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NATIONAL WATER RESEARCH INSTITUTE

INSTITUT NATIONAL DE RECHERCHE SUR LES EAUX

Ecosystem Interlaboratory QA Program
Study FP 72 - Rain and Soft Waters
(March & April 1998)

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June 19, 1998

To: Participants of the NWRI Ecosystem Interlaboratory Quality Assurance Program

Re: Final Report for NWRI Study FP 72 - Rain and Soft Waters Portion

Dear Participant:

We would like to thank you for your co-operation and prompt responses with respect to this study. In return, it is the aim of the quality assurance group to give prompt evaluations, reports, and effective remedial assistance.

The Institute is pleased to distribute this final report to the FP participant laboratories. This report includes results and evaluations for a unique series of samples: Rain and Soft Waters. The evaluation of results includes an evaluation for systematic bias and precision. The flagging criteria, used to assess precision, are open to change. In order to improve our data assessments and the quality of your data, you may find that these criteria change from study to study. This would be evident in Table 3 - Summary of Study-to-Study Performance. A complete listing of all laboratory results is included so that each laboratory can compare its results and evaluations with other laboratories. For details concerning these evaluations please refer to the attached appendix, Glossary of Terms, or to the Research & Applications Branch QA Manual.

In the data summary tables you will find the tabulation of the degree of bias. It has been difficult to quantify and determine its significance at low values. *In this report we have calculated bias in two components which relate directly to the chemical measurement.* Laboratory heads are encouraged to discuss the attached report openly with those who manage their programs and those who use their laboratory data.

The laboratories listed in this report submitted their data with a confidential laboratory code. This confidentiality is fully respected by our staff. Access to these codes is possible through the relevant laboratories or program authorities.

Should you have any questions or comments regarding this study, please do not hesitate to contact us.

Yours truly,

Harry A.

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Attachment: Individual Laboratory Appraisal

Canada

National Water Research Institute
National Laboratory for Environmental Testing

Report no. NWRI-QA-98-01

Ecosystem Interlaboratory Quality Assurance Program
Study FP 72 - Final Report

March and April 1998

An Interlaboratory Quality Assurance Study for Rain and Soft Waters*

by

H. Alkema and L. Hjelm

Environmental Standards and Reference Materials
Project Information & Quality Management
National Laboratory for Environmental Testing
National Water Research Institute
Burlington, Ontario

June 1998

* companion studies: Major Ions/Total P; Report NWRI-QA-97-02, and Trace Metals; Report NWRI-QA-97-03

NWRI Interlaboratory Quality Assurance Studies for Acid Rain and Surface Waters

Major Ions and Nutrients, Trace Metals, Total Phosphorus, and Mercury

The Institute's interlaboratory quality assurance (QA) studies support a core group of government labs and their QA requirements of various environmental programs. These programs include: acid rain research, Great Lakes trans-boundary issues, and issues involving provincial watershed/ecosystem research, monitoring, and jurisdiction. The QA program also addresses health issues, such as, toxic metal (lead, manganese, and mercury) contamination of drinking water.

The QA studies are executed twice a year and accommodate environmental programs in both Canada and the United States of America. The US Environmental Protection Agency, US Geological Survey, and numerous university acid rain programs show a continued interest in this program. More than 200 laboratories are invited to participate on a voluntary basis in each study. Currently, 40 of these labs participate in the various study matrixes. One study consists of five (5) series of ten (10) samples each and includes numerous parameters for analysis. The primary feature of these studies is to report the quality of data produced by the participating laboratories. Laboratory performance is ranked in terms of the number of biased parameters (systematic bias) and flagged results (precision measurement). The reports produced from the client data provide a powerful tool for the diagnosis of problematic analysis. Environmental programs and data users are therefore encouraged to have their labs participate as a means of quantifying laboratory performance and data quality.

As the NWRI studies run on a voluntary and cost recovery basis, laboratories and program managers express an ongoing interest in study design and sample requirements. The program is open to international participation and contractually specialized studies are available.

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Table 1 List of participating[†] laboratories in the acid rain and soft waters portion of interlaboratory study FP 72 (March & April 1998).

Adirondack Lakes Survey Corporation
AECL Research - ERB, Chalk River
ASL - Analytical Service Laboratories Ltd.
Chemex Environmental Services
CRD Water Department Laboratory
Environment Canada - AES, CAPMoN Laboratory
Environment Canada - AES, Remote Regions Atmospheric Laboratory
Environment Canada - CWS, ECB, Environmental Quality Section
Environment Canada - ETC, AMD
Environment Canada - NHRI, WQL
Environment Canada - NWRI, NLET
Environment Canada - Pacific Environmental Science Centre
Environnement Canada - CSL, Laboratoire régional - Québec
Enviro-Test Laboratories
Fisheries and Oceans Canada - Freshwater Institute
Harvard School of Public Health
Illinois State Water Survey - Analytical Chemistry Unit
Laboratoire de Santé Publique du Québec
Maxxam Analytics
Ministère de l'Environnement et de la Faune du Québec - Laval
Ministère de l'Environnement et de la Faune du Québec - Sainte-Foy
Ministère de Ressources Naturelles du Québec - Sainte-Foy
Monroe County Environmental Health Laboratory
Natural Resources Canada - CFS, Ontario Region
New Brunswick Department of the Environment - ASL
Norwest Labs
Ontario Hydro Technologies
Ontario Ministry of Environment and Energy - Dorset
Ontario Ministry of Environment and Energy - Etobicoke
Ontario Ministry of Northern Development and Mines - Geosciences Laboratory
Pennsylvania State University - ERRI
Philip Analytical Services Corporation
State of Vermont - Department of Environmental Conservation Laboratory
University of Maine - Water Research Institute
US Environmental Protection Agency - Western Ecology Division
US Geological Survey - National Water Quality Laboratory
US Geological Survey - Water Resources Division

[†] Laboratories select their routine parameters from the series of samples in this study.

Table 2 Laboratory Performance Scores (Study 0072)

Rain & Soft Waters

	SYSTEMATIC BIAS				FLAGGED RESULTS		
LAB CODE	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	SUM OF BIAS & FLAGGED DATA % SCORE
F109a	2	0	0.00	20	0	0.00	0.00
F053	10	0	0.00	95	1	1.05	0.53
F017	9	0	0.00	82	1	1.22	0.61
F036	14	0	0.00	131	3	2.29	1.15
F109	9	0	0.00	83	2	2.41	1.20
F118	4	0	0.00	39	1	2.56	1.28
F069	14	0	0.00	119	10	8.40	4.20
F110	11	0	0.00	107	9	8.41	4.21
F026	17	1	5.88	169	6	3.55	4.72
F068	7	0	0.00	63	6	9.52	4.76
F009	10	0	0.00	85	10	11.76	5.88
F002	14	0	0.00	102	13	12.75	6.37
F032	18	0	0.00	139	18	12.95	6.47
F113	10	1	10.00	99	3	3.03	6.52
F042	16	1	6.25	147	10	6.80	6.53
F129	7	0	0.00	63	9	14.29	7.14
F003	17	2	11.76	153	5	3.27	7.52
F025	13	1	7.69	119	12	10.08	8.89
F007	15	1	6.67	130	16	12.31	9.49
F112	15	2	13.33	138	10	7.25	10.29
F038	15	1	6.67	116	17	14.66	10.66
F133	13	2	15.38	119	16	13.45	14.41
F022	18	2	11.11	168	31	18.45	14.78
F004	6	1	16.67	44	6	13.64	15.15
F010	19	4	21.05	158	16	10.13	15.59
F015	17	2	11.76	113	26	23.01	17.39
F020	14	1	7.14	120	37	30.83	18.99
F107	18	3	16.67	172	38	22.09	19.38
F094	19	3	15.79	161	41	25.47	20.63
F072	16	2	12.50	141	44	31.21	21.85
F060	20	4	20.00	158	38	24.05	22.03
F014	18	4	22.22	149	38	25.50	23.86
F074	17	4	23.53	170	51	30.00	26.76
F037	13	4	30.77	106	35	33.02	31.89
F071	11	5	45.45	110	32	29.09	37.27
F122	7	3	42.86	63	20	31.75	37.30
F073	11	3	27.27	110	54	49.09	38.18
F139	9	4	44.44	74	49	66.22	55.33

The parameters were selected from:

Cond	pH	Alk Inf	NO3/2	NO3	Ammon
Na	Mg	Al	SO4 IC	Cl IC	Ca
Colour	DOC	Alk Gran	Si	K	DOC
DIC	TKN	SO4	Cl	Acid	Acid to 8.3

Table 3 SUMMARY of STUDY-TO-STUDY PERFORMANCE

Rain & Soft Water

LAB CODE	% BIASED PARAMETERS & FLAGGED RESULTS ON STUDIES 0063	0064	0065	0066	0067	0068	0069	0070	0071	0072	MEDIAN SCORE	COMMENTS
F002	27.0	13.7	11.9	11.8	20.6	14.1	3.2	10.4	2.7	6.4	11.8	SATISFACTORY
F003	14.0	18.1	6.9	14.6	8.9	4.3	7.1	2.6	13.5	7.5	8.2	SATISFACTORY
F004	14.3	1.2	7.1	1.0	19.7	-	3.5	4.1	18.1	15.2	7.1	SATISFACTORY
F007	-	-	23.3	13.9	13.8	12.3	11.8	9.2	0.0	9.5	12.1	SATISFACTORY
F009	19.3	20.0	21.5	6.5	-	14.0	16.0	2.9	21.7	5.9	16.0	MODERATE
F010	21.5	17.6	17.8	4.8	6.5	1.6	-	7.3	7.2	15.6	7.3	SATISFACTORY
F014	23.8	7.0	16.2	5.3	10.5	8.7	18.1	6.0	21.7	23.2	13.4	MODERATE
F015	14.6	6.8	3.3	9.8	4.4	7.1	12.4	14.4	25.3	17.4	11.1	SATISFACTORY
F017	2.9	27.6	1.3	1.8	0.0	9.3	1.3	1.2	0.7	0.6	1.3	GOOD
F020	14.7	6.9	15.1	16.5	19.1	-	23.9	23.7	20.3	19.0	19.0	MODERATE
F022	9.3	7.0	14.2	-	-	-	-	-	-	14.8	11.7	SATISFACTORY
F025	-	-	-	-	-	-	-	22.9	27.9	8.9	22.9	MODERATE
F026	3.1	7.1	7.4	7.5	4.1	5.6	6.2	15.0	3.0	4.7	5.9	SATISFACTORY
F032	9.3	6.0	-	13.0	6.8	16.1	13.7	17.3	10.3	6.0	10.3	SATISFACTORY
F036	6.0	14.0	9.1	8.8	-	11.8	4.0	3.1	5.1	1.1	6.0	SATISFACTORY
F037	25.9	24.5	11.5	18.8	20.7	35.7	18.8	37.7	47.8	31.9	25.2	MODERATE
F038	-	-	-	-	-	-	-	26.8	28.5	10.7	26.8	MODERATE
F042	3.8	6.2	4.4	10.1	14.1	7.7	-	7.3	23.0	6.5	7.3	SATISFACTORY
F053	1.1	2.6	1.0	1.5	6.1	9.7	31.3	9.2	1.1	0.5	2.0	GOOD
F060	-	-	-	-	-	33.2	-	17.0	24.5	22.0	23.3	MODERATE
F068	11.6	12.5	0.8	0.0	1.2	14.1	0.0	1.6	16.1	4.8	3.2	GOOD
F069	4.4	19.9	5.1	9.6	18.3	-	10.2	8.7	-	4.2	9.1	SATISFACTORY
F071	17.5	20.5	16.3	36.9	24.9	11.4	18.7	-	27.9	37.3	20.5	MODERATE
F072	-	-	-	35.2	-	-	-	35.5	29.1	21.9	32.2	POOR
F073	-	-	-	-	-	12.5	-	-	-	38.2	25.3	MODERATE
F074	12.5	15.0	13.8	-	-	15.3	-	-	13.4	26.8	14.4	MODERATE
F094	-	-	-	-	-	-	-	-	35.0	20.6	27.8	MODERATE
F107	7.3	6.0	17.8	18.8	21.4	-	7.0	27.1	13.9	19.4	17.8	MODERATE
F109	28.8	16.2	19.8	25.0	2.2	10.8	16.3	3.6	12.9	1.2	14.5	MODERATE
F109a	-	-	-	-	-	-	-	-	-	0.0	-	-
F110	4.7	3.6	2.8	5.6	9.7	-	-	8.2	5.8	4.2	5.1	SATISFACTORY
F112	9.7	12.0	20.2	9.7	23.2	-	11.7	12.6	6.4	10.3	11.7	SATISFACTORY
F113	-	-	-	-	-	-	-	-	18.5	6.5	12.5	MODERATE
F118	6.2	48.1	52.8	5.7	4.1	3.8	42.0	87.2	5.2	1.3	6.0	SATISFACTORY
F122	12.5	3.9	0.0	2.8	1.4	2.6	3.9	4.2	6.1	37.3	3.9	GOOD
F129	8.9	14.4	15.3	7.5	9.5	13.6	0.9	0.0	-	7.1	8.9	SATISFACTORY
F133	-	-	-	-	-	-	-	6.2	5.8	14.4	6.2	SATISFACTORY
F139	-	-	-	-	-	-	-	-	-	55.3	-	-
INTERLAB MEDIAN	11.6	12.5	11.9	9.6	9.7	11.4	11.7	9.2	13.9	10.3		

STUDY DATES: 0063(05-JUL-93), 0064(05-JAN-94), 0065(05-JUL-94), 0066(04-JAN-95), 0067(05-JUL-95), 0068(01-MAR-96), 0069(01-SEP-96), 0070(03-MAR-97), 0071(02-SEP-97), 0072(02-MAR-98)

Table 4 Sample design for the rain and soft waters portion of interlaboratory study FP 72 (March & April 1998).

Sample Number	Sample Name	Source (Province/State)	Expected Conductance (µS/cm 25°C)
FP 72 SW-1	RainGR-18	Grimsby, Ontario	8.64
FP 72 SW-2	RainGR-03	Grimsby, Ontario	12.0
FP 72 SW-3	AES-01	AES - Pooled Rainwater, Ontario	14.0
FP 72 SW-4	AES-04	AES - Precipitation Lab, Ontario	12.2
FP 72 SW-5	AES-03m‡	AES - Precipitation Lab, Ontario	152.0
FP 72 SW-6	AES-02	AES - Pooled Rainwater, Ontario	17.0
FP 72 SW-7	RainGR-06	Grimsby, Ontario	18.95
FP 72 SW-8	Beav-02	Beaverskin Lake, Ontario	33.7
FP 72 SW-9	Grm-05	Grimsby, Ontario	22.0
FP 72 SW-10	Miram-97b	Gardner Creek, New Brunswick	42.8

‡ Modification details are outlined in the following note.

NOTE: Modification of Rainwater Samples

When collecting rainwater samples for Interlaboratory Studies we make every effort to include a wide range of sample types and concentration levels. These studies and samples need to be current to relate to our clients' environmental programs.

By its nature, our collection of rainwater samples has tended to result in uniformity of samples. In order to provide a range of rainwaters which includes "acid rain" we have artificially manipulated selected rainwater samples with the addition of nitric and sulfuric acids.

To provide a highly acidic rainwater sample for FP72, the natural sample AES-03 was spiked with nitric acid and sulfuric acid to lower its pH from 4.6 to 3.5. This decrease in pH is necessarily accompanied by an increase in nitrate and sulfate concentrations, as well as an elevation of specific conductance.

Table 5

Summary of Interlaboratory Median Values for Rain & Soft Waters - Study 0072

PARAMETER		SAMPLE NUMBER						
		RAINGR-18 SAMPLE 1	RAINGR-03 SAMPLE 2	AES-01 SAMPLE 3	AES-04 SAMPLE 4	AES-03m SAMPLE 5	AES-02 SAMPLE 6	RAINGR-06 SAMPLE 7
Colour	Hazen Unit	1.9450	2.0000	2.5500	1.9450	1.8200	1.1400	1.2000
Specific Conductance	uS/cm	8.6400	12.000	14.000	12.200	152.000	17.000	18.950
Acidity to pH 8.3	mg/L CaCO3	2.1000	2.6000	3.0000	3.0000	20.000	4.0000	3.5000
pH	pH Units	5.9600	5.3400	4.6300	4.8000	3.4500	4.5100	6.3935
Diss Organic Carbon	mg/L C	0.2195	0.2460	0.4250	0.4050	0.2100	0.4000	0.3435
Alkalinity Fixed End Pt pH 4.5	mg/L	2.0500	1.5450	0.5660	0.8000	-	-	3.0500
Alkalinity Gran Infl Extrap	mg/L	0.6000	-0.0590	-1.2700	-0.8050	-	-1.7150	1.7000
Alkalinity Gran Titn	mg/L CaCO3	0.4660	-0.0500	-1.2050	-0.7330	-17.700	-1.5690	1.7100
Diss Inorg Carbon	mg/L C	0.3900	0.2600	0.2400	0.2400	0.2000	0.2710	0.6100
Nitrate + Nitrite	mg/L N	0.2780	0.5200	0.2135	0.2395	2.7600	0.2380	0.7065
Nitrate-IC	mg/L N	0.2700	0.5150	0.2100	0.2400	2.7695	0.2370	0.7000
Ammonia	mg/L N	0.1690	0.0030	0.1805	0.2248	0.1300	0.1666	0.0050
Total Kjeldahl N	mg/L N	0.2055	0.0700	0.2100	0.2390	0.1500	0.1800	0.0505
Sodium	mg/L	0.0745	0.0355	0.1070	0.0680	0.1665	0.0695	0.2200
Magnesium	mg/L	0.1700	0.3200	0.0330	0.0685	0.0380	0.0300	0.5500
Aluminum	mg/L	0.0090	0.0070	0.0040	0.0060	0.0079	0.0120	0.0021
Reactive Silica	mg/L Si	0.0256	0.0280	0.0123	0.0159	0.0101	0.0140	0.0242
Sulfate IC	mg/L	1.3100	1.8100	1.5900	1.6120	8.9900	1.8570	2.6920
Sulfate Colour	mg/L	1.3100	1.8000	1.5200	1.6000	8.5000	1.8000	2.7000
Chloride IC	mg/L	0.1548	0.1000	0.1932	0.1400	0.3070	0.1220	0.4120
Chloride Colour	mg/L	0.2030	0.1540	0.2615	0.1810	0.3000	0.1525	0.4485
Potassium	mg/L	0.0200	0.0360	0.0250	0.0300	0.0300	0.0280	0.0595
Calcium	mg/L	0.6170	0.9130	0.1725	0.2760	0.1225	0.1615	1.9000

		BEAV-02 SAMPLE 8	GRM-05 SAMPLE 9	MIRAM-97b SAMPLE 10
Colour	Hazen Unit	5.0000	2.3500	70.800
Specific Conductance	uS/cm	33.700	22.000	42.800
Acidity to pH 8.3	mg/L CaCO3	4.2000	2.0000	3.0000
pH	pH Units	4.5900	6.9500	6.6900
Diss Organic Carbon	mg/L C	1.2600	0.5000	7.3400
Alkalinity Fixed End Pt pH 4.5	mg/L	0.4000	7.3000	7.4150
Alkalinity Gran Infl Extrap	mg/L	-1.4200	6.0500	6.0500
Alkalinity Gran Titn	mg/L CaCO3	-1.2445	6.0500	6.1600
Diss Inorg Carbon	mg/L C	0.2400	1.6000	1.5300
Nitrate + Nitrite	mg/L N	0.1300	0.4580	0.1260
Nitrate-IC	mg/L N	0.1300	0.4530	0.1270
Ammonia	mg/L N	0.0040	0.0016	0.0050
Total Kjeldahl N	mg/L N	0.0730	0.0700	0.2575
Sodium	mg/L	2.6250	0.1110	3.9290
Magnesium	mg/L	0.3650	0.5750	0.6700
Aluminum	mg/L	0.0480	0.0030	0.0713
Reactive Silica	mg/L Si	0.1695	0.2145	1.1090
Sulfate IC	mg/L	3.7000	1.8800	1.9800
Sulfate Colour	mg/L	3.7600	2.0000	2.4000
Chloride IC	mg/L	4.1600	0.2000	6.1350
Chloride Colour	mg/L	3.9700	0.2100	6.2000
Potassium	mg/L	0.2300	0.1700	0.3805
Calcium	mg/L	0.5100	2.8100	2.9600

Appendix A

Glossary of Terms
Quantifying Bias in NWRI QA Studies

GLOSSARY OF TERMS

Used for the Evaluation of Interlaboratory Results

Acceptable Deviation: The absolute value of the maximum difference between a result and the target value which will not be flagged.

Bias: Results for a parameter are assessed to be biased by the procedure of Youden when they are consistently ranked to be either higher or lower than the median result. In these interlaboratory studies, for most parameters, a bias of greater than 5% is considered to be excessive. Biases of less than 5% are noted for caution and investigation.

Bias Blank: In the graph for bias % slope, the y-intercept for the laboratory results indicates a systematic blank of analysis. This is the second component of bias.

Bias % Slope: When laboratory results for a parameter are plotted against the target values, the slope as compared to the ideal results (no bias) is considered to be the major component of the degree of bias. For an explanation of Bias % Slope see the following explanation in "Quantifying Bias in NWRI QA Studies".

Erratic: Results for a parameter are evaluated as erratic when both high and low flags are assigned.

Flagged Result: A result is flagged when its value is beyond that of the median (target value) plus or minus the acceptable difference.

Isolated Outlier: A parameter analysis which performs satisfactorily but produces an extreme result. (formerly, 'out of control')

Satisfactory: Fully acceptable, 'good results'.

'W' or 'T' Code: A 'W' or 'T' code may be used with a reported result as described in ASTM. However, in the NWRI QA studies, these codes may result in flagging discrepancies. "Less than" values or negative results are also legitimate when reporting the results. Laboratories should use their usual data reporting protocols insofar as they are compatible with the other laboratories.

The following three terms define the acceptable differences from the median of results (**target value**) that is allowed without a result being flagged either low or high:

- **LLBAE:** Lower Limit for Use of Basic Acceptable Error,
- **BAE:** Basic Acceptable Error, and
- **CEI:** Concentration Error Increment.

In general, for the NWRI QA studies, the values chosen for the **basic acceptable error** and the **concentration error increment** are selected so that good precision may be inferred. Historically, for the Federal-Provincial QA Program, for moderate ranges, this has been achieved with the 10% Deviation Rule.

For a sample whose **target value** is at or below the **lower limit for use of basic acceptable error**, the **basic acceptable error** is used to determine the range of acceptable deviations.

> For example: Suppose that the **lower limit for use of the basic acceptable error** has been set as 10 μg/L and the **basic acceptable error** is 1.0 μg/L, if a **target** (median) **value** for a sample is 5 μg/L, then any **reported result** within the range 5 ± 1.0 or 4.0 to 6.0 μg/L would be considered acceptable. The **BAE** would define the acceptable result within the 0-10 μg/L range.

For results above the **lower limit for use of basic acceptable error**, an allowance is made for the increased variability due to concentration. For almost all substances it appears that the variability of results increases with concentration. The allowance is added to the **basic acceptable error**. It is calculated by multiplying the **concentration error increment** (as a percentage) by the difference between the **target value** and the **lower limit for use of basic acceptable error**.

> For example: A **target value** for a sample may be 21 μg/L, the **BAE** is 1.0, the **LLBAE** is 10 μg/L and the **CEI** 0.1. The acceptable difference is calculated by the equation: **(Target - LLBAE) x CEI + BAE**. For the figures mentioned the answer would be (21 - 10) x 0.10 + 1.0 = 2.1. Thus the range 18.9 to 23.1 μg/L would be considered acceptable and would not be flagged.

The calculated acceptable difference is termed **1 criteria** or **crit**. This value and the value of three standard deviations (**3SD**) are both action criteria in the determination of flags. When the

reported value is subtracted from the **target value**, the difference is then divided by the **1 criteria** value. This produces the number of **1 crit** deviations. The assigned flag depends upon what range this number falls into.

1 Criteria Deviations	Assigned Flag
1 - 1.5	L or H
1.5 - 3SD	VL or VH
> 3SD	EL or EH

In cases where the **3SD** value is lower than that of **1 crit**, only extreme flags (EL or EH) are assigned. A minimum of 6 results are needed for the calculation of **3SD**, otherwise, 2 criteria deviations are used.

References:

1. ASTM, 1983, Volume 11.01, Water 1, Section II, pp. D4210-83.
2. Ranking Laboratories by Round-Robin Tests, W.J. Youden, Precision Measurement and Calibration, H.H. Ku, Editor, NBS Special Publication 300-Volume 1, U.S. Government Printing Office, Washington, D.C., 1969.

June 1996

Quantifying Bias in NWRI QA Studies

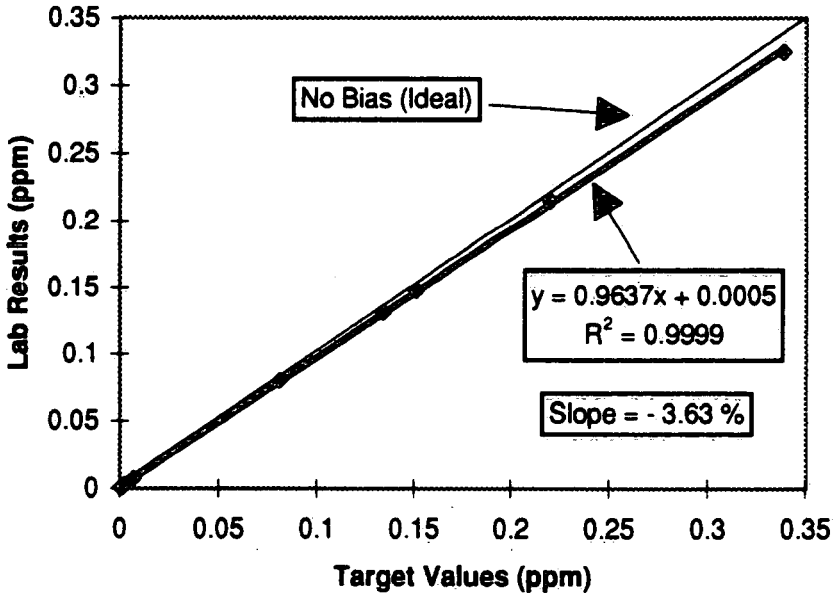
Introduction

Systematic bias as part of the QA data assessment is a major element in quantifying data quality. It is important in qualifying the accuracy of data in a general sense, when the entire set of analysis data may be affected by factors such as calibration, instrument setup, chemical reagent efficiency and purity of blank solutions. The absence of bias is not only very important when assessing data accuracy, but also when merging data sets from different times or locations.

Degree of Bias

In the NWRI QA studies with 10 sample series, systematic bias[1] is assessed non-parametrically by the procedure of Youden. Up until now, the degree of bias has not been calculated for the QA reports. The degree of bias may be parametrically quantified by two parameters taken from the parameter performance chart, as in figure 1. When bias is indicated by the procedure of Youden, the slope and intercept, give the degree of bias. A complication arises from the high precision of methodologies and instrumentation like ICPMS. A very high precision of analysis may lead to an assessment of very low bias, e.g. 2 or 3%.

