



The long-term accumulation of contaminants in sustainable drainage systems (SuDS) and end-of-life

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**EXCELLENCE
WITH IMPACT**



Introduction

- SuDS have been implemented to enhance natural drainage and treat urban runoff
- Effectively trap pollutants
- Trace metals can cause toxicity in the system
- Previous studies have not defined the fate of SuDS end-of-life



Introduction

- Lack of maintenance could effect the overall toxicity of accumulated sediment
- Soluble fractions of metals are the main interest as they would be available for uptake – concern for negative environmental impact and increasing potential bioaccessibility.
- Difficult to generalise



Aims

Aim 1 – To establish metal concentrations in SuDS that have received long-term pollutant accumulation.

Aim 2 - To distinguish the hazardous nature of SuDS end-of-life.



Sites – Porous Paving System (PPS), Bury, UK



- PPS before and during decommissioning.



Sites – Hopwood Motorway Service Area (HMSA) SuDS, Bromsgrove, UK



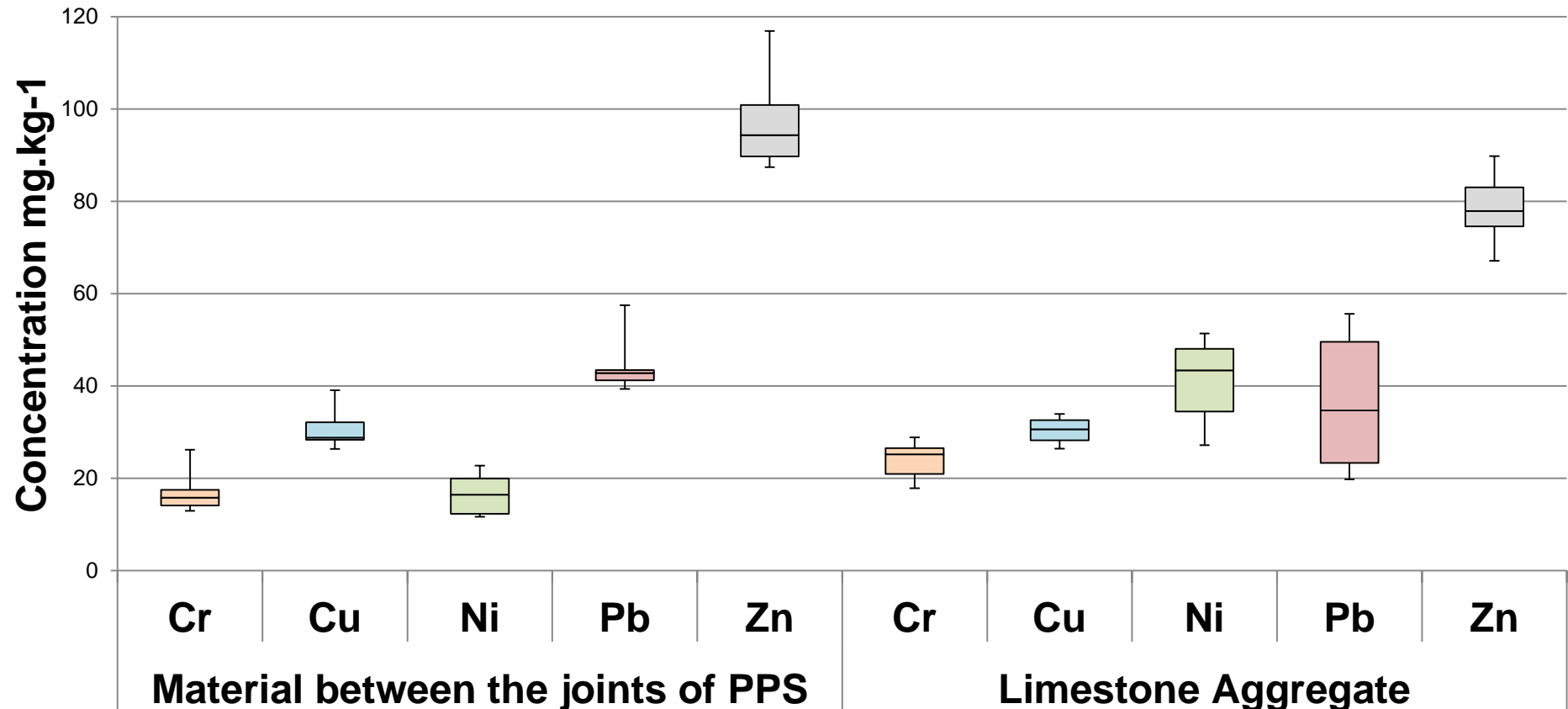
- HMSA second management train

Methods and Techniques

- Samples were collected during October and February 2015-2016.
- Samples were digested for total metal concentrations, total extractable metal concentrations and readily available metal concentrations (Zn, Cu, Ni, Pb, Cr).
- Analysis was completed by ICP-AES to determine metal concentrations.
- Organic matter (%OM) was determined by weight differences through loss on ignition.

