

Quality Assessment Report for Water Quality Monitoring

April – June 2011



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Technical Oversight Committee
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INTRODUCTION

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 April 1, 2011, through June 30, 2011:

- Everglades National Park Inflows North (PIN): S12A, S12B, S12C, S12D, S333, S355A, S355B, and S356-334
- Everglades National Park Inflow East (PIE): S332DX, S18C, DS2, 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 2010a) provides the minimum requirements followed in field sample collection. The *Chemistry Laboratory Quality Manual* (SFWMD 2010b) 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 C contains all total phosphorus results for samples of interest to the Everglades Technical Oversight Committee (TOC), collected from April 1, 2011, through June 30, 2011.

This report includes an analysis of the District laboratory's performance on the split (EVPA) and inter-laboratory studies 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 Program (NELAP) accreditation process.

Additionally, provided is an explanation of revision to the January – March 2011 Quality Assurance Report for Water Quality Monitoring for removal of "PMF" coded qualifier for EVPA project, collected for stations LOX7 and LOX8 on March 3, 2011 (**Appendix B**).

FIELD SAMPLING QUALITY ASSESSMENT

PROCEDURE UPDATES

The procedure for sample association of the equipment blanks was changed on May 1, 2011. Under the new procedure, equipment blanks (EB) are associated with all samples collected on the same sampling trip. For example, if the analyte is detected at or above the method detection limit in the EB, all samples from the trip are associated samples and any sample value that is less than (or equal to) 10 times the EB value are qualified with the "J9" code.

MISSING DATA

Table 1 lists the missing data for this reporting period. One hundred-one data points were missing (not collected) due to lack of flow, shallow water depth or insufficient water level.

Table 1. Missing data for April 1 to June 30, 2011.

Project	Collection Date	Station	Comments
EVPA	5-Apr-11	LOX3	Site dry, no samples collected.
EVPA	5-Apr-11	LOX4	Site dry, no samples collected.
EVPA	5-Apr-11	LOX5	Site dry, no samples collected.
EVPA	5-Apr-11	LOX7	Site dry, no samples collected.
EVPA	5-Apr-11	LOX9	Site dry, no samples collected.
EVPA	5-Apr-11	LOX10	Total depth less than 0.10 m, no sample collected
PIE	5-Apr-11	BERMB3	Site dry, no samples collected.
EVPA	6-Apr-11	LOX6	Total depth less than 0.10 m, no sample collected
PIN	6-Apr-11	S12B	No flow, no sample collected.
PIN	6-Apr-11	S12C	No flow, no sample collected.
PIN	6-Apr-11	S12D	No flow, no sample collected.
PIN	12-Apr-11	S12B	No flow, no sample collected.
PIN	12-Apr-11	S12C	No flow, no sample collected.
PIN	12-Apr-11	S12D	No flow, no sample collected.
PIN	12-Apr-11	S355A	No flow, no sample collected.
PIN	12-Apr-11	S355B	No flow, no sample collected.
PIE	18-Apr-11	BERMB3	Site dry, no samples collected.
PIN	19-Apr-11	S12B	No flow, no sample collected.
PIN	19-Apr-11	S12C	No flow, no sample collected.
PIN	19-Apr-11	S12D	No flow, no sample collected.
PIN	19-Apr-11	S355A	No flow, no sample collected.
PIN	19-Apr-11	S355B	No flow, no sample collected.
PIN	26-Apr-11	S12B	No flow, no sample collected.
PIN	26-Apr-11	S12C	No flow, no sample collected.
PIN	26-Apr-11	S12D	No flow, no sample collected.
PIN	26-Apr-11	S355A	No flow, no sample collected.
PIN	26-Apr-11	S355B	No flow, no sample collected.
PIE	2-May-11	BERMB3	Site dry, no samples collected.
PIN	3-May-11	S12B	No flow, no sample collected.
PIN	3-May-11	S12C	No flow, no sample collected.
PIN	3-May-11	S12D	No flow, no sample collected.
EVPA	3-May-11	LOX3	Site dry, no samples collected.
EVPA	3-May-11	LOX4	Site dry, no samples collected.
EVPA	3-May-11	LOX5	Site dry, no samples collected.
EVPA	3-May-11	LOX7	Site dry, no samples collected.
EVPA	3-May-11	LOX8	Site dry, no samples collected.
EVPA	3-May-11	LOX9	Site dry, no samples collected.

Project	Collection Date	Station	Comments
EVPA	3-May-11	LOX10	Site dry, no samples collected.
EVPA	4-May-11	LOX6	Site dry, no samples collected.
EVPA	4-May-11	LOX11	Total depth less than 0.10 m, no sample collected
EVPA	4-May-11	LOX12	Total depth less than 0.10 m, no sample collected
EVPA	4-May-11	LOX13	Total depth less than 0.10 m, no sample collected
EVPA	4-May-11	LOX14	Total depth less than 0.10 m, no sample collected
EVPA	4-May-11	LOX15	Site dry, no samples collected.
EVPA	4-May-11	LOX16	Site dry, no samples collected.
PIN	10-May-11	S12B	No flow, no sample collected.
PIN	10-May-11	S12C	No flow, no sample collected.
PIN	10-May-11	S12D	No flow, no sample collected.
PIN	10-May-11	S355A	No flow, no sample collected.
PIN	10-May-11	S355B	No flow, no sample collected.
PIE	16-May-11	BERMB3	Site dry, no samples collected.
PIN	17-May-11	S12B	No flow, no sample collected.
PIN	17-May-11	S12C	No flow, no sample collected.
PIN	17-May-11	S12D	No flow, no sample collected.
PIN	17-May-11	S355A	No flow, no sample collected.
PIN	17-May-11	S355B	No flow, no sample collected.
PIN	24-May-11	S12B	No flow, no sample collected.
PIN	24-May-11	S12C	No flow, no sample collected.
PIN	24-May-11	S12D	No flow, no sample collected.
PIN	24-May-11	S355A	No flow, no sample collected.
PIN	24-May-11	S355B	No flow, no sample collected.
PIE	31-May-11	BERMB3	Site dry, no samples collected.
EVPA	1-Jun-11	LOX3	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX4	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX5	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX6	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX7	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX8	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX9	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX10	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX11	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX12	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX13	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX14	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX15	Site not visited, water level too low – TOC approved
EVPA	1-Jun-11	LOX16	Site not visited, water level too low – TOC approved
PIN	1-Jun-11	S12B	No flow, no sample collected.
PIN	1-Jun-11	S12C	No flow, no sample collected.
PIN	1-Jun-11	S12D	No flow, no sample collected.
PIN	1-Jun-11	S355A	No flow, no sample collected.

