

# **REVISED FINAL REPORT**

## **WINTER 2010 PERFORMANCE EVALUATION, WATER SAMPLES**

*Submitted to:*

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Oversight Team (QAOT)**

**and**

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## ACRONYMS

CERP	Comprehensive Everglades Restoration Project
EC	Environment Canada
HG	total mercury
MI	major ions and nutrients
PE	performance evaluation
QAOT	Quality Assurance Oversight Team
QA/QC	quality assurance/quality control
R-SD	Robust Standard Deviation
SFWMD	South Florida Water Management District
TM	trace metals
TP	total phosphorus
TU	turbidity
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

## 1 INTRODUCTION

This report describes the results of an inorganic water Performance Evaluation (PE) study conducted during the Winter of 2010 (Winter 2010 Study) by PEER Consultants Inc. on behalf of the Comprehensive Everglades Restoration Project's (CERP) Quality Assurance Oversight Team (QAOT) and the South Florida Water Management District (SFWMD). This PE is a continuation of the 2006, 2007 and 2008 Water PE studies (Battelle, 2006, 2007, 2009) and PEER Consultants, P.C. 2009 as Task C under Contract No. ST060575-WO01R3, Quality Assurance Program Support for CERP Environmental and Ecological Monitoring and Assessment Projects. This data report was developed by Laboratory Data Consultants FL, with assistance by Battelle.

PT studies are a challenge to any laboratory and the goal of this or any PT study is to help laboratories improve their performance. These results will be used as part of the process in future laboratory audits.

The QAOT is responsible for administering a Quality Assurance/Quality Control (QA/QC) program for CERP, including overseeing field and laboratory comparison studies to assess consistency and comparability among agencies involved in CERP monitoring activities (CGM 041.01; July 21, 2010). The purpose of the study was to assess the ability of laboratories to precisely quantify the concentrations of selected inorganic parameters in water at various environmentally realistic concentration levels. Single-blind samples (i.e., samples known by the laboratories as PE samples<sup>a</sup> but with unknown concentrations) were submitted to laboratories identified by the QAOT for analysis using methodologies currently being used to analyze data for CERP related projects. The results will help project managers and the QAOT to ensure that the data and work products produced for CERP projects are of known and documented certainty.

The 2010 PE provider was Environment Canada (EC). The decision to change from the previous PE provider, U.S. Geological Survey (USGS), was done in an effort to conduct a more thorough evaluation of the data generated by the participating laboratories. The key drivers for the basis of the decision included EC's use of "real world" versus laboratory-synthesized ampouled samples; the use of lower concentrations in the samples reflecting a more environmentally realistic concentration range; and a larger, more robust evaluation of the data from the participating laboratories.

The EC PT<sup>b</sup> Program, which has been operating since 2006, was selected as the PE sample provider for this QAOT PE study. Currently, more than 30 laboratories worldwide participate twice a year in this EC study. Six PT types are available through the EC program. The primary targets of this study are the Major Ions and Nutrients (MI), Trace Metals (TM), Total Phosphorus (TP), Turbidity (TU), and Total Mercury (HG).

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<sup>a</sup> Proficiency testing is defined as a means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source (EPA, 2003).

<sup>b</sup> Environment Canada uses the term Proficiency Testing (PT) in its original report document.

## 2 MATERIALS AND METHODS

### 2.1 Selection of Laboratories

The QAOT selected 10 laboratories to participate in the study (Table 1). Complete contact information for these laboratories can be seen in Attachment 1 of this report. The laboratories were selected for participation in this PE study because they are contracted by either the U.S. Army Corps of Engineers (USACE) or SFWMD and could thus be used for the analysis of samples that support CERP projects. Each laboratory was instructed to analyze PE analyte classes based on their current CERP-related analyses. Some laboratories elected to analyze additional analyte classes that they are not currently analyzing for CERP-related projects at this time. Therefore, a low rating on a specific parameter does not necessarily indicate that data for CERP were generated by a poor-scoring laboratory.

**Table 1. Laboratory Participants in the Winter 2010 Environment Canada PT Study**

Laboratory	Environment Canada Laboratory ID Number
South Florida Water Management District Laboratory, West Palm Beach, FL	F207
Dade County DERM Lab, Miami, FL	F228
DB Environmental Labs, Rockledge, FL	F280
Columbia Analytical Services, Jacksonville, FL	F292
Florida DEP Central Laboratory, Tallahassee, FL	F293
Collier County PCPD Lab, Naples, FL	F299
Accutest Labs Southeast, Orlando FL	F305
Test America, Tallahassee, FL	F309
Brooks Rand LLC, Seattle, WA	F311
Test America, Savannah, GA	F317

### 2.2 Preparation of PE Samples

EC was chosen as the PE provider based on four criteria:

- Existence of a formal PE supplier program that would provide a large dataset for statistical analysis
- Use of natural water as the PE sample matrix
- Environmental realistic nominal concentrations
- Cost.

EC conducts these PE studies twice a year, summer and winter, and each study consists of six different analyte classes of which five were chosen for the QAOT's laboratories. The EC report provides the description of sample preparation procedures and description of their program in the Program Description Section. The full report is posted at

<http://www.evergladesplan.org/pm/qaot.aspx>.

Each of the five analyte classes chosen by the QAOT for the study consisted of 10 samples with concentrations ranging from low to high and consistent with values commonly found in natural environments. Each of the analyte classes consisted of the parameters listed in the following tables. Notice that two analyte classes include the parameter Turbidity, TU and MI. All of the laboratories opted to report TU from the MI analyte class, except the SFWMD laboratory, which opted to report the TU from the separate analyte class TU.

### 2.2.1 Analyte Class HG

The HG analyte class consisted only of one parameter, HG (Table 2). A total of 21 laboratories participated in this part of the study.

**Table 2. Parameters in the FPHG Analyte Class PE Sample**

Parameter Code	Parameter Name	Test Range	Units
80095	Hg	0.00120-0.496	ug/L

### 2.2.2 Analyte Class MI

The MI analyte class consisted of 21 parameters commonly known as major ions and nutrients (Table 3). A total of 38 laboratories participated in this part of the study.

