

Chemical Analysis Report

CEN-DIST-2023-11-21-02

Florida DEP Laboratory
2600 Blair Stone Road
Tallahassee, FL 32399-2400
DOH Accreditation E31780

Event Description: **Run 12**
Request ID: **RQ-2023-11-20-09**
Customer: **CEN-DIST**
Project ID: **SMP**

Send Reports to:
FL Dept. of Environmental Protection
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3319 Maguire Blvd., Suite 232
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Certified by: Colin Wright, Program Administrator

Date Certified: 08-DEC-2023 09:03



Case Narrative

Unless otherwise noted, all samples included in this report were received in accordance with protocols referenced in Chapter 62-160, Florida Administrative Code (F.A.C.). Results published in this report pertain only to the samples as submitted to, and received by the laboratory. All times in this report are adjusted to the applicable Eastern Time Zone (EST or EDT).

Results for the following analytical groups are included in this report: Metals and Nutrients.

Scientific notation may be used in reporting very large or small values. Values reported using scientific notation will take the form of the following example: 1.3E+03, which is equivalent to 1.3×10^3 or 1300.

Unless otherwise noted, analytical values for soil and sediment samples are reported on a dry weight basis, and analytical values for waste and tissue samples are reported on a wet weight basis.

Results for TNI accredited tests met requirements established by The NELAC Institute. A double asterisk (**) is used to indicate an analyte/matrix/method for which the laboratory is not TNI accredited by the Florida Department of Health Environmental Laboratory Certification Program or where accreditation for that field of testing is not applicable.

Any significant anomalies or deviations from established protocols are documented in Non-Conformance Reports, which, where appropriate, are included within this analytical report. Additional comments related to specific analytical tests may be included as remarks following the analytical results for each sample. Such comments and remarks are for informational purposes only and are not intended to convey judgement about the usability of the reported data.

A quality control report on the performance of the test method for the submitted samples is included. Uncertainty associated with the analytical results contained in this report can be estimated from the reported quality assurance results and from published quality control acceptance limits for each analytical test. Matrix quality control results (matrix spike recoveries and matrix sample precision) pertain only to the matrix sample tested and do not necessarily reflect test method performance for other samples.

Typical matrix quality control (QC) measurements may include matrix spike recovery, matrix spike duplicate recovery, matrix spike precision and matrix sample precision. Not all matrix QC results may be available or reportable; where they are not an explanation is provided. Typical reasons for unavailable QC results include, but are not limited to, a) insufficient matrix sample to perform some or all QC measurements; b) analyte concentration in the sample replicated was too low for a meaningful measurement of precision and c) analyte concentration in the matrix sample spiked was too high (relative to the amount of analyte spiked) for a meaningful measurement of recovery. Where matrix QC results are unavailable, other method performance metrics (e.g., LCS recovery, LCS precision, surrogate recovery) may be used to assess performance of the method. Comments explaining any missing QC measurements are not intended to convey any adverse conclusions about the quality of the reported data.

Precision is reported as relative percent difference unless otherwise noted.

Quality Control codes as defined below may be used in this report to indicate results that are associated with one or more quality control elements which did not fall within established test method criteria. Such results may be qualified as estimates using a J qualifier as required by 62-160 F.A.C. Explanations are included in the report for any results that were reported as estimates for other reasons.

QC Codes used in this report may include:

- LCS – Recovery for the batch Laboratory Control Sample (LCS) was outside existing control limits;
- MS – Recovery for the batch matrix spike (MS) was outside existing control limits;
- CCV – Recovery for a continuing calibration verification (CCV) standard was outside existing control limits;
- SUR – Recovery of a surrogate (SUR) for associated analytes was outside existing control limits;
- RPD – The precision, measured as relative percent difference (RPD), of batch replicate measurements was outside existing control limits;
- RSD – The precision, measured as relative standard deviation (RSD), of batch replicate measurements was outside existing control limits;
- SMP – Sample - used precision derived from replicate analyses of a sample;

The following data qualifiers are used, where applicable, in this report as specified in 62-160 F.A.C.

- A - Value reported is the mean of two or more determinations.
- B - Results based on colony counts outside the acceptable range.
- I - The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
- J - Estimated value and/or the analysis did not meet established quality control criteria.
- K - Actual value is known to be less than value given.
- L - Actual value is known to be greater than value given.
- N - Presumptive evidence of presence of material.
- O - Sampled, but analysis lost or not performed.
- Q - Sample held beyond normal holding time.
- T - Value reported is less than the criterion of detection.
- U - Material was analyzed for but not detected. The reported value is the method detection limit for the sample analyzed.
- V - Analyte was detected in both sample and method blank.
- X - Too few individuals to calculate SCI value.
- Y - The laboratory analysis was from an unpreserved or improperly preserved sample. The data may not be accurate.
- Z - Colonies were too numerous to count (TNTC).

Quality control information from overflow laboratories may not be included in this report. Please refer to the associated report from the overflow laboratory for additional information.

