SAMPLING EVENT TRIP REPORT

Site Name: Waldick Aerospace Devices Inc.
CERCLIS ID Number: NJD 054981337
EVENT Dates: September 28-29, 2020
DESA Lab Project Number: P-200941

1. Site Location:

Newark, New Jersey

2. Sample Descriptions:

Refer to the Appendix for all sample information.

3. Laboratories Receiving Samples:

Sample Type	Laboratory Code	Name and Address of Laboratory
AQUEOUS SAMPLES PFAS, VOCs, metals (Dissolved & Total), 1,4-Dioxane	LB	U.S. EPA, Region 2, LSASD Laboratory Branch 2890 Woodbridge Avenue, Bldg. 209, MS-230 Edison, NJ 08837

4. Sample Dispatch Data:

During September 28 & 29, U.S. EPA Region 2 Laboratory Services and Applied Science Division (LSASD)/ Hazardous Waste Support Branch (HWSB) / Superfund Support Team (SST) personnel collected aqueous samples for PFAS, VOCs, TAL metals (Dissolved & Total), and 1,4-Dioxane analysis from the Waldick Aerospace Devices Inc. Superfund Site in Wall Township, New Jersey. Nine (9) samples plus one (1) duplicate blind sample, two (2) rinsate blank samples (one for PFAS only plus one for other paramters), and one (1) Trip Blank (for VOC analysis only) were collected from the nine monitoring wells selected for this event. The monitoring wells selected for this event were: MW-102, MW-102M, MW-104S, MW-104M, MW-105S (MS/MSD), MW-105M (MW-105MD is the duplicate of MW-105M), MW-111S, MW-112S, & RD-101S. All samples were submitted for analysis to the EPA Region 2 Laboratory.

On September 28, Superfund Support Team Field Members consisting of Michael A. Mercado, Mark Denno, Robert Finke, and Graham Ellison departed the EPA facility in Edison, NJ for the Waldick Aerospace Devices Inc Superfund site. On arrival at the Site, the Team set out to locate all the wells to be sampled, to include MW-111S & MW-112S which have not been sampled since 2012. MW-111S and MW-112S were located and locks were cut off. The old locks were replaced with new locks and keys were provided to the RPM. Between 8:30am and 1130am all monitoring wells were located, opened, and HydraSleeves were lowered into the wells. In the afternoon, HydraSleeve bags were pulled and samples for

PFAS analysis were collected. Samples were placed in a cooler with ice. After pulling the HydraSleeve bags and collecting the samples, monitoring wells were sounded, and Grundfos Redi-Flo 2 pumps were lowered. The Field Team returned to the EPA Edison Facility and repacked the ice in the cooler containing the collected samples. The samples collected were secured in the walk-in refrigerator in the OSCAR Station for subsequent processing by the EPA Laboratory.

On September 29, the Superfund Support Team returned to the Waldick Aerospace Devices Inc. Site to collect the samples for VOCs, TAL metals (Dissolved & Total), and 1,4-Dioxane. Samples were collected using the Low Flow Sampling Method. Dissolved TAL metals samples were filtered using a 0.45um filter at the time of sampling. Samples for analysis for VOCs were preserved with HCl and for TAL metals with HNO_3. All samples were placed in a cooler with ice. Afterward the Field team returned to the Edison Facility, and repacked the ice in the cooler containing the collected samples. The samples collected were secured in the walk-in refrigerator in the OSCAR Station for subsequent processing by the EPA Laboratory.

5. Sampling Personnel:

Name	Organization	Site Duties
Michael A. Mercado	U.S. EPA Region 2 LSASD/HWSB/SST	Project/Sample Management
Mark Denno	U.S. EPA Region 2 LSASD/HWSB/SST	Field Support
Robert Finke	U.S. EPA Region 2 LSASD/HWSB/SST	Field Support
Graham Ellison	U.S. EPA Region 2 LSASD/HWSB/SST	Field Support

6. Additional Comments:

PFAS are contaminants of emerging concern. The 6/1/2020 NJDEP Higher of the PQL/Groundwater Quality criteria for three PFAS compounds are as follows:

- PFOA @ 14 ppt
- PFOS @ 13 ppt and
- PFNA @ 13 ppt.

The results of this sampling event will be provided in Data Summary tables comparing the results to this NJDEP criteria (or other criteria as instructed by the RPM).

The number of samples includes:

- 9 groundwater samples for PFAS, VOCs, metals (Dissolved & Total), 1,4-Dioxane including one MS/MSD
- One field duplicate
- Two rinsate blanks (one for PFAS only + one for other parameters)
- One trip blank (for VOC only)

The following Sample Numbers were used for laboratory and/or field quality control samples:

Analysis	**Laboratory Quality Control (QC) Samples**				**Field Quality Control (QC) Samples**	
	Matrix Spike (MS)/ Matrix Spike Duplicate (MSD)		**Field Duplicate**		**Trip Blank And Rinsate Blank**	
	Well #	Sample #	Well #	Sample #	Blank #	Sample #
PFAS	MW-105S	BG3D2	MW-105M MW-105MD	BG3D3 BG3D4	RB2-09820	BG3C5
VOCs, metals (Dissolved & Total), 1,4-Dioxane	MW-105S	BG3C0	MW-105M MW-105MD	BG3C1 BG3B7	TB1-092820 RB1-092820	BG3B3 BG3B4

Michael A. Mercado

Report Prepared By: Michael A. Mercado Date January 13, 2021

Appendix A
Chain-of Custody Record

U.S.EPA Region 2 (Laboratory Copy)
DateShipped: 9/29/2020
CarrierName: Hand Delivered
AirbillNo: NA

CHAIN OF CUSTODY RECORD
Waldick Aerospace Devices Inc.
Site #: F4
Project Code: 2009XXX

No: 1-09292020
Lab Contact: Ness Tirol
Lab: U.S.EPA R2 LSASD-LB
Lab Phone: (732) 321-4431

Lab #	Sample #	Location	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Analyses	Lab QC
	BG3C8	MW-102S	Ground Water	9/28/2020	02:40	1	250 ml PP	None	C-135 (PFAS)	N
	BG3C9	MW-102M	Ground Water	9/28/2020	02:30	1	250 ml PP	None	C-135 (PFAS)	N
	BG3D0	MW-104S	Ground Water	9/28/2020	01:30	1	250 ml PP	None	C-135 (PFAS)	N
	BG3D1	MW-104M	Ground Water	9/28/2020	01:40	1	250 ml PP	None	C-135 (PFAS)	N
	BG3D2	MW-105S	Ground Water	9/28/2020	02:05	2	250 ml PP	None	C-135 (PFAS)	Y
	BG3D3	MW-105M	Ground Water	9/28/2020	02:15	1	250 ml PP	None	C-135 (PFAS)	N
	BG3D4	MW-105MD	Ground Water	9/28/2020	02:15	1	250 ml PP	None	C-135 (PFAS)	N
	BG3D5	MW-111S	Ground Water	9/28/2020	01:55	1	250 ml PP	None	C-135 (PFAS)	N
	BG3D6	MW-112S	Ground Water	9/28/2020	02:10	1	250 ml PP	None	C-135 (PFAS)	N
	BG3D7	RD-101S	Ground Water	9/28/2020	02:55	1	250 ml PP	None	C-135 (PFAS)	N
	BG3C5	RB2-092820	D.I.Water	9/28/2020	04:35	1	250 ml PP	None	C-135 (PFAS)	Y

Special Instructions: Sample #: BF3B5 (MS/MSD)

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
For Analysis		9/28/2020 1840		9/29/20 7:00AM	INTACT

Direct from Sampling, chilling initiated. 9/29/20

U.S.EPA Region 2 (Laboratory Copy)
DateShipped: 9/29/2020
CarrierName: Hand Delivered
AirbillNo: None

CHAIN OF CUSTODY RECORD
Waldick Aerospace Devices Inc.
Site #: F4
Project Code: 200941

No: 2-092920-151627-0003
Lab Contact: Ness Tirol
Lab: U.S.EPA R2 LSASD-LB
Lab Phone: (732) 321-4431

Lab #	Sample #	Location	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Analyses	Lab QC
	BG3B3	TB1-092820	D.I.Water	9/28/2020	04:30	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	Y
	BG3B4	RB1-092820	D.I.Water	9/28/2020	04:35	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	Y
	BG3B4	RB1-092820	D.I.Water	9/28/2020	04:35	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	Y
	BG3B4	RB1-092820	D.I.Water	9/28/2020	04:35	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	Y
	BG3B4	RB1-092820	D.I.Water	9/28/2020	04:35	1	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	Y
	BG3B5	MW-102S	Ground Water	9/29/2020	09:45	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	N
	BG3B5	MW-102S	Ground Water	9/29/2020	09:45	1	250 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	N
	BG3B5	MW-102S	Ground Water	9/29/2020	09:45	1	250 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	N
	BG3B5	MW-102S	Ground Water	9/29/2020	09:45	1	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	N
	BG3B6	MW-102M	Ground Water	9/29/2020	10:45	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	N
	BG3B6	MW-102M	Ground Water	9/29/2020	10:45	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	N
	BG3B6	MW-102M	Ground Water	9/29/2020	10:45	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	N

Special Instructions: Event Completed

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
for Analysis	[signature]	9/29/20 1630	[signature]	9/29/20 16:30	INTACT

Direct from Sampling, chilling initiated. 9/29/20

U.S.EPA Region 2 (Laboratory Copy)
DateShipped: 9/29/2020
CarrierName: Hand Delivered
AirbillNo: None

CHAIN OF CUSTODY RECORD
Waldick Aerospace Devices Inc.
Site #: F4
Project Code: 200941

No: 2-092920-151627-0003
Lab Contact: Ness Tirol
Lab: U.S.EPA R2 LSASD-LB
Lab Phone: (732) 321-4431

Lab #	Sample #	Location	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Analyses	Lab QC
	BG3B6	MW-102M	Ground Water	9/29/2020	10:45	1	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	N
	BG3B7	MW-105MD	Ground Water	9/29/2020	10:40	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	N
	BG3B7	MW-105MD	Ground Water	9/29/2020	10:40	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	N
	BG3B7	MW-105MD	Ground Water	9/29/2020	10:40	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	N
	BG3B7	MW-105MD	Ground Water	9/29/2020	10:40	1	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	N
	BG3B8	MW-104S	Ground Water	9/29/2020	08:30	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	N
	BG3B8	MW-104S	Ground Water	9/29/2020	08:30	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	N
	BG3B8	MW-104S	Ground Water	9/29/2020	08:30	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	N
	BG3B8	MW-104S	Ground Water	9/29/2020	08:30	1	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	N
	BG3B9	MW-104M	Ground Water	9/29/2020	08:40	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	N

Special Instructions: Event Completed

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
For Analysis	[signature]	9/29/20 1630	[signature]	9/29/20 16:30	INTACT

U.S.EPA Region 2 (Laboratory Copy)
DateShipped: 9/29/2020
CarrierName: Hand Delivered
AirbillNo: None

CHAIN OF CUSTODY RECORD
Waldick Aerospace Devices Inc.
Site #: F4
Project Code: 200941

No: 2-092920-151627-0003
Lab Contact: Ness Tirol
Lab: U.S.EPA R2 LSASD-LB
Lab Phone: (732) 321-4431

Lab #	Sample #	Location	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Analyses	Lab QC
	BG3B9	MW-104M	Ground Water	9/29/2020	08:40	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	N
	BG3B9	MW-104M	Ground Water	9/29/2020	08:40	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	N
	BG3B9	MW-104M	Ground Water	9/29/2020	08:40	1	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	N
	BG3C0	MW-105S	Ground Water	9/29/2020	09:40	6	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	Y
	BG3C0	MW-105S	Ground Water	9/29/2020	09:40	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	Y
	BG3C0	MW-105S	Ground Water	9/29/2020	09:40	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	Y
	BG3C0	MW-105S	Ground Water	9/29/2020	09:40	2	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	Y
	BG3C1	MW-105M	Ground Water	9/29/2020	10:40	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	N
	BG3C1	MW-105M	Ground Water	9/29/2020	10:40	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	N
	BG3C1	MW-105M	Ground Water	9/29/2020	10:40	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	N

Special Instructions: Event Completed

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
For Analysis		9/29/20 16:30		9/29/20 16:30	INTACT

U.S.EPA Region 2 (Laboratory Copy)
DateShipped: 9/29/2020
CarrierName: Hand Delivered
AirbillNo: None

CHAIN OF CUSTODY RECORD
Waldick Aerospace Devices Inc.
Site #: F4
Project Code: 200941

No: 2-092920-151627-0003
Lab Contact: Ness Tirol
Lab: U.S.EPA R2 LSASD-LB
Lab Phone: (732) 321-4431

Lab #	Sample #	Location	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Analyses	Lab QC
	BG3C1	MW-105M	Ground Water	9/29/2020	10:40	1	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	N
	BG3C2	MW-111S	Ground Water	9/29/2020	10:45	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	N
	BG3C2	MW-111S	Ground Water	9/29/2020	10:45	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	N
	BG3C2	MW-111S	Ground Water	9/29/2020	10:45	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	N
	BG3C2	MW-111S	Ground Water	9/29/2020	10:45	1	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	N
	BG3C3	MW-112S	Ground Water	9/29/2020	10:30	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	N
	BG3C3	MW-112S	Ground Water	9/29/2020	10:30	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	N
	BG3C3	MW-112S	Ground Water	9/29/2020	10:30	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	N
	BG3C3	MW-112S	Ground Water	9/29/2020	10:30	1	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	N
	BG3C4	RD-101S	Ground Water	9/29/2020	08:25	3	40 ml VOA Vial	1:1 HCl, pH<2	DW-1 (TCL-VOC)	N

Special Instructions: Event Completed

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
for Analysis		9/29/20 1630		9/29/20 16:30	INTACT

U.S.EPA Region 2 (Laboratory Copy)
DateShipped: 9/29/2020
CarrierName: Hand Delivered
AirbillNo: None

CHAIN OF CUSTODY RECORD
Waldick Aerospace Devices Inc.
Site #: F4
Project Code: 200941

No: 2-092920-151627-0003
Lab Contact: Ness Tirol
Lab: U.S.EPA R2 LSASD-LB
Lab Phone: (732) 321-4431

Lab #	Sample #	Location	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Analyses	Lab QC
	BG3C4	RD-101S	Ground Water	9/29/2020	08:25	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Total)	N
	BG3C4	RD-101S	Ground Water	9/29/2020	08:25	1	125 ml LDPE	HNO3, pH<2	C-112 (TAL - Dissolved)	N
	BG3C4	RD-101S	Ground Water	9/29/2020	08:25	1	1 L Amber	None	C-90 SIM (1,4-Dioxane Only)	N

Special Instructions: Event Completed

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
for Analysis		9/29/20 1630		9/29/20 16:30	INTACT

Appendix B
Well Data Sheets

Low-Flow Test Report:

Test Date / Time: 9/29/2020 10:19:34 AM
Project: 2020-Waldick-MW-102M
Operator Name: C.Cabaroy, M.Denno, B.Finke, G.Ellison, M.Mercado

Location Name: MW-102M **Well Diameter: 4 in** **Casing Type: SS** **Screen Length: 10 ft** **Top of Screen: 22.0 ft** **Total Depth: 31.10 ft** **Initial Depth to Water: 12.83 ft** Latitude: 40.14259690110 Longitude: -74.0602155540	**Pump Type: Grundfos RediFLO2 S.S. Submersible Pump** **Tubing Type: 5/8" O.D. LDPE with 1/2" I.D. Teflon-Lined** **Tubing Inner Diameter: 0.5 in** **Tubing Length: 37 ft** **Pump Intake From TOC: 29 ft** **Estimated Total Volume Pumped: 4800 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min** **Final Draw Down: 0 ft**	**Instrument Used: Aqua TROLL 600 Vented** **Serial Number: 540511**

Test Notes:
2020-09_WADI_MW-102M

Weather Conditions:
Cloudy, 75*F

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.33	
9/29/2020 10:19 AM	00:00	5.53 pH	18.75 °C	141.43 µS/cm	5.48 mg/L	13.00 NTU	224.7 mV	12.87 ft	200.00 ml/min
9/29/2020 10:22 AM	03:00	5.56 pH	18.86 °C	141.03 µS/cm	5.49 mg/L	10.80 NTU	221.5 mV	12.87 ft	200.00 ml/min
9/29/2020 10:25 AM	06:00	5.57 pH	18.95 °C	141.25 µS/cm	5.51 mg/L	9.38 NTU	219.1 mV	12.87 ft	200.00 ml/min
9/29/2020 10:28 AM	09:00	5.57 pH	19.06 °C	141.17 µS/cm	5.50 mg/L	9.46 NTU	218.4 mV	12.87 ft	200.00 ml/min
9/29/2020 10:31 AM	12:00	5.58 pH	19.10 °C	141.18 µS/cm	5.51 mg/L	8.84 NTU	217.4 mV	12.87 ft	200.00 ml/min
9/29/2020 10:34 AM	15:00	5.59 pH	19.13 °C	141.16 µS/cm	5.51 mg/L	7.78 NTU	216.8 mV	12.87 ft	200.00 ml/min
9/29/2020 10:37 AM	18:00	5.59 pH	19.14 °C	141.08 µS/cm	5.51 mg/L	6.82 NTU	216.4 mV	12.87 ft	200.00 ml/min
9/29/2020 10:40 AM	21:00	5.59 pH	19.13 °C	141.13 µS/cm	5.51 mg/L	6.64 NTU	216.6 mV	12.87 ft	200.00 ml/min
9/29/2020 10:43 AM	24:00	5.59 pH	19.14 °C	140.95 µS/cm	5.51 mg/L	6.52 NTU	216.3 mV	12.87 ft	200.00 ml/min

Samples

Sample ID:	Description:
BG3B6	MW-102M @ 1045

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 9/29/2020 9:19:26 AM
Project: 2020-Waldick-MW-102S
Operator Name: C.Cabaroy, M.Denno, B.Finke, G.Ellison, M.Mercado

Location Name: MW-102S **Well Diameter: 4 in** **Casing Type: SS** **Screen Length: 10 ft** **Top of Screen: 11 ft** **Total Depth: 20.8 ft** **Initial Depth to Water: 13.32 ft** Latitude: 40.14258122970 Longitude: -74.06022136950	**Pump Type: Grundfos RediFLO2 S.S. Submersible Pump** **Tubing Type: 5/8" O.D. LDPE with 1/2" I.D. Teflon-Lined** **Tubing Inner Diameter: 0.5 in** **Tubing Length: 30 ft** **Pump Intake From TOC: 18 ft** **Estimated Total Volume Pumped: 4800 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min** **Final Draw Down: 0 ft**	**Instrument Used: Aqua TROLL 600 Vented** **Serial Number: 540511**

Test Notes:
2020_WADI_MW-102S

Weather Conditions:
Cloudy, 75*F

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.33	
9/29/2020 9:19 AM	00:00	5.40 pH	18.96 °C	143.71 µS/cm	6.17 mg/L	8.14 NTU	213.1 mV	13.32 ft	200.00 ml/min
9/29/2020 9:22 AM	03:00	5.41 pH	19.21 °C	143.80 µS/cm	6.17 mg/L	7.73 NTU	212.7 mV	13.32 ft	200.00 ml/min
9/29/2020 9:25 AM	06:00	5.43 pH	19.33 °C	143.77 µS/cm	6.14 mg/L	7.65 NTU	211.8 mV	13.32 ft	200.00 ml/min
9/29/2020 9:28 AM	09:00	5.43 pH	19.34 °C	143.77 µS/cm	6.12 mg/L	5.50 NTU	211.3 mV	13.32 ft	200.00 ml/min
9/29/2020 9:31 AM	12:00	5.44 pH	19.40 °C	143.98 µS/cm	6.12 mg/L	5.20 NTU	211.4 mV	13.32 ft	200.00 ml/min
9/29/2020 9:34 AM	15:00	5.44 pH	19.47 °C	144.21 µS/cm	6.10 mg/L	4.25 NTU	211.8 mV	13.32 ft	200.00 ml/min
9/29/2020 9:37 AM	18:00	5.44 pH	19.54 °C	144.42 µS/cm	6.09 mg/L	3.75 NTU	211.9 mV	13.32 ft	200.00 ml/min
9/29/2020 9:40 AM	21:00	5.45 pH	19.58 °C	144.58 µS/cm	6.07 mg/L	3.78 NTU	211.9 mV	13.32 ft	200.00 ml/min
9/29/2020 9:43 AM	24:00	5.44 pH	19.67 °C	144.92 µS/cm	6.07 mg/L	3.53 NTU	212.6 mV	13.32 ft	200.00 ml/min

Samples

Sample ID:	Description:
BG3B5	MW-102S @ 0945

Low-Flow Test Report:

Test Date / Time: 9/29/2020 8:22:52 AM
Project: 2020-Waldick-MW-104M
Operator Name: M.Denno, M.Mercado, R.Finke, C.Cabaroy, G. Ellison

Location Name: MW-104M Well Diameter: 4 in Casing Type: SS Screen Length: 10 ft Top of Screen: 16 ft Total Depth: 26.3 ft Initial Depth to Water: 10.05 ft Latitude: 40.14201628170 Longitude: -74.05909529830	**Pump Type: Grundfos RediFLO2 S.S. Submersible Pump** **Tubing Type: 5/8" O.D. LDPE with 1/2" I.D. Teflon-Lined** **Tubing Inner Diameter: 0.5 in** **Tubing Length: 32 ft** **Pump Intake From TOC: 24 ft** **Estimated Total Volume Pumped: 3600 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min** **Final Draw Down: 0 ft**	**Instrument Used: Aqua TROLL 600 Vented** **Serial Number: 540717**

Test Notes:
2020 Waldick MW104M

Weather Conditions:
Cloudy 70ies

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.33	
9/29/2020 8:22 AM	00:00	6.54 pH	18.11 °C	227.23 µS/cm	5.09 mg/L		199.9 mV	10.05 ft	200.00 ml/min
9/29/2020 8:25 AM	03:00	6.54 pH	18.17 °C	227.93 µS/cm	5.05 mg/L		199.0 mV	10.05 ft	200.00 ml/min
9/29/2020 8:28 AM	06:00	6.56 pH	18.18 °C	230.17 µS/cm	4.96 mg/L		194.8 mV	10.05 ft	200.00 ml/min
9/29/2020 8:31 AM	09:00	6.55 pH	18.19 °C	231.50 µS/cm	4.88 mg/L		193.5 mV	10.05 ft	200.00 ml/min
9/29/2020 8:34 AM	12:00	6.55 pH	18.21 °C	230.74 µS/cm	4.90 mg/L	3.07 NTU	194.0 mV	10.05 ft	200.00 ml/min
9/29/2020 8:37 AM	15:00	6.55 pH	18.22 °C	230.93 µS/cm	4.88 mg/L	2.60 NTU	194.5 mV	10.05 ft	200.00 ml/min
9/29/2020 8:40 AM	18:00	6.54 pH	18.25 °C	229.86 µS/cm	4.86 mg/L	2.73 NTU	195.0 mV	10.05 ft	200.00 ml/min

Samples

Sample ID:	Description:
BG3B9	MW-104M @ 08:40

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 9/29/2020 8:11:55 AM
Project: 2020-Waldick-MW-104S
Operator Name: M.Denno, M.Mercado, R.Finke, C.Cabaroy, G. Ellison

Location Name: Waldick MW104S Well Diameter: 4 in Casing Type: SS Screen Length: 10 ft Top of Screen: 7 ft Total Depth: 16.18 ft Initial Depth to Water: 10.18 ft **Latitude: 40.14203327150** **Longitude: -74.05908191100**	**Pump Type: Grundfos RediFLO2 S.S. Submersible Pump** **Tubing Type: 5/8" O.D. LDPE with 1/2" I.D. Teflon-Lined** **Tubing Inner Diameter: 0.5 in** **Tubing Length: 23 ft** **Estimated Total Volume Pumped: 3596.667 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min Final Draw Down: 0 ft**	**Instrument Used: Aqua TROLL 600 Vented** **Serial Number: 540699**

Test Notes:
2020 Waldick MW104S

Weather Conditions:
Cloudy 70ies

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.33	
9/29/2020 8:11 AM	00:00	6.57 pH	20.07 °C	306.32 µS/cm	3.88 mg/L		165.5 mV	10.18 ft	200.00 ml/min
9/29/2020 8:14 AM	02:59	6.59 pH	20.10 °C	306.32 µS/cm	3.77 mg/L		169.0 mV	10.18 ft	200.00 ml/min
9/29/2020 8:17 AM	05:59	6.59 pH	20.06 °C	306.18 µS/cm	3.60 mg/L		171.1 mV	10.18 ft	200.00 ml/min
9/29/2020 8:20 AM	08:59	6.59 pH	20.22 °C	306.20 µS/cm	3.41 mg/L	22.90 NTU	171.7 mV	10.18 ft	200.00 ml/min
9/29/2020 8:23 AM	11:59	6.60 pH	20.29 °C	306.10 µS/cm	3.32 mg/L	21.20 NTU	171.9 mV	10.18 ft	200.00 ml/min
9/29/2020 8:26 AM	14:59	6.60 pH	20.29 °C	305.99 µS/cm	3.27 mg/L	20.10 NTU	172.0 mV	10.18 ft	200.00 ml/min
9/29/2020 8:29 AM	17:59	6.59 pH	20.30 °C	305.94 µS/cm	3.23 mg/L	20.00 NTU	172.3 mV	10.18 ft	200.00 ml/min

Samples

Sample ID:	Description:
BG3B8	MW-104S @ 08:30

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 9/29/2020 9:37:01 AM
Project: 2020-Waldick-MW-105M
Operator Name: R. Finke

Location Name: MW-105M **Well Diameter: 4 in** **Casing Type: Stainless Steel** **Screen Length: 10 ft** **Top of Screen: 16 ft** **Total Depth: 26.1 ft** **Initial Depth to Water: 7.16 ft** Latitude: 40.14231501880 Longitude: -74.0581948240	**Pump Type: Grundfos RediFLO2 S.S. Submersible Pump** **Tubing Type: 5/8" O.D. LDPE with 1/2" I.D. Teflon-Lined** **Tubing Inner Diameter: 0.5 in** **Tubing Length: 35 ft** **Pump Intake From TOC: 24 ft** **Estimated Total Volume Pumped: 10800 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min** **Final Draw Down: 0.17 ft**	**Instrument Used: Aqua TROLL 600 Vented** **Serial Number: 540696**

Test Notes:
Waldick 105M Field DUP here
Sampled @ 10:40

Weather Conditions:
Partly Cloudy, 74 F @ 9 am

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 5 %	
9/29/2020 9:37 AM	00:00	5.60 pH	16.38 °C	197.91 µS/cm	4.74 mg/L	12.75 NTU	279.5 mV	7.05 ft	200.00 ml/min
9/29/2020 9:40 AM	03:00	5.59 pH	16.35 °C	198.04 µS/cm	4.71 mg/L	12.20 NTU	286.3 mV	7.05 ft	200.00 ml/min
9/29/2020 9:43 AM	06:00	5.60 pH	16.36 °C	198.37 µS/cm	4.68 mg/L	11.71 NTU	289.6 mV	7.00 ft	200.00 ml/min
9/29/2020 9:46 AM	09:00	5.58 pH	16.39 °C	198.48 µS/cm	4.65 mg/L	8.88 NTU	293.7 mV	7.01 ft	200.00 ml/min
9/29/2020 9:49 AM	12:00	5.59 pH	16.35 °C	198.22 µS/cm	4.67 mg/L	9.52 NTU	294.9 mV	6.95 ft	200.00 ml/min
9/29/2020 9:52 AM	15:00	5.58 pH	16.40 °C	198.34 µS/cm	4.66 mg/L	7.77 NTU	297.0 mV	6.85 ft	200.00 ml/min
9/29/2020 9:55 AM	18:00	5.58 pH	16.34 °C	197.28 µS/cm	4.73 mg/L	6.01 NTU	296.7 mV	6.88 ft	200.00 ml/min
9/29/2020 9:58 AM	21:00	5.58 pH	16.38 °C	197.74 µS/cm	4.72 mg/L	7.11 NTU	296.8 mV	6.80 ft	200.00 ml/min
9/29/2020 10:01 AM	24:00	5.57 pH	16.41 °C	197.13 µS/cm	4.73 mg/L	7.47 NTU	292.0 mV	6.80 ft	200.00 ml/min
9/29/2020 10:04 AM	27:00	5.59 pH	16.65 °C	196.80 µS/cm	4.75 mg/L	6.10 NTU	282.9 mV	6.80 ft	200.00 ml/min

9/29/2020 10:07 AM	30:00	5.59 pH	16.97 °C	196.66 µS/cm	4.76 mg/L	5.22 NTU	280.4 mV	6.80 ft	200.00 ml/min
9/29/2020 10:10 AM	33:00	5.59 pH	17.13 °C	196.94 µS/cm	4.77 mg/L	5.88 NTU	280.5 mV	6.80 ft	200.00 ml/min
9/29/2020 10:13 AM	36:00	5.59 pH	17.21 °C	197.17 µS/cm	4.76 mg/L	5.00 NTU	281.7 mV	6.80 ft	200.00 ml/min
9/29/2020 10:16 AM	39:00	5.59 pH	17.19 °C	197.20 µS/cm	4.74 mg/L	4.89 NTU	282.4 mV	6.80 ft	200.00 ml/min
9/29/2020 10:19 AM	42:00	5.59 pH	17.36 °C	197.54 µS/cm	4.74 mg/L	6.82 NTU	283.4 mV	6.80 ft	200.00 ml/min
9/29/2020 10:22 AM	45:00	5.59 pH	17.37 °C	197.14 µS/cm	4.74 mg/L	5.02 NTU	284.0 mV	6.80 ft	200.00 ml/min
9/29/2020 10:25 AM	48:00	5.59 pH	17.32 °C	196.89 µS/cm	4.75 mg/L	5.25 NTU	284.5 mV	6.80 ft	200.00 ml/min
9/29/2020 10:28 AM	51:00	5.59 pH	17.39 °C	196.71 µS/cm	4.76 mg/L	6.21 NTU	285.0 mV	6.80 ft	200.00 ml/min
9/29/2020 10:31 AM	54:00	5.59 pH	17.39 °C	196.46 µS/cm	4.78 mg/L	5.78 NTU	285.3 mV	6.88 ft	200.00 ml/min

Samples

Sample ID:	Description:
BG3C1 & BG3B7	MW-105M @ 10:40 & MW-105MD (DUPL) @ 10:40

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 9/29/2020 9:14:01 AM
Project: 2020-Waldick-MW-105S (MS/MSD)
Operator Name: R.Finke

Location Name: MW-105S **Well Diameter: 4 in** **Casing Type: Stainless** **Screen Length: 10 ft** **Top of Screen: 6 ft** **Total Depth: 16.74 ft** **Initial Depth to Water: 7.22 ft** Latitude: 40.14230592880 Longitude:-74.05821068460	**Pump Type: Grundfos RediFLO2 S.S. Submersible Pump** **Tubing Type: 5/8" O.D. LDPE with 1/2" I.D. Teflon-Lined** **Tubing Inner Diameter: 0.5 in** **Tubing Length: 27 ft** **Pump Intake From TOC: 13.75 ft** **Estimated Total Volume Pumped: 4870 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min** **Final Draw Down: 0 ft**	**Instrument Used: Aqua TROLL 600 Vented** **Serial Number: 540503**

Test Notes:
MS/MSD sample

Weather Conditions:
Partly Cloudy. 75 F @ 9 am

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 5	
9/29/2020 9:14 AM	00:00	5.02 pH	18.40 °C	155.56 µS/cm	4.49 mg/L	22.41 NTU	286.2 mV	7.22 ft	200.00 ml/min
9/29/2020 9:15 AM	01:56	5.00 pH	18.43 °C	156.57 µS/cm	4.46 mg/L	10.13 NTU	288.1 mV	7.22 ft	200.00 ml/min
9/29/2020 9:17 AM	03:48	5.01 pH	18.41 °C	157.10 µS/cm	4.45 mg/L	7.11 NTU	289.1 mV	7.22 ft	200.00 ml/min
9/29/2020 9:20 AM	06:48	5.01 pH	18.43 °C	155.80 µS/cm	4.43 mg/L	5.22 NTU	291.0 mV	7.22 ft	200.00 ml/min
9/29/2020 9:23 AM	09:48	5.00 pH	18.46 °C	155.28 µS/cm	4.38 mg/L	3.86 NTU	293.1 mV	7.20 ft	200.00 ml/min
9/29/2020 9:26 AM	12:48	4.99 pH	18.46 °C	156.26 µS/cm	4.35 mg/L	4.11 NTU	295.1 mV	7.22 ft	200.00 ml/min
9/29/2020 9:29 AM	15:48	4.98 pH	18.38 °C	154.21 µS/cm	4.34 mg/L	3.77 NTU	295.8 mV	7.22 ft	200.00 ml/min
9/29/2020 9:32 AM	18:48	4.97 pH	18.49 °C	154.00 µS/cm	4.32 mg/L	3.75 NTU	295.7 mV	7.22 ft	200.00 ml/min
9/29/2020 9:35 AM	21:21	4.99 pH	18.50 °C	154.30 µS/cm	4.29 mg/L	3.72 NTU	293.8 mV	7.22 ft	200.00 ml/min
9/29/2020 9:38 AM	24:21	4.95 pH	18.51 °C	153.40 µS/cm	4.30 mg/L	3.79 NTU	294.8 mV	7.22 ft	200.00 ml/min

Samples

Sample ID:	Description:
BG3C0	MW-105S @ 09:40

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 9/29/2020 10:16:29 AM
Project: 2020-Waldick-MW-111S
Operator Name: M.Denno, M.Mercado, R.Finke, C.Cabaroy, G. Ellison

Location Name: MW-111S **Well Diameter: 2 in** **Casing Type: PVC** **Screen Length: 10 ft** **Top of Screen: 6 ft** **Total Depth: 21.9 ft** **Initial Depth to Water: 4.65 ft** **Latitude: 40.14185820** **Longitude: -74.05874290**	**Pump Type: Grundfos RediFLO2 S.S. Submersible Pump** **Tubing Type: 5/8" O.D. LDPE with 1/2" I.D. Teflon-Lined** **Tubing Inner Diameter: 0.5 in** **Tubing Length: 24 ft** **Pump Intake From TOC: 16.4** **Estimated Total Volume Pumped: 5400 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min Final Draw Down: 0.3 ft**	**Instrument Used: Aqua TROLL 600 Vented** **Serial Number: 540717**

Test Notes:
2020 Waldick MW111S

Weather Conditions:
Cloudy 70ies

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.33	
9/29/2020 10:16 AM	00:00	6.51 pH	18.53 °C	324.05 µS/cm	2.90 mg/L	139.00 NTU	209.9 mV	4.65 ft	200.00 ml/min
9/29/2020 10:19 AM	03:00	6.51 pH	18.57 °C	324.91 µS/cm	2.88 mg/L		210.5 mV	5.45 ft	200.00 ml/min
9/29/2020 10:22 AM	06:00	6.49 pH	18.61 °C	325.65 µS/cm	2.88 mg/L	128.00 NTU	211.7 mV	5.45 ft	200.00 ml/min
9/29/2020 10:25 AM	09:00	6.48 pH	18.66 °C	326.61 µS/cm	2.87 mg/L	111.00 NTU	212.2 mV	5.45 ft	200.00 ml/min
9/29/2020 10:28 AM	12:00	6.48 pH	18.71 °C	327.13 µS/cm	2.88 mg/L	87.00 NTU	212.8 mV	5.45 ft	200.00 ml/min
9/29/2020 10:31 AM	15:00	6.49 pH	18.69 °C	326.87 µS/cm	2.89 mg/L	92.00 NTU	213.3 mV	5.45 ft	200.00 ml/min
9/29/2020 10:34 AM	18:00	6.49 pH	18.74 °C	326.46 µS/cm	2.89 mg/L	79.20 NTU	214.0 mV	5.45 ft	200.00 ml/min
9/29/2020 10:37 AM	21:00	6.48 pH	18.72 °C	327.49 µS/cm	2.91 mg/L	74.60 NTU	215.0 mV	5.45 ft	200.00 ml/min
9/29/2020 10:40 AM	24:00	6.49 pH	18.70 °C	327.68 µS/cm	2.92 mg/L	74.20 NTU	215.6 mV	5.45 ft	200.00 ml/min
9/29/2020 10:43 AM	27:00	6.48 pH	18.75 °C	328.06 µS/cm	2.93 mg/L	68.20 NTU	216.5 mV	5.45 ft	200.00 ml/min

Samples

Sample ID:	Description:
BG3C2	MW-111S @ 10:45

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 9/29/2020 9:40:48 AM
Project: 2020-Waldick-MW-112S
Operator Name: M.Denno, M.Mercado, R.Finke, C.Cabaroy, G. Ellison

Location Name: Waldick MW112S **Well Diameter: 2 in** **Casing Type: PVC** **Screen Length: 10 ft** **Top of Screen: 8 ft** **Total Depth: 18.99ft** **Initial Depth to Water: 4.78 ft** **Latitude: 40.14181150** **Longitude: -74.05843750**	**Pump Type: Grundfos RediFLO2 S.S. Submersible Pump** **Tubing Type: 5/8" O.D. LDPE with 1/2" I.D. Teflon-Lined** **Tubing Inner Diameter: 0.5 in** **Tubing Length: 25 ft** **Pump Intake From TOC: 17 ft** **Estimated Total Volume Pumped: 7200 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min Final Draw Down: 0 ft**	**Instrument Used: Aqua TROLL 600 Vented** **Serial Number: 540699**

Test Notes:
2020 Waldick MW112S

Weather Conditions:
Cloudy 70ies

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.33	
9/29/2020 9:40 AM	00:00	8.00 pH	22.22 °C	0.06 µS/cm	8.73 mg/L		130.0 mV	4.78 ft	200.00 ml/min
9/29/2020 9:43 AM	03:00	5.42 pH	17.02 °C	190.87 µS/cm	2.60 mg/L		235.4 mV	4.78 ft	200.00 ml/min
9/29/2020 9:46 AM	06:00	5.45 pH	16.92 °C	187.85 µS/cm	2.58 mg/L		246.9 mV	4.78 ft	200.00 ml/min
9/29/2020 9:49 AM	09:00	5.45 pH	16.94 °C	188.30 µS/cm	2.50 mg/L	47.00 NTU	249.3 mV	4.78 ft	200.00 ml/min
9/29/2020 9:52 AM	12:00	5.46 pH	17.10 °C	196.07 µS/cm	2.80 mg/L	37.80 NTU	249.4 mV	4.78 ft	200.00 ml/min
9/29/2020 9:55 AM	15:00	5.47 pH	17.31 °C	192.78 µS/cm	2.70 mg/L	43.30 NTU	249.5 mV	4.78 ft	200.00 ml/min
9/29/2020 9:58 AM	18:00	5.46 pH	17.34 °C	189.70 µS/cm	2.56 mg/L	38.80 NTU	245.7 mV	4.78 ft	200.00 ml/min
9/29/2020 10:01 AM	21:00	5.46 pH	17.44 °C	190.12 µS/cm	2.54 mg/L	32.10 NTU	245.2 mV	4.78 ft	200.00 ml/min
9/29/2020 10:04 AM	24:00	5.46 pH	17.45 °C	191.14 µS/cm	2.56 mg/L	41.50 NTU	246.5 mV	4.78 ft	200.00 ml/min
9/29/2020 10:07 AM	27:00	5.46 pH	17.47 °C	190.71 µS/cm	2.56 mg/L	29.80 NTU	243.6 mV	4.78 ft	200.00 ml/min
9/29/2020 10:10 AM	30:00	5.46 pH	17.43 °C	190.34 µS/cm	2.51 mg/L	15.50 NTU	242.0 mV	4.78 ft	200.00 ml/min

9/29/2020 10:13 AM	33:00	5.46 pH	17.41 °C	190.96 µS/cm	2.52 mg/L	15.10 NTU	239.3 mV	4.78 ft	200.00 ml/min
9/29/2020 10:16 AM	36:00	5.46 pH	17.40 °C	191.74 µS/cm	2.54 mg/L	14.60 NTU	239.5 mV	4.78 ft	200.00 ml/min

Samples

Sample ID:	Description:
BG3C3	MW-112S @ 10:30

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 9/29/2020 8:01:38 AM
Project: 2020-Waldick-RD-101S
Operator Name: C.Cabaroy, M.Denno, B.Finke, G.Ellison, M.Mercado

Location Name: RD-101S **Well Diameter: 4 in** **Casing Type: SS** **Screen Length: 10 ft** **Top of Screen: 22 ft** **Total Depth: 32.3 ft** **Initial Depth to Water: 18.23 ft** Latitude: 40.14279775770 Longitude: -74.06053801010	**Pump Type: Grundfos RediFLO2 S.S. Submersible Pump** **Tubing Type: 5/8" O.D. LDPE with 1/2" I.D. Teflon-Lined** **Tubing Inner Diameter: 0.5 in** **Tubing Length: 37 ft** **Pump Intake From TOC: 29 ft** **Estimated Total Volume Pumped: 3600 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min** **Final Draw Down: 0 ft**	**Instrument Used: Aqua TROLL 600 Vented** **Serial Number: 540511**

Test Notes:
2020-09_WADI_RD-101S

Weather Conditions:
Cloudy, 75*F

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth To Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.33	
9/29/2020 8:01 AM	00:00	5.66 pH	16.93 °C	81.82 µS/cm	6.40 mg/L	2.56 NTU	178.1 mV	18.23 ft	200.00 ml/min
9/29/2020 8:04 AM	03:00	5.30 pH	16.29 °C	84.17 µS/cm	6.04 mg/L	2.94 NTU	193.1 mV	18.23 ft	200.00 ml/min
9/29/2020 8:07 AM	06:00	5.31 pH	16.53 °C	78.73 µS/cm	6.63 mg/L	1.61 NTU	194.4 mV	18.23 ft	200.00 ml/min
9/29/2020 8:10 AM	09:00	5.35 pH	16.57 °C	81.94 µS/cm	6.36 mg/L	1.94 NTU	194.5 mV	18.23 ft	200.00 ml/min
9/29/2020 8:13 AM	12:00	5.37 pH	16.56 °C	83.79 µS/cm	6.16 mg/L	2.23 NTU	194.7 mV	18.23 ft	200.00 ml/min
9/29/2020 8:16 AM	15:00	5.39 pH	16.53 °C	84.63 µS/cm	6.08 mg/L	2.31 NTU	195.0 mV	18.23 ft	200.00 ml/min
9/29/2020 8:19 AM	18:00	5.41 pH	16.54 °C	84.95 µS/cm	6.05 mg/L	2.04 NTU	195.4 mV	18.23 ft	200.00 ml/min

Samples

Sample ID:	Description:

BG3C4	RD-101S @ 08:25

Created using VuSitu from In-Situ, Inc.

Appendix C
Data Summary Tables

Waldick Aerospace Inc. Superfund Site
Groundwater Sampling Event
September 28-30, 2020

Analyte	MW-105M (Sample#BG3D3) result (ng/L)	MW-105MD (Sample# BG3D4) Duplicate result (ng/L)	Relative Percent Difference (absolute value)
PFAS			
PFOS	5.29	5.43	2.611940299
NMeFOSAA	3.32	3.4	2.380952381
NEtFOSAA	3.32	3.4	2.380952381
PFHxA	3.32	3.4	2.380952381
PFOA	5.02	4.73	5.948717949
PFBS	3.32	3.4	2.380952381
PFHpA	3.32	3.4	2.380952381
4:2 FTS	3.32	3.4	2.380952381
Analyte	**MW-105M (Sample#BG3C1) result (ug/L)**	**MW-105MD (Sample# BG3B7) Duplicate result (ug/L)**	**Relative Percent Difference (absolute value)**
VOCs	non-detected	non-detected	
1-4,Dioxane	non-detected	non-detected	
TAL metals(Total)			
Aluminum (U)	20	42	70.96774194
Iron	230	910	119.2982456
Magnesium	2900	2800	3.50877193
Manganese	7.1	14	65.4028436
Nickel	12	12	0
Potassium	2100	2100	0
Sodium	19000	18000	5.405405405
Barium	21	20	4.87804878
Chromium	48	160	107.6923077
Copper	1.2	1.5	22.22222222
Zinc	41	41	0
Calcium	12000	12000	0
TAL metals(Dissolved)			
Magnesium	2900	2900	0
Manganese	4.5	4.6	2.197802198
Nickel	11	11	0
Potassium	2100	2100	0
Sodium	19000	19000	0
Barium	20	21	4.87804878
Chromium	8.9	8.9	0
Copper (U)	1	1.1	9.523809524
Zinc	42	42	0
Calcium	12000	12000	0

WALDICK AEROSPACE
Superfund Site
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept. 28, 2020
PFAS

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion

			Lab Sample ID:	2009041-11		2009041-01		2009041-02		2009041-03		2009041-04		2009041-05	
			Field Sample ID:	BG3C5		BG3C8		BG3C9		BG3D0		BG3D1		BG3D2	
			Sampling Location Code:	RB2-092820		MW-102S		MW-102M		MW-104S		MW-104M		MW-105S	
			Property Address:	NA		40.14258122970		40.14259690110		40.14203027150		40.14201628170		40.14230592880	
			Property Owner:	NA		-74.06022136950		-74.06021555400		-74.05908191100		-74.05909529830		-74.05821068460	
		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion	Sampling Sub-location:	Rinsate Blank #2		Screen: 11 - 21 ft.		Screen: 22 - 32 ft.		Screen: 7 - 17 ft.		Screen: 16 - 26 ft.		Screen: 6 - 16 ft.	
			Sampling Date:	9/28/2020		9/28/2020		9/28/2020		9/28/2020		9/28/2020		9/28/2020	
			Units:	ng/L		ng/L		ng/L		ng/L		ng/L		ng/L	
CAS No.	Fraction.	Action Level (ng/L)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
13252-13-6	HFPO-DA	-		3.7	U	3.32	UL	3.52	U	3.57	U	3.57	U	3.53	UL
1763-23-1	PFOS	13		3.7	UL	3.32	UL	5.34	L	7.32		3.57	U	6.51	L
2058-94-8	PFUdA	-		3.7	UL	3.32	UL	3.52	UL	3.57	U	3.57	U	3.53	UL
2355-31-9	NMeFOSAA	-		3.7	UL	3.32	UL	4.56	L	3.57	UL	3.57	UL	3.53	UL
2706-91-4	PFPeS	-		3.7	UL	3.32	UL	3.52	UL	3.57	UL	3.57	U	3.53	UL
27619-97-2	6:2 FTS	-		3.7	U	3.32	U	3.52	U	3.57	U	3.57	U	3.53	UL
2991-50-6	NEtFOSAA	-		3.7	UL	3.32	UL	3.69	L	3.57	UL	3.57	UL	3.53	UL
307-24-4	PFHxA	-		3.7	U	3.32	U	5.87		6.03		3.57	U	3.53	UL
307-55-1	PFDoA	-		3.7	UL	3.32	UL	3.52	UL	3.57	U	3.57	U	3.53	UL
335-67-1	PFOA	14		3.7	U	5.26		9.13		10.6		5.44		3.95	L
335-76-2	PFDA	-		3.7	UL	3.32	UL	3.52	UL	3.57	U	3.57	U	3.53	UL
335-77-3	PFDS	-		3.7	UL	3.32	UL	3.52	UL	3.57	UL	3.57	U	3.53	UL
355-46-4	PFHxS	-		3.7	UL	3.32	UL	3.52	UL	3.57	U	3.57	U	3.53	UL
375-73-5	PFBS	-		3.7	UL	3.32	UL	3.65	L	3.75		3.57	U	3.53	UL
375-85-9	PFHpA	-		3.7	U	3.32	U	4.71		3.57	U	3.57	U	3.53	UL
375-92-8	PFHpS	-		3.7	UL	3.32	UL	3.52	UL	3.57	UL	3.57	U	3.53	UL
375-95-1	PFNA	13		3.7	U	3.32	U	3.52	U	3.57	U	3.57	U	3.53	UL
376-06-7	PFTeDA	-		3.7	UL	3.32	UL	3.52	UL	3.57	U	3.57	U	3.53	UL
39108-34-4	8:2 FTS	-		3.7	U	3.32	U	3.52	U	3.57	U	3.57	U	3.53	UL
474511-07-4	PFNS	-		3.7	UL	3.32	UL	3.52	UL	3.57	UL	3.57	U	3.53	UL
72629-94-8	PFTrDA	-		3.7	UL	3.32	UL	3.52	UL	3.57	U	3.57	U	3.53	UL
756426-58-1	9Cl-PF3ONS	-		3.7	UL	3.32	UL	3.52	UL	3.57	U	3.57	U	3.53	UL
757124-72-4	4:2 FTS	-		3.7	U	3.32	U	3.89		3.57	U	3.57	U	3.53	UL
763051-92-9	11Cl-PF3OUdS	-		3.7	UL	3.32	UL	3.52	UL	3.57	U	3.57	U	3.53	UL
919005-14-4	ADONA	-		3.7	U	3.32	U	3.52	U	3.57	U	3.57	U	3.53	UL
		#N/A													

Qualifier Key:
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WALDICK AEROSPACE
Superfund Site
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept. 28, 2020
PFAS

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion

			Lab Sample ID:	2009041-06		2009041-07		2009041-08		2009041-09		2009041-10	
			Field Sample ID:	BG3D3		BG3D4		BG3D5		BG3D6		BG3D7	
			Sampling Location Code:	MW-105M		MW-105M Dup		MW-111S		MW-112S		RD-101S	
			Property Address:	40.14231501880		40.14231501880		40.14185820000		40.14181150000		40.14279775770	
			Property Owner:	-74.05818948240		-74.05818948240		-74.05874290000		-74.05843750000		-74.06053801010	
		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion	Sampling Sub-location:	Screen: 16 - 26 ft.		Screen: 16 - 26 ft.		Screen: 6 - 16 ft.		Screen: 8 - 18 ft.		Screen: 22 - 32 ft.	
			Sampling Date:	9/28/2020		9/28/2020		9/28/2020		9/28/2020		9/28/2020	
			Units:	ng/L		ng/L		ng/L		ng/L		ng/L	
CAS No.	Fraction.	Action Level (ng/L)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
13252-13-6	HFPO-DA	-		3.32	UL	3.4	U	3.45	U	4.44	U	3.3	U
1763-23-1	PFOS	13		5.29	L	5.43	L	5.08		4.44	U	9.03	L
2058-94-8	PFUdA	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
2355-31-9	NMeFOSAA	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
2706-91-4	PFPeS	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
27619-97-2	6:2 FTS	-		3.32	U	3.4	U	3.45	U	4.44	U	3.3	U
2991-50-6	NEtFOSAA	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
307-24-4	PFHxA	-		3.32	U	3.4	U	3.45	U	4.44	U	3.3	U
307-55-1	PFDoA	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
335-67-1	PFOA	14		5.02		4.73		9.34		4.44	U	7.49	
335-76-2	PFDA	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
335-77-3	PFDS	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
355-46-4	PFHxS	-		3.32	UL	3.4	UL	3.45	U	4.44	U	3.3	UL
375-73-5	PFBS	-		3.32	UL	3.4	UL	3.45	U	4.44	U	3.3	UL
375-85-9	PFHpA	-		3.32	U	3.4	U	3.45	U	4.44	U	3.3	U
375-92-8	PFHpS	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
375-95-1	PFNA	13		3.32	U	3.4	U	3.45	U	4.44	U	3.3	U
376-06-7	PFTeDA	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
39108-34-4	8:2 FTS	-		3.32	U	3.4	U	3.45	U	4.44	U	3.3	U
474511-07-4	PFNS	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
72629-94-8	PFTrDA	-		3.32	UL	3.4	UL	3.45	UL	4.44	U	3.3	UL
756426-58-1	9Cl-PF3ONS	-		3.32	UL	3.4	UL	3.45	U	4.44	U	3.3	UL
757124-72-4	4:2 FTS	-		3.32	U	3.4	U	3.45	U	4.44	U	3.3	U
763051-92-9	11Cl-PF3OUdS	-		3.32	UL	3.4	UL	3.45	U	4.44	U	3.3	UL
919005-14-4	ADONA	-		3.32	U	3.4	U	3.45	U	4.44	U	3.3	U
		#N/A											

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WALDICK AEROSPACE SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
Trace VOC

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

2020 05 RSL - Tapwater (ug/L)

			Lab Sample ID:			
			Field Sample ID:	BG3B3		BG3B4
			Sampling Location Code:	TB1-092820		RB1-092820
			Latitude:	NA		NA
			Longitude:	NA		NA
		2020 05 RSL - Tapwater (ug/L)	Sampling Sub-location:	Trip Blank #1		Rinsate Blank #1
			Sampling Date:	9/28/2020		9/28/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
100-41-4	Ethylbenzene	1.5		0.5	U	0.5	U
100-42-5	Styrene	1200		0.5	U	0.5	U
10061-01-5	cis-1,3-Dichloropropene	-		0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene	-		0.5	U	0.5	U
106-46-7	1,4-Dichlorobenzene	0.48		0.5	U	0.5	U
106-93-4	1,2-Dibromoethane	0.0075		0.5	U	0.5	U
107-06-2	1,2-Dichloroethane	0.17		0.5	U	0.5	U
108-10-1	4-Methyl-2-Pentanone	6300		5	U	5	U
108-87-2	Methylcyclohexane	-		0.5	U	0.5	U
108-88-3	Toluene	1100		0.5	U	0.5	U
108-90-7	Chlorobenzene	78		0.5	U	0.5	U
110-82-7	Cyclohexane	13000		0.5	U	0.5	U
120-82-1	1,2,4-Trichlorobenzene	1.2		0.5	U	0.5	U
124-48-1	Dibromochloromethane	0.87		0.5	U	0.5	U
127-18-4	Tetrachloroethene	11		0.5	U	0.5	U
156-59-2	cis-1,2-Dichloroethene	36		0.5	U	0.5	U
156-60-5	trans-1,2-Dichloroethene	360		0.5	U	0.5	U
1634-04-4	Methyl tert-Butyl Ether	14		0.5	U	0.5	U
179601-23-1	m,p-Xylene	-		0.5	U	0.5	U
541-73-1	1,3-Dichlorobenzene	-		0.5	U	0.5	U
56-23-5	Carbon Tetrachloride	0.46		0.5	U	0.5	U
591-78-6	2-Hexanone	38		5	U	5	U
67-64-1	Acetone	14000		5	U	5	U
67-66-3	Chloroform	0.22		0.5	U	0.5	U
71-43-2	Benzene	0.46		0.5	U	0.5	U
71-55-6	1,1,1-Trichloroethane	8000		0.5	U	0.5	U
74-83-9	Bromomethane	7.5		1	U	1	U
74-87-3	Chloromethane	190		2	U	2	U
74-97-5	Bromochloromethane	83		0.5	U	0.5	U
75-00-3	Chloroethane	21000		0.5	U	0.5	U
75-01-4	Vinyl Chloride	0.019		1	U	1	U
75-09-2	Methylene Chloride	11		0.5	U	0.5	U
75-15-0	Carbon Disulfide	810		0.5	U	0.5	U
75-25-2	Bromoform	3.3		0.5	U	0.5	U
75-27-4	Bromodichloromethane	0.13		0.5	U	0.5	U
75-34-3	1,1-Dichloroethane	2.8		0.5	U	0.5	U
75-35-4	1,1-Dichloroethene	280		0.5	U	0.5	U
75-69-4	Trichlorofluoromethane	5200		0.5	U	0.5	U
75-71-8	Dichlorodifluoromethane	200		0.5	U	0.5	U
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	10000		0.5	U	0.5	U
78-87-5	1,2-Dichloropropane	0.85		0.5	U	0.5	U
78-93-3	2-Butanone	5600		5	U	5	U
79-00-5	1,1,2-Trichloroethane	0.28		0.5	U	0.5	U
79-01-6	Trichloroethene	0.49		0.5	U	0.5	U
79-20-9	Methyl Acetate	20000		0.5	U	0.5	U
79-34-5	1,1,2,2-Tetrachloroethane	0.076		0.5	U	0.5	U
87-61-6	1,2,3-Trichlorobenzene	7		0.5	U	0.5	U
95-47-6	o-Xylene	190		0.5	U	0.5	U
95-50-1	1,2-Dichlorobenzene	300		0.5	U	0.5	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.00033		0.5	UL	0.5	UL
98-82-8	Isopropylbenzene	450		0.5	U	0.5	U

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WALDICK AEROSPACE SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
Trace VOC

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

2020 05 RSL - Tapwater (ug/L)

			Lab Sample ID:			
			Field Sample ID:	BG3B5		BG3B6
			Sampling Location Code:	MW-102S		MW-102M
			Latitude:	40.14258123		40.1425969
			Longitude:	-74.06022137		-74.06021555
		2020 05 RSL - Tapwater (ug/L)	Sampling Sub-location:	Screen: 11 - 21 ft.		Screen: 22 - 32 ft.
			Sampling Date:	9/29/2020		9/29/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
100-41-4	Ethylbenzene	1.5		0.5	U	0.5	U
100-42-5	Styrene	1200		0.5	U	0.5	U
10061-01-5	cis-1,3-Dichloropropene	-		0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene	-		0.5	U	0.5	U
106-46-7	1,4-Dichlorobenzene	0.48		0.5	U	0.5	U
106-93-4	1,2-Dibromoethane	0.0075		0.5	U	0.5	U
107-06-2	1,2-Dichloroethane	0.17		0.5	U	0.5	U
108-10-1	4-Methyl-2-Pentanone	6300		5	U	5	U
108-87-2	Methylcyclohexane	-		0.5	U	0.5	U
108-88-3	Toluene	1100		0.5	U	0.5	U
108-90-7	Chlorobenzene	78		0.5	U	0.5	U
110-82-7	Cyclohexane	13000		0.5	U	0.5	U
120-82-1	1,2,4-Trichlorobenzene	1.2		0.5	U	0.5	U
124-48-1	Dibromochloromethane	0.87		0.5	U	0.5	U
127-18-4	Tetrachloroethene	11		0.5	U	0.5	U
156-59-2	cis-1,2-Dichloroethene	36		0.5	U	0.5	U
156-60-5	trans-1,2-Dichloroethene	360		0.5	U	0.5	U
1634-04-4	Methyl tert-Butyl Ether	14		0.5	U	0.5	U
179601-23-1	m,p-Xylene	-		0.5	U	0.5	U
541-73-1	1,3-Dichlorobenzene	-		0.5	U	0.5	U
56-23-5	Carbon Tetrachloride	0.46		0.5	U	0.5	U
591-78-6	2-Hexanone	38		5	U	5	U
67-64-1	Acetone	14000		5	U	5	U
67-66-3	Chloroform	0.22		0.62		0.5	U
71-43-2	Benzene	0.46		0.5	U	0.5	U
71-55-6	1,1,1-Trichloroethane	8000		0.5	U	0.5	U
74-83-9	Bromomethane	7.5		1	U	1	U
74-87-3	Chloromethane	190		2	U	2	U
74-97-5	Bromochloromethane	83		0.5	U	0.5	U
75-00-3	Chloroethane	21000		0.5	U	0.5	U
75-01-4	Vinyl Chloride	0.019		1	U	1	U
75-09-2	Methylene Chloride	11		0.5	U	0.5	U
75-15-0	Carbon Disulfide	810		0.5	U	0.5	U
75-25-2	Bromoform	3.3		0.5	U	0.5	U
75-27-4	Bromodichloromethane	0.13		0.5	U	0.5	U
75-34-3	1,1-Dichloroethane	2.8		0.5	U	0.5	U
75-35-4	1,1-Dichloroethene	280		0.5	U	0.5	U
75-69-4	Trichlorofluoromethane	5200		0.5	U	0.5	U
75-71-8	Dichlorodifluoromethane	200		0.5	U	0.5	U
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	10000		0.5	U	0.5	U
78-87-5	1,2-Dichloropropane	0.85		0.5	U	0.5	U
78-93-3	2-Butanone	5600		5	U	5	U
79-00-5	1,1,2-Trichloroethane	0.28		0.5	U	0.5	U
79-01-6	Trichloroethene	0.49		0.5	U	0.5	U
79-20-9	Methyl Acetate	20000		0.5	U	0.5	U
79-34-5	1,1,2,2-Tetrachloroethane	0.076		0.5	U	0.5	U
87-61-6	1,2,3-Trichlorobenzene	7		0.5	U	0.5	U
95-47-6	o-Xylene	190		0.5	U	0.5	U
95-50-1	1,2-Dichlorobenzene	300		0.5	U	0.5	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.00033		0.5	UL	0.5	UL
98-82-8	Isopropylbenzene	450		0.5	U	0.5	U

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GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
Trace VOC

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

2020 05 RSL - Tapwater (ug/L)

		2020 05 RSL - Tapwater (ug/L)	Lab Sample ID:			
			Field Sample ID:	BG3B7		BG3B8
			Sampling Location Code:	MW-105M Dup		MW-104S
			Latitude:	40.14231502		40.14203027
			Longitude:	-74.05818948		-74.05908191
			Sampling Sub-location:	Screen: 16 - 26 ft.		Screen: 7 - 17 ft.
			Sampling Date:	9/29/2020		9/29/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
100-41-4	Ethylbenzene	1.5		0.5	U	0.5	U
100-42-5	Styrene	1200		0.5	U	0.5	U
10061-01-5	cis-1,3-Dichloropropene	-		0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene	-		0.5	U	0.5	U
106-46-7	1,4-Dichlorobenzene	0.48		0.5	U	0.5	U
106-93-4	1,2-Dibromoethane	0.0075		0.5	U	0.5	U
107-06-2	1,2-Dichloroethane	0.17		0.5	U	0.5	U
108-10-1	4-Methyl-2-Pentanone	6300		5	U	5	U
108-87-2	Methylcyclohexane	-		0.5	U	0.5	U
108-88-3	Toluene	1100		0.5	U	0.5	U
108-90-7	Chlorobenzene	78		0.5	U	0.5	U
110-82-7	Cyclohexane	13000		0.5	U	0.5	U
120-82-1	1,2,4-Trichlorobenzene	1.2		0.5	U	0.5	U
124-48-1	Dibromochloromethane	0.87		0.5	U	0.5	U
127-18-4	Tetrachloroethene	11		0.5	U	0.5	U
156-59-2	cis-1,2-Dichloroethene	36		0.5	U	0.5	U
156-60-5	trans-1,2-Dichloroethene	360		0.5	U	0.5	U
1634-04-4	Methyl tert-Butyl Ether	14		0.5	U	0.5	U
179601-23-1	m,p-Xylene	-		0.5	U	0.5	U
541-73-1	1,3-Dichlorobenzene	-		0.5	U	0.5	U
56-23-5	Carbon Tetrachloride	0.46		0.5	U	0.5	U
591-78-6	2-Hexanone	38		5	U	5	U
67-64-1	Acetone	14000		5	U	5	U
67-66-3	Chloroform	0.22		0.5	U	0.5	U
71-43-2	Benzene	0.46		0.5	U	0.5	U
71-55-6	1,1,1-Trichloroethane	8000		0.5	U	0.5	U
74-83-9	Bromomethane	7.5		1	U	1	U
74-87-3	Chloromethane	190		2	U	2	U
74-97-5	Bromochloromethane	83		0.5	U	0.5	U
75-00-3	Chloroethane	21000		0.5	U	0.5	U
75-01-4	Vinyl Chloride	0.019		1	U	1	U
75-09-2	Methylene Chloride	11		0.5	U	0.5	U
75-15-0	Carbon Disulfide	810		0.5	U	0.5	U
75-25-2	Bromoform	3.3		0.5	U	0.5	U
75-27-4	Bromodichloromethane	0.13		0.5	U	0.5	U
75-34-3	1,1-Dichloroethane	2.8		0.5	U	0.5	U
75-35-4	1,1-Dichloroethene	280		0.5	U	0.5	U
75-69-4	Trichlorofluoromethane	5200		0.5	U	0.5	U
75-71-8	Dichlorodifluoromethane	200		0.5	U	0.5	U
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	10000		0.5	U	0.5	U
78-87-5	1,2-Dichloropropane	0.85		0.5	U	0.5	U
78-93-3	2-Butanone	5600		5	U	5	U
79-00-5	1,1,2-Trichloroethane	0.28		0.5	U	0.5	U
79-01-6	Trichloroethene	0.49		0.5	U	0.5	U
79-20-9	Methyl Acetate	20000		0.5	U	0.5	U
79-34-5	1,1,2,2-Tetrachloroethane	0.076		0.5	U	0.5	U
87-61-6	1,2,3-Trichlorobenzene	7		0.5	U	0.5	U
95-47-6	o-Xylene	190		0.5	U	0.5	U
95-50-1	1,2-Dichlorobenzene	300		0.5	U	0.5	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.00033		0.5	UL	0.5	UL
98-82-8	Isopropylbenzene	450		0.5	U	0.5	U

Qualifier Key:

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WALDICK AEROSPACE SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
Trace VOC

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

2020 05 RSL - Tapwater (ug/L)

		2020 05 RSL - Tapwater (ug/L)	Lab Sample ID:			
			Field Sample ID:	BG3B9		BG3C0
			Sampling Location Code:	MW-104M		MW-105S
			Latitude:	40.14201628		40.14230593
			Longitude:	-74.0590953		-74.05821068
			Sampling Sub-location:	Screen: 16 - 26 ft.		Screen: 6 - 16 ft.
			Sampling Date:	9/29/2020		9/29/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
100-41-4	Ethylbenzene	1.5		0.5	U	0.5	U
100-42-5	Styrene	1200		0.5	U	0.5	U
10061-01-5	cis-1,3-Dichloropropene	-		0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene	-		0.5	U	0.5	U
106-46-7	1,4-Dichlorobenzene	0.48		0.5	U	0.5	U
106-93-4	1,2-Dibromoethane	0.0075		0.5	U	0.5	U
107-06-2	1,2-Dichloroethane	0.17		0.5	U	0.5	U
108-10-1	4-Methyl-2-Pentanone	6300		5	U	5	U
108-87-2	Methylcyclohexane	-		0.5	U	0.5	U
108-88-3	Toluene	1100		0.5	U	0.5	U
108-90-7	Chlorobenzene	78		0.5	U	0.5	U
110-82-7	Cyclohexane	13000		0.5	U	0.5	U
120-82-1	1,2,4-Trichlorobenzene	1.2		0.5	U	0.5	U
124-48-1	Dibromochloromethane	0.87		0.5	U	0.5	U
127-18-4	Tetrachloroethene	11		0.5	U	0.5	U
156-59-2	cis-1,2-Dichloroethene	36		0.5	U	0.5	U
156-60-5	trans-1,2-Dichloroethene	360		0.5	U	0.5	U
1634-04-4	Methyl tert-Butyl Ether	14		0.5	U	0.5	U
179601-23-1	m,p-Xylene	-		0.5	U	0.5	U
541-73-1	1,3-Dichlorobenzene	-		0.5	U	0.5	U
56-23-5	Carbon Tetrachloride	0.46		0.5	U	0.5	U
591-78-6	2-Hexanone	38		5	U	5	U
67-64-1	Acetone	14000		5	U	5	U
67-66-3	Chloroform	0.22		0.58		0.5	U
71-43-2	Benzene	0.46		0.5	U	0.5	U
71-55-6	1,1,1-Trichloroethane	8000		0.5	U	0.5	U
74-83-9	Bromomethane	7.5		1	U	1	U
74-87-3	Chloromethane	190		2	U	2	U
74-97-5	Bromochloromethane	83		0.5	U	0.5	U
75-00-3	Chloroethane	21000		0.5	U	0.5	U
75-01-4	Vinyl Chloride	0.019		1	U	1	U
75-09-2	Methylene Chloride	11		0.5	U	0.5	U
75-15-0	Carbon Disulfide	810		0.5	U	0.5	U
75-25-2	Bromoform	3.3		0.5	U	0.5	U
75-27-4	Bromodichloromethane	0.13		0.5	U	0.5	U
75-34-3	1,1-Dichloroethane	2.8		0.5	U	0.5	U
75-35-4	1,1-Dichloroethene	280		0.5	U	0.5	U
75-69-4	Trichlorofluoromethane	5200		0.5	U	0.5	U
75-71-8	Dichlorodifluoromethane	200		0.5	U	0.5	U
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	10000		0.5	U	0.5	U
78-87-5	1,2-Dichloropropane	0.85		0.5	U	0.5	U
78-93-3	2-Butanone	5600		5	U	5	U
79-00-5	1,1,2-Trichloroethane	0.28		0.5	U	0.5	U
79-01-6	Trichloroethene	0.49		0.5	U	0.5	U
79-20-9	Methyl Acetate	20000		0.5	U	0.5	U
79-34-5	1,1,2,2-Tetrachloroethane	0.076		0.5	U	0.5	U
87-61-6	1,2,3-Trichlorobenzene	7		0.5	U	0.5	U
95-47-6	o-Xylene	190		0.5	U	0.5	U
95-50-1	1,2-Dichlorobenzene	300		0.5	U	0.5	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.00033		0.5	UL	0.5	UL
98-82-8	Isopropylbenzene	450		0.5	U	0.5	U

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WALDICK AEROSPACE SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
Trace VOC

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

2020 05 RSL - Tapwater (ug/L)

		2020 05 RSL - Tapwater (ug/L)	Lab Sample ID:			
			Field Sample ID:	BG3C1		BG3C2
			Sampling Location Code:	MW-105M		MW-111S
			Latitude:	40.14231502		40.1418582
			Longitude:	-74.05818948		-74.0587429
			Sampling Sub-location:	Screen: 16 - 26 ft.		Screen: 6 - 16 ft.
			Sampling Date:	9/29/2020		9/29/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
100-41-4	Ethylbenzene	1.5		0.5	U	0.5	U
100-42-5	Styrene	1200		0.5	U	0.5	U
10061-01-5	cis-1,3-Dichloropropene	-		0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene	-		0.5	U	0.5	U
106-46-7	1,4-Dichlorobenzene	0.48		0.5	U	0.5	U
106-93-4	1,2-Dibromoethane	0.0075		0.5	U	0.5	U
107-06-2	1,2-Dichloroethane	0.17		0.5	U	0.5	U
108-10-1	4-Methyl-2-Pentanone	6300		5	U	5	U
108-87-2	Methylcyclohexane	-		0.5	U	0.5	U
108-88-3	Toluene	1100		0.5	U	0.5	U
108-90-7	Chlorobenzene	78		0.5	U	0.5	U
110-82-7	Cyclohexane	13000		0.5	U	0.5	U
120-82-1	1,2,4-Trichlorobenzene	1.2		0.5	U	0.5	U
124-48-1	Dibromochloromethane	0.87		0.5	U	0.5	U
127-18-4	Tetrachloroethene	11		0.5	U	0.5	U
156-59-2	cis-1,2-Dichloroethene	36		0.5	U	0.5	U
156-60-5	trans-1,2-Dichloroethene	360		0.5	U	0.5	U
1634-04-4	Methyl tert-Butyl Ether	14		0.5	U	0.5	U
179601-23-1	m,p-Xylene	-		0.5	U	0.5	U
541-73-1	1,3-Dichlorobenzene	-		0.5	U	0.5	U
56-23-5	Carbon Tetrachloride	0.46		0.5	U	0.5	U
591-78-6	2-Hexanone	38		5	U	5	U
67-64-1	Acetone	14000		5	U	5	U
67-66-3	Chloroform	0.22		0.5	U	0.5	U
71-43-2	Benzene	0.46		0.5	U	0.5	U
71-55-6	1,1,1-Trichloroethane	8000		0.5	U	0.5	U
74-83-9	Bromomethane	7.5		1	U	1	U
74-87-3	Chloromethane	190		2	U	2	U
74-97-5	Bromochloromethane	83		0.5	U	0.5	U
75-00-3	Chloroethane	21000		0.5	U	0.5	U
75-01-4	Vinyl Chloride	0.019		1	U	1	U
75-09-2	Methylene Chloride	11		0.5	U	0.5	U
75-15-0	Carbon Disulfide	810		0.5	U	0.5	U
75-25-2	Bromoform	3.3		0.5	U	0.5	U
75-27-4	Bromodichloromethane	0.13		0.5	U	0.5	U
75-34-3	1,1-Dichloroethane	2.8		0.5	U	0.5	U
75-35-4	1,1-Dichloroethene	280		0.5	U	0.5	U
75-69-4	Trichlorofluoromethane	5200		0.5	U	0.5	U
75-71-8	Dichlorodifluoromethane	200		0.5	U	0.5	U
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	10000		0.5	U	0.5	U
78-87-5	1,2-Dichloropropane	0.85		0.5	U	0.5	U
78-93-3	2-Butanone	5600		5	U	5	U
79-00-5	1,1,2-Trichloroethane	0.28		0.5	U	0.5	U
79-01-6	Trichloroethene	0.49		0.5	U	0.5	U
79-20-9	Methyl Acetate	20000		0.5	U	0.5	U
79-34-5	1,1,2,2-Tetrachloroethane	0.076		0.5	U	0.5	U
87-61-6	1,2,3-Trichlorobenzene	7		0.5	U	0.5	U
95-47-6	o-Xylene	190		0.5	U	0.5	U
95-50-1	1,2-Dichlorobenzene	300		0.5	U	0.5	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.00033		0.5	UL	0.5	UL
98-82-8	Isopropylbenzene	450		0.5	U	0.5	U

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WALDICK AEROSPACE SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
Trace VOC

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

2020 05 RSL - Tapwater (ug/L)

			Lab Sample ID:			
			Field Sample ID:	BG3C3		BG3C4
			Sampling Location Code:	MW-112S		RD-101S
			Latitude:	40.1418115		40.14279776
			Longitude:	-74.0584375		-74.06053801
		2020 05 RSL - Tapwater (ug/L)	Sampling Sub-location:	Screen: 8 - 18 ft.		Screen: 22 - 32 ft.
			Sampling Date:	9/29/2020		9/29/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
100-41-4	Ethylbenzene	1.5		0.5	U	0.5	U
100-42-5	Styrene	1200		0.5	U	0.5	U
10061-01-5	cis-1,3-Dichloropropene	-		0.5	U	0.5	U
10061-02-6	trans-1,3-Dichloropropene	-		0.5	U	0.5	U
106-46-7	1,4-Dichlorobenzene	0.48		0.5	U	0.5	U
106-93-4	1,2-Dibromoethane	0.0075		0.5	U	0.5	U
107-06-2	1,2-Dichloroethane	0.17		0.5	U	0.5	U
108-10-1	4-Methyl-2-Pentanone	6300		5	U	5	U
108-87-2	Methylcyclohexane	-		0.5	U	0.5	U
108-88-3	Toluene	1100		0.5	U	0.5	U
108-90-7	Chlorobenzene	78		0.5	U	0.5	U
110-82-7	Cyclohexane	13000		0.5	U	0.5	U
120-82-1	1,2,4-Trichlorobenzene	1.2		0.5	U	0.5	U
124-48-1	Dibromochloromethane	0.87		0.5	U	0.5	U
127-18-4	Tetrachloroethene	11		0.85		1.34	
156-59-2	cis-1,2-Dichloroethene	36		0.5	U	0.5	U
156-60-5	trans-1,2-Dichloroethene	360		0.5	U	0.5	U
1634-04-4	Methyl tert-Butyl Ether	14		0.5	U	0.5	U
179601-23-1	m,p-Xylene	-		0.5	U	0.5	U
541-73-1	1,3-Dichlorobenzene	-		0.5	U	0.5	U
56-23-5	Carbon Tetrachloride	0.46		0.5	U	0.5	U
591-78-6	2-Hexanone	38		5	U	5	U
67-64-1	Acetone	14000		5	U	5	U
67-66-3	Chloroform	0.22		0.5	U	0.5	U
71-43-2	Benzene	0.46		0.5	U	0.5	U
71-55-6	1,1,1-Trichloroethane	8000		0.5	U	0.5	U
74-83-9	Bromomethane	7.5		1	U	1	U
74-87-3	Chloromethane	190		2	U	2	U
74-97-5	Bromochloromethane	83		0.5	U	0.5	U
75-00-3	Chloroethane	21000		0.5	U	0.5	U
75-01-4	Vinyl Chloride	0.019		1	U	1	U
75-09-2	Methylene Chloride	11		0.5	U	0.5	U
75-15-0	Carbon Disulfide	810		0.5	U	0.5	U
75-25-2	Bromoform	3.3		0.5	U	0.5	U
75-27-4	Bromodichloromethane	0.13		0.5	U	0.5	U
75-34-3	1,1-Dichloroethane	2.8		0.5	U	0.5	U
75-35-4	1,1-Dichloroethene	280		0.5	U	0.5	U
75-69-4	Trichlorofluoromethane	5200		0.5	U	0.5	U
75-71-8	Dichlorodifluoromethane	200		0.5	U	0.5	U
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	10000		0.5	U	0.5	U
78-87-5	1,2-Dichloropropane	0.85		0.5	U	0.5	U
78-93-3	2-Butanone	5600		5	U	5	U
79-00-5	1,1,2-Trichloroethane	0.28		0.5	U	0.5	U
79-01-6	Trichloroethene	0.49		0.5	U	0.5	U
79-20-9	Methyl Acetate	20000		0.5	U	0.5	U
79-34-5	1,1,2,2-Tetrachloroethane	0.076		0.5	U	0.5	U
87-61-6	1,2,3-Trichlorobenzene	7		0.5	U	0.5	U
95-47-6	o-Xylene	190		0.5	U	0.5	U
95-50-1	1,2-Dichlorobenzene	300		0.5	U	0.5	U
96-12-8	1,2-Dibromo-3-Chloropropane	0.00033		0.5	UL	0.5	UL
98-82-8	Isopropylbenzene	450		0.5	U	0.5	U

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WALDICK AEROSPACE
SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
1,4-Dioxane

	Result Rejected, Qualified R		Lab Sample ID:	2009044-02		2009044-04
	Result equal to or over action level but Not Detected		Field Sample ID:	BG3B4		BG3B5
	Detected result equal to or over the action level		Sampling Location Code:	RB1-092820		MW-102S
June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)			Latitude:	NA		40.14258122970
		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion	Longitude:	NA		-74.06022136950
			Sampling Sub-location:	Rinsate Blank #1		Screen: 11 - 21 ft.
			Sampling Date:	9/28/2020		9/29/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
123-91-1	1,4-Dioxane	0.4		0.195	UJ	0.195	UJ
		#N/A					

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WALDICK AEROSPACE
SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
1,4-Dioxane

	Result Rejected, Qualified R		Lab Sample ID:	2009044-06		2009044-08
	Result equal to or over action level but Not Detected		Field Sample ID:	BG3B6		BG3B7
	Detected result equal to or over the action level		Sampling Location Code:	MW-102M		MW-105M Dup
June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)			Latitude:	40.14259690110		40.14231501880
		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion	Longitude:	-74.06021555400		-74.05818948240
			Sampling Sub-location:	Screen: 22 - 32 ft.		Screen: 16 - 26 ft.
			Sampling Date:	9/29/2020		9/29/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
123-91-1	1,4-Dioxane	0.4		0.195	UJ	0.206	UJ
		#N/A					

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WALDICK AEROSPACE
SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
1,4-Dioxane

	Result Rejected, Qualified R		Lab Sample ID:	2009044-10		2009044-12
	Result equal to or over action level but Not Detected		Field Sample ID:	BG3B8		BG3B9
	Detected result equal to or over the action level		Sampling Location Code:	MW-104S		MW-104M
June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)			Latitude:	40.14203027150		40.14201628170
		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion	Longitude:	-74.05908191100		-74.05909529830
			Sampling Sub-location:	Screen: 7 - 17 ft.		Screen: 16 - 26 ft.
			Sampling Date:	9/29/2020		9/29/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
123-91-1	1,4-Dioxane	0.4		0.196	UJ	0.208	UJ
		#N/A					

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WALDICK AEROSPACE
SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
1,4-Dioxane

	Result Rejected, Qualified R		Lab Sample ID:	2009044-14		2009044-16	
	Result equal to or over action level but Not Detected		Field Sample ID:	BG3C0		BG3C1	
	Detected result equal to or over the action level		Sampling Location Code:	MW-105S		MW-105M	
June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)			Latitude:	40.14230592880		40.14231501880	
		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion	Longitude:	-74.05821068460		-74.05818948240	
			Sampling Sub-location:	Screen: 6 - 16 ft.		Screen: 16 - 26 ft.	
			Sampling Date:	9/29/2020		9/29/2020	
			Units:	ug/L		ug/L	
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
123-91-1	1,4-Dioxane	0.4		0.193	UJ	0.211	UJ
		#N/A					

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WALDICK AEROSPACE
SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
1,4-Dioxane

	Result Rejected, Qualified R		Lab Sample ID:	2009044-18		2009044-20
	Result equal to or over action level but Not Detected		Field Sample ID:	BG3C2		BG3C3
	Detected result equal to or over the action level		Sampling Location Code:	MW-111S		MW-112S
June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)			Latitude:	40.14185820000		40.14181150000
		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion	Longitude:	-74.05874290000		-74.05843750000
			Sampling Sub-location:	Screen: 6 - 16 ft.		Screen: 8 - 18 ft.
			Sampling Date:	9/29/2020		9/29/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
123-91-1	1,4-Dioxane	0.4		0.211	UJ	0.194	UJ
		#N/A					

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WALDICK AEROSPACE
SUPERFUND SITE
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept 28-29, 2020
1,4-Dioxane

	Result Rejected, Qualified R	Lab Sample ID:	2009044-22
	Result equal to or over action level but Not Detected	Field Sample ID:	BG3C4
	Detected result equal to or over the action level	Sampling Location Code:	RD-101S
June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)		Latitude:	40.14279775770
		Longitude:	-74.06053801010
		Sampling Sub-location:	Screen: 22 - 32 ft.
		Sampling Date:	9/29/2020
		Units:	ug/L

CAS No.	Fraction.	June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion Action Level	Result	Qualifier
123-91-1	1,4-Dioxane	0.4	0.193	UJ
		#N/A		

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WALDICK AEROSPACE
Superfund Site
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept. 28-29, 2020
Total and Dissolved Metals

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)

		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)	Lab Sample ID:	2009044-02		2009044-03		2009044-04		2009044-05	
			Field Sample ID:	BG3B4		BG3B4		BG3B5		BG3B5 (dissolved)	
			Sampling Location Code:	RB1-092820		RB1-092820		MW-102S		MW-102S-Diss	
			Latitude:					40.1425812297		40.1425812297	
			Longitude:	NA		NA		-74.0602213695		-74.0602213695	
			Sampling Sub-location:	Rinsate Blank #1		Rinsate Blank #1		Screen: 11 - 21 ft.		Screen: 11 - 21 ft.	
			Sampling Date:	9/28/2020		9/28/2020		9/29/2020		9/29/2020	
			Units:	ug/L		ug/L		ug/L		ug/L	
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
7429-90-5	Aluminum	200		20	U	20	U	26		20	U
7439-89-6	Iron	300		20	U	40	U	96		40	U
7439-92-1	Lead	5		1	U	1	U	1	U	1	U
7439-95-4	Magnesium	-		100	U	100	U	3000		3100	
7439-96-5	Manganese	50		1.8		2.4		2.6		2.1	
7440-02-0	Nickel	100		2.2		5.3		4		3.6	
7440-09-7	Potassium	-		100	U	100	U	1500		1600	
7440-22-4	Silver	40		1	U	1	U	1	U	1	U
7440-23-5	Sodium	50000		100	U	100	U	12000		12000	
7440-28-0	Thallium	2		1	U	1	U	1	U	1	U
7440-36-0	Antimony	6		1	U	1	U	1	U	1	U
7440-38-2	Arsenic	3		1	U	1	U	1	U	1	U
7440-39-3	Barium	6000		1	U	1	U	30		30	
7440-41-7	Beryllium	1		1	U	1	U	1	U	1	U
7440-43-9	Cadmium	4		1	U	1	U	4.3		4.6	
7440-47-3	Chromium	70		1	U	3.8		13		2.7	
7440-48-4	Cobalt	100		1	U	1	U	1	U	1	U
7440-50-8	Copper	1300		1	U	1		2.9		1	
7440-62-2	Vanadium	-		1	U	1	U	1	U	1	U
7440-66-6	Zinc	2000		4.4		5.8		3.4		3.2	
7440-70-2	Calcium	-		100	U	100	U	9900		10000	
7782-49-2	Selenium	40		1	U	1	U	1	U	1	U
		-									

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WALDICK AEROSPACE
Superfund Site
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept. 28-29, 2020
Total and Dissolved Metals

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)

		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)	Lab Sample ID:	2009044-06		2009044-07		2009044-16		2009044-08	
			Field Sample ID:	BG3B6		BG3B6 (dissolved)		BG3C1		BG3B7	
			Sampling Location Code:	MW-102M		MW-102M-Diss		MW-105M		MW-105M Dup	
			Latitude:	40.1425969011		40.1425969011		40.14231501880		40.14231501880	
			Longitude:	-74.0602155540		-74.0602155540		-74.05818948240		-74.05818948240	
			Sampling Sub-location:	Screen: 22 - 32 ft.		Screen: 22 - 32 ft.		Screen: 16 - 26 ft.		Screen: 16 - 26 ft.	
			Sampling Date:	9/29/2020		9/29/2020		9/29/2020		9/29/2020	
			Units:	ug/L		ug/L		ug/L		ug/L	
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
7429-90-5	Aluminum	200		44		20	U	42		20	U
7439-89-6	Iron	300		320		40	U	910		230	
7439-92-1	Lead	5		1	U	1	U	1	U	1	U
7439-95-4	Magnesium	-		3200		3200		2800		2900	
7439-96-5	Manganese	50		5.1		3.4		14		7.1	
7440-02-0	Nickel	100		14		13		12		12	
7440-09-7	Potassium	-		1600		1700		2100		2100	
7440-22-4	Silver	40		1	U	1	U	1	U	1	U
7440-23-5	Sodium	50000		10000		11000		18000		19000	
7440-28-0	Thallium	2		1	U	1	U	1	U	1	U
7440-36-0	Antimony	6		1	U	1	U	1	U	1	U
7440-38-2	Arsenic	3		1	U	1	U	1	U	1	U
7440-39-3	Barium	6000		27		27		20		21	
7440-41-7	Beryllium	1		1	U	1	U	1	U	1	U
7440-43-9	Cadmium	4		6.5		6.5		1	U	1	U
7440-47-3	Chromium	70		47		13		160		48	
7440-48-4	Cobalt	100		1	U	1	U	1	U	1	U
7440-50-8	Copper	1300		3		1.5		1.5		1.2	
7440-62-2	Vanadium	-		1	U	1	U	1	U	1	U
7440-66-6	Zinc	2000		4.8		4		41		41	
7440-70-2	Calcium	-		10000		10000		12000		12000	
7782-49-2	Selenium	40		1	U	1	U	1	U	1	U
		-									

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WALDICK AEROSPACE
Superfund Site
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept. 28-29, 2020
Total and Dissolved Metals

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)

			Lab Sample ID:	2009044-17		2009044-09		2009044-10		2009044-11
			Field Sample ID:	BG3C1 (dissolved)		BG3B7 (dissolved)		BG3B8		BG3B8 (dissolved)
			Sampling Location Code:	MW-105M-Diss		MW-105M-Diss Dup		MW-104S		MW-104S-Diss
			Latitude:	40.14231501880		40.14231501880		40.14203027150		40.14203027150
			Longitude:	-74.05818948240		-74.05818948240		-74.05908191100		-74.05908191100
		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)	Sampling Sub-location:	Screen: 16 - 26 ft.		Screen: 16 - 26 ft.		Screen: 7 - 17 ft.		Screen: 7 - 17 ft.
			Sampling Date:	9/29/2020		9/29/2020		9/29/2020		9/29/2020
			Units:	ug/L		ug/L		ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
7429-90-5	Aluminum	200		20	U	20	U	**300**		48	
7439-89-6	Iron	300		40	U	40	U	**1100**		120	
7439-92-1	Lead	5		1	U	1	U	1	U	1	U
7439-95-4	Magnesium	-		2900		2900		2900		3000	
7439-96-5	Manganese	50		4.6		4.5		30		27	
7440-02-0	Nickel	100		11		11		**370**		**380**	
7440-09-7	Potassium	-		2100		2100		2700		2700	
7440-22-4	Silver	40		1	U	1	U	1	U	1	U
7440-23-5	Sodium	50000		19000		19000		42000		43000	
7440-28-0	Thallium	2		1	U	1	U	1	U	1	U
7440-36-0	Antimony	6		1	U	1	U	1	U	1	U
7440-38-2	Arsenic	3		1	U	1	U	1	U	1	U
7440-39-3	Barium	6000		21		20		9.3		9.1	
7440-41-7	Beryllium	1		1	U	1	U	1	U	1	U
7440-43-9	Cadmium	4		1	U	1	U	1	U	1	U
7440-47-3	Chromium	70		8.9		8.9		**250**		46	
7440-48-4	Cobalt	100		1	U	1	U	2.5		2.4	
7440-50-8	Copper	1300		1.1		1	U	9.1		6.9	
7440-62-2	Vanadium	-		1	U	1	U	1.3		1	U
7440-66-6	Zinc	2000		42		42		3.8		3.1	
7440-70-2	Calcium	-		12000		12000		9400		9500	
7782-49-2	Selenium	40		1	U	1	U	1	U	1	U
		-									

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GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept. 28-29, 2020
Total and Dissolved Metals

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)

			Lab Sample ID:	2009044-12		2009044-13		2009044-14		2009044-15		
			Field Sample ID:	BG3B9		BG3B9 (dissolved)		BG3C0		BG3C0 (dissolved)		
			Sampling Location Code:	MW-104M		MW-104M-Diss		MW-105S		MW-105S-Diss		
			Latitude:	40.14201628170		40.14201628170		40.14230592880		40.14230592880		
			Longitude:	-74.05909529830		-74.05909529830		-74.05821068460		-74.05821068460		
		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)	Sampling Sub-location:	Screen: 16 - 26 ft.		Screen: 16 - 26 ft.		Screen: 6 - 16 ft.		Screen: 6 - 16 ft.		
			Sampling Date:	9/29/2020		9/29/2020		9/29/2020		9/29/2020		
			Units:	ug/L		ug/L		ug/L		ug/L		
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	
7429-90-5	Aluminum	200		20	U	20	U	30		20	U	
7439-89-6	Iron	300		210		50		340		40	U	
7439-92-1	Lead	5		1	U	1	U	1	U	1	U	
7439-95-4	Magnesium	-		3400		3500		2800		2900		
7439-96-5	Manganese	50		31		31		3		3.1		
7440-02-0	Nickel	100		110		120		6.8		7.5		
7440-09-7	Potassium	-		2100		2100		1900		1900		
7440-22-4	Silver	40		1	U	1	U	1	U	1	U	
7440-23-5	Sodium	50000		25000		26000		19000		19000		
7440-28-0	Thallium	2		1	U	1	U	1	U	1	U	
7440-36-0	Antimony	6		1	U	1	U	1	U	1	U	
7440-38-2	Arsenic	3		1	U	1	U	1	U	1	U	
7440-39-3	Barium	6000		25		26		25		25		
7440-41-7	Beryllium	1		1	U	1	U	1	U	1	U	
7440-43-9	Cadmium	4		2.8		2.9		2.6		2.6		
7440-47-3	Chromium	70		80		33		52		2.3		
7440-48-4	Cobalt	100		1.1		1.1		1	U	1	U	
7440-50-8	Copper	1300		11		11		1	U	1		
7440-62-2	Vanadium	-		1	U	1	U	1	U	1	U	
7440-66-6	Zinc	2000		2	U	2	U	93		95		
7440-70-2	Calcium	-		10000		11000		11000		11000		
7782-49-2	Selenium	40		1	U	1	U	1	U	1	U	
		-										

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WALDICK AEROSPACE
Superfund Site
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept. 28-29, 2020
Total and Dissolved Metals

Result Rejected, Qualified R
Result equal to or over action level but Not Detected
Detected result equal to or over the action level

June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)

			Lab Sample ID:	2009044-18		2009044-19		2009044-20		2009044-21		
			Field Sample ID:	BG3C2		BG3C2 (dissolved)		BG3C3		BG3C3 (dissolved)		
			Sampling Location Code:	MW-111S		MW-111S-Diss		MW-112S		MW-112S-Diss		
			Latitude:	40.14185820000		40.14185820000		40.14181150000		40.14181150000		
			Longitude:	-74.05874290000		-74.05874290000		-74.05843750000		-74.05843750000		
		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)	Sampling Sub-location:	Screen: 6 - 16 ft.		Screen: 6 - 16 ft.		Screen: 8 - 18 ft.		Screen: 8 - 18 ft.		
			Sampling Date:	9/29/2020		9/29/2020		9/29/2020		9/29/2020		
			Units:	ug/L		ug/L		ug/L		ug/L		
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	
7429-90-5	Aluminum	200		**200**		20	U	**400**		**240**		
7439-89-6	Iron	300		**970**		47		**2400**		180		
7439-92-1	Lead	5		1	U	1	U	1	U	1	U	
7439-95-4	Magnesium	-		2600		2700		4100		4100		
7439-96-5	Manganese	50		6.3		6.3		33		33		
7440-02-0	Nickel	100		1	U	1	U	12		6.7		
7440-09-7	Potassium	-		2500		2600		2400		2400		
7440-22-4	Silver	40		1	U	1	U	1	U	1	U	
7440-23-5	Sodium	50000		45000		47000		19000		19000		
7440-28-0	Thallium	2		1	U	1	U	1	U	1	U	
7440-36-0	Antimony	6		1	U	1	U	1	U	1	U	
7440-38-2	Arsenic	3		1	U	1	U	1	U	1	U	
7440-39-3	Barium	6000		25		25		120		110		
7440-41-7	Beryllium	1		1	U	1	U	1	U	1	U	
7440-43-9	Cadmium	4		3		3		1	U	1	U	
7440-47-3	Chromium	70		11		6.3		11		1		
7440-48-4	Cobalt	100		1	U	1	U	1	U	1	U	
7440-50-8	Copper	1300		1	U	1	U	1		1.3		
7440-62-2	Vanadium	-		1		1	U	1	U	1	U	
7440-66-6	Zinc	2000		3.7		3.6		9		12		
7440-70-2	Calcium	-		11000		12000		6800		6900		
7782-49-2	Selenium	40		1	U	1	U	1	U	1	U	
		-										

Qualifier Key:
U - Not detected at or above the Reporting Limit;
J - The identification of the analyte is acceptable, the reported value is an estimate;
K - The identification of the analyte is acceptable, the reported value may be biased high;
L - The identification of the analyte is acceptable, the reported value may be biased low;
NJ - There is presumptive evidence that the analyte is present, the analyte is reported as a tentative identification, the reported value is an estima
B - Analyte is present in associated laboratory and/or field blank.

WALDICK AEROSPACE
Superfund Site
GW Monitoring Well Sampling
LSASD-HWSB-SST
Sept. 28-29, 2020
Total and Dissolved Metals

	Result Rejected, Qualified R
	Result equal to or over action level but Not Detected
	Detected result equal to or over the action level

June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)

		June 1, 2020 NJDEP Higher of PQL and IIA Grnd Water Quality Criterion (ug/L)	Lab Sample ID:	2009044-22		2009044-23
			Field Sample ID:	BG3C4		BG3C4 (dissolved)
			Sampling Location Code:	RD-101S		RD-101S-Diss
			Latitude:	40.14279775770		40.14279775770
			Longitude:	-74.06053801010		-74.06053801010
			Sampling Sub-location:	Screen: 22 - 32 ft.		Screen: 22 - 32 ft.
			Sampling Date:	9/29/2020		9/29/2020
			Units:	ug/L		ug/L
CAS No.	Fraction.	Action Level		Result	Qualifier	Result	Qualifier
7429-90-5	Aluminum	200		22		20	U
7439-89-6	Iron	300		27		40	U
7439-92-1	Lead	5		1	U	1	U
7439-95-4	Magnesium	-		1600		1600	
7439-96-5	Manganese	50		1.8		1.4	
7440-02-0	Nickel	100		1.2		1.1	
7440-09-7	Potassium	-		1000		1000	
7440-22-4	Silver	40		1	U	1	U
7440-23-5	Sodium	50000		4700		4700	
7440-28-0	Thallium	2		1	U	1	U
7440-36-0	Antimony	6		1	U	1	U
7440-38-2	Arsenic	3		1	U	1	U
7440-39-3	Barium	6000		14		13	
7440-41-7	Beryllium	1		1	U	1	U
7440-43-9	Cadmium	4		38		37	
7440-47-3	Chromium	70		1.1		1	U
7440-48-4	Cobalt	100		1	U	1	U
7440-50-8	Copper	1300		1	U	1	U
7440-62-2	Vanadium	-		1	U	1	U
7440-66-6	Zinc	2000		2	U	2	U
7440-70-2	Calcium	-		8000		7900	
7782-49-2	Selenium	40		1	U	1	U
		-					

Qualifier Key:

U - Not detected at or above the Reporting Limit;

J - The identification of the analyte is acceptable, the reported value is an estimate;

K - The identification of the analyte is acceptable, the reported value may be biased high;

L - The identification of the analyte is acceptable, the reported value may be biased low;

NJ - There is presumptive evidence that the analyte is present, the analyte is reported as a tentative identification, the reported value is an estima

B - Analyte is present in associated laboratory and/or field blank.

Appendix D
Laboratory Results

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory
2890 Woodbridge Avenue
Edison , New Jersey 08837
732-906-6886 Phone
732-906-6165 Fax

November 17, 2020

Michael Mercado
Hazardous Waste Support Branch
DESA/HWSB
Edison, NJ 08837

RE: Waldick Aerospace Devices - 2009041

Enclosed are the results of analyses for samples received by the laboratory on 09/29/2020. The signature below reflects the laboratory's approval of the reported results. If you have any questions concerning this report, please refer to Project Number 2009041 and contact the laboratory.

Sincerely,

John R. Bourbon
Chief, DESA/LB

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

Project Narrative:

The National Environmental Laboratory Accreditation Conference Institute (TNI) is a voluntary environmental laboratory accreditation association of State and Federal agencies. TNI established and promoted a National Environmental Laboratory Accreditation Program (NELAP) that provides a uniform set of standards for the generation of environmental data that are of known and defensible quality. The EPA Region 2 Laboratory is NELAP accredited. The Laboratory tests that are accredited have met all the requirements established under the TNI Standards.

Condition Comments

None

Comment(s):

Samples 2009041-01 thru -08:
During the extract concentration step on the water bath, extracts took an extended period of time to concentrate to dryness due to presence of surfactants.
Analytes affected are PFDA, PFUdA, PFDoA, PFTrDA, PFTeDA, NEtFOSAA, NMeFOSAA, HFPO-DA, PFBS, PFHxS, PFOS, 9Cl-PF3ONS, 11Cl-PF3OUdS, PFNS, PFDS, PFPeS, and PFHpS. Due to possible surfactant interference, surrogates representing a subset of the PFAS compounds had low recovery indicating the results may be biased low. The result for the analytes associated with these surrogates were qualified with an “L”.

The "Sample Analysis Date and Time" is included in the results section for any analyte with a prescribed holding time of 72 hours or less.

Data Qualifier(s):

U- The analyte was not detected at or above the Reporting Limit.
J- The identification of the analyte is acceptable; the reported value is an estimate.
K- The identification of the analyte is acceptable; the reported value may be biased high.
L- The identification of the analyte is acceptable; the reported value may be biased low.
NJ- There is presumptive evidence that the analyte is present; the analyte is reported as a tentative identification. The reported value is an estimate.

Reporting Limit(s):

The Laboratory was able to achieve the standard laboratory reporting limits, where applicable, for each analyte requested except for the following analyte(s):

Metals ICPMS

The reporting level of 20.00 ug/L was raised to 40 ug/L for the following analyte(s):
Iron
for the following samples:
2009044-03, -05, -07, -09, -15, -17, -23

VOA-TRACE GCMS

The reporting level of 0.50 ug/L was raised to 1 ug/L for the following analyte(s):
Bromomethane, Vinyl Chloride
for the following samples:
2009044-01, -02, -04, -06, -08, -10, -12, -14, -16, -18, -20, -22
The reporting level of 0.50 ug/L was raised to 2 ug/L for the following analyte(s):
Chloromethane
for the following samples:
2009044-01, -02, -04, -06, -08, -10, -12, -14, -16, -18, -20, -22

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

SUMMARY REPORT FOR SAMPLES

Field ID	Laboratory ID	Matrix	Date Sampled	Date Received
BG3C8	2009041-01	Aqueous	09/28/2020 14:40	09/29/2020 07:00
BG3C9	2009041-02	Aqueous	09/28/2020 14:30	09/29/2020 07:00
BG3D0	2009041-03	Aqueous	09/28/2020 13:30	09/29/2020 07:00
BG3D1	2009041-04	Aqueous	09/28/2020 13:40	09/29/2020 07:00
BG3D2	2009041-05	Aqueous	09/28/2020 14:05	09/29/2020 07:00
BG3D3	2009041-06	Aqueous	09/28/2020 14:15	09/29/2020 07:00
BG3D4	2009041-07	Aqueous	09/28/2020 14:15	09/29/2020 07:00
BG3D5	2009041-08	Aqueous	09/28/2020 13:55	09/29/2020 07:00
BG3D6	2009041-09	Aqueous	09/28/2020 14:10	09/29/2020 07:00
BG3D7	2009041-10	Aqueous	09/28/2020 14:55	09/29/2020 07:00
BG3C5	2009041-11	Aqueous	09/28/2020 16:35	09/29/2020 07:00
BG3B3	2009044-01	Aqueous	09/28/2020 16:30	09/29/2020 16:30
BG3B4	2009044-02	Aqueous	09/28/2020 16:35	09/29/2020 16:30
BG3B4	2009044-03	Aqueous	09/28/2020 16:35	09/29/2020 16:30
BG3B5	2009044-04	Aqueous	09/29/2020 09:45	09/29/2020 16:30
BG3B5	2009044-05	Aqueous	09/29/2020 09:45	09/29/2020 16:30
BG3B6	2009044-06	Aqueous	09/29/2020 10:45	09/29/2020 16:30
BG3B6	2009044-07	Aqueous	09/29/2020 10:45	09/29/2020 16:30
BG3B7	2009044-08	Aqueous	09/29/2020 10:40	09/29/2020 16:30
BG3B7	2009044-09	Aqueous	09/29/2020 10:40	09/29/2020 16:30
BG3B8	2009044-10	Aqueous	09/29/2020 08:30	09/29/2020 16:30
BG3B8	2009044-11	Aqueous	09/29/2020 08:30	09/29/2020 16:30
BG3B9	2009044-12	Aqueous	09/29/2020 08:40	09/29/2020 16:30
BG3B9	2009044-13	Aqueous	09/29/2020 08:40	09/29/2020 16:30
BG3C0	2009044-14	Aqueous	09/29/2020 09:40	09/29/2020 16:30
BG3C0	2009044-15	Aqueous	09/29/2020 09:40	09/29/2020 16:30
BG3C1	2009044-16	Aqueous	09/29/2020 10:40	09/29/2020 16:30
BG3C1	2009044-17	Aqueous	09/29/2020 10:40	09/29/2020 16:30

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

SUMMARY REPORT FOR SAMPLES

Field ID	Laboratory ID	Matrix	Date Sampled	Date Received
BG3C2	2009044-18	Aqueous	09/29/2020 10:45	09/29/2020 16:30
BG3C2	2009044-19	Aqueous	09/29/2020 10:45	09/29/2020 16:30
BG3C3	2009044-20	Aqueous	09/29/2020 10:30	09/29/2020 16:30
BG3C3	2009044-21	Aqueous	09/29/2020 10:30	09/29/2020 16:30
BG3C4	2009044-22	Aqueous	09/29/2020 08:25	09/29/2020 16:30
BG3C4	2009044-23	Aqueous	09/29/2020 08:25	09/29/2020 16:30

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

SUMMARY REPORT FOR METHODS

Analysis	Method	Certification	Matrix
625.1-1,4-Dioxane-SIM	EPA 625.1 SOP C-90 Rev 3.8	NELAP	Aqueous
E-Metals ICPMS TAL Dissolved	EPA 200.8 SOP C-112 Rev 3.8	NELAP	Aqueous
E-Metals ICPMS TAL	EPA 200.8 SOP C-112 Rev 3.8	NELAP	Aqueous
Perfluorinated alkyl acids (PFAAs)	EPA EPA 537 SOP C-135 Rev 1.3	NELAP	Aqueous
VOA Trace/SF	EPA DW-1 Rev 2.7	NELAP	Aqueous

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C8			**Sample ID: 2009041-01**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U L	3.32	ng/L	B009147	
9Cl-PF3ONS	---	U L	3.32	ng/L	B009147	
HFPO-DA	---	U L	3.32	ng/L	B009147	
ADONA	---	U	3.32	ng/L	B009147	
NEtFOSAA	---	U L	3.32	ng/L	B009147	
NMeFOSAA	---	U L	3.32	ng/L	B009147	
PFBS	---	U L	3.32	ng/L	B009147	
PFDA	---	U L	3.32	ng/L	B009147	
PFDoA	---	U L	3.32	ng/L	B009147	
PFHpA	---	U	3.32	ng/L	B009147	
PFHxA	---	U	3.32	ng/L	B009147	
PFHxS	---	U L	3.32	ng/L	B009147	
PFNA	---	U	3.32	ng/L	B009147	
PFOA	5.26		3.32	ng/L	B009147	
PFOS	---	U L	3.32	ng/L	B009147	
PFTeDA	---	U L	3.32	ng/L	B009147	
PFTrDA	---	U L	3.32	ng/L	B009147	
PFUdA	---	U L	3.32	ng/L	B009147	
PFPeS	---	U L	3.32	ng/L	B009147	
PFNS	---	U L	3.32	ng/L	B009147	
PFHpS	---	U L	3.32	ng/L	B009147	
PFDS	---	U L	3.32	ng/L	B009147	
4:2 FTS	---	U	3.32	ng/L	B009147	
6:2 FTS	---	U	3.32	ng/L	B009147	
8:2 FTS	---	U	3.32	ng/L	B009147	
Field ID: BG3C9			**Sample ID: 2009041-02**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U L	3.52	ng/L	B009147	
9Cl-PF3ONS	---	U L	3.52	ng/L	B009147	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C9			**Sample ID: 2009041-02**			
PFAAS, LCMS-MS						
HFPO-DA	---	U	3.52	ng/L	B009147	
ADONA	---	U	3.52	ng/L	B009147	
NEtFOSAA	3.69	L	3.52	ng/L	B009147	
NMeFOSAA	4.56	L	3.52	ng/L	B009147	
PFBS	3.65	L	3.52	ng/L	B009147	
PFDA	---	U L	3.52	ng/L	B009147	
PFDoA	---	U L	3.52	ng/L	B009147	
PFHpA	4.71		3.52	ng/L	B009147	
PFHxA	5.87		3.52	ng/L	B009147	
PFHxS	---	U L	3.52	ng/L	B009147	
PFNA	---	U	3.52	ng/L	B009147	
PFOA	9.13		3.52	ng/L	B009147	
PFOS	5.34	L	3.52	ng/L	B009147	
PFTeDA	---	U L	3.52	ng/L	B009147	
PFTrDA	---	U L	3.52	ng/L	B009147	
PFUdA	---	U L	3.52	ng/L	B009147	
PFPeS	---	U L	3.52	ng/L	B009147	
PFNS	---	U L	3.52	ng/L	B009147	
PFHpS	---	U L	3.52	ng/L	B009147	
PFDS	---	U L	3.52	ng/L	B009147	
4:2 FTS	3.89		3.52	ng/L	B009147	
6:2 FTS	---	U	3.52	ng/L	B009147	
8:2 FTS	---	U	3.52	ng/L	B009147	
Field ID: BG3D0			**Sample ID: 2009041-03**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U	3.57	ng/L	B009147	
9Cl-PF3ONS	---	U	3.57	ng/L	B009147	
HFPO-DA	---	U	3.57	ng/L	B009147	
ADONA	---	U	3.57	ng/L	B009147	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3D0			**Sample ID: 2009041-03**			
PFAAS, LCMS-MS						
NEtFOSAA	---	U L	3.57	ng/L	B009147	
NMeFOSAA	---	U L	3.57	ng/L	B009147	
PFBS	3.75		3.57	ng/L	B009147	
PFDA	---	U	3.57	ng/L	B009147	
PFDoA	---	U	3.57	ng/L	B009147	
PFHpA	---	U	3.57	ng/L	B009147	
PFHxA	6.03		3.57	ng/L	B009147	
PFHxS	---	U	3.57	ng/L	B009147	
PFNA	---	U	3.57	ng/L	B009147	
PFOA	10.6		3.57	ng/L	B009147	
PFOS	7.32		3.57	ng/L	B009147	
PFTeDA	---	U	3.57	ng/L	B009147	
PFTrDA	---	U	3.57	ng/L	B009147	
PFUdA	---	U	3.57	ng/L	B009147	
PFPeS	---	U L	3.57	ng/L	B009147	
PFNS	---	U L	3.57	ng/L	B009147	
PFHpS	---	U L	3.57	ng/L	B009147	
PFDS	---	U L	3.57	ng/L	B009147	
4:2 FTS	---	U	3.57	ng/L	B009147	
6:2 FTS	---	U	3.57	ng/L	B009147	
8:2 FTS	---	U	3.57	ng/L	B009147	
Field ID: BG3D1			**Sample ID: 2009041-04**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U	3.57	ng/L	B009147	
9Cl-PF3ONS	---	U	3.57	ng/L	B009147	
HFPO-DA	---	U	3.57	ng/L	B009147	
ADONA	---	U	3.57	ng/L	B009147	
NEtFOSAA	---	U L	3.57	ng/L	B009147	
NMeFOSAA	---	U L	3.57	ng/L	B009147	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3D1			**Sample ID: 2009041-04**			
PFAAS, LCMS-MS						
PFBS	---	U	3.57	ng/L	B009147	
PFDA	---	U	3.57	ng/L	B009147	
PFDoA	---	U	3.57	ng/L	B009147	
PFHpA	---	U	3.57	ng/L	B009147	
PFHxA	---	U	3.57	ng/L	B009147	
PFHxS	---	U	3.57	ng/L	B009147	
PFNA	---	U	3.57	ng/L	B009147	
PFOA	5.44		3.57	ng/L	B009147	
PFOS	---	U	3.57	ng/L	B009147	
PFTeDA	---	U	3.57	ng/L	B009147	
PFTrDA	---	U	3.57	ng/L	B009147	
PFUdA	---	U	3.57	ng/L	B009147	
PFPeS	---	U	3.57	ng/L	B009147	
PFNS	---	U	3.57	ng/L	B009147	
PFHpS	---	U	3.57	ng/L	B009147	
PFDS	---	U	3.57	ng/L	B009147	
4:2 FTS	---	U	3.57	ng/L	B009147	
6:2 FTS	---	U	3.57	ng/L	B009147	
8:2 FTS	---	U	3.57	ng/L	B009147	
Field ID: BG3D2			**Sample ID: 2009041-05**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U L	3.53	ng/L	B009147	
9Cl-PF3ONS	---	U L	3.53	ng/L	B009147	
HFPO-DA	---	U L	3.53	ng/L	B009147	
ADONA	---	U L	3.53	ng/L	B009147	
NEtFOSAA	---	U L	3.53	ng/L	B009147	
NMeFOSAA	---	U L	3.53	ng/L	B009147	
PFBS	---	U L	3.53	ng/L	B009147	
PFDA	---	U L	3.53	ng/L	B009147	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3D2			**Sample ID: 2009041-05**			
PFAAS, LCMS-MS						
PFDoA	---	U L	3.53	ng/L	B009147	
PFHpA	---	U L	3.53	ng/L	B009147	
PFHxA	---	U L	3.53	ng/L	B009147	
PFHxS	---	U L	3.53	ng/L	B009147	
PFNA	---	U L	3.53	ng/L	B009147	
PFOA	3.95	L	3.53	ng/L	B009147	
PFOS	6.51	L	3.53	ng/L	B009147	
PFTeDA	---	U L	3.53	ng/L	B009147	
PFTrDA	---	U L	3.53	ng/L	B009147	
PFUdA	---	U L	3.53	ng/L	B009147	
PFPeS	---	U L	3.53	ng/L	B009147	
PFNS	---	U L	3.53	ng/L	B009147	
PFHpS	---	U L	3.53	ng/L	B009147	
PFDS	---	U L	3.53	ng/L	B009147	
4:2 FTS	---	U L	3.53	ng/L	B009147	
6:2 FTS	---	U L	3.53	ng/L	B009147	
8:2 FTS	---	U L	3.53	ng/L	B009147	
Field ID: BG3D3			**Sample ID: 2009041-06**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U L	3.32	ng/L	B009147	
9Cl-PF3ONS	---	U L	3.32	ng/L	B009147	
HFPO-DA	---	U L	3.32	ng/L	B009147	
ADONA	---	U	3.32	ng/L	B009147	
NEtFOSAA	---	U L	3.32	ng/L	B009147	
NMeFOSAA	---	U L	3.32	ng/L	B009147	
PFBS	---	U L	3.32	ng/L	B009147	
PFDA	---	U L	3.32	ng/L	B009147	
PFDoA	---	U L	3.32	ng/L	B009147	
PFHpA	---	U	3.32	ng/L	B009147	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3D3			**Sample ID: 2009041-06**			
PFAAS, LCMS-MS						
PFHxA	---	U	3.32	ng/L	B009147	
PFHxS	---	U L	3.32	ng/L	B009147	
PFNA	---	U	3.32	ng/L	B009147	
PFOA	5.02		3.32	ng/L	B009147	
PFOS	5.29	L	3.32	ng/L	B009147	
PFTeDA	---	U L	3.32	ng/L	B009147	
PFTrDA	---	U L	3.32	ng/L	B009147	
PFUdA	---	U L	3.32	ng/L	B009147	
PFPeS	---	U L	3.32	ng/L	B009147	
PFNS	---	U L	3.32	ng/L	B009147	
PFHpS	---	U L	3.32	ng/L	B009147	
PFDS	---	U L	3.32	ng/L	B009147	
4:2 FTS	---	U	3.32	ng/L	B009147	
6:2 FTS	---	U	3.32	ng/L	B009147	
8:2 FTS	---	U	3.32	ng/L	B009147	
Field ID: BG3D4			**Sample ID: 2009041-07**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U L	3.40	ng/L	B009147	
9Cl-PF3ONS	---	U L	3.40	ng/L	B009147	
HFPO-DA	---	U	3.40	ng/L	B009147	
ADONA	---	U	3.40	ng/L	B009147	
NEtFOSAA	---	U L	3.40	ng/L	B009147	
NMeFOSAA	---	U L	3.40	ng/L	B009147	
PFBS	---	U L	3.40	ng/L	B009147	
PFDA	---	U L	3.40	ng/L	B009147	
PFDoA	---	U L	3.40	ng/L	B009147	
PFHpA	---	U	3.40	ng/L	B009147	
PFHxA	---	U	3.40	ng/L	B009147	
PFHxS	---	U L	3.40	ng/L	B009147	

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Field ID: BG3D4			**Sample ID: 2009041-07**			
PFAAS, LCMS-MS						
PFNA	---	U	3.40	ng/L	B009147	
PFOA	4.73		3.40	ng/L	B009147	
PFOS	5.43	L	3.40	ng/L	B009147	
PFTeDA	---	U L	3.40	ng/L	B009147	
PFTrDA	---	U L	3.40	ng/L	B009147	
PFUdA	---	U L	3.40	ng/L	B009147	
PFPeS	---	U L	3.40	ng/L	B009147	
PFNS	---	U L	3.40	ng/L	B009147	
PFHpS	---	U L	3.40	ng/L	B009147	
PFDS	---	U L	3.40	ng/L	B009147	
4:2 FTS	---	U	3.40	ng/L	B009147	
6:2 FTS	---	U	3.40	ng/L	B009147	
8:2 FTS	---	U	3.40	ng/L	B009147	
Field ID: BG3D5			**Sample ID: 2009041-08**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U	3.45	ng/L	B009147	
9Cl-PF3ONS	---	U	3.45	ng/L	B009147	
HFPO-DA	---	U	3.45	ng/L	B009147	
ADONA	---	U	3.45	ng/L	B009147	
NEtFOSAA	---	U L	3.45	ng/L	B009147	
NMeFOSAA	---	U L	3.45	ng/L	B009147	
PFBS	---	U	3.45	ng/L	B009147	
PFDA	---	U L	3.45	ng/L	B009147	
PFDoA	---	U L	3.45	ng/L	B009147	
PFHpA	---	U	3.45	ng/L	B009147	
PFHxA	---	U	3.45	ng/L	B009147	
PFHxS	---	U	3.45	ng/L	B009147	
PFNA	---	U	3.45	ng/L	B009147	
PFOA	9.34		3.45	ng/L	B009147	

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Field ID: BG3D5			**Sample ID: 2009041-08**			
PFAAS, LCMS-MS						
PFOS	5.08		3.45	ng/L	B009147	
PFTeDA	---	U L	3.45	ng/L	B009147	
PFTrDA	---	U L	3.45	ng/L	B009147	
PFUdA	---	U L	3.45	ng/L	B009147	
PFPeS	---	U L	3.45	ng/L	B009147	
PFNS	---	U L	3.45	ng/L	B009147	
PFHpS	---	U L	3.45	ng/L	B009147	
PFDS	---	U L	3.45	ng/L	B009147	
4:2 FTS	---	U	3.45	ng/L	B009147	
6:2 FTS	---	U	3.45	ng/L	B009147	
8:2 FTS	---	U	3.45	ng/L	B009147	
Field ID: BG3D6			**Sample ID: 2009041-09**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U	4.44	ng/L	B009147	
9Cl-PF3ONS	---	U	4.44	ng/L	B009147	
HFPO-DA	---	U	4.44	ng/L	B009147	
ADONA	---	U	4.44	ng/L	B009147	
NEtFOSAA	---	U	4.44	ng/L	B009147	
NMeFOSAA	---	U	4.44	ng/L	B009147	
PFBS	---	U	4.44	ng/L	B009147	
PFDA	---	U	4.44	ng/L	B009147	
PFDoA	---	U	4.44	ng/L	B009147	
PFHpA	---	U	4.44	ng/L	B009147	
PFHxA	---	U	4.44	ng/L	B009147	
PFHxS	---	U	4.44	ng/L	B009147	
PFNA	---	U	4.44	ng/L	B009147	
PFOA	---	U	4.44	ng/L	B009147	
PFOS	---	U	4.44	ng/L	B009147	
PFTeDA	---	U	4.44	ng/L	B009147	

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Field ID: BG3D6			**Sample ID: 2009041-09**			
PFAAS, LCMS-MS						
PFTrDA	---	U	4.44	ng/L	B009147	
PFUdA	---	U	4.44	ng/L	B009147	
PFPeS	---	U	4.44	ng/L	B009147	
PFNS	---	U	4.44	ng/L	B009147	
PFHpS	---	U	4.44	ng/L	B009147	
PFDS	---	U	4.44	ng/L	B009147	
4:2 FTS	---	U	4.44	ng/L	B009147	
6:2 FTS	---	U	4.44	ng/L	B009147	
8:2 FTS	---	U	4.44	ng/L	B009147	
Field ID: BG3D7			**Sample ID: 2009041-10**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U L	3.30	ng/L	B009147	
9Cl-PF3ONS	---	U L	3.30	ng/L	B009147	
HFPO-DA	---	U	3.30	ng/L	B009147	
ADONA	---	U	3.30	ng/L	B009147	
NEtFOSAA	---	U L	3.30	ng/L	B009147	
NMeFOSAA	---	U L	3.30	ng/L	B009147	
PFBS	---	U L	3.30	ng/L	B009147	
PFDA	---	U L	3.30	ng/L	B009147	
PFDoA	---	U L	3.30	ng/L	B009147	
PFHpA	---	U	3.30	ng/L	B009147	
PFHxA	---	U	3.30	ng/L	B009147	
PFHxS	---	U L	3.30	ng/L	B009147	
PFNA	---	U	3.30	ng/L	B009147	
PFOA	7.49		3.30	ng/L	B009147	
PFOS	9.03	L	3.30	ng/L	B009147	
PFTeDA	---	U L	3.30	ng/L	B009147	
PFTrDA	---	U L	3.30	ng/L	B009147	
PFUdA	---	U L	3.30	ng/L	B009147	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3D7			**Sample ID: 2009041-10**			
PFAAS, LCMS-MS						
PFPeS	---	U L	3.30	ng/L	B009147	
PFNS	---	U L	3.30	ng/L	B009147	
PFHpS	---	U L	3.30	ng/L	B009147	
PFDS	---	U L	3.30	ng/L	B009147	
4:2 FTS	---	U	3.30	ng/L	B009147	
6:2 FTS	---	U	3.30	ng/L	B009147	
8:2 FTS	---	U	3.30	ng/L	B009147	
Field ID: BG3C5			**Sample ID: 2009041-11**			
PFAAS, LCMS-MS						
11Cl-PF3OUdS	---	U L	3.70	ng/L	B009147	
9Cl-PF3ONS	---	U L	3.70	ng/L	B009147	
HFPO-DA	---	U	3.70	ng/L	B009147	
ADONA	---	U	3.70	ng/L	B009147	
NEtFOSAA	---	U L	3.70	ng/L	B009147	
NMeFOSAA	---	U L	3.70	ng/L	B009147	
PFBS	---	U L	3.70	ng/L	B009147	
PFDA	---	U L	3.70	ng/L	B009147	
PFDoA	---	U L	3.70	ng/L	B009147	
PFHpA	---	U	3.70	ng/L	B009147	
PFHxA	---	U	3.70	ng/L	B009147	
PFHxS	---	U L	3.70	ng/L	B009147	
PFNA	---	U	3.70	ng/L	B009147	
PFOA	---	U	3.70	ng/L	B009147	
PFOS	---	U L	3.70	ng/L	B009147	
PFTeDA	---	U L	3.70	ng/L	B009147	
PFTrDA	---	U L	3.70	ng/L	B009147	
PFUdA	---	U L	3.70	ng/L	B009147	
PFPeS	---	U L	3.70	ng/L	B009147	
PFNS	---	U L	3.70	ng/L	B009147	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C5			**Sample ID: 2009041-11**			
PFAAS, LCMS-MS						
PFHpS	---	U L	3.70	ng/L	B009147	
PFDS	---	U L	3.70	ng/L	B009147	
4:2 FTS	---	U	3.70	ng/L	B009147	
6:2 FTS	---	U	3.70	ng/L	B009147	
8:2 FTS	---	U	3.70	ng/L	B009147	
Field ID: BG3B3			**Sample ID: 2009044-01**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	---	U	0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B3				**Sample ID: 2009044-01**		
VOA-TRACE GCMS						
Benzene	---	U	0.500	ug/L	B010024	
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	---	U	0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B4			**Sample ID: 2009044-02**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	---	U	0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B4			**Sample ID: 2009044-02**			
VOA-TRACE GCMS						
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	---	U	0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	
NVOA GCMS						
1,4-Dioxane	---	U J	0.195	ug/L	B010027	

