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For Information

Risk-Based Remediation Goals as Contaminated Land Standards for Hong Kong

PURPOSE

This paper informs Members of the Environmental Protection Department's proposal to replace the existing contaminated land standards (based on the Dutch B levels) with Risk-Based Remediation Goals (RBRGs) that have been derived specifically for Hong Kong, and the consultation plan that has been put in place in relation to the proposal.

BACKGROUND

2. Land becomes contaminated when there is spillage, leakage or disposal of toxic chemicals to the ground. Soil at or below the ground surface, and sometimes groundwater as well, may be contaminated depending on the subsurface conditions. To determine objectively if a piece of land is 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 referenced in ProPECC PN3/94[1] – Contaminated Land Assessment and Remediation have been used up to the present. The Dutch levels were considered comprehensive in terms of coverage of parameters and were the most commonly used reference worldwide at that time. When a site is classified as contaminated based on the Dutch B levels, the contaminated soil and/or groundwater is required to be cleaned up to meet the Dutch B levels unless the affected soil or groundwater will be completely isolated to render it harmless to public health.

3. The Dutch B levels were developed many years ago in the Netherlands to protect humans, local plants and animals under any type of land use (i.e. a "good for all use" principle) and the groundwater for potable purpose. Since the Netherlands has very

[1] Professional Persons Environmental Consultative Committee - Practice Note for Professional Persons No. 3/94, dated 1994.

different conditions from Hong Kong, there is a need to develop contaminated land standards that are tailor-made for local conditions. Besides, the Dutch government recognized the obsolescence of the Dutch levels in light of the international trend of adopting a risk-based approach to contaminated land assessment and remediation. They had subsequently replaced the Dutch B levels with a new set of risk-based contaminated land standards in 2000.

4. The worldwide trend is for each country to adopt country-specific standards to suit local environmental conditions. These overseas standards are derived using a risk-based methodology, i.e. standards are set such that the decisions on defining a site as contaminated, and hence the level of remediation required, are made based on the potential risk to receptors. The United States (US) Environmental Protection Agency pioneered the application of chemical risk assessment principles and procedures to evaluate contaminated sites under their Superfund Program in the 1980s. Other countries (mainly Canada, Australia and some European countries including the Netherlands) followed the US footsteps and began developing their own risk-based standards in the 1990s by making reference to the US approach. EPD began in 1999 to review the overseas practice and examine the feasibility of updating the contaminated land standards for Hong Kong to keep up with the international trend and scientific advancement. Compared to most Asian countries, and regions, we are relatively advanced in contaminated land standard development.

RISK-BASED APPROACH

5. The risk-based approach means that contaminated land will be managed by considering the nature and extent of the potential risk it poses as a result of the receptors' exposure to chemicals in the soil and/or groundwater. This basically acknowledges that there is an acceptably low level of exposure to contaminants, which poses negligible risk. Choosing the level of negligible risk is a very important decision in the derivation of risk-based standards. The risk levels we have chosen for protection of public health are:

a. an excess lifetime cancer risk of 1 in 10^6 for carcinogens; and
b. actual intake must be less than the safe dose for non-carcinogens.

These risk limits are inline with the international practice and are at the conservative end of the range of risk limits adopted worldwide. For example, it is noted that the risk limit of 1 in 10^6 has also been adopted by some overseas countries such as the US, the Netherlands and Canada, etc. while the UK has used a higher risk of 1 in 10^4 to 10^5.

Risk-Based Remediation Goals

6. The proposed new standards, RBRGs, have been developed for different types of land use in Hong Kong based on the risk to human receptors under local conditions. Relevant overseas methodologies were used in establishing the RBRGs with input of local data as far as possible, resulting in standards more suitable for the Hong Kong conditions. The RBRGs derived using established methods and the risk-based approach are more objective, consistent, and scientifically defensible while more importantly, able to ensure a safe level of protection to sensitive 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 in Hong Kong remain unchanged.

7. A comparison of the attributes of RBRGs and Dutch B levels is summarized in the table below. Unlike the Dutch B levels, we have not taken into account the protection of native indigenous plants and animals in our derivation of RBRGs as the brownfield sites in Hong Kong are normally re-developed into residential, commericial or government/institutional use, rather than into country-park, nature conservation, or agricultural use. Also, the need to protect groundwater for potable use is not considered relevant since there is minimal possibility of using groundwater for drinking purposes in Hong Kong. In essence, the RBRGs that have been tailor-made for Hong Kong are more specifically relevant, scientifically robust and cost-effective than the Dutch B levels.

Table – Comparison of the attributes of RBRGs and Dutch B Levels

RBRGs	**Dutch B Levels**
Protection of humans in Hong Kong	Protection of humans, local plants and animals in the Netherlands
Groundwater not for drinking	Protection of groundwater for drinking purpose
Derived based on risk to land users	Not derived based on risk
Safe level of protection	Conservative level of protection
Different standards for different land uses[2]	One standard for all land uses

[2] The land uses are urban residential, rural residential, industrial and public parks.

8. There are a total of 54 chemicals of concern (COCs) in the RBRG list which were selected on the basis that either they are known to occur in the Hong Kong environment, or are in use locally. The Dutch B list has a total of 46 parameters which the Dutch government selected to suit their local needs for land contamination management at that time. Out of the 54 COCs under RBRGs, 29 of them can be directly compared with those of the Dutch list. The rest cannot be directly compared because the definitions of parameters of the two lists are different; for example, the Dutch list has one standard for a group of chemicals while the RBRG list has one value for each chemical within the group. This illustrates the fundamental difference between the Dutch B standards and RBRGs. Because RBRGs are risk-based, the toxicity and physical/chemical properties of each chemical were used in the derivation, thus allowing a specific RBRG for each COC which is much more robust and technically sound than one standard for a whole group of chemicals.

CONSULTATION

9. We shall be consulting the stakeholders on our proposal in the coming months. These stakeholders will include experts in risk-based standards (relevant consultants and academics), the green groups, relevant professional institutions and the users of RBRGs (e.g. oil companies and developers). We shall distribute to them a consultation package for their comments on the derivation methods and the practical application of RBRGs. The consultation package includes:

a. consultation paper (**Annex A**);
b. draft Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management (**Annex B**); and
c. draft Background Document on Development of Risk-Based Remediation Goals for Contaminated Land Management (**Annex C**).

10. After completing the consultation, we will make any adjustments considered necessary in the light of feedback received and present a final proposed package to the Advisory Council on the Environment (ACE) for advice as to whether it should be adopted. The work program of consultation and finalization of RBRGs is as follows:

Main Task	**Target Completion Date**
a. Consult stakeholders	September – December 2006
b. Seek ACE's advice/endorsement	January 2007
c. Issue the Guidance Manual	February 2007

OTHER IMPLICATIONS

11. The risk-based contaminated land standards are more rational and environmentally-friendly. The change is primarily technical in nature and there are no significant implications in other areas.

NEXT STEP

12. Members are requested to note EPD's proposal to replace the existing contaminated land standards (based on the Dutch B levels) with a set of risk-based standards that have been derived specifically for Hong Kong, and the work program of consulting stakeholders and finalizing the RBRGs as mentioned in paragraph 10 above.

Environmental Protection Department
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