Sample Location: LAKE WARREN AT CENTER

Collection Date/Time: 11/20/2023 12:15

Field ID: G4CE0236

Matrix: W-SURF-FRH

Sample ID	Ref. Method	Component	Result	Code	Units	Batch ID	QC Codes
2452436	DEP SOP: NU-094-1	Color (true)	68		PCU	P438136	
	EPA 180.1 Rev. 2.0	Turbidity	7.9		NTU	P438141	
	EPA 300.0 Rev. 2.1	Chloride	20		mg Cl/L	P438318	
		Sulfate	6.7		mg SO4/L	P438321	
	SM 2320 B-2011	Total Alkalinity	38		mg CaCO3/L	P438221	
	SM 2540 C-2015	TDS	98		mg/L	P438381	
	SM 2540 D-2015	TSS	8	I	mg/L	P438371	
	SM 4500-F- C-2011	Fluoride	0.076	I	mg F/L	P438334	
2452438	EPA 350.1 Rev. 2.0	Ammonia-N	0.005		mg N/L	P438502	
	EPA 351.2 Rev. 2.0	Kjeldahl Nitrogen	1.1		mg N/L	P438170	
	EPA 353.2 Rev. 2.0	NO2NO3-N	0.004	U	mg N/L	P438254	
	EPA 365.1 Rev. 2.0	Total-P	0.057		mg P/L	P438209	
	SM 5310 B-2011	Organic Carbon	15		mg C/L	P438187	

Ref. Method and Comment:

SM 2540 D-2015: Batch relative percent difference is unavailable because of low analyte concentration in the QC sample.

Sample Location: HOURGLASS LAKE AT CENTER

Collection Date/Time: 11/20/2023 13:26

Field ID: G4CE0178

Matrix: W-SURF-FRH

Sample ID	Ref. Method	Component	Result	Code	Units	Batch ID	QC Codes
2452437	DEP SOP: NU-094-1	Color (true)	14		PCU	P438136	
	EPA 180.1 Rev. 2.0	Turbidity	4.2		NTU	P438141	
	EPA 300.0 Rev. 2.1	Chloride	18		mg Cl/L	P438318	
		Sulfate	15		mg SO4/L	P438321	
	SM 2320 B-2011	Total Alkalinity	37		mg CaCO3/L	P438221	
	SM 2540 C-2015	TDS	89		mg/L	P438381	
	SM 2540 D-2015	TSS	6	I	mg/L	P438371	
	SM 4500-F- C-2011	Fluoride	0.025	U	mg F/L	P438334	
2452439	EPA 350.1 Rev. 2.0	Ammonia-N	0.003	I	mg N/L	P438502	
	EPA 351.2 Rev. 2.0	Kjeldahl Nitrogen	0.81		mg N/L	P438170	
	EPA 353.2 Rev. 2.0	NO2NO3-N	0.013		mg N/L	P438254	
	EPA 365.1 Rev. 2.0	Total-P	0.061		mg P/L	P438210	
	SM 5310 B-2011	Organic Carbon	5.4		mg C/L	P438187	

Ref. Method and Comment:

SM 2540 D-2015: Batch relative percent difference is unavailable because of low analyte concentration in the QC sample.

Sample Location: LAKE TERRACE AT CENTER

Collection Date/Time: 11/20/2023 14:21

Field ID: G4CE0153

Matrix: W-SURF-FRH

Sample ID	Ref. Method	Component	Result	Code	Units	Batch ID	QC Codes
2452433	DEP SOP: NU-094-1	Color (true)	11		PCU	P438136	
	EPA 180.1 Rev. 2.0	Turbidity	4.4		NTU	P438141	
	EPA 300.0 Rev. 2.1	Chloride	19		mg Cl/L	P438318	
		Sulfate	21		mg SO4/L	P438321	
	SM 2320 B-2011	Total Alkalinity	31		mg CaCO3/L	P438221	
	SM 2540 C-2015	TDS	87		mg/L	P438381	
	SM 2540 D-2015	TSS	7	I	mg/L	P438371	
2452434	SM 4500-F- C-2011	Fluoride	0.046	I	mg F/L	P438334	
	EPA 350.1 Rev. 2.0	Ammonia-N	0.004	I	mg N/L	P438502	
	EPA 351.2 Rev. 2.0	Kjeldahl Nitrogen	0.80		mg N/L	P438170	
	EPA 353.2 Rev. 2.0	NO2NO3-N	0.004	U	mg N/L	P438254	
	EPA 365.1 Rev. 2.0	Total-P	0.045		mg P/L	P438209	
2452435	SM 5310 B-2011	Organic Carbon	5.3		mg C/L	P438187	
	EPA 365.1 Rev. 2.0 dissolved	O-Phosphate-P	0.004	U	mg P/L	P438126	
2452444	EPA 200.7 Rev. 4.4	Calcium	17.8		mg/L	P438174	
		Iron	30	U	ug/L	P438174	
		Magnesium	2.49		mg/L	P438174	
		Potassium	3.1		mg/L	P438174	
		Sodium	11.5		mg/L	P438174	
		Strontium	42.7		ug/L	P438174	
		Tin	3.0	U	ug/L	P438174	
	EPA 200.8 Rev. 5.4	Titanium	0.75	U	ug/L	P438174	
		Vanadium	3.5	I	ug/L	P438174	
		Zinc	5.0	U	ug/L	P438174	
		Aluminum	75		ug/L	P438174	
		Antimony	0.28		ug/L	P438174	
		Arsenic	0.49		ug/L	P438174	
		Barium	7.38		ug/L	P438174	
		Beryllium	0.010	U	ug/L	P438174	
		Boron	24.9		ug/L	P438174	
		Cadmium	0.020	U	ug/L	P438174	
		Chromium	0.40	U	ug/L	P438174	
		Cobalt	0.028	I	ug/L	P438174	
		Copper	2.98		ug/L	P438174	
		Lead	0.20	I	ug/L	P438174	
		Manganese	5.57		ug/L	P438174	
		Molybdenum	0.58	I	ug/L	P438174	
		Nickel	0.50	U	ug/L	P438174	
		Selenium	0.20	U	ug/L	P438174	
		Silver	0.010	U	ug/L	P438174	
		Thallium	0.10	U	ug/L	P438174	
	SM 2340 B-2011	Hardness	54.8		mg/L	P438174	

Ref. Method and Comment:

SM 2540 D-2015: Batch relative percent difference is unavailable because of low analyte concentration in the QC sample.

