

10.1 INTRODUCTION

This section presents a review of relevant background information, identifies the potential areas of concerns and a proposed programme for the investigation of potential land contamination issues of the Study Area.

10.2 ENVIRONMENTAL LEGISLATION AND CRITERIA

The EIAO-TM provides the legislative framework for the environmental assessment of designated projects. This document identifies a number of land uses (petrol stations, scrap yards, power plants, dumping ground, etc) as being Potential Contaminated Land Issues and, as such, the preparation of a Contaminated Assessment Plan (CAP) is required and a Contamination Assessment should be conducted if the former site uses are identified as a major concern.

The EPD's Practice Note For Professional Persons, *Contaminated Land Assessment and Remediation* (ProPECC PN3/94) provides guidance on the evaluation of contaminated land impacts. ProPECC PN3/94 requires the following tasks to be performed, with respect to potential land contamination, prior to the development of a site:

- provide a clear and detailed account of the present use of the land and the relevant past land history in relation to possible land contamination;
- identify areas of potential contamination and associated impacts, risks or hazards;
- as required, submit a CAP (including details of the proposed site investigation programme to evaluate key contamination concerns identified) to evaluate actual contamination conditions of soil and/or groundwater; and
- where the site investigation programme indicates a contamination concern, propose appropriate remediation and mitigation measures to remediate the site to the satisfaction of the EPD before the commencement of construction.

There are currently no standards for the cleanup of contaminated soil and groundwater in Hong Kong. In ProPECC PN 3/94, the Dutch Ministry of Public Housing, Land-Use and Environment Guidelines (1994) are used as a reference by the EPD as the criteria for determining whether the soil and groundwater concerned is classified as contaminated.

As specified in the EIAO-TM, the findings of site investigations, based on an endorsed CAP, should be used for the compilation of a Contamination Assessment Report (CAR). If land contamination is confirmed, a Remediation Action Plan (RAP) should also be prepared and submitted together with the CAR for approval by the EPD. The Project Proponent is required to complete all site remediation or clean-up actions based on the approved RAP, prior to any development or redevelopment of the site concerned.

10.3 DESCRIPTION OF THE ENVIRONMENT

10.3.1 Contamination Action Plan

A Contamination Assessment Plan (CAP) has been prepared for the project. The CAP is contained in *Annex I* of this report. The CAP provides the assessment methodology, results of the initial screening for potentially contaminated site, and the proposed site investigation programme. A number of borehole locations were proposed for the site investigation programme, as detailed in the CAP and *Table 10.7a*. Since the Study Team could not get access to most of these borehole locations within the timeframe of this EIA study, the proposed site investigation programme (locations and number of boreholes) contained in the CAP would be subject to review prior to the site investigation works.

10.3.2 Environmental Setting and Site History

The following basic background information has been reviewed for the environmental setting and historical uses of the Study Area:

- *Hong Kong Geological Survey Memoir No. 3*, covering geology of the Western New Territories.
- Hong Kong Survey Map negatives (1:600 scale) held at Lands Department.
- Outline Zoning Plans (OZPs) covering the Study Area.
- Aerial photographs from Lam Tei CN 13890 (6 June 1996), from San Hing Tsuen A32394 (14 Oct. 1992), from Tsz Tin Tsuen A32395 (14 Oct. 1992), from San Hing Tsuen 10353 (17 Dec. 1974), from Po Tong Ha 10354 (17 Dec. 1974), from Kei Lun Wai 10313 and 10319 (both dated 17 Dec. 1974).
- Sheet 5 and 6 of the Geotechnical Control Office Series HGM 20 (1986), Solid and Superficial Geology Maps.
- Hong Kong Ordinance Survey Maps (1:1000 scale) for the period from May 1980 to April 1992.

The review of the Series HGM 20 Solid and Superficial Geology Maps indicates that the land within the Study Area is comprised of Mesozoic volcanic rocks overlain by Quaternary superficial deposits.

The geology consists mainly of the Upper Jurassic Repulse Bay Volcanic Group. Locally, the rocks are generally classified as the Tuen Mun Formation and consist of undivided andesite with tuff and tuffite. One portion of the eastern study area contains block bearing tuff and tuffite. The volcanic rocks are overlain by Pleistocene debris flow deposits and terraced alluvium, and Holocene alluvium deposits cover gullies and other low lying erosional features. The thickness of the Quaternary sediments is not known but expected to be a maximum of 20 m, and average 10 m.

There is no significant groundwater usage in the area, except for local village wells, which are likely to be used primarily for irrigation purposes. Groundwater is generally not used in Hong Kong, but groundwater may be used for the development for flushing water.

A review of old survey plans and aerial photographs indicates that the Study Area has

comprised primarily village land and agricultural use during its history. However, there are a number of open storage areas and scrap yards.

Specific information was requested from the District Lands Office (DLO), District Planning Office (DPO), Fire Services Department (FSD) and EPD's Local Control Office, regarding the Study area and any historical records of land uses that have the potential to cause any contamination. Specific locations, where potential of land contamination has been identified, are discussed in the CAP, which has already been agreed with the EPD, in *Annex I*.

