NATIONAL WATER RESEARCH INSTITUTE

INSTITUT NATIONAL DE RECHERCHE SUR LES EAUX

Ecosystem Interlaboratory QA Program
Study FP70 - Rain and Soft Waters
(March & April 1997)

H. Alkema and L. Hjelm

National Laboratory for Environmental Testing
National Water Research Institute
867 Lakeshore Rd, Burlington, ON
Canada L7R 4A6

Environment Canada Environnement Canada

National Water Research Institute
867 Lakeshore Road
Burlington, Ontario
L7R 4A6

June 20, 1997

To: Participants of the NWRI Ecosystem Interlaboratory QA Program

Re: Final Report for NWRI Study FP70 - 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.

Harry Alkema
QA Services
NLET/PI&QM/ESRM

Lisa Hjelm
Interlaboratory Study Logistics
NLET/PI&QM/ESRM

905-336-4929
Harry.Alkema@CCIW.ca

905-336-4989
facsimile

905-336-4926
Lisa.Hjelm@CCIW.ca

Attachment: Individual Laboratory Appraisal

Canada

NATIONAL WATER RESEARCH INSTITUTE

NATIONAL LABORATORY for ENVIRONMENTAL TESTING

REPORT NO. NWRI-QA-97-01

ECOSYSTEM INTERLABORATORY QUALITY ASSURANCE PROGRAM

STUDY FP70 - FINAL REPORT

March and April 1997

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 1997

*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.

Contacts:

Harry Alkema, QA Chemist	905-336-4929, Harry.Alkema@CCIW.ca
Lisa Hjelm, Interlaboratory Studies & CRMs	905-336-4926, Lisa.Hjelm@CCIW.ca
Dave Warry, Chief, NWRI/NLET/PI&QM	905-336-6264, Dave.Warry@CCIW.ca

Table of Contents

Table 1

ENVIRONMENT CANADA
National Water Research Institute

Ecosystem Interlaboratory Quality Assurance Program
PARTICIPATION LIST - Study FP 70 (March & April 1997)

Rain and Soft Waters

Adirondack Lakes Survey Corporation
Alberta Research Council
ASL - Analytical Service Laboratories Ltd.
Chemex Environmental Services
Chemex Labs Alberta Inc.
Environment Canada - AES, CAPMoN Laboratory
Environment Canada - AES, RRAC Laboratory, ARQM
Environment Canada - EQL, Atlantic
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 Manitoba Technology Centre
Greater Victoria Water District - Water Quality Division
Harvard School of Public Health
Illinois State Water Survey - Analytical Chemistry Unit
Laboratoire de Santé Publique du Québec
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, Atlantic Region
Natural Resources Canada - CFS, Ontario Region
NB Department of the Environment - ASL
Norwest Labs
Ontario Ministry of Environment and Energy - Dorset
Ontario Ministry of Environment and Energy - Etobicoke
Philip Analytical Services Corporation
State of Vermont - Department of Environmental Conservation Laboratory
TAIGA Environmental Laboratory
University of Maine - Water Research Institute
US Geological Survey - NWQL
US Geological Survey - Water Resources Division

Note: Laboratories select their routine parameters from the series of samples in this study.

Table 2 Laboratory Performance Scores (Study 0070)

Rain & Soft Waters

	BIAS				FLAGS		
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 AND % FLAGS SCORE
F129	7	0	0.00	64	0	0.00	0.00
F017	9	0	0.00	81	2	2.47	2.47
F068	7	0	0.00	63	2	3.17	3.17
F003	17	0	0.00	154	8	5.19	5.19
F009	9	0	0.00	86	5	5.81	5.81
F036	14	0	0.00	129	8	6.20	6.20
F109	11	0	0.00	110	8	7.27	7.27
F001	14	0	0.00	118	9	7.63	7.63
F004	6	0	0.00	49	4	8.16	8.16
F122	4	0	0.00	36	3	8.33	8.33
F014	18	1	5.56	149	10	6.71	12.27
F133	11	0	0.00	105	13	12.38	12.38
F042	16	1	6.25	156	13	8.33	14.58
F010	19	1	5.26	170	16	9.41	14.67
F110	11	1	9.09	108	8	7.41	16.50
F069	14	1	7.14	127	13	10.24	17.38
F053	10	1	10.00	96	8	8.33	18.33
F007	15	1	6.67	144	17	11.81	18.47
F002	14	1	7.14	117	16	13.68	20.82
F112	15	2	13.33	144	17	11.81	25.14
F015	17	2	11.76	141	24	17.02	28.79
F026	17	2	11.76	170	31	18.24	30.00
F060	20	2	10.00	154	37	24.03	34.03
F008	17	4	23.53	126	14	11.11	34.64
F011	15	2	13.33	135	29	21.48	34.81
F032	19	3	15.79	149	30	20.13	35.92
F025	19	4	21.05	150	37	24.67	45.72
F020	17	4	23.53	147	35	23.81	47.34
F038	18	3	16.67	146	54	36.99	53.65
F107	18	7	38.89	177	27	15.25	54.14
F072	17	6	35.29	143	51	35.66	70.96
F012	9	2	22.22	84	41	48.81	71.03
F037	10	2	20.00	83	46	55.42	75.42
F118	4	4	100.00	39	29	74.36	174.36

The following parameters were used in the analysis:

Cond	pH	Alk E.Pt	NO3 /2	NO3	NH3
Na	Mg	Al	Silica	SO4-IC	CL-IC
K	Ca	Colour	DOC	Alk Gran	DIC
Alk Infl	TKN	SO4	Cl	Acidity	

Table 3

SUMMARY OF STUDY-TO-STUDY PERFORMANCE

Rain & Soft Waters

LAB CODE	%BIAS PLUS %FLAGS ON STUDIES 0058	0059	0060	0061	0062	0063	0064	0065	0066	0067	0068	0069	0070	MEDIAN SCORE	COMMENTS
F001	25.2	16.5	8.0	7.2	32.6	9.6	29.7	11.8	11.5	6.8	5.2	7.1	7.1	9.6	GOOD
F001b	30.6	40.1	42.3	34.7	8.2	23.8	34.3	18.6	1.3	2.7	-	-	-	27.2	MODERATE
F002	-	44.9	40.9	42.6	24.7	54.0	27.4	23.8	24.4	41.3	28.2	6.5	20.8	27.8	MODERATE
F003	17.9	29.6	18.7	20.6	17.7	28.0	36.1	13.8	28.6	17.8	8.6	14.1	5.2	17.9	SATISFACTORY
F004	4.8	7.4	8.2	12.8	24.4	28.7	2.4	14.3	2.0	39.3	-	7.0	8.2	8.2	GOOD
F007	7.7	20.0	1.9	7.5	24.1	-	-	46.5	27.1	27.5	24.7	23.7	18.5	23.7	SATISFACTORY
F008	38.1	56.5	23.1	14.2	40.6	30.2	14.3	14.7	16.1	35.5	13.4	28.4	34.6	28.4	MODERATE
F009	57.1	29.6	16.9	21.6	42.0	38.5	40.0	43.0	9.1	-	27.9	31.9	5.8	30.8	MODERATE
F010	36.1	17.8	13.3	13.9	28.7	43.0	35.1	35.6	10.8	13.0	3.2	-	14.7	16.2	SATISFACTORY
F011	-	-	-	-	-	-	-	-	-	-	24.6	67.1	34.8	34.8	MODERATE
F012	107.1	66.7	81.5	91.7	155.0	-	82.7	60.8	16.0	-	83.8	-	71.0	82.1	POOR
F014	-	48.2	19.2	25.0	30.0	51.1	15.0	34.9	11.4	22.6	18.6	38.7	12.6	23.8	SATISFACTORY
F015	39.2	44.6	41.5	39.4	33.1	29.2	13.6	6.5	19.5	8.9	14.3	24.8	28.8	28.8	MODERATE
F017	31.5	9.4	3.8	5.5	5.3	5.8	55.2	2.6	3.7	0.0	18.6	2.5	2.5	5.3	GOOD
F017c	-	-	35.9	7.9	3.9	15.1	3.9	-	-	-	-	-	-	7.9	GOOD
F020	45.6	8.9	5.3	8.4	10.6	29.5	13.7	30.2	33.0	38.2	-	47.9	47.3	29.8	MODERATE
F022	39.8	20.9	13.2	3.8	20.2	18.6	13.9	28.3	-	-	-	-	-	19.4	SATISFACTORY
F023	-	34.9	49.8	103.9	-	-	-	-	-	-	-	-	-	49.8	MODERATE
F024	-	-	41.7	18.3	-	-	-	-	59.5	-	-	-	-	41.7	MODERATE
F025	11.2	15.2	32.9	74.2	39.7	-	-	-	-	-	-	-	45.7	36.3	MODERATE
F026	4.7	17.6	2.4	3.9	25.6	6.1	14.1	14.7	15.0	8.2	11.2	12.5	30.0	12.5	SATISFACTORY
F027	66.2	-	-	-	104.4	93.1	95.1	116.7	-	-	-	-	-	95.1	POOR
F028	62.7	36.1	77.8	46.9	36.8	42.7	93.8	36.0	26.0	-	-	-	-	42.7	MODERATE
F032	15.4	10.4	16.0	4.6	20.1	14.3	12.6	-	27.4	14.4	34.1	29.0	36.8	15.7	SATISFACTORY
F033	9.1	5.9	3.5	25.8	4.9	12.5	21.9	25.8	2.2	26.6	35.0	-	-	12.5	SATISFACTORY
F036	2.3	29.3	3.5	3.4	22.2	12.0	28.0	18.2	17.6	-	23.5	8.1	6.2	14.8	SATISFACTORY
F037	54.0	87.8	68.2	63.6	68.4	51.7	49.1	23.0	36.5	41.5	71.4	37.5	75.4	54.0	MODERATE
F038	-	-	-	-	-	-	-	-	-	-	-	-	53.7	-	-
F042	3.4	15.5	5.2	12.7	27.7	7.6	12.5	8.8	17.5	28.3	15.5	-	14.6	13.6	SATISFACTORY
F043	84.4	46.1	89.4	28.6	-	-	-	-	158.6	-	-	-	-	84.4	POOR
F046	-	-	-	-	51.4	38.9	43.3	46.4	17.3	-	49.3	-	-	44.8	MODERATE
F049	-	-	-	49.1	-	-	-	-	26.1	9.1	-	-	-	26.1	MODERATE
F053	9.6	3.2	3.1	3.1	5.1	2.1	5.1	2.0	3.0	12.2	19.5	62.7	18.3	5.1	GOOD
F054	2.2	1.1	-	4.3	-	2.2	5.9	0.0	0.0	-	-	-	-	2.2	GOOD
F056	47.9	59.3	-	14.5	-	-	-	-	-	-	-	-	-	47.9	MODERATE
F058	17.5	21.5	24.6	19.2	0.0	23.8	13.0	24.6	12.3	3.8	14.2	39.3	-	18.3	SATISFACTORY
F060	-	-	-	-	-	-	-	-	-	-	66.3	-	34.0	50.2	MODERATE
F062	-	-	-	-	-	-	-	-	-	-	-	59.0	-	-	-
F063	43.6	42.8	45.4	65.2	40.7	-	-	-	-	-	-	-	-	43.6	MODERATE
F067	55.8	39.6	34.2	31.2	-	-	-	-	-	-	-	-	-	36.9	MODERATE
F068	29.9	7.0	2.1	-	23.8	23.1	25.1	1.6	0.0	2.5	28.2	0.0	3.2	5.1	GOOD
F069	19.2	16.4	16.5	13.1	31.7	8.8	39.8	10.1	19.1	33.7	-	21.7	17.4	18.3	SATISFACTORY
F071	59.5	42.3	60.0	67.1	33.1	35.0	41.0	32.5	74.6	49.9	22.9	37.4	-	41.7	MODERATE
F072	33.5	35.5	44.5	-	58.5	-	-	-	70.3	-	-	-	71.0	51.5	MODERATE
F073	-	-	-	-	-	-	-	-	-	-	25.0	-	-	-	-
F074	-	18.8	60.0	40.0	52.5	25.0	30.0	27.5	-	-	30.6	-	-	30.3	MODERATE
F077	-	93.0	65.2	51.3	-	-	-	-	-	-	-	-	-	65.2	POOR
F080	-	-	-	-	-	-	-	-	-	-	21.3	-	-	-	-
F081	44.6	26.1	12.7	10.0	27.8	25.8	9.6	9.6	33.9	-	-	-	-	25.8	MODERATE
F089	78.1	18.6	14.1	46.8	72.7	99.0	53.3	57.8	-	-	-	43.0	-	53.3	MODERATE
F090	0.0	5.0	15.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	0.0	GOOD
F096	-	-	-	-	-	-	-	-	-	-	24.5	-	-	-	-
F099	24.9	14.7	36.4	-	-	-	-	-	-	-	-	-	-	24.9	SATISFACTORY
F101	60.4	38.1	-	41.6	66.3	75.8	32.0	42.9	-	-	-	-	-	42.9	MODERATE
F102	1.7	41.7	-	-	-	-	-	-	-	-	-	-	-	21.7	SATISFACTORY
F104	51.9	64.8	34.3	-	-	-	-	-	-	-	-	-	-	51.9	MODERATE
F105	1.4	5.5	2.9	-	10.0	-	-	-	-	-	-	-	-	4.2	GOOD
F107	27.7	21.3	34.4	33.3	10.4	14.6	12.0	35.6	36.3	42.8	-	14.0	54.1	30.5	MODERATE
F108	25.2	26.6	25.0	11.9	34.3	4.8	9.9	4.8	44.4	-	-	-	-	25.0	MODERATE
F109	27.6	70.0	63.6	18.7	-	57.7	32.3	39.5	50.8	4.4	21.7	32.5	7.3	32.4	MODERATE
F110	7.5	5.0	32.7	8.2	31.8	9.3	7.3	5.6	11.1	19.4	-	-	16.5	9.3	GOOD
F110b	0.0	0.0	175.0	0.0	0.0	33.3	0.0	-	50.0	30.0	-	-	-	0.0	GOOD
F112	-	81.4	50.8	49.0	26.1	19.3	24.0	40.4	20.1	46.3	-	23.5	25.1	26.1	MODERATE
F113	12.2	30.3	44.8	25.2	-	-	-	-	-	-	-	-	-	27.7	MODERATE
F114	86.7	94.4	160.0	152.0	-	-	-	-	-	-	-	-	-	123.2	POOR
F115	-	-	-	-	-	-	20.0	-	5.0	3.6	-	.8	-	4.3	GOOD
F116	-	21.1	18.4	19.9	19.9	41.7	44.9	10.9	27.2	37.2	14.6	15.2	-	19.9	SATISFACTORY
F117	53.3	10.0	6.7	-	-	-	-	-	46.7	26.7	-	-	-	26.7	MODERATE
F118	18.2	5.9	8.3	135.0	2.8	12.5	96.2	105.6	5.7	8.1	7.5	84.0	174.4	12.5	SATISFACTORY
F119	-	-	-	-	-	-	-	-	53.2	-	-	-	-	-	-
F121	4.2	3.1	3.3	6.0	4.1	1.2	9.0	1.1	6.8	6.7	10.0	26.7	-	5.1	GOOD
F122	18.4	20.0	0.0	10.0	18.4	25.0	7.9	0.0	5.6	2.8	5.3	7.9	8.3	7.9	GOOD
F123	90.5	41.0	-	-	-	-	-	-	-	-	-	-	-	65.7	POOR
F124	5.5	23.6	78.2	-	38.5	42.4	22.4	50.9	55.8	-	-	-	-	40.5	MODERATE
F125	48.0	-	-	-	37.8	-	27.7	-	36.3	-	-	-	-	37.1	MODERATE
F126	88.0	48.1	-	69.2	44.0	26.7	70.9	-	-	-	-	-	-	58.6	MODERATE
F127	-	81.2	88.3	56.0	-	-	-	-	-	-	-	-	-	81.2	POOR
F128	-	26.2	11.1	-	-	-	-	-	-	-	-	-	-	18.7	SATISFACTORY
F129	-	-	-	-	10.0	17.8	28.7	30.6	15.0	19.0	27.1	1.8	0.0	17.8	SATISFACTORY
F130	-	-	41.8	30.2	17.7	12.5	-	-	26.3	-	-	-	-	26.3	MODERATE
F131	-	-	-	-	-	-	-	-	-	-	81.8	53.0	-	67.4	POOR
F133	-	-	-	-	-	-	-	-	-	-	-	-	12.4	-	-
INTERLAB MEDIAN	29.9	26.1	24.6	20.6	26.1	25.0	25.1	23.8	19.5	19.0	22.9	23.7	18.5		

STUDY DATES: 0058(13-MAY-92), 0059(21-SEP-92), 0060(28-JAN-93), 0061(19-MAY-93), 0062(19-SEP-93), 0063(21-JAN-94), 0064(10-MAY-94), 0065(20-SEP-94), 0066(15-JAN-95), 0067(05-SEP-95), 0068(01-MAR-96), 0069(01-SEP-96), 0070(03-MAR-97)

Table 4

Rain and Soft Waters Sample Design for FP 70
March and April 1997

Sample Number	Sample Name	Source (Province/State)	Expected Conductance (µS/cm 25°C)
FP 70 SW-1	RainGR16	Grimsby Rain, 1996 (ON)	8
FP 70 SW-2	RainGR3-5*	Grimsby Rain, 1995 (ON)	NA†
FP 70 SW-3	RainGR6NS	Grimsby Rain, 1995 (ON), spiked‡	NA†
FP 70 SW-4	RainGR17NS	Grimsby Rain, 1996 (ON), spiked‡	NA†
FP 70 SW-5	GRM-07	Grimsby Rain, 1994 (ON)	29
FP 70 SW-6	BMOOS-01	Big Moose Lake (NY)	25
FP 70 SW-7	BEAV-02	Beaverskin Lake (ON)	26
FP 70 SW-8	MERSEY-01	Mersey River (NS)	29
FP 70 SW-9	TROIS-94	Trois Rivières (PQ)	33
FP 70 SW-10	TRKY-94	Turkey Lakes & Grimsby Rain (ON)	40

* An 80/20 mixture of RainGR3 and RainGR5.
† Not available.
‡ 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 and 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. These acids may react with organic constituents in the sample and show low recoveries of acid ions.

In FP70, two samples were acidified and the results are summarized below.

Sample Name	Parameter	Initial Concentration (ppm)	Amount Added (as HNO_3 and H_2SO_4)	Final Concentration (FP 70 Mean)	% Recovery
GR6NS	pH	6.47	1.1×10^{-4} moles/L H^+	4.1	74
	NO_3^-	0.408	3.0 mg/L	1.52	37
	SO_4^{2-}	2.7	3.0 mg/L	5.59	96
GR17NS	pH	NA*	7.32×10^{-5} moles/L H^+	4.1	NA*
	NO_3^-	NA*	2.0 mg/L	0.848	NA*
	SO_4^{2-}	NA*	2.0 mg/L	4.06	NA*

With the cooperation of study participants we are experimenting with ways to predict and improve these recoveries. Experimental results will be incorporated into future interlaboratory studies as our research indicates.

* Not available.

Table 5

SUMMARY of Interlaboratory MEDIAN VALUES for Rain & Soft Waters - Study 0070

PARAMETER		SAMPLE NUMBER						
		RAINGR-16 SAMPLE 1	RAINGR-3-5 SAMPLE 2	RAINGR-6NS SAMPLE 3	RAINGR-17NS SAMPLE 4	GRM-07 SAMPLE 5	BMOOS-01 SAMPLE 6	BEAV-02 SAMPLE 7
Colour	Hazen Unit	.9000	2.4000	1.0000	1.2000	3.8000	9.0000	5.9500
Specific Conductance	uS/cm	8.5350	15.000	53.900	43.400	29.900	23.550	34.050
Acidity to pH 8.3	mg/L CaCO3	2.0000	2.0000	6.2000	6.5500	2.1200	3.7100	4.0000
pH	pH Units	5.9600	5.8100	4.1000	4.1000	6.9100	5.3400	4.5850
Diss Organic Carbon	mg/L C	.2000	.3000	.2700	.1500	.8450	3.4000	1.2600
Alkalinity Fixed End Pt pH 4.5	mg/L	2.0000	1.9750	-	-	7.7000	1.8900	.2500
Alkalinity Gran Infl Extrap	mg/L	.6400	.4000	-	-	6.1200	.2500	-1.4100
Alkalinity Gran Titn	mg/L CaCO3	.4400	.2850	-4.1500	-4.1150	6.0500	.1450	-1.4200
Diss Inorg Carbon	mg/L C	.4050	.3975	.3250	.2825	1.6000	.2875	.3450
Nitrate + Nitrite	mg/L N	.2470	.6545	1.5150	.8448	.5665	.4100	.1250
Nitrate-IC	mg/L N	.2400	.6500	1.5000	.8470	.5700	.4100	.1240
Ammonia	mg/L N	.1680	.0030	.0023	.1700	.3550	.0180	.0030
Total Kjeldahl N	mg/L N	.2000	.0950	.1000	.2100	.4700	.2000	.1000
Sodium	mg/L	.0690	.1000	.2160	.0500	.2800	.6000	2.6200
Magnesium	mg/L	.1735	.4340	.5500	.1600	.9980	.3100	.3600
Aluminum	mg/L	.0070	.0040	.0023	.0082	.0550	.2250	.0467
Reactive Silica	mg/L Si	.0180	.0315	.0240	.0120	.0805	1.9650	.1695
Sulfate IC	mg/L	1.3625	2.4035	5.5370	4.0390	3.8100	5.4300	3.7000
Sulfate Colour	mg/L	1.4000	2.3650	5.4000	3.9500	3.8000	5.5000	3.7000
Chloride IC	mg/L	.1500	.2200	.4140	.1170	.4875	.4500	4.1075
Chloride Colour	mg/L	.2000	.2242	.3995	.1000	.5000	.5000	4.0605
Potassium	mg/L	.0250	.0600	.0600	.0160	.1590	.4100	.2300
Calcium	mg/L	.6060	1.3800	1.9100	.7080	2.6400	1.9800	.5000

		MERSEY-01 SAMPLE 8	TROIS-94 SAMPLE 9	TRKY-94 SAMPLE 10
Colour	Hazen Unit	40.500	36.000	5.0000
Specific Conductance	uS/cm	26.950	31.850	40.750
Acidity to pH 8.3	mg/L CaCO3	3.2000	2.2350	2.0500
pH	pH Units	5.4450	6.8000	6.9900
Diss Organic Carbon	mg/L C	4.1400	5.5755	1.5400
Alkalinity Fixed End Pt pH 4.5	mg/L	1.8250	6.4400	8.8500
Alkalinity Gran Infl Extrap	mg/L	.5000	4.7100	7.0400
Alkalinity Gran Titn	mg/L CaCO3	.2900	5.0280	7.1500
Diss Inorg Carbon	mg/L C	.3475	1.2000	1.9000
Nitrate + Nitrite	mg/L N	.0330	.0700	.8510
Nitrate-IC	mg/L N	.0320	.0700	.8600
Ammonia	mg/L N	.0050	.0260	.3050
Total Kjeldahl N	mg/L N	.1270	.2530	.4200
Sodium	mg/L	2.9370	2.2000	.5561
Magnesium	mg/L	.3850	.6000	.8300
Aluminum	mg/L	.1015	.0724	.0190
Reactive Silica	mg/L Si	1.0750	1.9600	.7780
Sulfate IC	mg/L	2.2210	4.7230	5.8600
Sulfate Colour	mg/L	2.8500	5.0600	5.8300
Chloride IC	mg/L	4.6535	1.7050	.5200
Chloride Colour	mg/L	4.7500	1.8000	.5200
Potassium	mg/L	.2930	.5100	.2000
Calcium	mg/L	.8000	2.5000	4.5500

Quantifying Bias in NWRI QA Studies

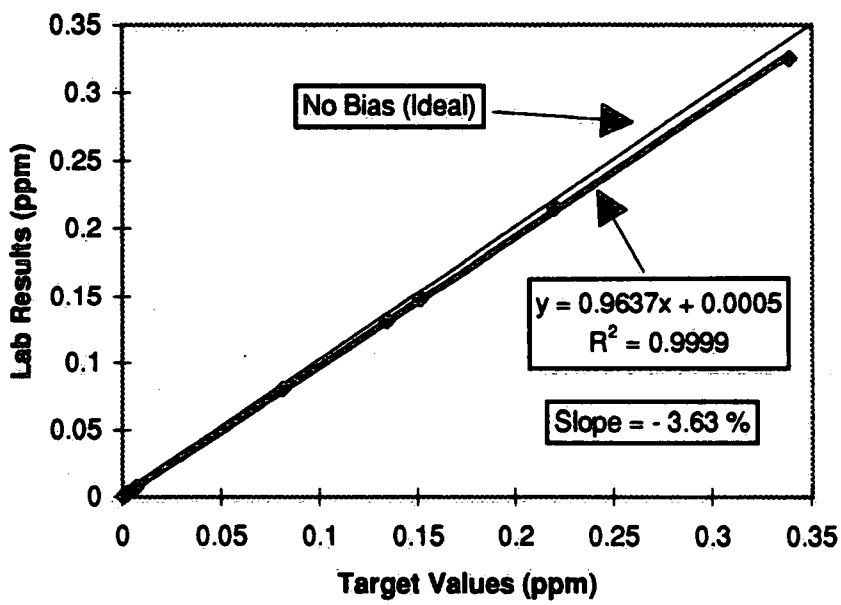
Introduction

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**



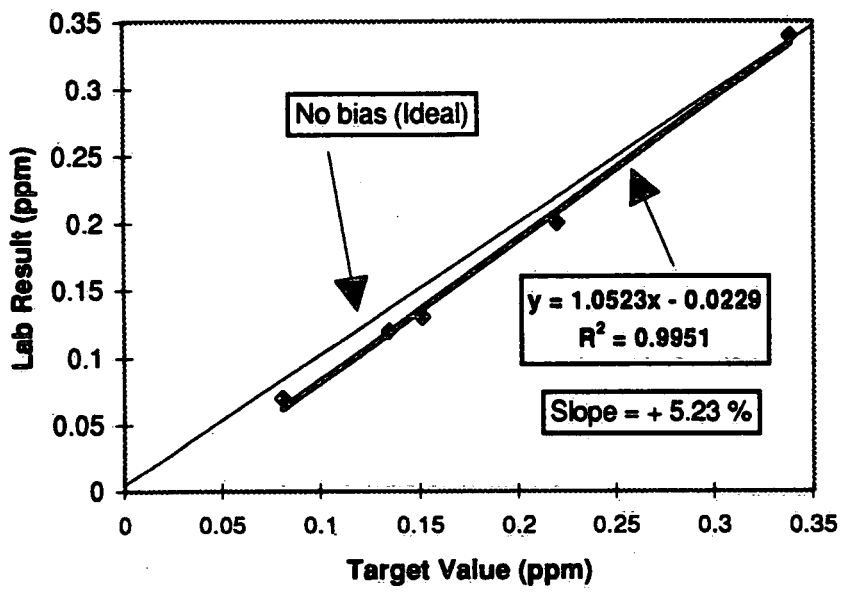
[1] Systematic bias is often identified with the comparison of data to a certified standard.

