Environment Canada Environnement Canada

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ECOSYSTEM PERFORMANCE EVALUATION QA PROGRAM

STUDY FP77 - MAJOR IONS & NUTRIENTS
FALL 2000

J. BLUM and H. ALKEMA

NLET-TN00-012

NATIONAL WATER RESEARCH INSTITUTE
INSTITUT NATIONAL DE RECHERCHE SUR LES EAUX

National Water Research Institute

National Laboratory for Environmental Testing

NLET-TN00-012

Ecosystem Performance Evaluation Quality Assurance Program Major Ions & Nutrients and Total Phosphorus in Surface Waters*

Study FP 77 - Final Report

Fall 2000

by

J. Blum and H. Alkema

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

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*companion studies: Rain & Soft Waters NLET-TN00-014 and Trace Elements/Mercury NLET-TN00-013

Management Perspective

Quality assured analytical results are critical when transforming environmental analytical data into useful scientific advice. In the area of water analysis, the NLET branch of NWRI provides a variety of QA products and services geared to assisting EC labs provide quality assured analytical results. One of the most valuable QA services provided is the performance evaluation (PE) studies. The PE studies conducted by NLET fill a parameter and concentration gap not covered by any other PE or proficiency testing (PT) program. Participant labs find the NLET PE studies very useful to improve the quality of their analytical processes, while project leaders use the results of these studies to enable them to better compare data generated from different laboratories, in both the private and public sector. These studies are provided to EC laboratories, affiliate institutions in Canada and the US, and other public and private laboratories for a cost recovery fee.

The PE studies are created using many water types of natural waters and their associated parameter groups as the raw material. The availability of so many different water types in Canada is ideally suited to the preparation of test samples spanning the complete range of available water matrices. Waters range from very soft natural rainwaters, to soft waters found in Ontario, Quebec and British Columbia and to hard surface waters found in the Prairies and Canadian groundwaters. The chemical composition of the natural waters are diverse, and include 50 different parameters for nutrients, minerals and trace elements. Special studies are provided for Total Phosphorus and ambient Mercury.

Evaluations of laboratory performance are timely and complete. Laboratories receive a preliminary report which discloses systematic bias and precision. The final reports, which are also scheduled, provide a complete listing of current and historical performance. Individual performance appraisals indicate areas and parameters where remedial action is required to improve performance. In this way, the PE studies are effective for improved performance of laboratories.

Methodologies and approaches in analytical laboratories change as research and monitoring programs evolve. The PE studies, while large in terms of the number of laboratories being assessed, are flexible enough to respond to these changing requirements. Feedback from laboratories is solicited and assessed on a regular basis, and changes to the studies are implemented to meet these new needs. One recent example of this change is the development of a customised PE study to assess trace elements in natural sediments for the Metals in the Environment (MITE) Program being conducted by Canadian universities. This study is being added to the PE program in the 2000-01 fiscal year.

Abstract

Performance evaluation studies are an important part of assuring the accuracy and integrity of analytic results. NLET provides these PE studies as part of its mandate. The branch provides this service to all EC laboratories and to many affiliated institutions in Canada and the US. Such a wide range of institutions and laboratories, in turn, provides a diversity of data which gives greater credibility to data analysis and laboratory performance statements.

Evaluation of the analytic results is the most visible aspect of PE studies. All results are evaluated for the two important aspects of data - systematic bias and precision. The former is extremely important for comparability of data sets from different origins and the latter, precision, is a measure of the reliability of the data. For the NLET PE studies, systematic bias is tested with the non-parametric method of Youden, and precision is tested against precision functions developed by the quality assurance staff. Both evaluations are totalled to give a performance rating for each laboratory.

Performance ratings for laboratories are given in relative terms. Laboratories are ranked from the best performance to the lowest (the least flagged results to the most flagged). In real terms, good laboratories have few flagged results and the laboratories with poor performance may have half their results flagged. These results are summarised in individual laboratory appraisals which are sent to the lab managers in a timely, expedient manner. This objective, third party performance rating is valued by the laboratory managers and data users alike.

Evaluations include historical listings of performance. With these historical listings laboratories may track their previous performance and see the effectiveness of their remedial action. This unique and highly developed tool helps many laboratories generate more reliable and accurate data.

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NWRI Performance Evaluation Quality Assurance Studies

NWRI's performance evaluation quality assurance (QA) studies support a core group of government labs and various environmental programs. The QA program also addresses health issues such as toxic metal (lead, manganese and mercury) contamination of drinking water. US government agencies as well as the Canadian Metals in the Environment (MITE) program participate in the semi-annual studies along with many global participants. More than 200 labs are invited to participate, with approximately 60 labs completing analyses of the various study matrices.

The primary feature of these studies is the quality of data produced by the participating labs. Lab 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 problem areas within labs, as well participation quantifies lab performance and data quality.

These NWRI studies are an independent client driven QA service with consulting on all aspects of the program. The format of this report has been revised by eliminating the duplication of Appendix A, which is available in any previous report. We expect this information to be on our website in the near future at www.cciw.ca/nwri/nlet/nlet.html.

NWRI studies run on a voluntary and cost recovery basis, which leads to ongoing interest in study design and sample requirements by lab and program managers. Proposals for specialised studies are welcomed.

Table 1 List of participating† laboratories in major ions & nutrients in surface waters and total phosphorus study FP 77.

Accutest Laboratories Ltd.
Atomic Energy of Canada Limited
ALS Chemex
Analytical Service Laboratories Ltd.
City of Calgary
CRD - Water Department Lab
Durham Regional Environmental Laboratory
Environment Canada - EPL
Environment Canada - ESC, Atlantic
Environment Canada - NHRC, NQL
Environment Canada - NWRI, NLET
Environment Canada - PESC
Enviro-Test Laboratories - Edmonton
Enviro-Test Laboratories - Winnipeg
EPCOR Water Services
Environmental Services Laboratory Inc.
Fisheries and Oceans Canada - Freshwater Institute
Laboratoire de Santé Publique du Québec
Lakefield Research
Lakehead University - Centre for Analytical Services
Maxxam Analytics Inc.
MB Labs Ltd.
Ministère de l'Environnement et de la Faune du Québec - Laval
Ministère de l'Environnement et de la Faune du Québec - Sainte-Foy
Monroe County Environmental Health Lab
Natural Resources Canada - CFS, Ontario
New Brunswick Department of the Environment - ASL
Ontario Ministry of the Environment - Dorset
Ontario Ministry of the Environment - Etobicoke
Ontario Ministry of Northern Development and Mines - Geosciences Lab
Ontario Power Technologies
Petroleo Brasileiro SA/CENPES/DIQUIM/SEQUIN
Queen Elizabeth II Health Sciences Centre
Region of Ottawa-Carleton
Saskatchewan Health - Provincial Lab
TAIGA Environmental Lab
Thunder Bay Analytical
Tsakalidis, Greece
US EPA, Chicago
US EPA, Corvallis
US GS - NWQL
University of Alberta - Department of Biological Sciences
University of Maine - WRI

† Labs select their routine parameters for this study

Table 2a Laboratory Performance Scores Study 77 Major Ions & Nutrients in Surface Waters

	SYSTEMATIC BIAS			FLAGGED RESULTS			
LAB CODE	# ANALYZED PARAMETERS	# BIASES	% BIASED PARAMETERS	# RESULTS RANKED	# FLAGS ASSIGNED	% RESULTS FLAGGED	AVE. BIAS & FLAGS (%)
F003	19	0	0.00	185	4	2.16	1.08
F099	6	0	0.00	60	2	3.33	1.67
F048	16	0	0.00	147	5	3.40	1.70
F143	14	0	0.00	131	5	3.82	1.91
F004	4	0	0.00	38	2	5.26	2.63
F095	20	0	0.00	185	15	8.11	4.05
F113	16	0	0.00	160	14	8.75	4.38
F036	15	0	0.00	143	14	9.79	4.90
F038	20	1	5.00	188	10	5.32	5.16
F019	11	0	0.00	103	11	10.68	5.34
F139	5	0	0.00	44	5	11.36	5.68
F094a	4	0	0.00	40	5	12.50	6.25
F092	18	1	5.56	180	13	7.22	6.39
F026	15	2	13.33	150	1	0.67	7.00
F141	17	1	5.88	148	14	9.46	7.67
F002	14	2	14.29	130	3	2.31	8.30
F032	18	2	11.11	178	10	5.62	8.36
F154	19	1	5.26	175	24	13.71	9.49
F014	17	2	11.76	146	12	8.22	9.99
F031	13	2	15.38	129	12	9.30	12.34
F073	8	1	12.50	80	10	12.50	12.50
F146	2	0	0.00	12	3	25.00	12.50
F010	15	2	13.33	137	21	15.33	14.33
F009	8	1	12.50	78	13	16.67	14.58
F074	16	3	18.75	152	20	13.16	15.95
F063	15	3	20.00	140	17	12.14	16.07
F133	13	2	15.38	126	22	17.46	16.42
F094	20	3	15.00	189	39	20.63	17.82
F015	19	3	15.79	178	42	23.60	19.69
F158	19	2	10.53	166	51	30.72	20.62
F042	16	4	25.00	157	29	18.47	21.74
F025	18	5	27.78	180	39	21.67	24.72
F144	14	4	28.57	139	36	25.90	27.24
F006	15	4	26.67	139	40	28.78	27.72
F062	18	3	16.67	154	69	44.81	30.74
F037	13	6	46.15	130	45	34.62	40.38
F140	3	1	33.33	20	10	50.00	41.67
F172	19	7	36.84	152	78	51.32	44.08
F022	20	8	40.00	168	95	56.55	48.27
F159	10	7	70.00	100	54	54.00	62.00

Laboratory parameters are selected from:

Colour	Sp Cond	pH	DOC	Tot Alk	DIC
NO3 /2	Tot N	Na	Mg	SO4	Cl
K	Ca	NH4	TKN	F	Tot Hard
SiO2	B				

Table 2b Laboratory Performance Scores Study 77 Total Phosphorus

	SYSTEMATIC BIAS			FLAGGED RESULTS			
LAB CODE	# ANALYZED PARAMETERS	# BIASES	% BIASED PARAMETERS	# RESULTS RANKED	# FLAGS ASSIGNED	% RESULTS FLAGGED	AVE. BIAS & FLAGS (%)
F002	1	0	0.00	10	0	0.00	0.00
F003	1	0	0.00	10	0	0.00	0.00
F004	1	0	0.00	10	0	0.00	0.00
F007	1	0	0.00	9	0	0.00	0.00
F014	1	0	0.00	9	0	0.00	0.00
F026	1	0	0.00	10	0	0.00	0.00
F036	1	0	0.00	10	0	0.00	0.00
F038	1	0	0.00	10	0	0.00	0.00
F072	1	0	0.00	9	0	0.00	0.00
F074	1	0	0.00	10	0	0.00	0.00
F092	1	0	0.00	10	0	0.00	0.00
F099	1	0	0.00	10	0	0.00	0.00
F133	1	0	0.00	9	0	0.00	0.00
F143	1	0	0.00	10	0	0.00	0.00
F022	1	0	0.00	10	1	10.00	5.00
F032	1	0	0.00	10	1	10.00	5.00
F095	1	0	0.00	10	1	10.00	5.00
F146	1	0	0.00	10	1	10.00	5.00
F010	1	0	0.00	9	1	11.11	5.56
F011	1	0	0.00	9	1	11.11	5.56
F141	1	0	0.00	9	1	11.11	5.56
F154	1	0	0.00	9	1	11.11	5.56
F015	1	0	0.00	10	2	20.00	10.00
F158	1	0	0.00	10	2	20.00	10.00
F063	1	0	0.00	10	3	30.00	15.00
F006	1	0	0.00	9	3	33.33	16.67
F025	1	0	0.00	9	4	44.44	22.22
F048	1	0	0.00	10	5	50.00	25.00
F062	1	0	0.00	10	5	50.00	25.00
F094	1	0	0.00	10	5	50.00	25.00
F113	1	0	0.00	10	5	50.00	25.00
F019	1	0	0.00	9	7	77.78	38.89
F009	1	1	100.00	9	0	0.00	50.00
F069	1	1	100.00	9	1	11.11	55.56
F172	1	1	100.00	7	2	28.57	64.29
F042	1	1	100.00	10	4	40.00	70.00
F147	1	1	100.00	8	8	100.00	100.00

Table 3a

Summary of Study-to-Study Performance
Major Ions & Nutrients

% BIASED PARAMETERS & FLAGGED RESULTS ON STUDIES

LAB	0068	0069	0070	0071	0072	0073	0074	0075	0076	0077	MEDIAN	RATING
F002	4.3	5.4	5.5	14.1	4.0	3.7	21.4	13.6	14.8	8.3	6.9	SATISFACTORY
F003	7.0	15.4	0.5	3.2	3.7	4.6	4.2	1.9	3.2	1.1	3.5	GOOD
F004	12.2	0.9	1.7	1.6	1.6	15.0	1.9	4.5	11.0	2.6	2.3	GOOD
F006	22.6	32.4	20.7	26.7	28.3	23.3	30.4	14.6	23.2	27.7	25.0	MODERATE
F009	1.2	1.3	22.5	2.8	11.2	20.8	3.5	5.8	16.6	14.6	8.5	SATISFACTORY
F010	8.4	-	14.4	24.5	22.0	26.1	10.3	12.5	18.0	14.3	14.4	MODERATE
F014	5.8	13.3	4.7	15.0	13.7	10.0	7.7	10.0	7.9	10.0	10.0	SATISFACTORY
F015	15.6	19.7	20.0	5.0	19.4	13.3	14.5	5.8	4.2	19.7	15.1	MODERATE
F019	3.1	9.2	5.2	2.4	8.1	9.1	18.4	12.7	20.7	5.3	8.6	SATISFACTORY
F022	13.6	-	14.5	29.3	14.9	-	18.7	16.1	11.3	47.5	15.5	MODERATE
F025	-	-	14.2	41.2	29.2	25.5	6.9	14.7	7.4	24.7	19.7	MODERATE
F026	10.7	15.7	25.0	11.3	9.7	31.3	0.7	3.0	3.7	7.0	10.2	SATISFACTORY
F031	15.4	18.1	14.3	11.5	19.6	16.4	22.4	8.9	23.5	12.3	15.9	MODERATE
F032	4.3	9.4	5.2	10.1	8.7	8.2	1.4	6.6	6.3	8.4	7.4	SATISFACTORY
F036	20.1	6.4	2.0	1.7	0.4	0.0	0.9	2.3	15.0	4.9	2.1	GOOD
F037	34.3	22.4	34.2	25.8	57.7	36.8	20.1	43.2	10.4	40.4	34.2	POOR
F038	10.6	19.4	27.8	14.7	13.9	6.2	10.6	15.0	4.4	5.2	12.3	SATISFACTORY
F042	7.7	-	13.4	24.7	31.0	19.6	14.0	18.0	30.3	21.7	19.6	MODERATE
F048	19.0	20.8	9.2	24.3	5.8	8.2	5.8	10.1	9.7	1.7	9.4	SATISFACTORY
F062	-	28.4	-	-	-	-	-	-	-	30.7	29.6	MODERATE
F063	1.4	12.2	9.8	8.8	19.5	29.2	8.1	16.2	19.4	16.1	14.1	MODERATE
F073	6.6	-	-	-	-	57.5	-	38.8	-	12.5	25.6	MODERATE
F074	19.0	-	-	16.6	29.7	17.4	9.5	-	-	16.0	17.0	MODERATE
F092	31.2	-	26.6	-	13.9	-	11.9	-	9.7	6.4	12.9	MODERATE
F094	36.4	19.3	23.9	5.2	9.0	19.2	12.7	5.0	11.3	17.8	15.3	MODERATE
F094a	-	-	-	-	-	-	-	32.7	38.2	6.2	32.7	POOR
F095	-	-	5.8	-	10.6	8.9	-	5.1	-	4.1	5.8	SATISFACTORY
F099	-	-	-	-	-	-	-	6.7	-	1.7	4.2	GOOD
F113	-	42.9	28.9	10.6	15.0	4.7	3.3	4.7	4.0	4.4	4.7	GOOD
F133	-	-	7.3	11.3	10.9	5.8	15.8	1.6	2.3	16.4	9.1	SATISFACTORY
F139	-	-	-	-	49.3	70.4	21.7	20.2	1.3	5.7	20.9	MODERATE
F140	-	-	-	-	-	0.0	-	5.1	22.8	41.7	14.0	MODERATE
F141	-	-	-	-	-	9.5	-	28.9	15.6	7.7	12.5	MODERATE
F143	-	-	-	-	-	5.0	14.8	5.5	-	1.9	5.2	SATISFACTORY
F144	-	-	-	-	-	45.2	-	-	19.7	27.2	27.2	MODERATE
F146	-	-	-	-	-	0.0	7.7	5.0	0.0	12.5	5.0	SATISFACTORY
F154	-	-	-	-	-	-	9.9	-	-	9.5	9.7	SATISFACTORY
F158	-	-	-	-	-	-	-	16.1	21.5	20.6	20.6	MODERATE
F159	-	-	-	-	-	-	-	20.0	46.4	62.0	46.4	POOR
F172	-	-	-	-	-	-	-	-	-	44.1	-	-

INTERLAB MEDIAN	0068	0069	0070	0071	0072	0073	0074	0075	0076	0077
	10.7	15.7	14.2	11.5	13.9	13.3	10.3	10.1	11.3	12.5

STUDY DATES: 0068(Spring '96), 0069(Fall '96), 0070(Spring '97), 0071(Fall '97), 0072(Spring '98), 0073(Fall '98), 0074(Spring '99), 0075(Fall '99), 0076(Spring '00), 0077(Fall '00).

DEFINITION OF RATING:

Good = 0 to 4.99%
Satisfactory = 5 to 12.49%
Moderate = 12.5 to 29.99%
Poor = >30%

Table 3b

Summary of Study-to-Study Performance
Total Phosphorus

% BIASED PARAMETERS & FLAGGED RESULTS ON STUDIES

LAB	0068	0069	0070	0071	0072	0073	0074	0075	0076	0077	MEDIAN	RATING
F002	5.0	81.2	5.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GOOD
F003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GOOD
F004	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	GOOD
F006	14.3	100	78.6	22.2	77.8	14.3	14.3	27.8	22.2	16.7	22.2	MODERATE
F007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	GOOD
F009	-	-	75.0	11.1	0.0	25.0	0.0	14.3	-	50.0	14.3	MODERATE
F010	0.0	-	50.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.0	GOOD
F011	55.0	0.0	5.0	30.0	-	-	65.0	0.0	64.3	5.6	17.8	MODERATE
F014	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GOOD
F015	0.0	0.0	0.0	0.0	0.0	12.5	35.0	10.0	5.6	10.0	2.8	GOOD
F019	-	-	-	-	-	-	-	0.0	22.2	38.9	22.2	MODERATE
F022	0.0	-	5.6	0.0	15.0	-	0.0	0.0	0.0	5.0	0.0	GOOD
F025	-	-	6.2	0.0	0.0	62.5	0.0	15.0	20.0	22.2	10.6	SATISFACTORY
F026	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GOOD
F032	5.0	6.2	12.5	0.0	5.6	0.0	0.0	0.0	0.0	5.0	2.5	GOOD
F036	70.0	0.0	5.6	10.0	16.7	15.0	10.0	5.6	0.0	0.0	7.8	SATISFACTORY
F038	15.0	0.0	10.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GOOD
F042	0.0	-	20.0	0.0	0.0	15.0	5.0	0.0	70.0	70.0	5.0	SATISFACTORY
F048	0.0	10.0	75.0	0.0	0.0	11.1	16.7	0.0	5.6	25.0	7.8	SATISFACTORY
F062	-	-	-	-	-	-	-	-	-	25.0	-	-
F063	77.8	0.0	7.1	5.6	-	-	0.0	0.0	5.6	15.0	5.6	SATISFACTORY
F069	-	87.5	78.6	0.0	0.0	68.8	0.0	0.0	0.0	55.6	0.0	GOOD
F072	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GOOD
F074	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	GOOD
F092	0.0	-	0.0	-	0.0	-	0.0	-	0.0	0.0	0.0	GOOD
F094	-	-	-	0.0	0.0	81.2	75.0	5.6	61.1	25.0	25.0	MODERATE
F095	-	-	-	-	5.0	5.0	-	25.0	-	5.0	5.0	SATISFACTORY
F099	-	-	-	-	-	-	-	0.0	-	0.0	0.0	GOOD
F113	-	25.0	100	-	0.0	10.0	10.0	10.0	0.0	25.0	10.0	SATISFACTORY
F133	-	-	10.0	5.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	GOOD
F141	-	-	-	-	-	0.0	-	0.0	0.0	5.6	0.0	GOOD
F143	-	-	-	-	-	-	0.0	0.0	-	0.0	0.0	GOOD
F146	-	-	-	-	-	5.6	5.6	0.0	0.0	5.0	5.0	SATISFACTORY
F147	-	-	-	-	-	-	-	-	-	100	-	-
F154	-	-	-	-	-	-	5.0	-	-	5.6	5.3	SATISFACTORY
F158	-	-	-	-	-	-	-	-	-	10.0	-	-
F172	-	-	-	-	-	-	-	-	-	64.3	-	-

INTERLAB	0068	0069	0070	0071	0072	0073	0074	0075	0076	0077
MEDIAN	0.0	0.0	6.2	0.0	0.0	0.0	0.0	0.0	0.0	5.6

STUDY DATES: 0068(Spring '96), 0069(Fall '96), 0070(Spring '97), 0071(Fall '97), 0072(Spring '98), 0073(Fall '98), 0074(Spring '99), 0075(Fall '99), 0076(Spring '00), 0077(Fall '00).

