

Sustainable Reuse of Metal Impacted River Sediments

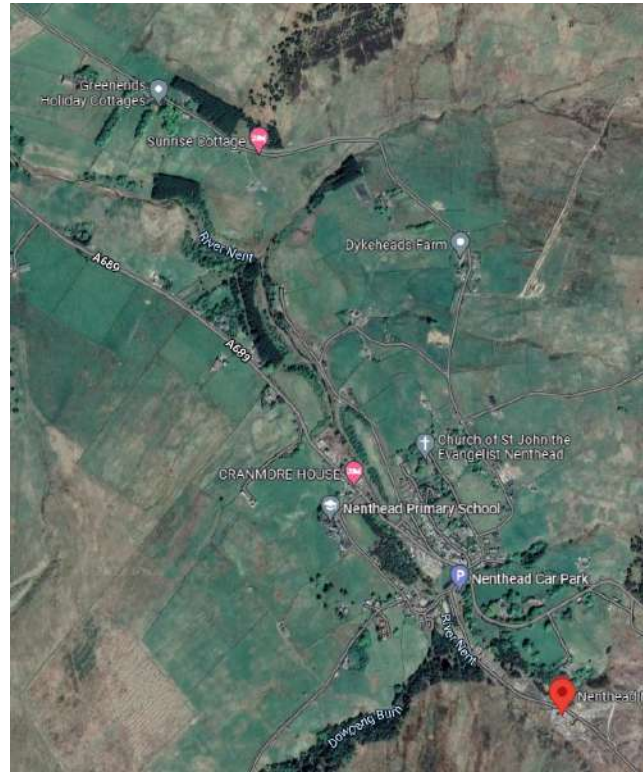
UK Coal Authority, Environment Agency & Defra



RAMBOLL

Bright ideas.
Sustainable change.

Nenthead Metal Mines, Cumbria



Historic metal mines

- Mining was intensive from c.1690 when the Rampgill lead & zinc vein was discovered
- Most of current on-site infrastructure that still remains dates from the 18th and 19th centuries
 - archaeological / historical interest
- Lead production peaked in the 1820s, replaced by zinc production in the late 19th century until mining ceased in 1920
- Some of the spoil heaps were reprocessed for zinc and fluorspar until 1971 – historical heritage!
- Wash out from historic spoil heaps **polluting** River Nent and River West Allen **up to 10km downstream**



National Programme

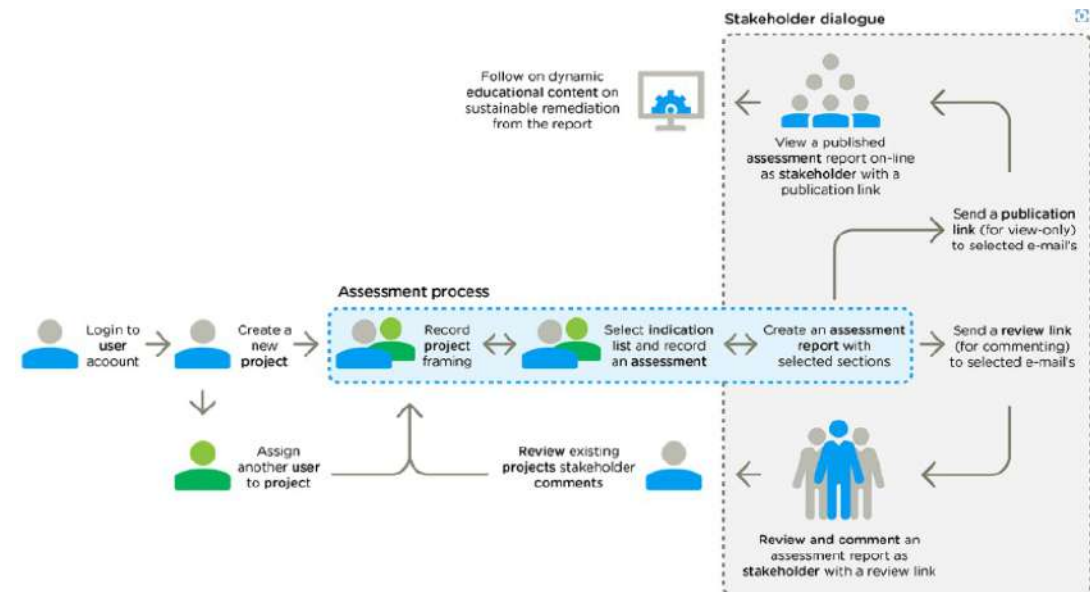
- Coal Authority, Environment Agency and Defra
- Part of the **Water and Abandoned Metal Mines** programme - aims to reduce water pollution caused by historical metal mining
- River sediment source - historic metal mining:
Cd, Pb, Zn
- Check weirs constructed in river to collect polluted sediments
- Check weirs dredged to remove contaminant loading & **improve river water quality**
- Dredged material **sent to landfill** as hazardous waste, landfill site located 100km away, disposal cost €500/m³



