

# **Quality Assessment Report for Water Quality Monitoring**

**October – December 2014**



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Technical Oversight Committee  
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## INTRODUCTION

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This report is an assessment of the South Florida Water Management District (SFWMD) laboratory analysis and field sampling for total phosphorus (TP) monitoring, primarily for the following projects and their associated stations from October 1, 2014 through December 31, 2014.

- Everglades National Park Inflows North (PIN): S12A, S12B, S12C, S12D, S333, S355A, S355B, and S356-334
- Everglades National Park Inflow East (PIE): S332DX, S18C, DS4, and BERMB3
- Everglades Protection Area (EVPA): LOX3 through LOX16

Because field quality control (QC) samples are collected for sampling events that include multiple project samples for the stations of interest, the report may also cover information on stations or projects other than those in the above list.

The SFWMD's *Field Sampling Quality Manual* (SFWMD 2013b) provides the minimum requirements followed in field sample collection. The *Chemistry Laboratory Quality Manual* (SFWMD 2013a) provides the minimum requirements followed in preparing and analyzing laboratory samples, as well as data verification and validation. The Field Sampling Quality Assessment and Laboratory Analysis Quality Assessment sections in this report provide the field and laboratory QC results during this quarter. The SFWMD's Laboratory Information Management System (LIMS) provided the data used in this report. These data are available in the SFWMD's DBHYDRO database. Appendix A contains all TP results for samples of interest to the Everglades Technical Oversight Committee (TOC), collected from October 1, 2014 through December 31, 2014.

This report includes an analysis of the SFWMD laboratory's performance on the split (EVPA) samples with the Florida Department of Environmental Protection (FDEP) for a one-year period. The report also includes the results of the National Proficiency Testing Program, which is designed to evaluate the laboratory's performance through analysis of unknown samples provided by an external source. Proficiency testing is one of the essential elements of the National Environmental Laboratory Accreditation Conference (NELAC) Institute requirements for certification.

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## FIELD SAMPLING QUALITY ASSESSMENT

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### PROCEDURE UPDATES

This period had no major procedural updates related to TP sample collection.

### SAMPLES NOT COLLECTED

**Table 1** lists the 17 samples that were not collected for this reporting period. Samples were not collected due to lack of flow.

Table 1. List of samples not collected from October 1, 2014 to December 31, 2014.

Project	Collection Date	Station	Comments
PIN	11/17/2014	S12B	No flow, no samples collected
PIN	11/17/2014	S12D	No flow, no samples collected
PIN	11/24/2014	S12B	No flow, no samples collected
PIN	11/24/2014	S12C	No flow, no samples collected
PIE	11/25/2014	BERMB3	No flow, no samples collected
PIN	12/01/2014	S12B	No flow, no samples collected
PIN	12/01/2014	S12C	No flow, no samples collected
PIE	12/09/2014	BERMB3	No flow, no samples collected
PIN	12/15/2014	S12B	No flow, no samples collected
PIN	12/15/2014	S12C	No flow, no samples collected
PIN	12/22/2014	S12B	No flow, no samples collected
PIN	12/22/2014	S12C	No flow, no samples collected
PIN	12/22/2014	S12D	No flow, no samples collected
PIE	12/23/2014	BERMB3	No flow, no samples collected
PIN	12/29/2014	S12B	No flow, no samples collected
PIN	12/29/2014	S12C	No flow, no samples collected
PIN	12/29/2014	S12D	No flow, no samples collected

### FIELD QUALITY CONTROL

Field QC measures consist of field generated equipment blanks (EB), field-cleaned equipment blanks (FCEB), field blanks (FB), split samples (SS), and replicate samples (RS). **Table 2** summarizes EB, FCEB, and FB results for projects of interest to the TOC, as referenced in the table's footnotes. **Table 3** shows the qualified field blank. TP was qualified a "G" code for analytes detected in the FBs. **Table 4** shows TP data qualified with a "G" code associated with this FCEB. **Table 5** summarizes the field precision results and shows that the field sampling precision was acceptable for all three project replicates.

Table 2. Field and equipment TP blank results.

Type of Blank	Project	Number of Blanks Collected	Number of Blanks with Analyte Detected
EB	EVPA	1	0
	PIE	1	0
	PIN	3	0
FCEB	EVPA	6	0
	PIE	26	1*
	PIN	17	0
FB	EVPA	0	0
	PIE	12	0
	PIN	0	0
<b>Total</b>		<b>78</b>	<b>1</b>

**Notes:**

- All blanks were from sampling events containing grab and autosampler samples collected during the sampling event on the day of collection or day adjacent to the collection date for the compliance samples.
- FCEB, EB, and FB acceptance criteria: they must be less than the method detection limit (MDL).
- When sample concentrations are less than 10 times the blank values that were equal or greater than the MDL, the qualifier "G" is assigned to the associated sample(s).
- MDL – 0.002 milligrams per liter (mg/L)

Table 3. Field blank qualified with "G" code.

Type of Blank	Project	Station	Date Collected	Value (mg/L)	Comments
FCEB	PIE	S177*	12/23/2014	0.002 (I)	FCEB $\geq$ method detection limit (MDL)

**Notes:**

- mg/L – milligrams per liter

Table 4. List of qualified TP samples.

Project Code	Date Collected	Station	Qualifier	Result (mg/L)	Comments
PIE	12/23/2014	S18C	G	0.004	Sample associated with FCEB $\geq$ method detection limit (MDL) and FCEB value was greater than 10% of the associated sample value (see <b>Table 3</b> )

**Notes:**

- mg/L – milligrams per liter
- G indicates that the analyte was detected at or above the MDL in both the sample and the associated EB, FB, or trip blank (TB), and the blank value was greater than 10% of the associated sample value.

Table 5. Precision summary for TP field replicates.

Project Code	Number of Samples (Replicates)	Date Collected	Station	% RSD	Average Value (mg/L)	Comments
PIE	3	10/13/2014	S357*	17.3	0.003 (l)	The precision criterion was met.
PIN	3	10/14/2014	US41-25*	5.6	0.010	The precision criterion was met.
EVPA	3	11/18/2014	CA318*	13.3	0.004	The precision criterion was met.
EVPA	3	12/02/2014	LOX8	8.7	0.007	The precision criterion was met.