**Table 3. Parameters in the MI Analyte Class PE Sample**

Parameter Code	Parameter Name	Test Range	Units
7192	Ammonia as N	0.006-0.0295	mg/L
5091	B	0.0047-0.270	mg/L
20091	Ca	7.28-77.7	mg/L
17092	Chloride	2.92-57.5	mg/L
292	Color	1.95-69.0	CPU
392	Conductivity	57.7-964	us/cm
6002	Dissolved Organic Carbon	3.40-14.8	mg/L
6592	Dissolved Inorganic Carbon	4.15-68.1	mg/L
9092	F	0.0335-0.190	mg/L
19091	K	0.304-15.0	mg/L
12091	Mg	1.10-42.7	mg/L
11091	Na	2.54-166	mg/L
7092	NO <sub>2</sub> /NO <sub>3</sub> as N	0.0410-1.54	mg/L
1092	pH	7.30-8.56	pH Units
14091	Silicates as SiO <sub>2</sub>	0.550-17.1	mg/L
16092	Sulfate	3.30-197	mg/L
6192	Total alkalinity as CaCO <sub>3</sub>	20.000-294	mg/L
10692	Total Hardness	22.6-318	mg/L
7392	Total Kjeldahl as N	0.140-1.100	mg/L
7293	Total Nitrogen	0.170-1.77	mg/L
192	Turbidity	0.100-0.200	NTU

### 2.2.3 Analyte Class TM

The TM analyte class consists of 28 metals. Each participating laboratory reported only the metals they report on a routine basis (Table 4). A total of 33 laboratories participated in this part of the study.

**Table 4. Parameters in the FPTM Analyte Class PE Sample**

Parameter Code	Parameter Name	Test Range	Units
47095	Ag	0.0141-22.20	ug/L
13095	Al	30.2-397	ug/L
33095	As	0.615-92.2	ug/L
5095	B	15.3-198	ug/L
56095	Ba	15.3-336	ug/L
4095	Be	0.01250-77.2	ug/L
83095	Bi	0.0855-44.4	ug/L
5095	B	15.3-198	ug/L
48095	Cd	3.94-158	ug/L
27095	Co	2.00-319	ug/L
24095	Cr	4.05-440	ug/L
29095	Cu	11.4-421	ug/L
26095	Fe	16.4-382	ug/L
3095	Li	1.90-54.6	ug/L
25095	Mn	9.92-286	ug/L
42095	Mo	6.90-302	ug/L
28095	Ni	9.54-339	ug/L
82095	Pb	8.74-516	ug/L
51095	Sb	0.278-85.4	ug/L
34095	Se	0.235-98.7	ug/L
50095	Sn	0.1030-56.5	ug/L
38095	Sr	70.5-599	ug/L
22095	Ti	3.90-73.0	ug/L
81095	Tl	0.157-65.9	ug/L
92095	U	0.396-138	ug/L
23095	V	2.97-349.00	ug/L
74095	W	0.032-9.72	ug/L
30095	Zn	28.3-546	ug/L

### 2.2.4 Analyte Class TP

The TP analyte class consisted only of one parameter, TP as P (Table 5). A total of 36 laboratories participated in this part of the study.

**Table 5. Parameters in the FPTP Analyte Class PE Sample**

Parameter Code	Parameter Name	Test Range	Units
15092	Total Phosphorus as P	0.00200-0.869	mg/L

### 2.2.5 Analyte Class TU

The TU analyte class consisted only of one parameter (Table 6). A total of 17 laboratories participated in this part of the study.

**Table 6. Parameters in the TU Analyte Class PE Sample**

Parameter Code	Parameter Name	Test Range	Units
192	Turbidity	0.182-638	NTU

## 2.3 PE Sample Schedule and Correspondence

A PE study proposal was developed for CERP QAOT in August 2010. PEER Consultants P.C. initially contacted candidate laboratories by phone to communicate the schedule for the upcoming PE study. The PE provider, EC, was then contacted via phone by PEER Consultants to inquire about their ability to provide a PE for this project. A letter was subsequently sent to EC on September 9, 2010, in which PEER provided the contact information for each laboratory that would participate in the PE study under this contract (a total of 10 labs). A formal e-mail invitation to participate in this PE was then sent by PEER Consultants P.C. to participating laboratories on October 18, 2010. The samples were shipped on December 6, 2010 from EC to the laboratories for overnight delivery. The due date for the laboratories to provide results back to EC was set for January 31, 2011. Preliminary data were received by the QAOT from EC on February 17, 2011 and the full final report, which included report cards for each laboratory, were received on March 28, 2011.

## 3 ANALYSIS

This section summarizes the chemical analyses conducted by each of the 10 participating laboratories and the data analysis performed by EC. Table 7 summarizes the parameter classes analyzed by each laboratory.

**Table 7. Laboratory Analysis of Parameter Classes for the Winter 2010 Environment Canada PT Study**

EC Laboratory ID Number	Laboratory	Major Ions and Nutrients (MI) <sup>1</sup>	Trace Metals (TM) <sup>1</sup>	Total Phosphorus (TP) <sup>1</sup>	Turbidity (TU) <sup>1</sup>	Total Mercury (HG) <sup>1</sup>
F207	South Florida Water Management District Laboratory, West Palm Beach, FL	✓	✓	✓	✓	
F228	Dade County DERM Lab, Miami, FL	✓	✓	✓		✓
F280	DB Environmental Labs, Rockledge, FL	✓		✓		
F292	Columbia Analytical Services, Jacksonville, FL	✓	✓	✓		✓
F293	Florida DEP Central Laboratory, Tallahassee, FL	✓	✓	✓		✓
F299	Collier County PCPD Lab, Naples, FL	✓	✓	✓		
F305	Accutest Labs Southeast, Orlando FL	✓	✓	✓		✓
F309	Test America, Tallahassee, FL	✓	✓	✓		
F311	Brooks Rand LLC, Seattle, WA		✓			✓
F317	Test America, Savannah, GA	✓	✓	✓		✓

<sup>1</sup>Empty shaded cells indicate that the laboratory did not report results for that analyte class.

### 3.1 Data Analysis

EC performed data analysis using the PE sample results for the Winter 2010 PE study. The following discussion describes the data analysis performed by EC. This data analysis is described in greater depth in the attached Environment Canada Proficiency Testing Program Report in its Appendix A: "Statistics Listed in Data Summary and in its Appendix B:

"Calculation of Performance Statistics" (see the full EC report for details at <http://www.evergladesplan.org/pm/qaot.aspx>).

### 3.1.1 Summary of Rating of Performance Calculations

Each individual result reported by the laboratories was given a Z-Score based on the Robust Standard Deviation. The Robust Standard Deviation (R-SD or R- $\delta$ ) is calculated based on the median of all results reported and not on the average, as regular standard deviation is calculated. The reason for this is that averages are very susceptible to variations due to outlier results while the median is not.

#### 3.1.1.1 Result Flags

The Z-Score, which in this case is the number of R-SDs that a result deviates from the median, was calculated as follows:

$$\text{Z-Score} = |(\text{Result} - \text{Median})/\text{R-}\delta$$

Based on the Z-Score, each result was qualified as follows:

Z-Score	Flag
<2	No flag
2 to 3	W
>3	A

where W stands for Warning and A stands for Action.

#### 3.1.1.2 Bias Determination

For each analyte reported by each of the labs, a bias flag (B+ or B-) was assigned when five or more of the 10 samples were not reported as undetected and analytes reported as detected were either all above or all below the median.

