

12 AUG 1987

Docket No. 50-293

Boston Edison Company M/C Nuclear
ATTN: Ralph G. Bird
Senior Vice President - Nuclear
800 Boylston Street
Boston, Massachusetts 02199

Gentlemen:

Subject: Results of Non-Radiological Chemistry Standards Inspection
Activities for All Region I Licensees

Routine safety inspections were conducted by this office during the period 1985 to 1986 at USNRC Region I licensees in the area of non-radiological water chemistry laboratory operations. The purpose of this report is to present results of all licensees inspected, as well as results of measurements made by Brookhaven National Laboratory. Each licensee is identified by a code. Your code is 24.

No reply to this letter is required.

Sincerely,

Original Signed By:

Ronald T. Bellamy

Thomas T. Martin, Director
Division of Radiation Safety
and Safeguards

Enclosure: Combined Results of Non-radiological Standards Comparison
Inspection Activities for Region I Licensees

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cc w/encl:

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Chairman, Board of Selectmen
Plymouth Civil Defense Director
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The Honorable E. J. Markey
Senator Edward P. Kirby
The Honorable Peter V. Forman
Sharon Pollard, Secretary of Energy Resources
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Region I Docket Room (with concurrences)
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Section Chief, DRP
W. Raymond, SRI, Vermont Yankee
T. Shedlosky, SRI, Millstone 1&2
H. Eichenholz, SRI, Yankee
R. Wessman, PM, NRR

Robert J. Bores, DRSS

[Signature]
RI:DRSS
Kottan
6/24/87

[Signature]
RI:DRSS
Zibulsky
6/18/87

[Signature]
RI:DRSS
Pasciak
6/24/87

[Signature]
RI:DRSS
Bellamy
6/3/87

[Signature]
RI:DRSS
Martin
6/1/87

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Combined Results of Non-Radiological Standards
Comparison Inspection Activities for
Region I Licensees

Inspectors:

Harvey Zibulsky
Harvey Zibulsky, Chemist, Effluents Radiation
Protection Section, EP&RPB, DRSS

J. J. Kottan
James J. Kottan, Radiation Laboratory Specialist,
Effluents Radiation Protection Section, EP&RPB, DRSS

Approved By:

Walt Pasciak
Walter J. Pasciak, Chief, Effluents Radiation
Protection Section, EP&RPB, DRSS

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Details

1. Introduction

Region I has implemented an inspection program in the area of non-radiological water chemistry. As part of this inspection program, licensees are required to analyze test standards prepared by Brookhaven National Laboratory (BNL) for NRC Region I. The data from the first round of this part of the inspection program are now available from all power reactors in Region I and are presented here.

The data as presented permits each Region I nuclear power plant chemistry laboratory to compare its performance with all other Region I nuclear power plant laboratories. The data for the BNL known values are also presented so that comparison of the average from all Region I sites to the known value may be made. The data were taken from inspection reports, but are coded here. The letter transmitting this report identified the individual code(s) for each addressee. Section 3.0 lists the inspection reports data were taken from. The data are presented in Appendix B.

2. Data Analysis

The data were analyzed as follows.

1. The analytical data from all Region I sites were entered into a data base at BNL. The analytical data consisted of each licensee's result for each analyte at each analyzed concentration.
2. At each concentration a grand average and standard deviation were calculated using the data from all sites.
3. A range consisting of the grand average plus or minus two standard deviations was established. Any values outside of this range were considered outliers.
4. A new grand average and standard deviation were calculated excluding the outliers determined in step 3.
5. A range consisting of the grand average plus or minus two standard deviations was again established. Any values outside this range were considered outliers.
6. The above process was repeated until a range was obtained with no outliers. This range was used for the data comparison.

A sample calculation is presented in Appendix A.

It must be recognized that the data used to generate the averages are not of equal weight. For example, some laboratories were permitted to reanalyze the standards if problems could be identified and corrected during the inspection. Also some of the BNL standards were diluted to different final concentrations by the licensees prior to analysis to allow them to analyze within their calibration range. The results were then normalized back to the original dilution in order to enable comparison. In addition, all methods of analysis for a particular analyte were grouped together.

3. References:

<u>Site</u>	<u>Docket No.</u>	<u>Inspection No.</u>
Beaver Valley #1	50-334	85-07
Beaver Valley #2	50-412	86-14
Calvert Cliffs #1	50-317	86-08
Calvert Cliffs #2	50-318	86-08
FitzPatrick	50-333	85-23
Ginna	50-244	85-14
Ct. Yankee	50-213	85-24
Hope Creek	50-354	85-59
Indian Pt. #2	50-247	86-07
Indian Pt. #3	50-286	86-04
Limerick	50-352	86-10
Maine Yankee	50-309	85-33
Millstone #1	50-245	86-04
Millstone #2	50-336	86-04
Millstone #3	50-423	86-13
Nine Mile Pt. #1	50-220	85-10
Oyster Creek	50-219	86-16
Peach Bottom #2	50-277	85-28
Peach Bottom #3	50-278	85-26
Pilgrim	50-293	85-23
Salem #1	50-272	86-03
Salem #2	50-311	86-03
Seabrook	50-443	86-22
Shoreham	50-322	86-11
Susquehanna #1	50-387	85-27
Susquehanna #2	50-388	85-22
Three Mile Island #1	50-289	85-17
Vermont Yankee	50-271	85-38
Yankee Atomic	50-29	85-21

Appendix A

Sample Calculation

The chloride measurements at approximately 30 ppb were chosen for this example.