Sample Location: LAKE GILES AT CENTER

Collection Date/Time: 11/20/2023 14:59

Field ID: G4CE0193

Matrix: W-SURF-FRH

Sample ID	Ref. Method	Component	Result	Code	Units	Batch ID	QC Codes
2452430	DEP SOP: NU-094-1	Color (true)	7.9		PCU	P438136	
	EPA 180.1 Rev. 2.0	Turbidity	1.8		NTU	P438141	
	EPA 300.0 Rev. 2.1	Chloride	23		mg Cl/L	P438318	
		Sulfate	16		mg SO4/L	P438321	
	SM 2320 B-2011	Total Alkalinity	26		mg CaCO3/L	P438221	
	SM 2540 C-2015	TDS	77		mg/L	P438381	
	SM 2540 D-2015	TSS	4	I	mg/L	P438371	
	SM 4500-F- C-2011	Fluoride	0.045	I	mg F/L	P438334	
2452431	EPA 350.1 Rev. 2.0	Ammonia-N	0.015		mg N/L	P438502	
	EPA 351.2 Rev. 2.0	Kjeldahl Nitrogen	0.51		mg N/L	P438170	
	EPA 353.2 Rev. 2.0	NO2NO3-N	0.016		mg N/L	P438254	
	EPA 365.1 Rev. 2.0	Total-P	0.021		mg P/L	P438209	
	SM 5310 B-2011	Organic Carbon	4.7		mg C/L	P438187	
2452432	EPA 365.1 Rev. 2.0 dissolved	O-Phosphate-P	0.004	U	mg P/L	P438126	

Ref. Method and Comment:

SM 2540 D-2015: Batch relative percent difference is unavailable because of low analyte concentration in the QC sample.

Quality Assurance Report Method Blank Results

Reference Method: DEP SOP: NU-094-1
Batch ID: P438136

Component	Result	Code	Units
Color (true)	2.5	U	PCU

Reference Method: EPA 180.1 Rev. 2.0
Batch ID: P438141

Component	Result	Code	Units
Turbidity	0.10	U	NTU

Reference Method: EPA 200.7 Rev. 4.4
Batch ID: P438174

Component	Result	Code	Units
Calcium	0.075	U	mg/L
Iron	30	U	ug/L
Magnesium	0.040	U	mg/L
Potassium	0.30	U	mg/L
Sodium	0.50	U	mg/L
Strontium	2.0	U	ug/L
Tin	3.0	U	ug/L
Titanium	0.75	U	ug/L
Vanadium	2.0	U	ug/L
Zinc	5.0	U	ug/L

Reference Method: EPA 200.8 Rev. 5.4
Batch ID: P438174

Component	Result	Code	Units
Aluminum	5.0	U	ug/L
Antimony	0.050	U	ug/L
Arsenic	0.050	U	ug/L
Barium	0.20	U	ug/L
Beryllium	0.010	U	ug/L
Boron	2.0	U	ug/L
Cadmium	0.020	U	ug/L
Chromium	0.40	U	ug/L
Cobalt	0.020	U	ug/L
Copper	0.40	U	ug/L
Lead	0.20	U	ug/L
Manganese	0.10	U	ug/L
Molybdenum	0.15	U	ug/L
Nickel	0.50	U	ug/L
Selenium	0.20	U	ug/L
Silver	0.010	U	ug/L
Thallium	0.10	U	ug/L

Reference Method: EPA 300.0 Rev. 2.1
Batch ID: P438318

Component	Result	Code	Units
Chloride	0.20	U	mg Cl/L

Quality Assurance Report

Method Blank Results

Reference Method: EPA 300.0 Rev. 2.1
Batch ID: P438321

Component	Result	Code	Units
Sulfate	0.20	U	mg SO4/L

Reference Method: EPA 350.1 Rev. 2.0
Batch ID: P438502

Component	Result	Code	Units
Ammonia-N	0.002	U	mg N/L

Reference Method: EPA 351.2 Rev. 2.0
Batch ID: P438170

Component	Result	Code	Units
Kjeldahl Nitrogen	0.080	U	mg N/L

Reference Method: EPA 353.2 Rev. 2.0
Batch ID: P438254

Component	Result	Code	Units
NO2NO3-N	0.004	U	mg N/L

Reference Method: EPA 365.1 Rev. 2.0
Batch ID: P438209

Component	Result	Code	Units
Total-P	0.002	U	mg P/L

Reference Method: EPA 365.1 Rev. 2.0
Batch ID: P438210

Component	Result	Code	Units
Total-P	0.002	U	mg P/L

Reference Method: EPA 365.1 Rev. 2.0 dissolved
Batch ID: P438126

Component	Result	Code	Units
O-Phosphate-P	0.004	U	mg P/L

Reference Method: SM 2320 B-2011
Batch ID: P438221

Component	Result	Code	Units
Total Alkalinity	0.65	U	mg CaCO3/L

Reference Method: SM 2540 C-2015
Batch ID: P438381

Component	Result	Code	Units
TDS	15	U	mg/L

Quality Assurance Report

Method Blank Results

Reference Method: SM 2540 D-2015
Batch ID: P438371

Component	Result	Code	Units
TSS	2	U	mg/L

Reference Method: SM 4500-F- C-2011
Batch ID: P438334

Component	Result	Code	Units
Fluoride	0.025	U	mg F/L

Reference Method: SM 5310 B-2011
Batch ID: P438187

Component	Result	Code	Units
Organic Carbon	0.50	U	mg C/L

Quality Assurance Report Laboratory Control Sample Accuracy

Reference Method: DEP SOP: NU-094-1
Batch ID: P438136

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Color (true)	97.5		P	90 - 110

