FREYTECH INC. ENVIRONMENTAL BALANCE DEVICE TECHNOLOGY (EBD) FOR SOIL & GROUNDWATER REMEDIATION

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Remediation: Air, Water and Soil

ENVIRONMENTAL BALANCE DEVICE (EBD) TECHNOLOGY BENEFITS IN SOIL & GROUNDWATER (GW) REMEDIATION APPLICATIONS

A) EBD technology fully remediates organic and inorganic contaminants in all soil types while costing significantly less than any other conventional soil remediation technology.

B) The EBD process is totally self-sustainable, non-intrusive/non-invasive and does **not** use: 1) Excavation, 2) Injection schemes, 3) Chemical add-on products, 4) Pump & Treat, 5) Thermal Desorption, 6) Nano or Phyto Remediation, 7) Aeration, 8) Activated Carbon, 9) Soil Vapor Extraction, 10) Soil Dilution, 11) Hydroxide or Permanganate or 12) External Electric Power.

C) EBD systems fully remediate soil and ground water down from surface-layers to great depths.

D) There is no need to tear down or remove any infrastructure or facilities located within the EBD active-remediation zone (ARZ) perimeter. EBD technology will remediate all soil such buildings and facilities under the ARZ perimeter.

E) Foul and dangerous odors emanating from polluted soil sites, will effectively be eliminated shortly after installing EBD systems.

F) The EBD Remediation service provided by Freytech is price fixed, takes less than two years to completely remediate contaminated site and is much more affordable than using conventional soil and ground water remediation techniques.

EBD TECHNICAL SUMMARY FOR SOIL & GW REMEDIATION APPLICATIONS

(Short Version)

All matter on Earth contains positive and negative energy particles. Environments containing man-made chemicals and pollution (including oil in soil), contain excessive levels of negative energy particles (NEP-) called Reactive Oxygen Species ("ROS"), and lack sufficient levels of PEP+. Excessive NEP- volumes are detrimental to living organisms including microbes. EBD units are placed surrounding the contaminated site in order to attract (and focus) positive energy particles (PEP+) via cosmic rays. By creating an energy particle balance between NEP- and PEP+ levels, the atomic frequencies of all matter situated above, below and within the EBD soil remediation perimeter, are naturally optimized causing indigenous microorganisms present within the EBD balanced perimeter to become much more active and much more prolific. By naturally optimizing: A) atomic excited states and frequencies in matter, B) microbial life in nature and C) physical properties of various natural elements in contaminated soil, EBD systems provide the benefits enumerated above in Section 1, in an environmentally sustainable, green and affordable way.

- EBD's do NOT leach CHEMICALS or apply CHEMICALS
- EBD's do NOT emit alpha, beta, or gamma radiation
- EBD's do not produce any electrostatic or electromagnetic fields
- EBD's are 100% safe to human and biological ecosystems (see Spec Sheet)

EBD systems effectively and consistently solve the soil remediation problems listed above in a clean, non-intrusive, natural and sustainable way – by using nature's energy and native bio-organisms. By

installing the EBD systems around the perimeter of any contaminated site, missing electrons on the outermost orbit of oxygen atoms are obtained from free electrons present in the contaminated environment. Thus, oxidizing and destructive ROS, is converted into the stable form of oxygen which is indispensable for healthy microorganism propagation. EBD makes ORC and other conventional soil remediation methods obsolete.

1. Soil contamination or soil pollution is caused by the presence of xenobiotic or anthropogenic (human-made) chemicals or other alteration in the natural soil environment. It is typically caused by industrial activity, agricultural chemicals, or improper waste disposal. The most common chemicals involved are petroleum hydrocarbons, polynuclear aromatic hydrocarbons (such as naphthalene and benzo(a)pyrene), solvents, pesticides, lead, and other heavy metals. Contamination is correlated with the degree of industrialization and intensity of chemical usage. (Wikipedia Nov. 2015)

2. The concern over soil contamination stems primarily from health risks, from direct contact with the contaminated soil, vapors from the contaminants and from secondary contamination of water supplies within and underlying the soil. Mapping of contaminated soil sites and the resulting cleanups are time consuming and expensive tasks, requiring extensive amounts of geology, hydrology, engineering, chemistry, computer modeling skills, and GIS in Environmental Contamination as well as an appreciation of the history of the chemistry in the waste from industry.

3. **Gasoline Stations (Fuel Supply Facilities):**

Gasoline station facilities store and dispense petroleum products such as gasoline, diesel, kerosene and other refined oils. Soil and ground water contamination can result when the storage tanks, piping, and/or dispensing systems leak resulting in the hydrocarbon based products being introduced into the ground. Common pollutants include, but are not limited to; Benzene, Ethylbenzene, Toluene, Isopropylbenezene, m.p.Xylene, Methyl tert-butyl ether (MTBE), Naphthalene, n-Butylbenzene, n-Propylbenzene, o-Xylene, Polynuclear Aromatic Hydrocarbons (PAHs), etc. If the gasoline station facility in question dispensed leaded gasoline, lead contamination may also be present in the soil and groundwater.