An I flag, representing Insufficient, was given to an analyte group of 10 samples when the number of detected samples all presented biased results but there were more than five results reported as undetected.

#### 3.1.1.3 Rating of Performance

A total % score was calculated for each analytical class by adding half the percent of parameters biased plus half the percent of flagged results.

$$\text{Half Biased \%Score} = (\text{Parameters Biased} / \text{Parameters Analyzed}) \times 50$$

$$\text{Half Flagged \%Score} = (\text{Flagged Result} / \text{No. of Results Reported}) \times 50$$

$$\text{Total \% Score} = \text{Half Biased \%Score} + \text{Half Flagged \%Score}$$

The total % score was then correlated to a final rating of performance as follows:

Total % Score	Rating
0 -5	Good
>5 - 12.5	Satisfactory
>12.5 - 30	Moderate
>30	Poor

## 4 RESULTS

The final score for each of the laboratories is based on a composite of the number of flagged results and the analysis bias. The highest ratings for each analyte class, Good and Satisfactory, were obtained by the laboratories that showed none or only a few flags in their results and none or only few bias determinations in the analysis of each of the parameters. The lower ratings, Moderate and Poor, correspond to laboratories with a large percentage of flagged results and/or a large number of analyses showing bias. Individual laboratory report cards as presented by EC can be seen on Attachment 2 of this report.

### 4.1 Flagged Results

Taking into consideration that each analyte class was a collection of 10 samples, Table 8 indicates the number of results that were flagged for each parameter based on the calculated Z-score.

**Table 8. Result Flags Assigned Based on Z-Score Values**

EC Laboratory ID Number	Analyte Class	Analytes Flagged with W ( $2 \leq Z\text{-Score} \leq 3$ ) <sup>1,2</sup>	Analytes flagged with A ( $Z\text{-Score} > 3$ ) <sup>1,2</sup>
F292	FPHG		
F293	FPHG		
F311	FPHG		2Hg
F305	FPHG		3Hg
F228	FPHG		
F317	FPHG		1Hg
F207	FPMI		
F293	FPMI	1pH	
F280	FPMI	4SO <sub>4</sub>	
F228	FPMI	1TKN, 1Turb	4Turb
F292	FPMI	2Cl, 2NH <sub>4</sub> , 2NO <sub>3</sub> /2, 1pH, 4SiO <sub>4</sub> , 2SO <sub>4</sub>	10DOC, 1NH <sub>4</sub> , 1SiO <sub>2</sub> , 3SO <sub>4</sub>
F299	FPMI	3Cl, 1K, 4Mg, 1SO <sub>4</sub> , 2TKN, 2Alk, 1Hard,	1Ca, 4Cl, 4K, 4Mg, 1Na, 5SO <sub>4</sub> , 3TKN, 2Hard, 3N
F309	FPMI	3Color, 4Cond, 7F, 1K, 2Na, 1NO <sub>3</sub> /2, 1pH, 5Alk	1Cl, 2Color, 1Cond, 1K, 1Na, 1NH <sub>4</sub> , 4pH, 2SO <sub>4</sub> , 2Alk, 1Turb

**Table 8. Result Flags Assigned Based on Z-Score Values, continued**

EC Laboratory ID Number	Analyte Class	Analytes Flagged with W ( $2 \leq Z\text{-Score} \leq 3$ ) <sup>1,2</sup>	Analytes flagged with A ( $Z\text{-Score} > 3$ ) <sup>1,2</sup>
F317	FPMI	1Ca, 2Cl, 2Color, 1DIC, 1Mg, 2Na, 2Alk, 3Hard	1Cond, 3K, 1SiO <sub>2</sub> , 1TKN, 1Alk, 6Hard, 1TN
F305	FPMI	2Ca, 1Color, 1Cond, 2F, 5Mg, 1NO <sub>3</sub> /2, 4pH, 2TKN, 1Hard, 2TN	2Cl, 1Cond, 5F, 1Mg, 4NO <sub>3</sub> /2, 1pH, 8SO <sub>4</sub> , 8TKN, 2Alk, 7TN
F292	FPTM	1Ba, 1Co, 1V	1Al, 1Ba, 1Mo, 1Pb, 1V, 2Zn
F293	FPTM	3B, 1Ba,	1Al, 5Ti
F228	FPTM	2As, 1Cd	
F207	FPTM	3Cd, 2Cr, 1Cu, 1Pb, 1Sr	1Cr, 1Cu, 1Pb, 1Sr
F309	FPTM	1Ag, 1Al, 1As, 2Ba, 1Cd, 1Fe, 2Pb, 2Sb, 1Sn, 1Ti	1As, 1Ba, 1Fe, 3Pb, 1Sb, 2Se, 1Ti, 2V
F299	FPTM	1Ba	1Ag, 9Pb, 10Ti, 1Zn
F311	FPTM	4Cd, 4Fe, 1Ni, 9Sr, 1Ti, 2Zn	3Ag, 1Cd, 4Fe, 1Sr, 8Ti
F317	FPTM	3Ag, 1Ba, 1Cd, 3Co, 5Cr, 4Cu, 2Fe, 1Mn, 2Mo, 5Pb, 2Sb, 1Se, 1Sn, 1Sr, 1Ti, 2Ti, 2V, 2Zn	1Al, 2As, 1Ba, 3Co, 3Fe, 2Ni, 1Sb, 2Sn, 5Ti, 1V
F305	FPTM	2Ag, 2Al, 1As, 5Ba, 2Cd, 2Cr, 1Fe, 5Mn, 4Mo, 1Ni, 1Se, 1Sn, 4V	6Al, 2As, 1Ba, 1Cd, 1Co, 7Cr, 1Fe, 2Mn, 5Sb, 2Ti, 3V
F207	FPTP		
F228	FPTP		
F280	FPTP		
F292	FPTP		
F293	FPTP		
F299	FPTP		1TP
F309	FPTP	1TP	1TP
F317	FPTP	1TP	2TP
F305	FPTP	1TP	8TP
F207	FPTU	3Turb	

<sup>1</sup>The number preceding the chemical abbreviation indicates the number of flags assigned for the parameter.

<sup>2</sup>Empty shaded cells indicate that the laboratory did not report results for that analyte class.

## 4.2 Biased Parameters

The biased flag was applied for each parameter analyzed by each laboratory. Table 9 summarizes the results of the bias analysis.

