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UNDERSTANDING CHROMIUM BEHAVIOUR IN COPR-IMPACTED SEDIMENTS IN THE POLMADIE BURN, GLASGOW

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Abstract

From ~1830-1968, one of the world's largest Cr chemical factories operated in Rutherglen, SE Glasgow, Scotland. During this time ~2.5 million tonnes of chromite ore processing residue (COPR) was produced and used mainly as landfill, leading to widespread contamination of nearby land, surface water and groundwater. Hexavalent chromium (Cr(VI)) is highly toxic and carcinogenic and is present in COPR at ~1% w/w. Although some of the contaminated sites have been remediated, Cr(VI) is still readily detected in burn-side soils, sediments and surface waters of the Polmadie Burn, which flows into the River Clyde, Glasgow. This project seeks to determine the biogeochemical and environmental factors that influence the preservation of Cr(VI), its transport and its bioaccessibility.

Initial studies have characterised the Polmadie Burn system: Cr(VI) concentrations of 1400 $\mu\text{g L}^{-1}$ were found in the Polmadie Burn waters, values of up to 1200 mg kg^{-1} were obtained in sediments and concentrations of 60 mg kg^{-1} were determined for the banking soils. Total Cr concentrations in the soil and sediment were up to 800 and 14900 mg kg^{-1} , respectively. Sequential analysis of the burn-side soil suggests that Cr is mainly associated with organic matter.

The effect drying has on the release of Cr from the sediment and burn-side soil has been investigated along with the inhalation bioaccessibility of the banking soils. This information will help access the potential risk posed by Cr in contaminated sediments and soils in areas where climatic change leads to prolonged dry periods.