4. **Dry-Cleaning Facilities:**

Dry cleaning facilities use chemical solvents such as tetrachloroethylene or perchloroethylene (PERC) which are specified as Class 1 hazardous substances, or dense non-aqueous phase liquids (or “DNAPL”). DNAPL contamination travels deep below the aquifers and can occur when such substances leak from storage tanks, dry cleaning equipment and/ or are directly discharged to the septic tank systems of the establishment without pretreatment. EBDs are able to efficiently remediate deep aquifer contamination caused by DNAPLs as well as soils affected from surface spills.

5. **Conventional Soil Treatment Methods:**

A) Soil washing method

This method involves washing contaminated soil containing metals and/or oils. It has practical applications in the extraction of metals from mineral ores and the soil is separated into washed soils

and concentrated substances. The concentrated substances are recycled for refining raw materials.

B) Iron powder or zero-valent iron (ZVI) method:

Soil contamination caused by organic chlorine compounds is treated by mixing special iron powders to decompose and eliminate contaminated substances. This method can be conducted on-site and treatment costs can be reduced.

C) Thermal treatment method:

There are various thermal treatment methods. If the contaminants are volatile organic substances, volatile removal through a medium temperature can be achieved. If pyrolysis is required, high temperature heat treatment is required.

D) Bio-remediation (Microorganisms):

Organic compounds such as oil can be treated using microorganisms in the soil. This method can be conducted on-site, therefore, treatment costs and the burden on the environment can be reduced.

E) Pump-and-Treat method:

The contaminated water is pumped and treated ex-situ. This method can be effective in preventing contamination migration in ground water, but expensive and long-term monitoring/maintenance required.

F) Soil vapor extraction:

This method involves the collection of volatile organic chlorine compounds which are suctioned from the soil via an elaborate system of air-injection wells and vapor extraction wells – expensive and long-term.

G) Solidification / Insolubilization (In Situ Vitrification / Chemical Oxidation):

These methods apply different systems and chemicals towards the removal of contaminants by converting them into immobilized states, or oxidizing in order to reduce the risk of soil contaminant diffusion.

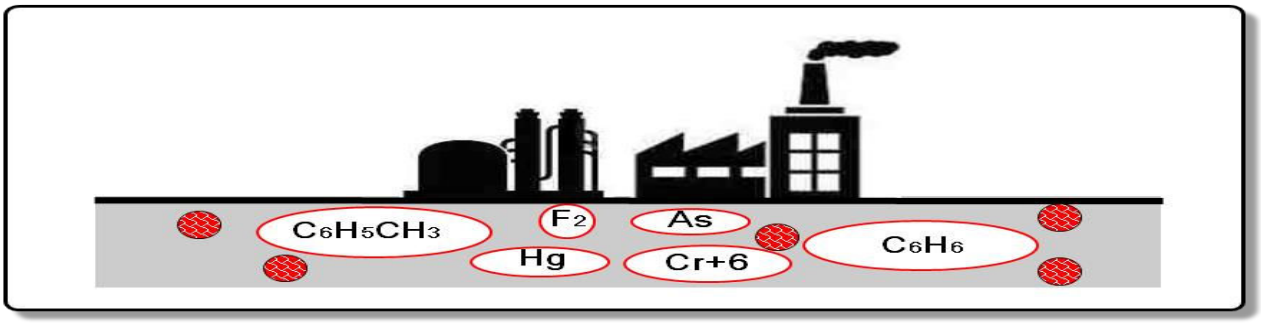
H) Encapsulation:

The encapsulation method is implemented in slightly or highly contaminated soils in those cases where the other conventional soil remediation methods are inadequate. Measures employed depend on the target contaminates in question. There are wide ranging measures which need to be considered, such as whether merely preventing diffusion to non-contaminated areas and/or complete isolation from non-contaminated areas. Typically this system only contains the problem, but does not eliminate the actual contaminants.

I) Excavation / removal of contaminated soils:

This type of operation differs from normal engineering works, thus environmental measures for the surrounding areas should be implemented as contaminated soil is excavated and transported. Dust

particles scattering from the excavation area can contain hazardous substances so the level of risk from contamination should be estimated and the surrounding environment should be strictly managed.



6. **Environmental Balance Device (EBD) Technical Explanation:**

The EBD remediation method differs from conventional physical and chemical soil remediation methods. Sites contaminated by organic and inorganic pollutants contain high volumes of free radicals, Reactive Oxygen Species (ROS) as well as negative elementary particles NEP (-), all of which cause ecosystem imbalance. This lack of balance negatively affects indigenous microbial life limiting their ability to feed, excrete, secrete and propogate as they would normally do in a balanced environment.

The EBD remediation process begins by first recovering the environmental balance at the site to be remediated. Microorganisms, which originally exist in nature, can aerobically propagate by gaining energy through petroleum-based hydrocarbons which act as electron donors and also through oxygen which acts as an electron acceptor.