Figure 1 **Parameter Performance**



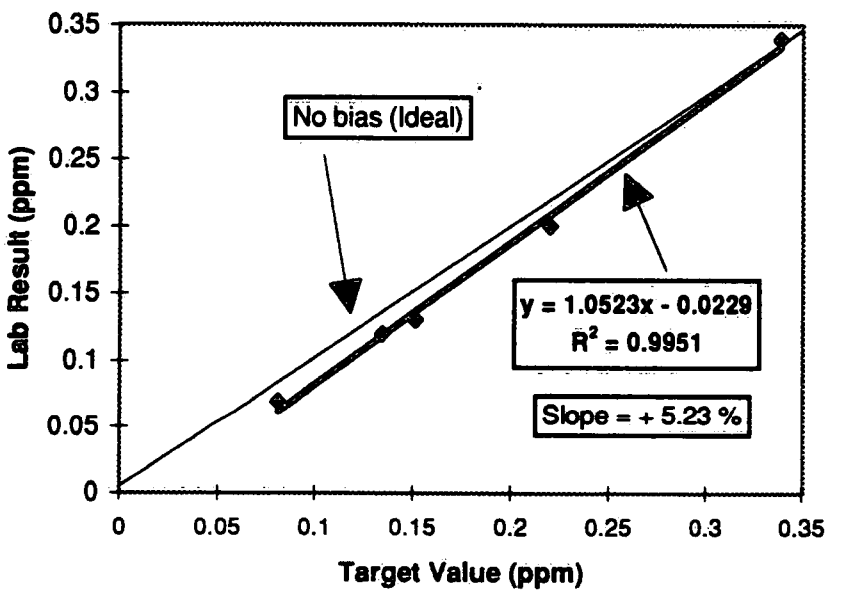
[1] Systematic bias is often identified with the comparison of data to a certified standard.

Parameter Performance Graph and Bias

The parameter performance graph, Figure 1, charts the laboratory results against the target values for a parameter. The ideal results, showing no bias and no deviating data, would fall on the 45° line labeled 'no bias (ideal)'. In this figure, the laboratory results have a very high degree of precision as indicated by the the correlation coefficient (R^2) of 0.9999. The slope of the regression line, as indicated by the equation was 0.9637 and as a percentage calculates to be -3.63%. This slope is one factor in evaluating the degree of bias.

The second contribution of bias, as indicated by the parameter performance graph, is the analysis blank. This blank value is given by the y-intercept, and in this case is indicated to be 0.0005 ppm. These two factors, slope and blank are considered to be the two important considerations in quantifying bias. Preliminary investigation indicates that the slope value is the most important factor and needs to be followed most closely. However, the blank may be contaminated (alternatively the standards) and become the larger factor of the two. The example in Figure 2 is a case in point.

Figure 2 **Parameter Performance**



In this parameter performance graph, we have a worst case situation. The Youden bias for this parameter is indicated as 'biased low'. However, the graph for this parameter and laboratory indicates a positive slope of 5.23%. Upon examining the graph, the regression line indicates a considerably large negative intercept or blank value. In this case it is the blank value that needs to be investigated.

Conclusion

Systematic bias as indicated in the NWRI interlaboratory study by the procedure of Youden has two distinct components. The regression equation as given in the performance graph can quantify these two important factors. Whereas the slope factor may be the most significant of the two, the blank bias factor should also be indicated for the cases where it may be the larger and more meaningful of the two.

June 1996

NWRI Ecosystem Interlaboratory QA Program

Bias Critical Values
Rain and Soft Waters

Parameter	%
Conductance	3
Colour	25
Acidity (to pH 8.3)	5
pH	5
DOC	5
DIC	5
Alkalinity (fixed end point)	3
Alkalinity (gran. inflec.)	3
Alkalinity (gran. titration)	3
Nitrate + Nitrite	5
Nitrate	5
Ammonia	7.5
TKN	10
Sodium	5
Magnesium	5
Silica	5
Sulfate (IC)	5
Sulfate (non-IC)	5
Chloride (IC)	5
Chloride (non-IC)	5
Potassium	5
Calcium	5
Aluminum	5

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Appendix B

Data & Evaluation Summary

PARAMETER: 00392 Specific Conductance uS/cm

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 1.2500 CONCENTRATION ERROR INCREMENT= 0.0300

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	8.35	11.00	11.70	10.00	14.80	21.00	12.60	20.50	153.0	17.00	17.60	21.00
F003	8.5	13.50	11.0	2.50	15.4	26.50	12.9	25.00	159. H	24.00	17.4	18.50
F004	8.58	15.00	12.2	20.50	14.8	21.00	12.6	20.50	156.	20.50	17.5	20.00
F007	8.7	17.00	12.0	16.00	14.8	21.00	13.2	27.50	159.6 H	25.00	17.0	15.00
F009	9.	22.00	12.	16.00	14.	13.50	12.	12.50	156.	20.50	16.	5.00
F010	8.5	13.50	12.0	16.00	14.0	13.50	11.5	7.00	155.	18.00	16.5	9.50
F014	8.95	19.00	12.4	24.50	15.4	26.50	12.9	25.00	161. VH	26.00	18.7	28.00
F015	8.	5.00	12.	16.00	13.	5.00	11.	3.50	144. L	2.00	15. L	1.00
F020	7.3	1.00	11.	2.50	14.	13.50	10. EL	1.00	156.	20.50	16.	5.00
F022	11.4 VH	28.00	12.2	20.50	14.2	18.50	12.5	18.50	151.	10.00	17.4	18.50
F025	9.56	27.00	12.4	24.50	15.2	24.50	13.3	29.00	162. VH	28.50	18.5	27.00
F026	8.97	20.00	12.13	19.00	15.45	28.00	12.82	23.00	162. VH	28.50	17.95	23.00
F032	7.4	2.00	11.6	7.00	13.4	8.00	11.6	8.00	150.	7.00	16.4	8.00
F036	8.0	5.00	11.2	5.00	13.0	5.00	11.0	3.50	152.	15.00	15.4	3.00
F037	9.28	26.00	11.91	13.00	13.50	9.00	12.20	15.50	151.1	12.00	17.30	17.00
F038	9.	22.00	12.	16.00	13.	5.00	12.	12.50	152.	15.00	20. VH	30.00
F042	8.28	8.00	11.4	6.00	14.1	17.00	11.9	10.00	147.	4.00	16.5	9.50
F053	8.7	17.00	13.	28.00	14.9	23.00	13.2	27.50	157.2	23.00	18.4	26.00
F060	7.5	3.00	11.0	2.50	12.4	2.00	11.0	3.50	150.	7.00	16.6	11.50
F069	9.09	24.00	12.3	22.50	12.8	3.00	11.3	6.00	146. L	3.00	15.3	2.00
F072	12.0 EH	30.00	11.9	12.00	10.0 EL	1.00	11.0	3.50	13.0 EL	1.00	17.0	15.00
F073	8.	5.00	11.	2.50	14.	13.50	12.	12.50	152.	15.00	16.	5.00
F074	9.	22.00	13.	28.00	14.	13.50	12.	12.50	148.	5.00	17.	15.00
F094	11.8 EH	29.00	15.1 EH	30.00	16.6 VH	30.00	19.7 EH	30.00	169. EH	30.00	19.7 VH	29.00
F107	8.23	7.00	11.61	8.00	14.2	18.50	11.83	9.00	151.	10.00	16.6	11.50
F110	9.2	25.00	13.	28.00	15.5	29.00	12.9	25.00	156.	20.50	18.1	24.50
F112	8.37	12.00	12.50	26.00	14.00	13.50	12.50	18.50	150.00	7.00	16.30	7.00
F113	8.3	9.50	11.7	10.00	13.2	7.00	12.2	15.50	151.9	13.00	17.8	22.00
F122	8.30	9.50	11.7	10.00	13.8	10.00	12.4	17.00	151.	10.00	16.8	13.00
F133	8.7	17.00	12.3	22.50	15.2	24.50	12.8	22.00	161.6 VH	27.00	18.1	24.50
MEDIAN	8.6400		12.0000		14.0000		12.2000		152.0000		17.0000	
1CRIT	1.4792		1.5800		1.6400		1.5860		5.7800		1.7300	
N	28		29		28		28		28		28	
MEAN	8.7736		11.9362		14.1446		12.1839		153.6214		17.1375	
3STDEV	2.7933		1.7017		2.6396		2.1033		14.6094		3.0532	

PARAMETER: 00392 Specific Conductance uS/cm

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	18.70	10.00	34.80	26.00	22.30	21.00	42.70	13.50
F003	18.9	14.50	33.9	17.50	22.2	18.50	41.9	6.00
F004	19.2	22.00	34.6	22.50	23.1	25.50	42.9	18.50
F007	18.9	14.50	33.6	13.50	21.9	8.50	42.4	10.50
F009	20.	27.50	34.	19.50	23.	24.00	43.	21.00
F010	18.5	9.00	33.6	13.50	21.9	8.50	42.4	10.50
F014	19.4	23.50	34.8	26.00	24.0 H	28.00	45.1	28.00
F015	18.	3.00	32.	2.00	22.	14.50	41.	2.50
F020	20.	27.50	33.	9.00	22.	14.50	42.	7.00
F022	19.1	19.00	33.6	13.50	22.3	21.00	42.7	13.50
F025	19.4	23.50	35.4	28.50	21.9	8.50	43.5	23.50
F026	19.85	26.00	35.4	28.50	23.45	27.00	44.25	27.00
F032	19.1	19.00	33.6	13.50	21.0	1.50	42.9	18.50
F036	18.4	8.00	32.4	4.00	22.0	14.50	42.8	16.00
F037	18.71	11.00	33.8	16.00	21.9	8.50	43.8	25.00
F038	23. EH	29.00	34.	19.50	26. EH	29.00	47. EH	29.00
F042	18.0	3.00	32.8	6.50	21.4	5.00	40.6	1.00
F053	19.1	19.00	34.6	22.50	22.6	23.00	43.	21.00
F060	18.3	6.50	32.7	5.00	21.3	4.00	42.4	10.50
F069	19.8	25.00	33.1	11.00	23.1	25.50	43.5	23.50
F072	6.0 EL	1.00	32.0	2.00	21.0	1.50	41.0	2.50
F073	18.	3.00	33.	9.00	22.	14.50	43.	21.00
F074	19.	16.00	32.	2.00	22.	14.50	44.	26.00
F094	23.1 EH	30.00	37.3 EH	30.00	28.1 EH	30.00	47.9 EH	30.00
F107	18.1	5.00	32.8	6.50	21.2	3.00	41.3	4.00
F110	19.1	19.00	34.4	21.00	22.3	21.00	42.8	16.00
F112	18.80	12.50	33.90	17.50	22.00	14.50	42.40	10.50
F113	18.8	12.50	34.8	26.00	21.9	8.50	42.3	8.00
F122	18.3	6.50	33.0	9.00	21.9	8.50	41.5	5.00
F133	19.1	19.00	34.7	24.00	22.2	18.50	42.8	16.00
MEDIAN	18.9500		33.7000		22.0000		42.8000	
1CRIT	1.7885		2.2310		1.8800		2.5040	
N	28		29		27		28	
MEAN	19.0557		33.6655		22.3648		42.8696	
3STDEV	2.8550		2.9268		2.8395		3.6410	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	171.00	17.100	10					02041
F003	166.50	16.650	10	H				Conductivity Probe
F004	206.00	20.600	10					02041
F007	168.50	16.850	10	H				CPQ002E2
F009	181.50	18.150	10					Electrode
F010	119.00	11.900	10					Conductivimeter
F014	254.50	25.450	10	VH H	BIASED HIGH	5.85	-0.0153	
F015	54.50	5.450	10	L L	BIASED LOW	-5.16	-0.0079	cond. meter, V2.2
F020	101.50	10.150	10	EL				Radiometer
F022	181.00	18.100	10	VH				Conductivity Meter
F025	244.50	24.450	10	VH	BIASED HIGH	6.52	-0.3867	Cond. Meter
F026	250.00	25.000	10	VH	BIASED HIGH	6.63	-0.3110	WATER ANALYSES SYS
F032	92.50	9.250	10					Electrode
F036	79.00	7.900	10					Electrode
F037	153.00	15.300	10					V.W.R.
F038	207.00	20.700	10	VHEH EHEH				CONDUCTIVITY METER
F042	70.00	7.000	10		BIASED LOW	-3.36	-0.0110	Cond. Meter
F053	230.00	23.000	10					bridge and cell
F060	55.50	5.550	10		BIASED LOW*	-0.67	-0.7850	Conductance meter
F069	145.50	14.550	10	L				TWRI I 2781-85
F072	69.50	6.950	10	EH EL EL EL	BIASED LOW	-97.81	16.7591	Conductivity meter
F073	101.00	10.100	10					tem compen probe
F074	154.50	15.450	10					electrode
F094	298.00	29.800	10	EHEHVHEHEHVHEHEHEHEH	BIASED HIGH	9.25	2.4173	Conductivity Meter
F107	82.50	8.250	10					Electro Po.
F110	229.00	22.900	10					YSI meter at 25 C
F112	139.00	13.900	10					YSI CONDUCT METER
F113	132.00	13.200	10					YSI conduct meter
F122	98.50	9.850	10					Radiometer CDM83
F133	215.00	21.500	10	VH				COND. METER

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 3.00

OVERALL AVERAGE
RANK IS 15.500

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F015	54.50	5.450	10	LL	BIASED LOW	-5.16	-0.0079	cond. meter, V2.2
F060	55.50	5.550	10		BIASED LOW*	-0.67	-0.7850	Conductance meter
F072	69.50	6.950	10	EHELELEL	BIASED LOW	-97.81	16.7591	Conductivity meter
F042	70.00	7.000	10		BIASED LOW	-3.36	-0.0110	Cond. Meter
F036	79.00	7.900	10					Electrode
F107	82.50	8.250	10					Electro Po.
F032	92.50	9.250	10					Electrode
F122	98.50	9.850	10					Radiometer CDM83
F073	101.00	10.100	10					tem compen probe
F020	101.50	10.150	10	EL				Radiometer
F010	119.00	11.900	10					Conductivimeter
F113	132.00	13.200	10					YSI conduct meter
F112	139.00	13.900	10					YSI CONDUCT METER
F069	145.50	14.550	10	L				TWRI I 2781-85
F037	153.00	15.300	10					V.W.R.
F074	154.50	15.450	10					electrode
F003	166.50	16.650	10	H				Conductivity Probe
F007	168.50	16.850	10	H				CPQ002E2
F002	171.00	17.100	10					02041
F022	181.00	18.100	10	VH				Conductivity Meter
F009	181.50	18.150	10					Electrode
F004	206.00	20.600	10					02041
F038	207.00	20.700	10	VHEHEHEH				CONDUCTIVITY METER
F133	215.00	21.500	10	VH				COND. METER
F110	229.00	22.900	10					YSI meter at 25 C
F053	230.00	23.000	10					bridge and cell
F025	244.50	24.450	10	VH	BIASED HIGH	6.52	-0.3867	Cond. Meter
F026	250.00	25.000	10	VH	BIASED HIGH	6.63	-0.3110	WATER ANALYSES SYS
F014	254.50	25.450	10	VHH	BIASED HIGH	5.85	-0.0153	
F094	298.00	29.800	10	EHEHVHEHEHVHEHEHEHEH	BIASED HIGH	9.25	2.4173	Conductivity Meter

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 3.00

OVERALL AVERAGE
RANK IS 15.500

Specific Conductance

PARAMETER: 00292 Colour Hazen Unit

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 3.0000 BASIC ACCEPTABLE ERROR= 3.0000 CONCENTRATION ERROR INCREMENT= 0.1500

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	<5.0	0.00	<5.0	0.00	<5.0	0.00	<5.0	0.00	<5.0	0.00	<5.0	0.00
F003	1.0	2.00	1.1	3.00	2.6	6.00	1.1	2.00	0.6	2.00	0.8	3.00
F004	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00
F007	<5.	0.00	<5.	0.00	7. H	9.00	<5.	0.00	<5.	0.00	<5.	0.00
F010	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00
F014	0.	1.00	0.	1.00	0.	1.00	0.	1.00	0.	1.00	0.	1.00
F032	<0.8	0.00	<0.8	0.00	1.4	3.00	<0.4	0.00	<0.4	0.00	<0.4	0.00
F036	<0.4	0.00	1.0	2.00	2.0	4.00	<0.4	0.00	<0.4	0.00	<0.4	0.00
F038	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00
F042	1.89	3.00	3.37	6.00	4.86	8.00	1.89	3.00	1.14	3.00	1.14	4.00
F060	5. H	6.00	2.	4.00	11. EH	10.00	2.	4.00	5. H	5.50	2.	5.00
F072	2.	4.00	5.	7.00	4.	7.00	5. H	6.00	5. H	5.50	4.	7.00
F094	2.5	5.00	2.5	5.00	2.5	5.00	2.5	5.00	2.5	4.00	2.5	6.00
F122	0.44W	0.00	0.07W	0.00	0.64T	2.00	0.45W	0.00	0.07W	0.00	0.64T	2.00
MEDIAN	1.9450		2.0000		2.5500		1.9450		1.8200		1.1400	
1CRIT	3.0000		3.0000		3.0000		3.0000		3.0000		3.0000	
N	4		5		8		4		3		5	
MEAN	1.8475		1.9940		3.1250		1.8725		1.4133		1.4160	
3STDEV	-		-		5.7973		-		-		-	

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	<5.0	0.00	<5.0	0.00	<5.0	0.00	70.0	6.50
F003	1.2	5.00	5.0	7.00	2.2	4.00	66.	5.00
F004	<5.	0.00	<5.	0.00	<5.	0.00	70.	6.50
F007	<5.	0.00	7.	10.50	7. VH	9.00	81.	12.00
F010	<1.	0.00	3.	3.00	<1.	0.00	50. VL	1.00
F014	0.	1.00	0. EL	1.00	0.	1.00	60.	3.50
F032	1.0	3.50	5.0	7.00	2.2	4.00	76.4	10.00
F036	1.0	3.50	4.8	4.50	2.2	4.00	71.6	8.00
F038	<5.	0.00	<5.	0.00	<5.	0.00	59.	2.00
F042	1.89	6.00	5.60	9.00	2.63	7.00	83.6	13.00
F060	3.	8.00	2.	2.00	20. EH	10.00	60.	3.50
F072	5. EH	9.00	7.	10.50	6. H	8.00	73.	9.00
F094	2.5	7.00	5.	7.00	2.5	6.00	100. EH	14.00
F122	0.64T	2.00	4.8	4.50	1.5T	2.00	80.	11.00
MEDIAN	1.2000		5.0000		2.3500		70.8000	
1CRIT	3.0000		3.3000		3.0000		13.1700	
N	7		8		8		12	
MEAN	1.6043		4.4000		3.2787		70.8833	
3STDEV	2.4466		3.4467		5.7055		24.2814	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	6.50	6.500	1					02011
F003	39.00	3.900	10					Spectrophotometric
F004	6.50	6.500	1					02021
F007	40.50	10.125	4	H VH				CPQ006E0
F010	4.00	2.000	2	VL				Colorimetry
F014	12.50	1.250	10	EL				
F032	27.50	5.500	5					TCU
F036	26.00	4.333	6					TCU
F038	2.00	2.000	1					Spectrophotometry
F042	62.00	6.200	10					Colorimetric
F060	58.00	5.800	10	H EH H EH				Filter visual comp
F072	73.00	7.300	10	H H EH H				Visual comparison
F094	64.00	6.400	10	EH				Nephelometric
F122	23.50	3.917	6					Spectro. 455nm

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 5.174

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F014	12.50	1.250	10	EL				
F010	4.00	2.000	2	VL				Colorimetry
F038	2.00	2.000	1					Spectrophotometry
F003	39.00	3.900	10					Spectrophotometric
F122	23.50	3.917	6					Spectro. 455nm
F036	26.00	4.333	6					TCU
F032	27.50	5.500	5					TCU
F060	58.00	5.800	10	HEHHEH				Filter visual comp
F042	62.00	6.200	10					Colorimetric
F094	64.00	6.400	10	EH				Nephelometric
F002	6.50	6.500	1					02011
F004	6.50	6.500	1					02021
F072	73.00	7.300	10	HHEHH				Visual comparison
F007	40.50	10.125	4	HVH				CPQ006E0

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 5.174

Colour

PARAMETER: 01092 pH pH Units

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.5000 BASIC ACCEPTABLE ERROR= 0.2000 CONCENTRATION ERROR INCREMENT= 0.0000

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	5.93	12.00	5.41	25.00	4.60	9.50	4.79	13.50	3.47	25.50	4.55	27.00
F003	5.98	18.00	5.61 H	29.00	4.61	13.00	4.81	18.00	3.46	21.50	4.55	27.00
F004	6.60 EH	32.00	6.19 EH	32.00	6.01 EH	33.00	5.95 EH	32.00	3.44	13.00	4.46	9.50
F007	5.99	19.00	5.38	19.50	4.59	8.00	4.78	11.00	3.45	17.50	4.51	17.50
F009	6.05	25.50	5.42	26.00	4.6	9.50	4.8	16.00	3.32	3.00	4.45	8.00
F010	5.72 L	6.00	5.11 L	2.00	4.54	5.00	4.70	6.00	3.43	10.00	4.44	6.50
F014	6.04	23.50	5.27	11.50	4.71	30.00	4.92	31.00	3.56	33.00	4.60	32.00
F015	6.02	21.00	5.39	22.00	4.65	21.00	4.78	11.00	3.48	28.00	4.52	21.50
F017	5.68 L	3.00	5.25	8.00	4.67	24.00	4.82	21.00	3.47	25.50	4.51	17.50
F020	5.96	16.00	5.21	5.00	4.62	15.50	4.82	21.00	3.44	13.00	4.44	6.50
F022	6.22 H	30.50	5.39	22.00	4.72	31.00	4.78	11.00	3.45	17.50	4.48	11.50
F025	5.73 L	7.00	5.22	6.00	4.58	7.00	7.73 EH	33.00	3.45	17.50	4.29 L	2.00
F026	5.95	13.50	5.38	19.50	4.55	6.00	4.76	8.00	3.41	8.00	4.46	9.50
F032	5.95	13.50	5.70 VH	31.00	4.51	3.00	4.70	6.00	3.41	8.00	4.52	21.50
F036	5.88	10.00	5.23	7.00	4.61	13.00	4.79	13.50	3.45	17.50	4.50	14.50
F037	6.04	23.50	5.39	22.00	4.69	27.50	4.87	28.50	3.49	29.50	4.57	29.50
F038	5.51 VL	1.00	5.16	4.00	4.53	4.00	4.68	3.50	3.38	5.00	4.36	5.00
F042	5.71 L	5.00	5.26	10.00	4.61	13.00	4.77	9.00	3.45	17.50	4.48	11.50
F053	5.92	11.00	5.27	11.50	4.63	17.50	4.8	16.00	3.49	29.50	4.5	14.50
F060	5.96	16.00	5.37	18.00	4.78	32.00	4.82	21.00	3.41	8.00	4.51	17.50
F068	5.695 L	4.00	5.057 L	1.00	4.44 EL	1.50	4.563 L	1.00	3.332	4.00	4.32	3.00
F071	6.20 H	28.50	5.29	13.50	4.62	15.50	4.80	16.00	3.47	25.50	4.51	17.50
F072	7.0 EH	33.00	6.5 EH	33.00	4.7	29.00	4.7	6.00	3.3	2.00	3.5 EL	1.00
F073	6.02	21.00	5.52	28.00	4.65	21.00	4.86	27.00	3.47	25.50	4.57	29.50
F074	6.22 H	30.50	5.64 H	30.00	4.68	25.00	4.83	24.50	3.39	6.00	4.53	24.00
F094	5.61 VL	2.00	5.15	3.00	4.44 EL	1.50	4.68	3.50	3.28 EL	1.00	4.35	4.00
F107	6.05	25.50	5.40	24.00	4.65	21.00	4.87	28.50	3.45	17.50	4.54	25.00
F109	5.821	8.00	5.295	15.00	4.684	26.00	4.830	24.50	3.464	23.00	4.550	27.00
F110	5.96	16.00	5.29	13.50	4.65	21.00	4.82	21.00	3.5	31.50	4.59	31.00
F112	5.863	9.00	5.256	9.00	4.602	11.00	4.677	2.00	3.439	11.00	4.489	13.00
F113	6.09	27.00	5.34	17.00	4.63	17.50	4.82	21.00	3.44	13.00	4.52	21.50
F122	6.20 H	28.50	5.33	16.00	4.65	21.00	4.84	26.00	3.46	21.50	4.52	21.50
F133	6.02	21.00	5.47	27.00	4.69	27.50	4.91	30.00	3.50	31.50	4.62	33.00
MEDIAN	5.9600		5.3400		4.6300		4.8000		3.4500		4.5100	
1CRIT	0.2000		0.2000		0.2000		0.2000		0.2000		0.2000	
N	31		31		30		31		31		31	
MEAN	5.9703		5.3739		4.6335		4.8315		3.4376		4.4900	
3STDEV	0.5894		0.6045		0.1770		0.6410		0.1463		0.2215	

