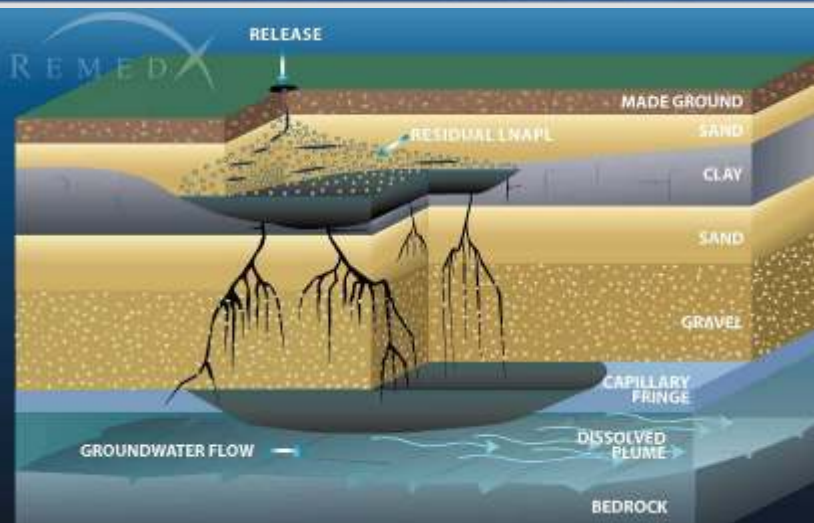




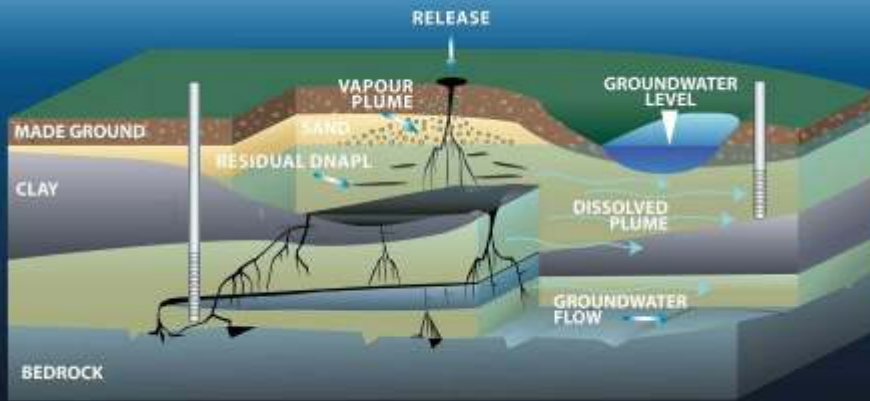
## Dealing With Hydrocarbon Contamination: A Whistle Stop Tour of Remediation

Richard Croft  
RemedX Ltd

## Fuel Hydrocarbon Contamination



## Chlorinated Hydrocarbon Contamination



## Remediation techniques matrix

EA Recognised Technology	Ex situ Bio	In situ Bio	MNA	LNAPL Skimming	SVE / AS / MPE	Chemical Oxidation	Thermal Treatment	Permeable Reactive Barriers
Fuel hydrocarbons	✓	✓	✓	✓	✓	✓	✓	✗
Chlorinated Hydrocarbons	✗	✓	✓	✓	✓	✓	✓	✓



