



The quantification of mining legacy stocks within sediment deposits in the lower reaches of the Cotehele Stream (UK)

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Mineral exploration in the UK has contaminated broad areas since the Bronze Age and reached its peak during the Industrial Revolution leaving a legacy of sediment contamination by metals in rivers and streams. This legacy comprises one of the most significant sources of diffuse pollution to surface waters in the UK.

The Cotehele stream, located in Cornwall, received contributions from the exploration of metals in mines located in tributaries upstream. These mines operated during the 18th and 19th century, however, flood regimes distributed metal-rich sediments along the stream and a great proportion has been accumulated in downstream deposits.

The aims of this piece of work is assess the magnitude of metals and distribution of legacy contaminants and estimate the stock of metals under future risk of remobilization in downstream deposits.

Field observations and LiDAR (Light Detection and Ranging) images have been used to identify sediments deposits downstream and to select sites for core sample collection. Metal concentrations were measured after sediment extraction with Aqua Regia and samples were analysed on a Varian Vista-Pro ICP OES.

Geochronological dating was used to support the identification of metal sources in the deposits according to the period of metal exploration upstream (1580 to 1855).

The magnitude of metals observed in core samples indicate concentrations which greatly exceed the PEL (Probable Effect Level) concentrations from Canadian Sediment Quality Guidelines (CSQG). PELs concentrations has been applied to each core sample and compared with the concentrations from Cotehele stream.

Metal concentrations data from each 2 cm, sediment density and the volume of sediments calculated using LiDAR and GIS enabled the calculation of the mass of metals stored in each deposit. These sites are within the Environment Agency flood alert area and are at risk of erosion/reworking. The estuary downstream poses an additional threat, once metal mobility may change with the increase of salinity.