0037453

9404930

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

94-ASB-046

JUL 7 1994

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JUL 21 1994
CORRESPONDENCE CONTROL

Mr. Doug Sherwood
Hanford Project Manager
U. S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99352

Mr. Roger F. Stanley, Director
Tri-Party Agreement Implementation
State of Washington
Department of Ecology
P. O. Box 47600
Olympia, Washington 98504-7600

JUL 1994
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SMC

Dear Messrs. Sherwood and Stanley:

QUARTERLY PERFORMANCE EVALUATION (PE) RESULTS

Enclosed are the PE results and corrective actions received from the laboratories supporting Hanford. This submittal includes the results from the following laboratories:

- Battelle Pacific Northwest Laboratories, Richland, Washington
- Westinghouse Hanford Company, 222-S Laboratory, Richland, Washington
- DataChem Laboratories, Salt Lake City, Utah
- Ortek Environmental Laboratory, Green Bay, Wisconsin
- Martin Marietta Energy System, Incorporated, K-25 Laboratory, Oak Ridge, Tennessee
- Thermo Analytical, Incorporated, Richmond, California
  - Norcal Laboratory, Richmond, California
  - ARLI Division, Monrovia, California
  - Eberline Laboratory, Albuquerque, New Mexico
  - ERG Laboratory, Ann Arbor, Michigan
- Roy F. Weston, Incorporated, Lionville Laboratory, Lionville, Pennsylvania
  - Teledyne Isotopes, Westwood, New Jersey

Overall, the evaluation has not identified any significant problems with the laboratories' performance, with the exception of Martin Marietta Energy System's K-25 Laboratory's scores on their metal and organic results, however Hanford has not submitted samples to the K-25 laboratory for quite some time. WHC's 222-S Laboratory also received a low score on their metal results from the Contract Laboratory Program samples.

If you have any questions, please feel free to contact Paul Carter, Chief of the Analytical Services Branch on (509) 376-0016.

Sincerely,

June M. Hennig, Director
Waste Management Division

WMD:DMW

Enclosure

cc w/encl:
[redacted]
B. Mauss, Ecology

PERFORMANCE EVALUATION SUMMARY SHEET

Laboratory: WHC 222S Laboratory

PE Sample	No. Analyzed	No. Acceptable	% Acceptable
EML-559	23	25	92.0

Lab Code = FJ

	EMSL-LV Acceptance Range (%)	% of EMSL-LV True Value	% of all Participating Laboratory's Grand Average
August 27, 1993			
Alpha	54.2 to 145.8	140.4	133.3
Beta	81.5 to 118.5	154.6(High)	147.3
October 19, 1993			
Alpha	56.8 to 143.2	77.5	76.1
Beta	70.2 to 129.8	119.0	125.0
Co-60	13.0 to 187.0	106.7	102.5
Cs-134	27.5 to 172.5	83.3	95.2
Cs-137	13.0 to 187.0	100.0	91.5
Uranium	65.6 to 134.4	60.5(Low)	63.6
October 29, 1993			
Alpha	56.5 to 143.5	58.4	78.9
Beta	42.0 to 158.0	197.8(High)	173.7
November 12, 1993			
Ba-133	82.4 to 117.6	94.5	97.6
Co-60	71.0 to 129.0	96.7	97.6
Cs-134	85.3 to 114.7	92.0	99.8
Cs-137	78.2 to 121.8	101.7	96.5
Ru-106	82.7 to 117.3	169.7(High)	194.6
Zn-65	82.7 to 117.3	102.0	97.6
November 5, 1993			
Tritium	82.6 to 117.4	71.7	73.5

PE Sample	EPA/CLP Score
EMSL-LV QB3 FY93	
Metals	88.9(Revised)
EMSL-LV QB1 FY94	
Metals	58.4(Fail)
Organic	86.6

PERFORMANCE EVALUATION SUMMARY SHEET

Laboratory: WHC 222S Laboratory

PE Sample	EPA/CLP Score
EMSL-LV QB2 FY94	
Metals	80.2
Organic	86.6

PE Sample	No. Analyzed	No. Acceptable	% Acceptable
WP-31			
Metals	42	39	92.9
Inorganic/Minerals	27	27	100.0
Organic	54	54	100.0

United States
Environmental Protection
Agency

Environmental Monitoring
Systems Laboratory
P.O. Box 93478
Las Vegas NV 89193-3478

EPA 600/R-93/236
August 1993

5497

Research and Development

EPA

Air Filter Performance Evaluation Study

A Statistical Evaluation of the August 27, 1993 Data

DEC 1993
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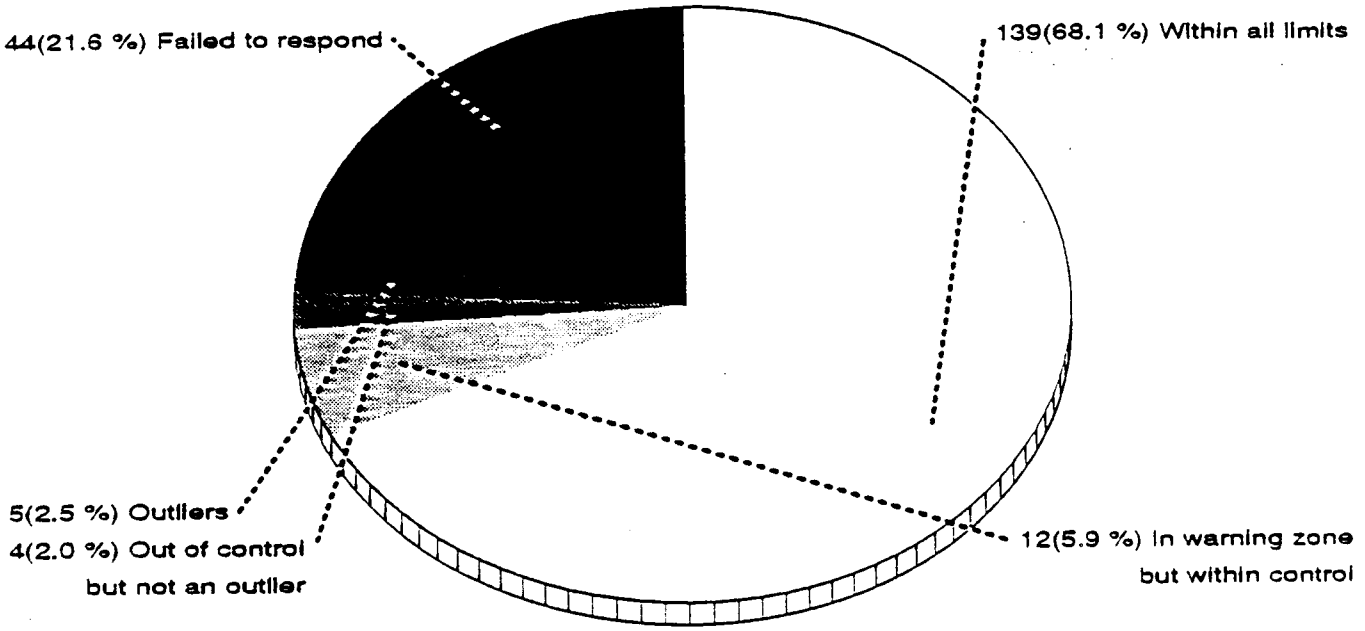
D.A. SEBELIEN

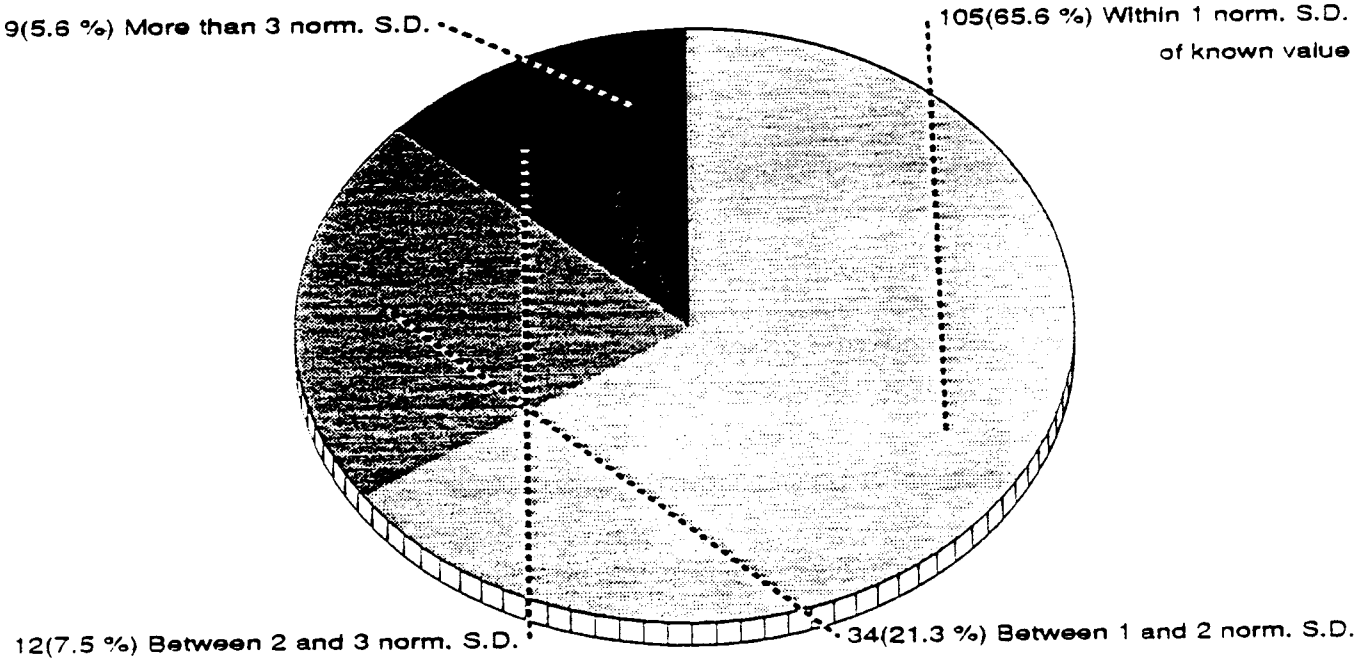
9312-0138nrd236

Alpha Statistical Summary 204 Participants

The known value of this nuclide is **19.0 pCi/F** with an expected precision of **5.0**; the control limits are 10.3 to 27.7; the warning regions are 10.3 to 13.2 and 24.8 to 27.7



Statistic	Respondents	Non-outliers
Mean	20.35	**Grand Avg 20.00**
Std. Dev.	4.67	3.27
Variance	21.78	10.70
% Coef. of Var.	22.93	16.36
% deviation of mean from known value	7.13	5.24
Norm. dev. of mean from known value	0.29	0.30
Median	19.67	19.67
% deviation of median from known value	3.51	3.51
Norm. dev. of median from known value	0.14	0.20



Alpha

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DT	19.0	21.0	17.0	2.00	0.473	19.00	-0.34	0.00	
DX	18.0	18.0	19.0	0.58	0.118	18.33	-0.58	-0.23	
DY									•
E	17.0	17.0	16.0	0.58	0.118	16.67	-1.15	-0.81	
EA	22.0	24.0	22.0	1.15	0.236	22.67	0.93	1.27	
EB	16.0	17.0	17.0	0.58	0.118	16.67	-1.15	-0.81	
EF	18.0	18.0	17.0	0.58	0.118	17.67	-0.81	-0.46	
EH	22.0	20.0	22.0	1.15	0.236	21.33	0.46	0.81	
EL	21.0	21.0	19.0	1.15	0.236	20.33	0.12	0.46	
EW									•
EX									•
EZ	19.0	22.0	23.0	2.08	0.473	21.33	0.46	0.81	
FE	18.0	17.0	18.0	0.58	0.118	17.67	-0.81	-0.46	
FJ	24.0	30.0	26.0	3.06	0.709	26.67	2.31	2.66	
FK	15.0	14.0	14.0	0.58	0.118	14.33	-1.96	-1.62	
FL	20.0	19.0	18.0	1.00	0.236	19.00	-0.34	0.00	
FO	23.0	22.0	20.0	1.53	0.354	21.67	0.58	0.92	
FZ	26.0	29.0	31.0	2.52	0.591	28.67	3.00	3.35	⇑
GE									•
GI	22.0	16.0	23.0	3.79	0.827	20.33	0.12	0.46	
GQ	19.0	20.0	21.0	1.00	0.236	20.00	0.00	0.35	
HE	18.0	17.0	17.0	0.58	0.118	17.33	-0.92	-0.58	
HI	29.0	26.0	26.0	1.73	0.354	27.00	2.43	2.77	
HL	19.0	20.0	19.0	0.58	0.118	19.33	-0.23	0.12	
HX									•
I	20.0	20.0	17.0	1.73	0.354	19.00	-0.34	0.00	
IA									•
IC	21.0	21.0	20.0	0.58	0.118	20.67	0.23	0.58	
IE	18.0	20.0	20.0	1.15	0.236	19.33	-0.23	0.12	
II									•
IU									•
IY	20.0	24.0	25.0	2.65	0.591	23.00	1.04	1.39	
J	18.0	18.0	19.0	0.58	0.118	18.33	-0.58	-0.23	
JE	25.0	25.0	26.0	0.58	0.118	25.33	1.85	2.19	
JI	22.0	21.0	22.0	0.58	0.118	21.67	0.58	0.92	
JS	18.0	18.0	21.0	1.73	0.354	19.00	-0.34	0.00	
JY	20.0	20.0	20.0	0.00	0.000	20.00	0.00	0.35	
K	20.0	22.0	19.0	1.53	0.354	20.33	0.12	0.46	
KF									•
KH	17.0	17.0	18.0	0.58	0.118	17.33	-0.92	-0.58	
KL	19.0	19.0	20.0	0.58	0.118	19.33	-0.23	0.12	
KM									•
KX	22.0	22.0	22.0	0.00	0.000	22.00	0.69	1.04	
L	18.0	18.0	19.0	0.58	0.118	18.33	-0.58	-0.23	
LA									•

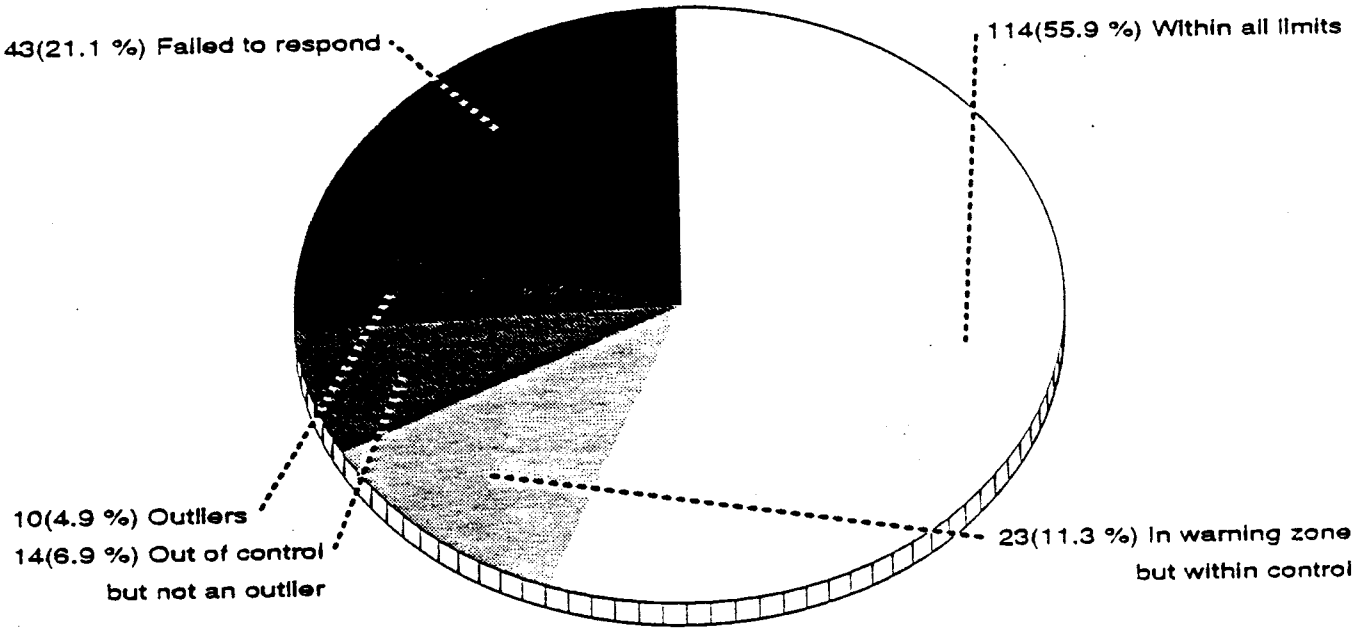
• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

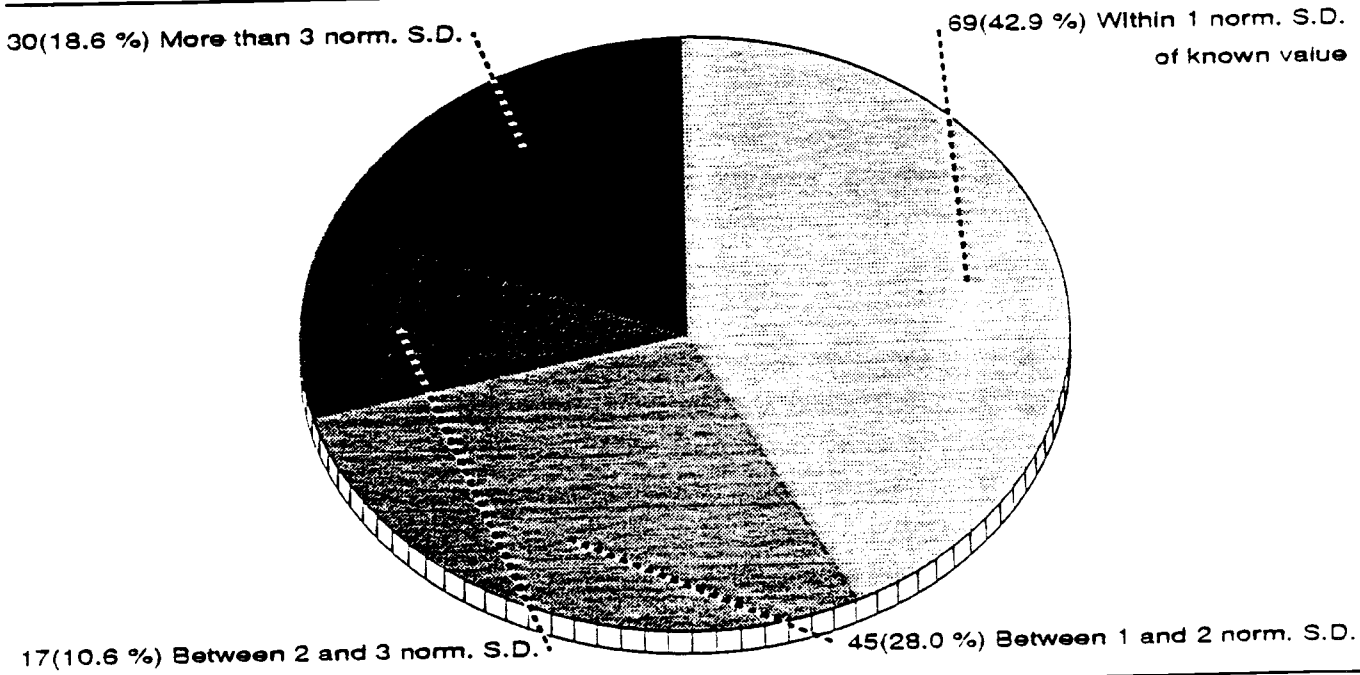
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Beta Statistical Summary 204 Participants

The known value of this nuclide is **47.0 pCi/F** with an expected precision of **5.0**; the control limits are 38.3 to 55.7; the warning regions are 38.3 to 41.2 and 52.8 to 55.7



Statistic	Respondents	Non-outliers
Mean	49.86	**Grand Avg 49.32**
Std. Dev.	7.82	4.62
Variance	61.22	21.38
% Coef. of Var.	15.69	9.37
% deviation of mean from known value	6.07	4.93
Norm. dev. of mean from known value	0.36	0.50
Median	49.00	49.00
% deviation of median from known value	4.26	4.26
Norm. dev. of median from known value	0.26	0.43



Beta Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DT	42.0	44.0	42.0	1.15	0.236	42.67	-2.30	-1.50	
DX	46.0	48.0	47.0	1.00	0.236	47.00	-0.80	0.00	
DY									•
E	51.0	51.0	53.0	1.15	0.236	51.67	0.81	1.62	
EA	55.0	58.0	57.0	1.53	0.354	56.67	2.55	3.35	⇑
EB	46.0	47.0	47.0	0.58	0.118	46.67	-0.92	-0.12	
EF	39.0	40.0	38.0	1.00	0.236	39.00	-3.57	-2.77	
EH	54.0	50.0	53.0	2.08	0.473	52.33	1.04	1.85	
EL	46.0	46.0	46.0	0.00	0.000	46.00	-1.15	-0.35	
EW	57.0	56.0	58.0	1.00	0.236	57.00	2.66	3.46	⇑
EX	53.0	54.0	52.0	1.00	0.236	53.00	1.28	2.08	
EZ	45.0	43.0	44.0	1.00	0.236	44.00	-1.84	-1.04	
FE									•
FJ	67.0	75.0	76.0	4.93	1.120	72.67	8.09	8.89	×
FK	47.0	47.0	46.0	0.58	0.118	46.67	-0.92	-0.12	
FL	51.0	55.0	53.0	2.00	0.473	53.00	1.28	2.08	
FO									•
FZ	38.0	36.0	45.0	4.73	1.120	39.67	-3.34	-2.54	
GE	52.0	52.0	50.0	1.15	0.236	51.33	0.70	1.50	
GI									•
GQ	50.0	49.0	48.0	1.00	0.236	49.00	-0.11	0.69	
HE	53.0	50.0	50.0	1.73	0.354	51.00	0.58	1.39	
HI	46.0	44.0	45.0	1.00	0.236	45.00	-1.50	-0.69	
HL	47.0	48.0	47.0	0.58	0.118	47.33	-0.69	0.12	
HX									•
I	49.0	50.0	47.0	1.53	0.354	48.67	-0.23	0.58	
IA									•
IC	56.0	53.0	56.0	1.73	0.354	55.00	1.97	2.77	
IE	45.0	48.0	45.0	1.73	0.354	46.00	-1.15	-0.35	
II									•
IU	45.0	47.0	44.0	1.53	0.354	45.33	-1.38	-0.58	
IY	56.0	55.0	56.0	0.58	0.118	55.67	2.20	3.00	
J	49.0	49.0	50.0	0.58	0.118	49.33	0.01	0.81	
JE	57.0	60.0	59.0	1.53	0.354	58.67	3.24	4.04	⇑
JI	67.0	67.0	67.0	0.00	0.000	67.00	6.13	6.93	×
JS	39.0	39.0	48.0	5.20	1.120	42.00	-2.53	-1.73	
JY	56.0	57.0	54.0	1.53	0.354	55.67	2.20	3.00	
K	55.0	55.0	55.0	0.00	0.000	55.00	1.97	2.77	
KF									•
KH	48.0	48.0	48.0	0.00	0.000	48.00	-0.46	0.35	
KL	58.0	54.0	57.0	2.08	0.473	56.33	2.43	3.23	⇑
KM									•
KX	48.0	47.0	48.0	0.58	0.118	47.67	-0.57	0.23	
L	50.0	50.0	50.0	0.00	0.000	50.00	0.24	1.04	
LA									•

TAG SYMBOLS

• ≡ No data submitted
∅ ≡ Insufficient data
× ≡ Determined to be an outlier
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Uranium in Water

Performance Evaluation Study

August 13, 1993

Environmental Protection Agency

Environmental Monitoring Systems Laboratory

Las Vegas, Nevada

Blind-A

Performance Evaluation Study

October 19, 1993

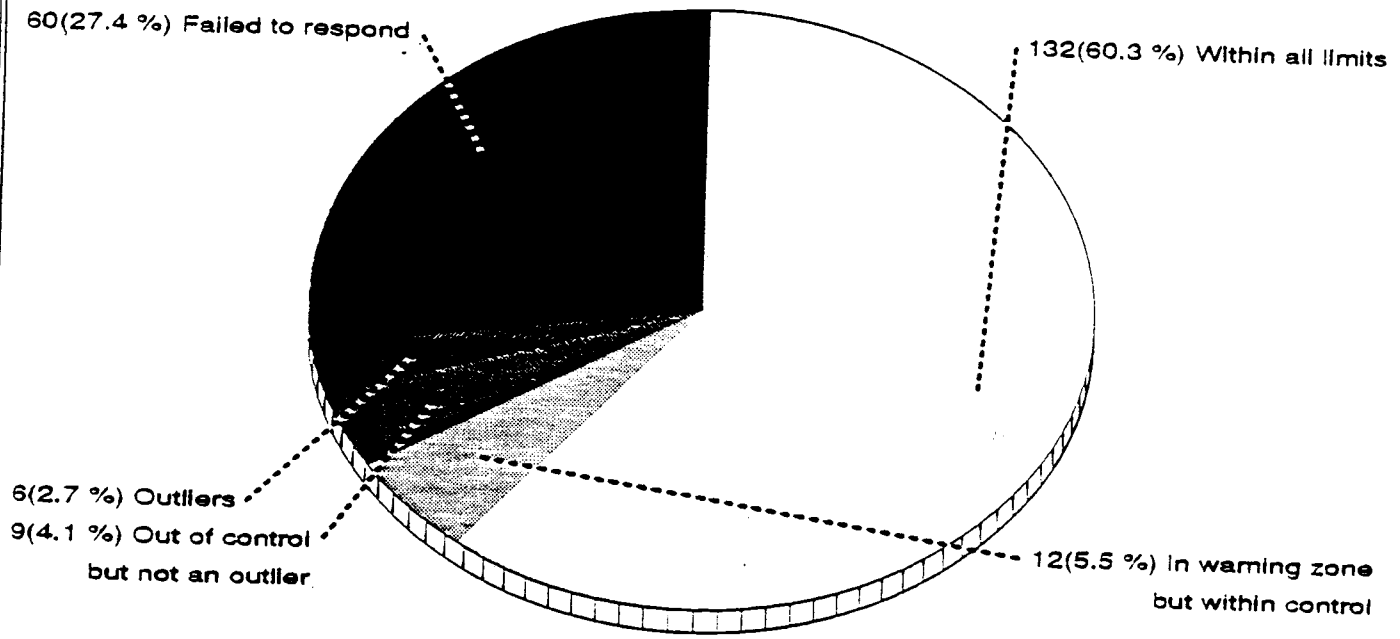
Environmental Protection Agency

Environmental Monitoring Systems Laboratory

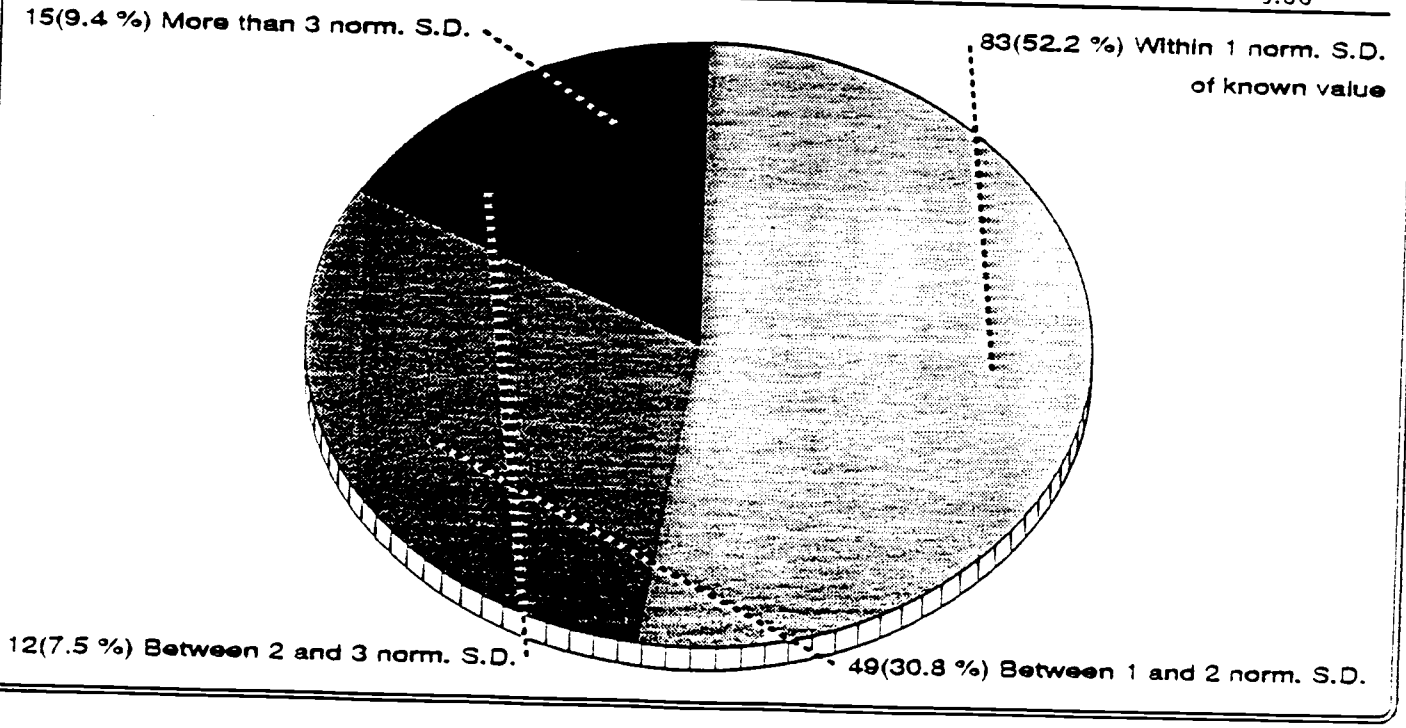
Las Vegas, Nevada

Gross Alpha Statistical Summary 219 Participants

The known value of this nuclide is **40.0 pCi/l** with an expected precision of **10.0**; the control limits are 22.7 to 57.3; the warning regions are 22.7 to 28.4 and 51.6 to 57.3



Statistic	Respondents	Non-outliers
Mean	47.94	**Grand Avg 40.77**
Std. Dev.	61.18	8.27
Variance	3742.45	68.33
% Coef. of Var.	127.61	20.28
% deviation of mean from known value	19.85	1.92
Norm. dev. of mean from known value	0.13	0.09
Median	40.00	40.00
% deviation of median from known value	0.00	0.00
Norm. dev. of median from known value	0.00	0.00



Gross Alpha

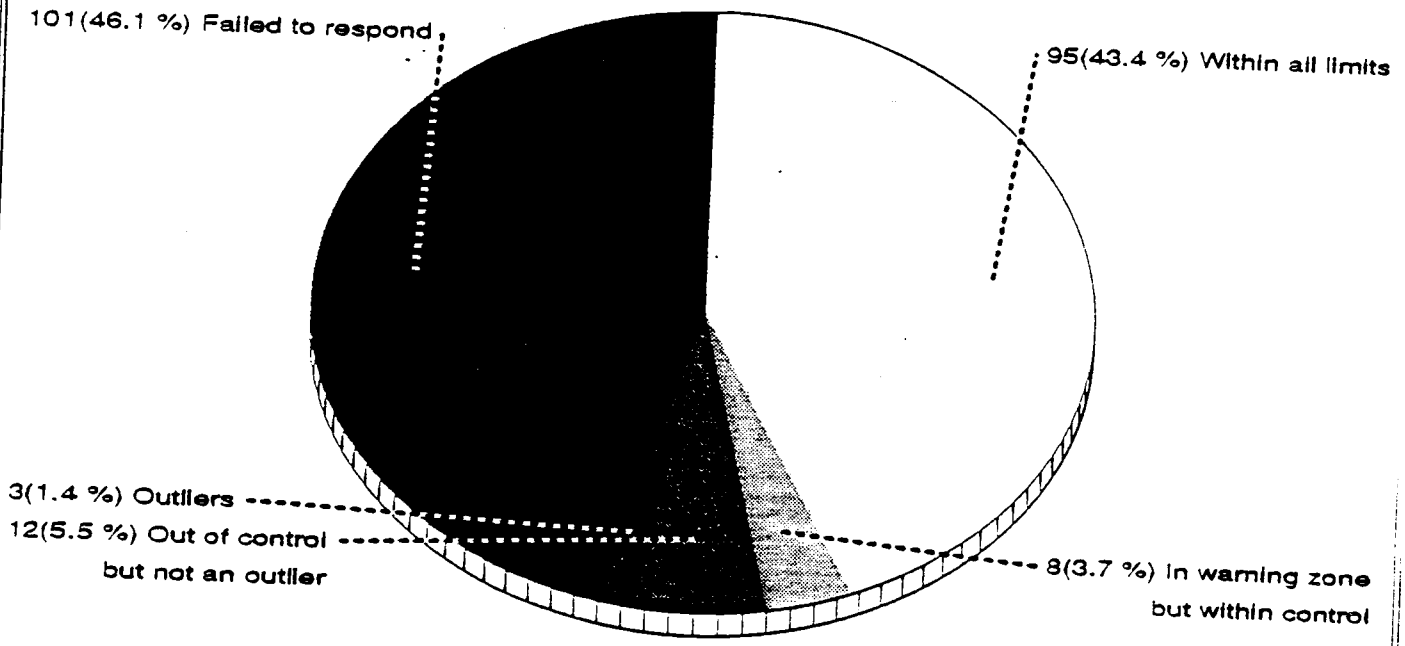
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DO									•
DS									•
DT	32.0	32.0	32.0	0.00	0.000	32.00	-1.52	-1.39	
DZ	42.0	43.0	42.0	0.58	0.059	42.33	0.27	0.40	
E	39.0	42.0	39.0	1.73	0.177	40.00	-0.13	0.00	
EB	34.0	35.0	35.0	0.58	0.059	34.67	-1.06	-0.92	
EH	53.0	54.0	39.0	8.39	0.886	48.67	1.37	1.50	
EL									•
EO	45.0	45.0	46.0	0.58	0.059	45.33	0.79	0.92	
ER									•
EV	30.0	32.0	31.0	1.00	0.118	31.00	-1.69	-1.56	
EX									•
FE	53.0	54.0	54.0	0.58	0.059	53.67	2.23	2.37	
FF	43.0	42.0	46.0	2.08	0.236	43.67	0.50	0.64	
FJ	27.0	32.0	34.0	3.61	0.413	31.00	-1.69	-1.56	
FL									•
FN	38.0	39.0	42.0	2.08	0.236	39.67	-0.19	-0.06	
FU	40.0	41.0	42.0	1.00	0.118	41.00	0.04	0.17	
FZ	23.0	31.0	30.0	4.36	0.473	28.00	-2.21	-2.08	
GE									•
GH									•
GQ	32.0	31.0	29.0	1.53	0.177	30.67	-1.75	-1.62	
GT	472.0	467.0	497.0	16.07	2.470	478.67	75.85	75.98	×
GZ	32.0	33.0	34.0	1.00	0.118	33.00	-1.35	-1.21	
HH	10.0	11.0	10.0	0.58	0.059	10.33	-5.27	-5.14	×
HI	80.0	82.0	83.0	1.53	0.177	81.67	7.08	7.22	×
HK	51.0	46.0	53.0	3.61	0.413	50.00	1.60	1.73	
HL	58.0	58.0	58.0	0.00	0.000	58.00	2.98	3.12	⇑
HN	47.0	50.0	57.0	5.13	0.591	51.33	1.83	1.96	
HP	40.0	39.0	41.0	1.00	0.118	40.00	-0.13	0.00	
HU	54.0	50.0	50.0	2.31	0.236	51.33	1.83	1.96	
HX									•
I	33.0	30.0	29.0	2.08	0.236	30.67	-1.75	-1.62	
IA									•
IC	39.0	35.0	38.0	2.08	0.236	37.33	-0.59	-0.46	
ID	38.0	36.0	37.0	1.00	0.118	37.00	-0.65	-0.52	
IE	29.0	30.0	31.0	1.00	0.118	30.00	-1.86	-1.73	
IL									•
IU									•
J	41.0	42.0	38.0	2.08	0.236	40.33	-0.08	0.06	
JE	39.0	39.0	39.0	0.00	0.000	39.00	-0.31	-0.17	
JG	48.0	48.0	48.0	0.00	0.000	48.00	1.25	1.39	
JH									•
JN	61.0	56.0	63.0	3.61	0.413	60.00	3.33	3.46	⇑
JQ	45.0	45.0	42.0	1.73	0.177	44.00	0.56	0.69	

TAG SYMBOLS

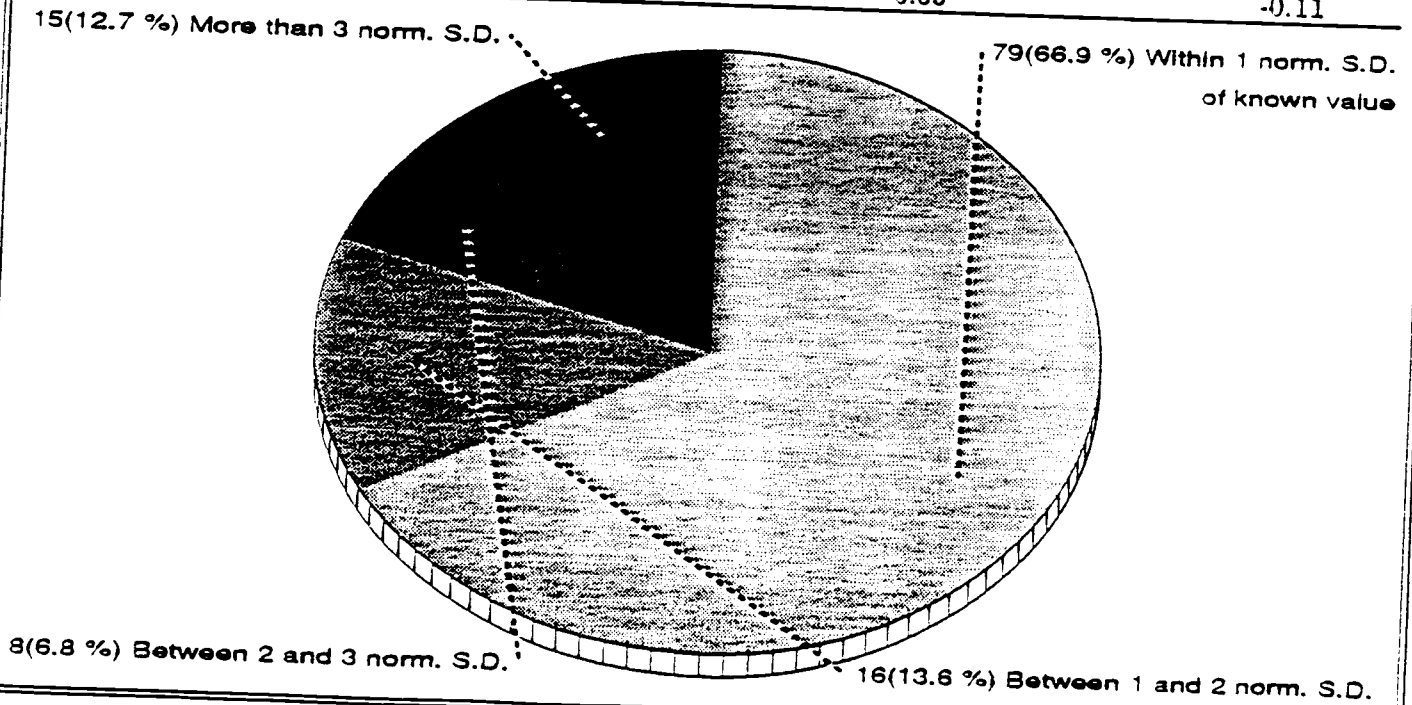
• ≡ No data submitted
∅ ≡ Insufficient data
× ≡ Determined to be an outlier
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Uranium (Natural) Statistical Summary 219 Participants

The known value of this nuclide is **15.1 pCi/l** with an expected precision of **3.0**; the control limits are 9.9 to 20.3; the warning regions are 9.9 to 11.6 and 18.6 to 20.3



Statistic	Respondents		Non-outliers
Mean	14.46	**Grand Avg**	**14.38**
Std. Dev.	3.14		2.63
Variance	9.83		6.91
% Coef. of Var.	21.68		18.29
% deviation of mean from known value	-4.22		-4.80
Norm. dev. of mean from known value	-0.20		-0.28
Median	14.82		14.80
% deviation of median from known value	-1.88		-1.99
Norm. dev. of median from known value	-0.09		-0.11



Uranium (Natural)

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DO	15.2	15.6	16.4	0.61	0.236	15.73	0.78	0.37	
DS									•
DT	14.6	15.0	14.6	0.23	0.079	14.73	0.21	-0.21	
DZ	14.1	14.2	13.9	0.15	0.059	14.07	-0.18	-0.60	
E	14.5	13.5	12.8	0.85	0.335	13.60	-0.45	-0.87	
EB	16.5	15.5	16.5	0.58	0.197	16.17	1.03	0.62	
EH									•
EL									•
EO									•
ER									•
EV									•
EX									•
FE	15.0	15.0	15.0	0.00	0.000	15.00	0.36	-0.06	
FF									•
FJ	9.2	9.0	9.2	0.12	0.039	9.13	-3.03	-3.44	⇓
FL									•
FN	26.9	27.1	24.8	1.27	0.453	26.27	6.87	6.45	×
FU									•
FZ	16.1	13.8	14.6	1.17	0.453	14.83	0.26	-0.15	
GE									•
GL									•
GQ	15.0	14.7	14.4	0.30	0.118	14.70	0.19	-0.23	
GT									•
GZ									•
HH									•
HI									•
HK	17.1	16.4	15.9	0.60	0.236	16.47	1.21	0.79	
HL	15.4	14.4	14.0	0.72	0.276	14.60	0.13	-0.29	
HN									•
HP	15.2	14.7	16.0	0.66	0.256	15.30	0.53	0.12	
HU	23.2	22.6	22.3	0.46	0.177	22.70	4.81	4.39	⇑
HX									•
I	12.7	12.7	16.2	2.02	0.689	13.87	-0.29	-0.71	
IA									•
IC									•
ID	8.7	8.1	8.4	0.30	0.118	8.40	-3.45	-3.87	⇓
IE	12.4	13.7	12.5	0.72	0.256	12.87	-0.87	-1.29	
IF									•
IU									•
J	15.4	15.4	15.3	0.06	0.020	15.37	0.57	0.15	
JE	14.6	11.8	14.7	1.65	0.571	13.70	-0.39	-0.81	
JG									•
JH									•
JN	13.7	14.3	13.0	0.65	0.256	13.67	-0.41	-0.83	
JQ									•

• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

⇑ ≡ Above control limit
⇓ ≡ Below control limit

Blind-B

Performance Evaluation Study

October 19, 1993

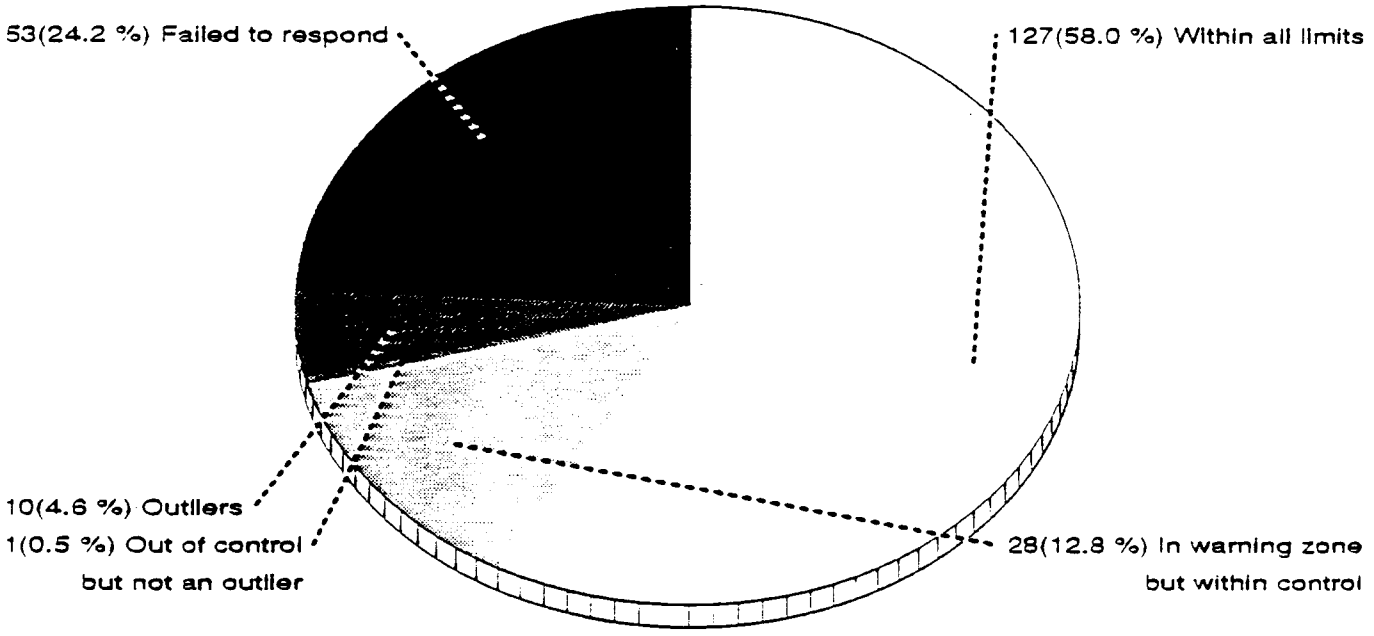
Environmental Protection Agency

Environmental Monitoring Systems Laboratory

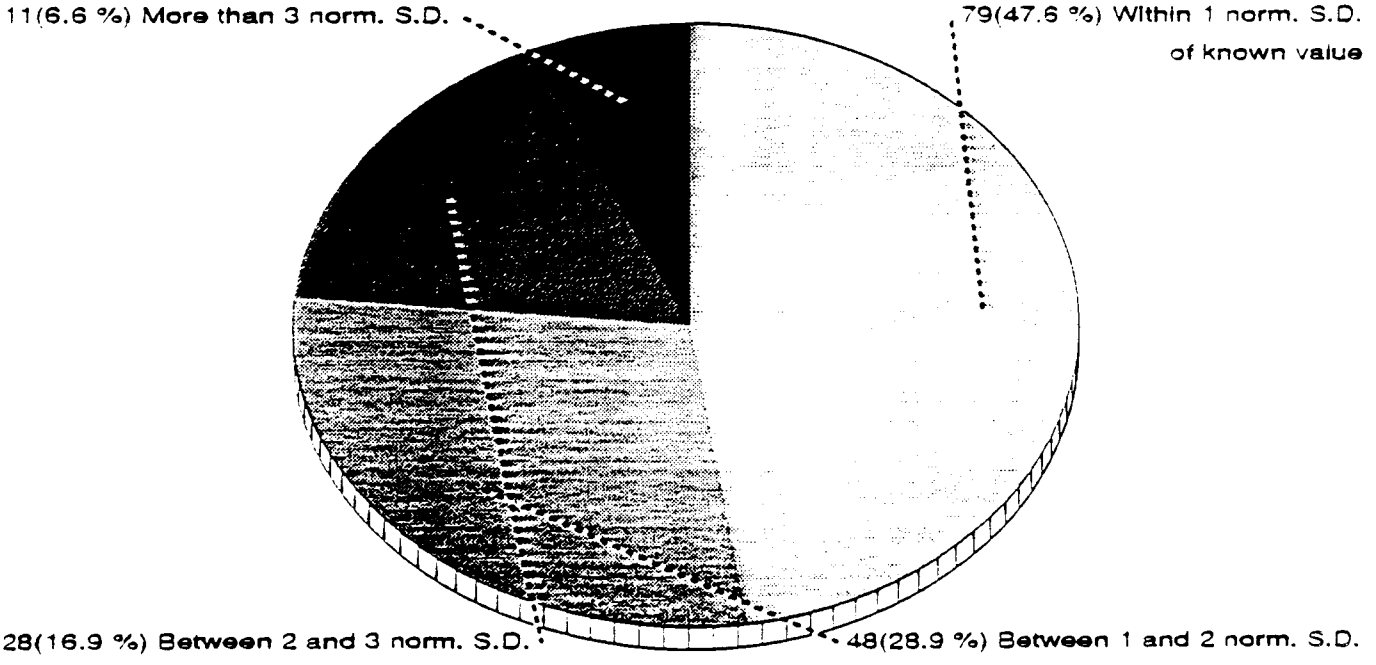
Las Vegas, Nevada

Gross Beta Statistical Summary 219 Participants

The known value of this nuclide is **58.0 pCi/l** with an expected precision of **10.0**; the control limits are 40.7 to 75.3; the warning regions are 40.7 to 46.4 and 69.6 to 75.3



Statistic	Respondents	Non-outliers
Mean	63.20	**Grand Avg 53.40**
Std. Dev.	75.20	6.43
Variance	5655.58	41.37
% Coef. of Var.	119.00	12.05
% deviation of mean from known value	8.96	-7.94
Norm. dev. of mean from known value	0.07	-0.72
Median	53.83	53.33
% deviation of median from known value	-7.18	-8.05
Norm. dev. of median from known value	-0.06	-0.73



Gross Beta

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DO									•
DS									•
DT	58.0	58.0	56.0	1.15	0.118	57.33	0.68	-0.12	
DZ	58.0	60.0	62.0	2.00	0.236	60.00	1.14	0.35	
E	55.0	56.0	54.0	1.00	0.118	55.00	0.28	-0.52	
EB	58.0	59.0	59.0	0.58	0.059	58.67	0.91	0.12	
EH	55.0	53.0	51.0	2.00	0.236	53.00	-0.07	-0.87	
EL									•
EO	51.0	53.0	52.0	1.00	0.118	52.00	-0.24	-1.04	
ER									•
EV	46.0	47.0	49.0	1.53	0.177	47.33	-1.05	-1.85	
EX									•
FE									•
FF	46.0	50.0	47.0	2.08	0.236	47.67	-0.99	-1.79	
FJ	69.0	69.0	69.0	0.00	0.000	69.00	2.70	1.91	
FL									•
FN	44.0	46.0	47.0	1.53	0.177	45.67	-1.34	-2.14	
FU	44.0	45.0	45.0	0.58	0.059	44.67	-1.51	-2.31	
FZ	41.0	43.0	29.0	7.57	0.827	37.67	-2.72	-3.52	⇓
GE	51.0	50.0	53.0	1.53	0.177	51.33	-0.36	-1.15	
GI									•
GQ	53.0	54.0	56.0	1.53	0.177	54.33	0.16	-0.64	
GT	784.0	765.0	728.0	28.48	5.396	759.00	122.21	121.42	×
GZ	61.0	61.0	58.0	1.73	0.177	60.00	1.14	0.35	
HH	12.0	10.0	9.0	1.53	0.177	10.33	-7.46	-8.26	×
HI	140.0	130.0	130.0	5.77	0.591	133.33	13.85	13.05	×
HK	56.0	56.0	56.0	0.00	0.000	56.00	0.45	-0.35	
HL	56.0	56.0	56.0	0.00	0.000	56.00	0.45	-0.35	
HN									•
HP	50.0	47.0	48.0	1.53	0.177	48.33	-0.88	-1.67	
HU	69.0	68.0	70.0	1.00	0.118	69.00	2.70	1.91	
HX									•
I	49.0	47.0	47.0	1.15	0.118	47.67	-0.99	-1.79	
IA									•
IC	54.0	53.0	59.0	3.21	0.354	55.33	0.34	-0.46	
ID	46.0	46.0	46.0	0.00	0.000	46.00	-1.28	-2.08	
IE	49.0	52.0	48.0	2.08	0.236	49.67	-0.65	-1.44	
II									•
IU									•
J	57.0	58.0	58.0	0.58	0.059	57.67	0.74	-0.06	
JE	58.0	58.0	56.0	1.15	0.118	57.33	0.68	-0.12	
JG	109.0	134.0	122.0	12.50	1.908	121.67	11.82	11.03	×
JH									•
JN	65.0	63.0	63.0	1.15	0.118	63.67	1.78	0.98	
JQ									•

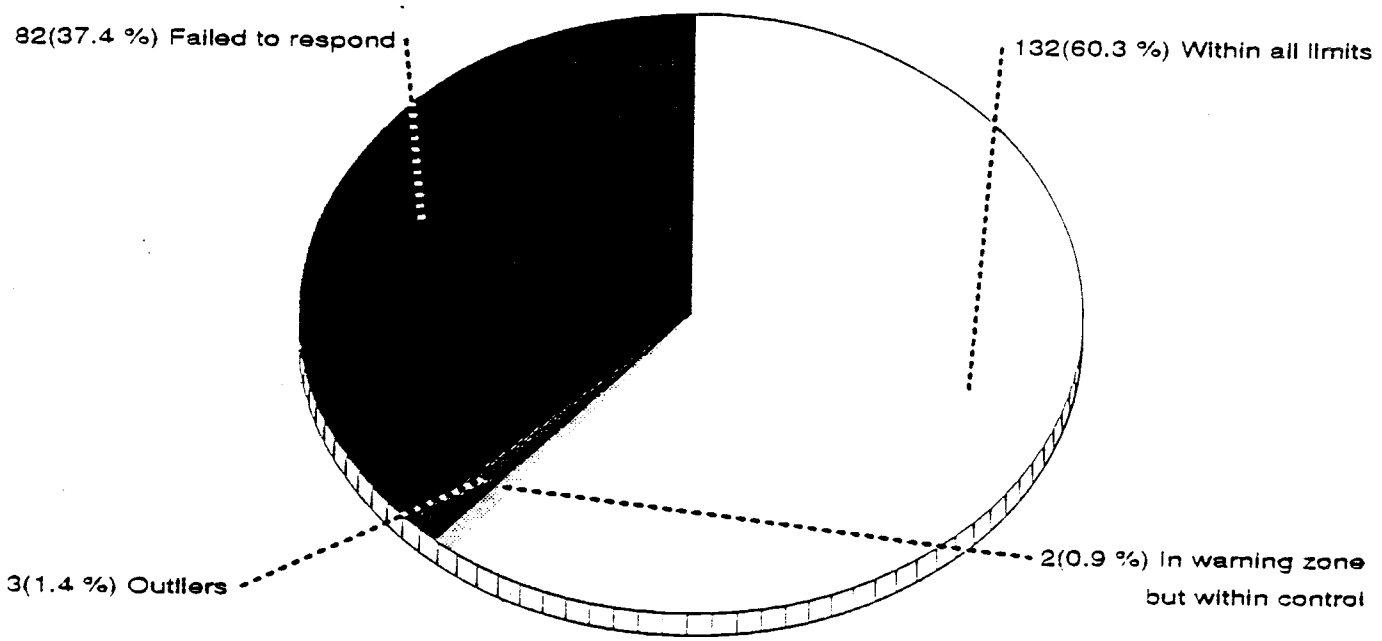
• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

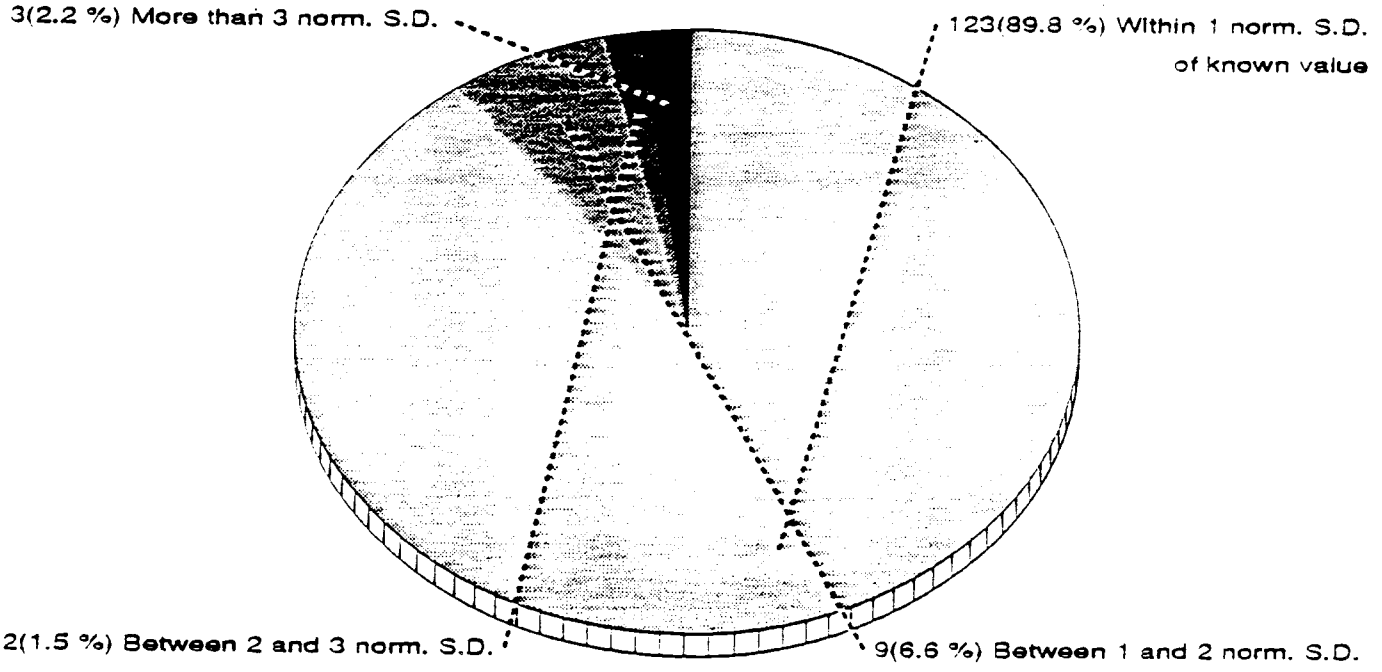
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Cobalt-60 Statistical Summary 219 Participants

The known value of this nuclide is **10.0 pCi/l** with an expected precision of **5.0**; the control limits are 1.3 to 18.7; the warning regions are 1.3 to 4.2 and 15.8 to 18.7



Statistic	Respondents	Non-outliers
Mean	10.81	**Grand Avg 10.41**
Std. Dev.	3.43	1.63
Variance	11.79	2.67
% Coef. of Var.	31.76	15.71
% deviation of mean from known value	8.13	4.05
Norm. dev. of mean from known value	0.24	0.25
Median	10.00	10.00
% deviation of median from known value	0.00	0.00
Norm. dev. of median from known value	0.00	0.00



Cobalt-60

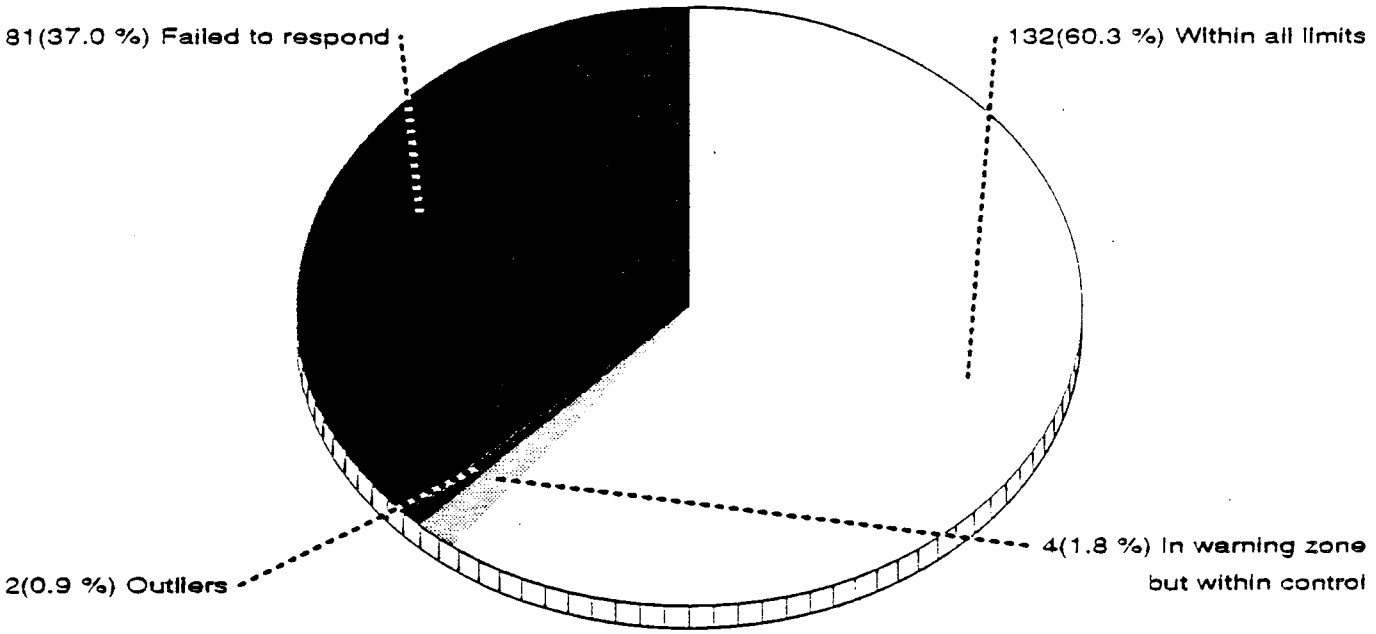
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DO	13.0	13.0	13.0	0.00	0.000	13.00	0.90	1.04	
DS									•
DT	9.0	11.0	13.0	2.00	0.473	11.00	0.21	0.35	
DZ	9.0	9.0	10.0	0.58	0.118	9.33	-0.37	-0.23	
E	9.0	9.0	10.0	0.58	0.118	9.33	-0.37	-0.23	
EB	9.0	10.0	9.0	0.58	0.118	9.33	-0.37	-0.23	
EH	9.0	9.0	9.0	0.00	0.000	9.00	-0.49	-0.35	
EL	10.0	9.0	10.0	0.58	0.118	9.67	-0.26	-0.12	
EO									•
ER									•
EV									•
EX	11.0	10.0	9.0	1.00	0.236	10.00	-0.14	0.00	
FE	10.0	10.0	11.0	0.58	0.118	10.33	-0.02	0.12	
FF									•
FJ	10.0	10.0	12.0	1.15	0.236	10.67	0.09	0.23	
FL									•
FN									•
FU	9.0	10.0	10.0	0.58	0.118	9.67	-0.26	-0.12	
FZ	10.0	13.0	13.0	1.73	0.354	12.00	0.55	0.69	
GE	9.0	10.0	11.0	1.00	0.236	10.00	-0.14	0.00	
GI	9.0	12.0	10.0	1.53	0.354	10.33	-0.02	0.12	
GQ									•
GT									•
GZ									•
HH									•
HI	25.0	27.0	26.0	1.00	0.236	26.00	5.40	5.54	×
HK	10.0	10.0	10.0	0.00	0.000	10.00	-0.14	0.00	
HL	12.0	11.0	12.0	0.58	0.118	11.67	0.44	0.58	
HN									•
HP	10.0	8.0	9.0	1.00	0.236	9.00	-0.49	-0.35	
HU	17.0	17.0	18.0	0.58	0.118	17.33	2.40	2.54	
HX									•
I	11.0	12.0	13.0	1.00	0.236	12.00	0.55	0.69	
IA	11.0	10.0	8.0	1.53	0.354	9.67	-0.26	-0.12	
IC	10.0	10.0	10.0	0.00	0.000	10.00	-0.14	0.00	
ID									•
IE									•
IT									•
IU									•
J	10.0	10.0	10.0	0.00	0.000	10.00	-0.14	0.00	
JE	10.0	10.0	10.0	0.00	0.000	10.00	-0.14	0.00	
JG	10.0	8.0	7.0	1.53	0.354	8.33	-0.72	-0.58	
JH									•
JN									•
JQ									•

• ≡ No data submitted — **TAG SYMBOLS** — ⇑ ≡ Above control limit

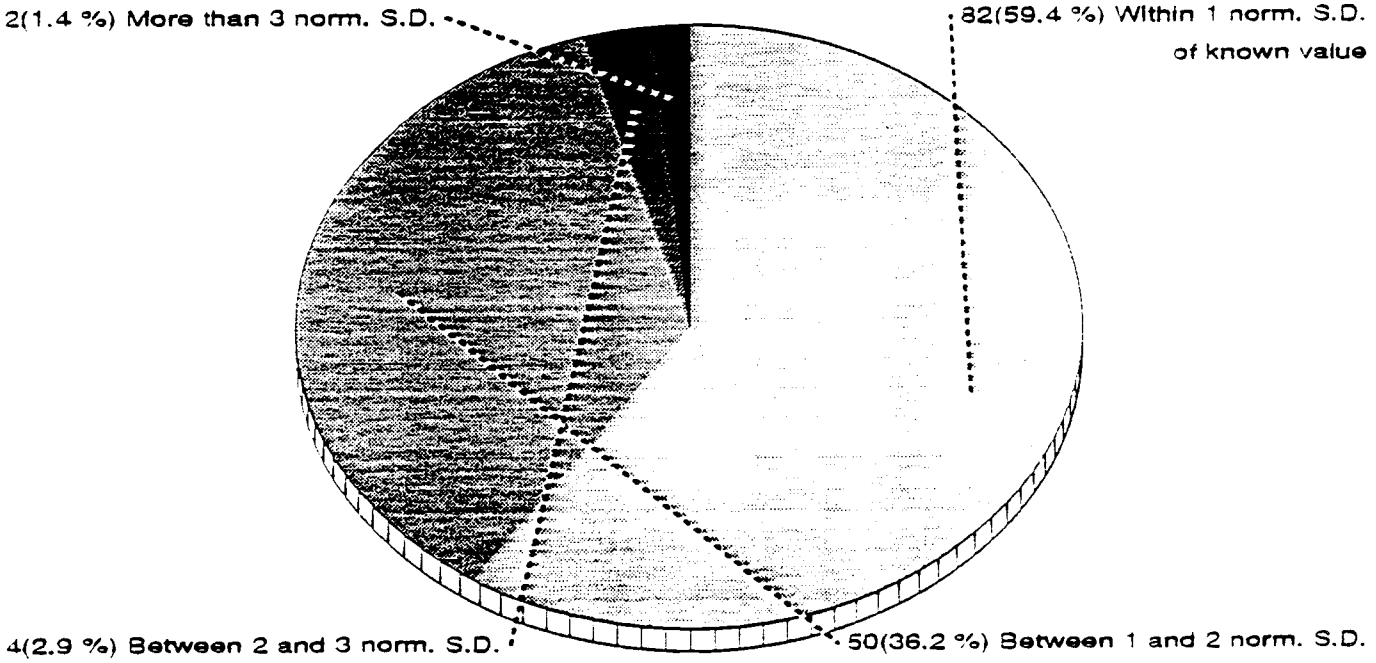
∅ ≡ Insufficient data — × ≡ Determined to be an outlier — ⇓ ≡ Below control limit

Cesium-134 Statistical Summary 219 Participants

The known value of this nuclide is **12.0 pCi/l** with an expected precision of **5.0**; the control limits are 3.3 to 20.7; the warning regions are 3.3 to 6.2 and 17.8 to 20.7



Statistic	Respondents	Non-outliers
Mean	11.83	**Grand Avg 9.78**
Std. Dev.	22.61	1.86
Variance	511.12	3.48
% Coef. of Var.	191.17	19.06
% deviation of mean from known value	-1.45	-18.48
Norm. dev. of mean from known value	-0.01	-1.19
Median	9.67	9.67
% deviation of median from known value	-19.44	-19.44
Norm. dev. of median from known value	-0.10	-1.25



Cesium-134

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DO	8.0	14.0	8.0	3.46	0.709	10.00	0.08	-0.69	
DS									•
DT	9.0	10.0	10.0	0.58	0.118	9.67	-0.04	-0.81	
DZ	10.0	10.0	10.0	0.00	0.000	10.00	0.08	-0.69	
E	10.0	11.0	10.0	0.58	0.118	10.33	0.19	-0.58	
EB	9.0	9.0	9.0	0.00	0.000	9.00	-0.27	-1.04	
EH	7.0	10.0	10.0	1.73	0.354	9.00	-0.27	-1.04	
EL	10.0	10.0	9.0	0.58	0.118	9.67	-0.04	-0.81	
EO									•
ER									•
EV									•
EX	13.0	12.0	12.0	0.58	0.118	12.33	0.88	0.12	
FE	10.0	10.0	9.0	0.58	0.118	9.67	-0.04	-0.81	
FF									•
FJ	11.0	9.0	10.0	1.00	0.236	10.00	0.08	-0.69	
FL									•
FN									•
FU	8.0	9.0	9.0	0.58	0.118	8.67	-0.39	-1.15	
FZ	9.0	9.0	10.0	0.58	0.118	9.33	-0.16	-0.92	
GE	9.0	9.0	10.0	0.58	0.118	9.33	-0.16	-0.92	
GI	9.0	9.0	9.0	0.00	0.000	9.00	-0.27	-1.04	
GQ									•
GT									•
GZ									•
HH									•
HI	29.0	29.0	25.0	2.31	0.473	27.67	6.20	5.43	×
HK	9.0	10.0	9.0	0.58	0.118	9.33	-0.16	-0.92	
HL	11.0	11.0	11.0	0.00	0.000	11.00	0.42	-0.35	
HN									•
HP	11.0	8.0	9.0	1.53	0.354	9.33	-0.16	-0.92	
HU	17.0	19.0	20.0	1.53	0.354	18.67	3.08	2.31	
HX									•
I	10.0	8.0	9.0	1.00	0.236	9.00	-0.27	-1.04	
IA	11.0	10.0	8.0	1.53	0.354	9.67	-0.04	-0.81	
IC	9.0	10.0	10.0	0.58	0.118	9.67	-0.04	-0.81	
ID									•
IE									•
II									•
IU									•
J	9.0	9.0	9.0	0.00	0.000	9.00	-0.27	-1.04	
JE	9.0	9.0	10.0	0.58	0.118	9.33	-0.16	-0.92	
JG	10.0	8.0	11.0	1.53	0.354	9.67	-0.04	-0.81	
JH									•
JN									•
JQ									•

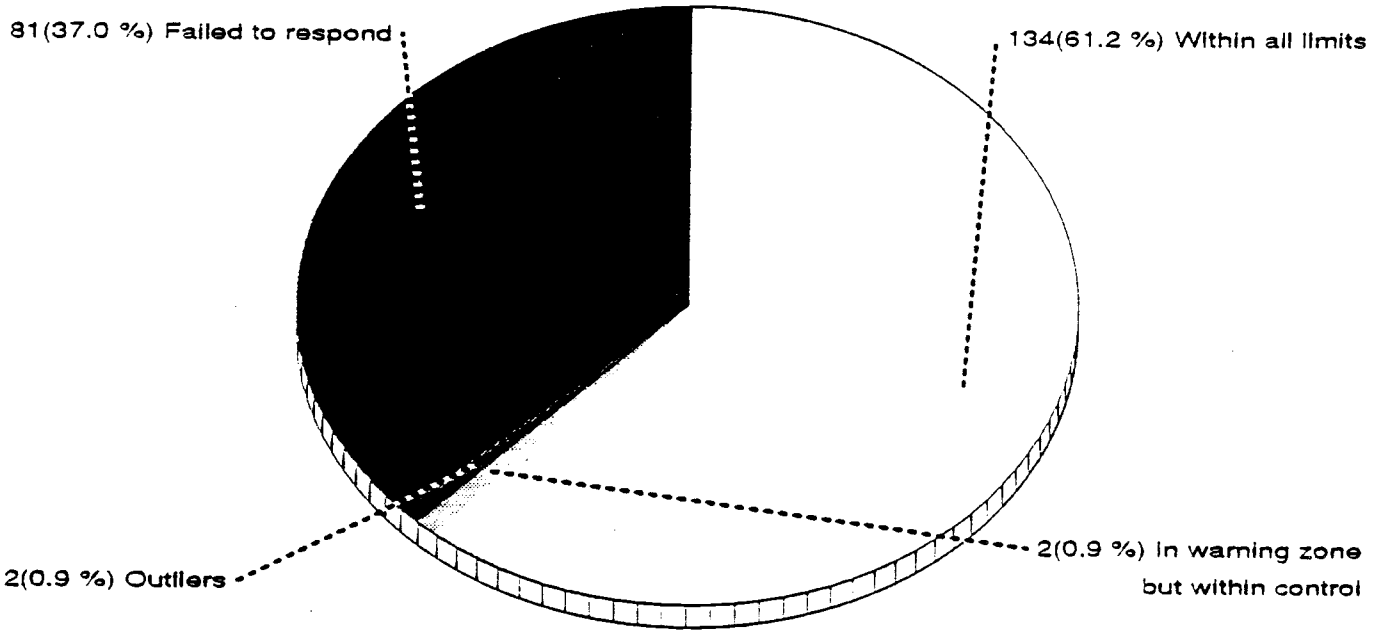
• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

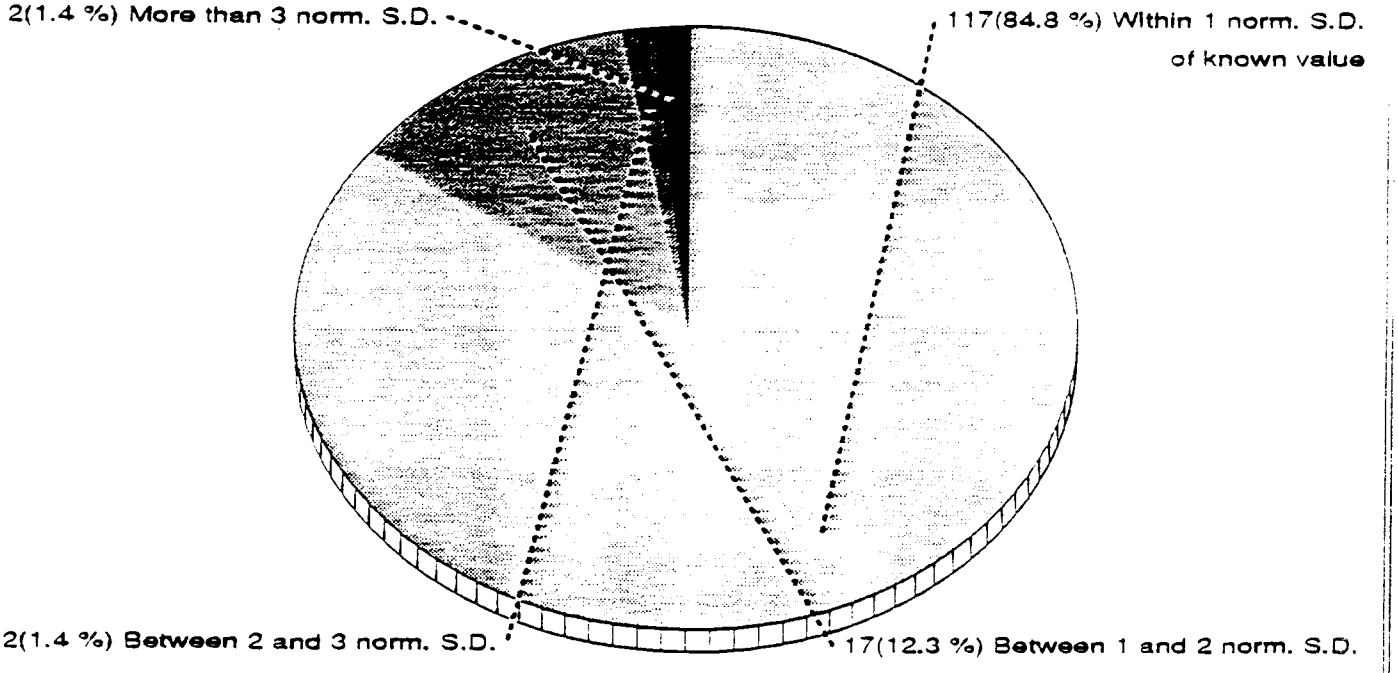
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Cesium-137 Statistical Summary 219 Participants

The known value of this nuclide is **10.0 pCi/l** with an expected precision of **5.0**; the control limits are 1.3 to 18.7; the warning regions are 1.3 to 4.2 and 15.8 to 18.7



Statistic	Respondents	Non-outliers
Mean	11.13	**Grand Avg 10.93**
Std. Dev.	2.38	1.72
Variance	5.67	2.95
% Coef. of Var.	21.40	15.71
% deviation of mean from known value	11.30	9.34
Norm. dev. of mean from known value	0.47	0.54
Median	10.67	10.67
% deviation of median from known value	6.67	6.67
Norm. dev. of median from known value	0.28	0.39



Cesium-137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DO	12.0	13.0	9.0	2.08	0.473	11.33	0.14	0.46	
DS									•
DT	11.0	9.0	10.0	1.00	0.236	10.00	-0.32	0.00	
DZ	11.0	11.0	10.0	0.58	0.118	10.67	-0.09	0.23	
E	10.0	10.0	12.0	1.15	0.236	10.67	-0.09	0.23	
EB	11.0	12.0	11.0	0.58	0.118	11.33	0.14	0.46	
EH	10.0	10.0	9.0	0.58	0.118	9.67	-0.44	-0.12	
EL	10.0	11.0	11.0	0.58	0.118	10.67	-0.09	0.23	
EO									•
ER									•
EV									•
EX	12.0	12.0	11.0	0.58	0.118	11.67	0.25	0.58	
FE	11.0	12.0	11.0	0.58	0.118	11.33	0.14	0.46	
FF									•
FJ	11.0	9.0	10.0	1.00	0.236	10.00	-0.32	0.00	
FL									•
FN									•
FU	9.0	10.0	11.0	1.00	0.236	10.00	-0.32	0.00	
FZ	11.0	13.0	10.0	1.53	0.354	11.33	0.14	0.46	
GE	11.0	11.0	10.0	0.58	0.118	10.67	-0.09	0.23	
GI	10.0	10.0	10.0	0.00	0.000	10.00	-0.32	0.00	
GQ									•
GT									•
GZ									•
HH									•
HI	27.0	29.0	26.0	1.53	0.354	27.33	5.68	6.00	×
HK	11.0	10.0	10.0	0.58	0.118	10.33	-0.21	0.12	
HL	12.0	12.0	12.0	0.00	0.000	12.00	0.37	0.69	
HN									•
HP	12.0	9.0	11.0	1.53	0.354	10.67	-0.09	0.23	
HU	17.0	16.0	17.0	0.58	0.118	16.67	1.99	2.31	
HX									•
I	14.0	13.0	12.0	1.00	0.236	13.00	0.72	1.04	
IA	13.0	15.0	10.0	2.52	0.591	12.67	0.60	0.92	
IC	13.0	11.0	13.0	1.15	0.236	12.33	0.48	0.81	
ID									•
IE									•
IL									•
IU									•
J	10.0	10.0	11.0	0.58	0.118	10.33	-0.21	0.12	
JE	11.0	9.0	12.0	1.53	0.354	10.67	-0.09	0.23	
JG	15.0	10.0	13.0	2.52	0.591	12.67	0.60	0.92	
JH									•
JN									•
JQ									•

• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

⇑ ≡ Above control limit
⇓ ≡ Below control limit

United States
Environmental Protection
Agency

Environmental Monitoring
Systems Laboratory
P.O. Box 93478
Las Vegas NV 89193-3478

EPA 600/R-93/244
October 1993

Research and Development

EPA

Gross Alpha-Beta in Water Performance Evaluation Study

JAN 1994
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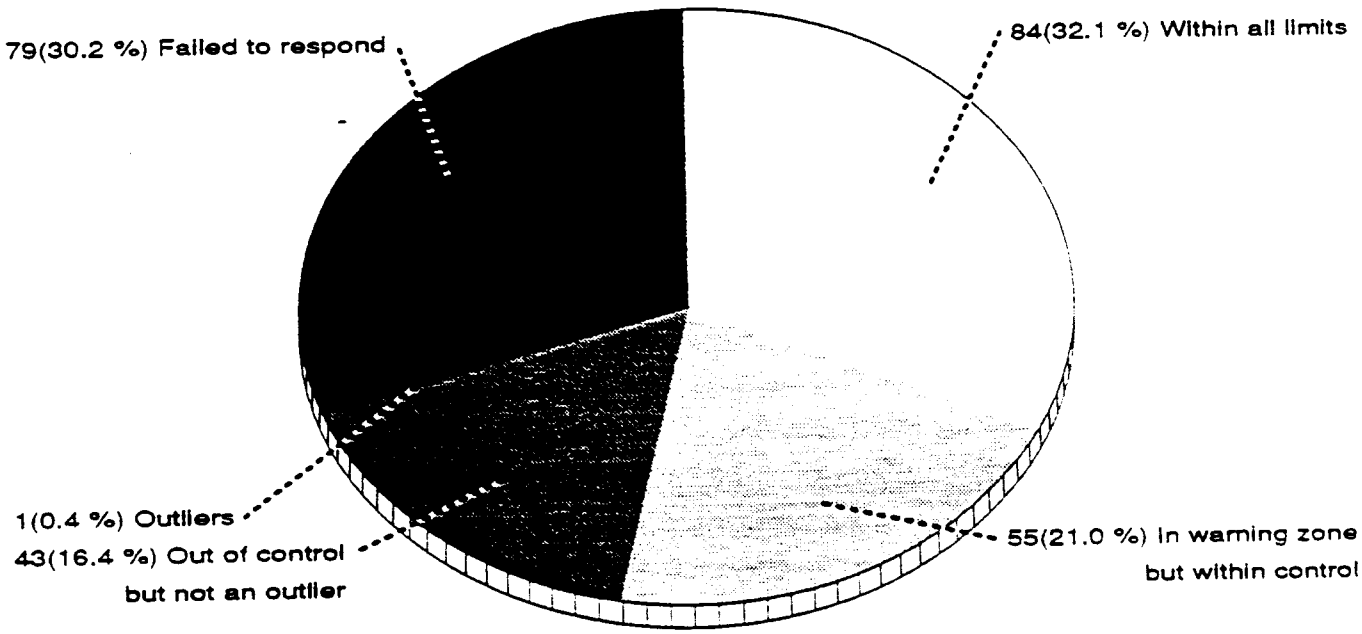
D.A. SEBELIEN

A Statistical Evaluation of the October 29, 1993 Data

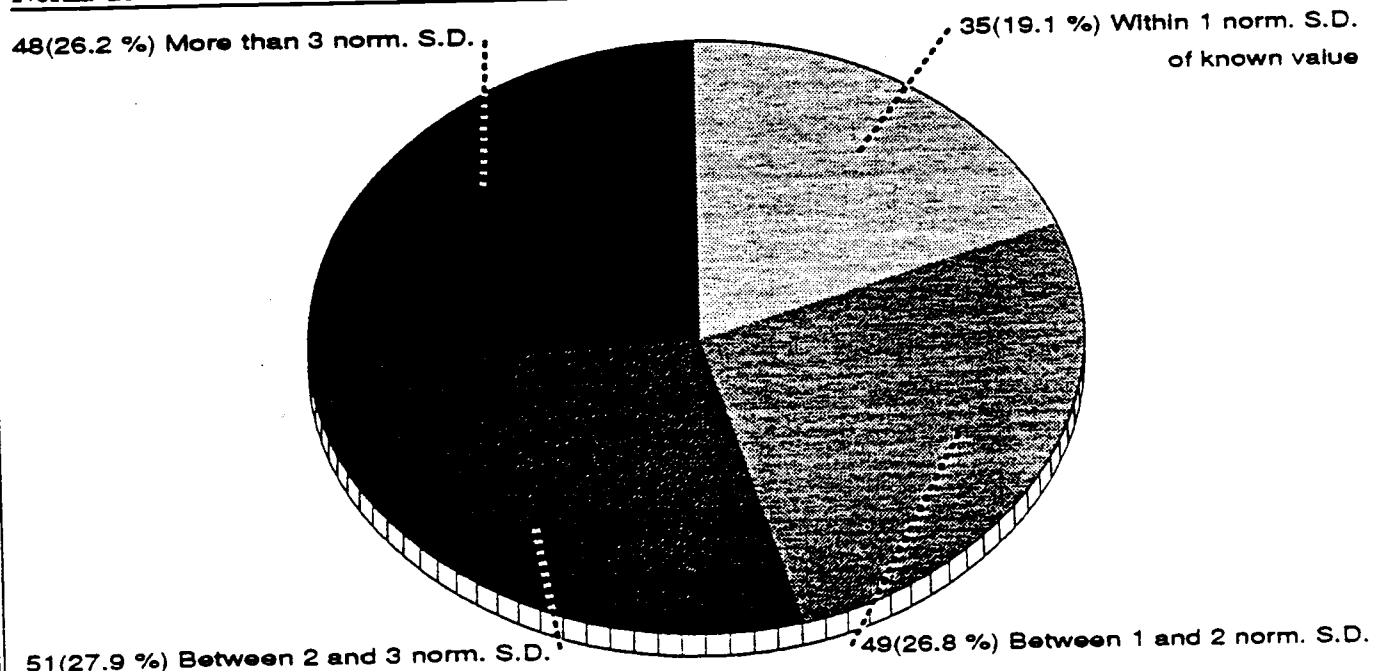
9311-0138nrd244

Gross Alpha Statistical Summary 262 Participants

The known value of this nuclide is **20.0 pCi/l** with an expected precision of **5.0**; the control limits are 11.3 to 28.7; the warning regions are 11.3 to 14.2 and 25.8 to 28.7



Statistic	Respondents	Non-outliers
Mean	14.20	**Grand Avg** 14.08
Std. Dev.	4.90	4.64
Variance	23.98	21.56
% Coef. of Var.	34.50	32.98
% deviation of mean from known value	-29.02	-29.61
Norm. dev. of mean from known value	-1.18	-1.28
Median	14.00	13.83
% deviation of median from known value	-30.00	-30.83
Norm. dev. of median from known value	-1.23	-1.33



Gross Alpha

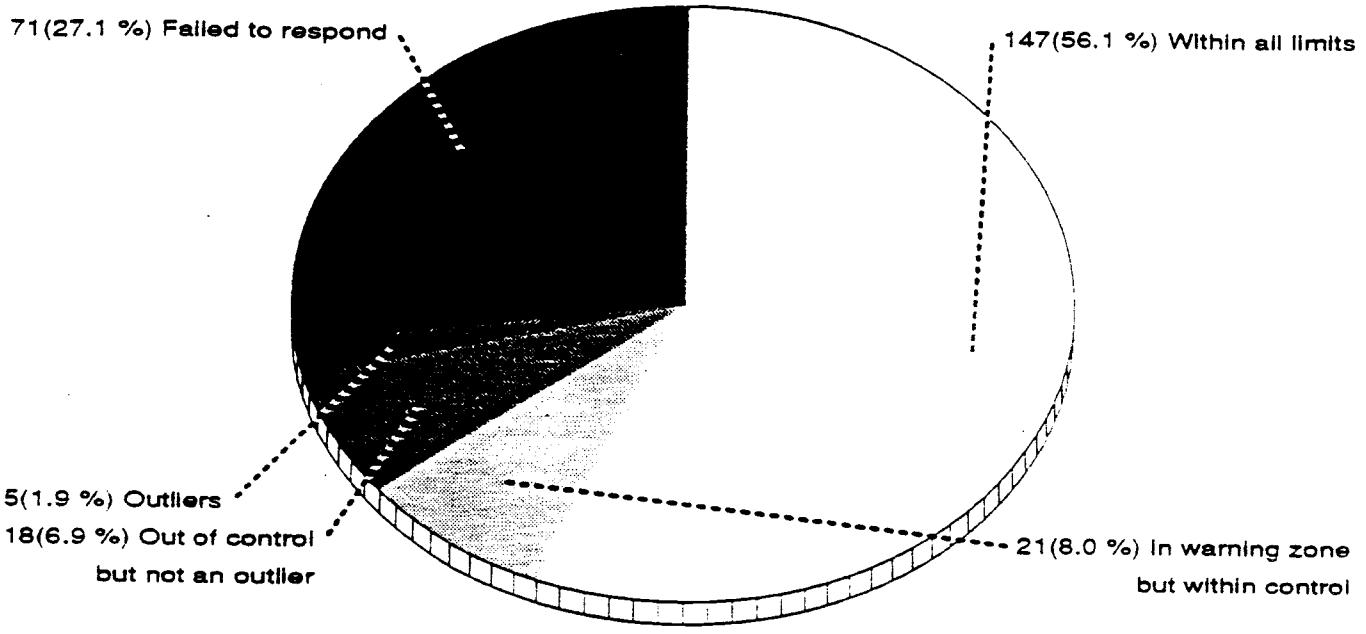
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DJ	6.0	5.0	5.0	0.58	0.118	5.33	-3.03	-5.08	⇓
DM									•
DO	21.0	16.0	19.0	2.52	0.591	18.67	1.59	-0.46	
DP									•
DR									•
DS									•
DT	20.0	20.0	19.0	0.58	0.118	19.67	1.94	-0.12	
DX									•
DY									•
DZ	16.0	15.0	17.0	1.00	0.236	16.00	0.67	-1.39	
E	17.0	15.0	14.0	1.53	0.354	15.33	0.43	-1.62	
EA									•
EB	13.0	15.0	19.0	3.06	0.709	15.67	0.55	-1.50	
EH	20.0	16.0	15.0	2.65	0.591	17.00	1.01	-1.04	
EL									•
EN	10.0	12.0	11.0	1.00	0.236	11.00	-1.07	-3.12	⇓
EO									•
ER	15.0	15.0	15.0	0.00	0.000	15.00	0.32	-1.73	
ES	14.0	15.0	17.0	1.53	0.354	15.33	0.43	-1.62	
EV	14.0	11.0	11.0	1.73	0.354	12.00	-0.72	-2.77	
EW									•
FE	11.0	13.0	12.0	1.00	0.236	12.00	-0.72	-2.77	
FF									•
FJ	11.0	10.0	14.0	2.08	0.473	11.67	-0.84	-2.89	
FK	7.0	6.0	7.0	0.58	0.118	6.67	-2.57	-4.62	⇓
FL	12.0	12.0	12.0	0.00	0.000	12.00	-0.72	-2.77	
FN	11.0	10.0	13.0	1.53	0.354	11.33	-0.95	-3.00	
FP	10.0	12.0	10.0	1.15	0.236	10.67	-1.18	-3.23	⇓
FU									•
FZ	12.0	7.0	14.0	3.61	0.827	11.00	-1.07	-3.12	⇓
GE									•
GJ	11.0	10.0	6.0	2.65	0.591	9.00	-1.76	-3.81	⇓
GO	8.0	9.0	10.0	1.00	0.236	9.00	-1.76	-3.81	⇓
GQ	14.0	15.0	16.0	1.00	0.236	15.00	0.32	-1.73	
GT	17.0	10.0	10.0	4.04	0.827	12.33	-0.60	-2.66	
GZ	19.0	20.0	17.0	1.53	0.354	18.67	1.59	-0.46	
HE	26.0	27.0	27.0	0.58	0.118	26.67	4.36	2.31	
HH									•
HI	9.0	8.0	8.0	0.58	0.118	8.33	-1.99	-4.04	⇓
HK									•
HL	12.0	10.0	12.0	1.15	0.236	11.33	-0.95	-3.00	
HN	18.0	19.0	18.0	0.58	0.118	18.33	1.47	-0.58	
HP	12.0	15.0	14.0	1.53	0.354	13.67	-0.14	-2.19	
HU	15.0	15.0	15.0	0.00	0.000	15.00	0.32	-1.73	
HX									•

TAG SYMBOLS

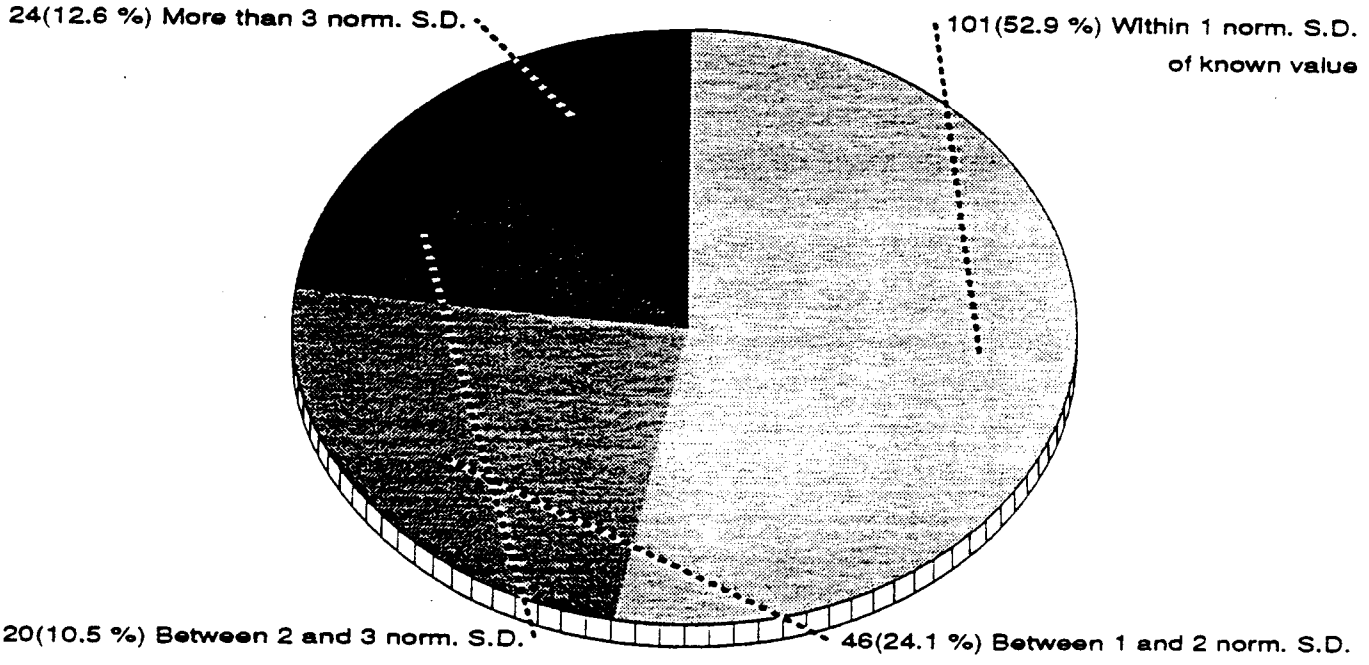
• ≡ No data submitted
∅ ≡ Insufficient data
× ≡ Determined to be an outlier
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Gross Beta Statistical Summary 262 Participants

The known value of this nuclide is **15.0 pCi/l** with an expected precision of **5.0**; the control limits are 6.3 to 23.7; the warning regions are 6.3 to 9.2 and 20.8 to 23.7



Statistic	Respondents	Non-outliers
Mean	20.19	**Grand Avg 17.01**
Std. Dev.	28.23	4.80
Variance	797.14	23.03
% Coef. of Var.	139.81	28.22
% deviation of mean from known value	34.62	13.38
Norm. dev. of mean from known value	0.18	0.42
Median	16.67	16.67
% deviation of median from known value	11.11	11.11
Norm. dev. of median from known value	0.06	0.35



Gross Beta

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DJ	21.0	17.0	19.0	2.00	0.473	19.00	0.69	1.39	
DM									•
DO	17.0	16.0	17.0	0.58	0.118	16.67	-0.12	0.58	
DP									•
DR	17.0	17.0	16.0	0.58	0.118	16.67	-0.12	0.58	
DS									•
DT	21.0	15.0	13.0	4.16	0.945	16.33	-0.23	0.46	
DX									•
DY									•
DZ	22.0	22.0	22.0	0.00	0.000	22.00	1.73	2.42	
E	19.0	17.0	19.0	1.15	0.236	18.33	0.46	1.15	
EA									•
EB	18.0	17.0	18.0	0.58	0.118	17.67	0.23	0.92	
EH	17.0	18.0	16.0	1.00	0.236	17.00	0.00	0.69	
EL	16.0	19.0	17.0	1.53	0.354	17.33	0.11	0.81	
EN	330.0	330.0	333.0	1.73	0.354	331.00	108.77	109.47	×
EO									•
ER									•
ES	18.0	19.0	19.0	0.58	0.118	18.67	0.57	1.27	
EV	16.0	16.0	15.0	0.58	0.118	15.67	-0.46	0.23	
EW									•
FE	15.0	14.0	14.0	0.58	0.118	14.33	-0.93	-0.23	
FF									•
FJ	29.0	31.0	29.0	1.15	0.236	29.67	4.39	5.08	⇑
FK	18.0	18.0	18.0	0.00	0.000	18.00	0.34	1.04	
FL	8.0	7.0	8.0	0.58	0.118	7.67	-3.24	-2.54	
FN	15.0	15.0	16.0	0.58	0.118	15.33	-0.58	0.12	
FP	13.0	15.0	15.0	1.15	0.236	14.33	-0.93	-0.23	
FU									•
FZ	8.0	9.0	13.0	2.65	0.591	10.00	-2.43	-1.73	
GE	14.0	15.0	16.0	1.00	0.236	15.00	-0.70	0.00	
GJ	4.0	3.0	4.0	0.58	0.118	3.67	-4.62	-3.93	⇓
GO	26.0	22.0	23.0	2.08	0.473	23.67	2.31	3.00	
GQ	15.0	15.0	16.0	0.58	0.118	15.33	-0.58	0.12	
GT	14.0	14.0	14.0	0.00	0.000	14.00	-1.04	-0.35	
GZ	6.0	5.0	7.0	1.00	0.236	6.00	-3.81	-3.12	⇓
HE	20.0	20.0	20.0	0.00	0.000	20.00	1.04	1.73	
HH									•
HI	15.0	16.0	16.0	0.58	0.118	15.67	-0.46	0.23	
HK									•
HL	25.0	22.0	23.0	1.53	0.354	23.33	2.19	2.89	
HN									•
HP	18.0	15.0	14.0	2.08	0.473	15.67	-0.46	0.23	
HU	27.0	26.0	26.0	0.58	0.118	26.33	3.23	3.93	⇑
HX									•

• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

⇑ ≡ Above control limit
⇓ ≡ Below control limit

United States
Environmental Protection
Agency

Environmental Monitoring
Systems Laboratory
P.O. Box 93478
Las Vegas NV 89193-3478

EPA 600/R-93/[illegible]
November 1993

Research and Development

EPA

Tritium in Water Performance Evaluation Study

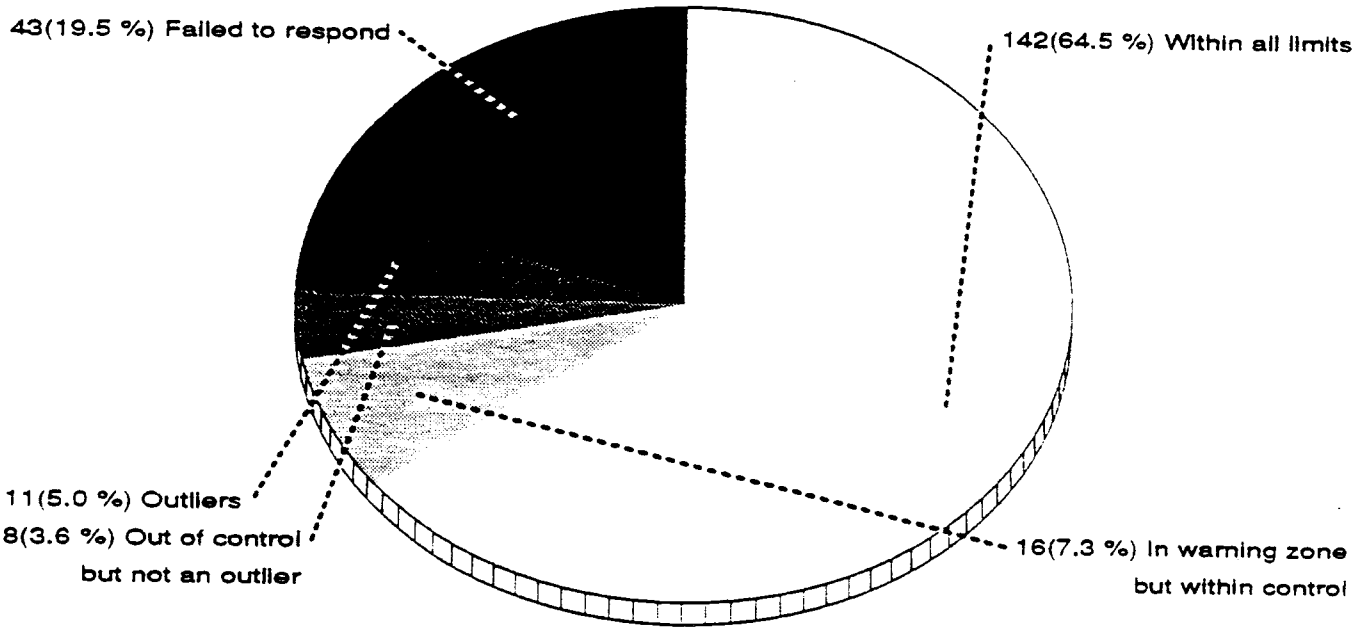
JAN 1994
RECEIVED
D.A. SEBELIEN

A Statistical Evaluation of the November 5, 1993 Data

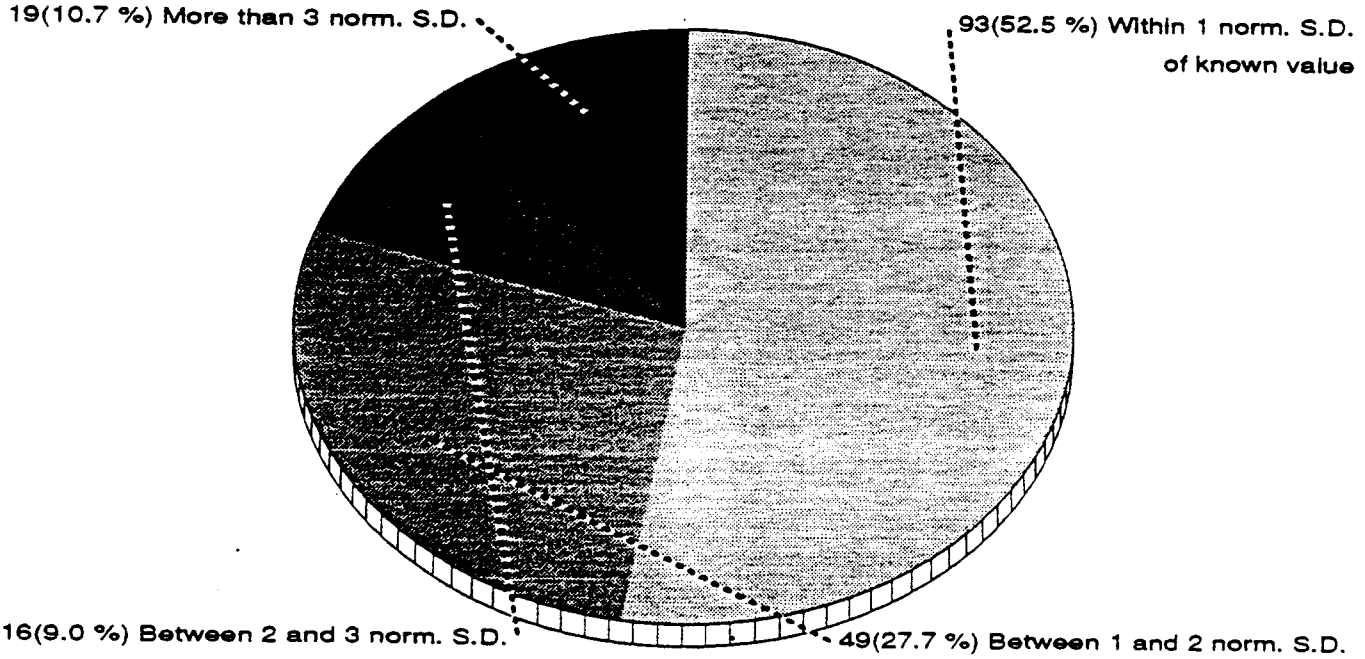
9311-0138nrd245

Tritium Statistical Summary 220 Participants

The known value of this nuclide is **7398.0 pCi/l** with an expected precision of **740.0**; the control limits are 6114.1 to 8681.9; the warning regions are 6114.1 to 6541.4 and 8254.6 to 8681.9



Statistic	Respondents	Non-outliers
Mean	7017.15	**Grand Avg 7215.65**
Std. Dev.	1320.54	574.68
Variance	1743826.64	330256.18
% Coef. of Var.	18.82	7.96
% deviation of mean from known value	-5.15	-2.46
Norm. dev. of mean from known value	-0.29	-0.32
Median	7209.00	7259.50
% deviation of median from known value	-2.55	-1.87
Norm. dev. of median from known value	-0.14	-0.24



Tritium

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DY									•
E	7266.0	7397.0	7463.0	100.28	0.157	7375.33	0.37	-0.05	
EA	8200.0	8240.0	8110.0	66.57	0.104	8183.33	2.26	1.84	
EB	7130.0	7360.0	7600.0	235.01	0.375	7363.33	0.35	-0.08	
EH	6370.0	6030.0	6490.0	238.61	0.367	6296.67	-2.15	-2.58	
EL	7446.0	6723.0	7324.0	387.05	0.577	7164.33	-0.12	-0.55	
EN	6709.0	5578.0	5885.0	584.86	0.903	6057.33	-2.71	-3.14	⇓
EW	6410.0	6313.0	6321.0	53.85	0.077	6348.00	-2.03	-2.46	
EX	5993.0	6161.0	6167.0	98.76	0.139	6107.00	-2.59	-3.02	⇓
FA									•
FB									•
FE	7180.0	7010.0	6830.0	175.04	0.279	7006.67	-0.49	-0.92	
FJ	6468.0	4528.0	4916.0	1026.55	2.045	5304.00	-4.47	-4.90	⇓
FK	7203.0	7012.0	7078.0	97.01	0.152	7097.67	-0.28	-0.70	
FL	7036.0	6797.0	6799.0	137.42	0.191	6877.33	-0.79	-1.22	
FU	5630.0	6250.0	6650.0	513.94	0.814	6176.67	-2.43	-2.86	
FZ	8500.0	9000.0	9200.0	360.56	0.559	8900.00	3.94	3.52	⇑
GE	7157.0	7078.0	7016.0	70.68	0.113	7083.67	-0.31	-0.74	
GO	7613.0	8246.0	8194.0	351.41	0.505	8017.67	1.88	1.45	
GQ	7140.0	7100.0	7060.0	40.00	0.064	7100.00	-0.27	-0.70	
HI	6665.0	6604.0	6514.0	75.97	0.121	6594.33	-1.45	-1.88	
HJ	7870.0	7570.0	8150.0	290.06	0.463	7863.33	1.52	1.09	
HK	7662.0	7254.0	7338.0	215.45	0.326	7418.00	0.47	0.05	
HP	7630.0	7370.0	7570.0	136.14	0.208	7523.33	0.72	0.29	
HR	7752.0	7712.0	7562.0	100.16	0.152	7675.33	1.08	0.65	
HU	7890.0	7826.0	7900.0	40.20	0.059	7872.00	1.54	1.11	
HX									•
I	6504.0	6563.0	6437.0	63.03	0.101	6501.33	-1.67	-2.10	
IA									•
IC	7389.0	7091.0	7241.0	149.00	0.238	7240.33	0.06	-0.37	
IL									•
IU	7703.0	7730.0	8054.0	195.33	0.280	7829.00	1.44	1.01	
J	7450.0	7500.0	7495.0	27.49	0.040	7481.67	0.62	0.20	
JE	7592.0	7592.0	7592.0	0.00	0.000	7592.00	0.88	0.45	
JG									•
JI	7345.0	7352.0	7333.0	9.76	0.015	7343.33	0.30	-0.13	
JK	7437.0	7577.0	7647.0	106.94	0.168	7553.67	0.79	0.36	
JM	7065.0	7117.0	6877.0	126.25	0.192	7019.67	-0.46	-0.89	
JN									•
JP	7533.0	7468.0	7369.0	82.60	0.131	7456.67	0.56	0.14	
JR	6700.0	6580.0	6550.0	79.39	0.120	6610.00	-1.42	-1.84	
JS	7300.0	7300.0	6600.0	404.15	0.559	7066.67	-0.35	-0.78	
JY	6710.0	6810.0	7260.0	292.98	0.439	6926.67	-0.68	-1.10	
K	6884.0	6080.0	5839.0	547.19	0.834	6267.67	-2.22	-2.65	
KH	7533.0	7487.0	7378.0	79.61	0.124	7466.00	0.59	0.16	

TAG SYMBOLS

• ≡ No data submitted
∅ ≡ Insufficient data
× ≡ Determined to be an outlier
⇑ ≡ Above control limit
⇓ ≡ Below control limit

United States
Environmental Protection
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Las Vegas NV 89193-3478

EPA 600/R-94-014
November 1993

Research and Development

EPA

Gamma in Water Performance Evaluation Study

FEB 1994
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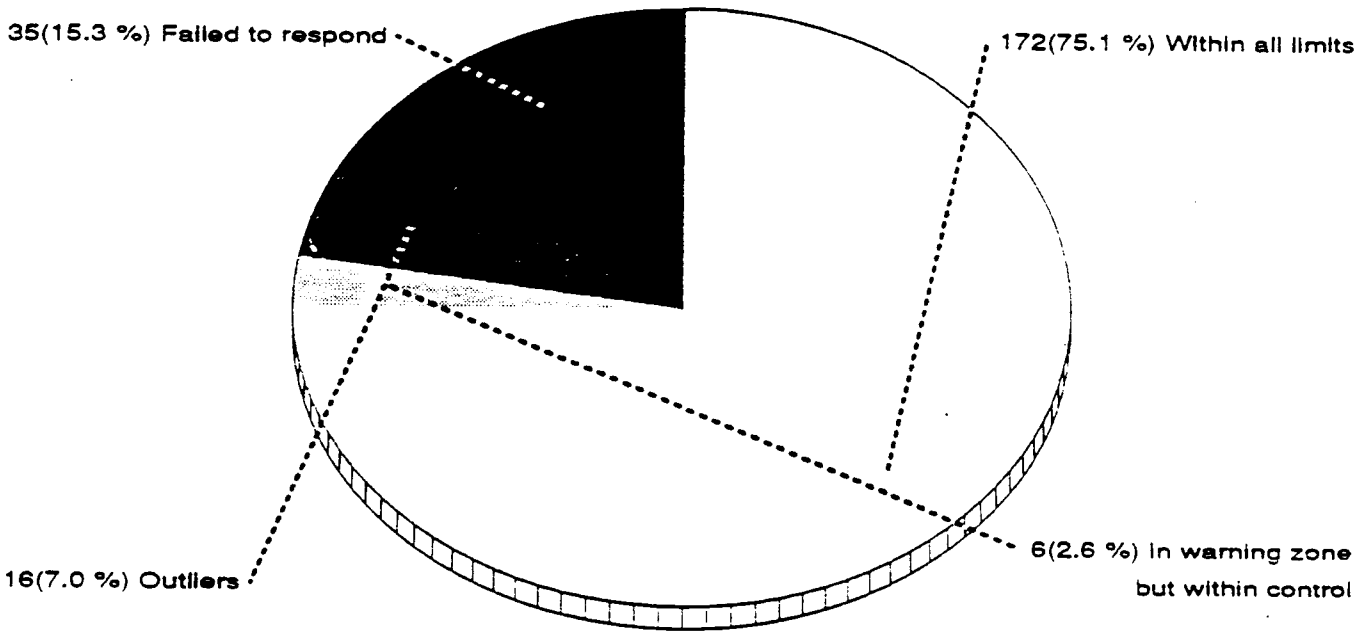
D.A. SEBELIEN

A Statistical Evaluation of the November 12, 1993 Data

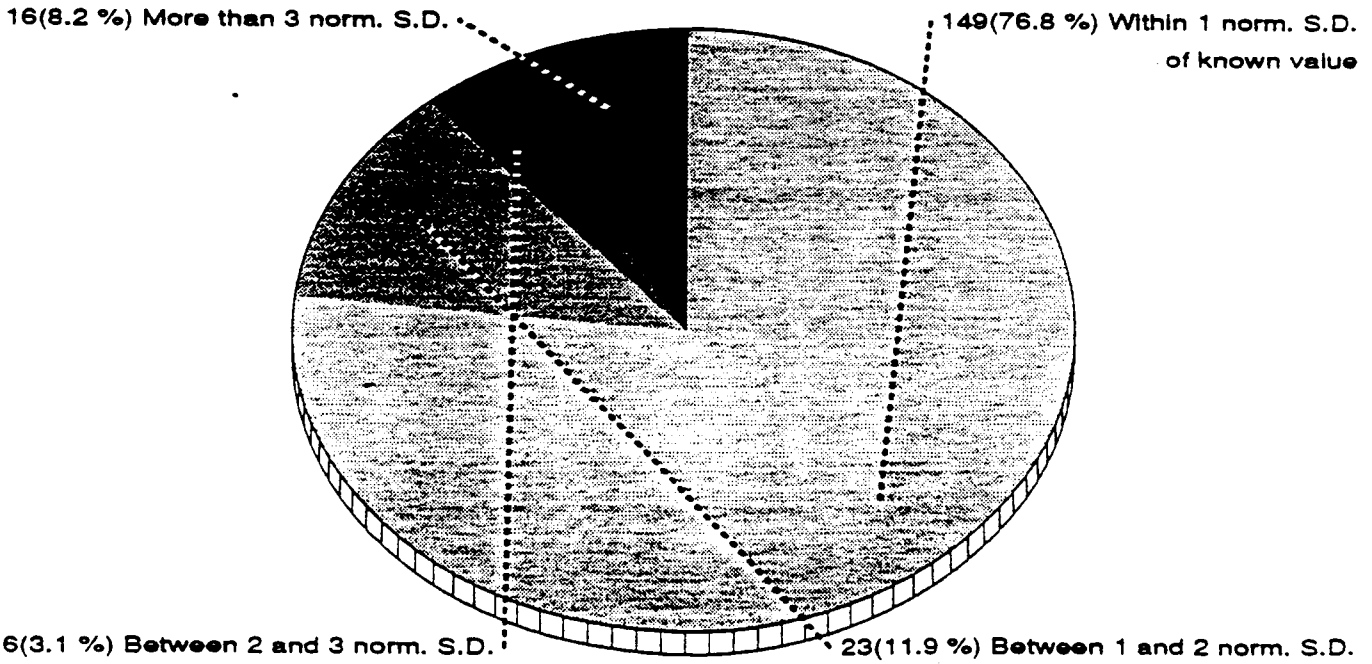
9311-0138nrd014

Cobalt-60 Statistical Summary 229 Participants

The known value of this nuclide is **30.0 pCi/l** with an expected precision of **5.0**; the control limits are 21.3 to 38.7; the warning regions are 21.3 to 24.2 and 35.8 to 38.7



Statistic	Respondents	Non-outliers
Mean	36.82	**Grand Avg 29.72**
Std. Dev.	37.61	2.33
Variance	1414.71	5.41
% Coef. of Var.	102.14	7.82
% deviation of mean from known value	22.74	-0.95
Norm. dev. of mean from known value	0.18	-0.12
Median	29.67	29.67
% deviation of median from known value	-1.11	-1.11
Norm. dev. of median from known value	-0.01	-0.14



Cobalt-60

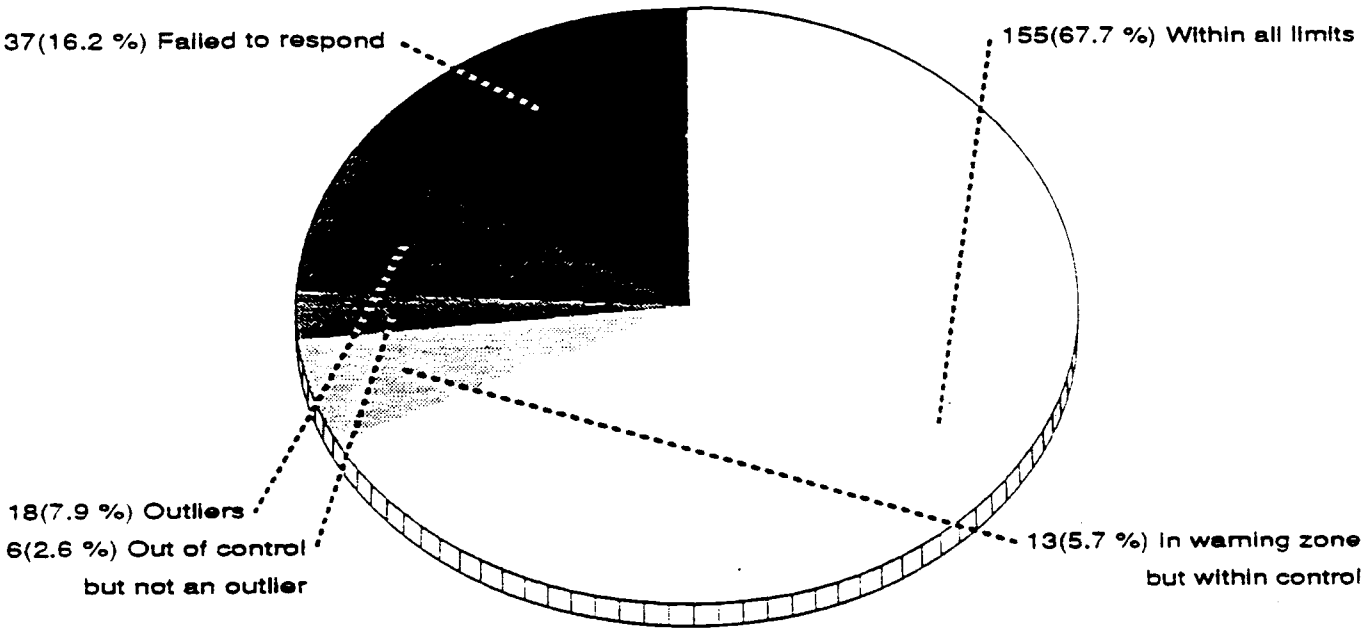
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DL	30.0	29.0	30.0	0.58	0.118	29.67	-0.02	-0.12	
DM	31.0	31.0	32.0	0.58	0.118	31.33	0.56	0.46	
DO	29.0	28.0	34.0	3.21	0.709	30.33	0.21	0.12	
DR	31.0	30.0	35.0	2.65	0.591	32.00	0.79	0.69	
DT	27.0	24.0	28.0	2.08	0.473	26.33	-1.17	-1.27	
DY									•
DZ	33.0	33.0	32.0	0.58	0.118	32.67	1.02	0.92	
E	30.0	29.0	31.0	1.00	0.236	30.00	0.10	0.00	
EA	28.0	29.0	27.0	1.00	0.236	28.00	-0.59	-0.69	
EB	32.0	31.0	31.0	0.58	0.118	31.33	0.56	0.46	
EH	30.0	27.0	29.0	1.53	0.354	28.67	-0.36	-0.46	
EL	29.0	32.0	29.0	1.73	0.354	30.00	0.10	0.00	
EN	29.0	25.0	28.0	2.08	0.473	27.33	-0.83	-0.92	
EW									•
EX	31.0	25.0	31.0	3.46	0.709	29.00	-0.25	-0.35	
EZ	236.0	371.0	236.0	77.94	29.472	281.00	87.05	86.95	×
FE	29.0	29.0	31.0	1.15	0.236	29.67	-0.02	-0.12	
FJ	30.0	26.0	31.0	2.65	0.591	29.00	-0.25	-0.35	
FK	30.0	30.0	30.0	0.00	0.000	30.00	0.10	0.00	
FL	33.0	32.0	34.0	1.00	0.236	33.00	1.14	1.04	
FU	28.0	28.0	29.0	0.58	0.118	28.33	-0.48	-0.58	
FZ	19.0	13.0	17.0	3.06	0.709	16.33	-4.64	-4.73	×
GE	30.0	29.0	30.0	0.58	0.118	29.67	-0.02	-0.12	
GI	31.0	32.0	31.0	0.58	0.118	31.33	0.56	0.46	
GL									•
GO	24.0	26.0	26.0	1.15	0.236	25.33	-1.52	-1.62	
GQ									•
HE	30.0	30.0	30.0	0.00	0.000	30.00	0.10	0.00	
HI	27.0	32.0	32.0	2.89	0.591	30.33	0.21	0.12	
HJ	26.0	34.0	34.0	4.62	0.945	31.33	0.56	0.46	
HK	29.0	29.0	30.0	0.58	0.118	29.33	-0.13	-0.23	
HL	33.0	30.0	29.0	2.08	0.473	30.67	0.33	0.23	
HP	34.0	33.0	34.0	0.58	0.118	33.67	1.37	1.27	
HU	26.0	27.0	27.0	0.58	0.118	26.67	-1.06	-1.15	
HX									•
I	31.0	30.0	30.0	0.58	0.118	30.33	0.21	0.12	
IA	38.0	37.0	39.0	1.00	0.236	38.00	2.87	2.77	
IC	29.0	27.0	31.0	2.00	0.473	29.00	-0.25	-0.35	
II									•
IU	31.0	30.0	31.0	0.58	0.118	30.67	0.33	0.23	
J	30.0	30.0	29.0	0.58	0.118	29.67	-0.02	-0.12	
JE	28.0	28.0	30.0	1.15	0.236	28.67	-0.36	-0.46	
JG	31.0	30.0	29.0	1.00	0.236	30.00	0.10	0.00	
JI									•
JR	27.0	31.0	33.0	3.06	0.709	30.33	0.21	0.12	

