City of Greater Sudbury 2001 Urban Soil Survey

Appendix D

Commercial Produce and Wild Blueberry Soil and Vegetation Sampling Results

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1. METHODS

During the period of July and August of 2001, soil and produce samples were collected from seven commercial berry farms, three wild blueberry patches, and six commercial market garden produce growers within the City of Greater Sudbury. At each site produce was collected in duplicate if enough produce was available and soil was collected from the vicinity in which the produce was grown (MOE 1993). Soil was sampled in duplicate and since these areas are cultivated on a regular basis, soil cores of 0 to 15 cm were taken (MOE 1993). In areas with shallow bedrock, soil samples of 0 to 10 cm were taken. All vegetation samples were kept on ice during transportation and shipping. It should be noted that most berry samples, especially strawberries and raspberries, were collected late in the season and were therefore extremely ripe. In order to collect samples large enough for duplicate analysis it was necessary to sample from large areas of the farms, some of which had closed for the season.

Vegetation samples were delivered to the MOE Phytotoxicology laboratory for processing (MOE 2000b). The protocol for vegetation processing includes washing the produce with tap water as would be done in the home prior to consumption. All produce samples were treated in this fashion with the exception of the berries. Berry samples could not be washed due to their over ripeness (ie. some had become almost liquified during shipping). Instead, the berry samples were poured into beakers, were oven dried, and ground in a Wiley™ mill. The chopped washed vegetables were oven dried and ground in the same fashion. The ground material was then stored in glass jars until submitted for analysis. All produce samples were forwarded to Laboratory Services Branch, MOE, for chemical analysis including: arsenic(As), aluminum (Al), barium (Ba), beryllium (Be), calcium (Ca), cadmium (Cd), cobalt (Co), copper (Cu), chromium (Cr), iron (Fe), magnesium (Mg), manganese (Mn), molybdenum (Mo), nickel (Ni), lead (Pb), selenium (Se), strontium (Sr), vanadium (V), and zinc (Zn). In addition, the vegetation analytical suite included sulphur (S), boron (B), chlorine (Cl), and potassium (K).

Soil samples were delivered to the MOE Phytotoxicology laboratory where they were organized and shipped to Agat Laboratories for processing (MOE 2000, Appendix F). Agat followed MOE Standard Operating Procedures which included air drying and sieving samples to obtain the 2 mm size fraction, and then further grinding the sample using a mortar and pestle to pass though a Number 45 mesh (0.355 mm) sieve (MOE 2000). Finally, the ground material was stored in glass jars. All soil samples were sent to Lakefield Laboratory for the same parameter analyses as the vegetation, except for S, B, Cl, and K. MOE data management and quality control procedures for both sample processing and metals analysis carried out by contract laboratories is outlined in Appendix F.

Interpretation of the produce results was based on comparisons with data from the following control locations: 2 control locations for raspberries, 1 control location for strawberries, and blueberries, and 1 market garden control station. Control sites were chosen based on current knowledge of the range and extent of elevated soil metal levels in the Sudbury area and were located approximately 125 km and 245 km west and 70 km northwest of the Copper Cliff superstack. Soil data were compared with the MOE Table F Soil Background Guidelines and Table A Soil Clean-up Guidelines (MOE 1997).

2. ANALYTICAL RESULTS SUMMARIES

Table D2.1: Summary Statistics for 0-15 cm Soil Samples from Market Gardens in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	5300	0.4	2.5	19	0.3	0.4	2600	16	3	26	8500	5	1700	100	0.75	27	0.5	13	18	19
10th	6080	0.4	2.5	24	0.3	0.4	2690	17	4	28	9430	5	1700	110	0.75	35	0.5	16	20	20
1st quartile	6400	0.4	5.0	27	0.3	0.4	3000	19	4	31	10000	7	1800	120	0.75	38	0.5	17	22	22
Median	7750	0.4	6.0	29	0.3	0.4	3650	21	4	35	10000	8	1900	125	0.75	44	0.5	19	23	27
3rd quartile	9350	0.4	7.0	32	0.3	0.4	3950	23	4	42	11000	10	2100	150	0.75	50	0.5	28	25	30
95th	11000	0.4	9.0	39	0.3	0.5	4820	25	5	44	12050	13	2310	201	0.75	59	0.5	34	28	34
Maximum	11000	0.4	9.0	44	0.3	1.9	5200	26	5	46	13000	17	2500	220	0.75	62	0.5	36	28	43
Mean	7830	0.4	5.7	29	0.3	0.5	3595	21	4	36	10390	9	1960	139	0.75	44	0.5	21	23	27
Geometric mean	7651	0.4	5.3	29	0.3	0.4	3528	20	4	35	10339	8	1948	135	0.75	43	0.5	20	23	26
Sample standard deviation	1694	0.0	2.0	6	0.0	0.3	702	3	0	6	1046	3	224	32	0.00	9	0.0	7	3	6
CV (standard deviation/mean)	22%	0%	36%	20%	0%	71%	20%	14%	11%	17%	10%	36%	12%	24%	0%	21%	0%	32%	11%	23%
Lower bound CI for the mean	7016	0.4	4.7	27	0.3	0.3	3258	19	4	33	9888	7	1852	123	0.75	39	0.5	18	22	24
Upper bound CI for the mean	8644	0.4	6.7	32	0.3	0.6	3932	22	4	39	10892	10	2068	154	0.75	48	0.5	25	24	29
Kurtosis	-1.0		-0.7	1.9		20.0	0.0	-0.9	3.0	-1.2	0.8	1.4	0.0	1.2		-0.2		-0.4	-0.2	1.1
Skewness	0.4		-0.2	0.6		4.5	0.5	0.0	0.0	0.1	0.7	1.1	0.8	1.4		0.2		0.9	0.1	0.9

There were 20 samples. Concentrations are in µg/g dry wt. ng - no guideline

Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

Table D2.2: Summary Statistics for 0-15 cm Soil Samples from Commercial Berry Producers in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	5900	0.4	2.5	18	0.3	0.4	550	13	3	20	7100	7	790	35	0.75	29	0.5	10	14	11
10th	6320	0.4	2.5	22	0.3	0.4	1420	14	3	22	7810	7	957	64	0.75	31	0.5	10	17	14
1st quartile	6650	0.4	2.5	24	0.3	0.4	1800	18	3	25	8400	7	1350	78	0.75	33	0.5	10	18	15
Median	7300	0.4	5.0	27	0.3	0.4	2100	19	4	29	9100	8	1600	110	0.75	39	0.5	10	19	18
3rd quartile	8200	0.4	7.0	33	0.3	0.4	2900	21	4	35	9950	10	1800	130	0.75	42	0.5	11	20	24
95th	12800	0.4	9.5	36	0.3	0.4	4595	26	5	51	15700	17	2635	170	0.75	50	1.0	15	22	33
Maximum	16000	0.4	10	39	0.3	0.4	5800	27	5	72	21000	18	2900	180	0.75	52	1.0	17	23	39
Mean	7903	0.4	5.0	28	0.3	0.4	2411	19	4	31	9759	9	1660	106	0.75	39	0.5	11	19	20
Geometric mean	7680	0.4	4.5	27	0.3	0.4	2171	19	4	30	9473	9	1583	99	0.75	38	0.5	11	19	19
Sample standard deviation	2210	0.0	2.4	5	0.0	0.0	1096	4	1	11	2862	3	515	37	0.00	6	0.1	2	2	7
CV (standard deviation/mean)	28%	0%	49%	20%	0%	0%	46%	19%	18%	36%	30%	35%	32%	35%	0%	17%	27%	17%	10%	34%
Lower bound CI for the mean	7093	0.4	4.2	26	0.3	0.4	2010	18	4	27	8711	8	1472	93	0.75	36	0.5	10	18	18
Upper bound CI for the mean	8713	0.4	5.9	30	0.3	0.4	2813	20	4	35	10808	10	1849	119	0.75	41	0.6	12	20	23
Kurtosis	7.5		-1.0	-0.8			2.5	0.4	-0.7	6.4	9.6	2.2	0.4	-0.5		-0.5	7.0	3.5	0.7	0.6
Skewness	2.7		0.4	0.1			1.3	0.6	0.3	2.4	3.0	1.8	0.7	0.1		0.5	2.9	2.1	-0.1	1.1

There were 32 samples. Concentrations are in µg/g dry wt. ng - no guideline

Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

Table D2.3: Summary Statistics for 0-15 cm Soil Samples from Wild Blueberry Sites in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	6400	0.4	33	24	0.3	0.4	610	16	6	120	10000	17	1100	110	0.75	77	0.5	10	18	16
Median	9250	0.7	36	39	0.3	0.4	905	25	11	225	16500	23	2300	180	0.75	179	2.0	12	31	33
Maximum	13000	1.0	39	51	0.3	0.4	1200	33	15	400	25000	32	3600	230	0.75	290	3.0	14	43	49
Mean	9475	0.7	36	38	0.3	0.4	905	25	11	243	17000	24	2325	175	0.75	181	1.9	12	31	33
Geometric mean	8975	0.6	36	36	0.3	0.4	870	23	10	217	15485	23	1976	167	0.75	154	1.5	12	28	28
Sample standard deviation	3046	0.3	3	12	0.0	0.0	250	9	4	111	7036	6	1226	51	0.00	95	1.1	2	12	17
CV (standard deviation/mean)	37%	49%	8%	36%	0%	0%	32%	40%	44%	53%	48%	27%	61%	34%	0%	60%	70%	18%	45%	59%

There were 4 samples. Concentrations are in µg/g dry wt.

Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

Table D2.4: Summary Statistics for All Market Garden Vegetables Collected in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	5.0	0.2	0.2	0.5	0.2	6.0	0.1	220	0.5	0.2	4.0	23	0.5	1100	3.7	0.2	0.5	0.2	0.5	0.5	12
10th percentile	5.0	0.2	0.2	0.6	0.2	7.6	0.1	319	0.5	0.2	6.1	36	0.5	1130	8.1	0.2	1.0	0.2	0.8	0.5	14
1st quartile	9.0	0.2	0.2	1.0	0.2	13	0.1	1050	0.5	0.2	7.8	58	0.5	1450	9.7	0.2	3.3	0.2	1.2	0.5	19
Median	40	0.2	0.2	4.8	0.2	16	0.2	2700	0.5	0.2	9.5	98	0.5	2550	22	0.3	6.0	0.2	6.8	0.5	30
3rd quartile	110	0.2	0.2	14	0.2	19	0.4	4650	0.7	0.5	11	185	0.5	3700	56	0.7	15	0.2	12	0.5	33
95th percentile	360	0.2	0.6	40	0.2	26	1.8	11000	1.1	1.1	16	378	0.9	6410	176	1.1	43	0.2	30	0.9	48
Maximum	1200	0.2	1.0	92	0.2	28	2.3	14000	3.4	1.1	17	1300	3.1	15000	230	2.6	45	0.2	43	2.9	61
Mean	112	0.2	0.3	12	0.2	16	0.4	3799	0.7	0.4	9.9	162	0.6	3107	45	0.5	11	0.2	9.0	0.6	28
Geometric mean	39	0.2	0.2	4.4	0.2	15	0.2	2180	0.6	0.3	9.4	104	0.5	2482	24	0.4	6.0	0.2	4.9	0.5	26
Sample standard deviation	213	0.0	0.2	17	0.0	5.8	0.6	3688	0.5	0.3	3.2	221	0.4	2642	56	0.5	12	0.0	9.1	0.4	11
CV (standard deviation/mean)	192%	0%	63%	151%	0%	36%	133%	98%	71%	75%	33%	138%	68%	86%	125%	104%	110%	0%	103%	70%	41%
Lower bound CI for the mean	46	0.2	0.2	6	0.2	14	0.3	2665	0.5	0.3	9.0	94	0.5	2294	28	0.3	7.2	0.2	6.2	0.5	25
Upper bound CI for the mean	177	0.2	0.3	17	0.2	18	0.6	4933	0.8	0.5	11	230	0.7	3919	62	0.7	14	0.2	12	0.7	32
Kurtosis	16.9		12.6	10.4		-0.5	3.7	0.9	24.0	0.7	-0.5	17.1	37.6	10.8	2.5	8.7	2.9		4.1	24.0	0.6
Skewness	3.9		3.5	2.9		0.0	2.1	1.3	4.6	1.4	0.5	3.9	6.0	3.0	1.8	2.8	1.8		1.9	4.8	0.7

There were 44 samples collected from 6 market vegetable producers. Concentrations are in µg/g dry wt.
Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

Table D2.4.1: Summary Statistics for Market Garden Fruit Vegetables Collected in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	5.0	0.2	0.2	0.5	0.2	11	0.1	380	0.5	0.2	4.0	23	0.5	1100	7.1	0.2	0.5	0.2	0.5	0.5	12
10th percentile	5.0	0.2	0.2	0.6	0.2	13	0.1	930	0.5	0.2	5.8	32	0.5	1410	9.0	0.2	1.6	0.2	1.0	0.5	14
1st quartile	5.0	0.2	0.2	1.5	0.2	14	0.1	1500	0.5	0.2	6.7	51	0.5	1700	13	0.3	3.3	0.2	3.6	0.5	19
Median	9.0	0.2	0.2	4.1	0.2	16	0.1	3150	0.5	0.2	8.8	67	0.5	2750	18	0.4	8.6	0.2	5.5	0.5	30
3rd quartile	35	0.2	0.2	7.4	0.2	19	0.1	4400	0.5	0.4	11	96	0.5	3400	25	0.7	18	0.2	9.2	0.5	40
95th percentile	58	0.2	0.2	14	0.2	26	0.4	4795	0.8	1.1	14	186	0.5	3795	85	2.2	45	0.2	13	0.5	56
Maximum	120	0.2	0.2	14	0.2	27	0.5	5100	0.8	1.1	14	200	0.5	3900	93	2.6	45	0.2	14	0.5	61
Mean	24	0.2	0.2	5.0	0.2	17	0.1	2912	0.6	0.4	8.9	78	0.5	2568	27	0.6	14	0.2	6.4	0.5	30
Geometric mean	14	0.2	0.2	3.2	0.2	17	0.1	2428	0.5	0.3	8.5	67	0.5	2390	20	0.5	7.5	0.2	4.5	0.5	27
Sample standard deviation	27	0.0	0.0	4.0	0.0	4	0.1	1450	0.1	0.3	2.6	44	0.0	910	24	0.6	15	0.0	4.2	0.0	14
CV (standard deviation/mean)	114%	0%	0%	83%	0%	26%	73%	51%	19%	78%	30%	58%	0%	36%	91%	102%	107%	0%	67%	0%	46%
Lower bound CI for the mean	12.0	0.2	0.2	3.1	0.2	15	0.1	2254	0.5	0.3	7.7	58	0.5	2155	16	0.3	7.5	0.2	4.5	0.5	24
Upper bound CI for the mean	36.6	0.2	0.2	6.8	0.2	19	0.2	3570	0.6	0.5	10	97	0.5	2981	37	0.9	21	0.2	8.3	0.5	37
Kurtosis	5.8			0.2		0.0	6.7	-1.3	1.0	1.4	-0.4	3.0		-1.5	3.0	5.9	0.2		-1.1		-0.2
Skewness	2.2			0.9		0.9	2.7	-0.2	1.6	1.6	0.2	1.6		-0.1	1.9	2.5	1.2		0.2		0.7

22 of the 44 vegetable samples collected were fruit vegetables. Concentrations are in µg/g dry wt.
Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

Table D2.4.2: Summary Statistics for Market Garden Leafy Vegetables Collected in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	31	0.2	0.2	3.1	0.2	14	0.3	8300	0.5	0.2	11	92	0.5	3800	23	0.2	3.2	0.2	9.7	0.5	28
10th percentile	66	0.2	0.2	4.4	0.2	16	0.3	9280	0.5	0.2	11	119	0.5	4220	27	0.2	5.0	0.2	11	0.5	29
1st quartile	96	0.2	0.3	9.0	0.2	18	0.4	9800	0.6	0.3	12	155	0.5	4450	70	0.2	6.0	0.2	12	0.5	30
Median	170	0.2	0.4	19	0.2	19	1.6	10500	0.8	0.6	15	255	0.5	5300	150	0.2	8.6	0.2	22	0.5	33
3rd quartile	540	0.2	0.7	45	0.2	21	2.0	12000	1.4	0.9	16	580	1.0	9250	180	0.7	16	0.2	31	1.3	34
95th percentile	1053	0.2	0.9	80	0.2	24	2.2	13650	2.9	1.0	17	1143	2.4	13950	213	1.0	17	0.2	39	2.6	38
Maximum	1200	0.2	1.0	92	0.2	25	2.3	14000	3.4	1.1	17	1300	3.1	15000	230	1.1	17	0.2	43	2.9	40
Mean	355	0.2	0.5	30	0.2	19	1.3	10863	1.2	0.6	14	422	0.9	7100	132	0.4	10	0.2	23	1.0	33
Geometric mean	193	0.2	0.4	18	0.2	19	1.0	10729	0.9	0.5	14	287	0.7	6287	103	0.3	8.7	0.2	20	0.8	32
Sample standard deviation	389	0.0	0.3	28	0.0	3	0.8	1733	1.0	0.3	2.1	400	0.8	3856	69	0.3	5.0	0.0	11	0.8	3
CV (standard deviation/mean)	117%	0%	59%	102%	0%	17%	65%	17%	88%	56%	16%	101%	96%	58%	56%	82%	53%	0%	53%	91%	11%
Lower bound CI for the mean	6.9	0.2	0.2	4.4	0.2	16	0.6	9312	0.3	0.3	12	64	0.2	3652	70	0.1	5.6	0.2	13	0.2	29
Upper bound CI for the mean	704	0.2	0.7	55	0.2	22	2.0	12413	2.0	0.9	16	779	1.7	10548	193	0.7	14	0.2	33	1.8	36
Kurtosis	1.6		-0.4	1.7		1.0	-2.1	-0.1	3.6	-1.1	-1.4	1.8	6.8	0.7	-0.7	0.6	-1.6		-1.0	2.2	2.2
Skewness	1.6		0.9	1.5		0.6	-0.3	0.6	2.0	0.3	-0.4	1.6	2.6	1.4	-0.6	1.4	0.3		0.5	1.8	1.1

8 of the 44 vegetable samples collected were leafy vegetables. Concentrations are in µg/g dry wt.

Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

Table D2.4.3: Summary Statistics for Market Garden Root Vegetables Collected in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	15	0.2	0.2	0.5	0.2	6.0	0.1	220	0.5	0.2	5.9	26	0.5	1100	3.7	0.2	0.5	0.2	0.6	0.5	12
10th percentile	21	0.2	0.2	0.5	0.2	6.0	0.1	256	0.5	0.2	6.8	46	0.5	1100	4.8	0.2	0.6	0.2	0.6	0.5	13
1st quartile	35	0.2	0.2	0.6	0.2	7.0	0.2	310	0.5	0.2	7.8	55	0.5	1100	7.9	0.2	1.0	0.2	0.9	0.5	16
Median	96	0.2	0.2	1.1	0.2	9.0	0.3	540	0.5	0.2	8.3	130	0.5	1250	9.7	0.2	3.7	0.2	1.4	0.5	20
3rd quartile	150	0.2	0.2	25	0.2	19	0.8	2400	0.7	0.3	10	210	0.5	1900	23	0.2	11	0.2	11.0	0.5	31
95th percentile	1053	0.2	0.9	80	0.2	24	2.2	13650	2.9	1.0	17	1143	2.4	13950	213	1.0	17	0.2	39.2	2.6	38
Maximum	370	0.2	0.3	41	0.2	28	1.0	2800	1.2	1.1	16	390	0.8	3200	110	1.1	21	0.2	15.0	0.9	35
Mean	110	0.2	0.2	12	0.2	13	0.4	1156	0.6	0.3	9.2	147	0.5	1671	24	0.3	6.0	0.2	5.2	0.5	22
Geometric mean	77	0.2	0.2	3.2	0.2	11	0.3	740	0.6	0.3	8.9	115	0.5	1548	14	0.3	3.4	0.2	2.5	0.5	21
Sample standard deviation	91	0.0	0.0	13.7	0.0	7.4	0.3	993	0.2	0.2	2.7	98	0.1	712	31	0.3	5.8	0.0	5.4	0.1	8.1
CV (standard deviation/mean)	86%	0%	17%	123%	0%	58%	80%	89%	33%	80%	30%	69%	17%	44%	130%	95%	101%	0%	108%	20%	37%
Lower bound CI for the mean	56	0.2	0.2	3.3	0.2	8.7	0.2	561	0.5	0.2	7.6	89	0.5	1245	6.1	0.2	2.5	0.2	2.0	0.5	18
Upper bound CI for the mean	165	0.2	0.2	20	0.2	17	0.6	1751	0.7	0.5	11	206	0.6	2098	43	0.5	9.5	0.2	8.4	0.6	27
Kurtosis	3.6		3.8	-0.8		-0.8	-0.7	-1.5	4.9	8.2	1.9	1.1	5.4	0.5	4.2	3.4	1.5		-1.2	14.0	-1.6
Skewness	1.6		2.3	0.9		0.8	1.0	0.6	2.1	2.8	1.5	1.0	2.5	1.3	2.2	2.2	1.4		0.8	3.7	0.3

14 of the 44 vegetables samples collected were root vegetables. Concentrations are in µg/g dry wt.

Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

Table D2.5: Summary Statistics for All Commercial Berries and Wild Blueberries Collected in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	5	0.2	0.2	1.0	0.2	5.0	0.1	640	0.5	0.2	2.0	13	0.5	260	5	0.2	1.4	0.2	0.9	0.5	2.0
10th percentile	5	0.2	0.2	2.0	0.2	6.0	0.1	925	0.5	0.2	2.9	20	0.5	355	12	0.2	1.6	0.2	1.0	0.5	4.0
1st quartile	5	0.2	0.2	4.0	0.2	6.0	0.1	1000	0.5	0.2	3.9	24	0.5	620	15	0.2	2.0	0.2	1.8	0.5	5.0
Median	5	0.2	0.2	5.7	0.2	7.0	0.1	1300	0.5	0.2	4.6	31	0.5	965	17	0.3	4.9	0.2	2.2	0.5	7.0
3rd quartile	9	0.2	0.2	8.9	0.2	8.5	0.1	1650	0.5	0.2	5.4	35	0.5	1050	51	0.5	6.6	0.2	3.1	0.5	13
95th percentile	15	0.2	0.2	12.3	0.2	11	0.2	1900	0.5	0.3	6.4	64	0.6	1500	101	0.8	8.5	0.2	4.8	0.5	15
Maximum	24	0.2	0.2	14.0	0.2	11	0.8	2100	0.5	0.4	6.7	160	1.1	1600	110	1.1	9.6	0.3	9.5	0.5	20
Mean	8	0.2	0.2	6.4	0.2	7.5	0.1	1330	0.5	0.2	4.6	34	0.5	903	34	0.4	4.6	0.2	2.6	0.5	8.6
Geometric mean	7	0.2	0.2	5.2	0.2	7.4	0.1	1279	0.5	0.2	4.5	30	0.5	812	24	0.3	3.9	0.2	2.3	0.5	7.5
Sample standard deviation	4.5	0.0	0.0	3.5	0.0	1.5	0.1	361	0.0	0.0	1.1	24	0.1	364	31	0.2	2.5	0.0	1.6	0.0	4.2
CV (standard deviation/mean)	61%	0%	0%	56%	0%	21%	94%	28%	0%	19%	25%	71%	20%	41%	92%	63%	54%	8%	61%	0%	50%
Lower bound CI for the mean	6	0.2	0.2	5.2	0.2	7.0	0.1	1206	0.5	0.2	4.2	26	0.5	777	23	0.3	3.8	0.2	2.1	0.5	7.2
Upper bound CI for the mean	9	0.2	0.2	7.6	0.2	8.1	0.2	1454	0.5	0.2	5.0	43	0.6	1028	45	0.4	5.5	0.2	3.1	0.5	10.1
Kurtosis	8.2			-0.7		0.1	33.0	-0.8		15.5	-0.2	20.9	30.4	-0.6	0.6	3.3	-1.2	36.0	9.2		-0.1
Skewness	2.8			0.4		0.7	5.7	0.1		3.9	-0.3	4.2	5.4	-0.1	1.4	1.8	0.1	6.0	2.5		0.6

There were 36 samples collected from 7 commercial berry producers and 3 wild blueberry sites. Concentrations are in µg/g dry wt.
Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