Table 9. Results of Bias Analysis

EC Laboratory ID Number	Analyte Class	Bias Low <sup>1</sup>	Bias High <sup>1</sup>
F292	FPHG		
F293	FPHG		
F311	FPHG		
F305	FPHG		
F228	FPHG	Hg	
F317	FPHG	Hg	
F207	FPMI		
F293	FPMI		F, SiO <sub>2</sub>
F280	FPMI		
F228	FPMI		Turb
F292	FPMI	Mg, pH, SiO <sub>2</sub>	DOC
F299	FPMI		TKN
F309	FPMI	Cond, F	Alk
F317	FPMI	F, NO <sub>3</sub> /2, Alk	K, Mg, HARD
F305	FPMI	Ca, Mg, Hard	F, TKN
F292	FPTM		
F293	FPTM		Fe, U
F228	FPTM	Zn	
F207	FPTM	Cu	
F309	FPTM		Ag, Be
F299	FPTM	Pb, Se, Tl	Ag
F311	FPTM	Be	Cd, Fe, Mn, Mo, Pb, Sr, Ti, U
F317	FPTM		Ba, Co, Cr, Cu, Fe, Mn, Mo, Pb, Zn
F305	FPTM		Al, Ba, Cd, Cr, Cu, Mn, Mo, V
F207	FPTP		
F228	FPTP		
F280	FPTP		
F292	FPTP		
F293	FPTP		
F299	FPTP		
F309	FPTP		
F317	FPTP		
F305	FPTP		
F207	FPTU		

<sup>1</sup>Empty shaded cells indicate that the laboratory did not report results for that analyte class.

### 4.3 Final Rating

The final rating performance is organized by analyte class groups in Table 10. The laboratories in each group are arranged by the final rating, from Best to Worst. Good represents the best rating and Poor represents the worst. A summary of the results for each laboratory is presented in Table 11.

The EC PT study was designed to compare data reproducibility between laboratories. The results are based on obtaining an assigned value for each of the analytes in each of the samples based on the median (or average in other studies). This assignment of value has high probability to coincide with the true value, and that probability increases with the number of participants. It is possible that although a laboratory shows a bias in the analysis, its results may be the closest to the absolute true value.

The EC final rating of performance assigned the categories of Good, Satisfactory, Moderate, or Poor to each laboratory based on the analytical results for each parameter class. The EC definitions for their categories are defined below:

- Good, represents the uppermost rating.
- Satisfactory, represents a possible inaccuracy in reporting due to a random error in the analytical sequence but does not necessarily represent a systematic error.
- Moderate, represents analysis that fails in a significant percentage of the results provided, such as a large percentage of results with large deviations from the Median or bias encountered in the analysis.
- Poor, represents a provider that fails in almost all parameters including presenting bias as a whole and deviations from the Median in a majority of concentrations tested.

**Table 10. Final Rating Performance of Each Laboratory Based on Z-Score and Bias Analysis**

Analyte Class	EC Laboratory ID Number	Analytes Reported	Biased Analytes	Half Biased %Score	Results Reported	Total Results Flagged	Results Flagged with W	Results Flagged with A	Half Flagged %Score	Total % Score	Rating Performance
FPHG	F292	1	0	0.0	10	0	0	0	0.0	0.0	Good
FPHG	F293	1	0	0.0	10	0	0	0	0.0	0.0	Good
FPHG	F311	1	0	0.0	10	2	0	2	10.0	10.0	Satisfactory
FPHG	F305	1	0	0.0	10	3	0	3	15.0	15.0	Moderate
FPHG	F228	1	1	50.0	10	0	0	0	0.0	50.0	Poor
FPHG	F317	1	1	50.0	10	1	0	1	5.0	55.0	Poor
FPMI	F207	16	0	0.0	160	0	0	0	0.0	0.0	Good
FPMI	F293	18	2	5.6	180	1	1	0	0.3	5.8	Satisfactory
FPMI	F280	3	0	0.0	30	4	4	0	6.7	6.7	Satisfactory
FPMI	F228	5	1	10.0	50	6	2	4	6.0	16.0	Moderate
FPMI	F292	20	4	10.0	200	28	13	15	7.0	17.0	Moderate
FPMI	F299	14	1	3.6	140	41	14	27	14.6	18.2	Moderate
FPMI	F309	17	3	8.8	170	40	25	15	11.8	20.6	Moderate
FPMI	F317	21	6	14.3	210	28	14	14	6.7	21.0	Moderate
FPMI	F305	17	5	14.7	170	60	18	42	17.6	32.4	Poor
FPTM	F292	22	0	0.0	220	10	3	7	2.3	2.3	Good
FPTM	F293	24	2	4.2	240	10	4	6	2.1	6.3	Satisfactory
FPTM	F228	7	1	7.1	70	3	3	0	2.1	9.3	Satisfactory
FPTM	F207	9	1	5.6	90	10	6	4	5.6	11.1	Satisfactory
FPTM	F309	20	2	5.0	200	25	12	13	6.3	11.3	Satisfactory
FPTM	F299	19	4	10.5	190	22	1	21	5.8	16.3	Moderate
FPTM	F311	27	9	16.7	270	38	21	17	7.0	23.7	Moderate
FPTM	F317	23	9	19.6	230	60	39	21	13.0	32.6	Poor
FPTM	F305	20	8	20.0	200	62	31	31	15.5	35.5	Poor
FPTP	F207	1	0	0.0	10	0	0	0	0.0	0.0	Good
FPTP	F228	1	0	0.0	10	0	0	0	0.0	0.0	Good
FPTP	F280	1	0	0.0	10	0	0	0	0.0	0.0	Good
FPTP	F292	1	0	0.0	10	0	0	0	0.0	0.0	Good
FPTP	F293	1	0	0.0	10	0	0	0	0.0	0.0	Good
FPTP	F299	1	0	0.0	10	1	0	1	5.0	5.0	Good
FPTP	F309	1	0	0.0	10	2	1	1	10.0	10.0	Satisfactory
FPTP	F317	1	0	0.0	10	3	1	2	15.0	15.0	Moderate
FPTP	F305	1	0	0.0	10	9	1	8	45.0	45.0	Poor
FPTU	F207	1	0	0.0	10	3	3	0	15.0	15.0	Moderate

**Table 11. Summary of Laboratory Rating of Performance for the 2010 Winter PT Study**

EC Laboratory ID Number	Laboratory	Total Mercury (HG) <sup>1</sup>	Major Ions and Nutrients <sup>1</sup>	Trace Metals (TM) <sup>1</sup>	Total Phosphorus (TP) <sup>1</sup>	Turbidity (TU) <sup>1</sup>
F207	South Florida Water Management District Laboratory, West Palm Beach, FL		Good	Satisfactory	Good	Moderate
F228	Dade County DERM Lab, Miami, FL	Poor	Moderate	Satisfactory	Good	
F280	DB Environmental Labs, Rockledge, FL		Satisfactory		Good	
F292	Columbia Analytical Services, Jacksonville, FL	Good	Moderate	Good	Good	
F293	Florida DEP Central Laboratory, Tallahassee, FL	Good	Satisfactory	Satisfactory	Good	
F299	Collier County PCPD Lab, Naples, FL		Moderate	Moderate	Good	
F305	Accutest Labs Southeast, Orlando FL	Moderate	Poor	Poor	Poor	
F309	Test America, Tallahassee, FL		Moderate	Satisfactory	Satisfactory	
F311	Brooks Rand LLC, Seattle, WA	Satisfactory		Moderate		
F317	Test America, Savannah, GA	Poor	Moderate	Poor	Moderate	

<sup>1</sup>Empty shaded cells indicate that the laboratory did not report results for that analyte class.

