UK/KRCEE Doc #: P6.4 2006

Total Maximum Daily Load Development
Paducah Gaseous Diffusion Plant: Data Supplemental Review

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UNIVERSITY OF KENTUCKY

February 2006

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Total Maximum Daily Load Development
Paducah Gaseous Diffusion Plant: Data Supplemental Review

Prepared by
Murray State University
Mike Kemp
Andrew Kellie

February 2006

Bayou Creek and Little Bayou Creek TMDL Development
Existing Data Supplemental Review

Attachments

Location maps for the Bayou Creek and little Bayou Creek stream sampling sites and the PGDP outfalls are attached. The maps include sites that were not routinely sampled, especially for all parameters. Representative upstream to downstream locations in Bayou Creek are L001 to L005 and L006. Representative upstream to downstream locations in Little Bayou Creek are L055 to L194 to L241 to L 012 to L008.

Plots of the mean concentrations of hardness, copper, iron, lead, mercury, and ^{99}Tc for the stream sampling sites and the outfalls using data collected from 1993 through 2003 are attached. The plots show error bars based on a 95-percent confidence interval for the true mean.

Tabular compilations of the data showing the number of samples, mean, maximum, and average concentrations, and confidence intervals for each stream and outfall location are attached.

Confidence Intervals

The plots and the tables include the calculated mean value for each parameter at each location and the 95 percent confidence interval for the true mean. Confidence intervals reflect the variability of the data. Statistically, the true mean can be anywhere within the confidence interval, i.e. the calculated mean is no more accurate than any other point within the interval. If the confidence intervals overlap, no statistical difference exists among the means. A 95 percent confidence level is the generally accepted level of "certainty" in scientific research. The confidence interval is usually reduced by increasing the number of samples, i.e. the level of "certainty".

Observations

Hardness

The calculated mean hardness concentration at the stream sampling sites was 113 mg/L as $CaCO_3$ on Bayou Creek and 85 mg/L as $CaCO_3$ on Little Bayou Creek. On Bayou Creek, hardness increases when moving downstream because of input from the plant outfalls. In Little Bayou Creek the change in hardness concentration is statistically insignificant when moving downstream, probably because the plant outfalls contribute essentially all the flow to Little Bayou Creek. An average hardness value of 100 mg/L as $CaCO_3$ yields chronic water quality limits of 0.009 mg/L for copper and 0.003 mg/L for lead, which were used for data comparison.

Copper

Calculated mean copper concentrations in Bayou Creek and in the outfalls discharging to Bayou Creek are higher than the estimated limit of 0.009 mg/L at all locations. Interestingly, the calculated mean copper concentration at site L001, which is upstream of PGDP, is as high or higher than all downstream locations. No statistically significant differences exist in the copper concentrations among all Bayou Creek stream sampling sites.

In Little Bayou Creek, no statistically significant differences exist, implying that there is no difference between the copper concentration at L055, an upstream site, and L008, a downstream site. All mean copper concentrations in Little Bayou Creek and the outfalls discharging to Little Bayou Creek exceed the estimated limit.

Iron

The calculated mean concentrations of iron in Little Bayou Creek are at or below the chronic water quality criteria of 1 mg/L. The data at L001, which is upstream of PGDP, showed the highest calculated mean and the highest variability along Bayou Creek. Site L306, which had a higher calculated mean concentration, is on the Ohio River at Cairo, Illinois. All outfalls discharging to Bayou Creek, except K017, had calculated mean iron concentrations less than the 1 mg/l limit.

Only one outfall discharging to Little Bayou Creek, K018, had a calculated mean iron concentration exceeding the limit. Several stream sites showed calculated mean concentrations exceeding 1 mg/L, but the only sites that did not have confidence intervals straddling the 1 mg/L limit were in the North/South Diversion Ditch, which is undergoing remediation. No statistically significant differences existed among sites along the main stem of the stream, upstream or downstream of the plant area.

Lead

All stream sites and all outfalls associated with Bayou Creek and Little Bayou Creek had calculated mean lead concentrations and 95 percent confidence intervals above the estimated limit of 0.003 mg/L. In Bayou Creek, no statistically significant differences existed among the mean concentrations at any stream sampling site or outfall site. The situation was similar for Little Bayou Creek

Mercury

All calculated mean mercury concentrations at stream and outfall sampling sites in Bayou Creek and Little Bayou Creek (except K013) were well below the chronic water quality limit of 0.00091 mg/L. In 1993, outfall K013 showed a high mercury concentration of 25 mg/L, but the high concentration was only observed once and was an anomaly or error.

Technetium

All calculated mean concentrations of ^{99}Tc at the stream and outfall sampling sites in Bayou Creek were less than 25 pCi/L. The mean concentration for all stream sites was 7.4 pCi/L. The mean concentration for all outfalls was 16.4 pCi/L.

At the Little Bayou Creek stream sites, the mean concentrations of ^{99}Tc were generally higher, with an average of 13.8 pCi/L and a high of 38 pCi/L. The average outfall concentration was 11.6 pCi/L in Little Bayou Creek.

Conclusions

TMDL development is not needed for iron, mercury, and ^{99}Tc. With the exception of sites along the North/South diversion ditch, the mean iron concentrations in the stream cannot be statistically distinguished from the limit of 1.0 mg/L. Although the number of samples analyzed for mercury is low, the concentrations were well below the limit of 0.00091 mg/L, and no other information suggests that mercury is a potential issue in Bayou Creek or Little Bayou Creek. The mean concentrations of ^{99}Tc are trivial compared to the DOE guideline of 900 pCi/L and are less than the Kentucky limit of 50 pCi/L for gross *Beta* radiation.

TMDL development should proceed for copper and lead in Bayou Creek and Little Bayou Creek. Since few, if any, statistically significant differences exist among the upstream and downstream sampling sites and among sites within the PGDP boundaries, addition monitoring is required to develop the TMDLs.

The impacts of outfall discharges from PGDP are statistically indeterminate, and additional flow and concentration data are needed upstream of PGDP. Furthermore, simultaneous flow and concentration data are needed for stream sites and outfall discharges within the plant site.

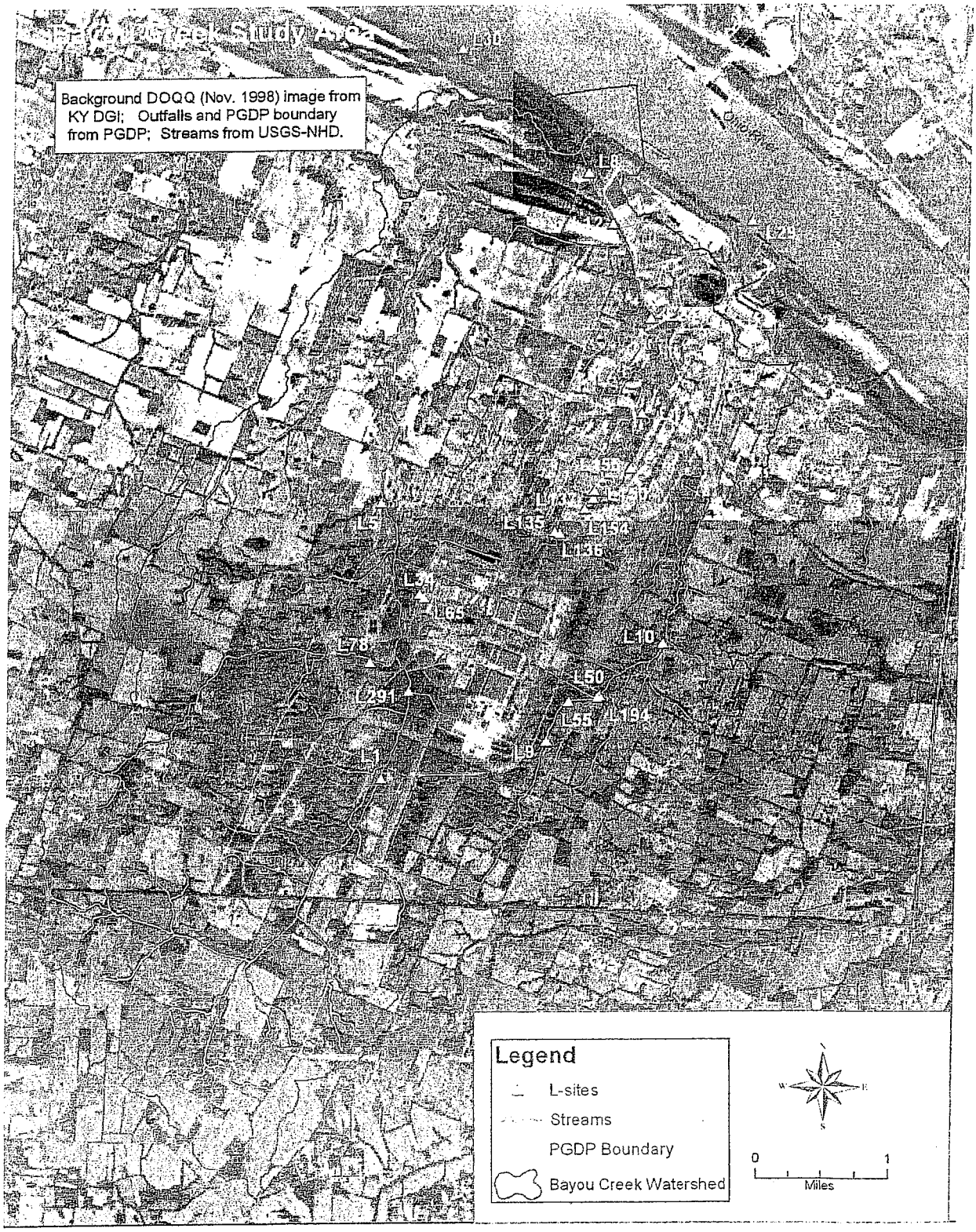
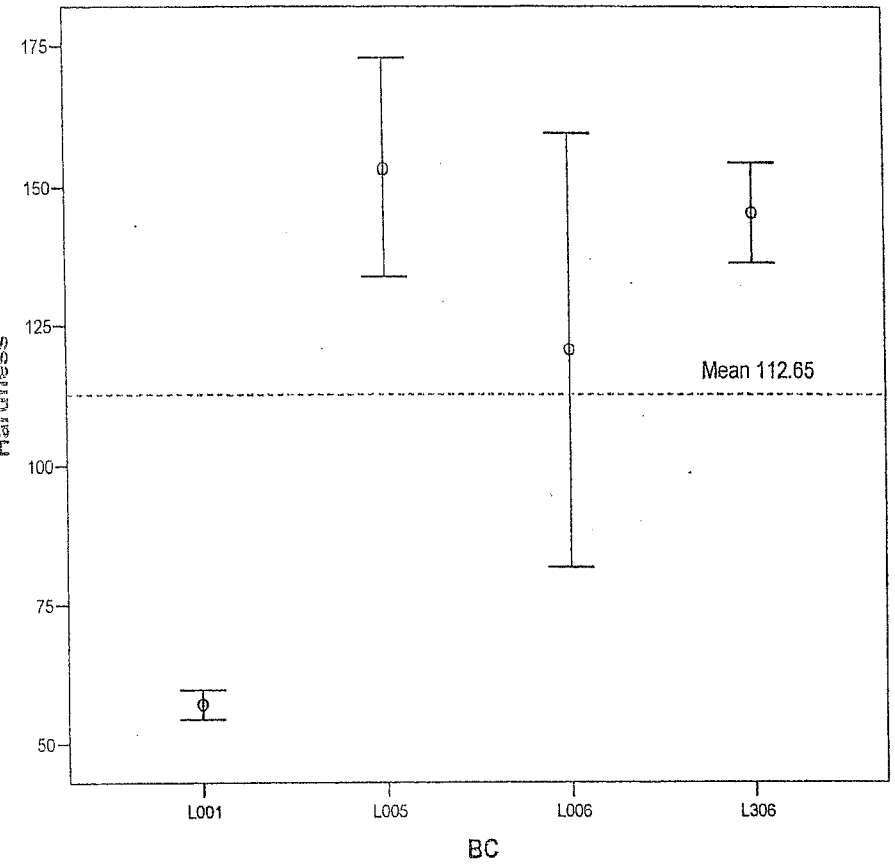
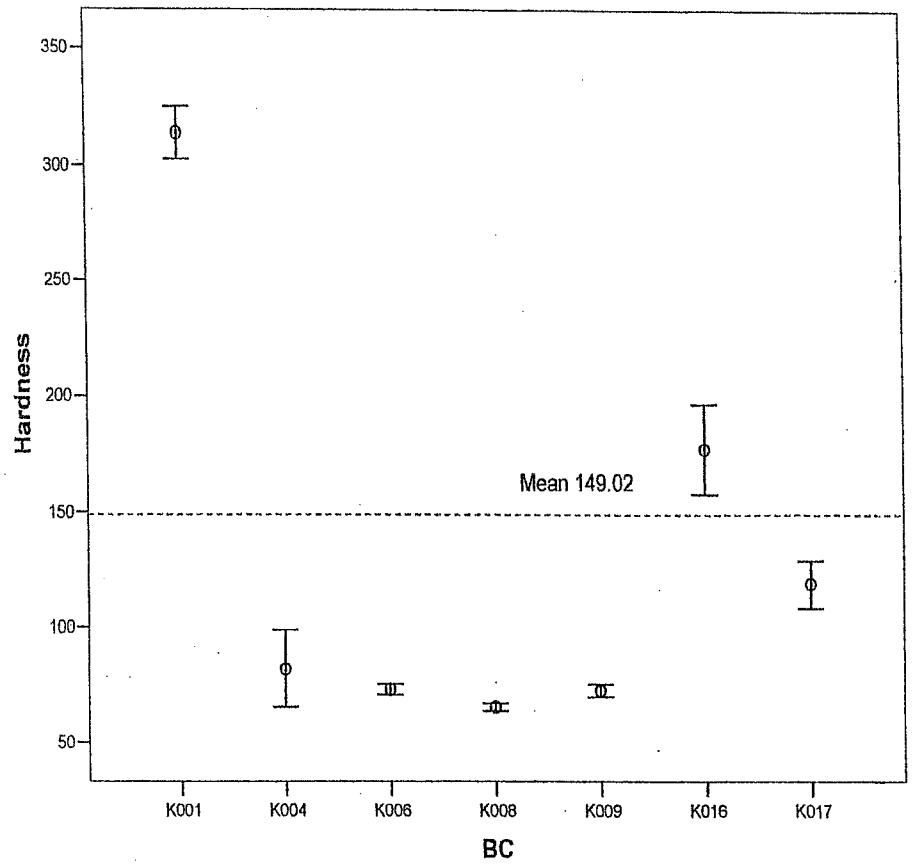