Preliminary Results

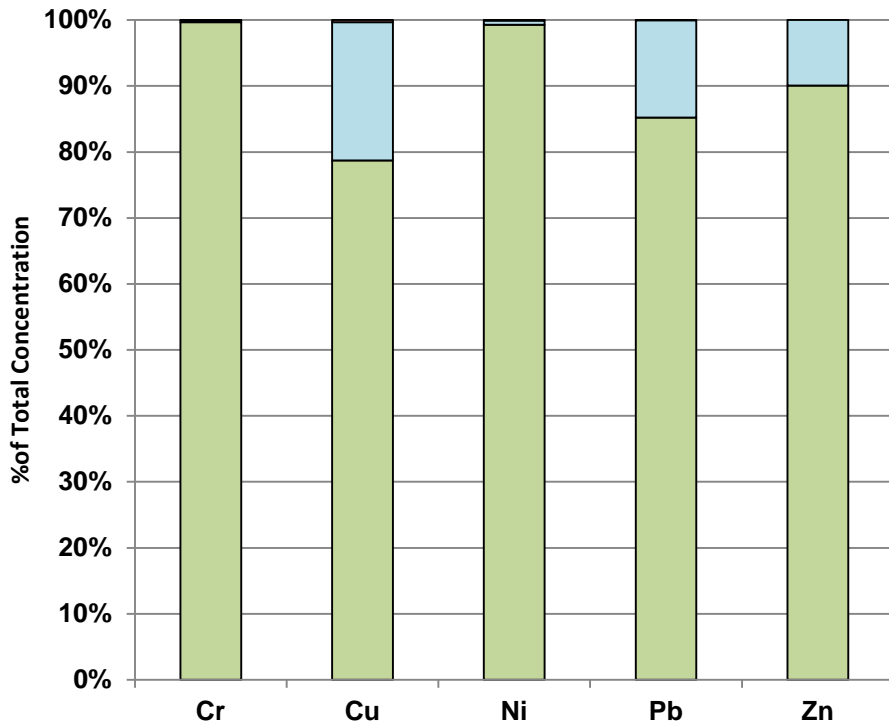
Total metal concentrations for PPS, Bury



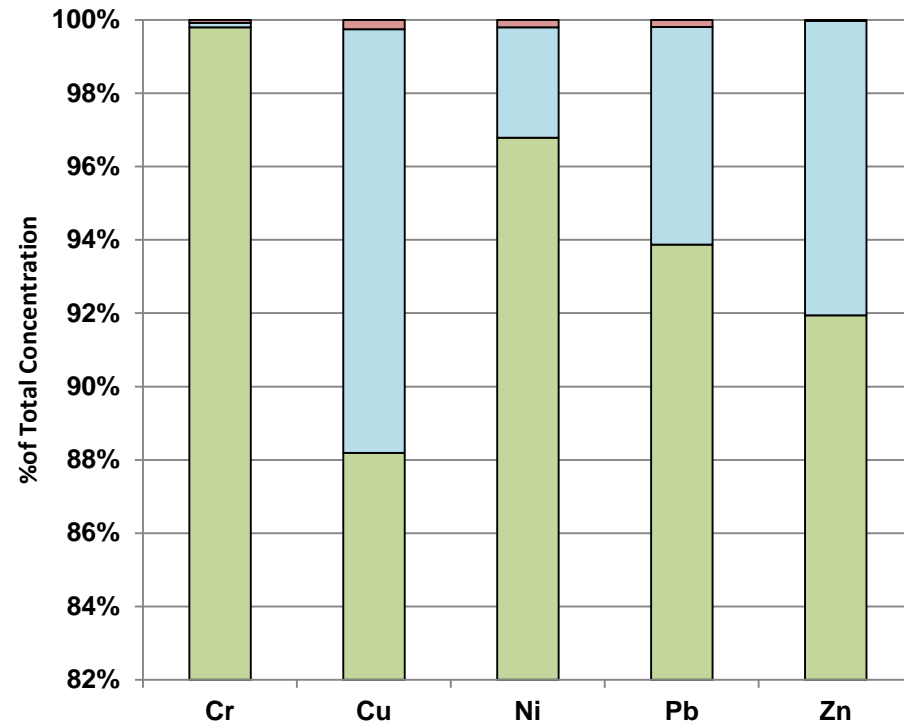
Preliminary Results

Extractable metal concentrations & percentage of total from PPS, Bury.

