
7. LAND CONTAMINATION

7.1 Introduction

This Chapter presents an assessment of the potential for the occurrence of ground contamination along the route of the YLH and thus the potential implications for alignment widening.

This contamination assessment has been carried out in accordance with Annex 19 of the EIAO and as such considers both existing and historical land uses along the highway footprint.

7.2 Environmental Legislation and Non-Statutory Guidelines

The assessment of contaminated land in Hong Kong is currently undertaken in accordance with the following documents:

- Environmental Protection Department (1994) Practice Note for Professional Persons on Contaminated Land Assessment and Remediation. ProPECC PN 3/94;
- Environmental Protection Department (1999) Guidance Note for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards and Car Repair/Dismantling Workshops; and
- Annex 19 of the EIAO.

Annex 19 of the EIAO identifies a number of land uses, which have the potential to cause land contamination – uses include, but are not limited to, the following:

- oil installations including oil depots and petrol filling stations;
- gas works;
- power stations;
- shipyards/boatyards;
- chemical manufacturing/processing plants;
- steel mills/metal workshops;
- car repairing and dismantling workshops; and
- dumping grounds and landfills.

If any of the above land uses (or other potentially contaminative land uses) are identified as part of the EIA Study, a Contamination Assessment Plan (CAP) should be submitted to the Director for endorsement prior to conducting a contamination assessment of the site.

Based upon an endorsed CAP, the applicant should conduct a contamination assessment and compile a Contamination Assessment Report (CAR) for the Directors review. During the preparation of the CAR, if land contamination is confirmed, a Remediation Action Plan (RAP)

should be prepared. The RAP and the CAR should be submitted as a combined report to the Director for approval, referencing the corresponding CAP. Upon approval of the CAR/RAP, the applicant should clean up the contaminated site prior to redevelopment. The preparation of the CAP, CAR and RAP should be based upon the guidance specified in ProPECC PN 3/94 and the EPD Guidance Note dated 1999, referenced in Section 7.2 above.

ProPECC PN 3/94 defines the objectives of a land contamination study, criteria and guidance for evaluating different levels of contamination. Under ProPECC PN 3/94 an evaluation of the following issues should be made prior to site development:

- an account of the present land use and the relevant past land history in relation to possible land contamination;
- identification of potential land contamination and associated impacts, risks or hazards;
- as required, submission of a plan to evaluate actual contamination of soil and groundwater, including details of the proposed site investigation programme to evaluate key contamination concerns identified; and
- where the site investigation programme indicates a contamination concern, remediation and mitigation measures are required to remediate the site to the satisfaction of EPD before the commencement of construction activities.

There are currently no standards for the clean up of contaminated soil and groundwater in Hong Kong. As outlined in ProPECC PN 3/94, in the absence of specific legislation regarding clean up of soils and groundwater, the Dutch Ministry of Public Housing, Land-Use and Environment Guidelines (1995) are used as a reference criteria by EPD for evaluating contaminated material.

7.3 Assessment Methodology

The objective of this assessment is to identify and evaluate the potential for soil contamination along the YLH alignment and if required, develop an assessment plan to determine the extent of any contamination present. In order to achieve this the following has been undertaken:

- review of the current and historical land use of the site to evaluate whether there is the potential for any soil or groundwater contamination to have occurred;
- assess any potential environmental impacts arising as a result of land contamination or during future use of the land; and
- site visits to confirm land uses and likely impacts of any land contamination identified.

In order to achieve the above, the following sources of information have been collated and reviewed:

- road alignment maps;
- Hong Kong Government Survey maps along the alignment;
- aerial photographs of the alignment;

- selected Outline Zoning Plans (OZPs) along the alignment;
- Hong Kong Geological Survey Memoirs;
- Hong Kong Geological Survey Solid and Superficial Geology Series maps;
- correspondence with relevant government departments; and
- “The Geochemical Atlas of Hong Kong” by RJ Sewell (GEO, CED 1999).

In addition to the above, site visits were undertaken on the 23-24 June 1999 along the road alignment to confirm land uses and identify potential land contamination sources.

7.4 Baseline Conditions

7.4.1 Geology and Superficial Deposits

The route of the YLH crosses widely varying terrain encompassing the foothills to the Tai Lam Country Park and several alluvial floodplains, resulting in a broad variation in both the type and character of the solid geology and superficial deposits beneath the route.

The Hong Kong Geological Survey Sheet 6 shows the lower lying areas beneath the route at Fu Tei and across the Yuen Long floodplain to be underlain by both recent (Holocene) alluvium and terraced alluvium from the Holocene and Pleistocene eras respectively of the Quaternary age. The recent Holocene deposits broadly follow existing drainage courses and are described as well sorted to semi-sorted clays/silts, sands and gravels. Deposition of the terraced alluvium has been widespread across the Yuen Long floodplain and on the margins of the foothills which the route traverses. This material is described as a well sorted to semi-sorted gravelly sandy clay/silt.

Recent debris flow deposits, also from the Pleistocene era of the Quaternary age, are present on the foothills. These materials are described as unsorted clayey and gravelly silt/sand with cobbles and boulders. Drillholes sunk beneath the route to the south of Yuen Long show the alluvium to be underlain by ancient debris flow deposits. This ancient deposit varies from soft to firm sandy silty clays through to medium dense to dense clayey silty sands with angular rock fragments.