When oil and gasoline, leak from tanks and permeate into soil, it does not fully decompose and remains underground for extended periods of time. The reason for this is not due to the absence of microorganisms which can decompose the oil, but to the shortage of the oxygen electron accepters which causes oil decomposition to cease. If however, sufficient amounts of oxygen can be introduced into the soil, an already present yet dormant specialized group of microorganisms which digest oil, awake and propagate.

Ensuring an effective oxygen supply into the soil is a key factor. There are some already existing methods which have been implemented to increase oxygen supply into the ground. These include 1) pumping air into groundwater which has been pumped up to the surface thus producing a highly concentrated dissolved oxygen state and thereafter re-injecting it back underground, 2) installing pipes in wells for pumped air injection, and 3) hydrogen peroxide injection (which produces oxygen) and drawing the groundwater from other wells located in the vicinity in order to accelerate groundwater flow movement and thus spread oxygen through that particular water table.

These conventional methods however, require electrical power to pump/inject air and water. One of the advantages of bioremediation is that it can decompose contaminants without the need for electric power. In the mid 1990's, bioremediation was heavily promoted due to the development of an oxygen

releasing agent containing magnesium peroxide. When magnesium peroxide contacts with water, it rapidly reacts and is converted into magnesium hydroxide thus releasing the oxygen into the water. The reaction of the oxygen release agent is controlled by special surface treatment which involves a powder-formed particle which continues to function between 6 to 12 months. This treatment process involves the use of boring equipment. The ground is bored down to a fixed depth at the contaminated site and then the oxygen releasing agent known as “aquatic slurry” is injected into the ground. Oxygen is continually supplied into the ground for 6 to12 months and petroleum-based hydrocarbons decompose through the activation of a specialized group of microorganisms.

There are various kinds of microorganisms such as bacteria, algae, actinomycetesk, archaeans, and filamentous fungus (mold) which exist in soils and have important functions for the circulation of materials in surface soil. Most organic substances such as plant residues, are digested by those microorganisms in the soil and inorganic substances which remain, will be reused as nutrition for plants in the cycle of the natural chain. When balanced microorganism functions are interrupted through the introduction of various pollutants, nature’s cycle is also broken and the ecosystem is negatively affected.

Soil contamination causes a negative impact to not only humans but also the microorganisms in the soil. It is well known that heavy metal contamination leads to a decrease in bacteria and actinomycetes and an increase in filamentous fungus in the soil. In addition, the acidification of soil has become a serious issue resulting from acidic rain which may also lead to a decrease in bacteria and actinomycetes and an increase in filamentous fungus. The reduced amounts of actinomycetes and decomposed organic substances can be tested and confirmed by adding various concentrations of metals into soils and then calculating the amount of microorganisms and organic substances present. Bioremediation is not an entirely flexible technology and does not always treat contaminated substances effectively nor thoroughly.

Microorganisms use various elements for their metabolic functions and to also resist various toxic elements. Microorganism resistance to heavy metals are classified into the following two categories 1) Resistance to absorption into their cells, and 2) transfer/discharge of the heavy metals outside of their bodies.
Various kinds of transporters (enzymes) which have been found in microorganisms include membrane proteins existing in the biological membranes which have the natural function to discharge physiologically active substances such as the nutrition of sugar and amino acids, hormones and metals in, as well as out of the microorganism cells. It is known that the mechanism of heavy metal resistance, is indicated through the transporters which can reduce the concentration of heavy metals in the cells.

(i) **Isolation within the cell through metalloproteins:** Microorganisms bond with heavy metals, metalloproteins and/or peptides (bonds with amino acid molecules) in their cells. Present day scientific understanding takes the position that microorganisms absorb heavy metals in their cells and

release them in their original form when they perish. With the implementation of EBD technology, we obtain very different and demonstrated results.

(ii) **Isolation out of the cells:** Heavy metals bond with polysaccharides or oxalic acid which are ejected or precipitated outside of the cells.

(iii) **Conversion to non-toxicity form:** Highly toxic Hg^2 (mercury) is resolved to Hg0 and the produced Hg0 evaporates and diffuses from the cell into the atmosphere. Such a mechanism occurs not only for mercury but also for arsenic and selenium which evaporate through microorganisms. This represents an important pathway for microorganisms to discharge transmuted substances from the inside of their cells out into the atmosphere.

An important point regarding the above mechanisms, is that contaminated substances such as heavy metals, organic solvents, agricultural chemicals, and oils cannot be eliminated through the activation of microorganisms using the bioremediation method. With EBD technology however, the activation of microorganisms differs completely from conventional microorganism activity and such substances are in fact eliminated through microorganisms functioning under the influence of EBD systems. EBD technology restores the original environmental conditions which existed prior to the introduction of the heavy metals and other pollutants in question. Biosynthesis is when organisms (microorganisms) produce biomolecules. The process of primary metabolic pathways in which substrate compounds such as amino acids, sugar, fatty acids, and nucleic acids are synthesized, is common with various organisms. The process of secondary metabolic pathways is when specific compounds such as hormone, pheromone, and toxins are synthesized. Generally, when a single kind of compound is synthesized, various enzymes are connected such as oxidation-reduction enzymes, transferase, synthesize enzymes, and/or hydrolytic enzymes and then multiple steps are taken.

