Churngold Remediation

Small Sites in Urban Areas

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Outline of Presentation

- Brief summary of sites
  - Conceptual models
  - System designs
  - System performance
- Comparisons of Cost & Performance
- Conclusions

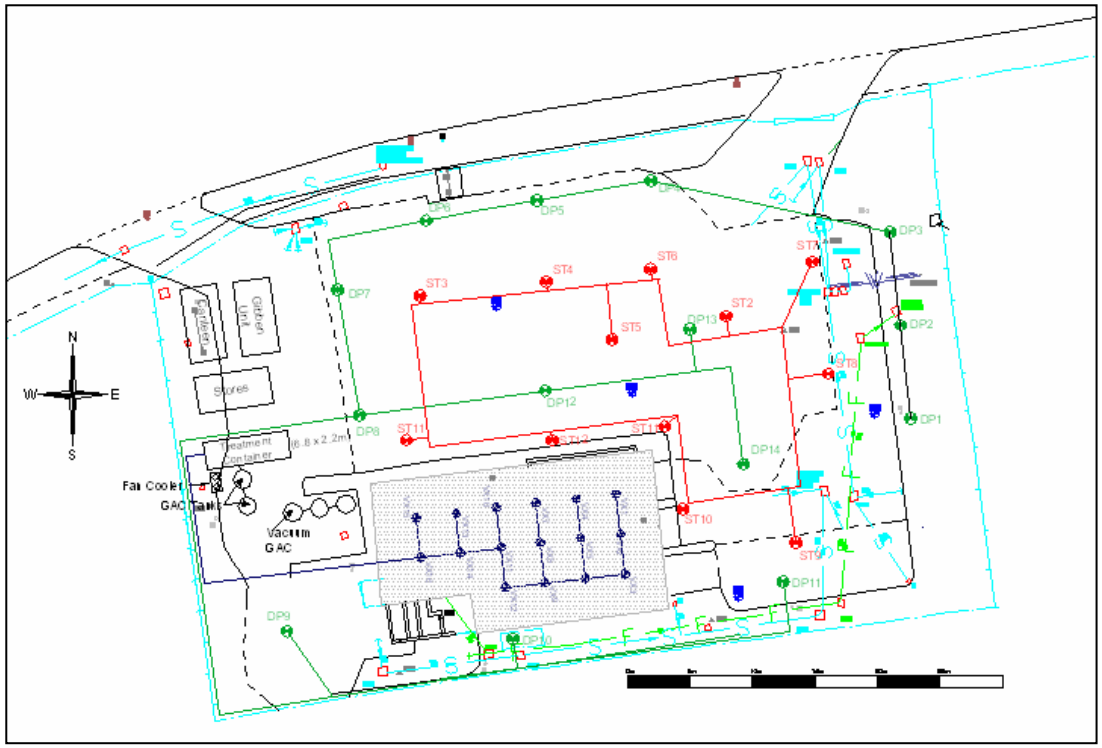
Site in South East England

Conceptual Model

- Former Petrol Filling Station (PFS) located in urban area (bordered by residential housing)
- Gross petrol range contamination (inc. BTEXs) in soils and groundwater
- Free Product Encountered
- SSTL's derived from QRA – effectively a 90-99% reduction required
- Geology – Sands and gravels – Weathered Sandstone
- Client wants quickest solution possible!