DEFINITION OF RATING:

Good = 0 to 4.99%
Satisfactory = 5 to 12.49%
Moderate = 12.5 to 29.99%
Poor = >30%

Table 4a Sample design for major ions and nutrients in surface waters FP 77

Sample Number	Sample Name	Source (Province/State)	Expected Conductance (µS/cm, 25° C)
FP77 MI-1	Winn-02	Winnipeg, Manitoba	112
FP77 MI-2	Ion-20	Lake Ontario / Lake Superior	175
FP77 MI-3	Calg-01	Calgary, Alberta	338
FP77 MI-4	Colling-96A	Collingwood, Ontario	190
FP77 MI-5	Hamilton-90	Hamilton Harbour, Ontario	495
FP77 MI-6	Raisin-99	Raisin River, Ontario	457
FP77 MI-7	Sour-01	Souris River, Manitoba	506
FP77 MI-8	HH-94	Hamilton Harbour, Ontario	499
FP77 MI-9	Wattap-94	Tap water Waterloo, Ontario	434
FP77 MI-10	Ion-96.3	Grand River, Ontario	881

Table 4b Sample design for total phosphorus FP 77

Sample No.	Sample Name	Background Water	Spiking Detail	Design Value (mg/L)
FP77 TP-1	TP771	Super-991	none added	0.003
FP77 TP-2	TP772	Nsask-97	none added	0.016
FP77 TP-3	TP773	French-98	none added	0.028
FP77 TP-4	TP774	mixture	none added	0.192
FP77 TP-5	TP775	mixture	none added	0.088
FP77 TP-6	TP776	Trky-96	organic spike	0.160
FP77 TP-7	TP777	Assum-95	inorganic spike	0.213
FP77 TP-8	TP778	Ssask-97	organic spike	0.236
FP77 TP-9	TP779	Belvu-95	inorganic spike	0.345
FP77 TP-10	TP7710	Beav-01D	inorganic/organic mix	0.370

Samples are prepared in natural lake and river waters and preserved with 0.2% sulfuric acid. Standard phosphate solutions were prepared with potassium dihydrogen phosphate and sodium β- glycerophosphate for inorganic and organic spikes respectively. All designs were verified by our reference laboratory.

Table 5a Summary of Median Values for Major Ions & Nutrients - Study 77

PARAMETER		Winn-02 Sample 1	Ion-20 Sample 2	Calg-01 Sample 3	Colling-96A Sample 4	Hamilton-90 Sample 5
Ammonia	mg/L N	0.0100	0.0050	0.0340	0.0050	0.3510
Boron	mg/L	0.0070	0.0040	0.0060	0.0135	0.0800
Calcium	mg/L	14.200	13.800	46.625	24.334	43.350
Chloride	mg/L	2.2000	16.600	4.5500	5.7100	61.750
Colour	Hazen Unit	16.000	5.0000	1.6500	2.0500	4.2500
Diss Inorg Carbon	mg/L C	10.800	5.3950	28.550	16.862	21.250
Diss Organic Carbon	mg/L C	6.1800	0.5800	0.8900	1.4000	3.2000
Fluoride	mg/L	0.0600	0.0400	0.9680	0.0800	0.5000
Magnesium	mg/L	3.8000	2.8760	13.400	6.3350	10.640
Nitrate + Nitrite	mg/L N	0.1060	0.0380	0.1580	0.3005	1.4000
Potassium	mg/L	0.8000	1.2000	1.1600	0.8150	3.7550
Silicates	mg/L SiO2	0.3790	1.3900	4.4050	0.7600	0.7790
Sodium	mg/L	2.5000	13.200	2.4200	3.3740	35.300
Specific Conduct	µS/cm	112.00	174.90	338.00	190.00	495.00
Sulfate	mg/L	4.9000	29.300	45.900	14.680	52.000
Total Alkalinity	mg/L CaCO3	47.355	23.100	121.00	71.800	90.000
Total Hardness	mg/L	51.300	46.000	172.00	88.000	153.00
Total Kjeldahl N	mg/L N	0.2300	0.0500	0.1000	0.0920	0.6350
Total N	mg/L N	0.3180	0.0610	0.2405	0.3800	1.9950
Turbidity	JTU/NTU	0.1000	0.0790	0.0800	0.0700	0.1000
pH	pH Units	7.8100	7.6300	8.2500	8.0400	7.9900

		Raisin-99 Sample 6	Sour-01 Sample 7	HH-94 Sample 8	Wattap-94 Sample 9	Ion-96.3 Sample 10
Ammonia	mg/L N	0.0050	0.0180	0.0050	0.0050	0.0125
Boron	mg/L	0.0200	0.0780	0.0490	0.0105	0.0600
Calcium	mg/L	76.700	34.250	46.530	45.150	97.900
Chloride	mg/L	15.165	17.900	59.319	15.200	85.700
Colour	Hazen Unit	100.00	10.000	4.6000	1.2500	16.400
Diss Inorg Carbon	mg/L C	47.310	40.550	23.380	33.915	50.077
Diss Organic Carbon	mg/L C	19.700	5.7112	2.1000	0.6100	5.2200
Fluoride	mg/L	0.1300	0.1350	0.3600	0.9000	0.1900
Magnesium	mg/L	10.300	20.638	10.700	24.450	25.462
Nitrate + Nitrite	mg/L N	0.2320	0.0100	2.3000	1.7150	4.2550
Potassium	mg/L	1.4000	6.3500	3.5500	1.5800	3.9000
Silicates	mg/L SiO2	3.0200	0.2600	1.6090	11.750	2.4000
Sodium	mg/L	9.4100	41.700	34.002	6.2250	47.835
Specific Conduct	µS/cm	456.50	506.20	499.00	433.90	880.55
Sulfate	mg/L	19.500	66.670	46.600	55.500	110.00
Total Alkalinity	mg/L CaCO3	203.00	173.00	100.00	143.00	211.00
Total Hardness	mg/L	234.00	171.00	161.00	214.00	352.00
Total Kjeldahl N	mg/L N	0.8650	0.4000	0.2090	0.0615	0.5400
Total N	mg/L N	1.0090	0.3950	2.5155	1.8050	4.7050
Turbidity	JTU/NTU	0.2050	0.1000	0.0700	0.0600	0.1470
pH	pH Units	8.0700	8.4000	8.1700	8.2100	8.2100

Table 5b Summary of Median Values for Total Phosphorus - Study 77

PARAMETER		TP77-1 Sample 1	TP77-2 Sample 2	TP77-3 Sample 3	TP77-4 Sample 4	TP77-5 Sample 5
Total Phosphorus	mg/L P	0.0030	0.0160	0.0280	0.1917	0.0880

		TP77-6 Sample 6	TP77-7 Sample 7	TP77-8 Sample 8	TP77-9 Sample 9	TP77-10 Sample 10
Total Phosphorus	mg/L P	0.1600	0.2130	0.2360	0.3452	0.3700

Appendix

Data & Evaluation Summary

FPMI STUDY 0077 DATA SUMMARY 2000-11-27 PAGE 1

PARAMETER: 00392 Specific Conductance uS/cm

NATIONAL WATER RESEARCH INSTITUTE
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NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 2.0000 CONCENTRATION ERROR INCREMENT= 0.0400

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	111.4	174.8	338.	191.	500.	459.	511.	510.	439.	892.
F003	114.	175.	342.	192.	498.	459.	506.	502.	437.	888.
F004	113.	174.	339.	190.	500.	460.	510.	503.	437.	888.
F006	113.	179.	346.	195.	505.	466.	514.	507.	442.	890.
F009	110.	180.	340.	190.	510.	460.	510.	510.	440.	890.
F010	118.	184. EH	344.	189.	480.	467.	490.	495.	445.	880.
F014	109.	170.	330.	187.	488.	455.	500.	496.	431.	879.
F015	110.	171.	334.	188.	496.	455.	507.	499.	432.	803. EL
F019	113.	174.	342.	190.	505.	462.	508.	502.	438.	894.
F022	112.	171.	339.	188.	500.	461.	510.	503.	439.	889.
F025	112.	170.	327.	186.	492.	448.	495.	490.	426.	858.
F026	114.3	178.0	345.0	194.0	504.0	462.5	514.0	508.0	441.5	887.5
F031	112.	175.	342.	190.	502.	462.	570. EH	505.	437.	891.
F032	110.	173.	332.	184.	481.	442.	460. EL	458. EL	399. EL	825. L
F036	111.	170.	331.	184.	492.	449.	499.	493.	400. EL	875.
F037	110.7	169.6	324.	185.4	466. L	433. L	477. L	469. L	413. L	802. EL
F038	119. EH	176.	339.	191.	495.	455.	505.	497.	433.	880.
F042	106.4	165.0 L	336.4	181.0	493.7	457.4	505.0	497.3	433.2	877.3
F048	113.2	175.	341.	191.	502.	463.	511.	505.	439.	893.
F062	102. EL	156. EL	310. EL	164. EL	452. EL	414. EL	450. EL	455. EL	392. EL	801. EL
F063	110.	173.	333.	184.	495.	449.	501.	487.	425.	874.
F073	110.	172.	336.	189.	495.	454.	508.	500.	433.	884.
F074	112.	175.	338.	192.	493.	453.	515.	507.	432.	884.
F092	112.0	173.7	338.6	189.7	497.4	456.0	504.0	500.0	434.6	881.1
F094	110.	175.	334.	193.	500.	460.	510.	498.	458. H	872.
F095	115.	176.	338.	191.	492.	453.	502.	495.	432.	865.
F099	115.	177.	342.	194.	503.	466.	515.	507.	441.	894.
F113	112.1	174.	337.9	189.2	494.8	452.8	506.4	496.2	430.2	882.2
F133	111.5	172.0	335.	188.0	495.	451.	505.	497.	429.	877.
F141	113.	176.	339.	191.	466. L	457.	505.	499.	435.	873.
F143	113.	176.	337.	192.	488.	447.	500.	493.	429.	850.
F144	114.	176.	343.	191.	503.	460.	514.	506.	440.	892.
F154	114.	178.	344.	194.	503.	463.	512.	506.	440.	884.
F158	109.	176.	317. EL	178. L	465. L	443.	486.	483.	426.	873.
F159	114.	166.	326.	183.	478.	438.	499.	488.	426.	862.
F172	113.	176.	340.	192.	501.	460.	511.	505.	438.	895.
MEDIAN	112.0000	174.9000	338.0000	190.0000	495.0000	456.5000	506.2000	499.0000	433.9000	880.5500
1CRIT	6.4400	8.9560	15.4800	9.5600	21.7600	20.2200	22.2080	21.9200	19.3160	37.1820
N	34	34	34	34	34	34	34	33	34	34
MEAN	112.0765	173.8853	336.5853	188.8912	493.2029	455.0500	503.6882	496.8636	432.1324	874.3853
3STDEV	6.4911	9.9702	18.4628	11.2734	32.6874	23.1712	33.7771	31.7490	30.8618	68.3159

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	241.50	24.150	10					meter
F003	241.00	24.100	10					
F004	227.50	22.750	10					02041
F006	325.00	32.500	10		BIASED HIGH*	1.02	2.9231	ELECTRODE
F009	267.00	26.700	10					Cond. 25C
F010	229.00	22.900	10	EH				Conduct. meter
F014	99.50	9.950	10					
F015	130.00	13.000	10	EL				
F019	255.50	25.550	10					Conductance
F022	215.50	21.550	10					
F025	81.00	8.100	10		BIASED LOW*	-2.38	1.5194	Electrode
F026	320.50	32.050	10		BIASED HIGH*	0.75	3.2192	Radiom. Syst.
F031	260.00	26.000	10	EH				Cond meter
F032	55.00	5.500	10	ELELELL	BIASED LOW	-7.72	9.3392	potentiometric
F036	82.50	8.250	10	EL	BIASED LOW*	-0.47	-6.2886	potentiometry
F037	43.50	4.350	10	L L L L L EL	BIASED LOW	-9.68	15.9022	V.W.R.
F038	207.50	20.750	10	EH				Meter
F042	119.50	11.950	10	L				Cond. Meter
F048	275.50	27.550	10					Electrode
F062	10.00	1.000	10	ELELELELELELELELELEL	BIASED LOW	-8.69	-3.4990	Conductivity Meter
F063	94.00	9.400	10					meter
F073	157.50	15.750	10					Jenway 4010
F074	213.50	21.350	10					Electrode
F092	178.50	17.850	10					Meter
F094	207.00	20.700	10	H				Cond. Meter
F095	171.00	17.100	10					Titralyzer
F099	326.50	32.650	10		BIASED HIGH*	1.51	0.6431	
F113	157.00	15.700	10					YSI 3200 Meter
F133	129.50	12.950	10					COND. METER
F141	184.50	18.450	10	L				Conductance Meter
F143	142.00	14.200	10					electrometric
F144	292.00	29.200	10		BIASED HIGH*	1.43	-0.5556	APHA2510B
F154	304.50	30.450	10		BIASED HIGH*	0.31	3.9423	Autoelectrode
F158	67.00	6.700	10	ELL L	BIASED LOW*	-1.27	-7.8028	Conductivity Meter
F159	76.00	7.600	10		BIASED LOW*	-2.05	-2.2332	N-1473
F172	273.00	27.300	10					Meter

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 2.50

OVERALL AVERAGE
RANK IS 18.500

PARAMETER: 00292 Colour Hazen Unit

NATIONAL WATER RESEARCH INSTITUTE
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NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.0000 BASIC ACCEPTABLE ERROR= 5.0000 CONCENTRATION ERROR INCREMENT= 0.1500

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	16.	<5.0	<5.0	<5.0	<5.0	101.	10.	<5.0	<5.0	17.
F003	16.8	5.1	3.2	2.7	5.9	98.7	11.4	5.7	2.4	16.9
F010	12.	1.	<1.	<1.	2.	80. L	7.	2.	<1.	11.
F014	5. EL	0.	0.	0.	0.	70. VL	0. EL	0.	0.	5. EL
F015	17.5	3.	<2.5	<2.5	4.	90.	12.5	3.	<2.5	16.
F031	18.1	4.7	1.3	2.1	5.5	112.	10.8	4.2	1.5	19.3
F032	16.8	2.4	0.6	0.8	3.4	98.8	10.0	4.0	0.4	16.8
F036	15.4	3.6	1.2	1.6	3.2	116.	9.8	9.2	0.8T	17.0
F038	14.	<5.	<5.	<5.	<5.	91.	9.	<5.	<5.	14.
F042	18.	5.	2.	7. EH	6.	108.	12.	5.	1.	20.
F048	14.2	2.6	<2.	<2.	4.5	102.3	9.0	3.7	<2.	16.4
F062	16.	<5.	<5.	<5.	<5.	121. H	11.	<5.	<5.	20.
F063	9. L	<2.	<2.	<2.	<2.	62. VL	6.	<2.	<2.	9. L
F092	7.5 L	1.	1.	1.	1.	100.	5.	2.	1.	7.5 L
F094	20.	8.	8. EH	5.	5.	55. VL	13.	8.	<3.	20.
F095	18.	5.	1.	1.	4.	115.	10.	4.	<1.	18.
F113	14.	9.	5.	5.	8.	90.	12.	7.	6. EH	16.
F141	21.	6.	4.	2.	6.	149. EH	13.	6.	2.	25. H
F154	15.	5.	<5.	<5.	5.	100.	10.	5.	<5.	15.
F158	17.5	5.0	2.5	2.5	2.5	70.0 VL	10.0	5.0	2.5	12.5
F172	19.	5.	<4.	<4.	<4.	104.	9.	<4.	<4.	16.
MEDIAN	16.0000	5.0000	1.6500	2.0500	4.2500	100.0000	10.0000	4.6000	1.2500	16.4000
1CRIT	6.6500	5.0000	5.0000	5.0000	5.0000	19.2500	5.7500	5.0000	5.0000	6.7100
N	19	15	10	10	14	19	18	14	8	19
MEAN	15.5158	4.1600	2.1800	2.3700	4.1429	96.3053	9.6944	4.6143	1.4500	15.7053
3STDEV	9.4514	5.4770	4.1845	4.3454	4.5408	47.7875	5.8826	4.9902	2.1840	10.4003

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING				BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	49.00	12.250	4					INSUFFICIENT DATA			Colorimeter
F003	115.50	11.550	10								PT-CO UN
F010	25.00	3.571	7			L		BIASED LOW*	-18.10	-1.8531	Colorimetry
F014	12.50	1.250	10	EL		VLEL	EL	BIASED LOW	-27.49	-3.6881	
F015	66.50	9.500	7								true color
F031	113.00	11.300	10								Spectrophotometry
F032	68.00	6.800	10								colourimetry
F036	91.50	9.150	10								colourimetry
F038	25.50	6.375	4					INSUFFICIENT DATA			Spectrophotometric
F042	128.00	12.800	10		EH						Colorimetric PCU
F048	57.00	8.143	7								Spectrophotometric
F062	64.50	16.125	4			H		INSUFFICIENT DATA			Colorimetric
F063	11.00	2.750	4	L		VL	L	INSUFFICIENT DATA			auto-colour
F092	36.00	3.600	10	L			L	BIASED LOW*	2.10	-3.7584	Spectrophot.
F094	124.50	13.833	9		EH	VL					Visual comparison
F095	93.50	10.389	9								HACH 4000V
F113	117.00	11.700	10				EH				Hach, Kit CO-1
F141	149.00	14.900	10			EH	H	BIASED HIGH	49.40	-0.6835	Colourimeter
F154	69.00	9.857	7								Disc Comparison
F158	84.00	8.400	10			VL					Visual Comparison
F172	60.00	12.000	5								Colourmetric

* 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 9.341

PARAMETER: 00192 Turbidity JTU/NTU

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.2000 BASIC ACCEPTABLE ERROR= 0.2500 CONCENTRATION ERROR INCREMENT= 0.1000