Table D2.5.1: Summary Statistics for Commercial Raspberries Collected in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	5	0.2	0.2	1.0	0.2	5.0	0.1	930	0.5	0.2	4.1	23	0.5	900	11	0.2	4.6	0.2	0.9	0.5	9.0
10th percentile	5	0.2	0.2	1.4	0.2	6.0	0.1	1050	0.5	0.2	4.5	24	0.5	945	14	0.2	5.2	0.2	1.3	0.5	10
1st quartile	5	0.2	0.2	2.0	0.2	6.5	0.1	1250	0.5	0.2	4.6	28	0.5	970	15	0.2	5.7	0.2	1.8	0.5	11
Median	5	0.2	0.2	3.7	0.2	7.0	0.1	1500	0.5	0.2	5.1	32	0.5	1050	17	0.4	6.5	0.2	2.2	0.5	13
3rd quartile	6	0.2	0.2	5.7	0.2	9.0	0.1	1700	0.5	0.2	5.6	34	0.6	1450	37	0.5	7.7	0.2	2.9	0.5	13
95th percentile	11	0.2	0.2	7.9	0.2	11	0.3	1750	0.5	0.2	6.0	47	0.7	1525	65	1.0	9.1	0.2	6.1	0.5	18
Maximum	12	0.2	0.2	8.4	0.2	11	0.8	1900	0.5	0.3	6.2	68	1.1	1600	84	1.1	9.6	0.2	9.5	0.5	20
Mean	6	0.2	0.2	4.0	0.2	7.8	0.1	1452	0.5	0.2	5.1	33	0.6	1177	27	0.4	6.7	0.2	2.7	0.5	13
Geometric mean	6	0.2	0.2	3.2	0.2	7.6	0.1	1423	0.5	0.2	5.1	32	0.5	1153	22	0.4	6.5	0.2	2.3	0.5	12
Sample standard deviation	2.3	0.0	0.0	2.3	0.0	1.9	0.2	277	0.0	0.0	0.6	10	0.1	241	21	0.3	1.4	0.0	2.0	0.0	2.6
CV (standard deviation/mean)	38%	0%	0%	61%	0%	25%	122%	20%	0%	12%	11%	31%	27%	21%	79%	63%	22%	0%	75%	0%	21%
Lower bound CI for the mean	5	0.2	0.2	2.7	0.2	6.8	0.1	1299	0.5	0.2	4.8	27	0.5	1044	16	0.3	5.9	0.2	1.6	0.5	11
Upper bound CI for the mean	8	0.2	0.2	5.3	0.2	8.8	0.2	1604	0.5	0.2	5.4	39	0.6	1309	39	0.6	7.4	0.2	3.8	0.5	14
Kurtosis	1.6			-1.1		-0.8	16.0	-0.7		16.0	-0.6	9.4	13.3	-1.5	1.9	1.7	-0.3		8.6		2.6
Skewness	1.8			0.4		0.6	4.0	-0.5		4.0	0.2	2.7	3.6	0.5	1.7	1.5	0.6		2.7		1.4

16 raspberry samples were collected. Concentrations are in µg/g dry wt.
Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

Table D2.5.2: Summary Statistics for Commercial Strawberries Collected in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	5	0.2	0.2	3.9	0.2	6.0	0.1	920	0.5	0.2	2.0	13.0	0.5	510	4.6	0.2	1.4	0.2	1.0	0.5	4.0
10th percentile	5	0.2	0.2	4.3	0.2	6.0	0.1	936	0.5	0.2	2.6	19.3	0.5	561	9.6	0.2	1.5	0.2	1.2	0.5	4.3
1st quartile	5	0.2	0.2	5.7	0.2	6.0	0.1	1000	0.5	0.2	2.8	23.0	0.5	630	13.0	0.2	1.5	0.2	1.8	0.5	5.0
Median	5	0.2	0.2	8.7	0.2	7.0	0.1	1300	0.5	0.2	3.9	26.0	0.5	850	16.5	0.3	1.9	0.2	2.8	0.5	6.0
3rd quartile	7	0.2	0.2	12.0	0.2	8.0	0.1	1700	0.5	0.2	4.5	35.0	0.5	1000	21.0	0.4	2.1	0.2	4.2	0.5	7.0
95th percentile	9	0.2	0.2	13.4	0.2	8.4	0.2	1970	0.5	0.3	6.2	97.0	0.5	1070	27.1	0.7	2.2	0.2	4.4	0.5	7.4
Maximum	11	0.2	0.2	14.0	0.2	9.0	0.2	2100	0.5	0.4	6.5	160.0	0.5	1200	29.0	0.7	2.2	0.2	4.7	0.5	8.0
Mean	6	0.2	0.2	8.6	0.2	7.2	0.1	1336	0.5	0.2	3.9	37.8	0.5	838	16.8	0.3	1.8	0.2	2.8	0.5	6.0
Geometric mean	6	0.2	0.2	7.9	0.2	7.2	0.1	1287	0.5	0.2	3.7	30.1	0.5	813	15.3	0.3	1.8	0.2	2.5	0.5	5.9
Sample standard deviation	1.8	0.0	0.0	3.3	0.0	0.9	0.0	375	0.0	0.1	1.3	35.7	0.0	199	6.5	0.2	0.3	0.0	1.2	0.0	1.2
CV (standard deviation/mean)	30%	0%	0%	40%	0%	14%	32%	29%	0%	26%	33%	98%	0%	25%	40%	51%	16%	0%	45%	0%	21%
Lower bound CI for the mean	5	0.2	0.2	6.6	0.2	6.7	0.1	1111	0.5	0.2	3.2	16.4	0.5	719	12.9	0.2	1.7	0.2	2.1	0.5	5.3
Upper bound CI for the mean	7	0.2	0.2	10.6	0.2	7.8	0.1	1560	0.5	0.3	4.7	59.2	0.5	957	20.7	0.4	2.0	0.2	3.5	0.5	6.7
Kurtosis	3.2			-1.5		-1.0	3.8	-0.6		7.7	-0.1	10.7		-0.8	-0.2	0.8	-1.6		-1.3		-0.9
Skewness	1.9			0.1		0.1	2.3	0.8		2.8	0.5	3.2		-0.2	0.2	1.3	-0.1		0.1		-0.3

14 strawberries samples were collected. Concentrations are in µg/g dry wt.

Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

Table D2.5.3: Summary Statistics for Wild Blueberries Collected in the City of Greater Sudbury - 2001.

	Al	Sb	As	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Minimum	8	0.2	0.2	4.3	0.2	5.0	0.1	640	0.5	0.2	3.7	15	0.5	260	66	0.2	4.3	0.2	0.9	0.5	2.0
10th percentile	8	0.2	0.2	4.7	0.2	5.4	0.1	664	0.5	0.2	4.1	20	0.5	260	78	0.2	4.5	0.2	1.2	0.5	2.0
1st quartile	9	0.2	0.2	5.3	0.2	6.0	0.1	700	0.5	0.2	3.9	16	0.5	260	73	0.2	4.7	0.2	1.6	0.5	2.0
Median	10	0.2	0.2	8.2	0.2	8.0	0.1	910	0.5	0.2	4.6	30	0.5	325	98	0.2	5.4	0.2	2.0	0.5	4.0
3rd quartile	24	0.2	0.2	9.4	0.2	9.0	0.1	1300	0.5	0.2	6.4	35	0.5	370	110	0.2	6.8	0.2	2.2	0.5	5.0
95th percentile	24	0.2	0.2	9.9	0.2	9.0	0.1	1460	0.5	0.2	6.6	49	0.5	386	110	0.2	7.0	0.3	2.2	0.5	5.6
Maximum	24	0.2	0.2	10.0	0.2	9.0	0.1	1500	0.5	0.2	6.7	53	0.5	390	110	0.2	7.1	0.3	2.3	0.5	6.0
Mean	14	0.2	0.2	7.6	0.2	7.5	0.1	993	0.5	0.2	5.0	30	0.5	322	92	0.2	5.6	0.2	1.8	0.5	3.8
Geometric mean	12	0.2	0.2	7.2	0.2	7.3	0.1	947	0.5	0.2	4.9	27	0.5	318	91	0.2	5.5	0.2	1.7	0.5	3.5
Sample standard deviation	7	0.0	0.0	2.1	0.0	1.5	0.0	312	0.0	0.0	1.2	13	0.0	50	17	0.0	1.1	0.0	0.5	0.0	1.5
CV (standard deviation/mean)	56%	0%	0%	30%	0%	22%	0%	34%	0%	0%	26%	48%	0%	17%	20%	0%	21%	19%	29%	0%	42%
Lower bound CI for the mean	6	0.2	0.2	5.2	0.2	5.8	0.1	635	0.5	0.2	3.6	15	0.5	264	73	0.2	4.4	0.2	1.3	0.5	2.2
Upper bound CI for the mean	22	0.2	0.2	9.9	0.2	9.2	0.1	1352	0.5	0.2	6.3	45	0.5	379	112	0.2	6.8	0.3	2.4	0.5	5.5
Kurtosis	-1.9			-1.4		-1.0		-1.2			-1.7	0.0		-1.9	-1.6		-2.2	6.0	1.4		-1.3
Skewness	0.9			-0.6		-0.8		0.7			0.6	0.7		-0.1	-0.7		0.3	2.4	-1.3		0.0

6 wild blueberries samples were collected. Concentrations are in µg/g dry wt.

Note: the standard-deviation and the confidence interval of the mean are valid only in the case of a simple random sampling

3. ANALYTICAL RESULTS

Table D3.1: Results of Chemical Analysis for Soil Collected from Market Gardens, Commercial Berry Farms, and Wild Blueberry Sites.

Station	Sample Number	Soil Depth	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
Market Gardens																						
5037619	14919	0 - 15	9100	<0.8	9	32	<0.5	<0.8	3800	23	4	43	11000	11	1900	140	<1.5	**62**	<1	34	26	22
	14920	0 - 15	8100	<0.8	9	30	<0.5	<0.8	3500	23	4	44	10000	10	1900	130	<1.5	**59**	<1	29	25	22
5037620	14921	0 - 15	9400	<0.8	6	32	<0.5	<0.8	3100	22	4	33	10000	8	1800	120	<1.5	**46**	<1	30	25	19
	14922	0 - 15	9300	<0.8	6	32	<0.5	<0.8	2700	22	4	36	10000	9	1700	120	<1.5	**50**	<1	26	25	19
5037621	14941	0 - 15	6400	<0.8	7	26	<0.5	<0.8	2600	18	4	46	10000	10	1700	100	<1.5	43	<1	17	23	27
	14942	0 - 15	6500	<0.8	6	28	<0.5	<0.8	2900	17	4	40	10000	9	1700	110	<1.5	39	<1	18	22	29
5037622	14945	0 - 15	6400	<0.8	8	29	<0.5	<0.8	3700	19	5	43	10000	13	1800	120	<1.5	**50**	<1	16	22	33
	14946	0 - 15	6200	<0.8	7	29	<0.5	<0.8	3800	20	4	43	10000	13	2000	130	<1.5	**44**	<1	16	22	34
5037623	14952	0 - 15	6400	<0.8	5	19	<0.5	<0.8	3300	20	4	27	12000	5	2000	130	<1.5	28	<1	13	25	29
	14953	0 - 15	6100	<0.8	5	19	<0.5	<0.8	3600	19	4	26	11000	5	2000	120	<1.5	27	<1	13	24	31
5037624	14961	0 - 15	5300	<0.8	5	24	<0.5	**1.9**	4800	17	4	33	8500	5	2100	120	<1.5	36	<1	18	18	25
	14962	0 - 15	5900	<0.8	5	26	<0.5	<0.8	5200	19	4	35	9500	5	2200	120	<1.5	36	<1	20	19	27
5037626	14988	0 - 15	9500	<0.8	8	32	<0.5	<0.8	2700	23	4	31	11000	7	1800	150	<1.5	43	<1	18	23	20
	14989	0 - 15	9500	<0.8	7	32	<0.5	<0.8	2600	22	4	31	11000	7	1700	150	<1.5	**44**	<1	16	23	21
5037627	14995	0 - 15	7400	<0.8	< 5	29	<0.5	<0.8	3900	23	4	32	10000	7	2500	120	<1.5	**44**	<1	21	22	31
	14996	0 - 15	6700	<0.8	5	27	<0.5	<0.8	3400	22	4	31	8800	7	2300	110	<1.5	40	<1	17	20	28
5037628	14999	0 - 15	11000	<0.8	5	39	<0.5	<0.8	3800	26	5	39	13000	9	2100	220	<1.5	**55**	<1	29	28	29
	15000	0 - 15	11000	<0.8	6	44	<0.5	<0.8	4500	25	4	41	12000	17	2300	160	<1.5	**54**	<1	36	28	43
5037629	15003	0 - 15	8100	<0.8	5	28	<0.5	<0.8	4000	16	3	28	10000	7	1900	200	<1.5	36	<1	19	21	21
	15004	0 - 15	8300	<0.8	5	28	<0.5	<0.8	4000	17	3	34	10000	8	1800	200	<1.5	39	<1	22	22	22
Market Garden Control																						
5037625	14977	0 - 15	6900	<0.8	5	54	<0.5	<0.8	4000	17	3	10	8100	37	1800	150	<1.5	9	<1	22	19	56
	14978	0 - 15	7000	<0.8	5	55	<0.5	<0.8	3900	17	3	10	8100	34	1800	150	<1.5	10	<1	22	19	56
Commercial Berry Farms																						
5037413	14845	0 - 10	8400	<0.8	6	34	<0.5	<0.8	1800	20	4	38	9900	13	1500	140	<1.5	41	<1	10	19	30
	14846	0 - 10	11000	<0.8	5	33	<0.5	<0.8	1700	21	4	38	13000	12	1400	130	<1.5	42	<1	11	20	29
5037414	14849	0 - 10	6300	<0.8	5	20	<0.5	<0.8	1800	18	3	33	7800	8	1700	56	<1.5	35	<1	<10	17	14
	14850	0 - 10	5900	<0.8	5	22	<0.5	<0.8	2100	19	3	35	7100	9	1800	64	<1.5	41	<1	10	19	15
5037415	14853	0 - 10	8100	<0.8	5	22	<0.5	<0.8	2000	20	3	28	9100	8	1900	69	<1.5	31	<1	<10	18	15
	14854	0 - 10	7900	<0.8	5	22	<0.5	<0.8	2100	20	3	31	9100	8	1900	69	<1.5	33	<1	<10	19	15
5037416	14857	0 - 15	6700	<0.8	7	18	<0.5	<0.8	550	13	3	**65**	7300	15	790	35	<1.5	**52**	1	10	14	11
	14858	0 - 15	6800	<0.8	9	19	<0.5	<0.8	610	15	3	**72**	7800	16	930	40	<1.5	**49**	1	10	16	12

Table D3.1: Results of Chemical Analysis for Soil Collected from Market Gardens, Commercial Berry Farms, and Wild Blueberry Sites.

Station	Sample Number	Soil Depth	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
5037417	14861	0 - 15	7600	<0.8	5	26	<0.5	<0.8	1400	19	4	25	9200	7	1600	110	<1.5	35	1	<10	18	18
	14862	0 - 15	8800	<0.8	6	27	<0.5	<0.8	1600	21	4	26	9500	7	1600	110	<1.5	37	<1	<10	19	19
5037418	14865	0 - 10	8000	<0.8	5	33	<0.5	<0.8	3100	27	5	29	10000	7	2500	140	<1.5	42	<1	17	23	23
	14866	0 - 10	7400	<0.8	5	33	<0.5	<0.8	2700	27	5	29	10000	8	2500	130	<1.5	42	<1	16	22	24
5037419	14869	0 - 10	15000	<0.8	5	32	<0.5	<0.8	5200	26	5	24	19000	7	2800	130	<1.5	38	<1	12	21	22
	14870	0 - 10	16000	<0.8	5	32	<0.5	<0.8	5800	26	5	25	21000	7	2900	130	<1.5	36	<1	13	21	22
5037420	14873	0 - 15	8000	<0.8	5	28	<0.5	<0.8	4100	19	4	22	9800	7	1600	81	<1.5	33	<1	11	20	15
	14874	0 - 15	7500	<0.8	5	27	<0.5	<0.8	3300	19	4	22	9200	8	1600	83	<1.5	35	<1	11	20	15
5037421	14877	0 - 15	7500	<0.8	5	28	<0.5	<0.8	2100	18	4	23	9700	8	1200	110	<1.5	33	<1	11	19	18
	14878	0 - 15	7000	<0.8	5	28	<0.5	<0.8	1800	18	4	22	8900	8	1200	110	<1.5	32	<1	<10	19	17
5037422	14881	0 - 15	6000	<0.8	5	27	<0.5	<0.8	2000	15	3	26	7900	8	920	74	<1.5	32	<1	<10	18	14
	14882	0 - 15	6300	<0.8	5	26	<0.5	<0.8	1800	14	3	24	8300	8	890	67	<1.5	31	<1	<10	17	13
5037423	14885	0 - 15	6500	<0.8	5	27	<0.5	<0.8	2900	17	3	20	8500	7	1300	82	<1.5	29	<1	<10	17	15
	14886	0 - 15	6500	<0.8	5	26	<0.5	<0.8	3100	18	3	20	9100	7	2500	84	<1.5	29	<1	11	18	15
5037424	14889	0 - 15	7100	<0.8	5	39	<0.5	<0.8	2800	22	4	40	10000	18	1800	120	<1.5	**50**	<1	15	22	39
	14890	0 - 15	8300	<0.8	8	37	<0.5	<0.8	2500	21	4	39	9300	18	1800	110	<1.5	**51**	<1	14	20	36
5037425	14893	0 - 15	6600	<0.8	7	25	<0.5	<0.8	3100	14	3	26	8000	8	1700	170	<1.5	39	<1	<10	17	21
	14894	0 - 15	6500	<0.8	8	25	<0.5	<0.8	2700	14	3	32	8100	8	1500	170	<1.5	39	<1	<10	17	20
5037426	14897	0 - 15	7000	<0.8	7	22	<0.5	<0.8	2800	19	4	29	9000	7	1700	110	<1.5	39	<1	<10	19	17
	14898	0 - 15	6800	<0.8	7	22	<0.5	<0.8	2900	19	4	25	8800	7	1800	110	<1.5	35	<1	<10	19	16
5037428	14905	0 - 15	7000	<0.8	10	34	<0.5	<0.8	1800	18	4	36	8800	10	1300	110	<1.5	43	<1	<10	18	24
	14906	0 - 15	7200	<0.8	10	35	<0.5	<0.8	1900	18	4	35	9100	10	1400	110	<1.5	42	<1	<10	19	25
5037429	14909	0 - 15	8400	<0.8	7	32	<0.5	<0.8	1400	19	4	31	10000	9	1500	160	<1.5	**45**	<1	<10	19	29
	14910	0 - 15	8800	<0.8	7	32	<0.5	<0.8	1700	20	4	31	10000	8	1600	180	<1.5	**44**	<1	11	21	28
Commercial Berry Farm Control																						
5037427	14901	0 - 15	4800	<0.8	5	19	<0.5	<0.8	2800	11	2	5	7700	8	1800	87	<1.5	9	<1	<10	16	24
	14902	0 - 15	4400	<0.8	5	19	<0.5	<0.8	2600	11	2	4	7100	8	1600	82	<1.5	8	<1	<10	16	23
5037617	14969	0 - 15	5600	<0.8	5	21	<0.5	<0.8	2500	13	1	<1	6200	7	890	87	<1.5	6	<1	11	15	27
	14970	0 - 15	5900	<0.8	5	22	<0.5	<0.8	2600	13	1	<1	6400	8	950	89	<1.5	7	<1	12	16	31
5037618	14973	0 - 15	6700	<0.8	5	21	<0.5	<0.8	2700	12	1	<1	5300	6	890	64	<1.5	6	<1	11	14	21
	14974	0 - 15	6900	<0.8	5	21	<0.5	<0.8	2900	13	1	<1	5500	6	940	64	<1.5	7	<1	12	14	23
Wild Blueberries																						
5037430	14913	0 - 15	12000	1	**38**	51	<0.5	<0.8	1100	33	15	**400**	23000	32	3500	230	<1.5	**290**	**3**	14	42	49
	14914	0 - 15	13000	1	**33**	49	<0.5	<0.8	1200	33	14	**290**	25000	25	3600	220	<1.5	**260**	**3**	13	43	49

Table D3.1: Results of Chemical Analysis for Soil Collected from Market Gardens, Commercial Berry Farms, and Wild Blueberry Sites.

Station	Sample Number	Soil Depth	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
5037431	14917	0 - 15	6400	<0.8	**34**	24	<0.5	<0.8	710	16	6	**120**	10000	17	1100	110	<1.5	**77**	<1	<10	19	16
	14918	0 - 15	6500	<0.8	**39**	29	<0.5	<0.8	610	16	7	**160**	10000	21	1100	140	<1.5	**98**	1	<10	18	16
Wild Blueberry Control																						
5037616	14965	0 - 10	8900	<0.8	6	59	<0.5	<0.8	3100	15	3	15	10000	15	1100	260	<1.5	20	<1	20	25	26
	14966	0 - 10	11000	<0.8	5	53	<0.5	<0.8	3600	19	3	14	13000	13	1400	230	<1.5	19	<1	36	32	25
Table F			N/A	1	14	190	1.2	1	N/A	67	19	56	N/A	55	N/A	N/A	2.5	43	1.4	N/A	91	150
Table A			N/A	13	20	750	1.2	3	N/A	750	40	150	N/A	200	N/A	N/A	5	150	2	N/A	200	600

All data are µg/g dry weight, mean of duplicate samples and analysis. Data in bold exceed the Table F Ontario Typical Range Background Soil Guideline for the agricultural land use category (MOE 1997, Appendix H). Data in bold and underlined exceed the Table A Soil Clean-up Guideline for coarse agricultural soils (MOE 1997, Appendix H). N/A - no applicable guidelines exist for naturally occurring elements. < - less than the Method Detection Limit (MDL).

Table D3.2: Results of Chemical Analysis for Commercial Market Garden Vegetables Collected in the City of Greater Sudbury.

Station	Sample Number	Vegetable	Al	As	Ba	Bo	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Sr	V	Zn
Market Gardens																				
5037622	14947	beans, green	5<w	0.2<w	6	16	0.1<w	4400	0.5<w	0.2<w	7	55	0.5<w	1900	16	2	5.3	6.2	0.5<w	24
5037620	14933	beans, yellow	35	0.2<w	14	15	0.1<w	4600	0	0.9<t	5.9	100	0.5<w	2700	87	0.2<w	45	12	0.5<w	32
	14934	beans, yellow	44	0.2<w	14	18	0.2<t	4800	0.5<w	0.8<t	6.4	96	0	2800	93	0.3<t	45	13	0.5<w	33
5037622	14948	beans, yellow	8<t	0.2<w	8.4	15	0.1<w	4600	0.5<w	0.2<w	8	78	0.5<w	2100	17	3	7.1	7.4	0.5<w	22
5037626	14992	beans, yellow	48	0.2<w	4.7	19	0.1<w	4700	0.5<w	0.3<t	10	100	0.5<w	3300	27	0.7<t	10	5.3	0.5<w	30
5037620	14937	beet root	140	0.2<w	27	14	0.8	1500	0.5<w	0.6<t	9	150	0.5<w	2400	82	0.2<w	13	11	0.5<w	32
	14938	beet root	190	0.3<t	25	16	1	1600	0.8<t	1.1	16	270	0.5<w	3200	110	0.2<w	21	12	0.5<w	35
5037626	14991	carrot	180	0.2<w	11	23	0.3<t	2500	0.8<t	0.2<w	10	230	0.5<w	1900	21	0.2<w	3.2	5.2	0.5<w	23
5037619	14925	carrot	92	0.2<w	28	28	0.8	2800	0.7<t	0.2<w	11	100	0.5<w	1800	23	0.2<w	11	15	0.5<w	33
	14926	carrot	99	0.2<w	24	24	0.8	2600	0.6<t	0.2<w	8	110	0.5<w	1700	23	0.2<w	12	14	0.5<w	31
5037620	14935	cucumber	30	0.2<w	6.6	18	0.1<w	3500	0.5<w	0.3<t	8	63	0.5<w	3900	17	0.3<t	15	12	0.5<w	30
	14936	cucumber	58	0.2<w	10	15	0.1<w	3600	0.5<w	0.5<t	10	91	0.5<w	3800	25	0.3<t	22	14	0.5<w	30
5037626	14990	cucumber	120	0.2<w	3.6	17	0.1<w	4000	0.8<t	0.2<w	9	190	0.5<w	3700	20	0.9<t	4.9	4.9	0.5<w	34
5037620	14929	lettuce	230	0.4<t	17	14	2.1	9900	0.6<t	0.5<t	13	310	0	4500	150	0.2<w	9.3	27	0.5<w	32
	14930	lettuce	780	0.8<t	20	17	2.3	11000	1.9<t	0.9<t	15	850	1.0<t	4700	180	0.2<w	14	30	1.9<t	33
5037623	14954	lettuce	81	0.6<t	4.9	22	0.4<t	14000	0.8<t	0.2<w	16	180	0.9<t	5900	29	0.8<t	6.2	16	0.5<w	40
	14955	lettuce	31	0.4<t	3.1	19	0.3<t	9700	0.5<w	0.2<w	11	92	0.5<w	4400	23	0.5<t	3.2	11	0.5<w	29
5037626	14994	lettuce	1200	1	13	18	1.8	11000	3	0.8<t	14	1300	3.1	3800	150	0.2<w	7.8	13	2.9	28
5037623	14960	peppers, banana	5<w	0.2<w	0.5<w	13	0.1<w	900	0.5<w	0.2<w	11	200	0.5<w	1700	12	0.8<t	3.6	0.7<t	0.5<w	19
5037623	14956	peppers, green	5<w	0.2<w	0.5<w	16	0.1<w	380	0.5<w	0.2<w	8	32	0.5<w	1200	8.4	0.5<t	3.2	0.5<w	0.5<w	12
5037621	14943	potato	17<t	0.2<w	0.6<t	6	0.1<w	310	0.5<w	0.2<w	6	26	0.5<w	1100	3.7	1	1.0<t	0.6<t	0.5<w	12
	14944	potato	35	0.2<w	0.5<w	6	0.1<w	310	0.5<w	0.2<w	7	44	0.5<w	1100	3.8	1	0.9<t	0.6<t	0.5<w	12
5037627	14997	potato	48	0.2<w	0.5<w	6	0.3<t	500	0.5<w	0.3<t	7	120	0.7<t	1200	7.2	0.2<w	3.6	1.2<t	0.5<w	14
	14998	potato	100	0.2<w	0.9<t	9	0.2<t	580	0.5<w	0.3<t	8	210	0.5<w	1300	8.4	0.2<w	4.2	1.5<t	0.5<w	16
5037628	15001	potato	150	0.2<w	1.2<t	7	0.3<t	340	0.5<w	0.2<w	8	170	0.8<t	1100	8.4	0.2<w	3.8	0.9<t	0.5<w	17
	15002	potato	76	0.2<w	1.0<t	9	0.2<t	270	0.5<w	0.2<w	8	140	0.5<w	1100	7.9	0.2<w	3.3	0.7<t	0.5<w	17
5037629	15005	potato	15.<t	0.2<w	0.6<t	9	0.2<t	220<t	0.5<w	0.2<w	7.8	49	0.5<w	1200	10	0	0.5<w	0.9<t	0.5<w	20
	15006	potato	31	0.2<w	0.7<t	7	0.1<w	250	0.5<w	0.2<w	8.1	55	0.5<w	1200	9.4	0	0.5<w	1.1<t	0.5<w	20

Table D3.2: Results of Chemical Analysis for Commercial Market Garden Vegetables Collected in the City of Greater Sudbury.