Reference Method: EPA 180.1 Rev. 2.0
Batch ID: P438141

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Turbidity	103		P	90 - 110

Reference Method: EPA 200.7 Rev. 4.4
Batch ID: P438174

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Calcium	108		P	85 - 115
Iron	109		P	85 - 115
Magnesium	110		P	85 - 115
Potassium	101		P	85 - 115
Sodium	106		P	85 - 115
Strontium	97.9		P	85 - 115
Tin	96.8		P	85 - 115
Titanium	101		P	85 - 115
Vanadium	99.5		P	85 - 115
Zinc	97.1		P	85 - 115

Reference Method: EPA 200.8 Rev. 5.4
Batch ID: P438174

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Aluminum	100		P	85 - 115
Antimony	100		P	85 - 115
Arsenic	99.2		P	85 - 115
Barium	101		P	85 - 115
Beryllium	89.9		P	85 - 115
Boron	101		P	85 - 115
Cadmium	98.5		P	85 - 115
Chromium	107		P	85 - 115
Cobalt	93.3		P	85 - 115
Copper	98.5		P	85 - 115
Lead	94.6		P	85 - 115
Manganese	100		P	85 - 115
Molybdenum	96.7		P	85 - 115
Nickel	100		P	85 - 115
Selenium	99.7		P	85 - 115
Silver	97.8		P	85 - 115
Thallium	98.6		P	85 - 115

Reference Method: EPA 300.0 Rev. 2.1
Batch ID: P438318

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Chloride	106		P	90 - 110

Quality Assurance Report Laboratory Control Sample Accuracy

Reference Method: EPA 300.0 Rev. 2.1
Batch ID: P438321

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Sulfate	108		P	90 - 110

Reference Method: EPA 350.1 Rev. 2.0
Batch ID: P438502

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Ammonia-N	95.4		P	90 - 110

Reference Method: EPA 351.2 Rev. 2.0
Batch ID: P438170

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Kjeldahl Nitrogen	104		P	90 - 110

Reference Method: EPA 353.2 Rev. 2.0
Batch ID: P438254

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
NO2NO3-N	99.5		P	90 - 110

Reference Method: EPA 365.1 Rev. 2.0
Batch ID: P438209

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Total-P	102		P	90 - 110

Reference Method: EPA 365.1 Rev. 2.0
Batch ID: P438210

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Total-P	100		P	90 - 110

Reference Method: EPA 365.1 Rev. 2.0 dissolved
Batch ID: P438126

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
O-Phosphate-P	93.1		P	90 - 110

Reference Method: SM 2320 B-2011
Batch ID: P438221

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Total Alkalinity	98.3		P	92 - 105

Reference Method: SM 2540 C-2015
Batch ID: P438381

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
TDS	97.2		P	85 - 115

Quality Assurance Report

Laboratory Control Sample Accuracy

Reference Method: SM 2540 D-2015
Batch ID: P438371

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
TSS	92.8		P	85 - 115

Reference Method: SM 4500-F- C-2011
Batch ID: P438334

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Fluoride	102		P	94 - 106

Reference Method: SM 5310 B-2011
Batch ID: P438187

Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
Organic Carbon	94.2		P	85 - 115

Quality Assurance Report Matrix Spike Accuracy

Reference Method: EPA 200.7 Rev. 4.4

Batch ID: P438174

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452360	Calcium	110	109	P/P	80 - 120
2452360	Iron	110	109	P/P	80 - 120
2452360	Magnesium	111	109	P/P	80 - 120
2452360	Potassium	103	102	P/P	80 - 120
2452360	Sodium	108	108	P/P	80 - 120
2452360	Strontium	102	101	P/P	80 - 120
2452360	Tin	98.1	99.1	P/P	80 - 120
2452360	Titanium	102	102	P/P	80 - 120
2452360	Vanadium	101	101	P/P	80 - 120
2452360	Zinc	98.4	98.3	P/P	80 - 120
2452610	Calcium	106		P	80 - 120
2452610	Iron	108		P	80 - 120
2452610	Magnesium	105		P	80 - 120
2452610	Potassium	99.7		P	80 - 120
2452610	Sodium	105		P	80 - 120
2452610	Strontium	99.1		P	80 - 120
2452610	Tin	94.5		P	80 - 120
2452610	Titanium	101		P	80 - 120
2452610	Vanadium	101		P	80 - 120
2452610	Zinc	98.4		P	80 - 120

Reference Method: EPA 200.8 Rev. 5.4

Batch ID: P438174

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452360	Aluminum	99.4	98.1	P/P	80 - 120
2452360	Antimony	99.2	99.8	P/P	80 - 120
2452360	Arsenic	98.2	97.7	P/P	80 - 120
2452360	Barium	100	100	P/P	80 - 120
2452360	Beryllium	89.5	87.4	P/P	80 - 120
2452360	Boron	104	103	P/P	80 - 120
2452360	Cadmium	97.9	98.2	P/P	80 - 120
2452360	Chromium	97.6	95.1	P/P	80 - 120
2452360	Cobalt	91.8	91.6	P/P	80 - 120
2452360	Copper	99.0	97.5	P/P	80 - 120
2452360	Lead	94.4	93.9	P/P	80 - 120
2452360	Manganese	100	100	P/P	80 - 120
2452360	Molybdenum	99.2	97.9	P/P	80 - 120
2452360	Nickel	95.8	95.1	P/P	80 - 120
2452360	Selenium	99.1	95.9	P/P	80 - 120
2452360	Silver	96.8	96.8	P/P	80 - 120
2452360	Thallium	99.9	98.7	P/P	80 - 120
2452610	Aluminum	99.6		P	80 - 120
2452610	Antimony	99.9		P	80 - 120
2452610	Arsenic	97.2		P	80 - 120
2452610	Barium	98.7		P	80 - 120
2452610	Beryllium	90.4		P	80 - 120
2452610	Boron	101		P	80 - 120
2452610	Cadmium	98.2		P	80 - 120
2452610	Chromium	96.2		P	80 - 120
2452610	Cobalt	89.4		P	80 - 120
2452610	Copper	98.7		P	80 - 120