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

June 1996

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

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= .0300

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	8.46	11.00	15.	12.50	55.3	23.00	44.2	20.50	30.2	22.00	23.5	13.50
F002	8.9	19.50	15.7	24.50	55.2	22.00	44.5	23.00	31.2	27.00	24.8	26.00
F003	8.9	19.50	15.3	18.50	55.7	24.50	44.1	19.00	30.4	24.50	23.6	15.00
F004	8.53	14.00	15.0	12.50	54.4	18.50	43.4	14.50	29.9	14.00	23.4	12.00
F007	8.1	6.50	14.6	5.00	53.4	11.00	41.9	5.50	28.8	6.50	22.4	4.50
F008	8.28	8.00	14.8	8.00	58.0 H	28.00	45.8	27.00	28.8	6.50	21.8	3.00
F009	9.	22.50	15.	12.50	52.	7.00	42.	8.00	30.	18.00	24.	21.50
F010	7.0 L	2.00	13.5	2.00	51. L	5.00	41.3	2.00	28.	2.00	22.6	6.00
F011	13.3 EH	28.00	15.4	20.50	57.2 H	27.00	45.9	28.00	30.7	26.00	24.1	24.00
F014	8.76	18.00	15.2	17.00	56.3	26.00	44.6	24.50	30.4	24.50	23.7	16.50
F015	10.	26.50	17. EH	28.00	54.	16.00	42.	8.00	32. EH	28.00	26. EH	27.50
F020	6.96 L	1.00	13.1 EL	1.00	54.0	16.00	43.1	13.00	26.4 EL	1.00	21.3 L	2.00
F025	9.1	24.00	15.4	20.50	52.2	8.00	44.6	24.50	30.0	18.00	23.9	19.00
F026	8.93	21.00	15.6	23.00	53.8	14.00	44.0	17.50	29.9	14.00	24.0	21.50
F032	8.0	5.00	16.0	27.00	54.4	18.50	45.0	26.00	30.0	18.00	26.0 EH	27.50
F036	7.8	3.00	14.4	4.00	53.6	12.00	42.0	8.00	29.2	8.50	22.8	7.50
F037	9.72	25.00	15.75	26.00	53.2	9.50	43.9	16.00	29.7	12.00	23.7	16.50
F038	9.	22.50	15.	12.50	47. EL	1.00	43.	12.00	30.	18.00	23.	10.00
F042	8.3	9.00	14.7	6.50	53.7	13.00	42.6	11.00	29.4	10.00	22.9	9.00
F053	8.7	16.00	15.5	22.00	55.7	24.50	44.4	22.00	30.3	23.00	24.6	25.00
F060	8.5	12.50	15.0	12.50	55.0	20.50	44.0	17.50	30.0	18.00	24.0	21.50
F069	8.5	12.50	15.3	18.50	50.9 L	3.50	42.2	10.00	30.1	21.00	24.0	21.50
F072	10.0	26.50	14.9	9.00	48.1 VL	2.00	40.0 L	1.00	28.3	3.50	20.7 EL	1.00
F107	7.97	4.00	14.1	3.00	51.9	6.00	41.7	3.50	28.5	5.00	22.4	4.50
F110	8.1	6.50	15.0	12.50	54.0	16.00	43.4	14.50	28.3	3.50	23.2	11.00
F112	8.73	17.00	15.1	16.00	53.2	9.50	41.7	3.50	29.6	11.00	23.5	13.50
F122	8.54	15.00	14.7	6.50	50.9 L	3.50	41.9	5.50	29.2	8.50	22.8	7.50
F133	8.40	10.00	15.7	24.50	55.0	20.50	44.2	20.50	29.9	14.00	23.8	18.00
MEDIAN	8.5350		15.0000		53.9000		43.4000		29.9000		23.5500	
1CRIT	1.4760		1.6700		2.8370		2.5220		2.1170		1.9265	
N	26		26		26		26		26		25	
MEAN	8.6238		15.0635		53.6192		43.2885		29.6462		23.3520	
3STDEV	1.9343		1.6013		5.8717		3.6613		2.3508		2.4521	

PARAMETER: 00392 Specific Conductance uS/cm

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	34.7	20.50	26.9	13.50	32.2	21.50	41.1	19.00
F002	35.2	26.00	27.9	26.00	32.9	27.00	42.1	27.00
F003	34.8	22.50	27.1	18.00	32.2	21.50	40.8	15.50
F004	34.3	16.50	26.8	12.00	31.8	14.00	40.7	14.00
F007	33.4	9.00	26.0	4.50	30.5	5.50	39.6	6.00
F008	34.4	18.00	26.0	4.50	30.5	5.50	39.2	4.00
F009	34.	13.00	27.	16.00	32.	16.50	41.	17.50
F010	32.5	3.00	25.3	2.00	30.1	3.00	39.3	5.00
F011	35.6	28.00	27.3	21.50	32.6	26.00	41.3	22.50
F014	35.4	27.00	27.2	19.50	32.2	21.50	41.2	20.00
F015	34.	13.00	29. EH	28.00	34. EH	28.00	43.	28.00
F020	31.4 L	2.00	24.0 EL	1.00	28.5 EL	1.00	40.1	10.00
F025	34.8	22.50	27.4	24.00	32.1	18.00	41.3	22.50
F026	34.3	16.50	27.4	24.00	31.9	15.00	40.8	15.50
F032	35.0	24.00	28.0	27.00	32.4	25.00	41.6	26.00
F036	33.2	8.00	26.2	7.50	31.2	10.50	40.4	13.00
F037	34.7	20.50	27.2	19.50	32.2	21.50	41.3	22.50
F038	33.	6.50	27.	16.00	31.	8.50	40.	9.00
F042	33.7	10.00	26.2	7.50	31.2	10.50	39.9	8.00
F053	35.1	25.00	27.4	24.00	32.2	21.50	41.4	25.00
F060	34.0	13.00	27.0	16.00	32.0	16.50	41.0	17.50
F069	33.8	11.00	27.3	21.50	32.2	21.50	41.3	22.50
F072	30.3 EL	1.00	26.2	7.50	30.3	4.00	38.8	2.00
F107	32.8	5.00	25.6	3.00	30.0	2.00	38.1 L	1.00
F110	33.0	6.50	26.4	10.00	30.7	7.00	39.0	3.00
F112	34.1	15.00	26.6	11.00	31.5	12.00	40.2	11.00
F122	32.7	4.00	26.2	7.50	31.0	8.50	39.7	7.00
F133	34.5	19.00	26.9	13.50	31.7	13.00	40.3	12.00
MEDIAN	34.0500		26.9500		31.8500		40.7500	
1CRIT	2.2415		2.0285		2.1755		2.4425	
N	26		26		26		26	
MEAN	33.9538		26.7885		31.5615		40.5154	
3STDEV	2.8633		1.9853		2.4216		2.5870	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	177.00	17.700	10					
F002	248.00	24.800	10		BIASED HIGH*	1.81	.4953	meter
F003	198.50	19.850	10					CONDUCTIVITYPROBE
F004	142.00	14.200	10					02041
F007	64.00	6.400	10		BIASED LOW*	-1.02	-.6035	CPQ002E2
F008	112.50	11.250	10	H				Autoelectrode
F009	152.50	15.250	10					
F010	32.00	3.200	10	L L	BIASED LOW*	-2.61	-.9262	
F011	251.50	25.150	10	EH H	BIASED HIGH*	.05	1.5374	
F014	214.50	21.450	10					
F015	231.00	23.100	10	EH EHEH EHEH	BIASED HIGH	-5.10	2.8820	02041
F020	48.00	4.800	10	L EL ELL L ELEL	BIASED LOW	4.68	-3.3427	Radiometer
F025	201.00	20.100	10					
F026	182.00	18.200	10					Radiometer
F032	224.00	22.400	10	EH	BIASED HIGH*	1.12	.5059	E3177A
F036	82.00	8.200	10					E3024A
F037	189.00	18.900	10					VWR
F038	116.00	11.600	10	EL				Cond. Meter
F042	94.50	9.450	10					Cond. meter
F053	228.00	22.800	10		BIASED HIGH*	2.67	-.0819	Bridge+Cell
F060	165.50	16.550	10					conductance meter
F069	163.50	16.350	10	L				Wheatstone BR
F072	57.50	5.750	10	VLL ELEL	BIASED LOW	-13.38	2.0913	Electrometric
F107	37.00	3.700	10	L	BIASED LOW	-3.62	-.3661	Electropo
F110	90.50	9.050	10					YSI meter
F112	119.50	11.950	10					YSI cond meter
F122	73.50	7.350	10	L				Radiometer
F133	165.00	16.500	10					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 14.500

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F010	32.00	3.200	10	LL	BIASED LOW*	-2.61	-.9262	
F107	37.00	3.700	10	L	BIASED LOW	-3.62	-.3661	Electropo
F020	48.00	4.800	10	LELELLLELEL	BIASED LOW	4.68	-3.3427	Radiometer
F072	57.50	5.750	10	VLLELEL	BIASED LOW	-13.38	2.0913	Electrometric
F007	64.00	6.400	10		BIASED LOW*	-1.02	-.6035	CPQ002E2
F122	73.50	7.350	10	L				Radiometer
F036	82.00	8.200	10					E3024A
F110	90.50	9.050	10					YSI meter
F042	94.50	9.450	10					Cond. meter
F008	112.50	11.250	10	H				Autoelectrode
F038	116.00	11.600	10	EL				Cond. Meter
F112	119.50	11.950	10					YSI cond meter
F004	142.00	14.200	10					02041
F009	152.50	15.250	10					
F069	163.50	16.350	10	L				Wheatstone BR
F133	165.00	16.500	10					Cond meter
F060	165.50	16.550	10					conductance meter
F001	177.00	17.700	10					
F026	182.00	18.200	10					Radiometer
F037	189.00	18.900	10					VWR
F003	198.50	19.850	10					CONDUCTIVITYPROBE
F025	201.00	20.100	10					
F014	214.50	21.450	10					
F032	224.00	22.400	10	EH	BIASED HIGH*	1.12	.5059	E3177A
F053	228.00	22.800	10		BIASED HIGH*	2.67	-.0819	Bridge+Cell
F015	231.00	23.100	10	EHEHEHEHEH	BIASED HIGH	-5.10	2.8820	02041
F002	248.00	24.800	10		BIASED HIGH*	1.81	.4953	meter
F011	251.50	25.150	10	EHH	BIASED HIGH*	.05	1.5374	

* 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 14.500

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= .1500

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
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. L	2.50
F003	<1.	0.00	2.8	4.00	<1.	0.00	1.4	4.00	3.2	3.00	8.9	7.00
F004	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	5. L	2.50
F007	1.W	0.00	1.W	0.00	1.W	0.00	1.W	0.00	4.T	6.50	7.	6.00
F008	<5.	0.00	<5.	0.00	<5.	0.00	5. H	6.00	5.	8.50	10.	10.00
F010	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	<1. EL	0.00	6.	5.00
F011	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5. L	0.00
F014	0.0	1.00	5.0	6.00	0.0	1.00	0.0	1.00	5.0	8.50	5.0 L	2.50
F025	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	5. L	2.50
F032	<.4	0.00	<.4	0.00	<.2	0.00	<.2	0.00	3.4	4.00	10.8	13.00
F036	<.6	0.00	<.8	0.00	<.6	0.00	<.6	0.00	3.6	5.00	10.6	12.00
F038	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	9.	8.00
F042	.8	2.00	1.6	2.00	.8	2.00	.8	2.00	5.2	10.00	10.3	11.00
F060	3.	4.00	3.	5.00	3.	5.00	3.	5.00	3.	1.00	13. H	15.00
F072	1.	3.00	2.	3.00	1.	3.00	1.	3.00	4.	6.50	12.	14.00
F122	.44W	0.00	.82	1.00	1.2	4.00	.07W	0.00	3.1	2.00	9.5	9.00
MEDIAN	.9000		2.4000		1.0000		1.2000		3.8000		9.0000	
1CRIT	3.0000		3.0000		3.0000		3.0000		3.1200		3.9000	
N	2		4		3		4		8		14	
MEAN	.9000		2.3500		1.0000		1.5500		3.9125		8.1500	
3STDEV	-		-		-		-		2.0970		7.3762	

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	<5.0	0.00	40.	6.50	35.	8.00	<5.0	0.00
F003	12. EH	12.00	50. H	15.50	30.	5.00	6.2	10.00
F004	<5.	0.00	35.	4.00	30.	5.00	<5.	0.00
F007	4.T	2.00	41.	9.00	37.	9.00	4.T	4.00
F008	10. H	11.00	40.	6.50	40.	14.00	10. EH	11.00
F010	2. L	1.00	27. VL	1.00	25. L	1.00	2.	1.00
F011	<5.	0.00	40.	6.50	30.	5.00	<5.	0.00
F014	5.0	3.50	40.0	6.50	30.0	5.00	5.0	6.50
F025	<5.	0.00	30. L	3.00	30.	5.00	<5.	0.00
F032	6.2	10.00	43.4	11.00	37.8	10.00	3.4	3.00
F036	5.2	5.00	42.2	10.00	38.4	12.00	5.0	6.50
F038	6.	7.50	28. L	2.00	27. L	2.00	<5.	0.00
F042	5.9	6.00	47.4	13.00	42.3	16.00	5.9	9.00
F060	5.	3.50	50. H	15.50	40.	14.00	3.	2.00
F072	6.	7.50	47.	12.00	38.	11.00	5.	6.50
F122	6.1	9.00	48.	14.00	40.	14.00	5.0	6.50
MEDIAN	5.9500		40.5000		36.0000		5.0000	
1CRIT	3.4425		8.6250		7.9500		3.3000	
N	10		13		14		9	
MEAN	5.9400		40.1538		34.5143		4.7222	
3STDEV	4.5164		17.7258		13.7266		3.0192	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	17.00	5.667	3	L	INSUFFICIENT DATA			spectrophotometer
F003	60.50	7.563	8	EHH				SPECTROPHOTOMETRIC
F004	11.50	3.833	3	L	INSUFFICIENT DATA			02021
F007	36.50	6.083	6					CPQ006E0
F008	67.00	9.571	7	H H EH				Manual visual
F010	9.00	1.800	5	EL L VLL	BIASED LOW	-28.24	-1.4426	
F011	11.50	5.750	2	L	INSUFFICIENT DATA			
F014	41.50	4.150	10	L	BIASED LOW*	-7.90	-.2394	
F025	10.50	3.500	3	L L	INSUFFICIENT DATA			
F032	51.00	8.500	6					E3219A
F036	50.50	8.417	6					E3025A
F038	19.50	4.875	4	L L	INSUFFICIENT DATA			Spectrophotometry
F042	73.00	7.300	10					Colourimetric
F060	70.00	7.000	10	H H				visual comparison
F072	69.50	6.950	10					Pt cobalt
F122	59.50	7.438	8					Spectro

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 25.00

OVERALL AVERAGE
RANK IS 6.515

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F010	9.00	1.800	5	ELLVLL	BIASED LOW	-28.24	-1.4426	
F025	10.50	3.500	3	LL	INSUFFICIENT DATA			
F004	11.50	3.833	3	L	INSUFFICIENT DATA			02021
F014	41.50	4.150	10	L	BIASED LOW*	-7.90	-.2394	
F038	19.50	4.875	4	LL	INSUFFICIENT DATA			Spectrophotometry
F002	17.00	5.667	3	L	INSUFFICIENT DATA			spectrophotometer
F011	11.50	5.750	2	L	INSUFFICIENT DATA			
F007	36.50	6.083	6					CPQ006E0
F072	69.50	6.950	10					Pt cobalt
F060	70.00	7.000	10	HH				visual comparison
F042	73.00	7.300	10					Colourimetric
F122	59.50	7.438	8					Spectro
F003	60.50	7.563	8	EHH				SPECTROPHOTOMETRIC
F036	50.50	8.417	6					E3025A
F032	51.00	8.500	6					E3219A
F008	67.00	9.571	7	HHEH				Manual visual

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 25.00

OVERALL AVERAGE
RANK IS 6.515

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= .6000 CONCENTRATION ERROR INCREMENT= .1000

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F015	2.	3.50	2.	3.50	8. VH	6.00	7.	5.00	3. H	6.00	4.	5.50
F020	2.31	5.00	2.40	5.00	6.71	5.00	6.70	4.00	2.24	4.00	3.62	3.00
F032	1.05 L	2.00	1.25 L	2.00	5.25	2.00	5.20 L	2.00	.95 VL	2.00	2.75 L	2.00
F038	2.	3.50	2.	3.50	4. VL	1.00	8. H	6.00	2.	3.00	4.	5.50
F072	2.9 H	6.00	4.3 EH	6.00	6.7	4.00	6.4	3.00	2.4	5.00	3.8	4.00
F107	0.W	1.00	0.W	1.00	5.70	3.00	3.96 EL	1.00	0.W	1.00	0.W	1.00
MEDIAN	2.0000		2.0000		6.2000		6.5500		2.1200		3.7100	
1CRIT	.7000		.7000		1.1200		1.1550		.7120		.8710	
N	4		4		4		4		4		3	
MEAN	1.8400		1.9125		6.0900		6.3250		1.8975		3.3900	
3STDEV	-		-		-		-		-		-	

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F015	4.	3.00	3.	3.00	3. H	5.00	3. H	6.00
F020	4.64	5.00	3.45	5.00	2.27	4.00	2.30	5.00
F032	2.95 L	1.00	2.20 L	2.00	1.10 VL	2.00	.75 VL	2.00
F038	4.	3.00	4.	6.00	4. EH	6.00	2.	3.00
F072	4.0	3.00	3.4	4.00	2.2	3.00	2.1	4.00
F107		0.00	0.W	1.00	0.W	1.00	0.W	1.00
MEDIAN	4.0000		3.2000		2.2350		2.0500	
1CRIT	.9000		.8200		.7235		.7050	
N	3		4		4		4	
MEAN	4.0000		3.0125		2.1425		1.7875	
3STDEV	-		-		-		-	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F015	46.50	4.650	10	VH H H H				
F020	45.00	4.500	10					Electrom
F032	19.00	1.900	10	L L L VLL L L VLVL				E3248A
F038	40.50	4.050	10	VLH EH				Titration
F072	42.00	4.200	10	H EH				Electro NaOH
F107	11.00	1.222	9	EL				Volumetric

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

OVERALL AVERAGE
RANK IS 3.458

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F107	11.00	1.222	9	EL				Volumetric
F032	19.00	1.900	10	LLLVLLLLVLVL				E3248A
F038	40.50	4.050	10	VLHEH				Titration
F072	42.00	4.200	10	HEH				Electro NaOH
F020	45.00	4.500	10					Electrom
F015	46.50	4.650	10	VHHHH				

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

OVERALL AVERAGE
RANK IS 3.458

Acidity to pH 8.3

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= .2000 CONCENTRATION ERROR INCREMENT= 0.0000

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	5.96	16.00	5.78	14.00	4.10	13.50	4.10	13.00	6.74	5.00	5.37	19.50
F002	5.88	11.00	5.68	7.50	4.05	8.00	4.06	8.00	7.02	20.00	5.21	6.00
F003	5.84	10.00	5.84	18.00	4.11	16.50	4.11	16.00	6.95	17.00	5.33	13.50
F004	6.02	20.50	6.20 VH	28.00	4.07	9.00	4.16	25.50	7.06	23.00	5.56 H	29.00
F007	5.91	13.00	5.75	11.50	4.04	7.00	4.05	7.00	7.05	22.00	5.40	22.50
F008	5.82	9.00	5.68	7.50	4.10	13.50	4.10	13.00	6.79	6.00	5.32	11.00
F010	5.98	19.00	5.88	22.00	4.03	6.00	4.03	6.00	7.03	21.00	5.28	7.00
F011	6.02	20.50	5.86	20.00	4.09	11.00	4.09	9.00	6.89	13.00	5.35	17.00
F014	5.81	8.00	5.75	11.50	4.15	23.00	4.14	19.50	6.84	9.00	5.31	9.50
F015	6.08	25.00	5.96	24.00	4.12	18.50	4.15	22.50	7.01	18.00	5.40	22.50
F017	5.79	7.00	5.71	9.00	4.14	20.00	4.14	19.50		0.00	5.42	24.00
F020	5.96	16.00	5.82	16.00	4.17	26.50	4.15	22.50	7.08	25.00	5.39	21.00
F025	6.37 VH	28.00	6.12 VH	27.00	4.18	28.00	4.16	25.50	7.42 VH	28.00	5.50	27.00
F026	5.94	14.00	5.94	23.00	4.12	18.50	3.95	3.00	6.81	7.00	5.51	28.00
F032	6.18 H	27.00	5.97	25.00	4.15	23.00	4.15	22.50	7.17 H	26.00	5.45	25.00
F036	5.77	5.50	5.56 L	5.00	4.10	13.50	4.10	13.00	6.82	8.00	5.34	15.50
F037	6.07	24.00	5.76	13.00	4.17	26.50	4.18	27.50	6.90	14.00	5.46	26.00
F038	5.58 VL	4.00	5.33 VL	3.00	3.89 L	2.00	3.90	2.00	6.61 L	4.00	5.11 L	4.00
F042	5.96	16.00	5.83	17.00	4.11	16.50	4.13	17.50	6.93	16.00	5.30	8.00
F053	6.61 EH	29.00	6.01	26.00	4.15	23.00	4.15	22.50	7.25 VH	27.00	5.33	13.50
F060	5.4 VL	1.50	5.4 VL	4.00	3.9	3.00	4.1	13.00	6.1 EL	1.00	5.1 L	2.50
F069	6.05	22.50	6.27 VH	29.00	4.15	23.00	4.13	17.50	6.87	11.50	5.37	19.50
F072	5.41 VL	3.00	5.22 VL	1.00	3.98	4.00	3.99	4.00	6.17 EL	2.00	5.10 L	2.50
F107	5.77	5.50	5.63	6.00	4.00	5.00	4.00	5.00	6.92	15.00	5.18	5.00
F109	5.976	18.00	5.850	19.00	4.196	29.00	4.191	29.00	7.018	19.00	5.356	18.00
F110	6.05	22.50	5.81	15.00	4.15	23.00	4.18	27.50	7.07	24.00	5.34	15.50
F112	5.901	12.00	5.742	10.00	4.085	10.00	4.095	10.00	6.854	10.00	5.322	12.00
F122	6.14	26.00	5.87	21.00	4.10	13.50	4.10	13.00	6.87	11.50	5.31	9.50
F133	5.40 VL	1.50	5.27 VL	2.00	3.76 EL	1.00	3.73 EL	1.00	6.55 VL	3.00	4.92 EL	1.00
MEDIAN	5.9600		5.8100		4.1000		4.1000		6.9100		5.3400	
1CRIT	.2000		.2000		.2000		.2000		.2000		.2000	
N	26		27		27		27		26		27	
MEAN	5.9322		5.7779		4.0891		4.0961		6.8951		5.3281	
3STDEV	.5571		.6280		.2227		.2069		.6349		.3235	