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	1.1 EH	0.6 EH	0.6 EH	0.6 EH	0.9 VH	2.0 EH	1.0 EH	0.6 EH	0.9 EH	1.5 EH
F003	0.17	<0.05	<0.05	<0.05	0.12	0.39	0.12	<0.05	<0.05	0.21
F004	0.06	0.05T	0.11	0.05T	0.08	0.23	0.05T	0.05	0.05T	0.19
F006	0.05	0.01	0.01	0.02	0.02	0.16	0.07	0.03	0.02	0.10
F010	0.13	0.08	0.07	0.12	0.16	0.21	0.16	0.21	0.16	0.2
F014	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
F015	0.09	0.08	0.10	0.07	0.06	0.24	0.10	0.07	<0.05	0.17
F019	0.	0.	0.	0.	1. VH	1. VH	0.	0.	0.	0.
F022	<0.01	0.26	<0.01	<0.01	<0.01	0.15	<0.01	0.27	<0.01	0.13
F031	0.09	0.08	0.11	0.09	0.07	0.17	0.16	0.08	0.05	0.29
F032	0.65 VH	<0.05	<0.05	<0.05	<0.10	0.68 VH	<0.05	<0.05	<0.05	0.12T
F038	0.2	0.2	<0.1	<0.1	0.1	0.5 H	0.1	<0.1	<0.1	0.1
F042	0.11	0.08	0.10	0.08	0.09	0.16	0.12	0.09	0.09	0.12
F048	0.07	0.04	0.05	0.06	0.09	0.15	0.10	0.06	0.06	0.15
F062	0.9 EH	1. EH	1. EH	1. EH	1.5 EH	1.5 EH	1.6 EH	1. EH	0.35 EH	2.0 EH
F063	0.1	<0.1	0.1	0.1	0.3	0.2	0.2	<0.1	<0.1	0.2
F092	0.14	0.079	0.12	0.07	0.15	0.31	0.15	0.11	0.18	0.26
F094	<0.1	<0.1	<0.1	<0.1	<0.1	0.36	0.17	0.13	0.13	0.22
F095	0.096	0.056	0.055	0.070	0.069	0.173	0.103	0.070	0.059	0.144
F113	0.077	0.045	0.047	0.058	0.17	0.176	0.083	0.054	0.049	0.14
F122	0.07T	0.05T	0.05T	0.08T	0.05T	0.17	0.08T	0.07T	0.10T	0.14
F133	0.11	0.06	0.08	0.06	0.10	0.21	0.10	0.07	0.06	0.16
F141	0.1	0.1	<0.1	<0.1	0.1	0.2	0.1	0.1	0.1	0.1
F154	0.14	0.03	0.01	0.03	0.03	0.15	0.06	0.05	0.01	0.10
F158	0.06	<0.05	<0.05	<0.05	<0.05	0.18	0.08	<0.05	<0.05	0.12
F172	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MEDIAN	0.1000	0.0790	0.0800	0.0700	0.1000	0.2050	0.1000	0.0700	0.0600	0.1470
1CRIT	0.2500	0.2500	0.2500	0.2500	0.2500	0.2505	0.2500	0.2500	0.2500	0.2500
N	20	17	15	15	18	23	20	17	15	22
MEAN	0.1707	0.1118	0.1075	0.1039	0.2022	0.3334	0.1553	0.1244	0.0979	0.2211
3STDEV	0.6257	0.4074	0.4077	0.4044	0.8139	0.9552	0.5926	0.3983	0.2455	0.8514

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	193.00	19.300	10	EHEHEHEHVHEHEHEHEHEH	BIASED HIGH	891.36	-0.0223	Hach Nephelometer
F003	83.50	16.700	5					JTU
F004	76.50	7.650	10					02081
F006	26.50	2.650	10		BIASED LOW*	4.51	-0.0567	NTU
F010	144.00	14.400	10					Nephelometry
F014	0.00	-	0		INSUFFICIENT DATA			
F015	94.50	10.500	9					neph.
F019	49.00	4.900	10	VHVH	BIASED LOW	488.68	-0.3952	Colourmetric
F022	45.00	11.250	4		INSUFFICIENT DATA			
F031	116.00	11.600	10					Turbidity meter
F032	48.00	16.000	3	VH VH	INSUFFICIENT DATA			nephelometry
F038	79.50	13.250	6	H				Nephelometric
F042	105.00	10.500	10					Nephelometric
F048	69.50	6.950	10					Stray light
F062	198.00	19.800	10	EHEHEHEHEHEHEHEHEHEH	BIASED HIGH	607.01	0.4702	Nephelometric
F063	102.50	14.643	7					turbidimeter
F092	147.50	14.750	10					Hach meter
F094	85.00	17.000	5					Nephelometer
F095	87.50	8.750	10					HACH 2100AN
F113	72.50	7.250	10					Hach 2100N
F122	74.50	7.450	10					HACH 18900
F133	103.50	10.350	10					NEPHELOMETRIC
F141	87.00	10.875	8					Hach Turbidimeter
F154	41.00	4.100	10		BIASED LOW*	-7.52	-0.0325	Turbidimeter
F158	26.00	6.500	4		INSUFFICIENT DATA			Nephlometric
F172	0.00	-	0		INSUFFICIENT DATA			Turbidimeter

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 50.00

OVERALL AVERAGE
RANK IS 10.721

PARAMETER: 01092 pH pH Units

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.5000 BASIC ACCEPTABLE ERROR= 0.2500 CONCENTRATION ERROR INCREMENT= 0.0000

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	7.94	7.75	8.33	8.15	8.1	8.17	8.46	8.26	8.32	8.3
F003	7.91	7.56	8.28	8.10	8.01	8.02	8.41	8.17	8.22	8.17
F006	7.5 L	7.4	8.1	7.8	7.8	7.8 L	8.3	8.0	8.1	8.1
F009	7.72	7.71	8.20	7.95	7.86	7.88	8.33	8.13	8.15	8.14
F010	7.65	7.43	8.17	7.9	8.03	8.19	8.28	8.04	8.19	8.2
F014	7.88	7.72	8.26	8.11	8.04	8.10	8.43	8.22	8.26	8.28
F015	7.70	7.31 L	8.16	7.97	7.94	8.14	8.32	8.08	8.20	8.21
F019	7.8	7.7	8.2	8.0	7.9	7.9	8.4	8.2	8.2	8.1
F022	7.49 L	7.29 L	7.91 L	7.74 L	7.61 EL	7.64 EL	8.07 EL	7.83 L	7.87 EL	7.92 EL
F025	7.55 L	7.22 VL	7.92 L	7.78 L	7.79	7.91	8.11 L	7.93	8.00	8.03
F026	7.81	7.63	8.19	8.05	8.09	8.29	8.43	8.19	8.35	8.40
F031	7.88	7.82	8.29	8.09	7.92	7.88	8.43	8.19	8.20	8.16
F032	7.92	7.66	8.30	8.11	8.05	8.15	8.34	8.10	8.20	8.21
F036	7.81	7.66	8.30	8.07	7.99	8.04	8.44	8.21	8.29	8.30
F037	7.8	7.79	8.27	8.03	7.92	7.92	8.41	8.17	8.21	8.2
F038	7.95	7.75	8.29	8.09	8.03	8.08	8.29	8.10	8.18	8.17
F042	7.64	7.49	8.11	7.99	7.98	8.16	8.32	8.13	8.21	8.23
F048	7.89	7.84	8.32	8.11	8.00	7.99	8.44	8.26	8.27	8.25
F062	7.8	8. H	8.3	8.2	8.1	8.2	8.5	8.1	8.2	8.2
F063	7.25 EL	6.88 EL	8.08	7.54 EL	7.82	8.07	8.18	7.87 L	8.11	8.21
F073	7.92	7.68	8.32	8.19	8.16	8.44 H	8.45	8.21	8.33	8.47 H
F074	8.11 H	7.84	8.33	8.28	8.3 EH	8.42 H	8.47	8.29	8.4	8.38
F092	7.66	7.46	8.24	8.04	7.96	8.01	8.41	8.18	8.23	8.24
F094	7.6	7.3 L	8.1	7.9	7.9	8.0	8.3	8.0	8.1	8.2
F095	7.88	7.75	8.31	8.12	8.03	8.08	8.40	8.20	8.25	8.26
F099	7.86	7.77	8.23	8.03	7.96	7.96	8.36	8.15	8.18	8.16
F113	7.85	7.62	8.26	8.1	8.1	8.2	8.38	8.26	8.27	8.31
F133	7.90	7.60	8.30	8.05	8.04	8.11	8.42	8.17	8.22	8.20
F141	7.83	7.66	8.27	8.04	8.01	8.05	8.41	8.18	8.25	8.22
F143	7.76	7.46	8.16	7.96	8.02	8.19	8.31	8.12	8.23	8.29
F144	7.62	7.45	8.1	7.9	7.9	8.07	8.24	8.04	8.1	8.13
F154	7.71	7.55	8.25	7.99	7.92	7.97	8.39	8.14	8.15	8.21
F158	7.6	7.5	7.8 EL	7.8	7.7 L	7.8 L	8.1 L	7.9 L	8.0	7.9 EL
F159	8.4 EH	7.9 H	8.5	8.2	8.0	8.1	8.4	8.3	8.3	8.3
F172	7.82	7.63	8.25	8.03	7.95	8.04	8.40	8.17	8.24	8.27
MEDIAN	7.8100	7.6300	8.2500	8.0400	7.9900	8.0700	8.4000	8.1700	8.2100	8.2100
1CRIT	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
N	33	33	33	33	33	33	33	33	33	33
MEAN	7.7806	7.6030	8.2152	8.0179	7.9703	8.0573	8.3564	8.1321	8.2033	8.2106
3STDEV	0.4263	0.5257	0.3194	0.3550	0.2996	0.4035	0.2771	0.3051	0.2441	0.2763

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	310.50	31.050	10		BIASED HIGH	-7.74	0.7260	pH meter
F003	201.00	20.100	10					PH 25-ELECTRO PH
F006	49.50	4.950	10	L L	BIASED LOW	24.30	-2.1517	STIRRED
F009	113.00	11.300	10					Stirred
F010	128.00	12.800	10					Stirred electrode
F014	259.50	25.950	10					
F015	128.50	12.850	10	L				
F019	146.00	14.600	10					Stirred
F022	16.00	1.600	10	L L L L ELELELL ELEL	BIASED LOW*	1.57	-0.4670	
F025	34.50	3.450	10	L VLL L L	BIASED LOW	12.74	-1.2833	Electrode
F026	252.00	25.200	10					Radiom. Syst.
F031	195.50	19.550	10					Stirred, pH meter
F032	219.50	21.950	10					potentiometric
F036	240.50	24.050	10					unstirred
F037	178.00	17.800	10					Accumet
F038	192.50	19.250	10					Meter
F042	150.00	15.000	10					Unstirred
F048	264.50	26.450	10					Stirred
F062	250.50	25.050	10	H				pH Meter
F063	62.00	6.200	10	ELEL EL L	BIASED LOW	82.70	-6.9587	meter
F073	313.50	31.350	10	H H	BIASED HIGH*	1.37	0.0273	Coring 345
F074	340.00	34.000	10	H EHH	BIASED HIGH	-25.94	2.2983	Electrode
F092	174.00	17.400	10					Stirred
F094	75.50	7.550	10	L	BIASED LOW	28.01	-2.4014	pH meter
F095	254.00	25.400	10					Titralyzer
F099	158.50	15.850	10					
F113	255.00	25.500	10					Beck 350 unstirred
F133	222.50	22.250	10					ELECTRODE
F141	212.00	21.200	10					stirred
F143	169.00	16.900	10					meter
F144	78.00	7.800	10		BIASED LOW	6.65	-0.6596	APHA4500-HB
F154	136.00	13.600	10					Autoelectrode
F158	36.00	3.600	10	EL L L L L EL	BIASED LOW	-25.36	1.7801	pH Meter
F159	295.00	29.500	10	EHH	BIASED HIGH	-45.29	3.8202	
F172	189.50	18.950	10					Meter

* 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 18.000

PARAMETER: 06192 Total Alkalinity mg/L CaCO3

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 1.5000 CONCENTRATION ERROR INCREMENT= 0.0400

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	46.4	21.7	118.9	68.8	88.1	201.	171.	98.1	141.	210.
F003	47.0	22.4	123.	71.5	88.9	206.	175.	100.	144.	212.
F006	49.	24.	125.	74.	92.	209.	178.	103.	147.	218.
F010	49.	22.	126.	72.	105. EH	214. EH	180.	102.	152. H	221. H
F014	44.0 EL	23.1	114. L	69.6	79.6 EL	197.	159. EL	96.4	138.	198. EL
F015	48.8	24.2	124.	73.4	91.7	208.	177.	102.	146.	216.
F019	48.	24.	120.	74.	90.	199.	173.	105.	141.	210.
F022	46.31	22.76	119.62	69.58	97.51 H	198.89	169.94	105.18	140.34	209.33
F025	50.4	25.6 H	125.	73.5	90.8	207.	175.	103.	147.	217.
F026	47.3550	22.83	124.42	73.32	92.06	209.31	178.62	103.63	147.23	219.52
F031	46.	22.	115.	68.	84. L	196.	165.	96.	138.	202.
F032	47.5	24.5	121.	72.5	90.5	204.	172.	101.	143.	213.
F036	48.6	24.0	122.	71.8	90.0	203.	173.	100.	143.	212.
F038	48.	23.	121.	72.	90.	197.	174.	100.	143.	208.
F042	48.01	22.90	121.7	72.30	91.20	208.3	177.3	101.9	147.7	217.8
F048	48.5	24.7	123.6	72.5	91.8	206.0	176.2	102.6	144.8	215.6
F062	44.9	25.4	137. EH	76.	99. VH	205.	182. H	110. EH	155. EH	209.
F063	47.	24.	120.	71.	89.	199.	169.	99.	140.	209.
F074	46.0	22.0	115.	69.9	84.3 L	196.	164. L	94.4 L	135. L	204.
F092	46.5	23.2	118.0	69.4	87.4	198.0	167.6	97.0	137.9	206.3
F094	47.	23.	120.	70.	88.	199.	169.	98.	139.	210.
F095	48.5	24.7	122.	71.7	90.2	203.	173.	99.9	142.	212.
F099	46.	23.	120.5	70.	88.	200.	170.5	98.5	141.	210.
F113	45.96	21.24	116.09	68.19	82.14 VL	198.70	167.30	95.78	136.54	205.17
F133	48.	24.	123.	73.	91.	205.	175.	101.	145.	216.
F141	48.	24.	122.	72.	90.	203.	172.	100.	143.	213.
F143	47.	22.	121.	71.	89.	204.	174.	100.	143.	214.
F144	48.	24.	125.	75.	90.	205.	180.	105.	145.	220.
F154	47.	23.5	122.	71.	87.	201.	173.	98.	142.	208.
F158	46.	23.	120.	72.	90.	201.	175.	100.	144.	209.
F172	48.	22.	120.	71.	88.	200.	171.	99.	143.	211.
MEDIAN	47.3550	23.1000	121.0000	71.8000	90.0000	203.0000	173.0000	100.0000	143.0000	211.0000
1CRIT	3.3542	2.3840	6.3000	4.3320	5.0600	9.5800	8.3800	5.4600	7.1800	9.9000
N	29	29	29	29	29	28	29	29	29	29
MEAN	47.3219	23.3066	121.2010	71.5859	89.7107	202.6857	172.9469	100.3790	142.9141	211.6110
3STDEV	3.2136	2.8918	8.4208	4.9661	9.9275	11.1196	12.2235	7.7959	10.2552	13.5104

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	86.00	8.600	10					H2SO4 titration
F003	168.50	16.850	10					ALK-T-POT
F006	271.00	27.100	10		BIASED HIGH	3.05	-0.0396	0.02 H2SO4 TITRN
F010	258.00	25.800	10	EHEH H H	BIASED HIGH	5.42	-0.4403	Titration-conduct.
F014	39.00	3.900	10	EL L EL EL EL	BIASED LOW	-5.22	-0.2793	
F015	254.00	25.400	10		BIASED HIGH*	2.23	0.1428	
F019	174.00	17.400	10					Titration
F022	122.00	12.200	10	H				
F025	264.50	26.450	10	H	BIASED HIGH*	1.37	1.4873	Titration
F026	247.00	24.700	10		BIASED HIGH	4.28	-1.5635	Titroprocessor
F031	31.00	3.100	10	L	BIASED LOW	-3.76	-0.6764	Titration
F032	191.00	19.100	10					titration
F036	183.50	18.350	10					titration
F038	144.50	14.450	10					Colourimetric
F042	228.00	22.800	10					ANC Gran plot
F048	244.00	24.400	10					Titrimetric
F062	248.00	24.800	10	EH VH H EHEH	BIASED HIGH*	0.37	5.5650	Auto Color
F063	111.00	11.100	10					titration pH4.5
F074	32.50	3.250	10	L L L L	BIASED LOW	-3.79	-0.7811	Automated gran
F092	65.00	6.500	10		BIASED LOW*	-2.71	0.0115	Autotitrator
F094	94.50	9.450	10					autotitrator
F095	183.50	18.350	10					Titralyzer
F099	101.50	10.150	10					
F113	30.00	3.000	10	VL	BIASED LOW*	-1.75	-2.5406	ManTech PC Titrate
F133	223.00	22.300	10					TITRIMETRIC
F141	179.00	17.900	10					Auto titrn
F143	149.00	14.900	10					
F144	250.50	25.050	10		BIASED HIGH*	2.92	-0.0822	APHA2320B
F154	122.00	12.200	10					Autoelectrode
F158	144.50	14.450	10					Auto Color
F172	120.00	12.000	10					Titrimetric

* 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 16.000

PARAMETER: 05091 Boron mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0050 BASIC ACCEPTABLE ERROR= 0.0050 CONCENTRATION ERROR INCREMENT= 0.1000

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F010	0.005	0.004	0.012 H	0.014	0.07	0.02	0.076	0.045	0.017 H	0.056
F014	<0.010	<0.010	<0.010	0.012	0.079	0.015	0.075	0.049	0.010	0.056
F015	0.01	<0.01	<0.01	0.02 H	0.08	0.02	0.08	0.05	0.01	0.06
F022	<0.025	<0.025	<0.025	<0.025	0.064 L	<0.025	0.056 VL	0.042	<0.025	0.048 L
F038	0.008	0.006	0.006	0.013	0.084	0.019	0.081	0.051	0.011	0.061
F062	<0.01	<0.01	<0.01	<0.01	0.05 EL	0.01 VL	0.06 L	0.04	<0.01	0.04 VL
F094	<0.05	<0.05	<0.05	<0.05	0.08	<0.05	0.08	0.05	<0.05	0.07
F095	0.007	0.004	0.005	0.012	0.086	0.017	0.080	0.051	0.010	0.061
F133	<5.	<5.	<5.	5. EH	70. EH	10. EH	60. EH	40. EH	10. EH	50. EH
F139					0.079		0.078	0.043		0.054
F144	0.001 L	0.011 H	0.01	0.023 VH	0.074	0.055 VH	0.049 EL	0.043	0.002 EL	0.065
F154	0.007	0.004	0.005	0.013	0.083	0.022	0.080	0.052	0.013	0.062
F158	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
F172	<0.01	<0.01	<0.01	<0.01	0.08	<0.01 VL	0.07	0.04	<0.01	0.05
MEDIAN	0.0070	0.0040	0.0060	0.0135	0.0800	0.0200	0.0780	0.0490	0.0105	0.0600
1CRIT	0.0052	0.0050	0.0051	0.0058	0.0125	0.0065	0.0123	0.0094	0.0055	0.0105
N	4	4	2	5	11	7	11	10	6	11
MEAN	0.0068	0.0045	0.0080	0.0166	0.0781	0.0240	0.0742	0.0476	0.0118	0.0585
3STDEV	-	-	-	-	0.0184	0.0385	0.0248	0.0111	0.0076	0.0185

