Table 1. Extraction water used in the Nordtest[39]

Method 1:

Reagent	Weight added*
NaCl	50 mg
Na_2SO_4	50 mg
$CaCO_3$	50 mg
CO_2 gas	until $CaCO_3$ is dissolved;
Air	then until pH=7.0 (+/-0.1)

Method 2:

Reagent	Weight added
NaCl	50 mg
Na_2SO_4	50 mg
$Ca(OH)_2$	37 mg
CO_2 gas	until pH < 5; then
Air	until pH=7.0 (+/-0.1)

* weight dissolved in 1 liter of test water

Table 2. Metal Composition of Test Metal Coupons Used in the Leach Study

Loop #	Alloy #	Metal Type	Cu(%)	Zn(%)	Pb(%)	Sn(%)	Fe(%)
1	C36000	FC Brass	60.49 ± 1.87	37.56 ± .89	2.73 ± 0.34	na	0.16 ± 0.04
2	C36000	FC Brass	61.26 ± 4.14	37.38 ± 1.24	2.78 ± 0.33	na	0.17 ± 0.03
3	C83600	Red Brass	84.56 ± 3.47	5.20 ± 1.84	5.06 ± 0.69	na	0.10 ± 0.06
4	C84400	Red Brass	77.25 ± 11.63	10.61 ± 3.55	6.61 ± 0.92	na	0.17 ± 0.04
5	C84500	Red Brass	78.89 ± 2.26	11.17 ± 1.13	5.97 ± 1.37	na	0.22 ± 0.10
6	C85200	Yellow Brass	69.30 ± 0.36	25.60 ± 2.75	1.98 ± 0.37	na	0.62 ± 0.05
7	C85400	Yellow Brass	64.82 ± 3.45	30.16 ± 6.24	1.59 ± 0.19	na	0.19 ± 0.26
8	C122	Cu Pipe	97.54 ± 2.93	0.00 ± 0.35	0.01 ± 0.08	na	0.03 ± 0.00
9	Pure Pb	Pure Pb	0.20 ± 2.80	0.05 ± 0.56	91.23 ± 6.85	na	0.02 ± 0.03
10	Pure Pb	Pure Pb	-	0.00 ± 0.43	91 ± 19.42	na	0.03 ± 0.02
11	Pure Zn	Pure Zn	-	99.66 ± 0.89	0.07 ± 0.06	na	0.03 ± 0.01
12	Pb/Sn	Solder	na	na	44.22 ± 5.55	58.29 ± 1.73	0.06 ± 0.11

FC= Free Cutting
na = Not Analyzed
* Pb Analyzed by Flame AA
±=95% Confidence Interval

Table 3. Analytical Methods Used for Chemical Analysis of Water Samples

Analysis	Method	Method Number	Reference	Detection Limit (mg/L)
Metals				
Calcium	AA-Flame	7140	EPA[1]	0.1
Magnesium	AA-Flame	7450	EPA[1]	2.0
Sodium	AA-Flame	7770	EPA[1]	3.0
Potassium	AA-Flame	7610	EPA[1]	0.25
Iron	AA-Flame	7380	EPA[1]	0.05
Copper	AA-Flame	7210	EPA[1]	0.02
Lead	GFAAS	7421	EPA[1]	0.002
Zinc	AA-Flame	7950	EPA[1]	0.01
Manganese	AA-Flame	7460	EPA[1]	0.01
Calcium	ICAP	200.7	EPA[6]	0.01
Magnesium	ICAP	200.7	EPA[6]	0.025
Sodium	ICAP	200.7	EPA[6]	0.025
Potassium	ICAP	200.7	EPA[6]	2.0
Copper	ICAP	200.7	EPA[6]	0.003
Lead	ICAP	200.7	EPA[6]	0.02
Zinc	ICAP	200.7	EPA[6]	0.001
Manganese	ICAP	200.7	EPA[6]	0.0004
Silicon (as SiO_2)	ICAP	200.7	EPA[6]	0.053
Sulfur (as SO_4^{-})	ICAP	200.7	EPA[6]	0.045
Aluminum	ICAP	200.7	EPA[6]	0.025
Iron	ICAP	200.7	EPA[6]	0.002
Anions				
Chloride	Automated Potentiometric Titration	4500-Cl^- D.	Std. Methods[7]	1.0
Fluoride	Automated Standard Additions	--	Orion[4]	< 0.1
	Potentiometric ISE	340.2	EPA[5]	0.10
Orthophosphate	Automated Colorimetric	I-2601-85	USGS[2]	0.02 (as PO_4)
Total Phosphate	Automated Colorimetric	I-2600-85	USGS[2]	0.05 (as PO_4)
Nitrate-N	Automated Colorimetric	A303-5173-00	Alpkem[3]	0.02 (as N)
Silicate	Automated Colorimetric	A303-5220-13	Alpkem[3]	0.4 (as SiO_2)
Sulfate	Automated Turbidimetric	A303-5220	Alpkem[3]	~6.0 (as SO_4)
Total Alkalinity	Automated Potentiometric	9038	EPA[1]	~0.3 (as $CaCO_3$)
	Titration to Equivalence Point	2320 B.4.6.	Std. Methods[7]	--
Others				
Dissolved Oxygen	Winkler (Azide Modification)	4500-0 D.	Std. Methods[7]	0.50
Temperature	--	--	--	--
Ammonia	Automated Colorimetric	350.1	EPA[5]	0.03
Total Inorganic Carbon	Coulometric Titration	D513-92	ASTM[8]	< 0.5
Total Chlorine	DPD Colorimetric	8167	Hach[9]	0.02
Free Chlorine	DPD Colorimetric	8021	Hach[9]	0.02
pH	Closed-System Electrometric	--	EPA(DWRD)[10]	--

