

# An Introduction to CL:AIRE & UK Contaminated Land Issues

For UKTI  
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Contaminated Land: [Applications In Real Environments](#)

CL:AIRE

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CL:AIRE

# CL:AIRE

**CL:AIRE** is a independent not-for-profit organisation

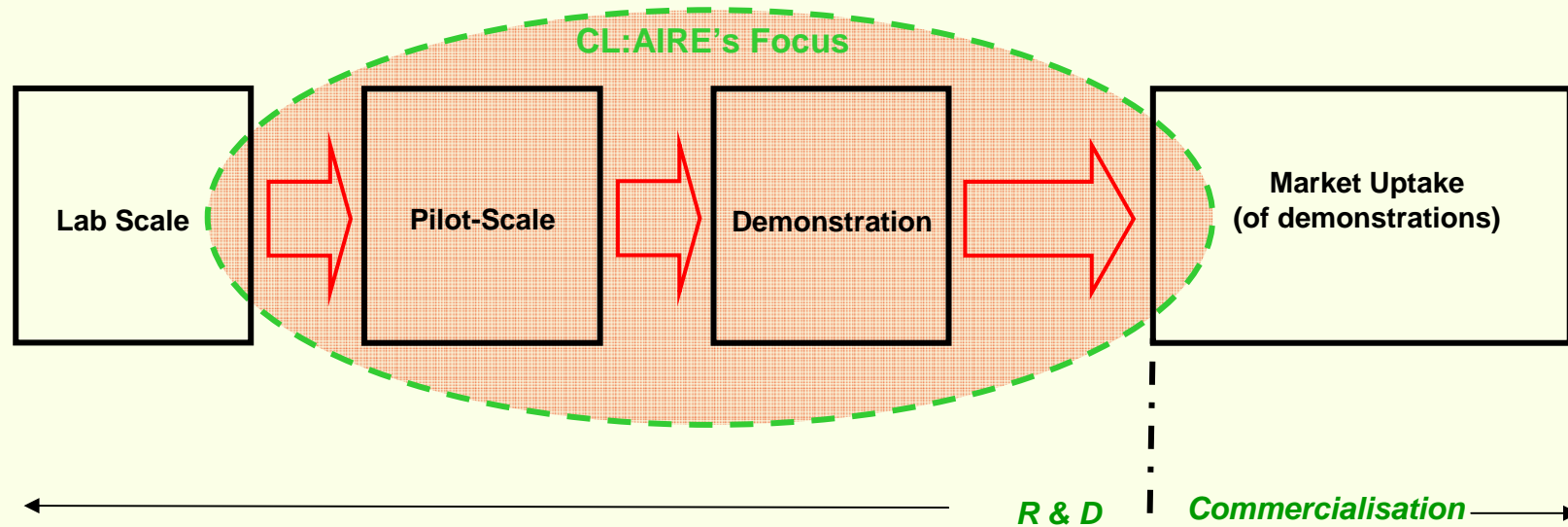
CL:AIRE plays a major role in the demonstration of remediation technologies and research and the dissemination of information relating to contaminated land in the UK.

Objectives include:

- to stimulate the *regeneration of contaminated land* in the UK by raising awareness of, and confidence in, practical and *sustainable remediation technologies*.
- fulfilling a need for objective, scientifically robust appraisals of *remediation technologies* and effective methods for monitoring and investigating sites.

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# Research to Market



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## London Olympics Main Stadium – June 2008 (ODA)

