

Lability, solubility and speciation of Cd, Pb and Zn in alluvial soils of the river Trent catchment UK

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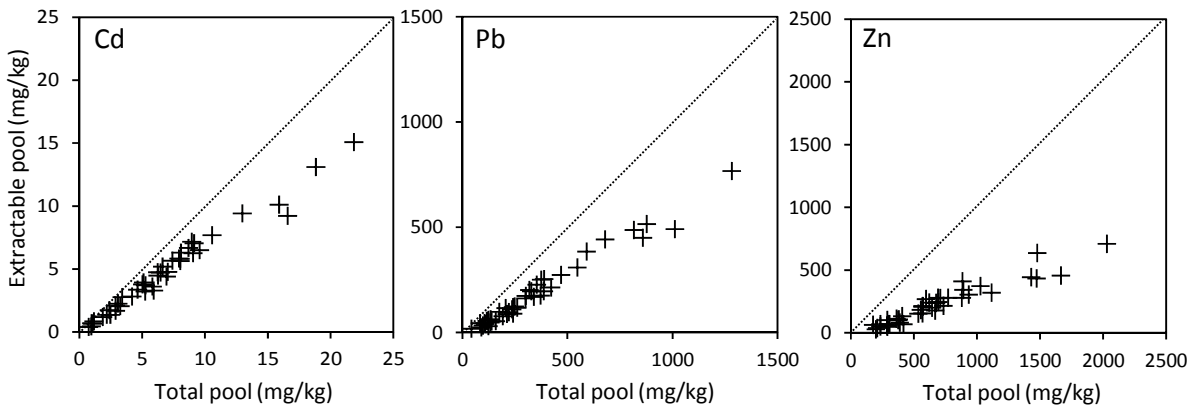


Fig S1. Comparison of Total v 0.05M EDTA extractable Pb, Cd and Zn. The 1:1 line is shown.

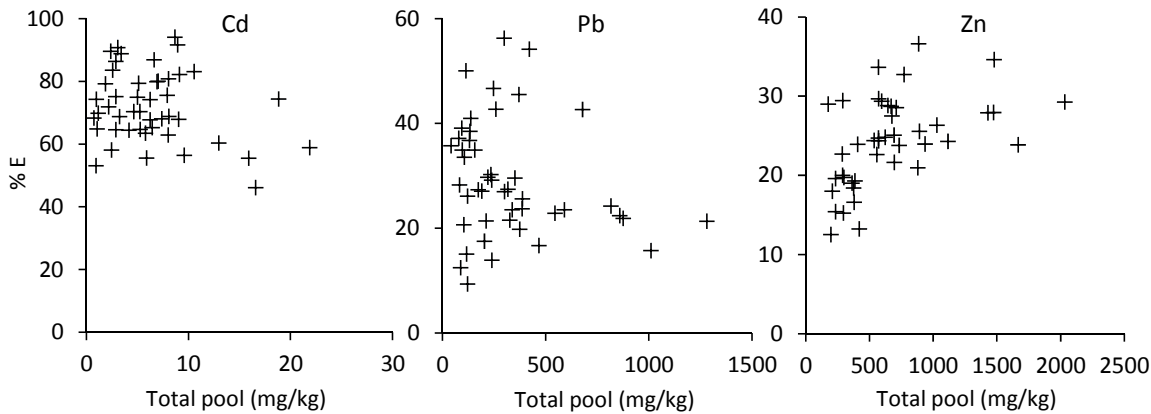


Fig S2. Comparison of total concentrations of Cd, Pb and Zn in soils and their lability as %E.

Table S1: General characteristics of the alluvial soils sampled from the Trent Catchment including those parameters used in the best fitting WHAM 7 modelling predictions (option 2, Table 3).