PARAMETER: 01092 pH pH Units

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	6.29	10.00	4.54	7.00	6.69 L	5.00	6.69	17.00
F003	6.55	27.00	4.60	19.50	7.10	26.00	6.86	25.00
F004	6.73 VH	31.00	5.18 EH	33.00	7.01	23.00	6.77	22.00
F007	6.55	27.00	4.56	12.00	7.11	27.00	6.94 H	27.50
F009	6.51	24.00	4.53	5.50	7.25 H	31.00	6.6	9.50
F010	6.41	18.00	4.51	4.00	6.92	14.00	6.71	19.00
F014	6.63 H	30.00	4.66	30.00	7.14	28.50	6.87	26.00
F015	6.30	11.00	4.60	19.50	6.87	11.00	6.51	4.50
F017		0.00	4.62	24.00		0.00		0.00
F020	6.13 L	4.50	4.57	14.50	6.79	8.00	6.52	6.00
F022	6.13 L	4.50	4.59	16.50	6.64 VL	4.00	6.69	17.00
F025	6.27	9.00	4.59	16.50	6.57 VL	3.00	6.66	15.00
F026	6.42	19.00	4.53	5.50	6.97	18.50	6.84	23.00
F032	6.57	29.00	4.62	24.00	7.00	21.50	6.94 H	27.50
F036	6.34	12.00	4.55	9.50	6.95	16.50	6.51	4.50
F037	6.37	13.50	4.64	29.00	6.94	15.00	6.47 L	3.00
F038	6.22	7.00	4.56	12.00	6.77	6.50	6.59	8.00
F042	6.08 VL	2.00	4.55	9.50	6.77	6.50	6.63	12.00
F053	6.45	21.00	4.6	19.50	7.	21.50	6.95 H	29.00
F060	6.03 VL	1.00	4.63	27.50	6.86	10.00	6.69	17.00
F068	6.206	6.00	4.347 EL	2.00	6.833	9.00	6.318 VL	2.00
F071	6.38	15.00	4.60	19.50	6.88	12.00	6.60	9.50
F072	6.4	17.00	4.0 EL	1.00	6.2 EL	1.00	7.2 VH	30.00
F073	6.37	13.50	4.62	24.00	7.02	24.00	6.74	21.00
F074	6.78 VH	32.00	4.62	24.00	7.41 VH	32.00	7.30 VH	31.00
F094	6.09 VL	3.00	4.45	3.00	6.48 VL	2.00	6.28 VL	1.00
F107	6.43	20.00	4.62	24.00	6.97	18.50	6.63	12.00
F109	6.387	16.00	4.664	31.00	6.986	20.00	6.844	24.00
F110	6.55	27.00	4.63	27.50	7.14	28.50	6.72	20.00
F112	6.261	8.00	4.546	8.00	6.893	13.00	6.643	14.00
F113	6.49	23.00	4.56	12.00	7.08	25.00	6.57	7.00
F122	6.48	22.00	4.57	14.50	6.95	16.50	6.63	12.00
F133	6.54	25.00	4.67	32.00	7.20 H	30.00	7.77 EH	32.00
MEDIAN	6.3935		4.5900		6.9500		6.6900	
1CRIT	0.2000		0.2000		0.2000		0.2000	
N	30		31		30		30	
MEAN	6.3845		4.5789		6.9261		6.7212	
3STDEV	0.4836		0.1919		0.5324		0.6120	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F094	24.00	2.400	10	VLELELVLVLVL	BIASED LOW	-9.63	0.2629	pH Meter
F068	33.50	3.350	10	LLELLELVL	BIASED LOW*	-2.13	-0.1067	unstirred
F038	56.00	5.600	10	VL	BIASED LOW*	-4.21	0.0689	pH METER
F010	90.50	9.050	10	LL				Stirred-electrode
F042	96.00	9.600	10	LVL				Unstirred
F112	98.00	9.800	10					METER STIRRED
F020	110.00	11.000	10	L				pH meter
F025	116.00	11.600	10	LEHLVL				ph Meter
F036	118.00	11.800	10					Unstirred
F026	130.50	13.050	10					WAT ANAL RADIO
F002	151.50	15.150	10	L				10301
F072	153.00	15.300	10	EHEHELELELVH				Stirred pH meter
F009	158.00	15.800	10	H				pH metter stirred
F022	165.50	16.550	10	HLVL				pH Meter
F060	168.00	16.800	10	VL				pH meter
F015	170.50	17.050	10					
F071	172.50	17.250	10	H				Ionalyzer
F017	123.00	17.571	7	L				Electrometric
F113	184.00	18.400	10					Elect unstirred
F032	185.00	18.500	10	VHH				Unstirred
F007	186.00	18.600	10	H				CPQ004D0
F053	191.00	19.100	10	H				meter-electrode
F122	199.50	19.950	10	H				HACH Combn Stirred
F109	214.50	21.450	10					unstirred autoelec
F107	216.00	21.600	10					Electro Po.
F037	221.00	22.100	10	L				Accumet
F003	224.00	22.400	10	H				pH Probe
F073	234.50	23.450	10					Comb El stirred
F110	237.00	23.700	10					Stirred at 25 C
F074	259.00	25.900	10	HHVHVHVH				stirred
F004	260.50	26.050	10	EHEHEHEHVHEH	BIASED HIGH	-8.53	0.9575	10301
F014	275.50	27.550	10	H	BIASED HIGH*	3.47	-0.0765	
F133	289.00	28.900	10	HEH	BIASED HIGH	14.94	-0.5889	ELECTRODE

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 16.853

pH

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	151.50	15.150	10	L				10301
F003	224.00	22.400	10	H				pH Probe
F004	260.50	26.050	10	EHEHEHEH VHEH	BIASED HIGH	-8.53	0.9575	10301
F007	186.00	18.600	10	H				CPQ004D0
F009	158.00	15.800	10	H				pH metter stirred
F010	90.50	9.050	10	L L				Stirred-electrode
F014	275.50	27.550	10	H	BIASED HIGH*	3.47	-0.0765	
F015	170.50	17.050	10					
F017	123.00	17.571	7	L				Electrometric
F020	110.00	11.000	10	L				pH meter
F022	165.50	16.550	10	H L VL				pH Meter
F025	116.00	11.600	10	L EH L VL				ph Meter
F026	130.50	13.050	10					WAT ANAL RADIO
F032	185.00	18.500	10	VH H				Unstirred
F036	118.00	11.800	10					Unstirred
F037	221.00	22.100	10	L				Accumet
F038	56.00	5.600	10	VL	BIASED LOW*	-4.21	0.0689	pH METER
F042	96.00	9.600	10	L VL				Unstirred
F053	191.00	19.100	10	H				meter-electrode
F060	168.00	16.800	10	VL				pH meter
F068	33.50	3.350	10	L L ELL EL VL	BIASED LOW*	-2.13	-0.1067	unstirred
F071	172.50	17.250	10	H				Ionalyzer
F072	153.00	15.300	10	EHEH EL ELELVH				Stirred pH meter
F073	234.50	23.450	10					Comb El stirred
F074	259.00	25.900	10	H H VH VHVH				stirred
F094	24.00	2.400	10	VL EL EL VL VLVL	BIASED LOW	-9.63	0.2629	pH Meter
F107	216.00	21.600	10					Electro Po.
F109	214.50	21.450	10					unstirred autoelec
F110	237.00	23.700	10					Stirred at 25 C
F112	98.00	9.800	10					METER STIRRED
F113	184.00	18.400	10					Elect unstirred
F122	199.50	19.950	10	H				HACH Combn Stirred
F133	289.00	28.900	10	H EH	BIASED HIGH	14.94	-0.5889	ELECTRODE

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 16.853

PARAMETER: 01090 Acidity to pH 8.3 mg/L CaCO3

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 0.6000 CONCENTRATION ERROR INCREMENT= 0.1000

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F014	0.660 VL	1.00	0.987 VL	1.00	1.82 L	1.00	1.43 VL	1.00	18.6	2.00	2.27 VL	1.00
F015	3. H	6.00	3.	6.00	3.	4.00	3.	4.50	25. EH	9.00	4.	5.50
F020	4.97 VH	9.00	1.80 L	3.00	6.19 EH	9.00	5.42 VH	9.00	23.05 H	8.00	7.57 VH	9.00
F022	2.1	5.00	3.1	7.00	3.7	6.00	3.1	6.00	20.8	6.00	3.8	4.00
F032	0.80 VL	2.00	2.60	5.00	3.00	4.00	2.20	3.00	19.5	4.00	2.95 L	2.00
F038	2.	4.00	2.	4.00	3.	4.00	3.	4.50	20.	5.00	4.	5.50
F072	4.7 VH	8.00	3.6 H	8.00	4.9 VH	8.00	5.3 VH	8.00	21.8	7.00	6.4 VH	8.00
F107	1.37 L	3.00	1.47 L	2.00	2.30	2.00	1.72 VL	2.00	18.93	3.00	3.02 L	3.00
F133	4.5 VH	7.00	5.0 EH	9.00	4.5 VH	7.00	4.0 H	7.00	12.0 EL	1.00	6.0 VH	7.00
MEDIAN	2.1000		2.6000		3.0000		3.0000		20.0000		4.0000	
1CRIT	0.7100		0.7600		0.8000		0.8000		2.5000		0.9000	
N	7		7		7		7		7		7	
MEAN	2.6386		2.5100		3.4857		3.1886		20.3829		4.3100	
3STDEV	4.1712		2.1604		2.5828		3.2725		4.4657		3.7931	

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F014	0.792 VL	1.00	2.36 VL	1.00	0.429 VL	1.00	1.12 VL	1.00
F015	4.	7.00	5.	6.00	3. H	7.00	3.	5.50
F020	5.61 VH	9.00	8.65 EH	9.00	6.57 EH	9.00	9.66 EH	9.00
F022	4.1	8.00	4.2	5.00	1.5	4.00	2.7	4.00
F032	1.30 VL	3.00	3.10 L	3.00	1.00 L	2.00	2.05 L	3.00
F038	2. VL	4.00	3. L	2.00	2.	5.50	3.	5.50
F072	3.8	6.00	6.0 VH	7.50	3.1 VH	8.00	7.1 VH	8.00
F107	1.27 VL	2.00	3.25 L	4.00	1.19 L	3.00	1.57 VL	2.00
F133	3.5	5.00	6.0 VH	7.50	2.0	5.50	3.5	7.00
MEDIAN	3.5000		4.2000		2.0000		3.0000	
1CRIT	0.8500		0.9200		0.7000		0.8000	
N	7		7		7		7	
MEAN	2.8529		4.3643		1.9700		3.2743	
3STDEV	3.5553		3.6714		2.2987		5.0162	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F014	11.00	1.100	10	VLVLL VL VLVLVLVLVL				
F015	60.50	6.050	10	H EH H				
F020	83.00	8.300	10	VHL EHVHH VHVHEHEHEH				Gran electron
F022	55.00	5.500	10					Titration
F032	31.00	3.100	10	VL L VLL L L				Titration
F038	44.00	4.400	10	VLL				Titration
F072	76.50	7.650	10	VHH VHVH VH VHVHVH				NaOH titration
F107	26.00	2.600	10	L L VL L VLL L VL				Volumetrie
F133	63.00	6.300	10	VHEHVHH ELVH VH				TITRIMETRIC

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 5.000

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F014	11.00	1.100	10	VLVLLVLVLVLVLVLVLVL				
F107	26.00	2.600	10	LLVLLVLLLVL				Volumetrie
F032	31.00	3.100	10	VLLVLLLL				Titration
F038	44.00	4.400	10	VLL				Titration
F022	55.00	5.500	10					Titration
F015	60.50	6.050	10	HEHH				
F133	63.00	6.300	10	VHEHVHHELVHVH				TITRIMETRIC
F072	76.50	7.650	10	VHHVHVHVHVHVHVH				NaOH titration
F020	83.00	8.300	10	VHLEHVHHVHVHEHEHEH				Gran electron

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 5.000

Acidity to pH 8.3

PARAMETER: 06193 Alkalinity Fixed End mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.5000 BASIC ACCEPTABLE ERROR= 0.5000 CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F007	1.9	3.50	1.4	3.50	<0.4	0.00	0.6	2.50	<0.4	0.00	<0.4	0.00
F014	2.05	5.50	1.99	6.00	0.566	3.00	1.05	7.00	0.	1.00	0.	1.00
F022	1.76	2.00	1.33	2.00	<5.00	0.00	0.45	1.00	<5.00	0.00	<5.00	0.00
F025	1.9	3.50	1.2	1.00	<0.5	0.00	0.6	2.50	<0.5	0.00	<0.5	0.00
F032	2.2	7.00	2.4 VH	7.00	0.8	4.00	1.0	6.00		0.00		0.00
F036	2.05	5.50	1.40	3.50	0.40	2.00	0.80	4.00		0.00		0.00
F038	<1.0 EL	0.00	<1.0 L	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00
F060	3. EH	9.00	3. EH	8.00	1.	5.00	<1.	0.00	<1.	0.00	<1.	0.00
F094	0.5 EL	1.00	<0.5 EL	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F107	2.38	8.00	1.69	5.00	0.34	1.00	0.91	5.00		0.00		0.00
MEDIAN	2.0500		1.5450		0.5660		0.8000					
1CRIT	0.5275		0.5023		0.5000		0.5000		0.5000		0.5000	
N	7		6		3		5		1		1	
MEAN	2.0343		1.7017		0.5887		0.7820		-		-	
3STDEV	0.5768		1.1561		-		-		-		-	

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F007	3.0	5.00	<0.4	0.00	7.3	5.00	7.0	3.00
F014	3.76 H	9.00	0.802	5.00	7.88	8.00	7.82	8.00
F022	2.88	4.00	<5.00	0.00	<5.00 EL	0.00	7.43	6.00
F025	3.1	6.50	0.5	4.00	6.9	3.00	7.4	4.50
F032	2.8	3.00	0.4	3.00	7.6	7.00	7.6	7.00
F036	3.10	6.50	0.20	2.00	7.45	6.00	7.40	4.50
F038	2. VL	2.00	<1.0	0.00	6. VL	2.00	6. EL	1.50
F060	5. EH	10.00	<1.	0.00	7.	4.00	8.	9.00
F094	1.4 EL	1.00	<0.5	0.00	5.4 EL	1.00	6. EL	1.50
F107	3.66 H	8.00	0.098	1.00	8.93 EH	9.00	8.97 EH	10.00
MEDIAN	3.0500		0.4000		7.3000		7.4150	
1CRIT	0.5775		0.5000		0.7900		0.7958	
N	8		3		7		7	
MEAN	3.0375		0.3667		7.1614		7.5214	
3STDEV	1.5284		-		1.7025		0.9030	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING			BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F007	22.50	3.750	6							CPQ005E0
F014	53.50	5.350	10		H					
F022	15.00	3.000	5			EL				Titration
F025	25.00	3.571	7							
F032	44.00	5.500	8	VH						Titration
F036	34.00	4.250	8							Titration
F038	5.50	1.833	3	ELL	VL	VLEL				Titration
F060	45.00	7.500	6	EHEH	EH					Potentio titn
F094	4.50	1.125	4	ELEL	EL	ELEL				Autotitrator
F107	47.00	5.875	8		H	EHEH				Volumetrie

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 4.554

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F094	4.50	1.125	4	ELELELELEL				Autotitrator
F038	5.50	1.833	3	ELLVLVLEL				Titration
F022	15.00	3.000	5	EL				Titration
F025	25.00	3.571	7					
F007	22.50	3.750	6					CPQ005E0
F036	34.00	4.250	8					Titration
F014	53.50	5.350	10	H				
F032	44.00	5.500	8	VH				Titration
F107	47.00	5.875	8	HEHEH				Volumetrie
F060	45.00	7.500	6	EHEHEH				Potentio titn

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 4.554

Alkalinity Fixed End Pt pH 4.5

PARAMETER: 06194 Alkalinity Gran Infl mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.5000 BASIC ACCEPTABLE ERROR= 0.3500 CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003		0.00		0.00		0.00		0.00		0.00		0.00
F010	0.6	4.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00
F015	0.8	5.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F020	1.49 EH	7.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F026	0.50	2.00	0.060	3.00	-1.415T	1.00	-0.925T	1.00		0.00	-2.18T L	1.00
F036	0.40	1.00	-0.24	1.00	-1.20	3.00	-0.83	2.00	-18.3	1.00	-1.61	4.00
F074	0.9	6.00	0.3 H	4.00	-0.6 VH	4.00	-0.7	4.00	-18.0	2.00	-1.8	2.00
F122	0.550	3.00	-0.178	2.00	-1.34	2.00	-0.78	3.00		0.00	-1.63	3.00
MEDIAN	0.6000		-0.0590		-1.2700		-0.8050				-1.7150	
1CRIT	0.3500		0.3500		0.3500		0.3500		0.3500		0.3500	
N	5		2		2		2		2		2	
MEAN	0.6700		-0.0590		-1.2700		-0.8050		-18.1500		-1.7150	
3STDEV	-		-		-		-		-		-	

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003		0.00		0.00	5.9	4.00	6.85 H	7.00
F010	1.7	4.00	<0.1	0.00	6.2	6.00	6.0	4.00
F015	1.8	5.00	<0.5	0.00	6.2	6.00	6.1	5.00
F020	2.02	6.00	<0.5	0.00	7.09 EH	8.00	6.75 H	6.00
F026	1.29 L	1.00	-1.465T	1.00	5.61	1.00	5.065 VL	1.00
F036	1.50	2.00	-1.38	3.00	5.78	2.00	5.79	3.00
F074	2.3 VH	7.00	-1.2	4.00	6.2	6.00	7.75 EH	8.00
F122	1.57	3.00	-1.46	2.00	5.88	3.00	5.73	2.00
MEDIAN	1.7000		-1.4200		6.0500		6.0500	
1CRIT	0.3600		0.3500		0.5775		0.5775	
N	5		2		6		6	
MEAN	1.7180		-1.4200		6.0267		6.2033	
3STDEV	-		-		0.5318		1.3213	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	11.00	5.500	2	H				Pot'metricTitrat'n
F010	18.00	4.500	4					Titrn conduct.
F015	21.00	5.250	4					poten ti. SA V2.2
F020	27.00	6.750	4	EH EHH				Gran electron
F026	12.00	1.333	9	L L VL				TITROPROCESSOR
F036	22.00	2.200	10					Titration
F074	47.00	4.700	10	H VH VH EH				Auto Titration
F122	23.00	2.556	9					pH 4.5-4.2

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 3.481

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F026	12.00	1.333	9	LLVL				TITROPROCESSOR
F036	22.00	2.200	10					Titration
F122	23.00	2.556	9					pH 4.5-4.2
F010	18.00	4.500	4					Titrn conduct.
F074	47.00	4.700	10	HVHVHEH				Auto Titration
F015	21.00	5.250	4					poten ti. SA V2.2
F003	11.00	5.500	2	H				Pot'metricTitrat'n
F020	27.00	6.750	4	EHEHH				Gran electron

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 3.481

PARAMETER: 06282 Alkalinity Gran Titn mg/L CaCO3

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NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 0.3500 CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.48	6.00	0.08	9.00	-1.56 L	1.00	-0.82	4.00		0.00	-1.71	3.00
F003	0.4	3.00	-0.06	5.00	-1.37	2.00	-0.86	3.00	-17.1 VH	5.00	-1.66	4.00
F007	0.64	9.00	0.05	8.00	-1.10	7.00	-0.62	9.00		0.00	-1.35	9.00
F014	0.532	7.00	-0.114	4.00	-1.24	5.00	-0.629	8.00	-17.7	4.00	-1.77	2.00
F042	0.41	4.00	-0.04	6.00	-1.17	6.00	-0.66	7.00	0.0 EH	7.00	-1.46	7.00
F074	0.9 EH	10.00	0.3 EH	10.00	-0.6 EH	10.00	-0.7	6.00	-18.0	2.00	-1.8	1.00
F109	0.452	5.00	-0.178	3.00	-0.975	9.00	-0.898	2.00	-17.78	3.00	-1.638	5.00
F110	0.36	2.00	-0.26	1.00	-1.35	3.00	-0.9	1.00	-19.43 EL	1.00	-1.5	6.00
F112	0.594	8.00	0.009	7.00	-1.065	8.00	-0.603	10.00	-16.977 EH	6.00	-1.410	8.00
F113	0.348	1.00	-0.219	2.00	-1.291	4.00	-0.766	5.00		0.00	-1.226	10.00
MEDIAN	0.4660		-0.0500		-1.2050		-0.7330		-17.7000		-1.5690	
1CRIT	0.3500		0.3500		0.3500		0.3500		0.3500		0.3500	
N	8		8		8		8		5		8	
MEAN	0.4835		-0.0590		-1.1951		-0.7441		-17.5114		-1.5623	
3STDEV	0.2759		0.2981		0.3981		0.3019		-		0.4280	

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	1.77	8.00	-1.07	10.00	5.89	3.00	6.17	6.00
F003	1.5	2.00	-1.35	1.50		0.00		0.00
F007	1.91	9.00	-1.16	8.00	6.18	7.00	6.16	5.00
F014	1.71	5.50	-1.32	3.00	6.05	5.00	6.30	8.00
F042	1.62	3.00	-1.3	4.00	5.90	4.00	5.92	1.00
F074	2.3 EH	10.00	-1.2	6.00	6.2	8.00	7.75 EH	9.00
F109	1.398	1.00	-1.085	9.00	5.745	1.00	6.102	3.00
F110	1.71	5.50	-1.35	1.50	6.21	9.00	6.19	7.00
F112	1.693	4.00	-1.168	7.00	5.815	2.00	5.961	2.00
F113	1.719	7.00	-1.289	5.00	6.088	6.00	6.15	4.00
MEDIAN	1.7100		-1.2445		6.0500		6.1600	
1CRIT	0.3855		0.3500		0.6025		0.6080	
N	8		7		7		7	
MEAN	1.7040		-1.2174		6.0176		6.1476	
3STDEV	0.3284		0.2433		0.4195		0.2837	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	50.00	5.556	9	L				10110
F003	25.50	3.188	8	VH				Gran Titration
F007	71.00	7.889	9		BIASED HIGH*	-0.89	0.1345	CPQ003E2
F014	51.50	5.150	10					
F042	49.00	4.900	10	EH				Gran titration
F074	72.00	7.200	10	EHEHEH EH EH				Auto Titration
F109	41.00	4.100	10					Radiometer
F110	37.00	3.700	10	EL				End point 3.5-3.6
F112	62.00	6.200	10	EH				TITRATION METER
F113	44.00	4.889	9					Gran titration

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 3.00

OVERALL AVERAGE
RANK IS 5.295

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	25.50	3.188	8	VH				Gran Titration
F110	37.00	3.700	10	EL				End point 3.5-3.6
F109	41.00	4.100	10					Radiometer
F113	44.00	4.889	9					Gran titration
F042	49.00	4.900	10	EH				Gran titration
F014	51.50	5.150	10					
F002	50.00	5.556	9	L				10110
F112	62.00	6.200	10	EH				TITRATION METER
F074	72.00	7.200	10	EHEHEHEHEH				Auto Titration
F007	71.00	7.889	9		BIASED HIGH*	-0.89	0.1345	CPQ003E2

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 3.00

OVERALL AVERAGE
RANK IS 5.295

PARAMETER: 06002 Diss Organic Carbon mg/L C

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 0.5000 CONCENTRATION ERROR INCREMENT= 0.0750

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	<0.5	0.00	<0.5	0.00	0.5	11.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F003	0.1	1.00	0.2	4.50	0.3	4.00	0.2	3.00	0.1	1.00	0.3	4.50
F004	0.179	4.00	0.186	3.00	0.231	3.00	0.183	2.00	<0.100	0.00	0.221	2.00
F007	0.32	12.00	0.33	9.50	0.54	12.00	0.42	8.00	0.24	9.00	0.45	11.50
F010	<0.2	0.00	<0.2	0.00	0.2	2.00	<0.2	0.00	<0.2	0.00	0.2	1.00
F014	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00
F015	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F022	0.23	10.00	0.42	14.00	0.39	7.00	0.43	9.00	0.42	13.00	0.48	13.50
F026	0.145	3.00	0.1165	1.00	0.199	1.00	0.124	1.00	0.114	2.00	0.265	3.00
F032	<0.2	0.00	<0.1	0.00	<0.3	0.00	<0.2	0.00	<0.1	0.00	<0.3	0.00
F037	0.2170	6.00	0.3841	12.00	0.6029	14.00	0.4662	12.00	0.2826	10.00	0.4285	9.00
F042	0.21	5.00	0.17	2.00	0.33	5.00	0.28	4.00	0.18	3.50	0.31	6.00
F060	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F069	0.14	2.00	0.20	4.50	0.40	8.00	0.31	5.00	0.19	5.00	0.30	4.50
F072	<0.40	0.00	<0.40	0.00	<0.40	0.00	<0.40	0.00	<0.40	0.00	<0.40	0.00
F073	0.219	7.00	0.252	8.00	0.451	10.00	0.363	6.00	0.229	8.00	0.366	7.00
F074	0.360	13.00	0.360	11.00	0.72	16.00	0.6	14.00	0.36	12.00	0.48	13.50
F094	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F107	0.39	14.00	0.40	13.00	0.70	15.00	0.45	10.00	0.20	6.00	0.60	15.00
F109	0.22T	8.50	0.24T	7.00	0.58	13.00	0.50	13.00	0.21T	7.00	0.44T	10.00
F112	0.22	8.50	0.23	6.00	0.36	6.00	0.39	7.00	0.18	3.50	0.40	8.00
F113	0.30	11.00	0.33	9.50	0.45	9.00	0.46	11.00	0.31	11.00	0.45	11.50
MEDIAN	0.2195		0.2460		0.4250		0.4050		0.2100		0.4000	
1CRIT	0.5000		0.5000		0.5000		0.5000		0.5000		0.5000	
N	12		12		14		12		11		13	
MEAN	0.2300		0.2735		0.4311		0.3710		0.2269		0.3762	
3STDEV	0.1911		0.2368		0.4166		0.3034		0.1970		0.2529	

PARAMETER: 06002 Diss Organic Carbon mg/L C

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	<0.5	0.00	1.3	14.00	<0.5	0.00	7.3	10.00
F003	0.2	2.50	1.1	4.00	0.5	9.00	6.5	1.00
F004		0.00	1.26	12.00	0.470	5.00	7.38	13.00
F007	0.20	2.50	1.26	12.00	0.44	2.00	7.14	8.00
F010	<0.2	0.00	1.1	4.00	0.4	1.00	6.7	4.00
F014	<1.0	0.00	1.4	18.50	<1.0	0.00	7.9	16.00
F015	0.5	14.00	1.4	18.50	0.6	12.00	7.8	15.00
F022	0.45	12.50	0.99	2.00	1.13 H	16.00	8.57 H	21.00
F026	0.174	1.00	1.1175	6.00	0.447	3.00	6.991	6.00
F032	<0.3	0.00	1.1	4.00	<0.4	0.00	6.6	2.50
F037	0.3435	8.00	1.3195	16.00	0.5630	10.00	7.6306	14.00
F042	0.24	5.00	1.19	7.00	0.46	4.00	6.95	5.00
F060	<0.5	0.00	0.9	1.00	<0.5	0.00	8.1	19.00
F069	0.23	4.00	1.22	10.00	0.48	6.00	7.32	11.00
F072	0.53	15.00	1.26	12.00	1.80 EH	17.00	9.06 VH	22.00
F073	0.284	7.00	1.205	9.00	0.498	8.00	7.102	7.00
F074	0.42	11.00	1.68 EH	22.00	0.72	13.00	8.04	18.00
F094	<0.5	0.00	1.2	8.00	<0.5	0.00	6.6	2.50
F107	0.45	12.50	1.45	20.00	0.79	14.00	8.26	20.00
F109	0.40T	10.00	1.55	21.00	1.06 H	15.00	8.00	17.00
F112	0.25	6.00	1.33	17.00	0.49	7.00	7.24	9.00
F113	0.38	9.00	1.31	15.00	0.59	11.00	7.36	12.00
MEDIAN	0.3435		1.2600		0.5000		7.3400	
1CRIT	0.5000		0.5195		0.5000		0.9755	
N	13		20		15		20	
MEAN	0.3344		1.2531		0.6159		7.4492	
3STDEV	0.3041		0.3992		0.6355		1.6599	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	35.00	11.667	3		INSUFFICIENT DATA			Shimadzu
F003	34.50	3.450	10		BIASED LOW	-10.44	-0.0664	UV dig IR detect
F004	44.00	5.500	8					06104
F007	86.50	8.650	10					NAQ06104
F010	12.00	2.400	5		BIASED LOW	-6.86	-0.1288	Conductimetry
F014	34.50	17.250	2		INSUFFICIENT DATA			
F015	59.50	14.875	4		INSUFFICIENT DATA			AutoC analyzer
F022	118.00	11.800	10	H H				UV-Oxidation
F026	27.00	2.700	10		BIASED LOW*	-2.93	-0.1323	AUTOANALYSER
F032	6.50	3.250	2		INSUFFICIENT DATA			Colourimetry
F037	111.00	11.100	10					Persulfate IR
F042	46.50	4.650	10		BIASED LOW*	-4.57	-0.0510	IR
F060	20.00	10.000	2		INSUFFICIENT DATA			UV-PerSO4 dig col
F069	60.00	6.000	10					Infrared Spectr
F072	66.00	16.500	4	EHVH	INSUFFICIENT DATA			Persulfate UV OX
F073	77.00	7.700	10					Persulfate-UV
F074	143.50	14.350	10	EH	BIASED HIGH	7.83	0.1502	PerSO4 IR CO2
F094	10.50	5.250	2		INSUFFICIENT DATA			Infrared
F107	139.50	13.950	10		BIASED HIGH	11.02	0.1090	Electro Po.
F109	121.50	12.150	10	H				UVPer Oxidation IR
F112	78.00	7.800	10					DOHRMAN
F113	110.00	11.000	10					UV-Presulfate-IR

