identified in further works will be properly treated using appropriate remediation techniques in accordance with approved RAP. After completion of soil and groundwater remediation, no residual impact in respect of land contamination on future users of the Project area is anticipated. No mitigation measures are recommended.

7.13 Conclusion

7.13.1 A land contamination assessment has been conducted for this Project. Suspected contaminative sites within the Project area were identified and considered as Concerned Area. Based on a review of historical information and current land uses,

the potential contamination hotspots in Concerned Area A, B1 and B2 were identified and 10 sampling locations were proposed for further SI. Findings of the site appraisal and proposed soil and groundwater sampling and testing plan are presented in the enclosed CAP in **Appendix 7.3**.

7.13.2 All the Concerned Area (i.e. Area A, Area B1 and Area B2) were still in operation and not accessible for site inspection and SI at the time of EIA. Although the Project Area, excluding the Concerned Areas, is not identified as potentially contaminated sites during the course of this CAP study, the site is still in use. Change in land use could take place on this site, which may cause potential land contamination. Further works including site re-appraisal for Project Area and submission of supplementary CAP(s), CAR(s) /RAP(s) and RR(s) shall be carried out by future project proponent to confirm whether the following SI locations will be still valid to reflect the land conditions. The further works shall follow EPD's Guidance Manual, Guidance Note and Practice Guide and according to **Section 7.11**.

7.13.3 Based on the land use types identified in the Concerned Area, these areas are typically used for goods storage with possibly small portion for potential contaminating activities such as chemical handling or storage. Therefore, it is anticipated the extent of land contamination, if any, would be localised.

7.13.4 The identified COCs in soil and groundwater, including metals, VOCs, SVOCs and PCRs, are readily treatable with biological treatment and physical / chemical treatment. In addition, the soil contaminated with the abovementioned COCs had successfully been remediated in Hong Kong using proven remediation techniques. With the implementation of further works, contaminated sites, if any, would be identified and the extent of contaminated soil / groundwater can be located and cleaned-up accordingly. No contamination causing insurmountable impacts to the future land users is expected.

END OF TEXT