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F010	47.00	4.700	10	H H				ICP-OES
F014	29.50	4.214	7					ICP-OES
F015	53.50	6.688	8	H				ICP
F022	9.00	2.250	4	L VL L				
F038	66.50	6.650	10					ICP-MS
F062	7.50	1.500	5	ELVLL VL				ICP-MS
F094	38.00	9.500	4					ICP-OES
F095	55.00	5.500	10					ICP
F133	77.00	11.000	7	EHEHEHEHEHEHEH				ICP-MS
F139	21.00	5.250	4					ICP-OES
F144	46.50	4.650	10	L H VH VHEL EL				APHA4500-BB
F154	65.00	6.500	10					ICP-MS
F158	0.00	-	0					ICP
F172	16.50	4.125	4	VL				ICP

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

OVERALL AVERAGE
RANK IS 5.720

PARAMETER: 06002 Diss Organic Carbon mg/L C

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.0000 BASIC ACCEPTABLE ERROR= 0.7500 CONCENTRATION ERROR INCREMENT= 0.1000

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	6.0	<0.5	<0.5	0.8	2.8	18.6	5.5	1.6	<0.5	4.6
F003	6.0	0.40	0.90	1.4	3.3	20.0	6.1	2.2	0.70	5.80
F004	6.11	0.461	0.636	1.22	3.10	19.0	5.48	1.91	0.453	5.02
F006	6.3	1.5 EH	1.7 H	2.2 EH	4.1 H	20.3	6.1	3.0 H	1.5 H	6.0
F010	6.	0.4	0.6	1.3	3.	19.7	5.6	1.9	0.4	5.1
F014	6.4	<1.0	<1.0	1.4	3.4	21.4	6.1	2.1	<1.0	5.8
F015	5.9	0.5	0.7	1.0	3.3	20.2	5.4	1.8	<0.5	5.2
F022	5.17	0.29	1.37	0.37 EL	2.18 L	14.03 EL	3.52 EL	1.27 L	0.93	3.82 L
F025	6.9	0.6	0.9	1.5	3.8	20.5	6.1	2.3	0.47	5.7
F026	6.037	0.600	0.746	1.324	3.0365	19.028	5.7225	2.067	0.574	5.091
F032	6.4	0.5	0.8	1.3	3.0	19.2	5.3	1.8	0.4	5.2
F036	5.7	0.4	0.7	1.0	2.6	19.5		1.4	0.2	4.6
F037	6.77	0.568	1.14	1.57	4.07	22.27 H	6.57	2.40	0.966	6.69 H
F038	6.8	1.0	1.0	1.4	3.3	18.6	5.7	2.5	1.1	5.3
F042	6.6	0.6	1.0	1.5	3.6	21.7	6.0	2.4	2.8 EH	5.7
F048	6.10	1.06	1.23	1.61	3.26	18.34	6.04	2.25	0.70	5.28
F062	6.2	0.6	1.9 EH	1.7	4.2 H	21.1	6.8	2.8	0.9	6.9 VH
F063	6.3	0.4	0.8	1.3	3.4	19.8	5.7	2.1	0.5	5.5
F073	5.99	0.54	0.73	1.30	2.86	19.11	5.53	1.86	0.55	4.26
F074	6.42	0.42	0.84	1.44	3.42	20.5	6.06	2.16	0.66	6.00
F092	5.74	0.58	0.79	1.24	3.09	18.17	5.68	1.88	0.39	5.24
F094	6.0	0.7	1.1	1.5	3.2	18.2	5.6	2.2	0.6	5.1
F094a	6.2	0.9	0.7	1.4	3.2	18.2	6.0	2.1	0.5	5.0
F095	5.90	0.64	0.88	1.24	2.90	19.9	5.70	1.92	0.63	5.22
F113	6.18	0.59	0.84	1.36	3.06	20.12	5.73	2.00	0.61	4.53
F141	<1. EL	<1.	<1.	<1.	<1. EL	<1. EL	<1. EL	<1. EL	<1.	<1. EL
F143	6.4	0.5	0.9	1.5	3.2	19.0	5.5	1.9	0.6	5.1
F154	5. EL	<1.	<1.	1.	2. EL	18.	5.	2.	<1.	3. EL
F158	6.42	0.58	2.15 EH	2.39 EH	3.52	20.36	8.02 EH	3.23 EH	2.15 EH	7.35 EH
F172	6.8	1.1	1.0	1.7	3.7	20.2	6.8	2.5	0.8	5.8
MEDIAN	6.1800	0.5800	0.8900	1.4000	3.2000	19.7000	5.7112	2.1000	0.6100	5.2200
1CRIT	1.1680	0.7500	0.7500	0.7500	0.8700	2.5200	1.1211	0.7600	0.7500	1.0720
N	27	24	24	27	27	27	26	27	23	27
MEAN	6.1791	0.6100	0.9709	1.3779	3.2369	19.5825	5.8389	2.1129	0.7427	5.3167
3STDEV	1.0617	0.6025	0.9203	0.7942	1.2219	3.0242	1.2700	1.0128	1.1831	1.9818

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	38.00	5.429	7		BIASED LOW*	-3.42	-0.3032	Shimadzu TOC
F003	162.00	16.200	10					UV-DIGESTION-AAII
F004	78.50	7.850	10					06104
F006	245.50	24.550	10	EHH EHH H H	BIASED HIGH*	-1.98	0.8011	UV PERSULPHATE
F010	79.50	7.950	10					Conductivity meter
F014	146.50	20.929	7					
F015	83.00	9.222	9					carbon analyzer
F022	54.00	5.400	10	ELL ELELL L	BIASED LOW	-29.06	0.0606	
F025	204.50	20.450	10					IR
F026	117.50	11.750	10					Autoanalyser
F032	95.00	9.500	10					colourimetry
F036	40.00	4.444	9		BIASED LOW*	0.72	-0.4521	colourimetry
F037	235.50	23.550	10	H H	BIASED HIGH	12.52	0.1717	Persulfate IR
F038	189.00	18.900	10					Combustion-IR
F042	220.50	22.050	10	EH				Wet oxidation IR
F048	179.50	17.950	10					Combustion IR
F062	241.00	24.100	10	EH H VH	BIASED HIGH*	4.94	0.5258	Persulfate, UV
F063	134.00	13.400	10					uv-persulfate
F073	77.50	7.750	10					UV Persulfate-IR
F074	185.00	18.500	10					Persulfate IR
F092	83.00	8.300	10					Comb CO2 by IR
F094	142.00	14.200	10					Combustion IR
F094a	125.50	12.550	10					Combustion IR
F095	122.00	12.200	10					Skalar SFA
F113	130.00	13.000	10					Dohrmann 8000
F141	0.00	-	0	EL ELELELEL EL	INSUFFICIENT DATA			Carbon Analyzer
F143	127.50	12.750	10					AA
F154	23.50	3.357	7	EL EL EL	BIASED LOW*	-6.18	-0.6890	Calculation
F158	248.00	24.800	10	EHEH EHEHEHEH	BIASED HIGH*	-0.88	1.0978	Auto Color
F172	235.50	23.550	10		BIASED HIGH*	1.48	0.4135	TOC Analyzer

* 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 14.491

PARAMETER: 06592 Diss Inorg Carbon mg/L C

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.5000 BASIC ACCEPTABLE ERROR= 0.5000 CONCENTRATION ERROR INCREMENT= 0.1000

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	10.5	5.1	27.8	16.5	20.7	46.1	39.6	23.3	32.7	48.6
F003	11.7	5.8	29.7	17.7	22.6	49.3	42.2	24.9	35.3	55.6 H
F010	11.2	5.6	30.	16.9	22.	50.	42.	26.	36.	52.
F015	11.8	5.6	28.5	17.2	21.3	47.7	40.8	23.8	33.9	50.2
F022	9.63	4.67	23.1 EL	13.5 EL	16.64 EL	35.22 EL	30.16 EL	16.38 EL	22.64 EL	32.24 EL
F025	9.7	4.7	28.3	15.8	20.3	49.2	42.4	23.0	34.3	52.3
F026	10.9	5.39	28.62	16.825	21.325	47.32	40.5	23.46	33.83	50.155
F032	10.8	5.4	28.6	17.0	21.4	48.2	40.6	23.8	33.8	50.6
F036	9.64	5.50	28.8	16.6	21.2	47.2	40.0	23.0	32.4	49.6
F038	10.7	5.1	28.9	16.9	21.2	47.3	40.7	23.5	34.0	48.7
F042	12.0	5.9	30.0	18.8	22.2	48.5	42.6	24.5	35.7	52.2
F073	9.88	4.95	25.52	15.09	19.05	42.75	36.16	21.75	30.20	45.45
F074	12.0	6.0	30.1	19.1 H	23.8	49.4	41.6	24.8	34.4	53.0
F092	11.0	5.67	31.5	17.42	22.18	56.91 EH	48.79 EH	25.29	37.72	59.14 VH
F094	10.8	5.4	27.2	16.5	20.6	45.7	39.0	23.0	31.9	48.0
F095	10.4	5.1	27.9	16.1	20.2	45.3	37.1	19.7 L	33.5	51.0
F113	10.53	5.09	28.24	16.34	21.02	45.24	40.88	22.95	33.93	49.09
F141	11.	5.	28.	17.	22.	48.	40.	25.	34.	50.
F154	11.	6.	29.	17.	22.	47.	40.	23.	34.	50.
F172	5.6 EL	5.3	25.1 L	15.7	18.8	40.4 L	29.7 EL	21.1	28.8 L	37.5 EL
MEDIAN	10.8000	5.3950	28.5500	16.8625	21.2500	47.3100	40.5500	23.3800	33.9150	50.0775
1CRIT	1.5300	0.9895	3.3050	2.1363	2.5750	5.1810	4.5050	2.7880	3.8415	5.4577
N	17	17	18	18	18	18	18	18	18	18
MEAN	10.6576	5.3294	28.3489	16.7431	21.1153	46.9228	39.7944	23.3250	33.4811	49.6664
3STDEV	1.9056	0.9534	3.9969	2.3972	3.0507	7.0817	8.5678	4.1437	5.2182	10.9432

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	67.50	6.750	10					Shimadzu TOC
F003	174.00	17.400	10	H	BIASED HIGH*	6.97	-0.2681	INFRARED-DETECTION
F010	163.50	16.350	10		BIASED HIGH*	4.84	0.0154	Conduct. meter
F015	130.00	13.000	10					carbon analyzer
F022	12.00	1.200	10	ELELELELELELELEL	BIASED LOW	-34.34	2.1573	
F025	97.50	9.750	10					IR
F026	108.00	10.800	10					Autoanalyser
F032	119.50	11.950	10					colourimetry
F036	85.00	8.500	10					colourimetry
F038	104.00	10.400	10					Combustion-IR
F042	175.00	17.500	10		BIASED HIGH*	2.17	0.8284	Wet oxidation NDIR
F073	32.00	3.200	10		BIASED LOW	-10.05	0.0669	UV Persulfate-IR
F074	181.00	18.100	10	H	BIASED HIGH*	2.04	1.0435	H+, purge to IR
F092	183.00	18.300	10	EHEH VH	BIASED HIGH	23.86	-2.8815	Phos acid CO2 IR
F094	66.00	6.600	10					Combustion IR
F095	60.00	6.000	10	L				Skalar SFA
F113	76.00	7.600	10					Dohrmann 8000
F141	115.50	11.550	10					Carbon Analyzer
F154	123.50	12.350	10					Auto DNR
F172	27.00	2.700	10	EL L L EL L EL	BIASED LOW	-22.31	1.1942	TOC Analyzer

* 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 10.500

PARAMETER: 07092 Nitrate + Nitrite mg/L N

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0200 BASIC ACCEPTABLE ERROR= 0.0200 CONCENTRATION ERROR INCREMENT= 0.0800

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	0.11	0.04	0.16	0.3	1.4	0.24	<0.02	2.21	1.69	4.1
F003	0.111	0.034	0.163	0.313	1.42	0.242	<0.005	2.38	1.90 H	4.29
F004	0.108	0.036	0.160	0.310	1.45	0.247	0.010W	2.39	1.78	4.36
F006	0.17 EH	0.08 EH	0.38 EH	0.51 EH	2.00 EH	0.53 EH	0.10 EH	2.98 EH	2.47 EH	5.74 EH
F009	0.08	<0.02	0.11 VL	0.27	1.32	0.17 VL	<0.02	2.3	1.58	4.1
F010	0.09	0.03	0.15	0.28	1.35	0.26	<0.02	2.1	1.52 L	3.9
F014	0.11	<0.05	0.15	0.31	1.44	0.26	<0.05	2.3	1.77	4.2
F015	0.097	0.035	0.146	0.292	1.38	0.228	<0.002	2.31	1.72	4.39
F019	0.10	0.03	0.15	0.29	1.38	0.24	<0.03	2.28	1.70	4.17
F022	0.483 EH	0.18 EH	0.744 EH	1.322 EH	6.82 EH	1.044 EH	0.03	10.04 EH	7.895 EH	17.74 EH
F025	0.111	0.041	0.159	0.313	1.44	0.236	0.003	2.35	1.76	4.27
F026	0.103	0.039	0.153	0.300	1.471	0.232	0.007	2.339	1.810	4.307
F031	0.11	0.04	0.16	0.30	1.40	0.24	<0.01	2.27	1.70	4.24
F032	0.111	0.039	0.167	0.311	1.44	0.257	<0.005	2.37	1.80	4.28
F036	0.108	0.036	0.156	0.308	1.440	0.228	<0.002	2.260	1.700	4.260
F037	0.104	0.0395	0.1711	0.3026	1.4013	0.2197	0.0176	2.2188	1.6892	4.1642
F038	0.105	0.037	0.164	0.311	1.50	0.249	<0.005	2.40	1.80	4.40
F048	0.106	0.0361	0.1573	0.307	1.375	0.224	<0.002	2.258	1.744	4.265
F062	0.1	0.04	0.15	0.26	1.23 L	0.25	<0.02	2.9 VH	1.69	4.6
F063	<0.10	<0.10	0.15	0.28	1.33	0.26	<0.10	2.23	1.69	4.26
F073	0.12	0.07 H	0.16	0.31	1.39	0.19 L	0.02	2.28	1.71	4.22
F074	0.107	0.038	0.159	0.310	1.44	0.240	0.001	2.33	1.77	4.35
F092	0.119	0.051	0.160	0.309	1.367	0.232	0.006	2.257	1.69	4.179
F094	0.107	0.039	0.161	0.301	1.40	0.252	<0.006	2.31	1.70	4.25
F095	0.15 VH	<0.05	0.12 L	0.27	1.36	0.22	<0.05	2.26	1.72	4.18
F099	0.1	0. EL	0.15	0.3	1.41	0.22	0.03	2.35	1.68	4.23
F113	0.106	0.038	0.163	0.307	1.47	0.231	0.	2.41	1.805	4.377
F133	0.101	0.038	0.145	0.271	1.330	0.221	<0.001	2.195	1.665	4.090
F140	0.102	0.0351	0.158	0.280	1.400	0.165 VL	<0.005	2.14	1.63	4.00
F141	0.10	0.04	0.15	0.31	1.37	0.24	<0.03	2.20	1.72	5.00 VH
F143	0.10	0.03	0.14	0.26	1.28	0.20	<0.01	2.18	1.59	4.22
F144	0.13	0.04	0.19 H	0.37 VH	1.64 VH	0.2	<0.01	2.87 VH	2.26 VH	5.48 EH
F146	0.102	0.0351	0.158	0.280	1.400	0.165 VL	<0.005	2.14	1.63	4.00
F154	0.08	0.02	0.13	0.26	1.30	0.21	0.01	2.29	1.61	4.22
F158	0.11	0.05	0.14	0.30	1.46	0.08 VL	<0.05	2.40	1.81	2.94 EL
F172	0.1	<0.1	0.2 H	0.3	1.4	0.2	<0.1	2.3	1.8	4.3
MEDIAN	0.1060	0.0380	0.1580	0.3005	1.4000	0.2320	0.0100	2.3000	1.7150	4.2550
1CRIT	0.0269	0.0214	0.0310	0.0424	0.1304	0.0370	0.0200	0.2024	0.1556	0.3588
N	32	29	34	35	34	34	9	34	34	34
MEAN	0.1096	0.0399	0.1627	0.3030	1.4222	0.2353	0.0138	2.3429	1.7583	4.3351
3STDEV	0.0454	0.0334	0.1211	0.1234	0.3578	0.1721	0.0313	0.5772	0.5056	1.1045

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	152.50	16.944	9					IC
F003	229.00	25.444	9	H				CD-REDUCTION
F004	222.00	24.667	9					07110
F006	320.00	32.000	10	EHEHEHEHEHEHEHEHEHEH	BIASED HIGH	31.68	0.1114	AUTO ANALYSER
F009	42.50	5.312	8	VL VL	BIASED LOW*	-2.27	-0.0374	TRAACS
F010	70.50	7.833	9	L	BIASED LOW	-8.73	0.0103	Colorimetry
F014	177.00	22.125	8					
F015	129.50	14.389	9					colorimetric
F019	109.00	12.111	9					IC
F022	327.50	32.750	10	EHEHEHEHEHEH EHEHEH	BIASED HIGH	323.58	0.1761	
F025	226.50	22.650	10					IC
F026	199.50	19.950	10					Autoanalyser
F031	174.00	19.333	9					IC
F032	242.50	26.944	9					colourimetry
F036	160.00	17.778	9					colourimetry
F037	150.00	15.000	10					I.C. Waters
F038	240.00	26.667	9					Colourimetric
F048	147.00	16.333	9					IC
F062	151.00	16.778	9	L VH				Auto Color
F063	98.00	14.000	7					IC
F073	185.50	18.550	10	H L				IC DIONEX-500
F074	207.50	20.750	10					Colour auto
F092	169.00	16.900	10					Colorimetric, Tech
F094	186.00	20.667	9					Colorimetric
F095	102.50	12.812	8	VH L				Skalar SFA
F099	127.50	12.750	10	EL				Cd Redn Spectro.
F113	222.50	22.250	10					FIA Lachat 8000
F133	73.50	8.167	9					IC
F140	79.50	8.833	9	VL				IC
F141	160.50	17.833	9	VH				IC
F143	48.00	5.333	9		BIASED LOW*	-1.49	-0.0387	IC
F144	264.00	29.333	9	H VHVH VHVHEH	BIASED HIGH	28.93	-0.0404	APHA4500-NO3E
F146	79.50	8.833	9	VL				IC
F154	61.50	6.150	10		BIASED LOW*	-0.65	-0.0316	Auto FIA Colour
F158	165.50	18.389	9	VL EL				Auto Color
F172	153.50	19.188	8	H				Skalar

* 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 17.793

PARAMETER: 07192 Ammonia mg/L N

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0050 BASIC ACCEPTABLE ERROR= 0.0050 CONCENTRATION ERROR INCREMENT= 0.1250

