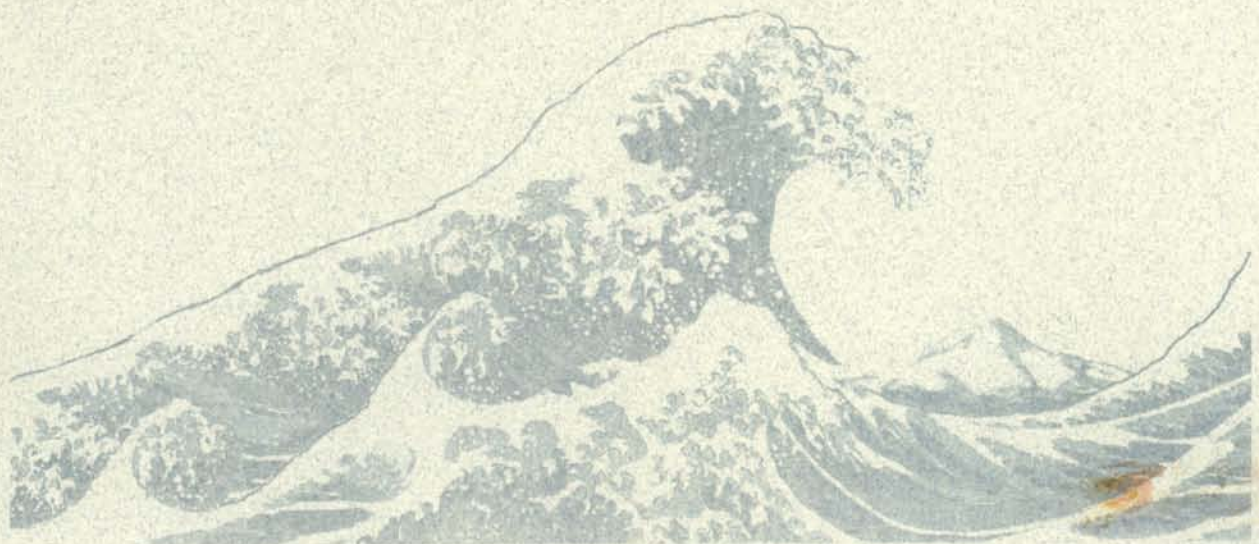


Frontier
Geosciences Inc.

Mercury Deposition Network

1998 Annual
Quality Assurance Report



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March 4, 1999

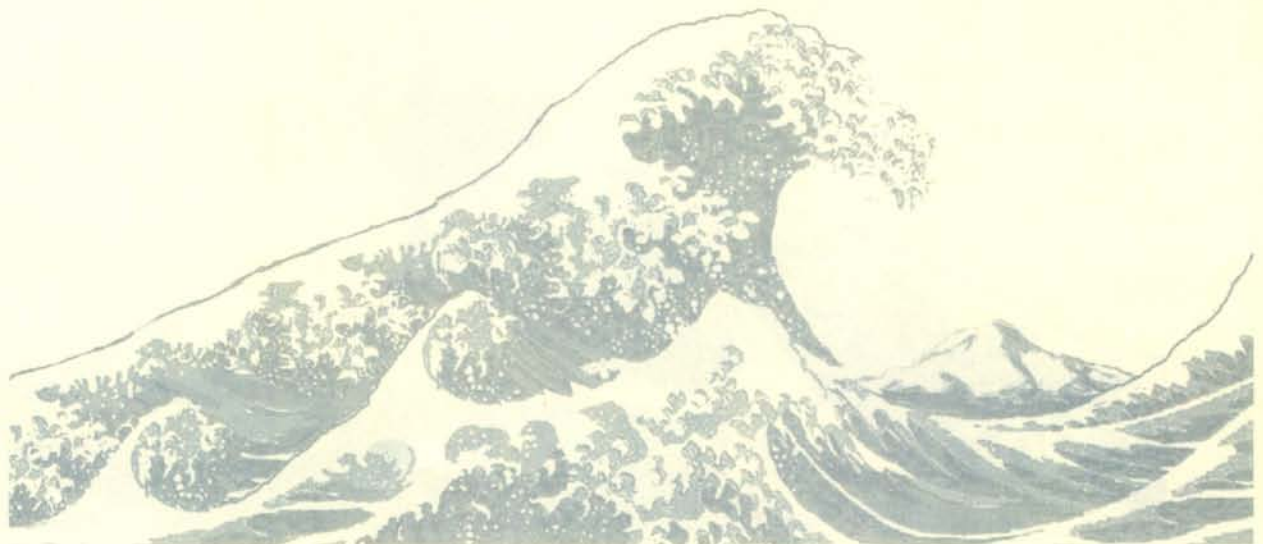
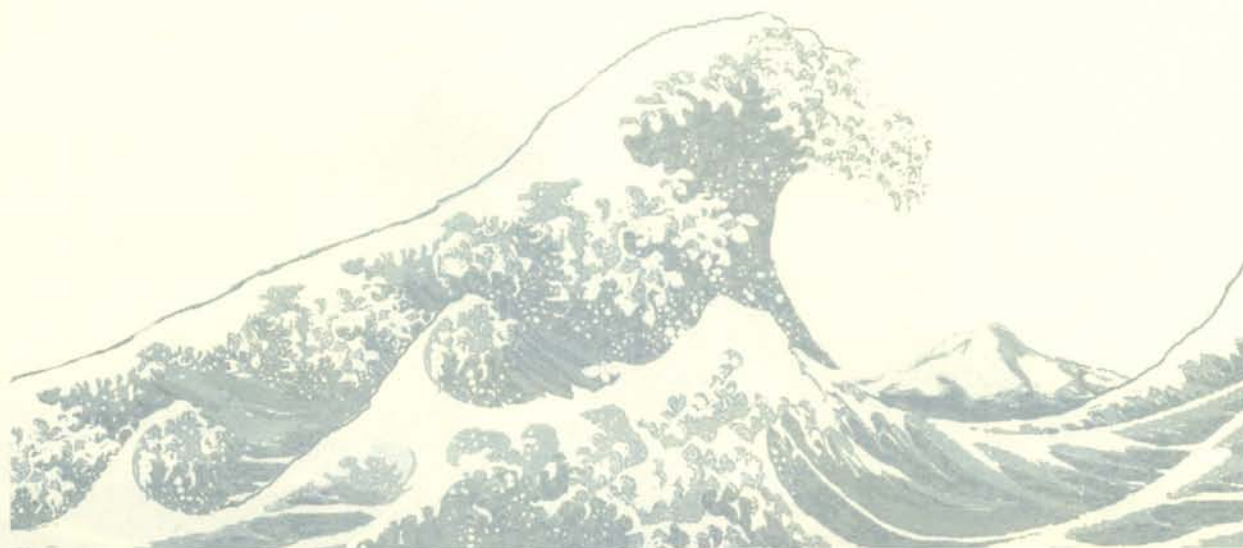


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I. Introduction

Since January of 1996 Frontier Geosciences Inc. (Frontier) has served as the Hg Analytical Lab (HAL) and Site Liaison center for the Mercury Deposition Network (MDN). The Mercury Deposition Network, coordinated through the National Atmospheric Deposition Program (NADP), was designed with the primary objective to quantify the wet deposition of mercury in North America in order to determine long term geographic and temporal distributions. Frontier receives weekly precipitation samples, which are analyzed for total mercury. The analytical technique employed to measure each sample for Total Hg, US EPA Method 1631 modified, was authored by Frontier's Senior Research Scientist and Frontier served as the referee lab for the Method 1631 final validation study. The MDN now incorporates 37 sites from the United States and Canada, a 76% increase of MDN sites since 1996. The MDN is expected to add 10 new sites, bringing the total to almost 50 in 1999.