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 8.895

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F010	12.00	2.400	5		BIASED LOW	-6.86	-0.1288	Conductimetry
F026	27.00	2.700	10		BIASED LOW*	-2.93	-0.1323	AUTOANALYSER
F032	6.50	3.250	2		INSUFFICIENT DATA			Colourimetry
F003	34.50	3.450	10		BIASED LOW	-10.44	-0.0664	UV dig IR detect
F042	46.50	4.650	10		BIASED LOW*	-4.57	-0.0510	IR
F094	10.50	5.250	2		INSUFFICIENT DATA			Infrared
F004	44.00	5.500	8					06104
F069	60.00	6.000	10					Infrared Spectr
F073	77.00	7.700	10					Persulfate-UV
F112	78.00	7.800	10					DOHRMAN
F007	86.50	8.650	10					NAQ06104
F060	20.00	10.000	2		INSUFFICIENT DATA			UV-PerSO4 dig col
F113	110.00	11.000	10					UV-Presulfate-IR
F037	111.00	11.100	10					Persulfate IR
F002	35.00	11.667	3		INSUFFICIENT DATA			Shimadzu
F022	118.00	11.800	10	HH				UV-Oxidation
F109	121.50	12.150	10	H				UVPer Oxidation IR
F107	139.50	13.950	10		BIASED HIGH	11.02	0.1090	Electro Po.
F074	143.50	14.350	10	EH	BIASED HIGH	7.83	0.1502	PerSO4 IR CO2
F015	59.50	14.875	4		INSUFFICIENT DATA			AutoC analyzer
F072	66.00	16.500	4	EHVH	INSUFFICIENT DATA			Persulfate UV OX
F014	34.50	17.250	2		INSUFFICIENT DATA			

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 8.895

PARAMETER: 06592 Diss Inorg Carbon mg/L C

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.5000 BASIC ACCEPTABLE ERROR= 0.3000 CONCENTRATION ERROR INCREMENT= 0.0750

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.9 EH	13.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F003	0.2	2.00	0.1	1.00	0.1	1.00	0.1	1.00	0.1	1.00	<0.1	0.00
F007	0.30	5.00	0.26	6.00	0.21	5.00	0.21	4.00	0.17	3.00	0.19	2.00
F010	0.4	9.00	0.2	3.00	0.2	4.00	0.2	3.00	0.2	6.00	0.2	4.00
F015	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F022	0.26	3.50	0.17	2.00	0.14	2.00	0.27	7.00	0.15	2.00	0.13	1.00
F026	0.26	3.50	0.21	4.00	0.195	3.00	0.17	2.00	0.19	5.00	0.195	3.00
F036	0.48	10.50	0.32	7.00	0.56 H	11.00	0.36	10.00	0.40	10.00	0.34	7.00
F042	0.51	12.00	0.40	9.00	0.44	9.00	0.35	9.00	0.39	9.00	0.38	8.00
F060	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F073	0.393	8.00	0.583 H	11.00	0.457	10.00	0.323	8.00	0.262	7.00	0.302	6.00
F074	0.36	6.00	0.24	5.00	0.24	6.00	0.24	6.00	0.18	4.00	0.24	5.00
F094	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F107	0.11	1.00		0.00		0.00		0.00		0.00		0.00
F112	0.39	7.00	0.35	8.00	0.27	7.00	0.22	5.00	0.28	8.00	0.42	10.00
F113	0.48	10.50	0.54	10.00	0.42	8.00	0.38	11.00	0.42	11.00	0.40	9.00
MEDIAN	0.3900		0.2600		0.2400		0.2400		0.2000		0.2710	
1CRIT	0.3000		0.3000		0.3000		0.3000		0.3000		0.3000	
N	11		9		9		9		9		8	
MEAN	0.3666		0.2989		0.2858		0.2603		0.2469		0.2809	
3STDEV	0.2911		0.3327		0.3407		0.1959		0.2654		0.2414	

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.6	6.00	<0.5	0.00	1.4	2.50	1.0 L	1.00
F003	0.5	2.00	0.1	1.00	1.5	5.00	1.6	10.50
F007	0.62	8.00	0.22	4.50	1.58	7.00	1.36	5.00
F010	0.6	6.00	0.2	3.00	1.6	8.50	1.6	10.50
F015	0.6	6.00	<0.5	0.00	1.7	13.00	1.4	6.00
F022	0.52	3.00	0.17	2.00	1.6	8.50	1.23	3.00
F026	0.56	4.00	0.22	4.50	1.56	6.00	1.495	7.00
F036	0.72	9.50	0.44	8.00	1.76	14.00	1.80	14.00
F042	0.77	12.00	0.35	7.00	1.80	15.50	1.73	13.00
F060	<0.5	0.00	<0.5	0.00	1.1 EL	1.00	1.1 L	2.00
F073	0.739	11.00	0.595 H	11.00	1.682	11.00	2.567 EH	16.00
F074	0.72	9.50	0.24	6.00	1.80	15.50	1.56	9.00
F094	<0.5	0.00	<0.5	0.00	1.4	2.50	1.5	8.00
F107	0.35 EL	1.00		0.00	1.41	4.00	1.34	4.00
F112	0.81	13.00	0.58 H	10.00	1.67	10.00	2.05 H	15.00
F113	0.83	14.00	0.51	9.00	1.69	12.00	1.66	12.00
MEDIAN	0.6100		0.2400		1.6000		1.5300	
1CRIT	0.3083		0.3000		0.3825		0.3773	
N	12		9		13		14	
MEAN	0.6466		0.3256		1.5809		1.5304	
3STDEV	0.2917		0.4266		0.3517		0.7035	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	22.50	5.625	4	EH L	INSUFFICIENT DATA			Shimadzu
F003	24.50	2.722	9		BIASED LOW	9.31	-0.1671	IR detection
F007	49.50	4.950	10					NAQ06180
F010	57.00	5.700	10					Conductimetry
F015	25.00	8.333	3		INSUFFICIENT DATA			AutoC analyzer
F022	34.00	3.400	10		BIASED LOW	-5.43	-0.0638	UV-Oxidation
F026	42.00	4.200	10		BIASED LOW*	1.01	-0.0582	AUTOANALYSER
F036	101.00	10.100	10	H				Colourimetry
F042	103.50	10.350	10		BIASED HIGH*	4.36	0.1296	IR
F060	3.00	1.500	2	ELL	INSUFFICIENT DATA			Color CO2 Dialysis
F073	99.00	9.900	10	H H EH				Persulfate-UV
F074	72.00	7.200	10					IR Detector
F094	10.50	5.250	2		INSUFFICIENT DATA			Infrared
F107	10.00	2.500	4	EL	INSUFFICIENT DATA			Electro Po.
F112	93.00	9.300	10	H H				DOHRMAN
F113	106.50	10.650	10		BIASED HIGH	-6.40	0.2106	Phosphoric acid-IR

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 6.879

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F060	3.00	1.500	2	ELL	INSUFFICIENT DATA			Color CO2 Dialysis
F107	10.00	2.500	4	EL	INSUFFICIENT DATA			Electro Po.
F003	24.50	2.722	9		BIASED LOW	9.31	-0.1671	IR detection
F022	34.00	3.400	10		BIASED LOW	-5.43	-0.0638	UV-Oxidation
F026	42.00	4.200	10		BIASED LOW*	1.01	-0.0582	AUTOANALYSER
F007	49.50	4.950	10					NAQ06180
F094	10.50	5.250	2		INSUFFICIENT DATA			Infrared
F002	22.50	5.625	4	EHL	INSUFFICIENT DATA			Shimadzu
F010	57.00	5.700	10					Conductimetry
F074	72.00	7.200	10					IR Detector
F015	25.00	8.333	3		INSUFFICIENT DATA			AutoC analyzer
F112	93.00	9.300	10	HH				DOHRMAN
F073	99.00	9.900	10	HHEH				Persulfate-UV
F036	101.00	10.100	10	H				Colourimetry
F042	103.50	10.350	10		BIASED HIGH*	4.36	0.1296	IR
F113	106.50	10.650	10		BIASED HIGH	-6.40	0.2106	Phosphoric acid-IR

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 6.879

PARAMETER: 07093 Nitrate-IC mg/L N

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0050 BASIC ACCEPTABLE ERROR= 0.0050 CONCENTRATION ERROR INCREMENT= 0.0800

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.26	10.00	0.35 EL	1.00	0.20	7.50	0.23	8.00	2.66	4.50	0.23	9.50
F009	0.27	15.00	0.5	6.00	0.21	16.50	0.23	8.00	2.7	7.50	0.24	19.00
F010	0.27	15.00	0.53	19.00	0.20	7.50	0.24	16.00	2.7	7.50	0.22	5.50
F015	0.251	5.00	0.512	13.00	0.191	2.00	0.222	3.00	2.5 L	1.00	0.218	4.00
F017	0.277	20.00	0.535	21.00	0.211	19.50	0.249	19.00	2.779	15.00	0.243	21.00
F020	0.255	7.00	0.515	15.50	0.201	11.50	0.234	12.00	3.00 H	24.00	0.233	13.00
F022	0.24 L	2.00	0.50	6.00	0.20	7.50	0.23	8.00	2.80	17.00	0.21 L	2.00
F025	0.275	19.00	0.505	9.00	0.220	22.50	0.252	25.00	2.724	11.00	0.238	17.00
F032	0.28	23.00	0.54	23.00	0.21	16.50	0.25	21.50	2.81	19.50	0.24	19.00
F037	0.2499	3.00	0.4215 EL	2.00	0.1981	4.00	0.2271	4.00	2.5560	2.00	0.2177	3.00
F038	0.27	15.00	0.514	14.00	0.198	3.00	0.237	13.00	2.76	14.00	0.231	12.00
F042	0.28	23.00	0.54	23.00	0.23	24.50	0.25	21.50	2.81	19.50	0.25	23.50
F053	0.27	15.00	0.54	23.00	0.21	16.50	0.24	16.00	2.82	21.00	0.24	19.00
F060	0.278	21.00	0.548	25.00	0.215	21.00	0.251	24.00	2.66	4.50	0.244	22.00
F068	0.262	12.00	0.515	15.50	0.202	13.00	0.23	8.00	2.806	18.00	0.234	14.00
F069	0.256	8.00	0.522	17.00	0.201	11.50	0.231	11.00	2.69	6.00	0.230	9.50
F071	0.294	26.00	0.506	10.00	0.233 H	27.00	0.264 H	26.50	3.223 VH	27.00	0.272 H	27.00
F073	1.404 EH	29.00	2.231 EH	29.00	1.171 EH	29.00	1.286 EH	29.00	13.673 EH	28.00	1.267 EH	29.00
F074	0.296	27.00	0.580 H	28.00	0.232 H	26.00	0.264 H	26.50	2.980	23.00	0.262 H	26.00
F094	0.253	6.00	0.501	8.00	0.2	7.50	0.228	5.00	2.73	12.00	0.227	7.00
F107	0.28	23.00	0.57 H	27.00	0.22	22.50	0.25	21.50	3.05 H	26.00	0.25	23.50
F109	0.2703	18.00	0.5338	20.00	0.2088	14.00	0.2431	18.00	2.7481	13.00	0.2370	15.50
F110	0.27	15.00	0.51	11.50	0.21	16.50	0.24	16.00	3.02 H	25.00	0.23	9.50
F112	0.26	10.00	0.50	6.00	0.20	7.50	0.23	8.00	2.71	9.50	0.23	9.50
F118	0.29	25.00	0.51	11.50	0.23	24.50	0.25	21.50	2.83	22.00	0.26	25.00
F122	0.222 VL	1.00	0.466 L	3.00	0.181 L	1.00	0.201 VL	1.00	2.560	3.00	0.201 VL	1.00
F129	0.260	10.00	0.524	18.00	0.211	19.50	0.239	14.00		0.00	0.237	15.50
F133	0.25	4.00	0.48	4.00	0.20	7.50	0.22	2.00	2.78	16.00	0.22	5.50
F139	0.35 EH	28.00	0.55	26.00	0.30 EH	28.00	0.33 EH	28.00	2.71	9.50	0.32 EH	28.00
MEDIAN	0.2700		0.5150		0.2100		0.2400		2.7695		0.2370	
1CRIT	0.0262		0.0458		0.0214		0.0238		0.2262		0.0236	
N	27		27		27		27		26		27	
MEAN	0.2710		0.5173		0.2127		0.2430		2.7929		0.2394	
3STDEV	0.0622		0.0929		0.0617		0.0617		0.4492		0.0631	

PARAMETER: 07093 Nitrate-IC mg/L N

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.66	4.00	0.11 L	2.00	0.43	5.00	0.09 VL	1.00
F009	0.65	3.00	0.13	19.00	0.42	2.50	0.13	20.00
F010	0.71	17.00	0.13	19.00	0.45	11.50	0.11 L	5.00
F015	0.753	27.00	0.118	6.00	0.439	7.00	0.121	12.50
F017	0.687	6.00	0.13	19.00	0.453	15.00	0.138	27.00
F020	0.727	20.00	0.108 L	1.00	0.476	22.50	0.104 VL	3.00
F022	0.67	5.00	0.12	8.00	0.42	2.50	0.12	9.50
F025	0.700	13.00	0.128	13.00	0.455	16.50	0.128	16.00
F032	0.73	22.50	0.13	19.00	0.47	21.00	0.13	20.00
F037	0.6284 L	2.00	0.1127 L	3.00	0.4256	4.00	0.1043 VL	4.00
F038	0.7	13.00	0.126	12.00	0.455	16.50	0.123	14.00
F042	0.73	22.50	0.13	19.00	0.49	25.50	0.13	20.00
F053	0.73	22.50	0.13	19.00	0.46	18.50	0.13	20.00
F060	0.732	25.00	0.135	24.00	0.476	22.50	0.134	24.00
F068	0.72	19.00	0.117	5.00	0.46	18.50	0.12	9.50
F069	0.703	16.00	0.115	4.00	0.450	11.50	0.097 VL	2.00
F071	0.730	22.50	0.151 H	26.00	0.485	24.00	0.137	26.00
F073	3.078 EH	29.00	0.868 EH	29.00	2.13 EH	29.00	0.835 EH	29.00
F074	0.790 H	28.00	0.143	25.00	0.500 H	27.50	0.135	25.00
F094	0.688	7.00	0.124	11.00	0.432	6.00	0.127	15.00
F107	0.75	26.00	0.13	19.00	0.50 H	27.50	0.13	20.00
F109	0.7114	18.00	0.1285	14.00	0.4679	20.00	0.1177	6.00
F110	0.7	13.00	0.13	19.00	0.45	11.50	0.12	9.50
F112	0.69	8.50	0.12	8.00	0.45	11.50	0.13	20.00
F118	0.70	13.00	0.13	19.00	0.45	11.50	0.13	20.00
F122	0.618 L	1.00	0.122	10.00	0.398 L	1.00	0.119	7.00
F129	0.693	10.00	0.153 VH	27.00	0.447	8.00	0.121	12.50
F133	0.69	8.50	0.12	8.00	0.45	11.50	0.12	9.50
F139	0.70	13.00	0.24 EH	28.00	0.49	25.50	0.24 EH	28.00
MEDIAN	0.7000		0.1300		0.4530		0.1270	
1CRIT	0.0606		0.0150		0.0408		0.0148	
N	27		27		27		27	
MEAN	0.7064		0.1316		0.4575		0.1276	
3STDEV	0.0983		0.0704		0.0671		0.0726	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	52.50	5.250	10	EL L VL	BIASED LOW*	-3.49	-0.0234	07315
F009	116.50	11.650	10					Dionex
F010	123.00	12.300	10	L				IC
F015	80.50	8.050	10	L				ICA, V1.2
F017	182.50	18.250	10					I.C.
F020	129.50	12.950	10	H L VL				IC
F022	67.50	6.750	10	L L	BIASED LOW*	1.75	-0.0240	IC
F025	162.00	16.200	10					LL IC
F032	205.00	20.500	10					Ion Chromatography
F037	31.00	3.100	10	EL L L VL	BIASED LOW	-7.62	-0.0080	I.C. Waters
F038	126.50	12.650	10					ION CHROMATOGRAPHY
F042	222.00	22.200	10					IC
F053	190.50	19.050	10					Ion Chromatography
F060	213.00	21.300	10					Colorimetry Cd Red
F068	132.50	13.250	10					IC, Dionex
F069	96.50	9.650	10	VL				Colorimetric
F071	242.00	24.200	10	H H VHH H	BIASED HIGH	16.71	-0.0301	IC
F073	289.00	28.900	10	EHEHEHEHEHEHEHEHEHEH	BIASED HIGH	387.62	0.0385	IC-Dionex
F074	262.00	26.200	10	H H H H H H	BIASED HIGH	7.49	0.0107	Autocolour
F094	84.50	8.450	10					IC
F107	236.00	23.600	10	H H H	BIASED HIGH	10.56	-0.0118	C.I.
F109	156.50	15.650	10					Dionex
F110	146.50	14.650	10	H				Dionex
F112	98.50	9.850	10					DIONEX IC
F118	193.00	19.300	10					I.C.
F122	29.00	2.900	10	VLL L VL VLL L	BIASED LOW	-7.16	-0.0159	IC
F129	134.50	14.944	9	VH				DIONEX IC
F133	76.50	7.650	10					I.C.
F139	242.00	24.200	10	EH EHEH EH EH EH	BIASED HIGH	-6.08	0.0922	IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 14.952

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F122	29.00	2.900	10	VLLLVLVLLL	BIASED LOW	-7.16	-0.0159	IC
F037	31.00	3.100	10	ELLLVL	BIASED LOW	-7.62	-0.0080	I.C. Waters
F002	52.50	5.250	10	ELLVL	BIASED LOW*	-3.49	-0.0234	07315
F022	67.50	6.750	10	LL	BIASED LOW*	1.75	-0.0240	IC
F133	76.50	7.650	10					I.C.
F015	80.50	8.050	10	L				ICA, V1.2
F094	84.50	8.450	10					IC
F069	96.50	9.650	10	VL				Colorimetric
F112	98.50	9.850	10					DIONEX IC
F009	116.50	11.650	10					Dionex
F010	123.00	12.300	10	L				IC
F038	126.50	12.650	10					ION CHROMATOGRAPHY
F020	129.50	12.950	10	HLVL				IC
F068	132.50	13.250	10					IC, Dionex
F110	146.50	14.650	10	H				Dionex
F129	134.50	14.944	9	VH				DIONEX IC
F109	156.50	15.650	10					Dionex
F025	162.00	16.200	10					LL IC
F017	182.50	18.250	10					I.C.
F053	190.50	19.050	10					Ion Chromatography
F118	193.00	19.300	10					I.C.
F032	205.00	20.500	10					Ion Chromatography
F060	213.00	21.300	10					Colorimetry Cd Red
F042	222.00	22.200	10					IC
F107	236.00	23.600	10	HHH	BIASED HIGH	10.56	-0.0118	C.I.
F071	242.00	24.200	10	HHVHHH	BIASED HIGH	16.71	-0.0301	IC
F139	242.00	24.200	10	EHEHEHEHEHEH	BIASED HIGH	-6.08	0.0922	IC
F074	262.00	26.200	10	HHHHHH	BIASED HIGH	7.49	0.0107	Autocolour
F073	289.00	28.900	10	EHEHEHEHEHEHEHEHEHEH	BIASED HIGH	387.62	0.0385	IC-Dionex

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 14.952

Nitrate-IC

PARAMETER: 07092 Nitrate + Nitrite mg/L N

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0050 BASIC ACCEPTABLE ERROR= 0.0050 CONCENTRATION ERROR INCREMENT= 0.0800

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	0.278	15.50	0.557	26.00	0.215	16.00	0.263	26.00	2.89	24.00	0.250	20.50
F004	0.280	21.00	0.490	6.00	0.217	18.00	0.248	17.00	2.83	22.50	0.248	18.00
F007	0.26	7.00	0.44 VL	2.00	0.20	6.50	0.22	2.50	2.55	3.00	0.21 L	2.00
F009	0.29	25.00	0.5	7.00	0.22	22.50	0.24	15.00	2.8	19.00	0.26	25.00
F010	0.27	12.00	0.52	14.50	0.20	6.50	0.23	7.50	2.9	25.00	0.23	7.50
F014	0.28	21.00	0.52	14.50	0.22	22.50	0.25	20.50	2.7	8.00	0.26	25.00
F015	0.251 L	4.00	0.512	11.00	0.191 L	2.00	0.222	4.00	2.5 L	2.00	0.218	4.00
F022	0.278	15.50	0.544	23.00	0.219	19.00	0.237	12.50	2.767	15.00	0.237	12.50
F025	0.279	18.00	0.505	9.00	0.220	22.50	0.252	24.00	2.724	10.00	0.238	15.00
F026	0.267	10.50	0.5255	19.00	0.205	11.00	0.2355	11.00	2.7745	16.00	0.238	15.00
F032	0.290	25.00	0.525	18.00	0.220	22.50	0.255	25.00	2.79	18.00	0.250	20.50
F036	0.278	15.50	0.536	21.00	0.212	14.00	0.248	17.00	2.49 L	1.00	0.232	10.00
F037	0.2499 L	2.00	0.4215 EL	1.00	0.1981	4.00	0.2271	5.00	2.5560	4.00	0.2177	3.00
F038	0.274	13.00	0.514	12.00	0.198	3.00	0.237	12.50	2.76	14.00	0.231	9.00
F060	0.278	15.50	0.548	24.00	0.215	16.00	0.251	23.00	2.66	6.00	0.244	17.00
F068	0.262	8.00	0.515	13.00	0.202	10.00	0.23	7.50	2.806	20.00	0.234	11.00
F069	0.259	6.00	0.522	16.00	0.201	9.00	0.231	9.00	2.69	7.00	0.230	7.50
F071	0.267	10.50	0.486	5.00	0.210	12.00	0.235	10.00	2.744	13.00	0.253	23.00
F072	0.28	21.00	0.54	22.00	0.22	22.50	0.25	20.50	2.82	21.00	0.25	20.50
F074	0.300	27.00	0.580 H	28.00	0.232	27.00	0.264 H	27.00	2.980	26.00	0.262 H	27.00
F094	0.253	5.00	0.501	8.00	0.2	6.50	0.228	6.00	2.73	11.50	0.227	6.00
F107	0.28	21.00	0.57 H	27.00	0.22	22.50	0.25	20.50	3.05 H	27.00	0.25	20.50
F113	0.280	21.00	0.526	20.00	0.215	16.00	0.248	17.00	2.730	11.50	0.238	15.00
F118	0.29	25.00	0.51	10.00	0.23	26.00	0.25	20.50	2.83	22.50	0.26	25.00
F122	0.226 EL	1.00	0.467 L	3.00	0.182 L	1.00	0.201 EL	1.00	2.566	5.00	0.203 L	1.00
F129	0.264	9.00	0.524	17.00	0.211	13.00	0.239	14.00		0.00	0.237	12.50
F133	0.25 L	3.00	0.48	4.00	0.20	6.50	0.22	2.50	2.78	17.00	0.22	5.00
F139	0.35 EH	28.00	0.55	25.00	0.30 EH	28.00	0.33 EH	28.00	2.71	9.00	0.32 EH	28.00
MEDIAN	0.2780		0.5200		0.2135		0.2395		2.7600		0.2380	
1CRIT	0.0268		0.0462		0.0217		0.0238		0.2254		0.0236	
N	26		26		26		26		25		26	
MEAN	0.2726		0.5164		0.2112		0.2408		2.7435		0.2394	
3STDEV	0.0398		0.0845		0.0315		0.0370		0.3352		0.0424	

PARAMETER: 07092 Nitrate + Nitrite mg/L N

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	0.722	23.00	0.131	18.00	0.482	25.00	0.128	18.00
F004	0.717	19.50	0.134	21.00	0.464	18.00	0.131	24.00
F007	0.61 EL	1.00	0.11 L	1.00	0.42	2.00	0.10 VL	2.00
F009	0.68	5.00	0.13	14.50	0.46	16.00	0.12	8.50
F010	0.71	15.50	0.13	14.50	0.45	9.50	0.12	8.50
F014	0.70	11.00	0.14	24.50	0.47	21.50	0.14	27.00
F015	0.753	27.00	0.118	5.00	0.439	5.00	0.121	11.50
F022	0.729	24.00	0.135	22.50	0.467	19.50	0.13	21.50
F025	0.700	11.00	0.128	11.00	0.455	12.00	0.128	18.00
F026	0.717	19.50	0.126	9.50	0.456	13.50	0.1135	4.00
F032	0.710	15.50	0.130	14.50	0.475	23.00	0.125	14.00
F036	0.714	17.00	0.130	14.50	0.460	16.00	0.128	18.00
F037	0.6284 L	3.00	0.1127 L	2.00	0.4256	3.00	0.1043 L	3.00
F038	0.7	11.00	0.126	9.50	0.456	13.50	0.123	13.00
F060	0.732	25.00	0.135	22.50	0.476	24.00	0.134	25.00
F068	0.72	21.50	0.117	4.00	0.46	16.00	0.12	8.50
F069	0.703	14.00	0.115	3.00	0.450	9.50	0.098 VL	1.00
F071	0.670	4.00	0.132	19.50	0.447	6.00	0.117	5.00
F072	0.72	21.50	0.14	24.50	0.47	21.50	0.13	21.50
F074	0.790 H	28.00	0.143	26.00	0.500 H	27.50	0.135	26.00
F094	0.688	6.00	0.124	8.00	0.432	4.00	0.127	15.50
F107	0.75	26.00	0.13	14.50	0.50 H	27.50	0.13	21.50
F113	0.715	18.00	0.132	19.50	0.467	19.50	0.127	15.50
F118	0.70	11.00	0.13	14.50	0.45	9.50	0.13	21.50
F122	0.620 L	2.00	0.122	7.00	0.398 EL	1.00	0.119	6.00
F129	0.694	8.00	0.153 VH	27.00	0.448	7.00	0.121	11.50
F133	0.69	7.00	0.12	6.00	0.45	9.50	0.12	8.50
F139	0.70	11.00	0.24 EH	28.00	0.49	26.00	0.24 EH	28.00
MEDIAN	0.7065		0.1300		0.4580		0.1260	
1CRIT	0.0611		0.0150		0.0412		0.0147	
N	26		26		25		26	
MEAN	0.7032		0.1294		0.4568		0.1239	
3STDEV	0.0883		0.0265		0.0491		0.0261	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	212.00	21.200	10					Cd reduction
F004	185.00	18.500	10					07110
F007	29.00	2.900	10	VL L ELL VL	BIASED LOW	-7.44	-0.0128	CPQ103E2
F009	157.50	15.750	10					TRAACS
F010	121.00	12.100	10					Hydrazine SO4
F014	195.50	19.550	10					
F015	75.50	7.550	10	L L L				ICA, V1.2
F022	185.00	18.500	10					Colorimetry
F025	150.50	15.050	10					LL IC
F026	129.00	12.900	10					AUTOANALYSER
F032	196.00	19.600	10					Colourimetry
F036	144.00	14.400	10	L				Colourimetry
F037	30.00	3.000	10	L EL L L L	BIASED LOW	-7.23	-0.0118	I.C. Waters
F038	110.50	11.050	10					ION CHROMATOGRAPHY
F060	198.00	19.800	10					Colorimetry Cd Red
F068	119.50	11.950	10					IC, Dionex
F069	82.00	8.200	10	VL				Colorimetric
F071	108.00	10.800	10					Colorimetric
F072	216.50	21.650	10					Cd reduction AA
F074	269.50	26.950	10	H H H H H	BIASED HIGH	7.93	0.0067	Autocolour
F094	76.50	7.650	10					IC and Colorimetry
F107	228.00	22.800	10	H H H	BIASED HIGH	11.02	-0.0165	C.I.
F113	173.00	17.300	10					FIA, Lachat 8000
F118	185.50	18.550	10					I.C.
F122	28.00	2.800	10	ELL L EL L L EL	BIASED LOW	-6.58	-0.0193	IC
F129	119.00	13.222	9	VH				DIONEX IC
F133	69.00	6.900	10	L				I.C.
F139	239.00	23.900	10	EH EHEH EH EH EH	BIASED HIGH	-5.69	0.0883	IC