## Benefits and limitations of in-situ and ex-situ

### **In Situ**

Less disturbance to the soil matrix and to other site activities/operations

Minimal waste

Longer treatment times

Difficult to ensure treatment effective throughout contaminated zone

### **Ex Situ**

Better control, more certainty, relatively rapid

Easier management of waste products

Significant disturbance of ground

Remobilisation of contaminants, damage to soil structure/geotechnics

Significant waste may result



## Petroleum Hydrocarbon Remediation



## In situ bioremediation



## Ex situ bioremediation



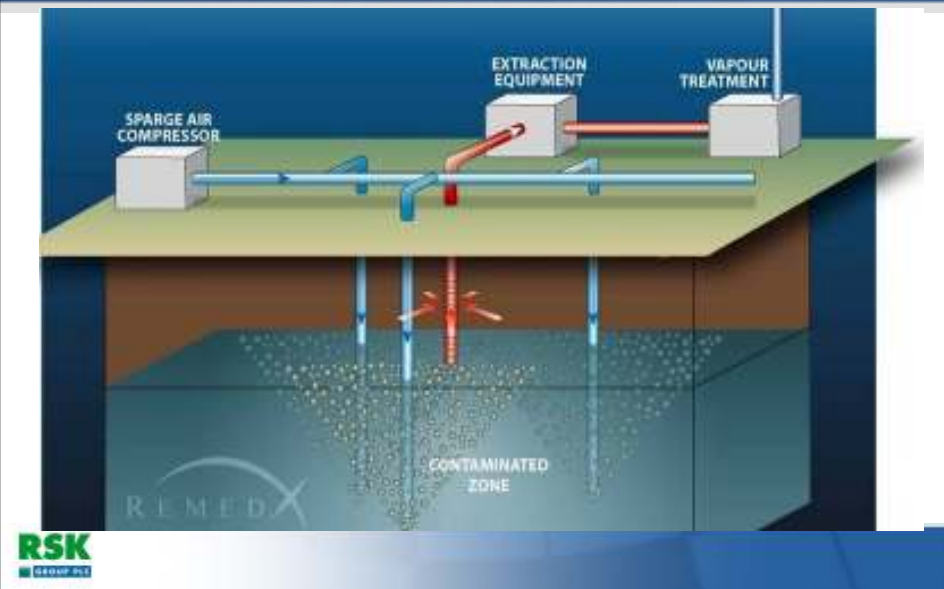
## Monitored Natural Attenuation



## LNAPL Skimming



## Air Sparging & Soil Vapour Extraction (In situ)



## Soil Vapour Extraction (Ex situ)

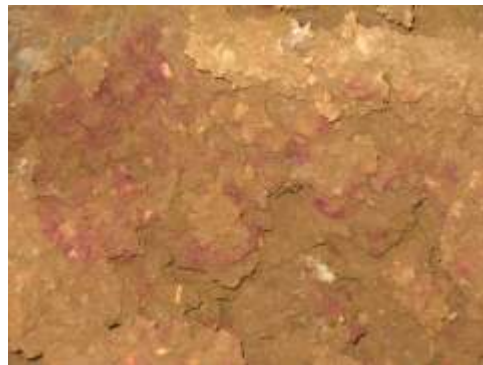


## Multi Phase Extraction



**RSK**  
GROUP PLC

## Chemical Oxidation

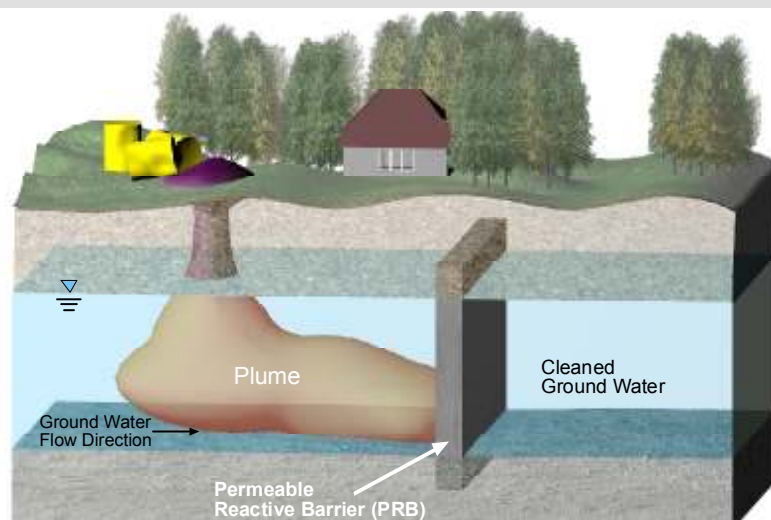


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## Thermal Treatment



## Permeable Reactive Barriers



## Summary

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