PARAMETER: 01092 pH pH Units

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001		0.00		0.00		0.00		0.00
F002	4.51	8.00	5.35	4.00	6.83	17.00	7.07	20.00
F003	4.58	14.00	5.41	8.50	6.64	7.00	6.96	11.50
F004	4.59	15.50	5.83 VH	27.00	6.97	24.00	7.14	26.00
F007	4.53	10.00	5.40	7.00	6.85	20.00	7.11	22.00
F008	4.48	5.00	5.41	8.50	6.62	6.00	6.84	5.00
F010	4.52	9.00	5.44	13.50	6.72	11.00	6.99	14.00
F011	4.59	15.50	5.49	18.00	6.82	16.00	7.05	18.00
F014	4.63	22.00	5.42	10.00	6.72	11.00	6.93	9.00
F015	4.74	27.50	5.80 VH	26.00	6.90	22.00	7.11	22.00
F017	4.63	22.00	5.44	13.50		0.00		0.00
F020	4.74	27.50	5.62	25.00	6.96	23.00	7.11	22.00
F025	4.63	22.00	5.53	20.50	7.21 VH	27.00	6.96	11.50
F026	4.30 L	2.00	5.55	22.00	6.68	8.00	6.89	6.50
F032	4.64	24.00	5.61	23.50	7.08 H	26.00	7.06	19.00
F036	4.56	11.00	5.38	6.00	6.60 L	5.00	6.89	6.50
F037	4.66	25.00	5.43	12.00	6.72	11.00	6.90	8.00
F038	4.36 L	3.00	5.12 VL	2.00	6.44 VL	4.00	6.72 L	4.00
F042	4.61	19.50	5.47	16.50	6.84	18.00	7.04	17.00
F053	4.61	19.50	5.53	20.50	7.01 H	25.00	7.25 H	27.00
F060	4.4	4.00	5.2 L	3.00	6.1 EL	2.00	6.1 EL	1.00
F069	4.60	17.50	5.51	19.00	6.80	14.00	6.98	13.00
F072	4.50	7.00	4.99 EL	1.00	6.02 EL	1.00	6.28 EL	2.00
F107	4.49	6.00	5.36	5.00	6.81	15.00	7.03	16.00
F109	4.663	26.00	5.61	23.50	6.848	19.00	7.133	25.00
F110	4.60	17.50	5.47	16.50	6.88	21.00	7.13	24.00
F112	4.562	12.00	5.426	11.00	6.746	13.00	6.993	15.00
F122	4.57	13.00	5.45	15.00	6.71	9.00	6.95	10.00
F133	4.15 EL	1.00	8.03 EH	28.00	6.40 VL	3.00	6.67 VL	3.00
MEDIAN	4.5850		5.4450		6.8000		6.9900	
1CRIT	.2000		.2000		.2000		.2000	
N	25		26		25		25	
MEAN	4.5526		5.4714		6.7478		6.9574	
3STDEV	.2710		.4427		.6163		.5484	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	81.00	13.500	6					Mettler Auto
F002	109.50	10.950	10					electrode
F003	132.00	13.200	10					pH ELECTRODE
F004	227.50	22.750	10	VH H VH	BIASED HIGH*	4.96	-.1217	10301
F007	142.00	14.200	10					CPQ004D0 stirred
F008	84.50	8.450	10					Autoelectrode
F010	128.50	12.850	10					
F011	158.00	15.800	10					
F014	132.50	13.250	10					
F015	228.00	22.800	10	VH	BIASED HIGH*	1.42	.0434	10301
F017	115.00	16.429	7					Electrometric
F020	224.50	22.450	10					pH meter
F025	244.50	24.450	10	VHVH VH VH	BIASED HIGH	9.30	-.3173	
F026	132.00	13.200	10	L				Radiometer stirred
F032	241.00	24.100	10	H H H	BIASED HIGH	5.71	-.1778	E3248A
F036	89.00	8.900	10	L L				E3042A
F037	187.00	18.700	10					Accumet
F038	32.00	3.200	10	VLVLL L L L VLVLL	BIASED LOW*	-4.34	-.0547	pH Meter
F042	162.00	16.200	10					Unstirred
F053	233.00	23.300	10	EH VH H H	BIASED HIGH	10.49	-.4017	Meter+Electrode
F060	35.00	3.500	10	VLVL ELL L ELEL	BIASED LOW	-25.92	1.0284	stirred/meter
F069	186.50	18.650	10	VH				Electrometric
F072	27.50	2.750	10	VLVL ELL ELELEL	BIASED LOW	-24.19	.9175	Electro stirred
F107	83.50	8.350	10					Electropo
F109	225.50	22.550	10		BIASED HIGH*	.18	.0701	electrometric
F110	206.50	20.650	10					stirred
F112	115.00	11.500	10					Stirred meter elec
F122	141.50	14.150	10					Hach comb. stirred
F133	44.50	4.450	10	VLVLELELVLELELEHVLVL	BIASED LOW*	-4.52	.1372	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 14.661

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F072	27.50	2.750	10	VLVLELLELELEL	BIASED LOW	-24.19	.9175	Electro stirred
F038	32.00	3.200	10	VLVLLLLLVLVLL	BIASED LOW*	-4.34	-.0547	pH Meter
F060	35.00	3.500	10	VLVLELLLELEL	BIASED LOW	-25.92	1.0284	stirred/meter
F133	44.50	4.450	10	VLVLELELVLELELEHVLVL	BIASED LOW*	-4.52	.1372	Electrode
F107	83.50	8.350	10					Electropo
F008	84.50	8.450	10					Autoelectrode
F036	89.00	8.900	10	LL				E3042A
F002	109.50	10.950	10					electrode
F112	115.00	11.500	10					Stirred meter elec
F010	128.50	12.850	10					
F026	132.00	13.200	10	L				Radiometer stirred
F003	132.00	13.200	10					pH ELECTRODE
F014	132.50	13.250	10					
F001	81.00	13.500	6					Mettler Auto
F122	141.50	14.150	10					Hach comb. stirred
F007	142.00	14.200	10					CPQ004D0 stirred
F011	158.00	15.800	10					
F042	162.00	16.200	10					Unstirred
F017	115.00	16.429	7					Electrometric
F069	186.50	18.650	10	VH				Electrometric
F037	187.00	18.700	10					Accumet
F110	206.50	20.650	10					stirred
F020	224.50	22.450	10					pH meter
F109	225.50	22.550	10		BIASED HIGH*	.18	.0701	electrometric
F004	227.50	22.750	10	VHHVH	BIASED HIGH*	4.96	-.1217	10301
F015	228.00	22.800	10	VH	BIASED HIGH*	1.42	.0434	10301
F053	233.00	23.300	10	EHVHHH	BIASED HIGH	10.49	-.4017	Meter+Electrode
F032	241.00	24.100	10	HHH	BIASED HIGH	5.71	-.1778	E3248A
F025	244.50	24.450	10	VHVHVHVH	BIASED HIGH	9.30	-.3173	

* 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 14.661

pH

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= .5000 CONCENTRATION ERROR INCREMENT= .0750

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	<.50	0.00	<.50	0.00	<.50	0.00	<.50	0.00	.6	3.50	3.3	6.00
F003	.2	5.50	.2	2.00	.2	3.00	.1	3.00	.8	6.00	3.2	4.50
F004	.199	4.00	.306	6.00	.359	7.00	.152	6.00	.845	9.00	3.32	7.00
F007	.17T	2.50	.23T	3.00	.20T	3.00	.11T	4.00	.81	7.00	3.41	13.00
F008	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	1.7 VH	16.00	4.3 EH	19.00
F010	<.2	0.00	<.2	0.00	<.2	0.00	<.2	0.00	.6	3.50	3.1	3.00
F014	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	3.7	16.50
F015	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	1.1	13.00	3.7	16.50
F020	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	2.88	1.00
F025	<.2	0.00	<.2	0.00	<.2	0.00	<.2	0.00	.2 L	1.00	2.9	2.00
F026	.0745	1.00	.1655	1.00	.0915	1.00	.0775	2.00	.8165	8.00	3.396	9.00
F032	<.1	0.00	<.1 EL	0.00	<.2	0.00	<.1	0.00	.7	5.00	3.2	4.50
F038	.7 EH	9.00	.8 EH	9.00	.6 EH	9.00	.6 EH	9.00	1.6 VH	15.00	3.8	18.00
F042	.26	7.00	.29	4.00	.30	6.00	.22	7.00	.92	12.00	3.40	11.00
F060	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	.5	2.00	3.5	14.00
F069	.2	5.50	.3	5.00	.2	3.00	.3	8.00	.9	11.00	3.4	11.00
F072	<.2	0.00	<.2	0.00	<.2	0.00	<.2	0.00	2.22 EH	17.00	3.37	8.00
F107	.17	2.50	.33	8.00	.40	8.00	0.W	1.00	1.22	14.00	3.59	15.00
F112	.45	8.00	.31	7.00	.27	5.00	.15	5.00	.88	10.00	3.40	11.00
MEDIAN	.2000		.3000		.2700		.1500		.8450		3.4000	
1CRIT	.5000		.5000		.5000		.5000		.5000		.6800	
N	7		7		7		7		15		17	
MEAN	.2356		.2809		.2756		.1585		.9328		3.3933	
3STDEV	.2755		.1316		.2274		.2159		.9996		.6600	

PARAMETER: 06002 Diss Organic Carbon mg/L C

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	1.0	5.00	4.0	7.00	5.4	6.50	1.4	4.00
F003	1.2	8.00	3.7	3.00	5.5	8.00	2.0	16.00
F004	1.26	10.00	4.03	8.50	5.36	5.00	1.47	6.50
F007	1.26	10.00	4.03	8.50	5.20	2.00	1.54	10.00
F008	1.4	16.00	4.8	19.00	6.7 EH	19.00	2.4 VH	18.00
F010	1.0	5.00	3.9	4.50	5.3	3.50	1.1	2.00
F014	1.4	16.00	4.5	15.00	6.0	16.00	1.6	13.50
F015	1.4	16.00	4.6	17.00	5.9	14.00	1.6	13.50
F020	.668 L	2.00	3.42	1.00	4.88	1.00	1.50	9.00
F025	.5 EL	1.00	3.6	2.00	5.4	6.50	.9 L	1.00
F026	1.3215	13.00	4.239	12.00	5.5755	10.00	1.4815	8.00
F032	1.1	7.00	3.9	4.50	5.3	3.50	1.4	4.00
F038	1.9 EH	19.00	4.7	18.00	6.0	16.00	2.2 H	17.00
F042	1.28	12.00	4.15	11.00	5.70	11.50	1.47	6.50
F060	1.0	5.00	4.4	14.00	6.0	16.00	1.4	4.00
F069	1.4	16.00	4.3	13.00	5.7	11.50	1.6	13.50
F072	.95	3.00	4.14	10.00	6.11	18.00	3.14 EH	19.00
F107	1.40	16.00	4.56	16.00	5.73	13.00	1.59	11.00
F112	1.26	10.00	3.96	6.00	5.54	9.00	1.60	13.50
MEDIAN	1.2600		4.1400		5.5755		1.5400	
1CRIT	.5195		.7355		.8432		.5405	
N	17		17		17		17	
MEAN	1.1941		4.1594		5.6303		1.6089	
3STDEV	.6117		.9217		.8433		.9175	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	32.00	5.333	6					Shimadzu
F003	59.00	5.900	10					IR/UV DIGESTION
F004	69.00	6.900	10					06104
F007	63.00	6.300	10					NAQ06104
F008	107.00	17.833	6	VHEH EHVH	BIASED HIGH	9.10	.5025	Calculation
F010	21.50	3.583	6		BIASED LOW*	.88	-.3181	
F014	77.00	15.400	5		BIASED HIGH	8.08	-.0003	
F015	90.00	15.000	6		BIASED HIGH	5.20	.1113	AutoCarbAnalyzer
F020	14.00	2.800	5	L	BIASED LOW	-9.64	-.2066	Filter, Sparge
F025	13.50	2.250	6	L EL L	BIASED LOW	9.67	-.8135	
F026	65.00	6.500	10					Autoanalyzer
F032	28.50	4.750	6	EL				E3370A
F038	139.00	13.900	10	EHEHEHEHVH EH H	BIASED HIGH*	-.94	.5387	Combustion IR
F042	88.00	8.800	10					Persulfate IR
F060	55.00	9.167	6					persulf/UV/colour
F069	97.50	9.750	10					Dorman
F072	75.00	12.500	6	EH EH				Persulfate UV OX
F107	104.50	10.450	10					Electropo
F112	84.50	8.450	10					Dohrmann

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

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F025	13.50	2.250	6	LELL	BIASED LOW	9.67	-.8135	
F020	14.00	2.800	5	L	BIASED LOW	-9.64	-.2066	Filter, Sparge
F010	21.50	3.583	6		BIASED LOW*	.88	-.3181	
F032	28.50	4.750	6	EL				E3370A
F002	32.00	5.333	6					Shimadzu
F003	59.00	5.900	10					IR/UV DIGESTION
F007	63.00	6.300	10					NAQ06104
F026	65.00	6.500	10					Autoanalyzer
F004	69.00	6.900	10					06104
F112	84.50	8.450	10					Dohrmann
F042	88.00	8.800	10					Persulfate IR
F060	55.00	9.167	6					persulf/UV/colour
F069	97.50	9.750	10					Dorman
F107	104.50	10.450	10					Electropo
F072	75.00	12.500	6	EHEH				Persulfate UV OX
F038	139.00	13.900	10	EHEHEHEHVHEHH	BIASED HIGH*	-.94	.5387	Combustion IR
F015	90.00	15.000	6		BIASED HIGH	5.20	.1113	AutoCarbAnalyzer
F014	77.00	15.400	5		BIASED HIGH	8.08	-.0003	
F008	107.00	17.833	6	VHEHEHVH	BIASED HIGH	9.10	.5025	Calculation

* 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 8.669

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= .5000 BASIC ACCEPTABLE ERROR= .3000 CONCENTRATION ERROR INCREMENT= .0750

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	<.50	0.00	<.50	0.00	<.50	0.00	<.50	0.00	.9 VL	2.00	<.50	0.00
F003	.4	4.00	.5	6.00	.4	6.00	.3	5.50	1.6	8.50	.3	5.00
F007	.34	3.00	.32	3.00	.21T	3.00	.18T	2.00	1.59	7.00	.22T	3.00
F008	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	1.5	5.50	<1.	0.00
F010	.2	2.00	.3	2.00	.2	2.00	.20	3.00	1.7	11.50	.2	2.00
F015	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	1.7	11.50	<.5	0.00
F025	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	.7 EL	1.00	<.5	0.00
F026	.410	5.00	.375	4.00	.290	4.00	.265	4.00	1.64	10.00	.275	4.00
F032	<.2	0.00	<.4	0.00	<.4	0.00	<.4	0.00	1.6	8.50	<.4	0.00
F036	.64	7.00	.66	8.00	.62	8.00	.48	7.00	1.80	14.00	.48	8.00
F038	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	1.5	5.50	<.5	0.00
F042	.74 H	8.00	.42	5.00	.36	5.00	.30	5.50	1.76	13.00	.35	6.00
F060	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	1.4	4.00	<.5	0.00
F107	.13	1.00	.07 EL	1.00	0.W	1.00	0.W	1.00	1.38	3.00	.01 EL	1.00
F112	.53	6.00	.54	7.00	.57	7.00	.56	8.00	1.93	15.00	.45	7.00
MEDIAN	.4050		.3975		.3250		.2825		1.6000		.2875	
1CRIT	.3000		.3000		.3000		.3000		.3825		.3000	
N	6		6		6		6		13		6	
MEAN	.4200		.4092		.3383		.2875		1.5438		.2992	
3STDEV	.4168		.2642		.3792		.2926		.6681		.2511	

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	<.50	0.00	<.50	0.00	.7 EL	1.00	1.4 L	2.50
F003	.4	6.00	.3	3.50	1.2	7.50	1.9	9.00
F007	.23T	3.00	.24T	2.00	1.11	5.00	1.80	6.00
F008	<1.	0.00	<1.	0.00	1.1	4.00	1.8	6.00
F010	.2	2.00	.3	3.50	1.2	7.50	2.	12.00
F015	<.5	0.00	<.5	0.00	1.2	7.50	1.9	9.00
F025	<.5	0.00	<.5	0.00	<.5 EL	0.00	1.0 EL	1.00
F026	.370	5.00	.395	5.00	1.245	10.00	1.945	11.00
F032	<.2	0.00	<.2	0.00	<.8 L	0.00	1.4 L	2.50
F036	.68 H	8.00	.56	8.00	1.46	13.00	2.04	13.50
F038	<.5	0.00	<.5	0.00	1.2	7.50	1.9	9.00
F042	.32	4.00	.41	6.00	1.27	11.00	2.04	13.50
F060	<.5	0.00	<.5	0.00	.8 L	2.00	1.8	6.00
F107	0.W	1.00	.04 EL	1.00	1.07	3.00	1.61	4.00
F112	.56	7.00	.49	7.00	1.45	12.00	2.15	15.00
MEDIAN	.3450		.3475		1.2000		1.9000	
1CRIT	.3000		.3000		.3525		.4050	
N	6		6		11		13	
MEAN	.3467		.3558		1.1677		1.8104	
3STDEV	.3565		.2514		.4549		.6232	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	5.50	1.833	3	VL ELL				Shimadzu
F003	61.00	6.100	10					IR
F007	37.00	3.700	10					NAQ06180
F008	15.50	5.167	3					Auto NDR
F010	47.50	4.750	10					
F015	28.00	9.333	3					AutoCarbAnalyzer
F025	2.00	1.000	2	EL ELEL				
F026	62.00	6.200	10					Autoanalyzer
F032	11.00	5.500	2	L L				E3370A
F036	94.50	9.450	10	H				E3028A
F038	22.00	7.333	3					Combustion IR
F042	77.00	7.700	10	H				IR
F060	12.00	4.000	3	L				autocolour
F107	17.00	1.700	10	EL EL EL				Electropo
F112	91.00	9.100	10					Dohrmann

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

OVERALL AVERAGE
RANK IS 5.889

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F025	2.00	1.000	2	ELELEL				
F107	17.00	1.700	10	ELELEL				Electropo
F002	5.50	1.833	3	VLELL				Shimadzu
F007	37.00	3.700	10					NAQ06180
F060	12.00	4.000	3	L				autocolour
F010	47.50	4.750	10					
F008	15.50	5.167	3					Auto NDR
F032	11.00	5.500	2	LL				E3370A
F003	61.00	6.100	10					IR
F026	62.00	6.200	10					Autoanalyzer
F038	22.00	7.333	3					Combustion IR
F042	77.00	7.700	10	H				IR
F112	91.00	9.100	10					Dohrmann
F015	28.00	9.333	3					AutoCarbAnalyzer
F036	94.50	9.450	10	H				E3028A

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

OVERALL AVERAGE
RANK IS 5.889

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= .5000 CONCENTRATION ERROR INCREMENT= .0500

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F007	2.0	5.50	1.8	4.00	.1W	0.00	.1W	0.00	7.6	5.00	1.8	4.00
F008	1.86	4.00	1.76	3.00		0.00		0.00	7.14	3.00	1.55	3.00
F011	.5 EL	1.00	.3 EL	1.00	<.3	0.00	<.3	0.00	6.2 VL	2.00	.3 EL	1.00
F014	2.33	8.00	2.14	7.00	0.	1.00	0.	1.00	8.11	10.00	1.88	5.00
F025	1.7	3.00	2.5 H	10.00	<.5	0.00	<.5	0.00	7.8	7.50	2.1	10.00
F032	2.8 VH	10.00	2.2	8.00		0.00		0.00	7.8	7.50	2.0	7.50
F036	2.15	7.00	1.95	5.00		0.00		0.00	7.70	6.00	1.90	6.00
F038	<1. EL	0.00	<1. VL	0.00	<1.	0.00	<1.	0.00	6. VL	1.00	<1. VL	0.00
F060	2.	5.50	2.	6.00	<1.	0.00	<1.	0.00	8.	9.00	2.	7.50
F072	1.5	2.00	1.1 VL	2.00	<.2	0.00	<.2	0.00	7.3	4.00	.7 VL	2.00
F107	2.59 H	9.00	2.26	9.00	0.W	0.00	0.W	0.00	8.88 H	11.00	2.04	9.00
MEDIAN OR *TARGET												
CONC.	2.0000		1.9750		*0.0000		*0.0000		7.7000		1.8900	
1CRIT	.5250		.5237		.5000		.5000		.8100		.5195	
N	8		8		1		1		9		8	
MEAN	2.0162		1.9012		-		-		7.5167		1.7337	
3STDEV	.9704		1.0388		-		-		1.6460		1.2511	

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F007	.2T	2.00	1.7	5.00	6.4	5.00	8.7	5.00
F008		0.00	1.25 L	3.00	6.44	6.00	8.64	4.00
F011	<.3	0.00	.3 EL	1.00	5.0 VL	1.00	7.3 VL	1.00
F014	.653	4.00	2.15	9.00	6.55	7.00	9.01	9.00
F025	.8 H	5.00	1.2 L	2.00	6.6	8.50	8.9	7.00
F032	<.6	0.00	2.0	7.50	6.8	10.00	9.6	10.00
F036	.25	3.00	1.95	6.00	6.60	8.50	8.85	6.00
F038	<1.	0.00	<1. VL	0.00	6.	3.50	8.	3.00
F060	<1.	0.00	2.	7.50	6.	3.50	9.	8.00
F072	<.2	0.00	1.3 L	4.00	5.2 VL	2.00	7.6 L	2.00
F107	0.W	1.00	2.21	10.00	7.51 H	11.00	10.20 VH	11.00
MEDIAN OR *TARGET								
CONC.	.2500		1.8250		6.4400		8.8500	
1CRIT	.5000		.5162		.7470		.8675	
N	3		8		9		9	
MEAN	.3677		1.6937		6.2878		8.7000	
3STDEV	-		1.0906		1.3823		1.6620	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F007	35.50	4.438	8					CPQ005E0
F008	26.00	3.714	7	L				Autoelectrode
F011	8.00	1.143	7	ELEL VLEL ELVLVL	BIASED LOW*	1.03	-1.5850	
F014	61.00	6.100	10					
F025	53.00	6.625	8	H H L				
F032	60.50	8.643	7	VH	BIASED HIGH*	2.11	.2676	E3289A
F036	47.50	5.938	8					E3042A
F038	7.50	2.500	3	ELVL VLVL VL	INSUFFICIENT DATA			Colorimetric
F060	47.00	6.714	7					potent titration
F072	18.00	2.571	7	VL VL L VLL	BIASED LOW	-3.12	-.7175	Electro H2SO4
F107	71.00	8.875	8	H H H VH	BIASED HIGH	16.39	-.0386	Volumetric