By installing the EBD units around the perimeter of the ARZ, the concentration of Higgs particles will increase over time. Under a balanced environment, Reactive Oxygen Species (ROS) will combine with free electrons in the contaminated area being remediated. As the amount of ROS decreases, microorganisms will commence to propagate exponentially. Under such a balanced environment, the microorganism cells and atoms as well as the atoms corresponding to the heavy metals, organic solvents, agricultural chemicals and oil which have caused environmental contamination, are changed from a ground state to a higher energy excited state.

Each atom which changes into an excited state, will increase its natural frequencies and this phenomenon will influence not only microorganisms but also the soil, water and contaminated substances. As a result, acidic soil will become neutral and in a neutralized soil environment, bacteria and actinomycosis begin to proliferate once again.

Microorganisms which exist in the natural environment, have different frequencies than those existing in contaminated substances. By enhancing the frequencies between the microorganisms and the contaminated substances, this leads to a smooth interaction between the two under a natural environment brought about by the implementation of EBD technology. An increase in the number of vibrations leads to microorganisms being able to feed on contaminated substances. When the

microorganisms feed on contaminated substances, they secrete various enzymes from their bodies through biosynthesis. The amount and types of such abundant secretions, differ completely from conventional microorganism secretions. The types of enzymes are oxidation-reduction enzymes, transferase, synthetase, and hydrolase, in addition to biological transmutation enzymes.

Biological Transmutation is defined as a specific element transmutation occurring in living organisms. Substances are basically composed by a chemical reaction by gaining energy through the oxidation reaction and reducing reaction resulting from inter-atomic electrical exchanges. Four fundamental interactions, also called interactive forces, are conventionally recognized and this reaction uses *Electromagnetic Interaction* (force) in those fundamental interactions.

The process of element transmutation is caused by the function of *Strong Nuclear Interaction* in an atomic nucleus instead of the inter-atomic electrical exchanges. Strong Nuclear Interaction is tens of thousands of times stronger than Electromagnetic Interaction (inter-atomic electrical exchanges).

Element transmutation is achieved due to an EBD balanced environment where entropic energy is very high thus enabling decomposition of contaminated substances. The phenomenon of element transmutation can be confirmed using an **Electron Probe Micro Analyzer (EPMA)**. Element compositions before and after the EBD system installation, can be confirmed in soil and water using an EPMA.

The required treatment period is calculated based on the history of the facility to be remediated.

For every 10 years of ongoing facility operation, 3 months will be required to improve soil and ground water quality. Soil and analysis should be carried out every three months. Complete remediation will require between 6 to 18 months depending on pollutant concentrations, precipitation, pH levels, temperature, humidity, and seasonal variations.

◇ ROS will be converted to stable oxygen form (O2).

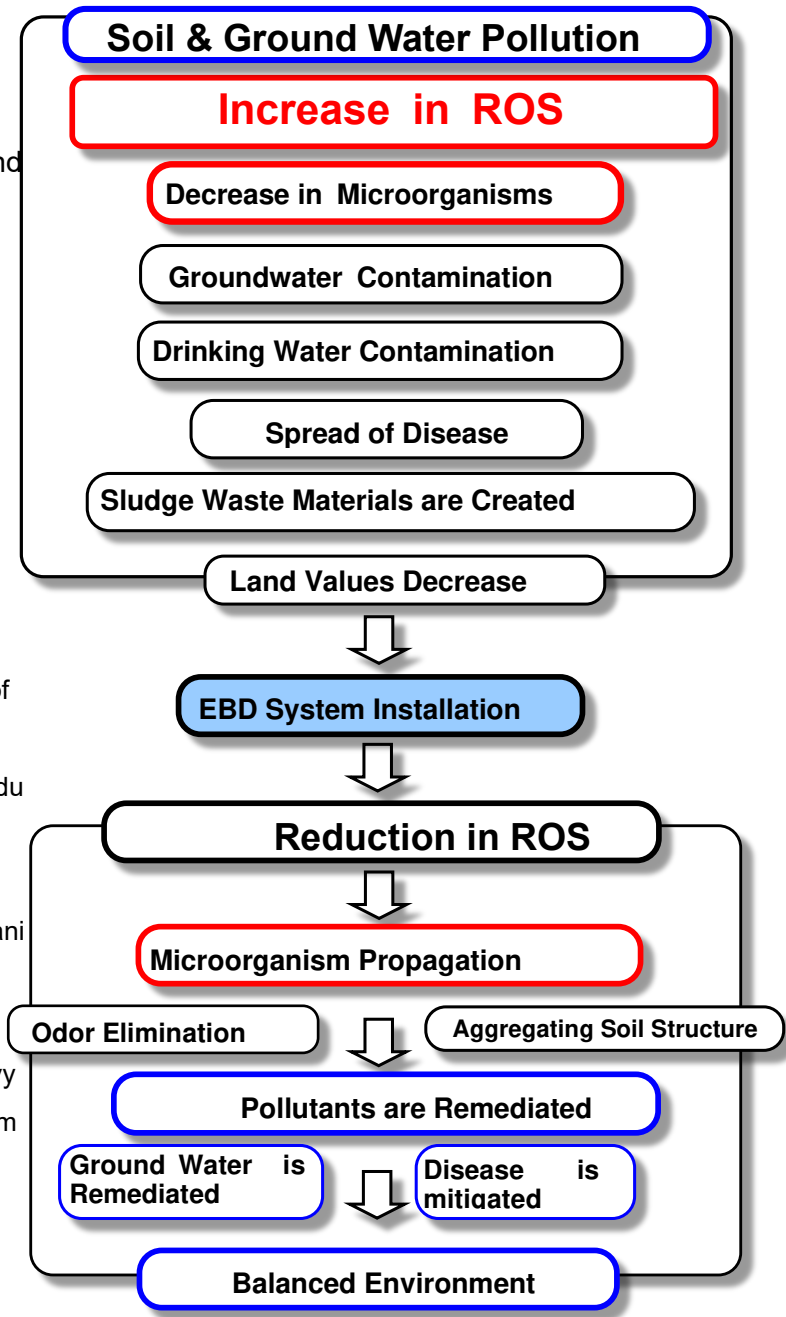
◇ EBD systems effectively enhance indigenous microorganism growth.