Station	Sample Number	Vegetable	Al	As	Ba	Bo	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Sr	V	Zn
5037619	14923	pumpkin	5<w	0.2<w	5.3	21	0.1<w	3200	0.5<w	0.2<w	11	51	0.5<w	3600	18	0.3<t	18	11	0.5<w	41
	14924	pumpkin	10<t	0.2<w	4.2	18	0.2<t	2400	0.5<w	0.2<w	8.6	86	0	3400	22	0.2<w	16	8.8	0.5<w	56
5037622	14949 †	radish	370	0.3<t	41	19	0.3<t	2400	1.2<t	0.3<t	14	390	0	3100	23	0.4<t	5.7	8.2	0.9<t	31
5037620	14939	swiss chard	110	0.2<w	57	18	1.3	10000	0.5<w	0.6<t	16	130	0	12000	180	0.2<w	17	32	0.5<w	33
	14940	swiss chard	300	0.3<t	92	19	1.8	13000	0.8<t	1.1	17	310	0	15000	230	0.2<w	17	43	0.7<t	34
5037622	14950	swiss chard	110	0.2<w	32	25	0.3<t	8300	0.7<t	0.4<t	11	200	0	6500	110	1	5.7	9.7	0.5<w	31
5037620	14931	tomato	17<t	0.2<w	2.7	14	0.4<t	1500	0.5<w	0.4<t	11	70	0.5<w	2000	22	0.2<w	11	3.6	0.5<w	25
	14932	tomato	34	0.2<w	4	14	0.5	1600	0.5<w	0.4<t	10	70	0.5<w	2100	25	0.2<w	12	4.6	0.5<w	24
5037626	14993	tomato	52	0.2<w	2.7	16	0.1<w	2200	0.5<w	0.2<w	7.8	63	0	1400	13	0.7<t	0.5<w	4.7	0.5<w	18
5037623	14957	tomato, red	7<t	0.2<w	0.9<t	13	0.1<w	1200	0.8<t	0.2<w	5.2	31	0	1500	9	0.6<t	1.8<t	1.1<t	0.5<w	14
	14958	tomato, red	8<t	0.2<w	0.8<t	11	0.1<w	1300	0.7<t	0.2<w	5.8	32	0	1600	9	0.7<t	1.6<t	1.2<t	0.5<w	15
5037623	14959	tomato, yellow	5<w	0.2<w	0.6<t	12	0.1<w	890	0.5<w	0.2<w	4	23<t	0.5<w	1100	7.1	0.4<t	1.1<t	1<t	0.5<w	13
5037620	14927	zucchini	8<t	0.2<w	8.9	23	0.1<w	3100	0.7<t	1.1	11	60	0.5<w	3000	55	0.4<t	40	9.2	0.5<w	48
	14928	zucchini	20<t	0.2<w	7.4	24	0.2<t	2900	0.5<w	1.1	14	100	0.5<w	3700	56	0.2<w	43	9.2	0.5<w	61
5037624	14963	zucchini	6<t	0.2<w	1.5<t	27	0.1<w	5100	0.7<t	0.2<w	14	64	0	2900	14	0.5<t	3.3	5.6	0.5<w	48
	14964	zucchini	5<w	0.2<w	1.8<t	26	0.1<w	3200	0.5<w	0.3<t	11	50	0	3100	13	0.3<t	3.3	4.6	0.5<w	40
Market Garden Controls																				
5037625	14983	beans, green	50	0.2<w	6	21	0.1<w	3300	0.6<t	0.2<w	8.2	120	1.4<t	2400	16	0.8<t	0.5<w	9.8	0.5<w	38
5037625	14984	beans, yellow	34	0.2<w	10	23	0.1<w	4800	0.5<w	0.2<w	7.9	100	0.5<w	3000	18	1	0.7<t	14	0.5<w	39
5037625	14979 †	beet root	310	0.2<w	35	20	0.4<t	3000	8.2	0.2<w	11	350	1.6<t	3200	46	1	5.6	19	0.7<t	77
5037625	14981	carrot	150	0.2<w	33	24	0.5	3300	0.6<t	0.2<w	7.1	150	1.9<t	1900	14	0.2<w	0.5<w	17	0.5<w	31
5037625	14980	cucumber	93	0.2<w	7.4	19	0.1<w	5500	0.8<t	0.2<w	11	150	1.0<t	4200	14	3	0.6<t	14	0.5<w	47
5037625	14987 †	lettuce	2400	0.8<t	40	19	0.4<t	13000	5.8	1.2	15	2300	19	3300	79	2	3.7	45	5.3	69
5037625	14982	pepper, green	71	0.2<w	2.7	20	0.2<t	2100	0.5<w	0.3<t	13	130	0.9<t	1900	14	0.6<t	0.7<t	4.5	0.5<w	28
5037625	14986 †	swiss chard	1600	0.8<t	65	21	0.2<t	14000	3.8	0.7<t	7.5	1500	10	11000	52	0.7<t	2.2<t	48	3.6	49
5037625	14985	tomato	7.<t	0.2<w	0.7<t	10	0.2<t	1100	0.5<w	0.2<w	6.5	35	0.6<t	850	11	0.2<w	1.1<t	0.9<t	0.5<w	23

All data are µg/g dry weight of duplicate samples where sufficient produce was available. <t - trace amount, <w - no measurable response above detection limit.
Antimony (Sb), beryllium (Be), and selenium (Se) are not reported as all results were 0.2<w.
† - magnetic particles removed before analysis, see Discussion 7.4 and Appendix G for details.

Table D3.3: Results of Chemical Analysis for Commercial and Wild Berries Collected Within the City of Greater Sudbury.

Station	Sample Number	Type of Fruit	Al	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	Zn
Commercial Berry Farms																			
5037413	14843	Raspberry	5<w	6.7	6	0.1<w	1400	0.5<w	0.2<w	4.6	23<t	0.5<w	960	17	0.2<w	4.6	0.2<w	3	10
	14844	Raspberry	5<w	7.7	7	0.1<w	1400	0.5<w	0.2<w	4.4	25	0.5<w	1000	17	0.2<w	4.9	0.2<w	2.9	11
5037414	14847	Raspberry	5<w	2.1<t	7	0.1<w	1700	0.5<w	0.2<w	4.9	32	0.6<t	1600	16	1	5.9	0.2<w	1.6<t	13
	14848	Raspberry	5<w	1.8<t	11	0.1<w	1600	0.5<w	0.2<w	5.1	27	0.5<w	1500	15	1.1	5.9	0.2<w	1.5<t	13
5037419	14867	Raspberry	5<w	2.1<t	9	0.8	1700	0.5<w	0.2<w	5.3	68	0.5<w	1100	59	0.2<w	8.9	0.2<w	2.2<t	13
	14868	Raspberry	5<w	1.9<t	11	0.1<w	1600	0.5<w	0.3<t	4.6	30	0.5<w	930	84	0.2<w	9.6	0.2<w	2.0<t	11
5037421	14875	Raspberry	11<t	8.4	9	0.1<w	1900	0.5<w	0.2<w	5.1	34	0.6<t	1000	25	0.4<t	8.3	0.2<w	9.5	12
	14876	Raspberry	5<w	4.8	5	0.1<w	1500	0.5<w	0.2<w	4.8	40	0.5<w	1000	12	0.3<t	5.8	0.2<w	2.1<t	10
5037424	14887	Raspberry	6<t	2.5	11	0.1<w	1100	0.5<w	0.2<w	5.9	34	0.6<t	1300	16	0.5<t	8	0.2<w	2.1<t	20
	14888	Raspberry	5<w	2.4<t	9	0.1<w	930	0.5<w	0.2<w	5.3	28	0.5<w	1200	11	0.5<t	6.6	0.2<w	1.9<t	17
5037425	14891	Raspberry	5<w	4.9	7	0.1<w	1500	0.5<w	0.2<w	5.6	33	0.5<w	1500	15	0.6<t	6.8	0.2<w	2.9	13
	14892	Raspberry	5<w	5.1	7	0.1<w	1400	0.5<w	0.2<w	6.2	32	0.5<w	1500	18	0.5<t	6.4	0.2<w	2.6	14
5037426	14895	Raspberry	6<t	6	7	0.1<w	1700	0.5<w	0.2<w	5.7	35	0.5<w	1400	15	0.5<t	7.4	0.2<w	2.3<t	13
	14896	Raspberry	6<t	5.3	7	0.1<w	1700	0.5<w	0.2<w	5.5	23<t	0.5<w	970	17	0.3<t	6.5	0.2<w	5	9
5037428	14903	Raspberry	12<t	1<t	6	0.1<w	1100	0.5<w	0.2<w	4.1	32	1.1<t	900	53	0.3<t	5.5	0.2<w	1.0<t	11
	14904	Raspberry	10<t	1<t	6	0.1<w	1000	0.5<w	0.2<w	4.6	32	0.5<w	970	49	0.2<w	5.4	0.2<w	0.9<t	13
5037415	14851	Strawberry	5<w	5.1	8	0.1<w	950	0.5<w	0.2<w	6	25	0.5<w	1000	8.5	0.7<t	1.4<t	0.2<w	1.0<t	7
	14852	Strawberry	5<w	5.7	6	0.1<w	920	0.5<w	0.2<w	6.5	23<t	0.5<w	1000	4.6	0.7<t	1.6<t	0.2<w	1.0<t	7
5037417	14859 †	Strawberry	6<t	5.7	9	0.1<w	1000	0.5<w	0.4<t	4.5	29	0.5<w	840	18	0.4<t	2.2<t	0.2<w	1.8<t	6
	14860	Strawberry	5<w	14	7	0.1<w	1900	0.5<w	0.2<w	4.5	23<t	0.5<w	1200	17	0.4<t	2.0<t	0.2<w	4.3	6
5037418	14863 †	Strawberry	8<t	4	7	0.1<w	1100	0.5<w	0.2<w	3.5	36	0.5<w	630	29	0.2<w	2.2<t	0.2<w	1.8<t	5
	14864	Strawberry	7<t	3.9	7	0.1<w	1300	0.5<w	0.2<w	2.7	25	0.5<w	610	26	0.2<w	1.5<t	0.2<w	2.1<t	5
5037420	14871	Strawberry	8<t	12	8	0.1<w	2100	0.5<w	0.2<w	4.5	27	0.5<w	960	16	0.4<t	2.0<t	0.2<w	4.7	6
	14872	Strawberry	11<t	9.8	6	0.1<w	1300	0.5<w	0.2<w	3.8	31	0.5<w	860	13	0.4<t	1.9<t	0.2<w	3.1	5
5037422	14879	Strawberry	5<w	12	6	0.1<w	1300	0.5<w	0.2<w	2.5	63	0.5<w	540	14	0.2<w	1.5<t	0.2<w	3.3	4<t
	14880	Strawberry	5<w	9.9	6	0.1<w	1300	0.5<w	0.2<w	2<t	13<t	0.5<w	510	12	0.2<w	1.5<t	0.2<w	3.2	4<t

Table D3.3: Results of Chemical Analysis for Commercial and Wild Berries Collected Within the City of Greater Sudbury.

Station	Sample Number	Type of Fruit	Al	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	Zn
5037423	14883	Strawberry	5<w	13	8	0.1<w	1700	0.5<w	0.3<t	3.9	160	0.5<w	1000	17	0.3<t	2.2<t	0.2<w	4.2	8
	14884	Strawberry	5<w	11	8	0.1<w	1800	0.5<w	0.2<w	4.6	35	0.5<w	1000	14	0.3<t	2.1<t	0.2<w	4.3	7
5037429	14907	Strawberry	5<w	7.2	7	0.2<t	930	0.5<w	0.2<w	2.8	19<t	0.5<w	740	21	0.2<w	1.7<t	0.2<w	1.9<t	7
	14908	Strawberry	5<w	7.5	8	0.2<t	1100	0.5<w	0.2<w	3	20<t	0.5<w	840	25	0.2<w	1.9<t	0.2<w	2.5	7
Commercial Berry Farm Control																			
5037427	14899	Raspberry	5<w	2.1<t	5	0.1<w	1900	0.5<w	0.2<w	4.4	29	0.8<t	1100	16	1	1.1<t	0.2<w	2.1<t	15
	14900	Raspberry	5<w	2.1<t	6	0.1<w	1800	0.5<w	0.2<w	3.9	26	0.5<w	1000	15	0.8<t	0.9<t	0.2<w	2.0<t	14
5037617	14971	Raspberry	250	3.3	10	0.1<w	1900	0.6<t	0.2<w	3.8	97	0.5<w	1200	18	0.8<t	1.0<t	0.2<w	2.7	21
	14972	Raspberry	160	5.1	14	0.1<w	2400	0.5<w	0.2<w	5.5	63	0.5<w	1400	21	0.9<t	0.5<w	0.2<w	3.8	25
5037618	14975	Strawberry	190	7.7	12	0.1<w	1600	0.5<w	0.2<w	4.4	32	1.2<t	920	13	0.6<t	0.5<w	0.2<w	3.3	8
	14976	Strawberry	240	7.3	12	0.1<w	1600	0.5<w	0.2<w	3.4	34	0.5<w	960	13	0.4<t	0.6<t	0.2<w	3	8
Wild Blueberry																			
5037416	14855	Wild	9<t	7.9	8	0.1<w	850	0.5<w	0.2<w	3.7	15<t	0.5<w	340	73	0.2<w	4.8	0.2<w	2.3<t	5
	14856	Wild	10<t	8.4	8	0.1<w	970	0.5<w	0.2<w	3.9	16<t	0.5<w	390	66	0.2<w	5.9	0.2<w	2.1<t	6
5037430	14911	Wild	8<t	5.3	6	0.1<w	700	0.5<w	0.2<w	4.5	53	0.5<w	260	97	0.2<w	4.7	0.2<w	2.2<t	2<t
	14912	Wild	9<t	4.3	5	0.1<w	640	0.5<w	0.2<w	4.7	25	0.5<w	260	98	0.2<w	4.3	0.2<w	1.6<t	2<t
5037431	14915	Wild	24<t	10	9	0.1<w	1500	0.5<w	0.2<w	6.7	35	0.5<w	310	110	0.2<w	6.8	0.2<w	1.8<t	4<t
	14916	Wild	24<t	9.4	9	0.1<w	1300	0.5<w	0.2<w	6.4	35	0.5<w	370	110	0.2<w	7.1	0.3<t	0.9<t	4<t
Wild Blueberry Control																			
5037616	14967	Wild	18<t	10	7	0.1<w	730	0.7<t	0.2<w	2.7	23<t	0.7<t	330	370	0.2<w	0.9<t	0.2<w	0.8<t	5
	14968	Wild	20<t	9.4	6	0.1<w	710	0.5<w	0.2<w	2.5	27	1.1<t	320	350	0.2<w	0.7<t	0.2<w	0.8<t	6

All data are µg/g dry weight of duplicate samples where sufficient produce was available. <t - trace amount, <w - no measurable response above detection limit.
Arsenic (As), beryllium (Be), and antimony (Sb) are not reported as all results were 0.2<w. All vanadium (V) results were 0.5<w.
† - magnetic particles removed before analysis, see Discussion 7.4 and Appendix G for details.

4. SAMPLING STATION CO-ORDINATES

Table D4.1: Market Garden, Commercial Berry and Wild Blueberry Sampling Station Coordinates
(Map Datum NAD 83, accurate to ±30 metres)

Station	Zone	Easting	Northing	Latitude	Longitude
5037413	17	508974	5167570	46.661632	-80.882699
5037414	17	509617	5166023	46.647701	-80.874327
5037415	17	509570	5166097	46.648368	-80.874939
5037416	17	509644	5166044	46.64789	-80.873973
5037417	17	509585	5166484	46.651851	-80.874735
5037418	17	496047	5164051	46.630012	-81.05164
5037419	17	496057	5163974	46.629319	-81.051509
5037420	17	487059	5160211	46.595341	-81.168948
5037421	17	487089	5160199	46.595234	-81.168556
5037422	17	487072	5160053	46.593919	-81.168774
5037423	17	487126	5160140	46.594703	-81.168071
5037424	17	509693	5166595	46.652848	-80.873322
5037425	17	509766	5166843	46.655079	-80.872362
5037426	17	509681	5166893	46.65553	-80.873472
5037427	17	410765	5114652	46.179598	-82.156175
5037428	17	492275	5160513	46.598139	-81.100857
5037429	17	492217	5160978	46.602323	-81.101622
5037430	17	494744	5152997	46.530523	-81.068537
5037431	17	513234	5157928	46.57479	-80.827292
5037616	17	453039	5201860	46.968599	-81.617339
5037617	17	326986	5127591	46.279836	-83.245763
5037618	17	326962	5127474	46.278777	-83.246032
5037619	17	495212	5161832	46.610037	-81.062525
5037620	17	495254	5161734	46.609155	-81.061976
5037621	17	512448	5155255	46.550749	-80.837622
5037622	17	512453	5155233	46.550551	-80.837557
5037623	17	512480	5155200	46.550254	-80.837206
5037624	17	512503	5155210	46.550343	-80.836905
5037625	17	328318	5125803	46.264094	-83.227835
5037626	17	493088	5160680	46.599651	-81.090245
5037627	17	494069	5162313	46.614356	-81.077458
5037628	17	494536	5163269	46.622964	-81.07137
5037629	17	434171	5117298	46.206074	-81.853324

City of Greater Sudbury 2001 Urban Soil Survey

Appendix E

Soil

pH
Electrical Conductivity
Total Organic Carbon

Results

1. Methods

In addition to the twenty inorganic chemical analysis conducted on each soil sample, one in ten soil samples were analyzed for pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC). Samples with sample numbers ending in “0" were selected to have these additional analysis carried out on them. In the initial sample submission to the laboratory the laboratory mistakenly performed the three additional test on all samples. This resulted in the quota for these analysis being used up before all samples had been analyzed. As a result only a portion of the Park soil samples were analyzed for pH, EC and TOC as the parks were sampled last.

The results are organized by sampling Station Number. The Electrical Conductivity results are in μS/cm and the Total Organic Carbon results are in mg/g dry weight. In some case only one or two of the three analysis were conducted on a sample.

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5028001	Sudbury (Core)	Residential	Yard - back	21115	Urban Soil	0-5 cm	50	49	6.8
5028002	Sudbury (Core)	Residential	Yard - back	21125	Urban Soil	10-20 cm	24	101	6.3
5028004	Sudbury (Core)	Residential	Yard - back	21135	Urban Soil	5-10 cm	25	89	6.2
5028006	Sudbury (Core)	Residential	Yard - back	21145	Urban Soil	0-5 cm	27	391	6.8
5028007	Sudbury (New)	Residential	Yard - front	17735	Urban Soil	5-10 cm	38	157	5.9
5028009	Sudbury (New)	Residential	Yard - front	17745	Urban Soil	0-5 cm	34	242	6.4
5028010	Sudbury (New)	Residential	Yard - front	17755	Urban Soil	10-20 cm	8	195	7.5
5028012	Sudbury (New)	Residential	Yard - back	17765	Urban Soil	5-10 cm	13	169	6.8
5028013	Sudbury (New)	Residential	Yard - front	17775	Urban Soil	0-5 cm	37	200	6.5
5028014	Sudbury (New)	Residential	Yard - back	17785	Urban Soil	10-20 cm	29	141	6.3
5028016	Sudbury (New)	Residential	Yard - back	17795	Urban Soil	5-10 cm	12	77	6.1
5028018	Sudbury (New)	Residential	Yard - front	17805	Urban Soil	0-5 cm	31	165	5.7
5028019	Sudbury (New)	Residential	Yard - back	17815	Urban Soil	10-20 cm	12	100	5.7
5028021	Sudbury (New)	Residential	Yard - back	17825	Urban Soil	5-10 cm	25	145	6.6
5028023	Sudbury (New)	Residential	Yard - front	17835	Urban Soil	0-5 cm	20	152	6.7
5028024	Sudbury (New)	Residential	Yard - front	17845	Urban Soil	10-20 cm	13	77	6.4
5028027	Sudbury (East)	Residential	Yard - back	17655	Urban Soil	0-5 cm	21	359	7.0
5028030	Sudbury (East)	Residential	Yard - front	21055	Urban Soil	0-5 cm	20	179	5.7
5028031	Sudbury (East)	Residential	Yard - back	21065	Urban Soil	10-20 cm	13	90	5.7
5028033	Sudbury (East)	Residential	Yard - front	21075	Urban Soil	5-10 cm	12	275	7.1
5028034	Sudbury (South)	Residential	Yard - front	19015	Urban Soil	5-10 cm	20	88	6.1
5028036	Sudbury (South)	Residential	Yard - back	19025	Urban Soil	0-5 cm	10	166	5.6
5028037	Sudbury (South)	Residential	Yard - back	19035	Urban Soil	10-20 cm	10	223	7.5
5028039	Sudbury (South)	Residential	Yard - front	19045	Urban Soil	5-10 cm	8	91	6.8
5028041	Lively	Residential	Yard - back	17665	Urban Soil	10-20 cm	42	373	6.9
5028043	Lively	Residential	Yard - back	17675	Urban Soil	5-10 cm	21	75	6.1
5028045	Lively	Residential	Yard - back	17685	Urban Soil	0-5 cm	63	330	7.0
5028046	Lively	Residential	Yard - front	17695	Urban Soil	10-20 cm	6	68	6.9
5028048	Lively	Residential	Yard - front	17705	Urban Soil	5-10 cm	20	224	6.7
5028050	Lively	Residential	Yard - front	17715	Urban Soil	0-5 cm	31	275	6.4

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5028051	Lively	Residential	Yard - front	17725	Urban Soil	10-20 cm	9	110	6.1
5028053	Lively	Residential	Yard - front	17855	Urban Soil	5-10 cm	18	58	5.7
5028055	Lively	Residential	Yard - front	17865	Urban Soil	0-5 cm	14	198	6.5
5028056	Lively	Residential	Yard - front	17885	Urban Soil	5-10 cm	10	155	7.1
5028057	Lively	Residential	Yard - back	17875	Urban Soil	10-20 cm	10	96	6.4
5028059	Azilda	Residential	Yard - front	19055	Urban Soil	0-5 cm	41	380	7.1
5028060	Azilda	Residential	Yard - back	19065	Urban Soil	10-20 cm	31	304	7.4
5028062	Azilda	Residential	Yard - back	19075	Urban Soil	5-10 cm	32	296	7.4
5028064	Azilda	Residential	Yard - front	19085	Urban Soil	0-5 cm	27	219	6.8
5028065	Azilda	Residential	Yard - back	19095	Urban Soil	10-20 cm	6	74	7.0
5028067	Azilda	Residential	Yard - front	19105	Urban Soil	5-10 cm	17	160	7.2
5028069	Azilda	Residential	Yard - back	19115	Urban Soil	0-5 cm	27	349	7.3
5028070	Azilda	Residential	Yard - front	19125	Urban Soil	10-20 cm	3	85	7.3
5028072	Azilda	Residential	Yard - back	19135	Urban Soil	5-10 cm	23	109	6.7
5028074	Sudbury (South)	Residential	Yard - back	19145	Urban Soil	0-5 cm	33	163	6.2
5028075	Sudbury (South)	Residential	Yard - back	19155	Urban Soil	10-20 cm	12	104	6.1
5028076	Sudbury (South)	Residential	Yard - side	19165	Urban Soil	5-10 cm	12	80	5.7
5028081	Sudbury (New)	Residential	Yard - back	20625	Urban Soil	5-10 cm	26	129	6.9
5028083	Sudbury (New)	Residential	Yard - back	20635	Urban Soil	0-5 cm	17	224	6.7
5028086	Sudbury (New)	Residential	Yard - back	20655	Urban Soil	5-10 cm	29	173	5.8
5028088	Sudbury (New)	Residential	Yard - back	20665	Urban Soil	0-5 cm	43	979	7.0
5028089	Sudbury (New)	Residential	Yard - back	20675	Urban Soil	10-20 cm	15	378	7.0
5028090	Copper Cliff	Residential	Yard - front	17895	Urban Soil	0-5 cm	86	346	5.4
5028091	Copper Cliff	Residential	Yard - back	17905	Urban Soil	10-20 cm	36	231	7.0
5028102	Garson	Residential	Yard - front	21715	Urban Soil	5-10 cm	14	108	6.0
5028104	Garson	Residential	Yard - back	21685	Urban Soil	5-10 cm	18	103	6.8
5028106	Garson	Residential	Yard - front	21675	Urban Soil	10-20 cm	7	65	6.8
5028107	Garson	Residential	Yard - front	21665	Urban Soil	0-5 cm	6	117	6.7
5028109	Garson	Residential	Yard - front	21655	Urban Soil	5-10 cm	12	208	7.4
5028111	Garson	Residential	Yard - back	21645	Urban Soil	10-20 cm	9	107	7.0