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F003	0.010	<0.005	0.030	<0.005	0.358	0.005	0.018	<0.005	<0.005	0.015
F004	0.008	0.005W	0.026	0.005T	0.307	0.018 VH	0.017	0.005T	0.005T	0.034 VH
F006	<0.02	<0.02	0.02 VL	<0.02	0.38	<0.02	<0.02	<0.02	<0.02	<0.02
F010	<0.02	<0.02	<0.02 VL	<0.02	0.34	<0.02	<0.02	<0.02	<0.02	<0.02
F014	<0.010	<0.010	0.025 L	<0.010	0.31	<0.010	0.011 L	<0.010	<0.010	<0.010
F015	0.020 VH	0.009	0.036	<0.005	0.360	0.010	0.019	<0.005	<0.005	0.012
F022	0.01	<0.01	0.02 VL	<0.01	0.32	<0.01	0.01 L	<0.01	<0.01	0.01
F025	0.01	0.01	0.01 EL	0.01	0.32	0.01	0.02	0.01	0.01	0.02 H
F026	0.0090	0.0004	0.0267	0.0000	0.3123	0.0037	0.0112L	0.0000	0.0000	0.0084
F032	0.020 VH	0.010	0.038	<0.002	0.352	0.008T	0.024	0.008T	0.004T	0.016
F036	0.014	<0.002	0.032	<0.002	0.356	<0.002	0.020	<0.002	<0.002	0.010
F038	0.008	<0.005	0.032	<0.005	0.33	<0.005	0.013	<0.005	<0.005	0.013
F042	0.02 VH	0.01	0.03	0.01	0.35	0.01	0.02	0.01	0.02 VH	0.01
F048	<0.02	<0.02	0.04	<0.02	3.996 EH	<0.02	<0.02	<0.02	<0.02	<0.02
F062	0.03 EH	<0.02	0.05 VH	<0.02	0.36	0.03 VH	0.03 VH	0.02 VH	0.02 VH	0.04 EH
F074	0.010	<0.005	0.030	<0.005	0.345	0.015 VH	0.015	<0.005	<0.005	0.010
F092	0.016 H	0.012 H	0.040	0.013 VH	0.343	0.031 VH	0.022	0.029 EH	0.017 VH	0.020 H
F094	0.017 H	0.010	0.046 H	0.013 VH	0.442 VH	0.017 VH	0.026 H	<0.005	0.010	0.021 H
F095	<0.05	<0.05	<0.05	<0.05	0.32	<0.05	<0.05	<0.05	<0.05	<0.05
F113	0.013	0.003	0.034	0.004	0.372	0.01	0.015	0.004	0.002	0.007
F140	0.010	<0.005	0.0364	<0.005	0.391	<0.005	<0.005 EL	<0.005	<0.005	<0.005 L
F141	<0.05	<0.05	<0.05	<0.05	0.33	<0.05	<0.05	<0.05	<0.05	<0.05
F143	0.010	<0.003	0.034	<0.003	0.357	0.006	0.018	0.003	<0.003	0.010
F144	0.012	0.004	0.034	0.004	0.42 H	0.001	0.021	0.002	0.002	0.019 H
F146	0.010	<0.005	0.0364	<0.005	0.391	<0.005	<0.005 EL	<0.005	<0.005	<0.005 L
F154	0.008	0.002	0.04	0.002	0.36	0.004	0.013	0.003	0.003	0.010
F158	<0.05	<0.05	<0.05	<0.05	0.33	<0.05	<0.05	<0.05	<0.05	<0.05
F172	<0.1	<0.1	<0.1	<0.1	0.3 L	<0.1	<0.1	<0.1	<0.1	<0.1
MEDIAN OR *TARGET CONC.	0.0100	*0.0050	0.0340	0.0050	0.3510	*0.0050	0.0180	0.0050	0.0050	0.0125
1CRIT	0.0056	0.0056	0.0086	0.0050	0.0483	0.0056	0.0066	0.0050	0.0050	0.0059
N	19	8	21	6	26	13	17	9	8	16
MEAN	0.0124	0.0072	0.0327	0.0058	0.3522	0.0113	0.0178	0.0072	0.0066	0.0149
3STDEV	0.0123	0.0100	0.0196	0.0092	0.0974	0.0210	0.0126	0.0160	0.0148	0.0194

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	58.50	9.750	6					ALK-PHENOL
F004	64.00	7.111	9	VH VH				07540
F006	25.50	12.750	2	VL	INSUFFICIENT DATA			AUTO ANALYSER
F010	11.00	11.000	1	VL	INSUFFICIENT DATA			Colorimetry
F014	9.00	3.000	3	L L	INSUFFICIENT DATA			
F015	86.50	12.357	7	VH				colorimetric
F022	23.00	4.600	5	VL L	BIASED LOW	-7.67	-0.0046	
F025	81.00	8.100	10	EL H				Colorimetric
F026	25.00	2.500	10	L	BIASED LOW	-9.78	-0.0043	Autoanalyser
F032	105.50	11.722	9	VH				colourimetry
F036	59.00	11.800	5					colourimetry
F038	36.00	7.200	5					Colourimetric
F042	100.00	10.000	10	VH VH				Colorimetric
F048	48.00	24.000	2	EH	INSUFFICIENT DATA			IC
F062	134.50	16.812	8	EH VH VHVHVHVHEH	BIASED HIGH*	-2.67	0.0183	Colorimetric
F074	52.00	8.667	6	VH				Colour auto
F092	131.00	13.100	10	H H VH VH EHVHH				Colorimetric, Tech
F094	134.50	14.944	9	H H VHVHVHH H				Colorimetric
F095	6.00	6.000	1		INSUFFICIENT DATA			Skalar SFA
F113	78.00	7.800	10					FIA Lachat 8000
F140	49.00	16.333	3	EL L	INSUFFICIENT DATA			Phenol Hypochlor.
F141	9.00	9.000	1		INSUFFICIENT DATA			ISE
F143	61.50	8.786	7					AA
F144	92.00	9.200	10	H H				APHA4500-NH3F
F146	49.00	16.333	3	EL L	INSUFFICIENT DATA			Phenol Hypochlor.
F154	66.50	6.650	10		BIASED LOW*	3.60	-0.0032	Auto FIA Colour
F158	9.00	9.000	1		INSUFFICIENT DATA			Auto Color
F172	1.00	1.000	1	L	INSUFFICIENT DATA			Skalar

* 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 9.787

PARAMETER: 07392 Total Kjeldahl N mg/L N

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0400 BASIC ACCEPTABLE ERROR= 0.0400 CONCENTRATION ERROR INCREMENT= 0.1500

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F003	0.212	0.027	0.107	0.092	0.627	0.806	0.410	0.203	0.053	0.595
F006	0.3 H	0.1 H	0.3 VH	0.2 VH	0.7	0.9	0.5 H	0.2	0.1	0.5
F014	0.22	<0.20	<0.20	<0.20	0.59	0.93	0.39	<0.20	<0.20	0.50
F022	0.3 H	0.063	0.116	0.126	0.56	0.85	0.385	0.215	<0.020	0.506
F025	0.12 VL	0.05	0.06	0.05	0.52	0.64 L	0.32	0.16	0.05	0.46
F032	0.20	0.04T	0.08T	0.10	0.64	0.84	0.38	0.20	0.04T	0.52
F038	0.23	0.05	0.10	0.09	0.67	0.91	0.39	0.28 H	0.07	0.55
F062	<1.0	1.3 EH	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
F063	0.18	<0.05	0.10	0.08	0.67	0.80	0.38	0.28 H	0.07	0.59
F074	0.188	<0.026	0.071	0.050	0.455 L	0.800	0.374	<0.026 EL	<0.026	<0.026 EL
F092	0.192	0.005 L	0.085	0.070	0.589	0.830	0.409	0.167	0.029	0.470
F094	0.35 VH	0.13 VH	0.19 VH	0.18 VH	0.96 VH	0.92	0.41	0.35 VH	0.20 VH	0.69 H
F095	0.23	<0.05	0.08	0.07	0.63	0.88	0.41	0.20	<0.05	0.53
F140	0.264	<0.100	0.156 H	0.147 H	0.871 VH	1.152 VH	0.553 VH	0.379 VH	<0.100	0.749 VH
F141	0.24	<0.10	0.12	0.13	0.70	0.88	0.43	0.27	<0.10	0.61
F143	0.19	0.02	0.06	0.06	0.63	0.85	0.39	0.20	0.02	0.57
F154	<0.2	<0.2	<0.2	<0.2	0.6	0.9	0.4	<0.2	<0.2	0.3 EL
F158	0.84 EH	0.46 VH	0.63 EH	0.63 EH	1.11 EH	1.33 EH	0.84 EH	0.73 EH	0.73 EH	1.33 EH
F172	0.6 EH	<0.5	<0.5	<0.5	0.9 VH	0.6 VL	<0.5	<0.5	<0.5	<0.5
MEDIAN	0.2300	0.0500	0.1000	0.0920	0.6350	0.8650	0.4000	0.2090	0.0615	0.5400
1CRIT	0.0685	0.0415	0.0490	0.0478	0.1292	0.1637	0.0940	0.0653	0.0432	0.1150
N	15	9	12	12	16	16	15	12	8	14
MEAN	0.2597	0.1044	0.1254	0.1121	0.6786	0.8680	0.4141	0.2453	0.0765	0.5600
3STDEV	0.3076	0.3899	0.1859	0.1296	0.3647	0.2993	0.1422	0.1915	0.1527	0.2381

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	75.00	7.500	10					Blk dig. Alk Phen.
F006	107.50	10.750	10	H H VHVH H				BLOCK DIGESTION
F014	40.50	8.100	5					
F022	71.00	7.889	9	H				
F025	21.50	2.150	10	VL L	BIASED LOW	-20.73	-0.0093	Color - block
F032	58.50	5.850	10					colourimetry
F038	88.00	8.800	10	H				Digestion-SIE
F062	11.00	11.000	1	EH	INSUFFICIENT DATA			Dig. Auto Color
F063	62.00	6.889	9	H				auto-colour
F074	14.00	2.333	6	L EL EL	BIASED LOW	-10.07	-0.0250	Calcd
F092	43.50	4.350	10	L	BIASED LOW*	-1.67	-0.0283	Calculated
F094	129.00	12.900	10	VHVHVHVHVH VHVHH	BIASED HIGH*	6.26	0.0998	Colorimetric
F095	62.00	7.750	8					Skalar SFA
F140	112.00	14.000	8	H H VHVHVHVH VH	BIASED HIGH	30.70	0.0322	Indo-phenol Auto
F141	93.00	11.625	8					Dig. Colourimetry
F143	50.00	5.000	10					AA
F154	28.50	7.125	4	EL	INSUFFICIENT DATA			Auto FIA Colour
F158	150.00	15.000	10	EHVHEHEHEHEHEHEHEH	BIASED HIGH*	-1.96	0.5510	S-Auto Block Dig.
F172	33.00	11.000	3	EH VHVL	INSUFFICIENT DATA			Skalar

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 10.00

OVERALL AVERAGE
RANK IS 8.278

PARAMETER: 07293 Total N mg/L N

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0500 BASIC ACCEPTABLE ERROR= 0.0500 CONCENTRATION ERROR INCREMENT= 0.1500

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	0.2 L	0.03	0.19	0.34	1.77	0.49 VL	0.11 EL	2.3	1.74	4.36
F003	0.291	0.062	0.226	0.361	1.95	0.961	0.364	2.66	1.83	4.84
F010	0.3	0.07	0.24	0.38	2.	0.93	0.36	2.6	1.86	4.7
F015	0.32	0.06	0.27	0.41	2.1	1.13	0.42	2.6	1.8	4.8
F022	0.783 EH	0.243 EH	0.86 EH	1.448 EH	7.38 EH	1.894 EH	0.415	10.255 EH	7.895 EH	18.246 EH
F025	0.23	0.05	0.22	0.36	1.96	0.88	0.32	2.51	1.81	4.73
F026	0.353	0.0765	0.2523	0.3877	2.0271	1.0757	0.4043	2.521	1.862	4.7359
F038	0.34	0.09	0.26	0.40	2.17	1.16	0.39	2.68	1.87	4.95
F042	0.324	0.074	0.251	0.404	2.080	1.132	0.425	2.571	1.914	4.894
F074	0.295	0.060	0.230	0.360	1.90	1.04	0.375	2.34	1.64	4.26
F092	0.311	0.057	0.245	0.379	1.956	1.062	0.415	2.424	1.719	4.649
F094	0.4	<0.2	0.2	<0.2 EL	1.4 EL	0.9	0.4	0.3 EL	0.2 EL	0.7 EL
F095	0.38	<0.05	0.20	0.34	1.99	1.10	0.41	2.46	1.72	4.71
F113	0.316	0.060	0.241	0.383	2.015	0.978	0.380	2.449	1.786	4.611
F158	0.25	0.04	0.21	0.36	2.00	0.64 VL	0.26 L	2.59	1.85	4.44
F159	0.50 VH	0.50 EH	0.50 EH	0.50 H	1.0 EL	0.50 VL	0.50 H	1.4 EL	1.2 EL	3.1 EL
MEDIAN	0.3180	0.0610	0.2405	0.3800	1.9950	1.0090	0.3950	2.5155	1.8050	4.7050
1CRIT	0.0902	0.0516	0.0786	0.0995	0.3418	0.1938	0.1018	0.4198	0.3133	0.7483
N	14	12	14	12	14	14	14	14	14	14
MEAN	0.3293	0.0785	0.2532	0.3904	1.9513	0.9635	0.3813	2.4361	1.7572	4.5557
3STDEV	0.1925	0.1533	0.2145	0.1116	0.5331	0.5516	0.1311	0.9212	0.5106	1.3387

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	22.50	2.250	10	L VLEL	BIASED LOW*	-4.65	-0.1269	Dig. Colour
F003	78.00	7.800	10					autoclave Hydrazin
F010	83.00	8.300	10					Colorimetry
F015	115.50	11.550	10					colorimetric
F022	152.50	15.250	10	EHEHEHEHEHEH EHEHEH	BIASED HIGH	303.75	-0.4780	
F025	55.00	5.500	10					
F026	111.00	11.100	10					Autoclave-AA
F038	129.00	12.900	10		BIASED HIGH*	5.30	0.0175	Calculation
F042	124.00	12.400	10					Colorimetric
F074	51.00	5.100	10					UV dig to NH3
F092	72.50	7.250	10					Persulfate Dig.
F094	35.50	4.438	8	ELEL ELELEL				Colorimetric
F095	69.00	7.667	9					Calculation
F113	77.00	7.700	10					Pers. Lachat 8000
F158	54.50	5.450	10	VLL				Auto Digestion
F159	83.00	8.300	10	VHEHEHH ELVLH ELELEL				ASTM D 5176

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON= 10.00

OVERALL AVERAGE
RANK IS 8.363

PARAMETER: 09092 Fluoride mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

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

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F003	0.07	0.03	0.95	0.11 H	0.49	0.14	0.14	0.36	0.88	0.20
F006	0.08	<0.05	1.02	0.11 H	0.54	0.14	0.15	0.39	0.94	0.2
F009	0.06	0.04	1.1 H	0.08	0.55	0.14	0.15	0.41	0.98	0.20
F014	<0.1	<0.1	0.931	<0.1	0.449	<0.1	0.111	0.313	0.806	0.134 VL
F015	0.06	0.05	0.98	0.07	0.56	0.10	0.11	0.38	0.94	0.18
F019	<0.05	<0.05	0.94	0.07	0.49	0.12	0.14	0.36	0.84	0.27 VH
F022	0.04	<0.020	0.89	0.06	0.41 L	0.09 L	0.1 L	0.3 L	0.79 L	0.11 VL
F025	0.05	0.05	0.96	0.05 L	0.47	0.10	0.10 L	0.33	0.85	0.15 L
F031	0.02 EL	0.02	0.92	0.06	0.53	0.13	0.14	0.36	0.94	0.18
F032	0.06	0.05	1.02	0.10	0.52	0.13	0.13	0.38	0.91	0.17
F037	0.08	0.05	0.98	0.09	0.5	0.14	0.15	0.38	0.9	0.19
F038	0.05	0.02	0.83 L	0.14 VH	0.45	0.15	0.14	0.33	0.83	0.21
F042	0.076W	0.076W	0.838 L	0.076W	0.419 L	0.076W	0.076W	0.274 VL	0.747 L	0.157
F048	0.082	0.025	0.974	0.071	0.4775	0.111	0.117	0.357	0.865	0.166
F062	<0.1	<0.1	0.75 VL	<0.1	0.441	0.108	0.121	0.267 VL	0.747 L	0.201
F073	0.07	0.05	0.87	0.08	0.48	0.145	0.17 H	0.35	0.765 L	0.05 EL
F094	0.08	0.05	1.06	0.10	0.54	0.18 VH	0.16	0.39	0.99	0.19
F095	0.04	0.02	1.01	0.07	0.51	0.10	0.13	0.37	0.92	0.18
F133	0.054	0.035	0.968	0.094	0.489	0.135	0.130	0.349	0.894	0.198
F141	0.07	0.04	1.00	0.08	0.50	0.13	0.13	0.36	0.91	0.18
F143	<0.1	<0.1	0.9	<0.1	0.4 L	<0.1	<0.1 L	0.3 L	0.8	0.1 VL
F154	<0.1	<0.1	1.0	<0.1	0.6 H	0.2 VH	0.2 VH	0.4	1.0	0.2
F158	<0.1	<0.1	1.17 VH	0.12 VH	0.60 H	0.15	0.16	0.43 H	1.06 H	0.21
F159	0.5 EH	0.5 EH	0.87	0.5 EH	0.5	0.5 EH	0.5 EH	0.5 EH	2.47 EH	1.73 EH
F172	<0.1	<0.1	1.2 VH	<0.1	0.5	0.1	0.1 L	0.4	1.0	0.2
MEDIAN	0.0600	0.0400	0.9680	0.0800	0.5000	0.1300	0.1350	0.3600	0.9000	0.1900
1CRIT	0.0240	0.0220	0.1148	0.0260	0.0680	0.0310	0.0315	0.0540	0.1080	0.0370
N	15	14	23	17	22	21	22	23	22	23
MEAN	0.0631	0.0379	0.9644	0.0885	0.4916	0.1304	0.1354	0.3597	0.9005	0.1816
3STDEV	0.0416	0.0366	0.2395	0.0652	0.1188	0.0802	0.0728	0.1128	0.2282	0.1046

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	125.50	12.550	10	H				AUTO-ISE
F006	159.50	17.722	9	H				ELECTRODE
F009	164.00	16.400	10	H				Technicon
F014	35.00	5.833	6	VL				
F015	118.00	11.800	10					IC
F019	94.50	11.812	8	VH				IC
F022	28.50	3.167	9	L L L L L VL	BIASED LOW	-7.36	-0.0320	
F025	64.00	6.400	10	L L L				Electrode
F031	99.00	9.900	10	EL				SIE
F032	132.50	13.250	10					colourimetry
F037	143.50	14.350	10					Accumet Electrode
F038	102.50	10.250	10	L VH				SIE
F042	17.50	2.500	7	L L VLL	BIASED LOW	-11.36	-0.0335	IC
F048	91.00	9.100	10					ISE
F062	43.50	6.214	7	VL VLL				SIE
F073	98.00	9.800	10	H L EL				IC DIONEX-500
F094	177.00	17.700	10	VH				ISE
F095	102.00	10.200	10					IC
F133	105.50	10.550	10					I.S.E.
F141	118.50	11.850	10					ISE
F143	18.50	3.700	5	L L L VL	BIASED LOW*	-0.13	-0.0829	IC
F154	149.00	21.286	7	H VHVH	BIASED HIGH*	2.07	0.0502	Auto FIA Colour
F158	176.00	22.000	8	VHVHH H H	BIASED HIGH	19.22	0.0012	Auto Color
F159	192.00	19.200	10	EHEH EH EHEHEHEHEH	BIASED HIGH	7.96	0.4939	ASTM D 4327
F172	109.00	15.571	7	VH L				IC Dionex

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

OVERALL AVERAGE
RANK IS 11.946

PARAMETER: 11091 Sodium mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 0.5000 CONCENTRATION ERROR INCREMENT= 0.0400