Figure 1 - L-sites study areas

Figure 2- K-sites study areas


175
150
125
100
75
50
Mean 112.65
L001
L005
L006
L306
BC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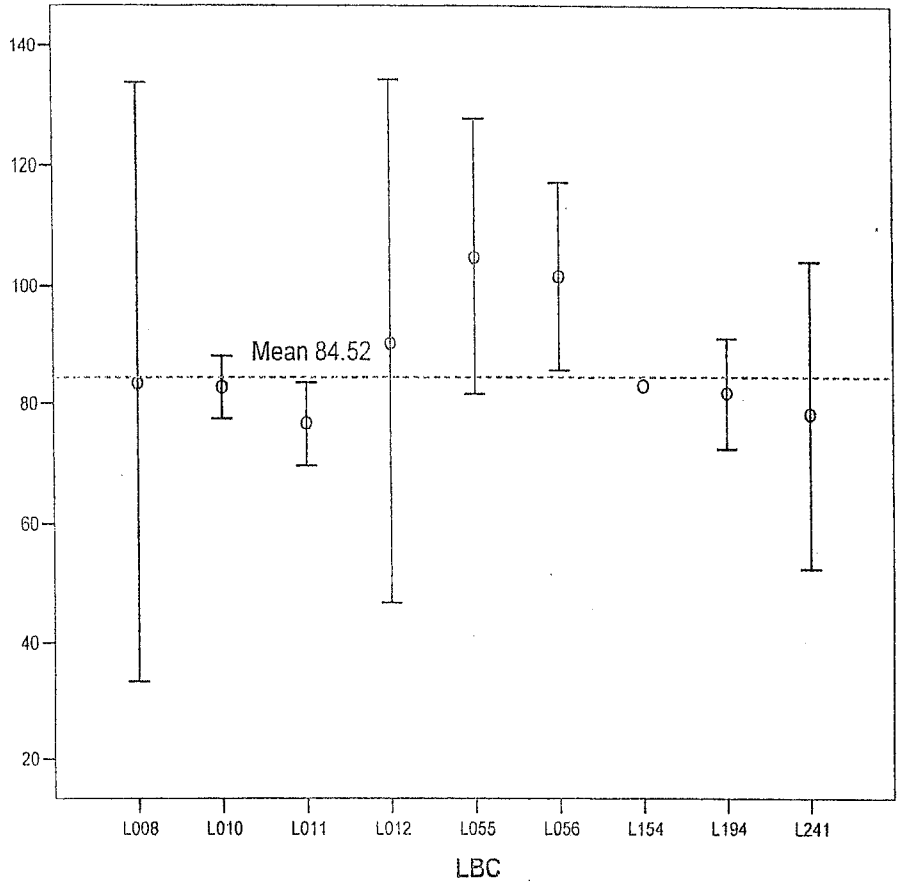
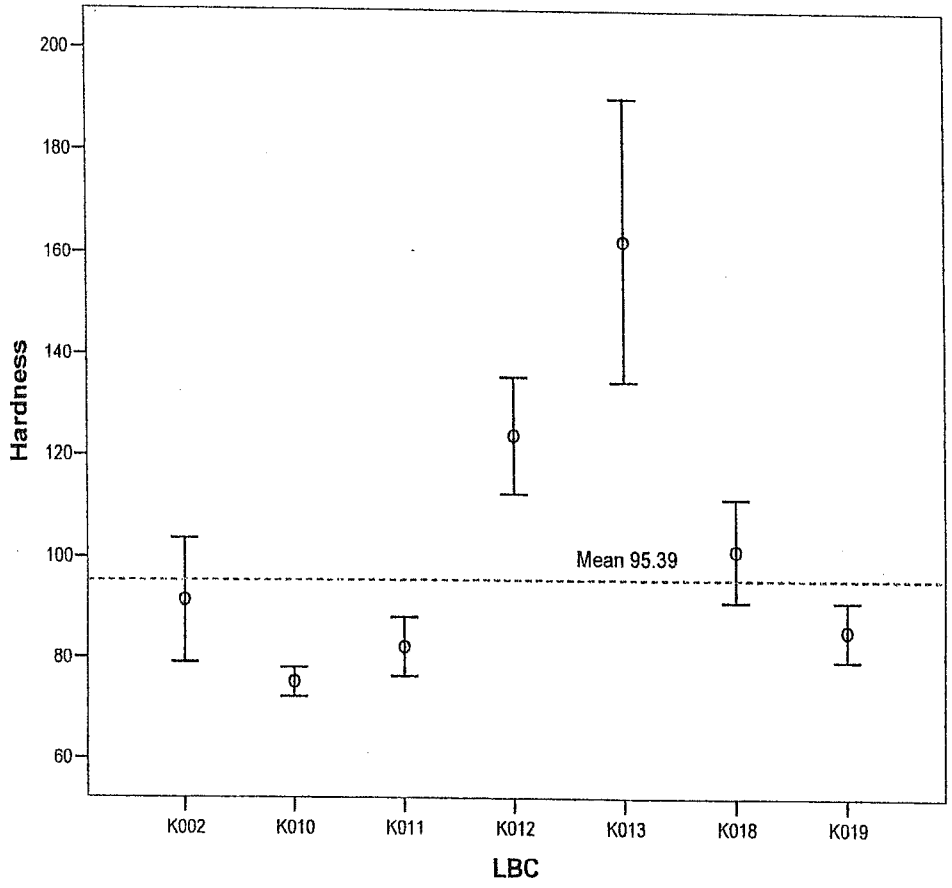
250
200
150
100
50
Mean 149.02
K001
K004
K006
K008
K009
K016
K017
BC


