Embedding Sustainability in Contaminated Site Management. Practical Experiences and Case Studies

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Contaminated land policy - 40 years of evolution

1980s
1990s
2000s
2010s
2020?

Clean to Background
Risk based Management
Sustainable Remediation
The risk based approach
Sustainable Risk Based Land Management

- We still need to mitigate the risks but there is increasing recognition of bigger picture
- Remediation itself can have costs & benefits
- Recognise and maximise the overall environmental, social and economic benefits and minimise impacts
The International Standard ISO 18504

- Provides a clear international standard for sustainable remediation

- Sustainable remediation defined as:

  “elimination and/or control of unacceptable risks in a safe and timely manner whilst optimising the environmental, social and economic value of the work”
Sustainable Remediation and the SDGs
Embedding Sustainability through project lifecycle

Are there unacceptable risks?

Setting the remediation specification and strategy

 minionising the environmental, social and economic value

Setting the remediation technical approach

OBJECTIVE

GOAL

PROJECT DEFINITION
PLANNING (brownfield)
SITE INVESTIGATION
RISK ASSESSMENT
REMEDIAL OPTIONS APPRAISAL
REMEDICATION CONSTRUCTION
REMEDICATION OPTIMISATION

Community & stakeholder engagement
Sustainable Procurement

ability to influence sustainability and drive cost reductions
Case Studies
Optimising Land Use at Masterplan Stage

**Issue**

- Manufacturing site in UK closing and relocating
- Number of known issues with historic land contamination
  - Risks to controlled waters (groundwater)
  - No risk to human health assuming continued industrial land use
- Site looking at future options for land use and minimising potential long term liabilities
- Could involve a change of use to residential – would require risk mitigation
Optimising Land Use at Masterplan Stage

Approach

■ Early identification and consideration of potential issues and opportunities associated with historic land contamination in context of future land use options

■ Optimisation of land use, land remediation and development proposals to minimise risks and maximise benefit

■ Economic, Social and Environmental Indicators considered
  ■ Corporate policy
  ■ Local plan
  ■ Uplift in land value
  ■ Integration of broad remedial strategy within context of other development issues – future layout
Optimising Land Use at Masterplan Stage

Benefits

- Process is on going and future not yet finalised
- To date relatively simple high level qualitative approach adopted has been sufficient to identify key issues – enable focus of future works
- Dialogue with stakeholders
- Ultimately develop a sustainable strategy for site - opportunity for positive outcome for site and community
Remedial Options Appraisal & Implementation

Issue

- A complex site – operational manufacturing facility
- Chlorinated solvents present in fractured bedrock
- Client wanted to minimise long term business risk
- Pump & Treat originally envisaged as solution
Remedial Options Appraisal

Approach

- Sustainability considered through life cycle of project
- Overall boundaries of project set by corporate policies, timescale and business objectives. Site specific sustainability indicators identified and metrics agreed and tracked

Technically

- A high resolution site characterisation approach used to characterise bedrock - better understand CSM & risks
- Remediation approach steam injection undertaken within challenging geological/hydrogeological scenario
- Post thermal treatment EVO injection to treat residual plume outside thermally treatment footprint
Remedial Options Appraisal

Benefits

- The high resolution site characterisation formed the basis for developing a robust conceptual model.
  - Refined and reduced areas of treatment
  - Minimised waste generated, eliminated multiple mobilisations and reduced time on site, manual handling and multiple journeys.
  - Minimised carbon footprint of works 13.5 tonnes CO2e c.f. 33 tonnes CO2e estimated

- Over 1,000kg of contaminant mass was recovered in less than three months and remedial objectives achieved. BMPs adopted and tracked. Post remedial monitoring demonstrated increased microbial activity.

- Significantly lower costs and associated emissions than the original strategy.
Delivering remediation in a complex site setting

Issue

Capacity Building for Industrial Pollution Management Project (CBIPMP) funded by the World Bank.

Orphan site (public & private land) in the eastern part of India:

Chromium bearing sludge dumped (over 30+ years) along a highway by some industries (no longer in operation).

Significant redevelopment using waste: filling in low lying area; access roads to industrial/commercial establishments, residences.

Investigations, remediation design; monitoring and validation of remediation.
Delivering remediation in a complex site setting

Approach

A remedial options appraisal was undertaken supplemented by multi criteria analysis (MCA) using sustainability indicators derived from SuRF UK framework.

In-situ chemical reduction selected as technically appropriate following pilot studies.

Given proximity of sites to community and potential interruption of business a detailed social environmental impact assessment was undertaken to identify potential conflicts and provide for early mitigation.

Included extensive consultation with the local community.
Delivering remediation in a complex site setting

**Benefits**

Broad consent from land owner and occupiers was obtained and outputs formed the basis for a detailed management plan and stakeholder engagement to accompany RAP.

The value to the project team was the incorporation of socio-economic concerns early in the remedy selection and remedial design process.

Through increased trust this provided a positive impact and maximised support of remediation activity.
Remedial Options Appraisal & Implementation – Barranquilla, Colombia

Issue

- Community developed (including elementary school) immediately adjacent to former industrial smelting operation
- Hexavalent chromium and lead impacted top 1m of soil
- Potential risk of heavy metal dust migrating from site
- Dig and haul initially considered as remedy
Remedial Options Appraisal & Implementation – Barranquilla, Colombia

**Approach**

- Semi-quantitative review of remedial options for sustainability
- Selected shallow soil mixing with chemical reduction and stabilization
- Coordinate with school to conduct work during holiday season to minimize intrusion and exposure
- Technically
  - Bench study determined chemical reduction dosing to reduce CrVI to CrIII
  - Identified local source of CaS5 saving cost and reducing carbon footprint
  - 15 cm asphalt cap added after completing stabilization allowing for beneficial reuse of property converting liability to asset
The practice and understanding of sustainable remediation has evolved significantly since its inception.

The recent publication of the ISO standard provides clarity and an international benchmark.

Alignment of sustainable remediation with broader corporate goals and SDGs provides additional justification.

Adopting sustainable remediation has been shown to have a number of positive benefits and can help change the perception of managing contaminated sites from one of minimising liabilities to a more positive opportunity.
Thank you

Questions?

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