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	2.74	13.6	2.79	3.68	36.1	10.1	42.8	35.	6.58	49.2
F003	2.53	13.2	2.42	3.38	35.4	9.51	42.1	34.8	6.31	48.9
F006	2.	13.	2.	3.	34.	9.	41.	34.	6.	47.
F009	2.86	14.82 VH	2.82	3.91	40.64 EH	10.34 H	46.6 VH	39.9 VH	6.82	56.5 EH
F010	2.33	13.3	2.51	3.27	31.4 VL	10.29 H	38. VL	30.8 VL	6.62	46.
F014	2.87	13.9	2.69	3.71	36.8	9.97	43.7	35.8	6.79	49.5
F015	1.2 EL	12.2 L	1.1 EL	2.1 EL	34.6	8.2 L	41.0	33.3	6.3	47.4
F019	2.7	14.0	2.7	3.6	37.1	9.8	43.8	36.5 H	6.7	49.8
F022	1.912 L	<0.050 EL	1.872	2.554 L	<0.050 EL	<0.050 EL	<0.050 EL	<0.050 EL	4.724 EL	<0.050 EL
F025	2.5	13.0	2.2	3.2	35.3	9.2	41.6	34.	6.0	47.6
F026	2.498	13.524	2.419	3.368	34.227	9.469	41.094	33.542	6.213	47.592
F031	2.6	13.3	2.7	3.7	36.0	9.5	41.7	33.5	6.4	47.2
F032	2.60	13.6	2.46	3.46	36.2	9.64	43.0	35.8	6.44	49.6
F036	2.62	13.1	2.56	3.58	35.3	9.41	43.9 H	34.4	6.23	46.6
F037	2.381	12.83	2.363	3.309	34.45	8.891	40.77	32.37	5.947	47.81
F038	2.54	14.1	2.60	3.48	36.6	9.70	44.2 H	34.7	6.50	50.0
F042	2.65	13.6	2.49	3.44	37.6 H	9.60	46.5 VH	38.5 VH	6.03	52.6 VH
F048	2.54	13.986	2.49	3.48	36.252	9.83	43.714	35.607	6.52	49.71
F062	2.2	13.6	2.08	3.11	37.6 H	9.23	48.8 VH	36.5 H	6.01	55.7 VH
F063	2.5	12.5	2.2	3.3	35.1	9.0	41.5	33.5	6.2	47.9
F074	2.50	12.9	2.42	3.35	34.7	8.80	40.5	33.4	5.90	46.8
F092	2.56	12.7	2.53	3.44	33.5	8.93	40.09	32.4	6.08	46.59
F094	2.	13.	2.	3.	36.	10.	43.	35.	7. H	49.
F095	2.5	13.9	2.4	3.5	35.0	9.6	44.5 H	36.6 H	6.5	51.1 H
F113	2.559	13.439	2.497	3.461	35.487	9.512	42.113	34.002	6.409	47.835
F133	2.45	12.30	2.70	3.65	34.7	9.25	40.5	32.8	6.60	47.4
F139	2.55	13.14	2.40	3.40	35.09	9.25	41.14	34.13	6.08	46.56
F141	2.52	13.4	2.46	3.42	35.7	9.32	42.9	35.3	6.30	49.8
F143	2.43	13.2	2.37	3.33	36.5	9.41	43.5	34.8	6.22	48.4
F144	2.3	10.6 EL	2.2	3.1	28.4 EL	7.8 EL	34. EL	27.2 EL	5.4 L	38. EL
F154	2.46	12.7	2.36	3.28	34.9	8.76	41.4	33.8	6.03	47.9
F158	2.4	12.6	3.8 EH	3.1	34.3	8.9	40.7	33.8	6.0	46.1
F159	2.5	12. L	2.4	3.3	34.	8.8	39. L	32. L	5.9	44. VL
F172	1.92 L	9.93 EL	2.13	2.67 L	27.3 EL	8.29 L	32.5 EL	26.4 EL	5.58	36.9 EL
MEDIAN	2.5000	13.2000	2.4200	3.3740	35.3000	9.4100	41.7000	34.0020	6.2250	47.8350
1CRIT	0.5600	0.9880	0.5568	0.5950	1.8720	0.8364	2.1280	1.8201	0.7090	2.3734
N	32	31	32	32	31	31	31	31	32	31
MEAN	2.4484	13.1038	2.4135	3.3319	35.1066	9.3278	41.9458	34.1242	6.2378	48.0515
3STDEV	0.6682	2.1106	0.6921	0.7912	5.2638	1.4647	7.1399	5.9639	0.9758	8.4414

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	270.00	27.000	10		BIASED HIGH*	2.06	0.2586	Flame AE
F003	195.50	19.550	10					AA
F006	85.50	8.550	10					ICP
F009	330.00	33.000	10	VH EHH VHVH EH	BIASED HIGH	16.21	-0.2517	ICP-MS
F010	136.50	13.650	10	VLH VLVL				ICP-OES
F014	290.00	29.000	10		BIASED HIGH*	3.66	0.2600	ICP-OES
F015	69.50	6.950	10	ELL ELEL L	BIASED LOW*	1.18	-1.0881	ICP
F019	293.00	29.300	10	H	BIASED HIGH*	4.76	0.1399	ICP-OES
F022	7.00	1.750	4	L EL L ELELELELEL	INSUFFICIENT DATA			
F025	131.00	13.100	10					ICP
F026	150.00	15.000	10					AAS
F031	212.00	21.200	10					ICP, Acid Extract
F032	244.50	24.450	10					AAS
F036	206.00	20.600	10	H				AAS
F037	96.00	9.600	10					ICP-MS
F038	264.50	26.450	10	H				FAES
F042	259.00	25.900	10	H VHVH VH				ICP-OES
F048	258.50	25.850	10					IC
F062	193.50	19.350	10	H VHH VH				ICP-MS
F063	129.00	12.900	10					AAS
F074	107.50	10.750	10					AAS
F092	125.50	12.550	10					Atomic Emission
F094	180.00	18.000	10	H				ICP-OES
F095	240.50	24.050	10	H H H				IC
F113	212.00	21.200	10					AAS PE5100
F133	158.00	15.800	10					ICP-MS
F139	153.00	15.300	10					ICP-OES
F141	210.50	21.050	10					ICP-OES
F143	182.50	18.250	10					ICP
F144	34.50	3.450	10	EL ELELELELL EL	BIASED LOW	-20.54	0.3286	APHA3500-NaD
F154	117.00	11.700	10					ICP-MS
F158	108.00	10.800	10	EH				Atomic Absorption
F159	73.00	7.300	10	L L L VL	BIASED LOW	-6.78	0.1212	ASTM D 4191
F172	23.00	2.300	10	L EL L ELL ELEL EL	BIASED LOW	-23.34	0.3383	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 17.204

PARAMETER: 19091 Potassium mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.5000 BASIC ACCEPTABLE ERROR= 0.1000 CONCENTRATION ERROR INCREMENT= 0.0600

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	0.77	1.16	1.04	0.79	3.58	1.26	5.97	3.28	1.43	3.64
F003	0.83	1.21	1.17	0.86	3.73	1.38	6.42	3.50	1.58	3.82
F006	0.9	1.3	1.3 H	0.9	3.8	1.5	6.3	3.5	1.7	4.0
F009	0.86	1.30	1.21	0.89	3.68	1.55	6.78	3.54	1.63	4.14
F010	0.72	1.24	1.17	0.8	4.59 EH	1.52	7.87 EH	4.24 VH	1.69	5.07 VH
F014	0.862	1.29	1.20	0.898	3.86	1.42	6.34	3.67	1.62	3.90
F015	0.9	1.3	1.3 H	0.9	3.9	1.4	6.5	3.6	1.6	3.9
F022	0.679 L	1.038 L	0.972 L	0.717	<0.010 EL	1.146 VL	<0.010 EL	3.505	1.24 VL	<0.010 EL
F025	0.7	1.1	1.1	0.8	3.6	1.3	6.1	3.3	1.4 L	3.7
F026	0.766	1.124	1.076	0.787	3.626	1.279	6.134	3.392	1.452	3.744
F031	0.9	1.2	1.3 H	0.9	4.0	1.5	6.8	3.7	1.8 H	4.6 VH
F032	0.83	1.24	1.16	0.86	3.90	1.40	6.45	3.64	1.60	3.95
F036	0.730	1.10	1.05	0.770	3.61	1.26	6.27	3.20 L	1.45	3.30 VL
F037	0.761	1.157	1.123	0.815	3.606	1.331	6.02	3.262 L	1.511	3.726
F038	0.82	1.29	1.18	0.87	4.04	1.50	6.80	3.80	1.64	4.36 VH
F042	0.73	1.10	1.00 L	0.74	3.43 L	1.15 VL	5.96	3.33	1.42	3.60
F048	0.76	1.17	1.12	0.79	3.88	1.37	6.415	3.57	1.55	4.06
F062	0.66 L	1.06	1.02 L	0.7	3.76	1.34	6.56	3.58	1.44	3.95
F063	0.8	1.2	1.1	0.8	3.7	1.4	6.3	3.4	1.5	3.8
F074	0.82	1.25	1.16	0.84	3.85	1.39	6.35	3.55	1.55	4.10
F092	0.81	1.22	1.16	0.839	3.89	1.419	6.46	3.69	1.61	4.15
F094	0.8	1.1	1.0 L	0.7	3.5	1.3	5.9	3.1 VL	1.4 L	3.4 VL
F095	0.8	1.2	1.2	0.8	3.6	1.4	6.0	3.4	1.6	3.7
F113	0.606 VL	0.917 EL	0.865 EL	0.632 VL	3.006 EL	1.053 EL	6.372	2.780 EL	1.193 EL	3.100 VL
F133	0.70	1.10	1.10	0.75	3.75	1.35	6.25	3.45	1.55	3.85
F139	0.94 H	1.35 H	1.37 VH	0.94 H	3.97	1.46	6.18	3.72	1.79 H	3.88
F141	0.840	1.21	1.16	0.859	3.87	1.40	6.33	3.69	1.59	4.31 H
F143	0.78	1.15	1.2	0.94 H	3.85	1.35	6.23	3.56	1.58	3.95
F144	0.8	1.3	1.2	0.8	3.5	1.5	7. H	4. VH	1.6	4.6 VH
F154	0.79	1.18	1.13	0.82	3.71	1.40	6.35	3.51	1.58	3.88
F158	0.8	1.2	1.2	0.8	3.7	1.3	6.5	3.6	1.5	3.9
F159	1.0 VH	1.4 H	1.2	0.90	4.0	1.5	6.6	3.9 H	1.6	4.6 VH
F172	0.92 H	1.59 EH	1.51 EH	1.01 VH	6.03 EH	2.03 EH	10.1 EH	5.58 EH	2.21 EH	6.83 EH
MEDIAN	0.8000	1.2000	1.1600	0.8150	3.7550	1.4000	6.3500	3.5500	1.5800	3.9000
1CRIT	0.1180	0.1420	0.1396	0.1189	0.2953	0.1540	0.4510	0.2830	0.1648	0.3040
N	31	31	31	31	30	31	30	31	31	30
MEAN	0.7993	1.2013	1.1507	0.8250	3.7827	1.3798	6.4204	3.5542	1.5549	3.9860
3STDEV	0.2100	0.2605	0.2786	0.1951	0.6551	0.2972	1.1036	0.6948	0.3458	1.1120

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	68.00	6.800	10		BIASED LOW	-5.89	-0.0145	Flame AE
F003	175.50	17.550	10					AA
F006	238.00	23.800	10	H				ICP
F009	244.50	24.450	10					ICP-MS
F010	246.50	24.650	10	EH EHVH VH				ICP-OES
F014	229.00	22.900	10					ICP-MS
F015	244.00	24.400	10	H				ICP
F022	29.00	4.143	7	L L L ELVLEL VLEL	BIASED LOW*	3.18	-0.2203	
F025	70.50	7.050	10	L	BIASED LOW*	-3.54	-0.0542	ICP
F026	85.00	8.500	10					AAS
F031	277.00	27.700	10	H H VH	BIASED HIGH	8.05	0.0217	ICP, Acid Extract
F032	215.00	21.500	10					AAS
F036	65.00	6.500	10	L VL	BIASED LOW*	-3.38	-0.0941	AAS
F037	98.00	9.800	10	L				ICP-MS
F038	262.50	26.250	10	VH	BIASED HIGH	8.63	-0.0324	FAES
F042	45.00	4.500	10	L L VL	BIASED LOW	-5.37	-0.0734	ICP-OES
F048	154.50	15.450	10					IC
F062	111.50	11.150	10	L L				ICP-MS
F063	131.50	13.150	10					AAS
F074	188.00	18.800	10					AAS
F092	221.00	22.100	10					Atomic Emission
F094	50.00	5.000	10	L VLL VL	BIASED LOW	-8.22	-0.0295	ICP-OES
F095	139.50	13.950	10					IC
F113	27.00	2.700	10	VLELELVLELEL ELELVL	BIASED LOW*	-2.74	-0.3316	AAS PE5100
F133	102.00	10.200	10					ICP-MS
F139	259.00	25.900	10	H H VHH H				ICP-OES
F141	208.00	20.800	10	H				ICP-OES
F143	174.00	17.400	10	H				ICP
F144	227.00	22.700	10	H VH VH				APHA3500-KD
F154	155.50	15.550	10					ICP-MS
F158	163.50	16.350	10					Atomic Absorption
F159	281.50	28.150	10	VHH H VH	BIASED HIGH	5.86	0.0754	ASTM D 4192
F172	325.00	32.500	10	H EHEHVHEHEHEHEHEHEH	BIASED HIGH	69.68	-0.3778	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 16.853

PARAMETER: 14091 Silicates mg/L SiO2

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.1000 BASIC ACCEPTABLE ERROR= 0.0250 CONCENTRATION ERROR INCREMENT= 0.0600

SAMPLE	1= WINN-02	2= ION-20	3= CALG-01	4= COLLING-96A	5= HAMILTON-90	6= RAISIN-99	7= SOUR-01	8= HH-94	9= WATTAP-94	10= ION-96.3
LAB NO	REPORTED VALUE	REPORTED VALUE	REPORTED VALUE	REPORTED VALUE	REPORTED VALUE	REPORTED VALUE	REPORTED VALUE	REPORTED VALUE	REPORTED VALUE	REPORTED VALUE
F003	0.39	1.40	4.29	0.76	0.78	2.97	0.26	1.60	11.4	2.41
F015	<0.1 EL	1.4	5.2 VH	0.6 VL	0.6 VL	3.6 VH	<0.1 VL	1.7	13.2 VH	2.7 VH
F022	0.4	1.45	4.514	0.807	0.804	3.21	0.274	1.694	12.215	2.567 H
F025	0.05 EL	1.37	4.30	0.85 H	0.80	2.95	0.05 EL	1.55	11.9	2.40
F026	0.406	1.377	4.414	0.767	0.775	2.982	0.276	1.609	11.619	2.360
F032	0.34	1.37	4.41	0.73	0.77	3.04	0.21 L	1.63	11.9	2.40
F036	0.30 VL	1.37	4.39	0.73	0.73	3.08	0.21 L	1.60	11.7	2.50
F037	0.475 VH	1.301	3.872 VL	0.77	0.796	2.712 VL	0.361 VH	1.405 VL	10.126 VL	2.175 L
F038	0.3 VL	1.4	4.5	1.0 VH	0.8	3.2	0.2 VL	1.7	12.1	2.6 H
F042	0.30 VL	1.24 L	4.16	0.66 VL	0.69 L	2.66 VL	0.17 VL	1.44 L	10.22 VL	2.12 VL
F048	0.287 VL	1.324	4.339	0.694 L	0.692 L	3.044	0.157 VL	1.552	11.582	2.383
F062	0.2 VL	1.3	4.3	0.7	0.7 L	3.0	0.3 H	1.6	11.7	2.3
F063	0.43 H	1.48	5.19 VH	0.82	0.83	3.68 VH	0.31 H	1.90 VH	16.7 EH	3.12 EH
F074	0.419	1.41	4.41	0.680 L	0.783	3.08	0.199 VL	1.65	11.5	2.40
F092	0.379	1.39	4.46	0.76	0.779	2.99	0.259	1.62	11.65	2.41
F094	0.5 VH	1.5 H	4.5	0.8	0.9 VH	3.2	0.3 H	1.7	11.9	2.6 H
F094a	0.3 VL	1.4	4.4	0.7	0.7 L	3.0	0.2 VL	1.6	11.8	2.4
F095	0.747 EH	1.55 VH	5.01 VH	1.05 EH	1.09 EH	3.38 VH	0.660 EH	1.91 VH	12.2	2.79 VH
F099	0.375	1.345	4.2	0.75	0.763	2.907	0.262	1.579	11.507	2.349
F113	0.412	1.483	4.519	0.833 H	0.838	3.211	0.282	1.77 H	12.294	2.601 H
F144	0.6 VH	1.4	4.54	0.82	0.78	3.4 VH	0.37 VH	1.75 H	12.48 H	2.78 VH
F154	0.3 VL	1.2 VL	4.0 L	0.6 VL	0.6 VL	2.8 L	0.2 VL	1.4 VL	10.9 L	2.2 L
F158	<0.5	1.2 VL	4.4	0.6 VL	0.6 VL	2.9	<0.5	1.4 VL	12.0	2.3
F172	<1.	<1. EL	2. EL	<1.	<1.	2. EL	<1.	<1. EL	6. EL	2. VL
MEDIAN	0.3790	1.3900	4.4050	0.7600	0.7790	3.0200	0.2600	1.6090	11.7500	2.4000
1CRIT	0.0417	0.1024	0.2833	0.0646	0.0657	0.2002	0.0346	0.1155	0.7240	0.1630
N	19	20	22	22	22	22	19	20	22	22
MEAN	0.3744	1.3855	4.4145	0.7469	0.7505	3.0598	0.2526	1.6325	11.7224	2.4430
3STDEV	0.2684	0.1888	0.8177	0.2751	0.2319	0.6496	0.1770	0.3230	1.9811	0.5343

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	107.00	10.700	10					HETEROPOLY BLUE
F015	128.00	16.000	8	EL VHVLVLVHVL VHVH				colorimetric
F022	172.00	17.200	10	H				
F025	95.50	9.550	10	EL H EL				Calculation
F026	117.00	11.700	10					Autoanalyser
F032	113.00	11.300	10	L				colourimetry
F036	103.50	10.350	10	VL L				colourimetry
F037	86.00	8.600	10	VH VL VLVHVLVLL				ICP-MS
F038	156.00	15.600	10	VL VH VL H				Colourimetric
F042	35.00	3.500	10	VLL VLL VLVLL VLVL	BIASED LOW	-12.39	0.0223	Colorimetric
F048	68.00	6.800	10	VL L L VL				Colorimetric
F062	82.00	8.200	10	VL L H				Auto Color
F063	210.50	21.050	10	H VH VHH VHEHEH	BIASED HIGH	42.58	-0.3683	colour
F074	119.50	11.950	10	L VL				Mo blue FIA
F092	121.00	12.100	10					Colorimetric
F094	182.00	18.200	10	VHH VH H H				ICP-OES
F094a	98.00	9.800	10	VL L VL				Colorimetric
F095	219.00	21.900	10	EHVHVHEHEHVHEHVH VH	BIASED HIGH*	1.56	0.3218	ICP
F099	81.00	8.100	10					Mo Blue. Sp. Phot
F113	194.00	19.400	10	H H H	BIASED HIGH*	4.19	0.0370	FIA Lachat 8000
F144	194.00	19.400	10	VH VHVHH H VH	BIASED HIGH	5.47	0.0706	APHA4500-SiO2C
F154	34.00	3.400	10	VLVLL VLVLL VLVLL L	BIASED LOW	-6.56	-0.0798	Autocolourimetric
F158	46.00	5.750	8	VL VLVL VL				Auto Color
F172	4.00	1.000	4	ELEL EL ELELVL	INSUFFICIENT DATA			AA

* 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 12.026

PARAMETER: 16092 Sulfate mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 0.5000 CONCENTRATION ERROR INCREMENT= 0.0600