140
120
100
80
60
40
20
Mean 84.52
L008
L010
L011
L012
L055
L056
L154
L194
L241
LBC


Hardness
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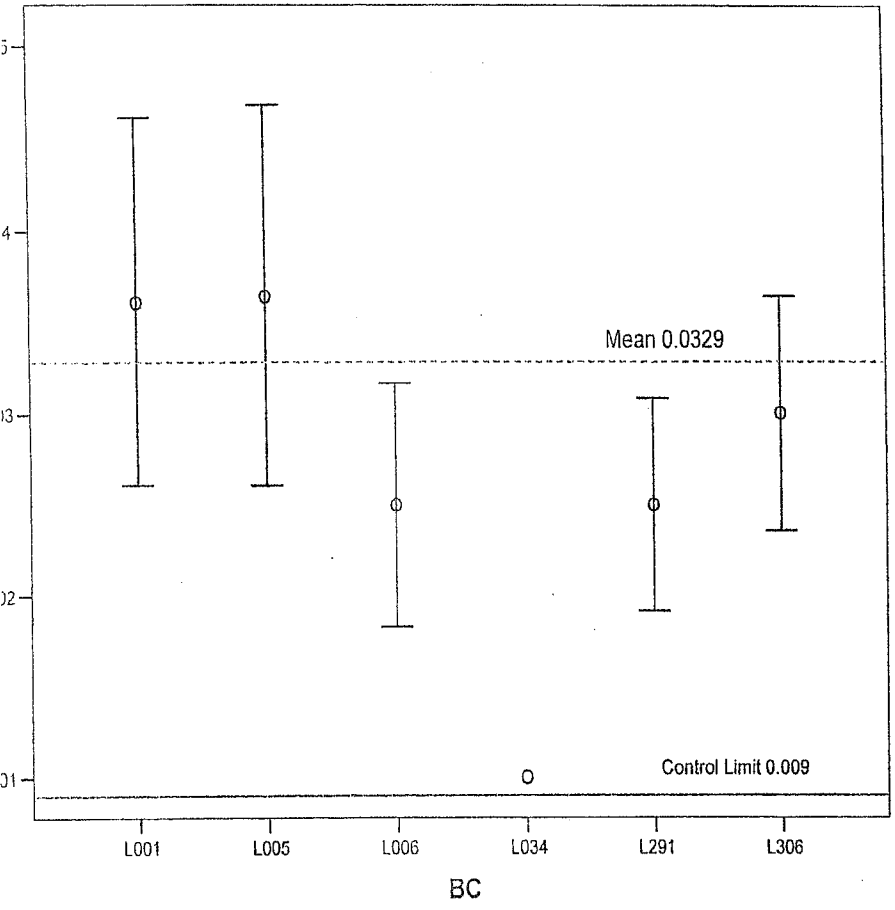
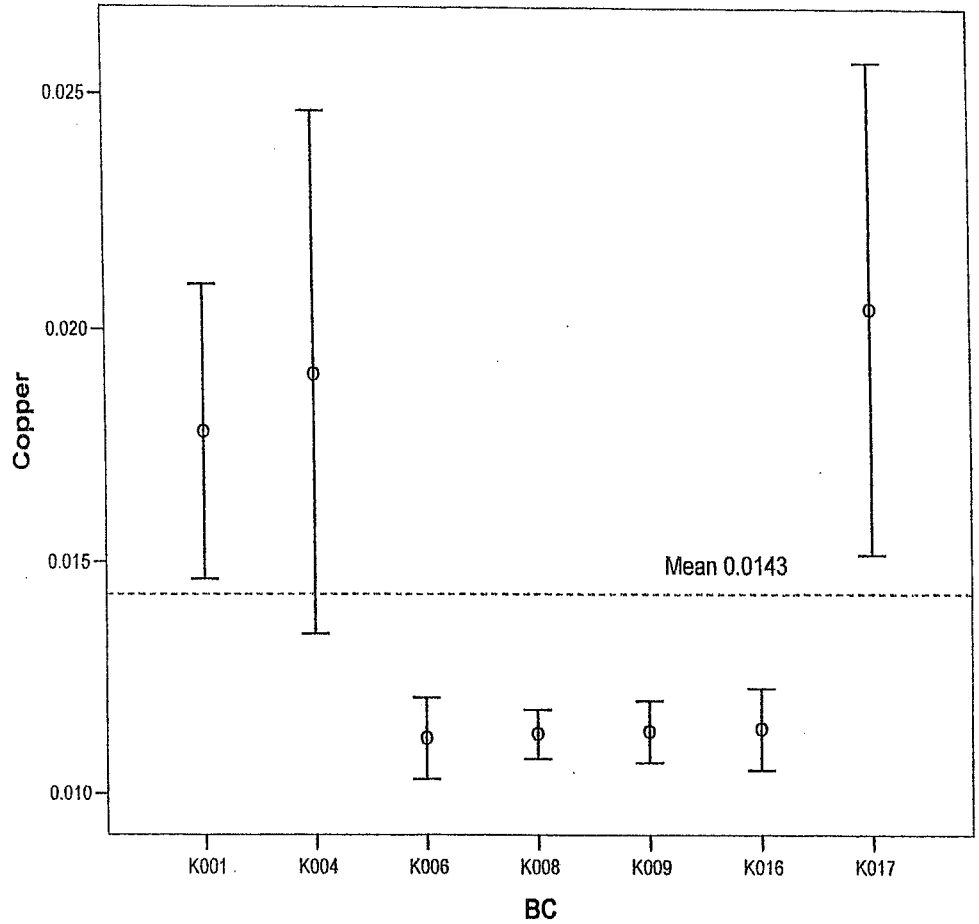
180
160
140
120
100
80
60
Mean 95.39
K002
K010
K011
K012
K013
K018
K019
LBC





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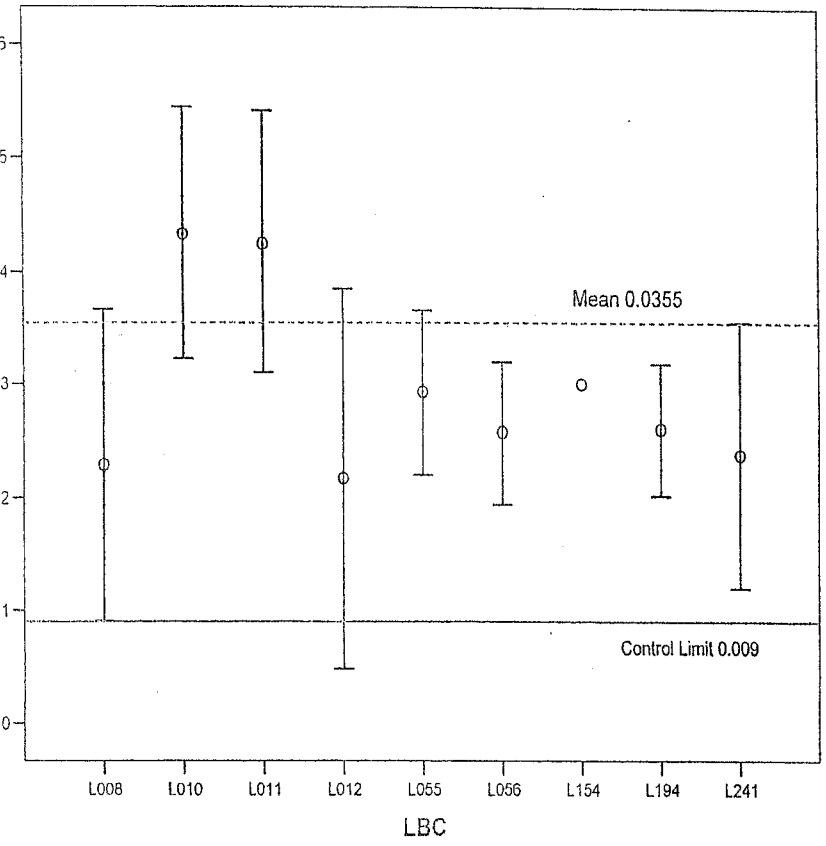
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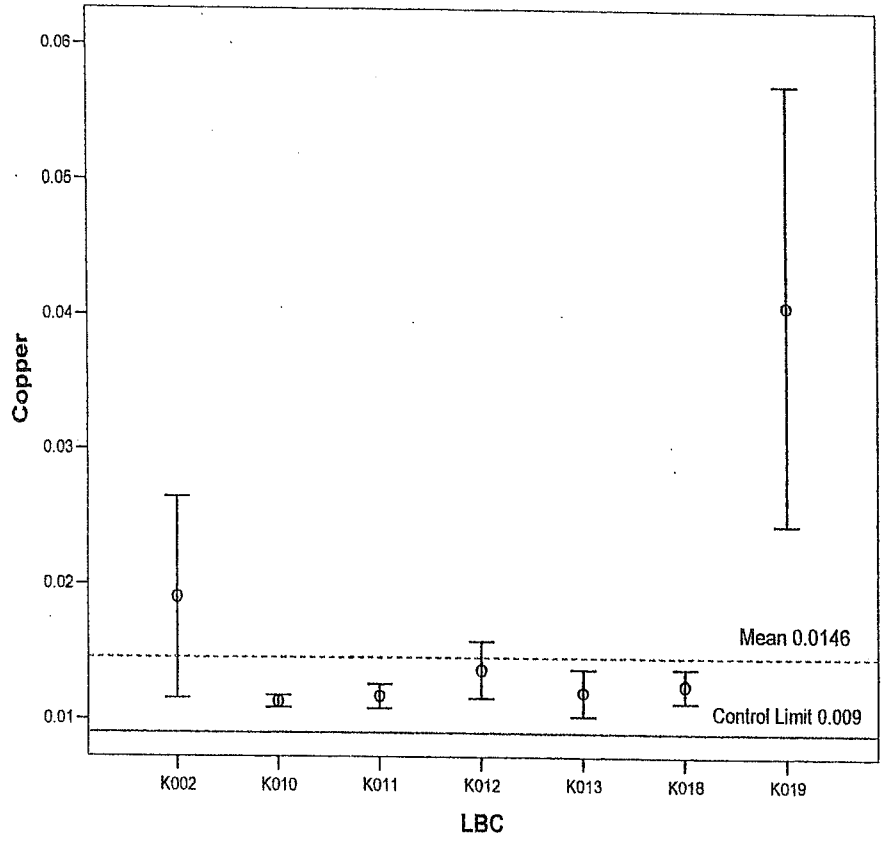
Control Limit 0.009
L008
L010
L011
L012
L055
L056
L154
L194
L241
LBC