Step 1

The following data were in the BNL data base for chloride at approximately 30 ppb.

<u>Site No.</u>	<u>Value (ppb)</u>	<u>Site No.</u>	<u>Value (ppb)</u>	<u>Site No.</u>	<u>Value (ppb)</u>
1	30.7	16	27.1	31*	26.7
2	30	17	39.3	32*	71
3	30.2	18	28.8	33	not analyzed
4	24.3	19	28		
5	30.9	20	29.3		
6	30.9	21	23.3		
7	32.7	22	28.9		
8	38.3	23	not analyzed		
9	32	24	30.7		
10	34.2	25	not analyzed		
11	37	26*	41.3		
12	28.7	27	33		
13	not analyzed	28	-		
14	30.7	29	52		
15*	43.35	30	29.7		

*normalized data

Step 2

A grand average and standard deviation were calculated for all 28 values:

$$\text{Grand average} = 33.6804 = \frac{\sum x_i}{n}$$

$$\text{Standard deviation} = 9.5116 = \left[\frac{\sum (x_i - \bar{x})^2}{n-1} \right]^{1/2}$$

Step 3

From step two above, a range of 52.7036 - 14.6572 was established. The value from site 32 was determined to be an outlier.

Step 4

A new grand average and standard deviation were calculated excluding the outlier determined in Step 3.

grand average = 32.2981 (n=27)
standard deviation = 6.1966

Appendix A

Sample Calculation (continued)

Step 5

From step 4 above a range of 44.6914 - 19.9048 was established. The value from site 29 was determined to be an outlier.

Step 6

The above process was completed through seven more iterations as follows:

<u>n</u>	<u>x</u>	<u>s</u>	<u>range</u>	<u>outlier sites</u>
26	31.5404	4.8796	41.2996 - 21.7812	26, 15
24	30.6417	3.8514	38.3444 - 22.9390	17
23	30.2652	3.4571	37.1794 - 23.3510	8, 21
21	30.2143	2.7368	35.6880 - 24.7406	4, 11
19	30.1684	1.9542	34.0768 - 26.2600	10
18	29.9444	1.7419	33.4283 - 26.4605	None

Thus out of a total of 28 values 10 were outliers. The range of 33.4283 - 26.4605, which contained no outliers, was used for final comparison.

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	69.8646	3.6778	24	-	77.2202	71.3 ELEC
FL	144.627	5.18286	15	-	154.992	140 ELEC
FI	303.444	37.8747	18	-	379.194	300
B	1.00262E+06	7309.1	13	-	1.01723E+06	1.004E+06
B	2.98458E+06	37483.4	18	-	3.05955E+06	2.946E+06
B	4.93482E+06	34950.4	17	-	5.00472E+06	4.875E+06
FE	1.27239	.0679298	15	-	1.40825	1.23 TITR
FE	2.4702	.102406	19	-	2.67501	2.4
FE	3.62507	.116941	18	-	3.85895	3.47
CU	1.34168	.068628	17	-	1.47894	1.39 AAGP
CU	2.63135	.0660583	18	-	2.76347	2.73
CU	3.9834	.100391	15	-	4.18418	3.95 AAGP
ATH	1193.62	88.4432	9	-	1370.51	1500 **
ATH	112.915	9.42891	10	-	131.773	157 **
ATH	355.4	28.397	9	-	412.194	443 ***
HY	100.592	4.68925	13	-	109.971	96.8 ELEC
HY	20.5538	.916166	13	-	22.3862	19.5
HY	50.55	1.88076	12	-	54.3115	49.9 SPEC

UNIT	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64667	.352271	15	-	8.94212	9
CL	69.8646	3.6778	24	-	62.509	70
CL	29.9444	1.74195	18	-	26.4606	27.1
FL	10058.7	649.237	15	-	8760.19	10800
FL	72313.3	2591.43	15	-	67130.5	71300
FL	30344.4	3787.47	18	-	22769.5	29500
B	1.00262E+06	7309.1	13	-	987997	961000
B	2.98458E+06	37483.4	18	-	2.90962E+06	2.832E+06
B	4.93482E+06	34950.5	17	-	4.86492E+06	4.69E+06
FE	9.88078	.409625	19	-	9.06154	11
CU	10.5254	.264233	18	-	9.99694	9.89
CU	15.9336	.401565	15	-	15.1305	16.52
DI	10.3064	.194564	11	-	9.91732	10.4
DI	15.2204	.749159	12	-	13.7221	14.1
CR	9.55203	.807373	12	-	7.93729	9.67
CR	14.7923	.932843	11	-	12.9266	15.1

OUTLIER

RECORD: 5 Code 26

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	96.4667	3.52271	15	89.4212	103.512	92
CL	698.646	36.778	24	625.09	772.202	647
CL	299.444	17.4195	18	264.606	334.283	413
						**
FL	100.587	6.49237	15	87.6019	113.571	107
FL	144.627	5.18286	15	134.261	154.992	150
FL	303.444	37.8747	18	227.695	379.194	283
						MERT
B	1.00262E+06	7309.1	13	987997	1.01723E+06	1.005E+06
B	2.98458E+06	37483.4	18	2.90962E+06	3.05955E+06	3.011E+06
B	4.93482E+06	34950.4	17	4.86492E+06	5.00472E+06	4.932E+06
						TITR
AMH	112915	9428.91	10	94057.2	131773	110000
AMH	355400	28397	9	298606	412194	337000
HY	100.592	4.68925	13	91.2138	109.971	95
HY	20.5538	.916166	13	18.7215	22.3862	21.5
HY	50.55	1.88076	12	46.7885	54.3115	56.8
						**
						SPEC
						SPEC