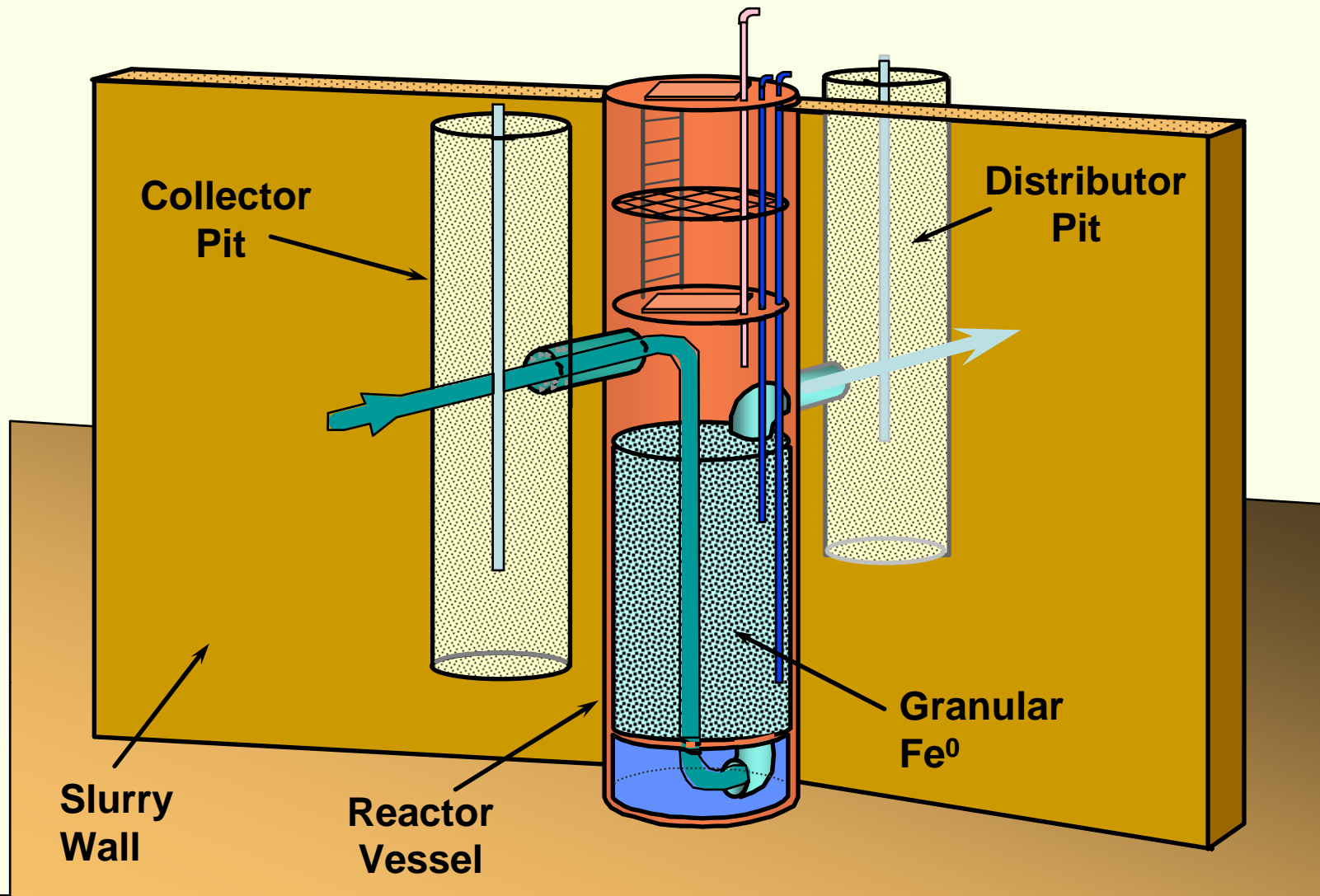


**TDP20: Installation of a PRB for the treatment of carbon disulhide contaminated groundwater using zero valent iron.**



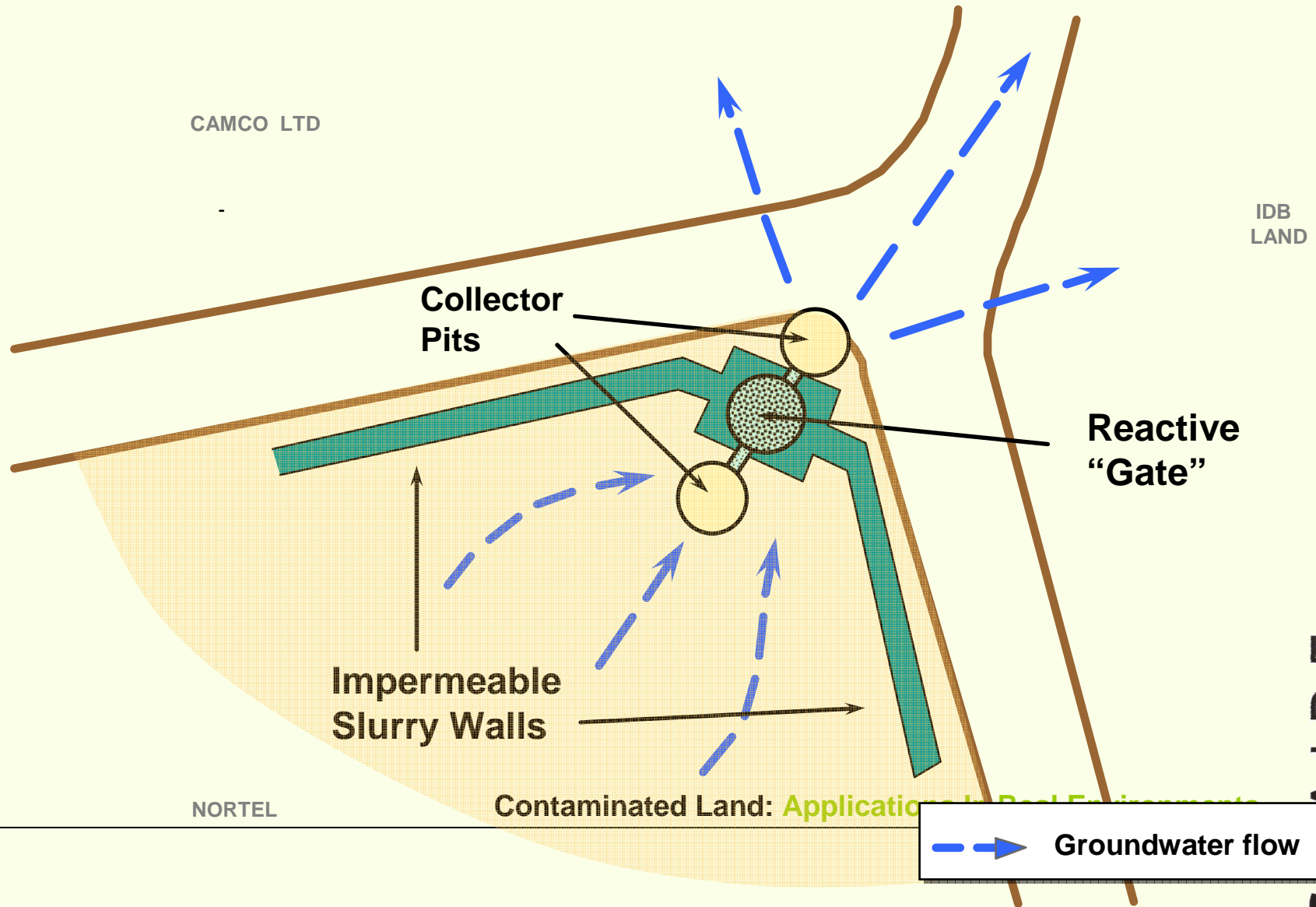
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# Belfast PRB – Funnel & Gate Construction