Joint material between PPS blocks

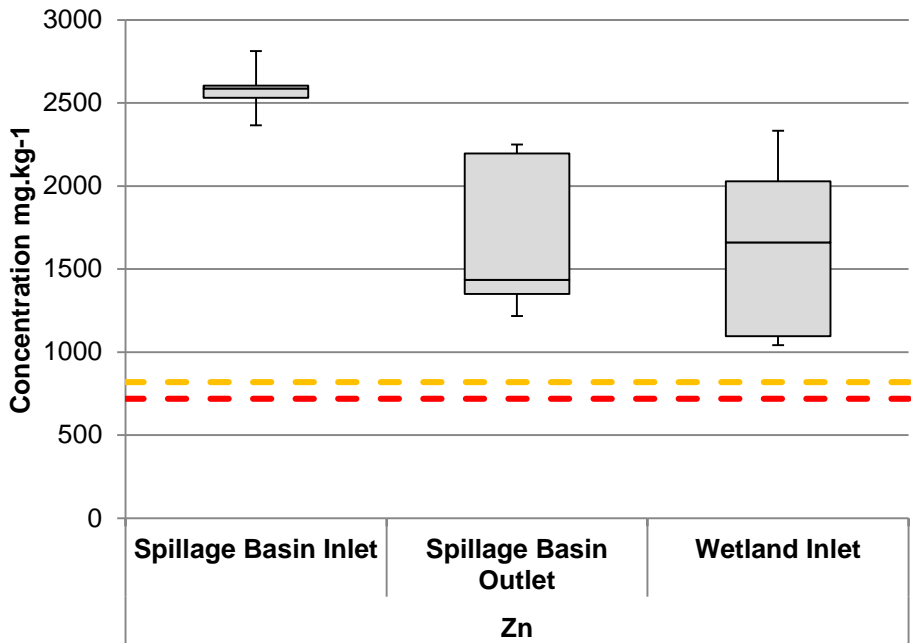
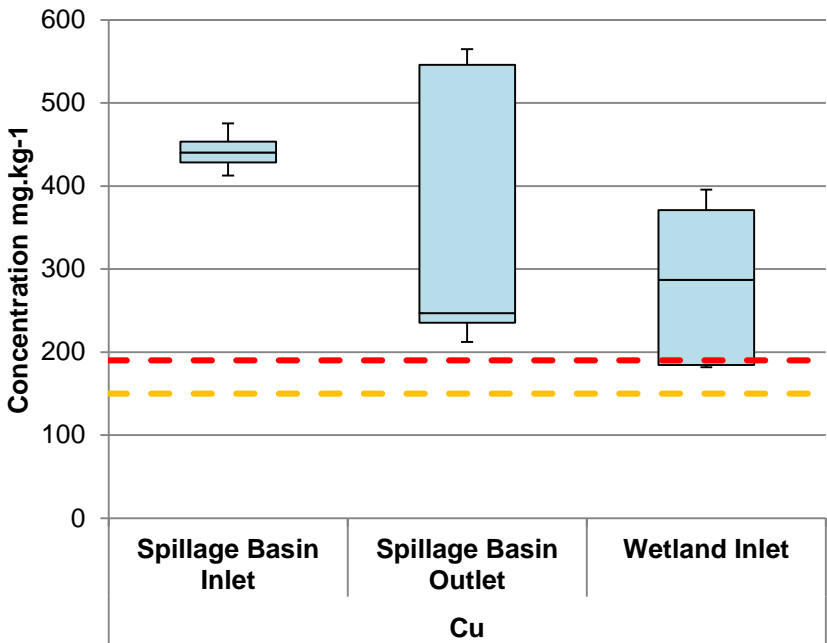


