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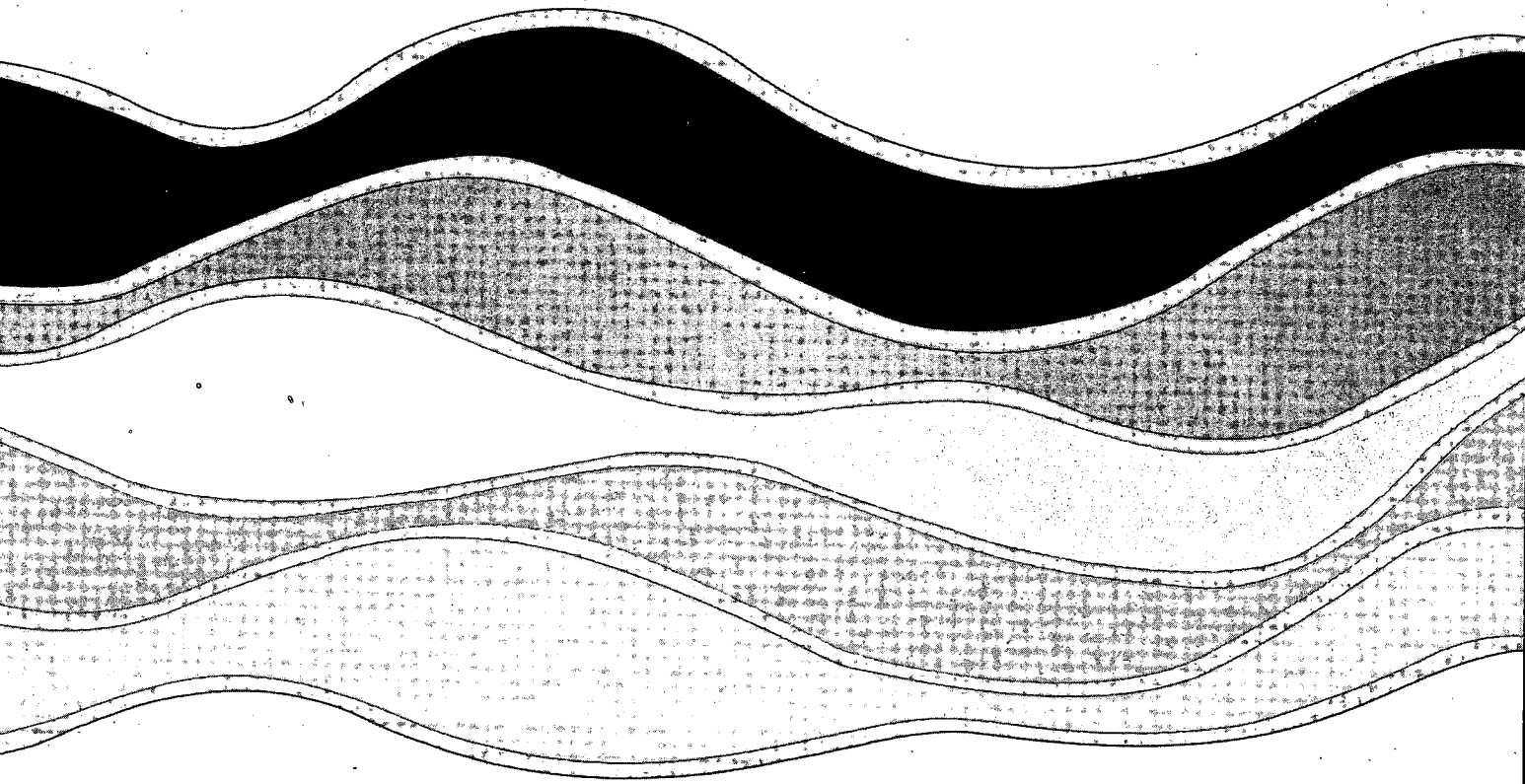

ANNUAL REPORT FOR THE INTERLAB FED-PROV QA PROGRAM, STUDIES FP45-56 (SEP 89 - AUG 90) FOR INORGANIC CONSTITUENTS IN WATERS

H. Alkema

NWRI Contribution # 90-148

RESEARCH & APPLICATIONS BRANCH

ANNUAL REPORT

FEDERAL PROVINCIAL QUALITY ASSURANCE PROGRAM

STUDIES 45 TO 56

for September 1989 to August 1990

TRACE METALS, MAJOR IONS, NUTRIENTS AND PHYSICAL PARAMETERS IN SURFACE WATERS

by

H. Alkema

Quality Assurance Project
Research & Applications Branch
National Water Research Institute
Burlington, Ontario

December 1990

(Ce rapport est aussi disponible en français)

Management Perspective

Interlaboratory QA studies FP45 - FP56

Under terms of the Federal-Provincial Agreements on Water Quality, a quality assurance program was initiated to assess comparability of surface water analysis data generated by the Provincial and Federal laboratories.

Within the framework of the NWRI Quality Assurance Project, six bimonthly quality assurance studies were distributed between September 1989 and August 1990. These studies dealt with the analysis of trace metals, major ions, nutrients and physical parameters in a variety of typical sample types.

In this annual report, data for fourteen laboratories (for the above mentioned period) are presented and evaluated for some 40 parameters involving some 200 analytical procedures.

Generally, analyses by both public and private laboratories were performed well, nevertheless, a number of key analyses were identified to be out of control and promptly brought to the attention of the laboratory managers. Prompt feedback helped laboratory managers to improve the quality of their data, and to alert them to re-evaluate their internal quality control. However, two laboratories continued to have an excessive number of flagged results and generally failed to make improvements in their weak areas.

Dr. J. Lawrence
Director
Research & Applications Branch

PERSPECTIVE DE GESTION

Etudes AQ Interlaboratoire FP45 - 56

Aux termes de l'Accord Canada-Provincial sur la qualité des eaux, on a mis sur pied un programme d'assurance de la qualité pour évaluer la comparabilité des résultats d'analyse des eaux de surface émenant des laboratoires provincials par rapport à ceux des laboratoires du gouvernement fédéral.

Suivant les réglementations de projet de l'assurance de qualité de l'INRE, six études d'assurance de la qualité ont été menées entre Septembre 1989 et Août 1990 (soit une tous les deux mois). Ces études ont été porté sur l'analyse des composés métalliques à l'état de trace, des principaux ions, des substances nutratives et des paramètres physiques à partir d'un éventail d'échantillons typiques.

Dans le rapport annuel, on présente et on évalue les données que nous ont fournies de quinzaine laboratoires (pour la période précitée) ayant eu à déterminer 40 paramètres en faisant appel à deux centaines environs de méthodes analytiques différentes.

Règle générale, les laboratoires ont éffectué de bonnes analyses. Cependant, on a constaté que les résultats de certaines analyses clés s'écartaient trop des marges d'erreur permises. Les directeurs de laboratoires visés en ont été informés ce qui leur a permis de se rendre compte qu'ils doivent réevaluer les méthodes de contrôle interne de la qualité et produire des données plus exactes. Cependent, deux laboratoires ont continué d'avoir un nombre excessif de résultats erronés (indiqés *) et n'ont jamais montrés d'amélioration de leurs points faibles.

Dr. J. Lawrence
Directeur
Direction de la Recherche et des Applications

ABSTRACT

This compiled report of twelve quality assurance studies evaluates the chemical analysis of surface waters for laboratories in the Federal Provincial Quality Assurance (FPQA) program. This report covers the period from September 1989 to August 1990 (studies FP45 to FP56). Each pair of studies describes the following: study design, treatment of data, performance indicators, and comments on individual laboratory performance.

A single bimonthly study consists of 4 standard reference samples of known values. Half of these samples are for trace metal analysis at two concentrations. The other half of the samples are analyzed for 25 major ion, nutrient and physical parameters. Altogether, over 200 analysis methodologies with their analysis results are tabulated in the data summary. Since other laboratories in other QA programs analyze the same samples, all results are reported in the data summary so that statistical analyses are more accurately made.

Each monthly report, in conclusion, summarizes laboratory performance. Good performance (and comparability) is indicated by the lack of flagged results. More than several flagged results indicates poorer performance. Results are flagged by two criteria: those that exceed the 10% or 1 Standard Deviation Test, and those that are statistical outliers according to the Grubbs' outlier test.

Generally, analyses were performed well, nevertheless, a number of key analyses were identified to be out of control and promptly brought to the attention of laboratory managers. Two laboratories in the FPQA program continued to have an accessive number of flagged results and generally failed to make improvements.

RESUME

Ce rapport annuel regroupant douze études sur le contrôle de la qualité (CQ) présente une évaluation de l'analyse chimique des eaux de surface pour les laboratoires aux termes de l'Accord Canada-Provincial sur la qualité des eaux. Dans ce rapport couvrant la période de Septembre 1989 à Août 1990 (études CQ FP45 à FP56), on décrit les aspects suivant du contrôle se la qualité: conception des études, traitment des données, indicateurs d'exactitude et commentaires sur la performance individuelle des laboratoires.

Une étude bimestrielle individuelle a porté sur quatre échantillons de référence de valeurs connues. On utilise la moitié de ces échantillons pour analyser la teneur en métaux à l'état de trace à deux niveaux. Les laboratoires utilisent l'autre moitié des échantillons pour faire rapport sur 25 principaux ions, des substances nutratives et des paramètres physiques à partir d'un éventail d'échantillons typiques. Environs 200 méthodologies d'analyse et résultats individuelles sont ensuite rassemblés dans un résumé des données. Puisque les autres laboratoires des programmes de contrôle de la qualité analysent les mêmes échantillons, on peut, grâce aux résultats présentés, faire les analyses statistiques plus précises possibles.

A la conclusion de chaque rapport bimestriel, on trouve un résumé de la performance des laboratoires. L'absence de résultats indiqués indique une bonne performance (et la comparabilité des données). S'il y a plusieurs résultats indiqués, c'est que la performance a été plus faibles. On indique aux résultats en fonction de deux critères: s'ils divergent de plus de test de 10% ou le deviation standard et, selon de Grubbs, ils sont des valeurs statistiques rejetées.

En général, les résultats des analyses ont été satisfaisant; on a constaté que les résultats de certaines analyses clés s'écartaient trop des marges d'erreur permises. Les directeurs de laboratoires visés en ont été informés ce qui leur a permis de se rendre compte qu'ils doivent réevaluer les méthodes de contrôle interne de la qualité et produire des données plus exactes. Cependent, deux laboratoires ont continué d'avoir un nombre excessif de résultats erronés (indiqués *) et n'ont jamais montrés d'amélioration de leurs points faibles.

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January 5 Janvier, 1990.

To: Participants & Managers in:
A: Participants et Directeurs dans:

Federal-Provicial Quality Assurance Program
Programme d'Assurance-Qualité Fédéral-Provincial (PAQFP)

Final Report/Rapport Dernier: FPQA Studies/Etudes 45-46

Vous trouverez en annexe le résumé dernier de l'étude F/P susmentionées.

Il y a un tableau supplimentaire dans ce rapport dernier. Ce tableau de résultats indiqués aidera les responsables et les directeurs évaluer la performance de leur laboratoire. La performance des laboratoires est rangé avec le pourcentage des résultats indiqués. Si la performance est pauvre, le 'QC' du laboratoire devrait être réviser. Le tableau supplimentaire donnera un meilleur indication de la performance et l'amèlioration du laboratoire.

Si vous avez de commentaire sur ce résumé, ou des corrections valable à notre base de données, veuillez me les transmettre.

I have enclosed the final report for the above mentioned studies.

There is a noteworthy additional table in this final report. This table, a summary of flagged results, is included to assist laboratory heads and managers in evaluating their laboratories performance relative to others. The laboratories are ranked according to the % of results flagged. In case of poor performance, internal QC procedures for the parameters listed in the Flagged Results Table should be reviewed. The additional table will give a more complete indication of laboratory performance or improvement.

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry A.

H. Alkema
Quality Assurance Project
Research & Applications Branch

Attachment: Distribution List
En annexe: Liste de diffusion

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RESEARCH & APPLICATIONS BRANCH

FINAL REPORT

REPORT NO. RAB 90-02 (Eng)

FEDERAL PROVINCIAL QUALITY ASSURANCE PROGRAM

STUDIES 45 AND 46

for September and October 1989

TRACE METALS, MAJOR IONS, NUTRIENTS AND PHYSICAL PARAMETERS IN SURFACE WATERS

by

H. Alkema

Quality Assurance Section
National Water Research Institute
Burlington, Ontario

January 1990

(Ce rapport est aussi disponible en français)

Introduction

As part of an on–going study, the Quality Assurance Section, NWRI in Burlington, Ontario, has been sending reference water samples bi–monthly to chemical laboratories participating in the FP program. This report summarizes the most recent FP interlaboratory quality assurance studies: FP 45 and 46, for the months September and October, 1989. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The concentrations were from medium to high.

Study Design

Four water samples were submitted to each laboratory for chemical analyses. Two samples were submitted for trace metals analysis, while the remaining two were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the four samples:

FP 45 – Sample 1 – 125 ml, high level* for trace metals (3% HNO_3)
Sample 2 – up to 1 L, major ions etc., stored at 4°C

FP 46 – Sample 3 – 1 L, low level* for trace metals (0.2% HNO_3)
Sample 4 – up to 1 L, major ions, etc., stored at 4°C

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were reported as required by the standard report sheets provided with the QA samples. Submitted results were tabulated for each parameter, first for each method reported, and then for

all methods combined. These data, and the resulting statistics are presented in the Data Summary. (attached)

Preliminary data summaries (RAB # 89-20), including problematic results, were sent November 8, and November 24. Each laboratory was given three weeks to notify us of any errors in data transcription, compilation, or flags.

Performance Indicators

In the Federal Provincial QA program, two types of reference samples are used for the accuracy assessment. These are Reference Waters (RMs) and Certified Reference waters (CRMs) which have Design Values for the stable parameters. Also, regional samples are used occasionally as natural representative samples. The means for these regional samples, and the Design Values for the reference waters are used to test each reported result for accuracy.

Percentage deviations from the reference values are used as an indication by the laboratory head to determine the extent of the discrepancies between the laboratory result and the reference value. However, please keep in mind that at low levels, high % deviations are often seen, and may be misleading if interpreted too strictly.

A result which deviates more than the greater of 10% or 1 standard deviation from the reference value is marked with an asterisk in the data table and its value tabulated in the flagged data table (Table 1). Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned an 'HDL' and is tabulated for each laboratory in Table 1.

If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

Attached are two tables listing flagged data by laboratory (Table 1), and listing parameters for which there was a high standard deviation (Table 2). Formerly called a high coefficient of variation, the standard deviation is generated with standardized criteria that are included with the automated flagging routine. These automated criteria have been in use since March 1988 (Study FP 27), and should provide a more accurate and consistent listing of the difficult to analyze parameters or levels. A listing of the criteria used to indicate high deviation of analysis is available on request. Your comments would be appreciated.

Provincial laboratories average number of deviations per sample was 1.2.
Federal laboratories average number of deviations per sample was 1.5.
(the worst laboratory excluded)

TABLE 1: FP & PPWB LABORATORIES FLAGGED RESULTS - STUDIES FP 45-46

LAB 1	FLAGS :	D I C	-17%		TKN	-46%		CHLORIDE	137%		
LAB 2	FLAGS :	MANGNESE	11%		D O C	-19%	R	ALKLINTY	12%		
		D O C	-32%		T N DIS	12%					
LAB 3	FLAGS :	T N DIS	23%		ALKLINTY	-22%		CHLORIDE	125%		
		AMMONIA	-69%								
LAB 4	FLAGS :	T N DIS	-24%		ALKLINTY	-12%		NITRATE	-11%		
LAB 5	FLAGS :	NITRATE	-19%		AMMONIA	43%		T N DIS	-55%	R	
		CHLORIDE	153%		FLUORIDE	37%					
LAB 6	FLAGS :	TKN	30%		NITRATE	-22%		AMMONIA	-29%		
		TOT P	1076%	R	CHLORIDE	114%		TKN	125%		
		NITRATE	39%	R	TOT P	150%					
	HDL :	VANADIUM									
LAB 7	FLAGS :	ALKLINTY	-14%		CHLORIDE	165%		TOT P	-88%	L	
LAB 8	FLAGS :	ALUMINUM	17%		NICKEL	-12%		COPPER	-33%	R	
		ZINC	-19%		CADMIUM	12%		LEAD	-12%		
		D I C	13%		ALKLINTY	15%		CHLORIDE	142%		
		PTASSIUM	-11%		CHROMIUM	23%		IRON	-30%	L	
		COPPER	-24%	L	ZINC	-34%	L	SULFATE	12%		
		PTASSIUM	-11%								
	HDL :	ALUMINUM			MANGNESE			IRON			
		COPPER			ZINC			D O C			
		TKN									
LAB 9	FLAGS :	ALUMINUM	-35%	R							
LAB 10	FLAGS :	COPPER	-15%		AMMONIA	-46%		CHLORIDE	111%		
		CHROMIUM	16%		IRON	-30%		LEAD	-21%		
	HDL :	TOT P			AMMONIA			TOT P			
LAB 11	FLAGS :	CHROMIUM	-19%		ALKLINTY	-12%		CHLORIDE	198%		
		CHROMIUM	23%		IRON	20%					
	HDL :	AMMONIA			AMMONIA						
LAB 13	FLAGS :	LEAD	-11%		ALKLINTY	12%		NITRATE	-12%		
LAB 14	FLAGS :	NONE									
LAB 15	FLAGS :	FLUORIDE	95%	R	VANADIUM	90%	R	CHROMIUM	23%		
		LEAD	-66%	R							
	HDL :	NICKEL									
LAB 16	FLAGS :	CHROMIUM	17%		IRON	13%		STRNTIUM	20%	R	
		LEAD	15%		D O C	-82%	R	D I C	495%	R	
		NITRATE	-33%	R	SODIUM	-14%	R	MGNESIUM	-17%	R	
		SILICA	-12%		SULFATE	31%	R	CALCIUM	-14%		
		VANADIUM	-24%		MANGNESE	39%		IRON	34%		
		STRNTIUM	22%		MOLYBNUM	-38%		D O C	779%	R	
		D I C	-79%	R	TKN	69%		NITRATE	-12%		
		SODIUM	-11%		MGNESIUM	-16%		SULFATE	13%		
		CALCIUM	-13%								

. . . ./2

LAB 19	FLAGS :	CHROMIUM	-24%	LEAD	-94% R	AMMONIA	-29% L
		CHLORIDE	131%	CALCIUM	11%	ALUMINUM	-18%
		COPPER	-24%	HARDNESS	13%	CALCIUM	17%
	HDL :	AMMONIA		TOT P		LEAD	
LAB 20	FLAGS :	CHROMIUM	-50% R	TKN	-28%	TOT N	-16%
		CHLORIDE	134%	ALUMINUM	128% R	CHROMIUM	70% R
LAB 21	FLAGS :	FLUORIDE	15%	CHLORIDE	134%	ZINC	559% R
		TURBIDTY	247%	NITRATE	-20%	AMMONIA	134%
		TOT N	-13%	HARDNESS	-20%	SILICA	-25%

NOTE: A VERY HIGH FREQUENCY OF FLAGGED RESULTS (OR A HIGH %) IS INDICATIVE OF POOR PERFORMANCE. ON THE OTHER HAND, LABS WITH FEW IF ANY FLAGS ARE JUDGED TO HAVE VERY GOOD PERFORMANCE.

ALSO, AN "R" FLAG INDICATES A NON COMPARABLE RESULT, THAT IS, ONE PRODUCED WITH NON RANDOM FACTORS. AN "L" FLAG INDICATES A 'LESS THAN' RESULT LOWER THAN THE REFERENCE VALUE.

TABLE 2: HIGH STANDARD DEVIATION

PARAMETER		LEVEL	
T N DIS	AT	1.990	PPM
CHLORIDE	AT	122.450	PPM
D O C	AT	1.628	PPM

Table 3:

FP & PPWB LABS - SUMMARY OF FLAGGED DATA - FP 45 FP 46

LAB	RESULTS REPORTED	>10% OR 1SD FLAGS	GRUBBS FLAGS	HDL'S INDICATED	% DATA FLAGGED
14	19	0	0	0	.0
9	50	1	1	0	2.0
1	66	3	0	0	4.5
3	70	4	0	0	5.7
15	62	4	3	1	6.5
10	68	6	0	3	8.8
2	52	5	1	0	9.6
11	52	5	0	2	9.6
20	59	6	3	0	10.2
7	27	3	0	0	11.1
13	26	3	0	0	11.5
6	60	8	2	1	13.3
19	66	9	1	5	13.6
4	20	3	0	0	15.0
5	32	5	1	0	15.6
21	45	9	1	0	20.0
8	56	16	1	7	28.6
16	64	25	9	0	39.1

NOTE: FLAGS GUIDELINE (PERFORMANCE INDEX)

0-3 FLAGS (<5%) - EXCELLENT TO VERY GOOD
4-9 FLAGS (<10%) - MODERATE PERFORMANCE
>10 FLAGS (>10%) - IMPROVEMENT NECESSARY, GENERATION OF INCOMPARABLE DATA

APPENDIX I

Definitions of Types of Metals Analysis

1. HIGH LEVEL ANALYSIS

Usually without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS), Inductively Coupled (Argon) Plasma or direct coupled plasma (ICAP, ICP, or DCP). Standards should contain the acid equivalent of the sample.

2. LOW LEVEL ANALYSIS

Analysis is carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP, or DCP.
3. Digestion of aqueous phase and ICAP or DCP analysis.
4. Graphite tube (flameless) AAS.

Updated March 1989.

APPENDIX II

Performance Indicators

1. Flagged Results

As a first indication that analysis results are appreciably deviant from the expected value, each submitted result is tested with the 10% or 1 Standard Deviation Rule. When a result is found to deviate more than 10%, or more than 1 standard deviation when this is greater than 10%, the result is flagged with an asterisk in the data summary and tabled for that laboratory in the Flagged Data Table. Typically at low levels the 10% criteria is too small and the 1 standard deviation criteria effectively indicates deviant analytical results. As performance indicator, the flagged results indicate to laboratory heads that in-house QC procedures and the methodology concerned need to be ivestigated. Results may still be comparable.

2. Grubbs' Rejectable Results

For every parameter, each laboratory result is statistically tested to see if it is outlying. Outlying results are caused by non random causes such as a faulty calibration or incorrect transcription. These outlying results, calculated by the Grubbs' procedure,* and indicated in the data tables with an 'R', are noncomparable with the other data for that parameter.

3. A High Standard Deviation for a Parameter

Occasionally data for a difficult to analyse parameter yields a very high relative standard deviation (RSD). When a high RSD is not due to outlying results, there are noncomparable results within the data set. In such a case, the RSD for that parameter is indicated in Table 2, entitiled: High Standard Deviations.

4. High Detection Limits (HDL's)

Each laboratory determines its own detection limits according to its own requirements. When major differences in detection limits occur, an HDL is indicated for the particular laboratory in the Flagged Data Table. An HDL indicates that low level analysis may not be comparable with the analyses of other laboratories.

* reference : Frank E. Grubbs, Technometrics, 1969, p. 1.

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 45 PP 85 DATE: 01/09/89 DUE DATE: 31/10/89 PAGE 1

SAMPLE 1 SPIKED SAMPLE. TRACE METALS DA. (IN 3.0% HNO3)

LAB	13004 AL TOT AAS GF	13009 AL TOT 5X ICP	13030	13111 AL DIS ICP DA	13302 AL EXT AAS DA	13321 AL EXT ICP DA	13322 AL EXT DCP DA	13999 ALUMINUM COMMON	23009 V TOT 5X ICP	23011 V TOT 5X ICP	23012 V TOT 5X DCP	23111 V DIS ICP DA
1	-	-	1.040	-	-	-	-	1.040	0.987	-	-	-
2	-	-	-	-	1.1	-	-	1.1	-	-	-	-
3	-	-	-	-	1.14	1.04	-	1.14	-	-	-	-
6	-	1.0	-	-	-	-	-	1.0	-	0.98	-	-
8	-	-	-	-	1.2	-	-	1.2 *	-	-	-	-
9	-	-	-	1.05	-	-	-	1.05	-	-	-	0.98
10	-	-	-	1.06	-	-	-	1.06	-	-	-	1.01
15	-	-	-	-	-	-	0.97	0.97	-	-	0.97	-
16	-	-	-	-	-	-	1.03	1.03	-	-	0.964	-
19	-	0.93	-	-	-	-	-	0.93	0.966	-	-	-
20	0.992	-	-	-	-	-	-	0.992	1.01	-	-	-
MEAN	.9920	.9650	1.0400	1.0550	1.1467	1.0400	1.0000	1.0465	.9877	.9800	.9670	.9950
STD DEV	-	.0495	-	.0071	.0503	-	.0424	.0776	.0220	-	.0042	.0212
REL STD	-	5.1	-	.7	4.4	-	4.2	7.4	2.2	-	.4	2.1
DES VAL	-	-	-	-	-	-	-	1.0286	-	-	-	-

LAB	23321 V EXT ICP DA	23999 VANADIUM COMMON	24009 CR TOT 5X ICP	24011 CR TOT 5X ICP	24012 CR TOT 5X DCP	24111 CR DIS ICP DA	24302 CR EXT AAS DA	24311 CR EXT ICP DA	24321 CR EXT ICP DA	24999 CHROMIUM COMMON	25003 MN TOT 5X ICP	25004 MN TOT AAS DA
1	-	0.987	0.102	-	-	-	-	-	-	0.102	0.098	-
3	0.960	0.960	-	-	-	-	-	-	0.101	0.101	-	-
6	-	0.98	-	0.10	-	-	-	-	-	0.10	-	-
8	-	-	-	-	-	-	0.11	-	-	0.11	-	-
9	-	0.98	-	-	-	0.100	-	-	-	0.100	-	-
10	-	1.01	-	-	-	0.101	-	-	-	0.101	-	-
11	-	-	-	-	-	-	0.080	-	-	0.080 *	-	0.100
13	-	-	-	-	-	-	-	0.09	-	0.09	-	-
15	-	0.97	-	-	0.093	-	-	-	-	0.093	-	-
16	-	0.964	-	-	0.115	-	-	-	-	0.115 *	-	-
19	-	0.966	0.075	-	-	-	-	-	-	0.075 *	-	-
20	-	1.01	0.049 R	-	-	-	-	-	-	0.049 R	-	-
MEAN	.9600	.9808	.0885	.1000	.1040	.1005	.0950	.0900	.1010	.0970	.0980	.1000
STD DEV	-	.0187	.0191	-	.0156	.0007	.0212	-	-	.0119	-	-
REL STD	-	1.9	21.6	-	15.0	.7	22.3	-	-	12.2	-	-
DES VAL	-	.9567	-	-	-	-	-	-	-	.09845	-	-

LAB	25009 MN TOT COL BIS	25010 MN TOT 5X ICP	25011 MN TOT 5X ICP	25012 MN TOT 5X DCP	25104 MN DIS AAS DA	25111 MN DIS ICP DA	25304 MN EXT AAS DA	25311 MN EXT ICP DA	25321 MN EXT ICP DA	25999 MANGNESE COMMON	26009 FE TOT 5X ICP	26011 FE TOT 5X ICP
1	-	-	-	-	-	-	-	-	-	0.098	0.511	-
2	-	-	-	-	-	-	0.11	-	-	0.11 *	-	-
3	-	-	-	-	-	-	0.098	-	0.100	0.098	-	-
6	-	-	0.099	-	-	-	-	-	-	0.099	-	0.51
8	-	-	-	-	-	-	-	0.089	-	0.089	-	-
9	-	-	-	-	-	0.100	-	-	-	0.100	-	-
10	-	-	-	-	-	0.102	-	-	-	0.102	-	-
11	-	-	-	-	-	-	-	-	-	0.100	-	-
13	-	-	-	-	-	-	-	0.10	-	0.10	-	-
15	-	-	-	0.100	-	-	-	-	-	0.100	-	-
16	-	-	-	0.100	-	-	-	-	-	0.100	-	-
19	0.100	-	-	-	-	-	-	-	-	0.100	0.503	-
20	-	0.099	-	-	-	-	-	-	-	0.099	0.485	-
21	-	-	-	-	0.095	-	-	-	-	0.095	-	-
MEAN	.1000	.0990	.0990	.1000	.0950	.1010	.1040	.0945	.1000	.0993	.4997	.5100
STD DEV	-	-	-	.0000	-	.0014	.0085	.0078	-	.0044	.0133	-
REL STD	-	-	-	-1.0	-	1.4	8.2	8.2	-	4.4	2.7	-
DES VAL	-	-	-	-	-	-	-	-	-	.09868	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 45 PP 85 SAMPLE 1

LAB	26012 FE TOT 5X DCP	26104 FE DIS AAS DA	26111 FE DIS ICP DA	26304 FE EXT AAS DA	26311 FE EXT ICP DA	26321 FE EXT ICP DA	26999 IRON COMMON	27009 CO TOT 5X ICP	27011 CO TOT 5X ICP	27012 CO TOT 5X DCP	27101 CO DIS AAS DA	27111 CO DIS ICP DA
1	-	-	-	-	-	-	0.511	0.297	-	-	-	-
2	-	-	-	0.50	-	-	0.50	-	-	-	-	-
3	-	-	-	0.507	-	0.500	0.507	-	-	-	-	-
6	-	-	-	-	-	-	0.51	-	0.29	-	-	-
8	-	-	-	-	0.447	-	0.447	-	-	-	-	-
9	-	-	0.50	-	-	-	0.50	-	-	-	-	0.28
10	-	-	0.49	-	-	-	0.49	-	-	-	-	0.304
11	-	-	-	0.500	-	-	0.500	-	-	-	-	-
13	-	-	-	-	0.46	-	0.46	-	-	-	-	-
15	0.495	-	-	-	-	-	0.495	-	-	0.287	-	-
16	0.562	-	-	-	-	-	0.562 *	-	-	0.301	-	-
19	-	-	-	-	-	-	0.503	0.302	-	-	-	-
20	-	-	-	-	-	-	0.485	0.286	-	-	-	-
21	-	0.52	-	-	-	-	0.52	-	-	-	0.29	-
MEAN	.5285	.5200	.4950	.5023	.4535	.5000	.4993	.2950	.2900	.2940	.2900	.2920
STD DEV	.0474	-	.0071	.0040	.0092	-	.0267	.0082	-	.0099	-	.0170
REL STD	9.0	-	1.4	.8	2.0	-	5.3	2.8	-	3.4	-	5.8
DES VAL	-	-	-	-	-	-	.4992	-	-	-	-	-

LAB	27301 CO EXT AAS DA	27321 CO EXT ICP DA	27999 COBALT COMMON	28009 NI TOT 5X ICP	28011 NI TOT 5X ICP	28012 NI TOT 5X DCP	28101 NI DIS AAS DA	28111 NI DIS ICP DA	28301 NI EXT AAS DA	28311 NI EXT ICP DA	28321 NI EXT ICP DA	28999 NICKEL COMMON
1	-	-	0.297	0.494	-	-	-	-	-	-	-	0.494
3	-	0.289	0.289	-	-	-	-	-	-	-	0.490	0.490
6	-	-	0.29	-	0.49	-	-	-	-	-	-	0.49
8	0.29	-	0.29	-	-	-	-	-	-	0.425	-	0.425 *
9	-	-	0.28	-	-	-	-	0.46	-	-	-	0.46
10	-	-	0.304	-	-	-	-	0.492	-	-	-	0.492
11	0.310	-	0.310	-	-	-	-	-	0.500	-	-	0.500
13	-	-	-	-	-	-	-	-	-	0.46	-	0.46
15	-	-	0.287	-	-	0.47	-	-	-	-	-	0.47
16	-	-	0.301	-	-	0.508	-	-	-	-	-	0.508
19	-	-	0.302	0.471	-	-	-	-	-	-	-	0.471
20	-	-	0.286	0.493	-	-	-	-	-	-	-	0.493
21	-	-	0.29	-	-	-	0.50	-	-	-	-	0.50
MEAN	.3000	.2890	.2938	.4860	.4900	.4890	.5000	.4760	.5000	.4425	.4900	.4810
STD DEV	.0141	-	.0088	.0130	-	.0269	-	.0226	-	.0247	-	.0229
REL STD	4.7	-	3.0	2.7	-	5.5	-	4.8	-	5.6	-	4.8
DES VAL	-	-	.2949	-	-	-	-	-	-	-	-	.4818

LAB	29009 CU TOT 5X ICP	29011 CU TOT 5X ICP	29012 CU TOT 5X DCP	29106 CU DIS AAS DA	29111 CU DIS ICP DA	29306 CU EXT AAS DA	29311 CU EXT ICP DA	29321 CU EXT ICP DA	29999 COPPER COMMON	30009 ZN TOT 5X ICP	30011 ZN TOT 5X ICP	30012 ZN TOT 5X DCP
1	0.101	-	-	-	-	-	-	-	0.101	0.109	-	-
2	-	-	-	-	-	0.10	-	-	0.10	-	-	-
3	-	-	-	-	-	-	-	0.101	0.101	-	-	-
6	-	0.10	-	-	-	-	-	-	0.10	-	0.10	-
8	-	-	-	-	-	-	0.069 R	-	0.069 R	-	-	-
9	-	-	-	-	0.100	-	-	-	0.100	-	-	-
10	-	-	-	-	0.088	-	-	-	0.088 *	-	-	-
11	-	-	-	-	-	0.110	-	-	0.110	-	-	-
13	-	-	-	-	-	-	0.10	-	0.10	-	-	-
15	-	-	0.096	-	-	-	-	-	0.096	-	-	0.097
16	-	-	0.098	-	-	-	-	-	0.098	-	-	0.117
19	0.097	-	-	-	-	-	-	-	0.097	0.107	-	-
20	0.095	-	-	-	-	-	-	-	0.095	0.107	-	-
21	-	-	-	0.11	-	-	-	-	0.11	-	-	-
MEAN	.0977	.1000	.0970	.1100	.0940	.1050	.1000	.1010	.0997	.1077	.1000	.1070
STD DEV	.0031	-	.0014	-	.0085	.0071	-	-	.0058	.0012	-	.0141
REL STD	3.1	-	1.5	-	9.0	6.7	-	-	5.8	1.1	-	13.2
DES VAL	-	-	-	-	-	-	-	-	.1030	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 45 PP 85 SAMPLE 1

LAB	30104 ZN DIS AAS DA	30111 ZN DIS ICP DA	30304 ZN EXT AAS DA	30311 ZN EXT ICP DA	30321 ZN EXT ICP DA	30999 ZINC COMMON	38012 SR TOT DCP DA	38111 SR DIS ICP DA	38301 SR EXT AAS DA	38321 SR EXT ICP DA	38999 STRNTIUM COMMON	42009 MO TOT 5X ICP
1	-	-	-	-	-	0.109	-	-	-	-	-	0.964
2	-	-	0.11	-	-	0.11	-	-	-	-	-	-
3	-	-	-	-	0.103	0.103	-	-	-	0.369	0.369	-
6	-	-	-	-	-	0.10	-	-	-	-	-	-
8	-	-	-	0.087	-	0.087 *	-	-	-	-	-	-
9	-	0.105	-	-	-	0.105	-	0.37	-	-	0.37	-
10	-	0.101	-	-	-	0.101	-	-	0.36	-	0.36	-
11	-	-	0.100	-	-	0.100	-	-	-	-	-	-
13	-	-	-	0.10	-	0.10	-	-	-	-	-	-
15	-	-	-	-	-	0.097	0.356	-	-	-	0.356	-
16	-	-	-	-	-	0.117	0.452 R	-	-	-	0.452 R	-
19	-	-	-	-	-	0.107	-	-	-	-	-	0.929
20	-	-	-	-	-	0.107	-	-	-	-	-	0.970
21	0.10 R	-	-	-	-	0.10 R	-	-	-	-	-	-
MEAN	-	.1030	.1050	.0935	.1030	.1033	.3560	.3700	.3600	.3690	.3638	.9543
STD DEV	-	.0028	.0071	.0092	-	.0073	-	-	-	-	.0068	.0221
REL STD	-	2.7	6.7	9.8	-	7.1	-	-	-	-	1.9	2.3
DES VAL	-	-	-	-	-	.1068	-	-	-	-	.3757	-

LAB	42011 MO TOT 5X ICP	42012 MO TOT 5X DCP	42111 MO DIS ICP DA	42121 MO EXT ICP DA	42999 MOLYBNUM COMMON	48009 CD TOT 5X ICP	48011 CD TOT 5X ICP	48012 CD TOT 5X DCP	48101 CD DIS AAS DA	48111 CD DIS ICP DA	48301 CD EXT AAS DA	48311 CD EXT ICP DA
1	-	-	-	-	0.964	0.097	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	0.10	-
3	-	-	-	0.964	0.964	-	-	-	-	-	-	-
6	0.99	-	-	-	0.99	-	0.10	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	0.11
9	-	-	0.95	-	0.95	-	-	-	-	0.104	-	-
10	-	-	0.973	-	0.973	-	-	-	-	0.093	-	-
11	-	-	-	-	-	-	-	-	-	-	0.097	-
13	-	-	-	-	-	-	-	-	-	-	-	0.10
15	-	0.91	-	-	0.91	-	-	0.093	-	-	-	-
16	-	1.02	-	-	1.02	-	-	0.100	-	-	-	-
19	-	-	-	-	0.929	0.098	-	-	-	-	-	-
20	-	-	-	-	0.970	0.099	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	0.097	-	-	-
MEAN	.9900	.9650	.9615	.9640	.9633	.0980	.1000	.0965	.0970	.0985	.0985	.1050
STD DEV	-	.0778	.0163	-	.0321	.0010	-	.0049	-	.0078	.0021	.0071
REL STD	-	8.1	1.7	-	3.3	1.0	-	5.1	-	7.9	2.2	6.7
DES VAL	-	-	-	-	.9676	-	-	-	-	-	-	-

LAB	48321 CD EXT ICP DA	48999 CADMIUM COMMON	56009 BA TOT 5X ICP	56011 BA TOT 5X ICP	56012 BA TOT 5X DCP	56111 BA DIS ICP DA	56301 BA EXT AAS DA	56321 BA EXT ICP DA	56999 BARIUM COMMON	82009 PB TOT 5X ICP	82011 PB TOT 5X ICP	82012 PB TOT 5X DCP
1	-	0.097	0.992	-	-	-	-	-	0.992	-	-	-
2	-	0.10	-	-	-	-	-	-	-	-	-	-
3	0.095	0.095	-	-	-	-	1.00	1.00	1.00	-	-	-
6	-	0.10	-	0.99	-	-	-	-	0.99	-	0.49	-
8	-	0.11 *	-	-	-	-	-	-	-	-	-	-
9	-	0.104	-	-	-	1.00	-	-	1.00	-	-	-
10	-	0.093	-	-	-	1.00	-	-	1.00	-	-	-
11	-	0.097	-	-	-	-	-	-	-	-	-	-
13	-	0.10	-	-	-	-	-	-	-	-	-	-
15	-	0.093	-	-	0.96	-	-	-	0.96	-	-	0.44
16	-	0.100	-	-	1.08	-	-	-	1.08	-	-	0.557
19	-	0.098	1.00	-	-	-	-	-	1.00	0.03 R	-	-
20	-	0.099	-	0.962	-	-	-	-	0.962	0.480	-	-
21	-	0.097	-	-	-	-	-	-	-	-	-	-
MEAN	.0950	.0988	.9960	.9760	1.0200	1.0000	1.0000	1.0000	.9982	.4800	.4900	.4985
STD DEV	-	.0044	.0057	.0198	.0849	.0000	-	-	.0346	-	-	.0827
REL STD	-	4.4	.6	2.0	8.3	-1.0	-	-	3.5	-	-	16.6
DES VAL	-	.09804	-	-	-	-	-	-	.9901	-	-	-

LAB	82111 PB DIS ICP DA	82301 PB EXT AAS DA	82302 PB EXT AAS SE	82311 PB EXT ICP DA	82321 PB EXT ICP DA	82999 LEAD COMMON	
1	-	-	0.499	-	-	0.499	
2	-	0.50	-	-	-	0.50	
3	-	-	-	-	0.490	0.490	
6	-	-	-	-	-	0.49	
8	-	-	-	0.424	-	0.424	*
9	0.49	-	-	-	-	0.49	
10	0.481	-	-	-	-	0.481	
11	-	0.480	-	-	-	0.480	
13	-	-	-	0.43	-	0.43	*
15	-	-	-	-	-	0.44	
16	-	-	-	-	-	0.557	*
19	-	-	-	-	-	0.03	R
20	-	-	-	-	-	0.480	
MEAN	.4855	.4900	.4990	.4270	.4900	.4801	
STD DEV	.0064	.0141	-	.0042	-	.0360	
REL STD	1.3	2.9	-	1.0	-	7.5	
DES VAL	-	-	-	-	-	.4835	

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 45 PP 85 SAMPLE 2

LAB	00110 IONIC BALANC %	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPARE	02021 COLOUR VIS COM	02023 COLOUR SPECT	02024 COL TRU SPECT	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02073 TURB HACH	02074 TURB NPLMTRI
1	2.93	10.92	11.58	-	-	-	2.	2.	1169.	1169.	0.1	-
2	23.5	10.759	6.658	5.0 L	-	-	-	5.0 L	1160.	1160.	0.1	-
3	-0.53	10.881	10.927	5. L	-	-	-	5. L	1165.	1165.	0.09	-
4	-	-	-	-	5. L	-	-	5. L	1167.	1167.	-	-
5	-	-	-	5.	-	-	-	5.	1180.	1180.	0.05	-
6	1.91	10.95	10.54	-	-	-	-	-	1130.	1130.	-	0.2
7	-	-	-	0.	-	-	-	0.	1158.	1158.	0.08	-
8	6.09	10.15	11.54	-	-	-	-	-	1180.	1180.	-	-
9	4.6	10.92	9.95	-	-	-	-	-	1150.	1150.	-	-
10	1.07	10.566	10.343	-	-	1.	-	1.	1130.	1130.	-	0.2
11	-	-	-	5. L	-	-	-	5. L	1170.	1170.	-	-
14	-	-	-	-	-	-	-	-	1164.	1164.	-	-
15	-	-	-	5. L	-	-	-	5. L	1100.	1100.	-	0.1 L
16	-	-	-	-	-	-	-	-	1140.	1140.	0.1	-
19	-	-	-	-	-	-	-	-	1174.	1174.	-	-
20	-4.86	10.38	11.44	-	-	-	-	-	1180.	1180.	-	-
21	-	-	-	-	-	5. L	-	5. L	1120.	1120.	-	0.1 L
MEAN	4.3388	10.6908	10.3723	2.5000	-	1.0000	2.0000	2.0000	1155.1176	1155.1176	.0867	.2000
STD DEV	8.4277	.2971	1.6157	3.5355	-	-	-	2.1602	23.4064	23.4064	.0197	.0000
REL STD	194.2	2.8	15.6	141.4	-	-	-	108.0	2.0	2.0	22.7	-1.0
DES VAL	-	-	-	-	-	-	-	2.7771	-	1158.44	-	-

LAB	02077 TURB HACH FZ	02081 TURB RATIO	02090 TURBIDTY COMMON	05100 BORON ?	05106 BORON F AZOMETH	05107 BORON ICP DA	05111 BORON F ICP DA	05190 BORON COMMON	06009 TOC CO2 IR	06051 TIC COMB IR	06104 DOC UV CO2 IR	06107 DOC UV CO2 PHE
1	-	-	0.1	-	-	-	-	-	-	-	-	28.6
2	-	-	0.1	-	-	-	-	-	-	-	-	23. R
3	-	-	0.09	-	-	-	-	-	-	-	26.4	-
4	-	1.0 L	1.0 L	-	-	-	-	-	-	-	28.6	-
5	-	-	0.05	-	-	-	-	-	-	-	-	-
6	-	-	0.2	-	-	-	-	-	-	-	30.	-
7	-	-	0.08	-	-	-	-	-	-	-	-	-
8	-	-	-	-	2.85	-	-	2.85	-	6.0	-	-
10	-	-	0.2	-	-	-	2.63	2.63	-	-	-	-
11	0.11	-	0.11	-	-	-	-	-	-	-	-	-
15	-	-	0.1 L	-	-	2.58	-	2.58	-	-	29.	-
16	-	-	0.1	2.45	-	-	-	2.45	-	-	-	-
19	-	-	-	2.63	-	-	-	2.63	28.	5.	-	-
21	-	-	0.1 L	-	-	-	-	-	-	-	-	-
MEAN	.1100	-	.1144	2.5400	2.8500	2.5800	2.6300	2.6280	28.0000	5.5000	28.5000	28.6000
STD DEV	-	-	.0515	.1273	-	-	-	.1443	-	.7071	1.5188	-
REL STD	-	-	45.0	5.0	-	-	-	5.5	-	12.9	5.3	-
DES VAL	-	-	.1203	-	-	-	-	2.7010	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 45 PP 85 SAMPLE 2

LAB	06108	06109 DOC UV CO2 OH	06112 DOC PER IR	06150 D O C COMMON	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 D I C COMMON	07003	07005 TKN INDO BL	07010 TKN AA SAL	07015 TKN DIG BERTHEL
1	-	-	-	28.6	-	4.4	-	4.4 *	-	-	-	-
2	-	-	-	23. R	-	-	-	-	-	-	-	-
3	-	-	-	26.4	5.6	-	-	5.6	-	-	0.882	-
4	-	-	-	28.6	-	-	-	-	-	-	-	-
6	-	-	-	30.	-	-	-	-	-	-	-	-
8	29.0	-	-	29.0	-	-	-	6.0 *	-	-	-	1.20
10	-	28.	-	28.	-	-	5.4	5.4	-	-	-	-
15	-	-	-	29.	5.	-	-	5.	-	-	-	-
16	-	-	5.1 R	5.1 R	31.7 R	-	-	31.7 R	1.2	-	-	-
19	-	-	-	28.	-	-	-	5.	-	-	-	-
21	-	-	-	-	-	-	-	-	-	1.35	-	-
MEAN	29.0000	28.0000	-	28.4500	5.3000	4.4000	5.4000	5.2333	1.2000	1.3500	.8820	1.2000
STD DEV	-	-	-	1.0461	.4243	-	-	.5574	-	-	-	-
REL STD	-	-	-	3.7	8.0	-	-	10.7	-	-	-	-
DES VAL	-	-	-	29.200	-	-	-	5.3321	-	-	-	-

LAB	07016 TKN BLK AMM-SAL	07021 TKN BLK DIG BER	07090 TKN COMMON	07105 NO3+NO2 DIS AA	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC	07112 NO3+NO2 UF AA CD	07390 NITRATE COMMON	07505 NH3 TOT AA BERT	07540 NH3 TOT AA SAL	07555 NH3 DIS AA PHEN
1	-	0.58	0.58 *	1.081	-	-	-	-	1.081	-	-	-
2	-	-	-	-	-	1.1	-	-	1.1	-	-	-
3	-	-	0.882	-	-	-	-	1.12	1.12	0.027	-	-
4	-	-	-	-	-	1.03	-	-	1.03	-	0.030	-
5	-	-	-	-	-	0.850	-	-	0.850 *	-	-	-
6	1.4	-	1.4 *	-	0.81	-	-	-	0.81 *	-	-	-
7	-	-	-	-	-	-	-	1.00	1.00	-	-	-
8	-	-	1.20	-	-	1.08	-	-	1.08	-	-	0.031
10	-	-	-	-	0.98	-	-	-	0.98	-	-	0.015
11	-	-	-	-	-	1.1	-	-	1.1	-	0.03 L	-
13	-	-	-	-	-	1.1	-	-	1.1	-	-	-
14	-	-	-	-	-	-	1.12	-	1.12	-	-	-
15	-	-	-	-	-	1.12	-	-	1.12	-	-	0.028
16	-	-	1.2	-	-	0.7 R	-	-	0.7 R	-	-	-
19	-	1.22	1.22	-	-	1.05	-	-	1.05	-	-	0.02 L
20	0.77	-	0.77 *	-	-	1.07	-	-	1.07	-	-	0.024
21	-	-	1.35	-	-	-	1.08	-	1.08	-	-	-
MEAN	1.0850	.9000	1.0753	1.0810	.8950	1.0556	1.1000	1.0600	1.0432	.0270	.0300	.0245
STD DEV	.4455	.4525	.2949	-	.1202	.0820	.0283	.0849	.0931	-	-	.0070
REL STD	41.1	50.3	27.4	-	13.4	7.8	2.6	8.0	8.9	-	-	28.4
DES VAL	-	-	1.1000	-	-	-	-	-	1.0203	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 45 PP 85 SAMPLE 2

LAB	07556 NH3 DIS INDO	07557 NH3 DIS AA INDO	07562 NH3 DIS AA EDTA	07590 AMMONIA COMMON	07601 T N UV AA SUL	07602 T N CALC'D	07605 T N UV HY SUL	07651 T N DIS UV AA	07655 T N DIS UV EDTA	07690 TOT N COMMON	07790 T N DIS COMMON	09103 F DIS COL SP
1	-	-	0.034	0.034	-	-	-	-	-	-	-	-
2	-	-	-	-	2.2	-	-	-	-	-	2.2	-
3	-	-	-	0.027	2.438	-	-	-	-	-	2.438 *	-
4	-	-	-	0.030	-	-	-	1.52	-	-	1.52 *	-
5	-	0.040	-	0.040 *	-	-	-	-	0.900 R	-	0.900 R	-
6	-	0.02	-	0.02 *	-	-	-	-	-	-	-	1.0
8	-	-	-	0.031	-	-	-	-	-	-	-	-
10	-	-	-	0.015 *	-	-	1.8	-	-	-	1.8	-
11	-	-	-	0.03 L	-	-	-	-	-	-	-	-
15	-	-	-	0.028	-	-	-	-	-	-	-	-
19	-	-	-	0.02 *	-	2.27	-	-	-	2.27	-	-
20	-	-	-	0.024	-	1.84	-	-	-	1.84 *	-	-
21	0.031	-	-	0.031	-	2.43	-	-	-	2.43	-	-
MEAN	.0310	.0300	.0340	.0280	2.3190	2.1800	1.8000	1.5200	-	2.1800	1.9895	1.0000
STD DEV	-	.0141	-	.0071	.1683	.3051	-	-	-	.3051	.4090	-
REL STD	-	47.1	-	25.3	7.3	14.0	-	-	-	14.0	20.6	-
DES VAL	-	-	-	.0283	-	-	-	-	-	1.9200	1.8403	-

LAB	09105 F DIS SP EL	09106 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL	09115 F DIS AA ALIZ	09116 F DIS IC	09190 FLUORIDE COMMON	10101 ALKLNTY TITR'N	10108 ALKLNTY POT TIT	10109 ALKLNTY POT TIT	10111 ALKLNTY TIT PRO	10112 ALKLNTY TIT CON
1	-	-	0.99	-	-	-	0.99	37.	-	-	-	-
2	-	1.0	-	-	-	-	1.0	38.	-	-	-	-
3	-	-	-	0.93	-	-	0.93	-	-	-	26.4	-
4	-	-	-	-	-	-	-	30.0	-	-	-	-
5	-	0.934	-	-	-	-	0.934	30.6	-	-	-	-
6	-	-	-	-	-	-	1.0	-	-	37.	-	-
7	-	-	-	-	-	-	-	29.3	-	-	-	-
8	-	-	-	-	-	-	-	-	-	39.0	-	-
9	-	-	-	-	-	-	-	-	34.	-	-	-
10	-	-	-	-	1.02	-	1.02	-	-	-	-	35.4
11	1.0	-	-	-	-	-	1.0	30.	-	-	-	-
13	-	-	-	-	-	-	-	38.	-	-	-	-
14	-	-	-	-	-	-	-	35.25	-	-	-	-
15	1.9 R	-	-	-	-	-	1.9 R	34.8	-	-	-	-
16	-	-	-	-	-	1.0	1.0	35.	-	-	-	-
19	0.90	-	-	-	-	-	0.90	-	-	34.2	-	-
20	0.89	-	-	-	-	-	0.89	36.2	-	-	-	-
21	-	1.12	-	-	-	-	1.12 *	35.8	-	-	-	-
MEAN	.9300	1.0180	.9900	.9300	1.0200	1.0000	.9804	34.1625	34.0000	36.7333	26.4000	35.4000
STD DEV	.0608	.0943	-	-	-	-	.0648	3.2699	-	2.4111	-	-
REL STD	6.5	9.3	-	-	-	-	6.6	9.6	-	6.6	-	-
DES VAL	-	-	-	-	-	-	.9764	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 45 PP 85 SAMPLE 2

LAB	10190 ALKLINTY COMMON	10301 PH	10302	10390 PH COMMON	10602 HARDNSS CALC'D	10603 HARDNSS TITR'N	10606 HARDNSS CALC'D	10690 HARDNESS COMMON	11001 NA TOT AAS	11005 NA TOT ICP	11007 NA DIS DCP	11102 NA F AAS
1	37.	7.52	-	7.52	404.	-	-	404.	-	-	-	-
2	38. *	7.5	-	7.5	402.2	-	-	402.2	-	-	-	-
3	26.4 *	7.32	-	7.32	-	-	403.1	403.1	-	-	-	-
4	30.0 *	7.50	-	7.50	-	-	-	-	-	-	-	-
5	30.6	7.58	-	7.58	-	-	-	-	-	-	-	-
6	37.	7.8	-	7.8	-	405.	-	405.	-	-	-	53.
7	29.3 *	7.5	-	7.5	-	409.5	-	409.5	-	-	-	-
8	39.0 *	6.85	-	6.85	379.	-	-	379.	-	-	-	-
9	34.	7.4	-	7.4	400.	-	-	400.	-	52.	-	-
10	35.4	7.51	-	7.51	-	-	-	-	-	47.	-	-
11	30. *	7.2	-	7.2	418.	-	-	418.	-	-	-	50.
13	38. *	7.5	-	7.5	-	416.	-	416.	-	-	-	-
14	35.25	7.55	-	7.55	-	-	-	-	52.0	-	-	-
15	34.8	7.7	-	7.7	434.	-	-	434.	-	-	-	-
16	35.	7.37	-	7.37	400.	-	-	400.	-	-	44.0 R	-
19	34.2	7.6	-	7.6	440.	-	-	440.	-	52.0	-	-
20	36.2	-	7.6	7.6	381.	-	-	381.	-	-	-	-
21	35.8	7.44	-	7.44	406.	-	-	406.	-	-	-	-
MEAN	34.2194	7.4612	7.6000	7.4689	406.4200	410.1667	403.1000	406.9857	52.0000	50.3333	-	51.5000
STD DEV	3.5216	.2090	-	.2054	19.7953	5.5302	-	16.7251	-	2.8868	-	2.1213
REL STD	10.3	2.8	-	2.8	4.9	1.3	-	4.1	-	5.7	-	4.1
DES VAL	34.004	-	-	7.4469	-	-	-	407.691	-	-	-	-

LAB	11103 NA DIS FL PH	11104 NA DIS FLAME	11105 NA DIS AAS DA	11107 NA UF FL PH	11111 NA DIS ICP	11311 NA EXT ICP	11990 SODIUM COMMON	12005 MG TOT ICP	12012 MG TOT DCP	12102 MG DIS AAS DA	12105 MG DIS AAS DA	12106 MG UF AAS DA
1	54.0	-	-	-	-	-	54.0	-	-	-	35.0	-
2	51.0	-	-	-	-	-	51.0	-	-	-	-	-
3	-	-	-	51.4	-	-	51.4	-	-	-	-	33.6
5	53.0	-	-	-	-	-	53.0	-	-	37.0	-	-
6	-	-	-	-	-	-	53.	-	-	35.2	-	-
7	-	-	50.7	-	-	-	50.7	-	-	34.4	-	-
8	-	-	-	-	-	48.5	48.5	-	-	-	-	-
9	-	-	-	-	-	-	52.	35.	-	-	-	-
10	-	-	-	-	-	-	47.	35.	-	-	-	-
11	-	-	-	-	-	-	50.	-	-	38.	-	-
13	-	-	-	-	53.27	-	53.27	-	-	-	-	-
14	-	-	-	-	-	-	52.0	-	-	38.4	-	-
15	-	-	-	-	54.8	-	54.8	-	-	-	-	-
16	-	-	-	-	-	-	44.0 R	-	29.1 R	-	-	-
19	-	-	-	-	-	-	52.0	33.8	-	-	-	-
20	-	51.5	-	-	-	-	51.5	-	-	-	-	-
MEAN	52.6667	51.5000	50.7000	51.4000	54.0350	48.5000	51.6113	34.6000	-	36.6000	35.0000	33.6000
STD DEV	1.5275	-	-	-	1.0819	-	2.0308	.6928	-	1.7436	-	-
REL STD	2.9	-	-	-	2.0	-	3.9	2.0	-	4.8	-	-
DES VAL	-	-	-	-	-	-	51.275	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 45 PP 85 SAMPLE 2

LAB	12107 MG DIS AAS AUT	12111 MG DIS ICP	12311 MG EXT ICP	12990 MGNESIUM COMMON	14005	14090 SILICA ?	14102 SILICA ANSA AA	14103 SILICA MOL SUL	14105 SILICA MOL ASC	14106 SI FIL MOL ASC	14107 SILICA MOLY AA	14111 SILICA ICP DA
1	-	-	-	35.0	-	-	-	-	-	-	3.5	-
2	34.	-	-	34.	-	-	3.49	-	-	-	-	-
3	-	-	-	33.6	-	-	-	-	-	3.33	-	-
5	-	-	-	37.0	-	-	-	-	3.5	-	-	-
6	-	-	-	35.2	-	-	-	-	-	-	-	-
7	-	-	-	34.4	-	-	-	-	-	-	-	-
8	-	-	32.5	32.5	-	-	-	-	3.3	-	-	-
9	-	-	-	35.	-	-	-	-	-	-	-	3.4
10	-	-	-	35.	3.5	3.5	-	-	-	-	-	-
11	-	-	-	38.	-	-	3.4	-	-	-	-	-
13	-	34.2	-	34.2	-	-	-	-	-	-	-	-
14	-	-	-	38.4	-	-	-	-	-	-	-	-
15	-	36.9	-	36.9	-	-	-	-	-	-	-	3.36
16	-	-	-	29.1 R	-	-	-	-	-	-	-	-
19	-	-	-	33.8	-	-	-	3.54	-	-	-	-
20	-	31.9	-	31.9	-	-	-	-	3.6	-	-	-
21	-	-	-	-	-	-	3.23	-	-	-	-	-
MEAN	34.0000	34.3333	32.5000	34.9933	3.5000	3.5000	3.3733	3.5400	3.4667	3.3300	3.5000	3.3800
STD DEV	-	2.5027	-	1.8798	-	-	.1320	-	.1528	-	-	.0283
REL STD	-	7.3	-	5.4	-	-	3.9	-	4.4	-	-	.8
DES VAL	-	-	-	34.654	-	-	-	-	-	-	-	-

LAB	14112 SILICA DCP DA	14190 SILICA COMMON	15301 T P ACL AA ASC	15313 T P ACL AA SNCL	15401 T P UV AA ASC	15403 T P UF AA SNCL	15406 T P UF AA ASC	15407 T P ASC AC	15409 T P BLK AA ASC	15413 T P ACL AA SNCL	15421 T P BLK DIG ASC	15490 TOT P COMMON
1	-	3.5	-	-	-	-	-	-	-	-	0.004	0.004
2	-	3.49	-	-	-	-	-	-	-	0.001 L	-	0.001 L
3	-	3.33	-	-	-	-	-	-	-	0.0002	-	0.0002
4	-	-	-	-	-	-	0.003 L	-	-	-	-	0.003 L
5	-	3.5	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	0.02 R	-	-	0.02 R
7	-	-	-	-	-	0.001	-	-	-	-	-	0.001
8	-	3.3	-	-	-	-	-	-	-	0.002 L	-	0.002 L
9	-	3.4	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	0.01 L	-	-	-	-	-	-	0.01 L
11	-	3.4	-	0.005 L	-	-	-	-	-	-	-	0.005 L
15	-	3.36	-	-	-	-	-	-	-	-	-	-
16	2.98	2.98 *	-	-	-	-	-	-	-	-	-	-
19	-	3.54	-	-	-	-	0.02 L	-	-	-	-	0.02 L
20	-	3.6	0.003 L	-	-	-	-	-	-	-	-	0.003 L
21	-	3.23	-	-	-	-	-	0.005 L	-	-	-	0.005 L
MEAN	2.9800	3.3858	-	-	-	.0010	-	-	-	.0002	.0040	.0017
STD DEV	-	.1671	-	-	-	-	-	-	-	-	-	.0020
REL STD	-	4.9	-	-	-	-	-	-	-	-	-	115.6
DES VAL	-	3.3801	-	-	-	-	-	-	-	-	-	.00626

