3.5 Trace Metals in New England Biosolids

This report looks at biosolids quality data from 1994 to 2000 from ten biosolids recycling facilities in each of the three northern New England states and seven biosolids recycling facilities in Massachusetts. The facilities vary widely in the amount, types, and methods of producing biosolids, from Class A products to Class B products, and from heat drying pelletization to composting and lime stabilization.

The levels of trace metals in New England biosolids reported below have little meaning unless they are put in context. Interestingly, most of the regulated metals are also important plant and animal micro-nutrients--in small amounts. Only arsenic, cadmium, lead, and mercury are considered to have no value to plants and animals (and, it is important to note that, for instance, the greatest source of cadmium in agricultural soils is traditional phosphorus fertilizers). The other trace metals that are controlled by law in biosolids are found in many multi-vitamin and mineral supplements as well as in expensive chemical fertilizers. Chart 3.2 provides comparative data on the levels of trace metals in other materials, including natural soils, fertilizers, soil amendments, and vitamin supplements.

Chart 3.3 compares statewide averages of metals in biosolids from the most

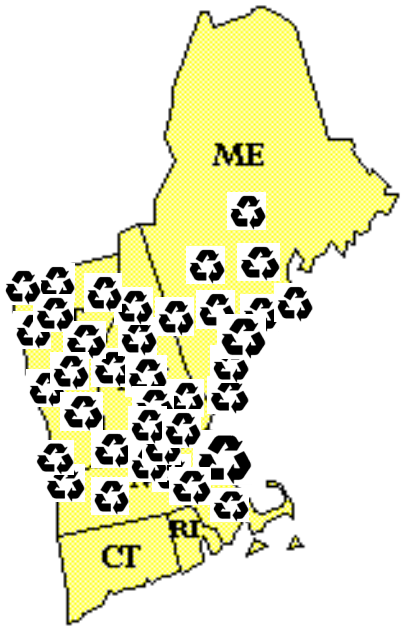

Chart 3.1: Locations of biosolids production facilities for which recycled biosolids trace metal data is included in this report. For a listing of the facilities, see the appendix.

Landscaping at a private central Massa-chusetts home using biosolids compost from Holyoke.

recent testing data available (2000 data for Massachusetts, New Hampshire, and Rhode Island, and 1999 data for Maine and Vermont). The data show that the concentrations of the ten metals for which testing is typically done are remarkably consistent across New England. The most stringent federal

Chart 3.2: Reported Averages (or Ranges) of Trace Metals Levels in Other Materials (ppm or mg/kg)

Trace Metal	Dairy Manure (4)	Dairy Manure (3)	Feedlot Manure (2)	Pig Waste (2)	Swine Manure (3)	Poultry Litter (2)	Chicken Manure (3)
Arsenic (As)	0.26	0.88	NA	3.7	NA	30	0.66
Cadmium (Cd)	0.32	0.03	0.2	ND	0.32	ND	0.59
Chromium (Cr)	5.2	20	NA	61	NA	20	4.9
Copper (Cu)	41	11.6	2.0	501	14.3	1195	13
Lead (Pb)	6.6	2.1	0.2	ND	1	12	11.5
Mercury (Hg)	0.09	0.05	NA	ND	NA	NA	0.04
Molybdenum(Mo)	2.5	22.1	NA	7.9	22.6	NA	95.3
Nickel (Ni)	7.8	3.3	NA	29.3	NA	NA	3.9
Selenium (Se)	0.5	NA	5000	ND	NA	NA	NA
Zinc (Zn)	215	21	8	656	60	631	297

	Phosphorus Fertilizer (5)	Phosphorus Fertilizers (ranges) (6)	MSW Compost (6)	Wood Ash (7)	Agricultural Soils (4)	Silty/Loam Soils (1)	Miracle-Gro® (fertilizer)	Rite-Aid Central Vite® (vitamins)
As	1	2 - 1200	NA	7	6	8.4		
Cd	101	0.1 - 170	7.6	6.3	0.06	0.45		
Cr	320	66 - 245	40	14	100	51		83
Cu	5.9	1 - 300	471	45	20	23	700	1276
Pb	5.6	7 - 225	496	39	10	28		
Hg	0.1	0.01 - 1.2	4.1	0.06	0.03	0.1		
Mo	7.0	40 - 2000	NA	4.7	2		5	102
Ni	303	7	43.4	19	40	26		3.2
Se	NA		NA	0.63	0.2	NA		12.8
Zn	1070	50 - 1450	902	537		60	600	9573

(1) - From Kabata-Pendias and Pendias, as reported in National Biosolids Partnership, 2000.

(2) - From Alpert, 1999

(3) - ASAE Standards, as reported in National Biosolids Partnership, 2000.

(4) - From Estes, University of New Hampshire, as reported by NH Dept. of Env. Svcs.

(5) - From Milwaukee Metropolitan Sewerage Dist, Milorganite Division, as reported by NH Dept. of Environmental Services.

(6) - From. Univ. of MN soil science department, as reported in National Biosolids Partnership, 2000.

(7) - As reported by White Mountian Resource Mgmt, Inc. for ash from electricity generation using only native tree wood chips

NA = Not available; ND = Not detected.

EPA biosolids quality standard - the "EQ Standard" - is included throughout this report for comparison. The scientifically-determined risk based ceiling standards for each trace metal in biosolids are higher.

Charts 3.4 through 3.11 graphically compare the most recent average metal concentration sampling data for each New England state to the state and federal standards. Biosolids metal concentration averages are mostly well below the strictest ("EQ") federal standards, as well as below the state's strictest standard.

Individual charts showing the yearly average concentration of each of the target trace metals for each of the states are included in the appendix. Most of these charts show a downward trend in trace metals levels over time as improved industrial pretreatment, drinking water corrosion control, pollution prevention, and other programs further reduce the concentrations of metals in wastewater.

Charts 3.12 through 3.15 summarize the average concentrations of arsenic, cadmium, lead, and mercury from 1994 to 2000 in each of the New England states. In general, the data show that the average concentrations of these metals of greatest concern are well below the federal Exceptional Quality (EQ) standards.

Chart 3.3: Trace Metal Concentrations in New England Biosolids (parts per million or mg/kg)

Metal	Federal EQ Standards	Maine (1999 Data)	Massachusetts (2000 Data)	New Hampshire (2000 Data)	Vermont (1999 Data)
Arsenic	41	6	9	2	9
Cadmium	39	3	2	3	3
Chromium	no standard	17	32	20	31
Copper	1500	310	388	433	490
Mercury	17	1	2	2	2
Molybdenum	no standard	13	7	11	9
Nickel	420	19	26	18	22
Lead	300	50	91	49	72
Selenium	36	2	4	2	6
Zinc	2800	419	498	663	649