* 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 5.438

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F011	8.00	1.143	7	ELELVLELELVLVL	BIASED LOW*	1.03	-1.5850	
F038	7.50	2.500	3	ELVLVLVLVL	INSUFFICIENT DATA			Colorimetric
F072	18.00	2.571	7	VLVLLVLL	BIASED LOW	-3.12	-.7175	Electro H2SO4
F008	26.00	3.714	7	L				Autoelectrode
F007	35.50	4.438	8					CPQ005E0
F036	47.50	5.938	8					E3042A
F014	61.00	6.100	10					
F025	53.00	6.625	8	HHL				
F060	47.00	6.714	7					potent titration
F032	60.50	8.643	7	VH	BIASED HIGH*	2.11	.2676	E3289A
F107	71.00	8.875	8	HHHVH	BIASED HIGH	16.39	-.0386	Volumetric

* 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 5.438

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= .3500 CONCENTRATION ERROR INCREMENT= .0500

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	.8	5.00	.4	3.50		0.00		0.00	6.2	5.50	.3	4.00
F007	.46	1.00	.33	2.00	-4.13	1.00	-4.18	1.00	6.12	4.00	.34	5.00
F010	.6	3.00	.4	3.50	<.1	0.00	<.1	0.00	5.6	1.00	.2	3.00
F015	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	6.2	5.50	<.5	0.00
F020	1.44 EH	6.00	1.56 EH	6.00		0.00		0.00	6.65	7.00	.62 H	6.00
F026	.5200	2.00	.4100	5.00	-4.06T	2.00	-4.14T	2.00	6.07	3.00	.1200	2.00
F122	.68	4.00	.19	1.00		0.00		0.00	5.97	2.00	.05	1.00
MEDIAN	.6400		.4000		-4.0950		-4.1600		6.1200		.2500	
1CRIT	.3500		.3500		.3500		.3500		.5810		.3500	
N	4		4		2		2		5		4	
MEAN	.6500		.3850		-4.0950		-4.1600		6.1120		.2400	
3STDEV	-		-		-		-		-		-	

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003		0.00	.6	4.00	4.8	5.00	6.9	3.00
F007	-1.41	2.00	.14 L	2.00	4.87	6.00	7.04	4.00
F010	<.1	0.00	.4	3.00	4.6	2.00	6.7	2.00
F015	<.5	0.00	<.5	0.00	4.7	3.00	7.4	6.00
F020		0.00	.81	5.00	5.72 VH	7.00	7.68 H	7.00
F026	-1.45T	1.00	43.00 EH	6.00	4.295	1.00	6.575	1.00
F122	-.795 VH	3.00	.107 L	1.00	4.71	4.00	7.25	5.00
MEDIAN	-1.4100		.5000		4.7100		7.0400	
1CRIT	.3500		.3500		.5105		.6270	
N	1		4		5		5	
MEAN	-1.4100		.4875		4.7360		7.0580	
3STDEV	-		-		-		-	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	30.00	4.286	7					POTENTIOMETRICTITN
F007	28.00	2.800	10	L				CPQ003E0
F010	17.50	2.500	7					
F015	14.50	4.833	3					10101
F020	44.00	6.286	7	EHEH H VHH				Electrom
F026	25.00	2.500	10	EH				Titroprocessor
F122	21.00	2.625	8	VHL				ext pH 4.5/4.2

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

OVERALL AVERAGE
RANK IS 3.462

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F010	17.50	2.500	7					
F026	25.00	2.500	10	EH				Titroprocessor
F122	21.00	2.625	8	VHL				ext pH 4.5/4.2
F007	28.00	2.800	10	L				CPQ003E0
F003	30.00	4.286	7					POTENTIOMETRICTITN
F015	14.50	4.833	3					10101
F020	44.00	6.286	7	EHEHHVHH				Electrom

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

OVERALL AVERAGE
RANK IS 3.462

PARAMETER: 06282 Alkalinity Gran Titn 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= .3500 CONCENTRATION ERROR INCREMENT= .0500

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	.08 L	1.00	.01	1.00	-4.55 L	1.00	-4.39	1.00	5.92	1.00	.02	1.00
F003		0.00		0.00	-4.0	8.00	-3.9	7.00		0.00		0.00
F014	.700	7.00	.372	5.00	-4.08	5.00	-4.13	4.00	6.16	5.00	.145	4.00
F036	.440	3.50	.210	3.00	-4.22	4.00	-4.23	2.00	5.98	2.00	.06	2.00
F042	.51	5.00	.52	7.00	-4.25	3.00	-4.20	3.00	6.31	7.00	.16	6.00
F109	.30	2.00	.285	4.00	-4.025	7.00	-4.10	5.00	6.05	4.00	.155	5.00
F110	.44	3.50	.08	2.00	-4.41	2.00	-3.99	6.00	6.22	6.00	.14	3.00
F112	.646	6.00	.379	6.00	-4.040	6.00	-3.899	8.00	6.008	3.00	.278	7.00
MEDIAN	.4400		.2850		-4.1500		-4.1150		6.0500		.1450	
1CRIT	.3500		.3500		.3500		.3500		.6025		.3500	
N	5		5		6		6		5		5	
MEAN	.4672		.2652		-4.1708		-4.0917		6.0836		.1320	
3STDEV	-		-		.4108		.3453		-		-	

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	-1.75	2.00	.14	1.00	4.81	1.50	6.95	2.00
F003	-1.3	7.00		0.00		0.00		0.00
F014	-3.86 EL	1.00	.348	5.00	5.04	5.00	7.16	5.00
F036	-1.43	4.00	.230	2.00	4.89	3.00	7.15	4.00
F042	-1.37	6.00	.46	6.00	5.15	6.00	7.32	6.00
F109	-1.41	5.00	.26	3.00	4.81	1.50	6.88	1.00
F110	-1.44	3.00	.29	4.00	5.24	7.00	7.44	7.00
F112	-1.135	8.00	.563	7.00	5.028	4.00	7.003	3.00
MEDIAN	-1.4200		.2900		5.0280		7.1500	
1CRIT	.3500		.3500		.5514		.6575	
N	6		5		4		5	
MEAN	-1.4500		.3176		5.0270		7.1166	
3STDEV	.4260		-		-		-	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	12.50	1.250	10	L L				titration
F003	22.00	7.333	3					POTENTIOMETRICTITN
F014	46.00	4.600	10	EL				
F036	29.50	2.950	10					E3042A
F042	55.00	5.500	10					ANC gran plot
F109	37.50	3.750	10					Radiometer
F110	43.50	4.350	10					end pt 3.5 - 3.6
F112	58.00	5.800	10					Titr meter electr

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

OVERALL AVERAGE
RANK IS 4.164

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	12.50	1.250	10	LL				titration
F036	29.50	2.950	10					E3042A
F109	37.50	3.750	10					Radiometer
F110	43.50	4.350	10					end pt 3.5 - 3.6
F014	46.00	4.600	10	EL				
F042	55.00	5.500	10					ANC gran plot
F112	58.00	5.800	10					Titr meter electr
F003	22.00	7.333	3					POTENTIOMETRICTITN

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

OVERALL AVERAGE
RANK IS 4.164

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= .0050 BASIC ACCEPTABLE ERROR= .0050 CONCENTRATION ERROR INCREMENT= .0800

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.241	10.00	.650	10.00	1.530	16.00	.839	7.50	.557	7.00	.408	10.00
F003	.252	21.00	.656	14.00	1.50	9.00	.841	13.00	.562	10.00	.404	8.00
F004	.248	15.00	.653	13.00	1.53	16.00	.839	7.50	.565	13.00	.413	15.00
F007	.26	22.50	.69	24.00	1.30 EL	2.00	.86	20.00	.60	25.00	.41	12.50
F008	.26	22.50	.67	19.00	1.59	24.00	.86	20.00	.58	21.50	.42	19.50
F009	.24	7.50	.65	10.00	1.53	16.00	.84	10.50	.57	16.00	.41	12.50
F010	.235	5.00	.665	16.00	1.52	14.00	.850	15.50	.570	16.00	.405	9.00
F011	.228	2.50	.645	6.00	1.40	3.00	.825	6.00	.545	3.00	.382	3.00
F014	.25	17.50	.68	22.00	1.58	22.50	.88	24.00	.58	21.50	.42	19.50
F015	.247	13.50	.634	4.00	1.5	9.00	.810	3.50	.562	10.00	.396	4.00
F020	.251	20.00	.603	2.00	1.55	19.50	.851	17.00	.579	19.00	.420	19.50
F025	.24	7.50	.65	10.00	1.51	12.50	.84	10.50	.57	16.00	.42	19.50
F026	.2435	12.00	.663	15.00	1.565	21.00	.8485	14.00	.5635	12.00	.399	5.00
F032	.240	7.50	.635	5.00	1.49	5.50	.810	3.50	.540	2.00	.410	12.50
F036	.268	24.00	.684	23.00	1.58	22.50	.892	25.00	.568	14.00	.424	23.00
F037	<.2 EL	0.00	.5620 EL	1.00	1.2711 EL	1.00	.7349 EL	1.00	.4312 EL	1.00	.3195 EL	1.00
F038	.240	7.50	.649	7.00	1.49	5.50	.802	2.00	.546	4.00	.414	16.00
F042	.25	17.50	.65	10.00	1.55	19.50	.84	10.50	.56	8.00	.42	19.50
F060	.23	4.00	.63	3.00	1.50	9.00	.82	5.00	.55	5.50	.41	12.50
F068	.2415	11.00	.6763	21.00	1.548	18.00	.8561	18.00	.5823	24.00	.3995	6.00
F069	.228	2.50	.692	25.00	2.07 EH	26.00	.867	22.00	.562	10.00	.368 L	2.00
F072	.25	17.50	.67	19.00	1.50	9.00	.85	15.50	.58	21.50	.43	25.00
F107	.25	17.50	.67	19.00	1.47	4.00	.86	20.00	.58	21.50	.42	19.50
F118	.27	25.00	.74 EH	26.00	1.66 H	25.00	.93 EH	26.00	.63 EH	26.00	.48 EH	26.00
F129	.247	13.50	.666	17.00	1.510	12.50	.868	23.00	.577	18.00	.426	24.00
F133	.22 L	1.00	.65	10.00	1.50	9.00	.84	10.50	.55	5.50	.40	7.00
MEDIAN	.2470		.6545		1.5150		.8448		.5665		.4100	
1CRIT	.0244		.0570		.1258		.0722		.0499		.0374	
N	23		24		24		24		24		24	
MEAN	.2452		.6576		1.5168		.8454		.5666		.4095	
3STDEV	.0294		.0605		.1991		.0638		.0422		.0416	

PARAMETER: 07092 Nitrate + Nitrite mg/L N

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.122	10.00		0.00	.065	8.50	.843	7.00
F003	.129	16.00	.039	14.00	.073	20.00	.838	5.00
F004	.127	15.00	.034	11.50	.070	13.00	.852	14.00
F007	.11 L	2.00	.02T VL	2.00	.06	5.50	.86	15.00
F008	.13	19.00	.04	16.00	.08	23.50	.89	22.00
F009	.12	6.50	<.05	0.00	.065	8.50	.85	11.50
F010	.115	4.00	.030	6.00	.060	5.50	.880	21.00
F011	.111	3.00	.029	4.00	.059 L	2.00	.848	9.00
F014	.12	6.50	<.05	0.00	.06	5.50	.90	23.50
F015	.124	11.50	.032	9.50	.070	13.00	.840	6.00
F020	.140 H	24.00	.036	13.00	.072	18.50	.846	8.00
F025	.13	19.00	.04	16.00	.07	13.00	.90	23.50
F026	.1215	9.00	.0285	3.00	.0595 L	3.00	.870	16.50
F032	.135	23.00	.050 EH	19.50	.085 H	25.00	.820	4.00
F036	.132	22.00	.034	11.50	.076	22.00	.906	25.00
F037	<.2	0.00	<.2	0.00	<.2	0.00	.7095 EL	1.00
F038	.125	13.00	.042 H	18.00	.074	21.00	.806	2.00
F042	.13	19.00	.05 EH	19.50	.07	13.00	.85	11.50
F060	.13	19.00	<.05	0.00	.06	5.50	.81	3.00
F068	.1240	11.50	.0305	8.00	.0707	17.00	.8719	19.00
F069	.091 EL	1.00	.018 VL	1.00	.044 EL	1.00	.871	18.00
F072	.13	19.00	<.05	0.00	.07	13.00	.87	16.50
F107	.12	6.50	.03	6.00	.07	13.00	.85	11.50
F118	.15 EH	25.00	.04T	16.00	.08	23.50	.96 EH	26.00
F129	.126	14.00	.032	9.50	.072	18.50	.875	20.00
F133	.12	6.50	.03	6.00	.07	13.00	.85	11.50
MEDIAN	.1250		.0330		.0700		.8510	
1CRIT	.0146		.0072		.0102		.0727	
N	23		17		23		24	
MEAN	.1248		.0334		.0685		.8582	
3STDEV	.0213		.0165		.0188		.0780	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	86.00	9.556	9					Cd Rdn Auto Colour
F003	130.00	13.000	10					Cd REDUCTION
F004	133.00	13.300	10					07110
F007	130.50	13.050	10	EL L VL				CPQ103E2
F008	207.00	20.700	10		BIASED HIGH*	4.11	-.0015	FIA
F009	99.00	11.000	9					
F010	112.00	11.200	10					
F011	41.50	4.150	10	L	BIASED LOW	-5.28	.0036	
F014	162.50	18.056	9					
F015	84.00	8.400	10					IC
F020	160.50	16.050	10	H				Auto Cd Red
F025	147.50	14.750	10					IC
F026	110.50	11.050	10	L				Autoanalyzer
F032	107.50	10.750	10	EHH				E3364A
F036	212.00	21.200	10		BIASED HIGH*	4.52	.0007	E3374A
F037	6.00	1.000	6	ELELELELELEL EL	BIASED LOW	-13.52	-.0265	IC Waters
F038	96.00	9.600	10	H				IC
F042	148.00	14.800	10	EH				IC
F060	66.50	7.389	9					autocolour
F068	153.50	15.350	10					IC Dionex
F069	108.50	10.850	10	EH L ELVLEL				Cd red,colour auto
F072	156.00	17.333	9					AA Cd reduction
F107	138.50	13.850	10					IC
F118	244.50	24.450	10	EHH EHEHEHEH EH	BIASED HIGH	9.62	.0112	IC
F129	170.00	17.000	10					Dionex IC
F133	80.00	8.000	10	L				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 13.112

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F037	6.00	1.000	6	ELELELELELELEL	BIASED LOW	-13.52	-.0265	IC Waters
F011	41.50	4.150	10	L	BIASED LOW	-5.28	.0036	
F060	66.50	7.389	9					autocolour
F133	80.00	8.000	10	L				IC
F015	84.00	8.400	10					IC
F001	86.00	9.556	9					Cd Rdn Auto Colour
F038	96.00	9.600	10	H				IC
F032	107.50	10.750	10	EHH				E3364A
F069	108.50	10.850	10	EHLELVLEL				Cd red,colour auto
F009	99.00	11.000	9					
F026	110.50	11.050	10	L				Autoanalyzer
F010	112.00	11.200	10					
F003	130.00	13.000	10					Cd REDUCTION
F007	130.50	13.050	10	ELLVL				CPQ103E2
F004	133.00	13.300	10					07110
F107	138.50	13.850	10					IC
F025	147.50	14.750	10					IC
F042	148.00	14.800	10	EH				IC
F068	153.50	15.350	10					IC Dionex
F020	160.50	16.050	10	H				Auto Cd Red
F129	170.00	17.000	10					Dionex IC
F072	156.00	17.333	9					AA Cd reduction
F014	162.50	18.056	9					
F008	207.00	20.700	10		BIASED HIGH*	4.11	-.0015	FIA
F036	212.00	21.200	10		BIASED HIGH*	4.52	.0007	E3374A
F118	244.50	24.450	10	EHHEHEHEHEHEH	BIASED HIGH	9.62	.0112	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 13.112

Nitrate + Nitrite

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= .0050 BASIC ACCEPTABLE ERROR= .0050 CONCENTRATION ERROR INCREMENT= .0800

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.240	12.50	.582 L	3.00	1.441	3.00	.822	9.00	.540	3.00	.404	10.00
F002	.25	18.50	.53 EL	1.00	1.49	5.50	.85	14.00	.58	17.00	.42	17.50
F009	.25	18.50	.70	23.00	1.50	10.50	.90	22.00	.59	20.00	.41	13.00
F010	.22	2.00	.64	9.00	1.53	18.00	.82	7.00	.54	3.00	.40	6.50
F011	.228	4.00	.645	10.00	1.40	2.00	.825	10.00	.545	6.00	.382	2.00
F012	.22	2.00	.62	4.00	1.50	10.50	.82	7.00	.55	8.00	.40	6.50
F014	.25	18.50	.68	21.00	1.58	22.00	.88	20.50	.58	17.00	.42	17.50
F015	.236	9.00	.634	8.00	1.5	10.50	.810	4.50	.562	10.00	.396	3.00
F017	.239	10.50	.633	7.00	1.495	7.00	.798	2.00	.563	11.00	.403	9.00
F020	.294 EH	24.00	.655	15.00	1.54	19.00	1.04 EH	25.00	.625 H	24.00	.472 EH	24.00
F025	.24	12.50	.65	12.50	1.51	15.00	.84	11.50	.57	13.50	.42	17.50
F032	.26	21.50	.71 H	24.00	1.61	23.00	.91	23.00	.61	23.00	.44	23.00
F037	<.2 EL	0.00	.5620 VL	2.00	1.2711 EL	1.00	.7349 EL	1.00	.4312 EL	1.00	.3195 EL	1.00
F038	.231	8.00	.648	11.00	1.49	5.50	.802	3.00	.544	5.00	.411	15.00
F042	.23	6.00	.63	5.50	1.50	10.50	.81	4.50	.54	3.00	.40	6.50
F053	.23	6.00	.67	18.50	1.52	16.50	.86	16.50	.57	13.50	.41	13.00
F060	.23	6.00	.63	5.50	1.50	10.50	.82	7.00	.55	8.00	.41	13.00
F068	.2415	14.00	.6763	20.00	1.548	20.00	.8561	15.00	.5823	19.00	.3995	4.00
F107	.25	18.50	.67	18.50	1.47	4.00	.86	16.50	.58	17.00	.42	17.50
F109	.242	15.00	.651	14.00	1.52	16.50	.847	13.00	.569	12.00	.407	11.00
F110	.26	21.50	.69	22.00	1.65 H	24.00	.88	20.50	.60	22.00	.43	22.00
F112	.246	16.00	.662	16.00	1.572	21.00	.867	18.00	.594	21.00	.429	21.00
F118	.27 H	23.00	.74 VH	25.00	1.66 H	25.00	.93 H	24.00	.63 H	25.00	.48 EH	25.00
F129	.239	10.50	.666	17.00	1.509	14.00	.868	19.00	.577	15.00	.423	20.00
F133	.22	2.00	.65	12.50	1.50	10.50	.84	11.50	.55	8.00	.40	6.50
MEDIAN	.2400		.6500		1.5000		.8470		.5700		.4100	
1CRIT	.0238		.0566		.1246		.0724		.0502		.0374	
N	23		23		23		23		23		23	
MEAN	.2401		.6502		1.5163		.8485		.5701		.4133	
3STDEV	.0390		.0994		.1538		.1040		.0694		.0538	

PARAMETER: 07093 Nitrate-IC mg/L N

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.137	20.00	.057 EH	21.00	.089 VH	22.00	.849	9.00
F002	.12	7.00	.03	6.00	.07	8.50	.86	12.50
F009	.11	1.00	<.10	0.00	<.10	0.00	.88	18.50
F010	.12	7.00	.02 VL	1.00	.07	8.50	.84	7.00
F011	.111	2.00	.029	2.50	.059 L	1.00	.848	8.00
F012	.12	7.00	.03	6.00	.07	8.50	.86	12.50
F014	.12	7.00	<.05	0.00	.06	2.50	.90	21.50
F015	.124	13.00	.032	10.50	.070	8.50	.831	5.00
F017	.142 H	22.00	.044 VH	18.00	.079	19.00	.839	6.00
F020	.158 EH	24.00	.029	2.50	.086 VH	21.00	.901	23.00
F025	.13	17.50	.04 H	14.50	.07	8.50	.90	21.50
F032	.14 H	21.00	.05 VH	20.00	.09 VH	23.00	.94 H	24.00
F037	<.2	0.00	<.2	0.00	<.2	0.00	.7095 EL	1.00
F038	.124	13.00	.041 H	17.00	.073	18.00	.800	2.00
F042	.12	7.00	.04 H	14.50	.07	8.50	.82	4.00
F053	.12	7.00	.04 H	14.50	.07	8.50	.87	16.00
F060	.13	17.50	<.05	0.00	.06	2.50	.81	3.00
F068	.1240	13.00	.0305	9.00	.0707	14.00	.8719	17.00
F107	.12	7.00	.03	6.00	.07	8.50	.85	10.50
F109	.129	16.00	.046 VH	19.00	.071	15.00	.867	14.00
F110	.12	7.00	.03	6.00	.07	8.50	.88	18.50
F112	.133	19.00	.036	12.00	.072	16.50	.886	20.00
F118	.15 VH	23.00	.04T H	14.50	.08	20.00	.96 EH	25.00
F129	.126	15.00	.032	10.50	.072	16.50	.868	15.00
F133	.12	7.00	.03	6.00	.07	8.50	.85	10.50
MEDIAN	.1240		.0320		.0700		.8600	
1CRIT	.0145		.0072		.0102		.0734	
N	22		19		21		23	
MEAN	.1264		.0358		.0720		.8618	
3STDEV	.0271		.0193		.0200		.0946	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	112.50	11.250	10	L EHVH				IC
F002	107.50	10.750	10	EL				I.C.
F009	126.50	15.813	8					
F010	69.00	6.900	10	VL				
F011	47.50	4.750	10	L	BIASED LOW*	-4.81	.0024	
F012	72.00	7.200	10					IC
F014	147.50	16.389	9					
F015	82.00	8.200	10					IC
F017	111.50	11.150	10	H VH				IC
F020	201.50	20.150	10	EH EHH EHEH VH	BIASED HIGH*	3.88	.0291	IC
F025	144.50	14.450	10	H				IC
F032	225.50	22.550	10	H H VHVHH	BIASED HIGH	6.76	.0099	E3372A
F037	7.00	1.167	6	ELVLELELELEL EL	BIASED LOW	-12.33	-.0354	IC Waters
F038	97.50	9.750	10	H				IC
F042	70.00	7.000	10	H				IC
F053	130.00	13.000	10	H				IC
F060	73.00	8.111	9					Cd red colour
F068	145.00	14.500	10					IC Dionex
F107	124.00	12.400	10					IC
F109	145.50	14.550	10	VH				Dionex IC
F110	172.00	17.200	10	H				IC Dionex
F112	180.50	18.050	10					Dionex IC
F118	229.50	22.950	10	H VHH H H EHVHH EH	BIASED HIGH	10.12	.0100	IC
F129	152.50	15.250	10					Dionex IC
F133	83.00	8.300	10					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 12.632

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F037	7.00	1.167	6	ELVLELELELELEL	BIASED LOW	-12.33	-.0354	IC Waters
F011	47.50	4.750	10	L	BIASED LOW*	-4.81	.0024	
F010	69.00	6.900	10	VL				
F042	70.00	7.000	10	H				IC
F012	72.00	7.200	10					IC
F060	73.00	8.111	9					Cd red colour
F015	82.00	8.200	10					IC
F133	83.00	8.300	10					IC
F038	97.50	9.750	10	H				IC
F002	107.50	10.750	10	EL				I.C.
F017	111.50	11.150	10	HVH				IC
F001	112.50	11.250	10	LEHVH				IC
F107	124.00	12.400	10					IC
F053	130.00	13.000	10	H				IC
F025	144.50	14.450	10	H				IC
F068	145.00	14.500	10					IC Dionex
F109	145.50	14.550	10	VH				Dionex IC
F129	152.50	15.250	10					Dionex IC
F009	126.50	15.813	8					
F014	147.50	16.389	9					
F110	172.00	17.200	10	H				IC Dionex
F112	180.50	18.050	10					Dionex IC
F020	201.50	20.150	10	EHEHHEHEHVH	BIASED HIGH*	3.88	.0291	IC
F032	225.50	22.550	10	HHVHVHH	BIASED HIGH	6.76	.0099	E3372A
F118	229.50	22.950	10	HVHHHHEHVHHEH	BIASED HIGH	10.12	.0100	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 12.632