Copper
0.06
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0.04
0.03
0.02
0.01
Mean 0.0146
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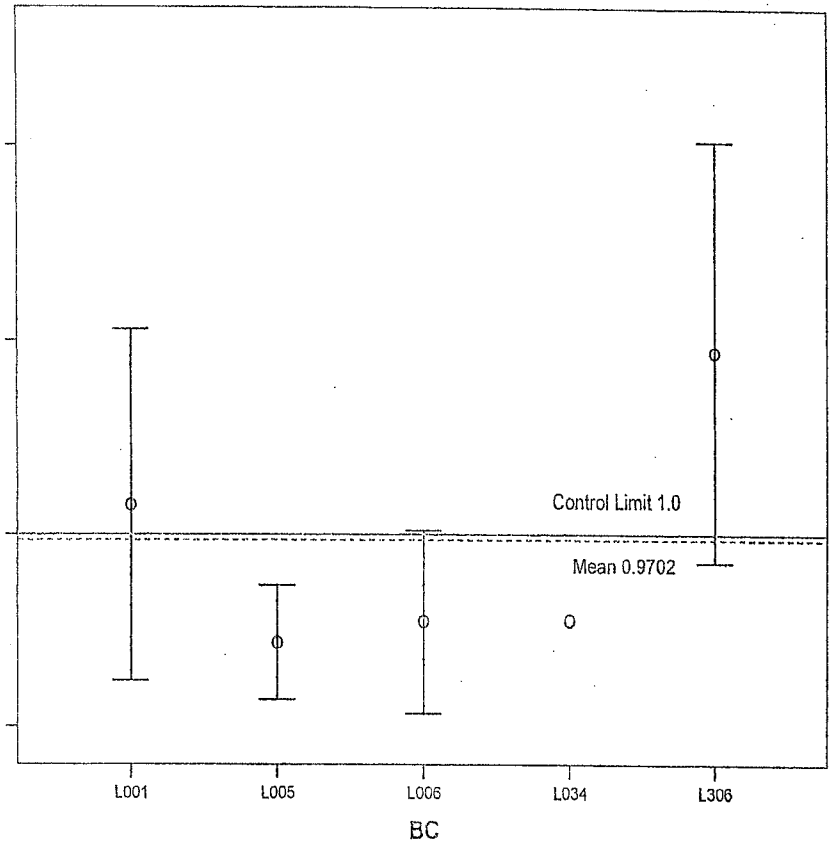
K002
K010
K011
K012
K013
K018
K019
LBC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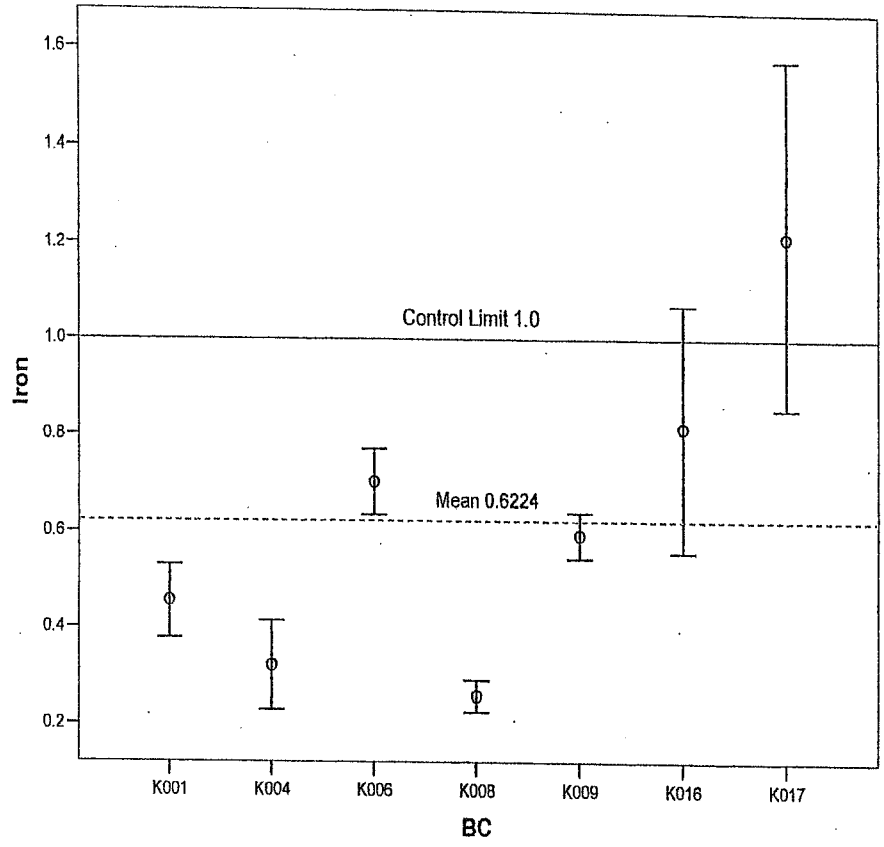
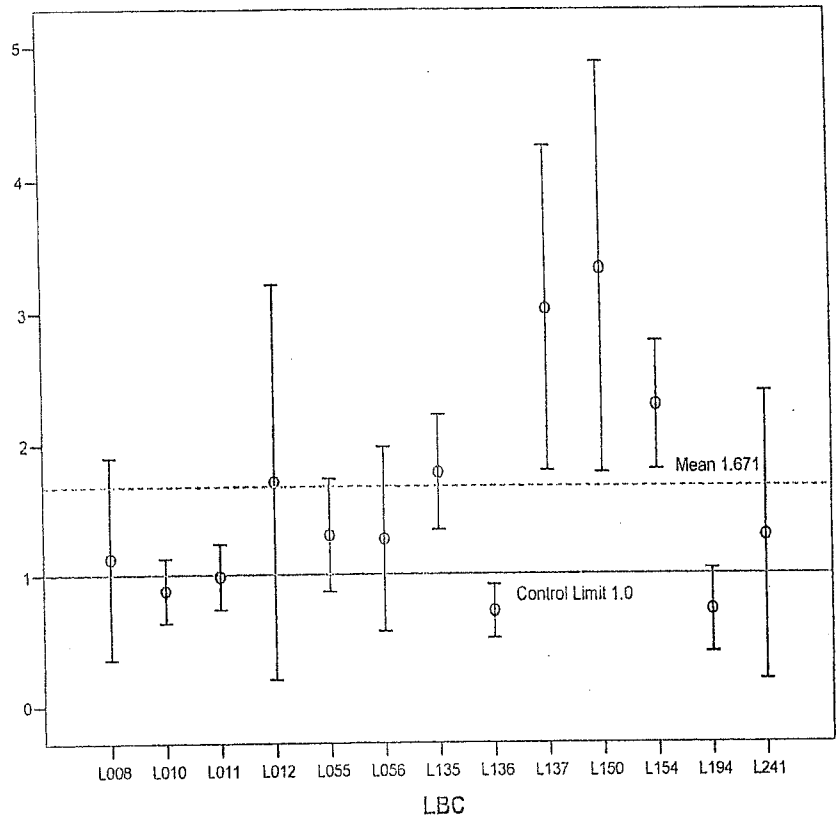
L001
L005
L006
L034
L306
BC


1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Iron
Control Limit 1.0
Mean 0.6224
K001
K004
K006
K008
K009
K016
K017
BC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4
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2
1
0
Mean 1.671
Control Limit 1.0
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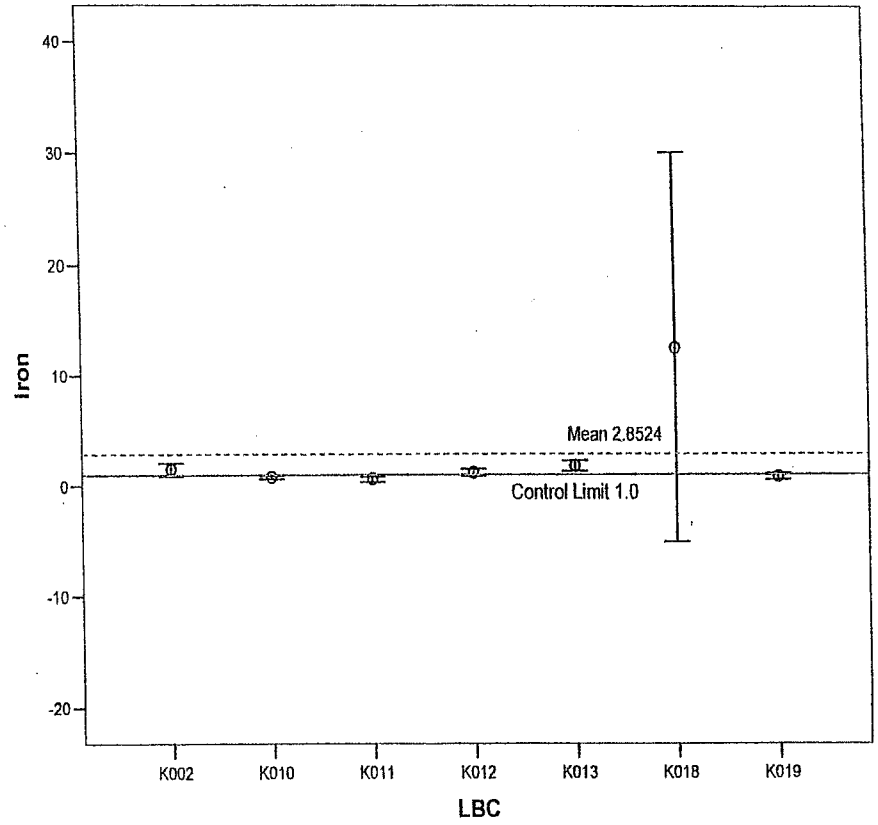
L011
L012
L055
L056
L135
L136
L137
L150
L154
L194
L241
LBC


40
30
20
10
0
-10
-20
Iron
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Control Limit 1.0
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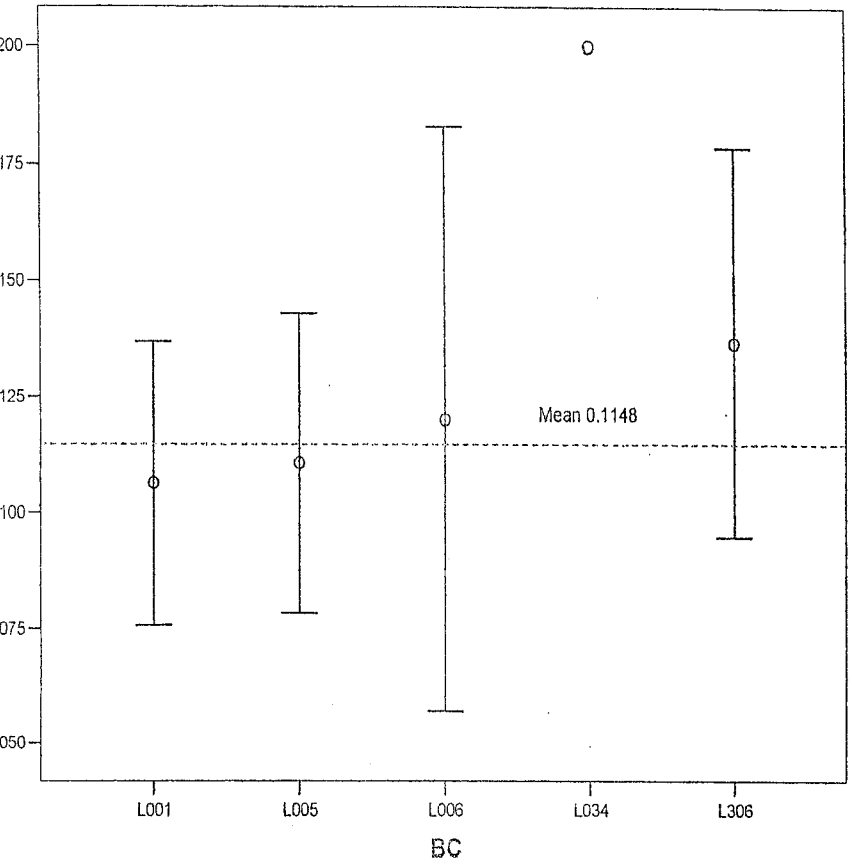
K010
K011
K012
K013
K018
K019
LBC