OVERALL AVERAGE
RANK IS 14.452

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F122	28.00	2.800	10	ELLLELLLEL	BIASED LOW	-6.58	-0.0193	IC
F007	29.00	2.900	10	VLLELLVL	BIASED LOW	-7.44	-0.0128	CPQ103E2
F037	30.00	3.000	10	LELLLL	BIASED LOW	-7.23	-0.0118	I.C. Waters
F133	69.00	6.900	10	L				I.C.
F015	75.50	7.550	10	LLL				ICA, V1.2
F094	76.50	7.650	10					IC and Colorimetry
F069	82.00	8.200	10	VL				Colorimetric
F071	108.00	10.800	10					Colorimetric
F038	110.50	11.050	10					ION CHROMATOGRAPHY
F068	119.50	11.950	10					IC, Dionex
F010	121.00	12.100	10					Hydrazine SO4
F026	129.00	12.900	10					AUTOANALYSER
F129	119.00	13.222	9	VH				DIONEX IC
F036	144.00	14.400	10	L				Colourimetry
F025	150.50	15.050	10					LL IC
F009	157.50	15.750	10					TRAACS
F113	173.00	17.300	10					FIA, Lachat 8000
F022	185.00	18.500	10					Colorimetry
F004	185.00	18.500	10					07110
F118	185.50	18.550	10					I.C.
F014	195.50	19.550	10					
F032	196.00	19.600	10					Colourimetry
F060	198.00	19.800	10					Colorimetry Cd Red
F003	212.00	21.200	10					Cd reduction
F072	216.50	21.650	10					Cd reduction AA
F107	228.00	22.800	10	HHH	BIASED HIGH	11.02	-0.0165	C.I.
F139	239.00	23.900	10	EHEHEHEHEHEH	BIASED HIGH	-5.69	0.0883	IC
F074	269.50	26.950	10	HHHHH	BIASED HIGH	7.93	0.0067	Autocolour

OVERALL AVERAGE
RANK IS 14.452

Nitrate + Nitrite

PARAMETER: 07192 Ammonia mg/L N

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0060 BASIC ACCEPTABLE ERROR= 0.0060 CONCENTRATION ERROR INCREMENT= 0.1250

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	0.163	13.00	<0.005	0.00	0.186	19.50	0.226	18.00	0.137	25.00	0.169	17.50
F004	0.161	12.00	<0.005	0.00	0.172	10.00	0.226	18.00	0.121	7.50	0.144	4.00
F007	0.172	19.00	0.010 H	10.50	0.180	14.00	0.223	14.00	0.131	18.00	0.164	13.00
F010	0.14 L	3.00	0.02 VH	15.00	0.15 L	3.00	0.19 L	4.00	0.12	5.00	0.14 L	3.00
F014	0.172	19.00	<0.010	0.00	0.185	18.00	0.230	21.50	0.130	15.00	0.169	17.50
F015	0.198 H	28.00	0.012 H	12.50	0.228 VH	30.00	0.273 H	30.00	0.166 EH	29.50	0.205 EH	29.50
F017	0.168	15.00	0.006W	0.00	0.178	12.00	0.222	13.00	0.125	11.50	0.163	12.00
F020	0.16	10.00	<0.01	0.00	0.17	7.50	0.210	7.00	0.124	10.00	0.155	8.00
F022	0.2 H	29.50	0.002	6.50	0.216 H	28.00	0.259 H	28.00	0.166 EH	29.50	0.205 EH	29.50
F025	0.182	25.00	<0.01	0.00	0.186	19.50	0.248	27.00	0.123	9.00	0.165	14.00
F026	0.1710	17.00	0.0001	3.00	0.1874	21.00	0.2257	16.00	0.1309	17.00	0.1653	15.00
F032	0.172	19.00	<0.002	0.00	0.172	10.00	0.22	11.50	0.134	20.50	0.168	16.00
F036	0.183	26.00	0.008	9.00	0.195	25.00	0.241	25.50	0.142	26.00	0.179	27.00
F038	0.142 L	4.00	<0.005	0.00	0.158	6.00	0.22	11.50	0.13	15.00	0.138 L	2.00
F042	0.16	10.00	0.00W	0.00	0.18	14.00	0.21	7.00	0.12	5.00	0.16	10.00
F053	0.16	10.00	0.02W	0.00	0.17	7.50	0.21	7.00	0.12	5.00	0.156	9.00
F060	0.173	21.50	0.016 VH	14.00	0.198	26.50	0.234	23.00	0.134	20.50	0.170	19.50
F068	0.180	23.50		0.00	0.192	24.00	0.235	24.00	0.135	23.50	0.178	25.50
F069	0.166	14.00	<0.002	0.00	0.172	10.00	0.215	9.00	0.125	11.50	0.161	11.00
F071	0.152	6.00	0.001	4.00	0.131 VL	2.00	0.156 EL	1.00	0.109	3.00	0.145	5.00
F072	0.17	16.00	<0.01	0.00	0.18	14.00	0.23	21.50	0.13	15.00	0.17	19.50
F074	0.20 H	29.50	0.00	1.50	0.22 H	29.00	0.27 H	29.00	0.15	28.00	0.20 H	28.00
F094	0.18	23.50	0.01 H	10.50	0.198	26.50	0.241	25.50	0.148	27.00	0.178	25.50
F107	0.148	5.00	0.012 H	12.50	0.154	5.00	0.204	5.00	0.105 L	2.00	0.15	7.00
F109	0.185	27.00	0.002T	6.50	0.1848	17.00	0.2286	20.00	0.1348	22.00	0.1744	24.00
F112	0.173	21.50		0.00	0.188	22.50	0.224	15.00	0.135	23.50	0.171	22.00
F113	0.000 EL	1.00	0.	1.50	0.188	22.50	0.226	18.00	0.133	19.00	0.171	22.00
F118	0.154	8.00	0.003T	8.00	0.181	16.00	0.216	10.00	0.127	13.00	0.171	22.00
F122	0.0956 EL	2.00	0.0016	5.00	0.118 EL	1.00	0.165 VL	2.00	0.0681 EL	1.00	0.107 EL	1.00
F129	0.153	7.00	<0.008	0.00	0.152 L	4.00	0.188 L	3.00	0.121	7.50	0.147	6.00
MEDIAN	0.1690		0.0030		0.1805		0.2248		0.1300		0.1666	
1CRIT	0.0264		0.0060		0.0278		0.0334		0.0215		0.0261	
N	27		12		28		28		27		27	
MEAN	0.1642		0.0065		0.1794		0.2228		0.1287		0.1638	
3STDEV	0.0568		0.0156		0.0563		0.0618		0.0298		0.0407	

PARAMETER: 07192 Ammonia mg/L N

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	<0.005	0.00	<0.005	0.00	<0.005	0.00	<0.005	0.00
F004	<0.005	0.00	<0.005	0.00	<0.005	0.00	<0.005	0.00
F007	<0.010	0.00	<0.010	0.00	<0.010	0.00	<0.010	0.00
F010	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00
F014	<0.010	0.00	<0.010	0.00	<0.010	0.00	<0.010	0.00
F015	0.005	7.00	<0.005	0.00	<0.005	0.00	0.007	8.50
F017	0.006W	0.00	0.006W	0.00	0.006W	0.00	0.006W	0.00
F020	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00
F022	0.004	6.00	0.001	3.50	0.001	3.50	0.003	4.00
F025	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00
F026	0.0012	4.00	0.0015	5.00	0.0017	7.00	0.0060	7.00
F032	<0.002	0.00	<0.002	0.00	<0.002	0.00	<0.002	0.00
F036	<0.004	0.00	0.006	8.50	0.005	9.00	<0.003	0.00
F038	<0.005	0.00	<0.005	0.00	0.021 EH	12.00	0.008	10.00
F042	0.05 EH	13.00	0.00W	0.00	0.01W	0.00	0.00W	0.00
F053	0.02W	0.00	0.02W	0.00	0.02W	0.00	0.02W	0.00
F060	0.006	8.00	0.006	8.50	<0.005	0.00	<0.005	0.00
F068		0.00		0.00		0.00		0.00
F069	<0.002	0.00	<0.002	0.00	<0.002	0.00	0.002	3.00
F071	0.001	3.00	0.001	3.50	0.001	3.50	0.001	2.00
F072	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00
F074	0.00	1.50	0.00	1.50	0.00	1.00	0.00	1.00
F094	0.014 VH	11.00	0.009	10.00	0.01 H	10.50	0.017 VH	11.00
F107	0.015 VH	12.00	0.01	11.00	0.01 H	10.50	0.02 EH	12.00
F109	0.009T	9.00	0.005T	7.00	0.003T	8.00	0.007T	8.50
F112		0.00		0.00		0.00		0.00
F113	0.000	1.50	0.000	1.50	0.001	3.50	0.004	6.00
F118	0.002T	5.00	0.004T	6.00	0.001T	3.50	0.001W	0.00
F122	0.0004W	0.00	0.0001W	0.00	0.0016	6.00	0.0034	5.00
F129	0.010	10.00	<0.008	0.00	<0.008	0.00	<0.008	0.00
MEDIAN	0.0050		0.0040		0.0016		0.0050	
1CRIT	0.0060		0.0060		0.0060		0.0060	
N	10		8		10		10	
MEAN	0.0067		0.0042		0.0035		0.0058	
3STDEV	0.0145		0.0081		0.0104		0.0130	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	93.00	18.600	5					Alkaline reduction
F004	51.50	10.300	5					07540
F007	88.50	14.750	6	H				CPQ117E0
F010	33.00	5.500	6	L VHL L L	BIASED LOW	-25.21	0.0177	Auto-colorimetry
F014	91.00	18.200	5					
F015	175.00	21.875	8	H H VHH EHEH	BIASED HIGH	20.77	0.0033	autoBerthelot V1.7
F017	63.50	12.700	5					Colourimetric
F020	42.50	8.500	5					IC
F022	168.00	16.800	10	H H H EHEH				Colorimetry
F025	94.50	18.900	5					LL IC
F026	112.00	11.200	10					AUTOANALYSER
F032	77.00	15.400	5					Colourimetry
F036	156.00	19.500	8					Colourimetry
F038	60.50	8.643	7	L L EH				COLOR - AUTOMATED
F042	59.00	9.833	6	EH				Colorimetric
F053	38.50	7.700	5					FIA, phenate
F060	141.50	17.688	8	VH				Phenate color
F068	120.50	24.100	5		BIASED HIGH*	4.80	0.0014	
F069	58.50	9.750	6					Colorimetric
F071	33.00	3.300	10	VLEL	BIASED LOW	-21.52	0.0000	Colorimetric
F072	86.00	17.200	5					Automated phenate
F074	150.00	15.000	10	H H H H				Autocolour
F094	181.00	18.100	10	H VH H VH				Colorimetry
F107	82.00	8.200	10	H L VH H EH				Colorimetrie
F109	149.00	14.900	10					FIA - phenate
F112	104.50	20.900	5					
F113	96.50	9.650	10	EL				FIA, Lachat 8000
F118	91.50	10.167	9					I.C.
F122	23.00	2.875	8	EL ELVLELEL	BIASED LOW	-33.41	-0.0033	Phenolhypochlorite
F129	37.50	6.250	6	L L				DIONEX IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 7.50

OVERALL AVERAGE
RANK IS 12.948

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F122	23.00	2.875	8	ELELVLELEL	BIASED LOW	-33.41	-0.0033	Phenolhypochlorite
F071	33.00	3.300	10	VLEL	BIASED LOW	-21.52	0.0000	Colorimetric
F010	33.00	5.500	6	LVHLLL	BIASED LOW	-25.21	0.0177	Auto-colorimetry
F129	37.50	6.250	6	LL				DIONEX IC
F053	38.50	7.700	5					FIA, phenate
F107	82.00	8.200	10	HLVHHEH				Colorimetrie
F020	42.50	8.500	5					IC
F038	60.50	8.643	7	LLEH				COLOR - AUTOMATED
F113	96.50	9.650	10	EL				FIA, Lachat 8000
F069	58.50	9.750	6					Colorimetric
F042	59.00	9.833	6	EH				Colorimetric
E118	91.50	10.167	9					I.C.
F004	51.50	10.300	5					07540
F026	112.00	11.200	10					AUTOANALYSER
F017	63.50	12.700	5					Colourimetric
F007	88.50	14.750	6	H				CPQ117E0
F109	149.00	14.900	10					FIA - phenate
F074	150.00	15.000	10	HHHH				Autocolour
F032	77.00	15.400	5					Colourimetry
F022	168.00	16.800	10	HHHEHEH				Colorimetry
F072	86.00	17.200	5					Automated phenate
F060	141.50	17.688	8	VH				Phenate color
F094	181.00	18.100	10	HVHHVH				Colorimetry
F014	91.00	18.200	5					
F003	93.00	18.600	5					Alkaline reduction
F025	94.50	18.900	5					LL IC
F036	156.00	19.500	8					Colourimetry
F112	104.50	20.900	5					
F015	175.00	21.875	8	HHVHHEHEH	BIASED HIGH	20.77	0.0033	autoBerthelot V1.7
F068	120.50	24.100	5		BIASED HIGH*	4.80	0.0014	

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 7.50

OVERALL AVERAGE
RANK IS 12.948

PARAMETER: 07392 Total Kjeldahl N mg/L N

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0250 BASIC ACCEPTABLE ERROR= 0.0250 CONCENTRATION ERROR INCREMENT= 0.1500

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	0.211	6.00	0.032 L	2.00	0.212	7.00	0.258	6.00	0.161	7.00	0.178	4.00
F014	0.20	5.00	<0.20	0.00	0.20	4.00	0.22	4.50	<0.20	0.00	<0.20	0.00
F022	0.05 EL	1.00	0.06	3.00	0.14 L	1.00	0.17 L	1.00	0.07 VL	2.00	0.14	2.00
F032	0.18	4.00	<0.02 VL	0.00	0.18	3.00	0.22	4.50	0.14	3.00	0.18	5.00
F060	0.23	8.00	<0.05	0.00	0.24	8.00	0.30 H	9.00	0.15	5.00	0.26 VH	7.00
F069	0.178	3.00	<0.1	0.00	0.210	5.50	0.259	7.00	0.146	4.00	0.145	3.00
F072	0.23	8.00	0.10	5.00	0.21	5.50	0.21	3.00	0.16	6.00	0.27 VH	8.00
F074	0.13 L	2.00	0.00 EL	1.00	0.17	2.00	0.20	2.00	0.00 EL	1.00	0.13 L	1.00
F094	0.23	8.00	0.08	4.00	0.25	9.00	0.28	8.00	0.21 H	8.00	0.23 H	6.00
F107	0.44 EH	10.00	0.537 EH	6.00	0.393 EH	10.00	0.489 EH	10.00	3.039 EH	9.00	0.399 EH	9.00
MEDIAN	0.2055		0.0700		0.2100		0.2390		0.1500		0.1800	
1CRIT	0.0521		0.0318		0.0527		0.0571		0.0438		0.0483	
N	8		4		8		8		7		7	
MEAN	0.1986		0.0680		0.2090		0.2434		0.1481		0.2004	
3STDEV	0.0983		-		0.0757		0.1011		0.1151		0.1474	

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	0.041	3.00	0.073	4.00	0.039	3.00	0.272	7.00
F014	<0.20	0.00	<0.20	0.00	<0.20	0.00	0.24	3.00
F022	0. VL	1.50	0.007 EL	1.00	0. EL	1.50	0.22	1.50
F032	<0.02 L	0.00	<0.04 L	0.00	<0.04	0.00	0.28	8.00
F060	<0.05	0.00	0.06	3.00	0.07	4.00	0.26	6.00
F069	<0.1	0.00	<0.1	0.00	<0.1	0.00	0.246	4.00
F072	0.21 EH	5.00	0.18 EH	6.00	0.15 EH	6.00	0.22	1.50
F074	0.00 VL	1.50	0.01 VL	2.00	0.00 EL	1.50	0.255	5.00
F094	0.06	4.00	0.12 H	5.00	0.09	5.00	0.36 EH	10.00
F107	0.726 EH	6.00	0.199 EH	7.00	0.489 EH	7.00	0.294	9.00
MEDIAN	0.0505		0.0730		0.0700		0.2575	
1CRIT	0.0288		0.0322		0.0318		0.0599	
N	3		5		4		7	
MEAN	0.1037		0.0886		0.0873		0.2639	
3STDEV	-		-		-		0.0534	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	49.00	4.900	10	L				Block digestion
F014	16.50	4.125	4					
F022	15.50	1.550	10	EL L L VL VLELEL				Colorimetry
F032	27.50	4.583	6	VL L L				Colourimetry
F060	50.00	6.250	8	H VH				Tot dig phen color
F069	26.50	4.417	6					Colorim Blk Dig
F072	54.00	5.400	10	VHEHEHEH				Block dig AA
F074	19.00	1.900	10	L EL ELL VLVLEL				UV Dig Colour
F094	67.00	6.700	10	H H H EH				Colorimetry
F107	83.00	8.300	10	EHEHEHEHEHEHEHEHEH				Colorimetrie

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 4.857

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F022	15.50	1.550	10	ELLLVLVLELEL				Colorimetry
F074	19.00	1.900	10	LELELLVLVLEL				UV Dig Colour
F014	16.50	4.125	4					
F069	26.50	4.417	6					Colorim Blk Dig
F032	27.50	4.583	6	VLLL				Colourimetry
F003	49.00	4.900	10	L				Block digestion
F072	54.00	5.400	10	VHEHEHEH				Block dig AA
F060	50.00	6.250	8	HVH				Tot dig phen color
F094	67.00	6.700	10	HHHEH				Colorimetry
F107	83.00	8.300	10	EHEHEHEHEHEHEHEHEH				Colorimetrie

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 4.857

Total Kjeldahl N

PARAMETER: 11091 Sodium mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.1000 BASIC ACCEPTABLE ERROR= 0.0400 CONCENTRATION ERROR INCREMENT= 0.0400

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	<0.05	0.00	<0.05	0.00	0.09	5.50	<0.05	0.00	0.15	6.50	<0.05	0.00
F003	0.07	9.50	0.03	5.50	0.11	20.50	0.06	7.50	0.15	6.50	0.07	17.00
F007	0.078	16.00	0.032	9.00	0.107	15.50	0.066	12.00	0.169	17.00	0.066	11.00
F009	<0.1	0.00	<0.1	0.00	0.11	20.50	<0.1	0.00	0.16	12.00	<0.1	0.00
F010	0.06	3.50	0.03	5.50	0.08	3.00	0.05	1.50	0.14	3.00	0.05	1.50
F014	0.15 VH	26.00	0.07 EH	24.00	0.15 EH	29.00	0.12 EH	25.00	0.24 EH	30.00	0.12 EH	25.00
F015	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	0.1 EL	2.00	<0.1	0.00
F017	0.073	12.50	0.035	11.00	0.105	13.00	0.068	13.50	0.167	16.00	0.076	23.00
F020	0.06	3.50	0.04	16.50	0.10	10.00	0.06	7.50	0.17	21.00	0.07	17.00
F022	0.07	9.50	0.04	16.50	0.11	20.50	0.06	7.50	0.17	21.00	0.06	5.50
F025	0.074	14.00	0.035	11.00	0.094	7.50	0.053	3.00	0.156	9.50	0.068	12.00
F026	0.075	15.00	0.042	19.00	0.106	14.00	0.070	17.00	0.166	15.00	0.073	22.00
F032	0.080	19.50	0.036	13.50	0.110	20.50	0.072	19.50	0.176	27.00	0.072	21.00
F036	0.080	19.50	0.035	11.00	0.110	20.50	0.075	21.00	0.170	21.00	0.065	9.50
F037	0.1086	25.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1 EL	0.00	<0.1	0.00
F038	0.06	3.50	0.03	5.50	0.09	5.50	0.06	7.50	0.15	6.50	0.06	5.50
F042	0.08	19.50	0.05	21.50	0.11	20.50	0.08	22.00	0.17	21.00	0.07	17.00
F053	0.073	12.50	0.036	13.50	0.104	12.00	0.068	13.50	0.164	14.00	0.065	9.50
F060	0.086	22.00	0.040	16.50	0.115	26.00	0.069	15.00	0.177	28.00	0.069	13.00
F068	0.067	7.00		0.00	0.087	4.00	0.056	4.00	0.147	4.00	0.062	8.00
F069	0.190 EH	27.00	<0.1	0.00	0.111	25.00	<0.1	0.00	0.174	26.00	<0.1	0.00
F071	0.107	24.00	0.053	23.00	0.127	28.00	0.084	23.00	0.185	29.00	0.090	24.00
F072	0.06	3.50	0.03	5.50	0.11	20.50	0.06	7.50	0.16	12.00	0.06	5.50
F073	0.49 EH	28.00	0.012 EL	1.00	0.036 EL	1.00	0.244 EH	26.00	0.081 EL	1.00	0.318 EH	26.00
F074	0.07	9.50	0.03	5.50	0.10	10.00	0.07	17.00	0.17	21.00	0.07	17.00
F094	0.1	23.00	0.05	21.50	0.12	27.00	0.1	24.00	0.17	21.00	0.07	17.00
F107	0.079	17.00	0.043	20.00	0.107	15.50	0.072	19.50	0.173	25.00	0.070	17.00
F110	0.08	19.50	0.04	16.50	0.11	20.50	0.07	17.00	0.17	21.00	0.07	17.00
F112	0.07	9.50	0.03	5.50	0.10	10.00	0.06	7.50	0.16	12.00	0.06	5.50
F129	0.065	6.00	0.028	2.00	0.094	7.50	0.064	11.00	0.156	9.50	0.057	3.00
F133	0.05	1.00	<0.05	0.00	0.05 EL	2.00	0.05	1.50	0.15	6.50	0.05	1.50
F139	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1 EL	0.00	<0.1	0.00
MEDIAN	0.0745		0.0355		0.1070		0.0680		0.1665		0.0695	
1CRIT	0.0400		0.0400		0.0403		0.0400		0.0427		0.0400	
N	26		22		27		23		28		23	
MEAN	0.0833		0.0370		0.1025		0.0703		0.1614		0.0701	
3STDEV	0.0858		0.0213		0.0433		0.0437		0.0473		0.0378	

PARAMETER: 11091 Sodium mg/L

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.19	2.50	2.72	27.50	<0.05 EL	0.00	4.09	24.00
F003	0.20	7.50	2.68	20.00	0.10	6.00	4.01	19.50
F007	0.220	18.00	2.69	22.50	0.112	16.00	4.06	22.00
F009	0.22	18.00	2.5	7.00	0.11	12.00	3.5 VL	2.00
F010	0.19	2.50	2.32 VL	3.00	0.09	2.00	3.61 VL	3.00
F014	0.25	30.00	2.61	15.50	0.27 EH	29.00	4.64 EH	32.00
F015	0.2	7.50	2.6	12.50	0.1	6.00	4.	18.00
F017	0.22	18.00	2.658	18.00	0.117	18.00	3.858	11.00
F020	0.21	11.50	2.64	17.00	0.10	6.00	3.67 L	5.00
F022	0.22	18.00	2.66	19.00	0.12	22.50	4.1	25.50
F025	0.214	13.00	2.770 H	29.00	0.113	17.00	3.897	14.00
F026	0.215	14.00	2.513	8.00	0.127	27.50	3.891	13.00
F032	0.234	28.00	2.71	25.50	0.120	22.50	4.16 H	27.00
F036	0.225	25.00	2.69	22.50	0.110	12.00	4.10	25.50
F037	0.1449 EL	1.00	2.084 EL	2.00	<0.1	0.00	3.137 EL	1.00
F038	0.2	7.50	2.4 VL	5.00	0.1	6.00	3.71 L	7.00
F042	0.22	18.00	2.58	11.00	0.12	22.50	3.81	10.00
F053	0.221	22.00	2.578	10.00	0.108	9.00	3.867	12.00
F060	0.236	29.00	2.84 VH	30.00	0.127	27.50	4.41 VH	30.00
F068	0.196	4.00	2.605	14.00	0.095	3.00	3.918	16.00
F069	0.224	23.50	2.686	21.00	0.121	26.00	4.0677	23.00
F071	0.232	26.50	2.360 VL	4.00	0.120	22.50	3.790	9.00
F072	0.20	7.50	2.70	24.00	0.12	22.50	4.01	19.50
F073	0.664 EH	31.00	3.228 EH	32.00	0.027 EL	1.00	4.43 VH	31.00
F074	0.20	7.50	2.46 L	6.00	0.11	12.00	3.74	8.00
F094	0.22	18.00	2.71	25.50	0.11	12.00	4.05	21.00
F107	0.224	23.50	2.576	9.00	0.111	15.00	3.697 L	6.00
F110	0.22	18.00	2.61	15.50	0.12	22.50	3.94	17.00
F112	0.21	11.50	2.72	27.50	0.11	12.00	4.21 H	28.00
F129	0.232	26.50	2.993 VH	31.00	0.118	19.00	4.375 VH	29.00
F133	0.20	7.50	2.60	12.50	0.10	6.00	3.90	15.00
F139	<0.1 EL	0.00	2.04 EL	1.00	<0.1	0.00	3.66 L	4.00
MEDIAN	0.2200		2.6250		0.1110		3.9290	
1CRIT	0.0448		0.1410		0.0404		0.1932	
N	29		30		27		30	
MEAN	0.2153		2.6088		0.1114		3.9510	
3STDEV	0.0435		0.4964		0.0289		0.6844	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	66.00	13.200	5	EL				11103
F003	119.50	11.950	10					ICP-OES
F007	159.00	15.900	10					CPQ116E0
F009	71.50	11.917	6	VL				ICP-MS
F010	28.50	2.850	10	VL VL	BIASED LOW	-8.80	-0.0134	ICP-OES
F014	265.50	26.550	10	VHEHEHEHEHEH EHEH	BIASED HIGH	11.26	0.0380	ICP-MS
F015	46.00	9.200	5	EL				ICP
F017	154.00	15.400	10					AAF
F020	115.00	11.500	10	L				IC
F022	165.50	16.550	10					AAS
F025	130.00	13.000	10	H				LL IC
F026	164.50	16.450	10					FLAME AA
F032	224.00	22.400	10	H				AAS
F036	187.50	18.750	10					AAS
F037	29.00	7.250	4	EL ELEL EL	INSUFFICIENT DATA			ICP-MS
F038	59.50	5.950	10	VL L	BIASED LOW	-6.25	-0.0083	FAES
F042	183.00	18.300	10					Flame AA, Air
F053	128.00	12.800	10					Atomic Absorption
F060	237.00	23.700	10	VH VH	BIASED HIGH	11.19	-0.0066	ICP
F068	64.00	7.111	9		BIASED LOW*	0.02	-0.0154	IC, Dionex
F069	171.50	24.500	7	EH	BIASED HIGH*	2.44	0.0234	ICP
F071	213.00	21.300	10	VL				Flame-AA
F072	128.00	12.800	10					Flame emission
F073	178.00	17.800	10	EHELELEHELEHEHEHELVH				IC-Dionex
F074	113.50	11.350	10	L				AAS
F094	210.00	21.000	10					IC
F107	167.50	16.750	10	L				SEAP
F110	184.50	18.450	10					Flame-AAS
F112	129.00	12.900	10	H				AA2380 FLAME
F129	144.50	14.450	10	VH VH				DIONEX IC
F133	53.50	5.944	9	EL	BIASED LOW*	-0.11	-0.0236	ICP-MS
F139	5.00	2.500	2	EL ELEL L	INSUFFICIENT DATA			ICP-OES