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	4.9	29.7	45.9	14.6	51.5	19.4	66.9	46.	55.4	106.
F003	5.1	28.4	43.3	14.7	50.9	21.3 H	65.2	46.6	53.4	107.
F006	<10.	30.	46.	17. EH	51.	24. EH	66.	46.	54.	104.
F014	5.08	28.8	44.2	15.1	50.5	19.3	66.4	45.5	54.9	111.
F015	5.2	31.6 H	49.5 H	16.1 H	55.4	21.3 H	70.8	49.3	59.7 H	116.
F019	4.8	29.3	44.8	14.3	14.3 EL	19.2	19.7 EL	46.5	55.1	19.9 EL
F022	4.81	29.9	46.8	14.5	51.9	19.5	69.1	45.6	56.7	110.
F025	4.7	29.2	45.4	13.9	51.8	18.8	65.6	46.7	54.3	112.
F026	5.0087	30.50	47.73	14.83	53.39	19.64	69.26	47.07	56.95	108.16
F031	4.6	28.8	45.9	14.1	52.9	18.9	66.2	46.8	56.1	110.
F032	4.5	27.5	43.0	13.0 L	49.5	17.0 VL	62.0 L	44.5	53.5	97.0 VL
F036	5.05	27.5	43.0	15.0	47.0 L	18.0	61.0 L	46.6	53.0	109.
F037	4.965	28.63	45.40	14.06	51.28	20.37	66.67	45.96	52.02	108.66
F038	5.	29.	46.	14.	53.	19.	69.	47.	56.	111.
F042	4.94	30.2	47.1	14.7	53.1	19.7	67.8	47.5	56.6	111.
F048	<9.	29.385	44.416	14.641	53.092	19.762	69.530	46.624	55.593	113.140
F062	5.9 H	28.3	44.1	14.9	53.	20.7	64.	47.2	53.	99. VL
F063	5.2	29.5	47.2	14.2	53.0	19.2	68.7	46.9	56.6	113.
F073	4.73	30.68	46.09	14.68	52.67	20.48	65.83	46.6	56.10	112.1
F074	4.58	29.7	41.3 L	14.6	52.7	20.5	63.5	48.2	51.5 L	108.
F092	4.92	30.04	46.9	14.86	50.88	19.79	66.38	45.75	55.71	108.08
F094	4.9	28.1	44.1	14.4	50.6	18.6	64.5	45.4	53.8	104.
F094a	6.0 H	30.6	48.0	15.0	55.1	26.8 EH	70.0	47.7	55.5	114.
F095	4.8	29.1	46.6	14.7	52.2	19.2	68.3	47.4	55.2	112.
F113	4.90	30.00	45.40	14.96	53.40	19.64	68.50	46.22	56.68	110.49
F133	4.90	28.70	44.25	14.20	50.95	19.15	64.95	44.85	53.85	106.5
F141	5.20	29.0	45.8	14.7	52.0	18.7	67.7	45.9	55.9	125. VH
F143	4.24	30.0	46.3	13.5	53.0	18.6	67.5	46.8	56.1	110.
F144	3.9 L	27.8	44.4	13.2 L	50.6	18.7	62.1 L	43.8	53.5	109.4
F154	0. EL	27. L	44.	13. L	49.	20.	67.	44.	52.	111.
F158	5.1	28.2	47.3	14.8	51.7	21.9 H	65.5	47.5	55.5	110.5
F159	3.3 EL	38.5 EH	66.1 EH	15.3	72.5 EH	19.0	90.7 EH	62.1 EH	77.2 EH	201.2 EH
F172	5.5	49. EH	72. EH	22. EH	116. EH	23. VH	102. EH	114. EH	76. EH	134. EH
MEDIAN	4.9000	29.3000	45.9000	14.6800	52.0000	19.5000	66.6700	46.6000	55.5000	110.0000
1CRIT	0.7340	2.1980	3.1940	1.3208	3.5600	1.6100	4.4402	3.2360	3.7700	7.0400
N	29	31	31	30	31	31	31	31	31	31
MEAN	4.8525	29.5689	46.2899	14.6510	52.5665	19.8494	67.3103	46.9927	55.7646	110.3558
3STDEV	1.3841	5.6771	11.7722	2.0816	11.9931	3.9055	14.6405	8.8554	12.0945	19.4149

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	147.50	14.750	10					IC
F003	132.50	13.250	10	H				METHYLTHYMOL BLUE
F006	158.50	17.611	9	EH EH				AUTO ANALYSER
F014	148.00	14.800	10					
F015	302.50	30.250	10	H H H H H	BIASED HIGH	5.23	0.6592	IC
F019	94.50	9.450	10	EL EL EL				IC
F022	183.00	18.300	10					
F025	131.50	13.150	10					IC
F026	240.50	24.050	10					IC DIONEX
F031	147.50	14.750	10					IC
F032	32.00	3.200	10	L VLL VL	BIASED LOW	-10.25	1.2052	colourimetry
F036	94.00	9.400	10	L L				IC
F037	127.00	12.700	10					I.C. Waters
F038	184.50	18.450	10					IC
F042	235.00	23.500	10					IC
F048	186.00	20.667	9					IC
F062	157.50	15.750	10	H VL				Auto Color
F063	219.50	21.950	10					IC
F073	199.00	19.900	10					IC DIONEX-500
F074	133.00	13.300	10	L L				IC
F092	175.00	17.500	10					IC
F094	73.50	7.350	10		BIASED LOW	-5.15	0.6260	IC
F094a	286.00	28.600	10	H EH	BIASED HIGH*	1.31	1.7799	ICP-OES
F095	187.50	18.750	10					IC
F113	209.00	20.900	10					IC Dionex DX-500
F133	93.00	9.300	10					IC
F141	180.50	18.050	10	VH				IC
F143	161.50	16.150	10					IC
F144	58.50	5.850	10	L L L	BIASED LOW*	-0.66	-1.4722	APHA4500-SO4D
F154	79.00	7.900	10	ELL L				Auto FIA Colour
F158	198.50	19.850	10	H				Auto Color
F159	267.50	26.750	10	ELEHEH EH EHEHEHEH	BIASED HIGH	83.06	-16.8796	ASTM D 4327
F172	322.00	32.200	10	EHEHEHEHVHEHEHEHEH	BIASED HIGH	31.51	12.8222	IC Dionex

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

OVERALL AVERAGE
RANK IS 16.905

PARAMETER: 17092 Chloride mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 0.5000 CONCENTRATION ERROR INCREMENT= 0.0600

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	2.23	16.5	4.5	5.71	60.6	15.2	17.6	58.7	14.7	83.2
F003	2.27	15.4	4.53	5.54	58.5	14.9	16.8	59.3	14.1	81.4
F006	<2.	17.	4.	6.	62.	13. VL	18.	58.	14.	87.
F010	2.	17.	3. VL	6.	62.	15.	18.	60.	13. VL	90.
F014	2.14	16.6	4.62	5.86	60.3	15.3	17.8	60.2	15.4	85.8
F015	2.5	18.4 H	5.3 H	6.6 H	66.4 H	16.6 H	19.7 H	62.1	16.9 H	93.7 H
F019	2.24	2.24 EL	4.47	5.68	<0.02 EL	<0.02 EL	2.96 EL	<0.02 EL	15.8	<0.02 EL
F022	2.14	16.5	4.55	5.68	61.5	14.8	17.8	59.8	15.5	85.4
F025	2.1	16.6	4.6	5.8	61.5	16.0	18.0	59.1	15.0	85.8
F026	2.2462	16.41	4.773	5.662	63.32	14.89	17.45	59.32	15.31	85.57
F031	2.2	17.2	4.8	5.6	61.0	15.0	18.1	59.0	15.5	85.6
F032	2.4	17.0	4.6	5.8	62.2	15.8	18.0	59.6	15.2	84.8
F036	2.22	15.7	4.65	5.51	63.2	15.4	17.4	59.0	16.6 H	86.2
F037	2.514	17.36	5.770 VH	6.653 EH	67.64 H	18.99 EH	20.75 EH	65.55 VH	17.28 VH	94.94 VH
F038	2.0	16.6	4.2	5.3	60.9	15.1	17.9	60.2	14.7	86.5
F042	2.13	17.0	4.65	5.82	63.4	14.4	17.8	60.0	15.2	86.0
F048	2.429	16.850	4.562	5.473	62.287	15.588	18.211	59.319	15.101	85.804
F062	2.7	16.1	4.3	5.5	61.	15.5	16.7	58.	13.8 L	84.
F063	2.4	18.0	4.8	6.0	65.9 H	16.4	19.0	62.5	15.9	92.7 H
F073	2.14	17.03	4.64	5.71	70.23 EH	15.13	17.33	66.3 VH	15.14	98.6 VH
F074	2.07	16.5	4.12	5.91	57.5 L	15.4	18.4	56.5	13.1 VL	82.6
F092	2.20	16.51	4.53	5.90	59.13	15.23	17.049	57.49	14.89	83.11
F094	2.36	16.1	4.43	5.36	58.9	15.0	17.7	56.4	14.6	76.6 VL
F094a	2.	16.	4.	5.	61.	15.	17.	59.	16.	85.
F095	2.1	16.9	4.2	5.5	59.8	14.6	18.0	58.4	14.6	85.1
F099	2.2	17.2	4.5	5.9	63.2	16.8 H	18.5	61.1	15.6	85.6
F113	2.30	16.70	4.78	5.92	63.00	15.30	17.95	61.19	15.49	86.57
F133	2.15	15.35	4.30	5.20	57.55 L	13.95	16.20 L	54.10 L	14.30	78.35 L
F141	2.40	15.5	4.51	5.52	57.1 L	15.1	17.8	56.3	15.0	94.6 VH
F143	2.13	16.9	4.28	5.77	62.2	14.5	18.1	60.3	15.2	86.0
F144	2.	17.	5.	5.	61.	12. EL	18.	59.	15.	85.
F154	2.4	19. VH	4.4	5.6	57. L	18. VH	19.	56.	17. H	81.
F158	2.0	16.5	7.2 EH	5.8	62.0	15.3	17.8	59.7	15.0	85.0
F159	240. EH	300. EH	260. EH	2.0 EL	415. EH	445. EH	345. EH	420. EH	390. EH	515. EH
F172	2.2	16.	4.8	6.2	62.	15.	17.	63.	17. H	91.
MEDIAN	2.2000	16.6000	4.5500	5.7100	61.7500	15.1650	17.9000	59.3195	15.2000	85.7000
1CRIT	0.5720	1.4360	0.7130	0.7826	4.1450	1.3499	1.5140	3.9992	1.3520	5.5820
N	33	33	33	33	32	32	33	32	33	32
MEAN	2.2276	16.7094	4.6474	5.6917	61.8205	15.3806	17.9042	59.6990	15.2700	86.6232
3STDEV	0.5040	2.3017	1.6982	0.9528	8.3925	3.2232	2.5300	6.9151	2.8017	12.8781

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	130.00	13.000	10					IC
F003	97.50	9.750	10					THIOCYANATE
F006	140.00	15.556	9	VL				AGNO3 TITRN
F010	164.50	16.450	10	VL VL				Titration-conduct.
F014	186.00	18.600	10					
F015	314.00	31.400	10	H H H H H H H H	BIASED HIGH	7.41	0.3068	IC
F019	78.50	13.083	6	EL ELELELEL EL				IC
F022	157.00	15.700	10					
F025	181.00	18.100	10					Colorimetric
F026	173.00	17.300	10					IC DIONEX
F031	194.00	19.400	10					IC
F032	214.00	21.400	10					colourimetry
F036	183.00	18.300	10	H				IC
F037	328.00	32.800	10	VHEHH EHEHVHVHVH	BIASED HIGH	9.62	0.6030	I.C. Waters
F038	133.00	13.300	10					IC
F042	194.00	19.400	10					IC
F048	207.00	20.700	10					IC
F062	118.50	11.850	10	L				Auto Color
F063	297.00	29.700	10	H H	BIASED HIGH	7.33	-0.1330	IC
F073	222.50	22.250	10	EH VH VH				IC DIONEX-500
F074	118.00	11.800	10	L VL				IC
F092	130.50	13.050	10					IC
F094	93.00	9.300	10	VL				IC
F094a	98.00	9.800	10					Colorimetric
F095	109.00	10.900	10					IC
F099	243.00	24.300	10	H				Fe(CN)3 Sp. Phot
F113	240.00	24.000	10					IC Dionex DX-500
F133	46.50	4.650	10	L L L L	BIASED LOW	-8.33	0.1016	IC
F141	137.50	13.750	10	L VH				IC
F143	178.50	17.850	10					IC
F144	135.50	13.550	10	EL				APHA4500-ClB
F154	187.00	18.700	10	VH L VH H				Auto FIA Colour
F158	171.50	17.150	10	EH				Auto Color
F159	311.00	31.100	10	EHEHEHELEHEHEHEHEHEH	BIASED HIGH	231.20	239.1093	N - 1454
F172	213.50	21.350	10	H				IC Dionex

OVERALL AVERAGE
RANK IS 17.754

PARAMETER: 20091 Calcium mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 0.2000 CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	13.9	13.8	46.6	24.	43.4	74.7	33.9	46.4	45.2	97.4
F003	14.2	13.8	45.7	24.0	43.1	77.2	34.2	47.5	45.8	102.
F006	15.	15. H	49.	25.	45.	78.	35.	47.	46.	102.
F009	13.90	13.37	45.6	45.6 EH	43.0	69.8 VL	31.4 VL	45.0	43.0	94.4
F010	14.51	14.09	47.	24.8	44.	77.	34.	48.	46.	104. H
F014	14.9	14.2	46.9	24.9	44.0	76.7	34.5	47.0	45.8	96.9
F015	14.3	13.9	47.7	24.6	44.0	78.7	34.2	46.7	45.8	98.8
F019	14.6	14.3	48.	25.2	44.	76.7	35.5	47.5	45.7	98.9
F022	9.613 EL	9.715 EL	30.965 EL	16.084 EL	43.125	52.014 EL	31.677 L	43.238 L	29.418 EL	91.728 L
F025	12.6 VL	12.9 L	43.3 L	22.2 VL	40.7 L	72.0 L	31.9 L	44.1	42.3 L	91.6 L
F026	13.902	13.709	46.922	24.328	43.685	77.427	34.564	47.134	44.193	102.276
F031	14.8	14.5	48.4	25.5	45.7 H	79.9	36.4 H	49.3 H	47.4	103. H
F032	14.3	13.9	45.6	24.9	42.6	75.4	34.4	46.0	44.5	98.5
F036	12.5 VL	12.2 VL	43.7 L	22.7 L	40.8 L	73.2	34.3	45.3	44.2	94.1
F037	12.75 VL	12.84 L	42.61 VL	22.7 L	39.76 VL	70.53 VL	30.9 VL	41.23 EL	41.47 VL	93.41
F038	14.3	13.7	47.0	24.1	43.6	76.8	34.7	46.3	45.5	98.0
F042	14.0	13.6	46.7	25.0	44.1	78.1	35.9	48.4	45.2	101.
F048	14.01	13.63	47.86	24.34	43.19	78.66	34.81	46.80	46.61	95.92
F062	15.3 H	14.8 H	49.4 H	26.4 VH	46.5 H	80.8 H	36.2 H	50.2 H	47.9 H	114. EH
F063	13.6	13.2	44.7	23.1	41.8	74.1	32.5	45.0	43.7	97.4
F074	14.2	13.9	45.3	23.6	43.1	74.8	34.3	46.0	43.9	99.8
F092	13.8	13.5	45.09	23.6	42.5	75.4	32.70	44.9	43.70	97.90
F094	13.8	13.6	44.5	22.8 L	42.2	78.2	33.3	44.2	43.5	96.7
F095	14.3	14.0	47.1	24.5	43.9	74.7	34.4	47.2	45.9	102.
F113	14.287	13.501	45.170	24.530	41.747	78.340	33.231	44.711	43.699	96.702
F133	12.20 VL	12.15 VL	43.0 L	22.0 VL	41.7	69.6 VL	32.1 L	43.0 L	42.5 L	87.6 VL
F139	14.68	14.02	46.65	25.54	44.39	75.9	33.99	46.66	44.91	97.2
F141	14.4	14.3	48.4	25.2	44.6	78.8	35.1	48.9	47.1	102.
F143	14.2	13.9	48.6	25.	44.9	78.6	34.7	47.8	47.1	97.9
F144	13. L	14.	44. L	24.	42.	74.	34.	45.	44.	94.
F154	13.9	13.6	45.6	23.7	43.3	75.2	34.0	46.2	45.0	100.
F158	13.1 L	12.9 L	46.4	22.4 L	42.7	74.6	30.5 VL	46.1	45.1	97.0
F159	15.	14.	47.	24.	45.	77.	35.	48.	48. H	97.
F172	15.8 VH	15.1 VH	49.8 H	26.3 H	46.7 H	85.7 EH	36.4 H	53. EH	48.3 H	112. EH
MEDIAN	14.2000	13.8000	46.6250	24.3340	43.3500	76.7000	34.2500	46.5300	45.1500	97.9000
1CRIT	0.8600	0.8400	2.4813	1.3667	2.3175	3.9850	1.8625	2.4765	2.4075	5.0450
N	32	32	32	32	32	32	31	32	32	32
MEAN	14.0075	13.7128	46.2344	24.2168	43.3855	75.9643	33.9152	46.4232	45.0213	98.4855
3STDEV	2.2530	1.8642	5.2588	3.3233	3.9342	8.2492	3.8584	5.0071	4.7795	11.9468

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	150.50	15.050	10					AAS
F003	192.00	19.200	10					AA
F006	280.00	28.000	10	H	BIASED HIGH*	2.97	0.1003	ICP
F009	106.00	10.600	10	EH VLVL				ICP-MS
F010	243.00	24.300	10	H				ICP-OES
F014	220.00	22.000	10					ICP-OES
F015	223.00	22.300	10					ICP
F019	252.50	25.250	10					ICP-OES
F022	31.00	3.100	10	ELELELEL ELL L ELL	BIASED LOW	-11.73	-3.3307	
F025	37.50	3.750	10	VLL L VLL L L L L	BIASED LOW	-5.77	-0.3699	ICP
F026	199.00	19.900	10					AAS
F031	311.00	31.100	10	H H H H	BIASED HIGH*	4.83	0.0657	ICP, Acid Extract
F032	171.00	17.100	10					AAS
F036	74.00	7.400	10	VLVLL L L	BIASED LOW*	-3.08	-0.6192	AAS
F037	30.50	3.050	10	VLL VLL VLVLVLELVL	BIASED LOW	-5.15	-1.1844	ICP-MS
F038	194.00	19.400	10					ICP-MS
F042	227.50	22.750	10					ICP-OES
F048	202.00	20.200	10					IC
F062	328.00	32.800	10	H H H VHH H H H H EH	BIASED HIGH	14.13	-2.3906	ICP-MS
F063	85.00	8.500	10					AAS
F074	148.50	14.850	10					AAS
F092	101.50	10.150	10					AAS
F094	99.50	9.950	10	L				ICP-OES
F095	219.00	21.900	10					IC
F113	124.00	12.400	10					AAS PE5100
F133	28.00	2.800	10	VLVLL VL VLL L L VL	BIASED LOW	-9.90	0.6865	ICP-MS
F139	205.00	20.500	10					ICP-OES
F141	288.50	28.850	10		BIASED HIGH*	4.00	-0.1753	ICP-OES
F143	251.00	25.100	10					ICP
F144	102.50	10.250	10	L L				APHA3500-CaB
F154	147.00	14.700	10					ICP-MS
F158	97.00	9.700	10	L L L VL				ICP
F159	244.50	24.450	10	H				ASTM D 511
F172	336.50	33.650	10	VHVHH H H EHH EHH EH	BIASED HIGH	14.68	-1.8763	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 17.500