Quality Assurance Report Matrix Spike Accuracy

Reference Method: EPA 200.8 Rev. 5.4
Batch ID: P438174

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452610	Lead	94.6		P	80 - 120
2452610	Manganese	91.7		P	80 - 120
2452610	Molybdenum	99.3		P	80 - 120
2452610	Nickel	94.7		P	80 - 120
2452610	Selenium	95.3		P	80 - 120
2452610	Silver	96.2		P	80 - 120
2452610	Thallium	98.4		P	80 - 120

Reference Method: EPA 300.0 Rev. 2.1
Batch ID: P438318

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452389	Chloride	104		P	90 - 110
2452437	Chloride	106		P	90 - 110

Reference Method: EPA 300.0 Rev. 2.1
Batch ID: P438321

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452389	Sulfate	105		P	90 - 110
2452437	Sulfate	107		P	90 - 110

Reference Method: EPA 350.1 Rev. 2.0
Batch ID: P438502

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452459	Ammonia-N	101	101	P/P	90 - 110

Reference Method: EPA 351.2 Rev. 2.0
Batch ID: P438170

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452438	Kjeldahl Nitrogen	101	104	P/P	90 - 110

Reference Method: EPA 353.2 Rev. 2.0
Batch ID: P438254

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452393	NO2NO3-N	99.5	100	P/P	90 - 110

Reference Method: EPA 365.1 Rev. 2.0
Batch ID: P438209

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452390	Total-P	103	104	P/P	90 - 110

Reference Method: EPA 365.1 Rev. 2.0
Batch ID: P438210

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452439	Total-P	103	104	P/P	90 - 110

Quality Assurance Report

Matrix Spike Accuracy

Reference Method: EPA 365.1 Rev. 2.0 dissolved
Batch ID: P438126

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452391	O-Phosphate-P	97.2	98.8	P/P	90 - 110

Reference Method: SM 4500-F- C-2011
Batch ID: P438334

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2451833	Fluoride	103	103	P/P	94 - 106

Reference Method: SM 5310 B-2011
Batch ID: P438187

Spiked Sample	Component	% Rec.1	% Rec.2	Pass/Fail	Control Limits
2452346	Organic Carbon	93.5	93.5	P/P	85 - 115

Quality Assurance Report Precision

Reference Method: DEP SOP: NU-094-1
Batch ID: P438136

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452389	Color (true)	8.43	Sample	P	0 - 20

Reference Method: EPA 180.1 Rev. 2.0
Batch ID: P438141

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452403	Turbidity	1.13	Sample	P	0 - 20

Reference Method: EPA 200.7 Rev. 4.4
Batch ID: P438174

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452360	Calcium	0.826	Spike	P	0 - 20
2452360	Iron	1.35	Spike	P	0 - 20
2452360	Magnesium	1.02	Spike	P	0 - 20
2452360	Potassium	0.746	Spike	P	0 - 20
2452360	Sodium	0.319	Spike	P	0 - 20
2452360	Strontium	0.764	Spike	P	0 - 20
2452360	Tin	0.922	Spike	P	0 - 20
2452360	Titanium	0.140	Spike	P	0 - 20
2452360	Vanadium	0.457	Spike	P	0 - 20
2452360	Zinc	0.120	Spike	P	0 - 20

Reference Method: EPA 200.8 Rev. 5.4
Batch ID: P438174

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452360	Aluminum	1.25	Spike	P	0 - 20
2452360	Antimony	0.610	Spike	P	0 - 20
2452360	Arsenic	0.485	Spike	P	0 - 20
2452360	Barium	0.104	Spike	P	0 - 20
2452360	Beryllium	2.34	Spike	P	0 - 20
2452360	Boron	1.46	Spike	P	0 - 20
2452360	Cadmium	0.394	Spike	P	0 - 20
2452360	Chromium	2.54	Spike	P	0 - 20
2452360	Cobalt	0.169	Spike	P	0 - 20
2452360	Copper	1.52	Spike	P	0 - 20
2452360	Lead	0.477	Spike	P	0 - 20
2452360	Manganese	0.118	Spike	P	0 - 20
2452360	Molybdenum	1.36	Spike	P	0 - 20
2452360	Nickel	0.727	Spike	P	0 - 20
2452360	Selenium	3.34	Spike	P	0 - 20
2452360	Silver	0.00468	Spike	P	0 - 20
2452360	Thallium	1.25	Spike	P	0 - 20

Quality Assurance Report Precision

Reference Method: EPA 300.0 Rev. 2.1
Batch ID: P438318

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452389	Chloride	1.31	Sample	P	0 - 20

Reference Method: EPA 300.0 Rev. 2.1
Batch ID: P438321

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452389	Sulfate	2.33	Sample	P	0 - 20

Reference Method: EPA 350.1 Rev. 2.0
Batch ID: P438502

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452459	Ammonia-N	0.347	Spike	P	0 - 20

Reference Method: EPA 351.2 Rev. 2.0
Batch ID: P438170

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452438	Kjeldahl Nitrogen	1.70	Spike	P	0 - 20

Reference Method: EPA 353.2 Rev. 2.0
Batch ID: P438254

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452393	NO2NO3-N	0.371	Spike	P	0 - 20

Reference Method: EPA 365.1 Rev. 2.0
Batch ID: P438209

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452390	Total-P	1.32	Spike	P	0 - 20