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 45 PP 85 SAMPLE 2

LAB	16302 SO4 DIS TURB BA	16303 SO4 DIS TIT THO	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UF AA MTB	16309 SO4 DIS I C	16310 SO4 DIS AA CALM	16311 SO4 DIS IC	16990 SULFATE COMMON	17203 CL DIS AA FE	17204 CL DIS AG TIT	17206 CL DIS AA HG
1	-	-	-	122.	-	-	-	-	122.	-	-	290.
2	-	-	126.	-	-	115.7	-	-	115.7	-	-	-
3	-	-	-	-	116.	-	-	-	116.	-	-	-
5	-	-	-	114.	-	-	-	-	114.	-	-	310.
6	-	-	116.	-	-	-	-	-	116.	-	262.	-
7	-	-	-	124.3	-	-	-	-	124.3	324.0	-	-
8	-	-	-	112.	-	-	-	-	112.	-	-	296.
9	-	-	-	-	-	112.	-	-	112.	-	-	-
10	-	-	-	-	-	-	110.	-	110.	-	-	-
11	-	-	-	114.	-	-	-	-	114.	-	-	365.
13	-	-	-	124.4	-	-	-	-	124.4	-	-	-
14	-	-	-	-	-	123.0	-	-	123.0	-	-	-
16	-	-	-	-	-	-	-	152. R	152. R	-	-	-
19	113.	-	-	-	-	-	-	-	113.	-	-	283.
20	-	-	-	124.	-	-	-	-	124.	286.	-	-
21	-	124.	-	-	-	-	-	-	124.	287.	-	-
MEAN	113.0000	124.0000	121.0000	119.2429	116.0000	116.9000	110.0000	-	117.6267	299.0000	262.0000	308.8000
STD DEV	-	-	7.0711	5.6249	-	5.5973	-	-	5.3308	21.6564	-	32.9500
REL STD	-	-	5.8	4.7	-	4.8	-	-	4.5	7.2	-	10.7
DES VAL	-	-	-	-	-	-	-	-	116.067	-	-	-

LAB	17208 CL DIS AA HG	17209 CL DIS I C	17210 CL DIS TIT CON	17211 CL DIS IC	17990 CHLORIDE COMMON	19001 K TOT AAS	19005 K TOT ICP	19008 K TOT DCP	19102 K DIS AAS	19103 K DIS FLM PH	19104 K DIS FLAME	19105 K DIS AAS DA
1	-	-	-	-	290. *	-	-	-	-	19.7	-	-
2	-	115.	-	-	115. *	-	-	-	-	19.7	-	-
3	276.	-	-	-	276. *	-	-	-	-	-	-	-
5	-	-	-	-	310. *	-	-	-	-	21.0	-	-
6	-	-	-	-	262. *	-	-	-	22.	-	-	-
7	-	-	-	-	324.0 *	-	-	-	20.4	-	-	-
8	-	-	-	-	296. *	-	-	-	-	-	-	-
9	-	120.	-	-	120.	-	21.	-	-	-	-	-
10	-	-	258.	-	258. *	-	20.9	-	-	-	-	-
11	-	-	-	-	365. *	-	-	-	-	-	-	-
14	-	116.0	-	-	116.0	19.3	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	21.5
16	-	-	-	117.	117.	-	-	18.4	-	-	-	-
19	-	-	-	-	283. *	-	21.2	-	-	-	-	-
20	-	-	-	-	286. *	-	-	-	-	20.4	-	-
21	-	-	-	-	287. *	-	-	-	-	-	19.3	-
MEAN	276.0000	117.0000	258.0000	117.0000	247.0000	19.3000	21.0333	18.4000	21.2000	20.2000	19.3000	21.5000
STD DEV	-	2.6458	-	-	85.0588	-	.1528	-	1.1314	.6272	-	-
REL STD	-	2.3	-	-	34.4	-	.7	-	5.3	3.1	-	-
DES VAL	-	-	-	-	122.450	-	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 45 PP 85 SAMPLE 2

LAB	19106 K DIS AAS LI	19107 K DIS FLM PH	19111 K DIS ICP	19301 K EXT HNO3 AA	19990 PTASSIUM COMMON	20005 CA TOT ICP	20007 CA TOT DCP	20050 CA DIS AAS NO	20100 CA DIS CALC'D	20103 CA DIS AAS	20107 CA DIS AAS	20108 CA DIS AAS UF
1	-	-	-	-	19.7	-	-	-	-	-	104.0	-
2	-	-	-	-	19.7	-	-	-	-	-	-	-
3	-	20.3	-	-	20.3	-	-	-	-	-	-	106.
5	-	-	-	-	21.0	-	-	-	-	106.	-	-
6	-	-	-	-	22.	-	-	-	104.	-	-	-
7	-	-	-	-	20.4	-	-	-	-	108.4	-	-
8	-	-	-	18.0	18.0 *	-	-	-	-	-	-	-
9	-	-	-	-	21.	105.	-	-	-	-	-	-
10	-	-	-	-	20.9	104.	-	-	-	-	-	-
11	21.	-	-	-	21.	-	-	-	-	105.	-	-
13	-	-	20.6	-	20.6	-	-	-	-	-	-	-
14	-	-	-	-	19.3	-	-	111.5	-	-	-	-
15	-	-	-	-	21.5	-	-	-	-	-	-	-
16	-	-	-	-	18.4	-	90.0	-	-	-	-	-
19	-	-	-	-	21.2	117.	-	-	-	-	-	-
20	-	-	-	-	20.4	-	-	-	-	-	-	-
21	-	-	-	-	19.3	-	-	-	-	-	-	-
MEAN	21.0000	20.3000	20.6000	18.0000	20.2765	108.6667	90.0000	111.5000	104.0000	106.4667	104.0000	106.0000
STD DEV	-	-	-	-	1.0808	7.2342	-	-	-	1.7474	-	-
REL STD	-	-	-	-	5.3	6.7	-	-	-	1.6	-	-
DES VAL	-	-	-	-	20.257	-	-	-	-	-	-	-

LAB	20110 CA DIS AAS AUT	20111 CA DIS ICP	20311 CA EXT ICP	20990 CALCIUM COMMON
1	-	-	-	104.0
2	105.	-	-	105.
3	-	-	-	106.
5	-	-	-	106.
6	-	-	-	104.
7	-	-	-	108.4
8	-	-	98.4	98.4
9	-	-	-	105.
10	-	-	-	104.
11	-	-	-	105.
13	-	109.1	-	109.1
14	-	-	-	111.5
15	-	113.	-	113.
16	-	-	-	90.0 *
19	-	-	-	117. *
20	-	100.	-	100.
MEAN	105.0000	107.3667	98.4000	105.4000
STD DEV	-	6.6711	-	6.1893
REL STD	-	6.2	-	5.9
DES VAL	-	-	-	105.013

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 46 PP 86 DATE: 01/10/89 DUE DATE: 31/10/89

SAMPLE 3 SPIKED SAMPLE. TRACE METALS -LOW. (IN 0.2% HNO3)

LAB	13004 AL TOT AAS GF	13009 AL TOT 5X ICP	13030	13111 AL DIS ICP DA	13302 AL EXT AAS DA	13304 AL EXT AAS GF	13305 AL EXT AAS SE	13322 AL EXT DCP DA	13999 ALUMINUM COMMON	23002 V TOT AAS SE	23009 V TOT 5X ICP	23011 V TOT 5X ICP
1	-	-	0.063	-	-	-	-	-	0.063	-	0.011	-
2	-	-	-	-	-	-	0.056	-	0.056	-	-	-
3	-	0.080	-	-	-	-	0.059	-	0.059	0.0104	0.0105	-
6	-	0.064	-	-	-	-	-	-	0.064	-	-	0.01 L
8	-	-	-	-	0.2 L	-	-	-	0.2 L	-	-	-
9	-	-	-	0.04 R	-	-	-	-	0.04 R	-	-	-
10	-	-	-	0.06	-	-	-	-	0.06	-	-	-
15	-	-	-	-	-	0.061	-	-	0.061	-	-	-
16	-	-	-	-	-	-	-	0.068	0.068	-	-	-
19	-	0.05	-	-	-	-	-	-	0.05 *	-	0.010	-
20	0.14 R	-	-	-	-	-	-	-	0.14 R	-	-	-
MEAN	-	.0647	.0630	.0600	-	.0610	.0575	.0680	.0601	.0104	.0105	-
STD DEV	-	.0150	-	-	-	-	.0021	-	.0054	-	.0005	-
REL STD	-	23.2	-	-	-	-	3.7	-	9.0	-	4.8	-
DES VAL	-	-	-	-	-	-	-	-	.06132	-	-	-

LAB	23012 V TOT 5X DCP	23111 V DIS ICP DA	23999 VANADIUM COMMON	24003 CR TOT AAS SE	24004 CR TOT AAS GF	24009 CR TOT 5X ICP	24011 CR TOT 5X ICP	24012 CR TOT 5X DCP	24111 CR DIS ICP DA	24303 CR EXT AAS SE	24999 CHROMIUM COMMON	25003 MN TOT 5X ICP
1	-	-	0.011	-	-	0.014	-	-	-	-	0.014	0.012
3	-	-	0.0104	0.0145	-	0.0157	-	-	-	-	0.0145	-
6	-	-	0.01 L	-	-	-	0.014	-	-	-	0.014	-
8	-	-	-	-	0.016	-	-	-	-	-	0.016 *	-
9	-	0.01	0.01	-	0.013	-	-	-	-	-	0.013	-
10	-	0.010	0.010	-	-	-	-	-	-	-	0.015 *	-
11	-	-	-	-	-	-	-	-	-	0.016	0.016 *	-
15	0.02 R	-	0.02 R	-	-	-	-	0.016	-	-	0.016 *	-
16	0.008	-	0.008 *	-	-	-	-	0.013	-	-	0.013	-
19	-	-	0.010	-	-	0.013	-	-	-	-	0.013	-
20	-	-	-	-	0.022 R	-	-	-	-	-	0.022 R	-
MEAN	.0080	.0100	.0099	.0145	.0145	.0142	.0140	.0145	.0150	.0160	.0145	.0120
STD DEV	-	.0000	.0010	-	.0021	.0014	-	.0021	-	-	.0013	-
REL STD	-	-1.0	10.2	-	14.6	9.6	-	14.6	-	-	8.7	-
DES VAL	-	-	.01054	-	-	-	-	-	-	-	.01297	-

LAB	25004 MN TOT AAS DA	25009 MN TOT COL BIS	25010 MN TOT 5X ICP	25011 MN TOT 5X ICP	25012 MN TOT 5X DCP	25107 MN DIS AAS GF	25111 MN DIS ICP DA	25304 MN EXT AAS DA	25311 MN EXT ICP DA	25999 MANGNESE COMMON	26003 FE TOT AAS GF	26005 FE TOT AAS SE
1	-	-	-	-	-	-	-	-	-	0.012	-	-
2	-	-	-	-	-	-	-	0.01	-	0.01	-	-
3	0.012	-	0.0115	-	-	-	-	-	-	0.012	-	0.0297
6	-	-	-	0.011	-	-	-	-	-	0.011	-	-
8	-	-	-	-	-	-	-	-	0.02 L	0.02 L	-	-
9	-	-	-	-	-	-	0.012	-	-	0.012	-	-
10	-	-	-	-	-	-	0.012	-	-	0.012	-	-
11	0.013	-	-	-	-	-	-	-	-	0.013	-	-
15	-	-	-	-	0.013	-	-	-	-	0.013	-	-
16	-	-	-	-	0.016	-	-	-	-	0.016 *	-	-
19	-	0.012	-	-	-	-	-	-	-	0.012	-	-
20	-	-	-	-	-	0.011	-	-	-	0.011	-	-
21	-	-	-	-	-	-	-	-	-	-	0.028	-
MEAN	.0125	.0120	.0115	.0110	.0145	.0110	.0120	.0100	-	.0122	.0280	.0297
STD DEV	.0007	-	-	-	.0021	-	.0000	-	-	.0015	-	-
REL STD	5.7	-	-	-	14.6	-	-1.0	-	-	12.6	-	-
DES VAL	-	-	-	-	-	-	-	-	-	.01153	-	-

LAB	26009 FE TOT 5X ICP	26011 FE TOT 5X ICP	26012 FE TOT 5X DCP	26111 FE DIS ICP DA	26305 FE EXT AAS SE	26311 FE EXT ICP DA	26999 IRON COMMON	27002 CO TOT AAS SE	27003 CO TOT AAS GF	27009 CO TOT 5X ICP	27011 CO TOT 5X ICP	27012 CO TOT 5X DCP
1	0.027	-	-	-	-	-	0.027	-	-	0.012	-	-
2	-	-	-	-	0.029	-	0.029	-	-	-	-	-
3	0.0321	-	-	-	-	-	0.0297	0.0102	-	0.0102	-	-
6	-	0.032	-	-	-	-	0.032	-	-	-	0.010	-
8	-	-	-	-	-	0.02 L	0.02 *	-	0.011	-	-	-
9	-	-	-	0.025	-	-	0.025	-	-	-	-	-
10	-	-	-	0.020	-	-	0.020 *	-	-	-	-	-
11	-	-	-	-	0.034	-	0.034 *	-	-	-	-	-
15	-	-	0.030	-	-	-	0.030	-	-	-	-	0.010
16	-	-	0.038	-	-	-	0.038 *	-	-	-	-	0.010
19	0.027	-	-	-	-	-	0.027	-	-	0.010	-	-
20	0.03	-	-	-	-	-	0.03	-	0.011	-	-	-
21	-	-	-	-	-	-	0.028	-	0.011	-	-	-
MEAN	.0290	.0320	.0340	.0225	.0315	-	.0291	.0102	.0110	.0107	.0100	.0100
STD DEV	.0025	-	.0057	.0035	.0035	-	.0045	-	.0000	.0011	-	.0000
REL STD	8.6	-	16.6	15.7	11.2	-	15.5	-	.0	10.3	-	-1.0
DES VAL	-	-	-	-	-	-	.02843	-	-	-	-	-

LAB	27111 CO DIS ICP DA	27302 CO EXT AAS SE	27999 COBALT COMMON	28002 NI TOT AAS SE	28007 NI TOT AAS GF	28009 NI TOT 5X ICP	28011 NI TOT 5X ICP	28012 NI TOT 5X DCP	28111 NI DIS ICP DA	28302 NI EXT AAS SE	28309 NI EXT AAS GF	28999 NICKEL COMMON
1	-	-	0.012	-	-	0.013	-	-	-	-	-	0.013
3	-	-	0.0102	0.0129	-	0.0119	-	-	-	-	-	0.0129
6	-	-	0.010	-	-	-	0.012	-	-	-	-	0.012
8	-	-	0.011	-	-	-	-	-	-	-	0.012	0.012
9	0.01	-	0.01	-	-	-	-	-	0.01	-	-	0.01
10	0.012	-	0.012	-	-	-	-	-	0.012	-	-	0.012
11	-	0.012	0.012	-	-	-	-	-	-	0.013	-	0.013
15	-	-	0.010	-	-	-	-	0.02 L	-	-	-	0.02 L
16	-	-	0.010	-	-	-	-	0.012	-	-	-	0.012
19	-	-	0.010	-	-	0.013	-	-	-	-	-	0.013
20	-	-	0.011	-	0.012	-	-	-	-	-	-	0.012
21	-	-	0.011	-	0.013	-	-	-	-	-	-	0.013
MEAN	.0110	.0120	.0108	.0129	.0125	.0126	.0120	.0120	.0110	.0130	.0120	.0123
STD DEV	.0014	-	.0009	-	.0007	.0006	-	-	.0014	-	-	.0009
REL STD	12.9	-	7.9	-	5.7	5.0	-	-	12.9	-	-	7.3
DES VAL	-	-	.01110	-	-	-	-	-	-	-	-	.01250

LAB	29003 CU TOT AAS GF	29005 CU TOT AAS SE	29009 CU TOT 5X ICP	29011 CU TOT 5X ICP	29012 CU TOT 5X DCP	29107 CU DIS AAS GF	29111 CU DIS ICP DA	29305 CU EXT AAS SE	29308 CU EXT AAS GF	29311 CU EXT ICP DA	29999 COPPER COMMON	30003 ZN TOT AAS GF
1	-	-	0.013	-	-	-	-	-	-	-	0.013	-
2	-	-	-	-	-	-	-	0.014	-	-	0.014	-
3	-	0.0139	0.0147	-	-	-	-	-	-	-	0.0139	-
6	-	-	-	0.014	-	-	-	-	-	-	0.014	-
8	-	-	-	-	-	-	-	-	-	0.010 L	0.010 *	-
9	-	-	-	-	-	-	0.013	-	-	-	0.013	-
10	-	-	-	-	-	-	0.012	-	-	-	0.012	-
11	-	-	-	-	-	-	-	0.014	-	-	0.014	-
14	-	-	-	-	-	0.0121	-	-	-	-	0.0121	-
15	-	-	-	-	-	-	-	-	0.0126	-	0.0126	-
16	-	-	-	-	0.014	-	-	-	-	-	0.014	-
19	-	-	0.010	-	-	-	-	-	-	-	0.010 *	-
20	0.012	-	-	-	-	-	-	-	-	-	0.012	0.016
21	0.012	-	-	-	-	-	-	-	-	-	0.012	0.10 R
MEAN	.0120	.0139	.0126	.0140	.0140	.0121	.0125	.0140	.0126	-	.0128	.0160
STD DEV	.0000	-	.0024	-	-	-	.0007	.0000	-	-	.0012	-
REL STD	-1.0	-	18.9	-	-	-	5.7	-1.0	-	-	9.4	-
DES VAL	-	-	-	-	-	-	-	-	-	-	.01317	-

LAB	30005 ZN TOT AAS SE	30009 ZN TOT 5X ICP	30011 ZN TOT 5X ICP	30012 ZN TOT 5X DCP	30111 ZN DIS ICP DA	30304 ZN EXT AAS DA	30305 ZN EXT AAS SE	30311 ZN EXT ICP DA	30999 ZINC COMMON	38009 SR TOT ICP DA	38012 SR TOT DCP DA	38111 SR DIS ICP DA
1	-	0.016	-	-	-	-	-	-	0.016	-	-	-
2	-	-	-	-	-	0.018	-	-	0.018	-	-	-
3	0.0153	0.0157	-	-	-	-	-	-	0.0153	0.366	-	-
6	-	-	0.018	-	-	-	-	-	0.018	-	-	-
8	-	-	-	-	-	-	-	0.010 L	0.010 *	-	-	-
9	-	-	-	-	0.015	-	-	-	0.015	-	-	0.38
10	-	-	-	-	0.014	-	-	-	0.014	-	-	-
11	-	-	-	-	-	-	0.017	-	0.017	-	-	-
15	-	-	-	0.015	-	-	-	-	0.015	-	0.361	-
16	-	-	-	0.016	-	-	-	-	0.016	-	0.441	-
19	-	0.015	-	-	-	-	-	-	0.015	-	-	-
20	-	-	-	-	-	-	-	-	0.016	-	-	-
21	-	-	-	-	-	-	-	-	0.10 R	-	-	-
MEAN	.0153	.0156	.0180	.0155	.0145	.0180	.0170	-	.0159	.3660	.4010	.3800
STD DEV	-	.0005	-	.0007	.0007	-	-	-	.0013	-	.0566	-
REL STD	-	3.3	-	4.6	4.9	-	-	-	8.0	-	14.1	-
DES VAL	-	-	-	-	-	-	-	-	.01517	-	-	-

LAB	38301 SR EXT AAS DA	38999 STRNTIUM COMMON	42009 MO TOT 5X ICP	42011 MO TOT 5X ICP	42012 MO TOT 5X DCP	42111 MO DIS ICP DA	42999 MOLYBNUM COMMON	48002 CD TOT AAS SE	48003 CD TOT AAS GF	48004	48009 CD TOT 5X ICP	48011 CD TOT 5X ICP
1	-	-	0.011	-	-	-	0.011	-	-	-	0.010	-
3	-	0.366	0.0122	-	-	-	0.0122	0.0101	-	-	0.0095	-
6	-	-	-	0.012	-	-	0.012	-	-	-	-	0.011
9	-	0.38	-	-	-	0.01	0.01	-	-	0.011	-	-
10	0.34	0.34	-	-	-	0.011	0.011	-	-	-	-	-
15	-	0.361	-	-	0.01	-	0.01	-	-	-	-	-
16	-	0.441 *	-	-	0.007	-	0.007 *	-	-	-	-	-
19	-	-	0.012	-	-	-	0.012	-	-	-	0.010	-
20	-	-	0.010	-	-	-	0.010	-	0.01	-	-	-
MEAN	.3400	.3776	.0113	.0120	.0085	.0105	.0106	.0101	.0100	.0110	.0098	.0110
STD DEV	-	.0382	.0010	-	.0021	.0007	.0016	-	-	-	.0003	-
REL STD	-	10.1	9.0	-	25.0	6.7	15.3	-	-	-	2.9	-
DES VAL	-	.3607	-	-	-	-	.01137	-	-	-	-	-

LAB	48012 CD TOT 5X DCP	48111 CD DIS ICP DA	48302 CD EXT AAS SE	48309 CD EXT AAS GF	48999 CADMIUM COMMON	56009 BA TOT 5X ICP	56011 BA TOT 5X ICP	56012 BA TOT 5X DCP	56111 BA DIS ICP DA	56999 BARIUM COMMON	82002 PB TOT AAS SE	82004 PB TOT AAS GF
1	-	-	-	-	0.010	0.054	-	-	-	0.054	-	-
2	-	-	0.011	-	0.011	-	-	-	-	-	-	-
3	-	-	-	-	0.0101	0.0536	-	-	-	0.0536	0.0092	-
6	-	-	-	-	0.011	-	0.051	-	-	0.051	-	-
8	-	-	-	0.011	0.011	-	-	-	-	-	-	-
9	-	-	-	-	0.011	-	-	-	0.05	0.05	-	0.01
10	-	0.009	-	-	0.009	-	-	-	0.05	0.05	-	-
11	-	-	0.010	-	0.010	-	-	-	-	-	-	-
15	-	-	-	0.0093	0.0093	-	-	0.053	-	0.053	-	-
16	0.011	-	-	-	0.011	-	-	0.061	-	0.061	-	-
19	-	-	-	-	0.010	0.054	-	-	-	0.054	-	-
20	-	-	-	-	0.01	-	0.055	-	-	0.055	-	0.010
21	-	-	-	-	-	-	-	-	-	-	-	0.011
MEAN	.0110	.0090	.0105	.0102	.0103	.0539	.0530	.0570	.0500	.0535	.0092	.0103
STD DEV	-	-	.0007	.0012	.0007	.0002	.0028	.0057	.0000	.0034	-	.0006
REL STD	-	-	6.7	11.8	6.9	.4	5.3	9.9	-1.0	6.3	-	5.6
DES VAL	-	-	-	-	.01036	-	-	-	-	.05233	-	-

LAB	82009 PB TOT 5X ICP	82011 PB TOT 5X ICP	82012 PB TOT 5X DCP	82302 PB EXT AAS SE	82309 PB EXT AAS GF	82999 LEAD COMMON
1	-	-	-	0.012	-	0.012
2	-	-	-	0.010	-	0.010
3	0.0100	-	-	-	-	0.0092
6	-	0.011	-	-	-	0.011
8	-	-	-	-	0.012	0.012
9	-	-	-	-	-	0.01
10	-	-	-	-	0.008	0.008 *
11	-	-	-	0.011	-	0.011
15	-	-	-	-	0.0034R	0.0034R
16	-	-	0.012	-	-	0.012
19	0.03 L	-	-	-	-	0.03 L
20	-	-	-	-	-	0.010
21	-	-	-	-	-	0.011
MEAN	.0100	.0110	.0120	.0110	.0100	.0106
STD DEV	-	-	-	.0010	.0028	.0013
REL STD	-	-	-	9.1	28.3	12.0
DES VAL	-	-	-	-	-	.01012

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 46 PP 86 SAMPLE 4

LAB	00110 IONIC BALANC %	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPARE	02021 COLOUR VIS COM	02023 COLOUR SPECT	02024 COL TRU SPECT	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02073 TURB HACH	02074 TURB NPLMTRI
1	0.	8.29	8.29	-	-	-	7.	7.	913.	913.	0.1	-
2	0.21	8.259	8.224	5.0	-	-	-	5.0	909.	909.	0.1	-
3	-1.07	8.274	8.454	5. L	-	-	-	5. L	912.	912.	0.07	-
4	-	-	-	-	5. L	-	-	5. L	910.	910.	-	-
5	-	-	-	5.	-	-	-	5.	920.	920.	0.05	-
6	1.42	8.40	8.17	-	-	-	-	-	880.	880.	-	0.20
7	0.8	8.35	8.21	8.	-	-	-	8.	878.	878.	0.07	-
8	6.68	7.70	8.80	-	-	-	-	-	925.	925.	-	-
9	2.13	8.4	8.1	-	-	-	-	-	887.	887.	-	-
10	0.24	8.212	8.172	-	-	4.	-	4.	880.	880.	-	0.1
11	-	-	-	5.	-	-	-	5.	900.	900.	-	-
14	-	-	-	-	-	-	-	-	916.0	916.0	-	-
15	-	-	-	5. L	-	-	-	5. L	880.	880.	-	0.1 L
16	-	-	-	-	-	-	-	-	900.	900.	0.1	-
19	-	-	-	-	-	-	-	-	915.	915.	-	-
20	-2.44	7.99	8.39	-	-	-	-	-	875.	875.	-	-
21	-	-	-	-	-	5. L	-	5. L	883.	883.	-	0.5
MEAN	.8856	8.2083	8.3122	5.7500	-	4.0000	7.0000	5.6667	899.0000	899.0000	.0817	.2667
STD DEV	2.5485	.2273	.2144	1.5000	-	-	-	1.5055	17.2301	17.2301	.0214	.2082
REL STD	287.8	2.8	2.6	26.1	-	-	-	26.6	1.9	1.9	26.2	78.1
DES VAL	-	-	-	-	-	-	-	4.5921	-	899.399	-	-

LAB	02077 TURB HACH FZ	02081 TURB RATIO	02090 TURBIDTY COMMON	05100 BORON ?	05106 BORON F AZOMETH	05107 BORON ICP DA	05111 BORON F ICP DA	05190 BORON COMMON	06009 TOC CO2 IR	06051 TIC COMB IR	06104 DOC UV CO2 IR	06107 DOC UV CO2 PHE
1	-	-	0.1	-	-	-	-	-	-	-	-	1.7
2	-	-	0.1	-	-	-	-	-	-	-	-	1.1
3	-	-	0.07	-	-	-	-	-	-	-	1.7	-
4	-	1.0 L	1.0 L	-	-	-	-	-	-	-	1.87	-
5	-	-	0.05	-	-	-	-	-	-	-	-	-
6	-	-	0.20	-	-	-	-	-	-	-	1.35	-
7	-	-	0.07	-	-	-	-	-	-	-	-	-
8	-	-	-	-	0.05 L	-	-	0.05 L	-	17.0	-	-
10	-	-	0.1	-	-	-	0.01	0.01	-	-	-	-
11	0.15	-	0.15	-	-	-	-	-	-	-	-	-
15	-	-	0.1 L	-	-	0.01	-	0.01	-	-	2.	-
16	-	-	0.1	0.05 L	-	-	-	0.05 L	-	-	-	-
19	-	-	-	0.012	-	-	-	0.012	2.	15.	-	-
21	-	-	0.5 *	-	-	-	-	-	-	-	-	-
MEAN	.1500	-	.1440	.0120	-	.0100	.0100	.0107	2.0000	16.0000	1.7300	1.4000
STD DEV	-	-	.1323	-	-	-	-	.0012	-	1.4142	.2815	.4243
REL STD	-	-	91.8	-	-	-	-	10.8	-	8.8	16.3	30.3
DES VAL	-	-	.1749	-	-	-	-	.01100	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 46 PP 86 SAMPLE 4

LAB	06108	06109 DOC UV CO2 OH	06112 DOC PER IR	06150 D O C COMMON	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 D I C COMMON	07003	07005 TKN INDO BL	07010 TKN AA SAL	07015 TKN DIG BERTHEL
1	-	-	-	1.7	-	16.0	-	16.0	-	-	-	-
2	-	-	-	1.1 *	-	-	-	-	-	-	-	-
3	-	-	-	1.7	16.1	-	-	16.1	-	-	0.104	-
4	-	-	-	1.87	-	-	-	-	-	-	-	-
6	-	-	-	1.35	-	-	-	-	-	-	-	-
8	5. L	-	-	5. L	-	-	-	17.0	-	-	-	0.2 L
10	-	1.3	-	1.3	-	-	16.2	16.2	-	-	-	-
15	-	-	-	2.	15.	-	-	15.	-	-	-	-
16	-	-	14.3 R	14.3 R	3.3 R	-	-	3.3 R	0.3	-	-	-
19	-	-	-	2.	-	-	-	15.	-	-	-	-
21	-	-	-	-	-	-	-	-	-	0.108	-	-
MEAN	-	1.3000	-	1.6275	15.5500	16.0000	16.2000	15.8833	.3000	.1080	.1040	-
STD DEV	-	-	-	.3400	.7778	-	-	.7705	-	-	-	-
REL STD	-	-	-	20.9	5.0	-	-	4.9	-	-	-	-
DES VAL	-	-	-	1.4801	-	-	-	15.832	-	-	-	-

LAB	07016 TKN BLK AMM-SAL	07021 TKN BLK DIG BER	07090 TKN COMMON	07105 NO3+NO2 DIS AA	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC	07112 NO3+NO2 UF AA CD	07390 NITRATE COMMON	07505 NH3 TOT AA BERT	07540 NH3 TOT AA SAL	07555 NH3 DIS AA PHEN
1	-	0.13	0.13	0.598	-	-	-	-	0.598	-	-	-
2	-	-	-	-	-	0.59	-	-	0.59	-	-	-
3	-	-	0.104	-	-	-	-	0.612	0.612	0.002	-	-
4	-	-	-	-	-	0.504	-	-	0.504 *	-	0.005	-
5	-	-	-	-	-	0.580	-	-	0.580	-	-	-
6	0.4	-	0.4 *	-	0.79 R	-	-	-	0.79 R	-	-	-
7	-	-	-	-	-	-	-	0.55	0.55	-	-	-
8	-	-	0.2 L	-	-	0.59	-	-	0.59	-	-	0.003
10	-	-	-	-	0.60	-	-	-	0.60	-	-	0.010 L
11	-	-	-	-	-	0.60	-	-	0.60	-	0.03 L	-
13	-	-	-	-	-	0.5	-	-	0.5 *	-	-	-
14	-	-	-	-	-	-	0.62	-	0.62	-	-	-
15	-	-	-	-	-	0.617	-	-	0.617	-	-	0.005 L
16	-	-	0.3 *	-	-	0.5	-	-	0.5 *	-	-	-
19	-	0.12	0.12	-	-	0.59	-	-	0.59	-	-	0.02 L
20	0.08	-	0.08	-	-	0.59	-	-	0.59	-	-	0.007
21	-	-	0.108	-	-	-	0.453	-	0.453 *	-	-	-
MEAN	.2400	.1250	.1774	.5980	.6000	.5661	.5365	.5810	.5684	.0020	.0050	.0050
STD DEV	.2263	.0071	.1223	-	-	.0457	.1181	.0438	.0510	-	-	.0028
REL STD	94.3	5.7	69.0	-	-	8.1	22.0	7.5	9.0	-	-	56.6
DES VAL	-	-	.1634	-	-	-	-	-	.5763	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 46 PP 86 SAMPLE 4

LAB	07556 NH3 DIS INDO	07557 NH3 DIS AA INDO	07562 NH3 DIS AA EDTA	07590 AMMONIA COMMON	07601 T N UV AA SUL	07602 T N CALC'D	07605 T N UV HY SUL	07651 T N DIS UV AA	07655 T N DIS UV EDTA	07690 TOT N COMMON	07790 T N DIS COMMON	09103 F DIS COL SP
1	-	-	0.006	0.006	-	-	-	-	-	-	-	-
2	-	-	-	-	0.75	-	-	-	-	-	0.75 *	-
3	-	-	-	0.002 *	0.650	-	-	-	-	-	0.650	-
4	-	-	-	0.005	-	-	-	0.619	-	-	0.619	-
5	-	0.003	-	0.003	-	-	-	-	0.600	-	0.600	-
6	-	0.01	-	0.01	-	-	-	-	-	-	-	0.1 L
8	-	-	-	0.003	-	-	-	-	-	-	-	-
10	-	-	-	0.010 L	-	-	0.72	-	-	-	0.72	-
11	-	-	-	0.03 L	-	-	-	-	-	-	-	-
15	-	-	-	0.005 L	-	-	-	-	-	-	-	-
19	-	-	-	0.02 L	-	0.71	-	-	-	0.71	-	-
20	-	-	-	0.007	-	0.67	-	-	-	0.67	-	-
21	0.015	-	-	0.015 *	-	0.561	-	-	-	0.561 *	-	-
MEAN	.0150	.0065	.0060	.0064	.7000	.6470	.7200	.6190	.6000	.6470	.6678	-
STD DEV	-	.0049	-	.0043	.0707	.0771	-	-	-	.0771	.0648	-
REL STD	-	76.1	-	68.1	10.1	11.9	-	-	-	11.9	9.7	-
DES VAL	-	-	-	.01191	-	-	-	-	-	.6972	.6603	-

LAB	09105 F DIS SP EL	09106 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL	09115 F DIS AA ALIZ	09116 F DIS IC	09190 FLUORIDE COMMON	10101 ALKLNTY TITR'N	10108 ALKLNTY POT TIT	10109 ALKLNTY POT TIT	10111 ALKLNTY TIT PRO	10112 ALKLNTY TIT CON
1	-	-	0.07	-	-	-	0.07	73.	-	-	-	-
2	-	0.07	-	-	-	-	0.07	66.1	-	-	-	-
3	-	-	-	0.11	-	-	0.11	-	-	-	68.5	-
4	-	-	-	-	-	-	-	68.9	-	-	-	-
5	-	0.113	-	-	-	-	0.113 *	69.1	-	-	-	-
6	-	-	-	-	-	-	0.1 L	-	-	68.	-	-
7	-	-	-	-	-	-	-	65.6	-	-	-	-
8	-	-	-	-	-	-	-	-	-	72.5	-	-
9	-	-	-	-	-	-	-	-	67.	-	-	-
10	-	-	-	-	0.09	-	0.09	-	-	-	-	65.
11	0.09	-	-	-	-	-	0.09	68.	-	-	-	-
13	-	-	-	-	-	-	-	62.	-	-	-	-
14	-	-	-	-	-	-	-	71.2	-	-	-	-
15	0.07	-	-	-	-	-	0.07	67.7	-	-	-	-
16	-	-	-	-	-	0.1	0.1	70.	-	-	-	-
19	0.08	-	-	-	-	-	0.08	-	-	68.6	-	-
20	0.10 L	-	-	-	-	-	0.10 L	70.6	-	-	-	-
21	-	0.09	-	-	-	-	0.09	71.	-	-	-	-
MEAN	.0800	.0910	.0700	.1100	.0900	.1000	.0883	68.6000	67.0000	69.7000	68.5000	65.0000
STD DEV	.0100	.0215	-	-	-	-	.0160	2.9872	-	2.4434	-	-
REL STD	12.5	23.6	-	-	-	-	18.1	4.4	-	3.5	-	-
DES VAL	-	-	-	-	-	-	.08231	-	-	-	-	-

LAB	10190 ALKLINTY COMMON	10301 PH	10302	10390 PH COMMON	10602 HARDNSS CALC'D	10603 HARDNSS TITR'N	10606 HARDNSS CALC'D	10690 HARDNESS COMMON	11001 NA TOT AAS	11005 NA TOT ICP	11007 NA DIS DCP	11102 NA F AAS
1	73.	8.05	-	8.05	257.	-	-	257.	-	-	-	-
2	66.1	8.0	-	8.0	261.2	-	-	261.2	-	-	-	-
3	68.5	7.78	-	7.78	-	-	261.5	261.5	-	-	-	-
4	68.9	8.02	-	8.02	-	-	-	-	-	-	-	-
5	69.1	8.05	-	8.05	-	-	-	-	-	-	-	-
6	68.	8.2	-	8.2	-	262.	-	262.	-	-	-	61.
7	65.6	8.0	-	8.0	-	268.0	-	268.0	-	-	-	-
8	72.5	7.33	-	7.33	246.	-	-	246.	-	-	-	-
9	67.	7.95	-	7.95	260.	-	-	260.	-	60.	-	-
10	65.	8.03	-	8.03	-	-	-	-	-	59.	-	-
11	68.	7.8	-	7.8	268.	-	-	268.	-	-	-	56.
13	62.	8.0	-	8.0	278.	-	-	278.	-	-	-	-
14	71.2	7.98	-	7.98	-	-	-	-	60.0	-	-	-
15	67.7	8.2	-	8.2	281.	-	-	281.	-	-	-	-
16	70.	7.91	-	7.91	250.	-	-	250.	-	-	52.8	-
19	68.6	8.1	-	8.1	297	-	-	297 *	-	59.7	-	-
20	70.6	-	8.1	8.1	247.	-	-	247.	-	-	-	-
21	71.	7.98	-	7.98	210.	-	-	210. *	-	-	-	-
MEAN	68.4889	7.9635	8.1000	7.9711	259.5636	265.0000	261.5000	260.4786	60.0000	59.5667	52.8000	58.5000
STD DEV	2.7551	.1972	-	.1940	22.7406	4.2426	-	20.0777	-	.5132	-	3.5355
REL STD	4.0	2.5	-	2.4	8.8	1.6	-	7.7	-	.9	-	6.0
DES VAL	66.204	-	-	7.9011	-	-	-	261.730	-	-	-	-

LAB	11103 NA DIS FL PH	11104 NA DIS FLAME	11105 NA DIS AAS DA	11107 NA UF FL PH	11111 NA DIS ICP	11311 NA EXT ICP	11990 SODIUM COMMON	12005 MG TOT ICP	12012 MG TOT DCP	12102 MG DIS AAS DA	12105 MG DIS AAS DA	12106 MG UF AAS DA
1	62.0	-	-	-	-	-	62.0	-	-	-	21.3	-
2	59.7	-	-	-	-	-	59.7	-	-	-	-	-
3	-	-	-	59.2	-	-	59.2	-	-	-	-	21.3
5	59.0	-	-	-	-	-	59.0	-	-	21.8	-	-
6	-	-	-	-	-	-	61.	-	-	20.9	-	-
7	-	-	57.6	-	-	-	57.6	-	-	21.6	-	-
8	-	-	-	-	-	54.6	54.6	-	-	-	-	-
9	-	-	-	-	-	-	60.	22.	-	-	-	-
10	-	-	-	-	-	-	59.	21.	-	-	-	-
11	-	-	-	-	-	-	56.	-	-	23.	-	-
13	-	-	-	-	60.4	-	60.4	-	-	-	-	-
14	-	-	-	-	-	-	60.0	-	-	21.9	-	-
15	-	-	-	-	62.9	-	62.9	-	-	-	-	-
16	-	-	-	-	-	-	52.8 *	-	18.1	-	-	-
19	-	-	-	-	-	-	59.7	21.9	-	-	-	-
20	-	59.5	-	-	-	-	59.5	-	-	-	-	-
MEAN	60.2333	59.5000	57.6000	59.2000	61.6500	54.6000	58.9625	21.6333	18.1000	21.8400	21.3000	21.3000
STD DEV	1.5695	-	-	-	1.7678	-	2.6099	.5508	-	.7570	-	-
REL STD	2.6	-	-	-	2.9	-	4.4	2.5	-	3.5	-	-
DES VAL	-	-	-	-	-	-	59.347	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 46 PP 86 SAMPLE 4

LAB	12107 MG DIS AAS AUT	12111 MG DIS ICP	12311 MG EXT ICP	12990 MGNESIUM COMMON	14102 SILICA ANSA AA	14103 SILICA MOL SUL	14105 SILICA MOL ASC	14106 SI FIL MOL ASC	14107 SILICA MOLY AA	14111 SILICA ICP DA	14112 SILICA DCP DA	14190 SILICA COMMON
1	-	-	-	21.3	-	-	-	-	14.9	-	-	14.9
2	21.	-	-	21.	15.5	-	-	-	-	-	-	15.5
3	-	-	-	21.3	-	-	-	14.29	-	-	-	14.29
5	-	-	-	21.8	-	-	14.5	-	-	-	-	14.5
6	-	-	-	20.9	-	-	-	-	-	-	-	-
7	-	-	-	21.6	-	-	-	-	-	-	-	-
8	-	-	20.2	20.2	-	-	13.5	-	-	-	-	13.5
9	-	-	-	22.	-	-	-	-	-	14.6	-	14.6
10	-	-	-	21.	-	-	14.0	-	-	-	-	14.0
11	-	-	-	23.	14.7	-	-	-	-	-	-	14.7
13	-	22.4	-	22.4	-	-	-	-	-	-	-	-
14	-	-	-	21.9	-	-	-	-	-	-	-	-
15	-	22.9	-	22.9	-	-	-	-	-	13.9	-	13.9
16	-	-	-	18.1 *	-	-	-	-	-	-	14.0	14.0
19	-	-	-	21.9	-	15.0	-	-	-	-	-	15.0
20	-	19.9	-	19.9	-	-	15.1	-	-	-	-	15.1
21	-	-	-	-	10.9	-	-	-	-	-	-	10.9 *
MEAN	21.0000	21.7333	20.2000	21.3250	13.7000	15.0000	14.2750	14.2900	14.9000	14.2500	14.0000	14.2223
STD DEV	-	1.6073	-	1.2097	2.4576	-	.6850	-	-	.4950	-	1.1432
REL STD	-	7.4	-	5.7	17.9	-	4.8	-	-	3.5	-	8.0
DES VAL	-	-	-	21.474	-	-	-	-	-	-	-	14.529

LAB	15301 T P ACL AA ASC	15313 T P ACL AA SNCL	15401 T P UV AA ASC	15403 T P UF AA SNCL	15406 T P UF AA ASC	15407 T P ASC AC	15409 T P BLK AA ASC	15413 T P ACL AA SNCL	15421 T P BLK DIG ASC	15490 TOT P COMMON	16302 SO4 DIS TURB BA	16303 SO4 DIS TIT THO
1	-	-	-	-	-	-	-	-	0.003	0.003	-	-
2	-	-	-	-	-	-	-	0.004	-	0.004	-	-
3	-	-	-	-	-	-	-	0.0063	-	0.0063	-	-
4	-	-	-	-	0.003 L	-	-	-	-	0.003 L	-	-
6	-	-	-	-	-	-	0.02	-	-	0.02 *	-	-
7	-	-	-	0.001 L	-	-	-	-	-	0.001 *	-	-
8	-	-	-	-	-	-	-	0.0065	-	0.0065	-	-
10	-	-	0.01 L	-	-	-	-	-	-	0.01 L	-	-
11	-	0.005 L	-	-	-	-	-	-	-	0.005 L	-	-
19	-	-	-	-	0.02 L	-	-	-	-	0.02 L	68.	-
20	0.003 L	-	-	-	-	-	-	-	-	0.003 L	-	-
21	-	-	-	-	-	0.005 L	-	-	-	0.005 L	-	70.
MEAN	-	-	-	-	-	-	.0200	.0056	.0030	.0080	68.0000	70.0000
STD DEV	-	-	-	-	-	-	-	.0014	-	.0069	-	-
REL STD	-	-	-	-	-	-	-	24.8	-	86.6	-	-
DES VAL	-	-	-	-	-	-	-	-	-	.00626	-	-

LAB	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UF AA MTB	16309 SO4 DIS I C	16310 SO4 DIS AA CALM	16311 SO4 DIS IC	16990 SULFATE COMMON	17203 CL DIS AA FE	17204 CL DIS AG TIT	17206 CL DIS AA HG	17208 CL DIS AA HG	17209 CL DIS I C
1	-	74.	-	-	-	-	74.	-	-	186.0	-	-
2	73.	-	-	72.	-	-	73.	-	-	-	-	195.
3	-	-	70.3	-	-	-	70.3	-	-	-	187.	-
5	-	73.7	-	-	-	-	73.7	-	-	192.	-	-
6	67.	-	-	-	-	-	67.	-	192.	-	-	-
7	-	-	-	-	-	-	-	186.9	-	-	-	-
8	-	80.	-	-	-	-	80. *	-	-	200.	-	-
9	-	-	-	74.	-	-	74.	-	-	-	-	190.
10	-	-	-	-	68.	-	68.	-	-	-	-	-
11	-	66.	-	-	-	-	66.	-	-	185.	-	-
13	-	76.4	-	-	-	-	76.4	-	-	-	-	-
16	-	-	-	-	-	81.	81. *	-	-	-	-	-
19	-	-	-	-	-	-	68.	-	-	191.	-	-
20	-	79.0	-	-	-	-	79.0	189.	-	-	-	-
21	-	-	-	-	-	-	70.	171.	-	-	-	-
MEAN	70.0000	74.8500	70.3000	73.0000	68.0000	81.0000	72.8857	182.3000	192.0000	190.8000	187.0000	192.5000
STD DEV	4.2426	5.0302	-	1.4142	-	-	4.9159	9.8423	-	5.9749	-	3.5355
REL STD	6.1	6.7	-	1.9	-	-	6.7	5.4	-	3.1	-	1.8
DES VAL	-	-	-	-	-	-	71.567	-	-	-	-	-

LAB	17210 CL DIS TIT CON	17211 CL DIS IC	17990 CHLORIDE COMMON	19001 K TOT AAS	19005 K TOT ICP	19008 K TOT DCP	19102 K DIS AAS	19103 K DIS FLM PH	19104 K DIS FLAME	19105 K DIS AAS DA	19106 K DIS AAS LI	19107 K DIS FLM PH
1	-	-	186.0	-	-	-	-	17.6	-	-	-	-
2	-	-	195.	-	-	-	-	17.2	-	-	-	-
3	-	-	187.	-	-	-	-	-	-	-	-	18.5
5	-	-	192.	-	-	-	-	18.7	-	-	-	-
6	-	-	192.	-	-	-	19.5	-	-	-	-	-
7	-	-	186.9	-	-	-	18.6	-	-	-	-	-
8	-	-	200.	-	-	-	-	-	-	-	-	-
9	-	-	190.	-	19.	-	-	-	-	-	-	-
10	192.	-	192.	-	18.6	-	-	-	-	-	-	-
11	-	-	185.	-	-	-	-	-	-	-	19.	-
14	-	-	-	16.9	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	20.0	-	-
16	-	180.	180.	-	-	17.4	-	-	-	-	-	-
19	-	-	191.	-	19.3	-	-	-	-	-	-	-
20	-	-	189.	-	-	-	-	18.2	-	-	-	-
21	-	-	171.	-	-	-	-	-	17.1	-	-	-
MEAN	192.0000	180.0000	188.3500	16.9000	18.9667	17.4000	19.0500	17.9250	17.1000	20.0000	19.0000	18.5000
STD DEV	-	-	6.9143	-	.3512	-	.6364	.6602	-	-	-	-
REL STD	-	-	3.7	-	1.9	-	3.3	3.7	-	-	-	-
DES VAL	-	-	191.590	-	-	-	-	-	-	-	-	-

LAB	19111 K DIS ICP	19301 K EXT HNO3 AA	19990 PTASSIUM COMMON	20005 CA TOT ICP	20007 CA TOT DCP	20050 CA DIS AAS NO	20100 CA DIS CALC'D	20103 CA DIS AAS	20107 CA DIS AAS	20108 CA DIS AAS UF	20110 CA DIS AAS AUT	20111 CA DIS ICP
1	-	-	17.6	-	-	-	-	-	68.	-	-	-
2	-	-	17.2	-	-	-	-	-	-	-	70.	-
3	-	-	18.5	-	-	-	-	-	-	69.6	-	-
5	-	-	18.7	-	-	-	-	70.3	-	-	-	-
6	-	-	19.5	-	-	-	70.4	-	-	-	-	-
7	-	-	18.6	-	-	-	-	72.0	-	-	-	-
8	-	16.0	16.0 *	-	-	-	-	-	-	-	-	-
9	-	-	19.	70.	-	-	-	-	-	-	-	-
10	-	-	18.6	69.	-	-	-	-	-	-	-	-
11	-	-	19.	-	-	-	-	70.	-	-	-	-
13	18.2	-	18.2	-	-	-	-	-	-	-	-	73.5
14	-	-	16.9	-	-	65.3	-	-	-	-	-	-
15	-	-	20.0	-	-	-	-	-	-	-	-	74.6
16	-	-	17.4	-	59.7	-	-	-	-	-	-	-
19	-	-	19.3	80.1	-	-	-	-	-	-	-	-
20	-	-	18.2	-	-	-	-	-	-	-	-	66.1
21	-	-	17.1	-	-	-	-	-	-	-	-	-
MEAN	18.2000	16.0000	18.2235	73.0333	59.7000	65.3000	70.4000	70.7667	68.0000	69.6000	70.0000	71.4000
STD DEV	-	-	1.0551	6.1403	-	-	-	1.0786	-	-	-	4.6228
REL STD	-	-	5.8	8.4	-	-	-	1.5	-	-	-	6.5
DES VAL	-	-	18.023	-	-	-	-	-	-	-	-	-

LAB	20311 CA EXT ICP	20990 CALCIUM COMMON	
1	-	68.	
2	-	70.	
3	-	69.6	
5	-	70.3	
6	-	70.4	
7	-	72.0	
8	65.2	65.2	
9	-	70.	
10	-	69.	
11	-	70.	
13	-	73.5	
14	-	65.3	
15	-	74.6	
16	-	59.7	*
19	-	80.1	*
20	-	66.1	
MEAN	65.2000	69.6125	
STD DEV	-	4.5377	
REL STD	-	6.5	
DES VAL	-	68.723	

DATES RECEIVED

1 89/10/12	2 89/10/31	3 89/11/03	3 89/11/08	4 89/11/01
5 89/11/01	6 89/09/19	6 89/10/29	7 89/11/08	8 89/11/02
9 89/11/01	10 89/11/01	11 89/11/08	13 89/11/01	14 89/11/22
15 89/11/02	16 89/10/23	19 89/10/05	20 89/10/31	21 89/11/01

NOTE: ALL CONCENTRATION UNITS ARE EXPRESSED IN MG/L OF EACH ELEMENT, THE EXCEPTIONS BEING: COLOUR IN RELATIVE UNITS, CONDUCTIVITY IN USIE/CM, TURBIDITY IN JTU OR NTU, NITROGEN ANALYSES IN "N", ALKALINITY & HARDNESS IN CACO3, SILICA IN SIO2, AND SULFATE IN SO4.

Environment Canada | Environnement Canada
Conservation and Protection | Conservation et Protection

Canada Centre for Inland Waters
National Water Research Institute
867 Lakeshore Road, P.O. Box 5050
Burlington, Ontario
L7R 4A6

Your file Votre référence

Our file Notre référence

March 8 Mars, 1990.

To: Participants & Managers in:
A: Participants et Directeurs dans:

Federal-Provicial Quality Assurance Program
Programme d'Assurance-Qualité Fédéral-Provincial (PAQFP)

Final Report/Rapport Dernier: FPQA Studies/Etudes 47-48

Vous trouverez en annexe le résumé dernier de l'étude F/P susmentionées.

Il y a un tableau supplimentaire dans ce rapport dernier. Ce tableau de résultats indiqués aidera les responsables et les directeurs évaluer la performance de leur laboratoire. La performance des laboratoires est rangé avec le pourcentage des résultats indiqués. Si la performance est pauvre, le 'QC' du laboratoire devrait être réviser. Le tableau supplimentaire donnera un meilleur indication de la performance et l'amèlioration du laboratoire.

Si vous avez de commentaire sur ce résumé, ou des corrections valable à notre base de données, veuillez me les transmettre.

I have enclosed the final report for the above mentioned studies.

There is a noteworthy additional table in this final report. This table, a summary of flagged results, is included to assist laboratory heads and managers in evaluating their laboratories performance relative to others. The laboratories are ranked according to the % of results flagged. In case of poor performance, internal QC procedures for the parameters listed in the Flagged Results Table should be reviewed. The additional table will give a more complete indication of laboratory performance or improvement.

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry Alkema

H. Alkema
Quality Assurance Project
Research & Applications Branch

Attachment: Distribution List
En annexe: Liste de diffusion

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RESEARCH & APPLICATIONS BRANCH

FINAL REPORT

REPORT NO. RAB 90-06 (Eng)

FEDERAL PROVINCIAL QUALITY ASSURANCE PROGRAM

STUDIES 47 AND 48

for November and December 1989

TRACE METALS, MAJOR IONS, NUTRIENTS AND PHYSICAL PARAMETERS IN SURFACE WATERS

by

H. Alkema

Quality Assurance Section
National Water Research Institute
Burlington, Ontario

March 1990

(Ce rapport est aussi disponible en français)

Introduction

As part of an on–going study, the Quality Assurance Section, NWRI in Burlington, Ontario, has been sending reference water samples bi–monthly to chemical laboratories participating in the FP program. This report summarizes the most recent FP interlaboratory quality assurance studies: FP 47 and 48, for the months November and December, 1989. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The concentrations were from low to medium.

Study Design

Four water samples were submitted to each laboratory for chemical analyses. Two samples were submitted for trace metals analysis, while the remaining two were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the four samples:

FP 47 – Sample 1 – 125 ml, high level* for trace metals (3% HNO_3)
Sample 2 – up to 1 L, major ions etc., stored at 4°C

FP 48 – Sample 3 – 1 L, low level* for trace metals (0.2% HNO_3)
Sample 4 – up to 1 L, major ions, etc., stored at 4°C

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were reported as required by the standard report sheets provided with the QA samples. Submitted results were tabulated for each parameter, first for each method reported, and then for

all methods combined. These data, and the resulting statistics are presented in the Data Summary. (attached)

Preliminary data summaries (RAB # 90-01), including problematic results, were sent January 3 and February 12. Each laboratory was given three weeks to notify us of any errors in data transcription, compilation, or flags.

Performance Indicators

In the Federal Provincial QA program, two types of reference samples are used for the accuracy assessment. These are Reference Waters (RMs) and Certified Reference waters (CRMs) which have Design Values for the stable parameters. Also, regional samples are used occasionally as natural representative samples. The means for these regional samples, and the Design Values for the reference waters are used to test each reported result for accuracy.

Percentage deviations from the reference values are used as an indication by the laboratory head to determine the extent of the discrepancies between the laboratory result and the reference value. However, please keep in mind that at low levels, high % deviations are often seen, and may be misleading if interpreted too strictly.

A result which deviates more than the greater of 10% or 1 standard deviation from the reference value is marked with an asterisk in the data table and its value tabulated in the flagged data table (Table 1). Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned an 'HDL' and is tabulated for each laboratory in Table 3.

If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

Three tables list the data from the above mentioned evaluations. Table 1 is a summary of the flagged results for each laboratory as they are found in Table 2. The summary will assist laboratory managers and lab heads in evaluating their laboratories performance relative to others. A listing parameters for which there was a high standard deviation is found in Table 2. Formerly called a high coefficient of variation, the standard deviation is generated with standardized criteria that are included with the automated flagging routine. These automated criteria have been in use since March 1988 (Study FP 27), and should provide a more accurate and consistent listing of the difficult to analyze parameters or levels. A listing of the criteria used to indicate high deviation of analysis is available on request. Your comments would be appreciated.

Provincial laboratories average number of deviations per sample was 1.3.
Federal laboratories average number of deviations per sample was 1.3.
(the worst laboratory excluded)

TABLE 1: FP & PPWB LABS - SUMMARY OF FLAGGED DATA - FP 47 FP 48

LAB	RESULTS REPORTED	>10% OR 1SD FLAGS	GRUBBS FLAGS	HDL'S INDICATED	% DATA FLAGGED
19	NO RESULTS REPORTED				
5	30	0	0	0	.0
3	72	2	0	0	2.8
11	52	3	2	0	5.8
9	50	3	1	7	6.0
21	49	4	3	0	8.2
10	68	6	0	3	8.8
4	22	2	0	0	9.1
2	50	5	0	2	10.0
7	28	3	2	0	10.7
1	65	9	2	0	13.8
20	64	9	7	3	14.1
14	32	5	3	0	15.6
15	70	11	2	5	15.7
13	31	5	0	2	16.1
6	62	16	10	3	25.8
8	61	18	8	4	29.5
16	63	19	8	0	30.2

NOTE: FLAGS GUIDELINE (PERFORMANCE INDEX)

< 5% - EXCELLENT TO VERY GOOD
5 - 10% - MODERATE PERFORMANCE
> 10% - IMPROVEMENT NECESSARY, GENERATION OF INCOMPARABLE DATA

TABLE 2: FP & PPWB LABORATORIES FLAGGED RESULTS - STUDIES FP 47-48

LAB 1	FLAGS :	ZINC	19%		NITRATE	-80%		SODIUM	-13%		
		TOT P	-78%		ALUMINUM	-34%		LEAD	82%	R	
		NITRATE	-98%	R	SODIUM	-18%		TOT P	-74%		
LAB 2	FLAGS :	T N DIS	33%		TOT P	-78%	L	ALUMINUM	-19%		
		SILICA	15%		PTASSIUM	11%					
	HDL :	MANGNESE			ZINC						
LAB 3	FLAGS :	AMMONIA	13%		FLUORIDE	28%					
LAB 4	FLAGS :	TOT P	117%		TOT P	58%					
LAB 5	FLAGS :	NONE									
LAB 6	FLAGS :	TURBIDTY	271%	R	D O C	107%	R	TKN	275%	R	
		NITRATE	82%		HARDNESS	20%	R	MGNESIUM	66%	R	
		TOT P	335%	R	PTASSIUM	-11%		ZINC	33%		
		D O C	96%	R	TKN	71%	R	NITRATE	11%		
		HARDNESS	15%		SODIUM	-18%		MGNESIUM	48%	R	
		PTASSIUM	-21%	R							
	HDL :	VANADIUM			MOLYBNUM			LEAD			
LAB 7	FLAGS :	MGNESIUM	-74%	R	MGNESIUM	-74%	R	SULFATE	12%		
LAB 8	FLAGS :	ALUMINUM	18%		COPPER	45%	R	ZINC	25%		
		TKN	50%	R	NITRATE	87%		HARDNESS	17%	R	
		MGNESIUM	19%	R	TOT P	74%		CALCIUM	18%	R	
		IRON	213%		COPPER	32%		ZINC	86%	R	
		NITRATE	11%		HARDNESS	15%		MGNESIUM	18%		
		TOT P	45%		CHLORIDE	35%	R	CALCIUM	19%	R	
	HDL :	D O C			ALUMINUM			MANGNESE			
LAB 9	FLAGS :	ALUMINUM	-49%	L	SODIUM	1023%	R	SILICA	13%		
	HDL :	VANADIUM			IRON			COBALT			
		NICKEL			COPPER			ZINC			
		MOLYBNUM									
LAB 10	FLAGS :	COBALT	-14%		CADMIUM	-19%		D O C	-31%		
		T N DIS	-24%		IRON	-69%		SILICA	-14%		
	HDL :	AMMONIA			TOT P						
LAB 11	FLAGS :	COPPER	36%	R	IRON	135%		FLUORIDE	788%	R	
LAB 13	FLAGS :	CADMIUM	-27%		NITRATE	-85%		SODIUM	13%		
		AMMONIA	-50%	L	SODIUM	20%					
	HDL :	AMMONIA			AMMONIA						
LAB 14	FLAGS :	MANGNESE	20%		COPPER	103%	R	ZINC	46%	R	
		CHLORIDE	14%	R	ZINC	-28%					

. . . ./2

LAB 15	FLAGS :	VANADIUM	-95%	R	ZINC	25%		D O C	-31%	L
		D I C	-17%		FLUORIDE	-12%		SILICA	-16%	
		ALUMINUM	-34%		ZINC	33%		LEAD	-80%	R
		D I C	-23%		SILICA	-15%				
	HDL :	D O C			VANADIUM			COBALT		
		NICKEL			MOLYBNUM					
LAB 16	FLAGS :	CHROMIUM	44%	R	MANGNESE	37%	R	COBALT	18%	
		NICKEL	22%	R	ZINC	70%	R	STRNTIUM	15%	
		SILICA	-21%		CALCIUM	-15%		ALUMINUM	40%	R
		VANADIUM	47%		CHROMIUM	69%	R	MANGNESE	63%	R
		IRON	57%		ZINC	33%		CONDUCT	-99%	R
		TKN	14%		NITRATE	-23%		SODIUM	-18%	
		CALCIUM	-13%							
LAB 19	FLAGS :	NO RESULTS REPORTED								
LAB 20	FLAGS :	CHROMIUM	-37%	R	IRON	30%	R	COPPER	-16%	
		ZINC	23%		SODIUM	59%	R	CHLORIDE	-37%	R
		ALUMINUM	126%	R	SODIUM	133%	R	CHLORIDE	-53%	R
	HDL :	VANADIUM			MOLYBNUM			BARIUM		
LAB 21	FLAGS :	MOLYBNUM	-16%	R	PTASSIUM	30%	R	ALUMINUM	-19%	
		PTASSIUM	29%	R						

NOTE: A VERY HIGH FREQUENCY OF FLAGGED RESULTS (OR A HIGH %) IS INDICATIVE OF POOR PERFORMANCE. ON THE OTHER HAND, LABS WITH FEW IF ANY FLAGS ARE JUDGED TO HAVE VERY GOOD PERFORMANCE.

ALSO, AN "R" FLAG INDICATES A NON COMPARABLE RESULT, THAT IS, ONE PRODUCED WITH NON RANDOM FACTORS. AN "L" FLAG INDICATES A 'LESS THAN' RESULT LOWER THAN THE REFERENCE VALUE.

TABLE 3: HIGH STANDARD DEVIATION

PARAMETER		LEVEL
BORON	AT	.045 PPM
T N DIS	AT	.330 PPM
IRON	AT	.006 PPM

APPENDIX I

Definitions of Types of Metals Analysis

1. HIGH LEVEL ANALYSIS

Usually without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS), Inductively Coupled (Argon) Plasma or direct coupled plasma (ICAP, ICP, or DCP). Standards should contain the acid equivalent of the sample.