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5028113	Garson	Residential	Yard - front	19425	Urban Soil	10-20 cm	4	127	7.2
5028114	Garson	Residential	Yard - front	19415	Urban Soil	0-5 cm	20	210	6.8
5028116	Garson	Residential	Yard - front	19405	Urban Soil	5-10 cm	6	92	6.7
5028118	SKEAD	Residential	Yard - back	19465	Urban Soil	10-20 cm	9	45	6.5
5028120	SKEAD	Residential	Yard - front	19455	Urban Soil	10-20 cm	4	66	6.7
5028121	SKEAD	Residential	Yard - back	19445	Urban Soil	0-5 cm	19	180	6.3
5028123	SKEAD	Residential	Yard - front	19435	Urban Soil	5-10 cm	4	55	5.4
5030445	Sudbury (Core)	Parks	Greenspace	20035	Urban Soil	0-5 cm	28	479	6.3
5030446	Sudbury (Core)	Parks	Greenspace	20045	Urban Soil	10-20 cm	13	149	6.7
5030449	Sudbury (Core)	Parks	Greenspace	20055	Urban Soil	0-5 cm	32	534	6.8
5030450	Sudbury (Core)	Parks	Greenspace	20065	Urban Soil	10-20 cm	31	162	6.7
5030453	Sudbury (Core)	Parks	Play structure	20075	Play/Beach Sand	0-10 cm	222	nd	7.4
5030456	Sudbury (Core)	Parks	Native	20085	Undisturbed Soil	0-5 cm	58	146	4.9
5030463	Copper Cliff	Parks	Baseball outfield	20095	Urban Soil	5-10 cm	12	264	6.8
5030465	Copper Cliff	Parks	Baseball outfield	20105	Urban Soil	0-5 cm	204	nd	7.2
5030466	Copper Cliff	Parks	Baseball infield	20115	Urban Soil	10-20 cm	9	74	7.0
5030468	Copper Cliff	Parks	Greenspace	20125	Urban Soil	5-10 cm	6	176	7.4
5030470	Copper Cliff	Parks	Play structure	20135	Play/Beach Sand	0-5 cm	1	30	7.5
5030473	Copper Cliff	Parks	Greenspace	20145	Urban Soil	10-20 cm	11	306	7.4
5030476	Falconbridge	Parks	Greenspace	20155	Urban Soil	10-20 cm	65	136	6.0
5030478	Falconbridge	Parks	Baseball outfield	20165	Urban Soil	5-10 cm	12	207	6.4
5030480	Falconbridge	Parks	Baseball outfield	20175	Urban Soil	0-5 cm	16	113	6.2
5030481	Falconbridge	Parks	Baseball infield	20185	Urban Soil	10-20 cm	2	529	4.3
5030486	Falconbridge	Parks	Play structure	20195	Play/Beach Sand	0-5 cm	4	28	6.8
5030488	Falconbridge	Parks	Greenspace	20205	Urban Soil	5-10 cm	18	100	6.2
5030490	Falconbridge	Parks	Play structure	20215	Play/Beach Sand	0-5 cm	1	25	6.7
5030493	Coniston	Parks	Baseball outfield	20225	Urban Soil	5-10 cm	7	211	7.5
5030495	Coniston	Parks	Greenspace	20235	Urban Soil	5-10 cm	10	161	6.9
5030497	Coniston	Parks	Baseball outfield	20245	Urban Soil	10-20 cm	6	861	7.5
5030502	Coniston	Parks	Baseball infield	20255	Urban Soil	0-5 cm	17	612	7.2

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5030504	Garson	Parks	Greenspace	20265	Urban Soil	5-10 cm	8	139	7.1
5030506	Garson	Parks	Play structure	20275	Play/Beach Sand	0-5 cm	1	49	6.4
5030509	Garson	Parks	Baseball infield	20285	Gravel	0-5 cm	2	128	7.5
5030511	Garson	Parks	Baseball infield	20295	Urban Soil	5-10 cm	1	117	6.6
5030545	Gatchell	Parks	Greenspace	20425	Urban Soil	5-10 cm	8	116	nd
5030547	Gatchell	Parks	Soccer field	20435	Urban Soil	10-20 cm	10	239	nd
5030551	Gatchell	Parks	Baseball outfield	20445	Urban Soil	5-10 cm	14	192	nd
5030553	Sudbury (Core)	Parks	Greenspace	20455	Urban Soil	10-20 cm	5	59	nd
5030595	Sudbury (Core)	Parks	Greenspace	20615	Urban Soil	10-20 cm	6	204	nd
5030596	Sudbury (South)	Parks	Soccer field	19175	Urban Soil	0-5 cm	30	174	6.9
5030609	Sudbury (New)	Parks	Play structure	20915	Play/Beach Sand	0-5 cm	1	25	nd
5030613	Sudbury (New)	Parks	Greenspace	20925	Urban Soil	5-10 cm	6	130	nd
5030617	Sudbury (New)	Parks	Greenspace	20935	Urban Soil	0-5 cm	38	287	nd
5030619	Sudbury (New)	Parks	Soccer field	20945	Urban Soil	5-10 cm	14	353	7.0
5030622	Sudbury (New)	Parks	Baseball outfield	20955	Urban Soil	5-10 cm	24	284	7.1
5030626	Sudbury (New)	Parks	Baseball outfield	20965	Urban Soil	0-5 cm	21	798	7.3
5030627	Sudbury (New)	Parks	Soccer field	20975	Urban Soil	10-20 cm	11	378	7.6
5030639	Val Caron	Parks	Play structure	19825	Play/Beach Sand	0-5 cm	2	25	5.9
5030643	Val Caron	Parks	Baseball outfield	19835	Urban Soil	10-20 cm	15	40	5.3
5030644	Val Caron	Parks	Greenspace	19845	Urban Soil	0-5 cm	19	54	5.3
5030647	Val Caron	Parks	Play structure	19855	Play/Beach Sand	0-15 cm	2	25	7.5
5030651	Val Caron	Parks	Play structure	19765	Play/Beach Sand	0-15 cm	3	25	5.8
5030654	Val Caron	Parks	Baseball infield	19775	Gravel	0-5 cm	8	184	7.0
5030657	Val Caron	Parks	Play structure	19785	Play/Beach Sand	0-15 cm	3	25	7.3
5030660	Val Caron	Parks	Play structure	19795	Play/Beach Sand	0-15 cm	2	25	6.9
5030663	Val Caron	Parks	Play structure	19805	Play/Beach Sand	0-15 cm	1	25	6.6
5030666	Guilletville	Parks	Play structure	19815	Play/Beach Sand	0-15 cm	1	25	6.0
5030670	Blezard Valley	Parks	Play structure	19865	Play/Beach Sand	0-5 cm	2	25	7.2
5030673	Blezard Valley	Parks	Baseball infield	19875	Gravel	0-5 cm	5	119	7.3
5030675	Blezard Valley	Parks	Baseball diamond	19885	Urban Soil	5-10 cm	19	74	6.2

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5030677	Sudbury (East)	Parks	Play structure	19735	Play/Beach Sand	0-5 cm	1	25	6.4
5030680	Sudbury (East)	Parks	Greenspace	19745	Urban Soil	0-5 cm	41	240	5.8
5030681	Sudbury (East)	Parks	Native	19755	Undisturbed Soil	10-20 cm	12	31	5.1
5030756	Azilda	Parks	Greenspace	21545	Urban Soil	10-20 cm	20	339	7.5
5030759	Capreol	Parks	Baseball outfield	21555	Urban Soil	0-5 cm	29	213	6.8
5030760	Capreol	Parks	Baseball outfield	21565	Urban Soil	5-10 cm	25	110	6.8
5030763	Capreol	Parks	Soccer field	21575	Urban Soil	10-20 cm	29	83	7.4
5030766	Capreol	Parks	Greenspace	21585	Urban Soil	0-5 cm	44	290	6.9
5030767	Capreol	Parks	Greenspace	21595	Urban Soil	10-20 cm	22	221	7.5
5030770	Capreol	Parks	Greenspace	21605	Urban Soil	0-5 cm	27	124	6.4
5030772	Capreol	Parks	Greenspace	21615	Urban Soil	5-10 cm	10	62	6.3
5030774	Capreol	Parks	Greenspace	21625	Urban Soil	5-10 cm	13	27	5.8
5030778	Capreol	Parks	Greenspace	21635	Urban Soil	0-5 cm	24	77	5.6
5030844	Sudbury (South)	Parks	Greenspace	17945	Urban Soil	5-10 cm	6	191	7.2
5030849	Sudbury (South)	Parks	Play structure	17965	Play/Beach Sand	0-5 cm	6	71	6.8
5030852	Copper Cliff	Parks	Greenspace	17975	Urban Soil	0-5 cm	47	340	6.7
5030854	Lively	Parks	Greenspace	17985	Urban Soil	5-10 cm	18	178	6.6
5030856	Lively	Parks	Play structure	17995	Play/Beach Sand	0-5 cm	1	34	7.2
5030859	Lively	Parks	Greenspace	18005	Urban Soil	10-20 cm	9	241	6.9
5030862	Lively	Parks	Play structure	18015	Play/Beach Sand	0-5 cm	1	25	7.0
5030865	Lively	Parks	Greenspace	18025	Urban Soil	0-5 cm	15	104	6.3
5030878	Whitefish	Parks	Greenspace	18135	Urban Soil	5-10 cm	13	56	6.3
5030879	Hanmer	Parks	Play structure	18325	Play/Beach Sand	0-5 cm	2	27	6.5
5030883	Hanmer	Parks	Baseball outfield	18315	Urban Soil	10-20 cm	8	67	6.7
5030887	Hanmer	Parks	Play structure	18335	Play/Beach Sand	0-5 cm	2	25	6.4
5030890	Hanmer	Parks	Baseball infield	18345	Gravel	0-5 cm	4	84	7.3
5030893	Hanmer	Parks	Greenspace	18355	Urban Soil	0-5 cm	22	48	5.5
5030895	Hanmer	Parks	Baseball outfield	18365	Urban Soil	5-10 cm	11	83	6.3
5030901	Val Therese	Parks	Baseball outfield	18295	Urban Soil	0-5 cm	25	195	6.2
5030902	Val Therese	Parks	Greenspace	18305	Urban Soil	10-20 cm	14	65	6.3

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Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5030908	Val Therese	Parks	Greenspace	18285	Urban Soil	5-10 cm	19	74	5.6
5030910	Whitefish	Parks	Greenspace	18145	Urban Soil	10-20 cm	17	115	6.5
5030913	Whitefish	Parks	Baseball outfield	18155	Urban Soil	0-5 cm	38	287	6.7
5030925	Naughton	Parks	Baseball outfield	18205	Urban Soil	5-10 cm	3	110	7.0
5030927	Lively	Parks	Greenspace	18215	Urban Soil	10-20 cm	1	25	7.2
5030930	Lively	Parks	Greenspace	18225	Urban Soil	10-20 cm	7	104	7.3
5030933	Lively	Parks	Baseball outfield	18235	Urban Soil	0-5 cm	29	186	6.1
5030950	Sudbury (South)	Parks	Native	21725	Undisturbed Soil	0-5 cm	39	48	4.5
5037003	Wanup	Schools/Day Cares	Baseball outfield	14233	Urban Soil	10-20 cm	15	64	5.8
5037008	Sudbury (South)	Schools/Day Cares	Greenspace	14030	Urban Soil	0-5 cm	16	314	6.5
5037010	Sudbury (South)	Schools/Day Cares	Play structure	14038	Play/Beach Sand	0-5 cm	1	25	6.9
5037012	Sudbury (South)	Schools/Day Cares	Greenspace	14047	Urban Soil	0-5 cm	25	593	6.8
5037014	Sudbury (South)	Schools/Day Cares	Baseball infield	14055	Gravel	0-5 cm	9	497	6.9
5037016	Sudbury (South)	Schools/Day Cares	Playground	14004	Urban Soil	5-10 cm	15	69	5.7
5037020	Sudbury (South)	Schools/Day Cares	Baseball outfield	14018	Urban Soil	0-5 cm	25	261	6.6
5037026	Sudbury (South)	Schools/Day Cares	Greenspace	14065	Urban Soil	0-5 cm	13	220	7.2
5037033	Sudbury (South)	Schools/Day Cares	Play structure	14075	Play/Beach Sand	0-5 cm	1	26	7.5
5037046	Sudbury (South)	Schools/Day Cares	Play structure	14094	Play/Beach Sand	0-5 cm	1	25	6.5
5037047	Sudbury (South)	Schools/Day Cares	Play structure	14104	Play/Beach Sand	0-5 cm	15	25	6.4
5037057	Sudbury (South)	Schools/Day Cares	Soccer field	14114	Urban Soil	0-5 cm	16	1440	6.6
5037064	Sudbury (South)	Schools/Day Cares	Play/beach sand pit	14122	Play/Beach Sand	0-5 cm	1	25	7.2
5037070	Sudbury (Core)	Schools/Day Cares	Long jump pit	14143	Play/Beach Sand	0-5 cm	1	25	6.0
5037074	Sudbury (Core)	Schools/Day Cares	Greenspace	14153	Urban Soil	10-20 cm	13	133	6.4
5037079	Sudbury (Core)	Schools/Day Cares	Soccer field	14162	Urban Soil	0-5 cm	26	642	5.0
5037080	Sudbury (Core)	Schools/Day Cares	Baseball infield	14163	Urban Soil	0-5 cm	7	27	6.6
5037081	Sudbury (Core)	Schools/Day Cares	Play structure	14164	Play/Beach Sand	0-5 cm	nd	35	6.3
5037087	Sudbury (Core)	Schools/Day Cares	Greenspace	14173	Urban Soil	0-5 cm	nd	142	6.1
5037090	Sudbury (Core)	Schools/Day Cares	Baseball infield	14183	Urban Soil	0-5 cm	nd	229	6.8
5037096	Sudbury (Core)	Schools/Day Cares	Baseball diamond	14193	Gravel	0-5 cm	nd	83	7.0
5037101	Sudbury (Core)	Schools/Day Cares	Greenspace	14212	Urban Soil	0-5 cm	16	112	5.8

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037105	Sudbury (Core)	Schools/Day Cares	Greenspace	14222	Urban Soil	0-5 cm	7	124	6.0
5037106	Sudbury (Core)	Schools/Day Cares	Baseball infield	14134	Gravel	0-5 cm	7	27	6.3
5037113	Sudbury (Core)	Schools/Day Cares	Play structure	14257	Play/Beach Sand	0-5 cm	1	25	6.7
5037117	Sudbury (Core)	Schools/Day Cares	Playground	14265	Play/Beach Sand	0-5 cm	2	27	6.6
5037122	Sudbury (Core)	Schools/Day Cares	Play structure	14275	Play/Beach Sand	0-5 cm	1	25	6.6
5037127	Sudbury (Core)	Schools/Day Cares	Playground	14285	Gravel	0-5 cm	5	300	7.1
5037134	Sudbury (Core)	Schools/Day Cares	Greenspace	14248	Urban Soil	5-10 cm	18	85	5.6
5037147	Sudbury (East)	Schools/Day Cares	Play structure	14305	Play/Beach Sand	0-5 cm	1	25	6.9
5037149	Sudbury (East)	Schools/Day Cares	Playground	14295	Gravel	0-5 cm	2	25	6.5
5037150	Sudbury (East)	Schools/Day Cares	Play structure	14363	Play/Beach Sand	0-5 cm	1	47	8.0
5037152	Sudbury (New)	Schools/Day Cares	Baseball diamond/soccer field	14395	Urban Soil	0-5 cm	23	93	5.7
5037157	Sudbury (New)	Schools/Day Cares	Baseball outfield	14385	Urban Soil	0-5 cm	5	63	5.9
5037164	Sudbury (New)	Schools/Day Cares	Baseball diamond	14445	Gravel	0-5 cm	2	25	4.7
5037171	Sudbury (New)	Schools/Day Cares	Baseball infield	14455	Urban Soil	0-5 cm	3	83	7.5
5037174	Sudbury (New)	Schools/Day Cares	Playground	14315	Urban Soil	10-20 cm	6	37	5.6
5037179	Sudbury (New)	Schools/Day Cares	Soccer field	14325	Urban Soil	0-5 cm	31	198	6.0
5037186	Sudbury (New)	Schools/Day Cares	Soccer field	14349	Urban Soil	0-5 cm	17	5460	7.0
5037187	Sudbury (New)	Schools/Day Cares	Play structure	14351	Play/Beach Sand	0-5 cm	1	25	6.6
5037195	Sudbury (New)	Schools/Day Cares	Baseball infield	14465	Urban Soil	0-5 cm	2	5420	7.9
5037200	Sudbury (New)	Schools/Day Cares	Playground	14472	Urban Soil	0-5 cm	14	100	6.1
5037209	Sudbury (New)	Schools/Day Cares	Baseball infield	14768	Gravel	0-5 cm	14	1282	5.4
5037216	Sudbury (New)	Schools/Day Cares	Soccer field	14335	Urban Soil	0-5 cm	24	360	6.7
5037224	Sudbury (New)	Schools/Day Cares	Play structure	14375	Play/Beach Sand	0-5 cm	1	31	8.0
5037229	Lively	Schools/Day Cares	Baseball infield	14699	Urban Soil	0-5 cm	13	471	7.4
5037231	Lively	Schools/Day Cares	Soccer field	14702	Urban Soil	0-5 cm	17	515	7.1
5037244	Lively	Schools/Day Cares	Playground	14719	Urban Soil	0-5 cm	5	102	5.4
5037251	Lively	Schools/Day Cares	Play structure	14730	Play/Beach Sand	0-5 cm	1	25	5.7
5037254	Copper Cliff	Schools/Day Cares	Playground	14675	Urban Soil	10-20 cm	24	406	6.8
5037255	Copper Cliff	Schools/Day Cares	Play structure	14676	Play/Beach Sand	0-5 cm	1	25	7.1
5037262	Whitefish	Schools/Day Cares	Soccer field	14741	Urban Soil	5-10 cm	12	78	5.6

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Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037266	Sudbury (East)	Schools/Day Cares	Playground	14773	Gravel	0-5 cm	2	318	7.9
5037270	Garson	Schools/Day Cares	Playground	14435	Gravel	0-5 cm	5	224	7.6
5037274	Garson	Schools/Day Cares	Playground	14425	Gravel	0-5 cm	5	42	7.3
5037276	Garson	Schools/Day Cares	Playground	14415	Gravel	0-5 cm	5	91	6.1
5037280	Val Caron	Schools/Day Cares	Baseball infield	14825	Urban Soil	0-5 cm	5	845	7.9
5037283	Val Caron	Schools/Day Cares	Soccer field	14834	Urban Soil	0-5 cm	59	195	6.0
5037287	Val Caron	Schools/Day Cares	Play structure	14785	Play/Beach Sand	0-5 cm	1	54	8.1
5037291	Val Caron	Schools/Day Cares	Play structure	14815	Play/Beach Sand	0-5 cm	5	34	6.5
5037302	Val Caron	Schools/Day Cares	Play structure	14795	Play/Beach Sand	0-5 cm	5	30	5.0
5037304	Blezard Valley	Schools/Day Cares	Playground	14805	Urban Soil	10-20 cm	14	65	5.3
5037311	Val Therese	Schools/Day Cares	Playground	14655	Urban Soil	0-5 cm	7	31	5.2
5037313	Val Therese	Schools/Day Cares	Play/beach sand box	14645	Play/Beach Sand	0-5 cm	1	66	7.4
5037318	Val Therese	Schools/Day Cares	Baseball diamond/soccer field	14665	Urban Soil	0-5 cm	17	145	6.3
5037323	Garson	Schools/Day Cares	Baseball diamond/soccer field	14405	Urban Soil	0-5 cm	38	117	6.5
5037325	Hanmer	Schools/Day Cares	Play structure	14625	Play/Beach Sand	0-5 cm	2	25	6.2
5037328	Hanmer	Schools/Day Cares	Baseball diamond/soccer field	14635	Urban Soil	10-20 cm	10	68	5.0
5037332	Hanmer	Schools/Day Cares	Soccer field	14613	Urban Soil	0-5 cm	20	102	5.7
5037334	Hanmer	Schools/Day Cares	Soccer field	14608	Urban Soil	0-5 cm	10	257	5.5
5037340	Hanmer	Schools/Day Cares	Soccer field	14588	Urban Soil	0-5 cm	17	405	6.6
5037342	Hanmer	Schools/Day Cares	Long jump pit	14595	Play/Beach Sand	0-5 cm	1	25	5.8
5037359	Falconbridge	Schools/Day Cares	Playground	14759	Play/Beach Sand	0-5 cm	1	29	7.3
5037364	Azilda	Schools/Day Cares	Playground	14483	Gravel	0-5 cm	3	25	6.6
5037371	Azilda	Schools/Day Cares	Playground	14499	Urban Soil	5-10 cm	9	92	5.6
5037375	Chelmsford	Schools/Day Cares	Football field	14505	Urban Soil	5-10 cm	13	195	6.2
5037378	Chelmsford	Schools/Day Cares	Play structure	14515	Play/Beach Sand	0-5 cm	1	25	6.8
5037391	Chelmsford	Schools/Day Cares	Play structure	14525	Play/Beach Sand	0-5 cm	1	25	7.7
5037393	Chelmsford	Schools/Day Cares	Playground	14535	Gravel	0-5 cm	7	85	7.2
5037396	Chelmsford	Schools/Day Cares	Baseball outfield	14545	Urban Soil	0-5 cm	9	114	6.0
5037399	Chelmsford	Schools/Day Cares	Play structure	14553	Play/Beach Sand	0-5 cm	1	25	7.1
5037402	Dowling	Schools/Day Cares	Soccer field	14557	Urban Soil	0-5 cm	36	135	6.5

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Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037406	Levack	Schools/Day Cares	Baseball diamond	14568	Gravel	0-5 cm	18	223	7.3
5037408	Levack	Schools/Day Cares	Baseball diamond/soccer field	14565	Urban Soil	5-10 cm	86	115	6.3
5037410	Whitefish	Schools/Day Cares	Soccer field	14746	Urban Soil	0-5 cm	26	1238	4.5
5037413	Capreol	Agriculture	Com. Berry	14845	Tilled Soil	0-10 cm	25	191	6.0
5037413	Capreol	Agriculture	Com. Berry	14846	Tilled Soil	0-10 cm	25	nd	nd
5037414	Capreol	Agriculture	Com. Berry	14849	Tilled Soil	0-10 cm	20	nd	nd
5037414	Capreol	Agriculture	Com. Berry	14850	Tilled Soil	0-10 cm	22	nd	nd
5037415	Capreol	Agriculture	Com. Berry	14853	Tilled Soil	0-10 cm	15	nd	nd
5037415	Capreol	Agriculture	Com. Berry	14854	Tilled Soil	0-10 cm	16	nd	nd
5037416	Capreol	Agriculture	Will blueberry	14857	Tilled Soil	0-15 cm	33	nd	nd
5037416	Capreol	Agriculture	Will blueberry	14858	Tilled Soil	0-15 cm	35	nd	nd
5037417	Capreol	Agriculture	Com. Berry	14861	Tilled Soil	0-15 cm	17	nd	nd
5037417	Capreol	Agriculture	Com. Berry	14862	Tilled Soil	0-15 cm	17	nd	nd
5037418	Blezard Valley	Agriculture	Com. Berry	14865	Tilled Soil	0-10 cm	17	411	5.1
5037418	Blezard Valley	Agriculture	Com. Berry	14866	Tilled Soil	0-10 cm	17	nd	nd
5037419	Blezard Valley	Agriculture	Com. Berry	14869	Tilled Soil	0-10 cm	14	nd	nd
5037419	Blezard Valley	Agriculture	Com. Berry	14870	Tilled Soil	0-10 cm	16	nd	nd
5037420	Chelmsford	Agriculture	Com. Berry	14874	Tilled Soil	0-15 cm	22	nd	nd
5037420	Chelmsford	Agriculture	Com. Berry	14873	Tilled Soil	0-15 cm	23	nd	nd
5037421	Chelmsford	Agriculture	Com. Berry	14877	Tilled Soil	0-15 cm	19	nd	nd
5037421	Chelmsford	Agriculture	Com. Berry	14878	Tilled Soil	0-15 cm	20	nd	nd
5037422	Chelmsford	Agriculture	Com. Berry	14882	Tilled Soil	0-15 cm	26	nd	nd
5037422	Chelmsford	Agriculture	Com. Berry	14881	Tilled Soil	0-15 cm	27	nd	nd
5037423	Chelmsford	Agriculture	Com. Berry	14885	Tilled Soil	0-15 cm	24	284	6.7
5037423	Chelmsford	Agriculture	Com. Berry	14886	Tilled Soil	0-15 cm	22	nd	nd
5037424	Hanmer	Agriculture	Com. Berry	14890	Tilled Soil	0-15 cm	33	nd	nd
5037424	Hanmer	Agriculture	Com. Berry	14889	Tilled Soil	0-15 cm	34	nd	nd
5037425	Hanmer	Agriculture	Com. Berry	14893	Tilled Soil	0-15 cm	18	nd	nd
5037425	Hanmer	Agriculture	Com. Berry	14894	Tilled Soil	0-15 cm	18	nd	nd
5037426	Hanmer	Agriculture	Com. Berry	14897	Tilled Soil	0-15 cm	15	nd	nd