Reference Method: EPA 365.1 Rev. 2.0
Batch ID: P438210

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452439	Total-P	0.484	Spike	P	0 - 20

Reference Method: EPA 365.1 Rev. 2.0 dissolved
Batch ID: P438126

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452391	O-Phosphate-P	1.63	Spike	P	0 - 20

Quality Assurance Report Precision

Reference Method: SM 2320 B-2011
Batch ID: P438221

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452403	Total Alkalinity	1.09	Sample	P	0 - 3.9

Reference Method: SM 2540 C-2015
Batch ID: P438381

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452047	TDS	1.17	Sample	P	0 - 10

Reference Method: SM 4500-F- C-2011
Batch ID: P438334

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2451833	Fluoride	0.0	Spike	P	0 - 1.9

Reference Method: SM 5310 B-2011
Batch ID: P438187

Replicated Lab Sample	Component	% RSD/RPD	Sample/Spike/LCS*	Pass/Fail	Control Limits
2452346	Organic Carbon	0.0478	Spike	P	0 - 20

* Sample, spike and/or laboratory control sample precision (LCS) is reported.

Quality Assurance Report Calibration Verification

Reference Method: EPA 365.1 Rev. 2.0 dissolved

Run ID: A122866

Included Lab Sample IDs: 2452432, 2452435

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
O-Phosphate-P	98.6	99.4	P/P	90 - 110

Reference Method: DEP SOP: NU-094-1

Run ID: A122870

Included Lab Sample IDs: 2452430, 2452433, 2452436, 2452437

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Color (true)	98.3	99.0	P/P	90 - 110

Reference Method: EPA 180.1 Rev. 2.0

Run ID: A122871

Included Lab Sample IDs: 2452430, 2452433, 2452436, 2452437

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Turbidity	99.0	99.0	P/P	95 - 105

Reference Method: SM 5310 B-2011

Run ID: A122895

Included Lab Sample IDs: 2452431, 2452434, 2452438, 2452439

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Organic Carbon	94.6	95.3	P/P	90 - 110

Reference Method: SM 2320 B-2011

Run ID: A122907

Included Lab Sample IDs: 2452430, 2452433, 2452436, 2452437

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Total Alkalinity	97.8	95.8	P/P	90 - 110

Reference Method: EPA 365.1 Rev. 2.0

Run ID: A122916

Included Lab Sample IDs: 2452438, 2452439

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Total-P	99.5	97.9	P/P	90 - 110

Reference Method: EPA 353.2 Rev. 2.0

Run ID: A122920

Included Lab Sample IDs: 2452431, 2452434, 2452438, 2452439

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
NO2NO3-N	101	102	P/P	90 - 110

Reference Method: EPA 200.8 Rev. 5.4

Run ID: A122924

Included Lab Sample IDs: 2452444

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Aluminum	103	101	P/P	90 - 110
Antimony	100	99.8	P/P	90 - 110

Quality Assurance Report Calibration Verification

Reference Method: EPA 200.8 Rev. 5.4

Run ID: A122924

Included Lab Sample IDs: 2452444

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Arsenic	99.2	98.6	P/P	90 - 110
Barium	101	100	P/P	90 - 110
Boron	102	104	P/P	90 - 110
Cadmium	99.3	99.4	P/P	90 - 110
Chromium	101	99.4	P/P	90 - 110
Cobalt	93.0	91.1	P/P	90 - 110
Copper	97.1	96.6	P/P	90 - 110
Lead	95.0	95.3	P/P	90 - 110
Manganese	101	98.6	P/P	90 - 110
Molybdenum	98.8	99.3	P/P	90 - 110
Nickel	97.9	97.3	P/P	90 - 110
Selenium	99.6	100	P/P	90 - 110
Silver	94.4	94.7	P/P	90 - 110
Thallium	96.5	96.2	P/P	90 - 110

Reference Method: EPA 365.1 Rev. 2.0

Run ID: A122927

Included Lab Sample IDs: 2452431, 2452434

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Total-P	99.8	99.0	P/P	90 - 110

Reference Method: EPA 351.2 Rev. 2.0

Run ID: A122935

Included Lab Sample IDs: 2452431, 2452434, 2452438, 2452439

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Kjeldahl Nitrogen	95.4	95.3	P/P	90 - 110

Reference Method: EPA 300.0 Rev. 2.1

Run ID: A122949

Included Lab Sample IDs: 2452430, 2452433, 2452436, 2452437

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Chloride	102	103	P/P	90 - 110
Chloride	103	105	P/P	90 - 110
Sulfate	101	104	P/P	90 - 110
Sulfate	101	101	P/P	90 - 110

Reference Method: SM 4500-F- C-2011

Run ID: A122950

Included Lab Sample IDs: 2452430, 2452433, 2452436, 2452437

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Fluoride	102	101	P/P	90 - 110

Reference Method: EPA 200.8 Rev. 5.4

Run ID: A122952

Included Lab Sample IDs: 2452444

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
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Quality Assurance Report Calibration Verification

Reference Method: EPA 200.8 Rev. 5.4

Run ID: A122952

Included Lab Sample IDs: 2452444

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Beryllium	93.5	93.0	P/P	90 - 110

Reference Method: EPA 350.1 Rev. 2.0

Run ID: A123027

Included Lab Sample IDs: 2452431, 2452434, 2452438, 2452439

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Ammonia-N	97.9	98.9	P/P	90 - 110

Reference Method: EPA 200.7 Rev. 4.4

Run ID: A123039

Included Lab Sample IDs: 2452444

Component	% Rec.1	% Rec.2	Pass/Fail*	Control Limits
Calcium	102	104	P/P	90 - 110
Iron	101	102	P/P	90 - 110
Magnesium	100	102	P/P	90 - 110
Potassium	99.4	101	P/P	90 - 110
Sodium	101	102	P/P	90 - 110
Strontium	101	102	P/P	90 - 110
Tin	101	101	P/P	90 - 110
Titanium	102	103	P/P	90 - 110
Vanadium	100	100	P/P	90 - 110
Zinc	100	101	P/P	90 - 110

* Pass/Fail determinations are made for each bracketing calibration verification check.

