

# Remediation

## Ex-Situ Bioremediation - Askern Colliery

Askern Colliery was a derelict colliery and coke works, and was identified, with many other colliery sites in Yorkshire, during the 1980s as requiring re-development to encourage local economies and prosperity. The site was re-developed by Yorkshire Forward. The consultant engineer was Carl Bro group, the main contractor was Mowlem Remediation and the bioremediation was carried out by Ecologia Environmental Solutions Ltd

Bioremediation is the use of bacteria to metabolise hydrocarbon contamination and is employed in a variety of technologies. Ecologia Environmental Solutions implemented *ex-situ* aerated biopile technology at Askern Colliery.

Biopiles are static, engineered, actively aerated soil piles. Aeration lines are installed to facilitate the active transfer of gases through the soil, thereby providing oxygen for the bacterial population. At Askern the aeration was induced with a vacuum blower. The biopiles were constructed on an impermeable base formed from colliery spoil which was present at the site. The nutrient and moisture content of the contaminated soils was adjusted during the formation works and the biopiles were then covered to prevent major fluctuations in moisture content. Proprietary bacterial products were not added, as the biopiles were designed to enhance the activity of the existing bacterial population rather than replace it.



Composite samples of the contaminated soils were taken during the formation works to provide a contamination baseline. Subsequent samples were taken every four weeks for the twenty week duration of the project. For sampling purposes the 22,000 cubic metres of soil undergoing treatment were sub-divided into 1,000 cubic metre lots. The gases within the biopiles were monitored on a weekly basis. The gas monitoring showed that the oxygen content, and therefore the biodegradation within the soils, was highly dependant upon the active aeration system. The monitoring also showed that very few volatile hydrocarbons were lost during the project.

The chemical analysis revealed that 20 of the 22 lots achieved the risk assessment target values. Two of the lots remained above the 1,000 mg/kg target for TPH and were placed in a part of the site over marl bedrock to comply with the risk assessment.

Careful monitoring allowed the process to be controlled and validation data produced. Ecologia estimate that the use of bioremediation not only saved the client several hundred thousand pounds compared to the cost of a traditional 'dig & dump' operation, but also prevented approximately 1800 truck movements of contaminated waste on public roads.

***This project has been published as a detailed CL:AIRE Technology Demonstration Project Report (TDP12), available for download at [www.claire.co.uk](http://www.claire.co.uk)***