• ≡ No data submitted | TAG SYMBOLS | ⇑ ≡ Above control limit

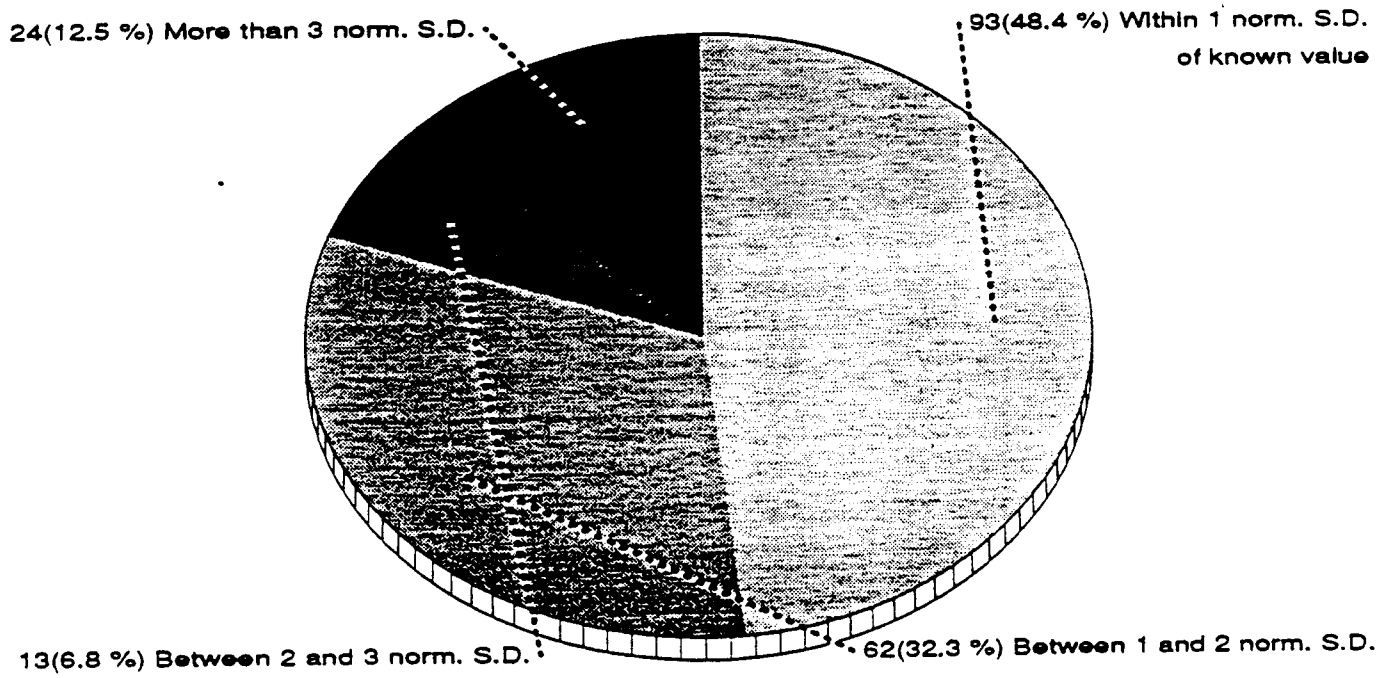
∅ ≡ Insufficient data | × ≡ Determined to be an outlier | ⇓ ≡ Below control limit

Zinc-65 Statistical Summary 229 Participants

The known value of this nuclide is **150.0 pCi/l** with an expected precision of **15.0**; the control limits are 124.0 to 176.0; the warning regions are 124.0 to 132.6 and 167.4 to 176.0



Statistic	Respondents	Non-outliers
Mean	189.88	**Grand Avg 156.07**
Std. Dev.	190.96	9.24
Variance	36465.03	85.36
% Coef. of Var.	100.57	5.92
% deviation of mean from known value	26.58	4.05
Norm. dev. of mean from known value	0.21	0.66
Median	156.50	156.33
% deviation of median from known value	4.33	4.22
Norm. dev. of median from known value	0.03	0.69



Zinc-65

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DL	154.0	157.0	158.0	2.08	0.158	156.33	0.03	0.73	
DM	156.0	156.0	153.0	1.73	0.118	155.00	-0.12	0.58	
DO	166.0	160.0	147.0	9.71	0.748	157.67	0.18	0.89	
DR	172.0	175.0	170.0	2.52	0.197	172.33	1.88	2.58	
DT	149.0	164.0	139.0	12.58	0.984	150.67	-0.62	0.08	
DY									•
DZ	158.0	160.0	157.0	1.53	0.118	158.33	0.26	0.96	
E	150.0	153.0	152.0	1.53	0.118	151.67	-0.51	0.19	
EA	144.0	150.0	144.0	3.46	0.236	146.00	-1.16	-0.46	
EB	176.0	174.0	173.0	1.53	0.118	174.33	2.11	2.81	
EH	150.0	146.0	148.0	2.00	0.158	148.00	-0.93	-0.23	
EL	153.0	151.0	153.0	1.15	0.079	152.33	-0.43	0.27	
EN	209.0	209.0	209.0	0.00	0.000	209.00	6.11	6.81	×
EW									•
EX	155.0	161.0	151.0	5.03	0.394	155.67	-0.05	0.65	
EZ	1331.0	1220.0	1334.0	64.97	7.646	1295.00	131.51	132.21	×
FE	157.0	150.0	149.0	4.36	0.315	152.00	-0.47	0.23	
FJ	158.0	150.0	151.0	4.36	0.315	153.00	-0.35	0.35	
FK	139.0	139.0	139.0	0.00	0.000	139.00	-1.97	-1.27	
FL	186.0	170.0	174.0	8.33	0.630	176.67	2.38	3.08	⇑
FU	154.0	154.0	158.0	2.31	0.158	155.33	-0.08	0.62	
FZ	89.0	75.0	86.0	7.37	0.551	83.33	-8.40	-7.70	×
GE	154.0	157.0	158.0	2.08	0.158	156.33	0.03	0.73	
GI	172.0	178.0	165.0	6.51	0.512	171.67	1.80	2.50	
GL									•
GO	227.0	232.0	223.0	4.51	0.354	227.33	8.23	8.93	×
GQ									•
HE	150.0	146.0	154.0	4.00	0.315	150.00	-0.70	0.00	
HI	152.0	143.0	147.0	4.51	0.354	147.33	-1.01	-0.31	
HJ	149.0	156.0	169.0	10.15	0.788	158.00	0.22	0.92	
HK	155.0	153.0	158.0	2.52	0.197	155.33	-0.08	0.62	
HL	149.0	145.0	148.0	2.08	0.158	147.33	-1.01	-0.31	
HP	189.0	167.0	179.0	11.02	0.866	178.33	2.57	3.27	⇑
HU	135.0	134.0	132.0	1.53	0.118	133.67	-2.59	-1.89	
HX									•
I	158.0	151.0	154.0	3.51	0.276	154.33	-0.20	0.50	
IA	178.0	175.0	182.0	3.51	0.276	178.33	2.57	3.27	⇑
IC	163.0	166.0	160.0	3.00	0.236	163.00	0.80	1.50	
II									•
IU	165.0	160.0	171.0	5.51	0.433	165.33	1.07	1.77	
J	160.0	159.0	160.0	0.58	0.039	159.67	0.42	1.12	
JE	156.0	147.0	154.0	4.73	0.354	152.33	-0.43	0.27	
JG	130.0	144.0	160.0	15.01	1.345	144.67	-1.32	-0.62	
JI									•
JR	151.0	153.0	161.0	5.29	0.394	155.00	-0.12	0.58	

TAG SYMBOLS

• ≡ No data submitted

∅ ≡ Insufficient data

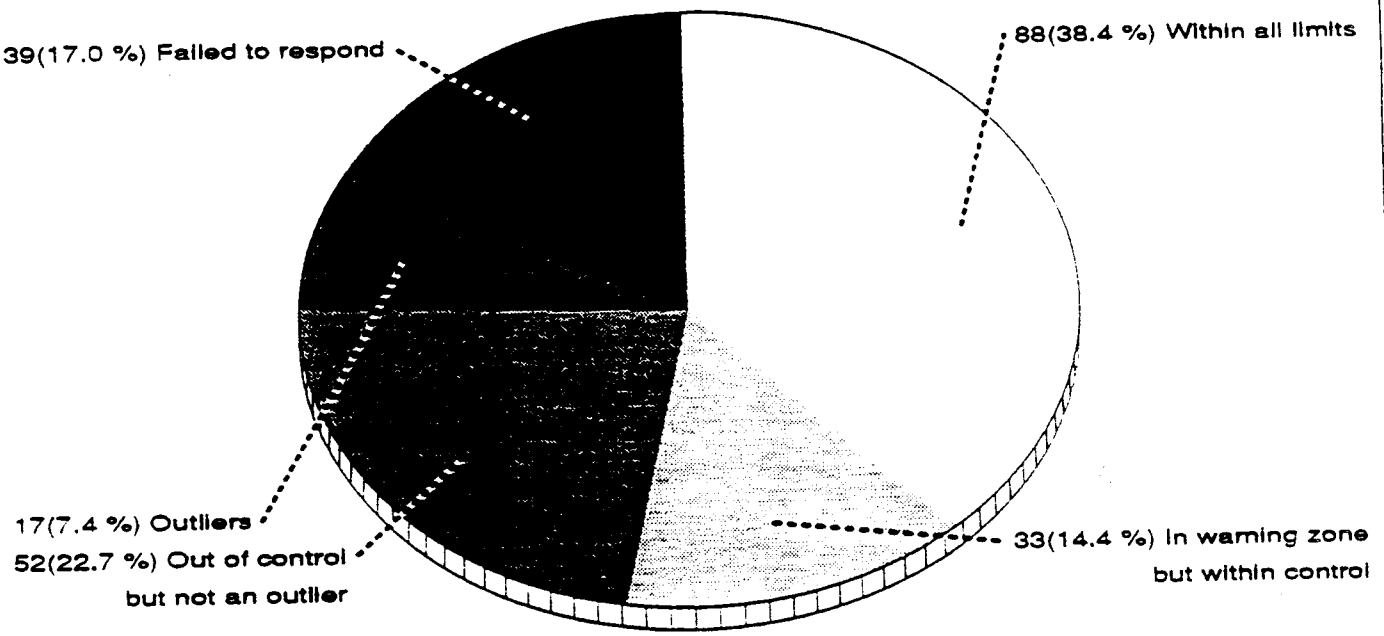
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

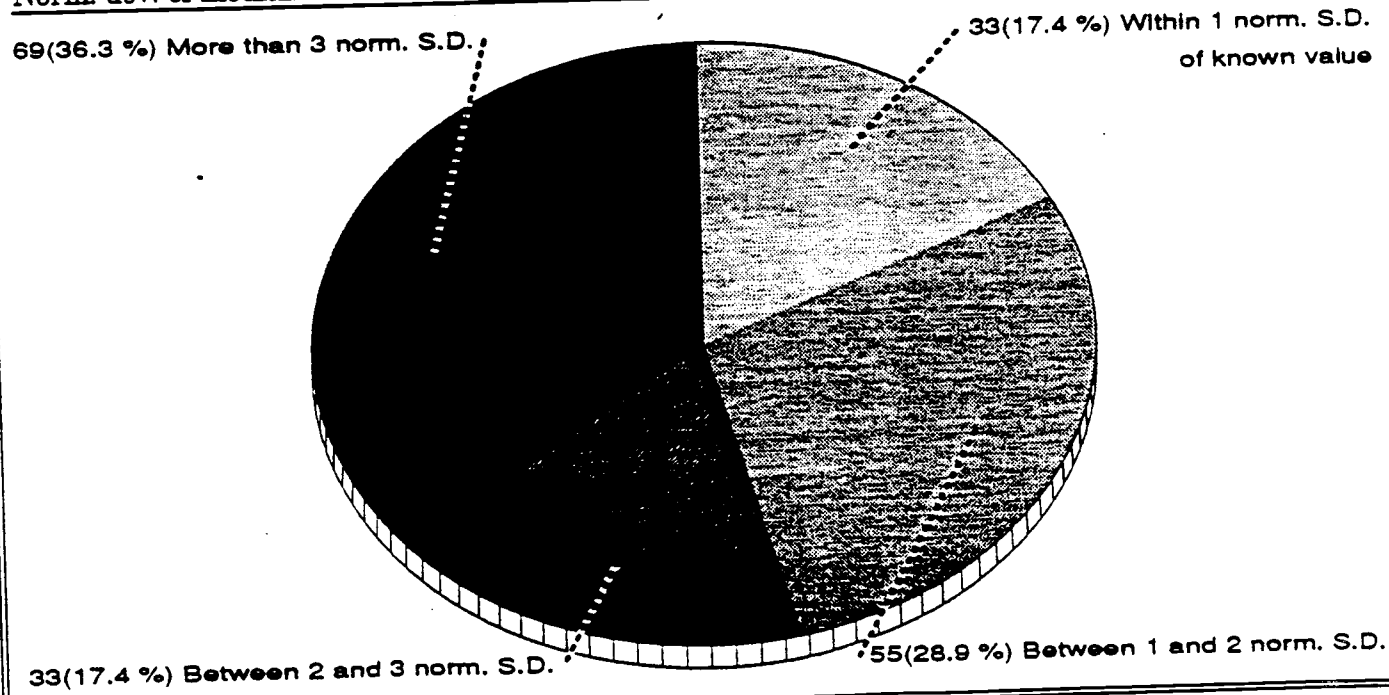
⇓ ≡ Below control limit

Ruthenium-106 Statistical Summary 229 Participants

The known value of this nuclide is **201.0 pCi/l** with an expected precision of **20.0**; the control limits are 166.3 to 235.7; the warning regions are 166.3 to 177.8 and 224.2 to 235.7



Statistic	Respondents	Non-outliers
Mean	213.00	Grand Avg 175.18
Std. Dev.	215.64	18.32
Variance	46501.37	335.52
% Coef. of Var.	101.24	10.46
% deviation of mean from known value	5.97	-12.85
Norm. dev. of mean from known value	0.06	-1.41
Median	178.33	178.33
% deviation of median from known value	-11.28	-11.28
Norm. dev. of median from known value	-0.11	-1.24



Ruthenium-106

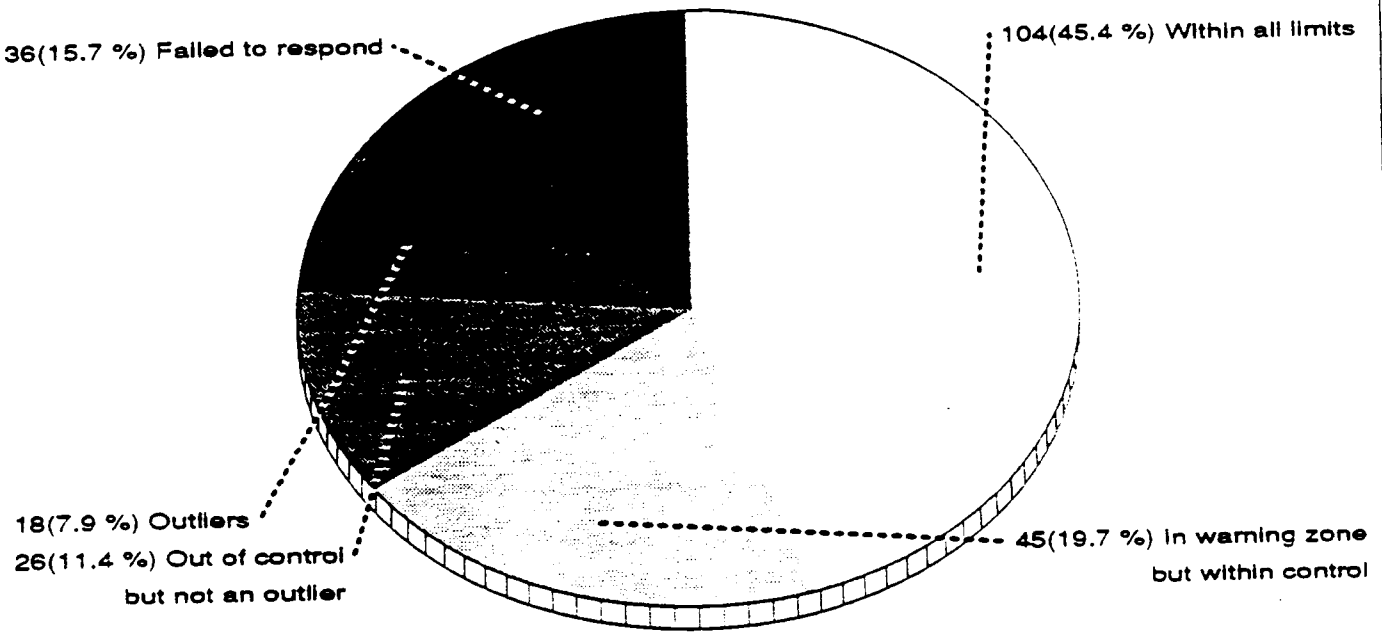
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DL	172.0	177.0	188.0	8.19	0.473	179.00	0.33	-1.91	
DM	165.0	161.0	161.0	2.31	0.118	162.33	-1.11	-3.35	⇓
DO	224.0	162.0	174.0	32.88	2.583	186.67	1.00	-1.24	
DR	199.0	207.0	177.0	15.53	0.886	194.33	1.66	-0.58	
DT	165.0	136.0	201.0	32.56	2.752	167.33	-0.68	-2.92	
DY									•
DZ	190.0	170.0	190.0	11.55	0.591	183.33	0.71	-1.53	
E	174.0	187.0	186.0	7.23	0.384	182.33	0.62	-1.62	
EA	205.0	202.0	200.0	2.52	0.148	202.33	2.35	0.12	
EB	193.0	194.0	193.0	0.58	0.030	193.33	1.57	-0.66	
EH	170.0	176.0	177.0	3.79	0.207	174.33	-0.07	-2.31	
EL	170.0	161.0	166.0	4.51	0.266	165.67	-0.82	-3.06	⇓
EN	200.0	232.0	233.0	18.77	0.975	221.67	4.03	1.79	
EW									•
EX	200.0	224.0	184.0	20.13	1.345	202.67	2.38	0.14	
EZ	1411.0	1548.0	1686.0	137.50	14.565	1548.33	118.92	116.68	×
FE	114.0	146.0	129.0	16.01	0.945	129.67	-3.94	-6.18	⇓
FJ	349.0	360.0	314.0	24.02	1.683	341.00	14.36	12.12	×
FK	159.0	159.0	159.0	0.00	0.000	159.00	-1.40	-3.64	⇓
FL	205.0	156.0	180.0	24.50	1.852	180.33	0.45	-1.79	
FU	153.0	166.0	173.0	10.15	0.591	164.00	-0.97	-3.20	⇓
FZ	110.0	74.0	90.0	18.04	1.120	91.33	-7.26	-9.50	×
GE	172.0	177.0	188.0	8.19	0.473	179.00	0.33	-1.91	
GI	176.0	175.0	159.0	9.54	0.502	170.00	-0.45	-2.68	
GL									•
GO									•
GQ									•
HE	178.0	186.0	188.0	5.29	0.295	184.00	0.76	-1.47	
HI	167.0	172.0	207.0	21.79	1.345	182.00	0.59	-1.65	
HJ	175.0	195.0	202.0	14.01	0.797	190.67	1.34	-0.89	
HK	171.0	184.0	159.0	12.50	0.738	171.33	-0.33	-2.57	
HL	184.0	185.0	178.0	3.79	0.207	182.33	0.62	-1.62	
HP	195.0	197.0	206.0	5.86	0.325	199.33	2.09	-0.14	
HU	187.0	185.0	190.0	2.52	0.148	187.33	1.05	-1.18	
HX									•
I	136.0	161.0	174.0	19.31	1.233	157.00	-1.57	-3.81	⇓
IA	207.0	160.0	179.0	23.64	1.739	182.00	0.59	-1.65	
IC	163.0	150.0	136.0	13.50	0.797	149.67	-2.21	-4.45	⇓
IL									•
IU	200.0	202.0	189.0	7.00	0.384	197.00	1.89	-0.35	
J	183.0	176.0	153.0	15.70	0.886	170.67	-0.39	-2.63	
JE	174.0	164.0	171.0	5.13	0.295	169.67	-0.48	-2.71	
JG	165.0	173.0	175.0	5.29	0.295	171.00	-0.36	-2.60	
JL									•
JR	162.0	180.0	175.0	9.29	0.532	172.33	-0.25	-2.48	

TAG SYMBOLS

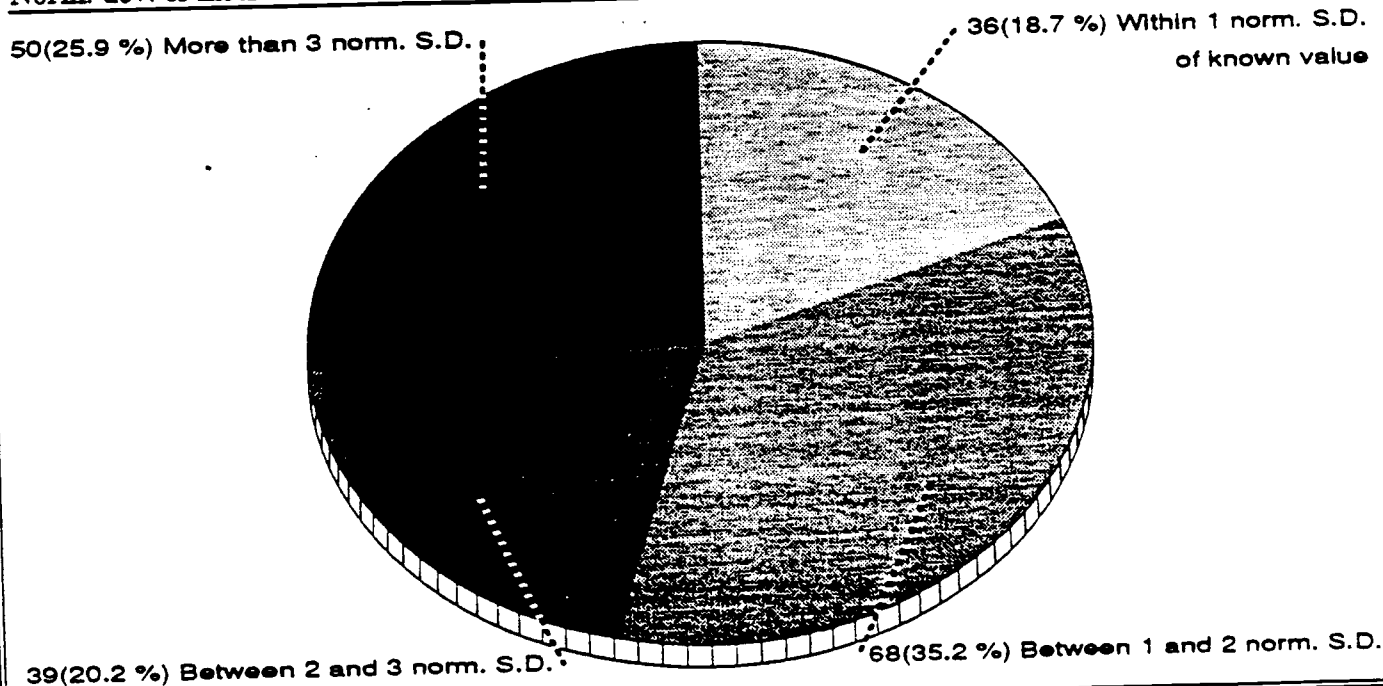
• ≡ No data submitted
∅ ≡ Insufficient data
× ≡ Determined to be an outlier
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Cesium-134 Statistical Summary 229 Participants

The known value of this nuclide is **59.0 pCi/l** with an expected precision of **5.0**; the control limits are 50.3 to 67.7; the warning regions are 50.3 to 53.2 and 64.8 to 67.7



Statistic	Respondents	Non-outliers
Mean	64.88	Grand Avg 54.42
Std. Dev.	63.91	4.53
Variance	4084.96	20.48
% Coef. of Var.	98.52	8.32
% deviation of mean from known value	9.96	-7.77
Norm. dev. of mean from known value	0.09	-1.01
Median	54.33	54.33
% deviation of median from known value	-7.91	-7.91
Norm. dev. of median from known value	-0.07	-1.03



Cesium-134

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DL	55.0	54.0	56.0	1.00	0.236	55.00	0.20	-1.39	
DM	57.0	64.0	55.0	4.73	1.120	58.67	1.47	-0.12	
DO	54.0	57.0	49.0	4.04	0.945	53.33	-0.38	-1.96	
DR	56.0	55.0	57.0	1.00	0.236	56.00	0.55	-1.04	
DT	63.0	56.0	62.0	3.79	0.827	60.33	2.05	0.46	
DY									•
DZ	61.0	60.0	56.0	2.65	0.591	59.00	1.59	0.00	
E	54.0	55.0	57.0	1.53	0.354	55.33	0.32	-1.27	
EA	53.0	53.0	52.0	0.58	0.118	52.67	-0.61	-2.19	
EB	56.0	56.0	56.0	0.00	0.000	56.00	0.55	-1.04	
EH	50.0	51.0	55.0	2.65	0.591	52.00	-0.84	-2.42	
EL	57.0	58.0	57.0	0.58	0.118	57.33	1.01	-0.58	
EN	58.0	60.0	58.0	1.15	0.236	58.67	1.47	-0.12	
EW									•
EX	57.0	59.0	62.0	2.52	0.591	59.33	1.70	0.12	
EZ	460.0	520.0	457.0	35.54	13.271	479.00	147.08	145.49	×
FE	51.0	51.0	52.0	0.58	0.118	51.33	-1.07	-2.66	
FJ	54.0	53.0	56.0	1.53	0.354	54.33	-0.03	-1.62	
FK	51.0	51.0	51.0	0.00	0.000	51.00	-1.18	-2.77	
FL	65.0	61.0	63.0	2.00	0.473	63.00	2.97	1.39	
FU	54.0	54.0	56.0	1.15	0.236	54.67	0.09	-1.50	
FZ	28.0	25.0	27.0	1.53	0.354	26.67	-9.61	-11.20	×
GE	55.0	54.0	56.0	1.00	0.236	55.00	0.20	-1.39	
GI	62.0	59.0	54.0	4.04	0.945	58.33	1.36	-0.23	
GL									•
GO									•
GQ									•
HE	57.0	55.0	57.0	1.15	0.236	56.33	0.66	-0.92	
HI	48.0	56.0	46.0	5.29	1.345	50.00	-1.53	-3.12	⇓
HJ	58.0	60.0	62.0	2.00	0.473	60.00	1.93	0.35	
HK	55.0	53.0	54.0	1.00	0.236	54.00	-0.14	-1.73	
HL	57.0	56.0	57.0	0.58	0.118	56.67	0.78	-0.81	
HP	61.0	62.0	64.0	1.53	0.354	62.33	2.74	1.15	
HU	47.0	46.0	48.0	1.00	0.236	47.00	-2.57	-4.16	⇓
HX									•
I	56.0	56.0	55.0	0.58	0.118	55.67	0.43	-1.15	
IA	52.0	61.0	61.0	5.20	1.120	58.00	1.24	-0.35	
IC	64.0	61.0	61.0	1.73	0.354	62.00	2.63	1.04	
II									•
IU	58.0	61.0	59.0	1.53	0.354	59.33	1.70	0.12	
J	55.0	51.0	51.0	2.31	0.473	52.33	-0.72	-2.31	
JE	49.0	50.0	50.0	0.58	0.118	49.67	-1.65	-3.23	⇓
JG	48.0	49.0	48.0	0.58	0.118	48.33	-2.11	-3.70	⇓
JL									•
JR	57.0	52.0	53.0	2.65	0.591	54.00	-0.14	-1.73	

• ≡ No data submitted

TAG SYMBOLS

⇑ ≡ Above control limit

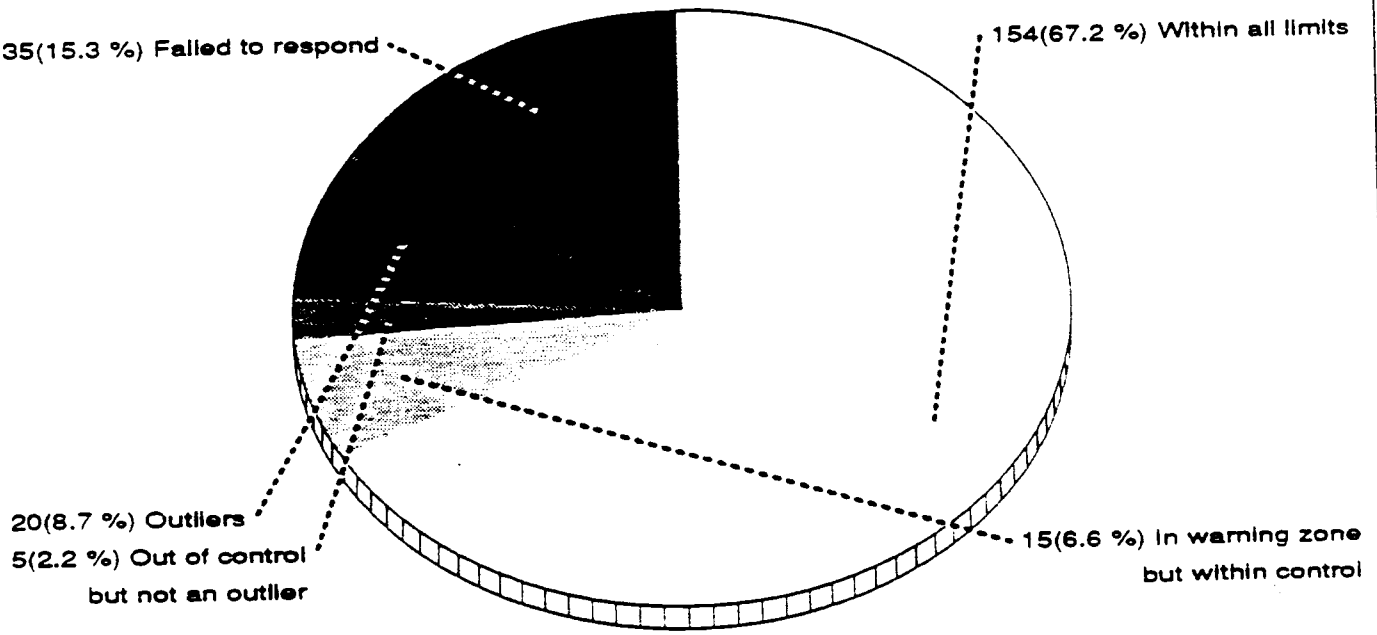
∅ ≡ Insufficient data

× ≡ Determined to be an outlier

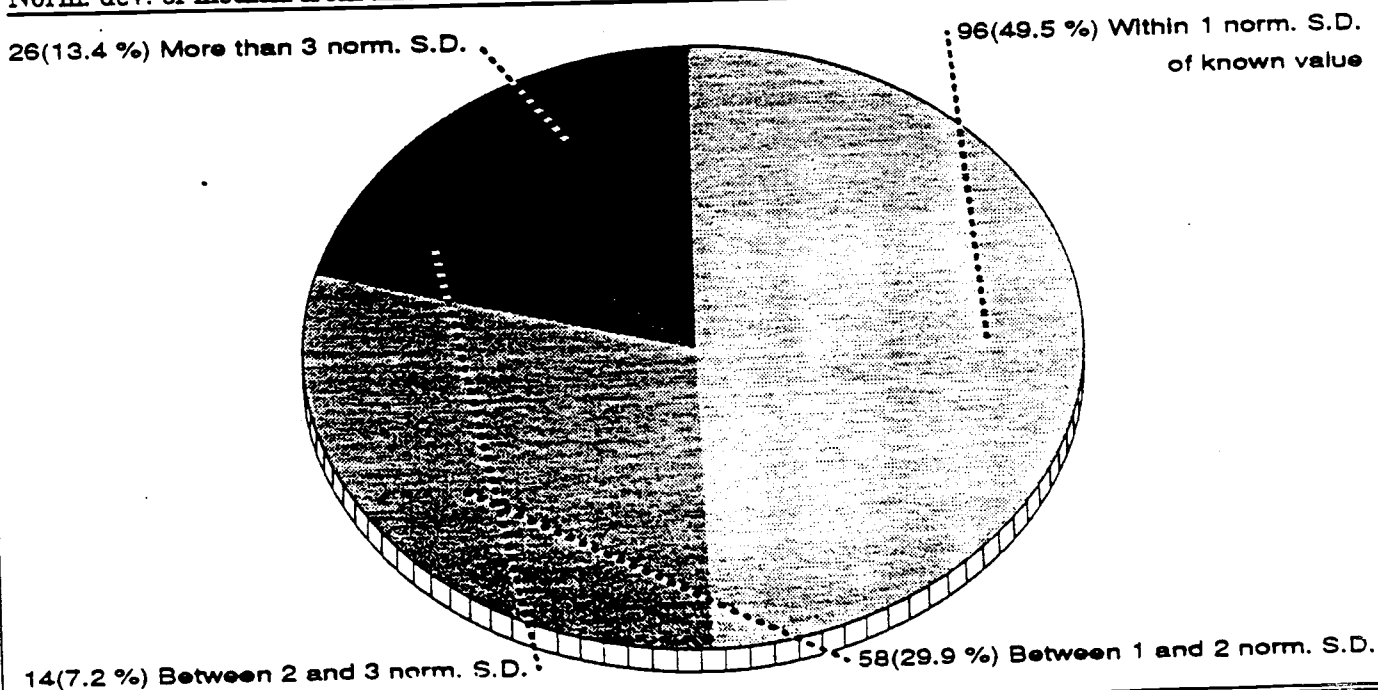
⇓ ≡ Below control limit

Cesium-137 Statistical Summary 229 Participants

The known value of this nuclide is **40.0 pCi/l** with an expected precision of **5.0**; the control limits are 31.3 to 48.7; the warning regions are 31.3 to 34.2 and 45.8 to 48.7



Statistic	Respondents	Non-outliers
Mean	49.26	Grand Avg 42.14
Std. Dev.	46.27	3.04
Variance	2140.47	9.23
% Coef. of Var.	93.92	7.21
% deviation of mean from known value	23.15	5.34
Norm. dev. of mean from known value	0.20	0.70
Median	42.00	42.00
% deviation of median from known value	5.00	5.00
Norm. dev. of median from known value	0.04	0.66



Cesium-137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DL	39.0	41.0	42.0	1.53	0.354	40.67	-0.51	0.23	
DM	40.0	41.0	42.0	1.00	0.236	41.00	-0.39	0.35	
DO	45.0	47.0	38.0	4.73	1.120	43.33	0.41	1.15	
DR	44.0	46.0	43.0	1.53	0.354	44.33	0.76	1.50	
DT	45.0	41.0	38.0	3.51	0.827	41.33	-0.28	0.46	
DY									•
DZ	52.0	52.0	50.0	1.15	0.236	51.33	3.19	3.93	⇑
E	43.0	43.0	43.0	0.00	0.000	43.00	0.30	1.04	
EA	44.0	42.0	41.0	1.53	0.354	42.33	0.07	0.81	
EB	45.0	46.0	46.0	0.58	0.118	45.67	1.22	1.96	
EH	41.0	42.0	39.0	1.53	0.354	40.67	-0.51	0.23	
EL	42.0	42.0	42.0	0.00	0.000	42.00	-0.05	0.69	
EN	48.0								∅
EW									•
EX	37.0	45.0	43.0	4.16	0.945	41.67	-0.16	0.58	
EZ	356.0	347.0	341.0	7.55	2.470	348.00	105.95	106.69	×
FE	42.0	39.0	41.0	1.53	0.354	40.67	-0.51	0.23	
FJ	41.0	43.0	38.0	2.52	0.591	40.67	-0.51	0.23	
FK	38.0	38.0	38.0	0.00	0.000	38.00	-1.43	-0.69	
FL	49.0	46.0	47.0	1.53	0.354	47.33	1.80	2.54	
FU	42.0	43.0	45.0	1.53	0.354	43.33	0.41	1.15	
FZ	22.0	21.0	20.0	1.00	0.236	21.00	-7.32	-6.58	×
GE	39.0	41.0	42.0	1.53	0.354	40.67	-0.51	0.23	
GI	46.0	46.0	45.0	0.58	0.118	45.67	1.22	1.96	
GL									•
GO	26.0	26.0	28.0	1.15	0.236	26.67	-5.36	-4.62	×
GQ									•
HE	39.0	40.0	39.0	0.58	0.118	39.33	-0.97	-0.23	
HI	37.0	37.0	42.0	2.89	0.591	38.67	-1.20	-0.46	
HJ	45.0	42.0	45.0	1.73	0.354	44.00	0.65	1.39	
HK	41.0	40.0	42.0	1.00	0.236	41.00	-0.39	0.35	
HL	46.0	46.0	46.0	0.00	0.000	46.00	1.34	2.08	
HP	50.0	50.0	50.0	0.00	0.000	50.00	2.72	3.46	⇑
HU	37.0	36.0	36.0	0.58	0.118	36.33	-2.01	-1.27	
HX									•
I	40.0	43.0	38.0	2.52	0.591	40.33	-0.63	0.12	
IA	45.0	47.0	42.0	2.52	0.591	44.67	0.88	1.62	
IC	44.0	46.0	44.0	1.15	0.236	44.67	0.88	1.62	
II									•
IU	43.0	43.0	43.0	0.00	0.000	43.00	0.30	1.04	
J	42.0	41.0	40.0	1.00	0.236	41.00	-0.39	0.35	
JE	40.0	38.0	41.0	1.53	0.354	39.67	-0.86	-0.12	
JG	38.0	41.0	38.0	1.73	0.354	39.00	-1.09	-0.35	
JI									•
JR	44.0	45.0	45.0	0.58	0.118	44.67	0.88	1.62	

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

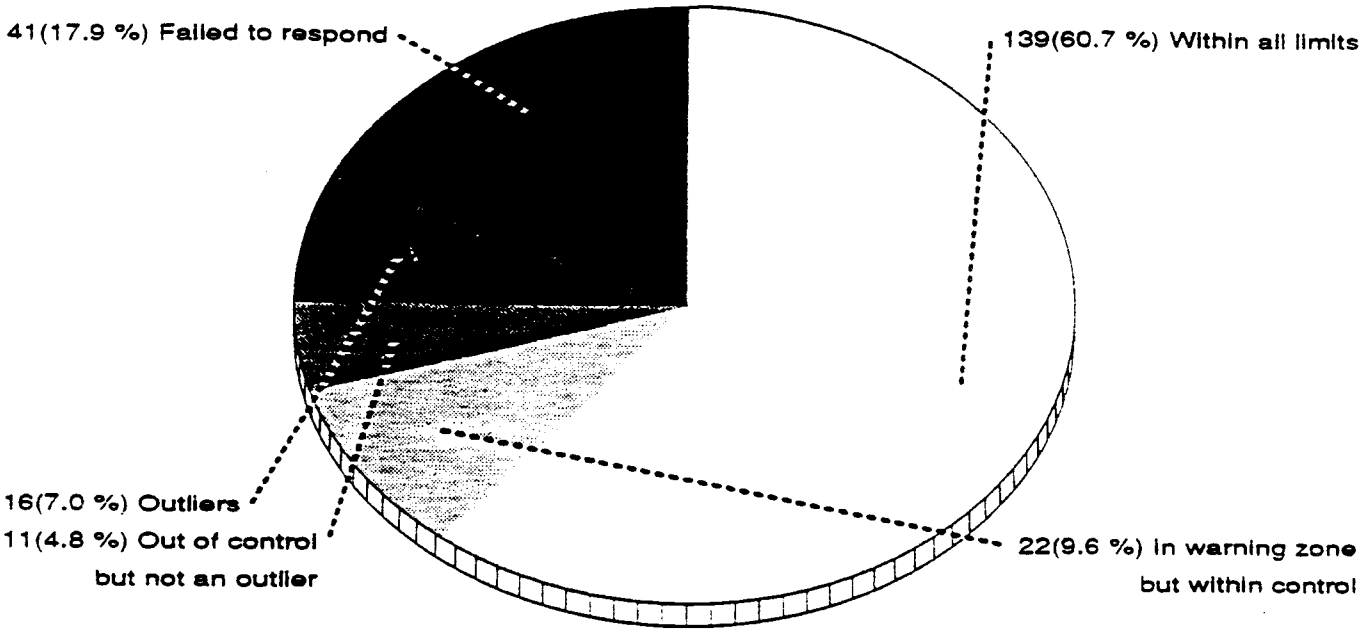
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

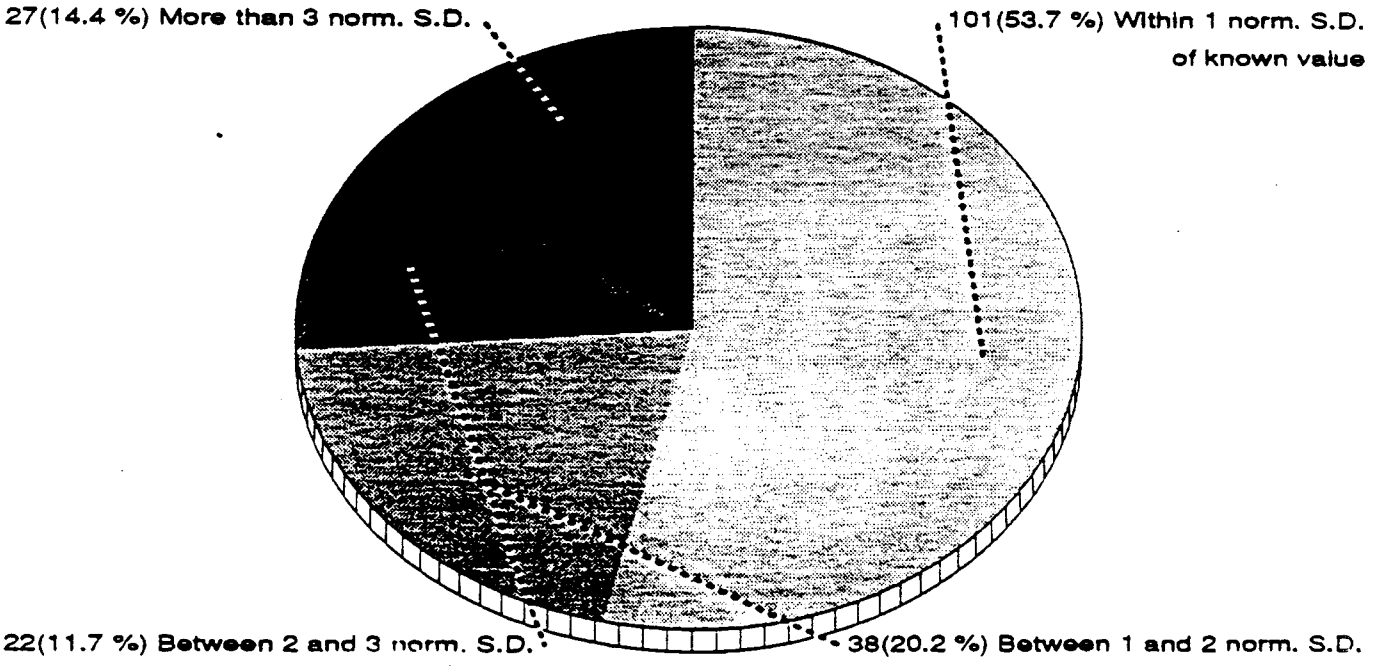
⇓ ≡ Below control limit

Barium-133 Statistical Summary 229 Participants

The known value of this nuclide is **79.0 pCi/l** with an expected precision of **8.0**; the control limits are 65.1 to 92.9; the warning regions are 65.1 to 69.7 and 88.3 to 92.9



Statistic	Respondents	Non-outliers
Mean	91.23	**Grand Avg 76.45**
Std. Dev.	88.87	6.31
Variance	7897.37	39.86
% Coef. of Var.	97.41	8.26
% deviation of mean from known value	15.48	-3.23
Norm. dev. of mean from known value	0.14	-0.40
Median	77.33	77.17
% deviation of median from known value	-2.11	-2.32
Norm. dev. of median from known value	-0.02	-0.29



Barium-133

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
DL	80.0	81.0	82.0	1.00	0.148	81.00	0.99	0.43	
DM	82.0	83.0	80.0	1.53	0.222	81.67	1.13	0.58	
DO	87.0	84.0	71.0	8.50	1.345	80.67	0.91	0.36	
DR									•
DT	79.0	75.0	84.0	4.51	0.665	79.33	0.63	0.07	
DY									•
DZ	103.0	103.0	106.0	1.73	0.222	104.00	5.97	5.41	×
E	76.0	77.0	77.0	0.58	0.074	76.67	0.05	-0.51	
EA	79.0	79.0	80.0	0.58	0.074	79.33	0.63	0.07	
EB	85.0	85.0	85.0	0.00	0.000	85.00	1.85	1.30	
EH	83.0	71.0	76.0	6.03	0.886	76.67	0.05	-0.51	
EL	81.0	81.0	78.0	1.73	0.222	80.00	0.77	0.22	
EN	84.0	81.0	82.0	1.53	0.222	82.33	1.27	0.72	
EW									•
EX	81.0	80.0	82.0	1.00	0.148	81.00	0.99	0.43	
EZ	610.0	616.0	610.0	3.46	0.443	612.00	115.95	115.40	×
FE	77.0	78.0	76.0	1.00	0.148	77.00	0.12	-0.43	
FJ	72.0	74.0	78.0	3.06	0.443	74.67	-0.39	-0.94	
FK	72.0	72.0	72.0	0.00	0.000	72.00	-0.96	-1.52	
FL	91.0	89.0	91.0	1.15	0.148	90.33	3.01	2.45	
FU	76.0	77.0	78.0	1.00	0.148	77.00	0.12	-0.43	
FZ									•
GE	80.0	81.0	82.0	1.00	0.148	81.00	0.99	0.43	
GI	85.0	82.0	78.0	3.51	0.517	81.67	1.13	0.58	
GL									•
GO									•
GQ									•
HE	79.0	79.0	80.0	0.58	0.074	79.33	0.63	0.07	
HI	74.0	70.0	76.0	3.06	0.443	73.33	-0.67	-1.23	
HJ	84.0	79.0	81.0	2.52	0.369	81.33	1.06	0.51	
HK	76.0	77.0	73.0	2.08	0.295	75.33	-0.24	-0.79	
HL	80.0	79.0	81.0	1.00	0.148	80.00	0.77	0.22	
HP	86.0	100.0	101.0	8.39	1.205	95.67	4.16	3.61	⇑
HU	64.0	63.0	62.0	1.00	0.148	63.00	-2.91	-3.46	⇓
HX									•
I	75.0	77.0	76.0	1.00	0.148	76.00	-0.10	-0.65	
IA	85.0	81.0	82.0	2.08	0.295	82.67	1.35	0.79	
IC	87.0	78.0	75.0	6.24	0.886	80.00	0.77	0.22	
IL									•
IU	81.0	79.0	84.0	2.52	0.369	81.33	1.06	0.51	
J	81.0	79.0	80.0	1.00	0.148	80.00	0.77	0.22	
JE	72.0	71.0	71.0	0.58	0.074	71.33	-1.11	-1.66	
JG	77.0	79.0	77.0	1.15	0.148	77.67	0.26	-0.29	
JI									•
JR	67.0	72.0	71.0	2.65	0.369	70.00	-1.40	-1.95	

• ≡ No data submitted · TAG SYMBOLS ⇑ ≡ Above control limit

∅ ≡ Insufficient data × ≡ Determined to be an outlier ⇓ ≡ Below control limit

EML-559

JAN 20 1994
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Environmental Measurements Laboratory

SEMI-ANNUAL REPORT OF THE DEPARTMENT OF ENERGY, OFFICE OF ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT, QUALITY ASSESSMENT PROGRAM

Colin G. Sanderson and Catherine S. Klusek

January 5, 1994

DEPARTMENT OF ENERGY
NEW YORK, N. Y. 10014

Department of Energy
Environmental Measurements Laboratory
376 Hudson Street
New York, New York 10014-3621

January 10, 1994

Dear Colleague:

There is a correction to EML-559, "Semi-Annual Report of the Department of Energy, Office of Environmental Restoration and Waste Management, Quality Assessment Program," by Colin G. Sanderson and Catherine S. Klusek. There is an error in the EML value for uranium (mg mL^{-1}) in water. The correct value should be 0.842E-01. Enclosed is the statistical summary with the corrected value.

We are sorry for any inconvenience this might have caused.

Sincerely,

Colin G. Sanderson,
Analytical Chemistry Division

Attachment:
Statistical summary

Laboratory Listing

Date	Type	Lab	Isotope	Ser	Reported Value	Reported % Error	EML Value	Ratio Rp/EML	Ratio +/-
93 03	AIR	RI	MN 54	1	0.151E+02	5	0.154E+02	0.98	0.06
93 03	AIR	RI	CO 57	1	0.120E+02	3	0.173E+02	0.69	0.04
93 03	AIR	RI	CO 60	1	0.181E+02	4	0.205E+02	0.88	0.06
93 03	AIR	RI	SR 90	1	0.123E+01	1	0.762E+00	1.61	0.08
93 03	AIR	RI	SB 125	1	0.171E+02	8	0.174E+02	0.98	0.10
93 03	AIR	RI	CS 134	1	0.121E+02	8	0.122E+02	0.99	0.09
93 03	AIR	RI	CS 137	1	0.176E+02	4	0.188E+02	0.94	0.06
93 03	AIR	RI	CE 144	1	0.299E+02	11	0.403E+02	0.74	0.09
93 03	AIR	RI	PU 238	1	0.910E-01	7	0.129E+00	0.71	0.06
93 03	AIR	RI	PU 239	1	0.632E-01	8	0.800E-01	0.79	0.07
93 03	AIR	RI	AM 241	1	0.485E-01	20	0.654E-01	0.74	0.17
93 03	AIR	RI	U UG	1	0.498E+01	1	0.541E+01	0.92	0.05
93 03	SOIL	RI	CS 137	1	0.179E+02	17	0.114E+02	1.57	0.28
93 03	VEGETN	RI	K 40	1	0.110E+04	9	0.842E+03	1.31	0.13
93 03	VEGETN	RI	CS 137	1	0.966E+02	6	0.892E+02	1.08	0.07
93 03	WATER	RI	H 3	1	0.106E+03	3	0.170E+03	0.62	0.04
93 03	WATER	RI	MN 54	1	0.121E+03	5	0.109E+03	1.11	0.06
93 03	WATER	RI	CO 60	1	0.115E+03	5	0.996E+02	1.15	0.06
93 03	WATER	RI	CS 134	1	0.640E+02	7	0.561E+02	1.14	0.09
93 03	WATER	RI	CS 137	1	0.818E+02	6	0.755E+02	1.08	0.07
93 03	WATER	RI	CE 144	1	0.164E+03	10	0.173E+03	0.95	0.10
93 03	WATER	RI	PU 238	1	0.765E+00	7	0.114E+01	0.67	0.05
93 03	WATER	RI	PU 239	1	0.229E+00	2	0.338E+00	0.68	0.04
93 03	WATER	RI	AM 241	1	0.861E+00	44	0.139E+01	0.62	0.27
93 03	WATER	RI	U UG	1	0.849E-01	1	~~0.842E+00~~ * 0.842E-01	~~0.10~~ 1.01	0.00

See correction 2-1-94

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L.P. MARKEL

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA156

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ALUMINUM	1	642	681	550- 784	579- 755	ACCEPTABLE
	2	121	140	107- 182	117- 173	ACCEPTABLE
ARSENIC	1	525	492	408- 587	430- 565	ACCEPTABLE
	2	76.0	74.3	56.7- 92.9	61.2- 88.4	ACCEPTABLE
BERYLLIUM	1	478	461	382- 533	401- 514	ACCEPTABLE
	2	246	240	198- 278	208- 268	ACCEPTABLE
CADMIUM	1	173	165	138- 194	145- 187	ACCEPTABLE
	2	63.9	61.0	50.8- 72.0	53.5- 69.4	ACCEPTABLE
COBALT	1	904	880	775- 980	801- 954	ACCEPTABLE
	2	48.5	53.8	45.4- 61.9	47.5- 59.8	ACCEPTABLE
CHROMIUM	1	750	730	604- 843	634- 813	ACCEPTABLE
	2	24.9	23.4	17.4- 29.0	18.9- 27.6	ACCEPTABLE
COPPER	1	627	601	524- 657	541- 640	ACCEPTABLE
	2	19.8	18.7	13.6- 24.1	14.9- 22.8	ACCEPTABLE
IRON	1	58.3	58.0	43.5- 72.5	47.2- 68.8	ACCEPTABLE
	2	1109	1100	950- 1270	991- 1230	ACCEPTABLE
MERCURY	1	9.46	9.38	7.31- 11.9	7.89- 11.3	ACCEPTABLE
	2	6.46	6.67	5.00- 8.48	5.44- 8.04	ACCEPTABLE
MANGANESE	1	622	600	536- 660	551- 644	ACCEPTABLE
	2	75.9	73.5	64.0- 82.7	66.4- 80.4	ACCEPTABLE
NICKEL	1	869	860	766- 952	789- 928	ACCEPTABLE
	2	342	340	296- 383	307- 372	ACCEPTABLE
LEAD	1	1235	1200	1060- 1350	1100- 1310	ACCEPTABLE
	2	729	738	636- 833	661- 809	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

pg = 54

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA156

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
SELENIUM	1	250	228	156- 277	171- 262	ACCEPTABLE
	2	413	387	268- 486	296- 459	ACCEPTABLE
VANADIUM	1	984	940	832- 1040	860- 1020	ACCEPTABLE
	2	174	170	146- 188	151- 183	ACCEPTABLE
ZINC	1	868	842	737- 947	763- 921	ACCEPTABLE
	2	130	46.3	37.5- 56.1	39.8- 53.7	NOT ACCEPTABLE
ANTIMONY	3	51.7	94.5	56.4- 119	64.3- 111	NOT ACCEPTABLE
	4	122	189	108- 244	125- 227	CHECK FOR ERROR
SILVER	3	71.5	73.9	60.6- 86.8	63.9- 83.5	ACCEPTABLE
	4	< 6.0	25.8	21.1- 30.4	22.2- 29.2	NOT ACCEPTABLE
THALLIUM	3	62.2	62.8	47.0- 77.3	50.8- 73.4	ACCEPTABLE
	4	578	539	421- 643	450- 615	ACCEPTABLE
MOLYBDENUM	3	25.3	24.5	18.6- 30.6	20.2- 29.0	ACCEPTABLE
	4	83.1	81.6	64.4- 95.0	68.3- 91.1	ACCEPTABLE
STRONTIUM	3	19.8	19.1	14.4- 23.3	15.5- 22.1	ACCEPTABLE
	4	74.9	73.4	62.0- 84.5	64.9- 81.5	ACCEPTABLE
TITANIUM	3	131	130	109- 151	114- 145	ACCEPTABLE
	4	43.6	43.0	34.0- 53.4	36.5- 50.9	ACCEPTABLE
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	9.50	9.50	9.19- 9.75	9.26- 9.68	ACCEPTABLE
	4	4.68	4.70	4.62- 4.77	4.64- 4.75	ACCEPTABLE
SPEC. COND.	1	920	899	840- 980	857- 963	ACCEPTABLE
(UMHOS/CM AT 25 C)	2	406	398	368- 435	377- 427	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA156

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
TOTAL HARDNESS (AS CACO3)	1	250	279	236- 307	245- 298	ACCEPTABLE
	2	60.7	57.4	51.2- 63.8	52.8- 62.2	ACCEPTABLE
CALCIUM	1	98.4	110	87.4- 126	92.2- 121	ACCEPTABLE
	2	7.89	7.00	5.95- 8.19	6.23- 7.91	ACCEPTABLE
MAGNESIUM	1	0.980	0.960	0.771- 1.18	0.822- 1.13	ACCEPTABLE
	2	9.94	9.70	8.38- 11.0	8.71- 10.6	ACCEPTABLE
SODIUM	1	62.6	61.7	56.2- 67.8	57.6- 66.3	ACCEPTABLE
	2	26.9	26.3	23.6- 29.2	24.3- 28.5	ACCEPTABLE
POTASSIUM	1	7.72	7.50	6.39- 8.81	6.70- 8.50	ACCEPTABLE
	2	41.5	40.0	34.5- 45.6	35.9- 44.2	ACCEPTABLE
CHLORIDE	1	214	199	183- 213	187- 210	NOT ACCEPTABLE
	2	47.9	41.2	36.5- 45.4	37.6- 44.3	NOT ACCEPTABLE
FLUORIDE	1	3.60	3.30	2.83- 3.77	2.95- 3.65	ACCEPTABLE
	2	0.502	0.380	0.319-0.457	0.336-0.439	NOT ACCEPTABLE
SULFATE	1	13.2	14.0	10.8- 16.8	11.5- 16.0	ACCEPTABLE
	2	98.5	92.0	78.1- 105	81.5- 102	ACCEPTABLE
NUTRIENTS IN MILLIGRAMS PER LITER:						
NITRATE-NITROGEN	1	0.622	0.520	0.378-0.658	0.412-0.625	ACCEPTABLE
	2	11.2	11.0	8.84- 13.0	9.34- 12.5	ACCEPTABLE
ORTHOPHOSPHATE	2	3.93	4.10	3.48- 4.68	3.62- 4.54	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA156

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
DEMANDS IN MILLIGRAMS PER LITER:						
TOC	1	28.1	26.0	23.9- 32.8	25.0- 31.6	ACCEPTABLE
	2	79.2	82.0	69.5- 95.3	72.6- 91.9	ACCEPTABLE
PCB'S IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1254	1	1.94	1.87	0.988- 2.71	1.21- 2.49	ACCEPTABLE
PCB-AROCLOR 1260	2	3.70	4.63	2.79- 5.96	3.19- 5.56	ACCEPTABLE
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1016/1242	2	20.1	35.3	8.02- 46.6	13.0- 41.6	ACCEPTABLE
PCB IN OIL- 1254	1	37.9	43.9	13.5- 61.8	19.8- 55.5	ACCEPTABLE
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	3	8.11	8.21	4.91- 9.72	5.52- 9.11	ACCEPTABLE
	4	2.10	2.21	1.07- 2.77	1.29- 2.56	ACCEPTABLE
ALDRIN	1	0.484	0.539	0.122-0.754	0.202-0.674	ACCEPTABLE
	2	.0778	0.086	.0171-0.121	.0303-0.109	ACCEPTABLE
DIELDRIN	1	0.469	0.475	0.203-0.710	0.267-0.645	ACCEPTABLE
	2	0.167	0.173	.0861-0.239	0.106-0.219	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA156

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PESTICIDES IN MICROGRAMS PER LITER:						
DDD	1	0.800	0.866	0.433- 1.15	0.524- 1.06	ACCEPTABLE
	2	0.183	0.202	.0956-0.268	0.117-0.246	ACCEPTABLE
DDE	1	0.508	0.539	0.235-0.756	0.301-0.690	ACCEPTABLE
	2	0.168	0.173	.0786-0.236	.0989-0.216	ACCEPTABLE
DDT	1	0.811	0.796	0.362- 1.06	0.450-0.972	ACCEPTABLE
	2	0.156	0.142	.0570-0.216	.0772-0.196	ACCEPTABLE
HEPTACHLOR	1	0.641	0.669	0.187-0.918	0.279-0.825	ACCEPTABLE
	2	0.203	0.216	.0756-0.269	0.100-0.245	ACCEPTABLE
HEPTACHLOR EPOXIDE	1	0.438	0.478	0.260-0.640	0.308-0.592	ACCEPTABLE
	2	0.154	0.174	.0858-0.235	0.105-0.216	ACCEPTABLE
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	14.6	15.1	10.2- 20.4	11.5- 19.1	ACCEPTABLE
	2	54.3	55.8	36.2- 73.4	40.9- 68.7	ACCEPTABLE
CHLOROFORM	1	11.6	11.8	7.85- 15.9	8.86- 14.8	ACCEPTABLE
	2	62.5	64.4	38.3- 86.7	44.4- 80.6	ACCEPTABLE
1,1,1 TRICHLOROETHANE	1	12.3	13.4	8.68- 18.2	9.89- 17.0	ACCEPTABLE
	2	33.0	37.8	22.7- 50.0	26.2- 46.6	ACCEPTABLE
TRICHLOROETHENE	1	7.41	7.57	5.10- 10.3	5.75- 9.62	ACCEPTABLE
	2	57.6	62.7	38.6- 80.5	43.9- 75.2	ACCEPTABLE
CARBONTETRACHLORIDE	1	14.3	16.4	10.9- 22.2	12.3- 20.8	ACCEPTABLE
	2	31.6	37.1	23.0- 50.1	26.4- 46.6	ACCEPTABLE
TETRACHLOROETHENE	1	8.94	9.24	6.08- 12.5	6.89- 11.7	ACCEPTABLE
	2	46.5	51.3	31.2- 66.7	35.7- 62.2	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
BROMODICHLOROMETHANE	1	10.3	10.8	7.33- 14.2	8.21- 13.3	ACCEPTABLE
	2	39.1	38.1	24.9- 53.6	28.5- 50.9	ACCEPTABLE
DIBROMOCHLOROMETHANE	1	11.1	13.1	8.48- 17.0	9.55- 15.9	ACCEPTABLE
	2	55.4	58.1	34.1- 80.2	39.9- 74.4	ACCEPTABLE
BROMOFORM	1	12.7	14.5	7.45- 20.0	9.04- 18.4	ACCEPTABLE
	2	41.3	42.3	25.5- 59.9	29.9- 55.6	ACCEPTABLE
METHYLENE CHLORIDE	1	11.0	10.6	6.59- 16.1	7.79- 14.9	ACCEPTABLE
	2	53.6	54.1	30.7- 76.5	36.5- 70.7	ACCEPTABLE
CHLOROBENZENE	1	16.0	16.0	11.4- 20.1	12.5- 19.6	ACCEPTABLE
	2	62.7	63.7	41.3- 79.8	46.2- 74.9	ACCEPTABLE
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
BENZENE	1	41.4	40.1	25.7- 56.0	29.5- 52.2	ACCEPTABLE
	2	8.60	8.25	5.24- 11.6	6.04- 10.9	ACCEPTABLE
ETHYLBENZENE	1	66.1	66.9	36.0- 94.3	43.4- 86.9	ACCEPTABLE
	2	13.2	14.0	9.26- 19.0	10.5- 17.8	ACCEPTABLE
TOLUENE	1	49.9	49.2	30.2- 65.2	34.6- 60.9	ACCEPTABLE
	2	9.54	9.51	6.09- 12.8	6.93- 11.9	ACCEPTABLE
1,2-DICHLOROBENZENE	1	66.8	65.5	32.7- 93.9	40.5- 86.2	ACCEPTABLE
	2	8.77	8.88	5.85- 11.7	6.59- 11.0	ACCEPTABLE
1,3-DICHLOROBENZENE	1	47.5	47.9	29.4- 61.7	33.5- 57.6	ACCEPTABLE
	2	15.9	16.6	11.6- 21.1	12.9- 19.9	ACCEPTABLE
1,4-DICHLOROBENZENE	1	63.5	62.5	34.4- 85.8	41.0- 79.3	ACCEPTABLE
	2	12.1	12.4	7.49- 17.8	8.79- 16.5	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA156

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MISCELLANEOUS PARAMETERS:						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ACCEPTABLE

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA156

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MISCELLANEOUS PARAMETERS:						
TOTAL CYANIDE	1	0.806	0.860	0.598- 1.15	0.668- 1.08	ACCEPTABLE
(IN MG/L)	2	0.146	0.160	0.102-0.208	0.116-0.194	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

Westinghouse
Hanford Company

Internal
Memo

From: Inorganic Chemistry 124EO-94-003
Phone: 372-0894
Date: February 16, 1994
Subject: CORRECTIVE ACTIONS FOR WATER POLLUTION EVALUATION STUDY #WP031

To: L. P. Markel T6-16

cc:	W. W. Baird	T6-51	R. P. Marshall	T6-14
	M. W. Barnes	T6-16	C. G. Mooers	H4-19
	M. L. Bell	T6-16	C. T. Narquis	T6-50
	D. A. Dodd	T6-50	K. N. Pool	H4-23
	T. G. Ibsen	T6-27	J. R. Prilucik	T6-24
	E. J. Kosiancic	T6-16	C. Stacey	H4-23
	J. R. Kristofzski	T6-20	C. R. Stroup	B2-23
	W. D. Leggett	T6-07	L. H. Taylor	H4-23

THB File/LB

Sixty-three of sixty-nine (91.3%) inorganic analytes were correctly identified in the most recent Water Pollution Performance Evaluation Study (WP031). Our results for the other six analytes were scored as unacceptable. Corrective actions to address these deficiencies are summarized below:

Chloride in Sample 1 and Sample 2 (by IC)

Both results were biased slightly high (107% and 116% of the true value; 5 and 6.7 mg/L respectively). This is likely a result of chloride contamination in the polyvials used during sample handling (aliquoting and diluting). However, the blank showed no evidence of contamination. This problem was recognized previously (since the WP031 results were submitted). We now thoroughly rinse these vials prior to use.

Fluoride in Sample 2 (by IC)

The true fluoride concentration (0.380 mg/L) was less than four times our estimated detection limit (0.1 mg/L). Although our sample and duplicate suggested good precision (0.508 and 0.496 mg/L, respectively), our spike recovery (for the higher level sample) of 79.4%, although acceptable, suggests the possibility of slight bias which becomes significant at this low concentration. We will be determining more realistic detection limits so that we can better assess when results are too close to the detection limit to report with confidence. We will use low (or high) spike recoveries, even when acceptable, to help judge accuracies near the detection limit.

Zinc in Sample 2 (by ICP)

The zinc in the low level sample was badly misquantified (280% of true value) while the zinc in the high level sample was acceptably quantified (103% of true value). The sample and duplicate suggested acceptable, albeit only fair, precision (17% RPD). Our ICP RPDs are typically 5% or less except at low levels. Several of our screening runs provided a lower, acceptable result, but the higher result was reported because of the overall quality of the ICP run. Zinc is a ubiquitous element and as such is often a cross-contaminant. We are currently implementing several refinements in our sample preparation procedures which will reduce the liklihood of cross-contamination.

Silver in Sample 4 (by ICP)

Our result for silver in Sample 3 was good (97% of true value) while our result for Sample 4, where the true silver concentration was one third the Sample 3 level, was reported less than 6 ug/L (below detection limit) when the true value was 25.8 ug/L. All QC was good and blanks were acceptable. Chloride contamination (causing precipitation of the silver) is a possibility (see chloride narrative above). We have taken measures to minimize chloride contamination in our sample vials and we are monitoring the chloride level in our water systems to ensure an acceptably low level.

Antimony in Sample 3 (by GFAA)

We reported a value of 51.7 ug/L. The true value was 94.5 ug/L and the acceptable range was 56.4 to 119 ug/L. Our result was scored unacceptable. A review of the calibration data shows a slight curvature which introduces a 10% low bias on the high and low ends of the calibration. Spike recoveries for both the sample and duplicate were 30% low. Correcting for this would produce an acceptable, but still low, result. The low recovery is likely the result of a matrix (chemical) or spectral interference. Organic contaminants may have been present since acid digestion was not performed (as is standard practice for WPs). Lead can introduce a spectral interference, although ICP results show lead as not detected.

In the future we will rerun samples that do not have a spike recovery of 100 ± 15%. For such samples we will perform additional dilutions, acid digestion, or standard additions until this QC is acceptable.

T. H. Bushaw, Manager

U.S. Environmental Protection Agency
QUALITY ASSURANCE RESEARCH BRANCH
QUALITY ASSURANCE & METHODS DEVELOPMENT DIVISION
P.O. BOX 93478
LAS VEGAS, NEVADA 89193-3478

JAN 1994
RECEIVED
L.P. MARKEL

FACSIMILE LEAD SHEET

TO: X Larry Markel

PHONE NUMBER/VERIFICATION NO:

FTS FAX NUMBER: X 509-373-4884

OFFICE: Westinghouse Hanford

FROM: Dr. Larry Butler

PHONE NUMBER: 702.798.2114

FAX TELEPHONE NUMBERS:
Commercial No. (702) 798-2107
FTS No. (702) 798-2107

OFFICE: QAB

SUBJECT (optional): Revised Score

DATE: 1/6/94

NUMBER OF PAGES (including this coversheet) 4

COMMENTS:

FYI, your score for the attached was revised upward (↑).

Thank you,
—LB

Revised 1/4/94

REMEDIAL

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QS 3 FY 93

LABORATORY NAME: Westinghouse Hanford Company (WA)
PERFORMANCE LEVEL: Unacceptable - Corrective Action Mandatory
LABORATORY RANK: Above = 1 Same = 0 Below = 0

% Score: 68.9
REPORT DATE: 12/03/93
MATRIX: SOIL

ELEMENT	PREDICTION INTERVAL LOWER	PREDICTION INTERVAL UPPER	LABORATORY REPORTED VALUE	G		#LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	2560	10280	6350								2
ANTIMONY	12	30.5	8.2	B	X						2
ARSENIC	880	1025	944								2
BARIUM	40	1194	1800		X						2
BERYLLIUM	c	c	0.61	U							2
CADMIUM	c	c	130								2
CALCIUM	29786	37351	35400								2
CHROMIUM	67.8	104	93.4								2
COBALT	13.9	28	21.8								2
[illegible]	3110	3120	4000								2
IRON	38351	58301	51300								2
LEAD	5252	6858	6210								2
MAGNESIUM	15150	18361	17400								2
MANGANESE	2675	3284	3060								2
MERCURY	0.3	1.2	0.72								2
NICKEL	20.7	31.1	27.9								2
POTASSIUM	1630	4870	3380								2
SELENIUM	1	3.9	2.1								2
SILVER	5.5	16.6	1.6	B	X						2
SODIUM	c	c	2620								2
THALLIUM	c	c	1.1	U							2
VANADIUM	630	864	747								2
ZINC	4631	6632	5940								2

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 3
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 2
SOIL: Sb, Se

OF DUPLICATES OUT: 1
SOIL: Ag

REMEDIAL
INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 3 FY 93

LABORATORY NAME: Westinghouse Hanford Company (WA)
PERFORMANCE LEVEL: Unacceptable - Corrective Action Mandatory
LABORATORY RANK: Above = 1 Same = 0 Below = 0

% Score: 68.9
REPORT DATE: 12/03/93
MATRIX: WATER1

ELEMENT	PREDICTION INTERVAL LOWER	PREDICTION INTERVAL UPPER	LABORATORY REPORTED VALUE	Q		PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	530	575	588		X						2
ANTIMONY	301	372	373		X						2
ARSENIC	53.4	70	63.5								2
BARIUM	c	c	3.0	U							2
BERYLLIUM	58	68.9	64.4								2
CADMIUM	27.3	33.4	29.4								2
CALCIUM	26550	31450	24700		X						2
CHROMIUM	69	87.8	80.8								2
COBALT	247	296	276	E							2
[illegible]PPER	232	271	253								2
[illegible]ON	412	500	440								2
[illegible]	[illegible]	[illegible]	[illegible]		X						2
MAGNESIUM	19600	22800	19500		X						2
MANGANESE	c	c	3.0	U							2
MERCURY	5.1	9.7	3.9		X						2
NICKEL	247	308	258								2
POTASSIUM	c	c	123	B							2
SELENIUM	47.4	67.0	48.2								2
SILVER	44.9	55.3	52.5								2
SODIUM	d	d	88.0	B							2
THALLIUM	79.5	111	105								2
VANADIUM	c	c	6.0	U							2
ZINC	223	278	400		X						2

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 7
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER:

OF DUPLICATES OUT: 1
[illegible]TER: Zn

REMEDIAL
INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 3 FY 93

LABORATORY NAME: Westinghouse Hanford Company (WA)
PERFORMANCE LEVEL: Unacceptable - Corrective Action Mandatory
LABORATORY RANK: Above = 1 Same = 0 Below = 0

% Score: 68.9
REPORT DATE: 12/03/93
MATRIX: WATER2

ELEMENT	PREDICTION INTERVAL LOWER	PREDICTION INTERVAL UPPER	LABORATORY REPORTED VALUE	Q		PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	c	c	576								2
ANTIMONY	310	544	446								2
ARSENIC	30.5	52.1	40.8								2
BARIUM	839	1290	928								2
BERYLLIUM	34.5	55.7	40.5								2
CADMIUM	18	33.3	21.9								2
CALCIUM	c	c	78.8	B							2
CHROMIUM	58.1	100	77.6								2
COBALT	262	410	290	E							2
COPPER	c	c	3.0	U							2
IRON	619	889	669								2
[illegible]	[illegible]	[illegible]	[illegible]								[illegible]
MAGNESIUM	c	c	3.0	U							2
MANGANESE	106	154	110								2
MERCURY	5.9	9.4	5.1		X						2
NICKEL	c	c	11.0	U							2
POTASSIUM	15900	26100	19000								2
SELENIUM	23.9	48.2	30.3								2
SILVER	45.9	76.4	52.1								2
SODIUM	20450	31051	22200								2
THALLIUM	c	c	5.2	U							2
VANADIUM	387	585	432								2
ZINC	c	c	3.0	U							2

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 1
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER:

OF DUPLICATES OUT: 0
WATER:

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 1 FY 94

FEB 1994
RECEIVED
L.P. MARKEE

LABORATORY NAME: Westinghouse Hanford Co. (WA) [A1] (WHCWA)
PERFORMANCE LEVEL: UNACCEPTABLE, Corrective Actions Mandatory
LABORATORY RANK: Above = 24 Same = 0 Below = 0

% Score: 58.4
REPORT DATE: 1/4/1994
MATRIX: SOIL

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q	PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	7480	19500	6170	20800	12500		0	0	0	1	0	25
ANTIMONY	c	c	c	c	0	NRS	0	0	6	16	3	25
ARSENIC	38.1	68.9	34.7	72.2	0	NRS	0	1	0	2	2	25
BARIUM	147	182	143	186	140	X	0	1	0	0	0	25
BERYLLIUM	1.2	1.7	1.1	1.7	1.9	X	0	5	0	0	2	25
CADMIUM	10.9	17.1	10.2	17.8	10	X	0	5	0	11	5	25
CALCIUM	17200	21000	17000	21200	17000	S	0	0	0	0	0	25
CHROMIUM	1840	2250	1820	2260	1740	X	0	1	0	1	0	25
COBALT	19.7	24.1	19.6	24.2	20.3		0	2	0	0	1	25
COPPER	296	362	287	370	276	X	0	1	0	1	0	25
[illegible]	19700	26800	18900	27600	19500	S	0	1	0	1	1	25
[illegible]	185	239	179	245	206		0	3	0	0	1	25
MAGNESIUM	7610	9430	7410	9630	7180	X	0	1	0	0	0	25
MANGANESE	2170	2650	2170	2650	2070	X	0	2	0	0	0	25
MERCURY	2.3	3.8	2.1	4.0	3		0	0	0	1	0	25
NICKEL	20.2	30.2	19.1	31.2	23.7		0	1	0	0	1	25
POTASSIUM	1000.0	2350	1000.0	2530	1330		0	0	0	0	1	25
SELENIUM	2.1	6.1	1.6	6.5	0	NRS	0	5	0	8	3	25
SILVER	3.2	5.9	2.9	6.2	3.6		1	3	0	1	1	25
SODIUM	d	d	d	d	204	B	0	0	1	0	0	25
THALLIUM	d	d	d	d	0	NRS	0	0	3	2	0	25
VANADIUM	23.8	46.5	21.3	49.0	33.3	E	0	1	0	0	0	25
ZINC	327	400	324	403	312	X	0	2	0	6	1	25

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS QUANTIFIED: 0
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 2
SOIL : Cd, Zn

OF DUPLICATES OUT: 0
SOIL:

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 1 FY 94

LABORATORY NAME: Westinghouse Hanford Co. (WA) [A1] (WHCWA)
PERFORMANCE LEVEL: UNACCEPTABLE, Corrective Actions Mandatory
LABORATORY RANK: Above = 24 Same = 0 Below = 0

% Score: 58.4
REPORT DATE: 1/4/1994
MATRIX: WATER 1

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q		PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	973	1190	973	1190	1240		X	0	2	0	0	1	25
ANTIMONY	60.0	107	60.0	113	0	NRB		0	1	0	2	4	25
ARSENIC	38.7	59.0	36.5	61.2	0	NRB		0	0	0	4	2	25
BARIUM	1900	2320	1900	2320	2380	E	X	0	1	0	0	1	25
BERYLLIUM	44.5	54.4	44.5	54.4	59.6		X	0	1	0	0	1	25
CADMIUM	77.7	95.0	77.7	95.0	94.6			0	0	0	0	1	25
CALCIUM	6180	7550	6180	7550	8120		X	0	2	0	0	1	25
CHROMIUM	50.3	61.5	50.3	61.5	63.1		X	0	3	0	0	1	25
COBALT	96.8	118	96.8	118	118			0	1	0	0	1	25
COPPER	131	161	131	161	159			0	2	0	0	1	25
I[illegible]	566	691	566	691	712		X	0	1	0	0	1	25
LE[illegible]	33.0	45.6	31.6	46.9	0	NRB		0	3	0	3	2	25
MAGNESIUM	5000.0	5830	5000.0	5830	5610	E		0	0	0	0	1	25
MANGANESE	106	130	106	130	125			0	0	0	1	2	25
MERCURY	7.4	10.6	7.0	11.0	7.8			1	3	0	1	1	25
NICKEL	106	130	104	132	136		X	0	1	0	0	1	25
POTASSIUM	9100	12000	8780	12300	11200			0	1	0	0	1	25
SELENIUM	24.8	36.2	23.5	37.4	0	NRB		0	1	0	0	0	25
SILVER	c	c	c	c	9	U		0	0	1	0	1	25
SODIUM	7320	8950	7320	8950	8840			0	0	0	0	1	25
THALLIUM	36.7	50.7	35.1	52.2	0	NRB		0	2	0	3	4	25
VANADIUM	120	147	120	147	149		X	0	1	0	0	1	25
ZINC	101	124	101	124	124			0	2	0	0	1	25

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 8
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER :

OF DUPLICATES OUT: 0

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 1 FY 94

LABORATORY NAME: Westinghouse Hanford Co. (WA) [A1] (WHCWA)
PERFORMANCE LEVEL: UNACCEPTABLE, Corrective Actions Mandatory
LABORATORY RANK: Above = 24 Same = 0 Below = 0

% Score: 58.4
REPORT DATE: 1/4/1994
MATRIX: WATER 2

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q	PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSP% OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	1080	1310	1080	1310	1290		0	1	0	0	1	25
ANTIMONY	171	277	159	289	0	NRQ	0	0	0	2	4	25
ARSENIC	19.6	31.0	18.4	32.2	0	NRQ	0	1	0	4	2	25
BARIUM	464	567	464	567	540	E	0	1	0	0	1	25
BERYLLIUM	24.4	29.8	24.4	29.8	29.8		0	1	0	0	1	25
CADMIUM	28.2	35.7	27.4	36.5	30.4		0	1	0	0	1	25
CALCIUM	5000.0	5200	5000.0	5040	5200	M	0	0	0	0	1	25
CHROMIUM	20.6	27.4	19.9	28.1	26		0	4	0	0	1	25
COBALT	57.2	69.9	57.2	69.9	70.1	X	0	2	0	0	1	25
COPPER	72.9	91.8	70.9	93.8	86.2		0	1	0	0	1	25
IRON	535	654	535	654	637		0	2	0	0	1	25
[illegible]	66.1	94.5	63.0	97.6	0	NRQ	0	1	0	3	2	25
MAGNESIUM	6430	7860	6430	7860	7300	E	0	1	0	0	1	25
MANGANESE	40.3	49.3	40.3	49.3	45.9		0	1	0	1	2	25
MERCURY	0.34	0.76	0.30	0.80	0.51		1	2	0	1	1	25
NICKEL	40.0	41.2	40.0	42.6	45.5	X	0	3	0	0	1	25
POTASSIUM	5130	7090	5000.0	7300	6130		0	1	0	0	1	25
SELENIUM	29.0	37.1	28.2	37.9	0	NRQ	0	2	0	0	0	25
SILVER	35.9	44.5	35.0	45.5	42.5		0	2	0	0	1	25
SODIUM	5000.0	5440	5000.0	5520	5110		0	1	0	0	1	25
THALLIUM	16.9	32.3	15.2	34.0	0	NRQ	0	0	0	3	4	25
VANADIUM	57.9	73.8	56.2	75.5	69.6		0	1	0	0	1	25
ZINC	72.9	89.1	72.9	89.1	85.4		0	2	0	0	1	25

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 3
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER :

OF DUPLICATES OUT: 0
WATER :

REGION 10
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 1 FY 94

LABORATORY: Westinghouse Hanford (WA)
PERFORMANCE: ACCEPTABLE • Response Explaining Deficiency(ies) Required
RANK: Above = 2 Same = 0 Below = 3

% SCORE: 86.6
REPORT DATE: 12/16/93
MATRIX: WATER

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-QNT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS
TCL VOLATILE										
CHLOROFORM	71	90	68	93	83		0	0	25	25
2-BUTANONE	78	130	71	140	100		2	0	25	25
CIS-1,3-DICHLOROPROPENE	89	100	87	100	94		6	0	25	25
1,1,2,2-TETRACHLOROETHANE	NU	NU	NU	NU	10		0	1	24	25
CHLOROBENZENE	31	36	30	37	34		1	1	24	25
STYRENE	92	100	90	100	120	X	7	0	25	25
XYLENES (TOTAL)	90	110	87	110	110		1	0	25	25
TCL SEMIVOLATILE										
4-METHYLPHENOL	21	40	19	51	28		0	0	25	25
ISOPHORONE	13	25	12	26	16		1	0	25	25
1,2,4-TRICHLOROBENZENE	25	48	22	52	38		1	0	25	25
NAPHTHALENE	13	27	11	29	19		5	1	24	25
4-CHLORO-3-METHYL PHENOL	19	31	17	33	23		0	0	25	25
2-METHYLNAPHTHALENE	12	21	11	22	15		2	0	25	25
HEXACHLOROCYCLOPENTADIENE	NU	NU	NU	NU	5		0	7	18	25
2-CHLORONAPHTHALENE	14	26	12	28	19		1	0	25	25
ACENAPHTHENE	48	92	41	98	71		1	0	25	25
[illegible]-DINITROTOLUENE	64	97	59	100	72		1	0	25	25
[illegible]ANTHRENE	34	49	31	51	41		0	0	25	25
DI-N-BUTYLPHTHALATE	13	22	12	24	17		0	0	25	25
PYRENE	31	62	26	67	38		1	0	25	25
BENZO(B)FLUORANTHENE	20	31	19	32	23		2	0	25	25
BENZO(G,H,I)PERYLENE	22	39	20	42	16	X	2	0	25	25
TCL PESTICIDES										
ALPHA-BHC	0.14	0.22	0.12	0.23	0.16		0	0	25	25
BETA-BHC	0.27	0.38	0.25	0.4	0.38		4	0	25	25
GAMMA-BHC (LINDANE)	0.15	0.24	0.14	0.25	0.21		2	0	25	25
HEPTACHLOR	0.26	0.43	0.23	0.46	0.6	X	3	0	25	25
ALDRIN	0.12	0.28	0.096	0.3	0.19		1	1	24	25
HEPTACHLOR EPOXIDE	0.3	0.45	0.28	0.47	0.4		1	0	25	25
AROCLOR-1016	2.1	3.8	1.8	4.1	3.7		2	3	22	25
AROCLOR-1260	1.2	1.9	1.2	2	1.8		3	0	25	25
NON-TCL VOLATILE										
EPICHLOROHYDRIN					0	NR		25	0	25
PROPANE,1,2-DIBROMO-3-CHLORO-					10			8	17	25
NON-TCL SEMIVOLATILE										
BETA-BHC					34			0	25	25
ENDRIN					0	NR		12	13	25
PARATHION					25			0	25	25
PHENOL,4-CHLORO-					52			8	17	25

REGION 10
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QS 1 FY 94

LABORATORY: Westinghouse Hanford (WA)
PERFORMANCE: ACCEPTABLE - Response Explaining Deficiency(ies) Required
RANK: Above = 2 Same = 0 Below = 3

% SCORE: 86.6
REPORT DATE: 12/16/93
MATRIX: WATER

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-QNT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS
TCL VOLATILE (Contaminants)										
ACETONE					3			21	4	25
1,2-DICHLOROPROPANE					1			19	6	25
TRANS-1,3-DICHLOROPROPENE					0.8			21	4	25
TCL SEMIVOLATILE (Contaminants)										
ACENAPHTHYLENE					0.4			23	2	25
BIS(2-ETHYLHEXYL)PHTHALATE					0.1			12	13	25
NON-TCL VOLATILE (Contaminants)										
UNKNOWN					12			22	3	25
NON-TCL SEMIVOLATILE (Contaminants)										
ENDRIN KETONE					14			22	3	25

OF TCL COMPOUNDS NOT-IDENTIFIED: 0
OF TCL COMPOUNDS MIS-QUANTIFIED: 3
OF TCL CONTAMINANTS: 0

OF NON-TCL COMPOUNDS NOT-IDENTIFIED: 0
OF NON-TCL CONTAMINANTS: 0

Westinghouse Hanford Company

Internal Memo

From: 222-S Analytical Operations 124F0-94-002
Phone: 373-2872 T6-50
Date: January 25, 1994
Subject: CORRECTIVE ACTION - EPA QUARTERLY BLIND ORGANIC PERFORMANCE EVALUATION PROGRAM

JAN 1994 RECEIVED L.P. MARKEL

To: L. P. Markel T6-16

cc:	M. L. Bell	T6-16	G. C. Mooers	H4-1[illegible]
	D. A. Dodd	T6-50	C. T. Narquis	[illegible]-50
	D. G. Farwick	H4-16	K. N. Pool	H4-[illegible]
	E. J. Kosiancic	T6-16	J. R. Prilucik	T6-24
	W. D. Leggett	T6-07	W. I. Winters	T6-50
	R. P. Marshall	T6-14	KBW File/LB	

CORRECTIVE ACTIONS

VOLATILES - Current standards are being compared with another standard from an independent source.

SEMI-VOLATILES - Samples spiked with benzo(g, h, i) perylene are being extracted and analyzed to determine if the extractors are working properly.

PESTICIDES - Chromatographs are being reviewed to determine if any contamination may have contributed to an elevated result.

K. B. Wehner, Manager
Organic Chemistry

klm

Westinghouse Hanford Company

Internal Memo

From: Inorganic Chemistry 124E0-94-002
Phone: 372-0894 T6-30
Date: February 10, 1994
Subject: CORRECTIVE ACTION PLAN - EPA INORGANIC PERFORMANCE EVALUATION PROGRAM (QB1FY94)

To: M. L. Bell T6-16

cc:	M. W. Barnes	T6-16	C. T. Narquis	T6-50
	D. A. Dodd	T6-50	K. N. Pool	H4-23
	D. G. Farwick	H4-16	C. Stacey	H4-23
	E. J. Kosiancic	T6-16	C. R. Stroup	B2-23
	J. R. Kristofzski	T6-20	L. H. Taylor	T6-16
	L. P. Markel	T6-16	W. I. Winters	T6-50
	R. P. Marshall	T6-14	THB File/LB	

INTRODUCTION

The 222-S laboratory failed to pass the Inorganic QB1FY94 Quarterly Blind Performance Evaluation Standards. This memo documents our plans to investigate the deficiencies that led to this failure. Once identified, corrective actions will be implemented and tests will be performed to ensure successful elimination of the deficiencies. This process will provide the evidence necessary to determine that the 222-S laboratory inorganic analyses meet our own and our customer's quality requirements. This investigation and corrective action plan were reviewed and discussed with David Dodd, Cliff Narquis, and Larry Markel in a meeting on February 7th.

SUMMARY OF RESULTS

This performance evaluation (PE) included one soil sample and two water samples. 18 analytes were scored for the Soil (17 ICP analytes and 1 AA analyte); 3 misquantified ICP analytes contributed to the score reduction. 17 analytes were scored for Water #1 (16 ICP analytes and 1 AA analyte); 8 misquantified ICP analytes contributed to the score reduction. 18 analytes were scored for Water #2 (17 ICP analytes and 1 AA analyte); 3 misquantified ICP analytes contributed to the score reduction. Matrix spike and duplicate failures also reduce the score. We had 2 single analyte matrix spike failures (a total deduction of one point) and no duplicate failures. The 19 misquantifications and 2 spike failures resulted in a score of 58.4%.

IMPACT ON CUSTOMER DATA

This PE only tested our sample preparation and ICP analysis capabilities (mercury by cold vapor atomic absorption was also scored; all results were acceptable). Other inorganic analyses were not tested in this evaluation.

The results certainly suggest that our practices can be improved to meet the tolerances required for this PE program. Execution of the plan outlined below is intended to accomplish this. Nonetheless, it is informative to speculate on the validity of these particular PE results, based on the customer-accepted criteria HAS uses for evaluating and reporting results for Hanford samples:

- We normally run 100% duplicates and report to the customer the average of the sample and duplicate result. In the PE program, only the sample results are used for scoring. The average of our sample and duplicate PE results would have been scored "acceptable" (82%), even with the biases identified below.

- Present HAS data validation guidelines qualify data with relative percent differences (RPD) greater than 20% for waters and greater than 35% for soils. All PE results, with the one exception of cadmium for the soil, if acquired for a customer, would have been reported and validated as usable. The RPD between our results and the acceptable range midpoints vary from 0.3% to 18% for the waters and 2.9% to 30.3% for the soil. The RPD for our sample and duplicate results range from 2.3% to 11.2% for Water #1 and 1.9% to 20.7% for the soil.

ASSESSMENT OF RESULTS

A comparison of our results to the acceptable ranges suggest that the misquantifications are likely the result of imprecision in the laboratory's sample preparation practices. This conclusion is based on the following evidence:

- Our ICP results for the Soil are biased approximately 10% low (relative to the midpoint of the acceptable range). The ICP results for Water #1 are biased approximately 10% high. The ICP results for Water #2 are biased approximately 5% high. The different directions of the bias suggest that the source of the bias is not a instrument calibration problem.

- The duplicate Soil and duplicate Water #1 results did not show this same bias (only 1% low and 4% high, respectively). In fact, in the duplicates, only one analyte in each sample was outside the acceptable range. A duplicate for Water #2 was not prepared.

- These same samples (full protocol) were run on two different ICP instruments, by different operators, using independently prepared calibration standards. Both result sets show the same general behavior.

- The recently received Water Pollution Study #31 (WP031) results suggested good ICP performance (38 of 40 ICP analytes were scored "acceptable"). The WP031 samples were diluted only; they were not subjected to the sample preparation digestions. Although the acceptable ranges for WP031 are generally wider than for the PE program, our 38 acceptable WP031 results deviated, on average, only 3.8% from the true values.

None of our systematic QC (or those dictated by the CLP program) suggested, prior to the receipt of our score, that our results were questionable. This QC includes blanks, duplicates, spikes, serial dilutions, an interference check standard, an independent commercial standard, LMCS standard, low level standard, and initial and continuing calibration verifications.

Our investigation is focused on confirming this assessment. If substantiated, corrective actions will address this deficiency.

VERIFICATION OF ASSESSMENT

We are in the process of taking actions (1) to determine if our assessment is correct and (2) to demonstrate that the 222-S laboratory is capable of generating good inorganic results. These actions include:

- With assistance, insight, and oversight from inorganic and sample preparation chemists, the sample preparation procedures have been walked through with the sample preparation technologist. Several areas for improvement which may impact results have been identified -- some of these are lab practices, some are potential improvements to our procedures.

- With the same involvement, we are re-preparing both the QB1FY94 PE samples and the recently-received QB2FY94 PE samples (the first preparation of the latter was completed last week, prior to receipt of the QB1FY94 score). In addition, we are including a blind commercial soil sample. These will all be analyzed on both of our ICP instruments. The results will be used to defend or disprove our hypothesis.

- We are examining our LMCS standards criteria to determine if they adequately track sample preparation performance and are suitable for the tight tolerances required for successful performance evaluation. We do not presently digest the LMCS standard included with our ICP analyses. It therefore does not presently help us identify sample preparation problems.

POTENTIAL CORRECTIVE ACTIONS

If, in fact, these data substantiate our hypothesis, we will identify variances between acceptable and practiced sample preparation procedures and will implement actions to eliminate the unacceptable practices. To demonstrate our subsequent ability to perform satisfactory sample preparation, we will analyze standards (e.g. SPEX or equivalent) that are certified for both direct analysis and analysis after sample preparation (acid digestion).

We will also review our LMCS tracking procedures and make changes to ensure we adequately track the quality of the laboratory's sample preparation practices.

In a follow-up memo, we will document the verification of our deficiencies and the actual corrective actions we are implementing.

Please call one of us if you have any questions.

Thomas Bushaw

T. H. Bushaw
Manager, Inorganic Chemistry

R. Akita

R. Akita
Manager, Hot Cells and Sample Preparation

Westinghouse
Hanford Company

Internal
Memo

From: Inorganic Chemistry 124E0-94-004
Phone: 372-0894 T6-30
Date: February 18, 1994
Subject: CORRECTIVE ACTIONS - EPA INORGANIC PERFORMANCE EVALUATION PROGRAM (QB1FY94)

To: L. P. Markel T6-16

cc: M. W. Barnes T6-16
J. R. Kristofzski T6-20
R. P. Marshall T6-14
C. T. Narquis T6-50
W. I. Winters T6-50
THB File/LB

FEB 1994
RECEIVED
L.P. MARKEL

In a prior memo to M. L. Bell (124E0-94-002), we outlined our plans for investigating and correcting the deficiencies which led to a failing score on the first quarter QB standards (QB1FY94). This memo describes the current status of this investigation and the corrective actions we are implementing.

RESULTS OF INVESTIGATION

The deficiencies leading to the failing QB1FY94 score have been identified as:

- Laboratory practices and bench techniques that result in poor sample preparation precision and accuracy (no deficiencies in written laboratory sample preparation procedures was found).

  Corrective Actions

  1. After careful monitoring of sample preparation bench techniques by staff chemists from both the Sample Preparation and Inorganic groups, several improvements have been identified and are being implemented. The impact of these improvements have (or will be) verified through:

     a) Re-preparation and reanalysis of the QB1FY94 samples and comparison of these results with EPA-acceptable concentration ranges.

     b) Comparison between digested water (QB1FY94) and direct (undigested) analysis results.

     c) The preparation and analysis of a commercial laboratory blind soil sample. This is complete and all twenty-two analytes were acceptably quantified.

     Implementation Status: Complete by February 25, 1994 (prior to submission of QB2FY94 results).

Several improvements that require acquisition of new lab ware (e.g., funnels and reagent dispensers) have been identified and have been recommended for implementation. These improvements will not require changes to current written procedures.

Implementation Status: Complete by March 31, 1994 or as soon as lab ware is acquired.

2. Staff chemists and management will continue to monitor sample preparation practices to ensure continued compliance.

   Implementation Status: Ongoing.

3. "Pre-Job Briefings" will be held before major projects to review special requirements and practices. Chemists and technologists from both the Sample Preparation and Inorganic groups will participate.

   Implementation Status: Ongoing.

4. Inorganic chemists will review results with Sample Preparation chemists and technologists to provide feedback on the impact of their work. This practice should be extended to all areas of analysis involving the Sample Preparation group.

   Implementation Status: Ongoing.

- Current laboratory QC procedures did not reveal the above deficiency.

  Corrective Actions

  1. Our LMCS standard for ICP is not carried through the sample preparation process. This will be changed. However, for QB standards, an independent Laboratory Control Standard is carried through sample preparation, as required by CLP protocol. (Most project work does include a standard that has gone through sample preparation.)

     Implementation Status: To be complete by March 18, 1994.

  2. The Analytical Operations QA Officer will submit a blind standard for analysis on a monthly basis. Results from these analyses will be used to demonstrate the effectiveness of the above corrective actions and will be documented by the QA Officer.

     Implementation Status: Ongoing (one blind standard has already been submitted and was successfully prepared and analyzed).

We do not believe this deficiency has had a significant effect on final results reported to customers. For Single Shell Tank work, all samples have been prepared and analyzed in duplicate. Those not satisfying customer-required precision (RPD criteria) are rerun or are noted in the narratives provided to the customer. The accuracy and precision of our QB1FY94 results, when evaluated by these standards, are acceptable.

Thomas Bushaw

T. H. Bushaw
Manager, Inorganic Chemistry

R. Akita R Akita
Manager, Hot Cells and Sample Preparation

DON'T SAY IT --- *Write It!*

DATE: February 23, 1994

TO: Claude Stacey H4-23

FROM: L. P. Markel T6-16

Telephone: 373-4131

SUBJECT: WHC 222-S LABORATORY CORRECTIVE ACTION RESPONSE TO QUARTERLY BLIND PERFORMANCE EVALUATION PROGRAM (QB1FY94)

The corrective action for the Inorganic QB is in progress. Prior to analysis of the next QB I have submitted a Blind Standard to the Laboratory to evaluate the all areas of the PE program. This blind was from Environmental Resource Associates (ERA). The standard was for Priority Pollutants/CLP protocol and is NIST certified. Please refer to Lotus table for the results. 2/17 preparation indicates improvements made in review of the preparation protocol. Average percent error was 6.9% with the average percent recovery of all standards at 96.5% of the certified value.

In evaluation of the range limits established for the blind, we are in the process of reviewing previous QB limits. After review we will reduce (tighten) the limits on the blinds to more applicable ranges of the CLP program PE's.

If there are any questions please call.

C:\WPDATA\TQONOTCA.QB

Priority PollutnT™/CLP Quality Control Standards
Laboratory Blind (Soil)

	Lot 214 Values				2/14 Preparation "Phase I" Improvements				2/17 Preparation "Phase II" Improvements			
	Low	High	True	Range True	Found	% Error	% Recovery		Found	% Error	% Recovery	
Al	1600	5610	4010	111%	3234	19.4%	80.6%	Acceptable	3174	20.8%	79.2%	Acceptable
Sb	4.1	107	25	185%	11.74	53.0%	47.0%	Acceptable	22.06	11.8%	88.2%	Acceptable
As	88	200	144	78%	134.44	6.6%	93.4%	Acceptable	148.9	3.4%	103.4%	Acceptable
Ba	158	275	206	54%	177.3	13.9%	86.1%	Acceptable	205.8	0.1%	99.9%	Acceptable
Be	54	120	85.7	76%	80.28	6.3%	93.7%	Acceptable	93.6	9.2%	109.2%	Acceptable
Cd	65	193	129	99%	118.42	8.2%	91.8%	Acceptable	134.9	4.6%	104.6%	Acceptable
Ca	1300	3100	2200	82%	1880.4	14.5%	85.5%	Acceptable	2002	9.0%	91.0%	Acceptable
Cr	41	158	100	118%	85.6	14.4%	85.6%	Acceptable	95.5	4.5%	95.5%	Acceptable
Co	41	140	90.2	109%	89.2	1.1%	98.9%	Acceptable	99.04	9.8%	109.8%	Acceptable
Cu	58	155	101	91%	91.24	9.7%	90.3%	Acceptable	102	1.0%	101.0%	Acceptable
Fe	3230	12700	7990	119%	5542	30.6%	69.4%	Acceptable	5438	31.9%	68.1%	Acceptable
Pb	45	191	118	124%	113.78	3.6%	96.4%	Acceptable	118.1	0.1%	100.1%	Acceptable
Mg	765	3200	1980	123%	1619.4	18.2%	81.8%	Acceptable	1729.2	12.7%	87.3%	Acceptable
Mn	187	348	260	60%	229	11.9%	88.1%	Acceptable	250	3.8%	96.2%	Acceptable
Ni	71	201	136	96%	125.36	7.8%	92.2%	Acceptable	141.3	3.9%	103.9%	Acceptable
K	1240	2930	2250	81%	2038	9.4%	90.6%	Acceptable	2140	4.9%	95.1%	Acceptable
Se	82	247	165	100%	149.22	9.6%	90.4%	Acceptable	169.4	2.7%	102.7%	Acceptable
Ag	46	138	92.1	100%	32.84	64.3%	35.7%	Unacceptable	94.28	2.4%	102.4%	Acceptable
Na	663	1600	1130	83%	992.4	12.2%	87.8%	Acceptable	1109.8	1.8%	98.2%	Acceptable
Th	30	89	59.4	99%	51.92	12.6%	87.4%	Acceptable	59.58	0.3%	100.3%	Acceptable
V	52	110	74	72%	61.1	17.4%	82.6%	Acceptable	67.14	9.3%	90.7%	Acceptable
Zn	55	265	160	131%	144.5	9.7%	90.3%	Acceptable	154.5	3.4%	96.6%	Acceptable
					Average:	16.1%	83.9%		Average:	6.9%	96.5%	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY-LAS VEGAS
P.O. BOX 93478
LAS VEGAS, NEVADA 89193-3478
702/798-2100

APR 1994
RECEIVED
L.P. MARKEL

MAR 30 1994

Mr. Larry Markel
Westinghouse-Hanford
200 W. 2704 S. Bldg. Room 18
Richland, WA 99352

Dear Mr. Markel:

The Individual Laboratory Summary Report (ILSR) summarizing your laboratory's results for the most recent Quarterly Blind (QB) Performance Evaluation (PE) Sample (QB2, FY94) is enclosed for your information and review. Please review your score as listed on the ILSR to determine the actions which are required to correct any deficiencies. The wording of these Performance Categories below was established by your contract and the Administrative Project Officers of the National Program Office for CLP Contracts:

- o Acceptable, No Response Required (Score greater than or equal to 90 percent):

  Data meets most or all of the scoring criteria. No response is required.

- o Acceptable, Response Explaining Deficiency(ies) Required (Score greater than or equal to 75 percent but less than 90 percent):

  Deficiencies exist in the Contractor's performance.

  Within 14 days of receipt of this notification from EPA, the Contractor shall describe the deficiency(ies) and the action(s) taken to correct the deficiency(ies) in a letter to the Administrative Project Officer, the Technical Project Officer and the Environmental Monitoring Systems Laboratory-Las Vegas (EMSL-LV)

- o Unacceptable, Response Explaining Deficiency(ies) Required (Score less than 75 percent):

  Deficiencies exist in the Contractor's performance to the extent that the National Program Office has determined that the Contractor has not demonstrated the capability to meet the contract requirements.

Within 14 days of receipt of notification from EPA, the Contractor shall describe the deficiency(ies) and the action)s) taken to correct the deficiency(ies) in a letter to the Administrative Project Officer, the Technical Project Officer, and EMSL-LV.

The Contractor shall be notified by the Technical Project Officer or Administrative Project Officer concerning the remedy for their unacceptable performance. A Contractor may expect, but the Agency is not limited to, the following actions: reduction of the number of samples sent under the contract, suspension of sample shipment to the Contractor, an On-Site laboratory evaluation, a GC/MS tape audit, a data package audit, a remedial laboratory evaluation sample, and/or a contract sanction, such as a Cure Notice.

Note: A Contractor's prompt response demonstrating that corrective actions have been taken to ensure the Contractor's capability to meet contract requirements may facilitate continuation of full sample delivery.

Your initial response, if any, to this letter should be to your Regional EPA Technical Project Officer for your contract.

Sincerely,

Larry C. Butler
Research Chemist
Quality Assurance Research Branch, QAD

Enclosure
Individual Laboratory Summary Report

REGION 10
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 2 FY 94

LABORATORY: Westinghouse Hanford (WA)
PERFORMANCE: ACCEPTABLE - Response Explaining Deficiency(ies) Required
RANK: Above = 4 Same = 0 Below = 2

% SCORE: 86.6
REPORT DATE: 03/23/94
MATRIX: WATER

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-QNT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS
TCL VOLATILE										
1,1-DICHLOROETHENE	NU	NU	NU	NU	4		0	3	22	25
DIBROMOCHLOROMETHANE	72	87	70	89	78		2	0	25	25
2-HEXANONE	280	400	260	410	340		6	0	25	25
1,1,2,2-TETRACHLOROETHANE	27	34	26	35	33		2	0	25	25
STYRENE	91	100	89	100	110	X	3	0	25	25
XYLENES (TOTAL)	140	170	140	170	160		0	0	25	25
TCL SEMIVOLATILE										
BIS(2-CHLOROETHYL)ETHER	15	22	13	24	16		0	0	25	25
2-CHLOROPHENOL	20	28	19	32	22		0	0	25	25
1,3-DICHLOROBENZENE	22	34	20	42	16	X	1	0	25	25
NITROBENZENE	42	59	40	62	52		1	0	25	25
2-NITROPHENOL	28	43	26	45	36		0	0	25	25
2,4-DIMETHYLPHENOL	42	75	37	80	53		1	0	25	25
2,4,5-TRICHLOROPHENOL	65	89	62	100	72		1	0	25	25
DIMETHYL PHTHALATE	62	94	57	98	76		1	0	25	25
ACENAPHTHYLENE	26	37	25	39	29		4	0	25	25
2,4-DINITROPHENOL	60	120	49	140	100		2	0	25	25
4,6-DINITRO-2-METHYLPHENOL	26	38	25	44	34		0	0	25	25
4-BROMOPHENYL PHENYL ETHER	24	37	22	39	27		1	0	25	25
PHENANTHRENE	12	16	12	17	14		2	0	25	25
PYRENE	66	130	56	160	100		0	0	25	25
BENZO(K)FLUORANTHENE	11	14	10	15	12		1	2	23	25
INDENO(1,2,3-CD)PYRENE	11	21	10	23	16		0	0	25	25
TCL PESTICIDES										
DELTA-BHC	0.098	0.15	0.09	0.16	0.14		1	0	25	25
HEPTACHLOR	0.098	0.15	0.09	0.16	0.53	X	2	0	25	25
ALDRIN	0.25	0.38	0.24	0.45	0.35		0	0	25	25
HEPTACHLOR EPOXIDE	0.26	0.35	0.25	0.37	0.33		2	1	24	25
4,4'-DDE	0.28	0.41	0.26	0.43	0.37		2	0	25	25
ENDOSULFAN SULFATE	0.42	0.61	0.39	0.64	0.54		3	0	25	25
AROCLOR-1260	1.3	1.8	1.2	2.2	1.7		2	0	25	25
NON-TCL VOLATILE										
ACETONITRILE					5			12	13	25
NON-TCL SEMIVOLATILE										
BENZOIC ACID					73			2	23	25
DIBENZOTHIOPHENE					12			0	25	25
TCL VOLATILE (Contaminants)										
ACETONE					4			17	8	25

REGION 10
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 2 FY 94

LABORATORY: Westinghouse Hanford (WA)
PERFORMANCE: ACCEPTABLE - Response Explaining Deficiency(ies) Required
RANK: Above = 4 Same = 0 Below = 2

% SCORE: 86.6
REPORT DATE: 03/23/94
MATRIX: WATER

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-QNT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS
2-BUTANONE					12			11	14	25
TRICHLOROETHENE					0.8			15	10	25
TETRACHLOROETHENE					0.4			22	3	25
BROMOFORM					0.2			24	1	25
TCL SEMIVOLATILE (Contaminants)										
BIS(2-ETHYLHEXYL)PHTHALATE					2			13	12	25
NON-TCL VOLATILE (Contaminants)										
ETHER,1-BUTYL-VINYL-METHYL-					11			24	1	25

OF TCL COMPOUNDS NOT-IDENTIFIED: 0
OF TCL COMPOUNDS MIS-QUANTIFIED: 3
OF TCL CONTAMINANTS: 0

OF NON-TCL COMPOUNDS NOT-IDENTIFIED: 0
OF NON-TCL CONTAMINANTS: 0

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY-LAS VEGAS
P.O. BOX 93478
LAS VEGAS, NEVADA 89193-3478
702/798-2100

MAR 30 1994

APR 1994
RECEIVED
L.P. MARKEL

Westinghouse Hanford Company
Mr. Larry Markel
222-S Lab Bldg/Room 13 200 West Area
Richland, WA 99352

Dear Mr. Markel:

The Individual Laboratory Summary Report (ILSR) summarizing your laboratory's results for the most recent Quarterly Blind (QB) Performance Evaluation (PE) Sample (QB2, FY94) is enclosed for your information and review. Please review your score as listed on the ILSR to determine the actions which are required to correct any deficiencies. The wording of these Performance Categories below was established by your contract and the Administrative Project Officers of the National Program Office for CLP laboratories:

- o Acceptable, No Response Required (Score greater than or equal to 90 percent):

  Data meets most or all of the scoring criteria. No response is required.

- o Acceptable, Response Explaining Deficiency(ies) Required (Score greater than or equal to 75 percent but less than 90 percent):

  Deficiencies exist in the Contractor's performance.

Within 14 days of receipt of this notification from EPA, the Contractor shall describe the deficiency(ies) and the action(s) taken to correct the deficiency(ies) in a letter to the Administrative Project Officer, the Technical Project Officer and the Environmental Monitoring Systems Laboratory-Las Vegas (EMSL-LV)

- o Unacceptable, Response Explaining Deficiency(ies) Required (Score less than 75 percent):

Deficiencies exist in the Contractor's performance to the extent that the National Program Office has determined that the Contractor has not demonstrated the capability to meet the contract requirements.

Within 14 days of receipt of notification from EPA, the Contractor shall describe the deficiency(ies) and the action)s) taken to correct the deficiency(ies) in a letter to the Administrative Project Officer, the Technical Project Officer, and EMSL-LV.

The Contractor shall be notified by the Technical Project Officer or Administrative Project Officer concerning the remedy for their unacceptable performance. A Contractor may expect, but the Agency is not limited to, the following actions: reduction of the number of samples sent under the contract, suspension of sample shipment to the Contractor, an On-Site laboratory evaluation, a data package audit, a remedial laboratory evaluation sample, and/or a contract sanction, such as a Cure Notice.

Note: A Contractor's prompt response demonstrating that corrective actions have been taken to ensure the Contractor's capability to meet contract requirements may facilitate continuation of full sample delivery.

Your initial response, if any, to this letter should be to your Regional EPA Technical Project Officer for your contract.

Sincerely,

Larry C. Butler
Research Chemist
Quality Assurance Research Branch, QAD

Enclosures

Individual Laboratory Summary Report

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 2 FY 94

LABORATORY NAME: Westinghouse Hanford Co. (WA) [N2] (WHCWA)
PERFORMANCE LEVEL: ACCEPTABLE - Corrective Actions Necessary
LABORATORY RANK: Above = 22 Same = 0 Below = 1

% Score: 80.2
REPORT DATE: 3/22/1994
MATRIX: SOIL

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q		PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	627	2670	406	2890	1510			0	0	0	1	3	24
ANTIMONY	c	c	c	c	0	NR		0	0	8	13	2	24
ARSENIC	321	475	305	491	358			0	3	0	0	1	24
BARIUM	689	1330	619	1400	1020			0	1	0	11	2	24
BERYLLIUM	d	d	d	d	2	U		0	0	0	0	0	24
CADMIUM	126	176	120	182	141			0	0	0	0	0	24
CALCIUM	25900	31700	25900	31700	32100		X	0	4	0	0	0	24
CHROMIUM	2.0	35.3	2.0	39.8	6.1	U@		2	2	0	1	0	24
COBALT	d	d	d	d	16.3	U@		0	0	0	1	0	24
COPPER	208	254	204	258	256		S	0	1	0	0	0	24
IRON	82401	113001	79100	116000	108000			0	0	0	0	0	24
LEAD	12000	15900	11600	16300	15400			0	0	0	0	0	24
MAGNESIUM	14500	17700	14200	18000	17800		S	0	2	0	0	0	24
MANGANESE	108000	154001	103001	158000	182000	E	X	0	2	0	0	1	24
MERCURY	0.16	0.54	0.12	0.58	0.38			0	0	0	0	0	24
NICKEL	3.0	17.8	8.0	19.8	20.3	U@		2	1	0	0	1	24
POTASSIUM	1000.0	1580	1000.0	1660	1930	B	X	1	1	0	0	0	24
SELENIUM	1.0	5.2	1.0	5.8	3.8	U@		0	2	0	12	0	24
SILVER	4.8	43.6	2.0	47.8	23.3			0	0	0	0	0	24
SODIUM	d	d	d	d	409	B		0	0	1	0	0	24
THALLIUM	2.0	5.7	2.0	6.1	3.8	U@		0	0	0	7	0	24
VANADIUM	10.0	20.0	10.0	22.4	37.8	B	X	0	2	0	0	0	24
ZINC	21000	28900	20100	29700	27900			0	1	0	0	0	24

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 4
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
SOIL :

OF DUPLICATES OUT: 1
SOIL : As

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 2 FY 94

LABORATORY NAME: Westinghouse Hanford Co. (WA) [N2] (WHCWA)
PERFORMANCE LEVEL: ACCEPTABLE - Corrective Actions Necessary
LABORATORY RANK: Above = 22 Same = 0 Below = 1

% Score: 80.2
REPORT DATE: 3/22/1994
MATRIX: WATER 1

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q	PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	810	990	806	995	894		0	1	0	0	0	24
ANTIMONY	314	384	309	389	412	X	0	2	0	0	0	24
ARSENIC	35.6	46.3	34.4	47.5	44.7		0	5	0	2	1	24
BARIUM	789	964	789	964	868		0	0	0	0	0	24
BERYLLIUM	23.3	28.5	23.3	28.5	29.4	X	0	2	0	0	0	24
CADMIUM	35.2	46.9	34.0	48.2	42.6		0	0	0	0	0	24
CALCIUM	11400	14000	11400	14000	13000		0	0	0	0	0	24
CHROMIUM	45.8	58.0	44.5	59.3	55.1		0	1	0	0	0	24
COBALT	183	224	183	224	214		0	0	0	0	0	24
COPPER	128	157	128	157	147		0	0	0	0	0	24
IRON	516	631	516	632	576		0	0	0	0	0	24
LEAD	25.2	36.3	24.0	37.5	36.1		0	0	0	0	1	24
MAGNESIUM	13500	16500	13500	16500	15300		0	0	0	0	0	24
MANGANESE	78.1	95.4	78.1	95.4	85.1		0	0	0	0	0	24
MERCURY	0.75	1.2	0.71	1.2	0.82		0	2	0	0	0	24
NICKEL	87.3	113	84.6	115	112		0	0	0	0	0	24
POTASSIUM	17200	21100	17200	21100	18000		0	1	0	0	0	24
SELENIUM	24.7	34.0	23.7	35.0	31.2		0	2	0	2	0	24
SILVER	55.3	74.6	53.2	76.7	65.6		0	1	0	0	0	24
SODIUM	20600	25200	20600	25200	22300		0	0	0	0	0	24
THALLIUM	36.2	46.3	35.0	48.0	46.1		0	2	0	1	0	24
VANADIUM	197	241	197	241	226		0	0	0	0	0	24
ZINC	83.1	109	80.3	112	103		0	0	0	0	1	24

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 2
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER :

OF DUPLICATES OUT: 0
WATER :

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 2 FY 94

LABORATORY NAME: Westinghouse Hanford Co. (WA) [N2] (WHCWA)
PERFORMANCE LEVEL: ACCEPTABLE - Corrective Actions Necessary
LABORATORY RANK: Above = 22 Same = 0 Below = 1

% Score: 80.2
REPORT DATE: 3/22/1994
MATRIX: WATER 2

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q		PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	537	740	515	762	647			0	1	0	0	0	24
ANTIMONY	288	352	288	352	368		X	0	1	0	0	0	24
ARSENIC	185	231	180	236	208			0	3	0	2	1	24
BARIUM	661	808	661	808	766			0	0	0	0	0	24
BERYLLIUM	46.5	56.8	46.5	56.8	59.4	E	X	0	2	0	0	0	24
CADMIUM	41.7	54.4	40.4	55.8	55		$	0	0	0	0	0	24
CALCIUM	12600	15400	12500	15500	14500			0	0	0	0	0	24
CHROMIUM	51.0	64.9	49.5	66.4	61.8			0	2	0	0	0	24
COBALT	136	166	133	170	166			0	0	0	0	0	24
COPPER	198	242	198	242	237			0	0	0	0	0	24
IRON	440	538	440	538	506			0	2	0	0	0	24
LEAD	23.8	31.5	23.0	32.4	29.5			0	3	0	0	1	24
MAGNESIUM	9990	12200	9990	12200	11800			0	0	0	0	0	24
MANGANESE	39.8	48.6	39.3	49.2	43.4			0	0	0	0	0	24
MERCURY	4.5	7.6	4.2	8.0	5.3			0	3	0	0	0	24
NICKEL	176	215	172	219	207			0	1	0	0	0	24
POTASSIUM	d	d	d	d	3010	B		0	0	0	0	0	24
SELENIUM	33.8	52.3	31.8	54.3	44.8			0	1	0	2	0	24
SILVER	10.0	15.4	10.0	16.8	6	U		0	0	0	0	0	24
SODIUM	d	d	d	d	2390	BE		0	0	0	0	0	24
THALLIUM	45.0	59.7	43.4	61.3	53			0	0	0	1	0	24
VANADIUM	118	144	118	144	136			0	0	0	0	0	24
ZINC	177	226	172	232	220			0	0	0	0	1	24

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 2
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER :

OF DUPLICATES OUT: 0
WATER :

Westinghouse Hanford Company | **Internal Memo**

From: Organic Chemistry 124F0-94-005
Phone: 373-2872 T6-50
Date: April 12, 1994
Subject: CORRECTIVE ACTION - EPA QUARTERLY BLIND ORGANIC PERFORMANCE EVALUATION PROGRAM (QB-2)

APR 1994 RECEIVED L.P. MARKEL

To: L. P. Markel T6-16

cc:	M. L. Bell	T6-16	G. C. Mooers	H4-19
	D. A. Dodd	T6-50	C. T. Narquis	T6-50
	D. G. Farwick	H4-16	K. N. Pool	H4-23
	E. J. Kosiancic	T6-16	J. R. Prilucik	T6-24
	W. D. Leggett	T6-07	W. I. Winters	T6-50
	R. P. Marshall	T6-14	KBW File/LB	

CORRECTIVE ACTIONS

VOLATILES - Run accuracy to precision analysis. Compare current standard with a standard from an independent source.