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Field ID: BG3B4			**Sample ID: 2009044-02**			
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	---	U	1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	---	U	1.0	ug/L	B010025	
Calcium	---	U	100	ug/L	B010025	
Chromium	---	U	1.0	ug/L	B010025	
Cobalt	---	U	1.0	ug/L	B010025	
Copper	---	U	1.0	ug/L	B010025	
Iron	---	U	20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	---	U	100	ug/L	B010025	
Manganese	1.8		1.0	ug/L	B010025	
Nickel	2.2		1.0	ug/L	B010025	
Potassium	---	U	100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	---	U	100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	---	U	1.0	ug/L	B010025	
Zinc	4.4		2.0	ug/L	B010025	
Field ID: BG3B4			**Sample ID: 2009044-03**			
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	
Barium	---	U	1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B4			**Sample ID: 2009044-03**			
Metals ICPMS						
Cadmium	---	U	1.0	ug/L	B010026	
Calcium	---	U	100	ug/L	B010026	
Chromium	3.8		1.0	ug/L	B010026	
Cobalt	---	U	1.0	ug/L	B010026	
Copper	1.0		1.0	ug/L	B010026	
Iron	---	U	40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	---	U	100	ug/L	B010026	
Manganese	2.4		1.0	ug/L	B010026	
Nickel	5.3		1.0	ug/L	B010026	
Potassium	---	U	100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	
Sodium	---	U	100	ug/L	B010026	
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	5.8		2.0	ug/L	B010026	
Field ID: BG3B5			**Sample ID: 2009044-04**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B5			**Sample ID: 2009044-04**			
VOA-TRACE GCMS						
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	0.620		0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	---	U	0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B5			**Sample ID: 2009044-04**			
VOA-TRACE GCMS						
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	
NVOA GCMS						
1,4-Dioxane	---	U J	0.195	ug/L	B010027	
Metals ICPMS						
Aluminum	26		20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	30		1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	4.3		1.0	ug/L	B010025	
Calcium	9900		100	ug/L	B010025	
Chromium	13		1.0	ug/L	B010025	
Cobalt	---	U	1.0	ug/L	B010025	
Copper	2.9		1.0	ug/L	B010025	
Iron	96		20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	3000		100	ug/L	B010025	
Manganese	2.6		1.0	ug/L	B010025	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B5			**Sample ID: 2009044-04**			
Metals ICPMS						
Nickel	4.0		1.0	ug/L	B010025	
Potassium	1500		100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	12000		100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	---	U	1.0	ug/L	B010025	
Zinc	3.4		2.0	ug/L	B010025	
Field ID: BG3B5			**Sample ID: 2009044-05**			
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	
Barium	30		1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	
Cadmium	4.6		1.0	ug/L	B010026	
Calcium	10000		100	ug/L	B010026	
Chromium	2.7		1.0	ug/L	B010026	
Cobalt	---	U	1.0	ug/L	B010026	
Copper	1.0		1.0	ug/L	B010026	
Iron	---	U	40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	3100		100	ug/L	B010026	
Manganese	2.1		1.0	ug/L	B010026	
Nickel	3.6		1.0	ug/L	B010026	
Potassium	1600		100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	
Sodium	12000		100	ug/L	B010026	

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Field ID: BG3B5				**Sample ID: 2009044-05**		
Metals ICPMS						
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	3.2		2.0	ug/L	B010026	
Field ID: BG3B6				**Sample ID: 2009044-06**		
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	---	U	0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B6			**Sample ID: 2009044-06**			
VOA-TRACE GCMS						
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	---	U	0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	

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Field ID: BG3B6			**Sample ID: 2009044-06**			
NVOA GCMS						
1,4-Dioxane	---	U J	0.195	ug/L	B010027	
Metals ICPMS						
Aluminum	44		20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	27		1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	6.5		1.0	ug/L	B010025	
Calcium	10000		100	ug/L	B010025	
Chromium	47		1.0	ug/L	B010025	
Cobalt	---	U	1.0	ug/L	B010025	
Copper	3.0		1.0	ug/L	B010025	
Iron	320		20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	3200		100	ug/L	B010025	
Manganese	5.1		1.0	ug/L	B010025	
Nickel	14		1.0	ug/L	B010025	
Potassium	1600		100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	10000		100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	---	U	1.0	ug/L	B010025	
Zinc	4.8		2.0	ug/L	B010025	
Field ID: BG3B6			**Sample ID: 2009044-07**			
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B6			**Sample ID: 2009044-07**			
Metals ICPMS						
Barium	27		1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	
Cadmium	6.5		1.0	ug/L	B010026	
Calcium	10000		100	ug/L	B010026	
Chromium	13		1.0	ug/L	B010026	
Cobalt	---	U	1.0	ug/L	B010026	
Copper	1.5		1.0	ug/L	B010026	
Iron	---	U	40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	3200		100	ug/L	B010026	
Manganese	3.4		1.0	ug/L	B010026	
Nickel	13		1.0	ug/L	B010026	
Potassium	1700		100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	
Sodium	11000		100	ug/L	B010026	
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	4.0		2.0	ug/L	B010026	
Field ID: BG3B7			**Sample ID: 2009044-08**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	

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Field ID: BG3B7				**Sample ID: 2009044-08**		
VOA-TRACE GCMS						
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	---	U	0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	---	U	0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	

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Field ID: BG3B7			**Sample ID: 2009044-08**			
VOA-TRACE GCMS						
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	
NVOA GCMS						
1,4-Dioxane	---	U J	0.206	ug/L	B010027	
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	21		1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	---	U	1.0	ug/L	B010025	
Calcium	12000		100	ug/L	B010025	
Chromium	48		1.0	ug/L	B010025	
Cobalt	---	U	1.0	ug/L	B010025	
Copper	1.2		1.0	ug/L	B010025	
Iron	230		20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	2900		100	ug/L	B010025	

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Field ID: BG3B7			**Sample ID: 2009044-08**			
Metals ICPMS						
Manganese	7.1		1.0	ug/L	B010025	
Nickel	12		1.0	ug/L	B010025	
Potassium	2100		100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	19000		100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	---	U	1.0	ug/L	B010025	
Zinc	41		2.0	ug/L	B010025	
Field ID: BG3B7			**Sample ID: 2009044-09**			
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	
Barium	20		1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	
Cadmium	---	U	1.0	ug/L	B010026	
Calcium	12000		100	ug/L	B010026	
Chromium	8.9		1.0	ug/L	B010026	
Cobalt	---	U	1.0	ug/L	B010026	
Copper	---	U	1.0	ug/L	B010026	
Iron	---	U	40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	2900		100	ug/L	B010026	
Manganese	4.5		1.0	ug/L	B010026	
Nickel	11		1.0	ug/L	B010026	
Potassium	2100		100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	

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Field ID: BG3B7			**Sample ID: 2009044-09**			
Metals ICPMS						
Sodium	19000		100	ug/L	B010026	
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	42		2.0	ug/L	B010026	
Field ID: BG3B8			**Sample ID: 2009044-10**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	---	U	0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	

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Field ID: BG3B8				**Sample ID: 2009044-10**		
VOA-TRACE GCMS						
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	---	U	0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	

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Field ID: BG3B8			**Sample ID: 2009044-10**			
NVOA GCMS						
1,4-Dioxane	---	U J	0.196	ug/L	B010027	
Metals ICPMS						
Aluminum	300		20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	9.3		1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	---	U	1.0	ug/L	B010025	
Calcium	9400		100	ug/L	B010025	
Chromium	250		1.0	ug/L	B010025	
Cobalt	2.5		1.0	ug/L	B010025	
Copper	9.1		1.0	ug/L	B010025	
Iron	1100		20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	2900		100	ug/L	B010025	
Manganese	30		1.0	ug/L	B010025	
Nickel	370		1.0	ug/L	B010025	
Potassium	2700		100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	42000		100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	1.3		1.0	ug/L	B010025	
Zinc	3.8		2.0	ug/L	B010025	
Field ID: BG3B8			**Sample ID: 2009044-11**			
Metals ICPMS						
Aluminum	48		20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	

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Field ID: BG3B8			**Sample ID: 2009044-11**			
Metals ICPMS						
Barium	9.1		1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	
Cadmium	---	U	1.0	ug/L	B010026	
Calcium	9500		100	ug/L	B010026	
Chromium	46		1.0	ug/L	B010026	
Cobalt	2.4		1.0	ug/L	B010026	
Copper	6.9		1.0	ug/L	B010026	
Iron	120		40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	3000		100	ug/L	B010026	
Manganese	27		1.0	ug/L	B010026	
Nickel	380		1.0	ug/L	B010026	
Potassium	2700		100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	
Sodium	43000		100	ug/L	B010026	
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	3.1		2.0	ug/L	B010026	
Field ID: BG3B9			**Sample ID: 2009044-12**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B9			**Sample ID: 2009044-12**			
VOA-TRACE GCMS						
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	0.580		0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	---	U	0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B9			**Sample ID: 2009044-12**			
VOA-TRACE GCMS						
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	
NVOA GCMS						
1,4-Dioxane	---	U J	0.208	ug/L	B010027	
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	25		1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	2.8		1.0	ug/L	B010025	
Calcium	10000		100	ug/L	B010025	
Chromium	80		1.0	ug/L	B010025	
Cobalt	1.1		1.0	ug/L	B010025	
Copper	11		1.0	ug/L	B010025	
Iron	210		20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	3400		100	ug/L	B010025	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B9			**Sample ID: 2009044-12**			
Metals ICPMS						
Manganese	31		1.0	ug/L	B010025	
Nickel	110		1.0	ug/L	B010025	
Potassium	2100		100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	25000		100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	---	U	1.0	ug/L	B010025	
Zinc	---	U	2.0	ug/L	B010025	
Field ID: BG3B9			**Sample ID: 2009044-13**			
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	
Barium	26		1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	
Cadmium	2.9		1.0	ug/L	B010026	
Calcium	11000		100	ug/L	B010026	
Chromium	33		1.0	ug/L	B010026	
Cobalt	1.1		1.0	ug/L	B010026	
Copper	11		1.0	ug/L	B010026	
Iron	50		40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	3500		100	ug/L	B010026	
Manganese	31		1.0	ug/L	B010026	
Nickel	120		1.0	ug/L	B010026	
Potassium	2100		100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3B9			**Sample ID: 2009044-13**			
Metals ICPMS						
Sodium	26000		100	ug/L	B010026	
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	---	U	2.0	ug/L	B010026	
Field ID: BG3C0			**Sample ID: 2009044-14**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	---	U	0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C0			**Sample ID: 2009044-14**			
VOA-TRACE GCMS						
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	---	U	0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	

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Field ID: BG3C0			**Sample ID: 2009044-14**			
NVOA GCMS						
1,4-Dioxane	---	U J	0.193	ug/L	B010027	
Metals ICPMS						
Aluminum	30		20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	25		1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	2.6		1.0	ug/L	B010025	
Calcium	11000		100	ug/L	B010025	
Chromium	52		1.0	ug/L	B010025	
Cobalt	---	U	1.0	ug/L	B010025	
Copper	---	U	1.0	ug/L	B010025	
Iron	340		20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	2800		100	ug/L	B010025	
Manganese	3.0		1.0	ug/L	B010025	
Nickel	6.8		1.0	ug/L	B010025	
Potassium	1900		100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	19000		100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	---	U	1.0	ug/L	B010025	
Zinc	93		2.0	ug/L	B010025	
Field ID: BG3C0			**Sample ID: 2009044-15**			
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	

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Field ID: BG3C0			**Sample ID: 2009044-15**			
Metals ICPMS						
Barium	25		1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	
Cadmium	2.6		1.0	ug/L	B010026	
Calcium	11000		100	ug/L	B010026	
Chromium	2.3		1.0	ug/L	B010026	
Cobalt	---	U	1.0	ug/L	B010026	
Copper	1.0		1.0	ug/L	B010026	
Iron	---	U	40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	2900		100	ug/L	B010026	
Manganese	3.1		1.0	ug/L	B010026	
Nickel	7.5		1.0	ug/L	B010026	
Potassium	1900		100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	
Sodium	19000		100	ug/L	B010026	
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	95		2.0	ug/L	B010026	
Field ID: BG3C1			**Sample ID: 2009044-16**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C1			**Sample ID: 2009044-16**			
VOA-TRACE GCMS						
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	---	U	0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	---	U	0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C1			**Sample ID: 2009044-16**			
VOA-TRACE GCMS						
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	
NVOA GCMS						
1,4-Dioxane	---	U J	0.211	ug/L	B010027	
Metals ICPMS						
Aluminum	42		20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	20		1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	---	U	1.0	ug/L	B010025	
Calcium	12000		100	ug/L	B010025	
Chromium	160		1.0	ug/L	B010025	
Cobalt	---	U	1.0	ug/L	B010025	
Copper	1.5		1.0	ug/L	B010025	
Iron	910		20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	2800		100	ug/L	B010025	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C1			**Sample ID: 2009044-16**			
Metals ICPMS						
Manganese	14		1.0	ug/L	B010025	
Nickel	12		1.0	ug/L	B010025	
Potassium	2100		100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	18000		100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	---	U	1.0	ug/L	B010025	
Zinc	41		2.0	ug/L	B010025	
Field ID: BG3C1			**Sample ID: 2009044-17**			
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	
Barium	21		1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	
Cadmium	---	U	1.0	ug/L	B010026	
Calcium	12000		100	ug/L	B010026	
Chromium	8.9		1.0	ug/L	B010026	
Cobalt	---	U	1.0	ug/L	B010026	
Copper	1.1		1.0	ug/L	B010026	
Iron	---	U	40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	2900		100	ug/L	B010026	
Manganese	4.6		1.0	ug/L	B010026	
Nickel	11		1.0	ug/L	B010026	
Potassium	2100		100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	

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Field ID: BG3C1			**Sample ID: 2009044-17**			
Metals ICPMS						
Sodium	19000		100	ug/L	B010026	
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	42		2.0	ug/L	B010026	
Field ID: BG3C2			**Sample ID: 2009044-18**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	---	U	0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C2			**Sample ID: 2009044-18**			
VOA-TRACE GCMS						
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	---	U	0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	

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Field ID: BG3C2			**Sample ID: 2009044-18**			
NVOA GCMS						
1,4-Dioxane	---	U J	0.211	ug/L	B010027	
Metals ICPMS						
Aluminum	200		20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	25		1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	3.0		1.0	ug/L	B010025	
Calcium	11000		100	ug/L	B010025	
Chromium	11		1.0	ug/L	B010025	
Cobalt	---	U	1.0	ug/L	B010025	
Copper	---	U	1.0	ug/L	B010025	
Iron	970		20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	2600		100	ug/L	B010025	
Manganese	6.3		1.0	ug/L	B010025	
Nickel	---	U	1.0	ug/L	B010025	
Potassium	2500		100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	45000		100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	1.0		1.0	ug/L	B010025	
Zinc	3.7		2.0	ug/L	B010025	
Field ID: BG3C2			**Sample ID: 2009044-19**			
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C2			**Sample ID: 2009044-19**			
Metals ICPMS						
Barium	25		1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	
Cadmium	3.0		1.0	ug/L	B010026	
Calcium	12000		100	ug/L	B010026	
Chromium	6.3		1.0	ug/L	B010026	
Cobalt	---	U	1.0	ug/L	B010026	
Copper	---	U	1.0	ug/L	B010026	
Iron	47		40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	2700		100	ug/L	B010026	
Manganese	6.3		1.0	ug/L	B010026	
Nickel	---	U	1.0	ug/L	B010026	
Potassium	2600		100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	
Sodium	47000		100	ug/L	B010026	
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	3.6		2.0	ug/L	B010026	
Field ID: BG3C3			**Sample ID: 2009044-20**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	

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Field ID: BG3C3			**Sample ID: 2009044-20**			
VOA-TRACE GCMS						
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	---	U	0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	0.850		0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	

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Field ID: BG3C3			**Sample ID: 2009044-20**			
VOA-TRACE GCMS						
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	
NVOA GCMS						
1,4-Dioxane	---	U J	0.194	ug/L	B010027	
Metals ICPMS						
Aluminum	400		20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	120		1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	---	U	1.0	ug/L	B010025	
Calcium	6800		100	ug/L	B010025	
Chromium	11		1.0	ug/L	B010025	
Cobalt	---	U	1.0	ug/L	B010025	
Copper	1.0		1.0	ug/L	B010025	
Iron	2400		20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	4100		100	ug/L	B010025	

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Field ID: BG3C3			**Sample ID: 2009044-20**			
Metals ICPMS						
Manganese	33		1.0	ug/L	B010025	
Nickel	12		1.0	ug/L	B010025	
Potassium	2400		100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	19000		100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	---	U	1.0	ug/L	B010025	
Zinc	9.0		2.0	ug/L	B010025	
Field ID: BG3C3			**Sample ID: 2009044-21**			
Metals ICPMS						
Aluminum	240		20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	
Barium	110		1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	
Cadmium	---	U	1.0	ug/L	B010026	
Calcium	6900		100	ug/L	B010026	
Chromium	1.0		1.0	ug/L	B010026	
Cobalt	---	U	1.0	ug/L	B010026	
Copper	1.3		1.0	ug/L	B010026	
Iron	180		40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	4100		100	ug/L	B010026	
Manganese	33		1.0	ug/L	B010026	
Nickel	6.7		1.0	ug/L	B010026	
Potassium	2400		100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	

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Field ID: BG3C3			**Sample ID: 2009044-21**			
Metals ICPMS						
Sodium	19000		100	ug/L	B010026	
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	12		2.0	ug/L	B010026	
Field ID: BG3C4			**Sample ID: 2009044-22**			
VOA-TRACE GCMS						
Dichlorodifluoromethane	---	U	0.500	ug/L	B010024	
Chloromethane	---	U	2.00	ug/L	B010024	
Vinyl Chloride	---	U	1.00	ug/L	B010024	
Bromomethane	---	U	1.00	ug/L	B010024	
Chloroethane	---	U	0.500	ug/L	B010024	
Trichlorofluoromethane	---	U	0.500	ug/L	B010024	
1,1-Dichloroethene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloro-1,2,2-Trifluoroethane	---	U	0.500	ug/L	B010024	
Carbon Disulfide	---	U	0.500	ug/L	B010024	
Acetone	---	U	5.00	ug/L	B010024	
Methyl Acetate	---	U	0.500	ug/L	B010024	
Methylene Chloride	---	U	0.500	ug/L	B010024	
trans-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
Methyl tert-Butyl Ether	---	U	0.500	ug/L	B010024	
1,1-Dichloroethane	---	U	0.500	ug/L	B010024	
cis-1,2-Dichloroethene	---	U	0.500	ug/L	B010024	
2-Butanone	---	U	5.00	ug/L	B010024	
Bromochloromethane	---	U	0.500	ug/L	B010024	
Chloroform	---	U	0.500	ug/L	B010024	
1,1,1-Trichloroethane	---	U	0.500	ug/L	B010024	
Cyclohexane	---	U	0.500	ug/L	B010024	
Carbon Tetrachloride	---	U	0.500	ug/L	B010024	
Benzene	---	U	0.500	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C4			**Sample ID: 2009044-22**			
VOA-TRACE GCMS						
1,2-Dichloroethane	---	U	0.500	ug/L	B010024	
Trichloroethene	---	U	0.500	ug/L	B010024	
1,2-Dichloropropane	---	U	0.500	ug/L	B010024	
Bromodichloromethane	---	U	0.500	ug/L	B010024	
cis-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
4-Methyl-2-Pentanone	---	U	5.00	ug/L	B010024	
Toluene	---	U	0.500	ug/L	B010024	
trans-1,3-Dichloropropene	---	U	0.500	ug/L	B010024	
1,1,2-Trichloroethane	---	U	0.500	ug/L	B010024	
Tetrachloroethene	1.34		0.500	ug/L	B010024	
Methylcyclohexane	---	U	0.500	ug/L	B010024	
Dibromochloromethane	---	U	0.500	ug/L	B010024	
1,2-Dibromoethane	---	U	0.500	ug/L	B010024	
2-Hexanone	---	U	5.00	ug/L	B010024	
Chlorobenzene	---	U	0.500	ug/L	B010024	
Ethylbenzene	---	U	0.500	ug/L	B010024	
m,p-Xylene	---	U	0.500	ug/L	B010024	
o-Xylene	---	U	0.500	ug/L	B010024	
Styrene	---	U	0.500	ug/L	B010024	
Bromoform	---	U	0.500	ug/L	B010024	
Isopropylbenzene	---	U	0.500	ug/L	B010024	
1,1,2,2-Tetrachloroethane	---	U	0.500	ug/L	B010024	
1,3-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,4-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dichlorobenzene	---	U	0.500	ug/L	B010024	
1,2-Dibromo-3-Chloropropane	---	U L	0.500	ug/L	B010024	
1,2,4-Trichlorobenzene	---	U	0.500	ug/L	B010024	
1,2,3-Trichlorobenzene	---	U	0.500	ug/L	B010024	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C4			**Sample ID: 2009044-22**			
NVOA GCMS						
1,4-Dioxane	---	U J	0.193	ug/L	B010027	
Metals ICPMS						
Aluminum	22		20	ug/L	B010025	
Antimony	---	U	1.0	ug/L	B010025	
Arsenic	---	U	1.0	ug/L	B010025	
Barium	14		1.0	ug/L	B010025	
Beryllium	---	U	1.0	ug/L	B010025	
Cadmium	38		1.0	ug/L	B010025	
Calcium	8000		100	ug/L	B010025	
Chromium	1.1		1.0	ug/L	B010025	
Cobalt	---	U	1.0	ug/L	B010025	
Copper	---	U	1.0	ug/L	B010025	
Iron	27		20	ug/L	B010025	
Lead	---	U	1.0	ug/L	B010025	
Magnesium	1600		100	ug/L	B010025	
Manganese	1.8		1.0	ug/L	B010025	
Nickel	1.2		1.0	ug/L	B010025	
Potassium	1000		100	ug/L	B010025	
Selenium	---	U	1.0	ug/L	B010025	
Silver	---	U	1.0	ug/L	B010025	
Sodium	4700		100	ug/L	B010025	
Thallium	---	U	1.0	ug/L	B010025	
Vanadium	---	U	1.0	ug/L	B010025	
Zinc	---	U	2.0	ug/L	B010025	
Field ID: BG3C4			**Sample ID: 2009044-23**			
Metals ICPMS						
Aluminum	---	U	20	ug/L	B010026	
Antimony	---	U	1.0	ug/L	B010026	
Arsenic	---	U	1.0	ug/L	B010026	

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Analyte	Result	Qualifier	Reporting Limit	Units	Batch	Date and Time of Analysis*
Field ID: BG3C4			**Sample ID: 2009044-23**			
Metals ICPMS						
Barium	13		1.0	ug/L	B010026	
Beryllium	---	U	1.0	ug/L	B010026	
Cadmium	37		1.0	ug/L	B010026	
Calcium	7900		100	ug/L	B010026	
Chromium	---	U	1.0	ug/L	B010026	
Cobalt	---	U	1.0	ug/L	B010026	
Copper	---	U	1.0	ug/L	B010026	
Iron	---	U	40	ug/L	B010026	
Lead	---	U	1.0	ug/L	B010026	
Magnesium	1600		100	ug/L	B010026	
Manganese	1.4		1.0	ug/L	B010026	
Nickel	1.1		1.0	ug/L	B010026	
Potassium	1000		100	ug/L	B010026	
Selenium	---	U	1.0	ug/L	B010026	
Silver	---	U	1.0	ug/L	B010026	
Sodium	4700		100	ug/L	B010026	
Thallium	---	U	1.0	ug/L	B010026	
Vanadium	---	U	1.0	ug/L	B010026	
Zinc	---	U	2.0	ug/L	B010026	

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010024									
Blank (B010024-BLK1)									
Dichlorodifluoromethane	--- U	0.500	ug/L						
Chloromethane	--- U	0.500	ug/L						
Vinyl Chloride	--- U	0.500	ug/L						
Bromomethane	--- U	0.500	ug/L						
Chloroethane	--- U	0.500	ug/L						
Trichlorofluoromethane	--- U	0.500	ug/L						
1,1-Dichloroethene	--- U	0.500	ug/L						
1,1,2-Trichloro-1,2,2-Trifluoroethane	--- U	0.500	ug/L						
Carbon Disulfide	--- U	0.500	ug/L						
Acetone	--- U	5.00	ug/L						
Methyl Acetate	--- U	0.500	ug/L						
Methylene Chloride	--- U	0.500	ug/L						
trans-1,2-Dichloroethene	--- U	0.500	ug/L						
Methyl tert-Butyl Ether	--- U	0.500	ug/L						
1,1-Dichloroethane	--- U	0.500	ug/L						
cis-1,2-Dichloroethene	--- U	0.500	ug/L						
2-Butanone	--- U	5.00	ug/L						
Bromochloromethane	--- U	0.500	ug/L						
Chloroform	--- U	0.500	ug/L						
1,1,1-Trichloroethane	--- U	0.500	ug/L						
Cyclohexane	--- U	0.500	ug/L						
Carbon Tetrachloride	--- U	0.500	ug/L						
Benzene	--- U	0.500	ug/L						
1,2-Dichloroethane	--- U	0.500	ug/L						
Trichloroethene	--- U	0.500	ug/L						
1,2-Dichloropropane	--- U	0.500	ug/L						
Bromodichloromethane	--- U	0.500	ug/L						
cis-1,3-Dichloropropene	--- U	0.500	ug/L						
4-Methyl-2-Pentanone	--- U	5.00	ug/L						
Toluene	--- U	0.500	ug/L						
trans-1,3-Dichloropropene	--- U	0.500	ug/L						
1,1,2-Trichloroethane	--- U	0.500	ug/L						
Tetrachloroethene	--- U	0.500	ug/L						
Methylcyclohexane	--- U	0.500	ug/L						

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010024									
Blank (B010024-BLK1)									
Dibromochloromethane	--- U	0.500	ug/L						
1,2-Dibromoethane	--- U	0.500	ug/L						
2-Hexanone	--- U	5.00	ug/L						
Chlorobenzene	--- U	0.500	ug/L						
Ethylbenzene	--- U	0.500	ug/L						
m,p-Xylene	--- U	0.500	ug/L						
o-Xylene	--- U	0.500	ug/L						
Styrene	--- U	0.500	ug/L						
Bromoform	--- U	0.500	ug/L						
Isopropylbenzene	--- U	0.500	ug/L						
1,1,2,2-Tetrachloroethane	--- U	0.500	ug/L						
1,3-Dichlorobenzene	--- U	0.500	ug/L						
1,4-Dichlorobenzene	--- U	0.500	ug/L						
1,2-Dichlorobenzene	--- U	0.500	ug/L						
1,2-Dibromo-3-Chloropropane	--- U	0.500	ug/L						
1,2,4-Trichlorobenzene	--- U	0.500	ug/L						
1,2,3-Trichlorobenzene	--- U	0.500	ug/L						
Surrogate: 1,2-Dichloroethane-D4	*5.18*		ug/L	*5.000*		*104*	*70-130*		
Surrogate: 4-Bromofluorobenzene	*ND*		ug/L	*5.000*		*90.2*	*70-130*		
LCS (B010024-BS1)									
Dichlorodifluoromethane	6.31		ug/L	5.000		126	23-117		
Chloromethane	5.78		ug/L	5.000		116	15-152		
Vinyl Chloride	5.63		ug/L	5.000		113	41-147		
Bromomethane	5.46		ug/L	5.000		109	31-157		
Chloroethane	5.58		ug/L	5.000		112	57-125		
Trichlorofluoromethane	5.03		ug/L	5.000		101	68-153		
1,1-Dichloroethene	4.47		ug/L	5.000		89.4	68-140		
1,1,2-Trichloro-1,2,2-Trifluoroethane	4.11		ug/L	5.000		82.2	78-139		
Carbon Disulfide	4.72		ug/L	5.000		94.4	65-135		
Acetone	25.9		ug/L	40.00		64.8	39-154		
Methyl Acetate	4.24		ug/L	5.000		84.8	49-141		
Methylene Chloride	4.63		ug/L	5.000		92.6	70-175		
trans-1,2-Dichloroethene	4.60		ug/L	5.000		92.0	74-136		
Methyl tert-Butyl Ether	4.73		ug/L	5.000		94.6	61-128		

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010024									
LCS (B010024-BS1)									
1,1-Dichloroethane	4.82		ug/L	5.000		96.4	80-133		
cis-1,2-Dichloroethene	4.54		ug/L	5.000		90.8	77-141		
2-Butanone	31.5		ug/L	40.00		78.8	68-157		
Bromochloromethane	4.42		ug/L	5.000		88.4	64-151		
Chloroform	4.60		ug/L	5.000		92.0	74-137		
1,1,1-Trichloroethane	4.51		ug/L	5.000		90.2	78-130		
Cyclohexane	4.80		ug/L	5.000		96.0	83-138		
Carbon Tetrachloride	4.24		ug/L	5.000		84.8	82-137		
Benzene	4.66		ug/L	5.000		93.2	76-131		
1,2-Dichloroethane	4.79		ug/L	5.000		95.8	70-133		
Trichloroethene	4.38		ug/L	5.000		87.6	81-120		
1,2-Dichloropropane	4.78		ug/L	5.000		95.6	84-123		
Bromodichloromethane	4.38		ug/L	5.000		87.6	79-119		
cis-1,3-Dichloropropene	4.22		ug/L	5.000		84.4	79-126		
4-Methyl-2-Pentanone	36.1		ug/L	40.00		90.2	84-145		
Toluene	4.53		ug/L	5.000		90.6	83-118		
trans-1,3-Dichloropropene	5.07		ug/L	5.000		101	74-126		
1,1,2-Trichloroethane	4.62		ug/L	5.000		92.4	80-125		
Tetrachloroethene	4.38		ug/L	5.000		87.6	85-122		
Methylcyclohexane	4.63		ug/L	5.000		92.6	82-127		
Dibromochloromethane	4.21		ug/L	5.000		84.2	79-122		
1,2-Dibromoethane	4.33		ug/L	5.000		86.6	76-128		
2-Hexanone	32.4		ug/L	40.00		81.0	82-150		
Chlorobenzene	4.56		ug/L	5.000		91.2	84-118		
Ethylbenzene	4.58		ug/L	5.000		91.6	85-115		
m,p-Xylene	9.12		ug/L	10.00		91.2	86-118		
o-Xylene	4.60		ug/L	5.000		92.0	84-120		
Styrene	4.54		ug/L	5.000		90.8	87-112		
Bromoform	4.17		ug/L	5.000		83.4	75-125		
Isopropylbenzene	4.57		ug/L	5.000		91.4	85-117		
1,1,2,2-Tetrachloroethane	4.37		ug/L	5.000		87.4	73-124		
1,3-Dichlorobenzene	4.68		ug/L	5.000		93.6	87-119		
1,4-Dichlorobenzene	4.52		ug/L	5.000		90.4	86-121		
1,2-Dichlorobenzene	4.56		ug/L	5.000		91.2	82-123		
1,2-Dibromo-3-Chloropropane	3.87		ug/L	5.000		77.4	58-130		

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010024									
LCS (B010024-BS1)									
1,2,4-Trichlorobenzene	4.39		ug/L	5.000		87.8	76-124		
1,2,3-Trichlorobenzene	4.22		ug/L	5.000		84.4	64-145		
Surrogate: 1,2-Dichloroethane-D4	*5.09*		ug/L	*5.000*		*102*	*70-130*		
Surrogate: 4-Bromofluorobenzene	*5.09*		ug/L	*5.000*		*102*	*70-130*		
LCS Dup (B010024-BSD1)									
Dichlorodifluoromethane	7.27		ug/L	5.000		145	23-117	14.1	20
Chloromethane	6.60		ug/L	5.000		132	15-152	13.2	20
Vinyl Chloride	6.27		ug/L	5.000		125	41-147	10.8	20
Bromomethane	6.12		ug/L	5.000		122	31-157	11.4	20
Chloroethane	6.21		ug/L	5.000		124	57-125	10.7	20
Trichlorofluoromethane	5.72		ug/L	5.000		114	68-153	12.8	20
1,1-Dichloroethene	5.17		ug/L	5.000		103	68-140	14.5	20
1,1,2-Trichloro-1,2,2-Trifluoroethane	4.56		ug/L	5.000		91.2	78-139	10.4	20
Carbon Disulfide	5.24		ug/L	5.000		105	65-135	10.4	20
Acetone	30.1		ug/L	40.00		75.2	39-154	14.9	20
Methyl Acetate	4.76		ug/L	5.000		95.2	49-141	11.6	20
Methylene Chloride	5.23		ug/L	5.000		105	70-175	12.2	20
trans-1,2-Dichloroethene	5.12		ug/L	5.000		102	74-136	10.7	20
Methyl tert-Butyl Ether	5.23		ug/L	5.000		105	61-128	10.0	20
1,1-Dichloroethane	5.49		ug/L	5.000		110	80-133	13.0	20
cis-1,2-Dichloroethene	4.99		ug/L	5.000		99.8	77-141	9.44	20
2-Butanone	36.5		ug/L	40.00		91.4	68-157	14.8	20
Bromochloromethane	4.85		ug/L	5.000		97.0	64-151	9.28	20
Chloroform	5.20		ug/L	5.000		104	74-137	12.2	20
1,1,1-Trichloroethane	4.95		ug/L	5.000		99.0	78-130	9.30	20
Cyclohexane	5.27		ug/L	5.000		105	83-138	9.33	20
Carbon Tetrachloride	4.82		ug/L	5.000		96.4	82-137	12.8	20
Benzene	5.16		ug/L	5.000		103	76-131	10.2	20
1,2-Dichloroethane	5.58		ug/L	5.000		112	70-133	15.2	20
Trichloroethene	5.07		ug/L	5.000		101	81-120	14.6	20
1,2-Dichloropropane	5.44		ug/L	5.000		109	84-123	12.9	20
Bromodichloromethane	5.23		ug/L	5.000		105	79-119	17.7	20
cis-1,3-Dichloropropene	4.90		ug/L	5.000		98.0	79-126	14.9	20
4-Methyl-2-Pentanone	44.3		ug/L	40.00		111	84-145	20.5	20

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010024									
LCS Dup (B010024-BSD1)									
Toluene	5.28		ug/L	5.000		106	83-118	15.3	20
trans-1,3-Dichloropropene	5.66		ug/L	5.000		113	74-126	11.0	20
1,1,2-Trichloroethane	5.35		ug/L	5.000		107	80-125	14.6	20
Tetrachloroethene	5.18		ug/L	5.000		104	85-122	16.7	20
Methylcyclohexane	5.26		ug/L	5.000		105	82-127	12.7	20
Dibromochloromethane	5.11		ug/L	5.000		102	79-122	19.3	20
1,2-Dibromoethane	5.26		ug/L	5.000		105	76-128	19.4	20
2-Hexanone	39.9		ug/L	40.00		99.6	82-150	20.7	20
Chlorobenzene	5.36		ug/L	5.000		107	84-118	16.1	20
Ethylbenzene	5.03		ug/L	5.000		101	85-115	9.37	20
m,p-Xylene	10.2		ug/L	10.00		102	86-118	11.1	20
o-Xylene	5.08		ug/L	5.000		102	84-120	9.92	20
Styrene	5.08		ug/L	5.000		102	87-112	11.2	20
Bromoform	4.46		ug/L	5.000		89.2	75-125	6.72	20
Isopropylbenzene	5.10		ug/L	5.000		102	85-117	11.0	20
1,1,2,2-Tetrachloroethane	5.21		ug/L	5.000		104	73-124	17.5	20
1,3-Dichlorobenzene	5.12		ug/L	5.000		102	87-119	8.98	20
1,4-Dichlorobenzene	5.09		ug/L	5.000		102	86-121	11.9	20
1,2-Dichlorobenzene	5.02		ug/L	5.000		100	82-123	9.60	20
1,2-Dibromo-3-Chloropropane	4.87		ug/L	5.000		97.4	58-130	22.9	20
1,2,4-Trichlorobenzene	5.03		ug/L	5.000		101	76-124	13.6	20
1,2,3-Trichlorobenzene	4.63		ug/L	5.000		92.6	64-145	9.27	20
Surrogate: 1,2-Dichloroethane-D4	*4.99*		ug/L	*5.000*		*99.8*	*70-130*		
Surrogate: 4-Bromofluorobenzene	*4.99*		ug/L	*5.000*		*99.8*	*70-130*		
Matrix Spike (B010024-MS1)		**Source: 2009044-14**							
Dichlorodifluoromethane	4.07		ug/L	5.000	0.00	81.4	23-117		
Chloromethane	5.92		ug/L	5.000	0.710	104	15-152		
Vinyl Chloride	5.39		ug/L	5.000	0.00	108	41-147		
Bromomethane	5.85		ug/L	5.000	0.720	103	31-157		
Chloroethane	5.98		ug/L	5.000	0.00	120	57-125		
Trichlorofluoromethane	5.44		ug/L	5.000	0.00	109	68-153		
1,1-Dichloroethene	5.08		ug/L	5.000	0.00	102	68-140		
1,1,2-Trichloro-1,2,2-Trifluoroethane	5.05		ug/L	5.000	0.00	101	78-139		
Carbon Disulfide	5.15		ug/L	5.000	0.00	103	65-135		

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VOA-TRACE GCMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010024									
Matrix Spike (B010024-MS1)		**Source: 2009044-14**							
Acetone	31.9		ug/L	40.00	1.40	76.2	39-154		
Methyl Acetate	4.67		ug/L	5.000	0.00	93.4	49-141		
Methylene Chloride	5.33		ug/L	5.000	0.00	107	70-175		
trans-1,2-Dichloroethene	5.21		ug/L	5.000	0.00	104	74-136		
Methyl tert-Butyl Ether	5.06		ug/L	5.000	0.00	101	61-128		
1,1-Dichloroethane	5.37		ug/L	5.000	0.00	107	80-133		
cis-1,2-Dichloroethene	4.94		ug/L	5.000	0.00	98.8	77-141		
2-Butanone	35.9		ug/L	40.00	0.00	89.7	68-157		
Bromochloromethane	5.07		ug/L	5.000	0.00	101	64-151		
Chloroform	5.58		ug/L	5.000	0.00	112	74-137		
1,1,1-Trichloroethane	5.19		ug/L	5.000	0.00	104	78-130		
Cyclohexane	5.10		ug/L	5.000	0.00	102	83-138		
Carbon Tetrachloride	4.79		ug/L	5.000	0.00	95.8	82-137		
Benzene	5.19		ug/L	5.000	0.00	104	76-131		
1,2-Dichloroethane	5.31		ug/L	5.000	0.00	106	70-133		
Trichloroethene	5.06		ug/L	5.000	0.00	101	81-120		
1,2-Dichloropropane	5.20		ug/L	5.000	0.00	104	84-123		
Bromodichloromethane	5.00		ug/L	5.000	0.00	100	79-119		
cis-1,3-Dichloropropene	4.93		ug/L	5.000	0.00	98.6	79-126		
4-Methyl-2-Pentanone	44.3		ug/L	40.00	0.00	111	84-145		
Toluene	5.15		ug/L	5.000	0.00	103	83-118		
trans-1,3-Dichloropropene	4.99		ug/L	5.000	0.00	99.8	74-126		
1,1,2-Trichloroethane	5.20		ug/L	5.000	0.00	104	80-125		
Tetrachloroethene	4.90		ug/L	5.000	0.00	98.0	85-122		
Methylcyclohexane	4.83		ug/L	5.000	0.00	96.6	82-127		
Dibromochloromethane	4.62		ug/L	5.000	0.00	92.4	79-122		
1,2-Dibromoethane	5.09		ug/L	5.000	0.00	102	76-128		
2-Hexanone	40.1		ug/L	40.00	0.00	100	82-150		
Chlorobenzene	4.92		ug/L	5.000	0.00	98.4	84-118		
Ethylbenzene	5.07		ug/L	5.000	0.00	101	85-115		
m,p-Xylene	10.2		ug/L	10.00	0.00	102	86-118		
o-Xylene	5.11		ug/L	5.000	0.00	102	84-120		
Styrene	5.03		ug/L	5.000	0.00	101	87-112		
Bromoform	4.25		ug/L	5.000	0.00	85.0	75-125		
Isopropylbenzene	5.11		ug/L	5.000	0.00	102	85-117		

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VOA-TRACE GCMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010024									
Matrix Spike (B010024-MS1)		**Source: 2009044-14**							
1,1,2,2-Tetrachloroethane	5.17		ug/L	5.000	0.00	103	73-124		
1,3-Dichlorobenzene	4.96		ug/L	5.000	0.00	99.2	87-119		
1,4-Dichlorobenzene	5.14		ug/L	5.000	0.00	103	86-121		
1,2-Dichlorobenzene	4.85		ug/L	5.000	0.00	97.0	82-123		
1,2-Dibromo-3-Chloropropane	4.51		ug/L	5.000	0.00	90.2	58-130		
1,2,4-Trichlorobenzene	4.79		ug/L	5.000	0.00	95.8	76-124		
1,2,3-Trichlorobenzene	4.70		ug/L	5.000	0.00	94.0	64-145		
Surrogate: 1,2-Dichloroethane-D4	*5.23*		ug/L	*5.000*		*105*	*70-130*		
Surrogate: 4-Bromofluorobenzene	*4.84*		ug/L	*5.000*		*96.8*	*70-130*		

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NVOA GCMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010027									
Blank (B010027-BLK1)									
1,4-Dioxane	--- U	0.200	ug/L						
Surrogate: 1,4-Dioxane-D8	*0.150*		ug/L	*0.8000*		*18.8*	*20-120*		
LCS (B010027-BS1)									
1,4-Dioxane	0.150	0.200	ug/L	0.8000		18.8	7-106		
Surrogate: 1,4-Dioxane-D8	*0.130*		ug/L	*0.8000*		*16.2*	*20-120*		
LCS Dup (B010027-BSD1)									
1,4-Dioxane	0.210	0.200	ug/L	0.8000		26.2	7-106	33.3	30
Surrogate: 1,4-Dioxane-D8	*0.160*		ug/L	*0.8000*		*20.0*	*20-120*		
Matrix Spike (B010027-MS1)		**Source: 2009044-14**							
1,4-Dioxane	0.0962	0.192	ug/L	0.7692	ND	12.5	7-106		
Surrogate: 1,4-Dioxane-D8	*0.0769*		ug/L	*0.7692*		*10.0*	*20-120*		

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Metals ICPMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010025									
Blank (B010025-BLK1)									
Aluminum	--- U	20	ug/L						
Antimony	--- U	1.0	ug/L						
Arsenic	--- U	1.0	ug/L						
Barium	--- U	1.0	ug/L						
Beryllium	--- U	1.0	ug/L						
Cadmium	--- U	1.0	ug/L						
Calcium	--- U	100	ug/L						
Chromium	--- U	1.0	ug/L						
Cobalt	--- U	1.0	ug/L						
Copper	--- U	1.0	ug/L						
Iron	--- U	20	ug/L						
Lead	--- U	1.0	ug/L						
Magnesium	--- U	100	ug/L						
Manganese	--- U	1.0	ug/L						
Nickel	--- U	1.0	ug/L						
Potassium	--- U	100	ug/L						
Selenium	--- U	1.0	ug/L						
Silver	--- U	1.0	ug/L						
Sodium	--- U	100	ug/L						
Thallium	--- U	1.0	ug/L						
Vanadium	--- U	1.0	ug/L						
Zinc	--- U	2.0	ug/L						
LCS (B010025-BS1)									
Aluminum	1030	20	ug/L	1000		103	80-120		
Antimony	47.9	1.0	ug/L	50.00		95.9	80-120		
Arsenic	50.5	1.0	ug/L	50.00		101	80-120		
Barium	48.9	1.0	ug/L	50.00		97.9	80-120		
Beryllium	49.1	1.0	ug/L	50.00		98.1	80-120		
Cadmium	47.5	1.0	ug/L	50.00		95.1	80-120		
Calcium	1170	100	ug/L	1000		117	80-120		
Chromium	49.6	1.0	ug/L	50.00		99.3	80-120		
Cobalt	49.7	1.0	ug/L	50.00		99.3	80-120		
Copper	50.5	1.0	ug/L	50.00		101	80-120		
Iron	977	20	ug/L	1000		97.7	80-120		

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Metals ICPMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010025									
LCS (B010025-BS1)									
Lead	50.4	1.0	ug/L	50.00		101	80-120		
Magnesium	942	100	ug/L	1000		94.2	80-120		
Manganese	46.9	1.0	ug/L	50.00		93.8	80-120		
Nickel	49.8	1.0	ug/L	50.00		99.6	80-120		
Potassium	976	100	ug/L	1000		97.6	80-120		
Selenium	48.2	1.0	ug/L	50.00		96.4	80-120		
Silver	51.3	1.0	ug/L	50.00		103	80-120		
Sodium	1060	100	ug/L	1000		106	80-120		
Thallium	50.5	1.0	ug/L	50.00		101	80-120		
Vanadium	49.2	1.0	ug/L	50.00		98.4	80-120		
Zinc	49.9	2.0	ug/L	50.00		99.7	80-120		
LCS Dup (B010025-BSD1)									
Aluminum	1030	20	ug/L	1000		103	80-120	0.195	20
Antimony	48.0	1.0	ug/L	50.00		96.0	80-120	0.131	20
Arsenic	50.7	1.0	ug/L	50.00		101	80-120	0.431	20
Barium	49.0	1.0	ug/L	50.00		98.0	80-120	0.0919	20
Beryllium	49.6	1.0	ug/L	50.00		99.2	80-120	1.07	20
Cadmium	47.3	1.0	ug/L	50.00		94.7	80-120	0.441	20
Calcium	1170	100	ug/L	1000		117	80-120	0.198	20
Chromium	49.5	1.0	ug/L	50.00		99.1	80-120	0.173	20
Cobalt	49.6	1.0	ug/L	50.00		99.2	80-120	0.179	20
Copper	50.8	1.0	ug/L	50.00		102	80-120	0.633	20
Iron	980	20	ug/L	1000		98.0	80-120	0.321	20
Lead	50.7	1.0	ug/L	50.00		101	80-120	0.502	20
Magnesium	942	100	ug/L	1000		94.2	80-120	0.0193	20
Manganese	46.7	1.0	ug/L	50.00		93.4	80-120	0.391	20
Nickel	49.8	1.0	ug/L	50.00		99.6	80-120	0.0643	20
Potassium	971	100	ug/L	1000		97.1	80-120	0.494	20
Selenium	48.2	1.0	ug/L	50.00		96.3	80-120	0.127	20
Silver	51.0	1.0	ug/L	50.00		102	80-120	0.657	20
Sodium	1050	100	ug/L	1000		105	80-120	1.05	20
Thallium	50.7	1.0	ug/L	50.00		101	80-120	0.289	20
Vanadium	48.8	1.0	ug/L	50.00		97.6	80-120	0.855	20
Zinc	50.0	2.0	ug/L	50.00		99.9	80-120	0.182	20

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Metals ICPMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010025									
Matrix Spike (B010025-MS1)		**Source: 2009044-14**							
Aluminum	1040	20	ug/L	1000	30.1	101	80-120		
Antimony	48.5	1.0	ug/L	50.00	0.232	96.6	80-120		
Arsenic	50.9	1.0	ug/L	50.00	0.245	101	80-120		
Barium	73.5	1.0	ug/L	50.00	24.9	97.2	80-120		
Beryllium	50.3	1.0	ug/L	50.00	ND	101	80-120		
Cadmium	49.8	1.0	ug/L	50.00	2.64	94.4	80-120		
Calcium	12200	100	ug/L	1000	11200	101	80-120		
Chromium	103	1.0	ug/L	50.00	52.4	101	80-120		
Cobalt	49.2	1.0	ug/L	50.00	ND	98.4	80-120		
Copper	51.2	1.0	ug/L	50.00	0.766	101	80-120		
Iron	1310	20	ug/L	1000	344	97.0	80-120		
Lead	50.6	1.0	ug/L	50.00	ND	101	80-120		
Magnesium	3780	100	ug/L	1000	2840	94.9	80-120		
Manganese	49.0	1.0	ug/L	50.00	3.02	92.0	80-120		
Nickel	55.7	1.0	ug/L	50.00	6.80	97.8	80-120		
Potassium	2890	100	ug/L	1000	1930	96.6	80-120		
Selenium	48.2	1.0	ug/L	50.00	0.337	95.7	80-120		
Silver	50.4	1.0	ug/L	50.00	ND	101	80-120		
Sodium	19400	100	ug/L	1000	18500	83.4	80-120		
Thallium	51.1	1.0	ug/L	50.00	ND	102	80-120		
Vanadium	49.9	1.0	ug/L	50.00	0.478	98.9	80-120		
Zinc	140	2.0	ug/L	50.00	93.5	93.0	80-120		
Batch B010026									
Blank (B010026-BLK1)									
Aluminum	--- U	20	ug/L						
Antimony	--- U	1.0	ug/L						
Arsenic	--- U	1.0	ug/L						
Barium	--- U	1.0	ug/L						
Beryllium	--- U	1.0	ug/L						
Cadmium	--- U	1.0	ug/L						
Calcium	--- U	100	ug/L						
Chromium	--- U	1.0	ug/L						
Cobalt	--- U	1.0	ug/L						
Copper	--- U	1.0	ug/L						

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Metals ICPMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010026									
Blank (B010026-BLK1)									
Iron	26	20	ug/L						
Lead	--- U	1.0	ug/L						
Magnesium	--- U	100	ug/L						
Manganese	--- U	1.0	ug/L						
Nickel	--- U	1.0	ug/L						
Potassium	--- U	100	ug/L						
Selenium	--- U	1.0	ug/L						
Silver	--- U	1.0	ug/L						
Sodium	--- U	100	ug/L						
Thallium	--- U	1.0	ug/L						
Vanadium	--- U	1.0	ug/L						
Zinc	--- U	2.0	ug/L						
LCS (B010026-BS1)									
Aluminum	1050	20	ug/L	1000		105	80-120		
Antimony	49.4	1.0	ug/L	50.00		98.8	80-120		
Arsenic	52.4	1.0	ug/L	50.00		105	80-120		
Barium	50.1	1.0	ug/L	50.00		100	80-120		
Beryllium	51.5	1.0	ug/L	50.00		103	80-120		
Cadmium	48.9	1.0	ug/L	50.00		97.9	80-120		
Calcium	1200	100	ug/L	1000		120	80-120		
Chromium	51.0	1.0	ug/L	50.00		102	80-120		
Cobalt	51.2	1.0	ug/L	50.00		102	80-120		
Copper	52.4	1.0	ug/L	50.00		105	80-120		
Iron	1020	20	ug/L	1000		102	80-120		
Lead	51.7	1.0	ug/L	50.00		103	80-120		
Magnesium	962	100	ug/L	1000		96.2	80-120		
Manganese	48.0	1.0	ug/L	50.00		96.1	80-120		
Nickel	51.4	1.0	ug/L	50.00		103	80-120		
Potassium	996	100	ug/L	1000		99.6	80-120		
Selenium	48.2	1.0	ug/L	50.00		96.4	80-120		
Silver	53.8	1.0	ug/L	50.00		108	80-120		
Sodium	1090	100	ug/L	1000		109	80-120		
Thallium	51.9	1.0	ug/L	50.00		104	80-120		
Vanadium	50.8	1.0	ug/L	50.00		102	80-120		

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Metals ICPMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010026									
LCS (B010026-BS1)									
Zinc	51.7	2.0	ug/L	50.00		103	80-120		
LCS Dup (B010026-BSD1)									
Aluminum	1060	20	ug/L	1000		106	80-120	0.569	20
Antimony	48.9	1.0	ug/L	50.00		97.8	80-120	1.02	20
Arsenic	52.1	1.0	ug/L	50.00		104	80-120	0.620	20
Barium	49.9	1.0	ug/L	50.00		99.9	80-120	0.366	20
Beryllium	51.3	1.0	ug/L	50.00		103	80-120	0.430	20
Cadmium	48.8	1.0	ug/L	50.00		97.6	80-120	0.340	20
Calcium	1190	100	ug/L	1000		119	80-120	1.10	20
Chromium	51.1	1.0	ug/L	50.00		102	80-120	0.170	20
Cobalt	51.0	1.0	ug/L	50.00		102	80-120	0.307	20
Copper	52.3	1.0	ug/L	50.00		105	80-120	0.201	20
Iron	1010	20	ug/L	1000		101	80-120	1.13	20
Lead	51.4	1.0	ug/L	50.00		103	80-120	0.755	20
Magnesium	970	100	ug/L	1000		97.0	80-120	0.842	20
Manganese	48.0	1.0	ug/L	50.00		95.9	80-120	0.160	20
Nickel	51.6	1.0	ug/L	50.00		103	80-120	0.387	20
Potassium	997	100	ug/L	1000		99.7	80-120	0.0702	20
Selenium	48.4	1.0	ug/L	50.00		96.8	80-120	0.399	20
Silver	53.8	1.0	ug/L	50.00		108	80-120	0.108	20
Sodium	1080	100	ug/L	1000		108	80-120	0.721	20
Thallium	51.6	1.0	ug/L	50.00		103	80-120	0.584	20
Vanadium	50.5	1.0	ug/L	50.00		101	80-120	0.494	20
Zinc	51.4	2.0	ug/L	50.00		103	80-120	0.662	20
Matrix Spike (B010026-MS1)	**Source: 2009044-15**								
Aluminum	1030	20	ug/L	1000	14.8	102	80-120		
Antimony	49.0	1.0	ug/L	50.00	0.196	97.6	80-120		
Arsenic	52.0	1.0	ug/L	50.00	ND	104	80-120		
Barium	74.5	1.0	ug/L	50.00	24.9	99.2	80-120		
Beryllium	52.2	1.0	ug/L	50.00	ND	104	80-120		
Cadmium	50.8	1.0	ug/L	50.00	2.64	96.4	80-120		
Calcium	12600	100	ug/L	1000	11400	118	80-120		
Chromium	52.3	1.0	ug/L	50.00	2.30	99.9	80-120		
Cobalt	49.7	1.0	ug/L	50.00	ND	99.4	80-120		

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Metals ICPMS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B010026									
Matrix Spike (B010026-MS1)		**Source: 2009044-15**							
Copper	51.6	1.0	ug/L	50.00	1.00	101	80-120		
Iron	999	20	ug/L	1000	9.35	99.0	80-120		
Lead	50.8	1.0	ug/L	50.00	ND	102	80-120		
Magnesium	3930	100	ug/L	1000	2860	107	80-120		
Manganese	49.8	1.0	ug/L	50.00	3.09	93.5	80-120		
Nickel	57.4	1.0	ug/L	50.00	7.46	99.9	80-120		
Potassium	2990	100	ug/L	1000	1940	105	80-120		
Selenium	47.5	1.0	ug/L	50.00	0.269	94.5	80-120		
Silver	51.4	1.0	ug/L	50.00	ND	103	80-120		
Sodium	20200	100	ug/L	1000	18800	145	80-120		
Thallium	51.6	1.0	ug/L	50.00	ND	103	80-120		
Vanadium	50.2	1.0	ug/L	50.00	ND	100	80-120		
Zinc	144	2.0	ug/L	50.00	95.1	98.1	80-120		

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PFAAS, LCMS-MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B009147									
Blank (B009147-BLK1)									
11Cl-PF3OUdS	--- U	3.98	ng/L						
9Cl-PF3ONS	--- U	3.98	ng/L						
HFPO-DA	--- U	3.98	ng/L						
ADONA	--- U	3.98	ng/L						
NEtFOSAA	--- U	3.98	ng/L						
NMeFOSAA	--- U	3.98	ng/L						
PFBS	--- U	3.98	ng/L						
PFDA	--- U	3.98	ng/L						
PFDoA	--- U	3.98	ng/L						
PFHpA	--- U	3.98	ng/L						
PFHxA	--- U	3.98	ng/L						
PFHxS	--- U	3.98	ng/L						
PFNA	--- U	3.98	ng/L						
PFOA	--- U	3.98	ng/L						
PFOS	--- U	3.98	ng/L						
PFTeDA	--- U	3.98	ng/L						
PFTrDA	--- U	3.98	ng/L						
PFUdA	--- U	3.98	ng/L						
PFPeS	--- U	3.98	ng/L						
PFNS	--- U	3.98	ng/L						
PFHpS	--- U	3.98	ng/L						
PFDS	--- U	3.98	ng/L						
4:2 FTS	--- U	3.98	ng/L						
6:2 FTS	--- U	3.98	ng/L						
8:2 FTS	--- U	3.98	ng/L						
Surrogate: 13C2-PFDA(SURR)	*33.1*		ng/L	*39.84*		*83*	*70-130*		
Surrogate: 13C2-PFHxA(SURR)	*40.9*		ng/L	*39.84*		*103*	*70-130*		
Surrogate: 13C3-HFPO-DA (SURR)	*39.5*		ng/L	*39.84*		*99*	*70-130*		
Surrogate: d5-NEtFOSAA-M (SURR)	*125*		ng/L	*159.4*		*78*	*70-130*		
Surrogate: 13C8-PFOS (SURR)	*30.0*		ng/L	*39.88*		*75*	*70-130*		
Surrogate: 13C2-6:2 FTS (SURR)	*36.3*		ng/L	*39.82*		*91*	*70-130*		

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

PFAAS, LCMS-MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B009147									
LCS (B009147-BS1)									
11Cl-PF3OUdS	5.43	3.98	ng/L	7.530		72	50-150		
9Cl-PF3ONS	5.49	3.98	ng/L	7.450		74	50-150		
HFPO-DA	5.79	3.98	ng/L	7.968		73	50-150		
ADONA	5.78	3.98	ng/L	7.530		77	50-150		
NEtFOSAA	5.59	3.98	ng/L	7.968		70	50-150		
NMeFOSAA	5.53	3.98	ng/L	7.968		69	50-150		
PFBS	4.54	3.98	ng/L	7.052		64	50-150		
PFDA	5.91	3.98	ng/L	7.968		74	50-150		
PFDoA	5.73	3.98	ng/L	7.968		72	50-150		
PFHpA	6.50	3.98	ng/L	7.968		82	50-150		
PFHxA	6.56	3.98	ng/L	7.968		82	50-150		
PFHxS	5.48	3.98	ng/L	7.270		75	50-150		
PFNA	6.11	3.98	ng/L	7.968		77	50-150		
PFOA	6.13	3.98	ng/L	7.968		77	50-150		
PFOS	5.75	3.98	ng/L	7.378		78	50-150		
PFTeDA	5.65	3.98	ng/L	7.968		71	50-150		
PFTrDA	5.74	3.98	ng/L	7.968		72	50-150		
PFUdA	5.79	3.98	ng/L	7.968		73	50-150		
PFPeS	6.24	3.98	ng/L	7.490		83	50-150		
PFNS	5.92	3.98	ng/L	7.649		77	50-150		
PFHpS	6.31	3.98	ng/L	7.570		83	50-150		
PFDS	5.80	3.98	ng/L	7.689		75	50-150		
4:2 FTS	7.11	3.98	ng/L	7.450		95	50-150		
6:2 FTS	7.24	3.98	ng/L	7.649		95	50-150		
8:2 FTS	6.77	3.98	ng/L	7.570		89	50-150		
Surrogate: 13C2-PFDA(SURR)	*35.7*		ng/L	*39.84*		*90*	*70-130*		
Surrogate: 13C2-PFHxA(SURR)	*39.5*		ng/L	*39.84*		*99*	*70-130*		
Surrogate: 13C3-HFPO-DA (SURR)	*39.7*		ng/L	*39.84*		*100*	*70-130*		
Surrogate: d5-NEtFOSAA-M (SURR)	*137*		ng/L	*159.4*		*86*	*70-130*		
Surrogate: 13C8-PFOS (SURR)	*32.5*		ng/L	*39.88*		*81*	*70-130*		
Surrogate: 13C2-6:2 FTS (SURR)	*36.0*		ng/L	*39.82*		*90*	*70-130*		

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

PFAAS, LCMS-MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B009147									
LCS Dup (B009147-BSD1)									
11Cl-PF3OUdS	4.92	3.98	ng/L	7.530		65	50-150	10	30
9Cl-PF3ONS	5.10	3.98	ng/L	7.450		68	50-150	7	30
HFPO-DA	5.75	3.98	ng/L	7.968		72	50-150	0.7	30
ADONA	5.66	3.98	ng/L	7.530		75	50-150	2	30
NEtFOSAA	5.37	3.98	ng/L	7.968		67	50-150	4	30
NMeFOSAA	5.04	3.98	ng/L	7.968		63	50-150	9	30
PFBS	4.18	3.98	ng/L	7.052		59	50-150	8	30
PFDA	5.62	3.98	ng/L	7.968		70	50-150	5	30
PFDoA	5.03	3.98	ng/L	7.968		63	50-150	13	30
PFHpA	5.94	3.98	ng/L	7.968		75	50-150	9	30
PFHxA	6.36	3.98	ng/L	7.968		80	50-150	3	30
PFHxS	5.14	3.98	ng/L	7.270		71	50-150	6	30
PFNA	5.90	3.98	ng/L	7.968		74	50-150	4	30
PFOA	5.88	3.98	ng/L	7.968		74	50-150	4	30
PFOS	5.60	3.98	ng/L	7.378		76	50-150	2	30
PFTeDA	4.84	3.98	ng/L	7.968		61	50-150	15	30
PFTrDA	4.88	3.98	ng/L	7.968		61	50-150	16	30
PFUdA	5.17	3.98	ng/L	7.968		65	50-150	11	30
PFPeS	5.91	3.98	ng/L	7.490		79	50-150	5	30
PFNS	5.33	3.98	ng/L	7.649		70	50-150	10	30
PFHpS	5.90	3.98	ng/L	7.570		78	50-150	7	30
PFDS	5.10	3.98	ng/L	7.689		66	50-150	13	30
4:2 FTS	6.36	3.98	ng/L	7.450		85	50-150	11	30
6:2 FTS	6.90	3.98	ng/L	7.649		90	50-150	5	30
8:2 FTS	6.26	3.98	ng/L	7.570		83	50-150	8	30
Surrogate: 13C2-PFDA(SURR)	*33.1*		ng/L	*39.84*		*83*	*70-130*		
Surrogate: 13C2-PFHxA(SURR)	*37.1*		ng/L	*39.84*		*93*	*70-130*		
Surrogate: 13C3-HFPO-DA (SURR)	*34.4*		ng/L	*39.84*		*86*	*70-130*		
Surrogate: d5-NEtFOSAA-M (SURR)	*119*		ng/L	*159.4*		*74*	*70-130*		
Surrogate: 13C8-PFOS (SURR)	*31.4*		ng/L	*39.88*		*79*	*70-130*		
Surrogate: 13C2-6:2 FTS (SURR)	*34.2*		ng/L	*39.82*		*86*	*70-130*		

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2 Laboratory

Final Report

Project: Waldick Aerospace Devices - 2009041

Project Number: 2009041

PFAAS, LCMS-MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B009147									
Matrix Spike (B009147-MS1)		**Source: 2009041-05**							
11Cl-PF3OUdS	2.14	3.39	ng/L	6.407	ND	33	70-130		
9Cl-PF3ONS	2.57	3.39	ng/L	6.339	ND	41	70-130		
HFPO-DA	3.81	3.39	ng/L	6.780	ND	56	70-130		
ADONA	3.42	3.39	ng/L	6.407	ND	53	70-130		
NEtFOSAA	2.08	3.39	ng/L	6.780	ND	31	70-130		
NMeFOSAA	2.02	3.39	ng/L	6.780	ND	30	70-130		
PFBS	4.95	3.39	ng/L	6.000	3.00	32	70-130		
PFDA	2.67	3.39	ng/L	6.780	0.204	36	70-130		
PFDoA	2.15	3.39	ng/L	6.780	ND	32	70-130		
PFHpA	4.66	3.39	ng/L	6.780	1.05	53	70-130		
PFHxA	6.29	3.39	ng/L	6.780	1.55	70	70-130		
PFHxS	3.92	3.39	ng/L	6.186	1.20	44	70-130		
PFNA	3.61	3.39	ng/L	6.780	0.582	45	70-130		
PFOA	6.93	3.39	ng/L	6.780	3.95	44	70-130		
PFOS	6.44	3.39	ng/L	6.278	6.51	NR	70-130		
PFTeDA	2.18	3.39	ng/L	6.780	0.077	31	70-133		
PFTrDA	2.14	3.39	ng/L	6.780	ND	32	70-130		
PFUdA	2.22	3.39	ng/L	6.780	ND	33	70-130		
PFPeS	4.05	3.39	ng/L	6.373	ND	64	70-130		
PFNS	2.52	3.39	ng/L	6.508	ND	39	70-130		
PFHpS	3.71	3.39	ng/L	6.441	0.205	54	70-130		
PFDS	2.26	3.39	ng/L	6.542	ND	35	70-130		
4:2 FTS	6.48	3.39	ng/L	6.339	1.01	86	70-130		
6:2 FTS	6.50	3.39	ng/L	6.508	0.056	99	70-130		
8:2 FTS	4.58	3.39	ng/L	6.441	0.087	70	70-130		
Surrogate: 13C2-PFDA(SURR)	*14.3*		ng/L	*33.90*		*42*	*70-130*		
Surrogate: 13C2-PFHxA(SURR)	*23.8*		ng/L	*33.90*		*70*	*70-130*		
Surrogate: 13C3-HFPO-DA (SURR)	*19.7*		ng/L	*33.90*		*58*	*70-130*		
Surrogate: d5-NEtFOSAA-M (SURR)	*47.0*		ng/L	*135.6*		*35*	*70-130*		
Surrogate: 13C8-PFOS (SURR)	*15.1*		ng/L	*33.93*		*45*	*70-130*		
Surrogate: 13C2-6:2 FTS (SURR)	*28.0*		ng/L	*33.88*		*83*	*70-130*		

Appendix E
UFP-QAPP & Appendices

UNIFORM FEDERAL POLICY (UFP)
QUALITY ASSURANCE PROJECT PLAN (QAPP)

FOR THE

WALDICK AEROSPACE INC.
GROUNDWATER SAMPLING

Sept 28 - Oct 1, 2020

Document Control Number:
WADI_OU2_UFP-QAPP_09-2020

Prepared by: Michael Mercado

Approved by: Amelia Jackson

X Michael A. Mercado 9/24/2020
Physical Scientist
LSASD-HWSB-SST

X Amelia Jackson 9/24/2020
QA Officer
LSASD-HWSB-SST

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APPENDICES

Appendix A: Site Map/ Sampling Locations/ Logs

Appendix B: Sampling Standard Operating Procedure (SOPs)
SOP#FA-SST-T-07 Rev. 2.0
EPA OSRTI SOP for Sampling Per- and Polyfluorinated Subtances (PFAS) in Groundwater, December 2017 (draft) and
GeoInsight HYDRASLEEVE SOP: Sampling Groundwater with a Hydrasleeve, 2016

Appendix C: Analytical Standard Operating Procedure (SOPs)
SOP# DW-1: ANALYSIS OF TRACE VOC IN WATER BY PURGE AND TRAP
SOP# C-112: DETERMINATION OF TRACE ELEMENTS IN AQUEOUS SAMPLES
SOP# C-135: ANALYSIS OF PERFLUORINATED ALKYL ACIDS IN WATER BY
SOP#C-90: ANALYSIS OF BASE/NEUTRAL AND ACID COMPOUNDS IN AQUEOUS, SOIL/SEDIMENT, AND WASTE OIL/WASTE ORGANIC SOLVENTS SAMPLES BY GC/MS (SIM)

Appendix D: Data Validation Standard Operating Procedure (SOPs)
SOP# G-26, Rev. 1.6: Data Review

Appendix E: Manuals and Guides
USEPA ERT, Scribe v3.10 Manuals: Parts 1, 2, 3
USEPA ERT, Scribe v3.10 Manual for CLP Sampling

ACRONYMS AND ABBREVIATIONS

ADR	Automated Data Review
ANSETS	Analytical Services Tracking System
AOC	Acknowledgment of Completion
ASTM	American Society for Testing and Materials
BGS	Below ground Surface
BNA	Base Nuetral and Acid Extractables
CCV	Continuing Calibration Verification
CDC	Continuing Demonstration of Capability
CEO	Chief Executive Officer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFM	Contract Financial Manager
CLP	Contract Laboratory Program
CO	Contract Officer
COC	Chain-of-Custody
COI	Conflict of Interest
COO	Chief Operations Officer
CQLOSS	Corporate Quality Leadership and Operations Support Services
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
CRTL	Core Response Team Leader
CWA	Clean Water Act
DCN	Document Control Number
DI	Deionized Water
DMC	Deuterated Monitoring Compound
DPO	Deputy Project Officer
DQI	Data Quality Indicator
DQO	Data Quality Objective
EB	Equipment Blank
EDD	Electronic Data deliverable
EM	Equipment Manager
ENVL	Environmental Unit Leader
EPA	Environmental Protection Agency
ERT	Environmental Response Team
ESD	Explanation of Significant Differences
FASTAC	Field and Analytical Services Teaming Advisory Committee
FD	Field Duplicate
FFS	Focus Feasibility Study
GC/ECD	Gas Chromatography/Electron Capture Detector
GC/MS	Gas Chromatography/Mass Spectrometry
GIS	Geographic Information System
HASP	Health and Safety Plan
HRS	Hazard Ranking System
HSO	Health and Safety Officer
HWSB	Hazardous Waste Support Branch
HWSS	Hazardous Waste Support Section
ICS	Initial Calibration Standard
ICV	Initial Calibration Verification
IDC	Initial Demonstration of Capability
IDL	Instrument Detection Limit

ACRONYMS AND ABBREVIATIONS

ITM	Information Technology Manager
LCS	Laboratory Control Sample
LD	Laboratory Duplicate
LEL	Lower Explosive Limit
LSASD	Laboratory Services & Applied Science Division
MB	Method Blank
MDL	Method Detection Limit
mg/Kg	miligrams per kilogram
MPC	Measurement Performance Criteria
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSA	Mine Safety Appliances
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NJDEP	New Jersey Department of Environmental Protection
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration
OLEM	Office of Land and Emergency Management
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbons
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, Sensitivity
PCB	Polychlorinated Biphenyls
PID	Photoionization Detector
PIO	Public Information Officer
PM	Program Manager
PO	Project Officer
ppb	Parts Per Billion
ppm	Parts Per Million
PQO	Project Quality Objective
PRG	Proposed Remediation Goal
PRP	Potentially Responsible Party
PT	Proficiency Testing
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAL	Quality Assurance Leader
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quanitation Limit
QMP	Quality Management Plan
RA	Remedial Action
RC	Readiness Coordinator
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPD	Relative Percent Difference
RPM	Remedial Project Manager

ACRONYMS AND ABBREVIATIONS

RRF	Relative Response Factor
RSCC	Regional Sample Control Coordinator
RSD	Relative Standard Deviation
RST	Removal Support Team
SARA	Superfund Amendments and Reauthorization Act
SDG	Sample Delivery Group
SEDD	Staged Electronic Data Deliverable
SEMD	Superfund and Emergency Management Division
SOP	Standard Operating Procedure
SOW	Statement of Work
SPCC	System Performance Check
SPM	Site Project Manager
START	Superfund Technical Assessment and Response Team
STR	Sampling Trip Report
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TBD	To Be Determined
TCL	Target Compound List
TDD	Technical Direction Document
TDL	Technical Direction Letter
TO	Task Order
TPH	Total Petroleum Hydrocarbons
TQM	Total Quality Management
TSCA	Toxic Substances Control Act
UFP	Uniform Federal Policy
ug/L	micrograms per liter
µg/Kg	micrograms per kilogram
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Analysis

QAPP Worksheet# 1
Title and Approval Page

Site Name: WALDICK AEROSPACE INC.
Site Location: Wall Township, New Jersey
Operable Unit: 02

Lead Organization:
U.S. Environmental Protection Agency, Region II
Preparer's Name and Organizational Affiliation:
Preparer's Address, Telephone Number, and E-mail Address:

Michael Mercado
U.S. EPA Region II, 2890 Woodbridge Ave, Edison, NY 08837
(732) 906-6808
Mercado.Michael@epa.gov

Preparation Date: 9/24/2020
(Day/Month/Year)

Project Manager: Michael Mercado

X Michael A. Mercado

Physical Scientist
LSASD-HWSB-SST

QA Officer: Amelia Jackson

X Amelia Jackson 9/24/2020

QA Officer
LSASD-HWSB-SST

Document Control Number: WADI_OU2_UFP-QAPP_09-2020

QAPP Worksheet# 2

Site Name/ Project Name: WALDICK AEROSPACE INC.
Site Location: Wall Township, New Jersey
Operable Unit: 02

1. Identify guidance used to prepare QAPP:
Uniform Federal Policy for Quality Assurance Project Plans

2. Identify regulatory program:
EPA Region 2

3. Identify approval entity:
EPA Region 2

4. Indicate whether the QAPP is a generic or a project-specific QAPP.
QAPP is site specific

5. List dates of scoping sessions that were held:
N/A

6. List dates and titles of QAPP documents written for previous site work, if applicable:
LSASD-HWSB-SST performed sampling in 2011-2018 at this Site.

7. List organizational partner (stakeholders) and connection with lead organization:
None

8. List data users:
EPA Region 2 SEMD (see Worksheet #4 for individuals)

9. If any required QAPP elements and required information are not applicable to the project, then provide an explanation for their exclusion below:

10. Document Control Number: WADI_OU2_UFP-QAPP_09-2020

QAPP Worksheet# 3
Distribution List

QAPP Recipient	Title	Organization	Telephone Number	E-mail Address	Document Control Number
Pamela Baxter	Remedial Project Manager	EPA R2 LSASD-HWSB-SST	(212) 637-4416	Baxter.Pamela@epa.gov	WADI_OU2_UFP-QAPP_09-2020
Amelia Jackson	QA Officer	EPA R2 LSASD-HWSB-SST	(732) 906-6164	Jackson.Amelia@epa.gov	WADI_OU2_UFP-QAPP_09-2020
Michael Mercado	Field Project Manager	EPA R2 LSASD-HWSB-SST	(732) 906-6808	Mercado.Michael@epa.gov	WADI_OU2_UFP-QAPP_09-2020

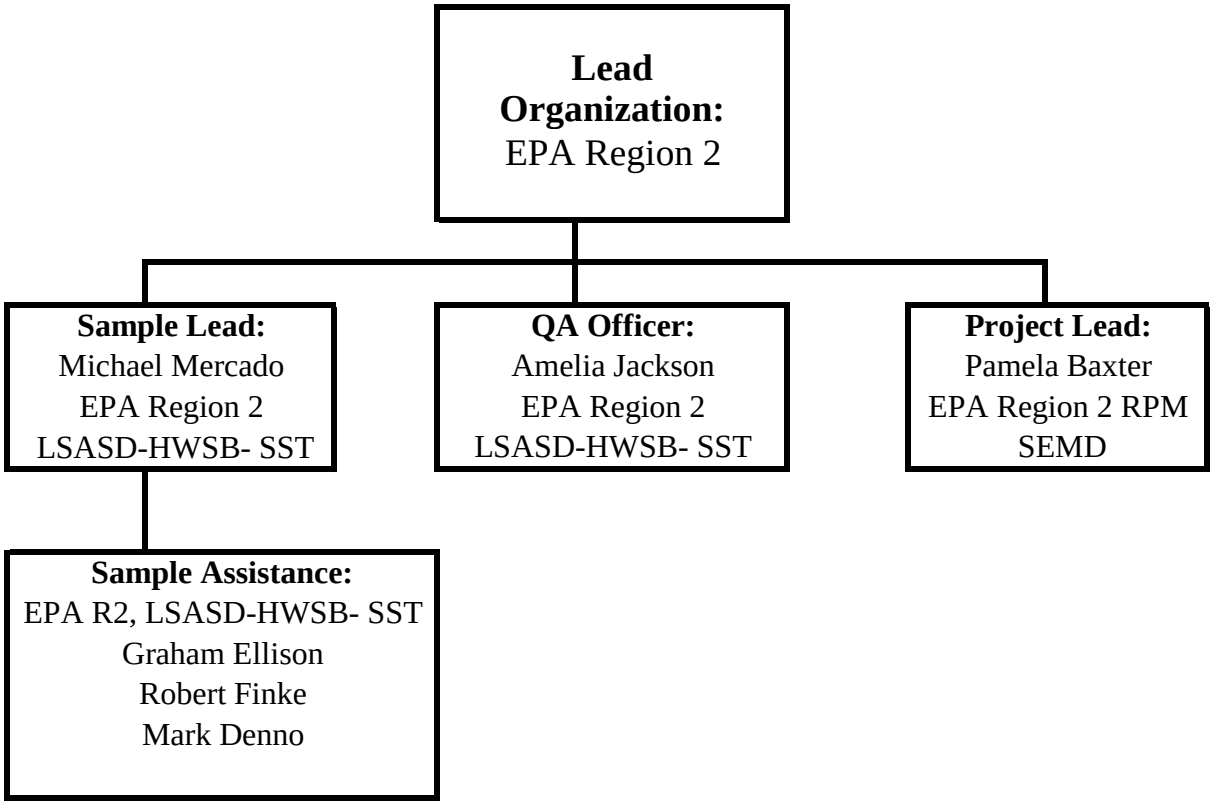
QAPP Worksheet #4
Project Personnel Sign-Off Sheet

Organization: EPA Region 2

[Have copies of this form signed by key project personnel from each organization to indicate that they have read the applicable sections of the QAPP and will perform the tasks as described; add additional sheets as required. Ask each organization to forward signed sheets to the central project file.]

Project Personnel	Title	Telephone #	Signature	Date QAPP Read
Pamela Baxter	Remedial Project Manager	(212) 637-4416		
Amelia Jackson	QA Officer	(732) 906-6164	Amelia Jackson	9/24/2020
Michael Mercado	Field Project Manager	(732) 906-6808	Michael A. Mercado	9/24/2020
Graham Ellison	Field Support	(732) 452-6401	Graham Ellison	09/24/2020
Robert Finke	Field Support	(732) 906-6802	Robert C. Finke	9/24/2020
Mark Denno	Field Support	(732) 321-6708	Mark Denno	09/24/2020

QAPP Worksheet #5
Project Organizational Chart



QAPP Worksheet #6
Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Sampling Request	EPA RPM	Pamela Baxter	(212) 637-4416	All technical, QA and decision-making matters in regard to the project (verbal, written or electronic)
Point of Contact with RPM	Sampling Project Lead	Michael Mercado	(732) 906-6808	All technical, QA and decision-making matters in regard to the project (verbal, written or electronic) while in the field – communication with the RPM who ultimately makes decisions regarding the project.
Laboratory Request	RAS RSCC	Christina Leung	(732) 906-6995	Completes lab Task Order and requests laboratory
Adjustments to QAPP	QA Officer	Amelia Jackson	(732) 906-6164	QAPP approval dialogue

QAPP Worksheet #7
Personnel Responsibilities and Qualifications Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Pamela Baxter	Remedial Project Manager	EPA/SEMD/NJRB	Overall project management	EPA job-related qualifications/EPA Files
Michael Mercado	Physical Scientist	EPA/LSASD/HWSB/SST	Sampling and Field Operations. Data management and final sampling report.	B.S. Degree in Chemistry. Over 35 years experience in environmental investigation and project management
Graham Ellison	Environmental Scientist	EPA/LSASD/HWSB/SST	Sampling	M.S. Degree In Environmental Science. Over 6 Years Experience In Environmental Investigation And Project Management
Robert Finke	Environmental Scientist	EPA/LSASD/HWSB/SST	Sampling	M.S. Degree In Environmental Policy & Management. Over 30 Years Experience In Environmental Consulting, Investigation, Analytical Instrumentation, And Project Management
Mark Denno	Environmental Scientist	EPA/LSASD/HWSB/SST	Sampling	M.S. Degree In Environmental Science. Over 30 Years Experience In Environmental Consulting, Investigation, Analytical Instrumentation, And Project Management

QAPP Worksheet #8
Special Personnel Training Requirements Table

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/ Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/ Certificates
All Field Activities	40-hour OSHA Annual 8-hour refresher	40-hour- EPA; 8-hour refresher training- EPA and on-site safety briefings	Various	All field team members	HWSB/SST staff	On-site and EPA Edison office records
Sample Collection	Trained in EPA CERCLA QA, sampling methods, sample shipping procedures	Office and on-site training	Various	HWSB/SST Staff	HWSB/SST Staff	EPA Region 2 in Edison, NJ
Sample Analysis	NELAC certified	Per lab specific requirements	Various	EPA Region II LSASD Laboratory	Laboratory management and staff	Individual laboratory records
Data Validation	EPA data validation experience	EPA R2 LSASD-HWSB and Lab	Various	EPA HWSS personnel	EPA HWSS Chemists	EPA Region 2 in Edison, NJ
Data Review and Assessment	EPA data validation experience	EPA R2 LSASD-HWSB	Various	EPA SST personnel	LSASD/HWSB Environmental Scientists/ Chemists	EPA Region 2 in Edison, NJ

QAPP Worksheet #9
Project Scoping Session Participants Sheet

Site Name/Project Name: Waldick Aerospace Inc.
Site Location: Wall Township, New Jersey
Operable Unit: 02

Date of Session: 9/18/2020

Scoping Session Purpose: Confirmed well locations and parameters of interest with RPM Pam Baxter.

Name	Title	Affiliation	Phone #
A. Jackson	Lead Chemist	R2 LSASD-HWSB-SST	732-906-6164
P. Baxter	RPM	R2 SEMD-NJRB	212-637-4416

Comments/Decisions

1.) Well locations are RD-101S , MW-102S, MW-102M, MW-104S, MW-104M, MW-105S, & MW-105M plus MW 111S and 112S if found;

2.) Parameters of interest are: VOC, Total + Dissolved Metals, PFAS and 1,4-dioxane

Action Items:

none

Consensus Decisions

Analysis of 1,2,3-TCP not needed since no prior detections of 1,2-DCP in 2011-2018 data sets.

QAPP Worksheet #10
Problem Definition

PROBLEM DEFINITION

In 1982, State and County inspectors found that various degreasing, dip, rinse and plating tanks, as well as a polishing machine were discharging wastewater directly onto the ground. The discharged waste infiltrated the groundwater, and sampling revealed that the wastes contained heavy metals, acids, and volatile organic compounds (VOCs).

The contaminated ground water contains VOCs and heavy metals (primarily chromium), however, concentrations have significantly declined since the source of contamination was cleaned up in 1993. About 41,000 people live within a 3-mile radius of the site. The nearest residence is approximately 100 yards west of the site. A public water system supplies potable water to the residents living hydraulically downgradient of the Site. Nine of the 47 existing monitoring wells present at the Site were selected and approved to be sampled. In January 2011 the EPA Region 2 Hazardous Waste Support Branch Superfund Support Team (HWSB SST) became the lead on the monitoring well sampling conducted at the site. The next round of sampling at Waldick will occur in 2020.

SITE HISTORY/CONDITIONS

The Waldick Aerospace Devices Site (Site) is a former industrial facility located at 2121 State Route 35 in the Sea Girt section of Wall Township, Monmouth County, New Jersey. It is bordered to the east by Route 35, to the south by commercial property, and to the north and west by undeveloped woodland. Two aquifers (Cohansey and Kirkwood) are present beneath the Site, separated by a clay layer ten feet thick. Hannabrand Brook flows approximately 900 feet south of the Site. It merges with a smaller stream northeast of the Site and flows eastward into Wreck Pond, which drains into the Atlantic Ocean. These water bodies are used recreationally for swimming and fishing. Both groundwater and surface runoff flow generally to the southeast in this area.

The site property was originally purchased and developed in the mid-1950s. For about 25 years, the main and auxiliary buildings were used primarily for storage and handling of plumbing supplies, as well as for office space. For several years in the late 1960s, the buildings were leased to the American Filter Press Company, which manufactured wooden filters for the dye industry. From 1979 until about 1984, Waldick Aerospace Devices, Inc. leased the site property for the manufacturing and plating of metal components for the aerospace industry.

In 1982, state and county inspectors found that wastewater and used machine oil was being discharged directly onto the ground. Samples revealed that the wastes contained heavy metals, acids, and volatile organic compounds (VOCs). Soil and groundwater, as well as two buildings were contaminated. A third building, never used by the Waldick firm, had been used for several retail operations.

After site investigations, EPA placed the site on the Superfund program's National Priorities List in June 1986.

In June 1983, the county and state authorities excavated about 40 cubic feet of contaminated soil from the southeastern corner of the main building and about 40 cubic feet more from an area behind another building. In January 1985, after the facility was abandoned, EPA discovered about 30 containers of varying sizes filled with hazardous materials, as well as a storage cabinet of laboratory chemicals. The hazardous materials were securely repackaged and shipped to a hazardous waste disposal facility.

QAPP Worksheet #10
Problem Definition

In 1986, EPA started an investigation into the nature and extent of contamination in order to evaluate cleanup options for the site. In 1987, after the study was completed, EPA selected a source control remedy in a Record of Decision (ROD) to address contaminated soil and buildings.

EPA updated the interim remedy in March 1991 that called for extracting contaminated groundwater and treating it by chemical precipitation to remove metals, followed by air stripping to remove VOCs, and reinjection into the aquifer. The main and the auxiliary buildings were demolished and approximately 4,600 cubic yards of contaminated soil was treated on-site using low-temperature thermal desorption. Residuals were sent off-site for stabilization and solidification and disposed at a Resource Conservation and Recovery Act (RCRA) permitted landfill. This work started in January 1993 and was completed in October 1993.
After soil cleanup, the groundwater sampling showed substantially reduced contaminant concentrations. As a result, EPA began a monitoring program in April 1997 to help determine whether implementing the selected groundwater remedy was still necessary or appropriate.

After considerable pre-design investigation and natural attenuation studies, it was determined that the groundwater plume, which originally consisted of cadmium, chromium, nickel, PCE and trichloroethene (TCE), had decreased significantly in contaminant concentrations. The studies showed that the concentrations of chromium, nickel and TCE were no longer present above state or federal MCLs. Cadmium and PCE were present in limited areas above MCLs. Due to the significant decrease in plume size and contaminant concentrations, a pump and treat remedy was no longer necessary. As a result of these studies, EPA amended the Operable Unit 2 (OU2) groundwater remedy on September 20, 2008. The ROD selected a final remedy for groundwater, which consisted of long-term groundwater sampling and analysis program to monitor the contaminant concentrations in the groundwater at the site; and institutional controls in the form of an NJDEP groundwater classification exception area (CEA).

PROJECT DECISION STATEMENT

Groundwater sampling events are conducted annually. The current monitoring network is comprised of seven wells, at four locations, in the area downgradient of the property. During the fall of 2012, Hurricane Sandy destroyed or rendered inaccessible two wells and the surface water and seep sampling locations. Groundwater samples collected from wells were analyzed for VOCs and metals. Prior to the loss of the two downgradient wells (MW-111-S and MW-112-S), PCE concentrations in both wells had dropped below the NJDEP groundwater standard. The cadmium concentration dropped to below the standard in MW-111-S and was just slightly above the standard in MW-112-S at 5.4 ug/L.
The current sampling consists of the seven wells, with attempts to locate and sample MW-111S and MW-112S. Parameters of interest are VOC, Metals (total and dissolved), and at the request of NJDEP, PFAS and 1,4-dioxane.

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

Who will use the data?
Data will be used by EPA Region 2 SEMD.

What will the data be used for?
Data will be used to derive observable trends of the results for the following analtyes:

VOCs	Metal, TAL	Metal Dissolved (Filtered)	PFAS	1,4-dioxane

What type of data is needed?
Definitive groundwater data will be acquired.

How "good" do the data need to be in order to support the environmental decision?
Definitive and screening level data will be required to meet project objectives. The quantitation limits for the samples are specified on Worksheet #15.

All definitive laboratory analyses will be performed by EPA Region II LSASD Laboratory. Worksheets #12 and #28 contain the measurement performance criteria that are needed for the quality indicators.
Worksheet #20 contains the quality control (QC) samples required. All data generated via EPA Region II LSASD Laboratory will be validated within the Lab prior to release.

Where, when, and how should the data be collected/generated?
U.S. EPA/LSASD/HWSB/SST employees will begin sampling 9 sample locations on Sept 28 - Oct 1, 2020

LSASD Region 2 Sampling SOPs which can be found Appendix B. The wells are located throughout the site boundaries. See Appendix A for the site map with well locations.

Who will collect and generate the data?
Samples collected will be collected by EPA personnel and the data will be generated by EPA Region II LSASD Laboratory in Edison, NJ.

How will the data be reported?
Data will be electronically reported in excel and .pdf format and posted to the Region 2 Environmental Data Services SharePoint site. Both the RPM and SST Project Lead will receive notification once posted.

How will the data be archived?
A copy of the complete data package will be maintained with the project files at the Federal Records Center in Kansas City, Missouri for a period of thirty years.

QAPP Worksheet #12
Measurement Performance Criteria Table - VOC

Matrix	Aqueous
Analytical Group	VOCs
Conc. Level (ug/L)	Trace

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
SOP#FA-SST-T-07 Rev. 2.0	**SOP# DW-1: ANALYSIS OF TRACE VOC IN WATER BY PURGE AND TRAP GC/MS**	Precision	< 20 % RPD	LCS/LCS Duplicate Field Duplicate	S&A
		Accuracy	Limits: Average Recovery ± 20%	LCS/LSD Duplicate	A
		Accuracy	±40% from the initial/ continuing calibration	Internal standards	A
		Accuracy	Limits 70% - 130%	Matrix spike	A
		Accuracy	Limits 80% - 120%	Surrogate Compounds	A
		Accuracy	< RL	Method Blank Trip Blank	A

QAPP Worksheet #12
Measurement Performance Criteria Table - Metals (Total and Dissolved)

Matrix	Aqueous
Analytical Group	Metal, TAL
Conc. Level	Low

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
SOP#FA-SST-T-07 Rev. 2.0	**LSASD LAB SOP C-112**	Precision	± 20 % RPD	LCS Duplicate	A
		Accuracy	Limits:Average Recovery ±20%	LCS	A
		Accuracy	± 20 % RPD	Matrix Spike, LCS	A
		Precision	< RL Except for Al, Fe, Ca, K, Mg and Na	Interference Check Sample (ICP-AES)	A
		Accuracy	< RL	Method Blank	A
		Precision	RPD < 20 %	Serial Dilution Test (ICP/AES)	A
		Accuracy	Range of 0.60 - 1.87 of the original response in the calibration blank	Internal Standards (ICP-MS)	A
		Precision	20 % RPD	Field Duplicate	S & A
		Accuracy	No analyte > CRQL	Rinsate Blank	S & A

QAPP Worksheet #12
Measurement Performance Criteria Table - PFAS

Matrix	Aqueous
Analytical Group	Per- and polyfluorinated Alkyl Substances (PFAS)[a]
Concentration Level	Low (ng/L)

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
EPA OSRTI SOP for Sampling Per- and Polyfluorinated Subtances (PFAS) in Groundwater, December 2017 (draft) and GeoInsight HYDRASLEEVE SOP: Sampling Groundwater with a Hydrasleeve, 2016	**SOP# C-135: ANALYSIS OF PERFLUORINATED ALKYL ACIDS IN WATER BY HPLC/MS/MS**	Accuracy/Bias/ Sensitivity- Contamination	Demonstrate that all method analytes are below 1/3 the RL [b]	Lab Reagent Blank/Instrument Blank	S&A
		Accuracy/Bias/ Sensitivity- Contamination	No target compound >RL 5 ppt[c]	Equipment Rinse Blank	S&A
		Accuracy/Bias	70%-130% R (high and mid level); 50%-150% R (near MRL)	Lab Fortified Blank and Duplicate, Lab Fortified Sample Matrix, Lab Fortified Sample Matrix Duplicate	A
		Precision	RPD ≤50% (near MRL), RPD ≤30% (high and mid-level)	Lab Fortified Blank/Duplicateand Lab Fortified Sample Matrix/ Duplicate	A
		Accuracy	Peak area counts for all ISs in all injections must be within +/- 50% of the average peak area calculated during the initial calibration and 70-140% from the most recent CCV.	Internal Standards	A
		Accuracy	70-130%	Surrogate Standards	A
		Precision	RPD ≤50% (near MRL), RPD ≤30% (high and mid-level)	Field Duplicates	S & A

QAPP Worksheet #12
Measurement Performance Criteria Table - PFAS

Matrix	Aqueous
Analytical Group	Per- and polyfluorinated Alkyl Substances (PFAS)[a]
Concentration Level	Low (ng/L)

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
		Completeness	>/= 90%	Data Completeness Check	A

a Refer to Worksheet #15 for a complete list of analytes for each analytical group.

b RL = 5 PPT. If Method Blank exceedances are widespread or reoccurring, analyses must stop and the source of contamination must be eliminated or reduced.

c Equipment blank contamination will be evaluated on an individual basis.

QAPP Worksheet #12
Measurement Performance Criteria Table - SVOC

Matrix	Aqueous
Analytical Group	SVOC 1,4-dioxane only
Conc. Level	Low

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
SOP#FA-SST-T-07 Rev. 2.0	**SOP#C-90: ANALYSIS OF BASE/NEUTRAL AND ACID COMPOUNDS IN AQUEOUS, SOIL/SEDIMENT, AND WASTE OIL/WASTE ORGANIC SOLVENTS SAMPLES BY GC/MS (SIM)**	Precision (Field)	≤ 50 % RPD	Field Duplicate	S&A
		Accuracy (field)	No analyte > CRQL*	Field Blank	S & A
		Precision (laboratory)	%RPD < 30	LCS/LCS Duplicate MS/MSD**	A
		Accuracy	Compnnd Specific (Full range: D-262%)	LCS/LCS Duplicate	A
		Accuracy	Factor of two (-50% to + 100%) from the initial/continuing calibration	Internal Standards	A

QAPP Worksheet #12
Measurement Performance Criteria Table - SVOC

Matrix	Aqueous
Analytical Group	SVOC 1,4-dioxane only
Conc. Level	Low

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
		Accuracy	Compound Specific (Full range: D-262%)	Matrix Spike	A
		Accuracy	Limits 30% - 120% for Base Neutrals Limits 20%-120% for Acids	Surrogate Compounds	A
		Accuracy	< RL	Method Blank	S & A

QAPP Worksheet #13
Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation / Collection Dates)	How Data May Be Used (if deemed usable during data assessment stage)	Limitations on Data Use
N/A	N/A	N/A	N/A	N/A

QAPP Worksheet #14
Summary of Project Tasks

Sampling Tasks:
Groundwater samples will be collected on site from 9 groundwater wells in accordance with the Sampling Standard Operating Procedure (SOP) which can be found in Appendix B. A map of sample locations can be found in Appendix A.

This method requires the following water quality parameter data: turbidity, pH, depth to water, temperature, specific conductance, dissolved oxygen, and oxidation-reduction potential. One matrix spike/matrix spike duplicate sample and one field duplicate sample will be collected per Sample Delivery Group (SDG) of 20 samples. Two aqueous rinsate blanks will be collected for this event since two different types of equipment will be used (pumps and hydrasleeves).

Other tasks to be conducted in the field by the SST include:
Record groundwater quality electronically via sonde well data sheets. These records will be provided in the Trip Report.

Analysis Tasks:
The groundwater samples collected from each monitoring well will be definitively analyzed according to the EPA Region II LSASD Laboratory SOPs references in Worksheets 12 and 23 for the following analytes:

VOCs Metal, TAL Metal Dissolved (Filtered) PFAS 1,4-dioxane

The samples will also be screened for turbidity, pH, oxidation reduction potential, specific conductance, temperature, and DO in the field.All samples will be analyzed by the EPA Region II LSASD Laboratory via SOPs noted on Worksheets #23 and #28 and in Appendix C.

Quality Control Tasks:
Groundwater samples will have one or more of the following QC samples analyzed: field duplicates, matrix spike, VOC trip blanks, temperature blank, rinsate blanks, regent water blanks, and all other QA/QC samples as defined in the method. Rinsate blank samples will be collected on decontaminated equipment at a rate of one rinsate sample per day per decon event per equipmetn type (one for pumps and another for hydrasleeves), not to exceed one/day. See worksheet #20 for the field quality control sample summary table.

Data Management Tasks:
The data collected for the sampling activities will be organized, analyzed, and summarized in a final Trip Reportto include Data Summary Tables that will be submitted to the RPM according to the Project Schedule. The report will be prepared by the project sampling lead and include appropriate data quality assessment. Standard methods and references will be used as guidelines for data reduction and reporting.

Data management tasks include data receipt, verification, completeness check, uploading, usability evaluations, and the preparation of reports, tables, and figures. The sampling project lead will be downloading the data and Summary Report tables from the Region 2 Environmental Data Services SharePoint site for inclusion in the final Trip Report. The RPM will also be notified of data and Summary Report posting to the SharePoint (SP) site, with permissions to download. The Trip Report and appendices prepared by the sampling project lead will be uploaded onto the SP site upon completion. The sample handling and custody requirements, including field logbook and generation of sample paperwork/sample labels, is discussed in worksheets #26 and #27. Data tables that compare the results obtained to the various EPA/state criteria will be prepared and included in the final Trip Report. Data management will utilize personal computers, local area networks, and electronic communications to support the software.

QAPP Worksheet #14
Summary of Project Tasks

The following deliverables will be provided under this project:

Trip Report:

A trip report will be prepared to provide a detailed accounting of what occurred during each sampling event. Information will be provided in regards to time of major events, dates, and personnel on-site (including affiliations) and will include Site map, COCs, well data sheets. Data Summary tables prepared subsequent to receipt of final, validated laboratory data will be prepared and included in the Trip Report posted to the Region 2 Environmental Data Services Sharepoint site.

Trip Report attachments to include (but not limited to):

Maps/Figures: Maps depicting site layout, contaminant source areas, and sample locations will be included in the trip report, as appropriate.

Analytical Report : An analytical report will be prepared for samples analyzed under this plan. Information regarding the analytical methods or procedures employed, sample results, QA/QC results, chain-of-custody documentation, laboratory correspondence, and raw data will be used for validation. The final Trip Report deliverable will contain the laboratory's results per sample and a Data Summary Table containing the results as compared to the NJDEP Higher of PQL/GW Quality standards.

Data Review: A review of the data generated under this plan will be undertaken. The assessment of data acceptability or usability will be included and posted to the site-specific library on the Region 2 Environmental Data Services SharePoint site.

Documentation and Records:

All field and sample documents will be legibly written in indelible ink. Any correction or revisions will be made by lining through the original entry and initialing the change. The following field and sample documentation will be maintained by the Project Sampling Lead:

Chain-of-Custody Records will be maintained from the time of sample collection until final deposition. Every transfer of custody will be noted and signed for and a copy of the record will be kept for each individual who has signed it. The chain-of-custody records will include, at a minimum, sample identification number, number of samples collected, sample collection date and time, sample type, sample matrix, sample container type, sample analysis requested, sample preservation, and the name(s) and signature(s) of samplers and all individuals who have had custody. Copies of the COC will be provided in the Trip Report as an attachment.

Well Data Sheets containing the well stabilization parameters will be available for each well sampled and included as an attachment in the Trip Report.

QAPP Worksheet #14
Summary of Project Tasks

Field Logbook:
The field logbook is a descriptive notebook detailing site activities and observations so that an accurate, factual account of field procedures may be reconstructed in the writer's absence.

All entries will be dated and signed by the individuals making the entries, and should include (at a minimum) the following:
1. Site name and project number
2. Name(s) of personnel on-site
3. Dates and times of all entries (military time preferred)
4. Descriptions of all site activities, site entry, and exit times
5. Noteworthy events and discussions including any deviations from protocol
6. Daily weather conditions
7. Methods used
8. Field measurements
9. Site observations
10. Sample preservation
11. Location identification
12. Subcontractor information and names of on-site personnel
13. Date and time of sample collections along with chain of custody information
14. Record of photographs
15. Site sketches

Assessment/Audit Tasks:
No performance audit of field operations is anticipated at this time. If conducted, performance and systems audits will be in accordance with the U.S. EPA Region 2, Sample SOP listed in Apendix B.

Data Review Tasks:
All samples will be processed by Ness Tirol and data will be validated by U.S. EPA Region 2 LSASD/LB in accordance with their internal procedures for compliance to technical criteria specified in the Data Validation and Analytical SOPs found in Appendix C and D.

UFP QAPP Worksheet #15 - Reference Limits and Evaluation Table

Matrix:	Aqueous
Analytical Group:	Volatile Organic Compounds
Conc. Level:	Low
SOP Number:	DW-1 (9/28/18)

CAS	Parameters	June 20, 2018 NYS Criterion for H(WS) in Class GA Groundwater (ug/L)	DESA LAB SOP DW-1 (9/28/18) Reporting Limit (ug/L)
100-41-4	Ethylbenzene	5	0.5
100-42-5	Styrene	5	0.5
10061-01-5	cis-1,3-Dichloropropene	0.40	0.5
10061-02-6	trans-1,3-Dichloropropene	0.40	0.5
106-46-7	1,4-Dichlorobenzene	3	0.5
106-93-4	1,2-Dibromoethane	0.00060	0.5
107-06-2	1,2-Dichloroethane	0.60	0.5
108-10-1	Methyl Isobutyl Ketone (4-methyl-2-pentanone)		5
108-87-2	METHYLCYCLOHEXANE		0.5
108-88-3	Toluene	5	0.5
108-90-7	Chlorobenzene	5	0.5
110-82-7	Cyclohexane		0.5
120-82-1	1,2,4-Trichlorobenzene	5	0.5
124-48-1	Dibromochloromethane (Chlorodibromomethane)	50	0.5
127-18-4	Tetrachloroethene	5	0.5
156-59-2	cis-1,2-Dichloroethene	5	0.5
156-60-5	trans-1,2-Dichloroethene	5	0.5
1634-04-4	Methyl tert-Butyl Ether (MTBE)	10	0.5
179601-23-1	M,P-XYLENE	5	0.5
541-73-1	1,3-Dichlorobenzene	3	0.5
56-23-5	Carbon Tetrachloride	5	0.5
563-58-6	1,1-dichloropropene		0.5
591-78-6	Hexanone, 2-	50	5
67-64-1	Acetone	50	5
67-66-3	Chloroform	7	0.5
71-43-2	Benzene	1	0.5
71-55-6	1,1,1-Trichloroethane	5	0.5
74-83-9	Methyl bromide (bromomethane)	5	0.5
74-87-3	Chloromethane		0.5
74-97-5	Bromochloromethane	5	0.5
75-00-3	Chloroethane	5	0.5
75-01-4	Vinyl chloride	2	0.5
75-09-2	Methylene chloride	5	0.5

75-15-0	Carbon Disulfide	60	0.5
75-25-2	Bromoform	50	0.5
75-27-4	Bromodichloromethane (Dichlorobromomethane)	50	0.5
75-34-3	1,1-Dichloroethane	5	0.5
75-35-4	1,1-Dichloroethylene	5	0.5
75-69-4	Trichlorofluoromethane	5	0.5
75-71-8	Dichlorodifluoromethane (Freon 12)	5	0.5
76-13-1	Trichloro-1,2,2-trifluoroethane, 1,1,2-	5	0.5
78-87-5	1,2-Dichloropropane	1	0.5
78-93-3	Methyl Ethyl Ketone (2-Butanone)	50	5
79-00-5	1,1,2-Trichloroethane	1	0.5
79-01-6	Trichloroethylene	5	0.5
79-20-9	Methyl acetate		0.5
79-34-5	1,1,2,2-Tetrachloroethane	5	0.5
87-61-6	1,2,3-Trichlorobenzene	5	0.5
95-47-6	Xylene, o-	5	0.5
95-50-1	1,2-Dichlorobenzene	3	0.5
96-12-8	1,2-Dibromo-3-chloropropane (DBCP)	0.04	0.5
98-82-8	Isopropyl benzene (Cumene)	5	0.5

UFP QAPP Worksheet #15 - Reference Limits and Evaluation Table

Matrix:	Aqueous
Analytical Group:	Metals-ICP/MS
Conc. Level:	Trace
LSASD Lab SOP:	C-112, Rev. 3.7 5/31/2018

Analyte	CAS Number	NJAC 7:9C, Higher of GW Quality Standard v. PQL, Class IIA 6/15/2020	Achievable Laboratory Limits-LSASD Lab RL (ug/L)
Ag (silver)	7440-22-4	40	1.0
Al (aluminum)	7429-90-5	200	20
As (arsenic)	7440-38-2	3	1.0
Ba (barium)	7440-39-3	6000	1.0
Be (beryllium)	7440-41-7	1	1.0
Ca (calcium)	7440-70-2	na	100
Cd (cadmium)	7440-43-9	4	1.0
Co (cobalt)	7440-48-4	100	1.0
Cr (chromium)	7440-47-3	70	1.0
Cu (copper)	7440-50-8	1300	1.0
Fe (iron)	7439-89-6	300	20
K (potassium)	7440-09-7	na	100
Mg (magnesium)	7439-95-4	na	100
Mn (manganese)	7439-96-5	50	1.0
Mo(molybdenum)	7439-98-7	40	1.0
Na (sodium)	7440-23-5	50000	100
Ni (nickel)	7440-02-0	100	1.0
Pb (lead)	7439-92-1	5	1.0
Sb (antimony)	7440-36-0	6	1.0
Se (selenium)	7782-49-2	40	2.0
Tl (thallium)	7440-28-0	2	1.0
V (vanadium)	7440-62-2	na	1.0
Zn (zinc)	7440-66-6	2000	2.0

https://www.nj.gov/dep/standards/ground%20water.pdf

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix:	Groundwater
Analytical Group:	Per- and Polyfluorinated Alkyl Substances (PFAS), LSASD Lab SOP C-135, Rev. 1.1
Concentration Level:	Trace (ng/L)

Analyte	CAS Number	6/15/2020 NJDEP Groundwater Quality Stds. Class IIA ng/L	Achievable Laboratory (LSASD) Reporting Limits (ng/L)
Perfluorobutanesulfonic acid (PFBS)	375-73-5		4
Perfluorodecanoic acid (PFDA)	335-76-2		4
Perfluorododecanoic acid (PFDoA)	307-55-1		4
Perfluoroheptanoic acid (PFHpA)	375-85-9		4
Perfluorohexanesulfonic acid (PFHxS)	355-46-4		4
Perfluorohexanoic acid (PFHxA)	307-24-4		4
Perfluorononanoic acid (PFNA)	375-95-1	13	4
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	10	4
Perfluorooctanoic acid (PFOA)	335-67-1	10	4
Perfluorotetradecanoic acid (PFTA)	376-06-7		4
Perfluorotridecanoic acid (PFTrDA)	72629-94-8		4
Perfluoroundecanoic acid (PFUnA)	2058-94-8		4
N-ethyl perfluorooctanesulfonamidoacetic acid	-------		4
N-methyl perfluorooctanesulfonamidoacetic acid	-------		4

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix:	Groundwater
Analytical Group:	SVOC: 1,4-Dioxane LSASD SOP C-90 SIM
Concentration Level:	Low (ug/L)

Analyte	**CAS Number**	**6/15/2020 NJDEP Groundwater Quality Stds. Class IIA ug/L**	**Achievable Laboratory (LSASD) Reporting Limits (ug/L)**		
1,4-Dioxane		0.4		0.2	

QAPP Worksheet #16
Project Schedule / Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Preparation of UFP-QAPP	EPA/LSASD/SST	7/23/2020	9/24/2020	UFP-QAPP	9/24/2020
Preparation of Health and Safety Plan	EPA/LSASD/SST	9/21/2020	9/24/2020	HASP	
Procurement of Equipment	EPA/LSASD/SST	na	na	Procurement Form	na
Laboratory Request	EPA/LSASD/SST	9/18/2020	9/18/2020	Analytical Request Form	9/18/2020
Collection of Field Samples	EPA/LSASD/SST	9/28/2020	10/1/2020	C-O-C/SCRIBE File, Trip Report	10/15/2020
Electronic Laboratory Package Received	EPA/LSASD/SST	11/13/2020	11/13/2020	Unvalidated data package	11/13/2020
Hard Copy Laboratory Package Received	EPA/LSASD	11/13/2020	11/13/2020	Unvalidated data package	11/13/2020
Validation of Laboratory Results	EPA R2 LSASD Laboratory	11/13/2020	11/13/2020	Validated data Packages	11/13/2020
Data Evaluation / Preparation of Final Report	EPA/LSASD/SST	1/13/2021	1/13/2021	final Trip Report	1/13/2021

QAPP Worksheet #17
Sampling Design and Rationale

Site Access
The EPA RPM will be responsible for providing site access to wells for the Sampling Team.

Field Planning
Prior to each field mobilization, each team member will review all project plans and participate in a field planning meeting. The meeting will be conducted by the EPA R2 LSASD HWSB/SST Project Lead and attended by all field staff. The meeting objective is to allow team members to become familiar with the site history, special project requirements, and other items listed below:

Objectives of field work
Equipment and training needs
Health and safety requirements
Field operating procedures, schedules of events, communications, and individual assignments
Required QC measures
Documents, governing field work that must be on site

Decontamination Procedures
Field decontamination is not anticipated for this event.

Describe and provide a rationale for choosing the approach:
The monitoring wells will initially be sampled for PFAS using a GeoInsight Hydrasleeve. Subsequent to PFAS sample collection, the wells will be purged and sampled following the EPA Region 2 LSASD HWSB-SST *Standard Operating Procedure (SOP) for Ground Water Sampling Procedure - Low Stress (Low Flow) Purging and Sampling* . Conventional monitoring wells will be purged and sampled with a Grundfos Redi-flo 2 submersible pump.
The primary use of data from the event will be utilized to determine impact to groundwater and effectiveness of the remedy.

Sample Selection Rationale:
Nine (9) monitoring wells are proposed for the sampling program. The wells were selected by the RPM based on data from previous sampling events and well accessibility.

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sample ID Number	Planned Sampling Locations and Field ID Number	Total Depth (ft)	Matrix/ Analytical Group/ Concentation Level	Approximate No. of Samples	Sampling SOP Reference	Rationale for Sampling Location
BG3B3	TB1-092820	trip blank	TCL Trace VOC, Metals (Total and Dissolved), PFAS, 1,4-Dioxane	1	SOP# FA-SST-T-07, Rev.2.0, 2019	locations selected by RPM
BG3B4	RB1-092820	rinse blank		1		
BG3B5	MW-102S	20.8		1		
BG3B6	MW-102M	30.5		1		
BG3B7	MW-102MD	30.5		1		
BG3B8	MW-104S	16.2		1		
BG3B9	MW-104M	26.2		1		
BG3C0	MW-105S	16.2		1		
BG3C1	MW-105M	24.1		1		
BG3C2	MW-111S	16.2		1		
BG3C3	MW-112S	16.2		1		
BG3C4	RD-101S	33		1		
BG3C5	RB-2	rinse blank		1		

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Approximate No. of Samples	Analytical Group	Concentration Level	Analytical Prep. Method/ SOP Reference	Sample Volume	Containers (number, size, type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Aqueous	9 plus 1 Trip Blank, 1 Duplicate & 2 equipment blanks	VOCs	Trace	DW-1 Rev. 2.6	120 ml (x2 for QC sample)	(3) 40 mL VOA vials w/Teflon lined septum	1:1 HCl to pH<2; cool to 4°C	14 days
		Metal, TAL	Low	C-112 Rev. 3.7	125 ml (250 for QC sample)	(1) 250 mL HDPE	HNO_3 to pH <2 at least 24 hrs before preparation	6 months
		Metal Dissolved (Filtered)	Low	C-112 Rev. 3.7	125 ml (250 for QC sample)	(1) 125 ml HDPE bottle	HNO_3 to pH <2 at least 24 hrs before preparation	6 months
		PFAS	NA	C-135 Rev. 1.1	250 ml (x2 for QC sample)	HDPE bottles (no Teflon lined cap)	Cool 0-6°C	14 days to extraction; 28 days to analysis
		1,4-dioxane	Low	C-90 Rev 3.7	1000 ml	(1) 1L amber glass bottle	Cool to 4°C	7 days to extraction; 40 days after extraction to analysis

QAPP Worksheet #20
Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical Prep. Method/ SOP Reference	Approx. No. of Sampling Locations	No. of Field Duplicate Pairs	No. of Extra Volume Lab QC (e.g., MS Samples	No. of Equipment Blanks	No. of Trip Blanks
Aqueous	VOCs	Trace	DW-1 Rev. 2.6	9	1 per 20 samples	1 X (MS Only)	1	1
	Metal, TAL	Low	C-112 Rev. 3.7	9	1 per 20 samples	1 X (MS Only)	1	NA
	Metal Dissolved (Filtered)	Low	C-112 Rev. 3.7	9	1 per 20 samples	1 X (MS Only)	1	NA
	PFAS	Low	C-135 Rev. 1.1	9	1 per 20 samples	1 X (MS Only)	1	NA
	1,4-dioxane	Low	C-90 Rev 3.7	9	1 per 20 samples	1 X (MS Only)	1	NA

QAPP Worksheet #21
Project Samping SOP Reference Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
SST-07	Standard Operating Procedure for Groundwater Sampling Procedure: Low Stress (Low-flow) Purging and Sampling 10-23- 19 Rev 2.0	EPA LSASD/HWSB/SST	Submersible, bladder or peristaltic (inorganic only) pump, Teflon lined tubing, water level meter, parameter meter, power source	N	N/A
	EPA OSRTI SOP for Sampling Per- and Polyfluorinated Subtances (PFAS) in Groundwater, December 2017 (draft) and GeoInsight HYDRASLEEVE SOP: Sampling Groundwater with a Hydrasleeve, 2016	EPA OSRTI snd GeoInsight	HDPE Hydrasleeve	N	N/A

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Frequency	Acceptance Criteria		Corrective Action	Responsible Person(s)	SOP Reference
In-situ Sondes	Calibrate with standard solution	Check sensors for calbration errors or inconsistency.	Prior to day's activities; end of day's activities; anytime anomaly suspected.	pH +/-	0.1 s.u	Clean probe, replace battery, replace membrane, replace probe.	EPA-SST	Manufacturer's Specifications and Operator Manuals
				ORP +/-	5 mV			
				DO +/-	0.1 mg/L			
				Spec Cond +/-	.5% + 1 µS/cm			
				Turbidity +/-	+/-2 NTU			
				Temp +/-	+/-0.1 °C			
Water Level Indicator or Interface Probe	NA	Visual inspection	Prior to day's activities	No defects noted		Replace Batteries; replace tape		
HaCH DR/2100Q Spectro-photometer	Calibrate with Stable Cal Standard	Periodic. Pre- & Postdaily activities; Anytime anomaly	Proactive When capacity is reached	10% with 10 NTU Standard. Replace batteries, Recalibrate		Replace Batteries & Recalibrate		

QAPP Worksheet #23
Analytical SOP Reference Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
DW-1 Rev. 2.6	SOP# DW-1: ANALYSIS OF TRACE VOC IN WATER BY PURGE AND TRAP GC/MS	Definitive	VOC	GC/MS	US EPA Region 2 LSASD Laboratory	N
C-112 Rev. 3.7	SOP# C-112: DETERMINATION OF TRACE ELEMENTS IN AQUEOUS SAMPLES BY INDUCTIVELY COUPLED PLASMA-MASS SPECTROMETRY	Definitive	Metals	ICP-MS	US EPA Region 2 LSASD Laboratory	N
C-90 Rev 3.7	SOP#C-90: ANALYSIS OF BASE/NEUTRAL AND ACID COMPOUNDS IN AQUEOUS, SOIL/SEDIMENT, AND WASTE OIL/WASTE ORGANIC SOLVENTS SAMPLES BY GC/MS (SIM)	Definitive	VOC (1,4-dioxane onl	GC/MS	US EPA Region 2 LSASD Laboratory	N
C-135 Rev. 1.1	SOP# C-135: ANALYSIS OF PERFLUORINATED ALKYL ACIDS IN WATER BY HPLC/MS/MS	Definitive	PFAS	HPLC/MS/MS	US EPA Region 2 LSASD Laboratory	N

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
ICP-AES	See SOP C-109	See SOP C-109	See SOP C-109	See SOP C-109	EPA R2 LSASD Laboratory Chemist	SOP C-109
ICP-MS	See SOP C-112	See SOP C-112	See SOP C-112	See SOP C-112	EPA R2 LSASD Laboratory Chemist	SOP C-112
GC-MS	See SOP C- 90, C-89	See SOP C- 90, C-89	See SOP C- 90, C-89	See SOP C- 90, C-89	EPA R2 LSASD Laboratory Chemist	SOP C- 90, C-89
HPLC/MS/MS	See SOP C-135	See SOP C-135	See SOP C-135	See SOP C-135	EPA R2 LSASD Laboratory Chemist	SOP C-135

QAPP Worksheet #25

Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
GC/MS	See LQMP, SOP C-90, DW-1, G-10, G-11, G-12, G-19	See LQMP, SOP C-90, DW-1, G-10, G-11, G-12, G-19	See LQMP, SOP C-90, DW-1, G-10, G-11, G-12, G-19	See LQMP, SOP C-90, DW-1, G-10, G-11, G-12, G-19	See LQMP, SOP C-90, DW-1, G-10, G-11, G-12, G-19	EPA R2 LSASD LB chemist	EPA R2 LSASD-LB SOP C-90, DW-1, G-10, G-11, G-12, G-19
HPLC/MS/MS	See SOP #C-135; as per instrument manufacturer's recommendations	See SOP #C-135; as per instrument manufacturer's recommendations	See SOP #C-135; as per instrument manufacturer's recommendations	Acceptable calibration; See SOP C-135	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	EPA R2 LSASD LB chemist	EPA R2 LSASD-LB, SOP C-135, G-10, G-11, G-12, G-19
ICP-MS	See LQMP, SOP C-112, G-10, G-11, G-12, G-19	See LQMP, SOP C-112, G-10, G-11, G-12, G-19	See LQMP, SOP C-112, G-10, G-11, G-12, G-19	See LQMP, SOP C-112, G-10, G-11, G-12, G-19	See LQMP, SOP C-112, G-10, G-11, G-12, G-19	EPA R2 LSASD LB chemist	EPA R2 LSASD-LB SOP C-112, G-10, G-11, G-12, G-19

QAPP Worksheet #26
Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): EPA LSASD HWSB SST
Sample Packaging (Personnel/Organization): EPA LSASD HWSB SST
Coordination of Shipment (Personnel/Organization): EPA LSASD HWSB SST
Type of Shipment/Carrier: Hand deliver to LSASD Lab
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Custodian, LSASD laboratory
Sample Custody and Storage (Personnel/Organization): Sample Custodian, LSASD laboratory
Sample Preparation (Personnel/Organization): Laboratory Technicians, LSASD laboratory
Sample Determinative Analysis (Personnel/Organization): Laboratory Techicians, LSASD laboratory
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): Samples to be hand delivered at the end of sampling event.
Sample Extract/Digestate Storage (No. of days from extraction/digestion): As per analytical method; see Worksheet #19
SAMPLE DISPOSAL
Personnel/Organization: Laboratory Technicians, LSASD laboratory
Number of Days from Analysis: Until analysis and QA/QC checks are completed; per analytical method, see Worksheet #19

QAPP Worksheet #27
Sample Custody Requirements

Sample Identification Procedures: Each sample will be labeled with the number that depicts a specific location.

Field Sample Custody Procedures: (sample collection, packaging, shipment, and delivery to laboratory): Each sample will be individually identified and labeled. All samples will be secured and maintained on ice.The sample information will be recorded on chain-of-custody (COC) forms, and the samples shipped to the appropriate laboratory via overnight delivery service or courier or hand delivered to the LSASD lab within 72 hours of sample completion for subsequent analysis.. EPA SCRIBE program will be used for field documentation including sample labels and COC records. Refer to the U.S. EPA ERT User Manual for Scribe CLP Sampling V3.10, See Appendix E.

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): A sample custodian at the laboratory will accept custody of the shipped samples, and check them for discrepancies, proper preservation, integrity, etc. If noted, issues will be forwarded to the laboratory manager for corrective action. The sample custodian will relinquish custody to the appropriate department for analysis. At this time, no samples will be archived at the laboratory. Disposal of the samples will occur only after analyses and QA/QC checks are completed.

Chain of Custody Procedures: A COC record establishes the documentation necessary to trace sample possession from time of collection through sample analysis and disposition. A sample is in the custody of a person if any of the following criteria are met: 1) The sample is in a person's physical possession; 2) The sample is in a person's view after being in his or her physical possession; 3) The sample was in a person's physical possession and was then locked up or sealed to prevent tampering; and 4) The sample is kept in a secured area. The sample collector will complete a COC record to accompany each delivery container (cooler) and will be responsible for shipment of samples to the laboratory. The sample collector will provide the site name and their signature in the designated fields on the COC record. For each sample submitted to the project laboratory, the sample collector will indicate the date, time, number of containers, analytical parameters, and designated sample ID numbers. When hand delivering the samples, the sample collector will sign the bottom of the form and enter the date and time (24-hour) at which the samples were relinquished. Lines not used on the COC record will be crossed out. Any required special handling of analyzed samples, such as hold or return, must be written on the COC record. A second member of the field crew will review the completed COC record to assure that required information is not omitted and that unused lines are crossed out. The original signature copy of the COC record will be enclosed in a plastic bag and placed in the shipping cooler. A copy of the COC record will be retained for project files.