**Notes:**

- The SFWMD's chemistry laboratory conducted all TP analyses.
- Field precision must be  $\leq 20$  percent. The laboratory applied this criterion only if sample values were greater than the practical quantitation limit (PQL).
- % RSD – percent relative standard deviation
- mg/L – milligrams per liter
- \*The replicate samples were collected at the stations different than stations of interest, which are listed in the Introduction section.
- l – indicates the reported value is greater than or equal to the method detection limit (MDL) but less than PQL

**FIELD AUDIT**

The SFWMD did not conduct any field audits on TOC-related projects during the fourth quarter of 2014.

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## LABORATORY ANALYSIS QUALITY ASSESSMENT

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**PROCEDURE UPDATES**

The TP analytical procedure (Standard Methods 4500 P-F, Automated Ascorbic Acid Reduction Method) did not change during this reporting period.

**LABORATORY QUALITY CONTROL**

Routine laboratory QC samples include QC checks, matrix spikes, and precision checks. **Figures 1 through 7** show the TP recoveries from various types and levels of QC samples at the SFWMD laboratory from October 1, 2014 through December 31, 2014. Control charts provide a graphical means to demonstrate statistical control, monitor a measurement process, diagnose measurement problems, and document measurement uncertainty. They also are used to monitor and document critical aspects of samples and sampling operation.

**Figure 1** shows the recoveries for a laboratory control sample (LCS1) at a TP concentration of 0.300 milligrams per liter (mg/L). Performance limits varied from 94 to 103 percent, and had a mean central line value of 99.6 percent based on 556 results. The acceptable control limit is 90–110 percent.

**Figure 2** shows the recoveries for a laboratory control sample (LCS3) at a TP concentration of 0.020 mg/L. Performance limits varied from 95 to 110 percent, and had a mean central line value of 99.7 percent based on 94 results. The acceptable control limit is 90–110 percent.

**Figure 3** shows the recoveries for a continuing calibration verification sample (CCV) at a TP concentration of 0.200 mg/L. Performance limits varied from 96 to 103 percent, and had a mean central line value of 99.7 percent based on 462 results. The acceptable control limit is 90–110 percent.

**Figure 4** shows the recoveries for the method detection limit (MDL) sample (LCS5) at a TP concentration 0.004 mg/L and results varied from 0.002 to 0.006 mg/L based on 94 results.

**Figure 5** show the recoveries for the practical quantitation limit (PQL) varied from 75 to 125 percent. The acceptable control limit is 55–145 percent.

**Figures 6 and 7** present the precision and matrix spike recoveries for TP analyses during the reporting period. If QC recoveries are outside the set limits, then the SFWMD's laboratory usually rejects the analytical batch and reanalyzes.

The acceptable recoveries for the QC samples, except the PQL check, are within  $\pm 10$  percent of the true value. The daily MDL check with a true value of 0.004 mg/L indicates that the laboratory has consistently achieved the established MDL of 0.002 mg/L. The mean recovery for the organic check, a solution prepared from phytic acid and used to prepare matrix spikes, was 99.6 percent based on 343 results.

**Figures 1 through 7** show also the distribution of QC samples (histograms) in the roughly symmetrical bell-shape form with most values clustered around the central line.

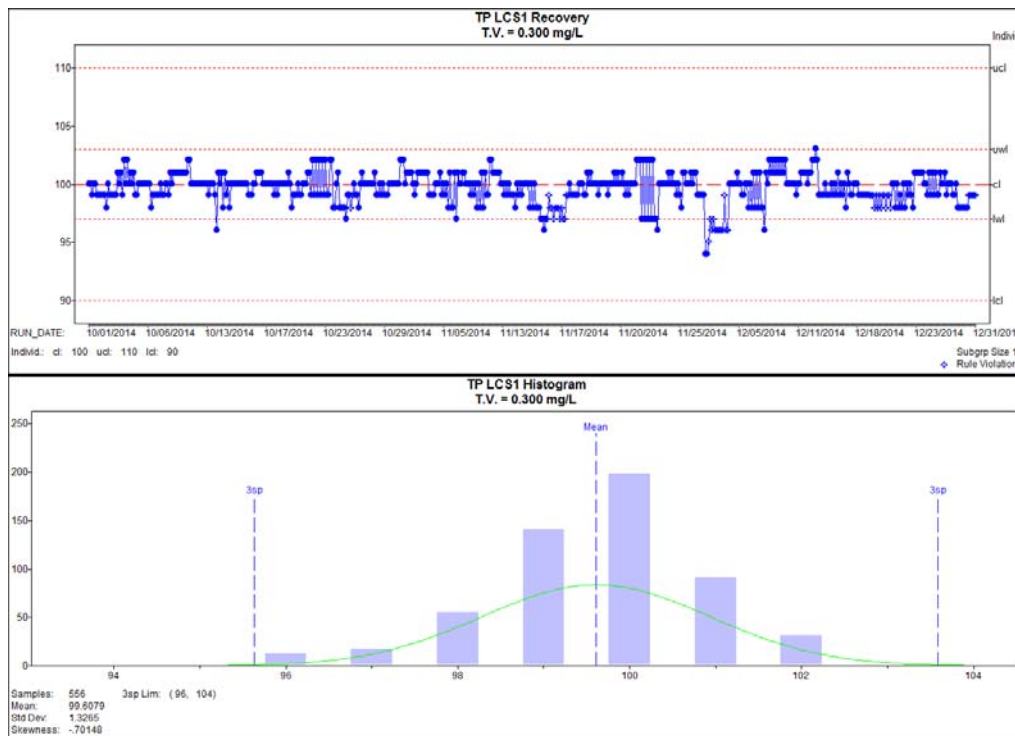


Figure 1. TP QC (Laboratory Control Sample 1, 0.300 mg/L) sample recoveries and histogram.