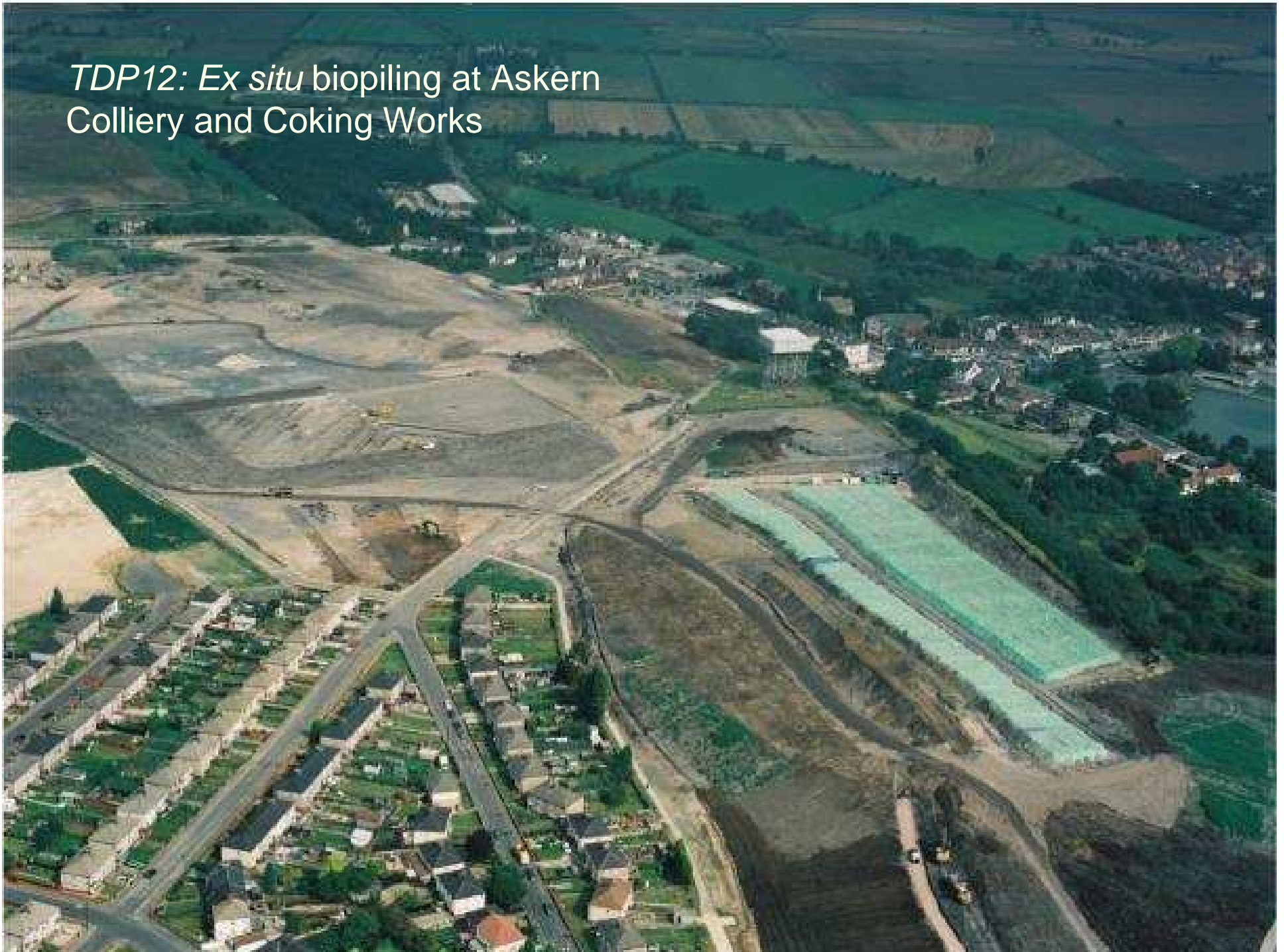


# Belfast PRB – Sketch Plan of Installation





*TDP12: Ex situ biopiling at Askern Colliery and Coking Works*



# Aerated biopiling at Askern

**Contamination:** predominantly hydrocarbons

**Material:** Made Ground over lenses of glacial sand and gravel

- contaminated area was accurately mapped; volume of treated material reduced from 52,000 m<sup>3</sup> to 24,000 m<sup>3</sup>
- aeration was induced with a vacuum blower
- vacuum aeration system allows the amount of VOCs to be quantified
  
- 22,000 m<sup>3</sup> soil underwent treatment, into 22 lots
- 20 of the 22 lots achieved the risk assessment target values