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= .0060 BASIC ACCEPTABLE ERROR= .0060 CONCENTRATION ERROR INCREMENT= .1250

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.163	6.50	<.001	0.00	<.001	0.00	.159	6.50	.343	7.00	.028 H	21.00
F003	.178	22.00	<.005	0.00	.006	6.00	.182	25.00	.374	22.00	.019	13.00
F004	.156	3.00	<.005	0.00	<.005	0.00	.156	3.50	.331	4.00	.018	12.00
F007	.229 EH	27.00	.033 VH	8.00	.031 EH	9.00	.219 EH	27.00	.428 EH	27.00	.046 EH	23.00
F008	.168	14.00	<.02	0.00	<.02	0.00	.178	19.00	.379	23.00	<.02	0.00
F010	.170	17.00	<.010	0.00	<.010	0.00	.170	15.00	.350	10.00	.020	15.50
F011	.118 EL	1.00	.002	3.00	<.002	0.00	.118 EL	1.00	.257 EL	1.00	.014	6.00
F012	.22 EH	26.00	.04 VH	9.00	.01 H	7.50	.18	23.00	.39	26.00	.04 EH	22.00
F014	.164	9.00	<.010	0.00	<.010	0.00	.159	6.50	.35	10.00	.016	9.00
F015	.174	20.00	.004	6.00	<.002	0.00	.184	26.00	.355	14.00	.023	18.50
F017	.167	12.00	<.006	0.00	<.006	0.00	.167	11.00	.365	17.00	.011	3.50
F020	.166	11.00	<.005	0.00	<.005	0.00	.157	5.00	.342	6.00	.016	9.00
F025	.157	4.00	<.003	0.00	<.003	0.00	.156	3.50	.336	5.00	<.003 VL	0.00
F026	.1704	19.00	.0021	4.00	.0023	5.00	.1697	13.00	.3682	19.00	.0236	20.00
F032	.168	14.00	<.006	0.00	<.002	0.00	.170	15.00	.354	12.50	.020	15.50
F036	.162	5.00	<.001	0.00	.010 H	7.50	.171	17.00	.359	15.00	.023	18.50
F042	.18	23.00	0.00T	1.50	0.00T	1.00	.18	23.00	.37	20.50	.02W	0.00
F053	.17	17.00	<.02	0.00	<.02	0.00	.18	23.00	.37	20.50	.02	15.50
F060	.184	24.00	.010 H	7.00	<.005	0.00	.173	18.00	.385	25.00	.011	3.50
F068	.1874	25.00		0.00		0.00	.1799	21.00	.3679	18.00		0.00
F069	.164	9.00	<.002	0.00	<.002	0.00	.166	9.50	.329	3.00	.013	5.00
F072	.17	17.00	<.01	0.00	<.01	0.00	.17	15.00	.35	10.00	.02	15.50
F107	.168	14.00	.003	5.00	.002	3.00	.166	9.50	.349	8.00	.017	11.00
F109	.175	21.00	0.0T	1.50	.002T	3.00	.169	12.00	.354	12.50	.005T VL	1.50
F112	.163	6.50		0.00		0.00	.179	20.00	.380	24.00	.016	9.00
F118	.150	2.00	.002W	0.00	.002T	3.00	.153	2.00	.295 EL	2.00	.005T VL	1.50
F129	.164	9.00	<.01	0.00	<.01	0.00	.164	8.00	.360	16.00	.015	7.00
MEDIAN	.1680		.0030		.0023		.1700		.3550		.0180	
1CRIT	.0263		.0060		.0060		.0265		.0496		.0075	
N	25		6		7		25		25		20	
MEAN	.1703		.0090		.0049		.1695		.3562		.0192	
3STDEV	.0392		.0332		.0105		.0272		.0607		.0192	

PARAMETER: 07192 Ammonia mg/L N

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	<.001	0.00	<.001	0.00	.035 H	23.00	.289	6.00
F003	.006	8.00	.005	5.00	.028	16.50	.322	21.00
F004	<.005	0.00	<.005	0.00	.024	7.00	.282	5.00
F007	.030 EH	11.00	.031 VH	9.00	.055 EH	24.00	.358 H	27.00
F008	<.02	0.00	<.02	0.00	.028	16.50	.324	22.00
F010	<.010	0.00	<.010	0.00	.025	8.00	.335	25.00
F011	.002	4.50	.007	8.00	.021	5.00	.212 EL	2.00
F012	.02 VH	10.00	.04 VH	10.00	.08 EH	25.00	.34	26.00
F014	<.010	0.00	<.010	0.00	.026	12.00	.30	10.50
F015	.003	6.00	.002	2.50	.026	12.00	.305	14.00
F017	<.006	0.00	<.006	0.00	.026	12.00	.303	13.00
F020	<.005	0.00	<.005	0.00	.026	12.00	.298	7.50
F025	<.003	0.00	<.003	0.00	<.003 EL	0.00	.219 VL	3.00
F026	.0033	7.00	.0058	7.00	.0291	20.00	.3153	19.00
F032	<.004	0.00	<.002	0.00	.026	12.00	.302	12.00
F036	<.001	0.00	<.001	0.00	.028	16.50	.298	7.50
F042	0.00T	1.50	0.00T	1.00	.02W	0.00	.31	17.00
F053	<.02	0.00	<.02	0.00	.02	3.50	.33	24.00
F060	<.005	0.00	<.005	0.00	.022	6.00	.326	23.00
F068		0.00		0.00	.0258	9.00	.3070	16.00
F069	<.002	0.00	<.002	0.00	.019	2.00	.316	20.00
F072	<.01	0.00	<.01	0.00	.02	3.50	.30	10.50
F107	.001	3.00	.005	5.00	.028	16.50	.299	9.00
F109	.018T VH	9.00	.041 VH	11.00	.029	19.00	.315	18.00
F112	0.000	1.50	.005	5.00	.033	21.50	.167 EL	1.00
F118	.002T	4.50	.002T	2.50	.014T L	1.00	.280	4.00
F129	<.01	0.00	<.01	0.00	.033	21.50	.306	15.00
MEDIAN	.0030		.0050		.0260		.3050	
1CRIT	.0060		.0060		.0085		.0434	
N	8		9		23		25	
MEAN	.0069		.0114		.0275		.3013	
3STDEV	.0214		.0394		.0214		.0880	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	70.00	11.667	6	H H				IC
F003	138.50	15.389	9					ALKALINE PHENOL
F004	34.50	5.750	6					07540
F007	192.00	19.200	10	EHVHEHEHEHEHEHVHEHH	BIASED HIGH	11.80	.0280	CPQ117E0
F008	94.50	18.900	5					Autocolourimetric
F010	90.50	15.083	6					
F011	31.50	3.500	9	EL ELEL EL	BIASED LOW	-29.39	.0008	
F012	184.50	18.450	10	EHVHH EHVHVHEH	BIASED HIGH*	2.13	.0282	TECHNICON
F014	57.00	9.500	6					
F015	119.00	13.222	9					07557
F017	68.50	11.417	6					Colourimetric
F020	50.50	8.417	6					Auto Bertholot
F025	15.50	3.875	4	VL ELVL	INSUFFICIENT DATA			
F026	133.00	13.300	10					Autoanalyzer
F032	81.00	13.500	6					E3364A
F036	87.00	12.429	7	H				E3374A
F042	88.50	11.063	8					Colourimetric
F053	103.50	17.250	6					colour Phenate
F060	106.50	15.214	7	H				phenate colour
F068	89.00	17.800	5					IC Dionex
F069	48.50	8.083	6					Colour auto
F072	71.50	11.917	6					AA phenate
F107	84.00	8.400	10					Colourimetric
F109	108.50	10.850	10	VLVHVH				FIA - phenate
F112	88.50	11.063	8	EL				Technicon
F118	22.50	2.500	9	ELVL L	BIASED LOW	-11.64	-.0030	IC
F129	76.50	12.750	6					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 11.913

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F118	22.50	2.500	9	ELVLL	BIASED LOW	-11.64	-.0030	IC
F011	31.50	3.500	9	ELELELEL	BIASED LOW	-29.39	.0008	
F025	15.50	3.875	4	VLELVL	INSUFFICIENT DATA			
F004	34.50	5.750	6					07540
F069	48.50	8.083	6					Colour auto
F107	84.00	8.400	10					Colourimetric
F020	50.50	8.417	6					Auto Bertholot
F014	57.00	9.500	6					
F109	108.50	10.850	10	VLVHVH				FIA - phenate
F042	88.50	11.063	8					Colourimetric
F112	88.50	11.063	8	EL				Technicon
F017	68.50	11.417	6					Colourimetric
F001	70.00	11.667	6	HH				IC
F072	71.50	11.917	6					AA phenate
F036	87.00	12.429	7	H				E3374A
F129	76.50	12.750	6					Dionex IC
F015	119.00	13.222	9					07557
F026	133.00	13.300	10					Autoanalyzer
F032	81.00	13.500	6					E3364A
F010	90.50	15.083	6					
F060	106.50	15.214	7	H				phenate colour
F003	138.50	15.389	9					ALKALINE PHENOL
F053	103.50	17.250	6					colour Phenate
F068	89.00	17.800	5					IC Dionex
F012	184.50	18.450	10	EHVHHEHVHVHEH	BIASED HIGH*	2.13	.0282	TECHNICON
F008	94.50	18.900	5					Autocolourimetric
F007	192.00	19.200	10	EHVHEHEHEHEHEHVHEHH	BIASED HIGH	11.80	.0280	CPQ117E0

* 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 11.913

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= .0250 BASIC ACCEPTABLE ERROR= .0250 CONCENTRATION ERROR INCREMENT= .1500

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	.195	2.00	<.014 EL	0.00	<.014 EL	0.00	.180	3.00	.485	7.00	.200	5.00
F008	<.2	0.00	<.2	0.00	<.2	0.00	.26	10.00	.51	9.00	.32 VH	9.00
F014	<.20	0.00	<.20	0.00	<.20	0.00	.24	9.00	.46	5.00	.22	7.00
F020	.197	3.00	.129	5.00	.117	4.00	.204	5.00	.408	2.00	.228	8.00
F025	.20	4.50	.07	1.00	.06 L	1.50	.21	6.50	.44	4.00	.17	3.00
F032	.20	4.50	<.04 VL	0.00	<.04 VL	0.00	.20	4.00	.52	10.00	.20	5.00
F038	.14 L	1.00	.09	3.00	<.05 L	0.00	.17	2.00	.06 EL	1.00	.16	2.00
F060	.22	6.00	.08	2.00	.06 L	1.50	.22	8.00	.50	8.00	.20	5.00
F069	<.2	0.00	<.2	0.00	<.2	0.00	.21	6.50	.42	3.00	<.2	0.00
F072	.27 H	7.00	.10	4.00	.10	3.00	.16	1.00	.47	6.00	.14 L	1.00
F107	1.177 EH	8.00	.70 EH	6.00	1.56 EH	5.00	1.03 EH	11.00	1.05 EH	11.00	.61 EH	10.00
MEDIAN	.2000		.0950		.1000		.2100		.4700		.2000	
1CRIT	.0513		.0355		.0362		.0528		.0918		.0513	
N	6		4		2		9		9		8	
MEAN	.2137		.0997		.1085		.2104		.4681		.2122	
3STDEV	.0795		-		-		.0783		.1120		.1378	

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	.067	1.00	.116	2.00	.241	4.00	.444	9.00
F008	<.2	0.00	<.2	0.00	.32 H	10.00	.42	6.50
F014	<.20	0.00	<.20	0.00	.25	5.00	.42	6.50
F020	.122	6.00	.134	5.00	.256	6.00	.365	4.00
F025	.09	2.50	.12	3.50	<.05 EL	0.00	.21 EL	1.00
F032	<.08	0.00	.12	3.50	.24	3.00	.46	10.00
F038	.09	2.50	.08 EL	1.00	.14 EL	1.00	.26 VL	2.00
F060	.10	4.00	.16	8.00	.27	7.00	.44	8.00
F069	<.2	0.00	<.2	0.00	.21	2.00	.36	3.00
F072	.11	5.00	.14	6.00	.28	8.00	.38	5.00
F107	.199 EH	7.00	.147	7.00	.30	9.00	1.28 EH	11.00
MEDIAN	.1000		.1270		.2530		.4200	
1CRIT	.0362		.0403		.0592		.0842	
N	5		6		8		9	
MEAN	.1024		.1295		.2559		.3943	
3STDEV	-		.0346		.0775		.1746	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	33.00	4.125	8	ELEL				BLOCK DIGESTION
F008	44.50	8.900	5	VH H	BIASED HIGH	-25.04	.1332	FIA
F014	32.50	6.500	5					
F020	48.00	4.800	10					HgSO4 Dig Auto
F025	27.50	3.056	9	L ELEL	BIASED LOW	-26.52	.0175	
F032	40.00	5.714	7	VLVL				E3367A
F038	15.50	1.722	9	L L EL ELELVL	BIASED LOW	-84.62	.0968	ISE
F060	57.50	5.750	10	L				digest colour
F069	14.50	3.625	4		INSUFFICIENT DATA			Block digestion
F072	46.00	4.600	10	H L				AA block dig
F107	85.00	8.500	10	EHEHEHEHEHEHEH EH	BIASED HIGH	20.79	.5426	Colourimetric

OVERALL AVERAGE
RANK IS 5.103

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F038	15.50	1.722	9	LLELELELVL	BIASED LOW	-84.62	.0968	ISE
F025	27.50	3.056	9	LELEL	BIASED LOW	-26.52	.0175	
F069	14.50	3.625	4		INSUFFICIENT DATA			Block digestion
F003	33.00	4.125	8	ELEL				BLOCK DIGESTION
F072	46.00	4.600	10	HL				AA block dig
F020	48.00	4.800	10					HgSO4 Dig Auto
F032	40.00	5.714	7	VLVL				E3367A
F060	57.50	5.750	10	L				digest colour
F014	32.50	6.500	5					
F107	85.00	8.500	10	EHEHEHEHEHEHEHEH	BIASED HIGH	20.79	.5426	Colourimetric
F008	44.50	8.900	5	VHH	BIASED HIGH	-25.04	.1332	FIA

OVERALL AVERAGE
RANK IS 5.103

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= .1000 BASIC ACCEPTABLE ERROR= .0400 CONCENTRATION ERROR INCREMENT= .0400

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.080	19.50	.107	17.50	.213	14.00	.061	20.00	.274	11.00	.598	13.50
F002	<.05	0.00	.12	25.00	.22	21.00	<.05	0.00	.33 H	30.00	.63	27.50
F003	.08	19.50	.11	21.00	.23	27.50	.05	13.00	.30	26.50	.63	27.50
F007	.035	2.00	.079	2.00	.191	5.00	.019 EL	1.00	.258	4.00	.592	10.50
F008	<.2	0.00	<.2	0.00	.22	21.00	<.2	0.00	.30	26.50	.62	23.50
F009	.057	4.00	.087	3.00	.20	7.00	.03	2.50	.26	6.50	.56	5.00
F010	.07	15.00	.10	12.50	.23	27.50	.05	13.00	.28	16.00	.61	19.00
F011	.07	15.00	.10	12.50	.19	4.00	.05	13.00	.29	22.50	.61	19.00
F012	<.02 EL	0.00	.05 EL	1.00	.16 L	3.00	<.02 EL	0.00	.23 L	3.00	.56	5.00
F014	<.10	0.00	.10	12.50	.24	29.00	<.10	0.00	.30	26.50	.60	16.00
F015	.1	23.00	.1	12.50	.2	7.00	<.1	0.00	.3	26.50	.6	16.00
F017	.063	7.00	.100	12.50	.214	15.00	.044	6.00	.278	12.50	.612	21.00
F020	.081	21.00	.110	21.00	.228	25.50	.068	22.00	.296	24.00	.640	29.00
F025	.066	9.00	.140 EH	26.00	.275 H	30.00	.046	9.50	.259	5.00	.838 EH	30.00
F026	.092	22.00	.117	24.00	.219	18.50	.067	21.00	.270	10.00	.564	7.00
F032	.074	18.00	.112	23.00	.228	25.50	.054	17.50	.304	29.00	.624	26.00
F036	.055	3.00	.090	5.00	.225	24.00	.045	8.00	.290	22.50	.620	23.50
F037	.316 EH	24.00	<.1	0.00	.115 EL	2.00	<.1	0.00	.219 L	2.00	.509 EL	2.00
F038	<.01 EL	0.00	.09	5.00	.21	11.00	.03	2.50	.28	16.00	.61	19.00
F042	.07	15.00	.11	21.00	.22	21.00	.05	13.00	.28	16.00	.59	8.50
F053	.069	12.50	.106	16.00	.219	18.50	.050	13.00	.284	20.00	.598	13.50
F060	<.6	0.00	<.6	0.00	<.6	0.00	<.6	0.00	<.6	0.00	<.6	0.00
F068	.0652	8.00	.0989	9.00	.2179	16.00	.0446	7.00	.2842	21.00	.6206	25.00
F069	<.2	0.00	<.2	0.00	.21	11.00	<.2	0.00	.28	16.00	.59	8.50
F072	.016 EL	1.00	<.005 EL	0.00	.096 EL	1.00	<.005 EL	0.00	.15 EL	1.00	.46 EL	1.00
F107	.068	10.50	.098	7.50	.202	9.00	.043	5.00	.261	8.00	.56	5.00
F109	.069	12.50	.108	19.00	.218	17.00	.053	16.00	.282	19.00	.616	22.00
F110	.073	17.00	.107	17.50	.212	13.00	.059	19.00	.280	16.00	.596	12.00
F112	.06	5.00	.09	5.00	.20	7.00	.04	4.00	.26	6.50	.55	3.00
F129	.068	10.50	.098	7.50	.210	11.00	.046	9.50	.265	9.00	.592	10.50
F133	.062	6.00	.100	12.50	.223	23.00	.054	17.50	.278	12.50	.600	16.00
MEDIAN	.0690		.1000		.2160		.0500		.2800		.6000	
1CRIT	.0400		.0400		.0446		.0400		.0472		.0600	
N	22		24		28		20		28		28	
MEAN	.0694		.1016		.2095		.0483		.2765		.5965	
3STDEV	.0384		.0287		.0717		.0264		.0595		.0856	

PARAMETER: 11091 Sodium mg/L

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	2.668	22.00	2.958	20.00	2.224	19.00	.552	14.00
F002	2.80 H	28.50	3.10 H	27.00	2.30	27.50	.60	26.50
F003	2.67	24.50	2.99	22.50	2.23	20.00	.58	24.50
F007	2.67	24.50	2.94	17.00	2.25	23.00	.562	19.00
F008	2.66	20.50	2.99	22.50	2.22	18.00	.58	24.50
F009	2.53	5.00	2.82	7.00	2.13	6.00	.52	4.50
F010	2.69	27.00	2.99	22.50	2.20	15.00	.57	22.00
F011	2.61	15.00	2.90	14.00	2.26	25.00	.56	17.50
F012	2.60	13.00	2.86	9.50	2.15	8.50	.52	4.50
F014	2.67	24.50	2.95	18.50	2.25	23.00	.62 H	30.00
F015	2.8 H	28.50	3.1 H	27.00	2.3	27.50	.6	26.50
F017	2.575	12.00	2.840	8.00	2.153	10.00	.570	22.00
F020	2.65	18.00	2.99	22.50	2.32	29.00	.618 H	29.00
F025	3.27 EH	31.00	3.65 EH	31.00	2.75 EH	31.00	.549	10.00
F026	2.472 L	4.00	2.474 EL	2.00	2.096	4.00	.538	7.00
F032	2.88 VH	30.00	3.14 H	30.00	2.42 VH	30.00	.610	28.00
F036	2.67	24.50	2.95	18.50	2.20	15.00	.570	22.00
F037	2.558	7.00	2.818	6.00	2.163	11.00	.465 VL	2.00
F038	2.62	16.50	3.01	25.00	2.17	13.00	.56	17.50
F042	2.57	10.50	3.10 H	27.00	2.25	23.00	.55	12.00
F053	2.556	6.00	2.796	5.00	2.128	5.00	.556	15.00
F060	2.1 EL	1.00	2.4 EL	1.00	1.9 EL	1.00	<.6	0.00
F068	2.609	14.00	3.132 H	29.00	2.291	26.00	.5562	16.00
F069	2.56	8.50	2.88	12.50	2.15	8.50	.55	12.00
F072	2.40 VL	2.00	2.60 VL	3.00	2.00 VL	2.00	.43 EL	1.00
F107	2.438 L	3.00	2.742 L	4.00	2.053 L	3.00	.526	6.00
F109	2.655	19.00	2.924	15.00	2.237	21.00	.563	20.00
F110	2.560	8.50	2.860	9.50	2.140	7.00	.541	8.00
F112	2.62	16.50	2.88	12.50	2.20	15.00	.50	3.00
F129	2.660	20.50	2.937	16.00	2.202	17.00	.544	9.00
F133	2.570	10.50	2.870	11.00	2.165	12.00	.550	12.00
MEDIAN	2.6200		2.9370		2.2000		.5561	
1CRIT	.1408		.1535		.1240		.0582	
N	29		29		29		28	
MEAN	2.6204		2.9152		2.2018		.5557	
3STDEV	.2996		.4351		.2505		.0953	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	170.50	17.050	10					IC
F002	213.00	26.625	8	H H H	BIASED HIGH	5.36	.0101	flame
F003	226.50	22.650	10					FLAME AA
F007	108.00	10.800	10	EL				CPQ116E0
F008	156.50	22.357	7					ICP/Flame
F009	50.50	5.050	10		BIASED LOW*	-3.13	-.0133	
F010	189.50	18.950	10					
F011	157.50	15.750	10					
F012	47.50	5.938	8	ELELL ELL	BIASED LOW*	-.13	-.0458	ICPMS
F014	180.00	22.500	8	H				
F015	194.50	21.611	9	H H				11111
F017	126.00	12.600	10					AAF
F020	241.00	24.100	10	H	BIASED HIGH*	1.75	.0205	IC
F025	212.50	21.250	10	EHH EHEHEHEH				IC
F026	119.50	11.950	10	L EL				Flame AA
F032	257.00	25.700	10	VHH VH	BIASED HIGH	8.67	-.0017	E3146A
F036	166.00	16.600	10					E3249A
F037	56.00	7.000	8	EH EL L EL VL				ICP
F038	125.50	13.944	9	EL				FAES
F042	167.00	16.700	10	H				Flame AA, air
F053	124.50	12.450	10					flame AA
F060	3.00	1.000	3	ELELEL	INSUFFICIENT DATA			ICP
F068	171.00	17.100	10	H				IC Dionex
F069	77.00	11.000	7					ICP
F072	12.00	1.500	8	ELELELELELELVLVLVLEL	BIASED LOW	-6.62	-.0873	AA air C2H2
F107	61.00	6.100	10	L L L	BIASED LOW	-6.82	.0019	ICP
F109	180.50	18.050	10					AA flame
F110	127.50	12.750	10					Flame - AAS
F112	77.50	7.750	10					AA 2380 flame
F129	120.50	12.050	10					Dionex IC
F133	133.00	13.300	10					FAA