SEMI-VOLATILES - Extract and analyze a spiked water sample of known concentration. (Compare an independent check standard to Q.B.-2 extracts.)

PESTICIDES - Try to improve chromatographic resolution (i.e. temp, gas flows). Compare current standard with a standard from an independent source.

K. B. Wehner, Manager
Organic Chemistry

klm

PNL

PERFORMANCE EVALUATION SUMMARY SHEET

Laboratory: Battlle Pacific Northwest Laboratory

PE sample	Number Acceptable	Number Analyzed	% Acceptable
WP-031 (325 Lab.)			
Metals	42	42	100.0
Inorganic/Minerals	13	14	92.9
Organic	53	54	98.1
WP-031 (3708 Lab.)			
Metals	41	42	97.6
Inorganic/Minerals	6	8	75.0

	EPA/CLP Score
EMSL-LV QB3 FY93	
Metals	83.4
EMSL-LV QB1 FY94	
Metals	85.7
Organics	77.7

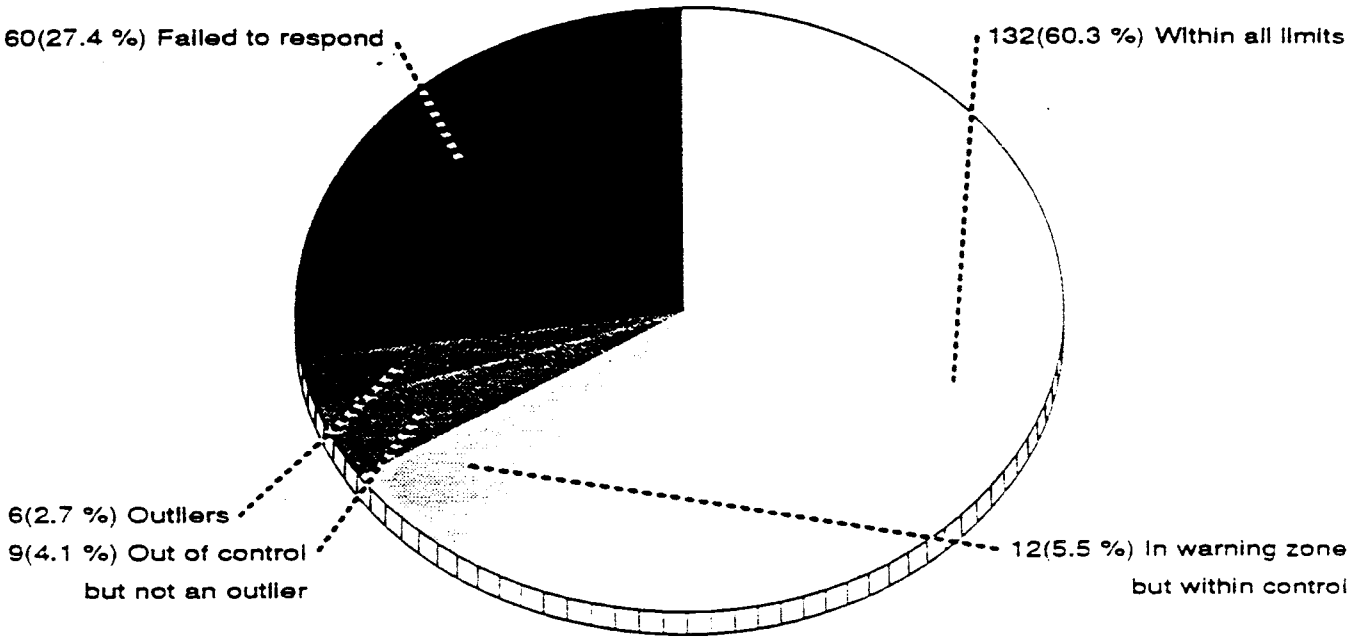
Lab Code = PQ

PE Sample	EMSL-LV Acceptance Range (%)	% of EMSL-LV True Value	% of all Participating Laboratory's Grand Average
August 13, 1993			
Uranium	79.4 to 120.6	95.9	97.3
October 19, 1993			
Alpha	56.8 to 143.2	96.7	94.9
Beta	70.2 to 129.8	91.4	99.2
Co-60	13.0 to 187.0	41.0	39.4
Cs-134	27.5 to 172.5	2283.0(Outlier)	2609.1
Cs-137	13.0 to 187.0	136.7	125.1
Sr-89	42.0 to 158.0	93.3	100.2
Sr-90	13.0 to 187.0	90.0	87.7
Uranium	65.6 to 134.4	96.9	101.8
October 29, 1993			
Alpha	56.5 to 143.5	73.4	99.2
Beta	42.0 to 158.0	108.9	96.0
November 12, 1993			
Ba-133	82.4 to 117.6	87.8	90.7
Co-60	71.0 to 129.0	104.4	105.3
Cs-134	85.3 to 114.7	102.8	111.5
Cs-137	78.2 to 121.8	151.7(HIGH)	143.9
Ru-106	82.7 to 117.3	98.6	113.1
Zn-65	82.7 to 117.3	110.2	105.5

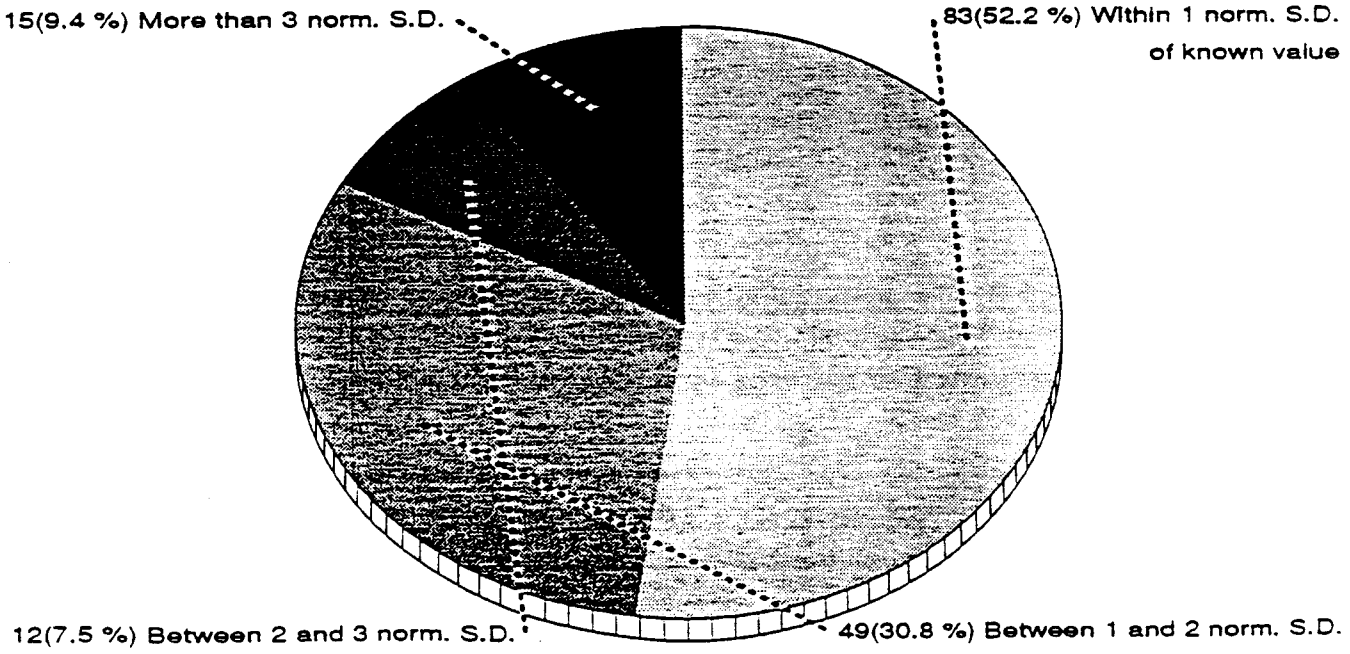
November 5, 1993			
Tritium	82.6 to 117.4	99.7	102.3
January 28, 1994			
Alpha	42.0 to 158.0	64.5	70.3
Beta	72.1 to 127.9	103.8	114.7

Gross Alpha Statistical Summary 219 Participants

The known value of this nuclide is **40.0 pCi/l** with an expected precision of **10.0**; the control limits are 22.7 to 57.3; the warning regions are 22.7 to 28.4 and 51.6 to 57.3



Statistic	Respondents	Non-outliers
Mean	47.94	**Grand Avg 40.77**
Std. Dev.	61.18	8.27
Variance	3742.45	68.33
% Coef. of Var.	127.61	20.28
% deviation of mean from known value	19.85	1.92
Norm. dev. of mean from known value	0.13	0.09
Median	40.00	40.00
% deviation of median from known value	0.00	0.00
Norm. dev. of median from known value	0.00	0.00



Gross Alpha

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PG	35.0	36.0	36.0	0.58	0.059	35.67	-0.88	-0.75	
PI									•
PM	46.0	50.0	50.0	2.31	0.236	48.67	1.37	1.50	
PP									•
PQ	40.0	37.0	39.0	1.53	0.177	38.67	-0.36	-0.23	
PR	38.0	38.0	36.0	1.15	0.118	37.33	-0.59	-0.46	
PT	43.0	37.0	39.0	3.06	0.354	39.67	-0.19	-0.06	
PV	57.0	42.0	44.0	8.14	0.886	47.67	1.20	1.33	
PW									•
PY									•
Q	32.0	31.0	32.0	0.58	0.059	31.67	-1.58	-1.44	
QC	44.0	48.0	48.0	2.31	0.236	46.67	1.02	1.15	
QJ	42.0	44.0	39.0	2.52	0.295	41.67	0.16	0.29	
QK									•
QL									•
QP	34.0	35.0	38.0	2.08	0.236	35.67	-0.88	-0.75	
QQ	53.0	56.0	51.0	2.52	0.295	53.33	2.18	2.31	
QT	52.0	70.0	67.0	9.64	1.120	63.00	3.85	3.98	⇑
QU	57.0	53.0	63.0	5.03	0.591	57.67	2.93	3.06	⇑
QW	37.0	32.0	32.0	2.89	0.295	33.67	-1.23	-1.10	
QX	33.0	34.0	33.0	0.58	0.059	33.33	-1.29	-1.15	
QZ	33.0	32.0	30.0	1.53	0.177	31.67	-1.58	-1.44	
RC									•
RD	39.0	32.0	42.0	5.13	0.591	37.67	-0.54	-0.40	
RE	50.0	53.0	51.0	1.53	0.177	51.33	1.83	1.96	
RF	33.0	32.0	32.0	0.58	0.059	32.33	-1.46	-1.33	
RG	30.0	32.0	34.0	2.00	0.236	32.00	-1.52	-1.39	
RJ	46.0	39.0	36.0	5.13	0.591	40.33	-0.08	0.06	
RK	58.0	50.0	52.0	4.16	0.473	53.33	2.18	2.31	
RL									•
RM	47.0	47.0	48.0	0.58	0.059	47.33	1.14	1.27	
RP									•
RR									•
RT									•
RV	34.0	30.0	33.0	2.08	0.236	32.33	-1.46	-1.33	
RZ	41.0	42.0	43.0	1.00	0.118	42.00	0.21	0.35	
S	40.0	39.0	40.0	0.58	0.059	39.67	-0.19	-0.06	
SC	38.0	37.0	41.0	2.08	0.236	38.67	-0.36	-0.23	
SD	38.0	44.0	41.0	3.00	0.354	41.00	0.04	0.17	
SF	43.0	42.0	41.0	1.00	0.118	42.00	0.21	0.35	
SI	31.0	29.0	26.0	2.52	0.295	28.67	-2.10	-1.96	
SL	56.0	53.0	57.0	2.08	0.236	55.33	2.52	2.66	
SM	33.0	30.0	32.0	1.53	0.177	31.67	-1.58	-1.44	
SO	31.0	31.0	32.0	0.58	0.059	31.33	-1.63	-1.50	
SR	47.0	41.0	44.0	3.00	0.354	44.00	0.56	0.69	

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

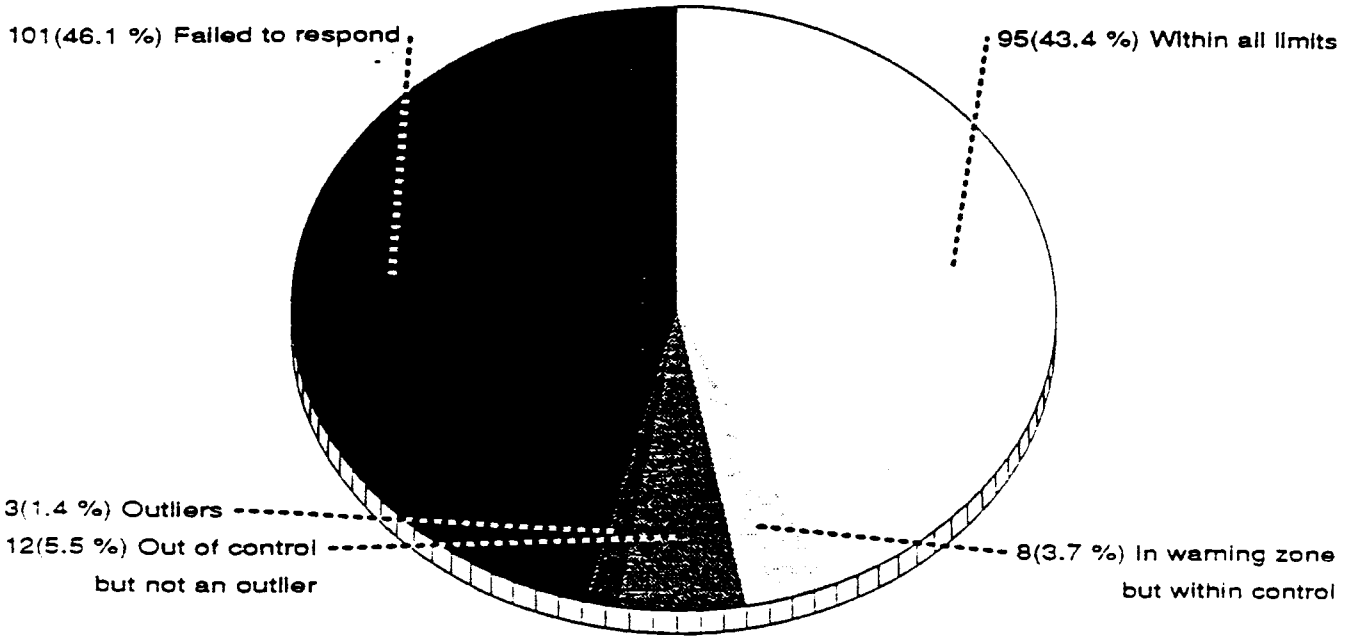
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

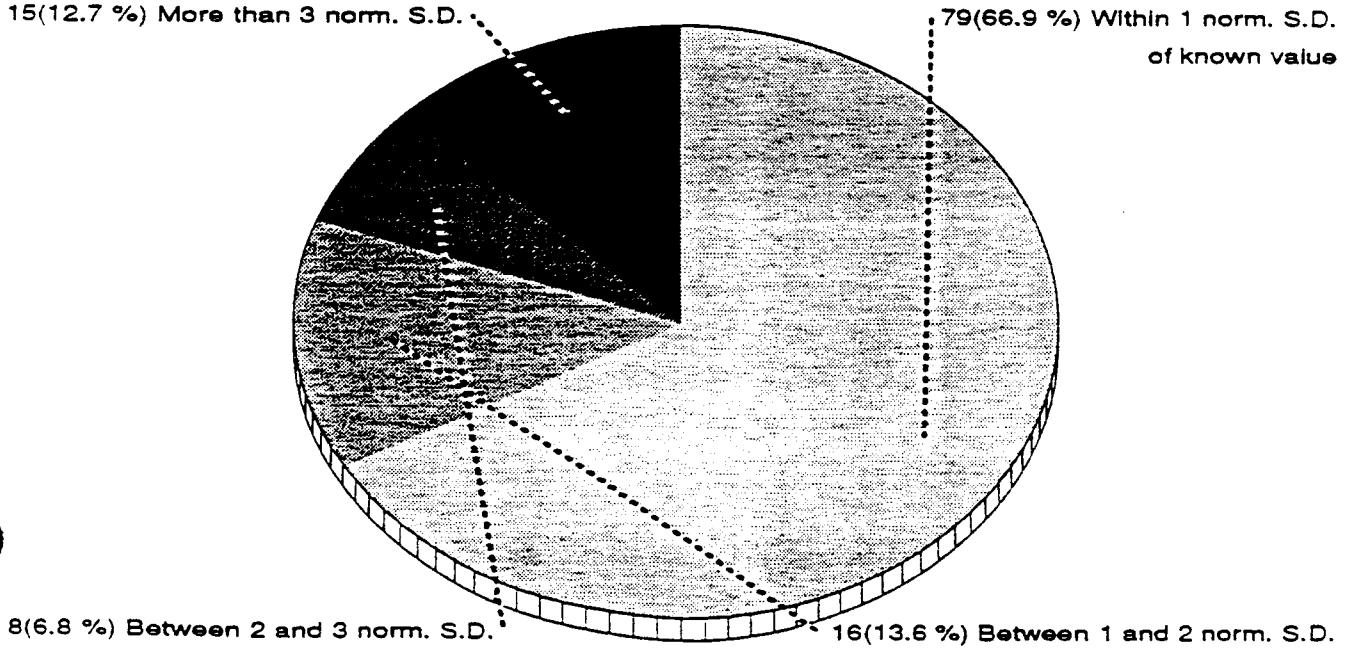
⇓ ≡ Below control limit

Uranium (Natural) Statistical Summary 219 Participants

The known value of this nuclide is **15.1 pCi/l** with an expected precision of **3.0**; the control limits are 9.9 to 20.3; the warning regions are 9.9 to 11.6 and 18.6 to 20.3



Statistic	Respondents	Non-outliers
Mean	14.46	**Grand Avg** 14.38
Std. Dev.	3.14	2.63
Variance	9.83	6.91
% Coef. of Var.	21.68	18.29
% deviation of mean from known value	-4.22	-4.80
Norm. dev. of mean from known value	-0.20	-0.28
Median	14.82	14.80
% deviation of median from known value	-1.88	-1.99
Norm. dev. of median from known value	-0.09	-0.11



Uranium (Natural)

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PG									•
PI									•
PM	15.0	15.0	15.0	0.00	0.000	15.00	0.36	-0.06	
PP	15.5	15.3	15.6	0.15	0.059	15.47	0.63	0.21	
PQ	14.9	14.1	14.9	0.46	0.158	14.63	0.15	-0.27	
PR									•
PT	13.4	14.6	14.5	0.67	0.236	14.17	-0.12	-0.54	
PV	19.5	18.6	20.8	1.11	0.433	19.63	3.04	2.62	
PW	9.0	11.9	12.6	1.91	0.709	11.17	-1.85	-2.27	
PY									•
Q	13.1	10.0	7.3	2.90	1.270	10.13	-2.45	-2.87	
QC									•
QJ	9.7	9.7	9.7	0.00	0.000	9.70	-2.70	-3.12	⇓
QK									•
QL									•
QP									•
QQ	12.5	14.1	13.7	0.83	0.315	13.43	-0.54	-0.96	
QT									•
QU	9.5	11.8	10.0	1.21	0.453	10.43	-2.28	-2.69	
QW									•
QX	3.0	3.1	3.2	0.10	0.039	3.10	-6.51	-6.93	×
QZ	13.5	12.4	14.0	0.82	0.315	13.30	-0.62	-1.04	
RC									•
RD	7.0	6.9	7.0	0.06	0.020	6.97	-4.28	-4.70	⇓
RE									•
RF	13.0	13.0	13.0	0.00	0.000	13.00	-0.79	-1.21	
RG	16.0	16.0	16.0	0.00	0.000	16.00	0.94	0.52	
RJ	15.6	15.3	15.6	0.17	0.059	15.50	0.65	0.23	
RK	8.4	8.7	9.4	0.51	0.197	8.83	-3.20	-3.62	⇓
RL	15.5	15.5	15.5	0.00	0.000	15.50	0.65	0.23	
RM	15.9	10.9	14.8	2.63	0.984	13.87	-0.29	-0.71	
RP	15.9	15.9	15.9	0.00	0.000	15.90	0.88	0.46	
RR									•
RT									•
RV	9.6	11.7	11.4	1.14	0.413	10.90	-2.01	-2.42	
RZ	15.0	14.9	16.2	0.72	0.256	15.37	0.57	0.15	
S	13.6	13.6	14.8	0.69	0.236	14.00	-0.22	-0.64	
SC	13.5	14.1	14.0	0.32	0.118	13.87	-0.29	-0.71	
SD	13.9	14.6	13.5	0.56	0.217	14.00	-0.22	-0.64	
SF	15.7	15.7	15.9	0.12	0.039	15.77	0.80	0.38	
SI	15.0	14.4	14.2	0.42	0.158	14.53	0.09	-0.33	
SL	4.6	8.3	7.6	1.97	0.728	6.83	-4.35	-4.77	⇓
SM	13.6	13.2	13.0	0.31	0.118	13.27	-0.64	-1.06	
SO	13.8	14.4	14.6	0.42	0.158	14.27	-0.06	-0.48	
SR									•

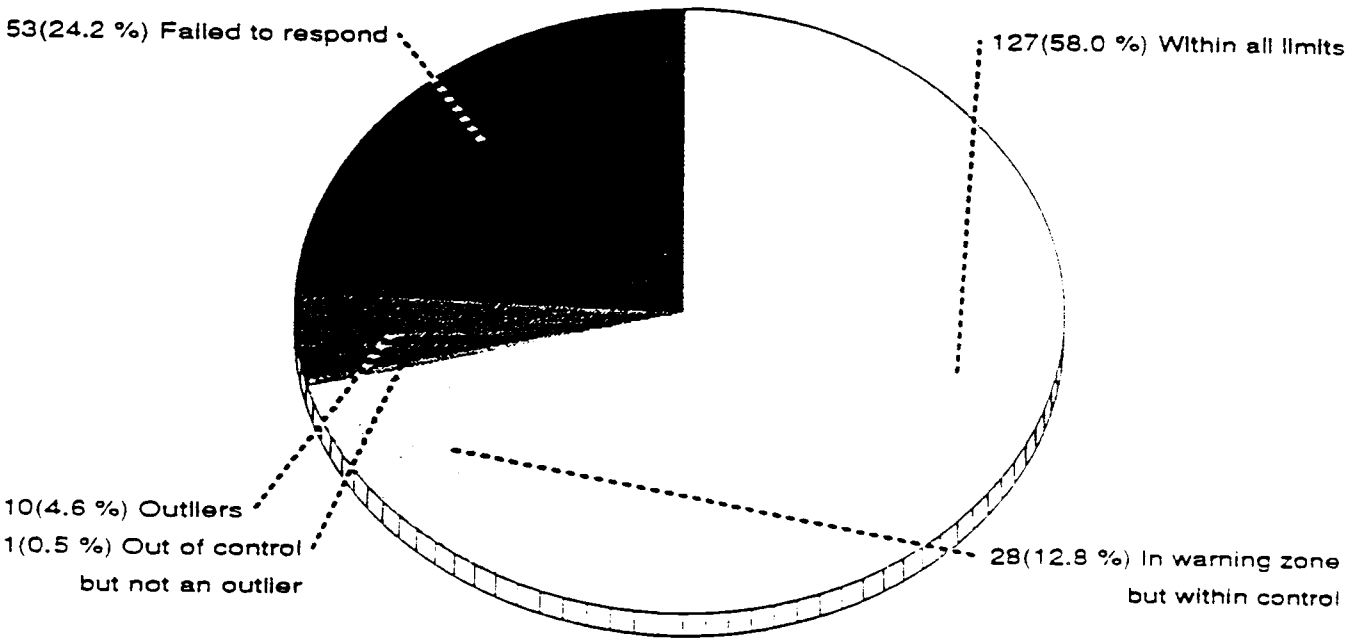
• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

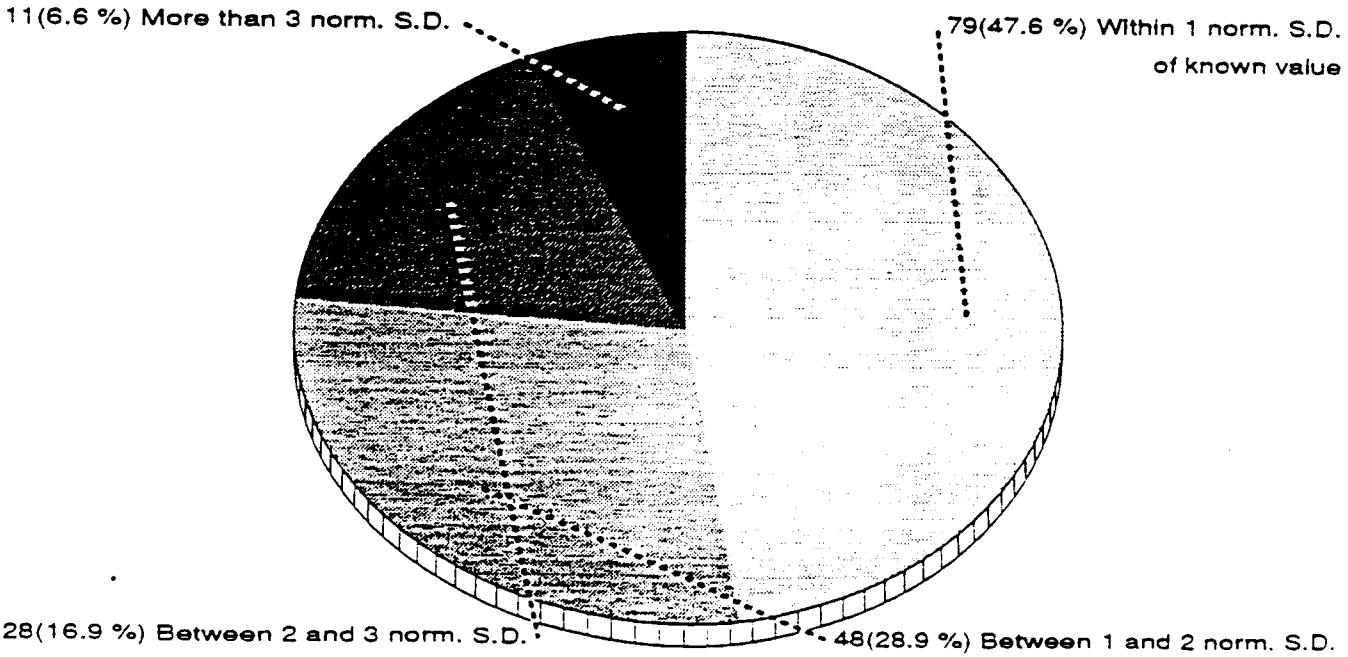
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Gross Beta Statistical Summary 219 Participants

The known value of this nuclide is **58.0 pCi/l** with an expected precision of **10.0**; the control limits are 40.7 to 75.3; the warning regions are 40.7 to 46.4 and 69.6 to 75.3



Statistic	Respondents	Non-outliers
Mean	63.20	**Grand Avg 53.40**
Std. Dev.	75.20	6.43
Variance	5655.58	41.37
% Coef. of Var.	119.00	12.05
% deviation of mean from known value	8.96	-7.94
Norm. dev. of mean from known value	0.07	-0.72
Median	53.83	53.33
% deviation of median from known value	-7.18	-8.05
Norm. dev. of median from known value	-0.06	-0.73



Gross Beta

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PG	53.0	54.0	55.0	1.00	0.118	54.00	0.10	-0.69	
PI									•
PM	58.0	62.0	52.0	5.03	0.591	57.33	0.68	-0.12	
PP									•
PQ	53.0	53.0	53.0	0.00	0.000	53.00	-0.07	-0.87	
PR	45.0	46.0	44.0	1.00	0.118	45.00	-1.45	-2.25	
PT	49.0	51.0	47.0	2.00	0.236	49.00	-0.76	-1.56	
PV	46.0	47.0	51.0	2.65	0.295	48.00	-0.93	-1.73	
PW									•
PY									•
Q	55.0	57.0	61.0	3.06	0.354	57.67	0.74	-0.06	
QC	57.0	58.0	59.0	1.00	0.118	58.00	0.80	0.00	
QJ	53.0	50.0	51.0	1.53	0.177	51.33	-0.36	-1.15	
QK	49.0	49.0	50.0	0.58	0.059	49.33	-0.70	-1.50	
QL									•
QP	49.0	44.0	47.0	2.52	0.295	46.67	-1.17	-1.96	
QQ	43.0	46.0	45.0	1.53	0.177	44.67	-1.51	-2.31	
QT	60.0	59.0	60.0	0.58	0.059	59.67	1.09	0.29	
QU	56.0	58.0	52.0	3.06	0.354	55.33	0.34	-0.46	
QW	51.0	53.0	55.0	2.00	0.236	53.00	-0.07	-0.87	
QX	56.0	55.0	55.0	0.58	0.059	55.33	0.34	-0.46	
QZ	58.0	55.0	67.0	6.24	0.709	60.00	1.14	0.35	
RC	54.0	51.0	47.0	3.51	0.413	50.67	-0.47	-1.27	
RD	58.0	61.0	50.0	5.69	0.650	56.33	0.51	-0.29	
RE	57.0	57.0	57.0	0.00	0.000	57.00	0.62	-0.17	
RF	50.0	57.0	55.0	3.61	0.413	54.00	0.10	-0.69	
RG	49.0	51.0	48.0	1.53	0.177	49.33	-0.70	-1.50	
RJ	58.0	58.0	56.0	1.15	0.118	57.33	0.68	-0.12	
RK	112.0	116.0	123.0	5.57	0.650	117.00	11.02	10.22	×
RL									•
RM	61.0	58.0	60.0	1.53	0.177	59.67	1.09	0.29	
RP									•
RR									•
RT									•
RV	42.0	40.0	42.0	1.15	0.118	41.33	-2.09	-2.89	
RZ	52.0	54.0	46.0	4.16	0.473	50.67	-0.47	-1.27	
S	53.0	53.0	53.0	0.00	0.000	53.00	-0.07	-0.87	
SC	53.0	53.0	54.0	0.58	0.059	53.33	-0.01	-0.81	
SD	55.0	58.0	57.0	1.53	0.177	56.67	0.57	-0.23	
SF	53.0	53.0	54.0	0.58	0.059	53.33	-0.01	-0.81	
SI	45.0	48.0	46.0	1.53	0.177	46.33	-1.22	-2.02	
SL	55.0	56.0	57.0	1.00	0.118	56.00	0.45	-0.35	
SM	53.0	49.0	49.0	2.31	0.236	50.33	-0.53	-1.33	
SO	51.0	51.0	52.0	0.58	0.059	51.33	-0.36	-1.15	
SR	47.0	49.0	43.0	3.06	0.354	46.33	-1.22	-2.02	

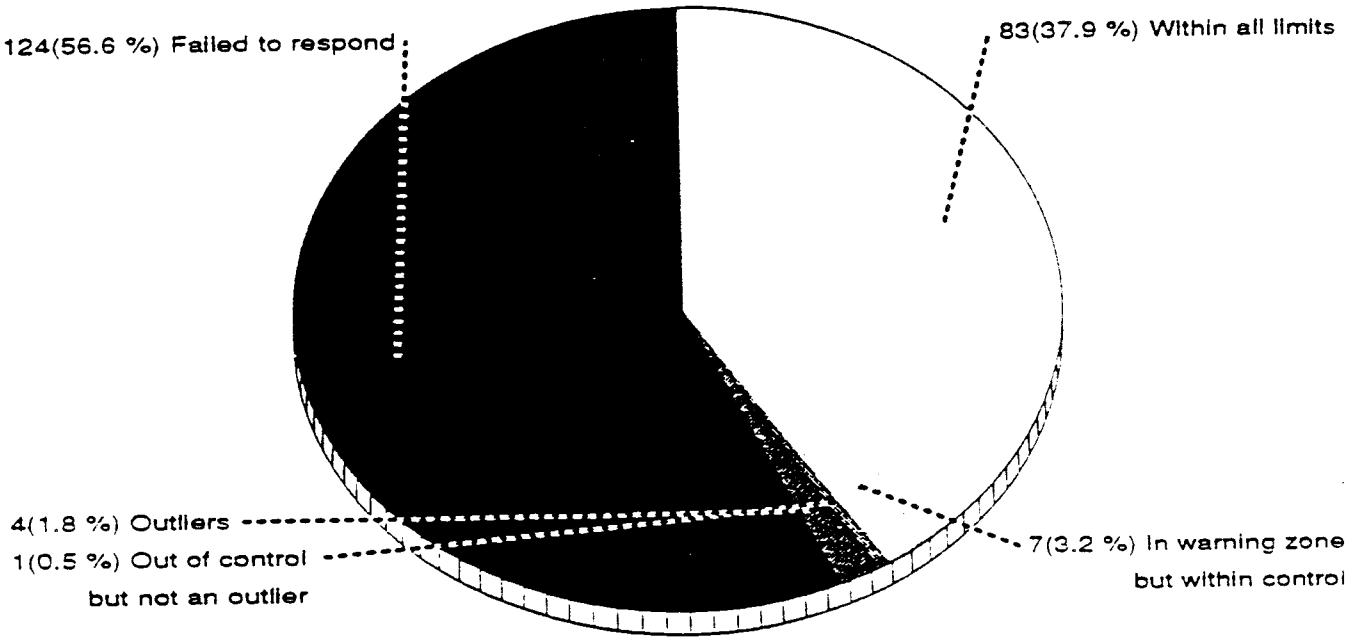
• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

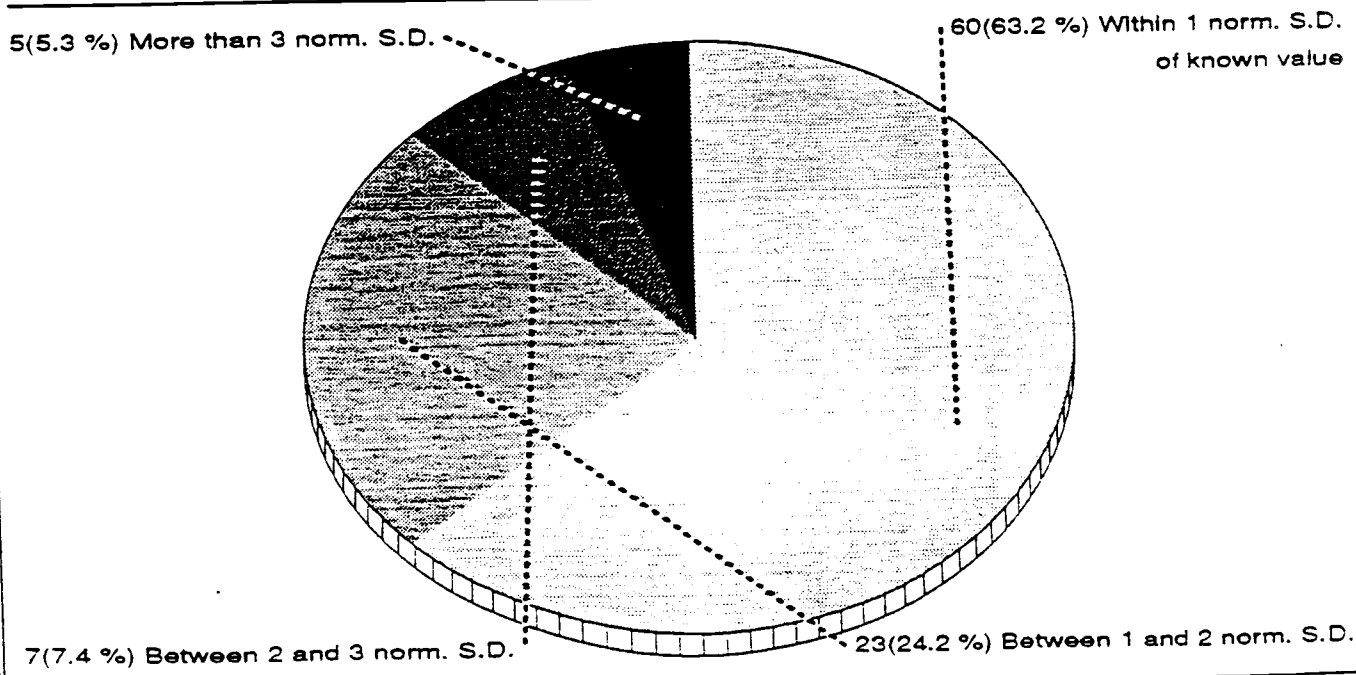
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Strontium-89 Statistical Summary 219 Participants

The known value of this nuclide is **15.0 pCi/l** with an expected precision of **5.0**; the control limits are 6.3 to 23.7; the warning regions are 6.3 to 9.2 and 20.8 to 23.7



Statistic	Respondents	Non-outliers
Mean	14.93	Grand Avg 13.96
Std. Dev.	6.26	3.03
Variance	39.25	9.20
% Coef. of Var.	41.96	21.72
% deviation of mean from known value	-0.47	-6.94
Norm. dev. of mean from known value	-0.01	-0.34
Median	14.00	14.00
% deviation of median from known value	-6.67	-6.67
Norm. dev. of median from known value	-0.16	-0.33



Strontium-89

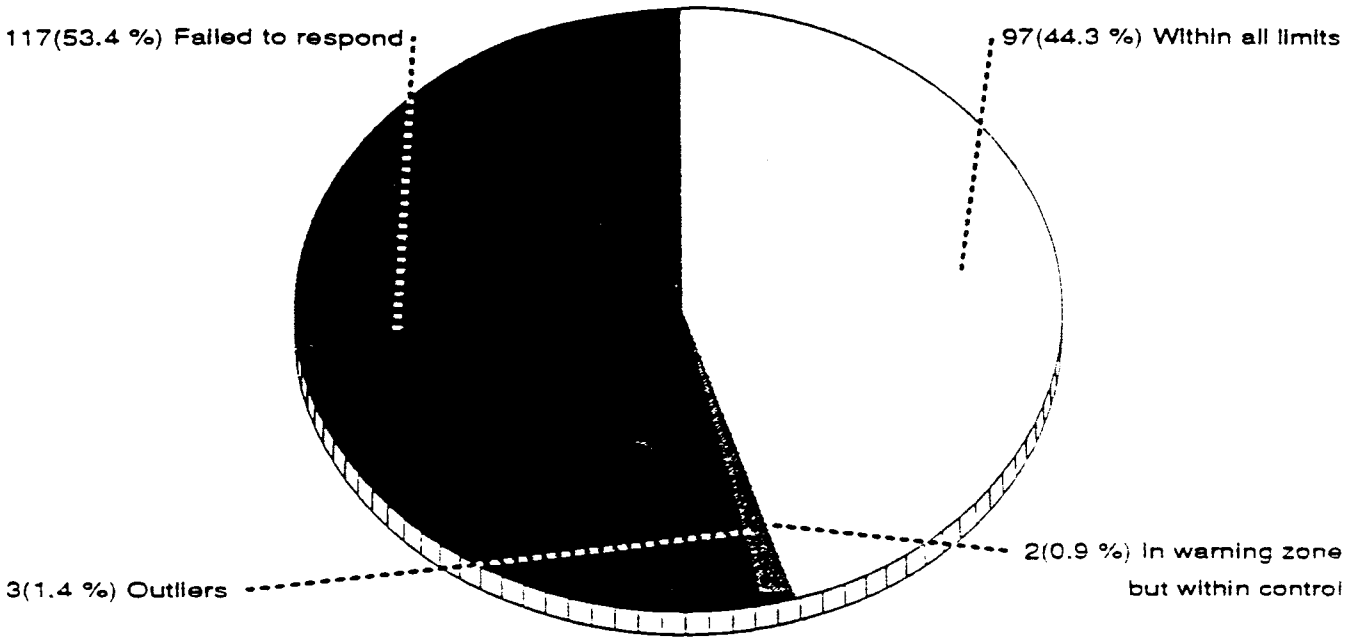
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PG									•
PI									•
PM	14.0	13.0	15.0	1.00	0.236	14.00	0.01	-0.35	
PP									•
PQ	13.0	14.0	15.0	1.00	0.236	14.00	0.01	-0.35	
PR									•
PT	22.0	16.0	19.0	3.00	0.709	19.00	1.75	1.39	
PV	25.0	29.0	29.0	2.31	0.473	27.67	4.75	4.39	×
PW									•
PY									•
Q	17.0	14.0	14.0	1.73	0.354	15.00	0.36	0.00	
QC									•
QJ									•
QK	15.0	13.0	14.0	1.00	0.236	14.00	0.01	-0.35	
QL	12.0	10.0	9.0	1.53	0.354	10.33	-1.26	-1.62	
QP									•
QQ									•
QT									•
QU	11.0	10.0	12.0	1.00	0.236	11.00	-1.03	-1.39	
QW	12.0	12.0	12.0	0.00	0.000	12.00	-0.68	-1.04	
QX	7.0	7.0	6.0	0.58	0.118	6.67	-2.53	-2.89	
QZ	16.0	14.0	15.0	1.00	0.236	15.00	0.36	0.00	
RC									•
RD									•
RE									•
RF	10.0	9.0	9.0	0.58	0.118	9.33	-1.60	-1.96	
RG									•
RJ									•
RK									•
RL									•
RM	10.0	15.0	11.0	2.65	0.591	12.00	-0.68	-1.04	
RP									•
RR									•
RT									•
RV	8.0	8.0	8.0	0.00	0.000	8.00	-2.06	-2.42	
RZ									•
S	34.0	36.0	35.0	1.00	0.236	35.00	7.29	6.93	×
SC	13.0	14.0	13.0	0.58	0.118	13.33	-0.22	-0.58	
SD	13.0	12.0	14.0	1.00	0.236	13.00	-0.33	-0.69	
SF	14.0	10.0	12.0	2.00	0.473	12.00	-0.68	-1.04	
SI	6.0	5.0	6.0	0.58	0.118	5.67	-2.87	-3.23	⇓
SL									•
SM	13.0	13.0	13.0	0.00	0.000	13.00	-0.33	-0.69	
SO									•
SR									•

TAG SYMBOLS

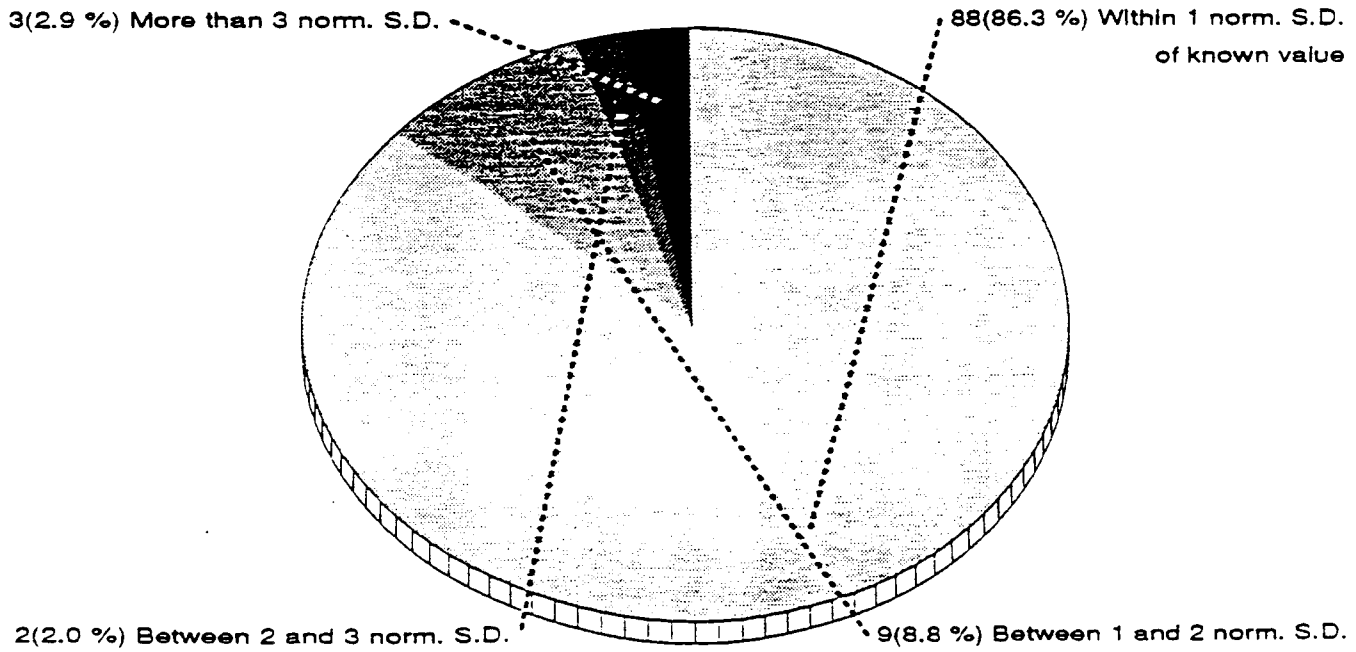
• ≡ No data submitted
∅ ≡ Insufficient data
× ≡ Determined to be an outlier
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Strontium-90 Statistical Summary 219 Participants

The known value of this nuclide is **10.0 pCi/l** with an expected precision of **5.0**; the control limits are 1.3 to 18.7; the warning regions are 1.3 to 4.2 and 15.8 to 18.7



Statistic	Respondents	Non-outliers
Mean	10.72	**Grand Avg 10.26**
Std. Dev.	3.50	2.02
Variance	12.27	4.10
% Coef. of Var.	32.69	19.74
% deviation of mean from known value	7.16	2.56
Norm. dev. of mean from known value	0.20	0.13
Median	10.00	10.00
% deviation of median from known value	0.00	0.00
Norm. dev. of median from known value	0.00	0.00



Strontium-90

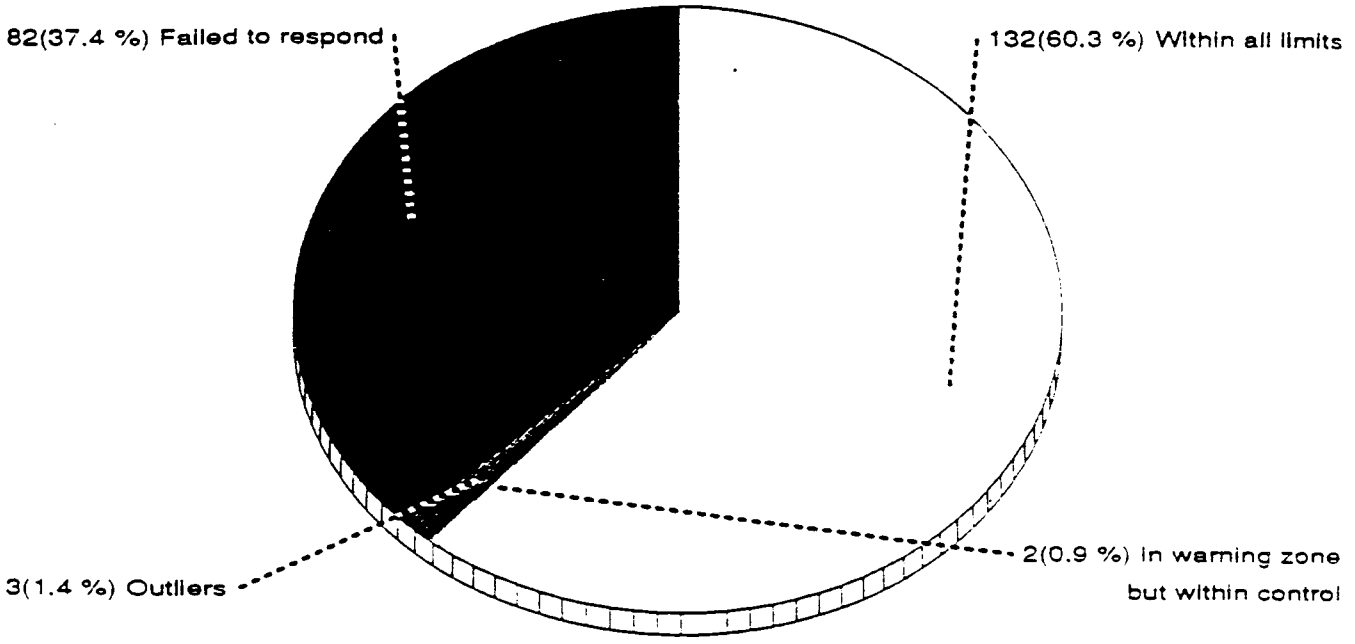
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PG									•
PI									•
PM	10.0	11.0	10.0	0.58	0.118	10.33	0.03	0.12	
PP	12.0	12.0	12.0	0.00	0.000	12.00	0.60	0.69	
PQ	9.0	9.0	9.0	0.00	0.000	9.00	-0.44	-0.35	
PR									•
PT	9.0	10.0	10.0	0.58	0.118	9.67	-0.20	-0.12	
PV	10.0	8.0	9.0	1.00	0.236	9.00	-0.44	-0.35	
PW									•
PY									•
Q	16.0	13.0	14.0	1.53	0.354	14.33	1.41	1.50	
QC									•
QJ	10.0	9.0	9.0	0.58	0.118	9.33	-0.32	-0.23	
QK	9.0	10.0	9.0	0.58	0.118	9.33	-0.32	-0.23	
QL	7.0	9.0	8.0	1.00	0.236	8.00	-0.78	-0.69	
QP									•
QQ									•
QT									•
QU	12.0	15.0	14.0	1.53	0.354	13.67	1.18	1.27	
QW	18.0	18.0	19.0	0.58	0.118	18.33	2.80	2.89	
QX	15.0	14.0	15.0	0.58	0.118	14.67	1.53	1.62	
QZ	8.0	9.0	9.0	0.58	0.118	8.67	-0.55	-0.46	
RC									•
RD									•
RE									•
RF	9.0	10.0	9.0	0.58	0.118	9.33	-0.32	-0.23	
RG									•
RJ									•
RK	6.0	10.0	8.0	2.00	0.473	8.00	-0.78	-0.69	
RL									•
RM	13.0	11.0	11.0	1.15	0.236	11.67	0.49	0.58	
RP									•
RR									•
RT									•
RV	11.0	12.0	11.0	0.58	0.118	11.33	0.37	0.46	
RZ									•
S	9.0	8.0	8.0	0.58	0.118	8.33	-0.67	-0.58	
SC	8.0	8.0	8.0	0.00	0.000	8.00	-0.78	-0.69	
SD	12.0	12.0	12.0	0.00	0.000	12.00	0.60	0.69	
SF	12.0	12.0	12.0	0.00	0.000	12.00	0.60	0.69	
SI	15.0	14.0	14.0	0.58	0.118	14.33	1.41	1.50	
SL									•
SM	5.0	6.0	6.0	0.58	0.118	5.67	-1.59	-1.50	
SO									•
SR									•

• ≡ No data submitted — TAG SYMBOLS — ⇑ ≡ Above control limit

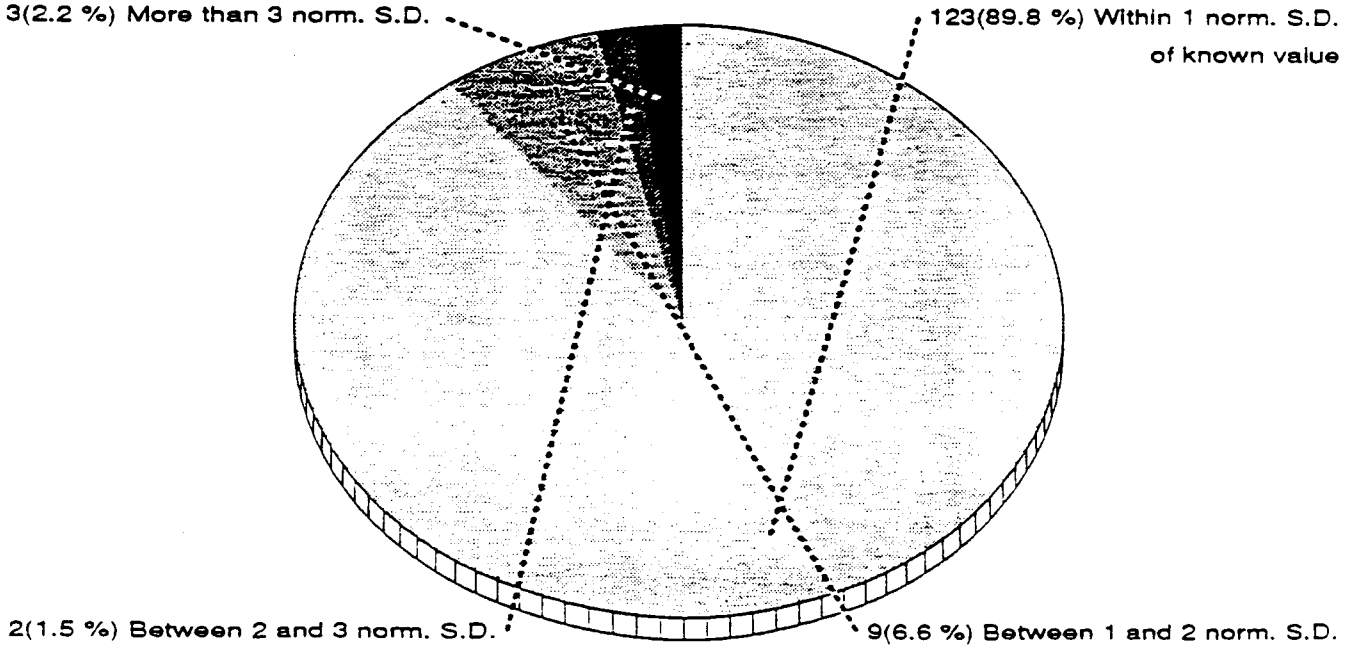
∅ ≡ Insufficient data — × ≡ Determined to be an outlier — ⇓ ≡ Below control limit

Cobalt-60 Statistical Summary 219 Participants

The known value of this nuclide is **10.0 pCi/l** with an expected precision of **5.0**; the control limits are 1.3 to 18.7; the warning regions are 1.3 to 4.2 and 15.8 to 18.7



Statistic	Respondents	Non-outliers
Mean	10.81	**Grand Avg** 10.41
Std. Dev.	3.43	1.63
Variance	11.79	2.67
% Coef. of Var.	31.76	15.71
% deviation of mean from known value	8.13	4.05
Norm. dev. of mean from known value	0.24	0.25
Median	10.00	10.00
% deviation of median from known value	0.00	0.00
Norm. dev. of median from known value	0.00	0.00



Cobalt-60

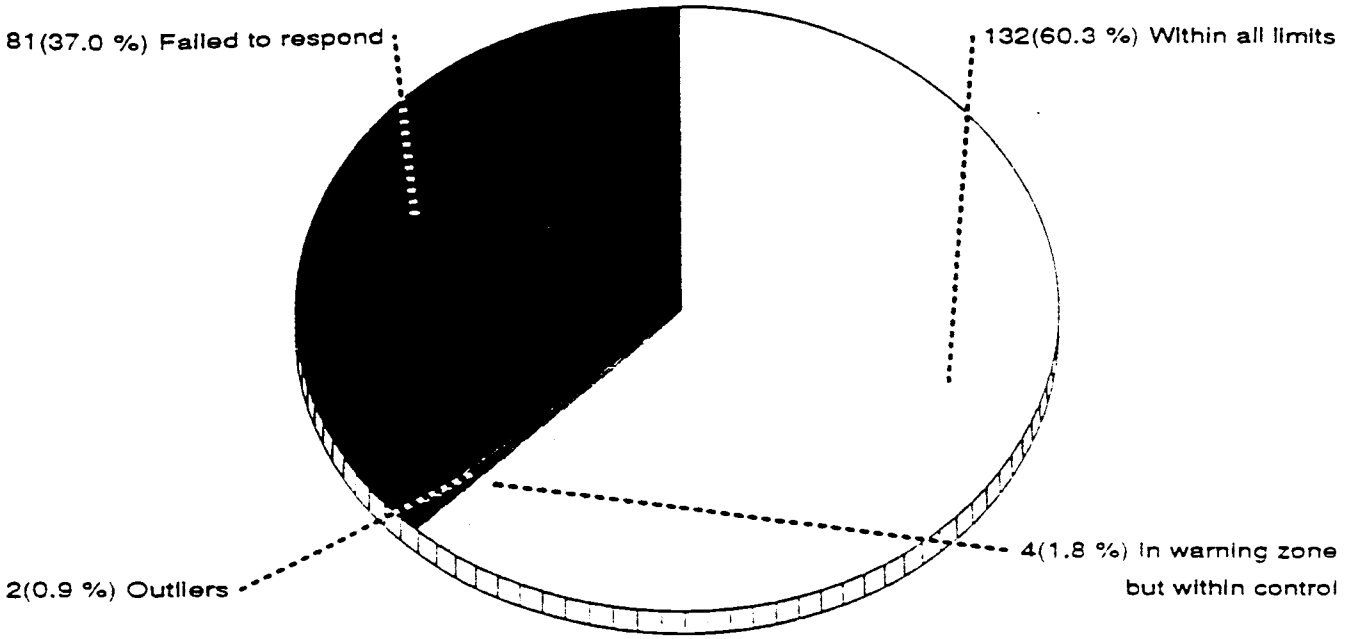
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PG									•
PI	10.0	10.0	10.0	0.00	0.000	10.00	-0.14	0.00	
PM	13.0	10.0	8.0	2.52	0.591	10.33	-0.02	0.12	
PP	10.0	9.0	12.0	1.53	0.354	10.33	-0.02	0.12	
PQ	42.0	40.0	41.0	1.00	0.236	41.00	10.60	10.74	×
PR									•
PT	12.0	9.0	12.0	1.73	0.354	11.00	0.21	0.35	
PV	10.0	10.0	13.0	1.73	0.354	11.00	0.21	0.35	
PW	10.0	9.0	9.0	0.58	0.118	9.33	-0.37	-0.23	
PY									•
Q	10.0	10.0	9.0	0.58	0.118	9.67	-0.26	-0.12	
QC									•
QJ	10.0	14.0	13.0	2.08	0.473	12.33	0.67	0.81	
QK	10.0	11.0	10.0	0.58	0.118	10.33	-0.02	0.12	
QL	9.0	10.0	9.0	0.58	0.118	9.33	-0.37	-0.23	
QP	13.0	10.0	14.0	2.08	0.473	12.33	0.67	0.81	
QQ									•
QT	9.0	10.0	10.0	0.58	0.118	9.67	-0.26	-0.12	
QU	11.0	11.0	10.0	0.58	0.118	10.67	0.09	0.23	
QW									•
QX	11.0	12.0	13.0	1.00	0.236	12.00	0.55	0.69	
QZ	10.0	12.0	10.0	1.15	0.236	10.67	0.09	0.23	
RC	8.0	9.0	7.0	1.00	0.236	8.00	-0.83	-0.69	
RD									•
RE									•
RF	10.0	10.0	10.0	0.00	0.000	10.00	-0.14	0.00	
RG									•
RJ									•
RK	10.0	9.0	9.0	0.58	0.118	9.33	-0.37	-0.23	
RL									•
RM	10.0	11.0	11.0	0.58	0.118	10.67	0.09	0.23	
RP									•
RR									•
RT									•
RV	7.0	10.0	10.0	1.73	0.354	9.00	-0.49	-0.35	
RZ	8.0	9.0	9.0	0.58	0.118	8.67	-0.60	-0.46	
S	8.0	10.0	10.0	1.15	0.236	9.33	-0.37	-0.23	
SC	10.0	11.0	12.0	1.00	0.236	11.00	0.21	0.35	
SD	9.0	9.0	9.0	0.00	0.000	9.00	-0.49	-0.35	
SF	11.0	10.0	11.0	0.58	0.118	10.67	0.09	0.23	
SI	8.0	7.0	11.0	2.08	0.473	8.67	-0.60	-0.46	
SL									•
SM	8.0	11.0	9.0	1.53	0.354	9.33	-0.37	-0.23	
SO									•
SR	10.0	11.0	10.0	0.58	0.118	10.33	-0.02	0.12	

• ≡ No data submitted — TAG SYMBOLS — ⇑ ≡ Above control limit

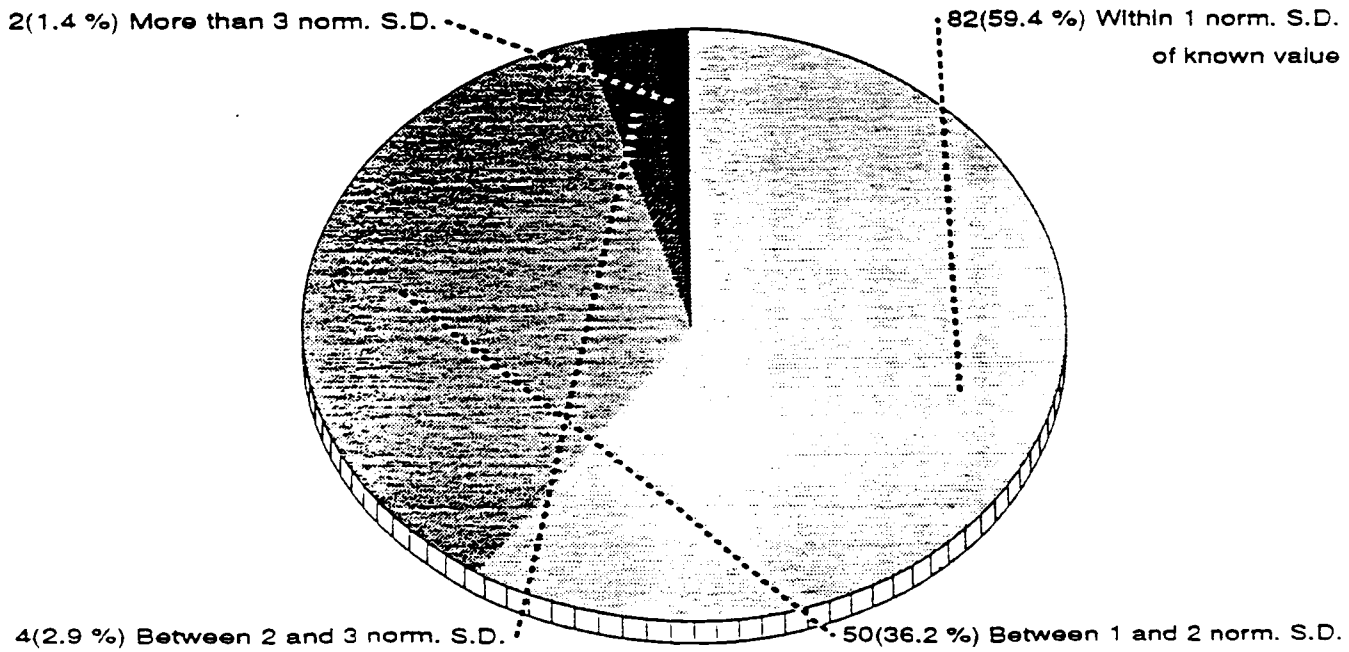
∅ ≡ Insufficient data — × ≡ Determined to be an outlier — ⇓ ≡ Below control limit

Cesium-134 Statistical Summary 219 Participants

The known value of this nuclide is **12.0 pCi/l** with an expected precision of **5.0**; the control limits are 3.3 to 20.7; the warning regions are 3.3 to 6.2 and 17.8 to 20.7



Statistic	Respondents	Non-outliers
Mean	11.83	Grand Avg 9.78
Std. Dev.	22.61	1.86
Variance	511.12	3.48
% Coef. of Var.	191.17	19.06
% deviation of mean from known value	-1.45	-18.48
Norm. dev. of mean from known value	-0.01	-1.19
Median	9.67	9.67
% deviation of median from known value	-19.44	-19.44
Norm. dev. of median from known value	-0.10	-1.25



Cesium-134

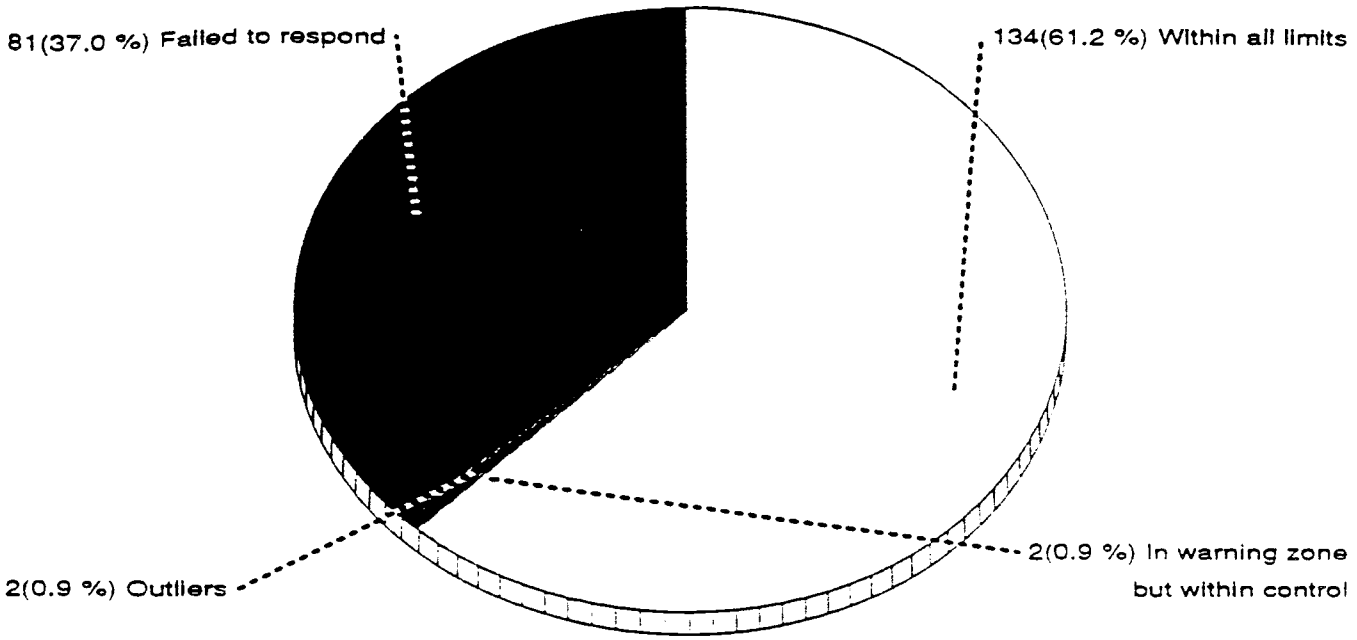
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PG									•
PI	9.0	9.0	9.0	0.00	0.000	9.00	-0.27	-1.04	
PM	8.0	7.0	7.0	0.58	0.118	7.33	-0.85	-1.62	
PP	10.0	7.0	8.0	1.53	0.354	8.33	-0.50	-1.27	
PQ	251.0	297.0	274.0	23.00	9.446	274.00	91.53	90.76	×
PR									•
PT	9.0	11.0	11.0	1.15	0.236	10.33	0.19	-0.58	
PV	10.0	11.0	12.0	1.00	0.236	11.00	0.42	-0.35	
PW	9.0	9.0	10.0	0.58	0.118	9.33	-0.16	-0.92	
PY									•
Q	9.0	9.0	9.0	0.00	0.000	9.00	-0.27	-1.04	
QC									•
QJ	11.0	12.0	8.0	2.08	0.473	10.33	0.19	-0.58	
QK	11.0	10.0	11.0	0.58	0.118	10.67	0.31	-0.46	
QL	9.0	9.0	9.0	0.00	0.000	9.00	-0.27	-1.04	
QP	7.0	8.0	9.0	1.00	0.236	8.00	-0.62	-1.39	
QQ									•
QT	10.0	10.0	8.0	1.15	0.236	9.33	-0.16	-0.92	
QU	16.0	16.0	17.0	0.58	0.118	16.33	2.27	1.50	
QW									•
QX	10.0	12.0	10.0	1.15	0.236	10.67	0.31	-0.46	
QZ	9.0	8.0	8.0	0.58	0.118	8.33	-0.50	-1.27	
RC	9.0	8.0	10.0	1.00	0.236	9.00	-0.27	-1.04	
RD									•
RE									•
RF	10.0	10.0	10.0	0.00	0.000	10.00	0.08	-0.69	
RG									•
RJ									•
RK	10.0	10.0	9.0	0.58	0.118	9.67	-0.04	-0.81	
RL									•
RM	9.0	11.0	11.0	1.15	0.236	10.33	0.19	-0.58	
RP									•
RR									•
RT									•
RV	9.0	7.0	4.0	2.52	0.591	6.67	-1.08	-1.85	
RZ	7.0	7.0	8.0	0.58	0.118	7.33	-0.85	-1.62	
S	10.0	10.0	10.0	0.00	0.000	10.00	0.08	-0.69	
SC	8.0	11.0	10.0	1.53	0.354	9.67	-0.04	-0.81	
SD	7.0	8.0	8.0	0.58	0.118	7.67	-0.73	-1.50	
SF	9.0	11.0	12.0	1.53	0.354	10.67	0.31	-0.46	
SI	9.0	10.0	11.0	1.00	0.236	10.00	0.08	-0.69	
SL									•
SM	7.0	7.0	9.0	1.15	0.236	7.67	-0.73	-1.50	
SO									•
SR	13.0	11.0	11.0	1.15	0.236	11.67	0.65	-0.12	

• ≡ No data submitted — TAG SYMBOLS — ⇑ ≡ Above control limit

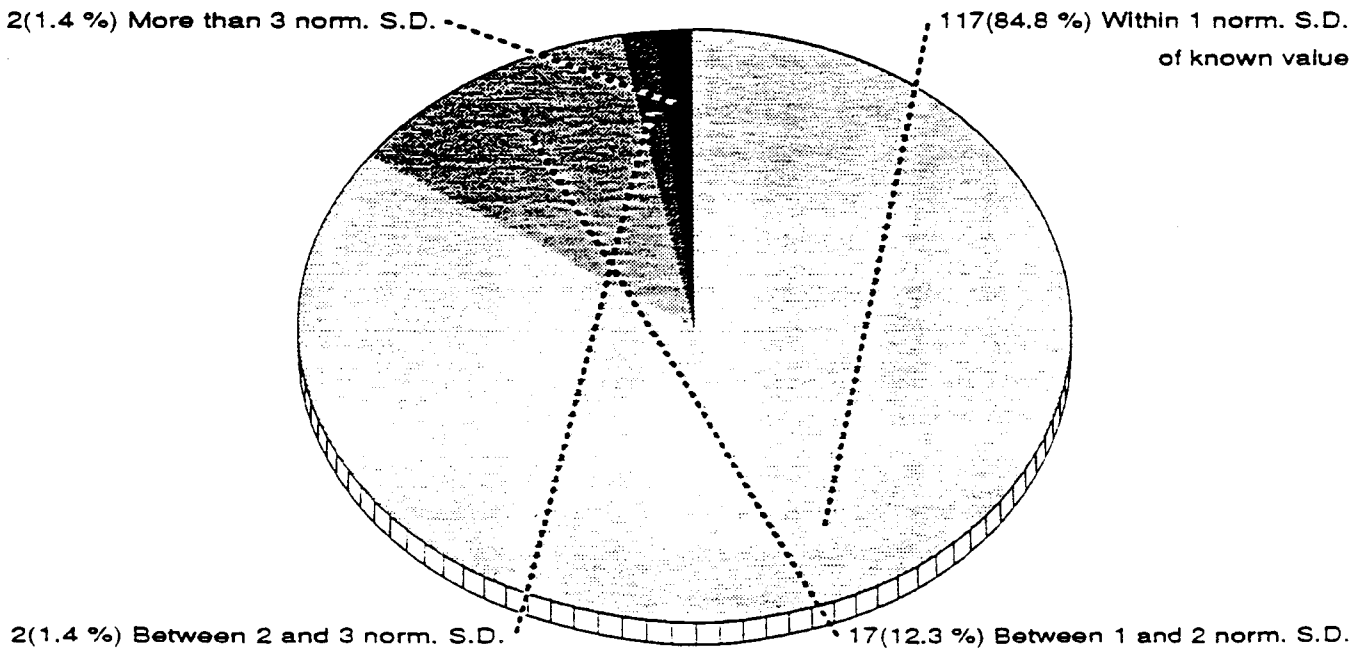
∅ ≡ Insufficient data — × ≡ Determined to be an outlier — ⇓ ≡ Below control limit

Cesium-137 Statistical Summary 219 Participants

The known value of this nuclide is 10.0 pCi/l with an expected precision of 5.0; the control limits are 1.3 to 18.7; the warning regions are 1.3 to 4.2 and 15.8 to 18.7



Statistic	Respondents	Non-outliers
Mean	11.13	Grand Avg 10.93
Std. Dev.	2.38	1.72
Variance	5.67	2.95
% Coef. of Var.	21.40	15.71
% deviation of mean from known value	11.30	9.34
Norm. dev. of mean from known value	0.47	0.54
Median	10.67	10.67
% deviation of median from known value	6.67	6.67
Norm. dev. of median from known value	0.28	0.39



Cesium-137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PG									•
PI	11.0	11.0	11.0	0.00	0.000	11.00	0.02	0.35	
PM	11.0	9.0	7.0	2.00	0.473	9.00	-0.67	-0.35	
PP	11.0	12.0	9.0	1.53	0.354	10.67	-0.09	0.23	
PQ	14.0	13.0	14.0	0.58	0.118	13.67	0.95	1.27	
PR									•
PT	12.0	10.0	11.0	1.00	0.236	11.00	0.02	0.35	
PV	8.0	12.0	8.0	2.31	0.473	9.33	-0.55	-0.23	
PW	10.0	10.0	10.0	0.00	0.000	10.00	-0.32	0.00	
PY									•
Q	10.0	10.0	10.0	0.00	0.000	10.00	-0.32	0.00	
QC									•
QJ	10.0	9.0	13.0	2.08	0.473	10.67	-0.09	0.23	
QK	12.0	12.0	12.0	0.00	0.000	12.00	0.37	0.69	
QL	10.0	10.0	10.0	0.00	0.000	10.00	-0.32	0.00	
QP	7.0	13.0	13.0	3.46	0.709	11.00	0.02	0.35	
QQ									•
QT	11.0	10.0	10.0	0.58	0.118	10.33	-0.21	0.12	
QU	9.0	10.0	11.0	1.00	0.236	10.00	-0.32	0.00	
QW									•
QX	15.0	16.0	14.0	1.00	0.236	15.00	1.41	1.73	
QZ	9.0	10.0	10.0	0.58	0.118	9.67	-0.44	-0.12	
RC	11.0	10.0	12.0	1.00	0.236	11.00	0.02	-0.35	
RD									•
RE									•
RF	9.0	11.0	9.0	1.15	0.236	9.67	-0.44	-0.12	
RG									•
RJ									•
RK	11.0	11.0	12.0	0.58	0.118	11.33	0.14	0.46	
RL									•
RM	10.0	9.0	10.0	0.58	0.118	9.67	-0.44	-0.12	
RP									•
RR									•
RT									•
RV	12.0	8.0	10.0	2.00	0.473	10.00	-0.32	0.00	
RZ	8.0	9.0	9.0	0.58	0.118	8.67	-0.79	-0.46	
S	10.0	11.0	11.0	0.58	0.118	10.67	-0.09	0.23	
SC	11.0	10.0	9.0	1.00	0.236	10.00	-0.32	0.00	
SD	10.0	10.0	9.0	0.58	0.118	9.67	-0.44	-0.12	
SF	9.0	9.0	10.0	0.58	0.118	9.33	-0.55	-0.23	
SI	7.0	12.0	11.0	2.65	0.591	10.00	-0.32	0.00	
SL									•
SM	9.0	11.0	10.0	1.00	0.236	10.00	-0.32	0.00	
SO									•
SR	7.0	8.0	9.0	1.00	0.236	8.00	-1.02	-0.69	

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

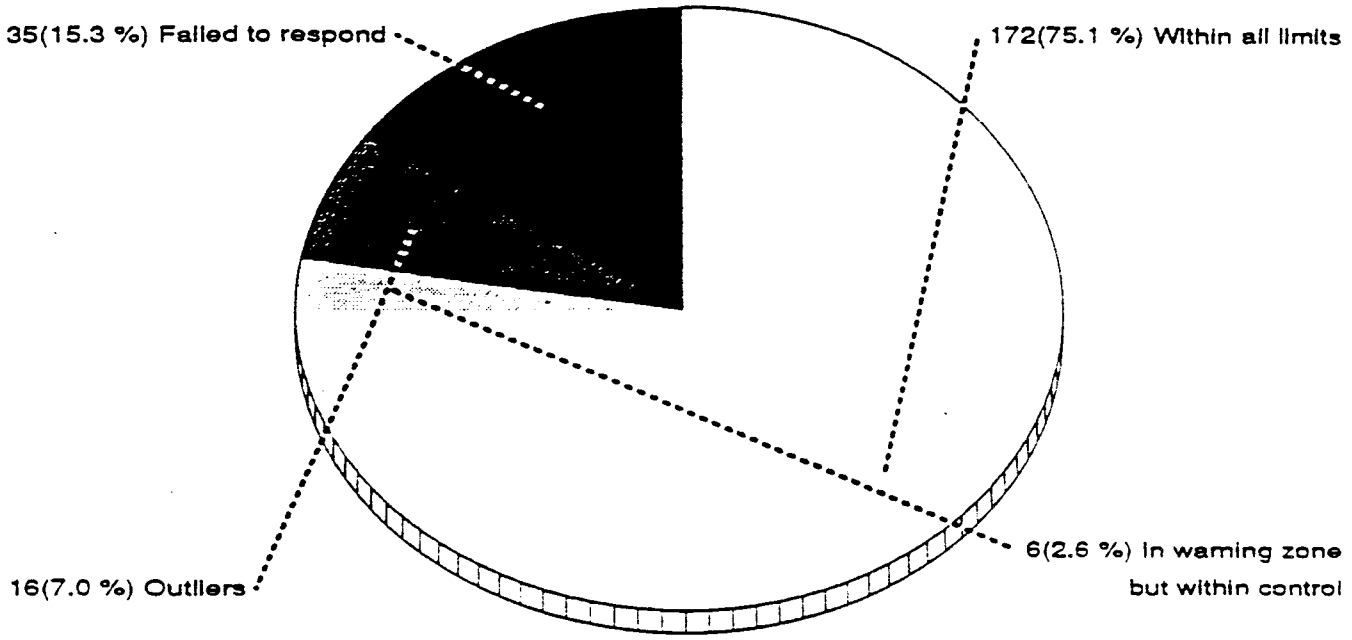
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

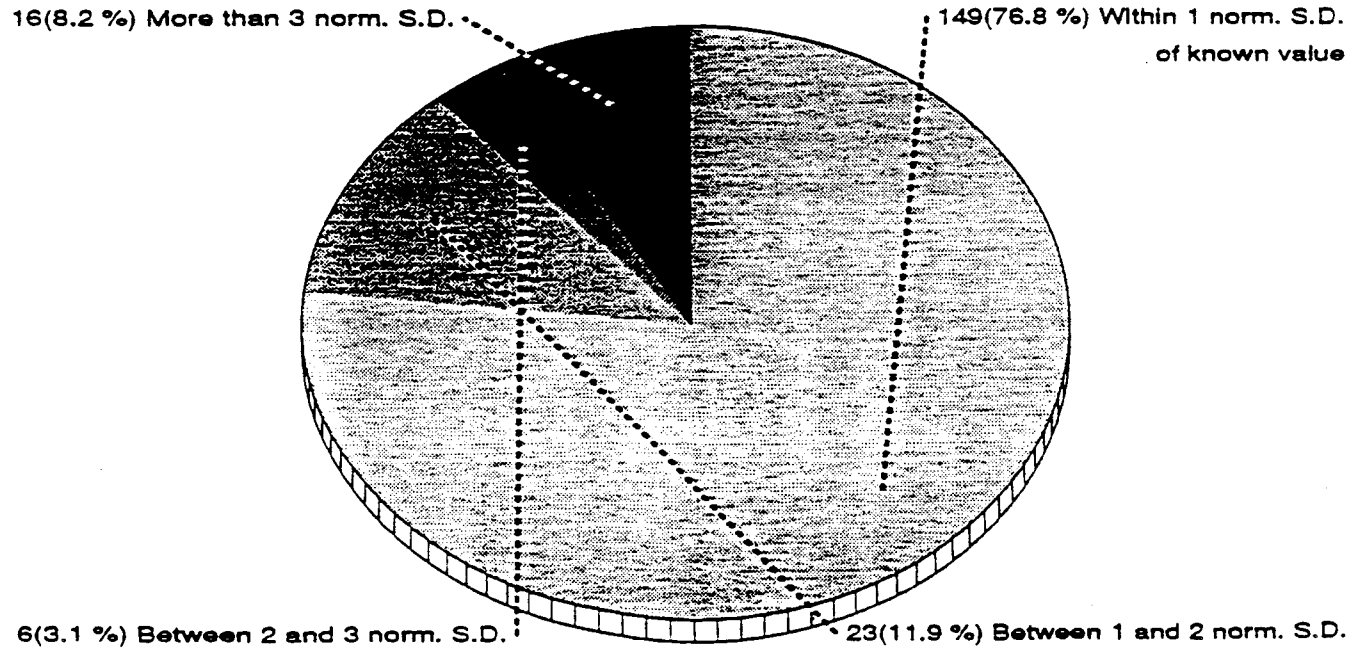
⇓ ≡ Below control limit

Cobalt-60 Statistical Summary 229 Participants

The known value of this nuclide is 30.0 pCi/l with an expected precision of 5.0; the control limits are 21.3 to 38.7; the warning regions are 21.3 to 24.2 and 35.8 to 38.7



Statistic	Respondents	Non-outliers
Mean	36.82	**Grand Avg 29.72**
Std. Dev.	37.61	2.33
Variance	1414.71	5.41
% Coef. of Var.	102.14	7.82
% deviation of mean from known value	22.74	-0.95
Norm. dev. of mean from known value	0.18	-0.12
Median	29.67	29.67
% deviation of median from known value	-1.11	-1.11
Norm. dev. of median from known value	-0.01	-0.14



Cobalt-60

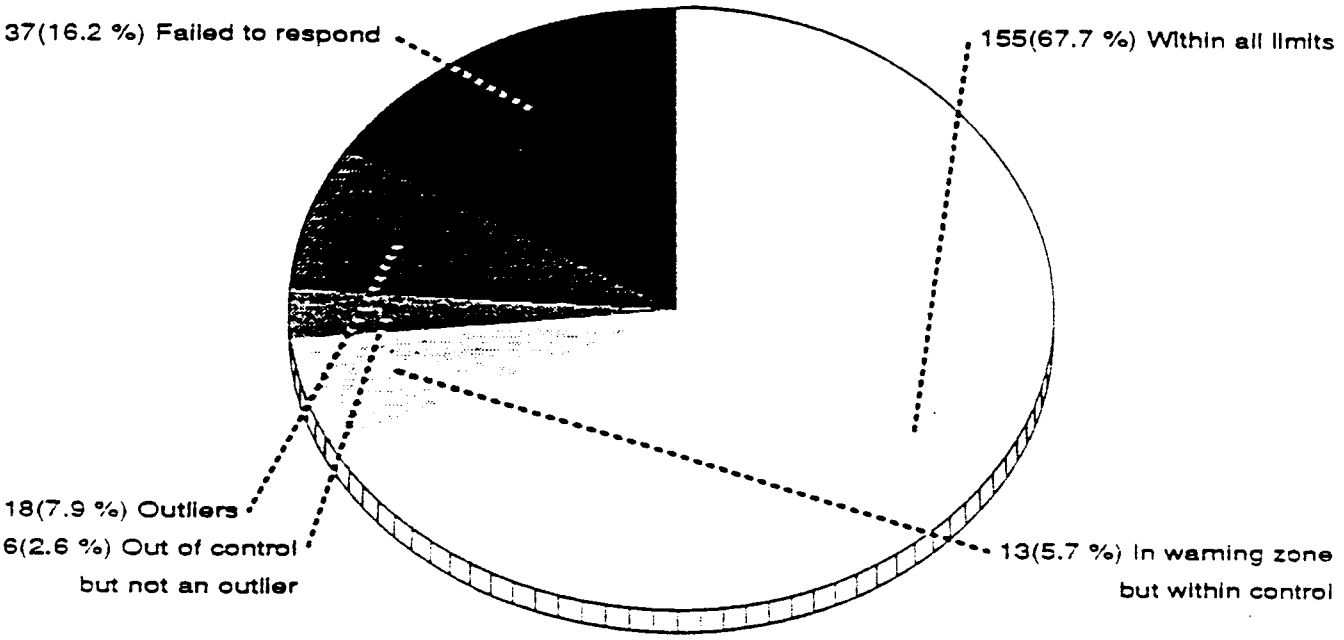
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PI	29.0	29.0	31.0	1.15	0.236	29.67	-0.02	-0.12	
PM	26.0	25.0	31.0	3.21	0.709	27.33	-0.83	-0.92	
PP	75.0	90.0	95.0	10.41	3.596	86.67	19.73	19.63	×
PQ	32.0	32.0	30.0	1.15	0.236	31.33	0.56	0.46	
PT	28.0	28.0	31.0	1.73	0.354	29.00	-0.25	-0.35	
PU									•
PV	29.0	31.0	30.0	1.00	0.236	30.00	0.10	0.00	
PW	30.0	30.0	26.0	2.31	0.473	28.67	-0.36	-0.46	
PX	29.0	28.0	32.0	2.08	0.473	29.67	-0.02	-0.12	
PY									•
Q	28.0	28.0	29.0	0.58	0.118	28.33	-0.48	-0.58	
QB	30.0	34.0	30.0	2.31	0.473	31.33	0.56	0.46	
QJ	26.0	34.0	29.0	4.04	0.945	29.67	-0.02	-0.12	
QK									
QL	29.0	30.0	30.0	0.58	0.118	29.67	-0.02	-0.12	
QM	30.0	25.0	30.0	2.89	0.591	28.33	-0.48	-0.58	
QP	31.0	38.0	32.0	3.79	0.827	33.67	1.37	1.27	
QQ									
QT	28.0	28.0	32.0	2.31	0.473	29.33	-0.13	-0.23	
QU	32.0	24.0	28.0	4.00	0.945	28.00	-0.59	-0.69	
QX	34.0	35.0	34.0	0.58	0.118	34.33	1.60	1.50	
QZ	28.0	29.0	28.0	0.58	0.118	28.33	-0.48	-0.58	
R	30.0	29.0	29.0	0.58	0.118	29.33	-0.13	-0.23	
RA	30.0	31.0	27.0	2.08	0.473	29.33	-0.13	-0.23	
RC	30.0	31.0	32.0	1.00	0.236	31.00	0.45	0.35	
RF	24.0	27.0	31.0	3.51	0.827	27.33	-0.83	-0.92	
RH	25.0	26.0	27.0	1.00	0.236	26.00	-1.29	-1.39	
RK	30.0	33.0	29.0	2.08	0.473	30.67	0.33	0.23	
RL	133.0	133.0	133.0	0.00	0.000	133.00	35.78	35.68	×
RM	33.0	29.0	29.0	2.31	0.473	30.33	0.21	0.12	
RO	32.0	27.0	30.0	2.52	0.591	29.67	-0.02	-0.12	
RQ									•
RR	32.0	31.0	30.0	1.00	0.236	31.00	0.45	0.35	
RV	25.0	23.0	26.0	1.53	0.354	24.67	-1.75	-1.85	
RX	31.0	28.0	25.0	3.00	0.709	28.00	-0.59	-0.69	
RZ	28.0	35.0	27.0	4.36	0.945	30.00	0.10	0.00	
S	28.0	27.0	29.0	1.00	0.236	28.00	-0.59	-0.69	
SA									•
SC	29.0	29.0	31.0	1.15	0.236	29.67	-0.02	-0.12	
SD	28.0	29.0	29.0	0.58	0.118	28.67	-0.36	-0.46	
SF	31.0	29.0	33.0	2.00	0.473	31.00	0.45	0.35	
SI	32.0	32.0	28.0	2.31	0.473	30.67	0.33	0.23	
SK	6.0	5.0	6.0	0.58	0.118	5.67	-8.33	-8.43	×
SM	28.0	28.0	27.0	0.58	0.118	27.67	-0.71	-0.81	
SN	257.0	240.0	244.0	8.89	2.921	247.00	75.27	75.17	×

• ≡ No data submitted — TAG SYMBOLS — ⇑ ≡ Above control limit

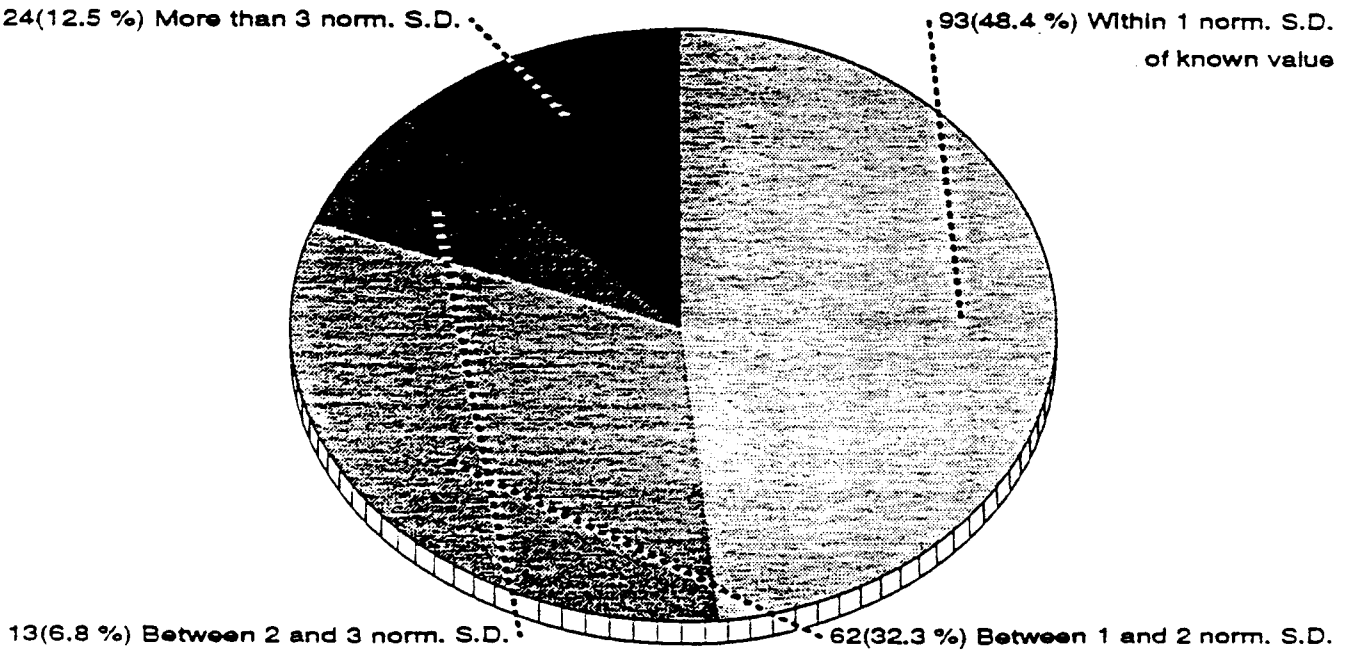
∅ ≡ Insufficient data — × ≡ Determined to be an outlier — ⇓ ≡ Below control limit

Zinc-65 Statistical Summary 229 Participants

The known value of this nuclide is **150.0 pCi/l** with an expected precision of **15.0**; the control limits are 124.0 to 176.0; the warning regions are 124.0 to 132.6 and 167.4 to 176.0



Statistic	Respondents	Non-outliers
Mean	189.88	**Grand Avg** 156.07
Std. Dev.	190.96	9.24
Variance	36465.03	85.36
% Coef. of Var.	100.57	5.92
% deviation of mean from known value	26.58	4.05
Norm. dev. of mean from known value	0.21	0.66
Median	156.50	156.33
% deviation of median from known value	4.33	4.22
Norm. dev. of median from known value	0.03	0.69



Zinc-65

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PI	159.0	157.0	162.0	2.52	0.197	159.33	0.38	1.08	
PM									•
PP	423.0	453.0	458.0	18.93	1.720	444.67	33.32	34.03	×
PQ	161.0	166.0	169.0	4.04	0.315	165.33	1.07	1.77	
PT	152.0	155.0	153.0	1.53	0.118	153.33	-0.32	0.38	
PU									•
PV	165.0	157.0	148.0	8.50	0.669	156.67	0.07	0.77	
PW	160.0	158.0	161.0	1.53	0.118	159.67	0.42	1.12	
PX	148.0	155.0	156.0	4.36	0.315	153.00	-0.35	0.35	
PY									•
Q	156.0	154.0	152.0	2.00	0.158	154.00	-0.24	0.46	
QB	153.0	176.0	181.0	14.93	1.195	170.00	1.61	2.31	
QJ	163.0	166.0	162.0	2.08	0.158	163.67	0.88	1.58	
QK									c
QL	165.0	168.0	172.0	3.51	0.276	168.33	1.42	2.12	
QM	147.0	151.0	133.0	9.45	0.709	143.67	-1.43	-0.73	
QP	159.0	161.0	161.0	1.15	0.079	160.33	0.49	1.19	
QQ									c
QT	154.0	159.0	138.0	10.97	0.827	150.33	-0.66	0.04	
QU	97.0	87.0	92.0	5.00	0.394	92.00	-7.40	-6.70	×
QX	168.0	169.0	169.0	0.58	0.039	168.67	1.45	2.16	
QZ	156.0	158.0	164.0	4.16	0.315	159.33	0.38	1.08	
R	154.0	158.0	158.0	2.31	0.158	156.67	0.07	0.77	
RA	176.0	171.0	173.0	2.52	0.197	173.33	1.99	2.69	
RC	164.0	164.0	164.0	0.00	0.000	164.00	0.92	1.62	
RF	157.0	142.0	157.0	8.66	0.591	152.00	-0.47	0.23	
RH	138.0	143.0	130.0	6.56	0.512	137.00	-2.20	-1.50	
RK	147.0	143.0	145.0	2.00	0.158	145.00	-1.28	-0.58	
RL	166.0	166.0	166.0	0.00	0.000	166.00	1.15	1.85	
RM	143.0	147.0	149.0	3.06	0.236	146.33	-1.12	-0.42	
RO	159.0	134.0	156.0	13.65	0.984	149.67	-0.74	-0.04	
RQ									•
RR	158.0	169.0	159.0	6.08	0.433	162.00	0.68	1.39	
RV	153.0	148.0	135.0	9.29	0.709	145.33	-1.24	-0.54	
RX	162.0	147.0	153.0	7.55	0.591	154.00	-0.24	0.46	
RZ	157.0	169.0	177.0	10.07	0.788	167.67	1.34	2.04	
S	157.0	164.0	167.0	5.13	0.394	162.67	0.76	1.46	
SA									•
SC	159.0	155.0	155.0	2.31	0.158	156.33	0.03	0.73	
SD	151.0	153.0	152.0	1.00	0.079	152.00	-0.47	0.23	
SF	163.0	158.0	161.0	2.52	0.197	160.67	0.53	1.23	
SI	175.0	153.0	160.0	11.24	0.866	162.67	0.76	1.46	
SK	27.0	27.0	29.0	1.15	0.079	27.67	-14.83	-14.13	×
SM	137.0	147.0	147.0	5.77	0.394	143.67	-1.43	-0.73	
SN	1182.0	1141.0	1220.0	39.51	5.021	1181.00	-118.35	-119.05	×

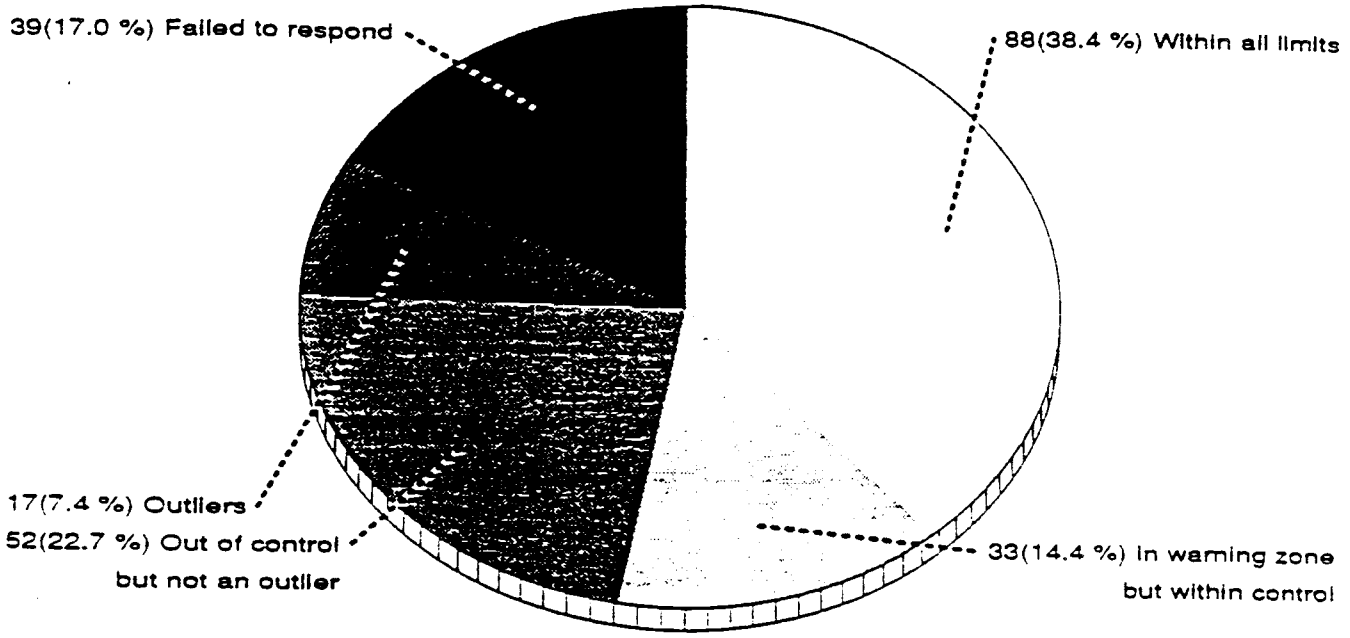
• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

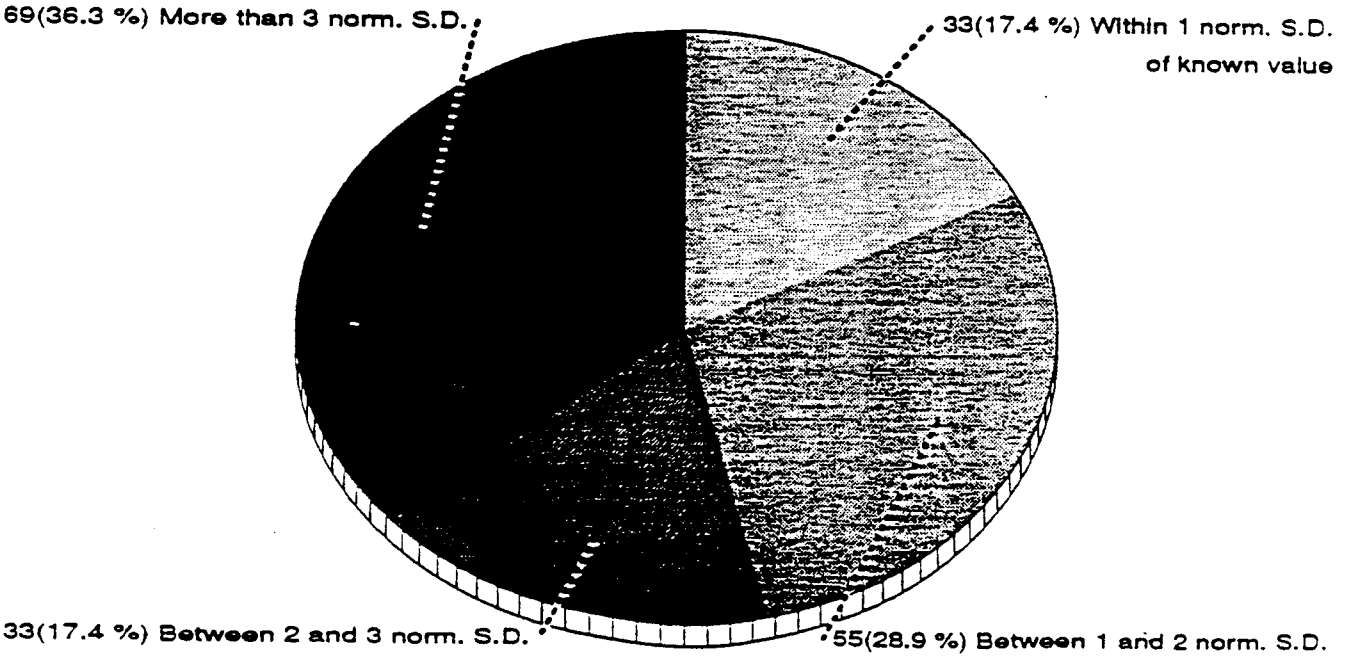
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Ruthenium-106 Statistical Summary 229 Participants

The known value of this nuclide is **201.0 pCi/l** with an expected precision of **20.0**; the control limits are 166.3 to 235.7; the warning regions are 166.3 to 177.8 and 224.2 to 235.7



Statistic	Respondents	Non-outliers
Mean	213.00	Grand Avg 175.18
Std. Dev.	215.64	18.32
Variance	46501.37	335.52
% Coef. of Var.	101.24	10.46
% deviation of mean from known value	5.97	-12.85
Norm. dev. of mean from known value	0.06	-1.41
Median	178.33	178.33
% deviation of median from known value	-11.28	-11.28
Norm. dev. of median from known value	-0.11	-1.24



Ruthenium-106

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PI	165.0	172.0	163.0	4.73	0.266	166.67	-0.74	-2.97	
PM									•
PP	692.0	587.0	603.0	56.57	5.002	627.33	39.16	36.92	×
PQ	164.0	148.0	162.0	8.72	0.473	158.00	-1.49	-3.72	⇓
PT	185.0	163.0	168.0	11.53	0.650	172.00	-0.28	-2.51	
PU									•
PV	172.0	163.0	163.0	5.20	0.266	166.00	-0.79	-3.03	⇓
PW	163.0	175.0	155.0	10.07	0.591	164.33	-0.94	-3.18	⇓
PX	183.0	201.0	182.0	10.69	0.561	188.67	1.17	-1.07	
PY									•
Q	151.0	149.0	158.0	4.73	0.266	152.67	-1.95	-4.19	⇓
QB	180.0	196.0	214.0	17.01	1.008	196.67	1.86	-0.38	
QJ	166.0	191.0	195.0	15.72	0.856	184.00	0.76	-1.47	
QK									•
QL	146.0	146.0	170.0	13.86	0.709	154.00	-1.83	-4.07	⇓
QM	322.0	341.0	349.0	13.87	0.797	337.33	14.04	11.81	×
QP	185.0	187.0	195.0	5.29	0.295	189.00	1.20	-1.04	
QQ									•
QT	178.0	175.0	183.0	4.04	0.236	178.67	0.30	-1.93	
QU	56.0	36.0	46.0	10.00	0.591	46.00	-11.19	-13.42	×
QX	179.0	188.0	185.0	4.58	0.266	184.00	0.76	-1.47	
QZ	173.0	172.0	160.0	7.23	0.384	168.33	-0.59	-2.83	
R	187.0	183.0	188.0	2.65	0.148	186.00	0.94	-1.30	
RA	189.0	192.0	187.0	2.52	0.148	189.33	1.23	-1.01	
RC	149.0	150.0	149.0	0.58	0.030	149.33	-2.24	-4.47	⇓
RF	174.0	157.0	181.0	12.34	0.709	170.67	-0.39	-2.63	
RH	187.0	166.0	181.0	10.82	0.620	178.00	0.24	-1.99	
RK	134.0	169.0	176.0	22.50	1.458	159.67	-1.34	-3.58	⇓
RL	120.0	120.0	120.0	0.00	0.000	120.00	-4.78	-7.01	⇓
RM	145.0	140.0	148.0	4.04	0.236	144.33	-2.67	-4.91	⇓
RO	168.0	178.0	179.0	6.08	0.325	175.00	-0.02	-2.25	
RQ									•
RR	169.0	152.0	168.0	9.54	0.502	163.00	-1.05	-3.29	⇓
RV	179.0	119.0	151.0	30.02	2.470	149.67	-2.21	-4.45	⇓
RX	200.0	186.0	192.0	7.02	0.413	192.67	1.51	-0.72	
RZ	164.0	194.0	189.0	16.07	0.886	182.33	0.62	-1.62	
S	177.0	171.0	178.0	3.79	0.207	175.33	0.01	-2.22	
SA									•
SC	172.0	188.0	180.0	8.00	0.473	180.00	0.42	-1.82	
SD	146.0	128.0	137.0	9.00	0.532	137.00	-3.31	-5.54	⇓
SF	178.0	169.0	189.0	10.02	0.591	178.67	0.30	-1.93	
SI	195.0	154.0	164.0	21.38	1.402	171.00	-0.36	-2.60	
SK	24.0	24.0	32.0	4.62	0.236	26.67	-12.86	-15.10	×
SM	161.0	142.0	149.0	9.61	0.561	150.67	-2.12	-4.36	⇓
SN	1586.0	1533.0	1763.0	120.44	12.034	1627.33	125.76	123.52	×

• ≡ No data submitted

TAG SYMBOLS

⇑ ≡ Above control limit

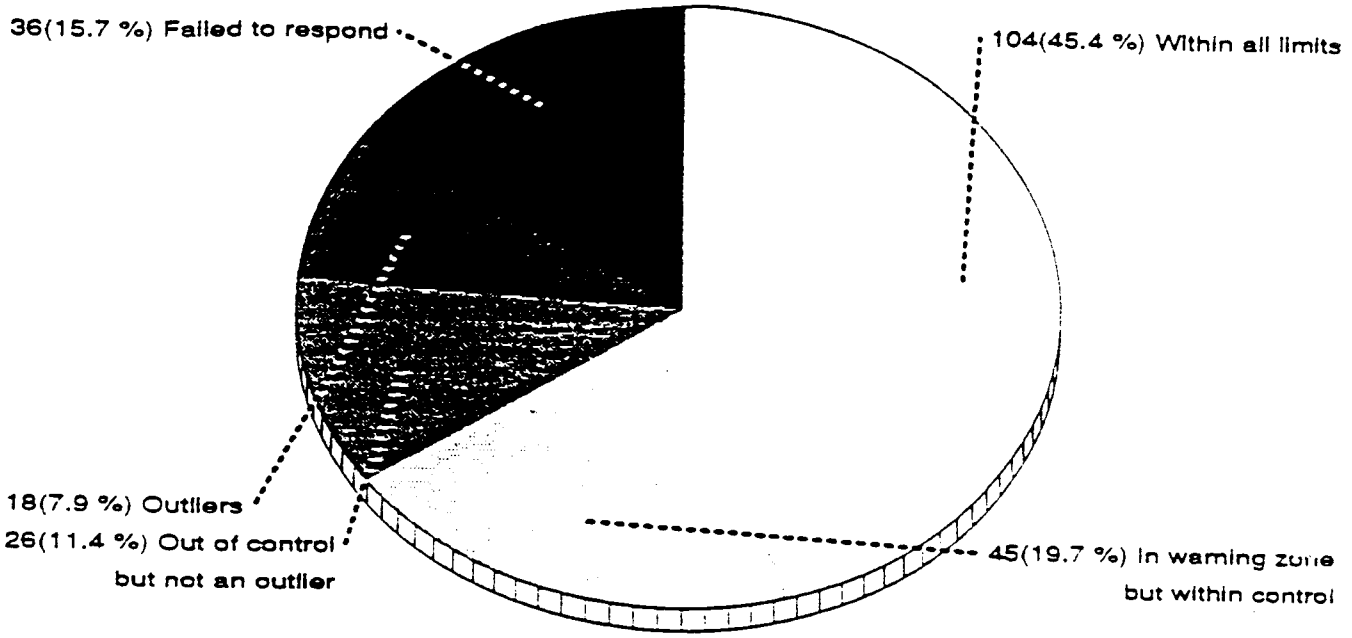
∅ ≡ Insufficient data

× ≡ Determined to be an outlier

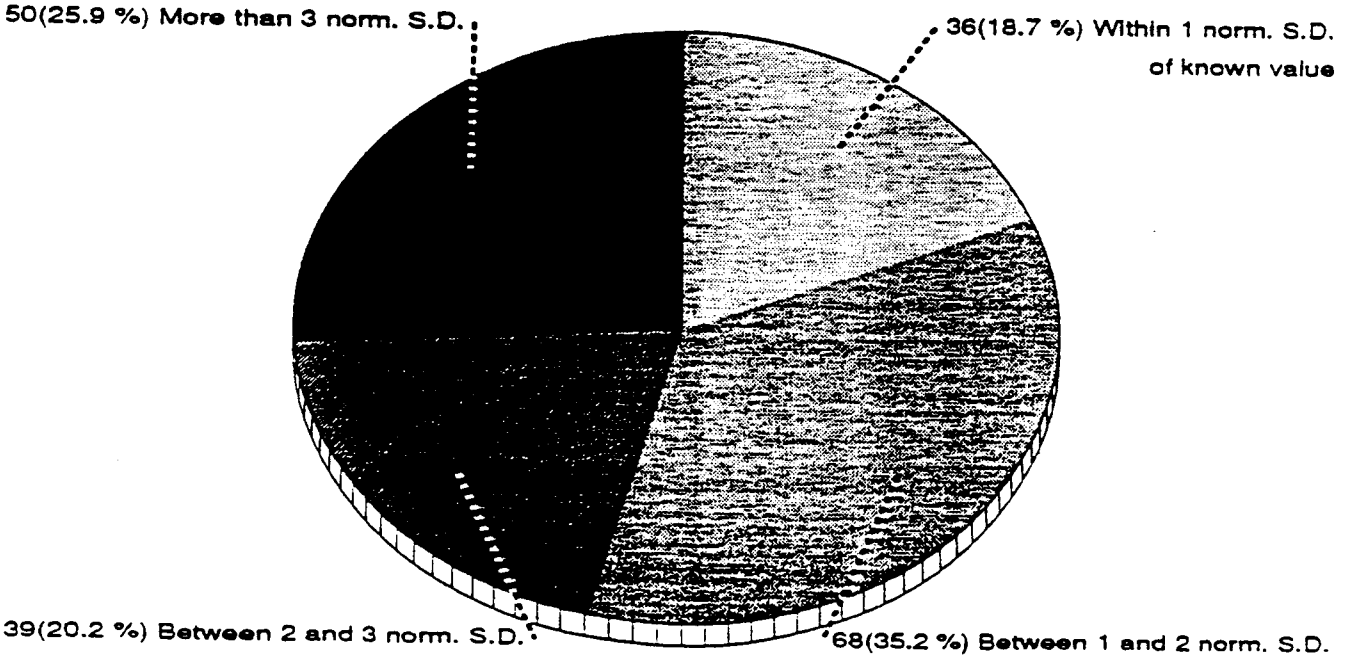
⇓ ≡ Below control limit

Cesium-134 Statistical Summary 229 Participants

The known value of this nuclide is **59.0 pCi/l** with an expected precision of **5.0**; the control limits are 50.3 to 67.7; the warning regions are 50.3 to 53.2 and 64.8 to 67.7



Statistic	Respondents	Non-outliers
Mean	64.88	**Grand Avg 54.42**
Std. Dev.	63.91	4.53
Variance	4084.96	20.48
% Coef. of Var.	98.52	8.32
% deviation of mean from known value	9.96	-7.77
Norm. dev. of mean from known value	0.09	-1.01
Median	54.33	54.33
% deviation of median from known value	-7.91	-7.91
Norm. dev. of median from known value	-0.07	-1.03



Cesium-134

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PI	52.0	51.0	54.0	1.53	0.354	52.33	-0.72	-2.31	
PM	41.0	41.0	47.0	3.46	0.709	43.00	-3.96	-5.54	⇓
PP	188.0	142.0	179.0	24.38	9.446	169.67	39.92	38.34	×
PQ	60.0	61.0	61.0	0.58	0.118	60.67	2.16	0.58	
PT	53.0	46.0	52.0	3.79	0.827	50.33	-1.41	-3.00	
PU									•
PV	53.0	49.0	54.0	2.65	0.591	52.00	-0.84	-2.42	
PW	54.0	55.0	54.0	0.58	0.118	54.33	-0.03	-1.62	
PX	57.0	56.0	56.0	0.58	0.118	56.33	0.66	-0.92	
PY									•
Q	50.0	48.0	50.0	1.15	0.236	49.33	-1.76	-3.35	⇓
QB	57.0	62.0	59.0	2.52	0.591	59.33	1.70	0.12	
QJ	47.0	53.0	50.0	3.00	0.709	50.00	-1.53	-3.12	⇓
QK									•
QL	52.0	52.0	52.0	0.00	0.000	52.00	-0.84	-2.42	
QM	47.0	48.0	50.0	1.53	0.354	48.33	-2.11	-3.70	⇓
QP	51.0	59.0	54.0	4.04	0.945	54.67	0.09	-1.50	
QQ									•
QT	52.0	54.0	54.0	1.15	0.236	53.33	-0.38	-1.96	
QU	19.0	16.0	17.0	1.53	0.354	17.33	-12.85	-14.43	×
QX	60.0	67.0	63.0	3.51	0.827	63.33	3.09	1.50	
QZ	51.0	51.0	50.0	0.58	0.118	50.67	-1.30	-2.89	
R	53.0	55.0	54.0	1.00	0.236	54.00	-0.14	-1.73	
RA	63.0	62.0	61.0	1.00	0.236	62.00	2.63	1.04	
RC	55.0	55.0	55.0	0.00	0.000	55.00	0.20	-1.39	
RF	50.0	52.0	47.0	2.52	0.591	49.67	-1.65	-3.23	⇓
RH	56.0	54.0	53.0	1.53	0.354	54.33	-0.03	-1.62	
RK	50.0	50.0	50.0	0.00	0.000	50.00	-1.53	-3.12	⇓
RL	51.0	51.0	51.0	0.00	0.000	51.00	-1.18	-2.77	
RM	59.0	58.0	65.0	3.79	0.827	60.67	2.16	0.58	
RO	53.0	50.0	52.0	1.53	0.354	51.67	-0.95	-2.54	
RQ									•
RR	54.0	55.0	56.0	1.00	0.236	55.00	0.20	-1.39	
RV	49.0	50.0	52.0	1.53	0.354	50.33	-1.41	-3.00	
RX	39.0	43.0	28.0	7.77	2.470	36.67	-6.15	-7.74	×
RZ	59.0	59.0	60.0	0.58	0.118	59.33	1.70	0.12	
S	56.0	57.0	56.0	0.58	0.118	56.33	0.66	-0.92	
SA									•
SC	52.0	53.0	53.0	0.58	0.118	52.67	-0.61	-2.19	
SD	52.0	49.0	51.0	1.53	0.354	50.67	-1.30	-2.89	
SF	55.0	53.0	52.0	1.53	0.354	53.33	-0.38	-1.96	
SI	61.0	55.0	57.0	3.06	0.709	57.67	1.13	-0.46	
SK	10.0	9.0	10.0	0.58	0.118	9.67	-15.50	-17.09	×
SM	50.0	48.0	50.0	1.15	0.236	49.33	-1.76	-3.35	⇓
SN	440.0	441.0	454.0	7.81	2.245	445.00	135.30	133.71	×