10.3.3 *Proposed Developments*

The Preferred Development Option for the Study Area have been described in detail in *Section 2* of this report. They include construction of residential blocks, schools, commercial centres and other community facilities.

As the Planning Study only serves the purpose of investigating the feasibility of the proposed developments, there is currently no definitive information regarding building construction details, such as the requirements for any excavations for foundation work or basement designs for the proposed buildings.

10.4 *IDENTIFICATION OF SENSITIVE RECEIVERS*

The sensitive receivers of potential land contamination impact arising from the proposed developments within the Study Area relate mainly to the potential exposure of site construction workers during demolition works, earth moving operations, the construction of building foundations, and the laying of services. The main exposure routes for site construction workers are inhalation of dusts and direct ingestion of contaminated soils through eating or smoking on site. However, as the majority of the proposed site is open, agricultural or village land, the potential impacts are considered minimal at this stage.

The impact on future users of the proposed developments and site maintenance workers involved in the maintenance of site services is also considered to be minimal as the site will be covered with buildings, concrete hardstanding or landscaped , thereby minimising contact with any potential contaminants present in the soil.

The presence of any phytotoxic levels of heavy metals in the soils may also impact upon potential landscaped areas. However, any impact can be minimised by the use of clean top soil.

10.5 *ASSESSMENT METHODOLOGY*

The assessment methodology for land contamination issues is presented in the CAP in *Annex I*.

10.6 *IDENTIFICATION OF POTENTIAL IMPACTS*

Based on the review of background information and observations during several site visits, a number of properties within the Study Area were noted to be open storage areas and vehicle maintenance facilities. Some areas were noted to store small volumes of chemicals in various drums and containers, and some properties had

visible staining and apparent contamination, which was suspected to be derived from the particular land uses.

Although these areas of concern and the contamination appeared to be localised, the implications for development relate to the following:

- Disposal of potentially contaminated soils which will arise during excavation of such areas in the development works. At present, there is no detailed design for the proposed development, nor estimate of the quantity of contaminated soils which will be generated in the works.
- Disposal of ground water where any excavations take place below the water table. At present, there is no detailed design for the proposed development, nor estimate of any locations where excavations will encounter groundwater. Likewise, there are no details available on the groundwater quality, but shallow groundwater may be encountered during the construction programme, and if contaminated, special handling and disposal will be required.
- Potential health risks to site construction workers during development works. This is likely to involve a short term risk, and as the majority of the works is likely to involve the use of mechanical excavators the potential interface with workers is not considered to be significant.
- Potential health risks to future site users. This is not considered to be a major concern as the potentially contaminated areas are small and localised, and works areas and the future developments will be built up or paved with hardstanding.

Typical contaminants associated with historic land use activities observed in the Study area are summarised in *Table 10.6a*.

Table 10.6a *Potential Contaminants Associated with Former Historical Land Uses*

Historical Use	Potential Site Contaminants	Comments
Scrap and container storage yards	Heavy metals, petroleum oils, possible acids	- Localised spillages
Vehicle maintenance and possible machining works	Oils, fuel storage, possible solvents, acids, degreasants	- Spillages from maintenance and dismantling of equipment - Localised areas of contamination - Possible presence of underground storage tanks
Timber yards and woodworking facilities	Oils, stains, wood preservatives and other treatment chemicals, creosote	- Localised spillages
Tannery	Acids, alkalis, phenolic compounds, heavy metals	- Localised spillages - Possible presence of storage tanks

The main contaminants in the Study Area are expected to be derived from container storage yards, container vehicle parks and vehicle repair workshops. The associated contaminants will comprise fuels, light and heavy petroleum oils, heavy metals, solvents, and possibly some acids. During the preliminary site inspection only small scale, localised staining was observed in the storage yard areas.

A description of general hazardous properties of typical compounds which may have been used or stored in the Study area is presented in *Table 10.6b*.

Table 10.6b *General Properties of Hazardous Substances Potentially Found in Storage Yards*

Typical Material	General Hazardous Properties
Petroleum hydrocarbons (including benzene, toluene, xylenes, and ethyl benzene - BTEX)	<ul style="list-style-type: none"> • Can be toxic by inhalation, ingestion and contact • Concentrations may be flammable
Oils, oily wastes	<ul style="list-style-type: none"> • Can be toxic by contact • Concentrations may be flammable
Thinners, solvents, degreasants	<ul style="list-style-type: none"> • Toxic by contact, inhalation and ingestion
Wood treatment chemicals	<ul style="list-style-type: none"> • Toxic by contact, inhalation and ingestion
Heavy Metals (including copper, chromium, lead, and zinc)	<ul style="list-style-type: none"> • Can be toxic by ingestion and contact • Most are toxic to fish, plants, and marine plants (especially copper) • Specific precautions may be required in relation to monitoring and dust control in site formation works
Acids	<ul style="list-style-type: none"> • Toxic and harmful by contact • Corrosive to metal, concrete
Polycyclic Aromatic Hydrocarbons (PAHs)	<ul style="list-style-type: none"> • Toxic by contact and ingestion

As indicated in *Section 10.3.2*, a number of locations have been identified to have the potential of impacts from land contamination. These are presented in *Table 10.6c* and discussed in detail in the CAP in *Annex I*. A plan of the Study Area showing these locations can also be found in the CAP.

