



Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management in Hong Kong

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Introduction

This consultation paper introduces a new "Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management" accompanied by a supplementary Background Document on its development. The RBRGs are a set of newly developed contaminated land assessment and remediation standards specific to Hong Kong conditions. These new standards have been derived for different types of land use based on the potential risks to local human receptors. The main purpose of this paper is to seek stakeholders' views on the use of these new standards.

Background

Land may become contaminated when there is spillage, leakage or disposal of toxic chemicals to the ground at commercial or industrial operations such as petrol-filling stations, boatyards or car repair / dismantling workshops (Figures 1, 2 and 3). Soil at or below the ground surface, and sometimes groundwater as well, may be contaminated depending on the subsurface conditions. To determine if a piece



Figure 1

of land is classed as contaminated, certain standards would need to be put in place. Historically, Hong Kong has no locally-derived standards for land contamination assessment. The Dutch B levels in ProPECC PN3/94 – Contaminated Land Assessment and Remediation have been used as reference standards since 1994.

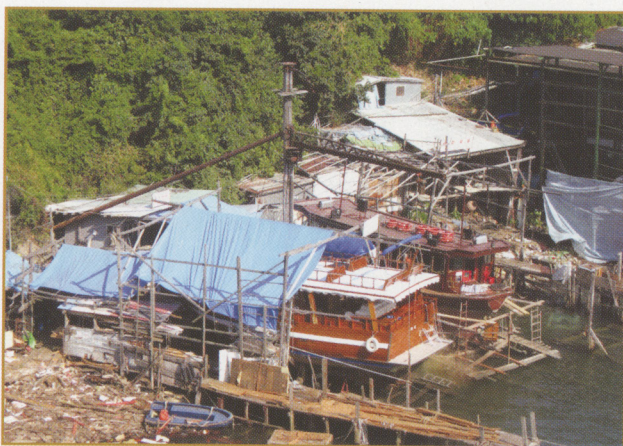


Figure 2



Figure 3

Before a potentially contaminated site is to be re-developed, or handed back from a tenant / purchaser / allocatee to the Government, site investigation which comprises collection and laboratory analysis of soil and groundwater samples is necessary to confirm the presence or absence of contaminants. The site investigation results are then compared with the Dutch B levels to assess if the site is considered as contaminated. For a contaminated site, the affected soil and / or groundwater is required to be restored to at or below the Dutch B levels unless it is completely isolated to render it harmless to public health.

We now propose a set of locally derived standards specific for Hong Kong to replace the Dutch B levels. The new standards, RBRGs, have been developed specifically for different types of land use in Hong Kong based on the risk to local human receptors. It should be pointed out that the replacement of the existing Dutch B levels with RBRGs concerns the contamination standards only; the existing contaminated land investigation and remediation practices or requirements in Hong Kong remain unchanged.



Reasons for Replacing the Dutch B Levels with RBRGs

The Dutch levels were developed many years ago specifically for use in the Netherlands to protect human, plants and animals under any type of land use ("good for all use" principle) and groundwater for potable purposes. As the Netherlands has conditions very different from those in Hong Kong, there is a need to develop contaminated land standards that are tailor-made for local conditions. Besides, the Dutch government has completely revamped the Dutch levels and recently developed a new set of risk-based Dutch standards in a manner similar to what we now propose in this paper.

In fact, the worldwide trend (e.g. USA, Canada, UK, EU and Australia) is to adopt standards that are risk-based, i.e. decisions on defining a site as contaminated, and hence the level of remediation required, are made based on the potential risks to receptors. Use of a risk-based approach means that management of contaminated land will be based on the nature and extent of the potential risks to receptors as a result of their exposure to toxic chemicals in the soil and / or groundwater. This approach basically acknowledges that there is an acceptably low level of exposure to contaminants, which poses negligible risks to the receptors. This level of negligible risk is quite well defined and does not vary a great deal from country to country. To protect human health, it is commonly set at an excess life time cancer risk of one in a million for chemicals that cause cancer, and at a hazard quotient of unity for chemicals that cause health effects other than cancer (please refer to the attached Guidance Manual for explanation of the risk level). In contrast to risk-based standards, the Dutch B levels currently used in Hong Kong are generic standards that apply to all sites equally with no consideration of risk. These levels therefore tend to be arbitrary and have the potential to be over-conservative.