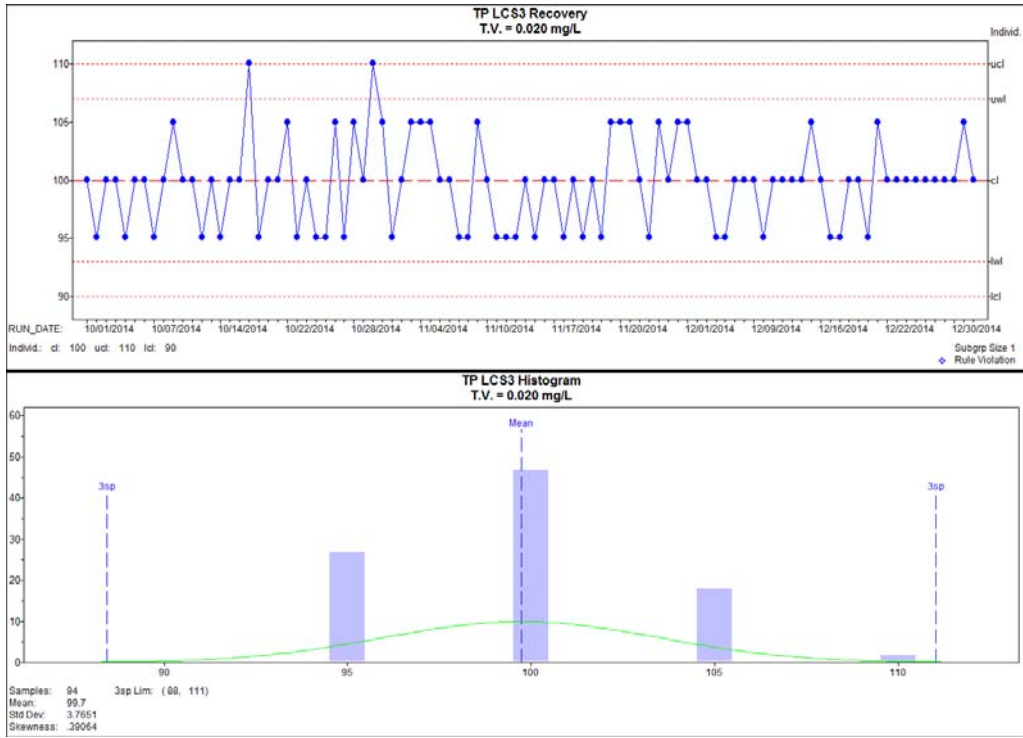


Figure 2. TP QC (Laboratory Control Sample 3, 0.020 mg/L) sample recoveries and histogram.

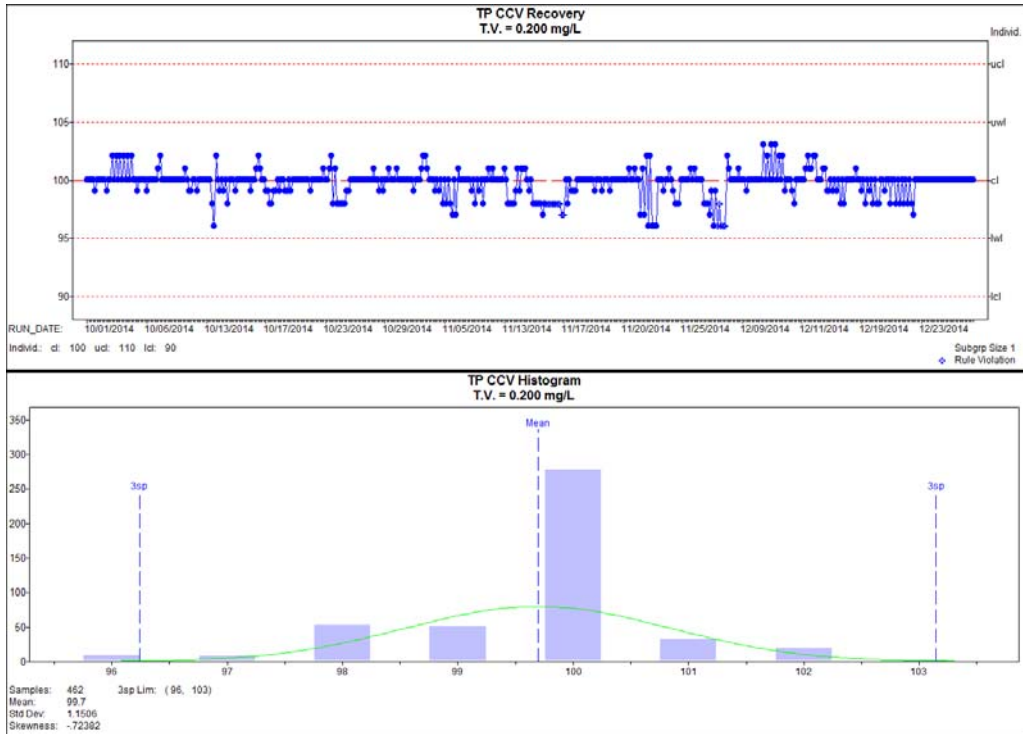


Figure 3. TP QC (Continuing Calibration Verification Sample, 0.200 mg/L) sample recoveries and histogram.

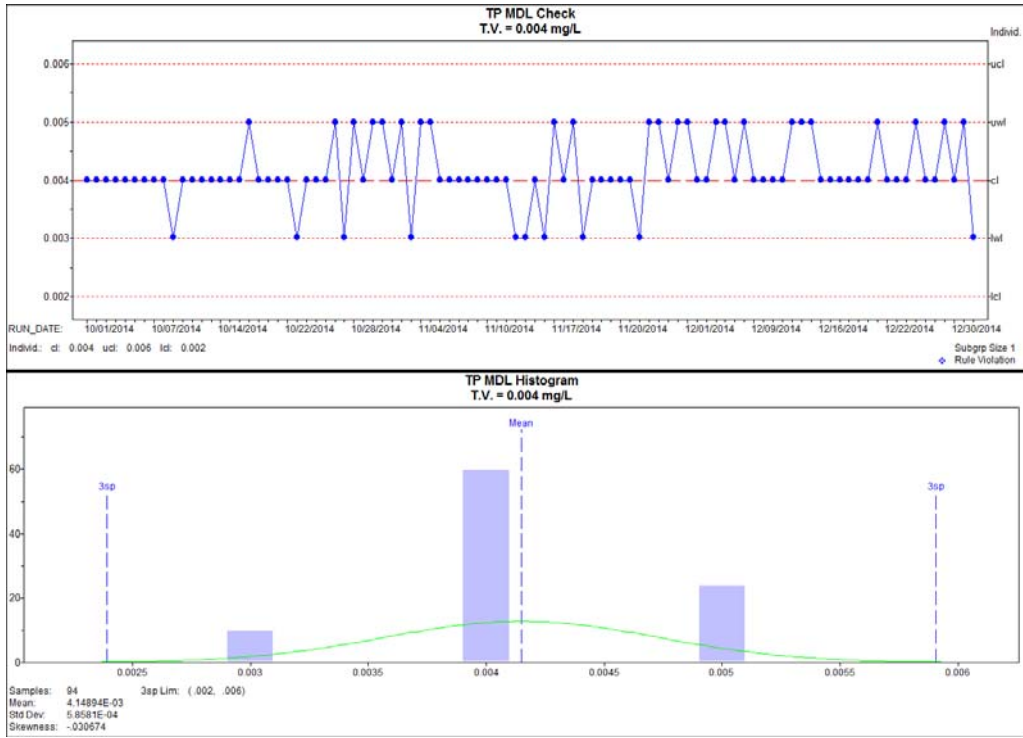


Figure 4. TP QC5 (Method Detection Limit Check, 0.004 mg/L) sample recoveries and histogram.