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Metals, TL (Total/Dissolved)
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	C-112
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	**Frequency/Number**	**Method/ SOP QC Acceptance limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Tuning/System Stability(ICP-MS)	As per C-112	Pass all the tune/stability criteria	Check Instrument Reanalyze, Retune	LSASD Lab technician	Sensitivity	Pass all the tune/stability criteria
Initial Calibration Verification	Immediately following each calibration ,after every 10 samples and at the end of each analytical run	90%-110%	Check Instrument, Reanalyze	LSASD Lab technician	Accuracy	90%-110%
Continuing Calibration Check Standard (Alternate check standard)	Every 10 samples and at the end of each analytical run	80%-120%	Reanalyze, Qualify data	LSASD Lab technician	Accuracy	80%-120%
Initial Calibration Blank(ICB)	After ICV	< RL	Investigate source of contamination	LSASD Lab technician	Sensitivity Contamination	<RL

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Metals, TL (Total/Dissolved)
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	C-112
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	**Frequency/Number**	**Method/ SOP QC Acceptance limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Continuing Calibration Blank(CCB)	After every CCV	< RL	Investigate source of contamination	Lab personnel	Sensitivity Contamination	< RL
Low Level Check Standard	At Beginning and end of each analytical run	± 30% of the true value	Check Instrument, Re-calibrate	Lab personnel	Accuracy	± 30% of the true value
Interference Check Sample(ICP-200.7)	At Beginning and end of each analytical run	< RL Except Al ,Fe, Ca, K, Mg and Na	As per C-112	Lab personnel	Precision	< RL Except Al ,Fe, Ca, K, Mg and Na
Method blank	1 per extraction batch of ≤ 20 samples	< RL	Investigate source of contamination	Lab personnel	Sensitivity Contamination	< RL

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	Metals, TL (Total/Dissolved)
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	C-112
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	**Frequency/Number**	**Method/ SOP QC Acceptance limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
LCS/LFB	2 per extraction batch of $\leq$ 20 samples	Limits: Average Recovery ± 20% aqueous, % RPD < 20(Aq)	Qualify data	Lab personnel	Accuracy/ Precision	Limits: Average Recovery ± 20% aqueous, % RPD < 20(Aq),
Laboratory Matrix spikes	1 per extraction batch of $\leq$ 20 samples	Limits ± 20% aqueous, ± 25% Soil)	Qualify data	Lab personnel	Accuracy	Limits ± 20% aqueous, ± 25% Soil)
Serial Dilution Test (ICP-200.7)	Matrix spike sample	RPD < 20 %	Qualify data	Lab personnel	Precision	RPD < 20 %
Internal Standards (ICP-MS 200.8)	Each sample, standard, blank	Range of 0.60-1.87 of the original response in the calibration blank	Check Instrument Analyse / Qualify data	Lab personnel	Quantitation	Range of 0.60-1.87 of the original response in the calibration blank

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	VOC
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP DW-1
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Tuning	12 hr period	Pass all PBFB tune criteria	Check Instrument Reanalyze, Retune	Lab personnel	Sensitivity	Pass all PBFB tune criteria
Initial Calibration	SOP DW-1	% RSD +/- 20% Not more than 10% of total analytes failure	Check Instrument, Reanalyze	Lab personnel	Accuracy/ Precision	% RSD +/- 20% Not more than 10% of total analytes failure
Continuing Calibration Check Standard (Alternate check standard)	1 per analytical batch	Max %D RRF +/- 30% Not more than 10% of total analytes failure	Reanalyze, Qualify data	Lab personnel	Accuracy	Max %D RRF +/- 30% Not more than 10% of total analytes failure

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	VOC
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP DW-1
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per extraction batch	< RL	Investigate source of contamination	Lab personnel	Sensitivity Contamination	< RL
Trip Blank	1 per cooler containing VOC samples	Client Defined	Investigate source of contamination	Lab personnel	Sensitivity Contamination	
LCS/LFB	2 per extraction batch	Limits: Average Recovery 70-130% % RPD < 20	Qualify data unless high recovery and/or Not Detected)	Lab personnel	Accuracy/ Precision	Limits: Average Recovery 70-130% RPD 20%
Laboratory Matrix spikes	1 per extraction batch	Limits 70-130%	Qualify data unless high recovery and/or Not Detected)	Lab personnel	Accuracy	Limits 70-130%

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	VOC
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP DW-1
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	**Frequency/Number**	**Method/ SOP QC Acceptance limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Internal Standards	Each sample, standard, blank	+/- 40% from the initial/continuing calibration	Check Instrument Analyse / Qualify data	Lab personnel	Quantitation	+/- 40% from the initial/continuing calibration
Surrogates	Each sample, standard, blank	Limits 80%-120%	Reinject, Qualify data	Lab personnel	Extraction efficiency, Accuracy	Limits 80%-120%

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	PFAS
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP C-135
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Demonstration of Precision (IDP)	Analyze four to seven replicate Lab Fortified Blanks (LFBs) fortified near the midrange calibration concentration.	% RSD must be <20%	Check Instrument Reanalyze, Retune	Lab Analyst	Bias/ Representative-ness	QC acceptance criteria as specified by Lab SOP
Initial Demonstration of Accuracy (IDA)	Calculate average recovery for replicates used in IDP	Mean recovery +/- 30% of true value	Correct problem and then repeat requirement	Lab Analyst	Sensitivity/Bias	QC acceptance criteria as specified by Lab SOP
Initial Demonstration of Peak Asymmetry Factor	Calculate peak asymmetry factor using equation in Section 9.3.9 for first two eluting peaks in a mid-level CAL standard.	Peak asymmetry factor 0.8-1.5	LC conditions require adjustment. Correct problem and then repeat requirement	Analyst or QA Officer	Sensitivity/Bias	As per SOP

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	PFAS
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP C-135
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
MRL Confirmation	Fortify, extract analyze 7 replicate LFBs at proposed MRL conc. Calculate Mean/HR & Confirm upper and lower limit meet criteria	Upper PIR ≤ 150% / Lower PIR ≥ 50%	If upper and lower PIR outside established range for any analyte, MRL is required to be tested at higher conc. until within range.	Analyst	Sensitivity/Bias	As per SOP
QC Sample (QCS)	Analyze std. from a 2nd source as part of IDC.	70-130% True Value	Correct & repeat or qualify	Analyst	Accuracy	As per SOP

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	PFAS
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP C-135
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Lab Reagent Blank	Daily, or with each extraction batch of up to 20 samples, whichever is more frequent.	Demonstrate that all analytes <1/3 the MRLand void of interferences. If exceeds 1/3 MRL or have interferences, analytes in batch are invalid.	Correct problem. If required, re prepare and reanalyze MB and all samples processed with the contaminated blank and/or qualify affected analytes as estimated (J).	Analyst	Sensitivity/Bias	No analytes detected >LOQ. For common laboratory contaminants, no analytes detected > LOQ.
LCS	1 per 20 samples of same matrix	Lab statistical derived control limits for compounds with isotopically labeled compounds (see SOP)	Re-prepare LCS/reanalyze	Lab personnel	Accuracy	QC acceptance criteria as specified by Lab SOP

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	PFAS
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP C-135
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Lab Fortified Sample Matrix Dup. (LFSMD) or Field Duplicates (FD)	1 per 20 samples of same matrix	<30% at mid to high levels. <50& near MRL. If out label as suspect results due to matrix.	If MS results outside limits, data shall be evaluated to determine the source(s) of diff., i.e., matrix effect or analytical error. If the analyte is within control in the CCVs, the %R is judged to be matrix biased and affected sample is qualified	Analyst/QA Officer	Accuracy & Precision	QC acceptance criteria as specified by SOP
Laboratory Fortified Sample Matrix (LFSM)	1 per 20 samples of same matrix	%R 70-130-% at mid to high level, 50-150% at low level near MRL	Re-prepare LCS/reanalyze	Lab personnel	Accuracy	QC acceptance criteria as specified by SOP

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	PFAS
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP C-135
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Reagent Blank (FRB)	Analysis of the FRB is required only if a Field Sample contains a method analyte or analytes at or above the MRL	If the method analyte(s) found in the Field Sample is present in the FRB at a concentration > 1/3 MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed.	If not recollected, associated results qualified estimated (J)	Analyst/QA Officer	Accuracy	QC acceptance criteria as specified by SOP
Peak Asymmetry Factor	Calculate peak asymmetry factor for the 1st two eluting peaks in mid-level CAL std. each time a calibration curve is generated	Peak asymmetry factor 0.8-1.5	LC conditions require adjustment.	Analyst/QA Officer	Accuracy	QC acceptance criteria as specified by SOP

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	PFAS
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP C-135
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate (Blind to Lab)	1 per 20 samples collected	None	Data assessor to inform PM if RPD (absolute value) exceeds MPC	Sampling Lead	Precision/ Homogeneity	RPD</= 50%(near RL)
Equipment Rinsate Blank	1 per decon event	</= RL	Verify results/qualify data	Analyst/ Sampling Lead	Contamination/Accuracy/ Bias	</= RL

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	SVOC (1,4-dioxane)
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP C-90
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Tuning	12 hr period	Pass all DFTPP tune criteria	Check Instrument Reanalyze, Retune	Lab personnel	Sensitivity	Pass all DFTPP tune criteria
Initial Calibration	SOP C-90	% RSD +/- 35% Allowed to fail 10% of total number of analytes but % RSD not be more than 60%	Check Instrument, Reanalyze	Lab personnel	Accuracy/ Precision	% RSD +/- 35% Allowed to fail 10% of total number of analytes but % RSD not be more than 60%
Continuing Calibration Check Standard (Alternate check standard)	1 per analytical batch of ≤ 20 samples	Min RRF 0.05 Max %D +/- 20% 10% of total analytes allowed to fail but not more than 60%	Reanalyze, Qualify data	Lab personnel	Accuracy	Min RRF 0.05 Max %D RRF +/- 20% 10% of total analytes allowed to fail but not more than 60%

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	SVOC (1,4-dioxane)
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP C-90
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per extraction batch of ≤ 20 samples	< RL	Investigate source of contamination	Lab personnel	Sensitivity Contamination	< RL
LCS/LFB	2 per extraction batch of ≤ 20 samples	Limits listed in Table3 in SOP C-90 for aqueous, manufacturer's limits for soil % RPD < 30	Qualify data unless high recovery and/or Not Detected)	Lab personnel	Accuracy/ Precision	Limits listed in Table3 in SOP C-90 for aqueous, manufacturer's limits for soil % RPD < 30
Laboratory Matrix spikes	1 per extraction batch of ≤ 20 samples	Limits listed in Table3 in SOP C-90	Qualify data unless high recovery and/or Not Detected)	Lab personnel	Accuracy	Limits listed in Table3 in SOP C-90

QAPP Worksheet #28
QC Samples Table

Matrix	Aqueous
Analytical Group	SVOC (1,4-dioxane)
Concentration Level	Trace
Sampling SOP	SOP#FA-SST-T-07 Rev. 2.0
Analytical method/SOP Reference	SOP C-90
Sampler's Name	Michael Mercado
Field Sampling Organization	LSASD-HWSB-SST
Analytical Organization	EPA Region II LSASD Laboratory
No. of Sample Locations	9

Lab QC Sample	Frequency/Number	Method/ SOP QC Acceptance limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards	Each sample, standard, blank	Factor of two (-50% to -100%)	Check Instrument Analyse / Qualify data	Lab personnel	Quantitation	Factor of two (-50% to -100%)
Surrogates	Each sample, standard, blank	30%-120% for Base Neutrals 20-120% for Acids	Reinject, Qualify data as per SOP C-90	Lab personnel	Extraction efficiency, Accuracy	30%-120% for Base Neutrals 20-120% for Acids

QAPP Worksheet #29
Project Documents and Records Table

Sample Collection Documents and Records	Analysis Documents and Records	Data Assessment Documents and Records	Other
Site and field logbooks	Sample receipt logs	Data validation reports	Scribe
COC forms	Internal and external COC forms	Field inspection checklist(s)	Phone Logs
Field Data Sheets	Sample preparation worksheets/logs	Laboratory Audit checklist (if performed)	Equipment Maintenance Logs
Site map	Sample analysis worksheets/run logs	Review forms for electronic entry of data into database	Validated Computer Software Records
Signed QAPP	Telephone/email logs	Corrective action documentation	
Signed HASP	Corrective action documentation	Sample acceptance checklist	
Project Data Evaluation Report	Internal Chains-of-Custody	PT Sample Results	
Trip Report	Sample Preparation Log	Training Records	
Groundwater Well Sheet	Standard Traceability Record	MDL Study Records	
Field Chains-of-Custody	Instrument Analysis Log	Initial DOC/CDOC Records	
Packing Slips, Sample Tags, and Sample Labels	QC summary checklist with all relevant information	Internal Audit Reports	
Analytical Request Forms	Sample Analysis Data	Corrective Action Reports	
Associated Correspondence	Instrument Calibration Data	External Laboratory Assessment	
Laboratory sample identification numbers	Instrument/ Computer Printouts	NELAC Accreditation	
	Definition of Qualifiers		
	Cover Letter		
	Approval Form		
	Case Narrative		
	Final Report		
	Overnight Carrier Receipts (if required)		

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name, Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name, Address, Contact Person and Telephone Number)
Aqueous	VOCs	Trace	DW-1 Rev. 2.6	21/42	EPA Region II LSASD Laboratory 2890 Woodbridge Ave, Edison NJ O8837 Ness Tirol 732-321 4431	NA
Aqueous	Metal, TAL	Low	C-112 Rev. 3.7	21/42	EPA Region II LSASD Laboratory 2890 Woodbridge Ave, Edison NJ O8837 Ness Tirol 732-321 4431	NA
Aqueous	Metal Dissolved (Filtered)	Low	C-112 Rev. 3.7	21/42	EPA Region II LSASD Laboratory 2890 Woodbridge Ave, Edison NJ O8837 Ness Tirol 732-321 4431	NA
Aqueous	PFAS	Low	C-135 Rev. 1.1	21/42	EPA Region II LSASD Laboratory 2890 Woodbridge Ave, Edison NJ O8837 Ness Tirol 732-321 4431	NA

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name, Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name, Address, Contact Person and Telephone Number)
Aqueous	1,4-dioxane	Low	C-90 Rev 3.7	21/42	EPA Region II LSASD Laboratory 2890 Woodbridge Ave, Edison NJ O8837 Ness Tirol 732-321 4431	NA
Aqueous		Low		21/42	EPA Region II LSASD Laboratory 2890 Woodbridge Ave, Edison NJ O8837 Ness Tirol 732-321 4431	NA
Aqueous				21/42	EPA Region II LSASD Laboratory 2890 Woodbridge Ave, Edison NJ O8837 Ness Tirol 732-321 4431	NA

QAPP Worksheet #31
Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (Title an d Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions (Title and Organizational Affiliation)
Laboratory Technical Systems/ Performance Audits	Annual	External	Regulatory Agency	Regulatory Agency	EPA R2 LSASD Laboratory	EPA R2 LSASD Laboratory	EPA or other regulatory Agency
Performance Evaluation Samples	NA	External	Regulatory Agency	Regulatory Agency	EPA R2 LSASD Laboratory	EPA R2 LSASD Laboratory	EPA or other regulatory Agency
On-Site Field Inspection	Annual	Internal	EPA	EPA R2 LSASD HWSS	EPA R2 LSASD SST	EPA R2 LSASD SST	EPA R2 LSASD HWSS

QAPP Worksheet #32
Assessment Findings and Corrective Response Actions

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Project Readiness Review	Checklist or logbook entry	SST Project Leader Michael Mercado, EPA	Immediately to within 24 hours of review	Checklist or logbook entry	EPA Lead Auditor	Immediately to within 24 hours of review
Field Observations/ Deviations from Work Plan	Logbook	RPM Pamela Baxter SST Project Leader Michael Mercado, EPA	Immediately to within 24 hours of deviation	Logbook	EPA Lead Auditor and EPA RPM	Immediately to within 24 hours of deviation
Laboratory Technical Systems/ Performance Audits	Written Report	EPA Region II LSASD Laboratory	30 days	Letter	Regulatory Agency Lead Auditor	14 days
On-Site Field Inspection	N/A	N/A	N/A	N/A	N/A	N/A
Performance Evaluation Samples	Electronic Report	EPA Region II LSASD Laboratory	30 days	Letter or Written Report	Regulatory Agency Lead Auditor	14 days

QAPP Worksheet #33 - QA Management Reports Table

Type of Report	Frequency (daily, weekly, monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person Responsible for Report Preparation (Title and Organizational Affiliation	Report Recipient(s) (Title and Organizational Affiliation)
EPA Region II LSASD Laboratory (Unvalidated)	As performed	up to 21 days after receipt of final sample.	EPA Region II LSASD Laboratory	SST Project Leader Mike Mercado and RPM Baxter
EPA Rregion II LSASD Laboratory (Validated)	As performed	Up to 42 days after receipt of unvalidated data	EPA Region II LSASD Laboratory	SST Project Leader Mike Mercado and RPM Baxter
Laboratory Technical Systems/ Performance Audits	Annual – As required by certification authority	Varies	EPA or another Regulatory Agency	EPA Region II LSASD Laboratory
Performance Evaluation Samples	Annual – As required by certification authority	Varies	EPA or another Regulatory Agency	EPA Region II LSASD Laboratory
On-Site Field Inspection	As performed	7 calendar days after completion of the inspection	SST Project Leader Michael Mercado, EPA	SST Project Leader Michael Mercado, EPA
Field Change Request	As required per field change	Three days after identification of need for field change	SST Project Leader Michael Mercado, EPA	SST Project Leader Michael Mercado, EPA
Final Sampling Trip Report	As performed	60 days after receipt of EPA approval of data package	SST Project Leader Michael Mercado, EPA	SST Project Leader Michael Mercado, EPA

QAPP Worksheet #34
Verification (Step I) Process Table

Verification Input	Description	Internal/External	Responsible for Verification (Name, Organization)
Site/field logbooks	Field notes will be prepared daily by the EPA Sample Leader and will be complete, appropriate, legible and pertinent. Upon completion of field work, logbooks will be placed in the project files.	I	Michael Mercado
Chains of custody	COC forms will be reviewed against the samples packed in the specific cooler prior to shipment. The reviewer will initial the form. An original COC will be sent with the samples to the laboratory, while copies are retained for (1) the Sampling Trip Report and (2) the project files. The OSCAR staff supervisor utilizes the analytical request form and the external COC to review the accuracy and completeness of LIMS log-in entries, as reflected on the LIMS Sample Receipt Form.	I	Michael Mercado
Sampling Trip Reports	STRs will be prepared for each week of field sampling [for which samples are sent to LSASD Information in the STR will be reviewed against the COC forms, and potential discrepancies will be discussed with field personnel to verify locations, dates, etc.	I	Michael Mercado

QAPP Worksheet #34
Verification (Step I) Process Table

Verification Input	Description	Internal/External	Responsible for Verification (Name, Organization)
Laboratory analytical data package	Data packages will be reviewed/verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. The procedures for data review: 1) Data reduction/review by Primary Analyst. 2) Review complete data package (raw data) by independent Peer Reviewer 3) The Sample Project Coordinator reviews the project documentation for completeness followed by a QA review by the QAO 4) Final review by Branch Chief/Section Chief prior to release. This review is to ensure completeness and general compliance with the objectives of the project. This final review typically does not include a review of raw data. 5) Submittal/upload to the R2 Environmental Data Services SharePoint site.	I	EPA Region II LSASD Laboratory
Laboratory analytical data package	Data packages will be reviewed as to content and sample information upon receipt by EPA.	I	EPA Region II LSASD Laboratory

QAPP Worksheet #34
Verification (Step I) Process Table

Verification Input	Description	Internal/External	Responsible for Verification (Name, Organization)
final Sample Trip Report	The project data results will be compiled in a sample report for the project. Entries will be reviewed/verified against hardcopy information.	I	Michael Mercado

QAPP Worksheet #35
Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	SOPs	Ensure that the sampling methods/procedures outlined in QAPP were followed, and that any deviations were noted/approved.	SST Project Leader Michael Mercado, EPA
IIb	SOPs	Determine potential impacts from noted/approved deviations, in regard to PQOs.	SST Project Leader Michael Mercado, EPA
IIa	Chains of custody	Examine COC forms against QAPP and laboratory contract requirements (e.g., analytical methods, sample identification, etc.).Chain-of-custody forms will be verified against the sample cooler they represent. Sample Acceptance Checklist is completed. The LSASD Lab OSCAR staff supervisor utilizes the analytical request form and the external COC to review the accuracy and completeness of LIMS log-in entries, as reflected on the LIMS Sample Receipt Form.	EPA Region 2 Laboratory personnel with contractor support
IIa	Laboratory data package	Examine packages against QAPP and laboratory contract requirements, and against COC forms (e.g., holding times, sample handling, analytical methods, sample identification, data qualifiers, QC samples, etc.).	EPA Region 2 Laboratory personnel with contractor support
IIb	Laboratory data package	Determine potential impacts from noted/approved deviations, in regard to PQOs. Examples include PQLs and QC sample limits (precision/accuracy).	SST Project Leader Michael Mercado, EPA
IIb	Field duplicates	Compare results of field duplicate (or replicate) analyses with RPD criteria.	SST Project Leader Michael Mercado, EPA
IIb	Field and Laboratory QC Sample Results	A summary of all Field and Laboratory QC sample results for field duplicates, and trip blanks will be verified against measurement performance criteria.	SST Project Leader Michael Mercado, EPA

QAPP Worksheet #35
Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIb	Data Usability Evaluation	Evaluate data for achievement of precision, accuracy, representativeness, comparability, and completeness goals per project objectives.	SST Project Leader Michael Mercado, EPA

QAPP Worksheet #36 - Sampling and Analysis Validation (Steps Iia and Iib) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (Title and Organizational Affiliation)
IIa / IIb	Aqueous	VOCs	Trace	Peer review in accordance with EPA Region 2 LSASD Data Validation SOP (See Appendix D)	EPA Region 2 LSASD Laboratory Personnel with contractor support
IIa / IIb	Aqueous	Metal, TAL	Low	Peer review in accordance with EPA Region 2 LSASD Data Validation SOP (See Appendix D)	EPA Region 2 LSASD Laboratory Personnel with contractor support
IIa / IIb	Aqueous	Metal Dissolved (Filtered)	Low	Peer review in accordance with EPA Region 2 LSASD Data Validation SOP (See Appendix D)	EPA Region 2 LSASD Laboratory Personnel with contractor support
IIa / IIb	Aqueous	PFAS	Low	Peer review in accordance with EPA Region 2 LSASD Data Validation SOP (See Appendix D)	EPA Region 2 LSASD Laboratory Personnel with contractor support
IIa / IIb	Aqueous	1,4-dioxane	Low	Peer review in accordance with EPA Region 2 LSASD Data Validation SOP (See Appendix D)	EPA Region 2 LSASD Laboratory Personnel with contractor support

QAPP Worksheet #37
Usability Assessment

Precision: Results of laboratory duplicates will be assessed during data validation and data will be qualified according to the data validation procedures cited in worksheet# 36. Field duplicates will be assessed during by matrix using the RPD for each pair of results above the RL for the performed analyses. RPD acceptance criteria, presented in Worksheet #12, will be used to access field sampling precision. Absolute difference will be used for low results as described in worksheet # #28. A discussion summarizing the results of laboratory and field precision and any limitations on the use of the data will be described.

To calculate field precision:

$$RPD = 100 \times \left(\frac{|X_1 - X_2|}{(X_1 + X_2)/2} \right)$$

where X1 and X2 are the reported concentrations for each duplicate or replicate.

Accuracy/Bias Contamination: Results for all laboratory blanks will be assessed as part of the data validation. During the data validation process, the validating personnel will qualify the data following the procedures described on Worksheet #36. A discussion summarizing the results of the laboratory accuracy and bias based on contamination will be presented and any limitations on the use of the data will be described. If the regional LSASD lab is used, the validating personnel will not assess field QC results (trip blank, equipment rinse blank and field duplicate) against the sample results. The project lead will discuss sample contamination relative to the equipment rinse blank results in the final Trip Report and Data Summary Tables.

Overall Accuracy/Bias: The results of instrument calibration and matrix spike recoveries will be reviewed and data will be qualified according to the data validation procedures cited on Worksheet #36. A discussion summarizing the results of laboratory accuracy and any limitations on the use of the data will be described.

Sensitivity: Data results will be compared to criteria provided in Worksheet #15. A discussion summarizing any conclusions about the sensitivity of the analyses will be presented and any limitations on the use of the data will be described.

Representativeness: Data representativeness will be assessed by collecting field replicate samples. The field replicates are by definition equally representative of a given point and space and time. Representativeness is a qualitative parameter which is dependent upon the proper design of the sampling program and proper laboratory protocol. The sampling design and locations are prescribed by the EPA RPM. Therefore, data representativeness will be satisfied by ensuring that the sampling program is followed according to RPM instructions and cited SOPs (Appendix B):

EPA/LSASD/HWSB/SST SOP: SST-7 Standard Operating Procedure for Groundwater Sampling Procedure: Low Stress (Low-flow) Purging and Sampling 10/23/19 Rev 2.0

Comparability: To ensure data comparability, sampling and analysis for all samples will be performed using standardized analytical methods and adherence to the quality control procedures outlined in the methods and this QAPP.

QAPP Worksheet #37
Usability Assessment

Reconciliation: The PQOs presented in Worksheet #11 will be examined against the data quality to determine if the objectives were met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of major impacts observed from data validation, data quality indicators, and measurement performance criteria assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the PQOs were met and whether project goals are being achieved. Conclusions will be drawn and any limitations on the usability of the data will be described.

Completeness: Calculate completeness: Data completeness will be expressed as the percentage of valid data obtained from measurement system. In other words, every well or location that was initially intended to be sampled, was sampled. For data to be considered valid, it must meet all the acceptable criteria including accuracy and precision, as well as any other criteria specified by the analytical method used. Therefore, all data points critical to the sampling program in terms of completeness will be 100% validated by USEPA Region 2 LSASD LAB- staff in accordance with EPA Region 2 LSASD LB SOP G-26, Guidance for Laboratory Data Review. 7/31/18 Rev. 1.6. See Appendix D. With 100% validation, the rationale for considering data points non-critical is not required.

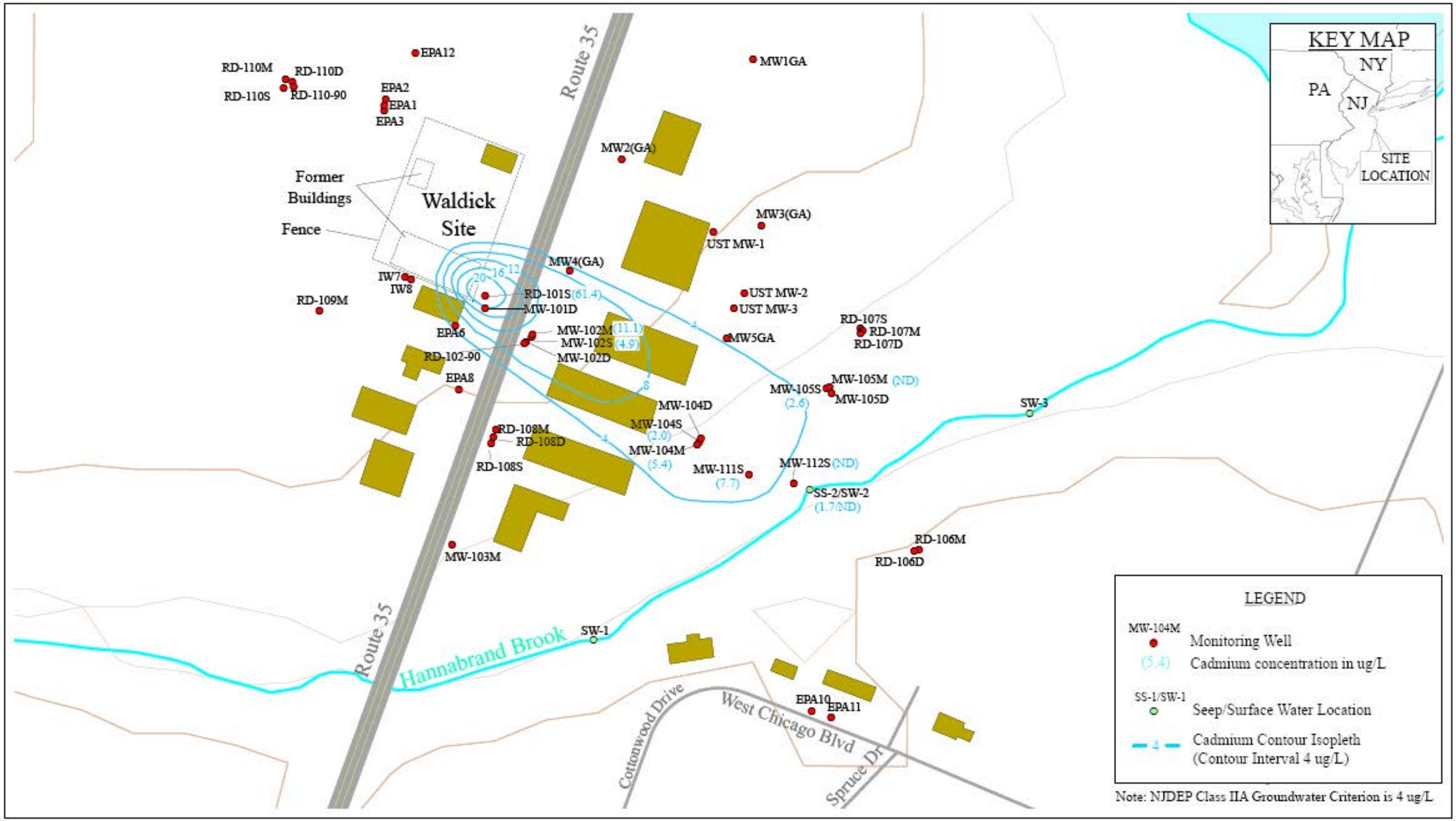
Describe the evaluative procedures used to assess overall measurement error associated with the project:
EPA Region 2 LSASD Lab personnel will determine if quality control data is within specification through validation process IIb.

Identify the personnel responsible for performing the usability assessment:
LSASD-HWSB-SST Sampling Project Leader.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:
A Data Evaluation Report will describe the rationale for the data used and present any data limitations. The report will include a discussion of the accuracy, precision, representativeness, completeness and comparability of the data set and deviations from planned procedures and analysis.

Tables will be prepared, including: a summary of samples collected and parameters analyzed; detections in field and trip blanks; and comparison of field duplicates.The report will be given to the RPM to allow examination of the current extent of groundwater contamination and decide the strategy going forward.

Appendix A
Site Map/ Sampling Locations/ Logs



Dissolved Cadmium Isoconcentration Map - September 2008

EARTH TECH | AECOM

Figure 6

Appendix B
Analytical Standard Operating Procedure (SOPs)

U.S. Environmental Protection Agency, Region 2 Field Operations Quality Procedures

TECHNICAL STANDARD OPERATING PROCEDURE

Standard Operating Procedure for Groundwater Sampling Procedure: Low Stress (Low-flow) Purging and Sampling

Effective Date	Number
11/8/2019	FA-SST-T-007

Author	
Name: Michael Mercado	
Title: Environmental Scientist	
Division/Branch/Section: LSASD/HWSB/SST	
Signature:	**Date:** 24 OCT 19

Review & Approvals	
Name: Robert Finke	
Title: Physical Scientist	
Signature:	**Date:** 10/24/19
Name:	
Title:	
Signature:	**Date:**
Name: Amelia Jackson	
Title: Lead Chemist, Superfund Support Team	
Signature: Amelia Jackson	**Date:** 10/30/19
Name: Jon Gabry	
Title: Chief, Hazardous Waste Support Branch	
Signature:	**Date:** 10/30/19

The table below identifies information about the reviews conducted of this SOP.

REVIEW HISTORY		
Date	Reviewer Name	Changes Required (Y/N)

The table below identifies changes to this controlled document and the respective effective date(s) over time.

REVISION HISTORY		
Revision Number	Revision Description	Effective Date
1.0	Original Issue	10/28/10

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1.0 PURPOSE AND APPLICABILITY

The *Low Stress (or Low-Flow) Purging and Sampling Procedure* is the EPA LSASD-HWSB-SST standard method for collecting low stress (low-flow) groundwater samples from monitoring wells that are representative of conditions in the geological formation. This is accomplished by minimizing stress on the geological formation and disturbance of sediment that has collected in the well. The procedure applies to monitoring wells that have an inner casing with a diameter of 2.0 inches or greater, and maximum screened intervals of ten feet (unless multiple intervals require characterization). The procedure is appropriate for collection of groundwater samples that will be analyzed for volatile and semi-volatile organic compounds (VOCs and SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, microbiological constituents and other contaminants in association with all EPA programs. This procedure does not address the collection of light or dense non-aqueous phase liquids (LNAPL or DNAPL) samples.

2.0 SUMMARY OF PROCESS OR METHODOLOGY

Sampling at the prescribed (low) flow rate has three primary benefits. First, it minimizes disturbance of sediment in the bottom of the well, thereby producing a sample with low turbidity (i.e., low concentration of suspended particles). Typically, this saves time and analytical costs by eliminating the need for collecting and analyzing an additional filtered sample from the same well. Second, this procedure minimizes aeration of the groundwater during sample collection, which improves the sample quality for VOC analysis. Third, in most cases, the procedure significantly reduces the volume of groundwater purged from a well and the costs associated with its proper treatment and disposal.

3.0 DEFINITIONS

3.1. Glossary of Terms

DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
FID	Flame Ionization Detector
HNO_3	Nitric Acid
HWSB	Hazardous Waste Support Branch
LNAPL	Light Non-Aqueous Phase Liquid
LSASD	Laboratory Services and Applied Science Division
NAPL	Non-Aqueous Phase Liquid
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PID	Photon Ionization Detector
PVC	Polyvinyl Chloride
QA	Quality Assurance

QC	Quality Control
QAPP	Quality Assurance Project Plan
RPM	Remedial Project Manager
SST	Superfund Support Team
SOP	Standard Operating Procedure
SVOC	Semi-volatile Organic Compound
U.S. EPA	United States Environmental Protection Agency
UFP	Uniform Federal Policy
VOC	Volatile Organic Compound

4.0 RESPONSIBILITIES/QUALIFICATIONS

4.1. All field samplers are required to take the OSHA 40-hour health and safety training course and annual refresher courses prior to participating in any field collection activities.

5.0 REFERENCES

5.1. U.S. Environmental Protection Agency, ERT/SERAS SOP #2006: Sampling Equipment Decontamination, Revision 1.0, December 28, 2015

5.2. U.S. Environmental Protection Agency, ERT/SERAS SOP #2007: Groundwater Well Sampling, Revision 1.0, June 25, 2015

5.3. Puls, R.W. and M.J. Barcelona, 1996, Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures, EPA/540/S-95/504.

5.4. Yeskis, Douglas and Zavala, Bernard, 2002, Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers, Ground Water Forum Issue Paper, EPA/542/S-02/001

5.5. U.S. EPA Field Operations Group Operational Guidelines for Field Activities, April 2013.

5.6. U.S. EPA QA Field Activities Procedure, CIO 2105-P-02.0, CIO Approval date 9/23/2014, Review Date 09/23/2017

5.7. U.S. EPA, 2007. Guidance for the Preparation of Standard Operating Procedures (SOPs) for Quality-Related Documents. EPA QA/G-6, EPA/600/B-07/001. April 2007

5.8. U.S. EPA Region II Groundwater Sampling Procedure: Low Stress (Low-flow) Purging and Sampling, Final March 16, 1998

6.0 HEALTH AND SAFETY WARNINGS

6.1. When working with potentially hazardous materials, follow EPA, OSHA and specific health and safety procedures.

6.2. When sampling a groundwater well containing known or suspected hazardous substances, take adequate precautions. Proper personal protective equipment, such as gloves and steel toed boots, should always be worn by all sampling personnel.

6.3. Prior to sampling a groundwater well, the well should be screened for volatile organic compounds and explosive atmosphere immediately upon opening the well. Proper personal protective equipment, such as respiratory protection, may be warranted if screening values exceed threshold limits specified in the health and safety plan.

7.0 CAUTIONS

7.1. Not Applicable

8.0 INTERFERENCES

8.1. Problems that may be encountered using this technique include:

8.1.1. Difficulty in sampling wells with insufficient yield;

8.1.2. Failure of one or more key indicator parameters to stabilize;

8.1.3. Cascading of water and/or formation of air bubbles in the tubing; and

8.1.4. Cross-contamination between wells.

8.2. Insufficient Yield:

8.2.1. Wells with insufficient yield (i.e., low recharge rate of the well) may dewater during purging. Care should be taken to avoid loss of pressure in the tubing line due to dewatering of the well below the level of the pump's intake.

8.2.2. Purging should be interrupted before the water level in the well drops below the top of the pump, as this may induce cascading of the sand pack.

8.2.3. Pumping the well dry should be avoided to the greatest extent possible in all cases.

8.2.4. Sampling should commence as soon as the volume in the well has recovered sufficiently to allow the collection of samples.

8.2.5. Alternatively, groundwater samples may be obtained with techniques designed for the unsaturated zone, such as lysimeters.

8.3. Failure to Stabilize Key Indicator Parameters:

8.3.1. If one or more key indicator parameters fails to stabilize after 2 hours, one of four options should be considered:

8.3.1.1. Continue purging to achieve stabilization;

8.3.1.2. Discontinue purging, do not collect samples, and document attempts to reach stabilization in the log book;

8.3.1.3. Discontinue purging, collect samples, and document attempts to reach stabilization in the log book; or

8.3.1.4. Secure the well, purge and collect samples the next day (preferred). The key indicator parameter for samples to be analyzed for VOCs is dissolved oxygen. The key indicator parameter for all other samples is turbidity.

8.4. Cascading:

8.4.1. To prevent cascading and/or air bubble formation in the tubing, care should be taken to ensure that the flow rate is sufficient to maintain pump suction.

8.4.2. Minimize the length and diameter of tubing (i.e., 1/4 or 3/8-inch ID) to ensure that the tubing remains filled with groundwater during sampling.

8.5. Cross-Contamination

8.5.1. To prevent cross-contamination between wells, it is strongly recommended that dedicated, in-place pumps be used.

8.5.2. As an alternative, the potential for cross-contamination can be reduced by performing the more thorough "daily" decontamination procedures (refer to Reference 5.1) between sampling of each well in addition to the start of each sampling day.

8.6. Equipment Failure

8.6.1. Adequate equipment should be on hand so that equipment failures do not adversely impact sampling activities.

9.0 EQUIPMENT AND SUPPLIES

9.1. Well construction data, location map, field data from last sampling event.

9.2. Polyethylene sheeting

9.3. Flame Ionization Detector (FID) and Photo Ionization Detector (PID).

9.4. Adjustable rate, submersible groundwater sampling pump constructed of stainless steel or Teflon. A peristaltic or positive displacement pump may be used for certain categories of contaminants, provided the rationale is presented and approved in the project QAPP.

9.5. Interface probe or equivalent device for determining the presence or absence of NAPL.

9.6. Teflon or Teflon-lined polyethylene tubing to collect samples for organic analysis. Teflon or Teflon-lined polyethylene, PVC, Tygon or polyethylene tubing to collect samples for inorganic analysis. Use of other tubing material compatible with the contaminants of concern must be presented and approved in the project QAPP. Sufficient tubing of the appropriate material must be available so that each well has dedicated tubing.

9.7. Water level measuring device, minimum 0.01-foot accuracy, (electronic preferred for tracking water level drawdown during all pumping operations).

9.8. Flow measurement supplies (e.g., graduated cylinder and stop watch or in-line flow meter).

9.9. Power source (generator, nitrogen tank, etc.).

9.10. Monitoring instruments (e.g., Aqua Troll® 600 Multiparameter Sonde) for indicator parameters. Eh and dissolved oxygen must be monitored inline using an instrument with a continuous readout display. Specific conductance, pH, and temperature may be monitored either in-line or using separate probes. A nephelometer is used to measure turbidity if not using an inline instrument capable of measuring turbidity.

9.11. Decontamination supplies (refer to Reference 5.1. and 5.7)

9.12. Logbook

9.13. Sample bottles

9.14. Sample preservation supplies (as required by the analytical methods)

9.15. Sample tags or labels, chain of custody

10.0 PROCEDURAL STEPS

10.1. Pre-Sampling Activities:

10.1.1. Start at the well location known or believed to have the least contaminated groundwater and proceed systematically to the well with the most contaminated groundwater. Check the well, the lock, and the locking cap for damage or evidence of tampering. Record observations.

10.1.2. Lay out sheet of polyethylene for placement of monitoring and sampling equipment.

10.1.3. Measure explosive atmosphere levels and ambient air VOCs at the rim of the unopened well with a PID and FID instrument and record the reading in the field log book.

10.1.4. Remove well cap.

10.1.5. Measure explosive atmosphere levels and VOCs at the rim of the opened well with a PID and an FID instrument and record the reading in the field log book.

10.1.6. If the well casing does not have a reference point (usually a V-cut or indelible mark in the well casing), make one. Note that the reference point should be surveyed for correction of groundwater elevations to the mean geodetic datum (MSL).

10.1.7. Measure and record the depth to water (to 0.01 feet) and total well depth in all wells to be sampled prior to purging. Care should be taken to minimize disturbance in the water column and dislodging of any particulate matter attached to the sides or settled at the bottom of the well. If desired, measure and record the depth of any NAPLs using an interface probe. Care should be taken to minimize disturbance of any sediment that has accumulated at the bottom of the well. Record the observations in the log book. If LNAPLs and/or DNAPLs are detected, install the pump now, as described below. Allow the well

to stabilize for several days between the measurement or sampling of any DNAPLs and the low-stress purging and sampling of the groundwater.

10.2. Sampling Procedures:

10.2.1. Install Pump: Slowly lower the pump, safety cable, tubing and electrical lines into the well to the depth specified for that well screen in the EPA-approved QAPP or a depth otherwise approved by the EPA regional hydrogeologist or project scientist. The pump intake must be kept at least two (2) feet above the bottom of the well to prevent disturbance and resuspension of any sediment or NAPL present in the bottom of the well. Record the depth to which the pump is lowered.

10.2.2. Measure Water Level: Before starting the pump, measure and record the water level again with the pump in the well. Leave the water level measuring device in the well.

10.2.3. Purge Well: Start pumping the well at 200 to 500 milliliters per minute (ml/min). The water level should be monitored and recorded every three to five minutes. Ideally, a steady flow rate should be maintained so that it results in a stabilized water level (drawdown of 0.3 feet or less). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. As noted above, care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.

10.2.4. Monitor Indicator Parameters using the Aqua Troll® 600 Multiparameter Sonde: During purging of the well, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh, and Dissolved Oxygen (DO)) every three to five minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows (Puls and Barcelona, 1996):

- ±0.1 for pH
- ±3% for specific conductance (conductivity)
- ±3% for temperature
- ±10 mv for redox potential
- ±10% for turbidity
- ±10% for DO

Turbidity (10% for values greater than 5NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized).
Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized).

Dissolved oxygen and turbidity usually require the longest time to achieve stabilization. The pump must not be removed from the well between purging and sampling.

10.2.5. Collect Samples: Collect samples at a flow rate between 100 and 250 ml/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 feet. All sample containers should be filled (volatile organics samples filled first) with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container. Remove pump and tubing from the well. After collection of the samples, the tubing, unless permanently installed, must be properly discarded. Close and lock the well.

10.3. Post-Sampling Activities-Pump Decontamination:

10.3.1. Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

10.3.2. Wash: Operate pump in a deep basin containing 8 to 10 gallons of a mixture of potable water and a non-phosphate detergent solution, such as Alconox or Luminox, for 5 minutes. Flush other equipment with fresh detergent solution for 5 minutes. Luminox can be used in place of nitric acid for decontamination of sampling equipment to be used for analyzing samples for metals, use the detergent sparingly.

10.3.3. Rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

10.3.4. Solvent Rinse: Fill a container such as a PVC tube, with a 25% solvent such as acetone or isopropanol, transfer the pump into the PVC tube container with the solvent and run pump for 5 minutes.

10.3.5. Rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

10.3.6. Acid Rinse (if Luminox is not utilized): Fill a container such as a PVC tube, with 1% nitric acid (HNO3), transfer the pump into the PVC tube container with the acid and run pump for 5 minutes.

10.3.7. Rinse: Operate pump in a deep basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

10.3.8. Final Rinse: Operate pump in a deep basin of distilled/deionized water for 5 minutes and flush other equipment with distilled/deionized water for 5 minutes.

10.3.9. Let pumps and equipment air dry.

10.3.10. Wrap the pumps and equipment individually into aluminum foil.

11.0 DATA AND RECORDS MANAGEMENT

11.1. Data Management

11.1.1. All data and data collection information (e.g., sample date/time, personnel, weather conditions, equipment issues, deviations, etc.) must be documented in a bound field notebook or on a field data sheet with permanent ink. When using the Aqua Troll 600 Multiparameter Sondes, well specific information is collected and/or recorded electronically via a tablet. Each well specific file is subsequently transferred by the project lead to the site-specific file within the LSASDDIV/HWSB-SST/Superfund sites folder on the network.

11.2. Records Management

11.2.1. All project/field-related records must comply with the Region 2 Records Management guidance.

12.0 QUALITY ASSURANCE AND QUALITY CONTROL

12.1. Quality control samples must be collected to determine if sample collection and handling procedures have adversely affected the quality of the groundwater samples. The appropriate EPA Program Guidance should be consulted in determining the appropriate field QC sample requirements documented in the site-specific QAPP.

12.2. All field quality control samples must be prepared in the same manner as the site-specific samples regarding sample volume, containers, and preservation. The following quality control samples are typically collected during the sampling event:

- Field duplicates
- Trip blanks (for VOCs only)
- Equipment rinse blank (not necessary if equipment is dedicated to the well) - collected at the start of the day, prior to using equipment for sample collection.

12.3. As noted above, groundwater samples should be collected systematically, starting with wells with the lowest level of contamination and proceeding to wells with the highest level of contamination.

Appendix C:
Laboratory Analytical Standard Operating Procedure (SOPs)

STANDARD OPERATING PROCEDURE

DETERMINATION OF TRACE ELEMENTS IN AQUEOUS SAMPLES BY INDUCTIVELY COUPLED PLASMA-MASS SPECTROMETRY

	Signature and Title	
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U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2
DIVISION OF ENVIRONMENTAL SCIENCE AND ASSESSMENT
LABORATORY BRANCH

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Table 1 Recommended Analytical Isotopes, Additional Masses and Reporting Limits
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Table 3 Common Molecular Ion Interferences in ICP-MS

Addendum 1 Orbeco-Hellige TB 200 Turbidimeter

1. Scope and Application

1.1 This SOP is applicable to the analysis of aqueous environmental samples for the determination of the following metals using inductively coupled argon plasma-mass spectrometry (ICP-MS).

Option 1
Ag, Al, As, Ba, Be, Cd, Co, Cu, Cr, Mn, Mo, Ni, Pb, Se, Sb, Tl, V, Zn. Refer to Table 1 for recommended elemental isotopes for this method.

Option 2
Ag, Al, As, Ba, Be, Ca, Cd, Co, Cu, Cr, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Se, Sb, Tl, V, Zn. Refer to Table 1 for recommended elemental isotopes for this method.

This SOP is also applicable for the preparation and analysis of drinking water (DW) compliance monitoring samples.

1.2 The range of the method

1.2.1 Option 1
The range of the method for most of the elements is 0.25 to 500.0 µg/L. The lowest standard concentration of the curve generated is used as the basis for the reporting limit for all types of sample matrices.

1.2.2 Option 2
The range of the method is 1000 µg/L for most elements except Ag (100 µg/L), up to 10,000 ug/L for Ba, Cr, Mn and up to 200,000 µg/L for Al, Ca, Fe, K, Mg, and Na. The lowest standard concentration of the curve generated is used as the basis for the reporting limit for all types of sample matrices.

1.3 The pH of all samples must be checked. pH must be verified at < 2.

1.4 Samples which have been properly preserved with acid (pH < 2) and have turbidity < 1.0 NTU may be analyzed directly (e.g. for DW samples). Silver and antimony are included in this procedure.

1.5 This SOP is based on EPA Methods 200.2, Revision 8.8 & 200.8, Revision 5.4.

2. Summary of Method

2.1 An aliquot of a well-mixed, homogenous sample is accurately measured for sample processing. For total recoverable analysis of an aqueous sample containing undissolved material, elements are first solubilized by gentle refluxing with HNO_3 and HCl. After cooling, the sample is brought up to volume, mixed, and filtered (if

necessary) prior to analysis.

Direct analysis (e.g. drinking water) – For total recoverable determination of analytes in samples where the turbidity is < 1 NTU, the acidified sample is analyzed directly. While it is recommended that samples be digested prior to the determination of silver, in practice, only samples analyzed for silver by direct analysis, with results for Ag > 200 ppb, must be digested and reanalyzed. These samples must be diluted prior to digestion so that the final Ag concentration in the analysis solution is < 200 ppb.

2.2 The method describes the multi-element determination of trace elements by ICP-MS. Sample material in solution is introduced by pneumatic nebulization into a radio-frequency plasma where energy transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially pumped vacuum interface and separated on the basis of their mass-to-charge ratio by a quadrupole mass spectrometer having a minimum resolution capability of 1 amu peak width at 5% peak height. The ions transmitted through the quadrupole are detected by an electron multiplier and the ion information processed by a data handling system. Interferences relating to the technique must be recognized and corrected. Such corrections must include compensation for isobaric elemental interferences and interferences from polyatomic ions derived from the plasma gas, reagents or sample matrix. Instrumental drift as well as suppressions or enhancements of instrument response caused by the sample matrix must be corrected for by the use of internal standards.

3. Definitions

See SOP G-15 for definitions.

4. Interferences

Several interferences sources may cause inaccuracies in the determination of trace elements by ICP-MS. They can be summarized as follows:

4.1 Isobaric elemental interferences are caused by isotopes of different elements which form singly or doubly charged ions of the same nominal mass-to-charge ratio and which cannot be resolved by the mass spectrometer in use. All elements determined by this method have, at a minimum, one isotope free of isobaric elemental interference. Of the analytical isotopes recommended for the use with this method, only molybdenum-98 (ruthenium) and selenium-82 (krypton) have isobaric elemental interferences. If alternative analytical isotopes having higher natural abundance are selected in order to achieve greater sensitivity, an isobaric interference may occur. All data obtained under such conditions must be corrected

by measuring the signal from another isotope of the interfering element and subtracting the appropriate signal ratio from the isotope of interest. A record of this correction process should be included with the report of the data. It should be noted that such corrections will only be as accurate as the accuracy of the isotope ratio used in the elemental equation for data calculations. Relevant isotope ratios should be established prior to the application of any corrections.

4.2 Abundance sensitivity is a property defining the degree to which the wings of a mass peak contribute to adjacent masses. The abundance sensitivity is affected by ion energy and quadrupole operating pressure. Wing overlap interferences may result when a small ion peak is being measured adjacent to a large one. The potential for these interferences should be recognized and the spectrometer resolution adjusted to minimize them.

4.3 Isobaric polyatomic ion interferences are caused by ions consisting of more than one atom which have the same nominal mass-to-charge ratio as the isotope of interest, and which cannot be resolved by the mass spectrometer in use. These ions are commonly formed in the plasma or interface system from support gases or sample components. Most of the common interferences have been identified in Table 3 together with the method elements affected. Such interferences must be recognized, and when they cannot be avoided by the selection of alternative analytical isotopes, appropriate corrections must be made to the data. Equations for the correction of data should be established at the time of the analytical run sequence as the polyatomic ion interferences will be highly dependent on the sample matrix and chosen instrument conditions. In particular, the common ^{82}Kr interference that affects the determination of both arsenic and selenium can be greatly reduced with the use of high purity krypton free argon.

Analysis using collision/reaction technology is useful for the removal of most isobaric polyatomic ion interferences and is permitted for waste water and non-regulated samples but is not yet approved for drinking water.

4.4 Physical interferences are associated with the physical processes which govern the transport of sample into the plasma, sample conversion process in the plasma, and the transmission of ions through the plasma-mass spectrometer interface. These interferences may result in differences between instrument responses for the sample and the calibration standards. Physical interferences may occur in the transfer of solution to the nebulizer (e.g., viscosity effects), at the point of aerosol formation and transport to the plasma (e.g., surface tension), or during excitation and ionization processes within the plasma itself. High levels of dissolved solids in the sample may contribute deposits of material on the extraction and/or skimmer cones reducing the effective diameter of the orifices and therefore ion transmission. Dissolved solids levels not exceeding 0.2% (w/v) have been recommended to reduce such effects. Internal standards ideally should have similar analytical behavior to the elements being determined.

4.5 Memory interferences result when isotopes of elements in a previous sample contribute to the signals measured in a new sample. Memory effects can result from sample deposition on the sampler and skimmer cones and from the buildup of sample material in the plasma torch and spray chamber. The site where these effects occur is dependent on the element and can be minimized by flushing the system with a rinse blank between samples. The possibility of memory interferences should be recognized within an analytical run and suitable rinse times should be used to reduce them. The rinse times necessary for a particular element should be estimated prior to analysis. This may be achieved by aspirating a standard containing elements corresponding to ten times the upper end of the linear range for a normal sample analysis period, followed by analysis of the rinse blank at designated intervals. The length of time required to reduce element signals to within a factor of ten of the method detection limit should be noted. Memory interferences may also be assessed within an analytical run by using a minimum of three replicate integrations for data acquisition. If the integrated signal values drop consecutively, the analyst should be alerted to the possibility of a memory effect, and should examine the element concentration in the previous sample to identify if this was high. If memory interference is suspected, the sample should be reanalyzed after a long rinse period.

5. Safety

5.1 The toxicity and carcinogenicity of each reagent used in this method has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be minimized by good laboratory practices, e.g. wear proper protective equipment, safety glasses, gloves, lab coat and working inside hoods whenever possible.

5.2 Refer to the Edison Facility Safety Manual Region II, Part 2 – Laboratory Safety and Appendices 13/13A – Chemical Hygiene Plan for specific guidelines. The manual is available on the Region II Intranet. A hard copy is available in the laboratory office area.

5.3 For detailed explanations consult the Material Safety Data Sheets (MSDS), available in the laboratory office area. MSDS are also electronically available.

5.4 Safety guidelines for the hot block

5.4.1 The hot block must be grounded and have a clearance of 3 inches on all sides. It must be in an operable fume hood. Never place the hot block on a surface of flammable material.

5.4.2 The hot block must be lifted only from the bottom, not by the top trim.

5.4.3 Use caution when working around the instrument during operation. The unit has exposed hot surfaces.

6. Apparatus and Materials

6.1 Turbidity Meter – Orbeco Hellige TB 200 Turbitimeter or equivalent

6.2 Hot block digestion system

6.3 50 mL screw cap digestion tubes

6.4 Disposable ribbed watch glasses

6.5 Certified 2 µm Teflon filters and plungers. Disposable plastic funnels and Whatman #41 filter paper may be used instead, where appropriate.

6.6 Analytical balance capable of measuring 0.001 gram

6.7 Calibrated pipettes with disposable tips

6.8 Teflon bottles are used to store prepared reagents.
Note: chromic acid must not be used for cleaning glassware

6.9 Acid dispensers with glass reservoirs

6.10 Inductively Coupled Argon Plasma Spectrometer

6.10.1 Agilent 7700X ICP-MS – capable of scanning the mass range 2 – 260 amu

6.10.2 High purity grade liquid argon (99.99%) and optional Helium (99.999%) and Hydrogen (99.999%) with gas purification assembly

6.10.3 Computer controlled mass flow controllers which regulate the argon flow rates

6.10.4 Heat exchanger to keep the instrument at optimal temperature

6.10.5 Autosampler – as supplied by instrument vendor

6.10.6 Test tubes for Autosampler, polypropylene, 15 mL (17 X 100 mm)

6.10.7 Computer, monitor and printer

7. Reagents and Solutions

All purchased and prepared standards and reagents are recorded in Element which assigns a unique ID to each. All containers must be labeled with the Name, ID, concentration, preparation date, and expiration date. Purchased standard solutions may be used until the expiration date given by the manufacturer or until three years after being opened if no date is given. Purchased reagents (solid and liquid) may be used until the expiration date given by the manufacturer or until five years after being opened if no date is given. Prepared solutions may be used for one year from date of preparation unless a shorter time is specified. Refer to SOP G-9 and SOP G-18 for details.

7.1 Reagents

All acids used for this method must be of ultra-high purity grade suitable for ultra-trace metals analysis. HNO_3 is preferred for ICP-MS in order to minimize polyatomic ion interferences. Several polyatomic ion interferences result when HCl is used (see Table 3); however, it should be noted that HCl is required to maintain stability in solutions containing Sb and Ag. When HCl is used, corrections for the chloride polyatomic ion interferences must be applied to all affected data. Use of the helium collision cell effectively eliminates chloride interference.

7.1.1 Reagent grade water – ASTM Type I Water

7.1.2 Nitric acid (HNO_3), concentrated – double distilled grade

7.1.3 Hydrochloric acid (HCl), concentrated – ACS reagent grade, 36 – 38%

7.2 Standards

Prepared calibration standards and ICV/CCV solutions expire six months after preparation. Other prepared solutions, such as blank, internal standard, and tuning solutions expire one year after preparation.

Solutions are prepared using blank solution (2% HNO_3).

Standard solutions equivalent to those listed below with dilutions adjusted as necessary may be substituted.

7.2.1 Turbidity Standards

7.2.1.1 Calibration Solutions – 1,000 NTU, 10.0 NTU, 0.02 NTU, available from Orbeco-Hellige or equivalent

7.2.1.2 Turbidity AQC Standard – ERA Turbidity # 699, or equivalent. Prepare according to manufacturer’s directions.

7.2.2 Blanks – four types of blanks are required for the analysis.

7.2.2.1 The Calibration Blank is prepared by adding HNO_3 to reagent grade water at the same concentrations used for the calibration standard solution. The calibration blank is used in establishing the analytical curve.

7.2.2.2 The Rinse Blank is prepared by adding HNO_3 to reagent grade water at the same concentration as used in the calibration blank. A controlled flush time with the rinse blank solution is used to flush the instrument uptake system and nebulizer between standards, check solutions, and samples to reduce or eliminate memory and carryover interferences.

7.2.2.3 The Initial Calibration Blank/Continuing Calibration Blank (ICB/CCB) are prepared by adding HNO_3 to reagent grade water at the same concentration as used in the calibration blank. The ICB/CCB is run after the calibration check standards (ICV/CCV) to assess carryover.

7.2.2.4 The Laboratory Reagent Blank (LRB)/Prep Blank (BLK) must contain all the reagents in the same volumes as used in digesting the samples. The BLK must be carried through the same preparation scheme as the samples including digestion, if applicable. The BLK is used to assess possible contamination from the sample preparation procedure and spectral background.

7.2.3 Tuning Solutions

7.2.3.1 1 ppb Start Up Tune

Stock Tuning Solution (e.g. Agilent Part# 5188-6564)
10 ppm Ce, Co, Li, Tl, Y

1 ppb Tune – Dilute 0.1 mL Stock Tuning Solution to 1 L with 2% HNO_3.

This tuning solution is also used for the lens tune.

7.2.3.2 P/A Tuning Solution Stock 1 and 2 (e.g. Agilent Part# 5188-6524)

P/A factor tuning is used to achieve linear functionality across the detector's pulse and analogue modes.

P/A Tuning Solution 1 Stock
20 ppm As, Be, Cd, Zn
10 ppm Mg, Ni, Pb
5 ppm Al, Ba, Bi, Co, Cr, Cu, In, Li, Lu, Mn, Na, Sc, Sr, Tl, V
2.5 ppm Y, Yb

P/A Tuning Solution 2 Stock
10 ppm Ge, Mo, Pd, Ru, Sb, Sn
5 ppm Ir, Ti

P/A Tuning Solution (1&2): Dilute 3 mL P/A Tuning Solution 1 Stock and 3 mL P/A Tuning Solution 2 Stock to 450 mL with blank solution.

7.2.3.3 QC Tuning Solution

QC Tuning Solution is used in no gas mode for regulatory programs to assure that the instrument, when tuned according to the manufacturer's instructions, meets the requirements specified in EPA Method 200.8.

QC Tune Stock Solution
10 ppm Ba, Be, Ce, Co, In, Li, Mg, Pb, Rh, Tl, Y

QC Tune Solution, 10 ppb: Dilute 0.5 mL QC Tune Stock (10 ppm) to 500 mL with blank solution.

7.2.4 Calibration Stock Solutions

7.2.4.1 Option 1

Calibration stock standards usually used for option 1 are as follows:

Instrument Calibration Stock
20 ppm of Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn

Aluminum Stock
10,000 ppm of Al

7.2.4.2 Option 2

Calibration stock standards usually used with for option 2 are as follows:

a) ICP CAL STOCK 1 (e.g. Inorganic Ventures, cat# USEPA-26 or equivalent supplier)
10 ppm of Ag
100 ppm of Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Si, Sn, Sr, Ti, Tl, V, Zn

b) Single Element Stocks (SES -Absolute Standards or equivalent supplier)
SE1=1000 ppm for Ba

SE2=1000 ppm for Cr
SE3=1000 ppm for Mn
Optional:
SE# = 1000 ppm for other trace elements which are intended to raise the Highest Cal standard in the future

c) ICP MIX2-CAL (e.g. SCP Science Part# 600-222-300 or equivalent supplier)
5000 ppm Al, Ca, Fe, K, Mg, Na

7.2.5 Intermediate Standard Solutions

7.2.5.1 Option 1

250 ppm Aluminum Intermediate Solution

Dilute 1.25 mL Aluminum Stock Solution (10,000 ppm) to 50 mL with 2% HNO_3.

7.2.5.2 Option 2

INT. CAL1 (Intermediate CAL STD1)
100 ppb Ag
1000 ppb Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Si, Sn, Sr, Ti, Tl, V, Zn.

Dilute 5.0 mL of ICP CAL STOCK 1 to 500 mL in 2% HNO_3.

7.2.6 Working Calibration Standards

7.2.6.1 Blank Solution (2% HNO_3) – Dilute 20 mL concentrated ultra-pure HNO_3 to 1,000 mL with reagent grade water. This solution is used for the calibration blank, the rinse blank, the ICB/CCB and for standard and sample dilution.

7.2.6.2 Option 1

CAL 250/2,500 ppb
250 ppb Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
2,500 ppb of Al.

Dilute 6.25 mL calibration stock standard (20 ppm) and 4.5 mL aluminum intermediate solution (250 ppm) to 500 mL with blank solution.

CAL 100/1,000 ppb

100 ppb Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
1,000 ppb of Al.

Dilute 2.5 calibration stock standard (20 ppm) and 1.8 mL aluminum intermediate solution (250 ppm) to 500 mL with blank solution.

CAL 50/500 ppb
50 ppb Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
500 ppb of Al.

Dilute 1.25 calibration stock standard (20 ppm) and 0.9 mL aluminum intermediate solution (250 ppm) to 500 mL with blank solution.

CAL 20/200 ppb
20 ppb Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
200 ppb of Al.

Dilute 0.5 calibration stock standard (20 ppm) and 0.36 mL aluminum intermediate solution (250 ppm) to 500 mL with blank solution.

CAL 5/50 ppb
5 ppb Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
50 ppb of Al.

Dilute 10 mL of 250/2,500 ppb calibration solution to 500 mL with blank solution.

CAL 2/20 ppb
2 ppb Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
20 ppb of Al.

Dilute 4 mL of 250/2,500 ppb calibration solution to 500 mL with blank solution.

CAL 1/10 ppb
1 ppb Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
10 ppb of Al.

Dilute 2 mL of 250/2,500 ppb calibration solution to 500 mL with blank solution.

A single mixed standard or any other suitable combinations of standards/concentrations/elements may also be used to calibrate the instrument. These may be varied to accommodate special requirements for non-routine projects.

7.2.6.3 Option 2

Working calibration standards are prepared by diluting appropriate intermediate calibration standard, according to the following table, in blank solution. Standards may be added or removed depending on analytical needs and/or instrument operation.

Nomenclature used:

Mix1 = As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn.
Mix1 + Ag = As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn + Ag.
Mix2 = Al, Ca, Fe, K, Mg, Na

Mix2 + SES = Al, Ca, Fe, K, Mg, Na + [Ba, Cr, Mn]

Basis: Final Volume = 500 mL

Solution Name	Aliquot of CAL Stock	Final Concentration (ppb)
Cal Std Level 1	N/A	0
Cal Std Level 2	0.50 mL of INT. CAL1	1 ppb (Mix1+Mix2); (Ag = 0.1 ppb)
Cal Std Level 3	2.50 mL of INT. CAL1	5 ppb (Mix1+Mix2); (Ag = 0.5 ppb)
Cal Std Level 4	5.0 mL of INT. CAL1	10 ppb (Mix1+Mix2); (Ag = 1 ppb)
Cal Std Level 5	0.25 mL of ICP CAL STOCK1	50 ppb (Mix1+Mix2); (Ag = 5 ppb)
Cal Std Level 6	1.25 mL of ICP CAL STOCK1	250 ppb (Mix1+Mix2); (Ag = 25 ppb)
Cal Std Level 7	2.50 mL of ICP CAL STOCK1	500 ppb (Mix1+Mix2); (Ag = 50 ppb)
Cal Std Level 8	5.00 mL of ICP CAL STOCK1	1000 ppb (Mix1+Mix2); (Ag = 100 ppb)
Cal Std Level 9	1.0 mL of ICP MIX2 + 0.5 mL SE1 + 0.5 mL SE2 + 0.5 mL SE3	10,000 ppb (Mix2+SES*)
Cal Std Level 10	2.50 mL of ICP MIX2	25,000 ppb Mix2
Cal Std Level 11	5.00 mL of ICP MIX2	50,000 ppb Mix2
Cal Std Level 12	20.0 mL of ICP MIX2	200,000 ppb Mix2

* The SES may be modified for future use such that other trace analytes listed in Mix1 (e.g. Lead, Copper, Zinc, etc.) may be added to Cal Std Level 9 for the purpose of raising

the highest CAL standard (e.g. 10,000 ppb) which are still within the linear range.

7.2.7 Initial Calibration Verification/Continuing Calibration Verification Solution (ICV/CCV)

These verification standard solutions are used to initially and periodically verify instrument performance during analysis. The ICV/CCV stocks must be obtained from a source different from the calibration stock standard solutions (different vendor or a verified separate source from the same vendor) and prepared in the same acid mixture as the calibration standards.

The concentration of the ICV/CCV solution may be varied to accommodate special requirements for non-routine projects. Acceptance criteria will remain the same.

7.2.7.1 Option 1

ICV Stock Standard 1
10 ppm of Al, Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Se, Tl, V, Zn

ICV Stock Standard 2
10 ppm of Ba, Ag

ICV Aluminum Stock
10,000 ppm of Al

Aluminum Intermediate Solution for ICV/CCV – 250 ppm Al

Dilute 1.25 mL ICV Aluminum Stock (10,000 ppm) to 50 mL with blank solution.

ICV/CCV 50 ppb, Al. 500 ppb

Dilute 2.5 mL ICV Stock Standard 1, 2.5 mL ICV Stock Standard 2, and 0.9 mL Aluminum Intermediate Solution for ICV/CCV to 500 mL with blank solution.

7.2.7.2 Option 2

Nomenclature used:
Mix1 = As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn.
Mix1 + Ag = As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn + Ag.
Mix2 = Al, Ca, Fe, K, Mg, Na

ICV Stock Solutions:
a) Mix1, QC 100 mg/L (e.g. Absolute Standards Part# 59371 or equivalent)
b) Ag, QC 1000 mg/L (e.g. Absolute Standards Part# 59047 or equivalent)
c) ICP MIX2, QC 5000 mg/L (e.g. Absolute Standards Part# 59274 or equivalent)

ICV/CCV Solution: Contains 0.10 ppm Mix1+ 0.05 ppm Ag, and 5.0 ppm Mix2

Dilute 1.0 mL of Mix1, QC 100 mg/L; 0.050 mL of Ag, QC 1000 mg/L; and 1.0 ml of ICP MIX2, QC 5000 mg/L to 1000 mL in 2% HNO3.

7.2.8 Low-level Calibration Verifications (LCVs)

The LCVs are used to initially and periodically verify instrument performance at low concentration levels. The concentration of the LCV solutions may be varied to accommodate special requirements for non-routine projects. Acceptance criteria will remain the same.

7.2.8.1 Option 1

Option 1 uses the following calibration solutions for LCVs

CAL 1/10 ppb
CAL 2/20 ppb
CAL 5/50 ppb

7.2.8.2 Option 2

Nomenclature used:
Mix1 = As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn.
Mix1 + Ag = As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn + Ag.
Mix2 = Al, Ca, Fe, K, Mg, Na

QC Stock Solutions:
a) ICP Trace Stock, QC 250 ppm (Mix1 + Ag) from Inorganic Ventures cat# USEPA-15 or equivalent supplier
b) Aluminum Stock at 10,000 ppm
c) Iron Stock at 10,000 ppm
d) Calcium Stock at 10,000 ppm
e) Potassium Stock at 10,000 ppm
f) Magnesium Stock at 10,000 ppm
g) Sodium Stock at 10,000 ppm

Intermediate QC Stock Solutions

ICP-MS Stock INT-1 (5 ppm)

Dilute 1.0 mL of ICP Trace Stock, 250 mg/L to 50 mL with blank solution.
This solution contains: 5.0 ppm of Mix1+Ag

ICP-MS Stock INT-2

Dilute 0.1 mL of Aluminum Stock (10,000 ppm), 0.1 mL Iron Stock (10,000 ppm), 0.5 mL Calcium Stock (10,000 ppm), 0.5 mL Potassium Stock (10,000 ppm), 0.5 mL Magnesium Stock (10,000 ppm), and 0.5 mL Sodium Stock (10,000 ppm) to 50 mL with blank solution.
This solution contains: 20 ppm of Aluminum and Iron and 100 ppm of Calcium, Potassium, Magnesium, Sodium.

Working Low Level Check QC Standards (LCV1, LCV2 and LCV3)
Dilute appropriate Intermediate QC Stock Solution as per following table to 500 mL with blank solution

Solution Name	**Aliquot of QC Stock Solution @Initial Conc.**	**Final Concentration**
Low Check Verification 1 (LCV1)	0.100 mL of ICP-MS Stock INT-1 (5 ppm) + 0.50 mL of ICP-MS Stock INT- 2	1 ppb (Mix1+Ag) + 20/100 ppb Mix2*
Low Check Verification 2 (LCV2)	0.200 mL of ICP-MS Stock INT-1 (5 ppm) + 1.00 mL of ICP-MS Stock INT- 2	2 ppb (Mix1+Ag) + 40/200 ppb Mix2**
Low Check Verification 3 (LCV3)	0.500 mL of ICP-MS Stock INT-1 (5 ppm) + 2.50 mL of ICP-MS Stock INT- 2	5 ppb (Mix1+Ag) 100 + 500 ppb Mix2***

20/100 ppb Mix2* = 20 ppb for Al, Fe and 100 ppb for Ca, K, Mg, Na
40/200 ppb Mix2** = 40 ppb for Al, Fe and 200 ppb for Ca, K, Mg, Na
100/500 ppb Mix2*** = 100 ppb for Al, Fe and 500 ppb for Ca, K, Mg, Na

7.2.9 Laboratory Control Sample (LCS/BS/BSD) Spike Standards

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7.2.9.1 Option 1

Trace Metals Stock
250 ppm of Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Ti, Tl, V, and Zn

Minerals Stock
250 ppm of Al, Ca, Fe, Mg, K, Na and Si

ICP-MS Low Level Spike Solution
2,500 ppb of Trace Metals and 25,000 ppb of Minerals

Dilute 1 mL Trace Metals Stock and 1 mL Minerals Stock to 100 mL using blank solution.

For direct analysis, pipet 0.2 mL ICP-MS Low Level Spike Solution into a 15 mL test tube. Dilute to 10 mL with blank solution. The sample will have a spike content of 50 ppb Trace Metals and 500 ppb Minerals.

For prepped batches, pipet 1 mL ICP-MS Low Level Spike Solution into a 50 mL test tube. Dilute to 50 mL with blank solution. The sample will have a spike content of 50 ppb Trace Metals and 500 ppb Minerals.

7.2.9.2 Option 2

Nomenclature used:
Mix1 = As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn.
Mix1 + Ag = As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn + Ag.
Mix2 = Al, Ca, Fe, K, Mg, Na

QC Stock Solutions:
a) ICP Trace Stock, QC 250 mg/L (Mix1 + Ag) from Inorganic Ventures cat# USEPA-15 or equivalent supplier
b) ICP MIX2, QC 5000 mg/L from Absolute Standards part# 59274 or equivalent supplier

ICP-MS/LCS SPIKE SOLUTION:
Dilute 5.0 mL ICP Trace Stock, QC 250 mg/L and 5 mL ICP MIX2, QC 5000 mg/L to 250 mL in 2% HNO_3.
This solution contains: 5 ppm of Mix1+Ag and 100 ppm of Mix2

Medium Level Spikes
Blank Spikes (BS1/BSD1)/Matrix Spikes (MS): Adding 0.50 mL of ICP-

MS/LCS SPIKE SOLUTION to a 50-mL digestion tube will have a spike content of 50 ppb for Mix1+Ag and 1000 ppb for Mix2.

7.2.10 Matrix Spike (MS)

The spike concentrations for the MS are practically the same as that added to the aqueous LCS (BS1/BSD1). It can be varied depending on analytical needs, reporting requirements and/or instrument operation but should not exceed the midpoint of the standard curve. The aliquot chosen for the MS must be a duplicate of the aliquot used for sample analysis.

7.2.11 Internal Standard Stock

The internal standard solution must contain analytes that are not a sample component. This solution is added in line to all analyzed solutions (blanks, calibration standards, QC solutions, and samples). Alternatively, this solution may be added in appropriate amounts, usually to a final concentration of 10 ppb, individually to blanks, calibration standards, and samples. Should the volume of aspirated sample change, a corresponding intensity change will occur for all elements. Since the ratio remains constant, the possible error is eliminated.

In-line (during analysis) Internal Standard Solution at 1 ppm:
Dilute 50 mL of either of the following internal standard stock solutions (10 ppm) to 500 mL with blank solution.

7.2.11.1 Option 1

This solution contains 10 ppm Lithium 6, Scandium, Yttrium, Indium, Terbium, Holmium and Bismuth.

7.2.11.2 Option 2
High Purity Standards, Part Number: ICP-MS-IS-3 or equivalent vendor
This solution contains 10 ppm Bismuth, Germanium, Indium, Lithium 6, Scandium, Terbium, and Yttrium.

8. Sample Collection, Preservation, Storage & Holding Time

8.1 Sample Collection – samples must be collected in plastic or glass containers.

8.2 Preservation and Storage

8.2.1 Aqueous samples are preserved to a pH < 2 using concentrated HNO_3. The preservation is performed either in the field at the time of collection, or in the laboratory upon receipt (within five days). All samples must be verified to a pH <

2 prior to sample processing. If the samples are preserved in the laboratory, they must be held for 24 hours after acidification. If the sample pH > 2 after the 24 hours, additional HNO_3 must be added and the sample held for an additional 24 hours until verified to a pH < 2. The samples are stored at room temperature.

8.3 Holding time

8.3.1 Aqueous samples must be digested within six months of collection and analyses should be performed as soon as possible after digestion.

9. Sample Preparation

Sample preparation is documented using *Element* Batch/Bench Sheets (refer to SOP G-28).

9.1 Direct Analysis

Turbidity analysis is intended as a screening procedure for direct analysis of DW samples or for samples designated for analysis of dissolved analytes (filtered through a 0.45-micron filter). Samples acidified with HNO_3 and the pH < 2, with a turbidity reading < 1.0 NTU may be analyzed directly. Samples with a reading ≥ 1.0 NTU must be digested prior to analysis.

9.1.1 Turn on the Orbeco Hellige TB 200 Turbidimeter. No warm up is necessary. The instrument will turn off after about 5 minutes if no keys are pressed.

9.1.2 Cells used for measurements must be unscratched and must be wiped clean and dry using lintless tissue.

9.1.3 Calibrate the turbidimeter following instructions outlined in the operating manual supplied with the instrument. The instrument should be recalibrated at least once every three months. See Addendum 1.

9.1.4 Sample Analysis – Record ICV/ICB values initially and CCV/CCB values after every 10 sample readings and at the end of the run. ICV/CCV readings must be within vendor specifications or within ± 10% of the true value if none are given. ICB/CCB readings must be < 0.2 NTU.

9.1.5 Record all readings in Metals Turbidity & pH Drinking Water Samples Logbook.

9.1.6 For samples with turbidity > 1.0 NTU, the sample must be digested according to the following procedure.

9.2 Aqueous Sample Preparation

9.2.1 Verify that the pH of the sample is < 2 using pH test paper and record on the *Element* Bench Sheet. If the pH is > 2, add concentrated HNO_3 until the pH is < 2, then wait at least 24 hours before rechecking the pH. If the pH is still > 2 add additional concentrated $HNO_3$and hold for an additional 24 hours. Do this until a pH<e is achieved. Samples with a pH < 2 are ready for sample prep.

9.2.2 Transfer 50 mL (or other suitable aliquot) from a well-mixed, acid preserved sample to a 50 mL digestion tube.

For samples analyzed under the NPDES, DW, RCRA and/or criminal enforcement programs, prepare one Laboratory Fortified Matrix (LFM)/Matrix Spike (MS) sample for each matrix per project for an analytical batch of 10 or fewer samples.

For samples analyzed under other programs, e.g., Superfund, ambient water, prepare one MS per matrix for an analytical batch of 20 or fewer samples regardless of the number of different projects that comprise the analytical batch.

In addition, prepare one BLK and two LCSs for each batch of 20 or fewer samples.

Refer to section 7.2.9 & 7.2.10 for LCS and MS spiking solution preparation.

9.2.3 Add 0.5 mL concentrated HNO_3 and 0.5 mL of concentrated HCl to each tube.

9.2.4 Turn on block and set the temperature set point to warm the hot block to no more than 85 ºC, measured in an open digestion tube.

9.2.5 Place digestion tubes on block and reduce volume to approximately 20 mL by gently heating at approximately but not higher than 85 ºC. Cap each tube with a disposable ribbed watch glass and reflux for 30 minutes.

9.2.6 Remove from hot block. Allow to cool. Dilute to 50 mL with reagent grade water, cap and mix well. Filter, if necessary.

Adjust the final volume of the digestate to 50 mL with reagent grade water and mix well. Allow the majority of the suspended matter to settle, then place a certified 2 µm Teflon filter into the top of the tube to be filtered and insert the plunger. Slowly and carefully press the plunger down until it reaches the bottom of the tube. Remove the plunger from the filter and cap the tube. Include filter lot numbers in the reagent list in the *Element* batch.

Alternate method for filtration:

Label a duplicate set of digestion tubes. Rinse Whatman #41 filter paper in disposable funnels with approximately 10 mL reagent grade water. Place rinsed funnels into the duplicate digestion tubes and filter each corresponding sample. Rinse original tube several times with reagent grade water and filter into the new sample tube. Dilute to 50 mL with reagent grade water, cap and mix well. Include filter lot numbers in the reagent list in the *Element* batch.

For analyses requiring lower detection limits, the final volume of the digested samples may be adjusted with appropriate dilution factors applied.

10. Instrument Operating Conditions

10.1 Instrument Set-Up

The analyst should follow the Agilent 7700X instructions unless other conditions provide better performance.

Before lighting the plasma, attach pump tubing and place into rinse. Turn on chiller. Water flow should be 1.0 ± 0.1 L/min and temperature should be between 10-40 ˚C. Argon gas tank pressure to the instrument should be set at 500 to 700 kPa. Cell gases may not be used for DW analyses. Cell gases, if used, should be: 1) 90 to 130 kPa for helium; 2) 20 to 60 kPa for hydrogen. When lighting the plasma, click *yes* to run *startup*.

The instrument will warm up for 30 minutes and then perform start up the following start up actions:

Torch Axis – aligns the torch
EM – checks the electron multiplier
Plasma Correction – checks plasma sensitivity
Standard Lens Tune – checks lens sensitivity
Resolution Axis – checks peak shape and resolution
Performance Report – generates report of startup checks
Full Spectrum – qualitative check
P/A Factor – checks the pulse/analog transition

10.2 Sequence

Prepare an *Element* sequence (refer to SOP G-28). Export sequence to a flash drive as an .xls file.

Create a new batch. Batches may be created from a preset method, an existing batch, or from a blank template. Batches include the following information/settings: the

acquisition method, the tune mode, the data analysis method, the sample list, and the QC configuration.

Copy and paste the calibration standards from the *Element* sequence into the *Calibration List*. Assign a sample type from the dropdown menu (e. g. CALBLK, CALSTD), Vial # (position in the autosampler) and the appropriate level to each calibration standard. (e. g.: CALBLK is Level 1; the lowest standard is Level 2 and in order until all standards have been assigned a level).

Copy and paste the ICV/CCV, ICB/CCB, BLK, BS, BSD, samples, and MSs into the *Sample List*. Assign a sample type from the dropdown menu (e. g., 2-ICV, 2-CCB, sample, etc.) and Vial # (position in the autosampler) to each entry.

When ready to analyze samples, click *Add to Queue* to start analysis.

10.3 Optimizing the System

The goal of tuning is to balance sensitivity with stability. The below target values should be adequate for most analyses.

Minor adjustments may be made to the *Ion Lenses*, *Octopole* and *Quadrupole* parameters to optimize sensitivity. The carrier gas may be adjusted to improve the oxide level. Any necessity for large adjustments will trigger the need for a troubleshooting session.

10.3.1 No Gas Tune

10.3.1.1 1 ppb Tune

Aspirate the tuning solution (1 ppb Li, Y, Tl, Ce, Co). Verify stable flow to the nebulizer and observe the tuning sensitivity window to assure that the solution has reached the plasma. Monitored analytes should include 7 (Li), 59 (Co), 89 (Y), 205 (Tl).

RSDs for monitored analytes should be < 5%

Perform *autotune* function.

10.3.1.2 QC Tune

QC Tune is performed before analysis of regulatory program samples (e.g. NPDES and DW) to assure that the instrument, when tuned according to the manufactures instructions, meets the requirements specified in EPA Method 200.8.

Aspirate the QC tune solution (10 ppb Ba, Be, Ce, Co, In, Li, Mg, Pb, Rh, Tl, Y). Verify stable flow to the nebulizer and observe the tuning sensitivity window to assure that the solution has reached the plasma.

Generate tune report. The following masses should be measured at an integration time of 0.1 s: 9 (Be), 24 (Mg), 25 (Mg), 26 (Mg), 59 (Co), 115 (In), 206 (Pb), 207 (Pb), 208 (Pb). Instrument stability is shown by running the tuning solution five times and resulting in the QC parameters below.

RSDs should be < 5%
Peak axis should be within ± 0.1 amu.
Peak width at 5% peak height should be < 0.9 amu.

10.3.2 Helium Mode

Set the Helium Gas Flow between 3 and 5 mL/minute. Adjust the gas settings to achieve required interference reduction.

Aspirate the tuning solution (1 ppb Li, Y, Tl, Ce, Co). Verify stable flow to the nebulizer and observe the tuning sensitivity window to assure that the solution has reached the plasma. Monitored analytes should include 59 (Co), 89 (Y), 140 (Ce+), 205 (Tl), 156/140 (CeO+/Ce+), 51 (ClO+), 56 (ArO+), 75 (ArCl+), 78 (ArAr+).

RSDs for monitored analytes should be < 5%
51 (ClO+), 75 (ArCl+), 78 (ArAr+) < 5 counts.

Perform autotune function.

Generate the tune report and check the QC parameters below. The following masses should be measured at an integration time of 0.1 s: 59 (Co), 89 (Y), 205 (Tl).

RSDs should be < 5%
Peak width at 10% peak height should be < 0.8 amu.
Peak axis should be within ± 0.1 amu.
CeO+/Ce+ (156/140) should be < 1.5%
Ce++/Ce+ (70/140) should be < 3%

10.4 Shut Down

Put tubes into rinse solution. Allow to rinse while transferring data to flash drive and capping standard tubes. Click *plasma off*, turn off chiller, unclamp tubes, send autosampler to home.

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10.5 Maintenance

Major repairs and preventative maintenance services are recorded in *Element*.

11. Sample Analysis

11.1 Calibration

Calibrate the instrument using the calibration blank solution and at least one standard. Follow with the initial check standards: ICV, ICB, and LCVs. Adequately flush the system with the rinse blank solution between each determination. A calibration blank and a single mixed standard or any other suitable combinations of standards, concentrations, or elements may also be used to calibrate the Agilent 7700X.

11.2 Internal Standard

The internal standard is added in line to all calibration, QC, and sample solutions.

11.3 Sample Analysis

Analyze the samples in the same operational manner used in the standardization routine.

11.4 Analysis Protocol

The routine sample analysis protocol consists of the following:

Calibration blank
Calibration standards
ICV
ICB
LCVs
BLK
BS
BSD
Samples & MS(s)
CCV
CCB
LCVs

The CCV/CCB is repeated after a maximum of every 10 samples and at the end of the run.

11.5 During the analytical run the laboratory must comply with the appropriate quality control requirements listed in Section 14 of this SOP.

11.6 Sample analyte concentrations that are ≥ 100% of the highest standard must be diluted with rinse solution and reanalyzed.

11.7 All aqueous samples, analyzed by the usual digestion procedure, with results for Ag > 200 ppb, must be reanalyzed. The sample must be diluted prior to digestion so that the final Ag concentration in the analysis solution is < 200 ppb.

11.8 Report data as directed in Section 12.

12. Data Analysis and Calculations

12.1 Aqueous Samples

Results are reported directly from the instrument in ppb.

All aqueous sample results are uploaded into *Element*. All dilution factors required as a result of the digestion procedure or dilutions made during analysis are applied in *Element*. Results are reported to three significant figures and, in most cases, are reported down to the standard reporting limits listed in Table 1.

12.2 Total Hardness

Hardness results are reported as $CaCO_3$ and are calculated using the Ca and Mg results reported from the instrument. Instrument results are uploaded into *Element* in ppb. The calculation for hardness as $CaCO_3$ is performed by *Element* and reported as ppm.

Manual calculation for hardness:

$$total\ hardness\ as\ CaCO_3\ (mg/L) = \frac{[2.497 * Ca\ (\mu g/L)] + [4.118 * Mg(\mu g/L)]}{1000}$$

where:

µg/L	=	instrument reading
1,000	=	factor to convert µg/L to mg/L

13. Method Performance

Method Performance (QA) studies must be performed as directed and also each time there is a significant change in the chemistry of the method, a major modification to an existing

instrument, or a new instrument is installed.

These studies are documented in Element.

13.1 Demonstration of Capability

A demonstration of capability (DOC) must be performed each time there is a significant change in the chemistry of the method, a major modification to an existing instrument, or a new instrument is installed. A DOC is performed by each analyst designated to analyze samples using this method. An annual check must subsequently be performed and documented for each analyst using this method.

13.1.1 Initial Demonstration of Capability (iDOC)

A demonstration of capability study must be conducted and documented for each analyst using this method. The study consists of the analysis of four standards which are from a source independent of the standard curve. Aqueous LCS standards must be within ± 15% of the true value. The RSD must be within 20%. The results of the accuracy and precision study (true value, % recovery, standard deviation, and RSD) for each analyst are documented in *Element*, and are maintained by the Quality Assurance Officer.

13.1.2 Continuing Demonstration of Capability (cDOC)

An annual continuing demonstration of capability study must be performed and documented for each analyst using this method. It may consist of either successfully analyzing a PT sample or analyzing four replicates of aqueous LCSs to within control limits as stated in Section 13.1.1. The results of the continuing accuracy and precision study (true value, % recovery, standard deviation, and RSD or final report from the PT provider) for each analyst are documented in *Element*, and are maintained by the Quality Assurance Officer.

13.2 Method Detection Limit (MDL)

A MDL study was conducted for this method. The study was based on the requirements listed in 40 CFR Part 136 Appendix B. Specific procedures for conducting an MDL study can be found in SOP G-8. The MDL Study is comprised of the analysis of a minimum of seven spiked samples and seven method blanks. The results of the MDL determination (true value, average concentration, standard deviation, and calculated MDL) are maintained by the Quality Assurance Officer. Ongoing annual verifications of the MDL are required for regulated NPDES methods using spike solutions and blank analyses. A new MDL study should be performed upon significant change in instrument or methodology.

13.3 Linear Dynamic Range (LDR)

The LDR is not verified for analyses by ICP-MS since results are reported within the calibration range.

13.4 Limit of Quantitation (LOQ)

The laboratory performs a LOQ study on an annual basis for analytes associated with chemistry methods. The validity of LOQ is confirmed by successful analysis of a LFB at approximately 2X the reporting limit. The acceptance is ± 30% of the true value. After this study is completed, it is reviewed and approved by the laboratory management. A summary of all LOQ study performance is documented in *Element* and maintained by the Quality Assurance Officer.

14. Quality Control

14.1 Calibration Curve

Acceptance Criteria – A minimum of 2 standards and a blank must be used to generate the calibration curve. The correlation coefficient must be ≥ 0.995.

Corrective Action – If the correlation coefficient is < 0.995, the calibration is disallowed. The analysis must be terminated and repeated after correcting the problem.

14.2 Initial Calibration Verification (ICV)

Acceptance Criteria – Immediately following calibration, initial instrument calibration will be verified with a standard obtained from a different vendor or verified separate source from the same vendor. The result of the ICV solution must be within ± 10% of calibration.

Corrective Action – If the calibration cannot be verified within the specified limits, reanalyze the ICV solution. If the results of the second analysis of the ICV solution are not within the acceptance limits, the analysis must be discontinued, the cause determined, and the instrument recalibrated.

14.3 Initial Calibration Blank/Continuing Calibration Blank (ICB/CCB)

Acceptance Criteria – Analyze a calibration blank immediately following each ICV/CCV. All ICB/CCB results must be < the |reporting limit|.

Corrective Action – If the result of the ICB/CCB is > |reporting limit|, the analysis should be stopped, the problem identified, and the ICB/CCB reanalyzed. If the ICB/CCB results remain > |reporting limit|, the instrument must be recalibrated.

14.4 Low-Level Calibration Verifications (LCVs)

Acceptance Criteria – Analyze the LCVs immediately following the ICB and at the end of the run. The % recovery of the LCVs must be within ± 30% of the true value.

$$\%\,recovery = \frac{LCV}{spike} * 100$$

where:

LCV	=	result of LCV analysis
spike	=	true value of LCV

Corrective Action – If an LCV cannot be verified within the specified limits, reanalyze that LCV solution. If the results of the second analysis of the LCV solution are not within the acceptance limits, the analysis must be evaluated, the cause determined and/or in the case of drift the instrument recalibrated. Alternatively, raise the reporting limit to the next highest check standard, or qualify all sample results between the failed LCV and the next highest check standard.

14.5 Continuing Calibration Verification (CCV)

Acceptance Criteria – Analyze the CCV solution, from the same source as that used for the calibration standards, after a maximum of every 10 samples and at the end of the sample run. The results of each CCV solution must be within ± 15% of the true value for DW and NPDES compliance monitoring samples and ± 20% for all other samples.

Corrective Action – If the calibration cannot be verified within the specified limits, reanalyze the CCV solution. If the results of the second analysis of the CCV solution are not within the acceptance limits, the analysis must be discontinued, the cause determined, and the instrument recalibrated. All samples following the last acceptable CCV solution must be reanalyzed.

14.6 Laboratory Reagent Blank (LRB)/Preparation Blank (BLK)

Acceptance Criteria – Analyze one BLK for each batch of 20 or fewer samples per program and matrix. The BLK results must be < the |reporting limit|.

Corrective Action – If the result of the BLK is > |reporting limit|, then all associated samples with a concentration of < 10X the amount found in the BLK should be reprepared and reanalyzed. If the samples cannot be reprepared, then all affected sample results must be either qualified accordingly, or for each sample < 10X the blank result, the reporting limit of that sample is raised to the amount found in the sample. Check with the team leader/section chief to determine which option should be used.

Sample results ≥ 10X the amount found in the BLK are not considered to be affected by the blank contamination or drift, so no corrective action is needed.

14.7 Laboratory Fortified Blank (LFB)/Laboratory Control Samples (LCS/BS/BSD)

Aqueous LCSs are run in duplicate. The recoveries are evaluated based on the average recovery of each of these types of samples.

Acceptance Criteria – Analyze two LCSs with each batch of 20 or fewer aqueous samples.

Calculate accuracy as % recovery using the following equation:

$$\%\, recovery = \frac{average\ of\ 2\ LCSs}{true\ value} * 100$$

The average % recovery of the aqueous LCS must be within ± 15% of the true value for DW and NPDES compliance monitoring samples and within ± 20% of the true value for all other samples. The RPD of the duplicate LCSs should be < 20%.

Corrective Action – If the % recovery or RPD results are outside the required control limits, the affected samples should be reprepared and reanalyzed. If the samples cannot be reprepared, then all affected sample results must be qualified accordingly.

14.8 Laboratory Fortified Matrix (LFM)/Matrix Spike (MS)

Acceptance Criteria – For NPDES compliance monitoring, DW, RCRA and/or criminal enforcement programs, prepare one MS for each matrix per project per batch of 10 or fewer samples. For other samples, prepare one MS per batch of 20 or fewer samples. The MS aliquot must be a duplicate of the aliquot used for sample analysis. When possible, regardless of sample matrix, the MS concentration should be the same as the aqueous LCS, but should not exceed the midpoint concentration of the calibration curve.

Calculate the percent recovery, corrected for background concentration measured in the unfortified sample. The control limits for percent recovery are ± 20% for aqueous samples.

Percent recovery is calculated using the following equation:

$$R = \frac{C_s - C}{s} * 100$$

where:

R	=	percent recovery
C_s	=	measured MS concentration
C	=	source sample concentration
s	=	true value of spike

Corrective Action – If the percent recovery of the MS is outside the required control limits and the laboratory performance is shown to be in control, the recovery problem encountered is judged to be matrix related, not system related. The source sample result of the sample used to produce the MS must be qualified accordingly.

The percent recovery of the MS is not evaluated if the result of the unfortified sample concentration is > 1X the level used to fortify the sample.

14.9 Internal Standard Responses

Acceptance Criteria – The range of 60% to 125% of the original response in the calibration blank will be used to monitor internal standard responses.

Corrective Action – If deviations greater than these are observed, reanalyze the sample. If reanalysis does not yield an internal standard recovery between 60 – 125%, dilute and reanalyze. If reanalysis with dilution does not yield an internal standard recovery between 60 – 125%, terminate the analysis and determine the cause of the drift. If reanalysis is not possible, consult the supervisor for further corrective action.

14.10 If it is determined that an internal standard response > 125% is due to interference from the sample at the same mass as the internal standard, the samples may be referred to an adjacent internal standard for the affected elements.

14.11 Triplicate Integrations

Acceptance Criteria – Each analysis consists of three separate integrations or readings. This includes the calibration standards, quality control solutions, and all samples. The average of the three measurements is the result reported by the instrument. The RSD must be < 20% for all results that are > the |reporting limit|.

Corrective Action – If the RSD for a calibration standard or quality control sample is outside the control limits, the analysis must be repeated. If the RSD of the second analysis is not within the acceptance limits, the analysis must be discontinued, the cause determined, and the instrument recalibrated.

If the RSD for a sample is outside the control limits, but the laboratory performance (i.e. CCV) is shown to be in control, the RSD problem encountered is judged to be matrix related, not system related, and the sample should be qualified accordingly.

Relative Standard Deviation (RSD)
Acceptance Criteria – RSD is calculated on all multiple internal scans of a single solution. The results from a total of 3 replicate analyses are used to calculate the RSD. The RSD must be < 20% unless otherwise specified.

The equation for RSD is as follows:

$$RSD = \frac{s}{\bar{X}} * 100$$

where:

s	=	standard deviation with n-1 degrees of freedom (n = total number of observed values)
$\bar{X}$	=	mean of observed/measured values

Corrective Action – If the RSD results are outside the required control limits, the affected samples must be qualified accordingly.

14.12 Relative Percent Difference (RPD)

RPD is a measure of precision and the degree to which a set of measurements of the same property, obtained under similar conditions, conform to themselves.

The formula for RPD is as follows:

$$RPD = \frac{|(X_1 - X_2)|}{\bar{X}} * 100$$

where:

X_1, X_2	=	duplicate results
$\bar{X}$	=	average of duplicate results

15. Reporting and Validation

15.1 Reporting Limits

The reporting limits are set based on the CRQL or client specifications. The reporting limits are matrix and dilution dependent. All results are reported to 3 significant figures. The standard reporting limits for aqueous samples are listed in Table 1.

15.2 Data Transfer

At the conclusion of the analysis run, transfer all raw data needed for data package

and *Element* upload to a flash drive. Refer to SOP G-26 and SOP G-28. Analyst and peer reviewer must verify all QC is acceptable or necessary qualifiers are applied. Add the Reviewer Checklist and complete all entries. When the data evaluation is complete, update the sample status to analyzed.

If no data reduction (i.e. unit conversion) is needed, instrument results will be reported directly. For sample results not reported directly from the instrument (i.e. hardness), a manual calculation using a result > RL (if possible) must be included in the data package. The manual calculation must be performed in a validated spreadsheet. The calculation will show all steps to convert the instrument result into the reported result. It is the responsibility of the analyst and peer reviewer to verify the accuracy of the calculations performed.

15.3 Sample Data Package

15.3.1 The data package is maintained in electronic format. Criminal enforcement data packages are maintained in hard copy format, as well.

15.3.2 The project electronic data package (EDP) is assembled in PDF format as laid out in SOP G-26.

15.4 Data Validation

Data review is performed by a second analyst not involved in the analysis, but knowledgeable in the analytical processes employed. See SOP G-26.

The peer reviewer verifies the QC checklist in *Element* to indicate that the data have been reviewed and all QC criteria have been met or data are qualified accordingly. The checklist is printed to PDF and saved in the project folder. The status is then updated to *Peer Reviewed* in *Element*.

15.5 Data Records

An analytical data package is prepared for each project and electronically stored in the designated project folder. The EDP is filed based on the nomenclature and sequence established. If a batch/sequence consists of several projects, the associated files are copied into each project folder.

16. Pollution Prevention

16.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The EPA has established a preferred hierarchy of environmental management techniques that places pollution

prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the Agency recommends recycling as the next best option.

16.2 The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

16.3 For information about pollution prevention that may be applicable to laboratories and research institutions, consult Less is Better: *Laboratory Chemical and Management for Waste Reduction*, available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street N.W., Washington D.C. 20036, (202) 872-4477.

17. Waste Management

The USEPA requires that laboratory waste management practices be conducted consistent with all applicable rules and regulations. Excess reagents, samples, and method process waste should be characterized and disposed of in an acceptable manner. The Agency urges laboratories to protect the air, water, and land by minimizing and controlling all releases from hoods and bench operations, complying with the letter and spirit of any water discharge permits and regulations, and by complying with all solid and hazardous waste regulations, particularly the hazardous waste identification rules and land disposal restrictions. For further information on waste management consult the Region 2 SOP G-6.

18. References

18.1 American Public Health Association. *Hardness by Calculation*, Method 2340B, Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998

18.2 Environmental Express. *HotBlock™ Digestion System Operation & Instruction Manual*, August 2012

18.3 Environmental, Health and Safety Operations Manual & Chemical Hygiene Plan, EPA Region 2, Current Version

18.4 Laboratory Quality Management Plan (LQMP), U.S. Environmental Protection Agency, Region 2 Laboratory Branch, Current Version.

18.5 SCP Science. *DigiPREP Digestion Blocks (Jr, MS, LS, HP) User Manual*, Version 3.

18.6 U.S. Environmental Protection Agency. *Contract Laboratory Program Statement of*

Work for Inorganic Superfund Methods, ISM02.3, Exhibit D, September 2015.

18.7 U.S. Environmental Protection Agency. *Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma - Mass Spectroscopy*, Method 200.8, Rev. 5.4, May 1994

18.8 U.S. Environmental Protection Agency, *Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements*, EPA Method 200.2, Revision 2.8, 2004

18.9 U.S. Environmental Protection Agency, *Acid Digestion of Aqueous Samples and Extracts For Total Metals For Analysis By FLAA or ICP Spectroscopy*, SW-846, Physical/Chemical Methods, Method 3010A, July 1992

18.10 U.S. Environmental Protection Agency, Region 2, SOP G-6 *Disposal of Samples & Hazardous Wastes and Chemical Inventory Management*

18.11 U.S. Environmental Protection Agency, Region 2, SOP G-8 *Laboratory Policy for the Determination of Method Detection Limits (MDLs)*

18.12 U.S. Environmental Protection Agency, Region 2, SOP G-9 *Laboratory Policy for the Establishment and Maintenance of Logbooks Associated with Chemical Analysis*

18.13 U.S. Environmental Protection Agency, Region 2, SOP G-15 *Laboratory Definitions and Qualifiers*

18.14 U.S. Environmental Protection Agency, Region 2, SOP G-18 *Good Laboratory Practice*

18.15 U.S. Environmental Protection Agency, Region 2, SOP G-26 *Guidance for Laboratory Data Review*

18.16 U.S. Environmental Protection Agency, Region 2, SOP G-28 *Laboratory Operations using* Element *LIMS*

18.17 Promium *Element* Data System, Laboratory Information Management Systems, Promium, LLC, current version

18.18 Working with Promium, current version

Table 1. Recommended analytical isotopes, additional masses and reporting limits. Isotopes recommended for analytical determination are underlined.

Element of Interest	Isotope	EPA Reporting Limit (µg/L)	ESAT Reporting Limit (µg/L)
Aluminum	27	20	20
Antimony	121, 123	1.0	1.0
Arsenic	75	1.0	1.0
Barium	135, 137	1.0	1.0
Beryllium	9	1.0	1.0
Cadmium	106, 108, 111, 114	1.0	1.0
Calcium	44	NA	100
Chromium	52, 53	2.0	1.0
Cobalt	59	1.0	1.0
Copper	63, 65	1.0	1.0
Iron	56	NA	20
Lead	306, 207, 208	1.0	1.0
Magnesium	24	NA	100
Manganese	55	1.0	1.0
Molybdenum	95, 97, 98	1.0	1.0
Nickel	60, 62	1.0	1.0
Potassium	39	NA	100
Selenium	77, 78, 82	1.0	2.0
Silver	107, 109	1.0	1.0
Sodium	23	NA	100
Thallium	203, 205	1.0	1.0
Vanadium	51	1.0	1.0
Zinc	66, 67, 68	2.0	2.0

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Table 2. Recommended elemental equations for data calculations

Element	Elemental Equation	Note
Al	(1.000) (^{27}C)	
Sb	(1.000) (^{123}C)	
As	(1.000) (^{75}C) – (3.127) [(^{77}C) – (0.815) (^{82}C)]	(1)
Ba	(1.000) (^{137}C)	
Be	(1.000) (^{9}C)	
Cd	(1.000) (^{111}C) – (1.073) [(^{108}C) – (0.712) (^{106}C)]	(2)
Cr	(1.000) (^{52}C)	(3)
Co	(1.000) (^{59}C)	
Cu	(1.000) (^{63}C)	
Pb	(1.000) (^{206}C) + (1.000) (^{207}C) + (1.000) (^{208}C)	(4)
Mn	(1.000) (^{55}C)	
Mo	(1.000) (^{98}C) – (0.146) (^{99}C)	(5)
Ni	(1.000) (^{60}C)	
Se	(1.000) (^{82}C)	(6)
Ag	(1.000) (^{107}C)	
Tl	(1.000) (^{205}C)	
V	(1.000) (^{51}C) – (3.127) [(^{53}C) – (0.113) (^{52}C)]	(7)
Zn	(1.000) (^{66}C)	
	Internal Standards	**Note**
Bi	(1.000) (^{209}C)	
In	(1.000) (^{115}C) – (1.000) (^{118}C)	(8)
Sc	(1.000) (^{45}C)	
Tb	(1.000) (^{159}C)	
Y	(1.000) (^{89}C)	
Li	(1.000) (^{6}C) – (0.0813) (^{7}C)	(9)

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Legend:

C – calibration blank subtracted counts at specified mass.

(1) – correction for chloride interference with adjustment for 77Se. ArCl 75/77 ratio may be determined from the reagent blank. Isobaric mass 82 must be from Se only and not BrH+.

(2) – correction for MoO interference. Isobaric mass 106 must be from Cd only not ZrO+. An additional isobaric elemental correction should be made if palladium is present.

(3) – In 0.4% v/v HCl, the background from ClOH will normally be small. However, the contribution may be estimated from the reagent blank. Isobaric mass from Cr only not ArC+.

(4) – allowance for isotopic variability of lead isotopes.

(5) – isobaric elemental correction for ruthenium.

(6) – some argon supplies contain krypton as an impurity. Selenium is corrected for 82Kr by background subtraction.

(7) – correction for chloride interference with adjustment for 53Cr. ClO 51/53 ratio may be determined from the reagent blank. Isobaric mass 52 must be from Cr only not ArC+.

(8) – isobaric elemental correction for tin.

(9) – correction for natural Lithium isotope.

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Table 3. Common molecular ion interferences in ICP-MS background molecular ions

Molecular Ion	Mass	Element Interference	Molecular Ion	Mass	Element Interference [a]
NH^+	15		$^{36}ArH^+$	37	
OH^+	17		$^{38}ArH^+$	39	
OH_2^+	18		$^{40}ArH^+$	41	
C_2^+	24		CO_2^+	44	
CN^+	26		CO_2H^+	45	Sc
CO^+	28		ArC^+, ArO^+	52	Cr
N_2^+	28		ArN^+	54	Cr
N_2H^+	29		$ArNH^+$	55	Mn
NO^+	30		ArO^+	56	
NOH^+	31		$ArOH^+$	57	
O_2^+	32		$^{40}Ar^{36}Ar^+$	76	Se
O_2H^+	33		$^{40}Ar^{+38}Ar^+$	78	Se
			$^{40}Ar_2$	80	Se

[a] method elements or internal standards affected by the molecular ions.

Matrix Molecular Ions

BROMIDE Molecular Ion	Mass	Element Interference	BROMIDE Molecular Ion	Mass	Element Interference
$^{81}BrH^+$	82	Se	$^{81}BrOH^+$	98	Mo
$^{79}BrO^+$	95	Mo	$Ar^{81}Br^+$	121	Sb
$^{81}BrO^+$	97	Mo			
CHLORIDE Molecular Ion	**Mass**	**Element Interference**	**CHLORIDE Molecular Ion**	**Mass**	**Element Interference**
$^{35}ClO^+$	51	V	$^{37}ClOH^+$	54	Cr
$^{35}ClOH^+$	52	Cr	$Ar^{35}Cl^+$	75	As
$^{37}ClO^+$	53	Cr	$Ar^{37}Cl^+$	77	Se

SULPHATE Molecular Ion	Mass	Element Interference	SULPHATE Molecular Ion	Mass	Element Interference
$^{32}SO^{+}$	48		$^{34}SOH^{+}$	51	V
$^{32}SOH^{+}$	49		SO_2^{+}, S_2^{+}	64	Zn
$^{34}SO^{+}$	50	V, Cr	$Ar^{32}S^{+}$	72	
			$Ar^{34}S^{+}$	74	

PHOSPHATE Molecular Ion	Mass	Element Interference	PHOSPHATE Molecular Ion	Mass	Element Interference
PO^{+}	47		PO_2^{+}	63	Cu
POH^{+}	48		ArP^{+}	71	

GROUP I, II METALS Molecular Ion	Mass	Element Interference	GROUP I, II METALS Molecular Ion	Mass	Element Interference
$ArNa^{+}$	63	Cu	ArK^{+}	79	
			$ArCa^{+}$	80	

MATRIX OXIDES* Molecular Ion	Mass	Element Interference	MATRIX OXIDES* Molecular Ion	Mass	Element Interference
TiO	62 – 66	Ni, Cu, Zn	ZrO	106 – 112	Ag, Cd
			MoO	108 – 116	Cd

*Oxide interferences will normally be very small and will only impact the method elements when present at relatively high concentrations. Some examples of matrix oxides are listed. It is recommended that Ti and Zr isotopes are monitored in solid waste samples, which are likely to contain high levels of these elements. Mo is monitored as method analyte.

ADDENDEUM 1

Orbeco Hellige TB 200 Turbitimeter

3.0 Normal Operation

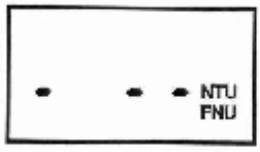
This instrument allows for the measurement of the turbidity of a grab sample. The turbidity is reported in Nephelometric Turbidity Units (NTU) and Formazin Nephelometric Units (FNU). Readings above 1100 NTU are outside the range of this instrument.

Note: Nephelometric turbidity units (NTU's) are numerically equivalent to Formazin nephelometric units (FNU's) (See Glossary).

Below are some typical screens and a description of when you should see them.

When turning on the instrument or after a calibration, this screen indicates that the instrument is ready to **read:**

The instrument will display moving dashes on the screen for 6-7 seconds while measuring prior to displaying a value. This will occur prior to taking a reading & prior to indexing. No keypad presses will operate during this time.



After taking a reading, a typical display:

If the sample that is being measured has a turbidity that is higher than that which the instrument can measure, the instrument will indicate this as an over-range condition by **flashing 1100:**

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3.1 Routine Measurement

Turn on the instrument by pressing the ON/OFF button for 1 second.

Following are the recommended steps to take a reading:

1. Secure approximately 100 mL of the sample water.

2. Obtain a clean and dry sample cell.

3. Rinse the sample cell with approximately 10 mL of the sample water (2/3 of cell volume), capping the cell with the black light shield (cell top) and inverting several times. Discard the used sample and repeat the rinsing procedure two more times.

4. Completely fill the rinsed cell (from step 3) with the remaining portion (approximately 15 mL) of the sample water and then cap the cell with the supplied cap. Ensure that the outside of the cell is dry, clean and free from smudges.

5. Place the sample cell into the instrument and press it down until it snaps fully into the sample well. While holding down the ↵ button, slowly rotate the calibration standard one complete revolution (360°) pausing in 20° increments to allow the display to update. While rotating the sample, observe the turbidity reading and locate the sample cell position with the lowest turbidity reading. With the sample positioned at the location having the lowest turbidity reading release the ↵ button and the instrument will automatically take the reading.

6. Repeat steps 1 through 5 for all samples.

⚠ **Warning:** ⚠

NEVER pour liquid directly into the sample well of the instrument - always use a sample cell. The instrument will only accurately measure the turbidity of a sample when sample cells sealed with the black cap are used. The black cap serves as both seal and a light shield.

Notes:

1. The instrument will turn off after approximately 5 minutes if no keys are pressed.

2. To minimize drift, indexing is allowed for only a short period of time. After this period, the calibration or reading of the sample is automatically initiated.

3. The value displayed during indexing is for the purpose indexing only. The final reading may vary from the indexing value.

4. Any typical glass cleaner can be used along with a lint free cloth (provided), or tissue (Kimwipes®), to clean the outside of the sample cell.

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4.0 Instrument Calibration

The instrument was calibrated and tested prior to leaving the factory. Therefore, it is possible to use the instrument directly out of the box. However, re-calibration of the instrument is recommended to help with familiarization and the operation of the instrument and the calibration procedures. In addition, re-calibration is recommended at least once every three months.

The instrument requires three (3) standards to be fully calibrated.

During calibration, the instrument performs several system self-diagnostics. As such, several warning messages may be displayed. If the instrument detects an irregularity (detectors or lamp) a warning message will be displayed. If this occurs please attempt to rectify the problem, or contact the authorized technical services department (see section 6.4). In any event, the instrument will continue to read the turbidity with a decreased accuracy until the error is rectified.

4.1 Calibration Standards

The following materials are used during calibration to achieve the accuracy stated in this manual. These are included with the instrument, may be reordered as a set (part number TB200-50):

1. 1000 NTU Primary Calibration Standard available from Orbeco-Hellige, Inc.
2. 10.0 NTU Primary Calibration Standard available from Orbeco-Hellige, Inc.
3. 0.02 NTU Primary Calibration Standard available from Orbeco-Hellige, Inc.

It is well known that diluted Formazin is unstable. If Formazin is used to calibrate the instrument, ensure that a fresh stock suspension of Formazin is used to achieve the accuracy quoted for the instrument. A Formazin Stock Solution Kit is available (Part Number R-3401-16). Primary Calibration standards are more stable than Formazin and have a limited shelf life of 1 year. If calibration standards are used to calibrate the instrument, review the expiration date to ensure that the standards have not expired. Primary calibration standards are a US EPA approved alternative standard to Formazin.

4.2 Indexing the Calibration Standards

The United States Environmental Protection Agency (US EPA) recommends that sample cells used for instrument calibration or sample measurement be indexed. To comply with this recommendation, each calibration standard is supplied with an indexing ring and each instrument has a reference point for quick and repeatable indexing of the calibration standard. To index a calibration standard perform the following steps:

1. While holding down the ◄/ button, slowly rotate the calibration standard one complete revolution (360°) pausing in 20° increments to allow the display to update.

2. While rotating the standard, observe the turbidity reading and locate the sample cell position with the lowest turbidity reading.

3. With the calibration standard positioned at the location having the lowest turbidity reading, install the Indexing Ring over the black light shield on the standard so that the pointer of the Ring aligns with the reference arrow on the instrument.

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4.3 Calibration Procedures

The following procedure is recommended to perform a full range calibration. Ensure that the calibration standards have been indexed (See Section 4.2) prior to proceeding.

1. Select the calibration function of the instrument by pressing the CAL button once. The "CAL" icon will be illuminated on the display with "1000" flashing indicating the standard required for this step of the calibration.

2. Insert the 1000 NTU standard into the sample well and press down until the cuvette snaps fully into the instrument. Align the indexing ring with the arrow on the instrument (see section 4.2 if the standard is not already indexed).

3. Press and hold the ↵ button while making fine adjustments to index the sample cell (achieve lowest value--see section 4.2). Release the button to initiate the calibration. The display will now show a 30 second count down.

4. When the instrument has completed the calibration on the 1000 NTU, it will briefly display 1000 to indicate that it was calibrated and then prompts for the 10 NTU standard with a flashing "10.0".

5. Insert the 10.0 NTU standard into the sample well and press down until the cuvette snaps fully into the instrument. Align the indexing ring with the arrow on the instrument (see section 4.2 if the standard is not already indexed).

6. Press and hold the ↵ button while making fine adjustments to index the sample cell (achieve lowest value--see section 4.2). Release the button to initiate the calibration. The display will now show a 60 second count down.

7. When the instrument has completed calibration on the 10.0 NTU, it will briefly display 10.0 to indicate that it was calibrated and then prompts for the 0.02 NTU standard with a flashing "0.02".

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8. Insert the 0.02 NTU standard into the sample well and press down until the cuvette snaps fully into the instrument. Align the indexing ring with the arrow on the instrument (see section 4.2 if the standard is not already indexed).

9. Press and hold the ↵ button while making fine adjustments to index the sample cell (achieve lowest value- see section 4.2). Release the button to initiate the calibration. The display will now show a 30 second count down.

10. When the instrument has completed the calibration on the 0.02 NTU standard, the instrument returns to the read mode and is ready to read.

Notes :

1. Exiting the calibration mode may be done at the end of any step by pressing the CAL button. The instrument will store any of the values calibrated prior to exiting.

2. Any of the three calibration points (1000 NTU, 10 NTU & 0.02 NTU) can be selected for individual calibration by using the ▲ & ▼ buttons.

3. The required calibration values are set in the software and cannot be changed.

4.4 Calibration Error

If the screen shown below is displayed after calibration, the internal diagnostics have determined that the calibration standards were bad or that they were inserted in the wrong order. Either check the standards and recalibrate or restore the factory calibration as indicated below in Section 4.5.

4.5 Restore Factory Calibration

If the above display appears and it can not be corrected by recalibration, the operator can restore the factory calibration. Please note that the instrument may operate with reduced accuracy until a new calibration can be performed.

Push and hold the ▲ button. Now push and release the ↵ button then release the ▲ button. The instrument will turn itself off when completed. When the instrument is turned on again the error screen will be no longer be present and the factory calibration will have been restored.

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5.0 Routine Maintenance

If the instrument is not kept in the supplied carrying case when not in use, ensure that the instrument has been turned off and that a clean sample cell fitted with a black cap has been placed in the sample well. This will ensure that a minimal amount of dust and/or debris will be able to settle on the optics of the instrument.

5.1 Sample Cell Cleaning and Care

Proper measurement of the turbidity of a sample requires the use of a sample cell that is free of marks, smudges, scratches and any bacterial growth. Cleaning the sample cell is accomplished by washing the interior and exterior of the cuvette in a detegent solution.

Once cleaned, the cell should be rinsed thoroughly 8 to 10 times with clean distilled water to eliminate the possibility of detergent buildup and streaking. Cleaned and dried sample cells should be stored with the black caps on.

During normal operation any typical glass cleaner along with a lint free cloth or tissue (Kimwipes®), may be used to clean the outside of the cuvettes. Condensation may appear on the cell when a sample is very cold and the relative humidity is high. When this happens, the turbidity displayed may be higher than the actual turbidity due to the light scattered by the condensate on the cell. To alleviate the problem, either coat the cell with an anti-fogging agent or by running warm water over the cell for a short period of time to warm the sample prior to measurement.

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STANDARD OPERATING PROCEDURE

ANALYSIS OF VOLATILE ORGANIC COMPOUNDS IN WATER BY PURGE AND TRAP GC/MS

Signature and Title

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U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2

DIVISION OF ENVIRONMENTAL SCIENCE AND ASSESSMENT
LABORATORY BRANCH

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STANDARD OPERATING PROCEDURE (SOP)

VOLATILE ORGANICS IN WATER BY PURGE AND TRAP GC/MS

1. Scope and Application

1.1 This SOP can be used to quantitate most volatile organic compounds that have boiling points below 200°C and are insoluble or slightly soluble in water. See Table 2 for a list of compounds, retention times, and their characteristic ions that have been evaluated on a purge-and-trap GC/MS system.

1.2 The Reporting Limit for each target analyte is 0.5 ug/L except for ketones, which is 5.0 ug/L. The reporting limits for Total Xylenes Reporting is 0.5 ug/L. The Reporting Limit is based on the concentration of the lowest calibration standard analyzed. NOTE: This SOP is not applicable to drinking water compliance sample analyses.

2. Summary of Method

2.1 A 5.0 mL or 25.0 mL water sample containing the analytes, surrogate standard and internal standard compounds is purged with helium via a purge-and-trap apparatus and collected on a 'K' or equivalent analytical trap. The trap is then heated; the analytes desorb into a helium carrier gas and collect in a gas chromatographic column. The analytes are eluted via a GC with a temperature program. They are in turn identified and quantified by the mass selective detector.

2.2 If the water sample as received is suspected to contain a high concentration of analytes, the sample is diluted (say, 5 mL to 25 mL) before introducing it into the purge-and-trap apparatus.

3. Definitions

All definitions may be found in EPA SOP-G-15 or Section 3.0 of EPA Method 524.2 Revision 4.1 August 1995.

4. Interferences

4.1 During analysis, major contaminant sources are volatile materials in the laboratory and impurities in the inert purging gas and in the sorbent trap. The use of Teflon tubing, Teflon thread sealants, or flow controllers with rubber components in the

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purging device should be avoided since such materials out-gas organic compounds which will be concentrated in the trap during the purge operation. Analyses of laboratory reagent blanks provide information about the presence of contaminants. When potential interfering peaks are noted in laboratory reagent blanks, the analyst should change the purge gas source and regenerate the molecular sieve purge gas filter. Subtracting blank values from sample results is not permitted.

4.2 Interfering contamination may occur when a sample containing low concentrations of volatile organic compounds is analyzed immediately after a sample containing relatively high concentrations of volatile organic compounds. A preventive technique is between-sample rinsing of the purging apparatus and sample syringes with two portions of reagent water. After analysis of a sample containing high concentrations of volatile organic compounds, one or more laboratory reagent blanks should be analyzed to check for cross-contamination.

4.3 Special precautions must be taken to determine methylene chloride. The sample storage area should be isolated from all atmospheric sources of methylene chloride, otherwise random background levels will result. Since methylene chloride will permeate Teflon tubing, all GC carrier gas lines and purge gas plumbing should be constructed of stainless steel or copper tubing. Lab coats should be cleaned frequently since clothing previously exposed to methylene chloride fumes during common liquid/liquid extraction procedures can contribute to sample contamination.

4.4 Traces of ketones, methylene chloride, and some other organic solvents can be present even in the highest purity methanol. This is another potential source of contamination, and should be assessed before standards are prepared in the methanol.

5. Safety

5.1 The toxicity and carcinogenicity of each reagent used in this method has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be minimized by good laboratory practices, e.g. wear proper protective equipment, safety glasses, gloves, lab coat and working inside hoods whenever possible.

5.2 Refer to the Edison Facility Safety Manual Region II Part 2 – Laboratory Safety and Appendices 13/13A - Chemical Hygiene Plan for specific guidelines. The manual is available on the Region II Intranet. A hard copy is available in the Laboratory Office Area.

5.3 For detailed explanations consult the Material Safety Data Sheets (MSDS), available

in the Laboratory Office area. MSDS are also electronically available.

5.4 The following method analytes have been tentatively classified as known or suspected human or mammalian carcinogens: benzene, carbon tetrachloride, 1,4-dichlorobenzene, 1,2-dichloroethane, hexachlorobutadiene, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, chloroform, 1,2-dibromoethane, tetrachloroethene, trichloroethene, and vinyl chloride. Pure standard materials and stock standard solutions of these compounds should be handled in a hood. A NIOSH/MESA approved toxic gas respirator should be worn when the analyst handles high concentrations of these toxic compounds.

6. Apparatus and Equipment

6.1 Gas Chromatograph

The gas chromatography (GC) system unit must be capable of temperature programming and have a flow controller that maintains a constant column flow rate throughout desorption and temperature program operations. The system must include or be interfaced to a purge and trap system, and have all required accessories including syringes, analytical columns, and gases. All GC carrier gas lined must be constructed from stainless steel or copper tubing. Non-PTFE thread sealants, or flow controllers with rubber components are not to be used.

6.2 Mass Spectrum Detector (MSD)

The MSD will scan from 35 to 260 amu every 1 sec or less, using 70 volts (nominal) electron energy in the electron impact ionization mode.

6.3 Purge and Trap device: Velocity-XPT concentrator with moisture control system and autosampler, or equivalent. Also, use of a multi-station autosampler unit with combined P/T such as a Teledyne-Tekmar Atomx or equivalent. The outlet from the concentrator is connected to the GC inlet.

6.4 Agilent DB-VRX GC column, 20 meters long, 0.18 mm I.D, or equivalent. See Section 10 for details and operating conditions.

6.5 Syringe and syringe valves

6.5.1 Syringes - 0.5 mL and 1.0 mL gas tight with shut-off valve

6.5.2 Micro syringes - 10 µL to 500 µL, gastight.

6.6 Samples and standard solution storage containers

6.61 Sample containers - 40 mL screw cap vials equipped with a Teflon-faced silicone septum.

6.6.2 Standard solution storage containers - 1.0 mL to ~ 15 mL.

7. Reagents and Standards

All purchased and prepared standards and reagents are recorded in Element which assigns a unique ID# to each. All containers must be labeled with the Name, ID#, concentration, preparation date and expiration date (where applicable). Please refer to SOP # G-9 for details.

7.1 Trap Packing Materials – 'K' or equivalent analytical trap.

7.2 Reagents

7.2.1 Reagent water is defined as a water in which an interference is not observed ≥ the MDL of each analyte of interest.

7.2.2 Methanol - Demonstrated to be free of analytes.

7.3 Internal /Surrogate Standard Solution: A solution containing the internal standards and surrogate compounds is required to prepare laboratory reagent blanks, and to fortify each sample. Prepare a fortification solution containing Fluorobenzene, Ethylbenzene-d_{10}, and Toluene-d_8 (the internal standards), with 1,2-Dichloroethane-d_4 and BFB (surrogates) in methanol at concentrations of 25 µg/mL of each (any appropriate concentration is acceptable – for a 5-mL purge volume, 5 µg/mL is prepared). A 5 µL aliquot of this solution added to a 25-mL water sample volume gives concentrations of 5 µg/L final concentration. Additional internal standards and surrogate analytes are optional. Any additional surrogate compounds used should be similar in physical and chemical characteristics to the analytes of concern. Up to 20 mLs of this solution can be prepared and used in the autosampler reservoir. The solution is dated and used for up to three (3) months or until degradation in sensitivity becomes apparent.