Mr. Robert Brunette, Project Manager, oversees all aspects of Frontier's involvement in the MDN. He serves as the MDN Liaison, HAL contact for multiple agencies currently sponsoring the MDN, and Vice Chair of the Data Management and Analysis Subcommittee for the NADP. His multiple roles require him to provide guidance and direction to all HAL staff, and to maintain his proficiency at all aspects of the work, including MDN site selection and equipment installation, MDN equipment troubleshooting, field and laboratory training, analysis and report writing as well as MDN research. Dr. Eric Prestbo, who serves as Science Advisor for the HAL, works with Mr. Brunette as an advisor to provide expert chemistry advice for MDN and help direct new initiatives which include Trace Metals in Wet Deposition



and Hg Dry Deposition Studies. Mr. Brunette is assisted by Analytical Laboratory staff who process incoming samples, analyze sample sets, clean glassware, ship weekly field equipment, and perform data entry. Mr. Brunette works closely with Ms. Michelle Gauthier, Laboratory Manager, and Ms. Beverly Heaphey, Quality Assurance Officer, to ensure all quality control parameters are consistently maintained.

Quality control is adhered to both in the laboratory and in the field. The MDN project saw an increase in quality control points from 444 to 624, which corresponds to the increase in MDN sites in 1998 and demonstrates Frontier's commitment to quality assurance. The MDN Site Liaison, Mr. Brunette, with the help of other HAL staff, reviews weekly rain gauge charts and MDN Observer Form (MOFs). Site equipment failures or procedural errors are addressed quickly and directly by the Site Liaison. MDN site equipment failures are minimized as the HAL now maintains an MDN Equipment Depot. The MDN Equipment Depot enables the Site Liaison to send replacement parts to sites within 24 hours of discovering equipment failures. Quick response to field issues overall ensures the continuity of the MDN data base.

Frontier improved quality control on the MDN project in 1998. Not one quality control point exceeded parameters for the entire year (n=624). All blank means were lower in concentration in 1998 than in 1997. For example, the Reagent Blank mean in 1997 was 0.143 ng/L and in 1998 was 0.087ng/L. This is an improvement in reducing mercury concentration in the reagent matrix of 60.8%. All quality control parameter findings improved in 1998 from 1997. The improvements in lab performance are contributed to the efforts of Project Manager, Mr. Robert Brunette working in cooperation with the Quality Assurance Officer, Senior Hg Analyst and Lab Manager.

II. General Description of Frontier's Quality Assurance Program

A. Quality Assurance and Quality Control

Frontier has a strong and vital commitment to its Quality Assurance Program, viewing quality assurance as a program *and* a philosophy. We begin quality control at the bench level, and continuously work to improve our processes at the management level. Our management style is to solicit process improvements and problem-solving from our laboratory technicians and analysts, then utilize management to see to implementation; rather than the traditional management style of issuing orders which may or may not have much bearing on how things actually work in the laboratory.

Our Quality Assurance Program is a system for ensuring that all information, data and interpretation resulting from an analytical procedure are technically sound, statistically valid and appropriately documented. Our quality control parameters are the mechanisms used to achieve quality assurance.

B. Data Quality Objectives

Data quality is achieved through Frontier's Data Quality Objectives (DQO's). Our DQO's consist of five components: precision, accuracy, representativeness, comparability and completeness (PARCC).

- **Precision** is a measure of data repeatability; it is measured by using sample replicates.



- **Accuracy** is a measure of how close the data is to the actual, or real value, and is measured by certified reference materials and matrix spikes.
- **Representativeness** is a measure of how typical a sample is compared to the sample population. It is achieved by accurate, artifact-free sampling procedures and appropriate sample homogenization.
- **Comparability** is a measure of how variable one set of data is to another.
- **Completeness** is a measure of how many data points collected are usable; Frontier strives for 95% completeness.

III. Quality Control Procedures

A. Bottle Blanks

Bottle blanks are expected to be at or near the method detection limit (MDL). In cases where the blanks are significantly higher than the MDL, the situation is examined. Possible contamination sources are researched and identified. Once the problem has been found and corrected, the run continues. Bottle blanks are control charted on an ongoing basis, helping to identify trends or anomalies.

The mean average for 1998 lab sample bottle blanks is 0.03 ng/L (n=67). The standard deviation is 0.019 ng/L. Numbers may be found in tabular format in Appendix A, while control charts are listed in Appendix B.

B. Reagent Blanks

Reagent blanks consist of 1% (v/v) 0.2N Bromine Monochloride, 0.2 mL 20% Hydroxylamine Hydrochloride, and 0.3 mL 20% Stannous Chloride. Reagent blanks are a measure of how much analyte may be found in the Bromine Monochloride used for oxidizing the samples. Reagent blanks help when researching possible sources of contamination.

The mean average for 1998 reagent blanks is 0.087 ng/L (n=66). The standard deviation is 0.050 ng/L. Numbers may be found in tabular format in Appendix A, while control charts are listed in Appendix B.

C. Matrix Duplicate Samples

A matrix duplicate sample is run with each analytical set. The relative percent difference (RPD) is calculated and is expected to be less than 25%. If the result is higher than 25% then the analysis is re-run. If the result is still higher than 25%, then the problem is researched and possible causes are identified and noted on the report.

The mean average for 1998 RPD's is 3.5% (n=183). The standard deviation is 3.6%. All matrix duplicate relative percent difference values fell within the designed parameters in 1998. Numbers may be found in tabular format in Appendix A, while control charts are listed in Appendix B.

D. Certified Reference Material Samples

Certified reference material (CRM) samples are a way to compare sample results with a known, certified value. This is a useful tool for validating the analytical curve. The acceptance range for the reference samples is 75-125%. If the percent recovery lies out of this range the problem is identified, corrected and the instrument is recalibrated. If the percent recovery is within the acceptance range, analysis continues. The CRM used is DORM-2, a fish tissue.



The mean average for 1998 CRMs is 94.4% recovery (n=130). The standard deviation is 3.4%. The Certified Reference Material recoveries were all in control, but the mean recovery dropped from approximately 98% to approximately 92% sometime near the end of May, 1998. This observation was noted lab-wide and is attributed to sample digestion of the DORM-2. Although the CRM percent recovery mean dropped, all samples were well within control parameters.

All reference samples fell within the designated parameters in 1998. Numbers may be found in tabular format in Appendix A, while control charts are listed in Appendix B.

E. Matrix Spike Samples

Matrix spikes are a tool for determining if, and how, the sample matrix interferes with analyte quantification. Matrix spikes help answer two questions. Does analyte in the sample go through the analytical system the same way analyte in the standards does? And are we able to carry analyte through the analytical system without significant losses?

Matrix spikes falling with 75-125% recovery are considered valid. Matrix spikes falling outside these parameters must be rerun. If the spike continues to fall outside of 75-125% recovery then possible causes must be looked for and identified. The MDN matrix (rainwater) is spiked with 1.00 ng of Hg (II).

The mean average for 1998 matrix spikes is 100.2% recovery (n=173). The standard deviation is 6.8%. There was just one incident of a matrix spike falling outside quality control limits. Numbers may be found in tabular format in Appendix A, while control charts are listed in Appendix B.

G. Quarterly Reports

Mr. Brunette prepares a quarterly Quality Control Report, outlining quality control results in tabular format. Trends and anomalies are looked for, and if found, are identified. Possible causes for trends or anomalies must be researched by examining original datasets. Conclusions are summarized and included in the report.

H. Performance Evaluation and Interlaboratory Intercomparison Studies

Performance evaluation and interlaboratory intercomparison studies are a vital part of our Quality Assurance Program. Frontier is a regular participant in studies prepared by the US EPA, National Water Research Institute (Canada), National Oceanic and Atmospheric Administration, National Research Council (Canada), US Geological Survey, the Institute for National Measurement Standards (Canada), and New York State PE samples. Results from the most recent US EPA Water Pollution Study (WP040) have been included in Appendix C.

IV. 1999 Outlook

The Mercury Deposition Network continues to gain more and more attention as the largest and longest running National scale Hg wet deposition network in North America. This increased exposure has led to expected significant growth in 1999 through 2000. With this growth, the HAL will continue to look for ways of improving this program to ensure it retains the highest of quality.