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Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037426	Hanmer	Agriculture	Com. Berry	14898	Tilled Soil	0-15 cm	16	nd	nd
5037427	Massey	Agriculture	Com. Berry	14901	Tilled Soil	0-15 cm	13	nd	nd
5037427	Massey	Agriculture	Com. Berry	14902	Tilled Soil	0-15 cm	21	nd	nd
5037428	Blezard Valley	Agriculture	Com. Berry	14905	Tilled Soil	0-15 cm	21	717	5.6
5037428	Blezard Valley	Agriculture	Com. Berry	14906	Tilled Soil	0-15 cm	22	nd	nd
5037429	Blezard Valley	Agriculture	Com. Berry	14910	Tilled Soil	0-15 cm	18	nd	nd
5037429	Blezard Valley	Agriculture	Com. Berry	14909	Tilled Soil	0-15 cm	18	nd	nd
5037430		Agriculture	Will blueberry	14914	Undisturbed Soil	0-15 cm	36	nd	nd
5037430		Agriculture	Will blueberry	14913	Undisturbed Soil	0-15 cm	38	nd	nd
5037431		Agriculture	Will blueberry	14918	Undisturbed Soil	0-15 cm	9	nd	nd
5037431		Agriculture	Will blueberry	14917	Undisturbed Soil	0-15 cm	11	nd	nd
5037432	Gatchell	Residential	Garden	15155	Garden Soil	0-15 cm	45	414	6.7
5037434	Gatchell	Residential	Yard - back	15175	Urban Soil	0-5 cm	37	95	6.3
5037436	Copper Cliff	Residential	Yard - front	15195	Urban Soil	10-20 cm	16	111	6.4
5037439	Copper Cliff	Residential	Garden	15185	Garden Soil	0-15 cm	40	264	6.9
5037440	Copper Cliff	Residential	Yard - front	15215	Urban Soil	0-5 cm	23	132	6.3
5037443	Copper Cliff	Residential	Yard - front	15225	Urban Soil	0-5 cm	37	230	8.1
5037444	Copper Cliff	Residential	Yard - back	15235	Urban Soil	10-20 cm	35	144	6.1
5037446	Copper Cliff	Residential	Yard - front	15245	Urban Soil	0-5 cm	52	50	6.1
5037447	Copper Cliff	Residential	Yard - back	15255	Urban Soil	10-20 cm	51	25	6.2
5037449	Copper Cliff	Residential	Yard - back	15265	Urban Soil	0-5 cm	34	339	6.2
5037453	Copper Cliff	Residential	Yard - back	15285	Urban Soil	0-5 cm	41	178	6.4
5037456	Copper Cliff	Residential	Garden	15305	Garden Soil	0-15 cm	58	287	6.7
5037457	Copper Cliff	Residential	Yard - front	15315	Urban Soil	5-10 cm	17	187	6.5
5037460	Lively	Residential	Yard - front	15335	Urban Soil	10-20 cm	24	50	5.4
5037460	Lively	Residential	Yard - front	15334	Urban Soil	5-10 cm	20	54	5.4
5037464	Lively	Residential	Yard - back	15365	Urban Soil	10-20 cm	12	122	6.8
5037469	Gatchell	Residential	Yard - back	15385	Urban Soil	0-5 cm	33	100	5.8
5037489	Coniston	Residential	Yard - back	15495	Urban Soil	10-20 cm	12	163	7.0
5037491	Coniston	Residential	Yard - front	15515	Urban Soil	10-20 cm	39	102	6.6

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037494	Coniston	Residential	Yard - back	15525	Urban Soil	10-20 cm	22	102	6.6
5037496	Coniston	Residential	Yard - front	15545	Urban Soil	5-10 cm	16	100	6.7
5037498	Coniston	Residential	Garden	15535	Garden Soil	0-15 cm	31	194	7.0
5037499	Coniston	Residential	Yard - front	15635	Urban Soil	10-20 cm	14	114	6.9
5037501	Coniston	Residential	Garden	15625	Garden Soil	0-15 cm	52	176	6.9
5037505	Coniston	Residential	Yard - back	15665	Urban Soil	0-5 cm	53	128	6.5
5037506	Coniston	Residential	Garden	15655	Garden Soil	0-15 cm	57	725	6.7
5037507	Coniston	Residential	Yard - front	15675	Urban Soil	0-5 cm	72	458	5.6
5037508	Coniston	Residential	Yard - back	15685	Urban Soil	10-20 cm	16	87	5.6
5037510	Falconbridge	Residential	Yard - front	15555	Urban Soil	5-10 cm	8	53	6.3
5037513	Falconbridge	Residential	Yard - front	15575	Urban Soil	10-20 cm	48	194	7.0
5037514	Falconbridge	Residential	Yard - back	15565	Urban Soil	0-5 cm	55	310	6.4
5037517	Falconbridge	Residential	Yard - back	15605	Urban Soil	10-20 cm	74	95	6.0
5037520	Falconbridge	Residential	Yard - back	15615	Urban Soil	5-10 cm	54	150	6.4
5037523	Falconbridge	Residential	Yard - back	15726	Urban Soil	5-10 cm	20	78	6.5
5037525	Falconbridge	Residential	Yard - back	15741	Urban Soil	10-20 cm	30	119	6.4
5037525	Falconbridge	Residential	Yard - back	15737	Urban Soil	0-5 cm	87	257	6.4
5037527	Falconbridge	Residential	Yard - back	15750	Urban Soil	5-10 cm	53	128	6.0
5037528	Falconbridge	Residential	Yard - front	15765	Urban Soil	10-20 cm	55	192	6.6
5037530	Falconbridge	Residential	Yard - front	15775	Urban Soil	5-10 cm	74	317	6.8
5037532	Falconbridge	Residential	Yard - front	15785	Urban Soil	0-5 cm	91	188	6.4
5037534	Falconbridge	Residential	Yard - front	15795	Urban Soil	10-20 cm	41	162	6.4
5037536	Falconbridge	Residential	Yard - front	15805	Urban Soil	5-10 cm	45	180	6.7
5037538	Falconbridge	Residential	Yard - front	15815	Urban Soil	0-5 cm	154	nd	6.3
5037539	Falconbridge	Residential	Yard - back	15825	Urban Soil	10-20 cm	67	165	6.4
5037540	Falconbridge	Residential	Yard - front	15835	Urban Soil	5-10 cm	60	113	6.2
5037542	Falconbridge	Residential	Yard - front	15845	Urban Soil	0-5 cm	101	554	6.4
5037544	Falconbridge	Residential	Yard - front	15855	Urban Soil	10-20 cm	50	257	6.5
5037546	Falconbridge	Residential	Yard - front	15865	Urban Soil	5-10 cm	78	261	6.8
5037548	Falconbridge	Residential	Yard - front	15895	Urban Soil	5-10 cm	58	218	6.3

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037550	Falconbridge	Residential	Yard - front	15875	Urban Soil	0-5 cm	84	388	6.9
5037551	Falconbridge	Residential	Yard - back	15885	Urban Soil	10-20 cm	70	156	5.7
5037553	Falconbridge	Residential	Yard - back	15905	Urban Soil	0-5 cm	53	108	6.1
5037554	Falconbridge	Residential	Yard - front	15915	Urban Soil	10-20 cm	39	163	6.5
5037557	Falconbridge	Residential	Yard - back	15926	Urban Soil	10-20 cm	47	140	6.3
5037559	Falconbridge	Residential	Yard - back	15943	Urban Soil	5-10 cm	34	319	6.7
5037561	Falconbridge	Residential	Yard - back	15956	Urban Soil	10-20 cm	18	276	6.8
5037561	Falconbridge	Residential	Yard - back	15955	Urban Soil	5-10 cm	27	374	6.9
5037563	Falconbridge	Residential	Yard - back	15965	Urban Soil	0-5 cm	85	445	5.7
5037564	Falconbridge	Residential	Yard - front	15975	Urban Soil	10-20 cm	46	78	6.5
5037566	Falconbridge	Residential	Yard - front	15985	Urban Soil	5-10 cm	40	189	6.5
5037569	Falconbridge	Residential	Yard - front	15995	Urban Soil	0-5 cm	143	nd	6.2
5037570	Falconbridge	Residential	Yard - front	18445	Urban Soil	0-5 cm	25	174	6.7
5037573	Falconbridge	Residential	Yard - back	18465	Urban Soil	5-10 cm	72	140	6.4
5037574	Falconbridge	Residential	Yard - front	18473	Urban Soil	10-20 cm	30	201	6.7
5037575	Falconbridge	Residential	Yard - back	18479	Urban Soil	10-20 cm	89	203	6.6
5037576	Falconbridge	Residential	Yard - front	18485	Urban Soil	10-20 cm	18	125	7.1
5037578	Falconbridge	Residential	Yard - front	18495	Urban Soil	5-10 cm	65	158	6.6
5037580	Falconbridge	Residential	Yard - front	18505	Urban Soil	0-5 cm	50	304	6.6
5037581	Falconbridge	Residential	Yard - back	18515	Urban Soil	10-20 cm	25	104	6.5
5037583	Falconbridge	Residential	Yard - back	18525	Urban Soil	5-10 cm	57	208	6.0
5037585	Falconbridge	Residential	Yard - back	18535	Urban Soil	0-5 cm	30	188	5.6
5037586	Falconbridge	Residential	Yard - front	18546	Urban Soil	10-20 cm	37	154	6.4
5037589	Falconbridge	Residential	Yard - back	18559	Urban Soil	0-5 cm	80	296	6.6
5037589	Falconbridge	Residential	Yard - back	18563	Urban Soil	10-20 cm	34	183	6.9
5037590	Falconbridge	Residential	Yard - front	18565	Urban Soil	0-5 cm	96	nd	6.7
5037591	Falconbridge	Residential	Yard - back	18575	Urban Soil	10-20 cm	119	273	7.0
5037593	Falconbridge	Residential	Yard - back	18585	Urban Soil	5-10 cm	155	91	6.2
5037595	Falconbridge	Residential	Yard - back	18595	Urban Soil	0-5 cm	63	151	6.5
5037598	Falconbridge	Residential	Yard - front	18615	Urban Soil	5-10 cm	134	213	6.8

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037600	Falconbridge	Residential	Yard - front	18625	Urban Soil	0-5 cm	101	152	6.4
5037601	Falconbridge	Residential	Yard - back	18635	Urban Soil	10-20 cm	10	43	6.2
5037603	Falconbridge	Residential	Yard - back	18643	Urban Soil	0-5 cm	76	117	5.3
5037605	Falconbridge	Residential	Yard - back	18655	Urban Soil	0-5 cm	50	121	5.8
5037606	Falconbridge	Residential	Yard - front	18665	Urban Soil	10-20 cm	95	281	6.8
5037608	Falconbridge	Residential	Yard - front	18675	Urban Soil	5-10 cm	52	110	6.2
5037610	Falconbridge	Residential	Yard - front	18685	Urban Soil	0-5 cm	81	320	6.2
5037611	Falconbridge	Residential	Yard - back	18695	Urban Soil	10-20 cm	46	139	6.4
5037613	Falconbridge	Residential	Yard - back	18705	Urban Soil	5-10 cm	51	152	6.4
5037615	Falconbridge	Residential	Yard - back	18715	Urban Soil	0-5 cm	51	128	6.4
5037616		Agriculture	Com. Berry	14965	Tilled Soil	0-10 cm	72	nd	nd
5037622		Agriculture	Market garden	14945	Tilled Soil	0-15 cm	21	480	7.0
5037627		Agriculture	Market garden	14995	Tilled Soil	0-15 cm	15	1100	6.6
5037629		Agriculture	Market garden	15003	Tilled Soil	0-15 cm	15	270	5.8
5037630	Coniston	Residential	Yard - front	16004	Urban Soil	10-20 cm	5	100	6.7
5037632	Coniston	Residential	Yard - front	16015	Urban Soil	5-10 cm	18	96	6.3
5037634	Coniston	Residential	Yard - front	16035	Urban Soil	10-20 cm	37	221	6.6
5037635	Coniston	Residential	Yard - back	16025	Urban Soil	0-5 cm	51	106	5.6
5037637	Coniston	Residential	Yard - back	16045	Urban Soil	5-10 cm	17	155	6.8
5037639	Coniston	Residential	Yard - back	16055	Urban Soil	0-5 cm	73	325	6.4
5037640	Coniston	Residential	Yard - front	16065	Urban Soil	10-20 cm	10	222	6.5
5037645	Coniston	Residential	Yard - front	16095	Urban Soil	10-20 cm	26	78	6.5
5037647	Coniston	Residential	Yard - front	16105	Urban Soil	5-10 cm	17	97	6.4
5037650	Coniston	Residential	Yard - back	16115	Urban Soil	0-5 cm	34	115	6.1
5037651	Coniston	Residential	Yard - front	16125	Urban Soil	10-20 cm	12	72	6.3
5037653	Coniston	Residential	Yard - front	16135	Urban Soil	5-10 cm	12	49	6.5
5037655	Coniston	Residential	Yard - front	16155	Urban Soil	10-20 cm	6	60	6.7
5037656	Coniston	Residential	Yard - back	16145	Urban Soil	0-5 cm	16	90	6.6
5037658	Coniston	Residential	Yard - back	16165	Urban Soil	5-10 cm	25	206	6.4
5037660	Coniston	Residential	Yard - back	16175	Urban Soil	0-5 cm	31	218	6.3

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037661	Coniston	Residential	Yard - front	16185	Urban Soil	10-20 cm	6	48	6.4
5037663	Coniston	Residential	Yard - front	16195	Urban Soil	5-10 cm	19	156	6.8
5037665	Coniston	Residential	Yard - front	16205	Urban Soil	0-5 cm	26	98	6.1
5037666	Coniston	Residential	Yard - back	16215	Urban Soil	10-20 cm	17	50	6.5
5037668	Coniston	Residential	Yard - back	16225	Urban Soil	5-10 cm	13	146	7.2
5037670	Coniston	Residential	Yard - back	16235	Urban Soil	0-5 cm	105	39	6.8
5037671	Coniston	Residential	Yard - front	16245	Urban Soil	10-20 cm	25	338	6.6
5037673	Coniston	Residential	Yard - front	16255	Urban Soil	5-10 cm	11	100	7.2
5037675	Coniston	Residential	Yard - front	16265	Urban Soil	0-5 cm	46	223	7.0
5037676	Coniston	Residential	Yard - back	16275	Urban Soil	10-20 cm	19	96	7.0
5037678	Coniston	Residential	Yard - back	16285	Urban Soil	5-10 cm	15	86	6.6
5037680	Coniston	Residential	Yard - back	16295	Urban Soil	0-5 cm	43	359	6.6
5037681	Coniston	Residential	Yard - front	16305	Urban Soil	10-20 cm	8	131	7.2
5037683	Coniston	Residential	Yard - front	16315	Urban Soil	5-10 cm	30	128	7.0
5037685	Coniston	Residential	Yard - front	16325	Urban Soil	0-5 cm	58	70	5.5
5037686	Coniston	Residential	Yard - back	16335	Urban Soil	10-20 cm	11	103	6.3
5037688	Coniston	Residential	Yard - back	16345	Urban Soil	5-10 cm	89	361	7.1
5037690	Coniston	Residential	Yard - back	16355	Urban Soil	0-5 cm	49	797	6.2
5037691	Coniston	Residential	Yard - front	16365	Urban Soil	10-20 cm	18	166	6.4
5037693	Coniston	Residential	Yard - front	16377	Urban Soil	10-20 cm	10	47	6.3
5037695	Coniston	Residential	Yard - front	16385	Urban Soil	0-5 cm	54	253	6.5
5037696	Coniston	Residential	Yard - back	16395	Urban Soil	10-20 cm	17	144	6.7
5037698	Coniston	Residential	Yard - back	16405	Urban Soil	5-10 cm	12	44	5.6
5037700	Coniston	Residential	Yard - back	16415	Urban Soil	0-5 cm	68	305	6.7
5037701	Coniston	Residential	Yard - front	16425	Urban Soil	10-20 cm	8	51	6.3
5037703	Coniston	Residential	Yard - front	16435	Urban Soil	5-10 cm	12	112	7.1
5037705	Coniston	Residential	Yard - front	16445	Urban Soil	0-5 cm	26	304	7.2
5037706	Coniston	Residential	Yard - back	16455	Urban Soil	10-20 cm	15	113	7.1
5037710	Coniston	Residential	Yard - back	16475	Urban Soil	0-5 cm	20	165	5.7
5037711	Coniston	Residential	Yard - front	16485	Urban Soil	10-20 cm	4	61	5.8

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037713	Coniston	Residential	Yard - front	16495	Urban Soil	5-10 cm	25	320	6.9
5037715	Coniston	Residential	Yard - front	16505	Urban Soil	0-5 cm	48	99	6.5
5037716	Coniston	Residential	Yard - back	16515	Urban Soil	10-20 cm	12	77	6.9
5037718	Coniston	Residential	Yard - back	16525	Urban Soil	5-10 cm	25	166	6.7
5037720	Coniston	Residential	Yard - back	16535	Urban Soil	0-5 cm	35	131	6.4
5037721	Coniston	Residential	Yard - back	16545	Urban Soil	10-20 cm	14	31	6.2
5037723	Coniston	Residential	Yard - back	16555	Urban Soil	5-10 cm	20	89	6.9
5037725	Coniston	Residential	Yard - back	16565	Urban Soil	0-5 cm	50	205	6.3
5037726	Coniston	Residential	Yard - front	16575	Urban Soil	10-20 cm	12	109	6.6
5037728	Coniston	Residential	Yard - front	16585	Urban Soil	5-10 cm	17	112	6.7
5037730	Coniston	Residential	Yard - front	16595	Urban Soil	0-5 cm	27	101	6.4
5037731	Coniston	Residential	Yard - back	16605	Urban Soil	10-20 cm	16	70	6.2
5037733	Coniston	Residential	Yard - back	16615	Urban Soil	5-10 cm	23	154	7.1
5037735	Coniston	Residential	Yard - back	18732	Urban Soil	10-20 cm	8	59	6.8
5037738	Coniston	Residential	Yard - front	18750	Urban Soil	10-20 cm	10	53	6.8
5037739	Coniston	Residential	Yard - back	18755	Urban Soil	10-20 cm	9	26	6.2
5037741	Coniston	Residential	Yard - back	18765	Urban Soil	5-10 cm	16	165	7.4
5037743	Coniston	Residential	Yard - back	18775	Urban Soil	0-5 cm	41	228	7.1
5037744	Coniston	Residential	Yard - front	18785	Urban Soil	10-20 cm	10	127	7.6
5037746	Coniston	Residential	Yard - front	18795	Urban Soil	5-10 cm	19	164	7.3
5037748	Coniston	Residential	Yard - front	18805	Urban Soil	0-5 cm	34	218	6.1
5037750	Gatchell	Residential	Yard - front	16625	Urban Soil	0-5 cm	44	234	6.7
5037752	Gatchell	Residential	Yard - back	16635	Urban Soil	10-20 cm	8	60	5.5
5037754	Gatchell	Residential	Yard - front	16645	Urban Soil	5-10 cm	28	290	6.8
5037756	Gatchell	Residential	Yard - front	16655	Urban Soil	0-5 cm	34	225	6.6
5037757	Gatchell	Residential	Yard - back	16665	Urban Soil	10-20 cm	11	51	7.2
5037759	Gatchell	Residential	Yard - back	16675	Urban Soil	5-10 cm	7	59	6.6
5037761	Gatchell	Residential	Yard - back	16685	Urban Soil	0-5 cm	44	176	6.0
5037762	Gatchell	Residential	Yard - front	16695	Urban Soil	10-20 cm	6	84	6.4
5037764	Gatchell	Residential	Yard - front	16705	Urban Soil	5-10 cm	24	102	6.4

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037766	Gatchell	Residential	Yard - front	16715	Urban Soil	0-5 cm	43	92	5.8
5037767	Gatchell	Residential	Yard - back	16725	Urban Soil	10-20 cm	18	75	6.2
5037769	Gatchell	Residential	Yard - back	16735	Urban Soil	5-10 cm	19	64	6.2
5037771	Gatchell	Residential	Yard - back	16745	Urban Soil	0-5 cm	48	121	6.8
5037772	Gatchell	Residential	Yard - front	16755	Urban Soil	10-20 cm	8	46	6.8
5037774	Gatchell	Residential	Yard - front	16765	Urban Soil	5-10 cm	15	48	5.8
5037776	Copper Cliff	Residential	Yard - front	16775	Urban Soil	0-5 cm	38	194	6.8
5037777	Copper Cliff	Residential	Yard - back	16785	Urban Soil	10-20 cm	20	109	7.4
5037779	Copper Cliff	Residential	Yard - back	16795	Urban Soil	5-10 cm	39	122	7.1
5037781	Copper Cliff	Residential	Yard - back	16805	Urban Soil	0-5 cm	27	164	7.1
5037782	Copper Cliff	Residential	Yard - front	16815	Urban Soil	10-20 cm	36	167	7.1
5037784	Copper Cliff	Residential	Yard - front	16825	Urban Soil	5-10 cm	22	300	7.5
5037786	Copper Cliff	Residential	Yard - front	16835	Urban Soil	0-5 cm	21	238	7.1
5037787	Copper Cliff	Residential	Yard - back	16845	Urban Soil	10-20 cm	22	176	6.8
5037789	Copper Cliff	Residential	Yard - back	16855	Urban Soil	5-10 cm	14	176	6.8
5037791	Copper Cliff	Residential	Yard - back	16865	Urban Soil	0-5 cm	62	59	6.6
5037792	Copper Cliff	Residential	Yard - front	16875	Urban Soil	10-20 cm	14	78	6.0
5037794	Copper Cliff	Residential	Yard - front	16885	Urban Soil	5-10 cm	8	61	6.9
5037796	Copper Cliff	Residential	Yard - front	16895	Urban Soil	0-5 cm	20	149	6.5
5037797	Copper Cliff	Residential	Yard - back	16905	Urban Soil	10-20 cm	32	108	6.5
5037799	Copper Cliff	Residential	Yard - back	16915	Urban Soil	5-10 cm	29	156	6.9
5037801	Copper Cliff	Residential	Yard - back	16925	Urban Soil	0-5 cm	85	62	6.9
5037802	Copper Cliff	Residential	Yard - front	16935	Urban Soil	10-20 cm	25	148	6.4
5037804	Copper Cliff	Residential	Yard - back	16945	Urban Soil	5-10 cm	4	308	6.6
5037806	Copper Cliff	Residential	Yard - back	16955	Urban Soil	0-5 cm	51	183	6.6
5037807	Copper Cliff	Residential	Yard - back	16965	Urban Soil	10-20 cm	57	190	6.5
5037809	Copper Cliff	Residential	Yard - front	17315	Urban Soil	10-20 cm	18	124	6.8
5037811	Copper Cliff	Residential	Yard - front	17325	Urban Soil	5-10 cm	40	101	5.8
5037813	Copper Cliff	Residential	Yard - front	17335	Urban Soil	0-5 cm	38	376	5.4
5037814	Copper Cliff	Residential	Yard - front	17345	Urban Soil	10-20 cm	20	88	5.9