* 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 14.919

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F060	3.00	1.000	3	ELELEL	INSUFFICIENT DATA			ICP
F072	12.00	1.500	8	ELELELELELELVLVLVLEL	BIASED LOW	-6.62	-.0873	AA air C2H2
F009	50.50	5.050	10		BIASED LOW*	-3.13	-.0133	
F012	47.50	5.938	8	ELELLELL	BIASED LOW*	-.13	-.0458	ICPMS
F107	61.00	6.100	10	LLL	BIASED LOW	-6.82	.0019	ICP
F037	56.00	7.000	8	EHELLELVL				ICP
F112	77.50	7.750	10					AA 2380 flame
F007	108.00	10.800	10	EL				CPQ116E0
F069	77.00	11.000	7					ICP
F026	119.50	11.950	10	LEL				Flame AA
F129	120.50	12.050	10					Dionex IC
F053	124.50	12.450	10					flame AA
F017	126.00	12.600	10					AAF
F110	127.50	12.750	10					Flame - AAS
F133	133.00	13.300	10					FAA
F038	125.50	13.944	9	EL				FAES
F011	157.50	15.750	10					
F036	166.00	16.600	10					E3249A
F042	167.00	16.700	10	H				Flame AA, air
F001	170.50	17.050	10					IC
F068	171.00	17.100	10	H				IC Dionex
F109	180.50	18.050	10					AA flame
F010	189.50	18.950	10					
F025	212.50	21.250	10	EHHEHEHEHEH				IC
F015	194.50	21.611	9	HH				11111
F008	156.50	22.357	7					ICP/Flame
F014	180.00	22.500	8	H				
F003	226.50	22.650	10					FLAME AA
F020	241.00	24.100	10	H	BIASED HIGH*	1.75	.0205	IC
F032	257.00	25.700	10	VHHVH	BIASED HIGH	8.67	-.0017	E3146A
F002	213.00	26.625	8	HHH	BIASED HIGH	5.36	.0101	flame

* 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 14.919

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= .1000 BASIC ACCEPTABLE ERROR= .0200 CONCENTRATION ERROR INCREMENT= .0500

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.193	26.00	.442	21.00	.557	18.00	.163	22.50	1.02	24.00	.355 EH	29.00
F002	.17	10.50	.42	10.00	.56	21.50	.16	17.00	1.00	18.00	.31	14.50
F003	.18	21.50	.44	18.00	.56	21.50	.16	17.00	1.02	24.00	.32	23.00
F007	.173	13.50	.433	14.00	.568	25.00	.160	17.00	1.02	24.00	.315	18.50
F008	.17	10.50	.44	18.00	.56	21.50	.16	17.00	1.02	24.00	.32	23.00
F009	.17	10.50	.41	7.00	.51	8.00	.15	9.00	1.00	18.00	.30	9.00
F010	.15	2.00	.42	10.00	.56	21.50	.16	17.00	.96	9.00	.33	26.50
F011	.19	25.00	.47	26.50	.58	28.00	.18	27.50	.98	12.50	.33	26.50
F012	.16	5.50	.42	10.00	.55	14.50	.15	9.00	.94	5.50	.31	14.50
F014	.174	15.50	.440	18.00	.560	21.50	.150	9.00	.980	12.50	.300	9.00
F015	.2 H	27.50	.4	5.00	.5 L	4.50	.1 EL	1.00	1.	18.00	.3	9.00
F017	.182	24.00	.449	23.00	.570	26.50	.166	25.00	1.035	27.00	.316	20.50
F020	.200 H	27.50	.480 H	28.50	.600 H	29.00	.180	27.50	1.09 H	29.00	.340	28.00
F025	.160	5.50	.399	3.00	.508	7.00	.146	7.00	.945	7.00	.288	5.00
F026	.162	7.00	.384 L	2.00	.490 L	3.00	.145	6.00	.882 VL	1.00	.274 L	2.00
F032	.176	19.00	.448	22.00	.530	9.00	.165	24.00	1.02	24.00	.323	25.00
F036	.180	21.50	.450	24.50	.430 EL	1.00	.160	17.00	.995	14.00	.315	18.50
F037	.159	4.00	.381 L	1.00	.487 L	2.00	.130 L	2.00	.935	4.00	.275 L	3.00
F038	.18	21.50	.47	26.50	.55	14.50	.14	3.50	.94	5.50	.26 EL	1.00
F042	.18	21.50	.44	18.00	.55	14.50	.17	26.00	1.00	18.00	.32	23.00
F053	.166	8.00	.420	10.00	.538	10.00	.154	11.00	.948	8.00	.300	9.00
F060	<.1 EL	0.00	.4	5.00	.5 L	4.50	.2 EH	29.00	.9 VL	2.00	.3	9.00
F069	.174	15.50	.434	15.00	.550	14.50	.158	12.00	.998	15.00	.311	16.00
F072	.14 EL	1.00	.43	13.00	.57	26.50	.14	3.50	1.04	28.00	.30	9.00
F107	.156	3.00	.4	5.00	.502 L	6.00	.143	5.00	.918 L	3.00	.285	4.00
F109	.175	17.50	.44	18.00	.553	17.00	.163	22.50	1.01	21.00	.316	20.50
F110	.173	13.50	.480 H	28.50	.545	12.00	.159	13.00	.975	11.00	.303	13.00
F112	.17	10.50	.42	10.00	.54	11.00	.16	17.00	.97	10.00	.30	9.00
F133	.175	17.50	.45	24.50	.56	21.50	.162	21.00	1.00	18.00	.312	17.00
MEDIAN	.1735		.4340		.5500		.1600		.9980		.3100	
1CRIT	.0237		.0367		.0425		.0230		.0649		.0305	
N	25		26		27		27		27		27	
MEAN	.1719		.4296		.5410		.1568		.9840		.3079	
3STDEV	.0301		.0645		.0805		.0340		.1094		.0467	

PARAMETER: 12091 Magnesium mg/L

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.383	26.00	.406	27.00	.625	25.00	.857	25.00
F002	.35	10.00	.37	7.00	.61	18.50	.83	16.50
F003	.36	16.00	.39	19.50	.61	18.50	.84	21.50
F007	.369	21.00	.395	23.00	.623	24.00	.842	23.00
F008	.36	16.00	.39	19.50	.60	14.50	.84	21.50
F009	.34	5.00	.37	7.00	.58	9.00	.79	5.00
F010	.36	16.00	.38	13.00	.59	11.50	.82	13.00
F011	.39	27.00	.41	28.50	.63	27.00	.83	16.50
F012	.35	10.00	.37	7.00	.58	9.00	.80	7.00
F014	.370	22.50	.390	19.50	.630	27.00	.890 H	27.50
F015	.4 H	28.00	.4	25.50	.6	14.50	.9 H	29.00
F017	.371	24.50	.390	19.50	.619	22.00	.846	24.00
F020	.430 EH	29.00	.410	28.50	.640	29.00	.890 H	27.50
F025	.341	6.00	.354	3.00	.544 L	2.00	.746 L	2.00
F026	.320 L	2.00	.348 L	2.00	.545 L	3.00	.721 EL	1.00
F032	.371	24.50	.397	24.00	.614	21.00	.838	20.00
F036	.365	19.50	.385	15.00	.600	14.50	.835	19.00
F037	.332	3.50	.361	4.00	.562	4.00	.776	3.00
F038	.36	16.00	.40	25.50	.57	6.00	.81	10.50
F042	.37	22.50	.39	19.50	.63	27.00	.83	16.50
F053	.344	7.00	.371	9.00	.572	7.00	.804	9.00
F060	.3 EL	1.00	.3 EL	1.00	.5 EL	1.00	.8	7.00
F069	.356	13.00	.386	16.00	.603	17.00	.819	12.00
F072	.36	16.00	.38	13.00	.62	23.00	.87	26.00
F107	.332	3.50	.363	5.00	.565	5.00	.778	4.00
F109	.365	19.50	.390	19.50	.612	20.00	.830	16.50
F110	.350	10.00	.374	10.00	.590	11.50	.810	10.50
F112	.35	10.00	.38	13.00	.58	9.00	.80	7.00
F133	.35	10.00	.375	11.00	.60	14.50	.825	14.00
MEDIAN	.3600		.3850		.6000		.8300	
1CRIT	.0330		.0342		.0450		.0565	
N	27		26		27		27	
MEAN	.3581		.3810		.5964		.8239	
3STDEV	.0523		.0433		.0747		.0965	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	243.50	24.350	10	EH	BIASED HIGH*	.70	.0167	ICP
F002	143.50	14.350	10					A.A.
F003	200.50	20.050	10					FLAME AA
F007	203.00	20.300	10					CPQ106E2
F008	185.50	18.550	10					ICP/Flame
F009	87.50	8.750	10					
F010	139.50	13.950	10					
F011	245.00	24.500	10		BIASED HIGH*	-3.95	.0379	
F012	92.00	9.200	10					ICPMS
F014	182.00	18.200	10	H				
F015	162.00	16.200	10	H L EL H H				12321
F017	236.00	23.600	10		BIASED HIGH*	3.09	-.0005	AAF
F020	283.50	28.350	10	H H H H EH H	BIASED HIGH	6.72	.0137	ICP
F025	47.50	4.750	10	L L	BIASED LOW	-7.16	-.0026	IC
F026	29.00	2.900	10	L L VLL L L L EL	BIASED LOW	-12.70	.0080	Flame AA
F032	212.50	21.250	10					E3146A
F036	164.50	16.450	10	EL				E3249A
F037	30.50	3.050	10	L L L L	BIASED LOW*	-4.90	-.0167	ICP
F038	130.50	13.050	10	EL				ICPOES
F042	206.50	20.650	10					Flame AA, nitrous
F053	88.00	8.800	10					flame AA
F060	59.50	6.611	9	EL L EHVL ELELEL	BIASED LOW	-10.15	.0047	ICP
F069	146.00	14.600	10					ICP
F072	159.00	15.900	10	EL				AA air C2H2
F107	43.50	4.350	10	L L	BIASED LOW	-6.83	-.0031	ICP
F109	192.00	19.200	10					AA flame
F110	133.00	13.300	10	H				Flame - AAS
F112	106.50	10.650	10					AA 2380 flame
F133	169.00	16.900	10					FAA

* 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
F026	29.00	2.900	10	LLVLLLLLEL	BIASED LOW	-12.70	.0080	Flame AA
F037	30.50	3.050	10	LLLL	BIASED LOW*	-4.90	-.0167	ICP
F107	43.50	4.350	10	LL	BIASED LOW	-6.83	-.0031	ICP
F025	47.50	4.750	10	LL	BIASED LOW	-7.16	-.0026	IC
F060	59.50	6.611	9	ELLEHVLELELEL	BIASED LOW	-10.15	.0047	ICP
F009	87.50	8.750	10					
F053	88.00	8.800	10					flame AA
F012	92.00	9.200	10					ICPMS
F112	106.50	10.650	10					AA 2380 flame
F038	130.50	13.050	10	EL				ICPOES
F110	133.00	13.300	10	H				Flame - AAS
F010	139.50	13.950	10					
F002	143.50	14.350	10					A.A.
F069	146.00	14.600	10					ICP
F072	159.00	15.900	10	EL				AA air C2H2
F015	162.00	16.200	10	HLELHH				12321
F036	164.50	16.450	10	EL				E3249A
F133	169.00	16.900	10					FAA
F014	182.00	18.200	10	H				
F008	185.50	18.550	10					ICP/Flame
F109	192.00	19.200	10					AA flame
F003	200.50	20.050	10					FLAME AA
F007	203.00	20.300	10					CPQ106E2
F042	206.50	20.650	10					Flame AA, nitrous
F032	212.50	21.250	10					E3146A
F017	236.00	23.600	10		BIASED HIGH*	3.09	-.0005	AAF
F001	243.50	24.350	10	EH	BIASED HIGH*	.70	.0167	ICP
F011	245.00	24.500	10		BIASED HIGH*	-3.95	.0379	
F020	283.50	28.350	10	HHHHEHH	BIASED HIGH	6.72	.0137	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 14.952

Magnesium

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= .0250 BASIC ACCEPTABLE ERROR= .0250 CONCENTRATION ERROR INCREMENT= .0600

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	<.05	0.00	.05	10.00	<.05	0.00	<.05	0.00	.10	12.00	1.99	14.00
F002	.030	9.00	.033	7.00	<.02	0.00	<.02	0.00	.061	7.00	1.86	1.00
F003	.019	6.00	.033	7.00	.028	6.00	.019	7.00	.084	9.00	1.97	12.00
F008	<.05	0.00	<.05	0.00	<.05	0.00	<.05	0.00	.05 L	2.50	2.0	15.00
F010	<.02	0.00	<.02	0.00	<.02	0.00	<.02	0.00	.05 L	2.50	1.96	9.00
F011	.0168	4.00	.030	5.00	.024	3.50	.015	5.00	.077	8.00	1.96	9.00
F015	<.05	0.00	<.05	0.00	<.05	0.00	<.05	0.00	.15 EH	16.00	1.97	12.00
F020	<.25	0.00	<.25	0.00	<.25	0.00	<.25	0.00	<.25	0.00	1.97	12.00
F025	<.02	0.00	<.02	0.00	<.02	0.00	<.02	0.00	<.02 VL	0.00	1.87	2.50
F026	.025	8.00	.046	9.00	.0306	7.00	.024	8.00	.086	10.00	2.01	16.00
F032	<.02	0.00	<.04	0.00	<.02	0.00	<.02	0.00	<.08	0.00	1.96	9.00
F038	<.05	0.00	<.05	0.00	<.05	0.00	<.05	0.00	.12 H	15.00	1.89	4.00
F042	0.00T	1.50	.01W	0.00	.01W	0.00	0.00T	1.50	.06	5.50	2.02	17.00
F060	.022	7.00	.033	7.00	.025	5.00	.017	6.00	.109 H	13.00	1.94	6.00
F069	.018	5.00	.026	4.00	.024	3.50	.009	4.00	.113 H	14.00	1.87	2.50
F072	<.01	0.00	.01	2.00	<.01	0.00	<.01	0.00	.06	5.50	1.9	5.00
F107	.001	3.00	.021	3.00	.004	2.00	.002	3.00	.057	4.00	1.941	7.00
F109	0.0T	1.50	0.0T L	1.00	0.0T	1.00	0.0T	1.50	0.0T EL	1.00	2.096	19.00
F112		0.00		0.00		0.00		0.00	.09	11.00	2.13 H	20.00
F133	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	2.08	18.00
MEDIAN	.0180		.0315		.0240		.0120		.0805		1.9650	
1CRIT	.0250		.0254		.0250		.0250		.0283		.1414	
N	6		8		5		5		14		18	
MEAN	.0170		.0290		.0210		.0124		.0798		1.9665	
3STDEV	.0229		.0295		-		-		.0698		.1823	

PARAMETER: 14092 Reactive Silica mg/L Si

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.18	17.50	1.10	16.00	1.92	6.50	.75	5.00
F002	.18	17.50	1.02	3.50	1.92	6.50	.75	5.00
F003	.173	14.00	1.08	12.50	1.99	15.00	.775	9.00
F008	.14	3.50	1.07	10.00	1.96	10.50	.79	15.50
F010	.16	6.50	1.05	7.50	1.98	13.50	.72	3.00
F011	.176	15.00	1.08	12.50	1.98	13.50	.781	12.00
F015	.17	11.50	1.08	12.50	1.97	12.00	.87 EH	20.00
F020	<.25	0.00	1.08	12.50	2.01	17.00	.776	10.00
F025	<.02 EL	0.00	1.005	2.00	1.87	1.50	.701 L	1.00
F026	.177	16.00	1.09	15.00	2.03	18.00	.7875	14.00
F032	.16	6.50	1.06	9.00	1.96	10.50	.76	7.00
F038	.17	11.50	1.04	5.00	1.90	3.50	.80	18.00
F042	.15	5.00	1.13	18.00	2.00	16.00	.79	15.50
F060	.169	9.00	1.05	7.50	1.94	8.00	.761	8.00
F069	.164	8.00	1.02	3.50	1.87	1.50	.791	17.00
F072	.14	3.50	1.0	1.00	1.9	3.50	.75	5.00
F107	.107 EL	1.00	1.046	6.00	1.952	9.00	.710	2.00
F109	.135 L	2.00	1.104	17.00	2.114 H	19.00	.783	13.00
F112	.17	11.50	1.24 EH	20.00	2.13 EH	20.00	.85 H	19.00
F133	.17	11.50	1.18 H	19.00	1.91	5.00	.78	11.00
MEDIAN	.1695		1.0750		1.9600		.7780	
1CRIT	.0337		.0880		.1411		.0702	
N	15		18		17		18	
MEAN	.1616		1.0714		1.9668		.7725	
3STDEV	.0402		.1227		.1579		.0913	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	81.00	11.571	7					Auto Colour
F002	56.50	7.063	8					auto-analyzer
F003	97.50	9.750	10					COLORIMETRIC
F008	57.00	9.500	6	L				Autocolourimetric
F010	42.00	7.000	6	L				
F011	87.50	8.750	10					
F015	84.00	14.000	6	EH EH				ICP
F020	51.50	12.875	4		INSUFFICIENT DATA			Auto Molyb bl
F025	7.00	1.750	4	VL EL L	INSUFFICIENT DATA			
F026	121.00	12.100	10					Autoanalyzer
F032	42.00	8.400	5					E3370A
F038	57.00	9.500	6	H				ICPOES
F042	80.00	10.000	8					Colourimetric
F060	76.50	7.650	10	H				ICP
F069	63.00	6.300	10	H				ICP
F072	25.50	3.643	7		BIASED LOW*	-2.25	-.0233	Molyb oxalic
F107	40.00	4.000	10	EL	BIASED LOW*	.10	-.0279	Colourimetric
F109	76.00	7.600	10	L EL L H				FIA - molybdate
F112	101.50	16.917	6	H EHEHH	BIASED HIGH	8.92	.0074	Technicon
F133	64.50	12.900	5	H				Colourimteric

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F025	7.00	1.750	4	VLELL	INSUFFICIENT DATA			
F072	25.50	3.643	7		BIASED LOW*	-2.25	-.0233	Molyb oxalic
F107	40.00	4.000	10	EL	BIASED LOW*	.10	-.0279	Colourimetric
F069	63.00	6.300	10	H				ICP
F010	42.00	7.000	6	L				
F002	56.50	7.063	8					auto-analyzer
F109	76.00	7.600	10	LELLH				FIA - molybdate
F060	76.50	7.650	10	H				ICP
F032	42.00	8.400	5					E3370A
F011	87.50	8.750	10					
F038	57.00	9.500	6	H				ICPOES
F008	57.00	9.500	6	L				Autocolourimetric
F003	97.50	9.750	10					COLORIMETRIC
F042	80.00	10.000	8					Colourimetric
F001	81.00	11.571	7					Auto Colour
F026	121.00	12.100	10					Autoanalyzer
F020	51.50	12.875	4		INSUFFICIENT DATA			Auto Molyb bl
F133	64.50	12.900	5	H				Colourimteric
F015	84.00	14.000	6	EHEH				ICP
F112	101.50	16.917	6	HEHEHH	BIASED HIGH	8.92	.0074	Technicon

* 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 8.858

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= .2500 BASIC ACCEPTABLE ERROR= .0500 CONCENTRATION ERROR INCREMENT= .0350

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	1.365	15.00	2.407	15.00	5.64	19.00	4.116	18.00	3.771	13.00	5.518	20.00
F002	1.42	23.00	2.34	4.00	6.19 VH	26.00	4.78 VH	26.00	3.51 VL	2.00	5.35	10.00
F009	1.41	22.00	2.47	23.00	6.4 VH	27.00	5.3 EH	27.00	4.0 H	26.00	5.5	19.00
F010	1.3	5.00	2.4	11.50	5.4	7.50	4.0	10.00	3.8	14.00	5.6	23.00
F012	1.37	16.50	2.43	16.50	7.22 EH	28.00	5.62 EH	28.00	3.82	15.00	5.62	24.50
F014	1.39	18.00	2.43	16.50	5.62	18.00	4.03	13.00	3.83	16.00	5.62	24.50
F015	1.4	20.00	2.4	11.50	5.5	11.50	4.	10.00	3.7	7.00	5.3	5.50
F017	1.329	7.00	2.377	7.00	5.418	9.00	3.892	5.00	3.758	10.00	5.347	8.00
F020	1.46 H	26.00	2.51	25.50	5.52	13.00	4.21	20.00	3.98	25.00	5.47	17.00
F025	1.35	11.00	2.35	5.00	5.82 H	22.00	4.15	19.00	3.77	11.50	5.35	10.00
F026	1.4625 H	27.00	2.5802 H	27.00	5.8279 H	23.00	4.2683 H	22.00	4.0889 VH	27.00	5.8550 VH	27.00
F032	1.45	25.00	2.50	24.00	5.35	6.00	4.00	10.00	3.90	22.50	5.45	15.00
F036	1.35	11.00	2.40	11.50	4.55 EL	1.00	3.25 VL	1.00	3.90	22.50	5.35	10.00
F037	1.1157 EL	2.00	2.0944 EL	2.00	5.0554 VL	3.00	3.7113 VL	2.00	3.5591 L	3.00	5.0329 VL	2.00
F038	1. EL	1.00	2. EL	1.00	5. VL	2.00	4.	10.00	3. EL	1.00	5. VL	1.00
F042	1.35	11.00	2.33	3.00	5.28 L	4.00	3.82 L	3.50	3.60 L	4.00	5.13 L	3.00
F053	1.35	11.00	2.45	20.50	5.55	16.00	4.05	16.00	3.85	20.00	5.49	18.00
F060	1.3	5.00	2.4	11.50	5.5	11.50	3.9	6.00	3.7	7.00	5.4	13.00
F068	1.399	19.00	2.510	25.50	5.700	21.00	4.250 H	21.00	3.929	24.00	5.628	26.00
F069	1.36	14.00	2.40	11.50	5.54	15.00	4.39 VH	23.00	3.85	20.00	5.30	5.50
F072	1.44	24.00	2.37	6.00	5.33	5.00	3.82 L	3.50	3.63 L	5.00	5.26	4.00
F107	1.35	11.00	2.38	8.00	5.45	10.00	4.00	10.00	3.71	9.00	5.38	12.00
F109	1.409	21.00	2.464	22.00	5.534	14.00	4.035	14.00	3.831	17.00	5.462	16.00
F110	1.26 L	3.00	2.44	19.00	6.05 VH	25.00	4.40 VH	24.50	3.77	11.50	5.41	14.00
F112	1.37	16.50	2.45	20.50	5.67	20.00	4.10	17.00	3.85	20.00	5.58	22.00
F118	1.6 EH	28.00	2.7 EH	28.00	5.9 VH	24.00	4.4 VH	24.50	4.1 VH	28.00	6.1 EH	28.00
F129	1.347	8.00	2.436	18.00	5.619	17.00	4.043	15.00	3.845	18.00	5.566	21.00
F133	1.30	5.00	2.40	11.50	5.40	7.50	3.92	7.00	3.70	7.00	5.33	7.00
MEDIAN	1.3625		2.4035		5.5370		4.0390		3.8100		5.4300	
1CRIT	.0889		.1254		.2350		.1826		.1746		.2313	
N	26		26		26		26		26		26	
MEAN	1.3618		2.4123		5.5871		4.1379		3.7943		5.4346	
3STDEV	.2120		.2549		.9229		.9638		.3977		.5030	