## 5 SUMMARY

The purpose of the PE study was to assess the ability of laboratories to generate accurate, unbiased data when the sample concentrations were blind to the laboratories but known to the PE provider. The results of the study indicate that approximately half of the results were Satisfactory or Good and half were Moderate or Poor. Thirty-four analysis class results were reported by the 10 participating laboratories. Of these, 24% (8 of 34) were Satisfactory, 29% (10 of 34) were Good, 29% (10 of 34) were Moderate, and 18% (6 of 34) were Poor.

Only two laboratories obtained either Good or Satisfactory ratings for all of the analyte classes reported. These were DB Environmental, who reported data for two analyte classes, and FDEP Central Laboratory, who reported in all four analyte classes.

A few trends are observed if the results are summarized by analyte class. Namely,

- The analysis of TP as P was Good or Satisfactory for the majority of the laboratories supporting CERP (eight of nine).
- Major ions/nutrient analyses were Moderate or Poor for the majority of the laboratories supporting CERP.
- Approximately half of the results for Hg and metals for the laboratories supporting CERP were Moderate or Poor.

Table 12 presents a comparison of % scores for laboratories supporting CERP and the other participants in the Winter EC PE study. For each analyte class, the laboratory score, range of scores for the study, and number of data sets evaluated for each analyte class are presented. It should be noted that some laboratories presented more than one set of results per analytical class. For three analyte classes (FPHG, FPML, and FPTM), at least one laboratory supporting CERP achieved the lowest (best) % score. For two analyte classes, FPTM and FPTU, the highest % scores (worst results) were calculated for QAOT laboratories. It is anticipated that the laboratories supporting CERP will use the PE study results to initiate improvement activities to improve their analytical procedures where needed.

**Table 12. Summary of Laboratory Rankings for the 2010 Winter PE Study**

Analyte Class	EC Laboratory ID Number	% Score	Range of % Scores	Number of Data Sets Submitted for the Winter PE Study
FPHG	F292	0.00	0.00 - 85.00	21
FPHG	F293	0.00		
FPHG	F311	10.00		
FPHG	F305	15.00		
FPHG	F228	50.00		
FPHG	F317	55.00		
FPMI	F207	0.00	0.00 - 83.75	44
FPMI	F293	5.83		
FPMI	F280	6.67		
FPMI	F228	16.00		
FPMI	F292	17.00		
FPMI	F299	18.21		
FPMI	F309	20.59		
FPMI	F317	20.95		
FPMI	F305	32.35		
FPTM	F292	2.27	0.00 - 35.50	42
FPTM	F293	6.25		
FPTM	F228	9.29		
FPTM	F207	11.11		
FPTM	F309	11.25		
FPTM	F299	16.32		
FPTM	F311	23.70		
FPTM	F317	32.61		
FPTM	F305	35.50		
FPTP	F207	0.00	0.00 - 65.00	38
FPTP	F228	0.00		
FPTP	F280	0.00		
FPTP	F292	0.00		
FPTP	F293	0.00		
FPTP	F299	5.00		
FPTP	F309	10.00		
FPTP	F317	15.00		
FPTP	F305	45.00		
FPTU	F207	15.00	0.00 - 15.00	17

## 6 REFERENCES

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Battelle, 2009. Revised Final Report for July 2008 Performance Evaluation Water Samples, Battelle Duxbury, MA, February 2009.

PEER Consultants, P.C. 2009. July 2009 Inorganic Water Samples Performance Evaluation Study. October 2009.

## **Attachment 1. Participating Laboratory Contact Information**

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## **Attachment 2. Individual Laboratory Report Cards**

## Environment Canada Proficiency Testing Studies - REPORT CARD

Start Date: December 01, 2010

End Date: March 01, 2011

**Table 1 Programs and Studies for Lab F207**

<u>Program</u>	<u>Studies</u>	<u>Begin Date</u>	<u>End Date</u>	<u>No. of Studies</u>	<u>Parameters</u>	<u>No. of Tests</u>
Major Ions	0097 - 0097	Dec 2010	Jan 2011	1	16	160
Trace Elements	0097 - 0097	Dec 2010	Jan 2011	1	9	90
Total P	0097 - 0097	Dec 2010	Jan 2011	1	1	10
Turbidity	0097 - 0097	Dec 2010	Jan 2011	1	1	10
<b>Totals</b>				<b>4</b>	<b>27</b>	<b>270</b>

**Table 2 Number of Tests for Lab F207 in each Program**

Program/Study	0097	Total
Major Ions	160	160
Trace Elements	90	90
Total P	10	10
Turbidity	10	10
<b>Total</b>	<b>270</b>	<b>270</b>

**Table 3 Study-to-Study Performance for Lab F207 in each Program**

(Laboratory Performance Score)

Program/Study	0097	Performance
Major Ions	0.0	Good
Trace Elements	11.1	Satisfactory
Total P	0.0	Good
Turbidity	15.0	Moderate

Rating	% Score
Good	0 - 5
Satisfactory	> 5 - 12.5
Moderate	> 12.5 - 30
Poor	> 30

**Table 4 Appraisal Assessment for Lab F207 in each Program**

(List Flagged Results for each Study)

		0097	Action Flagged
Major Ions	Ca		
	Cl		
	Colour		
	Cond		
	DOC		
	K		
	Mg		
	Na		
	NH4	I	
	NO3 /2		
	SiO2		
	SO4		
	TKN		
	Tot Alk		
Tot Hard			
Tot N			
Trace Elements	Al		
	As		
	Cd	3	
	Cr	3	1
	Cu	2/B-	1
	Fe		
	Pb	1	1
	Sr	1	1
Zn			
Total P	Tot P		
Turbidity	Turb	3	

**Explanation of Appraisal codes:**

- # = Number of Flagged Results
- B+, B- = Biased High or Low
- I = Insufficient Results for Bias Assessment

## Environment Canada Proficiency Testing Studies - REPORT CARD

Start Date: December 01, 2010

End Date: March 01, 2011

**Table 1 Programs and Studies for Lab F228**

Program	Studies	Begin Date	End Date	No. of Studies	Parameters	No. of Tests
Mercury	0097 - 0097	Dec 2010	Jan 2011	1	1	10
Major Ions	0097 - 0097	Dec 2010	Jan 2011	1	5	50
Trace Elements	0097 - 0097	Dec 2010	Jan 2011	1	7	70
Total P	0097 - 0097	Dec 2010	Jan 2011	1	1	10
<b>Totals</b>				<b>4</b>	<b>14</b>	<b>140</b>