Site in South East England

Proposed Treatment Solution



Proposed Solution – Steam Enhanced Remediation

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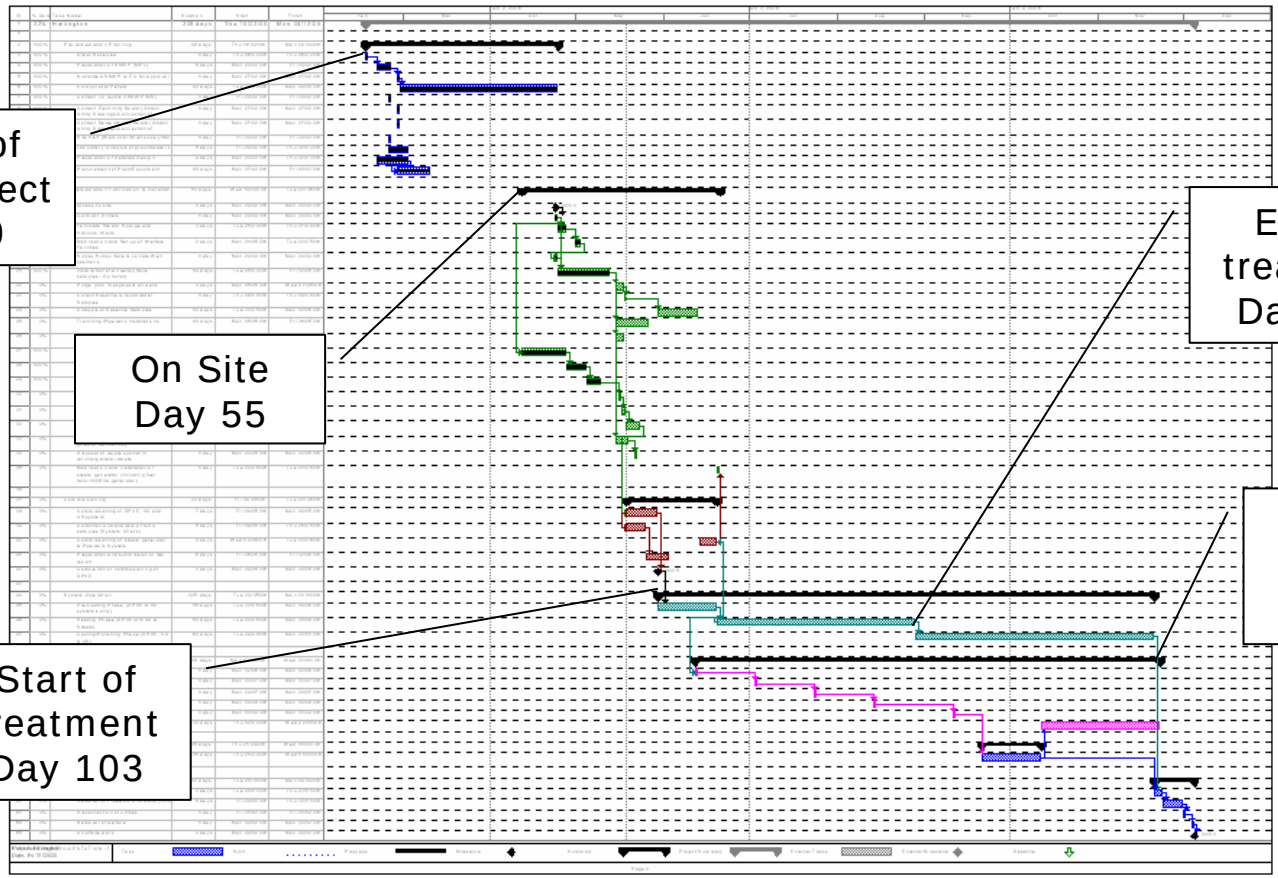
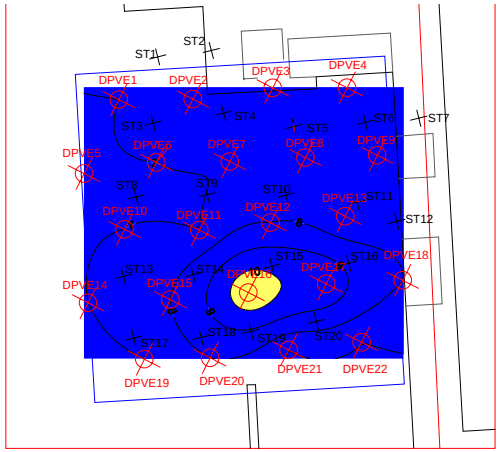
Programme

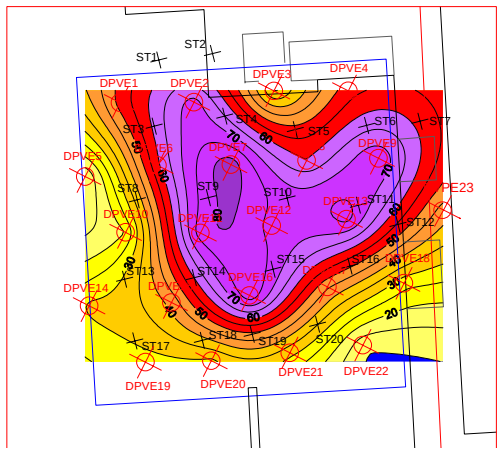

Start of the project Day 0
On Site Day 55
Start of treatment Day 103
End of treatment Day 193
Completion of Validation Day 277