* OUTLIER

RECORD: 6 Code 21

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	19.2933	.704543	15	17.8842	20.7024	20
CL	139.729	7.35559	24	125.018	154.44	128.3
CL	29.9444	1.74195	18	26.4606	33.4283	23.3
						**
						ELEC
B	1.00262E+06	7309.1	13	987997	1.01723E+06	1.006E+06
B	2.98458E+06	37483.4	18	2.90962E+06	3.05955E+06	2.923E+06
B	4.93482E+06	34950.4	17	4.86492E+06	5.00472E+06	4.945E+06
FE	1272.39	67.9298	15	1136.53	1408.25	1070
FE	2470.2	102.406	19	2265.38	2675.01	2300
FE	3625.07	116.941	18	3391.19	3858.95	3530
						**
						TITR
CU	1341.68	68.628	17	1204.43	1478.94	1280
CU	2631.35	66.0583	18	2499.23	2763.47	2630
CU	3983.4	100.391	15	3782.62	4184.18	3980
NI	1278.97	33.6022	10	1211.76	1346.17	1260
NI	2576.61	48.6409	11	2479.33	2673.89	2580
NI	3805.1	187.29	12	3430.53	4179.68	3890
CR	1238.83	77.0573	10	1084.71	1392.94	1230
CR	2388.01	201.843	12	1984.32	2791.7	2530
CR	3698.07	233.211	11	3231.65	4164.49	3850
						PLAS
						PLAS
						PLAS
						PLAS
						PLAS
						PLAS

** OUTLIER

RECORD: 7 Code 30

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	19.2933	.704543	15	17.8842	20.7024	**
CL	69.8646	3.6778	24	62.509	77.2202	
CL	29.9444	1.74195	18	26.4606	33.4283	
						ELEC
B	1.00262E+06	7309.1	13	987997	1.01723E+06	
B	2.98458E+06	37483.4	18	2.90962E+06	3.05955E+06	995000
B	4.93482E+06	34950.4	17	4.86492E+06	5.00472E+06	2.953E+06
FE	848.257	45.2865	15	757.684	938.83	4.955E+06
FE	1646.8	68.2708	19	1510.26	1783.34	800
FE	2416.71	77.9603	18	2260.79	2572.63	1680
						2500
CU	894.455	45.752	17	802.951	985.959	AA
CU	1754.23	44.0389	18	1666.16	1842.31	
CU	2655.6	66.9275	15	2521.75	2789.46	
HI	852.645	22.4014	10	807.842	897.448	AA
HI	1717.74	32.4273	11	1652.89	1782.6	
HI	2536.74	124.86	12	2287.02	2786.46	
CR	825.884	51.3716	10	723.141	928.627	AA
CR	1592.01	134.562	12	1322.88	1861.13	
CR	2465.38	155.474	11	2154.43	2776.33	
						750
						1540
						2430
						AA

RECORD: 8 Code 23

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
FL	20.1173	1.29847	15	-	22.7143	20.7
FL	72.3133	2.59143	15	-	77.4962	68
FL	30.3444	3.78747	18	-	37.9194	30.3
						ELEC
B	1.00262E+06	7309.1	13	-	1.01723E+06	1.01E+06
B	2.98458E+06	37483.4	18	-	3.05955E+06	2.989E+06
B	4.93482E+06	34950.4	17	-	5.00472E+06	4.929E+06
						TITR
FE	5.08954	.271719	15	-	5.63298	5.05
FE	9.88078	.409625	19	-	10.7	9.65
FE	14.5003	.467762	18	-	15.4358	13.63
						AAGF
CU	5.36673	.274512	17	-	5.91576	4.35
CU	10.5254	.264233	18	-	11.0539	9.02
CU	15.9336	.401565	15	-	16.7367	13.09
						AAGF
						**
						**
						**
HY	100.592	4.68925	13	-	109.971	103.7
HY	20.5538	.916166	13	-	22.3862	20.6
HY	50.55	1.88076	12	-	54.3115	52
						SPEC

OUTLIER

RECORD: 9 Code 24

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64667	.352271	15	8.94212	10.3512	9.7
CL	69.8646	3.6778	24	62.509	77.2202	70
CL	29.9444	1.74195	18	26.4606	33.4283	30.7
FL	10.0587	.649237	15	8.76019	11.3571	9.9
FL	72.3133	2.59143	15	67.1305	77.4962	70.7
FL	30.3444	3.78747	18	22.7695	37.9194	30.7
						IC
B	1.00262E+06	7309.1	13	987997	1.01723E+06	1.06E+06
B	2.98458E+06	37483.4	18	2.90962E+06	3.05955E+06	3.03E+06
B	4.93482E+06	34950.4	17	4.86492E+06	5.00472E+06	4.915E+06
FE	508.954	27.1719	15	454.61	563.298	511
FE	988.078	40.9625	19	906.154	1070	982
FE	1450.03	46.7762	18	1356.48	1543.58	1413
						TITR
CU	536.673	27.4512	17	481.771	591.576	498
CU	1052.54	26.4233	18	999.694	1105.39	1012
CU	1593.36	40.1565	15	1513.05	1673.67	1548
						PLAS
HI	511.587	13.4409	10	484.705	538.469	494
HI	1030.64	19.4564	11	991.732	1069.56	1009
HI	1522.04	74.9159	12	1372.21	1671.87	1519
						PLAS
CR	495.53	30.8229	10	433.884	557.176	489
CR	955.203	80.7373	12	793.729	1116.68	968
CR	1479.23	93.2843	11	1292.66	1665.8	1442
						PLAS

