



A COMMERCIAL APPLICATION OF VIROSOIL™ TECHNOLOGY

CASE STUDY: CEC CONSTRUCTIONS QUEENSLAND RAIL, HYDROCARBON TREATMENT

Hydrocarbon destruction and heavy metal sequestration using ViroSoil™ Technology is a safe, cost-effective and environmentally responsible method of dealing with and eliminating hydrocarbon and metals contamination in soils.



Excavating contaminated soil to be piled for treatment using ViroSoil™ Technology (left). Contaminated Soil (above).



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PROBLEM

A site in the heart of Townsville, Queensland, has historically been used by Queensland Rail as a maintenance depot and is now contaminated with diesel, oil and grease, and several heavy metals. The hydrocarbon contamination in the soil was largely a result of the rolling stock maintenance work carried out at the site. The heavy metal contamination was originally a result of the spillage of crushed ore and rock dust from the rolling stock being serviced and the metals have slowly dispersed into the surrounding soil. The site was scheduled for re-development and needed to be urgently decontaminated before construction could proceed.

Standard bioremediation of hydrocarbon-contaminated soils normally makes use of natural breakdown processes, but this method takes about 18 months. CEC Constructions wanted to decrease this timeframe dramatically due to pressures from the developer.



Figure 1 - Excavating the contaminated soil to be piled ready for treatment using ViroSoil™ Technology



Figure 2 - Contaminated construction site before ViroSoil™ Technology application

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VIROTEC TOTAL SOLUTION

Virotec was contracted by CEC Constructions to remediate the construction site using ViroSoil™ Technology. ViroSoil™ Technology utilises “Rapid Sequestro-Degradation” (RSD), an advanced form of bioremediation, and typically reduces the time taken to destroy hydrocarbons in soil by up to 50% relative to conventional land-farming or bioremediation methods. However, unlike standard methods, including the more costly thermal decomposition methods, the use of RSD allows heavy metals to be permanently bound in the soil in non-leachable mineral forms at the same time as the hydrocarbons are destroyed. This feature of ViroSoil™ Technology is unique. The rate of destruction of the hydrocarbons is significantly increased using an inoculum of naturally occurring petrophillic microbes to enhance the natural processes and to establish healthy microbial populations in the soil. ViroSoil™ Technology provides an ideal solution to achieve this objective.

ViroSoil™ Technology uses natural products from totally renewable sources, is completely safe to handle and apply, leaves surfaces dry and residue free, reduces the amount and hazardous nature of waste, does not release hydrocarbons under compaction, does not leach, and offers multiple treatment and disposal options.



Figure 3 - Pouring contaminated soil into piles ready for the application of ViroSoil™ Technology with watering and aeration

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BACKGROUND

Hydrocarbons, such as fuels, oil, grease, solvents, lubricants and coolants are the most common types of contaminants in industrial applications and contaminated soils are recognised as top of the four main priority waste streams in most countries. Virotec's unique technology for contaminated soil remediation, called ViroSoil™ Technology, has been successfully applied around the world to treat acidity, heavy metals and hydrocarbons in soils. It can rapidly break down heavy, tarry types of hydrocarbons such as oil, grease and coal tars and well as lighter hydrocarbons such as petrol, diesel, benzene, toluene, ethylbenzene, xylene and phenolics. The hydrocarbon contaminants are rapidly absorbed into the fibers of ViroSoil™ Technology reagent where its indigenous microbes can consume and transform the hydrocarbons into simpler compounds. This process continues until eventually the hazardous hydrocarbon material is degraded to carbon dioxide, water and benign organic substances.

ViroSoil™ Technology has been successfully applied at operational and disused industrial sites where heavy metal contamination is a problem; contaminated soil at oil refineries and processing facilities, landfills, marinas and other industrial facilities that generate and spill hydrocarbon-based contaminants, such as oil, diesel and petrol have also been treated. Unlike the standard methods of excavating and dumping, incineration, sterilisation (e.g. thermal desorption), and soil washing technologies, which are expensive methods for treating hydrocarbon-contaminated soil, ViroSoil™ Technology offers a cost-effective way to treat contaminated soils. ViroSoil™ Technology will neutralise acidity, permanently bind heavy metals and destroy hydrocarbons in the soil. ViroSoil™ Technology has been developed to meet the needs of the client and the site.