Performance

Results taken from a similar project 5mins away from site

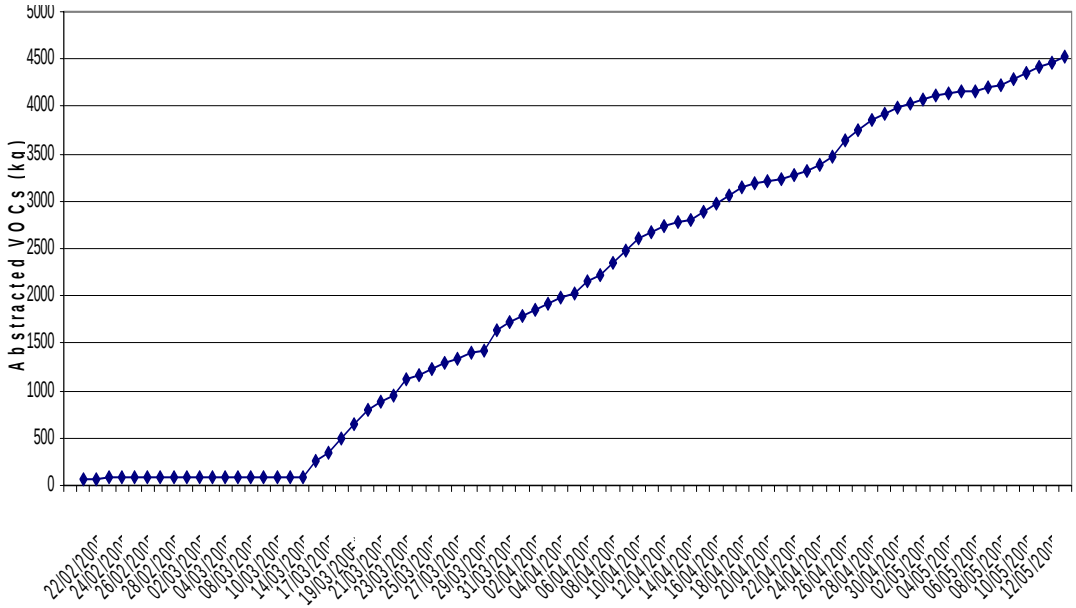


Baseline 17th February 2005 Results



58 Days Since Commissioning: 18th April 2005

Cumulative Mass Recovery Curve for Xylene Vapours



Increasing temperatures increases treatment rates

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Site in Midlands

Conceptual Model

- Another Petrol Filling Station (PFS) – contaminated with petrol range contamination
- Geology is very similar – sands on top of weathered sandstone
- Free product encountered
- SSTL's delivered from QRA – 90-95% reductions required
- Client's not concerned with timeframe