2. LOW LEVEL ANALYSIS

Analysis is carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP, or DCP.
3. Digestion of aqueous phase and ICAP or DCP analysis.
4. Graphite tube (flameless) AAS.

Updated March 1989.

APPENDIX II

Performance Indicators

1. Flagged Results

As a first indication that analysis results are appreciably deviant from the expected value, each submitted result is tested with the 10% or 1 Standard Deviation Rule. When a result is found to deviate more than 10%, or more than 1 standard deviation when this is greater than 10%, the result is flagged with an asterisk in the data summary and tabled for that laboratory in the Flagged Data Table. Typically at low levels the 10% criteria is too small and the 1 standard deviation criteria effectively indicates deviant analytical results. As performance indicator, the flagged results indicate to laboratory heads that in-house QC procedures and the methodology concerned need to be ivestigated. Results may still be comparable.

2. Grubbs' Rejectable Results

For every parameter, each laboratory result is statistically tested to see if it is outlying. Outlying results are caused by non random causes such as a faulty calibration or incorrect transcription. These outlying results, calculated by the Grubbs' procedure,* and indicated in the data tables with an 'R', are noncomparable with the other data for that parameter.

3. A High Standard Deviation for a Parameter

Occasionally data for a difficult to analyse parameter yields a very high relative standard deviation (RSD). When a high RSD is not due to outlying results, there are noncomparable results within the data set. In such a case, the RSD for that parameter is indicated in Table 2, entitiled: High Standard Deviations.

4. High Detection Limits (HDL's)

Each laboratory determines its own detection limits according to its own requirements. When major differences in detection limits occur, an HDL is indicated for the particular laboratory in the Flagged Data Table. An HDL indicates that low level analysis may not be comparable with the analyses of other laboratories.

* reference : Frank E. Grubbs, Technometrics, 1969, p. 1.

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 47 PP 87 DATE: 01/11/89 DUE DATE: 31/12/89 PAGE 1

SAMPLE 1 SPIKED SAMPLE. TRACE METALS DA. (IN 3.0% HNO3)

LAB	13009 AL TOT 5X ICP	13030 AL TOT ?	13102 AL DIS AAS DA	13111 AL DIS ICP DA	13302 AL EXT AAS DA	13321 AL EXT ICP DA	13322 AL EXT DCP DA	13999 ALUMINUM COMMON	23009 V TOT 5X ICP	23011 V TOT 5X ICP	23012 V TOT 5X DCP	23109 V DIS ICP
1	-	0.492	-	-	-	-	-	0.492	0.487	-	-	-
2	-	-	-	-	0.5	-	-	0.5	-	-	-	-
3	-	-	-	-	0.52	0.513	-	0.52	-	-	-	-
6	0.49	-	-	-	-	-	-	0.49	-	0.50	-	-
8	-	-	-	-	0.6	-	-	0.6 *	-	-	-	-
9	-	-	-	0.50	-	-	-	0.50	-	-	-	-
10	-	-	-	0.44	-	-	-	0.44	-	-	-	-
15	-	-	-	-	-	-	0.48	0.48	-	-	0.027 R	-
16	-	-	-	-	-	-	0.471	0.471	-	-	0.500	-
20	-	-	-	0.445	-	-	-	0.445	-	-	-	0.504
21	-	-	0.525	-	-	-	-	0.525	-	-	-	-
MEAN	.4900	.4920	.5250	.4617	.5400	.5130	.4755	.4966	.4870	.5000	.5000	.5040
STD DEV	-	-	-	.0333	.0529	-	.0064	.0435	-	-	-	-
REL STD	-	-	-	7.2	9.8	-	1.3	8.8	-	-	-	-
DES VAL	-	-	-	-	-	-	-	.5104	-	-	-	-

LAB	23111 V DIS ICP DA	23321 V EXT ICP DA	23999 VANADIUM COMMON	24004 CR TOT AAS GF	24009 CR TOT 5X ICP	24011 CR TOT 5X ICP	24012 CR TOT 5X DCP	24052 CR DIS AAS DA	24111 CR DIS ICP DA	24302 CR EXT AAS DA	24311 CR EXT ICP DA	24321 CR EXT ICP DA
1	-	-	0.487	-	0.049	-	-	-	-	-	-	-
3	-	0.484	0.484	-	-	-	-	-	-	-	-	0.049
6	-	-	0.50	-	-	0.048	-	-	-	-	-	-
8	-	-	-	0.056	-	-	-	-	-	-	-	-
9	0.49	-	0.49	-	-	-	-	-	0.050	-	-	-
10	0.453	-	0.453	-	-	-	-	-	0.047	-	-	-
11	-	-	-	-	-	-	-	-	-	0.056	-	-
13	-	-	-	-	-	-	-	-	-	-	0.05	-
15	-	-	0.027 R	-	-	-	0.052	-	-	-	-	-
16	-	-	0.500	-	-	-	0.075 R	-	-	-	-	-
20	-	-	0.504	-	-	-	-	-	0.033 R	-	-	-
21	-	-	-	-	-	-	-	0.049	-	-	-	-
MEAN	.4715	.4840	.4883	.0560	.0490	.0480	.0520	.0490	.0485	.0560	.0500	.0490
STD DEV	.0262	-	.0173	-	-	-	-	-	.0021	-	-	-
REL STD	5.5	-	3.5	-	-	-	-	-	4.4	-	-	-
DES VAL	-	-	.4910	-	-	-	-	-	-	-	-	-

LAB	24999 CHROMIUM COMMON	25003 MN TOT 5X ICP	25004 MN TOT AAS DA	25011 MN TOT 5X ICP	25012 MN TOT 5X DCP	25104 MN DIS AAS DA	25111 MN DIS ICP DA	25304 MN EXT AAS DA	25311 MN EXT ICP DA	25321 MN EXT ICP DA	25999 MANGNESE COMMON	26009 FE TOT 5X ICP
1	0.049	0.046	-	-	-	-	-	-	-	-	0.046	0.255
2	-	-	-	-	-	-	-	0.049	-	-	0.049	-
3	0.049	-	-	-	-	-	-	0.047	-	0.047	0.047	-
6	0.048	-	-	0.047	-	-	-	-	-	-	0.047	-
8	0.056	-	-	-	-	-	-	-	0.048	-	0.048	-
9	0.050	-	-	-	-	-	0.047	-	-	-	0.047	-
10	0.047	-	-	-	-	-	0.044	-	-	-	0.044	-
11	0.056	-	0.050	-	-	-	-	-	-	-	0.050	-
13	0.05	-	-	-	-	-	-	-	0.05	-	0.05	-
14	-	-	-	-	-	0.055	-	-	-	-	0.055 *	-
15	0.052	-	-	-	0.047	-	-	-	-	-	0.047	-
16	0.075 R	-	-	-	0.063 R	-	-	-	-	-	0.063 R	-
20	0.033 R	-	-	-	-	-	0.047	-	-	-	0.047	-
21	0.049	-	-	-	-	0.05	-	-	-	-	0.05	-
MEAN	.0506	.0460	.0500	.0470	.0470	.0525	.0460	.0480	.0490	.0470	.0482	.2550
STD DEV	.0031	-	-	-	-	.0035	.0017	.0014	.0014	-	.0027	-
REL STD	6.2	-	-	-	-	6.7	3.8	2.9	2.9	-	5.6	-
DES VAL	.05215	-	-	-	-	-	-	-	-	-	.04600	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 47 PP 87 SAMPLE 1

LAB	26011 FE TOT 5X ICP	26012 FE TOT 5X DCP	26104 FE DIS AAS DA	26109 FE DIS ICP	26111 FE DIS ICP DA	26304 FE EXT AAS DA	26311 FE EXT ICP DA	26321 FE EXT ICP DA	26999 IRON COMMON	27009 CO TOT 5X ICP	27011 CO TOT 5X ICP	27012 CO TOT 5X DCP
1	-	-	-	-	-	-	-	-	0.255	0.224	-	-
2	-	-	-	-	-	0.28	-	-	0.28	-	-	-
3	-	-	-	-	-	0.25	-	0.248	0.25	-	-	-
6	0.25	-	-	-	-	-	-	-	0.25	-	0.22	-
8	-	-	-	-	-	-	0.23	-	0.23	-	-	-
9	-	-	-	-	0.25	-	-	-	0.25	-	-	-
10	-	-	-	-	0.224	-	-	-	0.224	-	-	-
11	-	-	-	-	-	0.220	-	-	0.220	-	-	-
13	-	-	-	-	-	-	0.26	-	0.26	-	-	-
15	-	0.259	-	-	-	-	-	-	0.259	-	-	0.223
16	-	0.285	-	-	-	-	-	-	0.285	-	-	0.267
20	-	-	-	0.325 R	-	-	-	-	0.325 R	-	-	-
21	-	-	0.22	-	-	-	-	-	0.22	-	-	-
MEAN	.2500	.2720	.2200	-	.2370	.2500	.2450	.2480	.2486	.2240	.2200	.2450
STD DEV	-	.0184	-	-	.0184	.0300	.0212	-	.0217	-	-	.0311
REL STD	-	6.8	-	-	7.8	12.0	8.7	-	8.7	-	-	12.7
DES VAL	-	-	-	-	-	-	-	-	.2491	-	-	-

LAB	27101 CO DIS AAS DA	27111 CO DIS ICP DA	27301 CO EXT AAS DA	27321 CO EXT ICP DA	27999 COBALT COMMON	28009 NI TOT 5X ICP	28011 NI TOT 5X ICP	28012 NI TOT 5X DCP	28101 NI DIS AAS DA	28111 NI DIS ICP DA	28301 NI EXT AAS DA	28311 NI EXT ICP DA
1	-	-	-	-	0.224	0.268	-	-	-	-	-	-
3	-	-	-	0.222	0.222	-	-	-	-	-	-	-
6	-	-	-	-	0.22	-	0.26	-	-	-	-	-
8	-	-	0.22	-	0.22	-	-	-	-	-	-	0.268
9	-	0.22	-	-	0.22	-	-	-	-	0.27	-	-
10	-	0.196	-	-	0.196 *	-	-	-	-	0.235	-	-
11	-	-	0.211	-	0.211	-	-	-	-	-	0.251	-
13	-	-	-	-	-	-	-	-	-	-	-	0.27
15	-	-	-	-	0.223	-	-	0.25	-	-	-	-
16	-	-	-	-	0.267 *	-	-	0.322 R	-	-	-	-
20	-	0.213	-	-	0.213	-	-	-	-	0.267	-	-
21	0.25	-	-	-	0.25	-	-	-	0.28	-	-	-
MEAN	.2500	.2097	.2155	.2220	.2242	.2680	.2600	.2500	.2800	.2573	.2510	.2690
STD DEV	-	.0123	.0064	-	.0191	-	-	-	-	.0194	-	.0014
REL STD	-	5.9	3.0	-	8.5	-	-	-	-	7.5	-	.5
DES VAL	-	-	-	-	.2271	-	-	-	-	-	-	-

LAB	28321 NI EXT ICP DA	28999 NICKEL COMMON	29009 CU TOT 5X ICP	29011 CU TOT 5X ICP	29012 CU TOT 5X DCP	29106 CU DIS AAS DA	29111 CU DIS ICP DA	29306 CU EXT AAS DA	29311 CU EXT ICP DA	29321 CU EXT ICP DA	29999 COPPER COMMON	30009 ZN TOT 5X ICP
1	-	0.268	0.045	-	-	-	-	-	-	-	0.045	0.066
2	-	-	-	-	-	-	-	0.04	-	-	0.04	-
3	0.278	0.278	-	-	-	-	-	-	-	0.045	0.045	-
6	-	0.26	-	0.045	-	-	-	-	-	-	0.045	-
8	-	0.268	-	-	-	-	-	-	0.067 R	-	0.067 R	-
9	-	0.27	-	-	-	-	0.045	-	-	-	0.045	-
10	-	0.235	-	-	-	-	0.040	-	-	-	0.040	-
11	-	0.251	-	-	-	-	-	0.063 R	-	-	0.063 R	-
13	-	0.27	-	-	-	-	-	-	0.05	-	0.05	-
14	-	-	-	-	-	0.094 R	-	-	-	-	0.094 R	-
15	-	0.25	-	-	0.047	-	-	-	-	-	0.047	-
16	-	0.322 R	-	-	0.053	-	-	-	-	-	0.053	-
20	-	0.267	-	-	-	-	0.039	-	-	-	0.039 *	-
21	-	0.28	-	-	-	0.05	-	-	-	-	0.05	-
MEAN	.2780	.2634	.0450	.0450	.0500	.0500	.0413	.0400	.0500	.0450	.0454	.0660
STD DEV	-	.0134	-	-	.0042	-	.0032	-	-	-	.0045	-
REL STD	-	5.1	-	-	8.5	-	7.8	-	-	-	9.9	-
DES VAL	-	.2638	-	-	-	-	-	-	-	-	.04632	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 47 PP 87 SAMPLE 1

LAB	30011 ZN TOT 5X ICP	30012 ZN TOT 5X DCP	30104 ZN DIS AAS DA	30111 ZN DIS ICP DA	30304 ZN EXT AAS DA	30311 ZN EXT ICP DA	30321 ZN EXT ICP DA	30999 ZINC COMMON	38011 SR TOT ICP DA	38012 SR TOT DCP DA	38111 SR DIS ICP DA	38301 SR EXT AAS DA
1	-	-	-	-	-	-	-	0.066 *	-	-	-	-
2	-	-	-	-	0.06	-	-	0.06	-	-	-	-
3	-	-	-	-	-	-	0.055	0.055	-	-	-	-
6	0.056	-	-	-	-	-	-	0.056	0.18	-	-	-
8	-	-	-	-	-	0.069	-	0.069 *	-	-	-	-
9	-	-	-	0.06	-	-	-	0.06	-	-	0.17	-
10	-	-	-	0.062	-	-	-	0.062	-	-	-	0.17
11	-	-	-	-	0.060	-	-	0.060	-	-	-	-
13	-	-	-	-	-	0.06	-	0.06	-	-	-	-
14	-	-	0.081 R	-	-	-	-	0.081 R	-	-	-	-
15	-	0.069	-	-	-	-	-	0.069 *	-	0.173	-	-
16	-	0.094 R	-	-	-	-	-	0.094 R	-	0.192	-	-
20	-	-	-	0.068	-	-	-	0.068 *	-	-	-	-
21	-	-	0.06	-	-	-	-	0.06	-	-	-	-
MEAN	.0560	.0690	.0600	.0633	.0600	.0645	.0550	.0621	.1800	.1825	.1700	.1700
STD DEV	-	-	-	.0042	.0000	.0064	-	.0048	-	.0134	-	-
REL STD	-	-	-	6.6	-1.0	9.9	-	7.8	-	7.4	-	-
DES VAL	-	-	-	-	-	-	-	.05541	-	-	-	-

LAB	38321 SR EXT ICP DA	38999 STRNTIUM COMMON	42009 MO TOT 5X ICP	42011 MO TOT 5X ICP	42012 MO TOT 5X DCP	42111 MO DIS ICP DA	42121 MO EXT ICP DA	42301 MO EXT AAS DA	42999 MOLYBNUM COMMON	48009 CD TOT 5X ICP	48011 CD TOT 5X ICP	48012 CD TOT 5X DCP
1	-	-	0.874	-	-	-	-	-	0.874	0.038	-	-
3	0.173	0.173	-	-	-	-	0.876	-	0.876	-	-	-
6	-	0.18	-	0.88	-	-	-	-	0.88	-	0.038	-
9	-	0.17	-	-	-	0.88	-	-	0.88	-	-	-
10	-	0.17	-	-	-	0.836	-	-	0.836	-	-	-
15	-	0.173	-	-	0.85	-	-	-	0.85	-	-	0.037
16	-	0.192 *	-	-	0.929	-	-	-	0.929	-	-	0.047
20	-	-	-	-	-	0.875	-	-	0.875	-	-	-
21	-	-	-	-	-	-	-	0.745 R	0.745 R	-	-	-
MEAN	.1730	.1763	.8740	.8800	.8895	.8637	.8760	-	.8750	.0380	.0380	.0420
STD DEV	-	.0085	-	-	.0559	.0241	-	-	.0270	-	-	.0071
REL STD	-	4.8	-	-	6.3	2.8	-	-	3.1	-	-	16.8
DES VAL	-	.1671	-	-	-	-	-	-	.8910	-	-	-

LAB	48101 CD DIS AAS DA	48109 CD DIS ICP	48111 CD DIS ICP DA	48301 CD EXT AAS DA	48311 CD EXT ICP DA	48321 CD EXT ICP DA	48999 CADMIUM COMMON	56009 BA TOT 5X ICP	56011 BA TOT 5X ICP	56012 BA TOT 5X DCP	56109 BA DIS ICP	56111 BA DIS ICP DA
1	-	-	-	-	-	-	0.038	0.431	-	-	-	-
2	-	-	-	0.04	-	-	0.04	-	-	-	-	-
3	-	-	-	-	-	0.038	0.038	-	-	-	-	-
6	-	-	-	-	-	-	0.038	-	0.43	-	-	-
8	-	-	-	0.04	-	-	0.04	-	-	-	-	-
9	-	-	0.042	-	-	-	0.042	-	-	-	-	0.45
10	-	-	0.033	-	-	-	0.033 *	-	-	-	-	0.41
11	-	-	-	0.041	-	-	0.041	-	-	-	-	-
13	-	-	-	-	0.03	-	0.03 *	-	-	-	-	-
15	-	-	-	-	-	-	0.037	-	-	0.447	-	-
16	-	-	-	-	-	-	0.047	-	-	0.446	-	-
20	-	0.039	-	-	-	-	0.039	-	-	-	0.436	-
21	0.041	-	-	-	-	-	0.041	-	-	-	-	-
MEAN	.0410	.0390	.0375	.0403	.0300	.0380	.0388	.4310	.4300	.4465	.4360	.4300
STD DEV	-	-	.0064	.0006	-	-	.0041	-	-	.0007	-	.0283
REL STD	-	-	17.0	1.4	-	-	10.7	-	-	.2	-	6.6
DES VAL	-	-	-	-	-	-	.04088	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 47 PP 87 SAMPLE 1

LAB	56301 BA EXT AAS DA	56321 BA EXT ICP DA	56999 BARIUM COMMON	82009 PB TOT 5X ICP	82011 PB TOT 5X ICP	82012 PB TOT 5X DCP	82101 PB DIS AAS DA	82111 PB DIS ICP DA	82301 PB EXT AAS DA	82311 PB EXT ICP DA	82321 PB EXT ICP DA	82999 LEAD COMMON
1	-	-	0.431	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	0.29	-	-	0.29
3	0.45	0.439	0.45	-	-	-	-	-	-	-	0.285	0.285
6	-	-	0.43	-	0.26	-	-	-	-	-	-	0.26
8	-	-	-	-	-	-	-	-	-	0.31	-	0.31
9	-	-	0.45	-	-	-	-	0.28	-	-	-	0.28
10	-	-	0.41	-	-	-	-	0.243	-	-	-	0.243
11	-	-	-	-	-	-	-	-	0.286	-	-	0.286
13	-	-	-	-	-	-	-	-	-	0.30 R	-	0.30 R
14	-	-	-	-	-	-	0.299	-	-	-	-	0.299
15	-	-	0.447	-	-	0.28	-	-	-	-	-	0.28
16	-	-	0.446	-	-	0.287	-	-	-	-	-	0.287
20	-	-	0.436	-	-	-	-	0.283	-	-	-	0.283
21	0.47	-	0.47	0.30	-	-	-	-	-	-	-	0.30
MEAN	.4600	.4390	.4411	.3000	.2600	.2835	.2990	.2687	.2880	.3100	.2850	.2836
STD DEV	.0141	-	.0168	-	-	.0049	-	.0223	.0028	-	-	.0178
REL STD	3.1	-	3.8	-	-	1.7	-	8.3	1.0	-	-	6.3
DES VAL	-	-	.4498	-	-	-	-	-	-	-	-	.2753

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 47 PP 87 SAMPLE 2

LAB	00110 IONIC BALANC %	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPARE	02021 COLOUR VIS COM	02023 COLOUR SPECT	02024 COL TRU SPECT	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02073 TURB HACH	02074 TURB NPLMTRI
1	-2.67	2.73	2.88	-	-	-	1. L	1. L	295.	295.	0.1	-
2	0.89	2.837	2.789	5. L	-	-	-	5. L	304.	304.	0.2	-
3	-0.12	2.891	2.898	5. L	-	-	-	5. L	295.	295.	0.14	-
4	-	-	-	-	5.0 L	-	-	5.0 L	294.	294.	-	-
5	-	-	-	5.	-	-	-	5.	295.	295.	0.09	-
6	5.80	3.24	2.88	-	-	-	-	-	299.	299.	-	0.63 R
7	-7.4	2.44	2.82	0.	-	-	-	0.	294.	294.	0.1	-
8	6.31	3.30	2.91	-	-	-	-	-	306.	306.	-	0.13
9	0.17	2.91	2.90	-	-	-	-	-	290.	290.	-	-
10	1.61	2.875	2.784	-	-	1.	-	1.	285.	285.	-	0.2
11	-	-	-	5. L	-	-	-	5. L	270.	270.	-	-
14	-	-	-	-	-	-	-	-	294.	294.	-	-
15	-	-	-	5. L	-	-	-	5. L	280.	280.	-	0.1 L
16	-	-	-	-	-	-	-	-	298.	298.	0.32	-
20	9.05	3.130	2.610	-	-	-	-	-	295.	295.	-	0.2
21	-	-	-	-	-	5. L	-	5. L	279.	279.	-	-
MEAN	1.5156	2.9281	2.8301	2.5000	-	1.0000	-	2.0000	292.0625	292.0625	.1583	.1767
STD DEV	5.0000	.2661	.0957	3.5355	-	-	-	2.6458	9.3913	9.3913	.0891	.0404
REL STD	329.9	9.1	3.4	141.4	-	-	-	132.3	3.2	3.2	56.3	22.9
DES VAL	-	-	-	-	-	-	-	2.5170	-	291.432	-	-

LAB	02077 TURB HACH FZ	02081 TURB RATIO	02090 TURBIDTY COMMON	05100 BORON ?	05105 BORON AA CARM	05106 BORON F AZOMETH	05107 BORON ICP DA	05111 BORON F ICP DA	05190 BORON COMMON	06051 TIC COMB IR	06100 DOC ?	06104 DOC UV CO2 IR
1	-	-	0.1	-	-	-	-	-	-	-	-	-
2	-	-	0.2	-	-	-	-	-	-	-	-	-
3	-	-	0.14	-	-	-	-	-	-	-	-	1.8
4	-	0.09	0.09	-	0.062	-	-	-	0.062	-	-	1.69
5	-	-	0.09	-	-	-	-	-	-	-	-	-
6	-	-	0.63 R	-	-	-	-	-	-	-	-	3.0 R
7	-	-	0.1	-	-	-	-	-	-	-	-	-
8	-	-	0.13	-	-	0.05 L	-	-	0.05 L	17.0	5.0 L	-
10	-	-	0.2	-	-	-	-	0.03	0.03	-	-	-
11	0.3	-	0.3	-	-	-	-	-	-	-	-	-
15	-	-	0.1 L	-	-	-	0.02	-	0.02	-	-	1. L
16	-	-	0.32	0.070	-	-	-	-	0.070	-	-	-
20	-	-	0.2	-	-	-	0.016	-	0.016	-	-	-
MEAN	.3000	.0900	.1700	.0700	.0620	-	.0180	.0300	.0396	17.0000	-	1.7450
STD DEV	-	-	.0820	-	-	-	.0028	-	.0248	-	-	.0778
REL STD	-	-	48.2	-	-	-	15.7	-	62.6	-	-	4.5
DES VAL	-	-	.1908	-	-	-	-	-	.04485	-	-	-

LAB	06107 DOC UV CO2 PHE	06109 DOC UV CO2 OH	06112 DOC PER IR	06150 D O C COMMON	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 D I C COMMON	07010 TKN AA SAL	07015 TKN DIG BERTHEL	07016 TKN BLK AMM-SAL	07021 TKN BLK DIG BER
1	1.4	-	-	1.4	-	17.0	-	17.0	-	-	-	0.13
2	1.3	-	-	1.3	-	-	-	-	-	-	-	-
3	-	-	-	1.8	17.9	-	-	17.9	0.130	-	-	-
4	-	-	-	1.69	-	-	-	-	-	-	-	-
6	-	-	-	3.0 R	-	-	-	-	-	-	0.5 R	-
8	-	-	-	5.0 L	-	-	-	17.0	-	0.20 R	-	-
10	-	1.0	-	1.0 *	-	-	18.2	18.2	-	-	-	-
15	-	-	-	1. *	15.	-	-	15. *	-	-	-	-
16	-	-	1.5	1.5	19.4	-	-	19.4	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	0.14	-
MEAN	1.3500	1.0000	1.5000	1.4483	17.4333	17.0000	18.2000	17.4167	.1300	-	.1400	.1300
STD DEV	.0707	-	-	.2864	2.2368	-	-	1.4811	-	-	-	-
REL STD	5.2	-	-	19.8	12.8	-	-	8.5	-	-	-	-
DES VAL	-	-	-	1.3979	-	-	-	18.060	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 47 PP 87 SAMPLE 2

LAB	07090 TKN COMMON	07105 NO3+NO2 DIS AA	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC	07112 NO3+NO2 UP AA CD	07390 NITRATE COMMON	07505 NH3 TOT AA BERT	07540 NH3 TOT AA SAL	07555 NH3 DIS AA PHEN	07556 NH3 DIS INDO	07557 NH3 DIS AA INDO
1	0.13	0.040	-	-	-	-	0.040 *	-	-	-	-	-
2	-	-	-	0.28	-	-	0.28	-	-	-	-	-
3	0.130	-	-	-	-	0.185	0.185	0.005 L	-	-	-	-
4	-	-	-	0.184	-	-	0.184	-	0.005 L	-	-	-
5	-	-	-	0.220	-	-	0.220	-	-	-	-	-
6	0.5 R	-	0.37	-	-	-	0.37 *	-	-	-	-	0.01
7	-	-	-	-	-	0.23	0.23	-	-	-	-	-
8	0.20 R	-	-	0.38	-	-	0.38 *	-	-	0.002 L	-	-
10	-	-	0.150	-	-	-	0.150	-	-	0.010 L	-	-
11	-	-	-	0.11	-	-	0.11	-	0.04 R	-	-	-
13	-	-	-	0.03	-	-	0.03 *	-	0.1 L	-	-	-
14	-	-	-	-	0.20	-	0.20	-	-	-	-	-
15	-	-	-	0.183	-	-	0.183	-	-	0.005 L	-	-
16	-	-	-	0.2	-	-	0.2	-	-	-	-	-
20	0.14	-	-	0.28	-	-	0.28	-	-	0.005 L	-	-
21	-	-	-	-	-	-	-	-	-	-	0.005 L	-
MEAN	.1333	.0400	.2600	.2074	.2000	.2075	.2028	-	-	-	-	.0100
STD DEV	.0058	-	.1556	.1016	-	.0318	.1004	-	-	-	-	-
REL STD	4.3	-	59.8	49.0	-	15.3	49.5	-	-	-	-	-
DES VAL	.1265	-	-	-	-	-	.3353	-	-	-	-	-

LAB	07562 NH3 DIS AA EDTA	07590 AMMONIA COMMON	07600 T N PER AUTO	07601 T N UV AA SUL	07602 T N CALC'D	07605 T N UV HY SUL	07651 T N DIS UV AA	07655 T N DIS UV EDTA	07690 TOT N COMMON	07790 T N DIS COMMON	09103 F DIS COL SP	09105 F DIS SP EL
1	0.018 R	0.018 R	-	-	-	-	-	-	-	-	-	-
2	-	-	-	0.44	-	-	-	-	-	0.44 *	-	-
3	-	0.005 L	-	0.338	-	-	-	-	-	0.338	-	-
4	-	0.005 L	-	-	-	-	0.260	-	-	0.260	-	-
5	-	-	-	-	-	-	-	0.360	-	0.360	-	-
6	-	0.01	-	-	-	-	-	-	-	-	0.6	-
8	-	0.002 L	-	-	-	-	-	-	-	-	-	0.57
10	-	0.010 L	-	-	-	0.250	-	-	-	0.250 *	-	-
11	-	0.04 R	-	-	-	-	-	-	-	-	-	0.57
13	-	0.1 L	-	-	-	-	-	-	-	-	-	-
15	-	0.005 L	0.31	-	-	-	-	-	0.31	-	-	0.50
20	-	0.005 L	-	-	0.42	-	-	-	0.42	-	-	0.55
21	-	0.005 L	-	-	-	-	-	-	-	-	-	-
MEAN	-	.0100	.3100	.3890	.4200	.2500	.2600	.3600	.3650	.3296	.6000	.5475
STD DEV	-	-	-	.0721	-	-	-	-	.0778	.0780	-	.0330
REL STD	-	-	-	18.5	-	-	-	-	21.3	23.7	-	6.0
DES VAL	-	.01205	-	-	-	-	-	-	.5200	.4176	-	-

LAB	09106 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL	09115 F DIS AA ALIZ	09116 F DIS IC	09190 FLUORIDE COMMON	10101 ALKLNTY TITR'N	10108 ALKLNTY POT TIT	10109 ALKLNTY POT TIT	10111 ALKLNTY TIT PRO	10112 ALKLNTY TIT CON	10190 ALKLINTY COMMON
1	-	0.58	-	-	-	0.58	78.	-	-	-	-	78.
2	-	-	-	-	-	-	73.6	-	-	-	-	73.6
3	-	-	0.60	-	-	0.60	77.1	-	-	77.6	-	77.6
4	-	-	-	-	-	-	75.6	-	-	-	-	75.6
5	0.610	-	-	-	-	0.610	75.7	-	-	-	-	75.7
6	-	-	-	-	-	0.6	-	-	77.	-	-	77.
7	-	-	-	-	-	-	73.4	-	-	-	-	73.4
8	-	-	-	-	-	0.57	-	-	75.0	-	-	75.0
9	-	-	-	-	-	-	-	80.	-	-	-	80.
10	-	-	-	0.61	-	0.61	-	-	-	-	74.3	74.3
11	-	-	-	-	-	0.57	76.5	-	-	-	-	76.5
13	-	-	-	-	-	-	68.	-	-	-	-	68.
14	-	-	-	-	-	-	78.13	-	-	-	-	78.13
15	-	-	-	-	-	0.50 *	76.0	-	-	-	-	76.0
16	-	-	-	-	0.58	0.58	76.	-	-	-	-	76.
20	-	-	-	-	-	0.55	76.9	-	-	-	-	76.9
21	0.60	-	-	-	-	0.60	77.5	-	-	-	-	77.5
MEAN	.6050	.5800	.6000	.6100	.5800	.5791	75.5715	80.0000	76.0000	77.6000	74.3000	75.8371
STD DEV	.0071	-	-	-	-	.0324	2.6994	-	1.4142	-	-	2.6412
REL STD	1.2	-	-	-	-	5.6	3.6	-	1.9	-	-	3.5
DES VAL	-	-	-	-	-	-	-	-	-	-	-	75.668

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 47 PP 87 SAMPLE 2

LAB	10301 PH	10390 PH COMMON	10602 HARDNSS CALC'D	10603 HARDNSS TITR'N	10606 HARDNSS CALC'D	10690 HARDNESS COMMON	11001 NA TOT AAS	11005 NA TOT ICP	11007 NA DIS DCP	11102 NA F AAS	11103 NA DIS FL PH	11104 NA DIS FLAME
1	7.12	7.12	104.	-	-	104.	-	-	-	-	13.0	-
2	8.0	8.0	103.8	-	-	103.8	-	-	-	-	15.5	-
3	7.77	7.77	-	-	108.0	108.0	-	-	-	-	-	-
4	8.14	8.14	-	-	-	-	-	-	-	-	-	-
5	8.09	8.09	-	-	-	-	-	-	-	-	14.7	-
6	8.1	8.1	-	128. R	-	128. R	-	-	-	14.	-	-
7	7.8	7.8	-	109.4	-	109.4	-	-	-	-	-	-
8	7.76	7.76	125. R	-	-	125. R	-	-	-	-	-	-
9	7.73	7.73	107.	-	-	107.	-	15.5	-	-	-	-
10	7.82	7.82	-	-	-	-	-	15.24	-	-	-	-
11	7.3	7.3	104.	-	-	104.	-	-	-	15.	-	-
13	7.4	7.4	113.5	-	-	113.5	-	-	-	-	-	-
14	7.75	7.75	98.8	-	-	98.8	15.0	-	-	-	-	-
15	8.0	8.0	105.	-	-	105.	-	-	-	-	-	-
16	7.78	7.78	110.	-	-	110.	-	-	15.6	-	-	-
20	7.9	7.9	100.97	-	-	100.97	-	-	-	-	-	23.7 R
21	7.58	7.58	-	-	-	-	-	-	-	14.7	-	-
MEAN	7.7671	7.7671	105.2300	109.4000	108.0000	105.8609	15.0000	15.3700	15.6000	14.5667	14.4000	-
STD DEV	.2842	.2842	4.4567	-	-	4.2377	-	.1838	-	.5132	1.2767	-
REL STD	3.7	3.7	4.2	-	-	4.0	-	1.2	-	3.5	8.9	-
DES VAL	-	7.8907	-	-	-	107.061	-	-	-	-	-	-

LAB	11105 NA DIS AAS DA	11107 NA UF FL PH	11111 NA DIS ICP	11311 NA EXT ICP	11990 SODIUM COMMON	12005 MG TOT ICP	12012 MG TOT DCP	12101 MG DIS CALC'D	12102 MG DIS AAS DA	12105 MG DIS AAS DA	12106 MG UF AAS DA	12107 MG DIS AAS AUT
1	-	-	-	-	13.0 *	-	-	-	-	6.2	-	-
2	-	-	-	-	15.5	-	-	-	-	-	-	6.4
3	-	15.1	-	-	15.1	-	-	-	-	-	6.6	-
5	-	-	-	-	14.7	-	-	-	6.6	-	-	-
6	-	-	-	-	14.	-	-	10.9 R	-	-	-	-
7	13.9	-	-	-	13.9	-	-	-	1.7 R	-	-	-
8	-	-	-	16.4	16.4	-	-	-	-	-	-	-
9	-	-	-	-	15.5	6.8	-	-	-	-	-	-
10	-	-	-	-	15.24	6.53	-	-	-	-	-	-
11	-	-	-	-	15.	-	-	-	6.5	-	-	-
13	-	-	16.8	-	16.8 *	-	-	-	-	-	-	-
14	-	-	-	-	15.0	-	-	6.36	-	-	-	-
15	-	-	15.5	-	15.5	-	-	-	-	-	-	-
16	-	-	-	-	15.6	-	5.90	-	-	-	-	-
20	-	-	-	-	23.7 R	-	-	-	-	-	-	-
21	-	-	-	-	14.7	-	-	-	-	-	6.0	-
MEAN	13.9000	15.1000	16.1500	16.4000	15.0627	6.6650	5.9000	6.3600	6.5500	6.2000	6.3000	6.4000
STD DEV	-	-	.9192	-	.9528	.1909	-	-	.0707	-	.4243	-
REL STD	-	-	5.7	-	6.3	2.9	-	-	1.1	-	6.7	-
DES VAL	-	-	-	-	14.873	-	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 47 PP 87 SAMPLE 2

LAB	12111 MG DIS ICP	12311 MG EXT ICP	12990 MGNESIUM COMMON	14102 SILICA ANSA AA	14105 SILICA MOL ASC	14106 SI FIL MOL ASC	14107 SILICA MOLY AA	14111 SILICA ICP DA	14112 SILICA DCP DA	14190 SILICA COMMON	15301 T P ACL AA ASC	15313 T P ACL AA SNCL
1	-	-	6.2	-	-	-	2.0	-	-	2.0	-	-
2	-	-	6.4	2.29	-	-	-	-	-	2.29	-	-
3	-	-	6.6	-	-	2.11	-	-	-	2.11	-	-
5	-	-	6.6	-	2.1	-	-	-	-	2.1	-	-
6	-	-	10.9 R	-	-	-	-	-	-	-	-	-
7	-	-	1.7 R	-	-	-	-	-	-	-	-	-
8	-	7.78 R	7.78 R	-	2.1	-	-	-	-	2.1	-	-
9	-	-	6.8	-	-	-	-	2.14	-	2.14	-	-
10	-	-	6.53	-	2.0	-	-	-	-	2.0	-	-
11	-	-	6.5	2.2	-	-	-	-	-	2.2	-	0.003
13	7.0	-	7.0	-	-	-	-	-	-	-	-	-
14	-	-	6.36	-	-	-	-	-	-	-	-	-
15	6.6	-	6.6	-	-	-	-	1.80	-	1.80 *	-	-
16	-	-	5.90	-	-	-	-	-	1.70	1.70 *	-	-
20	6.16	-	6.16	-	2.2	-	-	-	-	2.2	0.003	-
21	-	-	6.0	-	-	-	-	-	-	-	-	-
MEAN	6.5867	-	6.4346	2.2450	2.1000	2.1100	2.0000	1.9700	1.7000	2.0582	.0030	.0030
STD DEV	.4202	-	.3110	.0636	.0816	-	-	.2404	-	.1757	-	-
REL STD	6.4	-	4.8	2.8	3.9	-	-	12.2	-	8.5	-	-
DES VAL	-	-	6.5468	-	-	-	-	-	-	2.1419	-	-

LAB	15401 T P UV AA ASC	15406 T P UF AA ASC	15407 T P ASC AC	15409 T P BLK AA ASC	15413 T P ACL AA SNCL	15421 T P BLK DIG ASC	15490 TOT P COMMON	16303 SO4 DIS TIT THO	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UF AA MTB	16309 SO4 DIS I C
1	-	-	-	-	-	0.001	0.001 *	-	-	30.	-	-
2	-	-	-	-	0.001 L	-	0.001 *	-	30.0	-	-	29.6
3	-	-	-	-	0.0028	-	0.0028	-	-	-	30.5	-
4	-	0.010	-	-	-	-	0.010 *	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	31.0	-	-
6	-	-	-	0.02 R	-	-	0.02 R	-	32.	-	-	-
7	-	-	-	-	0.002	-	0.002	-	-	32.2	-	-
8	-	-	-	-	0.008	-	0.008 *	-	-	32.5	-	-
9	-	-	-	-	-	-	-	-	-	-	-	30.
10	0.010 L	-	-	-	-	-	0.010 L	-	-	-	-	-
11	-	-	-	-	-	-	0.003	-	-	31.	-	-
13	-	0.005	-	-	-	-	0.005	-	-	31.8	-	-
14	-	-	-	-	-	-	-	-	-	-	-	31.0
15	-	0.002 L	-	-	-	-	0.002 L	-	-	31.	-	-
20	-	-	-	-	-	-	0.003	-	-	29.7	-	-
21	-	-	0.007	-	-	-	0.007	28.3	-	-	-	-
MEAN	-	.0075	.0070	-	.0043	.0010	.0046	28.3000	31.0000	31.1500	30.5000	30.2000
STD DEV	-	.0035	-	-	.0033	-	.0031	-	1.4142	.9885	-	.7211
REL STD	-	47.1	-	-	76.4	-	65.8	-	4.6	3.2	-	2.4
DES VAL	-	-	-	-	-	-	.00659	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 47 PP 87 SAMPLE 2

LAB	16310 SO4 DIS AA CALM	16311 SO4 DIS IC	16990 SULFATE COMMON	17203 CL DIS AA FE	17204 CL DIS AG TIT	17206 CL DIS AA HG	17208 CL DIS AA HG	17209 CL DIS I C	17210 CL DIS TIT CON	17211 CL DIS IC	17990 CHLORIDE COMMON	19001 K TOT AAS
1	-	-	30.	-	-	23.2	-	-	-	-	23.2	-
2	-	-	29.6	-	-	-	-	23.2	-	-	23.2	-
3	-	-	30.5	-	-	-	23.6	-	-	-	23.6	-
5	-	-	31.0	-	-	24.5	-	-	-	-	24.5	-
6	-	-	32.	-	24.	-	-	-	-	-	24.	-
7	-	-	32.2	23.9	-	-	-	-	-	-	23.9	-
8	-	-	32.5	-	-	25.	-	-	-	-	25.	-
9	-	-	30.	-	-	-	-	24.	-	-	24.	-
10	28.5	-	28.5	-	-	-	-	-	23.5	-	23.5	-
11	-	-	31.	-	-	22.7	-	-	-	-	22.7	-
13	-	-	31.8	-	-	23.	-	-	-	-	23.	-
14	-	-	31.0	-	-	-	-	27.1 R	-	-	27.1 R	3.15
15	-	-	31.	-	-	24.1	-	-	-	-	24.1	-
16	-	28.	28.	-	-	-	-	-	-	23.	23.	-
20	-	-	29.7	15.0 R	-	-	-	-	-	-	15.0 R	-
21	-	-	28.3	-	-	-	-	-	-	-	-	-
MEAN	28.5000	28.0000	30.4438	23.9000	24.0000	23.7500	23.6000	23.6000	23.5000	23.0000	23.6692	3.1500
STD DEV	-	-	1.3861	-	-	.9182	-	.5657	-	-	.6600	-
REL STD	-	-	4.6	-	-	3.9	-	2.4	-	-	2.8	-
DES VAL	-	-	29.765	-	-	-	-	-	-	-	23.740	-

LAB	19005 K TOT ICP	19008 K TOT DCP	19102 K DIS AAS	19103 K DIS FLM PH	19104 K DIS FLAME	19105 K DIS AAS DA	19106 K DIS AAS LI	19107 K DIS FLM PH	19111 K DIS ICP	19301 K EXT HNO3 AA	19990 PTASSIUM COMMON	20005 CA TOT ICP
1	-	-	-	2.9	-	-	-	-	-	-	2.9	-
2	-	-	-	3.5	-	-	-	-	-	-	3.5	-
3	-	-	-	-	-	-	-	3.08	-	-	3.08	-
5	-	-	-	3.1	-	-	-	-	-	-	3.1	-
6	-	-	2.8	-	-	-	-	-	-	-	2.8 *	-
7	-	-	2.98	-	-	-	-	-	-	-	2.98	-
8	-	-	-	-	-	-	-	-	-	3.20	3.20	-
9	3.2	-	-	-	-	-	-	-	-	-	3.2	32.
10	3.19	-	-	-	-	-	-	-	-	-	3.19	31.93
11	-	-	-	-	-	-	3.2	-	-	-	3.2	-
13	-	-	-	-	-	-	-	-	3.23	-	3.23	-
14	-	-	-	-	-	-	-	-	-	-	3.15	-
15	-	-	-	-	-	3.40	-	-	-	-	3.40	-
16	-	3.10	-	-	-	-	-	-	-	-	3.10	-
20	-	-	-	3.2	-	-	-	-	-	-	3.2	-
21	-	-	-	-	4.1 R	-	-	-	-	-	4.1 R	-
MEAN	3.1950	3.1000	2.8900	3.1750	-	3.4000	3.2000	3.0800	3.2300	3.2000	3.1487	31.9650
STD DEV	.0071	-	.1273	.2500	-	-	-	-	-	-	.1746	.0495
REL STD	.2	-	4.4	7.9	-	-	-	-	-	-	5.5	.2
DES VAL	-	-	-	-	-	-	-	-	-	-	3.1556	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 47 PP 87 SAMPLE 2

LAB	20007 CA TOT DCP	20050 CA DIS AAS NO	20100 CA DIS CALC'D	20103 CA DIS AAS	20107 CA DIS AAS	20108 CA DIS AAS UF	20110 CA DIS AAS AUT	20111 CA DIS ICP	20311 CA EXT ICP	20990 CALCIUM COMMON
1	-	-	-	-	31.6	-	-	-	-	31.6
2	-	-	-	-	-	-	31.	-	-	31.
3	-	-	-	-	-	32.3	-	-	-	32.3
5	-	-	-	31.	-	-	-	-	-	31.
6	-	-	33.	-	-	-	-	-	-	33.
7	-	-	-	32.4	-	-	-	-	-	32.4
8	-	-	-	-	-	-	-	-	37.4 R	37.4 R
9	-	-	-	-	-	-	-	-	-	32.
10	-	-	-	-	-	-	-	-	-	31.93
11	-	-	-	31.	-	-	-	-	-	31.
13	-	-	-	-	-	-	-	32.8	-	32.8
14	-	29.1	-	-	-	-	-	-	-	29.1
15	-	-	-	-	-	-	-	31.0	-	31.0
16	27.0	-	-	-	-	-	-	-	-	27.0 *
20	-	-	-	-	-	-	-	30.28	-	30.28
21	-	-	-	-	-	32.3	-	-	-	32.3
MEAN	27.0000	29.1000	33.0000	31.4667	31.6000	32.3000	31.0000	31.3600	-	31.2473
STD DEV	-	-	-	.8083	-	.0000	-	1.2980	-	1.5587
REL STD	-	-	-	2.6	-	-1.0	-	4.1	-	5.0
DES VAL	-	-	-	-	-	-	-	-	-	31.658

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 48 PP 88 DATE: 01/12/89 DUE DATE: 31/12/89

SAMPLE 3 SPIKED SAMPLE. TRACE METALS -LOW. (IN 0.2% HNO3)

LAB	13009 AL TOT 5X ICP	13030 AL TOT ?	13102 AL DIS AAS DA	13105 AL DIS AAS GF	13111 AL DIS ICP DA	13302 AL EXT AAS DA	13304 AL EXT AAS GF	13305 AL EXT AAS SE	13322 AL EXT DCP DA	13999 ALUMINUM COMMON	23002 V TOT AAS SE	23009 V TOT 5X ICP
1	-	0.026	-	-	-	-	-	-	-	0.026 *	-	0.005
2	-	-	-	-	-	-	-	0.032	-	0.032 *	-	-
3	0.043	-	-	-	-	-	-	0.0356	-	0.0356	0.0049	0.0045
6	0.036	-	-	-	-	-	-	-	-	0.036	-	-
8	-	-	-	-	-	0.2 L	-	-	-	0.2 L	-	-
9	-	-	-	-	0.02 L	-	-	-	-	0.02 *	-	-
10	-	-	-	-	0.04	-	-	-	-	0.04	-	-
14	-	-	-	0.035	-	-	-	-	-	0.035	-	-
15	-	-	-	-	-	-	0.026	-	-	0.026 *	-	-
16	-	-	-	-	-	-	-	-	0.055 R	0.055 R	-	-
20	-	-	-	0.089 R	-	-	-	-	-	0.089 R	-	-
21	-	-	0.032	-	-	-	-	-	-	0.032 *	-	-
MEAN	.0395	.0260	.0320	.0350	.0400	-	.0260	.0338	-	.0328	.0049	.0048
STD DEV	.0049	-	-	-	-	-	-	.0025	-	.0049	-	.0004
REL STD	12.5	-	-	-	-	-	-	7.5	-	14.9	-	7.4
DES VAL	-	-	-	-	-	-	-	-	-	.03938	-	-

LAB	23011 V TOT 5X ICP	23012 V TOT 5X DCP	23105	23109 V DIS ICP	23111 V DIS ICP DA	23999 VANADIUM COMMON	24003 CR TOT AAS SE	24004 CR TOT AAS GF	24009 CR TOT 5X ICP	24011 CR TOT 5X ICP	24012 CR TOT 5X DCP	24056 CR DIS AAS GF
1	-	-	-	-	-	0.005	-	-	0.006	-	-	-
3	-	-	-	-	-	0.0049	0.0062	-	0.0063	-	-	-
6	0.01 L	-	-	-	-	0.01 L	-	-	-	0.007	-	-
8	-	-	-	-	-	-	-	0.007	-	-	-	-
9	-	-	-	-	0.01 L	0.01 L	-	0.007	-	-	-	-
10	-	-	-	-	0.005	0.005	-	-	-	-	-	-
14	-	-	0.0052	-	-	0.0052	-	-	-	-	-	-
15	-	0.01 L	-	-	-	0.01 L	-	-	-	-	0.008	-
16	-	0.007	-	-	-	0.007 *	-	-	-	-	0.012 R	-
20	-	-	-	0.01 L	-	0.01 L	-	-	-	-	-	0.007
21	-	-	-	-	-	-	-	0.0064	-	-	-	-
MEAN	-	.0070	.0052	-	.0050	.0054	.0062	.0068	.0062	.0070	.0080	.0070
STD DEV	-	-	-	-	-	.0009	-	.0003	.0002	-	-	-
REL STD	-	-	-	-	-	16.4	-	5.1	3.4	-	-	-
DES VAL	-	-	-	-	-	.00477	-	-	-	-	-	-

LAB	24111 CR DIS ICP DA	24303 CR EXT AAS SE	24999 CHROMIUM COMMON	25003 MN TOT 5X ICP	25004 MN TOT AAS DA	25010 MN TOT 5X ICP	25011 MN TOT 5X ICP	25012 MN TOT 5X DCP	25107 MN DIS AAS GF	25111 MN DIS ICP DA	25304 MN EXT AAS DA	25311 MN EXT ICP DA
1	-	-	0.006	0.006	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	0.01 L	-
3	-	-	0.0062	-	0.006	0.0057	-	-	-	-	-	-
6	-	-	0.007	-	-	-	0.006	-	-	-	-	-
8	-	-	0.007	-	-	-	-	-	-	-	-	0.020 L
9	-	-	0.007	-	-	-	-	-	-	0.006	-	-
10	0.007	-	0.007	-	-	-	-	-	-	0.006	-	-
11	-	0.006	0.006	-	0.005	-	-	-	-	-	-	-
15	-	-	0.008	-	-	-	-	0.006	-	-	-	-
16	-	-	0.012 R	-	-	-	-	0.010 R	-	-	-	-
20	-	-	0.007	-	-	-	-	-	0.006	-	-	-
21	-	-	0.0064	-	-	-	-	-	0.0057	-	-	-
MEAN	.0070	.0060	.0068	.0060	.0055	.0057	.0060	.0060	.0059	.0060	-	-
STD DEV	-	-	.0006	-	.0007	-	-	-	.0002	.0000	-	-
REL STD	-	-	9.1	-	12.9	-	-	-	3.6	-1.0	-	-
DES VAL	-	-	.00711	-	-	-	-	-	-	-	-	-

LAB	25999 MANGNESE COMMON	26003 FE TOT AAS GF	26005 FE TOT AAS SE	26009 FE TOT 5X ICP	26011 FE TOT 5X ICP	26012 FE TOT 5X DCP	26107 FE DIS AAS GF	26111 FE DIS ICP DA	26305 FE EXT AAS SE	26311 FE EXT ICP DA	26999 IRON COMMON	27002 CO TOT AAS SE
1	0.006	-	-	0.006	-	-	-	-	-	-	0.006	-
2	0.01 L	-	-	-	-	-	-	-	0.007	-	0.007	-
3	0.006	-	0.0065	0.0060	-	-	-	-	-	-	0.0065	0.0045
6	0.006	-	-	-	0.008	-	-	-	-	-	0.008	-
8	0.020 L	-	-	-	-	-	-	-	-	0.020	0.020 *	-
9	0.006	-	-	-	-	-	-	0.01 L	-	-	0.01 L	-
10	0.006	-	-	-	-	-	-	0.002	-	-	0.002 *	-
11	0.005	-	-	-	-	-	-	-	0.015	-	0.015 *	-
14	-	-	-	-	-	-	0.0069	-	-	-	0.0069	-
15	0.006	-	-	-	-	0.007	-	-	-	-	0.007	-
16	0.010 R	-	-	-	-	0.010	-	-	-	-	0.010 *	-
20	0.006	-	-	-	-	-	0.005	-	-	-	0.005	-
21	0.0057	0.0054	-	-	-	-	-	-	-	-	0.0054	-
MEAN	.0059	.0054	.0065	.0060	.0080	.0085	.0060	.0020	.0110	.0200	.0082	.0045
STD DEV	.0003	-	-	.0000	-	.0021	.0013	-	.0057	-	.0048	-
REL STD	5.7	-	-	-1.0	-	25.0	22.6	-	51.4	-	58.8	-
DES VAL	.00615	-	-	-	-	-	-	-	-	-	.00638	-

LAB	27003 CO TOT AAS GF	27009 CO TOT 5X ICP	27011 CO TOT 5X ICP	27012 CO TOT 5X DCP	27107 CO DIS AAS GF	27111 CO DIS ICP DA	27302 CO EXT AAS SE	27999 COBALT COMMON	28002 NI TOT AAS SE	28007 NI TOT AAS GF	28009 NI TOT 5X ICP	28011 NI TOT 5X ICP
1	-	0.005	-	-	-	-	-	0.005	-	-	0.005	-
3	-	0.0047	-	-	-	-	-	0.0045	0.0050	-	0.0056	-
6	-	-	0.005	-	-	-	-	0.005	-	-	-	0.006
8	0.005	-	-	-	-	-	-	0.005	-	-	-	-
9	-	-	-	-	-	0.01 L	-	0.01 L	-	-	-	-
10	-	-	-	-	-	0.006	-	0.006	-	-	-	-
11	-	-	-	-	-	-	0.005	0.005	-	-	-	-
15	-	-	-	0.005 L	-	-	-	0.005 L	-	-	-	-
16	-	-	-	0.005	-	-	-	0.005	-	-	-	-
20	-	-	-	-	0.005	-	-	0.005	-	-	-	-
21	0.0051	-	-	-	-	-	-	0.0051	-	0.0055	-	-
MEAN	.0051	.0049	.0050	.0050	.0050	.0060	.0050	.0051	.0050	.0055	.0053	.0060
STD DEV	.0001	.0002	-	-	-	-	-	.0004	-	-	.0004	-
REL STD	1.4	4.4	-	-	-	-	-	7.7	-	-	8.0	-
DES VAL	-	-	-	-	-	-	-	.00550	-	-	-	-

LAB	28012 NI TOT 5X DCP	28107 NI DIS AAS GF	28111 NI DIS ICP DA	28302 NI EXT AAS SE	28309 NI EXT AAS GF	28999 NICKEL COMMON	29003 CU TOT AAS GF	29005 CU TOT AAS SE	29009 CU TOT 5X ICP	29011 CU TOT 5X ICP	29012 CU TOT 5X DCP	29107 CU DIS AAS GF
1	-	-	-	-	-	0.005	-	-	0.007	-	-	-
3	-	-	-	-	-	0.0050	-	0.0064	0.0074	-	-	-
6	-	-	-	-	-	0.006	-	-	-	0.008	-	-
8	-	-	-	-	0.006	0.006	-	-	-	-	-	-
9	-	-	0.01 L	-	-	0.01 L	-	-	-	-	-	-
10	-	-	0.008	-	-	0.008	-	-	-	-	-	-
11	-	-	-	0.006	-	0.006	-	-	-	-	-	0.0073
14	-	-	-	-	-	-	-	-	-	-	-	-
15	0.02 L	-	-	-	-	0.02 L	-	-	-	-	0.008	-
16	0.008	-	-	-	-	0.008	-	-	-	-	-	0.006
20	-	0.007	-	-	-	0.007	-	-	-	-	-	-
21	-	-	-	-	-	0.0055	0.0066	-	-	-	-	-
MEAN	.0080	.0070	.0080	.0060	.0060	.0063	.0066	.0064	.0072	.0080	.0080	.0067
STD DEV	-	-	-	-	-	.0011	-	-	.0003	-	-	.0009
REL STD	-	-	-	-	-	18.3	-	-	3.9	-	-	13.8
DES VAL	-	-	-	-	-	.00655	-	-	-	-	-	-

LAB	29111 CU DIS ICP DA	29305 CU EXT AAS SE	29308 CU EXT AAS GF	29311 CU EXT ICP DA	29999 COPPER COMMON	30003 ZN TOT AAS GF	30005 ZN TOT AAS SE	30009 ZN TOT 5X ICP	30011 ZN TOT 5X ICP	30012 ZN TOT 5X DCP	30104 ZN DIS AAS DA	30107 ZN DIS AAS GF
1	-	-	-	-	0.007	-	-	0.008	-	-	-	-
2	-	0.007	-	-	0.007	-	-	-	-	-	-	-
3	-	-	-	-	0.0064	-	0.0079	0.0082	-	-	-	-
6	-	-	-	-	0.008	-	-	-	0.010	-	-	-
8	-	-	-	0.010	0.010 *	-	-	-	-	-	-	-
9	0.01 L	-	-	-	0.01 L	-	-	-	-	-	-	-
10	0.007	-	-	-	0.007	-	-	-	-	-	-	-
11	-	0.008	-	-	0.008	-	-	-	-	-	-	-
14	-	-	-	-	0.0073	-	-	-	-	-	0.0054	-
15	-	-	0.0067	-	0.0067	-	-	-	-	0.010	-	-
16	-	-	-	-	0.008	-	-	-	-	0.010	-	-
20	-	-	-	-	0.006	-	-	-	-	-	-	0.0062
21	-	-	-	-	0.0066	0.0070	-	-	-	-	-	-
MEAN	.0070	.0075	.0067	.0100	.0073	.0070	.0079	.0081	.0100	.0100	.0054	.0062
STD DEV	-	.0007	-	-	.0011	-	-	.0001	-	.0000	-	-
REL STD	-	9.4	-	-	14.5	-	-	1.7	-	-1.0	-	-
DES VAL	-	-	-	-	.00760	-	-	-	-	-	-	-

LAB	30111 ZN DIS ICP DA	30304 ZN EXT AAS DA	30305 ZN EXT AAS SE	30311 ZN EXT ICP DA	30999 ZINC COMMON	38009 SR TOT ICP DA	38011 SR TOT ICP DA	38012 SR TOT DCP DA	38111 SR DIS ICP DA	38301 SR EXT AAS DA	38999 STRNTIUM COMMON	42009 MO TOT 5X ICP
1	-	-	-	-	0.008	-	-	-	-	-	-	0.006
2	-	0.01 L	-	-	0.01 L	-	-	-	-	-	-	-
3	-	-	-	-	0.0079	0.168	-	-	-	-	0.168	0.0064
6	-	-	-	-	0.010 *	-	0.18	-	-	-	0.18	-
8	-	-	-	0.014 R	0.014 R	-	-	-	-	-	-	-
9	0.01 L	-	-	-	0.01 L	-	-	-	0.17	-	0.17	-
10	0.008	-	-	-	0.008	-	-	-	-	0.17	0.17	-
11	-	-	0.007	-	0.007	-	-	-	-	-	-	-
14	-	-	-	-	0.0054*	-	-	-	-	-	-	-
15	-	-	-	-	0.010 *	-	-	0.174	-	-	0.174	-
16	-	-	-	-	0.010 *	-	-	0.165	-	-	0.165	-
20	-	-	-	-	0.0062	-	-	-	-	-	-	-
21	-	-	-	-	0.0070	-	-	-	-	-	-	-
MEAN	.0080	-	.0070	-	.0080	.1680	.1800	.1695	.1700	.1700	.1712	.0062
STD DEV	-	-	-	-	.0016	-	-	.0064	-	-	.0052	.0003
REL STD	-	-	-	-	20.5	-	-	3.8	-	-	3.1	4.6
DES VAL	-	-	-	-	.00753	-	-	-	-	-	.1697	-

LAB	42011 MO TOT 5X ICP	42012 MO TOT 5X DCP	42111 MO DIS ICP DA	42303 MO EXT AAS GF	42999 MOLYBNUM COMMON	48002 CD TOT AAS SE	48003 CD TOT AAS GF	48004	48009 CD TOT 5X ICP	48011 CD TOT 5X ICP	48012 CD TOT 5X DCP	48103 CD DIS AAS GF
1	-	-	-	-	0.006	-	-	-	0.005	-	-	-
3	-	-	-	-	0.0064	0.0044	-	-	0.0045	-	-	-
6	0.01 L	-	-	-	0.01 L	-	-	-	-	0.005	-	-
9	-	-	0.01 L	-	0.01 L	-	-	0.005	-	-	-	-
10	-	-	0.007	-	0.007	-	-	-	-	-	-	-
15	-	0.01 L	-	-	0.01 L	-	-	-	-	-	-	-
16	-	0.008	-	-	0.008	-	-	-	-	-	0.005	-
20	-	-	0.01 L	-	0.01 L	-	-	-	-	-	-	0.0047
21	-	-	-	0.0053	0.0053	-	0.0049	-	-	-	-	-
MEAN	-	.0080	.0070	.0053	.0065	.0044	.0049	.0050	.0048	.0050	.0050	.0047
STD DEV	-	-	-	-	.0010	-	-	-	.0004	-	-	-
REL STD	-	-	-	-	15.7	-	-	-	7.4	-	-	-
DES VAL	-	-	-	-	.00700	-	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 48 PP 88 SAMPLE 3

LAB	48111 CD DIS ICP DA	48302 CD EXT AAS SE	48309 CD EXT AAS GF	48999 CADMIUM COMMON	56000 BA TOT AAS	56009 BA TOT 5X ICP	56011 BA TOT 5X ICP	56012 BA TOT 5X DCP	56111 BA DIS ICP DA	56999 BARIUM COMMON	82002 PB TOT AAS SE	82004 PB TOT AAS GF
1	-	-	-	0.005	-	0.024	-	-	-	0.024	-	-
2	-	0.005	-	0.005	-	-	-	-	-	-	-	-
3	-	-	-	0.0044	-	0.0227	-	-	-	0.0227	0.0053	-
6	-	-	-	0.005	-	-	0.022	-	-	0.022	-	-
8	-	-	0.006	0.006	-	-	-	-	-	-	-	-
9	-	-	-	0.005	-	-	-	-	0.02	0.02	-	0.004
10	0.005	-	-	0.005	-	-	-	-	0.02	0.02	-	-
11	-	0.005	-	0.005	-	-	-	-	-	-	-	-
15	-	-	0.0056	0.0056	-	-	-	0.023	-	0.023	-	-
16	-	-	-	0.005	-	-	-	0.024	-	0.024	-	-
20	-	-	-	0.0047	-	0.5 L	-	-	-	0.5 L	-	-
21	-	-	-	0.0049	0.024	-	-	-	-	0.024	-	0.0046
MEAN	.0050	.0050	.0058	.0051	.0240	.0234	.0220	.0235	.0200	.0225	.0053	.0043
STD DEV	-	.0000	.0003	.0004	-	.0009	-	.0007	.0000	.0017	-	.0004
REL STD	-	-1.0	4.9	8.0	-	3.9	-	3.0	-1.0	7.5	-	9.9
DES VAL	-	-	-	.00487	-	-	-	-	-	.02266	-	-