7.4 Preparation of Calibration Standards: The number of calibration solutions (CALs) needed depends on the calibration range desired. Currently, the range is 0.5 to 60 µg/L for a six-point calibration curve. Other ranges and calibration points may be applicable depending on survey requirements. A minimum of three CAL solutions is required. Every CAL solution contains the internal standard and the surrogate

compounds at the same concentration of 5 µg/L, which are dispensed from the autosampler reservoir. To prepare a calibration standard, add an appropriate volume of a primary dilution standard containing all analytes of concern to an aliquot of reagent water in a 50-mL volumetric flask. Use a microsyringe and rapidly inject the methanol solutions below the surface of the water into the expanded area of the filled volumetric flask. Remove the needle as quickly as possible after injection. Stopper the flask and mix by inverting the flask three times only. Transfer to 40 mL VOA vial with no headspace, and discard the remainder appropriately.

7.5 Initial Calibration Verification Standard- The laboratory standard solution used for verifying the initial calibration is prepared from a stock standard solution, which in turn is prepared from alternate source VOC standard mixes. The final concentration for the initial calibration verification standard is 5 µg/L.

7.6 Hydrochloric Acid (1+1)

7.7 Ascorbic Acid - ACS Reagent Grade, Granular

7.8 Sodium Thiosulfate - ACS Reagent Grade, Granular

Note: A new cracked open standard would have an expiration date of 3 months. This expiration would supersede any longer manufacturer's expiration date or until degradation in sensitivity becomes apparent. These standards are stored at -10 to -20 °C.

8. Sample Collection, Preservation, Storage & Holding Time

8.1 Samples are collected in the field in triplicate and presented to the laboratory for analysis. The samples must be in 40 ml vials capped with Teflon-faced silicone rubber septa and contain no air space. If samples contain air bubble(s) or headspace, a case narrative would have to indicate the condition.

8.2 The samples must be chilled to 4° ± 2°C when collected and maintained at that temperature until analysis. The samples must be analyzed within 14 days of sample collection if preserved with HCL to a pH < 2 at the time of collection. Samples taken in the field, which cannot be preserved w/HCl for any reason, must be analyzed within seven days from the date of sample collection.

8.3 The samples are stored in the VOC sample refrigerator located in Bay D, kept at 4° ± 2°C.

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9. Sample Preparation

9.1 Sample Introduction and Purging

9.1.1 This method is designed for a 25-mL or 5-mL sample volume, but a smaller (5 mL) sample volume is recommended if the GC/MS system has adequate sensitivity to achieve the required method detection limits. An automated sampling device is employed for sample introduction to the purge and trap concentrator. Currently, a Teledyne Tekmar Atomx Autosampler/Purge & Trap instrument or equivalent is used. This allows field to instrument analysis without sample exposure as done in previous procedures. This minimizes loss of volatile components, since the sample is obtained directly from the sample container.

9.1.2 Adjust the helium purge gas flow rate to 40 mL/min. on the purge and trap concentrator.

9.1.3 Samples are placed in the autosampler tray after coming to room temperature.

9.1.4 The autosampler and concentrator are controlled by a computer program. Computer program is set up to initiate an appropriate schedule for transfer of the sample, purging and desorption. The autosampler adds a 1 µL (or other appropriate volume) of the fortification solution containing the internal standard and the surrogates from the autosampler reservoir.

9.1.5 Standards and samples must be analyzed in exactly the same manner. Room temperature must be reasonably constant, and changes in excess of 10°F will adversely affect the accuracy and precision of the method.

9.2 Sample Desorption

9.2.1 Non-cryogenic (split/splitless) interface - After the 11-min purge, place the purge and trap system in the desorb mode and preheat the trap to 245°C without a flow of desorption gas. Then initiate the flow of desorption gas at a flow rate suitable for the column being used (optimum desorb flow rate is 40 mL/min) for 1 min., begin the GC temperature program, and start data acquisition.

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9.2.2 While the trapped components are being introduced into the gas chromatograph (or cryogenic interface), empty the purging device using the sample syringe and wash the chamber with two 5 or 25-mL flushes of reagent water, dependent on purge volume. After the purging device has been emptied, leave syringe valve open to allow the purge gas to vent through the sample introduction needle.

9.2.3 The autosampler/concentrator combination used in this method are programmed to accomplish the procedures outlined in 11.2.1 and 11.2.2.

9.3 TRAP RECONDITIONING - After desorbing the sample for 1 minute, recondition the trap by returning the purge and trap system to the bake mode. Maintain the trap temperature at 270°C. Maintain the moisture system, if utilized, at 300°C to remove residual water for 4 minutes.

9.4 TERMINATION OF DATA ACQUISITION - When all the sample components have eluted from the GC, terminate MS data acquisition. Use appropriate data output software to display full range mass spectra and appropriate plots of ion abundance as a function of time. If any ion abundance exceeds the system working range, dilute the sample aliquot in the second syringe with reagent water and analyze the diluted aliquot.

9.5 IDENTIFICATION OF ANALYTES - Identify a sample component by comparison of its mass spectrum (after background subtraction) to a reference spectrum in the user-created data base. The GC retention time of the sample component should be within three standard deviations of the mean retention time of the compound in the calibration mixture.

9.5.1 In general, all ions that are present above 10% relative abundance in the mass spectrum of the standard should be present in the mass spectrum of the sample component and should agree within absolute 20%. For example, if an ion has a relative abundance of 30% in the standard spectrum, its abundance in the sample spectrum should be in the range of 10 to 50%. Some ions, particularly the molecular ion, are of special importance, and should be evaluated even if they are below 10% relative abundance.

9.5.2 Identification requires expert judgment when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When GC peaks obviously represent more than one sample component (i.e., broadened peak with shoulder(s) or valley between two or more maxima), appropriate analyte spectra and background spectra can be selected by examining plots of characteristic ions

for tentatively identified components. When analytes coelute (i.e., only one GC peak is apparent), the identification criteria can be met but each analyte spectrum will contain extraneous ions contributed by the coeluting compound. Because purgeable organic compounds are relatively small molecules and produce comparatively simple mass spectra, this is not a significant problem for most method analytes.

9.5.3 Structural isomers that produce very similar mass spectra can be explicitly identified only if they have sufficiently different GC retention times. Acceptable resolution is achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks. Otherwise, structural isomers are identified as isomeric pairs. Two of the three isomeric xylenes and two of the three dichlorobenzenes are examples of structural isomers that may not be resolved on the capillary columns. If unresolved, these groups of isomers must be reported as isomeric pairs.

10. Instrument Operating Conditions

10.1 Gas Chromatography/Mass Spectrometry

10.1.1 Mass Calibration Check-At the beginning of each 12-hour period during which GC/MS analyses are to be performed, the system is tested to ensure that acceptable performance criteria are achieved for PBFB.

10.1.2 The PBFB performance test requires the following instrument parameters:

Electron energy	70 volts nominal
Mass range	35 to 260 amu
Scan time	< 2 seconds per scan

The test is performed by acquiring data from a run of 25 ng of PBFB (either by purging or on-column direct injection) into the GC. After acquisition, a background subtracted mass spectrum is obtained using Chemstation BFB Autofind with three average scans and compared with the PBFB ion abundance criteria in Table 1. If these performance criteria are not met, the instrument is retuned and the test repeated until satisfactory. Only then are the blank, standards and samples run.

10.1.3 Acquire and store data over the nominal mass range 35-260 with a total cycle time (including scan overhead time) of 2 sec or less. If water, methanol, or carbon dioxide cause a background problem, start at 47 or 48 m/z. If ketones are to be determined, data must be acquired starting at m/z 43. Cycle time

must be adjusted to measure five or more spectra during the elution of each GC peak.

10.2 GC Conditions

The GC conditions will be varied somewhat for different columns. The following are recommended conditions:

Run time: 17 min
Scan start time: 1.0 min
Injection port temperature: 250^0C
Detector temperature: 235^0C
Starting temperature: 40^0C
Holding time at initial temperature:3 min
Temperature program rate: 10^0C
Final Temp:235^0C
Hold time – 3 minutes

10.2.1 The GC conditions will be varied somewhat for different columns. The following are the recommended conditions: Adjust the helium carrier gas flow rate to about 1.0 mL/min. The column temperature is 30°C and held for 3 minutes from beginning of desorption, then heated to 100°C at 10°C/min, heated to 235°C at 25°C/min and held at 235°C for 4 minutes or until all compounds of interest have eluted.

10.3 Purge and Trap Device

The recommended purge and tarp sampling cycle is as follows:
Carrier gas: Helium
Purge time: 11.0 min
Purge gas flow rate: 40ml/min
Desorb time: 1.0 min
Drypurge:2.0 min

11. Calibration

11.1 Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed. In addition, acceptable performance must be confirmed intermittently throughout analysis of samples by performing continuing calibration checks. These checks are required at the beginning of each work shift, but no less than every 12 hours.

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11.2 Initial Calibration

11.2.1 For initial calibration of GC/MS instrument, a multipoint (minimum of three to six points) calibration is made to define the operating range of the instrument. The concentration range will depend on the purpose of the intended analyses; but usually will include points at 0.5 ug/L through 60 ug/L. Larger ranges may be utilized for specific project objectives if quality control is maintained.

11.2.2 The occurrence of an unacceptable instrument response(s) from the analysis of calibration standards, e.g., unacceptable correlation coefficient or RSD of response factor(s), etc., is an indication of an analytical problem(s) with the selected calibration range for the analysis and must be corrected before sample analyses are conducted. Sample analysis may not proceed until the resulting calibration curve is fully acceptable according to the established criteria identified in this SOP.

Elimination of calibration point(s) from the calibration curve is an acceptable practice under the following special conditions:

11.2.2.1 *In multi-analyte tests* in which calibration solutions are prepared from mixtures, analyte concentrations analyzed which are outside of the established calibration range for a given analyte, should not be included in the calibration for that analyte. This is an unavoidable situation because the stock solutions are mixtures.

11.2.2.2 *The lowest calibration point(s)* may be eliminated from the calibration curve. If this occurs, the Reporting Limit, which is based on the lowest calibration standard, must be raised accordingly and reflected in the final report.

11.2.2.3 *The highest calibration point(s)* may be eliminated from the calibration curve if all sample concentrations and all associated quality control data (or their dilutions) are bracketed by the remaining calibration standards.

11.2.2.4 *An outlier calibration point (other than a high point or a low point)* may be eliminated only after an investigation has been performed and the reasons for the problem have been documented. At no time may this calibration point(s) be eliminated solely to meet or improve performance relative to

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calibration curve acceptance criteria.

11.2.3 Quantitation of the calibration standard runs provides area counts for the quantitation mass of each analyte. These area counts are used to calculate relative response factors (RRF's) according to the Method 524.2 section 10.2.6. The quantitation ion to be used for each analyte and the corresponding internal standard is given in Table 2.

11.2.4 The percent relative standard deviation (%RSD) of the average RRF values must be less than or equal to 20% for the calibration to be acceptable.

11.2.5 If the percent recovery falls outside of the acceptable range for more than 10% of the total analyte list, recalibration is required. If the percent recovery falls outside of the acceptable range for less than 10% of the total analyte list, all associated sample data for the affected analyte(s) must be qualified accordingly.

11.2.6 All analytical runs for the initial calibration must be made within a continuous 12-hour period.

11.3 Continuing Calibration Verification

11.3.1 Verify the MS tune and initial calibration at the beginning of each 12-hour work shift during which analyses are performed using the following procedure. Introduce into the GC (either by purging or on-column direct injection) 25 ng or less of PBFB and acquire a mass spectrum that includes data for m/z 35-260. If the spectrum does not meet all criteria (Table 1), the MS must be retuned and adjusted to meet all criteria.

11.3.2 A continuing calibration verification standard 5 ppb is run at the start of each 12-hour time period and the acceptance criteria for all the compounds is 30% D from the initial average response factors.

11.3.2.1 If the percent recovery falls outside of the acceptable range for more than 10% of the total analyte list, recalibration is required. If the percent recovery falls outside of the acceptable range for less than 10% of the total analyte list, all associated sample data for the affected analyte(s) must be qualified accordingly.

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12. Sample Analysis

12.1 Analytes are detected and identified by their characteristic chromatographic retention times and mass spectral ions. The retention time of the sample analyte should be with ±30 seconds of the corresponding analyte retention time in the daily standard run. A relative retention time of ± 0.02 units between the sample analyte and analyte of the Continuing calibration check run is used to account for possible minor variations in absolute retention times.

Note: The CCV (continuing calibration verification) analyzed on the same sequential run is used as the reference spectrum for a group of samples and QCs within a 12-hr period with the same method. The CCV uses the previous CCV run as the reference spectrum of the same method. If a new method is generated and a curve is run for the first time or maintenance was done on the instrument, then the midpoint level of the curve is used as the reference spectrum for the subsequent sample analysis until the next required CCV is run.

12.2 The mass spectrum of the sample analyte should include all of the characteristic ions for that analyte as listed in Table 2.

12.3 When an analyte is detected and identified, it is quantitated by the software program by first calculating the integrated ion abundance of the quantitation mass as given in the identification file. The concentration is then calculated from the equation:

$$Conc\ \frac{\mu g}{L} = \frac{Area\ of\ Analyte \times Conc\ IS \times DF}{Area\ of\ IS \times RRF}$$

Where the RRF is the average RRF value obtained from initial calibration, IS is the internal standard, and DF is the dilution factor if necessary.

13. Data Analysis and Calculations

13.1 The quantitation report generated by the software is examined to confirm that analytes present have been detected (i.e., no visible peaks missed), that identification has been made correctly (i.e., spectra are compared with known spectra), that calculation has been performed correctly (e.g., the ion profile used for quantitation is satisfactory), and that baselines have been properly

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assigned.

13.2 Manual Integration

13.2.1 The compound identification and integration results generated by the Enviroquant software may not accurately reflect the area of a target analyte peak due to the following reasons:

The automated integration routine may not identify the target analyte as a result of retention time shift, coeluting interference, or peak inappropriate (too high or too low) intensity.

The target analyte peak area may be incorrectly integrated by the automated integration routine. Poor peak shape, co-elution with other peaks, or a significant baseline drift may need to be addressed. Poor peak shapes can also be due to overloading of the GC column by higher concentration(s) from the calibration curve of certain target analytes. The overloading can cause multiple peaks, shoulders, or humps which have the same spectra proving that they come from the same analyte. The lower concentrations of these analytes, however, do not exhibit the poor peak shape characteristics.

If one or more peaks elute within the retention time window for a target analyte, the automated integrated routine may not identify the correct target peak, i.e., the peak with a retention time that best matches the retention time established by the calibration.

13.2.2 It is the analyst's responsibility to validate the integration report generated by the computer software for every sample and calibration analysis. When an inaccurate integration is detected in the target analyte identification and/or peak integration, the analyst must conduct manual integration to correct the inaccuracy.

13.2.3 The manual integration must be reasonable, scientifically valid, and logically sound. The entire area of the subject peak and only the area of the subject should be integrated for that peak. Conducting peak-shaving to eliminate part of the subject peak or including peaks not belonging to the subject peak is prohibited. Manual integration performed solely to meet the calibration and surrogate QC criteria is unacceptable.

13.2.4 Manual integrations must be documented in the following manner.

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Include the quantitation report and chromatogram for all samples and QC samples in the electronic data package.

Submit summary quantitation reports prior to manual integration in the electronic data package. Also submit detailed quantitation report showing manually integrated target analytes, surrogates and / or internal standards.

If manual integrations are done for reasons other than those listed in Section 11.2.4, they must be initialed and dated by the analyst performing the integration on the quantitation report along with a brief narrative explaining why the manual integrations were required.

13.3 Reporting limits- The lowest calibration concentration for a given analyte is used, generally 0.5 µg/L for most analytes. Ketones reporting lowest calibration concentration is 5.0 µg/L. In the case of a dilution, the lowest calibration concentration for a given analyte is multiplied by the dilution factor to obtain the reporting limit.

13.4 Calculations should utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of two significant figures.

13.5 When total trihalomethanes is requested, calculate the total trihalomethane concentration by summing the four individual trihalomethane concentrations from any given analytes.

13.6 Tentatively Identified Compounds (Performed Only Upon Request, or for Superfund work)

13.6.1 A library search must be executed for non-target sample components for the purpose of tentative identification. For this purpose, the most recent release of the NIST/EPA/MSDC mass spectra library shall be used. Guidelines for making tentative identification are:

- Up to 10 organic compounds of greatest apparent concentration not listed in component list for the purgeable organic fraction, excluding the system monitoring compounds shall be tentatively identified via a forward search of the NIST/EPA/MSDC Library. Substances with responses less than 10% of the internal standard are not required to be

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searched.

- The relative intensities of major ions in the reference spectrum (>10% relative abundance) must be present in the sample spectrum.

- The relative intensities of major ions in the sample spectrum should agree within ± 20% of the relative intensities of major ions in the reference spectrum.

- Molecular ions present in the reference must be present in the sample spectrum.

- Ions present in the sample spectrum but not in the reference spectrum must be reviewed for possible background contamination or co-elution.

- Only after visual comparison of sample spectra with the nearest library spectrum will the analyst assign a tentative identification. Computer generated library search routines must not use normalization routines that would misrepresent the library or unknown spectra when compared to each other. (Any Qual value less than 90, on the Library Search Compound Report, is not reported.)

- Unless the compound can be tentatively identified following the above criteria, it is designated as "Unknown" and not reported.

- If a compound cannot be verified by the above criteria, but in the judgement of the analyst, the identification is correct, then the analyst will report that identification.

- Any TIC found in a sample and the corresponding method blank is considered method related and <u>not</u> counted as one of the ten reported TIC peaks.

14. Method Performance

A demonstration of capability (DOC) should be performed each time there is a significant change in the chemistry of the method, a major modification to an existing instrument, or a new instrument is installed. A DOC is performed by each analyst designated to analyze samples using this method. An annual check must subsequently be performed and documented for each analyst using this method. If

QC criteria provided in this method are not achieved, then corrective action(s) should be implemented. This may include sample re-analysis, as determined by existing laboratory policy and/or in consult with lab management and QAO.

14.1 Accuracy and Precision

14.1.1 Demonstration of Capability

A demonstration of capability study was conducted for this method for each analyst using this method. The study consisted of the analysis of four standards which are from a source independent of the standard curve. The results of the standards are based on the Table 3 limits. The % RSD should be within 20%. The results of the accuracy and precision study (true value, % recovery, standard deviation and % RSD) are maintained by the Quality Assurance Officer for each analyst.

14.1.2 Continuing Demonstration of Capability

An annual continuing demonstration of capability study must be performed and documented. It may consist of either successfully analyzing a PT sample or analyzing 2 sets of BS/BSD standards to within control limits as stated in section 14.1.1. The results of the continuing accuracy and precision study (true value, % recovery, standard deviation and % RSD or final report from the PT provider) are maintained by the Quality Assurance Officer for each analyst.

14.2 Method Detection Limit (MDL)

An MDL Study was conducted for this method. The study is based on the requirements listed in 40 CFR Part 136 Appendix B. Specific procedures for conducting an MDL study can be found in SOP # G-8. The MDL Study comprised the analysis of seven reagent grade water samples fortified at a level between 2-3x the detection limit. The results of the MDL determination (true value, average concentration, standard deviation and calculated MDL) are maintained by the Quality Assurance Officer for each method.

14.3 Limit of Quantitation (LOQ)

The Laboratory performs a Limit of Quantitation (LOQ) study on an annual basis for analytes associated with chemistry methods. The validity of LOQ is

confirmed by successful analysis of an LFB at approximately 2X the reporting limit. The recovery of each analyte is within the acceptance criteria established for the LFB, Section 15.6.2. After this study is completed, it is reviewed and approved by the Laboratory Management. A summary of all LOQ study performance is maintained in the Laboratory's Central File.

15. Quality Control

15.1 Quality control (QC) requirements are the demonstration of the laboratory capability followed by regular analyses of laboratory reagent blanks, field reagent blanks, and laboratory fortified blanks. A MDL for each analyte must also be determined.

15.2 Laboratory Reagent Blank (LRB) / Prep Blank (PB): Before any samples are analyzed, an LRB is analyzed. This blank consists of reagent grade water which has been generated from a MILLIPORE deionization/activated carbon filter/organex system or equivalent water treatment system. Additionally, the water is purged for approximately one hour with nitrogen. An internal standard and a set of surrogate standards are added to this water. The LRB demonstrates the absence of contaminants from equipment and reagents.

Acceptance Criteria: A method blank is run every 12 hours that samples are run. The method blank should be processed in exactly the same manner as the samples. It should be clean without any contaminants, but if present, the concentration should be less than the reporting limit.

Corrective Action: If contaminants are detected in the LRB then in order for the same contaminants to be reportable in the samples the sample concentration must be 10X the concentrations in the LRB. If the amount is less than 10 times the amount found in the blank, report the amount found in the sample as a U value. If the contaminants found in the method blank are not in the sample, then report the analytes (contaminants) as non-detect with the reporting limit as their values.

15.3 Demonstration of Capability(DOC). Refer to Section 14 of this SOP.

15.4 Surrogate Standards:

Acceptance Criteria: Surrogate recoveries for each run are examined to confirm that they are within the acceptance range of 70% to 130%.

Corrective Action: If the % Recovery for one or more of the surrogate standards are outside the acceptable range, the root cause for the problem should be assessed including the reanalysis of the sample. If no correction is possible, the associated

data, including the non-detect results (except when the recovery is high the sample is not qualified) should be qualified accordingly.

15.5 Internal Standards:

Acceptance Criteria: The area of the Internal Standards should be examined to confirm that the absolute areas have not changed more than ±50% for regulatory and non-regulatory (Superfund) analysis compared to the midpoint level of the initial calibration and/or continuing calibration check. The midpoint level should have the same concentration as the continuing calibration check.

Corrective Action: Rerun the sample if possible to check for purge anomalies. If no correction is possible, the associated data, including the non-detect (except where the recovery is high the sample should not be qualified) should be qualified accordingly.

15.6 Laboratory Fortified Blank (LFB) / BS/BSD / LCS/LCSD

15.6.1 Two (2) LFB samples are analyzed with each batch of samples that is processed as a survey group of ≤ 20 samples. Each LFB is prepared from a standard mix of a different source from that used to prepare the calibration solutions (synonymous to the "BS/BSD"). The average percent recovery (%R) and relative percent difference (RPD) is calculated for each analyte.

Calculate the percent relative difference (%RPD) using the equation:

$$\%RPD = \frac{|X1 - X2|}{\overline{X}} * 100$$

Where:

X1, X2 = Duplicate results

$\bar{X}$ = Average of duplicate results

15.6.2 Acceptance Criteria: The average percent recovery of the concentration for each analyte is located on Table 3. Maximum Relative Percent Difference (RPD) limit is 20%.

Corrective Actions:

15.6.2.1 If the percent recovery falls outside of the acceptable range for more than 10% of the total analyte list, recalibration is required.

If the percent recovery falls outside of the acceptable range for less than 10% of the total analyte list, all associated sample data for the affected analyte(s) must be qualified accordingly.

15.7 Matrix Spike (MS) or LFM

15.7.1 One LFM/MS is prepared per matrix for an analytical batch of 20 samples or less regardless of the number of different projects that comprise the analytical batch. The LFM/MS is prepared from the same source as that used to prepare the calibration solutions. The LFM/MS is usually fortified at the midpoint concentration found in the calibration curve. In order to properly assess the LFM/MS, the concentrations should be equal to or greater than the background concentrations in the sample selected for fortification. If the fortification level is less than the background concentration, recoveries are not reported.

15.7.2 The mean percent recovery of the concentration for each analyte is located on Table 3. If the percent recovery falls outside of the acceptable range, a matrix induced bias can be assumed for the respective analyte(s) and the data for the analyte(s) must be qualified accordingly.

15.8 Initial Calibration Verification Standard (ICV)

15.8.1 An ASCS/ICV sample is analyzed whenever a new calibration curve is generated. The ICV sample is usually prepared in the same manner as the midpoint level of the calibration curve, but from a separate source different from the calibration standards. No verifications are necessary for any subsequent generation of calibration curves from the same set of working standards.

15.8.2 The percent recovery, R, of the concentration for each analyte, must be 70% – 130% for all the target analytes. If the recovery falls outside of this acceptable range, the cause(s) must be identified and resolved by analyzing a third independent source. Corrective Action: if 10% of the total analytes failed then the ICV must be rerun.

If it is still outside the acceptable range, the curve for that analyte should be reanalyzed. If reporting any analyte that failed the %D criteria (as long as it's less than 10% of the total analytes), any associated data including non-detect (except where %D is high) should be qualified

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15.8.3 The (ICV) will also be used as an LFB/BS/BSD if field samples are being analyzed after the calibration curve within the same 12-hour sequence.

16. Reporting and Validation

16.1 Reporting Limits

The reporting limit is based on the concentration of the lowest calibration standard analyzed. All results are reported to 2 significant figures. The reporting limit is calculated by taking the lowest standard of the calibration curve using the appropriate equation from Section 12.3. Results for the sample that has the lowest dilution should be reported.

16.2 Electronic Data Package (EDP)

Requirement for Electronic Data Packages is on \\X0202tnjecfs2\desalab\desalab\Laboratory_Branch\Electronic Data Packages\Requirements for EDP Packages.

16.3 Laboratory Information Management System (LIMS)

Note: Refer to SOP G-28 Analyst/reviewer sections

16.3.1 Data entry – upload into Element is done through DataTool. Verify the accuracy of the reported results from the instrument data, including unit conversion, reporting limit changes, dilution correction, TICs, etc.

16.3.2 Verify the contents of the Element reviewer checklist based on the method QC requirements.

16.3.3 The analyst completes the reviewer checklist. (Most instrument QC is not automatically checked and recorded in the reviewer checklist). The analyst must record these checks manually in the reviewer checklist and could be obtained from within Element (ex. Data review screen) and/or from the instrument data. Anomalies must be addressed in the comment section of the reviewer checklist by the Analyst.

16.4 Data Validation

The data package is given to the reviewer. The review is done by a peer who was not involved in the analysis. Upon completion of the review, including validation of all the appropriate codes in the LIMS for the particular project(s), the data reviewer will sign and date the QA/QC Checklist.

Analysts must include an example calculation on a sample for each method/matrix analyzed in all data packages and, if applicable, using a detect result. The calculation will begin with the sample result generated from the instrument and end with the result reported. It is the responsibility of the peer reviewer to verify the accuracy of the calculations performed.

The only exception to this policy would be if no data reduction/manipulation is performed on the sample results between the instrument output and final results reported. (that is to say if the sample results generated from the analyses is reported directly from the instrument). Also, for multi-analyte methods, one analyte needs to be carried through in the example calculation representing the group.

Once review is completed by the peer reviewer which is the final check off on the Reviewer Checklist, the peer reviewer, prints out the Reviewer Checklist and includes it to the Project folder.

Refer to SOP G-26 for Details.

16.5 Data Records

An analytical data package is prepared for each project and electronically stored in the designated project folder. The Electronic Data Package (EDP) is filed based on the nomenclature and sequence established. If a batch/sequence consists of several projects the associated files are copied into each project folder. Cross-reference sheets, if used to document the location of the electronic files are filed in the respective project folder.
Please refer to SOP G-26 for details.

16.6 Electronic Data Archive

Instrument data files are archived to a central server system. They are placed under subdirectories by instrument name, and date run. The main data file name generated is copied from the acquisition instrument with all associated

files to the server subdirectory.

17. Pollution Prevention

17.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The EPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the Agency recommends recycling as the next best option.

17.2 The quantity of chemicals purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

17.3 For information about pollution prevention that may be applicable to laboratories and research institutions, consult “Less is Better: Laboratory Chemical and Management for Waste Reduction”, available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street N.W., Washington D.C. 20036, (202)872-4477.

18. Waste Management

The USEPA requires that laboratory waste management practice be conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes should be characterized and disposed of in an acceptable manner. The agency urges laboratories to protect the air, water and land by minimizing and controlling all releases from hoods and bench operations, complying with the letter and spirit of any water discharge permit and regulations, and by complying with all solid and hazardous waste regulations, particularly the hazardous waste identification rules and land disposal restrictions. For further information on waste management consult the Region 2 SOP G- 6, “Disposal of samples and hazardous wastes in Regional Laboratory”.

19. References

19.1 EPA Method 524.2

19.2 EPA SOP G-15, Definitions, Current Version.

19.3 Promium Element Data System, Laboratory Information Management Systems, Promium, LLC. Current Version.

19.4 Laboratory Quality Management Plan (LQMP), U.S. Environmental Protection Agency, Region 2 Laboratory Branch. Current Version.

19.5 Environmental, Health and Safety Operations Manual & Chemical Hygiene Plan, EPA Region 2. Current Version.

19.6 SOP G-6 Disposal of Samples & Hazardous Waste and Chemical Inventory Management. Current Version.

19.7 SOP G-9, Laboratory Policy for the Establishment and Maintenance Of Logbooks Associated With Chemical Analysis. Current Version.

19.8 SOP G-26, Guidance for Laboratory Data Review Current Version

19.9 Working with Promium. Current version. Current Version

19.10 SOP G-28, Laboratory Operations using “Element” LIMS. Current Version

20. TABLES

TABLE 1 – BFB Ion Abundance Criteria

Mass	Ion Abundance
50	15-40% of base peak
75	30-80% of base peak
95	base peak, 100% relative abundance
96	5-9% of base peak
173	less than 2% of mass 174
174	greater than 50% of base peak
175	5-9% of mass 174
176	greater than 95% and less than 101% of mass 174
177	5-9% of mass 176

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TABLE 2 - Quantitation Ion, Internal Standard, and Target List Reference

Compound Name ANALYTE	QUANTITATION ION	QUANTITATION SEC ION(S)	INT STD. USED	TARGET LIST*
Fluorobenzene (IS #1)	96	---	---	---
Dichlorodifluoromethane	85	87	1	S
Chloromethane	50	52	1	S
Vinyl Chloride	62	64	1	S
Bromomethane	94	96	1	S
Chloroethane	64	66	1	S
Trichlorofluoromethane	101	103	1	S
1,1-Dichloroethene	96	61, 63	1	S
1,1,2-Trichloro-1,2,2-Trifluoroethane	101	85, 151	1	S
Carbon Disulfide	76	---	1	S
Acetone	43	58	1	S
Methyl Acetate	43	74	1	S
Acrylonitrile	52	53, 51	1	*
Methylene Chloride	49	84, 86	1	S
Trans-1,2-Dichloroethene	96	61, 98	1	S
Methyl tert-Butyl Ether	73	74, 57,43	1	S
1,1-Dichloroethane	63	65, 83	1	S
Cis-1,2-Dichloroethene	96	61, 98, 63	1	S
2-Butanone	43	57,72	1	S
Bromochloromethane	128	130, 49	1	S
2,2-Dichloropropane	77	79, 97	1	*
Chloroform	83	85	1	S
Dibromomethane	93	174, 95	1	*
Methylmethacrylate	69	100,41	1	*
1,1,1-Trichloroethane	97	61, 99	1	S
Cyclohexane	56	69, 84	1	S
Carbon Tetrachloride	117	119	1	S
Benzene	78	77	1	S
1,3-Dichloropropane	76	78,41	1	*
1,1,1,2-Tetrachloroethane	131	119, 133	1	*
1,2-Dichloroethane-d4 (SURR)	65	67	1	S

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Compound Name ANALYTE	QUANTITATION ION	QUANTITATION SEC ION(S)	INT STD. USED	TARGET LIST*
1,2-Dichloroethane	62	64	1	S
Toluene-d8 (IS #2)	98	---	---	---
Trichloroethene	95	130, 132	2	S
1,2-Dichloropropane	63	76, 65,41	2	S
1,1-Dichloropropene	75	110, 77	2	S
Bromodichloromethane	83	127, 85	2	S
Cis-1,3-Dichloropropene	75	110	2	S
4-Methyl-2-Pentanone	43	58,85	2	S
Toluene	91	92	2	S
Trans-1,3-Dichloropropene	75	77,110	2	S
1,1,2-Trichloroethane	97	83,99	2	S
Tetrachloroethene	166	168, 129	2	S
Methylcyclohexane	83	55, 98	2	S
Dibromochloromethane	129	127	2	S
1,2-Dibromoethane	107	109	2	S
2-Hexanone	43	58	2	S
Chlorobenzene	112	77, 114	2	S
Ethylbenzene-d10 (IS #3)	98	---	---	---
Ethylbenzene	91	106	3	S
m/p-Xylene	91	106	3	S
o-Xylene	91	106	3	S
n-Propylbenzene	91	120	3	*
o-Chlorotoluene	91	126	3	*
p-Chlorotoluene	91	126	3	*
t-Butylbenzene	91	119	3	*
Styrene	104	78	3	S
Bromoform	173	93, 175	3	S
Bromobenzene	156	77, 158	3	*
1,2,3-Trichloropropane	75	77	3	*
Isopropylbenzene	105	120	3	S
4-Bromofluorobenzene (SURR)	95	174, 176	3	S
1,1,2,2-Tetrachloroethane	83	85	3	S
1,3-Dichlorobenzene	146	111, 148	3	S
1,4-Dichlorobenzene	146	111, 148	3	S

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Compound Name ANALYTE	QUANTITATION ION	QUANTITATION SEC ION(S)	INT STD. USED	TARGET LIST*
1,2-Dichlorobenzene	146	111, 148	3	S
sec-Butylbenzene	105	134	3	*
n-Butylbenzene	91	134	3	*
1,2-Dibromo-3-Chloropropane	75	155,157	3	S
1,2,4-Trimethylbenzene	105	120	3	*
1,3,5-Trimethylbenzene	105	120	3	*
p-Isopropyltoluene	119	134, 91	3	*
1,2,4-Trichlorobenzene	180	145, 182	3	S
Naphthalene	128	--	3	*
Hexachlorobutadiene	225	260	3	*
1,2,3-Trichlorobenzene	180	145, 182	3	S

S = Superfund; *Non-specific project requests

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Table 3 -PERCENT RECOVERY LIMITS FOR MATRIX SPIKE AND BS/BSD

Analyte List	% Recovery
Dichlorodifluoromethane	23-117
Chloromethane	15-152
Vinyl Chloride	41-147
Bromomethane	31-157
Chloroethane	57-125
Trichlorofluoromethane	68-153
1,1-Dichloroethene	68-140
1,1,2-Trichloro-1,2,2-Trifluoroethane	78-139
Carbon Disulfide	65-135
Acetone	39-154
Methyl Acetate	49-141
Methylene Chloride	70-175
Trans-1,2-Dichloroethene	74-136
Methyl tert-Butyl Ether	61-128
1,1-Dichloroethane	80-133
Cis-1,2-Dichloroethene	77-141
2-Butanone	68-157
Bromochloromethane	64-151
Chloroform	74-137
1,1,1-Trichloroethane	78-130
Cyclohexane	83-138
Carbon Tetrachloride	82-137
Benzene	76-131
1,2-Dichloroethane	70-133
1,1,1,2-Tetrachloroethane	73-124
Trichloroethene	81-120
1,2-Dichloropropane	84-123
Bromodichloromethane	79-119
Cis-1,3-Dichloropropene	79-126
4-Methyl-2-Pentanone	84-145
Toluene	83-118
Trans-1,3-Dichloropropene	74-126
1,1,2-Trichloroethane	80-125
Tetrachloroethene	85-122

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Methylcyclohexane	82-127
Dibromochloromethane	79-122
1,2-Dibromoethane	76-128
2-Hexanone	82-150
Chlorobenzene	84-118
Ethylbenzene	85-115
m/p-Xylene	86-118
o-Xylene	84-120
n-Propylbenzene	85-125
Styrene	87-112
Bromoform	75-125
1,2,3-Trichloropropane	68-122
Isopropylbenzene	85-117
1,1,2,2-Tetrachloroethane	73-124
1,3-Dichlorobenzene	87-119
1,4-Dichlorobenzene	86-121
1,2-Dichlorobenzene	82-123
1,2-Dibromo-3-Chloropropane	58-130
1,2,4-Trimethylbenzene	82-129
1,3,5-Trimethylbenzene	80-110
1,2,4-Trichlorobenzene	76-124
1,2,3-Trichlorobenzene	64-145

The above limits are based on the control chart generated by Element(LIMS)

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Table 4 – QA/QC Remark Codes

Qualifier Code	Definitions
U	The analyte was not detected at or above the reporting limit
J	The identification of the analyte is acceptable; the reported value is an estimate
UJ	The analyte was not detected at or above the reporting limit. The reporting limit is an estimate.
NJ	There is presumptive evidence that the analyte is present; the analyte is reported as a tentative identification. The reported value is an estimate.
K	The identification of the analyte is acceptable; the reported value may be biased high. The actual value is expected to be less than the reported value.
L	The identification of the analyte is acceptable; the reported value may be biased low. The actual value is expected to be greater than the reported value.

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EPA

STANDARD OPERATING PROCEDURE

ANALYSIS OF PERFLUORINATED ALKYL ACIDS IN WATER BY HPLC/MS/MS

	Signature and Title	
Prepared by:	Nicholas Mendola, Chemist, OICS	7/31/18 Date
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Approved by:	John R. Bourbon, Chief, Laboratory Branch	7/31/18 Date

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2
DIVISION OF ENVIRONMENTAL SCIENCE AND ASSESSMENT
LABORATORY BRANCH

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1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes routine procedures for the analysis of selected perfluorinated compounds (PFCs) in drinking water using solid phase extraction (SPE) and liquid-chromatography tandem mass spectrometry (LC-MS/MS) analysis. Compounds included in this SOP are listed in the table below:

Analyte	ACRONYM	Chemical Abstract Services Registry Number (CASRN)
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorodecanoic acid	PFDA	335-76-2
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluorononanoic acid	PFNA	375-95-1
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorotetradecanoic acid	PFTA	376-06-7
Perfluorotridecanioc acid	PFFTrDA	72629-94-8
Perfluoroundecanoic acid	PFUnA	2058-94-8
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	----------
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	----------

1.1 This method is based on US EPA Method 537-1, Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC-MS/MS), Version 1.1, September 2009. The reporting limit for the target compounds is 4.0 ng/L. Refer to Table 1 in Appendix for complete list.

2.0 SUMMARY OF METHOD

Water samples are extracted using solid phase extraction (SPE) and concentrated to dryness, then re-dissolved in 96:4 methanol/reagent water. A 10 uL aliquot of the sample extract is injected into a UPLC/tandem mass spectrometer. Target compounds are separated chromatographically running a binary gradient consisting of methanol and 20mM ammonium acetate buffer. The ionization mode used is electrospray with the polarity operating in the negative mode. The target compounds are detected using an Agilent Triple Quad. Multiple reaction monitoring (MRM) is used to monitor the transition from the molecular ion to the product ion which is used for compound identification and quantitation. Quantitation is performed using an internal standard calibration method using isotopically labeled analogs and the sample preparation, and analysis performance is assessed by the use of isotopically labeled surrogate compounds.

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3.0 DEFINITIONS

Definitions are given in Section 19 (Glossary) of this SOP and SOP G-15 for definitions.

4.0 INTERFERENCES

4.1 All glassware must be meticulously cleaned. Wash glassware with detergent and tap water, rinse with tap water, followed by a reagent water rinse. Non-volumetric glassware can be heated in a muffle furnace at 400 °C for 2 hr or solvent rinsed. Volumetric glassware should be solvent rinsed and not be heated in an oven above 120 °C. Store clean glassware inverted or capped. Do not cover with aluminum foil because PFCs can be potentially transferred from the aluminum foil to the glassware. Analytes can potentially adsorb to glass surfaces. PFC analytes, IS and SUR standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers.

4.2 Method interferences may be caused by contaminants in solvents, reagents (including reagent water), sample bottles and caps, and other sample processing hardware that lead to discrete artifacts and / or elevated baselines in the chromatograms. The method analytes in this method can also be found in many common laboratory supplies and equipment, such as PTFE (polytetrafluoroethylene) products, LC solvent lines, methanol, aluminum foil, SPE sample transfer lines, etc. All items such as these must be routinely demonstrated to be free from interferences (less than 1/3 the MRL for each method analyte) under the conditions of the analysis by analyzing laboratory reagent blanks. **Subtracting blank values from sample results is not permitted.**

4.3 Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the water. Humic and / or fulvic material can be co-extracted during SPE and high levels can cause enhancement and / or suppression in the electrospray ionization source or low recoveries on the SPE sorbent. Total organic carbon (TOC) is a good indicator of humic content of the sample. Under the LC conditions used during method development, matrix effects due to total organic carbon (TOC) were not observed.

4.4 Relatively large quantities of the preservative are added to sample bottles. The potential exists for trace-level organic contaminants in these reagents. Interferences from these sources should be monitored by analysis of laboratory reagent blanks, particularly when new lots of reagents are acquired.

4.5 SPE cartridges can be a source of interferences. The analysis of field and laboratory reagent blanks can provide important information regarding the presence or absence of such interferences. Brands and lots of SPE devices should be tested to ensure that contamination does not preclude analyte identification and quantitation.

5.0 SAFETY

5.1 The toxicity and carcinogenicity of each reagent used in this method has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should

be minimized by good laboratory practices, e.g. wear proper protective equipment, safety glasses, gloves, lab coat and working inside hoods whenever possible.

5.2 Refer to the Edison Facility Safety Manual Region II Part 2 – Laboratory Safety and Appendices 13/13A - Chemical Hygiene Plan for specific guidelines. The manual is available on the Region II Intranet. A hard copy is available in the Laboratory Office Area.

5.3 PFOA has been described as "likely to be carcinogenic to humans". Both PFOS and PFOA have very low (70 parts per trillion) reference doses in water. Pure standard and high concentration solutions of these materials should be handled with suitable personal protective equipment. For detailed explanations consult the Material Safety Data Sheets (MSDS), available in the Laboratory Office area. MSDS are also electronically available.

6.0 EQUIPMENT AND SUPPLIES

6.1 LC/MS/MS

Agilent 1290 Infinity UHPLC system with autosampler, degasser, and refrigeration unit;

Agilent 6460 Triple Quadrapole LC/MS with Jetstream technology and electrospray source;

Waters Acquity BEH C18, 2.1 x 100 mm, 1.7 um particle size, Part # 1 86002352

PC is interfaced to the UHPLC and MS systems. The system must allow the continuous acquisition and storage on machine-readable media of all spectra obtained throughout the duration of the chromatographic program. Mass Hunter Version B.04.01 software provided by Agilent is used for data handling.

The system was modified by replacing Teflon solvent lines with PEEK tubing, and stainless steel frits.

6.2 Other Equipment / Materials

<u>ANALYTICAL BALANCE</u> capable of 0.0001 g.

<u>SONICATOR</u> – Cole-Parmer 8851.

<u>LC/MS/MS system</u> (Agilent Part #5182-0554).

<u>SAMPLE CONTAINERS</u> – 250 mL polypropylene bottles fitted with polypropylene screw caps. Sample bottles must be discarded after use. (ThermoFisher Scientific 250 mL Polypropylene bottles, Cat #: Nalgene 2187-0008)

AUTOSAMPLER VIALS – Polypropylene 0.7-mL autosampler vials with polypropylene caps. (Waters Corp. Polypropylene 12 x 32 mm screw neck vials, with polyethylene septumless cap, 700 uL volume, 100/pkg, Cat #: 186005230)

MICRO CENTRIFUGE TUBES – Corning 2.0 mL mircrocentrifuge polypropylene tubes, Cat #: CLS430917-500EA.

POLYPROPYLENE GRADUATED CYLINDERS – Suggested sizes include 25, 50, 100, 500, 1000-mL cylinders.

VAC ELUT 20 MANIFOLD w/COLLECTION RACK – Agilent Vac Elut 20 Manifold w/ collection rack for 16 x 100 mm test tubes, Cat #: 12234505.

SPE CARTRIDGES – (Oasis HLB 6cc 500 mg LP, Cat #: 186000115)

OA-SYS ORGANOMATION N-EVAP - 112 nitrogen evaporator.

CENTRIFUGE TUBES – Sigma-Aldrich Corning 15 mL centrifuge tubes, polypropylene, Cat #: CLS430790-50EA / CLS430790-500EA.

CLEAR PVC TUBING – (VWR Signature Clear PVC Tubing, Cat: #60985-544)

SPATULAS – (VWR Disposable Polypropylene Spatulas, Cat #: 80081-188)

DISPOSABLE TRANSFER PIPETS - (Samco Scientific, sm bulb 231)

DISPOSABLE TRANSFER PIPETS - (Fisherbrand, 13-711-7M)

PIPETTES - capable of delivering 5 to 5000 µL (Eppendorf).

VOLUMETRIC FLASKS - (5 mL, 10 mL, 50 mL, 250 mL).

WEIGHT PAPER - (Fisher Part #09-898-12A).

7.0 REAGENTS AND SOLUTIONS

All purchased and prepared standards and reagents are recorded in Element which assigns a unique ID# to each. All containers must be labeled with the Name, ID#, concentration, preparation date and expiration date (where applicable). Please refer to SOP # G-9 for details.

7.1 Reagents

Reagent Water (H_2O) (Fisher Optima Part#W6-4).

Methanol (MeOH) (Fisher Optima Part#A456-4).

Ammonium Acetate (AAC) (Sigma-Aldrich Part#: 09689-250G)

Preservative – Trizma Pre-Set Crystals – Sigma Aldrich T7193-250G – Trizma crystals pH 7.0, functions as a buffer (enhances SPE recoveries), as well as removes free chlorine in chlorinated finished waters (1.25 g to each 250 mL sample bottle).

7.2 Aqueous Mobile Phases Preparation:

ESI^- mode:

A1: 20 mM Ammonium Acetate. Prepared from reagents in Section 7.1 by adding 1.5400 g Ammonium Acetate into 1 L of Water.

B1: MeOH. Prepared from reagents in Section 7.1 by adding 1 L of Methanol.

7.3 Gases
Ultra-High Purity Nitrogen (99.999 % or greater) used as collision gas. Requires gas pressure of 30 psi. Nitrogen gas generator used for desolvation. Requires gas pressure of 95 psi.

7.4 Standard Solutions

All solutions prepared by the analyst are permanently recorded in Standard Logbook and/or Element. (Please refer to SOP #G-9 for details). Standard shall be purchased as neat, solutions or mixtures with certification to their purity, concentration and authenticity. Prepare all solutions in the Laboratory using Class A volumetric glassware or polypropylene centrifuge tubes. Store stock solutions at ≤4 °C. All containers of prepared reagents, standards, and reference materials must hold a unique identifier and expiration date and must be linked to the documentation in the Standard/ Reagent Preparation Logbook.

7.5 Calibration Standards

Compound	Manufacturer	CAS	Concentration
PFBS	Wellington	375-73-5	50 ug/mL
PFDA	Wellington	335-76-2	50 ug/mL
PFDoA	Wellington	307-55-1	50 ug/mL
PFHpA	Wellington	375-85-9	50 ug/mL
PFHxS	Wellington	355-46-4	50 ug/mL
PFHxA	Wellington	307-24-4	50 ug/mL
PFNA	Wellington	375-95-1	50 ug/mL
PFOS	Wellington	1763-23-1	50 ug/mL
PFOA	Wellington	335-67-1	50 ug/mL
PFTA	Wellington	376-06-07	50 ug/mL

PFTrDA	Wellington	72629-94-8	50 ug/mL
PFUnA	Wellington	2058-94-8	50 ug/mL
NEtFOSAA	Wellington	----------	50 ug/mL
NMeFOSAA	Wellington	----------	50 ug/mL
6:2 FTS	Wellington	----------	50 ug/mL
8:2 FTS	Wellington	----------	50 ug/mL

7.6 Internal Standards

Compound	Manufacturer	CAS	Concentration
$^{13}C_2$-PFOA	Wellington	----------	50 ug/mL
$^{13}C_4$-PFOS	Wellington	----------	50 ug/mL
d3-NMeFOSAA	Wellington	----------	50 ug/mL
$^{13}C_5$MPFNA	Wellington	----------	50 ug/mL
d-N-MeFOSA	Wellington	----------	50 ug/mL
M2-6:2FTS	Wellington	----------	50 ug/mL

7.7 Surrogate Standards

Compound	Manufacturer	CAS	Concentration
$^{13}C_2$-PFHxA	Wellington	----------	50 ug/mL
$^{13}C_2$-PFDA	Wellington	----------	50 ug/mL
d5-NEtFOSAA	Wellington	----------	50 ug/mL
MPFHxS	Wellington	----------	50 ug/mL
d-N-EtFOSA	Wellington	----------	50 ug/mL
M2-8:2FTS	Wellington	----------	50 ug/mL

7.8 Stock Standards

Calibration solutions prepared from neat materials are gravimetrically determined using a calibrated and NIST certified Mettler AE162 analytical balance. Materials are measured to 0.0001 g precision. Weigh as close to 0.0250 g as practical and add to 25 mL methanol for 1000 ug/mL stock.

SALT CONVERSION: PFHxS and PFOS in neat form are supplied as the potassium or sodium salts and the measured mass must be corrected for the salt content according to the equation below.

$$\text{Mass}_{acid} = \text{Measured Mass}_{salt} \times \text{MW}_{acid} / \text{MW}_{salt}$$

Where:

MW_{acid} = the molecular weight of PFAA
Mw_{salt} = the molecular weight of purchased salt

Example – For PFHxS – K + salt: if you weighed 0.02740 g

0.02740 x MW_{acid} 399.102 / MW_{salt} 438.20 = 0.02496 g of acid

7.9 Quality Control Samples (QCS) – Second source standards –

Compound	Manufacturer	CAS	Concentration
PFBS	SIGMA-ALDRICH	375-73-5	
PFDA	AccuStandard	335-76-2	100 ug/mL
PFDoA	AccuStandard	307-55-1	100 ug/mL
PFHpA	AccuStandard	375-85-9	100 ug/mL
PFHxS	SIGMA-ALDRICH	355-46-4	Neat
PFHxA	AccuStandard	307-24-4	100 ug/mL
PFNA	AccuStandard	375-95-1	100 ug/mL
PFOS	SIGMA-ALDRICH	1763-23-1	
PFOA	AccuStandard	335-67-1	100 ug/mL
PFTA	SIGMA-ALDRICH	376-06-07	Neat
PFTrDA	SIGMA-ALDRICH	72629-94-8	Neat
PFUnA	SIGMA-ALDRICH	2058-94-8	Neat
NEtFOSAA		----------	50 ug/mL
NMeFOSAA		----------	50 ug/mL
6:2 FTS		----------	50 ug/mL
8:2 FTS		----------	50 ug/mL

7.10 Matrix Spike/LFB Spiking Solution

Using the 100 ug/mL standards (9.13) add 250 uL of each individual compound to 25 mL 96/4 for a 1.0 ug/mL matrix spike solution. Spike each 250 mL sample with 20 uL for a spike concentration of 80 ng/L. Dilute this stock 2mL into 25 mL (96/4) for an 80 ng/mL low level spike solution. Spike each 250 mL low level LFB with 50 uL for a spike level of 16 ng/L.

8.0 SAMPLE COLLECTION, PRESERVATION, STORAGE AND HOLDING TIMES

8.1 Sample Bottle Preparation

8.1.1 Samples must be collected in a 250-mL polypropylene bottle fitted with a polypropylene screw-cap.

8.1.2 The preservation reagent, listed in the table below, is added to each sample bottle as a solid prior to shipment to the field (or prior to sample collection).

Trizma 5.0 g/L buffering reagent and removes free chlorine

8.2 Sample Collection

8.2.1 The sample handler must wash their hands before sampling and wear nitrile gloves while filling and sealing the sample bottles. PFAA contamination during sampling can occur from a number of common sources, such as food packaging and certain foods and beverages. Proper hand washing and wearing nitrile gloves will aid in minimizing this type of accidental contamination of the samples.

8.2.2 Open the tap and allow the system to flush until the water temperature has stabilized (approximately 3 to 5 min). Collect samples from the following system.

8.2.3 Fill sample bottles, taking care not to flush out the sample preservation reagent. Samples do not need to be collected headspace free.

8.2.4 After collecting the sample, cap the bottle and agitate by hand until preservative is dissolved. Keep the sample sealed from time of collection until extraction.

8.3 Field Reagent Blanks (FRB)

8.3.1 A FRB must be handled along with each sample set. The sample set is composed of samples collected from the same sample site and at the same time. At the laboratory, fill the field blank sample bottle with reagent water and preservatives, seal, and ship to the sampling site along with the sample bottles. For each FRB shipped, an empty sample bottle (no preservatives) must also be shipped. At the sampling site, the sampler must open the shipped FRB and pour the preserved reagent water into the empty shipped sample bottle, seal and label this bottle as the FRB. The FRB is shipped back to the laboratory along with the samples and analyzed to ensure that PFAAs were not introduced into the sample during sample collection/handling.

8.3.2 The same batch of preservative must be used for the FRBs as for the field samples.

8.3.3 The reagent water used for the FRBs must be initially analyzed for method analytes as a LRB and must meet the LRB criteria in Section prior to use. This requirement will ensure samples are not being discarded due to contaminated reagent water rather than contamination during sampling.

8.4 Sample shipment and storage – Samples must be chilled during shipment and must not exceed 10 °C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 10 °C when the samples are received at the laboratory. Samples stored in the lab must be held at or below 6 °C until extraction, but should not be frozen.

NOTE: Samples that are significantly above 10 °C, at the time of collection, may need to be iced or refrigerated for a period of time, in order to chill them prior to shipping. This will allow them to be shipped with sufficient ice to meet the above requirements.

8.5 Samples and extraction holding times – HOLDING TIME is 14 days from collection date. Extracts must be stored at room temperature and analyzed with 28 days after extraction.

8.6 SPE Extraction procedure

Condition cartridge with 15 mL MeOH
Condition cartridge with 18 mL reagent water
Load 250 mL sample onto cartridge (10-15 mL/min)
Rinse sample bottle 7.5 mL water (TWICE) drawing through tubes
Vacuum dry cartridges for 10 minutes (15 in. Hg)
Remove cartridges and place onto Agilent VAC ELUT manifold loaded with labeled vials
Add 4 mL methanol to bottles, rinse, and slowly draw through tubes and cartridges
Repeat with 2nd 4 mL aliquot of methanol

Concentration, and final Volume:

Turn on the N-EVAP and allow sample extracts to warm to room temperature. Concentrate the extract to dryness under a gentle stream of nitrogen in a heated water bath (60-65 °C) to remove all the water / methanol mix. Add the appropriate amount of 96:4% (vol/vol) methanol: water solution and the INTERNAL STANDARD to the collection vial to bring the volume to 1.0 mL and vortex. Transfer a small aliquot with a disposable polypropylene micro-pipet to a polypropylene autosampler vial.

9.0 SAMPLE PREPARATION

Sample preparation is documented in the Sample Preparation Log Book (refer to SOP #G-9) and/or in Element Batch/Bench Sheets (refer to SOP #G-28).

NOTE: Choose the correct Element Batch/Bench Sheets for specific extraction template to use (i.e for NVOA – NPDES/SF; Pesticide-GC).

9.1 LRB/ LFB – Add 1.25 g of Trizma to a 250 mL polypropylene bottle, and using a polypropylene graduated cylinder fill with 250 mL reagent water.

9.2 Sample Volume Determination – Mark the level of the sample on the bottles. After extraction determine sample volume by filling empty bottle with tap water to marked level and pouring into a graduated cylinder, measure and record to nearest 10 mL.

Spiking Samples – Spike all samples with 30 uL of surrogate and spike appropriate QC samples (MS, LFB etc.) with either 20 uL or 50 uL of the Low Level spike mix. Once spiked cap and invert each sample to mix.

SPE Cartridge Prep – Connect Oasis HLB SPE cartridges to

9.4 Extraction Logbook

Entries must be made in the Extraction Logbook for the samples and quality control samples. Refer to the Extraction Logbook for the entry of necessary information.

10.0 CALIBRATION AND STANDARDIZATION/INSTRUMENT OPERATING CONDITIONS

10.1 Calibration and Standardization of LC/MS/MS

The mass spectrometer must be calibrated using Cesium Iodide (Agilent Technologies Part# G1969-85000) following manufacturer specifications to ensure accurate assignments of m/z's by the instrument. This calibration must be performed at least annually to maintain instrument sensitivity and accuracy. It must be repeated after performing major maintenance of the mass spectrometer.

Before measuring a given PFC the analyte must be optimized. Tables 2 and 3 provide the optimized instrument operation for these analytes. Each analyte is calibrated by analyzing calibration standards containing the concentration levels of the PFCs with the labeled standards at constant concentration (Table 4). The calibration vials must be used within 72 hours of preparation to ensure optimum results. After obtaining the chromatogram for each standard an external calibration technique is used to monitor the primary and confirmatory MRM transitions of each analyte.

Calibration software (MassHunter) is used to conduct the quantitation of the target analytes and internal standards using the primary MRM transition. Concentrations are calculated using MassHunter to generate linear regression or quadratic calibration curves. Check Section 14.2 for additional information.

10.2 Instrument Operating Conditions

The LC/MS/MS conditions vary according to the ionization mode in use. Refer to the Tables 2 and 3 for the specific conditions.

If any maintenance is performed on the instrument, register the activities in the Element (LIMS) Maintenance Logbook. Refer to the Maintenance Logbook for the entry of necessary information.

11.0 PROCEDURE/SAMPLE ANALYSIS

11.1 Analytical Sequence

The date of all solutions used during the analysis must be recorded in the run log so that they can be traced back to the Standard Preparation Logbook or Element for such information as concentrations, lot, vendor, etc.

The analytical sequence must include runs of the solvents in use (MeOH and water), the calibration curve, a method blank, two LCS's, and samples. After analyzing the calibration standards ensure that no carry-over is occurring. If any carry-over is identified, add extra wash and solvent blanks.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Qualitative Identification

Verify the presence of the primary/confirmatory MRM transitions. For positive identification in the samples, the compound transitions must have a signal to noise ratio (S/N) >3. The only exception is when the secondary transition presents a S/N <3 in all calibration standards.

Verify the retention times of all analytes versus the Injection Internal Standards for accuracy of retention.

Verify that no interferences or unusual peaks are present in the chromatogram that may interfere with the target analytes. Verify that the blank sample does not contain target analytes. Refer to Section 14.4 for blank sample contamination acceptance criteria.

Verify that all analytes are within the calibration curve range concentration. If any analyte exceeds the highest concentration level the sample must be diluted and reinjected. Add the appropriate amount of labeled standard to the diluted sample to maintain a final concentration of 500 pg/mL.

12.2 Quantitative Determination

The analytes identified in the sample are quantified by using the internal standard method. Report the results using the available Reporting Software package. The quantitation report generated is examined to confirm that the analytes present have been detected (i.e. no visible

12.3 Internal Standard quantitation and compound recovery

The Data System determines the concentrations in the extract of the native compounds using the response factors determined from the calibration data (Section 11.2). Using the concentration in the extracts, calculate the percent recovery of the compounds using the following equation:

Recovery (%) = Concentration found (pg/mL)/ Concentration spiked (pg/mL) x 100.

The percent recovery of the spike shall fall within the limits specified in Table 7. If the percent recovery is not within these limits, matrix interference may be present in the selected sample. If the interference cannot be removed the results must be qualified with data qualifiers listed in SOP#G-26.

12.4 Manual Integration

The compound identification and integration results generated by MassHunter may not always be accurate because of the following reasons: the automated integration routine may not find the target analyte as a result of retention time shift, coeluting interference, or peak inappropriate intensity; the target analyte peak areas may be incorrectly integrated by the automated integration routine as a result of poor peak

shape, co-elution with other peaks, or significant baseline drift; if one or more peaks elute within the MRM transition window for a target analyte, the automated integrated routine may not pick the peak with a retention time that best matches the retention time established by the calibration.

It is the analyst's responsibility to validate the integration report generated by the computer software for every sample and calibration analysis. When errors are detected in the compound identification and peak integration, the analyst must conduct manual integration to correct the errors.
The manual integration must be scientifically valid. The entire area of the subject(s) peaks and only the area of the subject(s) should be integrated for that peak. Conducting peak-shaving to eliminate part of the subject peak or including peaks not belonging to the subject peak is prohibited. Manual calibration performed solely to meet the calibration and surrogate QC criteria is unacceptable. Manual integration must be documented (software) and a printout of detailed quantitation report showing the manually integrated analytes must be obtained.

If manual integrations are done for reasons other than those listed above, they must be initialed and dated by the analyst performing the integration on the quantitation report along with a brief narrative explaining the reasons for performing manual integration.

13. METHOD PERFORMANCE

13.1 Demonstration of capability

An initial demonstration of capability (DOC) should be performed each time there is a significant change in the chemistry of the method, a major modification to an existing instrument, or a new instrument is installed. A DOC is performed by each analyst designated to analyze samples using this method. An annual check must subsequently be performed and documented for each analyst using this method.

13.2 Accuracy and Precision

13.2.1 Initial Demonstration of Capability

Analyze four aliquots spiked with 50 µL of the native and labeled working standard solutions according to the procedures in Sections 9 to 12. Compute the average percent recovery of the extracts and the relative standard deviation of the concentration for each compound. For each PFC, compare the average percent recovery and RSD with the corresponding limits for IPR in Table 7. If the average percent recovery and RSD for all compounds meet the acceptance criteria, system performance is acceptable and analysis of blanks and samples may begin. If, however, any individual RSD exceeds the precision limit or any individual average percent recovery falls outside the range for recovery, system performance is unacceptable for that compound. Correct the problem and repeat the test. If the problem cannot be corrected for one or more compound(s) it will be qualified accordingly (note that the SOP covers a wide range of compound classes). The results of the accuracy and precision study (true value, % recovery, standard deviation and %RSD) must be maintained by the Quality Assurance Officer for each analyst and are located in the Central Branch File.

13.2.2 Continuing Demonstration of Capability

An annual continuing demonstration of capability study must be performed and documented. It consists of analyzing 2 sets of Blank Spike/Blank Spike Duplicate (BS/BSD) standards to within control limits as stated in Section 13.2.1. The results of the continuing accuracy and precision study (true value, % recovery, standard deviation and %RSD) must be maintained by the Quality Assurance Officer for each analyst and are located in the Central Branch File.

13.3 Method Detection Limit (MDL)

An MDL Study is conducted for this method. The study is based on the requirements listed in 40 CFR Part 136 Appendix B. Specific procedures for conducting an MDL study can be found in SOP # G-8. The MDL Study comprised the analysis of seven reagent grade water samples fortified at a level between 2-3x the detection limit. The results of the MDL determination (true value, average concentration, standard deviation and calculated MDL) are maintained by the Quality Assurance Officer for each method and are located in the Laboratory's Central File.

14. QUALITY CONTROL

[Note: See Table 5 in Appendix for additional Specification, Frequency and Acceptance Criteria]

14.1 Calibration of Mass Spectrometer (MS)

Acceptance criteria – calibration of MS must be done before running a calibration and samples to maintain sensitivity and accuracy and whenever major maintenance is performed.

Corrective action – if the criteria are not met, the instrument is recalibrated. If the instrument repeatedly fails calibration additional maintenance may be required. Make sure the Cesium Iodide solution has sufficient volume and is not expired.

14.2 Initial Calibration

Acceptance criteria – the selected MRM transitions specified in Table 3 must be used for data acquisition. All analytical runs for the initial calibration must be made within 72 hour of standard preparation and must be made within a continuous 24 hour time period.

Corrective action – if the calibration curve was not obtained within the time frame established data cannot be reported.

Acceptance criteria – Primary MRM transition must have a minimum Signal to Noise ratio (S/N) of 3.

Corrective action – if the primary MRM transition presents S/N < 3 that calibration point and all below that level of concentration must be excluded.

Acceptance criteria – All analytes must present accuracy between 50 – 150% for all calibration levels.

Corrective action – If an analyte presents accuracy outside the defined range that level of calibration must be excluded.

Acceptance criteria – linear calibration may be used if the coefficient of determination, r^2, is >0.98 for the analyte. The point of origin is forced and a fit weighting of 1/X is used in order to give more emphasis to the lower concentrations.

Corrective action - if the r^2 is <0.98 after excluding the low and/or high points qualify the affected analyte as estimated (J). At a minimum the calibration curve must have five points.

Acceptance criteria – quadratic calibration may be used if the coefficient of determination, r^2, is ≥0.98 for the analyte. The point of origin is forced, and a fit weighting of 1/X is used in order to give more emphasis to the lower concentrations.

Corrective action - if the r^2 is <0.98 after excluding the low and/ or high points qualify the affected analyte as estimated (J). At a minimum the calibration curve must have five points. Each calibration point used to generate the curve must have a calculated percent deviation less than 25% from the generated curve. If low and/ or high points are excluded the reporting range must be modified to reflect this change.

Acceptance criteria – calibration curve middle points should be present.

Corrective action – if a calibration curve middle point is not present qualify the affected data as estimated (J).

Acceptance criteria – the retention time window of the MRM transition must be within 10% (approximately 0.05 min) of the average retention time of the analyte in all calibration points detected.

Corrective action – if this is not the case, qualify hits as estimated (J).

14.3 Continuing Calibration Verification Standard

A midpoint calibration verification standard must be analyzed at the end of each batch of 20 samples or within 24 hours after the initial calibration curve was generated. This end calibration verification should be the same calibration standard that was used to generate the initial curve.

Acceptance criteria - the results from the end calibration verification standard must have a percent deviation <35% from the calculated concentration for the target analytes and surrogates.

Corrective action – if > 15% of all analytes have a percent deviation > 35% the calibration verification standard should be prepared fresh and re-analyzed.

Acceptance criteria – calculate the percent recovery for the native compounds. The percent recoveries for native compounds must be within 50 – 150 %.

Corrective action – if native compounds present recoveries outside 50 – 150 %, qualify the affected analytes as estimated (J).

14.4 Laboratory Reagent - Method Blank

One method blank is prepared and analyzed with every batch of samples. A batch is defined as a set of ≤20 samples of the same matrix prepared within a 12-hour period of time. For each QC batch of samples analyzed, the corresponding method blank must be processed through the same procedure.

Acceptance criteria – a method blank should be free of contaminants, but if present the concentration should not affect the quantitation.

Corrective action - if any contaminants are present in the blank above the lowest standard result qualify the affected analytes as estimated (J).

14.5 Blank Spike/ Blank Spike Duplicate/Laboratory Fortified Blank (BS/BSD/LFB)

Acceptance criteria –for the two blank spikes calculate the percent recovery for the native compounds. The percent recoveries for native compounds must be within the limits present in Table 7.

Corrective action – if native compounds present recoveries below <50%, qualify the affected analytes (including non-detects) as biased low (L). If average recoveries >150% qualify hits as biased high (K). If %RSD>35 qualify hits as estimated (J).

14.6 Internal Standards

Acceptance criteria – calculate the area count percent recovery for each internal standard against the average area counts obtained for the calibration solutions. The area count percent recovery for internal standards must be within 50 – 200 %.

Corrective action – If the internal standard area percent recovery is outside 50 – 200 % qualify the affected native analytes as estimated (J).

14.7 Surrogate Standards

Acceptance criteria - Surrogate recoveries must be 70-130% of the true value. If a surrogate fails this criteria, report all results for sample as suspects/surrogate recovery

Corrective action - If recoveries are outside the acceptable range correct the problem and reanalyze the extract. If the reinjected aliquot produces and acceptable ES response, the result can be reported. If the reinjected extract fails again, calibration must be checked by reanalyzing the most recently acceptable CCV standard and/or qualify affected samples as estimated (J).

14.8 Sample Matrix Spike / Matrix Spike Dup

Acceptance criteria - Recoveries at mid and high levels should be within 70-130% and within 50-150% at the low-level fortified amount (near the MRL). Method analytes RPDs for the MS/MSD should be ≤30% at

mid and high levels of fortification and ≤50% near the MRL. If these criteria are not met, results are labeled suspect due to matrix effects.

Corrective action - If MS/MSD results are outside the limits, the data shall be evaluated to determine the source(s) of error, i.e. matrix effect or analytical error. If the analyte is within control in the CCVs, the recovery is judged to be matrix biased and sample qualified with a J to indicate and estimated value(s).

15.0 REPORTING AND VALIDATION

15.1 The sample data package should include but not limited to the following:

a. LC/MS/MS Checklist and LC Survey Sheet;
b. LC/MS/MS tune;
c. Case Narrative;
d. Chain of Custody;
e. Copies of Logbook entries for applicable Standard Preparation;
f. Copies of Logbook entries of Sample Preparation Log and Analysis Run Log or Element Printouts;
g. Blanks Concentration Report;
h. Initial Calibration Reports. Including Native and IS Recoveries for all Standard levels;
i. Analytical Quality Control Summary Form;
j. Label standard recoveries for Blanks, BS/BSD and Samples;
k. Continuing Calibration Verification with recoveries;
l. Calibration Data/ Sample Data – Quantitative Analysis Calibration Report – calibration curves; Quantitative Analysis Sample Report - raw data and final concentrations for analytes found by the computer quantitation program and applicable qualifier code.

Additional Notes:

Analysts must include an example calculation on a sample for each method/matrix analyzed in all data packages and, if applicable, using a detect result. The calculation will begin with the sample result generated from the instrument and end with the result reported. It is the responsibility of the peer reviewer to verify the accuracy of the calculations performed.

The only exception to this policy would be if no data reduction/manipulation is performed on the sample results between the instrument output and final results reported (that is to say if the sample results generated from the analyses is reported directly from the instrument). Also, for multi-analyte methods, one analyte needs to be carried through in the example calculation representing the group.

15.2 Laboratory Information Management System (Promium)

All sample data/results should be entered to Promium for data management. Unless other formats have been approved for reporting by Section Chief and Project Manager.

15.3 Data Validation

The analyst enters the results on Promium and the data package is given to a reviewer. The review is done by a peer who was not involved in the analysis. Upon completion of the review, including validation of all the appropriate codes in Promium for the particular project(s), the data reviewer will sign and date the QA/QC checklist.

16. POLLUTION PREVENTION

16.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The EPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the Agency recommends recycling as the next best option.

16.2 The quantity of chemicals purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

16.3 For information about pollution prevention that may be applicable to laboratories and research institutions, consult “Less is Better: Laboratory Chemical and Management for Waste Reduction”, available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street N.W., Washington D.C. 20036, (202)872-4477.

17. WASTE MANAGEMENT

The USEPA requires that laboratory waste management practice be conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes should be characterized and disposed of in an acceptable manner. The agency urges laboratories to protect the air, water and land by minimizing and controlling all releases from hoods and bench operations, complying with the letter and spirit of any water discharge permit and regulations, and by complying with all solid and hazardous waste regulations, particularly the hazardous waste identification rules and land disposal restrictions. For further information on waste management consult the Region 2 SOP G- 6, “Disposal of samples and hazardous wastes in Regional Laboratory”.

18. REFERENCES

18.1 USEPA, Region 2, SOP G-6 “Disposal of samples and Hazardous Wastes”.

18.2 Edison Chemical Hygiene Plan

18.4 Promium Element Data System, Laboratory Information Management Systems, Promium, LLC. Current Version.

18.5 Laboratory Quality Management Plan (LQMP), U.S. Environmental Protection Agency, Region 2 Laboratory Branch. Current Version.

18.6 Environmental, Health and Safety Operations Manual & Chemical Hygiene Plan, EPA Region 2. Current Version.

18.7 SOP G-6 Disposal of Samples & Hazardous Waste and Chemical Inventory Management. Current Version.

18.8 SOP G-9, Laboratory Policy For The Establishment And Maintenance Of Logbooks Associated With Chemical Analysis. Current Version.

18.9 SOP G-26, Guidance for Laboratory Data Review Current Version

18.10 Working with Promium. Current version. Current Version

18.11 SOP G-28, Laboratory Operations using "Element" LIMS. Current Version

18.12 US EPA, Region 2 SOP G-15, Definitions, Current Version.

GLOSSARY

These definitions and purposes are specific to this Method but have been conformed to common usage to the extent possible.

Units of weight and measure and their abbreviations-

Symbols

°C degrees Celsius.
µL microliter.
µm micrometer.
< less than.
≤ less or equal than.
> greater than.
≥ greater or equal than.
% percent.

Alphabetical abbreviations

cm centimeter.
g gram.
h hour.
ID inside diameter.
L liter.
M molecular ion.
m meter.
mg milligram.
min minute.
mL milliliter.

mm millimeter.
m/z mass-to-charge ratio.
N normal; gram molecular weight of solute divided by hydrogen equivalent of solute, per liter of solution.
ng nanogram.
pg pictogram.
ppm part-per-million.
w/v weight per unit volume.

Definitions and acronyms (in alphabetical order):

Ultra Performance Liquid Chromatography – (UPLC)

Mass Spectrometry/Mass Spectrometry – (MS/MS)

Electrospray Ionization – (ESI)
Mass to charge ratio of a charged particle – (m/z)

Safety Data Sheet – (SDS)

Analysis Batch – Any instrument sequence that includes field samples. An analysis batch must start with either a valid initial calibration or a valid calibration verification (CV). The analysis batch includes samples, blanks, and quality control samples.

Mass Spectrometry – The basis in Mass Spectrometry is the production of ions that are subsequently separated or filtered according to their mass-to-charge (m/z) ratio and detected. The resulting mass spectrum is a plot of the (relative) abundance of the produced ions as a function of the m/z ratio. @ Niessen, W.M.A.; Van der Greef, J., Liquid ChromatographyBMass Spectrometry: Principles and Applications, 1992, Marcel Dekker, Inc., New York, p. 29.

Multiple Reaction Monitoring – (MRM) The MRM experiment is accomplished by specifying the parent mass of the compound for MS/MS fragmentation and then specifically monitoring for a single fragment ion. MRM delivers a unique fragment ion that can be monitored and quantified in the midst of a very complicated matrix.

Laboratory Fortified Blank (LFB) – An aliquot of reagent water to which a known quantity of a standard is added in the laboratory. The LFB is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and if the lab is capable of making accurate and precise measurements.

Matrix Spike (MS) – An aliquot of a field sample to which known quantities of target analytes are added in the laboratory. The Matrix Spike is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results.
Laboratory Reagent Blank (LRB) – An aliquot of reagent water or other blank matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, filtration and reagents that are used with other samples. The LRB is used to determine if target compounds or other interferences are present in the laboratory environment, the reagents, or the apparatus.

Calibration Verification (CV) – A calibration standard solution which brackets samples and verifies the previously established calibration curve. The CV confirms accurate analyte
quantitation for the previous samples analyzed in an analysis batch. The concentration for the CV varies throughout the sequence at a middle calibration level.

Method Detection Limit (MDL) - The minimum concentration of an analyte that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero. The MDL is simply a statistical evaluation of seven or more low level fortified reagent blanks analyzed in replicate.

Limit of Quantitation (LOQ) – The level above which quantitative results may be obtained, used to define the lower limit of the useful range of the measurement.

Reporting Limit (RL) - The minimum concentration that is reported by the laboratory as a qualified value for the target analyte in a sample following analysis. This defined concentration must be no lower than the concentration of the lowest calibration standard for the target analyte.

Field Blank – a water aliquot that is prepared in the field and treated as a sample (including shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and analytical procedures).

Internal standard – organic compound added in a constant amount to samples, blanks, QC standards, and calibration standards. The internal standard should match as closely as possible the chemicals of interest. Ideally, effects in the sample should be the same for the internal standard as for the target analytes. The internal standard is added to the samples immediately before analysis.

IPR – initial precision and recovery; four aliquots of a reference matrix spiked with the analytes of interest and labeled compounds and analyzed to establish the ability of the laboratory to generate acceptable precision and recovery. An IPR is performed prior to the first time this Method is used and any time the Method or instrumentation is modified.

Laboratory blank – see Method blank.

Method blank –aqueous aliquot that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with samples. The Method blank is used to determine if analytes or interferences are present in the laboratory environment, the reagents, or the apparatus.

MSDSs – Material Safety Data Sheets.

OPR – ongoing precision and recovery standard: a method blank spiked with known quantities of analytes. The OPR is analyzed exactly like a sample. Its purpose is to assure that the analytical method is meeting the required quality control criteria.

QA/QC – Quality control/quality assurance.
RSD – Relative standard deviation; the standard deviation times 100 divided by the mean. Also termed “coefficient of variation”.

BS/BSD – see OPR definition.

Field Blank – An aliquot of reagent water or other reference matrix that is placed in a sample container in the laboratory or the field, and treated as a sample in all respects, including exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the field blank is to determine if the field or sample transporting procedures and environments have contaminated the sample.

GC – Gas chromatograph or gas chromatography.

Internal standard – a labeled compound used as a reference for quantitation of other labeled compounds and for quantitation of native BDE congeners other than the congener for which it is a labeled analog. See internal standard quantitation.

Laboratory blank – See Method blank.

Laboratory control sample (LCS) – See Ongoing precision and recovery standard (OPR).

Laboratory reagent blank – See Method Blank.

MDL – See Method Detection Limit.

Method blank – an aliquot of reagent water or other reference matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with samples. The method blank is used to determine if analytes of interferences are present in the laboratory environment, the reagents, or the apparatus.

Minimum level of quantitation (ML) – The level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte.

MS – Mass spectrometer or mass spectrometry.

OPR – ongoing precision and recovery standards; a method blank spiked with known quantities of analytes. The OPR is analyzed exactly like a sample. Its purpose is to assure that the results produced by the Laboratory remain within the limits specified in this Method for precision and recovery.

Preparation blank – See Method Blank.

Quality control Check Sample (QCS) – A sample containing all or a subset of the analytes at known concentrations. The QCS is obtained from a source external to the laboratory or is prepared from a source of standards different from the source of calibration standards. It is used to check laboratory performance with test materials prepared external to the normal preparation process.

Reagent water – water demonstrated to be free from the analytes of interest and potentially interfering substances at the method detection limit for the analyte.

Relative Retention Time (RRT) – the retention time of the component of interest divided by the retention time of its reference. The RRT references for the BDEs and labeled compounds are listed in Table 2.

Relative Standard Deviation (RSD) – The standard deviation times 100 divided by the mean. Also termed "coefficient of variation".

Retention Time (RT) – The time between the time that an unretained component elutes and a component of interest elutes from a chromatographic column. Usually the time from the air peak or solvent front to the time at which the component of interest elutes, but also sometimes the time from the time of injection until the component of interest elutes. RTs for the BDEs on the RTX® 1614 column are listed in Table 2.

APPENDICES - Tables

Table 1. Names, CAS Registry numbers and Reporting Limits (RL) for PFCs determined by LC/MS/MS

Acronym	Compound	CAS	RL (ng/L)
PFBS	Perfluorobutanesulfonic acid	375-73-5	4.0
PFDA	Perfluorodecanoic acid	335-76-2	4.0
PFDoA	Perfluorododecanoic acid	307-55-1	4.0
PFHpA	Perfluoroheptanoic acid	375-85-9	4.0
PFHxS	Perfluorohexanesulfonic acid	355-46-4	4.0
PFHxA	Perfluorohexanoic acid	307-24-4	4.0
PFNA	Perfluorononanoic acid	375-95-1	4.0
PFOS	Perfluorooctanesulfonic acid	1763-23-1	4.0
PFOA	Perfluorooctanoic acid	335-67-1	4.0
PFTA	Perfluorotetradecanoic acid	376-06-07	4.0
PFTrDA	Perfluorotridecanoic acid	72629-94-8	4.0
PFUnA	Perfluoroundecanoic acid	2058-94-8	4.0
NEtFOSAA	N-ethyl perfluorooctanesulfonamidoacetic acid	----------	4.0
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid	----------	4.0

Table 2. Instrument conditions for PFC analysis in negative electrospray ionization (ESI-).

Instrument	Agilent 6460 triple Quadropole LC/MS with an Agilent 1290 Infinity	
LC column	Waters Acquity BEH C18, 2.1 x 100 mm, 1.7 µm particle size	
Ionization	Negative ion electrospray	
Acquisition	Dynamic MRM	
Injection volume	10 µL	
Needle Wash	80% Methanol, 20% Water.	
LC Gradient Program		
Time (min)	Mobile Phase	LC flow rate (mL/min)
0.0	**A_1: 90%** (20 mM Ammonium Acetic) **B_2: 10%** (MeOH)	0.3
1.0	**A_1: 90%** **B_2: 10%**	0.3
3.0	**A_1: 80%** **B_2: 20%**	0.3
3.1	**A_1: 70%** **B_2: 30%**	0.3
19	**A_1: 16%** **B_2: 84%**	0.3
19.1	**A_1: 10%** **B_2: 90%**	0.3
22	**A_1: 10%** **B_2: 90%**	0.3
22.1	**A_1: 90%** **B_2: 10%**	0.3
26.2	**A_1: 90%** **B_2: 10%**	0.3
Post run (5 min)	**A_1: 90%** **B_2: 10%**	0.3
General LC Conditions		
Column temperature	40 °C	
Max pressure	1000 bar	
Autosampler tray temperature	6 °C	
MS Conditions		
Sheath gas temperature	325 °C	
Sheath gas flow	11 L/min	
Gas temperature	300 °C	
Desolvation gas flow rate	10 L/min	
Nebulizer pressure	45	
Capillary voltage	3500 V	
Nozzle voltage	500 V	
Delta EMV	400 V	

Table 3. Dynamic MRM transitions and MS operating parameters selected for the analysis of PFCs in negative ion electrospray (ESI-).

Compound	RT[a]	MRM Transitions (m/z)	Fragmentor voltage	Collision Energy (eV)
PFOS	5.115	498.97→98.91 498.97→79.93	2	48 64
PFBS	7.564	298.9→98.92 298.9→79.3	1	28 32
PFHxA	9.335	313→269 313→119	1	4 16
PFHpA	11.541	363→319 363→168.92	1	4 12
PFHxS	11.78	398.97→98.91 398.97→79.93	1	92 36
PFOA	13.477	413→368.99 413→168.99	1	4 16
PFNA	15.138	462.97→418.97 462.97→218.98	1	8 16
PFDA	16.537	513.03→468.96 513.03→218.98	1	8 16
NMeFOSAA	17.212	570→483 570→419	1	12 20
PFUdA	17.717	562.97→518.95 562.97→269	1	8 16
NEtFOSAA	17.782	584→526 584→419	1	20 20
PFDoA	18.741	612.97→569 612.97→168.92	1	8 28
PFTrDA	19.619	663.03→619 663.03→169	1	8 28
PFTeDA	20.369	713→669.02 713→168.92	1	8 28

Table 4 – Final Concentration of Calibration Curve

Level (1 mL Vol. Flask)	Natives		SURROGATE		INTERNAL	
	Volume (µl)	Concentration (pg/mL)	Volume (µl)	Concentration (pg/mL)	Volume (µl)	Concentration (pg/mL)
CS-1	20	2	30	30	50	50
CS-2	50	5	30	30	50	50
CS-3	100	10	30	30	50	50
CS-4	200	20	30	30	50	50
CS-5	300	30	30	30	50	50
CS-6	400	40	30	30	50	50
CS-7	50	50	30	30	50	50
CS-8	60	60	30	30	50	50
CS-9	70	70	30	30	50	50
CS-10	80	80	30	30	50	50
CS-11	90	90	30	30	50	50
CS-12	100	100	30	30	50	50

Inject CS-1 to CS-12 for ESI^-

Table 5. Quality Control Requirements

REQUIREMENT	SPECIFICATION AND FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION
Initial Demonstration of Low System Background	Analyze LRB prior to any other IDC steps	Demonstrate that all method analytes are below 1/3 the MRL and that possible interferences from extraction media do not prevent the identification and quantification of method analytes.	Correct problem and then repeat requirement.
Initial Demonstration of Precision (IDP)	Analyze for to seven replicate LFBs fortified near the midrange calibration concentration.	% RSD must be <20%	Correct problem and then repeat requirement.
Initial Demonstration of Accuracy (IDA)	Calculate average recovery for replicates used in IDP.	Mean recovery +/- 30% of true value	Correct problem and then repeat requirement.
Initial Demonstration of Peak Asymmetry Factor	Calculate the peak asymmetry factor using the equation in Section 9.3.9 for the first two eluting chromatographic peaks in a mid-level CAL standard.	Peak asymmetry factor 0.8-1.5	LC conditions require adjustment. Correct problem and then repeat requirement.
Minimum Reporting Limit (MRL) Confirmation	Fortify, extract and analyze seven replicate LFBs at the proposed MRL concentration. Calculate the Mean and the Half Range (HR). Confirm that the upper and lower limits for the Prediction Interval of Result (Upper PIR, and Lower PIR, Sect. 9.2.5.2) meet the recovery criteria.	Upper PIR ≤ 150% / Lower PIR ≥ 50%	If upper and lower PIR are outside the established range for any analyte the MRL is required to be tested at higher concentration until measured within range.
Quality Control Sample (QCS)	Analyze a standard from a second source, as part of IDC.	Results must be within 70-130% of true value.	Correct problem and then repeat requirement or qualify data
Detection Limit (DL) Determination (optional)	Over a period of three days, prepare a minimum of seven replicate LFBs fortified at a concentration estimated to be near the DL. Analyze the replicates through all steps of the analysis. Calculate the DL using the equation in Sect. 9.2.7.1.	Data from DL replicates are not required to meet method precision and accuracy criteria. If the DL replicates are fortified at a low enough concentration, it is likely that they will not meet precision and accuracy criteria.	
Sample Holding Time	14 days with appropriate preservation and storage as described in Sections 8.1-8.5.	Sample results are valid only if samples are extracted within the sample holding time.	Recollect Samples
Extract Holding Time	28 days when stored at room temperature in polypropylene centrifuge tubes.	Extract results are valid only if extracts are analyzed within the extract holding time.	Re-extract Samples
Laboratory Reagent Blank (LRB)	Daily, or with each extraction batch of up to 20 samples, whichever is more frequent.	Demonstrate that all method analytes are below 1/3 the MRL, and confirm that possible interferences do not prevent quantification of method analytes. If targets exceed 1/3 the MRL or if interferences are present, results for these subject analytes in the extraction batch are invalid.	Correct problem. If require, reprepare and reanalyze MB and all samples processed with the contaminated blank and/or qualify affected analytes as estimated (J).
Laboratory Fortified Blank (LFB)	Analyze at least one LFB daily or one for each extraction batch of up to 20 Field Samples. Rotate the fortified concentrations between low, medium, and high amounts.	Results of LFB analyses must be 70-130% of the true value for each method analyte for all fortified concentrations except the lowest CAL point. Results of the LFBs corresponding to	Correct problem, then reprepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available and /or – if native compounds present recoveries below <50%, qualify the affected

		the lowest CAL point for each method analyte must be 50-150% of the true value.	analytes (including non-detects) as biased low (L). If average recoveries >150% qualify hits as biased high (K). If %RSD>35 qualify hits as estimated (J). .
Internal Standard (IS)	Internal standards, 13 C-PFOA (IS#1), 13C-PFOS (IS#2), and d3-NMeFOSAA (IS#3), are added to all standards and sample extracts, including QC samples. Compare IS areas to the average IS area in the initial calibration and to the most recent CCC.	Peak area counts for all IS in all injections must be within +/- 50% of the average peak area calculated during the initial calibration and 70-140% from the most recent CCC. If IS do not meet this criterion, corresponding target results are invalid.	If recoveries are outside the acceptable range prepare a second vial using the backup aliquot. If the reinjected aliquot produces an acceptable IS response, the result can be reported and/or qualify the affected analytes as estimated (J).
Surrogate Standard (SUR)	Surrogate standards, 12C-PFHxA, 13C-PFDA, and d5-NEtFOSAA, are added to all CAL standards and samples, including QC samples. Calculate SUR recoveries.	SUR recoveries must be 70-130% of the true value. If a SUR fails this criteria, report all results for sample as suspect/SUR recovery.	If recoveries are outside the acceptable range correct the problem and reanalyze the extract. If the reinjected aliquot produces and acceptable ES response, the result can be reported. If the reinjected extract fails again, calibration must be checked by reanalyzing the most recently acceptable CCV standard and/or qualify affected samples as estimated (J).
Laboratory Fortified Sample Matrix (LFSM)	Analyze one LFSM per extraction batch (20 samples or less) fortified with method analytes at a concentration close to but greater than the native concentration, if known. Calculate LFSM recoveries.	Recoveries at mid and high levels should be within 70-130% and within 50-150% at the low-level fortified amount (near the MRL). If these criteria are not met, results are labeled suspect due to matrix effects.	If MS results are outside the limits, the data shall be evaluated to determine the source(s) of difference, i.e., matrix effect or analytical error. If the analyte is within control in the CCVs, the recovery is judged to be matrix biased and affected sample is qualified.
Laboratory Fortified Sample Matrix Duplicate (LFSMD) or Field Duplicates (FD)	Extract and analyze at least one FD or LFSMD with each extraction batch (20 samples or less). A LFSMD may be substituted for a FD when the frequency of detects are low. Calculate RPDs.	Method analytes RPDs for the LFMD or FD should be ≤30% at mid and high levels of fortification and ≤50% near the MRL. If these criteria are not met, results are labeled suspect due to matrix effects.	If MSD/MD results are outside the limits, the data shall be evaluated to determine the source(s) of error, i.e. matrix effect or analytical error. If the analyte is within control in the CCVs, the recovery is judged to be matrix biased and sample qualified with a J to indicate and estimated value(s).
Field Reagent Blank (FRB)	Analysis of the FRB is required only if a Field Sample contains a method analyte or analytes at or above the MRL. The FRB is processed, extracted and analyzed in exactly the same manner as a Field Sample.	If the method analyte(s) found in the Field Sample is present in the FRB at a concentration greater than 1/3 the MRL, then all samples collected with that FRB are invalid and must be recollected and reanalyzed.	If the method analyte(s) found in the FS is present in the FB at concentration greater than 1/3 the MRL, then all samples collected with that FB are invalid and must be recollected and reanalyzed and/or results qualified as estimated (J).
Peak Asymmetry Factor	Calculate the peak asymmetry factor for the first two eluting chromatographic peaks in a mid-level CAL standard every time a calibration curve is generated.	Peak asymmetry factor 0.8-1.5	LC conditions require adjustment.
Quality Control Sample (QCS)	Analyze at least quarterly or when preparing new standards, as well as during the IDC.	Results must be within 70-130% of true value.	Correct problem, then reprepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available and/or qualify as estimated (J).

REQUEST FOR SOP CHANGE

Initiator Name:	Nicholas Mendola	Date of Initiation:	4/2/19

Dept:	Organic	SOP #:	C-135	Revision #:	1.0

SOP Title:	**Analysis of Perfluorinated Alkyl Acids in Water by HPLC/MS/MS**

Please Check One	MINOR REVISION ☒	MAJOR REVISION ☐

CHANGE(S) (Use attachment if necessary):

Analyte	Precursor Ion *(m/z)*	Product Ion *(m/z)*	Cone Voltage	Collision Energy	RT	IS # Ref
HFPO-DA (GenX)	285	169	73	0	11.05	1
ADONA	377	251	14	12	13.54	1
9Cl-PF3ONS	531	351	34	24	18.89	2
11Cl-PF3ONS	631	451	40	24	21.88	2
13C3-GenX	287	169	60	6	10.76	1

REASON(S) FOR CHANGE(S): Suggested changes proposed during the NELAC audit.

APPROVAL	NAME:	Signature/Date
EPA Branch Chief / Section Chief/Team Leader	**John Bourbon**	J R. Bourbon 4-3-19
ESAT Analytical Supervisor/ QAO	**Reginald St-Juste**	
EPA Task Order Project Officer	**Ness Tirol**	
Effective Date 4/3/19	**Sumy Cherukara** **EPA QAO**	4/3/19

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REQUEST FOR SOP CHANGE

Initiator Name:	Nicholas Mendola	Date of Initiation:	4/2/19

Dept:	Organic	SOP #:	C-135	Revision #:	1.0

SOP Title:	**Analysis of Perfluorinated Alkyl Acids in Water by HPLC/MS/MS**

Please Check One	MINOR REVISION ☒	MAJOR REVISION ☐

CHANGE(S) (Use attachment if necessary):

Analyte	Precursor Ion (m/z)	Product Ion (m/z)	Cone Voltage	Collision Energy	RT	IS # Ref
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REASON(S) FOR CHANGE(S): Suggested changes proposed during the NELAC audit.

APPROVAL	NAME:	Signature/Date
EPA Branch Chief / Section Chief/Team Leader	John Bourbon	J R. [illegible] 4-3-19
ESAT Analytical Supervisor/ QAO	Reginald St-Juste	
EPA Task Order Project Officer	Ness Tirol	
Effective Date 4/3/19	Sumy Cherukara EPA QAO	[illegible] 4/3/19

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REQUEST FOR SOP CHANGE

Initiator Name:	Sumy Cherukara	Date of Initiation:	05/14/19

Dept:	Organics	SOP C89,90,91,106,123,124,126,134,138, DW-1	Revision #:	

SOP Title:	

Please Check One	MINOR REVISION ☒	MAJOR REVISION ☐

CHANGE(S) (Use attachment if necessary):

Replace:

1. Division of Environmental Science and Assessment with Laboratory Services and Applied Science Division
2. DESA with LSASD

REASON(S) FOR CHANGE(S):

Change of name by the administration.

APPROVAL	NAME:	Signature/Date
EPA Branch Chief / Section Chief/Team Leader	G. Anderson	5-14-19
ESAT Analytical Supervisor/ QAO		
EPA Task Order Project Officer	**Ness Tirol**	
Effective Date 5/14/19	**Sumy Cherukara** **EPA QAO**	5/14/19

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STANDARD OPERATING PROCEDURE

ANALYSIS OF BASE/NEUTRAL AND ACID COMPOUNDS IN AQUEOUS, SOIL/SEDIMENT, AND WASTE OIL/WASTE ORGANIC SOLVENTS SAMPLES BY GC/MS

Signature and Title

Prepared by:	Corinne Spinks, Chemist, OICS	9/25/18 Date
Peer Reviewed by:	Mehul Trivedi, Chemist, OICS	09/25/18 Date
QA Reviewed by:	Sumy P. Cherukara, QAO, Laboratory Branch	09/27/18 Date
Approved by:	Gregory J. Santacroce, Section Chief, OICS	9/25/18 Date
Approved by:	John R. Bourbon, Chief, Laboratory Branch	9/25/18 Date

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2
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LABORATORY RANCH

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Appendix I - Definitions

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STANDARD OPERATING PROCEDURE
ANALYSIS OF BASE/NEUTRAL AND ACID COMPOUNDS IN AN AQUEOUS, SOIL/SEDIMENT, AND WASTE OIL/WASTE ORGANIC SOLVENTS SAMPLES

1. Scope and Application

1.1 This method is applicable to the determination of a number of semi-volatile organic compounds that are present in water or wastewater, in soil, in waste oils and waste organic solvents (also known as non-aqueous phase liquids {NAPL}), partition into an organic solvent and are amenable to gas chromatography.

1.2 The target compounds reporting limits are listed in Table 4 which may be qualitatively and quantitatively determined using this SOP.

1.3 The approximate linear range of this method is from 5-100(1, 4-Dioxane 2-100) µg/L for aqueous and 100-3333 (1, 4-Dioxane 67-3333) µg/kg for soil matrix. Higher concentrations can be analyzed by diluting the samples.

1.4 This SOP is based on EPA Method 625.1.1

NOTE: The following compounds may require special treatment when being determined by this SOP:

a) Hexachlorocyclopentadiene is subject to thermal decomposition in the inlet of the Gas Chromatograph (GC), chemical reaction in acetone solution, and photochemical decomposition.

b) Pentachlorophenol, 2, 4-Dinitrophenol, 4-Nitrophenol, benzoic acid, 4, 6-Dinitro2- methylphenol, 4-Chloroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling materials.

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c) Pyridine may perform poorly at the injection port with the usual conditions used to run the other target analytes. One remedy that may be used to improve the performance of pyridine is to adjust the pressure condition for the method. Therefore, if pyridine has to be determined in addition to the other target analytes, using constant pressure, instead of pressure programming, throughout the method would improve the detection of pyridine. This would not affect the performances of the other target analytes.

d) Benzoic acid and Benzidine are analyzed only on a by request basis.

2. Summary of Method

2.1 Aqueous Samples

A measured amount of a sample, generally one-liter (1-L) sample of water, is spiked with a known amount of surrogate solution. The spiked samples are serially extracted with methylene chloride ($MeCl_2$) three times at a pH greater than 11 and again three times at pH less than 2 using a separatory funnel. The $MeCl_2$ extract is dried by passing it through anhydrous sodium sulfate (Na_2SO_4). The extracts are evaporated in the Kuderna Danish (K-D) apparatus on a hot water bath using a closed system to 4-6 mL. The volume of the extract is further reduced to one mL using a Nitrogen concentration apparatus and stored in septum-capped glass vials at 4^oC until analyzed by GC/MS (See Sec. 2.4). Alternatively, a DryVap system may be used to concentrate the sample.

2.2 Soil/Sediment Samples

An equal mixture of an appropriate amount of a soil/sediment sample, generally a 30 g of sample, and anhydrous Na_2SO_4 are spiked with the known amount of surrogate solution. The spiked samples are ASE extracted with $MeCl_2$. The $MeCl_2$ is dried by passing it through Na_2SO_4 column. The volume of the extract is reduced to one mL using a Nitrogen concentration apparatus or DryVap system and stored in septum-capped glass vials at 4^oC until analyzed by GC/MS (See Sec. 2.4).

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2.3 Waste Oils and Waste Organic Solvents Samples (NAPLs)

A measured sample, generally one-gram, is spiked with an appropriate amount of surrogate solution. The spiked samples are diluted on a weight/volume basis with $MeCl_2$. The solution is dried with Na_2SO_4, and analyzed by GC/MS (see Sec 2.4).

2.4 Analysis

The 1-mL sample extract generated from the various ways of extraction as described above (Sections 2.1, 2.2, and 2.3) is analyzed by GC/MS. The semi-volatile compounds are introduced into the GC/MS by injecting one microliter (1-µL) of the sample extract into a gas chromatograph (GC). The GC column is temperature programmed to separate the analytes, which are then detected with a mass selective detector (MSD). Qualitative identification of target analytes is accomplished by using the retention time and relative abundance of characteristic masses (m/z). Quantitation is performed by the data system.

NOTE: If Selected Ion Monitoring (SIM) analysis is requested for a sample, a full scan analysis at the regular concentration levels must be performed on that sample prior to the SIM analysis. For all SIM target compounds detected at or above Reporting Limit during the full scan analysis, a SIM analysis is not performed for that target compound.

3. Definition

See SOP #G-15 or definitions. Additional definitions-for terms not included in G-15 may be found on Appendix 1.

4. Interferences

4.1 Method Interferences

Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the total ion current profiles. All these materials must be routinely demonstrated to be free from interferences under the conditions of the analysis by running laboratory reagent blanks as described in Sections 9.1, 9.2 and 9.3

Glassware must be scrupulously cleaned. Clean all glassware as soon as possible by rinsing them with the last solvent used. See EPA SOP G-13, section 9.2 for glassware washing and baking requirements.

4.2 Matrix Interference

Matrix interference may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature and diversity of the industrial complex or municipality being sampled.

The base-neutral extraction may cause significantly reduced recovery of phenol, 2-methylphenol, and 2, 4-Dimethyl phenol. The analyst must recognize that results obtained under these conditions are minimum concentrations.

5. Safety

5.1 The toxicity and carcinogenicity of each reagent used in this method has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be minimized by good laboratory practices, e.g. wearing proper protective equipment, safety glasses, gloves, lab coat and working inside hoods whenever possible.

5.2 Refer to the Edison Facility Safety Manual Region II Part 2 – Laboratory Safety and Appendices 13/13A - Chemical Hygiene Plan for specific guidelines. The manual is

available on the Region II Intranet. A hard copy is available in the Laboratory Office Area.

5.3 For detailed explanations consult the Material Safety Data Sheets (MSDS), available in the Laboratory Office area. MSDS are also electronically available.

5.4 The following analyses covered by this SOP have been tentatively classified as known or suspected mammalian carcinogens: Benzo(a)anthracene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)Pyrene, and N-nitrosodi-n-propylamine.

6. Apparatus and Materials

6.1 Gas Chromatograph

Agilent Model 5973 GC/MS instrument with MS Chemstation software or equivalent, an analytical system complete with a temperature-programmable gas chromatograph suitable for split injection and all required accessories, including syringes, analytical columns, and gases. The capillary column should be directly coupled to the source.

6.2 GC Column

RTX-5 Sil MS W/Integra-Guard (Cat# 13638-127, SR# 1026433). 30m, 0.25 mm ID, 0.5 um df.silicone coated fused silica capillary column or equivalent.

6.3 Mass Spectrometer

Capable of scanning from 35 to 500 amu every 1 sec or less, using 70 volts (nominal) electron energy in the electron impact ionization mode. The mass spectrometer must be capable of producing a mass spectrum for decafluorotriphenylphosphine (DFTPP) which meets the criteria in Table 2 when 1µL of the GC/MS tuning standard is injected through the GC (50ηg of DFTPP). GC/MS interface gives acceptable calibration points at 50ηg per injection for each compound of interest and achieves acceptable tuning

performance criteria. For a narrow bore capillary column, the interface is usually directly coupled into the mass spectrometer source.

6.4 Data System

The Data System is interfaced to the gas chromatograph and the mass spectrometer. The system allows the continuous acquisition and storage of data coming from these two entities during an analytical run. The Data System uses computer software that plots ion abundances of specific masses versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). The software also integrates the abundances in any EICP between specified retention time windows. All these data and information of a given analytical run is grouped into a datafile.

6.5 Common Apparatus

The following apparatus and materials used commonly in all types of samples are as follows:

- DryDisk™ Apparatus- A drying system equipped with a vacuum filtration system and a hydrohobic filtration membrane.
- Atlantic HLB-M Disks (47mm)

6.6 Sample Specific Apparatus

Additional apparatus and materials are used for specific type of samples.

A. For aqueous samples:

- Teflon separatory funnels - 2000-mL, with Teflon stopcock.
- Graduated cylinders - 1000-mL and 100-mL capacities

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- pH paper, with pH ranging from 0-14.
- Countdown Alarm Timer with manual shut off suitable for 2 minute timer or equivalent.
- Bench Top Mechanical Shaker.

B. For soil/sediment samples:

- Tongue Depressors.
- Evaporating dishes: capable of holding a minimum of 20 grams of sample.
- ASE: ASE cell 66 ml size, 60 and 250 ml collection vials
- Oven - for sample drying.
- Desiccator.
- Glass rods.
- Disposable aluminum dish

C. For solvent and oil samples:

- 100 ml volumetric flasks.

7. Reagents and Solutions

7.1 Reagents

Reagents are generated at the laboratory facilities.

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7.1.1 Reagent Grade Water - consist of organic-free water which has been through a Millipore deionization activated carbon filter (Organex System).

7.1.2 Sodium Hydroxide - NaOH solution (10 N) - dissolves 40 gm NaOH/100mL of reagent water.

7.1.3 Sulfuric Acid - H_2SO_4 solution (1:1).

7.1.4 Acetone, Hexane, and $MeCl_2$ - pesticide grade or equivalent.

7.1.5 Sodium sulfate - Na_2SO_4 (ACS) granular anhydrous, course and dried in an oven at least 4 hours at 400°C (unless otherwise specified) then kept in an oven at 130°C until use. Each batch dried will be recorded in PROMIUM-ELEMENT Standards.

7.1.6 Sand (sea sand washed) dried in the high temp oven for at least 4 hours at 400°C (unless otherwise specified) then kept in an oven at 130°C until use. Each batch dried should be recorded in PROMIUM-Element Standards.

7.2 Solutions Preparation

All purchased and prepared standards and reagents are recorded in Element which assigns a unique ID# to each. All containers must be labeled with the Name, ID#, Concentration, preparation date and expiration date where applicable. Please refer to SOP#G-9 for details.

7.2.1 Tuning Solution – 50 ug/ml solution of DFTPP in MeCl2 containing 50 ug/ml of Pentachlorophenol and 100 ug/ml of Benzidine for evaluation of tailing factor for column performance if needed (see Sec 14.1 for criteria). ~~The solution's expiration date is the same as the stock provided by the vendor.~~ This solution

may be used up to six months from the date of preparation, or sooner if comparison with quality control checks standards indicates a problem. They are stored at minus 4°C ±2 ^{o}C and protected from light.

7.2.2 The Surrogate Standard (SS) Solution contains the following compounds:

1, 4-Dioxane-d8		
Phenol-d_6	Naphthalene-d_8	**For SIM method**
2, 4-Dibromophenol	Anthracene-d_{10}	2-methyl naphthalene-d_{10}
2-Fluoroaniline	Chrysene-d_{12}	Fluoranthene-d_{10}
1-Fluoronaphthalene		

- For calibration standard use - 2000 ug/ml in methylene chloride.

- For Extraction use - 50 ug/ml in methanol.

7.2.3 Internal Standard (IS) Solution - 2,000 ug/mL of 1, 4-Dichlorobenzene-d4, p-bromochlorobenzene, perylene-d_{12} and p, p'-dibromobiphenyl in $MeCl_2$. Add 15 uL portion each of this solution to each 1mL of sample extract. This will result in 30 ηg of internal standard in the 1-uL volume of extract injected into the GC/MS.

For SIM analysis use p-terphenyl-d14 see Table 7 for SIM conc.

7.2.4 Calibration Check Standard Solutions, Continuing Check Verification and Initial Cal Verification - (CCV /CCC /ICV)

A calibration range of 5.0 to 100 ug/L consisting of at least three points and daily check standard of 50 ug/L is usually run. However, the calibration range and the concentration of the check standard may change due to project specific objectives. For PAH analysis the calibration range is usually 0.3 to 100 ug/L and a check standard of 30 ug/L. For superfund soil the calibration range is usually 3 to 100 ug/L and a check of 50 ug/L.

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Working standard solutions are made from purchased stock standards or prepared in methylene chloride from pure materials. Each level of calibration standards and the check standard must contain 30 ug/ml of IS and 50 ug/ml of SS. They are stored in teflon/silicone capped vials. These solutions are prepared in $MeCl_2$.

For SIM Analysis, see Table 7 for preparation of working standard.

If SIM technique is to be performed, prepare calibration levels that are applicable to the sensitivity of the instrument as in Table 7.

7.2.5 BS/BSD(LCS/LCSD) Solution-. The BS/BSD solution should be prepared by using a stock standard from a different vendor than the calibration standards. Usually the same stock that is used to make the check standard is used to make the BS/BSD solution. It has a concentration of 50 ug/ml in methanol and contains all the target analytes of interest (M625.1 or SF).

For SIM analysis the BS/BSD solution should be at or near the mid-point of the the calibration. (See Table 7)

7.2.6 Matrix Spike(MS) Solution-The MS solution contains the same analytes and has the same concentration as the BS/BSD. However, its source stock is different from that of the BS/BSD and can be prepared from the same source as the calibration standards. It has a concentration of 50 ug/ml in methanol and contains all the target analytes of interest (M625.1 or SF).

For SIM analysis MS Std Solution should be at or near the mid-point of the calibration. (See Table 7)

These solutions may be used up to six months from the date of preparation, or sooner if comparison with quality control checks standards indicates a problem. They are stored at minus 4ºC ±2 ºC and protected from light.

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8. Sample Collection, Preservation, Storage & Holding Time

8.1 Aqueous Samples

Samples are collected in the field in 1-L amber glass containers with Teflon lined caps.

The samples must be refrigerated at 4ºC± 2ºC from the time of collection until extraction.

All samples must be extracted within 7 days of collection and completely analyzed within

40 days of extraction.

8.2 Soil/Sediment Samples

Samples are collected by field personnel and presented to the laboratory for analysis. The samples are stored in a refrigerator at 4ºC± 2ºC until extracted. All samples should be extracted within 14 days after collection & completely analyzed within 40 days of extraction. All unused samples are kept in the unextracted-sample refrigerator for storage.

Irregular solid samples such as wood, gauze wipes, or cement do not have holding times.

8.3 Waste Oils & Organic Waste Solvents (NAPLs) Samples

Most NAPLs samples are drum samples. These samples are collected in the field in a 40mL glass vial with Teflon lined cap. The samples must be refrigerated at 4ºC± 2ºC from the time of collection until preparation. All samples must be prepared within 14 days of collection and completely analyzed within 40 days of extraction unless the Section Chief determines the holding time to be longer in a case by case basis. All unused samples are kept in the unextracted-sample refrigerator for storage.

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All analyzed sample extracts, as well as control samples, should be stored in the temperature controlled refrigerator (at 4ºC ± 2ºC) which is protected from light, in sealed vials (e.g., screw cap vials or crimp-capped vials) equipped with unpierced PTFE-lined septa, The extracts will be kept in the assigned refrigerator until the final reports were sent out and the sample disposal is carried out after 60-day issuance of final report to the customer.

8.4 Drum samples do not have holding times and may be stored at room temperature.

Note: Criminal enforcement samples are locked up at all times in the criminal enforcement room.

9. Sample Preparation

Sample preparation is documented in Element Batch/Bench Sheets (refer to SOP #G-28).

NOTE: Choose the correct Element Batch/Bench Sheets for specific extraction template to use (i.e. for NVOA – NPDES/SF)

9.1 Aqueous Samples

A. Separatory Funnel Extraction

- Push a small loose plug of prewashed borosilicate glass wool to the bottom of a drying column or funnel. Add approximately 5 inches of coarse anhydrous Na_2SO_4, previously baked in an oven for over 4-hours. Rinse twice by passing 20-mL aliquots of $MeCl_2$ through the prepared tube. Cover top and bottom of tube tightly with aluminum foil until use. If funnels are used, fill them half way up to the top with Na_2SO_4 then proceed in the same manner as with the drying columns.

- The measured amount of sample volume to be extracted, generally 1 L, is the volume contained in the usual collection bottles as delivered to the laboratory. All glassware (and Teflon separatory funnels) used during the extraction process is to be rinsed with acetone, hexane and $MeCl_2$. The glassware may also be baked at 400C for 1 hour after being washed and then rinsed once with $MeCl_2$ before use. Note that, after extraction and prior to taking used glassware (and Teflon separatory funnels) to the wash room solvent rinse with $MeCl_2$, and followed with a tap water rinse.

  Remove the sample bottles from the refrigerator and allow warming to room temperature. Mark the water level on the side of the sample bottle with a suitable marking pen or white glass pencil. Shake the bottle well to suspend any traces of sediment and pour into separatory funnel. Label with sample number and batch number appropriately.

  Check pH of sample with pH paper.

- Spike the water in the funnel with the required surrogate standards described in Section 7.2.2.

- Adjust the pH of the water sample to pH greater than 11 with 10 N NaOH. Multi range pH paper is used for pH measurement.

- Add 60 mL $MeCl_2$ to sample bottle, cap and shake. Carefully pour $MeCl_2$ quantitatively into separatory funnel.

- To measure the sample volume for documentary and calculation purposes, add water to sample bottle to level previously marked. Pour water into 1-L graduated cylinder to measure original sample volume. Record this volume in Element Bench Sheets. Discard water and put bottle aside for disposal.

- Shake capped separatory funnel containing $MeCl_2$ and water sample on the mechanical shaker for 2 minutes, with periodic careful release of pressure under hood through the stopcock. Then allow separatory funnel to stand undisturbed until layers are completely separated.

  - Pass the lower organic phase through a previously prepared Na_2SO_4 drying tube, funnel, or a DryDisk™ into a 500-mL K-D flask with a graduated 10-mL concentrator tube attached.
  - If a stable emulsion forms in the extraction, it can be broken by either centrifuging or by using another separatory funnel. Transfer the solvent layer to through the drying tube into the 500-mL K- D flask containing the graduated 10-mL concentrator tube. Pour the water phase back into the funnel. Save the centrifuge tube as is for subsequent separations on the same sample.

- Repeat the extraction twice more in the same way with 60-mL aliquots of $MeCl_2$. Centrifuge if necessary as before. Combine extracts in the K-D flask.

- The basic water sample remaining in the separatory funnel is acidified to pH less than 2 with 18N H_2SO_4. If centrifugation was necessary to break emulsion in the basic extraction; rinse the centrifuge tube with $MeCl_2$ and add this back into the funnel.

- Extract the acidified sample water three times with 60-mL aliquots of $MeCl_2$ as before. Both extracts of acid and basic are combined.

- Add a few boiling chips to the flask, cap with a water condenser column and put on hot water bath to concentrate (Temperature of bath should not be >70 degrees C). When the volume is about 4-6 mL; remove from bath & allow cooling in an upright position. In this way, the condensing solvent vapors in the column will rinse the flask walls down into the tube.

- Finish the evaporation by placing the tube into an N-Evap analytical evaporator. Bring the volume to about 0.5 mL, remove the liquid extract to a 1.0-mL sample

vial with a Pasteur pipette, add approximately 0.5 mL $MeCl_2$ to concentrator tube as a rinse and transfer this to the vial to a final volume of 1.0 mL. Cap the vial tightly (test by turning the cap). Label with sample number and batch number.

- Samples may also be concentrated on a DryVap system to a volume of approximately 0.9 mLs and then transferred to a sample vial and adjusted to 1 mL.

- For Aqueous TCLP leachate that was prepared by metals SOP C-107, due to high regulatory levels, a dilution of 5X can be used for analysis; further dilution may be required based in the judgment of the analyst. Follow above extraction procedure. Table 6 lists the TCLP regulatory levels.

- Prepare two portions of a measured DI water and spike with 1 mL of the AQC solution. Another 1-L of reagent grade water goes through the analytical procedure similar to the samples and serves as a method blank and BS/BSD for the batch. Prepare one portions of a measured sample DI water and spike with 1 mL of the matrix spike solution. Follow the above sample extractions procedure.

B. Solid Phase Extraction

For SPE the measured amount of sample volume to be extracted, generally between 500 and 1000 ml, in the usual collection bottles as delivered to the laboratory.

Apparatus – Dionex Autotrace 280

Disk assembly – 47mm Atlantic HLB-M disk

Solvents:	**Flow rates:**
Solvent1: Water (reagent Grade)	Cond. Flow: 15 ml/mim
Solvent2: Methanol	Load Flow: 60 ml/min

Solvent3: Ethyl acetate	Rinse Flow: 20 ml/min
Solvent4: Methylene Chloride.	Elute Flow: 20 ml/min
Solvent5: Acetone	Rinse, air push: 20 ml min
	Elute Air Push: 5 ml/min

Method 15 – using conditioning with MeOH and water/ Eluting with Ethyl Acetate/ MeOH and Methylene Chloride.

Add 6g KPO_4 to each 1-liter QC/Sample, check pH if <2. If not, add 1ml 1:1 H_2SO_4 one ml at a time. Then, spike with appropriate spiking standards and mix well. Put collection vials for each station being used.

b. Drying Eluant – After sample has been extracted and all eluant collected add approximately 5-10 ml of Methylene chloride to each vial and shake vigorously. Let stand for about 10 min.

Prepare drying funnels plugged with glass wool and about 10g of dried Na_2SO_4, rinse with Methylene Chloride. Filter and transfer extracts into a 50-ml vial, the sample is now ready for concentration.

d. Concentration

Use the N-Evap or DryVap to concentrate the extract to about less than 0.5 ml. Transfer to 2-ml sample vial and fill with Methylene Chloride to a final volume of 0.5 or 1ml, depending on the reporting limits required. The extract is now ready for analysis.

Note: This preparation is applicable to Superfund samples only, until a DOC is performed for NPDES samples.

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9.2 Soil/Sediment Samples

All glassware used during the extraction process is to be heated per the instruction of Sec.4.1 followed by rinse with $MeCl_2$.

9.2.1. Percent Solids Determination

Transfer 10 g of the soil/sediment sample into a tared aluminum pans. Determine the percent solids by drying overnight at 105°C. Allow to cool in a desiccator before weighing. Concentrations of individual analytes will be reported relative to the dry weight of sediment. All the data for percent solids are recorded on a bound logbook located near the drying ovens.

Equation for % Solids:

$$\%\ Solids = \frac{g\ of\ Dry\ Sample}{g\ of\ Sample}\ X\ 100$$

9.2.2. Soil/Sediment Samples – ASE 350

- Accelerated Soil Extractor [ASE350]
- Stainless steel ASE cells (66 ml size) and caps
- 60 ml or 250 ml clear glass sample collection vials
- Cellulose filters 19.8 mm or 30 mm
- Weigh 25-30 grams or sample in clean beaker and add approximately 10 g baked Na_2SO_4 or other drying agent
- Mix samples well with Na_2SO_4, if samples have a lot of moisture content let them air dry for a few minutes.
- Take ASE cells, screw caps on the bottom side of the cell (opposite to the dionex logo end) and insert cellulose filter with the help of insertion tool.
  Screw aluminum funnel on top side of the cells and transfer samples carefully.

- Add surrogate to all samples blank and BS/BSDs according to section 7.2.2.

- Prepare a method blank and a set of BS/BSD with a group of samples extracted each day, for BS/BSDs spike standards are also added beside surrogates.
- Method blank and BS/BSDs are consisting of 25-30g sand and 10g of Na_2SO_4.
- Place another cellulose filter on the top side of the cell and push it with insertion tool until filter settles down to the sample matrix.
- Screw another cell cap on top side and label cells and the collection vials and make sure labeling starts 1-1.5 inches from the top and bottom for collection vials because of the sensor.
- Push the "power" button on the instrument panel, push "trays" button to release the tray and load cells and collection vials in respective order same to each other.
- Open the Air valve on the wall and set pressure to 50 – 55 psi and Nitrogen valve to set pressure to 130 – 135 psi.
- Fill the solvents reservoir bottle with methyl chloride and tighten it up with hand.
- Push "menu" button on instrument, select method #2 and respective vial number in reference to the starting position on the tray, push "enter" and "start" button to start extraction procedure.
- Extract is now ready for concentration.

After extraction, solvent rinse extraction tubes and caps with $MeCl_2$ before washing in EPA washroom. If high level of target analytes are suspected, also employ a sonication step. These steps should minimize analyte carryover contamination when cells are used again for soil/sediment extraction.

9.2.3 Soxtherm Extraction [alternate to ASE extraction]

- Weigh a measured sample, 30 gm, into a soxhlet extraction thimble using a spatula (see Note after Reporting Limit Table 4). However, the amount of sample may change due to project specific objective.

- Add an equivalent amount of anhydrous Na_2SO_4 to the thimble and mix well. Cover the thimble with glass wool. Make sure that the thimble and glass wool are both pre-washed with $MeCl_2$.

- Place 2-3 boiling chips in the bottom of the round bottom flask.

- Insert thimble with sample into the extraction chamber and connect the chamber to the round bottom flask. Make sure to cover the extraction thimble with $MeCl_2$ rinsed-borosilicate glass wool to avoid light materials in floating out to the collection vessel.

- Surrogates are added to all samples, spike and blank. Add 1.0 mL of surrogate solution (Sec 7.2.2) to sample mixture.

- Add 1.0 mL of matrix standard spike solution (Sec 7.2.6) to the sample portion from the sample chosen for spiking. One spiked samples is prepared per batch or per 20 samples (whichever is less).

- Prepare a method blank with each group of samples extracted each day. The method blank consists of 10 g of Na_2SO_4 and 10 g of sand, spiked with the surrogates and carried throughout the entire analytical procedure.

- Add 150 mL of methylene chloride to the extraction vessel.

- Place the extraction vessel into the soxtherm unit giving it a slight twist to ensure that it forms a seal with the o-ring.

- Make sure the nitrogen and chiller are turned on and flowing to the units.

- Refer to the manufacturers Operating Instructions for the Soxtherm unit for running an extraction program. The extraction/concentration method takes approximately 2 hours.

9.2.3 Concentration

- Filter the extract by passing through Na_2SO_4 to remove moisture. Prepare a Na_2SO_4 drying column or DryDisk™ (or funnel).
- Insert a glass wool plug in the bottom of the column. Add three inches of coarse Na_2SO_4. Pre-rinse the column with $MeCl_2$.

Use N-Evap to concentrate to 0.5-1.0 ml. Transfer to 2-ml sample vial and make final volume 1.0 ml. The extract is now ready for analysis.

Extracts may also be concentrated on a DryVap system to a volume of approximately 0.9 mLs and then transferred to a sample vial and adjusted to 1 mL.

Note: This preparation is applicable to Superfund samples only, until a DOC is performed for NPDES samples.

Example program:
Method =02, Preheat = 0 min, Heat = 5 min, Static = 5 min, Flush % = 100 vol., Pressure = 1500 psi, Temperature = 100°C, Solvent C = Methylene Chloride 100%, Purge = 60 s and Cycle = 1.

9.3 Waste Oils & Waste Solvents (NAPLs) Samples

- All glassware used during the preparation process is to be rinsed with acetone, hexane and $MeCl_2$. The glassware may also be baked at 400°C for 1 hour after being washed and then rinsed once with $MeCl_2$ before use. Note that, after extraction and prior to taking used glassware to the wash room solvent rinse with $MeCl_2$, and follow with a tap water rinse.

- Transfer approximately 1 g of sample to a tared 10-mL volumetric flask using a Pasteur pipette. Record the weight of the sample to the nearest 0.001 g in the extraction logbook. Add 1 mL of surrogate solution to all samples and blanks. Dilute to volume with $MeCl_2$. Run the 10 times dilution to check the presence of target analytes and then run the appropriate dilution as required. In each analytical batch select a sample for duplicate analysis. Dilute to volume with $MeCl_2$ and mix.

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- Prepare a Na_2SO_4 column by placing a small plug of prewashed borosilicate glass wool at the bottom of a drying column. Add approximately four inches course anhydrous Na_2SO_4. Rinse twice by passing 60-mL aliquots of $MeCl_2$ through the prepared tube. Cover top and bottom of tube tightly with aluminum foil until use. A DryDisk™ set up can also be used instead of the Na_2SO_4 column.

- Pass the sample from the volumetric flask through the pre-rinsed Na_2SO_4 column discarding the first 3-mL and save the remaining portion into a 6-mL crimp vial. Seal the vial using a Teflon-backed silicone septum and aluminum vial seal. Store the vial in a refrigerator until analyzed.

- Prepare a duplicate sample for NAPL sample.

- Use $MeCl_2$ as the method blank following the above procedure.

Note: It has been found that phthalates are the most common contaminants; therefore, it is recommended that gloves made out of vinyl chloride or latex be kept out of laboratory and away from extractable samples. The use of synthetic rubber gloves free of phthalates, such as neoprene, is recommended.