Project	Collection Date	Station	Comments
PIN	1-Jun-11	S355B	No flow, no sample collected.
PIN	7-Jun-11	S12B	No flow, no sample collected.
PIN	7-Jun-11	S12C	No flow, no sample collected.
PIN	7-Jun-11	S12D	No flow, no sample collected.
PIE	13-Jun-11	BERMB3	Site dry, no samples collected.
PIN	14-Jun-11	S12B	No flow, no sample collected.
PIN	14-Jun-11	S12C	No flow, no sample collected.
PIN	14-Jun-11	S12D	No flow, no sample collected.
PIN	14-Jun-11	S355A	No flow, no sample collected.
PIN	14-Jun-11	S355B	No flow, no sample collected.
PIN	21-Jun-11	S12B	No flow, no sample collected.
PIN	21-Jun-11	S12C	No flow, no sample collected.
PIN	21-Jun-11	S12D	No flow, no sample collected.
PIN	21-Jun-11	S355A	No flow, no sample collected.
PIN	21-Jun-11	S355B	No flow, no sample collected.
PIE	27-Jun-11	BERMB3	Site dry, no samples collected.
PIN	28-Jun-11	S12B	No flow, no sample collected.
PIN	28-Jun-11	S12C	No flow, no sample collected.
PIN	28-Jun-11	S12D	No flow, no sample collected.
PIN	28-Jun-11	S355A	No flow, no sample collected.
PIN	28-Jun-11	S355B	No flow, no sample collected.

FIELD QUALITY CONTROL

Field QC measures consist of equipment blanks (EB), field-cleaned equipment blanks (FCEB), equipment blanks (EB), split samples (SS), and replicate samples (RS). **Table 2** summarizes EB, FCEB and FB results for projects of interest to the Technical Oversight Committee (TOC), as referenced in the table's footnotes. **Table 3** summarizes the field precision results and shows that the field sampling precision was acceptable for all but one PIE project. **Table 4** summarizes the qualified field blank. TP was qualified a "J9" code in the EB at S18C for analyte detected in the field blank. **Table 5** shows all TP data qualified with a "J9" code associated with this field generated blanks (EB).

Table 2. Field and equipment TP blank results.

Type of Blank	Project	Number of Blanks Collected	Number of Blanks Analyte (were) detected	% < 0.002 mg/L	% ≥ 0.002 mg/L
EB	PIN	0	0	NA	NA
	EVPA	2	0	100	0
	PIE	8	4	50	50
FCEB	EVPA	2	0	100	0
	PIE	15	0	100	0
	PIN	13	0	100	0

Table 2. Field and equipment TP blank results.

Type of Blank	Project	Number of Blanks Collected	Number of Blanks Analyte (were) detected	% < 0.002 mg/L	% ≥ 0.002 mg/L
FB	EVPA	1	0	100	0
	PIE	13	0	100	0

Notes:

- All blanks from sampling events containing grab and auto-sampler samples collected during the sampling event on the day adjacent to the collection date for the compliance samples.
- FCEB, EB and FB acceptance criteria must be less than the MDL.
- When sample concentrations are less than 10 times the blank values that were equal or greater than the MDL, the qualifier “J9” is assigned to the associated sample(s).
- mg/L – milligram per liter

Table 3. Precision summary for TP field replicates.

Project Code	Number of Samples (Replicates)	Date Collected	% RSD	Average Value (mg/L)	Comments
PIN*	3	7-Apr-11	22.7	0.053	A precision criterion was not met.
PIN*	3	4-Apr-11	1.9	0.052	A precision criterion was met.
PIE*	3	25-Apr-11	3.7	0.016	A precision criterion was met.
EVPA	3	6-Apr-11	7.9	0.007	A precision criterion was met.
PIE	2	4-Apr-11	0.0	0.006	A precision criterion was met.
PIE	2	4-Apr-11	0.0	0.008	A precision criterion was met.

Notes:

- *Samples not associated with the stations of interest
- Only replicates from sampling events containing samples collected at stations listed in the Introduction are included in this analysis. The QC replicates may have been collected during the sampling event on the day adjacent to the collection date for the compliance samples.
- The SFWMD’s chemistry laboratory conducted all TP analyses.
- Field precision must be ≤ 20%. The laboratory applied this criterion only if sample values were greater than the practical quantitation limit (PQL), which is four times the MDL.
- Qualifiers applied to samples (replicates) that a precision criterion was not met.

Table 4. Field blanks qualified with “J9” code

Type of Blank	Project	Station	Date Collected	Value (mg/L)	Comments
EB	PIE	S18C	31-May-11	0.004	EB ≥ MDL

Table 5. List of qualified TP data

Project Code	Date Collected	Station	Flag	Result (mg/L)	Comments
PIE	31-May-11	S332DX	J9	0.015	Sample associated with EB \geq MDL and \leq 10 times of EB (see Table4).
PIE	31-May-11	S18C	J9	0.011	Sample associated with EB \geq MDL and \leq 10 times of EB (see Table4).

- The value of 10 times the blank value equal to or greater than the sample value qualified with data code "J9" (FDEP QA Rule Chapter 62-160.700, F.A.C.)

FIELD AUDIT

There were no audits related to TOC water quality stations conducted during the second quarter of 2011.