◇ EBD systems effectively remediate highly concentrated substances as well as multiple kinds of contaminants.

◇ No side effects nor hazardous substances are produ in the remediation process through microorganism activation.

◇ EBD systems effectively use indigenous microorgani without introducing non-indigenous bacteria.

◇ The diagram below reflects the bio-transmutation process which converts inorganic substances and heavy metals into non-toxic substances through microorganism enzyme secretions.



6. Contamination Remediation and Oxygen:

Bioremediation methods that use microorganisms have been implemented to remediate petroleum contamination. However, the results are largely dependent on environmental conditions such as weather, geological features and residual petroleum aspects. Conventional bio-remediation methods are generally implemented in outdoor areas where such environmental variables are not controllable yet microbial activity which is directly affected by such variables must be controlled. Conventional bio-remediation techniques continue to be widely implemented for petroleum contaminated sites even though the end results vary significantly. The lack of uniform and effective results is due to an insufficient amount of oxygen in the ground which in turn restricts bacteria propagation. Healthy indigenous bacteria propagation leads to an increase in microbial varieties and population densities including the types that consume oil and its derivatives. Oxygen is the electron acceptor for increasing the amount and types of bacteria. Therefore, if sufficient amounts of oxygen can be introduced into the soil and groundwater where the contamination is present, bacteria which decomposes oil can awake and decompose the oil by activating and replicating naturally without having to introduce foreign non-indigenous bacteria. This is a basic bio remediation principle. From an engineering point of view however, increasing and effectively dispersing the necessary amount of oxygen in soil can be challenging. Oxygen Release Compounds (ORC) made of hydrogen peroxide releases oxygen and this is one of the preferred methods commonly used. The problem with ORC however is that it is: A) Difficult to disperse effectively, B) There is a limit to the depth of permeation, C) It is not effective in deep soil contamination areas and D) It does nothing to reduce microbe killing corrosive “ROS” present throughout contaminated sites and this severely limits and impedes microbial propagation.

EBD systems effectively and consistently solve the problems listed above in a clean, natural way.
By installing the EBD devices around the perimeter of a contaminated site (Active Remediation Zone – ARZ), missing electrons on the outermost orbit of oxygen atoms are obtained from the free electrons which are present in the contaminated environment. As a result, ROS is converted into the stable oxygen which is indispensable for microorganism propagation. EBD makes ORC and other soil remediation methods obsolete. Regardless of the depth, concentrations and size of the contaminated area in question, EBD will remediate organic and inorganic pollutants down to below legally mandated levels and/or non-detectable levels.