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

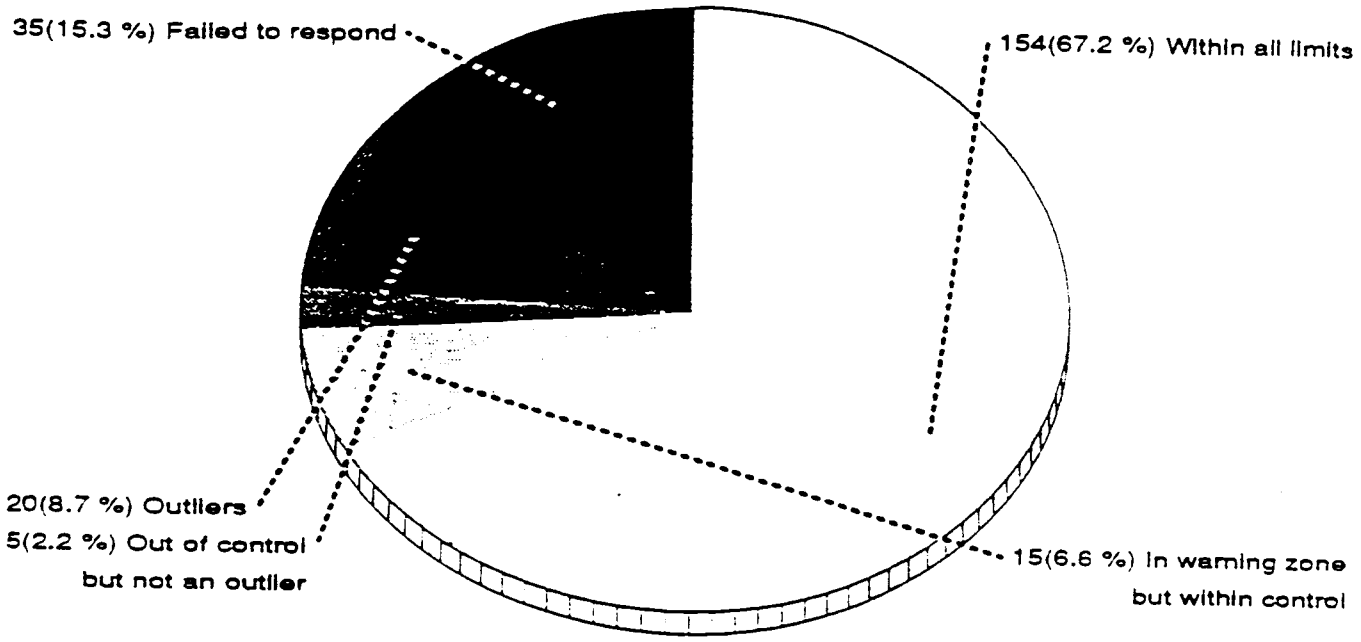
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

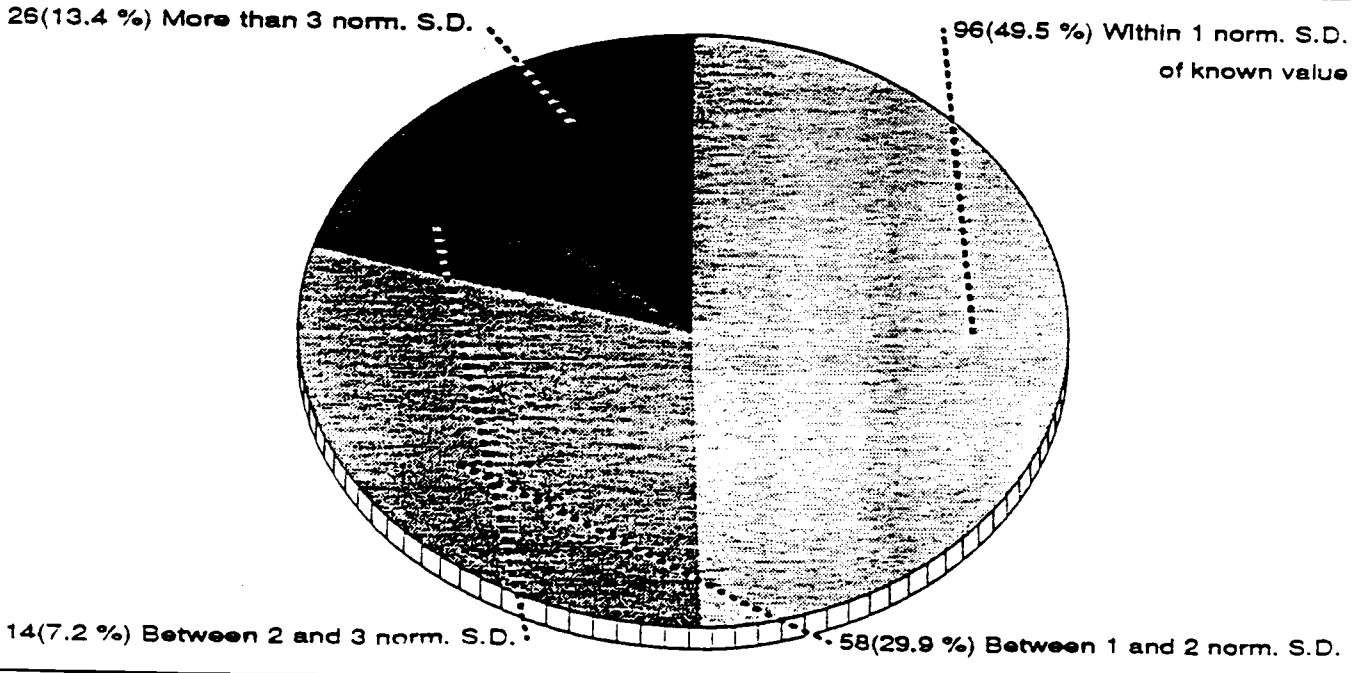
⇓ ≡ Below control limit

Cesium-137 Statistical Summary 229 Participants

The known value of this nuclide is 40.0 pCi/l with an expected precision of 5.0; the control limits are 31.3 to 48.7; the warning regions are 31.3 to 34.2 and 45.8 to 48.7



Statistic	Respondents	Non-outliers
Mean	49.26	Grand Avg 42.14
Std. Dev.	46.27	3.04
Variance	2140.47	9.23
% Coef. of Var.	93.92	7.21
% deviation of mean from known value	23.15	5.34
Norm. dev. of mean from known value	0.20	0.70
Median	42.00	42.00
% deviation of median from known value	5.00	5.00
Norm. dev. of median from known value	0.04	0.66



Cesium-137

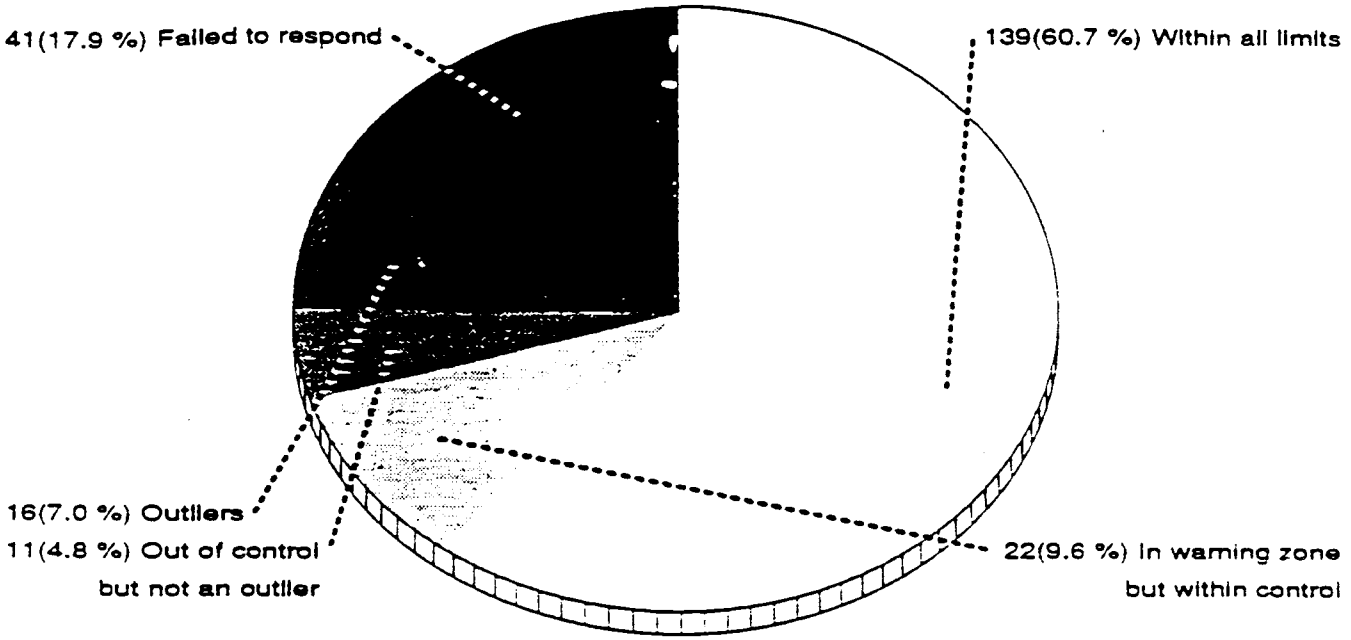
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PI	44.0	41.0	43.0	1.53	0.354	42.67	0.18	0.92	
PM	35.0	40.0	40.0	2.89	0.591	38.33	-1.32	-0.58	
PP	116.0	125.0	122.0	4.58	1.120	121.00	27.32	28.06	×
PQ	46.0	46.0	46.0	0.00	0.000	46.00	1.34	2.08	
PT	44.0	41.0	43.0	1.53	0.354	42.67	0.18	0.92	
PU									•
PV	41.0	41.0	42.0	0.58	0.118	41.33	-0.28	0.46	
PW	42.0	42.0	41.0	0.58	0.118	41.67	-0.16	0.58	
PX	39.0	40.0	39.0	0.58	0.118	39.33	-0.97	-0.23	
PY									•
Q	40.0	42.0	40.0	1.15	0.236	40.67	-0.51	0.23	
QB	45.0	48.0	45.0	1.73	0.354	46.00	1.34	2.08	
QJ	43.0	43.0	40.0	1.73	0.354	42.00	-0.05	0.69	
QK									•
QL	43.0	45.0	43.0	1.15	0.236	43.67	0.53	1.27	
QM	47.0	44.0	44.0	1.73	0.354	45.00	0.99	1.73	
QP	45.0	41.0	38.0	3.51	0.827	41.33	-0.28	0.46	
QQ									•
QT	43.0	44.0	37.0	3.79	0.827	41.33	-0.28	0.46	
QU	12.0	13.0	11.0	1.00	0.236	12.00	-10.44	-9.70	×
QX	51.0	49.0	48.0	1.53	0.354	49.33	2.49	3.23	⇑
QZ	38.0	39.0	40.0	1.00	0.236	39.00	-1.09	-0.35	
R	43.0	43.0	42.0	0.58	0.118	42.67	0.18	0.92	
RA	45.0	45.0	44.0	0.58	0.118	44.67	0.88	1.62	
RC	43.0	43.0	43.0	0.00	0.000	43.00	0.30	1.04	
RF	41.0	39.0	39.0	1.15	0.236	39.67	-0.86	-0.12	
RH	41.0	41.0	40.0	0.58	0.118	40.67	-0.51	0.23	
RK	41.0	38.0	39.0	1.53	0.354	39.33	-0.97	-0.23	
RL	12.0	12.0	12.0	0.00	0.000	12.00	-10.44	-9.70	×
RM	35.0	36.0	35.0	0.58	0.118	35.33	-2.36	-1.62	
RO	42.0	37.0	43.0	3.21	0.709	40.67	-0.51	0.23	
RQ									•
RR	39.0	40.0	42.0	1.53	0.354	40.33	-0.63	0.12	
RV	39.0	39.0	36.0	1.73	0.354	38.00	-1.43	-0.69	
RX	49.0	45.0	51.0	3.06	0.709	48.33	2.15	2.89	
RZ	40.0	42.0	41.0	1.00	0.236	41.00	-0.39	0.35	
S	39.0	40.0	39.0	0.58	0.118	39.33	-0.97	-0.23	
SA									•
SC	44.0	42.0	42.0	1.15	0.236	42.67	0.18	0.92	
SD	39.0	40.0	39.0	0.58	0.118	39.33	-0.97	-0.23	
SF	43.0	44.0	38.0	3.21	0.709	41.67	-0.16	0.58	
SI	48.0	39.0	41.0	4.73	1.120	42.67	0.18	0.92	
SK	8.0	7.0	9.0	1.00	0.236	8.00	-11.83	-11.09	×
SM	41.0	41.0	39.0	1.15	0.236	40.33	-0.63	0.12	
SN	358.0	276.0	301.0	42.03	17.547	311.67	93.37	94.11	×

• ≡ No data submitted — TAG SYMBOLS — ⇑ ≡ Above control limit

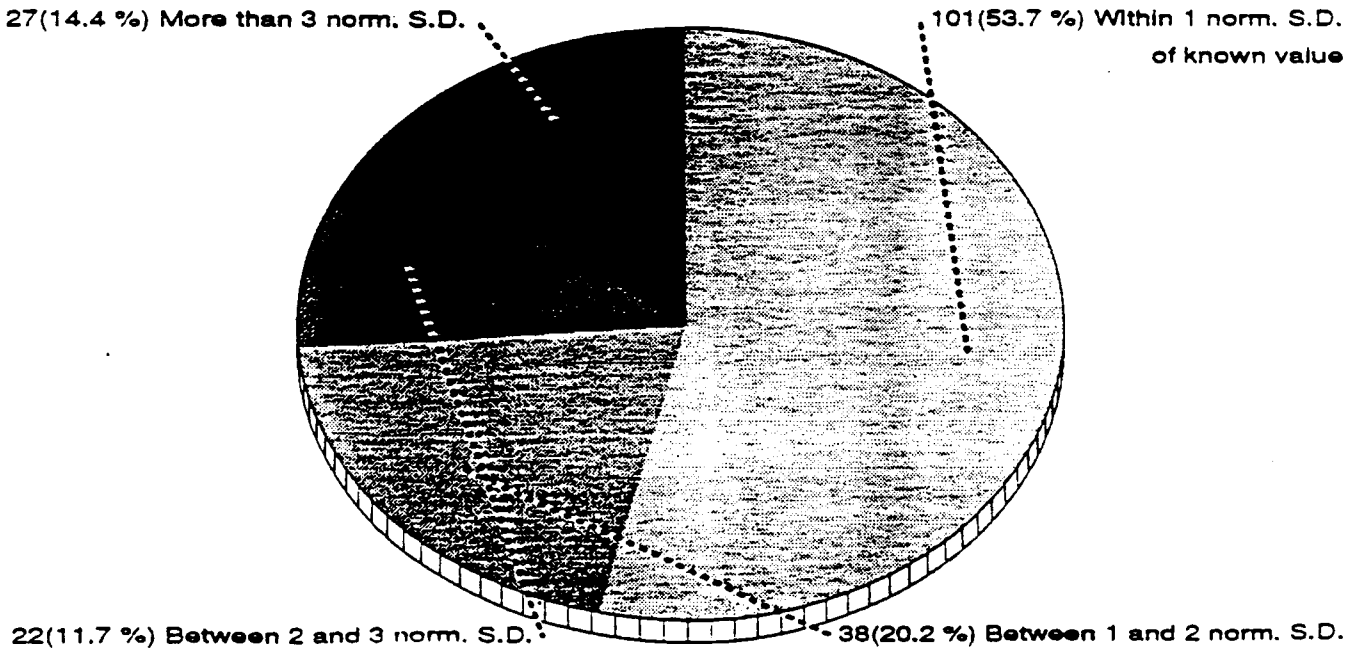
∅ ≡ Insufficient data — × ≡ Determined to be an outlier — ⇓ ≡ Below control limit

Barium-133 Statistical Summary 229 Participants

The known value of this nuclide is **79.0 pCi/l** with an expected precision of **8.0**; the control limits are 65.1 to 92.9; the warning regions are 65.1 to 69.7 and 88.3 to 92.9



Statistic	Respondents	Non-outliers
Mean	91.23	**Grand Avg 76.45**
Std. Dev.	88.87	6.31
Variance	7897.37	39.86
% Coef. of Var.	97.41	8.26
% deviation of mean from known value	15.48	-3.23
Norm. dev. of mean from known value	0.14	-0.40
Median	77.33	77.17
% deviation of median from known value	-2.11	-2.32
Norm. dev. of median from known value	-0.02	-0.29



Barium-133

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
PI	75.0	72.0	73.0	1.53	0.222	73.33	-0.67	-1.23	
PM									•
PP	233.0	243.0	263.0	15.28	3.314	246.33	36.78	36.23	×
PQ	80.0	79.0	81.0	1.00	0.148	80.00	0.77	0.22	
PT	76.0	71.0	77.0	3.21	0.443	74.67	-0.39	-0.94	
PU									•
PV	77.0	72.0	76.0	2.65	0.369	75.00	-0.31	-0.87	
PW	60.0	60.0	65.0	2.89	0.369	61.67	-3.20	-3.75	⇓
PX	80.0	81.0	80.0	0.58	0.074	80.33	0.84	0.29	
PY									•
Q	70.0	68.0	68.0	1.15	0.148	68.67	-1.68	-2.24	
QB	81.0	87.0	85.0	3.06	0.443	84.33	1.71	1.15	
QJ	79.0	78.0	76.0	1.53	0.222	77.67	0.26	-0.29	
QK									•
QL	76.0	76.0	75.0	0.58	0.074	75.67	-0.17	-0.72	
QM	71.0	72.0	67.0	2.65	0.369	70.00	-1.40	-1.95	
QP	81.0	78.0	75.0	3.00	0.443	78.00	0.34	-0.22	
QQ									•
QT	81.0	80.0	81.0	0.58	0.074	80.67	0.91	0.36	
QU	43.0	41.0	42.0	1.00	0.148	42.00	-7.46	-8.01	×
QX	86.0	84.0	86.0	1.15	0.148	85.33	1.92	1.37	
QZ	76.0	76.0	76.0	0.00	0.000	76.00	-0.10	-0.65	
R	77.0	75.0	76.0	1.00	0.148	76.00	-0.10	-0.65	
RA	82.0	79.0	80.0	1.53	0.222	80.33	0.84	0.29	
RC	62.0	63.0	64.0	1.00	0.148	63.00	-2.91	-3.46	⇓
RF	79.0	76.0	82.0	3.00	0.443	79.00	0.55	0.00	
RH	68.0	71.0	72.0	2.08	0.295	70.33	-1.32	-1.88	
RK	69.0	67.0	65.0	2.00	0.295	67.00	-2.05	-2.60	
RL	139.0	139.0	139.0	0.00	0.000	139.00	13.54	12.99	×
RM	76.0	81.0	75.0	3.21	0.443	77.33	0.19	-0.36	
RO	73.0	62.0	74.0	6.66	0.886	69.67	-1.47	-2.02	
RQ									•
RR	78.0	79.0	79.0	0.58	0.074	78.67	0.48	-0.07	
RV	78.0	73.0	72.0	3.21	0.443	74.33	-0.46	-1.01	
RX	102.0	93.0	112.0	9.50	1.767	102.33	5.60	5.05	×
RZ	78.0	81.0	84.0	3.00	0.443	81.00	0.99	0.43	
S	80.0	73.0	77.0	3.51	0.517	76.67	0.05	-0.51	
SA									•
SC	73.0	71.0	71.0	1.15	0.148	71.67	-1.03	-1.59	
SD	65.0	65.0	65.0	0.00	0.000	65.00	-2.48	-3.03	⇓
SF	73.0	70.0	72.0	1.53	0.222	71.67	-1.03	-1.59	
SI	83.0	80.0	74.0	4.58	0.665	79.00	0.55	0.00	
SK	15.0	14.0	15.0	0.58	0.074	14.67	-13.38	-13.93	×
SM	74.0	73.0	74.0	0.58	0.074	73.67	-0.60	-1.15	
SN	626.0	625.0	627.0	1.00	0.148	626.00	118.98	118.43	×

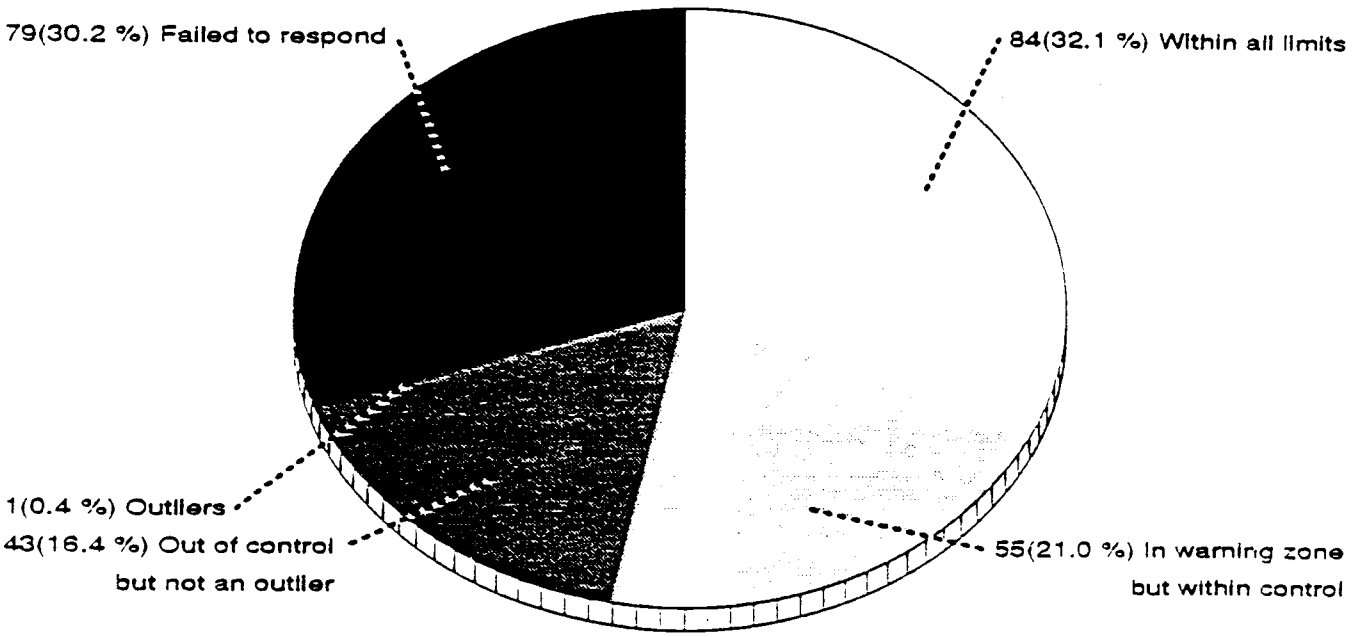
• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

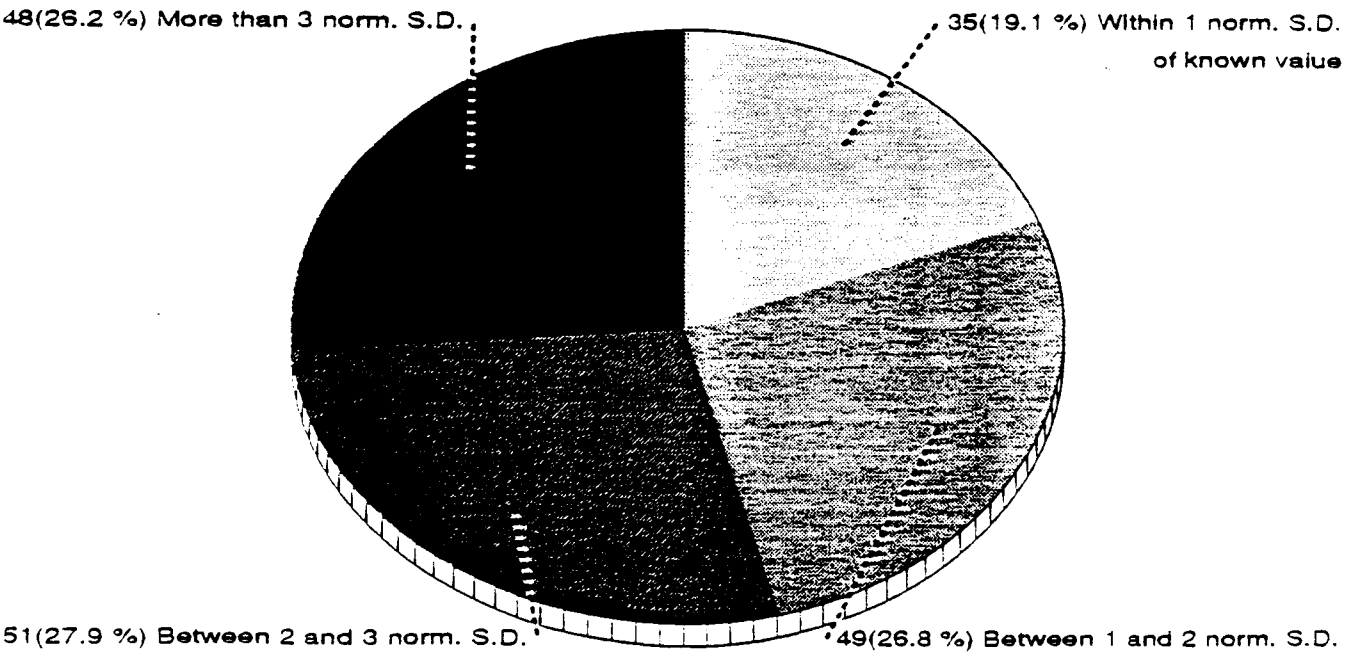
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Gross Alpha Statistical Summary 262 Participants

The known value of this nuclide is **20.0 pCi/l** with an expected precision of **5.0**; the control limits are 11.3 to 28.7; the warning regions are 11.3 to 14.2 and 25.8 to 28.7



Statistic	Respondents	Non-outliers
Mean	14.20	**Grand Avg 14.08**
Std. Dev.	4.90	4.64
Variance	23.98	21.56
% Coef. of Var.	34.50	32.98
% deviation of mean from known value	-29.02	-29.61
Norm. dev. of mean from known value	-1.18	-1.28
Median	14.00	13.83
% deviation of median from known value	-30.00	-30.83
Norm. dev. of median from known value	-1.23	-1.33



Gross Alpha

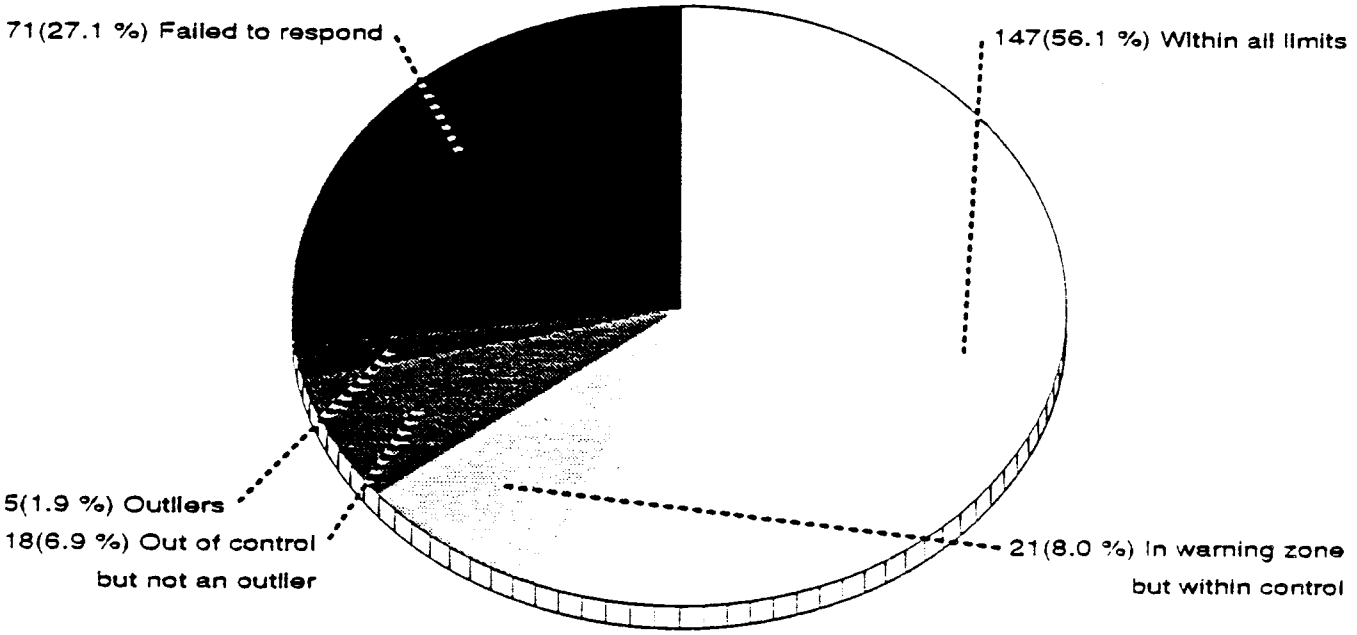
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
NE	36.0	34.0	37.0	1.53	0.354	35.67	7.48	5.43	×
NF									•
NG	6.0	7.0	8.0	1.00	0.236	7.00	-2.45	-4.50	⇓
NH	10.0	16.0	18.0	4.16	0.945	14.67	0.20	-1.85	
NI									•
NJ	11.0	12.0	14.0	1.53	0.354	12.33	-0.60	-2.66	
NK	8.0	6.0	6.0	1.15	0.236	6.67	-2.57	-4.62	⇓
NO	15.0	16.0	17.0	1.00	0.236	16.00	0.67	-1.39	
NP									•
NT	19.0	19.0	19.0	0.00	0.000	19.00	1.70	-0.35	
O	18.0	19.0	19.0	0.58	0.118	18.67	1.59	-0.46	
OA	20.0	18.0	22.0	2.00	0.473	20.00	2.05	0.00	
OB	10.0	16.0	18.0	4.16	0.945	14.67	0.20	-1.85	
OF	15.0	17.0	18.0	1.53	0.354	16.67	0.90	-1.15	
OM									•
OS	15.0	15.0	15.0	0.00	0.000	15.00	0.32	-1.73	
OT									•
OX									•
OY	24.0	28.0	33.0	4.51	1.120	28.33	4.94	2.89	
P	14.0	12.0	11.0	1.53	0.354	12.33	-0.60	-2.66	
PA									•
PB	18.0	18.0	18.0	0.00	0.000	18.00	1.36	-0.69	
PC	20.0	23.0	24.0	2.08	0.473	22.33	2.86	0.81	
PD									•
PE									•
PG	12.0	13.0	14.0	1.00	0.236	13.00	-0.37	-2.42	
PM	13.0	14.0	14.0	0.58	0.118	13.67	-0.14	-2.19	
PP									•
PQ	15.0	14.0	15.0	0.58	0.118	14.67	0.20	-1.85	
PR	21.0	19.0	18.0	1.53	0.354	19.33	1.82	-0.23	
PT									•
PV	18.0	19.0	19.0	0.58	0.118	18.67	1.59	-0.46	
Q	23.0	25.0	21.0	2.00	0.473	23.00	3.09	1.04	
QA									•
QB									•
QC	7.0	11.0	10.0	2.08	0.473	9.33	-1.64	-3.70	⇓
QI	4.0	3.0	3.0	0.58	0.118	3.33	-3.72	-5.77	⇓
QJ	11.0	6.0	15.0	4.51	1.120	10.67	-1.18	-3.23	⇓
QK									•
QM	5.0	4.0	4.0	0.58	0.118	4.33	-3.38	-5.43	⇓
QP	4.0	4.0	7.0	1.73	0.354	5.00	-3.14	-5.20	⇓
QQ									•
QT	22.0	21.0	17.0	2.65	0.591	20.00	2.05	0.00	
QU	22.0	25.0	29.0	3.51	0.827	25.33	3.90	1.85	
QW	17.0	22.0	19.0	2.52	0.591	19.33	1.82	-0.23	

• ≡ No data submitted — **TAG SYMBOLS** — ⇑ ≡ Above control limit

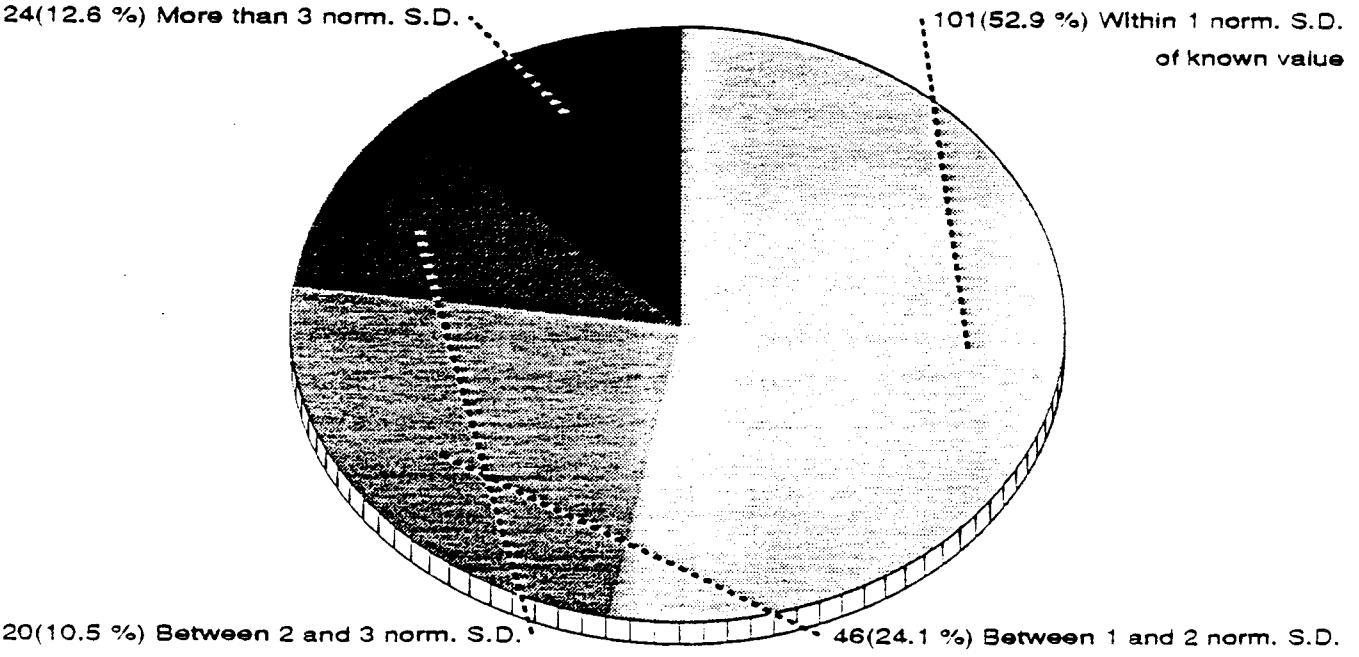
∅ ≡ Insufficient data — × ≡ Determined to be an outlier — ⇓ ≡ Below control limit

Gross Beta Statistical Summary 262 Participants

The known value of this nuclide is **15.0 pCi/l** with an expected precision of **5.0**; the control limits are 6.3 to 23.7; the warning regions are 6.3 to 9.2 and 20.8 to 23.7



Statistic	Respondents	Non-outliers
Mean	20.19	**Grand Avg** 17.01
Std. Dev.	28.23	4.80
Variance	797.14	23.03
% Coef. of Var.	139.81	28.22
% deviation of mean from known value	34.62	13.38
Norm. dev. of mean from known value	0.18	0.42
Median	16.67	16.67
% deviation of median from known value	11.11	11.11
Norm. dev. of median from known value	0.06	0.35



Gross Beta

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
NE	14.0	15.0	16.0	1.00	0.236	15.00	-0.70	0.00	
NF									•
NG	13.0	13.0	13.0	0.00	0.000	13.00	-1.39	-0.69	
NH	14.0	16.0	20.0	3.06	0.709	16.67	-0.12	0.58	
NI									•
NJ	10.0	13.0	11.0	1.53	0.354	11.33	-1.97	-1.27	
NK	11.0	9.0	7.0	2.00	0.473	9.00	-2.77	-2.08	
NO	18.0	19.0	20.0	1.00	0.236	19.00	0.69	1.39	
NP									•
NT	16.0	18.0	17.0	1.00	0.236	17.00	0.00	0.69	
O	17.0	18.0	17.0	0.58	0.118	17.33	0.11	0.81	
OA	17.0	15.0	15.0	1.15	0.236	15.67	-0.46	0.23	
OB	21.0	23.0	19.0	2.00	0.473	21.00	1.38	2.08	
OF	16.0	16.0	17.0	0.58	0.118	16.33	-0.23	0.46	
OM									•
OS	21.0	29.0	20.0	4.93	1.120	23.33	2.19	2.89	
OT	12.0	13.0	12.0	0.58	0.118	12.33	-1.62	-0.92	
OX									•
OY	34.0	38.0	46.0	6.11	1.795	39.33	7.73	8.43	×
P	16.0	18.0	13.0	2.52	0.591	15.67	-0.46	0.23	
PA									•
PB	18.0	18.0	18.0	0.00	0.000	18.00	0.34	1.04	
PC	13.0	15.0	14.0	1.00	0.236	14.00	-1.04	-0.35	
PD									•
PE									•
PG	13.0	15.0	16.0	1.53	0.354	14.67	-0.81	-0.12	
PM	19.0	19.0	18.0	0.58	0.118	18.67	0.57	1.27	
PP									•
PQ	16.0	17.0	16.0	0.58	0.118	16.33	-0.23	0.46	
PR	16.0	15.0	15.0	0.58	0.118	15.33	-0.58	0.12	
PT									•
PV	11.0	12.0	13.0	1.00	0.236	12.00	-1.73	-1.04	
Q	17.0	19.0	20.0	1.53	0.354	18.67	0.57	1.27	
QA									•
QB									•
QC	21.0	22.0	23.0	1.00	0.236	22.00	1.73	2.42	
QI	9.0	8.0	8.0	0.58	0.118	8.33	-3.00	-2.31	
QJ	249.0	239.0	224.0	12.58	4.721	237.33	76.32	77.02	×
QK	18.0	18.0	19.0	0.58	0.118	18.33	0.46	1.15	
QM	20.0	15.0	14.0	3.21	0.709	16.33	-0.23	0.46	
QP	16.0	13.0	13.0	1.73	0.354	14.00	-1.04	-0.35	
QQ									•
QT	46.0	85.0	24.0	30.89	12.821	51.67	12.01	12.70	×
QU	29.0	32.0	36.0	3.51	0.827	32.33	5.31	6.00	⇑
QW	31.0	29.0	25.0	3.06	0.709	28.33	3.92	4.62	⇑

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

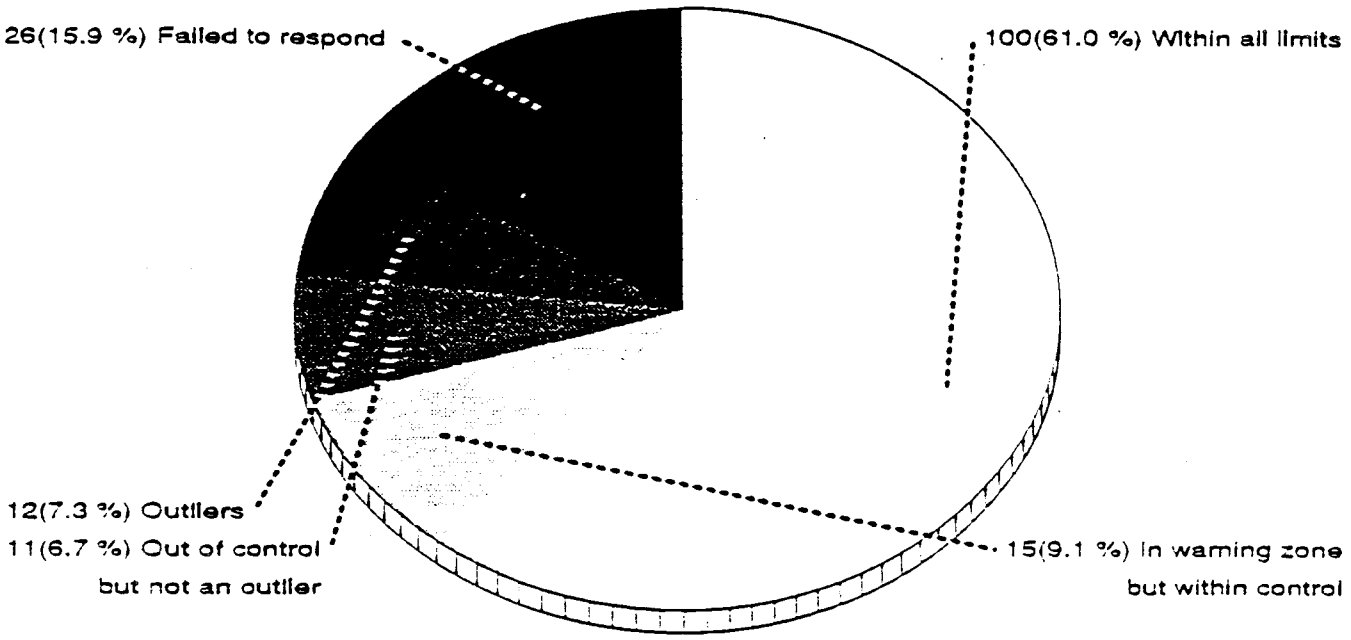
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

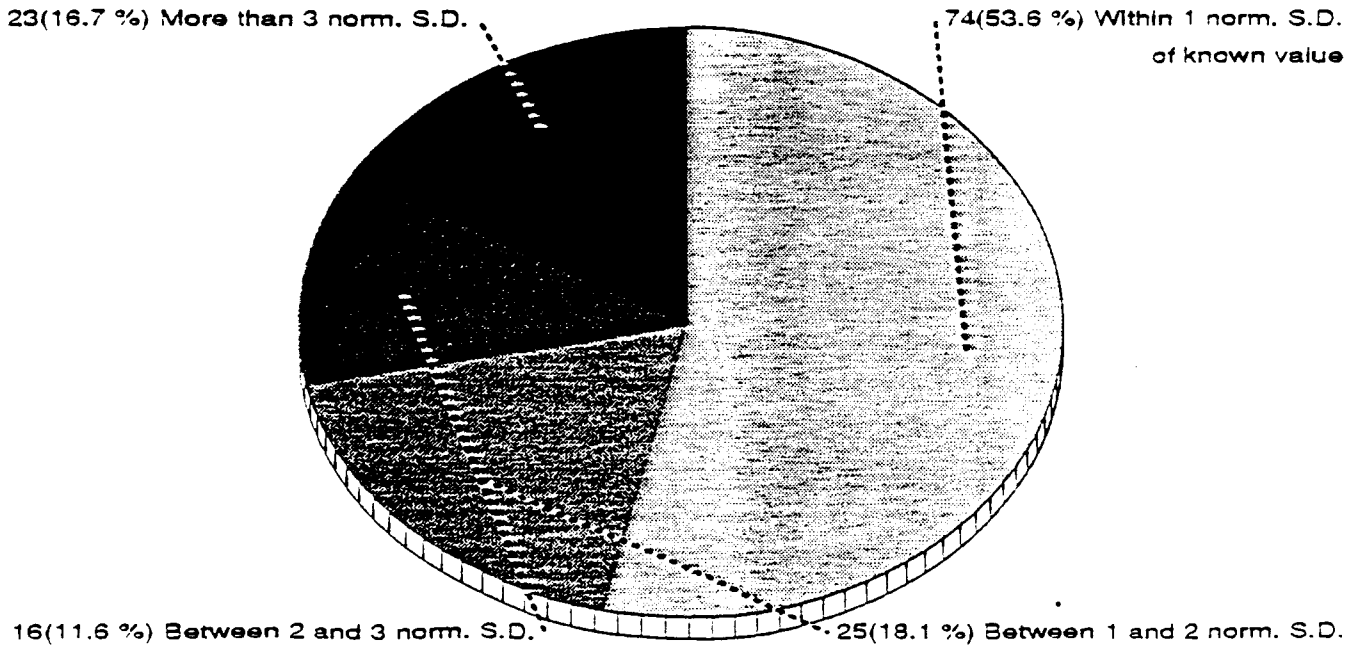
⇓ ≡ Below control limit

Uranium (Natural) Statistical Summary 164 Participants

The known value of this nuclide is **25.3 pCi/l** with an expected precision of **3.0**; the control limits are 20.1 to 30.5; the warning regions are 20.1 to 21.8 and 28.8 to 30.5



Statistic	Respondents	Non-outliers
Mean	24.41	**Grand Avg 24.91**
Std. Dev.	5.65	2.85
Variance	31.98	8.13
% Coef. of Var.	23.17	11.45
% deviation of mean from known value	-3.53	-1.55
Norm. dev. of mean from known value	-0.16	-0.14
Median	24.90	24.97
% deviation of median from known value	-1.58	-1.32
Norm. dev. of median from known value	-0.07	-0.12



Uranium (Natural)

[redacted]	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
OK	19.6	25.7	22.7	3.05	1.383	22.67	-1.29	-1.52	
OS	25.4	25.4	25.4	0.01	0.000	25.40	0.28	0.06	
OY	25.4	25.8	24.5	0.67	0.256	25.23	0.19	-0.04	
OZ									•
P	28.9	28.4	28.1	0.40	0.158	28.47	2.06	1.83	
PB	24.1	25.2	24.6	0.55	0.217	24.63	-0.16	-0.38	
PC	6.7	7.1	7.6	0.45	0.177	7.13	-10.26	-10.49	×
PP	25.3	24.4	24.4	0.52	0.177	24.70	-0.12	-0.35	
PQ	23.6	24.5	24.7	0.59	0.217	24.27	-0.37	-0.60	
PT	25.9	25.5	23.3	1.40	0.512	24.90	0.00	-0.23	
PV	23.3	21.8	22.3	0.76	0.295	22.47	-1.41	-1.64	
PW	27.8	32.8	37.8	5.00	2.846	32.80	4.56	4.33	⇑
PX	27.3	27.8	25.4	1.27	0.473	26.83	1.11	0.89	
PY									•
Q	29.1	32.2	33.4	2.22	0.847	31.57	3.85	3.62	⇑
QJ	24.0	22.7	23.8	0.70	0.256	23.50	-0.81	-1.04	
QM	9.7	7.1	9.8	1.53	0.532	8.87	-9.26	-9.49	×
QQ	19.3	19.3	19.2	0.06	0.020	19.27	-3.26	-3.48	⇓
QU	31.8	25.8	33.2	3.93	1.870	30.27	3.09	2.87	
QX	13.1	13.2	13.2	0.06	0.020	13.17	-6.78	-7.01	×
[redacted]	25.6	25.6	25.4	0.12	0.039	25.53	0.36	0.13	
[redacted]	25.3	23.4	25.0	1.02	0.374	24.57	-0.20	-0.42	
RA	25.0	24.3	25.0	0.40	0.138	24.77	-0.08	-0.31	
RC	24.2	28.2	30.6	3.23	1.495	27.67	1.59	1.37	
RF	23.2	23.0	23.1	0.10	0.039	23.10	-1.04	-1.27	
RG	25.0	25.0	25.0	0.00	0.000	25.00	0.05	-0.17	
RK	47.2	43.5	37.2	5.06	2.846	42.63	10.23	10.01	×
RL									•
RM	30.1	25.6	30.6	2.75	0.984	28.77	2.23	2.00	
RN	28.9	28.2	28.9	0.40	0.138	28.67	2.17	1.94	
RP	24.1	24.1	24.1	0.01	0.000	24.10	-0.47	-0.69	
RR	24.6	24.4	26.4	1.10	0.394	25.13	0.13	-0.10	
RV									•
RW	24.7	24.5	24.5	0.12	0.039	24.57	-0.20	-0.42	
RZ	22.9	25.0	24.4	1.08	0.413	24.10	-0.47	-0.69	
S	23.8	23.9	25.3	0.84	0.295	24.33	-0.33	-0.56	
SC	27.4	25.6	27.7	1.14	0.413	26.90	1.15	0.92	
SD	24.2	23.8	23.6	0.31	0.118	23.87	-0.60	-0.83	
SF	26.1	27.2	27.3	0.67	0.236	26.87	1.13	0.90	
SI	20.1	19.5	20.0	0.32	0.118	19.87	-2.91	-3.14	⇓
SL	13.4	12.7	13.9	0.60	0.236	13.33	-6.68	-6.91	×
SM									•
[redacted]	23.9	24.1	22.8	0.70	0.256	23.60	-0.75	-0.98	
[redacted]	22.5	22.3	19.4	1.73	0.610	21.40	-2.02	-2.25	
T	24.9	25.0	24.8	0.10	0.039	24.90	0.00	-0.23	

• ≡ No data submitted

TAG SYMBOLS

⇑ ≡ Above control limit

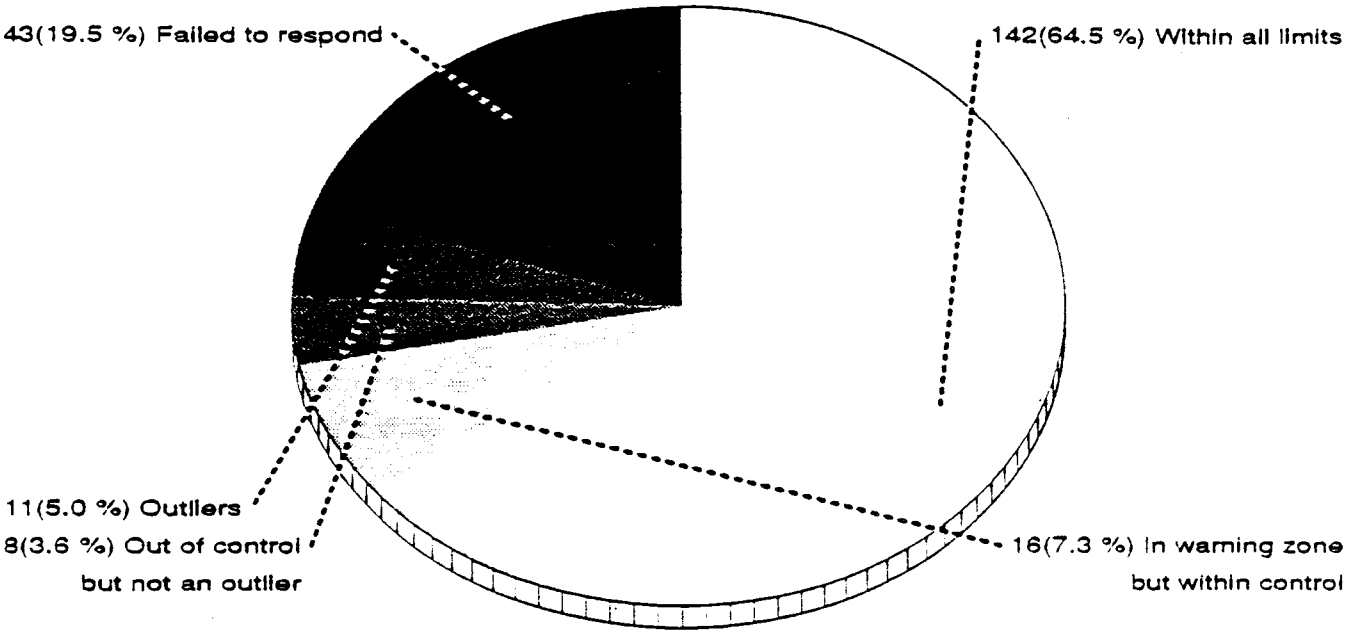
• ≡ Insufficient data

× ≡ Determined to be an outlier

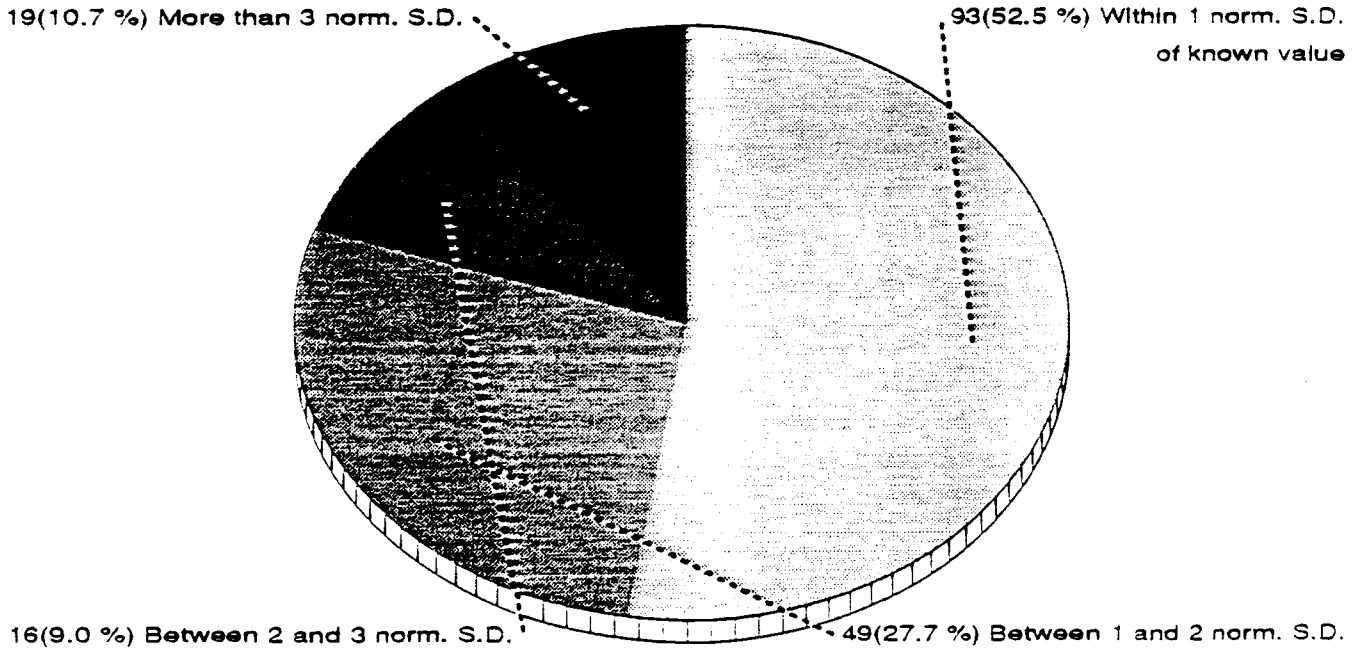
⇓ ≡ Below control limit

Tritium Statistical Summary 220 Participants

The known value of this nuclide is **7398.0 pCi/l** with an expected precision of **740.0**; the control limits are 6114.1 to 8681.9; the warning regions are 6114.1 to 6541.4 and 8254.6 to 8681.9



Statistic	Respondents	Non-outliers
Mean	7017.15	**Grand Avg 7215.65**
Std. Dev.	1320.54	574.68
Variance	1743826.64	330256.18
% Coef. of Var.	18.82	7.96
% deviation of mean from known value	-5.15	-2.46
Norm. dev. of mean from known value	-0.29	-0.32
Median	7209.00	7259.50
% deviation of median from known value	-2.55	-1.87
Norm. dev. of median from known value	-0.14	-0.24



Tritium

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
KM	7336.0	7660.0	7850.0	259.89	0.410	7615.33	0.94	0.51	
KX	7020.0	7070.0	6990.0	40.46	0.064	7026.67	-0.44	-0.87	
L	7565.0	7557.0	7662.0	58.42	0.084	7594.67	0.89	0.46	
LA									•
LE	8590.0	7910.0	8230.0	340.20	0.543	8243.33	2.41	1.98	
LF	7400.0	7700.0	7400.0	173.21	0.239	7500.00	0.67	0.24	
LM									•
LR	7070.0	7138.0	7089.0	35.14	0.054	7099.00	-0.27	-0.70	
LS									•
LT	6510.0	6563.0	6725.0	112.01	0.172	6599.33	-1.44	-1.87	
M	6530.0	6540.0	6510.0	15.28	0.024	6526.67	-1.61	-2.04	
MA	6784.0	6760.0	6679.0	55.01	0.084	6741.00	-1.11	-1.54	
ML	8400.0	8200.0	8100.0	152.75	0.239	8233.33	2.38	1.96	
MN									•
MQ	7940.0	7790.0	7600.0	170.39	0.271	7776.67	1.31	0.89	
MS	7800.0	7390.0	6880.0	460.90	0.734	7356.67	0.33	-0.10	
MT	6954.0	6956.0	6899.0	32.37	0.045	6936.33	-0.65	-1.08	
MV									•
N	7188.0	6984.0	7230.0	131.58	0.196	7134.00	-0.19	-0.62	
NB	6482.0	6580.0	6464.0	62.44	0.093	6508.67	-1.65	-2.08	
NH									•
NI									•
NJ	6946.0	6514.0	6649.0	221.01	0.345	6703.00	-1.20	-1.63	
NO									•
NP	7236.0	9375.0	8306.0	1069.50	2.347	8305.67	2.55	2.12	
O	7974.0	8072.0	8088.0	61.70	0.091	8044.67	1.94	1.51	
OA	6800.0	6800.0	7000.0	115.47	0.160	6866.67	-0.82	-1.24	
OK									•
OL	8369.0	7404.0	8071.0	494.12	0.770	7948.00	1.71	1.29	
OM									•
OT	7.0	6.0	7.0	0.58	0.001	6.67	-16.87	-17.30	×
OX	7844.0	7703.0	7515.0	165.07	0.263	7687.33	1.10	0.68	
P	7483.0	7388.0	7801.0	216.31	0.330	7557.33	0.80	0.37	
PB	7335.0	7147.0	7275.0	96.02	0.150	7252.33	0.09	-0.34	
PC	7349.0	7378.0	6788.0	332.58	0.471	7171.67	-0.10	-0.53	
PD									•
PE	6340.0	6470.0	6860.0	270.62	0.415	6556.67	-1.54	-1.97	
PI	7433.0	7583.0	7638.0	106.09	0.164	7551.33	0.79	0.36	
PJ	11418.0	11798.0	11999.0	295.05	0.464	11738.33	10.59	10.16	×
PM	7482.0	7595.0	7411.0	92.78	0.147	7496.00	0.66	0.23	
PP	6941.0	6903.0	6884.0	29.07	0.045	6909.33	-0.72	-1.14	
PQ	7561.0	7240.0	7318.0	167.41	0.256	7373.00	0.37	-0.06	
PT	6531.0	6520.0	6512.0	9.51	0.015	6521.00	-1.63	-2.05	
PU									•
PV	6760.0	7370.0	7010.0	306.66	0.487	7046.67	-0.40	-0.82	

• ≡ No data submitted

TAG SYMBOLS

⇑ ≡ Above control limit

∅ ≡ Insufficient data

× ≡ Determined to be an outlier

⇓ ≡ Below control limit

Gross Alpha-Beta in Water

Performance Evaluation Study

January 28, 1994

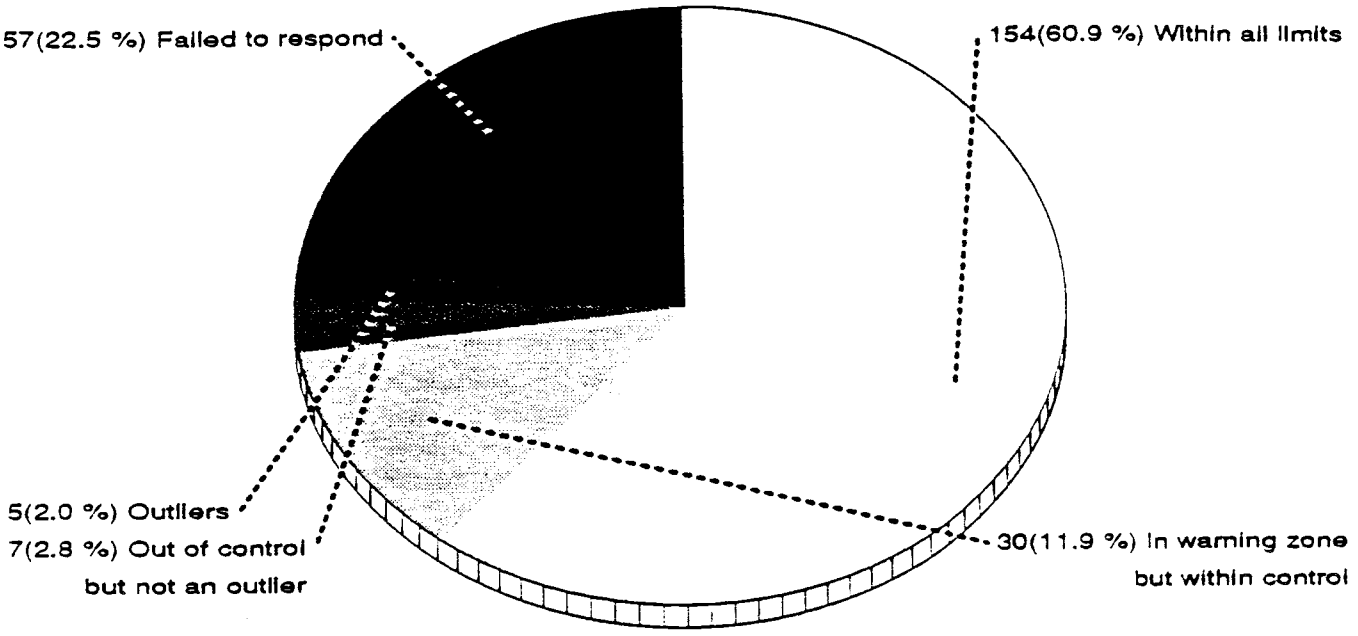
Environmental Protection Agency

Environmental Monitoring Systems Laboratory

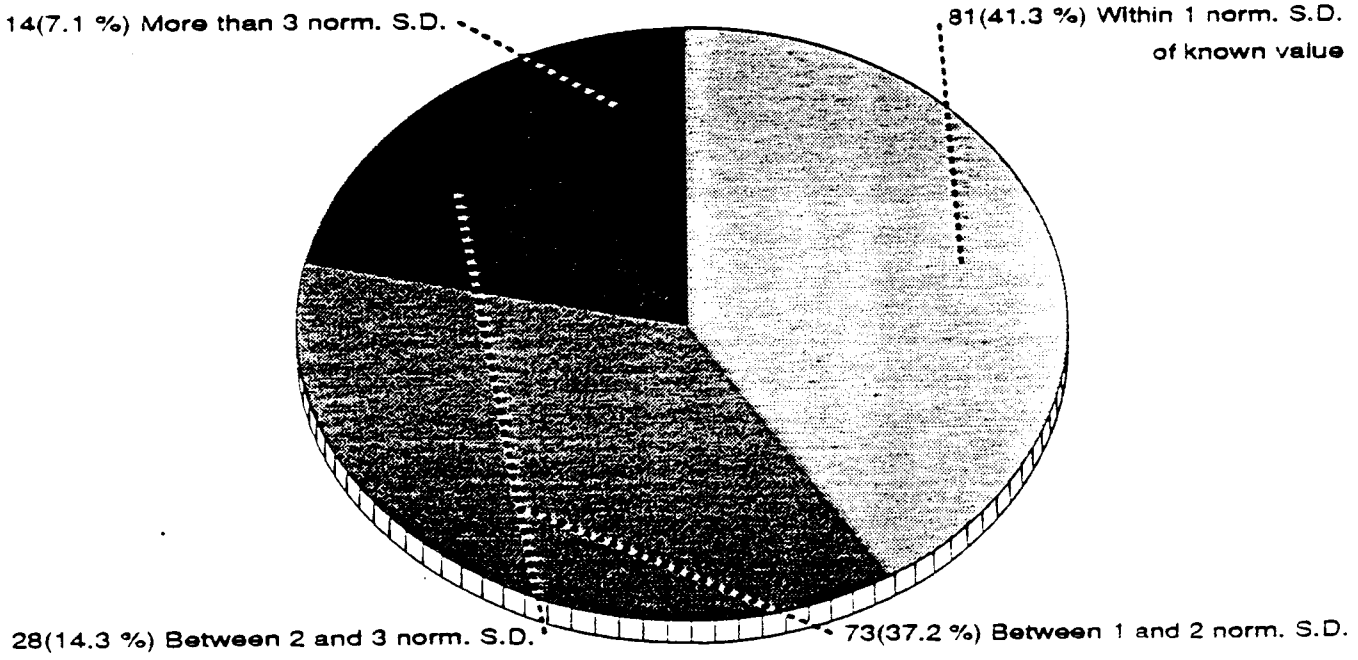
Las Vegas, Nevada

Gross Alpha Statistical Summary 253 Participants

The known value of this nuclide is **15.0 pCi/l** with an expected precision of **5.0**; the control limits are 6.3 to 23.7; the warning regions are 6.3 to 9.2 and 20.8 to 23.7



Statistic	Respondents	Non-outliers
Mean	14.38	**Grand Avg 13.75**
Std. Dev.	5.97	4.25
Variance	35.68	18.08
% Coef. of Var.	41.55	30.92
% deviation of mean from known value	-4.15	-8.32
Norm. dev. of mean from known value	-0.10	-0.29
Median	13.00	13.00
% deviation of median from known value	-13.33	-13.33
Norm. dev. of median from known value	-0.33	-0.47



Gross Alpha

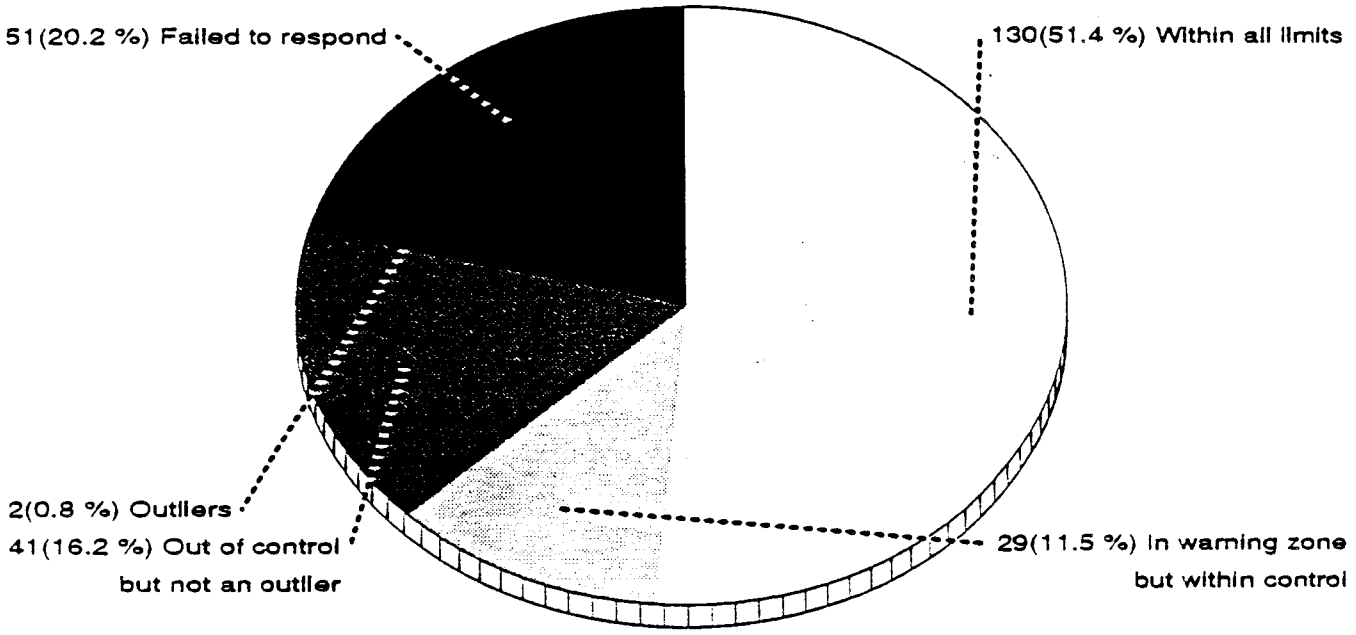
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
NJ									•
NK	10.0	12.0	11.0	1.00	0.236	11.00	-0.95	-1.39	
NO	12.0	15.0	18.0	3.00	0.709	15.00	0.43	0.00	
NT	20.0	21.0	21.0	0.58	0.118	20.67	2.40	1.96	
O	17.0	19.0	18.0	1.00	0.236	18.00	1.47	1.04	
OA	10.0	10.0	10.0	0.00	0.000	10.00	-1.30	-1.73	
OB	9.0	8.0	9.0	0.58	0.118	8.67	-1.76	-2.19	
OF	14.0	15.0	16.0	1.00	0.236	15.00	0.43	0.00	
OM									•
OS	13.0	13.0	11.0	1.15	0.236	12.33	-0.49	-0.92	
OT									•
OX	11.0	13.0	18.0	3.61	0.827	14.00	0.09	-0.35	
OY	16.0	17.0	16.0	0.58	0.118	16.33	0.89	0.46	
P	12.0	7.0	16.0	4.51	1.120	11.67	-0.72	-1.15	
PA									•
PB	20.0	19.0	20.0	0.58	0.118	19.67	2.05	1.62	
PC									•
PD									•
PE	5.0	4.0	6.0	1.00	0.236	5.00	-3.03	-3.46	⇓
PG	12.0	10.0	11.0	1.00	0.236	11.00	-0.95	-1.39	
PM	9.0	9.0	12.0	1.73	0.354	10.00	-1.30	-1.73	
PP									•
PQ	10.0	10.0	9.0	0.58	0.118	9.67	-1.42	-1.85	
PR	20.0	20.0	18.0	1.15	0.236	19.33	1.93	1.50	
PT	8.0	11.0	13.0	2.52	0.591	10.67	-1.07	-1.50	
PV	16.0	17.0	18.0	1.00	0.236	17.00	1.13	0.69	
Q	12.0	13.0	14.0	1.00	0.236	13.00	-0.26	-0.69	
QA	12.0	14.0	13.0	1.00	0.236	13.00	-0.26	-0.69	
QB	8.0	10.0	9.0	1.00	0.236	9.00	-1.65	-2.08	
QC	12.0	9.0	12.0	1.73	0.354	11.00	-0.95	-1.39	
QI	9.0	7.0	8.0	1.00	0.236	8.00	-1.99	-2.42	
QJ	13.0	16.0	15.0	1.53	0.354	14.67	0.32	-0.12	
QK									•
QM	4.0	5.0	5.0	0.58	0.118	4.67	-3.15	-3.58	⇓
QP	17.0	17.0	14.0	1.73	0.354	16.00	0.78	0.35	
QQ	11.0	12.0	12.0	0.58	0.118	11.67	-0.72	-1.15	
QT	13.0	13.0	14.0	0.58	0.118	13.33	-0.15	-0.58	
QU	20.0	24.0	28.0	4.00	0.945	24.00	3.55	3.12	⇑
QW	32.0	37.0	31.0	3.21	0.709	33.33	6.78	6.35	×
QX	11.0	9.0	9.0	1.15	0.236	9.67	-1.42	-1.85	
QZ	12.0	12.0	12.0	0.00	0.000	12.00	-0.61	-1.04	
R	16.0	19.0	14.0	2.52	0.591	16.33	0.89	0.46	
RB	9.0	11.0	9.0	1.15	0.236	9.67	-1.42	-1.85	
RC	7.0	10.0	6.0	2.08	0.473	7.67	-2.11	-2.54	
RD									•

TAG SYMBOLS

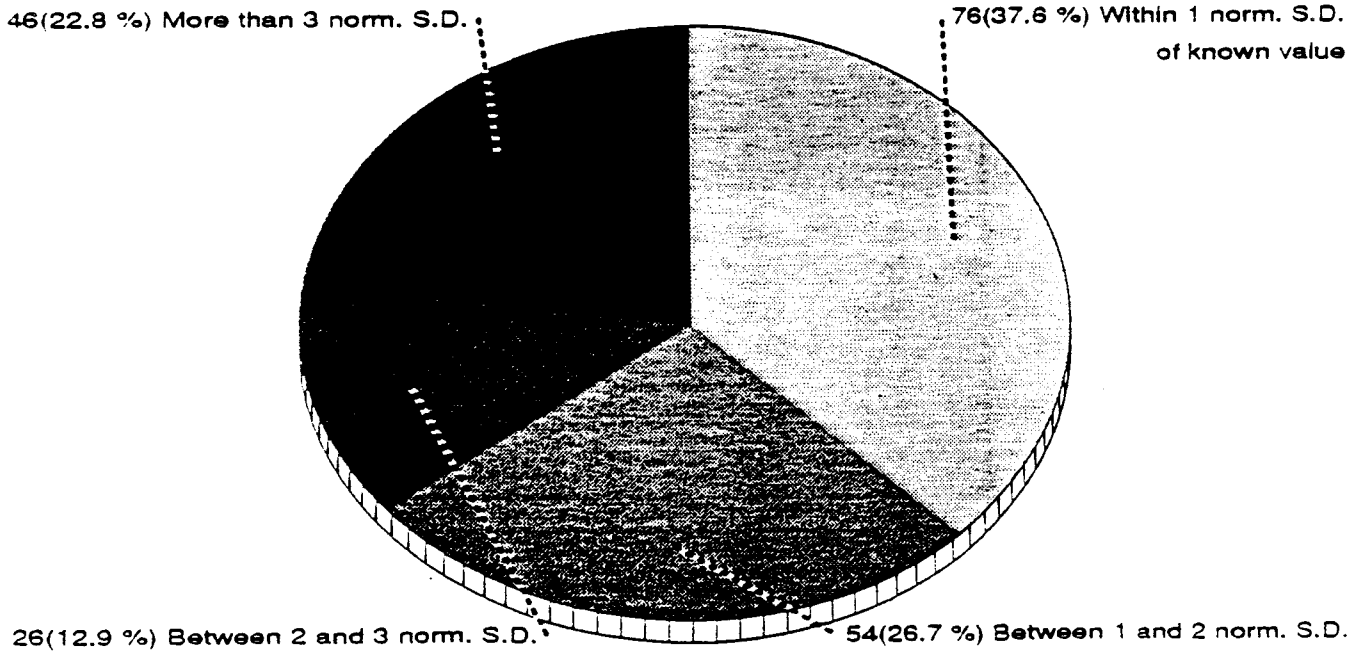
• ≡ No data submitted
∅ ≡ Insufficient data
× ≡ Determined to be an outlier
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Gross Beta Statistical Summary 253 Participants

The known value of this nuclide is **62.0 pCi/l** with an expected precision of **10.0**; the control limits are 44.7 to 79.3; the warning regions are 44.7 to 50.4 and 73.6 to 79.3



Statistic	Respondents	Non-outliers
Mean	56.86	**Grand Avg 56.14**
Std. Dev.	15.85	14.15
Variance	251.07	200.24
% Coef. of Var.	27.87	25.21
% deviation of mean from known value	-8.29	-9.45
Norm. dev. of mean from known value	-0.32	-0.41
Median	57.67	57.67
% deviation of median from known value	-6.99	-6.99
Norm. dev. of median from known value	-0.27	-0.31



Gross Beta

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
NJ									•
NK	58.0	58.0	61.0	1.73	0.177	59.00	0.50	-0.52	
NO	58.0	60.0	62.0	2.00	0.236	60.00	0.67	-0.35	
NT	41.0	41.0	41.0	0.00	0.000	41.00	-2.62	-3.64	⇓
O	67.0	64.0	62.0	2.52	0.295	64.33	1.42	0.40	
OA	53.0	41.0	50.0	6.24	0.709	48.00	-1.41	-2.42	
OB	44.0	45.0	50.0	3.21	0.354	46.33	-1.70	-2.71	
OF	57.0	58.0	64.0	3.79	0.413	59.67	0.61	-0.40	
OM									•
OS	60.0	63.0	58.0	2.52	0.295	60.33	0.73	-0.29	
OT									•
OX	52.0	51.0	52.0	0.58	0.059	51.67	-0.77	-1.79	
OY	56.0	58.0	59.0	1.53	0.177	57.67	0.26	-0.75	
P	34.0	28.0	38.0	5.03	0.591	33.33	-3.95	-4.97	⇓
PA									•
PB	52.0	54.0	53.0	1.00	0.118	53.00	-0.54	-1.56	
PC									•
PD									•
PE	74.0	75.0	78.0	2.08	0.236	75.67	3.38	2.37	
PG	54.0	53.0	56.0	1.53	0.177	54.33	-0.31	-1.33	
PM	52.0	58.0	58.0	3.46	0.354	56.00	-0.02	-1.04	
PP									•
PQ	64.0	64.0	65.0	0.58	0.059	64.33	1.42	0.40	
PR	53.0	53.0	49.0	2.31	0.236	51.67	-0.77	-1.79	
PT	59.0	58.0	64.0	3.21	0.354	60.33	0.73	-0.29	
PV	42.0	42.0	45.0	1.73	0.177	43.00	-2.28	-3.29	⇓
Q	68.0	70.0	73.0	2.52	0.295	70.33	2.46	1.44	
QA	69.0	70.0	71.0	1.00	0.118	70.00	2.40	1.39	
QB	51.0	56.0	51.0	2.89	0.295	52.67	-0.60	-1.62	
QC	59.0	51.0	53.0	4.16	0.473	54.33	-0.31	-1.33	
QI	23.0	23.0	24.0	0.58	0.059	23.33	-5.68	-6.70	⇓
QJ	67.0	72.0	70.0	2.52	0.295	69.67	2.34	1.33	
QK	65.0	58.0	69.0	5.57	0.650	64.00	1.36	0.35	
QM	52.0	49.0	38.0	7.37	0.827	46.33	-1.70	-2.71	
QP	55.0	51.0	58.0	3.51	0.413	54.67	-0.26	-1.27	
QQ	65.0	65.0	63.0	1.15	0.118	64.33	1.42	0.40	
QT	59.0	57.0	59.0	1.15	0.118	58.33	0.38	-0.64	
QU	55.0	60.0	63.0	4.04	0.473	59.33	0.55	-0.46	
QW	62.0	57.0	54.0	4.04	0.473	57.67	0.26	-0.75	
QX	61.0	61.0	60.0	0.58	0.059	60.67	0.78	-0.23	
QZ	81.0	80.0	79.0	1.00	0.118	80.00	4.13	3.12	⇑
R	65.0	68.0	62.0	3.00	0.354	65.00	1.53	0.52	
RB	59.0	51.0	51.0	4.62	0.473	53.67	-0.43	-1.44	
RC	67.0	65.0	62.0	2.52	0.295	64.67	1.48	0.46	
RD									•

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

× ≡ Determined to be an outlier

⇑ ≡ Above control limit

⇓ ≡ Below control limit

Battelle
Pacific Northwest Laboratories
Battelle Boulevard
P.O. Box 999
Richland, Washington 99352
Telephone (509) 372-0398

November 17, 1993

Dr. Larry C. Butler, Supervisor
Performance Evaluation Program
Quality Assurance Research Branch (QAB)
Quality Assurance and Methods Development Division (QAD)
Environmental Protection Agency
944 East Harmon
Las Vegas, Nevada 89119

Dear Dr. Butler:

REQUEST FOR INVESTIGATION OF REMEDIAL PREDICTION INTERVALS

Battelle, Pacific Northwest Laboratories Analytical Chemistry Laboratory (ACL) submitted results to you for Remedial QB3/FY93. The ACL obtained a score of 71.4% for this study. As you are aware, scores below 75% are considered unacceptable.

The ACL conducted a thorough investigation into performance for the Remedial study and was unable to detect any errors. I would therefore ask that you reevaluate the prediction intervals stated for this study to further ensure their adequacy.

This request is based upon the following information:

1. The ACL prepared and analyzed the Remedials along with the QB4/FY93 PEs. The QB4/FY93 PEs scored 85.5% (acceptable) with only silver and lead in Waters 1 and 2 showing a potential laboratory problem. These analytes did not fail in the Remedials; however, completely different analytes did fail. The two studies, therefore, conflict with each other.

2. The ACL prepared all samples in duplicate. The ACL also prepared all samples by two different techniques: one, the CLP beaker digestion; the other, a closed-vessel digestion using the same acid additions as the beaker. Furthermore, the ACL ran all samples on two different ICP systems. All Remedial Water 2 results obtained (8 data points) failed for Al, Cr, Co, Mn and V, which is quite unusual. Reanalysis by GFAA for Ag, Pb, Sb and As were performed, and results indicated that the laboratory had a correctable problem with As and Ag; Sb and Pb are still under investigation. None of these analytes showed problems in the Remedial Waters; again this is unusual.

—/—

Battelle

3. The ACL compared its results to that obtained by the Westinghouse Hanford Company 222S Laboratory. Both laboratories show similar low bias on Remedial Water 2 for Cr, Co, Mn and V. Both laboratories also show unusually low bias for Hg in Water 1.

Investigation of 1 through 3 above indicates that a problem exists with Remedial Water 2 and potentially with Hg in Water 1. Considering that multiple samples, multiple preparative procedures and multiple instruments were used, the high failure rate seems suspect.

The ACL would appreciate your reevaluation of the prediction intervals given for this remedial study. It is felt that an error may have occurred.

If you have any questions regarding the above or would like more information, please contact me at your earliest convenience at (509) 372-0398. I look forward to hearing from you regarding this issue.

Sincerely,

Kristine J. Kuhl-Klinger

Kristine J. Kuhl-Klinger
Group Manager
Analytical Chemistry Laboratory

KJK:pl

REMEDIAL
INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 3 FY 93

LABORATORY NAME: Battelle Pacific Northwest (WA)
PERFORMANCE LEVEL: Acceptable - Corrective Action Mandatory
LABORATORY RANK: Above = 0 Same = 0 Below = 1

% Score: 83.4
REPORT DATE: 12/03/93
MATRIX: SOIL

ELEMENT	PREDICTION INTERVAL LOWER	PREDICTION INTERVAL UPPER	LABORATORY REPORTED VALUE	Q	#LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	2560	10280	7350							2
ANTIMONY	12	30.5	11.6	X						2
ARSENIC	880	1025	1037	X						2
BARIUM	40	1194	747							2
BERYLLIUM	c	c	0.20	U						2
CADMIUM	c	c	120							2
CALCIUM	29786	37351	33200							2
CHROMIUM	67.8	104	91.3							2
COBALT	13.9	28	20.3							2
COPPER	3110	5120	3960							2
IRON	38351	58301	47600							2
LEAD	[illegible]	[illegible]	[illegible]							2
MAGNESIUM	15150	18361	16600							2
MANGANESE	2675	3284	3040							2
MERCURY	0.3	1.2	0.75							2
NICKEL	20.7	31.1	25.9							2
POTASSIUM	1630	4870	3530							2
SELENIUM	1	3.9	2.7							2
SILVER	5.5	16.6	10.4							2
SODIUM	c	c	2530							2
THALLIUM	c	c	2.1							2
VANADIUM	630	964	795							2
ZINC	4631	6632	5900							2

PROGRAM DATA

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 2
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
SOIL:

OF DUPLICATES OUT: 0
SOIL:

REMEDIAL
INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 3 FY 93

LABORATORY NAME: Battelle Pacific Northwest (WA)
PERFORMANCE LEVEL: Acceptable - Corrective Action Mandatory
LABORATORY RANK: Above = 0 Same = 0 Below = 1

% Score: 83.4
REPORT DATE: 12/03/93
MATRIX: WATER1

ELEMENT	PREDICTION INTERVAL LOWER	PREDICTION INTERVAL UPPER	LABORATORY REPORTED VALUE	Q		PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	530	575	628		X						2
ANTIMONY	301	372	333								2
ARSENIC	53.4	70	62.3								2
BARIUM	c	c	5.0	U							2
BERYLLIUM	58	68.9	65.7								2
CADMIUM	27.3	33.4	28.2								2
CALCIUM	26550	31450	28700								2
CHROMIUM	69	87.8	83.6								2
COBALT	247	296	277								2
[illegible]PER	232	271	248								2
[illegible]N	412	500	461								2
LEAD	[illegible]	[illegible]	[illegible]								2
MAGNESIUM	19600	22800	20600								2
MANGANESE	c	c	5.0	U							2
MERCURY	5.1	9.7	4.3		X						2
NICKEL	247	308	279								2
POTASSIUM	c	c	500	U							2
SELENIUM	47.4	67.0	59.2								2
SILVER	44.9	55.3	47.4								2
SODIUM	d	d	50.0	U							2
THALLIUM	79.5	111	104								2
VANADIUM	c	c	15.0	U							2
ZINC	223	278	241								2

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 2
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER:

[illegible] OF DUPLICATES OUT: 0
[illegible]TER:

REMEDIAL

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 3 FY 93

LABORATORY NAME: Battelle Pacific Northwest (WA)
PERFORMANCE LEVEL: Acceptable - Corrective Action Mandatory
LABORATORY RANK: Above = 0 Same = 0 Below = 1

%-Score: 83.4
REPORT DATE: 12/03/93
MATRIX: WATER2

ELEMENT	PREDICTION INTERVAL LOWER	PREDICTION INTERVAL UPPER	LABORATORY REPORTED VALUE	Q	PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	c	c	716							2
ANTIMONY	310	544	367							2
ARSENIC	30.5	52.1	40.4							2
BARIUM	839	1290	997							2
BERYLLIUM	34.5	55.7	42.4							2
CADMIUM	18	33.3	22.6							2
CALCIUM	c	c	50.0	U						2
CHROMIUM	58.1	100	73.6							2
COBALT	262	410	311							2
COPPER	c	c	5.0	U						2
IRON	619	889	719							2
LEAD	[illegible]	[illegible]	[illegible]							[illegible]
MAGNESIUM	c	c	50.0	U						2
MANGANESE	106	154	122							2
MERCURY	5.9	9.4	4.9	X						2
NICKEL	c	c	10.0	U						2
POTASSIUM	15900	26100	20600							2
SELENIUM	23.9	48.2	36.4							2
SILVER	45.9	76.4	44.4	X						2
SODIUM	20450	31051	23900							2
THALLIUM	c	c	0.33	U						2
VANADIUM	387	585	439							2
ZINC	c	c	10.0	U						2

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 2
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER:

OF DUPLICATES OUT: 0
WATER:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY-LAS VEGAS
P.O. BOX 93478
LAS VEGAS, NEVADA 89193-3478
702/798-2100

RECEIVED
APR 4 - 1994
KJ KUHL - KLINGER

MAR 30 1994

Mr. K. Kuhl-Klinger
Battelle Pacific Northwest
6th Street Warehouse/Bldg. 329
Richland, WA 99352

Dear Mr. Kuhl-Klinger:

The Individual Laboratory Summary Report (ILSR) summarizing your laboratory's results for the most recent Quarterly Blind (QB) Performance Evaluation (PE) Sample (QB2, FY94) is enclosed for your information and review. Please review your score as listed on the ILSR to determine the actions which are required to correct any deficiencies. The wording of these Performance Categories below was established by your contract and the Administrative Project Officers of the National Program Office for CLP Contracts:

- Acceptable, No Response Required (Score greater than or equal to 90 percent):

  Data meets most or all of the scoring criteria. No response is required.

- Acceptable, Response Explaining Deficiency(ies) Required (Score greater than or equal to 75 percent but less than 90 percent):

  Deficiencies exist in the Contractor's performance.

Within 14 days of receipt of this notification from EPA, the Contractor shall describe the deficiency(ies) and the action(s) taken to correct the deficiency(ies) in a letter to the Administrative Project Officer, the Technical Project Officer and the Environmental Monitoring Systems Laboratory-Las Vegas (EMSL-LV)

- Unacceptable, Response Explaining Deficiency(ies) Required (Score less than 75 percent):

  Deficiencies exist in the Contractor's performance to the extent that the National Program Office has determined that the Contractor has not demonstrated the capability to meet the contract requirements.

Within 14 days of receipt of notification from EPA, the Contractor shall describe the deficiency(ies) and the action)s) taken to correct the deficiency(ies) in a letter to the Administrative Project Officer, the Technical Project Officer, and EMSL-LV.

The Contractor shall be notified by the Technical Project Officer or Administrative Project Officer concerning the remedy for their unacceptable performance. A Contractor may expect, but the Agency is not limited to, the following actions: reduction of the number of samples sent under the contract, suspension of sample shipment to the Contractor, an On-Site laboratory evaluation, a GC/MS tape audit, a data package audit, a remedial laboratory evaluation sample, and/or a contract sanction, such as a Cure Notice.

Note: A Contractor's prompt response demonstrating that corrective actions have been taken to ensure the Contractor's capability to meet contract requirements may facilitate continuation of full sample delivery.

Your initial response, if any, to this letter should be to your Regional EPA Technical Project Officer for your contract.

Sincerely,

Larry C. Butler
Research Chemist
Quality Assurance Research Branch, QAD

Enclosure
Individual Laboratory Summary Report

REGION 10
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 2 FY 94

LABORATORY: Battelle Pacific NW (WA)
PERFORMANCE: ACCEPTABLE - Response Explaining Deficiency(ies) Required
RANK: Above = 5 Same = 1 Below = 0

% SCORE: 77.7
REPORT DATE: 03/23/94
MATRIX: WATER

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-QNT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS
TCL VOLATILE										
1,1-DICHLOROETHENE	NU	NU	NU	NU	4		0	3	22	25
DIBROMOCHLOROMETHANE	72	87	70	89	65	X	2	0	25	25
2-HEXANONE	280	400	260	410	142	X	6	0	25	25
1,1,2,2-TETRACHLOROETHANE	27	34	26	35	23	X	2	0	25	25
STYRENE	91	100	89	100	93		3	0	25	25
XYLENES (TOTAL)	140	170	140	170	155		0	0	25	25
TCL SEMIVOLATILE										
BIS(2-CHLOROETHYL)ETHER	15	22	13	24	17		0	0	25	25
2-CHLOROPHENOL	20	28	19	32	23		0	0	25	25
1,3-DICHLOROBENZENE	22	34	20	42	29		1	0	25	25
NITROBENZENE	42	59	40	62	44		1	0	25	25
2-NITROPHENOL	28	43	26	45	31		0	0	25	25
2,4-DIMETHYLPHENOL	42	75	37	80	53		1	0	25	25
2,4,5-TRICHLOROPHENOL	65	89	62	100	69		1	0	25	25
DIMETHYL PHTHALATE	62	94	57	98	85		1	0	25	25
ACENAPHTHYLENE	26	37	25	39	30		4	0	25	25
2,4-DINITROPHENOL	60	120	49	140	94		2	0	25	25
4,6-DINITRO-2-METHYLPHENOL	26	38	25	44	27		0	0	25	25
4-BROMOPHENYL PHENYL ETHER	24	37	22	39	30		1	0	25	25
PHENANTHRENE	12	16	12	17	14		2	0	25	25
PYRENE	66	130	56	160	100		0	0	25	25
BENZO(K)FLUORANTHENE	11	14	10	15	12		1	2	23	25
INDENO(1,2,3-CD)PYRENE	11	21	10	23	10	S	0	0	25	25
TCL PESTICIDES										
DELTA-BHC	0.098	0.15	0.09	0.16	0.11		1	0	25	25
HEPTACHLOR	0.098	0.15	0.09	0.16	0.11		2	0	25	25
ALDRIN	0.25	0.38	0.24	0.45	0.24	S	0	0	25	25
HEPTACHLOR EPOXIDE	0.26	0.35	0.25	0.37	0.24	X	2	1	24	25
4,4'-DDE	0.28	0.41	0.26	0.43	0.28		2	0	25	25
ENDOSULFAN SULFATE	0.42	0.61	0.39	0.64	0.42		3	0	25	25
AROCLOR-1260	1.3	1.8	1.2	2.2	1	X	2	0	25	25
NON-TCL VOLATILE										
ACETONITRILE					0	NR		12	13	25
NON-TCL SEMIVOLATILE										
BENZOIC ACID					43			2	23	25
DIBENZOTHIOPHENE					12			0	25	25

OF TCL COMPOUNDS NOT-IDENTIFIED: 0
OF TCL COMPOUNDS MIS-QUANTIFIED: 5
OF TCL CONTAMINANTS: 0

OF NON-TCL COMPOUNDS NOT-IDENTIFIED: 0
OF NON-TCL CONTAMINANTS: 0

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY-LAS VEGAS
P.O. BOX 93478
LAS VEGAS, NEVADA 89193-3478
702/798-2100

Battele Pacfic Northwest
Ms. Kristine Kuhl-Klinger
6th Street Warehouse
Building 325
Richland, WA 99352

Dear Ms. Kuhl-Klinger:

The Individual Laboratory Summary Report (ILSR) summarizing your laboratory's results for the most recent Quarterly Blind (QB) Performance Evaluation (PE) Sample (QB2, FY94) is enclosed for your information and review. Please review your score as listed on the ILSR to determine the actions which are required to correct any deficiencies. The wording of these Performance Categories below was established by your contract and the Administrative Project Officers of the National Program Office for CLP laboratories:

- Acceptable, No Response Required (Score greater than or equal to 90 percent):

  Data meets most or all of the scoring criteria. No response is required.

- Acceptable, Response Explaining Deficiency(ies) Required (Score greater than or equal to 75 percent but less than 90 percent):

  Deficiencies exist in the Contractor's performance.

Within 14 days of receipt of this notification from EPA, the Contractor shall describe the deficiency(ies) and the action(s) taken to correct the deficiency(ies) in a letter to the Administrative Project Officer, the Technical Project Officer and the Environmental Monitoring Systems Laboratory-Las Vegas (EMSL-LV)

- Unacceptable, Response Explaining Deficiency(ies) Required (Score less than 75 percent):

Deficiencies exist in the Contractor's performance to the extent that the National Program Office has determined that the Contractor has not demonstrated the capability to meet the contract requirements.

Within 14 days of receipt of notification from EPA, the Contractor shall describe the deficiency(ies) and the action)s) taken to correct the deficiency(ies) in a letter to the Administrative Project Officer, the Technical Project Officer, and EMSL-LV.

The Contractor shall be notified by the Technical Project Officer or Administrative Project Officer concerning the remedy for their unacceptable performance. A Contractor may expect, but the Agency is not limited to, the following actions: reduction of the number of samples sent under the contract, suspension of sample shipment to the Contractor, an On-Site laboratory evaluation, a data package audit, a remedial laboratory evaluation sample, and/or a contract sanction, such as a Cure Notice.

Note: A Contractor's prompt response demonstrating that corrective actions have been taken to ensure the Contractor's capability to meet contract requirements may facilitate continuation of full sample delivery.

Your initial response, if any, to this letter should be to your Regional EPA Technical Project Officer for your contract.

Sincerely,

Larry C. Butler
Research Chemist
Quality Assurance Research Branch, QAD

Enclosures

Individual Laboratory Summary Report

Sample # 94-03371-03373

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 2 FY 94

LABORATORY NAME: Battelle Pacific NW (WA) [P1] (BATPNW)
PERFORMANCE LEVEL: ACCEPTABLE - Corrective Actions Necessary
LABORATORY RANK: Above = 21 Same = 0 Below = 5

% Score: 85.7
REPORT DATE: 3/28/1994
MATRIX: SOIL

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q		PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	627	2670	406	2890	2628			0	1	0	1	3	27
ANTIMONY	c	c	c	c	20.7		#	0	0	9	15	2	27
ARSENIC	321	475	305	491	417			0	3	0	0	1	27
BARIUM	689	1330	619	1400	1288			0	1	0	11	2	27
BERYLLIUM	d	d	d	d	1	U		0	0	0	0	0	27
CADMIUM	126	176	120	182	136			0	0	0	0	0	27
CALCIUM	25900	31700	25900	31700	32880		X	0	6	0	0	0	27
CHROMIUM	2.0	35.3	2.0	39.8	4	U	X	3	2	0	1	0	27
CO[illegible]T	d	d	d	d	5	B		0	0	0	1	0	27
C[illegible]	208	254	204	258	243			0	1	0	0	0	27
IRON	82401	113001	79100	116000	107700			0	0	0	0	0	27
LEAD	12000	15900	11600	16300	15410			0	0	0	0	0	27
MAGNESIUM	14500	17700	14200	18000	17550			0	2	0	0	0	27
MANGANESE	108000	154001	103001	158000	138800			0	2	0	0	1	27
MERCURY	0.16	0.54	0.12	0.58	0.31			0	0	0	0	0	27
NICKEL	8.0	17.8	8.0	19.8	4	U		2	1	0	0	1	27
POTASSIUM	1000.0	1580	1000.0	1660	1500			1	2	0	0	0	27
SELENIUM	1.0	5.2	1.0	5.8	5.35		S	0	2	0	12	0	27
SILVER	4.8	43.6	2.0	47.8	18.4			0	0	0	1	0	27
SODIUM	d	d	d	d	470			0	0	1	0	0	27
THALLIUM	2.0	5.7	2.0	6.1	3.76			0	0	0	7	0	27
VANADIUM	10.0	20.0	10.0	22.4	15			0	3	0	0	0	27
ZINC	21000	28900	20100	29700	27500			0	1	0	0	0	27

OF ELEMENTS NOT-IDENTIFIED: 1
OF ELEMENTS MIS-QUANTIFIED: 1
OF FALSE POSITIVES: 1

OF MATRIX SPIKES OUT: 0
SOIL :

[illegible]UPLICATES OUT: 0
SOIL :

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 2 FY 94

LABORATORY NAME: Battelle Pacific NW (WA) [P1] (BATPNW)
PERFORMANCE LEVEL: ACCEPTABLE - Corrective Actions Necessary
LABORATORY RANK: Above = 21 Same = 0 Below = 5

% Score: 85.7
REPORT DATE: 3/28/1994
MATRIX: WATER 1

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q	PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	810	990	806	995	830.8		0	1	0	0	0	27
ANTIMONY	314	384	309	389	295.7	X	0	4	0	0	0	27
ARSENIC	35.6	46.3	34.4	47.5	45.8		0	5	0	2	1	27
BARIUM	789	964	789	964	851.3		0	0	0	0	0	27
BERYLLIUM	23.3	28.5	23.3	28.5	24.2		0	2	0	0	0	27
CADMIUM	35.2	46.9	34.0	48.2	36.7		0	0	0	0	0	27
CALCIUM	11400	14000	11400	14000	12170		0	0	0	0	0	27
[illegible]MIUM	45.8	58.0	44.5	59.3	48.2		0	1	0	0	0	27
[illegible]T	183	224	183	224	197		0	0	0	0	0	27
COPPER	128	157	128	157	136.2		0	0	0	0	0	27
IRON	516	631	516	632	561.4		0	0	0	0	0	27
LEAD	25.2	36.3	24.0	37.5	27.3		0	0	0	0	1	27
MAGNESIUM	13500	16500	13500	16500	14310		0	1	0	0	0	27
MANGANESE	78.1	95.4	78.1	95.4	85.8		0	0	0	0	0	27
MERCURY	0.75	1.2	0.71	1.2	0.87		0	2	0	0	0	27
NICKEL	87.3	113	84.6	115	94.9		0	0	0	0	0	27
POTASSIUM	17200	21100	17200	21100	18350		0	1	0	0	0	27
SELENIUM	24.7	34.0	23.7	35.0	31		0	2	0	2	0	27
SILVER	55.3	74.6	53.2	76.7	61.7		0	1	0	0	0	27
SODIUM	20600	25200	20600	25200	22370		0	0	0	0	0	27
THALLIUM	36.2	46.8	35.0	48.0	44.1		0	2	0	1	0	27
VANADIUM	197	241	197	241	214.8		0	0	0	0	0	27
ZINC	83.1	109	80.3	112	95.6		0	1	0	0	1	27

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 1
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER :

OF DUPLICATES OUT: 0
WATER :

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 2 FY 94

LABORATORY NAME: Battelle Pacific NW (WA) [P1] (BATPNW)
PERFORMANCE LEVEL: ACCEPTABLE - Corrective Actions Necessary
LABORATORY RANK: Above = 21 Same = 0 Below = 5

% Score: 85.7
REPORT DATE: 3/28/1994
MATRIX: WATER 2

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q	PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	537	740	515	762	583.4		0	1	0	0	0	27
ANTIMONY	288	352	288	352	275.5	X	0	3	0	0	0	27
ARSENIC	185	231	180	236	208		0	3	0	2	1	27
BARIUM	661	808	661	808	717.7		0	0	0	0	0	27
BERYLLIUM	46.5	56.8	46.5	56.8	49.3		0	2	0	0	0	27
CADMIUM	41.7	54.4	40.4	55.8	45.4		0	0	0	0	0	27
CALCIUM	12600	15400	12500	15500	13530		0	0	0	0	0	27
CHROMIUM	51.0	64.9	49.5	66.4	54.3		0	2	0	0	0	27
[illegible]LT	136	166	133	170	146.5		0	0	0	0	0	27
[illegible]PER	198	242	198	242	210.4		0	0	0	0	0	27
IRON	440	538	440	538	482.2		0	3	0	0	0	27
LEAD	23.8	31.5	23.0	32.4	25.2		0	3	0	0	1	27
MAGNESIUM	9990	12200	9990	12200	10590		0	1	0	0	0	27
MANGANESE	39.8	48.6	39.3	49.2	43.7		0	0	0	0	0	27
MERCURY	4.5	7.6	4.2	8.0	5.27		0	3	0	0	0	27
NICKEL	176	215	172	219	180		0	1	0	0	0	27
POTASSIUM	d	d	d	d	2429		0	0	0	0	0	27
SELENIUM	33.8	52.3	31.8	54.3	44		0	1	0	2	0	27
SILVER	10.0	15.4	10.0	16.8	2.5		0	0	0	0	0	27
SODIUM	d	d	d	d	2202		0	0	0	0	0	27
THALLIUM	45.0	59.7	43.4	61.3	52.5		0	0	0	1	0	27
VANADIUM	118	144	118	144	128.9		0	0	0	0	0	27
ZINC	177	226	172	232	189.2		0	0	0	0	1	27

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 1
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER :

[illegible]OF DUPLICATES OUT: 0
WATER :

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP-31

LABORATORY: WA184

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ALUMINUM	1	679	661	530- 784	579- 755	ACCEPTABLE
	2	139	140	107- 192	117- 173	ACCEPTABLE
ARSENIC	1	469	492	406- 537	430- 565	ACCEPTABLE
	2	69.4	74.3	56.7- 92.9	61.2- 88.4	ACCEPTABLE
BERYLLIUM	1	447	461	382- 533	401- 534	ACCEPTABLE
	2	231	240	196- 278	206- 265	ACCEPTABLE
CADMIUM	1	168	165	136- 194	145- 187	ACCEPTABLE
	2	60.0	61.0	50.6- 72.0	53.5- 69.4	ACCEPTABLE
COBALT	1	865	860	775- 980	801- 954	ACCEPTABLE
	2	52.4	53.8	45.4- 61.9	47.5- 59.8	ACCEPTABLE
CHROMIUM	1	717	730	604- 843	634- 813	ACCEPTABLE
	2	22.1	23.4	17.4- 29.0	18.9- 27.6	ACCEPTABLE
COPPER	1	578	601	524- 657	541- 640	ACCEPTABLE
	2	18.5	18.7	13.6- 24.1	14.9- 22.8	ACCEPTABLE
IRON	1	13	58.0	43.5- 72.5	47.2- 68.8	NOT ACCEPTABLE
	2	1050	1100	950- 1270	991- 1230	ACCEPTABLE
MERCURY	1	10.0	9.38	7.31- 11.9	7.69- 11.3	ACCEPTABLE
	2	7.0	6.67	5.00- 8.48	5.44- 8.04	ACCEPTABLE
MANGANESE	1	590	600	536- 660	551- 644	ACCEPTABLE
	2	69.0	73.5	64.0- 82.7	66.4- 80.4	ACCEPTABLE
NICKEL	1	860	860	766- 952	789- 926	ACCEPTABLE
	2	335	340	296- 383	307- 372	ACCEPTABLE
LEAD	1	1270	1200	1060- 1350	1100- 1310	ACCEPTABLE
	2	756	738	636- 833	661- 809	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

$50 - \frac{3}{50}(100) = 94\%$

3 out

3 check for Error

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA104

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
SELENIUM	1	217	228	156- 277	171- 262	ACCEPTABLE
	2	363	387	265- 486	296- 459	ACCEPTABLE
VANADIUM	1	924	940	832- 1040	860- 1020	ACCEPTABLE
	2	165	170	146- 186	151- 183	ACCEPTABLE
ZINC	1	798	842	737- 947	763- 921	ACCEPTABLE
	2	42.8	46.3	37.5- 56.1	39.8- 53.7	ACCEPTABLE
ANTIMONY	3	92.1	94.5	56.4- 119	64.3- 111	ACCEPTABLE
	4	209	189	108- 244	125- 227	ACCEPTABLE
SILVER	3	75.0	73.9	60.6- 86.8	63.9- 83.5	ACCEPTABLE
	4	26.1	25.8	21.1- 30.4	22.2- 29.2	ACCEPTABLE
THALLIUM	3	67.5	62.8	47.0- 77.3	50.8- 73.4	ACCEPTABLE
	4	540	539	421- 643	450- 615	ACCEPTABLE
MOLYBDENUM	3	22.4	24.5	18.6- 30.6	20.2- 29.0	ACCEPTABLE
	4	77.2	81.6	64.4- 95.0	68.3- 91.1	ACCEPTABLE
STRONTIUM	3	19.0	19.1	14.4- 23.3	15.5- 22.1	ACCEPTABLE
	4	72.1	73.4	62.0- 84.5	64.9- 81.5	ACCEPTABLE
TITANIUM	3	113	130	109- 151	114- 145	CHECK FOR ERROR
	4	39.4	43.0	34.0- 53.4	36.5- 50.9	ACCEPTABLE
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
CALCIUM	1	113	110	87.4- 126	92.2- 121	ACCEPTABLE
	2	6.33	7.00	5.95- 6.19	6.23- 7.91	ACCEPTABLE
MAGNESIUM	1	0.915	0.960	0.771- 1.18	0.822- 1.13	ACCEPTABLE
	2	8.38	9.70	6.38- 11.0	8.71- 10.6	CHECK FOR ERROR

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA184

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
SODIUM	1	55.6	61.7	56.2- 67.8	57.6- 66.3	NOT ACCEPTABLE
	2	23.4	26.3	23.6- 29.2	24.3- 28.5	NOT ACCEPTABLE
POTASSIUM	1	6.41	7.50	6.39- 8.81	6.70- 8.50	CHECK FOR ERROR
	2	38.4	40.0	34.5- 45.6	35.9- 44.2	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/27/

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA015

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ALUMINUM	1	689	681	550- 784	579- 755	ACCEPTABLE
	2	145	140	107- 132	117- 173	ACCEPTABLE
ARSENIC	1	486	492	408- 587	430- 565	ACCEPTABLE
	2	74.8	74.3	56.7- 92.9	61.2- 88.4	ACCEPTABLE
BERYLLIUM	1	442	461	382- 533	401- 514	ACCEPTABLE
	2	228	240	198- 278	208- 268	ACCEPTABLE
CADMIUM	1	167	165	138- 194	145- 187	ACCEPTABLE
	2	66.2	61.0	50.8- 72.0	53.5- 69.4	ACCEPTABLE
COBALT	1	911	880	775- 980	801- 954	ACCEPTABLE
	2	56.8	53.8	45.4- 61.9	47.5- 59.8	ACCEPTABLE
CHROMIUM	1	721	730	604- 843	634- 813	ACCEPTABLE
	2	24.2	23.4	17.4- 29.0	18.9- 27.6	ACCEPTABLE
COPPER	1	577	601	524- 657	541- 640	ACCEPTABLE
	2	17.5	18.7	13.6- 24.1	14.9- 22.6	ACCEPTABLE
IRON	1	55.3	58.0	43.5- 72.5	47.2- 68.8	ACCEPTABLE
	2	1091	1100	950- 1270	991- 1230	ACCEPTABLE
MERCURY	1	9.02	9.38	7.31- 11.9	7.89- 11.3	ACCEPTABLE
	2	6.75	6.67	5.00- 8.48	5.44- 8.04	ACCEPTABLE
MANGANESE	1	592	600	536- 660	551- 644	ACCEPTABLE
	2	73.0	73.5	64.0- 82.7	66.4- 80.4	ACCEPTABLE
NICKEL	1	866	860	766- 952	789- 928	ACCEPTABLE
	2	344	340	296- 383	307- 372	ACCEPTABLE
LEAD	1	1170	1200	1060- 1350	1100- 1310	ACCEPTABLE
	2	743	738	636- 833	661- 809	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

PERFORMANCE EVALUATION REPORT DATE: 12/27/9

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA015

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
SELENIUM	1	221	228	156- 277	171- 262	ACCEPTABL
	2	357	387	268- 486	296- 459	ACCEPTABL
VANADIUM	1	936	940	832- 1040	860- 1020	ACCEPTABL
	2	171	170	146- 198	151- 183	ACCEPTABL
ZINC	1	875	842	737- 947	763- 921	ACCEPTABL
	2	47.0	46.3	37.5- 56.1	39.8- 53.7	ACCEPTABL
ANTIMONY	3	82.2	94.5	56.4- 119	64.3- 111	ACCEPTABL
	4	165	189	108- 244	125- 227	ACCEPTABL
SILVER	3	68.8	73.9	60.6- 86.8	63.9- 83.5	ACCEPTABL
	4	24.0	25.8	21.1- 30.4	22.2- 29.2	ACCEPTABL
THALLIUM	3	64.3	62.8	47.0- 77.3	50.8- 73.4	ACCEPTABL
	4	532	539	421- 643	450- 615	ACCEPTAB
MOLYBDENUM	3	23.2	24.5	18.6- 30.6	20.2- 29.0	ACCEPTAB
	4	78.9	81.6	64.4- 95.0	68.3- 91.1	ACCEPTAB
STRONTIUM	3	19.4	19.1	14.4- 23.3	15.5- 22.1	ACCEPTAB
	4	73.5	73.4	62.0- 84.5	64.9- 81.5	ACCEPTAB
TITANIUM	3	129	130	109- 151	114- 145	ACCEPTAB
	4	42.8	43.0	34.0- 53.4	36.5- 50.9	ACCEPTAB
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	9.36	9.50	9.19- 9.75	9.26- 9.68	ACCEPTAB
	4	4.64	4.70	4.62- 4.77	4.64- 4.75	ACCEPTAB
SPEC. COND.	1	865	899	840- 980	857- 963	ACCEPTAB
(UMHOS/CM AT 25 C)	2	390	398	368- 435	377- 427	ACCEPTAB

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA015

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANC EVALUATIO
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
CALCIUM	1	96.7	110	87.4- 126	92.2- 121	ACCEPTA
	2	7.27	7.00	5.95- 8.19	6.23- 7.91	ACCEPTA
MAGNESIUM	1	1.00	0.960	0.771- 1.18	0.822- 1.13	ACCEPTA
	2	10.2	9.70	8.38- 11.0	8.71- 10.6	ACCEPTA
SODIUM	1	65.0	61.7	56.2- 67.8	57.6- 66.3	ACCEPTA
	2	28.1	26.3	23.6- 29.2	24.3- 28.5	ACCEPTA
POTASSIUM	1	7.71	7.50	6.39- 8.81	6.70- 8.50	ACCEPTA
	2	41.5	40.0	34.5- 45.6	35.9- 44.2	ACCEPTA
CHLORIDE	1	208	199	183- 213	187- 210	ACCEPTA
	2	41.6	41.2	36.5- 45.4	37.6- 44.3	ACCEPTA
FLUORIDE	1	3.29	3.30	2.83- 3.77	2.95- 3.65	ACCEPTA
	2	0.440	0.380	0.319-0.457	0.336-0.439	CHECK FOR E
SULFATE	1	14.0	14.0	10.6- 16.8	11.5- 16.0	ACCEPTA
	2	91.8	92.0	78.1- 105	81.5- 102	ACCEPTA
NUTRIENTS IN MILLIGRAMS PER LITER:						
AMMONIA-NITROGEN	1	4.30	7.70	6.10- 9.16	6.47- 8.79	NOT ACCEPTA
	2	0.530	0.730	0.491-0.982	0.550-0.923	CHECK FOR E
NITRATE-NITROGEN	1	0.499	0.520	0.378-0.658	0.412-0.625	ACCEPTA
	2	10.4	11.0	8.84- 13.0	9.34- 12.5	ACCEPTA
ORTHOPHOSPHATE	1	0.158	0.150	0.114-0.187	0.122-0.178	ACCEPTA
	2	3.98	4.10	3.48- 4.68	3.62- 4.54	ACCEPTA

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSAR

PERFORMANCE EVALUATION REPORT DATE: 12/27/

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA015

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANC EVALUATION
DEMANDS IN MILLIGRAMS PER LITER:						
TOC	1	29.0	28.0	23.9- 32.8	25.0- 31.6	ACCEPTAB
	2	85.0	82.0	69.5- 95.3	72.8- 91.9	ACCEPTAB
PCB'S IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1254	1	1.68	1.87	0.988- 2.71	1.21- 2.49	ACCEPTAB
PCB-AROCLOR 1260	2	4.11	4.63	2.79- 5.96	3.19- 5.56	ACCEPTAB
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1016/1242	2	38.3	35.3	8.02- 46.6	13.0- 41.6	ACCEPTAB
PCB IN OIL- 1254	1	42.7	43.9	13.5- 61.8	19.8- 55.5	ACCEPTAB
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	3	6.34	6.21	4.91- 9.72	5.52- 9.11	ACCEPTAB
	4	1.28	2.21	1.07- 2.77	1.29- 2.56	CHECK FOR EF
ALDRIN	1	0.292	0.539	0.122-0.754	0.202-0.674	ACCEPTAB
	2	0.636	0.066	.0171-0.121	.0303-0.108	NOT ACCEPTAB
DIELDRIN	1	0.553	0.475	0.203-0.710	0.267-0.645	ACCEPTAB
	2	0.164	0.173	.0861-0.239	0.106-0.219	ACCEPTAB

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

PERFORMANCE EVALUATION REPORT DATE: 12/27/9

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA015

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PESTICIDES IN MICROGRAMS PER LITER:						
DDD	1	0.931	0.866	0.433- 1.15	0.524- 1.06	ACCEPTABL
	2	0.181	0.202	.0956-0.268	0.117-0.246	ACCEPTABL
DDE	1	0.455	0.539	0.235-0.756	0.301-0.690	ACCEPTABL
	2	0.147	0.173	.0788-0.236	.0989-0.216	ACCEPTABL
DDT	1	0.800	0.796	0.362- 1.06	0.450-0.972	ACCEPTABL
	2	0.127	0.142	.0570-0.216	.0772-0.196	ACCEPTABL
HEPTACHLOR	1	0.450	0.669	0.187-0.918	0.279-0.825	ACCEPTABL
	2	0.180	0.216	.0756-0.269	0.100-0.245	ACCEPTABL
HEPTACHLOR EPOXIDE	1	0.569	0.478	0.260-0.640	0.308-0.592	ACCEPTABL
	2	0.171	0.174	.0858-0.235	0.105-0.216	ACCEPTABL
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	16.6	15.1	10.2- 20.4	11.5- 19.1	ACCEPTAB
	2	59.1	55.8	36.2- 73.4	40.9- 68.7	ACCEPTABL
CHLOROFORM	1	12.0	11.8	7.85- 15.9	8.86- 14.8	ACCEPTABL
	2	64.2	64.4	38.3- 86.7	44.4- 80.6	ACCEPTABL
1,1,1 TRICHLOROETHANE	1	11.8	13.4	8.68- 18.2	9.89- 17.0	ACCEPTAB
	2	33.4	37.8	22.7- 50.0	26.2- 46.6	ACCEPTAB
TRICHLOROETHENE	1	7.17	7.57	5.10- 10.3	5.75- 9.62	ACCEPTAB
	2	61.1	62.7	38.6- 80.5	43.9- 75.2	ACCEPTAB
CARBONTETRACHLORIDE	1	14.0	16.4	10.9- 22.2	12.3- 20.8	ACCEPTAB
	2	32.8	37.1	23.0- 50.1	26.4- 46.6	ACCEPTAB
TETRACHLOROETHENE	1	7.95	9.24	6.08- 12.5	6.89- 11.7	ACCEPTAB
	2	44.1	51.3	31.2- 66.7	35.7- 62.2	ACCEPTAB

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA015

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANC EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
BROMODICHLOROMETHANE	1	9.15	10.8	7.33- 14.2	8.21- 13.3	ACCEPTABI
	2	37.6	38.1	24.9- 53.6	28.5- 50.0	ACCEPTABI
DIBROMOCHLOROMETHANE	1	9.48	13.1	8.46- 17.0	9.55- 15.9	CHECK FOR ER
	2	54.8	56.1	34.1- 80.2	39.9- 74.4	ACCEPTAB
BROMOFORM	1	10.5	14.5	7.45- 20.0	9.04- 18.4	ACCEPTABI
	2	40.6	42.3	25.5- 59.9	29.9- 55.6	ACCEPTABI
METHYLENE CHLORIDE	1	10.7	10.6	6.59- 16.1	7.79- 14.9	ACCEPTABI
	2	55.6	54.1	30.7- 76.5	36.5- 70.7	ACCEPTABI
CHLOROBENZENE	1	16.1	16.0	11.4- 20.1	12.5- 19.0	ACCEPTABI
	2	64.9	63.7	41.3- 79.8	46.2- 74.9	ACCEPTABI
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
BENZENE	1	40.7	40.1	25.7- 56.0	29.5- 52.2	ACCEPTAB
	2	8.48	8.25	5.24- 11.6	6.04- 10.8	ACCEPTABI
ETHYLBENZENE	1	58.7	66.9	36.0- 94.3	43.4- 86.9	ACCEPTABI
	2	12.5	14.0	9.26- 19.0	10.5- 17.8	ACCEPTABI
TOLUENE	1	44.7	49.2	30.2- 65.2	34.6- 60.8	ACCEPTAB
	2	8.92	9.51	6.09- 12.8	6.93- 11.9	ACCEPTAB
1,2-DICHLOROBENZENE	1	60.5	65.5	32.7- 93.9	40.5- 86.2	ACCEPTAB
	2	8.89	8.88	5.85- 11.7	6.59- 11.0	ACCEPTAB
1,3-DICHLOROBENZENE	1	44.1	47.9	29.4- 61.7	33.5- 57.6	ACCEPTAB
	2	13.7	16.6	11.6- 21.1	12.9- 19.9	ACCEPTAB
1,4-DICHLOROBENZENE	1	53.4	62.5	34.4- 85.8	41.0- 79.3	ACCEPTAB
	2	11.1	12.4	7.49- 17.8	8.79- 16.5	ACCEPTAB

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

PERFORMANCE EVALUATION REPORT DATE: 12/27/

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WA015

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANC EVALUATION
MISCELLANEOUS PARAMETERS:						
TOTAL CYANIDE	1	0.747	0.860	0.598- 1.15	0.668- 1.08	ACCEPTAB
(IN MG/L)	2	0.156	0.160	0.102-0.208	0.116-0.194	ACCEPTAB

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

K-25

PERFORMANCE EVALUATION SUMMARY SHEET

Laboratory: Martin Marietta K-25 Laboratory

PE sample	Number Acceptable	Number Analyzed	% Acceptable
DOE-EML-559	16	18	88.9
APG-January 1994	94	94	100.0
WP-31			
Metals	41	42	97.6
Inorganic/Mineral	23	28	82.1

Lab Code = NK

	EMSL-LV Acceptance Range (%)	% of EMSL-LV True Value	% of all Participating Laboratory's Grand Average
July 23, 1993			
Alpha	42.0 to 158.0	55.6	69.2
Beta	72.1 to 127.9	50.4(Low)	57.5
August 13, 1993			
Uranium	79.4 to 120.6	97.70	99.1
August 27, 1993			
Alpha	54.2 to 145.8	80.7	76.6
Beta	81.5 to 118.5	94.3	89.9
Sr-90	54.2 to 145.8	---	----
Cs-137	3.3 to 196.7	92.5	83.3
October 19, 1993			
Co-60	13.0 to 187.0	63.3	60.9
Cs-134	27.5 to 172.5	50.0	57.1
Cs-137	13.0 to 187.0	86.7	79.3
Uranium	65.6 to 134.4	100.2	105.3
October 29, 1993			
Alpha	56.5 to 143.5	33.4(Low)	45.1
Beta	42.0 to 158.0	60.0	52.9
November 12, 1993			
Ba-133	82.4 to 117.6	78.1(Low)	80.7
Co-60	71.0 to 129.0	82.2	82.9
Cs-134	85.3 to 114.7	75.1(Low)	81.5