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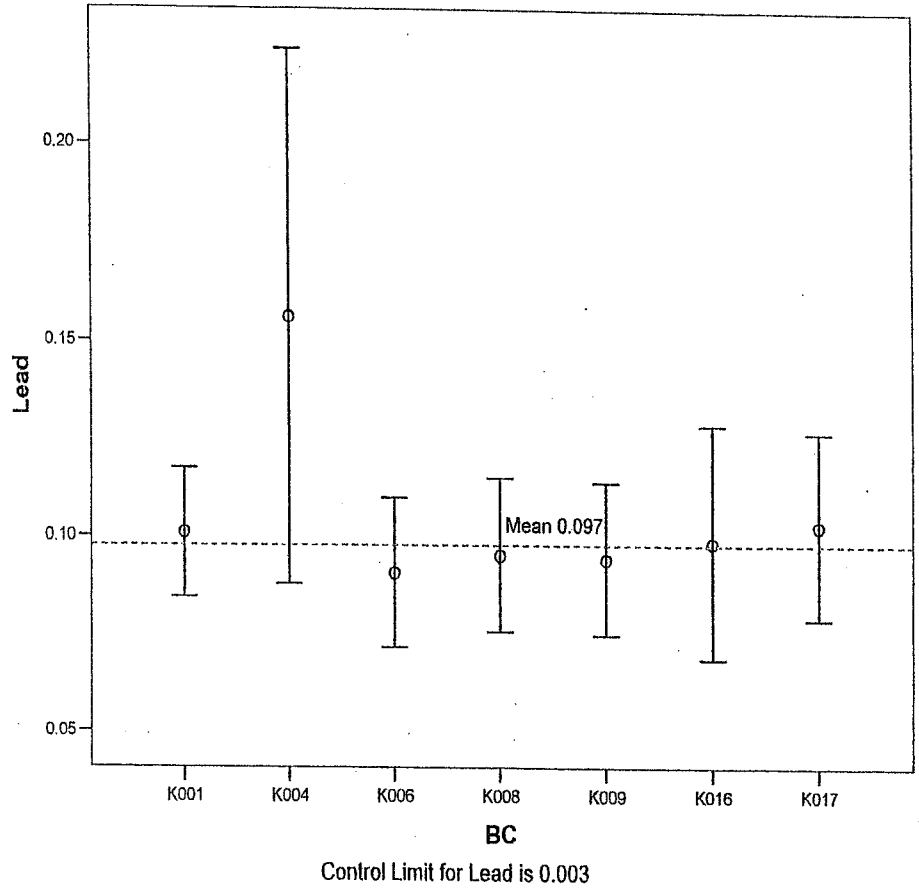
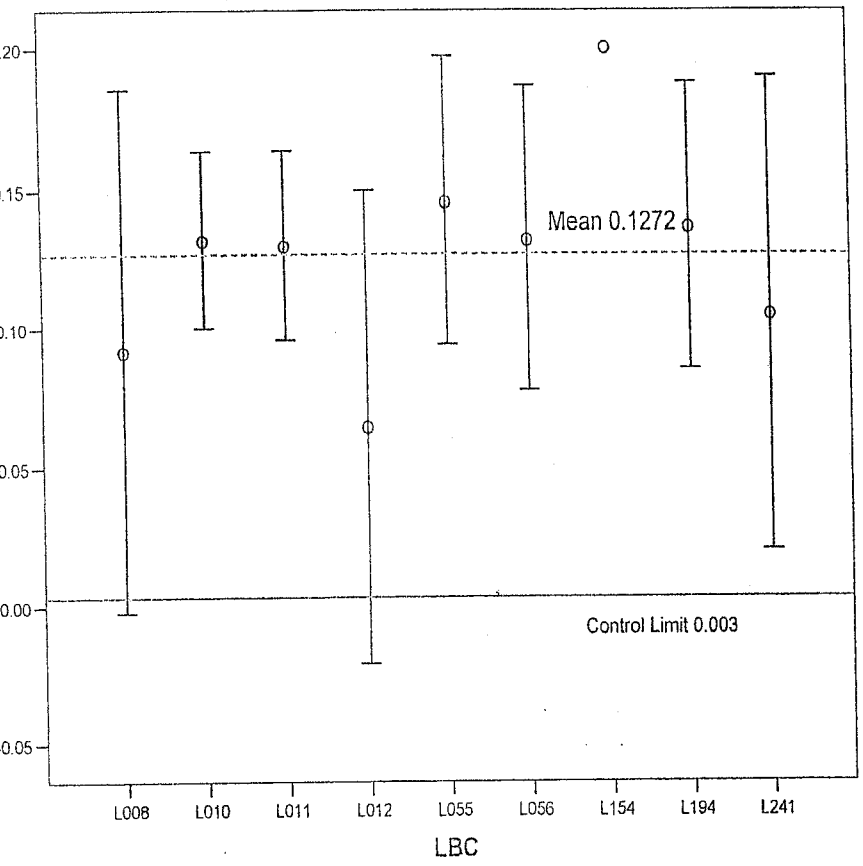
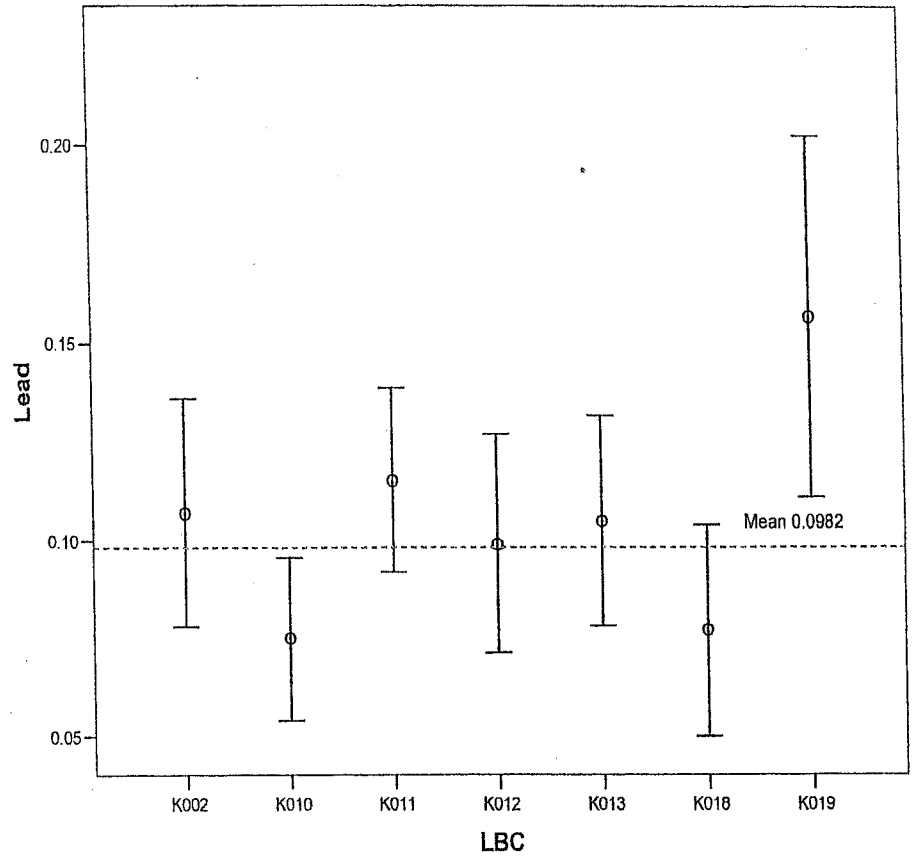
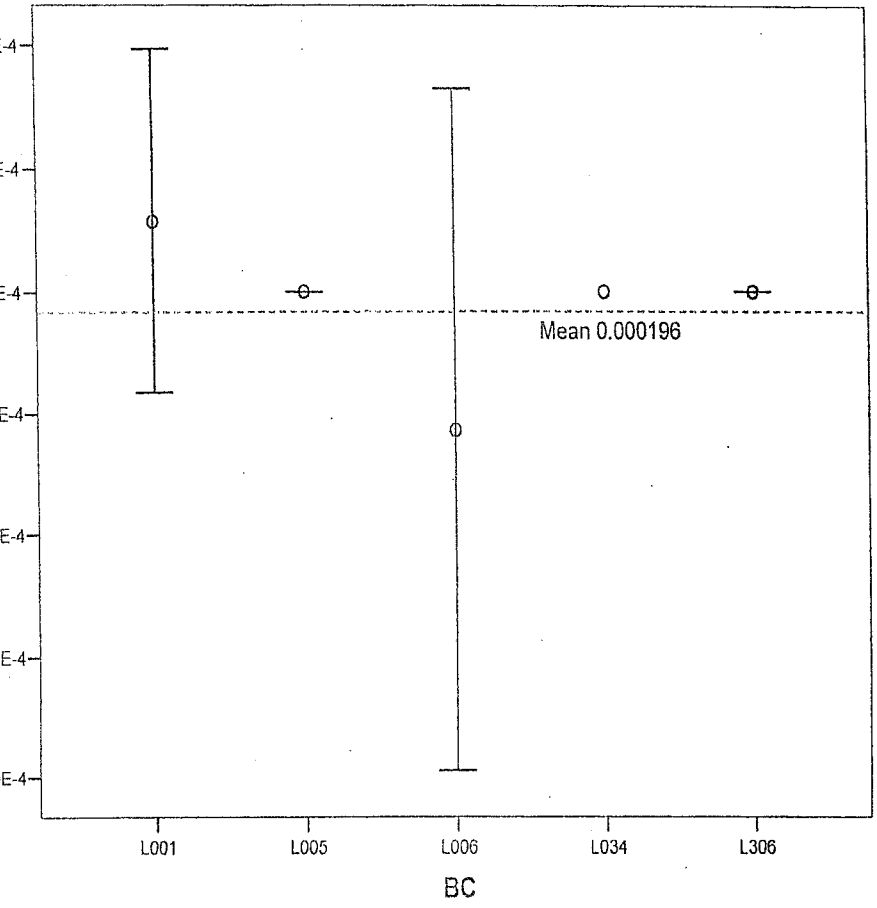


Control Limit for Lead is 0.003





Control Limit for Lead is 0.003



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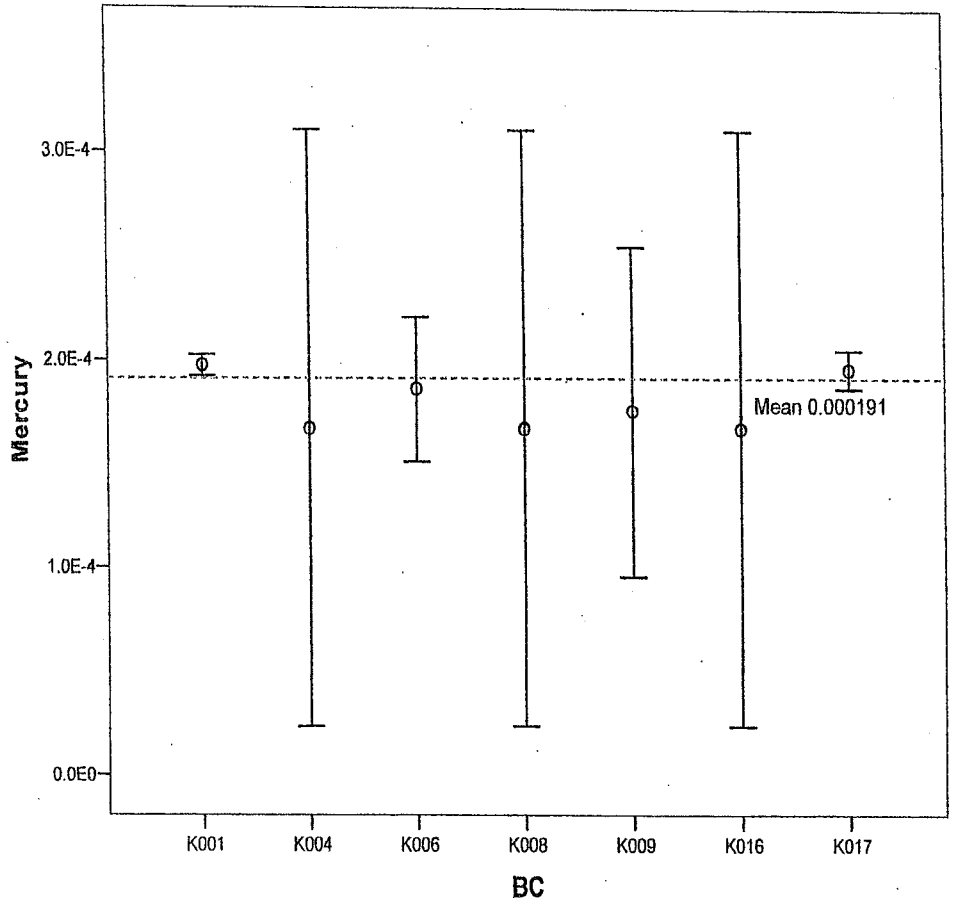
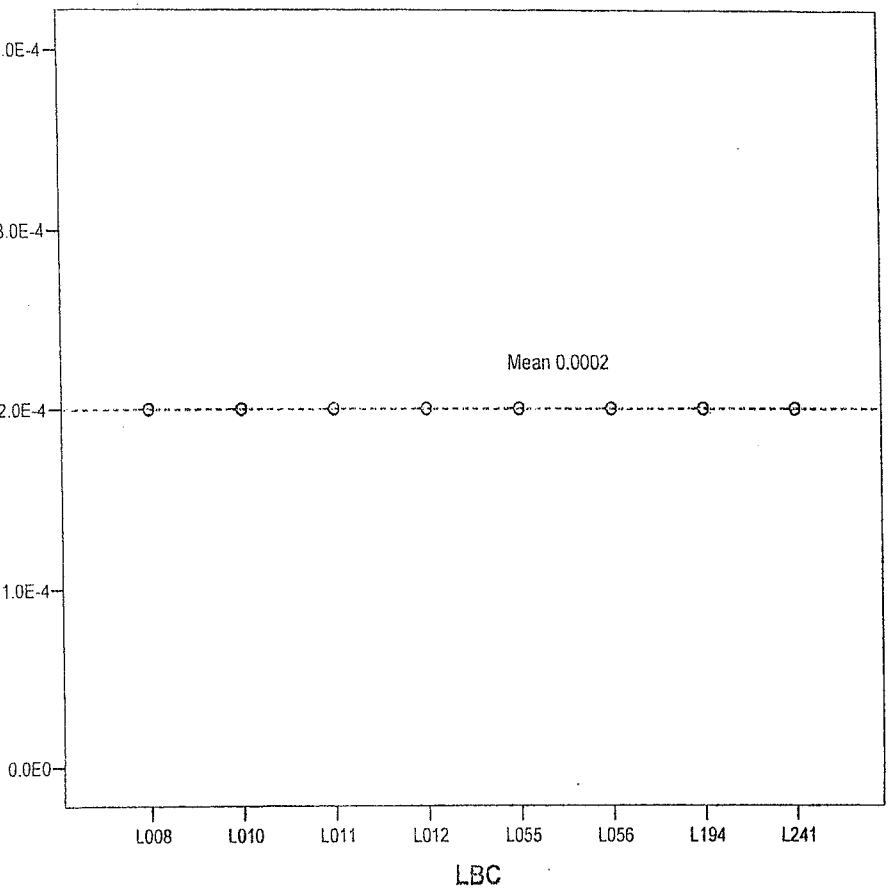