SURE by Ramboll – A Digital Tool for Sustainable Remediation

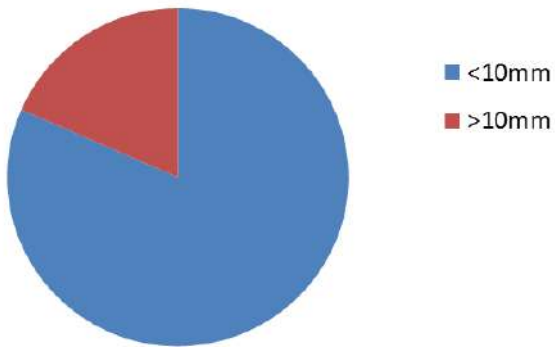
What is SURE by Ramboll

- SURE is an on-line platform developed by Ramboll for **rapid sustainable remediation** assessment, communication, and reporting
- The tool enables efficient and **cost-effective decision** making to better manage land contamination and is freely available for all remediation professionals: ramboll.com/sure
- The tool is aligned ISO 18504:2017, ASTM E2893-16 and SuRF (UK) compliant, and supports identification of related UN SDGs

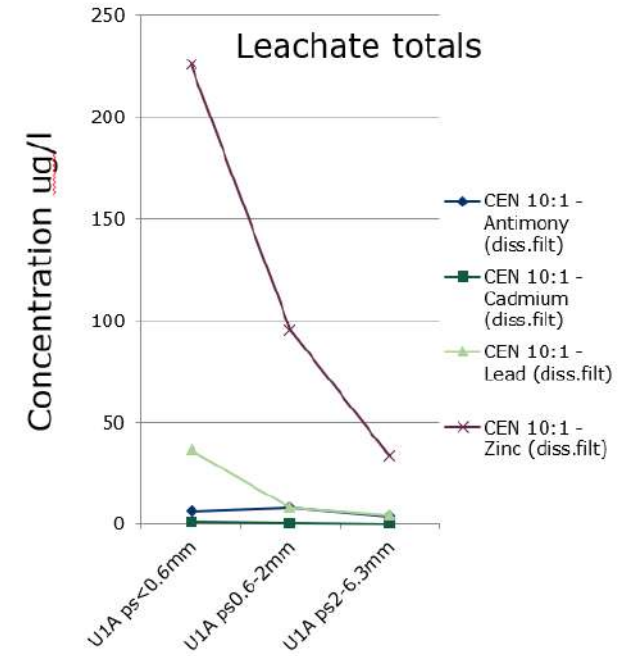
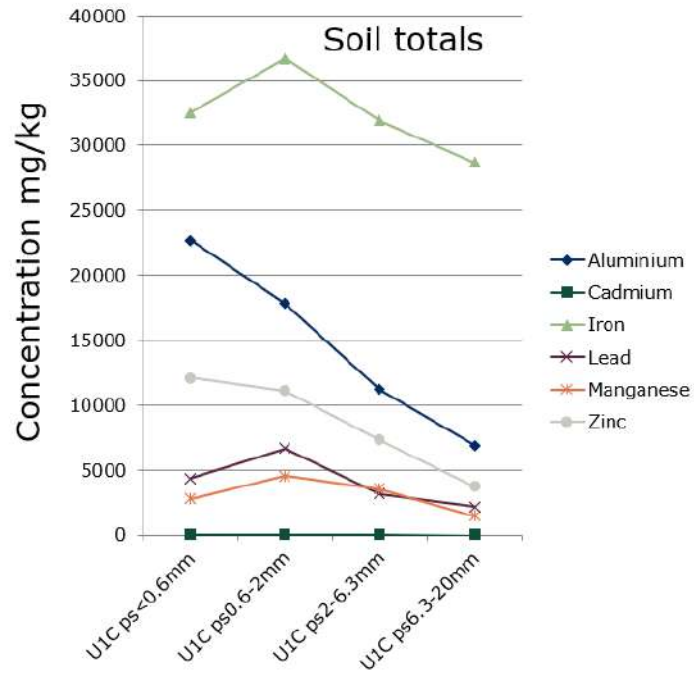
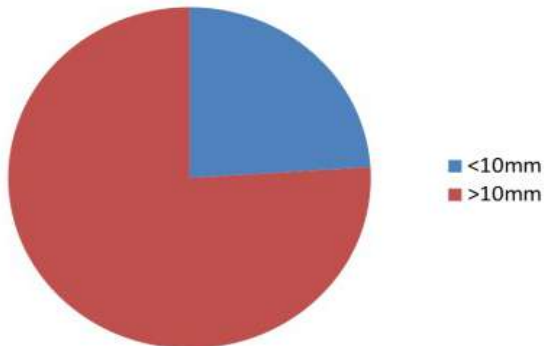