9.4 Extraction Log Book

Sample preparation is documented in Element Batch/Bench Sheets (refer to SOP#G-28). Choose the correct Element Batch/Bench Sheets for specific extraction template to use (i.e. for NVOA-NPDES/SF Soil)

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10. Instrument Operating Conditions

GC/MS operating conditions (temperatures, carrier gas flow rates, etc.) will depend on the instrument used for analysis. The conditions are set to allow for the detection of all desired analytes with "satisfactory" peak shapes and "resolution". Satisfactory means no excessive tailing and good resolution (proper separation of adjacent analyte peaks).

10.1 Scan Parameters

The exact conditions of the GC and data acquisition program will depend on the condition of the MS source and GC column. Generally, the MS conditions are taken from the manual tune results and will be shown by the DFTPP mass calibration run.

Scan parameters for the HP5973 are as follows:

Mass range: 35 to 550 amu (invariable)

Multiplier voltage: 2200 (variable)*

Number of A/D samples: 2 (invariable)

Threshold: 500 counts (variable)*

*Although these values are variable, they should not be changed without carefully checking to see the effect on analyte detection and quantitation.

NOTE: For SIM analyses the analyst uses professional judgement and the instrument manufacturer’s instruction and guidelines in choosing an appropriate single ion scan or dwell time (typically 50 to 500 msec per ion).

10.2 Tuning

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The DFTPP performance test requires the following instrument parameters:

Electron energy	70 volts nominal
Mass range	35 to 450 amu
Scan time	to give at least 5 scans Per peak but not to exceed 7 seconds per scan

The test is performed by acquiring data from an injection of 50 mg. of DFTPP in a suitable volume of $MeCl_2$. After acquisition, a background subtracted mass spectrum is obtained and compared with the acceptance criteria on Sec 14.1 and Table 2. Also, tailing evaluation for Pentachlorophenol & Benzidine are calculated and if meets criteria (see sec. 14.1) only then are the standards, blanks, BS/BSD, and samples run. The tailing factor of Pentachlorophenol must be <5 and Benzidine <3 and < 2 for NPDES analyses and should be determined by using the equation in the 40 CFR Method 625 or evaluated by the Enviroquant software.

10.3 GC Conditions

The GC conditions will be varied somewhat for different columns. Make sure all desired analytes elute during the run and have satisfactory peak shapes and resolution. The following conditions illustrate these parameters as currently set and which have been found to be satisfactory:

Run time	25.0 min (approx.)
Scan start time	2.0 minutes
Pulsed Split valve time	0.5 min
Pulse Pressure	40 psi
Split ratio	4:1

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Injection port temperature	280^{0}C
Detector temperature	250^{0}C
Starting temperature	50^{0}C
Holding at initial temperature	0
Final temperature	310^{0}C
Holding time at final temperature	4.6 minutes

10.4 Maintenance Log Book

Entries must be made for each instrument. Refer to the Element Instrument Maintenance Log for the entry of necessary information items.

11. Calibration

11.1 Calibration of GC/MS Instrument

11.1.1 Initial Calibration - The calibration solutions as prepared in section 7.2.4 contains the analytes routinely used to calibrate the instrument before analysis of samples (see section 14 for criteria). A calibration curve of six points (5 to 100 ug/L) is usually run. But the curve must have a minimum of three points. It is run only when a daily check standard verifies the previous calibration curve fails.

A 1-µL volume of standard is injected into the GC/MS. The analytical runs for the initial calibration must be made within a continuous 12-hour period.

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Relative Response Factor (RRF) can be calculated by using the following equation:

$$RRF = \frac{A_s \, C_{is}}{A_{is} \, C_s}$$

Where,

A_s= Area of the primary ion for the parameter to be measured

A_{is}= Area of the primary ion for the internal standard

C_{is}= Concentration of the internal standard, µg/L

C_s= Concentration of the parameter to be measured

The average RRF must be used for quantitation. The identification file is then updated with these average values. This calibration procedure is repeated after significant adjustments are made to the instrument. Refer to Sec 14.2 for acceptance criteria.

NOTE: For SIM analysis the GC/MS must be calibrated at a minimum of five concentrations (see Table 7), prior to the analysis of sample and required blanks in order to determine instrument sensitivity and linearity. The calibration should contain all analytes and associated DMCs and internal std.

The occurrence of an unacceptable instrument response(s) from the analysis of calibration standards, e.g., unacceptable correlation coefficient or RSD of response factor(s), etc., is an indication of an analytical problem(s) with the selected calibration range for the analysis and must be corrected before sample analyses are conducted. Sample analysis may not proceed until the resulting calibration curve

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is fully acceptable according to the established criteria identified in this SOP.

Elimination of calibration point(s) from the calibration curve is an acceptable practice under the following special conditions:

11.1.1.1 *In multi-analyte tests* in which calibration solutions are prepared from mixtures, analyte concentrations analyzed which are outside of the established calibration range for a given analyte, should not be included in the calibration for that analyte. This is an unavoidable situation because the stock solutions are mixtures.

11.1.1.2 *The lowest calibration points* may be eliminated from the calibration curve. If this occurs, the reporting limit, which is based on the lowest calibration standard, must be raised accordingly and reflected in the final report.

11.1.1.3 *The highest calibration points* may be eliminated from the calibration curve if all sample concentrations and all associated quality control data (or their dilutions) are bracketed by the remaining calibration standards.

11.1.1.4 An outlier calibration point (other than a high point or a low point) may be eliminated only after an investigation has been performed and the reasons for the problem have been documented.

11.1.2 Initial Calibration Verification Standard (ICVS)/Continuing Calibration Check Standard (CCCS)-

The CCCS is analyzed at the start of each 12-hour period (except when a calibration curve is run-then an ICVS is analyzed after the curve) samples are to be analyzed. When a new calibration curve is run it must be verified by the check standard in Sec. 7.2.4. The source of the check standard must be different from the source of

the calibration range. After the different source check standard verifies the curve it may also serve as the CCCS for that same 12-hr. period. If a different source check standard fails to verify then a 3rd source must be used. When a calibration curve is verified then one of its midpoints may be used to continuously calibrate the curve and become the CCCS. The check standard or CCCS is quantitated and the analyte responses compared with the average RRF of the calibration curve. Refer to Sec 14.3 for acceptance criteria.

NOTE: A calibration curve generated from a newly prepared set of working standards must be verified by a second source. No verifications are necessary for any subsequent generation of calibration curves from the same set of working standards.

12. Sample Analysis

12.1 Analytical Sequence

The Element# of all solutions used during the analysis must be recorded in the sequence log so that they can be traced back to the standard prep log for such information as concentrations, lot#, vendor, etc.

At the beginning of each 12-hour period during which GC/MS analyses are to be performed, the system is tested to ensure that acceptable performance criteria are achieved for DFTPP.

12.1.2 Internal Standard (IS) Responses & Retention Time (RT)-

The IS responses & RT in all standards must be evaluated during or immediately after data acquisition. If the RT for any IS changes by more than 0.5 minutes (30 secs) from the latest daily (12-hr) CCCS, the chromatographic system must be inspected for malfunctions, and corrections made as required. The EICP must

be monitored and evaluated for each standard. Refer to Sec 14.7 for acceptance criteria.

12.2 Sample and Quality Control Analysis

Spike the 1 mL extract with 30 ng of internal standard solution (Sec 7.2.3). Then, the extract samples, BS/BSD and duplicate, method blank, matrix spike shall be placed on the auto sampler tray for analysis. Injection size of the sample is generally 1-µL. Depending on the levels of analytes found, dilution and reinjection are performed if necessary. Refer to Sec 15 for acceptance criteria. All the runs must be recorded in the run logbook that is kept near the instrument.

12.3 Instrument Log Book

Entries must be made in the Instrument Logbook (described in SOP #G-9) as sample runs are made. Refer to the Instrument Logbook for the entry of necessary information.

13. Data Analysis and Calculations

Analytes are detected in the GC/MS run by the computer software by using criteria based on the expected retention time window and the characteristic mass ions for the individual analytes. Manual searches for required analytes and for other compounds can be performed by other procedures contained in the software programs.

13.1 Target Compounds

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Qualitatively identify a sample component by comparison of its mass spectrum (after background subtraction) to a reference spectrum in a collection. Use the following criteria to confirm a qualitatively identification:

- The GC retention time of the sample component must be within 30 seconds of the time observed for the same compound found in the CCCS.

- All ions that are present above 10% relative abundance in the mass spectrum of the standard should be present in the mass spectrum of the sample component that are located on Table 1 and should agree within absolute 20%. For example, if an ion has relative abundance of 30% in the standard spectrum, its abundance in the sample spectrum should be in the range of 10-50%. Some ions, particularly the molecular ion, are of special importance, and should be evaluated even if they are below 10% relative abundance.

- Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When GC peaks obviously represent more than one sample component (i.e., broadened peak with shoulders(s) or valley between two or more maxima), appropriate analyte spectra and background spectra can be selected by examining EICPs of characteristic ions for tentatively identified compounds (TIC). When analytes co elute (i.e., only one GC peak is apparent), the identification criteria described in the above paragraph can be met but each analyte spectrum will contain extraneous ions contributed by the co eluting compound.

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- Structural isomers that produce very similar mass spectra can be explicitly identified only if they have sufficiently different GC retention times. Acceptable resolution is achieved if the height of the valley between two isomer peaks is less than 25% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

Note: The CCCS (continuing calibration check standard) analyzed on the same sequential run is used as the reference spectrum for a group of samples and QCs within a 12-hr period with the same method. The CCCS uses the previous CCCS run as the reference spectrum of the same method. If a new method is generated and a curve is run for the first time or maintenance was done on the instrument, then the midpoint level of the curve is used as the reference spectrum for the subsequent sample analysis until the next CCCS required is run.

13.2 Non-Target Compounds (Performed only upon request)

A library search must be executed for non-target sample components for the purpose of tentative identification. For this purpose, the most recent release of the NBS or Wiley mass spectra library shall be used. Guidelines for making tentative identification are:

- Up to 10 organic compounds of greatest concentration not listed in component list for the semi-volatile organic compounds, excluding the system monitoring compound shall be tentative identified via a forward search of the NBS or Wiley Library. Substances with responses less than 10% of the internal standard are not required to be searched.

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- The relative intensities of major ions in the sample spectrum should agree within ±20% of the relative intensities of major ions in the reference spectrum.
- Molecular ions present in the reference must be present in the sample spectrum.
- Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or co elution. Only after visual comparison of sample spectra with the nearest library spectrum will the analyst assign a tentative identification.
- If a compound cannot be verified by the above criteria, then the analyst will report that identification as unknown & proceed with quantitation.
- Computer generated library search routines should not use a normalization routine that would misrepresent the library or unknown spectra when compare to each other. Only after visual comparison of sample with the nearest library searches will the mass spectral interpretation specialist assign a tentative identification. Analyst should use professional judgment to ensure spectra provided by library truly identify the TIC.

13.3 Quantitative Analysis

The analytes identified in the sample must be quantified by the internal standard method. The EICP area of the characteristic ion designated as quantitative ion must be used. The average response factor from the multi-point initial calibration is also used

to calculate the amount of the compound in the sample. When an analyte is detected and identified, it is quantitated by the software program by first calculating the integrated ion abundance of the quantitation mass as given in the identification file.

13.4 Target Compounds

The quantitation report generated by the software is examined to confirm that analytes present have been detected (i.e., no visible peaks missed), that identification has been made correctly (i.e., spectra are compared with known), that integration has been performed correctly (e.g., the ion profile used for quantitation is satisfactory), and that baselines have been properly assigned.

- Equation for aqueous samples:

$$\text{Concentration, ug/L} = \frac{(Ax)(Is)(Vt)(Df)}{(Ais)(RRF)(Vo)(Vi)}$$

A_x = Area of the characteristic ion for the compound to be measured

A_{is}= Area of the characteristic ion for the internal standard

I_s= Amount of internal standard injected in ηg

V_o= Volume of water extracted in mL

V_i= Volume of extract injected in uL

V_t= Volume of the concentrated extract in uL Df= Dilution Factor

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The dilution factor, Df, for analysis of samples for semi-volatiles by this SOP is defined as follows, in the following equation below:

$$\frac{\textit{uL most conc. Extract used for dilution + uL clean solvent}}{\textit{uL most conc. Extract used for dilution}}$$

If no dilution is performed, Df = 1.0

- Equation for soil/sediment samples:

$$Concentration, \frac{ug}{Kg} = \frac{(Ax)(Is)(Vt)(Df)}{(Ais)(RRF)(Vi)(Ws)(S)}$$

Where A_x, I_s, A_{is}, V_t, Df, and V_i are defined previously.

S = % solids of sample/100(see Sec 9.2)
W_s= Weight of sample extracted in g

- Equation for waste oils/waste solvent (NAPLs) samples,

$$Concentration, \frac{ug}{Kg} = \frac{(Ax)(Is)(Vt)(Df)}{(Ais)(RRF)(Vi)(Ws)}$$

Where A_x, I_s, A_{is}, V_t, Df, and V_i are defined previously.

W_s= Weight of sample in mg

13.5 Non-Target Compounds (Performed only upon request)

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TICs are defined as those compounds not contained in the initial calibration standard solutions, which therefore must be identified by the computer software, using the main spectra library. The computer software also quantitates the TIC against the internal standard having the closest retention time to the retention time of the TIC of interest. Total area counts from the total ion chromatograms are to be used for both the compound to be measured and the internal standard. An RRF of one is to be assumed, using the equation shown in 13.1.

For compounds to be reported, identification (as generated by the library search program) of those receiving a library searched match of 90% or higher should be considered a “probable match”. The compound should be reported with the identification generated by the search program unless mass spectral interpretation specialist feels there is just evidence not to report the compound identified by the library search program.

Since TIC's are not calibrated for all values are reported as estimated and given a Qualifier Code of NJ. Only the 10 TIC's with the highest area counts are reported unless otherwise requested.

13.6 Manual Integration

13.6.1 The compound identification and integration results generated by the EnviroQuant software may not always be accurate because of the reasons listed below:

- The automated integration routine may not find the target analyte as a result of retention time shift, co eluting interference, or peak inappropriate (too high or too low) intensity.

- The target analyte peak area may be incorrectly integrated by the automated integration routine as a result of poor peak shape, co

elution with other peaks, or a significant baseline drift. Poor peak shapes can also be due to overloading of the GC column by the higher concentrations of calibration curve of certain analytes. The overloading can cause multiple peaks, shoulders, or humps which have the same spectra proving that they come from the same analyte. The lower concentrations of these analytes, however, do not exhibit the poor peak shape characteristics.

- If one or more peaks elute within the retention time window for a target analyte, the automated integrated routine may not pick the peak with a retention time that best matches the retention time established by the calibration.

13.6.2 It is the analyst's responsibility to validate the integration report generated by the computer software for every sample and calibration analysis. When errors are detected in the compound identification and peak integration, the analyst must conduct manual integration to correct the errors.

13.6.3 The manual integration must be reasonable, scientifically valid, and logically sound. The entire area of the subject peak and only the area of the subject should be integrated for that peak. Conducting peak-shaving to eliminate part of the subject peak or including peaks not belonging to the subject peak is prohibited. Manual integration performed solely to meet the calibration and surrogate QC criteria is unacceptable.

13.6.4 Manual integrations must be documented in the following manner.

- Include the quantitation report and chromatogram for all samples and QC samples in the electronic data package.

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- Submit summary quantitation reports prior to manual integration in the electronic data package. Also submit detailed quantitation report showing manually integrated target analytes, surrogates and / or internal standards.

- If manual integrations are done for reasons other than those listed in Sec. 13.3.1 then they must be initialed and dated by the analyst performing the integration on the quantitation report along with a brief narrative explaining why the manual integrations were required.

14. Method Performance

A demonstration of capability (DOC) should be performed each time there is a significant change in the chemistry of the method, a major modification to an existing instrument, or a new instrument is installed. A DOC is performed by each analyst designated to analyze samples using this method. An annual check must subsequently be performed and documented for each analyst using this method. If QC criteria provided in this method are not achieved, then corrective action(s) should be implemented. This may include sample reanalysis as determined by existing laboratory policy and/or consult with lab management and QAO.

14.1 Accuracy and Precision

14.1.1 Demonstration of Capability

A demonstration of capability study was conducted for this method for each analyst using this method. The study consisted of the analysis of four standards which are from a source independent of the standard curve. The results of the standards must be within the acceptance criteria listed in Table 3. The % RSD should be within 30%. The results of the accuracy and precision study (true value, % recovery,

standard deviation and % RSD) are maintained by the Quality Assurance Officer for each analyst.

14.1.2 Continuing Demonstration of Capability

An annual continuing demonstration of capability study must be performed and documented. It will consist of analyzing four replicate LCSs to within acceptance criteria as stated in section 14.1.1. The results of the continuing accuracy and precision study (true value, % recovery, standard deviation and % RSD or final report from the PT provider) are maintained by the Quality Assurance Officer for each analyst and are located in the Laboratory's Central File.

14.2 Method Detection Limit (MDL)

An MDL Study was conducted for this method. The study is based on the requirements listed in 40 CFR Part 136 Appendix B. Specific procedures for conducting an MDL study can be found in SOP # G-8. The MDL Study comprised the analysis of seven replicate samples of the method fortified at a level between 2-3x the detection limit or the lowest point of the calibration curve. The results of the MDL determination (true value, average concentration, standard deviation and calculated MDL) are maintained by the Quality Assurance Officer for each method and are located in the Laboratory's Central File.

14.3 Limit of Quantitation

The Laboratory performs a Limit of Quantitation (LOQ) study on an annual basis for analytes associated with chemistry methods. The validity of LOQ is confirmed by successful analysis of an LCS at approximately 2X the reporting limit. The recovery of each analyte is

within the acceptance criteria established for the LCS (Sect. 15.9). After this study is completed, it is reviewed and approved by the Laboratory

Management. A summary of all LOQ study performance is maintained in the Laboratory's Central File.

15. Quality Control

15.1 Tuning (TUN) - Sec 7.2.1

Acceptance Criteria - Instrument tuning should be done before calibration, samples analysis and every 12-hour period. Refer to Table 2 for the DFTPP key ions and ion abundance criteria. Evaluation of tailing factor for Pentachlorophenol and Benzidine is done by the enviroquant software and should be <5.0 for Pentachlorophenol and <3.0 for Benzidine. Both tailing factors must be < 2 for NPDES analyses.

Corrective Action - If the criteria are not met, the instrument is retuned and DFTPP is reanalyzed. If the instrument repeatedly fails tune, it is most likely a dirty source which must be removed from the instrument and cleaned. If tailing criteria is not achieved maintenance is needed.

15.2 Initial Calibration (CAL) - Sec 7.2.4

Acceptance Criteria - All analytical runs for the initial calibration must be made within a continuous 12-hour time period. All average RRF criteria must be ≥0.05 at each concentration level with a maximum % RSD of ≤35%. The number of analytes not meeting the criteria must be 10% or less of the total analytes, the maximum %RSD must not be more than 60%. For NPDES analyses the number of NPDES analytes not meeting the criteria must be zero.

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Corrective Action - Up to 10% of the % RSD and RRF for the total analytes list of interest may exceed the 35% limit but they may not be over 60%. If the RSD for any analyte exceeds 60% or if the RSD for more than 10% of the analytes exceeds 35% then the curves for the affected analytes must be recalibrated. If any NPDES analyte fails the criteria then recalibration is also necessary. However, if less than 10% of the analytes fail the %RSD and RRF criteria, the associated data should be qualified. Use the appropriate QA/QC remark codes in Table 5, when necessary.

15.3 Continuing Calibration Check Standard (CCV) - Sec 7.2.4

Acceptance Criteria - All the compounds must be present in the quantitation report. The peak shape of the internal standard must be well defined and with a minimum degree of tailing. All compounds must have a minimum RRF of 0.05. The maximum %D for each analyte RRF must be ±30% of the average initial calibration RRF. For Superfund samples the number of analytes not meeting the criteria in must be < than 10% of the total analytes, the maximum %D must be < 60%.

Corrective Action - If %D of any analyte is more than 60%, or if 10% of the total analytes or any NPDES analyte fails, then the CCCS must be rerun. If it is still outside of the acceptable range the curve for that analyte should be reanalyzed. If there is a case where the CCCS for a NPDES analyte are high (>30%D but < 60%) then the samples do not necessarily need to be reanalyzed if that analyte was not identified in the affected samples. However, if it shown to be present then the CCCS and affected samples must be reanalyzed for that analyte until the %D criteria is met, also if a NPDES analyte fails the %D criteria biased low, CCCS must be reanalyzed for that analyte until the %D criteria is met. Check with the team leader/section chief to determine whether further action is necessary to insure data quality. If reporting any analyte that failed the %D criteria (as long as less than 10% of total analyte and value is < 60%), any

associated data, including the non-detect (except where the %D is high) should be qualified. Use the appropriate QA/QC remark codes in Table 5, when necessary.

15.4 Alternate Source Concentration Check (ICV) – Sec 7.2.4

When a curve is prepared, the concentration of each of the analytes in the calibration solution should be verified using a check solution prepared from a second source. The concentration is checked by analyzing a solution containing each of the analytes from the second source at a concentration close to the midpoint of the curve. If a separate source is not available then a second lot from the 1st source is acceptable. No verifications are necessary for any subsequent generation of calibration curves from the same set of working standards. When a calibration curve is verified then one of its midpoints may serve as the CCCS.

Acceptance Criteria - Same as Sec. 15.3.

Corrective Action – Same as Sec. 15.3

15.5 Method Blank (BLK) - Sections 9.1, 9.2, 9.3

Method Blank - A method blank is extracted and analyzed with every batch of samples. A batch is defined as a set of 20 samples of the same matrix extracted within a 24-hour period of time. For each QC batch of samples analyzed, the corresponding method blank must be processed through the same complete extraction procedure.

Acceptance Criteria - A method blank should be clean without any contaminant, but if present the concentration should be less than the reporting limit (RL).

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Corrective Action - Common contaminants include phenol, phthalates, and 2,4,5-trichlorophenol. Do not report as present any of the common contaminants if <10X the amount present in the method/reagent blank. For all other contaminants, do not report as present if <5X the amount reported in the blank. For RL, report the amount found in the sample as not detected when it is <5X for regular or <10X for common contaminants, as the case may be, as a U value.

15.6 Surrogate (Sur) - Sec 7.2.2

Acceptance Criteria - Surrogate recoveries for each run are examined to confirm that they are within the acceptable range of 30-120% recovery for base neutrals and 20-120% recovery for acids (Ref. CERCLA CLP SOW OLM04.3). The surrogate recoveries for NPDES are 60-140%until control charts are developed.

Corrective Action - If a surrogate standard recovery is outside the QC limits in the blank or sample, corrective action is recommended. Begin by checking the GC/MS instrument for operation problems, correcting apparent instrument problems, and re-injecting the sample. The cause of the problem must be determined and shall be corrected if feasible. If no correction is feasible, the associated data, including the non-detect, (except for the analytes with high recoveries, the non-detect should not be qualified) should be qualified.

The associated data should be qualified as follows: If the surrogate not meeting the acceptance limits is an acid, then all analytes that are acids quantitated on the same internal standard of the same chemical properties as the affected surrogates should be qualified accordingly. This rule is similarly applied to base-neutral surrogates. Use the appropriate QA/QC remark coded in Table 5, when necessary.

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15.7 Internal Standards (ISTD) - Sec 7.2.3

Acceptance Criteria - The area for any internal standards (IS) should not change by more than a factor of two (-50% to +100%) as compared to the daily check standard.

Corrective Action - The mass spectrometric system must be inspected for malfunction, and corrections made as appropriate and samples reanalyzed. If the results are the same, the sample should be qualified accordingly.

15.8 Matrix Spike/Matrix Spike Dup (MS/MSD) - Sec 7.2.6

Acceptance Criteria - For every batch (samples of the same matrix extracted within a 24hr. period) of 20 samples or less, one or two spiked field sample/s per site/survey is analyzed. Calculate percent recovery for all analytes listed in Table 3 (Ref. 40 CFR Method 625.1). RPD limit for the MS/MSD is ≤24%. All analytes are spiked in NPDES samples and the level should be at mid-level of the calibration curve. For waste oil samples duplicates are run instead of an MS. Evaluate MS results in conjunction with other QC data in determining data acceptability.

If the concentration of an analyte in the matrix spike is greater than the highest point of the calibration curve, then a dilution must be made. However, if the concentration of the analyte is greater in the unspiked sample than the amount spiked then no dilution or evaluation for that analyte is to be made.

For samples analyzed under the NPDES, prepare one MS/MSD pair per project for an analytical batch of 20 or less. For samples analyzed under the Drinking Water, RCRA and/or Criminal Enforcement programs, prepare one LFM/MS sample for each matrix per project for an analytical batch of 10 or less. For samples analyzed under other programs, e.g., Superfund, Ambient Water, prepare one LFM/MS per matrix for an analytical batch of 20 samples or less regardless of the number of different projects that comprise the analytical batch.

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Corrective Action - If the matrix spike samples are outside the acceptance criteria, professional judgment should be used to determine acceptability of the data. The data from the sample used for the MS should be flagged with appropriate QA/QC remark codes listed in Table 5.

15.9 Laboratory Control Sample/Standard Reference MaterialLCS/SRM (BS/BSD) – Sec. 7.2.5

Calculate the percent relative difference (%RPD) using the equation:

$$\%RPD = \frac{|X1 - X2|}{\overline{X}} * 100$$

Where:

X1, X2 = Duplicate results

$\overline{X}$ = Average of duplicate results

Acceptance Criteria – BS/BSDs must be done in duplicates within a 24-hr. period and a batch of 20 samples of the same matrix that extractions are performed. Averages are taken to evaluate % recovery limits. The %RPD must be 30 or less.

Aqueous Samples - Percent recovery limits are listed in Table 3. The amount of each analyte should be at the mid-level of its respective calibration curve.

- Soil/Sediment Samples - SRM purchased from vendors may be used as BS/BSDs. The SRM must contain all the regulatory analytes of the method. Refer to the certification submitted by the supplier because the acceptance limits for some SRMs are batch specific. If SRMs are not used as BS/BSDs then spiked sand containing the regulatory analytes may be used.

Corrective Action - Use the appropriate QA/QC remark codes on samples with hits for specific analyte results which are outside the QA/QC acceptance limits. The associated data, including the non-detect, should be qualified (the non-detect should not be qualified for analytes with the high recovery). Use the appropriate QA/QC remark codes in Table 5, when necessary.

16. Reporting and Validation

16.1 Reporting Limit

The reporting limits are calculated based on the concentration of the lowest calibration standard analyzed. The reporting limits are matrix and dilution dependent. For soil/sediments the reporting limits are calculated based on the dry weight. All reporting values should be rounded to 3 significant figures. The reporting limit is calculated by taking the lowest standard of the calibration curve using the appropriate equation at Section 13.1.

16.2 Electronic Data Package (EDP)

Requirement for Electronic Data Packages is on G:\Laboratory_Branch\Electronic Data Packages\Requirements for EDP Packages.

16.3 Laboratory Information Management System (LIMS)

Note: Refer to SOP G-28 Analyst/reviewer sections

16.3.1 Data entry: Upload into Element is done through DataTool. Verify the accuracy of the reported results from the instrument data, including unit conversion, reporting limit changes, dilution correction, TICs, etc.

16.3.2 Verify the contents of the Element reviewer checklist based on the method QC requirements.

16.3.3 The analyst completes the reviewer checklist. (Most instrument QC is not automatically checked and recorded in the reviewer checklist). The analyst must record these checks manually in the reviewer checklist and could be obtained from within Element (ex. Data review screen) and/or from the instrument data. Anomalies must be addressed in the comment section of the reviewer checklist by the Analyst.

16.4 Data Validation

The review is done by a peer who was not involved in the analysis. Upon completion of the review, including validation of all the appropriate codes in the LIMS for the particular project(s), the data reviewer will sign and date the Reviewer Checklist. Analysts must include an example calculation on a sample for each method/matrix analyzed in all data packages and, if applicable, using a detect result. The calculation will begin with the sample result generated from the instrument and end with the result reported. It is the responsibility of the peer reviewer to verify the accuracy of the calculations performed.

The only exception to this policy would be if no data reduction/manipulation is performed on the sample results between the instrument output and final results reported, i.e., if the sample results generated from the analyses are reported directly from the instrument. Also, for multi-analyte methods, one analyte needs to be carried through in the example calculation representing the group.

Once review is completed by the peer reviewer, which is the final check off on the Reviewer Checklist, the peer reviewer finalizes the Reviewer Checklist and includes it in the Project folder.

Please refer to SOP G-26 for details.

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16.5 Data Records

An analytical data package is created for each project and electronically saved in a designated project folder on the shared network drive. The Electronic Data Package (EDP) is prepared based on the EDP requirements established for the analyses. If a batch/sequence consists of several projects, the associated files are saved into each unique project folder.

Please refer to SOP G-26 for details.

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17. Pollution Prevention

17.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the Agency recommends recycling as the next best option.

17.2 The quantity of chemicals purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

17.3 For information about pollution prevention that may be applicable to laboratories and research institutions, consult “Less is Better: Laboratory Chemical and Management for Waste Reduction”, available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street N.W., Washington D.C. 20036, (202)872-4477.

18. Waste Management

The USEPA requires that laboratory waste management practice be conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes should be characterized and disposed of in an acceptable manner. The agency urges laboratories to protect the air, water and land by minimizing and controlling all releases from hoods and bench operations, complying with the letter and spirit of any water discharge permit and regulations, and by complying with all solid and hazardous waste regulations, particularly the hazardous waste identification rules and land disposal restrictions. For further information on waste management consult the Region 2 SOP G-6, Disposal of samples and hazardous wastes and Chemical Inventory Management.

19. References

19.1 40 Code of Federal Register, Part 136, Method 625.1, 2016Edition.

19.2 RCRA Method SW-846-8270D, Revision 4, Feb. 4, 2007 - Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS).

19.3 US EPA, Region 2, SOP G-6 Disposal of Samples & Hazardous Waste and Chemical Inventory Management. Current Version.

19.4 SOM 2.4 - Analytical Method for the Analysis of Semivolatile Organic Compounds. Current Version.

19.5 EPA, Region 2, SOP G-13 Glass Ware Washing. Current Version

19.6 EPA, Region 2, SOP G-23 Percent Dry Solids. Current Version

19.7 Promium Element Data System, Laboratory Information Management Systems, Promium, LLC. Current Version.

19.8 Laboratory Quality Management Plan (LQMP), U.S. Environmental Protection Agency, Region 2 Laboratory Branch. Current Version.

19.9 Environmental, Health and Safety Operations Manual & Chemical Hygiene Plan, EPA Region 2. Current Version.

19.10 SOP G-9, Laboratory Policy for The Establishment and Maintenance Of Logbooks Associated With Chemical Analysis. Current Version.

19.11 US EPA, Region 2, SOP G-26 “Guidance for Laboratory Data Review”. Current Version.

19.12 US EPA, Region 2, SOP G-28 “Laboratory Operations Utilizing Promium “Element” Lims”. Current Version

19.13 Working with Promium. Current version. Current Version

19.14 US EPA, Region 2 SOP G-15, Definitions, Current Version.

20. Tables

Table 1 - CHARACTERISTIC IONS FOR LISTED ANALYTES

Analytes	Primary Ion	Secondary Ion	Target Analyte (See Footnote)	Internal/Std Surrogate
*1-Bromo-4-Chlorobenzene –I1	192			
*4,4'-Dibromobiphenyl – I2	152	312		
*Perylene- d12 - I3	264			
* 1,4- Dichlorobenzene-d4 –I4	152	115		
2-Fluoroaniline (SS) –S1	111	84		I1
Phenol-d6 (SS) – S2	99			I1
Naphthalene-d8 (SS)-S3	136	137		I1
1-Fluoronaphthalene (SS)- S4	146			I1
2,4-Dibromophenol (SS) –S5	252			I1
Anthracene-d10 (SS) –S6	188			I2
Chrysene-d12 (SS) –S7	240			I3
1,4-Dioxane-d8 (SS)- S8	96	64,62		I4
1,2,4,5-Tetrachlorobenzene	216	214,218,179	SF	I1, S4
2,3,4,6-Tetrachlorophenol	232	131,230,166	SF	I2, S5
Acetophenone	105	77,51	SF	I1, S1

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Atrazine	200	173,215	SF	12, S6
Benzaldehyde	77	105,106	SF	I1, S1
Caprolactam	113	55,56	SF	I1, S4
Carbazole	167	166,139	SF	I2, S6
Pyridine	79	52	TCLP	I1, S1
1-Methylnapthalene	142	141, 115	PAH	I1, S3
Benzo(e)Pyrene	252		PAH	I3, S7
Biphenyl	154	153	PAH,SF	I1, S3, S4
Perylene	252		PAH	I3, S7
1-Methylphenanthrene	192	191	PAH	I2, S6
2,3,5-Trimethylnaphthalene	170	155	PAH	I1, S3
2,6-Dimethylnaphthalene	156	155	PAH	I1, S3
2-Methylnaphthalene	142	141	PAH,SF	I1, S3, S4
Acenaphthene	153	154, 152	NPDES,PAH,SF	I1, S3, S4
Acenaphthylene	152	151, 153	NPDES,PAH,SF	I1, S3, S4
Anthracene	178	179, 176	NPDES,PAH,SF	I2, S6
Benzo(a)Anthracene	228	229,226	NPDES,PAH,SF	I3, S7
Benzo(a)Pyrene	252	253, 125	NPDES,PAH,SF	I3, S7
Benzo(b)Fluoranthene	252	253, 125	NPDES,PAH,SF	I3, S7
Benzo(g,h,i)Perylene	276	138, 277	NPDES,PAH,SF	I3, S7
Benzo(k)Fluoranthene	252	253, 125	NPDES,PAH,SF	I3, S7
Chrysene	228	226, 229	NPDES,PAH,SF	I3, S7
Dibenzo(a,h)Anthracene	278	139, 279	NPDES,PAH,SF	I3, S7
Fluoranthene	202	101, 100	NPDES,PAH,SF	I2,S6
Fluorene	166	165, 167	NPDES,PAH,SF	I2, S6
Indeno(1,2,3-cd)Pyrene	276	138	NPDES,PAH,SF	I3, S7
Naphthalene	128	127, 129	NPDES,PAH,SF	I1, S3
Phenanthrene	178	179, 176	NPDES, PAH,SF	I2, S6
1,2,4-Trichlorobenzene	180	182	NPDES	I1, S1
1,2-Dichlorobenzene	146	113, 148	†	I1, S1
1,3-Dichlorobenzene	146	113, 148	†	I1, S1
1,4-Dichlorobenzene	146	113, 148	TCLP	I1, S1
1,4-Dioxane	88	58,43	†	I4, S8
2,4,5-Trichlorophenol	196	198, 200	SF	I1, S5
2,4,6-Trichlorophenol	196	198, 200	NPDES,SF	I1, S5

2,4-Dichlorophenol	162	98, 164	NPDES,SF	I1, S2
2,4-Dimethyl Phenol	107	122, 121	NPDES,SF	I1, S2
2,4-Dinitrotoluene	165	182, 63	NPDES,SF	I2, S5
2,6-Dinitrotoluene	165	121,89	NPDES,SF	I1, S4
2-4-Dinitrophenol	184	63, 154	NPDES.SF	I1, S5
2-Chloronaphthalene	162	127,164	NPDES,SF	I1, S4
2-Chlorophenol	128	64, 130	NPDES,SF	I1, S2
2-Methylphenol	108	107, 77	SF, TCLP	I1, S2
2-Nitrophenol	139	65,109	NPDES,SF	I1, S4
2-Nitroaniline	138	65,92	SF	I3, S7
3,3'-Dichlorobenzidine	252	254,126	NPDES, SF	I1, S4
3-Nitroaniline	138	92, 108	SF	I2, S5
4,6-Dinitro-2-Methylphenol	198	182, 77	NPDES,SF	I2, S6
4-Bromophenylphenylether	248	250	NPDES,SF	I1, S4
4-Chloro-3-Methylphenol	107	142, 144	NPDES,SF	I1,S2
4-Chloroaniline	127	65, 129	SF	I1, S4
4-Chlorophenylphenylether	204	206, 141	NPDES,SF	I2, S6
3&4-Methylphenol	107	108, 77	TCLP	I1, S2
4-Methylphenol	107	108,77	SF	I1, S2
4-Nitroaniline	138	108, 92	SF	I2, S6
4-Nitrophenol	65	139, 109	NPDES,SF	I1, S5
Benzidine	184	167	NPDES	I2, S6
Benzoic Acid	105	122, 77	†	I1, S1
Benzyl Alcohol	79	108	†	I1, S1
bis(2-Chloroethoxy)Methane	93	123, 95	NPDES,SF	I1, S1
Bis(2-Chloroethyl)Ether	93	63, 95	NPDES,SF	I1, S1
bis(2-chloroisopropyl)Ether / (2-2' Oxybis(1-chloropropane))	45	121	NPDES,SF	I1, S1
Bis(2-ethylhexyl)Phthalate	149	167, 279	NPDES,SF	I3, S7
Butylbenzylphthalate	149	91, 206	NPDES,SF	I2, S6
Diazene, diphenyl- (Azobenzene)	77	182, 51	NPDES	I2, S6
Dibenzofuran	168	139	SF	I1, S4
Diethylphthalate	149	177	NPDES,SF	I2, S6
Dimethyl Phthalate	163	164, 194	NPDES,SF	I1, S4
Di-n-butylphthalate	149	150, 104	NPDES,SF	I2, S6
Di-n-octyl Phthalate	149	150	NPDES,SF	I3, S7

Hexachlorobenzene	284	142, 249	NPDES,SF	I2, S6
Hexachlorobutadiene	225	223	NPDES,SF	I1, S4
Hexachlorocyclopentadiene	237	235, 272	NPDES,SF	I1, S4
Hexachloroethane	201	117	NPDES,SF,TCLP	I1, S1
Isophorone	82	138	NPDES,SF	I1, S1
Nitrobenzene	77	123, 65	NPDES,SF,TCLP	I1, S1
N-Nitrosodimethylamine	74	42,43	NPDES	I1, S1
N-Nitroso-Di-n-Propylamine	70	130	NPDES,SF	I1, S1
N-Nitrosodiphenylamine	169	168, 167	NPDES,SF	I2, S6
Pentachlorophenol	266	264, 268	NPDES,SF,TCLP	I2, S5
Phenol	94	65, 66	NPDES,SF	I1, S2
Pyrene	202	101, 100	NPDES,SF, PAH	I2, S6

*Internal Standards

(SS) Surrogate Standards

PAH - Target analytes for PAH analysis for above and following tables.

NPDES -Target analyte for NPDES semivolatile analyses for above and following tables.

TCLP - target analyte for TCLP analyses for above and following tables.

SF - Target analyte for CLP (SOMO2.3) analyses for above and following tables.

†- Non-specific project request

Table 2 - DFTPP KEY IONS AND ION ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria
51	*30-60% of mass 198*
68	*less than 2% of mass 69*
70	*less than 2% of mass 69*
127	*40-60% of mass 198*
197	*less than 1% of mass 198*
198	*base peak, 100% relative abundance*
199	*5-9% of mass 198*
275	*10-30% of mass 198*
365	*greater than 1% of mass 198*
441	*present but less than mass 443*
442	*greater than 40% of mass 198*
443	*17-23% of mass 442*

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Table 3 – Percent Recovery Limits for Matrix Spike, BS/BSD and DOC

Analytes List	**% Recovery Water (BS/BSD/MS/MSD)**	**%Recovery Soil**	- **% Recovery DOC**
1,2,4,5-Tetrachlorobenzene	36-124	19-137	36-124*
1,4-Dioxane	7-106	25-108	7-106*
2,3,4,6-Tetrachlorophenol	38-136	37-128	38-136*
2,4,5-Trichlorophenol	40-129	29-143	40-129*
2,4,6-Trichlorophenol	37-144	36-136	52-129
2,4-Dichlorophenol	39-135	35-129	53-122
2,4-Dimethylphenol	32-119	32-131	42-120
2,4-Dinitrophenol	D-191	2-143	D-173
2,4-Dinitrotoluene	39-139	38-133	48-127
2,6-Dinitrotoluene	50-158	37-138	68-137
2-Chloronaphthalene	60-118	36-132	65-120
2-Chlorophenol	23-134	33-124	36-120
2-methylnapthalene	41-126	37-135	41-126*
2-methylphenol	40-112	37-121	40-112*
2-Nitroaniline	35-136	39-133	35-136*
2-Nitrophenol	29-182	38-125	45-167
3&4-Methylphenol	34-116	37-125	34-116*
3,3’-Dichlorobenzidine	D-262	38-135	8-213
3-Nitroaniline	31-141	44-141	31-141*
4,6-Dinitro-2-methylphenol	D-181	25-136	53-130
4-Bromophenylphenylether	53-127	43-124	65-120
4-Chloro-3-methylphenol	22-147	39-132	41-128
4-Chloroaniline	26-172	32-123	26-172*

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4-Chlorophenylphenylether	25-158	39-126	38-145
4-Nitroaniline	39-123	39-137	39-123*
4-Nitrophenol	D-132	12-159	13-129
Acenaphthene	47-145	38-136	60-132
Acenaphthylene	33-145	44-137	54-126
Acetophenone	43-121	33-128	43-121*
Anthracene	27-133	46-125	43-120
Atrazine	23-152	10-127	23-152*
Benzaldehyde	8-154	16-157	8-154*
Benzo(a)anthracene	33-143	43-141	42-133
Benzo(a)pyrene	17-163	48-129	32-148
Benzo(b)fluoranthene	24-159	48-134	42-140
Benzo(g,h,i)perylene	D-219	38-130	D-195
Benzo(k)fluoranthene	11-162	50-135	25-146
Biphenyl	41-122	37-128	41-122*
Bis(2-Chloroethoxy)methane	33-184	34-132	33-184
Bis(2-Chloroethyl)ether	12-158	35-125	12-158
Bis(2-Chloroisopropyl)ether	36-166	31-127	36-166
Bis(2-ethylhexyl)phthalate	8-158	34-157	8-158
Butylbenzylphthalate	D-152	45-132	D-140
Caprolactam	D-143	D-120	D-143*
Carbazole	38-131	45-124	38-131*
Chrysene	17-168	43-139	44-140
Diazene, biphenyl (Azobenzene)	60-115	52-98	60-115*
Dibenzo(a,h)anthracene	D-227	38-134	D-200
Dibenzofuran	40-131	36-137	40-131*
Diethylphthalate	D-114	39-129	D-120
Dimethylphthalate	28-112 *	34-139	D-120

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Di-n-butylphthalate	43-118 *	41-134	8-120
Di-n-octyl phthalate	4-146	40-149	19-132
Fluoranthene	26-137	48-124	43-121
Fluorene	59-121	43-126	70-120
Hexachlorobenzene	D-152	44-127	8-142
Hexachlorobutadiene	24-116	37-127	38-120
Hexachlorocyclopentadiene	15-76	23-148	15-76*
Hexachloroethane	40-113	34-120	55-120
Indeno(1,2,3-cd)pyrene	D-171	41-133	D-151
Isophorone	21-196	45-128	47-180
Naphthalene	21-133	36-127	36-120
Nitrobenzene	35-180	33-130	54-158
N-Nitrosodimethylamine	17-127	21-101	14-198
N-Nitroso-di-n-propylamine	D-230	30-131	D-230*
N-Nitrosodiphenylamine	79-139	45-129	79-139*
Pentachlorophenol	14-176	28-136	38-152
Phenanthrene	54-120	46-124	65-120
Phenol	5-112	24-128	17-120
Pyrene	52-115	44-123	70-120

*For analytes where the DOC values are not specified in Table 6 of method 625.1 percent recoveries for Matrix Spike and BS/BSD were used.

‘D’ values must greater than zero.

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Table 4 - REPORTING LIMITS

Organics - NVOAs	Aqueous Matrix, ug/L	Superfund Limits, ug/L	Soil/Sediment, ug/Kg
4,6-Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	5	10	100
3,3'-Dichlorobenzidine	5	10	100
2,6-dinitrotoluene	5	5	100
2,4-dinitrotoluene	5	5	100
2,4,6-trichlorophenol	5	5	100
2,4-dichlorophenol	5	5	100
2,4-dimethyl phenol	5	5	100
2,4-dinitrophenol	5	10	100
2,4,5-trichlorophenol	5	5	100
2,6-Dimethylnaphthalene	5	5	100
2,3,5-Trimethylnaphthalene	5	5	100
2,3,4,6-Tetrachlorophenol	5	5	100
1,3-dichlorobenzene	5	5	100
1,4-dichlorobenzene	5	5	100
1,2-dichlorobenzene	5	5	100
1,4-Dioxane SIM	0.2	0.2	----
1,4-Dioxane	2	2	67
1,2,4-trichlorobenzene	5	5	100
1,2,4,5-Tetrachlorobenzene	5	5	100
Benzo(k)fluoranthene(11,12)	5	5	100
Benzo(b)fluoranthene(3,4)	5	5	100
Hexachloroethane	5	5	100
Hexachlorobutadiene	5	5	100
Naphthalene	5	5	100
Bis(2-chloroethyl)ether	5	10	100

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Bis(2-chloroethoxy)methane	5	5	100
Isophorone	5	5	100
Nitrobenzene	5	5	100
N-nitroso di-n-propylamine	5	5	100
N-nitrosodiphenylamine	5	5	100
Bis(2-chloroisopropyl)ether / (2,2'-bis oxybis (1chloropropane)	5	10	100
Hexachlorocyclopentadiene	5	10	100
2-chloronaphthalene	5	5	100
Acenaphthylene	5	5	100

Acenaphthene	5	5	100
Fluorene	5	5	100
Hexachlorobenzene	5	5	100
4-Bromophenylphenylether	5	5	100
Phenanthrene	5	5	100
Anthracene	5	5	100
Dimethylphthalate	5	5	100
Diethylphthalate	5	5	100
Di-n-butyl-phthalate	5	5	100
Butylbenzylphthalate	5	10	100
Di-n-octyl phthalate	5	10	100
Bis(2-ethylhexyl)phthalate	5	5	100
Fluoranthene	5	10	100
Pyrene	5	5	100
Pyridine	5	5	100
Benzo(a)anthracene / (1,2-Benz anthracene)	5	5	100
4-Chlorophenylphenylether	5	5	100

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Indeno(1,2,3-cd)pyrene	5	5	100
Benzo(a)pyrene	5	5	100
Benzo(g,h,i)perylene / (1,12-Benzo perylene)	5	5	100
Dibenzo(a,h)anthracene / (1,2:5,6-Dibenzo anthracene)	5	5	100
2-Methyl naphthalene	5	5	100
4-Chloroaniline	5	5	100
2-Nitroaniline	5	5	100
3-Nitroaniline	5	10	100
Dibenzofuran	5	5	100
4-Nitroaniline	5	10	100
Chrysene	5	5	100
p-Chloro-m-cresol / (4chloro-3-methylphenol)	5	5	100
2-Chlorophenol	5	5	100
2-Nitrophenol	5	5	100
4-Nitrophenol	5	10	100
Pentachlorophenol	5	10	100
Phenol	5	10	100
o-Cresol / (2-methylphenol)	5	5	100
m-Cresol / (3-methylphenol)	5	5	100
p-Cresol / (4-methylphenol)	5	10	100
1-Methylnapthalene	5	5	100
Biphenyl	5	5	100
1-Methylphenanthrene	5	5	100
Perylene	5	5	100
Benzo(e)pyrene	5	5	100
Acetophenone	5	10	100

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Atrazine	5	10	100
Benzaldehyde	5	10	100
Caprolactam	5	10	100
Carbazole	5	10	100

Notes: Reporting limits are based on the lowest calibration standard, initial sample amount (1000mL for aqueous samples, and 10g for soil/sediment sample, with the assumption of 100% solids), final sample extract volume (1000 uL), and injected extract volume (1uL).

For Superfund soil/sediment samples the lowest calibration standard is 3 ug/L, 25 g of sample & with the assumption of 100% solids reporting limit is 120 ug/kg except for certain phenols (i.e. 2,4-dinitrophenol, 4,6-dinitro-2-methylphenol & pentachlorophenol- reporting limit will be calculated based on the lowest calibration standard for these phenols).

The reporting limits for waste oil/organic solvents are dilution dependent and calculated based on weights and lowest calibration standard for target analytes being analyzed.

TABLE 5 QA/QC REMARK CODES

Code Explanation

U	The analyte was not detected at or above the reporting limit.
J	The identification of the analyte is acceptable; the reported value is an estimate.
UL	The analyte was not detected at or above the reporting limit; the reporting limit may be biased low. The actual value is expected to be greater than the reported value.
UJ	The analyte was not detected at or above the reporting limit. The reporting limit is an
NJ	There is presumptive evidence that the analyte is present; the analyte is reported as a
K	The identification of the analyte is acceptable; the reported value may be biased high.
L	The identification of the analyte is acceptable; the reported value may be biased low.

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Table 6 **TCLP REGULATORY LEVELS**

Analyte	Regulatory Level, mg/L	Reporting Limit, mg/L	Acceptable Limits	% RSD Limits ≤
o-Cresol (2-ethyphenol)	200	0.010	60-150	30
m-Cresol(3-methyphenol)	200	0.010	60-150	30
p-Cresol(4-mehtyphenol)	200	0.010	60-150	30
2,4-Dinitrotoluene	0.1	0.010	80-150	30
Hexachlorobenzene	0.1	0.010	D-150	30
Hexachlorobutadiene	0.5	0.010	D-150	30
Hexachloroethane	3.0	0.010	10-150	30
Nitrobenzene	2.0	0.010	65-150	30
Pentachlorophenol	100	0.010	30-150	30
Pyridine	5.0	0.010	40-50	30
2,4,5-Trichlorophenol	400	0.010	60-150	30
2,4,6-Trichlorophenol	2.0	0.010	70-150	30

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Table 7 **SIM analysis (Standard Levels/ Surr/IS Conc)**

Std level	Initial Aliquot uL	Conc. Int Std ng/uL	Final Volume ml	Final Conc. ng/uL	Surr/IS Con ng/uL
1	5	20	1.0	0.1	20uL/0.4ng/uL
2	10	20	1.0	0.2	20uL/0.4ng/uL
3	20	20	1.0	0.3	20uL/0.4ng/uL
4	40	20	1.0	0.8	20uL/0.4ng/uL
5	50	20	1.0	1.0	20uL/0.4ng/uL
6	100	20	1.0	2.0	20uL/0.4ng/uL

Stock Std Soln: 200 ug/ml (200000 ug/L = 200000 ng/ml)=200 ng/uL-BNA Std

Intermediate STD: 1ml (200ug/ml): 10-20ug/ml

IS Stock@200 ug/ml: Intermediate IS = 20 ug/ml (p-terphenyl-d_{14})

IS: 100uL (2000 ug/ml): 10ml in $MeC1_2$ = 20ug/ml

(20 ul into 1 ml = Final conc = 400 ng/ml)

Surr Stock @2000ug/ml: Intermediate = 200 ug/ml(SIM Surr Std)

Surr: 100uL (2000 ug/ml): 10 ml in $MeC1_2$ = 20 ug/ml

(use 20uL into 1 ml) = Final conc = 400

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APPENDIX I

DEFINITIONS OF TERMS

Analysis Date Time **-** the date and time of the injection of the sample, standard, or blank into the GC/MS system.

Bias **-** the deviation due to matrix effects of the measured value (X_s - X_u) from a known spiked amount. Bias can be assessed by comparing a measured value to an accepted reference value in a sample of known concentration or by determining the recovery of a known amount of contaminant spiked into a sample (matrix spike). Thus, the bias (B) due to matrix effects based on a matrix spike is calculated as

$$B = (X_s - X_u) - K$$

Where:

X_s	=	measured value for spiked sample,
X_u	=	measured value for unspiked sample, and
K	=	known value of the spike in the sample.

Using the following equation yields the percent recovery (%R).

$$\%R = 100 \frac{(X^s - X^u)}{K}$$

Method Blank **-** an analyte-free matrix which serves as an analytical control consisting of the same volumes or proportions of all reagents, internal standard and surrogate standards used in sample processing, that is carried throughout the entire analytical procedure. The method blank is used to define the level of laboratory, background and reagent contamination.

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Calibration Factor **-** a measure of the gas chromatographic response of a target analyte to the mass injected. The calibration factor is analogous to the Relative Response Factor (RRF) used in the fractions.

Contamination **-**a component of a sample fraction as low concentration or medium concentration is made on the basis of the laboratory=s preliminary screen, not on the basis of information entered on the Request for Analysis Sheet.

Continuing Calibration Verification (CCV) **-** analytical standard run every 12 hours to verify the initial calibration of the system.

Decafluorotriphenylphosphine (DFTPP) **-**compound chosen to establish mass spectral instrument performance.

Extractable **-**a compound that can be partitioned into an organic solvent from the sample matrix and is amenable to GC.

Extracted Ion Current Profile (EICP) **-** a plot of ion abundance versus time (or scan number) for ion/s of specified mass/es.

Gas Chromatography (GC) **-** the instrument used to separate analytes on a stationary phase within a chromatographic column. The analytes are volatilized from the injected extracts. The compounds are detected by a Mass Spectrometer (MS).

Initial Calibration **-** analysis of analytical standards for a series of different specified concentrations; used to define the linearity and dynamic range of the response of the MS or electron capture detector to the target compounds.

Internal Standards **-** compounds added to every standard, blank, matrix spike, matrix spike duplicate, and sample extract at a known concentration, prior to analysis. Internal standards are used as the basis for quantitation of the target compounds.

Instrument Blank **-** a blank designed to determine the level of contamination associated with the analytical instruments.

m/z **-** mass to charge ratio, synonymous with "m/e".

Matrix **-** the predominant material of which the sample to be analyzed is composed. For the purposes of this SOP, a sample matrix is either aqueous, soil/sediment, or waste oil/solvents (NAPL).

Matrix Spike (MS/MSD) LFM **-** aliquot of a matrix (aqueous or soil/sediment) fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery. The spiking occurs prior to sample preparation and analysis.

Organic-Free Reagent Water **-** all references to water in the methods refer to water in which an interferent is not observed at the method detection limit of the compounds of interest. Organicfree reagent water can be generated by passing tap water through a carbon filter bed containing about one pound of activated carbon. A water purification system may be used to generate organic-free deionized water.

Percent Moisture **-** an approximation of the amount of water in a soil/sediment sample made by drying an aliquot of the sample at 105°C. The percent moisture determined in this manner also includes contributions from all compounds that may volatilize at or below 105EC, including water. Percent moisture may be determined from decanted samples and from samples that are not decanted.

Primary Quantitation Ion **-** a contract specified ion used to quantitate a target analyte.

Relative Percent Difference (RPD) **-** as used in this SOP to compare two values, the relative percent difference is based on the mean of two values, and is reported as an absolute value, i.e., always expressed as a positive number or zero.

Relative Response Factor (RRF) **-** a measure of the relative mass spectral response of an analyte compared to its internal standard. Relative Response Factors are determined by analysis of standards and are used in the calculation of concentrations of analytes in samples. RRF is determined by the following equation:

$$RRF = \frac{As\ Cis}{Ais\ Cs}$$

Where,

A_s = Area of the primary ion for the parameter to be measured

A_{is}= Area of the primary ion for the internal standard

C_{is}= Concentration of the internal standard (ug/L)

C_s = Concentration of the parameter to be measured

Relative Retention Time (RRT) **-** the ratio of the retention time of a compound to that of a standard (such as an internal standard).

$$RRT = \frac{RT^c}{RT_{is}}$$

RT_c = Retention Time for the target or surrogate compound in continuing calibration.

RT_{is} = Retention Time for the internal standard in calibration standard or in a sample.

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Resolution **-** also termed separation or percent resolution, the separation between peaks on a chromatogram, calculated by dividing the depth of the valley between the peaks by the peak height of the smaller peak being resolved, multiplied by 100.

Response **-** or Instrumental Response: a measurement of the output of the GC detector (MS, ECD, or FID) in which the intensity of the signal is proportionate to the amount or concentration detected. Measured by peak are or peak height.

Retention Time (RT) **-** the time a target analyte is retained on a GC column before elution. The identification of a target analyte is dependent on a target compound=s retention time falling within the specified retention time window established for that compound. Retention time is dependent on the nature of the column=s stationary phase, column diameter, temperature, flow rate, and another parameter.

Sample **-** a portion of material to be analyzed that is contained in single or multiple containers and identified by a unique sample number.

Secondary Quantitation Ion **-** contract specified ion/s to be used in quantitation of target analytes when interferences prevent the use of the primary quantitation ion.

Semivolatile compounds **-** compounds amenable to analysis by extraction of the sample with an organic solvent. Used synonymously with Base/Neutral/Acid (BNA) compounds.

Standard Analysis **-** an analytical determination made with known quantities of target compounds; used to determine response factors.

Surrogates (Surrogate Standard) **-** compounds added to every blank, sample, matrix spike, matrix spike duplicate, BS/BSD, and standards; used to evaluate analytical efficiency by

measuring recovery. Surrogates are brominated, fluorinated, or isotopically labeled compounds not expected to be detected in environmental media.

Target Compound List (TCL) **-** a list of compounds designated by this SOP (see Table 1) for analysis.

Tentatively Identified Compounds (TIC) **-** compounds detected in samples that are not target compounds, internal standards, or surrogates. Up to 10 peaks (those greater than 10% of the peak area or heights of nearest internal standard) are subjected to mass spectral library searches for tentative identification.

Twelve-Hour Time Period **-** the twelve (12) hour time period for GC/MS system instrument performance check, standard calibration (initial or continuing calibration), and method blank analysis begins at the moment of injection of the DFTPP analysis that the laboratory submits as documentation of instrument performance. The time period ends after 12 hours have lapsed according to the system clock.

REQUEST FOR SOP CHANGE

Initiator Name:	Girma Admassu		Date of Initiation:	12/04/2018	
Dept :	Organics	SOP #:	C-90	Revision #:	3.7
SOP Title:	**ANALYSIS OF BASE/NEUTRAL AND ACID COMPOUNDS IN AQUEOUS, SOIL/SEDIMENT, AND WASTE OIL/WASTE ORGANIC SOLVENTS SAMPLES BY GC/MS**				
Please Check One	MINOR REVISION X		MAJOR REVISION ☐		

CHANGE(S) (Use attachment if necessary):

Please see Attachment

REASON(S) FOR CHANGE(S):

Soxhlet Extraction for Soil Samples Added

APPROVAL	NAME:	Signature/Date
EPA Branch Chief / Section Chief/Team Leader	G. SANTA CRUZ	12-4-2018
ESAT Analytical Supervisor/ QAO	~~J. Boulton~~	
EPA Task Order Project Officer	**Ness Tirol**	for 12-6-18
Effective Date 12/10/18	**Sumy Cherukara** **EPA QAO**	12/10/18

Change Form for SOP C-90

ANALYSIS OF BASE/NEUTRAL AND ACID COMPOUNDS IN AQUEOUS, SOIL/SEDIMENT, AND WASTE OIL/WASTE ORGANIC SOLVENTS SAMPLES BY GC/MS

Date 12/04/2018

Original section 9.2.2 & 9.2.3 will be replaced by 9.2.2. to 9.2.5

9.2.2 Soil, Sediment Samples – ASE 350

- Accelerated Soil Extractor [ASE350]
- Stainless steel ASE cells (66 ml size) and caps
- 60 ml or 250 ml clear glass sample collection vials
- Cellulose filters 19.8 mm or 30 mm
- Weigh 25-30 grams or sample in clean beaker and add approximately 10 g baked Na_2SO_4 or other drying agent
- Mix samples well with Na_2SO_4, if samples have a lot of moisture content let them air dry for a few minutes.
- Take ASE cells, screw caps on the bottom side of the cell (opposite to the dionex logo end) and insert cellulose filter with the help of insertion tool.
  Screw aluminum funnel on top side of the cells and transfer samples carefully.

- Add surrogate to all samples blank and BS/BSDs according to section 7.2.2.
- Prepare a method blank and a set of BS/BSD with a group of samples extracted each day, for BS/BSDs spike standards are also added beside surrogates.
- Method blank and BS/BSDs are consisting of 25-30g sand and 10g of Na_2SO_4.
- Place another cellulose filter on the top side of the cell and push it with insertion tool until filter settles down to the sample matrix.
- Screw another cell cap on top side and label cells and the collection vials and make sure labeling starts 1-1.5 inches from the top and bottom for collection vials because of the sensor.
- Push the "power" button on the instrument panel, push "trays" button to release the tray and load cells and collection vials in respective order same to each other.
- Open the Air valve on the wall and set pressure to 50 – 55 psi and Nitrogen valve to set pressure to 130 – 135 psi.
- Fill the solvents reservoir bottle with methyl chloride and tighten it up with hand.
- Push "menu" button on instrument, select method #2 and respective vial number in reference to the starting position on the tray, push "enter" and "start" button to start extraction procedure.
- Extract is now ready for concentration.

After extraction, solvent rinse extraction tubes and caps with $MeCl_2$ before washing in EPA washroom. If high level of target analytes are suspected, also employ a sonication step. These steps should minimize analyte carryover contamination when cells are used again for soil/sediment extraction.

9.2.3 Soxtherm Extraction [alternate to ASE extraction]

• Weigh a measured sample, 30 gm, into a soxhlet extraction thimble using a spatula (see Note after Reporting Limit Table 4). However, the amount of sample may change due to project specific objective.

• Add an equivalent amount of anhydrous Na_2SO_4 to the thimble and mix well. Cover the thimble with glass wool. Make sure that the thimble and glass wool are both prewashed with $MeCl_2$.

• Place 2-3 boiling chips in the bottom of the round bottom flask.

• Insert thimble with sample into the extraction chamber and connect the chamber to the round bottom flask. Make sure to cover the extraction thimble with $MeCl_2$ rinsedborosilicate glass wool to avoid light materials in floating out to the collection vessel.

• Surrogates are added to all samples, spike and blank. Add 1.0 mL of surrogate solution (Sec 7.2.2) to sample mixture.

• Add 1.0 mL of matrix standard spike solution (Sec 7.2.6) to the sample portion from the sample chosen for spiking. One spiked samples is prepared per batch or per 20 samples (whichever is less).

• Prepare a method blank with each group of samples extracted each day. The method blank consists of 10 g of Na_2SO_4 and 10 g of sand, spiked with the surrogates and carried throughout the entire analytical procedure.

• Add 150 mL of methylene chloride to the extraction vessel.

• Place the extraction vessel into the soxtherm unit giving it a slight twist to ensure that it forms a seal with the o-ring.

• Make sure the nitrogen and chiller are turned on and flowing to the units.

• Refer to the manufacturers Operating Instructions for the Soxtherm unit for running an extraction program. The extraction/concentration method takes approximately 2 hours.

9.2.3 Concentration

• Filter the extract by passing through Na_2SO_4 to remove moisture.
Prepare a Na_2SO_4 drying column or DryDisk™ (or funnel).

• Insert a glass wool plug in the bottom of the column. Add three inches of coarse Na_2SO_4. Pre-rinse the column with $MeCl_2$.

Use N-Evap to concentrate to 0.5-1.0 ml. Transfer to 2-ml sample vial and make final volume 1.0 ml. The extract is now ready for analysis.
Extracts may also be concentrated on a DryVap system to a volume of approximately 0.9 mLs and then transferred to a sample vial and adjusted to 1 mL.
Note: This preparation is applicable to Superfund samples only, until a DOC is performed for NPDES samples.

Example program:
Method =02, Preheat = 0 min, Heat = 5 min, Static = 5 min, Flush % = 100 vol., Pressure = 1500 psi, Temperature = 100°C, Solvent C = Methylene Chloride 100%, Purge = 60 s and Cycle = 1.

Replace with

9.2.2 Soil, Sediment Samples – ASE 350

- Accelerated Soil Extractor [ASE350]
- Stainless steel ASE cells (66 ml size) and caps
- 60 ml or 250 ml clear glass sample collection vials
- Cellulose filters 19.8 mm or 30 mm
- Weigh 25-30 grams or sample in clean beaker and add approximately 10 g baked Na_2SO_4 or other drying agent
- Mix samples well with Na_2SO_4, if samples have a lot of moisture content let them air dry for a few minutes.
- Take ASE cells, screw caps on the bottom side of the cell (opposite to the dionex logo end) and insert cellulose filter with the help of insertion tool.
  Screw aluminum funnel on top side of the cells and transfer samples carefully.

- Add surrogate to all samples blank and BS/BSDs according to section 7.2.2.
- Prepare a method blank and a set of BS/BSD with a group of samples extracted each day, for BS/BSDs spike standards are also added beside surrogates.
- Method blank and BS/BSDs are consisting of 25-30g sand and 10g of Na_2SO_4.
- Place another cellulose filter on the top side of the cell and push it with insertion tool until filter settles down to the sample matrix.
- Screw another cell cap on top side and label cells and the collection vials and make sure labeling starts 1-1.5 inches from the top and bottom for collection vials because of the sensor.
- Push the "power" button on the instrument panel, push "trays" button to release the tray and load cells and collection vials in respective order same to each other.
- Open the Air valve on the wall and set pressure to 50 – 55 psi and Nitrogen valve to set pressure to 130 – 135 psi.
- Fill the solvents reservoir bottle with methyl chloride and tighten it up with hand.
- Push "menu" button on instrument, select method #2 and respective vial number in reference to the starting position on the tray, push "enter" and "start" button to start extraction procedure.
- Extract is now ready for concentration.

After extraction, solvent rinse extraction tubes and caps with $MeCl_2$ before washing in EPA washroom. If high level of target analytes are suspected, also employ a sonication step. These steps should minimize analyte carryover contamination when cells are used again for soil/sediment extraction.

Example program:
Method =02, Preheat = 0 min, Heat = 5 min, Static = 5 min, Flush % = 100 vol., Pressure = 1500 psi, Temperature = 100°C, Solvent C = Methylene Chloride 100%, Purge = 60 s and Cycle = 1.

9.2.3 Soxtherm Extraction

• Weigh a measured sample, 30 gm, into a soxtherm extraction thimble using a spatula (see Note after Reporting Limit Table 4). However, the amount of sample may change due to project specific objective.
• Add an equivalent amount of anhydrous Na_2SO_4 to the thimble and mix well. Cover the thimble with glass wool. Make sure that the thimble and glass wool are both prewashed with $MeCl_2$
• Place 2-3 boiling chips in the bottom of the round bottom flask.
• Insert thimble with sample into the extraction chamber and connect the chamber to the round bottom flask. Make sure to cover the extraction thimble with $MeCl_2$ rinsed borosilicate glass wool to avoid light materials in floating out to the collection vessel.
• Add surrogate to all samples blank and BS/BSDs according to section 7.2.2.
• Prepare a method blank and a set of BS/BSD with a group of samples extracted each day, for BS/BSDs spike standards are also added beside surrogates.
• Method blank and BS/BSDs are consisting of 25-30g sand and 10g of Na_2SO_4.
• Add 150 mL of methylene chloride to the extraction vessel.
• Place the extraction vessel into the soxtherm unit giving it a slight twist to ensure that it forms a seal with the o-ring.
• Make sure the nitrogen and chiller are turned on and flowing to the units.
• Refer to the manufacturers Operating Instructions for the Soxtherm unit for running an extraction program. The extraction/concentration method takes approximately 2 hours.

9.2.4 Soil, Sediment Samples –Soxhlet Extractions

- Soxhlet Extraction weigh 25-30 g sample in a beaker and add 50g of sodium sulfate and mix.
- Place a piece of glass wool at the bottom of the Soxhlet extraction vessel with a little bit of sodium sulfate to hold the glass wool in place.
- Transfer each dried sample to Soxhlet extraction vessel.
- Transfer 300mLs of DCM to a 500 mLs of flask with a few boiling chips.
- Connect the 500mLs flask with the extraction vessel and then to the condenser which connected to a chiller.
- Place the whole assembly on heating mantel which is connected to heat controller which is set to 80°C.
- Extract the samples for about 16 hours.
- Prior to extraction on Soxhlet Extractor:
- Add surrogate to all samples blank and BS/BSDs according to section 7.2.2.
- Prepare a method blank, two BS/BSD, and MS with a group of samples extracted each day, for BS/BSDs and MSs spike standards are also added beside surrogates.
- Method blank and BS/BSDs are consisting of 25-30g sand and 10g of Na_2SO_4.
- Extract is now ready for concentration and analysis.

9.2.5 Concentration

• Filter the extract by passing through Na_2SO_4 to remove moisture.
Prepare a Na_2SO_4 drying column or DryDisk™ (or funnel).
• Insert a glass wool plug in the bottom of the column. Add three inches of coarse Na_2SO_4. Pre-rinse the column with $MeCl_2$.

Use N-Evap to concentrate to 0.5-1.0 ml. Transfer to 2-ml sample vial and make final volume 1.0 ml. The extract is now ready for analysis.

Extracts may also be concentrated on a DryVap system to a volume of approximately 0.9 mLs and then transferred to a sample vial and adjusted to 1 mL.

Note: This preparation is applicable to Superfund samples only, until a DOC is performed for NPDES samples.

REQUEST FOR SOP CHANGE

Initiator Name:	Reginald St-Juste	Date of Initiation:	2/19/2019

Dept :	Organics	SOP #:	C-90	Revision #:	3.7

SOP Title:	**Analysis of Base/Neutral and Acid Compounds in Aqueous, Soil/Sediment, and Waste Oil/Waste Organic Solvents Sample By GC/MS**

Please Check One	MINOR REVISION ☐	MAJOR REVISION ☐

CHANGE(S) (Use attachment if necessary):

* At the end of page 58 In Table 3-Percent recovery Limits for Matrix Spike, BS/BSD and DOC, replace "'D' values must greater than zero" by "'D' are from control Charts."
On page 57 Table 3-Percent recovery Limits for Matrix Spike, BS/BSD and DOC, % Recovery Water (BS/BSD/MS/MSD) for 'Dimethylphthalate' to be updated from '28-112' to 'D-120'

REASON(S) FOR CHANGE(S):

To satisfy the accuracy in the new method 625.1

APPROVAL	NAME:	Signature/Date
EPA Branch Chief / Section Chief/Team Leader	**John Bourbon**	2/21/19
ESAT Analytical Supervisor/ QAO	**Reginald St-Juste**	2/21/2019
EPA Task Order Project Officer	**Ness Tirol**	
Effective Date 2/21/19	**Sumy Cherukara** **EPA QAO**	2/21/19

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Form SOP Change Request, Version 1.2; Feb 2, 2017

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REQUEST FOR SOP CHANGE

Initiator Name:	Gregory J. Santacroce		Date of Initiation:	3/5/2019	
Dept :	Organics	SOP #:	C-90	Revision #:	3.7
SOP Title:	**Analysis of Base/Neutral and Acid Compounds in Aqueous, Soil/Sediment, and Waste Oil/Waste Organic Solvents Sample By GC/MS**				
Please Check One	MINOR REVISION X		MAJOR REVISION ☐		

CHANGE(S) (Use attachment if necessary):

Make changes to Table 3 limits as highlighted in attached table.

REASON(S) FOR CHANGE(S):

Proper DOC and MS/MSD/BS/BSD recovery ranges for Method 625.1

APPROVAL	NAME:	Signature/Date
EPA Branch Chief / Section Chief/Team Leader	**John Bourbon**	3/6/19
ESAT Analytical Supervisor/ QAO	**Reginald St-Juste**	3/6/9
EPA Task Order Project Officer	**Ness Tirol**	
Effective Date 03/7/19	**Sumy Cherukara** **EPA QAO**	03/7/19

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Form SOP Change Request, Version 1.2; Feb 2, 2017

Analytes List	% Recovery Water (BS/BSD/MS/MSD)	%Recovery Soil	% Recovery DOC
1,2,4,5-Tetrachlorobenzene	36-124	19-137	36-124*
1,4-Dioxane	7-106	25-108	7-106*
2,3,4,6-Tetrachlorophenol	38-136	37-128	38-136*
2,4,5-Trichlorophenol	40-129	29-143	40-129*
2,4,6-Trichlorophenol	37-144	36-136	52-129
2,4-Dichlorophenol	39-135	35-129	53-122
2,4-Dimethylphenol	32-119	32-131	42-120
2,4-Dinitrophenol	21-191	2-143	21-173
2,4-Dinitrotoluene	39-139	38-133	48-127
2,6-Dinitrotoluene	50-158	37-138	68-137
2-Chloronaphthalene	60-118	36-132	65-120
2-Chlorophenol	23-134	33-124	36-120
2-methylnapthalene	41-126	37-135	41-126*
2-methylphenol	40-112	37-121	40-112*
2-Nitroaniline	35-136	39-133	35-136*
2-Nitrophenol	29-182	38-125	45-167
3&4-Methylphenol	34-116	37-125	34-116*
3,3'-Dichlorobenzidine	38-262	38-135	8-213
3-Nitroaniline	31-141	44-141	31-141*
4,6-Dinitro-2-methylphenol	17-181	25-136	53-130
4-Bromophenylphenylether	53-127	43-124	65-120
4-Chloro-3-methylphenol	22-147	39-132	41-128
4-Chloroaniline	26-172	32-123	26-172*
4-Chlorophenylphenylether	25-158	39-126	38-145
4-Nitroaniline	39-123	39-137	39-123*
4-Nitrophenol	D-132	12-159	13-129
Acenaphthene	47-145	38-136	60-132
Acenaphthylene	33-145	44-137	54-126
Acetophenone	43-121	33-128	43-121*
Anthracene	27-133	46-125	43-120
Atrazine	23-152	10-127	23-152*
Benzaldehyde	8-154	16-157	8-154*

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Benzo(a)anthracene	33-143	43-141	42-133
Benzo(a)pyrene	17-163	48-129	32-148
Benzo(b)fluoranthene	24-159	48-134	42-140
Benzo(g,h,i)perylene	35-219	38-130	35-195
Benzo(k)fluoranthene	11-162	50-135	25-146
Biphenyl	41-122	37-128	41-122*
Bis(2-Chloroethoxy)methane	33-184	34-132	49-165
Bis(2-Chloroethyl)ether	12-158	35-125	43-126
Bis(2-Chloroisopropyl)ether	36-166	31-127	63-139
Bis(2-ethylhexyl)phthalate	8-158	34-157	29-137
Butylbenzylphthalate	38-152	45-132	38-140
Caprolactam	1-143	1-120	1-143*
Carbazole	38-131	45-124	38-131*
Chrysene	17-168	43-139	44-140
Diazene, biphenyl (Azobenzene)	60-115	52-98	60-115*
Dibenzo(a,h)anthracene	33-227	38-134	33-200
Dibenzofuran	40-131	36-137	40-131*
Diethylphthalate	31-114	39-129	31-120
Dimethylphthalate	38-120	34-139	38-120
Di-n-butylphthalate	43-118 *	41-134	8-120
Di-n-octyl phthalate	4-146	40-149	19-132
Fluoranthene	26-137	48-124	43-121
Fluorene	59-121	43-126	70-120
Hexachlorobenzene	35-152	44-127	8-142
Hexachlorobutadiene	24-116	37-127	38-120
Hexachlorocyclopentadiene	15-76	23-148	15-76*
Hexachloroethane	40-113	34-120	55-120
Indeno(1,2,3-cd)pyrene	39-171	41-133	39-151
Isophorone	21-196	45-128	47-180
Naphthalene	21-133	36-127	36-120
Nitrobenzene	35-180	33-130	54-158
N-Nitrosodimethylamine	17-127	21-101	14-198

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N-Nitroso-di-n-propylamine	17-230	30-131	14-198*
N-Nitrosodiphenylamine	79-139	45-129	79-139*
Pentachlorophenol	14-176	28-136	38-152
Phenanthrene	54-120	46-124	65-120
Phenol	5-112	24-128	17-120
Pyrene	52-120	44-123	70-120

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REQUEST FOR SOP CHANGE

Initiator Name:	Gregory Santacroce	Date of Initiation:	4/04/2019

Dept :	Organics	SOP #:	C-90	Revision #:	3.7

SOP Title:	**Analysis of Base/Neutral and Acid Compounds in Aqueous, Soil/Sediment, and Waste Oil/Waste Organic Solvents Sample By GC/MS**

Please Check One	MINOR REVISION X	MAJOR REVISION ☐

CHANGE(S) (Use attachment if necessary):

1) Section 7.2.4 - 'A calibration range of 5.0 to 100 ug/L consisting of at least three points and daily check standard of 50 ug/L is usually run.'

Change to: 'A calibration curve of 5.0 to 100 ug/L consisting of at least five points and daily check standard of 50 ug/L is required.'

2) Section 11.1.1 - 'A calibration curve of six points (5 to 100 ug/L) is usually run. But the curve must have a minimum of three points.'

Change to: 'A calibration curve of 5.0 to 100 ug/L consisting of at least five points is required.

3) Section 9.a page 15: Repeat the extraction twice more in the same way with 60-mL aliquots of $MeCl_2$. Centrifuge if necessary as before. Combine extracts in the K-D flask.

Change to: Repeat the extraction twice more in the same way with 60-mL aliquots of $MeCl_2$. Rinse the sample container each time with the 60 mL $MeCl_2$ aliquot. Centrifuge if necessary as before. Combine extracts in the K-D flask.

4) Section 9.a page 16: Then allow separatory funnel to stand undisturbed until layers are completely separated.

Change to: Then allow separatory funnel to stand undisturbed until layers are completely separated for at least 10 minutes.

5) Section 11.1.2 page 29 note and Section 15.4: An ICV is required after each calibration. The statement that verifications are not necessary for subsequent calibrations must be corrected.

Remove the statement: 'No verifications are necessary for any subsequent generation of calibration curves from the same set of working standards' from both sections.

6) Section 15.3: Remove the statement: 'The peak shape of the internal standard must be well defined and with a minimum degree of tailing. '

7) Section 16: Blank reporting limits – (Section 16.1) Add language/section to address reporting requirements for blanks run:
'Analytes reported in blanks to two significant figures. If results below MDL, then '<MDL' is reported. MDL is the

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_____Revised SOP replaced in g://Labsensmat/SOP _____ SOP Change Form Provided for All Control Copies

current laboratory concentration, or regulatory amount required by regulatory authority or permit. Separate report issued only if survey requires the additional information.'
REASON(S) FOR CHANGE(S):
Per NELAP audit observations for C-90 and EPA Method 625.1

APPROVAL	NAME:	Signature/Date
EPA Branch Chief / Section Chief/Team Leader	John Bourbon	4-4-19
ESAT Analytical Supervisor/ QAO	Reginald St-Juste	
EPA Task Order Project Officer	Ness Tirol	
Effective Date	Sumy Cherukara	04/04/19
04/04/19	EPA QAO	

Initials Administrative Steps for SOP Change
_____ SOP Change Form Scanned and Attached to Existing SOP and saved in .pdf directory on G:Drive
_____ SOP Change Effective Date Added to Master SOP Table
_____Revised SOP .pdf replaced in Promium (z:/drive – All Associated Analysis Codes in Promium)
_____Revised SOP replaced in G://Laboratory Branch/SOP/ Drive
_____Revised SOP replaced in g://Labsensmat/SOP _____ SOP Change Form Provided for All Control Copies

REQUEST FOR SOP CHANGE

Initiator Name:	Sumy Cherukara	Date of Initiation:	05/14/19

Dept:	Organics	SOP C89,90,91,106,123,124,126,134,138, DW-1	Revision #:	

SOP Title:	

Please Check One	MINOR REVISION ☒	MAJOR REVISION ☐

CHANGE(S) (Use attachment if necessary):

Replace:

1. Division of Environmental Science and Assessment with Laboratory Services and Applied Science Division
2. DESA with LSASD

REASON(S) FOR CHANGE(S):

Change of name by the administration.

APPROVAL	NAME:	Signature/Date
EPA Branch Chief / Section Chief/Team Leader	G. Anderson	5-14-19
ESAT Analytical Supervisor/ QAO		
EPA Task Order Project Officer	**Ness Tirol**	
Effective Date 5/14/19	**Sumy Cherukara** **EPA QAO**	5/14/19

Initials Administrative Steps for SOP Change
_____ SOP Change Form Scanned and Attached to Existing SOP and saved in .pdf directory on G:Drive
_____ SOP Change Effective Date Added to Master SOP Table
_____ Revised SOP .pdf replaced in Promium (z:/drive – All Associated Analysis Codes in Promium)
_____ Revised SOP replaced in G://Laboratory Branch/SOP/ Drive
_____ Revised SOP replaced in g://Labsensmat/SOP _____ SOP Change Form Provided for All Control Copies

Form SOP Change Request, Version 1.2; Feb 2, 2017

Initials Administrative Steps for SOP Change

_____ SOP Change Form Scanned and Attached to Existing SOP and saved in .pdf directory on G:Drive

_____ SOP Change Effective Date Added to Master SOP Table

_____Revised SOP .pdf replaced in Promium (z:/drive – All Associated Analysis Codes in Promium)

_____Revised SOP replaced in G://Laboratory Branch/SOP/ Drive

_____Revised SOP replaced in g://Labsensmat/SOP _____ SOP Change Form Provided for All Control Copies

Appendix D
Data Validation SOPs

Standard Operating Procedure

Guidance for Laboratory Data Review

Signature and Title

Prepared by:	Catherine G. Winters, Chemist, OICS	7/24/18 Date
Reviewed by:	Gregory J. Santacroce, Section, Chief, OICS	7/24/18 Date
QA Reviewed by:	Sumy P. Cherukara, QAO, Laboratory Branch	7/24/18 Date
Approved by:	John R. Bourbon, Chief, Laboratory Branch	7/24/18 Date

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2
DIVISION OF ENVIRONMENTAL SCIENCE AND ASSESSMENT
LABORATORY BRANCH

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2. Summary of the Procedure
3. Definitions
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5. References

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Attachment 2 Requirements for Electronic Data Packages

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1. Scope and Application

and authorization necessary for review of laboratory data. Many aspects of the data review process are already covered in method and general SOPs. This SOP standardizes the data review process throughout the laboratory.

Data review is a critical part of the analytical process and an important role of the analytical laboratory. Data uses may include regulatory and, in some cases, criminal application. During data review data is assessed for accuracy and precision using established criteria. The primary objective of this quality assurance function is to assess and document the technical quality of the data generated by the laboratory analysts. A supporting objective is to evaluate the overall performance of the measurement processes on a continuous basis.

2. Summary of the Procedure

2.1 All data are peer reviewed by another analyst or assignee familiar with the test procedures. Final deliverable data is saved as an Electronic Data Package (EDP) in PDF or hard copy format and includes a QA/QC Checklist summarizing the QC results in the *Element* Laboratory Information Management System (LIMS).

2.2 The data are entered into the LIMS by the analyst who updates the status to *Analyzed*. The peer reviewer reviews the entries, then updates the status to *Peer Reviewed* indicating the data are correctly entered (SOP G-28). The peer review could make applicable corrections and acknowledge the peer review on the QA/QC Checklist.

2.3 The draft final project report is generated by the Official Sample Control and Repository (OSCAR) staff with internal quality control checks included.

2.4 The project is then forwarded to the EPA Task Order Contracting Officer Representative (TOCOR) for review of analyses completed by the ESAT contractor.

2.5 OSCAR staff completes the function *OSCAR Draft Final RPT PVP + Date* in LIMS.

2.6 The TOCOR completes the function *TOCOR Review + Date* in LIMS (if applicable).

2.7 The project is then forwarded for final approval by branch chief or designee.

3. Definitions

Laboratory Information Management System (LIMS): The LIMS is a computer

database system that is used to store, track, and report analysis results for environmental samples.

Analyst: The designated individual who performs the hands-on analytical methods and associated techniques, and who is the one responsible for applying required laboratory practices and other pertinent quality control to meet the required level of quality in producing analytical results for environmental samples.

Peer Reviewer: The peer reviewer is the individual who performs a technical review of the given laboratory-generated data. The peer reviewer is not associated with the actual measurement operations for the given analytical batch, but is knowledgeable in the analytical processes employed.

Task Order Contracting Officer Representative (TOCOR): The TOCOR is an EPA staff member who provides work assignments to the ESAT contractor and ensures performance and deliverables are acceptable through contract specified oversight.

Quality Assurance Officer (QAO): The Laboratory Branch QAO is responsible for ensuring compliance with and implementation of all QA/QC policies and practices in the laboratory.

Environmental Services Assistance Team (ESAT): Contractors offering analytical support to the laboratory.

Laboratory Management: The laboratory management which includes the Branch Chief, Section Chief and the SCB Team Leader are responsible for ensuring all Region 2 Laboratory data or products meet client, division, and regional quality requirements and for ensuring all data are of known and documented quality.

4. Procedure

To ensure the identification and correction of potential problems early in the data generation process, all measurement data produced during laboratory analysis are reviewed, first by the analyst and then by another analyst familiar with the analytical method. Multiple levels of data review are performed on the data package to ensure data integrity before data are released to the client.

4.1 Analyst Review

4.1.1 The analyst who generates the analytical data has the primary responsibility for the accuracy and completeness of the data.

4.1.2 The analyst reviews the Analytical Request Form (ARF), project correspondences, chain-of-custody (COC) form and the LIMS Sample

Acceptance Checklist information for sample-specific information (e.g., sample collection, preservation, holding time requirements, and cooler/sample condition upon arrival) to assess sample integrity.

Comparisons are made between these forms and the raw data to ensure that:

1. all samples are analyzed
2. the correct analytical method are performed
3. all QC requirements are followed
4 holding times between sample collection, digestion or extraction, and analysis are checked to assess potential degradation or loss of analytes of interest
5. method detection limit requirements specified by the method or client are met
6. any special instructions are addressed

4.1.3 Information related to the analytical run is documented in the LIMS and/or the sample preparation and instrument analysis logbooks and other intermediate logbooks as applicable. See SOP G-9 for more information about logbooks.

4.1.3.1 The *Bench Sheet* which is prepared in the LIMS (and/or the sample preparation log book) documents the samples, method, equipment and reagents used, other pertinent preparation information, and Quality Control (QC) check samples added to the preparation batch.

4.1.3.2 The *Sequence* sheet (optional) which is prepared in the LIMS documents the instrument and method used, the samples analyzed, all required QC instrument check samples and other pertinent information used at the analysis level. All applicable QC check samples as specified in the respective SOPs are incorporated during the analytical procedure.

4.1.3.3 During the analytical run, the analyst should monitor the ongoing QC and sample results. If a QC check exceeds acceptance criteria, analysis may be halted and the appropriate corrective action (e.g., redigestion/reextraction, dilution, recalibration, and/or reanalysis) implemented. Any necessary calculations may be performed either manually or using appropriate software or spreadsheets.

4.1.4 After analysis, the data is transferred to the LIMS. All QC is evaluated against the requirements specified in the respective SOPs.

4.1.4.1 Instrument QC (e. g. ICV/CCV, ICB/CCB etc.) are evaluated against the method criteria.

4.1.4.2 Analytical precision and accuracy are evaluated by using Blanks (BLK),

Blank Spikes (BS)/Blank Spike Duplicates (BSD), Preparation Blank (PB), Laboratory Fortified Blank (LFB)/Laboratory Control Sample (LCS), Matrix Spikes (MS), Matrix Spike Duplicates (MSD) and unspiked replicates, where applicable, to estimate the degree of variance around the reported value as well as any bias effect due to matrix or laboratory sample processing procedures.

4.1.4.3 These evaluations are done in the LIMS wherever possible. Additional calculations may be performed either manually or using appropriate software or spreadsheet when necessary.

4.1.4.4 Data generated outside the % recovery acceptance range is qualified as “K” or “L” depending on the reporting value being biased high or low, e.g. results from BS/BSD/LFB/LCS, MS/MSD. Data generated outside % RPD or RSD acceptance range is qualified as “J” e.g. BS/BSD/LFB/LCS/LCS, MS/MSD, sample replicates, replicate integration. Qualifier “J” supersedes all other qualifiers and the reported value is an estimate.

4.1.4.5 The analyst prepares the LIMS QA/QC checklists to indicate the data has been evaluated and all QC criteria have been met or the data are qualified.

4.1.4.6 The analyst must verify the following:

1. Use instrument and method specific cross tables when using *DataTool*. Any *DataTool* cross tables used should be checked for accuracy.
2. Once all data is transferred, generate a draft final report and use it for each of the subsequent instructions.
3. Review one sample upload for each sequence/work order in a project, checking both the analyte list, results and the reporting limits.
4. For dual column analysis, ensure the proper column is designated for reporting, i.e., the result reported must be a ‘PR’ (Primary) result.
5. Once data is transferred, ensure all requested analytes and associated results are marked for reporting and locked.
6. If qualifiers are used, analyst must enter comments in the *General Comments* or other appropriate section of the of the *QA/QC Checklist*. Analyst must also enter any other comments that the peer reviewer may need to review to determine if this information needs to be entered into the Project Narrative or evaluate the need for data qualification.
7. The Final Report in either electronic or hard copy format is crossed checked with the LIMS raw data. All (100%) manual entries are verified. Automatic upload entries are verified at a minimum of 10%.
8. For multi-analyte analysis, the analyst must review the R2FinalReportWCNT and Promium Summary reports in their

respective EDPs at the project level in order to check analytes requested vs. analytes reported. Both reports are used for Organic projects and only Promium Summary is used for Metals projects.

9. When the data evaluation is complete, the analyst must then update the LIMS sample status to *Analyzed* for all reportable analytes in each sample in the analytical batch.

*__NOTE__: Do not save reports as PDF in Element – uncheck that option in order to save the file to screen for review.

4.1.5 The analyst is responsible for generating the data package for each analysis and for entering the data into the LIMS. The data package is saved as a PDF for the Electronic Data Package (EDP). EDPs are saved under a designated electronic project folder. The EDP is based on established nomenclature and sequence. If a batch/sequence consists of several projects, the associated files are copied into each electronic project folder. Specific laboratory requirements for generating an EDP are listed in Addendum 2 by department.

4.1.5.1 The supporting data includes but is not limited to: all instrument printouts, quantitation reports, chromatographs, spread sheets, sequence and bench sheets (where applicable).

4.1.5.2 A manual calculation check is prepared for each project for any data that is not entered directly from an instrument.

4.1.5.3 Comments to be included in the case narrative are prepared by the analyst. Any relevant procedural deviations or anomalies associated with the sample handling and analysis for the project are explained. The comments can be entered directly into the project narrative or noted on the QA/QC checklist.

4.2 Peer Review

4.2.1 After the analyst review, the peer reviewer performs a technical review of the data generated. This review is performed by a second analyst not associated with the actual measurement operations for the given analytical batch, but knowledgeable in the analytical processes employed. It is the responsibility of the peer reviewer to ensure that all data generated are correct and of known and documented quality. The peer reviewer audits the raw data and the spreadsheets generated in either electronic or hard-copy format.

4.2.2 The reviewer rechecks all the items in section 4.1.2 and verifies that:

1. all samples were analyzed
2. the correct analytical method was performed
3. all QC requirements were followed

4 holding times between sample collection, digestion or extraction and analysis were checked to assess potential degradation or loss of analytes of interest
5. method detection limit requirements specified by the method or client were met
6. any special instructions were addressed

4.2.3 The reviewer verifies the information related to the analytical run as documented in the LIMS and/or the sample preparation and instrument analysis logbooks and other intermediate logbooks as applicable.

4.2.3.1 The *Bench Sheet* (and/or the sample preparation logbook) is reviewed for samples, method, equipment and reagents used, other pertinent preparation information, and QC check samples added to the preparation batch.

4.2.3.2 The *Sequence* sheet (optional) (and/or the instrument analysis logbook) is reviewed for the instrument and method used, the samples analyzed, all required QC instrument check samples and other pertinent information used at the analysis level. All applicable QC check samples as specified in the respective SOPs are incorporated during the analytical procedure.

4.2.4 All QC is evaluated against the requirements specified in the respective SOPs.

4.2.4.1 The reviewer verifies that all applicable instrument (e. g. ICV/CCV, ICB/CCB etc.) and batch (e.g. BLK, BS/BSD/LCS) QC check samples have been incorporated at the required frequency during the analytical procedure.

4.2.4.2 The reviewer verifies that all QC data meet SOP requirements. These evaluations are done in the LIMS wherever possible. The reviewer also checks any calculations performed manually, using appropriate software, or using a validated spreadsheet for accuracy and completeness.

4.2.4.3 The reviewer verifies that data generated outside the % recovery acceptance range is qualified as “K” or “L” depending on the reporting value being biased high or low. Data generated outside % RPD or RSD acceptance range is qualified as “J”. Qualifier “J” supersedes all other qualifiers.

4.2.4.4 The peer reviewer must:

1. Generate a draft final report and use it for each of the subsequent instructions.
2. For every data package, review one sample upload for each sequence/work order in a project, checking both the analyte list, results, and the reporting limits.
3. All (100%) manual entries must be examined and validated. Automatic

upload entries are verified at a minimum of 10%. Reference comment section of the QA/QC Checklist for a summary of manual entries.

4. Ensure all requested analytes and associated results are marked for reporting and locked.
5. For multi-analyte analysis, the reviewer must review and save the R2FinalReportWCNT and Promium Summary reports in their respective EDPs at the project level in order to check analytes requested vs. analytes reported. Both reports are used for Organic projects and only Promium Summary is used for Metals projects

*__NOTE__: Do not save them as PDF in *Element*; uncheck that option in order to save the file to screen for review.

4.2.3 If there are any discrepancies, the data package is returned to the analyst for any necessary corrections. Any errors resulting from incorrect calculations, transcriptions, unit conversions, and switched samples are also examined by independent recalculations and raw data evaluation.

4.2.4 The peer reviewer verifies and completes the QA/QC Checklist in LIMS to indicate that the data have been reviewed and all QC criteria have been met or qualified accordingly. The checklist is then printed and included in the data package.

4.2.5 Comments to be included in the case narrative prepared by the analyst are reviewed. Any relevant procedural deviations or anomalies associated with the sample handling and analysis for the project are explained. Additional comments may be added as necessary.

4.2.6 When the data validation is complete, the peer reviewer must then update status to *Peer Reviewed* within LIMS for all reportable analytes for each sample in the analytical batch.

4.3 OSCAR Review

After all analyses associated with a given project have been reviewed and are validated on the Project Status Report, OSCAR staff will generate a draft final report.

The draft final report is reviewed for textual accuracy and completeness, then updated in the LIMS by completing the *OSCAR draft Final RPT RVR +Date* function.

The draft final report, COC, ARF, Sample Acceptance Checklist/Work Order Receipt, OSCAR tracking log, shipping form/air bills, and Project Correspondence are placed in the project folder. The draft final report package is then submitted to the EPA Management for review as indicated in SOP G-25.

Using the draft final report, ensure that the report is complete in terms of the client deliverable. Ensure the total number of project samples for all work orders were analyzed. Check that associated analysis/analytes are reported for each sample and are 100% complete and compliant against what was requested by the client.

4.4 TOCOR Review

The TOCOR reviews the ESAT deliverable data package for accuracy of the data, completeness of the data package, and compliance to the Technical Direction Form for the project.

The TOCOR performs LIMS review of ESAT data and completes the function *TOCOR Review + Date* in the LIMS Element.

4.5 Quality Assurance Officer Review

The QAO, who is independent of routine laboratory operations, performs a QA review of the final report to assess the overall quality of analysis and general integrity of the final report.

The review includes checks for completeness, correctness and regulatory & TNI conformance/compliance of the final report package. The QA review also helps to detect any unusual trends.

The QAO may choose to perform a spot check of the entire data package. Upon review, the QAO signs and dates the Project Approval Form.

4.6 Management Review

Using the draft report, review one sample in each work order, checking both the analyte list and reporting limits against what was requested by the client.

Ensure all work orders are accounted for in the draft report

Laboratory management reviews the final report for completeness and general compliance with the objectives of the project. Management then completes the project narrative and electronically signs the final report by clicking on the *Approve* button within LIMS. An electronic copy of the report including any requested supporting data may then be e-mailed to the client. A hard copy of the report, if requested, may also be authorized for distribution to the client. A draft report with sample QC are maintained with the project folder.

5. References

5.1 Promium *Element* Data System, Laboratory Information Management Systems, Promium, LLC. Current Version.

5.2 Laboratory Quality Management Plan (LQMP), U.S. Environmental Protection Agency, Region 2 Laboratory Branch. Current Version.

5.3 EPA Region 2 SOP G-9, *Laboratory Policy for The Establishment and Maintenance of Logbooks Associated with Chemical Analysis*. Current Version

5.4 EPA Region 2 SOP G-25, *Official Sample Control and Repository*. Current Version.

5.5 EPA Region 2 SOP G-28, *Laboratory Operations using* Element *LIMS.* Current Version.

5.6 EPA's Guidance on Environmental Data Verification and Data Validation (QA/G-8)

ATTACHMENT 1
List of Qualifiers Codes

Qualifier Codes	Definition
U	The analyte was not detected at or above the reporting limit.
J	The identification of the analyte is acceptable; the reported value is an estimate.
UJ	The analyte was not detected at or above the reporting limit. The reporting limit is an estimate.
NJ	There is presumptive evidence that the analyte is present; the analyte is reported as a tentative identification. The reported value is an estimate.
K	The identification of the analyte is acceptable; the reported value may be biased high. The actual value is expected to be less than the reported value
L	The identification of the analyte is acceptable; the reported value may be biased low. The actual value is expected to be greater than the reported value.

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ATTACHMENT 2
Requirements for Electronic Data Packages

METALS DEPARTMENT

Data is filed under:

\\x0202tnjecfs2\desalab\desalab\Electronic Data Packages\YYMM\Project # Project Name\

Metals\ CVAA, ICP-OES or ICP-MS
or
E Metals\ E CVAA, E ICP-AES or E ICP-MS

Multiple runs within the same project for the same test are further differentiated into separate folders by date (mmddyy) or sequence (SXXXXXX).

Sample preparation data including logbook entries and % solids must be turned into a PDF and uploaded to Element at the Bench Sheet level.

CVAA		File Name
1	QA/QC Checklist can be done by Batch or Sequence	01 Checklist Batch# or Sequence #
2	*Element* Bench Sheet	02 BXXXXXX
3	*Element* Sequence	03 SXXXXXX
4	Raw Data – includes calibration, instrument and batch QC, and sample results	04 Raw Data mmddyy
5	Standards – PDF for all standards used in Sequence/Batch	05 Standards mmddyy
6*	Manual Calculations (e.g. solids/hardness/TCLP)	06 Man Calc mmddyy
7*	LCS (SRM) RPD Check (e.g. solids analysis, DOC)	07 LCS RPD mmddyy
8*	Percent Solids worksheet (e.g. solids analysis)	08 Percent Solids mmddyy
9*	TCLP % Dry Solids	09 TCLP % Dry Solids mmddyy
10*	TCPL PREP Book number-page number	10 TCLP PREP Book #-pg #

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11	Promium Summary Report **Should be included only if used.*	11 [as generated by Element]

ICP-AES and ICP-OES		File Name
1	QA/QC Checklist can be done by Batch or Sequence	01 Checklist Batch # or Sequence #
2	*Element* Bench Sheet	02 BXXXXXX
3	*Element* Sequence	03 SXXXXXX
4	Calibration Summary – shows metals calibrated and correlation coefficients	04 Cal mmddyy
5	Raw Data – includes calibration, instrument and batch QC and sample results	05 Raw Data mmddyy
6	Internal Standard Recoveries	06 IS Recovery mmddyy
7	Standards - PDF for all standards used in Sequence/Batch	07 Standards mmddyy
8*	Manual Calculations (e.g. solids/hardness/TCLP)	08 Man Calc mmddyy
9*	LCS (SRM) Check (e.g. solids analysis, DOC)	09 LCS RPD mmddyy
10*	Percent Solids worksheet (e.g. solids analysis)	10 Percent Solids mmddyy
11*	TCLP % Dry Solids	11 TCLP % Dry Solids mmddyy
12*	TCPL PREP Book number-page number	12 TCPL PREP Book #-pg #
13	Promium Summary Report **Should be included only if used.*	13 [as generated by Element]

ICP-MS		File Name
1	QA/QC Checklist can be done by Batch or Sequence	01 Checklist Batch# or Sequence #
2	Element Bench Sheet	02 BXXXXXX
3	Element Sequence	03 SXXXXXX

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4	Tune Report	04 Tune mmddyy
5	Calibration Summary – shows metals calibrated and correlation coefficients	05 Cal mmddyy
6	Internal Standard Recoveries	06 IS mmddyy
7	Raw Data – includes calibration, instrument and batch QC and sample results	07 Raw Data mmddyy
8	Standards - PDF for all standards used in Sequence / Batch	08 Standards mmddyy
9*	LCS (SRM) Check (e.g. DOC)	09 LCS RPD mmddyy
10*	Turbidity & pH Logbook	10 Turbidity-pH mmddyy
11	Promium Summary Report	11 [as generated by Element]

*S*hould be included only if used*

MICROBIOLOGY DEPARTMENT

1. Data Package (in order)
   - Element **QA/QC Checklist**
   - **Raw data** (logbook pages, slide examinations, if applicable)
   - **Pictures** (*Cryptosporidium/Giardia,* if applicable)
   - **Percent solids** (if applicable)
   - **Manual calculations** (if applicable)
   - Element **bench sheet**

2. The data package from an analytical batch is scanned and attached in the Promium Element "Batch" screen.

3. Electronic data packages and standard reports will be filed in the corresponding project folder on the Y: drive.

4. Instructions on how to prepare the electronic data package (EDP) can be found in SOP G-25 (OSCAR).

SANITARY DEPARTMENT

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1. Data package (in order)
    - Element **QA/QC checklist**
    - **Calibration** (TOC, if printed on a separate sheet from raw data)
    - **pH Calibration** (Alkalinity and pH/Corrosivity)
    - **Raw data** (includes calibration, instrument QC, batch QC, sample results, logbook pages) (if applicable)
    - **pH adjustment sheet** (BOD and CBOD if applicable)
    - **TOC screening** (BOD and CBOD if applicable)
    - **Percent solids** (if applicable)
    - **Manual calculations** (if applicable)
    - **Sequence** (if applicable to capture standards used)
    - Element **bench sheet**

2. The data package from an analytical batch is scanned and attached in the *Element* "Batch" screen.

3. Electronic data packages and standard reports will be filed in the corresponding project folder on the Y drive.

4. Instructions on how to prepare the electronic data package (EDP) can be found in SOP G-25 (OSCAR).

GC DEPARTMENT

1) Core requirements to be included in Organics project packages based on the SOPs and the current practice and nomenclature used for naming the files in the project folder (PDF).

GC	**Comments**
01-PEM-LPC_mmddyy	Column Breakdown (Endrin/ DDT) or Lab Performance Check (HAA, incl TF, Sensitivity, Resolution)
02-CAL Raw_mmddyy	Cal pts. & ICV pt. Unedited (All curves)
03-CAL Final_mmddyy	Cal pts. QEdited (include Cal %RSD Report,)
04-SCV_[A]_mmddyy	Second Source Verification; [A] = Pest/Tox/Clor/Ar
05-Raw Data_mmddyy	QC and Sample raw data
06-CCV_[A]_mmddyy	Cont. Cal. Ver.[A] = Pest/Tox/Clor/Ar
07-BLK_ Bxxxxxx	Method Blank
08-BS-BSD _Bxxxxxx	Lab Blank Spike Dup (incl. eval Report)
09-MS_Bxxxxxx	Matrix Spike for each Batch (incl Eval Report)

10-Sample Final _mmddyy	QEdited sample reports (detailed report)
11-Element Bench_Bxxxxxx	Element Bench Sheet &Total Solids
12-Instrument Seq log mmddyy	Copy of Run log page from instrument
13-Element Seq_Sxxxxxx	Element generated Seq
14-RT Window_mmddyy	RT window report
15-Example Calc.	Manual calculation (See Attachment Link)
16-Std-Reagent Prep	Include only working Stds. (Cal, BS/BSD, MS etc.)
17-Checklist_ Seq_Sxxxxxx	Element Generated QA/QC Checklist
18-IS/Summary Report	Excel spreadsheet for IS/[HAAS only]
19-Overlays	Fingerprint ID.
20-GPC Data_mmddyy	Cleanup data files.
21 [as generated by Element]	Promium Summary Report
22 [as generated by Element]	R2FinalReportWCNT

Note: Sequential numbering may change according to Analysis Requirements.
Survey Sheet is Generated (pink) with info for the project.

2) All comments should be address accordingly and included in the following places:

- Clean-up (i.e. GPC, Acid, etc.) procedure should be included in the comments under bench sheet in *Element*.
- Anomalies observed in the prep should be included in the comments under Bench sheet in *Element*.
- Sequence comments should be used for any sequence comments.
- All other comments should be included in the Checklist Comments.

After peer review, reviewer should generate checklist as a PDF with their initials and date. Save in the EDP file for the project.

3) Sample Calculation

To access file right click on selected file then choose open hyperlink. These files are validated by the QAO.

Specific files for example calculations:

Y:\Electronic Data Packages\Example Calculation Organics\Example calculation for PEST.docx

Y:\Electronic Data Packages\Example Calculation Organics\Example Calculation PCB.docx

GC/MS DEPARTMENT

1) Core requirements to be included in Organics project packages based on the SOPs and the current practice and nomenclature used for naming the files in the project folder (PDF).

GCMS	**Comments**
01-BFB_mmddyy	Tune Report for VOA
01-DFTPP_mmddyy	Tune Report for SVOA incl tailing factor PCP and Benzidine
02-CAL Raw_mmddyy	Cal pts. & ICV pt. Unedited
03-CAL Final_mmddyy	Cal pts. QEdited (include Cal %RSD Report)
04-ICV_mmddyy	Alt-s or BS-BSD for VOA
05-CCV_mmddyy	Midpoint of curve if no cal curve evaluated
06-BLK_ Bxxxxxx	Method Blank
07-MS_ Bxxxxxx	Matrix Spike for each Batch (incl. evaluation report)
08-BS-BSD_ Bxxxxxx	Lab Blank Spike and Dup (Incl. eval report)
09-Element Bench_Bxxxxxx	Bench Sheet with TS% if applicable (Element Bench_208014)
10-Instrument Seq log_mmddyy	Copy of Run log page
11-Element Seq_Sxxxxxx	Element generated Seq (Element Seq_S208010)
12-Sample Raw_mmddyy	Unedited Sample Reports
13-Sample Final _mmddyy	Qedited sample Reports (Detailed report)
14-QAQC Summary_mmddyy	Excel Spreadsheet for IS/SUR/Time
15-QAQC Raw_mmddyy	Raw data for sample and instrument QC runs.
16-Checklist_ Seq_Sxxxxxx	Element Generated QA/QC Checklist
17-Example Calc.	Manual calculation (see Attachment Link)
18-Std-Reagent Prep	Include only working Stds (Cal, BS/BSD, MS etc.)
19 [as generated by Element]	Promium Summary Report
20 [as generated by Element]	R2FinalReportWCNT

*Multiple instances for same file types are distinguished by date stamp in PDF file name (mmddyy). Use beginning dates for sequences and batches.

2) All comments should be address accordingly and included in the following places:

- Clean-up (i.e. GPC, Acid, etc.) procedure should be included in the comments under bench sheet in Element.
- Anomalies observed in the prep should be included in the comments under Bench sheet in Element.
- Sequence comments should be used for any sequence comments.
- All other comments should be included in the Checklist Comments.

After peer review, reviewer should generate checklist as a PDF with their initials and date. Save in the EDP file for the project

CONTROLLED COPY

3) Sample Calculation

To access file right click on selected file then choose open hyperlink. These files are validated by the QAO.

Specific files for example calculations:

Y:\Electronic Data Packages\Example Calculation Organics\Example Calculation for VOA (Trace).xlsx
Y:\Electronic Data Packages\Example Calculation Organics\Example Calculation for VOA(Low Level).xlsx

Y:\Electronic Data Packages\Example Calculation Organics\Example Calculation for VOA(Medium Level).xlsx

Y:\Electronic Data Packages\Example Calculation Organics\Example Calculation for SVOA(aq).xlsx

Y:\Electronic Data Packages\Example Calculation Organics\Example Calculation for SVOA(soil).xlsx

Y:\Electronic Data Packages\Example Calculation Organics\Example Calculation for SVOA(Napls).xlsx

Appendix E
Manuals and Guides

ERT

QUICK START GUIDE
Part 1

SCRIBE V3.10

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PART 1 – QUICK START GUIDE

Starting a New Project

The first time Scribe is opened, the New Project Wizard starts and offers two (2) options:

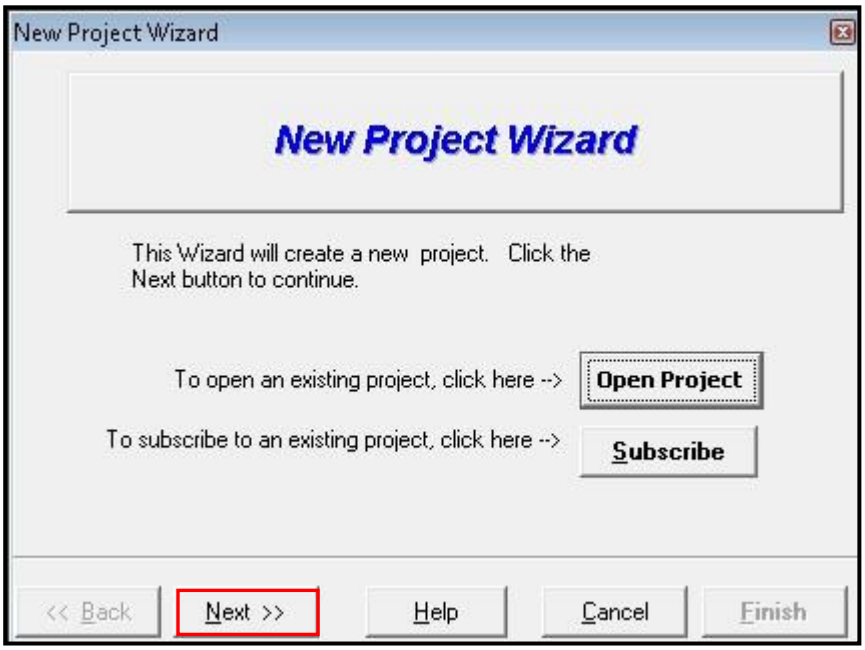
- Open a Project - if you already have an active Scribe project and would like to open it.
- Subscribe - if you have subscription information for a project that you wish to download.

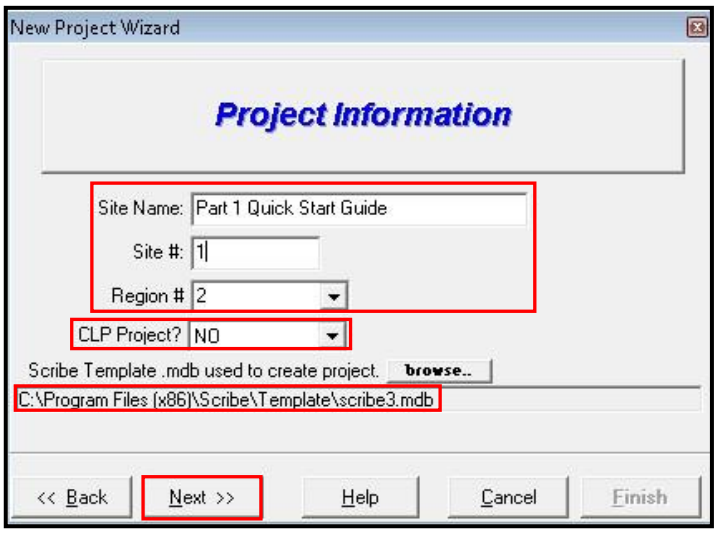
Follow the steps below to start a New Scribe project:

New Project Wizard Screen

To Start a New Scribe project,

Click the '**Next'** button.





1. Input the Site Name, Site # or Project Identifier and the Region.

2. Select 'Yes' or 'No' depending on if it is a CLP Project (Note: If Yes is selected, screen layouts and COC Types will default to CLP). However, both CLP and non-CLP samples and analyses can still be entered.

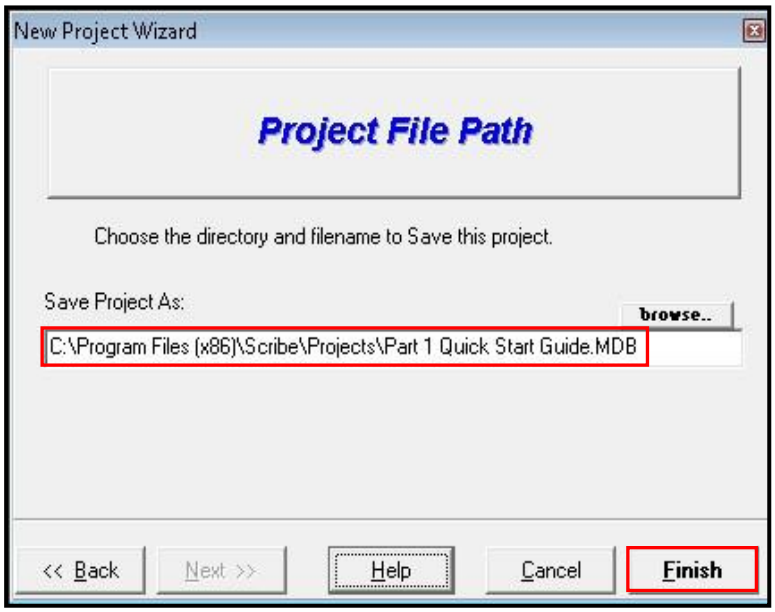
3. Use the default Template (scribe3.mdb) or a Region specific Template. Templates contain the pick-lists and layouts loaded with your new project.

4. Click the 'Next' button.

5. The Project File Path screen displays a **default location and filename** for the project.

   Optional: To change the location, click on the 'browse' button.

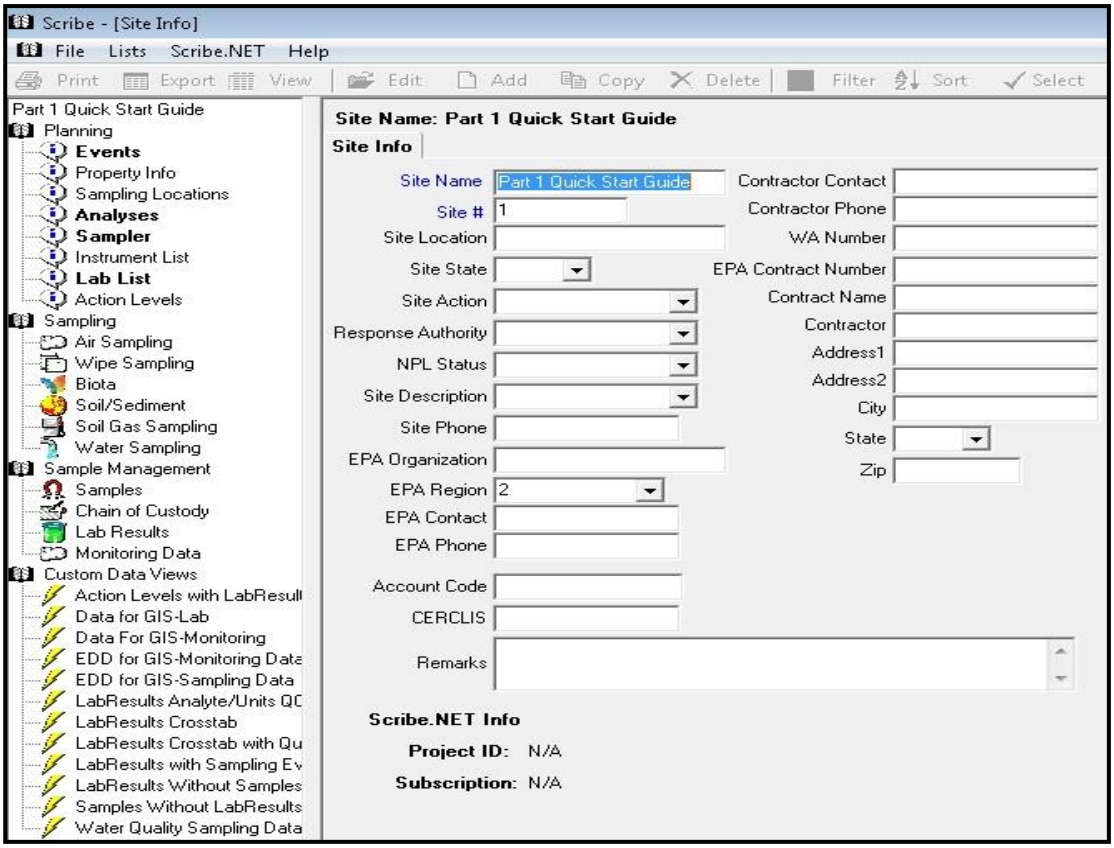
6. Click Finish to complete the creation of the new project.



The New Project Wizard closes and the 'Site Info' screen is displayed. Completing the information on this screen is not required, but is recommended when time permits.

The left navigation bar is laid out in the order of work flow.

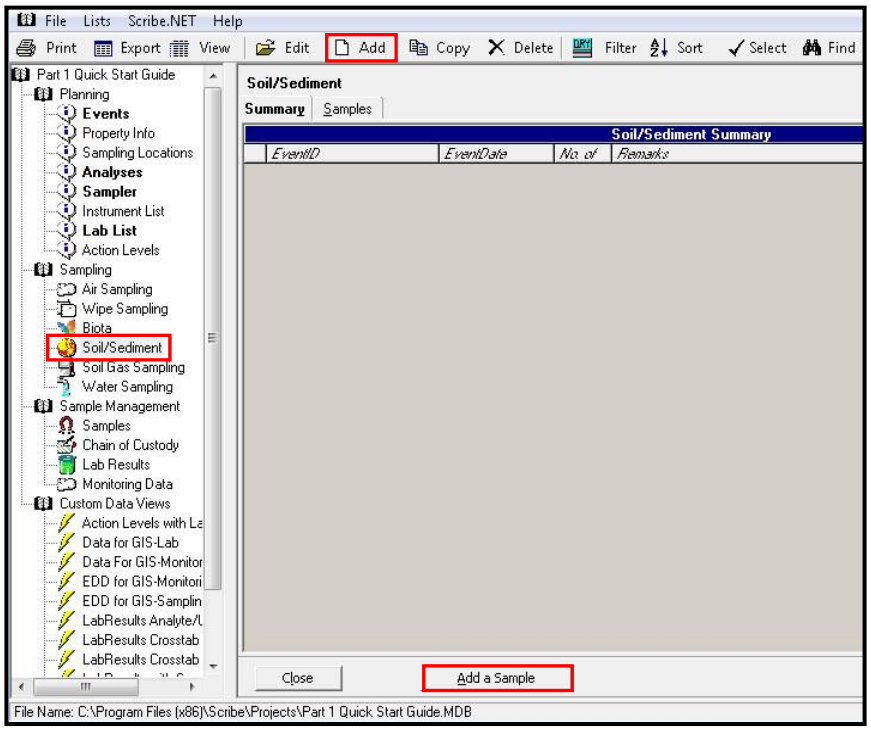
- Planning – manage lists to pre-populate certain fields in sampling tasks
- Sampling – manage sampling tasks and analyses
- Sample Management – manage sample data including labels and chains
- Custom Data Views – query your sample data



Add Samples

Sampling information can be input manually or by importing from a spreadsheet (see Management and Advanced Features Guide)

To manually add samples to the project, select one of the 'Sampling' tasks in the 'Navigation Pane' (i.e., Soil/Sediment).



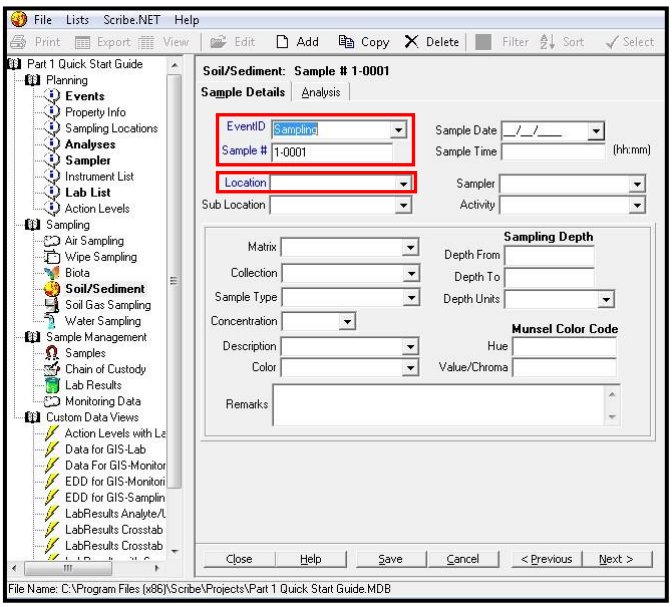
1. Click on 'Add' (on the toolbar) or 'Add a Sample' button at the bottom of the window.

2. The Sample Details tab will display.

   Note: Any field highlighted in Blue denotes a required field.

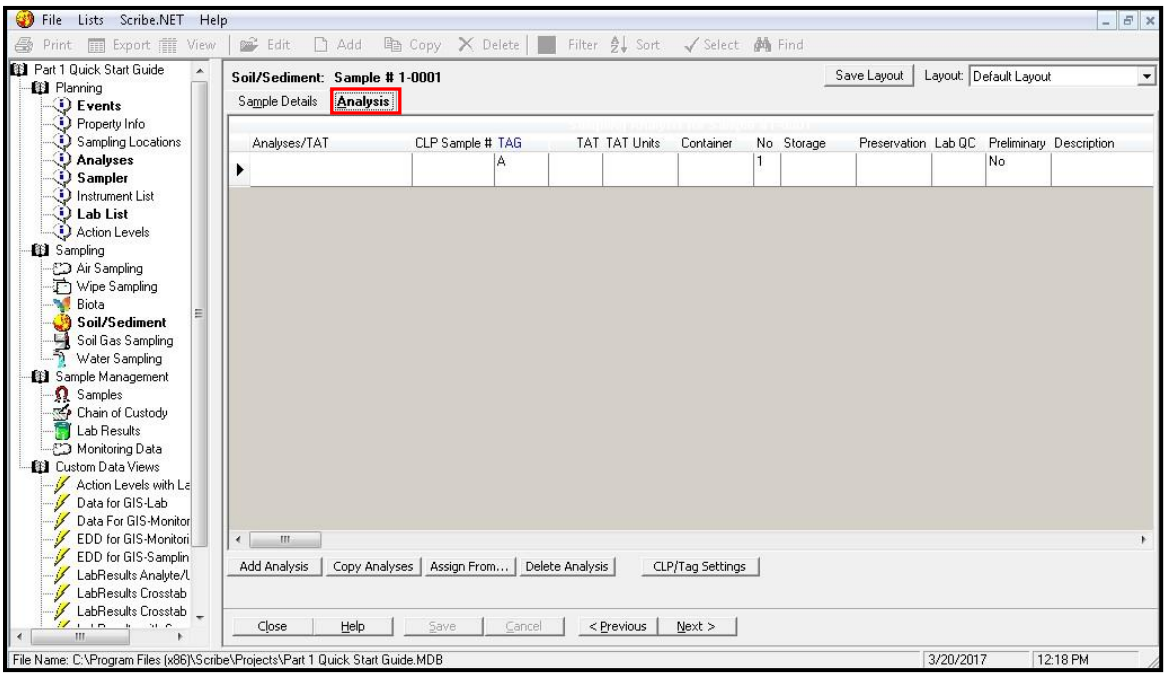
   By default, Scribe will auto-populate the EventID field with 'Sampling' and the Sample # will be the Site # you entered when creating the project, followed by sample number (1-0001). These fields can be changed at any time by entering a new value directly in the field.