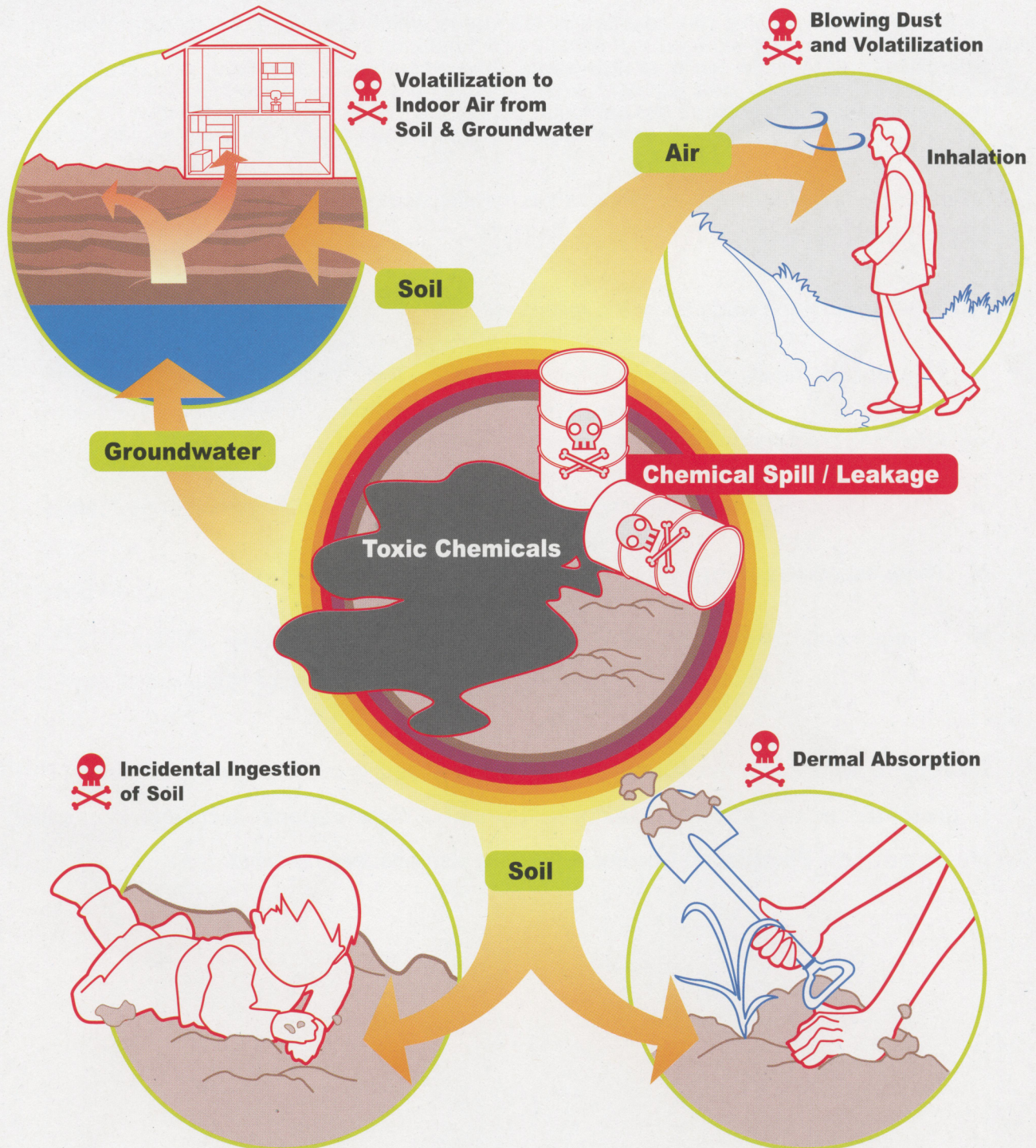
Following the risk-based approach, we have derived a set of RBRGs specifically for Hong Kong to protect the human receptors. Unlike the Dutch levels, we have not taken into account the protection of plants and animals in our derivation of RBRGs as it is not considered necessary for brownfield sites under the local context. Also, the need to protect groundwater for potable use, as in the Dutch case, is not considered relevant since there is minimal possibility of using groundwater for drinking purposes in Hong Kong. Another main difference between the Dutch levels and our RBRGs is that we have different sets of standards specific for different land uses ("fitness for use" principle) to cover different source-pathway-receptor scenarios, thus resulting in more cost effective and efficient contaminated land assessment and remediation. The source-pathway-receptor concept is explained in the following paragraph.

For a toxic chemical to adversely affect a human receptor, there has to be a source of the chemical, e.g. contaminated soil and / or groundwater, a transport medium to carry the chemical to where the receptor is, and an entry route whereby the chemical can actually enter the body of the receptor (e.g. through the skin, inhalation or ingestion). The term source-pathway-receptor, commonly known as the exposure pathway, is used to describe the course a chemical takes from its source to reach an individual and adversely affect the health of the individual (*Figure 4*). It is obvious that there are different exposure pathways for different types of land use which represent different physical settings. Also, the ways in which people come into contact with contaminated soil and / or groundwater, including the intensity and frequency of their contact, are largely dependent on the type of land use. It was therefore necessary to identify the relevant land use scenarios in Hong Kong and develop a set of risk-based standards for each land use. In comparison to the Dutch levels that are applicable to all types of land use and therefore by nature conservative, the RBRGs derived to suit different land uses and exposure scenarios are more rational, able to meet the objective of "fitness for use" principle, and provide a safe level of protection of public health.



Figure 4

Exposure Pathways



Relevant overseas methodologies were used in establishing our RBRGs with input of local data as far as possible. This has resulted in standards which are more objective, consistent, and scientifically defensible while at the same time ensuring a safe level of protection to the receptors, taking into account the particular conditions that apply in Hong Kong.

Scope of RBRGs for Hong Kong

The RBRGs for Hong Kong cover the following:

- ▶ Fifty four chemicals of concern
- ▶ Adult and child exposure scenarios
- ▶ Four kinds of land use (urban residential, rural residential, industrial and public parks)
- ▶ Three exposure pathways
- ▶ Environmental media of concern including both soil and groundwater

A further explanation of the risk-based approach and details of the proposed numerical RBRGs is presented in the attached Guidance Manual. More in-depth technical information is presented in the Background Document which is also attached herewith.

Consultation

We welcome comments on the attached documents and especially views on (i) use of locally derived RBRGs in preference to the Dutch B levels currently being used, and (ii) the derivation methodology presented in the supplementary document.

Comments and enquiries on the consultation documents may be sent in writing to the following by post, fax or e-mail before **8 December 2006**.

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如對本諮詢文件有任何意見或查詢，
請於十二月八日之前以書面方式郵
寄、傳真或電子郵件聯絡我們。

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Please note that the Government would wish, either in discussion with others or in any subsequent reports, whether privately or publicly, to be able to refer to and attribute comments submitted in response to the consultation documents. Any request to treat all or part of a response in confidence will be respected, but if no such request is made, it will be assumed that the response is not intended to be confidential.

Environmental Protection Department
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