LABORATORY ANALYSIS QUALITY ASSESSMENT

PROCEDURE UPDATES

The TP analytical procedure 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 6** show the TP recoveries from various types and levels of QC samples at the SFWMD laboratory from April 1, 2011 through June 30, 2011. Control charts provide a graphical means to demonstrate statistical control, monitoring 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 1a shows the recoveries for laboratory control sample (LCS1) at TP concentration 0.300 milligrams per liter (mg/L) varied from 97 to 103%, and mean central line value of 99.7% based on 491 results. The acceptable control limit is 90-110%.

Figure 2a shows the recoveries for laboratory control sample (LCS3) at TP concentration 0.020 mg/L varied from 90 to 105%, and mean central line value of 98.1% based on 94 results. The acceptable control limit is 90-110%.

Figure 3a shows the recoveries for continuing calibration verification sample (CCV) at TP concentration 0.200 mg/L varied from 98 to 103%, and mean central line value of 100.3% based on 397 results. The acceptable control limit is 95-105%.

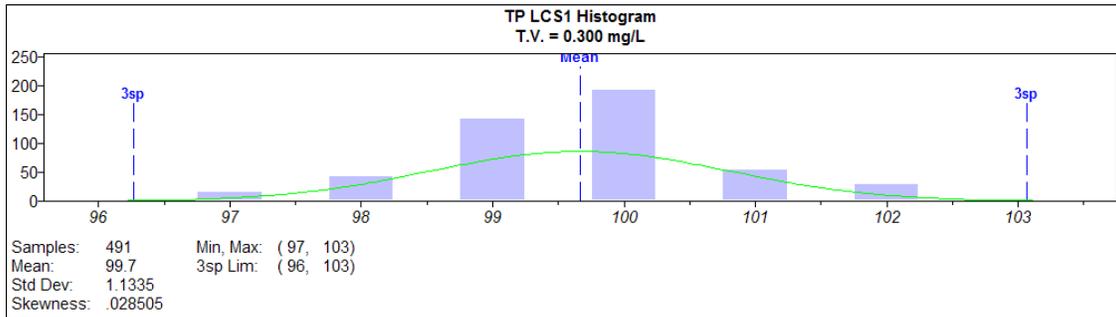
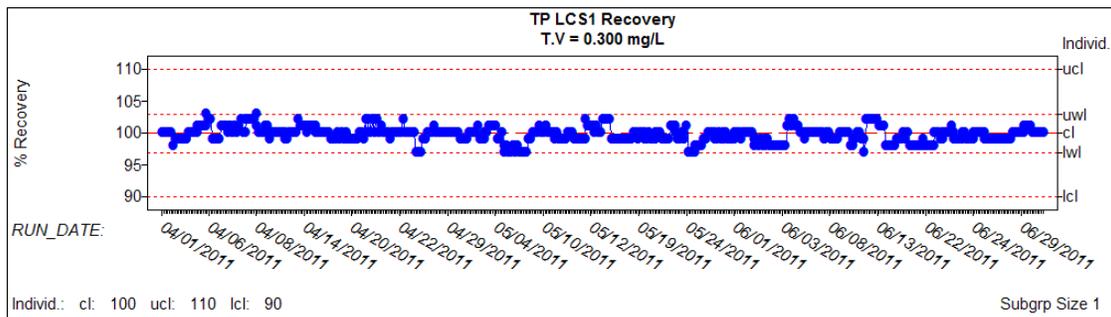
Figure 4a shows the recoveries for the MDL sample (LCS5) at TP concentration 0.004 mg/L varied from 0.003 to 0.005 mg/L based on 94 results.

Figures 5 and 6 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. If any deficiencies are noted, the samples have exceeded the

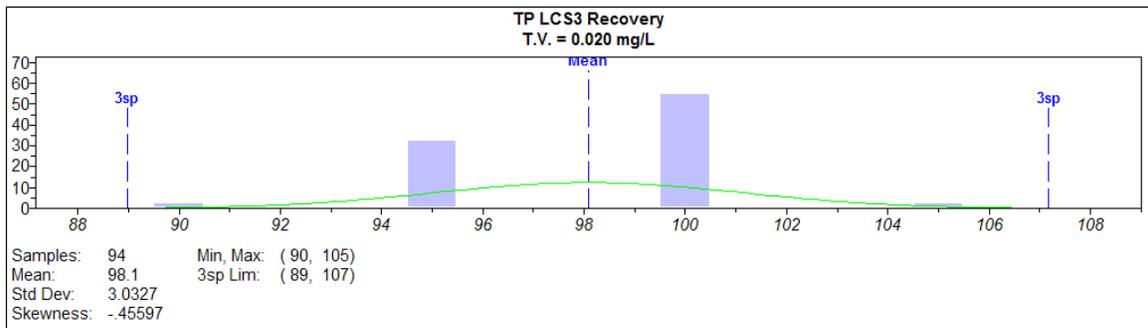
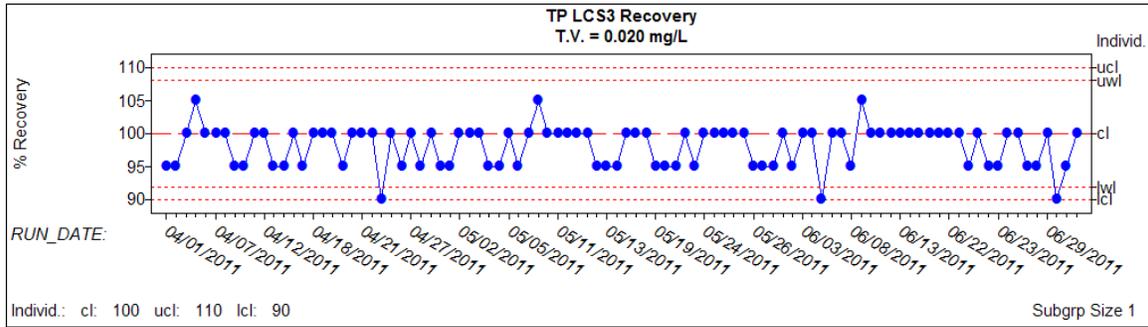
required holding times, and the laboratory cannot reanalyze the data, then the sample is qualified accordingly.

