

LIVING EARTH

Biodiverse Organic Solutions

Sunshine Canyon Landfill Bioremediation Project

INTRODUCTION

The **Living Earth Foundation** (LEF) is a 501c3 nonprofit research organization that specializes in the ability of naturally occurring microbes to cleanse and detoxify contaminants, which is commonly referred to a “bioremediation”. As a **neutral** nonprofit organization, our company has the ability to explore a wide variety of microbial applications that work best interactively for restoring ecological balance. In most cases, the greater the biodiversity of microbial consortiums, the more thorough and effective are the results. This flexibility allows for Living Earth to keep improving the microbial alliances to achieve preferred outcomes over the course of time.

There are three primary components that are considered when testing the viability of bioremediation inoculants, which are: a) the **qualitative effectiveness**, b) the **quantitative economy**, and c) the **promptness of supply** of the products. All three factors are essential for successfully introducing bioremediation solutions for viable commercial applications.

The Greatest Landfill Challenge is the toxic buildup of liquids when rainwaters percolate through layers of waste in a landfill, dissolving and carrying away various contaminants. These highly toxic liquids are called “leachate”, which are produced at the anaerobic sectors of the landfill where *methanogen bacteria* break down the organic wastes. The two most problematic landfill gas emissions produced by leachate are **methane** (CH₄) and **hydrogen sulfide** (H₂S). Methane is a major component of landfill gas, which is a powerful odorless greenhouse gas that the EPA says is 28 times more potent than CO₂. Hydrogen sulfide is a highly toxic volatile compound with a pungent rotten-egg odor that generates high complaints of offensive odors and ill-health effects even at low concentrations.

CURRENT LIVING EARTH PHYTOREMEDIATION PROJECTS

Phyto (plant) remediation uses special soil microbes working in alliance with plant root systems in creating a natural “biofilter” that transforms or neutralizes volatile gaseous pollutants before they escape into the atmosphere. Landfill officials have carefully planned and delineated four trial plots to test the unprecedented effectiveness of nature-based remediation systems to address the mounting landfill adversities of greenhouse and odorous gas emissions.

Biocover Test Sites. Two quarter-acre plots were delineated where grasslands were established to provide erosion control. The **test site** is applying specialty microbes that are designed to create a strong biological presence in the root systems to serve as a natural detoxifier of hazardous gas emissions, as well as to boost the health and productivity of the soil. The second plot is a **control site** that is watered at the same ratios, but without any bioaugmentation.



Hydroseeding Preparation Sites. Landfill officials have also delineated two half-acre plots to be prepared for planting new grass seed. Both sites will be prepared simultaneously with a preliminary layer of gravel for improved percolation purposes and will then add screened soil for a total of 24 inches of fill that will be hydroseeded for erosion-control plant growth. The **test site** will include biologically enhanced compost and biochar mixed into the topsoil. The plot will be treated weekly with biodiverse inoculants designed to remove pollutants from contaminated soils. In particular, *mycorrhizal fungi* form symbiotic relationships with the plant root systems that promotes plant growth and improves their tolerance to environmental stresses – which also plays a significant role in biofiltration for reducing hazardous gas emissions. Although seeded and watered at the same time intervals, the **control site** will simulate standard landfill planting practices and will not receive any biological embellishments.

Air quality monitoring devices will be positioned in prescribed flux boxes at all four trial plots. These monitoring systems will provide *carbon dioxide, methane, and hydrogen sulfide* readings in order to compare the differences in harmful gas emissions. The monitoring units will send emission readings to the nearby landfill office of the LA Local Enforcement Agency, which will then be transmitted onto the independent environmental engineering service, EcoTelesis, for objective documentation and analytical data evaluations.

SOLID WASTE BIOREMEDIATION

Treating Solid Wastes. The owners of the Sunshine Canyon Landfill, Republic Services, have begun testing microbial inoculants recommended and supplied by Living Earth primarily for odor control, but to also establish the toxin-consuming microbes into the solid wastes going into the landfill. Once embedded into the multiple levels of the compacted refuse cells, these specialty microbes exhibit a remarkable ability to consume a variety of pollutants including organic compounds, heavy metals, and even toxic substances like hydrogen sulfide. In addition, they sequester carbon as a food source for mitigating CO₂ and CH₄ emissions.

Bioregeneration. As toxins build up in the multiple levels of the landfill, the microbes wake up and begin mass producing and start remediating at an accelerated pace. Once the toxicity levels are minimized, then the microbial populations subside and go into a state of dormancy until new toxic food sources return. This bioregenerative cycle will continue indefinitely, as long as the organic wastes continue to decompose and degrade into pollutants.

Pretreatment. Republic Services is now adding the prescribed bioremediation inoculants into the air quality sprays for the incoming solid wastes at the Sunshine Canyon Landfill, as well as for **all six** of their transfer waste stations located throughout the City of Los Angeles. Once established in the refuse, the microbes begin the process of reducing greenhouse and odorous gas emissions for both the short-term and long-term remediation process.



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