

PERFORMANCE EVALUATION



Scheduled Study

QT-0004045

31-Mar-2016 Through 14-Apr-2016

49670108

RTC Labcode

MT00945

EPA Labcode

Participating Laboratory:

Energy Laboratories-Helena
Jon Hager
E 3161 Lyndale Avenue
Helena MT 59601 US

Thank you for participating in study QT-0004045. Additional information about this study may be found online at www.sigmaaldrich.com/pt.

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Sincerely,

A handwritten signature in black ink, appearing to read "Jennifer Duhon".

Jennifer Duhon
Proficiency Testing Supervisor

Accreditors

Evaluations of this dataset will be sent to the accreditor(s) listed below using your laboratory's labcode listed above each accrediting agency. If any of the information listed below is incorrect, please contact RTC immediately.

RTC is accredited to perform PT programs for the scope of accreditation to ISO/IEC 17043 under ACLASS certificate AP-1469



Demands

Method: EPA 410.4 [10077006]

Analyte	Result Units	Assigned Value	Accept. Window	Z	Evaluation
Chemical oxygen demand (COD) ^{1,2} 1565 / PE1130-20ML - Lot LRAB0835 /Analyst:CM/ Analysis Date: 2016-04-04	94 mg/L	88.1	67.4 to 109	0.86	Acceptable
		<i>Evaluation Criteria - 1</i> <input type="checkbox"/> Voluntary			<i>Evaluation Parameter - a:0.9843, b:-0.3171, c:0.0432, d:3.0191</i>

Miscellaneous Analytes

Method:EPA 1632A (1998) [10123407]

Analyte	Result Units	Assigned Value	Accept. Window	Z	Evaluation
Arsenic (V) ² 1011 / PE1075-20ML - Lot LRAB1199 /Analyst:RK/ Analysis Date: 2016-04-07	818 ug/L	753	527 to 979	0.86	Acceptable
		<i>Evaluation Criteria - 1</i> <input type="checkbox"/> Voluntary		<i>Evaluation Parameter - a:1, b:0, c:0.1, d:0</i>	
Arsenic (III) ^{1,2} 1012 / PE1075-20ML - Lot LRAB1199 /Analyst:RK/ Analysis Date: 2016-04-07	898 ug/L	913	639 to 1190	-0.16	Acceptable
		<i>Evaluation Criteria - 1</i> <input type="checkbox"/> Voluntary		<i>Evaluation Parameter - a:1, b:0, c:0.1, d:0</i>	

Method:SM 3114 C 22nd Ed (2011) [20060235]

Analyte	Result Units	Assigned Value	Accept. Window	Z	Evaluation
Selenium (VI) ^{1,2} 1141 / PE1075-20ML - Lot LRAB1199 /Analyst:RK/ Analysis Date: 2016-04-14	595 ug/L	697	488 to 906	-1.46	Acceptable
		<i>Evaluation Criteria - 1</i> <input type="checkbox"/> Voluntary		<i>Evaluation Parameter - a:1, b:0, c:0.1, d:0</i>	
Selenium (IV) ^{1,2} 1142 / PE1075-20ML - Lot LRAB1199 /Analyst:RK/ Analysis Date: 2016-04-12	855 ug/L	745	410 to 1080	0.98	Acceptable
		<i>Evaluation Criteria - 1</i> <input type="checkbox"/> Voluntary		<i>Evaluation Parameter - a:1, b:0, c:0.15, d:0</i>	

Group Analysis Summary

Acceptable : 4 / 4

Score : 100% - (Acceptable)

Nutrients

Method:EPA 350.1 2 (1993) [10063602]

Analyte	Result Units	Assigned Value	Accept. Window	Z	Evaluation
Ammonia as N ^{1,2} 1515 / PE1195-20ML - Lot LRAA9426 /Analyst:CM/ Analysis Date: 2016-04-05	6.9 mg/L	6.72	5.28 to 8.17	0.37	Acceptable <i>Evaluation Criteria - 1</i> <input type="checkbox"/> Voluntary <i>Evaluation Parameter - a:0.9923, b:0.0567, c:0.0583, d:0.0914</i>

Method:EPA 353.2 2 (1993) [10067604]

Analyte	Result Units	Assigned Value	Accept. Window	Z	Evaluation
Nitrate as N ^{1,2} 1810 / PE1195-20ML - Lot LRAA9426 /Analyst:AC/ Analysis Date: 2016-04-05	18.9 mg/L	18.9	15.8 to 21.9	0	Acceptable <i>Evaluation Criteria - 1</i> <input type="checkbox"/> Voluntary <i>Evaluation Parameter - a:0.9975, b:-0.0005, c:0.0506, d:0.0642</i>

