

Thermal Soil Remediation

Remediation in a residential area | Case Study

Customer

The Capital Region of Denmark

Location: Reerslev, DK

Technology

Thermal Conduction (TCH)

Keyfacts

Treatment area: 1.300 m²

Depth of treatment zone: 10-12 m

Treatment volume: 11.100 m³

Geology: Glacial till

Contaminant: PCE

Remediation target: 1 mg/kg

Target temperature: 100 °C

Heating period: 169 days

Number of heater wells: 147

The client's needs

In a residential area in Reerslev, Denmark a vast mass of contamination of Tetrachlorethylene (PCE) was found. A considerable hot spot was situated in an 8-10 m thick layer of impermeable clay till. The contamination caused a serious risk to the local groundwater resource, one of the most important in Denmark, supplying water to 50,000 homes in the Copenhagen metropolitan area. To prevent further spreading of the contamination, a soil vapor extraction (SVE) system was installed in the unsaturated zone of a high-permeable sand layer beneath the clay, combined with a pump and treat (P&T) system in the underlying shallow aquifer.

The motivation for remediating the hot spot was to considerably shorten the operation period of the SVE and P&T systems. Given the yearly flux of contamination migrating from the hot spot, the timeframe for these activities was estimated to be in the order of 100 years or more. To obtain an acceptable time frame for the operation period for the SVE and P&T systems, all dense non-aqueous phase liquids (DNAPL) had to be removed and soil concentrations in the clay layer had to be reduced to a maximum of 1 mg/kg.

The hot spot contamination was situated in a residential area with single-family houses and beneath an existing graveyard adjacent to a church. These circumstances combined with some very complicated geotechnical conditions made excavation both economically and ethically unsuitable.

Our solution

To ensure an effective removal of DNAPL, 147 heaters were placed from ground level and down to 10-12 m, corresponding to at least 2 m deeper than the hot spot contamination in the whole treatment area.

The treatment area, including the graveyard area and one of the front gardens, was covered by an insulating vapor cap. Beneath the vapor cap, horizontal venting drains were installed to secure pneumatic control and effectively collect the evaporated contamination during the heating period.



Moreover, the existing SVE system supported by some additional venting wells in the underlying unsaturated zone was maintained during the whole treatment period.

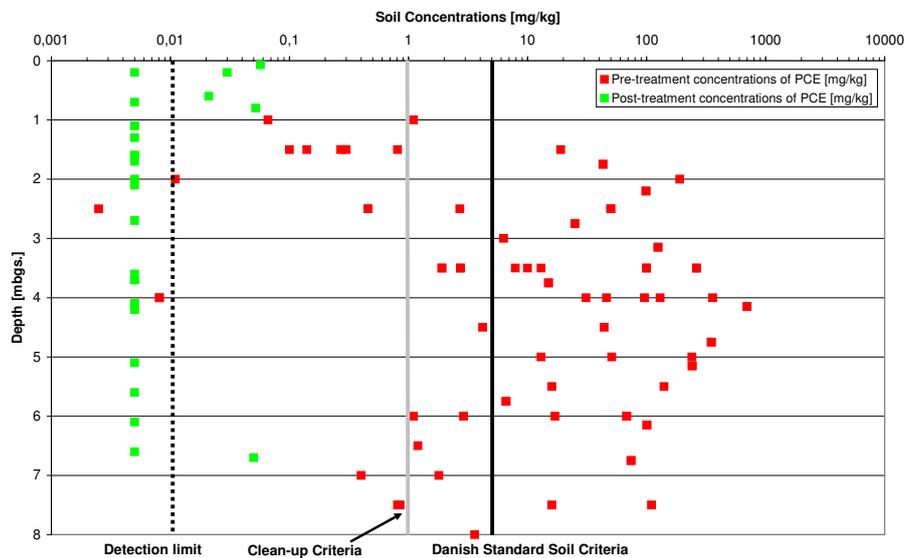
To ensure proper re-establishment the grave sites were carefully recorded and registered by photo documentation before any work was initiated. To reduce the disturbance of the neighbors, one of the implicated families were temporarily re-housed during the treatment period.

Results

After 169 days of heating, 28 soil samples were taken by an unbiased consultant to document the efficiency of the remediation.

- 23 soil samples were below the detection limit
- Average post-treatment concentration: 0.012 mg/kg
- Maximum post-treatment concentration: 0.057 mg/kg

After 660 days of rebound the client performed on a additional 17 soil samples. They were all non detect.



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