Control limits for initial calibration checks may be different from those for continuing checks, depending on method requirements.

Where they are different, both control limits are provided.

Quality Assurance Report Summary

Ref. Method	Analyte	LCS % Recovery	MS % Recovery			LCS	Precision	MS
							SMP	
DEP SOP: NU-094-1	Color (true)	97.5					8.43	
EPA 180.1 Rev. 2.0	Turbidity	103					1.13	
EPA 200.7 Rev. 4.4	Calcium	108	110	109	106			0.826
	Iron	109	110	109	108			1.35
	Magnesium	110	111	109	105			1.02
	Potassium	101	103	102	99.7			0.746
	Sodium	106	108	108	105			0.319
	Strontium	97.9	102	101	99.1			0.764
	Tin	96.8	98.1	99.1	94.5			0.922
	Titanium	101	102	102	101			0.140
	Vanadium	99.5	101	101	101			0.457
	Zinc	97.1	98.4	98.3	98.4			0.120
EPA 200.8 Rev. 5.4	Aluminum	100	99.4	98.1	99.6			1.25
	Antimony	100	99.2	99.8	99.9			0.610
	Arsenic	99.2	98.2	97.7	97.2			0.485
	Barium	101	100	100	98.7			0.104
	Beryllium	89.9	89.5	87.4	90.4			2.34
	Boron	101	104	103	101			1.46
	Cadmium	98.5	97.9	98.2	98.2			0.394
	Chromium	107	97.6	95.1	96.2			2.54
	Cobalt	93.3	91.8	91.6	89.4			0.169
	Copper	98.5	99.0	97.5	98.7			1.52
	Lead	94.6	94.4	93.9	94.6			0.477
	Manganese	100	100	100	91.7			0.118
	Molybdenum	96.7	99.2	97.9	99.3			1.36
	Nickel	100	95.8	95.1	94.7			0.727
	Selenium	99.7	99.1	95.9	95.3			3.34
	Silver	97.8	96.8	96.8	96.2			0.0046
	Thallium	98.6	99.9	98.7	98.4			1.25
EPA 300.0 Rev. 2.1	Chloride	106	104	106			1.31	
	Sulfate	108	105	107			2.33	
EPA 350.1 Rev. 2.0	Ammonia-N	95.4	101	101				0.347
EPA 351.2 Rev. 2.0	Kjeldahl Nitrogen	104	101	104				1.70
EPA 353.2 Rev. 2.0	NO2NO3-N	99.5	99.5	100				0.371
EPA 365.1 Rev. 2.0	Total-P	102	103	104				1.32
	Total-P	100	103	104				0.484
EPA 365.1 Rev. 2.0 dissolved	O-Phosphate-P	93.1	97.2	98.8				1.63
SM 2320 B-2011	Total Alkalinity	98.3					1.09	
SM 2540 C-2015	TDS	97.2					1.17	
SM 2540 D-2015	TSS	92.8						
SM 4500-F- C-2011	Fluoride	102	103	103				0.0
SM 5310 B-2011	Organic Carbon	94.2	93.5	93.5				0.0478

Reference Method Descriptions

Method	Description	Associated Samples
DEP SOP: NU-094-1	True Color measured at 450 nm (not valid for NPDES monitoring)	2452430, 2452433, 2452436, 2452437
EPA 180.1 Rev. 2.0	Turbidity in aqueous matrices	2452430, 2452433, 2452436, 2452437
EPA 200.7 Rev. 4.4	Total Recoverable Metals analysis using ICP emission spectroscopy for aqueous samples supporting Clean Water Act Projects	2452444
EPA 200.8 Rev. 5.4	Total Recoverable Metals analysis using ICP-MS for aqueous samples supporting Clean Water Act Projects	2452444
EPA 300.0 Rev. 2.1	Chloride in aqueous matrices	2452430, 2452433, 2452436, 2452437

Reference Method Descriptions

Method	Description	Associated Samples
EPA 300.0 Rev. 2.1	Sulfate in aqueous matrices	2452430, 2452433, 2452436, 2452437
EPA 350.1 Rev. 2.0	Ammonia in aqueous matrices as mg N/L	2452431, 2452434, 2452438, 2452439
EPA 351.2 Rev. 2.0	Total Kjeldahl Nitrogen in aqueous matrices	2452431, 2452434, 2452438, 2452439
EPA 353.2 Rev. 2.0	Nitrite/Nitrate in aqueous matrices as mg N/L	2452431, 2452434, 2452438, 2452439
EPA 365.1 Rev. 2.0	Total Phosphorus in aqueous matrices as mg P/L	2452431, 2452434, 2452438, 2452439
EPA 365.1 Rev. 2.0 dissolved	Ortho-phosphate, dissolved, in filtered, aqueous matrices as mg P/L	2452432, 2452435
SM 2320 B-2011	Alkalinity in aqueous matrices as mg CaCO ₃ /L	2452430, 2452433, 2452436, 2452437
SM 2340 B-2011	Hardness by calculation, in aqueous matrices, reported as mg/L CaCO ₃	2452444
SM 2540 C-2015	Total Dissolved Solids in aqueous matrices	2452430, 2452433, 2452436, 2452437
SM 2540 D-2015	Total Suspended Solids in aqueous matrices using a maximum of 250 mL of sample	2452430, 2452433, 2452436, 2452437
SM 4500-F- C-2011	Fluoride in aqueous matrices, without distillation (not valid for NPDES monitoring)	2452430, 2452433, 2452436, 2452437
SM 5310 B-2011	Nonpurgeable Organic Carbon in aqueous matrices	2452431, 2452434, 2452438, 2452439

