

10. LAND CONTAMINATION

10.1 Introduction

This Section reviews the potential environmental issues associated with land contamination. It presents an assessment of the environmental concerns relating to the potential for soil and groundwater contamination, specifically in regard to:

- the past and current uses of the site areas of the alignment and surrounding land within the consultation zone; and
- the exposure of potential contamination sources during development of the Route 10 (NLYLH), including tunnelling and excavation works.

The potential environmental impacts and health concerns arising as a result of the development are discussed. Preliminary environmental control measures, where necessary, are also outlined.

10.2 Environmental Legislation and Non-Statutory Guidelines

Assessments of land contamination sources and the potential impacts to particular development projects are investigated under the EPD's direction and oversight in accordance with the TMEIA and Practice Note for Professional Persons (*ProPECC PN 3/94*), *Contaminated Land Assessment and Remediation*.

Annex 19 of the TMEIA identifies a number of land uses, including petrol stations, storage and scrap yards, power plants, and dumping grounds, as being Potential Contaminated Land Issues. It provides guidance on developing a framework for Contamination Assessment Plan (CAP) and Remedial Action Plan (RAP) for these potential high land contamination areas.

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

- an account of the present land use and the relevant past land history in relation to possible land contamination;
- identification of potential 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 for 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. As outlined in *ProPECC PN 3/94*, and in the absence of any specific legislation regarding cleanup of soil and groundwater contamination, the Dutch Ministry of Public Housing, Land-Use and Environment Guidelines (the Dutch Guidelines) (1994) are used as reference criteria by the EPD for evaluating what is classified as contaminated soil and groundwater.

10.3 Baseline Conditions

10.3.1 Assessment Methodology

The objectives of this study are to identify and evaluate the potential soil and groundwater contamination issues along the Route 10 (NLYLH) (Southern Section). and, if required, to develop an assessment plan for determining the extent of any contamination prior to commencement of construction.

The assessment has been undertaken by conducting:

- a review of the current and historical land use of the sites to evaluate whether there is the potential for any soil and ground contamination to have occurred;
- an assessment of any potential environmental impacts or health concerns arising as a result of land contamination, or during future use of the land arising as a result of exposure to any potentially contaminated sources; and
- visits to confirm the land uses and likely potential impacts that may cause land contamination.

Sources of Information

During this study reference to the following sources of information was made:

- *Hong Kong Ordinance Survey* maps along the proposed alignment;
- selected aerial photos along the alignment route;
- selected Outline Zoning Plans (OZP's) along the alignment;
- Hong Kong Geological Survey Memoirs No. 3 and No. 6, covering geology along the alignment;
- Hong Kong Geological Survey Solid and Superficial Geology Series maps 6 (Yuen Long) and 10 (Silver Mine Bay) along the route;
- correspondence with Government Departments, including the Highways Department, Lands Department, EPD, Planning Department, Territory Development Department, and Fire Services Department; and
- selected site visits.

10.3.2 Environmental Setting

Geology and Hydrogeology

A review of the subsurface geology of the overall alignment route indicates that the solid geology of eastern Lantau Island is dominated by rocks of the Upper Jurassic - Lower Cretaceous Repulse Bay Volcanic Group, which cut fine to medium grained Mesozoic granites forming the Northeast Lantau Pluton. Superficial deposits of Quaternary age are present on the slopes, hills and valley areas on the island margins. These consist mainly of debris flows and alluvium.

Across the Ma Wan channel, the geology of the New Territories consists of Upper Jurassic - Lower Cretaceous, megacrystic fine to medium grained granite of the Tai Lam Pluton. As with the island sequences, superficial deposits of Quaternary debris flows and alluvium are found on slopes and in fans in valleys.

Northeast-trending faults and dykes dominate the entire area.

Although an undifferentiated layer of surficial soil deposits (i.e. alluvium) was noted for most alignment areas, there was no major concern of migration of contamination, as no contaminating industries were noted in the area.

There is no major groundwater usage near the alignment except for local village wells, which are likely to be used primarily for irrigation purposes. Groundwater is generally not used in Hong Kong.

Land Uses and Land Use History

Review of historical survey maps and aerial photographs indicated little or no land uses that appeared to be related to any potentially significant contaminating land use within the alignment or proposed works area. The alignment runs mainly through land that is, and historically has been, vacant and undeveloped. This was confirmed through site visits. Review of aerial photographs indicated a number of lots in the vicinity of the villages of Tai Lam Cheung Tseun/Luen On San Tsuen, to the southeast of Siu Lam, and to the south of So Kwun Wat, in use for trailer storage and truck maintenance. These activities generally began in the mid 1980s. However, none of these properties was located within the proposed alignment. The site visits confirmed that most of the trailer storage yards are paved with concrete, thus reducing any potential concern of contamination migration. The aerial photographs reviewed are listed in *Table 10.1*.

Table 10.1 Aerial Photographs Reviewed

Date/Year	Photograph	Height (ft)
8 Feb 1999	CN22671 / CN22672 / CN22673	4,000
8 Feb 1999	CN22659 / CN22660 / CN22661 / CN22662	4,000
5 Mar 1998	CN19525 / CN19526 / CN19527	4,000
27 Sept 1995	CN11386 / CN11387	3,500
26 Sept 1995	CN11085 / CN11086	3,500
26 Sept 1995	CN11099 / CN11100	3,500
26 Sept 1995	CN11010 / CN11011 / CN11012 / CN11013	3,500
6 Dec 1990	A24938 / A24939 / A24940	4,000

Date/Year	Photograph	Height (ft)
26 Nov 1990	A24963 / A24964 / A24965	4,000
26 Nov 1990	A23555 / A23556 / A23557	4,000
20 May 1990	A2323 / A2324	4,000
2 Oct 1985	67634 / 67635 / 67636 / 67637	4,000
2 Feb 1985	A269 / A270 / A271 / A272	4,000
Note: Aerial photographs reviewed for indications of major land use changes, or evidence of contamination. Survey maps were also reviewed from 1996 (6-SE-21A and -21B), 1993 (6-SW-25B and -25D), 1992 (6-SW-18A, -19A, and -19C), and 1991 (6-SW-18B and -18D).		