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 14.965

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F139	5.00	2.500	2	ELELELL	INSUFFICIENT DATA			ICP-OES
F010	28.50	2.850	10	VLVL	BIASED LOW	-8.80	-0.0134	ICP-OES
F133	53.50	5.944	9	EL	BIASED LOW*	-0.11	-0.0236	ICP-MS
F038	59.50	5.950	10	VLL	BIASED LOW	-6.25	-0.0083	FAES
F068	64.00	7.111	9		BIASED LOW*	0.02	-0.0154	IC, Dionex
F037	29.00	7.250	4	ELELELEL	INSUFFICIENT DATA			ICP-MS
F015	46.00	9.200	5	EL				ICP
F074	113.50	11.350	10	L				AAS
F020	115.00	11.500	10	L				IC
F009	71.50	11.917	6	VL				ICP-MS
F003	119.50	11.950	10					ICP-OES
F053	128.00	12.800	10					Atomic Absorption
F072	128.00	12.800	10					Flame emission
F112	129.00	12.900	10	H				AA2380 FLAME
F025	130.00	13.000	10	H				LL IC
F002	66.00	13.200	5	EL				11103
F129	144.50	14.450	10	VHVH				DIONEX IC
F017	154.00	15.400	10					AAF
F007	159.00	15.900	10					CPQ116E0
F026	164.50	16.450	10					FLAME AA
F022	165.50	16.550	10					AAS
F107	167.50	16.750	10	L				SEAP
F073	178.00	17.800	10	EHELELEHELEHEHEHELVH				IC-Dionex
F042	183.00	18.300	10					Flame AA, Air
F110	184.50	18.450	10					Flame-AAS
F036	187.50	18.750	10					AAS
F094	210.00	21.000	10					IC
F071	213.00	21.300	10	VL				Flame-AA
F032	224.00	22.400	10	H				AAS
F060	237.00	23.700	10	VHVH	BIASED HIGH	11.19	-0.0066	ICP
F069	171.50	24.500	7	EH	BIASED HIGH*	2.44	0.0234	ICP
F014	265.50	26.550	10	VHEHEHEHEHEHEHEH	BIASED HIGH	11.26	0.0380	ICP-MS

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 14.965

PARAMETER: 19091 Potassium mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.1000 BASIC ACCEPTABLE ERROR= 0.0300 CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.07 EH	22.50	<0.05	0.00	0.09 EH	26.00	0.06 EH	26.50	0.14 EH	27.00	0.05	24.00
F003	0.02	12.50	0.04	19.00	0.02	5.50	0.02	3.00	0.02	3.00	0.02	4.00
F007	<0.020	0.00	0.027	3.00	0.020	5.50	0.022	5.00	0.023	6.00	0.021	7.50
F009	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00
F010	0.01	3.00	0.03	7.00	0.02	5.50	0.02	3.00	0.02	3.00	0.02	4.00
F014	0.07 EH	22.50	0.06	25.00	0.05	25.00	0.06 EH	26.50	0.06	25.50	0.06 H	27.00
F015	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00
F017	0.019	10.00	0.036	14.50	0.028	17.50	0.03	14.50	0.031	17.50	0.03	18.00
F020	0.02	12.50	0.03	7.00	0.03	20.50	0.03	14.50	0.03	12.50	0.03	18.00
F022	0.02	12.50	0.03	7.00	0.02	5.50	0.03	14.50	0.03	12.50	0.02	4.00
F025	0.015	6.00	0.034	11.00	0.023	11.00	0.025	7.00	0.028	7.00	0.024	9.00
F026	0.021	15.50	0.036	14.50	0.028	17.50	0.029	10.00	0.032	19.50	0.032	21.50
F032	0.016	7.50	0.032	10.00	0.024	12.00	0.028	8.50	0.030	12.50	0.028	14.00
F036	<0.015	0.00	0.035	12.50	0.025	13.50	0.030	14.50	0.030	12.50	0.025	10.50
F037	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00
F038	0.01	3.00	0.03	7.00	0.02	5.50	0.03	14.50	0.03	12.50	0.02	4.00
F042	0.02	12.50	0.04	19.00	0.02	5.50	0.03	14.50	0.03	12.50	0.03	18.00
F053	0.016	7.50	0.035	12.50	0.026	15.50	0.028	8.50	0.03	12.50	0.027	12.50
F060	0.0653 EH	21.00	0.0712 H	26.00	<0.04	0.00	<0.04	0.00	<0.04	0.00	<0.04	0.00
F068		0.00	0.028	4.00	0.021	10.00	0.023	6.00	0.021	5.00	0.021	7.50
F069	0.018	9.00	0.040	19.00	0.025	13.50	0.032	19.00	0.030	12.50	0.025	10.50
F071	0.035	20.00	0.396 EH	27.00	0.045	24.00	0.058	25.00	0.041	23.00	0.058	26.00
F072	0.01	3.00	0.04	19.00	0.02	5.50	0.03	14.50	0.04	22.00	0.03	18.00
F073	0.01	3.00	0.02	1.00	0.01	1.00	0.01	1.00	0.01	1.00	0.01	1.00
F074	0.03	19.00	0.04	19.00	0.04	23.00	0.05	23.50	0.06	25.50	0.05	24.00
F094	0.023	17.50	0.059	24.00	0.026	15.50	0.03	14.50	0.029	8.00	0.027	12.50
F107	0.023	17.50	0.041	22.00	0.030	20.50	0.035	20.00	0.037	21.00	0.032	21.50
F110	0.021	15.50	0.039	16.00	0.031	22.00	0.036	21.50	0.031	17.50	0.03	18.00
F112	0.01	3.00	0.03	7.00	0.02	5.50	0.02	3.00	0.02	3.00	0.02	4.00
F129	<0.018	0.00	0.022	2.00	0.029	19.00	0.036	21.50	0.032	19.50	0.029	15.00
F133	<0.05	0.00	0.05	23.00	<0.05	0.00	0.05	23.50	0.05	24.00	0.05	24.00
F139	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00
MEDIAN	0.0200		0.0360		0.0250		0.0300		0.0300		0.0280	
1CRIT	0.0300		0.0300		0.0300		0.0300		0.0300		0.0300	
N	21		25		24		24		25		25	
MEAN	0.0206		0.0382		0.0267		0.0313		0.0326		0.0300	
3STDEV	0.0356		0.0333		0.0239		0.0280		0.0314		0.0315	

PARAMETER: 19091 Potassium mg/L

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.07	24.50	0.22	9.50	0.14	4.50	0.37	12.00
F003	0.06	16.50	0.24	24.00	0.18	26.00	0.40	25.00
F007	0.058	12.50	0.245	27.00	0.180	26.00	0.415	30.00
F009	<0.1	0.00	0.22	9.50	0.16	10.50	0.33 L	5.00
F010	0.05	7.00	0.19 L	4.00	0.14	4.50	0.34	7.00
F014	0.10 EH	28.00	0.23	16.50	0.18	26.00	0.40	25.00
F015	<0.1	0.00	0.2	5.50	0.1 EL	1.00	0.3 VL	4.00
F017	0.063	20.00	0.246	28.00	0.182	29.50	0.393	21.00
F020	0.06	16.50	0.21	7.00	0.15	6.50	0.34	7.00
F022	0.08	26.00	0.25	30.50	0.19	31.00	0.42	31.00
F025	0.054	11.00	0.219	8.00	0.165	15.00	0.374	13.00
F026	0.059	14.00	0.227	14.00	0.171	18.00	0.376	14.00
F032	0.060	16.50	0.240	24.00	0.182	29.50	0.400	25.00
F036	0.065	22.00	0.235	22.00	0.175	20.50	0.395	22.00
F037	<0.05	0.00	0.1562 VL	3.00	0.1101 EL	2.00	0.2843 VL	2.00
F038	0.05	7.00	0.23	16.50	0.17	16.50	0.38	15.50
F042	0.06	16.50	0.23	16.50	0.17	16.50	0.38	15.50
F053	0.064	21.00	0.232	19.00	0.178	22.00	0.387	19.00
F060	0.0978 EH	27.00	0.3023 VH	32.00	0.2331 EH	32.00	0.541 EH	32.00
F068	0.048	3.50	0.234	21.00	0.162	13.00	0.381	17.00
F069	0.058	12.50	0.226	12.50	0.174	19.00	0.391	20.00
F071	0.047	2.00	0.093 EL	2.00	0.161	12.00	0.194 EL	1.00
F072	0.05	7.00	0.24	24.00	0.16	10.50	0.41	29.00
F073	0.01 EL	1.00	0.243	26.00	0.175	20.50	0.353	9.00
F074	0.07	24.50	0.25	30.50	0.18	26.00	0.40	25.00
F094	0.053	10.00	0.224	11.00	0.163	14.00	0.367	11.00
F107	0.062	19.00	0.226	12.50	0.158	9.00	0.364	10.00
F110	0.067	23.00	0.233	20.00	0.179	23.00	0.384	18.00
F112	0.05	7.00	0.20	5.50	0.15	6.50	0.34	7.00
F129	0.048	3.50	0.247	29.00	0.156	8.00	0.403	28.00
F133	0.05	7.00	0.23	16.50	0.18	26.00	0.40	25.00
F139	<0.01 EL	0.00	0.046 EL	1.00	0.129 L	3.00	0.290 VL	3.00
MEDIAN	0.0595		0.2300		0.1700		0.3805	
1CRIT	0.0300		0.0365		0.0335		0.0440	
N	26		30		30		30	
MEAN	0.0598		0.2222		0.1650		0.3722	
3STDEV	0.0332		0.0928		0.0528		0.1058	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	176.50	19.611	9	EH EHEHEH				19103
F003	138.50	13.850	10					ICP-OES
F007	122.50	13.611	9					CPQ107E2
F009	25.00	8.333	3	L	INSUFFICIENT DATA			ICP-MS
F010	48.00	4.800	10	L	BIASED LOW	-10.95	-0.0059	ICP-OES
F014	247.00	24.700	10	EH EH H EH	BIASED HIGH	-7.22	0.0334	ICP-MS
F015	10.50	3.500	3	ELVL	INSUFFICIENT DATA			ICP
F017	190.50	19.050	10					AAF
F020	122.00	12.200	10					IC
F022	174.50	17.450	10					AAS
F025	98.00	9.800	10					LL IC
F026	158.50	15.850	10					FLAME AA
F032	159.50	15.950	10					AAS
F036	150.00	16.667	9					AAS
F037	7.00	2.333	3	VLELVL	INSUFFICIENT DATA			ICP-MS
F038	102.00	10.200	10					FAES
F042	147.00	14.700	10					
F053	150.00	15.000	10					Atomic Absorption
F060	170.00	28.333	6	EHH EHVHEHEH	BIASED HIGH	31.58	0.0220	ICP
F068	87.00	9.667	9					IC, Dionex
F069	147.50	14.750	10					Potassium FAA
F071	162.00	16.200	10	EH EL EL				Flame-AA
F072	152.50	15.250	10					Flame emission
F073	64.50	6.450	10	EL	BIASED LOW*	2.64	-0.0185	
F074	240.00	24.000	10		BIASED HIGH*	0.70	0.0154	AAS
F094	138.00	13.800	10					IC
F107	173.00	17.300	10					SEAP
F110	194.50	19.450	10					Flame-AAS
F112	51.50	5.150	10		BIASED LOW	-9.46	-0.0054	AA2380 FLAME
F129	145.50	16.167	9					DIONEX IC
F133	169.00	21.125	8					ICP-MS
F139	7.00	2.333	3	ELELL VL	INSUFFICIENT DATA			ICP-OES

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 14.694

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F037	7.00	2.333	3	VLELVL	INSUFFICIENT DATA			ICP-MS
F139	7.00	2.333	3	ELELLVL	INSUFFICIENT DATA			ICP-OES
F015	10.50	3.500	3	ELVL	INSUFFICIENT DATA			ICP
F010	48.00	4.800	10	L	BIASED LOW	-10.95	-0.0059	ICP-OES
F112	51.50	5.150	10		BIASED LOW	-9.46	-0.0054	AA2380 FLAME
F073	64.50	6.450	10	EL	BIASED LOW*	2.64	-0.0185	
F009	25.00	8.333	3	L	INSUFFICIENT DATA			ICP-MS
F068	87.00	9.667	9					IC, Dionex
F025	98.00	9.800	10					LL IC
F038	102.00	10.200	10					FAES
F020	122.00	12.200	10					IC
F007	122.50	13.611	9					CPQ107E2
F094	138.00	13.800	10					IC
F003	138.50	13.850	10					ICP-OES
F042	147.00	14.700	10					
F069	147.50	14.750	10					Potassium FAA
F053	150.00	15.000	10					Atomic Absorption
F072	152.50	15.250	10					Flame emission
F026	158.50	15.850	10					FLAME AA
F032	159.50	15.950	10					AAS
F129	145.50	16.167	9					DIONEX IC
F071	162.00	16.200	10	EHELEL				Flame-AA
F036	150.00	16.667	9					AAS
F107	173.00	17.300	10					SEAP
F022	174.50	17.450	10					AAS
F017	190.50	19.050	10					AAF
F110	194.50	19.450	10					Flame-AAS
F002	176.50	19.611	9	EHEHEHEH				19103
F133	169.00	21.125	8					ICP-MS
F074	240.00	24.000	10		BIASED HIGH*	0.70	0.0154	AAS
F014	247.00	24.700	10	EHEHHEH	BIASED HIGH	-7.22	0.0334	ICP-MS
F060	170.00	28.333	6	EHHEHVHEHEH	BIASED HIGH	31.58	0.0220	ICP

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 14.694

Potassium

PARAMETER: 14092 Reactive Silica mg/L Si

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0250 BASIC ACCEPTABLE ERROR= 0.0250 CONCENTRATION ERROR INCREMENT= 0.0600

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.047	10.00	0.037	9.00	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00
F003	0.019	5.00	0.028	7.00	0.009	4.00	0.014	6.00	0.009	5.00	0.014	5.50
F010	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00
F015	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00
F020	0.05	11.50	0.067 EH	13.00	<0.05	0.00	0.048 H	11.00	0.040 H	10.00	0.054 EH	11.00
F022	0.018	4.00	0.025	6.00	0.013	6.00	0.013	5.00	0.006	3.50	0.014	5.50
F025	0.05	11.50	0.04	10.00	0.09 EH	10.00	0.06 VH	12.00	<0.02	0.00	<0.02	0.00
F026	0.0244	6.00	0.0306	8.00	0.0157	7.00	0.0190	8.00	0.0136	7.00	0.0212	8.00
F032	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00
F037	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00
F042	0.01W	0.00	0.00W	1.00	0.00W	0.00	0.00W	1.00	0.00W	0.00	0.00W	1.00
F060	0.0268	7.00	0.0247	5.00	0.0116	5.00	0.0178	7.00	0.0112	6.00	0.0176	7.00
F069	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00
F071	0.009	2.00	0.020	4.00	0.001	2.00	0.001	2.00	0.002	2.00	0.006	2.50
F072	0.037	8.00	0.047	12.00	0.028	8.00	0.033	9.00	0.028	8.00	0.033	9.00
F074	0.014	3.00	0.018	3.00	0.006	3.00	0.008	4.00	0.006	3.50	0.008	4.00
F094	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00
F107	0.038	9.00	0.043	11.00	0.041 H	9.00	0.042 H	10.00	0.029	9.00	0.039	10.00
F109	<0.04	0.00	<0.04	0.00	<0.04	0.00	<0.04	0.00	<0.04	0.00	<0.04	0.00
F112		0.00		0.00		0.00		0.00		0.00		0.00
F113	0.008	1.00	0.014	2.00	0.0	1.00	0.002	3.00	0.0	1.00	0.006	2.50
F133	<0.10	0.00	<0.10	0.00	<0.10	0.00	<0.10	0.00	<0.10	0.00	<0.10	0.00
MEDIAN	0.0256		0.0280		0.0123		0.0159		0.0101		0.0140	
1CRIT	0.0250		0.0252		0.0250		0.0250		0.0250		0.0250	
N	9		11		8		10		8		9	
MEAN	0.0259		0.0298		0.0157		0.0198		0.0131		0.0176	
3STDEV	0.0354		0.0309		0.0363		0.0461		0.0285		0.0331	

PARAMETER: 14092 Reactive Silica mg/L Si

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.033	9.50	0.168	10.00	0.210	7.50	1.080	7.00
F003	0.023	5.50	0.173	14.50	0.210	7.50	1.05	4.00
F010	<0.02	0.00	0.12 L	3.00	0.19	4.00	1.13	15.00
F015	<0.05	0.00	0.18	17.00	0.22	14.50	1.11	12.00
F020	0.065 EH	12.00	0.203	20.00	0.550 EH	22.00	1.13	15.00
F022	0.023	5.50	0.169	11.00	0.215	12.00	1.075	5.00
F025	<0.02	0.00	0.24 EH	22.00	0.18	3.00	0.97 VL	2.00
F026	0.0329	8.00	0.1786	16.00	0.2249	17.00	1.1315	17.00
F032	<0.02	0.00	0.16	6.00	0.22	14.50	1.08	7.00
F037	<0.05	0.00	0.1147 VL	2.00	0.1573 VL	1.00	0.8425 EL	1.00
F042	0.00W	1.00	0.15	5.00	0.20	5.50	1.10	9.00
F060	0.0254	7.00	0.187	18.00	0.238	18.00	1.17	18.00
F069	<0.1	0.00	0.173	14.50	0.216	13.00	1.080	7.00
F071	0.011	2.00	0.163	8.00	0.214	10.00	1.171	19.00
F072	0.033	9.50	0.17	12.50	0.24	19.00	0.98 L	3.00
F074	0.019	4.00	0.162	7.00	0.214	10.00	1.130	15.00
F094	<0.05	0.00	0.21 H	21.00	0.25	20.50	1.34 EH	22.00
F107	0.041	11.00	0.188	19.00	0.224	16.00	1.107	10.00
F109	<0.04	0.00	0.14	4.00	0.20	5.50	1.12	13.00
F112		0.00	0.17	12.50	0.25	20.50	1.29 VH	21.00
F113	0.015	3.00	0.164	9.00	0.214	10.00	1.108	11.00
F133	<0.10	0.00	0.11 VL	1.00	0.16 L	2.00	1.18	20.00
MEDIAN	0.0242		0.1695		0.2145		1.1090	
1CRIT	0.0250		0.0337		0.0364		0.0900	
N	10		20		20		20	
MEAN	0.0256		0.1672		0.2145		1.1096	
3STDEV	0.0265		0.0686		0.0644		0.2018	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	53.00	8.833	6					14109 SiO2
F003	64.00	6.400	10					ColHeteropolyBlue
F010	22.00	7.333	3	L	INSUFFICIENT DATA			Colorimetry
F015	43.50	14.500	3		INSUFFICIENT DATA			ICP
F020	125.50	13.944	9	EH H H EHEH EH	BIASED HIGH*	-0.17	0.0665	Ascorbic Acid Rad
F022	63.50	6.350	10					Colorimetry
F025	70.50	10.071	7	EHVH EH VL				ICP
F026	102.00	10.200	10					AUTOANALYSER
F032	27.50	9.167	3		INSUFFICIENT DATA			Colourimetry
F037	4.00	1.333	3	VLVLEL	INSUFFICIENT DATA			ICP-MS
F042	23.50	3.357	7		BIASED LOW*	1.04	-0.0202	Colorimetric
F060	98.00	9.800	10					ICP
F069	34.50	11.500	3		INSUFFICIENT DATA			Colorimetric
F071	53.50	5.350	10		BIASED LOW	6.71	-0.0134	Colorimetric
F072	98.00	9.800	10	L				Heteropoly Blue
F074	56.50	5.650	10					Colour FIA
F094	63.50	21.167	3	H EH	INSUFFICIENT DATA			Colorimetry
F107	114.00	11.400	10	H H				Colorimetrie
F109	22.50	7.500	3		INSUFFICIENT DATA			FIA molybdate
F112	54.00	18.000	3	VH	INSUFFICIENT DATA			TECHNICON
F113	43.50	4.350	10		BIASED LOW*	1.07	-0.0109	FIA, Lachat 8000
F133	23.00	7.667	3	VLL	INSUFFICIENT DATA			COLORIMETRIC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE RANK IS 8.630

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F037	4.00	1.333	3	VLVLEL	INSUFFICIENT DATA			ICP-MS
F042	23.50	3.357	7		BIASED LOW*	1.04	-0.0202	Colorimetric
F113	43.50	4.350	10		BIASED LOW*	1.07	-0.0109	FIA, Lachat 8000
F071	53.50	5.350	10		BIASED LOW	6.71	-0.0134	Colorimetric
F074	56.50	5.650	10					Colour FIA
F022	63.50	6.350	10					Colorimetry
F003	64.00	6.400	10					ColHeteropolyBlue
F010	22.00	7.333	3	L	INSUFFICIENT DATA			Colorimetry
F109	22.50	7.500	3		INSUFFICIENT DATA			FIA molybdate
F133	23.00	7.667	3	VLL	INSUFFICIENT DATA			COLORIMETRIC
F002	53.00	8.833	6					14109 SiO2
F032	27.50	9.167	3		INSUFFICIENT DATA			Colourimetry
F072	98.00	9.800	10	L				Heteropoly Blue
F060	98.00	9.800	10					ICP
F025	70.50	10.071	7	EHVHEHVL				ICP
F026	102.00	10.200	10					AUTOANALYSER
F107	114.00	11.400	10	HH				Colorimetrie
F069	34.50	11.500	3		INSUFFICIENT DATA			Colorimetric
F020	125.50	13.944	9	EHHHEHEHEH	BIASED HIGH*	-0.17	0.0665	Ascorbic Acid Rad
F015	43.50	14.500	3		INSUFFICIENT DATA			ICP
F112	54.00	18.000	3	VH	INSUFFICIENT DATA			TECHNICON
F094	63.50	21.167	3	HEH	INSUFFICIENT DATA			Colorimetry

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE RANK IS 8.630

PARAMETER: 16000 Sulfate IC mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.2500 BASIC ACCEPTABLE ERROR= 0.0500 CONCENTRATION ERROR INCREMENT= 0.0350

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	1.30	12.50	1.76	9.50	1.56	12.00	1.63	17.50	9.02	17.00	1.95	26.00
F009	1.3	12.50	1.9	25.00	1.9 EH	31.00	1.8 VH	29.00	10. VH	31.00	2.1 VH	31.00
F010	1.3	12.50	1.8	13.50	1.5	5.00	1.5 L	3.00	8.9	13.00	1.7 L	2.00
F014	1.45 VH	28.00	1.86	23.00	1.67	26.00	1.56	7.00	9.24	23.00	1.87	18.50
F015	1.2 L	3.00	1.7 L	4.00	1.6	17.50	1.6	13.50	9.2	22.00	1.9	22.00
F017	1.363	21.00	1.848	19.00	1.6	17.50	1.649	20.00	9.289	25.00	1.857	16.00
F020	1.13 VL	1.00	1.66 L	2.00	1.35 VL	1.00	1.42 VL	1.00	9.47 H	29.00	1.81	9.00
F022	1.18 L	2.00	1.63 VL	1.00	1.42 VL	2.00	1.48 L	2.00	9.37 H	27.50	1.64 VL	1.00
F025	1.260	7.00	1.755	8.00	1.554	10.00	1.584	9.00	9.027	18.00	1.844	12.00
F026	1.2684	8.00	1.7786	11.00	1.5349	6.00	1.5819	8.00	8.9244	14.00	1.7873	5.00
F032	1.30	12.50	1.85	21.00	1.55	9.00	1.60	13.50	8.51 L	4.00	1.80	6.50
F036	1.35	19.50	1.85	21.00	1.65	23.50	1.65	21.50	8.45 VL	3.00	1.85	14.50
F037	1.4201 H	27.00	1.9885 VH	29.00	1.6280	20.00	1.5936	11.00	8.5323 L	5.00	2.0972 VH	30.00
F042	1.35	19.50	1.89	24.00	1.63	21.50	1.68	24.00	8.70	8.00	1.87	18.50
F053	1.31	16.00	1.81	16.00	1.56	12.00	1.6	13.50	8.75	9.00	1.82	10.00
F060	1.38	22.00	1.92 H	27.00	1.71 H	28.00	1.77 VH	28.00	9.33	26.00	1.98 H	27.50
F069	1.40 H	24.50	1.93 H	28.00	1.65	23.50	1.71 H	26.00	9.06	20.00	1.89	20.50
F071	1.407 H	26.00	1.906	26.00	1.630	21.50	1.712 H	27.00	9.614 VH	30.00	1.912	23.00
F072	1.39	23.00	1.80	13.50	1.59	16.00	1.63	17.50	8.69	7.00	1.80	6.50
F073	1.594 VH	31.00	2.013 VH	31.00	1.799 VH	30.00	1.84 VH	31.00	8.877	12.00	2.018 VH	29.00
F074	1.50 VH	29.00	1.84	18.00	1.68	27.00	1.70	25.00	7.45 EL	1.00	1.89	20.50
F094	1.25	6.00	1.73	6.00	1.49 L	4.00	1.54	5.00	7.96 VL	2.00	1.75 L	4.00
F107	1.333	18.00	1.825	17.00	1.561	14.00	1.612	16.00	8.933	15.00	1.847	13.00
F109	1.325	17.00	1.808	15.00	1.544	8.00	1.633	19.00	9.049	19.00	1.831	11.00
F110	1.22 L	4.00	1.68 L	3.00	1.58	15.00	1.6	13.50	9.37 H	27.50	1.86	17.00
F112	1.30	12.50	1.78	12.00	1.56	12.00	1.59	10.00	9.12	21.00	1.85	14.50
F113	1.239	5.00	1.706	5.00	1.476 L	3.00	1.518	4.00	8.768	11.00	1.708 L	3.00
F118	1.40 H	24.50	1.75	7.00	1.66	25.00	1.66	23.00	8.99	16.00	1.94	25.00
F129	1.275	9.00	1.760	9.50	1.540	7.00	1.548	6.00	8.755	10.00	1.803	8.00
F133	1.30	12.50	1.85	21.00	1.62	19.00	1.65	21.50	9.25	24.00	1.92	24.00
F139	1.59 VH	30.00	1.99 VH	30.00	1.79 VH	29.00	1.82 VH	30.00	8.56 L	6.00	1.98 H	27.50
MEDIAN	1.3100		1.8100		1.5900		1.6120		8.9900		1.8570	
1CRIT	0.0871		0.1046		0.0969		0.0977		0.3559		0.1062	
N	29		29		29		29		29		29	
MEAN	1.3331		1.8181		1.5978		1.6276		8.9555		1.8667	
3STDEV	0.2649		0.2522		0.2509		0.2428		1.0602		0.2585	