LAB	82009 PB TOT 5X ICP	82011 PB TOT 5X ICP	82012 PB TOT 5X DCP	82104 PB DIS AAS GF	82302 PB EXT AAS SE	82309 PB EXT AAS GF	82999 LEAD COMMON
1	-	-	-	-	0.010 R	-	0.010 R
2	-	-	-	-	0.006	-	0.006
3	0.0046	-	-	-	-	-	0.0053
6	-	0.005 L	-	-	-	-	0.005 L
8	-	-	-	-	-	0.006	0.006
9	-	-	-	-	-	-	0.004
10	-	-	-	-	-	0.005	0.005
11	-	-	-	-	0.005	-	0.005
14	-	-	-	0.0059	-	-	0.0059
15	-	-	-	-	-	0.0011R	0.0011R
16	-	-	0.007	-	-	-	0.007
20	-	-	-	0.005	-	-	0.005
21	-	-	-	-	-	-	0.0046
MEAN	.0046	-	.0070	.0055	.0055	.0055	.0054
STD DEV	-	-	-	.0006	.0007	.0007	.0009
REL STD	-	-	-	11.7	12.9	12.9	15.9
DES VAL	-	-	-	-	-	-	.00549

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 48 PP 88 SAMPLE 4

LAB	00110 IONIC BALANC %	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPARE	02021 COLOUR VIS COM	02023 COLOUR SPECT	02024 COL TRU SPECT	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02073 TURB HACH	02074 TURB NPLMTRI
1	-1.52	1.61	1.66	-	-	-	1. L	1. L	181.	181.	0.2	-
2	1.12	1.633	1.670	5. L	-	-	-	5. L	182.	182.	0.3	-
3	-1.25	1.739	1.783	5. L	-	-	-	5. L	182.	182.	0.15	-
4	-	-	-	-	5.0 L	-	-	5.0 L	180.	180.	-	-
5	-	-	-	5.	-	-	-	5.	181.	181.	0.16	-
6	5.03	1.88	1.70	-	-	-	-	-	185.	185.	-	0.24
7	13.3	1.72	1.31	4.	-	-	-	4.	179.	179.	0.2	-
8	3.92	1.95	1.81	-	5. L	-	-	5. L	189.	189.	-	0.17
9	1.42	1.78	1.73	-	-	-	-	-	175.	175.	-	-
10	2.20	1.721	1.647	-	-	1.	-	1.	173.	173.	-	0.3
11	-	-	-	5. L	-	-	-	5. L	172.	172.	-	-
14	-	-	-	-	-	-	-	-	180.	180.	-	-
15	-	-	-	5. L	-	-	-	5. L	170.	170.	-	0.1
16	-	-	-	-	-	-	-	-	1.8 R	1.8 R	0.4	-
20	20.5	2.223	1.467	-	-	-	-	-	180.	180.	-	0.3
21	-	-	-	-	-	5. L	-	5. L	171.	171.	-	-
MEAN	4.9689	1.8062	1.6419	4.5000	-	1.0000	-	3.3333	178.6667	178.6667	.2350	.2220
STD DEV	7.3108	.1898	.1586	.7071	-	-	-	2.0817	5.4072	5.4072	.0967	.0867
REL STD	147.1	10.5	9.7	15.7	-	-	-	62.4	3.0	3.0	41.1	39.1
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	02077 TURB HACH FZ	02081 TURB RATIO	02090 TURBIDTY COMMON	05100 BORON ?	05105 BORON AA CARM	05106 BORON F AZOMETH	05107 BORON ICP DA	05111 BORON F ICP DA	05190 BORON COMMON	06051 TIC COMB IR	06100 DOC ?	06104 DOC UV CO2 IR
1	-	-	0.2	-	-	-	-	-	-	-	-	-
2	-	-	0.3	-	-	-	-	-	-	-	-	-
3	-	-	0.15	-	-	-	-	-	-	-	-	1.1
4	-	0.20	0.20	-	0.147	-	-	-	0.147	-	-	1.03
5	-	-	0.16	-	-	-	-	-	-	-	-	-
6	-	-	0.24	-	-	-	-	-	-	-	-	1.80 R
7	-	-	0.2	-	-	-	-	-	-	-	-	-
8	-	-	0.17	-	-	0.11	-	-	0.11	10.0	5.0 L	-
10	-	-	0.3	-	-	-	-	0.12	0.12	-	-	-
11	0.3	-	0.3	-	-	-	-	-	-	-	-	-
15	-	-	0.1	-	-	-	0.11	-	0.11	-	-	1.
16	-	-	0.4	0.130	-	-	-	-	0.130	-	-	-
20	-	-	0.3	-	-	-	0.102	-	0.102	-	-	-
MEAN	.3000	.2000	.2323	.1300	.1470	.1100	.1060	.1200	.1198	10.0000	-	1.0433
STD DEV	-	-	.0832	-	-	-	.0057	-	.0164	-	-	.0513
REL STD	-	-	35.8	-	-	-	5.3	-	13.7	-	-	4.9
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	06107 DOC UV CO2 PHE	06109 DOC UV CO2 OH	06112 DOC PER IR	06150 D O C COMMON	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 D I C COMMON	07003 TKN AA ALK PHE	07010 TKN AA SAL	07015 TKN DIG BERTHEL	07016 TKN BLK AMM-SAL
1	0.9	-	-	0.9	-	10.6	-	10.6	-	-	-	-
2	0.9	-	-	0.9	-	-	-	-	-	-	-	-
3	-	-	-	1.1	11.2	-	-	11.2	-	0.344	-	-
4	-	-	-	1.03	-	-	-	-	-	-	-	-
6	-	-	-	1.80 R	-	-	-	-	-	-	-	0.6 R
8	-	-	-	5.0 L	-	-	-	10.0	-	-	0.35	-
10	-	0.6	-	0.6	-	-	11.6	11.6	-	-	-	-
15	-	-	-	1.	8.	-	-	8. *	-	-	-	-
16	-	-	0.9	0.9	10.6	-	-	10.6	0.4	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	0.32
MEAN	.9000	.6000	.9000	.9186	9.9333	10.6000	11.6000	10.3333	.4000	.3440	.3500	.3200
STD DEV	.0000	-	-	.1605	1.7010	-	-	1.2691	-	-	-	-
REL STD	-1.0	-	-	17.5	17.1	-	-	12.3	-	-	-	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	07021 TKN BLK DIG BER	07090 TKN COMMON	07105 NO3+NO2 DIS AA	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC	07112 NO3+NO2 UF AA CD	07390 NITRATE COMMON	07505 NH3 TOT AA BERT	07540 NH3 TOT AA SAL	07555 NH3 DIS AA PHEN	07556 NH3 DIS INDO
1	0.34	0.34	0.010 R	-	-	-	-	0.010 R	-	-	-	-
2	-	-	-	-	0.54	-	-	0.54	-	-	-	-
3	-	0.344	-	-	-	-	0.514	0.514	0.224	-	-	-
4	-	-	-	-	0.476	-	-	0.476	-	0.191	-	-
5	-	-	-	-	0.520	-	-	0.520	-	-	-	-
6	-	0.6 R	-	0.58	-	-	-	0.58 *	-	-	-	-
7	-	-	-	-	-	-	0.54	0.54	-	-	-	-
8	-	0.35	-	-	0.58	-	-	0.58 *	-	-	0.19	-
10	-	-	-	0.520	-	-	-	0.520	-	-	0.200	-
11	-	-	-	-	0.48	-	-	0.48	-	0.18	-	-
13	-	-	-	-	0.5	-	-	0.5	-	0.1 L	-	-
14	-	-	-	-	-	0.57	-	0.57	-	-	-	-
15	-	-	-	-	0.532	-	-	0.532	-	-	0.209	-
16	-	0.4 *	-	-	0.4	-	-	0.4 *	-	-	-	-
20	-	0.32	-	-	0.55	-	-	0.55	-	-	0.192	-
21	-	-	-	-	-	-	-	-	-	-	-	0.195
MEAN	.3400	.3508	-	.5500	.5087	.5700	.5270	.5216	.2240	.1855	.1978	.1950
STD DEV	-	.0297	-	.0424	.0527	-	.0184	.0479	-	.0078	.0087	-
REL STD	-	8.5	-	7.7	10.4	-	3.5	9.2	-	4.2	4.4	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	07557 NH3 DIS AA INDO	07562 NH3 DIS AA EDTA	07590 AMMONIA COMMON	07600 T N PER AUTO	07601 T N UV AA SUL	07602 T N CALC'D	07605 T N UV HY SUL	07651 T N DIS UV AA	07655 T N DIS UV EDTA	07690 TOT N COMMON	07790 T N DIS COMMON	09103 F DIS COL SP
1	-	0.2	0.2	-	-	-	-	-	-	-	-	-
2	-	-	-	-	0.75	-	-	-	-	-	0.75	-
3	-	-	0.224 *	-	0.868	-	-	-	-	-	0.868	-
4	-	-	0.191	-	-	-	-	0.783	-	-	0.783	-
5	-	-	-	-	-	-	-	-	0.775	-	0.775	-
6	0.20	-	0.20	-	-	-	-	-	-	-	-	0.1
8	-	-	0.19	-	-	-	-	-	-	-	-	-
10	-	-	0.200	-	-	-	0.74	-	-	-	0.74	-
11	-	-	0.18	-	-	-	-	-	-	-	-	-
13	-	-	0.1 *	-	-	-	-	-	-	-	-	-
15	-	-	0.209	0.79	-	-	-	-	-	0.79	-	-
20	-	-	0.192	-	-	0.87	-	-	-	0.87	-	-
21	-	-	0.195	-	-	-	-	-	-	-	-	-
MEAN	.2000	.2000	.1981	.7900	.8090	.8700	.7400	.7830	.7750	.8300	.7832	.1000
STD DEV	-	-	.0120	-	.0834	-	-	-	-	.0566	.0506	-
REL STD	-	-	6.0	-	10.3	-	-	-	-	6.8	6.5	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	09105 F DIS SP EL	09106 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL	09115 F DIS AA ALIZ	09116 F DIS IC	09190 FLUORIDE COMMON	10101 ALKLNTY TITR'N	10108 ALKLNTY POT TIT	10109 ALKLNTY POT TIT	10111 ALKLNTY TIT PRO	10112 ALKLNTY TIT CON
1	-	-	0.11	-	-	-	0.11	48.	-	-	-	-
2	-	-	-	-	-	-	-	45.7	-	-	-	-
3	-	-	-	0.16	-	-	0.16 *	48.3	-	-	47.7	-
4	-	-	-	-	-	-	-	46.0	-	-	-	-
5	-	0.140	-	-	-	-	0.140	45.9	-	-	-	-
6	-	-	-	-	-	-	0.1	-	-	48.	-	-
7	-	-	-	-	-	-	-	44.5	-	-	-	-
8	0.12	-	-	-	-	-	0.12	-	-	47.5	-	-
9	-	-	-	-	-	-	-	-	47.	-	-	-
10	-	-	-	-	0.12	-	0.12	-	-	-	-	44.6
11	1.11 R	-	-	-	-	-	1.11 R	46.5	-	-	-	-
13	-	-	-	-	-	-	-	42.0	-	-	-	-
14	-	-	-	-	-	-	-	47.84	-	-	-	-
15	0.10	-	-	-	-	-	0.10	46.4	-	-	-	-
16	-	-	-	-	-	0.14	0.14	48.	-	-	-	-
20	0.11	-	-	-	-	-	0.11	47.6	-	-	-	-
21	-	0.15	-	-	-	-	0.15	47.5	-	-	-	-
MEAN	.1100	.1450	.1100	.1600	.1200	.1400	.1250	46.4800	47.0000	47.7500	47.7000	44.6000
STD DEV	.0100	.0071	-	-	-	-	.0212	1.7619	-	.3536	-	-
REL STD	9.1	4.9	-	-	-	-	17.0	3.8	-	.7	-	-

LAB	10190 ALKLINTY COMMON	10301 PH	10390 PH COMMON	10602 HARDNSS CALC'D	10603 HARDNSS TITR'N	10606 HARDNSS CALC'D	10690 HARDNESS COMMON	11001 NA TOT AAS	11005 NA TOT ICP	11007 NA DIS DCP	11102 NA F AAS	11103 NA DIS FL PH
1	48.	6.78	6.78	67.	-	-	67.	-	-	-	-	4.0
2	45.7	7.8	7.8	65.68	-	-	65.68	-	-	-	-	5.3
3	47.7	7.72	7.72	-	-	71.1	71.1	-	-	-	-	-
4	46.0	8.07	8.07	-	-	-	-	-	-	-	-	-
5	45.9	7.91	7.91	-	-	-	-	-	-	-	-	5.1
6	48.	7.7	7.7	-	82.	-	82. *	-	-	-	4.	-
7	44.5	7.7	7.7	-	71.8	-	71.8	-	-	-	-	-
8	47.5	7.27	7.27	81.7	-	-	81.7 *	-	-	-	-	-
9	47.	7.43	7.43	72.	-	-	72.	-	55. R	-	-	-
10	44.6	7.72	7.72	-	-	-	-	-	5.23	-	-	-
11	46.5	6.9	6.9	69.	-	-	69.	-	-	-	4.8	-
13	42.0	7.2	7.2	75.8	-	-	75.8	-	-	-	-	-
14	47.84	7.53	7.53	66.4	-	-	66.4	5.16	-	-	-	-
15	46.4	7.7	7.7	69.4	-	-	69.4	-	-	-	-	-
16	48.	7.52	7.52	70.	-	-	70.	-	-	4.00	-	-
20	47.6	7.6	7.6	64.65	-	-	64.65	-	-	-	-	-
21	47.5	7.62	7.62	70.	-	-	70.	-	-	-	4.8	-
MEAN	46.5141	7.5394	7.5394	70.1482	76.9000	71.1000	71.1807	5.1600	5.2300	4.0000	4.5333	4.8000
STD DEV	1.6310	.3378	.3378	4.9487	7.2125	-	5.3642	-	-	-	.4619	.7000
REL STD	3.5	4.5	4.5	7.1	9.4	-	7.5	-	-	-	10.2	14.6
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	11104 NA DIS FLAME	11105 NA DIS AAS DA	11107 NA UF FL PH	11111 NA DIS ICP	11311 NA EXT ICP	11990 SODIUM COMMON	12005 MG TOT ICP	12012 MG TOT DCP	12101 MG DIS CALC'D	12102 MG DIS AAS DA	12105 MG DIS AAS DA	12106 MG UF AAS DA
1	-	-	-	-	-	4.0 *	-	-	-	-	5.5	-
2	-	-	-	-	-	5.3	-	-	-	-	-	-
3	-	-	5.15	-	-	5.15	-	-	-	-	-	5.8
5	-	-	-	-	-	5.1	-	-	-	5.8	-	-
6	-	-	-	-	-	4. *	-	-	8.5 R	-	-	-
7	-	4.7	-	-	-	4.7	-	-	-	1.5 R	-	-
8	-	-	-	-	5.45	5.45	-	-	-	-	-	-
9	-	-	-	-	-	55. R	6.2	-	-	-	-	-
10	-	-	-	-	-	5.23	5.79	-	-	-	-	-
11	-	-	-	-	-	4.8	-	-	-	5.7	-	-
13	-	-	-	5.9	-	5.9 *	-	-	-	-	-	-
14	-	-	-	-	-	5.16	-	-	-	5.62	-	-
15	-	-	-	5.0	-	5.0	-	-	-	-	-	-
16	-	-	-	-	-	4.00 *	-	5.20	-	-	-	-
20	11.4 R	-	-	-	-	11.4 R	-	-	-	-	-	-
21	-	-	-	-	-	4.8	-	-	-	-	-	5.3
MEAN	-	4.7000	5.1500	5.4500	5.4500	4.8993	5.9950	5.2000	-	5.7067	5.5000	5.5500
STD DEV	-	-	-	.6364	-	.5712	.2899	-	-	.0902	-	.3536
REL STD	-	-	-	11.7	-	11.7	4.8	-	-	1.6	-	6.4
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	12107 MG DIS AAS AUT	12111 MG DIS ICP	12311 MG EXT ICP	12990 MGNESIUM COMMON	14102 SILICA ANSA AA	14105 SILICA MOL ASC	14106 SI FIL MOL ASC	14107 SILICA MOLY AA	14111 SILICA ICP DA	14112 SILICA DCP DA	14190 SILICA COMMON	15301 T P ACL AA ASC
1	-	-	-	5.5	-	-	-	0.7	-	-	0.7	-
2	5.4	-	-	5.4	0.87	-	-	-	-	-	0.87 *	-
3	-	-	-	5.8	-	-	0.78	-	-	-	0.78	-
5	-	-	-	5.8	-	0.8	-	-	-	-	0.8	-
6	-	-	-	8.5 R	-	-	-	-	-	-	-	-
7	-	-	-	1.5 R	-	-	-	-	-	-	-	-
8	-	-	6.79	6.79 *	-	0.7	-	-	-	-	0.7	-
9	-	-	-	6.2	-	-	-	-	0.85	-	0.85 *	-
10	-	-	-	5.79	-	0.65	-	-	-	-	0.65 *	-
11	-	-	-	5.7	0.80	-	-	-	-	-	0.80	-
13	-	6.29	-	6.29	-	-	-	-	-	-	-	-
14	-	-	-	5.62	-	-	-	-	-	-	-	-
15	-	5.8	-	5.8	-	-	-	-	0.64	-	0.64 *	-
16	-	-	-	5.20	-	-	-	-	-	0.719	0.719	-
20	-	5.38	-	5.38	-	0.8	-	-	-	-	0.8	0.009
21	-	-	-	5.3	-	-	-	-	-	-	-	-
MEAN	5.4000	5.8233	6.7900	5.7550	.8350	.7375	.7800	.7000	.7450	.7190	.7554	.0090
STD DEV	-	.4554	-	.4324	.0495	.0750	-	-	.1485	-	.0778	-
REL STD	-	7.8	-	7.5	5.9	10.2	-	-	19.9	-	10.3	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	15313 T P ACL AA SNCL	15401 T P UV AA ASC	15406 T P UF AA ASC	15407 T P ASC AC	15409 T P BLK AA ASC	15413 T P ACL AA SNCL	15421 T P BLK DIG ASC	15490 TOT P COMMON	16303 SO4 DIS TIT THO	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UF AA MTB
1	-	-	-	-	-	-	0.002	0.002 *	-	-	18.	-
2	-	-	-	-	-	0.007	-	0.007	-	20.7	-	-
3	-	-	-	-	-	0.0079	-	0.0079	-	-	-	21.3
4	-	-	0.012	-	-	-	-	0.012 *	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	20.0	-
6	-	-	-	-	0.01	-	-	0.01	-	22.	-	-
7	-	-	-	-	-	0.007	-	0.007	-	-	22.4	-
8	-	-	-	-	-	0.011	-	0.011 *	-	-	18.8	-
10	-	0.010 L	-	-	-	-	-	0.010 L	-	-	-	-
11	0.005	-	-	-	-	-	-	0.005	-	-	18.	-
13	-	-	-	-	-	-	-	-	-	-	21.2	-
15	-	-	0.005	-	-	-	-	0.005	-	-	20.1	-
20	-	-	-	-	-	-	-	0.009	-	-	19.9	-
21	-	-	-	0.008	-	-	-	0.008	18.9	-	-	-
MEAN	.0050	-	.0085	.0080	.0100	.0082	.0020	.0076	18.9000	21.3500	19.8000	21.3000
STD DEV	-	-	.0049	-	-	.0019	-	.0029	-	.9192	1.5278	-
REL STD	-	-	58.2	-	-	23.1	-	38.1	-	4.3	7.7	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	16309 SO4 DIS I C	16310 SO4 DIS AA CALM	16311 SO4 DIS IC	16990 SULFATE COMMON	17203 CL DIS AA FE	17204 CL DIS AG TIT	17206 CL DIS AA HG	17208 CL DIS AA HG	17209 CL DIS I C	17210 CL DIS TIT CON	17211 CL DIS IC	17990 CHLORIDE COMMON
1	-	-	-	18.	-	-	11.3	-	-	-	-	11.3
2	18.8	-	-	20.7	-	-	-	-	11.2	-	-	11.2
3	-	-	-	21.3	-	-	-	11.2	-	-	-	11.2
5	-	-	-	20.0	-	-	11.1	-	-	-	-	11.1
6	-	-	-	22.	-	10.	-	-	-	-	-	10.
7	-	-	-	22.4 *	11.4	-	-	-	-	-	-	11.4
8	-	-	-	18.8	-	-	15. R	-	-	-	-	15. R
9	20.	-	-	20.	-	-	-	-	11.5	-	-	11.5
10	-	19.	-	19.	-	-	-	-	-	11.2	-	11.2
11	-	-	-	18.	-	-	10.8	-	-	-	-	10.8
13	-	-	-	21.2	-	-	11.	-	-	-	-	11.
14	21.1	-	-	21.1	-	-	-	-	11.6	-	-	11.6
15	-	-	-	20.1	-	-	11.5	-	-	-	-	11.5
16	-	-	18.	18.	-	-	-	-	-	-	11.	11.
20	-	-	-	19.9	5.2 R	-	-	-	-	-	-	5.2 R
21	-	-	-	18.9	-	-	-	-	-	-	-	-
MEAN	19.9667	19.0000	18.0000	19.9625	11.4000	10.0000	11.1400	11.2000	11.4333	11.2000	11.0000	11.1385
STD DEV	1.1504	-	-	1.4198	-	-	.2702	-	.2082	-	-	.4114
REL STD	5.8	-	-	7.1	-	-	2.4	-	1.8	-	-	3.7
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 48 PP 88 SAMPLE 4

LAB	19001 K TOT AAS	19005 K TOT ICP	19008 K TOT DCP	19102 K DIS AAS	19103 K DIS FLM PH	19104 K DIS FLAME	19105 K DIS AAS DA	19106 K DIS AAS LI	19107 K DIS FLM PH	19111 K DIS ICP	19301 K EXT HNO3 AA	19990 PTASSIUM COMMON
1	-	-	-	-	2.9	-	-	-	-	-	-	2.9
2	-	-	-	-	3.5	-	-	-	-	-	-	3.5 *
3	-	-	-	-	-	-	-	-	3.07	-	-	3.07
5	-	-	-	-	3.1	-	-	-	-	-	-	3.1
6	-	-	-	2.5 R	-	-	-	-	-	-	-	2.5 R
7	-	-	-	2.82	-	-	-	-	-	-	-	2.82
8	-	-	-	-	-	-	-	-	-	-	3.05	3.05
9	-	3.3	-	-	-	-	-	-	-	-	-	3.3
10	-	3.16	-	-	-	-	-	-	-	-	-	3.16
11	-	-	-	-	-	-	-	3.1	-	-	-	3.1
13	-	-	-	-	-	-	-	-	-	3.21	-	3.21
14	3.1	-	-	-	-	-	-	-	-	-	-	3.1
15	-	-	-	-	-	-	3.35	-	-	-	-	3.35
16	-	-	3.29	-	-	-	-	-	-	-	-	3.29
20	-	-	-	-	3.1	-	-	-	-	-	-	3.1
21	-	-	-	-	-	4.05 R	-	-	-	-	-	4.05 R
MEAN	3.1000	3.2300	3.2900	2.8200	3.1500	-	3.3500	3.1000	3.0700	3.2100	3.0500	3.1464
STD DEV	-	.0990	-	-	.2517	-	-	-	-	-	-	.1767
REL STD	-	3.1	-	-	8.0	-	-	-	-	-	-	5.6
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	20005 CA TOT ICP	20007 CA TOT DCP	20050 CA DIS AAS NO	20100 CA DIS CALC'D	20103 CA DIS AAS	20107 CA DIS AAS	20108 CA DIS AAS UF	20110 CA DIS AAS AUT	20111 CA DIS ICP	20311 CA EXT ICP	20980 CALCIUM COMMON
1	-	-	-	-	-	17.9	-	-	-	-	17.9
2	-	-	-	-	-	-	-	17.4	-	-	17.4
3	-	-	-	-	-	-	18.9	-	-	-	18.9
5	-	-	-	-	18.2	-	-	-	-	-	18.2
6	-	-	-	19.	-	-	-	-	-	-	19.
7	-	-	-	-	18.3	-	-	-	-	-	18.3
8	-	-	-	-	-	-	-	-	-	21.5 R	21.5 R
9	19.	-	-	-	-	-	-	-	-	-	19.
10	18.56	-	-	-	-	-	-	-	-	-	18.56
11	-	-	-	-	18.	-	-	-	-	-	18.
13	-	-	-	-	-	-	-	-	18.9	-	18.9
14	-	-	16.6	-	-	-	-	-	-	-	16.6
15	-	-	-	-	-	-	-	-	18.2	-	18.2
16	-	15.7	-	-	-	-	-	-	-	-	15.7 *
20	-	-	-	-	-	-	-	-	17.02	-	17.02
21	-	-	-	-	-	-	18.9	-	-	-	18.9
MEAN	18.7800	15.7000	16.6000	19.0000	18.1667	17.9000	18.9000	17.4000	18.0400	-	18.0387
STD DEV	.3111	-	-	-	.1528	-	.0000	-	.9502	-	.9809
REL STD	1.7	-	-	-	.8	-	-1.0	-	5.3	-	5.4
DES VAL	-	-	-	-	-	-	-	-	-	-	-

DATES RECEIVED

1 89/12/07	2 89/12/28	3 89/12/06	3 90/01/15	4 89/12/27
5 90/01/11	6 89/12/18	6 90/02/05	7 90/01/31	8 89/12/29
9 89/12/21	10 89/12/18	11 89/12/11	13 89/12/21	14 90/02/09
15 90/01/29	16 90/01/31	19 90/--/--	20 89/12/28	21 89/12/22

NOTE: ALL CONCENTRATION UNITS ARE EXPRESSED IN MG/L OF EACH ELEMENT, THE EXCEPTIONS BEING: COLOUR IN RELATIVE UNITS, CONDUCTIVITY IN USIE/CM, TURBIDITY IN JTU OR NTU, NITROGEN ANALYSES IN "N", ALKALINITY & HARDNESS IN CACO3, SILICA IN SIO2, AND SULFATE IN SO4.

Environment Canada | Environnement Canada
Conservation and Protection | Conservation et Protection

Canada Centre for Inland Waters
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Your file Votre référence

Our file Notre référence

May 4 Mai, 1990.

To/A: Participants & Managers/Directeurs:

Federal-Provincial Quality Assurance Program
Programme d'Assurance-Qualité Fédéral-Provincial (PAQFP)

Final Report/Rapport Dernier: FPQA Studies/Etudes 49-50

Vous trouverez en annexe le résumé dernier des études susmentionées.

Il y a un tableau supplimentaire dans ce rapport dernier. Ce tableau de résultats indiqués aidera les responsables et les directeurs évaluer la performance de leur laboratoire. La performance des laboratoires est rangé avec le pourcentage des résultats indiqués. Si la performance est pauvre, le 'QC' du laboratoire devrait être réviser. Le tableau supplimentaire donnera un meilleur indication de la performance et l'amèlioration du laboratoire.

Si vous avez de commentaire sur ce résumé, ou des corrections valable à notre base de données, veuillez me les transmettre.

I have enclosed the final report for the above mentioned studies.

There is a noteworthy additional table in this final report. This table, a summary of flagged results, is included to assist laboratory heads and managers in evaluating their laboratories performance relative to others. The laboratories are ranked according to the % of results flagged. In case of poor performance, internal QC procedures for the parameters listed in the Flagged Results Table should be reviewed. The additional table will give a more complete indication of laboratory performance or improvement.

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry A

H. Alkema
Quality Assurance Project
Research & Applications Branch

Attachment: Distribution List
En annexe: Liste de diffusion

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RESEARCH & APPLICATIONS BRANCH

FINAL REPORT

REPORT NO. RAB 90-07 (Eng)

FEDERAL PROVINCIAL QUALITY ASSURANCE PROGRAM

STUDIES 49 AND 50

for January and February 1990

TRACE METALS, MAJOR IONS, NUTRIENTS AND PHYSICAL PARAMETERS IN SURFACE WATERS

by

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(Ce rapport est aussi disponible en français)

Introduction

As part of an on-going study, the Quality Assurance Section, NWRI in Burlington, Ontario, has been sending reference water samples bi-monthly to chemical laboratories participating in the FP program. This report summarizes the most recent FP interlaboratory quality assurance studies: FP 49 and 50, for the months January and February, 1990. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The concentrations were from medium to high.

Study Design

Four water samples were submitted to each laboratory for chemical analyses. Two samples were submitted for trace metals analysis, while the remaining two were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the four samples:

FP 49 - Sample 1 - 125 ml, high level* for trace metals (3% HNO_3)
Sample 2 - up to 1 L, major ions etc., stored at 4^0C

FP 50 - Sample 3 - 1 L, low level* for trace metals (0.2% HNO_3)
Sample 4 - up to 1 L, major ions, etc., stored at 4^0C

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were reported as required by the standard report sheets provided with the QA samples. Submitted results were tabulated for each parameter, first for each method reported, and then

for all methods combined. These data, and the resulting statistics are presented in the Data Summary. (attached)

Preliminary data summaries (RAB # 90-07), including problematic results, were sent March 7 and April 6. Each laboratory was given three weeks to notify us of any errors in data transcription, compilation, or flags.

Performance Indicators

In the Federal Provincial QA program, two types of reference samples are used for the accuracy assessment. These are Reference Waters (RMs) and Certified Reference waters (CRMs) which have Design Values for the stable parameters. Also, regional samples are used occasionally as natural representative samples. The means for these regional samples, and the Design Values for the reference waters are used to test each reported result for accuracy.

Percentage deviations from the reference values are used as an indication by the laboratory head to determine the extent of the discrepancies between the laboratory result and the reference value. However, please keep in mind that at low levels, high % deviations are often seen, and may be misleading if interpreted too strictly.

A result which deviates more than the greater of 10% or 1 standard deviation from the reference value is marked with an asterisk in the data table and its value tabulated in the flagged data table (Table 1). Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned an 'HDL' and is tabulated for each laboratory in Table 2.

If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

Three tables list the data from the above mentioned evaluations. Table 1 is a summary of the flagged results for each laboratory as they are found in Table 2. The summary will assist laboratory managers and lab heads in evaluating their laboratories performance relative to others. A listing parameters for which there was a high standard deviation is found in Table 2. Formerly called a high coefficient of variation, the high standard deviation is generated with standardized criteria that are included with the automated flagging routine. These automated criteria have been in use since March 1988 (Study FP 27), and should provide a more accurate and consistent listing of the difficult to analyze parameters or levels. A listing of the criteria used to indicate high deviation of analysis is available on request. Your comments would be appreciated.

Provincial laboratories average number of deviations per sample was 1.1.
Federal laboratories average number of deviations per sample was 1.7.

TABLE 1: FP & PPWB LABS - SUMMARY OF FLAGGED DATA - FP 49 FP 50

LAB	RESULTS REPORTED	>10% OR 1SD FLAGS	GRUBBS FLAGS	HDL'S INDICATED	% DATA FLAGGED
4	22	0	0	0	.0
7	28	0	0	0	.0
20	59	2	1	0	3.4
9	52	2	0	0	3.8
3	70	3	0	0	4.3
11	52	3	1	0	5.8
21	48	3	0	0	6.3
10	67	5	0	3	7.5
1	62	5	0	0	8.1
8	60	6	0	1	10.0
13	32	4	2	1	12.5
15	64	8	5	2	12.5
2	47	6	0	0	12.8
6	60	11	7	1	18.3
19	40	10	4	1	25.0
14	31	9	3	0	29.0
16	62	27	8	0	43.5

NOTE: FLAGS GUIDELINE (PERFORMANCE INDEX)

< 5% - EXCELLENT TO VERY GOOD
5 - 10% - MODERATE PERFORMANCE
> 10% - IMPROVEMENT NECESSARY, GENERATION OF INCOMPARABLE DATA

TABLE 2: FP & PPWB LABORATORIES FLAGGED RESULTS - STUDIES FP 49-50

LAB 1	FLAGS :	PTASSIUM	-13%		ALUMINUM	-28%		SODIUM	-26%	
		MGNESIUM	15%		SULFATE	-12%				
LAB 2	FLAGS :	D O C	-14%		NITRATE	21%		D O C	13%	
		T N DIS	-14%		SILICA	11%		PTASSIUM	-16%	
LAB 3	FLAGS :	T N DIS	-58%		T N DIS	15%		FLUORIDE	24%	
LAB 4	FLAGS :	NONE								
LAB 6	FLAGS :	TKN	63%	R	NITRATE	25%		AMMONIA	-16%	
		TOT P	506%	R	PTASSIUM	29%	R	TKN	171%	R
		NITRATE	20%		HARDNESS	28%	R	SODIUM	16%	
		MGNESIUM	102%	R	TOT P	317%	R			
	HDL :	AMMONIA								
LAB 7	FLAGS :	NONE								
LAB 8	FLAGS :	TKN	16%		MANGNESE	21%		IRON	39%	
		COPPER	21%		TKN	27%		CHLORIDE	-15%	
	HDL :	ALUMINUM								
LAB 9	FLAGS :	IRON	22%		COBALT	-19%				
LAB 10	FLAGS :	NITRATE	-24%		ALUMINUM	33%		COBALT	34%	
		CADMIUM	-14%		BORON	-87%				
	HDL :	TOT P			AMMONIA			TOT P		
LAB 11	FLAGS :	AMMONIA	-29%	R	MANGNESE	-16%		AMMONIA	-93%	L
LAB 13	FLAGS :	CHROMIUM	-83%	R	MANGNESE	-13%		ALKLINTY	-12%	
		TOT P	108%	R						
	HDL :	AMMONIA								
LAB 14	FLAGS :	IRON	19%	R	NITRATE	-100%	R	CHLORIDE	13%	
		ALUMINUM	34%		VANADIUM	39%	R	IRON	-19%	
		COPPER	15%		ZINC	-19%		SULFATE	12%	
LAB 15	FLAGS :	D O C	44%	R	AMMONIA	299%	R	PTASSIUM	13%	
		D O C	100%	R	D I C	-27%	R	AMMONIA	1521%	
		FLUORIDE	28%		SILICA	-12%				
	HDL :	TOT P								

..../2

LAB 16	FLAGS :	CHROMIUM	-13%	MANGNESE	26% R	IRON	25% R
		ZINC	12%	MOLYBNUM	14% R	LEAD	18%
		TKN	-13%	NITRATE	-31%	SODIUM	-15% R
		MGNESIUM	-11%	SULFATE	-14%	CHLORIDE	-12%
		CALCIUM	-19%	ALUMINUM	42%	VANADIUM	139% R
		CHROMIUM	21%	MANGNESE	63% R	IRON	22%
		COBALT	13%	NICKEL	26%	CADMIUM	19%
		BARIUM	103% R	LEAD	39% R	FLUORIDE	28%
		SODIUM	-22%	CHLORIDE	-11%	CALCIUM	-19%
LAB 19	FLAGS :	ALUMINUM	-11%	CONDUCT	865% R	FLUORIDE	-22% R
		ALUMINUM	-43%	IRON	20%	NICKEL	18%
		CADMIUM	-14%	CONDUCT	928% R	FLUORIDE	-36% R
		SULFATE	19%				
	HDL :	LEAD					
LAB 20	FLAGS :	CHROMIUM	-29% R	IRON	16%		
LAB 21	FLAGS :	CADMIUM	19%	NITRATE	-23%	PTASSIUM	-23%

NOTE: A VERY HIGH FREQUENCY OF FLAGGED RESULTS (OR A HIGH %) IS INDICATIVE OF POOR PERFORMANCE. ON THE OTHER HAND, LABS WITH FEW IF ANY FLAGS ARE JUDGED TO HAVE VERY GOOD PERFORMANCE.

ALSO, AN "R" FLAG INDICATES A NON COMPARABLE RESULT, THAT IS, ONE PRODUCED WITH NON RANDOM FACTORS. AN "L" FLAG INDICATES A 'LESS THAN' RESULT LOWER THAN THE REFERENCE VALUE.

TABLE 3: HIGH STANDARD DEVIATION

PARAMETER		LEVEL
BORON	AT	.054 PPM
T N DIS	AT	2.246 PPM
ALUMINUM	AT	.053 PPM
BORON	AT	.076 PPM

APPENDIX I

Definitions of Types of Metals Analysis

1. DA - Direct Aspiration

Without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS) ar Inuctively Coupled (Argon) Plasma (ICAP or ICP). Standards should contain the acid equivalent of the sample.

2. SE - Code for low level analysis

Analysis is carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP.
3. Digestion of aqueous phase and ICAP analysis.
4. Graphite tube (flameless) AAS.

APPENDIX II

Performance Indicators

1. Circled Results

Results are circled in the data tables when a minor deviation from the comparator has ocurred. (The comparator is the design value of the reference sample, or the mean in the case of a biologically active sample.) Circled results are in general greater than or less than 10% from the comparator. At very low levels of analytes or with parameters that are difficult to analyse, a greater deviation than 10% is allowed. Under these conditions, a result is circled when it is outside one standard deviation of the comparator. These circled results, though acceptable values, are a warning to laboratory managers that the parameter analysis should be investigated.

2. Rejectable Results

Each laboratory result is statistically tested to see if it is outlying. Outlying results were caused by non random causes such as a faulty calibration or a transcription error. These outlying results, calculated by the Grubbs' procedure,* and indicated in the data tables with an 'R', are noncomparable with the other data for the parameter.

3. A High Co-efficient of Variation (HCV)

Occasionally data for a parameter yields a very high relative standard deviation (RSD). When this HCV is not due to outlying values, it indicates a high variability within the data set. The data in this set is then noncomparable. In such a case, the RSD for the parameter is circled in the data tables and the parameter's noncomparability is noted in the comments.

4. High Detection Limits (HDL)

Each laboratory determines its own detection limits according to its own requirements. When major differences of detection limits occur, the result is flagged with 'HDL' in the data tables. An HDL indicates that low level analysis may not be comparable with the analyses of other laboratories.

* reference : Frank E. Grubbs, Technometrics, 1969, p. 1.

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 49 PP 89 DATE: 01/01/90 DUE DATE: 28/02/90 PAGE 1

SAMPLE 1 SPIKED SAMPLE. TRACE METALS DA. (IN 3.0% HNO3)

LAB	13009 AL TOT 5X ICP	13030 AL TOT ?	13102 AL DIS AAS DA	13111 AL DIS ICP DA	13302 AL EXT AAS DA	13321 AL EXT ICP DA	13322 AL EXT DCP DA	13999 ALUMINUM COMMON	23009 V TOT 5X ICP	23011 V TOT 5X ICP	23012 V TOT 5X DCP	23109 V DIS ICP
1	-	2.746	-	-	-	-	-	2.746	2.344	-	-	-
2	-	-	-	-	2.8	-	-	2.8	-	-	-	-
3	-	-	-	-	2.68	2.64	-	2.68	-	-	-	-
6	2.6	-	-	-	-	-	-	2.6	-	2.3	-	-
8	-	-	-	-	2.9	-	-	2.9	-	-	-	-
9	-	-	-	2.7	-	-	-	2.7	-	-	-	-
10	-	-	-	2.69	-	-	-	2.69	-	-	-	-
15	-	-	-	-	-	-	2.59	2.59	-	-	2.32	-
16	-	-	-	-	-	-	2.58	2.58	-	-	2.22	-
19	2.38	-	-	-	-	-	-	2.38 *	2.27	-	-	-
20	-	-	-	2.75	-	-	-	2.75	-	-	-	2.41
21	-	-	2.69	-	-	-	-	2.69	-	-	-	-
MEAN	2.4900	2.7460	2.6900	2.7133	2.7933	2.6400	2.5850	2.6755	2.3070	2.3000	2.2700	2.4100
STD DEV	.1556	-	-	.0321	.1102	-	.0071	.1304	.0523	-	.0707	-
REL STD	6.2	-	-	1.2	3.9	-	.3	4.9	2.3	-	3.1	-
DES VAL	-	-	-	-	-	-	-	2.6874	-	-	-	-

LAB	23111 V DIS ICP DA	23321 V EXT ICP DA	23999 VANADIUM COMMON	24009 CR TOT 5X ICP	24011 CR TOT 5X ICP	24012 CR TOT 5X DCP	24052 CR DIS AAS DA	24111 CR DIS ICP DA	24302 CR EXT AAS DA	24311 CR EXT ICP DA	24321 CR EXT ICP DA	24999 CHROMIUM COMMON
1	-	-	2.344	0.291	-	-	-	-	-	-	-	0.291
3	-	2.27	2.27	-	-	-	-	-	-	-	0.300	0.300
6	-	-	2.3	-	0.30	-	-	-	-	-	-	0.30
8	-	-	-	-	-	-	-	-	0.33	-	-	0.33
9	2.4	-	2.4	-	-	-	-	0.30	-	-	-	0.30
10	2.30	-	2.30	-	-	-	-	0.299	-	-	-	0.299
11	-	-	-	-	-	-	-	-	0.270	-	-	0.270
13	-	-	-	-	-	-	-	-	-	0.05 R	-	0.05 R
15	-	-	2.32	-	-	0.289	-	-	-	-	-	0.289
16	-	-	2.22	-	-	0.260	-	-	-	-	-	0.260 *
19	-	-	2.27	-	-	-	-	-	-	-	-	-
20	-	-	2.41	-	-	-	-	0.212 R	-	-	-	0.212 R
21	-	-	-	-	-	-	0.305	-	-	-	-	0.305
MEAN	2.3500	2.2700	2.3149	.2910	.3000	.2745	.3050	.2995	.3000	-	.3000	.2944
STD DEV	.0707	-	.0619	-	-	.0205	-	.0007	.0424	-	-	.0192
REL STD	3.0	-	2.7	-	-	7.5	-	.2	14.1	-	-	6.5
DES VAL	-	-	2.3191	-	-	-	-	-	-	-	-	.2994

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 49 PP 89 SAMPLE 1

LAB	25003 MN TOT 5X ICP	25004 MN TOT AAS DA	25009 MN TOT COL BIS	25011 MN TOT 5X ICP	25012 MN TOT 5X DCP	25104 MN DIS AAS DA	25111 MN DIS ICP DA	25304 MN EXT AAS DA	25311 MN EXT ICP DA	25321 MN EXT ICP DA	25999 MANGNESE COMMON	26009 FE TOT 5X ICP
1	0.263	-	-	-	-	-	-	-	-	-	0.263	1.103
2	-	-	-	-	-	-	-	0.25	-	-	0.25	-
3	-	-	-	-	-	-	-	0.260	-	0.263	0.260	-
6	-	-	-	0.26	-	-	-	-	-	-	0.26	-
8	-	-	-	-	-	-	-	-	0.26	-	0.26	-
9	-	-	-	-	-	-	0.26	-	-	-	0.26	-
10	-	-	-	-	-	-	0.262	-	-	-	0.262	-
11	-	0.260	-	-	-	-	-	-	-	-	0.260	-
13	-	-	-	-	-	-	-	-	0.23	-	0.23 *	-
15	-	-	-	-	0.257	-	-	-	-	-	0.257	-
16	-	-	-	-	0.332 R	-	-	-	-	-	0.332 R	-
19	-	-	0.261	-	-	-	-	-	-	-	0.261	1.11
20	-	-	-	-	-	-	0.251	-	-	-	0.251	-
21	-	-	-	-	-	0.27	-	-	-	-	0.27	-
MEAN	.2630	.2600	.2610	.2600	.2570	.2700	.2577	.2550	.2450	.2630	.2572	1.1065
STD DEV	-	-	-	-	-	-	.0059	.0071	.0212	-	.0096	.0049
REL STD	-	-	-	-	-	-	2.3	2.8	8.7	-	3.7	.4
DES VAL	-	-	-	-	-	-	-	-	-	-	.2629	-

LAB	26011 FE TOT 5X ICP	26012 FE TOT 5X DCP	26104 FE DIS AAS DA	26111 FE DIS ICP DA	26304 FE EXT AAS DA	26311 FE EXT ICP DA	26321 FE EXT ICP DA	26999 IRON COMMON	27009 CO TOT 5X ICP	27011 CO TOT 5X ICP	27012 CO TOT 5X DCP	27101 CO DIS AAS DA
1	-	-	-	-	-	-	-	1.103	1.089	-	-	-
2	-	-	-	-	1.1	-	-	1.1	-	-	-	-
3	-	-	-	-	1.12	-	1.10	1.12	-	-	-	-
6	1.1	-	-	-	-	-	-	1.1	-	1.1	-	-
8	-	-	-	-	-	1.07	-	1.07	-	-	-	-
9	-	-	-	1.1	-	-	-	1.1	-	-	-	-
10	-	-	-	1.08	-	-	-	1.08	-	-	-	-
11	-	-	-	-	1.10	-	-	1.10	-	-	-	-
13	-	-	-	-	-	1.06	-	1.06	-	-	-	-
14	-	-	1.30 R	-	-	-	-	1.30 R	-	-	-	-
15	-	1.1	-	-	-	-	-	1.1	-	-	1.08	-
16	-	1.36 R	-	-	-	-	-	1.36 R	-	-	1.04	-
19	-	-	-	-	-	-	-	1.11	-	-	-	-
20	-	-	-	1.06	-	-	-	1.06	-	-	-	-
21	-	-	1.13	-	-	-	-	1.13	-	-	-	1.05
MEAN	1.1000	1.1000	1.1300	1.0800	1.1067	1.0650	1.1000	1.0948	1.0890	1.1000	1.0600	1.0500
STD DEV	-	-	-	.0200	.0115	.0071	-	.0215	-	-	.0283	-
REL STD	-	-	-	1.9	1.0	.7	-	2.0	-	-	2.7	-
DES VAL	-	-	-	-	-	-	-	1.0893	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 49 PP 89 SAMPLE 1

LAB	27111 CO DIS ICP DA	27301 CO EXT AAS DA	27321 CO EXT ICP DA	27999 COBALT COMMON	28009 NI TOT 5X ICP	28011 NI TOT 5X ICP	28012 NI TOT 5X DCP	28101 NI DIS AAS DA	28111 NI DIS ICP DA	28301 NI EXT AAS DA	28311 NI EXT ICP DA	28321 NI EXT ICP DA
1	-	-	-	1.089	1.284	-	-	-	-	-	-	-
3	-	1.12	1.04	1.12	-	-	-	-	-	1.29	-	1.25
6	-	-	-	1.1	-	1.3	-	-	-	-	-	-
8	-	1.07	-	1.07	-	-	-	-	-	-	1.23	-
9	1.05	-	-	1.05	-	-	-	-	1.25	-	-	-
10	1.09	-	-	1.09	-	-	-	-	1.259	-	-	-
11	-	1.09	-	1.09	-	-	-	-	-	1.20	-	-
13	-	-	-	-	-	-	-	-	-	-	1.24	-
15	-	-	-	1.08	-	-	1.26	-	-	-	-	-
16	-	-	-	1.04	-	-	1.32	-	-	-	-	-
19	-	-	-	-	1.33	-	-	-	-	-	-	-
20	1.01	-	-	1.01	-	-	-	-	1.23	-	-	-
21	-	-	-	1.05	-	-	-	1.25	-	-	-	-
MEAN	1.0500	1.0933	1.0400	1.0717	1.3070	1.3000	1.2900	1.2500	1.2463	1.2450	1.2350	1.2500
STD DEV	.0400	.0252	-	.0315	.0325	-	.0424	-	.0148	.0636	.0071	-
REL STD	3.8	2.3	-	2.9	2.5	-	3.3	-	1.2	5.1	.6	-
DES VAL	-	-	-	1.0669	-	-	-	-	-	-	-	-

LAB	28999 NICKEL COMMON	29005 CU TOT AAS SE	29009 CU TOT 5X ICP	29011 CU TOT 5X ICP	29012 CU TOT 5X DCP	29106 CU DIS AAS DA	29111 CU DIS ICP DA	29306 CU EXT AAS DA	29311 CU EXT ICP DA	29321 CU EXT ICP DA	29999 COPPER COMMON	30009 ZN TOT 5X ICP
1	1.284	-	0.294	-	-	-	-	-	-	-	0.294	0.334
2	-	-	-	-	-	-	-	0.3	-	-	0.3	-
3	1.29	-	-	-	-	-	-	0.280	-	0.282	0.280	-
6	1.3	-	-	0.28	-	-	-	-	-	-	0.28	-
8	1.23	-	-	-	-	-	-	-	0.31	-	0.31	-
9	1.25	-	-	-	-	-	0.28	-	-	-	0.28	-
10	1.259	-	-	-	-	-	0.282	-	-	-	0.282	-
11	1.20	-	-	-	-	-	-	0.313	-	-	0.313	-
13	1.24	-	-	-	-	-	-	-	0.29	-	0.29	-
15	1.26	-	-	-	0.291	-	-	-	-	-	0.291	-
16	1.32	-	-	-	0.280	-	-	-	-	-	0.280	-
19	1.33	0.282	-	-	-	-	-	-	-	-	0.282	0.315
20	1.23	-	-	-	-	-	0.265	-	-	-	0.265	-
21	1.25	-	-	-	-	0.298	-	-	-	-	0.298	-
MEAN	1.2648	.2820	.2940	.2800	.2855	.2980	.2757	.2977	.3000	.2820	.2889	.3245
STD DEV	.0379	-	-	-	.0078	-	.0093	.0166	.0141	-	.0131	.0134
REL STD	3.0	-	-	-	2.7	-	3.4	5.6	4.7	-	4.6	4.1
DES VAL	1.2335	-	-	-	-	-	-	-	-	-	.2879	-

LAB	30011 ZN TOT 5X ICP	30012 ZN TOT 5X DCP	30104 ZN DIS AAS DA	30111 ZN DIS ICP DA	30304 ZN EXT AAS DA	30311 ZN EXT ICP DA	30321 ZN EXT ICP DA	30999 ZINC COMMON	38012 SR TOT DCP DA	38111 SR DIS ICP DA	38321 SR EXT ICP DA	38999 STRNTIUM COMMON
1	-	-	-	-	-	-	-	0.334	-	-	-	-
2	-	-	-	-	0.3	-	-	0.3	-	-	-	-
3	-	-	-	-	0.319	-	0.317	0.319	-	-	0.482	0.482
6	0.30	-	-	-	-	-	-	0.30	-	-	-	-
8	-	-	-	-	-	0.31	-	0.31	-	-	-	-
9	-	-	-	0.32	-	-	-	0.32	-	0.50	-	0.50
10	-	-	-	0.333	-	-	-	0.333	-	0.47	-	0.47
11	-	-	-	-	0.319	-	-	0.319	-	-	-	-
13	-	-	-	-	-	0.31	-	0.31	-	-	-	-
14	-	-	0.346	-	-	-	-	0.346	-	-	-	-
15	-	0.323	-	-	-	-	-	0.323	0.49	-	-	0.49
16	-	0.352	-	-	-	-	-	0.352 *	0.500	-	-	0.500
19	-	-	-	-	-	-	-	0.315	-	-	-	-
20	-	-	-	0.318	-	-	-	0.318	-	-	-	-
21	-	-	0.34	-	-	-	-	0.34	-	-	-	-
MEAN	.3000	.3375	.3430	.3237	.3127	.3100	.3170	.3226	.4950	.4850	.4820	.4884
STD DEV	-	.0205	.0042	.0081	.0110	.0000	-	.0156	.0071	.0212	-	.0128
REL STD	-	6.1	1.2	2.5	3.5	-1.0	-	4.8	1.4	4.4	-	2.6
DES VAL	-	-	-	-	-	-	-	.3144	-	-	-	.4907

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 49 PP 89 SAMPLE 1

LAB	42009 MO TOT 5X ICP	42011 MO TOT 5X ICP	42012 MO TOT 5X DCP	42109	42111 MO DIS ICP DA	42121 MO EXT ICP DA	42301 MO EXT AAS DA	42999 MOLYBNUM COMMON	48009 CD TOT 5X ICP	48011 CD TOT 5X ICP	48012 CD TOT 5X DCP	48101 CD DIS AAS DA
1	4.566	-	-	-	-	-	-	4.566	0.240	-	-	-
3	-	-	-	-	-	4.44	-	4.44	-	-	-	-
6	-	4.6	-	-	-	-	-	4.6	-	0.24	-	-
9	-	-	-	-	4.6	-	-	4.6	-	-	-	-
10	-	-	-	-	4.51	-	-	4.51	-	-	-	-
15	-	-	4.5	-	-	-	-	4.5	-	-	0.239	-
16	-	-	5.26 R	-	-	-	-	5.26 R	-	-	0.220	-
19	-	-	-	-	-	-	-	-	0.229	-	-	-
20	-	-	-	4.34	-	-	-	4.34	-	-	-	-
21	-	-	-	-	-	-	4.5	4.5	-	-	-	0.23
MEAN	4.5660	4.6000	4.5000	4.3400	4.5550	4.4400	4.5000	4.5070	.2345	.2400	.2295	.2300
STD DEV	-	-	-	-	.0636	-	-	.0872	.0078	-	.0134	-
REL STD	-	-	-	-	1.4	-	-	1.9	3.3	-	5.9	-
DES VAL	-	-	-	-	-	-	-	4.6120	-	-	-	-

LAB	48111 CD DIS ICP DA	48301 CD EXT AAS DA	48311 CD EXT ICP DA	48321 CD EXT ICP DA	48999 CADMIUM COMMON	56009 BA TOT 5X ICP	56011 BA TOT 5X ICP	56012 BA TOT 5X DCP	56111 BA DIS ICP DA	56301 BA EXT AAS DA	56321 BA EXT ICP DA	56999 BARIUM COMMON
1	-	-	-	-	0.240	2.526	-	-	-	-	-	2.526
2	-	0.24	-	-	0.24	-	-	-	-	-	-	-
3	-	0.249	-	0.227	0.249	-	-	-	-	-	2.47	2.47
6	-	-	-	-	0.24	-	2.4	-	-	-	-	2.4
8	-	0.24	-	-	0.24	-	-	-	-	-	-	-
9	0.25	-	-	-	0.25	-	-	-	2.6	-	-	2.6
10	0.237	-	-	-	0.237	-	-	-	2.46	-	-	2.46
11	-	0.240	-	-	0.240	-	-	-	-	-	-	-
13	-	-	0.23	-	0.23	-	-	-	-	-	-	-
15	-	-	-	-	0.239	-	-	2.56	-	-	-	2.56
16	-	-	-	-	0.220	-	-	2.44	-	-	-	2.44
19	-	-	-	-	0.229	2.50	-	-	-	-	-	2.50
20	0.230	-	-	-	0.230	-	2.40	-	-	-	-	2.40
21	-	-	-	-	0.23	-	-	-	-	2.44	-	2.44
MEAN	.2390	.2423	.2300	.2270	.2367	2.5130	2.4000	2.5000	2.5300	2.4400	2.4700	2.4796
STD DEV	.0101	.0045	-	-	.0081	.0184	.0000	.0849	.0990	-	-	.0665
REL STD	4.2	1.9	-	-	3.4	.7	-1.0	3.4	3.9	-	-	2.7
DES VAL	-	-	-	-	.2371	-	-	-	-	-	-	2.5290

LAB	82009 PB TOT 5X ICP	82011 PB TOT 5X ICP	82012 PB TOT 5X DCP	82101 PB DIS AAS DA	82111 PB DIS ICP DA	82301 PB EXT AAS DA	82302 PB EXT AAS SE	82311 PB EXT ICP DA	82321 PB EXT ICP DA	82999 LEAD COMMON
1	-	-	-	-	-	-	1.376	-	-	1.376
2	-	-	-	-	-	1.31	-	-	-	1.31
3	-	-	-	-	-	1.35	-	-	1.29	1.35
6	-	1.3	-	-	-	-	-	-	-	1.3
8	-	-	-	-	-	-	-	1.30	-	1.30
9	-	-	-	-	1.32	-	-	-	-	1.32
10	-	-	-	-	1.347	-	-	-	-	1.347
11	-	-	-	-	-	1.37	-	-	-	1.37
13	-	-	-	-	-	-	-	1.30	-	1.30
14	-	-	-	1.37	-	-	-	-	-	1.37
15	-	-	1.28	-	-	-	-	-	-	1.28
16	-	-	1.56	-	-	-	-	-	-	1.56 *
19	1.32	-	-	-	-	-	-	-	-	1.32
20	-	-	-	-	1.34	-	-	-	-	1.34
21	1.34	-	-	-	-	-	-	-	-	1.34
MEAN	1.3300	1.3000	1.4200	1.3700	1.3357	1.3433	1.3760	1.3000	1.2900	1.3455
STD DEV	.0141	-	.1980	-	.0140	.0306	-	.0000	-	.0662
REL STD	1.1	-	13.9	-	1.0	2.3	-	-1.0	-	4.9
DES VAL	-	-	-	-	-	-	-	-	-	1.3255

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 49 PP 89 SAMPLE 2

LAB	00110 IONIC BALANC %	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPARE	02021 COLOUR VIS COM	02023 COLOUR SPECT	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02073 TURB HACH	02074 TURB NPLMTRI	02077 TURB HACH FZ
1	1.51	6.11	5.83	-	-	-	-	617.	617.	-	-	-
2	-0.75	5.915	6.004	5. L	-	-	5. L	595.	595.	0.2	-	-
3	0.85	5.9540	5.8538	5. L	-	-	5. L	615.	615.	0.15	-	-
4	-	-	-	-	5. L	-	5. L	608.	608.	-	-	-
6	2.4	6.2	5.9	-	-	-	-	615.	615.	-	0.18	-
7	-2.0	6.12	5.89	0.	-	-	0.	601.	601.	0.1	-	-
8	2.22	6.01	5.75	-	5. L	-	5. L	628.	628.	-	0.05	-
9	4.08	6.25	5.76	-	-	-	-	595.	595.	-	-	-
10	0.27	5.855	5.823	-	-	1.	1.	580.	580.	-	0.1	-
11	-	-	-	5. L	-	-	5. L	600.	600.	-	-	0.1 L
14	-	-	-	-	-	-	-	615.	615.	-	-	-
15	-	-	-	-	-	-	-	618.	618.	-	0.05	-
16	-	-	-	-	-	-	-	590.	590.	-	-	-
19	-	-	-	-	-	-	-	5860. R	5860. R	-	-	-
20	2.9	6.062	5.72	-	-	-	-	630.	630.	-	0.2	-
21	-	-	-	-	-	-	-	604.	604.	-	-	-
MEAN	1.2756	6.0529	5.8368	.0000	-	1.0000	.5000	607.4000	607.4000	.1500	.1160	-
STD DEV	1.8954	.1314	.0883	-	-	-	.7071	14.0956	14.0956	.0500	.0709	-
REL STD	148.6	2.2	1.5	-	-	-	141.4	2.3	2.3	33.3	61.1	-
DES VAL	-	-	-	-	-	-	2.7391	-	607.273	-	-	-

LAB	02081 TURB RATIO	02090 TURBIDTY COMMON	05100 BORON ?	05105 BORON AA CARM	05106 BORON F AZOMETH	05111 BORON F ICP DA	05190 BORON COMMON	06051 TIC COMB IR	06104 DOC UV CO2 IR	06107 DOC UV CO2 PHE	06108 DOC CALC'D	06109 DOC UV CO2 OH
1	-	-	-	-	-	-	-	-	-	14.7	-	-
2	-	0.2	-	-	-	-	-	-	-	12.6	-	-
3	-	0.15	-	-	-	-	-	-	13.7	-	-	-
4	0.15	0.15	-	0.082	-	-	0.082	-	15.9	-	-	-
6	-	0.18	-	-	-	-	-	-	13.79	-	-	-
7	-	0.1	-	-	-	-	-	-	-	-	-	-
8	-	0.05	-	-	0.05 L	-	0.05 L	18.0	-	-	16.0	-
10	-	0.1	-	-	-	0.03	0.03	-	-	-	-	14.8
11	-	0.1 L	-	-	-	-	-	-	-	-	-	-
15	-	0.05	-	-	-	-	-	-	21. R	-	-	-
16	-	-	0.05 L	-	-	-	0.05 L	-	-	-	-	-
20	-	0.2	-	-	-	-	-	-	-	-	-	-
MEAN	.1500	.1311	-	.0820	-	.0300	.0560	18.0000	14.4633	13.6500	16.0000	14.8000
STD DEV	-	.0588	-	-	-	-	.0368	-	1.2450	1.4849	-	-
REL STD	-	44.9	-	-	-	-	65.7	-	8.6	10.9	-	-
DES VAL	-	.1905	-	-	-	-	.05365	-	-	-	-	-