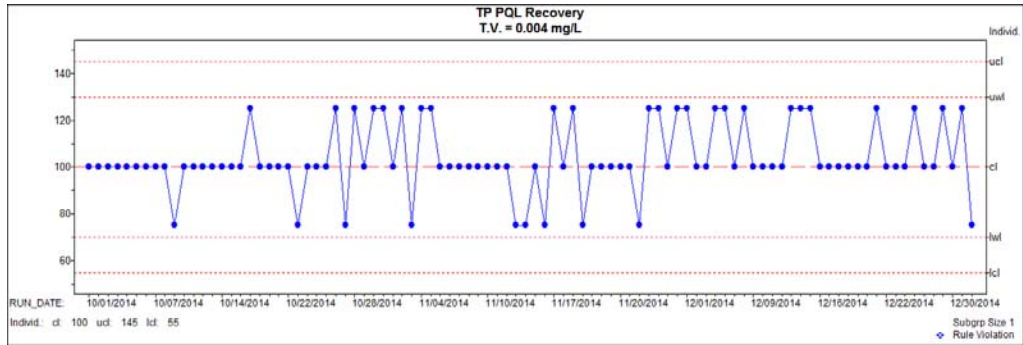


Figure 5. TP PQL (Practical Quantitation Limit) recovery.

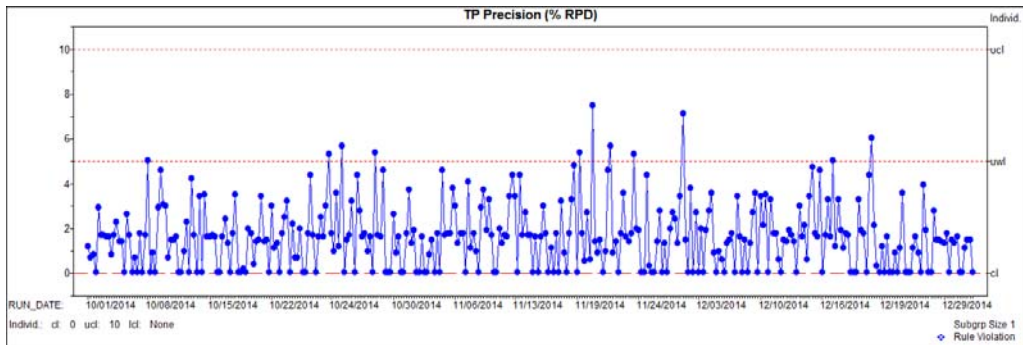


Figure 6. TP precision (%) relative percent different.



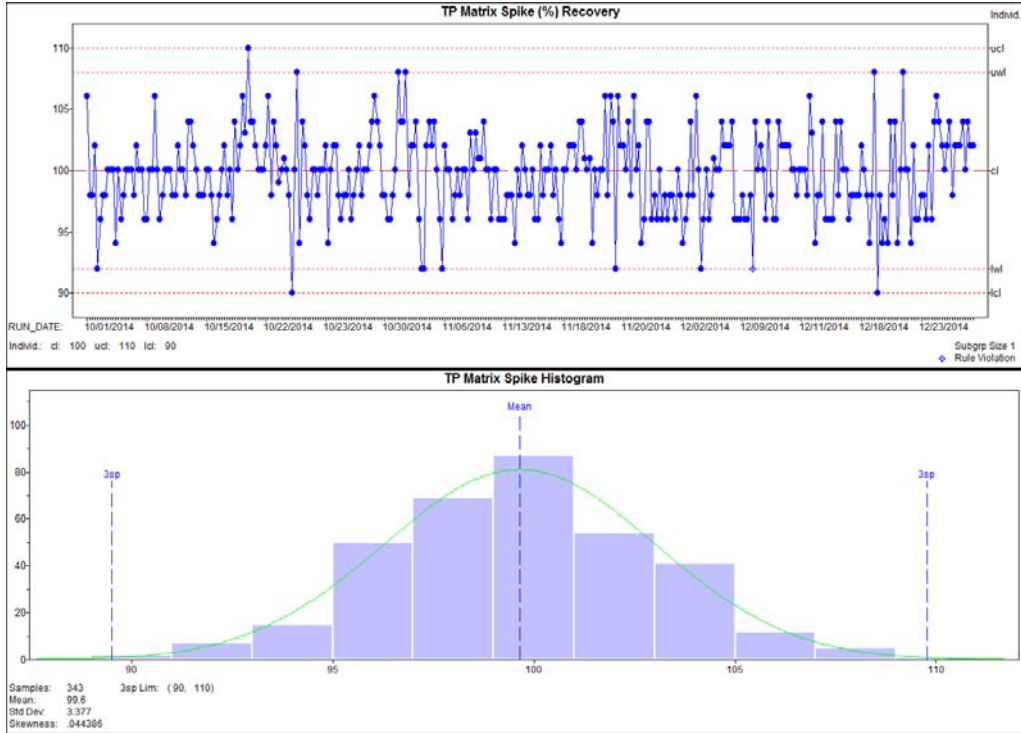


Figure 7. TP spike recovery (%) and histogram.

**Notes for Figures 1 through 7:**

- T.V. - true value
- ucl - upper control limit
- uwl - upper warning limit
- cl - central line
- lwl - lower warning limit
- lcl - lower control limit
- Min, Max - range of acceptable limits
- Std Dev - standard deviation
- Samples - number of analyzed QC samples
- 3sp Lim - calculated limits for subgroup based on 3 sigma factor
- y-axis label for histogram indicates number of data points

**METHOD DETECTION LIMIT AND PRACTICAL QUANTITATION LIMIT**

MDL checks are routinely analyzed with each analytical run. From October 1, 2014 to December 31, 2014, 94 results for MDL checks were reported for TP measurements. The calculated MDL from these results was determined to be 0.0014 mg/L, using the procedure described in the Code of Federal Regulations (CFR), 40 CFR 136 Appendix B. These results validated the current laboratory MDL value of 0.002 mg/L.