PARAMETER: 16000 Sulfate IC mg/L

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	2.71	17.50	3.65	8.00	1.74 L	6.00	1.87	6.00
F009	2.6	8.50	4. VH	30.00	1.8	9.50	1.9	7.50
F010	2.6	8.50	3.7	15.50	1.8	9.50	1.9	7.50
F014	2.55 L	5.00	3.69	14.00	2.15 VH	31.00	2.18 VH	30.00
F015	2.5 L	3.00	3.6	4.00	1.7 VL	5.00	1.8 VL	3.00
F017	2.674	15.00	3.686	13.00	1.887	17.00	1.972	15.00
F020	2.49 L	2.00	3.73	19.50	1.67 VL	3.00	1.77 VL	1.00
F022	2.44 VL	1.00	3.41 VL	1.00	1.68 VL	4.00	1.78 VL	2.00
F025	2.673	14.00	3.661	10.00	1.843	12.00	1.938	12.00
F026	2.7517	24.00	3.6567	9.00	1.8486	13.00	1.9071	9.00
F032	2.75	22.50	3.70	15.50	1.90	19.50	2.00	18.00
F036	2.80	26.00	3.75	23.50	1.95	24.00	2.05	23.00
F037	2.6648	13.00	3.7148	18.00	1.8632	15.00	2.0265	22.00
F042	2.81	28.00	3.82	26.00	2.00 H	25.00	2.09	26.00
F053	2.73	21.00	3.75	23.50	1.89	18.00	1.98	16.00
F060	2.82	29.00	3.93 H	28.00	2.01 H	27.00	2.07	25.00
F069	2.85 H	30.00	3.78	25.00	2.04 H	28.00	2.06	24.00
F071	2.873 H	31.00	3.937 H	29.00	2.005 H	26.00	2.130 H	27.00
F072	2.62	10.00	3.57	3.00	1.88	16.00	1.97	14.00
F073	2.808	27.00	3.741	22.00	2.089 VH	30.00	2.161 VH	29.00
F074	2.71	17.50	3.63	6.50	1.92	22.00	2.46 EH	31.00
F094	2.59	7.00	3.56	2.00	1.78	7.00	1.85 L	5.00
F107	2.692	16.00	3.714	17.00	1.910	21.00	1.991	17.00
F109	2.718	19.00	3.739	21.00	0.931 EL	1.00	2.009	19.00
F110	2.51 L	4.00	3.68	12.00	1.65 VL	2.00	1.83 L	4.00
F112	2.64	11.00	3.73	19.50	1.86	14.00	1.95	13.00
F113	2.587	6.00	3.614	5.00	1.785	8.00	1.912	10.00
F118	2.77	25.00	3.67	11.00	1.90	19.50	2.02	21.00
F129	2.652	12.00	4.465 EH	31.00	1.824	11.00	1.926	11.00
F133	2.72	20.00	3.84	27.00	1.93	23.00	2.01	20.00
F139	2.75	22.50	3.63	6.50	2.06 VH	29.00	2.14 H	28.00
MEDIAN	2.6920		3.7000		1.8800		1.9800	
1CRIT	0.1355		0.1708		0.1071		0.1106	
N	29		29		29		29	
MEAN	2.6807		3.7198		1.8695		1.9801	
3STDEV	0.2931		0.3101		0.3449		0.3106	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	132.00	13.200	10	L				16309
F009	215.00	21.500	10	EHVHVHVH VH				Dionex
F010	90.00	9.000	10	L L				IC
F014	205.50	20.550	10	VH L VHVH				
F015	97.00	9.700	10	L L L VLVL				ICA, V1.2
F017	178.50	17.850	10					I.C.
F020	68.50	6.850	10	VLL VLVLH L VLVL	BIASED LOW	9.06	-0.3405	IC
F022	43.50	4.350	10	L VLVLL H VLVLVLVLVL	BIASED LOW	6.99	-0.3307	IC
F025	112.00	11.200	10					Ion Chromatography
F026	107.00	10.700	10					DIONEX I.C.
F032	142.00	14.200	10	L				Ion Chromatography
F036	199.50	19.950	10	VL				Ion Chromatography
F037	190.00	19.000	10	H VH L VH				I.C. Waters
F042	220.50	22.050	10	H				IC
F053	155.00	15.500	10					Ion Chromatography
F060	267.50	26.750	10	H H VH H H H	BIASED HIGH*	3.21	0.0618	IC
F069	249.50	24.950	10	H H H H H	BIASED HIGH*	-0.30	0.1031	IC
F071	266.50	26.650	10	H H VH H H H H	BIASED HIGH	7.27	-0.0288	IC
F072	126.50	12.650	10					IC
F073	272.00	27.200	10	VHVHVHVH VH VHVH	BIASED HIGH*	-4.68	0.2803	IC-Dionex
F074	197.50	19.750	10	VH EL EH				I.C.
F094	48.00	4.800	10	L VLL L	BIASED LOW	-12.46	0.1494	IC
F107	164.00	16.400	10					C.I.
F109	149.00	14.900	10	EL				Dionex
F110	102.00	10.200	10	L L H L VLL				Dionex
F112	139.50	13.950	10					DIONEX IC
F113	60.00	6.000	10	L L	BIASED LOW*	-1.60	-0.0669	IC, Dionex
F118	197.00	19.700	10	H				I.C.
F129	114.50	11.450	10	EH				DIONEX IC
F133	212.00	21.200	10					I.C.
F139	238.50	23.850	10	VHVHVHVHL H VHH				IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 16.000

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F022	43.50	4.350	10	LVLVLLHVLVLVLVLVL	BIASED LOW	6.99	-0.3307	IC
F094	48.00	4.800	10	LVLLL	BIASED LOW	-12.46	0.1494	IC
F113	60.00	6.000	10	LL	BIASED LOW*	-1.60	-0.0669	IC, Dionex
F020	68.50	6.850	10	VLLVLVLHLVLVL	BIASED LOW	9.06	-0.3405	IC
F010	90.00	9.000	10	LL				IC
F015	97.00	9.700	10	LLLVLVL				ICA, V1.2
F110	102.00	10.200	10	LLHLVLL				Dionex
F026	107.00	10.700	10					DIONEX I.C.
F025	112.00	11.200	10					Ion Chromatography
F129	114.50	11.450	10	EH				DIONEX IC
F072	126.50	12.650	10					IC
F002	132.00	13.200	10	L				16309
F112	139.50	13.950	10					DIONEX IC
F032	142.00	14.200	10	L				Ion Chromatography
F109	149.00	14.900	10	EL				Dionex
F053	155.00	15.500	10					Ion Chromatography
F107	164.00	16.400	10					C.I.
F017	178.50	17.850	10					I.C.
F037	190.00	19.000	10	HVHLVH				I.C. Waters
F118	197.00	19.700	10	H				I.C.
F074	197.50	19.750	10	VHELEH				I.C.
F036	199.50	19.950	10	VL				Ion Chromatography
F014	205.50	20.550	10	VHLVHVH				
F133	212.00	21.200	10					I.C.
F009	215.00	21.500	10	EHVHVHVHVH				Dionex
F042	220.50	22.050	10	H				IC
F139	238.50	23.850	10	VHVHVHVHLHVHH				IC
F069	249.50	24.950	10	HHHHH	BIASED HIGH*	-0.30	0.1031	IC
F071	266.50	26.650	10	HHVHHHHH	BIASED HIGH	7.27	-0.0288	IC
F060	267.50	26.750	10	HHVHHHH	BIASED HIGH*	3.21	0.0618	IC
F073	272.00	27.200	10	VHVHVHVHVHVHVH	BIASED HIGH*	-4.68	0.2803	IC-Dionex

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 16.000

Sulfate IC

PARAMETER: 16001 Sulfate Colour mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 0.3000 CONCENTRATION ERROR INCREMENT= 0.0800

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	1.4	5.50	1.9	5.50	1.7	7.00	1.7	6.50	8.5	4.00	1.8	5.00
F007	0.8 VL	1.00	1.2 VL	1.00	1.0 VL	1.00	1.1 L	1.00	8.1	2.00	1.4 L	1.00
F010	1.2	2.00	1.9	5.50	1.5	2.00	1.6	4.00	8.4	3.00	1.8	5.00
F026	1.215	3.00	1.695	2.00	1.51	3.00	1.53	2.00	8.54	5.00	1.69	2.00
F038	1.4	5.50	1.8	3.50	1.6	6.00	1.7	6.50	7.9	1.00	1.8	5.00
F060	1.31	4.00	1.80	3.50	1.52	4.00	1.56	3.00	8.60	6.00	1.77	3.00
F094	1.8 VH	7.00	2.17 H	7.00	1.59	5.00	1.65	5.00	8.89	7.00	2.15	7.00
MEDIAN	1.3100		1.8000		1.5200		1.6000		8.5000		1.8000	
1CRIT	0.3248		0.3640		0.3416		0.3480		0.9000		0.3640	
N	5		5		5		4		5		5	
MEAN	1.3050		1.8190		1.5440		1.5850		8.4280		1.7720	
3STDEV	-		-		-		-		-		-	

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	2.7	4.50	3.8	5.00	2.0	4.50		0.00
F007	2.3	1.00	3.4	1.00	1.5 L	1.00	2.4	3.50
F010	2.8	6.00	3.6	2.50	2.1	6.00	2.4	3.50
F026	2.695	3.00	3.90	7.00	1.805	2.00	4.02 EH	6.00
F038	2.7	4.50	3.6	2.50	2.	4.50	2.	1.00
F060	2.69	2.00	3.83	6.00	1.89	3.00	2.32	2.00
F094	3.15 H	7.00	3.76	4.00	2.14	7.00	2.44	5.00
MEDIAN	2.7000		3.7600		2.0000		2.4000	
1CRIT	0.4360		0.5208		0.3800		0.4120	
N	5		5		5		4	
MEAN	2.7170		3.7180		1.9590		2.3900	
3STDEV	-		-		-		-	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	47.50	5.278	9					Colorimetric, MTB
F007	13.50	1.350	10	VLVLVLL L L				CPQ100E2
F010	39.50	3.950	10					Calmagite
F026	35.00	3.500	10	EH				AUTOANALYSER
F038	40.00	4.000	10					ION CHROMATOGRAPHY
F060	36.50	3.650	10					ICP
F094	61.00	6.100	10	VHH H				ICP

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE RANK IS 3.957

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F007	13.50	1.350	10	VLVLVLLLL				CPQ100E2
F026	35.00	3.500	10	EH				AUTOANALYSER
F060	36.50	3.650	10					ICP
F010	39.50	3.950	10					Calmagite
F038	40.00	4.000	10					ION CHROMATOGRAPHY
F003	47.50	5.278	9					Colorimetric, MTB
F094	61.00	6.100	10	VHHH				ICP

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE RANK IS 3.957

Sulfate Colour

PARAMETER: 17000 Chloride IC mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.2000 BASIC ACCEPTABLE ERROR= 0.0750 CONCENTRATION ERROR INCREMENT= 0.0350

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.14	5.50	<0.10	0.00	0.18	6.00	0.14	14.00	0.30	12.00	<0.10	0.00
F009	0.17	20.50	0.12	18.50	0.18	6.00	0.14	14.00	0.25	2.50	0.14	19.00
F010	0.2	24.00	<0.1	0.00	0.2	18.50	0.1	1.00	0.3	12.00	0.1	3.50
F014	0.212	25.00	0.124	21.00	0.226	27.50	0.172	25.00	0.324	19.00	0.163	24.00
F015	<0.10	0.00	<0.10	0.00	0.13	1.00	<0.10	0.00	0.25	2.50	<0.10	0.00
F017	0.153	14.00	0.094	8.00	0.186	10.50	0.133	8.00	0.287	7.00	0.118	6.00
F020	0.14	5.50	0.12	18.50	0.19	13.50	0.14	14.00	0.26	4.00	0.12	10.50
F022	0.12	2.00	0.08	2.00	0.17	3.00	0.12	3.00	0.38	25.00	0.09	2.00
F025	0.144	8.00	0.095	9.50	0.183	8.50	0.137	10.00	0.304	15.00	0.108	5.00
F026	0.1548	15.00	0.1179	16.00	0.2011	21.00	0.1583	22.00	0.2943	8.00	0.1401	20.00
F032	0.17	20.50	0.12	18.50	0.20	18.50	0.15	20.50	0.32	17.50	0.13	17.00
F036	0.15	12.00	0.10	12.50	0.21	23.50	0.15	20.50	0.33	20.00	0.12	10.50
F037	0.2530 H	28.00	1.1741 EH	26.00	0.1964	16.00	0.1801	27.00	0.3608	23.00	0.1841	26.00
F042	0.15	12.00	0.09	5.00	0.20	18.50	0.14	14.00	0.36	22.00	0.12	10.50
F053	0.15	12.00	0.1	12.50	0.19	13.50	0.14	14.00	0.3	12.00	0.12	10.50
F060	0.17	20.50	0.12	18.50	0.21	23.50	0.16	23.00	0.38	25.00	0.16	22.50
F068	0.140	5.50	0.092	7.00	0.183	8.50	0.129	5.00	0.286	6.00	0.121	14.00
F069	0.148	9.00	<0.1	0.00	0.177	4.00	0.136	9.00	0.275	5.00	0.1	3.50
F071	0.155	16.00	0.089	3.00	0.186	10.50	0.128	4.00	0.296	9.00	0.119	7.00
F073	0.232 H	26.00	0.196 H	24.00	0.293 EH	29.00	0.223 EH	28.00	0.399 H	28.00	0.211 H	27.00
F074	0.36 EH	29.00	0.31 EH	25.00	0.37 EH	30.00	0.35 EH	29.00	0.53 EH	30.00	0.33 EH	28.00
F094	0.14	5.50	0.1	12.50	0.2	18.50	0.13	6.50	0.31	16.00	0.12	10.50
F107	0.136	3.00	0.110	15.00	0.214	25.00	0.146	18.00	0.401 H	29.00	0.143	21.00
F109	0.192	23.00	0.148	23.00	0.226	27.50	0.173	26.00	0.332	21.00	0.170	25.00
F110	0.16	17.50	0.09	5.00	0.18	6.00	0.14	14.00	0.3	12.00	0.12	10.50
F112	0.16	17.50	0.10	12.50	0.19	13.50	0.13	6.50	0.32	17.50	0.13	17.00
F113	0.117	1.00	0.070	1.00	0.147	2.00	0.105	2.00	0.247	1.00	0.089	1.00
F129	0.149	10.00	0.095	9.50	0.204	22.00	0.149	19.00	0.395 H	27.00	0.123	15.00
F133	0.17	20.50	0.09	5.00	0.19	13.50	0.14	14.00	0.30	12.00	0.13	17.00
F139	0.25 H	27.00	0.13	22.00	0.22	26.00	0.17	24.00	0.38	25.00	0.16	22.50
MEDIAN	0.1548		0.1000		0.1932		0.1400		0.3070		0.1220	
1CRIT	0.0750		0.0750		0.0750		0.0750		0.0787		0.0750	
N	27		24		28		27		28		26	
MEAN	0.1670		0.1180		0.1976		0.1466		0.3212		0.1331	
3STDEV	0.1017		0.1401		0.0749		0.0672		0.1317		0.0811	

PARAMETER: 17000 Chloride IC mg/L

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.40	10.00	4.07	11.00	0.20	14.00	6.13	14.00
F009	0.36	2.00	4.1	14.00	0.2	14.00	6.1	12.00
F010	0.4	10.00	4.0	5.00	0.2	14.00	5.9	5.00
F014	0.429	20.00	4.27	20.00	0.418 EH	30.00	7.19 VH	28.00
F015	0.43	21.50	4.3	21.00	0.19	5.00	6.4	23.00
F017	0.401	12.00	4.039	6.00	0.193	7.00	6.018	9.00
F020	0.39	5.50	4.84 VH	29.00	0.20	14.00	6.52 H	25.00
F022	0.37	3.00	4.35	22.00	0.16	2.00	6.14	16.00
F025	0.412	15.00	4.043	7.00	0.196	8.00	5.799 L	3.00
F026	0.3989	8.00	4.0517	8.00	0.2149	22.00	6.0517	11.00
F032	0.43	21.50	4.4 H	23.00	0.22	23.00	5.45 VL	1.00
F036	0.44	23.00	4.2	17.00	0.20	14.00	6.3	21.00
F037	0.4266	19.00	3.8104 VL	2.00	0.2531	27.00	5.9114	6.00
F042	0.48	26.00	4.44 H	25.00	0.25	26.00	6.71 VH	26.00
F053	0.42	16.50	4.12	15.00	0.2	14.00	6.13	14.00
F060	0.38	4.00	3.99	4.00	0.19	5.00	6.15	17.00
F068	0.392	7.00	4.088	13.00	0.187	3.00	6.265	20.00
F069	0.404	13.00	3.89 L	3.00	0.198	9.00	5.92	7.00
F071	0.423	18.00	4.684 VH	27.00	0.199	10.00	7.327 VH	29.00
F073	0.497 H	28.00	4.433 H	24.00	0.308 H	28.00	6.996 VH	27.00
F074	0.59 EH	29.00	3.78 VL	1.00	0.41 EH	29.00	5.75 L	2.00
F094	0.4	10.00	4.06	9.50	0.21	19.50	5.98	8.00
F107	0.481	27.00	4.754 VH	28.00	0.249	25.00	7.397 VH	30.00
F109	0.455	24.00	4.254	19.00	0.240	24.00	5.883	4.00
F110	0.41	14.00	4.65 VH	26.00	0.21	19.50	6.41	24.00
F112	0.42	16.50	4.20	17.00	0.21	19.50	6.13	14.00
F113	0.343	1.00	4.085	12.00	0.158	1.00	6.26	19.00
F129	0.457	25.00	4.980 VH	30.00	0.210	19.50	6.152	18.00
F133	0.39	5.50	4.06	9.50	0.19	5.00	6.04	10.00
F139		0.00	4.20	17.00	0.20	14.00	6.32	22.00
MEDIAN	0.4120		4.1600		0.2000		6.1350	
1CRIT	0.0824		0.2136		0.0750		0.2827	
N	27		28		28		28	
MEAN	0.4184		4.2279		0.2174		6.2458	
3STDEV	0.0987		0.7662		0.1386		1.1593	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	86.50	10.813	8					17209
F009	122.50	12.250	10					Dionex
F010	93.00	10.333	9					IC
F014	239.50	23.950	10	EHVH	BIASED HIGH	12.40	0.0126	
F015	74.00	12.333	6					ICA, V1.2
F017	87.50	8.750	10					I.C.
F020	139.50	13.950	10	VH H				IC
F022	80.00	8.000	10					IC
F025	89.00	8.900	10	L				Ion Chromatography
F026	151.00	15.100	10					DIONEX I.C.
F032	181.00	18.100	10	H VL				Colourimetry
F036	174.00	17.400	10					Ion Chromatography
F037	200.00	20.000	10	H EH VL				I.C. Waters
F042	185.00	18.500	10	H VH				IC
F053	134.00	13.400	10					Ion Chromatography
F060	163.00	16.300	10					IC
F068	89.00	8.900	10					IC, Dionex
F069	62.50	6.944	9	L	BIASED LOW*	-4.29	-0.0077	IC
F071	133.50	13.350	10	VH VH				IC
F073	269.00	26.900	10	H H EHEHH H H H H VH	BIASED HIGH	10.56	0.0605	IC-Dionex
F074	232.00	23.200	10	EHEHEHEHEHEHEHVLEHL	BIASED HIGH	-11.27	0.2200	I.C.
F094	116.50	11.650	10					IC
F107	221.00	22.100	10	H VH VH				C.I.
F109	216.50	21.650	10					Dionex
F110	148.50	14.850	10	VH				Dionex
F112	151.50	15.150	10					DIONEX IC
F113	41.00	4.100	10		BIASED LOW*	1.78	-0.0516	IC, Dionex
F129	195.00	19.500	10	H VH				DIONEX IC
F133	112.00	11.200	10					I.C.
F139	199.50	22.167	9	H				IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 15.076

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F113	41.00	4.100	10		BIASED LOW*	1.78	-0.0516	IC, Dionex
F069	62.50	6.944	9	L	BIASED LOW*	-4.29	-0.0077	IC
F022	80.00	8.000	10					IC
F017	87.50	8.750	10					I.C.
F025	89.00	8.900	10	L				Ion Chromatography
F068	89.00	8.900	10					IC, Dionex
F010	93.00	10.333	9					IC
F002	86.50	10.813	8					17209
F133	112.00	11.200	10					I.C.
F094	116.50	11.650	10					IC
F009	122.50	12.250	10					Dionex
F015	74.00	12.333	6					ICA, V1.2
F071	133.50	13.350	10	VHVH				IC
F053	134.00	13.400	10					Ion Chromatography
F020	139.50	13.950	10	VHH				IC
F110	148.50	14.850	10	VH				Dionex
F026	151.00	15.100	10					DIONEX I.C.
F112	151.50	15.150	10					DIONEX IC
F060	163.00	16.300	10					IC
F036	174.00	17.400	10					Ion Chromatography
F032	181.00	18.100	10	HVL				Colourimetry
F042	185.00	18.500	10	HVH				IC
F129	195.00	19.500	10	HVH				DIONEX IC
F037	200.00	20.000	10	HEHVL				I.C. Waters
F109	216.50	21.650	10					Dionex
F107	221.00	22.100	10	HVHVH				C.I.
F139	199.50	22.167	9	H				IC
F074	232.00	23.200	10	EHEHEHEHEHEHEHVLEHL	BIASED HIGH	-11.27	0.2200	I.C.
F014	239.50	23.950	10	EHVH	BIASED HIGH	12.40	0.0126	
F073	269.00	26.900	10	HHEHEHHHHHHVH	BIASED HIGH	10.56	0.0605	IC-Dionex

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 15.076

Chloride IC

PARAMETER: 17001 Chloride Colour mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 0.3000 CONCENTRATION ERROR INCREMENT= 0.0800

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	0.16	1.00	0.13	1.00	0.22	2.00	0.16	2.00	0.29	2.00	0.12	2.00
F007	<0.10	0.00	<0.10	0.00	0.14	1.00	<0.10	0.00	0.20	1.00	<0.10	0.00
F010	0.2	2.00	<0.1	0.00	0.3	4.00	0.1	1.00	0.3	3.00	0.1	1.00
F026	0.206	3.00	0.154	2.00	0.2615	3.00	0.202	3.00	0.314	4.00	0.185	3.00
F038	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F060	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00	<0.5	0.00
F072	0.40	4.00	0.80 EH	3.00	0.80 VH	5.00	0.80 EH	4.00	1.00 EH	5.00	0.80 EH	4.00
MEDIAN	0.2030		0.1540		0.2615		0.1810		0.3000		0.1525	
1CRIT	0.3000		0.3000		0.3000		0.3000		0.3000		0.3000	
N	2		1		3		2		3		2	
MEAN	0.2030		0.1540		0.2605		0.1810		0.3013		0.1525	
3STDEV	-		-		-		-		-		-	

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	0.40	2.00	4.12	6.00	0.21	3.50	6.51	7.00
F007	0.32	1.00	3.97	4.00	0.21	3.50	6.20	4.50
F010	0.5	4.00	4.2	7.00	0.2	2.00	6.4	6.00
F026	0.4485	3.00	3.962	3.00	0.1585	1.00	6.061	3.00
F038	<0.5	0.00	3.8	1.00	<0.5	0.00	5.7	1.00
F060	<0.5	0.00	4.1	5.00	<0.5	0.00	6.2	4.50
F072	1.40 EH	5.00	3.90	2.00	0.80 VH	5.00	6.00	2.00
MEDIAN	0.4485		3.9700		0.2100		6.2000	
1CRIT	0.3000		0.5376		0.3000		0.7160	
N	3		5		3		5	
MEAN	0.4495		4.0104		0.2067		6.1722	
3STDEV	-		-		-		-	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	28.50	2.850	10					ColHg Thiocyanate
F007	15.00	2.500	6					CPQ101E2
F010	30.00	3.333	9					Titration
F026	28.00	2.800	10					AUTOANALYSER
F038	2.00	1.000	2					ION CHROMATOGRAPHY
F060	9.50	4.750	2					Colorimetry thioCN
F072	39.00	3.900	10	EHVHEHEHEHEH VH				Titration HgNO3

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 3.102

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F038	2.00	1.000	2					ION CHROMATOGRAPHY
F007	15.00	2.500	6					CPQ101E2
F026	28.00	2.800	10					AUTOANALYSER
F003	28.50	2.850	10					ColHg Thiocyanate
F010	30.00	3.333	9					Titration
F072	39.00	3.900	10	EHVHEHEHEHEHVH				Titration HgNO3
F060	9.50	4.750	2					Colorimetry thioCN

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS 3.102

Chloride Colour

PARAMETER: 20091 Calcium mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.2500 BASIC ACCEPTABLE ERROR= 0.0750 CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.57	5.00	0.86	6.00	0.20	28.50	0.28	19.00	0.14	24.00	0.16	12.50
F003	0.64	25.00	0.92	19.50	0.19	25.00	0.27	12.00	0.13	20.00	0.16	12.50
F007	0.630	22.00	0.936	24.00	0.178	18.50	0.276	16.00	0.117	10.00	0.151	7.00
F009	0.62	17.50	0.92	19.50	0.17	13.50	0.27	12.00	0.12	12.50	0.17	21.00
F010	0.62	17.50	0.94	25.50	0.17	13.50	0.27	12.00	0.13	20.00	0.16	12.50
F014	0.65	26.00	0.99	29.00	0.15	3.00	0.34 EH	31.00	0.19 EH	29.00	0.21	29.00
F015	0.6	9.00	0.9	12.00	0.2	28.50	0.3	27.50	0.1	3.50	0.2	27.50
F017	0.617	16.00	0.913	16.00	0.175	16.50	0.275	15.00	0.124	17.00	0.171	23.00
F020	0.88 EH	30.00	0.93	21.50	0.18	21.50	0.29	24.50	0.14	24.00	0.17	21.00
F022	0.56	3.50	0.91	15.00	0.16	7.50	0.26	7.50	0.11	7.50	0.16	12.50
F025	0.660	27.00	1.005	30.00	0.178	18.50	0.300	27.50	0.121	14.00	0.160	12.50
F026	0.622	19.00	0.931	23.00	0.192	27.00	0.282	22.00	0.123	16.00	0.163	16.00
F032	0.625	20.00	0.950	27.00	0.175	16.50	0.285	23.00	0.140	24.00	0.165	18.00
F036	0.60	9.00	0.90	12.00	0.18	21.50	0.28	19.00	0.14	24.00	0.18	24.50
F037	0.6695	28.00	0.8665	7.00	0.1649	9.00	0.2515	5.00	0.1128	9.00	0.1506	6.00
F038	0.6	9.00	0.88	8.00	0.17	13.50	0.25	3.50	0.12	12.50	0.16	12.50
F042	0.56	3.50	0.85	5.00	0.19	25.00	0.28	19.00	0.15	27.50	0.18	24.50
F053	0.61	14.50	0.918	18.00	0.169	11.00	0.271	14.00	0.122	15.00	0.164	17.00
F060	0.433 EL	1.00	0.809	2.00	<0.2	0.00	0.227	1.00	<0.2	0.00	<0.2	0.00
F069	0.607	12.00	0.889	9.00	0.158	6.00	0.258	6.00	0.118	11.00	0.156	9.00
F071	0.541	2.00	0.784 L	1.00	0.154	4.00	0.249	2.00	0.097	1.00	0.138	3.00
F072	0.59	7.00	0.89	10.00	0.12 EL	2.00	0.25	3.50	0.10	3.50	0.12	2.00
F073	0.639	24.00	0.815	3.00	0.10 EL	1.00	0.336 EH	30.00	0.10	3.50	0.10 EL	1.00
F074	0.63	22.00	0.94	25.50	0.18	21.50	0.29	24.50	0.14	24.00	0.17	21.00
F094	0.69	29.00	0.97	28.00	0.17	13.50	0.28	19.00	0.1	3.50	0.14	4.00
F107	0.601	11.00	0.904	14.00	0.168	10.00	0.263	9.00	0.126	18.00	0.168	19.00
F109a	0.609	13.00	0.916	17.00	0.157	5.00	0.264	10.00	0.109	6.00	0.153	8.00
F110	0.58	6.00	0.84	4.00	0.16	7.50	0.26	7.50	0.11	7.50	0.15	5.00
F112	0.61	14.50	0.90	12.00	0.19	25.00	0.31	29.00	0.15	27.50	0.19	26.00
F133	0.63	22.00	0.93	21.50	0.18	21.50	0.28	19.00	0.13	20.00	0.20	27.50
F139	1.37 EH	31.00	1.55 EH	31.00	0.30 EH	30.00	0.295	26.00	0.221 EH	30.00	0.235 EH	30.00
MEDIAN	0.6170		0.9130		0.1725		0.2760		0.1225		0.1615	
1CRIT	0.0934		0.1082		0.0750		0.0763		0.0750		0.0750	
N	29		29		28		29		28		28	
MEAN	0.6228		0.9077		0.1725		0.2767		0.1255		0.1650	
3STDEV	0.1751		0.1350		0.0494		0.0579		0.0573		0.0569	

