

# SocEnv Soils and Stones project: Case study demonstrating one or more of the ten principles of good soils and stones management

## Sustainable Reuse of Metal Impacted Sediments



*Photo of former metal mine [Coal Authority Image]*

**Summary:** The Coal Authority, Environment Agency (EA) and Department of Environment, Food and Rural Affairs (DEFRA) are working to address the widespread legacy of contamination from disused metals mines, to deliver a cleaner water environment for people and wildlife. The work forms part of the *Water and Abandoned Metal Mines* programme which aims to reduce water pollution caused by historical metal mining activities.

One part of the strategy is to construct check weirs within the polluted rivers to capture and subsequently remove metal impacted sediments, thus reducing the contaminant loading in the rivers. The check weirs require regular dredging to ensure they work at optimum efficiency. The dredged sediment was historically disposed to landfill, often as hazardous waste due to the high lead and zinc content. This approach involved transport of the sediment via minor country roads to landfill facilities >100km away. This had a significant cost and carbon impact from lorry emissions which caused severe disruption to local communities – to the point where the benefits of improving river water quality were outweighed by the negative impacts. Ramboll challenged the waste classification process to consider the excavated sediment as a resource, rather than a waste, and developed solutions to reuse the dredged sediment locally.

**Applying good practice:** Potential reuse options under the CL:AIRE Definition of Waste: Industry Code of Practice (DoWCoP) were identified;

- Using the cobbles fraction within gabion baskets to improve riverbank stability.
- Using the gravel fraction for footpaths/road sub-base or drainage layers.
- Using the fine fraction to create a *calaminarian* grassland nursery to encourage growth of plant species tolerant of high concentrations of heavy metals.

To reuse materials under DoWCoP requires the waste producer to establish lines of evidence to demonstrate:

- i) Protection of human health and the environment;
- ii) Suitability for use without further treatment;
- iii) Certainty of Use; and
- iv) Quantity of Material.

Ramboll demonstrated the DoWCoP requirements to the EA's satisfaction, thus avoiding tortuous waste regulations. By using the DoWCoP approach, material which was previously being sent to hazardous landfill could be reused safely and sustainably in the local area, to create the enhanced biodiversity grassland feature. This project is a perfect example of taking a Circular Economy approach to contaminated land management.

**Meeting the ten principles:**

Principle	How the principle was met in this project.
1. Implement soils and stones management practices to drive sustainable economic growth.	Considered metal impacted dredged sediment as resource rather than a waste and reused it as a construction material for development projects near to point of excavation. This avoided needing to use virgin materials for construction and removed the requirement for disposal to landfill.
2. Preserve, protect, and enhance the value of all soils and stones in situ.	N/A
3. Promote and enhance the inherent value of soils and stones as part of a wider integrated environmental system (e.g., for carbon sequestration, food security and biodiversity).	The lead and zinc impacted sediments were used to create a <i>calaminarian</i> grassland nursery which encouraged the growth of plant species tolerant of high concentrations of heavy metals. This enhanced the surrounding biodiversity, and the established vegetation increases water retention within the sediment. This approach also reduced contaminant run-off into the nearby river.
4. Use a common standard for soil health in relation to land-use, taking underlying soil conditions and functions into account in the management of land.	Assessed <i>aqua-regia extractable</i> soil concentrations against UK screening criteria for human health given in, <i>Road Testing of 'Trigger Values' for Assessing Site Specific Soil Quality. Phase 1 - Metals Science Report - SC050054SR1 Environment Agency, Oct 2008.</i> Also, assessed available metal data and leachate data against Environmental Quality Standards.
5. Use common quality standards for soil based on principle #4 for	Used geotechnical specification standards for construction of gabion baskets, footpaths, and drainage channels.

excavated soils, stones and dredgings to be used in specific end-uses.	
6. Understand and identify site specific soil conditions at the start of project planning or change of land-use. Define the status of any excavated soils and stones according to their value as an end-use resource and avoid the intention to discard them as surplus to the needs of the project. Protect undisturbed soils to enhance soil health.	The metal rich, lead and zinc, sediments were classified as hazardous waste based on the contaminant levels present, but the project identified a need to reuse the sediment through the construction of a grassland feature, to provide biodiversity enhancement.
7. Develop and implement a resource hierarchy for the management of land, soils and stones.	Different reuse options were identified based on grading of materials. The larger fraction 100-200mm used in gabion baskets, the 20mm grading was used for drainage channel and 10-40mm grading was used for footpaths, with the <10mm grading used in the grassland feature.
8. Implement financial metrics for the life cycle of all projects based on the impact on soil value in order to drive the market for offsetting (e.g., metrics for biodiversity loss, carbon sequestration and loss of food security).	N/A
9. Implement a national policy progressively to harmonise legislation, regulation, best practice guidance and monitoring programmes to protect soils. Include the fields of planning, land contamination, forestry, agriculture, ecological restoration, and waste management. Aim to promote integrated markets for soils and stones, offset trading and policies thereby allowing land values to reflect optimum soil health based on metrics in principle #4.	Ramboll used the CL:AIRE Definition of Waste: Industry Code of Practice (DoW CoP) to reuse site won excavated material. The DoW CoP process describes an auditable system to demonstrate that the Code of Practice has been adhered to, namely; <ul style="list-style-type: none"> <li>• Protection of human health and the environment;</li> <li>• Suitability of reuse without further treatment;</li> <li>• Certainty of use; and</li> <li>• Certainty of the quantity of material required</li> </ul>
10. Periodically benchmark the natural and economic value of UK soils against both base-line UK and international metrics, taking into account global social, economic and environmental sustainability (e.g., the	N/A

supply chain impacts of ensuring UK food security, and the valuation of soils and stones).



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

*Calaminarian grassland [Ramboll UK Ltd]*

**Final reflections:** The CL:AIRE Definition of Waste: Industry Code of Practice (DoW CoP) is a very efficient way to identify site won excavated material, which is suitable for reuse on the site of origin. It is a key tool in the management of contaminated land and it is a practice that sustains and enhances soil health which can lead to enhancing local biodiversity. The DoW CoP process embeds the principles of the circular economy and Improves cost efficiency by reducing transport costs and removing the need to use virgin materials for construction. The DoW CoP process provide an auditable system which demonstrates a safe, sustainable and circular use of excavated soil. It 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.

**About the author:** Dr. Phil Studds is a director for Environment and Health at Ramboll. He has over 30 years working in the fields of contaminated land assessment and material reuse. Ramboll is a globally leading engineering and consultancy company. In the UK our 1,400 experts are at the heart of designing and implementing sustainable change that creates a lasting impact for both our clients and society at large - <https://www.ramboll.com/en-gb/contact-us/united-kingdom>