Sect.	Sample	Depth (cm)	Easting	Northing	Clay g kg ⁻¹	Soil pH	LOI %	Fe _{free} mg kg ⁻¹	Mn _{free} mg kg ⁻¹	Al _{free} mg kg ⁻¹	Humic ac. mg kg ⁻¹	Fulvic ac. mg kg ⁻¹
I	1	0-15	416400	348200	337	5.9	14	39228	1549	2204	7380	8773
I	2	0-15	414300	343700	291	7.3	13	35358	1526	1645	8978	6295
I	3	0-15	414400	343600	152	6.4	15	37209	1614	1826	4421	8181
I	4	0-15	411600	342100	276	6.2	9	23883	793	1393	2299	4276
I	5	0-15	409900	337600	380	5.8	13	34074	1714	2398	6372	8006
I	6	0-15	415100	331500	377	7.2	9	27128	1487	1382	1248	3617
I	7	0-15	420700	329600	439	6.2	13	30421	1474	1635	3994	7183
II	8	0-15	428100	326300	353	6.8	8	28676	1721	2007	6627	7490
II	9	0-15	429300	327000	174	6.5	14	20938	1859	1293	3592	3078
II	10	0-15	434100	327200	256	7.3	8	29026	2238	1639	3954	2619
II	11	0-15	434200	327200	289	6.5	14	29092	1760	2112	7186	7515
II	12	0-15	441600	327500	216	6.1	11	27506	1601	1912	10480	7294
II	13	0-15	445300	329900	340	7.0	15	31922	2809	2055	4202	5535
II	14	0-15	451900	333300	197	6.7	8	17141	733	1025	6142	4350
III	15	0-15	469100	343900	367	7.4	15	31815	1855	1963	10110	7175
III	16	0-15	469200	344100	347	7.3	9	27008	2170	1556	6413	3664
III	17	0-15	469200	344200	437	7.3	9	23649	1209	1250	2652	3072
III	18	0-15	470600	346300	236	7.1	18	22373	1574	1275	10006	4056
III	19	0-15	473400	350600	182	7.2	9	23846	1563	1164	2471	1782
III	20	0-15	473500	350500	402	7.1	12	34175	2168	2126	8087	5674
III	21	0-15	477000	353800	430	7.2	11	27649	1576	1718	7744	5486
III	22	0-15	477000	353800	274	7.4	8	25284	1712	1499	5465	3394
III	23	0-15	477000	353900	419	7.1	11	21080	1344	1154	4446	3379
III	24	0-15	480100	359900	257	7.1	14	24957	1501	1452	5611	3877
III	25	0-15	480100	359900	284	7.8	6	28028	1867	1675	7625	4557
IV	26	0-15	483100	308900	302	7.7	7	21390	983	875	2665	2007
IV	27	0-15	486600	322200	462	7.5	15	33987	1343	1102	9038	4376
I	1	35-50	416400	348200	324	6.9	7	40716	1442	2039	3223	2621
I	2	35-50	414300	343700	332	7.5	7	35398	1230	1534	3077	3894
I	4	35-50	411600	342100	434	6.9	5	24611	818	1455	1675	1605
I	5	35-50	409900	337600	324	5.3	8	37219	1758	2315	7136	4426
II	8	35-50	428100	326300	272	6.9	4	21116	1288	1269	1048	2580
II	9	35-50	429300	327000	161	6.7	6	15026	1334	819	1699	1461
II	10	35-50	434100	327200	231	7.4	8	38911	4730	1370	2076	1616
II	11	35-50	434200	327200	221	6.2	5	19127	1283	1268	2154	3131
II	12	35-50	441600	327500	270	6.4	7	31434	2539	1681	1796	2726
II	13	35-50	445300	329900	322	7.0	14	38819	1938	2401	4563	3968
II	14	35-50	451900	333300	210	6.7	5	17839	775	932	1873	2190
III	15	35-50	469100	343900	335	7.6	10	35366	1767	2128	6863	3441
III	16	35-50	469200	344100	310	7.5	9	22520	1306	1395	3539	1970
III	17	35-50	469200	344200	444	7.6	8	33837	2145	2089	6406	2671
III	18	35-50	470600	346300	405	7.5	14	30755	2013	1745	4565	1975
III	22	35-50	477000	353800	359	7.4	7	30108	1688	1888	5869	2163
III	24	35-50	480100	359900	337	7.1	11	26094	1724	1478	3188	1602
IV	26	35-50	483100	308900	387	7.8	7	18080	873	950	2776	1135
IV	27	35-50	486600	322200	399	8.0	9	28389	1463	763	3773	1395

Table S2: Total, labile and % E values for soils collected from the Trent Catchment. Sample numbers marked * indicate that they were analysed using both 0.1M Ca(NO₃)₂ and 0.0005M EDTA as background electrolytes. NM denotes samples in which both electrolytes failed in providing accurate lability measurements.