[1] USEPA, OSWER, SW846, Sept. 1986.

[2] Modified from methods for Determination of Inorganic Substances in Water & Fluvial Sediments, U.S. Geological Survey Open-File Report, (85-495) 1985.

[3] Alpkem Research, Inc., Clackamas, OR.

[4] Orion Research, Inc., Boston, MA.

[5] USEPA, "Methods for Chemical Analysis of Water and Wastes," EPA-60014-79-020 (1983).

[6] USEPA, "Methods for the Determination of Metals in Environmental Samples," EPA-60014-91-010 (1994).

[7] "Standard Methods for the Examination of Water and Wastewater," 18th Edition (1992).

[8] "1994 Annual Book of ASTM Standards," section 11, volume 11.01 Water (I).

[9] Hach Company, Loveland, Co.

[10] Drinking Water Research Division, USEPA, Internal Method. References: Journal AWWA 72:5:304(1980); Schock & Lytle, Proc. AWWA WQTC (1994).

Table 4. Test run conditions

Test Run #	Date	Days	Conditions
1	8/14/91-1/6/92	146	Cincinnati tap water; no chemical adjustment
2	2/25/92-7/29/92	155	Cincinnati tap water; adjusted to pH of 7.0 with 6 N HCl
3	8/11/92-12/17/92	128	Cincinnati tap water; adjusted to pH of 7.5 with 6 N HCl and PO_4^{-3} adjusted to 3.0 mg/L* with sodium phosphate
4	2/18/93-6/24/93	127	Cincinnati tap water; adjusted to pH of 7.5 with 6 N HCl and PO_4^{-3} adjusted to 0.5 mg/L* with sodium phosphate
5	8/11/93-2/25/94	199	Cincinnati tap water; adjusted to pH of 7.5 with 6 N HCl

Table 5. Extraction water quality.

(a) Test run #1

Analyte	N	Min	Max	Run #1 Mean	Std. Dev.	95% CI	Median
Lead, μg/L	70	<0.002	11.9	1.4	2.4	0.7	0.5
Calcium, mg/L	64	34.7	54.8	42.4	4.6	1.2	40.9
Copper, mg/L	54	<0.02	0.03	0.00	<0.02	<0.02	<0.02
Iron, mg/L	57	<0.05	0.07	<0.05	<0.05	<0.05	<0.05
Potassium, mg/L	54	2.3	4.4	3.5	0.5	0.5	3.6
Magnesium, mg/L	64	9.1	16.6	13.5	1.8	0.5	13.5
Manganese, mg/L	43	<0.01	0.03	<0.01	0.01	0.01	<0.01
Sodium, mg/L	64	14.8	44.5	33.4	6.8	1.8	34.7
Zinc, mg/L	58	<0.01	0.39	0.03	0.06	0.02	0.01
Alkalinity, mg $CaCO_3$/L	60	43.5	74.1	60.2	5.6	1.4	60.4
Sulfate, mg SO_4/L	46	104.0	130.0	116.3	7.9	2.3	115.0
Chloride, mg/L	32	39.0	43.8	40.3	1.2	0.4	39.9
Silica, mg SiO_2/L	5	2.4	2.8	2.6	0.2	0.3	2.8
Nitrate, mg N/L	54	<0.02	1.1	0.77	0.17	0.04	0.73
Ammonia, mg NH_3/L	54	<0.03	<0.03	<0.03	0.00	0	<0.03
Phosphate, mg PO_4/L	25	<0.02	0.37	<0.02	0.08	0.08	<0.02
Dissolved oxygen, mg/L	na	na	na	na	na	na	na
Total inorganic carbon, mg C/L	na	na	na	na	na	na	na
Free chlorine, mg Cl_2/L	68	0.65	3.1	2.0	0.56	0.14	2.0
pH, pH units	67	8.04	8.79	8.53	0.18	0.04	8.54