LAB	06112 DOC PER IR	06150 D O C COMMON	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 D I C COMMON	07003 TKN AA ALK PHE	07010 TKN AA SAL	07015 TKN DIG BERTHEL	07016 TKN BLK AMM-SAL	07021 TKN BLK DIG BER	07090 TKN COMMON
1	-	14.7	-	18.8	-	18.8	-	-	-	-	0.70	0.70
2	-	12.6 *	-	-	-	-	-	-	-	-	-	-
3	-	13.7	18.6	-	-	18.6	-	0.710	-	-	-	0.710
4	-	15.9	-	-	-	-	-	-	-	-	-	-
6	-	13.79	-	-	-	-	-	-	-	1.12 R	-	1.12 R
8	-	16.0	-	-	-	18.0	-	-	0.80	-	-	0.80 *
10	-	14.8	-	-	18.4	18.4	-	-	-	-	-	-
15	-	21. R	16.	-	-	16.	-	-	-	-	-	-
16	15.1	15.1	17.4	-	-	17.4	0.6	-	-	-	-	0.6 *
20	-	-	-	-	-	-	-	-	-	0.63	-	0.63
MEAN	15.1000	14.5738	17.3333	18.8000	18.4000	17.8667	.6000	.7100	.8000	.6300	.7000	.6880
STD DEV	-	1.1595	1.3013	-	-	1.0405	-	-	-	-	-	.0779
REL STD	-	8.0	7.5	-	-	5.8	-	-	-	-	-	11.3
DES VAL	-	19.365	-	-	-	17.790	-	-	-	-	-	.8348

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 49 PP 89 SAMPLE 2

LAB	07105 NO3+NO2 DIS AA	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC	07112 NO3+NO2 UF AA CD	07390 NITRATE COMMON	07505 NH3 TOT AA BERT	07540 NH3 TOT AA SAL	07555 NH3 DIS AA PHEN	07556 NH3 DIS INDO	07557 NH3 DIS AA INDO	07562 NH3 DIS AA EDTA
1	2.02	-	-	-	-	2.02	-	-	-	-	-	0.30
2	-	-	2.45	-	-	2.45 *	-	-	-	-	-	-
3	-	-	-	-	2.24	2.24	0.317	-	-	-	-	-
4	-	-	2.1	-	-	2.1	-	0.298	-	-	-	-
6	-	2.54	-	-	-	2.54 *	-	-	-	-	0.25	-
7	-	-	-	-	2.00	2.00	-	-	-	-	-	-
8	-	-	2.20	-	-	2.20	-	-	0.310	-	-	-
9	-	2.05	-	-	-	2.05	-	-	-	-	-	-
10	-	1.54	-	-	-	1.54 *	-	-	0.29	-	-	-
11	-	-	1.80	-	-	1.80	-	0.213 R	-	-	-	-
13	-	-	1.9	-	-	1.9	-	0.3	-	-	-	-
14	-	-	-	0.01 R	-	0.01 R	-	-	-	-	-	-
15	-	-	2.18	-	-	2.18	-	-	1.19 R	-	-	-
16	-	-	1.4	-	-	1.4 *	-	-	0.3	-	-	-
20	-	-	2.08	-	-	2.08	-	-	0.290	-	-	-
21	-	-	-	1.96	-	1.96	-	-	-	0.325	-	-
MEAN	2.0200	2.0433	2.0138	1.9600	2.1200	2.0307	.3170	.2990	.2975	.3250	.2500	.3000
STD DEV	-	.5000	.3162	-	.1697	.2991	-	.0014	.0096	-	-	-
REL STD	-	24.5	15.7	-	8.0	14.7	-	.5	3.2	-	-	-
DES VAL	-	-	-	-	-	2.0333	-	-	-	-	-	-

LAB	07590 AMMONIA COMMON	07601 T N UV AA SUL	07602 T N CALC'D	07651 T N DIS UV AA	07690 TOT N COMMON	07790 T N DIS COMMON	09103 F DIS COL SP	09105 F DIS SP EL	09106 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL	09115 F DIS AA ALIZ
1	0.30	-	-	-	-	-	-	-	-	1.12	-	-
2	-	-	-	-	-	-	-	-	1.1	-	-	-
3	0.317	0.948	-	-	-	0.948 *	-	-	-	-	1.10	-
4	0.298	-	-	2.34	-	2.34	-	-	-	-	-	-
6	0.25 *	-	-	-	-	-	1.1	-	-	-	-	-
8	0.310	-	-	-	-	-	-	1.10	-	-	-	-
10	0.29	-	-	-	-	-	-	-	-	-	-	1.15
11	0.213 R	-	-	-	-	-	-	1.10	-	-	-	-
13	0.3	-	-	-	-	-	-	-	-	-	-	-
15	1.19 R	-	-	3.45	-	3.45	-	1.17	-	-	-	-
16	0.3	-	-	-	-	-	-	-	1.2	-	-	-
19	-	-	-	-	-	-	-	0.86 R	-	-	-	-
20	0.290	-	0.34	-	0.34	-	-	1.11	-	-	-	-
21	0.325	-	-	-	-	-	-	-	-	-	-	-
MEAN	.2980	.9480	.3400	2.8950	.3400	2.2460	1.1000	1.1200	1.1500	1.1200	1.1000	1.1500
STD DEV	.0202	-	-	.7849	-	1.2536	-	.0337	.0707	-	-	-
REL STD	6.8	-	-	27.1	-	55.8	-	3.0	6.1	-	-	-
DES VAL	.1130	-	-	-	2.9769	2.4185	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 49 PP 89 SAMPLE 2

LAB	09190 FLUORIDE COMMON	10101 ALKLNTY TITR'N	10108 ALKLNTY POT TIT	10109 ALKLNTY POT TIT	10111 ALKLNTY TIT PRO	10112 ALKLNTY TIT CON	10190 ALKLINTY COMMON	10301 PH	10390 PH COMMON	10602 HARDNSS CALC'D	10603 HARDNSS TITR'N	10606 HARDNSS CALC'D
1	1.12	86.7	-	-	-	-	86.7	8.03	8.03	206.3	-	-
2	1.1	82.5	-	-	-	-	82.5	8.0	8.0	195.9	-	-
3	1.10	-	-	-	82.1	-	82.1	8.06	8.06	-	-	199.
4	-	82.5	-	-	-	-	82.5	7.94	7.94	-	-	-
6	1.1	-	-	85.	-	-	85.	7.8	7.8	-	198.	-
7	-	80.0	-	-	-	-	80.0	8.0	8.0	-	202.3	-
8	1.10	-	-	85.2	-	-	85.2	8.01	8.01	199.	-	-
9	-	-	86.	-	-	-	86.	7.87	7.87	200.	-	-
10	1.15	-	-	-	-	85.	85.	7.92	7.92	-	-	-
11	1.10	82.	-	-	-	-	82.	7.60	7.60	200.	-	-
13	-	74.	-	-	-	-	74.	7.6	7.6	207.5	-	-
14	-	86.6	-	-	-	-	86.6	7.957	7.957	186.1	-	-
15	1.17	84.7	-	-	-	-	84.7	8.13	8.13	198.	-	-
16	1.2	88.	-	-	-	-	88.	7.97	7.97	194.	-	-
19	0.86 R	-	-	82.0	-	-	82.0	8.0	8.0	197.	-	-
20	1.11	84.8	-	-	-	-	84.8	8.0	8.0	202.14	-	-
21	-	86.7	-	-	-	-	86.7	8.18	8.18	198.	-	-
MEAN	1.1250	83.5000	86.0000	84.0667	82.1000	85.0000	83.7529	7.9451	7.9451	198.6617	200.1500	199.0000
STD DEV	.0360	4.0027	-	1.7926	-	-	3.3259	.1566	.1566	5.5844	3.0406	-
REL STD	3.2	4.8	-	2.1	-	-	4.0	2.0	2.0	2.8	1.5	-
DES VAL	1.1079	-	-	-	-	-	79.642	-	7.8208	-	-	-

LAB	10690 HARDNESS COMMON	11001 NA TOT AAS	11005 NA TOT ICP	11007 NA DIS DCP	11102 NA F AAS	11103 NA DIS FL PH	11104 NA DIS FLAME	11105 NA DIS AAS DA	11107 NA UF FL PH	11111 NA DIS ICP	11311 NA EXT ICP	11990 SODIUM COMMON
1	206.3	-	-	-	-	37.	-	-	-	-	-	37.
2	195.9	-	-	-	-	36.3	-	-	-	-	-	36.3
3	199.	-	-	-	-	-	-	-	35.7	-	-	35.7
6	198.	-	-	-	40.	-	-	-	-	-	-	40.
7	202.3	-	-	-	-	-	-	37.2	-	-	-	37.2
8	199.	-	-	-	-	-	-	-	-	-	37.5	37.5
9	200.	-	40.	-	-	-	-	-	-	-	-	40.
10	-	-	36.9	-	-	-	-	-	-	-	-	36.9
11	200.	-	-	-	34.5	-	-	-	-	-	-	34.5
13	207.5	-	-	-	-	-	-	-	-	39.49	-	39.49
14	186.1	37.8	-	-	-	-	-	-	-	-	-	37.8
15	198.	-	-	-	-	-	-	-	-	37.3	-	37.3
16	194.	-	-	32.0 R	-	-	-	-	-	-	-	32.0 R
19	197.	-	38.7	-	-	-	-	-	-	-	-	38.7
20	202.14	-	-	-	-	-	36.9	-	-	-	-	36.9
21	198.	-	-	-	39.5	-	-	-	-	-	-	39.5
MEAN	198.8827	37.8000	38.5333	-	38.0000	36.6500	36.9000	37.2000	35.7000	38.3950	37.5000	37.6527
STD DEV	5.0434	-	1.5567	-	3.0414	.4950	-	-	-	1.5486	-	1.6129
REL STD	2.5	-	4.0	-	8.0	1.4	-	-	-	4.0	-	4.3
DES VAL	199.457	-	-	-	-	-	-	-	-	-	-	37.737

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 49 PP 89 SAMPLE 2

LAB	12005 MG TOT ICP	12012 MG TOT DCP	12101 MG DIS CALC'D	12102 MG DIS AAS DA	12105 MG DIS AAS DA	12106 MG UF AAS DA	12107 MG DIS AAS AUT	12111 MG DIS ICP	12311 MG EXT ICP	12990 MGNESIUM COMMON	14102 SILICA ANSA AA	14105 SILICA MOL ASC
1	-	-	-	-	34.3	-	-	-	-	34.3	-	-
2	-	-	-	-	-	-	31.5	-	-	31.5	1.23	-
3	-	-	-	-	-	31.9	-	-	-	31.9	-	-
6	-	-	33.	-	-	-	-	-	-	33.	-	-
7	-	-	-	30.5	-	-	-	-	-	30.5	-	-
8	-	-	-	-	-	-	-	-	32.1	32.1	-	1.0
9	33.	-	-	-	-	-	-	-	-	33.	-	-
10	30.9	-	-	-	-	-	-	-	-	30.9	-	1.05
11	-	-	-	32.4	-	-	-	-	-	32.4	1.19	-
13	-	-	-	-	-	-	-	32.85	-	32.85	-	-
14	-	-	30.46	-	-	-	-	-	-	30.46	-	-
15	-	-	-	-	-	-	-	32.2	-	32.2	-	-
16	-	28.1	-	-	-	-	-	-	-	28.1 *	-	-
19	31.6	-	-	-	-	-	-	-	-	31.6	-	-
20	-	-	-	-	-	-	-	32.3	-	32.3	-	1.2
21	-	-	-	-	-	31.	-	-	-	31.	-	-
MEAN	31.8333	28.1000	31.7300	31.4500	34.3000	31.4500	31.5000	32.4500	32.1000	31.7569	1.2100	1.0833
STD DEV	1.0693	-	1.7961	1.3435	-	.6364	-	.3500	-	1.4102	.0283	.1041
REL STD	3.4	-	5.7	4.3	-	2.0	-	1.1	-	4.4	2.3	9.6
DES VAL	-	-	-	-	-	-	-	-	-	31.645	-	-

LAB	14106 SI FIL MOL ASC	14107 SILICA MOLY AA	14111 SILICA ICP DA	14112 SILICA DCP DA	14190 SILICA COMMON	15301 T P ACL AA ASC	15313 T P ACL AA SNCL	15401 T P UV AA ASC	15406 T P UF AA ASC	15407 T P ASC AC	15409 T P BLK AA ASC	15413 T P ACL AA SNCL
1	-	1.1	-	-	1.1	-	-	-	-	-	-	-
2	-	-	-	-	1.23	-	-	-	-	-	-	-
3	1.12	-	-	-	1.12	-	-	-	-	-	-	0.0010
4	-	-	-	-	-	-	-	-	0.006	-	-	-
6	-	-	-	-	-	-	-	-	-	-	0.02 R	-
7	-	-	-	-	-	-	-	-	-	-	-	0.001 L
8	-	-	-	-	1.0	-	-	-	-	-	-	0.0030
9	-	-	1.17	-	1.17	-	-	-	-	-	-	-
10	-	-	-	-	1.05	-	-	0.010 L	-	-	-	-
11	-	-	-	-	1.19	-	0.005 L	-	-	-	-	-
13	-	-	-	-	-	-	-	-	0.003	-	-	-
15	-	-	1.03	-	1.03	-	-	-	0.1 L	-	-	-
16	-	-	-	1.08	1.08	-	-	-	-	-	-	-
20	-	-	-	-	1.2	0.003 L	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	0.005 L	-	-
MEAN	1.1200	1.1000	1.1000	1.0800	1.1170	-	-	-	.0045	-	-	.0020
STD DEV	-	-	.0990	-	.0783	-	-	-	.0021	-	-	.0014
REL STD	-	-	9.0	-	7.0	-	-	-	47.1	-	-	70.7
DES VAL	-	-	-	-	1.1156	-	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 49 PP 89 SAMPLE 2

LAB	15421 T P BLK DIG ASC	15490 TOT P COMMON	16302 SO4 DIS TURB BA	16303 SO4 DIS TIT THO	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UF AA MTB	16309 SO4 DIS I C	16310 SO4 DIS AA CALM	16311 SO4 DIS IC	16990 SULFATE COMMON	17203 CL DIS AA FE
1	0.001 L	0.001 L	-	-	-	111.	-	-	-	-	111.	-
2	-	-	-	-	120.	-	-	119.7	-	-	119.7	-
3	-	0.0010	-	-	-	-	111.	-	-	-	111.	-
4	-	0.006	-	-	-	-	-	-	-	-	-	-
6	-	0.02 R	-	-	110.	-	-	-	-	-	110.	-
7	-	0.001 L	-	-	-	123.6	-	-	-	-	123.6	56.5
8	-	0.0030	-	-	-	112.	-	-	-	-	112.	-
9	-	-	-	-	-	-	-	111.	-	-	111.	-
10	-	0.010 L	-	-	-	-	-	-	110.	-	110.	-
11	-	0.005 L	-	-	-	102.	-	-	-	-	102.	-
13	-	0.003	-	-	-	120.1	-	-	-	-	120.1	-
14	-	-	-	-	-	-	-	102.0	-	-	102.0	-
15	-	0.1 L	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	96.	96. *	-
19	-	-	114.	-	-	-	-	-	-	-	114.	-
20	-	0.003 L	-	-	-	114.	-	-	-	-	114.	56.3
21	-	0.005 L	-	111.	-	-	-	-	-	-	111.	-
MEAN	-	.0033	114.0000	111.0000	115.0000	113.7833	111.0000	110.9000	110.0000	96.0000	111.1600	56.4000
STD DEV	-	.0021	-	-	7.0711	7.5642	-	8.8504	-	-	7.1956	.1414
REL STD	-	63.4	-	-	6.1	6.6	-	8.0	-	-	6.5	.3
DES VAL	-	.00311	-	-	-	-	-	-	-	-	112.265	-

LAB	17204 CL DIS AG TIT	17206 CL DIS AA HG	17208 CL DIS AA HG	17209 CL DIS I C	17210 CL DIS TIT CON	17211 CL DIS IC	17990 CHLORIDE COMMON	19001 K TOT AAS	19005 K TOT ICP	19008 K TOT DCP	19102 K DIS AAS	19103 K DIS FLM PH
1	-	56.1	-	-	-	-	56.1	-	-	-	-	13.9
2	-	-	-	57.8	-	-	57.8	-	-	-	-	16.5
3	-	-	58.9	-	-	-	58.9	-	-	-	-	-
6	62.	-	-	-	-	-	62.	-	-	-	20.5 R	-
7	-	-	-	-	-	-	56.5	-	-	-	16.1	-
8	-	55.	-	-	-	-	55.	-	-	-	-	-
9	-	-	-	56.	-	-	56.	-	17.	-	-	-
10	-	-	-	-	59.	-	59.	-	15.47	-	-	-
11	-	57.6	-	-	-	-	57.6	-	-	-	-	-
13	-	55.	-	-	-	-	55.	-	-	-	-	-
14	-	-	-	64.1	-	-	64.1 *	14.9	-	-	-	-
15	-	58.9	-	-	-	-	58.9	-	-	-	-	-
16	-	-	-	-	-	50.	50. *	-	-	15.9	-	-
19	-	-	-	-	-	-	-	-	17.2	-	-	-
20	-	-	-	-	-	-	56.3	-	-	-	-	16.3
MEAN	62.0000	56.5200	58.9000	59.3000	59.0000	50.0000	57.3714	14.9000	16.5567	15.9000	16.1000	15.5667
STD DEV	-	1.7050	-	4.2532	-	-	3.3426	-	.9464	-	-	1.4468
REL STD	-	3.0	-	7.2	-	-	5.8	-	5.7	-	-	9.3
DES VAL	-	-	-	-	-	-	56.800	-	-	-	-	-

LAB	19104 K DIS FLAME	19105 K DIS AAS DA	19106 K DIS AAS LI	19107 K DIS FLM PH	19111 K DIS ICP	19301 K EXT HNO3 AA	19990 PTASSIUM COMMON	20005 CA TOT ICP	20007 CA TOT DCP	20050 CA DIS AAS NO	20100 CA DIS CALC'D	20103 CA DIS AAS
1	-	-	-	-	-	-	13.9 *	-	-	-	-	-
2	-	-	-	-	-	-	16.5	-	-	-	-	-
3	-	-	-	15.5	-	-	15.5	-	-	-	-	-
6	-	-	-	-	-	-	20.5 R	-	-	-	26.	-
7	-	-	-	-	-	-	16.1	-	-	-	-	27.0
8	-	-	-	-	-	16.0	16.0	-	-	-	-	-
9	-	-	-	-	-	-	17.	27.	-	-	-	-
10	-	-	-	-	-	-	15.47	25.9	-	-	-	-
11	-	-	16.8	-	-	-	16.8	-	-	-	-	27.
13	-	-	-	-	15.74	-	15.74	-	-	-	-	-
14	-	-	-	-	-	-	14.9	-	-	24.4	-	-
15	-	18.	-	-	-	-	18. *	-	-	-	-	-
16	-	-	-	-	-	-	15.9	-	21.6	-	-	-
19	-	-	-	-	-	-	17.2	27.0	-	-	-	-
20	-	-	-	-	-	-	16.3	-	-	-	-	-
21	15.3	-	-	-	-	-	15.3	-	-	-	-	-
MEAN	15.3000	18.0000	16.8000	15.5000	15.7400	16.0000	16.0407	26.6333	21.6000	24.4000	26.0000	27.0000
STD DEV	-	-	-	-	-	-	1.0044	.6351	-	-	-	.0000
REL STD	-	-	-	-	-	-	6.3	2.4	-	-	-	-1.0
DES VAL	-	-	-	-	-	-	15.940	-	-	-	-	-

LAB	20107 CA DIS AAS	20108 CA DIS AAS UF	20110 CA DIS AAS AUT	20111 CA DIS ICP	20311 CA EXT ICP	20990 CALCIUM COMMON
1	26.1	-	-	-	-	26.1
2	-	-	26.5	-	-	26.5
3	-	27.2	-	-	-	27.2
6	-	-	-	-	-	26.
7	-	-	-	-	-	27.0
8	-	-	-	-	26.6	26.6
9	-	-	-	-	-	27.
10	-	-	-	-	-	25.9
11	-	-	-	-	-	27.
13	-	-	-	28.85	-	28.85
14	-	-	-	-	-	24.4
15	-	-	-	26.2	-	26.2
16	-	-	-	-	-	21.6 *
19	-	-	-	-	-	27.0
20	-	-	-	27.7	-	27.7
21	-	27.	-	-	-	27.
MEAN	26.1000	27.1000	26.5000	27.5833	26.6000	26.3781
STD DEV	-	.1414	-	1.3288	-	1.5865
REL STD	-	.5	-	4.8	-	6.0
DES VAL	-	-	-	-	-	26.601

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 50 PP 90 DATE: 01/02/90 DUE DATE: 28/02/90

SAMPLE 3 SPIKED SAMPLE. TRACE METALS -LOW. (IN 0.2% HNO3)

LAB	13009 AL TOT 5X ICP	13030 AL TOT ?	13102 AL DIS AAS DA	13105 AL DIS AAS GF	13111 AL DIS ICP DA	13302 AL EXT AAS DA	13304 AL EXT AAS GF	13305 AL EXT AAS SE	13322 AL EXT DCP DA	13999 ALUMINUM COMMON	23002 V TOT AAS SE	23009 V TOT 5X ICP
1	-	0.038	-	-	-	-	-	-	-	0.038 *	-	0.020
2	-	-	-	-	-	-	-	0.052	-	0.052	-	-
3	0.059	-	-	-	-	-	-	0.051	-	0.051	0.0188	0.0194
6	0.058	-	-	-	-	-	-	-	-	0.058	-	-
8	-	-	-	-	-	0.2 L	-	-	-	0.2 L	-	-
9	-	-	-	-	0.05	-	-	-	-	0.05	-	-
10	-	-	-	-	0.07	-	-	-	-	0.07 *	-	-
14	-	-	-	0.0705	-	-	-	-	-	0.0705*	-	-
15	-	-	-	-	-	-	0.061	-	-	0.061	-	-
16	-	-	-	-	-	-	-	-	0.075	0.075 *	-	-
19	0.03	-	-	-	-	-	-	-	-	0.03 *	-	0.019
20	-	-	-	0.0592	-	-	-	-	-	0.0592	-	-
21	-	-	0.048	-	-	-	-	-	-	0.048	-	-
MEAN	.0490	.0380	.0480	.0649	.0600	-	.0610	.0515	.0750	.0552	.0188	.0195
STD DEV	.0165	-	-	.0080	.0141	-	-	.0007	-	.0133	-	.0005
REL STD	33.6	-	-	12.3	23.6	-	-	1.4	-	24.0	-	2.6
DES VAL	-	-	-	-	-	-	-	-	-	.05274	-	-

LAB	23011 V TOT 5X ICP	23012 V TOT 5X DCP	23105	23111 V DIS ICP DA	23999 VANADIUM COMMON	24003 CR TOT AAS SE	24004 CR TOT AAS GF	24009 CR TOT 5X ICP	24011 CR TOT 5X ICP	24012 CR TOT 5X DCP	24056 CR DIS AAS GF	24111 CR DIS ICP DA
1	-	-	-	-	0.020	-	-	0.024	-	-	-	-
3	-	-	-	-	0.0188	0.0240	-	0.0244	-	-	-	-
6	0.02	-	-	-	0.02	-	-	-	0.030	-	-	-
8	-	-	-	-	-	-	0.027	-	-	-	-	-
9	-	-	-	0.021	0.021	-	0.026	-	-	-	-	-
10	-	-	-	0.022	0.022	-	-	-	-	-	-	0.027
14	-	-	0.029 R	-	0.029 R	-	-	-	-	-	-	-
15	-	0.02	-	-	0.02	-	-	-	-	0.026	-	-
16	-	0.050 R	-	-	0.050 R	-	-	-	-	0.033	-	-
19	-	-	-	-	0.019	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	0.028	-
21	-	-	-	-	-	-	0.030	-	-	-	-	-
MEAN	.0200	.0200	-	.0215	.0201	.0240	.0277	.0242	.0300	.0295	.0280	.0270
STD DEV	-	-	-	.0007	.0011	-	.0021	.0003	-	.0049	-	-
REL STD	-	-	-	3.3	5.5	-	7.5	1.2	-	16.8	-	-
DES VAL	-	-	-	-	.02090	-	-	-	-	-	-	-

LAB	24303 CR EXT AAS SE	24999 CHROMIUM COMMON	25003 MN TOT 5X ICP	25004 MN TOT AAS DA	25009 MN TOT COL BIS	25010 MN TOT 5X ICP	25011 MN TOT 5X ICP	25012 MN TOT 5X DCP	25107 MN DIS AAS GF	25111 MN DIS ICP DA	25311 MN EXT ICP DA	25999 MANGNESE COMMON
1	-	0.024	0.021	-	-	-	-	-	-	-	-	0.021
3	-	0.0240	-	0.022	-	0.0208	-	-	-	-	-	0.022
6	-	0.030	-	-	-	-	0.022	-	-	-	-	0.022
8	-	0.027	-	-	-	-	-	-	-	-	0.026	0.026 *
9	-	0.026	-	-	-	-	-	-	-	0.023	-	0.023
10	-	0.027	-	-	-	-	-	-	-	0.022	-	0.022
11	0.028	0.028	-	0.018	-	-	-	-	-	-	-	0.018 *
15	-	0.026	-	-	-	-	-	0.023	-	-	-	0.023
16	-	0.033 *	-	-	-	-	-	0.035 R	-	-	-	0.035 R
19	-	-	-	-	0.021	-	-	-	-	-	-	0.021
20	-	0.028	-	-	-	-	-	-	0.021	-	-	0.021
21	-	0.030	-	-	-	-	-	-	0.021	-	-	0.021
MEAN	.0280	.0275	.0210	.0200	.0210	.0208	.0220	.0230	.0210	.0225	.0260	.0218
STD DEV	-	.0027	-	.0028	-	-	-	-	.0000	.0007	-	.0019
REL STD	-	9.8	-	14.1	-	-	-	-	-1.0	3.1	-	8.9
DES VAL	-	.02718	-	-	-	-	-	-	-	-	-	.02143

LAB	26003 FE TOT AAS GF	26005 FE TOT AAS SE	26009 FE TOT 5X ICP	26011 FE TOT 5X ICP	26012 FE TOT 5X DCP	26107 FE DIS AAS GF	26111 FE DIS ICP DA	26305 FE EXT AAS SE	26311 FE EXT ICP DA	26999 IRON COMMON	27002 CO TOT AAS SE	27003 CO TOT AAS GF
1	-	-	0.050	-	-	-	-	-	-	0.050	-	-
2	-	-	-	-	-	-	-	0.048	-	0.048	-	-
3	-	0.0500	0.0478	-	-	-	-	-	-	0.0500	0.0250	-
6	-	-	-	0.053	-	-	-	-	-	0.053	-	-
8	-	-	-	-	-	-	-	-	0.068	0.068 *	-	0.026
9	-	-	-	-	-	-	0.06	-	-	0.06 *	-	-
10	-	-	-	-	-	-	0.046	-	-	0.046	-	-
11	-	-	-	-	-	-	-	0.045	-	0.045	-	-
14	-	-	-	-	-	0.0397	-	-	-	0.0397*	-	-
15	-	-	-	-	0.05	-	-	-	-	0.05	-	-
16	-	-	-	-	0.060	-	-	-	-	0.060 *	-	-
19	-	-	0.059	-	-	-	-	-	-	0.059 *	-	-
20	-	-	-	-	-	0.057	-	-	-	0.057 *	-	-
21	0.053	-	-	-	-	-	-	-	-	0.053	-	0.026
MEAN	.0530	.0500	.0523	.0530	.0550	.0484	.0530	.0465	.0680	.0528	.0250	.0260
STD DEV	-	-	.0059	-	.0071	.0122	.0099	.0021	-	.0074	-	.0000
REL STD	-	-	11.4	-	12.9	25.3	18.7	4.6	-	14.1	-	-1.0
DES VAL	-	-	-	-	-	-	-	-	-	.04908	-	-

LAB	27009 CO TOT 5X ICP	27011 CO TOT 5X ICP	27012 CO TOT 5X DCP	27107 CO DIS AAS GF	27111 CO DIS ICP DA	27302 CO EXT AAS SE	27999 COBALT COMMON	28002 NI TOT AAS SE	28007 NI TOT AAS GF	28009 NI TOT 5X ICP	28011 NI TOT 5X ICP	28012 NI TOT 5X DCP
1	0.023	-	-	-	-	-	0.023	-	-	0.025	-	-
3	0.0228	-	-	-	-	-	0.0250	0.0263	-	0.0235	-	-
6	-	0.023	-	-	-	-	0.023	-	-	-	0.025	-
8	-	-	-	-	-	-	0.026	-	-	-	-	-
9	-	-	-	-	0.02	-	0.02 *	-	-	-	-	-
10	-	-	-	-	0.033	-	0.033 *	-	-	-	-	-
11	-	-	-	-	-	0.025	0.025	-	-	-	-	-
15	-	-	0.025	-	-	-	0.025	-	-	-	-	0.03
16	-	-	0.028	-	-	-	0.028 *	-	-	-	-	0.034
19	-	-	-	-	-	-	-	-	-	0.032	-	-
20	-	-	-	0.025	-	-	0.025	-	-	-	-	-
21	-	-	-	-	-	-	0.026	-	0.025	-	-	-
MEAN	.0229	.0230	.0265	.0250	.0265	.0250	.0254	.0263	.0250	.0268	.0250	.0320
STD DEV	.0001	-	.0021	-	.0092	-	.0033	-	-	.0045	-	.0028
REL STD	.6	-	8.0	-	34.7	-	12.9	-	-	16.9	-	8.8
DES VAL	-	-	-	-	-	-	.02469	-	-	-	-	-

LAB	28107 NI DIS AAS GF	28111 NI DIS ICP DA	28302 NI EXT AAS SE	28309 NI EXT AAS GF	28999 NICKEL COMMON	29003 CU TOT AAS GF	29005 CU TOT AAS SE	29009 CU TOT 5X ICP	29011 CU TOT 5X ICP	29012 CU TOT 5X DCP	29107 CU DIS AAS GF	29111 CU DIS ICP DA
1	-	-	-	-	0.025	-	-	0.054	-	-	-	-
3	-	-	-	-	0.0263	-	0.0528	0.0534	-	-	-	-
6	-	-	-	-	0.025	-	-	-	0.050	-	-	-
8	-	-	-	0.026	0.026	-	-	-	-	-	-	-
9	-	0.025	-	-	0.025	-	-	-	-	-	-	0.053
10	-	0.026	-	-	0.026	-	-	-	-	-	-	0.054
11	-	-	0.025	-	0.025	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	0.0620	-
15	-	-	-	-	0.03	-	-	-	-	-	-	-
16	-	-	-	-	0.034 *	-	-	-	-	0.055	-	-
19	-	-	-	-	0.032 *	-	-	0.053	-	-	-	-
20	0.026	-	-	-	0.026	-	-	-	-	-	0.050	-
21	-	-	-	-	0.025	0.058	-	-	-	-	-	-
MEAN	.0260	.0255	.0250	.0260	.0271	.0580	.0528	.0535	.0500	.0550	.0560	.0535
STD DEV	-	.0007	-	-	.0031	-	-	.0005	-	-	.0085	.0007
REL STD	-	2.8	-	-	11.5	-	-	.9	-	-	15.2	1.3
DES VAL	-	-	-	-	.02708	-	-	-	-	-	-	-

LAB	29305 CU EXT AAS SE	29308 CU EXT AAS GF	29311 CU EXT ICP DA	29999 COPPER COMMON	30003 ZN TOT AAS GF	30005 ZN TOT AAS SE	30009 ZN TOT 5X ICP	30011 ZN TOT 5X ICP	30012 ZN TOT 5X DCP	30104 ZN DIS AAS DA	30107 ZN DIS AAS GF	30111 ZN DIS ICP DA
1	-	-	-	0.054	-	-	0.032	-	-	-	-	-
2	0.054	-	-	0.054	-	-	-	-	-	-	-	-
3	-	-	-	0.0528	-	0.0344	0.0327	-	-	-	-	-
6	-	-	-	0.050	-	-	-	0.032	-	-	-	-
8	-	-	0.065	0.065 *	-	-	-	-	-	-	-	-
9	-	-	-	0.053	-	-	-	-	-	-	-	0.033
10	-	-	-	0.054	-	-	-	-	-	-	-	0.031
11	0.051	-	-	0.051	-	-	-	-	-	-	-	-
14	-	-	-	0.0620*	-	-	-	-	-	0.0279	-	-
15	-	0.056	-	0.056	-	-	-	-	-	-	-	-
16	-	-	-	0.055	-	-	-	-	0.034	-	-	-
19	-	-	-	0.053	-	-	0.037	-	-	-	-	-
20	-	-	-	0.050	-	-	-	-	-	-	0.036	-
21	-	-	-	0.058	0.039	-	-	-	-	-	-	-
MEAN	.0525	.0560	.0650	.0548	.0390	.0344	.0339	.0320	.0340	.0279	.0360	.0320
STD DEV	.0021	-	-	.0043	-	-	.0027	-	-	-	-	.0014
REL STD	4.0	-	-	7.8	-	-	8.0	-	-	-	-	4.4
DES VAL	-	-	-	.05384	-	-	-	-	-	-	-	-

LAB	30305 ZN EXT AAS SE	30308	30311 ZN EXT ICP DA	30999 ZINC COMMON	38009 SR TOT ICP DA	38012 SR TOT DCP DA	38111 SR DIS ICP DA	38301 SR EXT AAS DA	38308	38999 STRNTIUM COMMON	42009 MO TOT 5X ICP	42011 MO TOT 5X ICP
1	-	-	-	0.032	-	-	-	-	-	-	0.017	-
3	-	-	-	0.0344	0.176	-	-	-	-	0.176	0.0165	-
6	-	-	-	0.032	-	-	-	-	-	-	-	0.020
8	-	-	0.038	0.038	-	-	-	-	-	-	-	-
9	-	-	-	0.033	-	-	0.18	-	-	0.18	-	-
10	-	-	-	0.031	-	-	-	0.18	-	0.18	-	-
11	0.035	-	-	0.035	-	-	-	-	-	-	-	-
14	-	-	-	0.0279*	-	-	-	-	-	-	-	-
15	-	0.035	-	0.035	-	-	-	-	0.182	0.182	-	-
16	-	-	-	0.034	-	0.190	-	-	-	0.190	-	-
19	-	-	-	0.037	-	-	-	-	-	-	-	-
20	-	-	-	0.036	-	-	-	-	-	-	-	-
21	-	-	-	0.039	-	-	-	-	-	-	-	-
MEAN	.0350	.0350	.0380	.0342	.1760	.1900	.1800	.1800	.1820	.1816	.0168	.0200
STD DEV	-	-	-	.0030	-	-	-	-	-	.0052	.0004	-
REL STD	-	-	-	8.9	-	-	-	-	-	2.9	2.1	-
DES VAL	-	-	-	.03454	-	-	-	-	-	.1786	-	-

LAB	42012 MO TOT 5X DCP	42111 MO DIS ICP DA	42303 MO EXT AAS GF	42308	42999 MOLYBNUM COMMON	48002 CD TOT AAS SE	48003 CD TOT AAS GF	48004	48009 CD TOT 5X ICP	48011 CD TOT 5X ICP	48012 CD TOT 5X DCP	48103 CD DIS AAS GF
1	-	-	-	-	0.017	-	-	-	0.021	-	-	-
3	-	-	-	-	0.0165	0.0201	-	-	0.0181	-	-	-
6	-	-	-	-	0.020	-	-	-	-	0.020	-	-
9	-	0.02	-	-	0.02	-	-	0.023	-	-	-	-
10	-	0.018	-	-	0.018	-	-	-	-	-	-	-
15	-	-	-	0.02	0.02	-	-	-	-	-	0.023	-
16	0.020	-	-	-	0.020	-	-	-	-	-	0.025	-
19	-	-	-	-	-	-	-	-	0.018	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	0.020
21	-	-	0.018	-	0.018	-	0.025	-	-	-	-	-
MEAN	.0200	.0190	.0180	.0200	.0187	.0201	.0250	.0230	.0190	.0200	.0240	.0200
STD DEV	-	.0014	-	-	.0015	-	-	-	.0017	-	.0014	-
REL STD	-	7.4	-	-	8.0	-	-	-	9.0	-	5.9	-
DES VAL	-	-	-	-	.01832	-	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 50 PP 90 SAMPLE 3

LAB	48111 CD DIS ICP DA	48302 CD EXT AAS SE	48309 CD EXT AAS GF	48999 CADMIUM COMMON	56000 BA TOT AAS	56009 BA TOT 5X ICP	56011 BA TOT 5X ICP	56012 BA TOT 5X DCP	56111 BA DIS ICP DA	56308	56999 BARIUM COMMON	82002 PB TOT AAS SE
1	-	-	-	0.021	-	0.024	-	-	-	-	0.024	-
2	-	0.021	-	0.021	-	-	-	-	-	-	-	-
3	-	-	-	0.0201	-	0.0234	-	-	-	-	0.0234	0.0258
6	-	-	-	0.020	-	-	0.024	-	-	-	0.024	-
8	-	-	0.020	0.020	-	-	-	-	-	-	-	-
9	-	-	-	0.023	-	-	-	-	0.025	-	0.025	-
10	0.018	-	-	0.018 *	-	-	-	-	0.02	-	0.02	-
11	-	0.020	-	0.020	-	-	-	-	-	-	-	-
15	-	-	-	0.023	-	-	-	-	-	0.024	0.024	-
16	-	-	-	0.025 *	-	-	-	0.048 R	-	-	0.048 R	-
19	-	-	-	0.018 *	-	0.024	-	-	-	-	0.024	-
20	-	-	-	0.020	-	-	-	-	-	-	-	-
21	-	-	-	0.025 *	0.029	-	-	-	-	-	0.029	-
MEAN	.0180	.0205	.0200	.0211	.0290	.0238	.0240	-	.0225	.0240	.0242	.0258
STD DEV	-	.0007	-	.0023	-	.0003	-	-	.0035	-	.0025	-
REL STD	-	3.4	-	10.8	-	1.5	-	-	15.7	-	10.1	-
DES VAL	-	-	-	.02100	-	-	-	-	-	-	.02359	-

LAB	82004 PB TOT AAS GF	82009 PB TOT 5X ICP	82011 PB TOT 5X ICP	82012 PB TOT 5X DCP	82104 PB DIS AAS GF	82302 PB EXT AAS SE	82309 PB EXT AAS GF	82999 LEAD COMMON
1	-	-	-	-	-	0.026	-	0.026
2	-	-	-	-	-	0.026	-	0.026
3	-	0.0229	-	-	-	-	-	0.0258
6	-	-	0.024	-	-	-	-	0.024
8	-	-	-	-	-	-	0.029	0.029
9	0.028	-	-	-	-	-	-	0.028
10	-	-	-	-	-	-	0.027	0.027
11	-	-	-	-	-	0.026	-	0.026
14	-	-	-	-	0.0269	-	-	0.0269
15	-	-	-	-	-	-	0.0249	0.0249
16	-	-	-	0.036 R	-	-	-	0.036 R
19	-	0.03 L	-	-	-	-	-	0.03 L
20	-	-	-	-	0.025	-	-	0.025
21	0.026	-	-	-	-	-	-	0.026
MEAN	.0270	.0229	.0240	-	.0260	.0260	.0270	.0262
STD DEV	.0014	-	-	-	.0013	.0000	.0021	.0014
REL STD	5.2	-	-	-	5.2	.0	7.6	5.2
DES VAL	-	-	-	-	-	-	-	.02581

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 50 PP 90 SAMPLE 4

LAB	00110 IONIC BALANC %	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPARE	02021 COLOUR VIS COM	02023 COLOUR SPECT	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02073 TURB HACH	02074 TURB NPLMTRI	02077 TURB HACH PZ
1	-1.31	1.51	1.55	-	-	-	-	177.	177.	-	-	-
2	-0.08	1.557	1.560	45.	-	-	45.	170.	170.	0.2	-	-
3	-0.34	1.6182	1.6294	40.	-	-	40.	176.	176.	0.10	-	-
4	-	-	-	-	40.	-	40.	175.	175.	-	-	-
6	9.9	2.0	1.7	-	-	-	-	183.	183.	-	0.31	-
7	-	-	-	46.	-	-	46.	173.	173.	0.2	-	-
8	18.57	1.68	1.15	-	-	-	-	184.	184.	-	0.23	-
9	3.93	1.72	1.59	-	-	-	-	168.	168.	-	-	-
10	1.81	1.576	1.520	-	-	31.	31.	169.	169.	-	0.2	-
11	-	-	-	40.	-	-	40.	172.	172.	-	-	0.1 L
14	-	-	-	-	-	-	-	176.	176.	-	-	-
15	-	-	-	-	-	-	-	178.	178.	-	0.15	-
16	-	-	-	-	-	-	-	172.	172.	-	-	-
19	-	-	-	-	-	-	-	1760. R	1760. R	-	-	-
20	3.1	1.673	1.573	-	-	-	-	175.	175.	-	0.4	-
21	-	-	-	-	-	-	-	178.	178.	-	-	-
MEAN	4.4475	1.6668	1.5341	42.7500	40.0000	31.0000	40.3333	175.0667	175.0667	.1667	.2580	-
STD DEV	6.7059	.1518	.1647	3.2016	-	-	5.3166	4.6363	4.6363	.0577	.0983	-
REL STD	150.8	9.1	10.7	7.5	-	-	13.2	2.6	2.6	34.6	38.1	-
DES VAL	-	-	-	-	-	-	41.578	-	171.142	-	-	-

LAB	02081 TURB RATIO	02090 TURBIDTY COMMON	05100 BORON ?	05105 BORON AA CARM	05106 BORON F AZOMETH	05111 BORON F ICP DA	05190 BORON COMMON	06051 TIC COMB IR	06104 DOC UV CO2 IR	06107 DOC UV CO2 PHE	06108 DOC CALC'D	06109 DOC UV CO2 OH
1	-	-	-	-	-	-	-	-	-	7.	-	-
2	-	0.2	-	-	-	-	-	-	-	7.9	-	-
3	-	0.10	-	-	-	-	-	-	6.7	-	-	-
4	0.13	0.13	-	0.071	-	-	0.071	-	7.08	-	-	-
6	-	0.31	-	-	-	-	-	-	6.93	-	-	-
7	-	0.2	-	-	-	-	-	-	-	-	-	-
8	-	0.23	-	-	0.05 L	-	0.05 L	7.5	-	-	6.5	-
10	-	0.2	-	-	-	0.01	0.01 *	-	-	-	-	6.5
11	-	0.1 L	-	-	-	-	-	-	-	-	-	-
15	-	0.15	-	-	-	-	-	-	14. R	-	-	-
16	-	-	0.050 L	-	-	-	0.050 L	-	-	-	-	-
20	-	0.4	-	-	-	-	-	-	-	-	-	-
MEAN	.1300	.2133	-	.0710	-	.0100	.0405	7.5000	6.9033	7.4500	6.5000	6.5000
STD DEV	-	.0927	-	-	-	-	.0431	-	.1914	.6364	-	-
REL STD	-	43.5	-	-	-	-	106.5	-	2.8	8.5	-	-
DES VAL	-	.2390	-	-	-	-	.07600	-	-	-	-	-

LAB	06112 DOC PER IR	06150 D O C COMMON	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 D I C COMMON	07010 TKN AA SAL	07015 TKN DIG BERTHEL	07016 TKN BLK AMM-SAL	07021 TKN BLK DIG BER	07090 TKN COMMON	07105 NO3+NO2 DIS AA
1	-	7.	-	6.5	-	6.5	-	-	-	0.27	0.27	0.19
2	-	7.9 *	-	-	-	-	-	-	-	-	-	-
3	-	6.7	7.1	-	-	7.1	0.186	-	-	-	0.186	-
4	-	7.08	-	-	-	-	-	-	-	-	-	-
6	-	6.93	-	-	-	-	-	-	0.64 R	-	0.64 R	-
8	-	6.5	-	-	-	7.5	-	0.30	-	-	0.30 *	-
10	-	6.5	-	-	7.1	7.1	-	-	-	-	-	-
15	-	14. R	5. R	-	-	5. R	-	-	-	-	-	-
16	7.4	7.4	6.8	-	-	6.8	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	0.19	-	0.19	-
MEAN	7.4000	7.0013	6.9500	6.5000	7.1000	7.0000	.1860	.3000	.1900	.2700	.2365	.1900
STD DEV	-	.4738	.2121	-	-	.3742	-	-	-	-	.0573	-
REL STD	-	6.8	3.1	-	-	5.3	-	-	-	-	24.2	-
DES VAL	-	7.1696	-	-	-	6.8850	-	-	-	-	.2431	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 50 PP 90 SAMPLE 4

LAB	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC	07112 NO3+NO2 UF AA CD	07390 NITRATE COMMON	07505 NH3 TOT AA BERT	07540 NH3 TOT AA SAL	07555 NH3 DIS AA PHEN	07556 NH3 DIS INDO	07557 NH3 DIS AA INDO	07562 NH3 DIS AA EDTA	07590 AMMONIA COMMON
1	-	-	-	-	0.19	-	-	-	-	-	0.023	0.023
2	-	0.21	-	-	0.21	-	-	-	-	-	-	-
3	-	-	-	0.189	0.189	0.005 L	-	-	-	-	-	0.005 L
4	-	0.216	-	-	0.216	-	0.005 L	-	-	-	-	0.005 L
6	0.24	-	-	-	0.24 *	-	-	-	-	0.01 L	-	0.01 L
7	-	-	-	0.21	0.21	-	-	-	-	-	-	-
8	-	0.20	-	-	0.20	-	-	0.006	-	-	-	0.006
9	0.19	-	-	-	0.19	-	-	-	-	-	-	-
10	0.190	-	-	-	0.190	-	-	0.010 L	-	-	-	0.010 L
11	-	0.18	-	-	0.18	-	0.001 L	-	-	-	-	0.001 *
13	-	0.20	-	-	0.20	-	0.1 L	-	-	-	-	0.1 L
14	-	-	0.19	-	0.19	-	-	-	-	-	-	-
15	-	0.217	-	-	0.217	-	-	0.235 R	-	-	-	0.235 R
16	-	0.2	-	-	0.2	-	-	-	-	-	-	-
20	-	0.22	-	-	0.22	-	-	0.005 L	-	-	-	0.005 L
21	-	-	0.153	-	0.153 *	-	-	-	0.005 L	-	-	0.005 L
MEAN	.2067	.2054	.1715	.1995	.1997	-	-	.0060	-	-	.0230	.0145
STD DEV	.0289	.0132	.0262	.0148	.0198	-	-	-	-	-	-	.0120
REL STD	14.0	6.4	15.3	7.4	9.9	-	-	-	-	-	-	82.9
DES VAL	-	-	-	-	.2126	-	-	-	-	-	-	.00500

LAB	07601 T N UV AA SUL	07602 T N CALC'D	07605 T N UV HY SUL	07651 T N DIS UV AA	07690 TOT N COMMON	07790 T N DIS COMMON	09103 F DIS COL SP	09105 F DIS SP EL	09106 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL	09115 F DIS AA ALIZ
1	-	-	-	-	-	-	-	-	-	0.33	-	-
2	0.31	-	-	-	-	0.31 *	-	-	0.34	-	-	-
3	0.412	-	-	-	-	0.412 *	-	-	-	-	0.39	-
4	-	-	-	0.362	-	0.362	-	-	-	-	-	-
6	-	-	-	-	-	-	0.3	-	-	-	-	-
8	-	-	-	-	-	-	-	0.34	-	-	-	-
10	-	-	0.35	-	-	0.35	-	-	-	-	-	0.34
11	-	-	-	-	-	-	-	0.33	-	-	-	-
15	-	-	-	0.360	-	0.360	-	0.40	-	-	-	-
19	-	-	-	-	-	-	-	0.20 R	-	-	-	-
20	-	0.41	-	-	0.41	-	-	0.33	-	-	-	-
MEAN	.3610	.4100	.3500	.3610	.4100	.3588	.3000	.3500	.3400	.3300	.3900	.3400
STD DEV	.0721	-	-	.0014	-	.0364	-	.0337	-	-	-	-
REL STD	20.0	-	-	.4	-	10.1	-	9.6	-	-	-	-
DES VAL	-	-	-	-	.4100	.3493	-	-	-	-	-	-

LAB	09116 F DIS IC	09190 FLUORIDE COMMON	10101 ALKLNTY TITR'N	10108 ALKLNTY POT TIT	10109 ALKLNTY POT TIT	10111 ALKLNTY TIT PRO	10112 ALKLNTY TIT CON	10190 ALKLINTY COMMON	10301 PH	10390 PH COMMON	10602 HARDNSS CALC'D	10603 HARDNSS TITR'N
1	-	0.33	32.	-	-	-	-	32.	7.46	7.46	56.9	-
2	-	0.34	30.5	-	-	-	-	30.5	7.4	7.4	55.2	-
3	-	0.39 *	-	-	-	29.5	-	29.5	7.76	7.76	-	-
4	-	-	29.3	-	-	-	-	29.3	7.55	7.55	-	-
6	-	0.3	31.	-	-	-	-	31.	7.4	7.4	-	73. R
7	-	-	28.2	-	-	-	-	28.2	7.5	7.5	-	58.2
8	-	0.34	-	-	28.7	-	-	28.7	7.64	7.64	59.5	-
9	-	-	-	32.	-	-	-	32.	7.37	7.37	59.	-
10	-	0.34	-	-	-	-	29.	29.	7.42	7.42	-	-
11	-	0.33	29.	-	-	-	-	29.	6.8	6.8	57.	-
13	-	-	26.	-	-	-	-	26. *	6.9	6.9	60.25	-
14	-	-	31.14	-	-	-	-	31.14	7.357	7.357	51.9	-
15	-	0.40 *	29.5	-	-	-	-	29.5	7.70	7.70	54.5	-
16	0.4	0.4 *	32.	-	-	-	-	32.	7.57	7.57	54.	-
19	-	0.20 R	-	-	28.0	-	-	28.0	7.2	7.2	57.0	-
20	-	0.33	31.0	-	-	-	-	31.0	7.5	7.5	59.02	-
21	-	-	31.8	-	-	-	-	31.8	7.34	7.34	56.8	-
MEAN	.4000	.3500	30.1200	32.0000	28.3500	29.5000	29.0000	29.9200	7.4039	7.4039	56.7558	58.2000
STD DEV	-	.0343	1.7989	-	.4950	-	-	1.7066	.2511	.2511	2.4996	-
[illegible]	[illegible]	[illegible]	6.0	[illegible]	1.7	[illegible]	[illegible]	5.7	3.4	3.4	4.4	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	29.636	[illegible]	7.3483	[illegible]	[illegible]

LAB	10606 HARDNSS CALC'D	10690 HARDNESS COMMON	11001 NA TOT AAS	11002	11005 NA TOT ICP	11102 NA F AAS	11103 NA DIS FL PH	11104 NA DIS FLAME	11105 NA DIS AAS DA	11107 NA UF FL PH	11111 NA DIS ICP	11311 NA EXT ICP
1	-	56.9	-	-	-	-	7.	-	-	-	-	-
2	-	55.2	-	-	-	-	9.0	-	-	-	-	-
3	57.4	57.4	-	-	-	-	-	-	-	9.06	-	-
6	-	73. R	-	-	-	11.	-	-	-	-	-	-
7	-	58.2	-	-	-	-	-	-	9.2	-	-	-
8	-	59.5	-	-	-	-	-	-	-	-	-	9.85
9	-	59.	-	-	10.	-	-	-	-	-	-	-
10	-	-	-	-	9.35	-	-	-	-	-	-	-
11	-	57.	-	-	-	9.8	-	-	-	-	-	-
13	-	60.25	-	-	-	-	-	-	-	-	10.31	-
14	-	51.9	9.52	-	-	-	-	-	-	-	-	-
15	-	54.5	-	-	-	-	-	-	-	-	9.3	-
16	-	54.	-	7.44	-	-	-	-	-	-	-	-
19	-	57.0	-	-	9.97	-	-	-	-	-	-	-
20	-	59.02	-	-	-	-	-	9.6	-	-	-	-
21	-	56.8	-	-	-	9.6	-	-	-	-	-	-
MEAN	57.4000	56.9050	9.5200	7.4400	9.7733	10.1333	8.0000	9.6000	9.2000	9.0600	9.8050	9.8500
STD DEV	-	2.3356	-	-	.3669	.7572	1.4142	-	-	-	.7142	-
REL STD	-	4.1	-	-	3.8	7.5	17.7	-	-	-	7.3	-
DES VAL	-	56.967	-	-	-	-	-	-	-	-	-	-

LAB	11990 SODIUM COMMON	12005 MG TOT ICP	12012 MG TOT DCP	12101 MG DIS CALC'D	12102 MG DIS AAS DA	12105 MG DIS AAS DA	12106 MG UF AAS DA	12107 MG DIS AAS AUT	12111 MG DIS ICP	12311 MG EXT ICP	12990 MGNESIUM COMMON	14102 SILICA ANSA AA
1	7. *	-	-	-	-	4.	-	-	-	-	4. *	-
2	9.0	-	-	-	-	-	-	3.4	-	-	3.4	3.73
3	9.06	-	-	-	-	-	3.5	-	-	-	3.5	-
6	11. *	-	-	7. R	-	-	-	-	-	-	7. R	-
7	9.2	-	-	-	3.2	-	-	-	-	-	3.2	-
8	9.85	-	-	-	-	-	-	-	-	3.76	3.76	-
9	10.	3.7	-	-	-	-	-	-	-	-	3.7	-
10	9.35	3.36	-	-	-	-	-	-	-	-	3.36	-
11	9.8	-	-	-	3.6	-	-	-	-	-	3.6	3.7
13	10.31	-	-	-	-	-	-	-	3.73	-	3.73	-
14	9.52	-	-	-	3.32	-	-	-	-	-	3.32	-
15	9.3	-	-	-	-	-	-	-	3.4	-	3.4	-
16	7.44 *	-	3.10	-	-	-	-	-	-	-	3.10	-
19	9.97	3.47	-	-	-	-	-	-	-	-	3.47	-
20	9.6	-	-	-	-	-	-	-	3.54	-	3.54	-
21	9.6	-	-	-	-	-	3.26	-	-	-	3.26	-
MEAN	9.3750	3.5100	3.1000	-	3.3733	4.0000	3.3800	3.4000	3.5567	3.7600	3.4893	3.7150
STD DEV	.9815	.1735	-	-	.2053	-	.1697	-	.1656	-	.2392	.0212
REL STD	10.5	4.9	-	-	6.1	-	5.0	-	4.7	-	6.9	.6
DES VAL	9.4960	-	-	-	-	-	-	-	-	-	3.4703	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 50 PP 90 SAMPLE 4

LAB	14105 SILICA MOL ASC	14106 SI FIL MOL ASC	14107 SILICA MOLY AA	14111 SILICA ICP DA	14112 SILICA DCP DA	14190 SILICA COMMON	15301 T P ACL AA ASC	15313 T P ACL AA SNCL	15401 T P UV AA ASC	15406 T P UF AA ASC	15407 T P ASC AC	15409 T P BLK AA ASC
1	-	-	3.4	-	-	3.4	-	-	-	-	-	-
2	-	-	-	-	-	3.73 *	-	-	-	-	-	-
3	-	3.45	-	-	-	3.45	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	0.006	-	-
6	-	-	-	-	-	-	-	-	-	-	-	0.02 R
8	3.3	-	-	-	-	3.3	-	-	-	-	-	-
9	-	-	-	3.5	-	3.5	-	-	-	-	-	-
10	3.30	-	-	-	-	3.30	-	-	0.010 L	-	-	-
11	-	-	-	-	-	3.7	-	0.005 L	-	-	-	-
13	-	-	-	-	-	-	-	-	-	0.010 R	-	-
15	-	-	-	2.95	-	2.95 *	-	-	-	0.1 L	-	-
16	-	-	-	-	3.25	3.25	-	-	-	-	-	-
20	3.6	-	-	-	-	3.6	0.005	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	0.005 L	-
MEAN	3.4000	3.4500	3.4000	3.2250	3.2500	3.4180	.0050	-	-	.0060	-	-
STD DEV	.1732	-	-	.3889	-	.2341	-	-	-	-	-	-
REL STD	5.1	-	-	12.1	-	6.8	-	-	-	-	-	-
DES VAL	-	-	-	-	-	3.3586	-	-	-	-	-	-

LAB	15413 T P ACL AA SNCL	15421 T P BLK DIG ASC	15490 TOT P COMMON	16302 SO4 DIS TURB BA	16303 SO4 DIS TIT THO	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UF AA MTB	16309 SO4 DIS I C	16310 SO4 DIS AA CALM	16311 SO4 DIS IC	16990 SULFATE COMMON
1	-	0.004	0.004	-	-	-	12.	-	-	-	-	12. *
2	-	-	-	-	-	12.9	-	-	13.1	-	-	12.9
3	0.004	-	0.004	-	-	-	-	12.9	-	-	-	12.9
4	-	-	0.006	-	-	-	-	-	-	-	-	-
6	-	-	0.02 R	-	-	15.	-	-	-	-	-	15.
7	0.003	-	0.003	-	-	-	15.1	-	-	-	-	15.1
8	0.0065	-	0.0065	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	13.	-	-	13.
10	-	-	0.010 L	-	-	-	-	-	-	12.5	-	12.5
11	-	-	0.005 L	-	-	-	13.	-	-	-	-	13.
13	-	-	0.010 R	-	-	-	14.85	-	-	-	-	14.85
14	-	-	-	15.3	-	-	-	-	-	-	-	15.3 *
15	-	-	0.1 L	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	14.	14.
19	-	-	-	16.3	-	-	-	-	-	-	-	16.3 *
20	-	-	0.005	-	-	-	14.0	-	-	-	-	14.0
21	-	-	0.005 L	-	14.9	-	-	-	-	-	-	14.9
MEAN	.0045	.0040	.0048	15.8000	14.9000	13.9500	13.7900	12.9000	13.0500	12.5000	14.0000	13.9821
STD DEV	.0018	-	.0013	.7071	-	1.4849	1.2954	-	.0707	-	-	1.2827
REL STD	40.1	-	28.0	4.5	-	10.6	9.4	-	.5	-	-	9.2
DES VAL	-	-	.00659	-	-	-	-	-	-	-	-	13.682

LAB	17203 CL DIS AA FE	17204 CL DIS AG TIT	17206 CL DIS AA HG	17208 CL DIS AA HG	17209 CL DIS I C	17210 CL DIS TIT CON	17211 CL DIS IC	17990 CHLORIDE COMMON	19001 K TOT AAS	19005 K TOT ICP	19008 K TOT DCP	19102 K DIS AAS
1	-	-	22.6	-	-	-	-	22.6	-	-	-	-
2	-	-	-	-	23.	-	-	23.	-	-	-	-
3	-	-	-	23.6	-	-	-	23.6	-	-	-	-
6	-	25.	-	-	-	-	-	25.	-	-	-	2.6
7	23.7	-	-	-	-	-	-	23.7	-	-	-	2.76
8	-	-	20.	-	-	-	-	20. *	-	-	-	-
9	-	-	-	-	23.5	-	-	23.5	-	3.2	-	-
10	-	-	-	-	-	23.	-	23.	-	2.86	-	-
11	-	-	23.5	-	-	-	-	23.5	-	-	-	-
13	-	-	23.	-	-	-	-	23.	-	-	-	-
14	-	-	-	-	25.9	-	-	25.9	2.89	-	-	-
15	-	-	24.5	-	-	-	-	24.5	-	-	-	-
16	-	-	-	-	-	-	21.	21. *	-	-	2.66	-
19	-	-	-	-	-	-	-	-	-	3.20	-	-
20	23.0	-	-	-	-	-	-	23.0	-	-	-	-
MEAN	23.3500	25.0000	22.7200	23.6000	24.1333	23.0000	21.0000	23.2357	2.8900	3.0867	2.6600	2.6800
STD DEV	.4950	-	1.6784	-	1.5503	-	-	1.4778	-	.1963	-	.1131
REL STD	2.1	-	7.4	-	6.4	-	-	6.4	-	6.4	-	4.2
DES VAL	-	-	-	-	-	-	-	23.632	-	-	-	-

LAB	19103 K DIS FLM PH	19104 K DIS FLAME	19105 K DIS AAS DA	19106 K DIS AAS LI	19107 K DIS FLM PH	19111 K DIS ICP	19301 K EXT HNO3 AA	19990 PTASSIUM COMMON	20005 CA TOT ICP	20007 CA TOT DCP	20050 CA DIS AAS NO	20100 CA DIS CALC'D
1	2.7	-	-	-	-	-	-	2.7	-	-	-	-
2	2.45	-	-	-	-	-	-	2.45 *	-	-	-	-
3	-	-	-	-	2.64	-	-	2.64	-	-	-	-
6	-	-	-	-	-	-	-	2.6	-	-	-	18.
7	-	-	-	-	-	-	-	2.76	-	-	-	-
8	-	-	-	-	-	-	2.8	2.8	-	-	-	-
9	-	-	-	-	-	-	-	3.2	17.5	-	-	-
10	-	-	-	-	-	-	-	2.86	16.43	-	-	-
11	-	-	-	3.0	-	-	-	3.0	-	-	-	-
13	-	-	-	-	-	2.94	-	2.94	-	-	-	-
14	-	-	-	-	-	-	-	2.89	-	-	15.3	-
15	-	-	3.	-	-	-	-	3.	-	-	-	-
16	-	-	-	-	-	-	-	2.66	-	13.7	-	-
19	-	-	-	-	-	-	-	3.20	17.1	-	-	-
20	3.0	-	-	-	-	-	-	3.0	-	-	-	-
21	-	2.25	-	-	-	-	-	2.25 *	-	-	-	-
MEAN	2.7167	2.2500	3.0000	3.0000	2.6400	2.9400	2.8000	2.8094	17.0100	13.7000	15.3000	18.0000
STD DEV	.2754	-	-	-	-	-	-	.2571	.5406	-	-	-
REL STD	10.1	-	-	-	-	-	-	9.2	3.2	-	-	-
DES VAL	-	-	-	-	-	-	-	2.9147	-	-	-	-

LAB	20103 CA DIS AAS	20107 CA DIS AAS	20108 CA DIS AAS UF	20110 CA DIS AAS AUT	20111 CA DIS ICP	20311 CA EXT ICP	20990 CALCIUM COMMON
1	-	16.2	-	-	-	-	16.2
2	-	-	-	16.5	-	-	16.5
3	-	-	17.4	-	-	-	17.4
6	-	-	-	-	-	-	18.
7	16.9	-	-	-	-	-	16.9
8	-	-	-	-	-	17.4	17.4
9	-	-	-	-	-	-	17.5
10	-	-	-	-	-	-	16.43
11	17.	-	-	-	-	-	17.
13	-	-	-	-	17.88	-	17.88
14	-	-	-	-	-	-	15.3
15	-	-	-	-	16.2	-	16.2
16	-	-	-	-	-	-	13.7 *
19	-	-	-	-	-	-	17.1
20	-	-	-	-	17.8	-	17.8
21	-	-	17.4	-	-	-	17.4
MEAN	16.9500	16.2000	17.4000	16.5000	17.2933	17.4000	16.7944
STD DEV	.0707	-	.0000	-	.9477	-	1.0992
REL STD	.4	-	-1.0	-	5.5	-	6.5
DES VAL	-	-	-	-	-	-	16.951

DATES RECEIVED

1 90/02/05	2 90/02/28	3 90/02/02	3 90/03/16	4 90/02/28
6 90/02/28	6 90/02/21	7 90/03/27	8 90/02/28	9 90/02/21
10 90/02/23	11 90/02/23	13 90/02/28	14 90/02/09	15 90/02/07
16 90/04/04	19 90/02/28	20 90/02/28	21 90/02/28	

NOTE: ALL CONCENTRATION UNITS ARE EXPRESSED IN MG/L OF EACH ELEMENT, THE EXCEPTIONS BEING: COLOUR IN RELATIVE UNITS, CONDUCTIVITY IN USIE/CM, TURBIDITY IN JTU OR NTU, NITROGEN ANALYSES IN "N", ALKALINITY & HARDNESS IN CACO3, SILICA IN SIO2, AND SULFATE IN SO4.