Site in Midlands

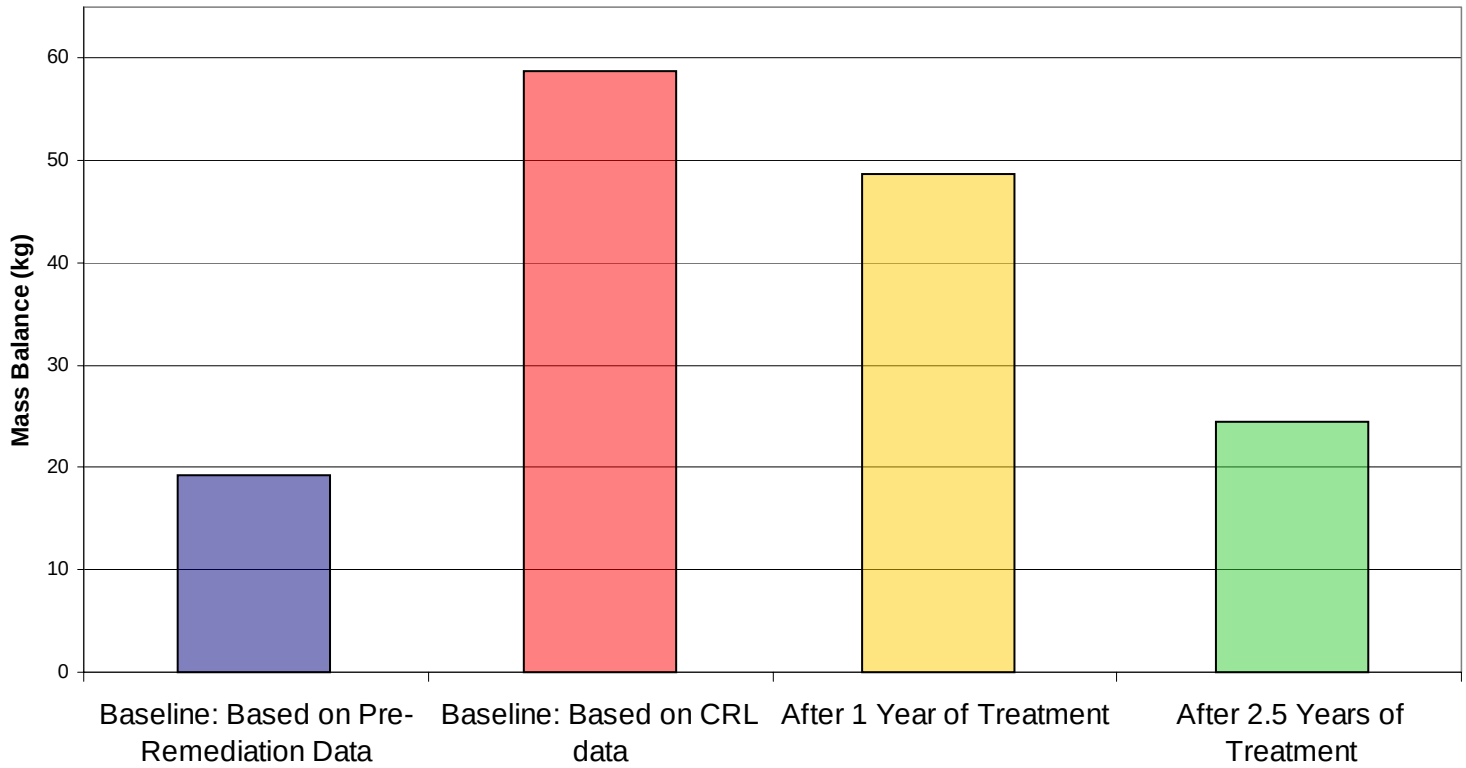
Proposed Treatment Solution/Programme

- Phased approach proposed
  - Free product skimming using vacuum enhanced pumping (3months)
  - Bio-venting
  - In-situ Bioremediation using Oxygen Infusion

  Timeframe for treatment = 60 months

Performance

Results below taken from project using similar technology



Mass Balance Calculation

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Comparing Costs and Performance

SER SYSTEM – Total cost: **€353,300 (£240,000)**

- More complex engineering required
- More expensive to run (fuel costs for boiler etc)
- Needs more engineers to operate (2no. full time) and manage Health & Safety

VACUUM/BIO SYSTEM - Total cost **€125,100 (£85,000)**

- System engineering less intensive
- System has minimal power requirements
- Very reliable, hence needs little operations (1 visit per month)

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Cost & Performance Comparison – Engineering Cost

The SER system needs complex engineering

- Upfront detail design/licensing
- Steam generator
- High vacuum extraction system
- Heat exchangers
- Treatment plant (GAC filters)
- Control system – (auto shutdown/temperature monitoring)

35% of total cost - €123,500 (£84,000)

The Bioventing / In-situ Bio is mostly

- Down well units
- Control system
- Compressor system

65% of Total costs - €81,300 (£55,250)

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Cost & Performance Comparison – Running Costs

The SER system will generate "hot" waste streams

- Additional monitoring to ensure Health & Safety maintained
- Needs treatment (GAC consumption, discharge to sewer)
- Needs initial heating (fuel consumption)

42% of total cost - €141,00 (£96,000)

The Bioventing / In-situ Bio system "after initial skimming phase"

- Low power required (oxygen injected via pressurised cylinders)
- No waste stream generation

6% of Total costs - €7,500 (£5,100)

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Cost & Performance Comparison – Man Power

The SER system needs fulltime operation / management

- During heating 2no. Engineers
- During cooling 1no. Engineer
- Additional project management (Health & Safety)

25% of total cost - €88,300 (£60,000)

The Bioventing / In-situ Bio system needs routine maintenance only

- System looks after itself
- Has little to go wrong
- Is inherently safe

29% of Total costs - €36,300 (£24,650)

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Conclusions

- More powerful solutions such as SER will get you there quicker!
- They also get you there with more certainty
- More powerful solutions come with a higher running cost

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