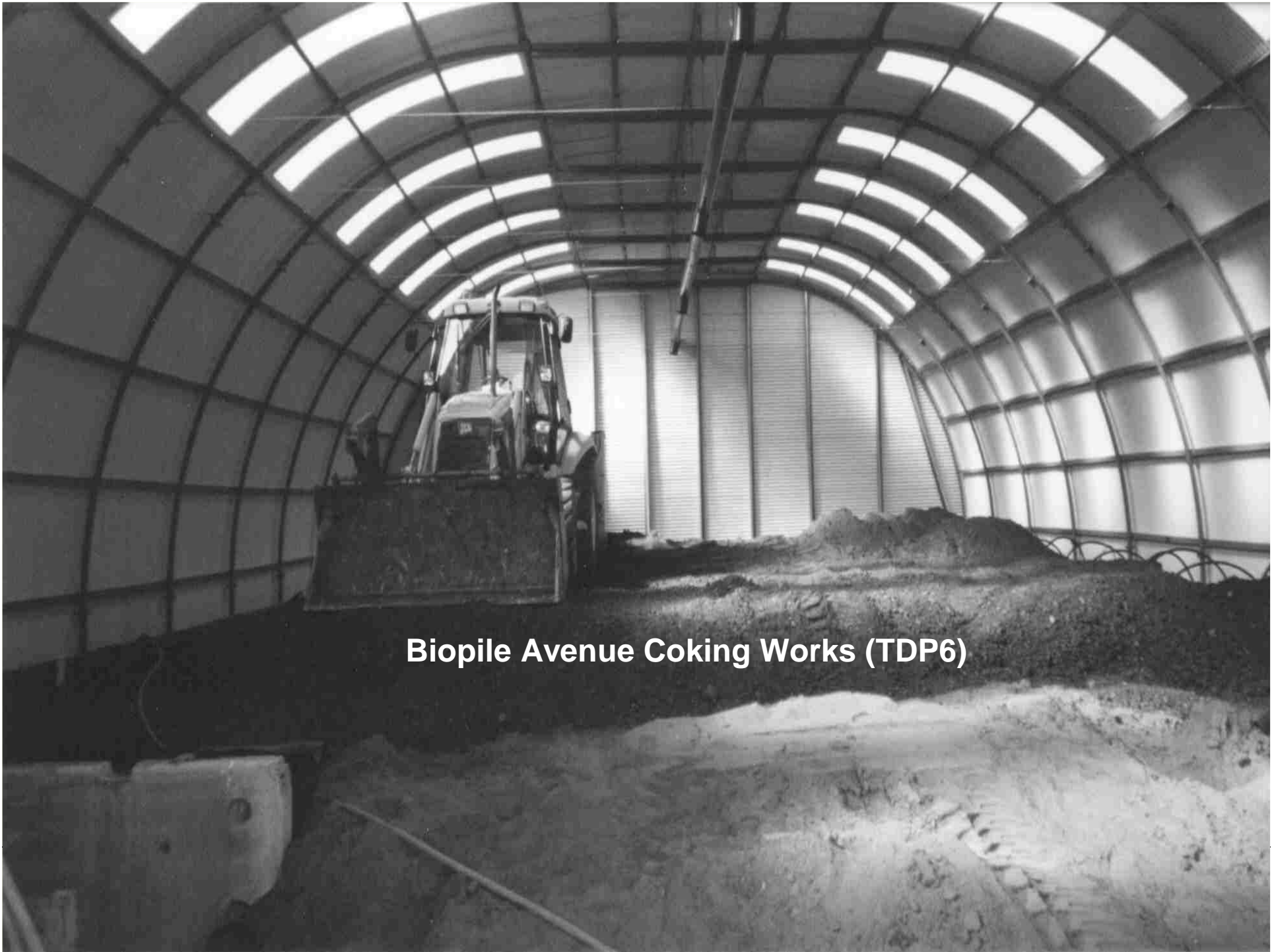


**TDP2: Basford gasworks soil washing plant**

**TDP10:Dismantling the thermal treatment cell at The Avenue to treat material on a coking works site**







**Biopile Avenue Coking Works (TDP6)**

# Avenue Coking Works (TDP6)

## Contaminant sources:

a waste tip containing builder's rubble, metal and coal gasification derivatives; a lagoon; and a contaminated plant area.

**Phase I:** Lab slurry biodegradation test

**Phase II:** Bench-scale bioreactor test

**Phase III:** Field-scale trial was designed using results from the laboratory tests

## Contaminants of major concern:

polycyclic aromatic hydrocarbons (Total PAH) (~41% reduction); phenols (~76% reduction); mineral oil (~14% reduction); benzene, toluene, ethyl-benzene and xylene (BTEX) (~99% reduction); & cyanides.

**TDP8: Stabilisation/Solidification and accelerated carbonation technology trial at The Avenue to treat material on a coking works site**







**TDP13: Construction of the Shilbottle permeable reactive barrier to treat acid mine drainage**

# What we do....

# CL:AIRE System

- Manage a number of Technology Demonstration Projects (from field trials to full-scale) and applied Research Projects
  - site investigation
  - site monitoring
  - remediation techniques
- 49 Projects approved by Technology & Research Group (TRG)
  - 5 Projects withdrawn after approval
- Total active/completed projects = 44
  - (24 Tech Demo; 20 Research)

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# CL:AIRE System

## What:

- Peer Review in Advance
- On Project Specifications / Methodology
- Also reviews Soft Skills, and Benefits to Market
- Generic Questioning
- Reviewing SINGLE APPLICATIONS of a Technology
- Evaluated by Technology & Research Group (TRG)