Table 10.6c *Locations of Potential Land Contamination Concern*

Location No	Description	Potential Contaminants
1	Former container storage yard (currently vacant) along Tsz Tin Road	Petroleum hydrocarbons, oils, possible degreasers and solvents, heavy metals, and acids
2	Unprotected and uncontained container storage location on Tsz Tin Road	Petroleum hydrocarbons, oil, degreasers and solvents, paint, and thinner
3	Wai Shing Motor Services yard at Lot 230, Tsz Tin Tsuen	Petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, acids, paint, thinners, lacquer
4	Lee Ki Woodworking and Sawmill at Tsz Tin Tsuen	Petroleum hydrocarbons, oils, stains and wood finishes, wood preservatives and treatment chemicals
5	Drum storage area for Kin Kat Waste, Waste Paper and Alloy Company at the end of an unpaved track adjacent to the Tsing Lun Nullah	Petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, acids, paint, thinners, stains and wood finishes, wood preservatives and treatment chemicals
6	Vacant lot on Hong Po Road where former existence of a tannery is suspected (not presently confirmed)	Petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, acids, alkalis, and phenols

Location No	Description	Potential Contaminants
7	Above ground fuel tanks and vehicle maintenance area on Hing Kwai Road	Petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, and acids
8	Open storage and vehicle service areas north of Po Tong Ha	Petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, and acids
9	PCL container storage yard on Hing Kwai Road	Petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, acids, possible wood preservatives and treatment chemicals

10.7

EVALUATION OF IMPACT

The EIA Study Team have encountered extreme difficulties with regard to site access for the recommended on-site contamination investigations. A review of the land status of borehole locations proposed in the CAP indicates that eight of the nine proposed locations for intrusive investigation are within private land lots. Details are presented in *Table 10.7a*.

Table 10.7a *Land Status of Proposed Borehole Locations*

Borehole No.	Land Status
1	Private land (within Lot No. 606)
2	Government land (abutting Tsz Tin Road)
3	Private land (within Lot 272)
4	Private land (within Lot 305)
5	Private land (within Lot 364RP)
6	Probably within private land (Lot 377RP)
7	Private land (within Lot 817RP)
8	Private land (within Lot 65)
9	Private land (within Lot 785)

Any investigation work on private land is subject to access approval/agreement by the owner of the land, at present, the Study Team could not gain site access within the time constraints of the Study. Site access problem, however, would be automatically resolved with the completion of the land resumption process during the early stages of the Implementation Programme.

For the above reasons, it is proposed that the on-site contamination investigations specified in the CAP, and any additional investigation work that may be identified by the findings of the investigations specified in the CAP, should be conducted as part of the Implementation Programme before the commencement of any site clearance works. A CAR should be compiled, upon completion of all relevant site work and laboratory analyses of soil and/or groundwater samples, to assess the presence of any land contamination and the associated environmental impacts. If site contamination is confirmed, a RAP should be compiled and submitted for approval by the EPD. The

preparation of these reports and any remediation action that may be required should all be conducted prior to any site clearance works, in accordance with the requirements of the EIAO-TM.

10.8 *MITIGATION OF ADVERSE IMPACTS*

Subject to the findings of the CAR to be prepared and the need of a RAP, the following generic measures can be adopted to limit potential effects in the event that contaminated soils are identified within the Study Area:

- bulk earth moving equipment should be used to minimise the potential interphase with site construction workers;
- exposure to any contaminated materials present should be minimised, and where there is contact, appropriate clothing and personal protective gear such as gloves should be worn, adequate hygiene and washing facilities should be provided, and smoking and eating during such activities should be prevented;
- the contractor should ensure that rainfall and surface run-off is diverted around any areas currently being worked, minimising groundwater volumes requiring disposal;
- consider the use of clean imported top soil in areas to be used for landscaping;
- prohibit stockpiling of contaminated soils and excavated materials, and sheeting of vehicles/lorries containing any contaminated materials to limit potential dust emissions or contaminated waste run-off under wet conditions; and
- clean topsoil and soil should be used in areas to be developed for landscaping to prevent any phytotoxic impacts on landscaped materials.

10.9 *ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS*

The requirements for environmental monitoring and audit with respect to land contamination should be determined and agreed with the EPD upon completion of all relevant site investigation work, which is proposed to be conducted immediately after land resumption and before commencement of any site clearance works as part of the Implementation Programme.

10.10 *CONCLUSIONS*

A Contamination Assessment Plan (CAP) has been prepared for the project. The CAP is contained in *Annex I* of this report. The CAP provides the assessment methodology, results of the initial screening for potentially contaminated site, and the proposed site investigation programme. A number of borehole locations were proposed for the site investigation programme, as detailed in the CAP and *Table 10.7a*. Since the Study Team could not get access to most of these borehole locations within the timeframe of this EIA study, the proposed site investigation programme (locations and number of boreholes) contained in the CAP would be subject to review prior to the site investigation works.