The following are ways the HAL expects to maintain quality throughout 1999:

- In 1998, Frontier created an Access Data Base which has greatly improved data handling and coordination. The HAL will continue to look for innovative ways to streamline and increase efficiency.
- The HAL is expected to upgrade its MDN facilities in order to stay ahead of projected growth in the Network.
- The HAL will continue Total and Methyl Mercury field studies at WA18 utilizing two co-located MDN Aerochemetrics Wet Deposition Samplers.
- The HAL will continue Trace Metals in Wet Deposition studies as well as Dry Deposition Hg studies.
- The HAL will continue Mercury laboratory intercomparison studies in 1999 and endeavor to increase the frequency of these studies.
- The HAL will begin an internal blind MDN sample program.
- Pending an NADP/MDN policy change, the HAL is expected to start a new Field Blank and System Blank program.

V. Appendix A Quality Control Tables

A. Analytical Run Data

Data Set	FGSSetID	AnalysisDate	InstrumentID	CF	BB	R	BrCl Bk
1998-01	THG41-980109	1/9/98	CVAFS-4	494.5 units/ng	2.11 units	0.99915	0.058 ng/L
1998-02	THG51-980109	1/9/98	CVAFS-5	1202.0 units/ng	3.90 units	0.99992	0.080 ng/L
1998-03	THG41-980126	1/26/98	CVAFS-4	494.9 units/ng	1.75 units	0.99992	0.071 ng/L
1998-04	THG51-980126	1/26/98	CVAFS-5	1239.4 units/ng	2.20 units	0.99993	0.071 ng/L
1998-05	THG51-980209	2/9/98	CVAFS-5	1430.0 units/ng	3.74 units	0.99990	0.081 ng/L
1998-06	THG41-980219	2/19/98	CVAFS-4	454.7 units/ng	2.22 units	1.00000	0.072 ng/L
1998-07	THG51-980219	2/19/98	CVAFS-5	1254.2 units/ng	5.78 units	0.99983	0.087 ng/L
1998-08	THG41-980223	2/23/98	CVAFS-4	443.1 units/ng	2.14 units	0.99965	0.213 ng/L
1998-09	THG41-980304	3/4/98	CVAFS-4	436.9 units/ng	1.79 units	0.99994	0.065 ng/L
1998-10	THG51-980304	3/4/98	CVAFS-5	1121.4 units/ng	1.97 units	0.99999	0.063 ng/L
1998-11	THG51-980317	3/17/98	CVAFS-5	1341.3 units/ng	3.12 units	0.99987	0.079 ng/L
1998-12	THG51-980319	3/19/98	CVAFS-5	1381.6 units/ng	5.44 units	0.99983	0.067 ng/L
1998-13	THG41-980319	3/19/98	CVAFS-4	448.2 units/ng	1.68 units	0.99989	0.054 ng/L
1998-14	THG41-980402	4/2/98	CVAFS-4	407.0 units/ng	4.33 units	0.99940	0.115 ng/L
1998-15	THG51-980402	4/2/98	CVAFS-5	1409.2 units/ng	6.21 units	0.99993	0.139 ng/L
1998-16	THG41-980417	4/17/98	CVAFS-4	417.5 units/ng	1.76 units	0.99995	0.100 ng/L
1998-17	THG51-980417	4/17/98	CVAFS-5	1388.0 units/ng	3.70 units	0.99999	0.117 ng/L
1998-18	THG41-980423	4/23/98	CVAFS-4	412.4 units/ng	2.49 units	0.99916	0.073 ng/L
1998-19	THG51-980423	4/23/98	CVAFS-5	1362.2 units/ng	9.95 units	0.99963	0.060 ng/L
1998-20	THG41-980508	5/8/98	CVAFS-4	404.2 units/ng	2.31 units	0.99975	0.159 ng/L
1998-21	THG51-980508	5/8/98	CVAFS-5	1456.5 units/ng	7.17 units	0.99994	0.192 ng/L
1998-22	THG41-980512	5/12/98	CVAFS-4	389.1 units/ng	1.36 units	0.99931	0.112 ng/L
1998-23	THG41-980526	5/26/98	CVAFS-4	412.3 units/ng	2.90 units	0.99994	0.129 ng/L
1998-24	THG51-980526	5/26/98	CVAFS-5	1386.2 units/ng	7.10 units	0.99988	0.200 ng/L
1998-25	THG41-980601	6/1/98	CVAFS-4	488.3 units/ng	2.06 units	0.99989	0.098 ng/L
1998-26	THG51-980601	6/1/98	CVAFS-5	1559.1 units/ng	12.09 units	0.99986	0.142 ng/L
1998-27	THG51-980608	6/8/98	CVAFS-5	1555.0 units/ng	10.40 units	0.99980	0.091 ng/L
1998-28	THG41-980608	6/8/98	CVAFS-4	440.2 units/ng	1.68 units	0.99988	0.099 ng/L
1998-29	THG51-980615	6/15/98	CVAFS-5	1506.7 units/ng	11.98 units	0.99996	0.249 ng/L
1998-30	THG41-980622	6/22/98	CVAFS-4	400.7 units/ng	2.41 units	0.99903	0.039 ng/L
1998-31	THG51-980629	6/29/98	CVAFS-5	1594.7 units/ng	8.68 units	0.99993	0.103 ng/L
1998-32	THG41-980629	6/29/98	CVAFS-4	420.9 units/ng	1.70 units	0.99983	0.093 ng/L
1998-33	THG51-980716	7/16/98	CVAFS-5	1594.3 units/ng	10.63 units	0.99990	0.099 ng/L
1998-34	THG41-980716	7/16/98	CVAFS-4	447.0 units/ng	2.91 units	0.99996	0.087 ng/L
1998-35	THG51-980721	7/21/98	CVAFS-5	1592.8 units/ng	10.79 units	0.99981	0.041 ng/L
1998-36	THG41-980721	7/21/98	CVAFS-4	421.4 units/ng	2.09 units	0.99993	0.059 ng/L
1998-37	THG51-980728	7/28/98	CVAFS-5	1636.1 units/ng	11.89 units	0.99977	0.058 ng/L
1998-38	THG41-980812	8/12/98	CVAFS-4	393.9 units/ng	1.96 units	0.99985	0.071 ng/L
1998-39	THG51-980812	8/12/98	CVAFS-5	1307.2 units/ng	9.55 units	0.99979	0.160 ng/L
1998-40	THG41-980818	8/18/98	CVAFS-4	368.0 units/ng	3.19 units	0.99974	0.021 ng/L