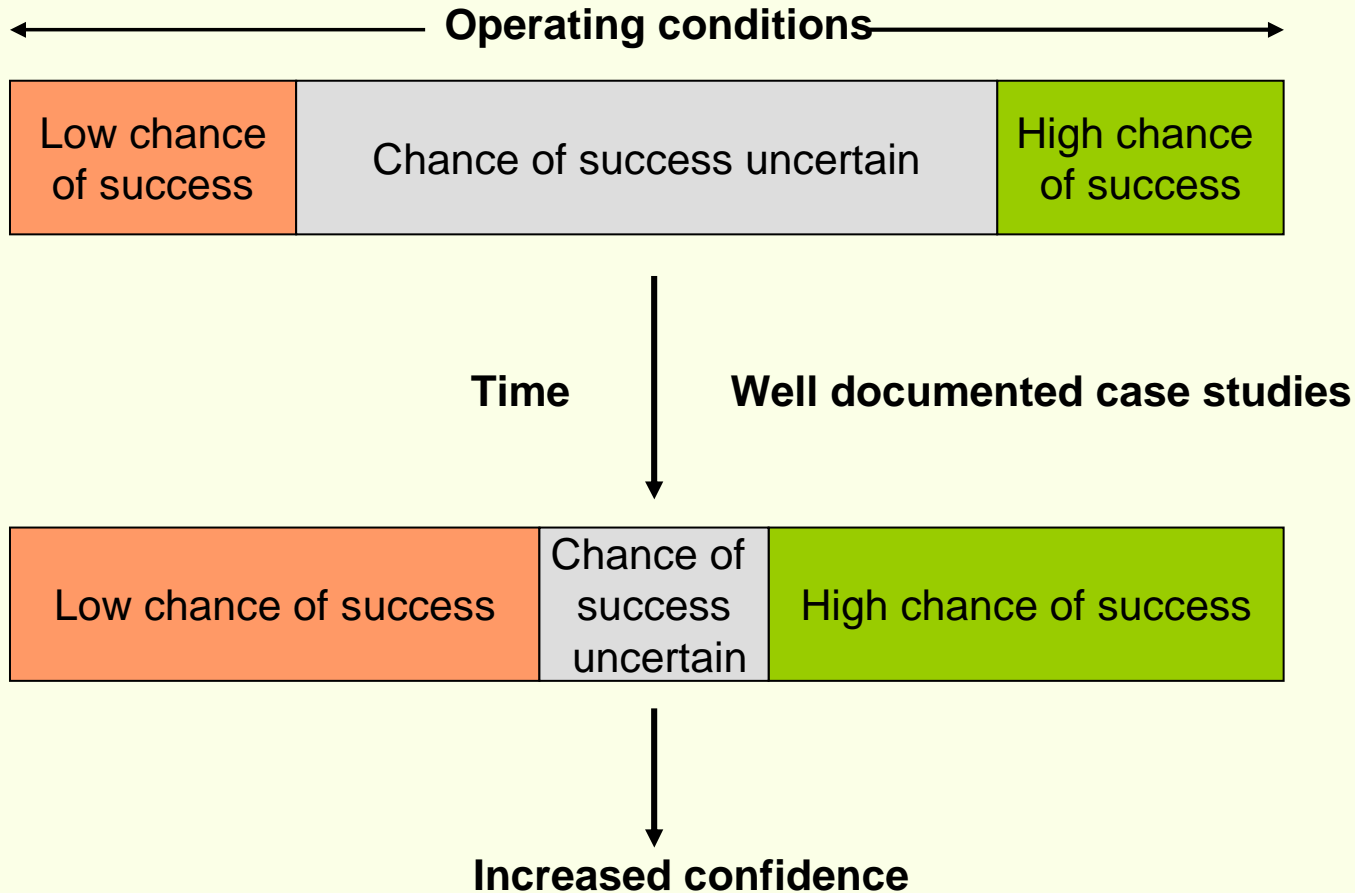
## Why:

- Increases Confidence
- Disseminate Good Practice & Lessons Learned
- Raises Standards

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# Defining the operational envelope of site investigation and remediation technologies



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# CL:AIRE System

## CL:AIRE Technology & Research Group

Professor Phil Morgan – Sirius Geotechnical and Environmental (TRG Chairman)

Mr Mike Pearl - UKAEA (TRG Deputy Chairman)

Mr Jonathan Smith – Shell Global Solutions

Professor David Lerner – University of Sheffield

Professor Max Coleman – Caltech USA

Dr Theresa Kearney - Department of Environment, Northern Ireland

Dr John Campbell - Rio Tinto (Retired)

Mr Mike Summersgill - RSK

Dr Brian Bone - Environment Agency

Professor Andy Moffat – Forest Research

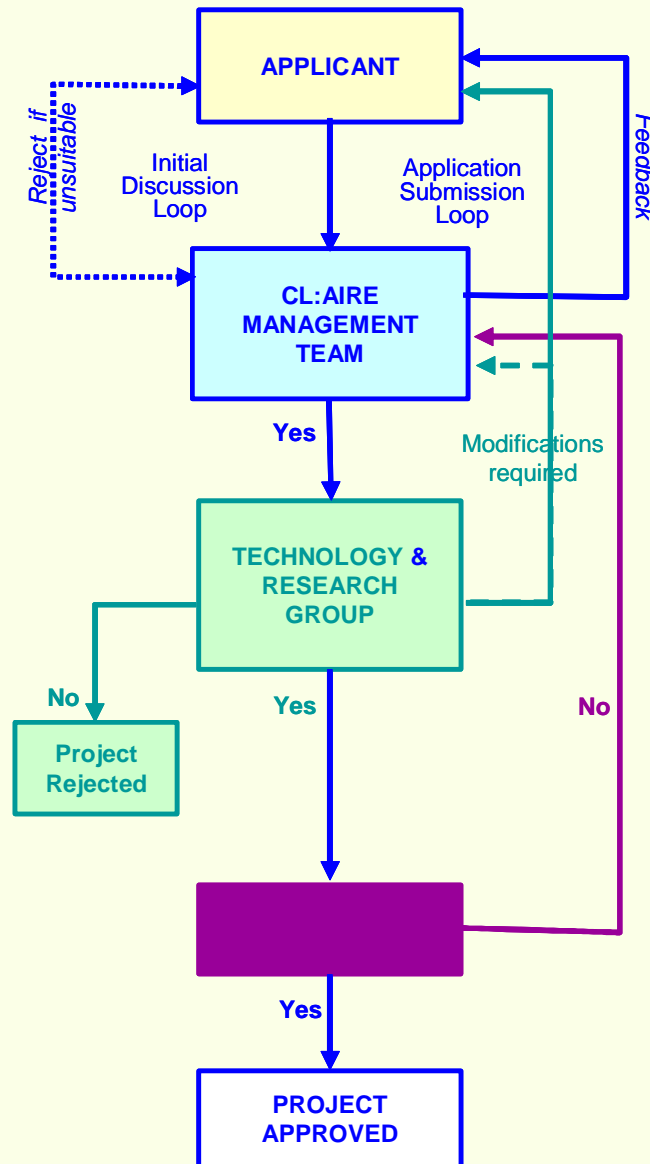
Dr Mike Rivett – University of Birmingham