Recoveries for the QC samples are within ± 10 percent of the true value, which is acceptable. 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. An organic check is a solution prepared from phytic acid, which is a stable form of organic phosphate used to prepare matrix spikes, the mean recovery for which was 99.5 percent.

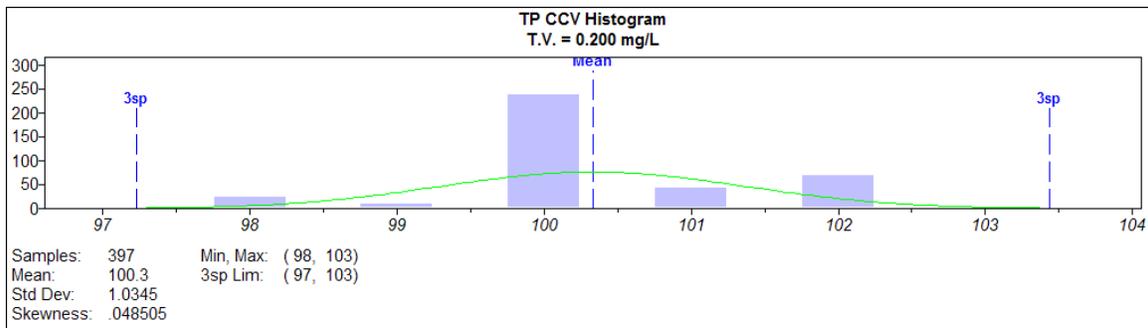
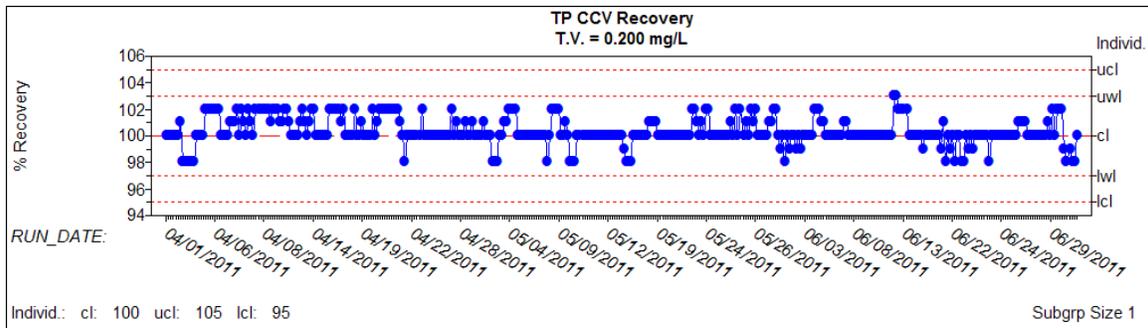
Figures 1b through 6b show the distributed of quality control samples in the roughly symmetrical bell-shape form with most values clustered around the central line.



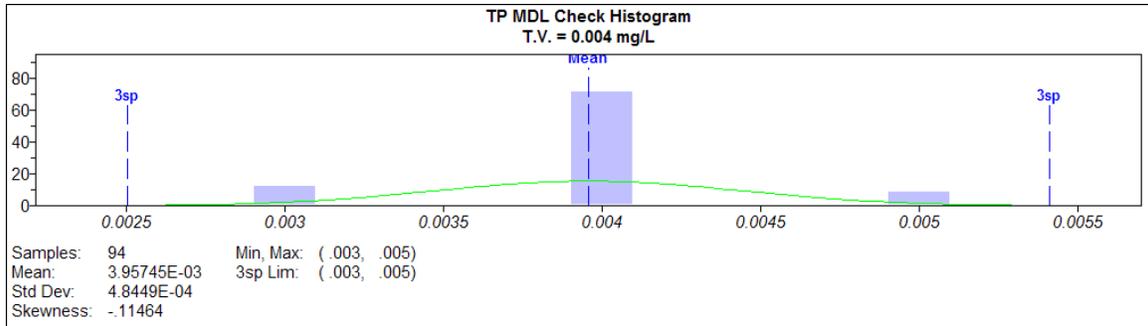
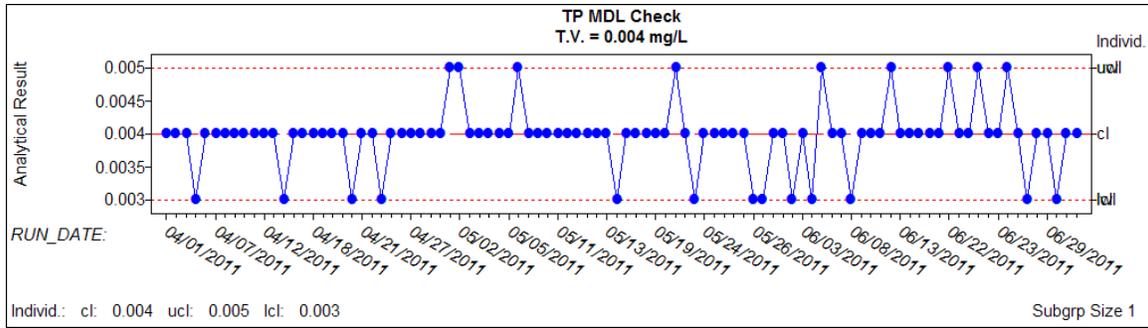
Figures 1a and 1b. TP QC (Laboratory Control Sample, 0.300 mg/L) sample recoveries and histogram.