Figure 4 - Contaminated soil that has been piled up ready for ViroSoil™ Technology to be applied

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TREATMENT DETAILS

ViroSoil™ Technology using RSD was used to treat approximately 50,000 cubic meters of contaminated soil from the Townsville site. The soil was heaped into piles and the piles were aerated by turning them over with an excavator and irrigated on a regular basis to optimize the dispersion of enzymes and to provide the microbes with optimal growth conditions. This enables a more rapid breakdown of the hydrocarbons into carbon dioxide, water and benign organic substances. Table I shows the treatment targets that were required for this site.

One composite sample was taken from each untreated pile before treatment and another composite sample was taken from all piles at monthly intervals after treatment with ViroSoil™ Technology.

RESULTS

The results show that ViroSoil™ Technology, using RSD, is an environmentally sound solution to treating hydrocarbons in contaminated soils. Treatment with ViroSoil™ Technology lowered the



Figure 5 - Moistening of contaminated soil stockpiles



Figure 6 - Piles of hydrocarbon contaminated soil being aerated

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concentrations of all hydrocarbon contaminants to well below the prescribed treatment target limits within three months of application. This treatment provided a fast and very effective result and construction was able to resume.

Tables 1 to 4 show the before and after results for several of the treatments performed. Due to the large volume of contaminated soil requiring remediation, treatment was performed in batches or piles of approximately 2,000 cubic meters in size.

ViroSoil™ Technology is ongoing and hence, contaminant concentrations will continue to decrease below the values reported in Tables 1 to 4.

TABLE 1: RESULTS AND TREATMENT TARGETS

Contaminant	Before ViroSoil™ Technology (mg/kg)	After ViroSoil™ Technology (mg/kg)	Treatment Targets (mg/kg)
TPH (C ₆ -C ₉)	7,600	20	100
TPH (C ₁₀ -C ₁₄)	12,500	55	100
TPH (C ₁₅ -C ₂₈)	52,000	780	1,000
TPH (C ₂₉ -C ₃₆)	35,000	560	1,000
TPH	107,100	1,415	-

TABLE 2: RESULTS AND TREATMENT TARGETS

Contaminant	Before ViroSoil™ Technology (mg/kg)	After ViroSoil™ Technology (mg/kg)	Treatment Targets (mg/kg)
TPH (C ₆ -C ₉)	<10	<10	100
TPH (C ₁₀ -C ₁₄)	2,394	<50	100
TPH (C ₁₅ -C ₂₈)	16,607	<100	1,000
TPH (C ₂₉ -C ₃₆)	52,097	<100	1,000
TPH	71,108	<260	-

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TABLE 3: RESULTS AND TREATMENT TARGETS

Contaminant	Before ViroSoil™ Technology (mg/kg)	After ViroSoil™ Technology (mg/kg)	Treatment Targets (mg/kg)
TPH (C ₆ -C ₉)	<10	<10	100
TPH (C ₁₀ -C ₁₄)	1,130	<50	100
TPH (C ₁₅ -C ₂₈)	5,324	<100	1,000
TPH (C ₂₉ -C ₃₆)	6,866	<100	1,000
TPH	13,330	<260	-

TABLE 4: RESULTS AND TREATMENT TARGETS

Contaminant	Before ViroSoil™ Technology (mg/kg)	After ViroSoil™ Technology (mg/kg)	Treatment Targets (mg/kg)
TPH (C ₆ -C ₉)	<10	<10	100
TPH (C ₁₀ -C ₁₄)	160	<50	100
TPH (C ₁₅ -C ₂₈)	11,200	<100	1,000
TPH (C ₂₉ -C ₃₆)	18,600	<100	1,000
TPH	29,970	<260	-

CONCLUSION

Hydrocarbon destruction using ViroSoil™ Technology is a safe, cost-effective and environmentally responsible method of dealing with and eliminating hydrocarbon contamination in soils.

ViroSoil™ reagents are non-toxic and environmentally safe. The soil at the CEC Constructions site in Townsville was successfully remediated within the required timeframe and all treatment targets were met. ViroSoil™ Technology has proven to be an ideal solution for contaminated site remediation.