Cs-137	78.2 to 121.8	88.2	83.7
Ru-106	82.7 to 117.3	57.9(Low)	66.4
Zn-65	82.7 to 117.3	90.7	88.9

PE Sample	EPA/CLP Score
EMSL-LV QB4 FY93	
Metals	89.5
Organic	75.5
EMSL-LV QB1 FY94	
Metals	71.2(Fail)
Organic	64.3(Fail)

Gross Alpha-Beta in Water

Performance Evaluation Study

July 23, 1993

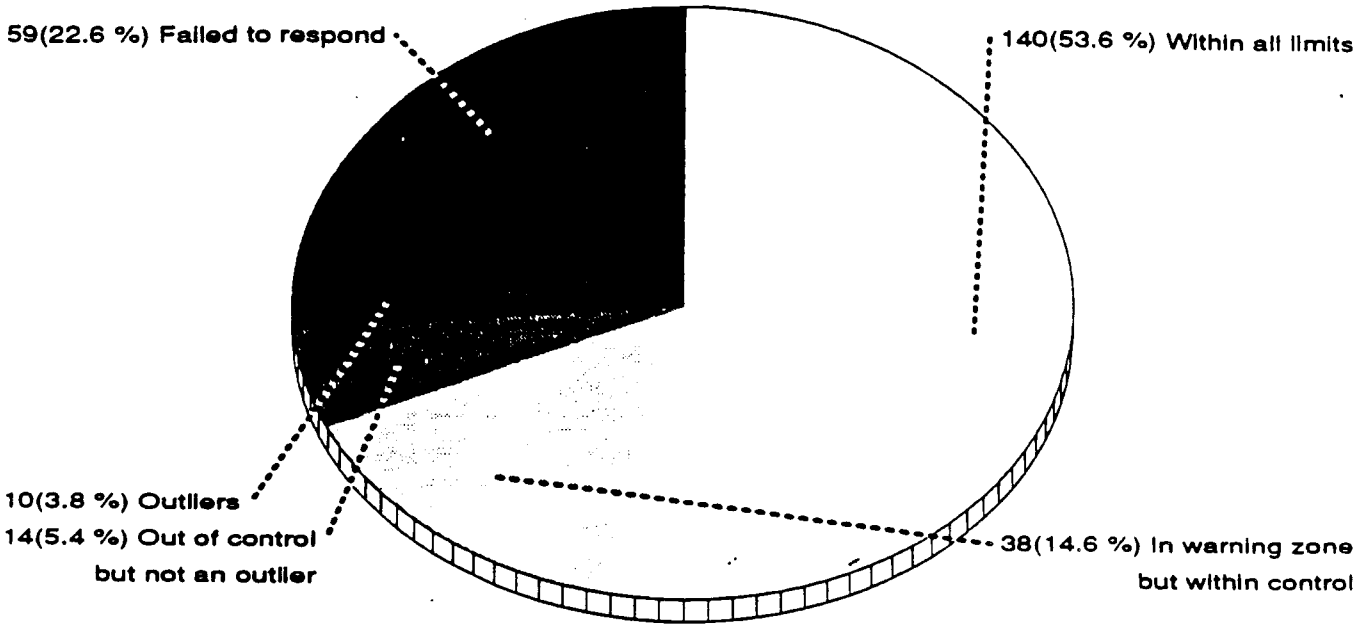
Environmental Protection Agency

Environmental Monitoring Systems Laboratory

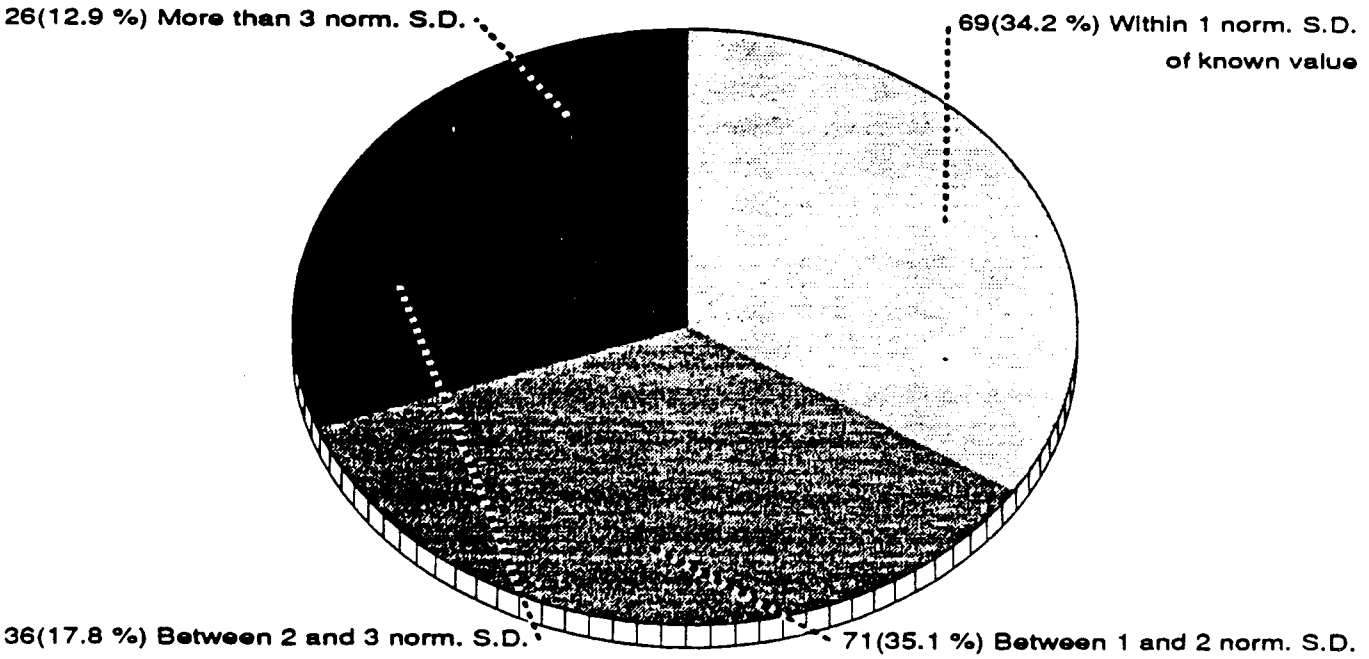
Las Vegas, Nevada

Gross Alpha Statistical Summary 261 Participants

The known value of this nuclide is **15.0 pCi/l** with an expected precision of **5.0**; the control limits are 6.3 to 23.7; the warning regions are 6.3 to 9.2 and 20.8 to 23.7



Statistic	Respondents	Non-outliers
Mean	14.84	Grand Avg 12.06
Std. Dev.	17.73	4.28
Variance	314.42	18.28
% Coef. of Var.	119.50	35.45
% deviation of mean from known value	-1.08	-19.59
Norm. dev. of mean from known value	-0.01	-0.69
Median	12.00	11.67
% deviation of median from known value	-20.00	-22.22
Norm. dev. of median from known value	-0.17	-0.78



Gross Alpha

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
NA	18.0	19.0	18.0	0.58	0.118	18.33	2.17	1.15	
NB	20.0	16.0	18.0	2.00	0.473	18.00	2.06	1.04	
NE	26.0	30.0	29.0	2.08	0.473	28.33	5.64	4.62	×
NF	9.0	10.0	8.0	1.00	0.236	9.00	-1.06	-2.08	
NG	8.0	7.0	8.0	0.58	0.118	7.67	-1.52	-2.54	
NH	10.0	11.0	14.0	2.08	0.473	11.67	-0.14	-1.15	
NI									•
NJ	10.0	10.0	10.0	0.00	0.000	10.00	-0.71	-1.73	
NK	8.0	9.0	8.0	0.58	0.118	8.33	-1.29	-2.31	
NO	17.0	18.0	19.0	1.00	0.236	18.00	2.06	1.04	
NP									•
NT	13.0	12.0	11.0	1.00	0.236	12.00	-0.02	-1.04	
O	16.0	14.0	14.0	1.15	0.236	14.67	0.90	-0.12	
OA	12.0	13.0	13.0	0.58	0.118	12.67	0.21	-0.81	
OB	15.0	12.0	11.0	2.08	0.473	12.67	0.21	-0.81	
OF	19.0	20.0	17.0	1.53	0.354	18.67	2.29	1.27	
OK									•
OM									•
OS	9.0	10.0	8.0	1.00	0.236	9.00	-1.06	-2.08	
OT									•
OX	11.0	13.0	11.0	1.15	0.236	11.67	-0.14	-1.15	
OY	14.0	14.0	13.0	0.58	0.118	13.67	0.56	-0.46	
P	15.0	24.0	16.0	4.93	1.120	18.33	2.17	1.15	
PA	6.0	7.0	5.0	1.00	0.236	6.00	-2.10	-3.12	⇓
PB	10.0	10.0	10.0	0.00	0.000	10.00	-0.71	-1.73	
PC	17.0	17.0	21.0	2.31	0.473	18.33	2.17	1.15	
PD									•
PG	10.0	13.0	11.0	1.53	0.354	11.33	-0.25	-1.27	
PM	14.0	15.0	13.0	1.00	0.236	14.00	0.67	-0.35	
PP									•
PQ	11.0	10.0	8.0	1.53	0.354	9.67	-0.83	-1.85	
PR	14.0	13.0	13.0	0.58	0.118	13.33	0.44	-0.58	
PT	10.0	8.0	8.0	1.15	0.236	8.67	-1.18	-2.19	
PV	12.0	13.0	14.0	1.00	0.236	13.00	0.33	-0.69	
Q	8.0	9.0	10.0	1.00	0.236	9.00	-1.06	-2.08	
QA	9.0	10.0	9.0	0.58	0.118	9.33	-0.94	-1.96	
QB									•
QC	12.0	15.0	12.0	1.73	0.354	13.00	0.33	-0.69	
QI	3.0	3.0	2.0	0.58	0.118	2.67	-3.25	-4.27	⇓
QJ	14.0	15.0	14.0	0.58	0.118	14.33	0.79	-0.23	
QK									•
QM	204.0	179.0	176.0	15.37	5.396	186.33	60.37	59.35	×
QP	5.0	3.0	3.0	1.15	0.236	3.67	-2.91	-3.93	⇓
QQ	17.0	13.0	14.0	2.08	0.473	14.67	0.90	-0.12	
QT	14.0	15.0	16.0	1.00	0.236	15.00	1.02	0.00	

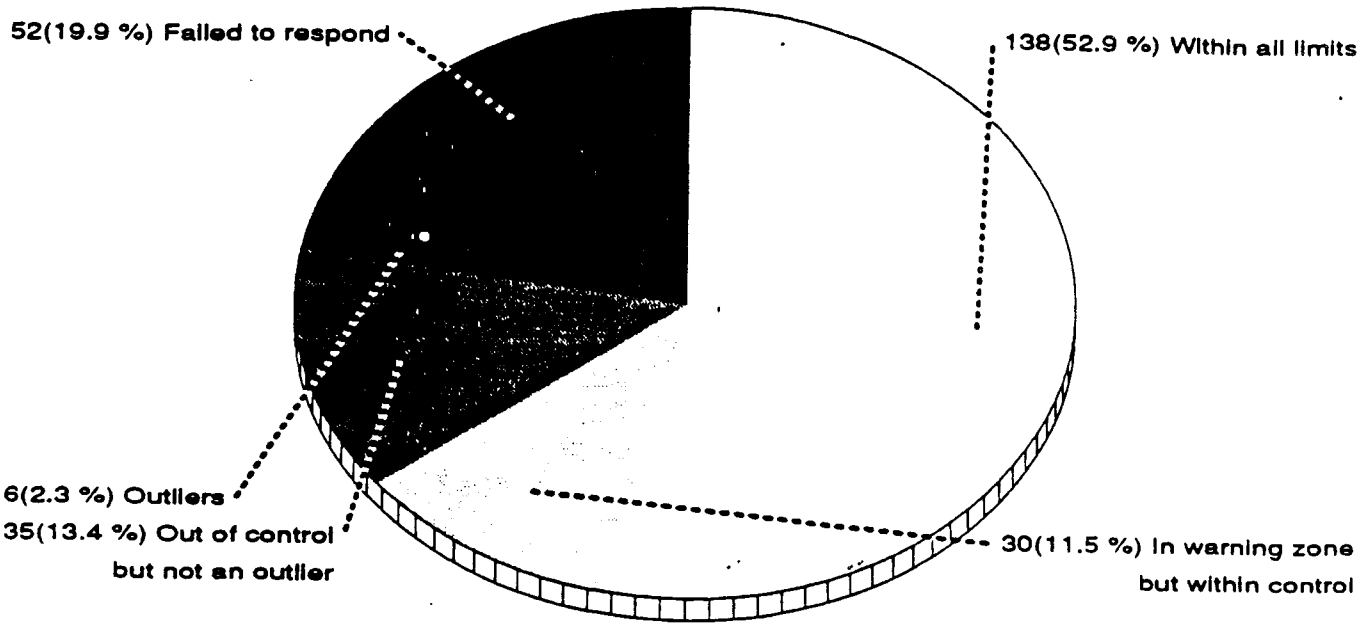
• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

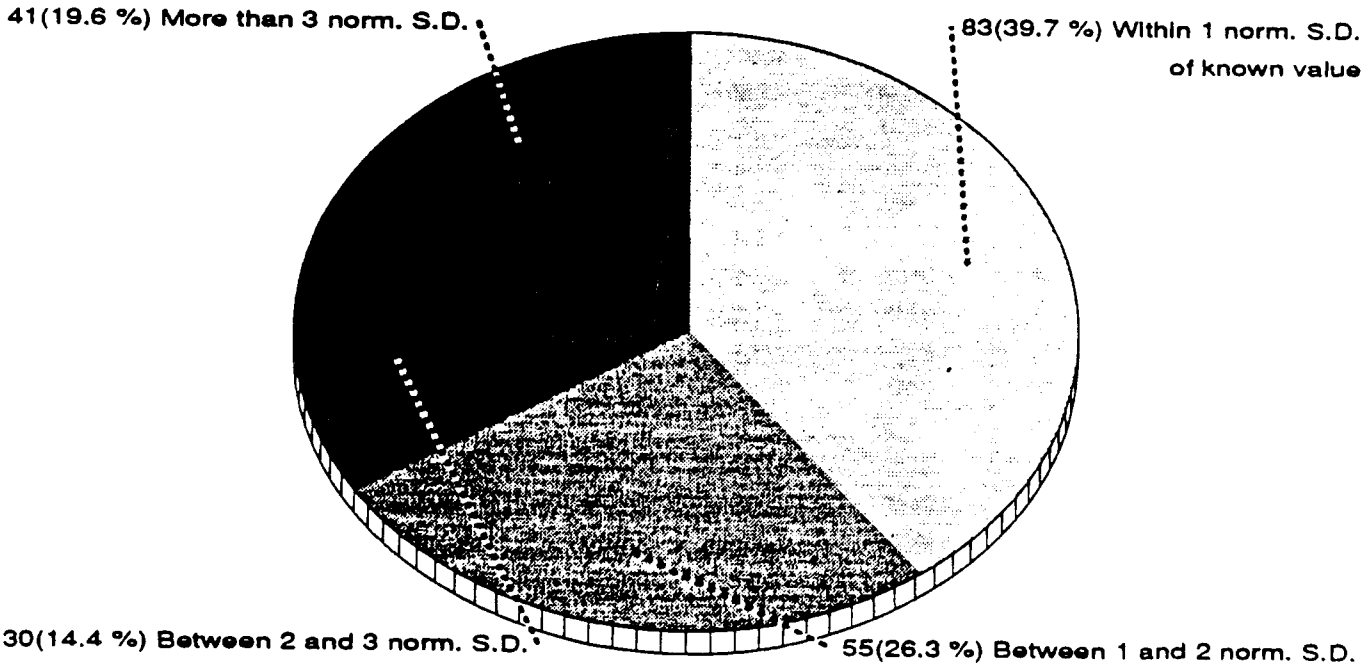
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Gross Beta Statistical Summary 261 Participants

The known value of this nuclide is **43.0 pCi/l** with an expected precision of **6.9**; the control limits are 31.0 to 55.0; the warning regions are 31.0 to 35.0 and 51.0 to 55.0



Statistic	Respondents	Non-outliers
Mean	43.74	Grand Avg 37.65
Std. Dev.	79.25	8.49
Variance	6281.29	72.09
% Coef. of Var.	181.19	22.55
% deviation of mean from known value	1.72	-12.44
Norm. dev. of mean from known value	0.01	-0.63
Median	38.67	38.67
% deviation of median from known value	-10.08	-10.08
Norm. dev. of median from known value	-0.05	-0.51



Gross Beta

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
NA	29.0	32.0	31.0	1.53	0.256	30.67	-1.75	-3.08	⇓
NB	40.0	40.0	37.0	1.73	0.256	39.00	0.34	-1.00	
NE	24.0	28.0	26.0	2.00	0.341	26.00	-2.91	-4.25	⇓
NF	48.0	47.0	50.0	1.53	0.256	48.33	2.67	1.33	
NG	32.0	31.0	32.0	0.58	0.085	31.67	-1.50	-2.83	
NH	39.0	36.0	38.0	1.53	0.256	37.67	0.00	-1.33	
NI									•
NJ	26.0	27.0	25.0	1.00	0.170	26.00	-2.91	-4.25	⇓
NK	23.0	23.0	19.0	2.31	0.341	21.67	-4.00	-5.33	⇓
NO	38.0	43.0	53.0	7.64	1.530	44.67	1.75	0.42	
NP									•
NT	23.0	28.0	26.0	2.52	0.426	25.67	-3.00	-4.33	⇓
O	34.0	38.0	37.0	2.08	0.341	36.33	-0.33	-1.67	
OA	41.0	42.0	42.0	0.58	0.085	41.67	1.00	-0.33	
OB	59.0	53.0	48.0	5.51	0.938	53.33	3.92	2.58	
OF	41.0	41.0	42.0	0.58	0.085	41.33	0.92	-0.42	
OK									•
OM									•
OS	54.0	53.0	53.0	0.58	0.085	53.33	3.92	2.58	
OT									•
OX	36.0	36.0	33.0	1.73	0.256	35.00	-0.66	-2.00	
OY	27.0	23.0	26.0	2.08	0.341	25.33	-3.08	-4.42	⇓
P	30.0	38.0	33.0	4.04	0.682	33.67	-1.00	-2.33	
PA	44.0	42.0	46.0	2.00	0.341	44.00	1.59	0.25	
PB	35.0	34.0	36.0	1.00	0.170	35.00	-0.66	-2.00	
PC	38.0	35.0	35.0	1.73	0.256	36.00	-0.41	-1.75	
PD									•
PG	39.0	41.0	36.0	2.52	0.426	38.67	0.25	-1.08	
PM	35.0	40.0	38.0	2.52	0.426	37.67	0.00	-1.33	
PP									•
PQ	42.0	42.0	42.0	0.00	0.000	42.00	1.09	-0.25	
PR	31.0	30.0	30.0	0.58	0.085	30.33	-1.83	-3.17	⇓
PT	36.0	33.0	39.0	3.00	0.511	36.00	-0.41	-1.75	
PV	33.0	36.0	37.0	2.08	0.341	35.33	-0.58	-1.92	
Q	40.0	46.0	36.0	5.03	0.852	40.67	0.75	-0.58	
QA	43.0	42.0	45.0	1.53	0.256	43.33	1.42	0.08	
QB									•
QC	36.0	37.0	39.0	1.53	0.256	37.33	-0.08	-1.42	
QI	16.0	17.0	16.0	0.58	0.085	16.33	-5.33	-6.66	⇓
QJ	39.0	37.0	34.0	2.52	0.426	36.67	-0.25	-1.58	
QK	42.0	44.0	43.0	1.00	0.170	43.00	1.34	0.00	
QM	36.0	39.0	34.0	2.52	0.426	36.33	-0.33	-1.67	
QP	27.0	31.0	33.0	3.06	0.511	30.33	-1.83	-3.17	⇓
QQ	42.0	45.0	43.0	1.53	0.256	43.33	1.42	0.08	
QT	44.0	66.0	42.0	13.32	2.992	50.67	3.25	1.92	

• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

⇑ ≡ Above control limit
⇓ ≡ Below control limit

Uranium in Water

Performance Evaluation Study

August 13, 1993

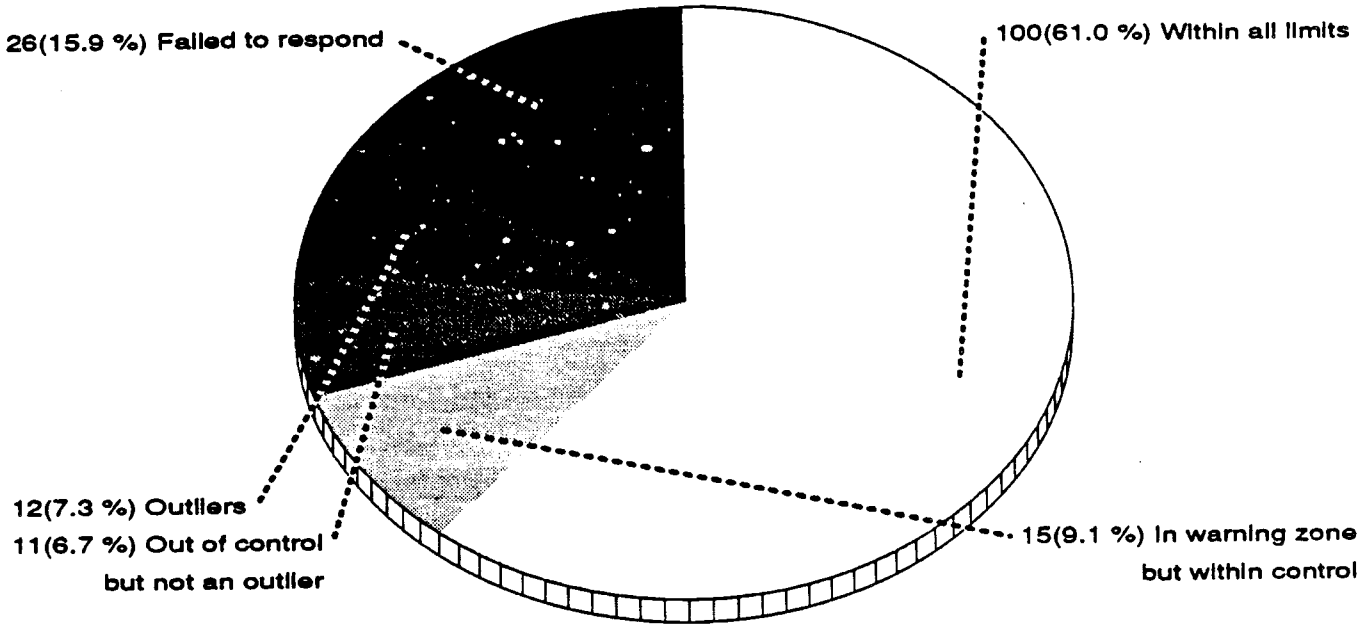
Environmental Protection Agency

Environmental Monitoring Systems Laboratory

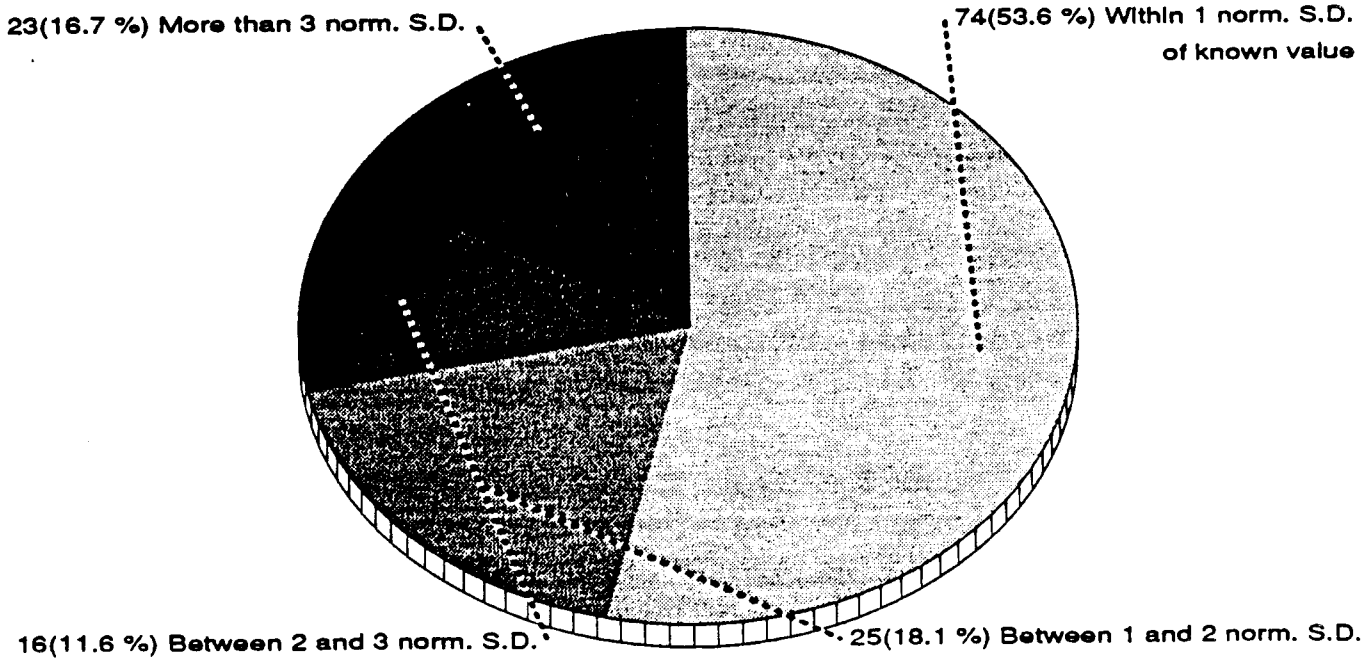
Las Vegas, Nevada

Uranium (Natural) Statistical Summary 164 Participants

The known value of this nuclide is **25.3 pCi/l** with an expected precision of **3.0**; the control limits are 20.1 to 30.5; the warning regions are 20.1 to 21.8 and 28.8 to 30.5



Statistic	Respondents	Non-outliers
Mean	24.41	Grand Avg 24.91
Std. Dev.	5.65	2.85
Variance	31.98	8.13
% Coef. of Var.	23.17	11.45
% deviation of mean from known value	-3.53	-1.55
Norm. dev. of mean from known value	-0.16	-0.14
Median	24.90	24.97
% deviation of median from known value	-1.58	-1.32
Norm. dev. of median from known value	-0.07	-0.12



Uranium (Natural)

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
FK									•
FN	26.9	28.8	24.0	2.42	0.945	26.57	0.96	0.73	
FZ	27.6	26.5	25.6	1.00	0.394	26.57	0.96	0.73	
GG									•
GN	23.5	24.6	23.8	0.57	0.217	23.97	-0.54	-0.77	
GO	29.9	30.6	33.7	2.02	0.748	31.40	3.75	3.52	⇑
GQ	22.6	23.0	24.5	1.00	0.374	23.37	-0.89	-1.12	
HE	24.4	24.5	24.4	0.06	0.020	24.43	-0.27	-0.50	
HK	29.4	30.6	29.6	0.64	0.236	29.87	2.86	2.64	
HL	27.2	27.2	27.2	0.01	0.000	27.20	1.32	1.10	
HP	26.3	24.6	25.3	0.85	0.335	25.40	0.28	0.06	
HU	20.5	20.2	19.9	0.30	0.118	20.20	-2.72	-2.94	
I	28.5	33.5	25.9	3.86	1.945	29.30	2.54	2.31	
ID	18.8	18.8	19.0	0.12	0.039	18.87	-3.49	-3.71	⇓
IE	25.1	23.3	22.4	1.37	0.532	23.60	-0.75	-0.98	
J	25.5	25.1	25.5	0.23	0.079	25.37	0.27	0.04	
JE	24.7	23.2	23.9	0.75	0.295	23.93	-0.56	-0.79	
JK	27.7	26.1	26.9	0.80	0.315	26.90	1.15	0.92	
JN	21.6	24.8	23.4	1.60	0.630	23.27	-0.95	-1.17	
JP	25.1	24.7	25.8	0.56	0.217	25.20	0.17	-0.06	
JS	21.5	21.4	21.4	0.06	0.020	21.43	-2.01	-2.23	
JU									•
JY	25.3	25.3	25.3	0.01	0.000	25.30	0.23	0.00	
K	21.9	24.2	22.5	1.19	0.453	22.87	-1.18	-1.40	
KH	25.2	25.3	24.8	0.26	0.098	25.10	0.11	-0.12	
L	26.1	24.6	25.1	0.76	0.295	25.27	0.21	-0.02	
LA									•
LB	13.0	13.0	12.0	0.58	0.197	12.67	-7.07	-7.29	×
LG									•
LH	26.0	26.0	26.0	0.00	0.000	26.00	0.63	0.40	
LM	23.8	22.2	24.9	1.36	0.532	23.63	-0.74	-0.96	
LS									•
LT	29.2	28.6	26.4	1.47	0.551	28.07	1.82	1.60	
LZ	24.8	24.6	24.6	0.12	0.039	24.67	-0.14	-0.37	
MN									•
MS	20.5	20.9	20.7	0.20	0.079	20.70	-2.43	-2.66	
N	23.2	23.1	23.4	0.15	0.059	23.23	-0.97	-1.19	
NA	29.0	30.0	31.0	1.00	0.394	30.00	2.94	2.71	
NC									•
NH									•
NK	24.6	24.6	25.0	0.23	0.079	24.73	-0.10	-0.33	
NO	20.2	20.7	21.3	0.55	0.217	20.73	-2.41	-2.64	
NT	24.3	24.9	23.6	0.65	0.256	24.27	-0.37	-0.60	
OB	16.7	16.9	16.9	0.12	0.039	16.83	-4.66	-4.89	⇓
OF	27.0	24.5	25.5	1.26	0.492	25.67	0.44	0.21	

TAG SYMBOLS

• ≡ No data submitted
∅ ≡ Insufficient data
× ≡ Determined to be an outlier
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Blind-A

Performance Evaluation Study

October 19, 1993

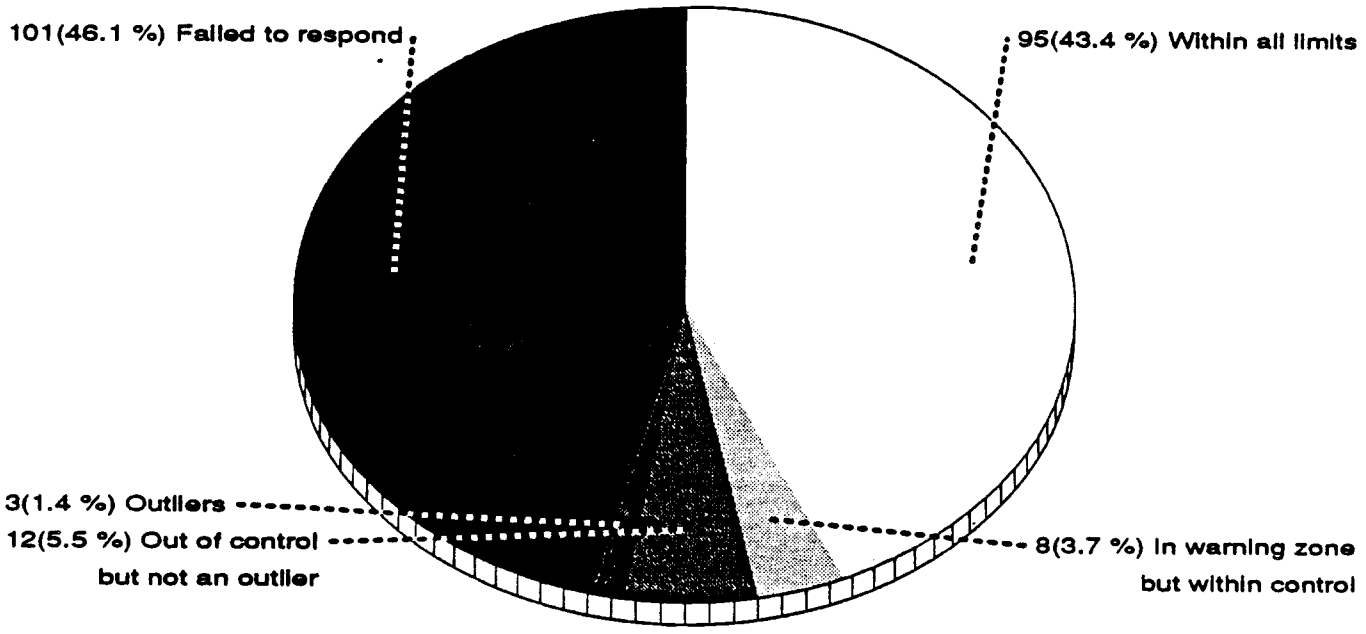
Environmental Protection Agency

Environmental Monitoring Systems Laboratory

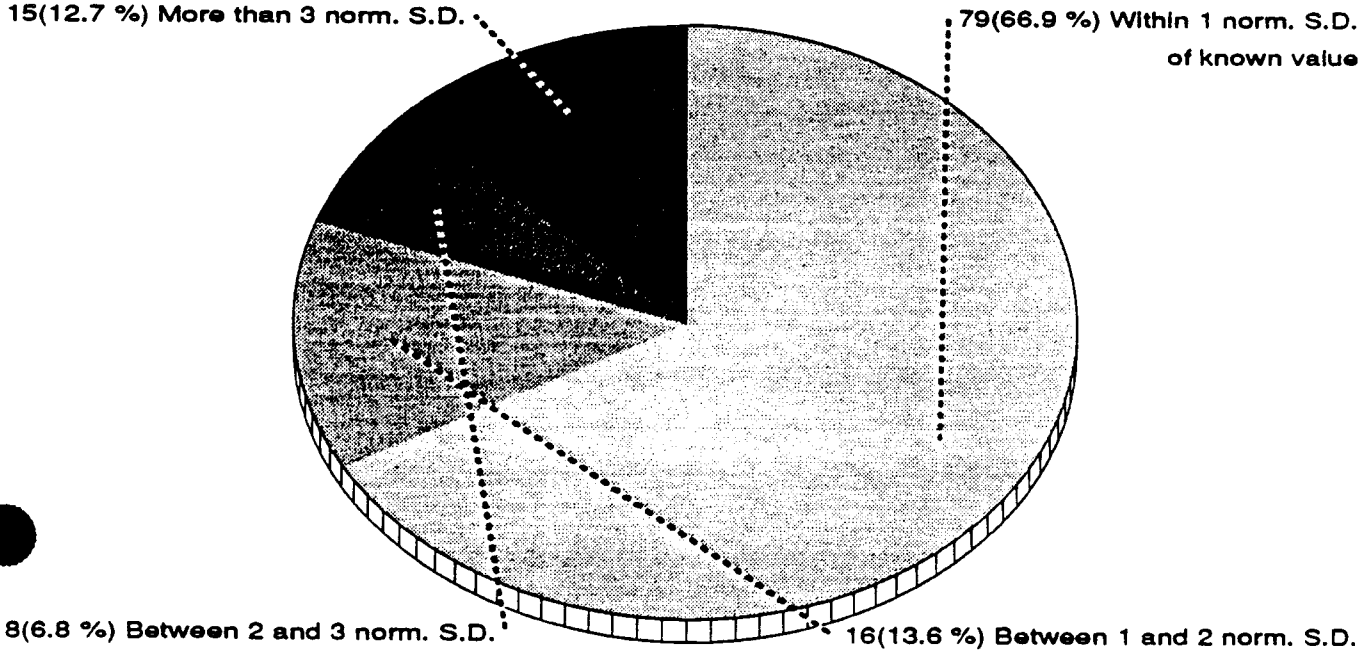
Las Vegas, Nevada

Uranium (Natural) Statistical Summary 219 Participants

The known value of this nuclide is **15.1 pCi/l** with an expected precision of **3.0**; the control limits are 9.9 to 20.3; the warning regions are 9.9 to 11.6 and 18.6 to 20.3



Statistic	Respondents	Non-outliers
Mean	14.46	Grand Avg 14.38
Std. Dev.	3.14	2.63
Variance	9.83	6.91
% Coef. of Var.	21.68	18.29
% deviation of mean from known value	-4.22	-4.80
Norm. dev. of mean from known value	-0.20	-0.28
Median	14.82	14.80
% deviation of median from known value	-1.88	-1.99
Norm. dev. of median from known value	-0.09	-0.11



Uranium (Natural)

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
JS	15.0	15.0	15.0	0.00	0.000	15.00	0.36	-0.06	
JX									•
JY	13.6	18.4	24.2	5.31	3.071	18.73	2.52	2.10	
K	13.2	13.4	13.3	0.10	0.039	13.30	-0.62	-1.04	
KE									•
KF									•
KT	8.0	8.6	8.8	0.42	0.158	8.47	-3.41	-3.83	⇓
KX									•
KZ									•
L	15.8	16.0	16.4	0.31	0.118	16.07	0.98	0.56	
LA									•
LE									•
LF									•
LG									•
LL									•
LM									•
LR									•
LT	15.1	15.3	15.2	0.10	0.039	15.20	0.48	0.06	
M									•
MA									•
MN									•
MO									•
MP									•
MQ									•
MS	16.7	16.9	17.2	0.25	0.098	16.93	1.48	1.06	
MV									•
MY									•
N									•
NA	15.0	15.0	15.0	0.00	0.000	15.00	0.36	-0.06	
NG									•
NH	14.5	14.2	13.9	0.30	0.118	14.20	-0.10	-0.52	
NJ	15.0	16.0	14.0	1.00	0.394	15.00	0.36	-0.06	
NK	15.0	15.4	15.0	0.23	0.079	15.13	0.44	0.02	
NO	15.4	16.1	15.0	0.56	0.217	15.50	0.65	0.23	
NT	14.1	13.7	14.5	0.40	0.158	14.10	-0.16	-0.58	
O									•
OF	12.1	13.5	13.9	0.95	0.354	13.17	-0.70	-1.12	
OS	13.0	13.0	13.0	0.00	0.000	13.00	-0.79	-1.21	
OX									•
OY	16.0	16.7	16.3	0.35	0.138	16.33	1.13	0.71	
OZ									•
P	18.7	20.4	14.2	3.20	1.420	17.77	1.96	1.54	
PA									•
PB	15.0	14.8	15.3	0.25	0.098	15.03	0.38	-0.04	
PC									•

• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

⇑ ≡ Above control limit
⇓ ≡ Below control limit

Air Filter

Performance Evaluation Study

August 27, 1993

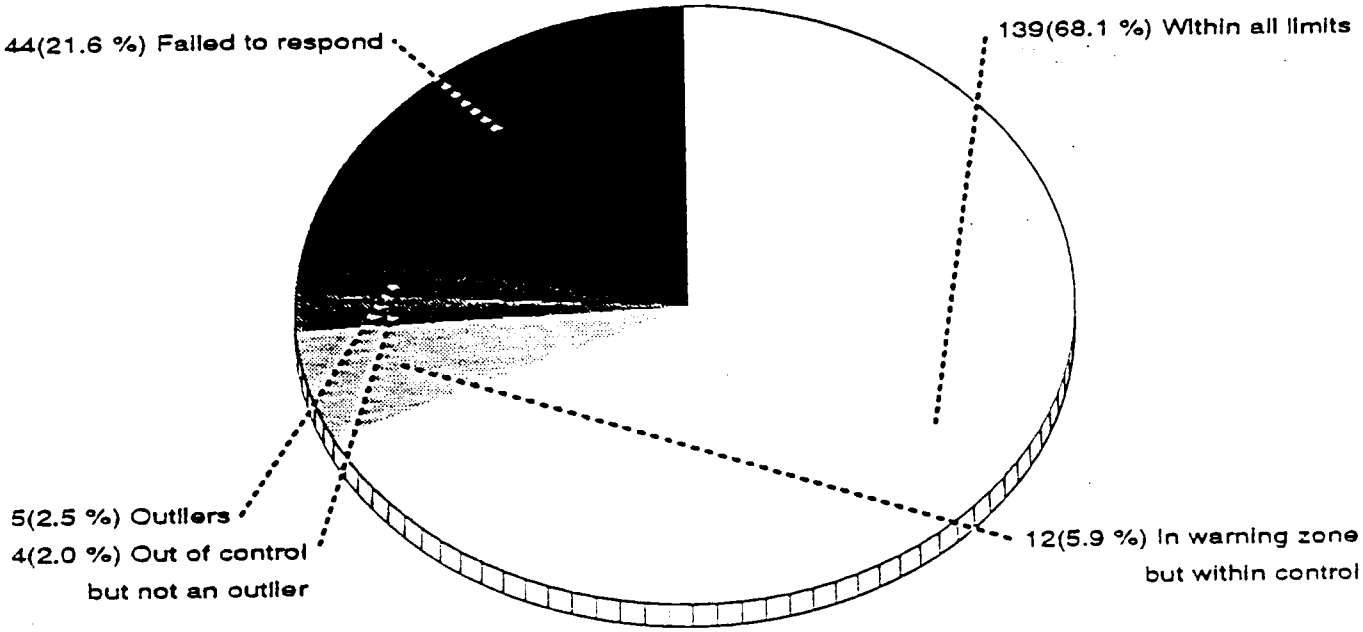
Environmental Protection Agency

Environmental Monitoring Systems Laboratory

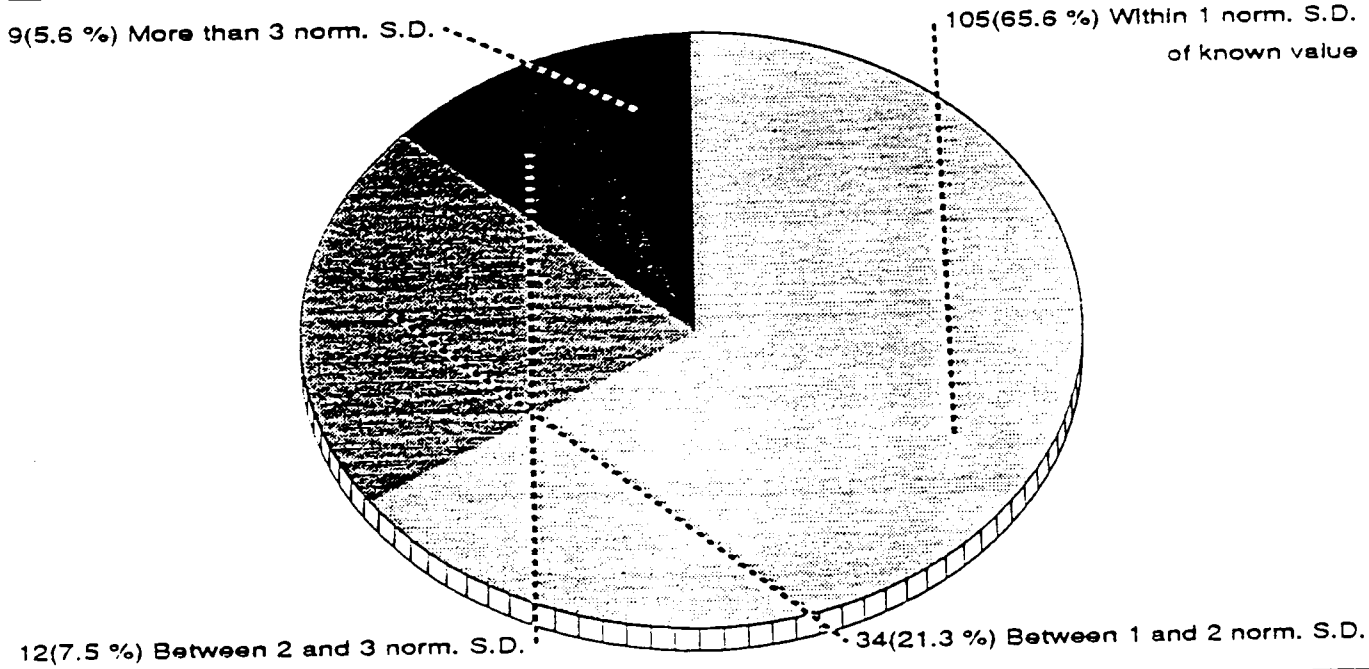
Las Vegas, Nevada

Alpha Statistical Summary 204 Participants

The known value of this nuclide is **19.0 pCi/F** with an expected precision of **5.0**; the control limits are 10.3 to 27.7; the warning regions are 10.3 to 13.2 and 24.8 to 27.7



Statistic	Respondents	Non-outliers
Mean	20.35	Grand Avg 20.00
Std. Dev.	4.67	3.27
Variance	21.78	10.70
% Coef. of Var.	22.93	16.36
% deviation of mean from known value	7.13	5.24
Norm. dev. of mean from known value	0.29	0.30
Median	19.67	19.67
% deviation of median from known value	3.51	3.51
Norm. dev. of median from known value	0.14	0.20

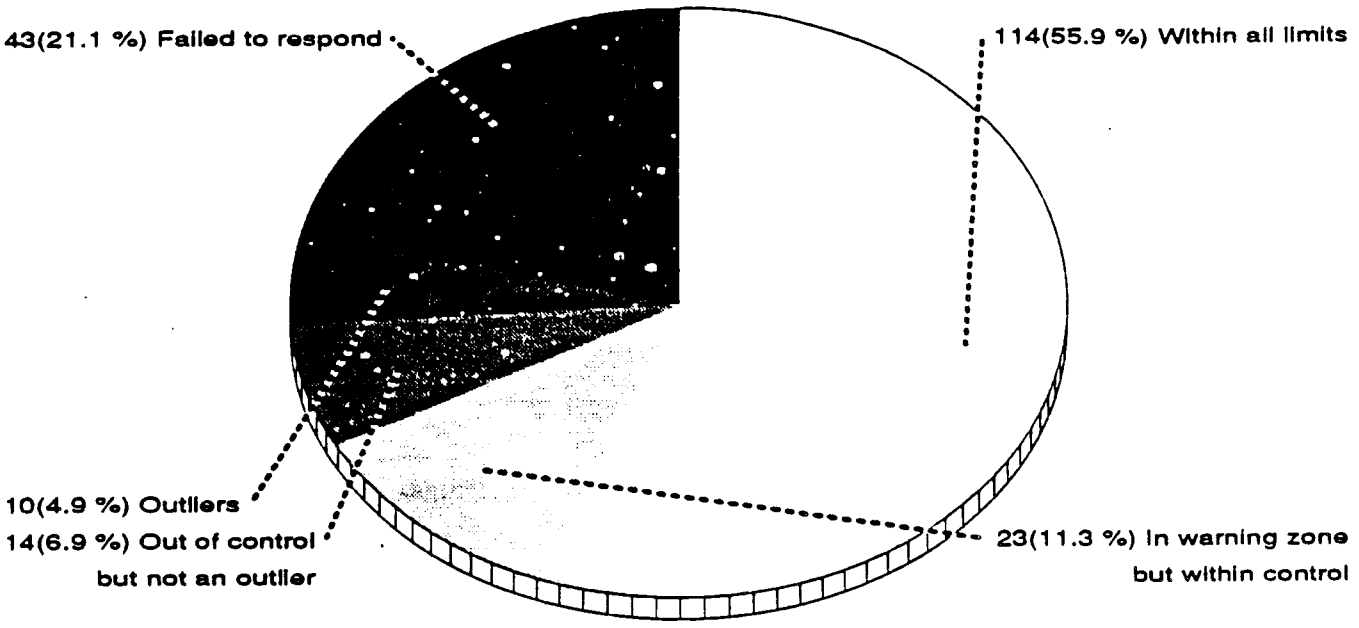


Alpha

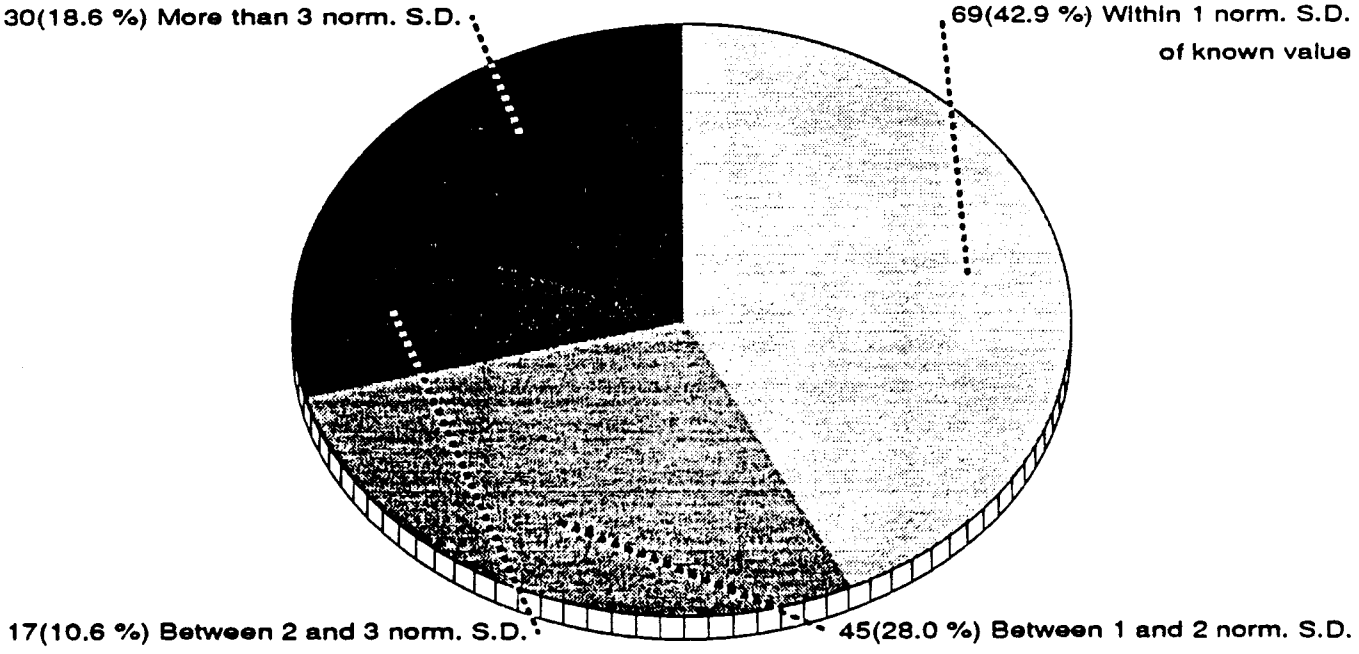
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
LE	21.0	19.0	20.0	1.00	0.236	20.00	0.00	0.35	
LF	20.0	22.0	21.0	1.00	0.236	21.00	0.35	0.69	
LM									•
LR									•
LS									•
LT	16.0	17.0	16.0	0.58	0.118	16.33	-1.27	-0.92	
LZ	21.0	19.0	21.0	1.15	0.236	20.33	0.12	0.46	
M	15.0	15.0	16.0	0.58	0.118	15.33	-1.62	-1.27	
MA	22.0	23.0	23.0	0.58	0.118	22.67	0.93	1.27	
ML	25.0	27.0	28.0	1.53	0.354	26.67	2.31	2.66	
MN									•
MP									•
MQ	24.0	22.0	20.0	2.00	0.473	22.00	0.69	1.04	
MS	19.0	20.0	18.0	1.00	0.236	19.00	-0.34	0.00	
MV	16.0	16.0	16.0	0.00	0.000	16.00	-1.38	-1.04	
N	18.0	16.0	19.0	1.53	0.354	17.67	-0.81	-0.46	
NH	21.0	21.0	22.0	0.58	0.118	21.33	0.46	0.81	
NJ	29.0	29.0	32.0	1.73	0.354	30.00	3.47	3.81	⇑
NK	16.0	15.0	15.0	0.58	0.118	15.33	-1.62	-1.27	
NP	28.0	27.0	26.0	1.00	0.236	27.00	2.43	2.77	
NT	19.0	20.0	18.0	1.00	0.236	19.00	-0.34	0.00	
NZ	19.0	17.0	19.0	1.15	0.236	18.33	-0.58	-0.23	
O	16.0	17.0	18.0	1.00	0.236	17.00	-1.04	-0.69	
OA	20.0	18.0	19.0	1.00	0.236	19.00	-0.34	0.00	
OB	18.0	16.0	15.0	1.53	0.354	16.33	-1.27	-0.92	
OK	1.0	1.0	1.0	0.00	0.000	1.00	-6.58	-6.24	×
OL									•
OM	16.0	17.0	18.0	1.00	0.236	17.00	-1.04	-0.69	
OQ	18.0	19.0	19.0	0.58	0.118	18.67	-0.46	-0.12	
OS									•
P	15.0	15.0	15.0	0.00	0.000	15.00	-1.73	-1.39	
PB	16.0	18.0	18.0	1.15	0.236	17.33	-0.92	-0.58	
PC									•
PE									•
PI	27.0	25.0	26.0	1.00	0.236	26.00	2.08	2.42	
PM	22.0	21.0	22.0	0.58	0.118	21.67	0.58	0.92	
PP	23.0	19.0	19.0	2.31	0.473	20.33	0.12	0.46	
PT	23.0	22.0	21.0	1.00	0.236	22.00	0.69	1.04	
PU									•

Beta Statistical Summary 204 Participants

The known value of this nuclide is **47.0 pCi/F** with an expected precision of **5.0**; the control limits are 38.3 to 55.7; the warning regions are 38.3 to 41.2 and 52.8 to 55.7



Statistic	Respondents	Non-outliers
Mean	49.86	**Grand Avg** 49.32
Std. Dev.	7.82	4.62
Variance	61.22	21.38
% Coef. of Var.	15.69	9.37
% deviation of mean from known value	6.07	4.93
Norm. dev. of mean from known value	0.36	0.50
Median	49.00	49.00
% deviation of median from known value	4.26	4.26
Norm. dev. of median from known value	0.26	0.43



Beta

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
LE	49.0	48.0	50.0	1.00	0.236	49.00	-0.11	0.69	
LF	42.0	48.0	44.0	3.06	0.709	44.67	-1.61	-0.81	
LM									•
LR									•
LS									•
LT	45.0	44.0	44.0	0.58	0.118	44.33	-1.73	-0.92	
LZ	47.0	46.0	47.0	0.58	0.118	46.67	-0.92	-0.12	
M	53.0	53.0	54.0	0.58	0.118	53.33	1.39	2.19	
MA	50.0	49.0	49.0	0.58	0.118	49.33	0.01	0.81	
ML	72.0	72.0	75.0	1.73	0.354	73.00	8.20	9.01	×
MN									•
MP									•
MQ	48.0	48.0	49.0	0.58	0.118	48.33	-0.34	0.46	
MS	53.0	54.0	53.0	0.58	0.118	53.33	1.39	2.19	
MV	44.0	43.0	44.0	0.58	0.118	43.67	-1.96	-1.15	
N	48.0	44.0	50.0	3.06	0.709	47.33	-0.69	0.12	
NH	48.0	52.0	53.0	2.65	0.591	51.00	0.58	1.39	
NJ	47.0	49.0	48.0	1.00	0.236	48.00	-0.46	0.35	
NK	44.0	44.0	45.0	0.58	0.118	44.33	-1.73	-0.92	
NP	40.0	38.0	38.0	1.15	0.236	38.67	-3.69	-2.89	
NT	50.0	51.0	49.0	1.00	0.236	50.00	0.24	1.04	
NZ	59.0	54.0	59.0	2.89	0.591	57.33	2.78	3.58	⇑
O	51.0	51.0	51.0	0.00	0.000	51.00	0.58	1.39	
OA	53.0	52.0	55.0	1.53	0.354	53.33	1.39	2.19	
OB	51.0	51.0	50.0	0.58	0.118	50.67	0.47	1.27	
OK									•
OL									•
OM	45.0	46.0	51.0	3.21	0.709	47.33	-0.69	0.12	
OQ	51.0	50.0	51.0	0.58	0.118	50.67	0.47	1.27	
OS									•
P	48.0	47.0	47.0	0.58	0.118	47.33	-0.69	0.12	
PB	48.0	49.0	50.0	1.00	0.236	49.00	-0.11	0.69	
PC									•
PE									•
PI	41.0	41.0	42.0	0.58	0.118	41.33	-2.77	-1.96	
PM	54.0	52.0	54.0	1.15	0.236	53.33	1.39	2.19	
PP	69.0	71.0	71.0	1.15	0.236	70.33	7.28	8.08	×
PT	66.0	66.0	67.0	0.58	0.118	66.33	5.89	6.70	×
PU									•
PV	52.0	53.0	54.0	1.00	0.236	53.00	1.28	2.08	
PW	52.0	52.0	51.0	0.58	0.118	51.67	0.81	1.62	
Q	42.0	43.0	45.0	1.53	0.354	43.33	-2.07	-1.27	
QA	51.0	49.0	49.0	1.15	0.236	49.67	0.12	0.92	
QB	47.0	48.0	49.0	1.00	0.236	48.00	-0.46	0.35	
QC	57.0	60.0	60.0	1.73	0.354	59.00	3.35	4.16	⇑

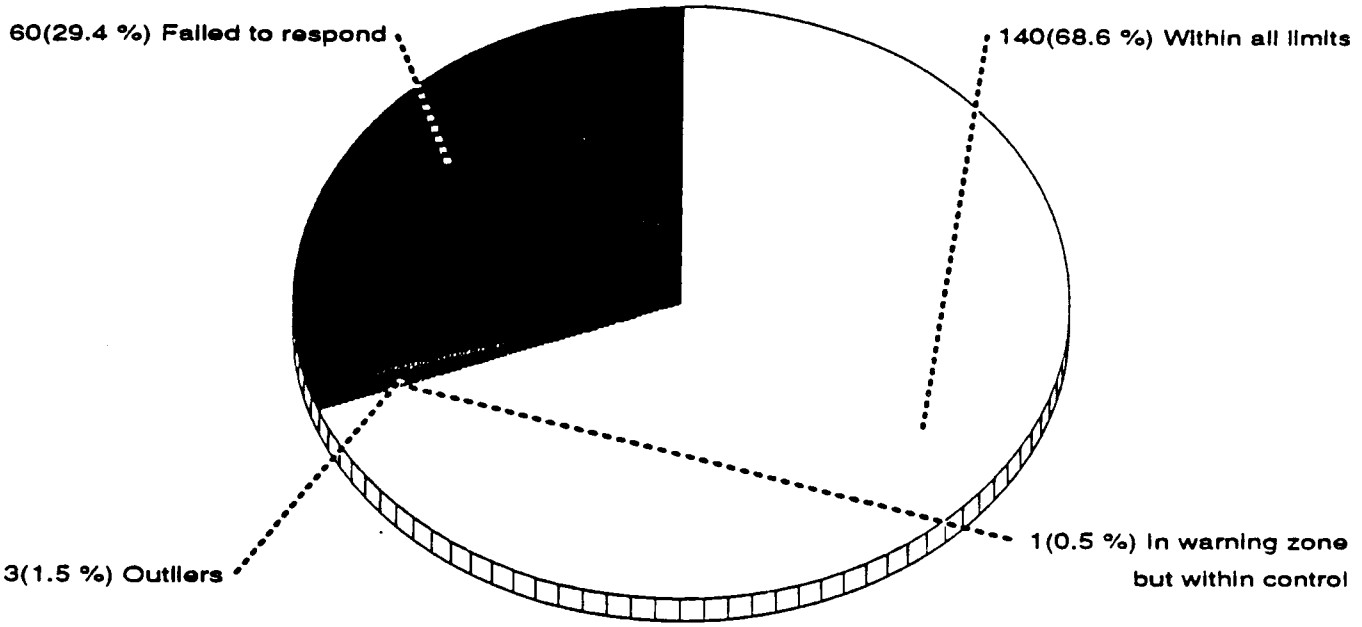
• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

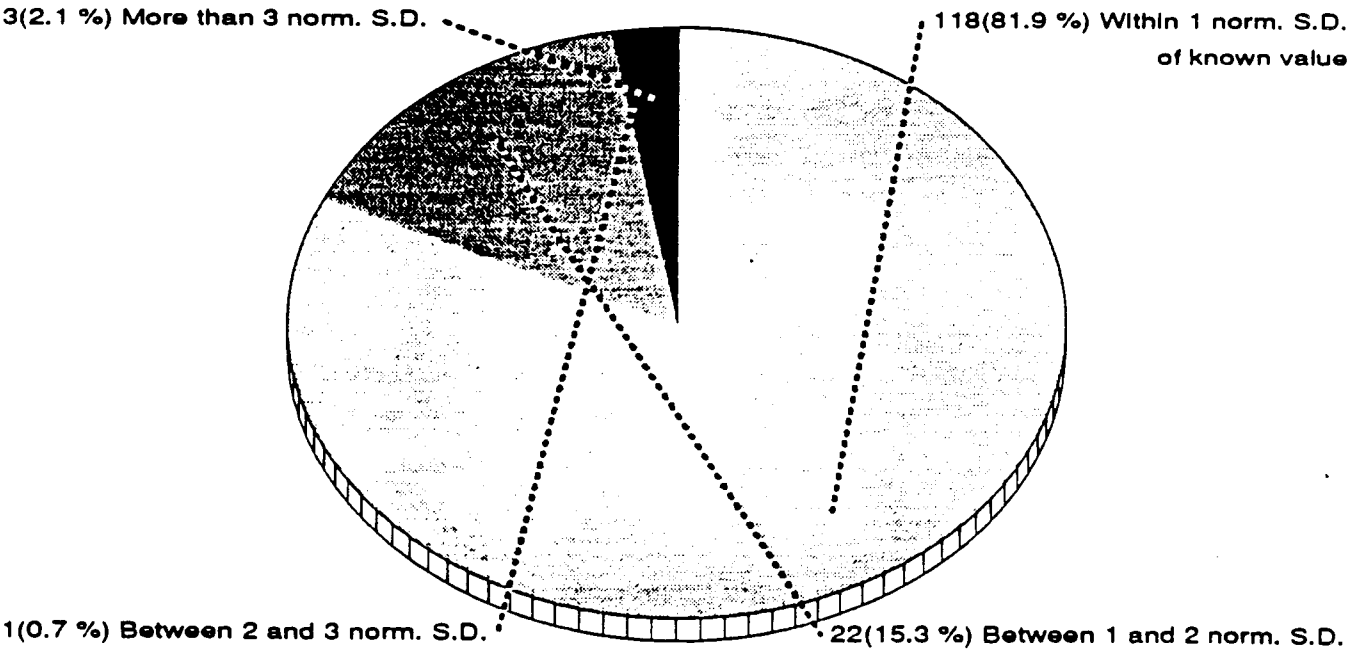
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Cesium 137 Statistical Summary 204 Participants

The known value of this nuclide is **9.0 pCi/F** with an expected precision of **5.0**; the control limits are 0.3 to 17.7; the warning regions are 0.3 to 3.2 and 14.8 to 17.7



Statistic	Respondents	Non-outliers
Mean	10.36	**Grand Avg** 10.00
Std. Dev.	2.98	1.62
Variance	8.89	2.63
% Coef. of Var.	28.80	16.22
% deviation of mean from known value	15.07	11.16
Norm. dev. of mean from known value	0.45	0.62
Median	10.00	10.00
% deviation of median from known value	11.11	11.11
Norm. dev. of median from known value	0.34	0.62



Cesium 137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
LE	16.0	12.0	12.0	2.31	0.473	13.33	1.15	1.50	
LF	11.0	11.0	10.0	0.58	0.118	10.67	0.23	0.58	
LM									•
LR									•
LS									•
LT	12.0	12.0	12.0	0.00	0.000	12.00	0.69	1.04	
LZ									•
M	10.0	10.0	11.0	0.58	0.118	10.33	0.11	0.46	
MA	8.0	9.0	10.0	1.00	0.236	9.00	-0.35	0.00	
ML	12.0	11.0	12.0	0.58	0.118	11.67	0.58	0.92	
MN									•
MP	11.0	10.0	13.0	1.53	0.354	11.33	0.46	0.81	
MQ	10.0	11.0	11.0	0.58	0.118	10.67	0.23	0.58	
MS	9.0	11.0	9.0	1.15	0.236	9.67	-0.12	0.23	
MV	11.0	12.0	14.0	1.53	0.354	12.33	0.81	1.15	
N	9.0	9.0	9.0	0.00	0.000	9.00	-0.35	0.00	
NH	10.0	11.0	10.0	0.58	0.118	10.33	0.11	0.46	
NJ	9.0	9.0	8.0	0.58	0.118	8.67	-0.46	-0.12	
NK	8.0	8.0	9.0	0.58	0.118	8.33	-0.58	-0.23	
NP	11.0	12.0	11.0	0.58	0.118	11.33	0.46	0.81	
NT									•
NZ	7.0	10.0	10.0	1.73	0.354	9.00	-0.35	0.00	
O	9.0	9.0	10.0	0.58	0.118	9.33	-0.23	0.12	
OA	11.0	11.0	9.0	1.15	0.236	10.33	0.11	0.46	
OB	6.0	6.0	6.0	0.00	0.000	6.00	-1.39	-1.04	
OK									•
OL									•
OM									•
OQ									•
OS									•
P	12.0	11.0	9.0	1.53	0.354	10.67	0.23	0.58	
PB	9.0	10.0	10.0	0.58	0.118	9.67	-0.12	0.23	
PC									•
PE									•
PI	8.0	8.0	8.0	0.00	0.000	8.00	-0.69	-0.35	
PM	9.0	8.0	7.0	1.00	0.236	8.00	-0.69	-0.35	
PP	12.0	9.0	9.0	1.73	0.354	10.00	0.00	0.35	
PT	14.0	14.0	13.0	0.58	0.118	13.67	1.27	1.62	
PU									•
PV	11.0	12.0	13.0	1.00	0.236	12.00	0.69	1.04	
PW	10.0	10.0	10.0	0.00	0.000	10.00	0.00	0.35	
Q	10.0	11.0	12.0	1.00	0.236	11.00	0.34	0.69	
QA	10.0	10.0	10.0	0.00	0.000	10.00	0.00	0.35	
QB	8.0	6.0	6.0	1.15	0.236	6.67	-1.16	-0.81	
QC									•

• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

⇑ ≡ Above control limit
⇓ ≡ Below control limit

Blind-B

Performance Evaluation Study

October 19, 1993

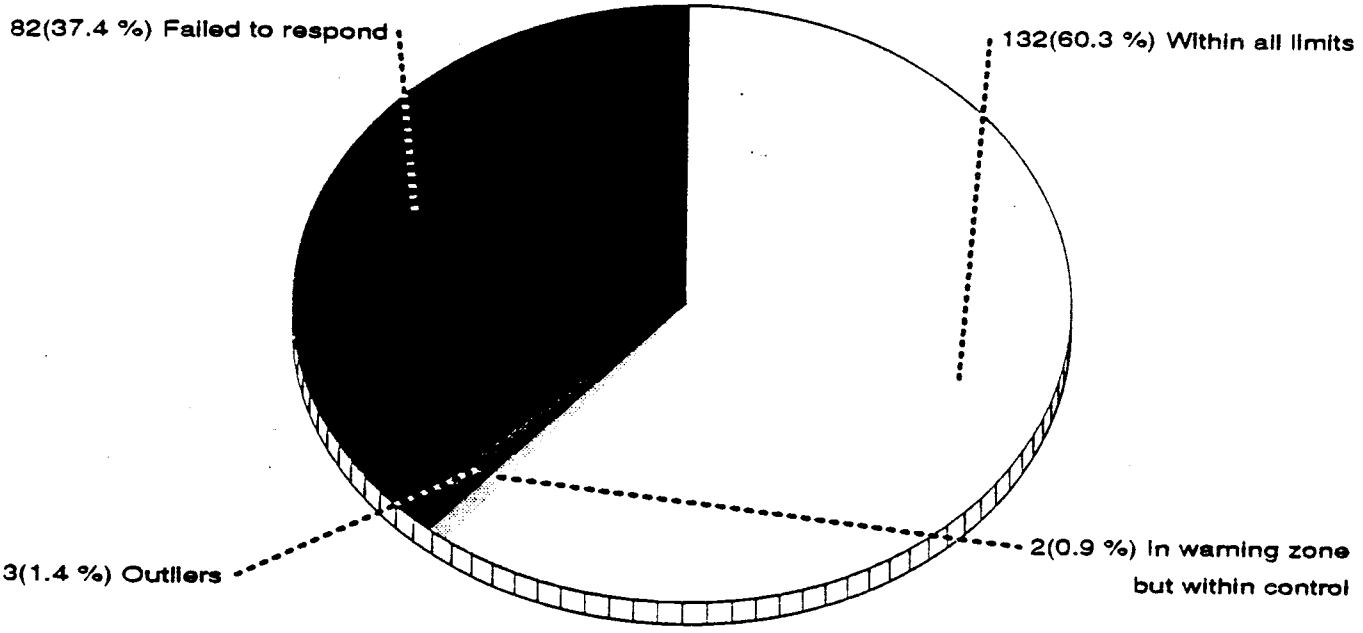
Environmental Protection Agency

Environmental Monitoring Systems Laboratory

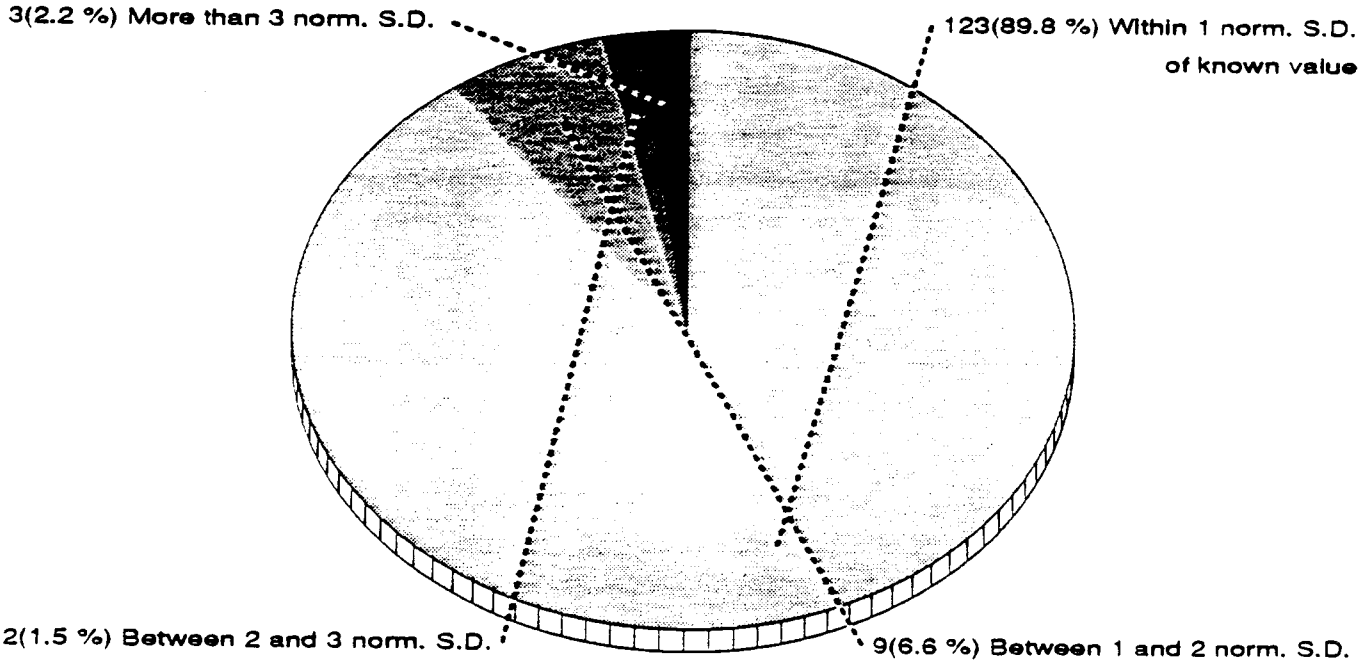
Las Vegas, Nevada

Cobalt-60 Statistical Summary 219 Participants

The known value of this nuclide is **10.0 pCi/l** with an expected precision of **5.0**; the control limits are 1.3 to 18.7; the warning regions are 1.3 to 4.2 and 15.8 to 18.7



Statistic	Respondents	Non-outliers
Mean	10.81	**Grand Avg 10.41**
Std. Dev.	3.43	1.63
Variance	11.79	2.67
% Coef. of Var.	31.76	15.71
% deviation of mean from known value	8.13	4.05
Norm. dev. of mean from known value	0.24	0.25
Median	10.00	10.00
% deviation of median from known value	0.00	0.00
Norm. dev. of median from known value	0.00	0.00



Cobalt-60

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
JS	10.0	11.0	14.0	2.08	0.473	11.67	0.44	0.58	
JX									•
JY	11.0	10.0	13.0	1.53	0.354	11.33	0.32	0.46	
K	13.0	13.0	13.0	0.00	0.000	13.00	0.90	1.04	
KE									•
KF									•
KT									•
KX	10.0	11.0	11.0	0.58	0.118	10.67	0.09	0.23	
KZ									•
L	12.0	9.0	11.0	1.53	0.354	10.67	0.09	0.23	
LA									•
LE									•
LF	10.0	11.0	11.0	0.58	0.118	10.67	0.09	0.23	
LG									•
LL									•
LM									•
LR	13.0	12.0	9.0	2.08	0.473	11.33	0.32	0.46	
LT	9.0	10.0	10.0	0.58	0.118	9.67	-0.26	-0.12	
M	10.0	9.0	10.0	0.58	0.118	9.67	-0.26	-0.12	
MA	9.0	9.0	9.0	0.00	0.000	9.00	-0.49	-0.35	
MN									•
MO									•
MP	10.0	10.0	11.0	0.58	0.118	10.33	-0.02	0.12	
MQ	13.0	15.0	15.0	1.15	0.236	14.33	1.36	1.50	
MS	12.0	11.0	12.0	0.58	0.118	11.67	0.44	0.58	
MV	5.0	5.0	10.0	2.89	0.591	6.67	-1.30	-1.15	
MY	10.0	10.0	10.0	0.00	0.000	10.00	-0.14	0.00	
N									•
NA									•
NG									•
NH	10.0	9.0	11.0	1.00	0.236	10.00	-0.14	0.00	
NJ	11.0	13.0	11.0	1.15	0.236	11.67	0.44	0.58	
NK	8.0	5.0	6.0	1.53	0.354	6.33	-1.41	-1.27	
NO									•
NT									•
O	11.0	11.0	11.0	0.00	0.000	11.00	0.21	0.35	
OF									•
OS									•
OX									•
OY									•
OZ									•
P	16.0	18.0	17.0	1.00	0.236	17.00	2.28	2.42	
PA									•
PB	10.0	11.0	10.0	0.58	0.118	10.33	-0.02	0.12	
PC	10.0	11.0	12.0	1.00	0.236	11.00	0.21	0.35	

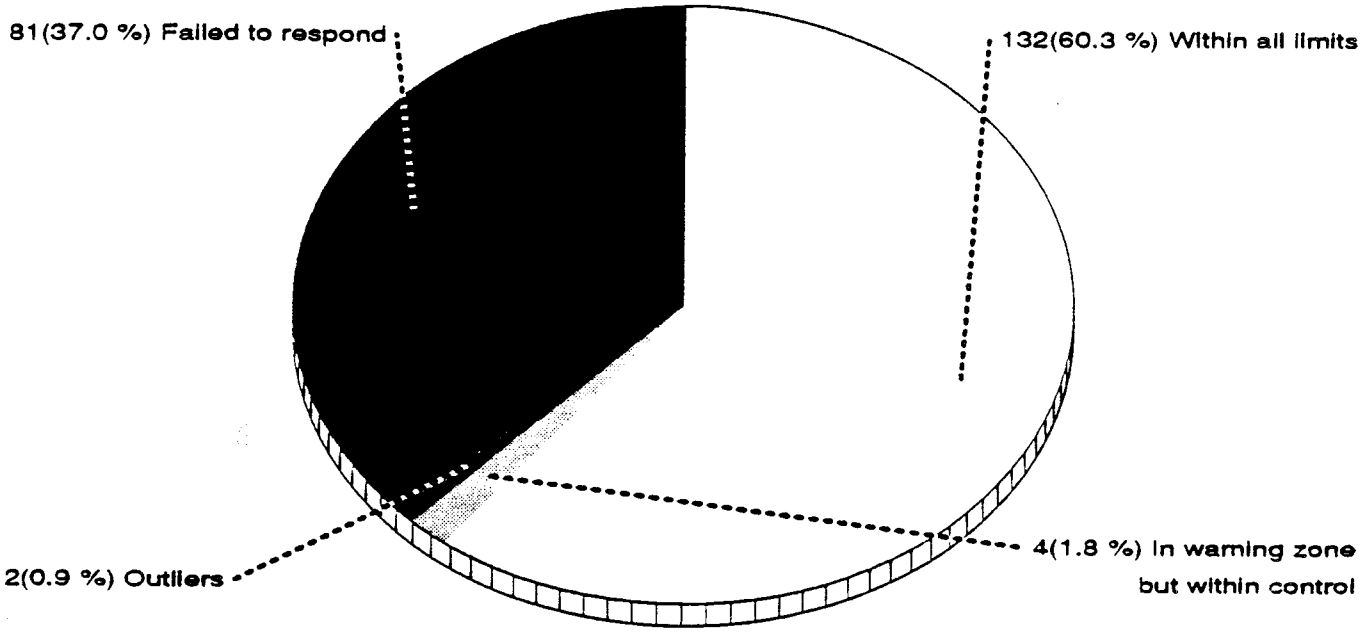
• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

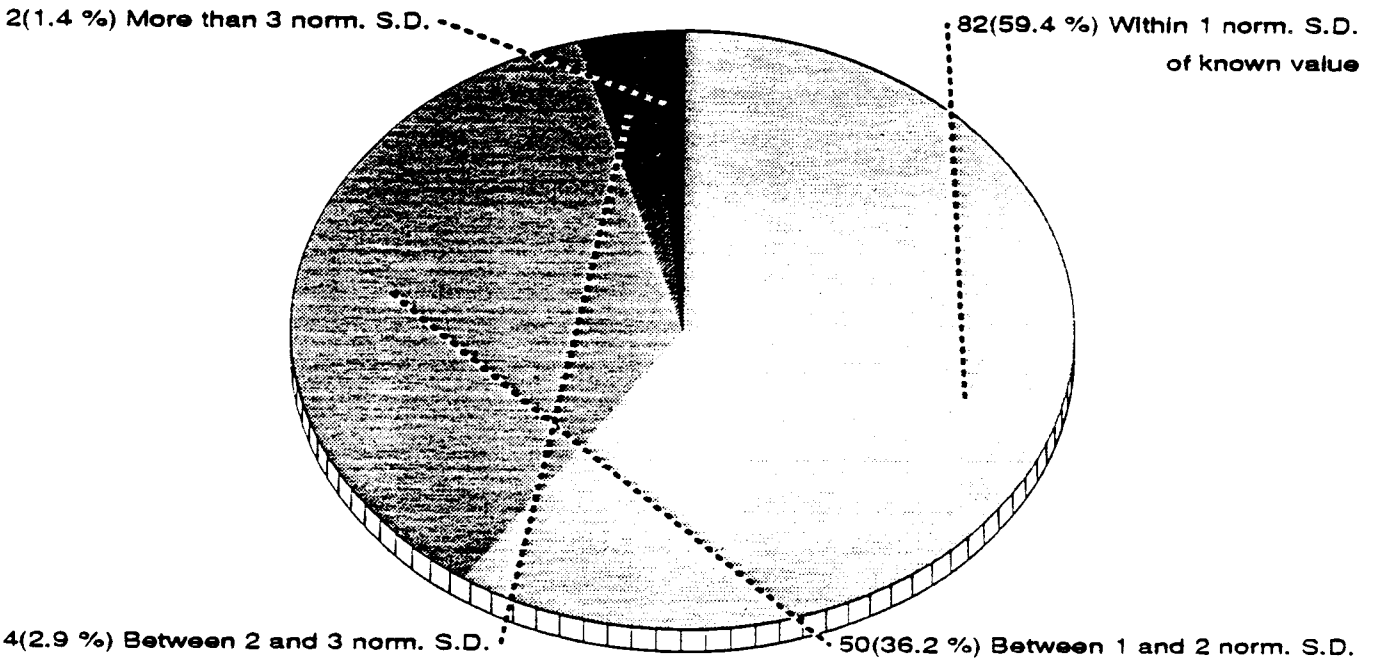
⇑ ≡ Above control limit
⇓ ≡ Below control limit

Cesium-134 Statistical Summary 219 Participants

The known value of this nuclide is **12.0 pCi/l** with an expected precision of **5.0**; the control limits are 3.3 to 20.7; the warning regions are 3.3 to 6.2 and 17.8 to 20.7



Statistic	Respondents	Non-outliers
Mean	11.83	**Grand Avg 9.78**
Std. Dev.	22.61	1.86
Variance	511.12	3.48
% Coef. of Var.	191.17	19.06
% deviation of mean from known value	-1.45	-18.48
Norm. dev. of mean from known value	-0.01	-1.19
Median	9.67	9.67
% deviation of median from known value	-19.44	-19.44
Norm. dev. of median from known value	-0.10	-1.25



Cesium-134

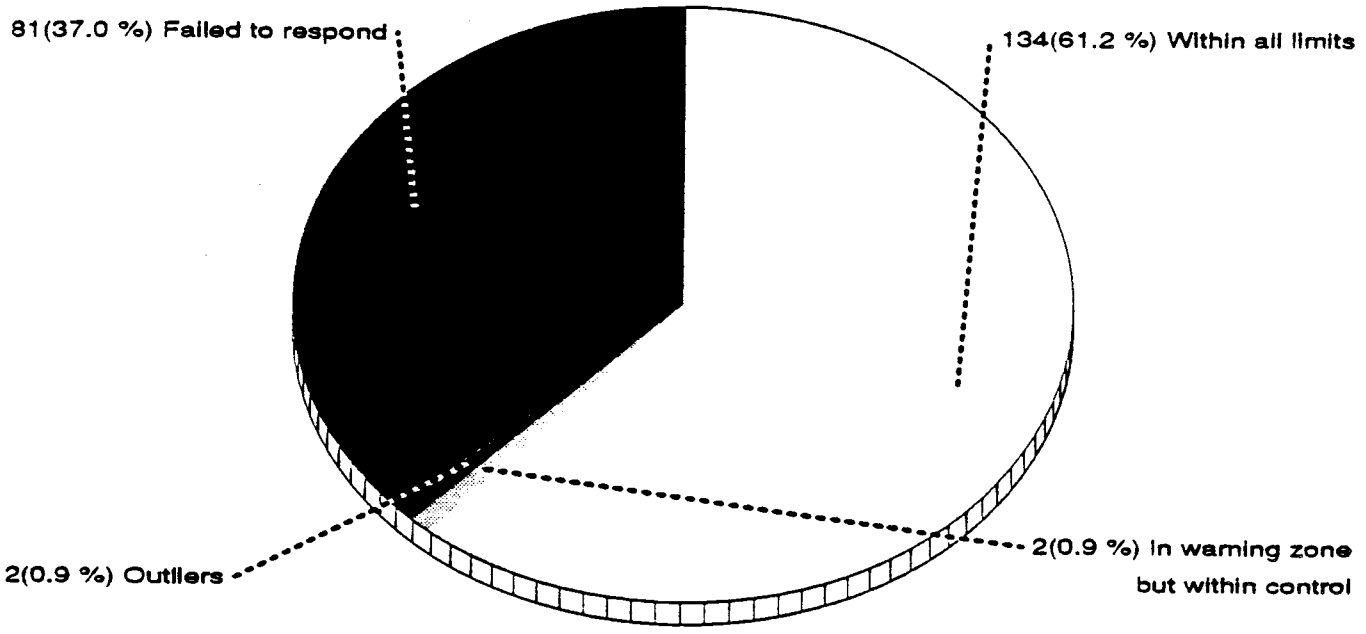
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
JS	9.0	9.0	10.0	0.58	0.118	9.33	-0.16	-0.92	
JX									•
JY	11.0	8.0	10.0	1.53	0.354	9.67	-0.04	-0.81	
K	9.0	8.0	9.0	0.58	0.118	8.67	-0.39	-1.15	
KE									•
KF									•
KT									•
KX	10.0	10.0	10.0	0.00	0.000	10.00	0.08	-0.69	
KZ									•
L	9.0	12.0	11.0	1.53	0.354	10.67	0.31	-0.46	
LA									•
LE									•
LF	11.0	10.0	10.0	0.58	0.118	10.33	0.19	-0.58	
LG									•
LL									•
LM									•
LR	3.0	12.0	8.0	4.51	1.120	7.67	-0.73	-1.50	
LT	10.0	10.0	10.0	0.00	0.000	10.00	0.08	-0.69	
M	9.0	9.0	8.0	0.58	0.118	8.67	-0.39	-1.15	
MA	9.0	9.0	9.0	0.00	0.000	9.00	-0.27	-1.04	
MN									•
MO									•
MP	12.0	13.0	12.0	0.58	0.118	12.33	0.88	0.12	
MQ	13.0	11.0	11.0	1.15	0.236	11.67	0.65	-0.12	
MS	10.0	10.0	9.0	0.58	0.118	9.67	-0.04	-0.81	
MV	7.0	4.0	5.0	1.53	0.354	5.33	-1.54	-2.31	
MY	9.0	10.0	9.0	0.58	0.118	9.33	-0.16	-0.92	
N									•
NA									•
NG									•
NH	9.0	9.0	9.0	0.00	0.000	9.00	-0.27	-1.04	
NJ	11.0	10.0	10.0	0.58	0.118	10.33	0.19	-0.58	
NK	5.0	7.0	6.0	1.00	0.236	6.00	-1.31	-2.08	
NO									•
NT									•
O	10.0	10.0	10.0	0.00	0.000	10.00	0.08	-0.69	
OF									•
OS									•
OX									•
OY									•
OZ									•
P	12.0	9.0	10.0	1.53	0.354	10.33	0.19	-0.58	
PA									•
PB	10.0	10.0	10.0	0.00	0.000	10.00	0.08	-0.69	
PC	10.0	11.0	11.0	0.58	0.118	10.67	0.31	-0.46	

• ≡ No data submitted — **TAG SYMBOLS** — ⇑ ≡ Above control limit

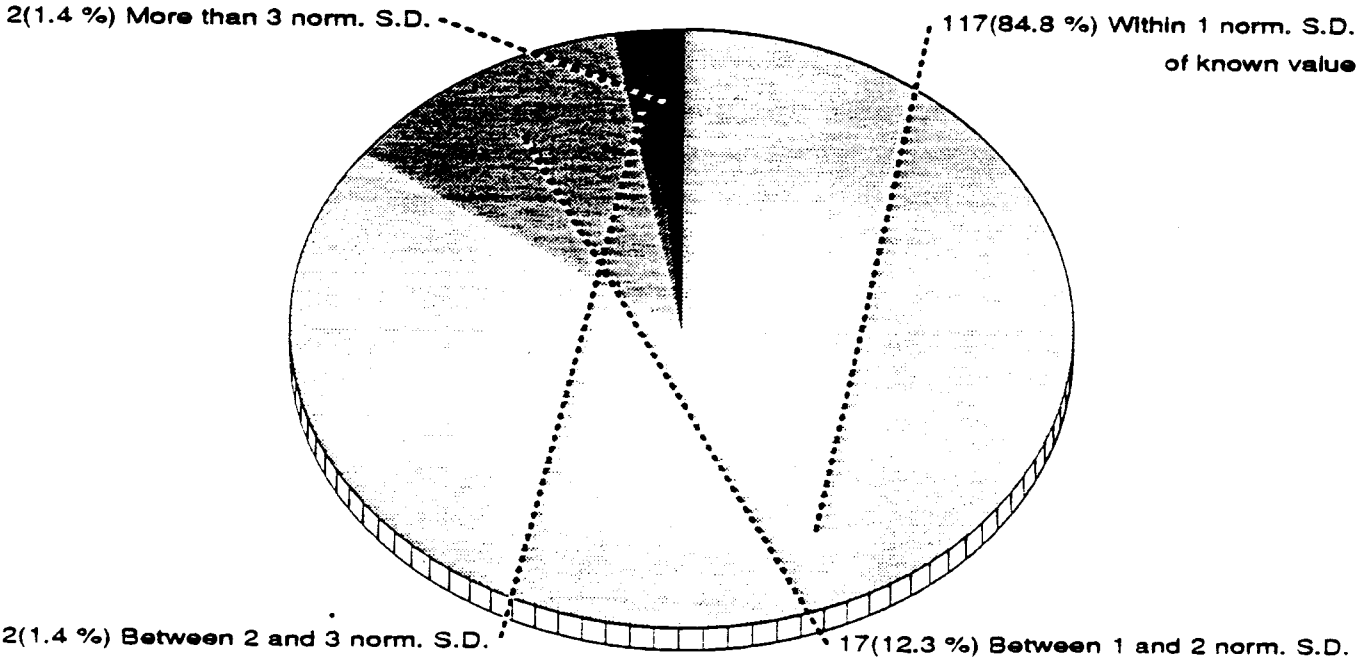
∅ ≡ Insufficient data — × ≡ Determined to be an outlier — ⇓ ≡ Below control limit

Cesium-137 Statistical Summary 219 Participants

The known value of this nuclide is **10.0 pCi/l** with an expected precision of **5.0**; the control limits are 1.3 to 18.7; the warning regions are 1.3 to 4.2 and 15.8 to 18.7



Statistic	Respondents	Non-outliers
Mean	11.13	**Grand Avg 10.93**
Std. Dev.	2.38	1.72
Variance	5.67	2.95
% Coef. of Var.	21.40	15.71
% deviation of mean from known value	11.30	9.34
Norm. dev. of mean from known value	0.47	0.54
Median	10.67	10.67
% deviation of median from known value	6.67	6.67
Norm. dev. of median from known value	0.28	0.39



Cesium-137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
JS	14.0	13.0	14.0	0.58	0.118	13.67	0.95	1.27	
JX									•
JY	14.0	12.0	11.0	1.53	0.354	12.33	0.48	0.81	
K	13.0	14.0	13.0	0.58	0.118	13.33	0.83	1.15	
KE									•
KF									•
KT									•
KX	11.0	11.0	11.0	0.00	0.000	11.00	0.02	0.35	
KZ									•
L	9.0	10.0	11.0	1.00	0.236	10.00	-0.32	0.00	
LA									•
LE									•
LF	10.0	12.0	10.0	1.15	0.236	10.67	-0.09	0.23	
LG									•
LL									•
LM									•
LR	6.0	9.0	10.0	2.08	0.473	8.33	-0.90	-0.58	
LT	10.0	10.0	10.0	0.00	0.000	10.00	-0.32	0.00	
M	10.0	10.0	11.0	0.58	0.118	10.33	-0.21	0.12	
MA	10.0	10.0	10.0	0.00	0.000	10.00	-0.32	0.00	
MN									•
MO									•
MP	10.0	10.0	11.0	0.58	0.118	10.33	-0.21	0.12	
MQ	14.0	13.0	13.0	0.58	0.118	13.33	0.83	1.15	
MS	10.0	13.0	12.0	1.53	0.354	11.67	0.25	0.58	
MV	9.0	5.0	6.0	2.08	0.473	6.67	-1.48	-1.15	
MY	12.0	11.0	12.0	0.58	0.118	11.67	0.25	0.58	
N									•
NA									•
NG									•
NH	11.0	12.0	11.0	0.58	0.118	11.33	0.14	0.46	
NJ	12.0	15.0	12.0	1.73	0.354	13.00	0.72	1.04	
NK	12.0	8.0	6.0	3.06	0.709	8.67	-0.79	-0.46	
NO									•
NT									•
O	11.0	11.0	12.0	0.58	0.118	11.33	0.14	0.46	
OF									•
OS									•
OX									•
OY									•
OZ									•
P	15.0	16.0	15.0	0.58	0.118	15.33	1.52	1.85	
PA									•
PB	10.0	11.0	10.0	0.58	0.118	10.33	-0.21	0.12	
PC	11.0	11.0	12.0	0.58	0.118	11.33	0.14	0.46	

• ≡ No data submitted
∅ ≡ Insufficient data

TAG SYMBOLS
× ≡ Determined to be an outlier

⇑ ≡ Above control limit
⇓ ≡ Below control limit

Gross Alpha-Beta in Water

Performance Evaluation Study

October 29, 1993

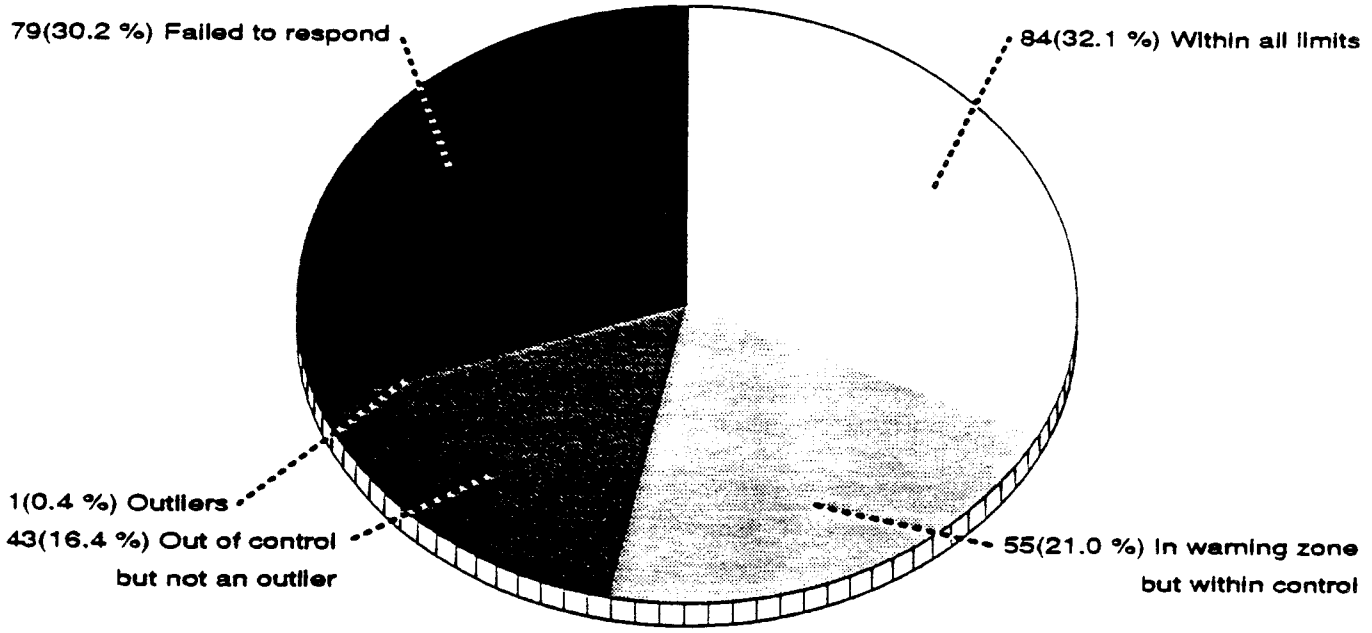
Environmental Protection Agency

Environmental Monitoring Systems Laboratory

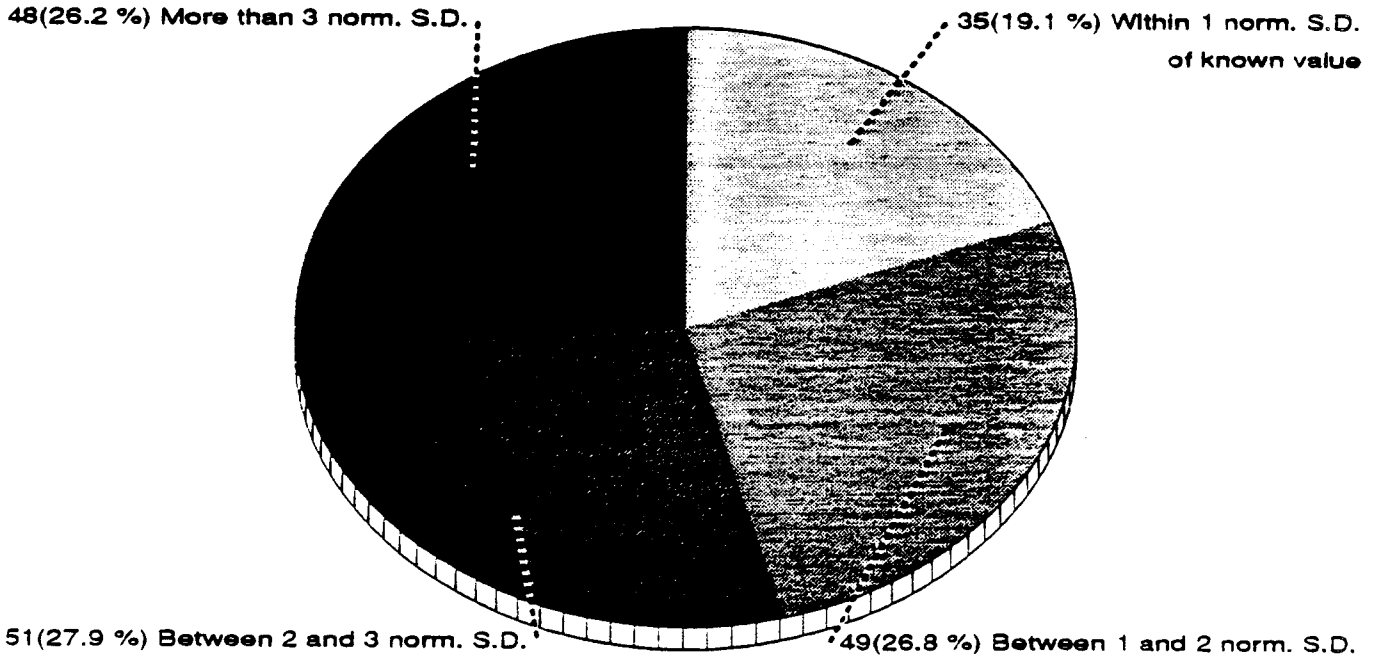
Las Vegas, Nevada

Gross Alpha Statistical Summary 262 Participants

The known value of this nuclide is **20.0 pCi/l** with an expected precision of **5.0**; the control limits are 11.3 to 28.7; the warning regions are 11.3 to 14.2 and 25.8 to 28.7



Statistic	Respondents	Non-outliers
Mean	14.20	**Grand Avg 14.08**
Std. Dev.	4.90	4.64
Variance	23.98	21.56
% Coef. of Var.	34.50	32.98
% deviation of mean from known value	-29.02	-29.61
Norm. dev. of mean from known value	-1.18	-1.28
Median	14.00	13.83
% deviation of median from known value	-30.00	-30.83
Norm. dev. of median from known value	-1.23	-1.33



Gross Alpha

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
NE	36.0	34.0	37.0	1.53	0.354	35.67	7.48	5.43	×
NF									•
NG	6.0	7.0	8.0	1.00	0.236	7.00	-2.45	-4.50	⇓
NH	10.0	16.0	18.0	4.16	0.945	14.67	0.20	-1.85	
NI									•
NJ	11.0	12.0	14.0	1.53	0.354	12.33	-0.60	-2.66	
NK	8.0	6.0	6.0	1.15	0.236	6.67	-2.57	-4.62	⇓
NO	15.0	16.0	17.0	1.00	0.236	16.00	0.67	-1.39	
NP									•
NT	19.0	19.0	19.0	0.00	0.000	19.00	1.70	-0.35	
O	18.0	19.0	19.0	0.58	0.118	18.67	1.59	-0.46	
OA	20.0	18.0	22.0	2.00	0.473	20.00	2.05	0.00	
OB	10.0	16.0	18.0	4.16	0.945	14.67	0.20	-1.85	
OF	15.0	17.0	18.0	1.53	0.354	16.67	0.90	-1.15	
OM									•
OS	15.0	15.0	15.0	0.00	0.000	15.00	0.32	-1.73	
OT									•
OX									•
OY	24.0	28.0	33.0	4.51	1.120	28.33	4.94	2.89	
P	14.0	12.0	11.0	1.53	0.354	12.33	-0.60	-2.66	
PA									•
PB	18.0	18.0	18.0	0.00	0.000	18.00	1.36	-0.69	
PC	20.0	23.0	24.0	2.08	0.473	22.33	2.86	0.81	
PD									•
PE									•
PG	12.0	13.0	14.0	1.00	0.236	13.00	-0.37	-2.42	
PM	13.0	14.0	14.0	0.58	0.118	13.67	-0.14	-2.19	
PP									•
PQ	15.0	14.0	15.0	0.58	0.118	14.67	0.20	-1.85	
PR	21.0	19.0	18.0	1.53	0.354	19.33	1.82	-0.23	
PT									•
PV	18.0	19.0	19.0	0.58	0.118	18.67	1.59	-0.46	
Q	23.0	25.0	21.0	2.00	0.473	23.00	3.09	1.04	
QA									•
QB									•
QC	7.0	11.0	10.0	2.08	0.473	9.33	-1.64	-3.70	⇓
QI	4.0	3.0	3.0	0.58	0.118	3.33	-3.72	-5.77	⇓
QJ	11.0	6.0	15.0	4.51	1.120	10.67	-1.18	-3.23	⇓
QK									•
QM	5.0	4.0	4.0	0.58	0.118	4.33	-3.38	-5.43	⇓
QP	4.0	4.0	7.0	1.73	0.354	5.00	-3.14	-5.20	⇓
QQ									•
QT	22.0	21.0	17.0	2.65	0.591	20.00	2.05	0.00	
QU	22.0	25.0	29.0	3.51	0.827	25.33	3.90	1.85	
QW	17.0	22.0	19.0	2.52	0.591	19.33	1.82	-0.23	

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

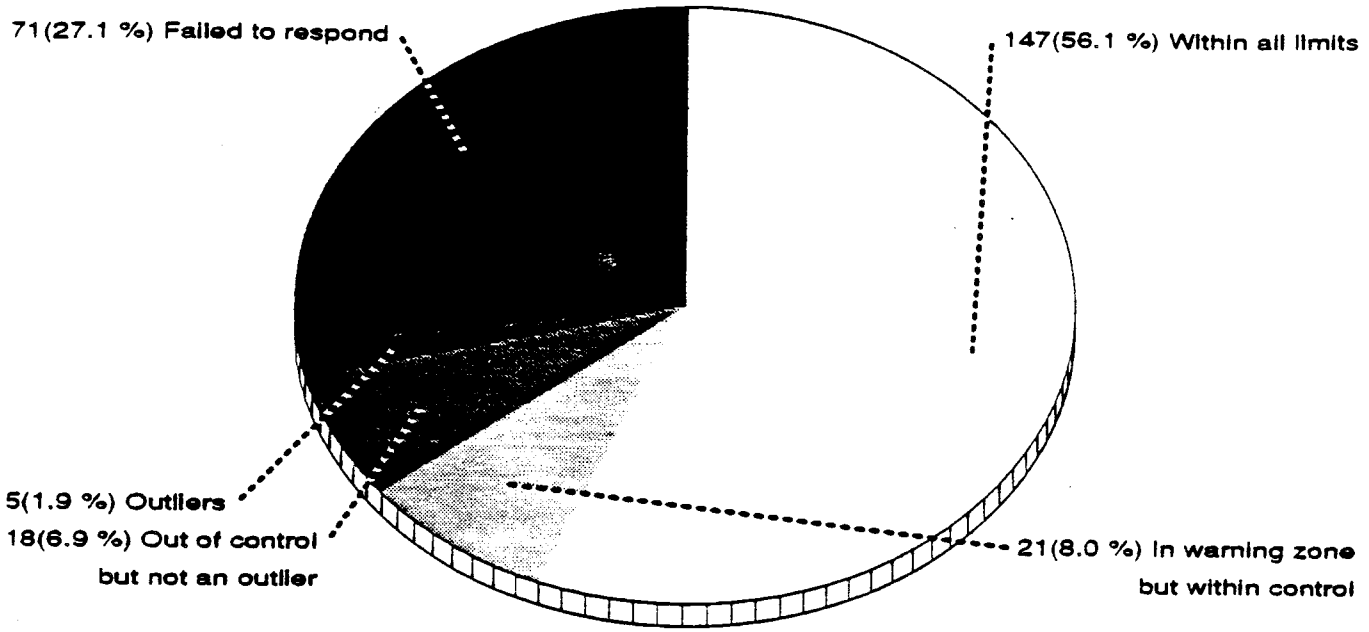
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

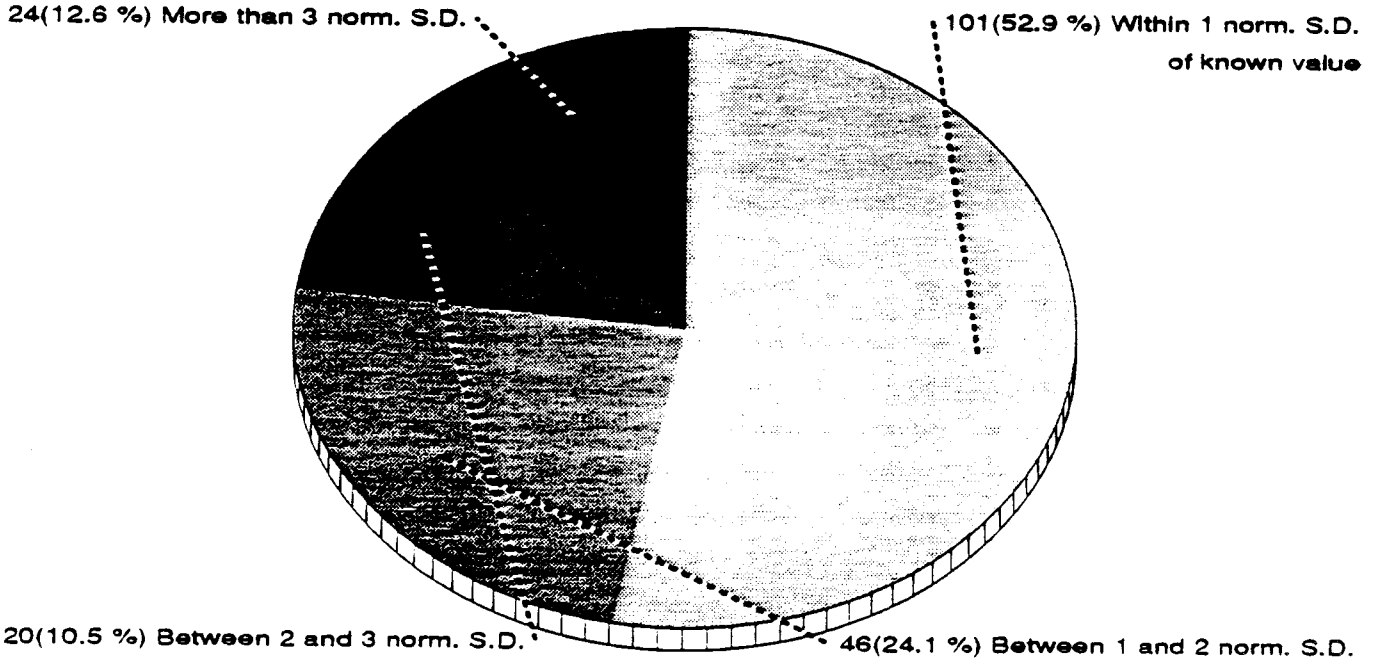
⇓ ≡ Below control limit

Gross Beta Statistical Summary 262 Participants

The known value of this nuclide is **15.0 pCi/l** with an expected precision of **5.0**; the control limits are 6.3 to 23.7; the warning regions are 6.3 to 9.2 and 20.8 to 23.7



Statistic	Respondents	Non-outliers
Mean	20.19	**Grand Avg 17.01**
Std. Dev.	28.23	4.80
Variance	797.14	23.03
% Coef. of Var.	139.81	28.22
% deviation of mean from known value	34.62	13.38
Norm. dev. of mean from known value	0.18	0.42
Median	16.67	16.67
% deviation of median from known value	11.11	11.11
Norm. dev. of median from known value	0.06	0.35



Gross Beta

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
NE	14.0	15.0	16.0	1.00	0.236	15.00	-0.70	0.00	
NF									•
NG	13.0	13.0	13.0	0.00	0.000	13.00	-1.39	-0.69	
NH	14.0	16.0	20.0	3.06	0.709	16.67	-0.12	0.58	
NI									•
NJ	10.0	13.0	11.0	1.53	0.354	11.33	-1.97	-1.27	
NK	11.0	9.0	7.0	2.00	0.473	9.00	-2.77	-2.08	
NO	18.0	19.0	20.0	1.00	0.236	19.00	0.69	1.39	
NP									•
NT	16.0	18.0	17.0	1.00	0.236	17.00	0.00	0.69	
O	17.0	18.0	17.0	0.58	0.118	17.33	0.11	0.81	
OA	17.0	15.0	15.0	1.15	0.236	15.67	-0.46	0.23	
OB	21.0	23.0	19.0	2.00	0.473	21.00	1.38	2.08	
OF	16.0	16.0	17.0	0.58	0.118	16.33	-0.23	0.46	
OM									•
OS	21.0	29.0	20.0	4.93	1.120	23.33	2.19	2.89	
OT	12.0	13.0	12.0	0.58	0.118	12.33	-1.62	-0.92	
OX									•
OY	34.0	38.0	46.0	6.11	1.795	39.33	7.73	8.43	×
P	16.0	18.0	13.0	2.52	0.591	15.67	-0.46	0.23	
PA									•
PB	18.0	18.0	18.0	0.00	0.000	18.00	0.34	1.04	
PC	13.0	15.0	14.0	1.00	0.236	14.00	-1.04	-0.35	
PD									•
PE									•
PG	13.0	15.0	16.0	1.53	0.354	14.67	-0.81	-0.12	
PM	19.0	19.0	18.0	0.58	0.118	18.67	0.57	1.27	
PP									•
PQ	16.0	17.0	16.0	0.58	0.118	16.33	-0.23	0.46	
PR	16.0	15.0	15.0	0.58	0.118	15.33	-0.58	0.12	
PT									•
PV	11.0	12.0	13.0	1.00	0.236	12.00	-1.73	-1.04	
Q	17.0	19.0	20.0	1.53	0.354	18.67	0.57	1.27	
QA									•
QB									•
QC	21.0	22.0	23.0	1.00	0.236	22.00	1.73	2.42	
QI	9.0	8.0	8.0	0.58	0.118	8.33	-3.00	-2.31	
QJ	249.0	239.0	224.0	12.58	4.721	237.33	76.32	77.02	×
QK	18.0	18.0	19.0	0.58	0.118	18.33	0.46	1.15	
QM	20.0	15.0	14.0	3.21	0.709	16.33	-0.23	0.46	
QP	16.0	13.0	13.0	1.73	0.354	14.00	-1.04	-0.35	
QQ									•
QT	46.0	85.0	24.0	30.89	12.821	51.67	12.01	12.70	×
QU	29.0	32.0	36.0	3.51	0.827	32.33	5.31	6.00	⇑
QW	31.0	29.0	25.0	3.06	0.709	28.33	3.92	4.62	⇑

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

× ≡ Determined to be an outlier

⇑ ≡ Above control limit

⇓ ≡ Below control limit

Gamma in Water

Performance Evaluation Study

November 12, 1993

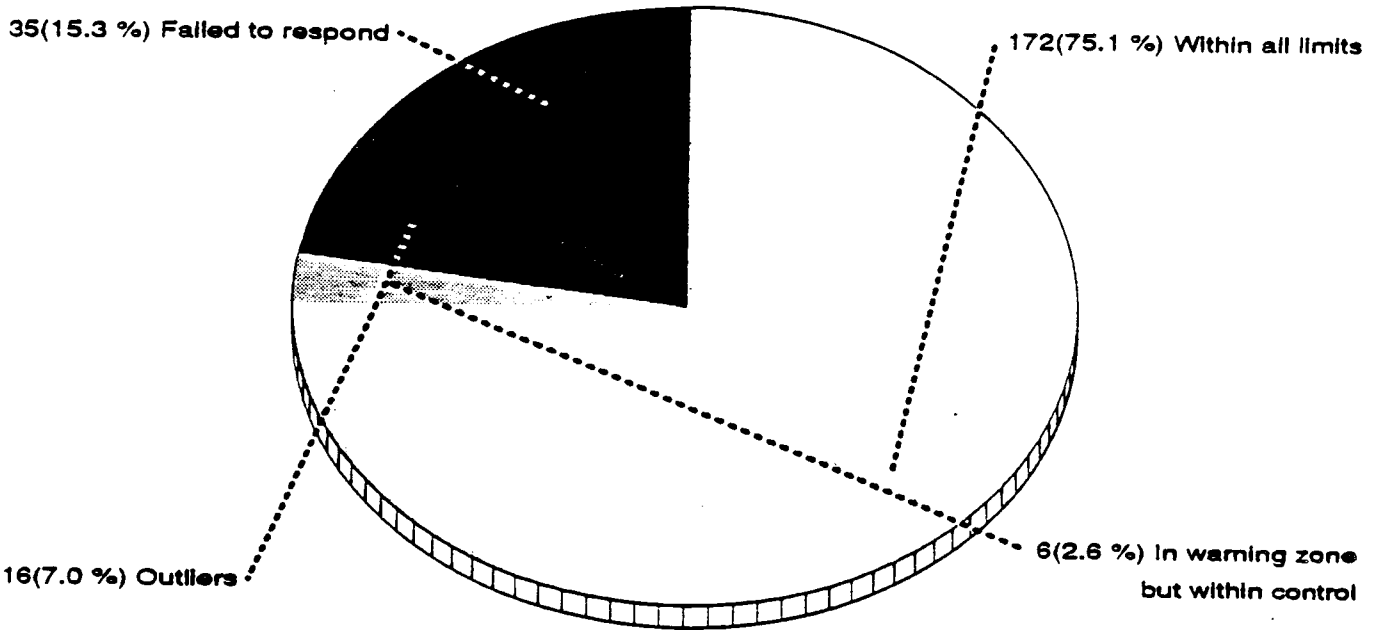
Environmental Protection Agency

Environmental Monitoring Systems Laboratory

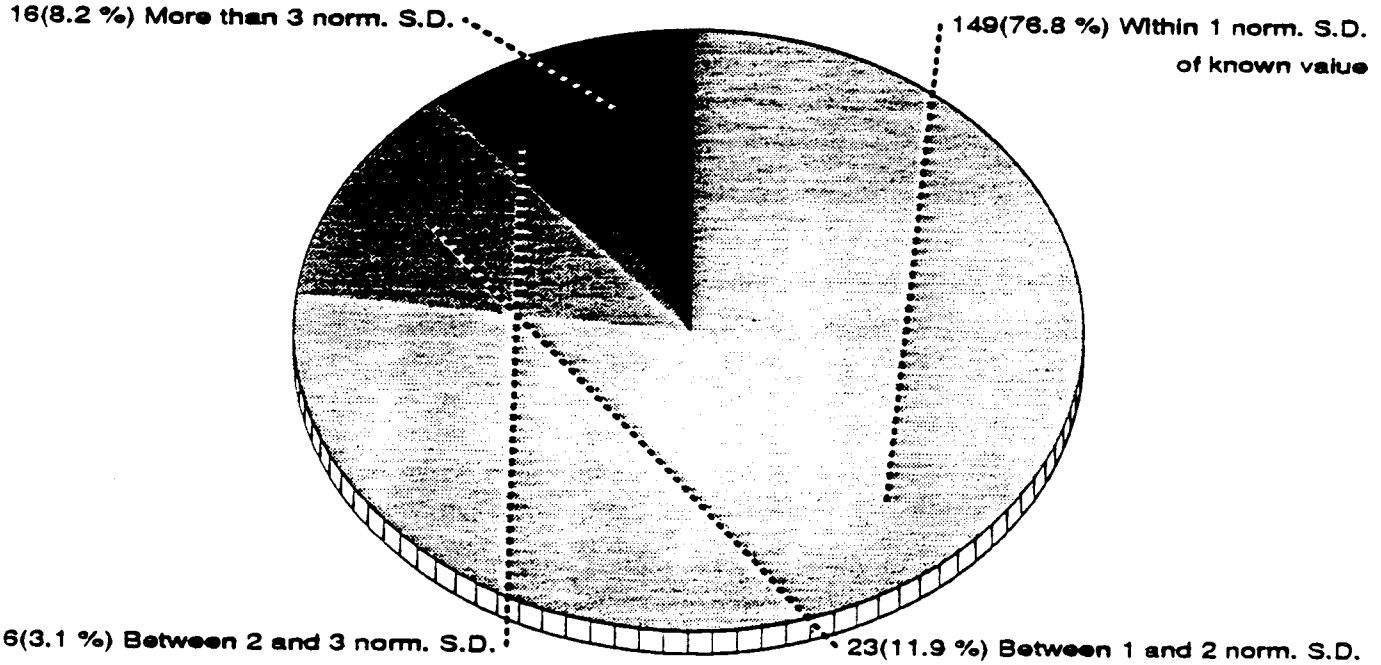
Las Vegas, Nevada

Cobalt-60 Statistical Summary 229 Participants

The known value of this nuclide is **30.0 pCi/l** with an expected precision of **5.0**; the control limits are 21.3 to 38.7; the warning regions are 21.3 to 24.2 and 35.8 to 38.7



Statistic	Respondents	Non-outliers
Mean	36.82	**Grand Avg 29.72**
Std. Dev.	37.61	2.33
Variance	1414.71	5.41
% Coef. of Var.	102.14	7.82
% deviation of mean from known value	22.74	-0.95
Norm. dev. of mean from known value	0.18	-0.12
Median	29.67	29.67
% deviation of median from known value	-1.11	-1.11
Norm. dev. of median from known value	-0.01	-0.14