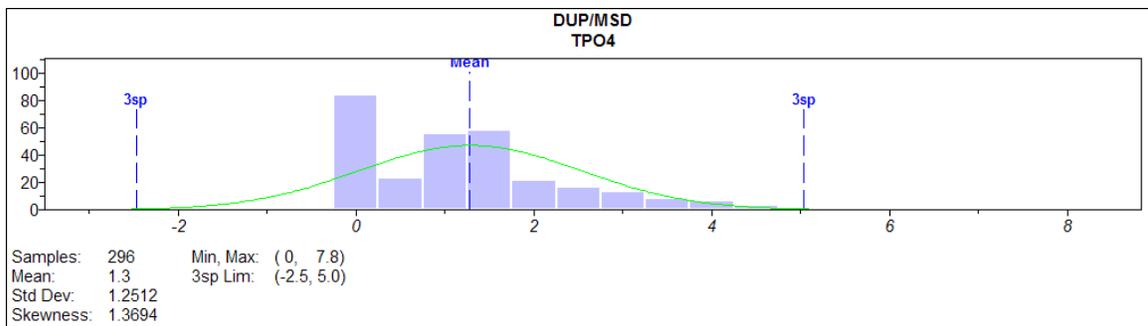
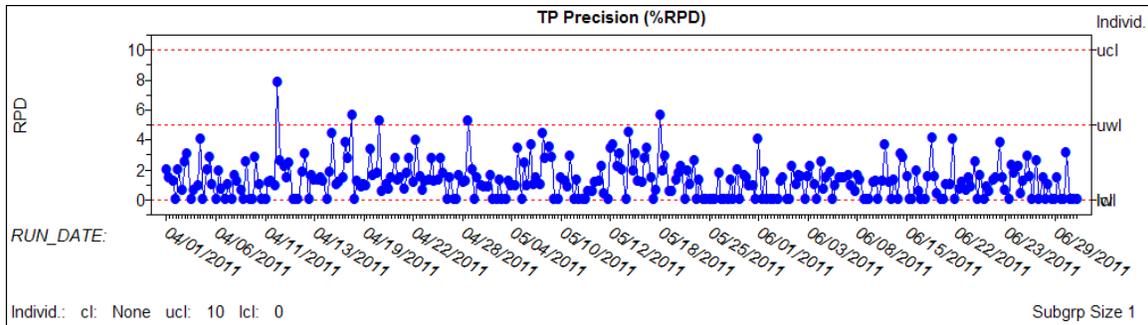
Figures 2a and 2b. TP QC (Laboratory Control Sample, 0.020 mg/L) sample recoveries and histogram.



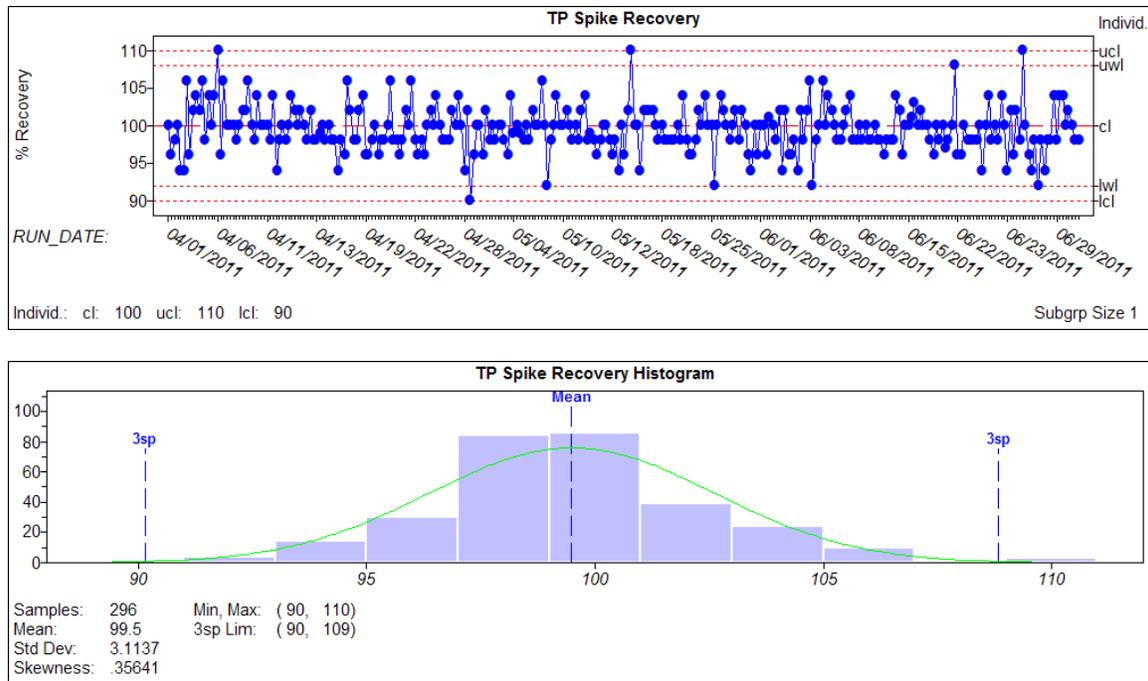
Figures 3a and 3b. TP QC (Continuing Calibration Verification Sample, 0.200 mg/L) sample recoveries and histogram.



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



Figures 5a and 5b. TP precision (%) relative percent different and histogram.



Figures 6a and 6b. TP spike recovery (%) data and histogram

Notes for Figures 1 through 6:

- 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

ESTIMATION OF ANALYTICAL MEASUREMENT UNCERTAINTY

The estimated analytical uncertainty for total phosphorus conducted by the SFWMD laboratory for the last quarter (April-June 2011) was determined to be 4.2 percent (with a 95 percent confidence level). This result applies to the analytical process and does not include uncertainty attributed to field sampling activities (e.g., sample collection and sample location effects). **Figure 7** is presented to clarify the concept of MDL and practical quantitation limit (PQL) of a measurement process.