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	19.2933	.704543	15	-	20.7024	24.7
CL	69.8646	3.6778	24	-	77.2202	83.5
CL	29.9444	1.74195	18	-	33.4283	32.7
						IC
B	1.00262E+06	7309.1	13	-	1.01723E+06	1.081E+06
B	2.98458E+06	37483.4	18	-	3.05955E+06	3.243E+06
B	4.93482E+06	34950.4	17	-	5.00472E+06	5.345E+06
						TITR
FE	1272.39	67.9298	15	-	1408.25	1310
FE	2470.2	102.406	19	-	2675.01	2490
FE	3625.07	116.941	18	-	3858.95	3640
						AA
CU	1341.68	68.628	17	-	1478.94	1350
CU	2631.35	66.0583	18	-	2763.47	2650
CU	3983.4	100.391	15	-	4184.18	3990
						AA
HI	1278.97	33.6022	10	-	1346.17	1400
HI	2576.61	48.6409	11	-	2673.89	2750
HI	3805.1	187.29	12	-	4179.68	4060
						AA
CR	1238.83	77.0573	10	-	1392.94	1270
CR	2388.01	201.843	12	-	2791.7	2010
CR	3698.07	233.211	11	-	4164.49	3970
						AA

RECORD: 11 Code 9

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64667	.352271	15	8.94212	10.3512	10
CL	69.8646	3.6778	24	62.509	77.2202	65.3
CL	29.9444	1.74195	18	26.4606	33.4283	32
FL	100.587	6.49237	15	87.6019	113.571	100
FL	144.627	5.18286	15	134.261	154.992	130
FL	303.444	37.8747	18	227.695	379.194	340
						IC
B	1.00262E+06	7309.1	13	987997	1.01723E+06	1.002E+06
B	2.98458E+06	37483.4	18	2.90962E+06	3.05955E+06	2.986E+06
B	4.93482E+06	34950.4	17	4.86492E+06	5.00472E+06	4.806E+06
FE	5.08954	.271719	15	4.5461	5.63298	9.2
FE	9.88078	.409625	19	9.06154	10.7	16.9
FE	14.5003	.467762	18	13.5648	15.4358	20.3
CU	5.36673	.274512	17	4.81771	5.91576	5
CU	10.5254	.264233	18	9.99694	11.0539	10.2
CU	15.9336	.401565	15	15.1305	16.7367	16
						AAGF
AIH4	1193.62	88.4432	9	1016.74	1370.51	1200
AIH1	112.915	9.42891	10	94.0572	131.773	100
AIH1	355.4	28.397	9	298.606	412.194	360
HY	100.592	4.68925	13	91.2138	109.971	101.3
HY	20.5538	.916166	13	18.7215	22.3862	20
HY	50.55	1.88076	12	46.7885	54.3115	51.3
						SPEC
						SPEC

RECORD: 12 Code 19

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	69.8646	3.6778	24	-	77.2202	65.7
CL	29.9444	1.74195	18	-	33.4283	28
						ELEC
FE	50.8954	2.71719	15	-	56.3298	59.4
FE	9.88078	.409625	19	-	10.7	9.5
FE	14.5003	.467762	18	-	15.4358	13.9
						PLAS
CU	53.6673	2.74512	17	-	59.1576	57.5
CU	10.5254	.264233	18	-	11.0539	26.6
CU	15.9336	.401565	15	-	16.7367	41.2
						PLAS
HI	51.1587	1.34409	10	-	53.8469	60.7
HI	10.3064	.194564	11	-	10.6956	16.2
HI	15.2204	.749159	12	-	16.7187	23.1
						PLAS
CR	49.553	3.08229	10	-	55.7176	59.5
CR	9.55203	.807373	12	-	11.1668	12.8
CR	14.7923	.932843	11	-	16.658	18
						PLAS

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ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64667	.352271	15	-	10.3512	9.6
CL	69.8646	3.6778	24	-	77.2202	83.2
CL	29.9444	1.74195	18	-	33.4283	34.2
						**
						**
FL	100.587	6.49237	15	-	113.571	109
FL	72.3133	2.59143	15	-	77.4962	74.7
FL	30.3444	3.78747	18	-	37.9194	37.7
						IC
B	1.00262E+06	7309.1	13	-	1.01723E+06	995000
B	2.98458E+06	37483.4	16	-	3.05955E+06	3.013E+06
B	4.93482E+06	34950.4	17	-	5.00472E+06	4.962E+06
						TITR
FE	101.791	5.43438	15	-	112.66	98
FE	98.8078	4.09625	19	-	107	102.3
FE	145.003	4.67762	18	-	154.358	146.5
						ICPL
CU	107.335	5.49024	17	-	118.315	111.7
CU	105.254	2.64233	18	-	110.539	103
CU	159.336	4.01565	15	-	167.367	163.2
						ICPL
HY	100.592	4.68925	13	-	109.971	106
HY	20.5538	.916166	13	-	22.3862	21.7
HY	50.55	1.88076	12	-	54.3115	53.7
						SPEC