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# CL:AIRE

## Technology Demonstration Projects, and Research Projects



The project is discussed with the CL:AIRE Management Team (CMT) to ensure fit within CL:AIRE remit and submission of **project application form**.

The TRG will review the application, scoring it against a project evaluation form. The individual reviews and comments are returned to the CMT who collate the comments and circulate them back to all of the TRG. The TRG evaluation will result in:

- Acceptance
- conditional acceptance (modifications required)
- rejection

The Board ratifies or rejects a project on a majority vote basis.

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# CL:AIRE System: Evaluation Criteria

- CL:AIRE Objectives
  - Areas of Innovation
  - Benefits to the Market
- Scientific & Technical Credibility
  - Process
  - Methodology & Scientific Rigor
- Practicability
  - Application to Site Conditions
- Project Management
  - Schedule
  - CVs
  - Risks
- Overall

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## THE SCALE OF THE CHALLENGE

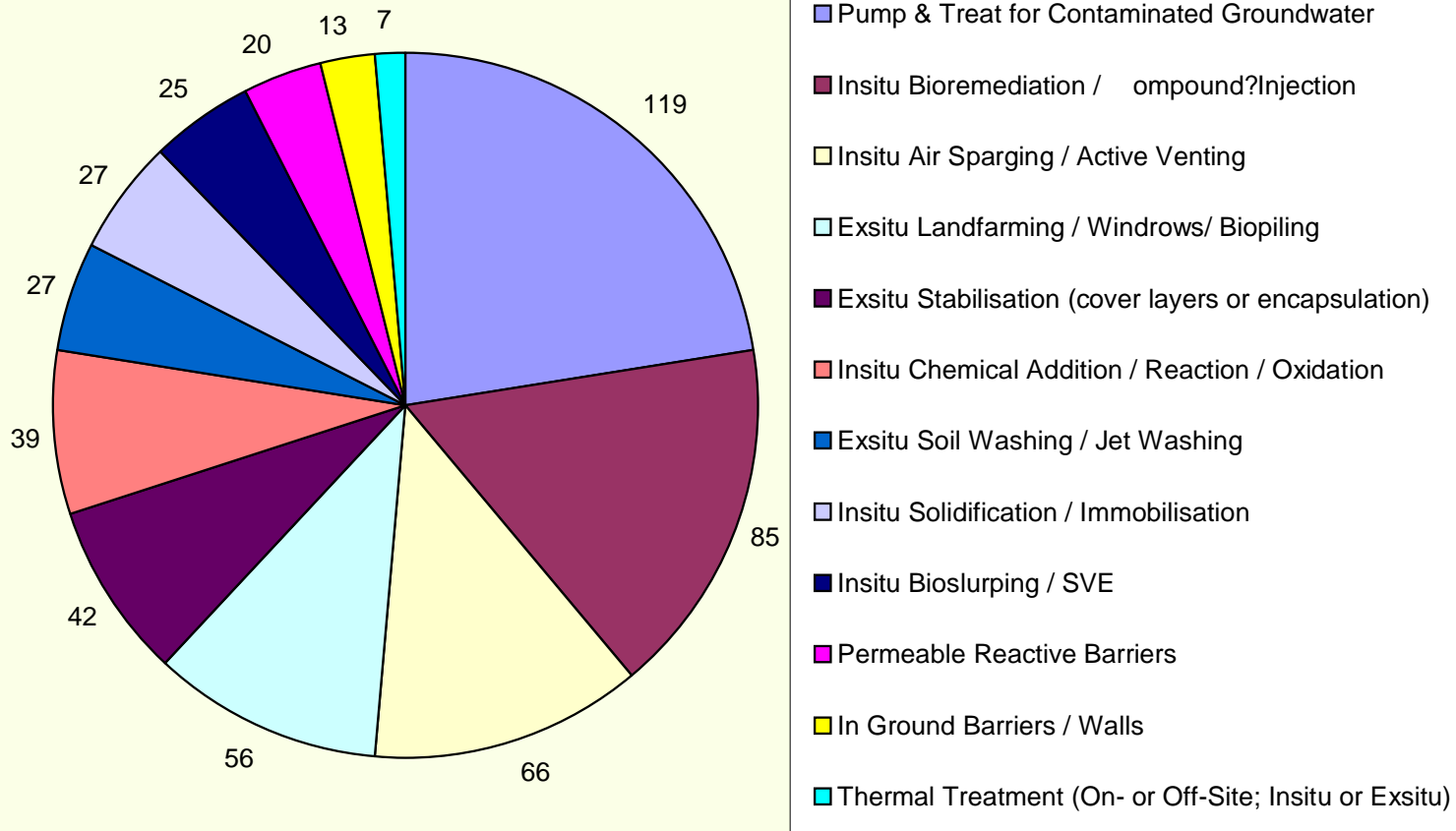
- Environment Agency Report – Indicators for Contaminated Land 2005
- 292,000 hectares potentially contaminated land on 333,000 sites in England and Wales
- Of which 57,000 hectares might be contaminated on 30,000 sites
- 5-20% of these might require intervention under Part IIA because of unacceptable harm
- This means 5,000 – 20,000 sites in England and Wales requiring regulatory intervention
- 3,500 km river at risk from mine water and 18,000 km<sup>2</sup> of aquifer at risk