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037816	Copper Cliff	Residential	Yard - back	17355	Urban Soil	5-10 cm	27	91	6.3
5037818	Copper Cliff	Residential	Yard - back	17365	Urban Soil	0-5 cm	18	64	6.0
5037819	Copper Cliff	Residential	Yard - front	17375	Urban Soil	10-20 cm	43	129	6.5
5037821	Copper Cliff	Residential	Yard - front	17385	Urban Soil	5-10 cm	74	133	5.9
5037823	Copper Cliff	Residential	Yard - back	17395	Urban Soil	0-5 cm	38	126	6.3
5037825	Copper Cliff	Residential	Yard - back	17425	Urban Soil	0-5 cm	42	239	5.2
5037826	Copper Cliff	Residential	Yard - front	17415	Urban Soil	5-10 cm	51	165	6.5
5037827	Copper Cliff	Residential	Yard - front	17405	Urban Soil	10-20 cm	17	98	6.7
5037829	Copper Cliff	Residential	Yard - front	17445	Urban Soil	5-10 cm	19	260	6.7
5037831	Copper Cliff	Residential	Yard - back	17435	Urban Soil	10-20 cm	42	187	6.6
5037833	Copper Cliff	Residential	Yard - back	17455	Urban Soil	0-5 cm	107	247	6.6
5037834	Copper Cliff	Residential	Yard - front	17485	Urban Soil	0-5 cm	56	188	6.1
5037835	Copper Cliff	Residential	Yard - back	17495	Urban Soil	10-20 cm	27	158	6.5
5037836	Copper Cliff	Residential	Yard - front	17465	Urban Soil	10-20 cm	54	403	6.9
5037838	Copper Cliff	Residential	Yard - front	17475	Urban Soil	5-10 cm	49	190	6.6
5037840	Copper Cliff	Residential	Yard - front	17305	Urban Soil	0-5 cm	44	212	6.5
5037842	Copper Cliff	Residential	Yard - front	17015	Urban Soil	10-20 cm	26	112	6.7
5037843	Copper Cliff	Residential	Yard - back	17005	Urban Soil	0-5 cm	48	196	5.2
5037844	Copper Cliff	Residential	Yard - front	17025	Urban Soil	5-10 cm	12	65	6.5
5037846	Copper Cliff	Residential	Yard - front	17035	Urban Soil	0-5 cm	46	130	6.2
5037849	Copper Cliff	Residential	Yard - back	17045	Urban Soil	10-20 cm	15	102	6.5
5037851	Copper Cliff	Residential	Yard - back	17055	Urban Soil	5-10 cm	36	170	6.7
5037852	Copper Cliff	Residential	Yard - front	17065	Urban Soil	0-5 cm	107	90	6.1
5037853	Copper Cliff	Residential	Yard - side	17075	Urban Soil	10-20 cm	38	85	6.0
5037855	Copper Cliff	Residential	Yard - back	17085	Urban Soil	5-10 cm	9	138	7.4
5037856	Copper Cliff	Residential	Yard - front	17095	Urban Soil	0-5 cm	79	nd	6.8
5037859	Copper Cliff	Residential	Yard - back	17105	Urban Soil	10-20 cm	21	62	6.6
5037861	Copper Cliff	Residential	Yard - back	17115	Urban Soil	5-10 cm	38	144	6.4
5037862	Copper Cliff	Residential	Yard - front	17135	Urban Soil	10-20 cm	36	103	6.2
5037863	Copper Cliff	Residential	Yard - back	17125	Urban Soil	0-5 cm	46	166	6.0

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037864	Copper Cliff	Residential	Yard - front	17145	Urban Soil	5-10 cm	20	66	6.1
5037866	Copper Cliff	Residential	Yard - front	17155	Urban Soil	0-5 cm	38	167	6.0
5037869	Copper Cliff	Residential	Yard - back	17165	Urban Soil	10-20 cm	37	230	7.1
5037871	Copper Cliff	Residential	Yard - back	17175	Urban Soil	5-10 cm	51	234	6.8
5037872	Copper Cliff	Residential	Yard - front	17195	Urban Soil	10-20 cm	13	81	6.8
5037873	Copper Cliff	Residential	Yard - back	17185	Urban Soil	0-5 cm	23	263	6.8
5037875	Copper Cliff	Residential	Yard - front	17211	Urban Soil	5-10 cm	14	184	7.0
5037877	Copper Cliff	Residential	Yard - front	17221	Urban Soil	0-5 cm	108	nd	6.5
5037878	Copper Cliff	Residential	Yard - back	17219	Urban Soil	10-20 cm	14	97	6.3
5037881	Copper Cliff	Residential	Yard - back	17235	Urban Soil	5-10 cm	44	169	6.6
5037882	Copper Cliff	Residential	Yard - front	17255	Urban Soil	10-20 cm	22	170	6.5
5037883	Copper Cliff	Residential	Yard - back	17245	Urban Soil	0-5 cm	100	87	6.1
5037884	Copper Cliff	Residential	Yard - front	17265	Urban Soil	5-10 cm	61	319	6.5
5037886	Copper Cliff	Residential	Yard - front	17275	Urban Soil	0-5 cm	35	336	6.6
5037888	Copper Cliff	Residential	Yard - back	17285	Urban Soil	10-20 cm	26	233	7.0
5037889	Copper Cliff	Residential	Yard - front	17295	Urban Soil	5-10 cm	17	103	6.7
5037892	Sudbury (Core)	Residential	Yard - back	17505	Urban Soil	5-10 cm	30	146	6.2
5037894	Sudbury (Core)	Residential	Yard - back	17515	Urban Soil	0-5 cm	31	551	7.2
5037895	Sudbury (Core)	Residential	Yard - back	18825	Urban Soil	5-10 cm	38	248	6.9
5037897	Sudbury (Core)	Residential	Yard - front	18835	Urban Soil	0-5 cm	79	582	6.8
5037898	Sudbury (Core)	Residential	Yard - back	18845	Urban Soil	10-20 cm	10	95	6.9
5037900	Sudbury (Core)	Residential	Yard - front	18855	Urban Soil	5-10 cm	14	126	5.7
5037902	Sudbury (Core)	Residential	Yard - back	18865	Urban Soil	0-5 cm	23	444	6.3
5037903	Sudbury (Core)	Residential	Yard - back	18875	Urban Soil	10-20 cm	25	234	7.5
5037905	Sudbury (Core)	Residential	Yard - back	18885	Urban Soil	5-10 cm	15	108	6.0
5037907	Sudbury (Core)	Residential	Yard - front	18895	Urban Soil	0-5 cm	35	220	6.4
5037908	Sudbury (East)	Residential	Yard - front	17545	Urban Soil	0-5 cm	40	441	6.9
5037910	Sudbury (East)	Residential	Yard - front	17525	Urban Soil	10-20 cm	11	56	6.0
5037912	Sudbury (East)	Residential	Yard - front	17535	Urban Soil	5-10 cm	26	230	7.1
5037913	Sudbury (East)	Residential	Yard - front	17555	Urban Soil	10-20 cm	23	207	6.8

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037915	Sudbury (East)	Residential	Yard - front	17565	Urban Soil	5-10 cm	14	227	7.4
5037917	Sudbury (East)	Residential	Yard - back	17585	Urban Soil	5-10 cm	11	100	6.7
5037919	Sudbury (East)	Residential	Yard - back	17595	Urban Soil	0-5 cm	29	256	6.5
5037920	Sudbury (East)	Residential	Yard - back	17605	Urban Soil	10-20 cm	13	172	6.9
5037922	Sudbury (East)	Residential	Yard - front	17615	Urban Soil	5-10 cm	28	151	6.7
5037924	Sudbury (East)	Residential	Yard - front	17625	Urban Soil	0-5 cm	33	183	6.1
5037925	Sudbury (East)	Residential	Yard - back	17635	Urban Soil	10-20 cm	6	58	6.5
5037927	Sudbury (East)	Residential	Yard - back	17645	Urban Soil	5-10 cm	19	74	6.0
5037928	Sudbury (South)	Residential	Yard - back	18905	Urban Soil	10-20 cm	8	90	5.6
5037930	Sudbury (South)	Residential	Yard - back	18915	Urban Soil	5-10 cm	14	155	6.7
5037932	Sudbury (South)	Residential	Yard - front	18925	Urban Soil	0-5 cm	19	392	6.6
5037933	Sudbury (South)	Residential	Yard - front	18935	Urban Soil	10-20 cm	10	83	6.4
5037935	Sudbury (South)	Residential	Yard - front	18945	Urban Soil	10-20 cm	6	120	5.2
5037937	Sudbury (South)	Residential	Yard - front	18955	Urban Soil	5-10 cm	10	49	5.8
5037939	Sudbury (South)	Residential	Yard - front	18965	Urban Soil	0-5 cm	105	nd	6.6
5037940	Sudbury (South)	Residential	Yard - front	18975	Urban Soil	10-20 cm	5	95	7.3
5037942	Sudbury (South)	Residential	Yard - front	18985	Urban Soil	5-10 cm	13	108	6.4
5037944	Sudbury (South)	Residential	Yard - front	18995	Urban Soil	0-5 cm	69	366	6.5
5037945	Sudbury (South)	Residential	Yard - front	19005	Urban Soil	10-20 cm	9	153	6.6
5037947	Sudbury (Core)	Residential	Yard - front	20755	Urban Soil	0-5 cm	54	190	5.8
5037948	Sudbury (Core)	Residential	Yard - front	20765	Urban Soil	10-20 cm	58	445	6.8
5037950	Sudbury (Core)	Residential	Yard - front	20775	Urban Soil	5-10 cm	12	167	6.5
5037952	Sudbury (Core)	Residential	Yard - front	20785	Urban Soil	0-5 cm	32	237	6.7
5037953	Sudbury (Core)	Residential	Yard - front	20795	Urban Soil	10-20 cm	13	122	5.5
5037955	Sudbury (Core)	Residential	Yard - back	20805	Urban Soil	5-10 cm	14	134	6.1
5037957	Sudbury (Core)	Residential	Yard - back	20815	Urban Soil	0-5 cm	70	190	6.5
5037958	Sudbury (Core)	Residential	Yard - front	20825	Urban Soil	10-20 cm	6	94	6.8
5037960	Sudbury (Core)	Residential	Yard - back	20835	Urban Soil	5-10 cm	6	54	6.2
5037962	Sudbury (Core)	Residential	Yard - back	20845	Urban Soil	0-5 cm	34	310	6.2
5037963	Sudbury (Core)	Residential	Yard - front	20855	Urban Soil	10-20 cm	20	106	6.0

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

Table E1: Soil pH, Electrical Conductivity (EC) and Total Organic Carbon (TOC) Results for the City of Greater Sudbury, 2001

Station No.	Community	Landuse	Area Used For	Sample No.	Sample Type	Soil Depth	TOC	EC	pH
5037965	Sudbury (Core)	Residential	Yard - front	20865	Urban Soil	5-10 cm	23	161	6.7
5037967	Sudbury (Core)	Residential	Yard - back	20875	Urban Soil	0-5 cm	47	426	6.6
5037968	Sudbury (Core)	Residential	Yard - front	20885	Urban Soil	10-20 cm	16	128	5.8
5037970	Sudbury (Core)	Residential	Yard - back	20895	Urban Soil	5-10 cm	60	207	7.3
5037973	Sudbury (New)	Residential	Yard - back	20685	Urban Soil	5-10 cm	20	118	6.9
5037975	Sudbury (New)	Residential	Yard - back	20695	Urban Soil	0-5 cm	22	196	7.1
5037976	Sudbury (New)	Residential	Yard - back	20705	Urban Soil	10-20 cm	18	257	7.3
5037978	Sudbury (New)	Residential	Yard - back	20715	Urban Soil	5-10 cm	13	135	6.0
5037980	Sudbury (New)	Residential	Yard - back	20725	Urban Soil	0-5 cm	37	378	6.8
5037981	Sudbury (New)	Residential	Yard - back	20735	Urban Soil	10-20 cm	8	133	5.8
5037983	Sudbury (New)	Residential	Yard - back	20745	Urban Soil	5-10 cm	8	88	5.9
5037985	Sudbury (Core)	Residential	Yard - front	20995	Urban Soil	10-20 cm	13	114	6.7
5037987	Sudbury (Core)	Residential	Yard - back	21005	Urban Soil	5-10 cm	29	127	6.3
5037989	Sudbury (Core)	Residential	Yard - front	21015	Urban Soil	0-5 cm	40	286	6.0
5037990	Sudbury (Core)	Residential	Yard - back	21025	Urban Soil	10-20 cm	19	84	6.0
5037992	Sudbury (Core)	Residential	Yard - back	21035	Urban Soil	5-10 cm	23	99	6.1
5037995	Sudbury (Core)	Residential	Yard - back	21085	Urban Soil	0-5 cm	50	205	5.8
5037996	Sudbury (Core)	Residential	Yard - front	21095	Urban Soil	10-20 cm	35	268	7.0
5037998	Sudbury (Core)	Residential	Yard - back	21105	Urban Soil	5-10 cm	43	101	6.5

EC - is in µS/cm TOC - is in mg/g dry weight nd - not determined

City of Greater Sudbury 2001 Urban Soil Survey

Appendix F

Soil Data Management

and

Laboratory Quality Control

1.0 Soil Sample Preparation

Soil sample preparation was initiated by the Phytotoxicology Laboratory of the Ministry of the Environment. Due to the large number of samples collected from the City of Greater Sudbury, MOE established a contract with Agat Laboratories in Mississauga, Ontario to continue processing the soil samples as outlined in the MOE Standard Operating Procedures (MOE 2000). Split samples, prepared by both MOE and Agat laboratories, were submitted to MOE Laboratory Services Branch for a metals scan to verify processing was being done correctly. The data agreed within the 20% criterion required by MOE. Agat also performed their own quality control assessment by having two individuals process selected split samples. Agat had the split samples analyzed for metals to verify that individuals of their staff were processing samples similarly. Data corresponding to Agat's internal verification process was accepted by the MOE. MOE staff also audited the Agat facility and required modifications as necessary to ensure compliance with MOE Standard Operating Procedures (MOE 2000).

2.0 Soil Sample Analysis

Lakefield Research Laboratories was selected and funded by local Sudbury industries (ie. Inco & Falconbridge) to analyze all Sudbury samples. The contract with Lakefield was signed after a thorough review of their proposal and evaluation of pre-selected samples. Lakefield is accredited by the Standards Council of Canada / Canadian Association of Environmental Analytical Laboratories to perform metals analysis in soils. All samples are prepared prior to analysis by Lakefield Method 9-2-37. Method 9-2-37 is based on EPA method 3051 and has been further developed at Lakefield Research Limited. Sewage sludge, sediment and/or soil samples are prepared for the determination of various analytes. A representative sample is weighed or measured into a Teflon vessel. Nitric acid and Hydrochloric acid are added, the vessel is sealed and microwave energy is applied. The resulting digestion is centrifuged and sent to various instrument groups for analysis.

Lakefield reported results for this study using three instrumental techniques: inductively coupled plasma mass spectrometry (ICP-MS), inductively coupled plasma-atomic emission spectrometry (ICP) and hydride generation atomic absorption spectrophotometry (HG-AAS). These analyses are performed after the metals in the soil samples are brought into solution using an acid digestion technique. This dissolution step is based on an aqua regia digestion procedure which involves nitric and hydrochloric acids in a 1:3 ratio. Methods were also set up for analysis of pH, Electrical Conductivity and Total Organic Carbon.

The ICP-MS (Method E2022) technique was used for chemical analysis of: antimony (Sb), cadmium (Cd), cobalt (Co), lead (Pb) and nickel (Ni). The ICP (Method E2027) technique was used for chemical analysis of: aluminum (Al), arsenic (As), barium (Ba), beryllium (Be), calcium (Ca), copper (Cu), chromium (Cr), iron (Fe), magnesium (Mg), manganese (Mn), molybdenum (Mo), strontium (Sr), vanadium (V), and zinc (Zn). The HG-AAS (Method E2023) technique was used for chemical analysis of: arsenic (As) and selenium (Se). Refer to Tables F2.1 through F2.3 for analytical method detection limits.

Table F2.1: ICP-MS Method Detection	
Element	MDL (µg/g)
Antimony	0.8
Cadmium	0.8
Cobalt	1
Lead	1
Nickel	1

Table F2.2: ICP Method Detection Limits			
Element	MDL (µg/g)	Element	MDL (µg/g)
Aluminum	2.5	Iron	5
Arsenic	10	Magnesium	1
Barium	0.5	Manganese	2
Beryllium	0.5	Molybdenum	1.5
Calcium	10	Strontium	10
Chromium	5	Vanadium	2
Copper	1	Zinc	2.5

Table F2.3: HG-AAS Method Detection	
Element	MDL (µg/g)
Arsenic	5
Selenium	1

3.0 Soil Quality Control and Assurance

The quality control activities for the Sudbury project involved a multi-step process. The first step was the analysis of 20 samples from the City of greater Sudbury by both the MOE Laboratory Services Branch and Lakefield. The criterion used was 20%, which is the same criterion used for in-house quality control duplicate samples. The MOE used a hot block digestion procedure while Lakefield used a microwave digestion technique. Both these digestion techniques are similar to those used by the United States Environmental Protection Agency (EPA). This step uncovered some data quality issues such as the use of wrong microwave settings during the microwave digestion process. Several of these issues were resolved.

The second step involved the analysis of a further 80 samples. Lakefield analysed these samples using both microwave and hot block digestions. The microwave digestion procedure produced results closer to those obtained by MOE. As a result, the microwave digestion technique was adopted. Several elements, showed better correlation with MOE data when analysed by ICP-MS rather than ICP. As a result, Co, Pb and Ni were reported by ICP-MS rather than by ICP.

Each sample submission sent to Lakefield contained up to 38 samples, 2 duplicate samples, calibration check samples, instrument blanks, method blanks, 2 certified or in-house reference materials, 1 sample from the original 100 samples analysed, and 1 sample split with the MOE.

Lakefield provided a QC run format for each analytical method used (ICP, ICP-MS, HG-AAS) as well as the acceptance criteria. These data were all passed through the Ministry of the Environment Laboratory Information Management System (MOE LIMS). The manager of the MOE Spectroscopy Section, or designate, checked all data being submitted before approving the results. This involved checking that the QC data provided met the acceptance criteria and that the results for the duplicates and sample split were within acceptable criteria (tentatively set at 20%). The frequency of QC checks for the other 3 parameters (pH, TOC, conductivity) was less frequent and did not exceed 75 samples in total.

Calibration/drift checks were controlled within 10%. Blanks were held under a maximum amount. All elements for Till-2, a reference material, were controlled within 20%. Lead was originally held within 10% which was in keeping with the suppliers specifications. Data for reference material Till-2, was plotted for each element to track changes with time. It appears that values for many elements in Till-2 changed slightly with time. This is likely due to changing to different bottles of material. As a result, acceptance criteria for lead were raised to 20%.

Each submission contained a large number of field replicates. These replicates were expected to be within 20%. Where larger differences occurred, samples were checked with a portable x-ray instrument. If the differences were confirmed, the original data were accepted. Where differences were not acceptable, the samples were re-analysed by either Lakefield or by MOE. Less than 5% of all samples were repeated. Many of the differences were the result of improper use of dilution factors or samples being mixed up during sample collection, preparation or analysis.

MOE also checked the sample processing done at AGAT Laboratories, a contract laboratory hired to prepare samples. This was done to uncover any problems with contamination in the sample processing steps. Approximately 5 samples were processed by both MOE and AGAT. Results for all metals generally fell within 20%. MOE and Agat participated in a large study previously to this, and data were found to be acceptable. This inter-comparison confirmed the acceptability of the data.

For further samples, Agat was responsible for proving their processing capability. This was done by having 2 AGAT staff each prepare a percentage of samples and having AGAT test the samples themselves at their Calgary laboratory. These data were monitored by MOE. Results for these samples were also compared to results supplied by Lakefield.

3.1 Laboratory Differences

Lakefield reported several samples with zinc values less than the detection limit. This was the result of some analytical difficulties. These problems were resolved and all the affected samples were re-analysed and reported.

At the end of the study, a comparison of twenty (20) high metal concentration samples uncovered a bias between MOE Laboratory Services Branch data and Lakefield data with respect to arsenic and cobalt. MOE results were approximately 20% higher than Lakefield's. The arsenic differences were not seen in the pre-project inter-comparison since most of the samples analysed in ths early inter-

comparison had relatively low concentrations.

Lakefield normally reports cobalt results by ICP-MS (inductively coupled plasma mass spectrometry) while MOE uses ICP (inductively coupled plasma-atomic emission spectrometry)

Lakefield normally reports high arsenic results (>100 ppm) by ICP and lower values by HG-AAS (hydride generation atomic absorption spectrophotometry). MOE currently reports all arsenic results by hydride generation atomic absorption spectrophotometry.

The methods used to get metals, such as cobalt and nickel, into solution are similar but slightly different. Both methods are based on an aqua regia digestion procedure which involves nitric and hydrochloric acids in a 1:3 ratio. The methods used to dissolve arsenic are quite different, with the MOE method being more rigorous ([MOE = nitric:sulphuric:perchloric] vs [Lakefield = aqua regia]). The perchloric digestion is closer to a 'total' digestion or analysis such as would be obtained by using hydrofluoric acid or fusion techniques or by analyzing by XRF or neutron activation. The aqua regia digestion yields what is generally referred to as 'environmentally available' results. Many Certified Reference Materials (CRM's) now provide results for both total analysis and 'environmentally available' based on specific EPA methodologies.

A number of steps were taken to try to resolve the differences:

1. MOE analysed a second batch of 30 samples to eliminate a one-shot anomaly. The results of the second study confirmed the observations of the first study.

2. Lakefield Research was contacted and told of the findings. Lakefield co-operated fully in the attempt to resolve the differences.

3. MOE analyzed 30 arsenic samples by a second digestion procedure and by two different analytical techniques (ICP and ICP-MS). Initial results by HG-AAS and ICP were similar even with different digestions. This was surprising since there has consistently been a low bias for the aqua regia. vs the nitric;sulphuric;perchloric (NSP) digestion . MOE ICP-MS results were slightly lower than MOE ICP results, but the samples were not analysed until almost 2 weeks later. MOE confirmed that some arsenic is lost from solution with time. Regression analysis showed slopes of 0.93 and 0.87 for samples which were not diluted prior to analysis and those which did need dilution respectively. Some of these differences may be attributable to slope drifts between days, but there does seem to be some loss with time. For samples with greater than 200 ppm arsenic, the MOE ICP-MS data resembled MOE ICP/hydride data or was intermediate between MOE ICP/ Hydride data and Lakefield.

4. MOE analysed all 30 cobalt samples by a second ICP instrument using different wavelengths and 15 samples by a second technique (ICP-MS). The second ICP gave slightly lower results than the instrument normally used for these analyses. The ICP-MS results were generally lower than either ICP instrument, but again these samples were analysed almost 2 weeks after the original analysis. The MOE ICP-MS data more closely resembled the data from Lakefield. MOE selected 2 samples with the widest differences between ICP and ICP-MS to analyse for a full element scan (i.e. look for all possible elements feasible given the equipment) and detected some cerium and neodymium. These should not interfere with either cobalt or arsenic and give any false high results. Both Lakefield and MOE found that the ICP wavelength most commonly used

for cobalt (228.616 nm) is biased slightly high with respect to other wavelengths which can be used. MOE has re-calculated an inter-element correction factor for the interference by titanium on cobalt. This will lower MOE values slightly and reduce the differences in results.

5. MOE purchased 2 certified reference materials which had elevated arsenic values. Results from this testing with the perchloric digestion are about 5% high for arsenic, but within the acceptable range. Lakefield provided data showing that their results were 5% to 15% low for these same two reference samples. MOE analysed these samples with the aqua regia digestion as well and results were 1% to 5% low. MOE cobalt results were 8.7 and 8.4 µg/g respectively with target values of 8.2 µg/g.

Conclusions:

1) For any health risk assessments, arsenic results provided by Lakefield Research should be corrected upwards by 10% to bring their results more in line with accepted values for certified reference materials. Lakefield Research has been notified of this decision and is in agreement.

2) Cobalt results provided by Lakefield Research will be accepted as will all other results.

3.2 Soil Data Management and QC Measures

Data checking was performed by the manager or a senior scientist of the Spectroscopy Section, as well as staff of the Phytotoxicology Section. If the results for the "check" samples and the replicate data were acceptable, then the rest of the data were checked for outliers. Outliers were generally due to the improper use of dilution factors or sample non-homogeneity. Many of these samples were checked by MOE Phytotoxicology staff using a portable x-ray fluorescence (XRF) unit to determine if differences in results were accurate. Results that were confirmed by the XRF data were accepted. If the original results were not confirmed by the XRF, MOE requested that Lakefield re-calculate the dilution factor or repeat the analyses. Once all these criteria were met, the data were released by MOE Laboratory Services Branch and incorporated into the Sudbury database for further evaluation and reporting.

Once all data had been extracted from the database, Phytotoxicology Staff checked through the data three more times to ensure that all data and sampling information was correct. Extracted data was compared to sampling field notes to ensure all information had been entered correctly into the database. Report tables were then checked again against the field notes and laboratory submissions to ensure data had been manipulated correctly and that sampling information had not changed. The final tables were checked a third and final time for accuracy of information and format consistency. All data management and quality control measures are outlined in Figure F1.