The performance of PQL QC sample is presented in **Figure 5**. The average recovery for PQL was 103.7 percent. The average relative standard deviation was 14.6 percent, which was less than acceptable criterion of 15 percent. These results validated the current laboratory PQL value of 0.004 mg/L.

The reported values between the MDL (0.002 mg/L) and less than PQL (0.004 mg/L) are assigned the “T” qualifier, indicating that the results are at concentrations that cannot be accurately quantified.

## ESTIMATION OF ANALYTICAL MEASUREMENT UNCERTAINTY

The reporting of estimated analytical measurement uncertainty values for all analytes was implemented in July 2012. The definition of uncertainty (of measurement) can be found in the *International Vocabulary of Basic and General Standard Terms in Metrology*: “A parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand” (JCGM 1993).

The uncertainty has a probabilistic basis and reflects incomplete knowledge of the quantity. All measurements are subject to uncertainty and a measured value is only complete if it is accompanied by a statement of the associated uncertainty.

The uncertainty has been estimated using the nested hierarchical methodology by Ingersoll (2001) in combination with a mathematical model found in the Eurachem/CITAC (2000) guide on uncertainty. This QC-based nested approach uses the statistical QC data attributed to laboratory measurement activities and does not include uncertainty attributed to field sampling activities. The estimated uncertainty is calculated using the following equation:

$$u(x) = \sqrt{s_0^2 + (s_1 x)^2}$$

where:

$u(x)$  is the combined standard uncertainty in the result  $x$ .

$s_0$  is a constant contribution to the overall uncertainty derived from the procedure to determine the MDL.

$s_1$  is proportionality constant derived from nested hierarchical methodology by Ingersoll.

**Figure 8** is presented to clarify the concept of uncertainty of a measurement process relative to the MDL and PQL.

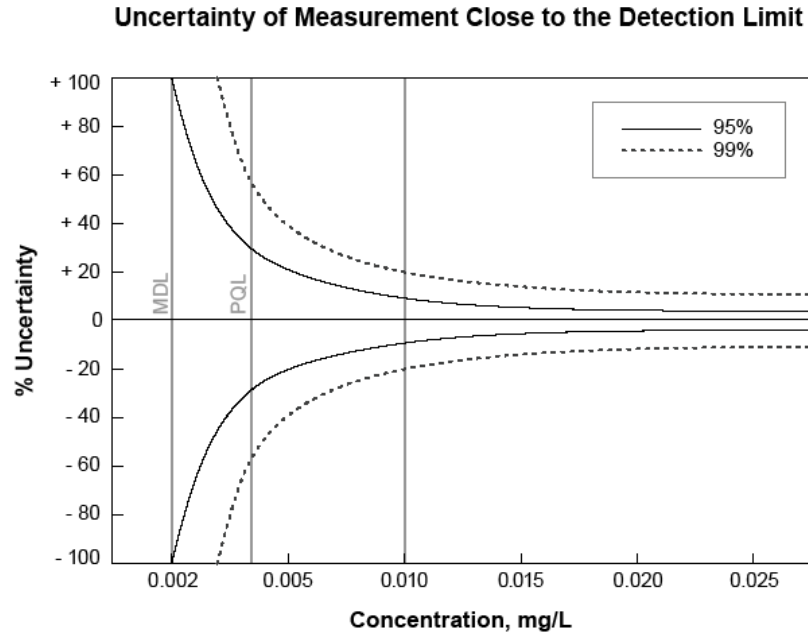


Figure 8. Uncertainty of TP measurement close to the detection limit.

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## INTER-LABORATORY QUALITY CONTROL ASSESSMENT

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### SPLIT STUDIES WITH FDEP LABORATORY

To continuously assess comparability of results, SFWMD has routinely sent split samples from the EVPA project to the FDEP laboratory at SFWMD expense. **Table 6** contains TP data from the EVPA quarterly splits conducted by FDEP and SFWMD laboratories from December 2013 to December 2014. **Effective May 1, 2015, splitting samples from the EVPA project will be discontinued as both the SFWMD and FDEP laboratories are now routinely participating in a performance evaluation program conducted by Environment Canada that provides much more useful statistical information regarding the accuracy and bias of measurements for TP in natural surface waters. The Environment Canada performance evaluation program meets the Guidelines for the Requirements for the Competence of Providers of Proficiency Testing (comprising ISO Guide 43-1:1997 [ISO 1997], as well as relevant elements of ISO/IEC 17025:2005 [ISO 2010] applicable to characterization, homogeneity and stability testing of proficiency testing materials), and the management system requirements of ISO/IEC 17025:2005, which includes the principles of ISO 9000:2005 (ISO 2009). For more information on proficiency testing and performance evaluation studies conducted by the SFWMD laboratory, please refer to the *Guidance in Implementation of Proficiency Testing and Performance Evaluation Studies*, SOP SFWMD-LAB-G-5610-002 (SFWMD 2010), which is available upon request.**

**Table 6.** Comparison of SFWMD and FDEP split TP samples  
(December 2013 – December 2014).

Project Code	Date Collected	Station	SFWMD TP result	FDEP TP result	Relative Percent Difference/Comments
EVPA	12/04/2013	LOX12	0.005±0.002	0.003 (I)	FDEP result < PQL
EVPA	12/04/2013	LOX15	0.004±0.002	0.003 (I)	FDEP result < PQL
EVPA	12/04/2013	LOX16	0.005±0.002	0.004 (I)	FDEP result < PQL
EVPA	12/04/2013	LOX14	0.005±0.002	0.004 (I)	FDEP result < PQL
EVPA	3/05/2014	LOX12	0.007±0.002	0.007	0.0
EVPA	3/05/2014	LOX15	0.005±0.002	0.005	0.0
EVPA	3/05/2014	LOX16	0.006±0.002	0.007	15.4
EVPA	3/05/2014	LOX14	0.006±0.002	0.005	18.2
EVPA	6/04/2014	LOX12	0.007±0.002	0.008	13.3
EVPA	6/04/2014	LOX15	0.006±0.002	0.006	0.0
EVPA	6/04/2014	LOX14	0.006±0.002	0.006	0.0
EVPA	6/04/2014	LOX12	0.008±0.002	0.009	11.8
EVPA	9/03/2014	LOX7	0.006±0.002	0.006	0.0
EVPA	9/03/2014	LOX8	0.009±0.002	0.009	0.0
EVPA	9/04/2014	LOX14	0.006±0.002	0.006	0.0
EVPA	9/04/2014	LOX6	0.006±0.002	0.005	18.2
EVPA	12/03/2014	LOX12	0.005±0.002	0.005	0.0
EVPA	12/03/2014	LOX15	0.004±0.002	0.004 (I)	FDEP result < PQL
EVPA	12/03/2014	LOX16	0.005±0.002	0.006	18.2
EVPA	12/03/2014	LOX14	0.005±0.002	0.005	0.0

**Notes:**

- SFWMD TP results include analytical uncertainty values.
- Qualifier code:  
I – indicates the reported value is greater than or equal to the MDL but less than PQL. SFWMD reported MDL = 0.002 mg/L and PQL = 0.004 mg/L. FDEP reported MDL = 0.002 mg/L and PQL = 0.005 mg.