Sediment analysis results

**Lead Concentration
(field particle size split)**



Particle Size %



Sediment analysis results

- Aqua-regia extractable **Lead** concentrations
 - **5,300 to 5,600mg/kg**
- Average concentration of 5,450mg/kg (aqua-regia digestion followed by ICP-OES)

- Aqua regia extractable **Zinc** concentrations –
 - **18,000 to 33,000mg/kg**
- Average concentration of 25,500mg/kg

- Available metal analysis - no metals recorded in concentrations exceeding the laboratory limit of detection (<1mg/kg) except zinc
- **Available zinc** concentrations ranged from 34 to 130mg/kg (Available metals by ICP-OES - Ammonium Acetate Extract)



Sustainable Reuse Options - Coarse Fraction

- Bankside stabilisation work
- Sub-base for road / car park
- Drainage infrastructure / French drain / soakaway construction
- Granular backfill for infrastructure and development projects

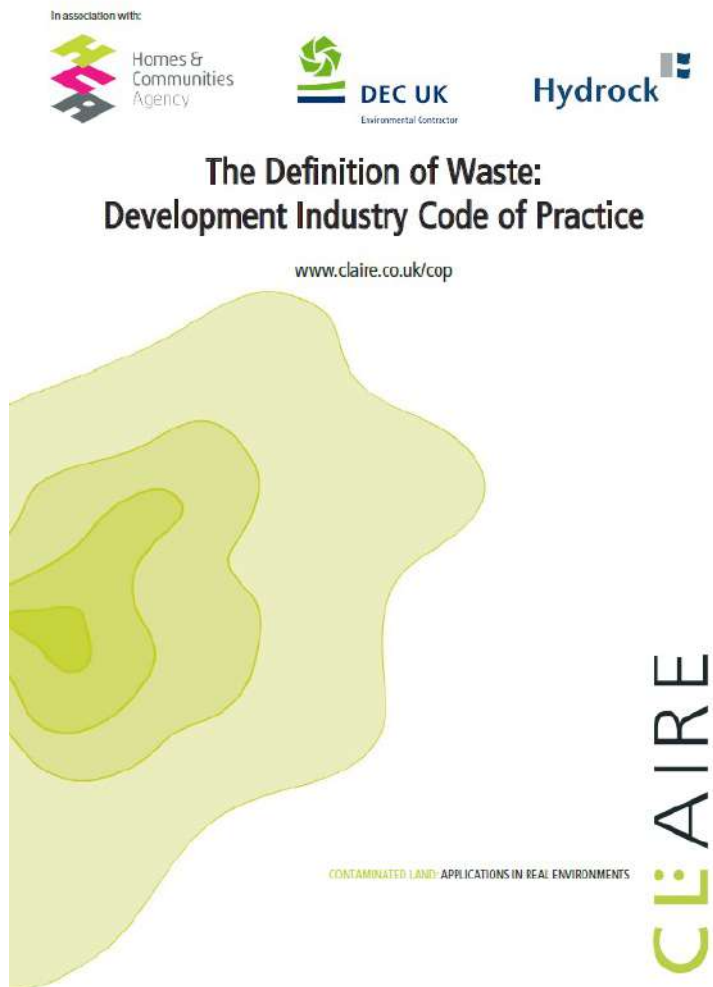


Sustainable Reuse Options – Fine Fraction

- Approved Planning Permission for mine-water treatment system included landscaped features
- Creation of *calaminarian* grassland (Dr. Janet Simkin - Newcastle University)
 - established vegetation **increases water retention** within the sediment and **reduces contaminant run-off**