Uncertainty of Measurement Close to the Detection Limit

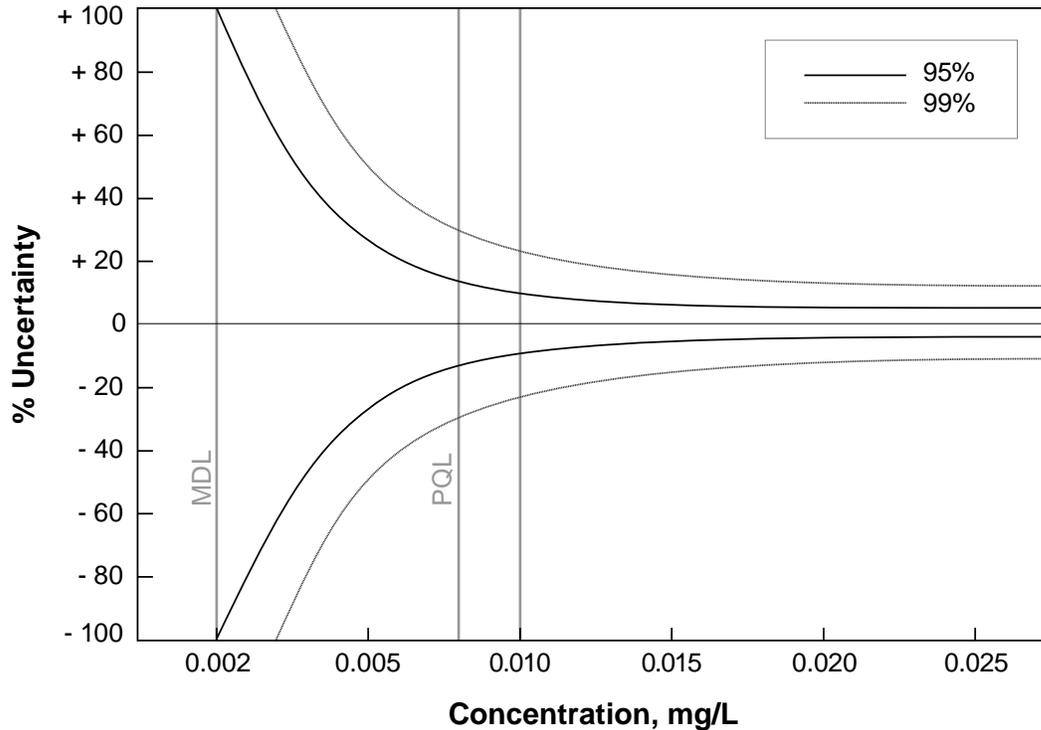


Figure 7. Uncertainty of TP measurement close to the detection limit.

METHOD DETECTION LIMIT AND PRACTICAL QUANTITATION LIMIT

MDL checks are routinely analyzed with each analytical run. From April 1 to June 30, 2011, 94 results for MDL checks were reported for TP measurements. The calculated MDL from these results was determined to be 0.001 milligram per liter (mg/L), using the procedure described in 40 CFR 136 Appendix B and the calculated PQL for this period was 0.004 mg/L. At this concentration, the relative uncertainty in the measured value is estimated to be ± 30 percent at the 95 percent confidence level (Taylor 1987).

The reported values between the MDL (established at 0.002 mg/L) and PQL (established at 0.008 mg/L) are assigned the “I” qualifier, indicating that the results are at concentrations that cannot be accurately quantified.

INTER-LABORATORY QUALITY CONTROL ASSESSMENT

SPLIT STUDIES WITH FDEP LABORATORY

To continuously assess comparability of results, the SFWMD routinely sends split samples to other laboratories. The statistical evaluation contains the EVPA Quarterly Splits conducted between the FDEP and the SFWMD's laboratory from June 2010 to April 2011 (see **Appendix A**) provided the data used in this analysis. **Figure 8** presents regression analysis of all data, and **Table 6** presents summary statistics for the data pairs.

ALL DATA

Figure 8 shows that the intercept is not statistically different from zero and the slope is not statistically different from one for all TP data from both laboratories. The r^2 (R-square) value is 0.8073. The intercept of the regression is not statistically different from zero since the 95 percent confidence interval for the intercept contains zero. The slope of the regression is not different from one statistically since the 95 percent confidence interval for slope contains one.

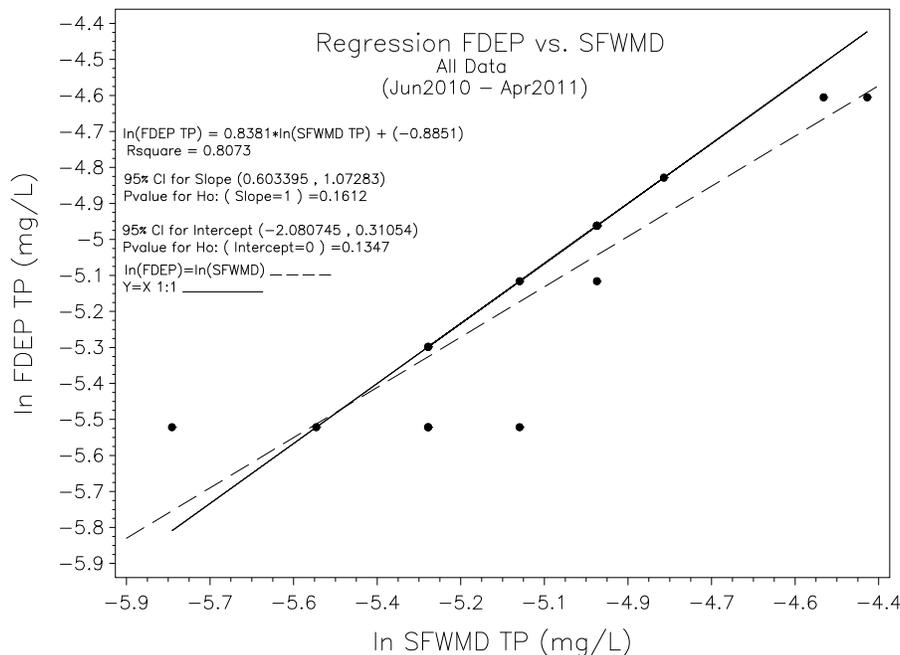


Figure 8. Regression analysis for all TP data.

Table 6 shows that the mean difference is marginally statistically significant, while the median difference is not statistically significant. The paired t-test and signed-rank test yield p-values of 0.0483 and 0.094 respectively.