Control Limit for Mercury is 0.00091



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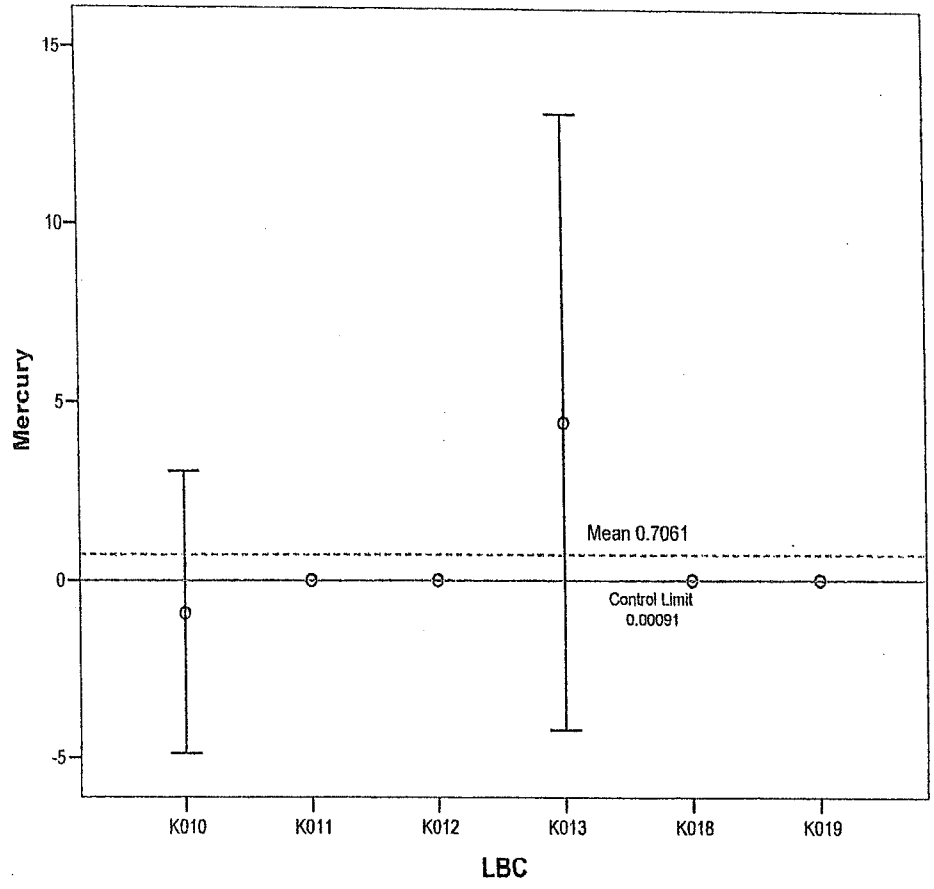
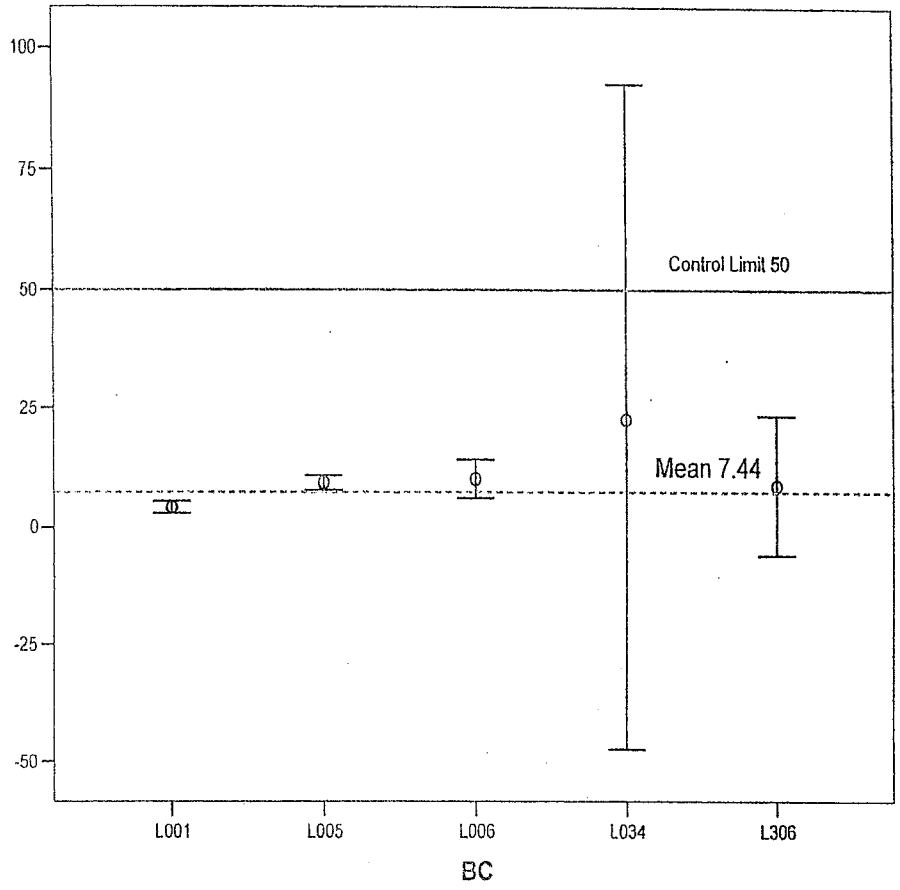
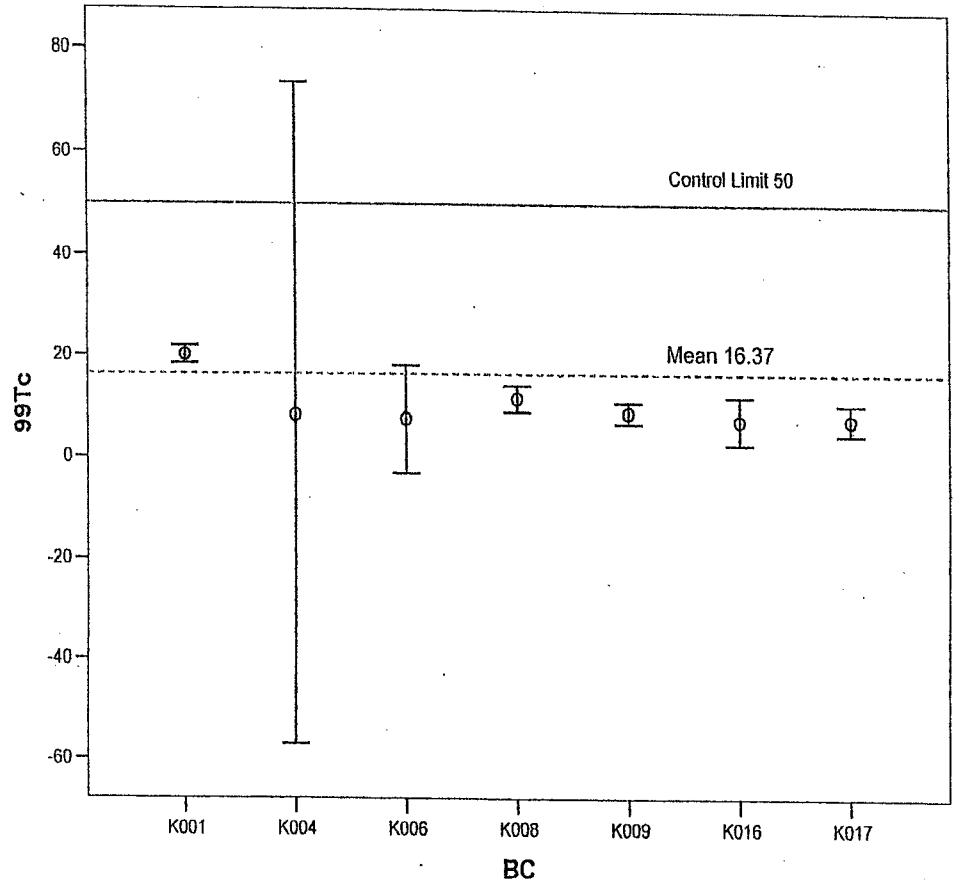
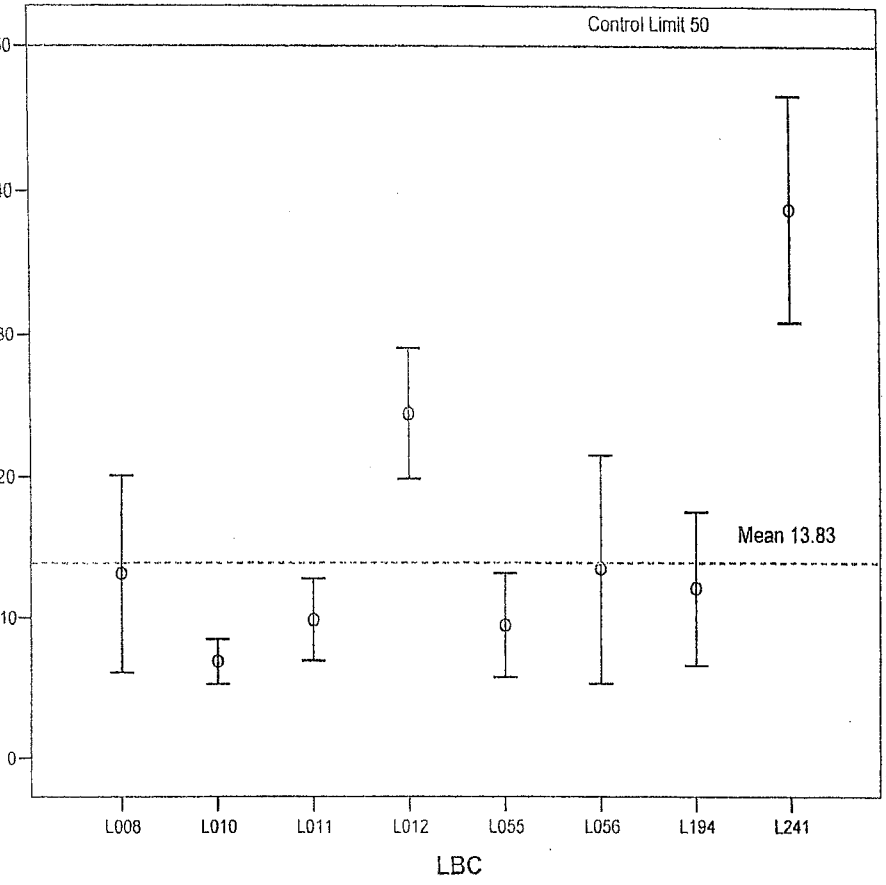
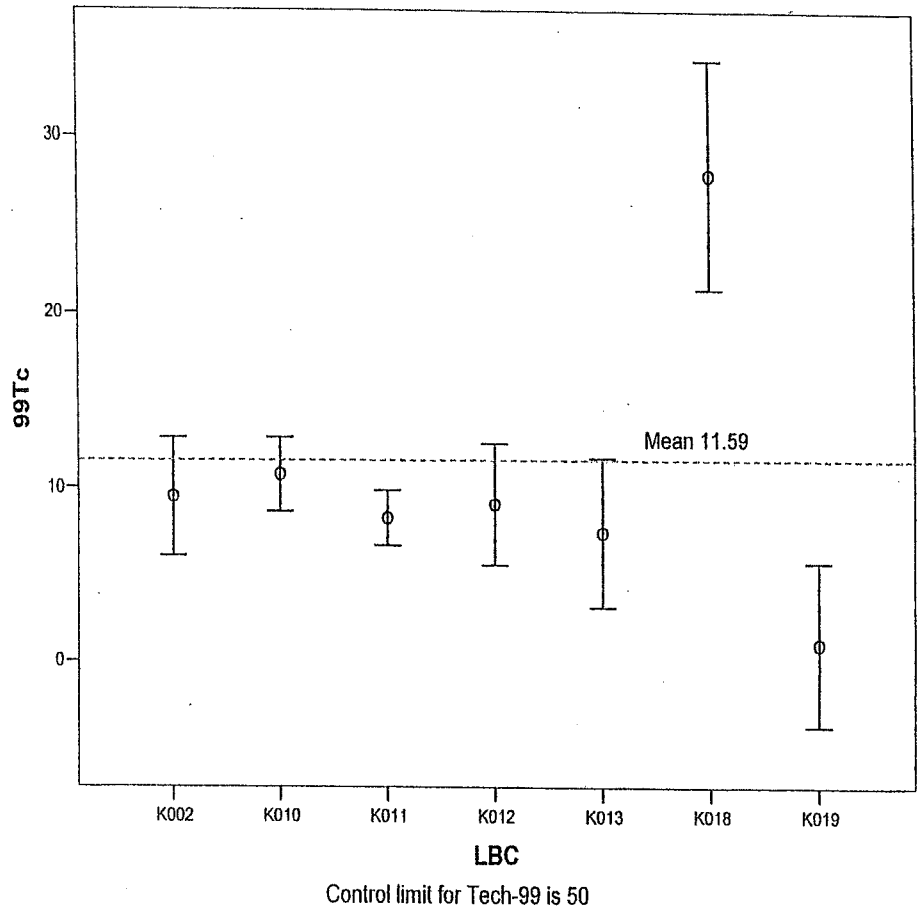