PARAMETER: 12091 Magnesium mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.5000 BASIC ACCEPTABLE ERROR= 0.2000 CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F002	3.8	2.9	13.4	6.4	10.6	10.3	20.7	10.7	24.1	25.5
F003	3.85	2.86	13.4	6.33	10.8	10.4	20.9	10.8	25.0	26.0
F006	4.	3.	14.	7. H	11.	11. H	22. H	11.	27. VH	27. H
F009	4.14	3.11	14.1	6.21	10.41	10.64	21.17	11.26	25.48	27.23 H
F010	3.98	2.98	13.81	6.63	10.94	10.55	20.9	10.98	25.3	25.5
F014	4.01	2.96	13.6	6.53	10.9	10.4	20.9	10.9	25.1	25.2
F015	4.3 H	3.2 H	14.9 VH	7.1 VH	11.6 H	11.4 VH	22.1 H	11.6 H	26.9 VH	26.8
F019	3.92	2.98	13.6	6.57	10.6	10.3	20.9	10.8	24.3	24.8
F022	2.801 EL	2.137 EL	9.894 EL	4.685 EL	11.061	8.25 EL	20.951	11.096	18.496 EL	25.794
F025	3.4 L	2.6	12.6	5.9	10.0	9.8	19.2 L	10.0	23.3	23.9 L
F026	3.861	2.882	13.947	6.526	11.178	10.545	19.869	11.064	23.727	24.450
F031	3.8	2.9	13.4	6.4	10.6	10.1	20.4	10.7	24.5	25.1
F032	3.90	2.90	13.1	6.40	10.7	10.3	20.6	10.7	24.4	25.5
F036	3.56	2.62	12.9	5.99	10.2	10.0	20.7	10.6	23.1	24.8
F037	3.582	3.051	12.76	6.16	10.09	9.746	19. L	9.831 L	23.44	23.87 L
F038	3.83	2.84	13.4	6.30	10.7	10.5	21.2	11.0	25.2	26.0
F042	3.54	2.68	12.2 L	5.85	9.90 L	9.63	19.6	10.2	21.9 VL	23.5 L
F048	3.68	2.72	13.44	6.28	10.66	10.29	20.51	10.31	24.65	25.28
F062	4.03	2.98	14.1	6.73	11.2	10.7	21.9 H	11.2	25.2	26.6
F063	3.8	3.1	13.3	6.4	10.6	10.3	20.6	10.9	24.6	25.6
F074	3.60	2.70	12.4 L	5.90	10.3	9.80	18.8 VL	10.5	24.3	24.8
F092	3.78	2.83	13.30	6.25	10.6	10.19	20.60	10.69	24.39	25.60
F094	3.7	2.9	13.0	5.9	10.6	10.6	20.7	10.3	24.0	25.1
F095	3.7	2.8	13.3	6.3	10.5	9.8	20.2	10.7	24.3	25.6
F113	3.679	2.798	13.484	6.368	10.687	10.310	20.676	10.752	24.591	25.423
F133	3.42 L	2.65	13.32	6.17	10.73	10.07	20.2	10.36	24.65	25.55
F139	3.81	2.85	13.23	6.34	10.62	10.05	19.89	10.62	23.87	24.29
F141	3.81	2.90	13.4	6.37	10.7	10.1	21.4	10.9	25.6	26.4
F143	3.84	2.87	13.6	6.49	10.7	10.4	20.6	10.7	24.9	25.3
F144	3.8	2.8	13.2	6.2	10.6	10.	20.2	10.4	24.	24.8
F154	3.67	2.77	12.7	6.07	10.4	9.71	19.8	10.4	23.7	25.2
F158	3.65	2.75	13.1	6.12	9.85 L	9.50 L	19.5	10.0	23.6	24.4
F159	4.0	2.9	17. EH	6.4	13. EH	13. EH	27. EH	13. EH	39. EH	32. EH
F172	4.38 EH	3.26 H	15.9 EH	6.89 H	13.0 EH	11.8 EH	23.5 EH	12.1 EH	30.3 EH	29.1 EH
MEDIAN	3.8000	2.8760	13.4000	6.3350	10.6400	10.3000	20.6380	10.7000	24.4500	25.4615
1CRIT	0.3650	0.3188	0.8450	0.4918	0.7070	0.6900	1.2069	0.7100	1.3975	1.4481
N	32	32	32	32	31	32	32	32	32	32
MEAN	3.7951	2.8682	13.4341	6.3242	10.6508	10.2885	20.6677	10.7573	24.6687	25.5152
3STDEV	0.5842	0.4218	2.0590	0.8060	1.0428	1.4412	2.6486	1.2786	4.2391	3.0959

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	178.50	17.850	10					AAS
F003	217.50	21.750	10					AA
F006	299.00	29.900	10	H H H VHH	BIASED HIGH	8.28	-0.2252	ICP
F009	262.50	26.250	10	H				ICP-MS
F010	260.50	26.050	10					ICP-OES
F014	242.00	24.200	10					ICP-OES
F015	321.00	32.100	10	H H VHVHH VHH H VH	BIASED HIGH	6.36	0.3122	ICP
F019	205.00	20.500	10					ICP-OES
F022	115.00	11.500	10	ELELELEL EL EL				
F025	34.50	3.450	10	L L L	BIASED LOW	-5.25	-0.1152	ICP
F026	202.00	20.200	10					AAS
F031	164.00	16.400	10					ICP, Acid Extract
F032	186.50	18.650	10					AAS
F036	78.00	7.800	10		BIASED LOW*	-2.49	-0.0922	AAS
F037	70.00	7.000	10	L L L	BIASED LOW	-6.55	0.1359	ICP-MS
F038	223.50	22.350	10					ICP-MS
F042	30.00	3.000	10	L L VLL	BIASED LOW	-8.59	0.1451	ICP-OES
F048	143.50	14.350	10					IC
F062	296.00	29.600	10	H	BIASED HIGH*	4.07	0.0807	ICP-MS
F063	197.50	19.750	10					AAS
F074	66.50	6.650	10	L VL	BIASED LOW*	-2.70	-0.2031	AAS
F092	149.50	14.950	10					AAS
F094	134.00	13.400	10					ICP-OES
F095	132.50	13.250	10					IC
F113	175.00	17.500	10					AAS PE5100
F133	128.50	12.850	10	L				ICP-MS
F139	125.50	12.550	10					ICP-OES
F141	225.00	22.500	10					ICP-OES
F143	205.00	20.500	10					ICP
F144	110.00	11.000	10					APHA3500-MgB
F154	76.00	7.600	10		BIASED LOW*	-2.06	-0.1535	ICP-MS
F158	54.00	5.400	10	L L	BIASED LOW*	-3.85	-0.1174	ICP
F159	310.50	31.050	10	EH EHEHEHEHEHEH	BIASED HIGH	47.59	-2.2498	ASTM D 511
F172	331.50	33.150	10	EHH EHH EHEHEHEHEHEH	BIASED HIGH	18.92	-0.2699	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 17.500

PARAMETER: 10692 Total Hardness mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Interlab QA for Major Ions

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= 1.0000 CONCENTRATION ERROR INCREMENT= 0.0400

SAMPLE LAB NO	1= WINN-02 REPORTED VALUE	2= ION-20 REPORTED VALUE	3= CALG-01 REPORTED VALUE	4= COLLING-96A REPORTED VALUE	5= HAMILTON-90 REPORTED VALUE	6= RAISIN-99 REPORTED VALUE	7= SOUR-01 REPORTED VALUE	8= HH-94 REPORTED VALUE	9= WATTAP-94 REPORTED VALUE	10= ION-96.3 REPORTED VALUE
F003	51.3	46.2	169.	86.0	152.	236.	171.	163.	217.	362.
F006	54.	50. H	180. H	91.	158.	245. H	180. H	168.	231. VH	366.
F014	53.6	47.6	173.	89.0	155.	234.	172.	162.	218.	346.
F015	53.2	48.1	180.7 H	90.8	157.6	243.2	176.5	164.3	224.9 H	357.1
F019	52.6	48.	176.	90.	154.	234.	175.	163.	214.	349.
F022	35.57 EL	33.09 EL	118.2 EL	59.5 EL	153.4	164. EL	165.5	153.8	149.7 EL	335.6 L
F025	46. VL	43. L	160. VL	80. VL	140. VL	220. L	160. L	150. L	200. L	330. L
F031	50.	45.	136. EL	93. H	150.	230.	165.	155.	210.	351.
F032	51.8	46.6	168.	88.6	150.	231.	171.	159.	212.	351.
F037	46.59 VL	44.63	158.94 VL	82.05 L	140.83 VL	216.25 VL	155.4 VL	143.44 EL	200.08 L	331.54 L
F038	51.5	45.9	173.	86.1	153.	235.	174.	161.	217.	352.
F048	53.2	48.2	176.8	89.2	157.8	238.6	173.8	163.0	219.4	356.8
F062	54.80 H	49.23 H	181.42 H	93.63 H	162.23 H	245.82 H	180.58 H	171.47 H	223.38	394.2 EH
F063	50.	46.	167.	84.	148.	227.	166.	157.	211.	349.
F092	50.3	45.4	167.4	84.7	150.2	230.3	166.5	156.2	209.6	349.9
F094	50.	46.	165.	81. VL	149.	239.	168.	153. L	207.	345.
F095	51.	46.	172.	87.	153.	227.	169.	162.	215.	360.
F133	54.0	49.0 H	175.5	91.0	157.0	239.0	173.0	167.0	219.	358.
F141	51.6	47.7	176.	89.2	155.	238.	176.	167.	223.	363.
F144	51.	46.	172.	88.	154.	233.	170.	161.	214.	352.
F154	49.8	45.4	166.	84.2	151.	228.	166.	158.	210.	353.
F158	47.7 L	43.4	170.	81.0 VL	147.	225.	156. VL	156.	210.	342.
F172	56.2 VH	50.65 VH	189. VH	92.9 H	165. VH	266. EH	186. VH	179. EH	244. EH	406. EH
MEDIAN	51.3000	46.0000	172.0000	88.0000	153.0000	234.0000	171.0000	161.0000	214.0000	352.0000
1CRIT	3.0120	2.8000	7.8400	4.4800	7.0800	10.3200	7.8000	7.4000	9.5200	15.0400
N	21	21	21	21	21	21	21	21	21	21
MEAN	51.1424	46.5409	169.7029	87.0833	152.7648	233.1033	170.2324	160.5129	214.5409	353.5305
3STDEV	6.9473	5.3890	28.9656	11.5786	13.6586	22.5468	17.9276	16.0403	22.4789	37.0074

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	131.00	13.100	10					CALCULATED
F006	209.00	20.900	10	H H H H VH	BIASED HIGH*	4.35	0.9242	CALCULATED
F014	141.00	14.100	10					Calculated
F015	188.50	18.850	10	H H	BIASED HIGH*	2.00	2.1244	ICP - calculation
F019	147.50	14.750	10					Calculation
F022	31.00	3.100	10	ELELELEL EL ELL	BIASED LOW	-8.12	-14.0515	
F025	22.00	2.200	10	VLL VLVLVLL L L L L	BIASED LOW	-5.61	-2.1203	Calculation
F031	77.00	7.700	10	ELH				Titration
F032	110.50	11.050	10					AAS
F037	26.00	2.600	10	VL VLL VLVLVLELL L	BIASED LOW	-6.15	-2.1485	Calculation
F038	126.50	12.650	10					Calculation
F048	173.00	17.300	10					Titrimetric
F062	218.00	21.800	10	H H H H H H H H EH	BIASED HIGH	10.62	-6.0030	
F063	71.00	7.100	10					calculation
F092	77.50	7.750	10					Calculated
F094	70.50	7.050	10	VL L				Calculation
F095	116.00	11.600	10					IC
F133	181.00	18.100	10	H				TITRIMETRIC
F141	173.00	17.300	10					ICP-OES
F144	117.50	11.750	10					ELOT170
F154	77.00	7.700	10					Calculation
F158	47.50	4.750	10	L VL VL	BIASED LOW*	-1.98	-3.1726	Calculation
F172	228.00	22.800	10	VHVHVHH VHEHVHEHEHEH	BIASED HIGH	16.49	-7.8321	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 12.000

PARAMETER: 15092 Total Phosphorus mg/L P

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA

NWRI Ecosystem Interlab QA for Total P

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0040 BASIC ACCEPTABLE ERROR= 0.0040 CONCENTRATION ERROR INCREMENT= 0.1000

SAMPLE LAB NO	1= TP77-1 REPORTED VALUE	2= TP77-2 REPORTED VALUE	3= TP77-3 REPORTED VALUE	4= TP77-4 REPORTED VALUE	5= TP77-5 REPORTED VALUE	6= TP77-6 REPORTED VALUE	7= TP77-7 REPORTED VALUE	8= TP77-8 REPORTED VALUE	9= TP77-9 REPORTED VALUE	10= TP77-10 REPORTED VALUE
F002	0.003	0.018	0.030	0.191	0.088	0.156	0.210	0.236	0.347	0.364
F003	0.0009	0.0155	0.0284	0.191	0.0888	0.160	0.213	0.238	0.348	0.373
F004	0.003	0.015	0.026	0.196	0.088	0.169	0.218	0.245	0.359	0.385
F006	0.02 VH	<0.02	0.07 EH	0.20	0.10	0.18 H	0.23	0.25	0.37	0.38
F007	<0.010	0.014	0.025	0.192	0.086	0.162	0.212	0.239	0.365	0.373
F009	<0.01	0.02	0.03	0.20	0.09	0.16	0.23	0.25	0.38	0.39
F010	<0.010	0.015	0.025	0.185	0.09	0.14 L	0.21	0.24	0.34	0.37
F011	<0.004	0.036 EH	0.025	0.179	0.083	0.159	0.198	0.221	0.321	0.344
F014	<0.005	0.011	0.032	0.20	0.084	0.16	0.21	0.25	0.34	0.38
F015	0.006	0.016	0.038 VH	0.208	0.091	0.190 VH	0.217	0.215	0.376	0.374
F019	<0.01	0.01 L	0.02 L	0.10 EL	0.07 L	0.14 L	0.24 H	0.13 EL	0.32	0.39
F022	0.005	0.022 H	0.03	0.205	0.096	0.168	0.228	0.252	0.362	0.375
F025	<0.003	0.008 VL	0.013 VL	0.185	0.073 L	0.138 L	0.206	0.232	0.339	0.356
F026	0.0015	0.0163	0.0288	0.1893	0.0869	0.1532	0.2071	0.2313	0.3354	0.3609
F032	0.008TH	0.016	0.028	0.196	0.092	0.158	0.216	0.220	0.320	0.340
F036	0.0024	0.0184	0.0316	0.192	0.094	0.165	0.224	0.234	0.332	0.358
F038	0.003	0.016	0.028	0.192	0.091	0.157	0.218	0.245	0.352	0.367
F042	0.018 VH	0.029 VH	0.042 VH	0.210	0.100	0.180 H	0.230	0.260	0.380	0.400
F048	0.0027	0.0161	0.0272	0.1726	0.0954	0.2057EH	0.1838L	0.2053L	0.2900L	0.3107L
F062	0.04 EH	0.05 EH	0.05 VH	0.19	0.10	0.15	0.23	0.21	0.29 L	0.31 L
F063	0.01 VH	0.02	0.03	0.17	0.08	0.16	0.20	0.21	0.26 VL	0.26 EL
F069	<0.004	0.015	0.030	0.211	0.103 H	0.177	0.229	0.257	0.370	0.392
F072	<0.003	0.014	0.027	0.193	0.086	0.151	0.209	0.230	0.327	0.359
F074	0.002	0.016	0.028	0.188	0.089	0.144	0.210	0.235	0.342	0.366
F092	0.002	0.016	0.028	0.192	0.086	0.161	0.213	0.232	0.346	0.364
F094	0.005	0.019	0.030	0.167 L	0.083	0.135 L	0.204	0.191 VL	0.268 VL	0.281 VL
F095	0.008 H	0.016	0.026	0.191	0.099	0.154	0.220	0.246	0.369	0.389
F099	0.0013	0.0151	0.0273	0.1917	0.0849	0.1554	0.214	0.237	0.3452	0.3727
F113	0.001	0.006 VL	0.015 VL	0.165 L	0.065 VL	0.096 EL	0.192	0.214	0.332	0.354
F133	<0.003	0.011	0.031	0.187	0.077	0.158	0.210	0.234	0.348	0.368
F141	<0.002	0.010 L	0.022	0.191	0.077	0.161	0.212	0.237	0.342	0.37
F143	0.001	0.017	0.028	0.198	0.093	0.163	0.219	0.242	0.354	0.377
F146	0.0015	0.0149	0.0289	0.202	0.0879	0.181 H	0.220	0.241	0.357	0.391
F147			0.014 VL	0.132 EL	0.056 EL	0.113 EL	0.119 EL	0.125 EL	0.191 EL	0.196 EL
F154	<0.001	0.007 VL	0.028	0.182	0.080	0.164	0.198	0.223	0.331	0.357
F158	0.011 VH	0.016	0.057 EH	0.200	0.091	0.170	0.220	0.250	0.360	0.380
F172	<0.03	<0.03	<0.03	0.20	0.09	0.15	0.25 EH	0.26	0.43 EH	0.40
MEDIAN	0.0030	0.0160	0.0280	0.1917	0.0880	0.1600	0.2130	0.2360	0.3452	0.3700
1CRIT	0.0040	0.0052	0.0064	0.0228	0.0124	0.0196	0.0249	0.0272	0.0381	0.0406
N	21	32	34	35	35	35	35	34	35	34
MEAN	0.0055	0.0162	0.0293	0.1892	0.0873	0.1584	0.2143	0.2301	0.3405	0.3612
3STDEV	0.0158	0.0162	0.0238	0.0431	0.0244	0.0437	0.0352	0.0688	0.0849	0.0889

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	180.00	18.000	10					Persulfate, colour
F003	178.50	17.850	10					Autoclave SnCl2
F004	215.50	21.550	10					15423
F006	282.00	31.333	9	VH EH H	BIASED HIGH*	-2.85	0.0235	AA
F007	168.00	18.667	9					CPQ123E0
F009	261.50	29.056	9		BIASED HIGH	7.53	-0.0024	Persulfate TRAACS
F010	129.00	14.333	9	L				colorimetry
F011	104.00	11.556	9	EH				Auto Color
F014	187.00	20.778	9					UV dig. colour
F015	252.00	25.200	10	VH VH				colorimetric
F019	95.00	10.556	9	L L ELL L H EL				Colourmetric
F022	284.00	28.400	10	H				Dig. - flow colour
F025	67.00	7.444	9	VLVL L L	BIASED LOW*	1.18	-0.0130	Auto Ascorbic
F026	138.50	13.850	10					autoclave, AA
F032	165.50	16.550	10	H				colourimetry
F036	213.50	21.350	10					colourimetry
F038	202.00	20.200	10					Dig. - Colour
F042	332.50	33.250	10	VHVHVH H	BIASED HIGH	5.20	0.0112	Colorimetric
F048	134.50	13.450	10	EHL L L L				Colorimetric
F062	196.00	19.600	10	EHEHVH L L				Dig. Auto Color
F063	122.50	12.250	10	VH VLEL				auto-colour
F069	277.00	30.778	9	H	BIASED HIGH	6.26	0.0037	persulfate digest
F072	110.50	12.278	9					Lachat Flow Inj.
F074	147.50	14.750	10					UV digest, AA
F092	169.50	16.950	10					Spectrophotometric
F094	100.50	10.050	10	L L VLVLVL				Colorimetric
F095	225.50	22.550	10	H				Skalar SFA
F099	155.50	15.550	10					Pers. Photom.
F113	42.00	4.200	10	VLVLL VLEL	BIASED LOW*	-2.08	-0.0177	Pers. Lachat 8000
F133	138.50	15.389	9					COLORIMETRIC
F141	129.00	14.333	9	L				Dig. colour
F143	228.00	22.800	10					TKNTP
F146	234.50	23.450	10	H				SnCl2 auto
F147	11.00	1.375	8	VLELELELELELELEL	BIASED LOW	-48.45	0.0131	Dig. colour
F154	96.50	10.722	9	VL				Auto FIA Colour
F158	275.50	27.550	10	VH EH				Auto Digestion
F172	208.50	29.786	7	EH EH	BIASED HIGH	23.00	-0.0275	Skalar

* 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 18.347

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