**Table 2 Number of Tests for Lab F228 in each Program**

Program/Study	0097	Total
Mercury	10	10
Major Ions	50	50
Trace Elements	70	70
Total P	10	10
<b>Total</b>	<b>140</b>	<b>140</b>

**Table 3 Study-to-Study Performance for Lab F228 in each Program**

(Laboratory Performance Score)

Program/Study	0097	Performance
Mercury	50.0	Poor
Major Ions	16.0	Moderate
Trace Elements	9.3	Satisfactory
Total P	0.0	Good

Rating	% Score
Good	0 - 5
Satisfactory	> 5 - 12.5
Moderate	> 12.5 - 30
Poor	> 30

**Table 4 Appraisal Assessment for Lab F228 in each Program**

(List Flagged Results for each Study)

		0097	Action Flagged
Mercury	Hg	B-	
Major Ions	NH4	I	
	NO3 /2		
	TKN	1	
	Tot Hard		
	Turb	5/B+	4
Trace Elements	As	2	
	Cd	1	
	Cr		
	Cu		
	Ni		
	Pb		
	Zn	B-	
Total P	Tot P		

**Explanation of Appraisal codes:**

- # = Number of Flagged Results
- B+, B- = Biased High or Low
- I = Insufficient Results for Bias Assessment

# Environment Canada Proficiency Testing Studies - REPORT CARD

Start Date: December 01, 2010

End Date: March 01, 2011

**Table 1 Programs and Studies for Lab F280**

Program	Studies	Begin Date	End Date	No. of Studies	Parameters	No. of Tests
Major Ions	0097 - 0097	Dec 2010	Jan 2011	1	3	30
Total P	0097 - 0097	Dec 2010	Jan 2011	1	1	10
<b>Totals</b>				<b>2</b>	<b>4</b>	<b>40</b>

**Table 2 Number of Tests for Lab F280 in each Program**

Program/Study	0097	Total
Major Ions	30	30
Total P	10	10
<b>Total</b>	<b>40</b>	<b>40</b>

**Table 3 Study-to-Study Performance for Lab F280 in each Program**

(Laboratory Performance Score)

Program/Study	0097	Performance
Major Ions	6.7	Satisfactory
Total P	0.0	Good

Rating	% Score
<b>Good</b>	<b>0 - 5</b>
<b>Satisfactory</b>	<b>&gt; 5 - 12.5</b>
<b>Moderate</b>	<b>&gt; 12.5 - 30</b>
<b>Poor</b>	<b>&gt; 30</b>

**Table 4 Appraisal Assessment for Lab F280 in each Program**

(List Flagged Results for each Study)

		0097
Major Ions	Ca	
	NH4	1
	SO4	4
Total P	Tot P	

**Explanation of Appraisal codes:**

---

# = Number of Flagged Results

B+, B- = Biased High or Low

I = Insufficient Results for Bias Assessment

## Environment Canada Proficiency Testing Studies - REPORT CARD

Start Date: December 01, 2010

End Date: March 01, 2011

**Table 1 Programs and Studies for Lab F292**

Program	Studies	Begin Date	End Date	No. of Studies	Parameters	No. of Tests
Mercury	0097 - 0097	Dec 2010	Jan 2011	1	1	10
Major Ions	0097 - 0097	Dec 2010	Jan 2011	1	20	200
Trace Elements	0097 - 0097	Dec 2010	Jan 2011	1	22	220
Total P	0097 - 0097	Dec 2010	Jan 2011	1	1	10
<b>Totals</b>				<b>4</b>	<b>44</b>	<b>440</b>

**Table 2 Number of Tests for Lab F292 in each Program**

Program/Study	0097	Total
Mercury	10	10
Major Ions	200	200
Trace Elements	220	220
Total P	10	10
<b>Total</b>	<b>440</b>	<b>440</b>

**Table 3 Study-to-Study Performance for Lab F292 in each Program**

(Laboratory Performance Score)

Program/Study	0097	Performance
Mercury	0.0	Good
Major Ions	17.0	Moderate
Trace Elements	2.3	Good
Total P	0.0	Good

Rating	% Score
Good	0 - 5
Satisfactory	> 5 - 12.5
Moderate	> 12.5 - 30
Poor	> 30

**Table 4 Appraisal Assessment for Lab F292 in each Program**

(List Flagged Results for each Study)

		0097	Action Flagged
Mercury	Hg		
Major Ions	B	I	
	Ca		
	Cl	2	
	Colour		
	Cond		
	DOC	10/B+	10
	F	I	
	K	I	
	Mg	B-	
	Na		
	NH4	3/I	1
	NO3 /2	2	
	pH	1/B-	
	SiO2	5/B-	1
	SO4	5	3
	TKN		
	Tot Alk		
Tot Hard			
Tot N			
Turb	I		
Trace Elements	Ag	I	
	Al	1/I	1
	As		
	B	I	
	Ba	2	1
	Be		
	Cd		
	Co	1	
	Cr		
	Fe	I	
	Mn		
	Mo	1	1
	Ni	I	
	Pb	1	1
	Sb	I	
	Se	I	
	Sn	I	
	Sr		
	Ti	I	
	Tl	I	
V	2	1	
Zn	2	2	
Total P	Tot P		

**Explanation of Appraisal codes:**

- # = Number of Flagged Results
- B+, B- = Biased High or Low
- I = Insufficient Results for Bias Assessment

## Environment Canada Proficiency Testing Studies - REPORT CARD

Start Date: December 01, 2010

End Date: March 01, 2011

**Table 1 Programs and Studies for Lab F293**

<u>Program</u>	<u>Studies</u>	<u>Begin Date</u>	<u>End Date</u>	<u>No. of Studies</u>	<u>Parameters</u>	<u>No. of Tests</u>
Mercury	0097 - 0097	Dec 2010	Jan 2011	1	1	10
Major Ions	0097 - 0097	Dec 2010	Jan 2011	1	18	180
Trace Elements	0097 - 0097	Dec 2010	Jan 2011	1	24	240
Total P	0097 - 0097	Dec 2010	Jan 2011	1	1	10
<b>Totals</b>				<b>4</b>	<b>44</b>	<b>440</b>

**Table 2 Number of Tests for Lab F293 in each Program**

Program/Study	0097	Total
Mercury	10	10
Major Ions	180	180
Trace Elements	240	240
Total P	10	10
<b>Total</b>	<b>440</b>	<b>440</b>

