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AMBSCIENCE SCOPE

MANAGEMENT OF CONTAMINATED AREAS

It covers a set of techniques and methodologies in order to assess the actual conditions of a given site, featuring the environmental legacy of the area from sequential assessments, which sometimes require remedial action or institutionalized restrictions, based on criteria and Normative references.

The complete process of environmental assessment encompasses seven sequential distinct phases, in response, which we can also detail and demonstrate personally. Contact us!

a. Preliminary Assessment

Its main objective is to survey the current and previous activities at a particular location, to identify potential sources of contamination and environmental liabilities, as well as situations that require emergency actions.

b. Confirmatory Assessment

It aims to confirm the existence of any environmental liabilities identified in the Preliminary Assessment. This step consists in fieldwork, searching for contamination (continuation of investigations), or deleting further assessment. Identified risk scenarios may require emergency actions.

c. Detailed Assessment

This step seeks to define more precisely the characteristics of contamination and the physical environment, and may require more than one investigative stage, including the need to carry out Mathematical Modeling Flow and Contaminant Transport. In detailed Assessment, the application of high resolution techniques has been used to get more precise characterization of the environment and contamination, optimizing subsequent actions.

d. Risk Assessment to Human Health

The Risk Assessment has been used as the main tool for decision making about the need for intervention actions, restriction or contingency and determination of viable targets, assessing the likelihood of contamination generate tic or carcinogenic risks to human beings.

e. Vapor Intrusion Studies

Risks related to the vapor intrusion have shown to be the most critical and, even in cases of intervention, monitoring and evolution the vapor intrusion pathway has been imperative. AmbScience has a pioneered staff in the application of these studies, with international experience and alignment with new trends.

f. Intervention Plan

The Intervention Plan shows the number of prior actions to be taken after an area is defined as contaminated and is presented as an initial step aiming the Rehabilitation of the Area for Declared Use (commercial, residential or industrial), supporting the intervention or remediation to be adopted.

g. Liabilities, Remediation and Monitoring

Concern for environmental issues is relatively recent. Because of this, much damage has already been done to the environment, particularly those related to pollution caused by industries that have left as a legacy to our generation hundreds of square kilometers of areas contaminated by industrial waste. Once contamination occurs, the alternative is to recover the contaminated area through specific techniques that vary according to the degree of contamination.

The techniques employed in the recovery of degraded areas can be classified according to the local where they are used: "in situ" or "ex situ", ie on-site or external contamination.

• "IN SITU" TREATMENT: the contaminated material is treated on the spot, without recourse to its mobilization and removal.
• "EX SITU "TREATMENT: always involves the removal by excavation (soil) or pumping (water) and their transport and treatment.

Depending on the site characteristics and the type and degree of contamination may be selected "in situ" or "ex situ" techniques, or both techniques simultaneously, for remediation. Regardless of implementation mode, the techniques can be classified according to physical / chemical method of operation and can be divided into 4 groups:

i. Physical techniques: Pump and Treat, SVE (Soil Vapor Extraction), Air Stripping, Air Sparging, MPE (Multi Phase Extraction), DPE (Dual Phase Extraction) and Bioventing.

Pump and Treat: prevents the advancement of contamination plume, avoiding his arrival in rivers, springs and / or neighbor receivers. It consists of installing wells or dig trenches in the flow path and pump contaminated groundwater, directing it to treatment. The water can be discarded or returned to the aquifer after treatment.

SVE (Soil Vapor Extraction): It is an unsaturated zone treatment technology. The result obtained by soil vapor extraction is the removal of highly volatile organic compounds (VOC's) and some semi-volatile (SVOC's). Depending on the concentration of the contaminants, it is often necessary to clean the exhausted air using activated carbon filters. This is, thus, an excellent method for cases where the volatiles are the main pollutant.

Air Stripping: The "stripping" consists of a treatment process by which force the air passage in groundwater affected by the presence of volatile contaminants. The airflow allows contaminants in the form of steam or liquid into the subsoil can move, passing to vapor state. The method requires the installation of a groundwater pumping system.