TP ≥ 0.020 mg/L

There were not any data points in this range where the TP was greater than or equal to 0.020 mg/L.

Table 6. Comparison of SFWMD and FDEP split TP samples.

All Data	Summary Statistics			
	Lab	N	Mean (mg/L)	Median (mg/L)
	FDEP	16	0.006	0.006
	SFWMD	16	0.007	0.006
	Statistical Test of Hypotheses			
	Summary of Paired Differences (mg/L)	Hypothesis	Test	P-value
	Mean of Differences	0.0004	Mean of Differences = 0	Student's t
Median of Differences	0.000	Median of Differences = 0	Signed Rank	0.094

Notes:

- Differences calculated as the SFWMD TP minus the FDEP TP. The mean and median differences for all concentration levels are at or below the MDL.
- Data were not used in this comparison study if the FDEP value was below the FDEP's detection limit (0.004 mg/L).

TP < 0.020 mg/L

All results for this analysis fell into the TP less than 0.020 mg/L range. The results for all “All Data” range are comparisons of concentration at this level.

In summary, the differences for all TP levels were below the MDL for both laboratories and the difference was statistically insignificant in both; the sign-rank test ($p > 0.05$) for non-normally distributed paired data and linear regression.

NATIONAL PROFICIENCY TESTING PROGRAM

As a requirement for laboratory certification, the SFWMD's laboratory performs proficiency testing on environmental samples on a semiannual basis. The result for the SFWMD's laboratory from the most recent proficiency testing study (March to April 2011) are shown in **Table 7**.

Table 7. Proficiency testing WP-194

Assigned Value	4.48 mg/L
Study Mean Value	4.50 mg/L
Reported Value	4.49 mg/L
Acceptance Limits	3.67 – 5.35 mg/L
Performance Evaluation	Acceptable

Notes:

- Assigned Value – this value is the calculated True Value of the standard based upon the actual composition of the standard.
- Study Mean Value – this value is calculated using all reported values after the removal of outliers.
- Reported Value – the test result reported to the study provider for a specific analyte.
- Acceptance Limits – this limit is calculated upon the US Environmental Protection Agency (EPA) National Standards for Water Proficiency Testing Criteria Document. For the Water Pollution Program (WP), EPA Acceptance Limits are defined as \pm three (3) EPA Standard Deviation from the EPA Mean.

REFERENCES

- SFWMD. 2010a. Field Sampling Quality Manual, SFWMD-FIELD-QM-001-06. South Florida Water Management District, Water Quality Monitoring Division. West Palm Beach, FL.
- SFWMD. 2010b. Chemistry Laboratory Quality Manual, SFWMD-LAB-QM-2010-01. South Florida Water Management District, Analytical Services Division, West Palm Beach, FL.
- Taylor, J.K. 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Chelsea, MI.
- Environmental Analytical Measurement Uncertainty Estimation. Nested Hierarchical Approach. William S. Ingersoll, Defense Technical Information Center #ADA396946, 2001

GLOSSARY

- 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):** A general term used for analyte-free water that is processed on site through all sampling equipment used in routine sample processing. May be an assessment of effectiveness of laboratory decontamination or on site (field) decontamination (FCEB).
- Field Blank (FB):** Analyte-free water that is poured directly into the sample container on site during routine collection, preserved, and kept open until sample collection is completed for the routine sample at that site. FB values are indicative of environmental contamination on site.
- Field Cleaned Equipment Blank (FCEB):** Analyte-free water that is processed on-site, after the first sampling site, through all sampling equipment used in routine sample processing. EB values are indicative of the effectiveness of the decontamination process.
- 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 section 40 CFR, Part 136, Appendix B, as established by the U.S. 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. Generally, the PQL is 12 times the standard deviation that is derived from the procedure used to determine the MDL, or can be assumed to be four times the MDL.
- 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 $\%RSD = [Std. Deviation / Mean] * 100$.
- Replicate Sample (RS):** A second sample collected from the same source as the routine sample, using the same sampling equipment. RS data are compared to routine sample to evaluate sampling precision.
- Split Sample (SS):** A second sample collected from the same sample obtained from the same sampling device. Results for SS are compared with routine sample results; agreement between these two results is mostly an indication of laboratory precision.
- 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 σ is a standard deviation) (EURACHEM).

APPENDIX A

Results of TP split studies between the SFWMD and FDEP laboratories,
EVPA Project, June 2010–April 2011.

Sample	Date	SFWMD	FDEP	%RPD/Comments
EVPA	2-Jun-10	0.005 (I)	0.005 (I)	<PQL
EVPA	2-Jun-10	0.007 (I)	0.006 (I)	<PQL
EVPA	3-Jun-10	0.005 (I)	0.005 (I)	<PQL
EVPA	3-Jun-10	0.012	0.010 (I)	18.2
EVPA	7-Sep-10	0.006 (I)	0.006 (I), (Y)	<PQL
EVPA	7-Sep-10	0.007 (I)	0.007 (I), (Y)	<PQL
EVPA	8-Sep-10	0.005 (I)	0.004 (I), (Y)	<PQL
EVPA	8-Sep-10	0.006 (I)	0.004 (I), (Y)	<PQL
EVPA	6-Dec-10	0.007 (I) (J)	0.007 (I)	<PQL
EVPA	7-Dec-10	0.003 (I)	0.004 (I)	<PQL
EVPA	7-Dec-10	0.004 (I)	0.004 (I)	<PQL
EVPA	7-Dec-10	0.005 (I)	0.004 (I)	<PQL
EVPA	6-Apr-11	0.007 (I)	0.007 (I)	<PQL
EVPA	6-Apr-11	0.011	0.010 (I)	9.5
EVPA	6-Apr-11	0.008	0.008 (I)	<PQL
EVPA	6-Apr-11	0.007 (I)	0.007 (I)	<PQL

Notes:

** Equipment blanks (EB) associated with this result were improperly preserved

Qualifier codes:

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

U: indicates the compound was analyzed for but not detected

Y: sample temperature is outside acceptable range

J: sample associated with EB \geq MDL

SFWMD: reported MDL = 0.002 mg/L and PQL = 0.008 mg/L

FDEP: reported MDL = 0.004 mg/L and PQL = 0.010 mg/L

APPENDIX B

REVISION TO THE JANUARY – MARCH 2011 QUALITY ASSESSMENT REPORT FOR WATER QUALITY MONITORING

The “PMF” qualifiers and comments were removed for TP samples and equipment blank (EB) collected for EVPA project, stations LOX7 and LOX8 on March 3, 2011. Problems with the data set related to the quality assurance procedure-discrepancy of the time stamp and validity of field blank-were resolved after a thorough investigation, and the validity of data were confirmed (see **Table 4** and **Table 5**).