## NATIONAL PROFICIENCY TESTING PROGRAM

As a requirement for laboratory continued certification, the SFWMD's laboratory performs proficiency testing on environmental samples twice per year. The result for the SFWMD's laboratory from the most recent proficiency testing study (September – October 2014) are shown in **Table 7**.

**Table 7.** Proficiency testing WP-236 study TP.

<b>Assigned Value</b>	3.14 mg/L
<b>Study Mean</b>	3.14 mg/L
<b>Reported Value</b>	3.10 mg/L
<b>Z-Score</b>	0.171
<b>Acceptance Limits</b>	2.57 – 3.68 mg/L
<b>Performance Evaluation</b>	Acceptable

**Notes:**

- Assigned Value – This value is the calculated true value of the standard based upon the actual composition of the standard.
- Reported Value – The test result reported to the study provider for a specific analyte.
- Acceptable Performance Evaluation – Reported value falls within the acceptance limits.
- Acceptance Limits – this limit is established per the criteria contained in the most current United States Environmental Protection Area (USEPA)/NELAC Fields of Proficiency Testing tables (<http://nelac-institute.org/content/NEPTP/fopt.php>). For the Water Pollution Program, USEPA acceptance limits are defined as  $\pm 3$  USEPA standard deviation from the USEPA mean.

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## REFERENCES

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- Eurachem/CITAC. 2000. *Quantifying Uncertainty in Analytical Measurement, Second Edition*. ISBN 0-948926-15-5, Eurachem/CITAC, Guide CG4.
- Ingersoll, W.S. 2001. *Environmental Analytical Measurement Uncertainty Estimation. Nested Hierarchical Approach*. Defense Technical Information Center #ADA396946, Fort Belvoir, VA.
- ISO. 1997. *ISO/IEC Guide 43-1: 1997, Proficiency Testing by Interlaboratory Comparisons -- Part 1: Development and Operation of Proficiency Testing Schemes*. International Organization for Standardization. Available at [http://www.iso.org/iso/iso\\_catalogue/catalogue\\_ics/catalogue\\_detail\\_ics.htm?csnumber=27216](http://www.iso.org/iso/iso_catalogue/catalogue_ics/catalogue_detail_ics.htm?csnumber=27216).
- ISO. 2009. *ISO 9000/2005, Quality Management Systems -- Fundamentals and Vocabulary*. International Organization for Standardization. Available at [http://www.iso.org/iso/home/store/catalogue\\_tc/catalogue\\_detail.htm?csnumber=42180](http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=42180).
- ISO. 2010. *ISO/IEC 17025:2005, General Requirements for the Competence of Testing and Calibration Laboratories*. International Organization for Standardization. Available at [http://www.iso.org/iso/home/store/catalogue\\_tc/catalogue\\_detail.htm?csnumber=39883](http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=39883).
- JCGM. 1993. *International Vocabulary of Basic and General Standard Terms in Metrology*. Joint Committee on Guides for Metrology, Geneva, Switzerland (ISBN 92-67-10175-1).
- SFWMD. 2010. *Guidance in Implementation of Proficiency Testing and Performance Evaluation Studies*. SFWMD-LAB-G-5610-002. South Florida Water Management District, West Palm Beach, FL.
- SFWMD. 2013a. *Chemistry Laboratory Quality Manual*. SFWMD-LAB-QM-2013-01. South Florida Water Management District, West Palm Beach, FL.
- SFWMD. 2013b. *Field Sampling Quality Manual*. SFWMD-FIELD-QM-001-08. South Florida Water Management District, West Palm Beach, FL.

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## GLOSSARY

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**Accuracy:** The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations.

**Equipment Blank (EB):** Field quality control sample prepared using sampling equipment that has been brought to the site or processing area precleaned and is collected before the equipment has been used. The results of these blanks are used to monitor the on-site sampling environment, sampling equipment decontamination, sample container cleaning, the suitability of sample preservatives and analyte-free water, sample transport and storage conditions, and laboratory process.

**Field Blank (FB):** FBs are collected by pouring analyte-free water directly into the sample container, preserved, and kept open for the same approximate time and interval as required for collection and/or processing of the routine sample. The results of this blank are used to monitor the on-site sampling environment, sample container cleaning, the suitability of sample preservatives and analyte-free water, sample transport and storage conditions, and laboratory process.

**Field Cleaned Equipment Blank (FCEB):** Field quality control sample prepared using sampling equipment that has been cleaned in the field or at the processing area. The results of this blank are used to monitor the on-site sampling environment, sampling equipment field decontamination, sample container cleaning, the suitability of sample preservatives and analyte-free water, sample transport and storage conditions, and laboratory process.

**Measurand:** Particular quantity subject to measurement.

**Method Detection Limit (MDL):** The smallest concentration of an analyte of interest that can be measured and reported with 99 percent confidence that the concentration is greater than zero. The MDLs are determined from the analysis of a sample in a given matrix, using accepted sampling and analytical preparation procedures, containing the analyte at a specified level. The MDL is determined by the protocol defined in the Code of Federal Regulations (CFR) section 40 CFR, Part 136, Appendix B, as established by the United States Environmental Protection Agency.

**Practical Quantitation Limit (PQL):** The smallest concentration of an analyte of interest that can be quantitatively reported with a specific degree of confidence. The PQL is verified for each matrix, technology, and analyte. The validity of the PQL is verified by analysis of quality control sample containing the analyte of concern.