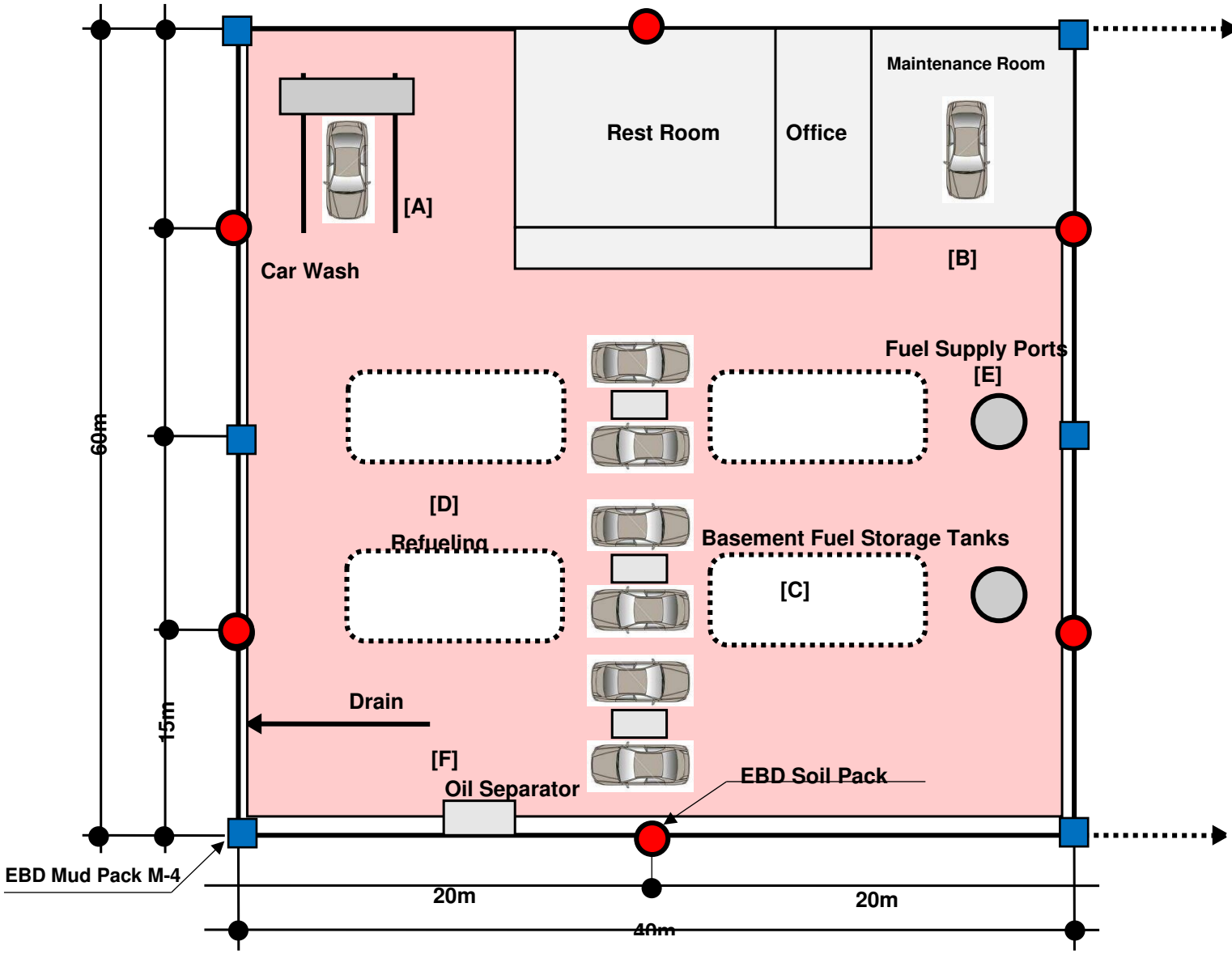
Indigenous microorganism varieties and population densities are incalculable and EBD systems greatly enhance their activation in balanced environment. Therefore, all types of soil contaminants can be effectively remediated. As already stated, all types of contaminated substances can be converted into harmless substances through element transmutation.

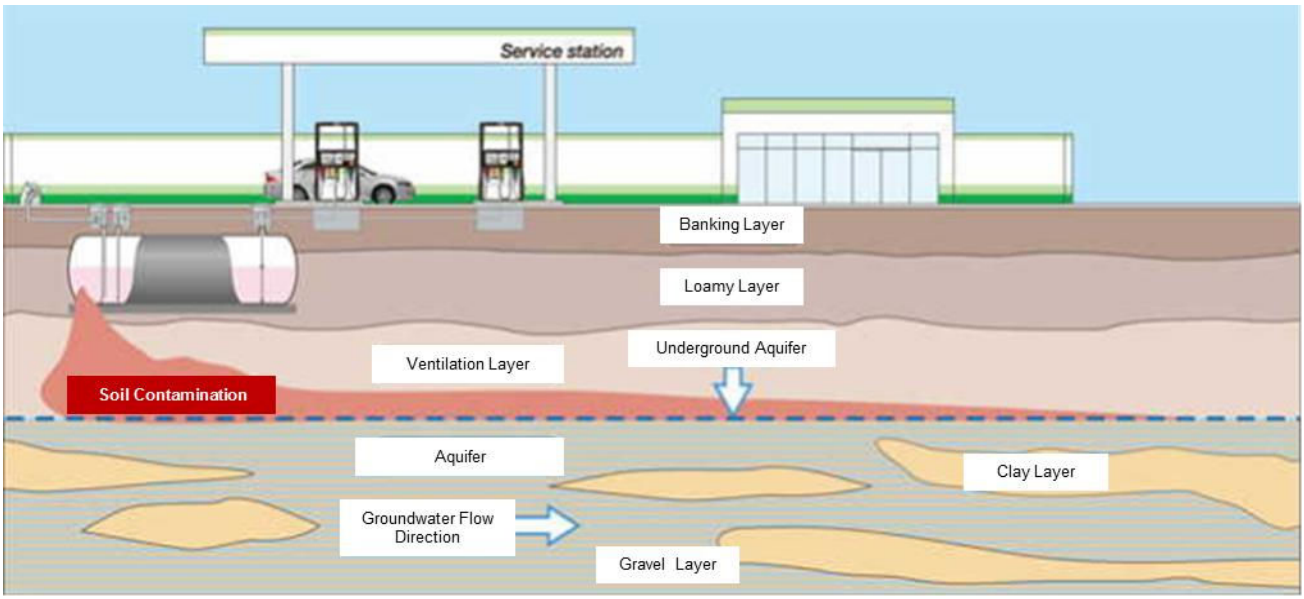
7. EBD Remediation for Gasoline Stations and Dry Cleaning Facilities:

When a balance environment is produced through EBD implementation, radical reaction will decrease and microorganism activation will become significant in soil, leading to the decomposition of inorganic and organic substances.
EBD remediation can easily be implemented at gas station and/or dry cleaning facilities which are

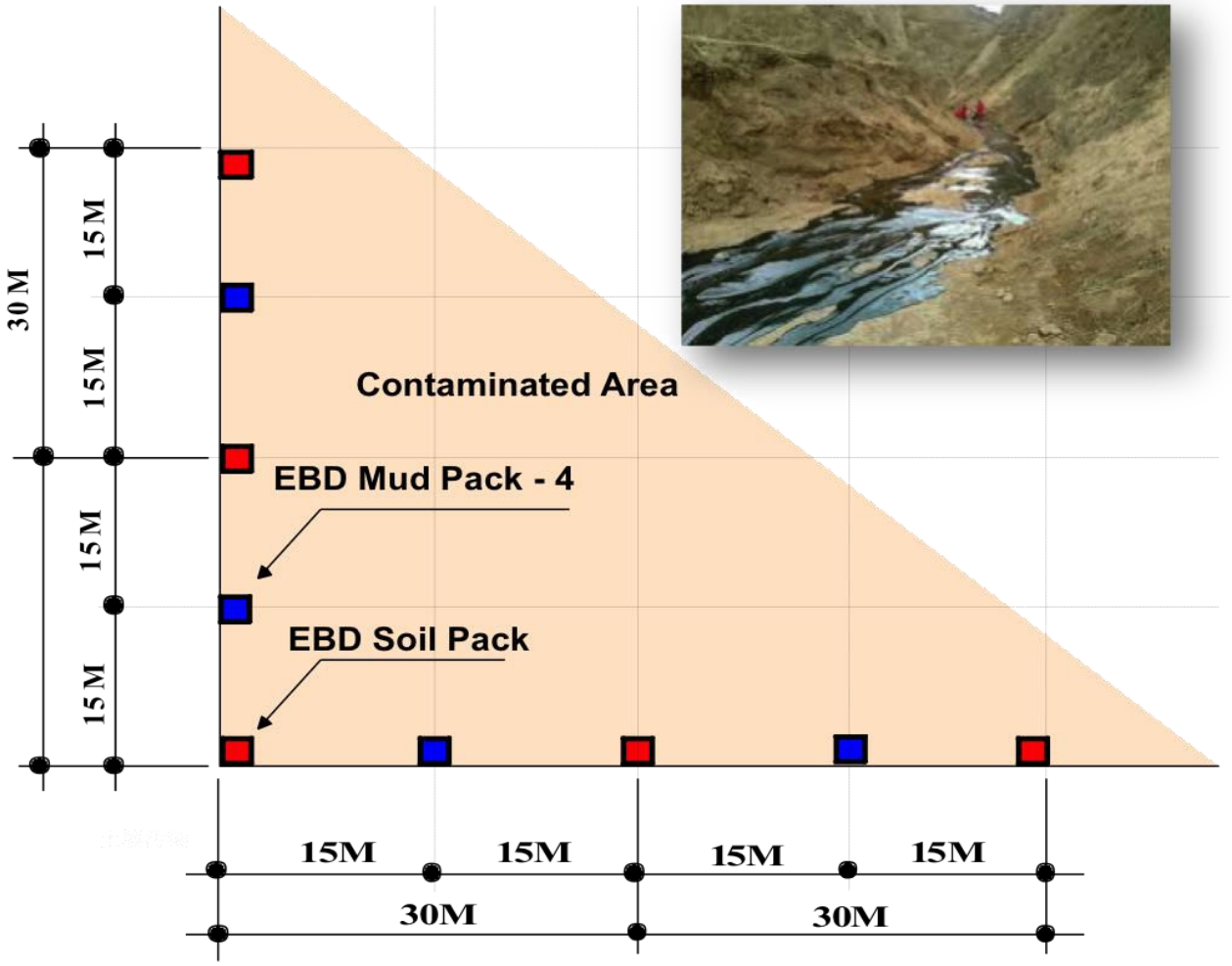
shut down or continue in operation. There is no need to excavate nor demolish standing structures. Installation is simple. Dig holes 10 inches in circumference and 20 inches in depth at intervals reflected in the diagram below and place each EBD unit horizontally in each hole and then cover with top soil. Ensure that one EBD Mud Pack unit is buried at each corner of the facility.