**Table 3 Study-to-Study Performance for Lab F293 in each Program**

(Laboratory Performance Score)

Program/Study	0097	Performance
Mercury	0.0	Good
Major Ions	5.8	Satisfactory
Trace Elements	6.3	Satisfactory
Total P	0.0	Good

Rating	% Score
Good	0 - 5
Satisfactory	> 5 - 12.5
Moderate	> 12.5 - 30
Poor	> 30

**Table 4 Appraisal Assessment for Lab F293 in each Program**

(List Flagged Results for each Study)

		0097	Action Flagged
Mercury	Hg		
Major Ions	B	I	
	Ca		
	Cl		
	Colour		
	Cond		
	DOC		
	F	B+	
	K		
	Mg		
	Na		
	NH4	I	
	NO3 /2		
	pH	1	
	SiO2	B+	
	SO4		
	TKN		
	Tot Alk		
Turb			
Trace Elements	Ag		
	Al	1	1
	As		
	B	3	
	Ba	1	
	Be		
	Cd		
	Co		
	Cr		
	Cu		
	Fe	B+	
	Mn		
	Mo		
	Ni		
	Pb		
	Sb		
	Se		
	Sn		
	Sr		
	Ti	5	5
Tl			
U	B+		
V			
Zn			
Total P	Tot P		

**Explanation of Appraisal codes:**

- # = Number of Flagged Results
- B+, B- = Biased High or Low
- I = Insufficient Results for Bias Assessment

# Environment Canada Proficiency Testing Studies - REPORT CARD

Start Date: December 01, 2010

End Date: March 01, 2011

**Table 1 Programs and Studies for Lab F299**

Program	Studies	Begin Date	End Date	No. of Studies	Parameters	No. of Tests
Major Ions	0097 - 0097	Dec 2010	Jan 2011	1	14	140
Trace Elements	0097 - 0097	Dec 2010	Jan 2011	1	19	190
Total P	0097 - 0097	Dec 2010	Jan 2011	1	1	10
<b>Totals</b>				<b>3</b>	<b>34</b>	<b>340</b>

**Table 2 Number of Tests for Lab F299 in each Program**

Program/Study	0097	Total
Major Ions	140	140
Trace Elements	190	190
Total P	10	10
<b>Total</b>	<b>340</b>	<b>340</b>

**Table 3 Study-to-Study Performance for Lab F299 in each Program**

(Laboratory Performance Score)

Program/Study	0097	Performance
Major Ions	18.2	Moderate
Trace Elements	16.3	Moderate
Total P	5.0	Good

Rating	% Score
<b>Good</b>	<b>0 - 5</b>
<b>Satisfactory</b>	<b>&gt; 5 - 12.5</b>
<b>Moderate</b>	<b>&gt; 12.5 - 30</b>
<b>Poor</b>	<b>&gt; 30</b>

**Table 4 Appraisal Assessment for Lab F299 in each Program**

(List Flagged Results for each Study)

		0097	Action Flagged
Major Ions	Ca	1	1
	Cl	7	4

		0097	Action Flagged
Major Ions	F		
	K	5	4
	Mg	8	4
	Na	1	1
	NH4	I	
	NO3 /2		
	SO4	6	5
	TKN	5/B+	3
	Tot Alk	2	
	Tot Hard	3	2
	Tot N	3	3
	Turb		
Trace Elements	Ag	1/B+	1
	Al		
	As		
	Ba	1	
	Be		
	Cd		
	Cr		
	Cu		
	Fe		
	Mn		
	Mo		
	Ni		
	Pb	9/B-	9
	Sb		
	Se	B-	
	Sr		
	Tl	10/B-	10
	V		
Zn	1	1	
Total P	Tot P	1	1

**Explanation of Appraisal codes:**

- 
- # = Number of Flagged Results
  - B+, B- = Biased High or Low
  - I = Insufficient Results for Bias Assessment

## Environment Canada Proficiency Testing Studies - REPORT CARD

Start Date: December 01, 2010

End Date: March 01, 2011

**Table 1 Programs and Studies for Lab F305**

<u>Program</u>	<u>Studies</u>	<u>Begin Date</u>	<u>End Date</u>	<u>No. of Studies</u>	<u>Parameters</u>	<u>No. of Tests</u>
Mercury	0097 - 0097	Dec 2010	Jan 2011	1	1	10
Major Ions	0097 - 0097	Dec 2010	Jan 2011	1	17	170
Trace Elements	0097 - 0097	Dec 2010	Jan 2011	1	20	200
Total P	0097 - 0097	Dec 2010	Jan 2011	1	1	10
<u>Totals</u>				4	39	390

**Table 2 Number of Tests for Lab F305 in each Program**

Program/Study	0097	Total
Mercury	10	10
Major Ions	170	170
Trace Elements	200	200
Total P	10	10
<b>Total</b>	<b>390</b>	<b>390</b>

**Table 3 Study-to-Study Performance for Lab F305 in each Program**

(Laboratory Performance Score)

Program/Study	0097	Performance
Mercury	15.0	Moderate
Major Ions	32.4	Poor
Trace Elements	35.5	Poor
Total P	45.0	Poor

Rating	% Score
Good	0 - 5
Satisfactory	> 5 - 12.5
Moderate	> 12.5 - 30
Poor	> 30

**Table 4 Appraisal Assessment for Lab F305 in each Program**

(List Flagged Results for each Study)

		0097	Action Flagged
Mercury	Hg	3	3
Major Ions	Ca	2/B-	
	Cl	2	2
	Colour	1	
	Cond	2	1
	F	7/B+	5
	K		
	Mg	6/B-	1
	Na		
	NH4	I	
	NO3 /2	5	4
	pH	5	1
	SO4	8	8
	TKN	10/B+	8
	Tot Alk	2	2
	Tot Hard	1/B-	
Tot N	9	7	
Turb	I		
Trace Elements	Ag	2	
	Al	8/B+	6
	As	3	2
	Ba	6/B+	1
	Be		
	Cd	3/B+	1
	Co	1	1
	Cr	9/B+	7
	Cu	B+	
	Fe	2	1
	Mn	7/B+	2
	Mo	4/B+	
	Ni	1	
	Pb		
	Sb	5	5
	Se	1	
	Sn	1	
Tl	2	2	
V	7/B+	3	
Zn			
Total P	Tot P	9	8

**Explanation of Appraisal codes:**

- # = Number of Flagged Results
- B+, B- = Biased High or Low
- I = Insufficient Results for Bias Assessment

# Environment Canada Proficiency Testing Studies - REPORT CARD

Start Date: December 01, 2010

End Date: March 01, 2011

**Table 1 Programs and Studies for Lab F309**

Program	Studies	Begin Date	End Date	No. of Studies	Parameters	No. of Tests
Major Ions	0097 - 0097	Dec 2010	Jan 2011	1	17	170
Trace Elements	0097 - 0097	Dec 2010	Jan 2011	1	20	200
Total P	0097 - 0097	Dec 2010	Jan 2011	1	1	10
<b>Totals</b>				<b>3</b>	<b>38</b>	<b>380</b>