Data Set	FGSetID	AnalysisDate	InstrumentID	CF	BB	B	BrCl	Bik	
1998-41	THG41-980828	8/28/98	CVAFS-4	383.8 units/ng	3.31 units	0.99983	0.105	ng/L	
1998-42	THG51-980904	9/4/98	CVAFS-5	1469.9 units/ng	13.93 units	0.99945	0.041	ng/L	
1998-43	THG41-980904	9/4/98	CVAFS-4	559.7 units/ng	3.14 units	0.99981	0.043	ng/L	
1998-44	THG41-980908	9/8/98	CVAFS-4	608.6 units/ng	3.39 units	0.99998	0.080	ng/L	
1998-45	THG51-980908	9/8/98	CVAFS-5	1426.8 units/ng	19.96 units	0.99990	0.121	ng/L	
1998-46	THG51-980918	9/18/98	CVAFS-5	1580.4 units/ng	13.65 units	0.99995	0.110	ng/L	
1998-47	THG51-980924	9/24/98	CVAFS-5	1530.1 units/ng	12.83 units	0.99978	0.030	ng/L	
1998-48	THG51-980925	9/25/98	CVAFS-5	1561.0 units/ng	6.77 units	0.99947	0.050	ng/L	
1998-49	THG41-980925	9/25/98	CVAFS-4	663.3 units/ng	2.24 units	0.99952	0.053	ng/L	
1998-50	THG51-981016	10/16/98	CVAFS-5	1550.0 units/ng	6.81 units	0.99968	0.028	ng/L	
1998-51	THG41-981016	10/16/98	CVAFS-4	475.2 units/ng	1.94 units	0.99990	0.024	ng/L	
1998-52	THG51-981019	10/19/98	CVAFS-5	1537.2 units/ng	12.41 units	0.99729	0.043	ng/L	
1998-53	THG41-981019	10/19/98	CVAFS-4	487.8 units/ng	1.81 units	0.99971	0.040	ng/L	
1998-54	THG51-981110	11/10/98	CVAFS-5	1588.4 units/ng	12.08 units	0.99931	0.005	ng/L	
1998-55	THG51-981112	11/12/98	CVAFS-5	1567.7 units/ng	7.93 units	0.99988	0.061	ng/L	
1998-56	THG41-981113	11/13/98	CVAFS-4	418.3 units/ng	1.84 units	0.99965	0.083	ng/L	
1998-57	THG51-981120	11/20/98	CVAFS-5	1455.8 units/ng	8.62 units	0.99985	0.161	ng/L	
1998-58	THG41-981120	11/20/98	CVAFS-4	450.8 units/ng	2.13 units	0.99980	0.117	ng/L	
1998-59	THG51-981125	11/25/98	CVAFS-5	1498.5 units/ng	7.98 units	0.99991	0.093	ng/L	
1998-60	THG51-981201	12/1/98	CVAFS-5	1413.6 units/ng	6.18 units	0.99965	0.076	ng/L	
1998-61	THG41-981201	12/1/98	CVAFS-4	436.6 units/ng	1.89 units	0.99996	0.069	ng/L	
1998-62	THG51-981217	12/17/98	CVAFS-5	1148.7 units/ng	8.69 units	0.99843	0.057	ng/L	
1998-63	THG41-981217	12/17/98	CVAFS-4	392.1 units/ng	3.42 units	0.99945	0.010	ng/L	
1998-64	THG51-981222	12/22/98	CVAFS-5	1171.7 units/ng	5.55 units	0.99956	0.172	ng/L	
1998-65	THG51-981231	12/31/98	CVAFS-5	1195.5 units/ng	5.98 units	0.99994	0.040	ng/L	
1998-66	THG41-981231	12/31/98	CVAFS-4	487.4 units/ng	2.05 units	0.99969	0.041	ng/L	
						Mean	0.99971	0.087	ng/L
						St Dev	0.00041	0.050	ng/L

B. Bottle Blanks

Quarter	Data Set	Sample ID	BottleBlk
1-1998	1998-02	MDN587	0.030 ng/Bottle
1-1998	1998-02	MDN499	0.029 ng/Bottle
1-1998	1998-03	MDN525	0.037 ng/Bottle
1-1998	1998-03	MDN473	0.029 ng/Bottle
1-1998	1998-06	MDN030	0.030 ng/Bottle
1-1998	1998-07	MDN568	0.027 ng/Bottle
1-1998	1998-07	MDN533	0.028 ng/Bottle
1-1998	1998-07	MDN576	0.034 ng/Bottle
1-1998	1998-09	MDN536	0.030 ng/Bottle
1-1998	1998-10	MDN478	0.037 ng/Bottle
1-1998	1998-11	MDN455	0.028 ng/Bottle
1-1998	1998-11	MDN583	0.030 ng/Bottle
1-1998	1998-11	MDN567	0.036 ng/Bottle
2-1998	1998-15	MDN109	0.029 ng/Bottle
2-1998	1998-16	MDN001	0.029 ng/Bottle
2-1998	1998-17	MDN205	0.020 ng/Bottle
2-1998	1998-18	MDN516	0.031 ng/Bottle
2-1998	1998-19	MDN572	0.051 ng/Bottle
2-1998	1998-21	MDN528	0.049 ng/Bottle
2-1998	1998-23	MDN222	0.042 ng/Bottle
2-1998	1998-23	MDN539	0.034 ng/Bottle
2-1998	1998-23	MDN328	0.036 ng/Bottle
2-1998	1998-23	MDN403	0.025 ng/Bottle
2-1998	1998-29	MDN205	0.048 ng/Bottle
2-1998	1998-29	MDN023	0.041 ng/Bottle
2-1998	1998-29	MDN067	0.046 ng/Bottle
2-1998	1998-30	MDN227	0.040 ng/Bottle
2-1998	1998-30	MDN530	0.071 ng/Bottle
2-1998	1998-32	MDN219	0.032 ng/Bottle
3-1998	1998-33	MDN343	0.043 ng/Bottle
3-1998	1998-34	MDN341	0.077 ng/Bottle
3-1998	1998-37	MDN534	0.036 ng/Bottle
3-1998	1998-37	MDN329	0.043 ng/Bottle
3-1998	1998-37	MDN367	0.071 ng/Bottle
3-1998	1998-38	MDN040	0.017 ng/Bottle
3-1998	1998-38	MDN311	0.050 ng/Bottle
3-1998	1998-39	MDN616	0.022 ng/Bottle
3-1998	1998-41	MDN837	0.082 ng/Bottle
3-1998	1998-42	MDN403	0.019 ng/Bottle
3-1998	1998-42	MDN451	0.019 ng/Bottle
3-1998	1998-43	MDN328	0.015 ng/Bottle
3-1998	1998-47	MDN355	0.010 ng/Bottle
3-1998	1998-47	MDN512	0.003 ng/Bottle
3-1998	1998-48	MDN354	0.010 ng/Bottle
3-1998	1998-48	MDN004	0.022 ng/Bottle
4-1998	1998-50	MDN238	0.018 ng/Bottle
4-1998	1998-50	MDN320	0.014 ng/Bottle
4-1998	1998-51	MDN552	0.011 ng/Bottle
4-1998	1998-52	MDN051	0.009 ng/Bottle
4-1998	1998-52	MDN812	0.049 ng/Bottle
4-1998	1998-53	MDN331	0.014 ng/Bottle
4-1998	1998-53	MDN630	0.007 ng/Bottle
4-1998	1998-53	MDN204	0.009 ng/Bottle
4-1998	1998-53	MDN857	0.013 ng/Bottle
4-1998	1998-55	MDN857	0.073 ng/Bottle
4-1998	1998-55	MDN817	0.070 ng/Bottle
4-1998	1998-57	MDN508	0.002 ng/Bottle
4-1998	1998-58	MDN248	0.050 ng/Bottle
4-1998	1998-58	MDN050	0.023 ng/Bottle
4-1998	1998-58	MDN852	0.008 ng/Bottle
4-1998	1998-64	MDN563	0.012 ng/Bottle
4-1998	1998-64	MDN812	0.008 ng/Bottle
4-1998	1998-64	MDN821	0.009 ng/Bottle
4-1998	1998-65	MDN897	0.008 ng/Bottle
4-1998	1998-65	MDN312	0.031 ng/Bottle
4-1998	1998-66	MDN827	0.020 ng/Bottle
4-1998	1998-66	MDN565	0.017 ng/Bottle
		Mean	0.030 ng/Bottle
		Std Dev	0.019 ng/Bottle