Air Sparging: It consists of injecting the air in the saturated zone for transferring volatile organic contaminants from the aqueous phase to the vapor phase. The air, when is injected, allows the migration of volatile compounds to the unsaturated zone, where they are subsequently removed by other techniques. Complementary systems, such as injection of specific compounds that increase the biodegradability of the soil, may be held at any time, if it is detected that the installed system is not effective to carry out a thorough decontamination.

MPE (Multi Phase Extraction): Uses vacuum extraction system that captures phases: liquid, steam and dissolved in the soil and groundwater. This technique promotes the simultaneous extraction of fuels (gasoline, diesel, etc.), volatile organic vapors (VOC's) present in the unsaturated zone of the soil and dissolved phase groundwater. The multiphase extraction promotes a secondary effect in the contaminated area, since the vacuum extraction results in a forced air circulation in the unsaturated zone of the soil, which, in turn, stimulates aerobic bacterial activity.

Bioventing: Performs injection of air and nutrients in the subsurface environment. aiming the soil aeration, and stimulating the aerobic microorganisms activity of the medium itself , promoting aerobic degradation of contaminants.

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ii. Chemical techniques: Chemical Oxidation, Chemical Reduction, Reactive Barriers, Ozone Sparging.

Reactive Barriers: This technology consists on creating a physical barrier downstream of the contamination plume that aim to "filter" the contaminants that pass through it and promote treatment through chemical and / or biological reactions. The permeable reactive material is disposed within the aquifer, and so is crossed by the contaminated water, that moves itself through the natural gradient. The reactive barrier is posed in the way of the contamination plume.

ISCR: Combines the performance of carbon source with zero valent iron (ZVI), that together provide an extremely reducing environment, in which the compound accelerates degradation. In addition, organochlorine compounds, pesticides, herbicides and even explosives can be easily degraded, on short time, using this new technology. The reaction principle of this technique is also used in the stabilization of heavy metals such as lead, silver and zinc.

ISCO: One of the most innovative and emerging techniques for remediation of contaminated areas, which uses highly oxidizing chemicals such as Hydrogen Peroxide, Potassium Permanganate or Ozone. Its application in the soil and groundwater promote chemical reactions of redox of organic compounds, turning them into water, carbon dioxide and some nontoxic salt types.

Ozone Sparging: A technology where the ozone gas is applied (O_3) in the groundwater for the oxidation of compounds as BTXE, MTBE, TPH, Chlorinated Solvents and Pesticides. O_3 facilitates its propagation through the porous media, compared with other liquid oxidants that have a higher viscosity and friction coefficient.
iii. Physical and Chemical techniques: Soil Washing, Soil Flushing.

Soil Washing: Process in which the contaminated soil is excavated, removed from the original location (can be taken on site or off site), physically treated on the surface and mixed with prepared additives to remove contaminants, in order to return the soil itself, previously contaminated, to the excavated trench.

Soil Flushing: is presented as an innovative technology, which consists in producing a flow of a laundering solution in the basement, which moves the contaminants into a certain area, where they will be removed. The washing solution is determined according to the chemical or physical specifications of each contaminant.

iv. Biological techniques: Bioremediation, Natural Attenuation.

Bioremediation: consists in using microorganisms such as bacteria, fungi and yeasts existing in the soil itself, to degrade harmful substances to the environment, by transforming them into substances with little or no toxicity, mainly carbon dioxide and water. The treatment may be performed in situ (by adding nutrients in the media) or ex situ.

Natural Attenuation: Monitored Natural Attenuation is a technology for recovery of contaminated areas, also known as passive or intrinsic remediation, and refers to the physical, chemical and biological processes that, under favorable conditions, act without human intervention, reducing the mass, toxicity, mobility, volume or concentration of contaminants in soil or groundwater.

v. Containment Techniques: Encapsulation and Immobilization, Coverage, Hydraulic Barriers.

Encapsulation and Immobilization: consists in the confinement of a contaminated site using low permeability barriers, which can be vertical coverage or horizontal barriers. This process can also be associated with other techniques for containment of the contamination plume.

