

## Ejlskov BioRemediation, source treatment

**With regards to treatment of soil and groundwater contaminations by means of injection of BOS injectates, different aspects have to be taken into consideration both in terms of design (site investigation phase) and installation (remediation phase).**

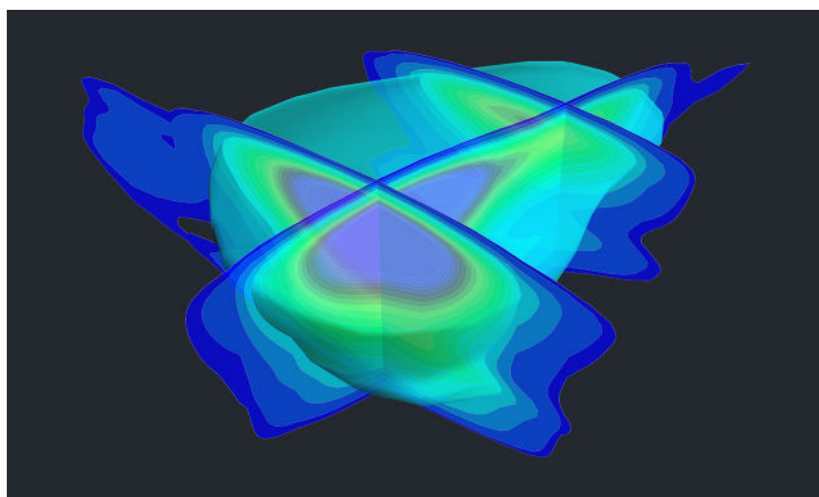
### Source treatment – design

The data which are of relevance when performing a site investigation across a potential contaminated source area are:

- Soil contaminant mass
  - High frequency soil data to be collected to define
    - Lateral and vertical extent of contamination
    - Total contaminant mass
- Soil type / geology
  - Soil description is critical in order to assess potential preferential pathways and layers where most of the contaminant mass may be present (e.g. sand vs. clay)
- Groundwater conditions
  - Assess where soil is saturated in order to install monitoring wells screens at correct depths
  - Cluster wells may become relevant to assess different levels of dissolved phase contamination at different depths

The outputs of the investigation phase will provide the following information for the design of the remediation:

- Soil contaminant mass estimate needed to design the correct loadings of injectates needed to achieve both absorption and complete biodegradation of contaminants of concern
- Soil type / geology will define the injection spacing grid and volumes to be injected per interval
- Groundwater conditions will define in conjunction with soil contaminant mass and geology the correct loadings to achieve dissolved phase contaminant clean up.



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### Source treatment - installation

Installation of BOS injectates can be achieved by:

- Direct push injections: 2-1/4" rods with internal hydraulic hoses are advanced into the formation and injection of BOS is performed within the depth intervals assessed to be in need of treatment during the design / investigation phase. Injections are performed with high pressure / high flow pumps and customized injection system

- Soil mixing: if contamination is assessed to be present within the first 1 or 1.5 meter below ground and no underground installations are present, soil mixing of BOS can be performed by spraying slurry while mixing with an excavator the soil in need of treatment. This operation, generally requires stabilization of soil by means of lime or cement after installation of BOS. Compared to injections, this solution allows the application of higher quantities of BOS hence allowing treatment of extremely highly contaminated soil.