Cobalt-60

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
JS	30.0	33.0	33.0	1.73	0.354	32.00	0.79	0.69	
JY	30.0	29.0	36.0	3.79	0.827	31.67	0.68	0.58	
K	36.0	34.0	34.0	1.15	0.236	34.67	1.72	1.62	
KF									•
KH	33.0	33.0	31.0	1.15	0.236	32.33	0.91	0.81	
KL	30.0	31.0	31.0	0.58	0.118	30.67	0.33	0.23	
KM	28.0	30.0	30.0	1.15	0.236	29.33	-0.13	-0.23	
KX	32.0	30.0	30.0	1.15	0.236	30.67	0.33	0.23	
L	29.0	29.0	26.0	1.73	0.354	28.00	-0.59	-0.69	
LA									•
LE	31.0	37.0	30.0	3.79	0.827	32.67	1.02	0.92	
LF	29.0	29.0	30.0	0.58	0.118	29.33	-0.13	-0.23	
LM									•
LR	33.0	32.0	32.0	0.58	0.118	32.33	0.91	0.81	
LT	30.0	30.0	30.0	0.00	0.000	30.00	0.10	0.00	
M	28.0	29.0	27.0	1.00	0.236	28.00	-0.59	-0.69	
MA	30.0	30.0	30.0	0.00	0.000	30.00	0.10	0.00	
ML	29.0	30.0	28.0	1.00	0.236	29.00	-0.25	-0.35	
MN									•
MP	29.0	28.0	32.0	2.08	0.473	29.67	-0.02	-0.12	
MQ	29.0	28.0	29.0	0.58	0.118	28.67	-0.36	-0.46	
MS	29.0	29.0	29.0	0.00	0.000	29.00	-0.25	-0.35	
MT	236.0	238.0	246.0	5.29	1.345	240.00	72.84	72.75	×
MV	31.0	31.0	28.0	1.73	0.354	30.00	0.10	0.00	
MY	22.0	22.0	23.0	0.58	0.118	22.33	-2.56	-2.66	
N	31.0	29.0	33.0	2.00	0.473	31.00	0.45	0.35	
NB	29.0	24.0	28.0	2.65	0.591	27.00	-0.94	-1.04	
NH	30.0	29.0	29.0	0.58	0.118	29.33	-0.13	-0.23	
NI	29.0	24.0	28.0	2.65	0.591	27.00	-0.94	-1.04	
NJ	28.0	28.0	28.0	0.00	0.000	28.00	-0.59	-0.69	
NK	28.0	23.0	23.0	2.89	0.591	24.67	-1.75	-1.85	
NP	29.0	28.0	32.0	2.08	0.473	29.67	-0.02	-0.12	
NZ	37.0	28.0	30.0	4.73	1.120	31.67	0.68	0.58	
O	30.0	30.0	30.0	0.00	0.000	30.00	0.10	0.00	
OA	29.0	30.0	29.0	0.58	0.118	29.33	-0.13	-0.23	
OB	23.0	23.0	23.0	0.00	0.000	23.00	-2.33	-2.42	
OK	27.0	26.0	26.0	0.58	0.118	26.33	-1.17	-1.27	
OL	39.0	39.0	39.0	0.00	0.000	39.00	3.22	3.12	×
OM	28.0	30.0	31.0	1.53	0.354	29.67	-0.02	-0.12	
OT	37.0	40.0	35.0	2.52	0.591	37.33	2.64	2.54	
OZ									•
PB	32.0	31.0	29.0	1.53	0.354	30.67	0.33	0.23	
PC	29.0	30.0	31.0	1.00	0.236	30.00	0.10	0.00	
PD									•
PE	52.0	44.0	42.0	5.29	1.345	46.00	5.64	5.54	×

• ≡ No data submitted

Ø ≡ Insufficient data

TAG SYMBOLS

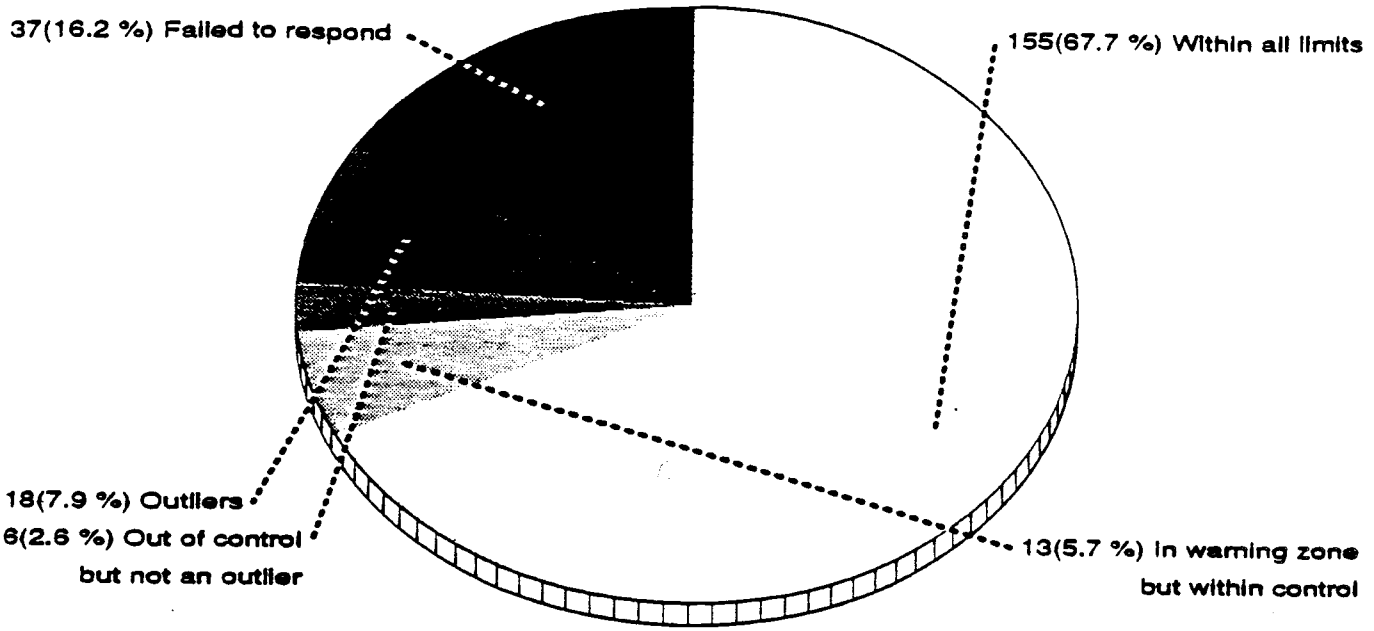
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

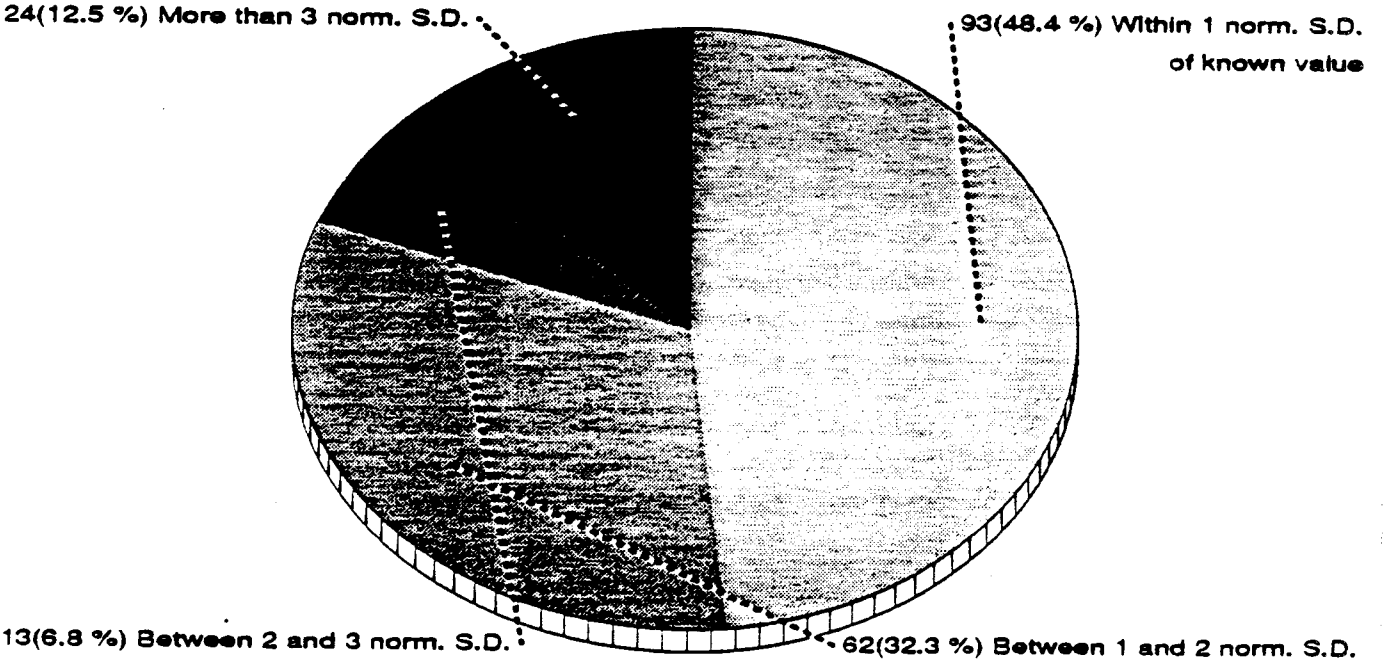
⇓ ≡ Below control limit

Zinc-65 Statistical Summary 229 Participants

The known value of this nuclide is **150.0 pCi/l** with an expected precision of **15.0**; the control limits are 124.0 to 176.0; the warning regions are 124.0 to 132.6 and 167.4 to 176.0



Statistic	Respondents	Non-outliers
Mean	189.88	**Grand Avg 156.07**
Std. Dev.	190.96	9.24
Variance	36465.03	85.36
% Coef. of Var.	100.57	5.92
% deviation of mean from known value	26.58	4.05
Norm. dev. of mean from known value	0.21	0.66
Median	156.50	156.33
% deviation of median from known value	4.33	4.22
Norm. dev. of median from known value	0.03	0.69



Zinc-65

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
JS	161.0	190.0	181.0	14.84	1.270	177.33	2.46	3.16	⇑
JY	186.0	166.0	179.0	10.15	0.788	177.00	2.42	3.12	⇑
K	177.0	181.0	181.0	2.31	0.158	179.67	2.72	3.43	⇑
KF									•
KH	156.0	156.0	161.0	2.89	0.197	157.67	0.18	0.89	
KL	160.0	168.0	157.0	5.69	0.433	161.67	0.65	1.35	
KM	147.0	151.0	148.0	2.08	0.158	148.67	-0.85	-0.15	
KX	156.0	151.0	157.0	3.21	0.236	154.67	-0.16	0.54	
L	145.0	144.0	140.0	2.65	0.197	143.00	-1.51	-0.81	
LA									•
LE	176.0	168.0	160.0	8.00	0.630	168.00	1.38	2.08	
LF	160.0	150.0	150.0	5.77	0.394	153.33	-0.32	0.38	
LM									•
LR	183.0	203.0	190.0	10.15	0.788	192.00	4.15	4.85	×
LT	157.0	157.0	157.0	0.00	0.000	157.00	0.11	0.81	
M	158.0	156.0	160.0	2.00	0.158	158.00	0.22	0.92	
MA	161.0	163.0	161.0	1.15	0.079	161.67	0.65	1.35	
ML	163.0	171.0	153.0	9.02	0.709	162.33	0.72	1.42	
MN									•
MP	175.0	169.0	164.0	5.51	0.433	169.33	1.53	2.23	
MQ	144.0	141.0	139.0	2.52	0.197	141.33	-1.70	-1.00	
MS	161.0	159.0	158.0	1.53	0.118	159.33	0.38	1.08	
MT	1344.0	1365.0	1372.0	14.57	1.195	1360.33	139.06	139.76	×
MV	164.0	158.0	158.0	3.46	0.236	160.00	0.45	1.15	
MY	135.0	141.0	138.0	3.00	0.236	138.00	-2.09	-1.39	
N	161.0	162.0	163.0	1.00	0.079	162.00	0.68	1.39	
NB	155.0	158.0	159.0	2.08	0.158	157.33	0.15	0.85	
NH	164.0	165.0	167.0	1.53	0.118	165.33	1.07	1.77	
NI	164.0	132.0	149.0	16.01	1.495	148.33	-0.89	-0.19	
NJ	150.0	150.0	150.0	0.00	0.000	150.00	-0.70	0.00	
NK	147.0	137.0	124.0	11.53	0.906	136.00	-2.32	-1.62	
NP	157.0	157.0	145.0	6.93	0.473	153.00	-0.35	0.35	
NZ	116.0	138.0	130.0	11.14	0.866	128.00	-3.24	-2.54	
O	163.0	162.0	163.0	0.58	0.039	162.67	0.76	1.46	
OA	157.0	154.0	150.0	3.51	0.276	153.67	-0.28	0.42	
OB									•
OK	140.0	137.0	129.0	5.69	0.433	135.33	-2.39	-1.69	
OL	162.0	162.0	162.0	0.00	0.000	162.00	0.68	1.39	
OM	156.0	160.0	162.0	3.06	0.236	159.33	0.38	1.08	
OT	166.0	164.0	156.0	5.29	0.394	162.00	0.68	1.39	
OZ									•
PB	146.0	145.0	145.0	0.58	0.039	145.33	-1.24	-0.54	
PC	156.0	161.0	168.0	6.03	0.473	161.67	0.65	1.35	
PD									•
PE	159.0	152.0	146.0	6.51	0.512	152.33	-0.43	0.27	

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

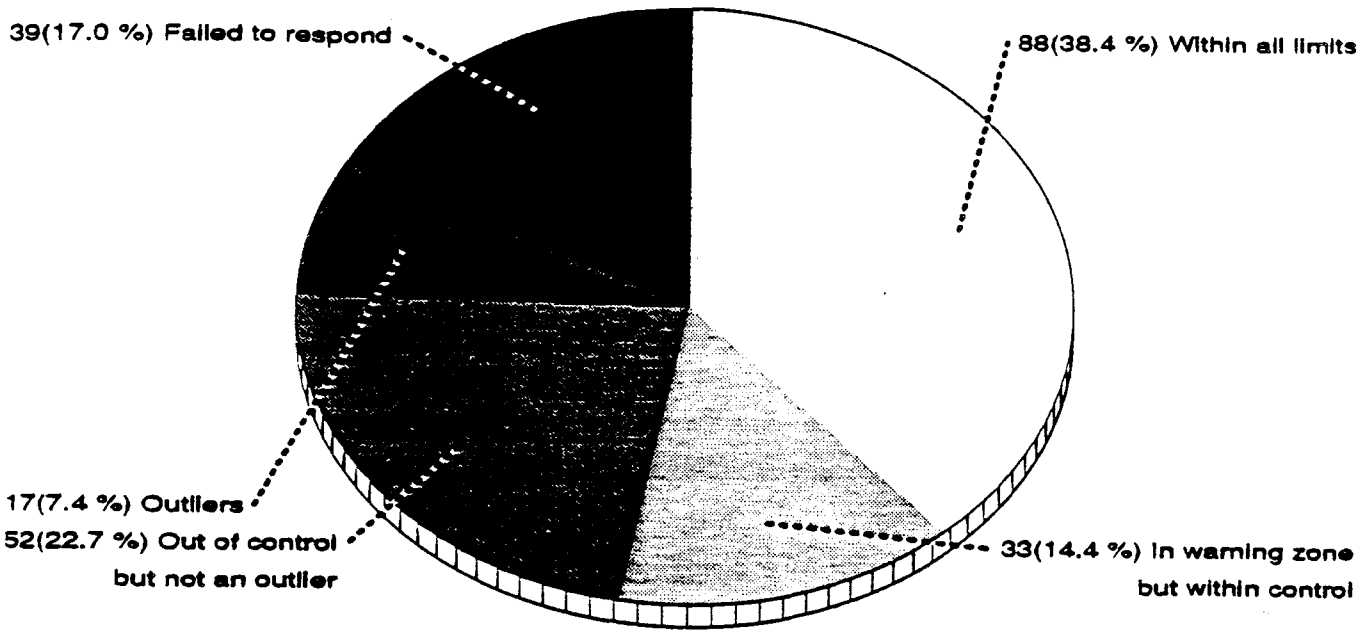
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

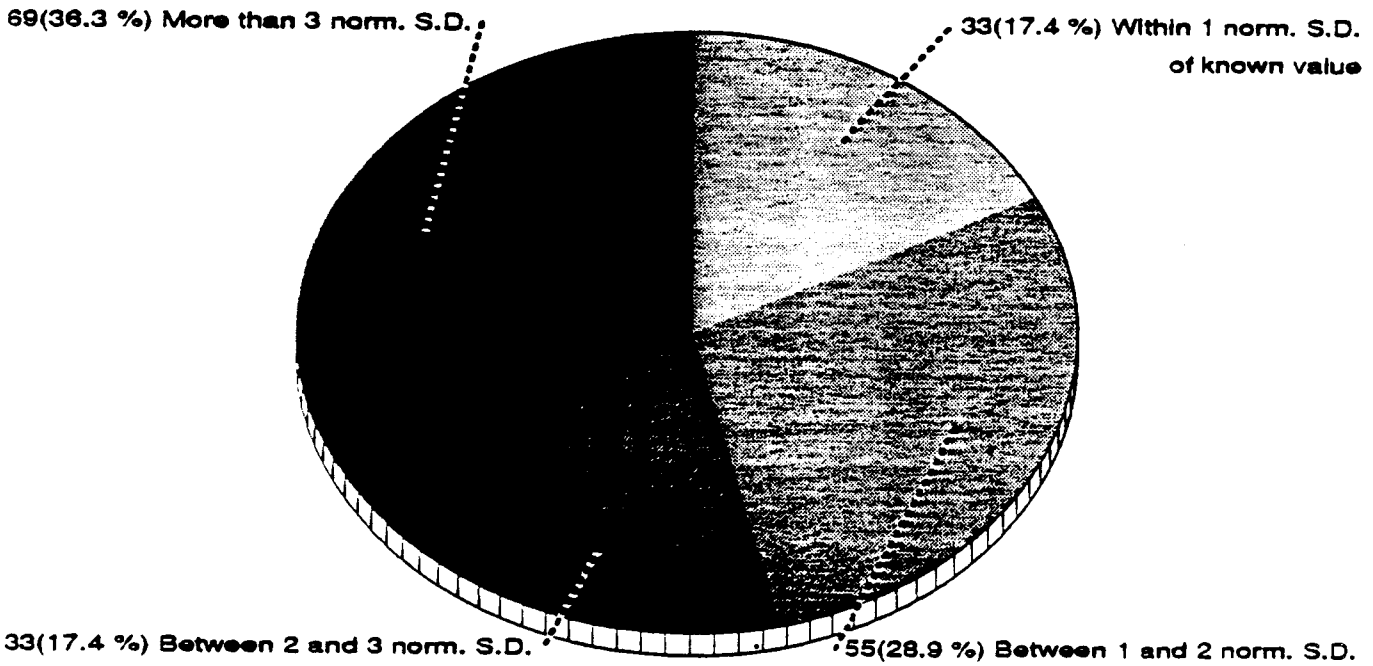
⇓ ≡ Below control limit

Ruthenium-106 Statistical Summary 229 Participants

The known value of this nuclide is **201.0 pCi/l** with an expected precision of **20.0**; the control limits are 166.3 to 235.7; the warning regions are 166.3 to 177.8 and 224.2 to 235.7



Statistic	Respondents	Non-outliers
Mean	213.00	**Grand Avg** 175.18
Std. Dev.	215.64	18.32
Variance	46501.37	335.52
% Coef. of Var.	101.24	10.46
% deviation of mean from known value	5.97	-12.85
Norm. dev. of mean from known value	0.06	-1.41
Median	178.33	178.33
% deviation of median from known value	-11.28	-11.28
Norm. dev. of median from known value	-0.11	-1.24



Ruthenium-106

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
JS	221.0	263.0	257.0	22.72	1.458	247.00	6.22	3.98	×
JY	202.0	231.0	200.0	17.35	0.916	211.00	3.10	0.87	
K	160.0	157.0	171.0	7.37	0.413	162.67	-1.08	-3.32	⇓
KF									•
KH	207.0	196.0	196.0	6.35	0.325	199.67	2.12	-0.12	
KL	160.0	162.0	158.0	2.00	0.118	160.00	-1.31	-3.55	⇓
KM	195.0	203.0	202.0	4.36	0.236	200.00	2.15	-0.09	
KX	213.0	194.0	192.0	11.59	0.620	199.67	2.12	-0.12	
L	162.0	165.0	159.0	3.00	0.177	162.00	-1.14	-3.38	⇓
LA									•
LE	148.0	192.0	142.0	27.30	1.908	160.67	-1.26	-3.49	⇓
LF	180.0	170.0	200.0	15.28	0.886	183.33	0.71	-1.53	
LM									•
LR	134.0	153.0	161.0	13.87	0.797	149.33	-2.24	-4.47	⇓
LT	205.0	205.0	205.0	0.00	0.000	205.00	2.58	0.35	
M	163.0	168.0	169.0	3.21	0.177	166.67	-0.74	-2.97	
MA	153.0	159.0	154.0	3.21	0.177	155.33	-1.72	-3.95	⇓
ML	157.0	150.0	163.0	6.51	0.384	156.67	-1.60	-3.84	⇓
MN									•
MP	185.0	173.0	172.0	7.23	0.384	176.67	0.13	-2.11	
MQ	165.0	193.0	191.0	15.62	0.827	183.00	0.68	-1.56	
MS	174.0	174.0	166.0	4.62	0.236	171.33	-0.33	-2.57	
MT	1395.0	1395.0	1392.0	1.73	0.089	1394.00	105.55	103.32	×
MV	189.0	175.0	200.0	12.53	0.738	188.00	1.11	-1.13	
MY	102.0	110.0	105.0	4.04	0.236	105.67	-6.02	-8.28	×
N	188.0	191.0	218.0	16.52	0.886	199.00	2.06	-0.17	
NB	180.0	172.0	191.0	9.54	0.561	181.00	0.50	-1.73	
NH	183.0	182.0	178.0	2.65	0.148	181.00	0.50	-1.73	
NI	154.0	113.0	131.0	20.55	1.402	132.67	-3.68	-5.92	⇓
NJ	175.0	165.0	175.0	5.77	0.295	171.67	-0.30	-2.54	
NK	106.0	122.0	121.0	8.96	0.473	116.33	-5.10	-7.33	⇓
NP	167.0	159.0	162.0	4.04	0.236	162.67	-1.08	-3.32	⇓
NZ	167.0	151.0	180.0	14.53	0.856	166.00	-0.79	-3.03	⇓
O	196.0	200.0	200.0	2.31	0.118	198.67	2.03	-0.20	
OA	184.0	189.0	183.0	3.21	0.177	185.33	0.88	-1.36	
OB									•
OK	192.0	199.0	200.0	4.36	0.236	197.00	1.89	-0.35	
OL	256.0	256.0	256.0	0.00	0.000	256.00	7.00	4.76	×
OM	174.0	175.0	180.0	3.21	0.177	176.33	0.10	-2.14	
OT	132.0	229.0	190.0	48.81	4.552	183.67	0.74	-1.50	
OZ									•
PB	188.0	206.0	213.0	12.90	0.738	202.33	2.35	0.12	
PC	152.0	161.0	170.0	9.00	0.532	161.00	-1.23	-3.46	⇓
PD									•
PE	228.0	198.0	205.0	15.70	0.886	210.33	3.04	0.81	

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

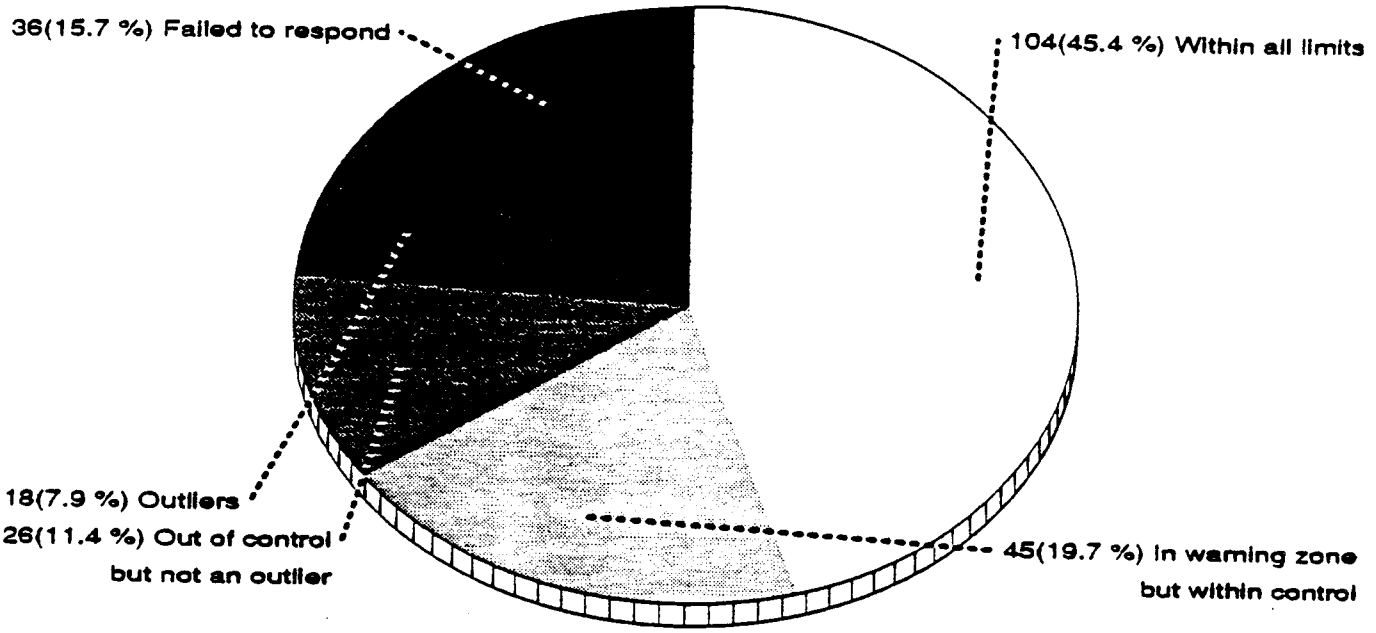
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

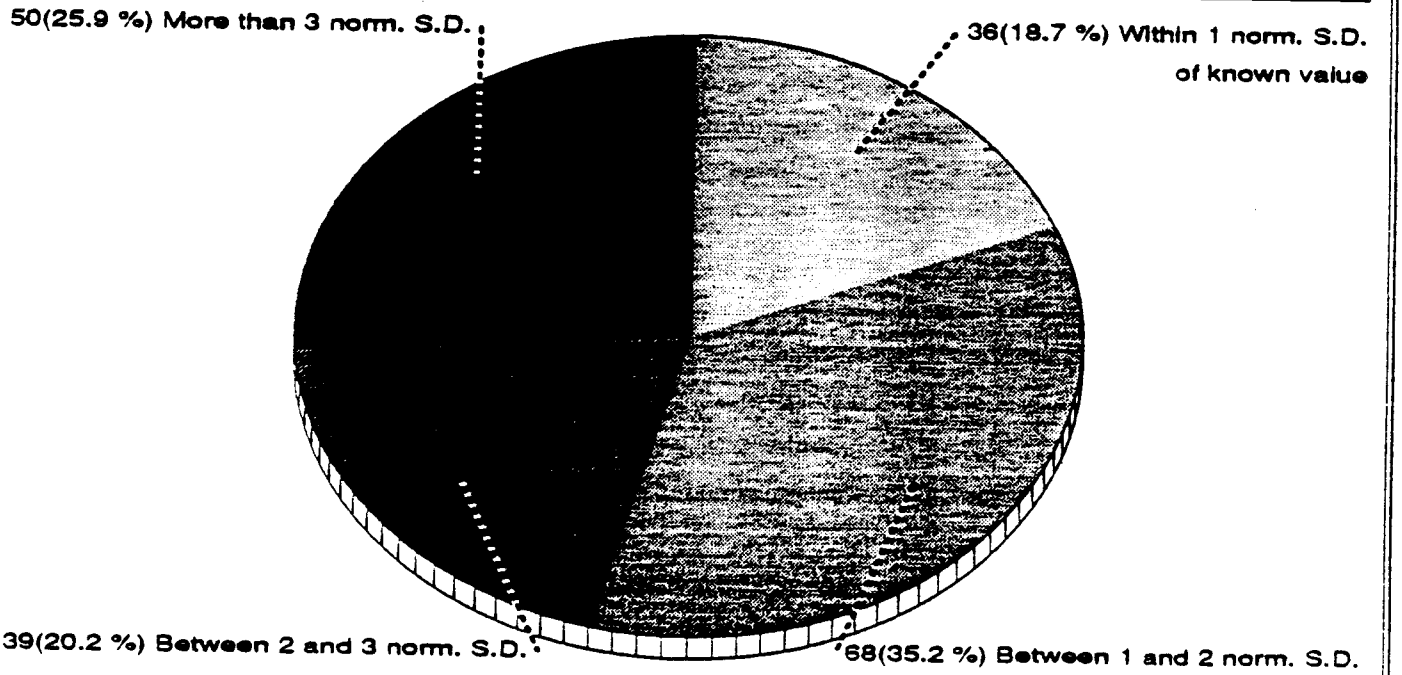
⇓ ≡ Below control limit

Cesium-134 Statistical Summary 229 Participants

The known value of this nuclide is **59.0 pCi/l** with an expected precision of **5.0**; the control limits are 50.3 to 67.7; the warning regions are 50.3 to 53.2 and 64.8 to 67.7



Statistic	Respondents	Non-outliers
Mean	64.88	**Grand Avg 54.42**
Std. Dev.	63.91	4.53
Variance	4084.96	20.48
% Coef. of Var.	98.52	8.32
% deviation of mean from known value	9.96	-7.77
Norm. dev. of mean from known value	0.09	-1.01
Median	54.33	54.33
% deviation of median from known value	-7.91	-7.91
Norm. dev. of median from known value	-0.07	-1.03



Cesium-134

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
JS	52.0	61.0	59.0	4.73	1.120	57.33	1.01	-0.58	
JY	55.0	55.0	54.0	0.58	0.118	54.67	0.09	-1.50	
K	50.0	57.0	48.0	4.73	1.120	51.67	-0.95	-2.54	
KF									•
KH	51.0	56.0	55.0	2.65	0.591	54.00	-0.14	-1.73	
KL	56.0	56.0	58.0	1.15	0.236	56.67	0.78	-0.81	
KM	54.0	54.0	55.0	0.58	0.118	54.33	-0.03	-1.62	
KX	78.0	74.0	77.0	2.08	0.473	76.33	7.59	6.00	×
L	54.0	54.0	53.0	0.58	0.118	53.67	-0.26	-1.85	
LA									•
LE	47.0	47.0	57.0	5.77	1.345	50.33	-1.41	-3.00	
LF	57.0	54.0	56.0	1.53	0.354	55.67	0.43	-1.15	
LM									•
LR	75.0	69.0	72.0	3.00	0.709	72.00	6.09	4.50	×
LT	60.0	60.0	60.0	0.00	0.000	60.00	1.93	0.35	
M	49.0	50.0	50.0	0.58	0.118	49.67	-1.65	-3.23	⇓
MA	53.0	53.0	54.0	0.58	0.118	53.33	-0.38	-1.96	
ML	50.0	51.0	50.0	0.58	0.118	50.33	-1.41	-3.00	
MN									•
MP	60.0	61.0	56.0	2.65	0.591	59.00	1.59	0.00	
MQ	53.0	55.0	53.0	1.15	0.236	53.67	-0.26	-1.85	
MS	59.0	59.0	59.0	0.00	0.000	59.00	1.59	0.00	
MT	455.0	453.0	451.0	2.00	0.473	453.00	138.07	136.49	×
MV	52.0	54.0	59.0	3.61	0.827	55.00	0.20	-1.39	
MY	47.0	47.0	46.0	0.58	0.118	46.67	-2.68	-4.27	⇓
N	56.0	57.0	54.0	1.53	0.354	55.67	0.43	-1.15	
NB	62.0	67.0	63.0	2.65	0.591	64.00	3.32	1.73	
NH	52.0	53.0	52.0	0.58	0.118	52.33	-0.72	-2.31	
NI	50.0	40.0	44.0	5.03	1.345	44.67	-3.38	-4.97	⇓
NJ	51.0	50.0	50.0	0.58	0.118	50.33	-1.41	-3.00	
NK	41.0	51.0	41.0	5.77	1.345	44.33	-3.49	-5.08	⇓
NP	54.0	58.0	50.0	4.00	0.945	54.00	-0.14	-1.73	
NZ	48.0	50.0	50.0	1.15	0.236	49.33	-1.76	-3.35	⇓
O	56.0	56.0	56.0	0.00	0.000	56.00	0.55	-1.04	
OA	55.0	55.0	55.0	0.00	0.000	55.00	0.20	-1.39	
OB									•
OK	60.0	61.0	62.0	1.00	0.236	61.00	2.28	0.69	
OL	49.0	49.0	49.0	0.00	0.000	49.00	-1.88	-3.46	⇓
OM	54.0	58.0	55.0	2.08	0.473	55.67	0.43	-1.15	
OT	67.0	62.0	58.0	4.51	1.120	62.33	2.74	1.15	
OZ									•
PB	54.0	53.0	53.0	0.58	0.118	53.33	-0.38	-1.96	
PC	55.0	58.0	60.0	2.52	0.591	57.67	1.13	-0.46	
PD									•
PE	60.0	57.0	57.0	1.73	0.354	58.00	1.24	-0.35	

• ≡ No data submitted

Ø ≡ Insufficient data

TAG SYMBOLS

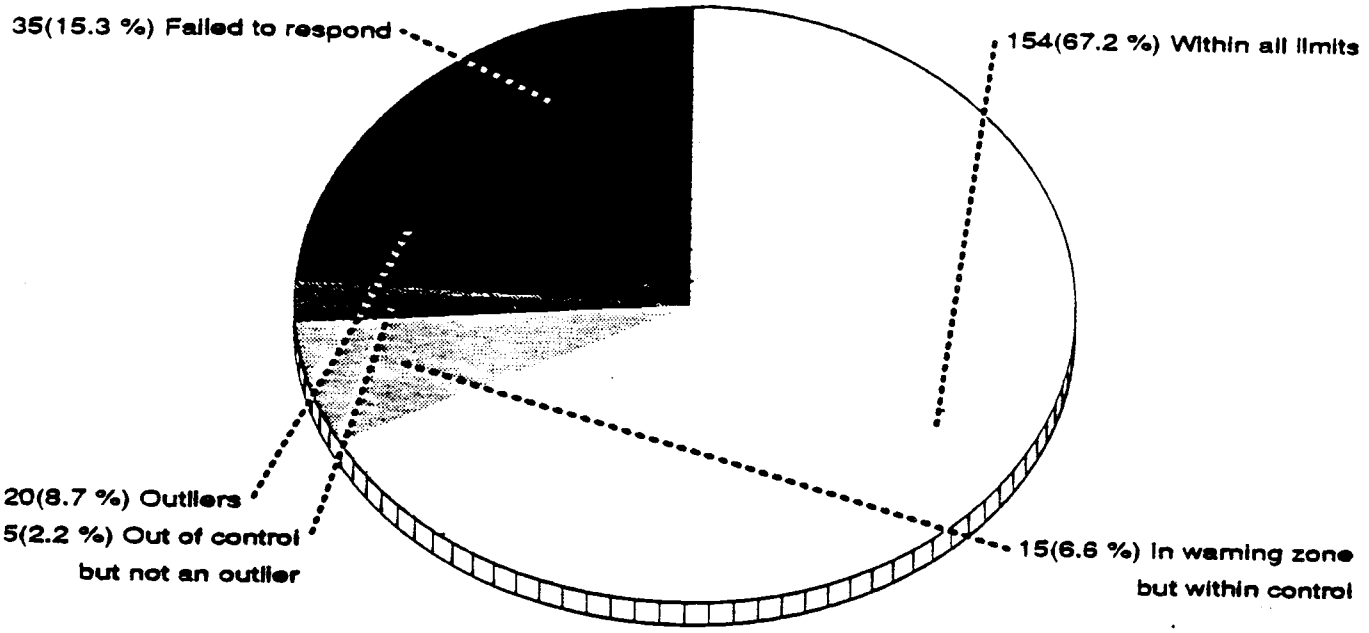
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

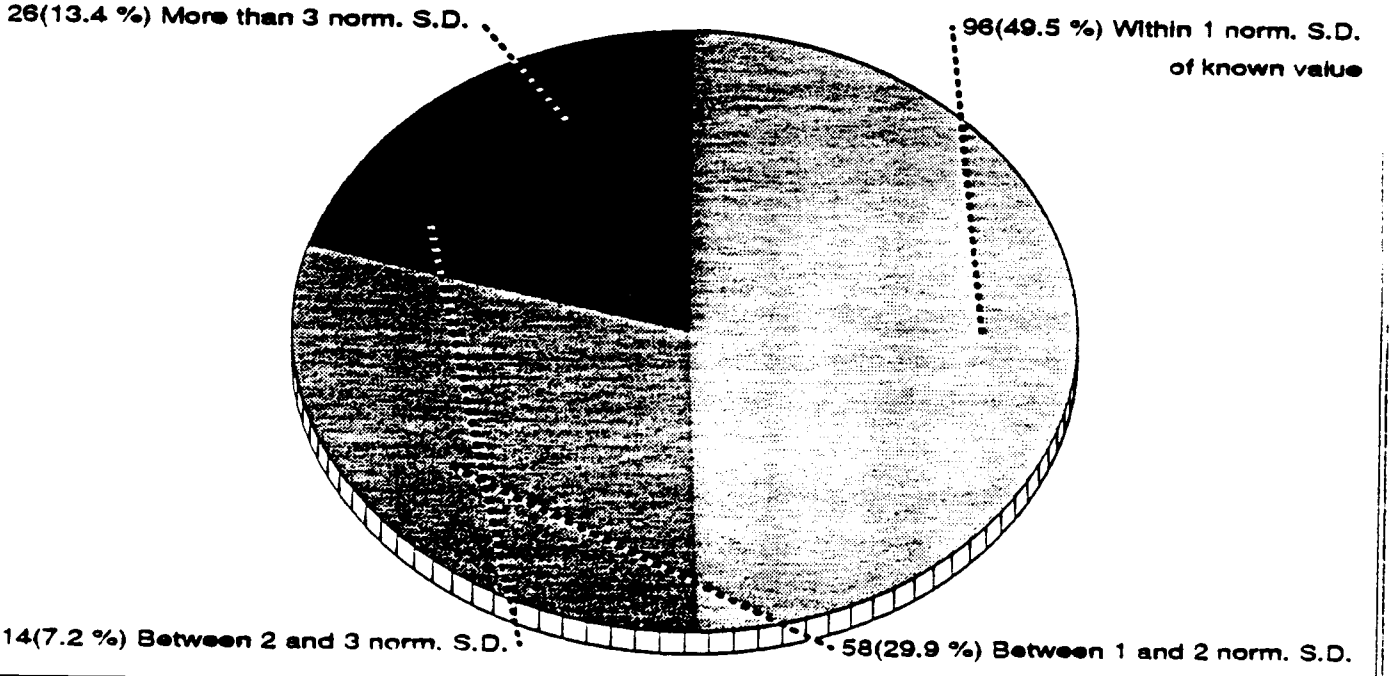
⇓ ≡ Below control limit

Cesium-137 Statistical Summary 229 Participants

The known value of this nuclide is **40.0 pCi/l** with an expected precision of **5.0**; the control limits are 31.3 to 48.7; the warning regions are 31.3 to 34.2 and 45.8 to 48.7



Statistic	Respondents	Non-outliers
Mean	49.26	Grand Avg 42.14
Std. Dev.	46.27	3.04
Variance	2140.47	9.23
% Coef. of Var.	93.92	7.21
% deviation of mean from known value	23.15	5.34
Norm. dev. of mean from known value	0.20	0.70
Median	42.00	42.00
% deviation of median from known value	5.00	5.00
Norm. dev. of median from known value	0.04	0.66



Cesium-137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
JS	45.0	48.0	44.0	2.08	0.473	45.67	1.22	1.96	
JY	42.0	48.0	50.0	4.16	0.945	46.67	1.57	2.31	
K	47.0	47.0	49.0	1.15	0.236	47.67	1.92	2.66	
KF									•
KH	42.0	45.0	43.0	1.53	0.354	43.33	0.41	1.15	
KL	43.0	41.0	45.0	2.00	0.473	43.00	0.30	1.04	
KM	38.0	40.0	39.0	1.00	0.236	39.00	-1.09	-0.35	
KX	56.0	56.0	58.0	1.15	0.236	56.67	5.03	5.77	×
L	38.0	41.0	39.0	1.53	0.354	39.33	-0.97	-0.23	
LA									•
LE	42.0	41.0	44.0	1.53	0.354	42.33	0.07	0.81	
LF	43.0	44.0	43.0	0.58	0.118	43.33	0.41	1.15	
LM									•
LR	41.0	43.0	42.0	1.00	0.236	42.00	-0.05	0.69	
LT	44.0	44.0	44.0	0.00	0.000	44.00	0.65	1.39	
M	39.0	40.0	40.0	0.58	0.118	39.67	-0.86	-0.12	
MA	43.0	43.0	43.0	0.00	0.000	43.00	0.30	1.04	
ML	40.0	40.0	40.0	0.00	0.000	40.00	-0.74	0.00	
MN									•
MP	44.0	43.0	41.0	1.53	0.354	42.67	0.18	0.92	
MQ	41.0	39.0	36.0	2.52	0.591	38.67	-1.20	-0.46	
MS	43.0	43.0	44.0	0.58	0.118	43.33	0.41	1.15	
MT	355.0	344.0	349.0	5.51	1.570	349.33	106.42	107.16	×
MV	41.0	43.0	43.0	1.15	0.236	42.33	0.07	0.81	
MY	32.0	33.0	32.0	0.58	0.118	32.33	-3.40	-2.66	
N	46.0	43.0	44.0	1.53	0.354	44.33	0.76	1.50	
NB	42.0	45.0	43.0	1.53	0.354	43.33	0.41	1.15	
NH	44.0	44.0	43.0	0.58	0.118	43.67	0.53	1.27	
NI	40.0	39.0	36.0	2.08	0.473	38.33	-1.32	-0.58	
NJ	50.0	50.0	48.0	1.15	0.236	49.33	2.49	3.23	⇑
NK	40.0	36.0	30.0	5.03	1.345	35.33	-2.36	-1.62	
NP	40.0	41.0	40.0	0.58	0.118	40.33	-0.63	0.12	
NZ	42.0	36.0	31.0	5.51	1.570	36.33	-2.01	-1.27	
O	43.0	43.0	43.0	0.00	0.000	43.00	0.30	1.04	
OA	39.0	41.0	41.0	1.15	0.236	40.33	-0.63	0.12	
OB	37.0	39.0	37.0	1.15	0.236	37.67	-1.55	-0.81	
OK	26.0	27.0	23.0	2.08	0.473	25.33	-5.82	-5.08	×
OL	46.0	46.0	46.0	0.00	0.000	46.00	1.34	2.08	
OM	40.0	41.0	38.0	1.53	0.354	39.67	-0.86	-0.12	
OT	39.0	45.0	46.0	3.79	0.827	43.33	0.41	1.15	
OZ									•
PB	42.0	39.0	42.0	1.73	0.354	41.00	-0.39	0.35	
PC	42.0	44.0	45.0	1.53	0.354	43.67	0.53	1.27	
PD									•
PE	49.0	38.0	47.0	5.86	1.570	44.67	0.88	1.62	

• ≡ No data submitted

Ø ≡ Insufficient data

TAG SYMBOLS

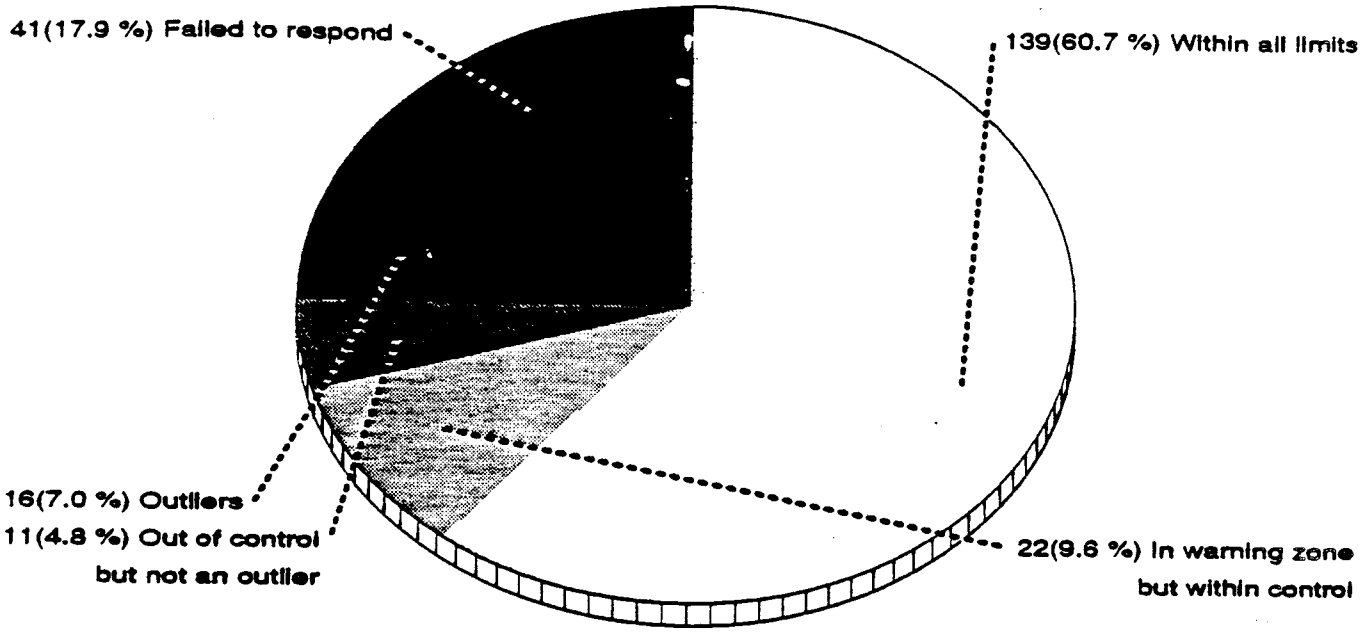
× ≡ Determined to be an outlier

⇑ ≡ Above control limit

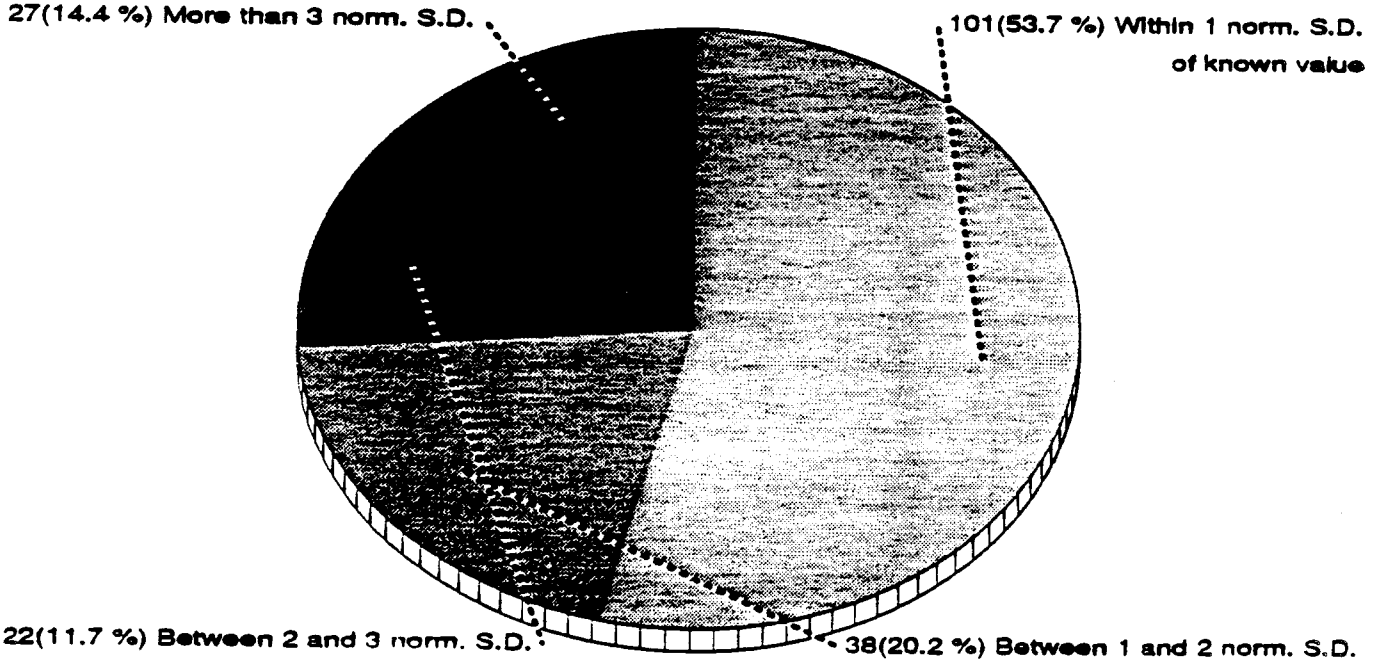
⇓ ≡ Below control limit

Barium-133 Statistical Summary 229 Participants

The known value of this nuclide is **79.0 pCi/l** with an expected precision of **8.0**; the control limits are 65.1 to 92.9; the warning regions are 65.1 to 69.7 and 88.3 to 92.9



Statistic	Respondents	Non-outliers
Mean	91.23	Grand Avg 76.45
Std. Dev.	88.87	6.31
Variance	7897.37	39.86
% Coef. of Var.	97.41	8.26
% deviation of mean from known value	15.48	-3.23
Norm. dev. of mean from known value	0.14	-0.40
Median	77.33	77.17
% deviation of median from known value	-2.11	-2.32
Norm. dev. of median from known value	-0.02	-0.29



Barium-133

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg)	(known)	Tag
JS	72.0	80.0	82.0	5.29	0.738	78.00	0.34	-0.22	
JY	79.0	74.0	73.0	3.21	0.443	75.33	-0.24	-0.79	
K	81.0	81.0	81.0	0.00	0.000	81.00	0.99	0.43	
KF									•
KH	76.0	70.0	76.0	3.46	0.443	74.00	-0.53	-1.08	
KL	79.0	80.0	79.0	0.58	0.074	79.33	0.63	0.07	
KM	70.0	72.0	73.0	1.53	0.222	71.67	-1.03	-1.59	
KX	42.0	41.0	42.0	0.58	0.074	41.67	-7.53	-8.08	×
L	73.0	73.0	76.0	1.73	0.222	74.00	-0.53	-1.08	
LA									•
LE	81.0	65.0	86.0	10.97	2.049	77.33	0.19	-0.36	
LF	83.0	80.0	77.0	3.00	0.443	80.00	0.77	0.22	
LM									•
LR	84.0	50.0	85.0	19.92	4.017	73.00	-0.75	-1.30	
LT	80.0	80.0	80.0	0.00	0.000	80.00	0.77	0.22	
M	65.0	67.0	64.0	1.53	0.222	65.33	-2.41	-2.96	
MA	78.0	78.0	77.0	0.58	0.074	77.67	0.26	-0.29	
ML	75.0	71.0	76.0	2.65	0.369	74.00	-0.53	-1.08	
MN									•
MP	72.0	79.0	75.0	3.51	0.517	75.33	-0.24	-0.79	
MQ	74.0	75.0	77.0	1.53	0.222	75.33	-0.24	-0.79	
MS	78.0	76.0	78.0	1.15	0.148	77.33	0.19	-0.36	
MT	679.0	653.0	658.0	13.80	2.752	663.33	127.06	126.51	×
MV	76.0	75.0	76.0	0.58	0.074	75.67	-0.17	-0.72	
MY	64.0	65.0	66.0	1.00	0.148	65.00	-2.48	-3.03	⇓
N	83.0	80.0	79.0	2.08	0.295	80.67	0.91	0.36	
NB	68.0	68.0	67.0	0.58	0.074	67.67	-1.90	-2.45	
NH	89.0	89.0	88.0	0.58	0.074	88.67	2.65	2.09	
NI	72.0	62.0	62.0	5.77	0.738	65.33	-2.41	-2.96	
NJ	70.0	74.0	74.0	2.31	0.295	72.67	-0.82	-1.37	
NK	77.0	51.0	57.0	13.61	2.752	61.67	-3.20	-3.75	⇓
NP	64.0	76.0	75.0	6.66	0.886	71.67	-1.03	-1.59	
NZ	58.0	62.0	54.0	4.00	0.591	58.00	-3.99	-4.55	⇓
O	76.0	77.0	77.0	0.58	0.074	76.67	0.05	-0.51	
OA	77.0	80.0	77.0	1.73	0.222	78.00	0.34	-0.22	
OB									•
OK	75.0	75.0	78.0	1.73	0.222	76.00	-0.10	-0.65	
OL	81.0	81.0	81.0	0.00	0.000	81.00	0.99	0.43	
OM	78.0	80.0	81.0	1.53	0.222	79.67	0.70	0.14	
OT	88.0	80.0	79.0	4.93	0.665	82.33	1.27	0.72	
OZ									•
PB	78.0	83.0	85.0	3.61	0.517	82.00	1.20	0.65	
PC	71.0	75.0	80.0	4.51	0.665	75.33	-0.24	-0.79	
PD									•
PE	76.0	77.0	82.0	3.21	0.443	78.33	0.41	-0.14	

• ≡ No data submitted

∅ ≡ Insufficient data

TAG SYMBOLS

× ≡ Determined to be an outlier

⇑ ≡ Above control limit

⇓ ≡ Below control limit

16/18 = 88.9% Acceptable

Unacceptable Results:

Matrix	DDS#	Analyte	True Value	Reported Result	Ratio*
Soil	930910-116	^{239}Pu	1.52	0.739	0.49
Soil	930910-116	^{241}Am	0.248	0.882	3.56

*The ratio range of the reported value to the true value must be between 0.5 to 1.5 for an analyte to be rated acceptable in this program.

Environmental Measurements Laboratory

SEMI-ANNUAL REPORT OF THE DEPARTMENT OF ENERGY, OFFICE OF ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT, QUALITY ASSESSMENT PROGRAM

Colin G. Sanderson and Catherine S. Klusek

January 5, 1994

DEPARTMENT OF ENERGY
NEW YORK, N. Y. 10014

Department of Energy
Environmental Measurements Laboratory
376 Hudson Street
New York, New York 10014-3621

January 10, 1994

Dear Colleague:

There is a correction to EML-559, "Semi-Annual Report of the Department of Energy, Office of Environmental Restoration and Waste Management, Quality Assessment Program," by Colin G. Sanderson and Catherine S. Klusek. There is an error in the EML value for uranium (mg mL^{-1}) in water. The correct value should be 0.842E-01. Enclosed is the statistical summary with the corrected value.

We are sorry for any inconvenience this might have caused.

Sincerely,

Colin G. Sanderson,
Analytical Chemistry Division

Attachment:
Statistical summary

Laboratory Listing

Date	Type	Lab	Isotope	Ser	Reported Value	Reported % Error	EML Value	Ratio Rp/EML	Ratio +/-
93 09	AIR	UK	MN 54	1	0.146E+02	5	0.154E+02	0.95	0.06
93 09	AIR	UK	CO 57	1	0.138E+02	2	0.173E+02	0.80	0.04
93 09	AIR	UK	CO 60	1	0.192E+02	3	0.205E+02	0.94	0.05
93 09	AIR	UK	CS 134	1	0.115E+02	4	0.122E+02	0.94	0.05
93 09	AIR	UK	CS 137	1	0.177E+02	4	0.188E+02	0.94	0.05
93 09	AIR	UK	CE 144	1	0.336E+02	7	0.403E+02	0.83	0.07
93 09	AIR	UK	AM 241	1	0.496E-01	46	0.654E-01	0.76	0.36
93 09	AIR	UK	U BQ	1	0.160E+00	26	0.137E+00	1.17	0.31
93 09	SOIL	UK	K 40	1	0.193E+02	67	0.286E+02	0.67	0.46
93 09	SOIL	UK	CS 137	1	0.100E+02	4	0.114E+02	0.88	0.04
93 09	SOIL	UK	PU 239	1	0.739E+00	105	0.152E+01	0.49	0.52
93 09	SOIL	UK	AM 241	1	0.882E+00	56	0.248E+00	3.56	2.02
93 09	WATER	UK	MN 54	1	0.115E+03	1	0.109E+03	1.06	0.02
93 09	WATER	UK	CO 60	1	0.108E+03	1	0.996E+02	1.08	0.02
93 09	WATER	UK	CS 134	1	0.598E+02	1	0.561E+02	1.07	0.02
93 09	WATER	UK	CS 137	1	0.813E+02	1	0.755E+02	1.08	0.03
93 09	WATER	UK	CE 144	1	0.169E+03	2	0.173E+03	0.98	0.03
93 09	WATER	UK	AM 241	1	0.142E+01	15	0.139E+01	1.02	0.16

COPY FOR YOUR INFORMATION

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 4 FY 93

LABORATORY NAME: Martin Marietta K-25 (TN) [Z1] (ORGDP)
PERFORMANCE LEVEL: ACCEPTABLE - Corrective Actions Necessary
LABORATORY RANK: Above = 17 Same = 0 Below = 16

% Score: 89.5
REPORT DATE: 2/4/1994
MATRIX: SOIL

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q		PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	2970	7560	2470	8060	4660			0	0	0	1	0	34
ANTIMONY	12.0	15.2	12.0	17.0	23.1		X	1	9	0	25	1	34
ARSENIC	136	203	129	210	186			0	4	0	1	0	34
BARIUM	d	d	d	d	32.5	B		0	0	0	0	0	34
BERYLLIUM	d	d	d	d	0.08	U		0	0	2	0	0	34
CADMIUM	5.4	22.1	3.6	23.9	23.7		$	1	4	0	2	1	34
CALCIUM	38101	48901	36901	50001	42000			0	0	0	0	0	34
CHROMIUM	6.8	17.4	5.6	18.5	6.8			1	3	0	0	0	34
COBALT	15.6	31.5	13.8	33.2	31			0	0	0	0	0	34
COPPER	1180	1450	1150	1480	1420			0	8	0	1	0	34
[illegible]N	130000	183000	124000	189000	145000			0	0	0	0	0	34
[illegible]D	806	1030	781	1060	871			0	2	0	1	0	34
MAGNESIUM	1180	1800	1110	1870	1310			0	0	0	0	0	34
MANGANESE	706	974	677	1000	791			0	0	0	0	0	34
MERCURY	0.097	0.32	0.074	0.34	0.23			0	2	0	4	1	34
NICKEL	8.0	9.0	8.0	9.6	7.6	B		0	1	0	0	0	34
POTASSIUM	1000.0	1450	1000.0	1520	1140			1	0	0	0	0	34
SELENIUM	1.0	3.2	1.0	3.4	5.2	S	X	2	2	0	11	0	34
SILVER	50.1	77.4	47.1	80.3	55			0	2	0	2	0	34
SODIUM	d	d	d	d	223	B		0	0	1	0	0	34
THALLIUM	d	d	d	d	0.46	BEN		0	0	2	5	0	34
VANADIUM	10.0	56.0	10.0	61.4	58.2		$	0	0	0	0	1	34
ZINC	4520	6370	4320	6570	5270			0	1	0	1	0	34

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 2
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 3
SOIL : Sb, Hg, Tl

OF DUPLICATES OUT: 1
[illegible]IL : Sb

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 4 FY 93

.ABORATORY NAME: Martin Marietta K-25 (TN) [Z1] (ORGDP)
'ERFORMANCE LEVEL: ACCEPTABLE - Corrective Actions Necessary
LABORATORY RANK: Above = 17 Same = 0 Below = 16

% Score: 89.5
REPORT DATE: 2/4/1994
MATRIX: WATER 1

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q		PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	c	c	c	c	17.6	U		0	0	1	1	0	34
ANTIMONY	425	520	425	520	484			0	3	0	0	0	34
ARSENIC	583	734	567	750	619			0	2	0	1	0	34
BARIUM	783	957	783	957	917			0	0	0	0	0	34
BERYLLIUM	31.5	38.5	30.9	39.0	33			0	2	0	0	0	34
CADMIUM	32.7	40.0	32.7	40.0	32.8			0	2	0	0	0	34
CALCIUM	c	c	c	c	16.1	U		0	0	0	1	0	34
CHROMIUM	48.0	61.2	46.6	62.6	53.9			0	0	0	0	0	34
COBALT	137	167	137	167	147			0	0	0	1	0	34
COPPER	280	342	277	345	319			0	1	0	0	0	34
IRON	451	552	448	555	500			0	0	0	0	0	34
L[illegible]	11.1	14.1	10.8	14.4	14.9		X	0	7	0	1	0	34
MA[illegible]IUM	c	c	c	c	26.2	B		0	0	0	0	0	34
MANGANESE	48.3	59.0	47.2	60.1	52.2			0	1	0	0	0	34
MERCURY	8.0	10.8	7.6	11.1	10.5			0	5	0	1	0	34
NICKEL	178	217	176	218	196			0	1	0	0	0	34
POTASSIUM	c	c	c	c	586	U		0	0	0	0	0	34
SELENIUM	37.8	53.7	36.1	55.4	43.8			1	1	0	2	1	34
SILVER	31.1	39.2	30.2	40.1	34.1			0	4	0	2	0	34
SODIUM	d	d	d	d	98.2	U		0	0	0	0	0	34
THALLIUM	c	c	c	c	1.7	U		0	0	0	1	0	34
VANADIUM	325	397	325	397	373			0	0	0	1	0	34
ZINC	249	304	249	304	262	E		0	1	0	0	1	34

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 1
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER :

OF DUPLICATES OUT: 0
WATER :

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 4 FY 93

LABORATORY NAME: Martin Marietta K-25 (TN) [Z1] (ORGDP)
PERFORMANCE LEVEL: ACCEPTABLE - Corrective Actions Necessary
LABORATORY RANK: Above = 17 Same = 0 Below = 16

% Score: 89.5
REPORT DATE: 2/4/1994
MATRIX: WATER 2

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q	PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	1160	1470	1130	1510	1310		0	1	0	1	0	34
ANTIMONY	272	346	264	354	294		0	3	0	0	0	34
ARSENIC	201	282	192	291	218		0	1	0	1	0	34
BARIUM	c	c	c	c	0.44	U	0	0	0	0	0	34
BERYLLIUM	44.0	53.8	44.0	53.8	45.2		0	1	0	0	0	34
CADMIUM	25.4	31.0	25.0	31.4	25.7		0	3	0	0	0	34
CALCIUM	14100	17200	14100	17200	16700		0	0	0	1	0	34
CHROMIUM	82.5	101	82.5	101	88.6		0	6	0	0	0	34
COBALT	133	163	133	163	140		0	0	0	1	0	34
COPPER	c	c	c	c	2.4	U	0	0	0	0	0	34
[illegible]	795	972	795	972	857		0	0	0	0	0	34
[illegible]	11.5	16.3	11.0	16.8	15.7		0	6	0	1	0	34
MAGNESIUM	d	d	d	d	2490	B	0	0	0	0	0	34
MANGANESE	c	c	c	c	0.67	U	0	0	0	0	0	34
MERCURY	5.2	9.5	4.7	10.0	8.6		0	2	0	1	0	34
NICKEL	c	c	c	c	7.4	U	0	0	0	0	0	34
POTASSIUM	17900	21900	17900	21900	20800		0	0	0	0	0	34
SELENIUM	38.5	61.0	36.1	63.5	47.7		1	0	0	2	1	34
SILVER	38.7	49.7	37.5	50.8	48.4		0	2	0	2	0	34
SODIUM	27400	33501	27400	33501	31200		0	1	0	0	0	34
THALLIUM	70.0	101	66.7	105	88.3	S	0	1	0	1	0	34
VANADIUM	c	c	c	c	2.8	U	0	0	0	1	0	34
ZINC	c	c	c	c	8.9	BE	0	0	2	0	1	34

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 0
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 0
WATER :

OF DUPLICATES OUT: 0
[illegible]R :

REGION 4
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 4 FY 93

LABORATORY: Martin Marietta ORGDP (TN)
PERFORMANCE: ACCEPTABLE - Response Explaining Deficiency(ies) Required
RANK: Above = 6 Same = 0 Below = 8

X SCORE: 75.5
REPORT DATE: 12/21/93
MATRIX: WATER

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-QNT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS
TCL VOLATILE										
2-BUTANONE	130	210	120	220	200		3	0	51	51
TETRACHLOROETHENE	NU	NU	NU	NU	9		0	1	50	51
1,1,2,2-TETRACHLOROETHANE	81	110	76	120	100		1	0	51	51
TOLUENE	NU	NU	NU	NU	10		0	0	51	51
STYRENE	89	110	86	110	97		2	0	51	51
TCL SEMIVOLATILE										
BIS(2-CHLOROETHYL)ETHER	19	27	18	28	26		6	0	51	51
2,2'-OXYBIS(1-CHLOROPROPANE)	18	28	17	29	28		6	0	51	51
NITROBENZENE	24	47	25	43	--		[illegible]	[illegible]	[illegible]	[illegible]
2,4-DINITROTOLUENE	--	--	--	--	--		[illegible]	[illegible]	[illegible]	[illegible]
NAPHTHALENE	16	25	15	29	23		3	0	51	51
DIMETHYL PHTHALATE	29	34	28	35	16	X	14	0	51	51
ACENAPHTHENE	23	31	22	32	32	$	6	0	51	51
2,4-DINITROPHENOL	49	82	44	87	45	$	8	1	50	51
4-BROMOPHENYL PHENYL ETHER	23	31	22	32	31		6	0	51	51
HEXACHLOROBENZENE	24	32	23	36	32		6	0	51	51
PHENANTHRENE	16	21	16	22	22	$	8	0	51	51
[illegible]	--	--	--	--	--					
PYRENE	48	79	43	97	83	$	2	0	51	51
BENZO(K)FLUORANTHENE	14	20	13	21	16		12	2	49	51
DIBENZ(A,H)ANTHRACENE	22	37	20	39	29		9	0	51	51
TCL PESTICIDES										
BETA-BHC	0.079	0.12	0.072	0.13	0.089		5	4	47	51
GAMMA-BHC (LINDANE)	0.48	0.78	0.44	0.82	0.043	X	6	0	51	51
ALDRIN	0.15	0.24	0.14	0.26	0.018	X	7	0	51	51
DIELDRIN	0.2	0.28	0.19	0.29	0.19	$	6	1	50	51
4,4'-DDE	0.53	0.73	0.5	0.75	0.6		4	0	51	51
ENDRIN	0.56	0.76	0.54	0.79	0.56		7	0	51	51
ENDOSULFAN SULFATE	0.53	0.73	0.5	0.78	0.67		7	1	50	51
4,4'-DDT	0.55	0.77	0.52	0.8	0.93	X	6	0	51	51
METHOXYCHLOR	1.2	1.8	1.1	1.9	1.7		3	0	51	51
GAMMA-CHLORDANE	0.5	0.69	0.48	0.79	0.38	X	3	1	50	51
NON-TCL VOLATILE										
BENZENE,DICHLORO- (O M, OR P)					46			8	43	51
HYDRAZINE,DIMETHYL-					0	NR		51	0	51
PROPANE,1,2-DIBROMO-3-CHLORO-					35			17	34	51
NON-TCL SEMIVOLATILE										
ANILINE					0	NR		35	16	51
BENZOIC ACID					0	&		8	43	51
BENZYL ALCOHOL					37			4	47	51

REGION 4
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 4 FY 93

LABORATORY: Martin Marietta ORGDP (TN)
PERFORMANCE: ACCEPTABLE - Response Explaining Deficiency(ies) Required
RANK: Above = 6 Same = 0 Below = 8

% SCORE: 75.5
REPORT DATE: 12/21/93
MATRIX: WATER

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-QNT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS
DIBENZOTHIOPHENE					38			0	51	51
TCL VOLATILE (Contaminants)										
TRICHLOROETHENE					3			7	44	51
NON-TCL SEMIVOLATILE (Contaminants)										
2-PENTANONE,4-HYDROXY-4-MET					120			47	4	51
QUINOLINE,METHYL-					16			50	1	51

OF TCL COMPOUNDS NOT-IDENTIFIED: 0
OF TCL COMPOUNDS MIS-QUANTIFIED: 5
OF TCL CONTAMINANTS: 0

OF NON-TCL COMPOUNDS NOT-IDENTIFIED: 1
OF NON-TCL CONTAMINANTS: 0

REGION 4
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QS 1 FY 94

LABORATORY: Martin Marietta ORGDP (TN)
PERFORMANCE: UNACCEPTABLE - Response Explaining Deficiency(ies) Required
RANK: Above = 8 Same = 0 Below = 0

% SCORE: 64.3
REPORT DATE: 12/28/93
MATRIX: WATER

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-QNT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS
TCL VOLATILE										
CHLOROFORM	71	90	68	93	79		0	0	29	29
2-BUTANONE	78	130	71	140	80		4	0	29	29
CIS-1,3-DICHLOROPROPENE	89	100	87	100	91		8	0	29	29
1,1,2,2-TETRACHLOROETHANE	NU	NU	NU	NU	9		0	1	28	29
CHLOROBENZENE	31	36	30	37	31		2	1	28	29
STYRENE	92	100	90	100	91	$	8	0	29	29
XYLENES (TOTAL)	90	110	87	110	92		2	0	29	29
TCL SEMIVOLATILE										
4-METHYLPHENOL	21	40	19	51	36		0	0	29	29
ISOPHORONE	13	25	12	26	20		1	0	29	29
1,2,4-TRICHLOROBENZENE	25	48	22	52	49	$	1	0	29	29
NAPHTHALENE	13	27	11	29	25		5	1	28	29
4-CHLORO-3-METHYL PHENOL	19	31	17	33	10 U	&	0	1	28	29
2-METHYLNAPHTHALENE	12	21	11	22	21		2	0	29	29
HEXACHLOROCYCLOPENTADIENE	NU	NU	NU	NU	22		0	7	22	29
2-CHLORONAPHTHALENE	14	26	12	28	23		1	0	29	29
ACENAPHTHENE	48	92	41	98	98	$	1	0	29	29
2,4-DINITROTOLUENE	64	97	59	100	87		1	0	29	29
PHENANTHRENE	34	49	31	51	47		0	0	29	29
DI-N-BUTYLPHTHALATE	13	22	12	24	13		0	0	29	29
PYRENE	31	62	26	67	58		1	0	29	29
BENZO(B)FLUORANTHENE	20	31	19	32	26		3	0	29	29
BENZO(G,H,I)PERYLENE	22	39	20	42	31		2	0	29	29
TCL PESTICIDES										
ALPHA-BHC	0.14	0.22	0.12	0.23	0.34	X	1	0	29	29
BETA-BHC	0.27	0.38	0.25	0.4	0.77	X	5	0	29	29
GAMMA-BHC (LINDANE)	0.15	0.24	0.14	0.25	0.34	X	3	0	29	29
HEPTACHLOR	0.26	0.43	0.23	0.46	0.5	X	4	0	29	29
ALDRIN	0.12	0.28	0.096	0.3	0.24		1	1	28	29
HEPTACHLOR EPOXIDE	0.3	0.45	0.28	0.47	0.58	X	3	0	29	29
AROCLOR-1016	2.1	3.8	1.8	4.1	4.1	$	3	4	25	29
AROCLOR-1260	1.2	1.9	1.2	2	2.6	X	4	0	29	29
NON-TCL VOLATILE										
EPICHLOROHYDRIN					0	NR		29	0	29
PROPANE,1,2-DIBROMO-3-CHLORO-					8			9	20	29
NON-TCL SEMIVOLATILE										
BETA-BHC					30			0	29	29
ENDRIN					0	NR		14	15	29
PARATHION					24			0	29	29
PHENOL,4-CHLORO-					30			8	21	29

REGION 4
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 1 FY 94

LABORATORY: Martin Marietta ORGDP (TN)
PERFORMANCE: UNACCEPTABLE - Response Explaining Deficiency(ies) Required
RANK: Above = 8 Same = 0 Below = 0

% SCORE: 64.3
REPORT DATE: 12/28/93
MATRIX: WATER

COMPOUND	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-QNT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS

OF TCL COMPOUNDS NOT-IDENTIFIED: 1
OF TCL COMPOUNDS MIS-QUANTIFIED: 6
OF TCL CONTAMINANTS: 0

OF NON-TCL COMPOUNDS NOT-IDENTIFIED: 0
OF NON-TCL CONTAMINANTS: 0

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 1 FY 94

LABORATORY NAME: Martin Marietta K-25 (TN) [A2] (ORGDP)
PERFORMANCE LEVEL: UNACCEPTABLE, Corrective Actions Mandatory
LABORATORY RANK: Above = 26 Same = 0 Below = 2

% Score: 71.2
REPORT DATE: 2/4/1994
MATRIX: SOIL

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q		#LABS NOT-ID	#LABS MIS-QUANT	PROGRAM DATA #LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	7480	19500	6170	20800	13300			0	0	0	1	0	29
ANTIMONY	c	c	c	c	6.1	BN		0	0	6	19	4	29
ARSENIC	38.1	68.9	34.7	72.2	54.2			0	1	0	2	2	29
BARIUM	147	182	143	186	160			0	1	0	0	0	29
BERYLLIUM	1.2	1.7	1.1	1.7	1.3			0	6	0	0	2	29
CADMIUM	10.9	17.1	10.2	17.8	15.9			0	5	0	11	5	29
CALCIUM	17200	21000	17000	21200	18900			0	0	0	0	0	29
CHROMIUM	1840	2250	1820	2260	1950			0	2	0	1	0	29
COBALT	19.7	24.1	19.6	24.2	20.5			0	2	0	0	1	29
[illegible]ER	296	362	289	370	334			0	1	0	1	0	29
[illegible]	19700	26800	18900	27600	22700			0	1	0	1	1	29
LEAD	185	239	179	245	202			0	3	0	0	1	29
MAGNESIUM	7610	9430	7410	9630	8010			0	1	0	0	0	29
MANGANESE	2170	2650	2170	2650	2330			0	3	0	0	0	29
MERCURY	2.3	3.8	2.1	4.0	2.7			0	0	0	1	0	29
NICKEL	20.2	30.2	19.1	31.2	24.6			0	1	0	0	1	29
POTASSIUM	1000.0	2350	1000.0	2530	1450			0	0	0	0	2	29
SELENIUM	2.1	6.1	1.6	6.5	5.5	S		0	5	0	9	2	29
SILVER	3.2	5.9	2.9	6.2	2.7		X	1	4	0	2	1	29
SODIUM	d	d	d	d	229	B		0	0	1	0	0	29
THALLIUM	d	d	d	d	0.97	BWN		0	0	3	3	0	29
VANADIUM	23.8	46.5	21.3	49.0	33.5			0	1	0	0	0	29
ZINC	327	400	324	403	368	E		0	3	0	6	1	29

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 1
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 2
SOIL : Sb, Tl

[illegible] DUPLICATES OUT: 0
[illegible] :

COPY FOR YOUR INFORMATION

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 1 FY 94

LABORATORY NAME: Martin Marietta K-25 (TN) [A2] (ORGDP)
PERFORMANCE LEVEL: UNACCEPTABLE, Corrective Actions Mandatory
LABORATORY RANK: Above = 26 Same = 0 Below = 2

% Score: 71.2
REPORT DATE: 2/4/1994
MATRIX: WATER 1

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q		#LABS NOT-ID	#LABS MIS-QUANT	PROGRAM DATA #LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	973	1190	973	1190	1070			0	2	0	0	1	29
ANTIMONY	60.0	107	60.0	113	66.7	B		0	1	0	2	4	29
ARSENIC	38.7	59.0	36.5	61.2	56			0	0	0	4	2	29
BARIUM	1900	2320	1900	2320	2120			0	1	0	0	1	29
BERYLLIUM	44.5	54.4	44.5	54.4	43.3		X	0	2	0	0	1	29
CADMIUM	77.7	95.0	77.7	95.0	75.4		X	0	1	0	0	1	29
CALCIUM	6180	7550	6180	7550	6570	E		0	2	0	0	1	29
CHROMIUM	50.3	61.5	50.3	61.5	45.8		X	0	4	0	0	1	29
COBALT	96.8	118	96.8	118	97.2			0	1	0	0	1	29
C[illegible]	131	161	131	161	141			0	2	0	0	1	29
[illegible]	566	691	566	691	556		X	0	2	0	0	1	29
LEAD	33.0	45.6	31.6	46.9	43.3			0	4	0	3	2	29
MAGNESIUM	5000.0	5830	5000.0	5830	4770	BE		0	0	0	0	1	29
MANGANESE	106	130	106	130	107	E		0	0	0	1	2	29
MERCURY	7.4	10.6	7.0	11.0	11.8		X	1	4	0	1	1	29
NICKEL	106	130	104	132	102		X	0	2	0	0	2	29
POTASSIUM	9100	12000	8780	12300	10200			0	1	0	0	1	29
SELENIUM	24.8	36.2	23.5	37.4	35.5	SN		0	1	0	1	0	29
SILVER	c	c	c	c	4	B		0	0	1	0	1	29
SODIUM	7320	8950	7320	8950	8260	E		0	0	0	0	1	29
THALLIUM	36.7	50.7	35.1	52.2	45.8			0	3	0	3	4	29
VANADIUM	120	147	120	147	127			0	1	0	0	1	29
ZINC	101	124	101	124	100		X	0	3	0	0	1	29

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 7
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 1
WATER : Se

DUPLICATES OUT: 0
[illegible]:

INORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 1 FY 94

LABORATORY NAME: Martin Marietta K-25 (TN) [A2] (ORGDP)
PERFORMANCE LEVEL: UNACCEPTABLE, Corrective Actions Mandatory
LABORATORY RANK: Above = 26 Same = 0 Below = 2

% Score: 71.2
REPORT DATE: 2/4/1994
MATRIX: WATER 2

ELEMENT	PREDICTION INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY REPORTED VALUE	Q		PROGRAM DATA #LABS NOT-ID	#LABS MIS-QUANT	#LABS FALSE POS	#LABS MSPK OUT	#LABS DUP OUT	TOTAL #LABS
ALUMINUM	1080	1310	1080	1310	1120			0	1	0	0	1	29
ANTIMONY	171	277	159	289	200			0	0	0	2	4	29
ARSENIC	19.6	31.0	18.4	32.2	29.1			0	1	0	4	2	29
BARIUM	464	567	464	567	513			0	1	0	0	1	29
BERYLLIUM	24.4	29.8	24.4	29.8	23.9		X	0	2	0	0	1	29
CADMIUM	28.2	35.7	27.4	36.5	29			0	1	0	0	1	29
CALCIUM	5000.0	5800	5000.0	5860	5060	BE		0	2	0	0	1	29
CHROMIUM	20.6	27.4	19.9	28.1	19.1		X	0	7	0	0	1	29
COBALT	57.2	69.9	57.2	69.9	58.9			0	2	0	0	1	29
COPPER	72.9	91.8	70.9	93.8	80.7			0	1	0	0	1	29
IRON	535	654	535	654	526		X	0	3	0	0	1	29
LEAD	66.1	94.5	63.0	97.6	87.7			0	1	0	3	2	29
MAGNESIUM	6430	7860	6430	7860	6530	E		0	1	0	0	1	29
MANGANESE	40.3	49.3	40.3	49.3	41	E		0	1	0	1	2	29
MERCURY	0.34	0.76	0.30	0.80	0.21		X	1	4	0	1	1	29
NICKEL	40.0	41.2	40.0	42.6	30.9	B		0	4	0	0	2	29
POTASSIUM	5130	7090	5000.0	7300	6000			0	2	0	0	1	29
SELENIUM	29.0	37.1	28.2	37.9	37.3		$	0	3	0	1	0	29
SILVER	35.9	44.5	35.0	45.5	40.2			0	2	0	0	1	29
SODIUM	5000.0	5440	5000.0	5520	5140	BE		0	1	0	0	1	29
THALLIUM	16.9	32.3	15.2	34.0	26.3			0	0	0	3	4	29
VANADIUM	57.9	73.8	56.2	75.5	64.8			0	1	0	0	1	29
ZINC	72.9	89.1	72.9	89.1	71.6		X	0	3	0	0	1	29

OF ELEMENTS NOT-IDENTIFIED: 0
OF ELEMENTS MIS-QUANTIFIED: 5
OF FALSE POSITIVES: 0

OF MATRIX SPIKES OUT: 1
WATER : Se

OF DUPLICATES OUT: 0
WATER :

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY-LAS VEGAS
P.O. BOX 93478
LAS VEGAS, NEVADA 89193-3478
(702/798-2100 - FTS 545-2100)

JAN 18 1994

Ms. Larissa Welch
Martin Marietta Energy Systems, Inc.
Oak Ridge Gaseous Diffusion Plant
Hwy. 58, Drop Point A-20, Box 2003
Oak Ridge, TN 37831-7440

Dear Ms. Welch:

A report of your participation in the water pollution sample study, WP031, is enclosed. True values and acceptance limits for analytes in the multi-laboratory study are also furnished.

We would be glad to provide any further assistance you may require regarding the WP030 study.

Sincerely,

Harold A Vincent

Harold A Vincent
Chemist
Quality Assurance Research Branch, QAD

Enclosures

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: TN043

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ALUMINUM	1	711	681	550- 784	579- 755	ACCEPTABLE
	2	141	140	107- 182	117- 173	ACCEPTABLE
ARSENIC	1	517	492	408- 587	430- 565	ACCEPTABLE
	2	70.6	74.3	56.7- 92.9	61.2- 88.4	ACCEPTABLE
BERYLLIUM	1	452	461	382- 533	401- 514	ACCEPTABLE
	2	231	240	198- 278	209- 269	ACCEPTABLE
CADMIUM	1	180	165	138- 194	145- 187	ACCEPTABLE
	2	65.4	61.0	50.8- 72.0	53.5- 69.4	ACCEPTABLE
COBALT	1	923	880	775- 980	801- 954	ACCEPTABLE
	2	54.9	53.8	45.4- 61.9	47.5- 59.8	ACCEPTABLE
CHROMIUM	1	773	730	604- 843	634- 813	ACCEPTABLE
	2	23.4	23.4	17.4- 29.0	18.9- 27.6	ACCEPTABLE
COPPER	1	645	601	524- 657	541- 640	CHECK FOR ERROR
	2	20.4	18.7	13.6- 24.1	14.9- 22.9	ACCEPTABLE
IRON	1	57.6	58.0	43.5- 72.5	47.2- 68.8	ACCEPTABLE
	2	1170	1100	950- 1270	991- 1230	ACCEPTABLE
MERCURY	1	11.9	9.38	7.31- 11.9	7.89- 11.3	CHECK FOR ERROR
	2	8.40	6.67	5.00- 8.48	5.44- 8.04	CHECK FOR ERROR
MANGANESE	1	642	600	536- 660	551- 644	ACCEPTABLE
	2	76.6	73.5	64.0- 82.7	66.4- 80.4	ACCEPTABLE
NICKEL	1	964	860	766- 952	789- 928	NOT ACCEPTABLE
	2	363	340	296- 383	307- 372	ACCEPTABLE
LEAD	1	1300	1200	1060- 1350	1100- 1310	ACCEPTABLE
	2	815	738	636- 833	661- 809	CHECK FOR ERROR

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: TN043

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
SELENIUM	1	230	228	156- 277	171- 262	ACCEPTABLE
	2	382	387	268- 496	296- 459	ACCEPTABLE
VANADIUM	1	965	940	832- 1040	860- 1020	ACCEPTABLE
	2	178	175	146- 188	151- 183	ACCEPTABLE
ZINC	1	894	842	737- 947	783- 901	ACCEPTABLE
	2	49.4	46.3	37.5- 56.1	39.8- 53.7	ACCEPTABLE
ANTIMONY	3	78.2	94.5	56.4- 119	64.3- 111	ACCEPTABLE
	4	187	189	106- 244	125- 227	ACCEPTABLE
SILVER	3	65.2	73.9	60.6- 86.8	63.9- 83.5	ACCEPTABLE
	4	22.7	25.8	21.1- 30.4	22.2- 29.2	ACCEPTABLE
THALLIUM	3	68.6	62.8	47.0- 77.3	50.8- 73.4	ACCEPTABLE
	4	524	539	421- 643	450- 615	ACCEPTABLE
MOLYBDENUM	3	23.4	24.5	18.6- 30.6	20.2- 29.0	ACCEPTABLE
	4	86.9	81.6	64.4- 95.0	68.3- 91.1	ACCEPTABLE
STRONTIUM	3	18.8	19.1	14.4- 23.3	15.5- 22.1	ACCEPTABLE
	4	72.1	73.4	62.0- 84.5	64.9- 81.5	ACCEPTABLE
TITANIUM	3	132	130	109- 151	114- 145	ACCEPTABLE
	4	43.3	43.0	34.0- 53.4	36.5- 50.9	ACCEPTABLE
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	9.6	9.50	9.19- 9.75	9.26- 9.68	ACCEPTABLE
	4	4.7	4.70	4.62- 4.77	4.64- 4.75	ACCEPTABLE
SPEC. COND.	1	879	899	840- 980	857- 963	ACCEPTABLE
(UMHOS/CM AT 25 C)	2	384	398	368- 435	377- 427	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: TN043

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
TDS AT 180 C	1	535	577	396- 759	441- 713	ACCEPTABLE
	2	209	223	168- 284	183- 269	ACCEPTABLE
TOTAL HARDNESS (AS CACO3)	1	245	279	236- 307	245- 299	ACCEPTABLE
	2	56	57.4	51.2- 63.8	52.8- 62.2	ACCEPTABLE
CALCIUM	1	111	110	87.4- 126	92.2- 121	ACCEPTABLE
	2	7.33	7.00	5.95- 8.19	6.23- 7.91	ACCEPTABLE
MAGNESIUM	1	1.02	0.960	0.771- 1.18	0.822- 1.13	ACCEPTABLE
	2	10.4	9.70	8.38- 11.0	8.71- 10.6	ACCEPTABLE
SODIUM	1	62.9	61.7	56.2- 67.8	57.6- 66.3	ACCEPTABLE
	2	26.6	26.3	23.6- 29.2	24.3- 28.5	ACCEPTABLE
POTASSIUM	1	8.44	7.50	6.39- 8.81	6.70- 8.50	ACCEPTABLE
	2	42.6	40.0	34.5- 45.6	35.9- 44.2	ACCEPTABLE
TOTAL ALKALINITY (AS CACO3)	1	103	120	106- 133	109- 130	NOT ACCEPTABLE
	2	12	11.0	7.65- 15.3	8.77- 14.3	ACCEPTABLE
CHLORIDE	1	194.8	199	183- 213	187- 210	ACCEPTABLE
	2	36.5	41.2	36.5- 45.4	37.6- 44.3	ACCEPTABLE
FLUORIDE	1	3.65	3.30	2.83- 3.77	2.95- 3.65	ACCEPTABLE
	2	0.42	0.380	0.319-0.457	0.336-0.439	ACCEPTABLE
SULFATE	1	12.25	14.0	10.8- 16.8	11.5- 16.0	ACCEPTABLE
	2	81.90	92.0	78.1- 105	81.5- 102	ACCEPTABLE
NUTRIENTS IN MILLIGRAMS PER LITER:						
AMMONIA-NITROGEN	1	7.67	7.70	6.10- 9.16	6.47- 8.79	ACCEPTABLE
	2	0.74	0.730	0.491-0.982	0.550-0.923	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: TN043

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
NUTRIENTS IN MILLIGRAMS PER LITER:						
NITRATE-NITROGEN	1	0.557	0.520	0.376-0.658	0.412-0.625	ACCEPTABLE
	2	11.36	11.0	8.84- 13.0	9.34- 12.5	ACCEPTABLE
ORTHOPHOSPHATE	1	0.16	0.150	0.114-0.187	0.122-0.178	ACCEPTABLE
	2	4.27	4.10	3.46- 4.68	3.62- 4.54	ACCEPTABLE
KJELDAHL-NITROGEN	3	5.14	14.0	10.3- 17.1	11.1- 16.3	NOT ACCEPTABLE
	4	3.15	0.710	0.226- 1.32	0.357- 1.19	NOT ACCEPTABLE
TOTAL PHOSPHORUS	3	7.62	7.40	5.57- 8.05	5.86- 7.75	ACCEPTABLE
	4	0.83	0.490	0.341-0.569	0.369-0.542	NOT ACCEPTABLE
DEMANDS IN MILLIGRAMS PER LITER:						
COD	1	82	70.6	52.4- 84.6	56.5- 80.5	CHECK FOR ERROR
	2	208	207	183- 230	172- 221	ACCEPTABLE
TOC	1	28.52	28.0	23.9- 32.8	25.0- 31.6	ACCEPTABLE
	2	81.50	82.0	69.5- 95.3	72.8- 91.9	ACCEPTABLE
5-DAY BOD	1	45.52	44.9	26.1- 60.1	30.3- 55.8	ACCEPTABLE
	2	136.0	131	75.4- 180	88.5- 167	ACCEPTABLE
MISCELLANEOUS PARAMETERS:						
TOTAL CYANIDE (IN MG/L)	1	1.092	0.860	0.598- 1.15	0.668- 1.06	CHECK FOR ERROR
	2	0.199	0.160	0.102-0.208	0.116-0.194	CHECK FOR ERROR
NON-FILTERABLE RESIDUE (IN MG/L)	1	57	61.0	47.7- 64.6	49.8- 62.5	ACCEPTABLE
	2	81	83.0	62.6- 91.3	66.4- 87.8	ACCEPTABLE
OIL AND GREASE (IN MG/L)	1	5.1	8.30	3.07- 12.2	4.22- 11.0	ACCEPTABLE
	2	41.1	48.4	33.7- 56.0	36.5- 53.2	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: TN043

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MISCELLANEOUS PARAMETERS:						
TOTAL PHENOLICS	1	0.659	0.595	0.312-0.878	0.384-0.805	ACCEPTABLE
(IN MG/L)	2	3.404	3.13	1.66- 4.60	2.04- 4.23	ACCEPTABLE
TOTAL RESIDUAL CHLORINE	1	3.69	3.70	3.06- 4.52	3.25- 4.32	ACCEPTABLE
(IN MG/L)	2	1.42	1.50	1.09- 1.77	1.18- 1.68	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION

94/94 = 100% ACCEPTABLE

DDS#s 940107-083-114

January 1994

Prepared for

Martin Marietta Energy Systems
Plant K-25
Highway 58 at Blair Road
Oak Ridge, TN 37831

8254

INTRODUCTION

The Proficiency Environmental Testing Program is designed to evaluate your laboratory's performance against other participating laboratories on the same set of standards. Standard levels have been chosen to assist you in ensuring that the procedure is in-control. In most cases, standard levels are not designed to challenge the detection limits of the method.

The following information is provided to assist you in the evaluation of the report. All statistical measures have been calculated based upon generally accepted formulae.

Your Result: Every effort has been made to insure correct data entry. Should you find a data entry error please notify Analytical Products Group and we will adjust the data and reissue the report.

Reference Value: The reported Reference Value is the calculated True Value of the standard based upon the actual composition of the standard.

Mean of Reporting Laboratories: This value is the Mean value of all reporting laboratories after Outliers have been removed. Please note the normalization of Solids data discussed below.

Standard Deviation: This parameter is also calculated on the data set after Outliers have been removed.

Outliers: Outliers are evaluated based upon the ASTM recommended t Test at the 0.05 significance level. Outliers are marked in the report for rapid identification. APG will provide additional information on Outliers as requested. Outliers do not necessarily indicate poor performance. They can be caused by a faulty standard, calculation errors, or a dilution error. However, a review of each element of the analytical process is

indicated. If we can assist you in resolving why a value was an Outlier, please contact APG.

Solids Standards: Solids standards are individually prepared and each standard has a unique Reference Value. In order to allow comparison between laboratories, the reported Means and Standard Deviation have been normalized based upon the following formula:

X = (Reference Value-Your Result)/Reference Value

The resulting statistics are therefore reported as relative values. The Relative Error is related to the Mean and the Relative Deviation is related to the Standard Deviation.

Deviation from the Mean or z score: This result is an expression of how far your reported value was from the Mean of all reporting laboratories in terms of number of Standard Deviations. As a point of reference, EPA Warning Limits are 1.96 deviations from the Mean and EPA Acceptance Limits are 2.58 deviations from the Mean.

Comment Line: Following the Deviation from the Mean for each parameter is a Comment line. The Comment line may have one of the four entries:

Entry	Description
Unreported	No data was submitted
Warning	Data between 1.97 and 2.58 Deviations Data outside 95% Confidence Interval
Unacceptable	Data more than 2.58 Deviations Data outside 99% Confidence Interval
Blank	Data within 95% Confidence Interval

These notations can be used as a guideline in evaluating your performance.

Comment Section: This section contains comments submitted to Analytical Products Group by program participants. It also contains comments from APG to participants concerning unusual characteristics of the data set or problems with standards which could influence the interpretation of the data.

Performances Evaluation Summary: This section summarizes performance data in a format similar to the USEPA DMR-QA Report. Detailed information on each parameter is included in the main report.

Certification: This program meets the requirements ISO/REMCO N263 which is the protocol for Proficiency Testing of Analytical Laboratories. This program is also a part of the ISO 9001 registered quality system of APG as audited by the American Association for Laboratory Accreditation

Submitted: February 17, 1994

Thomas V. Coyner
General Manager

APG The Measure of Quality
Analytical Products Group, Inc.
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PERFORMANCE EVALUATION

Performance Evaluation Summary

Customer Code: 8254

January, 1994

Parameter	Level	Reported	Ref Value	Mean	Std Dev	Acceptance Range	Comment
Standard: Demand mg/L							
Biochemical Oxygen Demand	1	125.06	133.300	128.103	18.641	80.009 - 176.197	
Biochemical Oxygen Demand	2	41.14	41.360	39.047	6.639	21.919 - 56.174	
Chemical Oxygen Demand	1	200	214.600	202.147	18.088	155.480 - 248.813	
Chemical Oxygen Demand	2	71	66.590	61.032	7.708	41.144 - 80.919	
Total Organic Carbon	1	81.2	80.800	81.681	2.888	74.229 - 89.132	
Total Organic Carbon	2	24.9	25.070	25.261	1.223	22.105 - 28.417	
Standard: Nutrients mg/L							
Ammonia Nitrogen as N	1	0.32	0.302	0.326	0.100	0.068 - 0.584	
Ammonia Nitrogen as N	2	8.06	7.986	8.091	0.724	6.224 - 9.958	
Nitrate Nitrogen as N	1	NA	0.609	0.620	0.072	0.433 - 0.807	Unreported
Nitrate Nitrogen as N	2	NA	6.372	6.321	0.586	4.808 - 7.833	Unreported
Orthophosphate as P	1	0.22	0.206	0.207	0.013	0.173 - 0.241	
Orthophosphate as P	2	5.80	5.457	5.465	0.338	4.592 - 6.338	
Total Kjeldahl Nitrogen	1	0.476	0.382	0.520	0.214	0.000 - 1.072	
Total Kjeldahl Nitrogen	2	1.022	1.505	1.639	0.400	0.607 - 2.672	
Total Phosphorus as P	1	0.14	0.110	0.112	0.018	0.065 - 0.159	
Total Phosphorus as P	2	9.55	9.507	9.254	0.803	7.183 - 11.326	
Standard: Solids mg/L							
Total Suspended Solids	1	51	55.600	50.347	3.801	40.541 - 60.153	
Total Suspended Solids	2	148	176.500	164.665	11.533	134.911 - 194.419	

Customer Code: 8254 January, 1994 Page: 2

Parameter	Level	Reported	Ref Value	Mean	Std Dev	Acceptance Range	Comment
Total Dissolved Solids	1	168	157.100	162.344	19.678	111.574 - 213.114	
Total Dissolved Solids	2	273	253.400	261.632	28.314	188.582 - 334.681	
Standard: Oil & Grease mg/L							
Oil & Grease	1	6.15	4.984	5.204	2.069	0.000 - 10.541	
Oil & Grease	2	34.9	37.450	33.445	4.245	22.493 - 44.397	
Standard: Minerals mg/L							
Alkalinity as CaCO3	1	75	79.630	77.510	3.858	67.556 - 87.465	
Alkalinity as CaCO3	2	126	135.090	132.025	5.091	118.889 - 145.160	
Calcium	1	22.0	20.820	20.697	1.681	16.359 - 25.034	
Calcium	2	1.47	1.480	1.544	0.185	1.067 - 2.020	
Chloride	1	101.2	106.920	107.116	6.641	89.983 - 124.249	
Chloride	2	88.7	96.190	94.466	5.107	81.290 - 107.642	
Conductivity umho/cm	1	691	699.000	696.793	31.068	616.637 - 776.949	
Conductivity umho/cm	2	846	852.000	855.802	29.770	778.995 - 932.609	
Magnesium	1	1.56	1.510	1.479	0.099	1.224 - 1.734	
Magnesium	2	24.2	24.120	23.730	1.049	21.024 - 26.436	
Potassium	1	74.7	72.070	70.290	5.323	56.556 - 84.023	
Potassium	2	27.2	26.290	26.389	1.351	22.903 - 29.875	
Sodium	1	70.7	69.480	70.093	4.483	58.525 - 81.660	
Sodium	2	130	126.350	125.441	7.600	105.834 - 145.048	
Sulfate	1	71.040	69.250	68.887	5.021	55.933 - 81.841	
Sulfate	2	118.043	135.220	133.776	12.844	100.639 - 166.913	
Total Hardness as CaCO3	1	54	58.190	59.491	5.962	44.110 - 74.873	
Total Hardness as CaCO3	2	94	103.020	100.364	4.115	89.747 - 110.982	

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Customer Code: 8254

January, 1994

Parameter	Level	Reported	Ref Value	Mean	Std Dev	Acceptance Range	Comment
Standard: pH Units							
pH	1	4.0	4.190	4.075	0.237	3.463 - 4.687	
pH	2	7.2	7.673	7.416	0.314	6.606 - 8.226	
Standard: Trace Metals ug/L							
Aluminum	1	36.7	30.820	36.755	8.642	14.458 - 59.051	
Aluminum	2	458	462.240	470.065	46.994	348.819 - 591.310	
Antimony	1	464	456.990	471.558	41.982	363.244 - 579.872	
Antimony	2	524	515.150	541.574	29.242	466.130 - 617.018	
Arsenic	1	33.2	33.460	34.206	5.869	19.064 - 49.348	
Arsenic	2	412	416.400	412.598	44.296	298.314 - 526.882	
Barium	1	907	904.590	900.649	33.715	813.665 - 987.633	
Barium	2	2190	2196.980	2207.783	88.539	1979.353 - 2436.213	
Beryllium	1	29.7	32.660	32.502	1.681	28.165 - 36.840	
Beryllium	2	215	236.180	233.300	10.544	206.096 - 260.504	
Boron	1	48.4	49.710	48.617	7.257	29.893 - 67.341	
Boron	2	289	298.250	288.004	19.668	237.261 - 338.747	
Cadmium	1	70.3	72.930	72.455	4.477	60.904 - 84.006	
Cadmium	2	135	139.780	139.231	8.224	118.013 - 160.448	
Chromium	1	60.0	58.440	58.715	5.371	44.858 - 72.573	
Chromium	2	189	189.220	190.791	12.383	158.842 - 222.740	
Cobalt	1	164	166.870	165.748	8.539	143.717 - 187.778	
Cobalt	2	218	222.500	223.086	12.777	190.122 - 256.049	
Copper	1	46.0	45.470	45.918	3.337	37.309 - 54.527	
Copper	2	170	166.740	167.346	6.393	150.852 - 183.840	
Iron	1	165	162.560	160.427	9.226	136.624 - 184.230	
Iron	2	679	690.900	685.859	38.744	585.900 - 785.817	

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PERFORMANCE EVALUATION

Parameter	Level	Reported	Ref Value	Mean	Std Dev	Acceptance Range	Comment
Lead	1	62.0	63.780	62.815	8.114	41.882 - 83.748	
Lead	2	455	451.810	444.392	30.883	364.713 - 524.070	
Manganese	1	23.9	23.170	23.998	1.598	19.875 - 28.122	
Manganese	2	178	182.210	181.238	10.302	154.658 - 207.818	
Mercury	1	0.806	0.710	0.770	0.203	0.246 - 1.294	
Mercury	2	4.10	3.810	3.897	0.551	2.476 - 5.318	
Molybdenum	1	151	153.550	145.706	11.342	116.444 - 174.967	
Molybdenum	2	294	294.300	282.706	15.845	241.826 - 323.586	
Nickel	1	78.1	74.820	75.043	6.043	59.451 - 90.634	
Nickel	2	285	281.310	281.565	12.182	250.136 - 312.995	
Selenium	1	37.8	39.080	37.978	4.244	27.028 - 48.928	
Selenium	2	61.1	61.410	61.117	6.189	45.151 - 77.084	
Silver	1	30.4	30.800	30.491	2.992	22.773 - 38.210	
Silver	2	352	352.060	348.900	24.298	286.210 - 411.590	
Thallium	1	154.1	152.980	148.118	11.689	117.961 - 178.276	
Thallium	2	275	250.330	249.400	19.130	200.044 - 298.756	
Vanadium	1	176	175.720	174.325	7.622	154.660 - 193.990	
Vanadium	2	1490	1490.820	1486.539	61.526	1327.803 - 1645.275	
Zinc	1	67.5	69.660	70.287	4.078	59.766 - 80.807	
Zinc	2	135	144.300	145.858	8.148	124.836 - 166.881	
Standard: Phenol mg/L							
Phenol	1	0.3235	0.310	0.300	0.033	0.215 - 0.384	
Phenol	2	3.062	3.004	2.979	0.252	2.329 - 3.630	
Standard: Cyanide mg/L							
Cyanide	1	0.2146	0.195	0.195	0.028	0.124 - 0.266	

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PERFORMANCE EVALUATION

Customer Code: 8254 January, 1994 Page: 5

Parameter	Level	Reported	Ref Value	Mean	Std Dev	Acceptance Range	Comment
Cyanide	2	4.212	4.297	4.255	0.397	3.229 - 5.280	
Standard: Residual Chlorine mg/L							
Residual Chlorine	1	0.30	0.441	0.424	0.076	0.230 - 0.619	
Residual Chlorine	2	1.26	1.276	1.272	0.138	0.917 - 1.627	
Standard: Fluoride mg/L							
Fluoride	1	0.97	0.990	0.988	0.070	0.807 - 1.168	
Fluoride	2	14.0	14.027	14.125	0.598	12.584 - 15.667	
Standard: Total Organic Halide ug/L							
Total Organic Halide	1	13.75	14.570	14.806	2.591	8.121 - 21.491	
Total Organic Halide	2	181.9	196.690	192.771	25.510	126.956 - 258.585	
Standard: Hexavalent Chromium mg/L							
Hexavalent Chromium	1	NA	0.070	0.067	0.006	0.052 - 0.082	Unreported
Hexavalent Chromium	2	NA	0.451	0.447	0.022	0.391 - 0.504	Unreported
Standard: Uranium ug/L							
Uranium	1	85	90.090	87.271	6.808	69.707 - 104.836	
Uranium	2	535	550.600	499.571	47.920	375.939 - 623.204	

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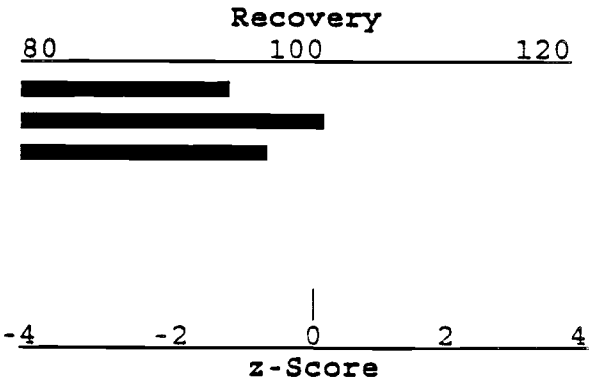
PERFORMANCE EVALUATION

Customer Code: 8254 **January 1994** Page: 1

Standard: Demand

Parameter: Biochemical Oxygen Demand **mg/L** **Level 1**

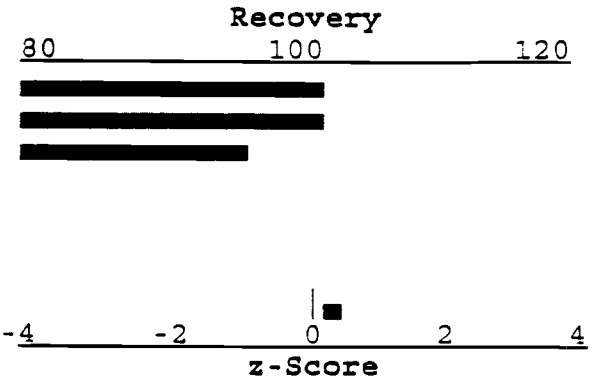
Your Result:	125.06
Reference Value:	133.300
Mean of Reporting Laboratories:	128.103
Actual Standard Deviation:	18.641
Number Reporting:	97
Average % Recovery:	96.101
Your % Recovery:	93.818
Deviation from Mean - z Score:	0.163



Comment:

Parameter: Biochemical Oxygen Demand **mg/L** **Level 2**

Your Result:	41.14
Reference Value:	41.360
Mean of Reporting Laboratories:	39.047
Actual Standard Deviation:	6.639
Number Reporting:	102
Average % Recovery:	94.407
Your % Recovery:	99.468
Deviation from Mean - z Score:	0.315



Comment:

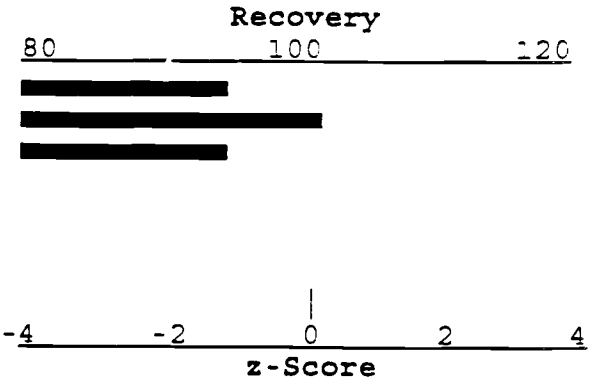
PERFORMANCE EVALUATION

Customer Code: 8254 **January 1994** Page: 2

Standard: Demand

Parameter: Chemical Oxygen Demand **mg/L** **Level 1**

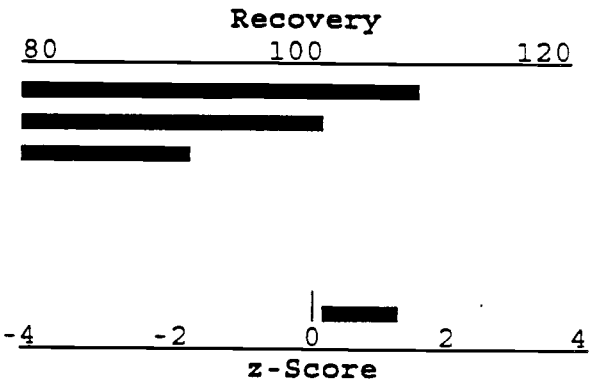
Your Result:	200
Reference Value:	214.600
Mean of Reporting Laboratories:	202.147
Actual Standard Deviation:	18.088
Number Reporting:	72
Average % Recovery:	94.197
Your % Recovery:	93.197
Deviation from Mean - z Score:	0.119



Comment:

Parameter: Chemical Oxygen Demand **mg/L** **Level 2**

Your Result:	71
Reference Value:	66.590
Mean of Reporting Laboratories:	61.032
Actual Standard Deviation:	7.708
Number Reporting:	76
Average % Recovery:	91.653
Your % Recovery:	106.623
Deviation from Mean - z Score:	1.293



Comment:

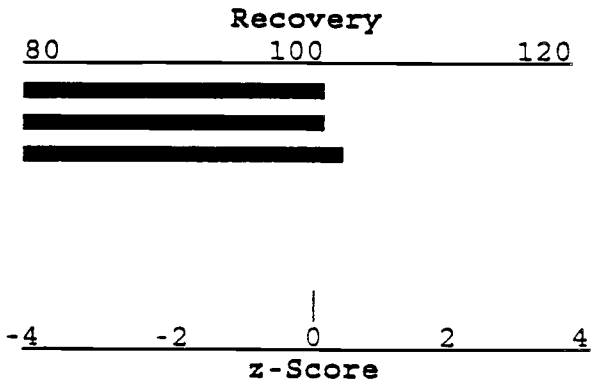
PERFORMANCE EVALUATION

Customer Code: 8254 **January 1994** Page: 3

Standard: Demand

Parameter: Total Organic Carbon **mg/L** **Level 1**

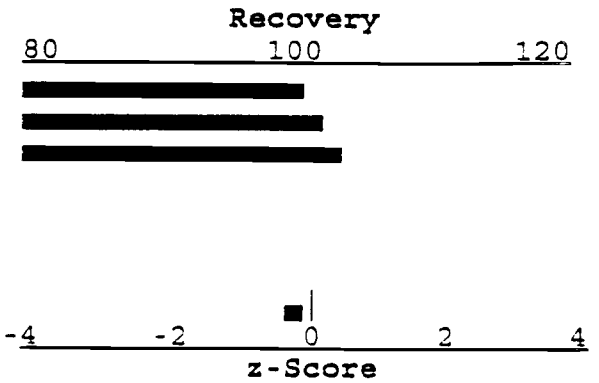
Your Result:	81.2
Reference Value:	80.800
Mean of Reporting Laboratories:	81.681
Actual Standard Deviation:	2.888
Number Reporting:	40
Average % Recovery:	101.090
Your % Recovery:	100.495
Deviation from Mean - z Score:	0.166



Comment:

Parameter: Total Organic Carbon **mg/L** **Level 2**

Your Result:	24.9
Reference Value:	25.070
Mean of Reporting Laboratories:	25.261
Actual Standard Deviation:	1.223
Number Reporting:	43
Average % Recovery:	100.763
Your % Recovery:	99.322
Deviation from Mean - z Score:	0.295



Comment:

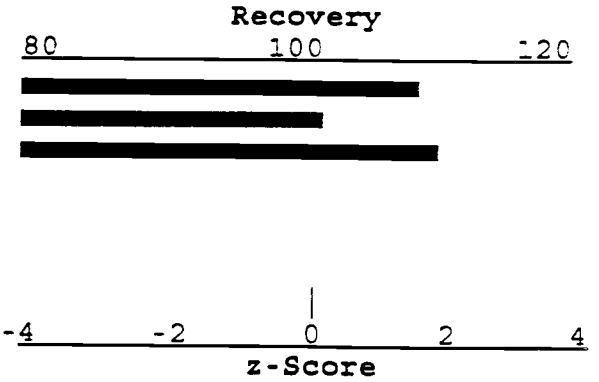
PERFORMANCE EVALUATION

Customer Code: 8254 **January 1994** Page: 4

Standard: Nutrients

Parameter: Ammonia Nitrogen as N **mg/L** **Level 1**

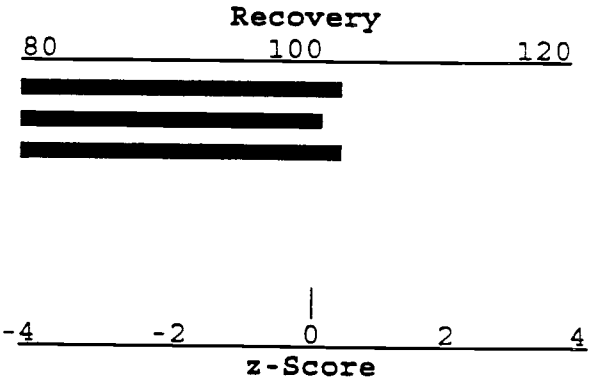
Your Result:	0.32
Reference Value:	0.302
Mean of Reporting Laboratories:	0.326
Actual Standard Deviation:	0.100
Number Reporting:	87
Average % Recovery:	108.064
Your % Recovery:	105.960
Deviation from Mean - z Score:	0.064



Comment:

Parameter: Ammonia Nitrogen as N **mg/L** **Level 2**

Your Result:	8.06
Reference Value:	7.986
Mean of Reporting Laboratories:	8.091
Actual Standard Deviation:	0.724
Number Reporting:	85
Average % Recovery:	101.313
Your % Recovery:	100.927
Deviation from Mean - z Score:	0.043



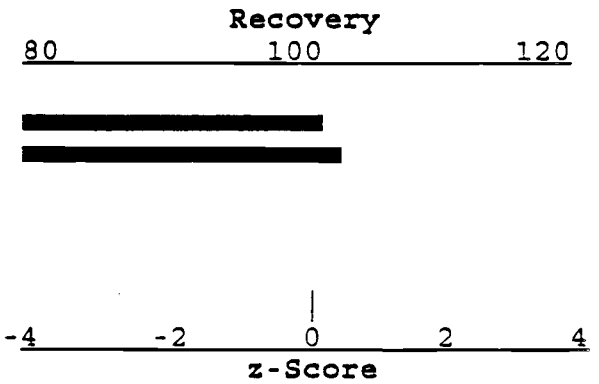
Comment:

Customer Code: 8254 **January 1994** Page: 5

Standard: Nutrients

Parameter: Nitrate Nitrogen as N **mg/L** **Level 1**

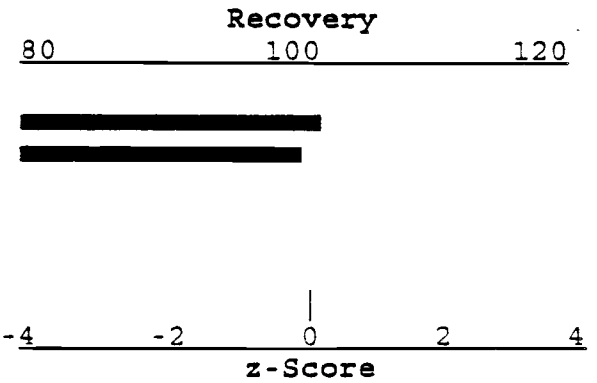
Your Result:	NA
Reference Value:	0.609
Mean of Reporting Laboratories:	0.620
Actual Standard Deviation:	0.072
Number Reporting:	49
Average % Recovery:	101.841
Your % Recovery:	
Deviation from Mean - z Score:	0.000



Comment: **Unreported**

Parameter: Nitrate Nitrogen as N **mg/L** **Level 2**

Your Result:	NA
Reference Value:	6.372
Mean of Reporting Laboratories:	6.321
Actual Standard Deviation:	0.586
Number Reporting:	55
Average % Recovery:	99.195
Your % Recovery:	
Deviation from Mean - z Score:	0.000



Comment: **Unreported**

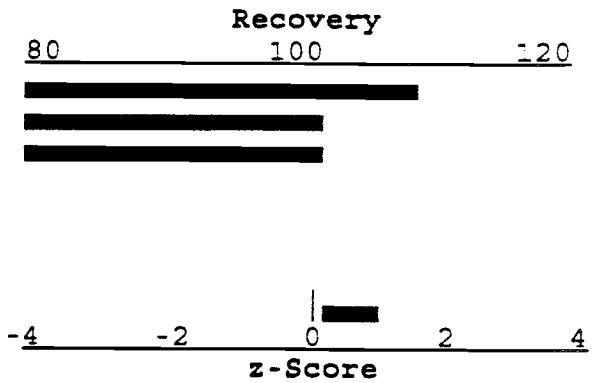
PERFORMANCE EVALUATION

Customer Code: 8254 **January 1994** Page: 6

Standard: Nutrients

Parameter: Orthophosphate as P **mg/L** **Level 1**

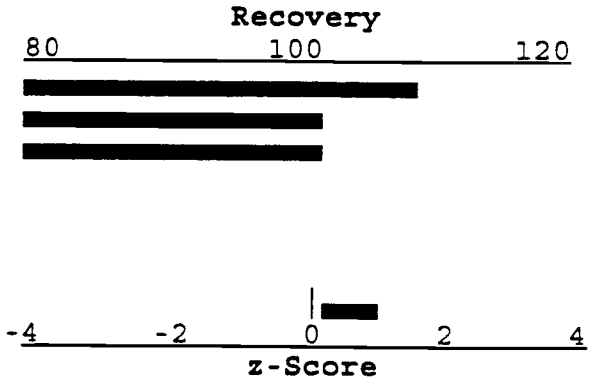
Your Result:	0.22
Reference Value:	0.206
Mean of Reporting Laboratories:	0.207
Actual Standard Deviation:	0.013
Number Reporting:	41
Average % Recovery:	100.500
Your % Recovery:	106.796
Deviation from Mean - z Score:	0.974



Comment:

Parameter: Orthophosphate as P **mg/L** **Level 2**

Your Result:	5.80
Reference Value:	5.457
Mean of Reporting Laboratories:	5.465
Actual Standard Deviation:	0.338
Number Reporting:	44
Average % Recovery:	100.145
Your % Recovery:	106.286
Deviation from Mean - z Score:	0.990



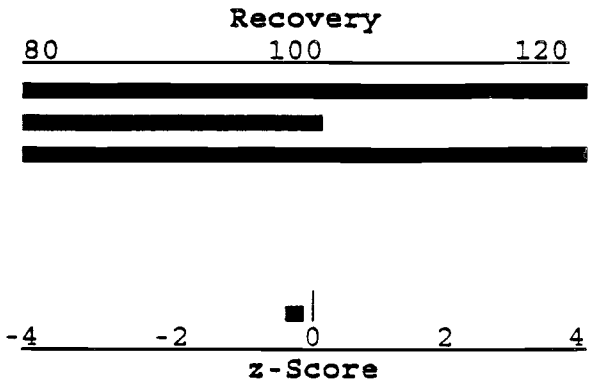
Comment:

Customer Code: 8254 **January 1994** Page: 7

Standard: Nutrients

Parameter: Total Kjeldahl Nitrogen **mg/L** **Level 1**

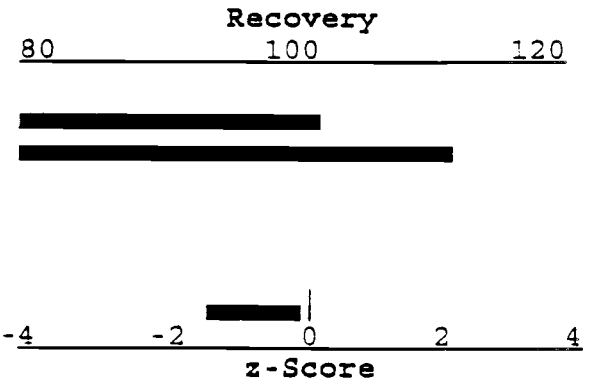
Your Result:	0.476
Reference Value:	0.382
Mean of Reporting Laboratories:	0.520
Actual Standard Deviation:	0.214
Number Reporting:	46
Average % Recovery:	136.019
Your % Recovery:	124.607
Deviation from Mean - z Score:	0.203



Comment:

Parameter: Total Kjeldahl Nitrogen **mg/L** **Level 2**

Your Result:	1.022
Reference Value:	1.505
Mean of Reporting Laboratories:	1.639
Actual Standard Deviation:	0.400
Number Reporting:	43
Average % Recovery:	108.914
Your % Recovery:	67.907
Deviation from Mean - z Score:	1.542



Comment:

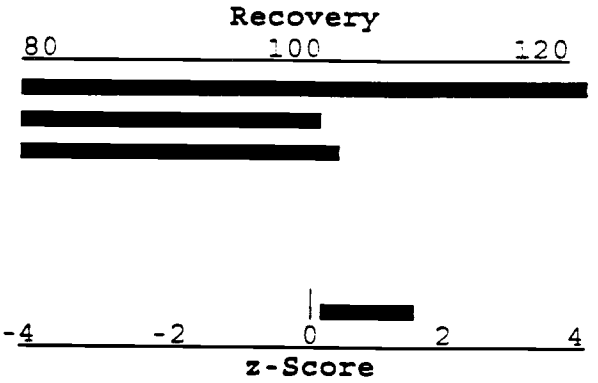
PERFORMANCE EVALUATION

Customer Code: 8254 **January 1994** Page: 8

Standard: Nutrients

Parameter: Total Phosphorus as P **mg/L** **Level 1**

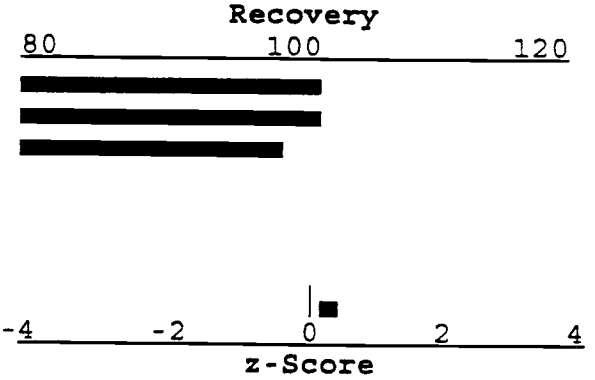
Your Result:	0.14
Reference Value:	0.110
Mean of Reporting Laboratories:	0.112
Actual Standard Deviation:	0.018
Number Reporting:	53
Average % Recovery:	101.550
Your % Recovery:	127.273
Deviation from Mean - z Score:	1.553



Comment:

Parameter: Total Phosphorus as P **mg/L** **Level 2**

Your Result:	9.55
Reference Value:	9.507
Mean of Reporting Laboratories:	9.254
Actual Standard Deviation:	0.803
Number Reporting:	57
Average % Recovery:	97.344
Your % Recovery:	100.452
Deviation from Mean - z Score:	0.368



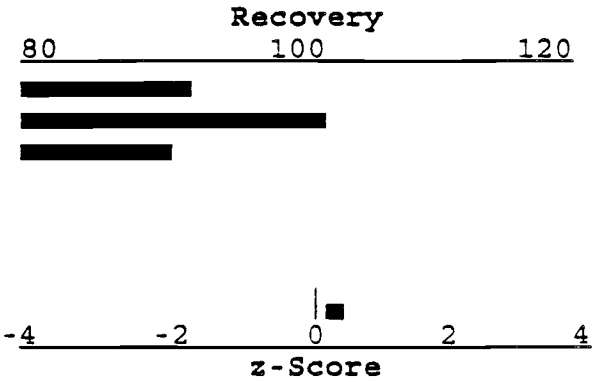
Comment:

Customer Code: 8254 **January 1994** Page: 9

Standard: Solids

Parameter: Total Suspended Solids **mg/L** **Level 1**

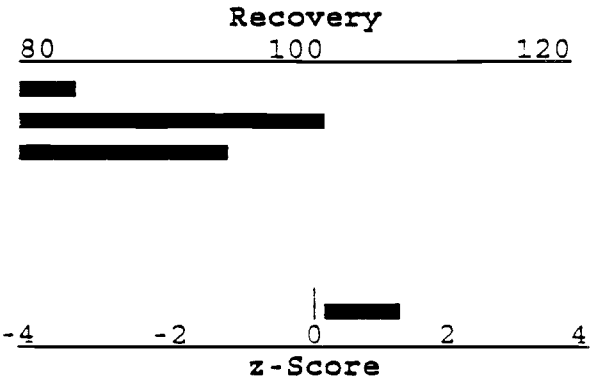
Your Result:	51
Reference Value:	55.600
Relative Error % :	9.448
Relative Deviation % :	6.836
Number Reporting:	122
Average % Recovery:	90.552
Your % Recovery:	91.727
Deviation from Mean - z Score:	0.172



Comment:

Parameter: Total Suspended Solids **mg/L** **Level 2**

Your Result:	148
Reference Value:	176.500
Relative Error % :	6.705
Relative Deviation % :	6.534
Number Reporting:	121
Average % Recovery:	93.295
Your % Recovery:	83.853
Deviation from Mean - z Score:	1.445



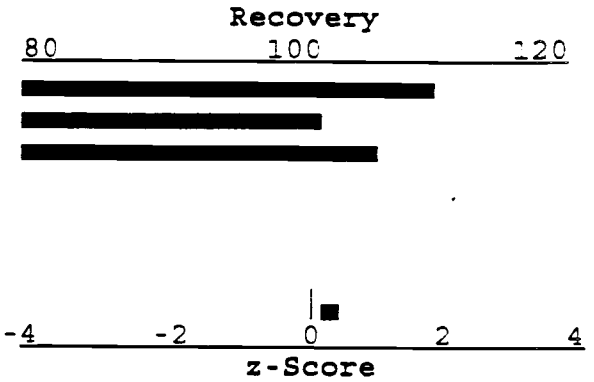
Comment:

Customer Code: 8254 **January 1994** Page: 10

Standard: Solids

Parameter: Total Dissolved Solids **mg/L** **Level 1**

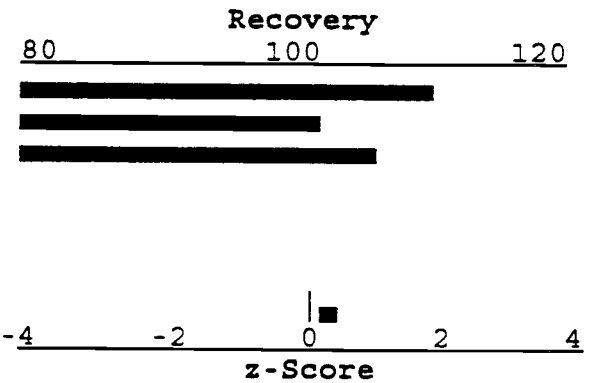
Your Result:	168
Reference Value:	157.100
Relative Error % :	3.338
Relative Deviation % :	12.526
Number Reporting:	54
Average % Recovery:	103.338
Your % Recovery:	106.938
Deviation from Mean - z Score:	0.287



Comment:

Parameter: Total Dissolved Solids **mg/L** **Level 2**

Your Result:	273
Reference Value:	253.400
Relative Error % :	3.248
Relative Deviation % :	11.174
Number Reporting:	58
Average % Recovery:	103.248
Your % Recovery:	107.735
Deviation from Mean - z Score:	0.402



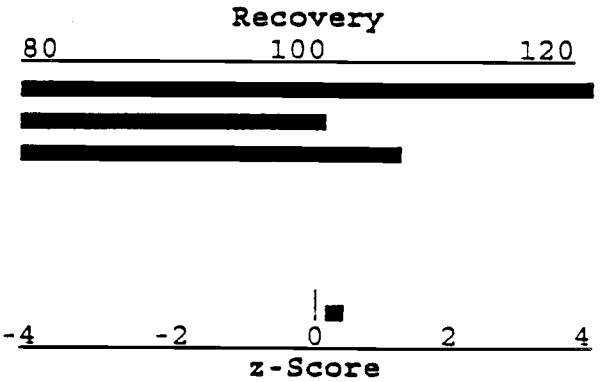
Comment:

Customer Code: 8254 **January 1994** Page: 11

Standard: Oil & Grease

Parameter: Oil & Grease **mg/L** **Level 1**

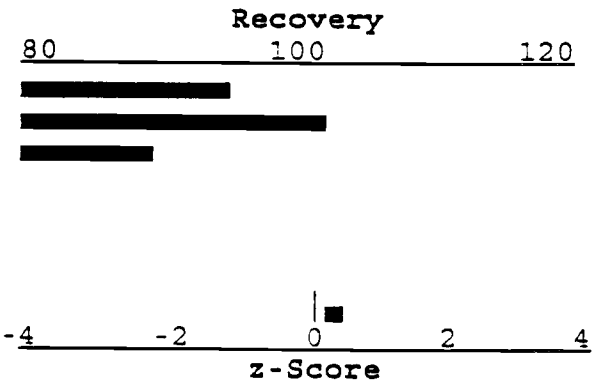
Your Result:	6.15
Reference Value:	4.984
Mean of Reporting Laboratories:	5.204
Actual Standard Deviation:	2.069
Number Reporting:	66
Average % Recovery:	104.410
Your % Recovery:	123.395
Deviation from Mean - z Score:	0.457



Comment:

Parameter: Oil & Grease **mg/L** **Level 2**

Your Result:	34.9
Reference Value:	37.450
Mean of Reporting Laboratories:	33.445
Actual Standard Deviation:	4.245
Number Reporting:	65
Average % Recovery:	89.306
Your % Recovery:	93.191
Deviation from Mean - z Score:	0.343



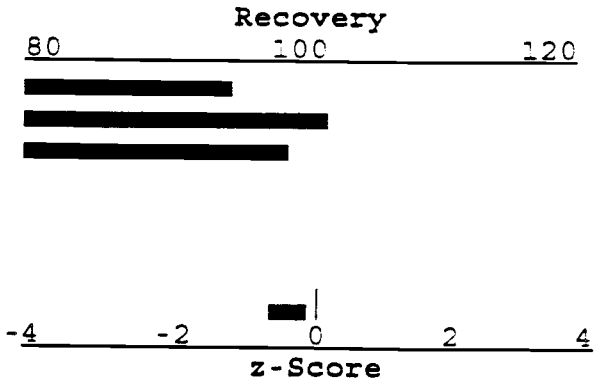
Comment:

Customer Code: 8254 **January 1994** Page: 12

Standard: Minerals

Parameter: Alkalinity as CaCO3 **mg/L** **Level 1**

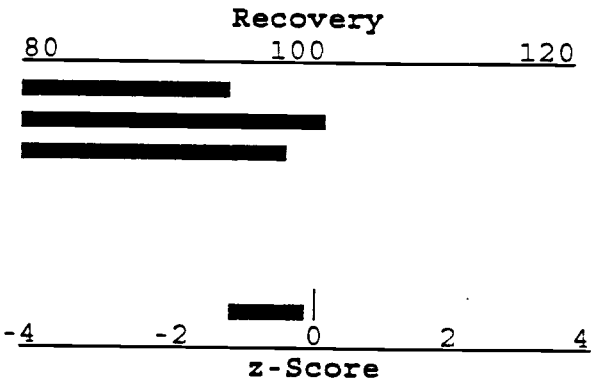
Your Result:	75
Reference Value:	79.630
Mean of Reporting Laboratories:	77.510
Actual Standard Deviation:	3.858
Number Reporting:	55
Average % Recovery:	97.338
Your % Recovery:	94.186
Deviation from Mean - z Score:	0.651



Comment:

Parameter: Alkalinity as CaCO3 **mg/L** **Level 2**

Your Result:	126
Reference Value:	135.090
Mean of Reporting Laboratories:	132.025
Actual Standard Deviation:	5.091
Number Reporting:	51
Average % Recovery:	97.731
Your % Recovery:	93.271
Deviation from Mean - z Score:	1.183



Comment:

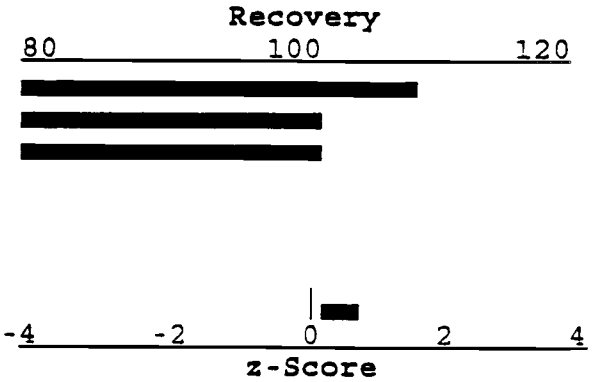
PERFORMANCE EVALUATION

Customer Code: 8254 **January 1994** Page: 13

Standard: Minerals

Parameter: Calcium **mg/L** **Level 1**

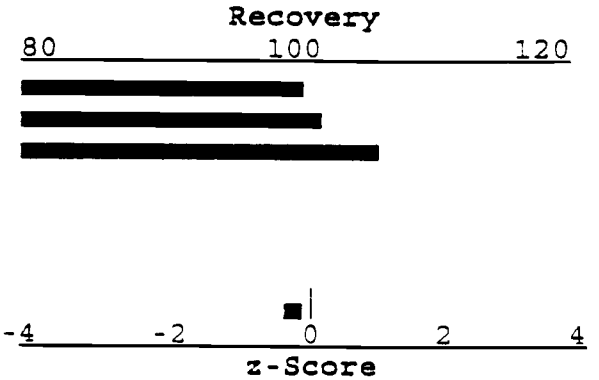
Your Result:	22.0
Reference Value:	20.820
Mean of Reporting Laboratories:	20.697
Actual Standard Deviation:	1.681
Number Reporting:	47
Average % Recovery:	99.408
Your % Recovery:	105.668
Deviation from Mean - z Score:	0.775



Comment:

Parameter: Calcium **mg/L** **Level 2**

Your Result:	1.47
Reference Value:	1.480
Mean of Reporting Laboratories:	1.544
Actual Standard Deviation:	0.185
Number Reporting:	44
Average % Recovery:	104.300
Your % Recovery:	99.324
Deviation from Mean - z Score:	0.398



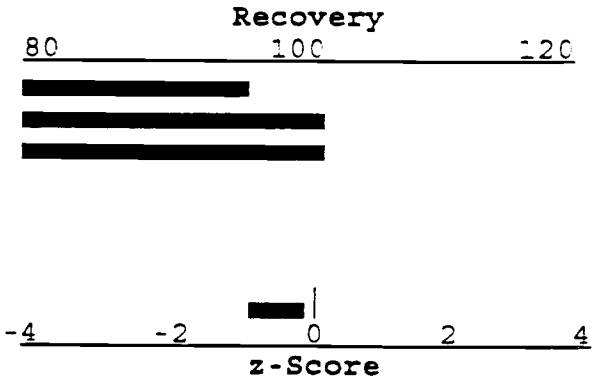
Comment:

Customer Code: 8254 **January 1994** Page: 14

Standard: Minerals

Parameter: Chloride **mg/L** **Level 1**

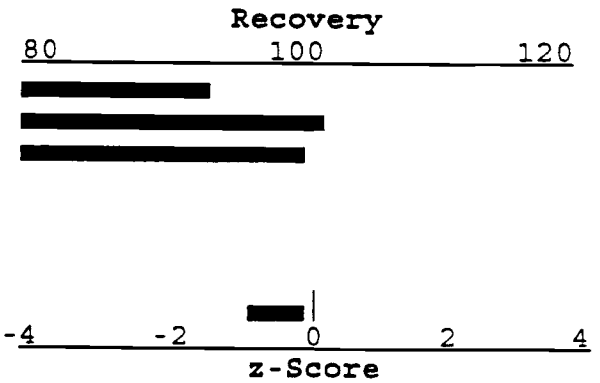
Your Result:	101.2
Reference Value:	106.920
Mean of Reporting Laboratories:	107.116
Actual Standard Deviation:	6.641
Number Reporting:	54
Average % Recovery:	100.183
Your % Recovery:	94.650
Deviation from Mean - z Score:	0.891



Comment:

Parameter: Chloride **mg/L** **Level 2**

Your Result:	88.7
Reference Value:	96.190
Mean of Reporting Laboratories:	94.466
Actual Standard Deviation:	5.107
Number Reporting:	55
Average % Recovery:	98.207
Your % Recovery:	92.213
Deviation from Mean - z Score:	1.129



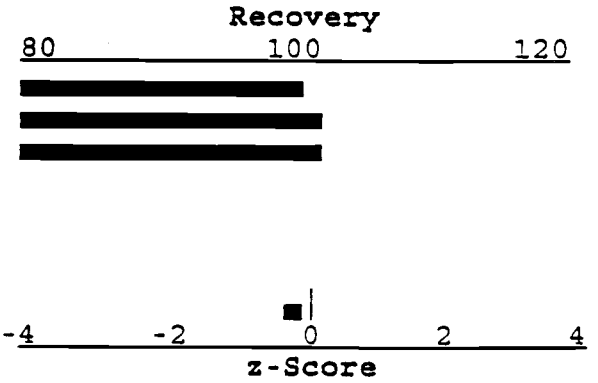
Comment:

Customer Code: 8254 **January 1994** Page: 15

Standard: Minerals

Parameter: Conductivity umho/cm **umhos/cm** **Level 1**

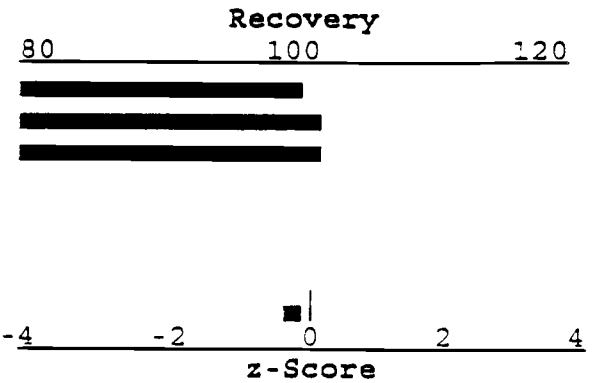
Your Result:	691
Reference Value:	699.000
Mean of Reporting Laboratories:	696.793
Actual Standard Deviation:	31.068
Number Reporting:	57
Average % Recovery:	99.684
Your % Recovery:	98.856
Deviation from Mean - z Score:	0.186



Comment:

Parameter: Conductivity umho/cm **umhos/cm** **Level 2**

Your Result:	846
Reference Value:	852.000
Mean of Reporting Laboratories:	855.302
Actual Standard Deviation:	29.770
Number Reporting:	55
Average % Recovery:	100.446
Your % Recovery:	99.296
Deviation from Mean - z Score:	0.329



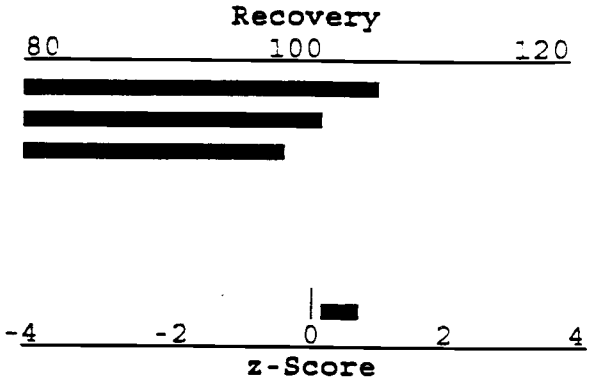
Comment:

Customer Code: 8254 **January 1994** Page: 16

Standard: Minerals

Parameter: Magnesium **mg/L** **Level 1**

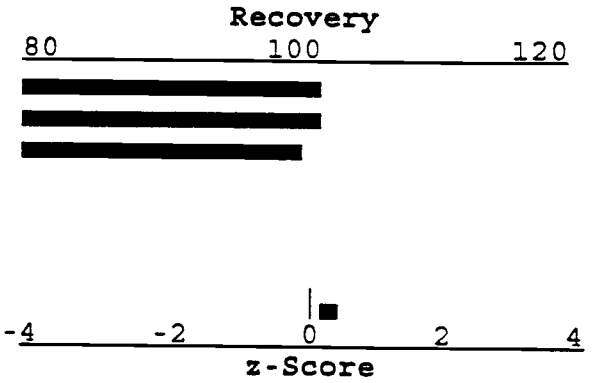
Your Result:	1.56
Reference Value:	1.510
Mean of Reporting Laboratories:	1.479
Actual Standard Deviation:	0.099
Number Reporting:	42
Average % Recovery:	97.919
Your % Recovery:	103.311
Deviation from Mean - z Score:	0.824



Comment:

Parameter: Magnesium **mg/L** **Level 2**

Your Result:	24.2
Reference Value:	24.120
Mean of Reporting Laboratories:	23.730
Actual Standard Deviation:	1.049
Number Reporting:	42
Average % Recovery:	98.382
Your % Recovery:	100.332
Deviation from Mean - z Score:	0.448



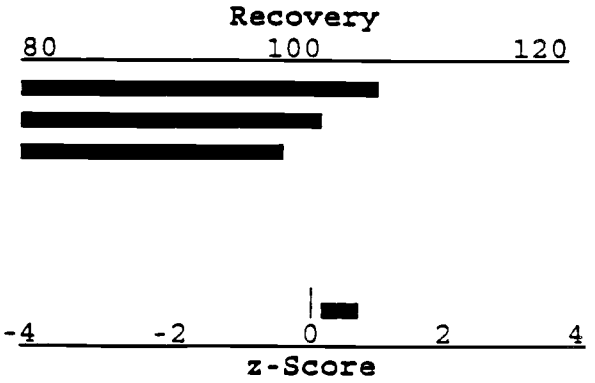
Comment:

Customer Code: 8254 **January 1994** Page: 17

Standard: Minerals

Parameter: Potassium **mg/L** **Level 1**

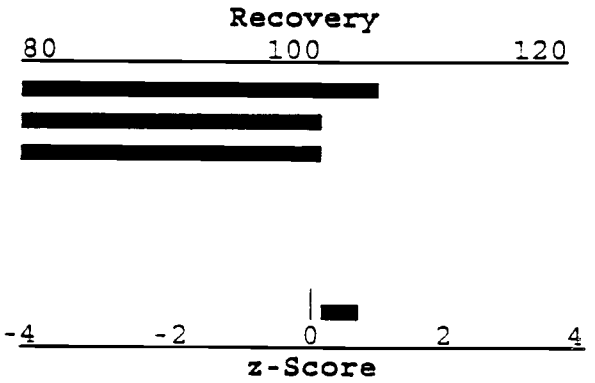
Your Result:	74.7
Reference Value:	72.070
Mean of Reporting Laboratories:	70.290
Actual Standard Deviation:	5.323
Number Reporting:	41
Average % Recovery:	97.530
Your % Recovery:	103.649
Deviation from Mean - z Score:	0.829



Comment:

Parameter: Potassium **mg/L** **Level 2**

Your Result:	27.2
Reference Value:	26.290
Mean of Reporting Laboratories:	26.389
Actual Standard Deviation:	1.351
Number Reporting:	39
Average % Recovery:	100.375
Your % Recovery:	103.461
Deviation from Mean - z Score:	0.600



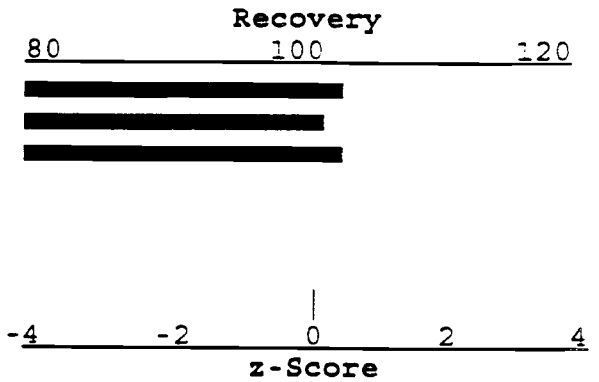
Comment:

Customer Code: 8254 **January 1994** Page: 18

Standard: Minerals

Parameter: Sodium **mg/L** **Level 1**

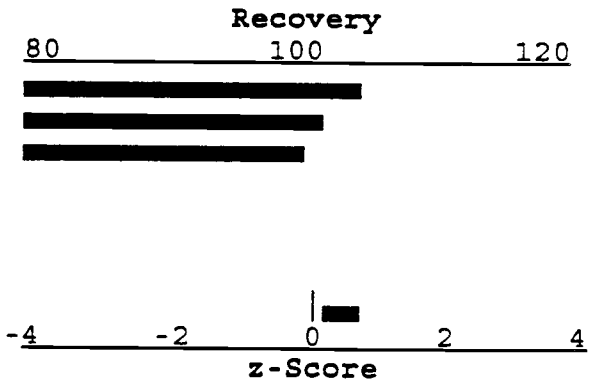
Your Result:	70.7
Reference Value:	69.480
Mean of Reporting Laboratories:	70.093
Actual Standard Deviation:	4.483
Number Reporting:	41
Average % Recovery:	100.882
Your % Recovery:	101.756
Deviation from Mean - z Score:	0.135



Comment:

Parameter: Sodium **mg/L** **Level 2**

Your Result:	130
Reference Value:	126.350
Mean of Reporting Laboratories:	125.441
Actual Standard Deviation:	7.600
Number Reporting:	44
Average % Recovery:	99.280
Your % Recovery:	102.889
Deviation from Mean - z Score:	0.600



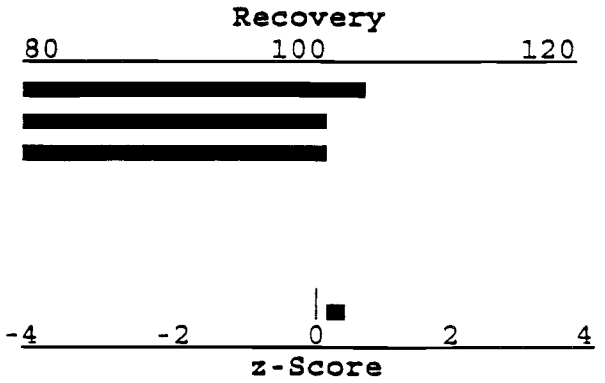
Comment:

Customer Code: 8254 **January 1994** Page: 19

Standard: Minerals

Parameter: Sulfate **mg/L** **Level 1**

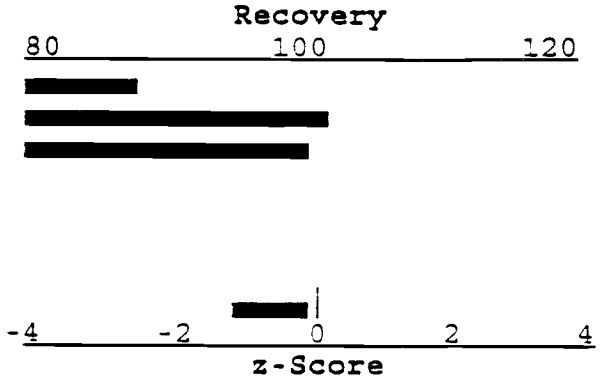
Your Result:	71.040
Reference Value:	69.250
Mean of Reporting Laboratories:	68.887
Actual Standard Deviation:	5.021
Number Reporting:	55
Average % Recovery:	99.476
Your % Recovery:	102.585
Deviation from Mean - z Score:	0.429



Comment:

Parameter: Sulfate **mg/L** **Level 2**

Your Result:	118.043
Reference Value:	135.220
Mean of Reporting Laboratories:	133.776
Actual Standard Deviation:	12.844
Number Reporting:	58
Average % Recovery:	98.932
Your % Recovery:	87.297
Deviation from Mean - z Score:	1.225



Comment:

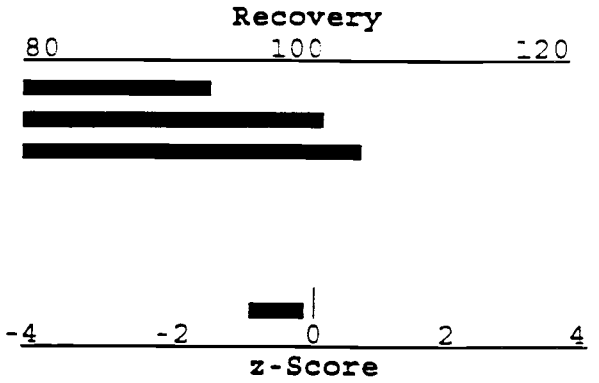
PERFORMANCE EVALUATION

Customer Code: 8254 **January 1994** Page: 20

Standard: Minerals

Parameter: Total Hardness as CaCO3 **mg/L** **Level 1**

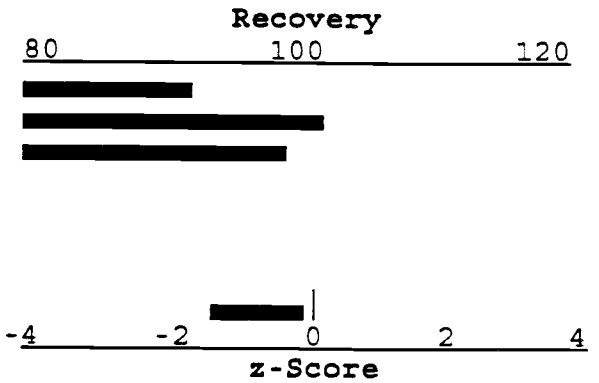
Your Result:	54
Reference Value:	58.190
Mean of Reporting Laboratories:	59.491
Actual Standard Deviation:	5.962
Number Reporting:	52
Average % Recovery:	102.236
Your % Recovery:	92.799
Deviation from Mean - z Score:	0.921



Comment:

Parameter: Total Hardness as CaCO3 **mg/L** **Level 2**

Your Result:	94
Reference Value:	103.020
Mean of Reporting Laboratories:	100.364
Actual Standard Deviation:	4.115
Number Reporting:	45
Average % Recovery:	97.422
Your % Recovery:	91.244
Deviation from Mean - z Score:	1.546



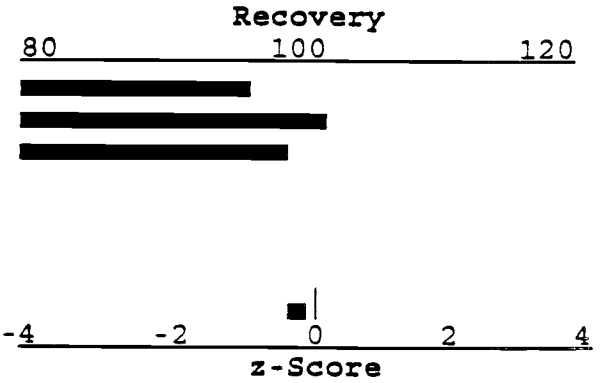
Comment:

Customer Code: 8254 **January 1994** Page: 21

Standard: pH

Parameter: pH **Units** **Level 1**

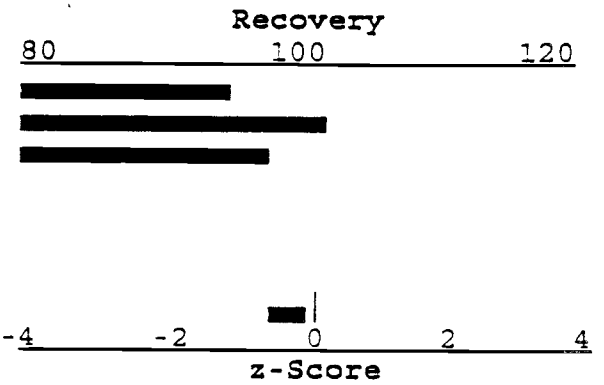
Your Result:	4.0
Reference Value:	4.190
Mean of Reporting Laboratories:	4.075
Actual Standard Deviation:	0.237
Number Reporting:	124
Average % Recovery:	97.253
Your % Recovery:	95.465
Deviation from Mean - z Score:	0.316



Comment:

Parameter: pH **Units** **Level 2**

Your Result:	7.2
Reference Value:	7.673
Mean of Reporting Laboratories:	7.416
Actual Standard Deviation:	0.314
Number Reporting:	122
Average % Recovery:	96.655
Your % Recovery:	93.836
Deviation from Mean - z Score:	0.689



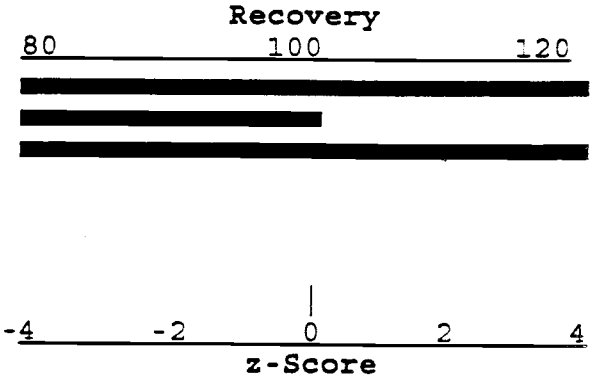
Comment:

Customer Code: 8254 **January 1994** Page: 22

Standard: Trace Metals

Parameter: Aluminum **ug/L** **Level 1**

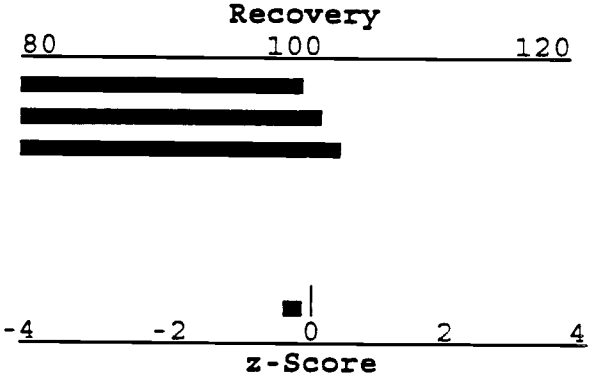
Your Result:	36.7
Reference Value:	30.820
Mean of Reporting Laboratories:	36.755
Actual Standard Deviation:	8.642
Number Reporting:	39
Average % Recovery:	119.256
Your % Recovery:	119.079
Deviation from Mean - z Score:	0.006



Comment:

Parameter: Aluminum **ug/L** **Level 2**

Your Result:	458
Reference Value:	462.240
Mean of Reporting Laboratories:	470.065
Actual Standard Deviation:	46.994
Number Reporting:	45
Average % Recovery:	101.693
Your % Recovery:	99.083
Deviation from Mean - z Score:	0.257



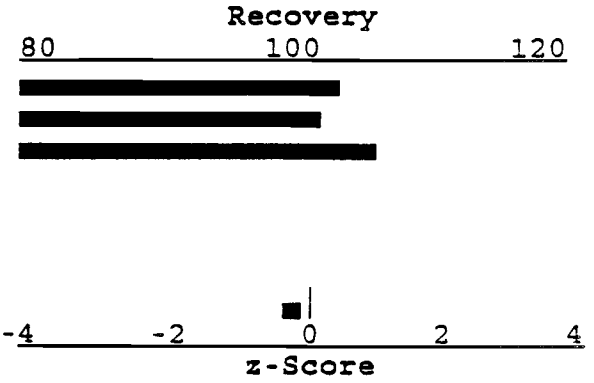
Comment:

Customer Code: 8254 **January 1994** Page: 23

Standard: Trace Metals

Parameter: Antimony **ug/L** **Level 1**

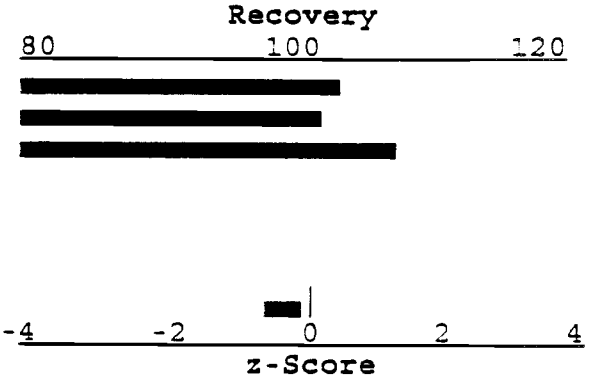
Your Result:	464
Reference Value:	456.990
Mean of Reporting Laboratories:	471.558
Actual Standard Deviation:	41.982
Number Reporting:	43
Average % Recovery:	103.188
Your % Recovery:	101.534
Deviation from Mean - z Score:	0.180



Comment:

Parameter: Antimony **ug/L** **Level 2**

Your Result:	524
Reference Value:	515.150
Mean of Reporting Laboratories:	541.574
Actual Standard Deviation:	29.242
Number Reporting:	39
Average % Recovery:	105.129
Your % Recovery:	101.718
Deviation from Mean - z Score:	0.601



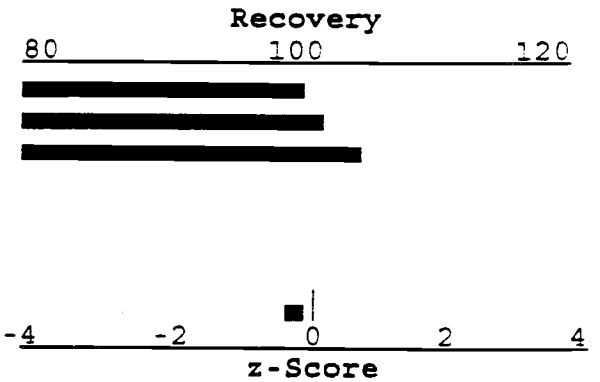
Comment:

Customer Code: 8254 **January 1994** Page: 24

Standard: Trace Metals

Parameter: Arsenic **ug/L** **Level 1**

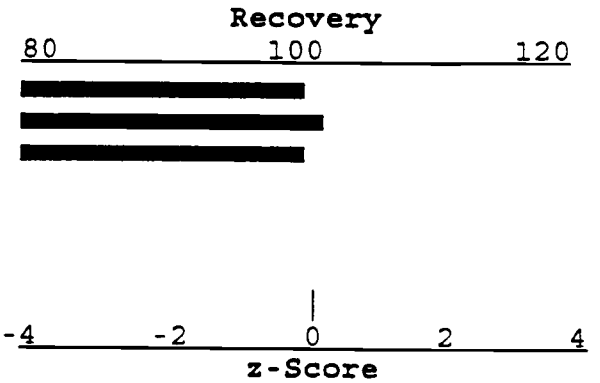
Your Result:	33.2
Reference Value:	33.460
Mean of Reporting Laboratories:	34.206
Actual Standard Deviation:	5.869
Number Reporting:	48
Average % Recovery:	102.230
Your % Recovery:	99.223
Deviation from Mean - z Score:	0.171



Comment:

Parameter: Arsenic **ug/L** **Level 2**

Your Result:	412
Reference Value:	416.400
Mean of Reporting Laboratories:	412.598
Actual Standard Deviation:	44.296
Number Reporting:	52
Average % Recovery:	99.087
Your % Recovery:	98.943
Deviation from Mean - z Score:	0.014



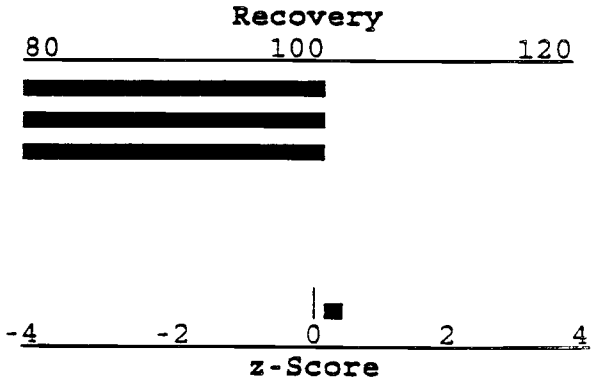
Comment:

Customer Code: 8254 **January 1994** Page: 25

Standard: Trace Metals

Parameter: Barium **ug/L** **Level 1**

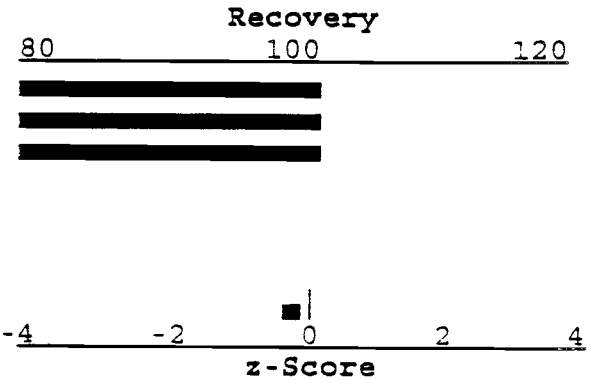
Your Result:	907
Reference Value:	904.590
Mean of Reporting Laboratories:	900.649
Actual Standard Deviation:	33.715
Number Reporting:	45
Average % Recovery:	99.564
Your % Recovery:	100.266
Deviation from Mean - z Score:	0.188



Comment:

Parameter: Barium **ug/L** **Level 2**

Your Result:	2190
Reference Value:	2196.980
Mean of Reporting Laboratories:	2207.783
Actual Standard Deviation:	88.539
Number Reporting:	46
Average % Recovery:	100.492
Your % Recovery:	99.682
Deviation from Mean - z Score:	0.201



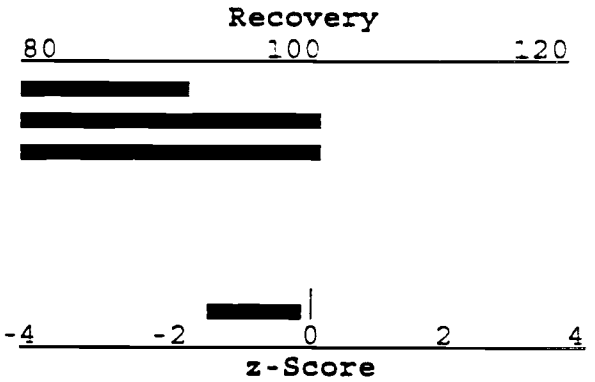
Comment:

Customer Code: 8254 **January 1994** Page: 26

Standard: Trace Metals

Parameter: Beryllium **ug/L** **Level 1**

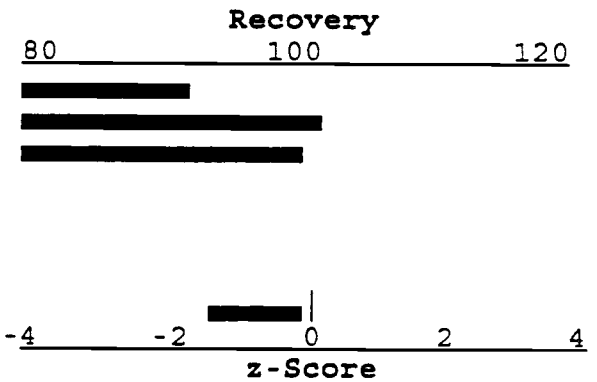
Your Result:	29.7
Reference Value:	32.660
Mean of Reporting Laboratories:	32.502
Actual Standard Deviation:	1.681
Number Reporting:	45
Average % Recovery:	99.517
Your % Recovery:	90.937
Deviation from Mean - z Score:	1.667



Comment:

Parameter: Beryllium **ug/L** **Level 2**

Your Result:	215
Reference Value:	236.180
Mean of Reporting Laboratories:	233.300
Actual Standard Deviation:	10.544
Number Reporting:	46
Average % Recovery:	98.781
Your % Recovery:	91.032
Deviation from Mean - z Score:	1.736



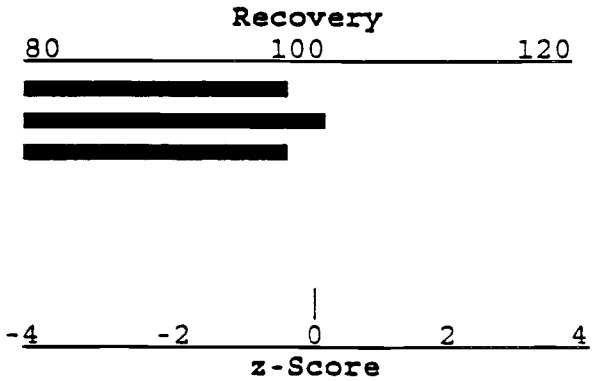
Comment:

Customer Code: 8254 **January 1994** Page: 27

Standard: Trace Metals

Parameter: Boron **ug/L** **Level 1**

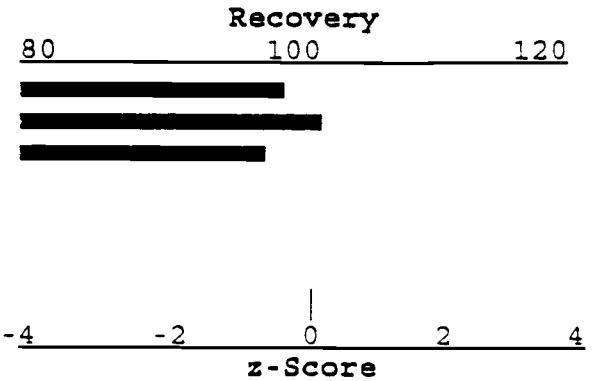
Your Result:	48.4
Reference Value:	49.710
Mean of Reporting Laboratories:	48.617
Actual Standard Deviation:	7.257
Number Reporting:	23
Average % Recovery:	97.802
Your % Recovery:	97.365
Deviation from Mean - z Score:	0.030



Comment:

Parameter: Boron **ug/L** **Level 2**

Your Result:	289
Reference Value:	298.250
Mean of Reporting Laboratories:	288.004
Actual Standard Deviation:	19.668
Number Reporting:	26
Average % Recovery:	96.565
Your % Recovery:	96.899
Deviation from Mean - z Score:	0.051



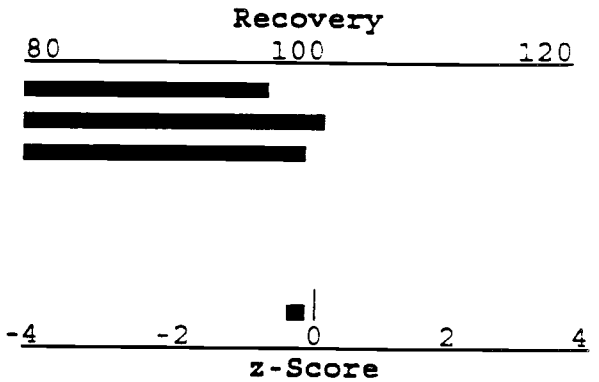
Comment:

Customer Code: 8254 **January 1994** Page: 28

Standard: Trace Metals

Parameter: Cadmium **ug/L** **Level 1**

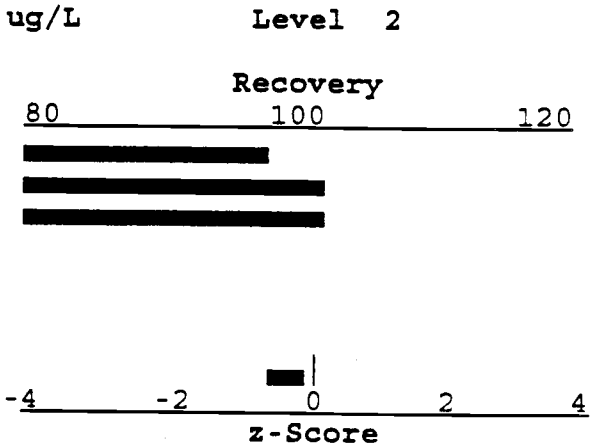
Your Result:	70.3
Reference Value:	72.930
Mean of Reporting Laboratories:	72.455
Actual Standard Deviation:	4.477
Number Reporting:	68
Average % Recovery:	99.349
Your % Recovery:	96.394
Deviation from Mean - z Score:	0.481



Comment:

Parameter: Cadmium **ug/L** **Level 2**

Your Result:	135
Reference Value:	139.780
Mean of Reporting Laboratories:	139.231
Actual Standard Deviation:	8.224
Number Reporting:	68
Average % Recovery:	99.607
Your % Recovery:	96.580
Deviation from Mean - z Score:	0.514



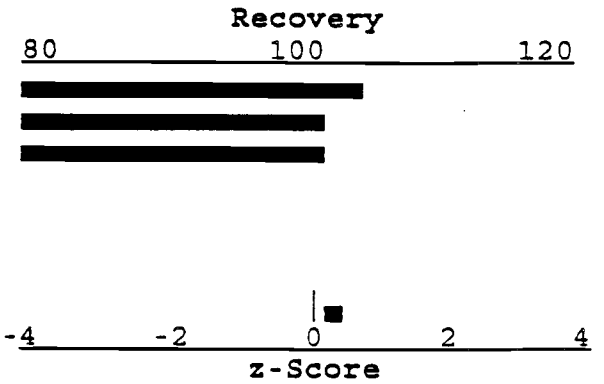
Comment:

Customer Code: 8254 **January 1994** Page: 29

Standard: Trace Metals

Parameter: Chromium **ug/L** **Level 1**

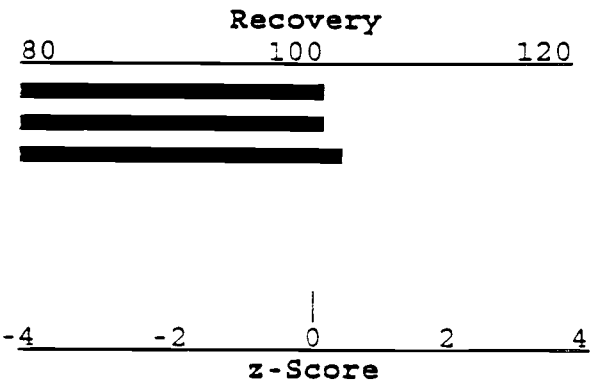
Your Result:	60.0
Reference Value:	58.440
Mean of Reporting Laboratories:	58.715
Actual Standard Deviation:	5.371
Number Reporting:	65
Average % Recovery:	100.471
Your % Recovery:	102.669
Deviation from Mean - z Score:	0.239



Comment:

Parameter: Chromium **ug/L** **Level 2**

Your Result:	189
Reference Value:	189.220
Mean of Reporting Laboratories:	190.791
Actual Standard Deviation:	12.383
Number Reporting:	66
Average % Recovery:	100.830
Your % Recovery:	99.884
Deviation from Mean - z Score:	0.145



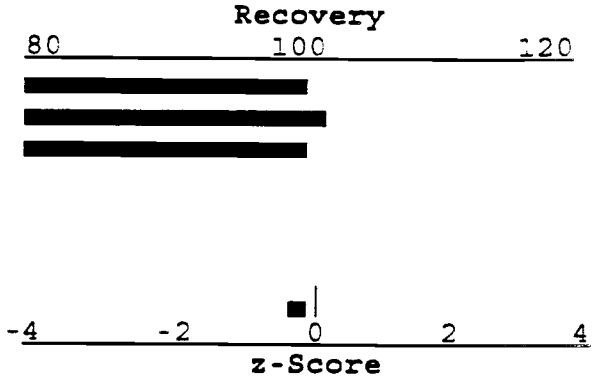
Comment:

Customer Code: 8254 **January 1994** Page: 30

Standard: Trace Metals

Parameter: Cobalt **ug/L** **Level 1**

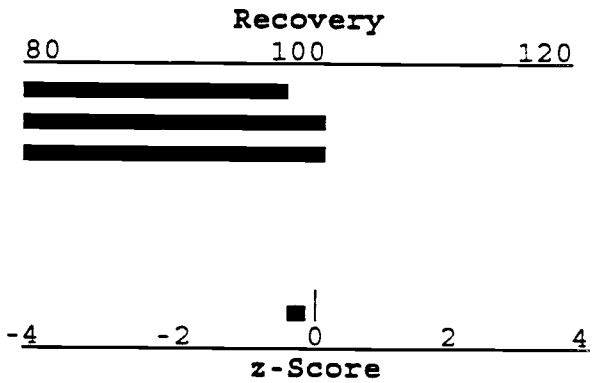
Your Result:	164
Reference Value:	166.870
Mean of Reporting Laboratories:	165.748
Actual Standard Deviation:	8.539
Number Reporting:	42
Average % Recovery:	99.327
Your % Recovery:	98.280
Deviation from Mean - z Score:	0.205



Comment:

Parameter: Cobalt **ug/L** **Level 2**

Your Result:	218
Reference Value:	222.500
Mean of Reporting Laboratories:	223.086
Actual Standard Deviation:	12.777
Number Reporting:	43
Average % Recovery:	100.263
Your % Recovery:	97.978
Deviation from Mean - z Score:	0.398



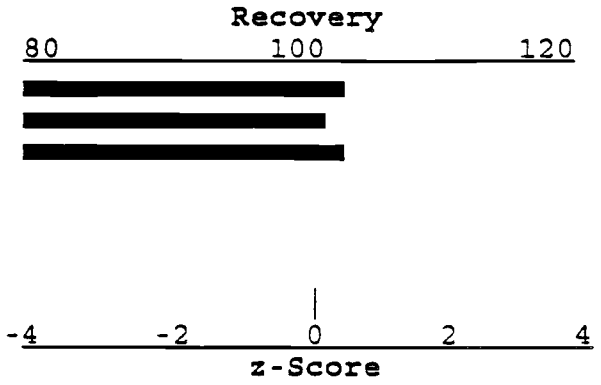
Comment:

Customer Code: 8254 **January 1994** Page: 31

Standard: Trace Metals

Parameter: Copper **ug/L** **Level 1**

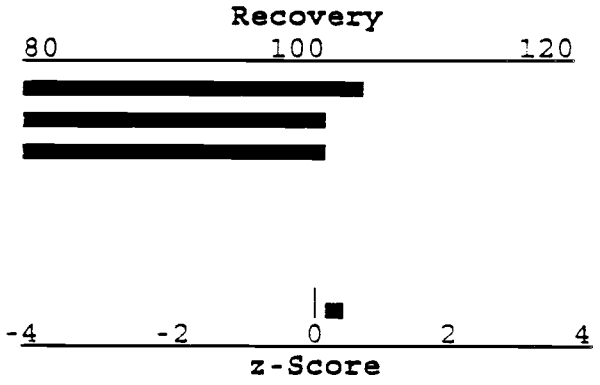
Your Result:	46.0
Reference Value:	45.470
Mean of Reporting Laboratories:	45.918
Actual Standard Deviation:	3.337
Number Reporting:	70
Average % Recovery:	100.985
Your % Recovery:	101.166
Deviation from Mean - z Score:	0.025



Comment:

Parameter: Copper **ug/L** **Level 2**

Your Result:	170
Reference Value:	166.740
Mean of Reporting Laboratories:	167.346
Actual Standard Deviation:	6.393
Number Reporting:	71
Average % Recovery:	100.363
Your % Recovery:	101.955
Deviation from Mean - z Score:	0.415



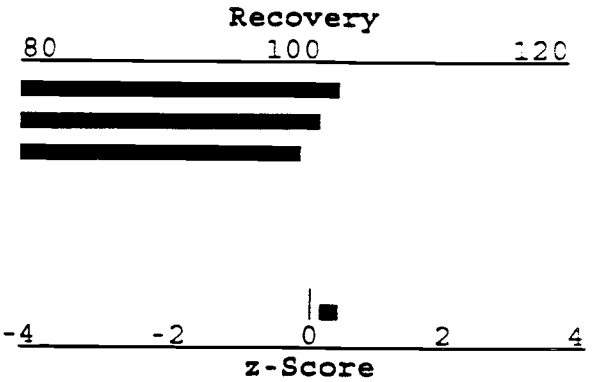
Comment:

Customer Code: 8254 **January 1994** Page: 32

Standard: Trace Metals

Parameter: Iron **ug/L** **Level 1**

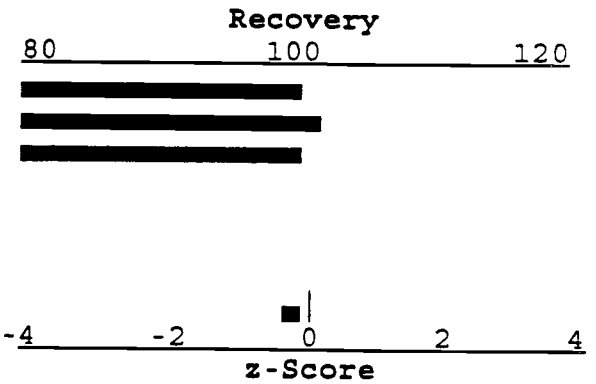
Your Result:	165
Reference Value:	162.560
Mean of Reporting Laboratories:	160.427
Actual Standard Deviation:	9.226
Number Reporting:	63
Average % Recovery:	98.688
Your % Recovery:	101.501
Deviation from Mean - z Score:	0.496



Comment:

Parameter: Iron **ug/L** **Level 2**

Your Result:	679
Reference Value:	690.900
Mean of Reporting Laboratories:	685.859
Actual Standard Deviation:	38.744
Number Reporting:	72
Average % Recovery:	99.270
Your % Recovery:	98.278
Deviation from Mean - z Score:	0.177



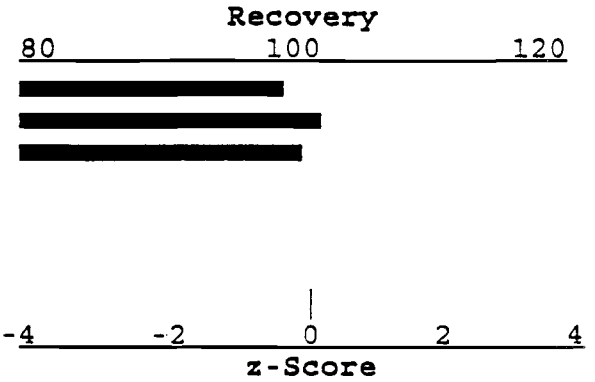
Comment:

Customer Code: 8254 **January 1994** Page: 33

Standard: Trace Metals

Parameter: Lead **ug/L** **Level 1**

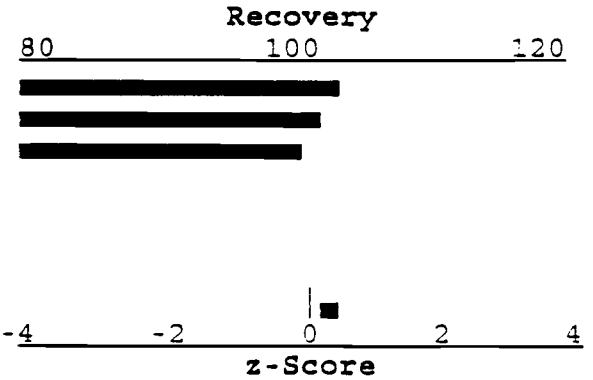
Your Result:	62.0
Reference Value:	63.780
Mean of Reporting Laboratories:	62.815
Actual Standard Deviation:	8.114
Number Reporting:	69
Average % Recovery:	98.488
Your % Recovery:	97.209
Deviation from Mean - z Score:	0.100



Comment:

Parameter: Lead **ug/L** **Level 2**

Your Result:	455
Reference Value:	451.810
Mean of Reporting Laboratories:	444.392
Actual Standard Deviation:	30.883
Number Reporting:	71
Average % Recovery:	98.358
Your % Recovery:	100.706
Deviation from Mean - z Score:	0.344



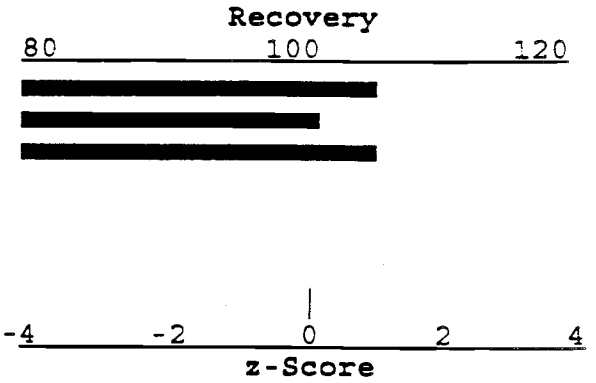
Comment:

Customer Code: 8254 **January 1994** Page: 34

Standard: Trace Metals

Parameter: Manganese **ug/L** **Level 1**

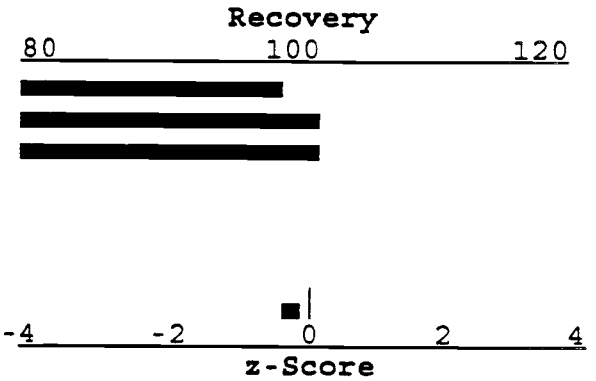
Your Result:	23.9
Reference Value:	23.170
Mean of Reporting Laboratories:	23.998
Actual Standard Deviation:	1.598
Number Reporting:	53
Average % Recovery:	103.574
Your % Recovery:	103.151
Deviation from Mean - z Score:	0.061



Comment:

Parameter: Manganese **ug/L** **Level 2**

Your Result:	178
Reference Value:	182.210
Mean of Reporting Laboratories:	181.238
Actual Standard Deviation:	10.302
Number Reporting:	59
Average % Recovery:	99.466
Your % Recovery:	97.689
Deviation from Mean - z Score:	0.314



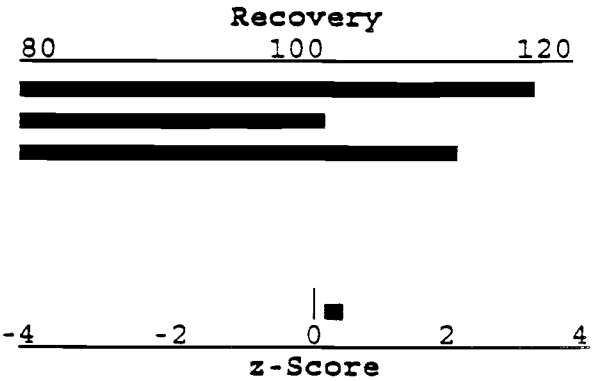
Comment:

Customer Code: 8254 **January 1994** Page: 35

Standard: Trace Metals

Parameter: Mercury **ug/L** **Level 1**

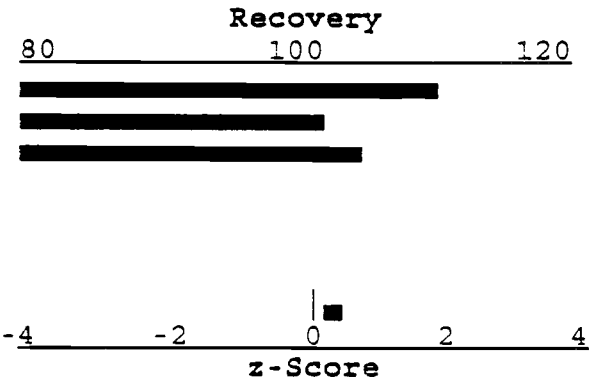
Your Result:	0.806
Reference Value:	0.710
Mean of Reporting Laboratories:	0.770
Actual Standard Deviation:	0.203
Number Reporting:	48
Average % Recovery:	108.430
Your % Recovery:	113.521
Deviation from Mean - z Score:	0.178



Comment:

Parameter: Mercury **ug/L** **Level 2**

Your Result:	4.10
Reference Value:	3.810
Mean of Reporting Laboratories:	3.897
Actual Standard Deviation:	0.551
Number Reporting:	49
Average % Recovery:	102.280
Your % Recovery:	107.612
Deviation from Mean - z Score:	0.369



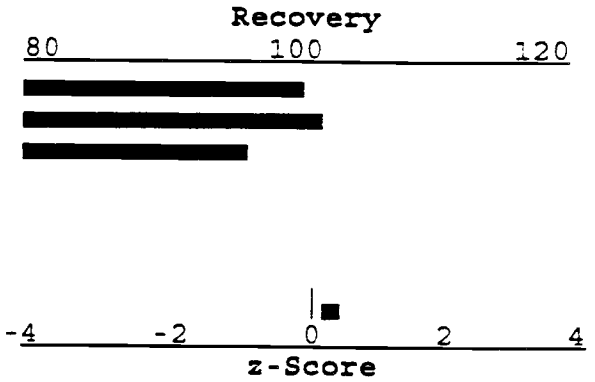
Comment:

Customer Code: 8254 **January 1994** Page: 36

Standard: Trace Metals

Parameter: Molybdenum **ug/L** **Level 1**

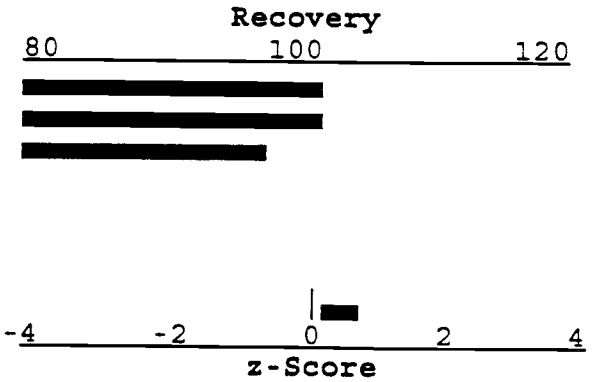
Your Result:	151
Reference Value:	153.550
Mean of Reporting Laboratories:	145.706
Actual Standard Deviation:	11.342
Number Reporting:	35
Average % Recovery:	94.891
Your % Recovery:	98.339
Deviation from Mean - z Score:	0.467



Comment:

Parameter: Molybdenum **ug/L** **Level 2**

Your Result:	294
Reference Value:	294.300
Mean of Reporting Laboratories:	282.706
Actual Standard Deviation:	15.845
Number Reporting:	34
Average % Recovery:	96.060
Your % Recovery:	99.898
Deviation from Mean - z Score:	0.713



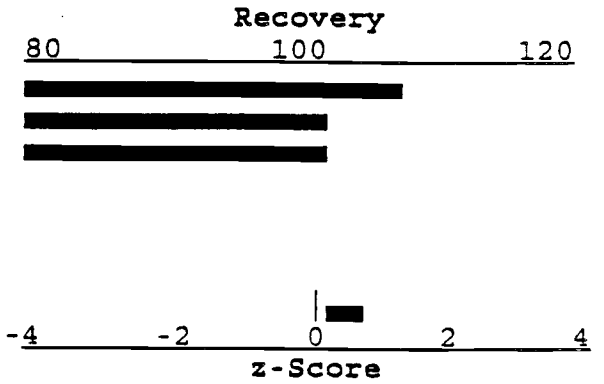
Comment:

Customer Code: 8254 **January 1994** Page: 37

Standard: Trace Metals

Parameter: Nickel **ug/L** **Level 1**

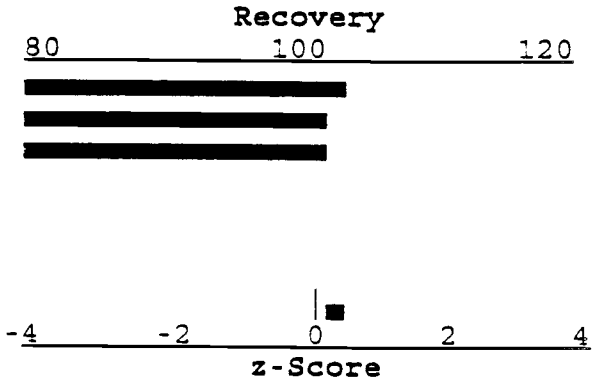
Your Result:	78.1
Reference Value:	74.820
Mean of Reporting Laboratories:	75.043
Actual Standard Deviation:	6.043
Number Reporting:	70
Average % Recovery:	100.298
Your % Recovery:	104.384
Deviation from Mean - z Score:	0.506



Comment:

Parameter: Nickel **ug/L** **Level 2**

Your Result:	285
Reference Value:	281.310
Mean of Reporting Laboratories:	281.565
Actual Standard Deviation:	12.182
Number Reporting:	69
Average % Recovery:	100.091
Your % Recovery:	101.312
Deviation from Mean - z Score:	0.282



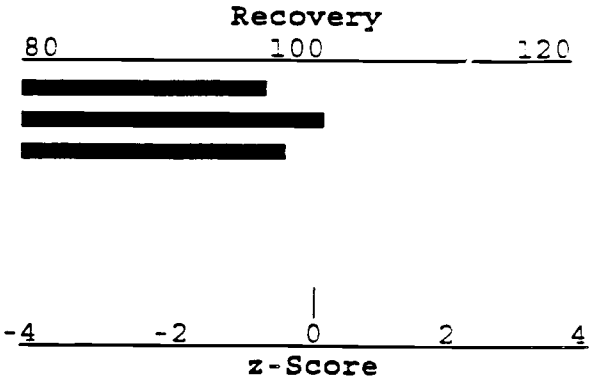
Comment:

Customer Code: 8254 **January 1994** Page: 38

Standard: Trace Metals

Parameter: Selenium **ug/L** **Level 1**

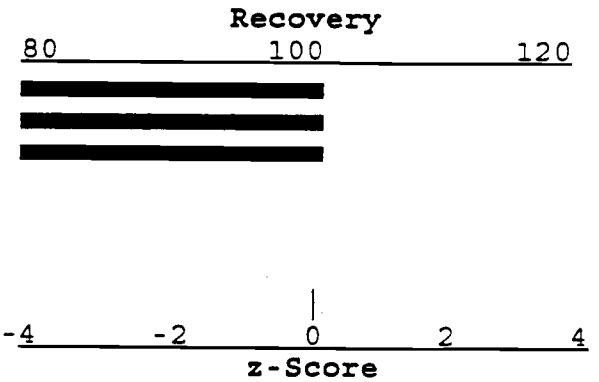
Your Result:	37.8
Reference Value:	39.080
Mean of Reporting Laboratories:	37.978
Actual Standard Deviation:	4.244
Number Reporting:	43
Average % Recovery:	97.180
Your % Recovery:	96.725
Deviation from Mean - z Score:	0.042



Comment:

Parameter: Selenium **ug/L** **Level 2**

Your Result:	61.1
Reference Value:	61.410
Mean of Reporting Laboratories:	61.117
Actual Standard Deviation:	6.189
Number Reporting:	43
Average % Recovery:	99.524
Your % Recovery:	99.495
Deviation from Mean - z Score:	0.003



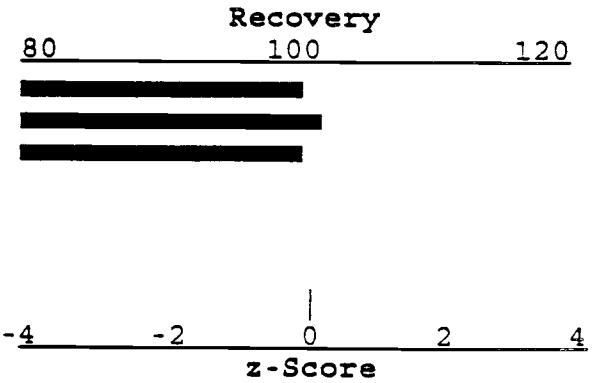
Comment:

Customer Code: 8254 **January 1994** Page: 39

Standard: Trace Metals

Parameter: Silver **ug/L** **Level 1**

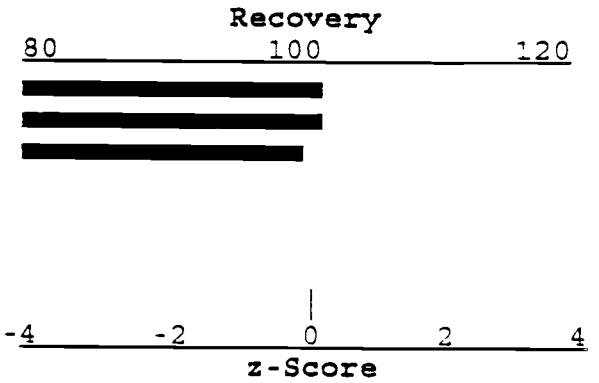
Your Result:	30.4
Reference Value:	30.800
Mean of Reporting Laboratories:	30.491
Actual Standard Deviation:	2.992
Number Reporting:	53
Average % Recovery:	98.997
Your % Recovery:	98.701
Deviation from Mean - z Score:	0.030



Comment:

Parameter: Silver **ug/L** **Level 2**

Your Result:	352
Reference Value:	352.060
Mean of Reporting Laboratories:	348.900
Actual Standard Deviation:	24.298
Number Reporting:	56
Average % Recovery:	99.102
Your % Recovery:	99.983
Deviation from Mean - z Score:	0.128



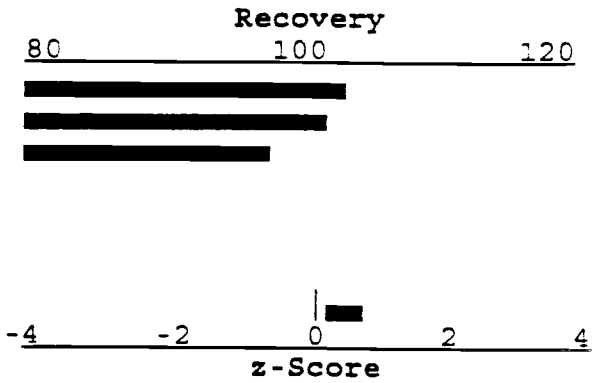
Comment:

Customer Code: 8254 **January 1994** Page: 40

Standard: Trace Metals

Parameter: Thallium **ug/L** **Level 1**

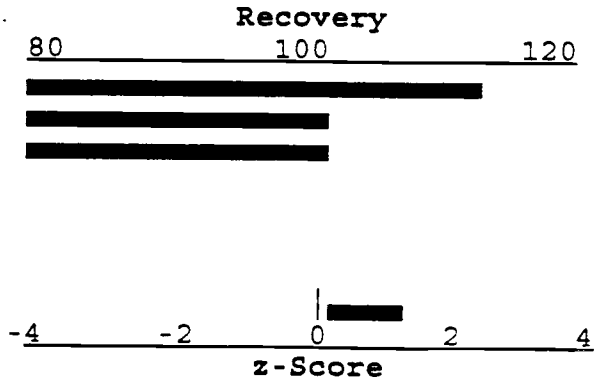
Your Result:	154.1
Reference Value:	152.980
Mean of Reporting Laboratories:	148.118
Actual Standard Deviation:	11.689
Number Reporting:	38
Average % Recovery:	96.822
Your % Recovery:	100.732
Deviation from Mean - z Score:	0.512



Comment:

Parameter: Thallium **ug/L** **Level 2**

Your Result:	275
Reference Value:	250.330
Mean of Reporting Laboratories:	249.400
Actual Standard Deviation:	19.130
Number Reporting:	41
Average % Recovery:	99.628
Your % Recovery:	109.855
Deviation from Mean - z Score:	1.338



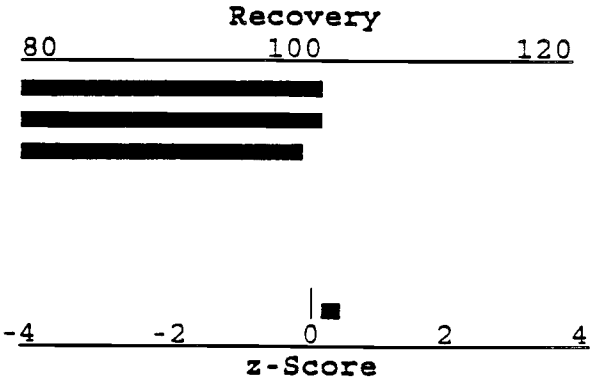
Comment:

Customer Code: 8254 **January 1994** Page: 41

Standard: Trace Metals

Parameter: Vanadium **ug/L** **Level 1**

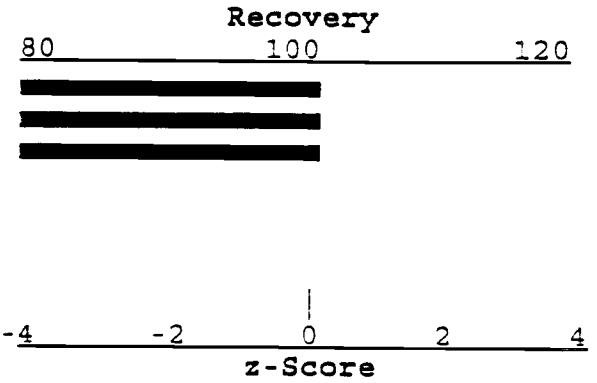
Your Result:	176
Reference Value:	175.720
Mean of Reporting Laboratories:	174.325
Actual Standard Deviation:	7.622
Number Reporting:	40
Average % Recovery:	99.206
Your % Recovery:	100.159
Deviation from Mean - z Score:	0.220



Comment:

Parameter: Vanadium **ug/L** **Level 2**

Your Result:	1490
Reference Value:	1490.820
Mean of Reporting Laboratories:	1486.539
Actual Standard Deviation:	61.526
Number Reporting:	44
Average % Recovery:	99.713
Your % Recovery:	99.945
Deviation from Mean - z Score:	0.056



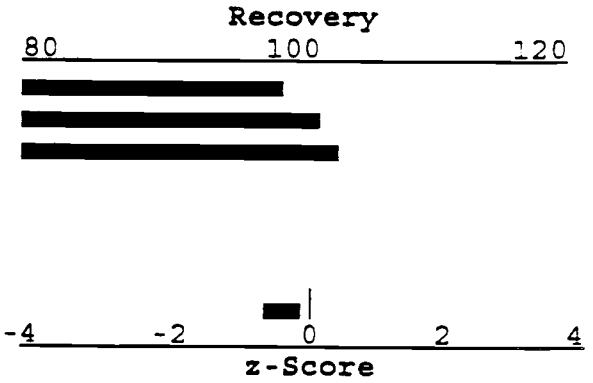
Comment:

Customer Code: 8254 **January 1994** Page: 42

Standard: Trace Metals

Parameter: Zinc **ug/L** **Level 1**

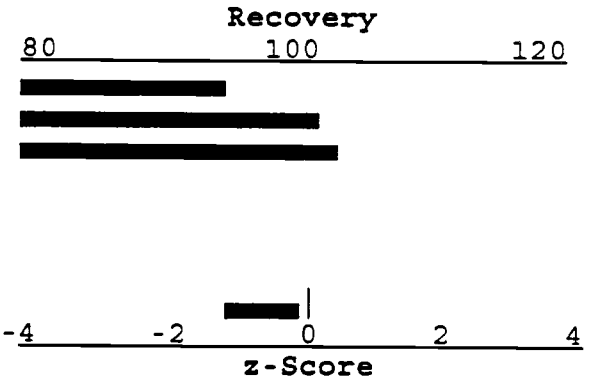
Your Result:	67.5
Reference Value:	69.660
Mean of Reporting Laboratories:	70.287
Actual Standard Deviation:	4.078
Number Reporting:	61
Average % Recovery:	100.899
Your % Recovery:	96.899
Deviation from Mean - z Score:	0.683



Comment:

Parameter: Zinc **ug/L** **Level 2**

Your Result:	135
Reference Value:	144.300
Mean of Reporting Laboratories:	145.858
Actual Standard Deviation:	8.148
Number Reporting:	71
Average % Recovery:	101.080
Your % Recovery:	93.555
Deviation from Mean - z Score:	1.333



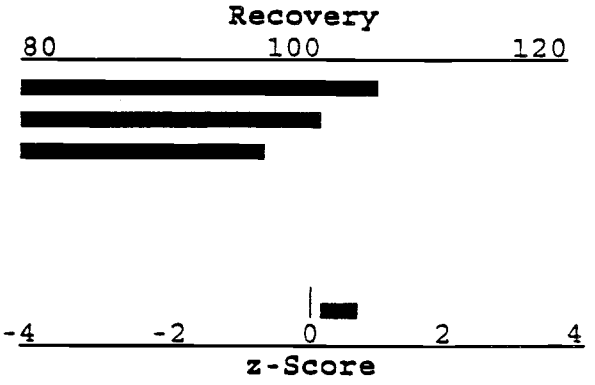
Comment:

Customer Code: 8254 **January 1994** Page: 43

Standard: Phenol

Parameter: Phenol **mg/L** **Level 1**

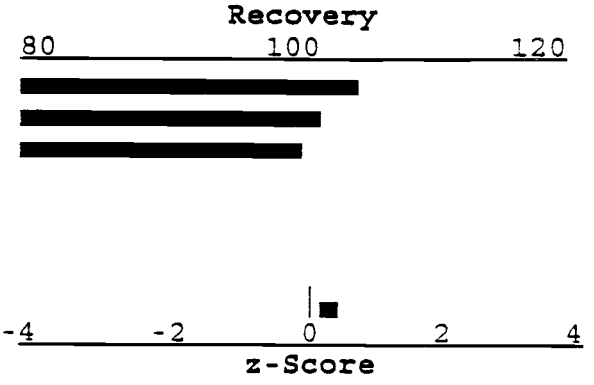
Your Result:	0.3235
Reference Value:	0.310
Mean of Reporting Laboratories:	0.300
Actual Standard Deviation:	0.033
Number Reporting:	43
Average % Recovery:	96.637
Your % Recovery:	104.355
Deviation from Mean - z Score:	0.729



Comment:

Parameter: Phenol **mg/L** **Level 2**

Your Result:	3.062
Reference Value:	3.004
Mean of Reporting Laboratories:	2.979
Actual Standard Deviation:	0.252
Number Reporting:	39
Average % Recovery:	99.177
Your % Recovery:	101.931
Deviation from Mean - z Score:	0.328



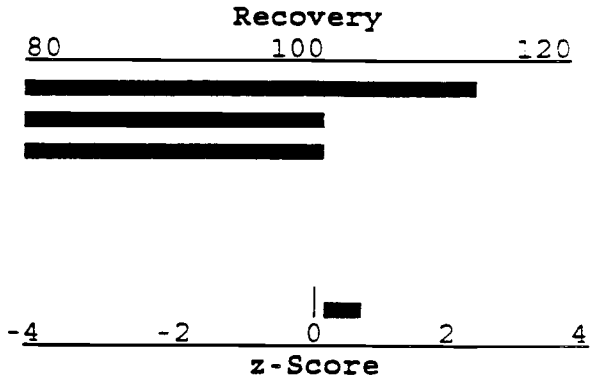
Comment:

Customer Code: 8254 **January 1994** Page: 44

Standard: Cyanide

Parameter: Cyanide **mg/L** **Level 1**

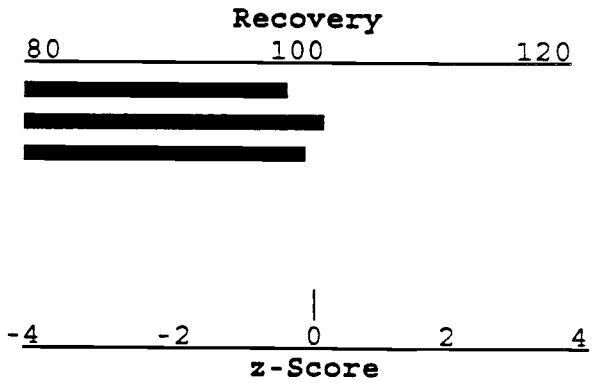
Your Result:	0.2146
Reference Value:	0.195
Mean of Reporting Laboratories:	0.195
Actual Standard Deviation:	0.028
Number Reporting:	40
Average % Recovery:	99.905
Your % Recovery:	110.051
Deviation from Mean - z Score:	0.718



Comment:

Parameter: Cyanide **mg/L** **Level 2**

Your Result:	4.212
Reference Value:	4.297
Mean of Reporting Laboratories:	4.255
Actual Standard Deviation:	0.397
Number Reporting:	40
Average % Recovery:	99.015
Your % Recovery:	98.022
Deviation from Mean - z Score:	0.107



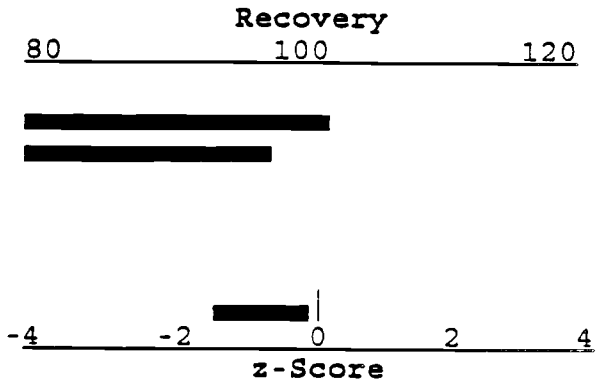
Comment:

Customer Code: 8254 **January 1994** Page: 45

Standard: Residual Chlorine

Parameter: Residual Chlorine **mg/L** **Level 1**

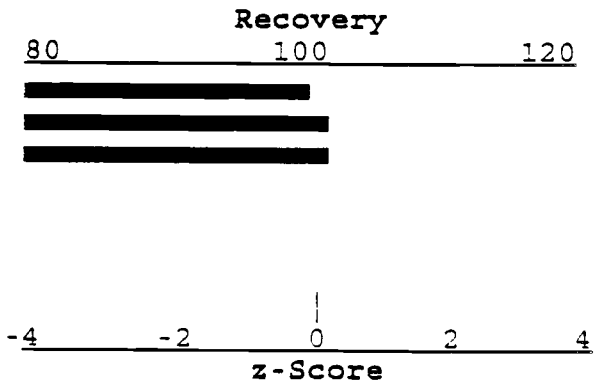
Your Result:	0.30
Reference Value:	0.441
Mean of Reporting Laboratories:	0.424
Actual Standard Deviation:	0.076
Number Reporting:	56
Average % Recovery:	96.230
Your % Recovery:	68.027
Deviation from Mean - z Score:	1.647



Comment:

Parameter: Residual Chlorine **mg/L** **Level 2**

Your Result:	1.26
Reference Value:	1.276
Mean of Reporting Laboratories:	1.272
Actual Standard Deviation:	0.138
Number Reporting:	52
Average % Recovery:	99.668
Your % Recovery:	98.746
Deviation from Mean - z Score:	0.086



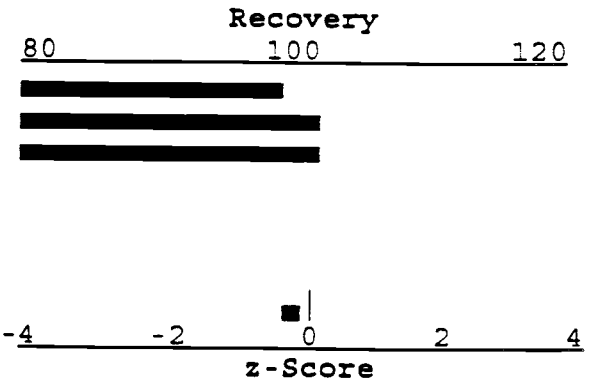
Comment:

Customer Code: 8254 **January 1994** Page: 46

Standard: Fluoride

Parameter: Fluoride **mg/L** **Level 1**

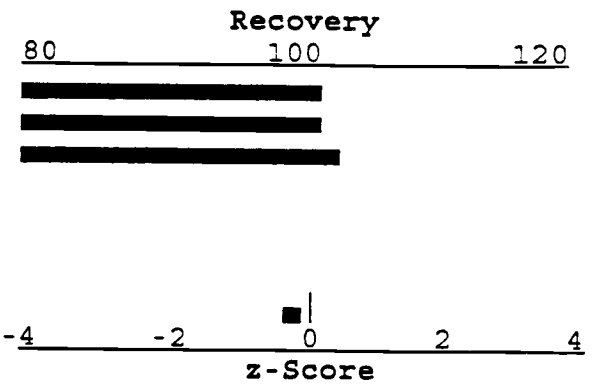
Your Result:	0.97
Reference Value:	0.990
Mean of Reporting Laboratories:	0.988
Actual Standard Deviation:	0.070
Number Reporting:	33
Average % Recovery:	99.773
Your % Recovery:	97.980
Deviation from Mean - z Score:	0.254



Comment:

Parameter: Fluoride **mg/L** **Level 2**

Your Result:	14.0
Reference Value:	14.027
Mean of Reporting Laboratories:	14.125
Actual Standard Deviation:	0.598
Number Reporting:	30
Average % Recovery:	100.701
Your % Recovery:	99.808
Deviation from Mean - z Score:	0.210



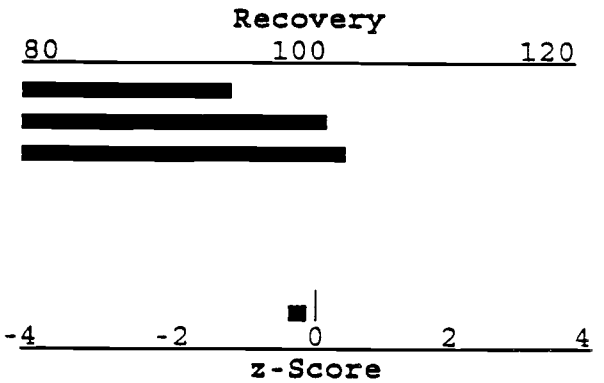
Comment:

Customer Code: 8254 **January 1994** Page: 47

Standard: Total Organic Halide

Parameter: Total Organic Halide **ug/L** **Level 1**

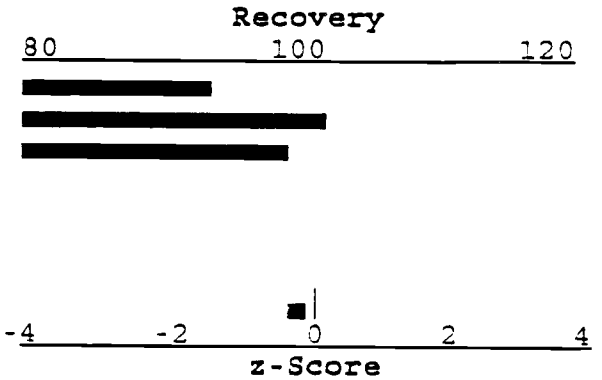
Your Result:	13.75
Reference Value:	14.570
Mean of Reporting Laboratories:	14.806
Actual Standard Deviation:	2.591
Number Reporting:	10
Average % Recovery:	101.620
Your % Recovery:	94.372
Deviation from Mean - z Score:	0.408



Comment:

Parameter: Total Organic Halide **ug/L** **Level 2**

Your Result:	181.9
Reference Value:	196.690
Mean of Reporting Laboratories:	192.771
Actual Standard Deviation:	25.510
Number Reporting:	12
Average % Recovery:	98.007
Your % Recovery:	92.481
Deviation from Mean - z Score:	0.426



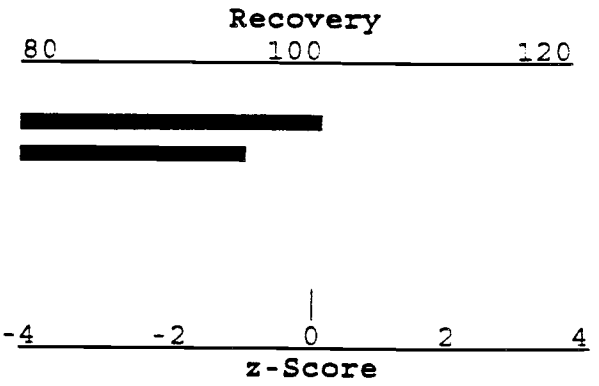
Comment:

Customer Code: 8254 January 1994 Page: 48

Standard: Hexavalent Chromium

Parameter: Hexavalent Chromium mg/L **Level 1**

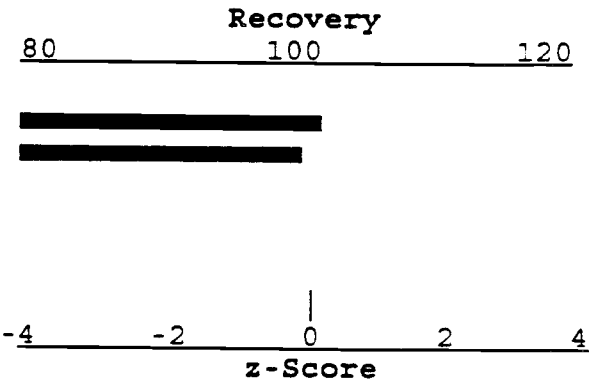
Your Result:	NA
Reference Value:	0.070
Mean of Reporting Laboratories:	0.067
Actual Standard Deviation:	0.006
Number Reporting:	28
Average % Recovery:	95.591
Your % Recovery:	
Deviation from Mean - z Score:	0.000



Comment: **Unreported**

Parameter: Hexavalent Chromium mg/L **Level 2**

Your Result:	NA
Reference Value:	0.451
Mean of Reporting Laboratories:	0.447
Actual Standard Deviation:	0.022
Number Reporting:	27
Average % Recovery:	99.164
Your % Recovery:	
Deviation from Mean - z Score:	0.000



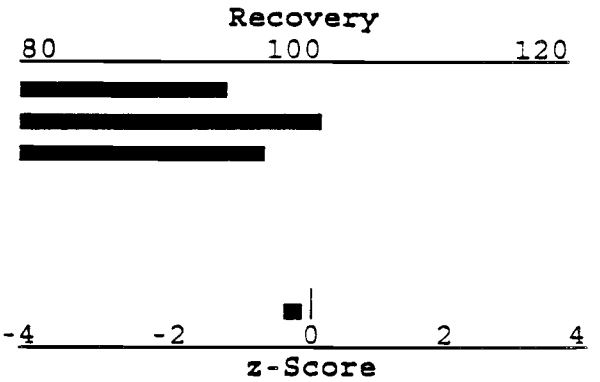
Comment: **Unreported**

Customer Code: 8254 **January 1994** Page: 49

Standard: Uranium

Parameter: Uranium **ug/L** **Level 1**

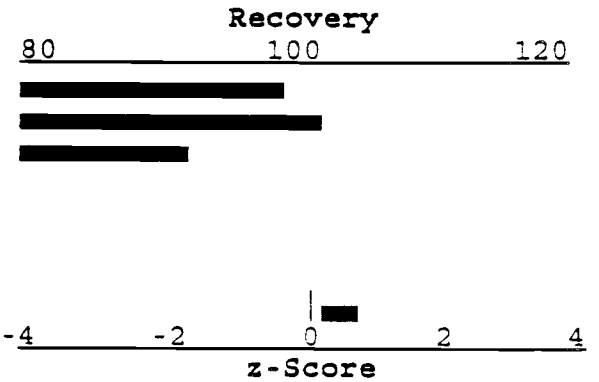
Your Result:	85
Reference Value:	90.090
Mean of Reporting Laboratories:	87.271
Actual Standard Deviation:	6.808
Number Reporting:	7
Average % Recovery:	96.871
Your % Recovery:	94.350
Deviation from Mean - z Score:	0.334



Comment:

Parameter: Uranium **ug/L** **Level 2**

Your Result:	535
Reference Value:	550.600
Mean of Reporting Laboratories:	499.571
Actual Standard Deviation:	47.920
Number Reporting:	7
Average % Recovery:	90.732
Your % Recovery:	97.167
Deviation from Mean - z Score:	0.739



Comment:

Data Return Instructions

Data Reporting:

The P.E.T. Program has been designed to allow you to compare your results with those of other participating laboratories. In order to insure comparability of results, please check the units for each parameter with the data reporting form. Your results should be returned on the enclosed reporting form.

All data is handled as proprietary information and will not be exchanged with other laboratories. Therefore, feel free to add additional information for your own internal use. Reports will include a transcription of your original data for verification.

Each data form should be signed by the laboratory supervisor before submittal. In order to be included in the statistical analysis your data **must** be received by the submittal date shown on the front of this form. If you choose to submit your data by FAX, you must also return the original of this form. Please note that the FAX results **must** have the customer code on every page.

Should you have any questions regarding the P.E.T. Program, contact:

Analytical Products Group, Inc.
2730 Washington Blvd.
Belpre, OH 45714
(614)423-4200 (800)272-4442
FAX (614)423-5588

DATA MUST BE RETURNED BY:

FEB 08 1994

LAB SUPERVISOR:

R C Canada

Demand		Level 1	Level 2	Test Method
Biochemical Oxygen Demand	mg/L	125.06	41.14	EPA-405.1
Chemical Oxygen Demand	mg/L	200	71	EPA-410.4
Total Organic Carbon	mg/L	81.2	24.9	EPA-415.1
Nutrients				
Ammonia Nitrogen as N	mg/L	0.32	8.06	EPA-350.3
Nitrate Nitrogen as N	mg/L	Not	Analyzed	
Orthophosphate as P	mg/L	0.22	5.80	SM-4500P
Total Kjeldahl Nitrogen	mg/L	0.476	1.022	EPA-351.3
Total Phosphorus as P	mg/L	0.14	9.55	SM-4500P
Solids				
Total Suspended Solids	mg/L	51	148	EPA-160.2
Total Dissolved Solids	mg/L	168	273	EPA-160.1
Oil & Grease				
Oil & Grease	mg/L	6.15	34.9	EPA-413.1
Minerals				
Alkalinity as $CaCO_3$	mg/L	75	126	EPA-310.1
Calcium	mg/L	22.0	1.47	EPA-200.7
Chloride	mg/L	101.2	88.7	EPA-325.3
Conductivity	umho/cm	691	846	EPA-120.1
Magnesium	mg/L	1.56	24.2	EPA-200.7
Potassium	mg/L	74.7	27.2	EPA-200.7
Sodium	mg/L	70.7	130	EPA-200.7
Sulfate	mg/L	71.040	118.043	EPA-300.0
Total Hardness as $CaCO_3$	mg/L	54	94	SM-2340C
pH				
pH	units	4.0	7.2	EPA-150.1

Report ALL results as mg/L except as indicated

8 2 4

Trace Metals		Level 1	Level 2	Test Method
Aluminum	ug/l	36.7	1158	EPA-200.7
Antimony	ug/L	4.4	52.4	EPA-200.7
Arsenic	ug/L	33.2	41.2	EPA-206.2
Barium	ug/L	90.7	217.0	EPA-200.7
Beryllium	ug/L	29.7	21.5	EPA-200.7
Boron	ug/L	48.4	28.9	EPA-200.7
Cadmium	ug/L	70.3	13.5	EPA-200.7
Chromium	ug/L	60.0	18.9	EPA-200.7
Cobalt	ug/L	16.4	21.8	EPA 200.7
Copper	ug/L	46.0	17.0	EPA 200.7
Iron	ug/L	16.5	6.79	EPA-200.7
Lead	ug/L	62.0	45.5	EPA-239.2
Manganese	ug/L	23.9	11.8	EPA-200.7
Mercury	ug/L	0.806	4.10	EPA-245.1
Molybdenum	ug/L	15.1	29.4	EPA-200.7
Nickel	ug/L	78.1	28.5	EPA-200.7
Selenium	ug/L	37.8	61.1	EPA-270.2
Silver	ug/L	30.4	55.2	EPA-200.7
Thallium	ug/L	154.1	27.5	EPA-279.2
Vanadium	ug/L	17.6	149.0	EPA 200.7
Zinc	ug/L	67.5	13.5	EPA 200.7
Phenol	mg/L	0.3235	3.062	EPA-420.1
Cyanide	mg/L	0.2146	4.212	EPA-335.2
Residual Chlorine	mg/L	0.30	1.26	EPA-330.1
Aluminum High Level	mg/L	Not Analyzed		
Fluoride	mg/L	0.97	14.0	EPA-340.2
Total Organic Halides (TOX)	ug/L	13.75	181.9	EPA-9020
Hexavalent Chromium	mg/L	Not Analyzed		
Uranium	ug/L	85	5.35	ACD-183.108

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VOLATILES

		Level 1	Level 2	Test Method
Benzene	ug/L			
Chlorobenzene	ug/L			
1,2-Dichlorobenzene	ug/L			
1,3-Dichlorobenzene	ug/L			
1,4-Dichlorobenzene	ug/L			
Ethyl benzene	ug/L			
Toluene	ug/L			
Bromodichloromethane	ug/L			
Bromoform	ug/L			
Bromomethane	ug/L			
Carbon tetrachloride	ug/L			
Chloroethane	ug/L			
2-Chloroethylvinyl ether	ug/L			
Chloroform	ug/L			
Chloromethane	ug/L			
Dibromochloromethane	ug/L			
Dichlorodifluoromethane	ug/L			
1,1-Dichloroethane	ug/L			
1,2-Dichloroethane	ug/L			
1,1-Dichloroethene	ug/L			
trans-1,2-Dichloroethene	ug/L			
1,2-Dichloropropane	ug/L			
cis-1,3-Dichloropropene	ug/L			
trans-1,3-Dichloropropene	ug/L			
Methylene chloride	ug/L			

Detachem

PERFORMANCE EVALUATION SUMMARY SHEET

Laboratory: DataChem Laboratories

PE Sample	Number Acceptable	Number Analyzed	% Acceptable
WP-031			
Metal	42	42	100.0
Inorganic/Mineral	49	50	98.0
Organic	54	54	100.0
WS-033			
Metal	18	18	100.0
Inorganic/Mineral	13	13	100.0
Organic	42	44	95.5

DataChem Laboratories
EPA LAB NUMBER UT009
WS033 FOLLOW-UP REPORT ON DEFICIENT PARAMETERS
4/8/94

1. STYRENE (Sample #2)
   Reported Value: 10.3 ug/L
   Acceptance Limits: 10.4-15.6 ug/L
   Performance Eval.: Not Acceptable
   Corrective Action: A review of the data and discussions with the analysts have been completed. It is suspected that the reason for the reported value being slightly below the acceptance limit is due to the analytical standards being high. The in-house QC sample was below the control limits, indicating that the standards were high. Since the standard curve was good, it was probably an error with the intermediate standard (which would have carried through equally to each of the working standards). In the future, a second-source verification standard will be analyzed to aid in the detection of errors with standards, and the samples will be reanalyzed if there is any indication of a problem with the standards.

2. ENDRIN (Sample #1)
   Reported Value: 4.15 ug/L
   Acceptance Limits: 1.84-3.42 ug/L
   Performance Eval.: Not Acceptable
   Corrective Action: A review of the data and discussions with the analysts have been completed. The analytical procedures and data appear to be valid. The in-house QC values were acceptable, and no problems were detected with the standards or with Endrin breakdown. No assignable cause for the reported value being above the acceptance limit could be determined.

PERFORMANCE EVALUATION REPORT

DATE: 2/10/94

WATER SUPPLY STUDY NUMBER WS033

DATACHEM LABORATORIES
8012667700 / SALT LAKE CITY, UT / CDO

LABORATORY UT009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
TRACE METALS IN MICROGRAMS PER LITER:					
ALUMINUM	1	1330	1400	1260- 1510	ACCEPTABLE
ANTIMONY	2	45.5	48.9	34.2- 63.6	ACCEPTABLE
ARSENIC	1	41.7	39.5	33.1- 45.1	ACCEPTABLE
BARIUM	2	1740	1800	1530- 2070	ACCEPTABLE
BERYLLIUM	1	8.73	9.07	7.71- 10.4	ACCEPTABLE
BORON	2	1660	1700	1500- 1990	ACCEPTABLE
CADMIUM	1	49.1	49.0	39.2- 58.8	ACCEPTABLE
CHROMIUM	1	159	159	135- 183	ACCEPTABLE
COPPER	1	1900	1900	1710- 2090	ACCEPTABLE
LEAD	1	79.5	78.7	55.1- 102	ACCEPTABLE
MANGANESE	1	63.5	63.3	56.7- 67.7	ACCEPTABLE
MERCURY	1	1.68	1.77	1.24- 2.30	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 2/10/94

WATER SUPPLY STUDY NUMBER WS033

LABORATORY UT009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
TRACE METALS IN MICROGRAMS PER LITER:					
MOLYBDENUM	2	126	130	89.2- 166	ACCEPTABLE
NICKEL	1	493	490	417- 563	ACCEPTABLE
SELENIUM	1	99.8	98.3	78.6- 118	ACCEPTABLE
SILVER	2	65.1	66.9	57.1- 75.6	ACCEPTABLE
THALLIUM	2	10.7	9.56	6.69- 12.4	ACCEPTABLE
ZINC	1	2100	2090	1920- 2240	ACCEPTABLE
NITRATE/NITRITE/FLUORIDE IN MILLIGRAMS PER LITER:					
NITRATE AS N	1	9.91	9.80	8.82- 10.8	ACCEPTABLE
NITRITE AS N	1	1.45	1.40	1.19- 1.61	ACCEPTABLE
FLUORIDE	1	6.47	6.60	5.94- 7.26	ACCEPTABLE
INSECTICIDES IN MICROGRAMS PER LITER:					
CHLORDANE (TOTAL)	3	2.46	2.76	1.52- 4.00	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 2/10/94

WATER SUPPLY STUDY NUMBER WS033

LABORATORY UT009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
INSECTICIDES IN MICROGRAMS PER LITER:					
ENDRIN	1	4.15	2.63	1.84- 3.42	NOT ACCEPTABLE
HEPTACHLOR	4	1.50	1.73	0.951- 2.51	ACCEPTABLE
HEPTACHLOR EPOXIDE	4	0.633	0.679	0.373-0.985	ACCEPTABLE
LINDANE	1	0.111	0.136	.0748-0.197	ACCEPTABLE
METHOXYCHLOR	1	48.0	42.3	23.3- 61.3	ACCEPTABLE
TOXAPHENE	2	7.46	9.23	5.08- 13.4	ACCEPTABLE
HERBICIDES IN MICROGRAMS PER LITER:					
2,4-D	1	7.51	7.57	3.78- 11.4	ACCEPTABLE
2,4,5-TP (SILVEX)	1	4.93	5.60	2.80- 8.40	ACCEPTABLE
DALAPON	2	13.7	18.6	D.L.- 37.4	ACCEPTABLE
DICAMBA	2	14.6	16.9	D.L.- 31.9	ACCEPTABLE
DINOSEB	2	4.79	** 12.7	D.L.- 19.8	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT BIAS IS ANTICIPATED FOR THIS RESULT.
D.L. STANDS FOR DETECTION LIMIT

PERFORMANCE EVALUATION REPORT

DATE: 2/10/94

WATER SUPPLY STUDY NUMBER WS033

LABORATORY UT009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
HERBICIDES IN MICROGRAMS PER LITER:					
PENTACHLOROPHENOL	1	3.07	2.72	1.36- 4.08	ACCEPTABLE
PICLORAM	2	12.4 **	17.4	D.L.- 27.7	ACCEPTABLE
TRIHALOMETHANES IN MICROGRAMS PER LITER:					
BROMODICHLOROMETHANE	1	13.5	15.8	12.6- 19.0	ACCEPTABLE
BROMOFORM	1	33.3	34.4	27.5- 41.3	ACCEPTABLE
CHLORODIBROMOMETHANE	1	28.4	28.7	23.0- 34.4	ACCEPTABLE
CHLOROFORM	1	33.4	36.7	29.4- 44.0	ACCEPTABLE
TOTAL TRIHALOMETHANE	1	108.6	115.6	92.5- 139	ACCEPTABLE
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:					
BENZENE	1	11.8	12.0	9.60- 14.4	ACCEPTABLE
CARBON TETRACHLORIDE	1	12.8	13.4	10.7- 16.1	ACCEPTABLE
CHLOROBENZENE	2	19.0	18.4	14.7- 22.1	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT BIAS IS ANTICIPATED FOR THIS RESULT.
D.L. STANDS FOR DETECTION LIMIT

PERFORMANCE EVALUATION REPORT

DATE: 2/10/94

WATER SUPPLY STUDY NUMBER WS033

LABORATORY UT009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:					
1,2 DICHLOROBENZENE	2	14.9	15.5	12.4- 18.6	ACCEPTABLE
1,4-DICHLOROBENZENE	1	13.5	15.1	12.1- 18.1	ACCEPTABLE
1,2-DICHLOROETHANE	1	17.5	16.9	13.5- 20.3	ACCEPTABLE
1,1-DICHLOROETHYLENE	1	12.9	12.9	10.3- 15.5	ACCEPTABLE
C 1,2 DICHLOROETHYLENE	2	16.0	16.5	13.2- 19.8	ACCEPTABLE
T 1,2 DICHLOROETHYLENE	2	13.2	13.9	11.1- 16.7	ACCEPTABLE
1,[illegible] DICHLOROPROPANE	2	13.6	14.3	11.4- 17.2	ACCEPTABLE
ETHYLBENZENE	2	18.2	17.0	13.6- 20.4	ACCEPTABLE
STYRENE	2	10.3	13.0	10.4- 15.6	NOT ACCEPTABLE
TETRACHLOROETHYLENE	2	12.4	12.9	10.3- 15.5	ACCEPTABLE
TOLUENE	2	11.6	12.3	9.84- 14.8	ACCEPTABLE
1,1,1-TRICHLOROETHANE	1	12.4	14.6	11.7- 17.5	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 2/10/94

WATER SUPPLY STUDY NUMBER WS033

LABORATORY UT009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:					
TRICHLOROETHYLENE	1	15.4	14.9	11.9- 17.9	ACCEPTABLE
VINYL CHLORIDE	1	7.75	7.35	4.41- 10.3	ACCEPTABLE
TOTAL XYLENES	2	11.1	11.6	9.28- 13.9	ACCEPTABLE
CHLOROETHANE	3	16.4	16.8	10.3- 24.6	ACCEPTABLE
1,2DIBROMO3CHLOROPROPANE	4	0.208	0.233	0.140-0.326	ACCEPTABLE
DIBROMOMETHANE	3	12.6	15.2	10.5- 18.7	ACCEPTABLE
DICHLOROMETHANE	3	14.1	12.8	9.25- 16.3	ACCEPTABLE
1,1,1,2TETRACHLOROETHANE	3	8.69 **	8.63	6.37- 9.98	ACCEPTABLE
1,2,4-TRICHLOROBENZENE	3	16.5	16.8	12.0- 20.1	ACCEPTABLE
1,1,2-TRICHLOROETHANE	3	16.0	15.7	9.66- 19.7	ACCEPTABLE
MISCELLANEOUS ANALYTES:					
RESIDUAL FREE CHLORINE (MILLIGRAMS PER LITER)	1	3.92 **	4.20	3.32- 4.71	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

** SIGNIFICANT BIAS IS ANTICIPATED FOR THIS RESULT.

PERFORMANCE EVALUATION REPORT DATE: 2/10/94

WATER SUPPLY STUDY NUMBER WS033

LABORATORY UT009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE		TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
MISCELLANEOUS ANALYTES:						
TURBIDITY (NTUS)	1	1.05	**	1.10	0.836- 1.54	ACCEPTABLE
TOTAL FILTERABLE RESIDUE (MILLIGRAMS PER LITER)	1	333		384	255- 567	ACCEPTABLE
CALCIUM (MG. CACO3/L)	1	206		200	187- 212	ACCEPTABLE
PH-UNITS	1	8.96		9.10	8.86- 9.31	ACCEPTABLE
ALKALINITY (MG. CACO3/L)	1	42.0		41.0	37.3- 46.4	ACCEPTABLE
CORROSIVITY (LANGELIER IND. AT 20C)	1	0.947		1.057	0.679- 1.39	ACCEPTABLE
SODIUM (MILLIGRAMS PER LITER)	1	19.4		18.8	17.1- 20.5	ACCEPTABLE
SULFATE (MILLIGRAMS PER LITER)	1	172		170	152- 185	ACCEPTABLE
TOTAL CYANIDE (MILLIGRAMS PER LITER)	1	0.292		0.340	0.255-0.425	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT BIAS IS ANTICIPATED FOR THIS RESULT.

DataChem Laboratories
EPA LAB NUMBER UT009
WP031 FOLLOW-UP REPORT ON DEFICIENT PARAMETERS
2/4/94

1. SULFATE (Sample Number 1)
Reported Value: 8.27 mg/L
Acceptance Limits: 10.8-16.8 mg/L
Performance Eval.: Not Acceptable
Root Cause & Corrective Action: A review of the data has been completed and no problems were detected in the standards or laboratory control sample, which had recoveries from 93-98%. The QC recovery was 88%, which was within the DCL internal control limits of 80-120%. The values for the alkalinity and chloride (which came from the same ampule as the sulfate) were within acceptance limits, indicating that there was no problem with the sample preparation. The reported value for the other sulfate ampule in this performance evaluation (Sample 2, with a higher concentration than Sample 1) was well within the acceptance limits. The history of the method shows no recurring problem with sulfate recoveries. Since no assignable cause can be determined for the sulfate value being slightly below the acceptance limit, it is considered to be an isolated incident with no assignable corrective action.