**Precision:** The agreement or closeness between two or more results and is an indication that the measurement system is operating consistently and is a quantifiable indication of variations introduced by the analytical systems over a given time and field sampling period.

**Relative Percent Difference (RPD):** A measure of precision, used when comparing two values. It is calculated as  $\%RPD = [Value1 - Value2] / Mean * 100$ .

**Relative Standard Deviation (RSD):** A measurement of precision, used when comparing more than two results. It is calculated as  $\%RSD = [Standard Deviation / Mean] * 100$ .

**Replicate Sample (RS):** A RS is collected by repeating (simultaneously or in rapid succession) the entire sample acquisition technique that was used to obtain the routine sample. A single RS set (e.g., one sample and two replicate samples) is collected per quarter, per project, at the same station, for the longest parameter list. RS data are compared to routine sample data to evaluate sampling precision.

**Split Sample (SS):** A second sample collected from the same sample obtained from the same sampling device. Results for split samples are compared with routine sample results; agreement between these two results is mostly an indication of laboratory precision.

**Uncertainty:** The range of values within which the true value is estimated to lie. It is a best estimate of possible inaccuracy due to both random and systematic error.

**Z-Score:** A measure of the deviation of the result ( $X_i$ ) from the assigned value ( $X$ ) for that determinant (calculated as  $z = (X_i - X) / \sigma$ , where  $\sigma$  is a standard deviation) (Eurachem/CITAC 2000).

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## APPENDIX A

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TP results for projects and their associated stations specified in the Introduction section from October 1, 2014 to December 31, 2014. Among 147 reported results, ten were qualified with a code "I".

Project	Date Collected	Station	Total Phosphorus Result (mg/L)	Uncertainty (mg/L)	Qualifier Code
EVPA	10/1/2014	LOX4	0.012	+/- 0.002	
EVPA	10/1/2014	LOX7	0.013	+/- 0.002	
EVPA	10/1/2014	LOX8	0.011	+/- 0.002	
EVPA	10/1/2014	LOX9	0.008	+/- 0.002	
EVPA	10/1/2014	LOX10	0.006	+/- 0.002	
EVPA	10/1/2014	LOX5	0.007	+/- 0.002	
EVPA	10/1/2014	LOX3	0.008	+/- 0.002	
EVPA	10/2/2014	LOX12	0.008	+/- 0.002	
EVPA	10/2/2014	LOX15	0.007	+/- 0.002	
EVPA	10/2/2014	LOX16	0.008	+/- 0.002	
EVPA	10/2/2014	LOX14	0.007	+/- 0.002	
EVPA	10/2/2014	LOX13	0.006	+/- 0.002	
EVPA	10/2/2014	LOX11	0.007	+/- 0.002	
EVPA	10/2/2014	LOX6	0.006	+/- 0.002	
PIN	10/6/2014	S12A	0.007	+/- 0.002	
PIN	10/6/2014	S12B	0.006	+/- 0.002	
PIN	10/6/2014	S12C	0.008	+/- 0.002	
PIN	10/6/2014	S12D	0.010	+/- 0.002	
PIN	10/6/2014	S333	0.009	+/- 0.002	
PIE	10/6/2014	S332DX	0.005	+/- 0.002	
PIN	10/6/2014	S356-334	0.008	+/- 0.002	
PIE	10/7/2014	S18C	0.002	+/- 0.002	I
PIN	10/13/2014	S12A	0.005	+/- 0.002	
PIN	10/13/2014	S12B	0.007	+/- 0.002	
PIN	10/13/2014	S12C	0.007	+/- 0.002	
PIN	10/13/2014	S12D	0.008	+/- 0.002	
PIN	10/13/2014	S333	0.008	+/- 0.002	
PIN	10/13/2014	S356-334	0.008	+/- 0.002	
PIE	10/13/2014	S332DX	0.005	+/- 0.002	
PIE	10/14/2014	BERMB3	0.010	+/- 0.002	
PIE	10/14/2014	S18C	0.003	+/- 0.002	I
PIN	10/14/2014	S355A	0.010	+/- 0.002	
PIN	10/14/2014	S355B	0.010	+/- 0.002	
PIN	10/20/2014	S12A	0.007	+/- 0.002	
PIN	10/20/2014	S12B	0.006	+/- 0.002	
PIN	10/20/2014	S12C	0.008	+/- 0.002	



Project	Date Collected	Station	Total Phosphorus Result (mg/L)	Uncertainty (mg/L)	Qualifier Code
PIN	10/20/2014	S12D	0.009	+/- 0.002	
PIN	10/20/2014	S333	0.007	+/- 0.002	
PIE	10/20/2014	S332DX	0.007	+/- 0.002	
PIN	10/20/2014	S356-334	0.011	+/- 0.002	
PIE	10/21/2014	S18C	0.003	+/- 0.002	I
PIN	10/27/2014	S12A	0.006	+/- 0.002	
PIN	10/27/2014	S12B	0.006	+/- 0.002	
PIN	10/27/2014	S12C	0.007	+/- 0.002	
PIN	10/27/2014	S12D	0.008	+/- 0.002	
PIN	10/27/2014	S333	0.008	+/- 0.002	
PIN	10/27/2014	S356-334	0.010	+/- 0.002	
PIE	10/27/2014	S332DX	0.006	+/- 0.002	
PIE	10/28/2014	BERMB3	0.014	+/- 0.002	
PIN	10/28/2014	S355A	0.008	+/- 0.002	
PIN	10/28/2014	S355B	0.009	+/- 0.002	
PIE	10/28/2014	S18C	0.003	+/- 0.002	I
PIN	11/3/2014	S12A	0.009	+/- 0.002	
PIN	11/3/2014	S12B	0.006	+/- 0.002	
PIN	11/3/2014	S12C	0.007	+/- 0.002	
PIN	11/3/2014	S12D	0.008	+/- 0.002	
PIN	11/3/2014	S333	0.008	+/- 0.002	
PIN	11/3/2014	S356-334	0.008	+/- 0.002	
PIE	11/3/2014	S332DX	0.005	+/- 0.002	
PIE	11/4/2014	S18C	0.003	+/- 0.002	I
EVPA	11/5/2014	LOX12	0.004	+/- 0.002	
EVPA	11/5/2014	LOX15	0.006	+/- 0.002	
EVPA	11/5/2014	LOX16	0.006	+/- 0.002	
EVPA	11/5/2014	LOX14	0.006	+/- 0.002	
EVPA	11/5/2014	LOX13	0.005	+/- 0.002	
EVPA	11/5/2014	LOX11	0.005	+/- 0.002	
EVPA	11/5/2014	LOX6	0.005	+/- 0.002	
EVPA	11/5/2014	LOX4	0.007	+/- 0.002	
EVPA	11/5/2014	LOX7	0.007	+/- 0.002	
EVPA	11/5/2014	LOX8	0.008	+/- 0.002	
EVPA	11/5/2014	LOX9	0.008	+/- 0.002	
EVPA	11/5/2014	LOX10	0.006	+/- 0.002	
EVPA	11/5/2014	LOX5	0.007	+/- 0.002	
EVPA	11/5/2014	LOX3	0.006	+/- 0.002	
PIE	11/10/2014	S332DX	0.005	+/- 0.002	
PIE	11/10/2014	BERMB3	0.020	+/- 0.002	
PIN	11/10/2014	S12A	0.014	+/- 0.002	
PIN	11/10/2014	S12B	0.008	+/- 0.002	
PIN	11/10/2014	S12C	0.006	+/- 0.002	