PARAMETER: 16000 Sulfate IC mg/L

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	3.687	12.00	2.206	11.00	4.772	20.00	5.948	18.00
F002	3.89 H	23.00	2.23	16.00	4.36 VL	2.50	5.44 VL	2.00
F009	4.2 VH	27.00	2.25	19.50	4.8	21.50	5.75	8.50
F010	3.7	14.50	2.2	8.50	4.8	21.50	6.0	20.50
F012	4.30 VH	28.00	2.39 H	26.00	4.87	25.00	6.18 H	25.00
F014	3.80	22.00	2.27	23.00	4.82	23.00	6.36 VH	27.00
F015	3.6	8.50	2.2	8.50	4.6	8.00	5.8	11.00
F017	3.599	7.00	2.208	12.00	4.606	9.00	5.836	12.00
F020	3.75	18.50	2.20	8.50	4.85	24.00	6.15 H	24.00
F025	3.75	18.50	2.24	18.00	4.70	12.50	5.78	10.00
F026	3.9794 VH	24.00	2.4156 VH	27.00	5.0360 VH	27.00	6.2584 VH	26.00
F032	3.70	14.50	2.25	19.50	4.70	12.50	5.90	16.00
F036	3.40 VL	2.00	2.15	4.00	4.75	17.00	5.85	13.50
F037	3.4192 VL	3.00	1.9049 EL	1.00	4.4709 L	4.00	5.7103	7.00
F038	3. EL	1.00	2. VL	2.00	4. EL	1.00	5. EL	1.00
F042	3.51 L	4.50	2.14	3.00	4.50 L	6.50	5.60 L	4.00
F053	3.73	17.00	2.26	22.00	4.72	14.00	5.87	15.00
F060	3.6	8.50	2.2	8.50	4.5 L	6.50	5.7	6.00
F068	3.773	21.00	2.305	25.00	4.878	26.00	6.073	23.00
F069	4.10 VH	25.50	2.19	6.00	4.36 VL	2.50	5.46 VL	3.00
F072	3.51 L	4.50	2.18	5.00	4.49 L	5.00	5.65	5.00
F107	3.67	11.00	2.23	16.00	4.68	11.00	5.85	13.50
F109	3.705	16.00	2.257	21.00	4.726	15.00	5.935	17.00
F110	3.56	6.00	2.23	16.00	4.74	16.00	6.00	20.50
F112	3.77	20.00	2.28	24.00	4.76	19.00	6.07	22.00
F118	4.1 VH	25.50	2.5 EH	28.00	5.2 EH	28.00	6.5 VH	28.00
F129	3.696	13.00	2.212	14.00	4.752	18.00	5.977	19.00
F133	3.63	10.00	2.21	13.00	4.62	10.00	5.75	8.50
MEDIAN	3.7000		2.2210		4.7230		5.8600	
1CRIT	.1707		.1190		.2066		.2463	
N	26		26		26		26	
MEAN	3.7242		2.2271		4.6870		5.8807	
3STDEV	.5860		.2271		.4838		.6637	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	161.00	16.100	10					IC
F002	134.50	13.450	10	VHVHVL H VLVL				I.C.
F009	220.50	22.050	10	VHEHH VH				
F010	136.00	13.600	10					
F012	232.50	23.250	10	EHEH VHH H	BIASED HIGH	16.63	-.1766	IC
F014	201.00	20.100	10	VH				
F015	101.50	10.150	10					ICP
F017	86.00	8.600	10					IC
F020	201.50	20.150	10	H H				Z
F025	137.50	13.750	10	H				IC
F026	257.00	25.700	10	H H H H VHVHVHVHVHVH	BIASED HIGH	5.91	.0375	Dionex
F032	165.00	16.500	10					E3372A
F036	93.50	9.350	10	ELVL VL				E3147A
F037	29.00	2.900	10	ELELVLVLL VLVLELL	BIASED LOW*	-1.03	-.2608	IC Waters
F038	21.00	2.100	10	ELELVL ELVLELVLELEL	BIASED LOW	-7.92	-.1990	IC
F042	46.50	4.650	10	L L L L L L L	BIASED LOW	-5.94	.0495	IC
F053	169.50	16.950	10					IC
F060	83.50	8.350	10	L				IC
F068	231.50	23.150	10	H	BIASED HIGH*	3.38	.0036	IC Dionex
F069	126.00	12.600	10	VH VH VLVL				IC
F072	67.00	6.700	10	L L L L	BIASED LOW	-5.90	.0898	
F107	111.50	11.150	10					IC
F109	173.00	17.300	10					Dionex IC
F110	155.50	15.550	10	L VHVH				IC Dionex
F112	201.00	20.100	10					Dionex IC
F118	270.00	27.000	10	EHEHVHVHVHEHVHEHEHVH	BIASED HIGH	7.87	.0938	IC
F129	161.00	16.100	10					Dionex
F133	86.50	8.650	10					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 14.500

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F038	21.00	2.100	10	ELELVLELVLELVLELEL	BIASED LOW	-7.92	-.1990	IC
F037	29.00	2.900	10	ELELVLVLLVLVLELL	BIASED LOW*	-1.03	-.2608	IC Waters
F042	46.50	4.650	10	LLLLLLL	BIASED LOW	-5.94	.0495	IC
F072	67.00	6.700	10	LLLL	BIASED LOW	-5.90	.0898	
F060	83.50	8.350	10	L				IC
F017	86.00	8.600	10					IC
F133	86.50	8.650	10					IC
F036	93.50	9.350	10	ELVLVL				E3147A
F015	101.50	10.150	10					ICP
F107	111.50	11.150	10					IC
F069	126.00	12.600	10	VHVHVLVL				IC
F002	134.50	13.450	10	VHVHVLHVLVL				I.C.
F010	136.00	13.600	10					
F025	137.50	13.750	10	H				IC
F110	155.50	15.550	10	LVHVH				IC Dionex
F001	161.00	16.100	10					IC
F129	161.00	16.100	10					Dionex
F032	165.00	16.500	10					E3372A
F053	169.50	16.950	10					IC
F109	173.00	17.300	10					Dionex IC
F014	201.00	20.100	10	VH				
F112	201.00	20.100	10					Dionex IC
F020	201.50	20.150	10	HH				Z
F009	220.50	22.050	10	VHEHHVH				
F068	231.50	23.150	10	H	BIASED HIGH*	3.38	.0036	IC Dionex
F012	232.50	23.250	10	EHEHVHHH	BIASED HIGH	16.63	-.1766	IC
F026	257.00	25.700	10	HHHHVHVHVHVHVHVH	BIASED HIGH	5.91	.0375	Dionex
F118	270.00	27.000	10	EHEHVHVHVHEHVHEHEHVH	BIASED HIGH	7.87	.0938	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 14.500

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= .3000 CONCENTRATION ERROR INCREMENT= .0800

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	1.5	6.00	2.6	6.00	5.6	5.50	4.4	7.00	4.2	7.00	5.7	7.00
F007	1.1	1.00	2.0	1.00	5.0	2.00	3.5	2.00	3.5	1.00	5.0	1.50
F008	1.45	5.00	2.33	3.00	5.40	4.00	3.95	4.00	3.79	3.00	5.59	5.00
F010	1.4	3.50	2.5	5.00	4.7 L	1.00	3.3 L	1.00	4.0	5.50	5.1	3.00
F011	<3.	0.00	<3.	0.00	7. EH	7.00	4.	5.00	4.	5.50	5.	1.50
F026	1.295	2.00	2.255	2.00	5.365	3.00	4.055	6.00	3.75	2.00	5.625	6.00
F060	1.4	3.50	2.4	4.00	5.6	5.50	3.9	3.00	3.8	4.00	5.5	4.00
MEDIAN	1.4000		2.3650		5.4000		3.9500		3.8000		5.5000	
1CRIT	.3320		.4092		.6520		.5360		.5240		.6600	
N	4		4		5		5		5		4	
MEAN	1.3862		2.3712		5.3930		3.8810		3.8680		5.4537	
3STDEV	-		-		-		-		-		-	

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	4.4 H	7.00	3.7 VH	6.00	5.8 H	6.00	5.8	3.00
F007	3.2	2.00	2.6	3.00	4.7	1.00	5.4	2.00
F008	3.90	6.00	2.85	4.00	5.06	4.00	5.83	4.00
F010	3.3	3.00	2.2 L	1.00	4.8	2.00	5.9	5.50
F011	3. L	1.00	6.0 EH	7.00	8. EH	7.00	5. L	1.00
F026	3.84	5.00	3.375 H	5.00	5.635	5.00	5.90	5.50
F060	3.7	4.00	2.3 L	2.00	4.9	3.00	6.0	7.00
MEDIAN	3.7000		2.8500		5.0600		5.8300	
1CRIT	.5160		.4480		.6248		.6864	
N	5		5		5		5	
MEAN	3.5880		2.9650		5.2390		5.7660	
3STDEV	-		-		-		-	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	60.50	6.050	10	H VHH				COLORIMETRIC-MTB
F007	16.50	1.650	10					CPQ100E2
F008	42.00	4.200	10					AutocolorLR/TurbHR
F010	30.50	3.050	10	L L L				
F011	35.00	4.375	8	EH L EHEHL				
F026	41.50	4.150	10	H				Autoanalyzer
F060	40.00	4.000	10	L				ICP

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

OVERALL AVERAGE
RANK IS 3.912

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F007	16.50	1.650	10					CPQ100E2
F010	30.50	3.050	10	LLL				
F060	40.00	4.000	10	L				ICP
F026	41.50	4.150	10	H				Autoanalyzer
F008	42.00	4.200	10					AutocolorLR/TurbHR
F011	35.00	4.375	8	EHLEHEHL				
F003	60.50	6.050	10	HVHH				COLORIMETRIC-MTB

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

OVERALL AVERAGE
RANK IS 3.912

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= .2000 BASIC ACCEPTABLE ERROR= .0750 CONCENTRATION ERROR INCREMENT= .0350

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.110	2.00	.170	1.00	.415	13.00	.112	10.00	.493	17.50	.456	17.00
F002	.16	17.00	.27	22.00	.41	10.00	.12	15.50	.46	3.00	.42	4.00
F009	.14	4.00	.26	20.50	.41	10.00	.13	18.00	.50	20.50	.48	21.00
F010	.1	1.00	.2	4.50	.4	5.50	.1	2.50	.5	20.50	.4	1.00
F012	.28 EH	24.00	.34 EH	24.00	.66 EH	24.00	.35 EH	24.00	.64 EH	24.00	.53	23.00
F014	.181	19.00	.216	9.00	.416	14.00	.119	13.00	.488	13.00	.464	20.00
F015	.15	13.00	.20	4.50	.4	5.50	.12	15.50	.47	5.50	.42	4.00
F017	.149	10.00	.218	11.00	.407	8.00	.114	11.00	.475	8.00	.441	9.50
F020	.144	6.00	.194	2.00	.385	1.00	.115	12.00	.435	1.00	.421	6.00
F025	.145	7.00	.203	7.00	.394	3.00	.105	5.00	.472	7.00	.441	9.50
F026	.1854	21.00	.2701	23.00	.4258	17.00	.1412	20.00	.5348	23.00	.5505 EH	24.00
F032	.18	18.00	.23	16.50	.60 EH	23.00	.12	15.50	.49	14.50	.45	13.50
F036	.15	13.00	.22	13.50	.41	10.00	.11	7.50	.48	10.00	.45	13.50
F037	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00
F038	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00
F042	.19	22.00	.26	20.50	.45	21.50	.15	21.00	.48	10.00	.45	13.50
F053	.15	13.00	.22	13.50	.42	16.00	.12	15.50	.48	10.00	.44	8.00
F060	.20	23.00	.23	16.50	.39	2.00	.14	19.00	.46	3.00	.41	2.00
F068	.1531	16.00	.2173	10.00	.4171	15.00	.1103	9.00	.4930	17.50	.4469	11.00
F069	.148	9.00	.215	8.00	.413	12.00	.100	2.50	.487	12.00	.427	7.00
F107	.14	4.00	.20	4.50	.40	5.50	.10	2.50	.47	5.50	.42	4.00
F109	.184	20.00	.249	19.00	.427	18.00	.154	22.00	.492	16.00	.455	16.00
F110	.15	13.00	.24	18.00	.45	21.50	.20 EH	23.00	.53	22.00	.46	19.00
F112	.15	13.00	.22	13.50	.43	19.00	.11	7.50	.49	14.50	.45	13.50
F129	.146	8.00	.220	13.50	.442	20.00	.109	6.00	.496	19.00	.458	18.00
F133	.14	4.00	.20	4.50	.40	5.50	.10	2.50	.46	3.00	.50	22.00
MEDIAN	.1500		.2200		.4140		.1170		.4875		.4500	
1CRIT	.0750		.0757		.0825		.0750		.0851		.0837	
N	22		22		22		23		22		22	
MEAN	.1566		.2251		.4239		.1217		.4864		.4495	
3STDEV	.0623		.0692		.1251		.0677		.0570		.0813	

PARAMETER: 17000 Chloride IC mg/L

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	4.075	9.00	4.647	13.00	1.846 H	26.00	.529	16.00
F002	4.21	17.50	4.70	16.00	1.70	11.00	.48	2.00
F009	3.95	5.00	4.41 L	4.00	1.71	14.00	.53	17.00
F010	4.3	22.00	4.9 H	25.50	1.7	11.00	.5	5.00
F012	4.07	8.00	4.67	15.00	1.74	17.50	.56	24.00
F014	4.26	21.00	4.79	22.00	1.70	11.00	.546	20.00
F015	4.1	12.50	4.6	11.00	1.7	11.00	.52	12.50
F017	4.046	6.00	4.574	9.00	1.649	4.00	.522	14.00
F020	4.21	17.50	4.61	12.00	1.74	17.50	.456 EL	1.00
F025	4.09	11.00	4.66	14.00	1.66	6.00	.513	9.00
F026	4.3243 H	23.00	4.7509	19.00	1.8356 H	25.00	.5550	23.00
F032	3.92	4.00	4.51	6.00	1.76	20.50	.54	18.50
F036	4.08	10.00	4.59	10.00	1.73	15.50	.52	12.50
F037	3.2138 EL	1.00	3.5867 EL	1.00	1.0876 EL	1.00	<.5	0.00
F038	3.5 EL	2.00	4.0 EL	2.00	1.3 EL	2.00	<.5	0.00
F042	4.12	15.00	4.77	20.50	1.65	5.00	.51	7.50
F053	4.05	7.00	4.55	8.00	1.69	8.00	.51	7.50
F060	3.80 L	3.00	4.30 VL	3.00	1.52 L	3.00	.50	5.00
F068	4.115	14.00	4.542	7.00	1.788	23.00	.5195	11.00
F069	4.18	16.00	4.85	23.00	1.73	15.50	.497	3.00
F107	4.35 H	24.00	4.71	18.00	1.77	22.00	.55	21.50
F109	4.237	19.50	4.709	17.00	1.70	11.00	.516	10.00
F110	4.39 H	25.00	4.90 H	25.50	1.76	20.50	.55	21.50
F112	4.40 H	26.00	4.89 H	24.00	1.80	24.00	.54	18.50
F129	4.237	19.50	4.770	20.50	1.684	7.00	.524	15.00
F133	4.10	12.50	4.50	5.00	1.75	19.00	.50	5.00
MEDIAN	4.1075		4.6535		1.7050		.5200	
1CRIT	.2118		.2309		.1277		.0862	
N	24		23		24		22	
MEAN	4.1131		4.6132		1.6986		.5214	
3STDEV	.5611		.5647		.3094		.0581	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	124.50	12.450	10	H				IC
F002	118.00	11.800	10					I.C.
F009	134.00	13.400	10	L				
F010	98.50	9.850	10	H				
F012	207.50	20.750	10	EHEHEHEHEH	BIASED HIGH*	-3.91	.1516	IC
F014	162.00	16.200	10					
F015	95.00	9.500	10					IC
F017	90.50	9.050	10					IC
F020	76.00	7.600	10	EL				IC
F025	78.50	7.850	10					IC
F026	218.00	21.800	10	EHH H	BIASED HIGH*	2.76	.0395	Dionex
F032	150.00	15.000	10	EH				E3372A
F036	115.50	11.550	10					E3147A
F037	3.00	1.000	3	ELELEL	INSUFFICIENT DATA			IC Waters
F038	6.00	2.000	3	ELELEL	INSUFFICIENT DATA			IC
F042	156.50	15.650	10					IC
F053	106.50	10.650	10					IC
F060	79.50	7.950	10	L VLL				IC
F068	133.50	13.350	10					IC Dionex
F069	108.00	10.800	10					IC
F107	111.50	11.150	10	H				IC
F109	168.50	16.850	10					Dionex IC
F110	209.00	20.900	10	EH H H	BIASED HIGH	5.54	.0095	IC Dionex
F112	173.50	17.350	10	H H				Dionex IC
F129	146.50	14.650	10					Dionex
F133	83.00	8.300	10					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 12.817

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F037	3.00	1.000	3	ELELEL	INSUFFICIENT DATA			IC Waters
F038	6.00	2.000	3	ELELEL	INSUFFICIENT DATA			IC
F020	76.00	7.600	10	EL				IC
F025	78.50	7.850	10					IC
F060	79.50	7.950	10	LVLL				IC
F133	83.00	8.300	10					IC
F017	90.50	9.050	10					IC
F015	95.00	9.500	10					IC
F010	98.50	9.850	10	H				
F053	106.50	10.650	10					IC
F069	108.00	10.800	10					IC
F107	111.50	11.150	10	H				IC
F036	115.50	11.550	10					E3147A
F002	118.00	11.800	10					I.C.
F001	124.50	12.450	10	H				IC
F068	133.50	13.350	10					IC Dionex
F009	134.00	13.400	10	L				
F129	146.50	14.650	10					Dionex
F032	150.00	15.000	10	EH				E3372A
F042	156.50	15.650	10					IC
F014	162.00	16.200	10					
F109	168.50	16.850	10					Dionex IC
F112	173.50	17.350	10	HH				Dionex IC
F012	207.50	20.750	10	EHEHEHEHEH	BIASED HIGH*	-3.91	.1516	IC
F110	209.00	20.900	10	EHHH	BIASED HIGH	5.54	.0095	IC Dionex
F026	218.00	21.800	10	EHHH	BIASED HIGH*	2.76	.0395	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 12.817

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= .3000 CONCENTRATION ERROR INCREMENT= .0800

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	.14	2.00	.19	2.00	.39	2.00	.08	1.50	.50	4.50	.50	5.00
F007	.11	1.00	.16	1.00	.32	1.00	.08T	1.50	.42	2.00	.43	3.00
F008	.2	5.00	.3	6.00	.4	4.00	<.2	0.00	.5	4.50	.5	5.00
F010	.2	5.00	.2	3.00	.5	6.00	.1	3.00	.5	4.50	.4	1.50
F011	.23	7.00	.26	5.00	.43	5.00	.19	5.00	.50	4.50	.50	5.00
F025	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00	<.5	0.00
F026	.1735	3.00	.2485	4.00	.399	3.00	.135	4.00	.502	7.00	.5045	7.00
F060	<.1	0.00	<.1	0.00	<.1	0.00	<.1	0.00	<.1 L	0.00	<.1 L	0.00
F072	.20	5.00	<.20	0.00	<.20	0.00	<.20	0.00	.20	1.00	.40	1.50
MEDIAN	.2000		.2242		.3995		.1000		.5000		.5000	
1CRIT	.3000		.3000		.3000		.3000		.3000		.3000	
N	5		4		4		2		5		4	
MEAN	.1827		.2246		.4047		.1175		.4840		.4825	
3STDEV	-		-		-		-		-		-	

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F003	4.10	6.50	4.79	6.00	2.0 EH	9.00	.55	7.00
F007	4.12	8.00	4.80	7.00	1.78	2.00	.46	2.00
F008	4.1	6.50	4.9	8.00	1.9	7.00	.6	8.00
F010	3.9	2.00	4.7	4.00	1.8	4.50	.5	3.50
F011	4.03	4.00	4.75	5.00	1.80	4.50	.54	5.00
F025	4.0	3.00	4.6	2.00	1.8	4.50	.5	3.50
F026	4.0605	5.00	4.602	3.00	1.9065	8.00	.5415	6.00
F060	4.2	9.00	5.0	9.00	1.8	4.50	.3 EL	1.00
F072	3.60 EL	1.00	4.10 EL	1.00	1.60 EL	1.00	<.20 EL	0.00
MEDIAN	4.0605		4.7500		1.8000		.5200	
1CRIT	.5448		.6000		.3640		.3000	
N	7		7		7		6	
MEAN	4.0444		4.7346		1.8266		.5152	
3STDEV	.2127		.3039		.1469		.0951	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	45.50	4.550	10	EH				FERRICTHIOCYANATE
F007	28.50	2.850	10					CPQ101E2
F008	54.00	6.000	9					FIA
F010	37.00	3.700	10					
F011	50.00	5.000	10					
F025	13.00	3.250	4					
F026	50.00	5.000	10					Autoanalyzer
F060	23.50	5.875	4	L L EL				thiocyan colour
F072	10.50	1.750	6	ELELELEL				Titr Hg(NO3)2

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

OVERALL AVERAGE RANK IS 4.274

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F072	10.50	1.750	6	ELELELEL				Titr Hg(NO3)2
F007	28.50	2.850	10					CPQ101E2
F025	13.00	3.250	4					
F010	37.00	3.700	10					
F003	45.50	4.550	10	EH				FERRICTHIOCYANATE
F026	50.00	5.000	10					Autoanalyzer
F011	50.00	5.000	10					
F060	23.50	5.875	4	LLEL				thiocyan colour
F008	54.00	6.000	9					FIA

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

OVERALL AVERAGE RANK IS 4.274

Chloride Colour

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= .1000 BASIC ACCEPTABLE ERROR= .0300 CONCENTRATION ERROR INCREMENT= .0500

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.051	19.00	.081	24.00	.084	25.00	.049 H	15.00	.216 VH	27.00	.419	16.00
F002	.05	17.50	.07	23.00	.08	24.00	<.05	0.00	.18	23.00	.43	20.00
F003	.03	15.00	.06	15.50	.06	12.00	<.02	0.00	.16	17.00	.43	20.00
F007	.001W	1.00	.021 EL	1.00	.026 EL	1.00	.001W	1.00	.128	1.00	.408	11.00
F008	<.2	0.00	<.2	0.00	<.2	0.00	<.2	0.00	<.2	0.00	.44	23.50
F009	.015	2.00	.051	7.00	.053	7.50	<.01	0.00	.15	6.50	.38	2.00
F010	.03	15.00	.05	5.00	.07	23.00	.02	11.50	.16	17.00	.46 H	26.00
F011	.05	17.50	.06	15.50	.06	12.00	.05 H	16.00	.16	17.00	.42	17.00
F012	.08 EH	21.00	.15 EH	26.00	.17 EH	27.00	.14 EH	17.00	.27 EH	28.00	.55 EH	29.00
F014	<.05	0.00	<.05	0.00	.053	7.50	<.05	0.00	.151	8.00	.392	6.00
F015	<.1	0.00	<.1	0.00	<.1	0.00	<.1	0.00	.2 H	26.00	.5 VH	28.00
F017	<.018	0.00	.054	9.00	.060	12.00	<.018	0.00	.153	9.00	.410	14.50
F020	.06 H	20.00	.089	25.00	.092 H	26.00	<.01	0.00	.190	25.00	.490 VH	27.00
F025	.03	15.00	.06	15.50	.06	12.00	.01	4.50	.16	17.00	.41	14.50
F026	.026	12.00	.062	19.50	.064	20.00	.022	13.00	.149	5.00	.382	3.00
F032	.024	10.00	.064	22.00	.068	22.00	.016	9.50	.184	24.00	.430	20.00
F036	<.020	0.00	.060	15.50	.065	21.00	<.015	0.00	.170	22.00	.445	25.00
F038	.02	6.00	.06	15.50	.06	12.00	.01	4.50	.16	17.00	.44	23.50
F042	.02	6.00	.05	5.00	.05	4.00	.01	4.50	.15	6.50	.40	8.00
F053	.019	4.00	.059	12.00	.062	18.50	.013	8.00	.158	13.50	.407	10.00
F060	<.6	0.00	<.6	0.00	<.6	0.00	<.6	0.00	<.6	0.00	<.6	0.00
F068		0.00	.0583	11.00	.0602	15.00		0.00	.1564	12.00	.4097	13.00
F069	.021	8.50	.049	3.00	.046	2.00	.010	4.50	.141	4.00	.438	22.00
F072	<.005	0.00	.03	2.00	.05	4.00	<.005	0.00	.13	2.50	.39	5.00
F107	.029	13.00	.052	8.00	.055	9.00	.008	2.00	.154	10.00	.387	4.00
F109	.016T	3.00	.060	15.50	.061	16.50	.016T	9.50	.161	20.00	.425	18.00
F110	.021	8.50	.063	21.00	.061	16.50	.023	14.00	.162	21.00	.409	12.00
F112	.02	6.00	.05	5.00	.05	4.00	.02	11.50	.13	2.50	.33 EL	1.00
F129	<.015	0.00	.056	10.00	.052	6.00	<.015	0.00	.158	13.50	.397	7.00
F133	.025	11.00	.062	19.50	.062	18.50	.012	7.00	.155	11.00	.403	9.00
MEDIAN	.0250		.0600		.0600		.0160		.1590		.4100	
1CRIT	.0300		.0300		.0300		.0300		.0330		.0455	
N	19		24		25		15		26		27	
MEAN	.0293		.0588		.0615		.0193		.1615		.4204	
3STDEV	.0390		.0330		.0320		.0382		.0569		.0871	