Environment Canada | Environnement Canada
Conservation and Protection | Conservation et Protection

Canada Centre for Inland Waters
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Burlington, Ontario
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Your file Votre référence

Our file Notre référence

July 18 Juillet, 1990.

To/A: Participants & Managers/Directeurs:

Federal-Provincial Quality Assurance Program
Programme d'Assurance-Qualité Fédéral-Provincial (PAQFP)

Final Report/Rapport Dernier: FPQA Studies/Etudes 51-52

Vous trouverez en annexe le résumé dernier des études susmentionées.

Ce rapport dernier aide les responsables et les directeurs évaluer la performance de leur laboratoire. Dans Tableau 1, la performance des laboratoires est rangé avec le pourcentage des résultats indiqués. Si la performance est pauvre, le 'QC' du laboratoire devrait être réviser. Les tableaux 1 et 2 donneront un meilleur indication de la performance et l'amèlioration du laboratoire.

Si vous avez de commentaire sur ce résumé, ou des corrections valable à notre base de données, veuillez me les transmettre.

I have enclosed the final report for the above mentioned studies.

This final report assists laboratory heads and managers in evaluating their laboratories performance relative to others. In Table 1, laboratories are ranked according to the % of results flagged. In case of poor performance, internal QC procedures for the parameters listed in the Flagged Results Table (Table 2) should be reviewed. These tables of Flagged Results and Summary of Flagged Results will give a more complete indication of laboratory performance or improvement.

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry A.

H. Alkema
Quality Assurance Project
Research & Applications Branch

Attachment: Distribution List
En annexe: Liste de diffusion

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RESEARCH & APPLICATIONS BRANCH

FINAL REPORT

REPORT NO. RAB 90-12 (Eng)

FEDERAL PROVINCIAL QUALITY ASSURANCE PROGRAM

STUDIES 51 AND 52

for March and April 1990

TRACE METALS, MAJOR IONS, NUTRIENTS AND PHYSICAL PARAMETERS IN SURFACE WATERS

by

H. Alkema

Quality Assurance Section
National Water Research Institute
Burlington, Ontario

July 1990

(Ce rapport est aussi disponible en français)

Introduction

As part of an on-going study, the Quality Assurance Section, NWRI in Burlington, Ontario, has been sending reference water samples bi-monthly to chemical laboratories participating in the FP program. This report summarizes the most recent FP interlaboratory quality assurance studies: FP 51 and 52, for the months March and April, 1990. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The concentrations were from low to medium.

Study Design

Four water samples were submitted to each laboratory for chemical analyses. Two samples were submitted for trace metals analysis, while the remaining two were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the four samples:

FP 51 - Sample 1 - 125 ml, high level* for trace metals (3% HNO_3)
Sample 2 - up to 1 L, major ions etc., stored at 4^0C

FP 52 - Sample 3 - 1 L, low level* for trace metals (0.2% HNO_3)
Sample 4 - up to 1 L, major ions, etc., stored at 4^0C

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were reported as required by the standard report sheets provided with the QA samples. Submitted results were tabulated for each parameter, first for each method reported, and then

for all methods combined. These data, and the resulting statistics are presented in the Data Summary. (attached)

Preliminary data summaries (RAB # 90-09), including problematic results, were sent May 3 and June 8. Each laboratory was given three weeks to notify us of any errors in data transcription, compilation, or flags.

Performance Indicators

In the Federal Provincial QA program, two types of reference samples are used for the accuracy assessment. These are Reference Waters (RMs) and Certified Reference waters (CRMs) which have Design Values for the stable parameters. Also, regional samples are used occasionally as natural representative samples. The means for these regional samples, and the Design Values for the reference waters are used to test each reported result for accuracy.

Percentage deviations from the reference values are used as an indication by the laboratory head to determine the extent of the discrepancies between the laboratory result and the reference value. However, please keep in mind that at low levels, high % deviations are often seen, and may be misleading if interpreted too strictly.

A result which deviates more than the greater of 10% or 1 standard deviation from the reference value is marked with an asterisk in the data table and its value tabulated in the flagged data table (Table 1). Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned an 'HDL' and is tabulated for each laboratory in Table 2.

If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

Three tables list the data from the above mentioned evaluations. Table 1 is a summary of the flagged results for each laboratory as they are found in Table 2. The summary will assist laboratory managers and lab heads in evaluating their laboratories performance relative to others. A listing parameters for which there was a high standard deviation is found in Table 3. Formerly called a high coefficient of variation, the standard deviation is generated with standardized criteria that are included with the automated flagging routine. These automated criteria have been in use since March 1988 (Study FP 27), and should provide a more accurate and consistent listing of the difficult to analyze parameters or levels. A listing of the criteria used to indicate high deviation of analysis is available on request. Your comments would be appreciated.

Provincial laboratories average number of deviations per sample was 1.2.

Federal laboratories average number of deviations per sample was 1.9.

TABLE 1: FP & PPWB LABS - SUMMARY OF FLAGGED DATA - FP 51 FP 52

LAB	RESULTS REPORTED	>10% OR 1SD FLAGS	GRUBBS FLAGS	HDL'S INDICATED	% DATA FLAGGED
10	68	1	0	5	1.5
2	44	1	0	0	2.3
9	52	2	2	9	3.8
4	22	1	0	0	4.5
3	70	4	0	1	5.7
21	48	3	2	1	6.3
15	57	4	1	9	7.0
1	63	5	1	0	7.9
11	52	5	2	0	9.6
20	56	6	1	1	10.7
13	32	4	2	2	12.5
8	59	8	0	10	13.6
7	28	5	0	0	17.9
6	60	15	6	4	25.0
16	61	16	9	0	26.2
19	49	17	4	2	34.7
14	34	12	0	0	35.3

NOTE: FLAGS GUIDELINE (PERFORMANCE INDEX)

< 5% - EXCELLENT TO VERY GOOD
5 - 10% - MODERATE PERFORMANCE
> 10% - IMPROVEMENT NECESSARY, GENERATION OF INCOMPARABLE DATA

TABLE 2: FP & PPWB LABORATORIES FLAGGED RESULTS - STUDIES FP 51-52

LAB 1	FLAGS :	HARDNESS	12%		SULFATE	-39%		ALUMINUM	172%	R
		IRON	44%		PTASSIUM	-23%				
LAB 2	FLAGS :	T N DIS	-47%							
LAB 3	FLAGS :	TKN	-68%		D I C	-84%		NITRATE	92%	
		T N DIS	-56%	L						
	HDL :	T N DIS								
LAB 4	FLAGS :	T N DIS	53%							
LAB 6	FLAGS :	CONDUCT	17%	R	TKN	86%		HARDNESS	12%	
		SODIUM	57%		MGNESIUM	82%	R	TOT P	590%	R
		SULFATE	207%	R	ALUMINUM	63%		IRON	76%	
		TKN	136%		AMMONIA	1951%	R	ALKLINTY	353%	
		MGNESIUM	16%		TOT P	400%	R	PTASSIUM	59%	
	HDL :	AMMONIA			CHLORIDE			VANADIUM		
		MOLYBNUM								
LAB 7	FLAGS :	TURBIDTY	185%		NITRATE	12%		SODIUM	-61%	
		PTASSIUM	146%		TURBIDTY	171%				
LAB 8	FLAGS :	ALUMINUM	16%		CHROMIUM	22%		COPPER	-14%	
		LEAD	14%		SODIUM	55%		CALCIUM	15%	
		COPPER	76%		MGNESIUM	11%				
	HDL :	D O C			ALUMINUM			MANGNESE		
		IRON			ZINC			D I C		
		TKN			ALKLINTY			SILICA		
LAB 9	FLAGS :	LEAD	966%	R	NITRATE	146%	R			
	HDL :	VANADIUM			IRON			COBALT		
		NICKEL			COPPER			ZINC		
		MOLYBNUM			ALKLINTY			SILICA		
LAB 10	FLAGS :	ALUMINUM	63%							
	HDL :	AMMONIA			TOT P			NICKEL		
LAB 11	FLAGS :	FLUORIDE	91%	R	ALKLINTY	-99%	L	IRON	60%	
		NICKEL	33%		SODIUM	-92%	R			
LAB 13	FLAGS :	CHLORIDE	38%	R	NITRATE	885%	R	MGNESIUM	12%	
		CALCIUM	13%							
	HDL :	AMMONIA			AMMONIA					
LAB 14	FLAGS :	COPPER	24%		ZINC	21%		NITRATE	-24%	
		HARDNESS	-12%		TOT P	141%		CALCIUM	-13%	
		ALUMINUM	123%		VANADIUM	48%		LEAD	-57%	
		HARDNESS	-16%		CHLORIDE	13%		CALCIUM	-18%	
LAB 15	FLAGS :	D O C	44%	R	CHROMIUM	-29%	L	CADMIUM	-48%	
		LEAD	-48%							
	HDL :	TOT P			VANADIUM			CHROMIUM		
		NICKEL			MOLYBNUM			D O C		
		D I C			ALKLINTY			TOT P		

.../ Page 2

LAB 16	FLAGS :	ALUMINUM	27%	R	CHROMIUM	12%		MANGNESE	405%	R
		IRON	25%	R	MOLYBNUM	-16%	R	LEAD	68%	R
		NITRATE	-28%		SULFATE	-39%		CHLORIDE	-21%	
		PTASSIUM	-46%	R	VANADIUM	182%	R	IRON	140%	R
		SODIUM	-18%		SULFATE	13%		PTASSIUM	-61%	R
		CALCIUM	-13%							
LAB 19	FLAGS :	VANADIUM	13%		IRON	13%		NICKEL	18%	R
		ZINC	13%		CADMIUM	12%		BARIUM	12%	
		LEAD	15%		AMMONIA	1329%	R	FLUORIDE	-80%	
		SODIUM	46%		SILICA	45%	R	MANGNESE	-84%	L
		IRON	-68%	L	NICKEL	33%		COPPER	-71%	
		SULFATE	29%	R	PTASSIUM	-20%				
	HDL :	LEAD			AMMONIA					
LAB 20	FLAGS :	CHROMIUM	-56%	R	COPPER	-14%		CALCIUM	17%	
		HARDNESS	13%		MGNESIUM	12%		CALCIUM	16%	
	HDL :	SILICA								
LAB 21	FLAGS :	NITRATE	-96%	R	MOLYBNUM	-30%		NITRATE	1319%	R
	HDL :	ALKLINTY								

NOTE: A VERY HIGH FREQUENCY OF FLAGGED RESULTS (OR A HIGH %) IS INDICATIVE OF POOR PERFORMANCE. ON THE OTHER HAND, LABS WITH FEW IF ANY FLAGS ARE JUDGED TO HAVE VERY GOOD PERFORMANCE.

ALSO, AN "R" FLAG INDICATES A NON COMPARABLE RESULT, THAT IS, ONE PRODUCED WITH NON RANDOM FACTORS. AN "L" FLAG INDICATES A 'LESS THAN' RESULT LOWER THAN THE REFERENCE VALUE.

TABLE 3: HIGH STANDARD DEVIATION

PARAMETER		LEVEL
BORON	AT	.029 PPM
SODIUM	AT	1.277 PPM
PTASSIUM	AT	.484 PPM
ALUMINUM	AT	.018 PPM
IRON	AT	.006 PPM
COPPER	AT	.007 PPM
LEAD	AT	.006 PPM
D O C	AT	.167 PPM
T N DIS	AT	.057 PPM

APPENDIX I

Definitions of Types of Metals Analysis

1. DA - Direct Aspiration

Without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS) ar Inuctively Coupled (Argon) Plasma (ICAP or ICP). Standards should contain the acid equivalent of the sample.

2. SE - Code for low level analysis

Analysis is carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP.
3. Digestion of aqueous phase and ICAP analysis.
4. Graphite tube (flameless) AAS.

APPENDIX II

Performance Indicators

1. Circled Results

Results are circled in the data tables when a minor deviation from the comparator has ocurred. (The comparator is the design value of the reference sample, or the mean in the case of a biologically active sample.) Circled results are in general greater than or less than 10% from the comparator. At very low levels of analytes or with parameters that are difficult to analyse, a greater deviation than 10% is allowed. Under these conditions, a result is circled when it is outside one standard deviation of the comparator. These circled results, though acceptable values, are a warning to laboratory managers that the parameter analysis should be investigated.

2. Rejectable Results

Each laboratory result is statistically tested to see if it is outlying. Outlying results were caused by non random causes such as a faulty calibration or a transcription error. These outlying results, calculated by the Grubbs' procedure,* and indicated in the data tables with an 'R', are noncomparable with the other data for the parameter.

3. A High Co-efficient of Variation (HCV)

Occasionally data for a parameter yields a very high relative standard deviation (RSD). When this HCV is not due to outlying values, it indicates a high variability within the data set. The data in this set is then noncomparable. In such a case, the RSD for the parameter is circled in the data tables and the parameter's noncomparability is noted in the comments.

4. High Detection Limits (HDL)

Each laboratory determines its own detection limits according to its own requirements. When major differences of detection limits occur, the result is flagged with 'HDL' in the data tables. An HDL indicates that low level analysis may not be comparable with the analyses of other laboratories.

* reference : Frank E. Grubbs, Technometrics, 1969, p. 1.

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 51 PP 91 DATE: 01/03/90 DUE DATE: 30/04/90

SAMPLE 1 SPIKED SAMPLE. TRACE METALS DA. (IN 3.0% HNO3)

LAB	13009 AL TOT 5X ICP	13030 AL TOT ?	13102 AL DIS AAS DA	13111 AL DIS ICP DA	13302 AL EXT AAS DA	13311 AL EXT ICP DA	13321 AL EXT ICP DA	13322 AL EXT DCP DA	13999 ALUMINUM COMMON	23009 V TOT 5X ICP	23012 V TOT 5X DCP	23111 V DIS ICP DA
1	-	0.970	-	-	-	-	-	-	0.970	0.964	-	-
2	-	-	-	-	1.1	-	-	-	1.1	-	-	-
3	-	-	-	-	1.12	-	1.08	-	1.12	-	-	-
6	-	-	-	-	-	1.0	-	-	1.0	-	-	-
8	-	-	-	-	1.2	-	-	-	1.2 *	-	-	-
9	-	-	-	1.1	-	-	-	-	1.1	-	-	1.0
10	-	-	-	1.05	-	-	-	-	1.05	-	-	0.962
15	-	-	-	-	-	-	1.01	-	1.01	-	-	-
16	-	-	-	-	-	-	-	1.31 R	1.31 R	-	1.00	-
19	1.04	-	-	-	-	-	-	-	1.04	1.08	-	-
20	-	-	-	1.07	-	-	-	-	1.07	-	-	1.01
21	-	-	0.99	-	-	-	-	-	0.99	-	-	-
MEAN	1.0400	.9700	.9900	1.0733	1.1400	1.0000	1.0450	-	1.0591	1.0220	1.0000	.9907
STD DEV	-	-	-	.0252	.0529	-	.0495	-	.0679	.0820	-	.0253
REL STD	-	-	-	2.3	4.6	-	4.7	-	6.4	8.0	-	2.6
DES VAL	-	-	-	-	-	-	-	-	1.0307	-	-	-

LAB	23311 V EXT ICP DA	23321 V EXT ICP DA	23999 VANADIUM COMMON	24009 CR TOT 5X ICP	24012 CR TOT 5X DCP	24052 CR DIS AAS DA	24111 CR DIS ICP DA	24302 CR EXT AAS DA	24311 CR EXT ICP DA	24321 CR EXT ICP DA	24999 CHROMIUM COMMON	25003 MN TOT 5X ICP
1	-	-	0.964	0.094	-	-	-	-	-	-	0.094	0.099
3	-	0.968	0.968	-	-	-	-	-	-	0.105	0.105	-
6	0.94	-	0.94	-	-	-	-	-	0.10	-	0.10	-
8	-	-	-	-	-	-	-	0.12	-	-	0.12 *	-
9	-	-	1.0	-	-	-	0.100	-	-	-	0.100	-
10	-	-	0.962	-	-	-	0.098	-	-	-	0.098	-
11	-	-	-	-	-	-	-	0.094	-	-	0.094	-
13	-	-	-	-	-	-	-	-	0.09	-	0.09	-
15	-	0.93	0.93	-	-	-	-	-	-	0.096	0.096	-
16	-	-	1.00	-	0.110	-	-	-	-	-	0.110 *	-
19	-	-	1.08 *	-	-	-	-	-	-	-	-	-
20	-	-	1.01	-	-	-	0.043 R	-	-	-	0.043 R	-
21	-	-	-	-	-	0.10	-	-	-	-	0.10	-
MEAN	.9400	.9490	.9838	.0940	.1100	.1000	.0990	.1070	.0950	.1005	.1006	.0990
STD DEV	-	.0269	.0453	-	-	-	.0014	.0184	.0071	.0064	.0084	-
REL STD	-	2.8	4.6	-	-	-	1.4	17.2	7.4	6.3	8.4	-
DES VAL	-	-	.9591	-	-	-	-	-	-	-	.09829	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 51 PP 91 SAMPLE 1

LAB	25004 MN TOT AAS DA	25009 MN TOT COL BIS	25012 MN TOT 5X DCP	25104 MN DIS AAS DA	25111 MN DIS ICP DA	25304 MN EXT AAS DA	25311 MN EXT ICP DA	25321 MN EXT ICP DA	25999 MANGNESE COMMON	26009 FE TOT 5X ICP	26012 FE TOT 5X DCP	26104 FE DIS AAS DA
1	-	-	-	-	-	-	-	-	0.099	0.498	-	-
2	-	-	-	-	-	0.1	-	-	0.1	-	-	-
3	-	-	-	-	-	0.105	-	0.102	0.105	-	-	-
6	-	-	-	-	-	-	0.098	-	0.098	-	-	-
8	-	-	-	-	-	-	0.096	-	0.096	-	-	-
9	-	-	-	-	0.100	-	-	-	0.100	-	-	-
10	-	-	-	-	0.097	-	-	-	0.097	-	-	-
11	0.097	-	-	-	-	-	-	-	0.097	-	-	-
13	-	-	-	-	-	-	0.10	-	0.10	-	-	-
14	-	-	-	0.102	-	-	-	-	0.102	-	-	0.529
15	-	-	-	-	-	-	-	0.099	0.099	-	-	-
16	-	-	0.500 R	-	-	-	-	-	0.500 R	-	0.625 R	-
19	-	0.106	-	-	-	-	-	-	0.106	0.565	-	-
20	-	-	-	-	0.095	-	-	-	0.095	-	-	-
21	-	-	-	0.10	-	-	-	-	0.10	-	-	0.52
MEAN	.0970	.1060	-	.1010	.0973	.1025	.0980	.1005	.0996	.5315	-	.5245
STD DEV	-	-	-	.0014	.0025	.0035	.0020	.0021	.0031	.0474	-	.0064
REL STD	-	-	-	1.4	2.6	3.4	2.0	2.1	3.1	8.9	-	1.2
DES VAL	-	-	-	-	-	-	-	-	.09903	-	-	-

LAB	26111 FE DIS ICP DA	26304 FE EXT AAS DA	26311 FE EXT ICP DA	26321 FE EXT ICP DA	26999 IRON COMMON	27009 CO TOT 5X ICP	27012 CO TOT 5X DCP	27101 CO DIS AAS DA	27111 CO DIS ICP DA	27301 CO EXT AAS DA	27311 CO EXT ICP DA	27321 CO EXT ICP DA
1	-	-	-	-	0.498	0.290	-	-	-	-	-	-
2	-	0.51	-	-	0.51	-	-	-	-	-	-	-
3	-	0.526	-	0.512	0.526	-	-	-	-	-	-	0.284
6	-	-	0.49	-	0.49	-	-	-	-	-	0.30	-
8	-	-	0.459	-	0.459	-	-	-	-	0.30	-	-
9	0.52	-	-	-	0.52	-	-	-	0.28	-	-	-
10	0.483	-	-	-	0.483	-	-	-	0.291	-	-	-
11	-	0.490	-	-	0.490	-	-	-	-	0.300	-	-
13	-	-	0.47	-	0.47	-	-	-	-	-	-	-
14	-	-	-	-	0.529	-	-	-	-	-	-	-
15	-	-	-	0.485	0.485	-	-	-	-	-	-	0.287
16	-	-	-	-	0.625 R	-	0.268	-	-	-	-	-
19	-	-	-	-	0.565 *	-	-	-	-	-	-	-
20	0.494	-	-	-	0.494	-	-	-	0.267	-	-	-
21	-	-	-	-	0.52	-	-	0.29	-	-	-	-
MEAN	.4990	.5087	.4730	.4985	.5028	.2900	.2680	.2900	.2793	.3000	.3000	.2855
STD DEV	.0190	.0180	.0157	.0191	.0276	-	-	-	.0120	.0000	-	.0021
REL STD	3.8	3.5	3.3	3.8	5.5	-	-	-	4.3	-1.0	-	.7
DES VAL	-	-	-	-	.4982	-	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 51 PP 91 SAMPLE 1

LAB	27999 COBALT COMMON	28009 NI TOT 5X ICP	28012 NI TOT 5X DCP	28101 NI DIS AAS DA	28111 NI DIS ICP DA	28301 NI EXT AAS DA	28311 NI EXT ICP DA	28321 NI EXT ICP DA	28999 NICKEL COMMON	29009 CU TOT 5X ICP	29012 CU TOT 5X DCP	29106 CU DIS AAS DA
1	0.290	0.488	-	-	-	-	-	-	0.488	0.101	-	-
3	0.284	-	-	-	-	-	-	0.482	0.482	-	-	-
6	0.30	-	-	-	-	-	0.50	-	0.50	-	-	-
8	0.30	-	-	-	-	-	0.438	-	0.438	-	-	-
9	0.28	-	-	-	0.48	-	-	-	0.48	-	-	-
10	0.291	-	-	-	0.487	-	-	-	0.487	-	-	-
11	0.300	-	-	-	-	0.490	-	-	0.490	-	-	-
13	-	-	-	-	-	-	0.47	-	0.47	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	0.127
15	0.287	-	-	-	-	-	-	0.48	0.48	-	-	-
16	0.268	-	0.500	-	-	-	-	-	0.500	-	0.104	-
19	-	0.569 R	-	-	-	-	-	-	0.569 R	0.109	-	-
20	0.267	-	-	-	0.474	-	-	-	0.474	-	-	-
21	0.29	-	-	0.50	-	-	-	-	0.50	-	-	0.11
MEAN	.2870	.4880	.5000	.5000	.4803	.4900	.4693	.4810	.4824	.1050	.1040	.1185
STD DEV	.0117	-	-	-	.0065	-	.0310	.0014	.0172	.0057	-	.0120
REL STD	4.1	-	-	-	1.4	-	6.6	.3	3.6	5.4	-	10.1
DES VAL	.2940	-	-	-	-	-	-	-	.4804	-	-	-

LAB	29111 CU DIS ICP DA	29306 CU EXT AAS DA	29311 CU EXT ICP DA	29321 CU EXT ICP DA	29999 COPPER COMMON	30009 ZN TOT 5X ICP	30012 ZN TOT 5X DCP	30104 ZN DIS AAS DA	30111 ZN DIS ICP DA	30304 ZN EXT AAS DA	30311 ZN EXT ICP DA	30321 ZN EXT ICP DA
1	-	-	-	-	0.101	0.108	-	-	-	-	-	-
2	-	0.1	-	-	0.1	-	-	-	-	0.107	-	-
3	-	-	-	0.107	0.107	-	-	-	-	-	-	0.115
6	-	-	0.098	-	0.098	-	-	-	-	-	0.097	-
8	-	-	0.088	-	0.088 *	-	-	-	-	-	0.099	-
9	0.100	-	-	-	0.100	-	-	-	0.105	-	-	-
10	0.097	-	-	-	0.097	-	-	-	0.105	-	-	-
11	-	0.106	-	-	0.106	-	-	-	-	0.098	-	-
13	-	-	0.10	-	0.10	-	-	-	-	-	0.10	-
14	-	-	-	-	0.127 *	-	-	0.129	-	-	-	-
15	-	-	-	0.094	0.094	-	-	-	-	-	-	0.108
16	-	-	-	-	0.104	-	0.118	-	-	-	-	-
19	-	-	-	-	0.109	0.120	-	-	-	-	-	-
20	0.088	-	-	-	0.088 *	-	-	-	0.101	-	-	-
21	-	-	-	-	0.11	-	-	0.11	-	-	-	-
MEAN	.0950	.1030	.0953	.1005	.1019	.1140	.1180	.1195	.1037	.1025	.0987	.1115
STD DEV	.0062	.0042	.0064	.0092	.0096	.0085	-	.0134	.0023	.0064	.0015	.0049
REL STD	6.6	4.1	6.7	9.1	9.4	7.4	-	11.2	2.2	6.2	1.5	4.4
DES VAL	-	-	-	-	.1028	-	-	-	-	-	-	-

LAB	30999 ZINC COMMON	38012 SR TOT DCP DA	38111 SR DIS ICP DA	38321 SR EXT ICP DA	38999 STRNTIUM COMMON	42009 MO TOT 5X ICP	42012 MO TOT 5X DCP	42111 MO DIS ICP DA	42121 MO EXT ICP DA	42301 MO EXT AAS DA	42311 MO EXT ICP DA	42321
1	0.108	-	-	-	-	0.954	-	-	-	-	-	-
2	0.107	-	-	-	-	-	-	-	-	-	-	-
3	0.115	-	-	0.368	0.368	-	-	-	0.986	-	-	-
6	0.097	-	-	-	-	-	-	-	-	-	0.95	-
8	0.099	-	-	-	-	-	-	-	-	-	-	-
9	0.105	-	0.38	-	0.38	-	-	0.96	-	-	-	-
10	0.105	-	0.38	-	0.38	-	-	0.949	-	-	-	-
11	0.098	-	-	-	-	-	-	-	-	-	-	-
13	0.10	-	-	-	-	-	-	-	-	-	-	-
14	0.129 *	-	-	-	-	-	-	-	-	-	-	-
15	0.108	-	-	0.356	0.356	-	-	-	-	-	-	0.94
16	0.118	0.336	-	-	0.336	-	0.810 R	-	-	-	-	-
19	0.120 *	-	-	-	-	-	-	-	-	-	-	-
20	0.101	-	-	-	-	-	-	0.906	-	-	-	-
21	0.11	-	-	-	-	-	-	-	-	0.99	-	-
MEAN	.1080	.3360	.3800	.3620	.3640	.9540	-	.9383	.9860	.9900	.9500	.9400
STD DEV	.0091	-	.0000	.0085	.0185	-	-	.0285	-	-	-	-
REL STD	8.5	-	-1.0	2.3	5.1	-	-	3.0	-	-	-	-
DES VAL	.1065	-	-	-	.3747	-	-	-	-	-	-	-

LAB	42999 MOLYBNUM COMMON	48009 CD TOT 5X ICP	48012 CD TOT 5X DCP	48101 CD DIS AAS DA	48111 CD DIS ICP DA	48301 CD EXT AAS DA	48311 CD EXT ICP DA	48321 CD EXT ICP DA	48999 CADMIUM COMMON	56009 BA TOT 5X ICP	56012 BA TOT 5X DCP	56109 BA DIS ICP
1	0.954	0.096	-	-	-	-	-	-	0.096	0.993	-	-
2	-	-	-	-	-	0.1	-	-	0.1	-	-	-
3	0.986	-	-	-	-	-	-	0.095	0.095	-	-	-
6	0.95	-	-	-	-	-	0.097	-	0.097	-	-	-
8	-	-	-	-	-	0.09	-	-	0.09	-	-	-
9	0.96	-	-	-	0.102	-	-	-	0.102	-	-	-
10	0.949	-	-	-	0.097	-	-	-	0.097	-	-	-
11	-	-	-	-	-	0.099	-	-	0.099	-	-	-
13	-	-	-	-	-	-	0.09	-	0.09	-	-	-
15	0.94	-	-	-	-	-	-	0.089	0.089	-	-	-
16	0.810 R	-	0.093	-	-	-	-	-	0.093	-	0.915	-
19	-	0.110	-	-	-	-	-	-	0.110 *	1.11	-	-
20	0.906	-	-	-	0.091	-	-	-	0.091	-	-	0.952
21	0.99	-	-	0.097	-	-	-	-	0.097	-	-	-
MEAN	.9544	.1030	.0930	.0970	.0967	.0963	.0935	.0920	.0961	1.0515	.9150	.9520
STD DEV	.0264	.0099	-	-	.0055	.0055	.0049	.0042	.0057	.0827	-	-
REL STD	2.8	9.6	-	-	5.7	5.7	5.3	4.6	5.9	7.9	-	-
DES VAL	.9673	-	-	-	-	-	-	-	.09809	-	-	-

LAB	56111 BA DIS ICP DA	56231	56301 BA EXT AAS DA	56311 BA EXT ICP DA	56321 BA EXT ICP DA	56999 BARIUM COMMON	82009 PB TOT 5X ICP	82012 PB TOT 5X DCP	82101 PB DIS AAS DA	82111 PB DIS ICP DA	82301 PB EXT AAS DA	82302 PB EXT AAS SE
1	-	-	-	-	-	0.993	-	-	-	-	-	0.527
2	-	-	-	-	-	-	-	-	-	-	0.488	-
3	-	0.983	1.01	-	-	1.01	-	-	-	-	-	-
6	-	-	-	0.96	-	0.96	-	-	-	-	-	-
9	1.05	-	-	-	-	1.05	-	-	-	0.49	-	-
10	0.99	-	-	-	-	0.99	-	-	-	0.478	-	-
11	-	-	-	-	-	-	-	-	-	-	0.480	-
14	-	-	-	-	-	-	-	-	0.50	-	-	-
15	-	-	-	-	0.979	0.979	-	-	-	-	-	-
16	-	-	-	-	-	0.915	-	0.810 R	-	-	-	-
19	-	-	-	-	-	1.11 *	0.553	-	-	-	-	-
20	-	-	-	-	-	0.952	-	-	-	0.458	-	-
21	-	-	0.93	-	-	0.93	0.52	-	-	-	-	-
MEAN	1.0200	.9830	.9700	.9600	.9790	.9889	.5365	-	.5000	.4753	.4840	.5270
STD DEV	.0424	-	.0566	-	-	.0578	.0233	-	-	.0162	.0057	-
REL STD	4.2	-	5.8	-	-	5.8	4.3	-	-	3.4	1.2	-
DES VAL	-	-	-	-	-	.9926	-	-	-	-	-	-

LAB	82311 PB EXT ICP DA	82321 PB EXT ICP DA	82999 LEAD COMMON	
1	-	-	0.527	
2	-	-	0.488	
3	-	0.486	0.486	
6	0.47	-	0.47	
8	0.550	-	0.550	*
9	-	-	0.49	
10	-	-	0.478	
11	-	-	0.480	
13	0.47	-	0.47	
14	-	-	0.50	
15	-	0.47	0.47	
16	-	-	0.810	R
19	-	-	0.553	*
20	-	-	0.458	
21	-	-	0.52	
MEAN	.4967	.4780	.4957	
STD DEV	.0462	.0113	.0303	
REL STD	9.3	2.4	6.1	
DES VAL	-	-	.4826	

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 51 PP 91 SAMPLE 2

LAB	00110 IONIC BALANC %	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPARE	02021 COLOUR VIS COM	02022	02023 COLOUR SPECT	02024 COL TRU SPECT	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02073 TURB HACH
1	4.07	1.021	0.941	-	-	-	-	5.	5.	95.2	95.2	0.14
2	-	-	-	5.0 L	-	-	-	-	5.0 L	93.0	93.0	0.2
3	-1.10	0.968	0.990	5. L	-	-	-	-	5. L	95.3	95.3	0.15
4	-	-	-	-	5. L	-	-	-	5. L	95.6	95.6	-
6	9.9	1.08	0.88	-	-	-	-	-	-	110. R	110. R	-
7	0.5	0.91	0.90	-	-	0.	-	-	0.	89.6	89.6	0.5
8	4.88	1.07	0.974	-	5.	-	-	-	5.	100.	100.	-
9	1.54	0.99	0.96	-	-	-	-	-	-	95.	95.	-
10	1.66	0.951	0.920	-	-	-	2.	-	2.	94.	94.	-
11	-	-	-	5.	-	-	-	-	5.	92.	92.	-
14	-	-	-	-	-	-	-	-	-	95.4	95.4	-
15	-	-	-	-	-	-	-	-	-	93.8	93.8	-
16	-	-	-	-	-	-	-	-	-	98.	98.	-
20	4.49	1.06	0.97	-	-	-	-	-	-	90.	90.	-
21	-	-	-	-	-	-	-	-	-	96.	96.	-
MEAN	3.2425	1.0063	.9419	5.0000	5.0000	.0000	2.0000	5.0000	3.4000	94.4929	94.4929	.2475
STD DEV	3.4022	.0617	.0388	-	-	-	-	-	2.3022	2.7963	2.7963	.1704
REL STD	104.9	6.1	4.1	-	-	-	-	-	67.7	3.0	3.0	68.8
DES VAL	-	-	-	-	-	-	-	-	4.0393	-	94.264	-

LAB	02074 TURB NPLMTRI	02077 TURB HACH FZ	02081 TURB RATIO	02090 TURBIDTY COMMON	05100 BORON ?	05105 BORON AA CARM	05106 BORON F AZOMETH	05111 BORON F ICP DA	05190 BORON COMMON	06051 TIC COMB IR	06100 DOC ?	06104 DOC UV CO2 IR
1	-	-	-	0.14	-	-	-	-	-	-	-	-
2	-	-	-	0.2	-	-	-	-	-	-	-	-
3	-	-	-	0.15	-	-	-	-	-	-	-	1.4
4	-	-	0.13	0.13	-	0.036	-	-	0.036	-	-	1.50
6	0.08	-	-	0.08	-	-	-	-	-	-	-	1.6
7	-	-	-	0.5 *	-	-	-	-	-	-	-	-
8	0.08	-	-	0.08	-	-	0.05 L	-	0.05 L	10.	5. L	-
10	0.1	-	-	0.1	-	-	-	0.01	0.01	-	-	-
11	-	0.1 L	-	0.1 L	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	2. R
16	-	-	-	-	0.05 L	-	-	-	0.05 L	-	-	-
20	0.2	-	-	0.2	-	-	-	-	-	-	-	-
MEAN	.1150	-	.1300	.1756	-	.0360	-	.0100	.0230	10.0000	-	1.5000
STD DEV	.0574	-	-	.1296	-	-	-	-	.0184	-	-	.1000
REL STD	50.0	-	-	73.8	-	-	-	-	79.9	-	-	6.7
DES VAL	-	-	-	.1795	-	-	-	-	.02856	-	-	-

LAB	06107 DOC UV CO2 PHE	06109 DOC UV CO2 OH	06112 DOC PER IR	06150 D O C COMMON	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 D I C COMMON	07003 TKN AA ALK PHE	07010 TKN AA SAL	07015 TKN DIG BERTHEL	07016 TKN BLK AMM-SAL
1	1.3	-	-	1.3	-	9.6	-	9.6	-	-	-	-
2	1.4	-	-	1.4	-	-	-	-	-	-	-	-
3	-	-	-	1.4	10.1	-	-	10.1	-	0.068	-	-
4	-	-	-	1.50	-	-	-	-	-	-	-	-
6	-	-	-	1.6	-	-	-	-	-	-	-	0.4
8	-	-	-	5. L	-	-	-	10.	-	-	0.20	-
10	-	1.2	-	1.2	-	-	10.0	10.0	-	-	-	-
15	-	-	-	2. R	10.	-	-	10.	-	-	-	-
16	-	-	1.3	1.3	10.9	-	-	10.9	0.2	-	-	-
MEAN	1.3500	1.2000	1.3000	1.3857	10.3333	9.6000	10.0000	10.1000	.2000	.0680	.2000	.4000
STD DEV	.0707	-	-	.1345	.4933	-	-	.4290	-	-	-	-
REL STD	5.2	-	-	9.7	4.8	-	-	4.2	-	-	-	-
DES VAL	-	-	-	1.3090	-	-	-	9.9753	-	-	-	-

LAB	07021 TKN BLK DIG BER	07090 TKN COMMON	07105 NO3+NO2 DIS AA	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC	07112 NO3+NO2 UF AA CD	07390 NITRATE COMMON	07505 NH3 TOT AA BERT	07540 NH3 TOT AA SAL	07555 NH3 DIS AA PHEN	07556 NH3 DIS INDO
1	-	-	0.290	-	-	-	-	0.290	-	-	-	-
2	-	-	-	-	0.29	-	-	0.29	-	-	-	-
3	-	0.068 *	-	-	-	-	0.295	0.295	0.0025	-	-	-
4	-	-	-	-	0.283	-	-	0.283	-	0.005 L	-	-
6	-	0.4 *	-	0.30	-	-	-	0.30	-	-	-	-
7	-	-	-	-	-	-	0.31	0.31 *	-	-	-	-
8	-	0.20	-	-	0.29	-	-	0.29	-	-	0.003	-
9	-	-	-	0.30	-	-	-	0.30	-	-	-	-
10	-	-	-	0.290	-	-	-	0.290	-	-	0.010 L	-
11	-	-	-	-	0.264	-	-	0.264	-	0.002 L	-	-
13	-	-	-	-	0.3	-	-	0.3	-	0.1 L	-	-
14	-	-	-	-	-	0.21	-	0.21 *	-	-	-	-
16	-	0.2	-	-	0.2	-	-	0.2 *	-	-	-	-
19	0.21	0.21	-	-	0.27	-	-	0.27	-	-	0.04 R	-
20	-	-	-	-	0.26	-	-	0.26	-	-	0.005 L	-
21	-	-	-	-	-	0.010 R	-	0.010 R	-	-	-	0.005 L
MEAN	.2100	.2156	.2900	.2967	.2696	.2100	.3025	.2768	.0025	-	.0030	-
STD DEV	-	.1186	-	.0058	.0314	-	.0106	.0323	-	-	-	-
REL STD	-	55.0	-	1.9	11.6	-	3.5	11.7	-	-	-	-
DES VAL	-	.08457	-	-	-	-	-	.2987	-	-	-	-

LAB	07557 NH3 DIS AA INDO	07562 NH3 DIS AA EDTA	07590 AMMONIA COMMON	07601 T N UV AA SUL	07602 T N CALC'D	07605 T N UV HY SUL	07651 T N DIS UV AA	07690 TOT N COMMON	07790 T N DIS COMMON	09103 F DIS COL SP	09105 F DIS SP EL	09106 F DIS EL POT
1	-	0.003	0.003	-	-	-	-	-	-	-	-	-
2	-	-	-	0.35	-	-	-	-	0.35	-	-	0.05 L
3	-	-	0.0025	0.341	-	-	-	-	0.341	-	-	-
4	-	-	0.005 L	-	-	-	0.328	-	0.328	-	-	-
6	0.01 L	-	0.01 L	-	-	-	-	-	-	0.1 L	-	-
8	-	-	0.003	-	-	-	-	-	-	-	0.1 L	-
10	-	-	0.010 L	-	-	0.34	-	-	0.34	-	-	-
11	-	-	0.002 L	-	-	-	-	-	-	-	0.097 R	-
13	-	-	0.1 L	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	0.05	-
19	-	-	0.04 R	-	0.48	-	-	0.48	-	-	0.01	-
20	-	-	0.005 L	-	-	-	-	-	-	-	0.10 L	-
21	-	-	0.005 L	-	-	-	-	-	-	-	-	0.1 L
MEAN	-	.0030	.0028	.3455	.4800	.3400	.3280	.4800	.3398	-	.0300	-
STD DEV	-	-	.0003	.0064	-	-	-	-	.0090	-	.0283	-
REL STD	-	-	10.2	1.8	-	-	-	-	2.7	-	94.3	-
DES VAL	-	-	.00336	-	-	-	-	.3684	.3287	-	-	-

LAB	09107 F DIS AUT POT	09108 F DIS SP EL	09115 F DIS AA ALIZ	09116 F DIS IC	09190 FLUORIDE COMMON	10101 ALKLNTY TITR'N	10108 ALKLNTY POT TIT	10109 ALKLNTY POT TIT	10111 ALKLNTY TIT PRO	10112 ALKLNTY TIT CON	10190 ALKLINTY COMMON	10301 PH
1	0.03	-	-	-	0.03	42.4	-	-	-	-	42.4	7.75
2	-	-	-	-	0.05 L	40.6	-	-	-	-	40.6	7.7
3	-	0.04	-	-	0.04	-	-	-	40.8	-	40.8	7.95
4	-	-	-	-	-	40.5	-	-	-	-	40.5	8.00
6	-	-	-	-	0.1 L	-	-	44.	-	-	44.	7.8
7	-	-	-	-	-	38.4	-	-	-	-	38.4	7.9
8	-	-	-	-	0.1 L	-	-	42.7	-	-	42.7	7.75
9	-	-	-	-	-	-	42.	-	-	-	42.	7.57
10	-	-	0.04	-	0.04	-	-	-	-	40.3	40.3	7.93
11	-	-	-	-	0.097 R	0.5 L	-	-	-	-	0.5 *	7.6
13	-	-	-	-	-	40.	-	-	-	-	40.	7.6
14	-	-	-	-	-	43.32	-	-	-	-	43.32	7.70
15	-	-	-	-	0.05	41.0	-	-	-	-	41.0	7.8
16	-	-	-	0.04	0.04	42.	-	-	-	-	42.	7.62
19	-	-	-	-	0.01 *	-	-	42.0	-	-	42.0	8.1
20	-	-	-	-	0.10 L	43.2	-	-	-	-	43.2	7.6
21	-	-	-	-	0.1 L	44.	-	-	-	-	44.	7.86
MEAN	.0300	.0400	.0400	.0400	.0350	41.5420	42.0000	42.9000	40.8000	40.3000	41.7013	7.7782
STD DEV	-	-	-	-	.0138	1.7453	-	1.0149	-	-	1.5685	.1591
REL STD	-	-	-	-	39.4	4.2	-	2.4	-	-	3.8	2.0
DES VAL	-	-	-	-	.05073	-	-	-	-	-	41.277	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 51 PP 91 SAMPLE 2

LAB	10390 PH COMMON	10602 HARDNSS CALC'D	10603 HARDNSS TITR'N	10606 HARDNSS CALC'D	10690 HARDNESS COMMON	11001 NA TOT AAS	11005 NA TOT ICP	11007 NA DIS DCP	11102 NA F AAS	11103 NA DIS FL PH	11104 NA DIS FLAME	11105 NA DIS AAS DA
1	7.75	50.	-	-	50. *	-	-	-	-	1.5	-	-
2	7.7	-	-	-	-	-	-	-	-	1.4	-	-
3	7.95	-	-	45.1	45.1	-	-	-	-	-	-	-
4	8.00	-	-	-	-	-	-	-	-	-	-	-
6	7.8	-	50.	-	50. *	-	-	-	2.	-	-	-
7	7.9	-	45.9	-	45.9	-	-	-	-	-	-	0.5
8	7.75	49.0	-	-	49.0	-	-	-	-	-	-	-
9	7.57	46.	-	-	46.	-	1.3	-	-	-	-	-
10	7.93	-	-	-	-	-	1.33	-	-	-	-	-
11	7.6	46.	-	-	46.	-	-	-	1.1	-	-	-
13	7.6	47.98	-	-	47.98	-	-	-	-	-	-	-
14	7.70	39.2	-	-	39.2 *	1.28	-	-	-	-	-	-
15	7.8	43.7	-	-	43.7	-	-	-	-	-	-	-
16	7.62	44.	-	-	44.	-	-	1.00	-	-	-	-
19	8.1	44.5	-	-	44.5	-	1.87	-	-	-	-	-
20	7.6	49.6	-	-	49.6	-	-	-	-	-	1.4	-
21	7.86	43.2	-	-	43.2	-	-	-	1.27	-	-	-
MEAN	7.7782	45.7436	47.9500	45.1000	46.0129	1.2800	1.5000	1.0000	1.4567	1.4500	1.4000	.5000
STD DEV	.1591	3.2677	2.8991	-	3.0924	-	.3208	-	.4782	.0707	-	-
REL STD	2.0	7.1	6.0	-	6.7	-	21.4	-	32.8	4.9	-	-
DES VAL	7.6671	-	-	-	44.739	-	-	-	-	-	-	-

LAB	11107 NA UF FL PH	11111 NA DIS ICP	11311 NA EXT ICP	11990 SODIUM COMMON	12005 MG TOT ICP	12012 MG TOT DCP	12101 MG DIS CALC'D	12102 MG DIS AAS DA	12105 MG DIS AAS DA	12106 MG UF AAS DA	12107 MG DIS AAS AUT	12111 MG DIS ICP
1	-	-	-	1.5	-	-	-	-	2.9	-	-	-
2	-	-	-	1.4	-	-	-	-	-	-	2.6	-
3	1.27	-	-	1.27	-	-	-	-	-	2.76	-	-
6	-	-	-	2. *	-	-	5. R	-	-	-	-	-
7	-	-	-	0.5 *	-	-	-	2.7	-	-	-	-
8	-	-	1.98	1.98 *	-	-	-	-	-	-	-	-
9	-	-	-	1.3	3.0	-	-	-	-	-	-	-
10	-	-	-	1.33	2.74	-	-	-	-	-	-	-
11	-	-	-	1.1	-	-	-	2.9	-	-	-	-
13	-	1.34	-	1.34	-	-	-	-	-	-	-	3.03
14	-	-	-	1.28	-	-	2.76	-	-	-	-	-
15	-	1.2	-	1.2	-	-	-	-	-	-	-	2.6
16	-	-	-	1.00	-	2.72	-	-	-	-	-	-
19	-	-	-	1.87 *	2.79	-	-	-	-	-	-	-
20	-	-	-	1.4	-	-	-	-	-	-	-	3.01
21	-	-	-	1.27	-	-	-	-	-	2.64	-	-
MEAN	1.2700	1.2700	1.9800	1.3588	2.8433	2.7200	2.7600	2.8000	2.9000	2.7000	2.6000	2.8800
STD DEV	-	.0990	-	.3712	.1380	-	-	.1414	-	.0849	-	.2427
REL STD	-	7.8	-	27.3	4.9	-	-	5.1	-	3.1	-	8.4
DES VAL	-	-	-	1.2771	-	-	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 51 PP 91 SAMPLE 2

LAB	12311 MG EXT ICP	12990 MGNESIUM COMMON	14102 SILICA ANSA AA	14103 SILICA MOL SUL	14105 SILICA MOL ASC	14106 SI FIL MOL ASC	14109	14111 SILICA ICP DA	14112 SILICA DCP DA	14190 SILICA COMMON	15111	15301 T P ACL AA ASC
1	-	2.9	-	-	-	-	-	-	-	-	-	-
2	-	2.6	-	-	-	-	2.49	-	-	2.49	-	-
3	-	2.76	-	-	-	2.39	-	-	-	2.39	-	-
6	-	5. R	-	-	-	-	-	-	-	-	-	-
7	-	2.7	-	-	-	-	-	-	-	-	-	-
8	2.93	2.93	-	-	2.3	-	-	-	-	2.3	-	-
9	-	3.0	-	-	-	-	-	2.4	-	2.4	-	-
10	-	2.74	-	-	2.40	-	-	-	-	2.40	-	-
11	-	2.9	2.2	-	-	-	-	-	-	2.2	-	-
13	-	3.03	-	-	-	-	-	-	-	-	-	-
14	-	2.76	-	-	-	-	-	-	-	-	-	-
15	-	2.6	-	-	-	-	-	2.63	-	2.63	0.1 L	-
16	-	2.72	-	-	-	-	-	-	2.46	2.46	-	-
19	-	2.79	-	3.44 R	-	-	-	-	-	3.44 R	-	-
20	-	3.01	-	-	2.6	-	-	-	-	2.6	-	0.003 L
21	-	2.64	-	-	-	-	-	-	-	-	-	-
MEAN	2.9300	2.8053	2.2000	-	2.4333	2.3900	2.4900	2.5150	2.4600	2.4300	-	-
STD DEV	-	.1470	-	-	.1528	-	-	.1626	-	.1354	-	-
REL STD	-	5.2	-	-	6.3	-	-	6.5	-	5.6	-	-
DES VAL	-	2.7537	-	-	-	-	-	-	-	2.3790	-	-

LAB	15313 T P ACL AA SNCL	15400	15401 T P UV AA ASC	15406 T P UF AA ASC	15407 T P ASC AC	15409 T P BLK AA ASC	15413 T P ACL AA SNCL	15421 T P BLK DIG ASC	15490 TOT P COMMON	16302 SO4 DIS TURB BA	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB
1	-	-	-	-	-	-	-	0.001 L	0.001 L	-	-	2.
2	-	-	-	-	-	-	0.001	-	0.001	-	-	-
3	-	-	-	-	-	-	0.0012	-	0.0012	-	-	-
4	-	-	-	0.003 L	-	-	-	-	0.003 L	-	-	-
6	-	-	-	-	-	0.02 R	-	-	0.02 R	-	10. R	-
7	-	-	-	-	-	-	0.001	-	0.001	-	-	3.5
8	-	-	-	-	-	-	0.002	-	0.002	-	-	3.00
10	-	-	0.010 L	-	-	-	-	-	0.010 L	-	-	-
11	0.005 L	-	-	-	-	-	-	-	0.005 L	-	-	3.
13	-	-	-	0.005	-	-	-	-	0.005	-	-	3.37
14	-	0.007	-	-	-	-	-	-	0.007 *	-	-	-
15	-	-	-	-	-	-	-	-	0.1 L	-	-	3.1
19	-	-	-	-	-	-	-	-	-	3.40	-	-
20	-	-	-	-	-	-	-	-	0.003 L	-	-	3.2
21	-	-	-	-	0.005 L	-	-	-	0.005 L	-	-	-
MEAN	-	.0070	-	.0050	-	-	.0013	-	.0029	3.4000	-	3.0243
STD DEV	-	-	-	-	-	-	.0005	-	.0025	-	-	.4887
REL STD	-	-	-	-	-	-	36.6	-	88.4	-	-	16.2
DES VAL	-	-	-	-	-	-	-	-	.00428	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 51 PP 91 SAMPLE 2

LAB	16307 SO4 UF AA MTB	16309 SO4 DIS I C	16310 SO4 DIS AA CALM	16311 SO4 DIS IC	16313	16990 SULFATE COMMON	17203 CL DIS AA FE	17204 CL DIS AG TIT	17206 CL DIS AA HG	17208 CL DIS AA HG	17209 CL DIS I C	17210 CL DIS TIT CON
1	-	-	-	-	-	2. *	-	-	1.1	-	-	-
2	-	-	-	-	3.38	3.38	-	-	-	-	-	-
3	3.0	-	-	-	-	3.0	-	-	-	1.4	-	-
6	-	-	-	-	-	10. R	-	2. L	-	-	-	-
7	-	-	-	-	-	3.5	-	-	1.3	-	-	-
8	-	-	-	-	-	3.00	-	-	1.30	-	-	-
9	-	3.0	-	-	-	3.0	-	-	-	-	1.3	-
10	-	-	2.8	-	-	2.8	-	-	-	-	-	1.2
11	-	-	-	-	-	3.	-	-	1.1	-	-	-
13	-	-	-	-	-	3.37	-	-	1.75 R	-	-	-
14	-	3.28	-	-	-	3.28	-	-	-	-	1.36	-
15	-	-	-	-	-	3.1	-	-	-	-	-	-
16	-	-	-	2.0	-	2.0 *	-	-	-	-	-	-
19	-	-	-	-	-	3.40	-	-	1.07	-	-	-
20	-	-	-	-	-	3.2	1.4	-	-	-	-	-
MEAN	3.0000	3.1400	2.8000	2.0000	3.3800	3.0021	1.4000	-	1.1740	1.4000	1.3300	1.2000
STD DEV	-	.1980	-	-	-	.4690	-	-	.1157	-	.0424	-
REL STD	-	6.3	-	-	-	15.6	-	-	9.9	-	3.2	-
DES VAL	-	-	-	-	-	3.2596	-	-	-	-	-	-

LAB	17211 CL DIS IC	17990 CHLORIDE COMMON	19001 K TOT AAS	19005 K TOT ICP	19008 K TOT DCP	19102 K DIS AAS	19103 K DIS FLM PH	19104 K DIS FLAME	19105 K DIS AAS DA	19106 K DIS AAS LI	19107 K DIS FLM PH	19111 K DIS ICP
1	-	1.1	-	-	-	-	0.32	-	-	-	-	-
2	-	-	-	-	-	-	0.41	-	-	-	-	-
3	-	1.4	-	-	-	-	-	-	-	-	0.47	-
6	-	2. L	-	-	-	0.6	-	-	-	-	-	-
7	-	1.3	-	-	-	1.19	-	-	-	-	-	-
8	-	1.30	-	-	-	-	-	-	-	-	-	-
9	-	1.3	-	0.5	-	-	-	-	-	-	-	-
10	-	1.2	-	0.56	-	-	-	-	-	-	-	-
11	-	1.1	-	-	-	-	-	-	-	0.56	-	-
13	-	1.75 R	-	-	-	-	-	-	-	-	-	0.57
14	-	1.36	0.46	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	0.54	-	-	-
16	1.0	1.0 *	-	-	0.260 R	-	-	-	-	-	-	-
19	-	1.07	-	0.59	-	-	-	-	-	-	-	-
20	-	1.4	-	-	-	-	0.5	-	-	-	-	-
21	-	-	-	-	-	-	-	0.52	-	-	-	-
MEAN	1.0000	1.2300	.4600	.5500	-	.8950	.4100	.5200	.5400	.5600	.4700	.5700
STD DEV	-	.1423	-	.0458	-	.4172	.0900	-	-	-	-	-
REL STD	-	11.6	-	8.3	-	46.6	22.0	-	-	-	-	-
DES VAL	-	1.2664	-	-	-	-	-	-	-	-	-	-

LAB	19311 K EXT ICP	19990 PTASSIUM COMMON	20005 CA TOT ICP	20007 CA TOT DCP	20050 CA DIS AAS NO	20100 CA DIS CALC'D	20103 CA DIS AAS	20107 CA DIS AAS	20108 CA DIS AAS UP	20110 CA DIS AAS AUT	20111 CA DIS ICP	20311 CA EXT ICP
1	-	0.32	-	-	-	-	-	14.1	-	-	-	-
2	-	0.41	-	-	-	-	-	-	-	12.8	-	-
3	-	0.47	-	-	-	-	-	-	13.5	-	-	-
6	-	0.6	-	-	-	12.	-	-	-	-	-	-
7	-	1.19 *	-	-	-	-	12.7	-	-	-	-	-
8	0.51	0.51	-	-	-	-	-	-	-	-	-	14.7
9	-	0.5	13.5	-	-	-	-	-	-	-	-	-
10	-	0.56	13.09	-	-	-	-	-	-	-	-	-
11	-	0.56	-	-	-	-	14.	-	-	-	-	-
13	-	0.57	-	-	-	-	-	-	-	-	14.12	-
14	-	0.46	-	-	11.15	-	-	-	-	-	-	-
15	-	0.54	-	-	-	-	-	-	-	-	13.2	-
16	-	0.260 R	-	11.4	-	-	-	-	-	-	-	-
19	-	0.59	13.1	-	-	-	-	-	-	-	-	-
20	-	0.5	-	-	-	-	-	-	-	-	14.9	-
21	-	0.52	-	-	-	-	-	-	13.5	-	-	-
MEAN	.5100	.5533	13.2300	11.4000	11.1500	12.0000	13.3500	14.1000	13.5000	12.8000	14.0733	14.7000
STD DEV	-	.1906	.2339	-	-	-	.9192	-	.0000	-	.8510	-
REL STD	-	34.5	1.8	-	-	-	6.9	-	-1.0	-	6.0	-
DES VAL	-	.4835	-	-	-	-	-	-	-	-	-	-

LAB	20990 CALCIUM COMMON
1	14.1
2	12.8
3	13.5
6	12.
7	12.7
8	14.7 *
9	13.5
10	13.09
11	14.
13	14.12
14	11.15 *
15	13.2
16	11.4
19	13.1
20	14.9 *
21	13.5
MEAN	13.2350
STD DEV	1.0646
REL STD	8.0
DES VAL	12.760

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 52 PP 92 DATE: 01/04/90 DUE DATE: 30/04/90

SAMPLE 3 SPIKED SAMPLE. TRACE METALS -LOW. (IN 0.2% HNO3)

LAB	13009 AL TOT 5X ICP	13030 AL TOT ?	13102 AL DIS AAS DA	13105 AL DIS AAS GF	13111 AL DIS ICP DA	13302 AL EXT AAS DA	13304 AL EXT AAS GF	13305 AL EXT AAS SE	13322 AL EXT DCP DA	13999 ALUMINUM COMMON	23002 V TOT AAS SE	23009 V TOT 5X ICP
1	-	0.050 R	-	-	-	-	-	-	-	0.050 R	-	0.006
2	-	-	-	-	-	-	-	0.014	-	0.014	-	-
3	0.023	-	-	-	-	-	-	0.018	-	0.018	0.0057	0.0049
6	0.030	-	-	-	-	-	-	-	-	0.030 *	-	0.01 L
8	-	-	-	-	-	0.2 L	-	-	-	0.2 L	-	-
9	-	-	-	-	0.02	-	-	-	-	0.02	-	-
10	-	-	-	-	0.03	-	-	-	-	0.03 *	-	-
14	-	-	-	0.041	-	-	-	-	-	0.041 *	-	-
15	-	-	-	-	-	-	0.018	-	-	0.018	-	-
16	-	-	-	-	-	-	-	-	0.018	0.018	-	-
19	0.02 L	-	-	-	-	-	-	-	-	0.02 L	-	0.007
20	-	-	-	0.014	-	-	-	-	-	0.014	-	-
21	-	-	0.016	-	-	-	-	-	-	0.016	-	-
MEAN	.0265	-	.0160	.0275	.0250	-	.0180	.0160	.0180	.0219	.0057	.0060
STD DEV	.0049	-	-	.0191	.0071	-	-	.0028	-	.0088	-	.0011
REL STD	18.7	-	-	69.4	28.3	-	-	17.7	-	40.4	-	17.6
DES VAL	-	-	-	-	-	-	-	-	-	.01838	-	-