Sect.	Sample	Depth cm	Total Pb mg kg ⁻¹	E-value mg kg ⁻¹	Pb % E	Total Zn mg kg ⁻¹	E-value mg kg ⁻¹	Zn % E	Total Cd mg kg ⁻¹	E-value mg kg ⁻¹	Cd % E
I	1	0-15	249	116	47	569	141	25	9.0	8.2	92
I	2*	0-15	124	32	26	408	97	24	7.0	5.6	80
I	3	0-15	261	92	43	536	131	24	8.7	8.2	94
I	4	0-15	116	58	50	198	25	13	2.9	2.5	86
I	5	0-15	108	36	34	300	59	20	3.1	2.8	91
I	6	0-15	84	24	28	234	46	20	3.4	3.0	89
I	7*	0-15	135	52	38	308	32	20	4.7	3.3	70
II	8	0-15	237	72	30	772	252	33	8.0	6.5	81
II	9*	0-15	192	53	27	734	174	24	5.9	3.3	56
II	10*	0-15	205	36	17	693	174	25	8.1	5.6	69
II	11*	0-15	221	66	30	572	170	30	6.6	5.8	87
II	12	0-15	159	55	35	644	186	29	6.9	5.6	80
II	13	0-15	241	44	14	886	324	37	7.9	6.0	75
II	14*	0-15	373	170	45	387	85	22	2.9	1.9	65
III	15	0-15	860	193	22	1474	412	28	15.9	8.8	55
III	16	0-15	340	80	23	677	186	27	5.3	3.7	70
III	17*	0-15	212	45	21	290	42	14	2.5	1.4	58
III	18	0-15	319	88	27	596	175	29	5.1	4.1	79
III	19	0-15	376	74	20	696	150	22	6.5	4.2	65
III	20*	0-15	547	125	23	937	224	24	9.1	6.2	68
III	21	0-15	680	315	43	1029	271	26	9.1	7.5	82
III	22*	0-15	470	78	17	892	228	26	8.0	5.1	63
III	23	0-15	302	81	27	557	126	23	4.2	2.7	64
III	24*	0-15	353	104	30	572	139	24	5.0	3.8	75
III	25	0-15	389	100	26	709	202	28	6.2	4.6	74
IV	26*	0-15	90	11	12	235	40	17	0.8	0.5	68
IV	27*	0-15	175	48	27	376	69	18	1.0	0.7	74
I	1	35-50	422	229	54	671	193	29	10.6	8.8	83
I	2*	35-50	119	18	15	379	63	17	5.8	3.7	63
I	4	35-50	95	37	39	158	NM	NM	2.9	2.2	75
I	5	35-50	139	57	41	208	37	18	1.9	1.5	79
II	8	35-50	80	30	37	287	NM	NM	2.6	2.2	84
II	9*	35-50	43	15	36	177	56	32	1.2	0.8	70
II	10*	35-50	106	22	21	364	NM	NM	5.3	3.4	65
II	11*	35-50	97	34	35	291	89	31	2.4	2.2	90
II	12	35-50	132	49	37	570	192	34	3.3	2.3	69
II	13	35-50	387	91	24	1479	511	35	18.9	14.0	74
II	14*	35-50	300	169	56	288	65	23	2.2	1.6	72
III	15	35-50	1282	273	21	2033	594	29	21.9	12.9	59
III	16*	35-50	328	71	22	623	175	28	6.3	4.2	68
III	17*	35-50	817	188	24	1431	399	28	13.0	7.8	60
III	18	35-50	877	192	22	1117	271	24	9.6	5.4	56
III	22*	35-50	1012	159	16	1668	398	24	16.6	7.7	46
III	24	35-50	592	139	23	880	184	21	7.4	5.0	68
IV	26*	35-50	123	12	9	294	71	24	1.0	0.5	53
IV	27*	35-50	241	70	29	419	55	13	1.1	0.7	65

Table S3. Characteristics of extracted soil solutions including [M_{Soil}] and calculated K_d values for soils sampled from the Trent Catchment. NM denotes samples in which both equilibrating electrolytes failed to provide accurate lability measurements.