Preparation and Analysis Log

Ref. Method	Received Date	Prep Date/Time	Prepared By	Analysis Date/Time	Analyzed By	Associated Samples
DEP SOP: NU-094-1	11/21/2023			11/21/2023 14:28	Chandler E Cox	2452430
	11/21/2023			11/21/2023 14:29	Chandler E Cox	2452433
	11/21/2023			11/21/2023 14:30	Chandler E Cox	2452436, 2452437
EPA 180.1 Rev. 2.0	11/21/2023			11/21/2023 14:13	Anna M. Plaviak	2452430
	11/21/2023			11/21/2023 14:14	Anna M. Plaviak	2452433
	11/21/2023			11/21/2023 14:15	Anna M. Plaviak	2452436
	11/21/2023			11/21/2023 14:16	Anna M. Plaviak	2452437
EPA 200.7 Rev. 4.4	11/21/2023	11/27/2023 13:20	George D Taylor	12/05/2023 16:16	Chase Roberts	2452444
EPA 200.8 Rev. 5.4	11/21/2023	11/27/2023 13:20	George D Taylor	11/28/2023 17:10	Conrad Hartmann	2452444
	11/21/2023	11/27/2023 13:20	George D Taylor	11/29/2023 18:28	Emily M Philpot	2452444
EPA 300.0 Rev. 2.1	11/21/2023			11/28/2023 12:18	James L Waggeberby	2452437
	11/21/2023			11/28/2023 16:06	James L Waggeberby	2452430
	11/21/2023			11/28/2023 16:21	James L Waggeberby	2452433
	11/21/2023			11/28/2023 16:36	James L Waggeberby	2452436
EPA 350.1 Rev. 2.0	11/21/2023			12/05/2023 13:03	Ping Hua	2452431
	11/21/2023			12/05/2023 13:06	Ping Hua	2452434
	11/21/2023			12/05/2023 13:07	Ping Hua	2452438
	11/21/2023			12/05/2023 13:09	Ping Hua	2452439
EPA 351.2 Rev. 2.0	11/21/2023	11/27/2023 13:33	Simonne.V. Calhoun	11/29/2023 12:11	Ping Hua	2452431
	11/21/2023	11/27/2023 13:33	Simonne.V. Calhoun	11/29/2023 12:13	Ping Hua	2452434
	11/21/2023	11/27/2023 13:33	Simonne.V. Calhoun	11/29/2023 12:14	Ping Hua	2452438
	11/21/2023	11/27/2023 13:33	Simonne.V. Calhoun	11/29/2023 12:19	Ping Hua	2452439
EPA 353.2 Rev. 2.0	11/21/2023			11/28/2023 13:14	Fadila Guebre	2452431
	11/21/2023			11/28/2023 13:15	Fadila Guebre	2452434
	11/21/2023			11/28/2023 13:16	Fadila Guebre	2452438
	11/21/2023			11/28/2023 13:17	Fadila Guebre	2452439
EPA 365.1 Rev. 2.0	11/21/2023	11/28/2023 10:59	Adam P Silver	11/28/2023 14:47	James L Waggeberby	2452438
	11/21/2023	11/28/2023 10:59	Adam P Silver	11/28/2023 14:50	James L Waggeberby	2452439
	11/21/2023	11/28/2023 10:59	Adam P Silver	11/29/2023 10:54	James L Waggeberby	2452431
	11/21/2023	11/28/2023 10:59	Adam P Silver	11/29/2023 10:55	James L Waggeberby	2452434
EPA 365.1 Rev. 2.0 dissolved	11/21/2023			11/21/2023 13:12	Elise M. Gillis	2452432
	11/21/2023			11/21/2023 13:13	Elise M. Gillis	2452435
SM 2320 B-2011	11/21/2023			11/27/2023 22:02	Adam P Silver	2452430
	11/21/2023			11/27/2023 22:13	Adam P Silver	2452433
	11/21/2023			11/27/2023 22:25	Adam P Silver	2452436
	11/21/2023			11/27/2023 22:36	Adam P Silver	2452437
SM 2340 B-2011	11/21/2023			12/05/2023 16:16	Chase Roberts	2452444
SM 2540 C-2015	11/21/2023			11/21/2023 16:31	Yijie Li	2452430, 2452433, 2452436, 2452437
SM 2540 D-2015	11/21/2023			11/21/2023 16:31	Yijie Li	2452430, 2452433, 2452436, 2452437
SM 4500-F- C-2011	11/21/2023			11/30/2023 04:14	Chandler E Cox	2452430

Preparation and Analysis Log

Ref. Method	Received Date	Prep Date/Time	Prepared By	Analysis Date/Time	Analyzed By	Associated Samples
SM 4500-F- C-2011	11/21/2023			11/30/2023 04:20	Chandler E Cox	2452433
	11/21/2023			11/30/2023 04:25	Chandler E Cox	2452436
	11/21/2023			11/30/2023 04:31	Chandler E Cox	2452437
SM 5310 B-2011	11/21/2023			11/27/2023 16:39	Kenneth H Lee	2452431
	11/21/2023			11/27/2023 16:52	Kenneth H Lee	2452434
	11/21/2023			11/27/2023 17:06	Kenneth H Lee	2452438
	11/21/2023			11/27/2023 17:19	Kenneth H Lee	2452439