** OUTLIER

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	SPEC
CL	9.64667	.352271	15	-	10.3512	10
CL	69.8546	3.6778	24	-	77.2202	67.5
CL	29.9444	1.74195	18	-	33.4283	30
B	1.00262E+06	7309.1	13	-	1.01723E+06	1.081E+06 **
B	2.98458E+06	37483.4	18	-	3.05955E+06	2.919E+06
B	4.93482E+06	34950.4	17	-	5.00472E+06	4.919E+06
FE	1272.39	67.9298	15	-	1408.25	1350
FE	2470.2	102.406	19	-	2675.01	2640
FE	3625.07	116.941	18	-	3858.95	3760
CU	1341.68	68.628	17	-	1478.94	1330
CU	2631.35	66.0583	18	-	2763.47	2720
CU	3983.4	100.391	15	-	4184.18	4060
NI	1278.97	33.6022	10	-	1346.17	1300
NI	2576.61	48.6409	11	-	2673.89	2550
NI	3805.1	187.29	12	-	4179.68	3640
CR	1238.83	77.0573	10	-	1392.94	1350
CR	2388.01	201.843	12	-	2791.7	2540
CR	3698.07	233.211	11	-	4164.49	3310

AA OUTLIER

RECORD: 15 Code '1

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	SPEC
CL	96.4667	3.52271	15	-	103.512	**
CL	698.646	36.778	24	-	772.202	72
CL	299.444	17.4195	18	-	334.283	663
						267
B	1.00262E+06	7309.1	13	-	1.01723E+06	994000
B	2.38458E+06	37483.4	18	-	3.05955E+06	2.927E+06
B	4.93482E+06	34950.4	17	-	5.00472E+06	4.885E+06
FE	1272.39	67.9298	15	-	1408.25	1040
FE	2470.2	102.406	19	-	2675.01	2460
FE	3625.07	116.941	18	-	3858.95	3720
CU	1341.68	68.628	17	-	1478.94	1350
CU	2631.35	66.0583	18	-	2763.47	2710
CU	3983.4	100.391	15	-	4184.18	4120
NI	1278.97	33.6022	10	-	1346.17	1270
HI	2576.61	48.6409	11	-	2673.89	2640
NI	3805.1	187.29	12	-	4179.68	3980
CR	1238.83	77.0573	10	-	1392.94	1280
CR	2388.01	201.843	12	-	2791.7	2580
CR	3698.07	233.211	11	-	4164.49	3880

RECORD: 16 Code 27

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64667	.352271	15	-	10.3512	12.7
CL	69.8646	3.6778	24	-	77.2202	72
CL	29.9444	1.74195	18	-	33.4283	33
FL	100.587	6.49237	15	-	113.571	106
FL	144.627	5.18286	15	-	154.992	145
FL	305.444	37.8747	18	-	379.194	304
						ELEC
B	1.00262E+06	7309.1	13	-	1.01723E+06	1.002E+06
B	2.98458E+06	37483.4	18	-	3.05955E+06	2.081E+06
B	4.93482E+06	34950.4	17	-	5.00472E+06	4.89E+06
FE	5.08954	.271719	15	-	5.63298	4
FE	9.88078	.409625	19	-	10.7	9.2
FE	14.5003	.467762	18	-	15.4358	14.2
						TITR
CU	5.36673	.274512	17	-	5.91576	5.9
CU	10.5254	.264233	18	-	11.0539	10.4
CU	15.9336	.401565	15	-	16.7367	14.5
						AAGF
						AAGF
HY	100.592	4.68925	13	-	109.971	105.3
HY	20.5538	.916166	13	-	22.3862	20
HY	50.55	1.88076	12	-	54.3115	51
						SPEC

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64667	.352271	15	-	10.3512	**
CL	69.8646	3.6778	24	-	77.2202	**
FL	40.2347	2.59695	15	-	45.4286	**
FL	72.3133	2.59143	15	-	77.4962	**
FL	30.3444	3.78747	18	-	37.9194	**
						IC
						IC
CU	5.36673	.274512	17	-	5.91576	**
CU	10.5254	.264233	18	-	11.0539	**
CU	15.9336	.401565	15	-	16.7367	**
						AAGF
						AAGF
ATH	1193.62	88.4432	9	-	1370.51	
ATH	112.915	9.42891	10	-	131.773	
ATH	355.4	28.397	9	-	412.194	
						SPEC
HY	100.592	4.68925	13	-	109.971	**
HY	205.538	9.16166	13	-	223.862	
HY	101.1	3.76153	12	-	108.623	
						SPEC