C. SRMs

Quarter	MDN Data Set ID	DormConc	Recov
1-1998	1998-01	4.68 ng/mL	100.9%
1-1998	1998-01	4.60 ng/mL	99.1%
1-1998	1998-02	4.46 ng/mL	96.1%
1-1998	1998-02	4.59 ng/mL	98.9%
1-1998	1998-03	4.60 ng/mL	99.1%
1-1998	1998-03	4.52 ng/mL	97.5%
1-1998	1998-04	4.57 ng/mL	98.5%
1-1998	1998-04	4.58 ng/mL	98.8%
1-1998	1998-05	4.56 ng/mL	98.4%
1-1998	1998-05	4.57 ng/mL	98.4%
1-1998	1998-06	4.58 ng/mL	98.7%
1-1998	1998-06	4.59 ng/mL	99.0%
1-1998	1998-07	4.62 ng/mL	99.6%
1-1998	1998-07	4.47 ng/mL	96.4%
1-1998	1998-08	4.62 ng/mL	99.7%
1-1998	1998-08	4.32 ng/mL	93.0%
1-1998	1998-09	4.54 ng/mL	97.9%
1-1998	1998-09	4.52 ng/mL	97.4%
1-1998	1998-10	4.58 ng/mL	98.7%
1-1998	1998-10	4.58 ng/mL	98.8%
1-1998	1998-11	4.54 ng/mL	97.8%
1-1998	1998-11	4.54 ng/mL	97.8%
1-1998	1998-12	4.53 ng/mL	97.7%
1-1998	1998-12	4.56 ng/mL	98.3%
1-1998	1998-13	4.47 ng/mL	96.3%
1-1998	1998-13	4.51 ng/mL	97.2%
2-1998	1998-14	4.65 ng/mL	100.1%
2-1998	1998-14	4.43 ng/mL	95.4%
2-1998	1998-15	4.54 ng/mL	97.9%
2-1998	1998-15	4.51 ng/mL	97.2%
2-1998	1998-16	4.43 ng/mL	95.4%
2-1998	1998-16	4.51 ng/mL	97.2%
2-1998	1998-17	4.40 ng/mL	94.7%
2-1998	1998-17	4.51 ng/mL	97.1%
2-1998	1998-18	4.60 ng/mL	99.1%
2-1998	1998-18	4.91 ng/mL	105.9%
2-1998	1998-19	4.57 ng/mL	98.4%
2-1998	1998-19	4.47 ng/mL	96.3%
2-1998	1998-20	4.50 ng/mL	97.0%
2-1998	1998-20	4.51 ng/mL	97.2%
2-1998	1998-21	4.51 ng/mL	97.2%
2-1998	1998-21	4.58 ng/mL	98.6%
2-1998	1998-22	4.69 ng/mL	101.2%
2-1998	1998-22	4.46 ng/mL	96.1%
2-1998	1998-23	4.46 ng/mL	96.2%
2-1998	1998-23	4.48 ng/mL	96.5%
2-1998	1998-24	4.53 ng/mL	97.6%
2-1998	1998-24	4.67 ng/mL	100.7%
2-1998	1998-25	4.23 ng/mL	91.2%
2-1998	1998-25	4.22 ng/mL	90.9%
2-1998	1998-26	4.20 ng/mL	90.6%
2-1998	1998-26	4.28 ng/mL	92.3%
2-1998	1998-27	4.26 ng/mL	91.9%
2-1998	1998-27	4.30 ng/mL	92.6%
2-1998	1998-28	4.27 ng/mL	92.1%
2-1998	1998-28	4.20 ng/mL	90.4%
2-1998	1998-29	4.24 ng/mL	91.4%
2-1998	1998-29	4.24 ng/mL	91.4%
2-1998	1998-30	4.05 ng/mL	87.2%

Quarter	MDN Data Set ID	DormConc	Recov
2-1998	1998-30	4.15 ng/mL	89.4%
2-1998	1998-31	4.27 ng/mL	92.1%
2-1998	1998-31	4.27 ng/mL	92.0%
2-1998	1998-32	4.30 ng/mL	92.6%
2-1998	1998-32	4.15 ng/mL	89.3%
3-1998	1998-33	4.19 ng/mL	90.2%
3-1998	1998-33	4.28 ng/mL	92.3%
3-1998	1998-34	4.19 ng/mL	90.3%
3-1998	1998-34	4.22 ng/mL	91.0%
3-1998	1998-35	4.24 ng/mL	91.4%
3-1998	1998-35	4.30 ng/mL	92.6%
3-1998	1998-36	4.21 ng/mL	90.8%
3-1998	1998-36	4.24 ng/mL	91.5%
3-1998	1998-37	4.22 ng/mL	90.9%
3-1998	1998-37	4.29 ng/mL	92.4%
3-1998	1998-38	4.24 ng/mL	91.3%
3-1998	1998-38	4.22 ng/mL	90.9%
3-1998	1998-39	4.22 ng/mL	90.9%
3-1998	1998-39	4.31 ng/mL	92.8%
3-1998	1998-40	4.42 ng/mL	95.3%
3-1998	1998-40	4.22 ng/mL	90.9%
3-1998	1998-41	4.24 ng/mL	91.4%
3-1998	1998-41	4.20 ng/mL	90.6%
3-1998	1998-42	4.28 ng/mL	92.3%
3-1998	1998-42	4.41 ng/mL	95.0%
3-1998	1998-43	4.21 ng/mL	90.8%
3-1998	1998-43	4.21 ng/mL	90.7%
3-1998	1998-44	4.30 ng/mL	92.6%
3-1998	1998-44	4.23 ng/mL	91.2%
3-1998	1998-45	4.31 ng/mL	92.9%
3-1998	1998-45	4.28 ng/mL	92.3%
3-1998	1998-46	4.35 ng/mL	93.8%
3-1998	1998-46	4.23 ng/mL	91.2%
3-1998	1998-47	4.46 ng/mL	96.2%
3-1998	1998-47	4.38 ng/mL	94.4%
3-1998	1998-48	4.38 ng/mL	94.3%
3-1998	1998-48	4.09 ng/mL	88.2%
3-1998	1998-49	4.30 ng/mL	92.7%
3-1998	1998-49	4.08 ng/mL	87.9%
4-1998	1998-50	4.25 ng/mL	91.6%
4-1998	1998-50	4.33 ng/mL	93.4%
4-1998	1998-51	4.30 ng/mL	92.7%
4-1998	1998-51	4.37 ng/mL	94.2%
4-1998	1998-52	4.23 ng/mL	91.3%
4-1998	1998-52	4.12 ng/mL	88.9%
4-1998	1998-53	4.21 ng/mL	90.7%
4-1998	1998-53	4.26 ng/mL	91.9%
4-1998	1998-54	4.52 ng/mL	97.3%
4-1998	1998-54	4.23 ng/mL	91.2%
4-1998	1998-55	4.36 ng/mL	93.9%
4-1998	1998-55	4.28 ng/mL	92.3%
4-1998	1998-56	4.42 ng/mL	95.3%
4-1998	1998-56	4.38 ng/mL	94.4%
4-1998	1998-57	4.29 ng/mL	92.5%
4-1998	1998-57	4.39 ng/mL	94.6%
4-1998	1998-58	4.38 ng/mL	94.5%
4-1998	1998-58	4.27 ng/mL	92.0%
4-1998	1998-59	4.39 ng/mL	94.5%
4-1998	1998-59	4.35 ng/mL	93.8%
4-1998	1998-60	4.40 ng/mL	94.8%
4-1998	1998-60	4.39 ng/mL	94.6%
4-1998	1998-61	4.15 ng/mL	89.4%
4-1998	1998-61	4.38 ng/mL	94.3%
4-1998	1998-62	4.42 ng/mL	95.3%
4-1998	1998-63	4.35 ng/mL	93.8%
4-1998	1998-64	4.24 ng/mL	91.5%
4-1998	1998-64	4.44 ng/mL	95.6%
4-1998	1998-65	4.32 ng/mL	93.0%
4-1998	1998-65	4.30 ng/mL	92.6%
4-1998	1998-66	4.37 ng/mL	94.2%
4-1998	1998-66	4.34 ng/mL	93.6%
Mean		4.38 ng/mL	94.4%
St Dev		0.16 ng/mL	3.4%