Coverage: are layers of low permeability, which prevents rain from entering the confined material and gases to escape, besides preventing animal and surface water access. They are usually built with soil, soil-additive mixtures and geosynthetics and are similar to landfill covers.

Hydraulic barriers: Prevents the advancement of contamination plume, treating groundwater and afterwards discard or reintroduce them into the aquifer. The type of treatment will depend on the water contaminants:

1. Organic compounds: oxidation or adsorption on granular activated carbon,
2. Volatile organic compounds: air capture (air stripping),
3. Metals: precipitation by pH adjustment.

Combined techniques (Remediation Train)
Combining honored techniques over time, when used alone do not lead to problem solution.

These techniques may operate simultaneously or at different moments of the remediation process. Goals require optimization and increased efficiency to ensure effectiveness.

Treatability tests: They consist in simulating the treatment of groundwater to define the better treatment process option, through the use of static reactors equipment, where it is possible to perform tests simulating the various steps of the complete cycle of treatment.

Pilot Tests:
After finishing the treatability assay, it is defined the product and its dosage to be used for remediation of the area. This aims to obtain parameters allowing improvement of the full-scale technology, and simultaneously evaluate the efficiency of chosen remediation technique.

Detailed Engineering Design:
After the development of pilot testing, detailed design of remediation will be proposed, that aims to provide all technical details, as well as an action plan for the remediation activities to be developed.

Monitoring for Closure
After the achievement of remediation goals, monitoring for closure of the case is started, ie it is to conduct six-monthly monitoring campaigns for a period of two years.

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2) ADVICE FOR INDUSTRIES

Action with the companies and their partners, proposing the best technologies and environmental solutions, seeking an integrated, participatory and collaborative performance. Guidance regarding the processes related to environmental liabilities and contaminated areas, aiming to compliance with the relevant legislation, process monitoring and proposing the best techniques and methodologies choices for each case.

3) SOLID WASTE MANAGEMENT

a. Characterization of Industrial Wastes: Characterization of industrial wastes is made to determine their main physical, chemical, biological, quantitative and qualitative aspects. From this characterization, it is possible to determine which will be their final disposal.
b. CADRI License: Document approving the disposal of industrial waste of environmental interest to reprocessing sites, storage, treatment or final disposal, licensed or authorized by CETESB.
c. Packaging of industrial wastes: Technical guidance on the acquisition of packaging material for packaging and transportation of waste. The waste must be properly packed in material approved by INMETRO
d. Final disposal of industrial waste: Final disposal with disposal certificate issued, exempting the generator from future responsibilities

4) SCALING REUSE SYSTEMS

a. Water treatment for industrial use (reuse and recycle): Development of projects for industrial process reusing of water, or rain water, aiming economy of the natural resource and customer funds.

5) TRAINING

a. Conceptual and Environmental Education: Training on environment and changing of paradigms, demonstrating opportunities for improvement and gains with the implementation of actions for the environmental preservation.
b. Legal Requirements: Training on the relevant legislation for the industry operation, stating in a practical way the actions to be taken and the involved risks.
c. Standards: Specific training for ISO 9000, ISO 14000, OSHAS 18000 (interpretation, implementation, internal auditors and Management Integrated Systems).
d. Operational: Training for engineers, supervisors and operators aiming a good performance of daily activities (ie: ETE and ETA operations).

6) LAW / Environmental Licensing

a. Environmental regulation: Survey of applicable legal requirements and Preparation and monitoring processes.
b. Licensing and Grant: Licensing and regulation processes, and Preparation and monitoring processes.
c. Compliance Audit: Checking adherence to compliance with the legal requirements and legal compliance report.
d. RAP, EIA-RIMA, PRAD: Preparation of documents, studies and assessment processes of licensing in Brazil.

7) ENVIRONMENTAL STRATEGIC PROJECTS

a. Strategic Reengineering: Proposes several actions together with customers, aiming pollution prevention and environmental improvement in the industrial process.
b. Corporate Environmental Image: Development of Design, aiming the environmental image improvement among the consumer market, environmental agencies and community.
c. Advanced Performance indicators: Development of advanced sustainability indicators, aiming the responsible environmental performance of the company.

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