Table 4. Field blanks with “PMF” qualifier removed

Type of Blank	Project	Station	Date Collected	Value (mg/L)	Comments
EB	EVPA	LOX8	3-Mar-11	0.002 (U)	The sample collection time for the blank was estimated because the original recorded time occurs after the time from the laboratory login time stamp. There was no equipment used to collect and process the blank.

Table 5. TP data with “PMF” qualifier removed

Project Code	Date Collected	Station	Flag	Result (mg/L)	Comments
EVPA	3-Mar-11	LOX7	PMF	0.012	The sample collection time for the blank was estimated because the original recorded time occurs after the time from the laboratory login time stamp. There was no equipment used to collect or process the TP sample therefore the EB collected for the TP sample is considered representative of the TP sample. (see Table 4)
EVPA	3-Mar-11	LOX8	PMF	0.015	The sample collection time for the blank was estimated because the original recorded time occurs after the time from the laboratory login time stamp. There was no equipment used to collect or process the TP sample therefore the EB collected for the TP sample is considered representative of the TP sample. (see Table 4)

APPENDIX C

Total phosphorus results for projects and their associated stations specified in the Introduction from April 1 to June 30, 2011.

Project	Date Collected	Station	TP Result (mg/L)	Qualifier Code
PIE	4-Apr-11	S18C	0.006	I
EVPA	5-Apr-11	LOX8	0.048	
PIE	5-Apr-11	S332DX	0.012	
EVPA	6-Apr-11	LOX11	0.010	
EVPA	6-Apr-11	LOX12	0.007	I
EVPA	6-Apr-11	LOX13	0.007	I
EVPA	6-Apr-11	LOX14	0.012	
EVPA	6-Apr-11	LOX15	0.008	
EVPA	6-Apr-11	LOX16	0.011	
PIN	6-Apr-11	S12A	0.045	
PIN	6-Apr-11	S333	0.031	
PIN	6-Apr-11	S355A	0.050	
PIN	6-Apr-11	S355B	0.047	
PIN	6-Apr-11	S356-334	0.028	
PIE	11-Apr-11	S332DX	0.012	
PIE	11-Apr-11	S18C	0.006	I
PIN	12-Apr-11	S12A	0.067	
PIN	12-Apr-11	S333	0.027	
PIN	12-Apr-11	S356-334	0.023	
PIE	18-Apr-11	S332DX	0.012	
PIE	18-Apr-11	S18C	0.007	I
PIN	19-Apr-11	S12A	0.053	
PIN	19-Apr-11	S333	0.026	
PIN	19-Apr-11	S356-334	0.022	
PIE	25-Apr-11	S332DX	0.021	
PIE	25-Apr-11	S18C	0.008	
PIN	26-Apr-11	S12A	0.064	
PIN	26-Apr-11	S333	0.031	
PIN	26-Apr-11	S356-334	0.027	
PIE	2-May-11	S332DX	0.012	
PIE	2-May-11	S18C	0.009	
PIN	3-May-11	S12A	0.056	
PIN	3-May-11	S333	0.043	
PIN	3-May-11	S355A	0.036	
PIN	3-May-11	S355B	0.069	
PIN	3-May-11	S356-334	0.032	
PIE	9-May-11	S332DX	0.019	
PIE	9-May-11	S18C	0.011	
PIN	10-May-11	S12A	0.044	

Project	Date Collected	Station	TP Result (mg/L)	Qualifier Code
PIN	10-May-11	S333	0.050	
PIN	10-May-11	S356-334	0.031	
PIE	16-May-11	S332DX	0.017	
PIE	16-May-11	S18C	0.012	
PIN	17-May-11	S12A	0.043	
PIN	17-May-11	S333	0.029	
PIN	17-May-11	S356-334	0.024	
PIE	23-May-11	S332DX	0.014	
PIE	23-May-11	S18C	0.012	
PIN	24-May-11	S12A	0.059	
PIN	24-May-11	S333	0.030	
PIN	24-May-11	S356-334	0.023	
PIE	31-May-11	S332DX	0.015	J9
PIE	31-May-11	S18C	0.011	J9
PIN	1-Jun-11	S12A	0.074	
PIN	1-Jun-11	S333	0.039	
PIN	1-Jun-11	S356-334	0.029	
PIE	6-Jun-11	S332DX	0.016	
PIE	6-Jun-11	S18C	0.012	
PIN	7-Jun-11	S12A	0.078	
PIN	7-Jun-11	S333	0.030	
PIN	7-Jun-11	S355A	0.038	
PIN	7-Jun-11	S355B	0.053	
PIN	7-Jun-11	S356-334	0.030	
PIE	13-Jun-11	S332DX	0.016	
PIE	13-Jun-11	S18C	0.013	
PIN	14-Jun-11	S12A	0.062	
PIN	14-Jun-11	S333	0.049	
PIE	20-Jun-11	S332DX	0.018	
PIE	20-Jun-11	S18C	0.010	
PIN	21-Jun-11	S12A	0.078	
PIN	21-Jun-11	S333	0.035	
PIE	27-Jun-11	S332DX	0.014	
PIE	27-Jun-11	S18C	0.009	
PIN	28-Jun-11	S12A	0.083	
PIN	28-Jun-11	S333	0.030	

Notes:

Qualifier codes:

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

J9: indicates that the analyte was detected in field blank and associated sample