Potential European market  
750 000 M€ in 2007

EEA, Management of contaminated  
sites in Western Europe (2005)

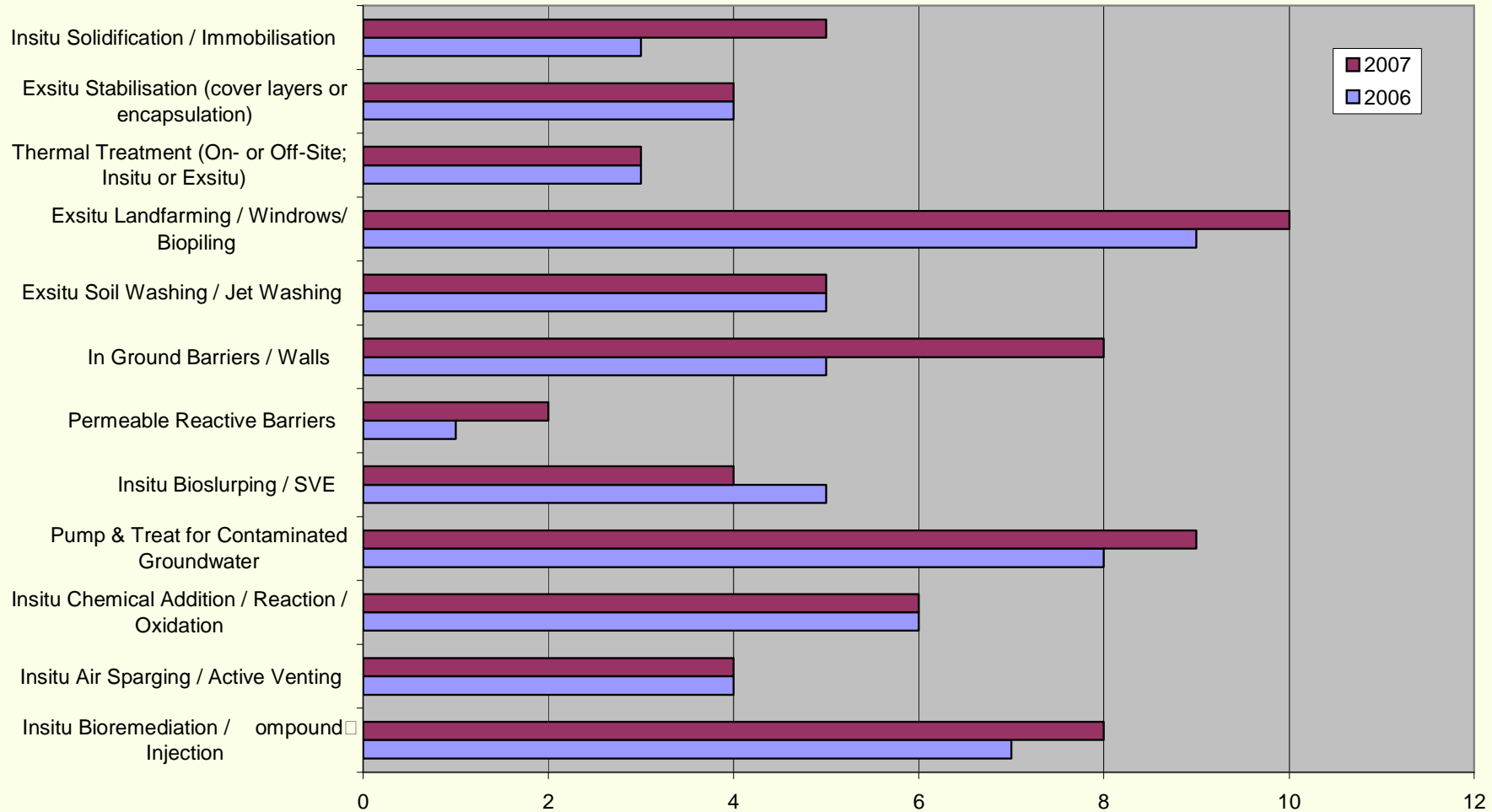
Country	Estimation of contaminated sites	Cost (m €)	Specifications of the costs	Population concerned (millions)	Surface area concerned (10 <sup>3</sup> km <sup>2</sup> )
Germany	240,000	5,378	Total cost	19.7	123
Austria	80,000	1,500	300 sites having priority	7.7	84
Belgium	14,000	6,900	Total cost	5.8	13
Denmark	40,000	1,138	Total cost	5.1	43
Spain	14,902	800	Rehabilitation of 38M m <sup>3</sup> soil and 9M m <sup>3</sup> of groundwater	38.9	505
Finland	25,000	900	Total cost	4.9	338
Italy	18,873	510	1250 sites having priority	57.7	301
Norway	13,231	500	700 sites having priority	4.2	324
Netherlands	120,000	46,000	Total cost	14.9	37
UK	100,000	39,000	Treatment of 10000 ha	57.4	245
Sweden	17,000	3,532	Total cost	85.7	450
Switzerland	50,000	3,000	Total cost	6.7	41
<b>Total</b>				<b>231.5</b>	<b>2504</b>