CL:AIRE - Definition of Waste: Industry Code of Practice - DoW CoP

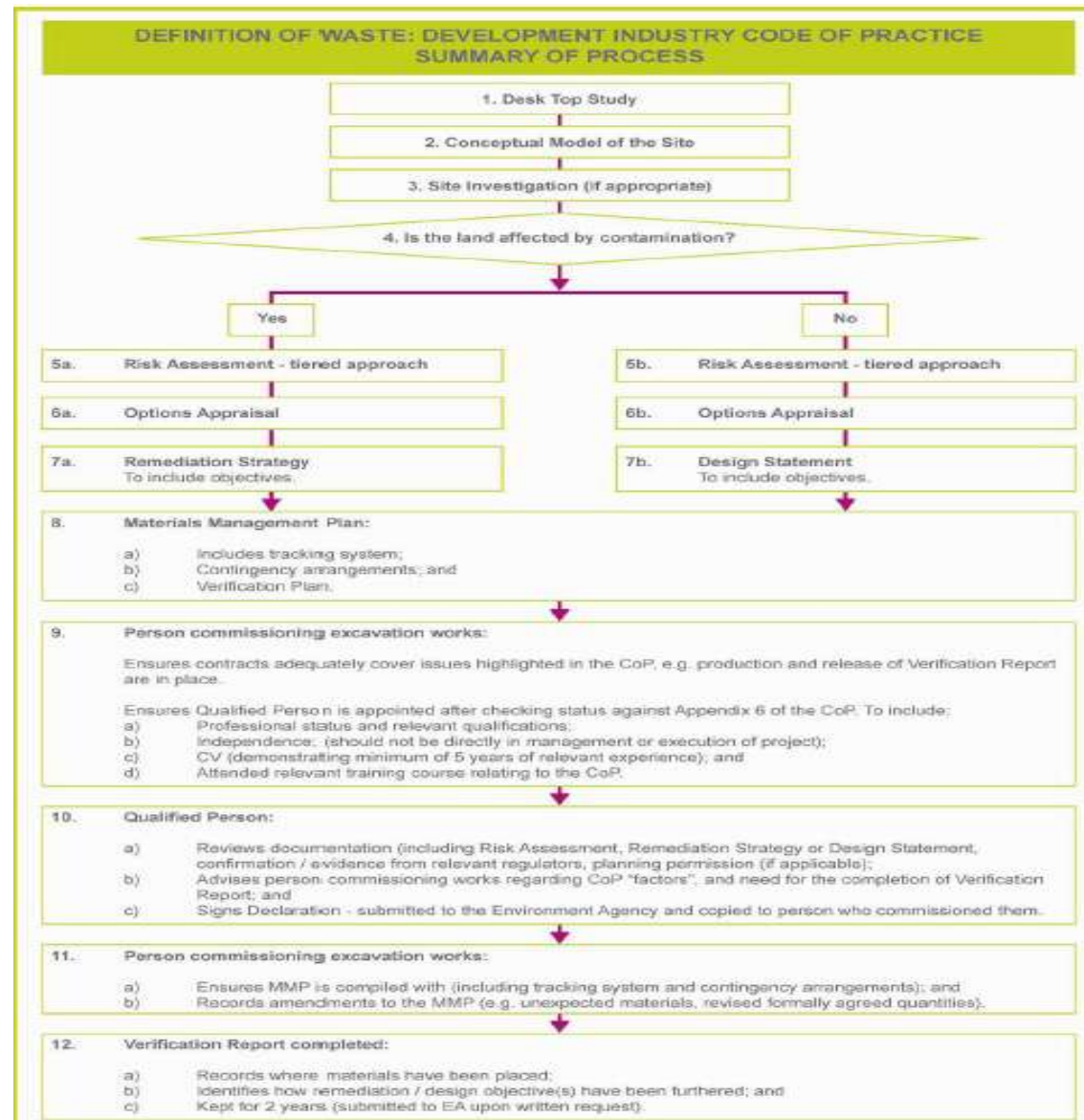


Code of Practice developed for the following purposes:

- Good practice for development industry to use when:
 1. Assessing on a site specific basis whether **excavated materials** are classified as waste or not
 2. Determining on a site specific basis when **excavated waste** can **cease to be waste** for a particular use.
- It describes an **auditable system** to demonstrate that the Code of Practice has been adhered to;
 - Protection of human health and the environment;
 - Suitability of reuse without further treatment;
 - Certainty of use; and
 - Quantity of material

Summary of DoW CoP Process

- Desk Top Study
- Site Investigation
- Risk Assessment
- Remediation Strategy
- Material Management Plan
- Qualified Person
- Verification Report



Materials Management Plan

- **Good practice** has three basic steps:
 - **1.** Materials Management Plan (MMP) defines the **use of materials** on a specific site
 - **2.** MMP is based on an **appropriate risk assessment**, that underpins the Remediation Strategy

Risk assessment concludes **low risk to human health and the environment** if materials are used in the manner proposed in the MMP

- **3.** Ensure that materials are actually **used** as stated in the MMP
 - subsequently demonstrated in a **Verification Report**





**Spring sandwort
(*Minuartia verna*) &
Field Pennycress
(*Thlaspi arvense*)**



Exemplifies key features of the EU Soil Strategy of 2030

- Contaminated land management practices that sustain and enhance soil health & enhance local biodiversity
- Improve cost efficiency - reduce transport costs and remove the need for virgin materials for construction
- Demonstrates a safe, sustainable and circular use of excavated soil.
