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SEMARNAT PROPOSES STANDARD ESTABLISHING REMEDIATION GOALS FOR METAL-CONTAMINATED SOILS

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On December 11, 2005, Mexico's Official Gazette of the Federation published PROY-NOM 147-SEMARNAT/SSA1-2004, a proposed Official Mexican Standard establishing the criteria for sampling, characterization, and determination of remediation concentrations for soils contaminated with arsenic, beryllium, cadmium, hexavalent chromium, mercury, nickel, lead, selenium, thallium and vanadium, as well as their remediation criteria.

This Standard responds to Article 78 of the General Law for Prevention and Integral Management of Waste, which requires the Secretariat of Environmental and Natural Resources (SEMARNAT for its Spanish acronym), in coordination with the Health Secretariat (SSA) to issue standards for characterization of contaminated sites, to evaluate risks to human health and the environment, and to determine the appropriate remedial actions based on the risk.

The Federal Attorney General for Environmental Protection (PROFEPA) has identified 61 sites in Mexico that are contaminated by the elements included in this Standard.

The proposed Standard, referred to as a NOM in Mexico, establishes the criteria to determine the concentrations at which soil is considered contaminated using a risk assessment methodology, based on the probability that adverse human health and environmental effects will occur from exposure to contaminated soil.

In order to account for site-specific situations, as well as the variation in industry with respect to size, type, and dimensions, the Standard divides contaminated sites into two categories:

A. Sites with an affected surface area less than or equal to 1,000 m² (\leq 10,763 ft²)

This category applies generally to accidents, emergencies, or contamination events that need immediate action. Based on agency experience with industry, the affected area in most sites is less than 1,000 m². Taking into account the surface area and immediate risk, the Standard establishes general remediation criteria that must be applied without

requiring studies or decision-making procedures that delay the response. When the presumed contaminated soil has a surface area of up to 1,000 m², the responsible party may proceed to remediate to the Total Reference Concentrations (CR_T) as shown on Table 1, or follow any of the methodologies described in the Standard to determine the Remedial Objective Concentration, commonly referred to as the “clean-up level”.

B. Sites with an affected surface area greater than 1,000 m² (> 10,763 ft²)

For deliberate, accidental, continuous or one-time contamination events with affected areas greater than 1,000 m², a conceptual model must be developed to determine the existence, origin, nature, and area of contamination by one or more of the listed elements, as well as the potential receptors. If there is vertical transport of contaminants, it must also identify the presence of vulnerable aquifers. The conceptual model must also determine if there is a potentially exposed human population, and if so, the routes and paths of exposure.

The NOM establishes various alternatives to determine the soil remediation concentration limits. After the conceptual model confirms the existence of contamination, the responsible party can select from among four options to establish the clean-up level.

1. Remediate to the Total Reference Concentrations established in Table 1. These concentrations were obtained from the international literature based on the health risk assessment methodology for evaluating and remediating contaminated sites. The reference concentrations are considered protective of human health under particular land use conditions, and do not consider environmental or groundwater impacts.
2. Remediate to background concentrations. This requires obtaining the values of the regulated elements as found naturally at the site or its surroundings.
3. Remediate to the Total Specific Concentrations. This applies when there is a human population potentially exposed to any of the contaminants, and requires a health risk assessment to be performed according to one of the methodologies recognized by the international scientific community to establish site-specific levels.
4. Remediate to the Soluble Fraction Reference Concentrations. This option applies when there is no potentially exposed human population. It is based on the assumption that the soluble fraction represents a potential risk to water bodies, and the environment.

TABLE 1.- Total Reference Concentrations (CRT) by land use type.		
Contaminant	Agricultural/residential use (mg/kg)	Industrial Use (mg/kg)
Arsenic	22	260
Beryllium	150	1900
Cadmium	37	450
Hexavalent Chrome	280	510
Mercury	23	310
Nickel	1600	20000
Lead	400	750
Selenium	390	5100
Thallium	5.2	67
Vanadium	550	7200

The Standard establishes criteria to determine anthropogenic soil contamination, and the corresponding remediation concentrations, taking into account that the metal elements may be naturally present in the soil.

When the soil concentrations of these elements in a particular site are greater than the reference concentrations, site-specific studies may be conducted to determine the mobility and bioavailability of the metals, and the real exposure parameters of the site in order to determine the specific soil concentrations that do not pose a major risk.

A health risk assessment must be performed to determine the Total Specific Concentrations (CET) of those soil contaminants (Option 3). The soil will only require remediation when the total initial concentrations of the elements are greater than the CET. Otherwise, remedial actions are not necessary.

In the event of lead contamination, the responsible party may opt to conduct a bioaccessibility evaluation instead of a risk assessment.

The Standard stipulates that preventative actions must be implemented prior to the remediation when there is a possibility that people may be exposed to potentially contaminated soil by routes other than soil ingestion, such as inhalation from wind dispersion.

Remediation of the affected areas must proceed after the contaminated area has been delineated with the objective of reducing the contaminant concentration, or controlling it in such a manner that it will not present a risk to human health or the environment. The following remediation strategies may be applied:

- Permanently reduce the concentrations of contaminants.
- Reduce the bioavailability or solubility of the contaminants.
- Prevent the dispersion of contaminants in the environment.
- Establish institutional controls.

The evaluation of compliance with the Standard may be carried out by Verification Units (VU) and accredited and approved laboratories, or in their absence, by the competent

authorities. If a health risk assessment methodology is used, the Health Secretariat must evaluate the determination of the specific remedial concentrations. The UV or agency will verify that the requirements of the Standard are being followed through site evaluation visits.

SEMARNAT will recognize as valid analytical results that have been sampled and analyzed by an accredited and approved laboratory according to the methods established in the Standard.

Compliance with the Standard corresponds to SEMARNAT through PROFEPA, and to the Health Secretariat through the Federal Commission for the Protection of Sanitary Risks. Violations will be prosecuted according to the General Law of Ecologic Balance and Environmental Protection, the General Law for the Prevention and Integral Management of Waste, and the General Health Law, as well as applicable legal regulations.

The Standard refers to various risk assessment and corrective action methodologies, including the American Society of Testing and Materials' Standard Guide for Corrective Action Applied at Petroleum Release Sites. ASTM-E1739-95, and Groundwater Services Inc.'s RBCA Tool Kit for Chemical Releases v. 1.2.

The National Consultation Committee for Normalization of Environmental and Natural Resources will receive comments during the 60 days following publication of the proposed Standard. SEMARNAT will publish the responses to comments in the Official Gazette. After the evaluation process has been finalized, the NOM will become active 60 days after their publication.

Alliance Consulting International has used these technical approaches in many completed and active remedial projects in Mexico involving metals, petroleum hydrocarbons, and volatile organic chemicals. The promulgation of this standard and its companion NOM-138-SEMARNAT/SS-2003 for hydrocarbon-contaminated sites (see Pulse Point newsletter, Oct. 2005) is expected to streamline the regulatory review and approval process by establishing clear guidelines for site characterization and remediation.

If you have questions about how this article or other health, safety or environmental issues, please contact us at (619) 297-1469 or send us an email at emedina@pulse-point.com.

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