3. Enter the Location and all other sample details.



Add an Analysis(es)

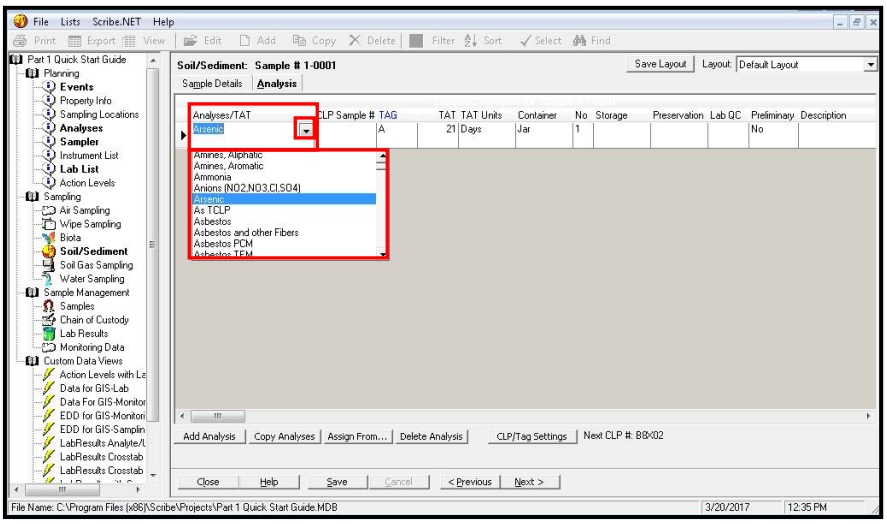
To add an analysis(es), click on the **Analysis** Tab. The information entered here will be added to the Chain of Custody.



1. Click in the **Analyses/TAT** field. A drop down arrow will appear.

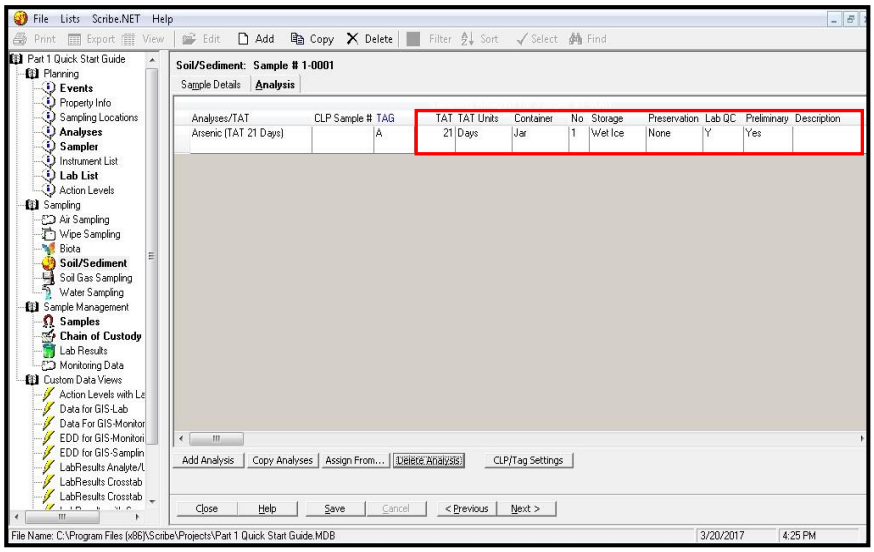
2. Click on the drop down arrow to display the list of analyses.

3. Select the analysis(es).



Note: *The 'TAG' field will automatically increment with an Alpha character (i.e., A, B, C, etc.).*

4. Enter TAT, TAT Units, Container (type), No. of Containers, Storage, Preservation, Lab QC (MS/MSD), Preliminary (Results), and additional description (if necessary).



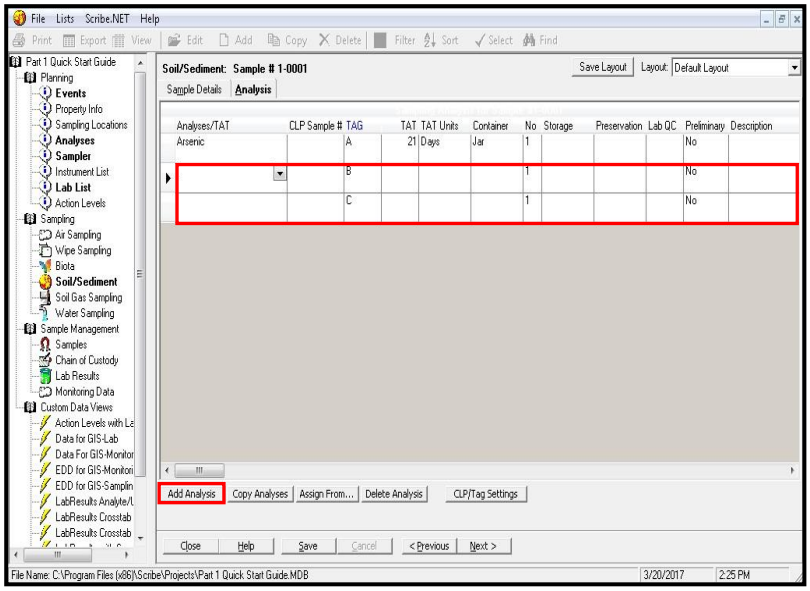
Note: TAT, Container and Preservation can also be entered in the Analyses table under the Planning section in Scribe. When entered in the analyses table first, the information will automatically carry over to the sample analysis fields when the Analysis is selected.

Note: *CLP Sample # will not be populated unless the CLP/Tag Settings have been set up and the analysis is part of the CLP Program. Please refer to the* ***Scribe CLP User Guide*** *for Adding CLP Analyses.*

5. To add additional analyses, click on 'Add Analysis'.

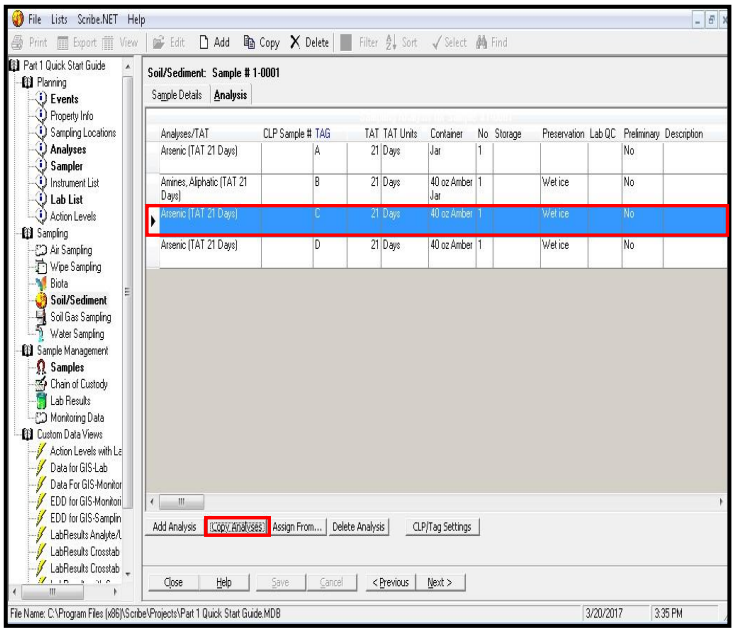
6. Follow Steps 1 and 2 above.

7. Click 'Close' to save and close the screen.



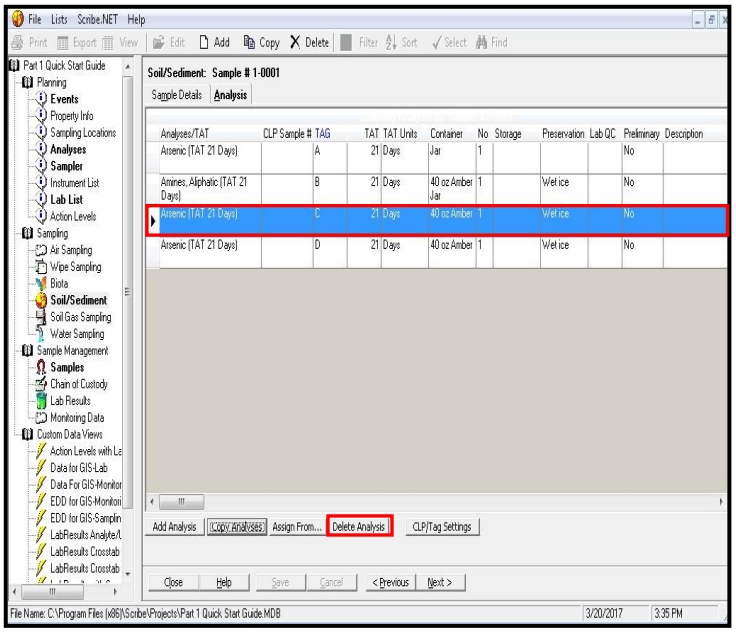
Copy an Analysis(es)

1. Highlight an analysis.
2. Click 'Copy Analyses'.
3. Click Close to close the screen.



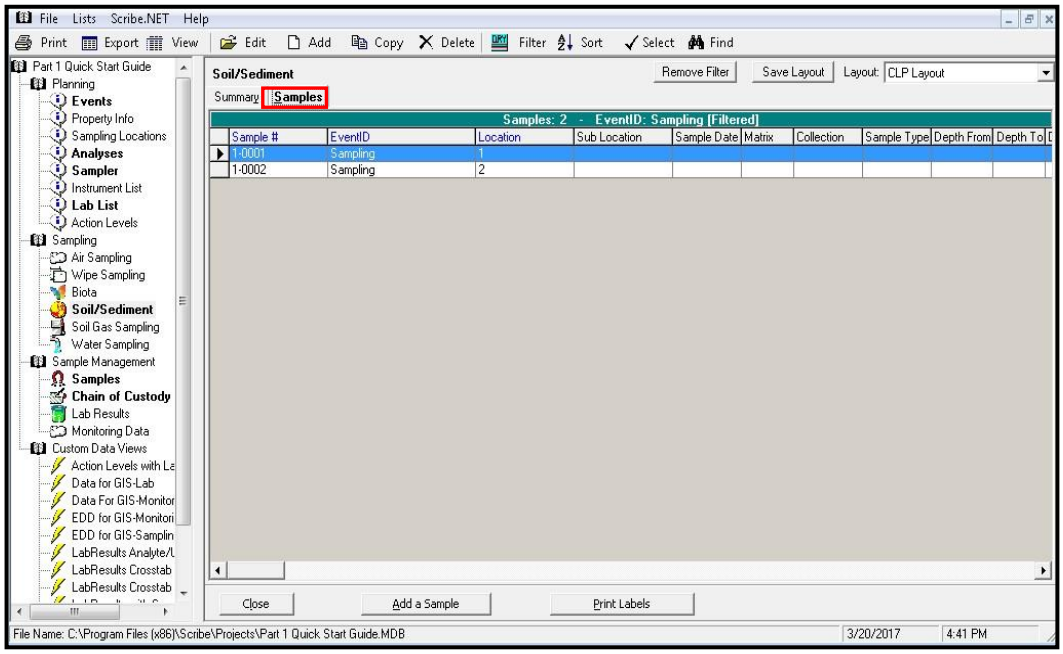
Delete an Analysis

1. Highlight an Analysis.
2. Click 'Delete Analyses'.
3. Click Close to close the screen.

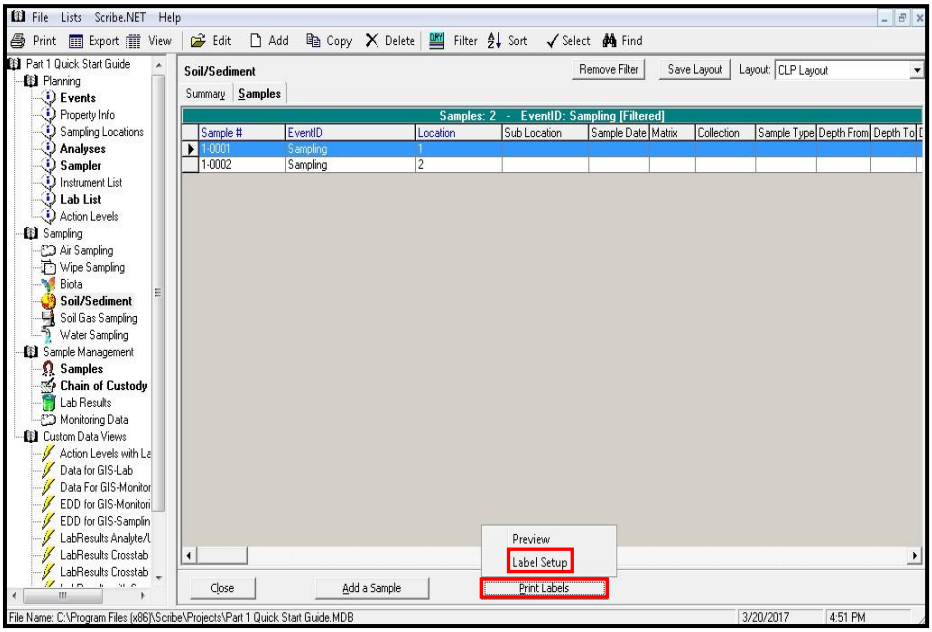


Print Labels

To print labels, return to the **Samples** tab. By default, all samples shown on the screen will be printed. For printing specific samples, use the 'Filter' feature to retrieve specific samples.

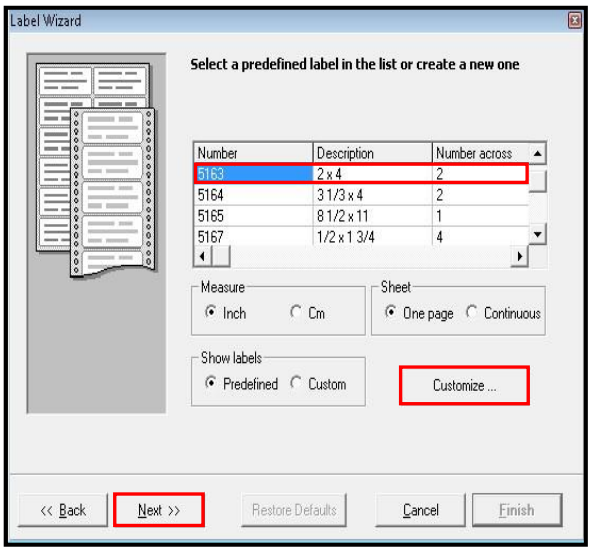


1. Click on **Print Labels** button.
2. Select 'Label Setup'.



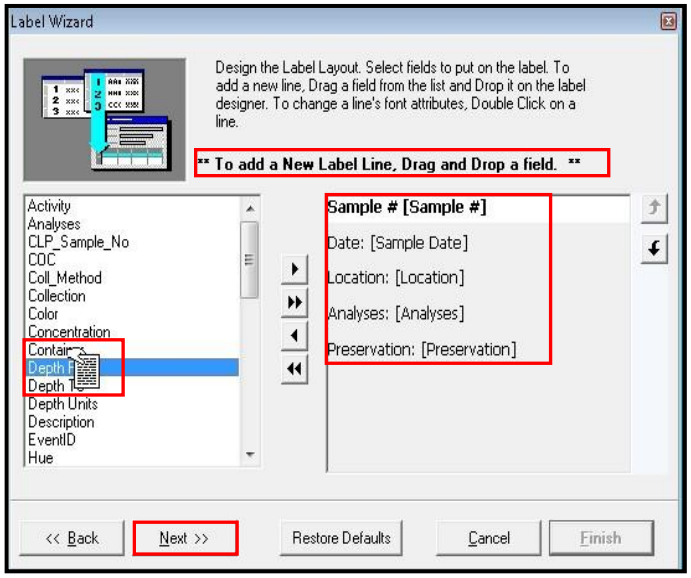
3. Select a pre-defined label (Avery) in the list or create a new one (Customize).

4. Click 'Next'.

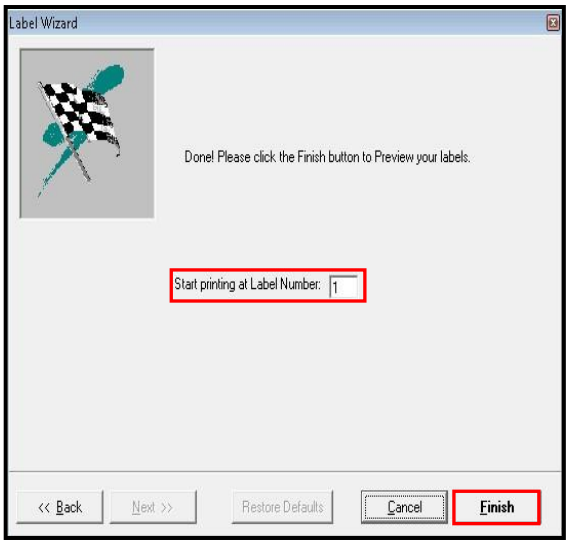


5. You may change the design by dragging and dropping fields, or accept the default Label Layout.

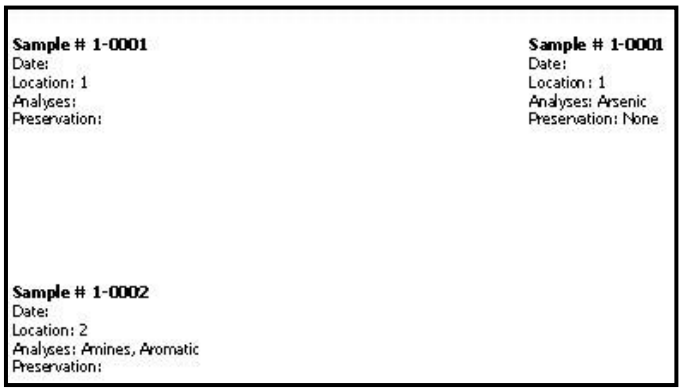
6. Click 'Next' to continue.



7. Enter the Label Number to start printing from.



8. Click 'Finish' to Preview the labels before printing.



9. Click the Printer Icon to print the labels.

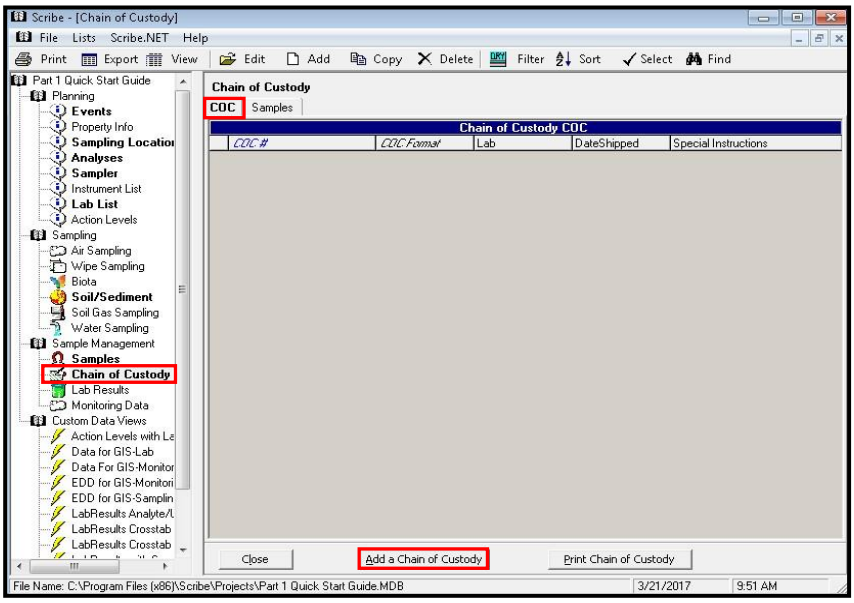
10. Click Close.

Chain of Custody

To prepare and print a Chain of Custody:

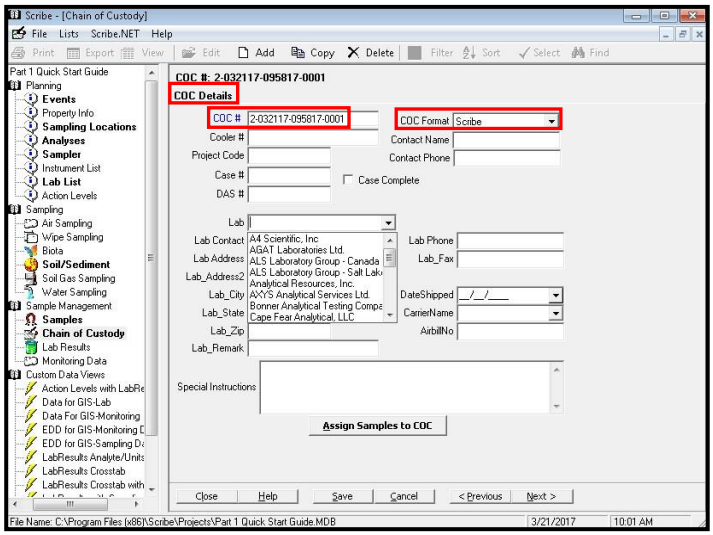
1. Select 'Chain of Custody' in left the Navigation Pane.

2. Click on the 'Add a Chain of Custody' button on the bottom of the window.



3. The COC Details form will come up. Scribe will automatically assign a unique COC number that contains the Region # (2), current date (032117), current time (095817) and COC # (0001). This number can be changed at any time.

4. By default, the COC format will be set to Scribe (if you did not say yes to CLP project when initially starting the new project. ***See Starting a New Project.***



5. Fill out the remainder of the COC Details, as needed. ***Note:*** *the completion of other COC details will print in the header of the Chain of Custody.*

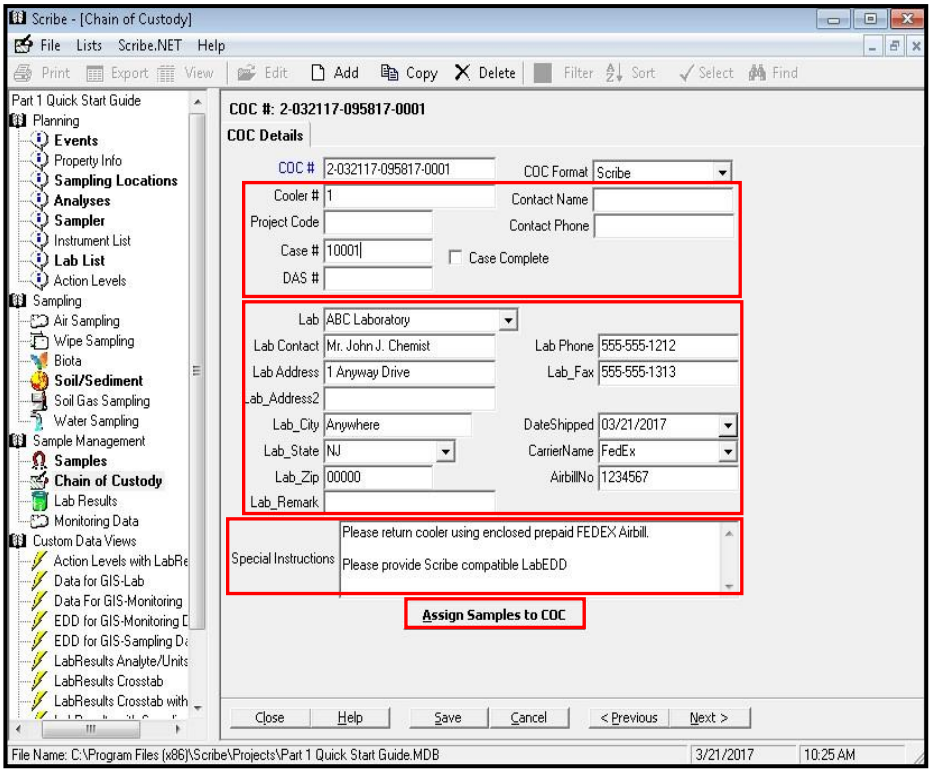
6. Select a Lab from the dropdown box or hand enter the Lab information (if the Lab was not part of the Lab picklist).

7. Select a DateShipped.

8. Select a Carrier Name from the dropdown box or hand enter a new Carrier Name.

9. Add an Airbill number.

10. Add Special Instructions, as needed.

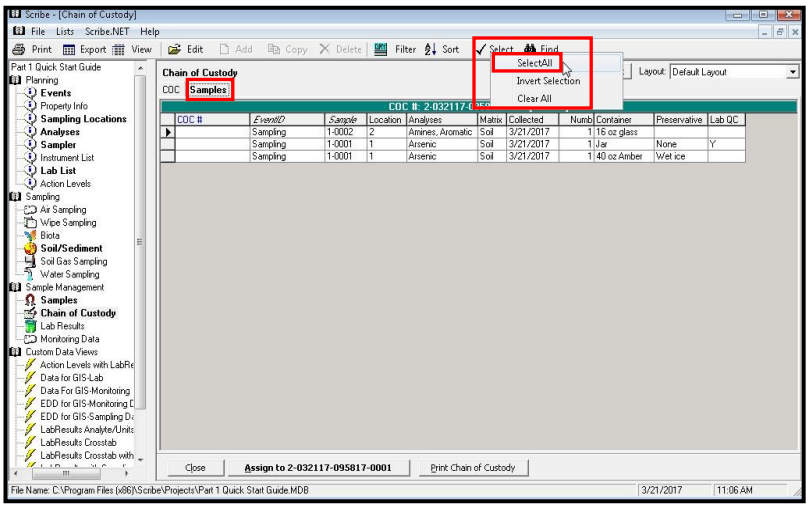


After preparing your Chain of Custody details, you can now assign samples to the Chain of Custody

11. Click ‘Assign Samples to COC’.

The list of Samples will display.

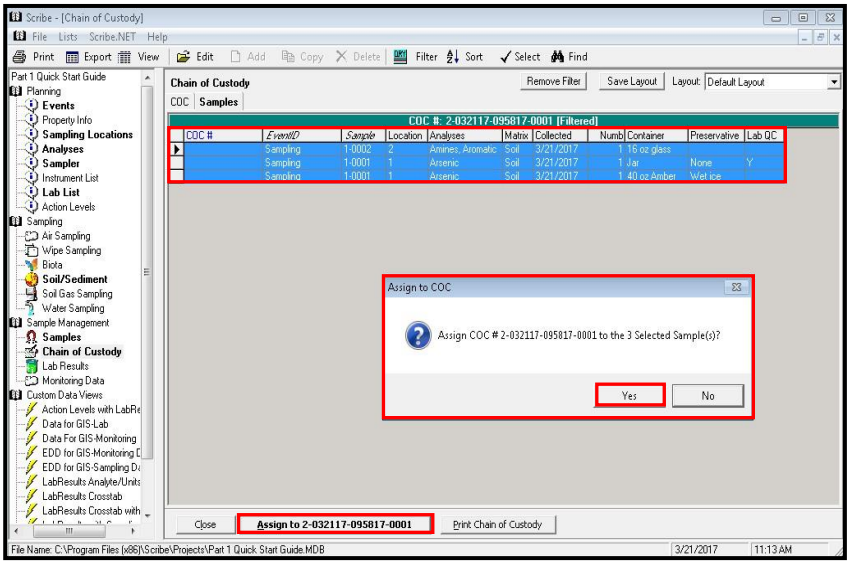
12. Click on the ‘Select’ button on the toolbar and click ‘SelectAll’ or highlight individual samples if all will not be assigned to the same COC (see step 15). The samples/analyses will be highlighted in blue.



13. Click on the 'Assign to…' button.

14. A prompt will display asking if you want to Assign those selected Sample(s) to the COC.

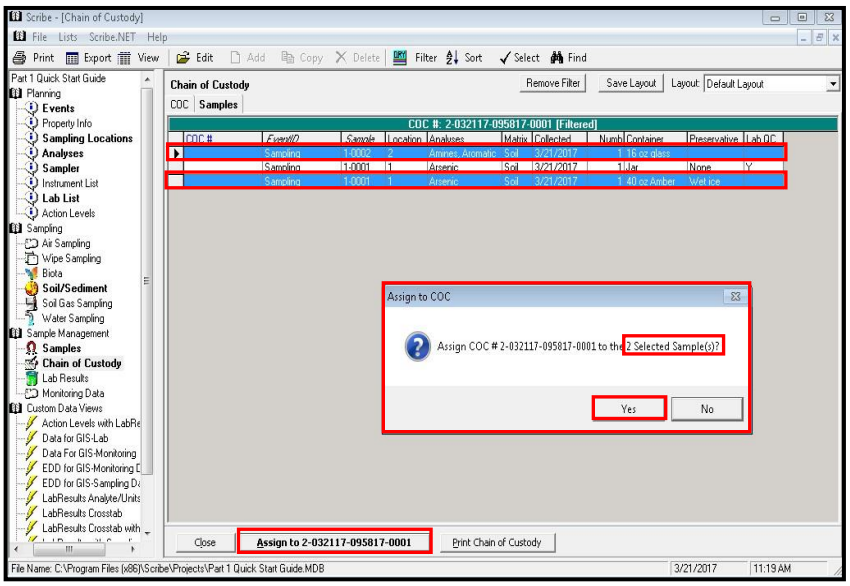
15. Click 'Yes'.

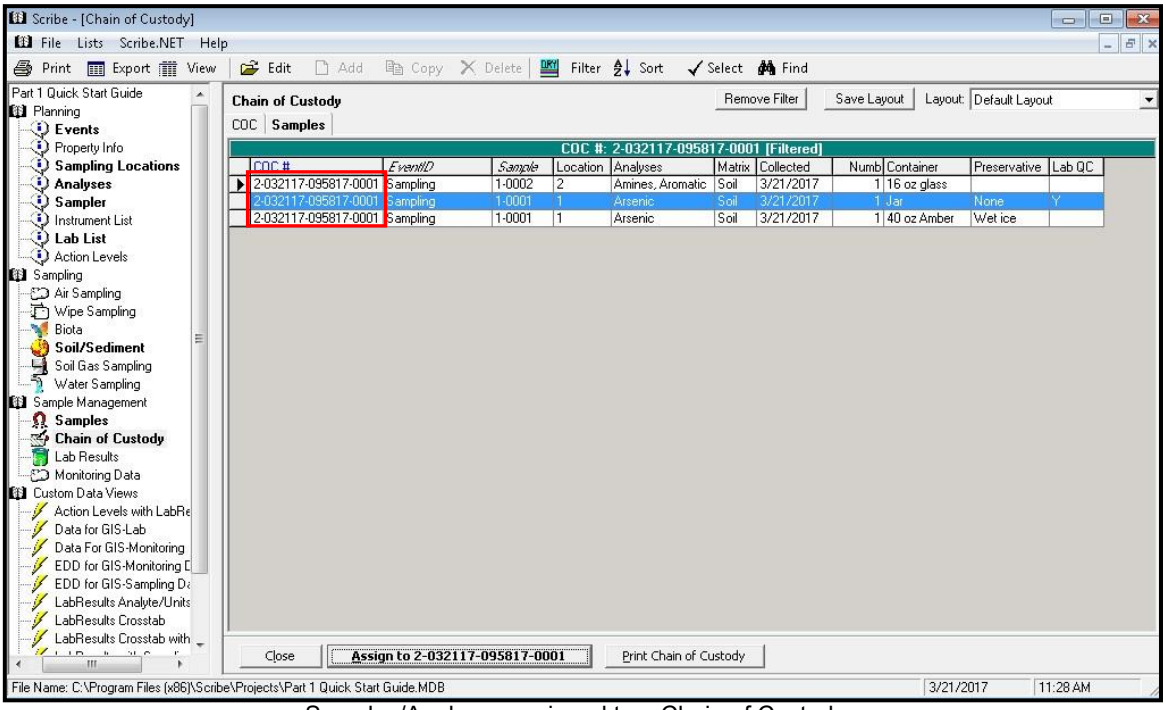


16. To select specific samples, highlight the samples by holding down the **Ctrl** key + Click on the sample(s). Or use the **Shift** + Click to highlight a series of samples.

17. Click on the 'Assign to…' button.

18. Click Yes.





Samples/Analyses assigned to a Chain of Custody

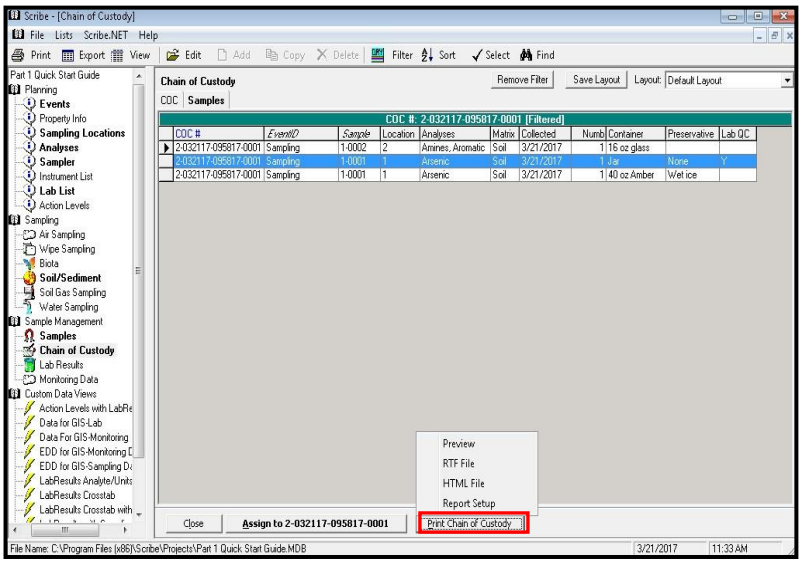
Print Chain of Custody

To print a Chain of Custody:

1. Click on 'Print Chain of Custody' button on the bottom of the window.

2. Click on Preview, RTF File, or HTML File

   Note: The Report Setup window will be displayed first for all options.

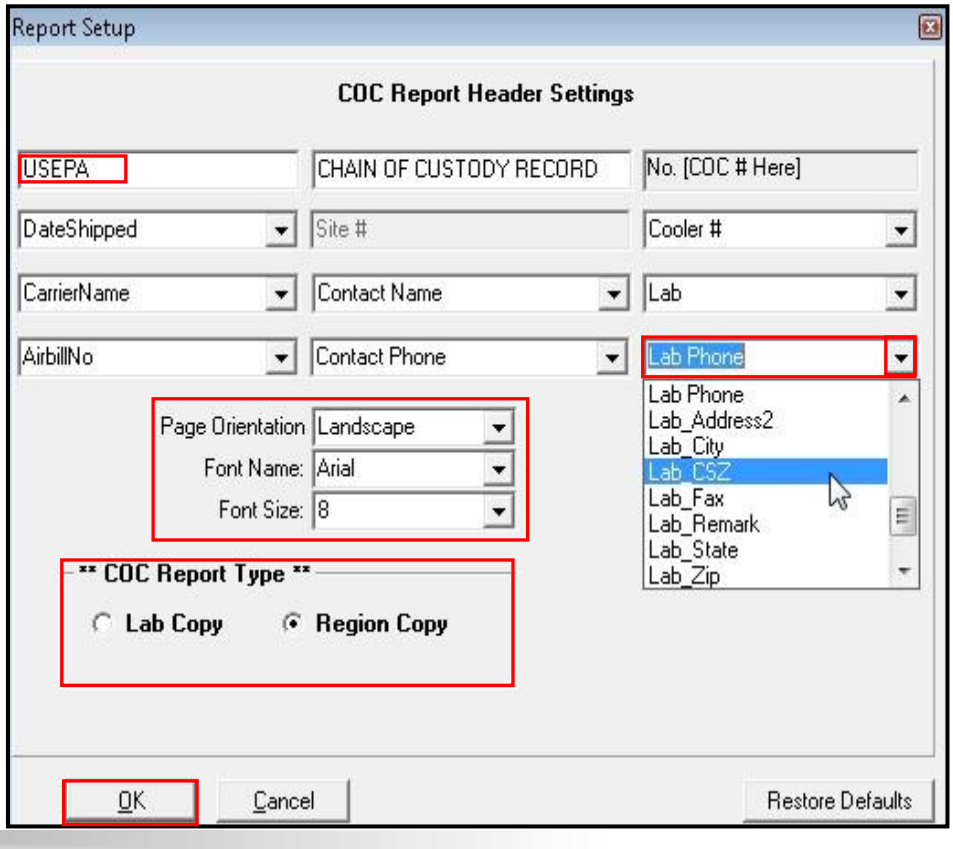


The Report Setup screen allows you to customize the Chain of Custody Report Header. Modify the fields as necessary. If the field has a drop down arrow, click on the drop down arrow and select an item from the list (see Planning section lists).

3. Select the COC Report Type.

   Note: The Lab Copy of the COC should be selected when shipping samples. Certain information about the sample/analysis is omitted from the Lab Copy of the COC (i.e., Site Name).

4. Click 'OK'.



ERT

Field Use Basics
Part 2

Scribe v3.10

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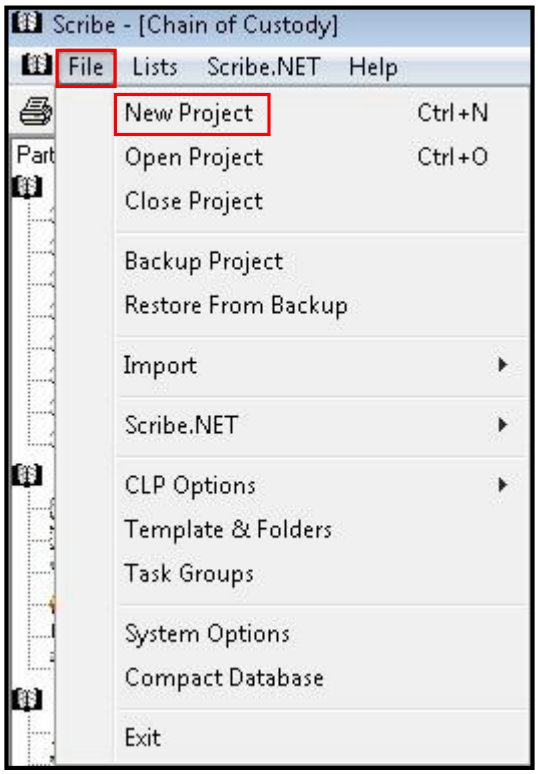
PART 2 – FIELD USE BASICS

The information presented in this Section describes he various fields and their purpose. You will start each new project with the default set of data in the new database (Scribe3.mdb template file), and then tailor that database to your specific project.

Starting a New Project

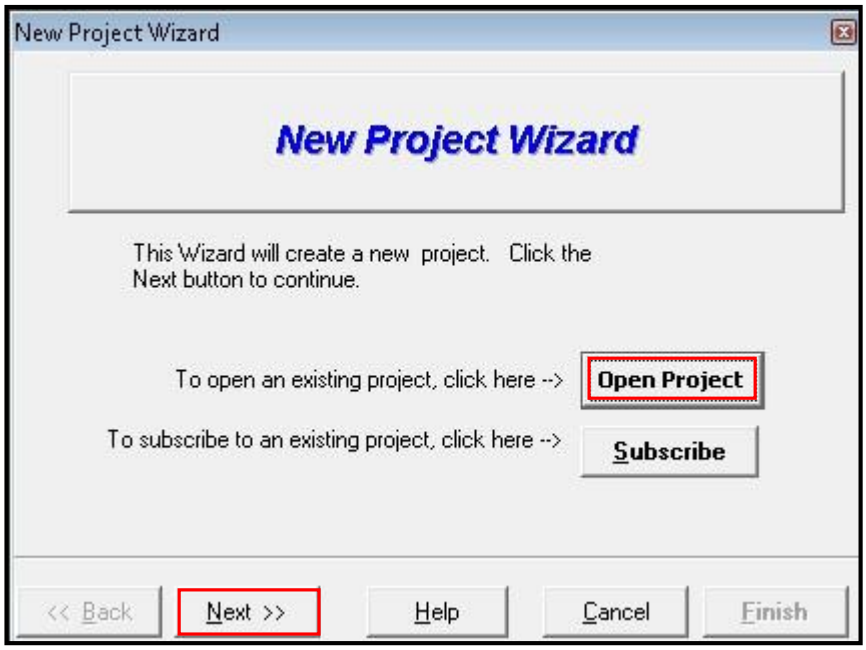
After an initial installation of Scribe, the New Project Wizard automatically helps create the first Scribe project. If you have already started a project and need to create another one, click **File | New Project** and the New Project Wizard will be displayed.



New Project Wizard

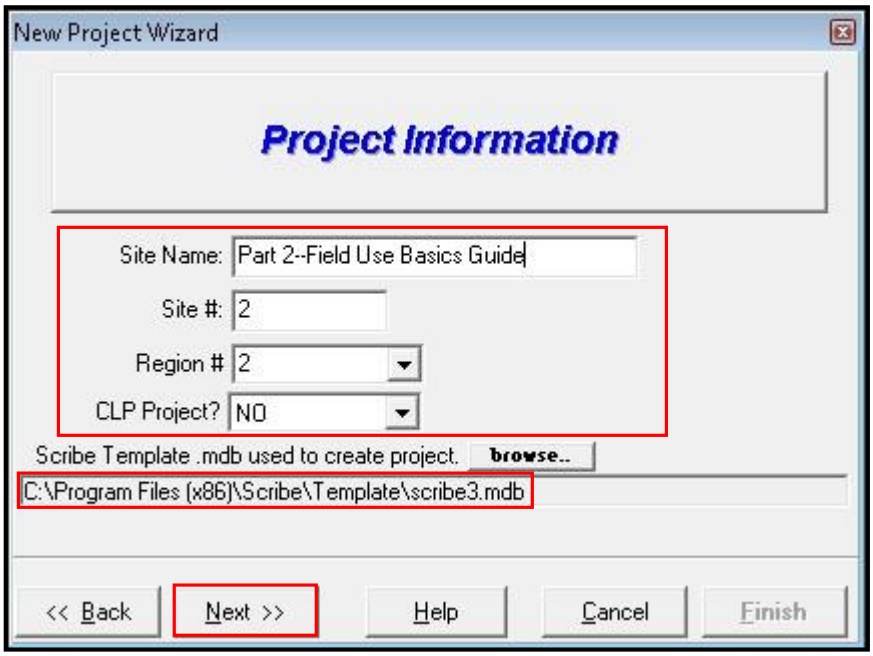
If you are starting Scribe for the first time, the dialog box shown below will be displayed.

1. To Open an existing Project, click Open Project.
2. To Create a New Project, click Next.
3. To download a project with a Subscription ID and password, click 'Subscribe'. You must have the Subscription ID and password to use this option.



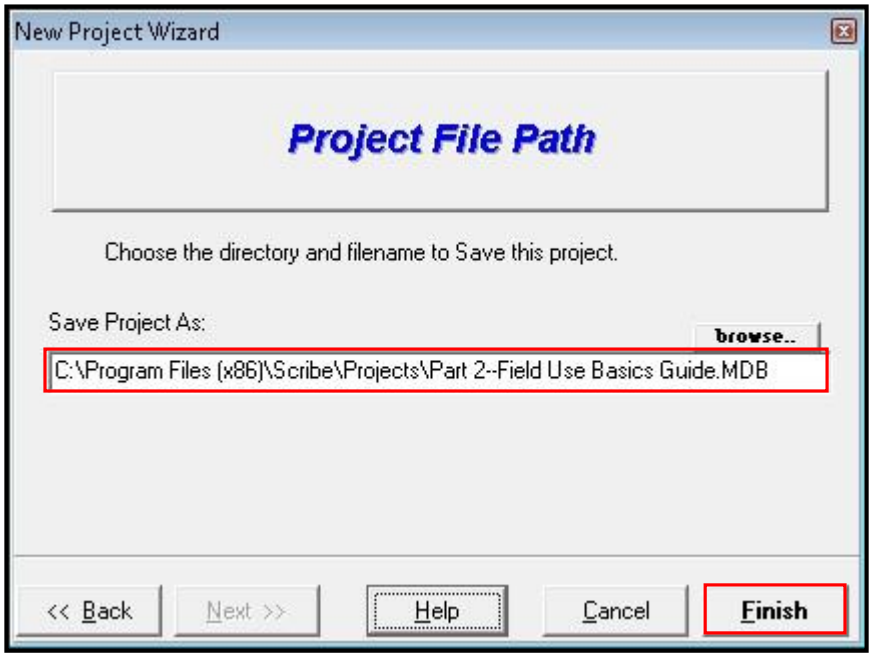
4. Input the Site Name, Site # (or Project Identifier) and the Region.
5. Select 'Yes' or 'No' depending on if it is a CLP Project (Note: If Yes is selected, all of the CLP functionality will be set as the default)
6. Use the default Template (scribe3.mdb) or a Region specific Template.

   Templates contain the picklists, layouts, Custom Tasks and Custom Data Views loaded with your new project.
7. Click the Next button.

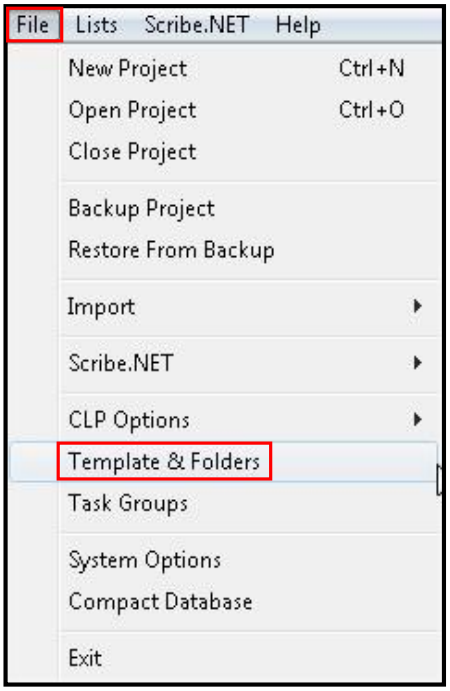


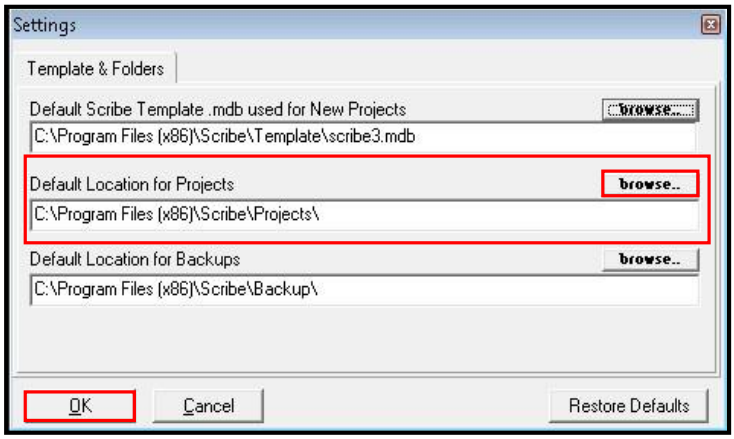
8. The Project File Path screen is displayed

   To accept the default location and filename for the project, Click Finish to complete the creation of the new project.



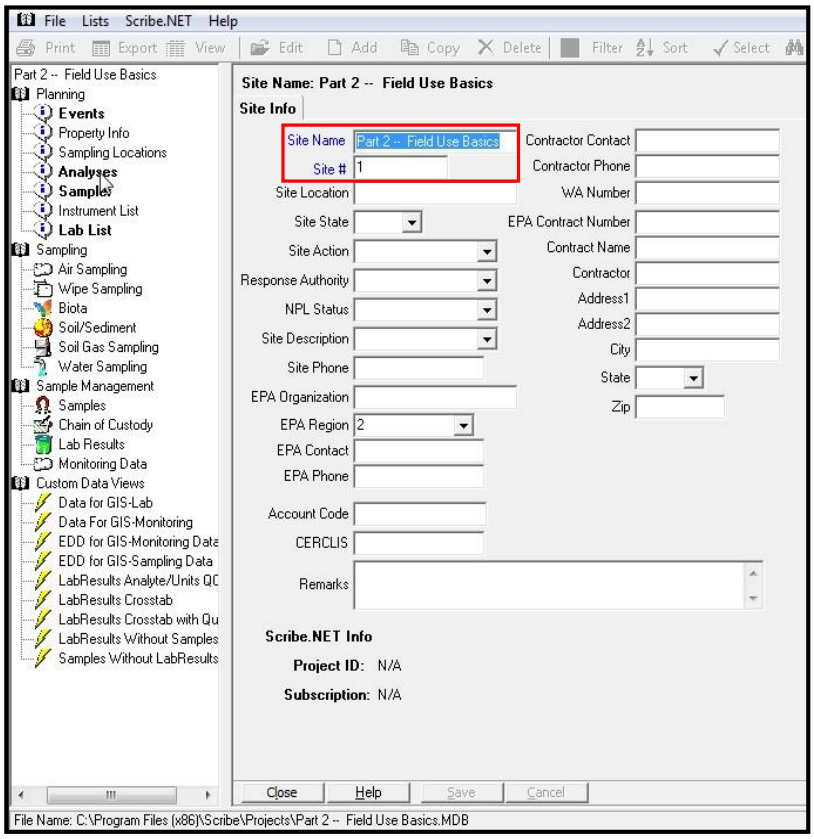
The *default* Project File Path can be changed by clicking on **File|Template & Folders.** Browse to where your new default Project File Path will be. ***Note:*** *All new Projects created will now be saved in this default directory. You can set different default directories for the Scribe Template file and for the Backups.*





9. The New Project Wizard closes and the 'Site Info' screen is displayed.

   The 'Site Name' and 'Site #' are the only two required fields to start a new Scribe Project. Completing the information on this screen is not required at this time, but it is recommended that as much of this information is pre-populates fields in later tasks.



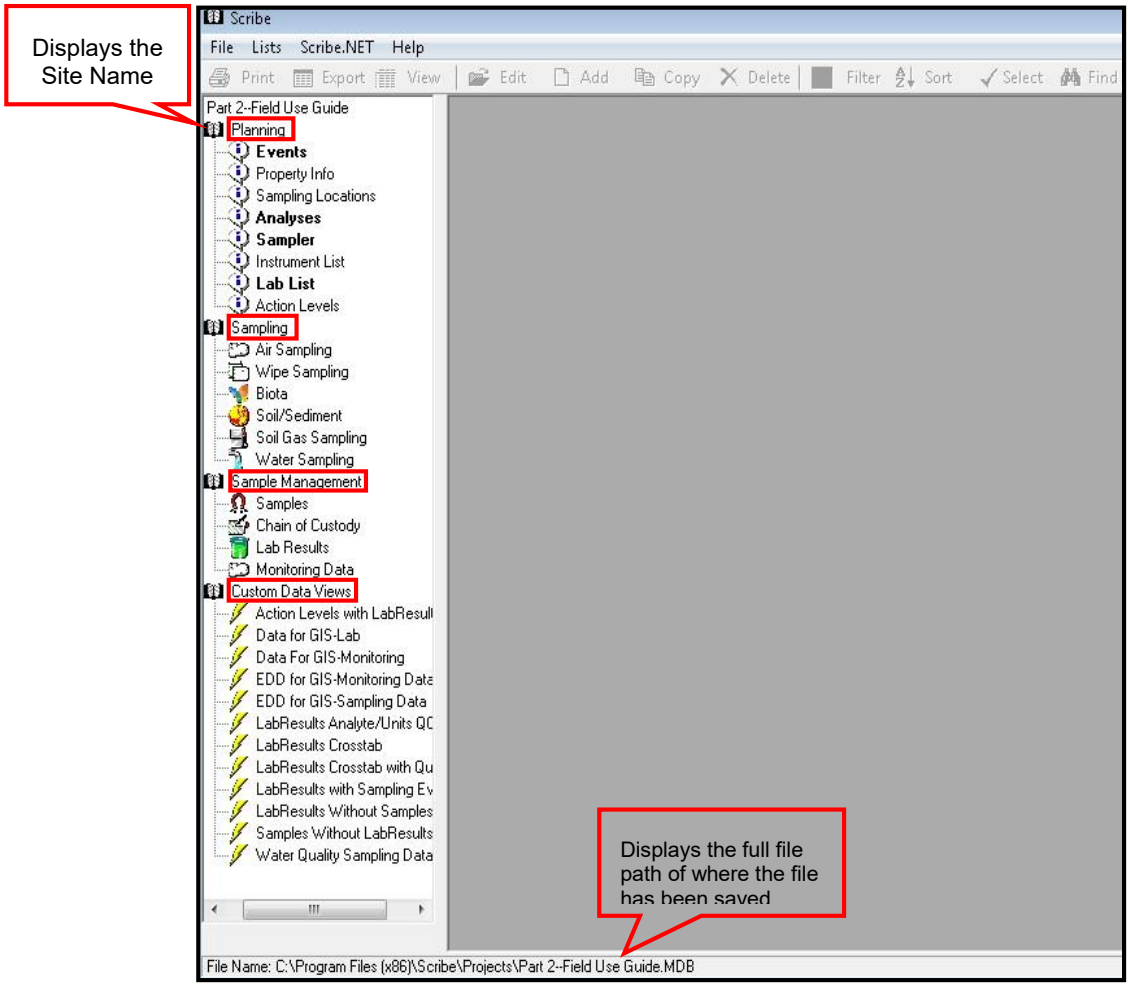
NAVIGATING SCRIBE

Navigation Pane

Scribe is broken down into four (4) main tasks as displayed in the Navigation Pane (Planning, Sampling, Sample Management and Custom Data Views). In some cases, another section called Custom Tasks will also be available (see Advanced Scribe Guide for adding Custom Tasks).

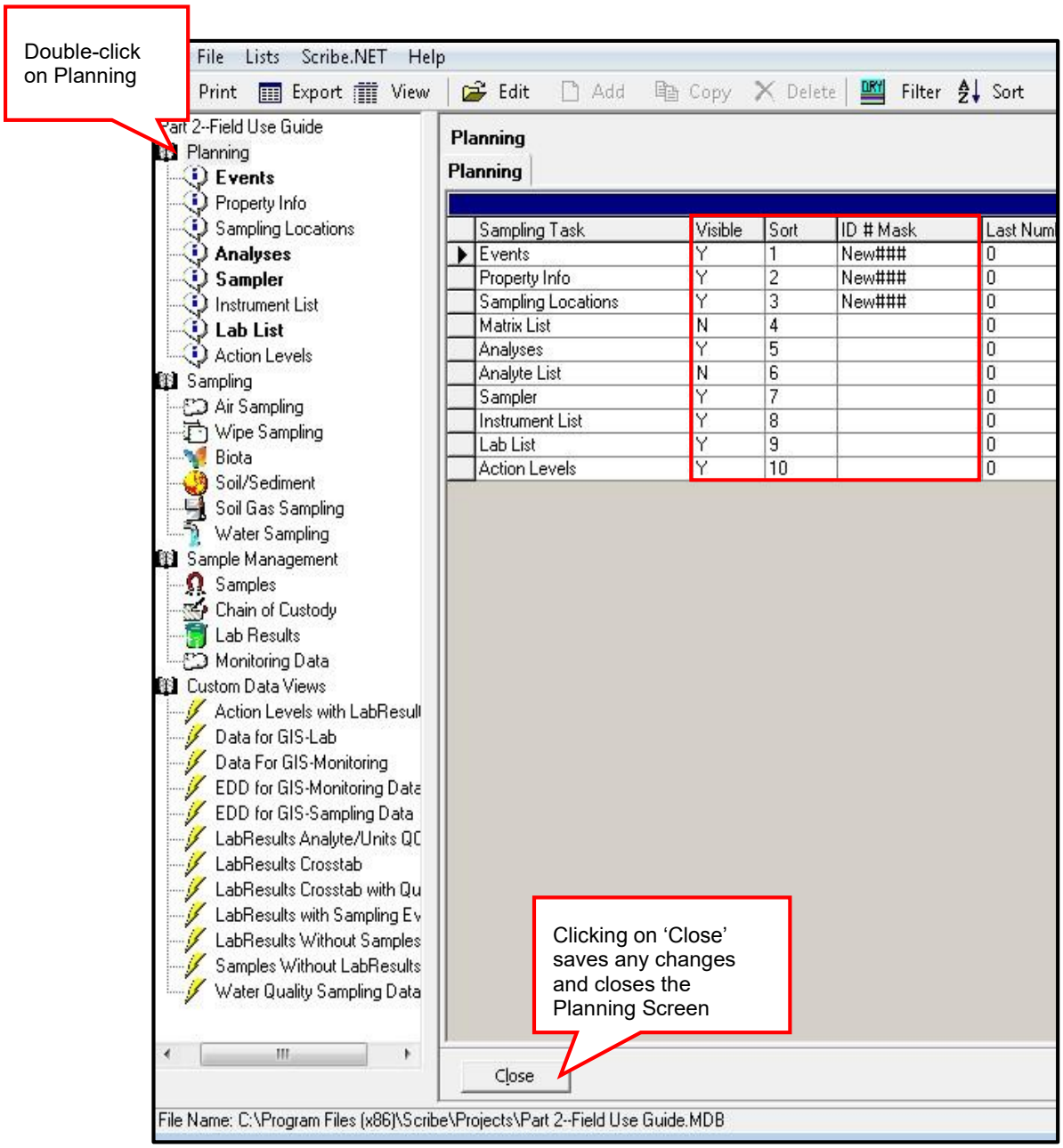
The left side of the screen is called the 'Navigation Pane'. Clicking on an item in the 'Navigation Pane' opens a screen for that function (i.e., Events, Soil/Sediment, Chain of Custody, etc.) on the right side of the screen. By default, you may have up to four screens open at the same time. When you open the fifth screen, the first screen closes. To close a screen, click on the Close button on the bottom. To close all screens, keep clicking Close until you go to a grey screen.

The following sections will discuss each Task, what information should be entered and how it is used.



Planning

The Planning section is a useful tool for pre-populating information that might facilitate sampling activities. The Planning section consists of eight (8) Planning Tasks entitled Events, Property Info, Sampling Locations, Analyses, Sampler, Instrument List, Lab List and Action Levels. These tasks aid in the planning process, allowing you to group and copy information and facilitate tailoring projects to project specific needs. By double-clicking on the word Planning, you can set the Visibility of each Sampling Task, the Sort Order of the Task, and set an ID Mask.



Events

The first task in the Planning section is Events. Events are groupings of data. For example, you may group your sampling effort by the reason you are taking samples. In that case, all your samples for a given day would be considered one event. You may also do a complete yearlong project under one event. Grouping by Events may be quite helpful when conducting monitoring jobs. For example you are required to do air monitoring every day at the same ten locations for the next six months. Name the first sampling event and enter all of the samples for that event. The following day, you can copy the first event, give it a new event name and Scribe will copy all of the previous sample info to new samples for the new event.

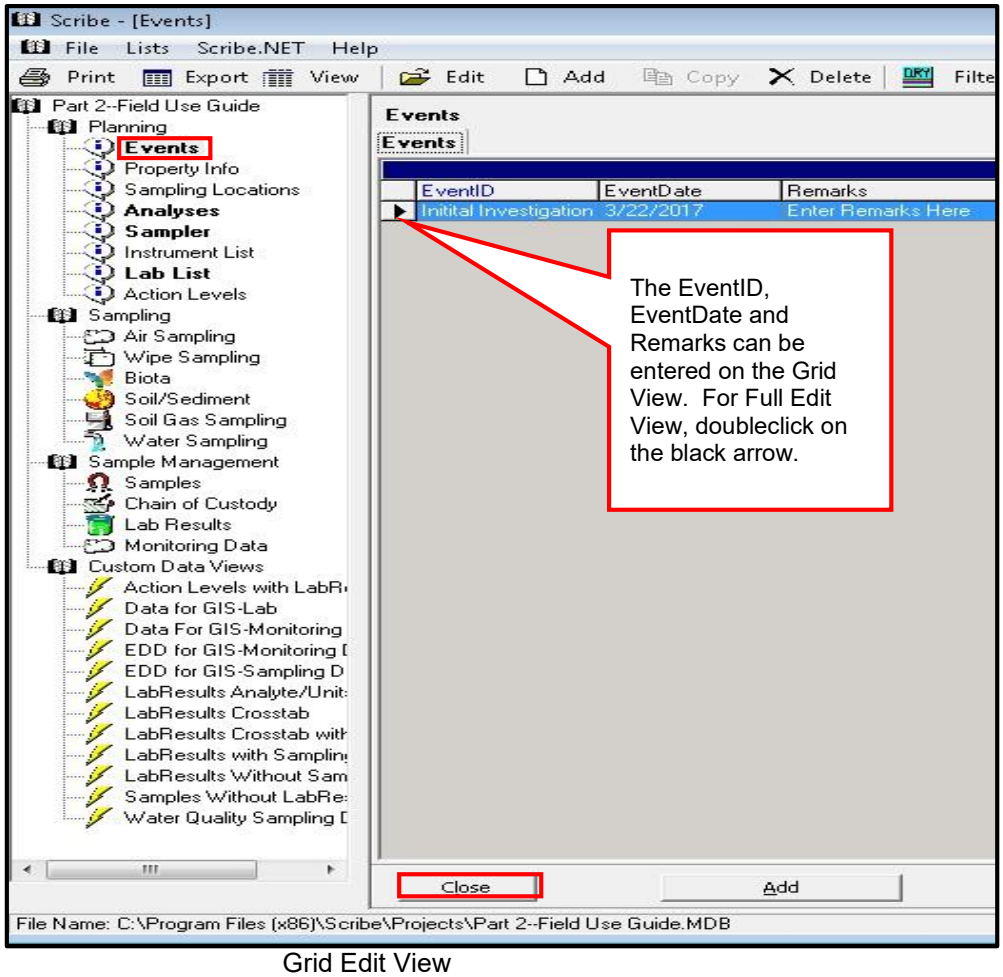
If your event(s) will have the same type of samples, analysis, sample collection, etc., it can then by copied to the next event and so on. This saves time when typing in repetitive information for multiple samples for each day and reduces data entry errors.

Note: *By default, Event is a required field (denoted in blue). In order to get a new project started, Scribe will assign a default Event of Sampling. It is highly recommended that careful thought is used when setting up your Scribe sampling events.*

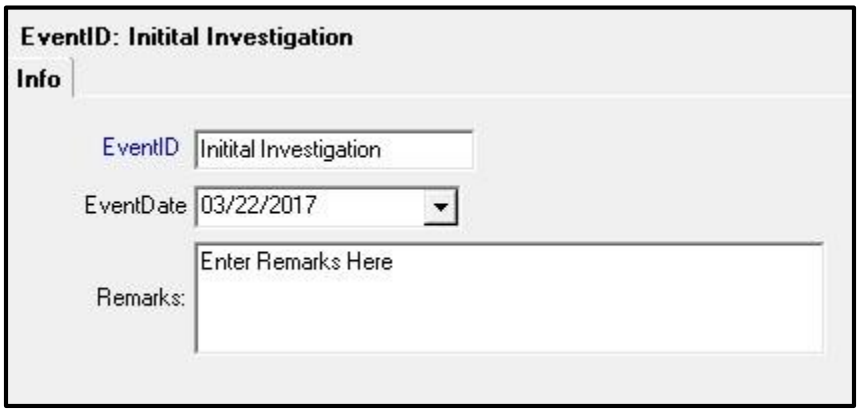
Add an Event:

Enter the new Event ID, EventDate and any remarks.

Click the Close button at the bottom of the screen to save the Event.



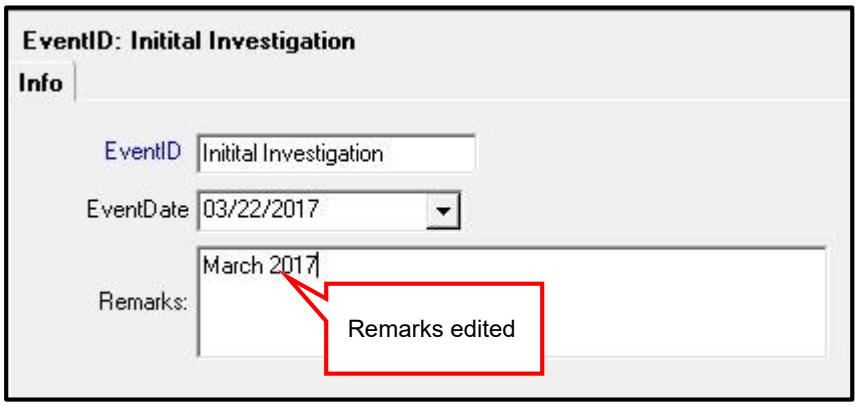
Grid Edit View



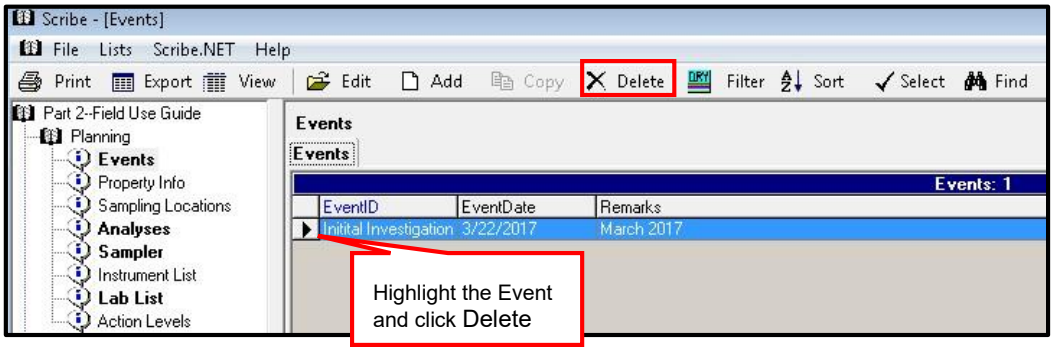
Full Edit View

Edit/Delete Event Information:

To **edit** 'Event' Information, it can be changed from the Grid View (see above) or by selecting the Event and double clicking in the block just to the left of the Event to bring up the Full Edit Screen (see above).

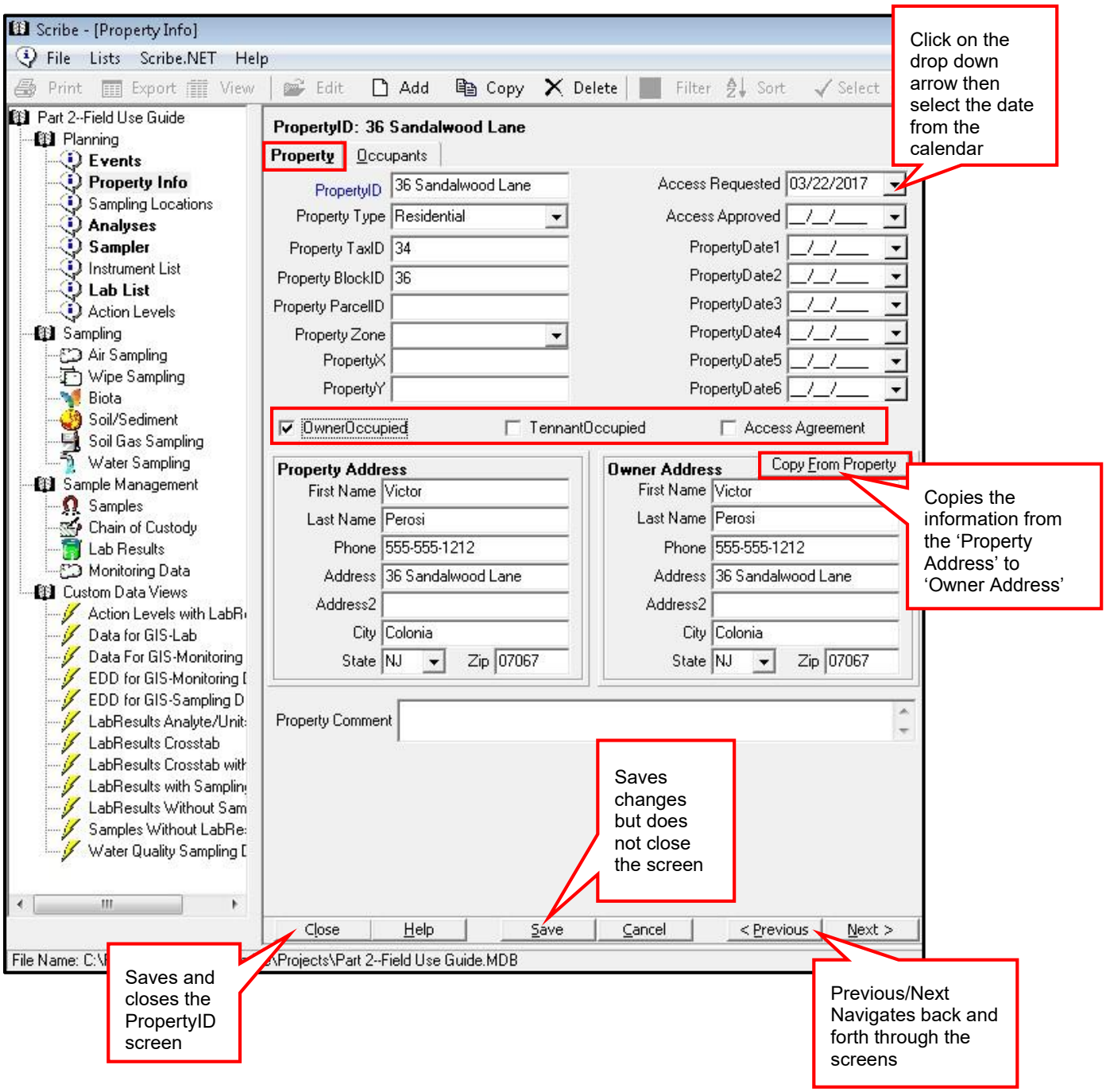


To **delete** 'Event' information, highlight the event in the Grid View and press the 'Delete' key.



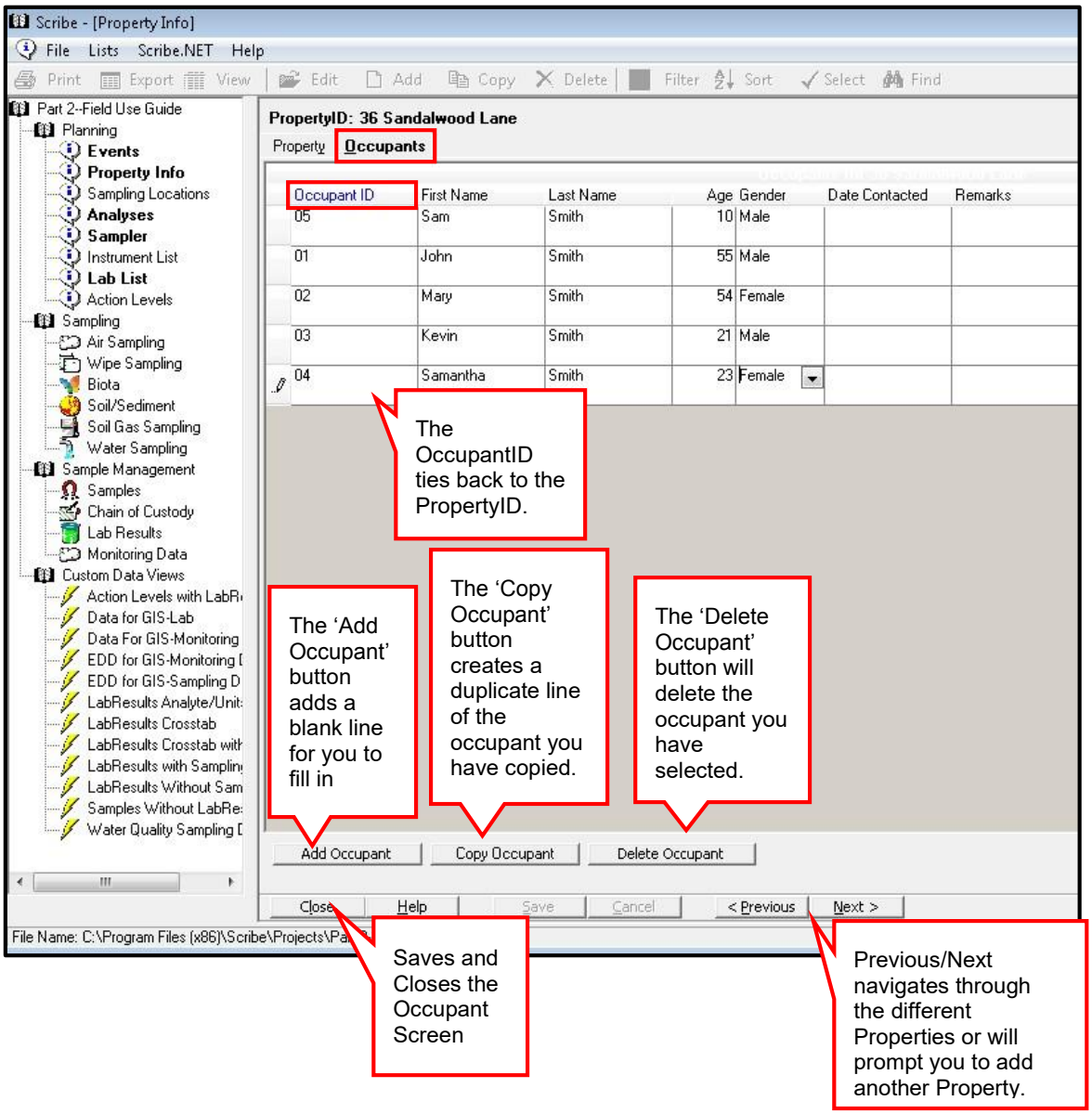
Property Info

The **Property *Info*** tab opens a screen that provides a way to input specific Property and Occupant information. Property information, Property Dates, Property Addresses and Property Comments are entered in this screen. The Property Dates can be used to record property access agreement dates.



Occupants

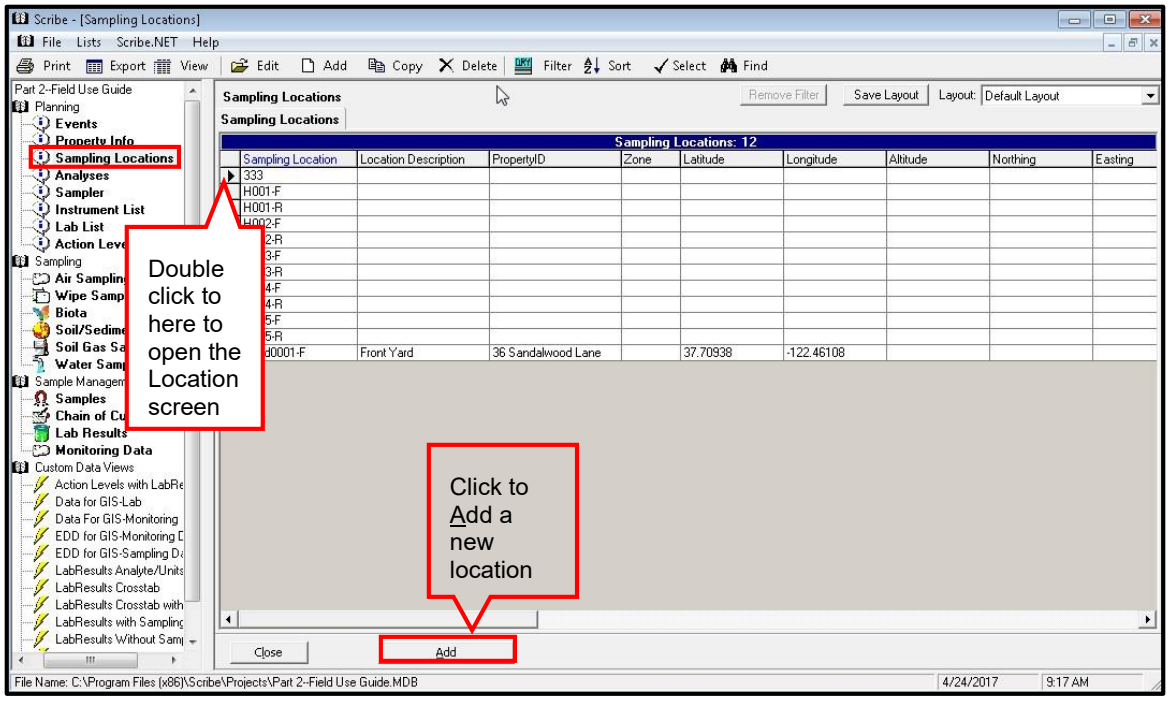
The **Occupants** tab opens a screen that contains specific information regarding the occupant(s) of the Property. This tab allows you to Add, Copy or Delete occupants.



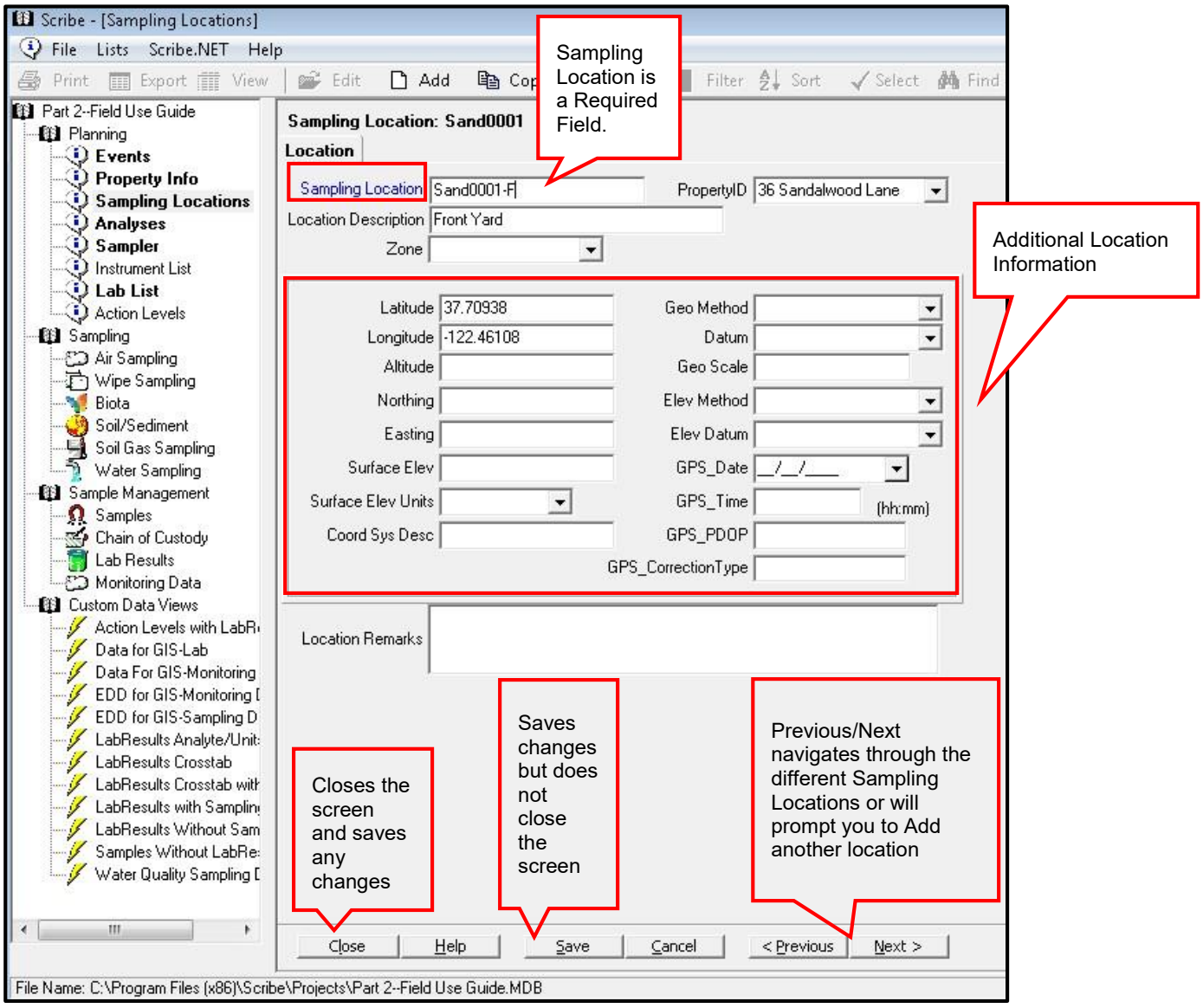
Sampling Locations

Each sample that you take should have location information associated with it (i.e., GPS coordinates). It is important to understand that you can have many samples taken at one (1) Sampling Location. In addition, Sampling Locations can be associated with a specific PropertyID. **Sampling Location** (denoted in blue) is a required field and must be entered at the **Sampling Locations** table or under a specific **Sampling** task. All other Location information can be filled out or imported in at a later time.

To add a sampling location, click on the Add button at the bottom of the Sampling Locations screen.

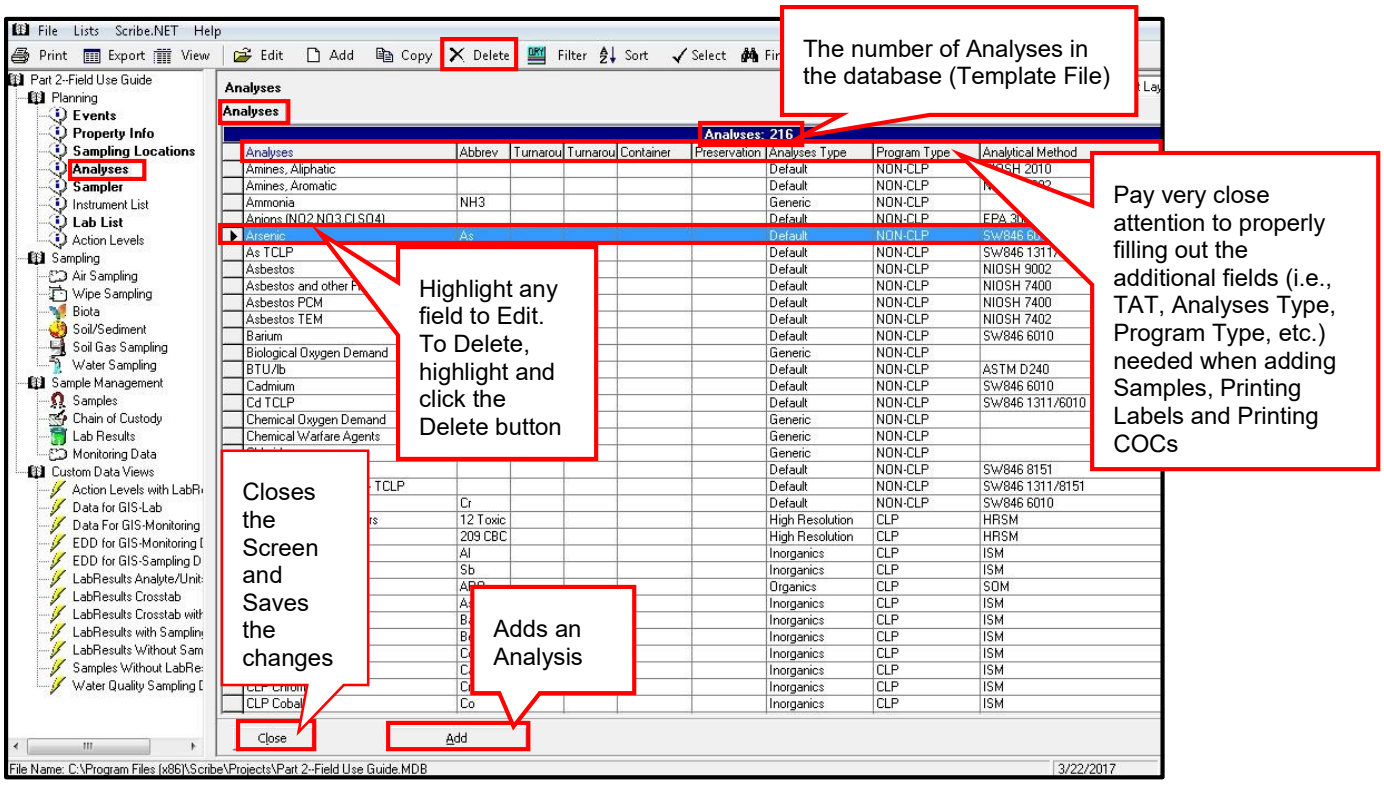


The Location Screen allows you to enter basic information about a sampling location. More than one sampling location can be associated with one Property ID. For example, a Sampling Location could be Sand0001-F and the Property ID would be 36 Sandalwood Lane, that was previously entered under the Property Info table.



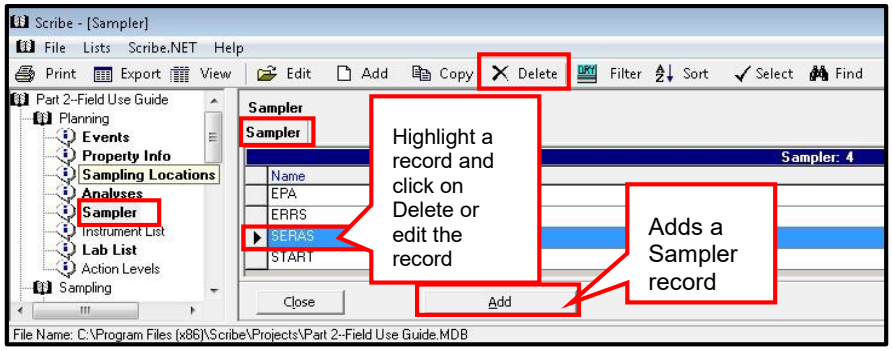
Analyses

The **Analyses** Table provides a default set of analyses that comes prepopulated when you start a New Scribe Project from the Scribe3.mdb Template file. If using a Regional specific Template file, your default set of analyses may be different. Optionally, **Analyses** that do/do not apply can be added and deleted to the table.



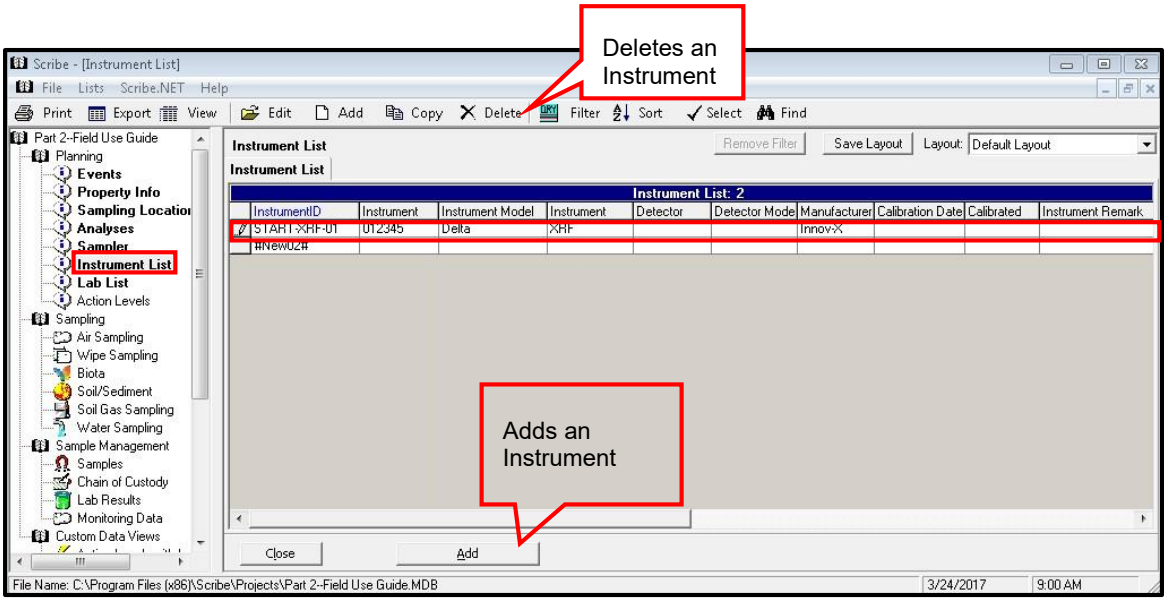
Sampler

Sampler contains the names of sampling 'teams' or individuals. The default set of **Sampler**s comes prepopulated when you start a New Scribe Project from the Scribe3.mdb Template file. If using a Regional specific Template file, your default set of Sampler(s) may be different. Optionally, **Sampler(s)** that do/do not apply can be added and deleted to the table.



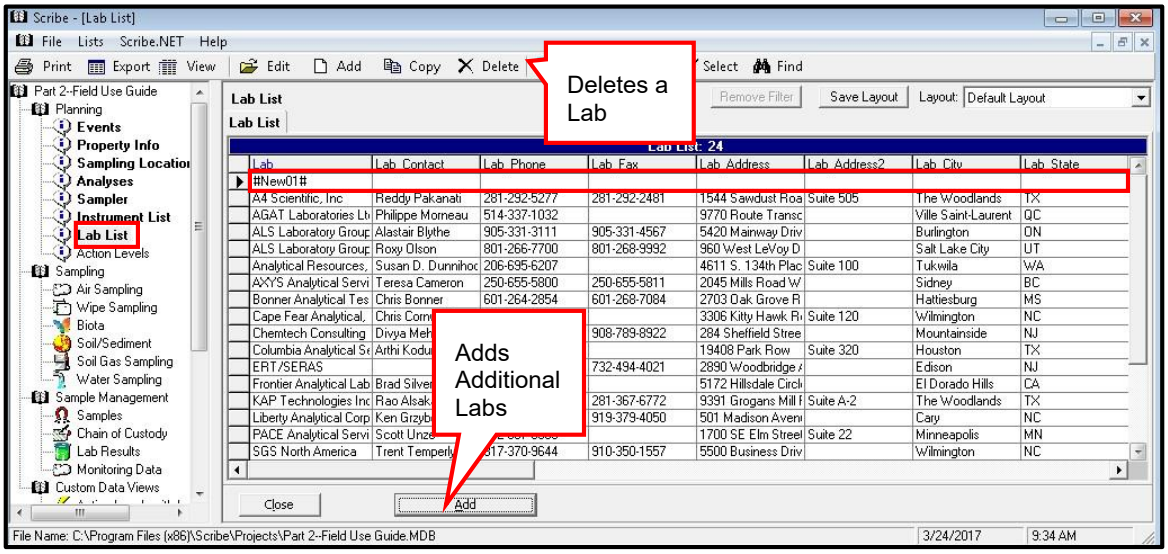
Instrument List

The Instrument List screen provides you with a means of identifying real-time monitoring instruments used for field sampling.



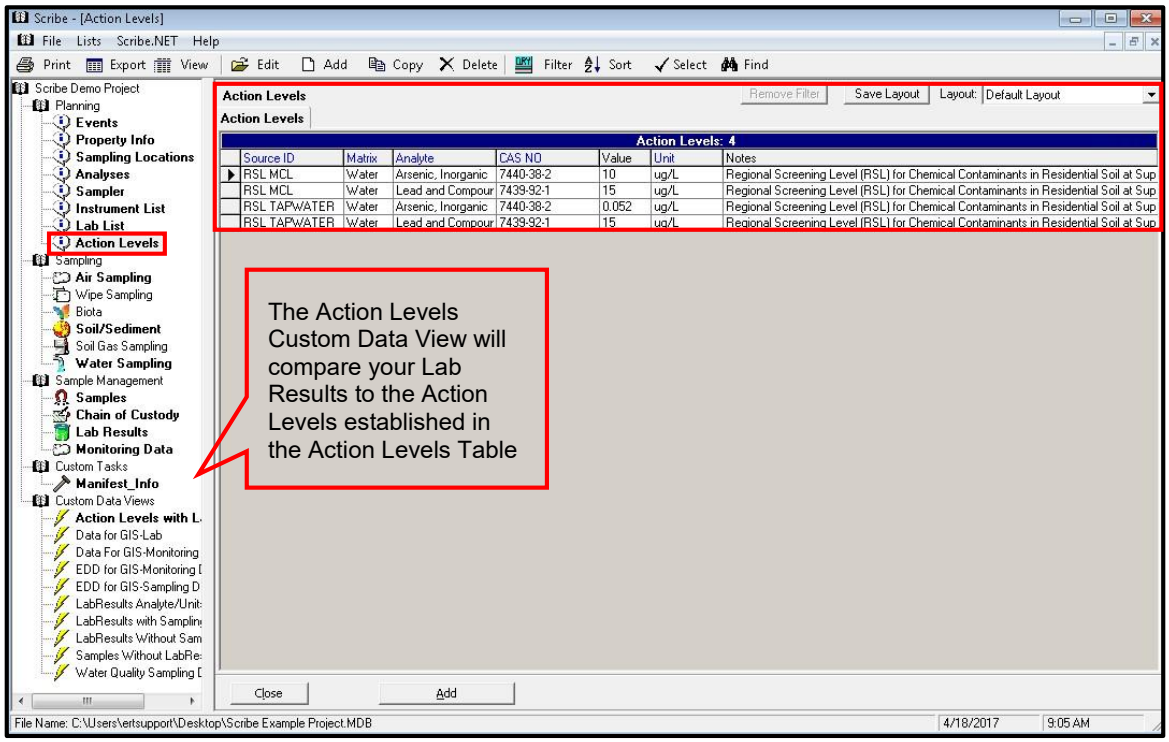
Lab List

The **Lab List** contains a list of Laboratories. The default **Lab List** comes pre-populated when you start a New Scribe Project from the Scribe3.mdb Template file. If using a Regional specific Template file, your default Lab List set may be different. Optionally, **Labs** that do/do not apply can be added and deleted to the table.



Action Levels

The Action Levels table is where you can load project specific Actions Levels (MCLs, Benchmarks, etc.). If Action Levels are loaded, a query exists under Custom Data Views that will compare the Analyte in the Action Levels table to Lab Results and identify which results exceed the Action Level. (The CAS # and Result Units are the key fields compared between tables.

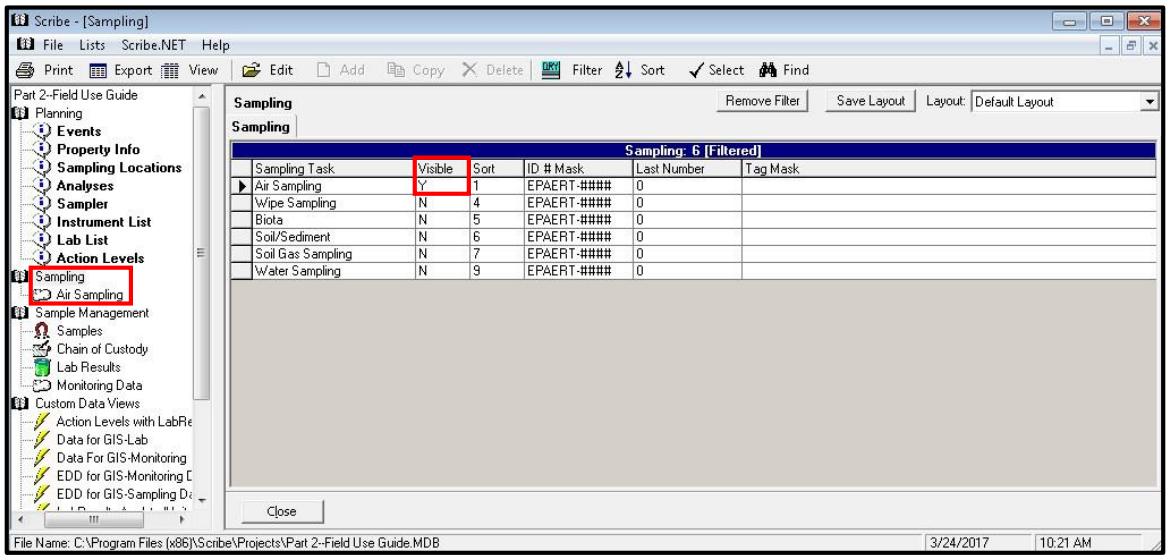


Sampling

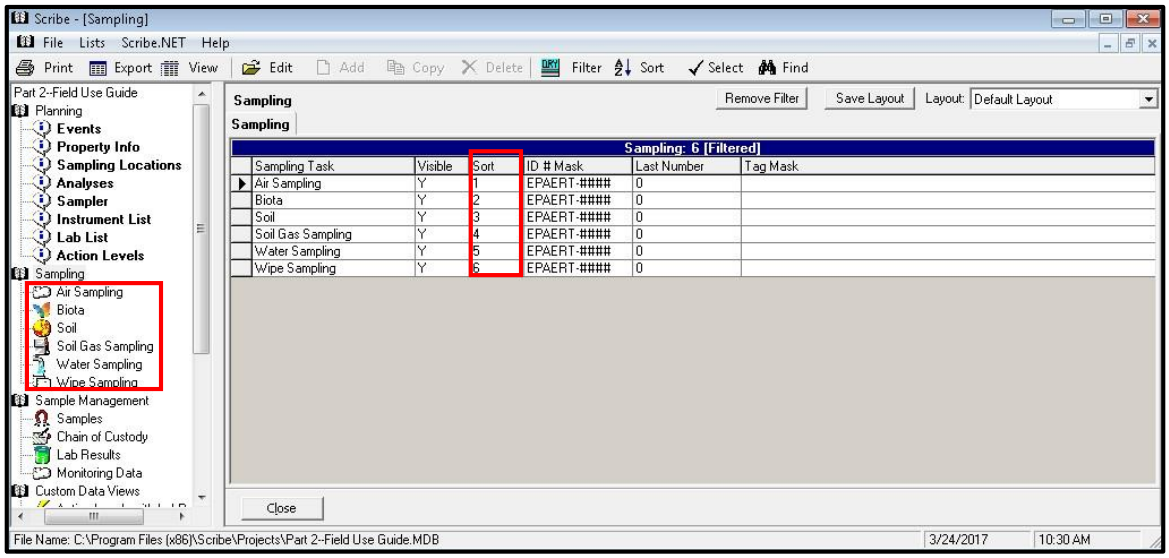
The **Sampling** section provides a means for creating, updating and viewing Sampling Tasks. Clicking on 'Sampling' in the Navigation Pane opens the 'Sampling' screen.

The first column on the Sampling screen lists the 'Sampling Tasks' available.

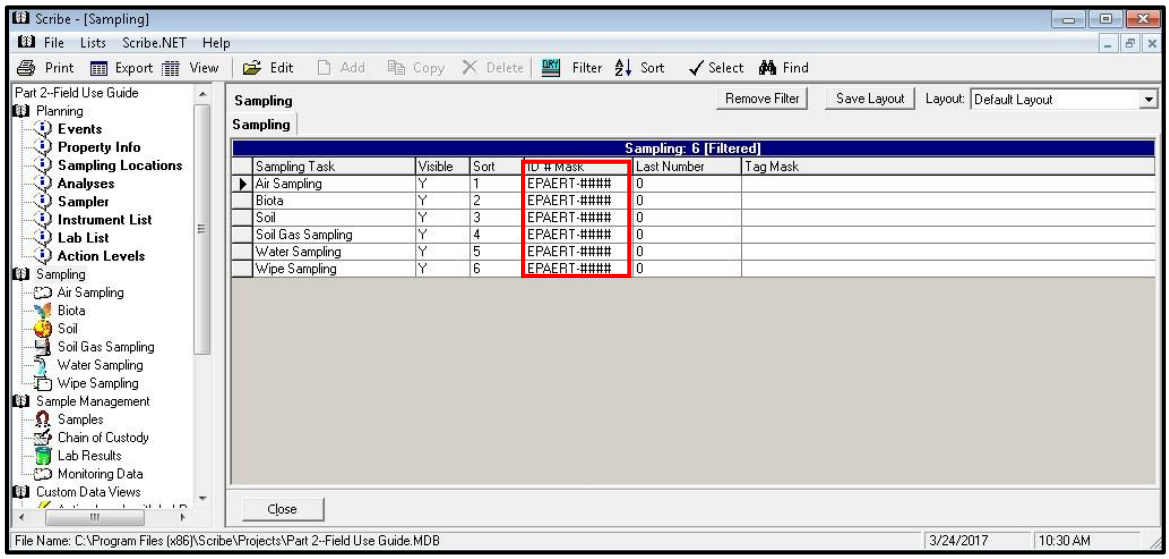
By default, all Sampling Tasks are visible in the Navigation Pane. By changing **Visible** to an 'N', the Sampling Task will no longer be visible and not available for selection in the Navigation Pane. A 'Y' indicates that a task is visible and available for selection. For example, if your project only requires Air Sampling, you can place an 'N' in all other sampling tasks so that only 'Air Sampling' is visible in the Navigation Pane. You can also edit/modify the Sampling Task Name (i.e., Soil/Sediment to Soil).



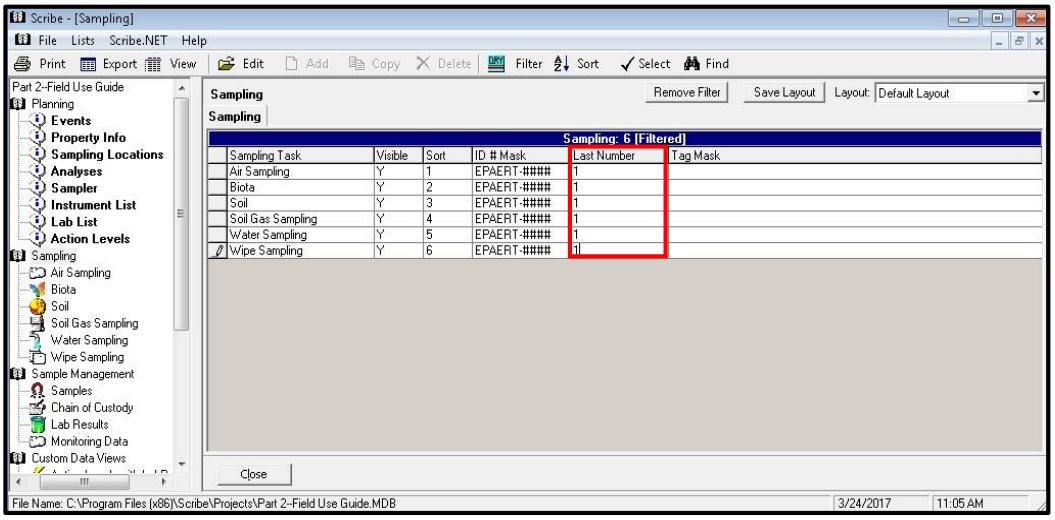
Sort allows you to sort your Sampling Tasks in another order. For example, alphabetical, etc.).



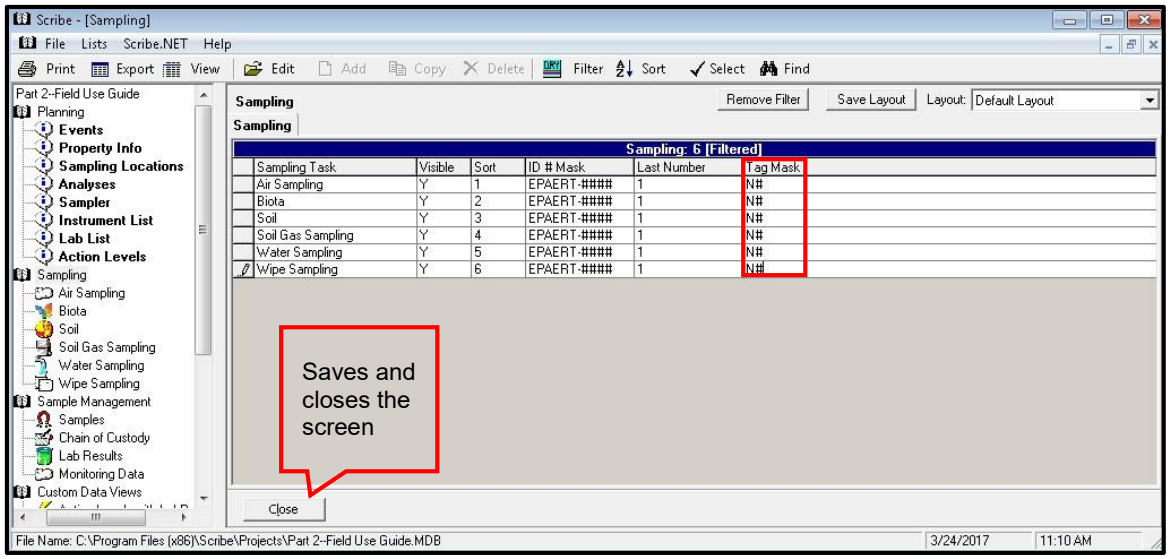
ID # Mask is useful when a specific Sampling Number (Mask) scheme is outlined in a site specific Data Management Plan, as well as when multiple crews are sampling the same project using Scribe and all the data is to be merged to one central database. You customize your sample numbers using the ID #Mask. The # symbol represents an auto-incrementing numeric field. For example, if you want your sample numbers to appear as EPAERT-0001, your ID # Mask would read 'EPAERT-####'. ***Note:*** *By default, you Sample ID # Mask will be set with your Site # followed by an auto-incrementing numeric field.*



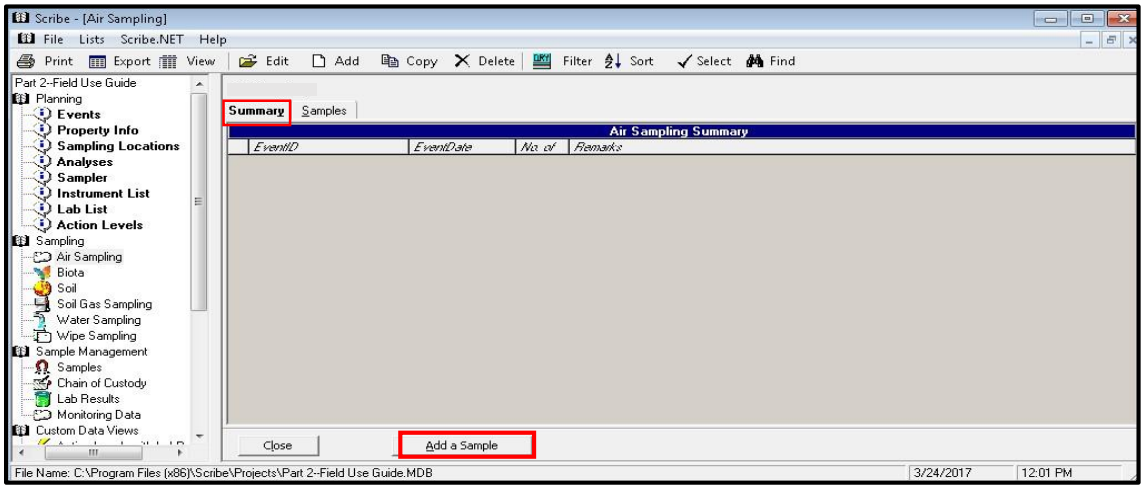
The **Last Number** field will show the last sample number used (i.e., the last sample # used was EPAERT-0001 (next one would be 0002). Changing the Last Number field can be particularly helpful when multiple sampling crews are out sampling at the same project, different locations and you do not want duplicate sample numbers in each project.

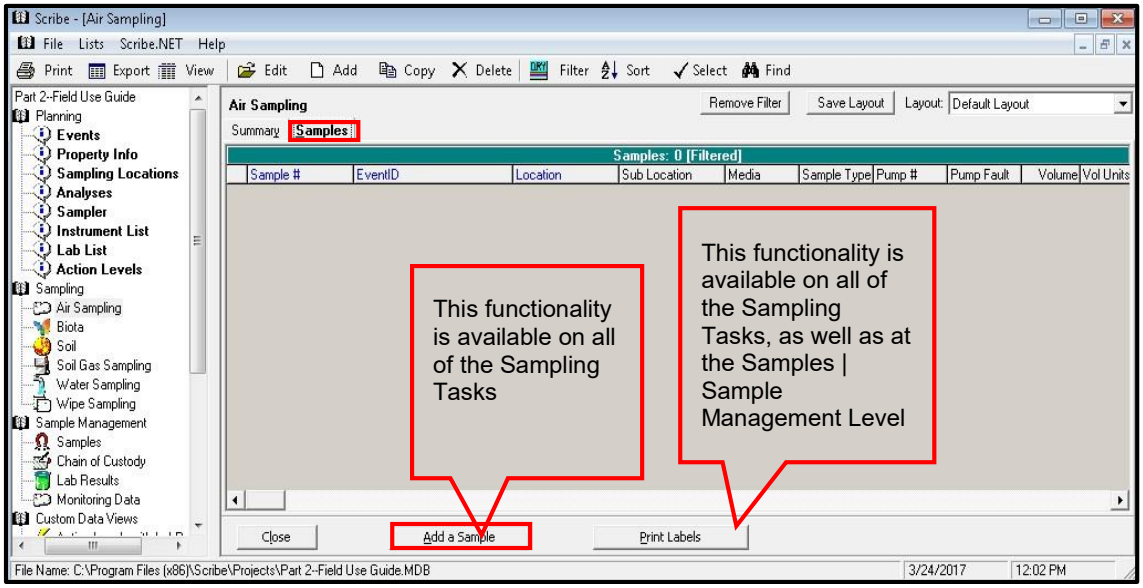


By default, the Tag settings in Scribe are set to 'Alpha' characters for generic Scribe samples and 'Numeric' for CLP Scribe samples. Some Regional Data Management Plans require that the Sample Tag consist of both an Alpha and auto-incrementing numeric field. Under Sampling, a custom **Tag Mask** can be configured. Remember that at least one auto-incrementing digit (#) needs to be included in a custom mask.. In this example, the Tag settings will be set to N1, N2, etc.



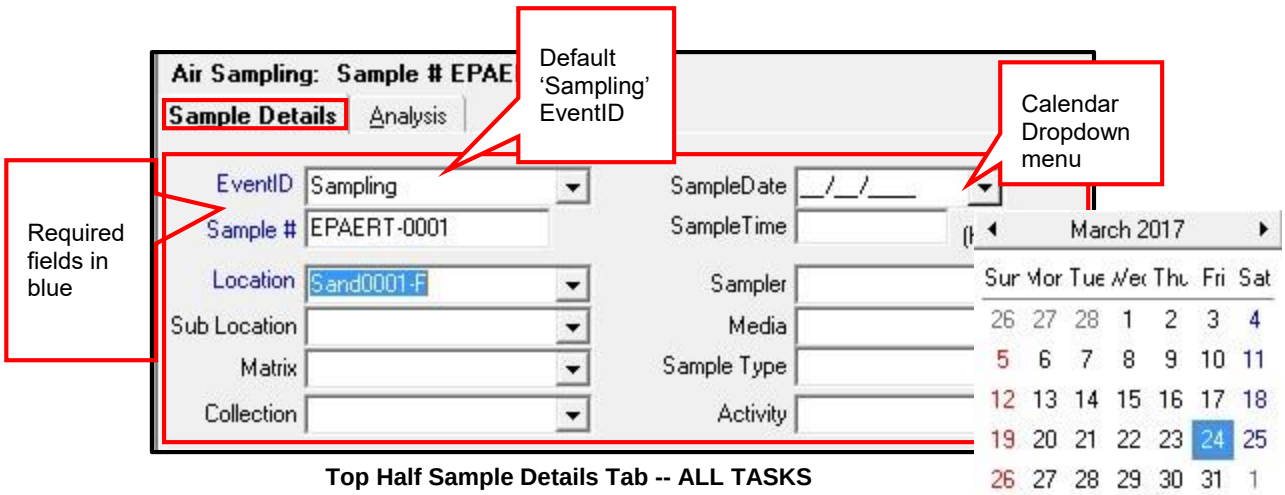
By clicking on any of the Sampling Task(s) (e.g., Air, Biota, Soil, Soil Gas, Water, Wipe), a Summary screen for the sampling task is displayed. The 'Summary' screen contains a **Summary** tab and a **Samples** tab. Before any samples are entered in Scribe, the Summary tab will be blank. Going forward, a summary of the Sampling Events will be displayed on the Summary tab, showing the number of samples collected in that event..



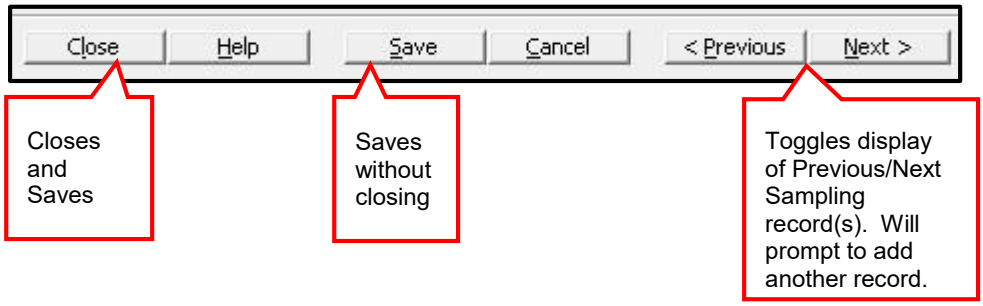


You can click on Add a Sample on the Summary or Samples Tab. ***Note:*** *This same functionality is available on all of the Sampling Tasks.*

In each Sampling task, the upper half of the Sample Details tab will capture the exact same information for each Task. The lower half of the Sample Details tab will include specific sample detail information to the task. ***Note:*** *The functionality of Closing, Saving, Cancel and Previous/Next are the same in each one of the sampling Tasks.*

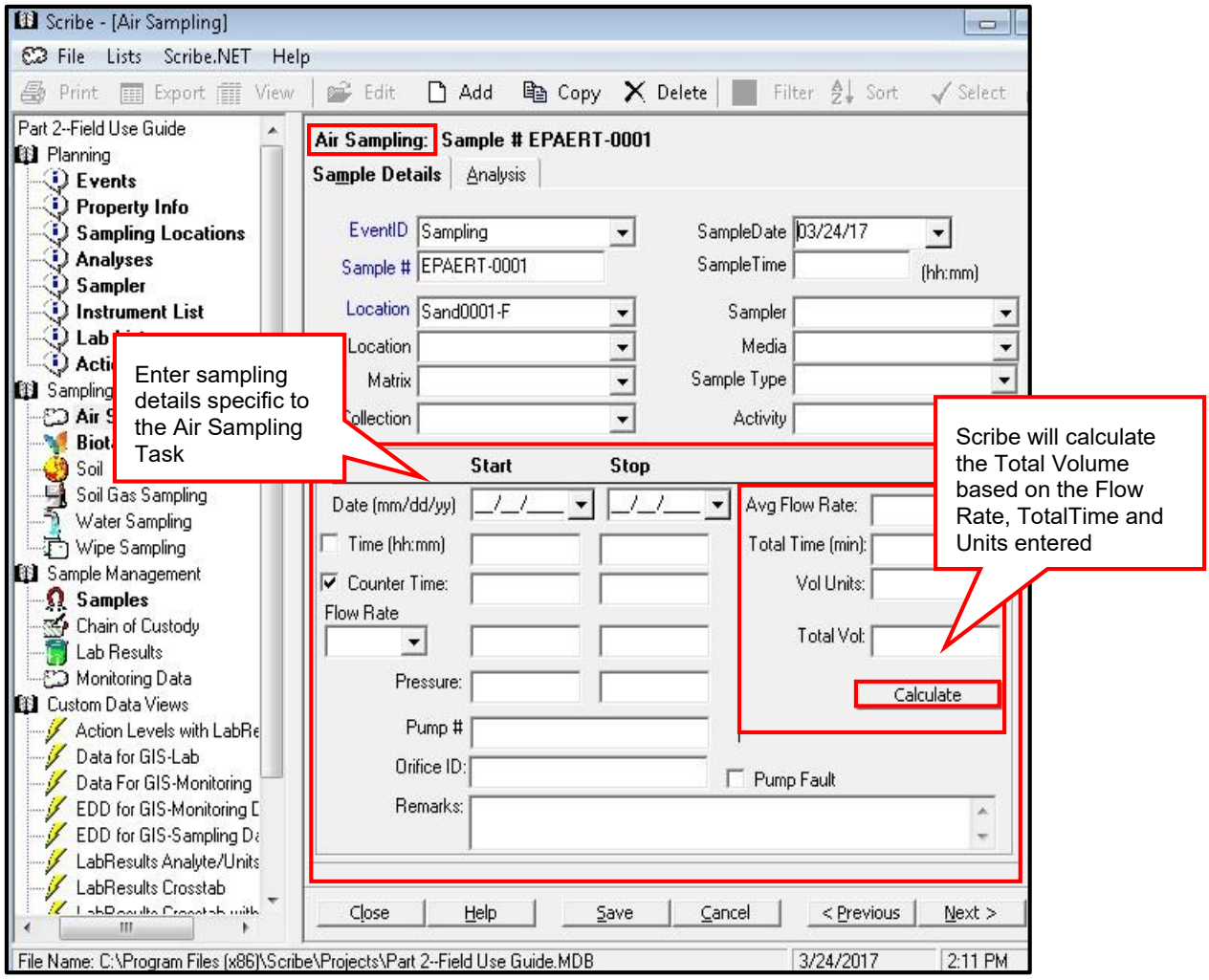


Top Half Sample Details Tab -- ALL TASKS



Air Sampling

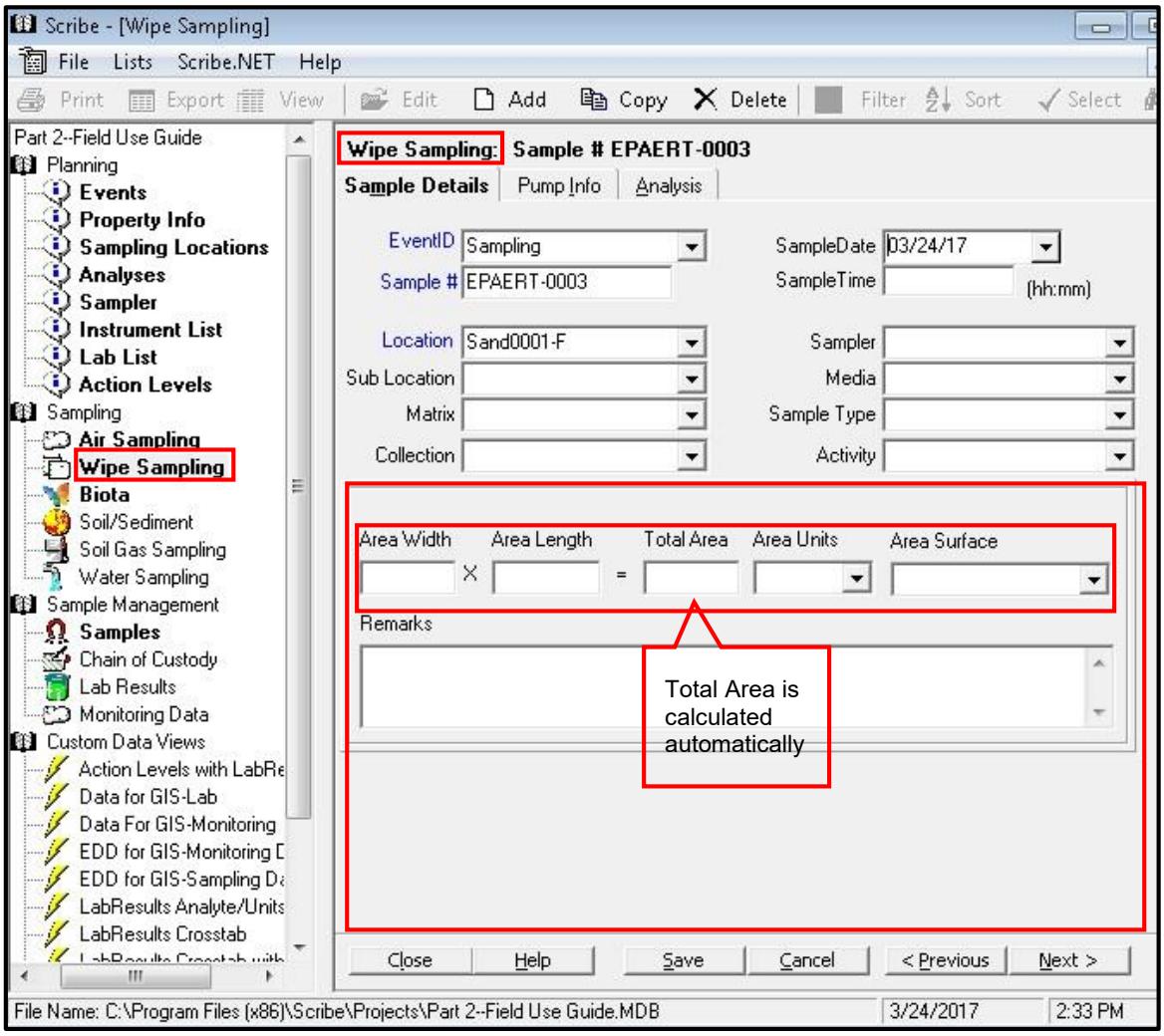
The bottom half of the Sample Details screen will capture the sample details specific to the task. In this example, Flow Rates, Pressure, Pump #, Time, Units, etc. can be captured for each Air Sample taken.