## Contractor: Number of Remediation Projects undertaken between 2001 and 2007, by type



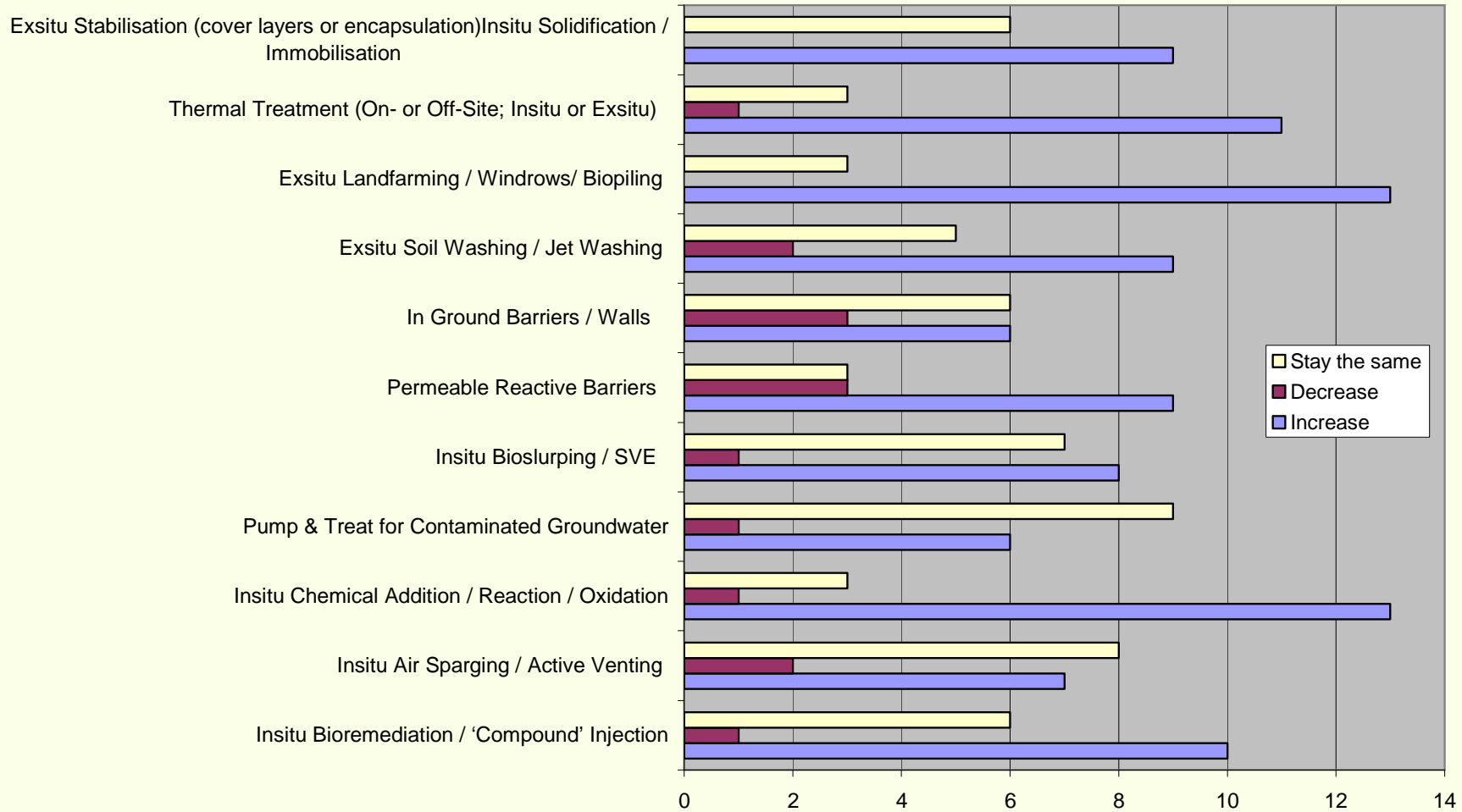
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## Contractor: Remediation Techniques Deployed By Surveyed Contractors in 2006 and 2007 (2007)



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### Contractors: Opinion on Future Demand of Remediation Techniques



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# What is New(ish) in UK

A number of technologies and techniques are being adapted for UK conditions from other countries such as: -

- Thermal treatments including: Thermally Enhanced Soil Vapour Extraction, Steam Injection and six Phase Electrical Heating –all imported from USA
- Permeable Reactive Barrier to treat Carbon Disulphide (CS<sub>2</sub>) – UK 1st in World
- Use of Microwaves is in its infancy
- Real-time gas-monitoring probes

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CONTAMINATED LAND: APPLICATIONS IN REAL ENVIRONMENTS

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**Promoting sustainable remediation**

CL:AIRE is an independent, not-for-profit organisation, established to stimulate the regeneration of contaminated land in the UK by raising awareness of, and confidence in, practical sustainable remediation technologies.  
[Learn more](#) about what we do.

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