D. Dups

Quarter	MDN_Data_Set_ID	Sample_ID	%Diff
1-1998	1998-01	MDN057D	2.3%
1-1998	1998-01	MDN060D	23.2%
1-1998	1998-01	MDN068D	2.2%
1-1998	1998-02	MDN100D	6.5%
1-1998	1998-02	MDN221D	7.6%
1-1998	1998-02	MDN015D	3.6%
1-1998	1998-03	MDN464D	0.7%
1-1998	1998-03	MDN0570D	2.3%
1-1998	1998-03	MDN001D	13.7%
1-1998	1998-04	MDN051D	1.0%
1-1998	1998-04	MDN067D	1.1%
1-1998	1998-04	MDN031D	1.1%
1-1998	1998-05	MDN217D	1.0%
1-1998	1998-05	MDN0501D	0.7%
1-1998	1998-05	MDN054D	3.8%
1-1998	1998-06	MDN0597D	2.2%
1-1998	1998-06	MDN067D	3.1%
1-1998	1998-07	MDN474D	2.0%
1-1998	1998-07	MDN0577D	0.8%
1-1998	1998-08	MDN063D	6.7%
1-1998	1998-08	MDN068D	2.1%
1-1998	1998-08	MDN0502D	2.5%
1-1998	1998-09	MDN220D	2.7%
1-1998	1998-09	MDN0505D	1.7%
1-1998	1998-09	MDN0581D	2.5%
1-1998	1998-09	MDN014D	1.7%
1-1998	1998-10	MDN104D	2.8%
1-1998	1998-10	MDN477D	7.8%
1-1998	1998-10	MDN0580D	1.5%
1-1998	1998-11	MDN483D	5.2%
1-1998	1998-11	MDN022D	0.6%
1-1998	1998-11	MDN0585D	1.1%
1-1998	1998-12	MDN048D	2.5%
1-1998	1998-12	MDN048D	2.8%
1-1998	1998-12	MDN050D	0.3%
1-1998	1998-12	MDN0581D	0.4%
1-1998	1998-13	MDN037D	1.9%
1-1998	1998-13	MDN450D	0.7%
1-1998	1998-13	MDN450D	3.1%
1-1998	1998-13	MDN0534D	2.7%
2-1998	1998-14	MDN0501D	2.0%
2-1998	1998-14	MDN0514D	9.2%
2-1998	1998-14	MDN0560D	1.7%
2-1998	1998-15	MDN0530D	1.8%
2-1998	1998-15	MDN0580D	0.1%
2-1998	1998-15	MDN0587D	1.2%
2-1998	1998-16	MDN081D	0.8%
2-1998	1998-16	MDN105D	1.9%
2-1998	1998-17	MDN453D	6.9%
2-1998	1998-17	MDN0574D	1.1%
2-1998	1998-18	MDN0290D	3.8%
2-1998	1998-18	MDN033D	2.7%
2-1998	1998-18	MDN0578D	3.9%
2-1998	1998-19	MDN464D	6.7%
2-1998	1998-19	MDN480D	6.0%
2-1998	1998-19	MDN028D	3.1%
2-1998	1998-20	MDN028D	1.5%
2-1998	1998-20	MDN088D	6.1%
2-1998	1998-21	MDN023D	3.6%
2-1998	1998-21	MDN465D	7.8%
2-1998	1998-22	MDN015D	1.2%
2-1998	1998-22	MDN024D	6.0%
2-1998	1998-22	MDN025D	0.8%
2-1998	1998-23	MDN0207D	0.4%
2-1998	1998-23	MDN0253D	4.3%
2-1998	1998-23	MDN044D	1.7%
2-1998	1998-24	MDN004D	3.0%
2-1998	1998-24	MDN0231D	13.0%
2-1998	1998-25	MDN068D	1.8%
2-1998	1998-25	MDN0559D	1.7%
2-1998	1998-25	MDN0571D	0.6%
2-1998	1998-26	MDN028D	1.4%
2-1998	1998-26	MDN0230D	5.1%
2-1998	1998-26	MDN054D	0.7%
2-1998	1998-27	MDN480D	0.7%
2-1998	1998-27	MDN0584D	1.9%
2-1998	1998-27	MDN060D	11.5%
2-1998	1998-28	MDN0251D	1.0%
2-1998	1998-28	MDN476D	1.5%
2-1998	1998-28	MDN012D	0.9%
2-1998	1998-29	MDN022D	0.5%
2-1998	1998-29	MDN0503D	4.9%
2-1998	1998-30	MDN486D	23.6%
2-1998	1998-30	MDN478D	2.1%
2-1998	1998-31	MDN0244D	3.2%
2-1998	1998-31	MDN0254D	0.6%
2-1998	1998-31	MDN457D	5.9%
2-1998	1998-32	MDN0364D	1.6%

Quarter	MDN_Data_Set_ID	Sample_ID	%Diff
2-1998	1998-32	MDN005D	1.4%
2-1998	1998-32	MDN057D	1.1%
3-1998	1998-33	MDN074D	1.8%
3-1998	1998-33	MDN053D	2.8%
3-1998	1998-33	MDN077D	4.1%
3-1998	1998-34	MDN003D	1.2%
3-1998	1998-34	MDN403D	0.2%
3-1998	1998-34	MDN093D	2.0%
3-1998	1998-35	MDN054D	2.8%
3-1998	1998-35	MDN028D	3.4%
3-1998	1998-35	MDN471D	5.8%
3-1998	1998-36	MDN059D	4.3%
3-1998	1998-36	MDN022D	3.0%
3-1998	1998-36	MDN057D	0.4%
3-1998	1998-37	MDN054D	1.6%
3-1998	1998-37	MDN060D	3.0%
3-1998	1998-37	MDN068D	2.3%
3-1998	1998-38	MDN073D	2.7%
3-1998	1998-38	MDN479D	0.7%
3-1998	1998-38	MDN030D	0.0%
3-1998	1998-39	MDN027D	1.4%
3-1998	1998-39	MDN030D	3.2%
3-1998	1998-39	MDN037D	5.2%
3-1998	1998-40	MDN036D	3.4%
3-1998	1998-40	MDN057D	7.7%
3-1998	1998-41	MDN008D	0.2%
3-1998	1998-41	MDN029D	6.2%
3-1998	1998-41	MDN080D	2.1%
3-1998	1998-42	MDN067D	0.8%
3-1998	1998-42	MDN038D	1.6%
3-1998	1998-42	MDN064D	10.9%
3-1998	1998-43	MDN082D	2.0%
3-1998	1998-43	MDN012D	1.5%
3-1998	1998-43	MDN013D	0.1%
3-1998	1998-44	MDN065D	2.3%
3-1998	1998-44	MDN108D	1.4%
3-1998	1998-45	MDN486D	0.8%
3-1998	1998-45	MDN011D	3.5%
3-1998	1998-46	MDN082D	5.2%
3-1998	1998-46	MDN000D	6.1%
3-1998	1998-47	MDN060D	1.7%
3-1998	1998-47	MDN010D	1.7%
3-1998	1998-47	MDN027D	6.9%
3-1998	1998-47	MDN000D	4.5%
3-1998	1998-48	MDN048D	5.4%
3-1998	1998-48	MDN010D	2.5%
3-1998	1998-48	MDN026D	2.9%
3-1998	1998-49	MDN456D	0.2%
3-1998	1998-49	MDN479D	2.0%
4-1998	1998-50	MDN063D	5.9%
4-1998	1998-50	MDN018D	8.8%
4-1998	1998-50	MDN477D	0.0%
4-1998	1998-51	MDN016D	2.1%
4-1998	1998-51	MDN097D	11.8%
4-1998	1998-51	MDN041D	1.9%
4-1998	1998-52	MDN009D	3.6%
4-1998	1998-52	MDN087D	8.4%
4-1998	1998-52	MDN014D	5.0%
4-1998	1998-53	MDN066D	1.9%
4-1998	1998-53	MDN028D	7.0%
4-1998	1998-53	MDN040D	6.0%
4-1998	1998-54	MDN014D	11.3%
4-1998	1998-54	MDN058D	7.6%
4-1998	1998-54	MDN088D	1.5%
4-1998	1998-54	MDN022D	4.1%
4-1998	1998-55	MDN048D	6.2%
4-1998	1998-55	MDN097D	2.1%
4-1998	1998-55	MDN097D	4.7%
4-1998	1998-55	MDN097D	1.8%
4-1998	1998-56	MDN021D	3.7%
4-1998	1998-56	MDN475D	1.0%
4-1998	1998-56	MDN066D	4.1%
4-1998	1998-57	MDN108D	0.7%
4-1998	1998-57	MDN480D	5.1%
4-1998	1998-58	MDN480D	3.1%
4-1998	1998-58	MDN081D	2.8%
4-1998	1998-59	MDN058D	1.1%
4-1998	1998-59	MDN071D	1.8%
4-1998	1998-60	MDN082D	2.9%
4-1998	1998-60	MDN066D	0.7%
4-1998	1998-60	MDN067D	5.2%
4-1998	1998-61	MDN000D	3.9%
4-1998	1998-61	MDN023D	3.0%
4-1998	1998-61	MDN025D	6.6%
4-1998	1998-62	MDN051D	1.7%
4-1998	1998-62	MDN099D	12.9%
4-1998	1998-63	MDN007D	16.7%
4-1998	1998-63	MDN113D	1.1%
4-1998	1998-64	MDN080D	8.6%
4-1998	1998-64	MDN023D	3.2%
4-1998	1998-64	MDN045D	0.7%
4-1998	1998-65	MDN022D	2.5%
4-1998	1998-65	MDN029D	1.1%
4-1998	1998-65	MDN461D	2.8%
4-1998	1998-66	MDN036D	1.5%
		Mean	3.5%
		St Dev	3.6%