Nitrate+nitrite as N ^{1,2} 1820 / PE1195-20ML - Lot LRAA9426 /Analyst:CM/ Analysis Date: 2016-04-04	18.9 mg/L	18.8	15.8 to 21.8	0.1	Acceptable <i>Evaluation Criteria - 1</i> <input type="checkbox"/> Voluntary <i>Evaluation Parameter - a:0.9957, b:-0.0010, c:0.0509, d:0.0400</i>
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Method:EPA 365.1 2 (1993) [10070005]

Analyte	Result Units	Assigned Value	Accept. Window	Z	Evaluation
Orthophosphate as P ^{1,2} 1870 / PE1195-20ML - Lot LRAA9426 /Analyst:CM/ Analysis Date: 2016-04-04	1.93 mg/L	2.1	1.79 to 2.42	-1.62	Acceptable <i>Evaluation Criteria - 1</i> <input type="checkbox"/> Voluntary <i>Evaluation Parameter - a:1, b:0, c:0.05, d:0</i>

Sample Information

DEMAND - WP

PE1130-20ML / Lot LRAB0835

Analytes	Units	Gravimetric Value	Study Mean	Study Std. Dev.
5-day BOD ^{1,2} 1530 Demands	mg/L	87.8±0.448	0	0
Carbonaceous BOD (CBOD) ^{1,2} 1555 Demands	mg/L	87.8±0.448	0	0
Chemical oxygen demand (COD) ^{1,2} 1565 Demands	mg/L	89.8±0.458	0	0
Dissolved organic carbon (DOC) ^{1,2} 1710 Demands	mg/L	35.5±0.181	0	0
Total organic carbon (TOC) ^{1,2} 2040 Demands	mg/L	35.5±0.181	0	0
5-day BOD ^{1,2} 1530 Miscellaneous Analytes	mg/L	87.8±0.448	0	0
Carbonaceous BOD (CBOD) ^{1,2} 1555 Miscellaneous Analytes	mg/L	87.8±0.448	0	0
Chemical oxygen demand (COD) ^{1,2} 1565 Miscellaneous Analytes	mg/L	89.8±0.458	0	0
Total organic carbon (TOC) ^{1,2} 2040 Miscellaneous Analytes	mg/L	35.5±0.181	0	0

SIMPLE NUTRIENTS - WP

PE1195-20ML / Lot LRAA9426

Analytes	Units	Gravimetric Value	Study Mean	Study Std. Dev.
Ammonia as N ^{1,2} 1515 Nutrients	mg/L	6.72±0.034	0	0
Nitrate as N ^{1,2} 1810 Nutrients	mg/L	18.9±0.096	0	0
Nitrate+nitrite as N ^{1,2} 1820 Nutrients	mg/L	18.9±0.096	0	0
Orthophosphate as P ^{1,2} 1870 Nutrients	mg/L	2.10±0.011	0	0
Ammonia as N ^{1,2} 1515	mg/L	6.72±0.034	0	0
Nitrate as N ^{1,2} 1810	mg/L	18.9±0.096	0	0
Nitrate+nitrite as N ^{1,2} 1820	mg/L	18.9±0.096	0	0
Orthophosphate as P ^{1,2} 1870	mg/L	2.10±0.011	0	0

Speciation - Arsenic and Selenium

PE1075-20ML / Lot LRAB1199

Analytes	Units	Gravimetric Value	Study Mean	Study Std. Dev.
Arsenic (V) ² 1011	ug/L	753±3.84	0	0
Arsenic (III) ^{1,2} 1012	ug/L	913±4.66	0	0
Selenium (VI) ^{1,2} 1141	ug/L	697±3.56	0	0
Selenium (IV) ^{1,2} 1142	ug/L	745±3.80	0	0

Definitions and Interpretation of Statistical Analysis:

Assigned Value: Value attributed to a particular quantity and accepted, sometimes by convention, as having an uncertainty appropriate for a given purpose. See ISO/IEC 17043 for additional information. In general the assigned value is the value used to assess proficiency and may or may not be the made to value (gravimetric value).

Accept. Window: The range of values that constitute acceptable performance for a laboratory participating in this PT study.