The solid geology under the route consists of volcanic rocks and granite intrusions of Jurassic to Cretaceous age and metamorphic rocks which include marble of Carboniferous age. Interbedded siltstone, sandstone and marble-bearing tuff breccia and tuffs of the Repulse Bay Volcanic Group are present at the Fu Tei interchange. As the route proceeds westwards, it crosses over and straddles interbedded metasiltstones and metasandstones of the Lok Ma Chau formation along the base of the foothills before passing through intrusive granites of Mesozoic age. Where the route descends onto the Yuen Long floodplain near Tong Yan San Tsuen, the solid geology reverts to interbedded metasiltstones and metasandstones of the Lok Ma Chau formation over a short section. The majority of the remaining route to the south of Yuen Long is underlain by marble and interbedded marble of the Yuen Long formation. Near Shap Pat Heung the bedrock is a coarse ash crystal tuff of the Tai Mo Shan formation.

The geological characteristics of the site have an impact upon the naturally occurring heavy metal content of the overlying soils and river sediments. As illustrated in the Geochemical Atlas of Hong Kong (GEO, CED 1999) river sediment in the Yuen Long area has relatively low

concentrations of arsenic (<28ppm), cadmium (<0.22ppm), copper (<18ppm), mercury (<0.2ppm) and zinc (<144ppm), whilst concentrations of chromium, lead and nickel can be found at locally elevated levels.

7.4.2 Land Uses

A review of aerial photographs indicates little or no land use that appear related to any of the potential significant contaminated land uses defined in Section 7.2 along the alignment of the YLH. Development within the “P” zone at San Hei Tsuen to the north of YLH and the “I(D)” zone at Tong Yan San Tsuen to the south of YLH on the Tong Yan San Tsuen OZP may lead to land contamination.

However, during a detailed walk over site survey the following potential land uses in the vicinity of the YLH have been identified that could feasibly lead to land contamination (refer to **Table 7.1** and **Figure 7.1**).

Table 7.1 Potential Contaminative Land Uses Along the Alignment

No	Land Use	Location
1	Car Repair Workshop	To Yuen Wai
2	Car Repair Workshop	Fuk Hang Tsuen
3	Woo Lei Iron Works Co	Tsoi Yuen Tsuen
4	Temporary Metal Workshop	Tsoi Yuen Tsuen
5	Car Repair Workshop	Tsoi Yuen Tsuen
6	Screw Factory	San Hei Tsuen
7	Hop Hing Industrial Building	San Hei Tsuen
8	Car Spare Parts Company	Tong Yan San Tsuen
9	A-Chow Engineering Co Ltd	Tong Yan San Tsuen
10	Kam Wah Hong Construction Material Co	Tong Yan San Tsuen
11	Sun Luen (Hing Kee) Machine Factory Co Ltd	Tong Yan San Tsuen
12	Ho Wing Kee Iron Works	Tong Yan San Tsuen
13	Leung Kai Iron Works	Tong Yan San Tsuen
14	Kwong Fat Chemicals and Dyestuffs Co Ltd	Tong Yan San Tsuen
15	Building Material Production Yard	Lung Tin Tsuen

Table 7.1 and **Figure 7.1** illustrate that there are several land uses that may have the ability to cause land contamination. These premises are mainly car repair workshops and metal working premises in the southern and central parts of the YLH.

7.5 Potential for Site Contamination and Contamination Characteristics

As illustrated in Section 7.4, there are a number of land uses in the vicinity of the YLH that could feasibly result in land contamination. Contaminants associated with the main land uses identified above are illustrated in **Table 7.2**.

Table 7.2 Contaminants Associated with Identified Potentially Contaminative Land Uses Along the Alignment

Land Use	Contaminants	Characteristics
Metal workshop	Heavy metals such as Cu, Cd, Cr, Fe, Hg, Ni, Zn	If contamination is present, it is most likely to be isolated to the surface soil

Land Use	Contaminants	Characteristics
	Oil and fuel residues Solvents and degreasing agents	horizon unless there have been major solvent/fuel spillages
Car repair workshops	Heavy metals such as Cu, Cd, Cr, Fe, Hg, Ni, Zn Oil and fuel residues Paint residues Asbestos from brake linings	Contamination likely to be confined to surface horizons unless there has been fuel spillages
Chemical and dye works	Organic and inorganic chemicals Metals and metalloids Chlorinated solvents Bonding agents Water repellents Flame retardants Soaps and detergents Pesticides	The potential for ground contamination is dependent upon site practices, chemical handling procedures and spill history

7.6 Implications for Road Development

It has been identified that there are a number of isolated potentially contaminated land uses in the vicinity of the YLH. However, the YLH widening scheme will not extend beyond the existing road reserve (which is a minimum of 20m from the proposed works) therefore, the road widening scheme will not encroach upon any of these identified land uses which have the ability to cause land contamination. It is not anticipated that contaminated material will be encountered during the road widening construction phase and thus there are minimal implications with respect to construction worker exposure to contaminated material and contaminated material disposal.

7.7 Investigation Requirements

Given that the YLH widening scheme is not anticipated to impinge upon any of the identified contaminative land uses, a detailed contaminated land site investigation prior to the works is not deemed necessary.

7.8 Conclusions

There are a number of land uses adjacent to the YLH that, according to Section 3.1 of Annex 19 of the EIATM, have the ability to cause land contamination. The proposed widening scheme is not anticipated to extend beyond the road's existing reserve and thus impinge upon these potentially contaminated plots of land. Therefore, it is considered that the potential for impacts upon site workers during the construction of Yuen Long Highway is insignificant and a CAP or further measures are not recommended.