- Complements the vision and objectives of the EU Soil Strategy of 2030 to achieve good soil health by 2050 and reach good ecological and chemical status in surface waters.

Meets UN Sustainable Development Goals:



6 and 14 – Improving water quality of the River Nent and River West Allen by removing 2,000kg lead and 5,000kg zinc contaminants from the rivers

9 – Using detail risk assessment to allow the safe reuse of dredged sediment material under CL:AIRE Definition of Waste: Industry Code of Practice (DoW CoP)

11 – Reuse of sediment to construct biodiversity land avoiding the need for virgin materials in construction and avoiding the need to transport dredged sediment to landfill

15 – Construction of *calaminarian* grassland areas to enhance local biodiversity for wild plants, including wild pansy, spring sandwort and alpine penny-cress

CL:AIRE Launches DoW CoP International Construction Soil Passports

- Principles and procedures **based on the EU Waste Framework Directive**
 - Projects outside this jurisdiction adapt or seek approval to use DoW CoP
 - **Step-by-step process** for EU & International Projects is as follows –
1. Are **guidance documents** applicable in the country?
 2. If the not applicable agree with the Qualified Person (QP) and CL:AIRE to **determine equivalent procedures.**
 3. Contact CL:AIRE intention to use the DoW CoP and obtain **permission from the relevant regulatory authority**
 4. Appoint a QP - knowledge and experience in the project location
 5. QP review & approve the **Materials Management Plan (MMP)** before work begins & submits a **Construction Soil Passport Declaration** via the CL:AIRE portal
 6. QP to monitor the implementation of the MMP during the project
 7. Once the project is complete, QP complete the **Verification Report** & submit to CL:AIRE for review and acceptance

DoW CoP
Sustainable Reuse of Soils