**Table 2 Number of Tests for Lab F309 in each Program**

Program/Study	0097	Total
Major Ions	170	170
Trace Elements	200	200
Total P	10	10
<b>Total</b>	<b>380</b>	<b>380</b>

**Table 3 Study-to-Study Performance for Lab F309 in each Program**

(Laboratory Performance Score)

Program/Study	0097	Performance
Major Ions	20.6	Moderate
Trace Elements	11.3	Satisfactory
Total P	10.0	Satisfactory

Rating	% Score
<b>Good</b>	<b>0 - 5</b>
<b>Satisfactory</b>	<b>&gt; 5 - 12.5</b>
<b>Moderate</b>	<b>&gt; 12.5 - 30</b>
<b>Poor</b>	<b>&gt; 30</b>

**Table 4 Appraisal Assessment for Lab F309 in each Program**

(List Flagged Results for each Study)

		0097	Action Flagged
Major Ions	Ca		
	Cl	1	1

		0097	Action Flagged
Major Ions	Colour	5	2
	Cond	5/B-	1
	F	7/B-	
	K	2	1
	Mg		
	Na	3	1
	NH4	1/I	1
	NO3 /2	1	
	pH	5	4
	SO4	2	2
	TKN		
	Tot Alk	7/B+	2
	Tot Hard		
	Tot N		
Turb	1/I	1	
Trace Elements	Ag	1/B+	
	Al	1	
	As	2	1
	Ba	3	1
	Be	B+	
	Cd	1	
	Co		
	Cr		
	Cu		
	Fe	2	1
	Mn		
	Mo		
	Ni		
	Pb	5	3
	Sb	3	1
	Se	2	2
	Sn	1	
	Tl	2	1
V	2	2	
Zn			
Total P	Tot P	2	1

**Explanation of Appraisal codes:**

- # = Number of Flagged Results  
 B+, B- = Biased High or Low  
 I = Insufficient Results for Bias Assessment

# Environment Canada Proficiency Testing Studies - REPORT CARD

Start Date: December 01, 2010

End Date: March 01, 2011

**Table 1 Programs and Studies for Lab F311**

Program	Studies	Begin Date	End Date	No. of Studies	Parameters	No. of Tests
Mercury	0097 - 0097	Dec 2010	Jan 2011	1	1	10
Trace Elements	0097 - 0097	Dec 2010	Jan 2011	1	27	270
<b>Totals</b>				2	28	280

**Table 2 Number of Tests for Lab F311 in each Program**

Program/Study	0097	Total
Mercury	10	10
Trace Elements	270	270
<b>Total</b>	280	280

**Table 3 Study-to-Study Performance for Lab F311 in each Program**

(Laboratory Performance Score)

Program/Study	0097	Performance
Mercury	10.0	Satisfactory
Trace Elements	23.7	Moderate

Rating	% Score
Good	0 - 5
Satisfactory	> 5 - 12.5
Moderate	> 12.5 - 30
Poor	> 30

**Table 4 Appraisal Assessment for Lab F311 in each Program**

(List Flagged Results for each Study)

		0097	Action Flagged
Mercury	Hg	2	2
Trace Elements	Ag	3	3
	Al		
	As		

		0097	Action Flagged
Trace Elements	B		
	Ba		
	Be	B-	
	Bi		
	Cd	5/B+	1
	Co		
	Cr		
	Cu		
	Fe	8/B+	4
	Li		
	Mn	B+	
	Mo	B+	
	Ni	1	
	Pb	B+	
	Sb		
	Se		
	Sn		
	Sr	10/B+	1
	Ti	9/B+	8
	Tl		
U	B+		
V			
W	I		
Zn	2		

**Explanation of Appraisal codes:**

- 
- # = Number of Flagged Results
  - B+, B- = Biased High or Low
  - I = Insufficient Results for Bias Assessment

## Environment Canada Proficiency Testing Studies - REPORT CARD

Start Date: December 01, 2010

End Date: March 01, 2011

**Table 1 Programs and Studies for Lab F317**

Program	Studies	Begin Date	End Date	No. of Studies	Parameters	No. of Tests
Mercury	0097 - 0097	Dec 2010	Jan 2011	1	1	10
Major Ions	0097 - 0097	Dec 2010	Jan 2011	1	21	210
Trace Elements	0097 - 0097	Dec 2010	Jan 2011	1	23	230
Total P	0097 - 0097	Dec 2010	Jan 2011	1	1	10
<b>Totals</b>				<b>4</b>	<b>46</b>	<b>460</b>

**Table 2 Number of Tests for Lab F317 in each Program**

Program/Study	0097	Total
Mercury	10	10
Major Ions	210	210
Trace Elements	230	230
Total P	10	10
<b>Total</b>	<b>460</b>	<b>460</b>

**Table 3 Study-to-Study Performance for Lab F317 in each Program**

(Laboratory Performance Score)

Program/Study	0097	Performance
Mercury	55.0	Poor
Major Ions	21.0	Moderate
Trace Elements	32.6	Poor
Total P	15.0	Moderate

Rating	% Score
Good	0 - 5
Satisfactory	> 5 - 12.5
Moderate	> 12.5 - 30
Poor	> 30

**Table 4 Appraisal Assessment for Lab F317 in each Program**

(List Flagged Results for each Study)

		0097	Action Flagged
Mercury	Hg	1/B-	1
Major Ions	B	I	
	Ca	1	
	Cl	2	
	Colour	2	
	Cond	1	1
	DIC	1	
	DOC		
	F	B-	
	K	3/B+	3
	Mg	1/B+	
	Na	2	
	NH4	I	
	NO3 /2	B-	
	pH		
	SiO2	1	1
	SO4		
	TKN	1	1
	Tot Alk	3/B-	1
	Tot Hard	9/B+	6
Tot N	1	1	
Turb			
Trace Elements	Ag	3	
	Al	1/I	1
	As	2	2
	B	I	
	Ba	2/B+	1
	Be		
	Cd	1	
	Co	6/B+	3
	Cr	5/B+	
	Cu	4/B+	
	Fe	5/B+	3
	Mn	1/B+	
	Mo	2/B+	
	Ni	2	2
	Pb	5/B+	
	Sb	3	1
	Se	1	
	Sn	3	2
	Sr	1	
	Ti	1	
Tl	7	5	
V	3	1	
Zn	2/B+		
Total P	Tot P	3	2

**Explanation of Appraisal codes:**

- # = Number of Flagged Results
- B+, B- = Biased High or Low
- I = Insufficient Results for Bias Assessment