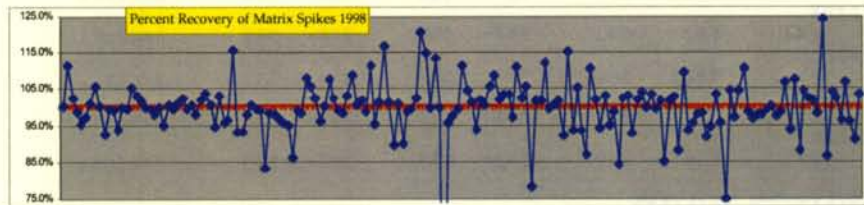
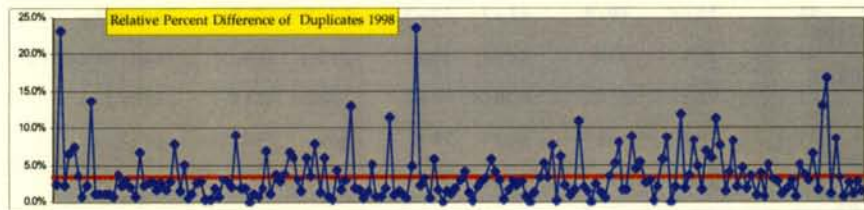
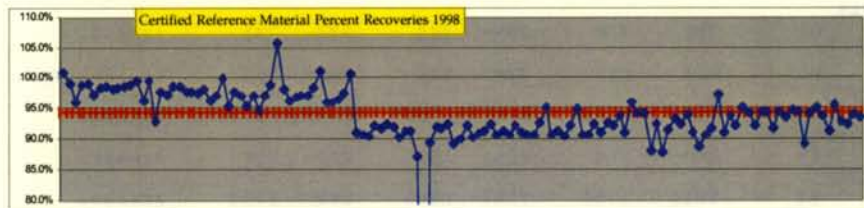
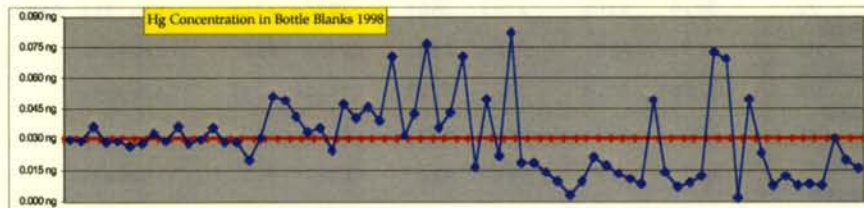
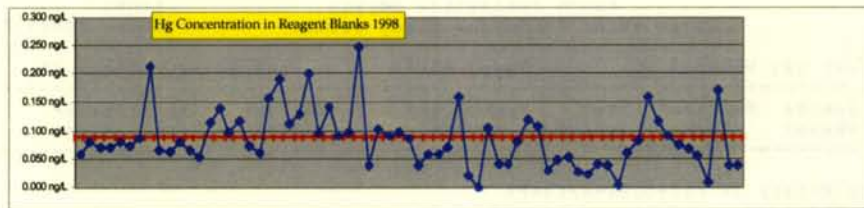
D. Spikes

Quarter	MDN_Data_Set_ID	Sample_ID	%Rec
1-1998	1998-01	MDN0575	100.4%
1-1998	1998-01	MDN5805	111.3%
1-1998	1998-01	MDN5885	102.7%
1-1998	1998-02	MDN1008	99.0%
1-1998	1998-02	MDN1005	95.6%
1-1998	1998-02	MDN2215	97.5%
1-1998	1998-02	MDN5155	101.3%
1-1998	1998-03	MDN4645	105.8%
1-1998	1998-03	MDN5705	100.3%
1-1998	1998-03	MDN6015	92.8%
1-1998	1998-04	MDN0515	99.6%
1-1998	1998-04	MDN0675	99.2%
1-1998	1998-04	MDN6315	94.3%
1-1998	1998-05	MDN2175	100.0%
1-1998	1998-05	MDN5015	99.8%
1-1998	1998-05	MDN5545	105.6%
1-1998	1998-06	MDN5975	103.2%
1-1998	1998-06	MDN6075	101.9%
1-1998	1998-07	MDN4745	100.0%
1-1998	1998-07	MDN5775	99.7%
1-1998	1998-08	MDN0635	98.1%
1-1998	1998-08	MDN0695	100.1%
1-1998	1998-08	MDN5025	95.4%
1-1998	1998-09	MDN2205	100.7%
1-1998	1998-09	MDN5065	99.5%
1-1998	1998-09	MDN6145	101.2%
1-1998	1998-10	MDN1045	102.6%
1-1998	1998-10	MDN4775	99.5%
1-1998	1998-10	MDN5285	100.7%
1-1998	1998-11	MDN4635	98.1%
1-1998	1998-11	MDN5225	102.2%
1-1998	1998-11	MDN5855	104.2%
1-1998	1998-12	MDN2505	100.6%
1-1998	1998-12	MDN5815	94.9%
1-1998	1998-13	MDN2335	103.4%
1-1998	1998-13	MDN5345	96.0%
2-1998	1998-14	MDN5015	96.6%
2-1998	1998-14	MDN5145	115.7%
2-1998	1998-14	MDN5695	93.5%
2-1998	1998-15	MDN5535	93.5%
2-1998	1998-15	MDN5565	98.1%
2-1998	1998-15	MDN5875	100.8%
2-1998	1998-16	MDN0615	99.6%
2-1998	1998-16	MDN1055	99.2%
2-1998	1998-17	MDN4535	83.4%
2-1998	1998-17	MDN5745	98.7%
2-1998	1998-18	MDN2905	98.2%
2-1998	1998-18	MDN5335	97.0%
2-1998	1998-18	MDN5785	95.8%
2-1998	1998-19	MDN4645	95.3%
2-1998	1998-19	MDN4655	86.2%
2-1998	1998-19	MDN5865	99.2%
2-1998	1998-20	MDN0285	98.7%
2-1998	1998-20	MDN8885	107.9%
2-1998	1998-21	MDN0235	105.9%
2-1998	1998-21	MDN4555	102.6%
2-1998	1998-22	MDN0155	96.3%
2-1998	1998-22	MDN2245	100.3%
2-1998	1998-22	MDN2535	107.6%
2-1998	1998-23	MDN2075	102.6%
2-1998	1998-23	MDN2535	99.1%
2-1998	1998-23	MDN5445	98.5%
2-1998	1998-24	MDN0845	103.3%
2-1998	1998-24	MDN2315	108.9%
2-1998	1998-25	MDN0685	100.9%
2-1998	1998-25	MDN5595	102.4%
2-1998	1998-25	MDN5715	98.9%
2-1998	1998-26	MDN2265	111.3%
2-1998	1998-26	MDN2345	95.6%
2-1998	1998-26	MDN5545	101.3%
2-1998	1998-27	MDN4635	117.0%
2-1998	1998-27	MDN5845	101.6%
2-1998	1998-27	MDN6065	89.7%
2-1998	1998-28	MDN2515	101.1%
2-1998	1998-28	MDN4765	90.0%
2-1998	1998-28	MDN5125	98.9%
2-1998	1998-29	MDN5225	99.7%
2-1998	1998-29	MDN5835	102.5%
2-1998	1998-30	MDN4685	120.6%
2-1998	1998-30	MDN4795	114.9%
2-1998	1998-31	MDN2445	99.9%
2-1998	1998-31	MDN2545	113.5%
2-1998	1998-31	MDN4575	99.9%