PARAMETER: 19091 Potassium mg/L

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.227	12.00	.285	7.00	.497	10.00	.202	17.00
F002	.25	24.50	.32	25.50	.53	23.50	.22	25.00
F003	.24	21.50	.30	20.50	.52	18.00	.20	15.00
F007	.205	3.00	.268	3.00	.485	6.00	.176	4.00
F008	.23	15.50	.36 EH	28.00	.56	27.00	.23	26.50
F009	.21	5.50	.29	12.50	.49	7.00	.18	5.50
F010	.23	15.50	.31	23.50	.51	15.50	.21	22.50
F011	.25	24.50	.31	23.50	.52	18.00		0.00
F012	.35 EH	29.00	.38 EH	29.00	.59 EH	28.50	.27 EH	28.00
F014	.230	15.50	.295	16.50	.509	14.00	.206	21.00
F015	.2	2.00	.3	20.50	.5	11.50	.2	15.00
F017	.225	11.00	.287	9.00	.521	20.00	.204	19.00
F020	.270 H	28.00	.320	25.50	.590 EH	28.50	.230	26.50
F025	.22	8.50	.29	12.50	.52	18.00	.19	8.00
F026	.223	10.00	.279	5.00	.474	4.00	.186	7.00
F032	.240	21.50	.298	18.00	.524	21.00	.212	24.00
F036	.240	21.50	.295	16.50	.545	25.00	.205	20.00
F038	.23	15.50	.30	20.50	.53	23.50	.20	15.00
F042	.22	8.50	.29	12.50	.50	11.50	.18	5.50
F053	.229	13.00	.290	12.50	.505	13.00	.198	12.50
F060	<.6	0.00	<.6	0.00	<.6	0.00	<.6	0.00
F068	.2178	7.00	.2885	10.00	.5246	22.00	.1916	9.00
F069	.255	26.50	.234 L	2.00	.467	3.00	.195	11.00
F072	.21	5.50	.27	4.00	.48	5.00	.16 L	1.50
F107	.208	4.00	.28	6.00	.461	2.00	.174	3.00
F109	.255	26.50	.321	27.00	.558	26.00	.203	18.00
F110	.231	18.00	.286	8.00	.491	8.00	.193	10.00
F112	.19 L	1.00	.23 VL	1.00	.41 EL	1.00	.16 L	1.50
F129	.240	21.50	.293	15.00	.495	9.00	.198	12.50
F133	.234	19.00	.300	20.50	.510	15.50	.210	22.50
MEDIAN	.2300		.2930		.5100		.2000	
1CRIT	.0365		.0396		.0505		.0350	
N	27		27		26		25	
MEAN	.2304		.2948		.5087		.1997	
3STDEV	.0493		.0650		.0746		.0430	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	172.00	17.200	10	H VH				IC
F002	206.00	22.889	9		BIASED HIGH*	.50	.0193	flame
F003	154.50	17.167	9					FLAME AA
F007	32.00	3.200	10	ELEL	BIASED LOW*	2.47	-.0293	CPQ107E2
F008	120.50	24.100	5	EH	BIASED HIGH	7.86	.0096	ICP/Flame
F009	55.50	6.167	9		BIASED LOW*	-3.17	-.0074	
F010	174.50	17.450	10	H				
F011	161.00	17.889	9	H				
F012	262.50	26.250	10	EHEHEHEHEHEHEHEHEHEH	BIASED HIGH*	1.78	.0952	ICPMS
F014	88.50	12.643	7					
F015	103.00	17.167	6	H VH				19111
F017	103.50	12.938	8					AAF
F020	231.50	25.722	9	H H VHH EH	BIASED HIGH	10.56	.0198	IC
F025	125.50	12.550	10					IC
F026	98.50	9.850	10					Flame AA
F032	192.00	19.200	10					E3146A
F036	166.50	20.813	8					E3249A
F038	153.00	15.300	10					FAES
F042	72.00	7.200	10		BIASED LOW*	-.38	-.0085	Flame AA, air
F053	117.00	11.700	10					flame AA
F060	0.00	-	0		INSUFFICIENT DATA			ICP
F068	99.00	12.375	8					IC Dionex
F069	86.50	8.650	10	L				AA
F072	29.50	3.688	8	L	BIASED LOW*	-.74	-.0235	AA air C2H2
F107	61.00	6.100	10		BIASED LOW	-7.71	-.0004	ICP
F109	180.00	18.000	10					AA flame
F110	137.00	13.700	10					Flame - AAS
F112	34.50	3.450	10	ELL VLELL	BIASED LOW	-20.44	.0028	AA 2380 flame
F129	94.50	11.813	8					Dionex IC
F133	153.50	15.350	10					FAA

* 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 13.935

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F060	0.00	-	0		INSUFFICIENT DATA			ICP
F007	32.00	3.200	10	ELEL	BIASED LOW*	2.47	-.0293	CPQ107E2
F112	34.50	3.450	10	ELLVLELL	BIASED LOW	-20.44	.0028	AA 2380 flame
F072	29.50	3.688	8	L	BIASED LOW*	-.74	-.0235	AA air C2H2
F107	61.00	6.100	10		BIASED LOW	-7.71	-.0004	ICP
F009	55.50	6.167	9		BIASED LOW*	-3.17	-.0074	
F042	72.00	7.200	10		BIASED LOW*	-.38	-.0085	Flame AA, air
F069	86.50	8.650	10	L				AA
F026	98.50	9.850	10					Flame AA
F053	117.00	11.700	10					flame AA
F129	94.50	11.813	8					Dionex IC
F068	99.00	12.375	8					IC Dionex
F025	125.50	12.550	10					IC
F014	88.50	12.643	7					
F017	103.50	12.938	8					AAF
F110	137.00	13.700	10					Flame - AAS
F038	153.00	15.300	10					FAES
F133	153.50	15.350	10					FAA
F003	154.50	17.167	9					FLAME AA
F015	103.00	17.167	6	HVH				19111
F001	172.00	17.200	10	HVH				IC
F010	174.50	17.450	10	H				
F011	161.00	17.889	9	H				
F109	180.00	18.000	10					AA flame
F032	192.00	19.200	10					E3146A
F036	166.50	20.813	8					E3249A
F002	206.00	22.889	9		BIASED HIGH*	.50	.0193	flame
F008	120.50	24.100	5	EH	BIASED HIGH	7.86	.0096	ICP/Flame
F020	231.50	25.722	9	HHVHHEH	BIASED HIGH	10.56	.0198	IC
F012	262.50	26.250	10	EHEHEHEHEHEHEHEHEH	BIASED HIGH*	1.78	.0952	ICPMS

* 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 13.935

Potassium

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= .2500 BASIC ACCEPTABLE ERROR= .0750 CONCENTRATION ERROR INCREMENT= .0500

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.63	23.50	1.38	15.50	1.89	14.00	.71	17.50	2.66	19.50	2.10	27.00
F002	.56	8.50	1.37	14.00	1.96	22.50	.72	21.00	2.65	16.50	1.99	16.50
F003	.64	26.00	1.42	25.50	1.95	20.50	.74	27.00	2.68	21.00	2.00	20.50
F007	.607	17.00	1.39	20.00	1.98	24.00	.745	28.00	2.69	22.00	1.98	15.00
F008	.65	27.50	1.44	28.00	2.01	27.50	.77	29.00	2.91 H	27.00	2.07	26.00
F009	.57	10.00	1.31	10.00	1.79	5.00	.67	7.00	2.73	24.50	1.91	9.00
F010	.51 L	5.00	1.32	11.00	1.95	20.50	.71	17.50	2.48	9.00	2.00	20.50
F011	.59	11.00	1.73 EH	29.00	2.26 EH	29.00	.69	8.00	3.45 EH	29.00	2.33 EH	29.00
F012	.36 EL	2.00	1.28	6.50	2.01	27.50	.51 EL	1.00	2.58	13.00	2.11	28.00
F014	.60	12.50	1.3	8.50	1.8	6.50	.7	10.00	2.4 L	4.50	1.8 L	5.00
F015	.5 L	4.00	1.3	8.50	1.8	6.50	.7	10.00	2.4 L	4.50	1.9	8.00
F017	.614	20.00	1.396	22.00	1.934	17.50	.707	14.00	2.637	14.00	1.973	14.00
F020	.650	27.50	1.43	27.00	1.96	22.50	.73	23.00	2.73	24.50	2.00	20.50
F025	.606	15.50	1.38	15.50	1.93	16.00	.708	15.00	2.75	26.00	2.03	24.00
F026	.654	29.00	1.330	12.00	1.807	8.00	.738	26.00	2.456	8.00	1.818 L	6.00
F032	.620	21.50	1.42	25.50	1.99	25.00	.735	25.00	2.72	23.00	2.04	25.00
F036	.56	8.50	1.34	13.00	1.94	19.00	.72	21.00	2.50	10.50	1.96	12.00
F037	.60	12.50	1.20 L	3.00	1.72 L	2.00	.54 EL	2.00	2.42 L	6.00	1.82	7.00
F038	.63	23.50	1.41	24.00	1.85	9.00	.62	4.00	2.30 VL	2.00	1.63 VL	2.00
F042	.61	18.50	1.39	20.00	1.86	10.00	.71	17.50	2.92 H	28.00	2.00	20.50
F053	.606	15.50	1.386	18.00	1.887	13.00	.703	12.00	2.436 L	7.00	1.947	11.00
F060	.2 EL	1.00	1.2 L	3.00	2.0	26.00	.7	10.00	2.2 VL	1.00	2.0	20.50
F069	.61	18.50	1.39	20.00	1.91	15.00	.71	17.50	2.65	16.50	1.97	13.00
F072	.49 L	3.00	1.20 L	3.00	1.70 L	1.00	.62	4.00	2.50	10.50	1.30 EL	1.00
F107	.545	7.00	1.264	5.00	1.73 L	3.00	.638	6.00	2.396 L	3.00	1.785 L	4.00
F109	.635	25.00	1.397	23.00	1.934	17.50	.733	24.00	2.653	18.00	1.99	16.50
F110	.602	14.00	1.381	17.00	1.880	11.00	.704	13.00	2.660	19.50	1.920	10.00
F112	.54	6.00	1.28	6.50	1.75 L	4.00	.62	4.00	2.53	12.00	1.72 VL	3.00
F133	.620	21.50	.141 EL	1.00	1.885	12.00	.720	21.00	2.640	15.00	2.00	20.50
MEDIAN	.6060		1.3800		1.9100		.7080		2.6400		1.9800	
1CRIT	.0928		.1315		.1580		.0979		.1945		.1615	
N	27		27		27		27		27		27	
MEAN	.5835		1.3446		1.8929		.6941		2.5955		1.9431	
3STDEV	.1846		.2109		.2543		.1399		.4592		.3367	

PARAMETER: 20091 Calcium mg/L

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.52	23.00	.83	24.00	2.61	23.50	4.78	24.00
F002	.51	21.00	.79	10.00	2.52	17.00	4.70	23.00
F003	.51	21.00	.82	23.00	2.57	20.50	4.64	19.00
F007	.523	24.50	.833	26.00	2.61	23.50	4.67	21.00
F008	.53	26.00	.86	29.00	2.64	25.50	4.84	26.00
F009	.46	7.50	.77	9.00	2.41	13.00	4.55	15.50
F010	.55	29.00	.76	7.50	2.64	25.50	4.47	13.00
F011	.46	7.50	.84	27.50	3.12 EH	29.00	5.87 EH	29.00
F012	.29 EL	1.00	.65 L	2.00	2.59	22.00	4.91 H	27.00
F014	.4 L	4.00	.8	13.00	2.3 L	5.50	4.3	5.00
F015	.5	16.00	.8	13.00	2.3 L	5.50	4.3	5.00
F017	.493	11.00	.806	18.00	2.501	16.00	4.547	14.00
F020	.510	21.00	.840	27.50	2.34	9.00	4.80	25.00
F025	.486	9.00	.808	19.00	2.69 H	27.00	5.00 VH	28.00
F026	.536	27.00	.811	21.00	2.324	8.00	3.995 VL	1.00
F032	.505	19.00	.815	22.00	2.53	18.50	4.68	22.00
F036	.50	16.00	.76	7.50	2.38	12.00	4.44	12.00
F037	.39 L	3.00	.67 L	3.00	2.36	11.00	4.40	11.00
F038	.49	10.00	.80	13.00	2.22 L	3.00	4.32	8.00
F042	.54	28.00	.80	13.00	2.96 VH	28.00	4.34	9.00
F053	.495	12.00	.802	16.00	2.308 L	7.00	4.196 L	3.00
F060	.5	16.00	.7	5.00	2.1 VL	2.00	4.3	5.00
F069	.50	16.00	.81	20.00	2.53	18.50	4.61	18.00
F072	.36 VL	2.00	.58 EL	1.00	1.70 EL	1.00	4.10 VL	2.00
F107	.454	6.00	.754	6.00	2.343	10.00	4.317	7.00
F109	.523	24.50	.832	25.00	2.57	20.50	4.57	17.00
F110	.498	13.00	.803	17.00	2.500	14.50	4.660	20.00
F112	.42	5.00	.69 L	4.00	2.26 L	4.00	4.39	10.00
F133	.500	16.00	.800	13.00	2.500	14.50	4.55	15.50
MEDIAN	.5000		.8000		2.5000		4.5500	
1CRIT	.0875		.1025		.1875		.2900	
N	27		27		27		27	
MEAN	.4857		.7850		2.4669		4.5326	
3STDEV	.1339		.1515		.5285		.6670	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	211.50	21.150	10					ICP
F002	170.00	17.000	10					A.A.
F003	224.00	22.400	10					FLAME AA
F007	221.00	22.100	10					CPQ106E2
F008	271.50	27.150	10	H	BIASED HIGH	6.69	-.0029	ICP/FLame
F009	110.50	11.050	10					
F010	158.50	15.850	10	L				
F011	228.00	22.800	10	EHEH EHEH EHEH				
F012	130.00	13.000	10	EL EL ELL H				ICPMS
F014	74.50	7.450	10	L L L L				
F015	81.00	8.100	10	L L L				20111
F017	160.50	16.050	10					AAF
F020	227.50	22.750	10					ICP
F025	195.00	19.500	10	H VH				IC
F026	146.00	14.600	10	L VL				Flame AA
F032	226.50	22.650	10					E3146A
F036	131.50	13.150	10					E3249A
F037	60.50	6.050	10	L L ELL L L	BIASED LOW*	-1.88	-.1124	ICP
F038	98.50	9.850	10	VLVL L				ICPOES
F042	192.50	19.250	10	H VH				Flame AA, nitrous
F053	114.50	11.450	10	L L L				flame AA
F060	89.50	8.950	10	ELL VL VL				ICP
F069	173.00	17.300	10					ICP
F072	28.50	2.850	10	L L L ELVLELELVL	BIASED LOW	-10.35	-.1205	AA air C2H2
F107	57.00	5.700	10	L L L	BIASED LOW	-5.36	-.0407	ICP
F109	211.00	21.100	10					AA flame
F110	149.00	14.900	10					Flame - AAS
F112	58.50	5.850	10	L VL L L	BIASED LOW*	-2.75	-.0891	AA 2380 flame
F133	150.00	15.000	10	EL				FAA

* 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 15.000

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F072	28.50	2.850	10	LLLELVLELELVL	BIASED LOW	-10.35	-.1205	AA air C2H2
F107	57.00	5.700	10	LLL	BIASED LOW	-5.36	-.0407	ICP
F112	58.50	5.850	10	LVLLL	BIASED LOW*	-2.75	-.0891	AA 2380 flame
F037	60.50	6.050	10	LLELLLL	BIASED LOW*	-1.88	-.1124	ICP
F014	74.50	7.450	10	LLLL				
F015	81.00	8.100	10	LLL				20111
F060	89.50	8.950	10	ELLVLVL				ICP
F038	98.50	9.850	10	VLVLL				ICPOES
F009	110.50	11.050	10					
F053	114.50	11.450	10	LLL				flame AA
F012	130.00	13.000	10	ELELELLH				ICPMS
F036	131.50	13.150	10					E3249A
F026	146.00	14.600	10	LVL				Flame AA
F110	149.00	14.900	10					Flame - AAS
F133	150.00	15.000	10	EL				FAA
F010	158.50	15.850	10	L				
F017	160.50	16.050	10					AAF
F002	170.00	17.000	10					A.A.
F069	173.00	17.300	10					ICP
F042	192.50	19.250	10	HVH				Flame AA, nitrous
F025	195.00	19.500	10	HVH				IC
F109	211.00	21.100	10					AA flame
F001	211.50	21.150	10					ICP
F007	221.00	22.100	10					CPQ106E2
F003	224.00	22.400	10					FLAME AA
F032	226.50	22.650	10					E3146A
F020	227.50	22.750	10					ICP
F011	228.00	22.800	10	EHEHEHEHEHEH				
F008	271.50	27.150	10	H	BIASED HIGH	6.69	-.0029	ICP/FLame

* 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 15.000

Calcium

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= .0080 BASIC ACCEPTABLE ERROR= .0080 CONCENTRATION ERROR INCREMENT= .0800

SAMPLE	1 = RAINGR-16		2 = RAINGR-3-5		3 = RAINGR-6NS		4 = RAINGR-17NS		5 = GRM-07		6 = BMOOS-01	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.0072	9.00	.0040	6.00	.0030	7.00	.0084	8.00	.0540	8.50	.2130	5.00
F008	<.01	0.00	<.01	0.00	<.01	0.00	<.01	0.00	.054	8.50	.216	6.00
F010	.012	13.00	.012 EH	11.00	.010	10.00	.016	13.00	.061	16.00	.205	3.00
F011	.0026	1.00	.0021	1.00	.0005	1.00	.006	2.00	.0562	11.00	.297 EH	17.50
F012	<.02	0.00	<.02	0.00	<.02	0.00	<.02	0.00	.04 L	4.00	.18 VL	1.50
F014	.007	7.00	.0029	3.00	.0023	6.00	.0069	3.00	.0056 EL	1.00	.210	4.00
F015	.005	3.00	<.002	0.00	.002	5.00	.008	6.50	.045	5.00	.22	7.00
F020	<.01	0.00	<.01	0.00	<.01	0.00	<.01	0.00	.05	6.50	.244	14.00
F025	.008	10.00	.005	7.00	.004	8.00	.009	10.00	.059	13.50	.225	9.50
F026	.0106	11.00	.0058	8.00	.0141 EH	11.00	.0206 EH	14.00	.0620	17.00	.2201	8.00
F037	.0039	2.00	.0023	2.00	.0014	4.00	.0038	1.00	.0315 VL	2.00	.297 EH	17.50
F038	.011	12.00	.007	9.50	<.005	0.00	.009	10.00	.060	15.00	.240	12.00
F060	<.008	0.00	<.008	0.00	<.008	0.00	.008	6.50	.038 L	3.00	.180 VL	1.50
F069	.007	7.00	.007	9.50	.005	9.00	.009	10.00	.063	18.00	.248	15.00
F072	<.01	0.00	<.01	0.00	<.01	0.00	<.01	0.00	.05	6.50	.24	12.00
F107	.006	4.50	.003	4.50	.001	2.50	.007	4.50	.059	13.50	.225	9.50
F110	.007	7.00	<.005	0.00	<.005	0.00	.007	4.50	.058	12.00	.240	12.00
F112	.006	4.50	.003	4.50	.001	2.50	.014	12.00	.056	10.00	.277 VH	16.00
MEDIAN	.0070		.0040		.0023		.0082		.0550		.2250	
1CRIT	.0080		.0080		.0080		.0080		.0118		.0254	
N	11		9		9		12		16		14	
MEAN	.0072		.0044		.0033		.0090		.0521		.2302	
3STDEV	.0061		.0052		.0081		.0086		.0264		.0555	

PARAMETER: 13091 Aluminum mg/L

SAMPLE	7 = BEAV-02		8 = MERSEY-01		9 = TROIS-94		10 = TRKY-94	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.0464	9.00	.0970	3.50	.0654	5.00	.0193	11.00
F008	.042	5.00	.097	3.50	.076	13.00	.018	6.00
F010	.047	10.50	.111	15.00	.080	17.00	.029 H	18.00
F011	.047	10.50	.0988	5.00	.0646	4.00	.0186	8.00
F012	.03 VL	2.00	.09	2.00	.06	2.00	.01 L	1.50
F014	.0479	12.00	.104	11.00	.0708	9.00	.0236	15.00
F015	.048	13.50	.102	10.00	.069	6.00	.019	9.50
F020	.038	3.00	.113	16.00	.062	3.00	.018	6.00
F025	.048	13.50	.080 EL	1.00	.074	11.00	.022	13.50
F026	.0563	17.00	.1093	12.00	.0803	18.00	.0253	17.00
F037	.0274 EL	1.00	.117 H	18.00	.0388 EL	1.00	.0113	3.00
F038	.060 H	18.00	.110	13.50	.078	15.50	.022	13.50
F060	.044	6.00	.100	7.00	.070	7.50	.013	4.00
F069	.054	16.00	.115	17.00	.077	14.00	.025	16.00
F072	.04	4.00	.10	7.00	.07	7.50	.01 L	1.50
F107	.045	7.00	.1	7.00	.074	11.00	.018	6.00
F110	.049	15.00	.101	9.00	.074	11.00	.020	12.00
F112	.046	8.00	.110	13.50	.078	15.50	.019	9.50
MEDIAN	.0467		.1015		.0724		.0190	
1CRIT	.0111		.0155		.0132		.0089	
N	16		16		16		15	
MEAN	.0455		.1036		.0714		.0195	
3STDEV	.0178		.0203		.0175		.0113	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F001	72.00	7.200	10					ICPMS
F008	42.00	7.000	6					GF/ICP
F010	126.50	12.650	10	EH H				
F011	61.00	6.100	10	EH				
F012	13.00	2.167	6	L VLVL L	BIASED LOW	-16.73	-.0038	ICPMS
F014	71.00	7.100	10	EL				
F015	65.50	7.278	9					GFAA
F020	48.50	8.083	6					GFAA
F025	97.00	9.700	10	EL				ICP-MS
F026	133.00	13.300	10	EHEH	BIASED HIGH*	-4.81	.0089	ICP
F037	51.50	5.150	10	VLEHELH EL				GFAA
F038	119.00	13.222	9	H	BIASED HIGH	5.45	.0032	GFAAS
F060	35.50	5.071	7	L VL				ICP
F069	131.50	13.150	10		BIASED HIGH	9.55	.0017	ICP
F072	38.50	6.417	6	L				GFAA
F107	70.00	7.000	10					ICP
F110	82.50	10.313	8					Furnace
F112	96.00	9.600	10	VH				HGA 300 furnace

* 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 8.624

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F012	13.00	2.167	6	LVLVLL	BIASED LOW	-16.73	-.0038	ICPMS
F060	35.50	5.071	7	LVL				ICP
F037	51.50	5.150	10	VLEHELHEL				GFAA
F011	61.00	6.100	10	EH				
F072	38.50	6.417	6	L				GFAA
F008	42.00	7.000	6					GF/ICP
F107	70.00	7.000	10					ICP
F014	71.00	7.100	10	EL				
F001	72.00	7.200	10					ICPMS
F015	65.50	7.278	9					GFAA
F020	48.50	8.083	6					GFAA
F112	96.00	9.600	10	VH				HGA 300 furnace
F025	97.00	9.700	10	EL				ICP-MS
F110	82.50	10.313	8					Furnace
F010	126.50	12.650	10	EHH				
F069	131.50	13.150	10		BIASED HIGH	9.55	.0017	ICP
F038	119.00	13.222	9	H	BIASED HIGH	5.45	.0032	GFAAS
F026	133.00	13.300	10	EHEH	BIASED HIGH*	-4.81	.0089	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 8.624

National Water Research Institute
Environment Canada
Canada Centre for Inland Waters

P.O. Box 5050
867 Lakeshore Road
Burlington, Ontario
Canada L7R 4A6

Institut national de recherche sur les eaux
Environnement Canada
Centre canadien des eaux intérieures

Case postale 5050
867, chemin Lakeshore
Burlington, Ontario
Canada L7R 4A6

Environment Canada Environnement Canada

Canada