PARAMETER: 20091 Calcium mg/L

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	1.78	4.50	0.51	17.00	2.81	15.50	2.98	17.50
F003	1.87	10.00	0.52	22.00	2.81	15.50	3.06	24.00
F007	1.99	26.50	0.525	26.50	2.90	24.50	3.07	25.00
F009	1.88	12.50	0.5	10.00	2.76	11.00	2.91	11.00
F010	1.97	24.00	0.53	29.00	2.83	19.50	3.05	23.00
F014	2.09 H	30.00	0.48	5.50	3.04 H	30.00	3.75 EH	30.00
F015	1.8	6.50	0.5	10.00	2.7	8.00	2.9	10.00
F017	1.911	19.00	0.521	25.00	2.928	28.00	2.998	20.00
F020	1.93	22.00	0.51	17.00	2.97	29.00	3.00	21.00
F022	1.99	26.50	0.52	22.00	2.9	24.50	3.09	27.00
F025	1.993	28.00	0.478	4.00	2.926	27.00	3.471 VH	29.00
F026	1.982	25.00	0.525	26.50	2.916	26.00	3.077	26.00
F032	1.93	22.00	0.535	30.00	2.40 VL	2.00	2.46 VL	3.00
F036	1.88	12.50	0.52	22.00	2.8	13.00	2.92	12.50
F037	1.821	8.00	0.4770	3.00	2.694	7.00	2.764	6.00
F038	1.88	12.50	0.51	17.00	2.79	12.00	2.96	15.50
F042	1.69 L	3.00	0.52	22.00	2.59 L	4.00	2.73 L	5.00
F053	1.905	18.00	0.51	17.00	2.82	18.00	2.997	19.00
F060	1.68 L	2.00	0.526	28.00	2.60 L	5.00	2.83	8.00
F069	1.90	16.50	0.504	14.00	2.83	19.50	2.93	14.00
F071	1.825	9.00	0.368 EL	1.00	2.702	9.00	2.272 VL	1.00
F072	1.80	6.50	0.40 EL	2.00	2.58 L	3.00	2.70 L	4.00
F073	1.474 EL	1.00	0.50	10.00	2.131 EL	1.00	2.286 VL	2.00
F074	1.89	15.00	0.51	17.00	2.81	15.50	2.92	12.50
F094	2.07 H	29.00	0.48	5.50	2.81	15.50	3.24 H	28.00
F107	1.9	16.50	0.502	13.00	2.757	10.00	2.805	7.00
F109a	1.913	20.00	0.497	7.00	2.847	21.00	2.980	17.50
F110	1.88	12.50	0.5	10.00	2.87	23.00	2.96	15.50
F112	1.78	4.50	0.52	22.00	2.62	6.00	2.84	9.00
F133	1.93	22.00	0.50	10.00	2.85	22.00	3.03	22.00
F139	2.310 EH	31.00	0.679 EH	31.00	3.98 EH	31.00	4.01 EH	31.00
MEDIAN	1.9000		0.5100		2.8100		2.9600	
1CRIT	0.1575		0.0880		0.2030		0.2105	
N	29		29		29		29	
MEAN	1.8917		0.5045		2.7883		2.9554	
3STDEV	0.2831		0.0753		0.4016		0.7804	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	149.50	14.950	10					20110
F003	185.50	18.550	10					ICP-OES
F007	200.00	20.000	10					CPQ106E3
F009	140.50	14.050	10					ICP-MS
F010	196.50	19.650	10					ICP-OES
F014	242.50	24.250	10	EHEH H H EH				ICP-MS
F015	142.50	14.250	10					ICP
F017	195.50	19.550	10					AAF
F020	231.50	23.150	10	EH				IC
F022	153.50	15.350	10					AAS
F025	217.50	21.750	10	VH				LL IC
F026	226.50	22.650	10					FLAME AA
F032	185.50	18.550	10	VLVL				AAS
F036	170.00	17.000	10					AAS
F037	88.00	8.800	10					ICP-MS
F038	116.00	11.600	10					ICPOES
F042	138.50	13.850	10	L L L				Flame AA, Nitrous
F053	161.50	16.150	10					Atomic Absorption
F060	47.00	6.714	7	EL L L				ICP
F069	117.00	11.700	10					ICP
F071	33.00	3.300	10	L EL VL	BIASED LOW	-12.44	-0.0013	Flame-AA
F072	43.50	4.350	10	EL ELL L	BIASED LOW	-7.22	-0.0138	Flame absorption
F073	76.50	7.650	10	ELEH ELEL ELVL				IC-Dionex
F074	198.50	19.850	10					AAS
F094	175.00	17.500	10	H H				IC
F107	127.50	12.750	10					SEAP
F109a	124.50	12.450	10					
F110	98.50	9.850	10					Flame-AAS
F112	175.50	17.550	10					AA2380 FLAME
F133	207.50	20.750	10					ICP-MS
F139	302.00	30.200	10	EHEHEH EHEHEHEHEHEH	BIASED HIGH	33.24	0.1036	ICP-OES

OVERALL AVERAGE
RANK IS 15.853

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F071	33.00	3.300	10	LELVL	BIASED LOW	-12.44	-0.0013	Flame-AA
F072	43.50	4.350	10	ELELLL	BIASED LOW	-7.22	-0.0138	Flame absorption
F060	47.00	6.714	7	ELLL				ICP
F073	76.50	7.650	10	ELEHELELELVL				IC-Dionex
F037	88.00	8.800	10					ICP-MS
F110	98.50	9.850	10					Flame-AAS
F038	116.00	11.600	10					ICPOES
F069	117.00	11.700	10					ICP
F109a	124.50	12.450	10					
F107	127.50	12.750	10					SEAP
F042	138.50	13.850	10	LLL				Flame AA, Nitrous
F009	140.50	14.050	10					ICP-MS
F015	142.50	14.250	10					ICP
F002	149.50	14.950	10					20110
F022	153.50	15.350	10					AAS
F053	161.50	16.150	10					Atomic Absorption
F036	170.00	17.000	10					AAS
F094	175.00	17.500	10	HH				IC
F112	175.50	17.550	10					AA2380 FLAME
F003	185.50	18.550	10					ICP-OES
F032	185.50	18.550	10	VLVL				AAS
F017	195.50	19.550	10					AAF
F010	196.50	19.650	10					ICP-OES
F074	198.50	19.850	10					AAS
F007	200.00	20.000	10					CPQ106E3
F133	207.50	20.750	10					ICP-MS
F025	217.50	21.750	10	VH				LL IC
F026	226.50	22.650	10					FLAME AA
F020	231.50	23.150	10	EH				IC
F014	242.50	24.250	10	EHEHHHEH				ICP-MS
F139	302.00	30.200	10	EHEHEHEHEHEHEHEHEH	BIASED HIGH	33.24	0.1036	ICP-OES

OVERALL AVERAGE RANK IS 15.853

Calcium

PARAMETER: 12091 Magnesium mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.1000 BASIC ACCEPTABLE ERROR= 0.0200 CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.16	8.00	0.31	9.50	<0.05	0.00	0.06	6.50	<0.05	0.00	<0.05	0.00
F003	0.18	28.00	0.31	9.50	0.04	21.00	0.07	22.00	0.05	22.50	0.04	23.00
F007	0.176	25.00	0.324	19.50	0.033	13.00	0.067	12.50	0.038	12.50	0.030	14.50
F009	0.18	28.00	0.33	24.50	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00
F010	0.17	15.00	0.33	24.50	0.03	5.50	0.07	22.00	0.04	18.00	0.03	14.50
F014	0.17	15.00	0.32	15.50	<0.05	0.00	0.08	27.50	0.05	22.50	<0.05	0.00
F015	0.1 EL	1.00	0.3	6.50	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00
F017	0.175	24.00	0.329	22.00	0.035	17.00	0.069	16.00	0.039	14.50	0.032	20.00
F020	0.20 H	31.00	0.33	24.50	0.04	21.00	0.07	22.00	0.03	4.00	0.03	14.50
F022	0.17	15.00	0.32	15.50	0.03	5.50	0.07	22.00	0.03	4.00	0.03	14.50
F025	0.173	21.00	0.338	29.00	0.034	15.00	0.068	14.00	0.035	7.50	0.026	4.00
F026	0.167	10.00	0.310	9.50	0.032	10.50	0.065	8.50	0.038	12.50	0.029	9.00
F032	0.178	26.00	0.324	19.50	0.033	13.00	0.069	16.00	0.039	14.50	0.031	19.00
F036	0.170	15.00	0.320	15.50	0.035	17.00	0.070	22.00	0.040	18.00	0.030	14.50
F037	0.1001 EL	2.00	0.2154 EL	1.00	<0.1	0.00	<0.1	0.00	<0.1	0.00	<0.1	0.00
F038	0.17	15.00	0.31	9.50	<0.05	0.00	0.05	3.00	<0.05	0.00	<0.05	0.00
F042	0.16	8.00	0.30	6.50	0.03	5.50	0.07	22.00	0.04	18.00	0.03	14.50
F053	0.17	15.00	0.319	13.00	0.033	13.00	0.067	12.50	0.037	9.50	0.029	9.00
F060	0.121 VL	3.00	0.275 L	3.00	<0.05	0.00	0.0518	4.00	<0.05	0.00	<0.05	0.00
F069	0.173	21.00	0.322	18.00	0.0317	9.00	0.0658	10.00	0.0379	11.00	0.0288	7.00
F071	0.172	19.00	0.594 EH	31.00	0.322 EH	24.00	0.033 EL	2.00	0.066 EH	25.00	0.038	22.00
F072	0.16	8.00	0.33	24.50	0.06 EH	23.00	0.08	27.50	0.06 EH	24.00	0.05 EH	24.00
F073	0.151	5.00	0.227 EL	2.00	0.02	1.00	0.02 EL	1.00	0.02	1.00	0.02 EL	1.50
F074	0.17	15.00	0.32	15.50	0.04	21.00	0.07	22.00	0.04	18.00	0.03	14.50
F094	0.181	30.00	0.334	27.00	0.037	19.00	0.07	22.00	0.033	6.00	0.028	5.50
F107	0.174	23.00	0.325	21.00	0.035	17.00	0.069	16.00	0.044	21.00	0.033	21.00
F109a	0.173	21.00	0.335	28.00	0.030	5.50	0.065	8.50	0.035	7.50	0.028	5.50
F110	0.168	11.00	0.314	12.00	0.032	10.50	0.066	11.00	0.037	9.50	0.029	9.00
F112	0.15	4.00	0.29	5.00	0.03	5.50	0.06	6.50	0.03	4.00	0.02 EL	1.50
F133	0.159	6.00	0.289	4.00	0.025	2.00	0.058	5.00	0.029	2.00	0.025	3.00
F139	0.18	28.00	0.34	30.00	0.03	5.50	0.07	22.00	0.04	18.00	0.03	14.50
MEDIAN	0.1700		0.3200		0.0330		0.0685		0.0380		0.0300	
1CRIT	0.0235		0.0310		0.0200		0.0200		0.0200		0.0200	
N	29		29		22		25		23		21	
MEAN	0.1656		0.3147		0.0344		0.0645		0.0388		0.0303	
3STDEV	0.0514		0.0674		0.0201		0.0255		0.0211		0.0099	

PARAMETER: 12091 Magnesium mg/L

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	0.53	10.50	0.35	6.50	0.56	10.50	0.65	11.00
F003	0.54	12.50	0.37	21.50	0.56	10.50	0.67	15.00
F007	0.569	23.00	0.368	17.50	0.592	23.00	0.696	23.00
F009	0.53	10.50	0.36	13.50	0.52 L	4.50	0.6 L	5.00
F010	0.57	25.00	0.53 EH	30.00	0.59	21.50	0.69	21.00
F014	0.57	25.00	0.36	13.50	0.58	18.50	0.79 VH	31.00
F015	0.5 L	5.50	0.4 H	29.00	0.6	28.00	0.7	25.00
F017	0.568	21.50	0.373	26.00	0.594	24.00	0.684	20.00
F020	0.58	28.50	0.38	27.50	0.60	28.00	0.71	28.00
F022	0.56	20.00	0.37	21.50	0.59	21.50	0.68	18.00
F025	0.541	14.00	0.352	8.00	0.563	12.00	0.661	12.00
F026	0.545	15.00	0.356	10.00	0.572	14.00	0.666	13.00
F032	0.510	7.00	0.369	19.00	0.546	8.00	0.630	9.00
F036	0.555	18.50	0.365	16.00	0.575	15.50	0.670	15.00
F037	0.4357 VL	3.00	0.2560 VL	2.00	0.4566 VL	3.00	0.5314 VL	2.00
F038	0.54	12.50	0.36	13.50	0.58	18.50	0.7	25.00
F042	0.52	9.00	0.35	6.50	0.55	9.00	0.63	9.00
F053	0.554	17.00	0.359	11.00	0.578	17.00	0.678	17.00
F060	0.484 VL	4.00	0.334	4.00	0.523 L	6.00	0.608 L	6.00
F069	0.568	21.50	0.372	24.50	0.595	25.00	0.683	19.00
F071	0.029 EL	1.00	0.559 EH	31.00	0.361 EL	1.00	0.586 VL	3.00
F072	0.58	28.50	0.38	27.50	0.60	28.00	0.72 H	29.50
F073	0.418 VL	2.00	0.247 VL	1.00	0.401 EL	2.00	0.496 EL	1.00
F074	0.55	16.00	0.37	21.50	0.57	13.00	0.70	25.00
F094	0.588	30.00	0.372	24.50	0.609	31.00	0.708	27.00
F107	0.570	25.00	0.360	13.50	0.583	20.00	0.630	9.00
F109a	0.576	27.00	0.368	17.50	0.600	28.00	0.695	22.00
F110	0.555	18.50	0.355	9.00	0.575	15.50	0.67	15.00
F112	0.50 L	5.50	0.32 L	3.00	0.52 L	4.50	0.59 VL	4.00
F133	0.518	8.00	0.337	5.00	0.529 L	7.00	0.620 L	7.00
F139	0.59	31.00	0.37	21.50	0.60	28.00	0.72 H	29.50
MEDIAN	0.5500		0.3650		0.5750		0.6700	
1CRIT	0.0425		0.0333		0.0437		0.0485	
N	29		29		29		29	
MEAN	0.5388		0.3643		0.5622		0.6613	
3STDEV	0.1209		0.1192		0.1333		0.1364	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	62.50	8.929	7					12107
F003	185.50	18.550	10					ICP-OES
F007	183.50	18.350	10					CPQ106E3
F009	86.00	14.333	6	L L				ICP-MS
F010	197.00	19.700	10	EH				ICP-OES
F014	168.50	21.063	8	VH				ICP-MS
F015	95.00	15.833	6	EL L H				ICP
F017	205.00	20.500	10					AAF
F020	229.00	22.900	10	H				IC
F022	157.50	15.750	10					AAS
F025	136.50	13.650	10					LL IC
F026	112.00	11.200	10					FLAME AA
F032	151.00	15.100	10					AAS
F036	167.00	16.700	10					AAS
F037	13.00	2.167	6	ELEL VLVLVLVL	BIASED LOW	-11.21	-0.0596	ICP-MS
F038	97.00	13.857	7					ICPOES
F042	108.00	10.800	10					Flame AA, Nitrous
F053	134.00	13.400	10					Atomic Absorption
F060	30.00	4.286	7	VLL VL L L	BIASED LOW	-6.09	-0.0223	ICP
F069	166.00	16.600	10					ICP
F071	159.00	15.900	10	EHEHELEH ELEHELVL				Flame-AA
F072	244.50	24.450	10	EH EHEH H	BIASED HIGH*	3.20	0.0110	Flame absorption
F073	17.50	1.750	10	EL EL ELVLVLELEL	BIASED LOW	-25.84	-0.0071	IC-Dionex
F074	181.50	18.150	10					AAS
F094	222.00	22.200	10					IC
F107	186.50	18.650	10					SEAP
F109a	170.50	17.050	10					
F110	121.00	12.100	10					Flame-AAS
F112	43.50	4.350	10	ELL L L VL	BIASED LOW	-10.04	-0.0027	AA2380 FLAME
F133	49.00	4.900	10	L L	BIASED LOW	-6.44	-0.0049	ICP-MS
F139	228.00	22.800	10	H				ICP-OES

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 15.007

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F073	17.50	1.750	10	ELELELVLVLELEL	BIASED LOW	-25.84	-0.0071	IC-Dionex
F037	13.00	2.167	6	ELELVLVLVLVL	BIASED LOW	-11.21	-0.0596	ICP-MS
F060	30.00	4.286	7	VLLVLLL	BIASED LOW	-6.09	-0.0223	ICP
F112	43.50	4.350	10	ELLLLVL	BIASED LOW	-10.04	-0.0027	AA2380 FLAME
F133	49.00	4.900	10	LL	BIASED LOW	-6.44	-0.0049	ICP-MS
F002	62.50	8.929	7					12107
F042	108.00	10.800	10					Flame AA, Nitrous
F026	112.00	11.200	10					FLAME AA
F110	121.00	12.100	10					Flame-AAS
F053	134.00	13.400	10					Atomic Absorption
F025	136.50	13.650	10					LL IC
F038	97.00	13.857	7					ICPOES
F009	86.00	14.333	6	LL				ICP-MS
F032	151.00	15.100	10					AAS
F022	157.50	15.750	10					AAS
F015	95.00	15.833	6	ELLH				ICP
F071	159.00	15.900	10	EHEHELEHELEHELVL				Flame-AA
F069	166.00	16.600	10					ICP
F036	167.00	16.700	10					AAS
F109a	170.50	17.050	10					
F074	181.50	18.150	10					AAS
F007	183.50	18.350	10					CPQ106E3
F003	185.50	18.550	10					ICP-OES
F107	186.50	18.650	10					SEAP
F010	197.00	19.700	10	EH				ICP-OES
F017	205.00	20.500	10					AAF
F014	168.50	21.063	8	VH				ICP-MS
F094	222.00	22.200	10					IC
F139	228.00	22.800	10	H				ICP-OES
F020	229.00	22.900	10	H				IC
F072	244.50	24.450	10	EHEHEHH	BIASED HIGH*	3.20	0.0110	Flame absorption

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 15.007

Magnesium

PARAMETER: 13091 Aluminum mg/L

NATIONAL WATER RESEARCH INSTITUTE
NATIONAL LAB FOR ENVIRONMENTAL TESTING
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0080 BASIC ACCEPTABLE ERROR= 0.0080 CONCENTRATION ERROR INCREMENT= 0.0800

SAMPLE	1 = RAINGR-18		2 = RAINGR-03		3 = AES-01		4 = AES-04		5 = AES-03m		6 = AES-02	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F010	0.013	12.00	0.010	13.00	0.004	6.50	0.007	9.00	0.011	11.00	0.012	8.00
F014	0.008	6.00	0.006	3.50	0.003	4.50	0.006	7.50	0.006	5.50	0.012	8.00
F015	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00	<0.05	0.00
F020	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00
F022	<0.010	0.00	<0.010	0.00	<0.010	0.00	<0.010	0.00	<0.010	0.00	0.015	13.00
F026	0.0190 H	13.00	0.0062	6.00	0.0072	9.00	0.0072	10.00	0.0107	9.50	0.0149	12.00
F037	0.0348 EH	14.00	0.0070	7.50	0.0028	3.00	0.0027	1.50	0.0034	1.00	0.0086	1.00
F038	0.007	5.00	0.006	3.50	<0.005	0.00	<0.005	0.00	0.006	5.50	0.012	8.00
F042	0.005W	1.00	0.004W	0.00	0.002W	0.00	0.005W	0.00	0.004W	0.00	0.010T	2.50
F060	0.0092	10.00	0.0099	12.00	0.0120	10.00	0.0128	12.00	0.0142	13.00	0.0182	15.00
F069	0.0057	2.00	0.0062	5.00	<0.001	0.00	0.0033	4.00	0.0049	4.00	0.0106	4.00
F072	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00
F094	0.0099	11.00	0.0085	11.00	0.006	8.00	0.0088	11.00	0.0107	9.50	0.0148	11.00
F107	0.009	8.50	0.007	7.50	0.004	6.50	0.006	7.50	0.008	8.00	0.013	10.00
F109	0.0066T	4.00	0.0048T	2.00	0.0023T	2.00	0.0027T	1.50	0.0044T	3.00	0.0109T	5.00
F110	0.0085	7.00	0.0075	9.00	<0.005	0.00	0.0055	6.00	0.0078	7.00	0.0161	14.00
F112	0.009	8.50	0.008	10.00	0.003	4.50	0.005	5.00	0.013	12.00	0.011	6.00
F133	0.006	3.00	0.004	1.00	0.001	1.00	0.003	3.00	0.004	2.00	0.010	2.50
F139	0.080 EH	15.00	0.060 EH	14.00	0.058 EH	11.00	0.027 EH	13.00	0.052 EH	14.00	0.076 EH	16.00
MEDIAN	0.0090		0.0070		0.0040		0.0060		0.0079		0.0120	
1CRIT	0.0081		0.0080		0.0080		0.0080		0.0080		0.0083	
N	13		12		9		10		12		14	
MEAN	0.0112		0.0073		0.0049		0.0065		0.0084		0.0129	
3STDEV	0.0228		0.0046		0.0088		0.0080		0.0099		0.0073	

PARAMETER: 13091 Aluminum mg/L

SAMPLE	7 = RAINGR-06		8 = BEAV-02		9 = GRM-05		10 = MIRAM-97b	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F010	0.006	9.00	0.048	9.50	0.007	8.00	0.083	18.00
F014	0.001	2.00	0.048	9.50	0.002	3.00	0.068	6.00
F015	<0.05	0.00	<0.05	0.00	<0.05	0.00	0.08	16.50
F020	<0.02	0.00	0.05	12.50	<0.02	0.00	0.08	16.50
F022	<0.010	0.00	0.047	6.00	<0.010	0.00	0.06	3.00
F026	0.0032	7.00	0.0505	14.50	0.0086	9.00	0.0699	9.00
F037	0.0016	3.00	0.0401 EL	1.00	0.0026	4.00	0.0589	2.00
F038	<0.005	0.00	0.048	9.50	<0.005	0.00	0.069	7.00
F042	0.002W	0.00	0.046	4.50	0.002W	0.00	0.067	4.50
F060	0.0127 H	10.00	0.0516	16.00	0.0159 VH	10.00	0.0863 H	19.00
F069	0.0021	6.00	0.0475	7.00	<0.001	0.00	0.0713	10.00
F072	<0.01	0.00	0.045	3.00	<0.01	0.00	0.074	14.00
F094	0.0049	8.00	0.0505	14.50	0.0052	7.00	0.0698	8.00
F107	0.002	4.50	0.050	12.50	0.003	5.50	0.073	13.00
F109	0.0000T	1.00	0.0480	9.50	0.0010T	1.50	0.0718	11.00
F110	<0.005	0.00	0.0525	17.00	<0.005	0.00	0.0765	15.00
F112	0.002	4.50	0.042	2.00	0.003	5.50	0.072	12.00
F133	<0.001	0.00	0.046	4.50	0.001	1.50	0.067	4.50
F139	0.093 EH	11.00	0.107 EH	18.00	0.072 EH	11.00	0.052 EL	1.00
MEDIAN	0.0021		0.0480		0.0030		0.0713	
1CRIT	0.0080		0.0112		0.0080		0.0131	
N	9		16		8		17	
MEAN	0.0039		0.0482		0.0059		0.0712	
3STDEV	0.0104		0.0078		0.0131		0.0188	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F010	104.00	10.400	10					ICP-OES
F014	55.50	5.550	10					ICP-MS
F015	16.50	16.500	1		INSUFFICIENT DATA			ICP
F020	29.00	14.500	2		INSUFFICIENT DATA			ICP
F022	22.00	7.333	3		INSUFFICIENT DATA			ICP-AES
F026	99.00	9.900	10	H				ICP
F037	38.00	3.800	10	EH EL	BIASED LOW	-20.48	0.0027	ICP-MS
F038	38.50	6.417	6					GFAAS
F042	12.50	3.125	4		INSUFFICIENT DATA			GFAAS
F060	127.00	12.700	10	H VHH	BIASED HIGH	5.90	0.0062	ICP
F069	42.00	5.250	8					ICP
F072	17.00	8.500	2		INSUFFICIENT DATA			Carbon rod
F094	99.00	9.900	10					ICPMS
F107	83.50	8.350	10					SEAP
F109	40.50	4.050	10		BIASED LOW*	4.59	-0.0026	ICP
F110	75.00	10.714	7					Furnace
F112	70.00	7.000	10					HGA 300 FURNACE
F133	23.00	2.556	9		BIASED LOW*	-1.11	-0.0027	ICP-MS
F139	124.00	12.400	10	EHEHEHEHEHEHEHEHEHEL	BIASED HIGH	-88.06	0.0657	ICP-OES

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 7.859

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F133	23.00	2.556	9		BIASED LOW*	-1.11	-0.0027	ICP-MS
F042	12.50	3.125	4		INSUFFICIENT DATA			GFAAS
F037	38.00	3.800	10	EHEL	BIASED LOW	-20.48	0.0027	ICP-MS
F109	40.50	4.050	10		BIASED LOW*	4.59	-0.0026	ICP
F069	42.00	5.250	8					ICP
F014	55.50	5.550	10					ICP-MS
F038	38.50	6.417	6					GFAAS
F112	70.00	7.000	10					HGA 300 FURNACE
F022	22.00	7.333	3		INSUFFICIENT DATA			ICP-AES
F107	83.50	8.350	10					SEAP
F072	17.00	8.500	2		INSUFFICIENT DATA			Carbon rod
F026	99.00	9.900	10	H				ICP
F094	99.00	9.900	10					ICPMS
F010	104.00	10.400	10					ICP-OES
F110	75.00	10.714	7					Furnace
F139	124.00	12.400	10	EHEHEHEHEHEHEHEHEHEL	BIASED HIGH	-88.06	0.0657	ICP-OES
F060	127.00	12.700	10	HVHH	BIASED HIGH	5.90	0.0062	ICP
F020	29.00	14.500	2		INSUFFICIENT DATA			ICP
F015	16.50	16.500	1		INSUFFICIENT DATA			ICP

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 5.00

OVERALL AVERAGE
RANK IS 7.859

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