Joint material between PPS blocks



Preliminary Results

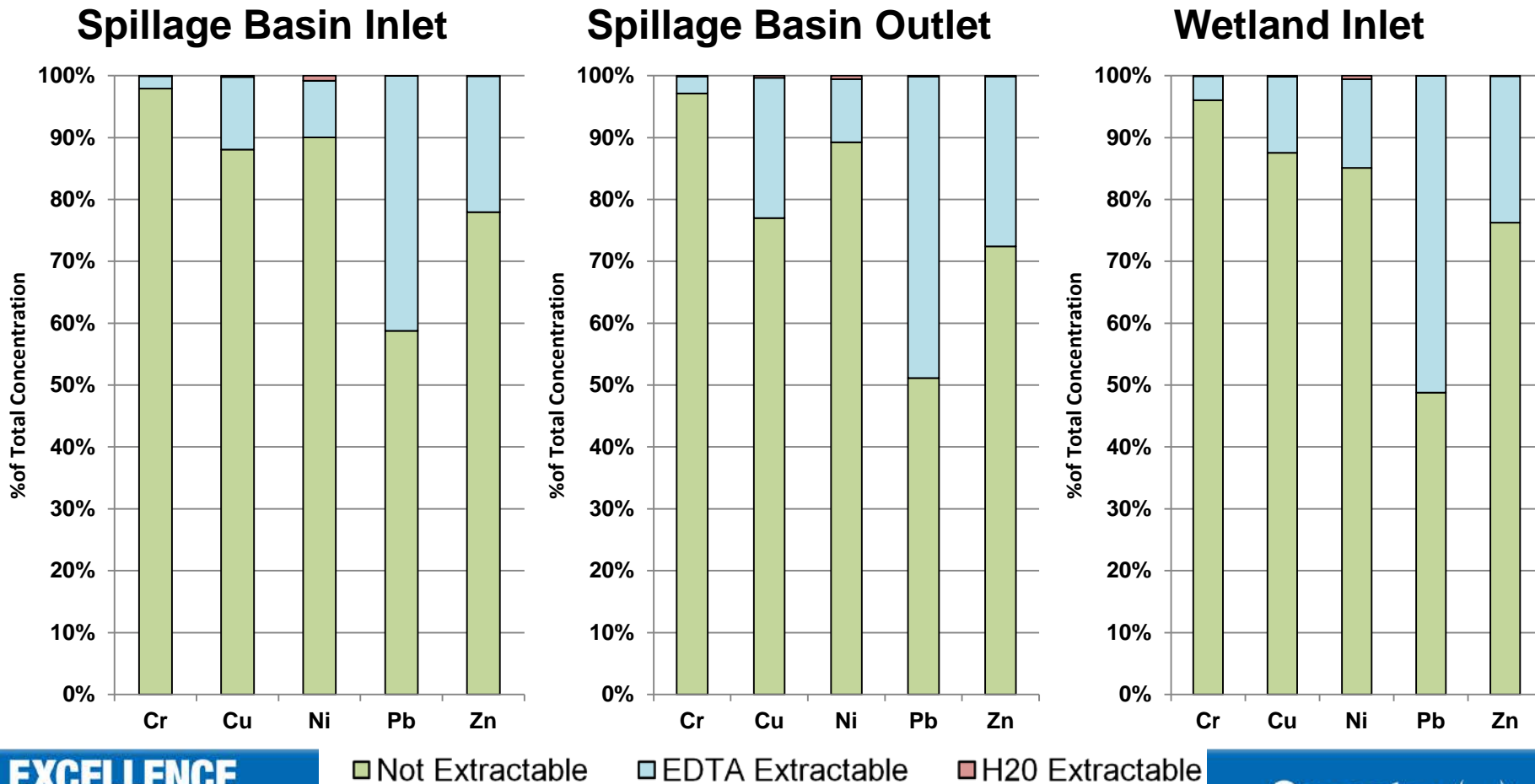
Total metal concentrations for HMSA Spillage Basin and Wetland inlet.



----- Dutch Intervention Values (2013)
 ----- Ontario Sediment Severe Effect Level Values (1993)

Preliminary Results

Extractable metal concentrations & percentage of total from HMSA.



Preliminary Results

- Water quality results from the HMSA spillage basin and PPS.

Site	Zn	Cu	Pb	Ni	Cr	pH
Spillage Basin inlet (HMSA) (<i>mg l⁻¹</i>)	0.087	0.002	ND	0.03	0.01	6.9
Spillage Basin outlet (HMSA) (<i>mg l⁻¹</i>)	0.107	0.009	ND	0.003	0.002	6.9
PPS outlet (<i>mg l⁻¹</i>)	0.003	0.002	ND	0.002	0.001	7
WHO drinking water quality standards (mg/l) (WHO 2011) (<i>mg l⁻¹</i>)	3	2	0.01	0.02	0.05	

Conclusion

- Making assumptions on end-of-life issues for the HMSA spillage basin and PPS are premature.
- Although metal concentrations exceed sediment quality values for Zn and Cu in the spillage basin, the water extractable concentrations and water quality results have indicated that the treatment efficiency of the system has not declined over time.

Further Work

- Additional chemical analysis will aid in establishing issues associated with the waste disposal of SuDS.
- Further monitoring of the whole management train and accelerated loading tests on the reconstructed PPS rigs simulate the potential end-of-life of SuDS.



Thank you for Listening

Reference List

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Accelerated Loading Tests & A5 Filter Drain