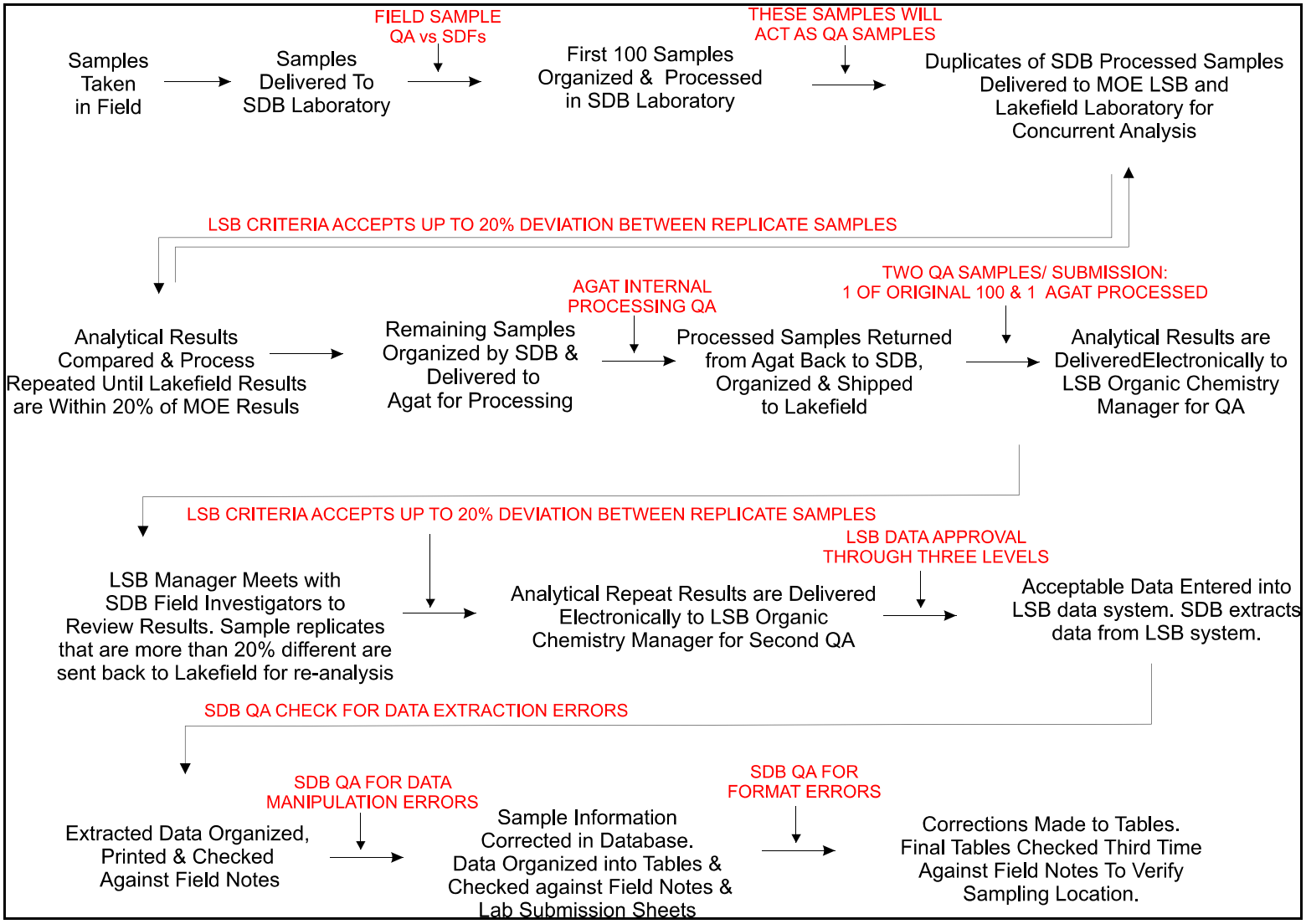

Figure F1: Soil Data Management and Quality Control Measures, City of Greater Sudbury 2001 Survey.

City of Greater Sudbury 2001 Urban Soil Survey

Appendix G

Edible Produce

Laboratory Quality Control Issues

1.0 Grinder Filing Issue

During the period of July and August of 2001, soil and produce samples were collected from seven commercial berry farms, three wild blueberry patches, and six commercial market garden produce growers within the City of Greater Sudbury. Residential garden produce was also sampled at a subset of the residential properties in close proximity to the smelting areas. Six gardens were sampled in Falconbridge and 15 in Coniston and 15 in Copper Cliff, including Gatchell and North Lively.

Vegetation samples were delivered to the MOE Phytotoxicology laboratory for processing (MOE 2000b). The protocol for vegetation processing includes washing the produce with tap water as would be done in the home prior to consumption. All produce samples were treated in this fashion with the exception of the berries. Berry samples could not be washed due to their over ripeness (ie. some had become almost liquified during shipping). Instead, the berry samples were poured into beakers, were oven dried, and ground in a Thomas-Wiley™ mill. The chopped washed vegetables were oven dried and ground in the same fashion. Two different types of Thomas-Wiley mills were used; the Standard Bench Model (Photo 1) with chamber dimensions of 20 cm diameter and 7.6 cm depth and the Intermediate Model (Photo 2) with chamber dimensions of 40 mm diameter and 22 mm depth. Both mills were used in the Sudbury project; however use was dependent on sample size and laboratory sample load. Regardless of which mill was used, the ground material was stored in glass jars until submitted for analysis. All produce samples were forwarded to Laboratory Services Branch (LSB), MOE, for chemical analysis including arsenic(As), aluminum (Al), barium (Ba), beryllium (Be), calcium (Ca), cadmium (Cd), cobalt (Co), copper (Cu), chromium (Cr), iron (Fe), magnesium (Mg), manganese (Mn), molybdenum (Mo), nickel (Ni), lead (Pb), selenium (Se), strontium (Sr), vanadium (V), zinc (Zn), as well as sulphur (S), boron (B), chlorine (Cl), and potassium (K).

Prior to analysis of these samples, the LSB lab technician noted foreign material in the samples that resembled iron filings. He passed a magnet over the sample and noted that these particles were magnetic. All samples were returned to the Phytotoxicology Laboratory, without any analysis completed, where a magnet was passed through all samples in the following manner:

- small aliquots (approximately 1-2 grams) of the processed vegetation samples were poured out onto a sheet of white 81/2 x 11 inch paper.
- the fingers a of Neo-Pro powder-free Chloroprene examination glove were removed and placed over a 4.8 cm x 2.2 cm x 1 cm bar magnet to prevent any cross contamination between the magnet and the sample as well as to prevent contamination between samples.
- the covered bar magnet was swept over each aliquot until the entire sample had been screened and any filings that were in the sample adhered to the magnet.
- the glove was removed from the magnet in order for the filings to detach and fall onto the white paper.
- the filings were gathered together by running the magnet underneath the paper.
  the collected filings were stuck onto a piece of adhesive tape and placed on the sample jar lid from which they were removed.

Following this procedure, 21 of 246 vegetation samples were found to have magnetic particles with 14 from residential gardens, 4 from commercial vegetable growers, 2 from commercial berry growers and 1 wild blueberry sample. These samples are marked with a † in Appendix A Table 3.6

and Appendix D Tables 3.2 and 3.3. Each piece of tape with filings was stuck onto a microscope slide and all 21 slides were submitted to Laboratory Services Branch for identification by Energy Dispersive X-ray Fluorescence Method ID3092 (C97957) to determine the relative concentrations of total metals present. The samples were examined by stereoscopic and polarized light microscopy. Particles from the samples were mounted on carbon stubs and examined in the scanning electron microscope (SEM) and analysis of individual particles was done by energy dispersive x-ray analysis (EDXRA) to determine elemental composition.

The origin of these magnetic particles was assumed to be either the Standard or Intermediate Wiley Mills used during the processing of the samples. The Standard Wiley Mill, with chamber dimensions of 20 cm diameter and 7.6 cm depth, is composed of both steel and stainless steel materials. The body and blades of the Standard Wiley Mill are composed of steel (primarily iron), while the 1 mm screen is stainless steel. As illustrated in Photo G1, the blades of the Standard Wiley Mill can not come in contact with the stainless steel screen.

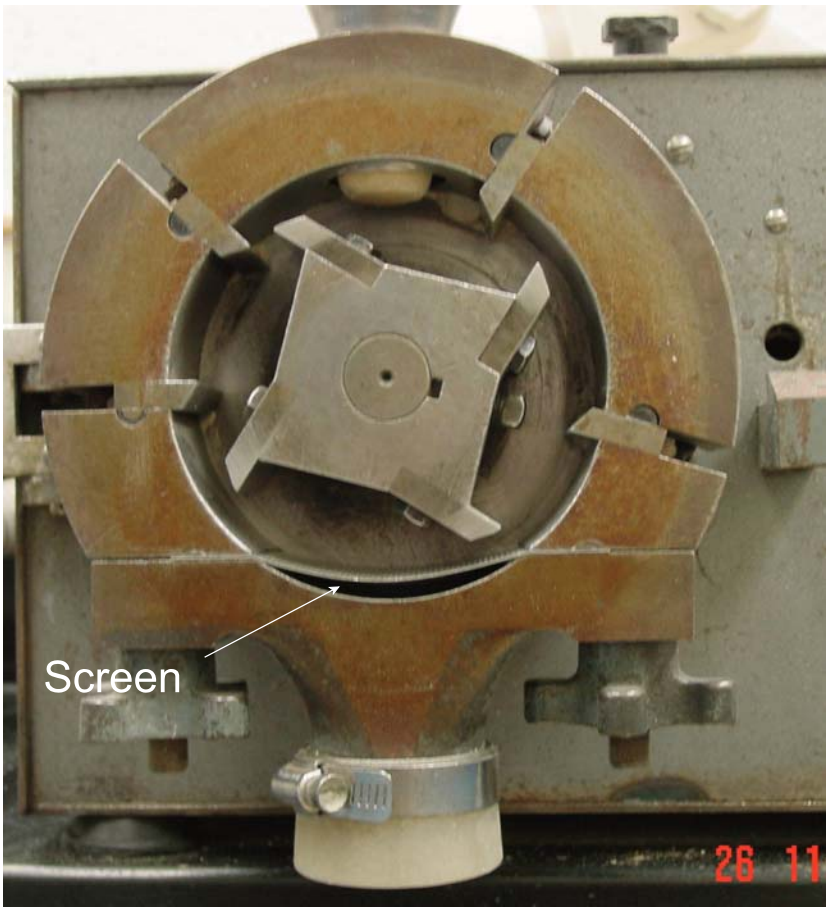

Photo G1: Standard Thomas-Wiley Mill, with chamber dimensions of 20 cm diameter and 7.6 cm depth.

The Intermediate Wiley Mill, with chamber dimensions of 40 mm diameter and 22 mm depth, is composed of nickel, zinc, copper, lead and iron. The body and blades of this grinder are composed of steel. No other parts of the mill have steel or stainless steel materials present. The receiving tube is nickel plated brass, which is an alloy of copper and zinc. The screen had no yellow metal, suggesting it is pure nickel. The screen is attached to the receiving tube with pure lead solder. As illustrated in Photo G2, the receiving tube is not fixed and therefore there it is possible for the blades to come into contact with the screen and/or lead solder during operation.

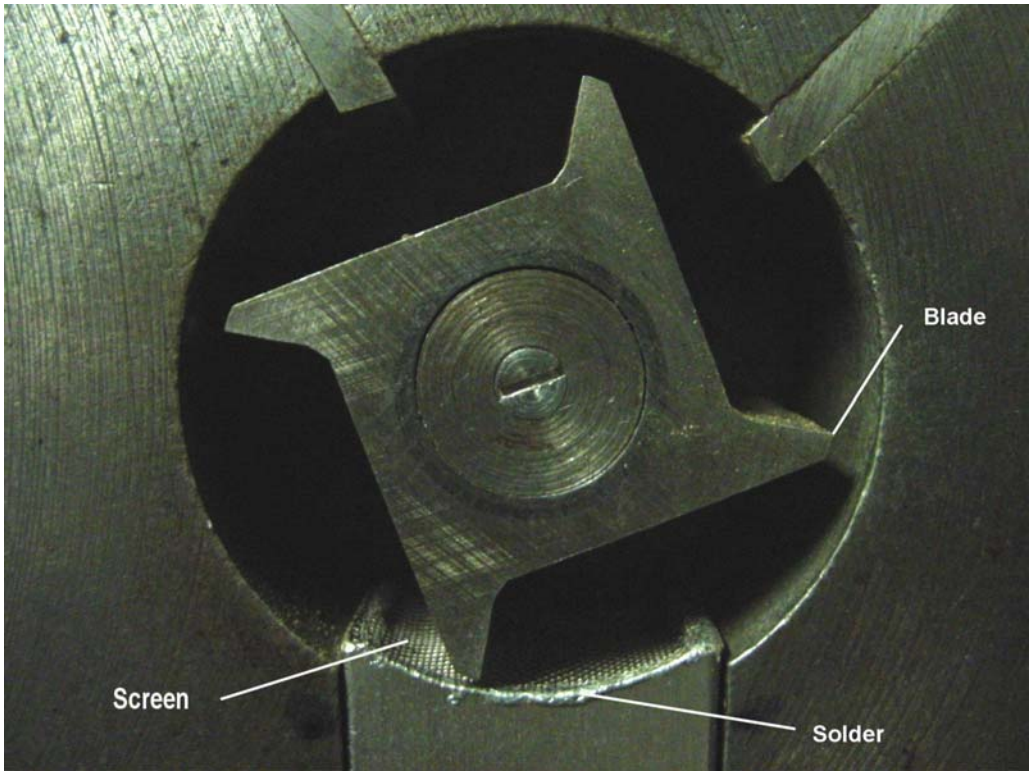

Photo G2: Intermediate Thomas-Wiley Mill, with chamber dimensions of 40 mm diameter and 22 mm depth.

2.0 Results

Table G1.1: Energy Dispersive X-ray Fluorescence Results of Metal Filings Present in Sudbury Edible Produce Samples, 2001.

Sample	Station	Cr	Fe	Ni	Cu	Zn	Pb	Ca
15151	5037432	-	86	3	3	-	-	6
15160	5037435	-	88	-	-	-	-	9
15161	5037435	-	75	-	-	-	-	22
15205	5037442	-	84	4	3	-	-	8
15343	5037462	-	96	-	-	-	-	3
15356	5037465	-	3	60	4	-	30	-
15378	5037470	-	90	-	-	-	-	7
15354	5037465	-	93	-	-	-	-	5
15658	5037506	-	78	-	-	-	-	16
15532	5037498	-	76	-	-	-	-	21
15534	5037498	-	75	-	-	-	-	21
15221	5037445	-	85	-	-	-	-	10
15326	5037459	-	89	-	-	8	-	-
15183	5037439	-	92	-	-	-	-	4
14979	5037625	7	88	-	-	-	-	3
14949	5037622	-	69	-	-	-	-	28
14987	5037625	-	90	-	-	-	-	7
14986	5037625	-	90	-	-	7	-	-
14863	5037418	-	84	-	-	-	-	14
14859	5037417	-	95	-	-	-	-	4
14916	5037431	-	93	-	-	5	-	-

Concentrations are expressed as percent of the total metals present. These results are qualitative only. No results are given where the measured concentration was less than 2.5 % of the metals present

Table G1.2: Conclusions Regarding the Source of Metals Found in Sudbury Edible Produce Samples with Filings, 2001.

Field Number	Sample & Location	Comments
15151-2001 15160-2001 15161-2001 15205-2001 15343-2001 15378-2001 15354-2001 15658-2001 15532-2001 15534-2001 15221-2001 15183-2001 14949-2001 14987-2001 14863-2001 14859-2001	lettuce - (5037432) parsley - (5037435) lettuce - (5037435) lettuce - (5037442) lettuce - (5037462) lettuce - (5037470) lettuce - (5037465) lettuce - (5037506) tomato - (5037498) beets - (5037498) beets - (5037445) lettuce - (5037439) radish - (5037622) lettuce - (5037625) strawberry - (5037418) strawberry - (5037417)	These samples contained iron from environmental sources. The presence of magnetite (iron oxide) spheres and other fly ash in many of these samples indicates that, in addition to the iron from the mineral particles, the source of some of the iron could be a high temperature furnace. A more likely scenario is that not all of the soil from the surrounding garden soil was removed during washing and the iron found in these samples was environmental or naturally occurring.
15356-2001	tomato - (5037465)	This sample contained very high levels of Ni and Pb. Analysis of the small shiny metallic fragments present in this sample revealed that they were Ni and Pb. The high levels of nickel and lead in this sample are apparently due to the presence of these metal fragments. This sample was likely ground in the Intermediate Wiley Mill which has both nickel and lead in its composition.
15326-2001 14986-2001 14916-2001	beets - (5037459) swiss chard - (5037625) wild blueberry - (5037431)	These samples contained mainly Fe and a lesser amount of Zn. The metallic particles in these samples were mostly in the shape of straight and curved fragments of wire. The appearance and the results from the elemental analysis of these samples are consistent with contamination of the samples with metal from staples.
14979-2001	beets - (5037625)	In addition to particles containing iron, (iron oxide), this sample contained small irregularly shaped fragments of metal with a bright shiny luster. Elemental analysis of this material revealed that it was Fe and Cr, possibly an iron-chromium stainless steel. This sample was likely ground in the Standard Wiley Mill which is composed of both steel and stainless steel materials.

3.0 Metals Analysis Procedures for Vegetation Samples

Once all samples had been screened for magnetic particles, all 246 edible produce samples were re-submitted to LSB for metals analysis (MET3065) and hydrides (HYD3245) including arsenic(As), aluminum (Al), barium (Ba), beryllium (Be), calcium (Ca), cadmium (Cd), cobalt (Co), copper (Cu), chromium (Cr), iron (Fe), magnesium (Mg), manganese (Mn), molybdenum (Mo), nickel (Ni), lead (Pb), selenium (Se), strontium (Sr), vanadium (V), zinc (Zn), as well as sulphur (S), boron (B), chlorine (Cl), and potassium (K).

In the CAEAL accredited LSB Method MET3065, vegetation samples are ashed and then digested with aqua regia and hydrogen peroxide. The samples are cooled, made to volume and analyzed by Inductively Coupled Plasma Optical Emission Spectrometry.

In the CAEAL accredited LSB Method HYD3245, vegetation samples are digested with a 6:3:1 ratio of Nitric:Sulphuric:Perchloric acid solution. The samples are mixed with hydrochloric acid and made to volume. The samples are then analyzed by Hydride Generation Flameless Atomic Absorption Spectrophotometry.

4.0 Elevated Lead and Nickel Concentrations in Sudbury Residential Garden Produce

There were two distinct collections of produce collected in Sudbury in 2001. The first was of commercial berries, market gardens and wild blueberries. The second was of residential garden vegetables in Coniston, Copper Cliff and Falconbridge.

At the commercial farms and wild berry patches there was a large amount of produce available to sample and large duplicate samples were collected. As a result, all of the commercial berries and vegetables samples were ground using the Standard Thomas-Wiley Mill. No evidence of any lead contamination by grinding was present in these samples.

The residential gardens were small, often only a few plants of each vegetable, and to take enough sample as was collected in the market gardens would have meant the removal of a significant portion of the available produce. As a result only **single** small samples were collected of each vegetable from the residential gardens. Even though the residential garden vegetable samples were small in size, most of the samples were ground on the large Standard Wiley Mill. However, a small number of residential garden vegetable samples were ground using the Intermediate Wiley Mill as well as recollected by technicians. At that time no record was kept as to what grinder was used to grind each sample.

Two factors made the evaluation of the residential garden vegetable results for possible lead, nickel and/or copper contamination from the use of the Intermediate grinder difficult. The first was that only single samples were collected at each garden. If duplicate samples had been collected, as was done with the commercial samples, it would have been easier to discern spurious contamination by the grinder as there would have been a significant difference between the duplicates. The second problem was that the main contamination in the Sudbury area soils from the mining and smelting operations is nickel, copper, and cobalt and to a lesser degree lead. Also lead contamination from paint, historic automobile exhaust, and other sources often result in elevated soil lead concentrations

in residential soils. These are the same elements that contaminate the samples when the grinder blades strike the screen in the small grinder.

During this same time period, vegetable samples from a non-related project were also found to have unexpected elevated lead concentrations. All of these secondary samples were known to have been passed through the small Intermediate Thomas-Wiley Mill which had both nickel and lead present as composition materials of the receiving tube. It is not known which, if any, of the Sudbury vegetable samples were ground in this small grinder. However, the unexpected lead concentrations found in two unrelated projects indicated that some part of the small grinder may be contributing a contaminant.

All Thomas-Wiley mill grinders were temporarily decommissioned for use until the following quality control project was conducted to determine the malleability of the small grinder sieve (MOE inventory tag number C98021).

Step One:
Washed and dried cabbage samples were passed through the Intermediate (small) grinder which was equipped with the 60 mesh nickel plated and lead soldered sieve. This sieve was the only sieve available for use in the small grinder during the time frame of the Sudbury and non-Sudbury related vegetable collection. A new technician was instructed on the grinding processing methodology without any mention of the suspected sieve problem. A total of 14 samples were passed through the grinder to see if lead and/or nickel were removed from the receiving tube during the grinding process or when the receiving tube was removed and replaced during cleaning.

Findings:
Nickel was elevated above the method detection limit in all 14 samples with concentrations ranging from 4.5 to 230 ppm. Lead was elevated above the method detection limit in 11 of 14 samples with concentrations ranging from 2.5 to 24 ppm. Copper was also elevated in 2 of the 14 samples with the highest concentration being 120 ppm. After each sample, the receiving tube is removed and the grinder parts cleaned. It is clear from these results that it is not always possible to place the receiving tube back in the exact location required for proper functioning, thereby resulting in elevated levels of nickel, lead and copper.

Step Two:
Washed and dried cabbage samples were passed through the Intermediate (small) grinder using the 60 mesh nickel plated and lead soldered sieve by a technician who was instructed to push the receiving tube as high as possible so that the stainless steel blades came in contact with the receiving tube and screen. The purpose of this experiment was to determine the degree of abrasion possible when the receiving tube was intentionally placed into the grinder improperly.

Findings:
In this stage of testing, the receiving tube was deliberately placed in a position that would cause contamination of the sample as the blades came into contact with the receiving tube parts. Following the processing of only 4 samples, the mesh screen of the receiving tube was damaged beyond repair due to the constant friction of the blades against the mesh. For all 4 samples, nickel, lead and copper were extremely elevated with the last sample having concentrations of 1200, 180 and 530 ppm, respectively. This testing indicated that with improper placement of the receiving tube, it is possible to contaminate the sample to a large degree and that the highest nickel, copper and lead results

occurred in the same sample.

Step Three:
Washed and dried cabbage samples (14 samples) were passed through the Intermediate (small) grinder using a new receiving tube with a 20 mesh stainless steel sieve mesh. It is not known if this mesh is attached to the receiving tube by lead solder. This receiving tube was properly placed in the small grinder so that the circle of the small grinder inner chamber was completed and the blades did not come in contact with the screen or edges where the screen was attached to the receiving tube. This experiment was done to ensure that the proposed replacement sieve would not contribute any contaminants to study samples.

Findings:
Of the 14 samples, 1 sampled had an elevated nickel concentration of 5.2, while 5 had elevated lead concentrations ranging from 2.7 to 10. These concentrations are not as high as those from the previous testing stage but this testing indicates that sample contamination is still occurring when the Intermediate (small) grinder is used, regardless of the receiving tube used. It was decided after this stage of testing that the Intermediate (small) grinder would be permanently decommissioned from use in the Phytotoxicology Laboratory.

Step Four:
A new Thomas-Wiley Mill Standard Mill, with all parts being stainless steel, was purchased. Prior to using this grinder for processing of any vegetation samples, 67 samples of washed and dried cabbage samples were processed to determine if the stainless steel parts are contributing metals to the study samples.

Findings:

Of the 67 samples, 8 had elevated nickel, iron and chromium concentrations from the wear of the stainless steel blades and grinder body. Elevated nickel concentrations ranged from 2.6 to 34 ppm, elevated iron concentrations ranged from 62 to 220 ppm and elevated chromium concentrations ranged from 4.7 to 69 ppm. This stage of testing indicated that sample contamination was possible when the stainless steel Standard (large) grinder was used and therefore, it may be better to continue using the Standard Thomas-Wiley Mill composed of steel.

Step Five:
Dried cabbage samples will be used as quality control and assurance from this point in time forward. All vegetation samples will be processed on the Standard (large) Thomas-Wiley Mill, with steel body and blades and stainless steel screen. A total of 67 washed and dried cabbage samples were processed through this grinder prior to study samples, during the run of study samples and following the study samples. These cabbage samples will be analyzed along with the study samples to ensure that there is not an increase in metals over time due to grinder deterioration.

Findings:

Of the 67 samples, only 1 sample had an elevated iron concentration of 220 ppm. All nickel, copper, chromium and lead concentrations were very low and in most cases, below the method detection limit. Iron is not normally an element that we are concerned with in Phytotoxicology investigations and therefore, this type of Thomas-Wiley Mill grinder is best suited to use in our laboratory. It was

decided at this point that only this type of grinder would be used for all future vegetation processing, with the grinder blades and body composed of steel and the sieve composed of stainless steel.

Step Seven:
All samples from this point in time forward will be documented with regards to grinder used and technician responsible for processing. This will aid in isolating any future problems with grinder filings and/or increased metal concentrations.

All data relating to this quality control procedure is documented in the MOE report *"Phytotoxicity Laboratory Incident Report"* (MOE 2003).

5.0 Implications for Sudbury Residential Garden Produce:

Following the laboratory quality control project, it was determined that several Sudbury residential garden produce samples had been processed in the Intermediate (small) grinder by several technicians over a 2 month period. To determine which samples had been compromised by the processing, statistical testing was undertaken as outlined below.

It was decided to use lead as the tracer for possible contamination by the Intermediate grinder as lead is not as common as nickel, copper, or cobalt in Sudbury, it is not readily taken up by most plants, and the lead solder is one of the first parts of the Intermediate receiving tube screen struck by the grinder blades. To be on the conservative side it was decided to use a lead concentration of greater than 2 μg/g dry weight as an indication of possible grinder contamination. Of the 148 garden vegetable samples, there were 28 with a lead concentration greater than 2 μg/g. Of these 7 were root vegetables (potato, carrot, beet, etc.), 5 were fruit vegetables (tomato, beans, cucumber, etc.), and 16 were leafy vegetables (lettuce, Swiss chard. parsley, etc.). These samples are marked with an * in Appendix A Table 3.6. There was no correlation between the copper, nickel, cobalt and lead in the root or fruit vegetables in the vegetables with lead greater that 2 μg/g. However, there was a correlation between nickel and copper in the leafy vegetables with lead greater that 2 μg/g. There was also a good correlation between the concentrations of lead and aluminum and aluminum and chromium in the leafy vegetables. Therefore, high lead concentrations occurred with high aluminum concentrations in the leafy vegetables.