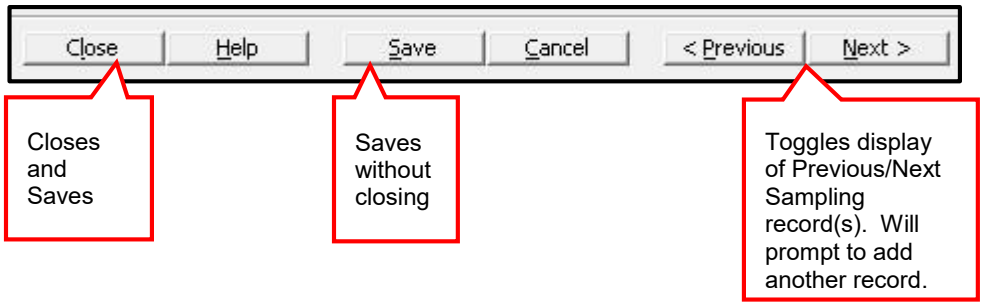


Bottom Half of Sample Details Tab -- Air Sampling

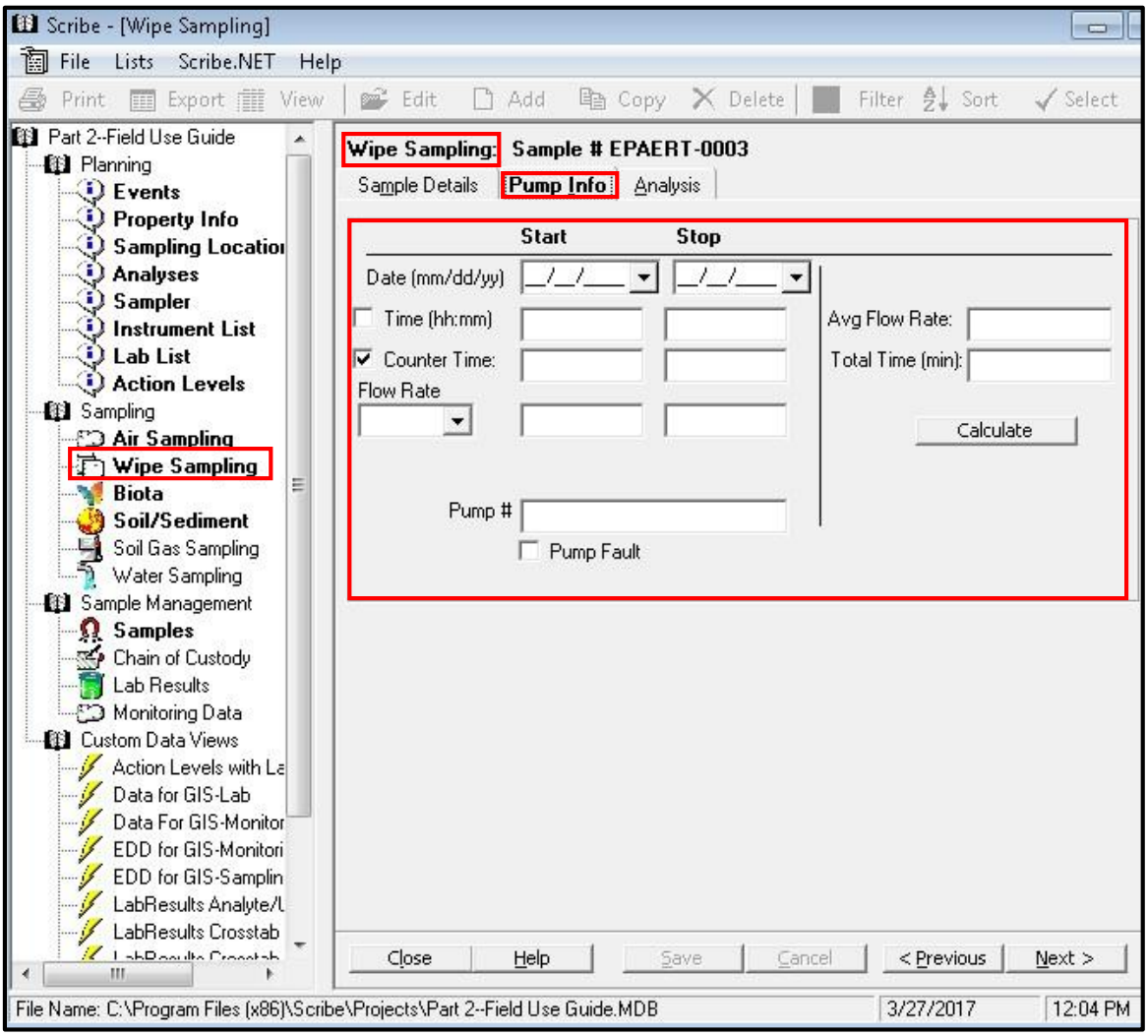
Wipe Sampling

Sample detail fields specific to Wipe Sampling include the Area Width, Length, Total Area, Units and Area Surface can be captured for each Wipe Sample taken. Total Area is calculated automatically based on the width and length.



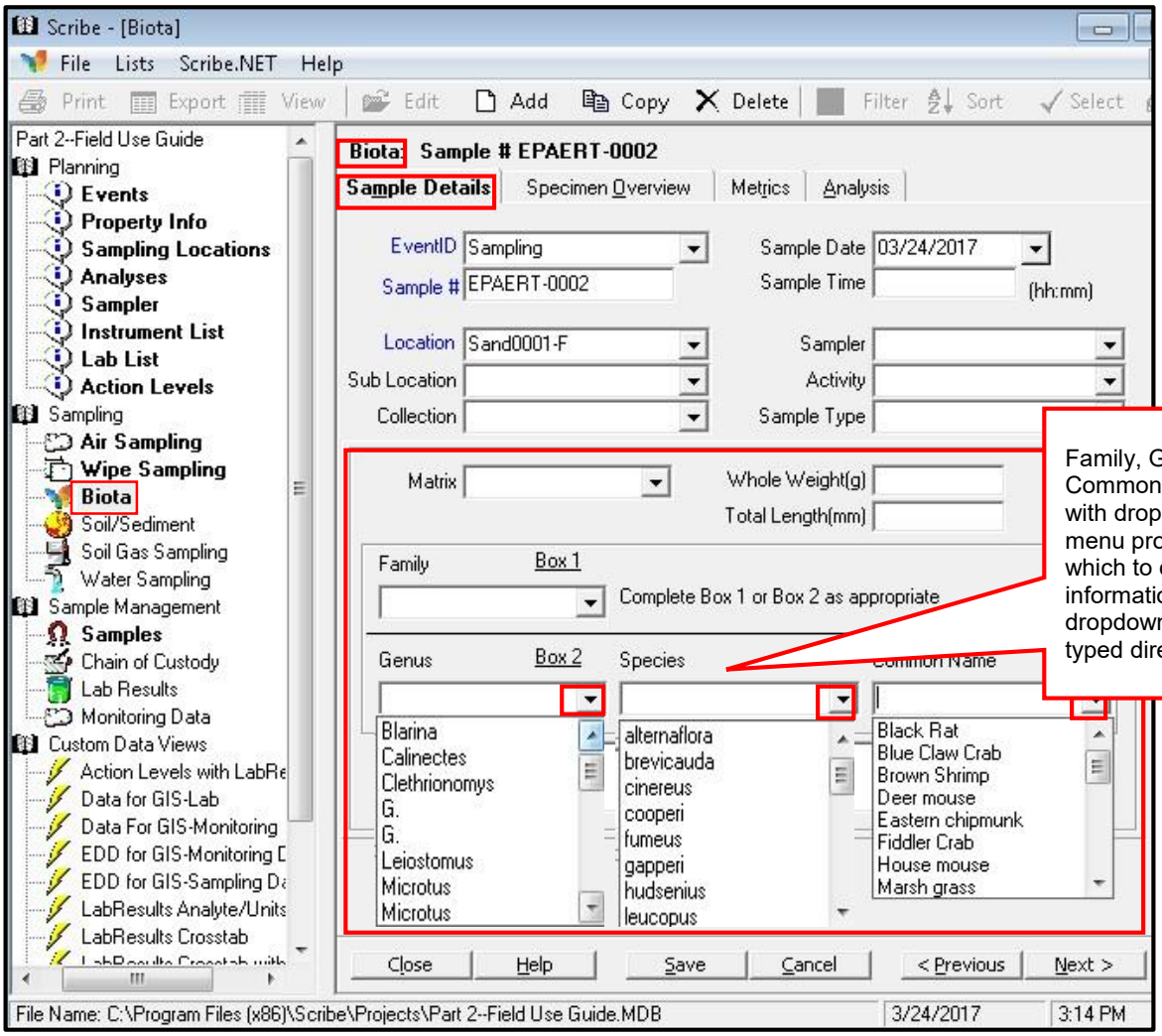


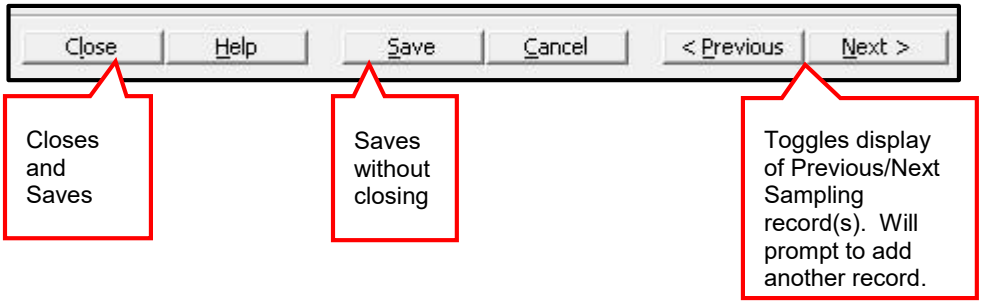
The **Pump Info** tab captures pre and post (Start/Stop) flow data from dust/microvac sampling using an SKC pump.



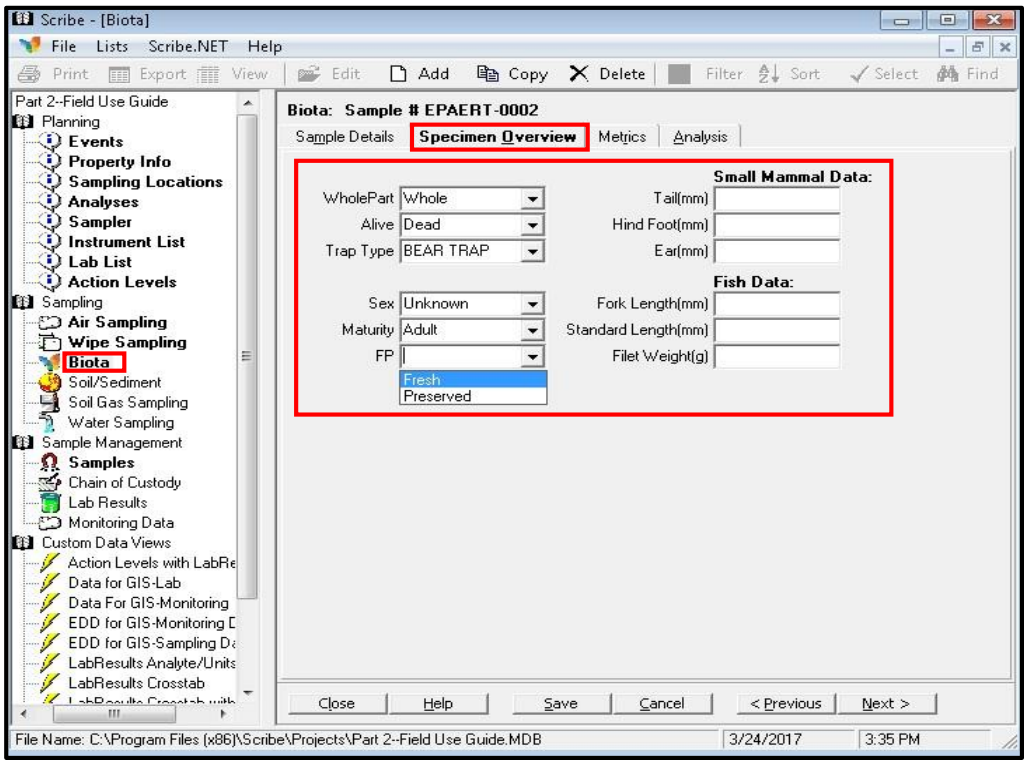
Biota Sampling

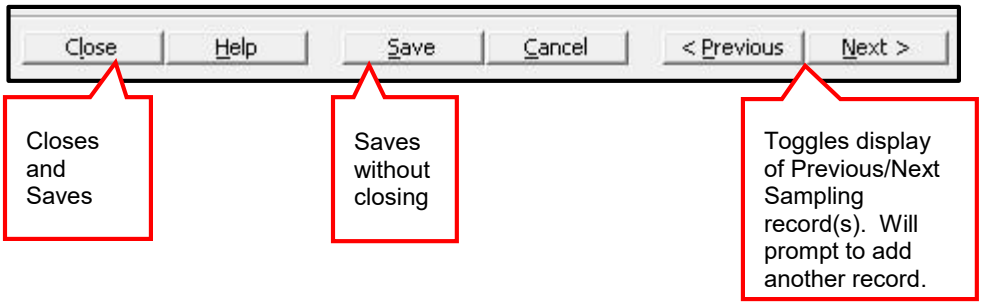
Sample detail fields specific to Biota Sampling include, the Genus, Species and Common Names, etc.



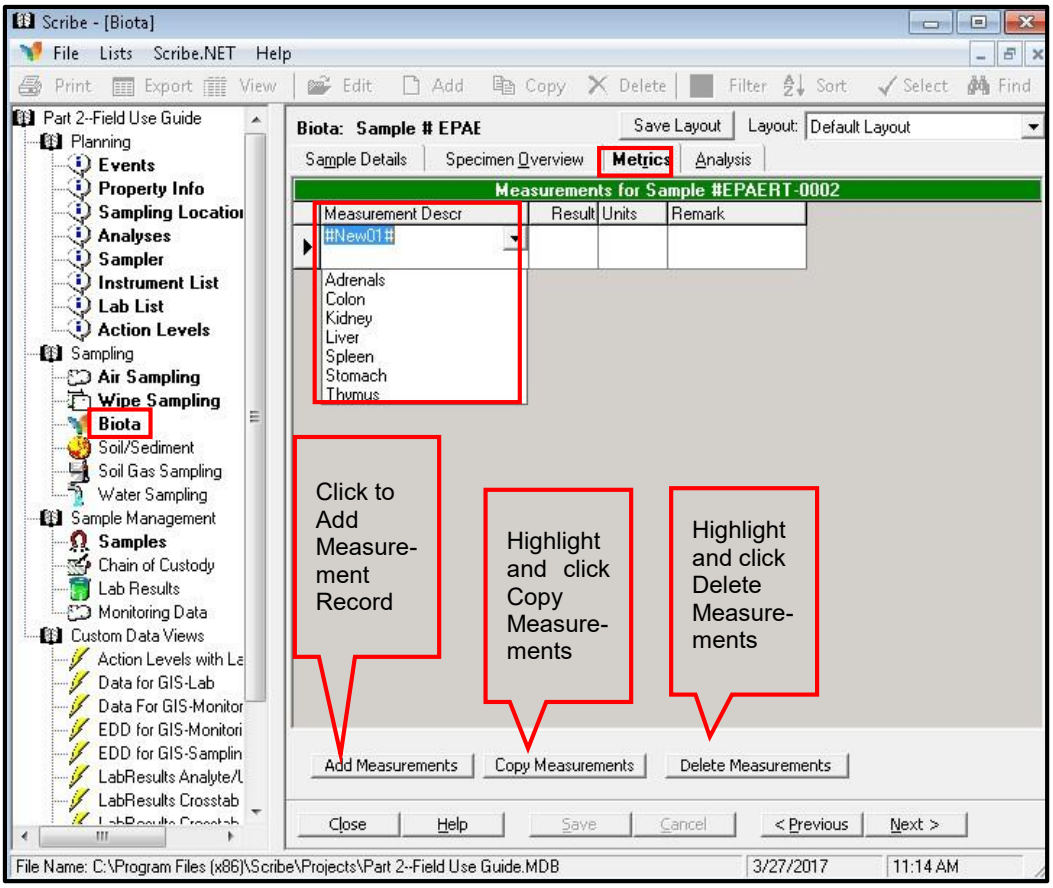


Additional Biota-specific information can be found on the **Specimen Overview** tab. Dropdown menus provide selections for Specimen Overview information. Select from the dropdown menu(s) or enter new data as appropriate.



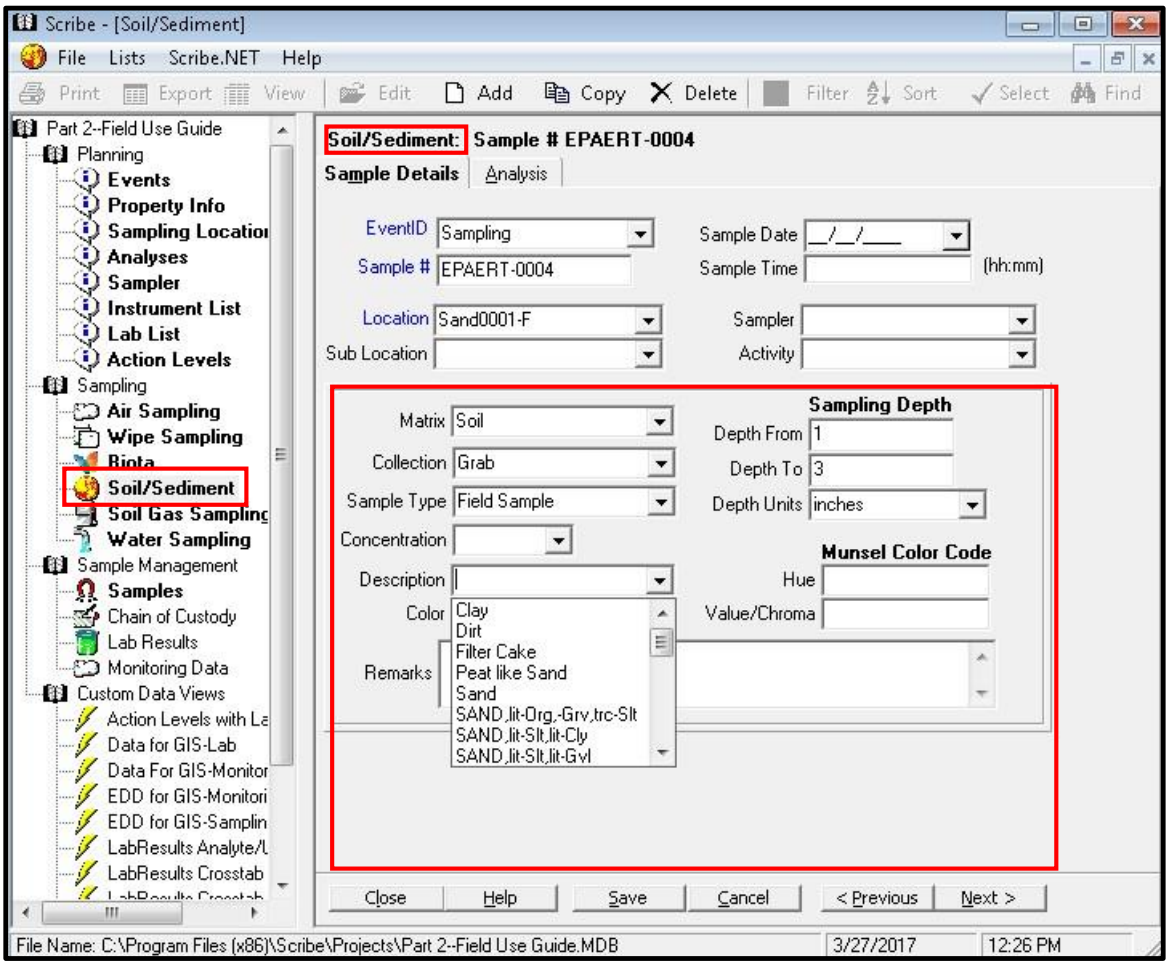


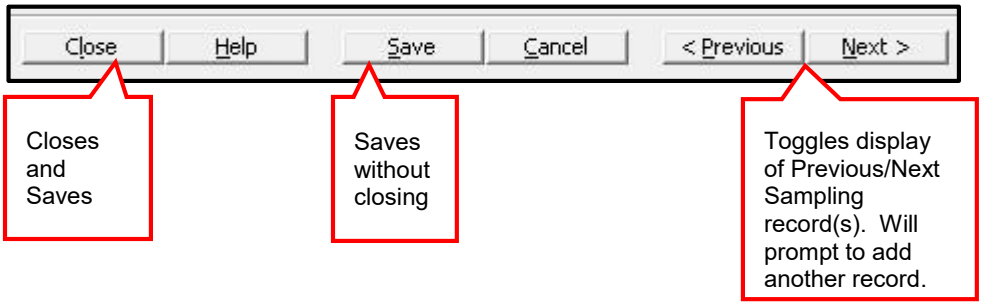
Clicking on the **Metrics** tab opens the Measurements for Sample screen. Dropdown menus provide selections for measurement information. Select from the dropdown menus or enter new data as appropriate.



Soil/Sediment Sampling

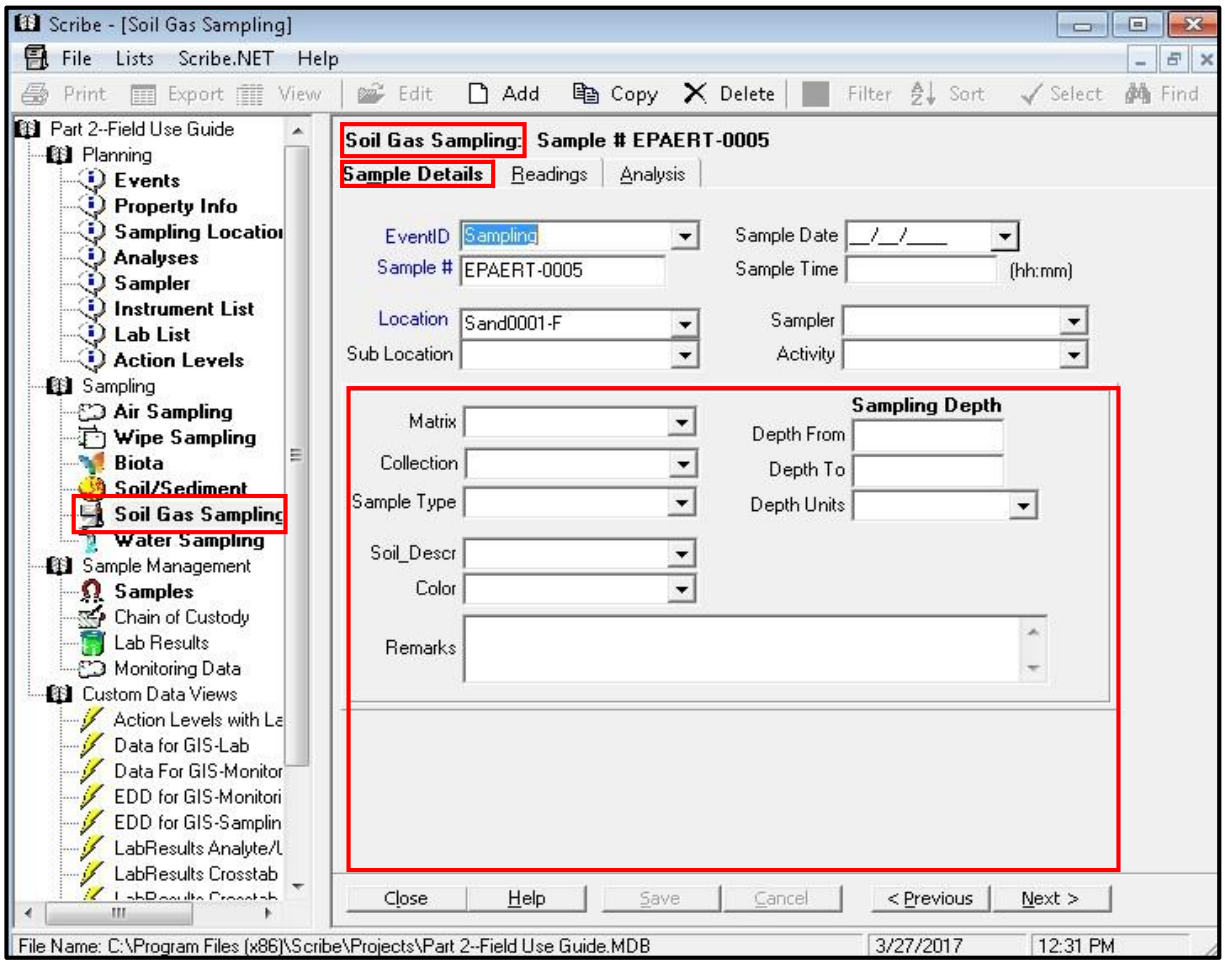
Sample detail fields specific to Soil/Sediment sampling include Depths, Color, Hue, etc. Details can be selected by clicking on the dropdown list or by entering the information directly.



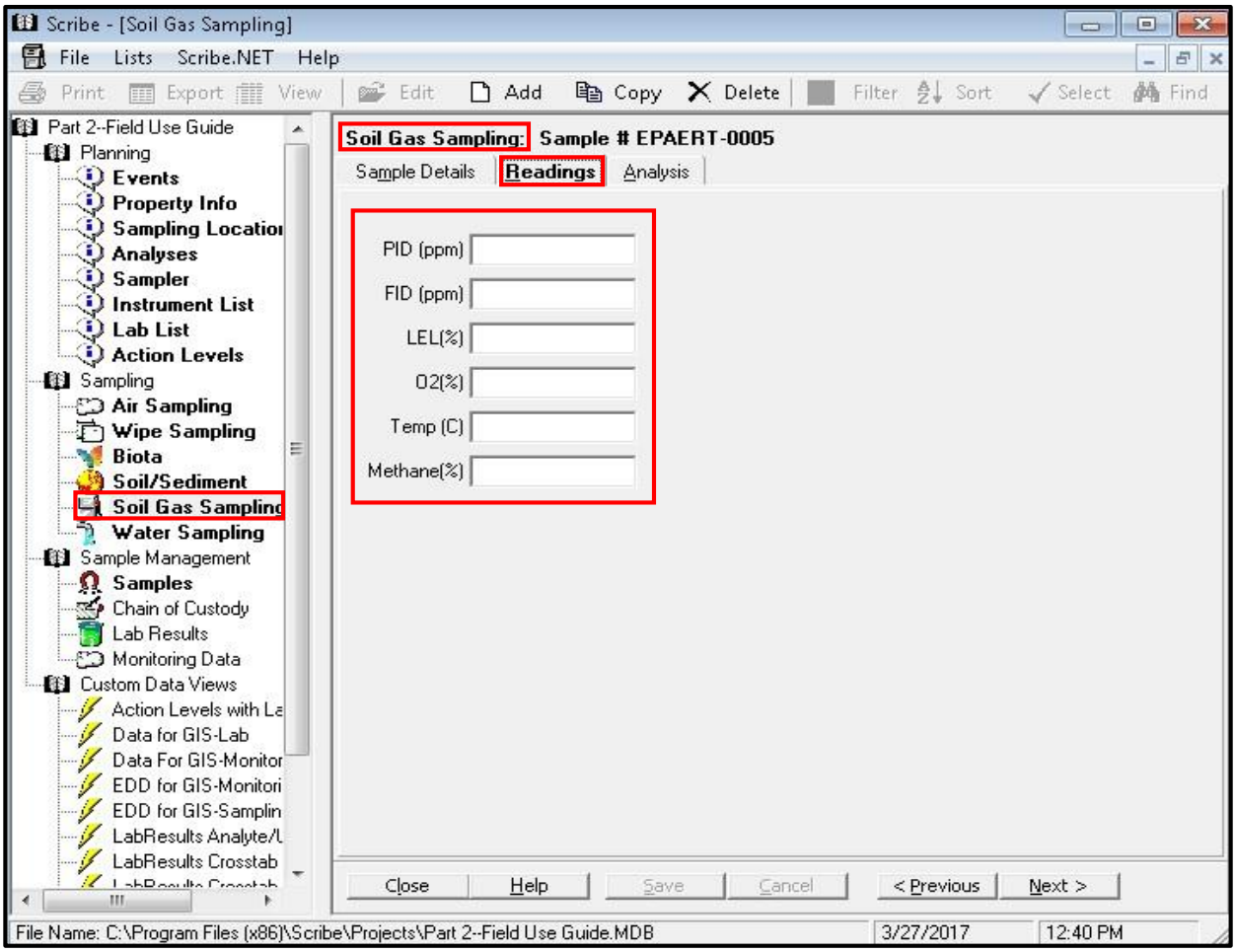


Soil Gas Sampling

The bottom half of the Sample Details screen captures the sample details (Matrix, Depths, Sample Type, Color, etc. Details can be selected by clicking on the dropdown list or by entering the information directly.

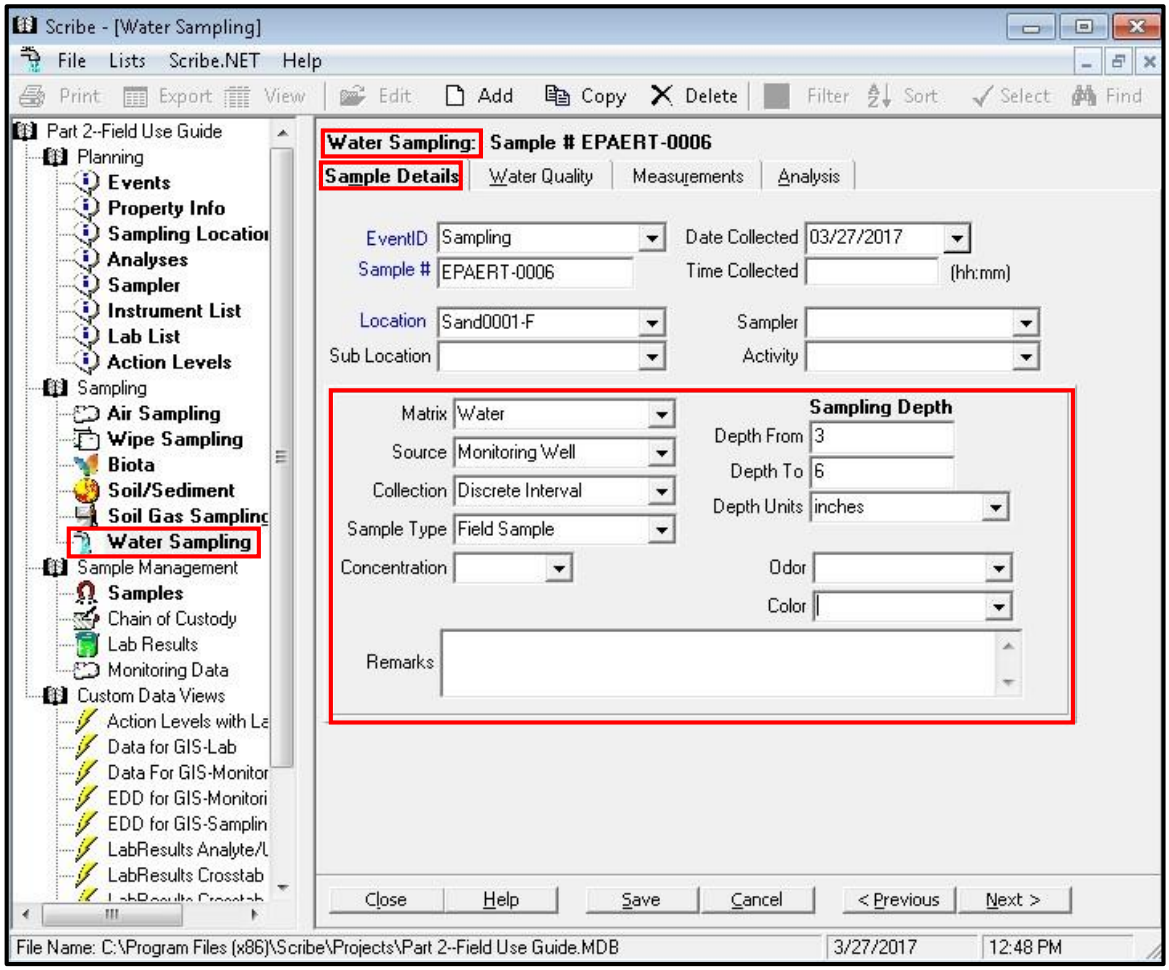


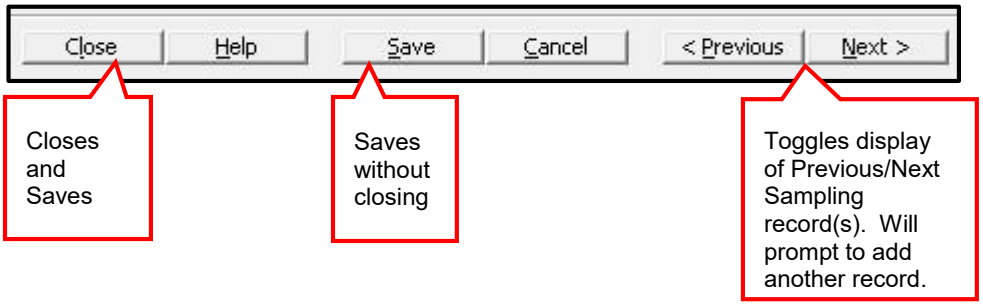
Clicking on the **Readings** tab opens the Readings screen. Enter appropriate readings in each of the fields.



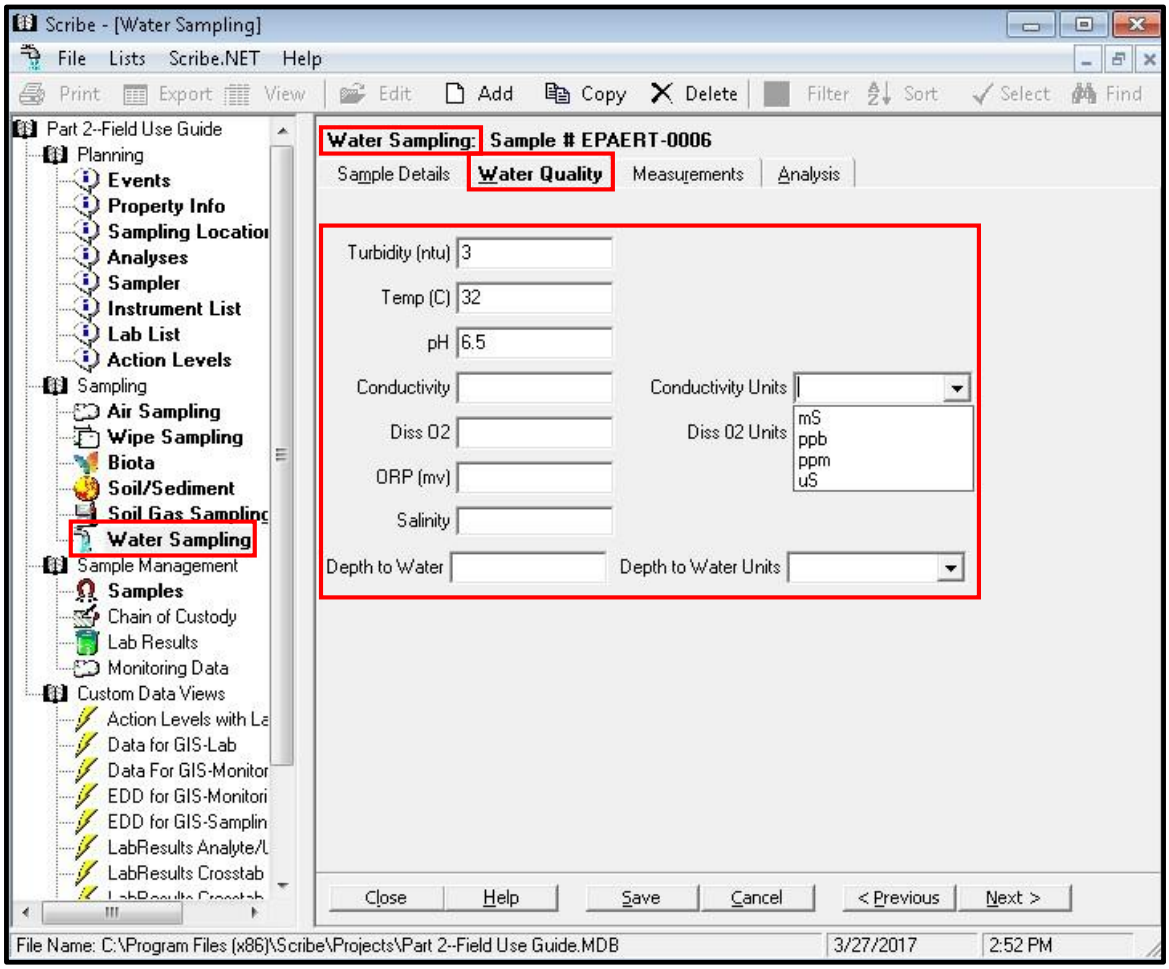
Water Sampling

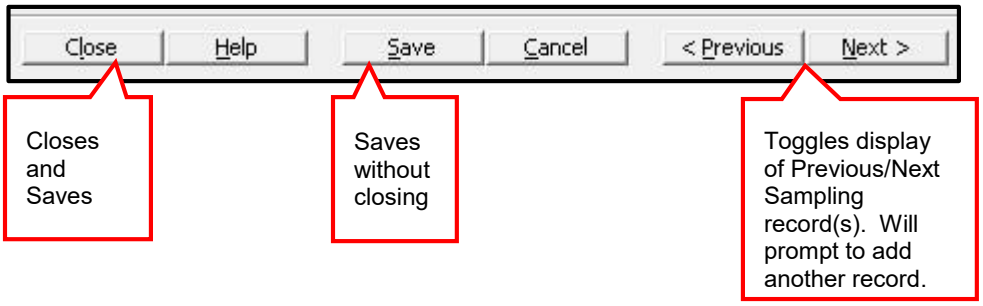
Sample detail fields specific to Water Sampling include Source, Odor, Color, etc. Details can be selected by clicking on the dropdown list or by entering the information directly.



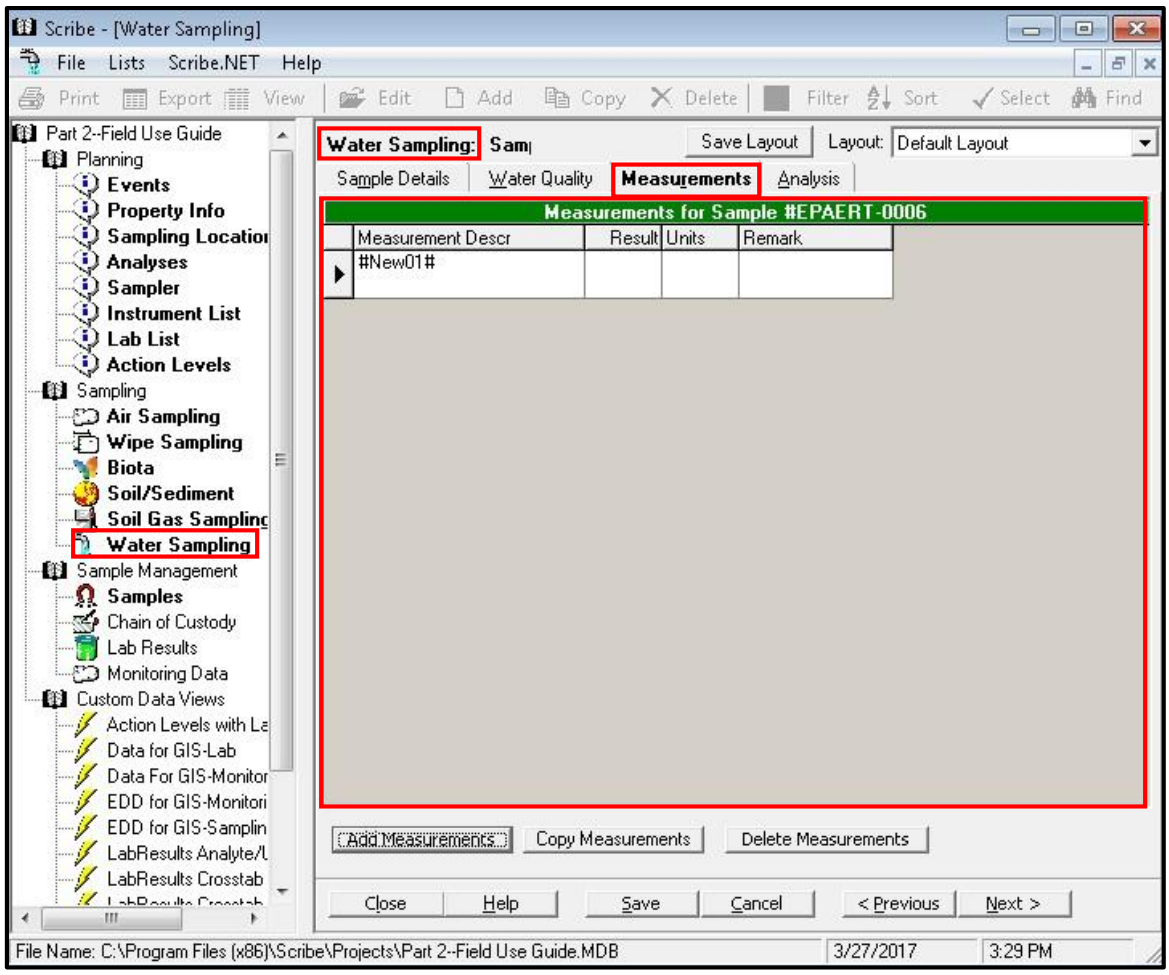


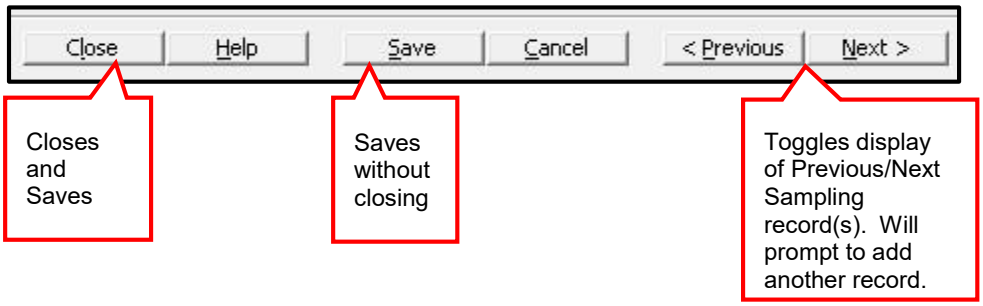
Click on the **Water Quality** tab to enter the appropriate water quality readings collected along with the sample.





Clicking on the **Measurements** tab opens the Measurements for Sample screen. Use this screen to add any additional water quality or water measurement information not specifically address in any of the other Water Sampling tabs.





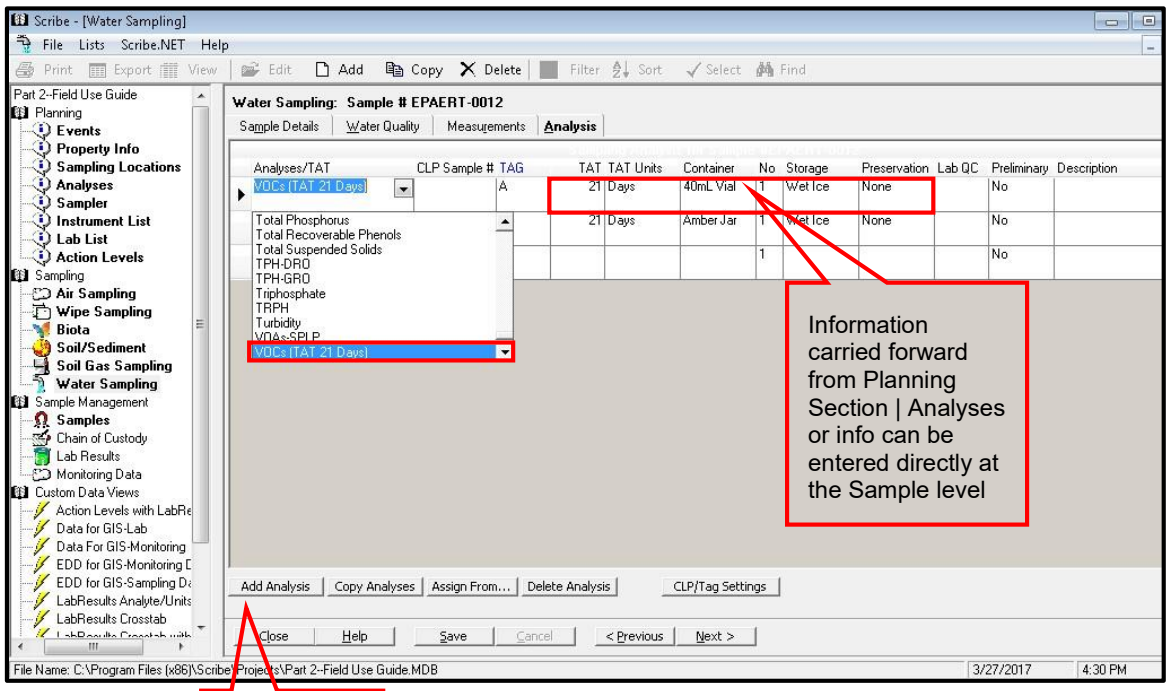
Add Analysis(es) to All Sampling Tasks

The **Analysis Tab** is the same in all of the Sampling Tasks (e.g., Air, Wipe, Soil/Sediment, etc.)

To add an Analyses, click on the Analysis tab and click in the Analyses/TAT field .

Click on the dropdown arrow for a list of Analyses in your Scribe project.

Note: *The dropdown list of Analyses can be customized under Planning | Analyses. (refer to Analyses, Page 15). Analyses can be added, edited and deleted and include TAT, TAT Units, Container(s), Preservation. Analyses Type and Program Type are extremely important when adding CLP samples. Refer to the CLP Guide for additional information. If TAT, Conatiner, Preservative is added in the Planning Section, Analyses table, the information will automatically carry forward to your Sample/Analyses.* The information can also be entered directly in the field(s) in the Analysis section.



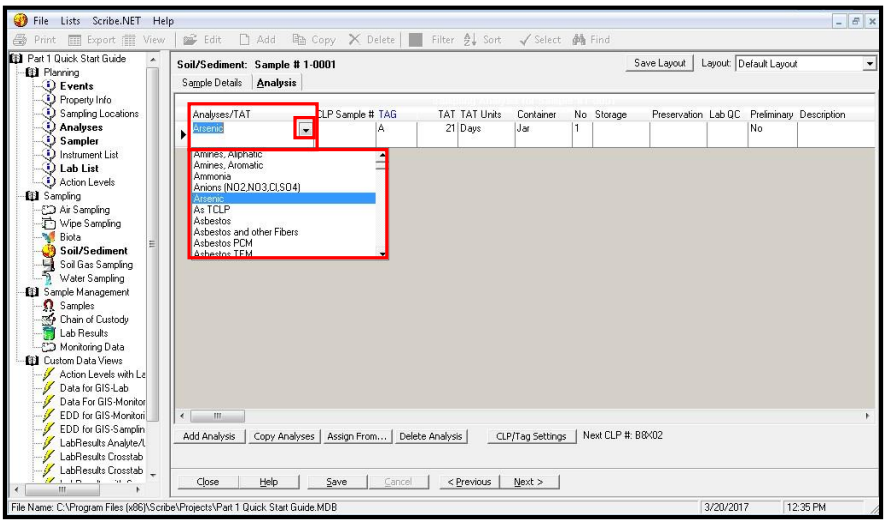
Click on Add Analysis to create a new analysis record

Closes and Saves

Saves without closing

Toggles display of Previous/Next Sampling record(s). Will prompt to add another record.

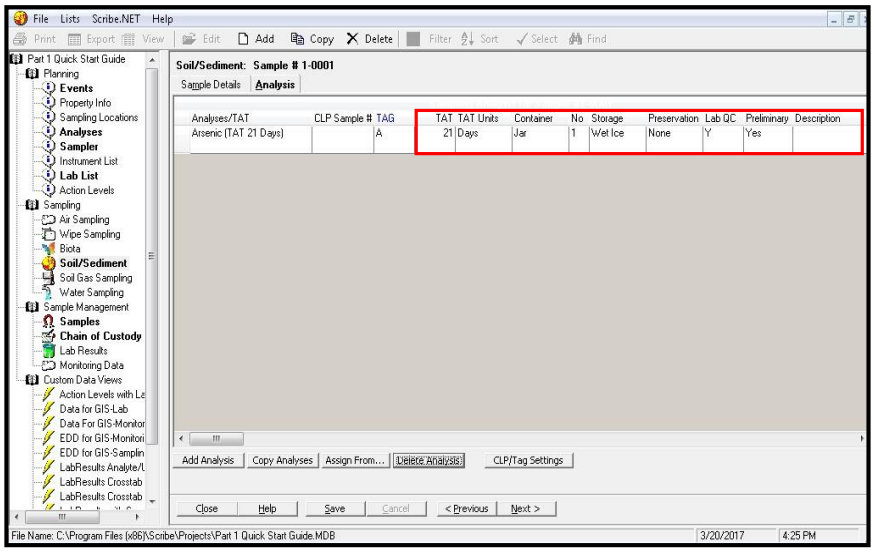
1. Click in the Analyses/TAT field. A drop down arrow will appear.
2. Click on the drop down arrow to display the list of analyses.
3. Select the analysis(es).



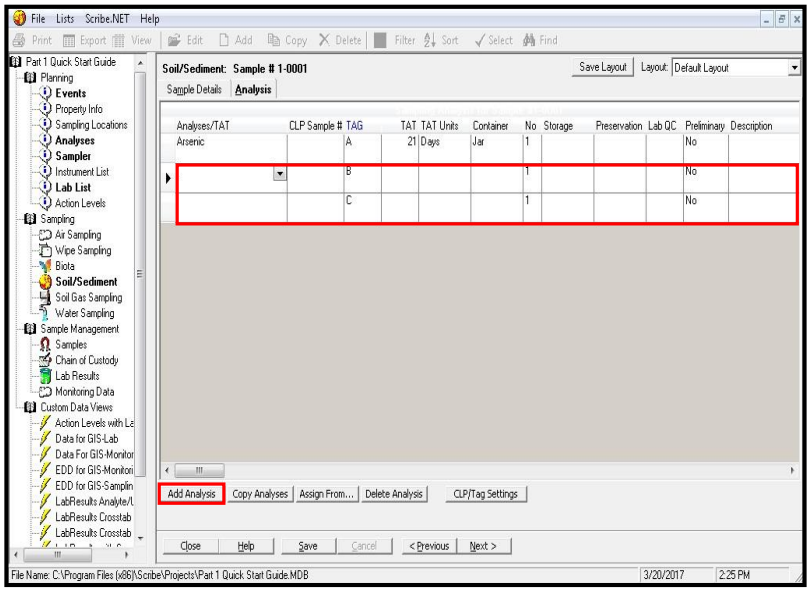
Note: The 'TAG' field will automatically increment with an Alpha character (i.e., A, B, C, etc.).

4. Enter TAT, TAT Units, Container (type), No. of Containers, Storage, Preservation, Lab QC (MS/MSD), Preliminary (Results), and additional description (if necessary).

Note: *CLP Sample # will not be populated unless the CLP/Tag Settings have been set up and the analysis is part of the CLP Program. Please refer to the* ***Scribe CLP User Guide*** *for Adding CLP Analyses.*

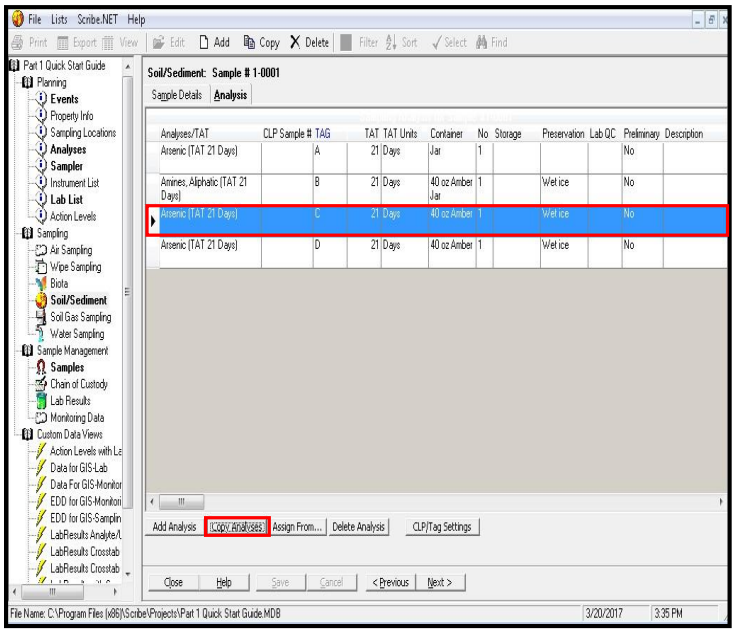


5. To add additional analyses, click on 'Add Analysis'.
6. Follow Steps 1 and 2 above.
7. Click Close to close the screen.



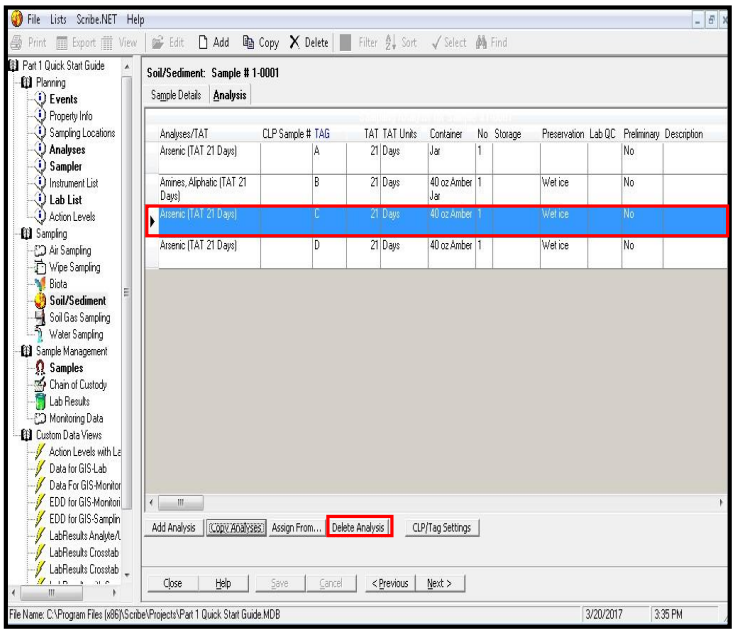
Copy an Analysis(es)

1. Highlight an analysis.
2. Click 'Copy Analyses'.
3. Click Close to close the screen.



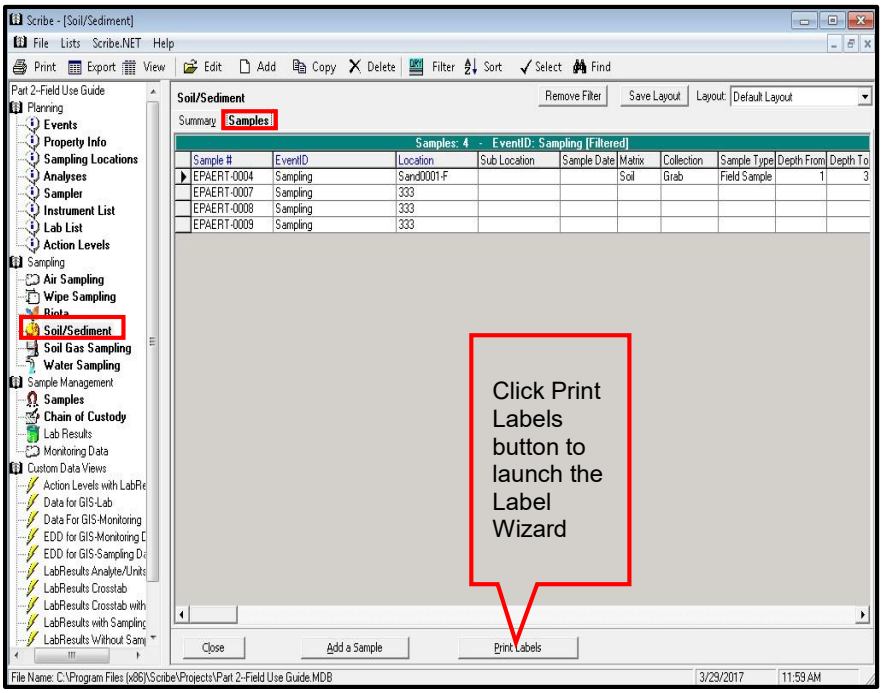
Delete an Analysis

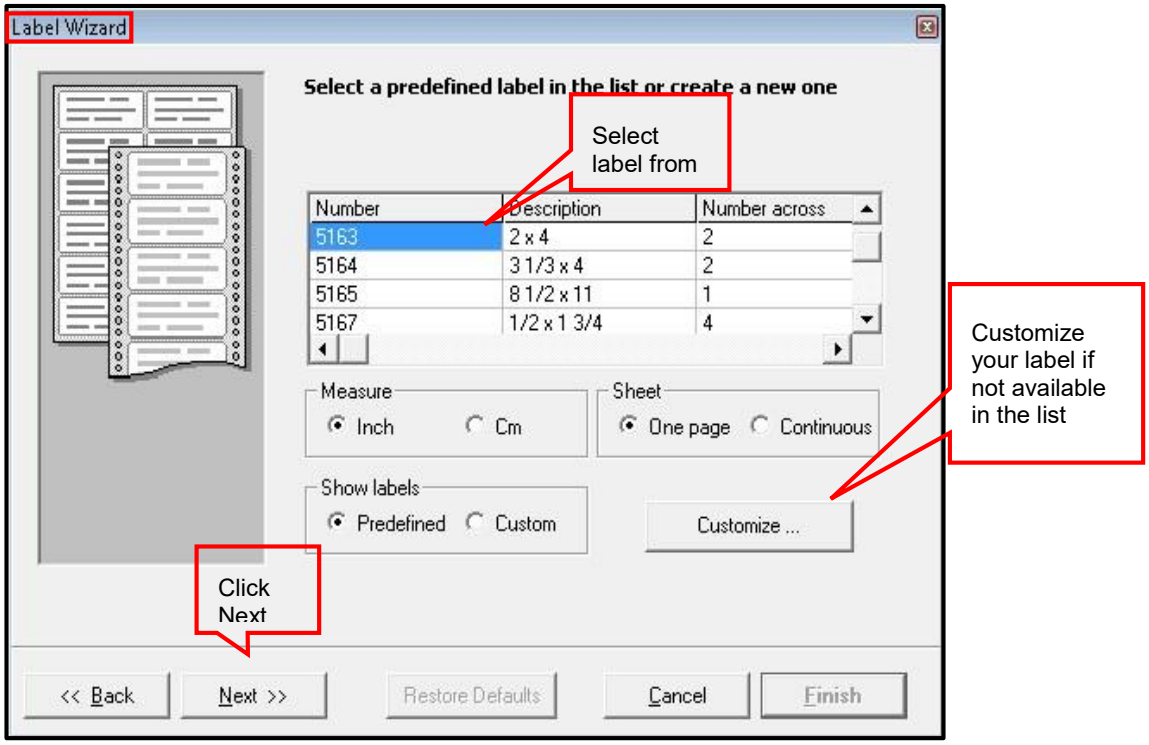
1. Highlight an Analysis.
2. Click 'Delete Analyses'.
3. Click Close to close the screen.

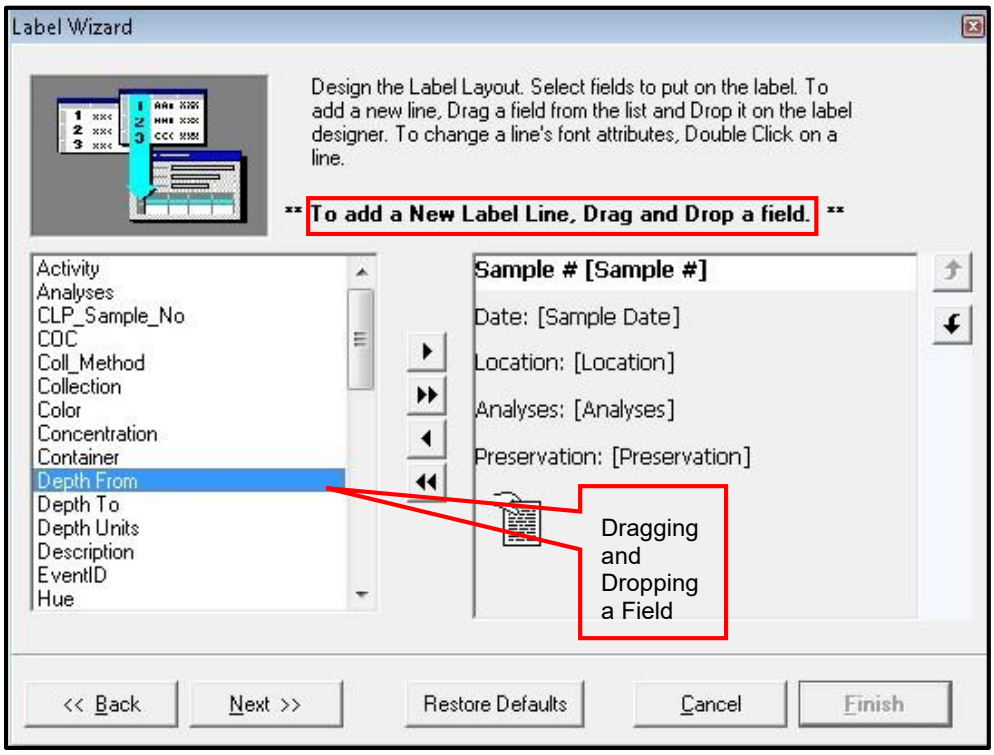


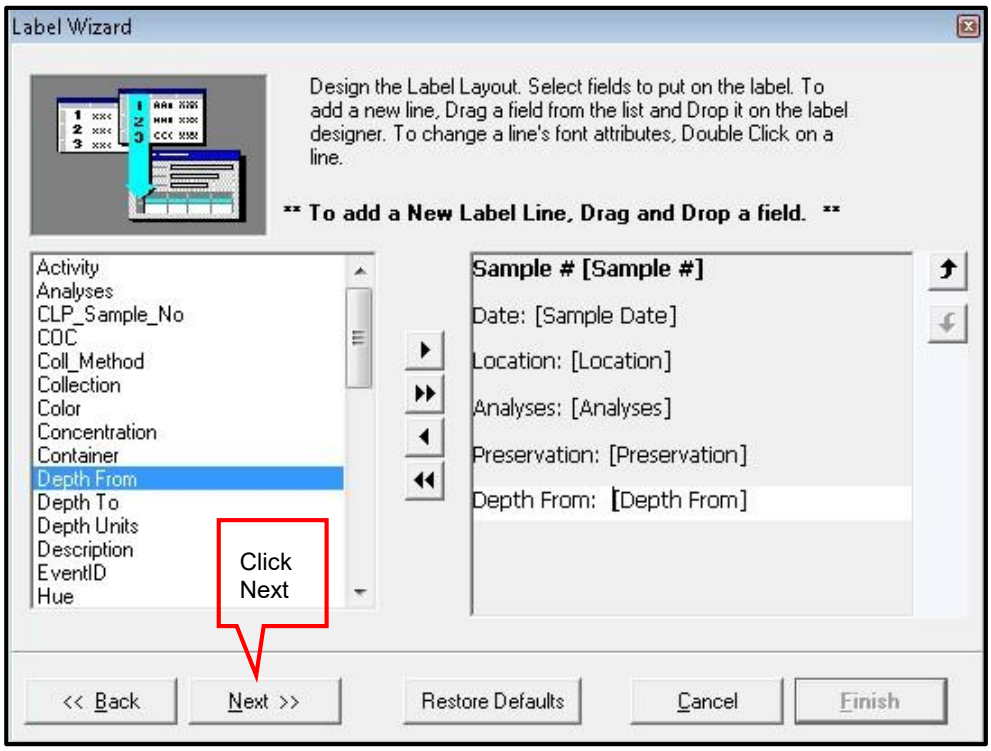
Print Labels (from Sampling)

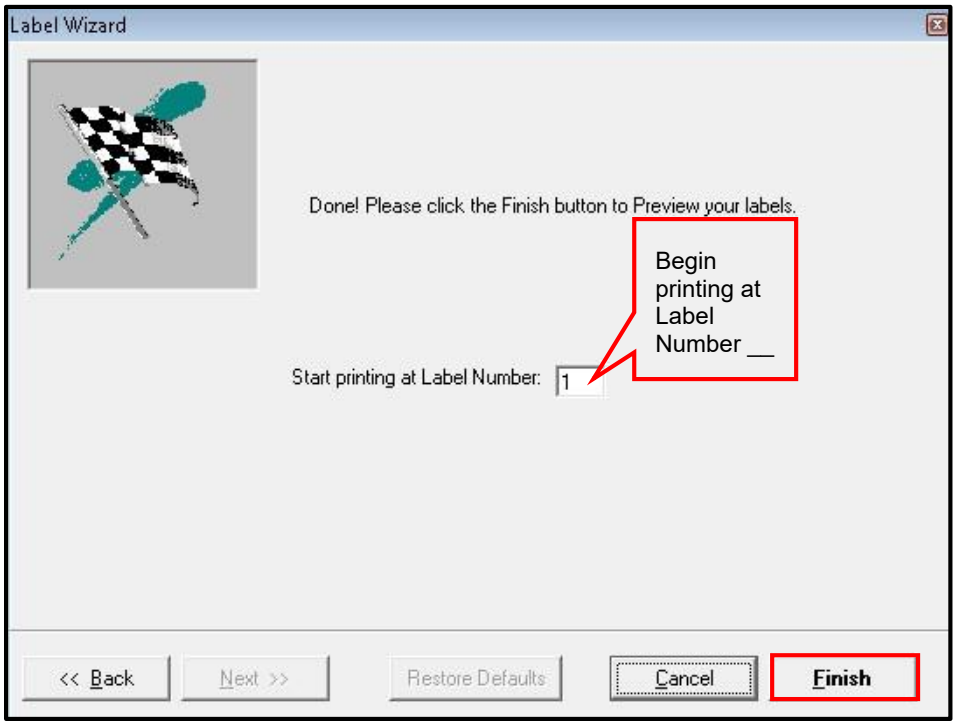
To Print Labels from the individual Sampling Task, return to the Samples Tab. By default, all samples shown on the screen will be printed. For printing specific samples, the Filter Button should be used.

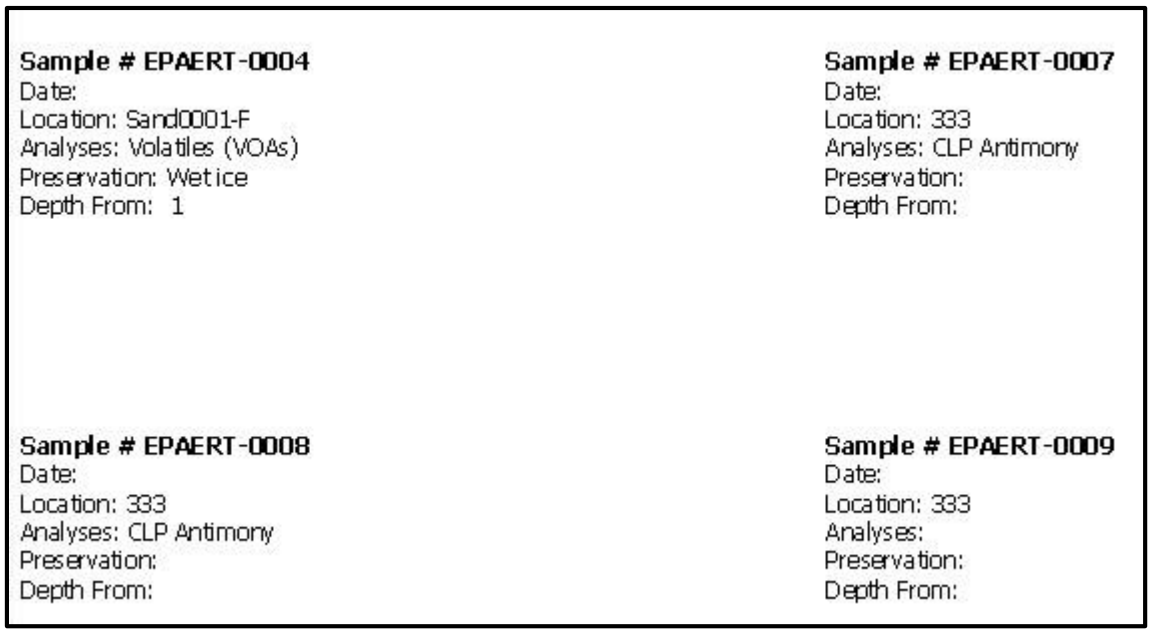



Label Wizard
Select a predefined label in the list or create a new one
Select label from
Number
Description
Number across
5163
2 x 4
2
5164
3 1/3 x 4
2
5165
8 1/2 x 11
1
5167
1/2 x 1 3/4
4
Measure
Inch
Cm
Sheet
One page
Continuous
Show labels
Predefined
Custom
Customize ...
Customize your label if not available in the list
Click Next
<< Back
Next >>
Restore Defaults
Cancel
Finish


Label Wizard
Design the Label Layout. Select fields to put on the label. To add a new line, Drag a field from the list and Drop it on the label designer. To change a line's font attributes, Double Click on a line.
** To add a New Label Line, Drag and Drop a field. **
Activity
Analyses
CLP_Sample_No
COC
Coll_Method
Collection
Color
Concentration
Container
Depth From
Depth To
Depth Units
Description
EventID
Hue
Sample # [Sample #]
Date: [Sample Date]
Location: [Location]
Analyses: [Analyses]
Preservation: [Preservation]
Dragging and Dropping a Field
<< Back
Next >>
Restore Defaults
Cancel
Finish


Label Wizard
Design the Label Layout. Select fields to put on the label. To add a new line, Drag a field from the list and Drop it on the label designer. To change a line's font attributes, Double Click on a line.
** To add a New Label Line, Drag and Drop a field. **
Activity
Analyses
CLP_Sample_No
COC
Coll_Method
Collection
Color
Concentration
Container
Depth From
Depth To
Depth Units
Description
EventID
Hue
Sample # [Sample #]
Date: [Sample Date]
Location: [Location]
Analyses: [Analyses]
Preservation: [Preservation]
Depth From: [Depth From]
Click Next
<< Back
Next >>
Restore Defaults
Cancel
Finish



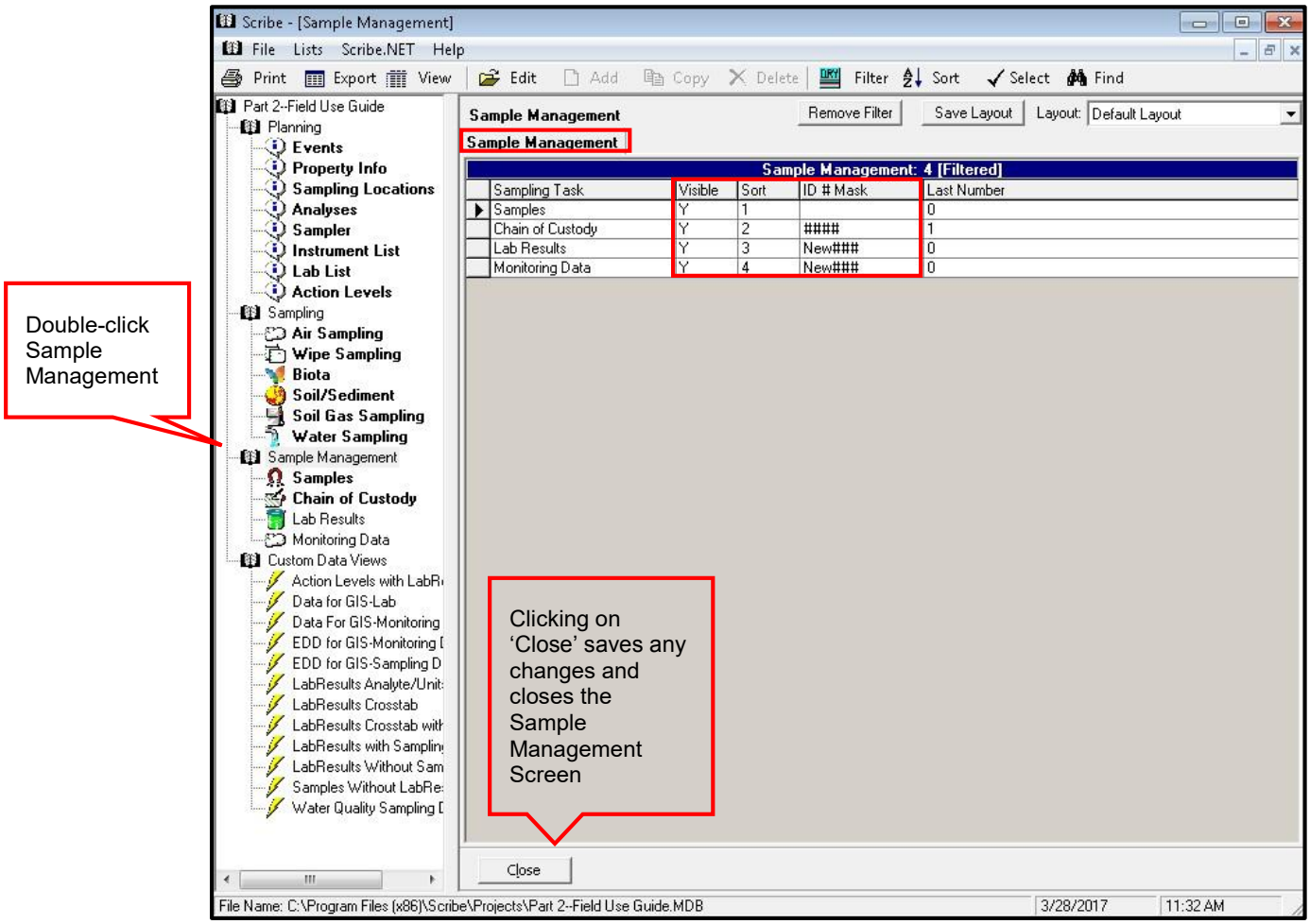


Print Preview

In addition, labels can be printed under the Sample Management | Samples section.

Sample Management

The **Sample Management** section consists of four (4) sections: **Samples, Chain of Custody**, **Lab Results** and **Monitoring Data**. By double-clicking on the word Sample Management you can set the Visibility, Sort Order, and set an ID Mask.



The first column on the **Sample Management** screen lists the type of Sampling Tasks available. By default, the Tasks are visible in the Navigation Pane. By changing **Visible** to an 'N', the Task will no longer be visible and not available for selection in the Navigation Pane. For example, if your project will only include Samples, Chain of Custody and Lab Results, change the 'Y' to an 'N' in Monitoring Data and that Task will no longer be visible in the Navigation Pane.

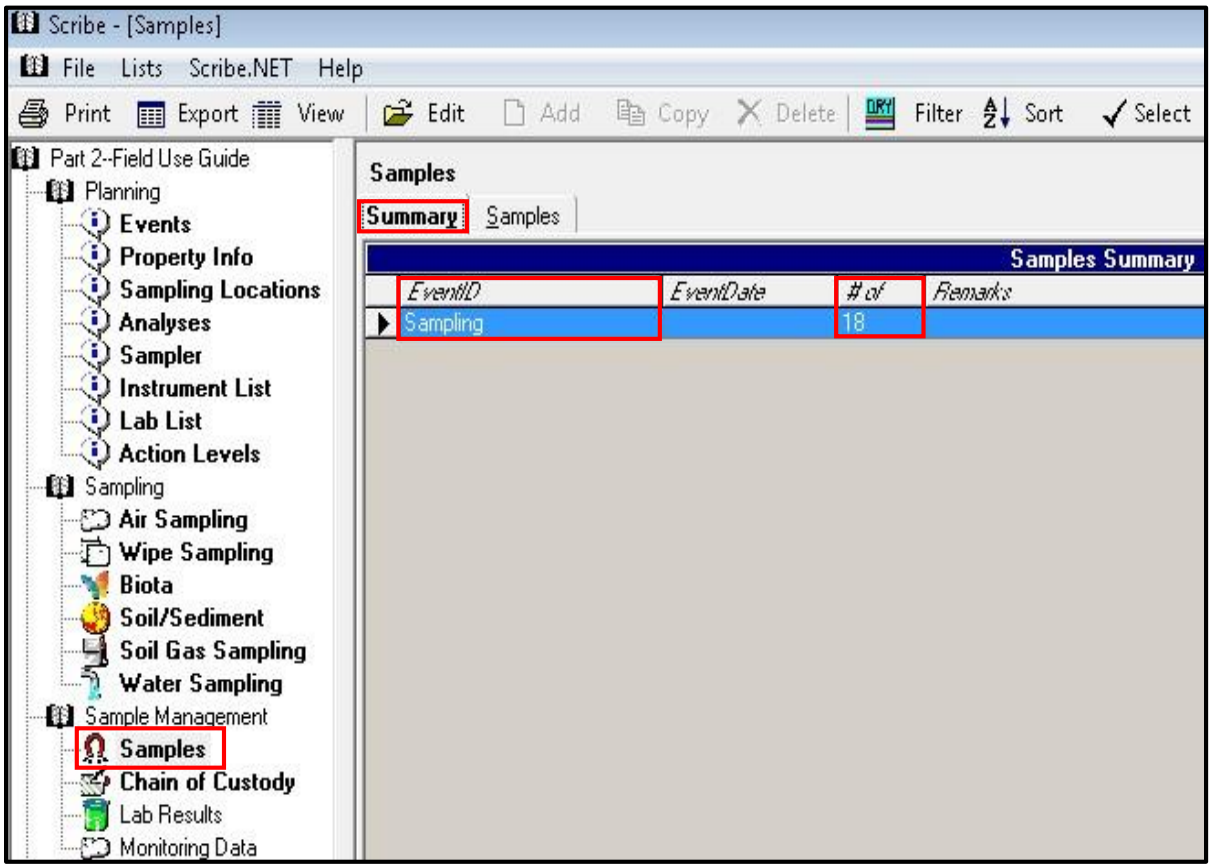
Sort allows you to sort your Tasks in another order. For example, alphabetical, etc.

Chain of Custody ID # Mask is useful when a specific Chain of Custody number (Mask) scheme is outline in a site specific Data Management Plan, as well when multiple crews are sampling and distinct Chain of Custodies per crew need to be configured.

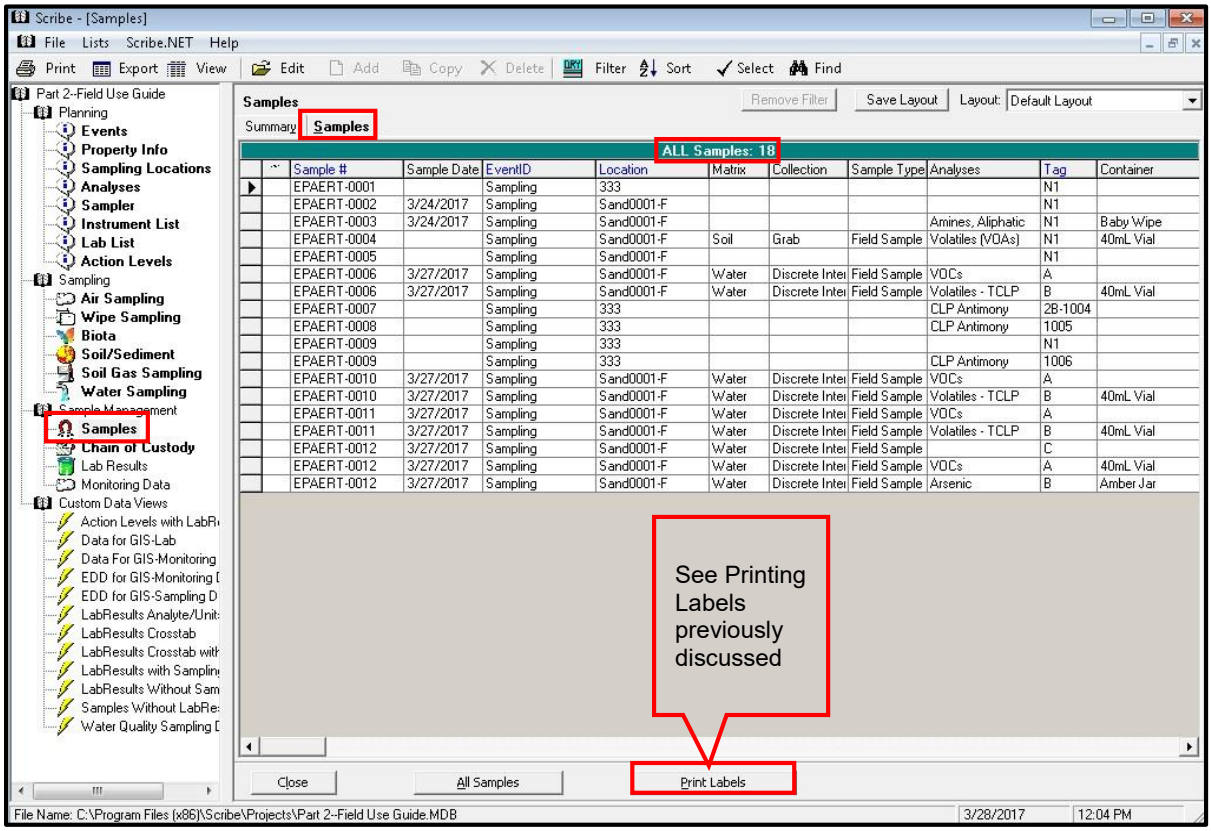
The **Last Number** field will show the last Chain of Custody number used (i.e., the last COC # was 0001 (the next ne would be 0002).

Samples

Clicking on '**Samples**' in the Navigation pane displays a **Summary** tab and a **Samples** tab. The Summary tab summarizes the number of Samples per EventID in the Scribe project.



Clicking on the **'Samples'** tab will display ALL the samples – more specifically – all the analyses assigned to samples in the Scribe project. This differs from the Sampling section because you can see each analysis for each Sample Type. When working in the Sampling Section, Samples for only one type at a time can be viewed.



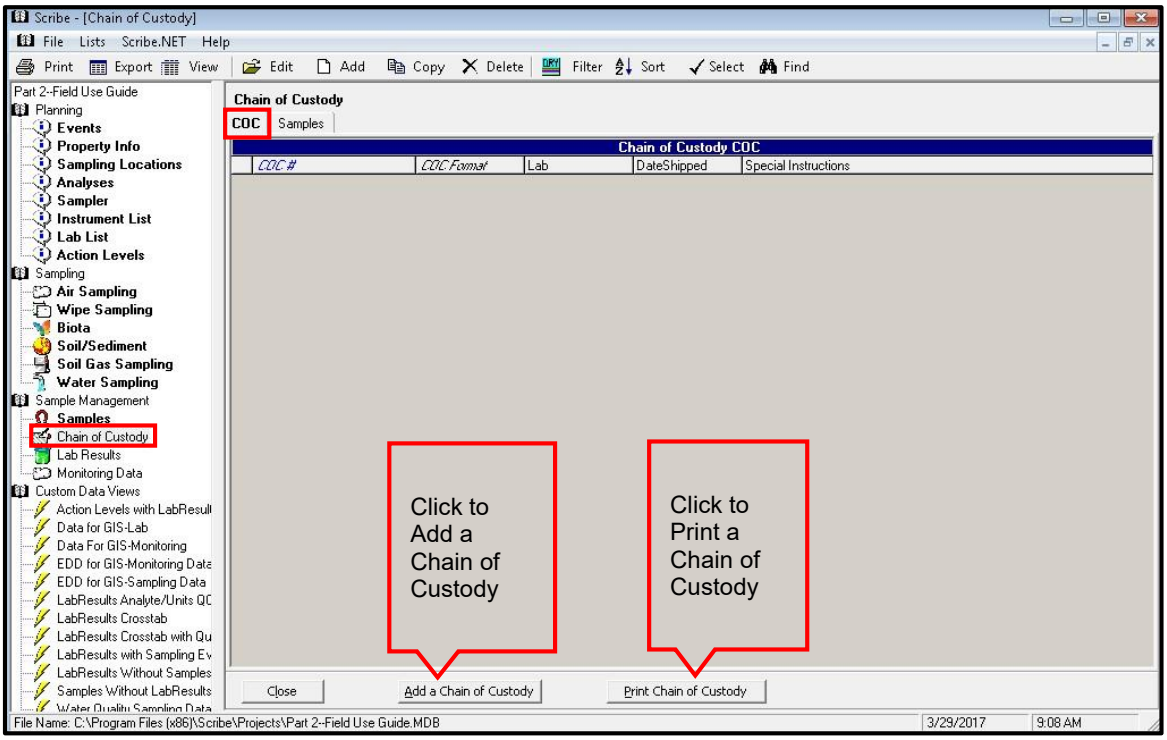
Sample #	Sample Date	EventID	Location	Matrix	Collection	Sample Type	Analyses	Tag	Container
EPAERT-0001		Sampling	333					N1	
EPAERT-0002	3/24/2017	Sampling	Sand0001-F					N1	
EPAERT-0003	3/24/2017	Sampling	Sand0001-F				Amines, Aliphatic	N1	Baby Wipe
EPAERT-0004		Sampling	Sand0001-F	Soil	Grab	Field Sample	Volatiles (VOAs)	N1	40mL Vial
EPAERT-0005		Sampling	Sand0001-F					N1	
EPAERT-0006	3/27/2017	Sampling	Sand0001-F	Water	Discrete Inter	Field Sample	VOCs	A	
EPAERT-0006	3/27/2017	Sampling	Sand0001-F	Water	Discrete Inter	Field Sample	Volatiles - TCLP	B	40mL Vial
EPAERT-0007		Sampling	333				CLP Antimony	2B-1004	
EPAERT-0008		Sampling	333				CLP Antimony	1005	
EPAERT-0009		Sampling	333					N1	
EPAERT-0009		Sampling	333				CLP Antimony	1006	
EPAERT-0010	3/27/2017	Sampling	Sand0001-F	Water	Discrete Inter	Field Sample	VOCs	A	
EPAERT-0010	3/27/2017	Sampling	Sand0001-F	Water	Discrete Inter	Field Sample	Volatiles - TCLP	B	40mL Vial
EPAERT-0011	3/27/2017	Sampling	Sand0001-F	Water	Discrete Inter	Field Sample	VOCs	A	
EPAERT-0011	3/27/2017	Sampling	Sand0001-F	Water	Discrete Inter	Field Sample	Volatiles - TCLP	B	40mL Vial
EPAERT-0012	3/27/2017	Sampling	Sand0001-F	Water	Discrete Inter	Field Sample		C	
EPAERT-0012	3/27/2017	Sampling	Sand0001-F	Water	Discrete Inter	Field Sample	VOCs	A	40mL Vial
EPAERT-0012	3/27/2017	Sampling	Sand0001-F	Water	Discrete Inter	Field Sample	Arsenic	B	Amber Jar

Example: ALL Samples displayed

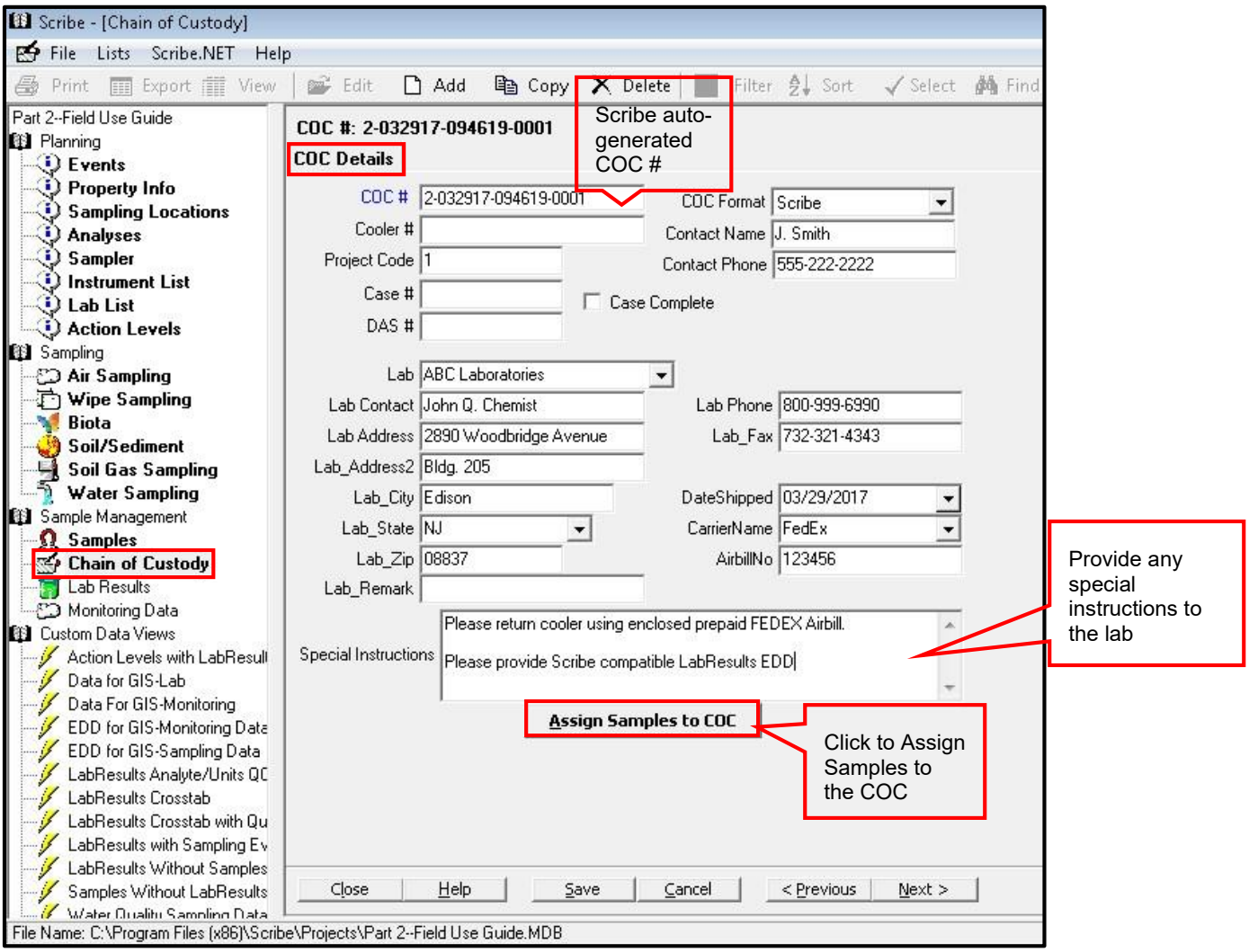
Samples can also be filtered for a specific Sample #, Location, EventID, etc.

Chain of Custody

Chain of Custody records are created under the Chain of Custody section under Sample Management. Clicking on Chain of Custody displays a COC tab and Samples tab. By clicking on Add a Chain of custody, a COC Details screen will display.

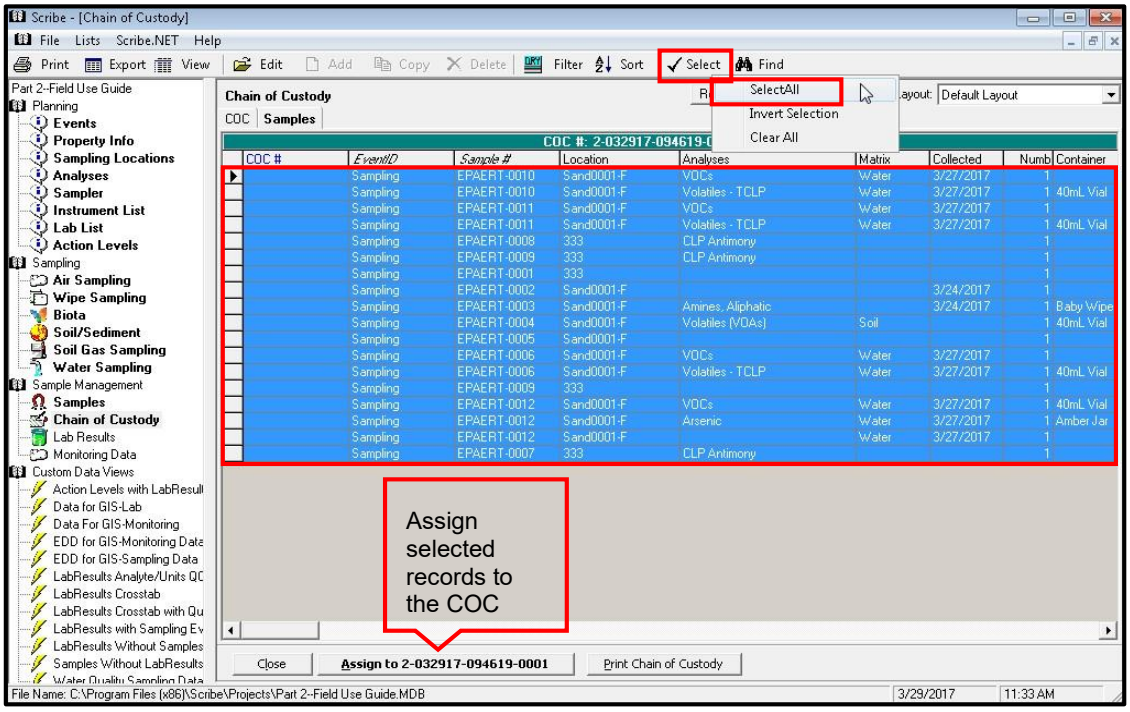


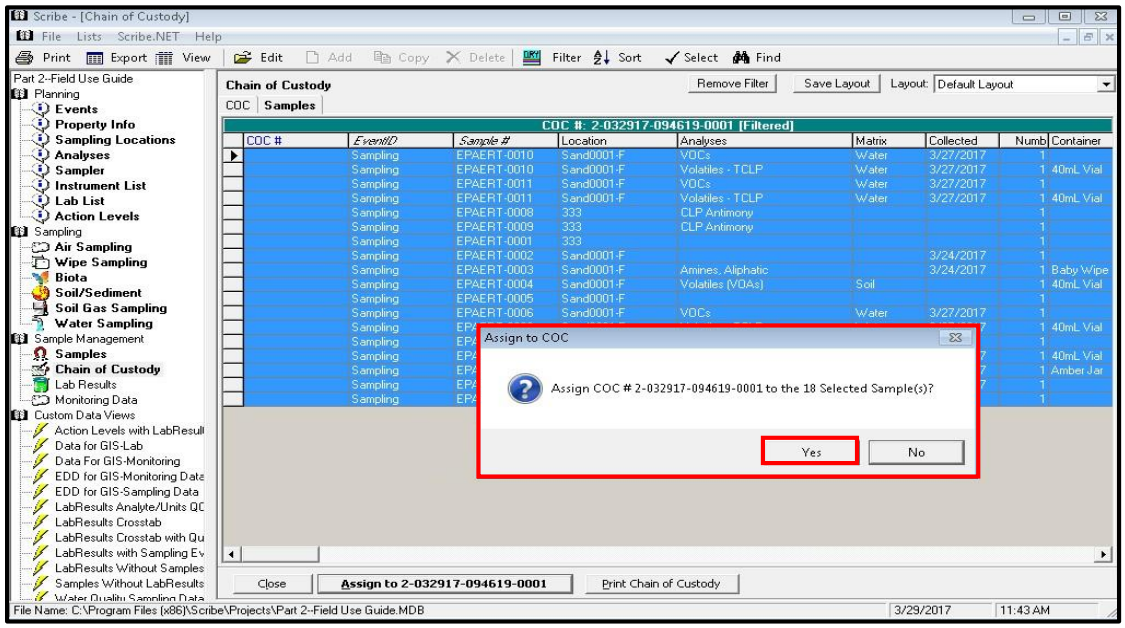
On the COC Details screen, the COC # (denoted in **blue**) is a required field. By default, Scribe will auto-generate a COC # (Region #-Date-Time-####). This number can be changed. Additional information is added to the COC by adding directly into the field, or by clicking on the dropdown arrows.

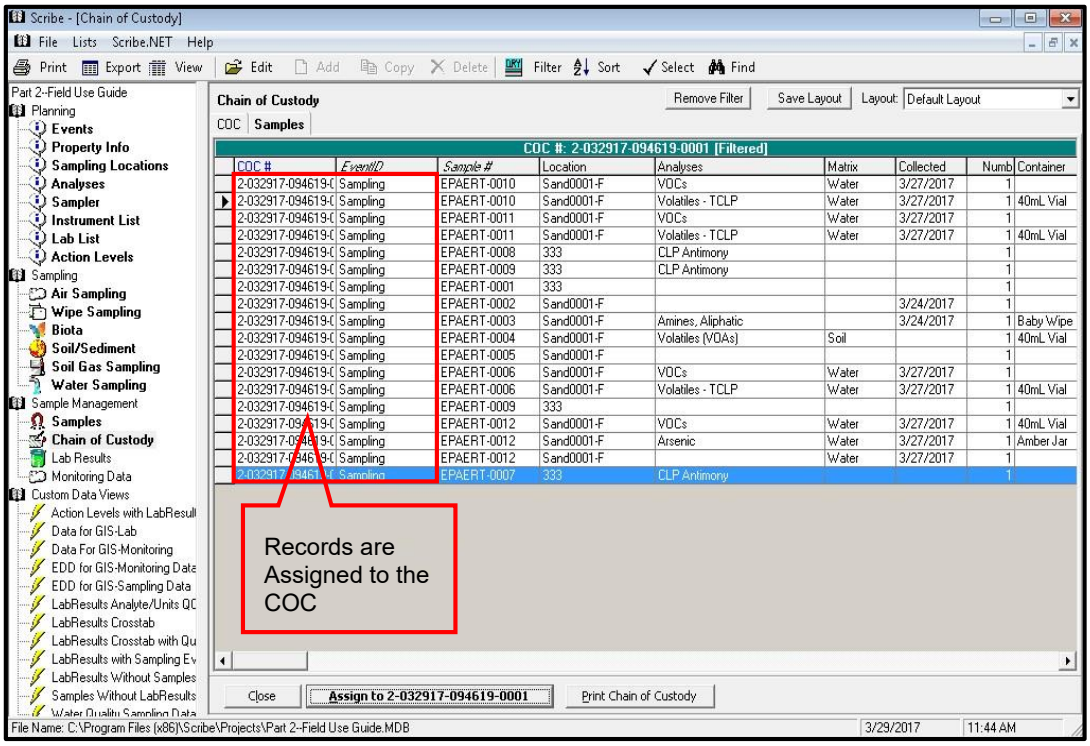


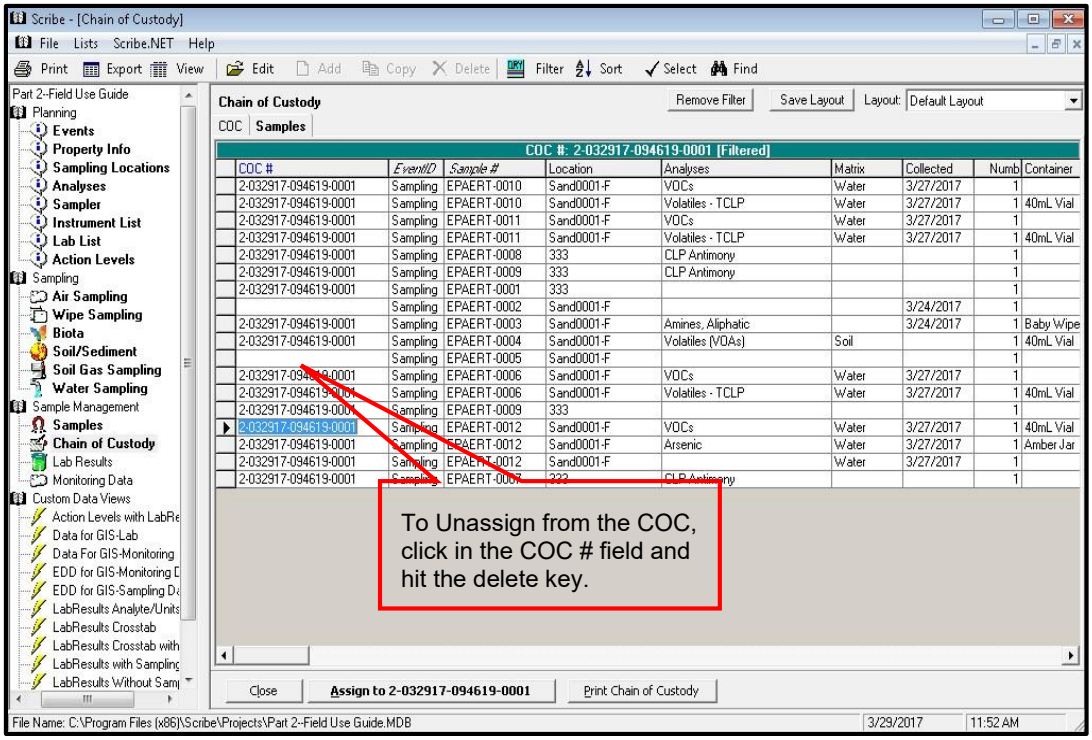
Assigning Samples to a COC

By clicking on the Select | Select All button, the Samples/analyses are highlighted. To assign all of the selected records, click **Assign to** button. To assign only certain records, use the Ctrl key to deselect records to be assigned.



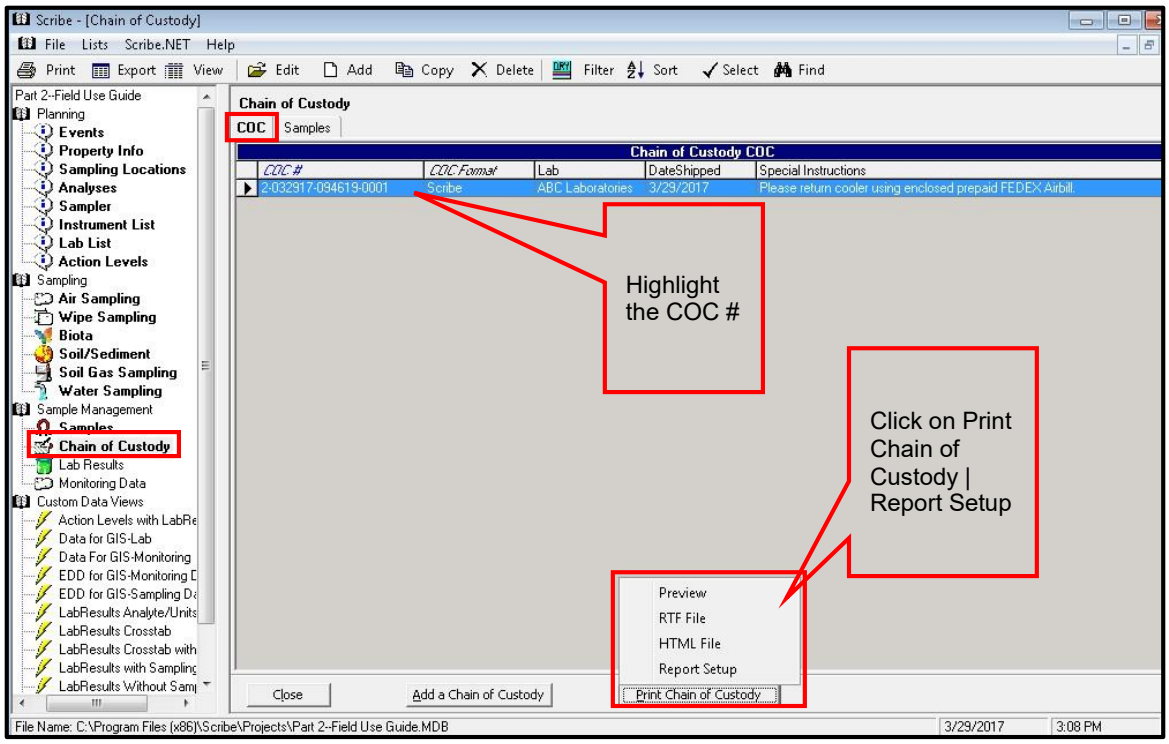



Scribe - [Chain of Custody]
File Lists Scribe.NET Help
Print Export View Edit Add Copy Delete Filter Sort Select Find
Chain of Custody
Remove Filter
Save Layout
Layout: Default Layout
COC Samples
COC #: 2-032917-094619-0001 [Filtered]
Records are Assigned to the COC
Close
Assign to 2-032917-094619-0001
Print Chain of Custody
File Name: C:\Program Files (x86)\Scribe\Projects\Part 2--Field Use Guide.MDB
3/29/2017
11:44 AM

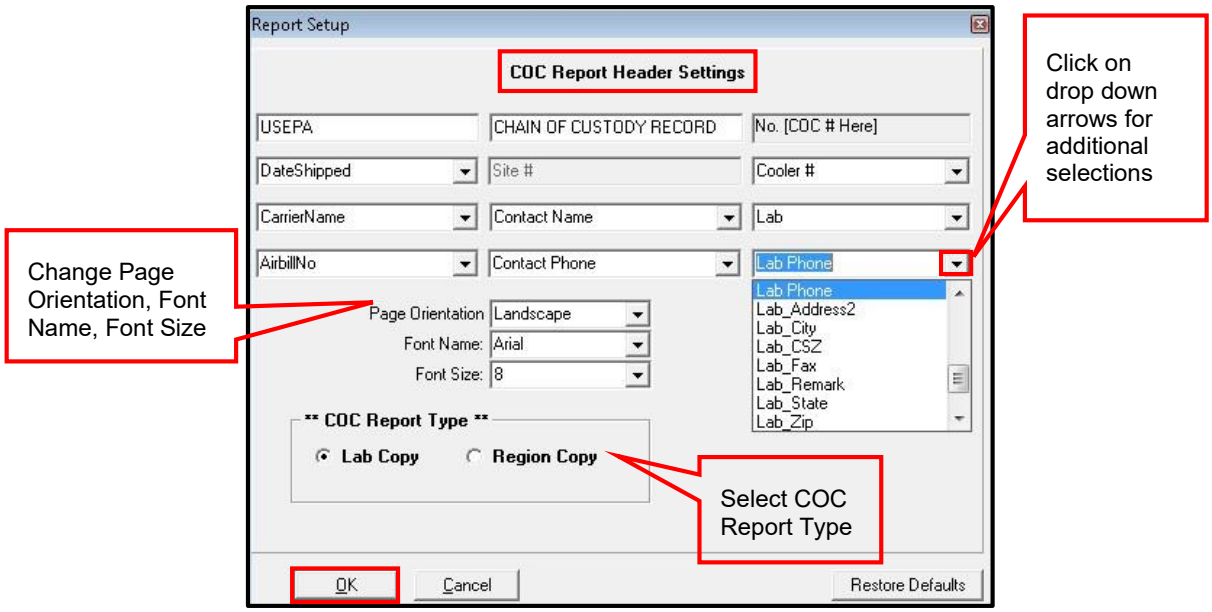

Scribe - [Chain of Custody]
File Lists Scribe.NET Help
Print Export View Edit Add Copy Delete Filter Sort Select Find
Chain of Custody
Remove Filter
Save Layout
Layout: Default Layout
COC Samples
COC #: 2-032917-094619-0001 [Filtered]
To Unassign from the COC, click in the COC # field and hit the delete key.
Close
Assign to 2-032917-094619-0001
Print Chain of Custody
File Name: C:\Program Files (x86)\Scribe\Projects\Part 2--Field Use Guide.MDB
3/29/2017
11:52 AM

Printing a Chain of Custody

To print a Chain of Custody, click on the COC tab and select Report Setup.



The **Report Header** screen allows you to customize the Chain of Custody Report Header by clicking in the field you wish to change and/or by clicking on a drop down arrow and select an item from the menu.



Page 1 of 1

USEPA
DateShipped: 3/29/2017
CarrierName: FedEx
AirbillNo: 123456

CHAIN OF CUSTODY RECORD
Site #: 1
Contact Name: J. Smith
Contact Phone: 555-222-2222

No: 2-032917-094619-0001
Cooler #:
Lab: ABC Laboratories
Lab Phone: 800-999-6990

Lab #	Sample #	Location	Analyses	Matrix	Collected	Numb Cont	Container	Preservative	Lab QC
	EPAERT-0001	333				1			
	EPAERT-0003	Sand0001-F	Amines, Aliphatic		3/24/2017	1	Baby Wipe	None	
	EPAERT-0004	Sand0001-F	Volatiles (VOAs)	Soil		1	40mL Vial	Wet ice	
	EPAERT-0006	Sand0001-F	VOCs	Water	3/27/2017	1			
	EPAERT-0006	Sand0001-F	Volatiles - TCLP	Water	3/27/2017	1	40mL Vial	Wet ice	
	EPAERT-0009	333				1			
	EPAERT-0010	Sand0001-F	VOCs	Water	3/27/2017	1			
	EPAERT-0010	Sand0001-F	Volatiles - TCLP	Water	3/27/2017	1	40mL Vial	Wet ice	
	EPAERT-0011	Sand0001-F	VOCs	Water	3/27/2017	1			
	EPAERT-0011	Sand0001-F	Volatiles - TCLP	Water	3/27/2017	1	40mL Vial	Wet ice	
	EPAERT-0012	Sand0001-F	VOCs	Water	3/27/2017	1	40mL Vial	None	
	EPAERT-0012	Sand0001-F	Arsenic	Water	3/27/2017	1	Amber Jar	None	
	EPAERT-0012	Sand0001-F		Water	3/27/2017	1			
	EPAERT-0007	333	CLP Antimony			1			
	EPAERT-0008	333	CLP Antimony			1			
	EPAERT-0009	333	CLP Antimony			1			

Special Instructions: Please return cooler using enclosed prepaid FEDEX Airbill.

Please provide Scribe compatible LabResults EDD

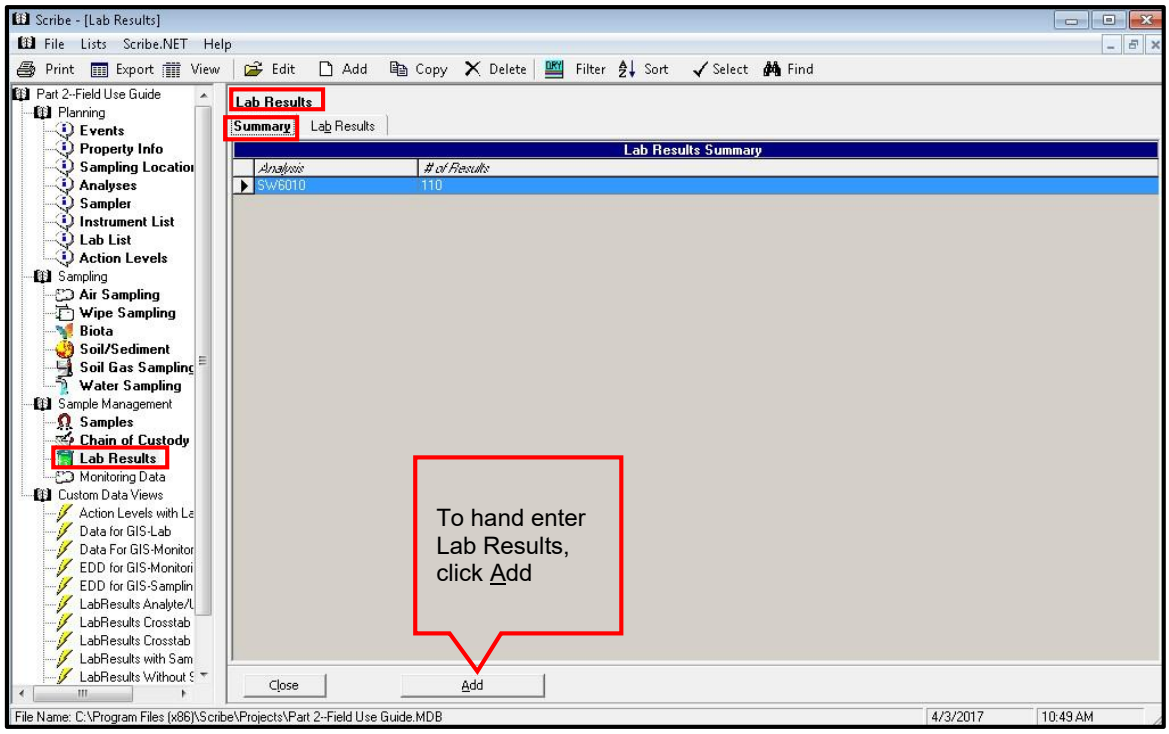
SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

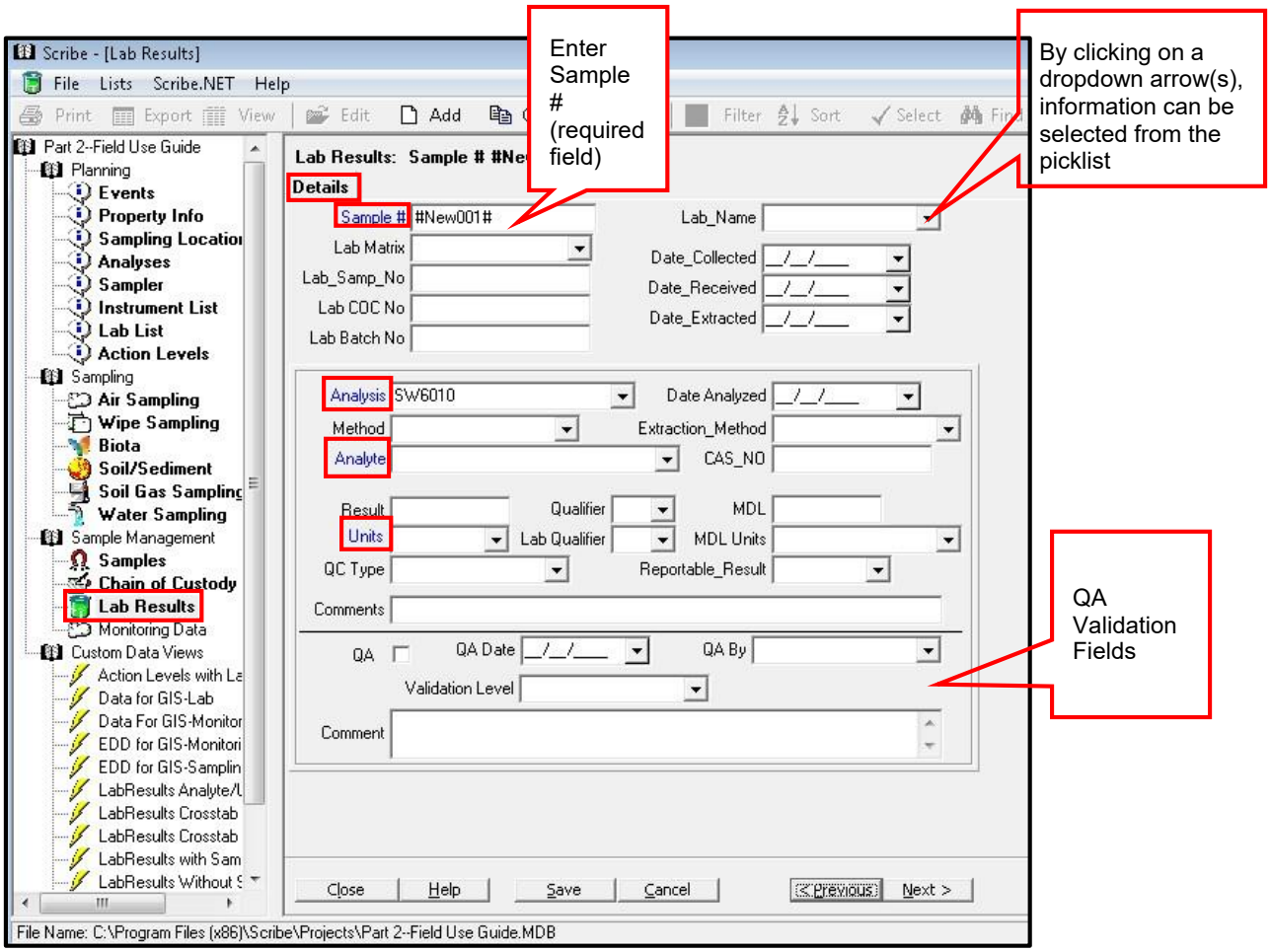
Example Scribe Chain of Custody Record

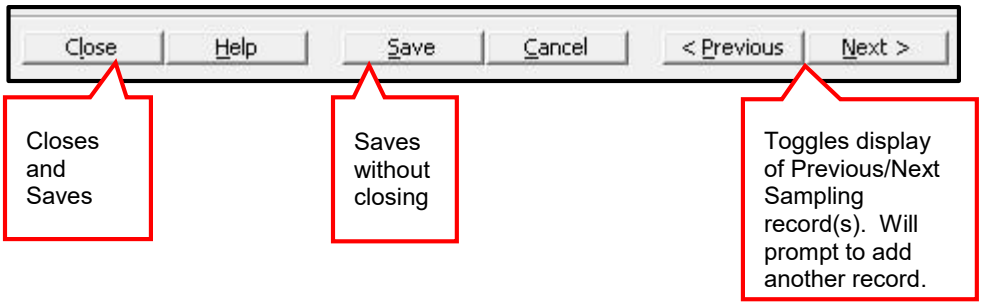
Lab Results

The Lab Results screen contains a **Summary** tab and **Lab Results** tab. Lab Results can easily be *imported* into a Scribe project from a laboratory supplied EDD (electronic data deliverable) file. *Refer to Management and Advanced Features – Part 3.* If an EDD is not supplied, lab results can be hand entered individually. ***Note:*** *the Sample # being entered on the Lab Results Detail tab should match the Sample # in the Samples screen exactly. Otherwise any corresponding Sample information will not be linked.*



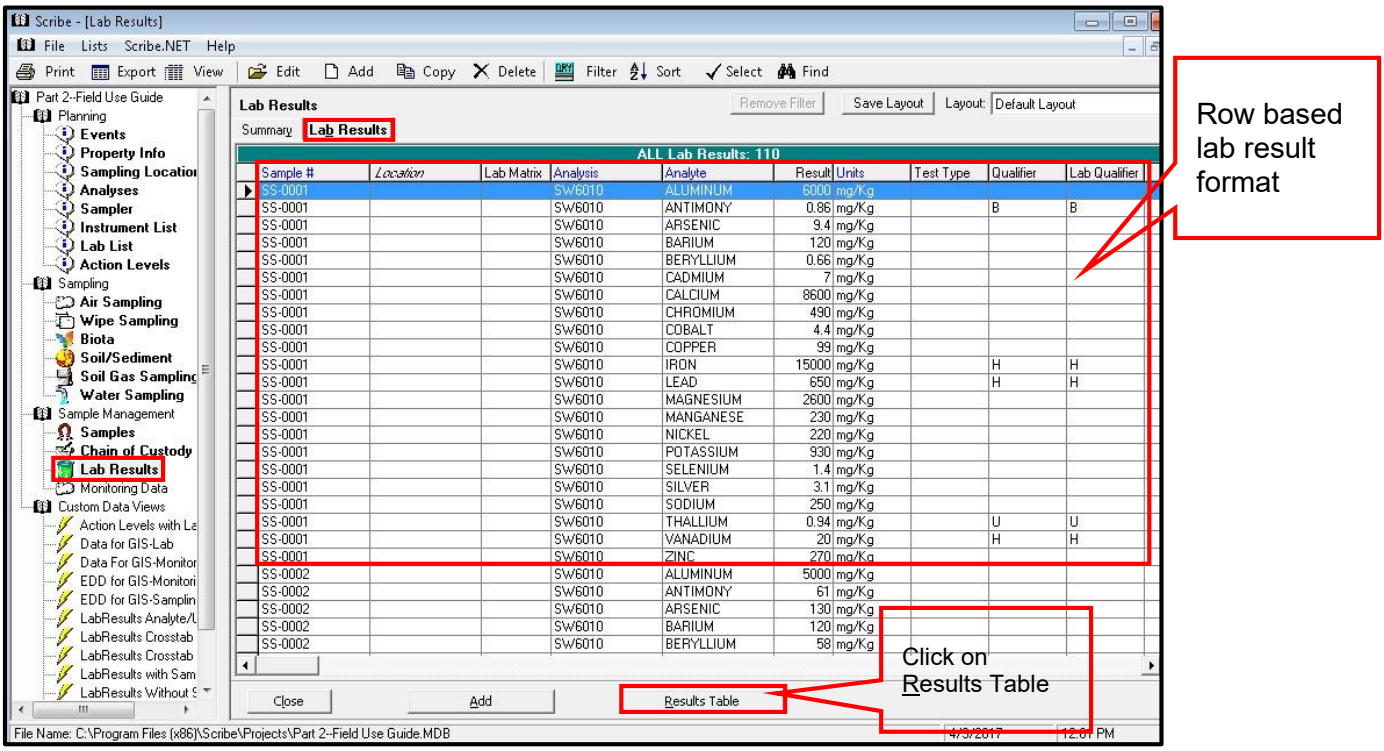
The Details tab contains several dropdown menus with information to support each sample. Fields denoted in **blue** are required fields (Sample #, Analysis, Analyte and Units).

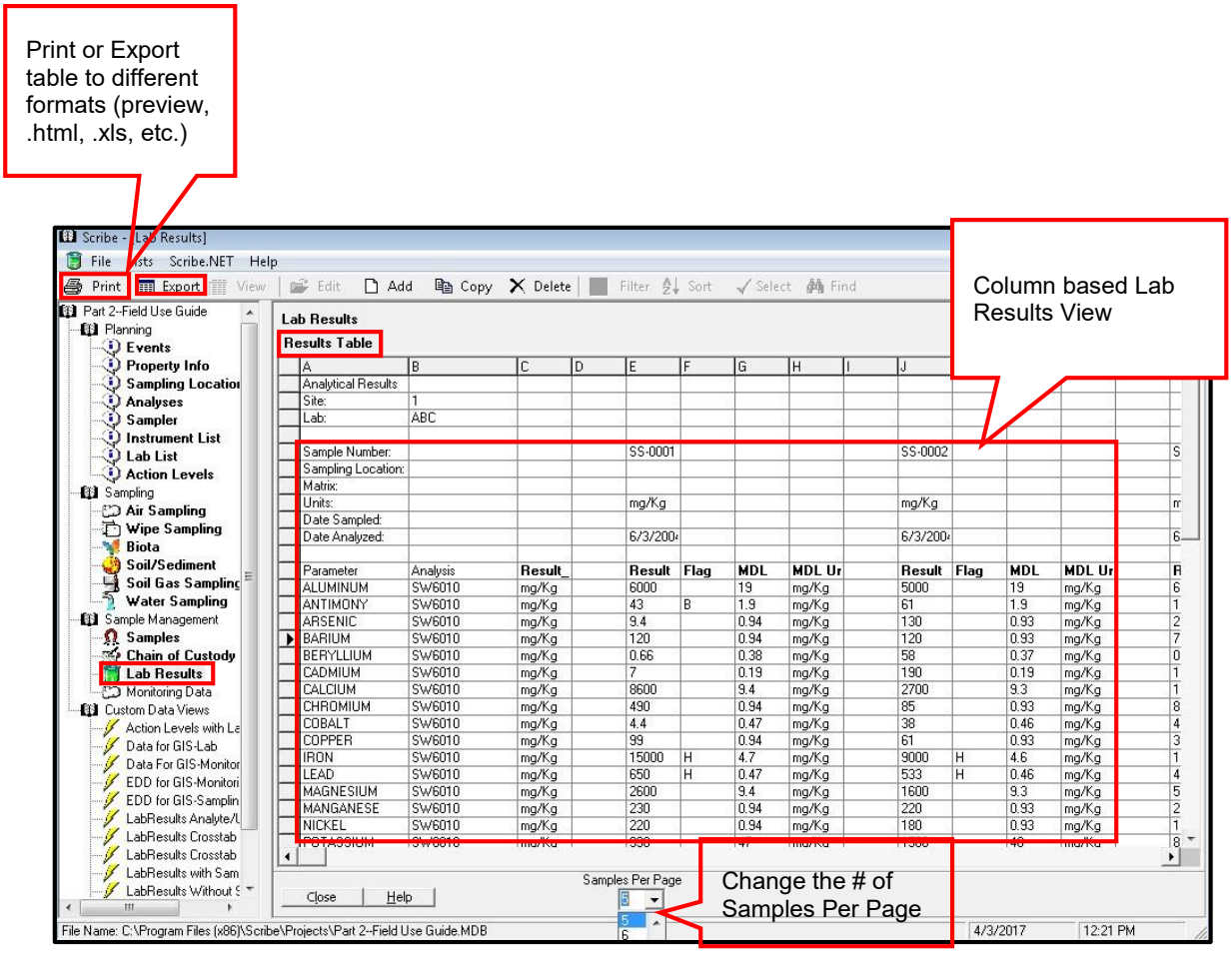




Results Table

The default Lab Results view in Scribe is a row-based format (i.e., one line per analyte per sample). By clicking the Results Table button, Scribe will provide a column based, standard format of the sample results.