100
75
50
25
0
-25
-50
Control Limit 50
Mean 7.44
L001
L005
L006
L034
L306
BC


80
60
40
20
0
-20
-40
-60
99Tc
Control Limit 50
Mean 16.37
K001
K004
K006
K008
K009
K016
K017
BC





Control limit for Tech-99 is 50

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DATE$	REFDATE	STATNAME$	STATION$	COPPER	HARDNESS
IRON	LEAD	MERCURY	TECH99		

The following results are for:
STATNAME$ = BC
STATION$ = L001

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	45	49	51	49	7
Minimum	32.000	0.010	0.200	0.000	0.000
Maximum	80.000	0.100	23.400	0.250	0.000
Mean	57.111	0.036	1.149	0.106	0.000
95% CI Upper	59.814	0.046	2.056	0.137	0.000
95% CI Lower	54.408	0.026	0.242	0.076	0.000

	TECH99
N of cases	110
Minimum	-17.000
Maximum	27.000
Mean	4.218
95% CI Upper	5.553
95% CI Lower	2.883

The following results are for:
STATNAME$ = BC
STATION$ = L291

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	0	16	0	0	0
Minimum	.	0.010	.	.	.
Maximum	.	0.050	.	.	.
Mean	.	0.025	.	.	.
95% CI Upper	0.000	0.031	0.000	0.000	0.000
95% CI Lower	0.000	0.019	0.000	0.000	0.000

	TECH99
N of cases	0
Minimum	.
Maximum	.
Mean	.
95% CI Upper	0.000
95% CI Lower	0.000

The following results are for:
STATNAME$ = BC
STATION$ = L306

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	21	21	21	21	6
Minimum	92.000	0.010	0.200	0.010	0.000
Maximum	170.000	0.050	7.630	0.200	0.000
Mean	145.238	0.030	1.937	0.137	0.000
95% CI Upper	154.327	0.036	3.020	0.178	0.000
95% CI Lower	136.149	0.024	0.853	0.095	0.000

	TECH99
N of cases	21
Minimum	-6.000
Maximum	148.000
Mean	8.714
95% CI Upper	23.381
95% CI Lower	-5.953

The following results are for:
STATNAME$ = BC
STATION$ = L034

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	0	1	1	1	1
Minimum	.	0.010	0.550	0.200	0.000
Maximum	.	0.010	0.550	0.200	0.000
Mean	.	0.010	0.550	0.200	0.000
95% CI Upper	0.000	0.010	0.550	0.200	0.000
95% CI Lower	0.000	0.010	0.550	0.200	0.000

	TECH99
N of cases	2
Minimum	17.000
Maximum	28.000
Mean	22.500
95% CI Upper	92.384
95% CI Lower	-47.384

The following results are for:
STATNAME$ = BC
STATION$ = L005

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	43	45	44	45	4
Minimum	60.000	0.010	0.170	0.000	0.000
Maximum	308.000	0.100	6.710	0.250	0.000
Mean	153.209	0.036	0.437	0.111	0.000
95% CI Upper	172.711	0.047	0.733	0.143	0.000
95% CI Lower	133.707	0.026	0.140	0.078	0.000

	TECH99
N of cases	135
Minimum	-9.000
Maximum	45.000
Mean	9.385
95% CI Upper	10.924
95% CI Lower	7.847

The following results are for:
STATNAME$ = BC
STATION$ = L006

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	9	14	13	12	7
Minimum	63.000	0.010	0.200	0.000	0.000
Maximum	188.000	0.050	3.120	0.200	0.000
Mean	120.556	0.025	0.545	0.120	0.000
95% CI Upper	159.563	0.032	1.020	0.183	0.000
95% CI Lower	81.548	0.018	0.070	0.057	0.000

	TECH99
N of cases	13
Minimum	-3.000
Maximum	22.000
Mean	10.154
95% CI Upper	14.138
95% CI Lower	6.169

The following results are for:
STATNAME$ = LBC
STATION$ = L010

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	44	44	50	43	4
Minimum	38.000	0.010	0.200	0.000	0.000
Maximum	116.000	0.100	4.550	0.250	0.000
Mean	82.841	0.044	0.881	0.130	0.000
95% CI Upper	88.305	0.055	1.133	0.163	0.000
95% CI Lower	77.377	0.033	0.630	0.098	0.000

	TECH99
N of cases	91
Minimum	0.000
Maximum	47.000
Mean	6.758
95% CI Upper	8.392
95% CI Lower	5.124

The following results are for:
STATNAME$ = LBC
STATION$ = L011

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	40	41	41	41	5
Minimum	37.000	0.010	0.200	0.000	0.000
Maximum	180.000	0.100	3.590	0.250	0.000
Mean	76.600	0.042	0.982	0.132	0.000
95% CI Upper	83.546	0.053	1.227	0.165	0.000
95% CI Lower	69.654	0.030	0.738	0.098	0.000

	TECH99
N of cases	30
Minimum	0.000
Maximum	29.000
Mean	9.967
95% CI Upper	12.865
95% CI Lower	7.068

The following results are for:
STATNAME$ = LBC
STATION$ = L012

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	5	6	7	7	6
Minimum	51.000	0.010	0.200	0.010	0.000
Maximum	131.000	0.050	4.800	0.200	0.000
Mean	90.400	0.022	1.909	0.064	0.000
95% CI Upper	134.155	0.038	3.616	0.150	0.000
95% CI Lower	46.645	0.005	0.201	-0.021	0.000

	TECH99
N of cases	23
Minimum	8.000
Maximum	45.000
Mean	23.783
95% CI Upper	28.361
95% CI Lower	19.204

The following results are for:
STATNAME$ = LBC
STATION$ = L135

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	0	0	45	0	0
Minimum	.	.	0.200	.	.
Maximum	.	.	7.680	.	.
Mean	.	.	1.781	.	.
95% CI Upper	0.000	0.000	2.218	0.000	0.000
95% CI Lower	0.000	0.000	1.343	0.000	0.000

	TECH99
N of cases	0
Minimum	.
Maximum	.
Mean	.
95% CI Upper	0.000
95% CI Lower	0.000

The following results are for:
STATNAME$ = LBC
STATION$ = L136

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	0	0	45	0	0
Minimum	.	.	0.200	.	.
Maximum	.	.	2.850	.	.
Mean	.	.	0.714	.	.
95% CI Upper	0.000	0.000	0.918	0.000	0.000
95% CI Lower	0.000	0.000	0.509	0.000	0.000

	TECH99
N of cases	0
Minimum	.
Maximum	.
Mean	.
95% CI Upper	0.000
95% CI Lower	0.000

The following results are for:
STATNAME$ = LBC
STATION$ = L137

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	0	0	42	0	0
Minimum	.	.	0.380	.	.
Maximum	.	.	7.050	.	.
Mean	.	.	2.412	.	.
95% CI Upper	0.000	0.000	2.904	0.000	0.000
95% CI Lower	0.000	0.000	1.921	0.000	0.000

	TECH99
N of cases	0
Minimum	.
Maximum	.
Mean	.
95% CI Upper	0.000
95% CI Lower	0.000

The following results are for:
STATNAME$ = LBC
STATION$ = L150

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	0	0	34	0	0
Minimum	.	.	0.270	.	.
Maximum	.	.	26.000	.	.
Mean	.	.	4.043	.	.
95% CI Upper	0.000	0.000	6.099	0.000	0.000
95% CI Lower	0.000	0.000	1.987	0.000	0.000

	TECH99
N of cases	0
Minimum	.
Maximum	.
Mean	.
95% CI Upper	0.000
95% CI Lower	0.000

The following results are for:
STATNAME$ = LBC
STATION$ = L154

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	0	0	39	0	0
Minimum	.	.	0.510	.	.
Maximum	.	.	7.600	.	.
Mean	.	.	2.295	.	.
95% CI Upper	0.000	0.000	2.785	0.000	0.000
95% CI Lower	0.000	0.000	1.804	0.000	0.000