(b) Test run #2

Analyte	N	Min	Max	Run #2 Mean	Std. Dev.	95% CI	Median
Lead, μg/L	93	<0.002	14.1	0.68	2.12	0.44	0.50
Calcium, mg/L	91	25.6	51.2	33.5	6.3	1.3	33.3
Copper, mg/L	90	<0.02	2.3	0.1	0.4	0.1	<0.02
Iron, mg/L	89	<0.05	0.66	<0.05	0.13	<0.05	<0.05
Potassium, mg/L	91	1.6	3.2	2.0	0.4	0.1	2.0
Magnesium, mg/L	91	6.0	12.8	8.1	1.7	0.4	8.1
Manganese, mg/L	87	<0.01	0.03	<0.01	0.02	0.17	<0.01
Sodium, mg/L	91	3.8	53.9	15.7	7.4	1.6	14.0
Zinc, mg/L	89	<0.01	0.07	<0.01	0.03	0.01	<0.01
Alkalinity, mg $CaCO_3$/L	92	21.7	52.2	34.9	6.4	1.3	33.9
Sulfate, mg SO_4/L	92	52.8	108.9	68.2	10.7	2.2	66.2
Chloride, mg/L	82	21.4	46.0	29.6	5.6	1.2	28.0
Silica, mg SiO_2/L	88	4.3	7.7	6.0	0.7	0.7	6.1
Nitrate, mg N/L	70	<0.02	2.0	1.1	0.3	0.1	1.2
Ammonia, mg NH_3/L	83	<0.03	<0.03	<0.03	0.11	0.11	<0.03
Phosphate, mg PO_4/L	76	<0.02	0.31	0.02	0.05	0.01	<0.02
Dissolved oxygen, mg/L	41	6.0	10.2	8.9	0.7	0.2	9.0
Total inorganic carbon, mg C/L	23	10.9	14.1	12.5	1.2	0.5	12.4
Free chlorine, mg Cl_2/L	92	1.0	2.2	1.4	0.3	0.1	1.3
pH, pH units	93	6.9	7.1	7.0	0.1	0.0	7.0

Table 5 (continued)
(c) Test run #3

Analyte	N	Min	Max	Run #3 Mean	Std. Dev.	95% CI	Median
Lead, μg/L	66	<0.002	2.00	0.29	0.49	0.12	0.10
Calcium, mg/L	63	34.5	44.5	40.0	2.6	0.6	40.3
Copper, mg/L	61	<0.003	0.02	0.00	0.01	<0.003	<0.003
Iron, mg/L	64	<0.002	0.17	0.01	0.03	0.01	0.01
Potassium, mg/L	64	<2.00	3.4	3.0	0.42	0.11	3.1
Magnesium, mg/L	64	<0.025	11.1	9.7	1.4	0.36	9.9
Manganese, mg/L	61	<0.0004	0.01	<0.0004	<0.0004	<0.0004	<0.0004
Sodium, mg/L	64	16.3	26.2	21.3	4.4	1.1	22.8
Zinc, mg/L	61	<0.001	0.01	<0.001	<0.001	<0.001	<0.001
Alkalinity, mg $CaCO_3$/L	58	43.1	58.4	52.2	3.0	0.8	52.6
Sulfate, mg SO_4/L	56	64.6	93.6	78.6	7.5	2.0	78.8
Chloride, mg/L	59	0.0	36.5	30.8	5.0	1.3	31.7
Silica, mg SiO_2/L	63	3.7	8.5	6.1	1.1	0.3	5.6
Nitrate, mg N/L	43	<0002	1.14	0.85	0.33	0.10	0.96
Ammonia, mg NH_3/L	57	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phosphate, mg PO_4/L	57	2.5	3.3	2.8	0.16	1.3	2.8
Dissolved oxygen, mg/L	51	5.5	10.8	8.7	0.76	0.21	8.8
Total inorganic carbon, mg C/L	30	11.2	14.8	13.7	0.76	0.28	13.7
Free chlorine, mg Cl_2/L	68	0.7	2.3	1.4	0.49	0.12	1.2
pH, pH units	68	7.4	7.6	7.5	0.05	0.01	7.5