OUTLIER

RECORD: 18 Code 20

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64667	.352271	15	-	10.3512	9.3
CL	69.8646	3.6778	24	-	77.2202	71.3
CL	29.9444	1.74195	18	-	33.4283	29.3
FL	50.2933	3.24619	15	-	56.7857	45
FL	144.627	5.18286	15	-	154.992	140
FL	30.3444	3.78747	18	-	37.9194	25
						IC
B	1.00262E+06	7309.1	13	-	1.01723E+06	1.095E+06
B	2.98458E+06	37483.4	18	-	3.05955E+06	3.074E+06
B	4.93482E+06	34950.4	17	-	5.00472E+06	5.004E+06
						TITR
AM	1193.62	88.4432	9	-	1370.51	1050
AM	112.915	9.42891	10	-	131.773	116
HY	100.592	4.68925	13	-	109.971	97.5
HY	20.5538	.916166	13	-	22.3862	19.8
HY	50.55	1.88076	12	-	54.3115	49.5
						ELEC
						SPEC

OUTLIER

ANALYTE	MEAN	STD DEV	N	RANGE		REPORTED VALUE	
CL	48.2333	1.76136	15	44.7106	-	51.7561	**
CL	69.8646	3.6778	24	62.509	-	77.2202	**
CL	59.8889	3.4839	18	52.9211	-	66.8567	**
FL	20.1173	1.29847	15	17.5204	-	22.7143	**
FL	144.627	5.18286	15	134.261	-	154.992	
FL	30.3444	3.78747	18	22.7695	-	37.9194	
							MERT
B	501308	3654.55	13	493999	-	508617	
B	596917	7496.68	18	581923	-	611910	
B	1.64494E+06	11650.1	17	1.62164E+06	-	1.66824E+06	
FE	1017.91	54.3438	15	909.221	-	1126.6	
FE	1976.16	81.9249	19	1812.31	-	2140.01	
FE	2900.06	93.5524	18	2712.95	-	3087.16	
							ITIR
CU	1073.35	54.9024	17	963.541	-	1183.15	AA
CU	2105.08	52.8467	18	1999.39	-	2210.77	
CU	3186.72	80.313	15	3026.09	-	3347.35	
HI	1023.17	26.8817	10	969.411	-	1076.94	AA
HI	2061.29	38.9127	11	1983.46	-	2139.11	
HI	3044.08	149.832	12	2744.42	-	3343.75	
CR	991.06	61.6459	10	867.769	-	1114.35	AA
CR	1910.41	161.475	12	1587.46	-	2233.36	**
CR	2958.45	186.569	11	2585.32	-	3331.59	**
							AA
AIN	596.811	64.2216	9	508.368	-	685.254	
AIN	112.915	9.42891	10	94.0572	-	131.773	
AIN	177.7	14.1985	9	149.303	-	206.097	
							ELEC
HY	100.592	4.68925	13	91.2138	-	109.971	
HY	20.5538	.916166	13	18.7215	-	22.3862	
HY	50.55	1.88076	12	46.7885	-	54.3115	
							SPEC

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64667	.352271	15	-	10.3512	10.1
CL	69.8646	3.6778	24	-	77.2202	73.7
CL	29.9444	1.74195	18	-	33.4283	30.2
FL	10.0587	.649237	15	-	11.3571	9.2
FL	72.3133	2.59143	15	-	77.4962	72.2
FL	30.3444	3.78747	18	-	37.9194	26.1
B	1.00262E+06	7309.1	13	-	1.01723E+06	1.042E+06
B	2.98458E+06	37483.4	18	-	3.05955E+06	3.006E+06
B	4.93482E+06	34950.4	17	-	5.00472E+06	4.752E+06
FE	1017.91	54.3438	15	-	1126.6	1040
FE	1976.16	81.9249	19	-	2140.01	2010
FE	2900.06	93.5524	18	-	3087.16	3020
CU	1073.35	54.9024	17	-	1183.15	1030
CU	2105.08	52.8467	18	-	2210.77	1910
CU	3186.72	80.313	15	-	3347.35	2870
AlM	1193.62	88.5432	9	-	1370.51	1247
AlM	112.915	9.42891	10	-	131.773	113.3
AlM	355.4	28.397	9	-	412.194	370
HY	-100.592	4.68925	13	-	109.971	103.7
HY	20.5538	.916166	13	-	22.3862	21.7
HY	56.55	1.88076	12	-	54.3115	49.3

A OUTLIER

RECORD: 21

Code 17

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	19.2933	.704543	15	-	20.7024	27.7 **
CL	69.8646	3.6778	24	-	77.2202	72
CL	29.9444	1.74195	18	-	33.4283	39.3 **
						ELEC
B	100262	730.91	13	-	101723	99100
B	59691.7	749.668	18	-	61191	59700
B	246741	1747.52	17	-	250235	241700 **
						TITR
FE	1017.91	54.3438	15	-	1126.6	1010
FE	1976.16	81.9249	19	-	2140.01	1950
FE	2900.06	93.5524	18	-	3087.16	2930
						AA
CU	1073.35	54.9024	17	-	1183.15	1020
CU	2105.08	52.8467	18	-	2210.77	2090
CU	3186.72	80.313	15	-	3347.35	2990 **
						AA
NI	1023.17	26.8817	10	-	1076.94	1000
NI	2061.29	38.9127	11	-	2139.11	2060
NI	3044.08	149.832	12	-	3343.75	3100
						AA
CR	991.06	61.6459	10	-	1114.35	900
CR	1910.41	161.475	12	-	2233.36	1850
CR	2958.45	186.569	11	-	3331.59	2770
						AA