Quarter	MDN_Data_Set_ID	Sample_ID	%Rec
2-1998	1998-32	MDN0045	95.9%
2-1998	1998-32	MDN0055	97.9%
2-1998	1998-32	MDN5875	99.7%
3-1998	1998-33	MDN0745	111.5%
3-1998	1998-33	MDN5255	104.7%
3-1998	1998-33	MDN5775	101.4%
3-1998	1998-34	MDN0035	94.2%
3-1998	1998-34	MDN4035	102.2%
3-1998	1998-34	MDN0955	100.8%
3-1998	1998-35	MDN0045	105.9%
3-1998	1998-35	MDN2255	108.9%
3-1998	1998-35	MDN4715	102.1%
3-1998	1998-36	MDN0055	103.8%
3-1998	1998-36	MDN5225	103.6%
3-1998	1998-36	MDN5675	97.3%
3-1998	1998-37	MDN0045	110.9%
3-1998	1998-37	MDN0805	102.7%
3-1998	1998-37	MDN5095	106.1%
3-1998	1998-38	MDN3735	78.2%
3-1998	1998-38	MDN4795	101.9%
3-1998	1998-38	MDN5305	101.9%
3-1998	1998-39	MDN2275	112.0%
3-1998	1998-39	MDN3035	99.7%
3-1998	1998-39	MDN3875	100.6%
3-1998	1998-40	MDN0365	101.8%
3-1998	1998-40	MDN5375	92.3%
3-1998	1998-41	MDN0065	115.4%
3-1998	1998-41	MDN2365	93.6%
3-1998	1998-41	MDN3625	105.5%
3-1998	1998-42	MDN0875	93.6%
3-1998	1998-42	MDN3565	87.2%
3-1998	1998-42	MDN5845	110.5%
3-1998	1998-43	MDN0825	102.3%
3-1998	1998-43	MDN5125	94.6%
3-1998	1998-43	MDN5135	103.2%
3-1998	1998-44	MDN0555	95.2%
3-1998	1998-44	MDN1095	99.0%
3-1998	1998-45	MDN4885	84.5%
3-1998	1998-45	MDN6115	102.5%
3-1998	1998-46	MDN0625	103.2%
3-1998	1998-46	MDN2005	93.1%
3-1998	1998-47	MDN0905	102.2%
3-1998	1998-47	MDN2275	104.3%
3-1998	1998-47	MDN6305	100.0%
3-1998	1998-48	MDN0485	103.6%
3-1998	1998-48	MDN3105	99.6%
3-1998	1998-48	MDN3685	101.9%
3-1998	1998-49	MDN4565	85.2%
3-1998	1998-49	MDN4785	101.7%
4-1998	1998-50	MDN3185	103.1%
4-1998	1998-50	MDN8475	88.2%
4-1998	1998-51	MDN0195	109.6%
4-1998	1998-51	MDN5975	93.7%
4-1998	1998-51	MDN6415	95.9%
4-1998	1998-52	MDN2035	98.3%
4-1998	1998-52	MDN5875	98.5%
4-1998	1998-52	MDN8145	92.0%
4-1998	1998-53	MDN2665	94.9%
4-1998	1998-53	MDN6265	103.5%
4-1998	1998-53	MDN8405	95.9%
4-1998	1998-54	MDN5145	75.0%
4-1998	1998-54	MDN8225	104.7%
4-1998	1998-55	MDN5465	97.4%
4-1998	1998-55	MDN6075	104.6%
4-1998	1998-56	MDN0215	110.7%
4-1998	1998-56	MDN4725	99.1%
4-1998	1998-56	MDN5965	97.2%
4-1998	1998-57	MDN1085	98.0%
4-1998	1998-57	MDN4835	98.3%
4-1998	1998-58	MDN0495	99.6%
4-1998	1998-58	MDN5815	100.3%
4-1998	1998-59	MDN6595	97.6%
4-1998	1998-59	MDN8715	98.6%
4-1998	1998-60	MDN0625	107.1%
4-1998	1998-60	MDN3955	94.2%
4-1998	1998-60	MDN3875	107.6%
4-1998	1998-61	MDN0305	88.2%
4-1998	1998-61	MDN3025	104.8%
4-1998	1998-61	MDN5525	102.6%
4-1998	1998-62	MDN2915	102.0%
4-1998	1998-62	MDN8995	98.4%
4-1998	1998-63	MDN3075	124.3%
4-1998	1998-63	MDN8135	86.9%
4-1998	1998-64	MDN0905	104.3%
4-1998	1998-64	MDN5235	102.4%
4-1998	1998-64	MDN4655	98.5%
4-1998	1998-65	MDN5235	108.9%
4-1998	1998-65	MDN8295	96.3%
4-1998	1998-66	MDN4815	91.3%
4-1998	1998-66	MDN6365	103.8%

Mean 100.2%
St Dev 6.8%

VI. Appendix B Quality Control Charts



VII. Appendix C US EPA WP 040 Results

E87575 WA01127
Frontier Geosciences, Inc.

Performance Evaluation Report
US EPA Water Pollution Study WP040

Report: FECC5
Page: 1
Date: 1980V98

Participant ID: WA01127 Type: OTHER Requesting Office: FI

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
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TRACE METALS IN MICROGRAMS/LITER						
01-ALUMINIUM	01	2620	3105	2740- 3440	2830- 3350	Ck. for Err.
02-ARSENIC	01	153	160	128- 190	136- 183	Accept.
03-BERYLLIUM	02	37.30	36.9	33.1- 42.2	34.2- 41	Accept.
04-CADMIUM	01	182	170	147- 193	152- 187	Accept.
05-COBALT	01	527	503	449- 561	464- 547	Accept.
06-CHROMIUM	01	679	650	579- 726	598- 706	Accept.
07-COPPER	01	750	700	654- 781	670- 765	Accept.
08-IRON	01	916	834	744- 936	768- 912	Ck. for Err.
09-MERCURY	01	1.10	1.15	0.813- 1.47	0.895- 1.39	Accept.
10-MANGANESE	01	244	240	216- 259	222- 254	Accept.
11-NICKEL	01	2620	2501	2340- 2860	2400- 2790	Accept.
12-LEAD	01	71.5	70.6	61.7- 83.3	64.4- 80.6	Accept.
13-SELENIUM	01	305	260	189- 297	202- 284	Not Accept.
14-VANADIUM	01	4530	4202	3880- 4640	3980- 4550	Accept.
15-ZINC	01	583	631	563- 709	581- 690	Accept.
16-ANTIMONY	02	515	499	381- 590	407- 564	Accept.
17-SILVER	02	834	851	736- 930	760- 906	Accept.
18-THALLIUM	02	863	841	747- 970	775- 942	Accept.
74-HOLYBDENUM	02	18.4	18.2	14- 22	15- 21	Accept.
75-STROMTIUM	02	324	301	263- 342	273- 332	Accept.
76-TITANIUM	02	166	160	142- 177	147- 173	Accept.

MISCELLANEOUS ANALYTES

Performance Evaluation Report
USEPA Water Pollution Study WFO40

Report: IECC5
Page: 2
Date: 15NOV98

Participant ID: WA01127 Type: OTHER Requesting Office: F1

Sample Number	Reported Value	True Value*	Acceptance Limits	Warning Limits	Performance Evaluation
/2-NON-FILTERABLE RESIDUE (IN MG/L)					
01	65.0	64.0	12.4- 80.7	20.9- 72.1	Accept.

***** END OF DATA FOR WA01127 *****
NOTE: FOR LIMITS AND TRUE VALUES, ASSUME THREE SIGNIFICANT DIGITS.
***** END OF REPORT FOR WA01127 *****

based on gravimetric calculations, or a reference value when necessary.



