



Case study 5:

bioremediation successfully protects end-users and environment

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KEY FACTS

- ▶ Extension to an existing development, with occupied housing nearby
- ▶ Creosote, diesel, oil, solvents and varnishes located in the ground
- ▶ Estimated 6000m³ of contaminated soil
- ▶ GRM utilised naturally occurring bacteria to reduce levels of harmful hydrocarbons
- ▶ Project proceeded on time and to budget for successful site completion

The challenge

The site in question was an extension to a previous residential development lying in close proximity to occupied housing, having previously been occupied by a furniture factory, paint shop and part of a garage. Investigations by GRM identified contaminants at concentrations that posed significant risks to development workers, future occupants and the environment.

GRM first determined the concentrations they needed to reduce the contaminants to, in order to make the site safe. GRM then set about identifying an efficient and effective remedial solution that was relatively inexpensive, caused minimal delay and would not affect the occupants of the nearby houses.

The solution

Site specific Detailed Quantitative Risk Assessments (DQRA's) were undertaken to determine acceptable levels of residual contaminants. These levels were agreed with the Local Authority and Environment Agency and set as 'remediation targets' for the project.

GRM considered a number of remedial options, and in close consultation with the client, opted for 'ex-situ bioremediation'.

geoenvironmental
civil
structural

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At a cost of £230,000, this option was one of the most cost-effective available, saving up to £470,000 over alternative methods. Additionally, this method is delivered on a fixed cost basis, takes a relatively short guaranteed period to complete, and is extremely effective at reducing the concentration levels, which would address both the short and long-term issues. Being able to predict exactly how long this particular remedial option would take to implement meant that the developer was able to work their schedule around the bioremediation. The fixed price also enabled the developer to factor the cost into their budget.

The site remediation was carried out by Biogénie, with GRM as project managers.

Investigations had revealed that the majority of the contamination was at 2-3m depth, with the upper layers of soil being relatively uncontaminated. To avoid unnecessarily treating soil that was already 'safe', these sections were excavated and stockpiled separately for later use, without treatment. They were, however, tested again to ensure that contamination levels were below the agreed limits.

Validation samples were also taken from the base and the sides of the excavation site to ensure that all affected soil had been removed for treatment.

The affected soil was then treated to create the optimum growing conditions for naturally occurring bacteria which process hydrocarbons, breaking them down into water and carbon dioxide. This process of bioremediation is particularly effective at reducing volatile hydrocarbons, which were present in this case. Throughout the process, samples were taken to ensure progress was on target, and that the agreed levels would be met within the designated 16-week period.

In consideration of the site's close neighbours, an odour neutralisation system was put in place. Halfway through the project however, this system was removed as odours were minimal and the system deemed unnecessary.

Following the treatment period programme, samples were obtained to confirm success and the treated soil replaced. All samples revealed residual contamination values below the agreed target. Post remediation monitoring of groundwater also revealed levels below the agreed target, therefore satisfying the Environment Agency that future issues had been addressed.

Conclusion

GRM's knowledge and detailed planning identified the principal remedial option in this situation. Other options, including excavation and disposal of the contaminated soil, which may strike the inexperienced as easiest, would have been considerably more costly at around £600,000. Methods such as capping would not have addressed long-term or environmental issues, and would not have satisfied the Environment Agency or the Local Authority.



Bioremediation effectively removed the problem, addressing both the immediate danger to site workers, and the longer-term damaging effects to the environment. The project was also conducted on time and to budget, causing no further delays or additional, unexpected costs. Potential disruption to the occupants of the nearby houses was managed with no residential complaints received.

GRM and Biogénie submitted final validation reports to the Local Authority and Environment Agency verifying the success of the project. Both confirmed the acceptability of the remediation works, allowing the project to proceed as planned to successful completion.

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