	TECH99
N of cases	0
Minimum	.
Maximum	.
Mean	.
95% CI Upper	0.000
95% CI Lower	0.000

The following results are for:
STATNAME$ = LBC
STATION$ = L194

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	16	16	16	16	4
Minimum	57.000	0.010	0.210	0.010	0.000
Maximum	118.000	0.050	2.090	0.200	0.000
Mean	81.875	0.026	0.778	0.141	0.000
95% CI Upper	90.620	0.032	1.095	0.189	0.000
95% CI Lower	73.130	0.021	0.461	0.092	0.000

	TECH99
N of cases	12
Minimum	1.000
Maximum	29.000
Mean	10.917
95% CI Upper	16.318
95% CI Lower	5.515

The following results are for:
STATNAME$ = LBC
STATION$ = L241

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	4	7	7	7	7
Minimum	48.000	0.010	0.320	0.010	0.000
Maximum	89.000	0.050	4.150	0.200	0.000
Mean	71.750	0.023	1.143	0.091	0.000
95% CI Upper	99.322	0.037	2.383	0.185	0.000
95% CI Lower	44.178	0.009	-0.097	-0.002	0.000

	TECH99
N of cases	26
Minimum	8.000
Maximum	79.000
Mean	38.154
95% CI Upper	45.773
95% CI Lower	30.535

The following results are for:
STATNAME$ = LBC
STATION$ = L055

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	10	14	14	14	4
Minimum	41.000	0.010	0.260	0.010	0.000
Maximum	142.000	0.050	2.370	0.200	0.000
Mean	106.100	0.029	1.281	0.146	0.000
95% CI Upper	128.856	0.037	1.692	0.197	0.000
95% CI Lower	83.344	0.022	0.871	0.094	0.000

	TECH99
N of cases	10
Minimum	3.000
Maximum	21.000
Mean	9.400
95% CI Upper	13.066
95% CI Lower	5.734

The following results are for:
STATNAME$ = LBC
STATION$ = L056

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	15	15	15	15	4
Minimum	56.000	0.010	0.280	0.010	0.000
Maximum	156.000	0.050	4.790	0.200	0.000
Mean	100.733	0.026	1.367	0.137	0.000
95% CI Upper	115.353	0.032	2.050	0.188	0.000
95% CI Lower	86.114	0.020	0.683	0.085	0.000

	TECH99
N of cases	10
Minimum	2.000
Maximum	40.000
Mean	13.500
95% CI Upper	22.613
95% CI Lower	4.387

The following results are for:
STATNAME$ = LBC
STATION$ = L008

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	4	7	7	7	6
Minimum	42.000	0.010	0.670	0.010	0.000
Maximum	115.000	0.050	2.990	0.200	0.000
Mean	83.500	0.023	1.126	0.091	0.000
95% CI Upper	133.693	0.037	1.897	0.185	0.000
95% CI Lower	33.307	0.009	0.355	-0.002	0.000

	TECH99
N of cases	22
Minimum	-3.000
Maximum	69.000
Mean	13.000
95% CI Upper	19.657
95% CI Lower	6.343

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created Sun Dec 04, 2005 at 22:11:17, contains variables:

DATE$	REFDATE	STATION$	STANAME$	COPPER	HARDNESS
IRON	LEAD	MERCURY	TECH99		

The following results are for:
STANAME$ = BC
STATION$ = K001

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	310	144	144	143	39
Minimum	59.000	0.005	0.059	0.001	0.000
Maximum	530.000	0.100	4.690	0.250	0.000
Mean	313.516	0.018	0.455	0.101	0.000
95% CI Upper	324.349	0.021	0.531	0.117	0.000
95% CI Lower	302.683	0.015	0.379	0.084	0.000

	TECH99
N of cases	282
Minimum	0.000
Maximum	99.000
Mean	20.099
95% CI Upper	21.847
95% CI Lower	18.351

The following results are for:
STANAME$ = LBC
STATION$ = K002

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	57	58	58	58	0
Minimum	32.000	0.005	0.140	0.003	.
Maximum	316.000	0.222	16.600	0.510	.
Mean	91.421	0.019	1.525	0.107	.
95% CI Upper	103.725	0.027	2.109	0.136	0.000
95% CI Lower	79.117	0.012	0.941	0.078	0.000

	TECH99
N of cases	30
Minimum	0.000
Maximum	33.000
Mean	9.468
95% CI Upper	12.884
95% CI Lower	6.051

The following results are for:
STANAME$ = BC
STATION$ = K004

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	7	8	8	8	3
Minimum	57.000	0.010	0.166	0.020	0.000
Maximum	105.000	0.025	0.490	0.200	0.000
Mean	82.143	0.019	0.322	0.156	0.000
95% CI Upper	98.837	0.025	0.414	0.224	0.000
95% CI Lower	65.449	0.013	0.229	0.088	0.000

	TECH99
N of cases	2
Minimum	3.040
Maximum	13.300
Mean	8.170
95% CI Upper	73.353
95% CI Lower	-57.013

The following results are for:
STANAME$ = BC
STATION$ = K006

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	203	101	101	101	7
Minimum	50.000	0.004	0.085	0.003	0.000
Maximum	132.000	0.050	2.020	0.200	0.000
Mean	73.443	0.011	0.702	0.091	0.000
95% CI Upper	75.784	0.012	0.769	0.110	0.000
95% CI Lower	71.103	0.010	0.635	0.071	0.000

	TECH99
N of cases	4
Minimum	0.000
Maximum	16.000
Mean	7.425
95% CI Upper	18.072
95% CI Lower	-3.222

The following results are for:
STANAME$ = BC
STATION$ = K008

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	199	96	96	97	3
Minimum	38.000	0.006	0.108	0.003	0.000
Maximum	96.000	0.025	1.160	0.250	0.000
Mean	65.543	0.011	0.258	0.095	0.000
95% CI Upper	67.133	0.012	0.291	0.115	0.000
95% CI Lower	63.952	0.011	0.225	0.075	0.000

	TECH99
N of cases	46
Minimum	0.000
Maximum	37.000
Mean	11.478
95% CI Upper	14.118
95% CI Lower	8.839

The following results are for:
STANAME$ = BC
STATION$ = K009

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	199	97	97	98	4
Minimum	16.000	0.003	0.105	0.003	0 .0 00
Maximum	140.000	0.034	1.410	0.250	0 .0 00
Mean	72.935	0.011	0.593	0.094	0 .0 00
95% CI Upper	75.733	0.012	0.640	0.114	0 .000
95% CI Lower	70.136	0.011	0.546	0.074	0 .000

	TECH99
N of cases	48
Minimum	0.000
Maximum	26.000
Mean	8.625
95% CI Upper	10.681
95% CI Lower	6.569

The following results are for:
STANAME$ = LBC
STATION$ = K010

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	147	80	80	80	3
Minimum	46.000	0.006	0.129	0.003	-2.760
Maximum	168.000	0.025	4.630	0.200	0.000
Mean	75.238	0.011	0.808	0.075	-0.920
95% CI Upper	78.113	0.012	0.972	0.096	3.039
95% CI Lower	72.363	0.011	0.644	0.054	-4.879

	TECH99
N of cases	173
Minimum	0.000
Maximum	116.000
Mean	10.752
95% CI Upper	12.888
95% CI Lower	8.616

The following results are for:
STANAME$ = LBC
STATION$ = K011

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	104	69	68	68	4
Minimum	32.000	0.009	0.117	0.003	0.000
Maximum	210.000	0.030	8.380	0.204	0.000
Mean	82.154	0.012	0.610	0.115	0.000
95% CI Upper	87.952	0.013	0.857	0.139	0.000
95% CI Lower	76.356	0.011	0.364	0.092	0.000

	TECH99
N of cases	102
Minimum	0.000
Maximum	32.000
Mean	8.238
95 % CI Upper	9.826
95 % CI Lower	6.650

The following results are for:
STANAME$ = LBC
STATION$ = K012

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	49	50	50	50	4
Minimum	60.000	0.006	0.200	0.003	0.000
Maximum	270.000	0.050	6.600	0.200	0.000
Mean	123.776	0.014	1.202	0.099	0.000
95% CI Upper	135.323	0.016	1.522	0.127	0.000
95% CI Lower	112.228	0.012	0.882	0.071	-0.000

	TECH99
N of cases	22
Minimum	0.000
Maximum	24.000
Mean	9.033
95% CI Upper	12.565
95% CI Lower	5.501

The following results are for:
STANAME$ = LBC
STATION$ = K013

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	49	51	51	53	7
Minimum	45.000	0.006	0.090	0.003	0.000
Maximum	380.000	0.050	8.570	0.221	25.000
Mean	162.306	0.012	1.804	0.105	4.429
95% CI Upper	190.218	0.014	2.277	0.132	13.069
95% CI Lower	134.394	0.010	1.331	0.078	-4.212

	TECH99
N of cases	14
Minimum	0.000
Maximum	24.000
Mean	7.401
95% CI Upper	11.720
95% CI Lower	3.082

The following results are for:
STANAME$ = BC
STATION$ = K016

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	42	43	43	44	3
Minimum	78.000	0.006	0.047	0.003	0.000
Maximum	306.000	0.025	3.550	0.201	0.000
Mean	177.024	0.011	0.815	0.098	0.000
95% CI Upper	196.339	0.012	1.072	0.128	0.000
95% CI Lower	157.708	0.011	0.559	0.068	0.000

	TECH99
N of cases	13
Minimum	0.000
Maximum	19.000
Mean	7.077
95% CI Upper	11.708
95% CI Lower	2.445

The following results are for:
STANAME$ = BC
STATION$ = K017

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	151	81	81	80	22
Minimum	24.000	0.006	0.180	0.000	0.000
Maximum	466.000	0.100	8.180	0.425	0.000
Mean	118.483	0.020	1.215	0.103	0.000
95% CI Upper	128.649	0.026	1.578	0.126	0.000
95% CI Lower	108.318	0.015	0.853	0.079	0.000

	TECH99
N of cases	31
Minimum	0.000
Maximum	28.700
Mean	7.234
95% CI Upper	10.149
95% CI Lower	4.319

The following results are for:
STANAME$ = LBC
STATION$ = K018

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	58	59	59	59	3
Minimum	44.000	0.006	0.263	0.001	0.000
Maximum	196.000	0.038	520.000	0.450	0.000
Mean	101.138	0.013	12.478	0.077	0.000
95% CI Upper	111.270	0.014	30.053	0.104	0.000
95% CI Lower	91.006	0.011	-5.097	0.050	0.000

	TECH99
N of cases	50
Minimum	0.000
Maximum	132.000
Mean	27.866
95% CI Upper	34.363
95% CI Lower	21.369

The following results are for:
STANAME$ = LBC
STATION$ = K019

	HARDNESS	COPPER	IRON	LEAD	MERCURY
N of cases	43	19	19	19	19
Minimum	45.000	0.005	0.205	0.005	0.000
Maximum	118.000	0.100	2.030	0.250	0.000
Mean	85.163	0.041	0.806	0.157	0.000
95% CI Upper	91.015	0.057	1.070	0.202	0.000
95% CI Lower	79.310	0.024	0.542	0.111	0.000

	TECH99
N of cases	14
Minimum	-7.310
Maximum	22.100
Mean	0.979
95% CI Upper	5.633
95% CI Lower	-3.674