LAB	23012 V TOT 5X DCP	23105	23111 V DIS ICP DA	23321 V EXT ICP DA	23999 VANADIUM COMMON	24003 CR TOT AAS SE	24004 CR TOT AAS GF	24009 CR TOT 5X ICP	24012 CR TOT 5X DCP	24056 CR DIS AAS GF	24111 CR DIS ICP DA	24303 CR EXT AAS SE
1	-	-	-	-	0.006	-	-	0.006	-	-	-	-
3	-	-	-	-	0.0057	0.0079	-	0.0081	-	-	-	-
6	-	-	-	-	0.01 L	-	-	0.007	-	-	-	-
8	-	-	-	-	-	-	0.006	-	-	-	-	-
9	-	-	0.01 L	-	0.01 L	-	0.006	-	-	-	-	-
10	-	-	0.005	-	0.005	-	-	-	-	-	0.007	-
11	-	-	-	-	-	-	-	-	-	-	-	0.006
14	-	0.0079	-	-	0.0079*	-	-	-	-	-	-	-
15	-	-	-	0.01 L	0.01 L	-	-	-	-	-	-	-
16	0.015 R	-	-	-	0.015 R	-	-	-	0.006	-	-	-
19	-	-	-	-	0.007	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	0.006	-	-
21	-	-	-	-	-	-	0.0066	-	-	-	-	-
MEAN	-	.0079	.0050	-	.0063	.0079	.0062	.0070	.0060	.0060	.0070	.0060
STD DEV	-	-	-	-	.0011	-	.0003	.0011	-	-	-	-
REL STD	-	-	-	-	18.0	-	5.6	14.9	-	-	-	-
DES VAL	-	-	-	-	.00532	-	-	-	-	-	-	-

LAB	24321 CR EXT ICP DA	24999 CHROMIUM COMMON	25003 MN TOT 5X ICP	25004 MN TOT AAS DA	25005	25009 MN TOT COL BIS	25010 MN TOT 5X ICP	25012 MN TOT 5X DCP	25107 MN DIS AAS GF	25111 MN DIS ICP DA	25311 MN EXT ICP DA	25321 MN EXT ICP DA
1	-	0.006	0.005	-	-	-	-	-	-	-	-	-
3	-	0.0079	-	-	0.006	-	0.0057	-	-	-	-	-
6	-	0.007	-	-	-	0.006	-	-	-	-	-	-
8	-	0.006	-	-	-	-	-	-	-	-	0.020 L	-
9	-	0.006	-	-	-	-	-	-	-	0.006	-	-
10	-	0.007	-	-	-	-	-	-	-	0.005	-	-
11	-	0.006	-	0.008	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	0.0050	-	-	-
15	0.005 L	0.005 *	-	-	-	-	-	-	-	-	-	0.005
16	-	0.006	-	-	-	-	-	0.008	-	-	-	-
19	-	-	-	-	-	0.001 L	-	-	-	-	-	-
20	-	0.006	-	-	-	-	-	-	0.007	-	-	-
21	-	0.0066	-	-	-	-	-	-	0.0061	-	-	-
MEAN	-	.0065	.0050	.0080	.0060	.0060	.0057	.0080	.0060	.0055	-	.0050
STD DEV	-	.0007	-	-	-	-	-	-	.0010	.0007	-	-
REL STD	-	10.3	-	-	-	-	-	-	16.6	12.9	-	-
DES VAL	-	.00702	-	-	-	-	-	-	-	-	-	-

LAB	25999 MANGNESE COMMON	26003 FE TOT AAS GF	26005 FE TOT AAS SE	26009 FE TOT 5X ICP	26012 FE TOT 5X DCP	26107 FE DIS AAS GF	26111 FE DIS ICP DA	26305 FE EXT AAS SE	26311 FE EXT ICP DA	26321 FE EXT ICP DA	26999 IRON COMMON	27002 CO TOT AAS SE
1	0.005	-	-	0.009	-	-	-	-	-	-	0.009 *	-
2	-	-	-	-	-	-	-	0.007	-	-	0.007	-
3	0.006	-	0.0060	0.0088	-	-	-	-	-	-	0.0060	0.0044
6	0.006	-	-	0.011	-	-	-	-	-	-	0.011 *	-
8	0.020 L	-	-	-	-	-	-	-	0.020 L	-	0.020 L	-
9	0.006	-	-	-	-	-	0.02 L	-	-	-	0.02 L	-
10	0.005	-	-	-	-	-	0.005	-	-	-	0.005	-
11	0.008	-	-	-	-	-	-	0.010	-	-	0.010 *	-
14	0.0050	-	-	-	-	-	-	-	-	-	-	-
15	0.005	-	-	-	-	-	-	-	-	0.007	0.007	-
16	0.008	-	-	-	0.015 R	-	-	-	-	-	0.015 R	-
19	0.001 *	-	-	0.002 L	-	-	-	-	-	-	0.002 *	-
20	0.007	-	-	-	-	0.007	-	-	-	-	0.007	-
21	0.0061	0.008	-	-	-	-	-	-	-	-	0.008	-
MEAN	.0061	.0080	.0060	.0096	-	.0070	.0050	.0085	-	.0070	.0078	.0044
STD DEV	.0011	-	-	.0012	-	-	-	.0021	-	-	.0019	-
REL STD	18.6	-	-	12.7	-	-	-	25.0	-	-	24.7	-
DES VAL	.00617	-	-	-	-	-	-	-	-	-	.00625	-

LAB	27003 CO TOT AAS GF	27009 CO TOT 5X ICP	27012 CO TOT 5X DCP	27107 CO DIS AAS GF	27111 CO DIS ICP DA	27302 CO EXT AAS SE	27321 CO EXT ICP DA	27999 COBALT COMMON	28002 NI TOT AAS SE	28007 NI TOT AAS GF	28009 NI TOT 5X ICP	28012 NI TOT 5X DCP
1	-	0.004	-	-	-	-	-	0.004	-	-	0.006	-
3	-	0.0044	-	-	-	-	-	0.0044	0.0062	-	0.0065	-
6	-	0.005	-	-	-	-	-	0.005	-	-	0.007	-
8	0.006	-	-	-	-	-	-	0.006	-	-	-	-
9	-	-	-	-	0.01 L	-	-	0.01 L	-	-	-	-
10	-	-	-	-	0.007	-	-	0.007	-	-	-	-
11	-	-	-	-	-	0.005	-	0.005	-	-	-	-
15	-	-	-	-	-	-	0.006	0.006	-	-	-	-
16	-	-	0.006	-	-	-	-	0.006	-	-	-	0.008
19	-	-	-	-	-	-	-	-	-	-	0.009	-
20	-	-	-	0.005	-	-	-	0.005	-	-	-	-
21	0.0050	-	-	-	-	-	-	0.0050	-	0.0062	-	-
MEAN	.0055	.0045	.0060	.0050	.0070	.0050	.0060	.0053	.0062	.0062	.0071	.0080
STD DEV	.0007	.0005	-	-	-	-	-	.0009	-	-	.0013	-
REL STD	12.9	11.3	-	-	-	-	-	16.8	-	-	18.5	-
DES VAL	-	-	-	-	-	-	-	.00514	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 52 PP 92 SAMPLE 3

LAB	28107 NI DIS AAS GF	28111 NI DIS ICP DA	28302 NI EXT AAS SE	28309 NI EXT AAS GF	28321 NI EXT ICP DA	28999 NICKEL COMMON	29003 CU TOT AAS GF	29005 CU TOT AAS SE	29009 CU TOT 5X ICP	29012 CU TOT 5X DCP	29107 CU DIS AAS GF	29111 CU DIS ICP DA
1	-	-	-	-	-	0.006	-	-	0.008	-	-	-
3	-	-	-	-	-	0.0062	-	0.0063	0.0065	-	-	-
6	-	-	-	-	-	0.007	-	-	0.006	-	-	-
8	-	-	-	0.006	-	0.006	-	-	-	-	-	-
9	-	0.01 L	-	-	-	0.01 L	-	-	-	-	-	0.01 L
10	-	0.010 L	-	-	-	0.010 L	-	-	-	-	-	0.006
11	-	-	0.009	-	-	0.009 *	-	-	-	-	-	-
15	-	-	-	-	0.02 L	0.02 L	-	-	-	-	-	-
16	-	-	-	-	-	0.008	-	-	-	0.008	-	-
19	-	-	-	-	-	0.009 *	-	-	0.002	-	-	-
20	0.006	-	-	-	-	0.006	-	-	-	-	0.006	-
21	-	-	-	-	-	0.0062	0.0067	-	-	-	-	-
MEAN	.0060	-	.0090	.0060	-	.0070	.0067	.0063	.0056	.0080	.0060	.0060
STD DEV	-	-	-	-	-	.0013	-	-	.0026	-	-	-
REL STD	-	-	-	-	-	18.3	-	-	45.5	-	-	-
DES VAL	-	-	-	-	-	.00676	-	-	-	-	-	-

LAB	29305 CU EXT AAS SE	29308 CU EXT AAS GF	29311 CU EXT ICP DA	29999 COPPER COMMON	30003 ZN TOT AAS GF	30005 ZN TOT AAS SE	30009 ZN TOT 5X ICP	30012 ZN TOT 5X DCP	30104 ZN DIS AAS DA	30107 ZN DIS AAS GF	30111 ZN DIS ICP DA	30305 ZN EXT AAS SE
1	-	-	-	0.008	-	-	0.008	-	-	-	-	-
2	0.007	-	-	0.007	-	-	-	-	-	-	-	-
3	-	-	-	0.0063	-	0.0072	0.0076	-	-	-	-	-
6	-	-	-	0.006	-	-	0.007	-	-	-	-	-
8	-	-	0.012	0.012 *	-	-	-	-	-	-	-	-
9	-	-	-	0.01 L	-	-	-	-	-	-	0.01 L	-
10	-	-	-	0.006	-	-	-	-	-	-	0.005	-
11	0.007	-	-	0.007	-	-	-	-	-	-	-	0.007
14	-	-	-	-	-	-	-	-	0.0063	-	-	-
15	-	0.0062	-	0.0062	-	-	-	-	-	-	-	-
16	-	-	-	0.008	-	-	-	0.008	-	-	-	-
19	-	-	-	0.002 *	-	-	0.007	-	-	-	-	-
20	-	-	-	0.006	-	-	-	-	-	0.007	-	-
21	-	-	-	0.0067	0.0070	-	-	-	-	-	-	-
MEAN	.0070	.0062	.0120	.0068	.0070	.0072	.0074	.0080	.0063	.0070	.0050	.0070
STD DEV	.0000	-	-	.0022	-	-	.0005	-	-	-	-	-
REL STD	-1.0	-	-	33.2	-	-	6.6	-	-	-	-	-
DES VAL	-	-	-	.00681	-	-	-	-	-	-	-	-

LAB	30311 ZN EXT ICP DA	30321 ZN EXT ICP DA	30999 ZINC COMMON	38009 SR TOT ICP DA	38012 SR TOT DCP DA	38111 SR DIS ICP DA	38321 SR EXT ICP DA	38999 STRNTIUM COMMON	42009 MO TOT 5X ICP	42012 MO TOT 5X DCP	42109	42111 MO DIS ICP DA
1	-	-	0.008	-	-	-	-	-	0.005	-	-	-
3	-	-	0.0072	0.167	-	-	-	0.167	0.0064	-	-	-
6	-	-	0.007	-	-	-	-	-	0.01 L	-	-	-
8	0.01 L	-	0.01 L	-	-	-	-	-	-	-	-	-
9	-	-	0.01 L	-	-	0.18	-	0.18	-	-	-	0.01 L
10	-	-	0.005	-	-	0.17	-	0.17	-	-	-	0.007
11	-	-	0.007	-	-	-	-	-	-	-	-	-
14	-	-	0.0063	-	-	-	-	-	-	-	-	-
15	-	0.007	0.007	-	-	-	0.174	0.174	-	-	-	-
16	-	-	0.008	-	0.160	-	-	0.160	-	0.007	-	-
19	-	-	0.007	-	-	-	-	-	-	-	-	-
20	-	-	0.007	-	-	-	-	-	-	-	0.0051	-
21	-	-	0.0070	-	-	-	-	-	-	-	-	-
MEAN	-	.0070	.0070	.1670	.1600	.1750	.1740	.1702	.0057	.0070	.0051	.0070
STD DEV	-	-	.0008	-	-	.0071	-	.0075	.0010	-	-	-
REL STD	-	-	11.6	-	-	4.0	-	4.4	17.4	-	-	-
DES VAL	-	-	.00699	-	-	-	-	.1727	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 52 PP 92 SAMPLE 3

LAB	42303 MO EXT AAS GF	42321	42999 MOLYBNUM COMMON	48002 CD TOT AAS SE	48003 CD TOT AAS GF	48004	48009 CD TOT 5X ICP	48012 CD TOT 5X DCP	48103 CD DIS AAS GF	48104	48111 CD DIS ICP DA	48302 CD EXT AAS SE
1	-	-	0.005	-	-	-	0.005	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	0.005
3	-	-	0.0064	0.0045	-	-	0.0046	-	-	-	-	-
6	-	-	0.01 L	-	-	-	0.005	-	-	-	-	-
9	-	-	0.01 L	-	-	0.005	-	-	-	-	-	-
10	-	-	0.007	-	-	-	-	-	-	-	0.005	-
11	-	-	-	-	-	-	-	-	-	-	-	0.0053
14	-	-	-	-	-	-	-	-	-	0.0045	-	-
15	-	0.01 L	0.01 L	-	-	-	-	-	-	-	-	-
16	-	-	0.007	-	-	-	-	0.006	-	-	-	-
19	-	-	-	-	-	-	0.005	-	-	-	-	-
20	-	-	0.0051	-	-	-	-	-	0.0053	-	-	-
21	0.0049	-	0.0049*	-	0.0043	-	-	-	-	-	-	-
MEAN	.0049	-	.0059	.0045	.0043	.0050	.0049	.0060	.0053	.0045	.0050	.0052
STD DEV	-	-	.0010	-	-	-	.0002	-	-	-	-	.0002
REL STD	-	-	17.2	-	-	-	4.1	-	-	-	-	4.1
DES VAL	-	-	.00696	-	-	-	-	-	-	-	-	-

LAB	48308	48309 CD EXT AAS GF	48321 CD EXT ICP DA	48999 CADMIUM COMMON	56000 BA TOT AAS	56009 BA TOT 5X ICP	56012 BA TOT 5X DCP	56111 BA DIS ICP DA	56321 BA EXT ICP DA	56999 BARIUM COMMON	82002 PB TOT AAS SE	82004 PB TOT AAS GF
1	-	-	-	0.005	-	0.021	-	-	-	0.021	-	-
2	-	-	-	0.005	-	-	-	-	-	-	-	-
3	-	-	-	0.0045	-	0.0222	-	-	-	0.0222	0.0053	-
6	-	-	-	0.005	-	0.025	-	-	-	0.025	-	-
8	-	0.005	-	0.005	-	-	-	-	-	-	-	-
9	-	-	-	0.005	-	-	-	0.02	-	0.02	-	0.06 R
10	-	-	-	0.005	-	-	-	0.02	-	0.02	-	-
11	-	-	-	0.0053	-	-	-	-	-	-	-	-
14	-	-	-	0.0045	-	-	-	-	-	-	-	-
15	0.0026	-	0.008 R	0.0026*	-	-	-	-	0.022	0.022	-	-
16	-	-	-	0.006	-	-	0.024	-	-	0.024	-	-
19	-	-	-	0.005	-	0.026	-	-	-	0.026	-	-
20	-	-	-	0.0053	-	-	-	-	-	-	-	-
21	-	-	-	0.0043	0.024	-	-	-	-	0.024	-	0.0064
MEAN	.0026	.0050	-	.0048	.0240	.0236	.0240	.0200	.0220	.0227	.0053	.0064
STD DEV	-	-	-	.0008	-	.0023	-	.0000	-	.0022	-	-
REL STD	-	-	-	15.7	-	9.9	-	-1.0	-	9.6	-	-
DES VAL	-	-	-	.00504	-	-	-	-	-	.02252	-	-

LAB	82009 PB TOT 5X ICP	82012 PB TOT 5X DCP	82104 PB DIS AAS GF	82111 PB DIS ICP DA	82302 PB EXT AAS SE	82309 PB EXT AAS GF	82999 LEAD COMMON
1	-	-	-	-	0.004	-	0.004
2	-	-	-	-	0.006	-	0.006
3	0.0048	-	-	-	-	-	0.0053
6	0.007	-	-	-	-	-	0.007
8	-	-	-	-	-	0.007	0.007
9	-	-	-	-	-	-	0.06 R
10	-	-	-	0.006	-	-	0.006
11	-	-	-	-	0.005	-	0.005
14	-	-	0.0024	-	-	-	0.0024*
15	-	-	-	-	-	0.0029	0.0029*
16	-	0.007	-	-	-	-	0.007
19	0.03 L	-	-	-	-	-	0.03 L
20	-	-	0.006	-	-	-	0.006
21	-	-	-	-	-	-	0.0064
MEAN	.0059	.0070	.0042	.0060	.0050	.0050	.0054
STD DEV	.0016	-	.0025	-	.0010	.0029	.0016
REL STD	26.4	-	60.6	-	20.0	58.6	29.0
DES VAL	-	-	-	-	-	-	.00563

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 52 PP 92 SAMPLE 4

LAB	00110 IONIC BALANC %	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPARE	02021 COLOUR VIS COM	02022	02023 COLOUR SPECT	02024 COL TRU SPECT	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02073 TURB HACH
1	0.67	3.74	3.69	-	-	-	-	1.	1.	451.	451.	0.1
2	-	-	-	5.0 L	-	-	-	-	5.0 L	439.0	439.0	0.2
3	0.21	3.761	3.746	5. L	-	-	-	-	5. L	445.	445.	0.09
4	-	-	-	-	5. L	-	-	-	5. L	450.	450.	-
6	1.18	3.89	3.79	-	-	-	-	-	-	435.	435.	-
7	-2.7	3.64	3.85	-	-	0.	-	-	0.	435.	435.	0.4
8	14.06	4.04	3.07	-	5. L	-	-	-	5. L	459.	459.	-
9	1.16	3.91	3.82	-	-	-	-	-	-	440.	440.	-
10	1.55	3.826	3.709	-	-	-	1.	-	1.	447.	447.	-
11	-	-	-	0.5 L	-	-	-	-	0.5 L	440.	440.	-
14	-	-	-	-	-	-	-	-	-	461.	461.	-
15	-	-	-	-	-	-	-	-	-	454.	454.	-
16	-	-	-	-	-	-	-	-	-	470.	470.	-
20	4.39	4.20	3.85	-	-	-	-	-	-	450.	450.	-
21	-	-	-	-	-	-	-	-	-	455.	455.	-
MEAN	2.5650	3.8759	3.6906	-	-	.0000	1.0000	1.0000	.6667	448.7333	448.7333	.1975
STD DEV	5.0320	.1785	.2580	-	-	-	-	-	.5774	10.0887	10.0887	.1438
REL STD	196.2	4.6	7.0	-	-	-	-	-	86.6	2.2	2.2	72.8
DES VAL	-	-	-	-	-	-	-	-	2.4679	-	444.209	-

LAB	02074 TURB NPLMTRI	02077 TURB HACH FZ	02081 TURB RATIO	02090 TURBIDTY COMMON	05100 BORON ?	05105 BORON AA CARM	05111 BORON F ICP DA	05190 BORON COMMON	06051 TIC COMB IR	06100 DOC ?	06104 DOC UV CO2 IR	06107 DOC UV CO2 PHE
1	-	-	-	0.1	-	-	-	-	-	-	-	0.13
2	-	-	-	0.2	-	-	-	-	-	-	-	0.5 L
3	-	-	-	0.09	-	-	-	-	-	-	0.1	-
4	-	-	0.11	0.11	-	0.02 L	-	0.02 L	-	-	0.274	-
6	0.04	-	-	0.04	-	-	-	-	-	-	0.2	-
7	-	-	-	0.4 *	-	-	-	-	-	-	-	-
8	0.09	-	-	0.09	-	-	-	-	5.0 L	5.0 L	-	-
10	0.1	-	-	0.1	-	-	0.01	0.01	-	-	-	-
11	-	0.1 L	-	0.1 L	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	1. L	-
16	-	-	-	-	0.05 L	-	-	0.05 L	-	-	-	-
20	0.2	-	-	0.2	-	-	-	-	-	-	-	-
MEAN	.1075	-	.1100	.1478	-	-	.0100	.0100	-	-	.1913	.1300
STD DEV	.0670	-	-	.1080	-	-	-	-	-	-	.0873	-
REL STD	62.3	-	-	73.1	-	-	-	-	-	-	45.6	-
DES VAL	-	-	-	.1790	-	-	-	.01176	-	-	-	-

LAB	06109 DOC UV CO2 OH	06112 DOC PER IR	06150 D O C COMMON	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 D I C COMMON	07003 TKN AA ALK PHE	07010 TKN AA SAL	07015 TKN DIG BERTHEL	07016 TKN BLK AMM-SAL	07021 TKN BLK DIG BER
1	-	-	0.13	-	0.5 L	-	0.5 L	-	-	-	-	-
2	-	-	0.5 L	-	-	-	-	-	-	-	-	-
3	-	-	0.1	0.1	-	-	0.1 *	-	0.039	-	-	-
4	-	-	0.274	-	-	-	-	-	-	-	-	-
6	-	-	0.2	-	-	-	-	-	-	-	0.4	-
8	-	-	5.0 L	-	-	-	5.0 L	-	-	0.20 L	-	-
10	0.2	-	0.2	-	-	0.2 L	0.2 L	-	-	-	-	-
15	-	-	1. L	1. L	-	-	1. L	-	-	-	-	-
16	-	0.1	0.1	0.5	-	-	0.5	0.2	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	0.04
MEAN	.2000	.1000	.1673	.3000	-	-	.3000	.2000	.0390	-	.4000	.0400
STD DEV	-	-	.0692	.2828	-	-	.2828	-	-	-	-	-
REL STD	-	-	41.4	94.3	-	-	94.3	-	-	-	-	-
DES VAL	-	-	.5488	-	-	-	.6196	-	-	-	-	-

LAB	07090 TKN COMMON	07105 NO3+NO2 DIS AA	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC	07112 NO3+NO2 UF AA CD	07390 NITRATE COMMON	07505 NH3 TOT AA BERT	07540 NH3 TOT AA SAL	07555 NH3 DIS AA PHEN	07556 NH3 DIS INDO	07557 NH3 DIS AA INDO
1	-	0.020	-	-	-	-	0.020	-	-	-	-	-
2	-	-	-	0.02	-	-	0.02	-	-	-	-	-
3	0.039	-	-	-	-	0.039	0.039 *	0.0024	-	-	-	-
4	-	-	-	0.019	-	-	0.019	-	0.007	-	-	-
6	0.4 *	-	0.03	-	-	-	0.03	-	-	-	-	0.08 R
7	-	-	-	-	-	0.02	0.02	-	-	-	-	-
8	0.20 L	-	-	0.02	-	-	0.02	-	-	0.002	-	-
9	-	-	0.05 R	-	-	-	0.05 R	-	-	-	-	-
10	-	-	0.010	-	-	-	0.010	-	-	0.010 L	-	-
11	-	-	-	0.010	-	-	0.010	-	0.002 L	-	-	-
13	-	-	-	0.2 R	-	-	0.2 R	-	0.1 L	-	-	-
14	-	-	-	-	0.015	-	0.015	-	-	-	-	-
16	0.2	-	-	-	-	-	-	-	-	-	-	-
19	0.04	-	-	0.02	-	-	0.02	-	-	0.02 L	-	-
20	-	-	-	0.02	-	-	0.02	-	-	0.005 L	-	-
21	-	-	-	-	0.288 R	-	0.288 R	-	-	-	0.005 L	-
MEAN	.1698	.0200	.0200	.0182	.0150	.0295	.0203	.0024	.0070	.0020	-	-
STD DEV	.1711	-	.0141	.0040	-	.0134	.0079	-	-	-	-	-
REL STD	100.8	-	70.7	22.1	-	45.5	39.0	-	-	-	-	-
DES VAL	.03123	-	-	-	-	-	.02561	-	-	-	-	-

LAB	07562 NH3 DIS AA EDTA	07590 AMMONIA COMMON	07601 T N UV AA SUL	07605 T N UV HY SUL	07651 T N DIS UV AA	07790 T N DIS COMMON	09103 F DIS COL SP	09105 F DIS SP EL	09106 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL	09116 F DIS IC
1	0.004	0.004	-	-	-	-	-	-	-	0.01 L	-	-
2	-	-	0.03	-	-	0.03 *	-	-	0.05 L	-	-	-
3	-	0.0024	0.025 L	-	-	0.025 *	-	-	-	-	0.01 L	-
4	-	0.007	-	-	0.087	0.087 *	-	-	-	-	-	-
6	-	0.08 R	-	-	-	-	0.1 L	-	-	-	-	-
8	-	0.002	-	-	-	-	-	0.1 L	-	-	-	-
10	-	0.010 L	-	0.07	-	0.07	-	0.08	-	-	-	-
11	-	0.002 L	-	-	-	-	-	0.05 L	-	-	-	-
13	-	0.1 L	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	0.05 L	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	0.01 L
19	-	0.02 L	-	0.04	-	0.04	-	0.01 L	-	-	-	-
20	-	0.005 L	-	-	-	-	-	0.010 L	-	-	-	-
21	-	0.005 L	-	-	-	-	-	-	0.1 L	-	-	-
MEAN	.0040	.0039	.0300	.0550	.0870	.0568	-	.0800	-	-	-	-
STD DEV	-	.0023	-	.0212	-	.0264	-	-	-	-	-	-
REL STD	-	59.0	-	38.6	-	46.5	-	-	-	-	-	-
DES VAL	-	.00463	-	-	-	.04848	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 52 PP 92 SAMPLE 4

LAB	09190 FLUORIDE COMMON	10101 ALKLNTY TITR'N	10108 ALKLNTY POT TIT	10109 ALKLNTY POT TIT	10110 ALKLNTY GRN TIT	10111 ALKLNTY TIT PRO	10112 ALKLNTY TIT CON	10190 ALKLINTY COMMON	10301 PH	10390 PH COMMON	10602 HARDNSS CALC'D	10603 HARDNSS TITR'N
1	0.01 L	2.21	-	-	-	-	-	2.21	5.85	5.85	146.	-
2	0.05 L	-	-	-	0.7	-	-	0.7	5.6	5.6	-	-
3	0.01 L	-	-	-	-	0.7	-	0.7	5.64	5.64	-	-
4	-	0.252	-	-	-	-	-	0.252	5.74	5.74	-	-
6	0.1 L	-	-	4.	-	-	-	4. *	5.8	5.8	-	149.
7	-	0.1 L	-	-	-	-	-	0.1 L	5.6	5.6	-	149.8
8	0.1 L	-	-	1.0 L	-	-	-	1.0 L	5.47	5.47	160.	-
9	-	-	4. L	-	-	-	-	4. L	5.39	5.39	150.	-
10	0.08	-	-	-	-	-	0.2	0.2	5.62	5.62	-	-
11	0.05 L	0.5 L	-	-	-	-	-	0.5 L	5.6	5.6	148.	-
13	-	0.95	-	-	-	-	-	0.95	5.7	5.7	163.61	-
14	-	2.4	-	-	-	-	-	2.4	5.45	5.45	123.7	-
15	0.05 L	1.0 L	-	-	-	-	-	1.0 L	5.5	5.5	143.	-
16	0.01 L	2.	-	-	-	-	-	2.	5.18	5.18	148.	-
19	0.01 L	-	-	-	-	-	-	-	5.6	5.6	142.	-
20	0.010 L	2.0	-	-	-	-	-	2.0	5.4	5.4	167.0	-
21	0.1 L	1. L	-	-	-	-	-	1. L	5.60	5.60	144.	-
MEAN	.0800	1.6353	-	4.0000	.7000	.7000	.2000	1.5412	5.5729	5.5729	148.6645	149.4000
STD DEV	-	.8443	-	-	-	-	-	1.1962	.1642	.1642	11.9135	.5657
REL STD	-	51.6	-	-	-	-	-	77.6	2.9	2.9	8.0	.4
DES VAL	.02597	-	-	-	-	-	-	.8830	-	5.4856	-	-

LAB	10606 HARDNSS CALC'D	10690 HARDNESS COMMON	11001 NA TOT AAS	11004	11005 NA TOT ICP	11007 NA DIS DCP	11102 NA F AAS	11103 NA DIS FL PH	11105 NA DIS AAS DA	11107 NA UF FL PH	11111 NA DIS ICP	11311 NA EXT ICP
1	-	146.	-	-	-	-	-	18.5	-	-	-	-
2	-	-	-	-	-	-	-	16.0	-	-	-	-
3	146.	146.	-	-	-	-	-	-	-	19.0	-	-
6	-	149.	-	-	-	-	20.	-	-	-	-	-
7	-	149.8	-	-	-	-	-	-	18.3	-	-	-
8	-	160.	-	-	-	-	-	-	-	-	-	20.2
9	-	150.	-	-	20.	-	-	-	-	-	-	-
10	-	-	-	-	20.24	-	-	-	-	-	-	-
11	-	148.	-	-	-	-	1.6 R	-	-	-	-	-
13	-	163.61	-	-	-	-	-	-	-	-	20.72	-
14	-	123.7 *	19.3	-	-	-	-	-	-	-	-	-
15	-	143.	-	-	-	-	-	-	-	-	19.	-
16	-	148.	-	-	-	15.8	-	-	-	-	-	-
19	-	142.	-	-	19.8	-	-	-	-	-	-	-
20	-	167.0 *	-	19.3	-	-	-	-	-	-	-	-
21	-	144.	-	-	-	-	18.9	-	-	-	-	-
MEAN	146.0000	148.5793	19.3000	19.3000	20.0133	15.8000	19.4500	18.2500	18.3000	19.0000	19.8600	20.2000
STD DEV	-	10.4797	-	-	.2203	-	.7778	.3536	-	-	1.2162	-
REL STD	-	7.1	-	-	1.1	-	4.0	1.9	-	-	6.1	-
DES VAL	-	147.754	-	-	-	-	-	-	-	-	-	-

LAB	11990 SODIUM COMMON	12005 MG TOT ICP	12012 MG TOT DCP	12101 MG DIS CALC'D	12102 MG DIS AAS DA	12105 MG DIS AAS DA	12106 MG UF AAS DA	12107 MG DIS AAS AUT	12111 MG DIS ICP	12311 MG EXT ICP	12990 MGNESIUM COMMON	14102 SILICA ANSA AA
1	18.5	-	-	-	-	10.2	-	-	-	-	10.2	-
2	18.0	-	-	-	-	-	-	9.5	-	-	9.5	-
3	19.0	-	-	-	-	-	9.34	-	-	-	9.34	-
6	20.	-	-	11.	-	-	-	-	-	-	11. *	-
7	18.3	-	-	-	9.3	-	-	-	-	-	9.3	-
8	20.2	-	-	-	-	-	-	-	-	10.5	10.5 *	-
9	20.	10.	-	-	-	-	-	-	-	-	10.	-
10	20.24	9.45	-	-	-	-	-	-	-	-	9.45	-
11	1.6 R	-	-	-	10.1	-	-	-	-	-	10.1	0.02 L
13	20.72	-	-	-	-	-	-	-	10.63	-	10.63 *	-
14	19.3	-	-	-	9.02	-	-	-	-	-	9.02	-
15	19.	-	-	-	-	-	-	-	8.9	-	8.9	-
16	15.8 *	-	8.8	-	-	-	-	-	-	-	8.8	-
19	19.8	9.41	-	-	-	-	-	-	-	-	9.41	-
20	19.3	-	-	-	-	-	-	-	10.6	-	10.6 *	-
21	18.9	-	-	-	-	-	9.1	-	-	-	9.1	-
MEAN	19.1373	9.6200	8.8000	11.0000	9.4733	10.2000	9.2200	9.5000	10.0433	10.5000	9.7406	-
STD DEV	1.2090	.3297	-	-	.5605	-	.1697	-	.9903	-	.6941	-
REL STD	6.3	3.4	-	-	5.9	-	1.8	-	9.9	-	7.1	-
DES VAL	19.160	-	-	-	-	-	-	-	-	-	9.4594	-

LAB	14103 SILICA MOL SUL	14105 SILICA MOL ASC	14106 SI FIL MOL ASC	14107 SILICA MOLY AA	14109	14111 SILICA ICP DA	14112 SILICA DCP DA	14190 SILICA COMMON	15111	15301 T P ACL AA ASC	15313 T P ACL AA SNCL	15401 T P UV AA ASC
1	-	-	-	0.1 L	-	-	-	0.1 L	-	-	-	-
2	-	-	-	-	0.1 L	-	-	0.1 L	-	-	-	-
3	-	-	0.02 L	-	-	-	-	0.02 L	-	-	-	-
8	-	0.2 L	-	-	-	-	-	0.2 L	-	-	-	-
9	-	-	-	-	-	0.2 L	-	0.2 L	-	-	-	-
10	-	0.05 L	-	-	-	-	-	0.05 L	-	-	-	0.010 L
11	-	-	-	-	-	-	-	0.02 L	-	-	0.005 L	-
15	-	-	-	-	-	0.05 L	-	0.05 L	0.1 L	-	-	-
16	-	-	-	-	-	-	0.05 L	0.05 L	-	-	-	-
19	0.05 L	-	-	-	-	-	-	0.05 L	-	-	-	-
20	-	0.5 L	-	-	-	-	-	0.5 L	-	0.003 L	-	-
MEAN	-	-	-	-	-	-	-	-	-	-	-	-
STD DEV	-	-	-	-	-	-	-	-	-	-	-	-
REL STD	-	-	-	-	-	-	-	-	-	-	-	-
DES VAL	-	-	-	-	-	-	-	.01652	-	-	-	-

LAB	15406 T P UF AA ASC	15407 T P ASC AC	15409 T P BLK AA ASC	15413 T P ACL AA SNCL	15421 T P BLK DIG ASC	15490 TOT P COMMON	16302 SO4 DIS TURB BA	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UF AA MTB	16309 SO4 DIS I C	16310 SO4 DIS AA CALM
1	-	-	-	-	0.001 L	0.001 L	-	-	39.	-	-	-
2	-	-	-	0.001 L	-	0.001 L	-	-	-	-	-	-
3	-	-	-	0.0011	-	0.0011	-	-	-	36.8	-	-
4	0.003 L	-	-	-	-	0.003 L	-	-	-	-	-	-
6	-	-	0.01 R	-	-	0.01 R	-	35.	-	-	-	-
7	-	-	-	0.001 L	-	0.001 L	-	-	38.9	-	-	-
8	-	-	-	0.002	-	0.002	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	38.	-
10	-	-	-	-	-	0.010 L	-	-	-	-	-	35.5
11	-	-	-	-	-	0.005 L	-	-	39.	-	-	-
13	0.003	-	-	-	-	0.003	-	-	40.47	-	-	-
14	-	-	-	-	-	-	-	-	-	-	38.85	-
15	-	-	-	-	-	0.1 L	-	-	35.4	-	-	-
19	-	-	-	-	-	-	47.9 R	-	-	-	-	-
20	-	-	-	-	-	0.003 L	-	-	36.5	-	-	-
21	-	0.005 L	-	-	-	0.005 L	-	-	-	-	-	-
MEAN	.0030	-	-	.0016	-	.0020	-	35.0000	38.2117	36.8000	38.4250	35.5000
STD DEV	-	-	-	.0006	-	.0010	-	-	1.8789	-	.6010	-
REL STD	-	-	-	41.1	-	46.7	-	-	4.9	-	1.6	-
DES VAL	-	-	-	-	-	.00494	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 52 PP 92 SAMPLE 4

LAB	16311 SO4 DIS IC	16313	16990 SULFATE COMMON	17203 CL DIS AA FE	17204 CL DIS AG TIT	17206 CL DIS AA HG	17208 CL DIS AA HG	17209 CL DIS I C	17210 CL DIS TIT CON	17211 CL DIS IC	17990 CHLORIDE COMMON	19001 K TOT AAS
1	-	-	39.	-	-	100.5	-	-	-	-	100.5	-
2	-	39.55	39.55	-	-	-	-	-	-	-	-	-
3	-	-	36.8	-	-	-	105.0	-	-	-	105.0	-
6	-	-	35.	-	106.	-	-	-	-	-	106.	-
7	-	-	38.9	-	-	107.5	-	-	-	-	107.5	-
8	-	-	-	-	-	108.	-	-	-	-	108.	-
9	-	-	38.	-	-	-	-	105.	-	-	105.	-
10	-	-	35.5	-	-	-	-	-	105.	-	105.	-
11	-	-	39.	-	-	105.	-	-	-	-	105.	-
13	-	-	40.47	-	-	95.	-	-	-	-	95.	-
14	-	-	38.85	-	-	-	-	119.1	-	-	119.1 *	0.879
15	-	-	35.4	-	-	-	-	-	-	-	-	-
16	42.	-	42. *	-	-	-	-	-	-	104.	104.	-
19	-	-	47.9 R	-	-	105.	-	-	-	-	105.	-
20	-	-	36.5	108.	-	-	-	-	-	-	108.	-
MEAN	42.0000	39.5500	38.0746	108.0000	106.0000	103.5000	105.0000	112.0500	105.0000	104.0000	105.6231	.8790
STD DEV	-	-	2.1147	-	-	4.9396	-	9.9702	-	-	5.3250	-
REL STD	-	-	5.6	-	-	4.8	-	8.9	-	-	5.0	-
DES VAL	-	-	37.105	-	-	-	-	-	-	-	105.462	-

LAB	19005 K TOT ICP	19008 K TOT DCP	19102 K DIS AAS	19103 K DIS FLM PH	19104 K DIS FLAME	19105 K DIS AAS DA	19106 K DIS AAS LI	19107 K DIS FLM PH	19111 K DIS ICP	19990 PTASSIUM COMMON	20005 CA TOT ICP	20007 CA TOT DCP
1	-	-	-	0.68	-	-	-	-	-	0.68 *	-	-
2	-	-	-	0.88	-	-	-	-	-	0.88	-	-
3	-	-	-	-	-	-	-	0.91	-	0.91	-	-
6	-	-	1.4	-	-	-	-	-	-	1.4 *	-	-
7	-	-	0.88	-	-	-	-	-	-	0.88	-	-
9	0.9	-	-	-	-	-	-	-	-	0.9	44.	-
10	0.93	-	-	-	-	-	-	-	-	0.93	42.93	-
11	-	-	-	-	-	-	0.97	-	-	0.97	-	-
13	-	-	-	-	-	-	-	-	1.00	1.00	-	-
14	-	-	-	-	-	-	-	-	-	0.879	-	-
15	-	-	-	-	-	0.98	-	-	-	0.98	-	-
16	-	0.34 R	-	-	-	-	-	-	-	0.34 R	-	37.0
19	0.71	-	-	-	-	-	-	-	-	0.71 *	41.4	-
20	-	-	-	0.9	-	-	-	-	-	0.9	-	-
21	-	-	-	-	0.89	-	-	-	-	0.89	-	-
MEAN	.8467	-	1.1400	.8200	.8900	.9800	.9700	.9100	1.0000	.9221	42.7767	37.0000
STD DEV	.1193	-	.3677	.1217	-	-	-	-	-	.1644	1.3068	-
REL STD	14.1	-	32.3	14.8	-	-	-	-	-	17.8	3.1	-
DES VAL	-	-	-	-	-	-	-	-	-	.8820	-	-

LAB	20050 CA DIS AAS NO	20100 CA DIS CALC'D	20103 CA DIS AAS	20107 CA DIS AAS	20108 CA DIS AAS UF	20110 CA DIS AAS AUT	20111 CA DIS ICP	20311 CA EXT ICP	20990 CALCIUM COMMON
1	-	-	-	41.7	-	-	-	-	41.7
2	-	-	-	-	-	41.6	-	-	41.6
3	-	-	-	-	42.9	-	-	-	42.9
6	-	42.	-	-	-	-	-	-	42.
7	-	-	41.3	-	-	-	-	-	41.3
8	-	-	-	-	-	-	-	46.7	46.7
9	-	-	-	-	-	-	-	-	44.
10	-	-	-	-	-	-	-	-	42.93
11	-	-	43.	-	-	-	-	-	43.
13	-	-	-	-	-	-	47.90	-	47.90 *
14	34.7	-	-	-	-	-	-	-	34.7 *
15	-	-	-	-	-	-	42.5	-	42.5
16	-	-	-	-	-	-	-	-	37.0 *
19	-	-	-	-	-	-	-	-	41.4
20	-	-	-	-	-	-	49.4	-	49.4 *
21	-	-	-	-	42.	-	-	-	42.
MEAN	34.7000	42.0000	42.1500	41.7000	42.4500	41.6000	46.6000	46.7000	42.5644
STD DEV	-	-	1.2021	-	.6364	-	3.6290	-	3.5859
REL STD	-	-	2.9	-	1.5	-	7.8	-	8.4
DES VAL	-	-	-	-	-	-	-	-	42.545

DATES RECEIVED

1 90/04/02	2 90/05/30	3 90/05/02	3 90/05/04	4 90/04/03
6 90/03/12	6 90/04/25	7 90/06/07	8 90/04/30	9 90/04/12
10 90/04/20	11 90/04/30	13 90/04/26	14 90/05/29	15 90/05/01
16 90/04/19	19 90/05/01	20 90/04/27	21 90/04/30	

NOTE: ALL CONCENTRATION UNITS ARE EXPRESSED IN MG/L OF EACH ELEMENT, THE EXCEPTIONS BEING: COLOUR IN RELATIVE UNITS, CONDUCTIVITY IN USIE/CM, TURBIDITY IN JTU OR NTU, NITROGEN ANALYSES IN "N", ALKALINITY & HARDNESS IN CACO3, SILICA IN SIO2, AND SULFATE IN SO4.

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National Water Research Institute
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Your file *Votre référence*

Our file *Notre référence*

September 13 Septembre, 1990.

To/A: Participants & Managers/Directeurs:

Federal-Provincial Quality Assurance Program
Programme d'Assurance-Qualité Fédéral-Provincial (PAQFP)

Final Report/Rapport Dernier: FPQA Studies/Etudes 53-54

Vous trouverez en annexe le résumé dernier des études susmentionées.

Ce rapport dernier aide les responsables et les directeurs évaluer la performance de leur laboratoire. Dans Tableau 1, la performance des laboratoires est rangé avec le pourcentage des résultats indiqués. Si la performance est pauvre, le 'QC' du laboratoire devrait être réviser. Les Tableaux 1 et 2 donneront un meilleur indication de la performance et l'amèlioration du laboratoire.

On pouvait voir que Le Résumé de Donnés était condensé. Les codes de méthodologie qui normalement complétent la plupart de ce resumé étaient exclu. S'il faut necessaire voir des methodologies, on pouvait les voir dans la deuxième evaluation préliminaire de donnés (RAB # 90-11b, 1 Août).

Si vous avez de commentaire sur ce résumé, ou des corrections valable à notre base de données, veuillez me les transmettre.

I have enclosed the final report for the above mentioned studies.

This final report assists laboratory heads and managers in evaluating their laboratories performance relative to others. In Table 1, laboratories are ranked according to the % of results flagged. In case of poor performance, internal QC procedures for the parameters listed in the Flagged Results Table (Table 2) should be reviewed. These tables of Flagged Results and Summary of Flagged Results will give a more complete indication of laboratory performance or improvement.

Please note that the Data Summary has been condensed. Methodology codes which make up the bulk of this data table, have been excluded. If it is necessary to check on methodologies, these can be found in the second preliminary data evaluation (RAB # 90-11b, August 1).

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry A.

H. Alkema
Quality Assurance Project
Research & Applications Branch

Attachment: Distribution List
En annexe: Liste de diffusion

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RESEARCH & APPLICATIONS BRANCH

FINAL REPORT

REPORT NO. RAB 90-15 (Eng)

FEDERAL PROVINCIAL QUALITY ASSURANCE PROGRAM

STUDIES 53 AND 54

for May and June 1990

TRACE METALS, MAJOR IONS, NUTRIENTS AND PHYSICAL PARAMETERS IN SURFACE WATERS

by

H. Alkema

Quality Assurance Project
Research & Applications Branch
National Water Research Institute
Burlington, Ontario

September 1990

(Ce rapport est aussi disponible en français)

Introduction

As part of an on-going study, the Quality Assurance Section, NWRI in Burlington, Ontario, has been sending reference water samples bi-monthly to chemical laboratories participating in the FP program. This report summarizes the most recent FP interlaboratory quality assurance studies: FP 53 and 54, for the months May and June, 1990. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The concentrations were mainly from low to medium (including a coloured water).

Study Design

Five water samples were submitted to each laboratory for chemical analyses. Two samples were submitted for trace metals analysis, while the remaining three were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the four samples:

FP 53 - Sample 1 - 125 ml, high level* for trace metals (3% HNO_3)
Sample 2 - up to 1 L, major ions etc., stored at 4^0C

FP 54 - Sample 3 - 1 L, low level* for trace metals (0.2% HNO_3)
Samples 4 & 5 - up to 1 L, major ions, etc., stored at 4^0C

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were reported as required by the standard report sheets provided with the QA samples. Submitted results were tabulated for each parameter, first for each method reported, and then

for all methods combined. These data, and the resulting statistics are presented in the Data Summary (attached). Preliminary data summaries (RAB # 90-11), including problematic results, were sent July 5 and August 1. Each laboratory was given three weeks to notify us of any errors in data transcription, compilation, or flags.

Performance Indicators

In the Federal Provincial QA program, two types of reference samples are used for the accuracy assessment. These are Reference Waters (RMs) and Certified Reference waters (CRMs) which have Design Values for the stable parameters. Also, regional samples are used occasionally as natural representative samples. The means for these regional samples, and the Design Values for the reference waters are used to test each reported result for accuracy.

Percentage deviations from the reference values are used as an indication by the laboratory head to determine the extent of the discrepancies between the laboratory result and the reference value. However, please keep in mind that at low levels, high % deviations are often seen, and may be *misleading* if interpreted too strictly.

A result which deviates more than the greater of 10% or 1 standard deviation from the reference value is marked with an asterisk in the Data Summary* and its value tabulated in the flagged data table (Table 1). Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

* The Data Summary is condensed for this report; for methodologies please see RAB # 90-11b

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned an 'HDL' and is tabulated for each laboratory in Table 2. If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

Three tables list laboratory data evaluations and performance. They are as follows:

Table 1: a summary of flagged results ranked according to the % results flagged. This summary will assist lab managers and heads in evaluating their performance relative to others.

Table 2: provides a listing of flagged results according to the performance indicators - the principal one being the 10% - 1 Std. Dev. Rule. Also included are Grubbs' Rejectables and the high detection limits. *Newly included in this table is the acceptable deviation for the 10% - 1 Std Dev. Rule.*

Table 3: Lists those analytes for which there was a high standard deviation (HSD). In other words, there were at least several erratic results reported. Some reasons for the HSD may include low concentration, lack of analyte stability, or a non-sensitive methodology.

Note: Evaluations for each result submitted relative to design values or means are now fully automated. Further information for treatment of data may be found in our QA Manual: A Manual for Effective Interlaboratory Quality Assurance, NWRI # 89-99.

Provincial (and private) laboratories average number of deviations per sample was 2.2.

Federal laboratories average number of deviations per sample was 2.3.

TABLE 1: FP & PPWB LABS - SUMMARY OF FLAGGED DATA - FP 53 FP 54

LAB	RESULTS REPORTED	>10% OR 1SD FLAGS	GRUBBS FLAGS	HDL'S INDICATED	% DATA FLAGGED
7	42	2	1	0	4.8
2	66	4	0	0	6.1
24	28	2	0	0	7.1
21	50	4	0	1	8.0
1	86	8	0	0	9.3
10	87	9	1	5	10.3
9	61	7	0	0	11.5
11	69	8	2	0	11.6
3	91	11	2	1	12.1
8	80	10	4	2	12.5
20	78	11	1	0	14.1
4	33	5	3	0	15.2
15	92	15	4	3	16.3
13	44	8	2	2	18.2
19	74	15	11	4	20.3
23	78	17	8	14	21.8
16	82	28	10	1	34.1
14	48	17	6	0	35.4
6	51	20	11	2	39.2

NOTE: FLAGS GUIDELINE (PERFORMANCE INDEX)

< 5% - EXCELLENT TO VERY GOOD
5 - 10% - MODERATE PERFORMANCE
10 - 25% - POOR PERFORMANCE
> 25% - VERY POOR

TABLE 2: FP & PPWB LABORATORIES FLAGGED RESULTS - STUDIES FP 53-54

LAB	FLAGGED RESULT		ACCEPT DEVIAT	FLAGGED RESULT		ACCEPT DEVIAT	FLAGGED RESULT		ACCEPT DEVIAT
1	PB	-20%	18%	NO3	62%	10%	MG	12%	10%
	SI	13%	10%	COL	26%	23%	NA	-27%	10%
	SI	21%	10%	CL	-17%	10%			
2	DOC	-39%	24%	K	-11%	10%	NO3	-62%	57%
	SO4	36%	10%						
3	DOC	-14%	10%	NH3	31%	10%	DOC	45%	24%
	TKN	32%	13%	NO3	-85% R	10%	F	16%	10%
	DOC	-18%	10%	TKN	-36%	10%	NH3	-32% L	10%
	TN	-25%	10%	TP	202% R	54%			
	HDL:	NH3							
4	B	215% R	128%	B	180% R	145%	NO3	-46%	10%
	B	1055% R	273%	NH3	-66% L	10%			
6	TKN	40%	10%	NO3	-21% R	10%	TP	194%	88%
	TKN	281% R	13%	NH3	150% R	50%	NA	21%	10%
	MG	38% R	10%	TP	376% R	71%	SO4	14%	10%
	CA	-11%	10%	DOC	17%	10%	TKN	142% R	10%
	NH3	-32% L	10%	HARD	88% R	10%	NA	22%	10%
	MG	190% R	36%	TP	257% R	54%	SO4	257% R	10%
	CL	-11%	10%	CA	66% R	10%			
	HDL:	NO3	NH3						
7	SO4	-32% R	10%	SO4	64%	10%			
8	SI	-15%	10%	TP	488% R	88%	AL	21%	10%
	FE	27% R	10%	CU	39%	15%	ZN	33%	19%
	NO3	62%	10%	TP	614% R	71%	TP	436% R	54%
	CL	-11%	10%						
	HDL:	MN	DIC						
9	AL	22%	10%	NI	-24%	23%	CU	-23%	15%
	ZN	27%	19%	MO	-20%	16%	PB	-91% L	18%
	CL	-11%	10%						
10	DOC	-16%	10%	NH3	53%	10%	TN	14%	10%
	SI	66% R	10%	AL	22%	10%	NO3	55%	10%
	TN	62%	10%	COL	-30%	23%	NH3	-32% L	10%
	HDL:	TP	NH3 TP	NH3	TP				

..../2

LAB	FLAGGED RESULT		ACCEPT DEVIAT	FLAGGED RESULT		ACCEPT DEVIAT	FLAGGED RESULT		ACCEPT DEVIAT
11	CR	-17%	15%	CU	41%	18%	F	-13%	10%
	FE	-51% R	10%	F	-15%	10%	COL	-30%	23%
	NH3	44%	10%	SO4	214% R	10%			
13	CR	-42% R	15%	MN	30%	15%	CU	30%	18%
	CD	72% R	15%	NO3	80%	10%	TP	138%	71%
	TP	79%	54%	CL	24%	10%			
	HDL:	NH3	NH3						
14	CU	30%	18%	ZN	96% R	15%	PB	19%	15%
	NO3	-11%	10%	TP	-100%	88%	CA	-16%	10%
	AL	86% R	10%	MN	-19%	16%	CD	-21%	18%
	PB	-58% R	18%	HARD	-19% R	10%	MG	-20% R	10%
	TP	-100%	71%	CL	20% R	10%	HARD	-33%	10%
	TP	-100%	54%	CA	-47%	10%			
15	ZN	32%	15%	MO	-13%	10%	CD	-21%	15%
	PB	-23%	15%	F	-46% R	10%	AL	22%	10%
	CU	-25%	15%	MO	-20%	16%	PB	-69% R	18%
	F	-44% R	10%	SI	16%	10%	DOC	21%	10%
	TN	19%	10%	HARD	18%	10%	SO4	128% R	10%
	HDL:	V	NI DIC						
16	AL	41% R	15%	CR	23%	15%	MN	43% R	15%
	FE	19%	15%	NI	16%	10%	ZN	32%	15%
	MO	-64% R	10%	BA	32% R	10%	PB	22%	15%
	NO3	-36% R	10%	NH3	-49%	10%	NA	-17% R	10%
	K	-28% R	10%	CR	16%	15%	MN	48%	16%
	FE	34% R	10%	BA	53%	44%	PB	25%	18%
	TKN	218% R	13%	NO3	-55%	10%	NA	-20%	10%
	SI	-17%	10%	SO4	-13%	10%	K	-13%	10%
	TKN	142% R	10%	NA	-14%	10%	CL	-11%	10%
	K	-36%	36%						
	HDL:	V							
19	CR	-44% R	15%	MO	-51% R	10%	COND	-12% R	10%
	NH3	-44%	10%	V	-55% R	18%	ZN	27%	19%
	MO	36%	16%	COND	-14% R	10%	NH3	-32% L	10%
	HARD	1738% R	10%	NA	239% R	10%	MG	1191% R	36%
	SI	-69% R	10%	K	401% R	36%	CA	2136% R	10%
	HDL:	PB	NH3 NH3	SO4					

..../3

LAB	FLAGGED RESULT		ACCEPT DEVIAT	FLAGGED RESULT		ACCEPT DEVIAT	FLAGGED RESULT		ACCEPT DEVIAT
20	V	14%	10%	CR	-62% R	15%	ZN	25%	15%
	MG	-13%	10%	SI	19%	10%	ZN	52%	19%
	NO3	92%	57%	HARD	22%	10%	SI	12%	10%
	SO4	71%	10%	CA	38%	10%			
21	NO3	-12%	10%	AL	15%	10%	NO3	-53%	10%
	SO4	-64% L	10%						
	HDL:	SO4							
23	CR	-23%	15%	MN	30%	15%	NI	14%	10%
	MO	12%	10%	CD	23%	15%	COND	-25% R	10%
	NH3	104% R	10%	AL	144% R	10%	V	78% R	18%
	MN	147% R	16%	FE	-30% L	10%	ZN	-37% L	19%
	BA	-61%	44%	COND	-20% R	10%	TURB	267% R	92%
	COND	-33% R	10%	NH3	-32% L	10%			
	HDL:	TP CR FE		CO NI CU ZN CD PB					
		NH3 TP NH3		F TP					
24	AL	17%	10%	ZN	20%	19%			

NOTE: A VERY HIGH FREQUENCY OF FLAGGED RESULTS (OR A HIGH %) IS INDICATIVE OF POOR PERFORMANCE. ON THE OTHER HAND, LABS WITH FEW IF ANY FLAGS ARE JUDGED TO HAVE VERY GOOD PERFORMANCE.

ALSO, AN "R" FLAG INDICATES A NON COMPARABLE RESULT, THAT IS, ONE PRODUCED WITH NON RANDOM FACTORS. AN "L" FLAG INDICATES A 'LESS THAN' RESULT LOWER THAN THE REFERENCE VALUE.

TABLE 3: HIGH STANDARD DEVIATION

PARAMETER		LEVEL
BA	AT	.023 PPM
DOC	AT	1.653 PPM
TN	AT	.290 PPM
COL	AT	127.778 PPM
ALK	AT	3.390 PPM
SO4	AT	2.802 PPM

APPENDIX I

Definitions of Types of Metals Analysis

1. HIGH LEVEL ANALYSIS

Usually without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS), Inductively Coupled (Argon) Plasma or direct coupled plasma (ICAP, ICP, or DCP). Standards should contain the acid equivalent of the sample.

2. LOW LEVEL ANALYSIS

Analysis is carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP, or DCP.
3. Digestion of aqueous phase and ICAP or DCP analysis.
4. Graphite tube (flameless) AAS.

Updated March 1989.

APPENDIX II

Performance Indicators

1. Flagged Results

As a first indication that analysis results are appreciably deviant from the expected value, each submitted result is tested with the 10% – 1 Standard Deviation Rule. When a result is found to deviate more than 10%, or more than 1 standard deviation when this is greater than 10%, the result is flagged with an asterisk in the Data Summary and tabled for that laboratory in the Flagged Data Table. Typically at low levels the 10% criteria is too small and the 1 standard deviation criteria effectively indicates deviant analytical results. As performance indicator, the flagged results indicate to laboratory heads that in-house QC procedures and general procedures need to be investigated. Results may still be comparable.

2. Grubbs' Rejectable Results

For every constituent (parameter), each laboratory result is statistically tested to see if it is outlying. Outlying results are caused by non random causes such as a faulty calibration or incorrect transcription. These outlying results, calculated by the Grubbs' procedure*, and indicated in the data tables with an 'R', are non-comparable with the other data for that constituent.

3. A High Standard Deviation for a Constituent

Occasionally data for a difficult to analyze constituent yields a very high relative standard deviation (RSD). When a high RSD is not due to outlying results, there are non-comparable results within the data set. (Euphemistically speaking, there are erratic results.) In such cases, the RSD for that parameter is indicated in Table 3, entitled: High Standard Deviations.

4. High Detection Limits (HDL's)

Each laboratory determines its own detection limits according to its own requirements. When major differences in detection limits occur, an HDL is indicated for the particular laboratory in the Flagged Data Table. An HDL indicates that low level analysis may not be comparable with the analyses of other laboratories.

* reference : Frank E. Grubbs, Technometrics, 1969, p. 1.

