



# Remediation NOM site



Bart van der Meer, project manager VOPAK:

*"BioSoil is a good, creative soil remediation company."*

## Advantages of the BioSoil approach:

- >> Minimum risks for the client because of the obligation to achieve specified Results
- >> Considerable cost savings compared to the costs of the original remediation plan due to application of in situ and on site remediation techniques
- >> The concentration of contaminants in the soil will continue to decrease for years because the enhanced natural degradation continues to work
- >> No large-scale transportation of soil to and from the site
- >> Optimal use of existing permits

The so-called NOM site is situated at the Butaanweg in the Rotterdam Europoort (harbour) area. About fifty percent of this 15-hectare location was contaminated with mineral oil and BTEX in the past. BioSoil contracted the remediation operation, based upon an obligation to achieve a specific result, early 2005. The general methodology consisted of a combination of in situ and on site techniques. The remediation operation was completed and the site delivered in October 2006. In all, about 100,000 tons of contaminated soil had been remediated. The final objective, remediation of the contaminated soil to a value lower than the Dutch Intervention value (Mineral oil: 1,000 mg/kg), had been more than achieved.

## Background

VOPAK began using the NOM site in 1948 for the storage and distribution of oil products in particular. In the distant past, when the environmental regulations were different from what they are now, some of the products leaked into the soil. Due to the transfer of the location to the Port Authority and subsequently to a project developer, VOPAK first wanted to clear the remains of the past. The phases of the remediation operation were tendered out based on specifications drawn up in advance. Several parties submitted offers for every tender. Eventually, all tenders were awarded to BioSoil. The remediation operation was prepared and supervised by two environmental consultancy agencies. At the initiative of BioSoil, the remediation plans have been adapted several times during the realization phase. Because of these adaptations, considerable savings on the remediation costs were achieved.

## Soil remediation

In all, about 100,000 tons of soil, distributed over five parcels of land, were remediated. In the original plans the contaminated soil was to be partly removed. Within the confines of the permits already issued, on site storage for a period of six months was possible. Consequently, BioSoil proposed fast, on site biological treatment, enabling considerable savings on, among other things, the costs of transport and processing the contaminated soil. This proposal was accepted. After excavation the soil was conditioned with special additives and nutrients and remediated using forced aeration on site. This stimulation of the natural degradation process resulted in extraordinarily high degradation rates (about 20mg/kg mineral oil per day) in large quantities of soil (>6,000 m<sup>3</sup>). Once the concentrations had sufficiently declined the soil was used on site for backfilling the excavations.

## The client

VOPAK project manager Bart van der Meer was responsible for this project. He is extremely satisfied with the process and the results of the remediation operation. About the BioSoil approach he said: "BioSoil proposed conducting the remediation operation with the obligation to achieve a specified result. That guarantee was an important reason to select BioSoil for the realization of the project. BioSoil was



## Characteristics

Client: VOPAK  
 Location: Butaanweg, Rotterdam Botlek area  
 Contract: obligation to achieve specific results (UAVGC)  
 Contract sum: €2.800.000,  
 Management: Environmental consultancy Royal Haskoning en Tauw  
 Start: 26-03-2005  
 Delivery: 11-02-2006  
 Site size: 15 ha

Contamination	start	end
Mineral oil	9,000	<1.000 mg/kg
BTEX	3,000	<20 mg/kg

Amount of soil treated: 100,000 tons  
 Soil structure: sand, moderate clay or loamy  
 Applied techniques: in situ and on site enhanced biological degradation



Jan van den Boogaart, project leader (BioSoil)

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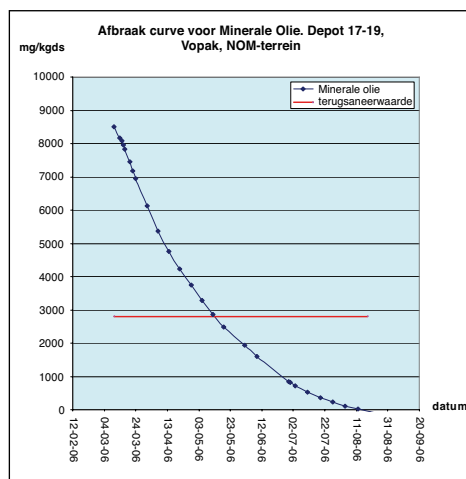
attentive to our interests and really thought along with us. BioSoil employees have a critical attitude, but they also have the guts to veer off the trodden paths. They are creative and smart when it comes to optimally using the possibilities of the site and of the permits.”

## Groundwater remediation.

With the help of an extraction and infiltration system and a groundwater treatment installation the groundwater in three of the parcels of land was remediated in situ. The most important element in this process was a bioreactor with a capacity of 20 m<sup>3</sup> per hour. The purified water was discharged onto the surface water.

## The project leader

BioSoil employee Jan van den Boogaart was the project leader and as such he often had to race against time in order to meet the strict deadlines for the delivery of the various phases of the remediation operation. He looks back with satisfaction. “Due to good conditioning in combination with a new way of aerating the on site remediation depots, most of the soil met the remediation target levels after only eight months. Even the last batch was ready exactly on time.”



## Rapid degradation

A number of important indicators for the enhanced natural degradation of mineral oil in the soil were monitored with sensors during the on site remediation operation. This enabled us to keep the process conditions at an optimum level, so that high degradation rates could be achieved. The progress was also regularly checked by analyzing soil samples in the laboratory.

## Some striking details:

- The remediation operation was split up into five phases and included both soil and groundwater remediation in the area from 2 - 7 metres below the surface level. Demolition of deposit wells, the pump cellar, railroads and weighing bridges.
- A drainage system was installed in one of the tank pits, at a depth of 6 metres below surface level over an area of about 0.5 ha.
- During the remediation operation a docking pier (123 x 28 m) was dismantled, the soil was remediated down to 7 metres below surface level and a new docking pier was constructed (145 x 35 m) for handling about 40,000 containers per year.
- In consultation with the client the four existing and partially obsolete railroad tracks were removed and replaced by three new rail tracks.