Correspondence with the Government Departments did not indicate that there were any existing land uses within the study area that would or could have resulted in land contamination. This included the North Lantau Island, Tsing Lung Tau, Siu Lam and the So Kwun Wat areas. The Planning Department in Tuen Mun/Yuen Long, however, noted potential contaminating land uses (*ref: () in PDYL 1/110/3A*), including workshops in the So Kwun Wat Tsuen village and north-east of Siu Lam. However, site visits to these properties did not reveal any land uses likely to cause land contamination.

The location where the alignment makes landfall west of Dragon Beach (from the Ma Wan Channel crossing from Kwai Shek to Tsing Lung Tau) and prior to the tunnel portal at Tai Lam Chung Tunnel was zoned as "undetermined." However, this land was previously a quarry and is expected to be used as a staging or work site in the construction phase.

The alignment will cut across existing lands which primarily include cultivated or fallow agricultural land, vegetated open areas, portions of Tai Lam County Park, and villages which are zoned as "Residential (R)" or Village Type Development (V)".

10.3.3 Sensitive Receivers

There are no significant sources of land contamination noted. In the absence of contaminating land uses, the main sensitive receivers associated with these aspects will relate to the potential exposure of site construction workers to contamination during construction.

The main exposure routes for site construction workers are inhalation of dust and direct ingestion through poor hygiene practices, such as 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. In addition, excavation work is likely to be limited.

During operation road users or site maintenance workers will have low exposure to any contamination as the highway will be in fully lined tunnel, on raised viaduct, or covered concrete hardstanding or landscaped, thereby minimising any potential contaminants that might be present in the soil.

10.4 Construction Phase

10.4.1 Potential Sources and Assessment of Impacts

As stated in Section 10.3.2 and 10.3.3, no significant industrial activities have been identified on the land along the alignment. Impacts relate primarily to excavation and tunneling works. The principal area of concern is the potential contamination of surface water arising from runoff generated by the use of dust suppression equipment during excavation. The potential impacts from contaminated soil and groundwater, if present, are discussed below.

Health Risk to Site Workers

Site construction workers may possibly become exposed to contaminated soils and groundwater during earth moving operations and the construction of tunnels, foundations or underground services. The main exposure routes for site construction workers would be direct ingestion of contaminated materials through poor hygiene and eating or smoking on site, or through direct contact with potentially toxic or harmful contaminants which may be in soils and sediments.

Although no industrial or contaminating land uses were noted in the alignment area, typical contaminants associated with the main industrial land use activities generally noted throughout Hong Kong are summarised in *Table 10.2*.

Table 10.2 Potential Contaminants Associated with Industrial 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

A description of general hazardous properties of typical compounds arising from such land uses is presented in *Table 10.3*.

Table 10.3 General Properties of Hazardous Substances

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

Disposal of Soils and Sediments

All construction works will be required to follow appropriate practices. If contaminated soils or sediments are identified during the construction of the works, they will be disposed of in a manner agreed by the Waste Facilities Management Group of the EPD. Disposal arrangements could include pre-treatment, off site disposal at an appropriate site that is licensed to accept 'contaminated' soils, or disposal as contaminated mud. The actual type(s) and concentration of specific contaminants, the relevant toxicity characteristic leaching procedure (TCLP) data and the volume involved will determine the actual disposal requirement.

Currently, the SENT Landfill site is the only facility in Hong Kong which is licensed to accept contaminated soil, although acceptance is on a case by case basis, based upon the specific contaminants and TCLP data. It should also be noted that landfill disposal will be considered as a last resort only, due to the extremely limited landfill space available in Hong Kong. As such, all other disposal options or alternatives must first be examined, such as appropriate treatment of the spoil for potential reuse as fill, or identification of alternative disposal locations.

Groundwater Disposal

Disposal of groundwater is not expected to be an issue. Where any excavation activities take place below the water table, the works area must be dewatered for safety and construction purposes. Groundwater will need to be disposed of in an appropriate manner and to ensure compliance with the *Water Pollution Control Ordinance (WPCO)*.

10.5 Operational Phase

During the operational phase, there is little potential for impact associated with any contaminated sediments.

10.6 Environmental Control Measures

The following typical practices and environmental control measures are recommended to limit potential effects in the event that any contaminated soils and/or groundwater were identified during construction:

- bulk earth moving equipment should be used to minimise the potential interface 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 water volumes requiring disposal; and
- prohibit stockpiling of any 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.

10.7 Conclusions

Following review of relevant background information, desk top studies, and site visits, there has been no positive identification of potential areas of concern with regard to land contamination.

In accordance with *ProPECC PN3/94*, an account of the present land uses does not indicate any contaminating uses of concern. Land use is primarily village type developments, agricultural, or undeveloped. Potential contamination and associated impacts are noted to be minimal based upon these land uses, thus it is judged that no CAP is required for this assignment.