I-17-03

OMOVEJ - DENMARK - UK

Context

The site is located Omøvej 1, 4000 Roskilde, Denmark. It is a private house located in a residential area, West of Copenhagen. Contamination is partially located under the house and mainly in the garden.

The target zone is contaminated with mineral oil. The average concentration in soil is close to 2750 mg/kg with a maximum concentration of 6750 mg/kg, locally. The total mass of the pollutant into the soil is estimated to 5000 kg.

1. Omøvej 1, 4000 Rosklide, Denmark.

Project description

An organic pollution of mineral oil (hydrocarbons: C_{10}-C_{40}) has been caused by leakage from a tank. The mineral oil dumped and widespread into the soil.
The polluted zone is a 65 m² area for 13 m below ground level at most. It means that there is around 850 m³ of polluted soil.

The project ends as a success (targets completed), temperatures raised very fast and homogeneously. No condensed products are recovered. All the hydrocarbons are directly reinjected into the burners via a re-burn system.

2. Target area to be treated is depicted in red

3. Outside heating elements

Monitoring

Temperature monitoring: 37 heating tubes

Key facts

Contaminants
TH : C_{10} – C_{40}
BTEX

Max. Concentration
6750 mg/kg DM

Volume
1022 m³

Tonnage
1260 tons

Heating elements
37 (L: 13m)

Temperature target
220°C

Heating duration
57 days

Treatment objectives
<100 mg/kg DM

Area
Omøvej - Denmark

Future use
Residential

Client
NIRAS

Consultant
ARKIL

Date
2017

Key facts

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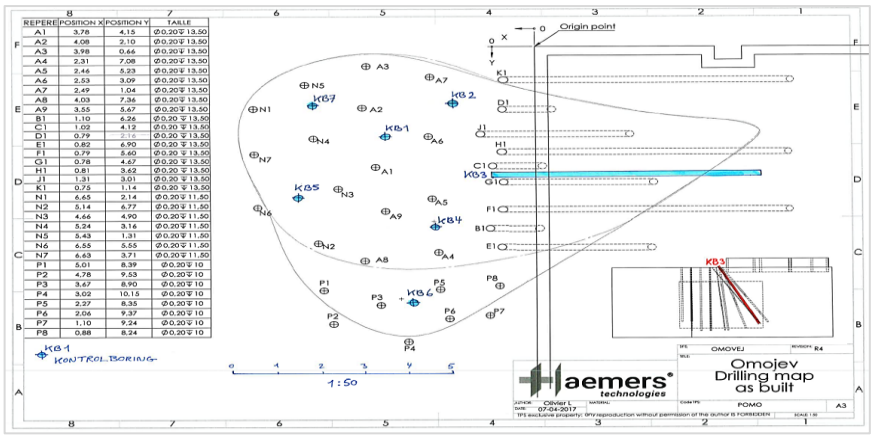
Polluted zone



4. Core sampling drills locations

Analysis results

	KB1	KB2	KB3	KB4	KB5	KB6	KB7
Sampling uppest depth (m)	2.5 - 3	2.5	2.5	4	3	5	3
Sampling deepest depth (m)	8.5 - 9.0	10.5	13	13	6	9	6
BTEX sum (mg/kg DS)	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Average hydrocarbons concentration (mg/kg DS)	350	13.35	589.55	<9	<9	<9	<9
Highest hydrocarbons concentration (mg/kg DS)	590	20	2100	<25	<25	<25	<25
Lowest hydrocarbons concentration (mg/kg DS)	110	6.7	6.3	<1	<1	<1	<1
Target (mg/kg DM)	**100**	**100**	**100**	**100**	**100**	**100**	**100**

4. BTEX and hydrocarbons concentrations average in validation samples wells

Planning:

Installation: 7 weeks - Treatment: 8 weeks
Analyses & reports: 1 week - Demobilization: 2 weeks

Conclusion:

The objective of TH remediation was obtained

The energy consumption after 57 days is 45 kg/ton of soil. That extended period of heating is be explained by the presence of the groundwater close to the heating tubes and the velocity of the groundwater which generates heat losses.

After 57 heating days, the maximum temperature (411°C) L1 up is located in the center of the treatment zone at 4.5 m bgl. The average soil temperature at the end of the heating is 255°C and the minimum is 143°C R1 down (located at 10m bgl close to groundwater). 9 thermocouples out of the 15 placed in the soil, reached target temperature (220°C).

A satisfying allowance average of 99.84 was recorded by the end of the treatment. 5000 kg (close to 2750 mg/kg DS with a maximum concentration of 6750 mg/kg DS) was initially present in the soil and subsequently only 8 kg remains as residual concentration.

The project ends as a success (targets completed), temperatures raised very fast and homogeneously, reburn worked successfully.