Sect.	Sample	Depth	Sol pH	DOC mg L ⁻¹	[Pb _{Soil}] µg L ⁻¹	Pb Log Kd _{Tot}	Pb Log Kd _{Lab}	[Zn _{Soil}] µg L ⁻¹	Zn Log Kd _{Tot}	Zn Log Kd _{Lab}	[Cd _{Soil}] µg L ⁻¹	Cd Log Kd _{Tot}	Cd Log Kd _{Lab}
I	1	0-15	6.13	21	6.5	4.58	4.25	178	3.50	2.90	2.17	3.62	3.58
I	2	0-15	7.57	27	2.7	4.66	4.07	120	3.53	2.91	1.76	3.60	3.50
I	3	0-15	6.39	33	1.3	5.30	4.85	67	3.90	3.29	1.70	3.71	3.68
I	4	0-15	6.22	20	2.4	4.68	4.38	52	3.58	2.68	0.71	3.61	3.55
I	5	0-15	6.05	24	1.7	4.80	4.33	133	3.35	2.65	1.30	3.38	3.33
I	6	0-15	7.23	20	0.3	5.45	4.90	29	3.91	3.20	0.34	4.00	3.95
I	7	0-15	6.27	30	2.1	4.81	4.39	80	3.59	2.60	1.16	3.61	3.45
II	8	0-15	6.54	34	2.0	5.07	4.56	104	3.87	3.38	1.40	3.76	3.67
II	9	0-15	6.93	31	0.8	5.38	4.82	65	4.05	3.43	0.48	4.09	3.84
II	10	0-15	7.27	21	0.2	6.01	5.26	38	4.26	3.66	0.46	4.25	4.09
II	11	0-15	6.27	29	2.1	5.02	4.50	201	3.45	2.93	1.92	3.54	3.48
II	12	0-15	5.79	27	4.9	4.51	4.05	786	2.91	2.37	8.73	2.90	2.81
II	13	0-15	6.99	22	0.2	6.08	5.34	55	4.21	3.77	0.55	4.16	4.04
II	14	0-15	7.25	31	5.5	4.83	4.49	157	3.39	2.73	1.28	3.36	3.17
III	15	0-15	7.83	62	1.7	5.70	5.06	53	4.44	3.89	1.57	4.01	3.75
III	16	0-15	7.81	28	0.5	5.83	5.20	32	4.33	3.76	0.61	3.94	3.78
III	17	0-15	7.62	25	0.5	5.63	4.95	17	4.23	3.39	0.27	3.97	3.71
III	18	0-15	7.88	24	1.2	5.42	4.87	20	4.47	3.94	0.39	4.12	4.02
III	19	0-15	8.11	24	0.5	5.88	5.17	17	4.61	3.95	0.84	3.89	3.70
III	20	0-15	7.90	43	1.0	5.74	5.10	23	4.61	3.99	0.63	4.16	3.99
III	21	0-15	7.64	41	1.0	5.83	5.50	47	4.34	3.76	4.46	3.31	3.23
III	22	0-15	7.90	19	1.0	5.67	4.89	71	4.10	3.51	0.67	4.08	3.88
III	23	0-15	8.07	25	0.7	5.63	5.06	80	3.84	3.20	1.23	3.53	3.34
III	24	0-15	7.72	28	0.9	5.59	5.06	20	4.46	3.84	0.59	3.93	3.81
III	25	0-15	7.70	37	0.4	5.99	5.40	32	4.35	3.80	0.59	4.02	3.89
IV	26	0-15	7.91	19	0.3	5.48	4.56	31	3.88	3.11	0.12	3.82	3.62
IV	27	0-15	8.90	59	0.7	5.40	4.84	23	4.21	3.48	0.14	3.85	3.70
I	1	35-50	7.13	14	1.2	5.55	5.28	64	4.02	3.48	0.86	4.09	4.01
I	2	35-50	7.23	43	1.4	4.93	4.11	75	3.70	2.92	0.59	3.99	3.80
I	4	35-50	7.02	21	2.5	4.58	4.17	60	3.42	NM	0.49	3.77	NM
I	5	35-50	5.03	30	1.1	5.10	4.71	396	2.72	1.97	3.34	2.76	2.65
II	8	35-50	6.95	36	0.9	4.95	4.52	72	3.60	NM	0.47	3.74	NM
II	9	35-50	6.81	38	0.3	5.16	4.70	38	3.67	3.17	0.21	3.76	3.58
II	10	35-50	7.63	19	0.4	5.42	4.74	67	3.74	NM	0.67	3.90	NM
II	11	35-50	5.84	41	1.6	4.78	4.33	361	2.91	2.39	2.72	2.95	2.91
II	12	35-50	6.26	20	1.6	4.92	4.49	157	3.56	3.09	0.55	3.78	3.62
II	13	35-50	6.80	31	0.6	5.81	5.18	75	4.29	3.83	1.17	4.21	4.08
II	14	35-50	7.02	28	2.6	5.06	4.81	90	3.51	2.86	0.72	3.49	3.35
III	15	35-50	7.69	63	1.1	6.07	5.39	83	4.39	3.85	2.16	4.01	3.78
III	16	35-50	7.60	22	0.3	6.04	5.37	43	4.16	3.61	0.74	3.93	3.75
III	17	35-50	7.29	33	0.2	6.61	5.97	26	4.74	4.19	0.78	4.22	4.00
III	18	35-50	7.80	35	0.6	6.16	5.51	31	4.56	3.94	0.83	4.06	3.81
III	22	35-50	7.80	18	0.9	6.05	5.25	82	4.31	3.69	1.15	4.16	3.83
III	24	35-50	7.78	28	0.4	6.17	5.54	26	4.53	3.85	0.50	4.17	4.00
IV	26	35-50	7.92	24	0.2	5.79	4.78	22	4.13	3.51	0.13	3.89	3.59
IV	27	35-50	8.16	38	0.5	5.68	5.15	37	4.05	3.17	0.45	3.39	3.19