* OUTLIER

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64667	.352271	15	8.94212	10.3512	9.8
CL	69.8646	3.6778	24	62.509	77.2202	72.4
CL	29.9444	1.74195	18	26.4606	33.4283	28.7
FL	40.2347	2.59695	15	35.0408	45.4286	37.7
FL	72.3133	2.59143	15	67.1305	77.4962	73.7
FL	30.3444	3.78747	18	22.7695	37.9194	27.7
B	1.00262E+06	7309.1	13	987997	1.01723E+06	1.029E+06
B	2.98458E+06	37483.4	18	2.90962E+06	3.05955E+06	3.002E+06
B	4.93482E+06	34950.4	17	4.86492E+06	5.00472E+06	4.962E+06
FE	814.327	43.475	15	727.377	901.277	790
FE	1580.93	65.5399	19	1449.85	1712.01	1640
FE	1160.02	37.421	18	1085.18	1234.86	1210
CU	858.677	43.9219	17	770.833	946.521	890
CU	1684.06	42.2773	18	1599.51	1768.62	1730
CU	1274.69	32.1252	15	1210.44	1338.94	1320
NI	818.539	21.5054	10	775.528	861.55	830
NI	1649.03	31.1302	11	1586.77	1711.29	1680
NI	1217.63	59.9327	12	1097.77	1337.5	1290
CR	792.848	49.3167	10	694.215	891.482	860
CR	1528.33	129.18	12	1269.97	1786.68	1670
CR	1183.38	74.6275	11	1034.13	1332.64	1270
AMM	596.811	44.2216	9	508.368	685.254	597
AMM	225.83	18.8578	10	188.114	263.546	238
AMM	355.4	28.397	9	298.606	412.194	340
HY	100.592	4.68925	13	91.2138	109.971	108
HY	20.5538	.916166	13	18.7215	22.3862	21
HY	50.55	1.88076	12	46.7885	54.3115	53.7

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	19.2933	.704543	15	-	20.7024	18.4
CL	69.8646	3.6778	24	-	77.2202	64.6
CL	29.9444	1.74195	18	-	33.4283	28.8
						ELEC
B	1.00262E+06	7309.1	13	-	1.01723E+06	1.017E+06
B	2.98458E+06	37483.4	18	-	3.05955E+06	3E+06
B	4.93482E+06	34950.4	17	-	5.00472E+06	4.93E+06
FE	254.477	13.586	15	-	281.649	228
FE	494.039	20.4812	19	-	535.002	469
FE	725.014	23.3881	18	-	771.79	725
						TITR
CU	268.337	13.7256	17	-	295.788	257
CU	526.27	13.2117	18	-	552.694	508
CU	796.68	20.0782	15	-	836.836	782
						DCPL
NI	255.794	6.72043	10	-	269.234	249
NI	515.322	9.72818	11	-	534.779	497
NI	761.021	37.4579	12	-	835.937	748
						DCPL
CR	247.765	15.4115	10	-	278.588	241
CR	477.602	40.3686	12	-	558.339	476
CR	739.614	46.6422	11	-	832.898	766
						DCPL

★ OUTLIER

ANALYTE	MEAN	STD DEV	N		RANGE	REPORTED VALUE	
CL	19.2933	.704543	15	17.8842	-	20.7024	27
CL	69.8646	3.6778	24	62.509	-	77.2202	54.7
CL	29.9444	1.74195	18	26.4606	-	33.4283	30.7
							ELEC
FL	100.587	6.49237	15	87.6019	-	113.571	105.7
FL	144.627	5.18286	15	134.261	-	154.992	146
FL	60.6889	7.57495	18	45.539	-	75.8388	53
							ELEC
B	1.00262E+06	7309.1	13	987997	-	1.01723E+06	1.008E+06
B	2.98458E+06	37483.4	18	2.90962E+06	-	3.05955E+06	3E+06
B	4.93482E+06	34950.4	17	4.86492E+06	-	5.00472E+06	4.946E+06
							TITR
FE	5.08954	.271719	15	4.5461	-	5.63298	5.6
FE	9.88078	.409625	19	9.06154	-	10.7	9.64
FE	14.5003	.467762	18	13.5648	-	15.4358	14.87
							AAGF
CU	5.36673	.274512	17	4.81771	-	5.91576	4.61
CU	10.5254	.264233	18	9.99694	-	11.0539	10.86
CU	15.9336	.401565	15	15.1305	-	16.7367	15.5
							AAGF
AIH	596.811	44.2216	9	508.368	-	685.254	670
AIH	112.915	9.42891	10	94.0572	-	131.773	120
AIH	355.4	28.397	9	298.606	-	412.194	410
							SPEC
HY	100.592	4.68925	13	91.2138	-	109.971	101
HY	20.5538	.916166	13	18.7215	-	22.3862	20.7
HY	50.55	1.88076	12	46.7885	-	54.3115	49.7
							SPEC