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 53 PP 93 DATE: 01/05/90 DUE DATE: 30/06/90 PAGE 1

SAMPLE 1 SPIKED SAMPLE. TRACE METALS DA. (IN 3.0% HNO3)

LAB	13999 ALUMINUM COMMON	23999 VANADIUM COMMON	24999 CHROMIUM COMMON	25999 MANGNESE COMMON	26999 IRON COMMON	27999 COBALT COMMON	28999 NICKEL COMMON	29999 COPPER COMMON	30999 ZINC COMMON	38999 STRNTIUM COMMON	42999 MOLYBNUM COMMON	48999 CADMIUM COMMON
1	0.494	0.498	0.049	0.046	0.254	0.233	0.275	0.048	0.060	-	0.893	0.041
2	0.50	-	-	0.048	0.25	-	-	0.048	0.058	-	-	0.04
3	0.512	0.487	0.051	0.050	0.257	0.227	0.262	0.045	0.057	0.169	0.883	0.040
8	0.50	-	0.055	0.042	0.239	0.24	0.27	0.039	0.053	-	-	0.04
9	0.55	0.50	0.050	0.048	0.26	0.22	0.26	0.045	0.06	0.17	0.89	0.043
10	0.46	0.509	0.048	0.048	0.235	0.215	0.281	0.040	0.053	0.17	0.898	0.038
11	-	-	0.043 *	0.049	0.226	0.236	0.247	0.065 *	0.059	-	-	0.040
13	-	-	0.03 R	0.06 *	0.24	-	0.25	0.06 *	0.06	-	-	0.07 R
14	-	-	-	0.050	0.276	-	-	0.060 *	0.11 R	-	-	-
15	0.45	0.45	0.046	0.041	0.233	0.205	0.24	0.04	0.074 *	0.165	0.77 *	0.032 *
16	0.720 R	0.460	0.064 *	0.066 R	0.296 *	0.250	0.306 *	0.046	0.074 *	0.180	0.320 R	0.038
19	0.49	0.513	0.029 R	0.050	0.261	0.236	0.292	0.041	0.064	-	0.440 R	0.041
20	0.47	0.56 *	0.02 R	0.05	0.26	0.23	0.27	0.04	0.07 *	0.17	0.92	0.04
23	0.44	0.51	0.04 *	0.06 *	0.25	0.22	0.30 *	0.04	0.06	0.18	1.00 *	0.05 *
24	0.50	0.50	0.050	0.047	0.25	0.23	0.26	0.044	0.055	0.18	0.90	0.039
MEAN	.4878	.4987	.0496	.0492	.2525	.2285	.2702	.0467	.0612	.1730	.8943	.0402
STD DEV	.0312	.0302	.0066	.0054	.0177	.0121	.0202	.0084	.0069	.0060	.0627	.0039
REL STD	6.4	6.1	13.3	10.9	7.0	5.3	7.5	17.9	11.3	3.5	7.0	9.7
DES VAL	.5089	.4908	.05199	.04624	.2491	.2268	.2638	.04623	.05607	.1684	.8896	.04066

LAB	56999 BARIUM COMMON	82999 LEAD COMMON
1	0.446	0.262
2	-	0.29
3	0.455	0.281
8	0.441	0.29
9	0.46	0.28
10	0.43	0.292
11	-	0.257
13	-	0.28
14	-	0.34 *
15	0.428	0.22 *
16	0.59 R	0.350 *
19	0.461	0.290
20	0.45	0.28
23	0.45	0.30
24	0.44	0.28
MEAN	.4461	.2861
STD DEV	.0114	.0307
REL STD	2.6	10.7
DES VAL	.4487	.2761

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 53 PP 93 SAMPLE 2

LAB	02040 COLOUR COMMON	02060 CONDUCT COMMON	02090 TURBIDTY COMMON	05190 BORON COMMON	06150 D O C COMMON	06490 D I C COMMON	07090 TKN COMMON	07390 NITRATE COMMON	07590 AMMONIA COMMON	07690 TOT N COMMON	07790 T N DIS COMMON	09190 FLUORIDE COMMON
1	1. L	617.	0.1 L	-	19.1	17.8	0.63	2.020	0.172	-	-	1.12
2	5. L	607.	0.2	-	18.5	-	-	2.20	-	-	2.5	-
3	5. L	611.	0.11	-	15.7 *	18.2	0.658	2.02	0.256 *	-	2.358	1.05
4	5. L	615.	0.13	0.074 R	18.7	-	-	1.964	0.172	-	2.27	-
6	-	615.	0.24	-	19.	-	1.1 *	1.60 R	0.17	-	-	1.1
7	0.	608.	0.1 L	-	-	-	-	2.16	-	-	-	-
8	5. L	627.	0.05	0.05 L	17.5	18.5	0.95	2.08	0.205	-	-	1.12
9	-	590.	-	-	-	-	-	-	-	-	-	-
10	1.	610.	0.1	0.04	15.2 *	18.2	-	2.1	0.300 *	-	2.9 *	1.14
11	5. L	600.	0.1	-	-	-	-	2.04	0.224	-	-	0.97 *
13	-	-	-	-	-	-	-	2.05	0.2	-	-	-
14	-	621.	0.1	-	-	-	-	1.8 *	-	-	-	-
15	5. L	636.	0.1	0.01 L	20.	18.	-	2.07	0.197	-	2.65	0.60 R
16	-	600.	0.13	0.050 L	20.0	15.9	1.0	1.3 R	0.1 *	-	-	1.14
19	-	535. R	-	0.004 L	-	-	0.59	1.87	0.11 *	2.46	-	-
20	-	630.	0.2	0.01 L	-	-	0.58	2.20	0.219	2.78	-	-
21	-	623.	-	-	-	-	-	1.79 *	0.222	-	-	1.12
23	5.	456. R	0.28	0.007	-	-	-	1.99	0.40 R	-	-	1.16
MEAN	2.0000	614.0000	.1450	.0235	18.1889	17.7667	.7869	2.0236	.1959	2.6200	2.5356	1.1022
STD DEV	2.6458	12.3288	.0688	.0233	1.7324	.9438	.2209	.1270	.0540	.2263	.2496	.0585
REL STD	132.3	2.0	47.5	99.3	9.5	5.3	28.1	6.3	27.5	8.6	9.8	5.3
DES VAL	2.5600	607.288	.1850	.02350	18.874	17.798	.8212	2.0330	.1333	2.7885	2.4064	1.1097

LAB	10190 ALKLINTY COMMON	10390 PH COMMON	10690 HARDNESS COMMON	11990 SODIUM COMMON	12990 MGNESIUM COMMON	14190 SILICA COMMON	15490 TOT P COMMON	16990 SULFATE COMMON	17990 CHLORIDE COMMON	19990 PTASSIUM COMMON	20990 CALCIUM COMMON
1	83.	7.78	210.	38.0	34.8	1.2	0.002	113.	57.1	15.1	26.8
2	80.98	7.97	192.5	38.	31.	1.13	0.001	107.4	58.	16.2	26.
3	82.2	8.09	194.	36.8	31.6	1.12	0.0012	112.	55.3	16.0	25.8
4	80.8	8.02	-	-	-	-	0.005	-	-	-	-
6	83.	8.0	207.	40.	34.	-	0.01 *	109.	60.	16.4	26.
7	78.5	8.0	203.	36.0	32.1	-	0.001	76.2 R	59.1	16.8	26.4
8	83.2	7.85	209.	37.2	35.0	1.0 *	0.020 R	112.	58.	15.0	26.0
9	87.	8.00	205.	40.	34.	1.22	-	115.	58.	18.	27.
10	83.	8.07	-	36.44	31.97	1.96 R	0.010 L	111.	56.	15.53	26.51
11	84.	7.6	197.	36.7	31.4	1.10	0.003 L	103.	56.3	17.	27.
13	79.0	7.7	215.9	40.06	34.77	-	0.005	120.9	55.0	16.21	29.06
14	86.1	7.95	189.1	38.0	32.4	-	0.000 *	107.4	-	16.5	22.4 *
15	80.5	8.1	200.	40.1	31.8	1.28	0.002 L	110.	58.3	16.1	27.4
16	84.0	7.97	200.	31.6 R	30.0	1.13	-	103.	59.	11.7 R	26.8
19	82.	8.0	208.	40.7	33.5	1.27	-	110.	56.9	17.0	27.9
20	83.3	8.0	185.	36.4	28.2 *	1.4 *	0.003 L	118.	57.	16.2	27.5
21	86.	7.86	197.	38.	31.	-	0.005	116.	-	16.	28.
23	83.1	8.0	-	36.2	32.0	1.13	0.05 L	113.	57.8	15.9	26.5
MEAN	82.7600	7.9422	200.8333	38.0375	32.3259	1.1800	.0034	111.2938	57.4533	16.2463	26.6512
STD DEV	2.2852	.1346	8.5543	1.6315	1.8393	.1088	.0032	4.8754	1.4157	.7418	1.3903
REL STD	2.8	1.7	4.3	4.3	5.7	9.2	94.9	4.4	2.5	4.6	5.2
DES VAL	80.155	7.8368	199.375	37.727	31.659	1.1157	.00313	112.197	56.863	15.951	26.573

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 54 PP 94 DATE: 01/06/90 DUE DATE: 30/06/90 PAGE 3

SAMPLE 3 SPIKED SAMPLE. TRACE METALS -LOW. (IN 0.2% HNO3)

LAB	13999 ALUMINUM COMMON	23999 VANADIUM COMMON	24999 CHROMIUM COMMON	25999 MANGNESE COMMON	26999 IRON COMMON	27999 COBALT COMMON	28999 NICKEL COMMON	29999 COPPER COMMON	30999 ZINC COMMON	38999 STRNTIUM COMMON	42999 MOLYBNUM COMMON	48999 CADMIUM COMMON
1	0.038	0.013	0.014	0.013	0.030	0.010	0.014	0.013	0.018	-	0.011	0.012
2	0.041	-	-	-	0.029	-	-	0.013	-	-	-	0.011
3	0.040	0.0103	0.0118	0.0107	0.0305	0.0109	0.0135	0.0127	0.0167	0.178	0.0107	0.0106
8	0.0496*	-	0.012	0.02 L	0.036 R	0.011	0.011	0.018 *	0.021 *	-	-	0.010
9	0.05 *	0.011	0.013	0.013	0.03	0.01	0.01 *	0.01 *	0.02 *	0.18	0.01 *	0.012
10	0.05 *	0.013	0.014	0.013	0.028	0.011	0.013	0.012	0.017	0.18	0.012	0.011
11	-	-	0.011	0.014	0.014 R	0.012	0.012	0.013	0.017	-	-	0.011
14	0.076 R	-	-	0.0098*	-	-	-	0.0112	0.0139	-	-	0.0087*
15	0.050 *	0.01 L	0.014	0.012	0.028	0.011	0.02 L	0.0097*	0.016	0.178	0.01 *	0.011
16	0.045	0.010 L	0.015 *	0.018 *	0.038 R	0.012	0.015	0.014	0.016	0.170	0.014	0.010
19	0.04	0.005 R	0.013	0.014	0.031	0.011	0.012	0.012	0.020 *	-	0.017 *	0.011
20	0.044	-	0.0125	0.013	0.030	0.011	0.012	0.012	0.024 *	-	-	0.0105
21	0.047 *	-	0.014	0.012	0.030	0.011	0.012	0.012	0.017	-	0.012	0.011
23	0.10 R	0.02 R	0.03 L	0.03 R	0.02 *	0.02 L	0.03 L	0.02 L	0.01 *	0.19	-	0.01 L
24	0.048 *	0.010	0.013	0.012	0.031	0.011	0.012	0.013	0.019 *	0.17	0.012	0.011
MEAN	.0452	.0115	.0131	.0129	.0298	.0110	.0124	.0125	.0181	.1780	.0121	.0108
STD DEV	.0045	.0015	.0012	.0020	.0011	.0006	.0014	.0020	.0026	.0068	.0022	.0008
REL STD	10.0	12.7	8.8	15.8	3.7	5.5	11.2	15.7	14.5	3.8	18.4	7.7
DES VAL	.04095	.01122	.01298	.01215	.02844	.01108	.01308	.01299	.01581	.1744	.01248	.01095

LAB	56999 BARIUM COMMON	82999 LEAD COMMON
1	0.024	0.009 *
2	-	0.011
3	0.0239	0.0098
8	0.024	0.012
9	0.02	0.001 *
10	0.02	0.012
11	-	0.012
14	-	0.0047R
15	0.024	0.0035R
16	0.035 *	0.014 *
19	0.025	0.03 L
20	-	0.010
21	0.024	0.011
23	0.009 *	0.03 L
24	0.023	0.011
MEAN	.0229	.0112
STD DEV	.0061	.0014
REL STD	26.4	12.7
DES VAL	.02380	.01037

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 54 PP 94 SAMPLE 4

LAB	02040 COLOUR COMMON	02060 CONDUCT COMMON	02090 TURBIDTY COMMON	05190 BORON COMMON	06150 D O C COMMON	06490 D I C COMMON	07090 TKN COMMON	07390 NITRATE COMMON	07590 AMMONIA COMMON	07690 TOT N COMMON	07790 T N DIS COMMON	09190 FLUORIDE COMMON
1	1.	297.	0.2	-	1.3	18.3	0.12	0.360 *	0.008	-	-	0.57
2	5. L	294.	0.4	-	1.0 *	-	-	-	-	-	-	-
3	5. L	294.	0.16	-	2.4 *	18.3	0.207 *	0.033 R	0.005 L	-	0.162	0.66 *
4	5. L	296.	0.26	0.058 R	1.82	-	-	0.119 *	0.005 L	-	0.211	-
6	-	303.	0.23	-	1.8	-	0.6 R	0.14	0.02 R	-	-	0.6
7	4.	292.	0.1	-	-	-	-	0.24	-	-	-	-
8	5.	309.	0.20	0.05 L	-	18.5	0.20	0.36 *	0.010	-	-	0.57
9	-	286.	-	-	-	-	-	-	-	-	-	-
10	1.	288.	0.2	0.03	1.2	17.5	-	0.345 *	0.010 L	-	0.47 *	0.62
11	5. L	270.	0.3	-	-	-	-	0.175	0.005 L	-	-	0.48 *
13	-	-	-	-	-	-	-	0.4 *	0.1 L	-	-	-
14	-	298.	0.2	-	-	-	-	0.19	-	-	-	-
15	5. L	306.	0.1	0.01 L	2.	19.	-	0.213	0.006	-	0.315	0.32 R
16	-	290.	0.18	0.050 L	1.7	17.3	0.5 R	0.1 *	-	-	-	0.60
19	-	252. R	-	0.014	-	-	0.14	0.21	0.01 L	0.35	-	-
20	-	275.	0.3	0.01 L	-	-	0.12	0.21	0.005 L	0.33	-	-
21	-	301.	-	-	-	-	-	0.104 *	0.005 L	-	-	0.56
23	5.	233. R	0.8 R	0.018	-	-	-	0.17	0.010 L	-	-	0.54
MEAN	3.2000	293.2667	.2177	.0207	1.6525	18.1500	.1574	.2224	.0080	.3400	.2895	.5778
STD DEV	2.0494	10.6131	.0829	.0083	.4608	.6380	.0429	.0992	.0020	.0141	.1362	.0512
REL STD	64.0	3.6	38.1	40.3	27.9	3.5	27.3	44.6	25.0	4.2	47.0	8.9
DES VAL	2.4818	291.512	.1876	.02070	1.4040	17.972	.1273	.3182	.01200	.4918	.4034	.5680

LAB	10190 ALKLINTY COMMON	10390 PH COMMON	10690 HARDNESS COMMON	11990 SODIUM COMMON	12990 MGNESIUM COMMON	14190 SILICA COMMON	15490 TOT P COMMON	16990 SULFATE COMMON	17990 CHLORIDE COMMON	19990 PTASSIUM COMMON	20990 CALCIUM COMMON
1	77.	7.86	109.	14.0	7.3 *	2.4 *	0.006	30.	22.8	3.0	31.8
2	75.5	7.90	103.8	13.5	6.4	2.20	0.003	28.	23.2	2.8 *	31.
3	76.4	7.85	107.	15.1	6.62	2.16	0.0051	28.3	23.8	3.20	31.8
4	76.3	7.83	-	-	-	-	0.003	-	-	-	-
6	78.	8.0	106.	18. *	9. R	-	0.02 R	34. *	24.	3.5	28. *
7	73.4	7.8	109.5	14.5	6.5	-	0.002	30.7	24.0	3.17	31.3
8	78.1	7.88	103.	15.8	6.88	2.0	0.030 R	32.	25.	3.00	30.0
9	78.	7.75	107.	16.	7.	2.14	-	30.	23.	3.3	33.
10	72.	8.08	-	14.60	6.56	2.12	0.010 L	29.5	24.	3.05	32.18
11	76.	7.4	106.	14.4	6.5	2.15	0.003 L	30.	22.8	3.2	32.
13	74.	7.7	114.3	16.12	7.17	-	0.010 *	31.34	23.0	3.17	33.84
14	77.3	7.79	86.4 R	14.8	5.2 R	-	0.000 *	29.3	28.4 R	3.19	-
15	75.7	7.8	108.	16.2	6.5	2.48 *	0.002 L	28.	23.9	3.44	32.6
16	80.0	7.72	105.	11.9 *	6.64	1.77 *	-	26. *	24.	2.74 *	31.5
19	76.	7.8	112.	16.0	7.03	2.29	-	28.2	23.2	3.27	33.3
20	77.4	8.0	105.	14.8	6.57	2.3	0.003 L	30.1	23.3	3.0	31.4
21	80.	7.65	105.	15.	6.3	-	0.005 L	29.	-	3.0	32.
23	75.4	7.8	-	13.8	6.20	2.18	0.05 L	29.8	22.0	3.25	31.5
MEAN	76.4722	7.8117	107.1857	14.9718	6.6780	2.1825	.0042	29.6612	23.4667	3.1341	31.7013
STD DEV	2.0688	.1497	3.1537	1.3574	.3242	.1840	.0032	1.8072	.7287	.2011	1.3533
REL STD	2.7	1.9	2.9	9.1	4.9	8.4	78.0	6.1	3.1	6.4	4.3
DES VAL	75.704	7.8740	106.886	14.897	6.5335	2.1294	.00616	29.857	23.732	3.1547	31.604

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 54 PP 94 SAMPLE 5

LAB	02040 COLOUR COMMON	02060 CONDUCT COMMON	02090 TURBIDTY COMMON	05190 BORON COMMON	06150 D O C COMMON	06490 D I C COMMON	07090 TKN COMMON	07390 NITRATE COMMON	07590 AMMONIA COMMON	07690 TOT N COMMON	07790 T N DIS COMMON	09190 FLUORIDE COMMON
1	161. *	36.	0.3	-	10.0	0.6	0.28	0.020	0.011	-	-	0.03
2	140.	37.	0.4	-	10.0	0.5 L	-	0.01 *	-	-	0.22	0.05 L
3	140.	36.5	0.17	-	8.8 *	0.1 L	0.158 *	0.015	0.010 *	-	0.165 *	0.03
4	125.	36.5	0.15	0.127 R	9.76	-	-	0.030	0.005 *	-	0.230	-
6	-	39.	0.43	-	12.5 *	-	0.6 R	0.03 L	0.01 *	-	-	0.1 L
7	156.	36.4	0.2	-	-	-	-	0.02	-	-	-	-
8	-	39.2	-	-	11.0	5. L	0.25	0.03	0.017	-	-	0.1 L
9	-	36.	-	-	-	-	-	-	-	-	-	-
10	90. *	34.0	0.2	-	9.8	0.4	-	0.035	0.010 *	-	0.22	0.06
11	90. *	34.	0.2	-	-	-	-	0.031	0.021 *	-	-	0.05 L
13	-	-	-	-	-	-	-	0.02	0.1 L	-	-	-
14	-	36.7	0.2	-	-	-	-	0.03	-	-	-	-
15	100.	38.	0.2	0.01 L	13. *	1. L	-	0.027	0.012	-	0.260 *	0.05 L
16	-	36.	0.24	0.050 L	11.7	0.5	0.6 R	-	-	-	-	0.04
19	-	33.8	-	0.013	-	-	0.30	0.02	0.01 *	0.32	-	-
20	-	35.	0.4	0.01 L	-	-	0.25	0.05 *	0.012	0.30	-	-
21	-	37.	-	-	-	-	-	0.013	-	-	-	0.1 L
23	148.	24.7 R	0.40	0.009	-	-	-	0.04	0.010 *	-	-	0.2 L
MEAN	127.7778	36.3188	.2685	.0110	10.7289	.5000	.2476	.0261	.0146	.3100	.2190	.0400
STD DEV	27.9320	1.6043	.1029	.0028	1.4096	.1000	.0544	.0107	.0043	.0141	.0344	.0141
REL STD	21.9	4.4	38.3	25.7	13.1	20.0	22.0	41.2	29.3	4.6	15.7	35.4
DES VAL	131.606	36.724	.2821	.01100	11.276	.5618	.3079	.03481	.01824	.3196	.1996	.03000

LAB	10190 ALKLINTY COMMON	10390 PH COMMON	10690 HARDNESS COMMON	11990 SODIUM COMMON	12990 MGNESIUM COMMON	14190 SILICA COMMON	15490 TOT P COMMON	16990 SULFATE COMMON	17990 CHLORIDE COMMON	19990 PTASSIUM COMMON	20990 CALCIUM COMMON
1	5.	6.56	8.	3.0 *	0.8	2.8 *	0.006	3.	4.7 *	0.3	2.0
2	4.54	6.50	7.25	4.2	0.67	2.42	0.005	3.82 *	5.05	0.26	1.8
3	1.80	6.56	7.4	4.11	0.68	2.39	0.0169R	2.9	5.6	0.32	1.85
4	2.51	6.41	-	-	-	-	0.005	-	-	-	-
6	5.	6.5	14. R	5. *	2. R	-	0.02 R	10. R	5. *	0.3	3. R
7	2.1	6.2	7.4	3.9	0.7	-	0.005	4.6 *	5.6	0.26	1.8
8	2.48	6.13	7.34	4.25	0.69	2.5	0.03 R	-	5. *	0.30	1.81
9	4.	6.12	7.	4.3	0.7	2.14	-	2.8	5.0 *	0.3	1.8
10	3.0	6.80	-	3.98	0.65	2.34	0.010 L	3.0	5.3	0.28	1.75
11	2.	6.0	7.	4.1	0.7	2.33	0.003 L	8.8 R	5.8	0.2	2.
13	2.5	6.1	7.53	4.36	0.69	-	0.010 *	3.16	7.0 *	0.33	1.78
14	4.68	6.28	5.0 *	3.88	0.633	-	0.000 *	2.90	5.15	0.31	0.96 *
15	2.4	6.4	8.8 *	4.2	0.7	2.50	0.006	6.4 R	6.1	0.31	1.7
16	5.0	6.11	8.	3.51 *	0.660	2.11	-	3. *	5. *	0.180 *	1.78
19	4.	6.2	137. R	13.9 R	8.90 R	0.71 R	-	8. L	5.81	1.41 R	40.3 R
20	4.9	6.4	9.12 *	4.0	0.71	2.6 *	0.007	4.8 *	5.7	0.3	2.48 *
21	3.7	6.32	7.	4.0	0.64	-	0.006	1. *	-	0.31	1.81
23	3.1	6.2	-	3.85	0.60	2.25	0.05 L	2.83	5.39	0.21	1.80
MEAN	3.4839	6.3217	7.4492	4.0400	.6815	2.3982	.0056	3.3464	5.4500	.2794	1.8080
STD DEV	1.1747	.2096	.9954	.4200	.0453	.2008	.0026	.7258	.5676	.0454	.3004
REL STD	33.7	3.3	13.4	10.4	6.6	8.4	46.9	21.7	10.4	16.2	16.6
DES VAL	3.3901	6.2723	7.4530	4.1033	.6892	2.3117	.00775	2.8018	5.6315	.2812	1.8027

DATES RECEIVED

1 90/05/29	2 90/06/28	3 90/06/08	3 90/07/27	4 90/06/27
6 90/05/15	6 90/06/29	7 90/07/27	8 90/07/27	9 90/06/28
10 90/07/03	11 90/06/22	13 90/07/03	14 90/07/27	15 90/07/03
16 90/07/	19 90/06/25	20 90/07/03	21 90/06/29	23 90/06/27
24 90/06/27				

NOTE: ALL CONCENTRATION UNITS ARE EXPRESSED IN MG/L OF EACH ELEMENT, THE EXCEPTIONS BEING: COLOUR IN RELATIVE UNITS, CONDUCTIVITY IN USIE/CM, TURBIDITY IN JTU OR NTU, NITROGEN ANALYSES IN "N", ALKALINITY & HARDNESS IN CACO3, SILICA IN SIO2, AND SULFATE IN SO4.

Environment Canada | Environnement Canada
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National Water Research Institute
867 Lakeshore Road, P.O. Box 5050
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Your file Votre référence

Our file Notre référence

November 15 Novembre, 1990.

To/A: Participants & Managers/Gestionnaires:

Federal-Provincial Quality Assurance Program
Programme d'Assurance-Qualité Fédéral-Provincial (PAQFP)

Final Report/Rapport Dernier: FPQA Studies/Etudes 55-56

I have enclosed the final report for the above mentioned studies.

This final report assists laboratory heads and managers in evaluating their laboratories performance relative to others. In Table 1, laboratories are ranked according to the % of results flagged. In case of poor performance, internal QC procedures for the parameters listed in the Flagged Results Table (Table 2) should be reviewed. These tables of Flagged Results and Summary of Flagged Results will give a more complete indication of laboratory performance or improvement.

Please note that the Data Summary has been condensed. Methodology codes which make up the bulk of this data table, have been excluded. If it is necessary to check on methodologies, these can be found in the second preliminary data evaluation (RAB # 90-14b, September 19).

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Vous trouverez en annexe le résumé dernier des études susmentionées.

Ce rapport dernier aide les responsables et les gestionnaires évaluer la performance de leur laboratoire. Dans Tableau 1, la performance des laboratoires est rangé avec le pourcentage des résultats indiqués. Si la performance est pauvre, le 'QC' du laboratoire devrait être réviser. Les Tableaux 1 et 2 donneront un meilleur indication de la performance et l'amèlioration du laboratoire.

On pouvait voir que Le Résumé de Donnés était condensé. Les codes de méthodologie qui normalement complétent la plupart de ce resumé étaient exclu. S'il faut necessaire voir des methodologies, on pouvait les voir dans la deuxième evaluation préliminaire de donnés (RAB # 90-14b, le 19 Septembre. Nous apprécierons tout commentaire pouvant permettre d'améliorer la qualité du présent rapport et de ceux qui suivront.

Harry A.

H. Alkema
Q A Chemist
Research & Applications Branch

Attachment: Distribution List
En annexe: Liste de diffusion

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RESEARCH & APPLICATIONS BRANCH

FINAL REPORT

REPORT NO. RAB 90-19 (Eng)

FEDERAL PROVINCIAL QUALITY ASSURANCE PROGRAM

STUDIES 55 AND 56

for July and August 1990

TRACE METALS, MAJOR IONS, NUTRIENTS AND PHYSICAL PARAMETERS IN SURFACE WATERS

by

H. Alkema

Quality Assurance Project
Research & Applications Branch
National Water Research Institute
Burlington, Ontario

November 1990

(Ce rapport est aussi disponible en français)

Introduction

As part of an on-going study, the Quality Assurance Section, NWRI in Burlington, Ontario, has been sending reference water samples bi-monthly to chemical laboratories participating in the FP program. This report summarizes the most recent FP interlaboratory quality assurance studies: FP 55 and 56, for the months July and August, 1990. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The concentrations were high for trace metals and low to medium for major ions.

Study Design

Five water samples were submitted to each laboratory for chemical analyses. Two samples were submitted for trace metals analysis, while the remaining three were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the five samples:

FP 55 - Sample 1 - 125 ml, high level* for trace metals (3% HNO_3)
Sample 2 - up to 1 L, major ions etc., stored at 4^0C

FP 56 - Sample 3 - 1 L, low level* for trace metals (0.2% HNO_3)
Samples 4 & 5 - up to 1 L, major ions, etc., stored at 4^0C

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were reported as required by the standard report sheets provided with the QA samples.

Submitted results were tabulated for each parameter, first for each method reported, and then for all methods combined. These data, and the resulting statistics are presented in the Data Summary (attached). Preliminary data summaries (RAB # 90-14), including problematic results, were sent September 6, and September 19. Each laboratory was given three weeks to notify us of any errors in data transcription, compilation, or flags.

Performance Indicators

In the Federal Provincial QA program, two types of reference samples are used for the accuracy assessment. These are Reference Waters (RMs) and Certified Reference waters (CRMs) which have Design Values for the stable parameters. Also, regional samples are used occasionally as natural representative samples. The means for these regional samples, and the Design Values for the reference waters are used to test each reported result for accuracy.

Percentage deviations from the reference values are used as an indication by the laboratory head to determine the extent of the discrepancies between the laboratory result and the reference value. However, please keep in mind that at low levels, high % deviations are often seen, and may be *misleading* if interpreted too strictly.

A result which deviates more than the greater of 10% or 1 standard deviation from the reference value is marked with an asterisk in the Data Summary* and its value tabulated in the flagged data table (Table 1). Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

* The Data Summary is condensed for this report; for methodologies please see RAB # 90-14b

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned an 'HDL' and is tabulated for each laboratory in Table 2. If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

Three tables list laboratory data evaluations and performance. They are as follows:

Table 1: a summary of flagged results ranked according to the % results flagged. This summary will assist lab managers and heads in evaluating their performance relative to others.

Table 2: provides a listing of flagged results according to the performance indicators - the principal one being the 10% - 1 Std. Dev. Rule. Also included are Grubbs' Rejectables and the high detection limits. *Newly included in this table is the acceptable deviation for the 10% - 1 Std Dev. Rule.*

Table 3: Lists those analytes for which there was a high standard deviation (HSD). In other words, there were at least several erratic results reported. Some reasons for the HSD may include low concentration, lack of analyte stability, or a non-sensitive methodology.

Note: Evaluations for each result submitted relative to design values or means are now fully automated. Further information for treatment of data may be found in our QA Manual: A Manual for Effective Interlaboratory Quality Assurance, NWRI # 89-99.

Provincial (and private) laboratories average number of deviations per sample was 1.4.

Federal laboratories (one lab excluded) average number of deviations per sample was 0.9.

TABLE 1: FP & PPWB LABS - SUMMARY OF FLAGGED DATA - FP 55 FP 56

LAB	RESULTS REPORTED	>10% OR 1SD FLAGS	GRUBBS FLAGS	HDL'S INDICATED	% DATA FLAGGED
4	30	0	0	0	.0
7	42	0	0	0	.0
24	28	1	0	0	3.6
3	91	4	0	0	4.4
21	68	4	0	0	5.9
15	67	4	1	1	6.0
9	64	4	1	0	6.3
10	87	6	0	4	6.9
1	86	6	0	0	7.0
20	77	6	3	0	7.8
2	69	6	0	1	8.7
8	83	9	2	6	10.8
11	69	8	3	0	11.6
13	44	7	0	3	15.9
19	74	14	5	5	18.9
14	39	9	3	0	23.1
6	45	16	8	1	35.6
16	81	32	13	1	39.5

NOTE: FLAGS GUIDELINE (PERFORMANCE INDEX)

< 5% - EXCELLENT TO VERY GOOD
5 - 10% - MODERATE PERFORMANCE
10 - 25% - POOR PERFORMANCE
> 25% - VERY POOR

TABLE 2: FP & PPWB LABORATORIES FLAGGED RESULTS - STUDIES FP 55-56

LAB	FLAGGED RESULT		ACCEPT DEVIAT	FLAGGED RESULT		ACCEPT DEVIAT	FLAGGED RESULT		ACCEPT DEVIAT
1	TKN	-35%	26%	NA	-22%	16%	NA	-20%	10%
	SI	-20%	10%	DIC	-13%	10%	NA	-18%	10%
2	DOC	-51%	32%	DIC	12%	10%	F	47%	16%
	K	-97% L	10%	TN	-28%	10%	SO4	-15%	10%
	HDL: K								
3	TN	19%	10%	SO4	-29%	10%	CL	-29%	16%
	F	42%	16%						
4	NO FLAGGED RESULTS								
6	NO3	-15%	10%	NH3	400% R	67%	HARD	16%	10%
	NA	56%	16%	MG	45% R	10%	CL	106% R	16%
	K	43% R	20%	NH3	167%	10%	F	57%	16%
	NA	20%	10%	MG	37% R	10%	NH3	1233% R	133%
	HARD	21% R	10%	NA	12%	10%	MG	108% R	10%
	K	14%	10%						
	HDL: SO4								
7	NO FLAGGED RESULTS								
8	AL	12%	10%	DIC	12%	10%	AL	21%	15%
	F	36%	16%	SO4	-34% R	10%	CL	-28% R	10%
	DIC	13%	10%	SO4	-15%	10%	K	-18%	10%
	HDL: DOC TKN								
9	NO3	13%	10%	K	13%	10%	HARD	52% R	10%
	K	14%	10%						
10	TN	-19%	10%	CO	-12%	10%	NI	-12%	10%
	ZN	29%	15%	MO	-13%	10%	F	57%	16%
	HDL: TP NH3								
11	CU	49% R	10%	SI	-91% R	10%	SO4	116% R	10%
	MN	-26%	15%	FE	-26%	15%	F	21%	16%
	MG	-17%	10%	SO4	12%	10%			
13	CD	-11%	10%	NO3	-11%	10%	TP	122%	111%
	CL	19%	16%	TP	63%	61%	TP	131%	115%
	K	14%	10%						
	HDL: NH3								

.../Page 2

LAB	FLAGGED RESULT		ACCEPT DEVIAT	FLAGGED RESULT		ACCEPT DEVIAT	FLAGGED RESULT		ACCEPT DEVIAT
14	PB	-19% R	10%	CL	21%	16%	CU	-20%	15%
	PB	-76% R	15%	HARD	-12%	10%	SO4	16%	10%
	CA	-12%	10%	NO3	-78% R	33%	ALK	17%	10%
15	CD	-11%	10%	ZN	76% R	15%	DOC	96%	78%
	DIC	13%	10%						
	HDL:	PB							
16	CR	30%	10%	MN	41% R	10%	FE	14%	10%
	CU	11%	10%	ZN	20% R	10%	SR	31% R	10%
	BA	11%	10%	TKN	199% R	26%	NA	-22%	16%
	SI	-15%	10%	SO4	517% R	10%	CL	691% R	16%
	CA	22% R	10%	V	69% R	10%	CR	24%	15%
	MN	68% R	15%	FE	20%	15%	SR	-13%	10%
	MO	14%	10%	CD	19%	10%	PB	31% R	15%
	DIC	15%	10%	TKN	321% R	21%	F	31%	16%
	SO4	41% R	10%	CL	45% R	10%	K	-11%	10%
	DIC	19%	10%	NA	-14%	10%	SO4	22%	10%
	K	-15%	10%	CA	11%	10%			
	HDL:	NH3							
19	CR	-22%	10%	DOC	-100% R	32%	TKN	30%	26%
	NH3	900% R	67%	SO4	40%	10%	K	66% R	20%
	CO	12%	10%	NI	21%	10%	COND	-38% R	10%
	TKN	-79% L	21%	SI	12%	10%	SO4	-11%	10%
	COND	-36% R	10%	K	23%	10%			
	HDL:	TP	PB	NH3					
20	CR	-36%	10%	TURB	783% R	177%	TURB	590% R	138%
	F	26%	16%	TURB	774% R	175%	ALK	22%	10%
21	NO3	15%	10%	COND	-11%	10%	F	21%	16%
	MG	-13%	10%						
24	FE	18%	15%						

NOTE: A VERY HIGH FREQUENCY OF FLAGGED RESULTS (OR A HIGH %) IS INDICATIVE OF POOR PERFORMANCE. ON THE OTHER HAND, LABS WITH FEW IF ANY FLAGS ARE JUDGED TO HAVE VERY GOOD PERFORMANCE.

ALSO, AN "R" FLAG INDICATES A NON COMPARABLE RESULT, THAT IS, ONE PRODUCED WITH AN IRREGULARITY. AN "L" FLAG INDICATES A 'LESS THAN' RESULT LOWER THAN THE REFERENCE VALUE.

TABLE 3: HIGH STANDARD DEVIATION

PARAMETER		LEVEL
DOC	AT	1.234 PPM
B	AT	.028 PPM
DOC	AT	.888 PPM
DOC	AT	.511 PPM

APPENDIX I

Definitions of Types of Metals Analysis

1. DA - Direct Aspiration

Without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS) ar Inuctively Coupled (Argon) Plasma (ICAP or ICP). Standards should contain the acid equivalent of the sample.

2. SE - Code for low level analysis

Analysis is carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP.
3. Digestion of aqueous phase and ICAP analysis.
4. Graphite tube (flameless) AAS.

APPENDIX II

Performance Indicators

1. Flagged Results

As a first indication that analysis results are appreciably deviant from the expected value, each submitted result is tested with the 10% – 1 Standard Deviation Rule. When a result is found to deviate more than 10%, or more than 1 standard deviation when this is greater than 10%, the result is flagged with an asterisk in the Data Summary and tabled for that laboratory in the Flagged Data Table. Typically at low levels the 10% criteria is too small and the 1 standard deviation criteria effectively indicates deviant analytical results. As performance indicator, the flagged results indicate to laboratory heads that in-house QC procedures and general procedures need to be investigated. Results may still be comparable.

2. Grubbs' Rejectable Results

For every constituent (parameter), each laboratory result is statistically tested to see if it is outlying. Outlying results are caused by non random causes such as a faulty calibration or incorrect transcription. These outlying results, calculated by the Grubbs' procedure*, and indicated in the data tables with an 'R', are non-comparable with the other data for that constituent.

3. A High Standard Deviation for a Constituent

Occasionally data for a difficult to analyze constituent yields a very high relative standard deviation (RSD). When a high RSD is not due to outlying results, there are non-comparable results within the data set. (Euphemistically speaking, there are erratic results.) In such cases, the RSD for that parameter is indicated in Table 3, entitled: High Standard Deviations.

4. High Detection Limits (HDL's)

Each laboratory determines its own detection limits according to its own requirements. When major differences in detection limits occur, an HDL is indicated for the particular laboratory in the Flagged Data Table. An HDL indicates that low level analysis may not be comparable with the analyses of other laboratories.

* reference : Frank E. Grubbs, Technometrics, 1969, p. 1.

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 55 095 DATE: 01/07/90 DUE DATE: 31/08/90 PAGE 1

SAMPLE 1 SPIKED SAMPLE. TRACE METALS DA. (IN 3.0% HNO3)

LAB	13999 ALUMINUM COMMON	23999 VANADIUM COMMON	24999 CHROMIUM COMMON	25999 MANGNESE COMMON	26999 IRON COMMON	27999 COBALT COMMON	28999 NICKEL COMMON	29999 COPPER COMMON	30999 ZINC COMMON	38999 STRNTIUM COMMON	42999 MOLYBNUM COMMON	48999 CADMIUM COMMON
1	2.636	2.332	0.292	0.268	1.104	1.084	1.284	0.303	0.330	-	4.558	0.238
2	2.7	-	-	0.27	1.11	-	-	0.29	0.31	-	-	0.24
3	2.74	2.27	0.312	0.265	1.14	1.06	1.24	0.284	0.326	0.492	4.61	0.228
8	3.0 *	-	0.28	0.246	1.05	1.05	1.19	0.264	0.297	-	-	0.24
9	2.7	2.4	0.30	0.29	1.1	1.05	1.25	0.29	0.32	0.50	4.5	0.25
10	2.63	2.373	0.310	0.269	1.119	1.103	1.277	0.276	0.330	0.48	4.539	0.241
11	-	-	0.29	0.26	1.07	1.07	1.14	0.43 R	0.35	-	-	0.23
13	-	-	0.28	0.26	1.13	-	1.28	0.29	0.32	-	-	0.21 *
14	-	-	-	0.272	1.11	-	-	0.288	0.326	-	-	-
15	2.52	2.2	0.293	0.243	1.02	0.991	1.17	0.273	0.295	0.469	4.3	0.21 *
16	2.80	2.40	0.386 *	0.370 R	1.24 *	1.10	1.31	0.320 *	0.378 R	0.640 R	5.10	0.250
19	2.69	2.32	0.232 *	0.265	1.14	1.10	1.30	0.275	0.333	-	4.80	0.237
20	2.61	2.56	0.19 *	0.26	1.12	1.03	1.22	0.28	0.32	0.49	4.57	0.24
21	2.7	-	0.32	0.28	1.11	1.06	1.29	0.30	0.33	-	4.6	0.24
24	2.7	2.3	0.30	0.26	1.1	1.1	1.2	0.28	0.31	0.49	4.5	0.24
MEAN	2.7022	2.3506	.2912	.2649	1.1109	1.0665	1.2424	.2866	.3212	.4868	4.6077	.2353
STD DEV	.1172	.1014	.0454	.0121	.0484	.0340	.0543	.0142	.0146	.0108	.2124	.0122
REL STD	4.3	4.3	15.6	4.6	4.4	3.2	4.4	5.0	4.5	2.2	4.6	5.2
DES VAL	2.6877	-	.2979	.2625	1.0925	-	1.2380	.2879	.3161	-	4.6022	.2369

LAB	56999 BARIUM COMMON	82999 LEAD COMMON
1	2.533	1.343
2	-	1.35
3	2.47	1.35
8	-	1.27
9	2.55	1.35
10	2.49	1.342
11	-	1.34
13	-	1.30
14	-	1.08 R
15	2.43	1.22
16	2.80 *	1.41
19	2.55	1.34
20	2.42	1.34
21	2.5	1.4
24	2.5	1.3
MEAN	2.5243	1.3325
STD DEV	.1067	.0485
REL STD	4.2	3.6
DES VAL	2.5216	1.3287

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 55 095 SAMPLE 2

LAB	02040 COLOUR COMMON	02060 CONDUCT COMMON	02090 TURBIDTY COMMON	05190 BORON COMMON	06150 D O C COMMON	06490 D I C COMMON	07090 TKN COMMON	07390 NITRATE COMMON	07590 AMMONIA COMMON	07690 TOT N COMMON	07790 T N DIS COMMON	09190 FLUORIDE COMMON
1	6.	95.	0.1	-	1.3	9.2	0.05 *	0.28	0.002	-	-	0.04
2	5. L	95.3	0.3	-	0.6 *	9.8	-	0.28	-	-	0.32	0.05
3	5. L	95.1	0.09	-	1.5	10.1	0.070	0.277	0.005 L	-	0.408 *	0.04
4	5. L	95.2	0.02	-	1.47	-	-	0.278	0.005 L	-	0.321	-
6	-	96.	0.05	-	1.5	-	-	0.24 *	0.03 R	-	-	0.1 L
7	7.	94.9	0.1	-	-	-	-	0.28	-	-	-	-
8	5. L	97.9	0.11	0.05 L	5.0 L	11.5 *	0.20 L	0.27	0.002 L	-	-	0.1 L
9	-	93.	-	-	-	-	-	0.32 *	-	-	-	-
10	2.	91.	0.1	0.01	1.1	10.0	-	0.28	0.010	-	0.28 *	0.04
11	5.	92.	0.1 L	-	-	-	-	0.29	0.005 L	-	-	0.05 L
13	-	-	-	-	-	-	-	0.25 *	0.1 L	-	-	-
14	-	95.5	-	-	-	-	-	0.27	-	-	-	-
15	-	-	-	0.01 L	1.	10.	-	0.3	0.002 L	-	0.39	-
16	-	102.	0.15	0.050	1.4	11.2	0.23 R	0.29	0.1 L	-	-	0.04
19	-	85.5	-	-	0.004 R	-	0.10 *	0.27	0.06 R	0.37	-	-
20	-	87.	1.0 R	-	-	-	0.08	0.30	0.005 L	0.38	-	0.10 L
21	-	86.	-	-	-	-	0.084	0.326 *	0.005 L	0.410	-	0.1 L
MEAN	5.0000	93.4267	.1133	.0300	1.2338	10.2571	.0768	.2824	.0060	.3867	.3438	.0420
STD DEV	2.1602	4.5192	.0791	.0283	.3171	.8080	.0185	.0215	.0057	.0208	.0534	.0045
REL STD	43.2	4.8	69.8	94.3	25.7	7.9	24.1	7.6	94.3	5.4	15.5	10.6
DES VAL	4.0453	-	.1742	.02818	1.3083	-	.09642	.2965	.00343	-	.3308	.04737

LAB	10190 ALKLINTY COMMON	10390 PH COMMON	10690 HARDNESS COMMON	11990 SODIUM COMMON	12990 MGNESIUM COMMON	14190 SILICA COMMON	15490 TOT P COMMON	16990 SULFATE COMMON	17990 CHLORIDE COMMON	19990 PTASSIUM COMMON	20990 CALCIUM COMMON
1	43.	7.48	44.	1.0 *	2.9	2.4	0.001	3.	1.1	0.4	13.0
2	39.8	7.8	43.08	1.2	2.7	2.49	0.001 L	3.00	1.2	0.51	12.8
3	40.2	7.87	44.7	1.28	2.80	2.38	0.0006	2.3 *	0.9 *	0.56	13.3
4	40.9	7.85	-	-	-	-	0.002 L	-	-	-	-
6	43.	7.6	52. *	2. *	4. R	-	-	10. L	2.6 R	0.7 R	14.
7	39.9	7.7	46.9	1.2	2.7	-	0.001 L	3.2	1.34	0.47	12.9
8	42.1	7.70	43.5	1.24	2.80	2.2	0.001 L	3.00	1.35	0.48	12.9
9	43.	7.62	45.	1.3	3.0	2.46	-	3.07	1.23	0.5	13.5
10	42.	7.73	-	1.23	2.69	2.23	0.010 L	3.0	1.3	0.48	13.17
11	41.2	7.2	44.	1.2	2.8	0.22 R	0.005 L	7. R	1.3	0.5	13.
13	39.	7.3	46.97	1.33	2.90	-	0.006 *	3.16	1.5 *	0.53	13.93
14	42.38	7.65	40.6	1.23	2.60	-	-	3.21	1.53 *	0.494	12.0
15	-	-	46.	-	2.8	-	0.002 L	3.1	1.3	0.48	13.8
16	44.0	7.77	42.0	1.00 *	2.90	2.00 *	-	20. R	10. R	0.440	15.6 R
19	41.	7.8	45.9	1.44	2.94	2.56	0.01 L	4.54 *	-	0.81 R	13.5
20	39.2	7.2	43.2	1.3	2.76	-	0.003	3.2	1.1	0.5	12.7
21	44.	7.84	43.	1.23	2.5	-	0.005 L	3.5	-	0.49	13.5
MEAN	41.5425	7.6319	44.7233	1.2787	2.7860	2.3400	.0027	3.1754	1.2625	.4881	13.2000
STD DEV	1.6327	.2236	2.6830	.2287	.1337	.1843	.0025	.4896	.1745	.0377	.5294
REL STD	3.9	2.9	6.0	17.9	4.8	7.9	93.1	15.4	13.8	7.7	4.0
DES VAL	41.319	7.6715	44.856	1.2822	2.7587	-	.00393	3.2408	1.2645	-	12.815

DATA SUMMARY

FEDERAL-PROVINCIAL & PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAMS

STUDY NO. FP 56 096 DATE: 01/08/90 DUE DATE: 31/08/90

SAMPLE 3 SPIKED SAMPLE. TRACE METALS -LOW. (IN 0.2% HNO3)

LAB	13999 ALUMINUM COMMON	23999 VANADIUM COMMON	24999 CHROMIUM COMMON	25999 MANGNESE COMMON	26999 IRON COMMON	27999 COBALT COMMON	28999 NICKEL COMMON	29999 COPPER COMMON	30999 ZINC COMMON	38999 STRNTIUM COMMON	42999 MOLYBNUM COMMON	48999 CADMIUM COMMON
1	0.049	0.022	0.027	0.022	0.049	0.025	0.028	0.056	0.034	-	0.017	0.022
2	0.050	-	-	-	0.047	-	-	0.053	-	-	-	0.021
3	0.052	0.0205	0.0260	0.021	0.0485	0.0258	0.0276	0.0516	0.0327	0.175	0.0169	0.0216
8	0.0657*	-	0.026	0.023	0.056	0.026	0.025	0.058	0.034	-	-	0.019
9	0.05	0.02	0.025	0.023	0.05	0.023	0.03	0.055	0.034	0.18	0.018	0.023
10	0.05	0.022	0.027	0.022	0.046	0.022 *	0.024 *	0.054	0.047 *	0.18	0.016 *	0.020
11	-	-	0.027	0.016 *	0.037 *	0.026	0.028	0.060	0.033	-	-	0.021
14	-	-	-	0.0195	-	-	-	0.0431*	-	-	-	-
15	0.052	0.02	0.027	0.021	0.045	0.026	0.03	0.052	0.064 R	0.176	0.02	0.02
16	0.060	0.035 R	0.034 *	0.036 R	0.060 *	0.025	0.025	0.060	0.035	0.156 *	0.021 *	0.025 *
19	0.050	0.021	0.025	0.022	0.054	0.028 *	0.033 *	0.053	0.037	-	0.019	0.023
20	0.061	-	0.028	0.022	0.045	0.025	0.026	0.056	0.040	-	0.018	0.022
21	0.056	-	0.028	0.021	0.056	0.027	0.028	0.055	0.039	-	0.019	0.021
24	0.055	0.020	0.030	0.024	0.059 *	0.025	0.027	0.057	0.034	0.19	0.020	0.020
MEAN	.0542	.0208	.0275	.0214	.0502	.0253	.0276	.0546	.0363	.1762	.0185	.0214
STD DEV	.0054	.0009	.0025	.0021	.0066	.0016	.0025	.0042	.0043	.0112	.0016	.0016
REL STD	10.0	4.4	9.0	9.6	13.1	6.4	9.2	7.8	11.8	6.4	8.6	7.5
DES VAL	-	.02072	.02731	.02148	-	.02493	.02718	.05415	-	.1786	.01839	.02108

LAB	56999 BARIUM COMMON	82999 LEAD COMMON
1	0.024	0.025
2	-	0.026
3	0.0230	0.0267
8	-	0.028
9	0.025	0.026
10	0.02	-
11	-	0.028
14	-	0.0061R
15	0.023	0.05 L
16	0.025	0.034 R
19	0.027	0.03 L
20	0.025	0.027
21	0.024	0.026
24	0.026	0.026
MEAN	.0242	.0265
STD DEV	.0019	.0010
REL STD	8.0	3.8
DES VAL	-	.02595

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 56 096 SAMPLE 4

LAB	02040 COLOUR COMMON	02060 CONDUCT COMMON	02090 TURBIDTY COMMON	05190 BORON COMMON	06150 D O C COMMON	06490 D I C COMMON	07090 TKN COMMON	07390 NITRATE COMMON	07590 AMMONIA COMMON	07690 TOT N COMMON	07790 T N DIS COMMON	09190 FLUORIDE COMMON
1	2.	181.	0.1	-	1.0	10.0	0.09	0.78	0.002	-	-	0.20
2	5. L	179.	0.3	-	0.5	12.2 *	-	0.76	-	-	0.77	0.28 *
3	5. L	181.	0.14	-	1.0	11.1	0.085	0.734	0.005 L	-	0.822	0.27 *
4	5. L	180.	0.12	-	0.970	-	-	0.720	0.005 L	-	0.782	-
6	-	180.	0.09	-	1.0	-	-	0.73	0.04 *	-	-	0.3 *
7	3.	179.	0.1	-	-	-	-	0.76	-	-	-	-
8	5. L	185.	0.14	0.11	5. L	11.5	0.20 L	0.76	0.003	-	-	0.26 *
9	-	175.	-	-	-	-	-	0.77	-	-	-	-
10	1.	173.	0.2	0.11	0.7	11.2	-	0.74	0.010	-	0.75	0.30 *
11	5. L	174.	0.1	-	-	-	-	0.80	0.005 L	-	-	0.23 *
13	-	-	-	-	-	-	-	0.83	0.1 L	-	-	-
14	-	180.	-	-	-	-	-	0.77	-	-	-	-
15	-	-	-	0.09	1.	11.	-	0.81	0.002 L	-	0.81	-
16	-	190.	0.16	0.105	0.93	12.5 *	0.41 R	0.80	-	-	-	0.25 *
19	-	111. R	-	0.096	-	-	0.02 *	0.75	0.02	0.75	-	-
20	-	170.	1.0 R	-	-	-	0.10	0.74	0.005 L	0.84	-	0.24 *
21	-	158. *	-	-	-	-	0.115	0.792	0.005 L	0.907	-	0.23 *
MEAN	2.0000	177.5000	.1450	.1022	.8875	11.3571	.0975	.7674	.0150	.8323	.7868	.2560
STD DEV	1.0000	7.5218	.0642	.0089	.1869	.8264	.0132	.0310	.0157	.0788	.0293	.0324
REL STD	50.0	4.2	44.2	8.7	21.1	7.3	13.6	4.0	104.8	9.5	3.7	12.7
DES VAL	2.6666	178.103	-	.1118	.9020	10.884	-	.6563	.1370	.8314	-	.1905

LAB	10190 ALKLINTY COMMON	10390 PH COMMON	10690 HARDNESS COMMON	11990 SODIUM COMMON	12990 MGNESIUM COMMON	14190 SILICA COMMON	14490	15490 TOT P COMMON	16990 SULFATE COMMON	17990 CHLORIDE COMMON	19990 PTASSIUM COMMON	20990 CALCIUM COMMON
1	46.	7.22	72.	4.0 *	6.4	0.6 *	-	0.005	19.	11.0	2.8	18.1
2	43.2	7.6	66.84	5.3	5.5	0.82	-	0.003	20.5	11.1	0.10 *	17.7
3	43.1	7.85	69.5	5.21	5.91	0.78	-	0.0057	18.5	10.5	3.08	18.1
4	44.2	7.65	-	-	-	-	-	0.003	-	-	-	-
6	46.	7.5	77.	6. *	8. R	-	-	-	19.	12.	3.3	18.
7	43.3	7.7	73.2	4.9	5.9	-	-	0.003	20.5	10.9	2.94	17.8
8	45.7	7.67	68.6	4.70	5.98	0.7	-	0.005	13. R	8. R	2.98	17.6
9	46.	7.51	72.	5.5	6.2	0.75	-	-	20.	11.1	3.5 *	19.
10	45.	7.45	-	5.05	5.84	-	0.63	0.010 L	18.0	10.6	3.03	18.57
11	44.0	7.1	69.	4.8	5.8	0.77	-	0.005 L	21.	11.2	3.2	18.
13	43.	7.2	74.66	5.41	6.20	-	-	0.008 *	20.25	10.5	3.27	19.58
14	46.66	7.56	61.7 *	5.06	5.25	-	-	-	22.9 *	-	3.06	16.1 *
15	-	-	70.8	-	5.9	-	-	0.002 L	19.1	11.	3.03	18.6
16	45.0	7.73	68.0	4.60	6.20	0.727	-	-	28. R	16. R	2.74 *	20.0
19	44.	7.7	73.0	5.46	6.25	0.84 *	-	0.01 L	17.6 *	-	2.87	18.9
20	49.5	7.7	69.2	5.2	5.90	-	-	0.005	20.0	10.8	3.0	18.3
21	47.	7.60	67.	5.0	5.3	-	-	0.006	20.	-	2.9	19.7
MEAN	45.1038	7.5463	70.1667	5.0793	5.9020	.7484	.6300	.0049	19.7393	10.9727	3.0467	18.3781
STD DEV	1.7645	.2109	3.7216	.4641	.3386	.0754	-	.0017	1.3542	.4197	.2019	.9523
REL STD	3.9	2.8	5.3	9.1	5.7	10.1	-	34.4	6.9	3.8	6.6	5.2
DES VAL	45.902	7.5427	-	4.9924	5.8310	.7524	.6300	-	19.824	11.062	3.0948	-

DATA SUMMARY - FED-PROV & PPWB QA PROGRAMS

STUDY NO. FP 56 096 SAMPLE 5

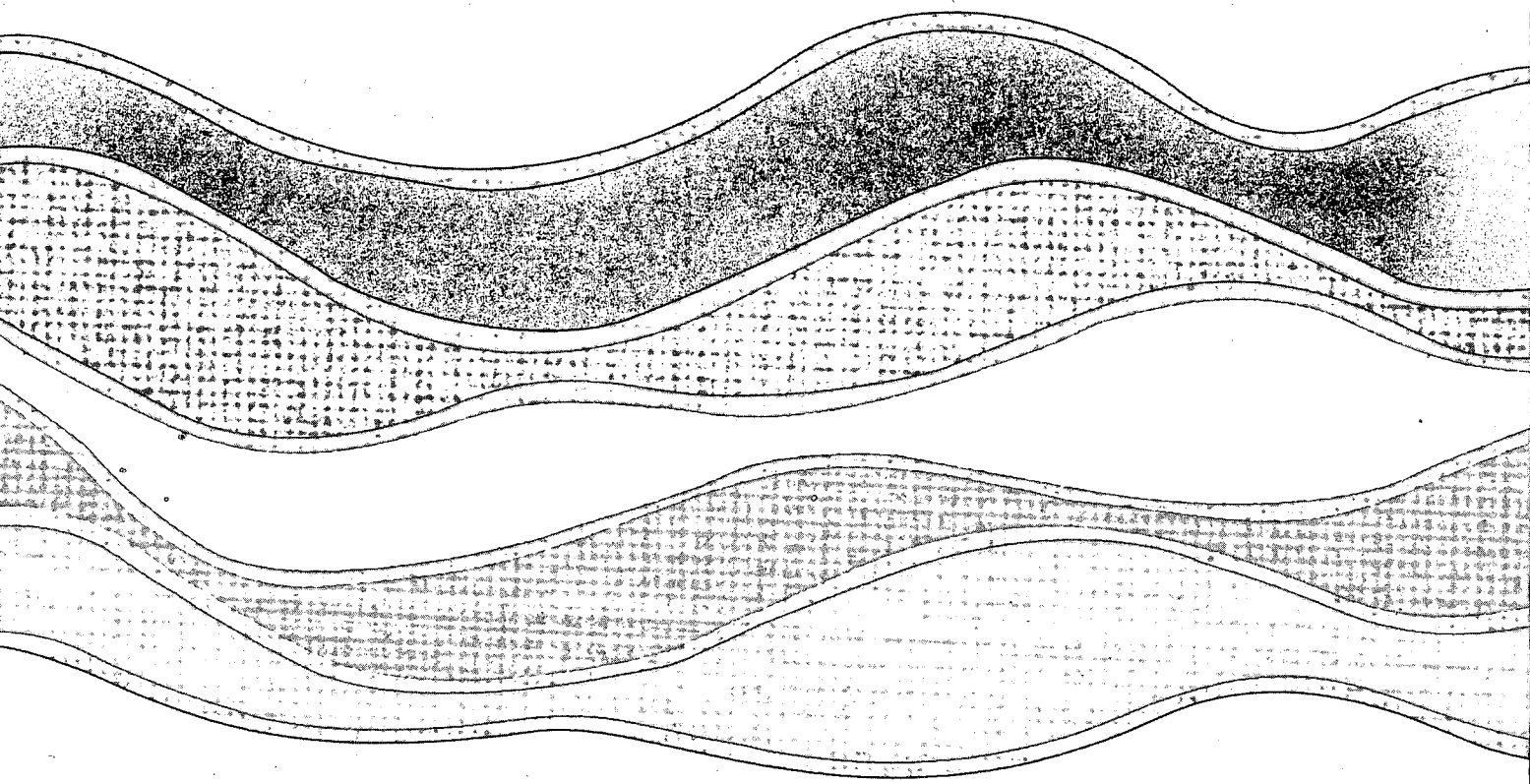
LAB	02040 COLOUR COMMON	02060 CONDUCT COMMON	02090 TURBIDTY COMMON	05190 BORON COMMON	06150 D O C COMMON	06490 D I C COMMON	07090 TKN COMMON	07390 NITRATE COMMON	07590 AMMONIA COMMON	07690 TOT N COMMON	07790 T N DIS COMMON	09190 FLUORIDE COMMON
1	2.	175.	0.1	-	0.4	4.6 *	0.03	0.04	0.002	-	-	0.02
2	3. L	174.	0.3	-	0.5 L	5.8	-	0.05	-	-	0.05 *	0.05 L
3	5. L	180.	0.10	-	0.5	5.4	0.028	0.040	0.005 L	-	0.075	0.04
4	5. L	174.	0.06	-	0.374	-	-	0.038	0.005	-	0.080	-
6	-	175.	0.05	-	0.5	-	-	0.03	0.04 R	-	-	0.1 L
7	3.	173.	0.1	-	-	-	-	0.05	-	-	-	-
8	5. L	182.	0.11	0.05 L	5.0 L	6.0 *	0.20 L	0.04	0.002	-	-	0.1 L
9	-	172.	-	-	-	-	-	0.06	-	-	-	-
10	1.	168.	0.1	0.01	0.2	5.4	-	0.045	0.010 L	-	0.06	0.04
11	5. L	170.	0.1 L	-	-	-	-	0.04	0.005 L	-	-	0.05 L
13	-	-	-	-	-	-	-	0.041	0.1 L	-	-	-
14	-	175.	-	-	-	-	-	0.01 R	-	-	-	-
15	-	-	-	0.01 L	1. *	6. *	-	0.048	0.002 L	-	0.08	-
16	-	185.	0.11	0.050 L	0.6	6.3 *	-	-	-	-	-	0.03
19	-	111. R	-	0.004 L	-	-	0.02 L	0.04	0.02 L	0.04	-	-
20	-	160.	1.0 R	-	-	-	0.04	0.06	0.005 L	0.10	-	0.10 L
21	-	164.	-	-	-	-	0.05 L	0.053	0.005 L	-	-	0.1 L
MEAN	2.0000	173.3571	.1144	.0100	.5106	5.6429	.0327	.0450	.0030	.0700	.0690	.0325
STD DEV	1.0000	6.6287	.0728	-	.2500	.5653	.0064	.0084	.0017	.0424	.0134	.0096
REL STD	50.0	3.8	63.6	-	49.0	10.0	19.7	18.7	57.7	60.6	19.4	29.5
DES VAL	-	172.329	.1442	.01283	-	5.2983	.06288	.04406	-	.09143	.06835	.04035

LAB	10190 ALKLINTY COMMON	10390 PH COMMON	10690 HARDNESS COMMON	11990 SODIUM COMMON	12990 MGNESIUM COMMON	14190 SILICA COMMON	15490 TOT P COMMON	16990 SULFATE COMMON	17990 CHLORIDE COMMON	19990 PTASSIUM COMMON	20990 CALCIUM COMMON
1	24.	7.14	49.	11.0 *	2.8	1.2	0.002	30.	17.1	1.1	15.0
2	22.3	7.6	44.58	13.2	2.7	1.42	0.001	25.0 *	17.3	1.2	13.4
3	22.0	7.75	46.5	13.3	2.92	1.38	0.0012	28.6	16.3	1.20	13.8
4	21.8	7.62	-	-	-	-	0.002 L	-	-	-	-
6	24.	7.3	57. R	15. *	6. R	-	-	29.	18.	1.4 *	13.
7	21.8	7.6	49.3	13.0	2.9	-	0.001 L	30.0	16.7	1.17	13.4
8	21.8	7.48	46.2	12.6	2.94	1.3	0.001 L	25. *	15.	1.0 *	13.7
9	24.	7.34	72. R	14.	3.1	1.33	-	30.3	17.	1.4 *	14.5
10	22.	7.59	-	13.29	2.94	1.20	0.010 L	28.	15.6	1.09	14.39
11	22.0	6.9	46.	12.6	2.4 *	1.35	0.005 L	33. *	16.2	1.3	14.
13	21.	7.1	50.35	14.28	3.06	-	0.006 *	30.65	16.0	1.39 *	15.02
14	26.62 *	7.487	44.5	13.5	2.74	-	-	32.5	-	1.19	13.3
15	-	-	47.2	-	2.9	-	0.002 L	27.3	16.6	1.20	14.1
16	24.0	7.52	46.0	11.5 *	2.90	1.24	-	36. *	16.	1.04 *	15.6 *
19	23.	7.6	49.6	14.4	3.14	1.42	0.01 L	29.2	-	1.50 *	14.8
20	27.9 *	7.5	45.2	13.4	2.94	-	0.003	29.8	16.3	1.2	13.8
21	25.	7.65	45.	13.4	2.5 *	-	0.005 L	31.	-	1.19	14.3
MEAN	23.3263	7.4486	46.8792	13.2313	2.8587	1.3156	.0026	29.7094	16.4692	1.2231	14.1319
STD DEV	1.9187	.2326	2.0281	1.0403	.2050	.0866	.0020	2.7850	.7782	.1406	.7232
REL STD	8.2	3.1	4.3	7.9	7.2	6.6	77.1	9.4	4.7	11.5	5.1
DES VAL	22.836	-	47.274	13.392	2.8865	-	.00353	29.391	16.621	-	14.053

DATES RECEIVED

1 90/08/01	2 90/08/31	3 90/08/30	3 90/09/10	4 90/08/28
6 90/08/31	7 90/08/21	8 90/09/10	9 90/08/21	10 90/08/24
11 90/08/13	13 90/08/31	14 90/08/29	15 90/09/05	16 90/08/07
19 90/08/31	20 90/08/31	21 90/08/31	24 90/07/17	

NOTE: ALL CONCENTRATION UNITS ARE EXPRESSED IN MG/L OF EACH ELEMENT, THE EXCEPTIONS BEING: COLOUR IN RELATIVE UNITS, CONDUCTIVITY IN USIE/CM, TURBIDITY IN JTU OR NTU, NITROGEN ANALYSES IN "N", ALKALINITY & HARDNESS IN CACO3, SILICA IN SIO2, AND SULFATE IN SO4.



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