Project	Date Collected	Station	Total Phosphorus Result (mg/L)	Uncertainty (mg/L)	Qualifier Code
PIN	11/10/2014	S12D	0.009	+/- 0.002	
PIN	11/10/2014	S333	0.008	+/- 0.002	
PIN	11/10/2014	S356-334	0.010	+/- 0.002	
PIE	11/10/2014	S18C	0.003	+/- 0.002	I
PIN	11/13/2014	S355A	0.007	+/- 0.002	
PIN	11/13/2014	S355B	0.006	+/- 0.002	
PIN	11/17/2014	S12A	0.012	+/- 0.002	
PIN	11/17/2014	S12C	0.007	+/- 0.002	
PIN	11/17/2014	S333	0.007	+/- 0.002	
PIE	11/17/2014	S332DX	0.005	+/- 0.002	
PIN	11/17/2014	S356-334	0.008	+/- 0.002	
PIE	11/18/2014	S18C	0.004	+/- 0.002	
PIN	11/24/2014	S12A	0.008	+/- 0.002	
PIN	11/24/2014	S12D	0.007	+/- 0.002	
PIN	11/24/2014	S333	0.007	+/- 0.002	
PIE	11/24/2014	S332DX	0.006	+/- 0.002	
PIN	11/24/2014	S356-334	0.007	+/- 0.002	
PIN	11/25/2014	S355A	0.008	+/- 0.002	
PIN	11/25/2014	S355B	0.009	+/- 0.002	
PIE	11/25/2014	S18C	0.003	+/- 0.002	I
PIN	12/1/2014	S12A	0.008	+/- 0.002	
PIN	12/1/2014	S12D	0.006	+/- 0.002	
PIN	12/1/2014	S333	0.006	+/- 0.002	
PIN	12/1/2014	S356-334	0.007	+/- 0.002	
PIE	12/1/2014	S332DX	0.005	+/- 0.002	
EVPA	12/2/2014	LOX3	0.006	+/- 0.002	
EVPA	12/2/2014	LOX5	0.006	+/- 0.002	
EVPA	12/2/2014	LOX10	0.006	+/- 0.002	
EVPA	12/2/2014	LOX9	0.008	+/- 0.002	
EVPA	12/2/2014	LOX8	0.007	+/- 0.002	
EVPA	12/2/2014	LOX7	0.007	+/- 0.002	
EVPA	12/2/2014	LOX4	0.007	+/- 0.002	
PIE	12/2/2014	S18C	0.002	+/- 0.002	I
EVPA	12/3/2014	LOX12	0.005	+/- 0.002	
EVPA	12/3/2014	LOX15	0.004	+/- 0.002	
EVPA	12/3/2014	LOX16	0.005	+/- 0.002	
EVPA	12/3/2014	LOX14	0.005	+/- 0.002	
EVPA	12/3/2014	LOX13	0.006	+/- 0.002	
EVPA	12/3/2014	LOX11	0.004	+/- 0.002	
EVPA	12/3/2014	LOX6	0.004	+/- 0.002	
PIN	12/8/2014	S12A	0.008	+/- 0.002	
PIN	12/8/2014	S12B	0.009	+/- 0.002	
PIN	12/8/2014	S12C	0.007	+/- 0.002	

Project	Date Collected	Station	Total Phosphorus Result (mg/L)	Uncertainty (mg/L)	Qualifier Code
PIN	12/8/2014	S12D	0.007	+/- 0.002	
PIN	12/8/2014	S333	0.007	+/- 0.002	
PIN	12/8/2014	S356-334	0.007	+/- 0.002	
PIE	12/8/2014	S332DX	0.006	+/- 0.002	
PIN	12/9/2014	S355A	0.008	+/- 0.002	
PIN	12/9/2014	S355B	0.009	+/- 0.002	
PIE	12/9/2014	S18C	0.004	+/- 0.002	
PIN	12/15/2014	S12A	0.009	+/- 0.002	
PIN	12/15/2014	S12D	0.007	+/- 0.002	
PIN	12/15/2014	S333	0.007	+/- 0.002	
PIN	12/15/2014	S356-334	0.008	+/- 0.002	
PIE	12/15/2014	S332DX	0.005	+/- 0.002	
PIE	12/16/2014	S18C	0.002	+/- 0.002	I
PIN	12/22/2014	S12A	0.007	+/- 0.002	
PIN	12/22/2014	S333	0.008	+/- 0.002	
PIN	12/22/2014	S356-334	0.006	+/- 0.002	
PIE	12/22/2014	S332DX	0.004	+/- 0.002	
PIN	12/23/2014	S355A	0.010	+/- 0.002	
PIN	12/23/2014	S355B	0.011	+/- 0.002	
PIE	12/23/2014	S18C	0.004	+/- 0.002	G
PIN	12/29/2014	S12A	0.013	+/- 0.002	
PIN	12/29/2014	S333	0.010	+/- 0.002	
PIN	12/29/2014	S356-334	0.007	+/- 0.002	
PIE	12/29/2014	S332DX	0.005	+/- 0.002	
PIE	12/30/2014	S18C	0.002	+/- 0.002	I

**Notes:**

Qualifier code:

I: indicates the reported value is greater than or equal to the MDL but less than PQL

G: indicates that the analyte was detected at or above the method detection limit in both the sample and the associated equipment blank (EB), field blank (FB), or trip blank (TB), and the blank value was greater than 10% of the associated sample value