(d) Test run #4

Analyte	N	Min	Max	Run #4 Mean	Std. Dev.	95% CI	Median
Lead, μg/L	54	<0.002	1.3	0.13	0.40	0	0.10
Calcium, mg/L	59	27.7	39.6	34.3	3.0	0.9	34.7
Copper, mg/L	59	<0.003	0.01	0.00	0.00	0.008	<0.003
Iron, mg/L	60	<0.002	0.03	0.01	0.01	0.003	0.004
Potassium, mg/L	58	1.6	2.4	2.1	0.3	0.1	2.1
Magnesium, mg/L	58	7.1	10.7	9.0	0.9	0.4	9.0
Manganese, mg/L	56	<0.0004	0.01	<0.0004	<0.0004	<0.0004	<0.0004
Sodium, mg/L	58	8.8	19.8	13.8	2.5	0.8	13.3
Zinc, mg/L	60	<0.001	0.01	0.002	0.003	0.008	<0.001
Alkalinity, mg $CaCO_3$/L	60	32.1	56.2	45.6	6.7	1.9	44.9
Sulfate, mg SO_4/L	59	54.1	79.6	67.3	5.8	2.6	67.1
Chloride, mg/L	60	15.0	28.3	21.1	4.1	1.1	22.2
Silica, mg SiO_2/L	59	4.6	10.2	6.5	0.1	0.4	6.7
Nitrate, mg N/L	59	0.79	1.8	1.2	0.3	0.1	1.0
Ammonia, mg NH_3/L	40	<0.03	0.09	<0.03	0.03	<0.03	<0.03
Phosphate, mg PO_4/L	59	0.30	0.54	0.46	0.05	<0.02	0.47
Dissolved oxygen, mg/L	na	na	na	na	na	na	na
Total inorganic carbon, mg C/L	57	8.2	14.4	11.2	1.9	8.0	11.1
Free chlorine, mg Cl_2/L	53	1.0	1.5	1.3	0.11	1.3	1.2
pH, pH units	53	7.4	7.7	7.5	0.07	0.07	7.5

Table 5 (continued)
(e) Test run #5

Analyte	N	Min	Max	Run #5 Mean	Std. Dev.	95% CI	Median
Lead, μg/L	78	<0.002	<0.002	<0.02	<0.002	<0.002	<0.002
Calcium, mg/L	81	27.7	47.4	38.9	6.5	1.4	42.5
Copper, mg/L	80	<0.003	0.01	0.00	<0.003	<0.003	<0.003
Iron, mg/L	81	<0.002	0.05	0.01	0.007	<0.002	0.01
Potassium, mg/L	54	1.0	6.1	3.9	0.8	0.2	3.9
Magnesium, mg/L	81	6.7	15.6	11.3	3.1	0.7	13.4
Manganese, mg/L	81	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Sodium, mg/L	81	9.0	43.1	25.1	10.4	2.3	29.0
Zinc, mg/L	81	0.01	0.02	0.01	0.03	<0.001	0.01
Alkalinity, mg $CaCO_3$/L	80	17.9	94.3	57.2	22.4	5.0	63.4
Sulfate, mg SO_4/L	69	43.8	136.3	100.8	23.4	5.6	106.8
Chloride, mg/L	74	24.0	49.5	35.0	5.8	52.0	35.1
Silica, mg SiO_2/L	61	1.3	5.8	3.0	1.6	0.3	2.8
Nitrate, mg N/L	34	0.69	1.5	1.05	0.23	0.08	1.1
Ammonia, mg NH_3/L	76	<0.03	<0.03	<0.03	<0.03	0.06	<0.03
Phosphate, mg PO_4/L	31	<0.02	0.05	0.02	<0.02	<0.02	<0.02
Dissolved oxygen, mg/L	21	5.1	10.6	8.4	1.6	0.7	8.7
Total inorganic carbon, mg C/L	64	13.4	23.7	17.6	3.4	31.7	16.0
Free chlorine, mg Cl_2/L	72	0.68	1.4	0.94	0.15	0.04	0.92
pH, pH units	72	7.4	7.7	7.5	0.1	0.1	7.6