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

DATACHEM LABORATORIES
8012667700 / SALT LAKE CITY, UT / CDO

LABORATORY: UT009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ALUMINUM	1	670	681	550- 784	579- 755	ACCEPTABLE
	2	143	140	107- 182	117- 173	ACCEPTABLE
ARSENIC	1	495	492	408- 587	430- 565	ACCEPTABLE
	2	73.4	74.3	56.7- 92.9	61.2- 88.4	ACCEPTABLE
BERYLLIUM	1	439	461	382- 533	401- 514	ACCEPTABLE
	2	227	240	198- 278	208- 268	ACCEPTABLE
CADMIUM	1	149	165	138- 194	145- 187	ACCEPTABLE
	2	58.1	61.0	50.8- 72.0	53.5- 69.4	ACCEPTABLE
COBALT	1	907	880	775- 980	801- 954	ACCEPTABLE
	2	55.6	53.8	45.4- 61.9	47.5- 59.8	ACCEPTABLE
CHROMIUM	1	704	730	604- 843	634- 813	ACCEPTABLE
	2	24.0	23.4	17.4- 29.0	18.9- 27.6	ACCEPTABLE
COPPER	1	582	601	524- 657	541- 640	ACCEPTABLE
	2	18.8	18.7	13.6- 24.1	14.9- 22.8	ACCEPTABLE
IRON	1	56.8	58.0	43.5- 72.5	47.2- 68.8	ACCEPTABLE
	2	1090	1100	950- 1270	991- 1230	ACCEPTABLE
MERCURY	1	8.72	9.38	7.31- 11.9	7.89- 11.3	ACCEPTABLE
	2	6.22	6.67	5.00- 8.48	5.44- 8.04	ACCEPTABLE
MANGANESE	1	580	600	536- 660	551- 644	ACCEPTABLE
	2	71.1	73.5	64.0- 82.7	66.4- 80.4	ACCEPTABLE
NICKEL	1	834	860	766- 952	789- 928	ACCEPTABLE
	2	337	340	296- 383	307- 372	ACCEPTABLE
LEAD	1	1160	1200	1060- 1350	1100- 1310	ACCEPTABLE
	2	735	738	636- 833	661- 809	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: UT009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
SELENIUM	1	218	228	156- 277	171- 262	ACCEPTABLE
	2	374	387	268- 486	296- 459	ACCEPTABLE
VANADIUM	1	909	940	832- 1040	860- 1020	ACCEPTABLE
	2	166	170	146- 188	151- 183	ACCEPTABLE
ZINC	1	824	842	737- 947	763- 921	ACCEPTABLE
	2	46.9	46.3	37.5- 56.1	39.8- 53.7	ACCEPTABLE
ANTIMONY	3	89.5	94.5	56.4- 119	64.3- 111	ACCEPTABLE
	4	181	189	108- 244	125- 227	ACCEPTABLE
SILVER	3	73.1	73.9	60.6- 86.8	63.9- 83.5	ACCEPTABLE
	4	25.6	25.8	21.1- 30.4	22.2- 29.2	ACCEPTABLE
THALLIUM	3	62.4	62.8	47.0- 77.3	50.8- 73.4	ACCEPTABLE
	4	525	539	421- 643	450- 615	ACCEPTABLE
MOLYBDENUM	3	25.0	24.5	18.6- 30.6	20.2- 29.0	ACCEPTABLE
	4	82.4	81.6	64.4- 95.0	68.3- 91.1	ACCEPTABLE
STRONTIUM	3	18.4	19.1	14.4- 23.3	15.5- 22.1	ACCEPTABLE
	4	70.9	73.4	62.0- 84.5	64.9- 81.5	ACCEPTABLE
TITANIUM	3	128	130	109- 151	114- 145	ACCEPTABLE
	4	42.1	43.0	34.0- 53.4	36.5- 50.9	ACCEPTABLE
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	9.42	9.50	9.19- 9.75	9.26- 9.68	ACCEPTABLE
	4	4.68	4.70	4.62- 4.77	4.64- 4.75	ACCEPTABLE
SPEC. COND.	1	912	899	840- 980	857- 963	ACCEPTABLE
(UMHOS/CM AT 25 C)	2	397	398	368- 435	377- 427	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: UT009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
TDS AT 180 C	1	528	577	396- 759	441- 713	ACCEPTABLE
	2	221	223	168- 284	183- 269	ACCEPTABLE
TOTAL HARDNESS (AS CACO3)	1	278	279	236- 307	245- 298	ACCEPTABLE
	2	59.8	57.4	51.2- 63.8	52.8- 62.2	ACCEPTABLE
CALCIUM	1	110	110	87.4- 126	92.2- 121	ACCEPTABLE
	2	7.40	7.00	5.95- 8.19	6.23- 7.91	ACCEPTABLE
MAGNESIUM	1	1.01	0.960	0.771- 1.18	0.822- 1.13	ACCEPTABLE
	2	10.0	9.70	8.38- 11.0	8.71- 10.6	ACCEPTABLE
SODIUM	1	62.7	61.7	56.2- 67.8	57.6- 66.3	ACCEPTABLE
	2	27.0	26.3	23.6- 29.2	24.3- 28.5	ACCEPTABLE
POTASSIUM	1	7.89	7.50	6.39- 8.81	6.70- 8.50	ACCEPTABLE
	2	41.1	40.0	34.5- 45.6	35.9- 44.2	ACCEPTABLE
TOTAL ALKALINITY (AS CACO3)	1	118	120	106- 133	109- 130	ACCEPTABLE
	2	9.75	11.0	7.85- 15.3	8.77- 14.3	ACCEPTABLE
CHLORIDE	1	207	199	183- 213	187- 210	ACCEPTABLE
	2	41.5	41.2	36.5- 45.4	37.6- 44.3	ACCEPTABLE
FLUORIDE	1	3.33	3.30	2.83- 3.77	2.95- 3.65	ACCEPTABLE
	2	0.416	0.380	0.319-0.457	0.336-0.439	ACCEPTABLE
SULFATE	1	8.27	14.0	10.8- 16.8	11.5- 16.0	NOT ACCEPTABLE
	2	88.4	92.0	78.1- 105	81.5- 102	ACCEPTABLE
NUTRIENTS IN MILLIGRAMS PER LITER:						
AMMONIA-NITROGEN	1	7.71	7.70	6.10- 9.16	6.47- 8.79	ACCEPTABLE
	2	0.749	0.730	0.491-0.982	0.550-0.923	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: UT009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
NUTRIENTS IN MILLIGRAMS PER LITER:						
NITRATE-NITROGEN	1	0.565	0.520	0.378-0.658	0.412-0.625	ACCEPTABLE
	2	10.9	11.0	8.84- 13.0	9.34- 12.5	ACCEPTABLE
ORTHOPHOSPHATE	1	0.145	0.150	0.114-0.187	0.122-0.178	ACCEPTABLE
	2	4.02	4.10	3.48- 4.68	3.62- 4.54	ACCEPTABLE
KJELDAHL-NITROGEN	3	14.3	14.0	10.3- 17.1	11.1- 16.3	ACCEPTABLE
	4	0.747	0.710	0.226- 1.32	0.357- 1.19	ACCEPTABLE
TOTAL PHOSPHORUS	3	7.05	7.40	5.57- 8.05	5.86- 7.75	ACCEPTABLE
	4	0.449	0.490	0.341-0.569	0.369-0.542	ACCEPTABLE
DEMANDS IN MILLIGRAMS PER LITER:						
COD	1	69.4	70.8	52.4- 84.6	56.5- 80.5	ACCEPTABLE
	2	200	207	163- 230	172- 221	ACCEPTABLE
[illegible]	1	28.5	28.0	23.9- 32.8	25.0- 31.6	ACCEPTABLE
	2	81.9	82.0	69.5- 95.3	72.8- 91.9	ACCEPTABLE
PCB'S IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1254	1	2.23	1.87	0.988- 2.71	1.21- 2.49	ACCEPTABLE
PCB-AROCLOR 1260	2	4.97	4.63	2.79- 5.96	3.19- 5.56	ACCEPTABLE
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1016/1242	2	24.2	35.3	8.02- 46.6	13.0- 41.6	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: UT009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1254	1	37.7	43.9	13.5- 61.8	19.8- 55.5	ACCEPTABLE
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	3	7.47	8.21	4.91- 9.72	5.52- 9.11	ACCEPTABLE
	4	2.05	2.21	1.07- 2.77	1.29- 2.56	ACCEPTABLE
ALDRIN	1	0.424	0.539	0.122-0.754	0.202-0.674	ACCEPTABLE
	2	.0563	0.086	.0171-0.121	.0303-0.108	ACCEPTABLE
DIELDRIN	1	0.497	0.475	0.203-0.710	0.267-0.645	ACCEPTABLE
	2	0.175	0.173	.0861-0.239	0.106-0.219	ACCEPTABLE
DDD	1	0.915	0.866	0.433- 1.15	0.524- 1.06	ACCEPTABLE
	2	0.182	0.202	.0956-0.268	0.117-0.246	ACCEPTABLE
	1	0.495	0.539	0.235-0.756	0.301-0.690	ACCEPTABLE
	2	0.151	0.173	.0788-0.236	.0989-0.216	ACCEPTABLE
DDT	1	0.809	0.796	0.362- 1.06	0.450-0.972	ACCEPTABLE
	2	0.123	0.142	.0570-0.216	.0772-0.196	ACCEPTABLE
HEPTACHLOR	1	0.566	0.669	0.187-0.918	0.279-0.825	ACCEPTABLE
	2	0.180	0.216	.0756-0.269	0.100-0.245	ACCEPTABLE
HEPTACHLOR EPOXIDE	1	0.481	0.478	0.260-0.640	0.308-0.592	ACCEPTABLE
	2	0.169	0.174	.0858-0.235	0.105-0.216	ACCEPTABLE
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	16.3	15.1	10.2- 20.4	11.5- 19.1	ACCEPTABLE
	2	55.7	55.8	36.2- 73.4	40.9- 68.7	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: UT009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
CHLOROFORM	1	11.7	11.8	7.85- 15.9	8.86- 14.8	ACCEPTABLE
	2	62.5	64.4	38.3- 86.7	44.4- 80.6	ACCEPTABLE
1,1,1 TRICHLOROETHANE	1	13.6	13.4	8.68- 18.2	9.89- 17.0	ACCEPTABLE
	2	35.9	37.8	22.7- 50.0	26.2- 46.6	ACCEPTABLE
TRICHLOROETHENE	1	7.90	7.57	5.10- 10.3	5.75- 9.62	ACCEPTABLE
	2	60.0	62.7	38.6- 80.5	43.9- 75.2	ACCEPTABLE
CARBONTETRACHLORIDE	1	16.6	16.4	10.9- 22.2	12.3- 20.8	ACCEPTABLE
	2	36.5	37.1	23.0- 50.1	26.4- 46.6	ACCEPTABLE
TETRACHLOROETHENE	1	8.20	9.24	6.08- 12.5	6.89- 11.7	ACCEPTABLE
	2	44.8	51.3	31.2- 66.7	35.7- 62.2	ACCEPTABLE
BROMODICHLOROMETHANE	1	10.5	10.8	7.33- 14.2	8.21- 13.3	ACCEPTABLE
	2	37.9	38.1	24.9- 53.6	28.5- 50.0	ACCEPTABLE
DIBROMOCHLOROMETHANE	1	12.6	13.1	8.48- 17.0	9.55- 15.9	ACCEPTABLE
	2	55.7	58.1	34.1- 80.2	39.9- 74.4	ACCEPTABLE
BROMOFORM	1	14.2	14.5	7.45- 20.0	9.04- 18.4	ACCEPTABLE
	2	44.6	42.3	25.5- 59.9	29.9- 55.6	ACCEPTABLE
METHYLENE CHLORIDE	1	10.4	10.6	6.59- 16.1	7.79- 14.9	ACCEPTABLE
	2	53.5	54.1	30.7- 76.5	36.5- 70.7	ACCEPTABLE
CHLOROBENZENE	1	18.4	16.0	11.4- 20.1	12.5- 19.0	ACCEPTABLE
	2	57.6	63.7	41.3- 79.8	46.2- 74.9	ACCEPTABLE
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
BENZENE	1	41.4	40.1	25.7- 56.0	29.5- 52.2	ACCEPTABLE
	2	8.35	8.25	5.24- 11.6	6.04- 10.8	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: UT009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
ETHYLBENZENE	1	67.1	66.9	36.0- 94.3	43.4- 86.9	ACCEPTABLE
	2	14.2	14.0	9.26- 19.0	10.5- 17.8	ACCEPTABLE
TOLUENE	1	49.6	49.2	30.2- 65.2	34.6- 60.8	ACCEPTABLE
	2	9.55	9.51	6.09- 12.8	6.93- 11.9	ACCEPTABLE
1,2-DICHLOROBENZENE	1	58.9	65.5	32.7- 93.9	40.5- 86.2	ACCEPTABLE
	2	9.68	8.88	5.85- 11.7	6.59- 11.0	ACCEPTABLE
1,3-DICHLOROBENZENE	1	46.0	47.9	29.4- 61.7	33.5- 57.6	ACCEPTABLE
	2	18.5	16.6	11.6- 21.1	12.9- 19.9	ACCEPTABLE
1,4-DICHLOROBENZENE	1	58.7	62.5	34.4- 85.8	41.0- 79.3	ACCEPTABLE
	2	14.1	12.4	7.49- 17.8	8.79- 16.5	ACCEPTABLE
MISCELLANEOUS PARAMETERS:						
TOTAL CYANIDE	1	0.827	0.860	0.598- 1.15	0.668- 1.08	ACCEPTABLE
(IN MG/L)	2	0.147	0.160	0.102-0.208	0.116-0.194	ACCEPTABLE
NON-FILTERABLE RESIDUE	1	53.8	61.0	47.7- 64.6	49.8- 62.5	ACCEPTABLE
(IN MG/L)	2	71.8	83.0	62.8- 91.3	66.4- 87.8	ACCEPTABLE
OIL AND GREASE	1	8.20	8.30	3.07- 12.2	4.22- 11.0	ACCEPTABLE
(IN MG/L)	2	43.0	48.4	33.7- 56.0	36.5- 53.2	ACCEPTABLE
TOTAL PHENOLICS	1	0.478	0.595	0.312-0.878	0.384-0.805	ACCEPTABLE
(IN MG/L)	2	2.71	3.13	1.66- 4.60	2.04- 4.23	ACCEPTABLE
TOTAL RESIDUAL CHLORINE	1	3.47	3.70	3.06- 4.52	3.25- 4.32	ACCEPTABLE
(IN MG/L)	2	1.47	1.50	1.09- 1.77	1.18- 1.68	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

Vorcal

PERFORMANCE EVALUATION SUMMARY SHEET

Laboratory: TMA/Norcal

Lab Code = AZ

PE Sample	EMSL-LV Acceptance Range (%)	% of EMSL-LV True Value	% of all Participating Laboratory's Grand Average
April 20, 1993			
Alpha	56.2 to 143.8	113.7	117.1
Uranium	82.0 to 118.0	107.9	103.2
Beta	73.6 to 126.4	83.8	89.4
Sr-89	78.8 to 121.2	68.3(LOW)	74.5
Sr-90	70.0 to 130.0	101.0	105.2
Co-60	77.7 to 122.3	94.9	94.0
Cs-134	67.8 to 132.2	114.8	122.0
Cs-137	72.8 to 127.2	95.8	94.1
Ra-226	74.3 to 125.7	108.3	110.5
Ra-228	56.3 to 143.7	0.0(Outlier)	0.0
June 4, 1993			
Tritium	82.7 to 117.3	84.9	87.1
June 11, 1993			
Co-60	42.0 to 158.0	108.9	108.3
Zn-65	83.2 to 116.8	117.8	112.8
Ru-106	82.5 to 117.5	89.4	102.3
Cs-134	0.0 to 274.0	113.4	105.2
Cs-137	0.0 to 274.0	133.4	115.8
Ba-133	82.5 to 117.5	105.3	107.7
July 16, 1993			
Sr-89	74.4 to 125.6	100.0	99.4
Sr-90	65.2 to 134.8	104.0	108.2
July 23, 1993			
Alpha	42.0 to 158.0	62.2	77.4
Beta	72.1 to 127.9	76.7	87.2
August 13, 1993			
Uranium	79.4 to 120.6	106.7	108.2
August 27, 1993			
Alpha	54.2 to 145.8	87.7	83.3
Beta	81.5 to 118.5	105.7	100.8
Cs-137	3.3 to 196.7	92.5	83.3
Sr-90	54.2 to 145.8	89.5	93.6
September 17, 1993			
Ra-226	74.5 to 125.5	96.0	99.1
Ra-228	56.9 to 143.1	89.2	93.0
November 5, 1993			
Tritium	82.6 to 117.4	70.0	71.8

INTEROFFICE MEMORANDUM

TMA/Norcal

To: Larry Johnson

From: K. Yamamoto K. Yamamoto

Subject: EPA Performance Evaluation Study Results

Date: 17 January 1994

Attached are TMA/Norcal's results in the EPA Gross Alpha-Beta in Water Performance Evaluation Study of October 29, 1993, and the Tritium in Water Performance Evaluation Study of November 5, 1993.

A Corrective Action Request will be issued for failure to be within the control limits in the analysis for tritium.

cc: DER/RM/DS/MWT/DPK/NJV/AG/CS/QA File

EPA PERFORMANCE EVALUATION STUDY
WATER

DATE	ANALYSIS	KNOWN VALUE pCi/L	CONTROL LIMITS +/- pCi/L	GRAND AVERAGE pCi/L	STD DEV pCi/L	TMA VALUE pCi/L	EXPERI-MENTAL SIGMA pCi/L	NORM DEV FROM GRAND	NORM DEV FROM KNOWN	CODE
10/29/93	Gross Alpha	20.00	8.70	14.08	4.64	23.67	1.53	3.32	1.27	
10/29/93	Gross Beta	15.00	8.70	17.01	4.80	14.00	0.00	-1.04	-0.35	
11/05/93	Tritium	7398.00	1283.90	7215.65	574.68	5175.33	53.02	-4.78	-5.20	

INTEROFFICE MEMORANDUM

TMA/Norcal

To: Larry Johnson

From: K. Yamamoto K. Yamamoto

Subject: EPA Performance Evaluation Study Results

Date: 30 December 1993

Attached are TMA/Norcal's results in the EPA Air Filter Performance Evaluation Study of August 27, 1993.

Apparently the EPA has changed the names of the studies. What was known as the Intercomparison Study is now the Performance Evaluation Study and what was known as the Performance Evaluation Study is now the Blind Performance Evaluation Study.

cc: DER/RM/DS/MWT/DPK/NJV/AG/CS/QA File

EPA AIR FILTER PERFORMANCE EVALUATION STUDY

DATE	ANALYSIS	KNOWN VALUE pCi/F	CONTROL LIMITS +/- pCi/F	GRAND AVERAGE pCi/F	STD DEV pCi/F	TMA VALUE pCi/F	EXPERI-MENTAL SIGMA pCi/F	NORM DEV FROM GRAND	NORM DEV FROM KNOWN	CODE
08/27/93	Cs-137	9.00	8.70	10.00	1.62	8.33	0.58	-0.58	-0.23	
08/27/93	Gross Alpha	19.00	8.70	20.00	3.27	16.67	0.58	-1.15	-0.81	
08/27/93	Gross Beta	47.00	8.70	49.32	4.62	49.67	1.53	0.12	0.92	
08/27/93	Sr-90	19.00	8.70	18.17	3.16	17.00	1.00	-0.40	-0.69	

EPA AIR FILTER PERFORMANCE EVALUATION STUDY

DATE	ANALYSIS	KNOWN VALUE pCi/F	CONTROL LIMITS +/- pCi/F	GRAND AVERAGE pCi/F	STD DEV pCi/F	TMA VALUE pCi/F	EXPERI-MENTAL SIGMA pCi/F	NORM DEV FROM GRAND	NORM DEV FROM KNOWN	CODE
08/27/93	Cs-137	9.00	8.70	10.00	1.62	8.33	0.58	-0.58	-0.23	
08/27/93	Gross Alpha	19.00	8.70	20.00	3.27	16.67	0.58	-1.15	-0.81	
08/27/93	Gross Beta	47.00	8.70	49.32	4.62	49.67	1.53	0.12	0.92	
08/27/93	Sr-90	19.00	8.70	18.17	3.16	17.00	1.00	-0.40	-0.69	

INTEROFFICE MEMORANDUM

TMA/Norcal

To: Larry Johnson

From: K. Yamamoto K. Yamamoto

Subject: EPA Performance Evaluation Study Results

Date: 20 December 1993

Attached are TMA/Norcal's results in the EPA Radium in Water Performance Evaluation Study of September 17, 1993.

Apparently the EPA has changed the names of the studies. What was known as the Intercomparison Study is now the Performance Evaluation Study and what was known as the Performance Evaluation Study is now the Blind Performance Evaluation Study.

cc: DER/RM/DS/MWT/DPK/NJV/AG/CS/QA File

EPA PERFORMANCE EVALUATION STUDY
WATER

DATE	ANALYSIS	KNOWN VALUE pCi/L	CONTROL LIMITS +/- pCi/L	GRAND AVERAGE pCi/L	STD DEV pCi/L	TMA VALUE pCi/L	EXPERI-MENTAL SIGMA pCi/L	NORM DEV FROM GRAND	NORM DEV FROM KNOWN	CODE
09/17/93	Ra-226	14.90	3.80	14.73	1.84	14.30	0.20	-0.34	-0.47	
09/17/93	Ra-228	20.40	8.80	19.57	5.09	18.20	1.05	-0.46	-0.75	

INTEROFFICE MEMORANDUM

TMA/Norcal

To: Larry Johnson

From: K. Yamamoto K. Yamamoto

Subject: EPA Performance Evaluation Study Results

Date: 8 December 1993

Attached are TMA/Norcal's results in the EPA Strontium in Water Performance Evaluation Study of July 16, 1993 and the Uranium in Water Performance Evaluation Study of August 13, 1993.

Apparently the EPA has changed the names of the studies. What was known as the Intercomparison Study is now the Performance Evaluation Study and what was known as the Performance Evaluation Study is now the Blind Performance Evaluation Study.

cc: DER/RM/DS/MWT/DPK/NJV/AG/CS/QA File

EPA PERFORMANCE EVALUATION STUDY
WATER

DATE	ANALYSIS	KNOWN VALUE pCi/L	CONTROL LIMITS +/- pCi/L	GRAND AVERAGE pCi/L	STD DEV pCi/L	TMA VALUE pCi/L	EXPERI-MENTAL SIGMA pCi/L	NORM DEV FROM GRAND	NORM DEV FROM KNOWN	CODE
07/16/93	Sr-89	34.00	8.70	34.20	6.66	34.00	5.00	-0.07	0.00	
07/16/93	Sr-90	25.00	8.70	24.02	3.15	26.00	1.00	0.69	0.35	
08/13/93	Uranium	25.30	5.20	24.91	2.85	27.00	1.00	1.21	0.98	

INTEROFFICE MEMORANDUM

TMA/Norcal

To: Larry Johnson

From: K. Yamamoto K. Yamamoto

Subject: EPA Intercomparison Study Results

Date: 15 October 1993

Attached are TMA/Norcal's results in the EPA Gross Alpha-Beta in Water Intercomparison Study of July 23, 1993.

cc: DER/RM/DS/MWT/DPK/NJV/AG/CS/QA File

EPA LABORATORY INTERCOMPARISON PROGRAM
WATER

DATE	ANALYSIS	KNOWN VALUE pCi/L	CONTROL LIMITS +/- pCi/L	GRAND AVERAGE pCi/L	STD DEV pCi/L	TMA VALUE pCi/L	EXPERI-MENTAL SIGMA pCi/L	NORM DEV FROM GRAND	NORM DEV FROM KNOWN	CODE
07/23/93	Gross Alpha	15.00	8.70	12.06	4.28	9.33	1.53	-0.94	-1.96	
07/23/93	Gross Beta	43.00	12.00	37.65	8.49	33.00	2.00	-1.16	-2.50	

INTEROFFICE MEMORANDUM **TMA/Norcal**

To: Larry Johnson

From: K. Yamamoto K. Yamamoto

Subject: EPA Intercomparison Study Results

Date: 30 August 1993

Attached are TMA/Norcal's results in the EPA Gamma in Water Intercomparison Study of June 11, 1993.

cc: DER/RM/DS/MWT/DPK/NJV/AG/CS/QA File

EPA LABORATORY INTERCOMPARISON PROGRAM
GAMMA IN WATER

DATE	ANALYSIS	KNOWN VALUE pCi/L	CONTROL LIMITS +/- pCi/L	GRAND AVERAGE pCi/L	STD DEV pCi/L	TMA VALUE pCi/L	EXPERI-MENTAL SIGMA pCi/L	NORM DEV FROM GRAND	NORM DEV FROM KNOWN	CODE
06/11/93	Ba-133	99.00	17.30	96.74	6.87	97.67	5.13	0.16	-0.23	
06/11/93	Co-60	15.00	8.70	14.90	2.08	13.67	1.53	-0.43	-0.46	
06/11/93	Cs-134	5.00	8.70	5.39	1.57	5.67	0.58	0.10	0.23	
06/11/93	Cs-137	5.00	8.70	5.76	1.47	8.33	1.53	0.89	1.15	
06/11/93	Ru-106	119.00	20.80	103.87	12.83	117.67	23.46	1.99	-0.19	
06/11/93	Zn-65	103.00	17.30	107.54	7.83	110.33	10.02	0.48	1.27	

INTEROFFICE MEMORANDUM **TMA/Norcal**

To: Larry Johnson

From: K. Yamamoto K. Yamamoto

Subject: EPA Intercomparison Study Results

Date: 24 August 1993

Enclosed are TMA/Norcal's results in the EPA Performance Evaluation Intercomparison Study of April 20, 1993. An "ND" in the Code column indicates that TMA/Norcal did not submit any data.

Corrective Action Request Number NSD-93-47 was issued for TMA/Norcal's failure to submit ^{228}Ra results and Corrective Action Request Number NSD-93-48 was issued for failure to be within the control limits in the analysis for ^{89}Sr.

cc: DER/RM/DS/MWT/DPK/NJV/AG/QA File

EPA LABORATORY INTERCOMPARISON PROGRAM
PERFORMANCE EVALUATION

DATE	ANALYSIS	KNOWN VALUE pCi/L	CONTROL LIMITS +/- pCi/L	GRAND AVERAGE pCi/L	STD DEV pCi/L	TMA VALUE pCi/L	EXPERI-MENTAL SIGMA pCi/L	NORM DEV FROM GRAND	NORM DEV FROM KNOWN	CODE
04/20/93	Gross Alpha	95.00	41.60	96.63	20.17	108.00	19.08	0.82	0.94	
04/20/93	Ra-226	24.90	6.40	24.41	3.14	26.97	1.75	1.20	0.97	
04/20/93	Ra-228	19.00	8.30	18.61	3.14	0.00	0.00	0.00	0.00	ND
04/20/93	Uranium	28.90	5.20	27.64	5.01	31.20	0.36	2.05	1.33	
04/20/93	Co-60	39.00	8.70	39.36	2.90	37.00	2.65	-0.82	-0.69	
04/20/93	Cs-134	27.00	8.70	25.40	2.14	31.00	1.00	1.94	1.39	
04/20/93	Cs-137	32.00	8.70	32.60	2.81	30.67	3.21	-0.67	-0.46	
04/20/93	Gross Beta	177.00	46.80	155.52	18.41	148.33	5.51	-0.46	-1.84	
04/20/93	Sr-89	41.00	8.70	37.59	8.32	28.00	2.65	-3.32	-4.50	
04/20/93	Sr-90	29.00	8.70	27.82	3.45	29.33	0.58	0.52	0.12	

INTEROFFICE MEMORANDUM TMA/Norcal

To: Larry Johnson

From: K. Yamamoto K. Yamamoto

Subject: EPA Intercomparison Study Results

Date: 13 August 1993

Attached is TMA/Norcal's result in the EPA Tritium in Water Intercomparison Study of June 4, 1993.

cc: DER/RM/DS/MWT/DPK/NJV/QA File

EPA LABORATORY INTERCOMPARISON PROGRAM
WATER

DATE	ANALYSIS	KNOWN VALUE pCi/L	CONTROL LIMITS +/- pCi/L	GRAND AVERAGE pCi/L	STD DEV PCi/L	TMA VALUE pCi/L	EXPERI-MENTAL SIGMA pCi/L	NORM DEV FROM GRAND	NORM DEV FROM KNOWN
06/04/93	Tritium	9844.00	1707.20	9591.82	689.10	8408.00	372.02	-2.08	-2.53

TMA/
ERG

PERFORMANCE EVALUATION SUMMARY SHEET

Laboratory: TMA/ERG Laboratory

PE Sample	Number Acceptable	Number Analyzed	% Acceptable
WP-031			
Metal	38	42	90.5
Inorganic/Mineral	46	50	92.0
Organic	37	54	68.5

PERFORMANCE EVALUATION REPORT

DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

RECEIVED

LABORATORY: MI007

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ALUMINUM	1	700	681	550- 784	579- 755	ACCEPTABLE
	2	141	140	107- 182	117- 173	ACCEPTABLE
ARSENIC	1	490	492	408- 587	430- 565	ACCEPTABLE
	2	111	74.3	56.7- 92.9	61.2- 88.4	NOT ACCEPTABLE
BERYLLIUM	1	439	461	382- 533	401- 514	ACCEPTABLE
	2	226	240	198- 278	208- 268	ACCEPTABLE
CADMIUM	1	172	165	138- 194	145- 187	ACCEPTABLE
	2	62.4	61.0	50.8- 72.0	53.5- 69.4	ACCEPTABLE
COBALT	1	893	880	775- 980	801- 954	ACCEPTABLE
	2	50.8	53.8	45.4- 61.9	47.5- 59.8	ACCEPTABLE
CHROMIUM	1	699	730	604- 843	634- 813	ACCEPTABLE
	2	15.0	23.4	17.4- 29.0	18.9- 27.6	NOT ACCEPTABLE
COPPER	1	628	601	524- 657	541- 640	ACCEPTABLE
	2	19.5	18.7	13.6- 24.1	14.9- 22.8	ACCEPTABLE
IRON	1	61.9	58.0	43.5- 72.5	47.2- 68.8	ACCEPTABLE
	2	1100	1100	950- 1270	991- 1230	ACCEPTABLE
MERCURY	1	9.12	9.38	7.31- 11.9	7.89- 11.3	ACCEPTABLE
	2	6.30	6.67	5.00- 8.48	5.44- 8.04	ACCEPTABLE
MANGANESE	1	623	600	536- 660	551- 644	ACCEPTABLE
	2	75.1	73.5	64.0- 82.7	66.4- 80.4	ACCEPTABLE
NICKEL	1	899	860	766- 952	789- 928	ACCEPTABLE
	2	350	340	296- 383	307- 372	ACCEPTABLE
LEAD	1	1260	1200	1060- 1350	1100- 1310	ACCEPTABLE
	2	761	738	636- 833	661- 809	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

RECEIVED JA

LABORATORY: MI007

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
SELENIUM	1	230	228	156- 277	171- 262	ACCEPTABLE
	2	390	387	268- 486	296- 459	ACCEPTABLE
VANADIUM	1	971	940	832- 1040	860- 1020	ACCEPTABLE
	2	171	170	146- 188	151- 183	ACCEPTABLE
ZINC	1	849	842	737- 947	763- 921	ACCEPTABLE
	2	18.2	46.3	37.5- 56.1	39.8- 53.7	NOT ACCEPTABLE
ANTIMONY	3	94.0	94.5	56.4- 119	64.3- 111	ACCEPTABLE
	4	195	189	108- 244	125- 227	ACCEPTABLE
SILVER	3	75.1	73.9	60.6- 86.8	63.9- 83.5	ACCEPTABLE
	4	26.4	25.8	21.1- 30.4	22.2- 29.2	ACCEPTABLE
THALLIUM	3	136	62.8	47.0- 77.3	50.8- 73.4	NOT ACCEPTABLE
	4	566	539	421- 643	450- 615	ACCEPTABLE
MOLYBDENUM	3	25.2	24.5	18.6- 30.6	20.2- 29.0	ACCEPTABLE
	4	82.4	81.6	64.4- 95.0	68.3- 91.1	ACCEPTABLE
STRONTIUM	3	18.6	19.1	14.4- 23.3	15.5- 22.1	ACCEPTABLE
	4	72.0	73.4	62.0- 84.5	64.9- 81.5	ACCEPTABLE
TITANIUM	3	134	130	109- 151	114- 145	ACCEPTABLE
	4	45.6	43.0	34.0- 53.4	36.5- 50.9	ACCEPTABLE
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	9.38	9.50	9.19- 9.75	9.26- 9.68	ACCEPTABLE
	4	4.64	4.70	4.62- 4.77	4.64- 4.75	ACCEPTABLE
SPEC. COND. (UMHOS/CM AT 25 C)	1	945	899	840- 980	857- 963	ACCEPTABLE
	2	421	398	368- 435	377- 427	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 12/27/9

WATER POLLUTION STUDY NUMBER WP031

RECEIVED JA

LABORATORY: MI007

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
TDS AT 180 C	1	500	577	396- 759	441- 713	ACCEPTABL
	2	636	223	168- 284	183- 269	NOT ACCEPTABL
TOTAL HARDNESS (AS CACO3)	1	299	279	236- 307	245- 298	CHECK FOR ERR
	2	61.4	57.4	51.2- 63.8	52.8- 62.2	ACCEPTABL
CALCIUM	1	118	110	87.4- 126	92.2- 121	ACCEPTABL
	2	7.56	7.00	5.95- 8.19	6.23- 7.91	ACCEPTABL
MAGNESIUM	1	1.03	0.960	0.771- 1.18	0.822- 1.13	ACCEPTABL
	2	10.3	9.70	8.36- 11.0	8.71- 10.6	ACCEPTABL
SODIUM	1	62.8	61.7	56.2- 67.8	57.6- 66.3	ACCEPTABL
	2	26.8	26.3	23.6- 29.2	24.3- 28.5	ACCEPTABL
POTASSIUM	1	7.49	7.50	6.39- 8.81	6.70- 8.50	ACCEPTABL
	2	40.2	40.0	34.5- 45.6	35.9- 44.2	ACCEPTABL
TOTAL ALKALINITY (AS CACO3)	1	118	120	106- 133	109- 130	ACCEPTABL
	2	12.5	11.0	7.85- 15.3	8.77- 14.3	ACCEPTABL
CHLORIDE	1	172	199	183- 213	187- 210	NOT ACCEPTABL
	2	44.8	41.2	36.5- 45.4	37.6- 44.3	CHECK FOR ERRO
FLUORIDE	1	2.88	3.30	2.83- 3.77	2.95- 3.65	CHECK FOR ERRO
	2	0.257	0.380	0.319-0.457	0.336-0.439	NOT ACCEPTABL
SULFATE	1	12.95	14.0	10.8- 16.8	11.5- 16.0	ACCEPTABL
	2	89.0	92.0	78.1- 105	81.5- 102	ACCEPTABL
NUTRIENTS IN MILLIGRAMS PER LITER:						
AMMONIA-NITROGEN	1	5.40	7.70	6.10- 9.16	6.47- 8.79	NOT ACCEPTABLE
	2	0.493	0.730	0.491-0.982	0.550-0.923	CHECK FOR ERRO

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

RECEIVED JAN

LABORATORY: MI007

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
NUTRIENTS IN MILLIGRAMS PER LITER:						
NITRATE-NITROGEN	1	0.490	0.520	0.378-0.658	0.412-0.625	ACCEPTABLE
	2	10.4	11.0	8.84- 13.0	9.34- 12.5	ACCEPTABLE
ORTHOPHOSPHATE	1	0.131	0.150	0.114-0.187	0.122-0.178	ACCEPTABLE
	2	4.17	4.10	3.46- 4.68	3.62- 4.54	ACCEPTABLE
KJELDAHL-NITROGEN	3	13.5	14.0	10.3- 17.1	11.1- 16.3	ACCEPTABLE
	4	1.31	0.710	0.226- 1.32	0.357- 1.19	CHECK FOR ERRO
TOTAL PHOSPHORUS	3	5.54	7.40	5.57- 8.05	5.86- 7.75	NOT ACCEPTABLE
	4	0.424	0.490	0.341-0.569	0.369-0.542	ACCEPTABLE
DEMANDS IN MILLIGRAMS PER LITER:						
COD	1	62.0	70.8	52.4- 84.6	56.5- 80.5	ACCEPTABLE
	2	195	207	163- 230	172- 221	ACCEPTABLE
TOC	1	25.6	28.0	23.9- 32.8	25.0- 31.6	ACCEPTABLE
	2	75.5	82.0	69.5- 95.3	72.8- 91.9	ACCEPTABLE
5-DAY BOD	1	47.3	44.9	26.1- 60.1	30.3- 55.8	ACCEPTABLE
	2	143	131	75.4- 180	88.5- 167	ACCEPTABLE
PCB'S IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1254	1	2.69	1.87	0.988- 2.71	1.21- 2.49	CHECK FOR ERRO
PCB-AROCLOR 1260	2	5.20	4.63	2.79- 5.96	3.19- 5.56	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

RECEIVED JAN 19

LABORATORY: MI007

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1016/1242	2	39.8	35.3	8.02- 46.6	13.0- 41.6	ACCEPTABLE
PCB IN OIL- 1254	1	51.5	43.9	13.5- 61.8	19.8- 55.5	ACCEPTABLE
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	3	5.82	8.21	4.91- 9.72	5.52- 9.11	ACCEPTABLE
	4	0.887	2.21	1.07- 2.77	1.29- 2.56	NOT ACCEPTABLE
ALDRIN	1	0.455	0.539	0.122-0.754	0.202-0.674	ACCEPTABLE
	2	0.081	0.086	.0171-0.121	.0303-0.108	ACCEPTABLE
DIELDRIN	1	0.965	0.475	0.203-0.710	0.267-0.645	NOT ACCEPTABLE
	2	0.367	0.173	.0861-0.239	0.106-0.219	NOT ACCEPTABLE
[illegible]	1	0.828	0.866	0.433- 1.15	0.524- 1.06	ACCEPTABLE
	2	0.211	0.202	.0956-0.268	0.117-0.246	ACCEPTABLE
DDE	1	<0.075	0.539	0.235-0.756	0.301-0.690	NOT ACCEPTABLE
	2	<0.075	0.173	.0788-0.236	.0989-0.216	NOT ACCEPTABLE
DDT	1	0.780	0.796	0.362- 1.06	0.450-0.972	ACCEPTABLE
	2	0.172	0.142	.0570-0.216	.0772-0.196	ACCEPTABLE
HEPTACHLOR	1	0.622	0.669	0.187-0.918	0.279-0.825	ACCEPTABLE
	2	0.221	0.216	.0756-0.269	0.100-0.245	ACCEPTABLE
HEPTACHLOR EPOXIDE	1	0.430	0.478	0.260-0.640	0.308-0.592	ACCEPTABLE
	2	0.171	0.174	.0858-0.235	0.105-0.216	ACCEPTABLE

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PERFORMANCE EVALUATION REPORT

DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

RECEIVED JAN

LABORATORY: MI007

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	12.7	15.1	10.2- 20.4	11.5- 19.1	ACCEPTABLE
	2	47.5	55.8	36.2- 73.4	40.9- 68.7	ACCEPTABLE
CHLOROFORM	1	9.02	11.8	7.85- 15.9	8.86- 14.8	ACCEPTABLE
	2	44.8	64.4	38.3- 86.7	44.4- 80.6	ACCEPTABLE
1,1,1 TRICHLOROETHANE	1	9.04	13.4	8.68- 18.2	9.89- 17.0	CHECK FOR ERROR
	2	20.6	37.8	22.7- 50.0	26.2- 46.6	NOT ACCEPTABLE
TRICHLOROETHENE	1	4.55	7.57	5.10- 10.3	5.75- 9.62	NOT ACCEPTABLE
	2	35.9	62.7	38.6- 80.5	43.9- 75.2	NOT ACCEPTABLE
CARBONTETRACHLORIDE	1	12.7	16.4	10.9- 22.2	12.3- 20.8	ACCEPTABLE
	2	26.4	37.1	23.0- 50.1	26.4- 46.6	ACCEPTABLE
TETRACHLOROETHENE	1	9.41	9.24	6.08- 12.5	6.89- 11.7	ACCEPTABLE
	2	48.2	51.3	31.2- 66.7	35.7- 62.2	ACCEPTABLE
BROMODICHLOROMETHANE	1	9.98	10.8	7.33- 14.2	8.21- 13.3	ACCEPTABLE
	2	36.0	38.1	24.9- 53.6	28.5- 50.0	ACCEPTABLE
DIBROMOCHLOROMETHANE	1	1.86	13.1	8.48- 17.0	9.55- 15.9	NOT ACCEPTABLE
	2	11.0	58.1	34.1- 80.2	39.9- 74.4	NOT ACCEPTABLE
BROMOFORM	1	26.5	14.5	7.45- 20.0	9.04- 18.4	NOT ACCEPTABLE
	2	52.0	42.3	25.5- 59.9	29.9- 55.6	ACCEPTABLE
METHYLENE CHLORIDE	1	10.2	10.6	6.59- 16.1	7.79- 14.9	ACCEPTABLE
	2	46.3	54.1	30.7- 76.5	36.5- 70.7	ACCEPTABLE
CHLOROBENZENE	1	14.5	16.0	11.4- 20.1	12.5- 19.0	ACCEPTABLE
	2	53.8	63.7	41.3- 79.8	46.2- 74.9	ACCEPTABLE
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
BENZENE	1	61.7	40.1	25.7- 56.0	29.5- 52.2	NOT ACCEPTABLE
	2	16.3	8.25	5.24- 11.6	6.04- 10.8	NOT ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 12/27/93

WATER POLLUTION STUDY NUMBER WP031

RECEIVED JAN 19 199

LABORATORY: MI007

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
ETHYLBENZENE	1	62.2	66.9	36.0- 94.3	43.4- 86.9	ACCEPTABLE
	2	16.3	14.0	9.26- 19.0	10.5- 17.8	ACCEPTABLE
TOLUENE	1	46.6	49.2	30.2- 65.2	34.6- 60.8	ACCEPTABLE
	2	17.4	9.51	6.09- 12.8	6.93- 11.9	NOT ACCEPTABLE
1,2-DICHLOROBENZENE	1	35.8	65.5	32.7- 93.9	40.5- 86.2	CHECK FOR ERRO
	2	4.48	8.88	5.85- 11.7	6.59- 11.0	NOT ACCEPTABLE
1,3-DICHLOROBENZENE	1	24.7	47.9	29.4- 61.7	33.5- 57.6	NOT ACCEPTABLE
	2	8.65	16.6	11.6- 21.1	12.9- 19.9	NOT ACCEPTABLE
1,4-DICHLOROBENZENE	1	36.5	62.5	34.4- 85.8	41.0- 79.3	CHECK FOR ERRO
	2	7.58	12.4	7.49- 17.8	8.79- 16.5	CHECK FOR ERRO
MISCELLANEOUS PARAMETERS:						
TOTAL CYANIDE (IN MG/L)	1	1.12	0.860	0.598- 1.15	0.668- 1.08	CHECK FOR ERRO
	2	0.192	0.160	0.102-0.208	0.116-0.194	ACCEPTABLE
NON-FILTERABLE RESIDUE (IN MG/L)	1	57.3	61.0	47.7- 64.6	49.8- 62.5	ACCEPTABLE
	2	76.0	83.0	62.8- 91.3	66.4- 87.8	ACCEPTABLE
OIL AND GREASE (IN MG/L)	1	5.7	8.30	3.07- 12.2	4.22- 11.0	ACCEPTABLE
	2	36	48.4	33.7- 56.0	36.5- 53.2	CHECK FOR ERRO
TOTAL PHENOLICS (IN MG/L)	1	0.488	0.595	0.312-0.878	0.384-0.805	ACCEPTABLE
	2	2.518	3.13	1.66- 4.60	2.04- 4.23	ACCEPTABLE
TOTAL RESIDUAL CHLORINE (IN MG/L)	1	3.90	3.70	3.06- 4.52	3.25- 4.32	ACCEPTABLE
	2	1.77	1.50	1.09- 1.77	1.18- 1.68	CHECK FOR ERRO

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

ORTEK

PERFORMANCE EVALUATION SUMMARY SHEET

Laboratory: Ortek Laboratories

PE Sample	Number Acceptable	Number Analyzed	% Acceptable
WP-031			
Metal	40	42	95.2
Inorganic/Mineral	25	48	52.1
Organic	53	54	98.1
Wisconsin State Proficiency Testing Samples			
E1_94			
Metals	26	26	100.0
Inorganic	15	15	100.0
Organic	47	49	95.9
Analytical Standards Incorporated PE Samples - January 1994			
Organic	8	8	100.0

ORTEK
ENVIRONMENTAL LABORATORY
1609 Western Avenue
P.O. Box 12435
(414) 498-2222
(800) 236-4067
FAX (414) 498-4067
Green Bay, WI 54307-2435

March 28, 1994

Ms. Donna Wanek
U.S. DOE Richland Office
825 Jadwin Avenue
Richland, WA 99353

Dear Ms. Wanek,

The following is a corrective action report for the deficient parameters for the Wisconsin State Laboratory of Hygiene E1 94 Performance Evaluation Study. I have also enclosed a copy of ORTEK's results for this study.

Anthracene: The analyst reported phenanthrene rather than anthracene. This is very disturbing to us. I understand that the two compounds elute approximately ten seconds apart, and that they also share a common quantitation ion. However I feel that the data was not thoroughly reviewed. If it had been, the retention times of these compounds in the sample would have been compared against those of the standard and therefore the compounds properly identified.

TPH: There was a mathematical error here. The reported result is in error by a factor of ten. The corrected result is 110 mg/L, which would have been within the acceptable range.

Should you have any questions regarding this report, please feel free to contact me.

Sincerely,

Becki Detaege MT(ASCP)

Becki Detaege MT(ASCP)
Quality Assurance/Quality Control Officer

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Wisconsin State Laboratory of Hygiene
465 Henry Mall
Madison, WI 53706-1578
(608) 262-3438

Proficiency Testing

University of Wisconsin Center for Health Sciences

15 March 1994
E1_94 -- Inorganic and Metal Analytes

0234
Laboratory Supervisor
Oneida Research & Technology
1609 Western, PO Box 12435
Green Bay, WI 54307-2435

Parameter Tested	Number Reporting	True* Value	Mean	SD	Acceptable Range	Your Answer
BOD	310	57	57	9	31-83 mg/L	46
Your result is a correct answer						
CBOD**	4				Please call	36
The participation in this test is too small to grade your result						
COD	70	87.9	84.8	8.1	62.4-107.2 mg/L	100
Your result is a correct answer						
pH	45	9.05	9.11	0.13	8.74-9.48	9.2
Your result is a correct answer						
Nitrate	79	5.97	5.87	0.40	4.77-6.97 mg/L	6.1
Your result is a correct answer						
Ammonia	148	1.53	1.51	0.19	0.98-2.03 mg/L	1.6
Your result is a correct answer						
Kjeldahl Nitrogen	58	3.88	3.82	0.42	2.65-4.99 mg/L	3.8
Your result is a correct answer						
Phosphorus	112	1.06	1.18	0.08	0.94-1.41 mg/L	1.2
Your result is a correct answer						
Suspended Solids	342	36	32	4	21-43 mg/L	29
Your result is a correct answer						
Chloride	88	13.2	13.5	1.4	9.6-17.2 mg/L	15
Your result is a correct answer						
Fluoride	71	1.64	1.64	0.09	1.40-1.88 mg/L	1.6
Your result is a correct answer						
Sulfate	75	33.0	34.4	1.9	29.1-39.6 mg/L	32
Your result is a correct answer						

A correct answer for a parameter does not automatically grant a laboratory certification or registration. Refer to Chp. NR. 149, Wis. Adm. Code

* True value is based on a calculated value of the added analyte.

** Participation in this test was too small to grade results statistically. Answers were graded on EPA regression.

The next shipment will be sent from Madison May 10, 1994. You will get samples at that time to repeat any current wrong or outlying results.

Environmental Proficiency Testing -- Report of results

15 March 1994

E1_94 -- Inorganic and Metal Analytes

0234
Laboratory Supervisor
Oneida Research & Technology
1609 Western, PO Box 12435
Green Bay, WI 54307-2435

Parameter Tested	Number Reporting	True* Value	Mean	SD	Acceptable Range	Your Answer
Cyanide	54	0.36	0.33	0.04	0.22-0.44 mg/L	0.30
Your result is a correct answer						
Phenolics	52	75	72	11	40-103 µg/L	80
Your result is a correct answer						
Hardness (EDTA)	59	244	240	7	220-259 mg/L	230
Your result is a correct answer						
Oil and Grease	26	41	37	4	25-48 mg/L	34
Your result is a correct answer						
Aluminum	61	1375	1372	118	1043-1700 µg/L	1400
Your result is a correct answer						
Antimony	46	438	407	45	281-532 µg/L	420
Your result is a correct answer						
Arsenic	67	75.0	73.1	7.0	53.5-92.7 µg/L	76
Your result is a correct answer						
Barium	70	1375	1345	98	1074-1616 µg/L	1400
Your result is a correct answer						
Beryllium	45	43.8	43.4	2.9	35.2-51.5 µg/L	46
Your result is a correct answer						
Cadmium	77	138	135	9	109-160 µg/L	140
Your result is a correct answer						
Calcium	67	22500	22511	2023	16886-28136 µg/L	24000
Your result is a correct answer						
Chromium	77	138	135	13	97-172 µg/L	140
Your result is a correct answer						

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Environmental Proficiency Testing -- Report of results

15 March 1994
E1_94 -- Inorganic and Metal Analytes

0234
Laboratory Supervisor
Oneida Research & Technology
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Green Bay, WI 54307-2435

Parameter Tested	Number Reporting	True* Value	Mean	SD	Acceptable Range	Your Answer
Cobalt	52	250	246	13	209-281 µg/L	250
Your result is a correct answer						
Copper	78	1375	1356	81	1132-1580 µg/L	1400
Your result is a correct answer						
Hardness (Calculation)	50	149	149	9	122-174 mg/L	154
Your result is a correct answer						
Iron	74	2750	2699	229	2062-3336 µg/L	2900
Your result is a correct answer						
Lead	79	550	547	42	430-664 µg/L	500
Your result is a correct answer						
Magnesium	66	22500	22363	1555	18040-26687 µg/L	23000
Your result is a correct answer						
Manganese	68	1375	1372	102	1088-1656 µg/L	1400
Your result is a correct answer						
Mercury	62	1.50	1.41	0.32	0.52-2.31 µg/L	1.6
Your result is a correct answer						
Molybdenum	41	438	420	38	315-525 µg/L	380
Your result is a correct answer						
Nickel	72	1375	1344	112	1032-1656 µg/L	1400
Your result is a correct answer						
Potassium	63	2000	2011	224	1389-2633 µg/L	1700
Your result is a correct answer						
Selenium	66	75.0	71.6	5.8	55.5-87.7 µg/L	65
Your result is a correct answer						

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15 March 1994

E1_94 -- Inorganic and Metal Analytes

0234
Laboratory Supervisor
Oneida Research & Technology
1609 Western, PO Box 12435
Green Bay, WI 54307-2435

Parameter Tested	Number Reporting	True* Value	Mean	SD	Acceptable Range	Your Answer
Silver	75	9.0	9.2	1.8	4.1-14.3 µg/L	10
Your result is a correct answer						
Sodium	68	22500	21804	1807	16782-26827 µg/L	22000
Your result is a correct answer						
Thallium	45	438	432	24	366-498 µg/L	450
Your result is a correct answer						
Vanadium	41	175	173	10	145-200 µg/L	160
Your result is a correct answer						
Zinc	75	688	673	49	538-808 µg/L	710
Your result is a correct answer						

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Wisconsin State Laboratory of Hygiene
465 Henry Mall
Madison, WI 53706-1578
(608) 262-3438

Proficiency Testing

University of Wisconsin Center for Health Sciences

17 March 1994
E1_94 -- Organic Analytes

0234
Laboratory Supervisor
Oneida Research & Technology
1609 Western, PO Box 12435
Green Bay, WI 54307-2435

Parameter Tested	Number Reporting	True* Value	Mean	SD	Acceptable Range	Your Answer
Tetrachloroethylene	57	87.7	83.6	10.1	55.4-111.6 µg/L	79
Your result is a correct answer						
Trichloroethylene	57	76.3	72.0	8.9	47.3-96.6 µg/L	70
Your result is a correct answer						
Toluene	58	55.9	53.5	5.4	38.5-68.4 µg/L	50
Your result is a correct answer						
Benzene	58	31.4	30.0	2.9	22.0-37.9 µg/L	27
Your result is a correct answer						
Chlorobenzene	58	42.0	42.8	5.3	28.0-57.5 µg/L	39
Your result is a correct answer						

Satisfactory performance for Purgeable Halocarbons and Aromatics.
Your score = 100%

bis (2 ethyl hexyl) Phtha	38	44.3	36.8	11.4	5.0-68.6 µg/L	46
Your result is a correct answer						
butyl benzyl Phthalate	35	43.4	25.3	14.1	DL-64.5 µg/L	9
Your result is a correct answer						
di-methyl Phthalate	33	55.0	30.0	18.7	DL-81.9 µg/L	4
Your result is a correct answer						
di-n-octyl Phthalate	38	82.6	62.1	17.8	12.6-111.7 µg/L	88
Your result is a correct answer						
di-ethyl Phthalate	35	61.3	41.5	19.3	DL-95.1 µg/L	28
Your result is a correct answer						

Satisfactory performance for Phthalates.
Your score = 100%

n-nitrosodimethylamine	36	82.2	43.5	19.9	DL-98.8 µg/L	66
Your result is a correct answer						
n-nitrosodiphenylamine	37	51.4	39.7	11.2	8.7-70.6 µg/L	36
Your result is a correct answer						
n-nitroso, di-n-propylami	37	58.6	44.6	8.4	21.4-67.9 µg/L	62
Your result is marginally acceptable, review your procedure						

Satisfactory performance for Nitrosamines.
Your score = 100%

A correct answer for a parameter does not automatically grant a laboratory certification or registration. Refer to Chp. NR. 149, Wis. Adm. Code
* True value is based on a calculated value of the added analyte.
The next shipment will be sent from Madison May 10, 1994. You will get samples at that time to repeat any current wrong or outlying results.

Environmental Proficiency Testing -- Report of results

17 March 1994
E1_94 -- Organic Analytes

0234
Laboratory Supervisor
Oneida Research & Technology
1609 Western, PO Box 12435
Green Bay, WI 54307-2435

Parameter Tested	Number Reporting	True* Value	Mean	SD	Acceptable Range	Your Answer
GC/MS Naphthalene	29	60.0	45.7	11.1	14.9-76.4 µg/L	51
Your result is a correct answer						
GC/MS Acenaphthene	29	25.8	20.4	5.1	6.3-34.5 µg/L	22
Your result is a correct answer						
GC/MS Anthracene	27	32.6	27.2	5.6	11.8-42.7 µg/L	No reply
Your laboratory did not report a result for this analyte.						
GC/MS Pyrene	29	78.3	71.3	13.5	33.6-108.9 µg/L	85
Your result is a correct answer						
GC/MS Benzo(a)pyrene	23	7.84	6.28	1.81	1.24-11.32 µg/L	6
Your result is a correct answer						

Satisfactory performance for PAH's by GC/MS.
Your score = 80%

4,4 - DDD	39	4.10	3.65	0.88	1.21-6.09 µg/L	3.9
Your result is a correct answer						
4,4 - DDE	39	9.40	7.86	2.11	1.98-13.74 µg/L	8.8
Your result is a correct answer						
4,4 - DDT	39	12.8	10.2	2.9	2.0-18.3 µg/L	11
Your result is a correct answer						
Heptachlor	39	6.00	4.83	1.22	1.44-8.23 µg/L	5.6
Your result is a correct answer						
Heptachlor epoxide	39	7.60	6.37	1.25	2.89-9.85 µg/L	6.8
Your result is a correct answer						

Satisfactory performance for Organochlorine Pesticides.
Your score = 100%

PCB Aqueous	39	7.95	7.43	1.43	3.45-11.40 µg/L	8.7
Your result is a correct answer						

Satisfactory performance for PCB's (aqueous).
Your score = 100%

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Environmental Proficiency Testing -- Report of results

17 March 1994
E1_94 -- Organic Analytes

0234
Laboratory Supervisor
Oneida Research & Technology
1609 Western, PO Box 12435
Green Bay, WI 54307-2435

Parameter Tested	Number Reporting	True* Value	Mean	SD	Acceptable Range	Your Answer
2-chlorophenol	39	54.9	40.9	8.4	17.6-64.2 µg/L	55
Your result is a correct answer						
2,4-dichlorophenol	41	30.7	22.4	4.6	9.6-35.1 µg/L	29
Your result is a correct answer						
2-nitrophenol	42	38.4	28.0	7.8	6.3-49.6 µg/L	42
Your result is a correct answer						
4-chloro, 3-methyl Phenol	41	66.1	50.7	10.6	21.2-80.1 µg/L	71
Your result is a correct answer						
4-nitrophenol	40	77.5	30.2	17.6	DL-79.3 µg/L	32
Your result is a correct answer						

Satisfactory performance for Phenols or Substituted Phenols.
Your score = 100%

2,4-D	23	12.40	9.01	2.26	2.73-15.28 µg/L	5.7
Your result is a correct answer						
2,4,5-TP	23	7.74	7.14	2.63	DL-14.46 µg/L	3.6
Your result is a correct answer						
Dicamba	17	4.56	3.27	1.01	0.46-6.09 µg/L	3.3
Your result is a correct answer						
Pentachloro. (herbicide)	13	4.44	3.87	1.99	DL-9.41 µg/L	2.0
Your result is a correct answer						
Dinoseb	19	4.47	2.50	1.58	DL-6.88 µg/L	0.8
Your result is a correct answer						

Satisfactory performance for Chlorinated Acid Herbicides.
Your score = 100%

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17 March 1994
E1_94 -- Organic Analytes

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Parameter Tested	Number Reporting	True* Value	Mean	SD	Acceptable Range	Your Answer
bis (2-chloroethoxy) Meth	35	88.2	71.4	15.0	29.6-113.1 µg/L	87
Your result is a correct answer						
bis (2-chloroethyl) Ether	36	59.0	50.9	12.4	16.4-85.3 µg/L	64
Your result is a correct answer						
bis (2-chloroisopropyl) E	35	68.8	56.4	11.4	24.7-88.1 µg/L	67
Your result is a correct answer						
4-bromophenyl phenyl Ethe	33	69.8	58.9	12.1	25.2-92.6 µg/L	69
Your result is a correct answer						
4-chlorophenyl phenyl Eth	34	40.5	35.5	8.5	11.8-59.2 µg/L	39
Your result is a correct answer						

Satisfactory performance for Haloethers.
Your score = 100%

GRO	70	251	248		188-314 µg/L	250
Your result is a correct answer						

Satisfactory performance for Gasoline Range Organics.
Your score = 100%

DRO	69	960	834		672-1248 µg/L	900
Your result is a correct answer						

Satisfactory performance for Diesel Range Organics.
Your score = 100%

TP	27	68.0	67.3	28.2	DL-145.9 mg/L	1100
Your result is an outlier						

Unsatisfactory performance for Total Recoverable Petroleum Hydrocarbons.
Your score = 0%

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17 March 1994
E1_94 -- Organic Analytes

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Parameter Tested	Number Reporting	True* Value	Mean	SD	Acceptable Range	Your Answer
t-methyl butyl Ether	65	27.2	25.9	5.2	11.4-40.3 µg/L	21
Your result is a correct answer						
Benzene	65	36.4	35.0	4.2	23.2-46.8 µg/L	32
Your result is a correct answer						
Toluene	65	25.3	25.0	2.6	17.6-32.4 µg/L	22
Your result is a correct answer						
Ethyl benzene	65	20.7	20.4	2.3	13.9-26.8 µg/L	17
Your result is a correct answer						
Total Xylenes	65	48.3	48.7	6.6	30.4-67.0 µg/L	43
Your result is a correct answer						
1,3,5 trimethyl Benzene	65	41.3	42.4	4.4	30.0-54.7 µg/L	38
Your result is a correct answer						
1,2,4 trimethyl Benzene	65	25.6	27.1	3.1	18.5-35.7 µg/L	24
Your result is a correct answer						

Satisfactory performance for Petroleum Volatile Organic Carbon.
Your score = 100%

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The next shipment will be sent from Madison May 10, 1994. You will get samples at that time to repeat any current wrong or outlying results.

ORTEK
ENVIRONMENTAL LABORATORY
9 Western Avenue
P.O. Box 12435
(414) 498-2222
(800) 236-4067
FAX (414) 498-4067
Green Bay, WI 54307-2435

February 22, 1994

Ms. Donna Wanek
U.S. DOE
P.O. Box 550
Richland, WA 99352

Dear Ms. Wanek,

The following is a corrective action follow up report for deficient parameters for the U.S. EPA WP031 study.

Molybdenum: Until recently, our detection limit was 100 ug/L for molybdenum. The optics in our instrument were recently serviced and some parts replaced. We now feel that we will be able to achieve lower detection limits.

Specific Conductivity: Vials were most likely switched (mislabeled) in the sample receiving area. We recently purchased a new meter that obtains more accurate readings. We had been using a field type meter.

TDS: Even though we obtained acceptable data on one of the vials, we do believe that the vials were switched at some point. At the time these sample were being analyzed, we were seeing an elevation in the TDS blanks due to a water problem. Since then, our water problem has been corrected.

Total Hardness: Possible vial switch again. To increase the accuracy of our data at low levels, we have purchased a class A buret that allows readings to the nearest one hundredth of a point.

Calcium, Magnesium, Sodium, Potassium: Vials switched in sample receiving.

Total Alkalinity: Vials switched. Class A buret was purchased to achieve greater accuracy in reading.

Chloride: Vials switched.

Fluoride: Vials switched. We have replaced our meter with a more accurate meter.

Sulfate: Vials switched.

Total Cyanide: We have been experiencing problems with the low

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level cyanides. We suspect poor fittings on the distillation apparatus, and have since replaced many of the parts in question.

PCB Aroclor 1260: The reported value was 5.65 ug/L and was obtained from the primary column. The value from the confirmation column was 5.26 (below the warning limit of 5.56). The rule of thumb is to report the lower of the two results. This is based on the assumption that it is more common for the interference peaks to falsely enhance the detected result than to affect the quantitation such that the reported result is too low. In this case, we reported the higher result based on the fact that the QC which was analyzed on the primary column was exhibiting recoveries closer to those expected than that of the confirmation column.

Chlordane: The reported result for chlordane was 14.38 ug/L (primary column) and 15.01 ug/L (confirmation column) . Sample # 3 2.71 ug/L (primary) and 3.01 ug/L (confirmation). For sample #4, the actual numbers were 8.21 and 2.21 respectively. We were unable to find anything which might account for this high bias. The daily checks and spikes were well within acceptable limits and would not account for this high bias.

These results were most disturbing to us since it appears that most of our deficiencies were due to improper vial labelling and or a switch in the vials.

Should you have any questions regarding this corrective action report, please feel free to contact me.

Sincerely,

Becki Detaege MT(ASCP)

Becki Detaege MT(ASCP)
Quality Assurance/Quality Control Officer

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WI041

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ALUMINUM	1	639	681	550- 784	579- 755	ACCEPTABLE
	2	124	140	107- 192	117- 173	ACCEPTABLE
ARSENIC	1	504	492	408- 587	430- 565	ACCEPTABLE
	2	73.8	74.3	56.7- 92.9	61.2- 88.4	ACCEPTABLE
BERYLLIUM	1	432	461	382- 533	401- 514	ACCEPTABLE
	2	219	240	198- 278	208- 268	ACCEPTABLE
CADMIUM	1	163	165	138- 194	145- 187	ACCEPTABLE
	2	59.3	61.0	50.8- 72.0	53.5- 69.4	ACCEPTABLE
COBALT	1	850	880	775- 980	801- 954	ACCEPTABLE
	2	50.7	53.8	45.4- 61.9	47.5- 59.8	ACCEPTABLE
CHROMIUM	1	710	730	604- 843	634- 813	ACCEPTABLE
	2	22.2	23.4	17.4- 29.0	18.9- 27.6	ACCEPTABLE
COPPER	1	596	601	524- 657	541- 640	ACCEPTABLE
	2	15.7	18.7	13.6- 24.1	14.9- 22.8	ACCEPTABLE
IRON	1	56.5	58.0	43.5- 72.5	47.2- 68.8	ACCEPTABLE
	2	1050	1100	950- 1270	991- 1230	ACCEPTABLE
MERCURY	1	10.2	9.38	7.31- 11.9	7.89- 11.3	ACCEPTABLE
	2	6.79	6.67	5.00- 8.48	5.44- 8.04	ACCEPTABLE
MANGANESE	1	584	600	536- 660	551- 644	ACCEPTABLE
	2	69.3	73.5	64.0- 82.7	66.4- 80.4	ACCEPTABLE
NICKEL	1	868	860	766- 952	789- 928	ACCEPTABLE
	2	337	340	296- 383	307- 372	ACCEPTABLE
LEAD	1	1180	1200	1060- 1350	1100- 1310	ACCEPTABLE
	2	706	738	636- 833	661- 809	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WI041

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
SELENIUM	1	239	228	156- 277	171- 262	ACCEPTABLE
	2	352	387	263- 486	296- 459	ACCEPTABLE
VANADIUM	1	900	940	832- 1040	860- 1020	ACCEPTABLE
	2	160	170	146- 188	151- 183	ACCEPTABLE
ZINC	1	817	842	737- 947	763- 921	ACCEPTABLE
	2	44.2	46.3	37.5- 56.1	39.8- 53.7	ACCEPTABLE
ANTIMONY	3	92.2	94.5	56.4- 119	64.3- 111	ACCEPTABLE
	4	173	189	108- 244	125- 227	ACCEPTABLE
SILVER	3	73.7	73.9	60.6- 86.8	63.9- 83.5	ACCEPTABLE
	4	25.8	25.8	21.1- 30.4	22.2- 29.2	ACCEPTABLE
THALLIUM	3	65.8	62.8	47.0- 77.3	50.8- 73.4	ACCEPTABLE
	4	549	539	421- 643	450- 615	ACCEPTABLE
MOLYBDENUM	3	< 100	24.5	18.6- 30.6	20.2- 29.0	UNUSABLE DATA
	4	< 100	81.6	64.4- 95.0	68.3- 91.1	UNUSABLE DATA
TITANIUM	3	132	130	109- 151	114- 145	ACCEPTABLE
	4	41.5	43.0	34.0- 53.4	36.5- 50.9	ACCEPTABLE
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	9.60	9.50	9.19- 9.75	9.26- 9.68	ACCEPTABLE
	4	4.64	4.70	4.62- 4.77	4.64- 4.75	ACCEPTABLE
SPEC. COND. (UMHOS/CM AT 25 C)	1	433	899	840- 980	857- 963	NOT ACCEPTABLE
	2	956	398	368- 435	377- 427	NOT ACCEPTABLE
TDS AT 180 C	1	474	577	396- 759	441- 713	ACCEPTABLE
	2	870	223	168- 284	183- 269	NOT ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WI041

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
TOTAL HARDNESS (AS CACO3)	1	90.0	279	236- 307	245- 298	NOT ACCEPTABLE
	2	274	57.4	51.2- 63.8	52.8- 62.2	NOT ACCEPTABLE
CALCIUM	1	7.15	110	87.4- 126	92.2- 121	NOT ACCEPTABLE
	2	101	7.00	5.95- 8.19	6.23- 7.91	NOT ACCEPTABLE
MAGNESIUM	1	9.89	0.960	0.771- 1.18	0.822- 1.13	NOT ACCEPTABLE
	2	0.967	9.70	8.38- 11.0	8.71- 10.6	NOT ACCEPTABLE
SODIUM	1	26.7	61.7	56.2- 67.8	57.6- 66.3	NOT ACCEPTABLE
	2	61.6	26.3	23.6- 29.2	24.3- 28.5	NOT ACCEPTABLE
POTASSIUM	1	40.5	7.50	6.39- 8.81	6.70- 8.50	NOT ACCEPTABLE
	2	7.43	40.0	34.5- 45.6	35.9- 44.2	NOT ACCEPTABLE
TOTAL ALKALINITY (AS CACO3)	1	11.6	120	106- 133	109- 130	NOT ACCEPTABLE
	2	120	11.0	7.85- 15.3	8.77- 14.3	NOT ACCEPTABLE
CHLORIDE	1	50.6	199	183- 213	187- 210	NOT ACCEPTABLE
	2	213	41.2	36.5- 45.4	37.6- 44.3	NOT ACCEPTABLE
FLUORIDE	1	1.30	3.30	2.83- 3.77	2.95- 3.65	NOT ACCEPTABLE
	2	3.30	0.380	0.319-0.457	0.336-0.439	NOT ACCEPTABLE
SULFATE	1	14.3	14.0	10.8- 16.8	11.5- 16.0	ACCEPTABLE
	2	106	92.0	78.1- 105	81.5- 102	NOT ACCEPTABLE
NUTRIENTS IN MILLIGRAMS PER LITER:						
AMMONIA-NITROGEN	1	7.91	7.70	6.10- 9.16	6.47- 8.79	ACCEPTABLE
	2	0.80	0.730	0.491-0.982	0.550-0.923	ACCEPTABLE
NITRATE-NITROGEN	1	0.56	0.520	0.378-0.658	0.412-0.625	ACCEPTABLE
	2	10.8	11.0	8.84- 13.0	9.34- 12.5	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WI041

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
NUTRIENTS IN MILLIGRAMS PER LITER:						
ORTHOPHOSPHATE	1	0.13	0.150	0.114-0.187	0.122-0.178	ACCEPTABLE
	2	4.05	4.10	3.48- 4.68	3.62- 4.54	ACCEPTABLE
KJELDAHL-NITROGEN	3	13.4	14.0	10.3- 17.1	11.1- 16.3	ACCEPTABLE
	4	0.70	0.710	0.226- 1.32	0.357- 1.19	ACCEPTABLE
TOTAL PHOSPHORUS	3	6.43	7.40	5.57- 8.05	5.86- 7.75	ACCEPTABLE
	4	0.40	0.490	0.341-0.569	0.369-0.542	ACCEPTABLE
DEMANDS IN MILLIGRAMS PER LITER:						
COD	1	70.0	70.8	52.4- 84.6	56.5- 80.5	ACCEPTABLE
	2	200	207	163- 230	172- 221	ACCEPTABLE
5-DAY BOD	1	52.0	44.9	26.1- 60.1	30.3- 55.8	ACCEPTABLE
	2	136	131	75.4- 180	88.5- 167	ACCEPTABLE
CARBONACEOUS BOD	1	36.7	38.5	16.5- 60.4	22.5- 54.4	ACCEPTABLE
	2	95.0	112	52.8- 171	69.0- 155	ACCEPTABLE
PCB'S IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1254	1	2.06	1.87	0.988- 2.71	1.21- 2.49	ACCEPTABLE
PCB-AROCLOR 1260	2	5.65	4.63	2.79- 5.96	3.19- 5.56	CHECK FOR ERRO
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1016/1242	2	33.2	35.3	8.02- 46.6	13.0- 41.6	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WI041

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1254	1	47.0	43.9	13.5- 61.8	19.8- 55.5	ACCEPTABLE
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	3	14.4	8.21	4.91- 9.72	5.52- 9.11	NOT ACCEPTABLE
	4	2.71	2.21	1.07- 2.77	1.29- 2.56	CHECK FOR ERROR
ALDRIN	1	0.44	0.539	0.122-0.754	0.202-0.674	ACCEPTABLE
	2	0.08	0.086	.0171-0.121	.0303-0.108	ACCEPTABLE
DIELDRIN	1	0.48	0.475	0.203-0.710	0.267-0.645	ACCEPTABLE
	2	0.20	0.173	.0861-0.239	0.106-0.219	ACCEPTABLE
DDD	1	0.68	0.866	0.433- 1.15	0.524- 1.06	ACCEPTABLE
	2	0.20	0.202	.0956-0.268	0.117-0.246	ACCEPTABLE
DDE	1	0.52	0.539	0.235-0.756	0.301-0.690	ACCEPTABLE
	2	0.21	0.173	.0788-0.236	.0989-0.216	ACCEPTABLE
DDT	1	0.58	0.796	0.362- 1.06	0.450-0.972	ACCEPTABLE
	2	0.16	0.142	.0570-0.216	.0772-0.196	ACCEPTABLE
HEPTACHLOR	1	0.53	0.669	0.187-0.918	0.279-0.825	ACCEPTABLE
	2	0.20	0.216	.0756-0.269	0.100-0.245	ACCEPTABLE
HEPTACHLOR EPOXIDE	1	0.40	0.478	0.260-0.640	0.308-0.592	ACCEPTABLE
	2	0.17	0.174	.0858-0.235	0.105-0.216	ACCEPTABLE
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	12.8	15.1	10.2- 20.4	11.5- 19.1	ACCEPTABLE
	2	50.1	55.8	36.2- 73.4	40.9- 68.7	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: WI041

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
CHLOROFORM	1	9.26	11.8	7.85- 15.0	8.06- 14.8	ACCEPTABLE
	2	54.7	64.4	38.3- 86.7	44.4- 80.6	ACCEPTABLE
1,1,1 TRICHLOROETHANE	1	11.2	13.4	8.68- 18.2	9.89- 17.0	ACCEPTABLE
	2	31.1	37.8	22.7- 50.0	26.2- 46.6	ACCEPTABLE
TRICHLOROETHENE	1	6.10	7.57	5.10- 10.3	5.75- 9.62	ACCEPTABLE
	2	54.4	62.7	38.6- 80.5	43.9- 75.2	ACCEPTABLE
CARBONTETRACHLORIDE	1	13.2	16.4	10.9- 22.2	12.3- 20.8	ACCEPTABLE
	2	33.5	37.1	23.0- 50.1	26.4- 45.6	ACCEPTABLE
TETRACHLOROETHENE	1	8.68	9.24	6.08- 12.5	6.89- 11.7	ACCEPTABLE
	2	50.8	51.3	31.2- 66.7	35.7- 62.2	ACCEPTABLE
BROMODICHLOROMETHANE	1	8.42	10.8	7.33- 14.2	8.21- 13.3	ACCEPTABLE
	2	34.1	38.1	24.9- 53.6	28.5- 50.0	ACCEPTABLE
DIBROMOCHLOROMETHANE	1	11.3	13.1	8.48- 17.0	9.55- 15.9	ACCEPTABLE
	2	58.9	58.1	34.1- 80.2	39.9- 74.4	ACCEPTABLE
BROMOFORM	1	14.7	14.5	7.45- 20.0	9.04- 18.4	ACCEPTABLE
	2	47.5	42.3	25.5- 59.9	29.9- 55.6	ACCEPTABLE
METHYLENE CHLORIDE	1	9.50	10.6	6.59- 16.1	7.79- 14.9	ACCEPTABLE
	2	44.3	54.1	30.7- 76.5	36.5- 70.7	ACCEPTABLE
CHLOROBENZENE	1	12.7	16.0	11.4- 20.1	12.5- 19.0	ACCEPTABLE
	2	54.6	63.7	41.3- 79.8	46.2- 74.9	ACCEPTABLE
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
BENZENE	1	33.8	40.1	25.7- 56.0	29.5- 52.2	ACCEPTABLE
	2	6.66	8.25	5.24- 11.6	6.04- 10.8	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WP031

LABORATORY: #1041

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
ETHYLBENZENE	1	56.3	66.9	36.0- 94.3	43.4- 86.9	ACCEPTABLE
	2	10.6	14.0	9.26- 19.0	10.5- 17.8	ACCEPTABLE
TOLUENE	1	41.5	49.2	30.2- 65.2	34.6- 60.8	ACCEPTABLE
	2	7.59	9.51	6.09- 12.8	6.93- 11.9	ACCEPTABLE
1,2-DICHLOROBENZENE	1	53.4	65.5	32.7- 93.9	40.5- 86.2	ACCEPTABLE
	2	8.28	8.88	5.85- 11.7	6.59- 11.0	ACCEPTABLE
1,3-DICHLOROBENZENE	1	41.4	47.9	29.4- 61.7	33.5- 57.6	ACCEPTABLE
	2	15.1	16.6	11.6- 21.1	12.9- 19.9	ACCEPTABLE
1,4-DICHLOROBENZENE	1	54.5	62.5	34.4- 85.8	41.0- 79.3	ACCEPTABLE
	2	12.2	12.4	7.49- 17.8	8.79- 16.5	ACCEPTABLE
MISCELLANEOUS PARAMETERS:						
TOTAL CYANIDE	1	0.748	0.860	0.598- 1.15	0.668- 1.08	ACCEPTABLE
(IN MG/L)	2	0.096	0.160	0.102-0.208	0.116-0.194	NOT ACCEPTABLE
NON-FILTERABLE RESIDUE	1	56.0	61.0	47.7- 64.6	49.8- 62.5	ACCEPTABLE
(IN MG/L)	2	75.0	83.0	62.8- 91.3	66.4- 87.8	ACCEPTABLE
OIL AND GREASE	1	43.0	8.30	3.07- 12.2	4.22- 11.0	NOT ACCEPTABLE
(IN MG/L)	2	< 5.00	48.4	33.7- 56.0	36.5- 53.2	NOT ACCEPTABLE
TOTAL PHENOLICS	1	0.320	0.595	0.312-0.878	0.384-0.805	CHECK FOR ERRO
(IN MG/L)	2	3.40	3.13	1.66- 4.60	2.04- 4.23	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION

January 1994

Prepared for

Ortek

1609 Western Avenue
Green Bay, WI 54303

2993

APG The Measure of Quality
Analytical Products Group, Inc.
2730 Washington Blvd., Belpre, OH 45714 800-272-4442 614-423-4200

INTRODUCTION

The Proficiency Environmental Testing Program is designed to evaluate your laboratory's performance against other participating laboratories on the same set of standards. Standard levels have been chosen to assist you in ensuring that the procedure is in-control. In most cases, standard levels are not designed to challenge the detection limits of the method.

The following information is provided to assist you in the evaluation of the report. All statistical measures have been calculated based upon generally accepted formulae.

Your Result: Every effort has been made to insure correct data entry. Should you find a data entry error please notify Analytical Products Group and we will adjust the data and reissue the report.

Reference Value: The reported Reference Value is the calculated True Value of the standard based upon the actual composition of the standard.

Mean of Reporting Laboratories: This value is the Mean value of all reporting laboratories after Outliers have been removed. Please note the normalization of Solids data discussed below.

Standard Deviation: This parameter is also calculated on the data set after Outliers have been removed.

Outliers: Outliers are evaluated based upon the ASTM recommended t Test at the 0.05 significance level. Outliers are marked in the report for rapid identification. APG will provide additional information on Outliers as requested. Outliers do not necessarily indicate poor performance. They can be caused by a faulty standard, calculation errors, or a dilution error. However, a review of each element of the analytical process is

indicated. If we can assist you in resolving why a value was an Outlier, please contact APG.

Solids Standards: Solids standards are individually prepared and each standard has a unique Reference Value. In order to allow comparison between laboratories, the reported Means and Standard Deviation have been normalized based upon the following formula:

X = (Reference Value-Your Result)/Reference Value

The resulting statistics are therefore reported as relative values. The Relative Error is related to the Mean and the Relative Deviation is related to the Standard Deviation.

Deviation from the Mean or z score: This result is an expression of how far your reported value was from the Mean of all reporting laboratories in terms of number of Standard Deviations. As a point of reference, EPA Warning Limits are 1.96 deviations from the Mean and EPA Acceptance Limits are 2.58 deviations from the Mean.

Comment Line: Following the Deviation from the Mean for each parameter is a Comment line. The Comment line may have one of the four entries:

Entry	Description
Unreported	No data was submitted
Warning	Data between 1.97 and 2.58 Deviations Data outside 95% Confidence Interval
Unacceptable	Data more than 2.58 Deviations Data outside 99% Confidence Interval
Blank	Data within 95% Confidence Interval

PERFORMANCE EVALUATION

These notations can be used as a guideline in evaluating your performance.

Comment Section: This section contains comments submitted to Analytical Products Group by program participants. It also contains comments from APG to participants concerning unusual characteristics of the data set or problems with standards which could influence the interpretation of the data.

Performances Evaluation Summary: This section summarizes performance data in a format similar to the USEPA DMR-QA Report. Detailed information on each parameter is included in the main report.

Certification: This program meets the requirements ISO/REMCO N263 which is the protocol for Proficiency Testing of Analytical Laboratories. This program is also a part of the ISO 9001 registered quality system of APG as audited by the American Association for Laboratory Accreditation

Submitted: February 17, 1994

Thomas V. Coyner
General Manager

Performance Evaluation Summary

Customer Code: 2993 | January, 1994 | Page: 1

Parameter	Level	Reported	Ref Value	Mean	Std Dev	Acceptance Range	Comment
Standard: Total Organic Halide ug/L							
Total Organic Halide	1	9.9	14.570	14.806	2.591	8.121 - 21.491	
Total Organic Halide	2	230	196.690	192.771	25.510	126.956 - 258.585	
Standard: Fuels-Gasoline mg/L							
Gasoline Range Fuels	1	0.36	0.268	0.223	0.073	0.034 - 0.412	
Gasoline Range Fuels	2	0.93	0.709	0.595	0.153	0.200 - 0.989	Warning
Standard: Fuels-Diesel mg/L							
Diesel Range Fuels	1	0.59	0.664	0.472	0.219	0.000 - 1.037	
Diesel Range Fuels	2	1.6	1.309	1.005	0.430	0.000 - 2.115	
Standard: Total Petroleum Hydrocarbons mg/L							
TPH by 418.1	1	17.0	7.880	9.880	2.905	2.385 - 17.376	Warning
TPH by 418.1	2	64.0	40.580	49.514	11.203	20.609 - 78.418	

APG The Measure of Quality
2730 Washington Blvd., Belpre, OH 45714 800-272-4442 614-423-4200

PERFORMANCE EVALUATION

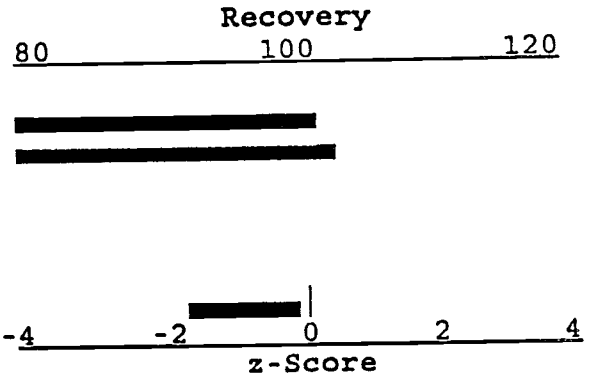
PERFORMANCE EVALUATION

Customer Code: 2993 **January 1994** Page: 1

Standard: Total Organic Halide

Parameter: Total Organic Halide ug/L **Level 1**

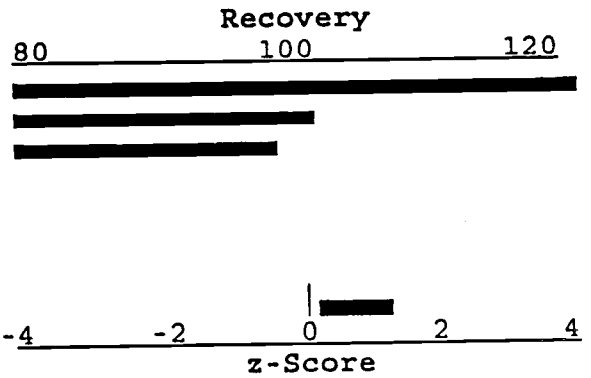
Your Result:	9.9
Reference Value:	14.570
Mean of Reporting Laboratories:	14.806
Actual Standard Deviation:	2.591
Number Reporting:	10
Average % Recovery:	101.620
Your % Recovery:	67.948
Deviation from Mean - z Score:	1.894



Comment:

Parameter: Total Organic Halide ug/L **Level 2**

Your Result:	230
Reference Value:	196.690
Mean of Reporting Laboratories:	192.771
Actual Standard Deviation:	25.510
Number Reporting:	12
Average % Recovery:	98.007
Your % Recovery:	116.935
Deviation from Mean - z Score:	1.459



Comment:

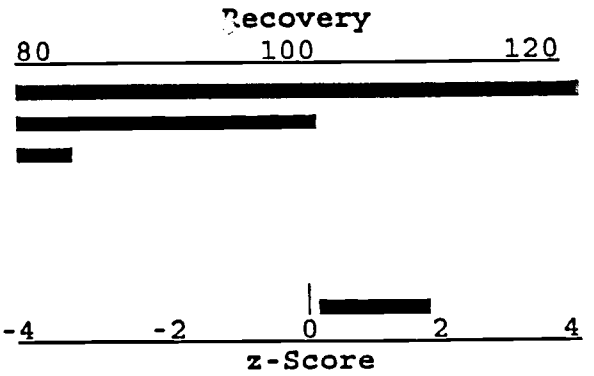
PERFORMANCE EVALUATION

Customer Code: 2993 **January 1994** Page: 2

Standard: Fuels-Gasoline

Parameter: Gasoline Range Fuels **mg/L** **Level 1**

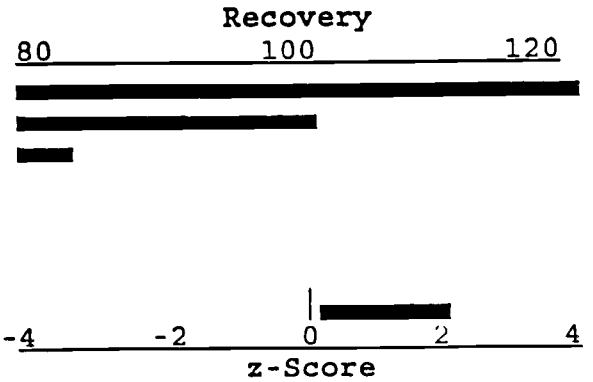
Your Result:	0.36
Reference Value:	0.268
Mean of Reporting Laboratories:	0.223
Actual Standard Deviation:	0.073
Number Reporting:	20
Average % Recovery:	83.228
Your % Recovery:	134.328
Deviation from Mean - z Score:	1.873



Comment:

Parameter: Gasoline Range Fuels **mg/L** **Level 2**

Your Result:	0.93
Reference Value:	0.709
Mean of Reporting Laboratories:	0.595
Actual Standard Deviation:	0.153
Number Reporting:	19
Average % Recovery:	83.884
Your % Recovery:	131.171
Deviation from Mean - z Score:	2.191



Comment: **Warning**

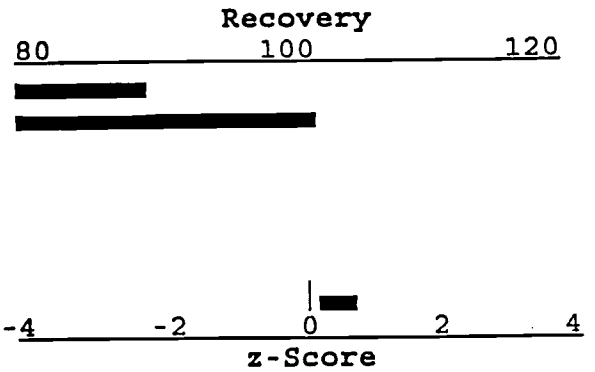
PERFORMANCE EVALUATION

Customer Code: 2993 **January 1994** Page: 3

Standard: Fuels-Diesel

Parameter: Diesel Range Fuels **mg/L** **Level 1**

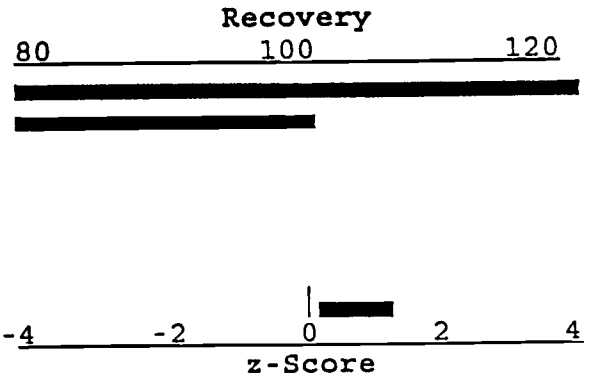
Your Result:	0.59
Reference Value:	0.664
Mean of Reporting Laboratories:	0.472
Actual Standard Deviation:	0.219
Number Reporting:	21
Average % Recovery:	71.063
Your % Recovery:	88.855
Deviation from Mean - z Score:	0.539



Comment:

Parameter: Diesel Range Fuels **mg/L** **Level 2**

Your Result:	1.6
Reference Value:	1.309
Mean of Reporting Laboratories:	1.005
Actual Standard Deviation:	0.430
Number Reporting:	21
Average % Recovery:	76.762
Your % Recovery:	122.231
Deviation from Mean - z Score:	1.383



Comment:

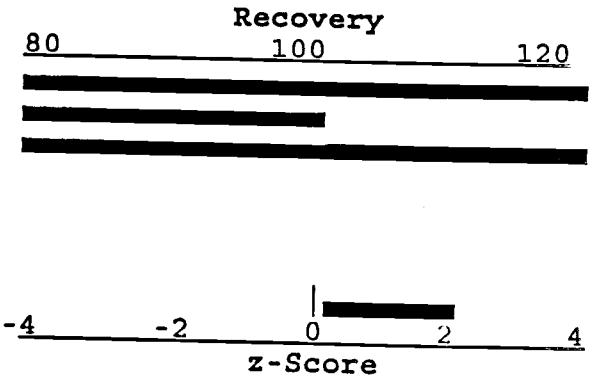
PERFORMANCE EVALUATION

Customer Code: 2993 January 1994

Standard: Total Petroleum Hydrocarbons

Parameter: TPH by 418.1 mg/L Level 1

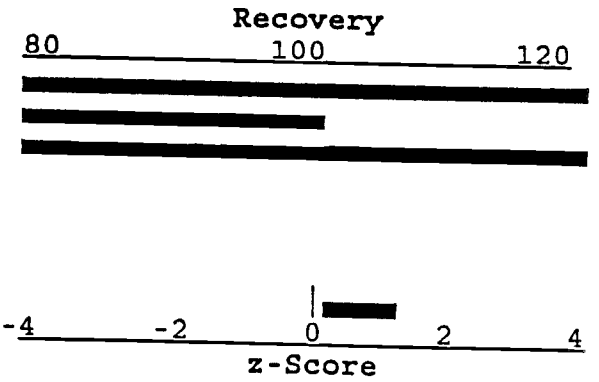
Your Result:	17.0
Reference Value:	7.880
Mean of Reporting Laboratories:	9.880
Actual Standard Deviation:	2.905
Number Reporting:	22
Average % Recovery:	125.386
Your % Recovery:	215.736
Deviation from Mean - z Score:	2.451



Comment: Warning

Parameter: TPH by 418.1 mg/L Level 2

Your Result:	64.0
Reference Value:	40.580
Mean of Reporting Laboratories:	49.514
Actual Standard Deviation:	11.203
Number Reporting:	22
Average % Recovery:	122.015
Your % Recovery:	157.713
Deviation from Mean - z Score:	1.293



Comment:

e Metals		Level 1	Level 2	Test Method
uminum	ug/L			
timony	ug/L			
senic	ug/L			
rium	ug/L			
ryllium	ug/L			
ron	ug/L			
dmium	ug/L			
romium	ug/L			
balt	ug/L			
pper	ug/L			
n	ug/L			
ad	ug/L			
nganese	ug/L			
cury	ug/L			
ybdenum	ug/L			
kel	ug/L			
enium	ug/L			
er	ug/L			
llium	ug/L			
adium	ug/L			
	ug/L			
nol	mg/L			
nide	mg/L			
idual Chlorine	mg/L			
ninum High Level	mg/L			
ride	mg/L			
l Organic Halides (TOX)	ug/L	9.9	230	9020
avalent Chromium	mg/L			
ium	ug/L			

JAN 1994

2993

VOLATILES

		Level 1	Level 2	Test Method
Benzene	ug/L			
Chlorobenzene	ug/L			
1,2-Dichlorobenzene	ug/L			
1,3-Dichlorobenzene	ug/L			
1,4-Dichlorobenzene	ug/L			
Ethyl benzene	ug/L			
Toluene	ug/L			
Bromodichloromethane	ug/L			
Bromoform	ug/L			
Bromomethane	ug/L			
Carbon tetrachloride	ug/L			
Chloroethane	ug/L			
2-Chloroethylvinyl ether	ug/L			
Chloroform	ug/L			
Chloromethane	ug/L			
Dibromochloromethane	ug/L			
Dichlorodifluoromethane	ug/L			
1,1-Dichloroethane	ug/L			
1,2-Dichloroethane	ug/L			
1,1-Dichloroethene	ug/L			
trans-1,2-Dichloroethene	ug/L			
1,2-Dichloropropane	ug/L			
cis-1,3-Dichloropropene	ug/L			
trans-1,3-Dichloropropene	ug/L			
Methylene chloride	ug/L			

TMA/ARLI

PERVORMANCE EVALUATION SAMPLE SUMMARY SHEET

Laboratory: TMA/ARLI

PE Sample	Number Accepable	Number Analyzed	% Acceptable
WS-032			
Metals	13	19	68.4
Inorganics	12	12	100.0
WS-033			
Metals	18	18	100.0
Inorganics/Minerals	13	13	100.0
Organic	42	44	95.5
WP-30			
Metals	22	22	100.0
Inorganic/Minerals	44	46	95.6
Organic	54	54	100.0

TMA/ARLI
THERMO ANALYTICAL

WATER SUPPLY STUDY
~~WP~~-032
WS

'quality environmental services'

PERFORMANCE EVALUATION REPORT DATE: 8/13/93

WATER SUPPLY STUDY NUMBER WS032

LABORATORY CA204

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
TRACE METALS IN MICROGRAMS PER LITER:					
ALUMINUM	1	262.8	309	274- 335	NOT ACCEPTABLE
ANTIMONY	2	4.4	5.58	3.34- 7.41	ACCEPTABLE
ARSENIC	1	88	91.4	76.5- 103	ACCEPTABLE
BARIUM	2	508.4	511	434- 588	ACCEPTABLE
BERYLLIUM	1	1.52	0.933	0.699- 1.17	NOT ACCEPTABLE
BORON	2	927 **	864	810- 1010	ACCEPTABLE
CADMIUM	1	4.7	4.80	3.84- 5.76	ACCEPTABLE
CHROMIUM	1	68.3	68.1	57.9- 78.3	ACCEPTABLE
COPPER	1	726	820	738- 902	NOT ACCEPTABLE
LEAD	1	4.4	5.16	3.61- 6.71	ACCEPTABLE
MANGANESE	1	217.5	221	203- 234	ACCEPTABLE
MERCURY	1	10.3	6.23	4.36- 8.10	NOT ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT BIAS IS ANTICIPATED FOR THIS RESULT.

LAB ACCREDITATION PROGRAM
AUG 27 1993
CAL DEPT HEALTH SERVICES

PERFORMANCE EVALUATION REPORT DATE: 3/13/93

WATER SUPPLY STUDY NUMBER WS032

LABORATORY CA204

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
TRACE METALS IN MICROGRAMS PER LITER:					
MOLYBDENUM	2	7.4	6.58	4.80- 8.58	ACCEPTABLE
NICKEL	1	96.0	95.2	80.9- 109	ACCEPTABLE
SELENIUM	1	6.6	65.9	52.7- 79.1	NOT ACCEPTABLE
SILVER	2	25	25.1	21.2- 29.4	ACCEPTABLE
THALLIUM	2	2.2	2.56	1.79- 3.33	ACCEPTABLE
VANADIUM	1	170.6	160	143- 174	ACCEPTABLE
ZINC	1	93.2	83.8	72.7- 91.1	NOT ACCEPTABLE
NITRATE/NITRITE/FLUORIDE IN MILLIGRAMS PER LITER:					
NITRATE AS N	1	3.48	3.60	3.24- 3.96	ACCEPTABLE
NITRITE AS N	1	2.23	2.30	1.95- 2.64	ACCEPTABLE
FLUORIDE	1	1.87	2.00	1.80- 2.20	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 8/13/93

WATER SUPPLY STUDY NUMBER WS032

LABORATORY CA204

ANALYTES	SAMPLE NUMBER	REPORTED VALUE		TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
MISCELLANEOUS ANALYTES:						
RESIDUAL FREE CHLORINE (MILLIGRAMS PER LITER)	1	1.15	**	1.09	0.805- 1.21	ACCEPTABLE
TURBIDITY (NTU'S)	1	4.3	**	4.10	3.76- 4.93	ACCEPTABLE
TOTAL FILTERABLE RESIDUE (MILLIGRAMS PER LITER)	1	257	**	275	201- 463	ACCEPTABLE
CALCIUM (MG. CACO3/L)	1	154		160	149- 172	ACCEPTABLE
PH-UNITS	1	9.12		9.12	8.85- 9.34	ACCEPTABLE
ALKALINITY (MG. CACO3/L)	1	30.4	**	29.0	27.0- 33.6	ACCEPTABLE
SODIUM (MILLIGRAMS PER LITER)	1	14.2		13.3	11.9- 14.8	ACCEPTABLE
SULFATE (MILLIGRAMS PER LITER)	1	27.5		27.0	24.7- 29.4	ACCEPTABLE
TOTAL CYANIDE (MILLIGRAMS PER LITER)	1	0.402		0.400	0.300-0.500	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT BIAS IS ANTICIPATED FOR THIS RESULT.

TMA/ARLI
THERMO ANALYTICAL

63.7

35/38 = 92.1

= 100

WATER POLLUTION STUDY
WP-030

'quality environmental services'

PERFORMANCE EVALUATION REPORT

DATE: 6/22/93

WATER POLLUTION STUDY NUMBER WP030

LABORATORY: CA208

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ALUMINUM	1	1023	1100	898- 1300	949- 1250	ACCEPTABLE
	2	3535	4000	3370- 4570	3520- 4410	ACCEPTABLE
ARSENIC	1	235	280	225- 334	238- 320	CHECK FOR ERROR
BERYLLIUM	1	85.5	63.0	51.1- 74.5	54.1- 71.5	NOT ACCEPTABLE
CADMIUM	1	8.3	8.12	6.30- 10.3	6.80- 9.79	ACCEPTABLE
	2	95.5	93.9	78.3- 110	82.2- 106	ACCEPTABLE
COBALT	1	525.6	480	416- 536	431- 521	CHECK FOR ERROR
	2	266.3	240	206- 275	214- 266	CHECK FOR ERROR
CHROMIUM	1	60.5	62.0	49.2- 73.7	52.3- 70.6	ACCEPTABLE
	2	455	460	378- 533	397- 514	ACCEPTABLE
COPPER	1	61.1	62.0	53.5- 69.8	55.6- 67.8	ACCEPTABLE
	2	419	410	365- 462	377- 450	ACCEPTABLE
IRON	1	4097	3800	3350- 4230	3460- 4120	ACCEPTABLE
	2	957	850	755- 963	781- 937	NOT ACCEPTABLE
MERCURY	1	1.85	0.983	0.620- 1.42	0.719- 1.32	NOT ACCEPTABLE
	2	3.95	2.10	1.57- 2.75	1.72- 2.61	NOT ACCEPTABLE
MANGANESE	1	2.278	2200	1950- 2450	2010- 2390	NOT ACCEPTABLE
	2	240.2	221	196- 248	202- 239	CHECK FOR ERROR
NICKEL	1	110.3	130	111- 150	116- 145	NOT ACCEPTABLE
	2	1281	1300	1160- 1450	1200- 1420	ACCEPTABLE
LEAD	1	75	79.2	62.7- 97.1	67.0- 92.8	ACCEPTABLE
	2	448	450	393- 513	408- 498	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

LAB ACCREDITATION PROGRAM

JUL 9 1993

CAL DEPT HEALTH SERVICES

PERFORMANCE EVALUATION REPORT

DATE: 6/22/93

WATER POLLUTION STUDY NUMBER WP030

LABORATORY: CA204

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
SELENIUM	1	19	23.0	14.3- 29.1	16.1- 27.3	ACCEPTABLE
	2	65.7	79.1	52.8- 94.6	58.1- 89.3	ACCEPTABLE
VANADIUM	1	8863	8000	7110- 8830	7330- 8610	NOT ACCEPTABLE
	2	17450	15000	12700-17800	13300-16800	NOT ACCEPTABLE
ZINC	1	1200	1100	961- 1220	993- 1190	CHECK FOR ERROR
	2	270.7	240	209- 271	216- 253	CHECK FOR ERROR
ANTIMONY	3	111	116	79.4- 140	87.2- 133	ACCEPTABLE
	4	13	14.0	7.01- 20.4	8.73- 18.7	ACCEPTABLE
SILVER	3	3.2	2.39	1.80- 2.96	1.95- 2.82	NOT ACCEPTABLE
	4	9.0	9.75	7.80- 11.5	8.25- 11.0	ACCEPTABLE
THALLIUM	3	80.6	90.2	70.7- 108	75.5- 103	ACCEPTABLE
	4	9.3	9.00	6.71- 11.3	7.29- 10.7	ACCEPTABLE
MOLYBDENUM	3	6.7	6.48	3.34- 8.82	4.04- 8.12	ACCEPTABLE
	4	45.3	39.0	30.3- 47.9	32.6- 45.6	ACCEPTABLE
STRONTIUM	3	5.0	4.01	3.01- 4.99	3.26- 4.73	NOT ACCEPTABLE
	4	52	51.0	41.4- 60.1	43.8- 57.7	ACCEPTABLE
TITANIUM	3	68.7	66.0	51.5- 76.5	54.7- 73.3	ACCEPTABLE
	4	201.2	182	149- 205	156- 198	CHECK FOR ERROR
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	8.79	8.70	8.31- 9.05	8.40- 8.96	ACCEPTABLE
	4	6.09	6.10	5.95- 6.22	5.99- 6.19	ACCEPTABLE
SPEC. COND. (UMHOS/CM AT 25 C)	1	238	253	226- 279	232- 268	ACCEPTABLE
	2	882	868	819- 916	831- 904	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 5/22/93

WATER POLLUTION STUDY NUMBER WP030

LABORATORY: CA204

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
TDS AT 180 C	1	100	116	76.2- 166	87.5- 155	ACCEPTABLE
	2	518	480	385- 617	414- 588	ACCEPTABLE
TOTAL HARDNESS (AS CACO3)	1	82.3	75.6	66.7- 84.1	68.8- 82.0	CHECK FOR ERROR
	2	229.3	225	209- 242	213- 238	ACCEPTABLE
CALCIUM	1	5.366	3.69	3.00- 4.87	3.18- 4.29	NOT ACCEPTABLE
	2	99.99	80.9	73.4- 90.2	75.5- 88.1	NOT ACCEPTABLE
MAGNESIUM	1	20.15	16.1	14.0- 18.1	14.5- 17.6	NOT ACCEPTABLE
	2	6.045	5.64	4.84- 6.32	5.03- 6.13	ACCEPTABLE
SODIUM	1	18.57	15.9	14.0- 17.9	14.5- 17.4	NOT ACCEPTABLE
	2	67.02	65.6	59.6- 72.0	61.2- 70.4	ACCEPTABLE
POTASSIUM	1	2.476	2.60	2.05- 3.22	2.19- 3.08	ACCEPTABLE
	2	18.40	19.0	16.2- 21.9	16.9- 21.1	ACCEPTABLE
TOTAL ALKALINITY (AS CACO3)	1	22.8	21.1	17.2- 26.1	18.3- 25.0	ACCEPTABLE
	2	96.9	97.0	85.0- 109	88.0- 106	ACCEPTABLE
CHLORIDE	1	59.1	54.3	48.2- 59.1	49.6- 57.8	CHECK FOR ERROR
	2	176.8	178	166- 191	170- 188	ACCEPTABLE
FLUORIDE	1	2.32	2.40	2.09- 2.65	2.16- 2.58	ACCEPTABLE
	2	0.76	0.230	0.175-0.286	0.189-0.272	NOT ACCEPTABLE
SULFATE	1	8.91	9.10	6.48- 11.4	7.10- 10.8	ACCEPTABLE
	2	41.5	42.0	35.2- 48.1	36.8- 46.5	ACCEPTABLE
NUTRIENTS IN MILLIGRAMS PER LITER:						
AMMONIA-NITROGEN	1	4.83	5.50	4.35- 6.65	4.62- 6.37	ACCEPTABLE
	2	9.02	9.80	7.80- 11.6	8.25- 11.2	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 5/22/83

WATER POLLUTION STUDY NUMBER WP030

LABORATORY: CA204

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
NUTRIENTS IN MILLIGRAMS PER LITER:						
NITRATE-NITROGEN	1	33.9	34.0	27.5- 40.2	29.0- 38.7	ACCEPTABLE
	2	7.51	7.10	5.70- 8.43	6.03- 8.10	ACCEPTABLE
ORTHOPHOSPHATE	1	0.96	0.830	0.692-0.961	0.724-0.929	CHECK FOR ERROR
	2	0.151	0.090	.0617-0.122	.0689-0.115	NOT ACCEPTABLE
KJELDAHL-NITROGEN	3	9.54	9.30	6.67- 11.5	7.26- 10.9	ACCEPTABLE
	4	19.6	19.0	13.9- 23.1	15.0- 22.0	ACCEPTABLE
TOTAL PHOSPHORUS	3	3.12	3.20	2.35- 3.57	2.49- 3.42	ACCEPTABLE
	4	1.72	1.60	1.25- 1.94	1.33- 1.86	ACCEPTABLE
DEMANDS IN MILLIGRAMS PER LITER:						
COD	1	19.9	21.8	12.6- 30.5	14.9- 28.2	ACCEPTABLE
	2	32.3	35.4	23.6- 43.0	26.0- 40.5	ACCEPTABLE
PCB'S IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1016/1242	2	4.228	4.29	1.86- 5.71	2.35- 5.22	ACCEPTABLE
PCB-AROCLOR 1232	1	1.292	1.43	0.657- 1.79	0.800- 1.64	ACCEPTABLE
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1016/1242	1	14.94	21.5	5.04- 27.6	7.92- 24.7	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 5/22/93

WATER POLLUTION STUDY NUMBER WP030

LABORATORY: CA208

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1260	2	32.95	36.6	7.82- 57.8	14.2- 51.4	ACCEPTABLE
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	3	0.919	0.964	0.469- 1.32	0.575- 1.21	ACCEPTABLE
	4	8.923	9.49	5.38- 12.4	6.26- 11.5	ACCEPTABLE
ALDRIN	1	0.124	0.159	.0344-0.214	.0572-0.191	ACCEPTABLE
	2	0.329	0.444	.0957-0.577	0.156-0.517	ACCEPTABLE
DIELDRIN	1	0.106	0.121	.0572-0.163	.0704-0.150	ACCEPTABLE
	2	0.474	0.553	0.270-0.750	0.330-0.690	ACCEPTABLE
DDD	1	0.198	0.216	.0863-0.317	0.115-0.288	ACCEPTABLE
	2	0.552	0.626	0.334-0.865	0.400-0.799	ACCEPTABLE
DDE	1	0.107	0.131	.0562-0.171	.0706-0.157	ACCEPTABLE
	2	0.390	0.495	0.229-0.599	0.298-0.639	ACCEPTABLE
DDT	1	0.170	0.186	.0628-0.284	.0905-0.257	ACCEPTABLE
	2	0.474	0.576	0.252-0.844	0.326-0.770	ACCEPTABLE
HEPTACHLOR	1	0.139	0.157	.0438-0.221	.0706-0.199	ACCEPTABLE
	2	0.407	0.514	0.180-0.715	0.247-0.649	ACCEPTABLE
HEPTACHLOR EPOXIDE	1	0.076	0.087	.0427-0.120	.0526-0.110	ACCEPTABLE
	2	0.302	0.375	0.189-0.513	0.229-0.473	ACCEPTABLE
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	47.39	48.6	34.5- 62.8	39.0- 59.2	ACCEPTABLE
	2	10.89	10.2	7.28- 13.8	8.11- 12.9	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 5/22/93

WATER POLLUTION STUDY NUMBER WP030

LABORATORY: CA204

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
CHLOROFORM	1	44.64	45.7	31.6- 59.5	35.1- 56.0	ACCEPTABLE
	2	13.36	13.8	9.42- 18.0	10.5- 16.9	ACCEPTABLE
1,1,1 TRICHLOROETHANE	1	47.74	52.0	32.3- 67.9	36.8- 63.4	ACCEPTABLE
	2	9.009	9.34	5.56- 12.6	6.46- 11.7	ACCEPTABLE
TRICHLOROETHENE	1	31.40	39.9	26.8- 49.1	29.6- 46.2	ACCEPTABLE
	2	8.512	9.31	6.52- 13.0	7.34- 12.2	ACCEPTABLE
CARBONTETRACHLORIDE	1	43.46	46.3	29.8- 63.7	34.1- 59.4	ACCEPTABLE
	2	12.81	13.5	8.93- 18.2	10.1- 17.0	ACCEPTABLE
TETRACHLOROETHENE	1	46.69	57.2	39.7- 71.9	43.8- 67.8	ACCEPTABLE
	2	18.33	16.2	10.9- 21.1	12.2- 19.8	ACCEPTABLE
BROMODICHLOROMETHANE	1	51.52	49.5	34.2- 64.3	38.0- 60.5	ACCEPTABLE
	2	8.350	7.75	4.88- 10.5	5.59- 9.86	ACCEPTABLE
DIBROMOCHLOROMETHANE	1	43.53	42.2	30.0- 54.4	33.1- 51.3	ACCEPTABLE
	2	14.67	16.4	10.9- 21.5	12.2- 20.2	ACCEPTABLE
BROMOFORM	1	66.44	53.7	33.5- 73.7	38.6- 68.6	ACCEPTABLE
	2	13.54	11.9	6.48- 17.1	7.83- 15.7	ACCEPTABLE
METHYLENE CHLORIDE	1	39.42	37.3	24.1- 53.2	27.7- 49.6	ACCEPTABLE
	2	10.16	8.77	4.21- 13.5	5.39- 12.3	ACCEPTABLE
CHLOROBENZENE	1	40.61	43.2	30.8- 55.0	33.9- 51.9	ACCEPTABLE
	2	12.78	12.9	8.99- 15.7	9.97- 15.7	ACCEPTABLE
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
BENZENE	1	9.962	10.3	7.34- 13.4	8.11- 12.6	ACCEPTABLE
	2	49.35	54.1	37.7- 70.8	41.9- 66.6	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 5/22/93

WATER POLLUTION STUDY NUMBER WP030

LABORATORY: CA204

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUES*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
ETHYLBENZENE	1	10.71	11.3	7.71- 14.7	8.60- 13.8	ACCEPTABLE
	2	44.51	52.4	36.2- 68.5	40.3- 64.4	ACCEPTABLE
TOLUENE	1	12.40	13.9	9.86- 17.7	10.9- 16.7	ACCEPTABLE
	2	27.30	33.9	24.0- 43.1	26.4- 40.7	ACCEPTABLE
1,2-DICHLOROBENZENE	1	11.45	12.1	8.47- 15.8	9.37- 14.5	ACCEPTABLE
	2	47.88	52.0	36.1- 66.4	40.0- 62.5	ACCEPTABLE
1,3-DICHLOROBENZENE	1	8.722	9.43	6.17- 12.1	6.92- 11.4	ACCEPTABLE
	2	42.70	47.8	33.6- 61.2	37.2- 57.6	ACCEPTABLE
1,4-DICHLOROBENZENE	1	11.16	11.7	7.95- 15.2	8.86- 14.2	ACCEPTABLE
	2	52.34	58.1	39.1- 76.5	43.9- 71.7	ACCEPTABLE
MISCELLANEOUS PARAMETERS:						
TOTAL CYANIDE (IN MG/L)	1	0.21	0.250	0.138-0.341	0.164-0.316	ACCEPTABLE
	2	0.12	0.130	.0921-0.169	.0932-0.158	ACCEPTABLE
NON-FILTERABLE RESIDUE (IN MG/L)	1	41.4	43.2	34.7- 45.2	36.0- 43.9	ACCEPTABLE
	2	30.6	33.0	24.0- 34.6	25.3- 33.2	ACCEPTABLE
OIL AND GREASE (IN MG/L)	1	14.6	15.0	3.13- 19.4	9.56- 19.0	ACCEPTABLE
	2	21.7	23.0	14.1- 29.1	15.9- 26.3	ACCEPTABLE
TOTAL PHENOLICS (IN MG/L)	1	0.04	.0271	.0093-.0449	.0139-.0403	ACCEPTABLE
	2	0.304	0.291	0.125-0.457	0.167-0.414	ACCEPTABLE
TOTAL RESIDUAL CHLORINE (IN MG/L)	1	0.65	0.729	0.469-0.912	0.528-0.853	ACCEPTABLE
	2	0.30	0.240	.0656-0.280	0.112-0.254	NOT ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

TMA/Eberline

PERFORMANCE EVALUATION SUMMARY SHEET

Laboratory: TMA/Eberline

Lab Code = BC

PE Sample	EMSL-LV Acceptance Range (%)	% of EMSL-LV True Value	% of all Participating Laboratory's Grand Average
June 11, 1993			
Co-60	42.0 to 158.0	91.1	90.6
Zn-65	83.2 to 116.8	107.1	103.2
Ru-106	82.5 to 117.5	98.8	113.1
Cs-134	0.0 to 274.0	113.4	105.2
Cs-137	0.0 to 274.0	166.6	144.6
Ba-133	82.5 to 117.5	98.7	101.9
July 16, 1993			
Sr-89	74.4 to 125.6	99.1	98.5
Sr-90	65.2 to 134.8	92.0	95.7
July 23, 1993			
Alpha	42.0 to 158.0	64.5	80.2
Beta	72.1 to 127.9	82.2	93.8
August 13, 1993			
Uranium	79.4 to 120.6	98.8	100.2
August 27, 1993			
Alpha	54.2 to 145.8	50.9(LOW)	48.3
Beta	81.5 to 118.5	106.4	101.4
Cs-137	3.3 to 196.7	81.4	73.3
Sr-90	54.2 to 145.8	121.1	126.7
September 17, 1993			
Ra-226	74.5 to 125.5	105.8	107.0
Ra-228	56.9 to 143.1	91.7	95.6

TMA
Thermo Analytical Inc.

TMA/Eberline Albuquerque Laboratory
7021 Pan American Hwy. NE
Albuquerque, NM 87109
(505) 345-3461 • FAX # (505) 761-5416

Interoffice Memorandom
TMA/Eberline

Date: January 10, 1994

To: Dan Stuermer

From: Kathy Burnham, KB QA Manager TMA/Eberline

Subject: Fourth Quarter EPA Results

Below is a summary of the TMA/Eberline analytical laboratory's performance in the EPA Intercomparison Studies.

Water- July 16, 1993

Laboratory	Analysis	TMA/E pCi/l	EPA pCi/l	Precision	Accuracy
Albuquerque	Sr-89	33.7±1.15	34.0±5.0	0.236	-0.12 Pass
Albuquerque	Sr-90	23.0±0.00	25.0±5.0	0.000	-0.69 Pass

B. Water- July 23, 1993

Laboratory	Analysis	TMA/E pCi/l	EPA pCi/l	Precision	Accuracy
Albuquerque	Alpha	9.67±0.58	15.0±5.0	0.118	-1.85 Pass
Albuquerque	Beta	35.33±1.53	43.0±6.9	0.256	-1.92 Pass

C. Water- August 13, 1993

Laboratory	Analysis	TMA/E pCi/l	EPA pCi/l	Precision	Accuracy
Albuquerque	Uranium	25.0±0.44	25.3±3.0	0.158	-0.17 Pass

D. Air Filter- August 27, 1993

Laboratory	Analysis	TMA/E pCi/l	EPA pCi/l	Precision	Accuracy
Albuquerque	Alpha	9.67±0.58	15.0±5.0	0.118	-1.85 Passy
Albuquerque	Beta	50.00±1.00	47.0±5.0	0.236	+1.04 Pass
Albuquerque	Sr-90	23.00±3.00	19.0±5.0	0.709	+1.39 Pass
Albuquerque	Cs-137	7.33±0.58	9.0±5.0	0.118	-0.58 Pass

E. Water- September 17, 1993

Laboratory	Analysis	TMA/E pCi/l	EPA pCi/l	Precision	Accuracy
Albuquerque	Ra-226	15.77±0.23	14.9±2.2	0.107	+0.68 Pass
Albuquerque	Ra-228	18.70±0.72	20.4±5.1	0.162	-0.58 Pass

F. Water- October 8, 1993

Laboratory	Analysis	TMA/E pCi/l	EPA pCi/l	Precision	Accuracy
Albuquerque	I-131	117.67±5.13	117.0±12.0	0.492	+0.10 Pass

The average reported results were within acceptable limits set by EPA.

Teledyne

PERFORMANCE EVALUATION SUMMARY SHEET

Laboratory: Teledyne

Lab Code = CU

PE Sample	EMSL-LV Acceptance Range (%)	% of EMSL-LV True Value	% of all Participating Laboratory's Grand Average
July 16, 1993			
Sr-89	74.4 to 125.6	93.1	92.5
Sr-90	65.2 to 134.8	96.0	99.9
July 23, 1993			
Alpha	42.0 to 158.0	124.5	154.8
Beta	72.1 to 127.9	99.2	113.2
August 13, 1993			
Uranium	79.4 to 120.6	96.2	97.6
August 27, 1993			
Alpha	54.2 to 145.8	89.5	85.0
Beta	81.5 to 118.5	104.3	99.4
Cs-137	3.3 to 196.7	107.4	96.7
September 17, 1993			
Ra-226	74.5 to 125.5	102.9	104.0
Ra-228	56.9 to 143.1	101.3	105.6
October 29, 1993			
Alpha	56.5 to 143.5	101.6	137.3
Beta	42.0 to 158.0	104.5	92.2
November 5, 1993			
Tritium	82.6 to 117.4	93.4	95.8
November 12, 1993			
Ba-133	82.4 to 117.6	87.8	90.7
Co-60	71.0 to 129.0	95.6	96.5
Cs-134	85.3 to 114.7	90.3	97.9
Cs-137	78.2 to 121.8	103.3	98.0
Ru-106	82.7 to 117.3	88.2	101.1
Zn-65	82.7 to 117.3	101.3	96.9

TELEDYNE
BROWN ENGINEERING
Environmental Services

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22 February 1994

Ms. Josie Edwards
Roy F. Weston, Inc.
208 Welsh Pool Road
Pickering Creek Industrial Parks
Lionville, PA 19341-1313

Re: EPA Inter-Laboratory Comparison Results

Dear Josie:

The most recent EPA results are enclosed for your files. If you have any questions, please contact me.

Sincerely,

Al Hogan
Program Manager

AJH:

EPA INTERLABORATORY COMPARISON PROGRAM 1993

Collection Date	Media	Nuclide	EPA Result(a)		Teledyne Isotopes Result(b)		Deviation(c)	
01/15/93	Water	Sr-89	15.0 ±	5.0	12.67 ±	1.15	-0.81	
		Sr-90	10.0 ±	5.0	8.33 ±	1.15	-0.58	
01/22/93	Water	Pu-239	20.0 ±	2.0	18.00 ±	1.00	-1.73	
01/29/93	Water	Gr-Alpha	34.0 ±	9.0	17.33 ±	1.15	-3.21	(d)
		Gr-Beta	44.0 ±	5.0	52.00 ±	1.00	2.77	(e)
02/05/93	Water	I-131	100.0 ±	10.0	106.67 ±	5.77	1.15	
02/12/93	Water	U	7.6 ±	3.0	6.93 ±	0.15	-0.38	
03/05/93	Water	Ra-226	9.8 ±	1.5	7.67 ±	0.12	-2.46	(f)
		Ra-228	18.5 ±	4.6	19.33 ±	2.31	0.31	
04/20/93	Water	Gr-Alpha	95.0 ±	24.0	94.33 ±	1.15	-0.05	
		Ra-226	24.9 ±	3.7	19.00 ±	1.00	-2.76	(f)
		Ra-228	19.0 ±	4.8	18.33 ±	0.58	-0.24	
		Gr-Beta	177.0 ±	27.0	150.0 ±	0.00	-1.73	
		Sr-89	41.0 ±	5.0	35.33 ±	1.53	-1.96	
		Sr-90	29.0 ±	5.0	27.33 ±	0.58	-0.58	
		Co-60	39.0 ±	5.0	40.67 ±	3.51	0.58	
		Cs-134	27.0 ±	5.0	23.67 ±	1.53	-1.15	
		Cs-137	32.0 ±	5.0	34.33 ±	2.08	0.81	
06/04/93	Water	H-3	9844.0 ±	984.0	9366.67 ±	152.75	-0.84	
06/11/93	Water	Co-60	15.0 ±	5.0	16.33 ±	1.53	0.46	
		Zn-65	103.0 ±	10.0	121.33 ±	20.09	3.18	(g)
		Ru-106	119.0 ±	12.0	106.33 ±	15.89	-1.83	
		Cs-134	5.0 ±	5.0	5.67 ±	0.58	0.23	
		Cs-137	5.0 ±	5.0	6.67 ±	0.58	0.58	
		Ba-133	99.0 ±	10.0	104.33 ±	9.29	0.92	
07/16/93	Water	Sr-89	34.0 ±	5.0	31.67 ±	2.52	-0.81	
		Sr-90	25.0 ±	5.0	24.00 ±	0.00	-0.35	
07/23/93	Water	Gr-Alpha	15.0 ±	5.0	18.67 ±	2.08	1.27	
		Gr-Beta	43.0 ±	6.9	42.67 ±	2.52	-0.08	
08/13/93	Water	U	25.3 ±	3.0	24.33 ±	0.58	-0.56	
08/27/93	Air Filter	Gr-Alpha	19.0 ±	5.0	17.00 ±	0.00	-0.69	
		Gr-Beta	47.0 ±	5.0	49.00 ±	1.73	0.69	
		Sr-90	19.0 ±	5.0	17.67 ±	0.58	-0.46	
		Cs-137	9.0 ±	5.0	9.67 ±	0.58	0.23	

EPA INTERLABORATORY COMPARISON PROGRAM 1993

Collection Date	Media	Nuclide	EPA Result(a)		Teledyne Isotopes Result(b)			
09/09/93	Water	Ra-226	14.9 ±	2.2	15.33 ±	0.58	0.34	
		Ra-228	20.4 ±	5.1	20.67 ±	1.15	0.09	
09/24/93	Milk	Sr-89	30.0 ±	5.0	35.67 ±	3.51	1.96	
		Sr-90	25.00 ±	5.0	24.00 ±	1.73	-0.35	
		I-131	120.0 ±	12.0	126.67 ±	5.77	0.96	
		Cs-137	49.0 ±	5.0	50.67 ±	1.15	0.58	
		K	1679.0 ±	84.0	1620.00 ±	17.32	-1.22	
10/08/93	Water	I-131	117.0 ±	12.0	103.33 ±	5.77	-1.97	
10/29/93	Water	Gr-Alpha	20.0 ±	5.0	20.33 ±	2.08	0.12	
		Gr-Beta	15.0 ±	5.0	15.67 ±	2.08	0.23	
11/5/93	Water	H-3	7398.0 ±	740.0	6900.00 ±	100.00	-1.17	
11/12/93	Water	Co-60	30.0 ±	5.0	28.67 ±	2.89	-0.46	
		Zn-65	150.0 ±	15.0	152.00 ±	9.17	0.23	
		Ru-106	201.0 ±	20.0	177.33 ±	5.51	-2.05	(h)
		Cs-134	59.0 ±	5.0	53.33 ±	4.93	-1.96	
		Cs-137	40.0 ±	5.0	41.33 ±	3.06	0.46	
		Ba-133	79.0 ±	8.0	69.33 ±	3.06	-2.09	(h)

Footnotes:

(a) EPA Results-Expected laboratory precision (1 sigma). Units are pCi/liter for water and milk except K is in mg/liter. Units are total pCi for air particulate filters.

(b) Teledyne Results - Average ± one sigma. Units are pCi/liter for water and milk except K is in mg/liter. Units are total pCi for air particulate filters.

(c) Normalized deviation from the known.

(d) The EPA switched from Am-241 to Th-230 alpha spike. We calibrated with Th-230, using sodium nitrate to generate a self-absorption curve. The EPA water, however has minerals which have greater self-absorption than the sodium nitrate matrix. The EPA has agreed to send us a gallon of their water which we can use to prepare a self-absorption curve with Th-230.

(e) By oversight, we did not use the special self-absorption curve which we had previously derived using EPA water and Cs-137 standard. We will use the EPA curve in the future. We may also re-derive this curve using a water sample which the EPA has agreed to send us.

(f) The counting data and backgrounds were verified. Possibly some efficiencies used were erroneously high, causing low values. A less likely cause is an error in dilution. New Ra-226 standards will be prepared. Closer monitoring of out of control efficiencies will be done and extra care in preparation of the sample will be maintained.

(g) The calculations were checked and found to be correct. The results of six gamma emitting isotopes were reported to the EPA. The results of four were within 1 normalized deviation; a fifth, within 2 normalized deviations. Only the Zn-65 average was outside the control limits. There is no obvious reason why one isotope would be outside the control limits, while five other isotopes were within control limits.

(h) An investigation is being conducted; the results will be available shortly.

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Subject: QUARTERLY PERFORMANCE EVALUATION (PE) RESULTS

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