Aluminum is a main constituent of soil and elevated aluminum concentrations in the samples suggest that not all of the soil particles were washed off the leafy vegetables. In the soils from the residential properties there was a good correlation between the aluminum concentrations with the chromium and vanadium concentrations. The ratio of aluminum to chromium and vanadium in the soil from each of the gardens in which leafy vegetables had lead greater that 2 μg/g were the same as that found in the leafy vegetables. Thus it can be concluded that the aluminum in the leafy vegetables originated from the soil in which it was grown. The ratio of lead to aluminum in the soil where each sample was collected was multiplied by the amount of aluminum in the leafy vegetable sample to estimate the amount of lead in the leafy vegetable that came from the surrounding soil. There was a very good correlation between the calculated lead concentration and that measured in the lab, see Figure G1. From these results it was concluded that all of the lead greater that 2 μg/g in the leafy vegetables, up to 32 μg/g, is likely due to soil left on the leafy vegetables after washing and not contamination by the Intermediate Wiley Mill grinder. Consequently the nickel and copper results for these same samples are considered accurate.

The same process was used to determining how much of the lead in seven root and five fruit vegetables with lead concentrations above 2.0 µg/g was due to all of the soil particles not being washed of based on the aluminum concentrations in these samples. The aluminum concentrations in these samples was much lower than the leafy vegetables and very little of the lead was attributed to soil particles not being all washed off these samples. Thus these samples were considered to have been potentially contaminated by processing in the Intermediate (small) grinder. Re-sampling of some of the gardens in 2002 confirmed this, see Section 4 below.

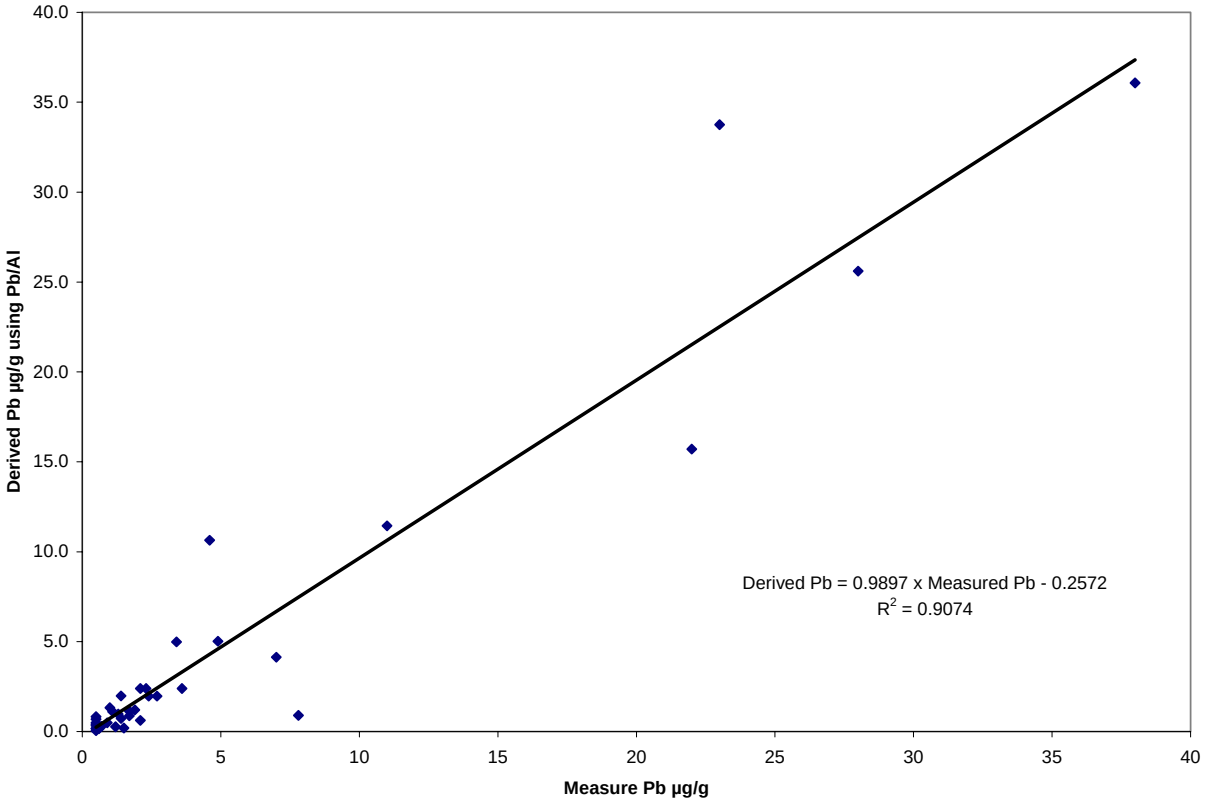

Figure G1: Relationship of measured lead concentration to calculated lead concentration in leafy vegetables collected in residential gardens in Coniston, Copper Cliff and Falconbridge, 2001.

6.0 2002 Sudbury Garden Re-Sampling

In order to verify that the lead concentrations that were found in a small subset of Sudbury residential garden vegetables sampled in 2001 were due to quality control issues associated with the Intermediate (small) Thomas-Wiley Mill used for sample processing and not due to uptake by produce. Five of the original properties sampled in 2001 were re-visited in 2002, those being Diorite and Collins Street in Copper Cliff, Tuddenham Street in Gatchell and John and Suzanne Streets in Lively. Due to the time of sampling, September 2002, only root and fruit vegetables were available 0for harvest, as well as garden soil.

The results of the 2002 re-sampling of vegetables and soil for the five properties are given in Tables G4.1 to G4.10.

7.0 Conclusions of Re-Sampling

For all five properties, the 2002 re-sampling results of garden soil did not indicate any change from the 2001 soil data. The 2002 vegetation data from properties in Copper Cliff and Gatchell verified the 2001 data found, which indicates that these samples were processed correctly in 2001.

The 2002 vegetation results from John and Suzanne Street in Lively indicate that the 2001 vegetation data was compromised by the use of the Intermediate Wiley Mill for processing. In 2001, carrots from the John Street garden were found to have lead and nickel concentrations of 42 and 54 ppm, respectively. Following re-sampling in 2002 and use of the steel Standard Thomas-Wiley Mill for processing indicated that carrots from this same garden had lead concentrations that were below method detection limits and nickel concentrations ranging from 1.3 to 1.4 ppm.

In 2001, carrots from the Suzanne Street garden were found to have lead and nickel concentrations of 40 and 9.6 ppm, respectively. Following re-sampling in 2002 and the use of the steel Standard Thomas-Wiley Mill for processing indicated that carrots and tomatoes from this same garden had lead concentrations also below method detection and nickel concentrations ranging from 1.9 to 4.1.

These are more accurate vegetation values and were expected based on the surrounding soil concentrations of the same metals. Re-sampling results have proven that the small Intermediate Thomas-Wiley Mill grinder did have an impact on certain vegetable samples that were processed in 2001 (these are indicated in Appendix A by an “*”) and that with proper processing using the large Standard Steel Thomas-Wiley Mill (Photo 1), these elevated lead and nickel concentrations do not occur.

Table G4.1: Results of 2001 and 2002 garden vegetable sampling at Station 5037454, Diorite St., Copper Cliff.

Station	Sample No.	Vegetable	Al	Sb	As	Ba	Cd	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
2001 Sampling																				
5037454 Diorite St.	15290	beets	120	0.2 <w	0.2 <w	8.5	0.3 <t	0.6 <t	0.4 <t	27	160	0.5 <w	2700	6.1	0.2 <w	22	0.3 <t	5.6	0.5 <w	29
	15292	carrot	82	0.2 <w	0.2 <w	3.3 <t	0.2 <t	0.5 <w	0.2 <w	10	110	0.8 <t	1600	4.7	0.2 <w	16	0.4 <t	5.2	0.5 <w	14
	15294	tomato	13 <t	0.2 <w	0.2 <w	0.5 <w	0.3 <t	0.5 <w	0.2 <w	8.4	40	0.5 <w	840	5.9	0.2 <w	5.2	1	1 <t	0.5 <w	11
2002 Sampling																				
5037454 Diorite St.	1320	beet rep 1	28	0.2 <w	0.2 <w	12	0.3 <t	0.5 <w	0.3 <t	19	47	0.5 <w	2600	4.7	0.2 <w	18	0.6 <t	8.4	0.5 <w	37
	1321	beet rep 2	13 <t	0.2 <w	0.2 <w	16	0.3 <t	0.5 <w	0.2 <w	15	39	0.5 <w	3900	4	0.2 <w	19	0.4 <t	7.8	0.5 <w	41
	1318	carrot rep 1	16 <t	0.2 <w	0.2 <w	3.8	0.1 <w	0.5 <w	0.2 <w	7.5	33	0.5 <w	1100	4	0.2 <w	11	0.4 <t	4.1	0.5 <w	19
	1319	carrot rep 2	13 <t	0.2 <w	0.2 <w	3.7	0.1 <w	0.5 <w	0.2 <w	6.4	28	1.4 <t	1000	2.1	0.2 <w	10	0.5 <t	4.1	0.5 <w	13
	1322	tomato reg.	14 <t	0.2 <w	0.2 <w	0.5 <w	0.2 <t	0.5 <w	0.4 <t	9.4	39	0.5 <w	1500	9.2	0.5 <w	10	0.2 <w	1.1 <t	0.5 <w	14
	1323	tomato cherry	38	0.2 <w	0.2 <w	0.6 <t	0.5	0.5 <w	0.3 <t	10	87	1.1 <t	2000	11	0.9 <w	8.6	1.4	1 <t	0.5 <w	17

Table G4.2: Results of 2001 and 2002 garden soil sampling at Station 5037454, Diorite St., Copper Cliff.

Station	Depth	Sample No.	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
2001 Sampling																						
5037454 Diorite St. (garden)	0-15 cm	15299	9700	< 0.8	7	40	< 0.5	< 0.8	6800	28	8	**280**	13000	19	3500	170	< 1.5	**200**	**2**	37	29	42
		15300	9200	< 0.8	7	38	< 0.5	< 0.8	6800	27	9	**280**	12000	20	3600	160	< 1.5	**220**	**2**	38	28	41
2002 Sampling																						
5037454 Diorite St. (garden)	0-15 cm	1326	11000	< 0.4	8	51	< 0.5	< 0.8	7100	30	13	**400**	13000	32	4200	170	< 0.5	**310**	**3**	25	30	54
		1328	9700	< 0.2	7	38	< 0.5	< 0.6	6900	27	12	**330**	12000	21	4200	150	< 0.5	**260**	**4**	23	26	49
	15-25 cm	1327	10000	< 0.3	10	51	< 0.5	< 0.4	5600	29	12	**310**	13000	23	3500	180	< 0.5	**240**	**3**	21	30	42
		1329	9600	< 0.2	8	39	< 0.5	< 0.6	5100	27	9	**230**	12000	15	3200	160	< 0.5	**180**	**2**	19	26	46

Table G4.3: Results of 2001 and 2002 garden vegetable sampling at Station 5037439, Collins St., Copper Cliff.

Station	Sample No.	Vegetable	Al	Sb	As	Ba	Cd	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
2001 Sampling																				
5037439 Collins St.	15180	tomato	5 <w	0.2 <w	0.2 <w	0.6 <t	0.1 <w	0.5 <w	0.2 <w	4.9	15 <t	0.5 <w	1100	5.9	0.3 <t	2.8	0.2 <w	1.9 <t	0.5 <w	12
2002 Sampling																				
5037439 Collins St.	1342	tomato rep 1	5 <w	0.2 <w	0.2 <w	0.5 <	0 <t	0.5 <w	0.2 <w	4.3	17	0.5 <w	1100	3.7	0.7 <t	3.7	0.2 <w	2 <t	0.5 <w	8
	1343	tomato rep 2	5 <w	0.2 <w	0.2 <w	0.7 <t	0 <w	0.5 <w	0.2 <w	5.4	11	0.5 <w	1000	2.7	0.6 <t	4.1	0.3 <t	2.9	0.5 <w	9

Table G4.4: Results of 2001 and 2002 garden soil sampling at Station 5037439, Collins St., Copper Cliff.

Station	Depth	Sample No.	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
2001 Sampling																						
5037439 Collins St. (garden)	0-15 cm	15184	11000	1	**38**	100	< 0.5	0.9	19000	30	20	**580**	17000	**160**	6100	270	< 2	**570**	**2**	53	26	140
		15185	10000	1	**36**	92	< 0.5	0.9	18000	26	21	**520**	17000	**160**	6000	240	< 2	**590**	1	48	24	130
2002 Sampling																						
5037439 Collins St. (garden)	0-15 cm	1344	10000	1.7	**44**	120	< 0.5	0.9	19000	39	21	**610**	14000	190	6900	290	< 1	**600**	**3**	43	26	180
		1346	11000	1.2	**38**	130	< 0.5	0.8	21000	34	22	**680**	15000	160	7200	310	< 1	**640**	**3**	46	27	180
	15-20 cm	1345	10000	1.3	**41**	120	< 0.5	0.8	14000	35	22	**650**	16000	160	4800	260	< 1	**620**	**3**	39	27	160
		1347	11000	1.2	**40**	120	< 0.5	0.6	15000	36	22	**590**	16000	150	4900	270	< 1	**610**	**4**	39	27	160

Table G4.5: Results of 2001 and 2002 garden vegetable sampling at Station 5037435, Tuddenham St., Gatchell.

Station	Sample No.	Vegetable	Al	Sb	As	Ba	Cd	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
2001 Sampling																				
5037435 Tuddenham St.	15165	potato	19 <t	0.2 <w	0.2 <w	0.5 <w	0.1 <w	0.5 <w	0.2 <w	6	53	0.5 <w	1100	4.1	1 <t	2.3 <t	0.2 <w	0.5 <w	0.5 <w	13
	15157	tomato	5 <w	0.2 <w	0.2 <w	0.6 <t	0.1 <w	1.1 <t	0.2 <w	4.8	63	0.5 <w	1100	8.8	0 <w	2.9	0.2 <w	1.4 <t	0.5 <w	13
2002 Sampling																				
2001 5037435 Tuddenham St.	1334	potato rep 1	5 <w	0.2 <w	0.2 <w	0.5 <w	0.1 <w	0.5 <w	0.2 <w	7.2	26	0.5 <w	1200	4.3	1 <t	2.5	0.2 <w	0.5 <w	0.5 <w	16
	1335	potato rep 2	40	0.2 <w	0.2 <w	0.5 <w	0.1 <w	0.6 <t	0.2 <w	8.2	63	1.7 <t	1200	5.1	1 <t	3.9	0.2 <w	0.5 <w	0.5 <w	18
	1330	tomato rep 1	5 <w	0.2 <w	0.2 <w	0.5 <w	0.2 <t	0.5 <w	0.2 <w	4.3	17	0.5 <w	1200	4.9	1 <t	3.1	0.2 <w	1.7 <t	0.5 <w	9
	1331	tomato rep 2	5 <w	0.2 <w	0.2 <w	0.5 <w	0.2 <t	0.5 <w	0.2 <w	4.3	12	0.5 <w	1200	5.3	0 <t	1.8 <t	0.2 <w	0.9 <t	0.5 <w	10

Table G4.6: Results of 2001 and 2002 garden soil sampling at Station 5037435, Tuddenham St., Gatchell.

Station	Depth	Sample No.	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
2001 Sampling																						
5037435 Tuddenham St. (garden)	0-15 cm	15166	9900	< 0.8	6	85	< 0.5	< 0.8	6900	35	11	**210**	16000	**130**	4100	260	< 1.5	**190**	1	32	28	87
		15167	7200	< 0.8	6	54	< 0.5	< 0.8	3500	56	15	**440**	14000	51	2700	170	< 1.5	**300**	1	22	25	58
2002 Sampling																						
5037435 Tuddenham St. (garden)	0-15 cm	1332	11000	< 0.5	7	99	< 0.5	< 0.6	8100	39	12	**220**	15000	48	4900	290	< 0.5	**210**	**2**	32	30	110
		1336	12000	< 0.4	7	100	< 0.5	< 0.7	8900	40	13	**220**	15000	47	5200	310	< 1.1	**210**	**2**	34	32	100
	15-30 cm	1333	11000	< 0.4	7	97	< 0.5	< 0.7	7600	42	13	**220**	16000	53	5100	290	< 0.5	**220**	**2**	32	33	110
		1337	12000	< 0.5	8	100	< 0.5	< 0.6	8600	41	14	**230**	15000	50	5200	310	< 0.5	**220**	**2**	34	32	110

Table G4.7: Results of 2001 and 2002 garden vegetable sampling at Station 5037465, John St., North Lively.

Station	Sample No.	Vegetable	Al	Sb	As	Ba	Cd	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
2002 Sampling																				
5037465 John St.	15357*	carrot	64	0 <t	0.2 <w	15	0.2 <t	1 <w	0.2 <w	19	92	42	990	6.6	0.2 <w	54	0.2 <w	22	0.5 <w	11
2002 Sampling																				
5037465 John St.	1310	carrot rep 1	26	0 <w	0.2 <w	14	0.1 <w	1 <t	0.2 <w	4.3	50	0.5 <w	980	4.8	0.2 <w	1.4	0.2 <w	26	0.5 <w	15
	1311	carrot rep 2	21	0	0.2 <w	12	0.1 <w	1 <w	0.2 <w	3.5	34	0.5 <w	970	5.1	0.2 <w	1.3	0.2 <w	26	0.5 <w	13

Table G4.8: Results of 2001 and 2002 garden soil sampling at Station 5037465, John St., North Lively.

Station	Depth	Sample No.	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
2001 Sampling																						
5037465 John St. (garden)	0-15 cm	15358	11000	< 0.8	< 5	94	< 0.5	< 1	12000	28	8	79	1700	55	5500	320	< 1.5	**80**	< 1	65	33	93
		15359	13000	**1**	< 5	110	< 0.5	< 1	15000	29	8	**92**	2000	80	6700	340	< 1.5	**91**	< 1	72	35	110
2002 Sampling																						
5037465 John St. (garden)	0-15 cm	1312	8400	< 0.4	6	75	< 0.5	< 0	9200	25	9	75	13000	35	5600	270	< 0.5	**79**	< 0.8	45	29	88
		1313	9200	< 0.5	6	84	< 0.5	< 0	9700	26	10	**86**	14000	48	6000	300	< 0.5	**94**	< 0.7	46	31	97
	15-30 cm	1314	8500	< 0.3	5	47	< 0.5	< 0	3500	23	10	50	13000	21	3700	200	< 0.5	**56**	< 0.4	20	31	53
		1315	8300	< 0.3	5	130	< 0.5	< 0	4000	23	9	41	13000	64	3700	190	< 0.5	43	< 0.3	61	30	78

Table G4.9: Results of 2001 and 2002 garden vegetable sampling at Station 5037461, Suzanne St., North Lively.

Station	Sample No.	Vegetable	Al	Sb	As	Ba	Cd	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
2001 Sampling																				
5037461 Suzanne St.	15338*	carrot	57	0.2 <w	0.2 <w	15	0.1 <w	0.5 <w	0.3 <t	9.7	91	40	1800	5.8	0.2 <w	9.6	0.2 <w	9.8	0.5 <w	23
2002 Sampling																				
5037461 Suzanne St.	1300	carrot rep 1	18	0.2 <w	0.2 <w	8.8	0.1 <w	0.5 <w	0.2 <w	5.4	56	0.5 <w	970	4.6	0.2 <w	2	0.2 <w	5.9	0.5 <w	15
	1301	carrot rep 2	41	0.2 <w	0.2 <w	13	0.1 <w	0.5 <w	0.2 <w	7.4	65	0.5 <w	1200	5.5	0.2 <w	4.1	0.2 <w	7.7	0.5 <w	19
	1306	tomato rep 1	42	0.2 <w	0.2 <w	1	0.1 <w	0.5 <w	0.2 <w	10	85	0.5 <w	1400	11	0.4 <t	1.9	0.2 <w	1.8	0.5 <w	21
	1307	tomato rep 2	25	0.2 <w	0.2 <w	2.2	0.1 <w	0.5 <w	0.2 <w	12	73	0.5 <w	2300	14	0.2 <w	3.1	0.2 <w	3.5	0.5 <w	28

Table G4.10: Results of 2001 and 2002 garden soil sampling at Station 5037461, Suzanne St., North Lively.

Station	Depth	Sample No.	Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	Sr	V	Zn
2001 Sampling																						
5037461 Suzanne St. (garden)	0-15 cm	15340	14000	< 0.8	8	76	< 0.5	< 0.8	9900	32	10	**120**	2200	110	6600	270	< 1.5	**130**	< 1	28	36	110
		15341	18000	< 0.8	9	89	< 0.5	< 0.8	12000	37	11	**110**	2500	93	7000	350	< 1.5	**150**	< 1	49	46	96
2002 Sampling																						
5037461 Suzanne St. (garden)	0-15 cm	1302	17000	< 0.6	11	85	< 0.5	< 0.6	10000	37	13	**110**	22000	45	7200	300	< 0.5	**130**	1	31	44	95
		1303	17000	< 0.6	11	85	< 0.5	< 0.3	10000	37	13	**100**	21000	44	7300	300	< 0.5	**130**	1	32	45	96
	15-25 cm	1304	17000	< 0.7	11	81	< 0.5	< 0.4	5300	36	14	**130**	22000	28	5400	270	< 0.5	**150**	**2**	23	44	73
		1305	17000	< 0.7	11	84	< 0.5	< 0.7	5300	38	14	**190**	23000	26	5300	290	< 0.5	**160**	**2**	25	48	72

City of Greater Sudbury 2001 Survey

Appendix H

Ministry Soil Criteria

MOE Ontario Soil Background Criteria (Table F)

The numbers listed as being "Ontario Soil Background Criteria", or Table F, were derived from the "Ontario Typical Ranges (OTR)" guidelines (MOE 1997). The OTRs represent the expected upper background range of various chemicals in soil in Ontario. These were derived from a province-wide soil sampling program conducted to determine the range of ambient background chemical concentrations in surface soil in Ontario result from natural geological processes and human activity remote from the influence of known point sources of pollution. Soils were analyzed for approximately 39 inorganic and 119 organic compounds. Soil concentrations above the "background levels" may be indicative of local pollution impacts or could also be a result of local geological deposits or natural sources of organic chemicals, such as ash from forest fires or oil seepage. Complete details on the "background criteria/OTR" development process can be found in the MOE report "*Ontario Typical Range of Chemical Parameters in Soil, Vegetation, Moss Bags and Snow*", (MOE 1993c). For the Table F, "Ontario Soil Background Criteria" a number of the OTR parameters were taken and new background numbers were created that, with a few minor exceptions, are higher than the OTR_{98} guideline numbers. The exception occur when the Table A derived number was less than the OTR_{98} guideline number. In this case both the Table F and Table A numbers were set at the OTR_{98} guideline number. Complete details on the Table F, "Ontario Soil Background Criteria" development process can be found in the MOE report "*Guideline for Use at Contaminated Sites in Ontario*", (MOE 1997).

MOE Soil Remediation Criteria (Table A)

The MOE soil remediation criteria have been developed to provide guidance in assessing and triggering certain decisions or actions for soils that have elevated soil concentrations. These criteria are not action levels, in that exceeding one or more of the criteria does not automatically mean that a clean-up must be conducted, but that further study of the potential human and/or ecological risks is warranted.

Decisions on the need to undertake action when the criteria are exceeded require consideration of factors such as:

- a demonstrated presence or likelihood of an adverse effect to human health and/or the natural environment;
- an understanding of the type of protection provided by the criteria gained through knowledge of the exposure pathways and receptors (i.e. humans, animals, plants) which were considered in the development of the criteria, and through understanding how that combination of pathways and receptors relate to those which could be found in the community;
- local environment conditions that are known to modify chemicals availability and toxicity; and
- an understanding of the relationship between dose and health response for sensitive receptors

from all exposure pathways, including the safety and uncertainty factors that have been used in the development of the criteria.

In each case, the decision to undertake action should entail all of these factors plus any additional factors specific to the community in question. When the decision is made that action is needed, it is generally accepted that a human health and/or ecological risk assessment(s) are carried out to assess the level of risks to the community, identify the major contributing factors to risk and, if warranted develop intervention levels for remediation.

The soil remediation criteria are effects-based concentrations set to protect against the potential for adverse effects to human health, ecological health, and the natural environment, whichever is the most sensitive, often a plant or soil dwelling animal. The overarching assumption is by protecting the most sensitive receptor and the most sensitive endpoint the rest of the environment is protected by default. There are different criteria for land use, soil texture, soil depth, and ground water use. The criteria have also been established so that there will not be a potential for adverse effects through chemicals transferred from soil to indoor air, from ground water or surface water through release of volatile gases, from leaching of chemicals in soil to ground water, or from ground water discharge to surface water.

Currently there are criteria for approximately 25 inorganic elements and 90 organic compounds. Criteria were developed only if there were sufficient, defendable, effects-based data on the potential to cause an adverse effect. The development of Soil Remediation Criteria is a continuous program, and criteria for more elements and compounds will be developed as additional environmental data become available. Similarly, new information could result in future modifications to the existing criteria.

For more information, please refer to the Guideline for Use at Contaminated Sites in Ontario. Revised December 1997, Ontario Ministry of Environment and Energy, PIBs 3161E01, ISBN 0-7778-5905-X.1.