A OUTLIER

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64667	.352271	15	8.94212	10.3512	9.7
CL	59.8646	3.6778	24	62.509	77.2202	70.9
CL	29.9444	1.74195	18	26.4606	33.4203	30.9
FL	50.2933	3.24619	15	43.801	56.7857	47.3
FL	144.627	5.18286	15	134.261	154.992	126
FL	60.6889	7.57495	18	45.539	75.8388	57
						IC
						★
B	2.98458E+06	37483.4	18	2.90962E+06	3.05955E+06	3.054E+06
B	4.93482E+06	34950.4	17	4.86492E+06	5.00472E+06	4.99E+06
FE	610.99	32.6193	15	545.751	676.228	608
FE	591.664	24.5284	19	542.607	640.721	617
FE	483.343	15.5921	18	452.158	514.527	469
						TITR
CU	644.265	32.9546	17	578.356	710.175	627
CU	630.264	15.8224	18	598.619	661.508	624
CU	531.12	13.3855	15	504.349	557.891	461
						PLAS
NI	614.15	16.1355	10	581.879	646.421	640
NI	617.152	11.6505	11	593.851	640.453	627
NI	507.347	24.972	12	457.403	557.291	470
						PLAS
CR	594.874	37.0023	10	520.87	668.879	594
CR	571.978	48.3457	12	475.287	668.669	607
CR	493.076	31.0948	11	430.886	555.265	451
						PLAS
ANM	1193.62	88.4432	9	1016.74	1370.51	1215
ANM	225.83	18.8578	10	188.114	263.546	231.7
ANM	355.4	28.397	9	298.606	412.194	310
HY	100.592	4.68925	13	91.2138	109.971	93.7
HY	20.5538	.916166	13	18.7215	22.3862	19
HY	50.55	1.28076	12	46.7885	54.3115	47.7
						SPEC
						SPEC

TABLE: 27 Code 29

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	9.64657	.352271	15	-	22.7	**
CL	69.8646	3.6778	24	-	76	
CL	29.9444	1.74195	18	-	52	**
						ELEC
FL	40.2347	2.59695	15	-	43	
FL	72.3133	2.59143	15	-	78.7	**
FL	30.3444	3.78747	18	-	36	
						ELEC

* OUTLIER

RECORD: 28 Code 32

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	4.82333	.176136	15	-	5.59	**
CL	6.98646	.36778	24	-	3.29	**
CL	2.99444	.174195	18	-	7.1	**

IC

** OUTLIER

RECORD: 29 Code 11

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE
CL	69.8646	3.6778	24	62.509	74
CL	29.9444	1.74195	18	26.4606	37

ELEC

*** OUTLIER

RECORD: 30 Code 8

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
CL	19.2933	.704543	15	-	20.7024	**
CL	69.8646	3.6778	24	-	77.2202	**
CL	29.9444	1.74195	18	-	33.4283	**

SPEC

** OUTLIER

RECORD: 31

Code 22

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE
CL	19.2933	.704543	15	-	21.7
CL	69.8646	3.6778	24	-	65.9
CL	29.9444	1.74195	18	-	28.9

**

IC

** OUTLIER

RECORD: 32 Code 6

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE
CL	9.64667	.352271	15	-	9.7
CL	69.8646	3.6778	24	-	70.9
CL	29.9444	1.74195	18	-	30.9

IC

*** OUTLIER

RECORD: 33 Code 13

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE
FL	40.2347	2.59695	15	-	37.7
FL	72.3133	2.59143	15	-	73.7
FL	30.3444	3.78747	18	-	27.7

* OUTLIER

RECORD: 34 Code 4

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE
CL	9.64667	.352271	15	-	10
CL	69.8646	3.6778	24	-	74
CL	29.9444	1.74195	18	-	24.3
					**
					ELEC
FL	72.3133	2.59143	15	-	76.3
FL	30.3444	3.78747	18	-	27.3

OUTLIER

RECORD: 35 (BML)

ANALYTE	MEAN	STD DEV	N	RANGE	REPORTED VALUE	
ACL	9.64667	.352271	15	-	8.94212	10.3
BCI	69.8646	3.6778	24	-	62.509	69.7
CCL	29.9444	1.74195	18	-	26.4606	27.7
						ELEC
AFL	100.587	6.49237	15	-	87.6019	96.1
HFL	144.627	5.18286	15	-	134.261	149
CFL	303.444	37.8747	18	-	227.695	329
						ELEC
DR	1.00262E+06	7309.1	13	-	987997	1.014E+06
ER	2.98458E+06	37483.4	18	-	2.90962E+06	3.047E+06
FR	4.93482E+06	34950.4	17	-	4.86492E+06	5.04E+06
						**
GFE	1272.39	67.9298	15	-	1136.53	1280
HFE	2470.2	102.406	19	-	2265.38	2390
IFE	3625.07	116.941	18	-	3391.19	3430
						TIRR
GCH	1341.68	68.628	17	-	1204.43	1330
HCH	2631.35	66.0583	18	-	2499.23	2600
ICH	3983.4	100.391	15	-	3782.62	3840
						AA
GNI	1278.97	33.6022	10	-	1211.76	1320
HNI	2576.61	48.6409	11	-	2479.33	2580
INI	3805.1	187.29	12	-	3430.53	3790
						AA
GCR	1238.83	77.0573	10	-	1084.71	1200
HCR	2388.01	201.843	12	-	1984.32	2690
ICR	3698.07	233.211	11	-	3231.65	3740
						AA
HANH	1193.62	88.4432	9	-	1016.74	1166.9
HANH	112.915	9.42891	10	-	94.0572	119.7
OANH	355.4	28.397	9	-	298.606	355
						ELEC
PHY	100.592	4.68925	13	-	91.2138	100
QHY	20.5538	.916166	13	-	18.7215	19.3
RHY	50.55	1.88076	12	-	46.7885	52.4
						SPEC