If contaminated ground water extends beyond the facility, enlarge the EBD Active Remediation Zone (ARZ) perimeter accordingly in order to also remediate the water. Polluted groundwater will be fully remediated regardless of depth so long as it is located below the EBD installed ARZ.

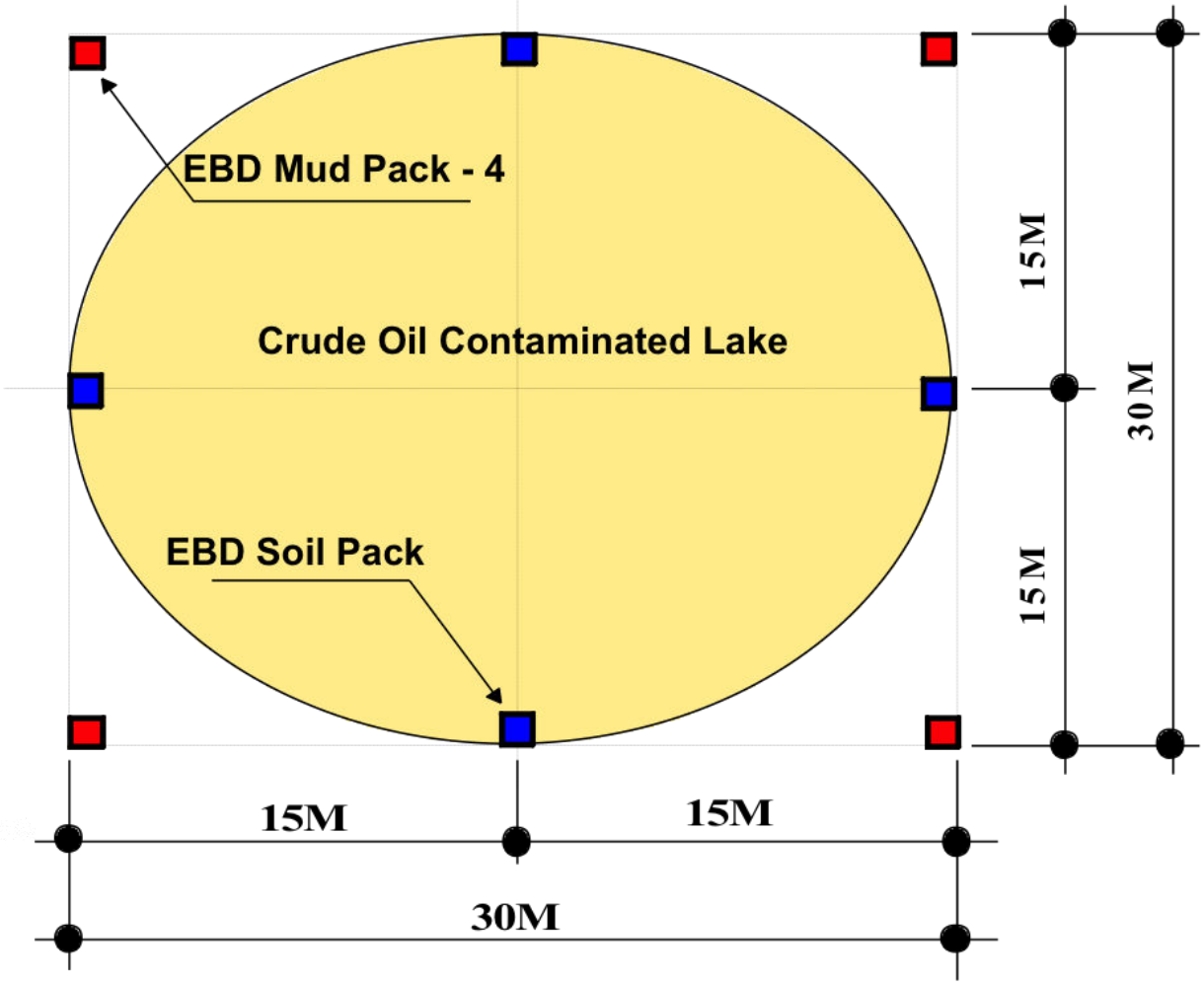




[Device Installation into Crude Oil Contaminated Lands]



[Device Installation into Crude Oil Contaminated Lakes]



EBD Systems comply with OSHA 29 CFR XVII-1910.1200 Section (i). Affidavit: Contains no hazardous components under current OSHA definitions, or EPA listing. This material contains NO ingredients that are on the NPT list or registered with IARC for carcinogens and the material mixture tested as a whole has been found to be: • Nontoxic • Non corrosive • Not an irritant • Not a sensitizer in oral, dermal and ocular tests (see Federal Hazardous Substance Act 16 CFR 1500) Section 3. PHYSICAL & CHEMICAL CHARACTERISTICS.