Z: A Z-Score tells how a single data point compares to normal data. A Z-Score says not only whether a point was above or below average, but how unusual the measurement is. Generally, a method result with a Z-Score less than |2| is considered to be in control, a Z-Score between |2| and |3| is considered 'Questionable', but still within control and a Z greater than |3| is considered not acceptable and the method is out of control. For WS studies, a z-score greater than |2| is unacceptable. Calculated as **Z = (Reported Value - Assigned Value) / Proficiency Std. Dev.**

Proficiency Std. Dev.: Standard deviation calculated based on **Evaluation Criteria.**

Study Mean: Statistical study mean calculated using a robust statistical model (RTC employs the 'Biweight Program'). Robust statistical techniques to minimize the influence that extreme results can have on estimates of the mean and standard deviation. NOTE - These techniques assign less weight to extreme results, rather than eliminate them from a data set.

Study Std. Dev.: Standard deviation calculated from study data using robust statisticals (Biweight).

Gravimetric Value: The 'prepared to' value, determined by gravimetric means. The uncertainty associated to this value is standard uncertainty and based on RTC's gravimetric tolerances.

Evaluation Criteria:

1 - Regression Equation - Acceptance windows based on TNI adopted equation of proficiency value +/- 3 proficiency standard deviations and check limits of proficiency value +/- 2 proficiency standard deviations. Proficiency value and proficiency standard deviation are calculated from gravimetric variables a, b, c, & d as proficiency value = a * gravimetric + b and proficiency standard deviation = c * gravimetric + d.

2 - Study Robust Mean and c,d regression - Acceptance windows based on TNI adopted equation of proficiency value +/- 3 proficiency standard deviations and check limits of proficiency value +/- 2 proficiency standard deviations. Proficiency value and proficiency standard deviation calculated from robust study mean and variables c & d as proficiency value = robust mean and proficiency standard deviation = c * proficiency value + d.

3 - Fixed Limits - Acceptance windows based on span of gravimetric percentage from gravimetric as gravimetric +/- gravimetric * percentage.

4 - Adjustable Fixed Limits - Acceptance windows base on a span of gravimetric percentage from gravimetric as gravimetric +/- gravimetric * lowPercentage where gravimetric < break and gravimetric +/-

gravimetric * highPercentage where gravimetric >= break.

5 - Study Statistics - Acceptance windows based on a number of standard deviations span from the study mean as study mean +/- (deviations * standard deviation).

6 - Log Transform Statistics - Acceptance windows based on lognormal distributed data. Acceptance windows = mean(lognormal) +/- span * standard deviation(lognormal).

7 - Reserved

8 - Regression Equation 2SD - Acceptance windows based on EPA equation of proficiency value +/- 2 proficiency standard deviations. Proficiency value and proficiency standard deviation are calculated from gravimetric variables a, b, c, & d as proficiency value = a * gravimetric + b and proficiency standard deviation = c * gravimetric + d. Generally reserved for drinking water studies.

Proficiency Test Item Preparation, Homogeneity and Stability Assessment - RTC uses proprietary and published methods for the manufacture, homogeneity and stability testing of proficiency test items. RTC's proficiency test materials meet requirements of ISO Guide 34. For more information contact RTC. Additionally RTC complies with TNI Volume 3 'General Requirements for Environmental Proficiency Test Providers', EL-V3-2009, 2009 for all TNI Fields of Proficiency Testing analytes.

Metrological Traceability - All preparations are made using balances calibrated annually traceable to NIST standards. Where appropriate analytical measurements are traceable through an unbroken chain to NIST standards, or a Certified Reference Material manufactured under ISO Guide 34 in conjunction with ISO/IEC 17025.

Statistical Analysis - RTC uses robust statistics to calculate study means and standard deviations - Reference - Kafadar, K, A Biweight Approach to the One-Sample Problem, Journal of the American Statistical Association, Vol. 77, No. 378, June, 1982, pp. 416-424.

Additional Information - Go to www.rt-corp.com/reporting for additional information on summary statistics for specific methods, advice on the interpretation of the statistical analysis, and additional comments/recommendations. If you failed an analyte it may be required to perform a corrective action and/or retest. RTC recommends that you contact your accreditation body for specific instruction.

Program analyte accrediting footnotes

¹ NELAC Compliant, covered by RTC's ACLASS Proficiency Testing Provider accreditation, Cert. AP-1469

² ISO 17043 Accredited, covered by RTC's ACLASS Proficiency Testing Provider accreditation, Cert AP-1469

Authorizing Officer:  _____

Date: 4/16/2016

Patrick Brumfield, ASQ CQA
QA Manager

This section of the report is for informational purposes only. If you are unsure about specific accreditation requirements, please contact your state coordinator.

UNACCEPTABLE ANALYTES

PASS RATE

Number of Reported Results:	9
Number of Passing Results:	9
Pass Rate:	100%