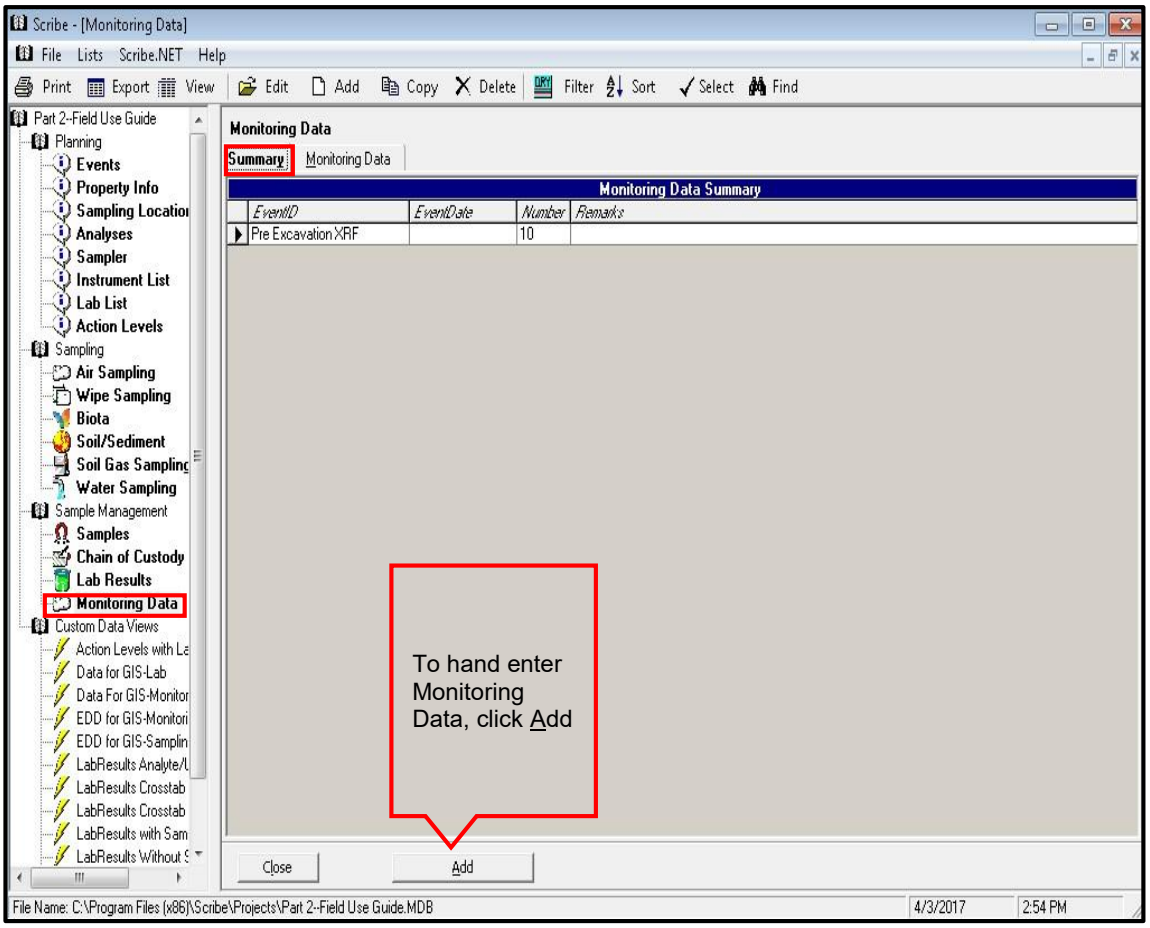




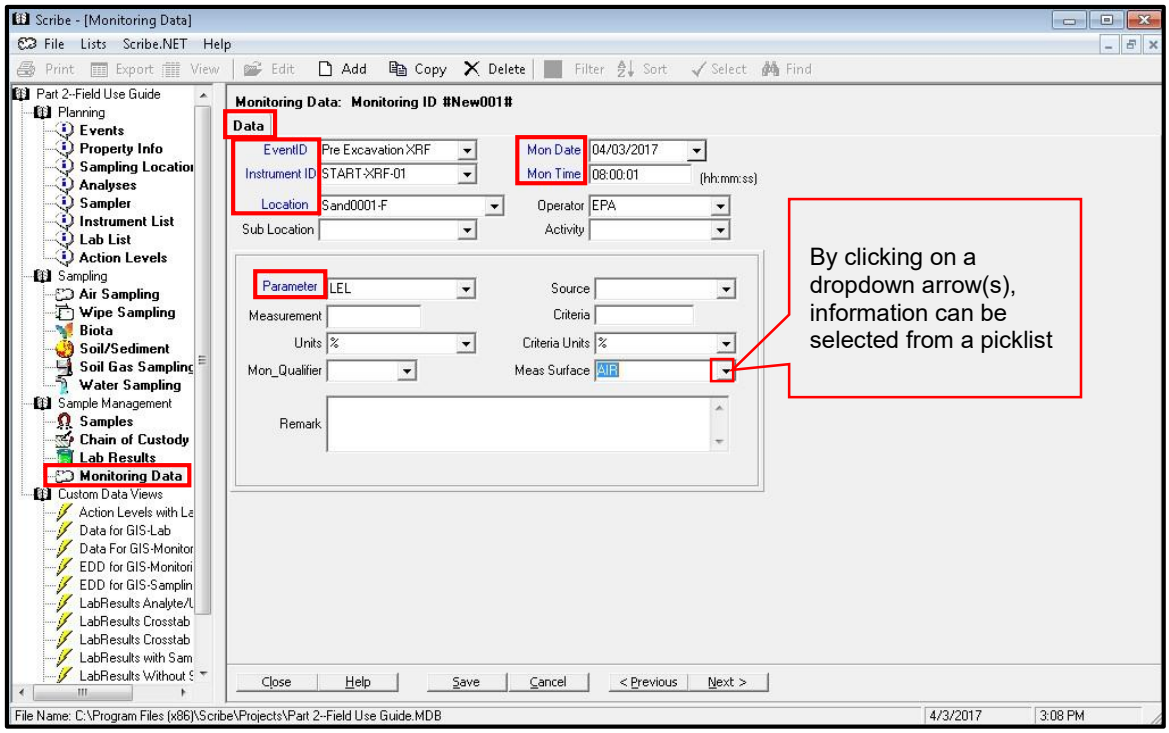
Lab Results Table

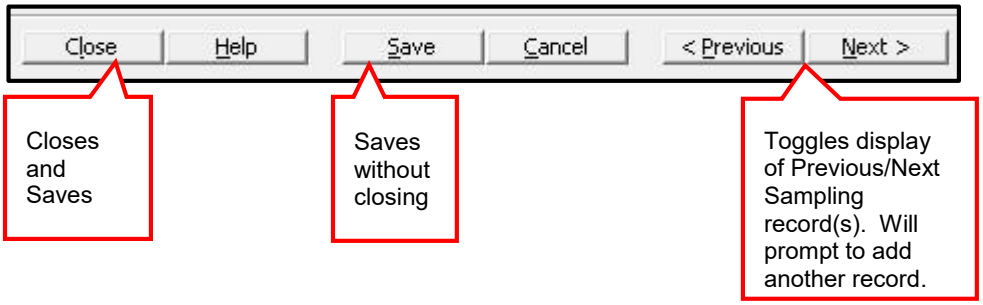
Monitoring Data

The Monitoring Data screen contains a **Summary** tab and **Monitoring Data** tab. Monitoring Data can easily be *imported* into a Scribe project from an EDD (electronic data deliverable) file. If an EDD is not available, monitoring data can be hand entered.



The Data tab contains fields that may contain dropdown menus with information in support of monitoring data. Fields denoted in **blue** are required fields (EventID, InstrumentID, Mon Date, Mon Time, Location and Parameter). ***Note:*** *EventID will be prepopulated with a default Sampling EventID.*

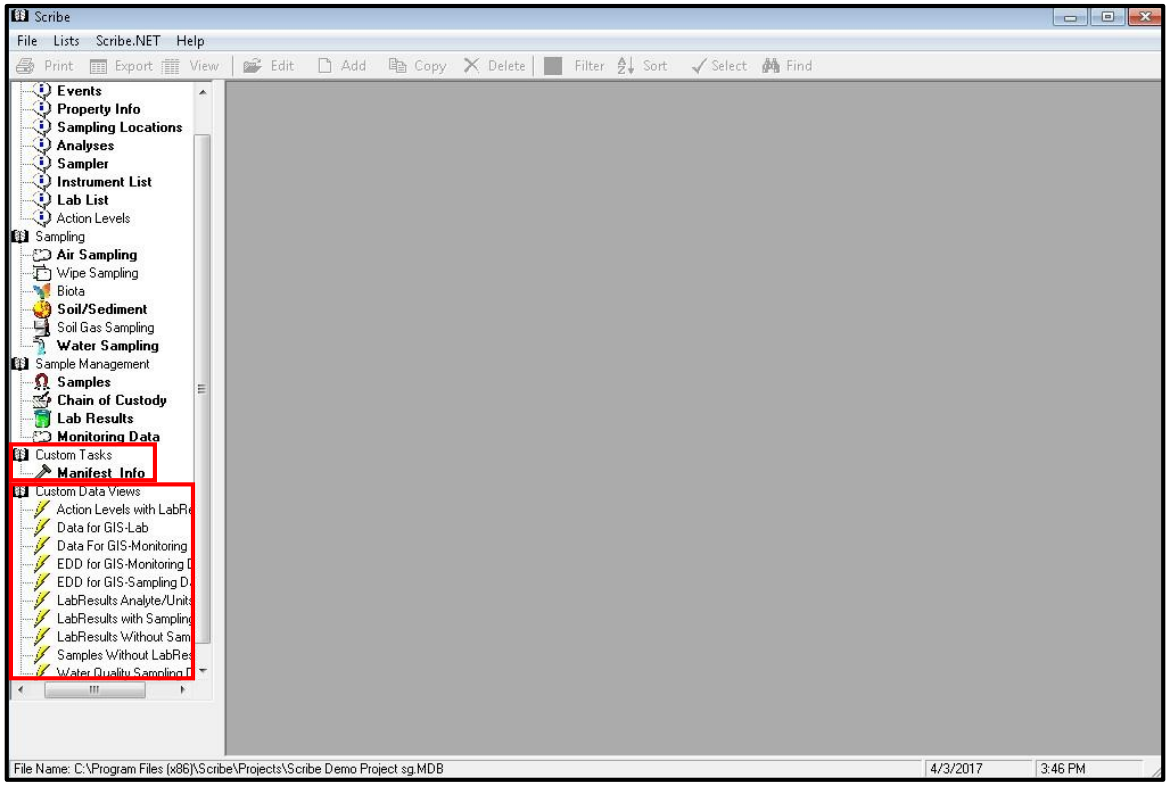




Custom Task(s) and Data Views

Custom Task(s) and Data Views

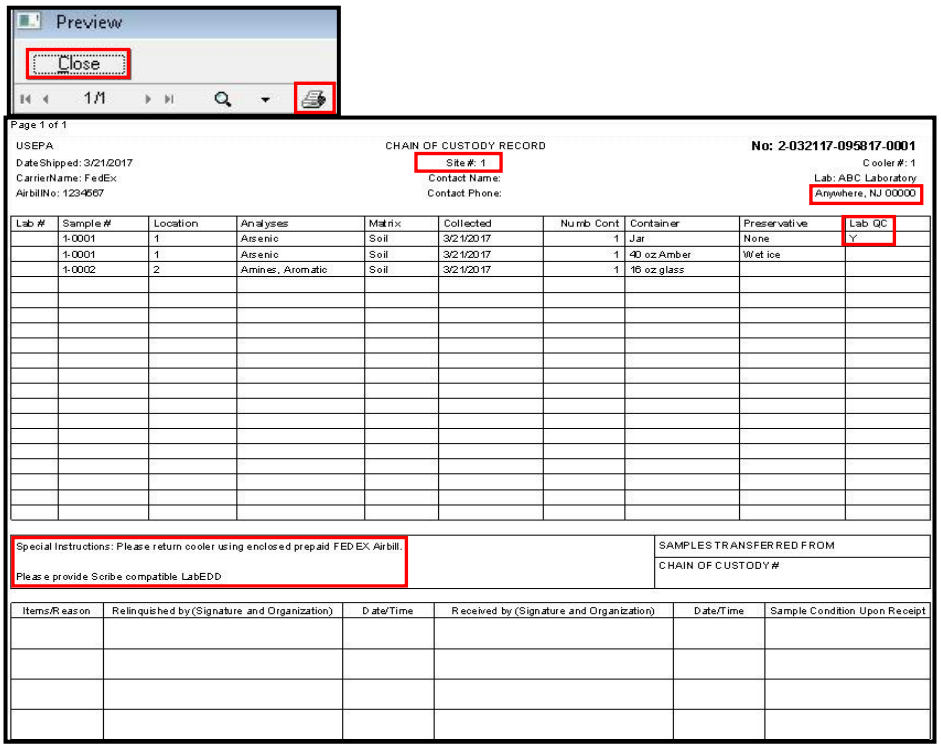
Custom Task(s) and Custom Data Views will be discussed in Part 3 – Management and Advanced Features. Please refer to that guide for assistance.



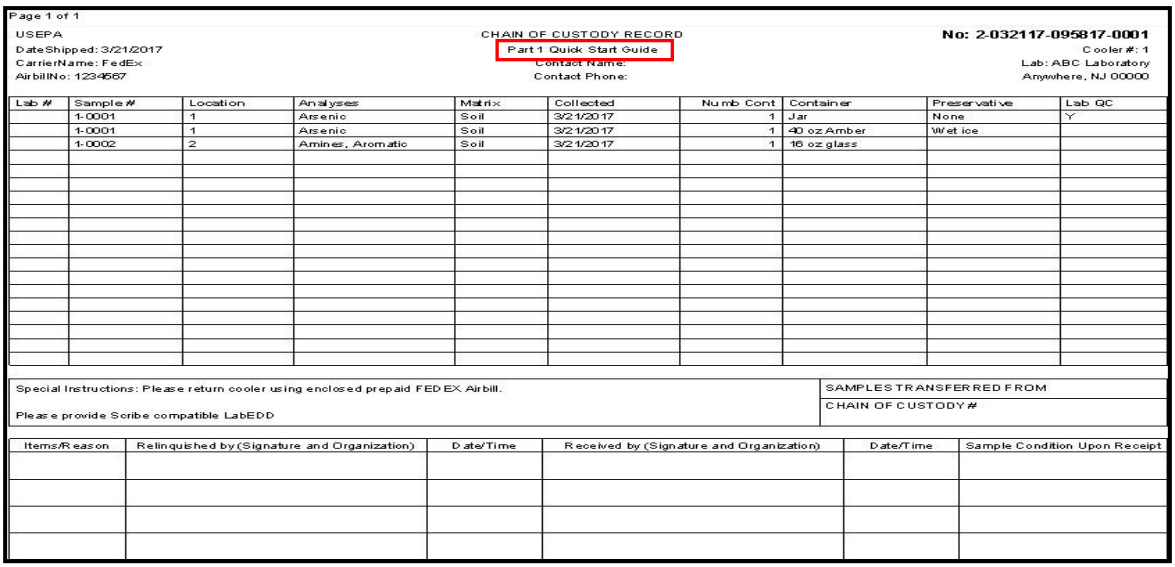
A Preview of the Chain of Custody Record will display. ***Note:*** *The Site Name is not identified on a Lab Copy; changes to the Report Setup; the Lab QC from the sample; and the Special Instructions entered when creating the Chain of Custody.*

5. Click on the Printer icon to print.

6. Click 'Close'.



Example 'Lab Copy' of Chain of Custody



Example 'Region Copy' of Chain of Custody

This completes the Part 1 -- Quick Start Guide. For more information on any feature discussed in this guide, refer to Part 2 -- Field Use Basics, which presents extensive information on the use of this database.

ERT

MANAGEMENT AND ADVANCED FEATURES
Part 3

SCRIBE V3.10

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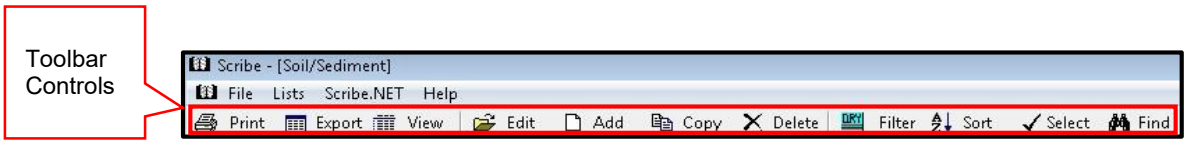
PART 3 - MANAGEMENT FEATURES & ADVANCED FEATURES

The information presented in this section describes the advanced functionality of Scribe. This section will address importing data (e.g. lab results), using the common controls (sorting, filtering), creating custom labels and grid layouts, Custom Tasks (MS Access Tables) and Custom Data Views (MS Access queries). Custom Templates, Custom Tasks and Custom Data Views will require that the user is familiar with MS Access and working the MS Access database tools on a live database.

Common Controls - Toolbar

Scribe has many features that offer convenient ways to manage and update records and files. They are also convenient when you want to display specific data in a specific format (i.e. reports). The following information will be discussed using the 'Samples' and 'Lab Results' screens as examples, but applies to most Scribe screens.

Some features and controls available on the toolbar work the same as those in the Grid Controls (right-click option). These features include Print, Export, View, Edit, Add, Copy, Delete, Filter Sort and Find.



Print

The Print feature offers several printing options:

- Preview – Preview your current grid view
- Page Setup – Change your page setup, margins, orientation
- Print – Print the current grid view to a printer
- Export – Grid data can be exported and then used in other applications for reporting, mapping or modeling. Scribe supports several standard data formats. Choices for exporting include .txt, .csv, .html, .xml file formats. ***NOTE:*** *When working in the Chain of Custody (COC) section, there is an additional export option of COC .xml. This option is required when exporting CLP COC files to be uploaded to the Sample Management Office (SMO) Portal. See User Manual for Scribe CLP Sampling.*
- Labels – Can print standard mailing labels (e.g. if Property Info is captured, standard mailing labels with property information can be created from this print feature)
- Worksheet – Can be used to create Worksheets (e.g. Sample Receipt Worksheet and Sample Weight Log reports)

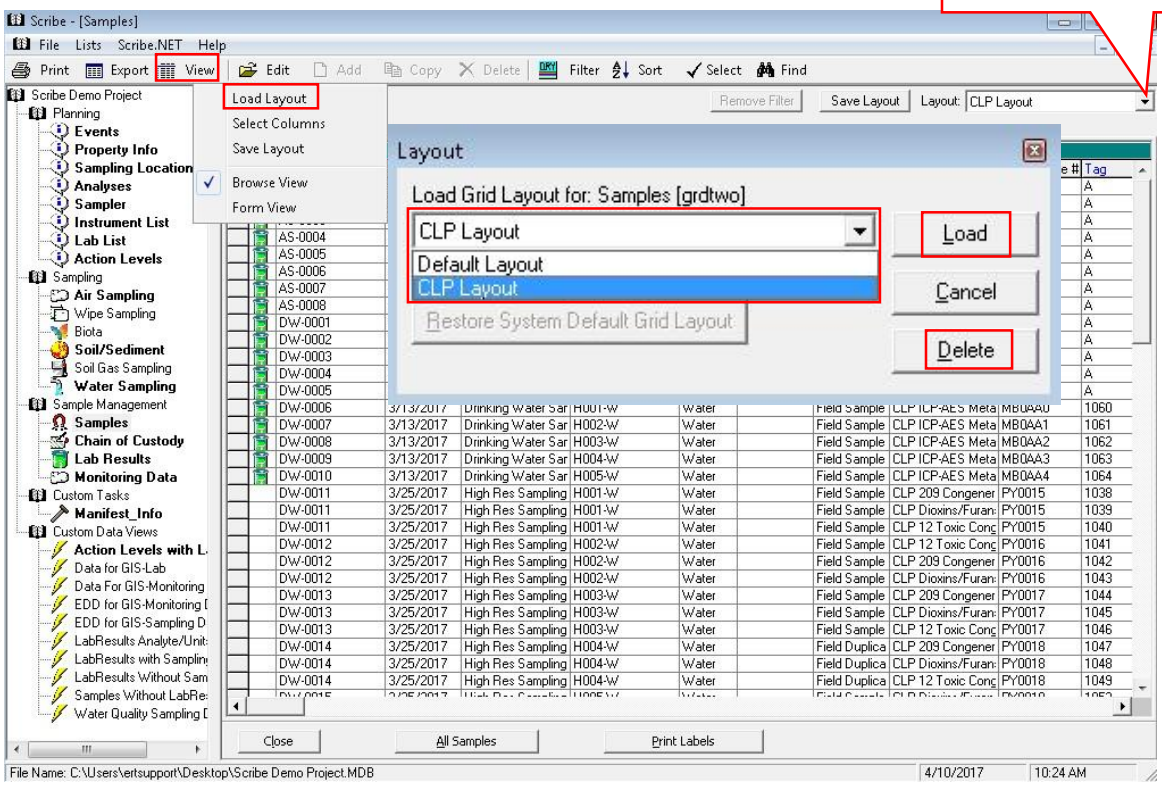
View

Depending on which section of the Navigation Pane you are in, there are a default view of columns (column headings) exposed in the grid. Under the 'View' option on the Toolbar, you can:

Load Grid Layout

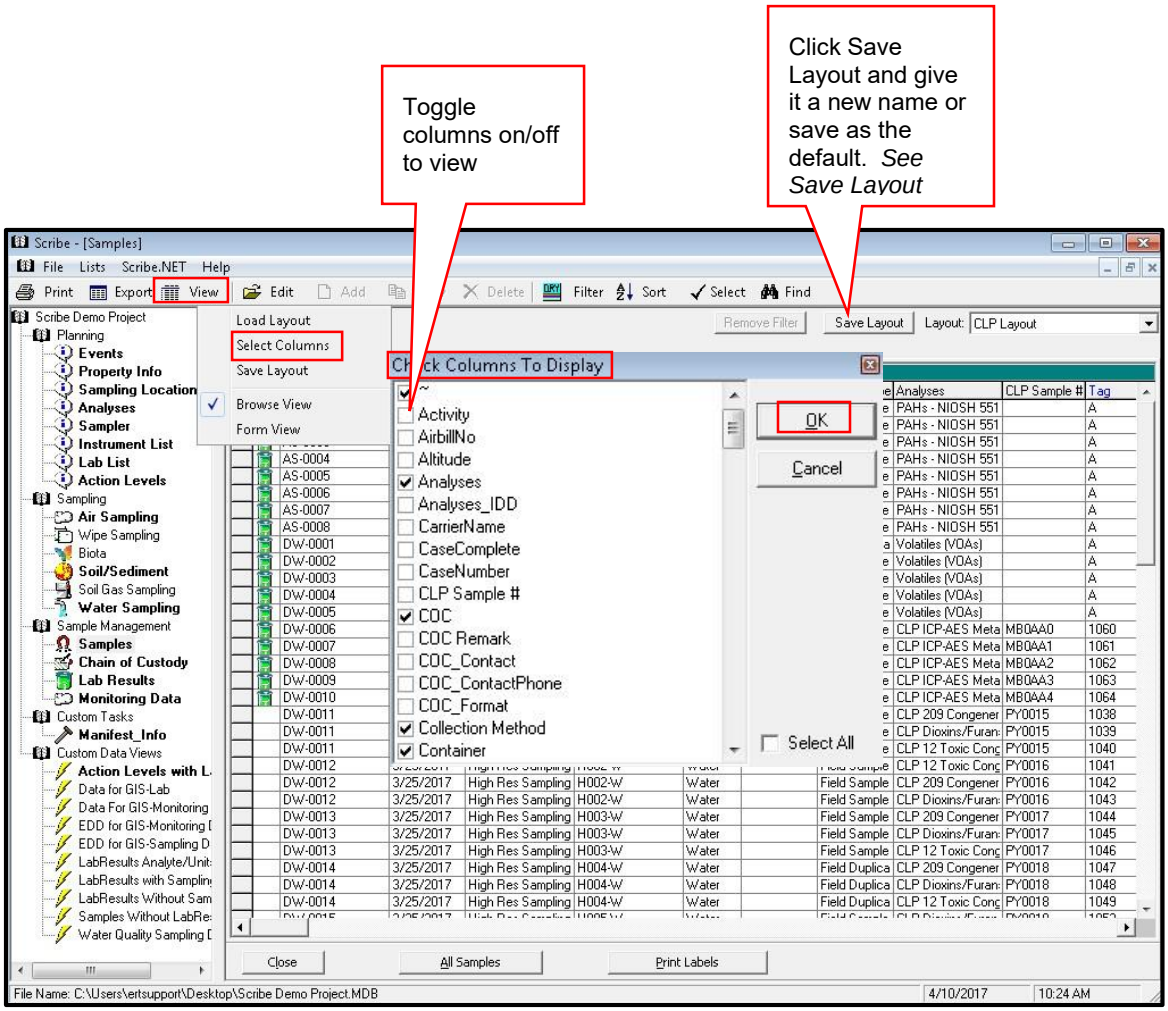
When Scribe is installed, there are two (2) Layouts: Default Layout or CLP Layout. The 'View' of the layout is determined when first creating the Scribe project. If CLP is NOT selected as the project type, the layout will be set to Default. Changing the layout is very easy and can be done from the View | Load Layout or by clicking on the down arrow at the top of the grid. Once new Layouts have been created, they will be available.

Layouts can also be loaded and/or saved as new layouts. *See Save Layout*



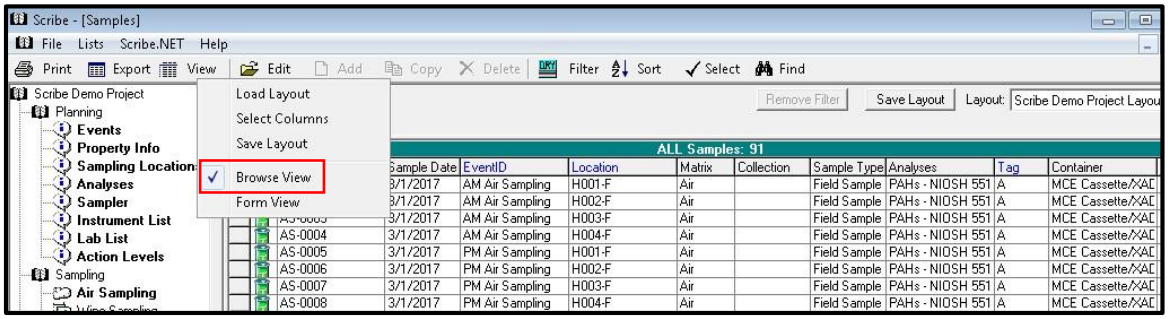
Select Columns

By default certain columns are turned on in the grid view. Columns can be turned on/off, moved and viewed differently on the grid and specific layouts can be saved.



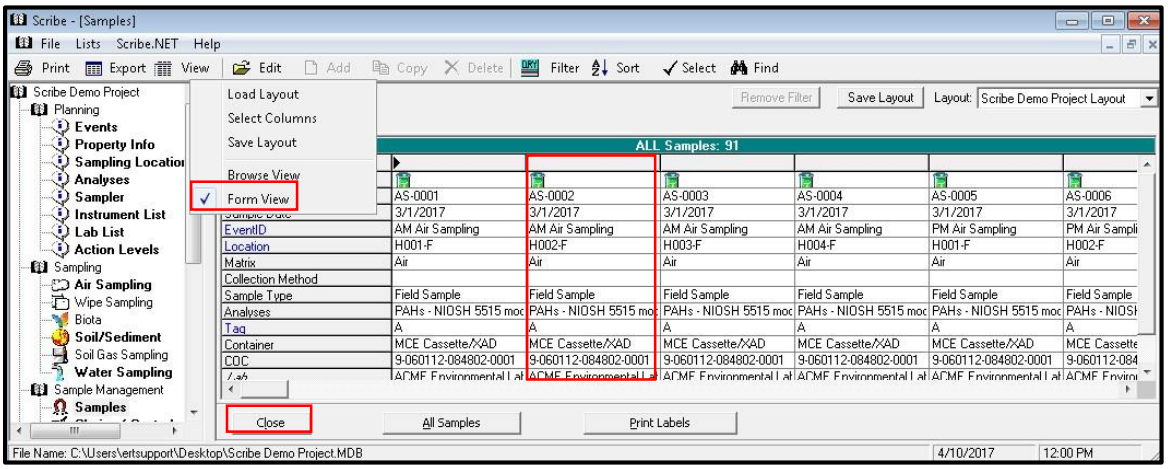
Browse View

The Browse View shows the samples in row format (default view)



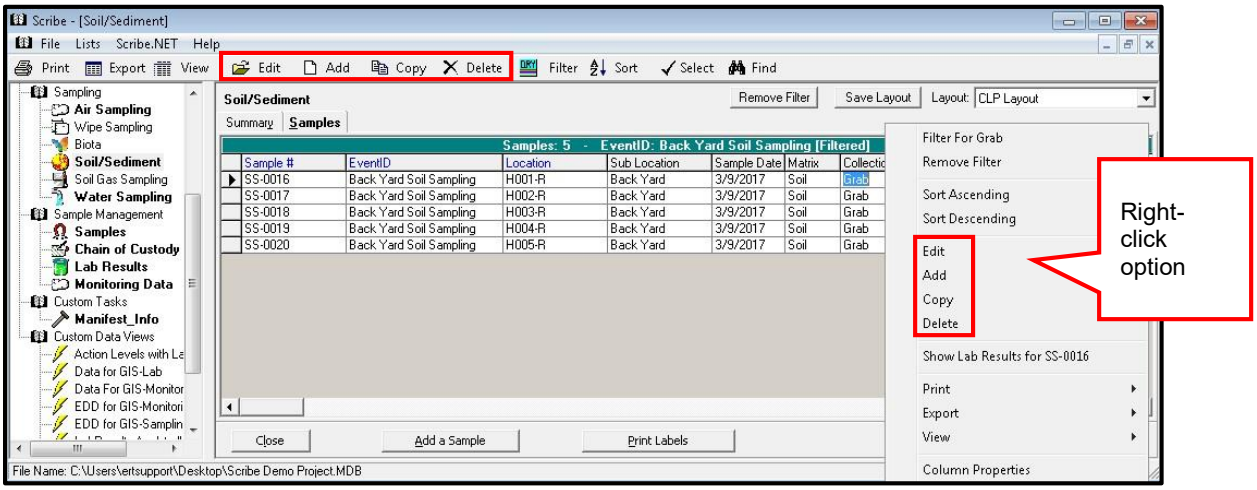
Form View

The Form View allows you to view each sample in column format. To return to the Browse View, click on Close.

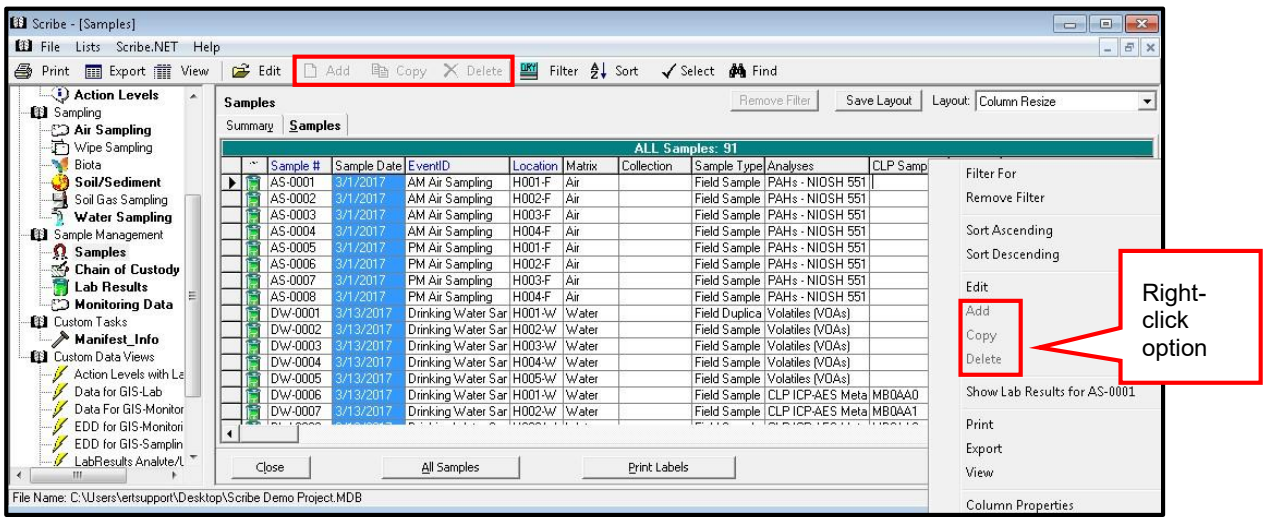


Edit, Add, Copy and Delete

The Edit, Add, Copy and Delete controls are only available on the Toolbar and right-click feature when you are working in the individual sampling tasks (e.g. Air, Soil/Sediment, Water). They can be used when editing, adding, copying or deleting samples, analyses, events, etc.

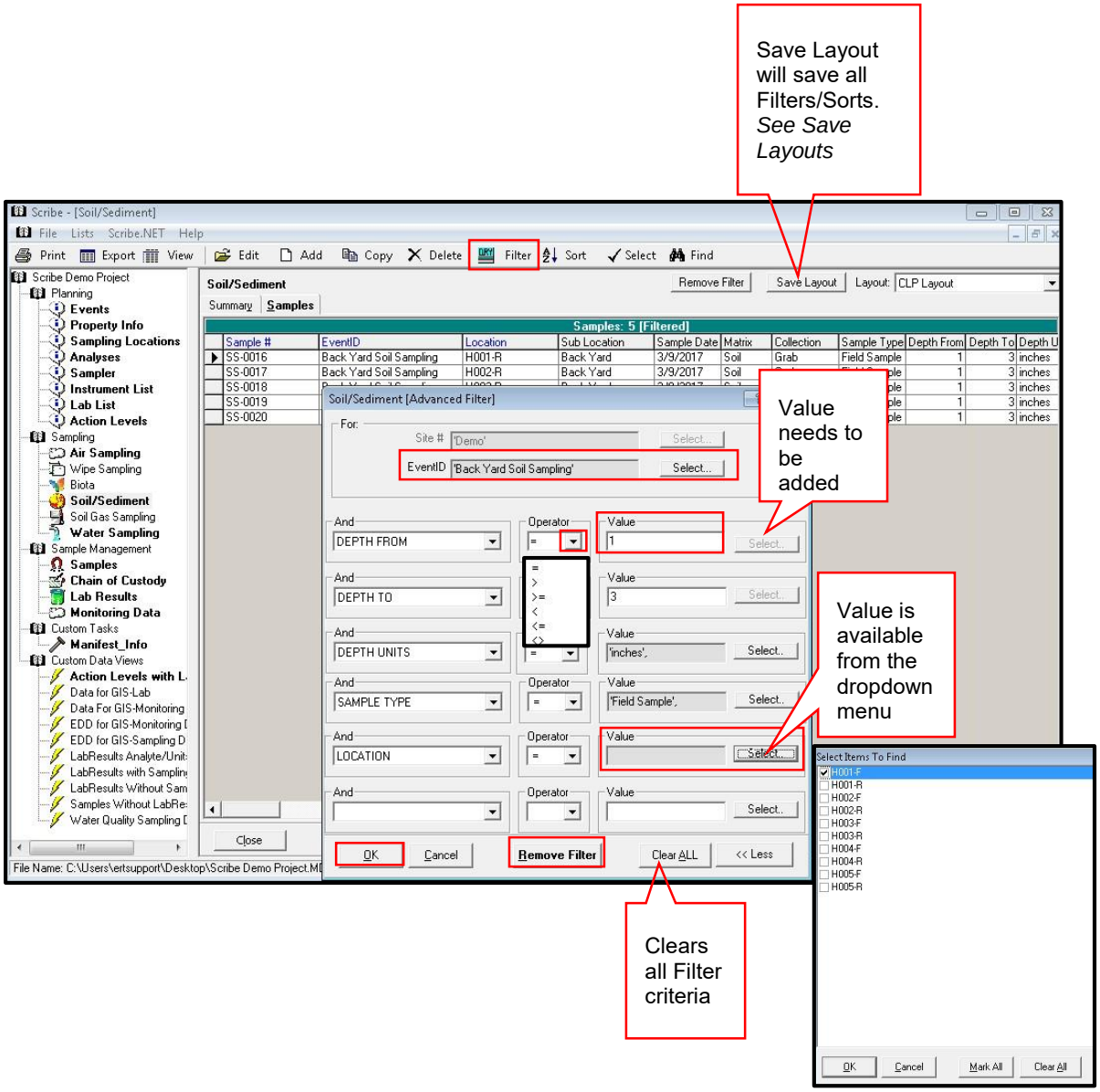


The Add, Copy and Delete controls are **not** available options under Sample Management | Samples.



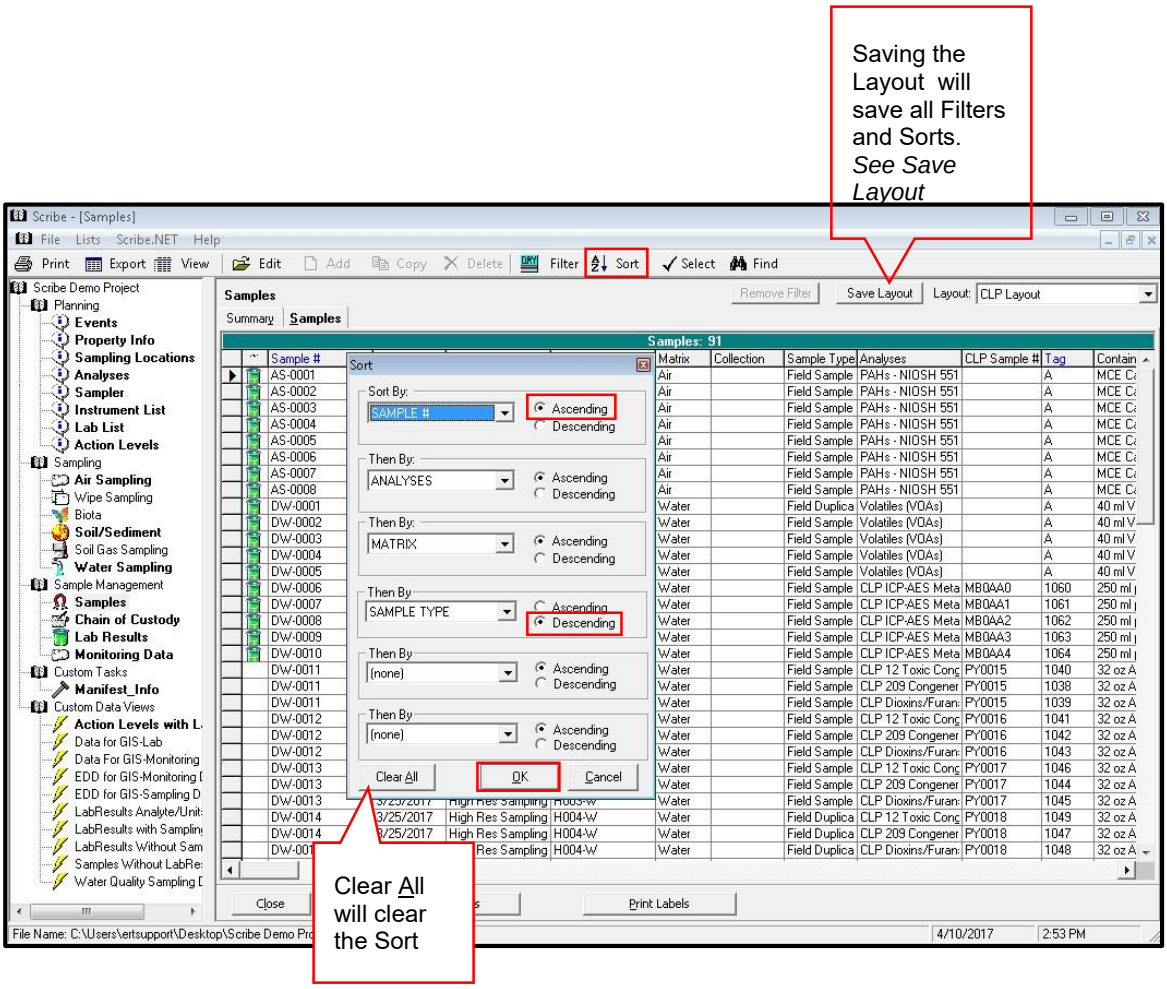
Advanced Filter

The 'Filter' on the toolbar offers a more advanced filter for up to six (6) fields. In this example, we are filtering for the Back Yard Soil Sampling EventID. Numerous filtering options are available using dropdown menus and select buttons. Select as many fields as needed and click OK. If the Select button is grayed out, you will need to enter a value. If the Select button is highlighted, a dropdown is available to select the field(s) in the Scribe project that need to be filtered.



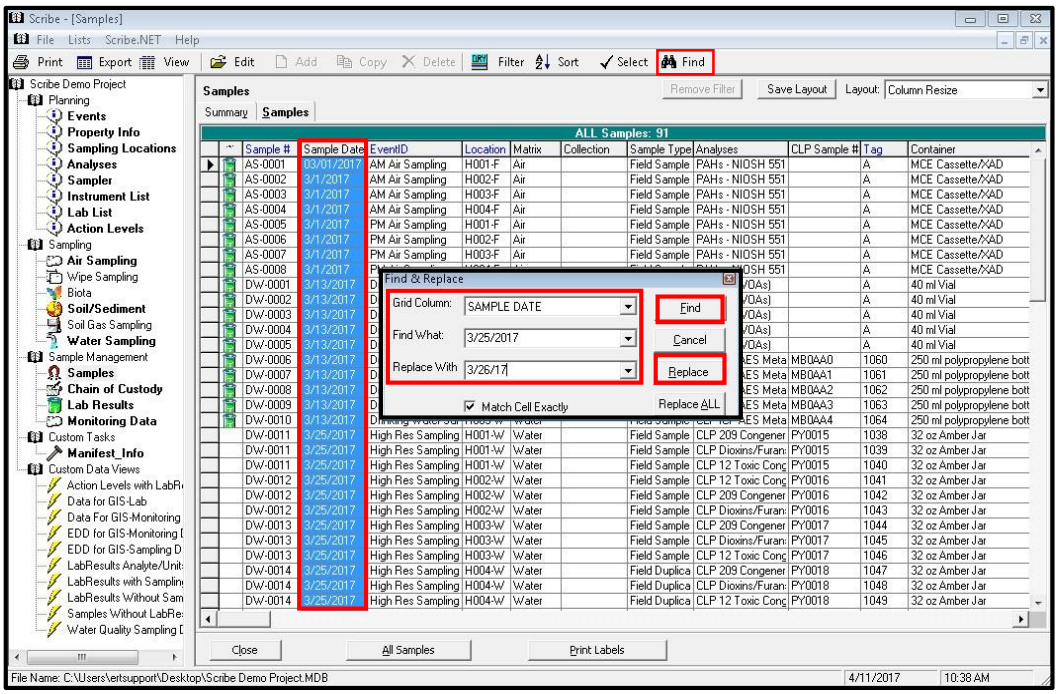
Advanced Sort

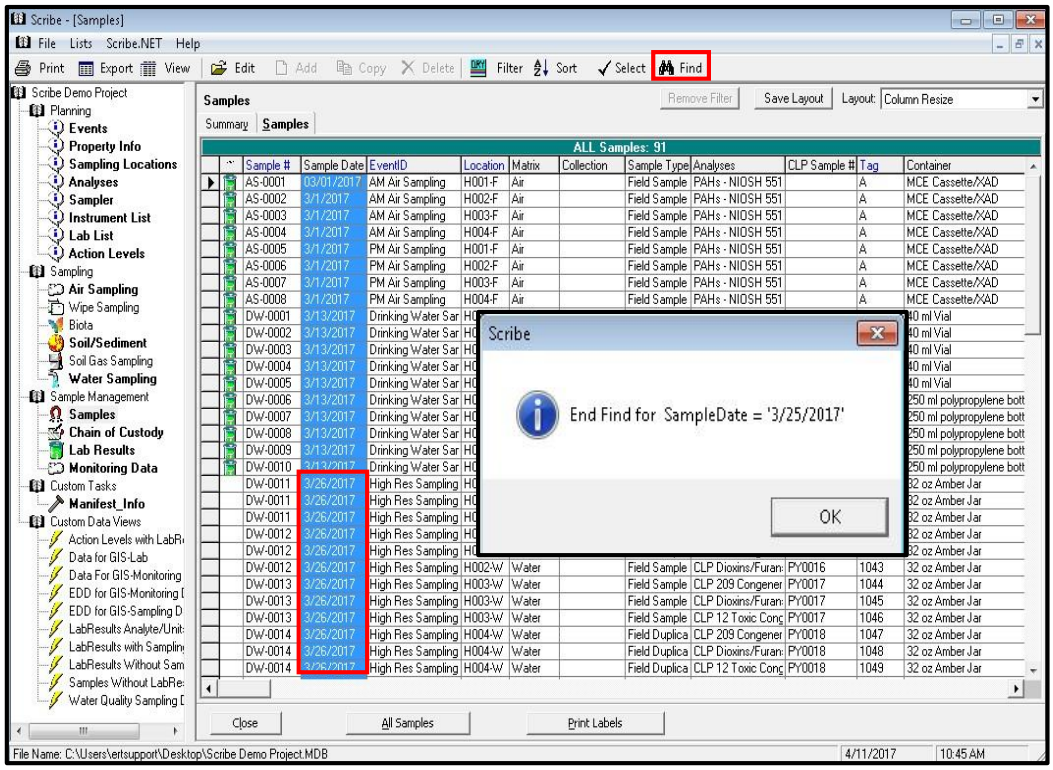
The 'Sort' on the toolbar opens a more advanced Sort window. The advanced feature offers a more advanced sort for up to six (6) fields. In this example, we are sorting by Sample #, Analyses and Matrix **Ascending** and Sample Type **Descending**. Select as many fields as needed and click OK.



Find and Replace

Use the Find and Replace feature in Scribe (similar to Excel) to search for something in your project, such as a particular sampling date, and replace it with another value.

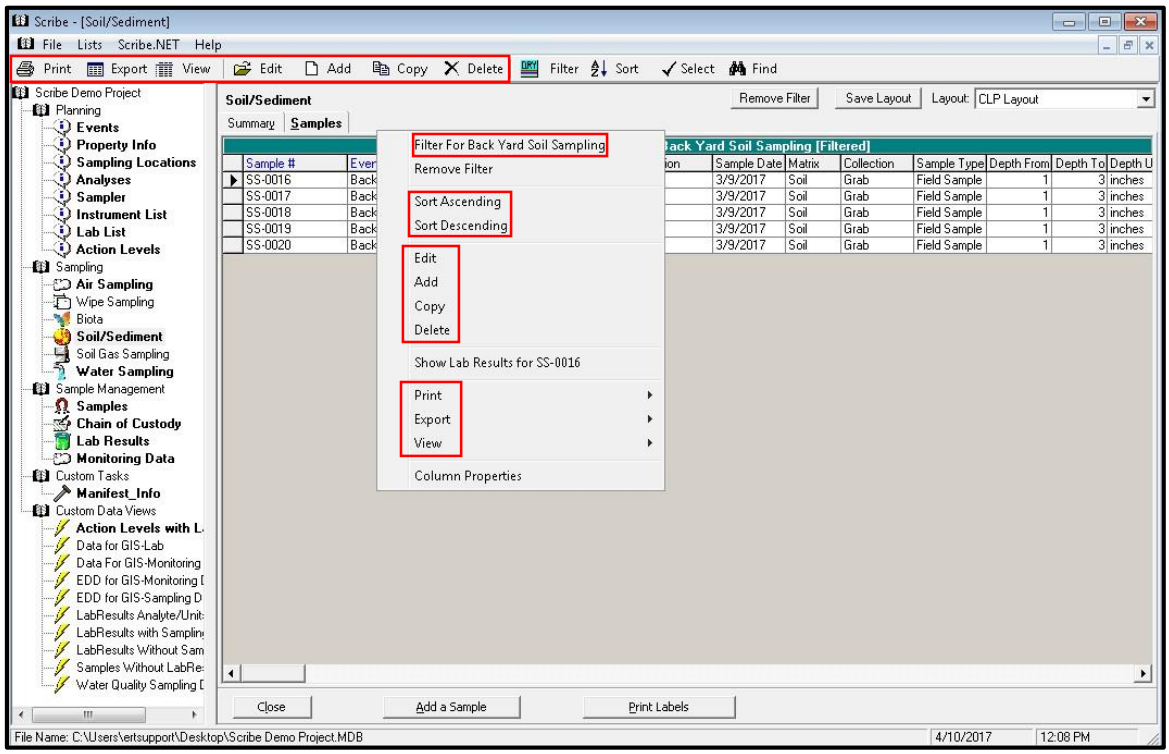




Common Controls – Right-Click

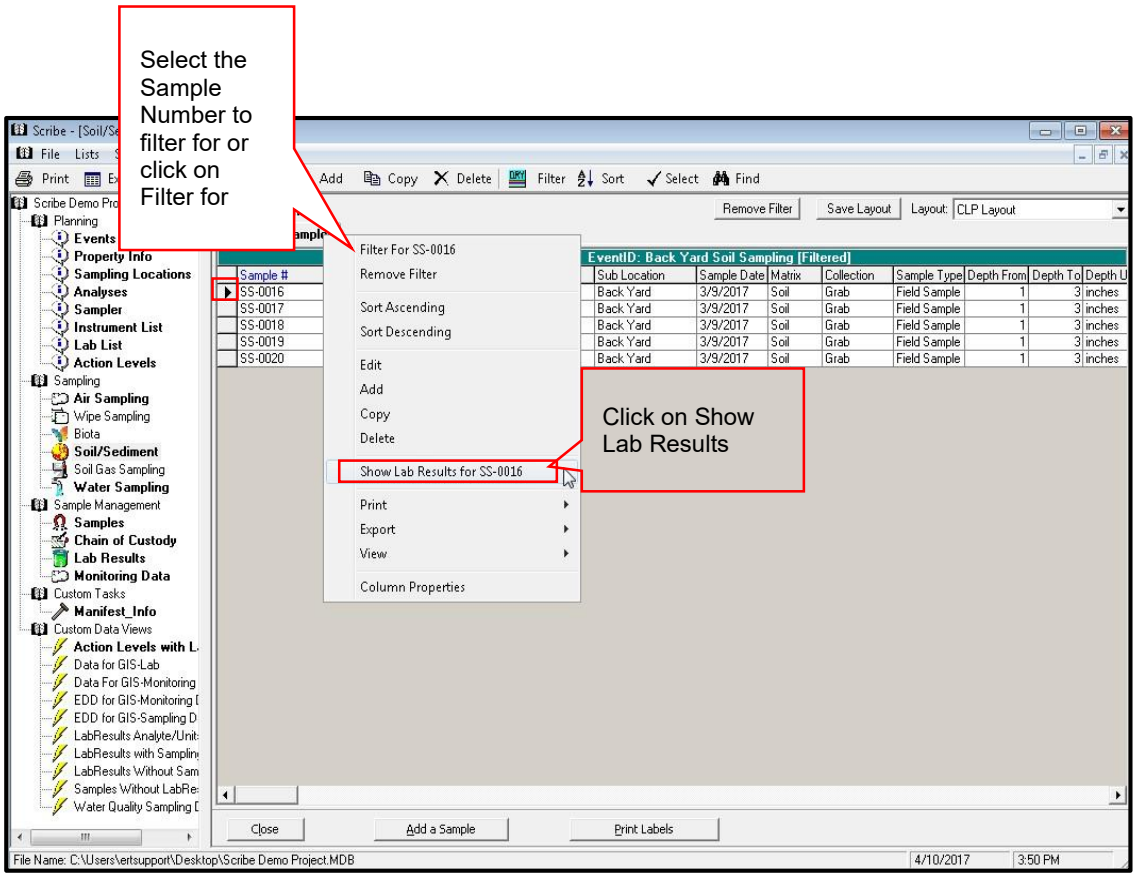
Some features and controls available on the toolbar work the same way as those in the Grid Controls (right click in the Grid). These features are **Edit**, **Add**, **Copy**, **Delete**, **Print**, **Export** and **View**.

The **Filter** and **Sort** feature on the Grid provides a simplified Filter and Sort. For example, the grid filter allows you to filter on one item (i.e., Back Yard Soil Sampling) and the Sort only allows for Ascending or Descending.



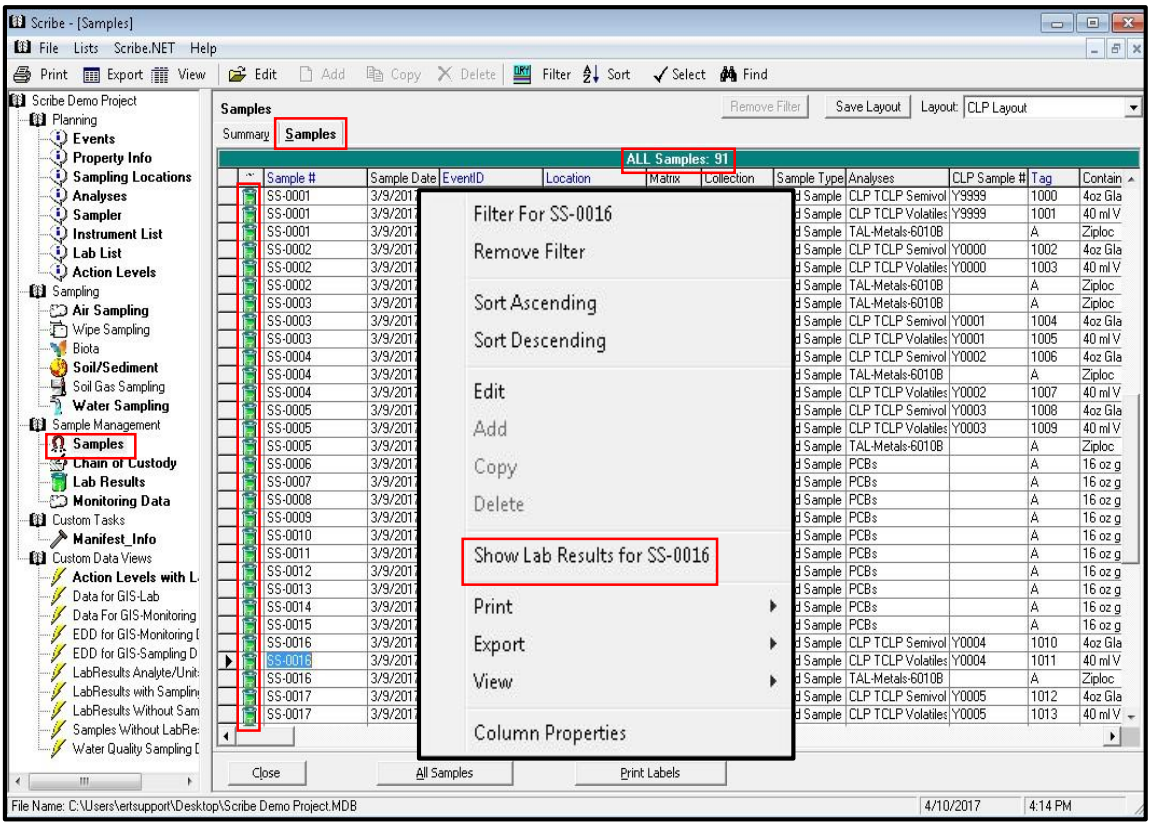
Right-Click Options in the Sampling sections

To show any **Lab Results** for a particular sample using the right click option, right-click a sample and selecting Show Lab Results, the Lab Results section of Scribe will be displayed and the results will be filtered for any Lab Results pertaining to the selected sample number.

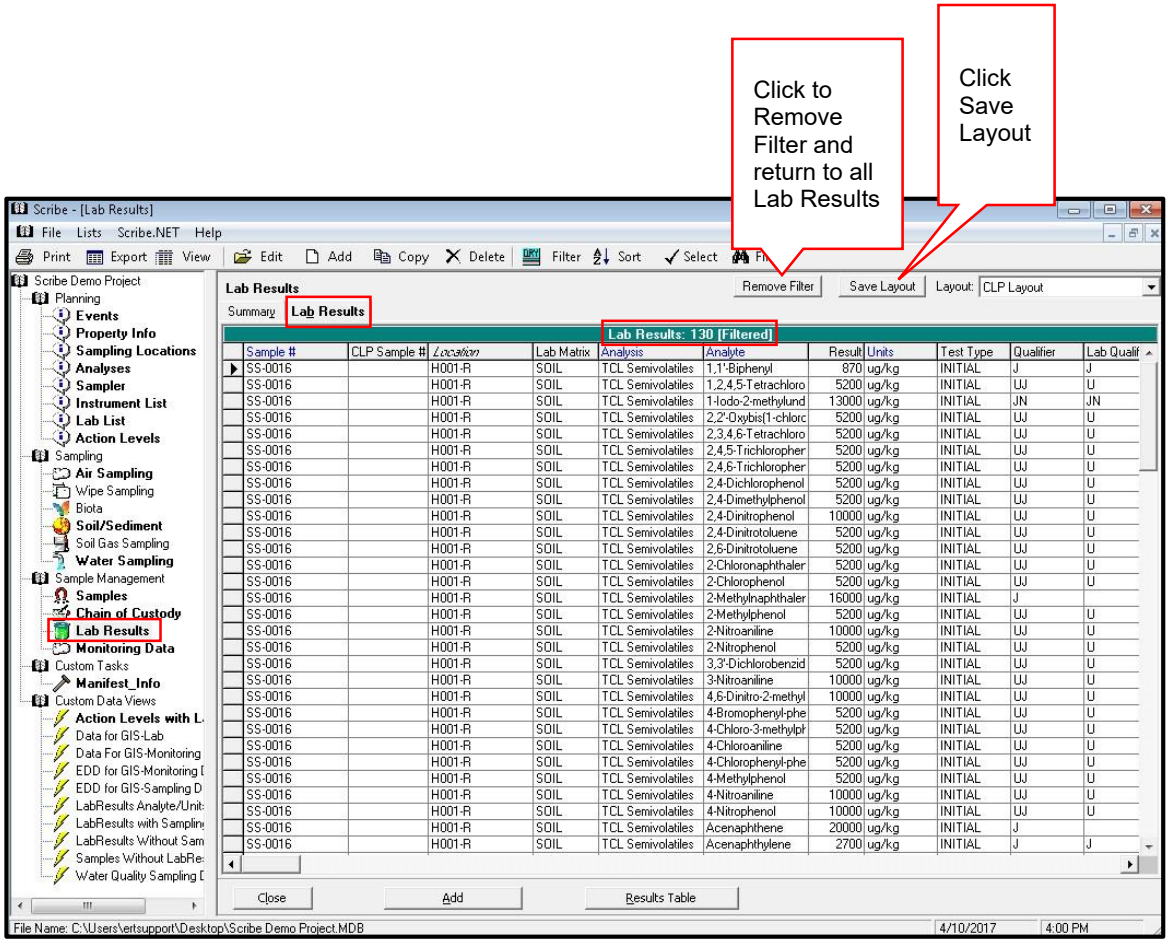


Filtering for Sample SS-0016 Under Sampling Task (Soil/Sediment)

Under Sample Management | Samples - a green beaker next to the Sample # indicates that the sample has lab results data.

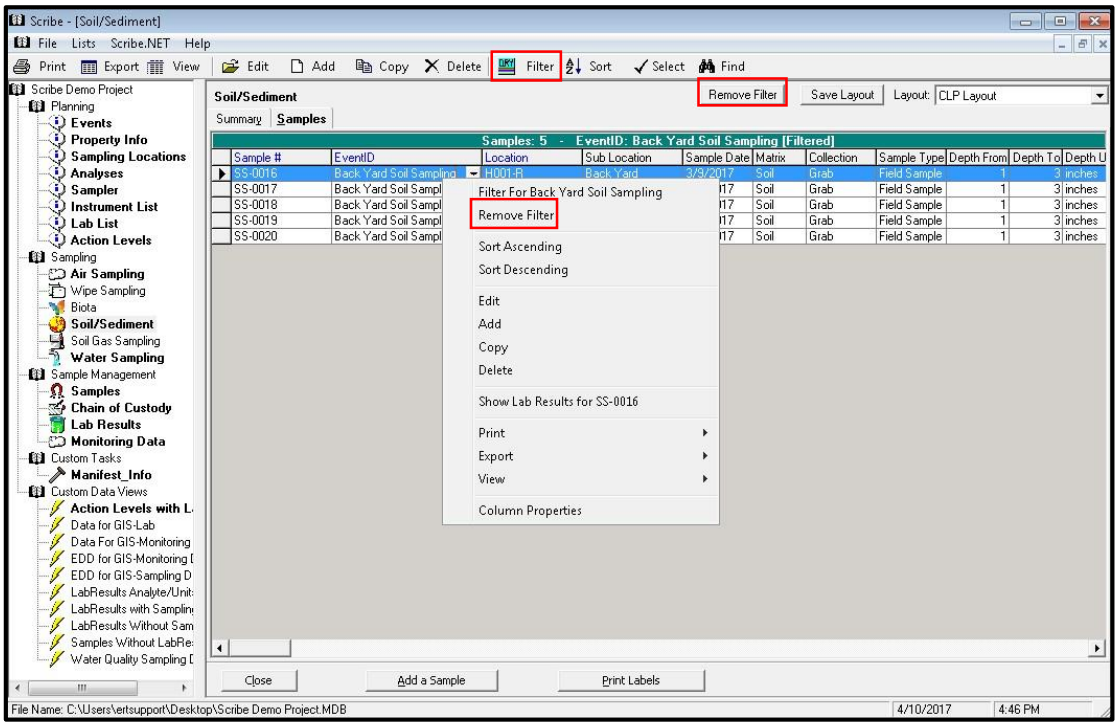


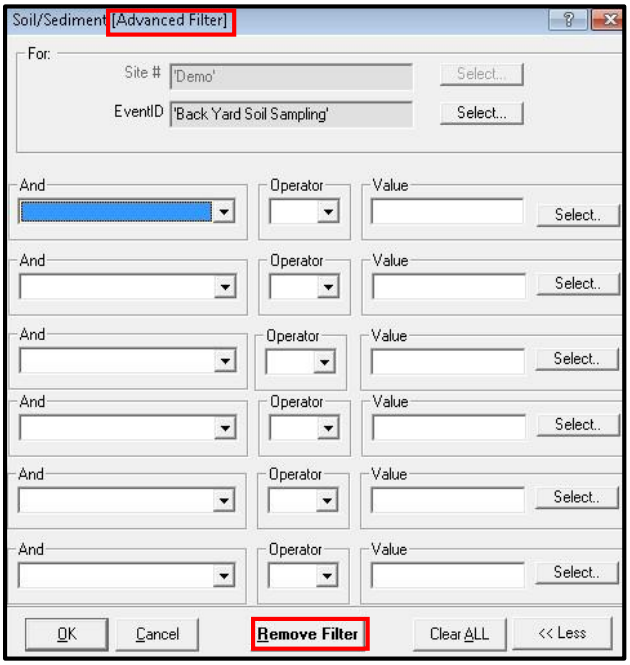
When in the Lab Results table, additional Filters and Sorts can be done. New Layouts can be created and saved.



Remove Filters

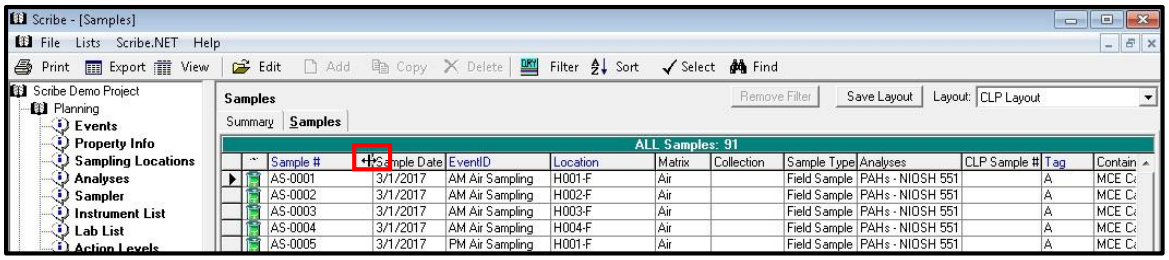
When working with the data and applying Filters, it is important to **Remove** any filter that has been applied to get back to your full data set. There are three (3) ways to remove a filter from the Grid View clicking on Remove Filter, right-clicking and select Remove Filter, or by clicking on the Filter button and click Remove Filter.



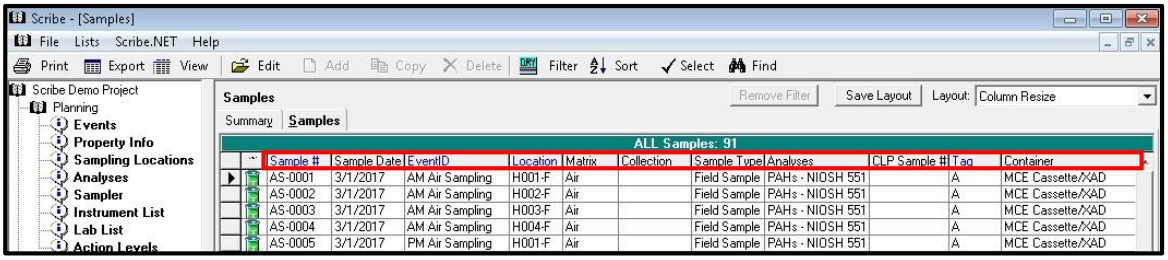


Column Resizing

To resize the columns in the Grid (similar to resizing columns in Excel), hover the mouse between columns to expose a double-sided arrow . Drag the double-sided arrow (left or right) to adjust the column width. The resizing of columns can be saved with Layouts.



Example prior to resizing



Example after resizing

Create Layouts

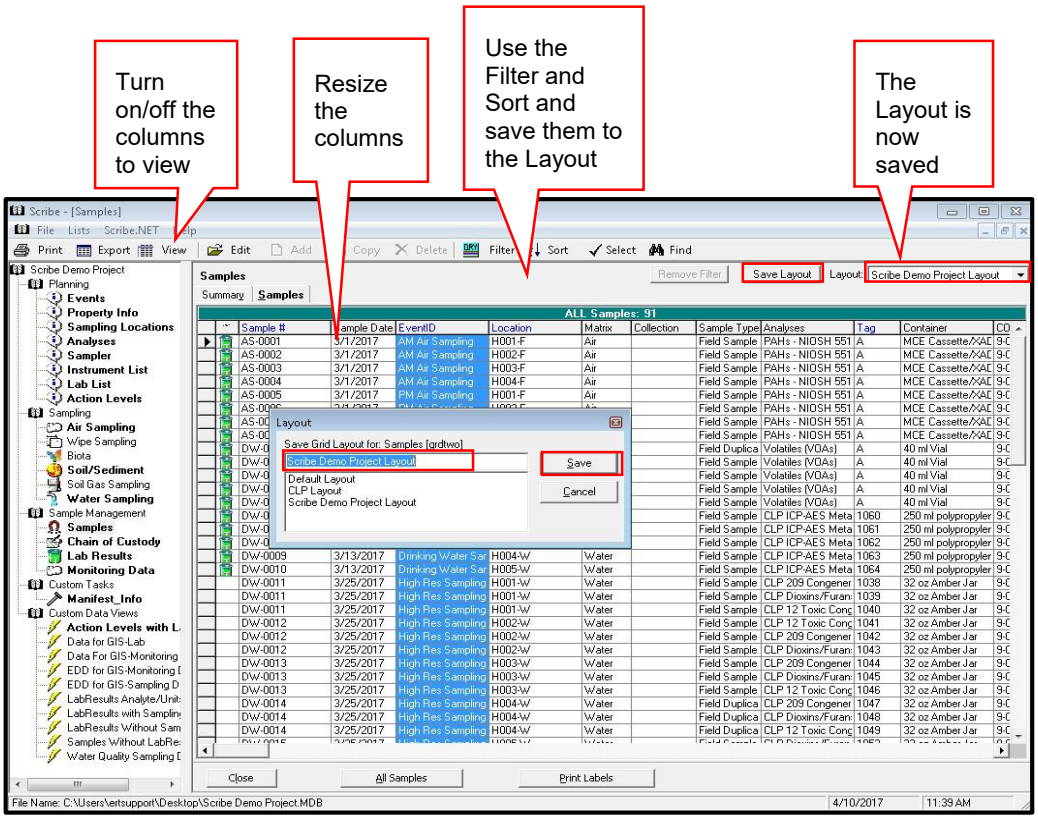
In Scribe, you can create and customize Grid Layouts and Label Layouts. These custom layouts can then be imported into new Scribe projects or be made part of a custom Template for use in future projects.

Grid Layout

Scribe is loaded with two (2) default layouts with certain fields displayed on the grid (Default and CLP). They are also sorted in a specific order.

There are many fields that are available to view/display in the various sections of Scribe (Planning, Sampling, Sample Management). Prior to saving the layout, format the grid by turning columns on/off and providing any filter or sort order required.

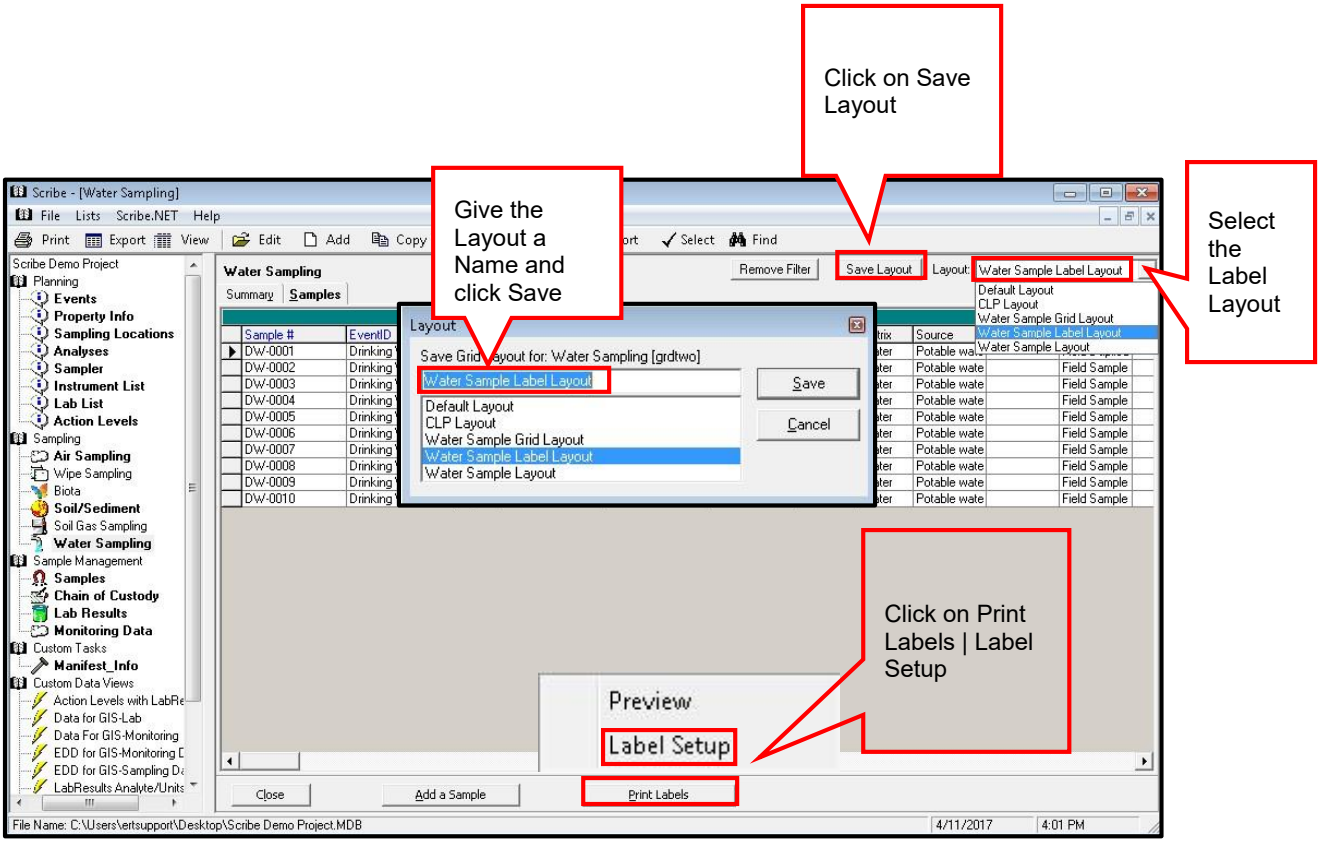
When the grid is formatted, select View | Save Layout from the toolbar or click on Save Layout on the grid. Provide a name for the grid layout and click the Save button. ***Note:*** *Layouts are only saved to the section of Scribe you are in. For example, if you are creating a layout under the Samples section, that layout is only available in that section. Many Layouts can be created.*

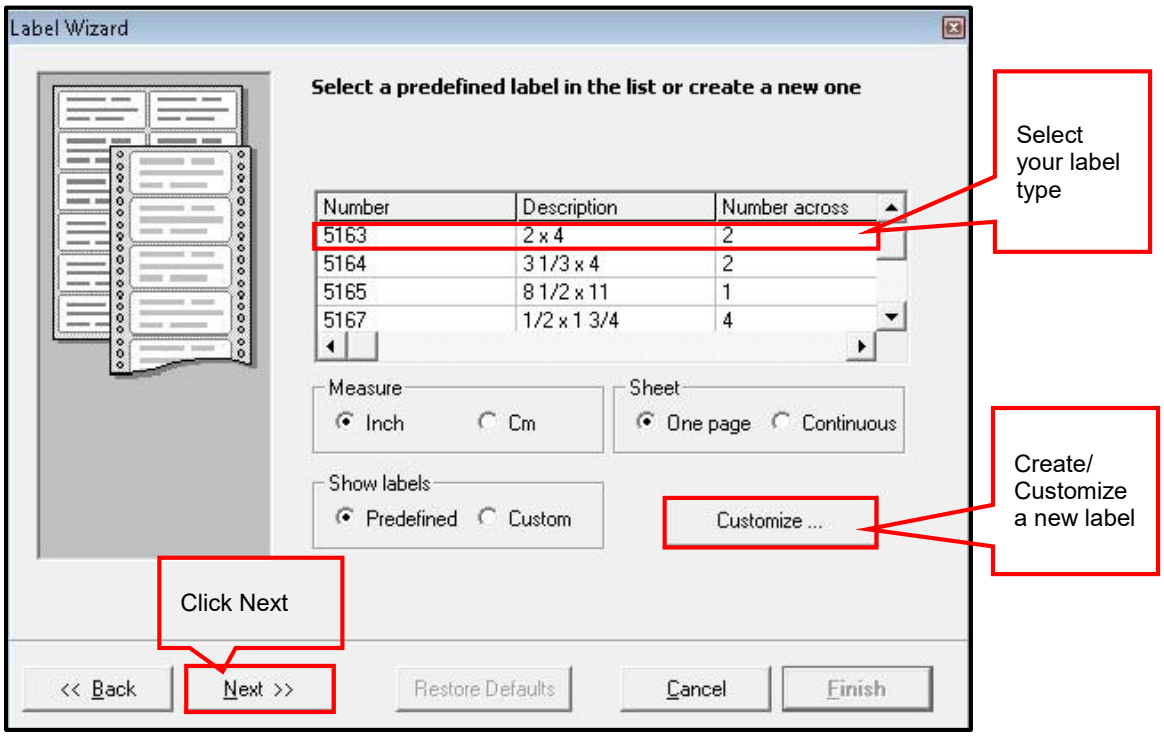


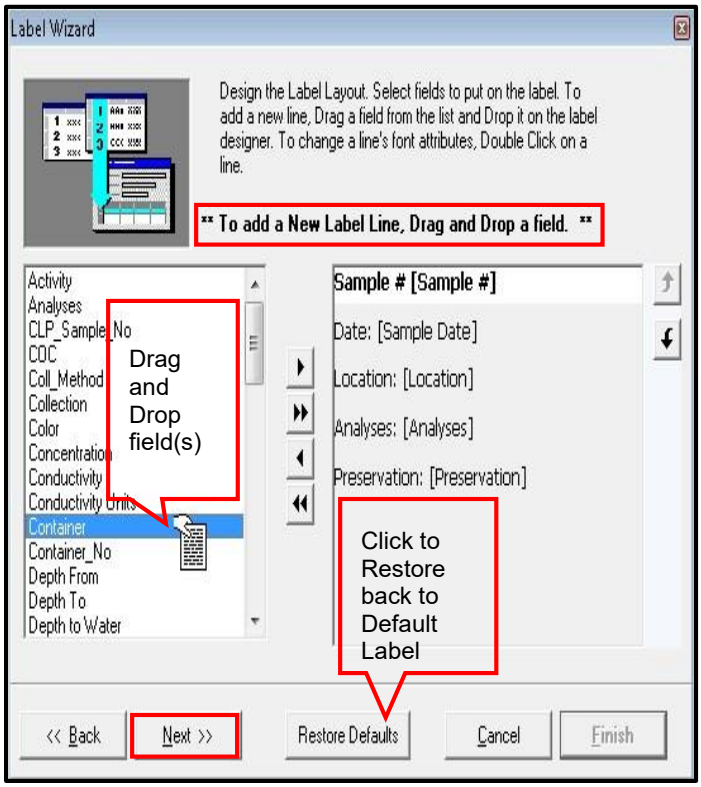
Label Layouts

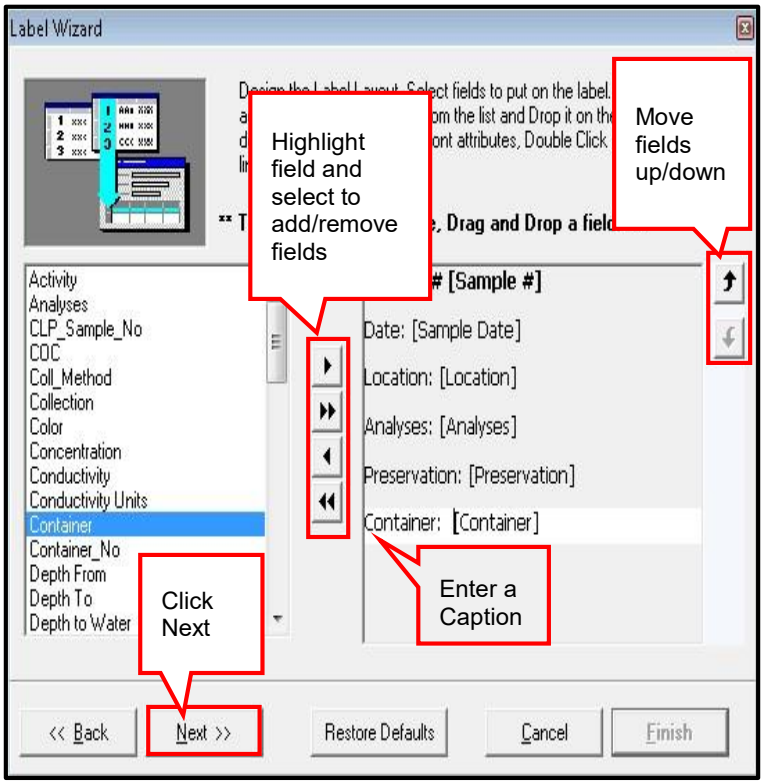
For each of the default layouts in the Samples and Sample Management sections, a default label exists. This label can be modified if necessary. Also, new custom labels can be created if you want to maintain the default label options.

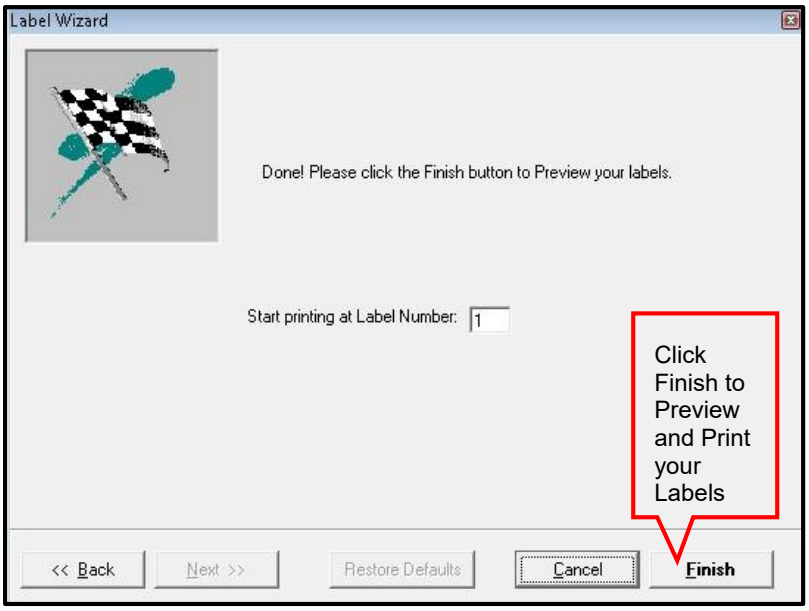
Prior to creating a Label Layout, you must first save a new Grid Layout. Labels are tied to grid layouts. Once you save a new grid layout, labels for that layout can be configured from the Print Labels button. Once the fields have been selected, that Label Layout will be available any time you select the custom grid layout it was designed under. ***Note:*** *Layouts are only saved to the section of Scribe you are in. For example, if you are creating a Label layout under the Samples section, that layout is only available in that section.*

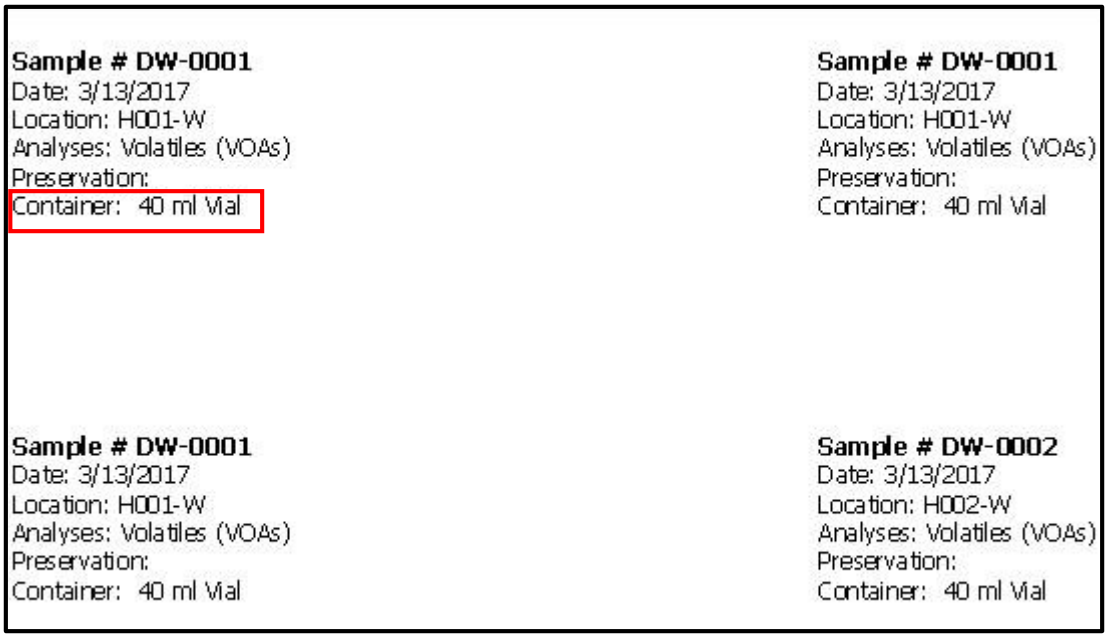



Label Wizard
Select a predefined label in the list or create a new one
Number
Description
Number across
5163
2 x 4
2
5164
3 1/3 x 4
2
5165
8 1/2 x 11
1
5167
1/2 x 1 3/4
4
Measure
Inch
Cm
Sheet
One page
Continuous
Show labels
Predefined
Custom
Customize ...
Select your label type
Create/ Customize a new label
Click Next
<< Back
Next >>
Restore Defaults
Cancel
Finish


Label Wizard
Design the Label Layout. Select fields to put on the label. To add a new line, Drag a field from the list and Drop it on the label designer. To change a line's font attributes, Double Click on a line.
** To add a New Label Line, Drag and Drop a field. **
Activity
Analyses
CLP_Sample_No
COC
Coll_Method
Collection
Color
Concentration
Conductivity
Conductivity Units
Container
Container_No
Depth From
Depth To
Depth to Water
Sample # [Sample #]
Date: [Sample Date]
Location: [Location]
Analyses: [Analyses]
Preservation: [Preservation]
Drag and Drop field(s)
Click to Restore back to Default Label
<< Back
Next >>
Restore Defaults
Cancel
Finish


Label Wizard
Highlight field and select to add/remove fields
Move fields up/down
Activity
Analyses
CLP_Sample_No
COC
Coll_Method
Collection
Color
Concentration
Conductivity
Conductivity Units
Container
Container_No
Depth From
Depth To
Depth to Water
Date: [Sample Date]
Location: [Location]
Analyses: [Analyses]
Preservation: [Preservation]
Container: [Container]
Enter a Caption
Click Next
<< Back
Next >>
Restore Defaults
Cancel
Finish





Custom Label Layout Preview

Custom Import

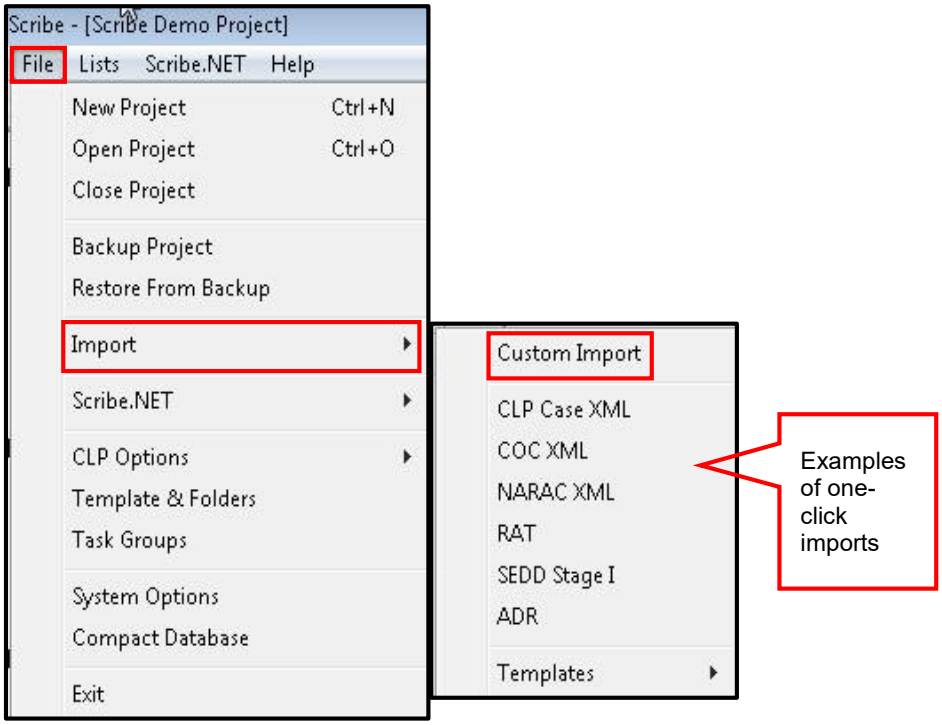
The File Menu contains several of the features described above. This section will address some of the more advanced features included with Scribe.

Import a File

Scribe supports importing of data to facilitate data entry. Rather than re-typing data into Scribe from another source (e.g., spreadsheet), the data can be imported into Scribe, thereby reducing the level of effort and transcription errors. It is very important to be familiar with the data you are importing. Column headings in your import source may differ significantly from the Column headings in Scribe.

NOTE: All file imports go through an Import Wizard that are similar in execution. This guide will only illustrate the Import process using an Electronic Data Deliverable (EDD) containing lab results. All EDDs need to be in a .csv or .txt format to go through the import process. If you are supplied with an .xlsx format, you can open it up on Excel and save it as a .csv file. PDFs are NOT Electronic Data Deliverables.

Click on File | Import | Custom Import

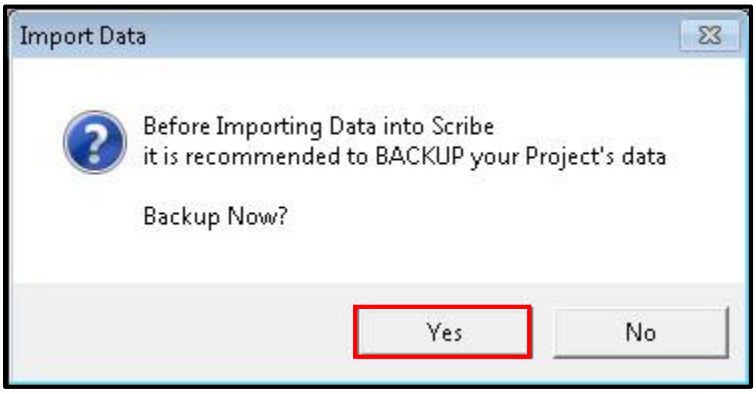


Backup Project

When doing any type of Import, Scribe will prompt you to Backup your projects data. It's always a good idea to make a backup of the project. The Backup will take a snapshot of your existing project, prior to the import. In the event something is wrong with the import data, you will be able to Restore your project prior to the import.

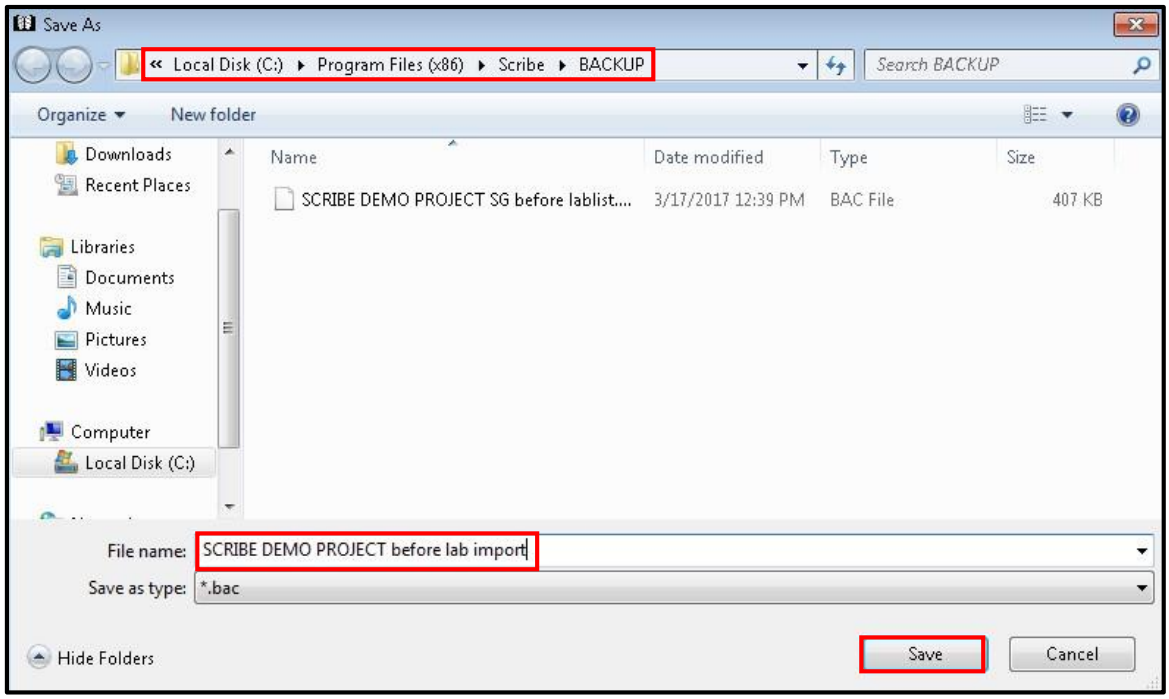
In addition to backing up your project prior to an import, you can Backup your project at anytime.

Under the File Menu select Backup Project. The following prompts remain the same throughout any backup process.



By default, Scribe will save your backup file to the BACKUP directory. BACKUPs, as well as your PROJECT files and TEMPLATE files, can be saved wherever you choose. Under the File Menu | Template and Folder, you can change your default directory or browse to another location at this screen.

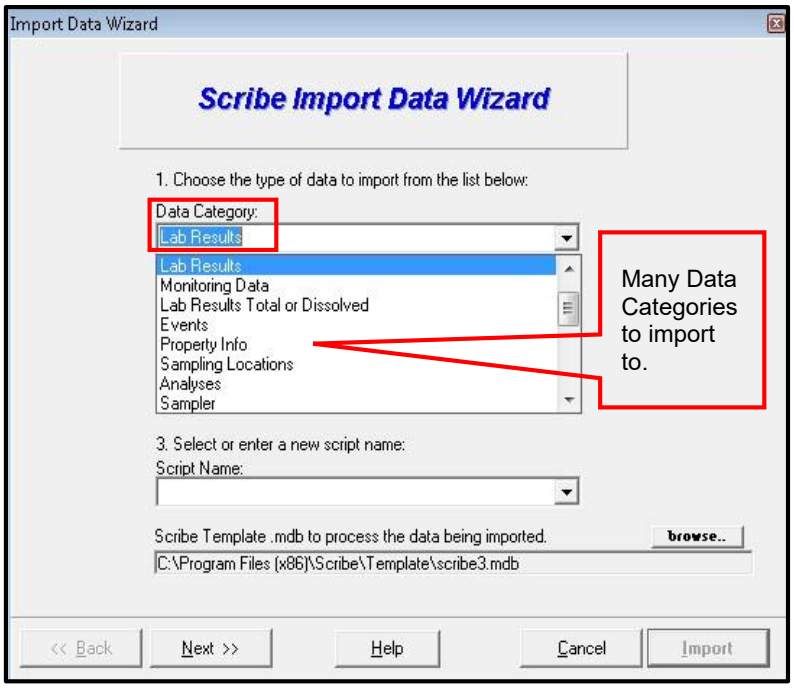
Naming your Backup file is important. By default, Scribe will stamp it with just the File Name of your project, with a .bac extension. Additional information in the file name (e.g., before import or date) is very helpful in the event there is an issue with the import and you want to restore your project prior to the import.


Save As
« Local Disk (C:) ▸ Program Files (x86) ▸ Scribe ▸ BACKUP
Search BACKUP
Organize
New folder
Downloads
Recent Places
Libraries
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
Name
Date modified
Type
Size
SCRIBE DEMO PROJECT SG before lablist....
3/17/2017 12:39 PM
BAC File
407 KB
File name:
SCRIBE DEMO PROJECT before lab import
Save as type:
*.bac
Hide Folders
Save
Cancel

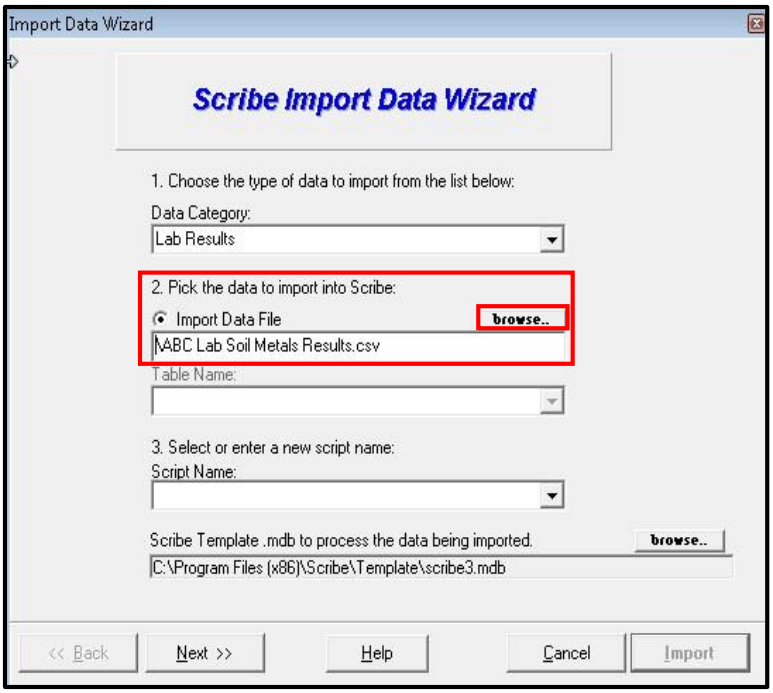
Backup
Backup To:
C:\PROGRAM
(X86)\SCRIBE
PROJECT
SCRIBE
DB
Backup
Backup Completed
OK

Scribe Import Data Wizard

The Scribe Import Data Wizard will launch. Click on the Data Category dropdown box and select the specific category you will be importing data to. In this example, we've selected Lab Results.

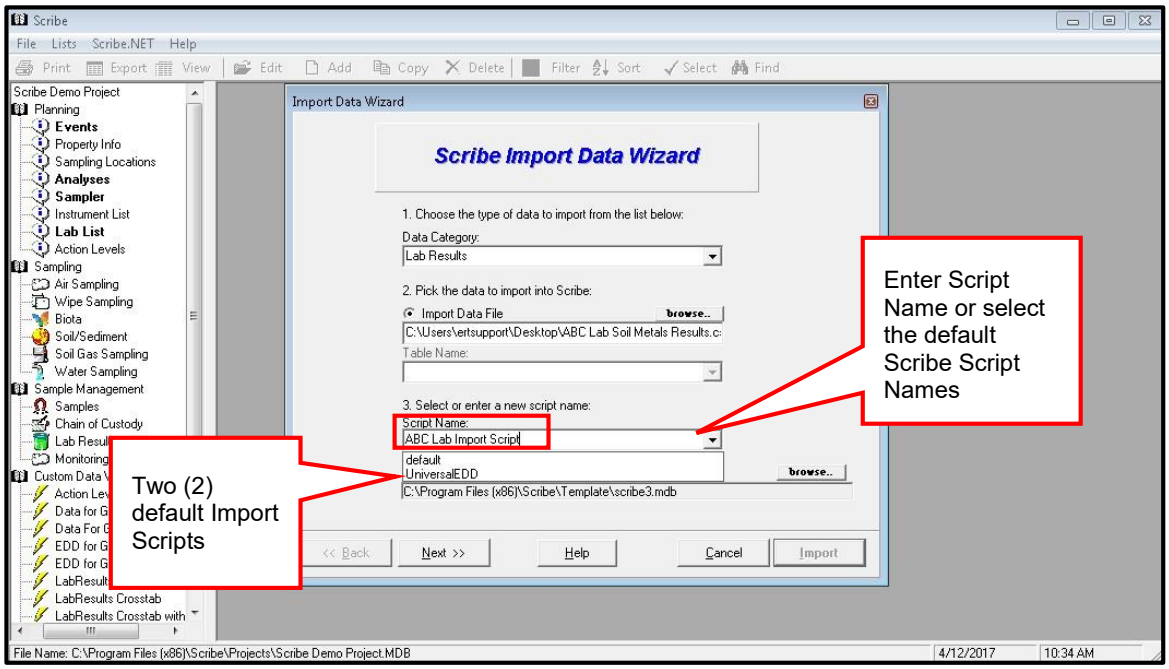


Use the 'browse' button to locate the file you want to import.

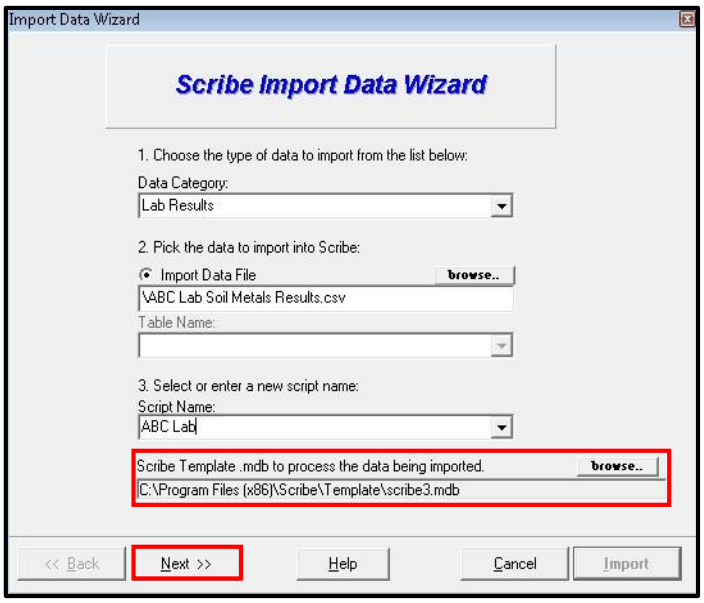


Import Scripts

Script Names provide a way to save your data mappings for a specific EDD format to avoid having to re-map future imports of similar files. For example, if you regularly get import files from a lab, you can save the data mappings to a Script Name (e.g., ABC Lab). Subsequent files from ABC Lab would not require re-mapping the data fields when importing. **Note:** *Script Names must be entered **prior** to mapping the fields. In this example, we are creating a Script Name for our ABC Lab Import.*

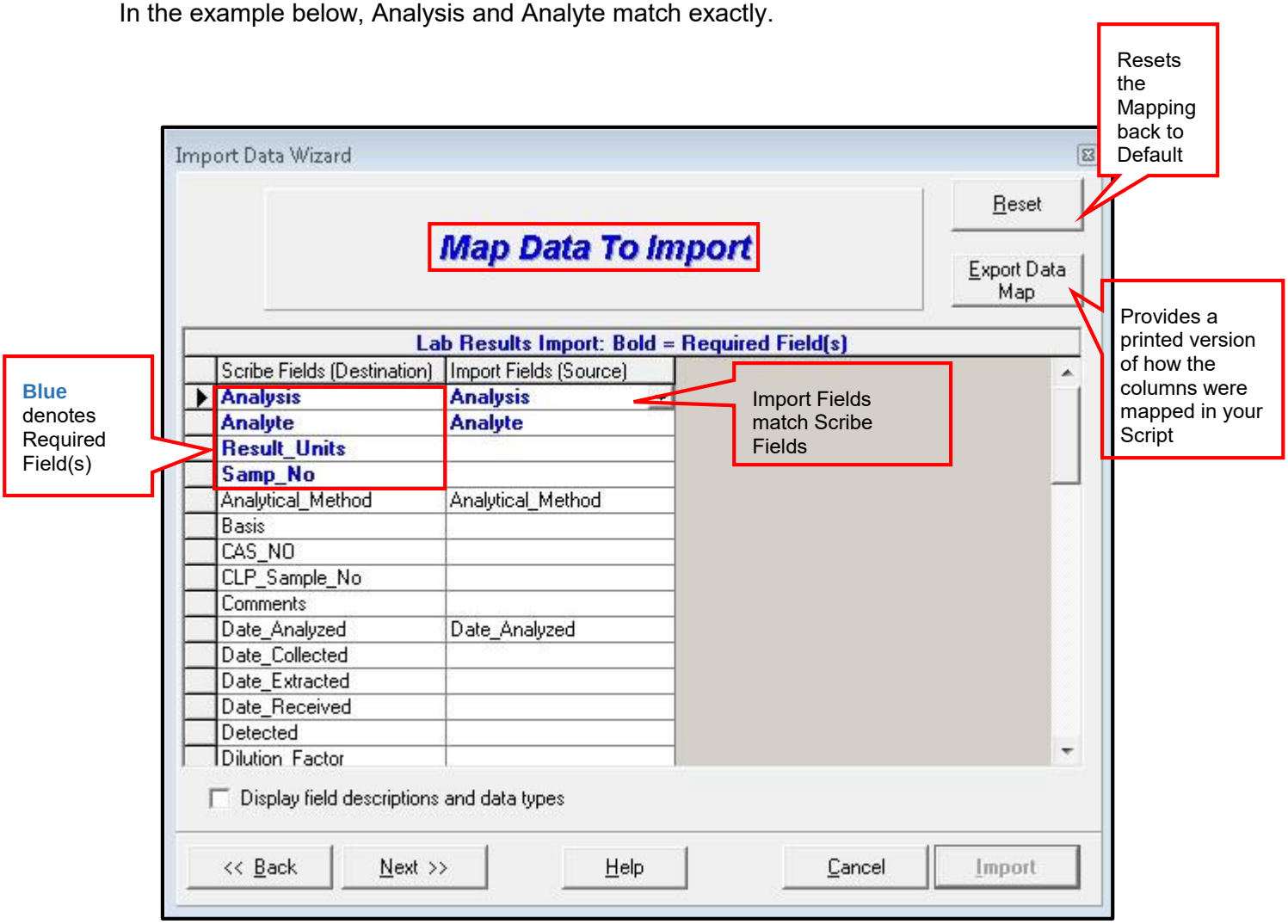


By default, Scribe uses the scribe3.mdb template file. If you are using a site/region specific template file, browse to where the file is stored. In this example, we will use the default Scribe template. When completed, click on Next.

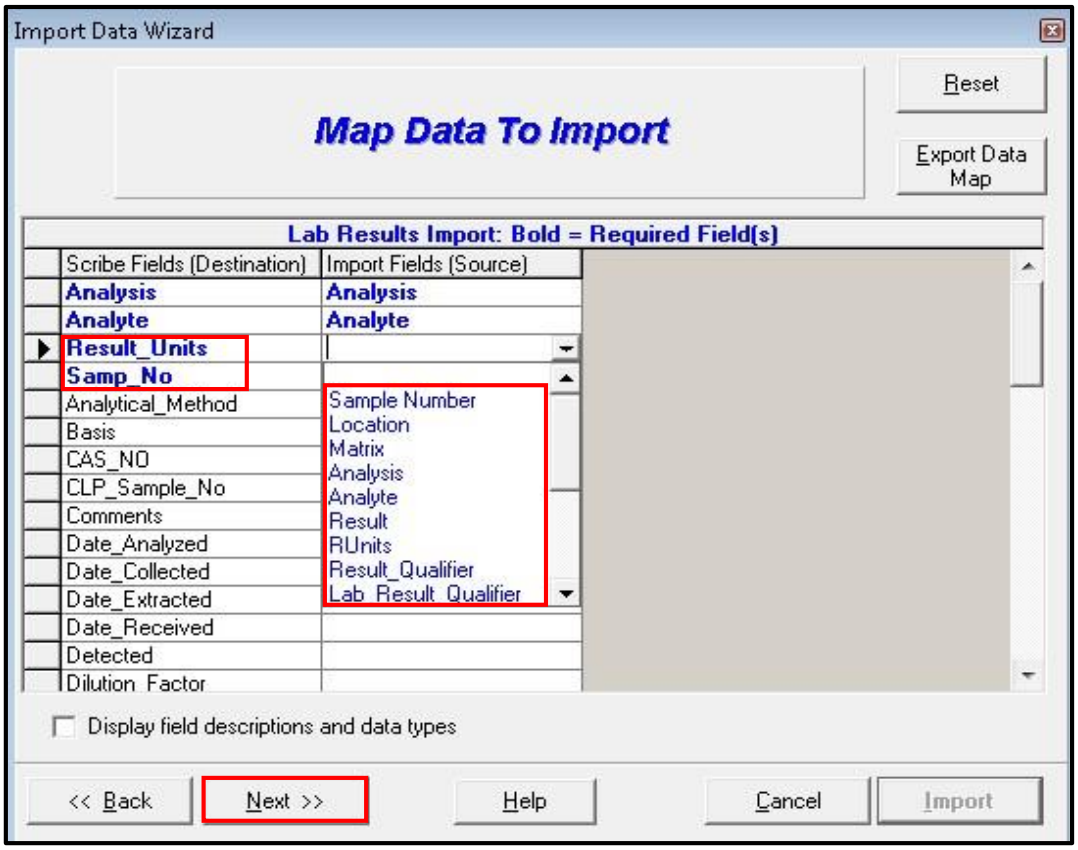


Map Data To Import

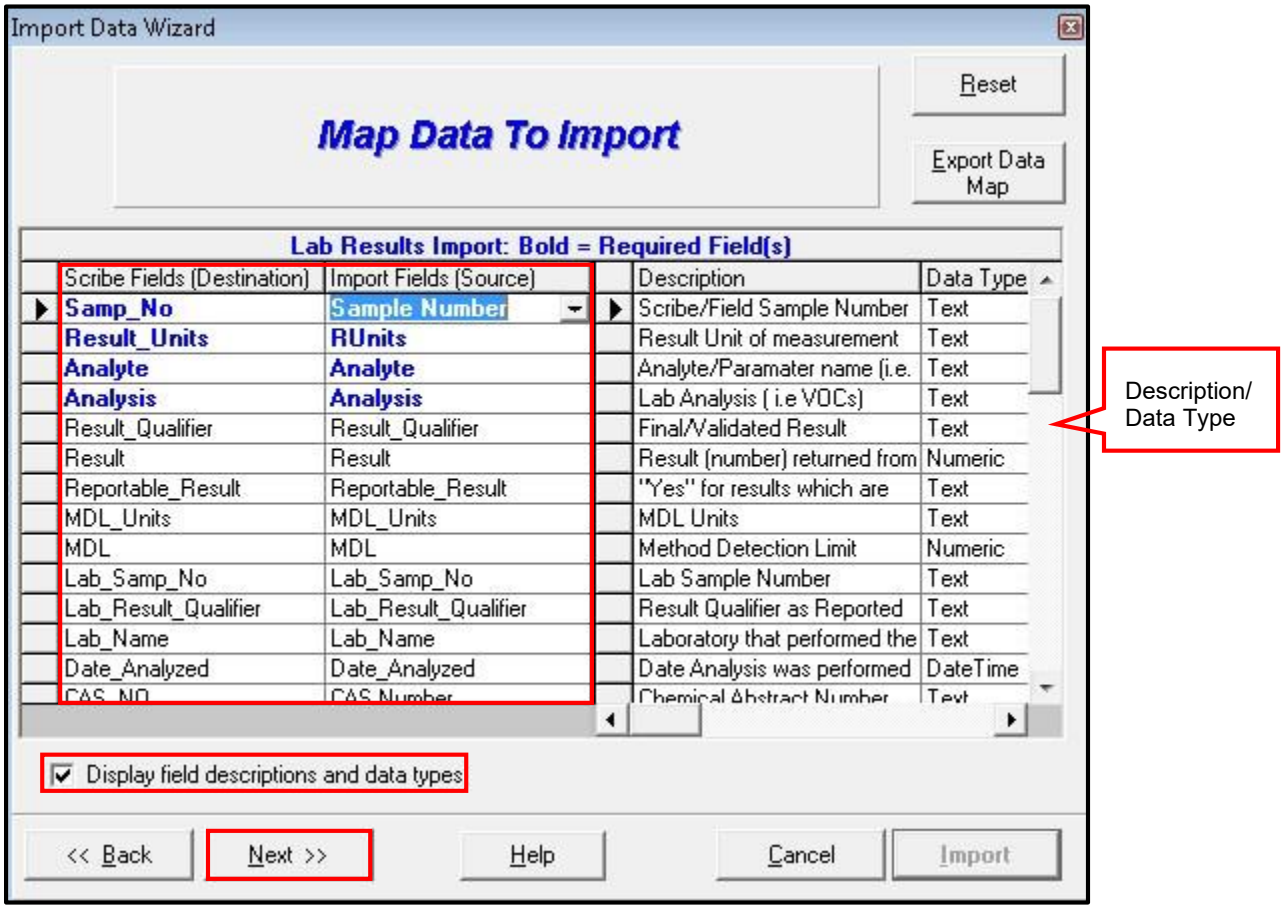
The 'Map Data To Import' window allows you to correlate Scribe data headings with the information contained in the EDD file. Any fields highlighted in **Blue** are required fields and must be mapped for the data to be imported. If the EDD (Import Fields (Source)) column headers match the Scribe Fields Destination, they will be mapped automatically. In the example below, Analysis and Analyte match exactly.



If headings do not match (e.g. Result_Units and Samp_No), click on the dropdown arrow in the cell to view the list of column headings in your EDD. Select the correct field in the EDD to map. Only data in the mapped fields will be imported into Scribe. Any heading that is not mapped will not be imported. ***NOTE**: As indicated earlier, it is very important to be familiar with your EDD. Knowing what your column headings are and what data is contained in them before the import will help eliminate any errors of data being mapped incorrectly.*

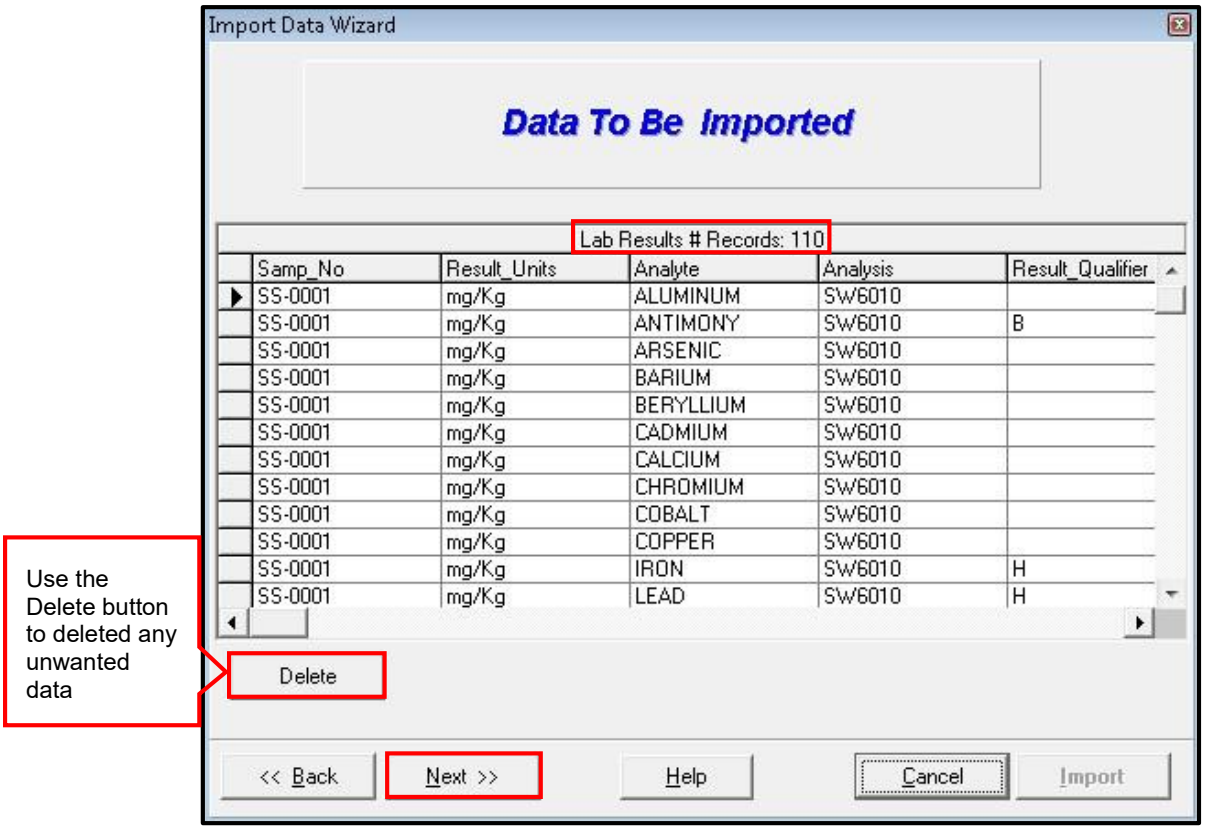


Continue mapping all other fields, as needed. ***NOTE:*** *To view the Scribe Field Description and Data Types, place a checkmark in the Display field descriptions and data types.* When all of the fields have been mapped, click Next.



Data To Be Imported

All data to be imported is displayed for you to review **before** the import process begins. ***NOTE**: As indicated earlier, it is very important to be familiar with your EDD. This screen will give you a preview of how many records will be imported and how you mapped your data. If something is mapped incorrectly, use the Back button to get back to the Map Data To Import screen.* Click the Next button to continue.



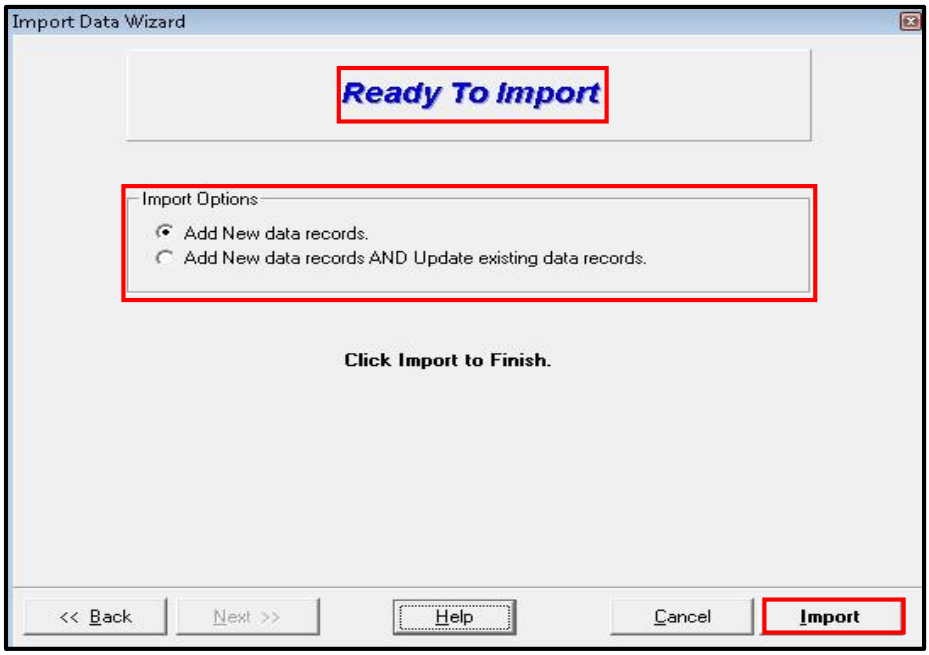
Ready To Import

The 'Ready to Import' screen opens. You are presented with two (2) Import Options:

- Add New data records
- Add New data records AND update existing data records

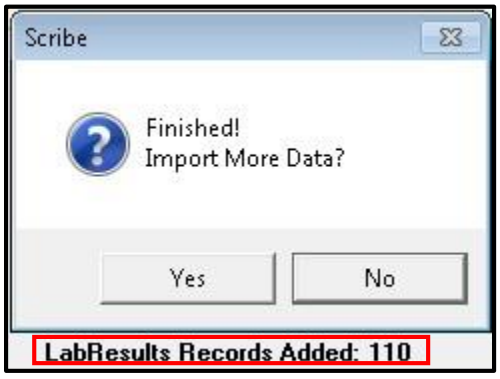
Add New data records is on by default. If this is the first time bringing this data set into Scribe, you would select this option.

Add New data records AND Update existing data records. Use this option if updates need to be made to data already loaded or if additional information needs to be added to data already loaded.

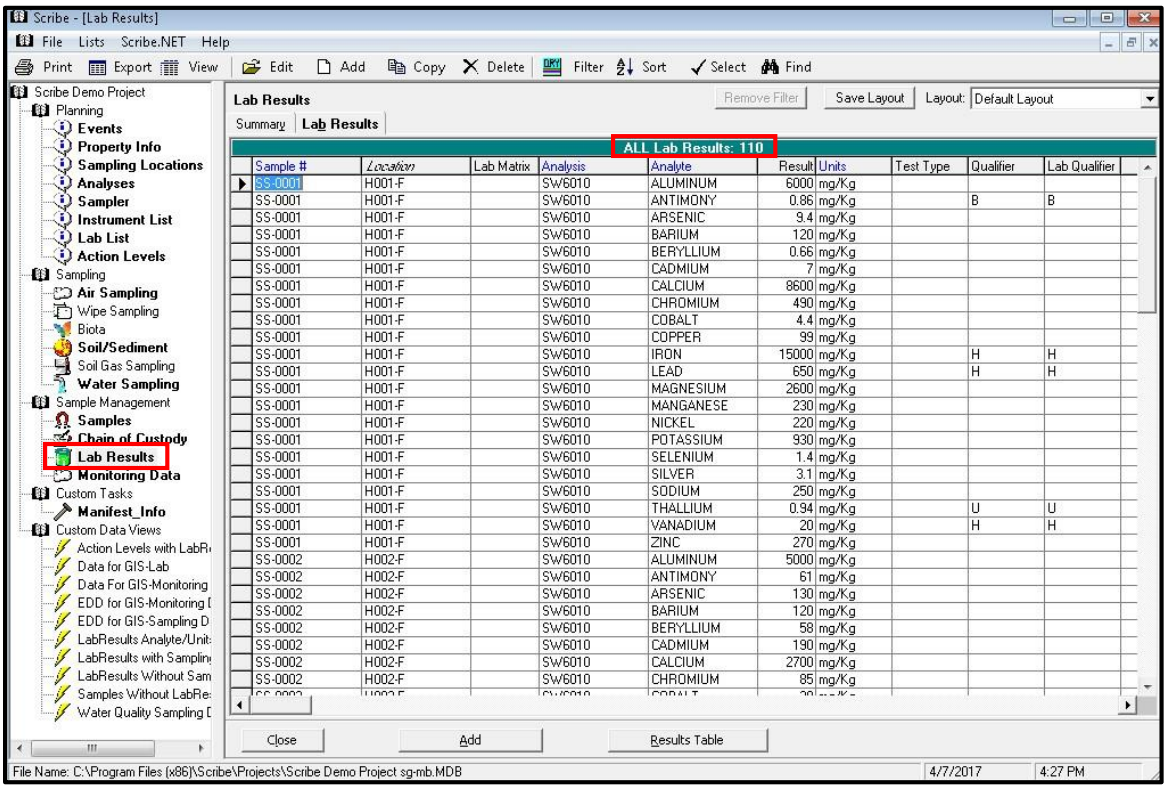


Once the import is complete, a prompt appears asking if you wish to import more data. If no more data is to be imported, click No.

Displays # of records added



In this Import example, Lab Results were imported. Clicking on 'Lab Results' in the Navigation Pane will open the Lab Results window and display the imported records. 110 LabResult Records were imported and are displayed. ***NOTE:*** *To manually add Lab Results, please refer to Field Use Basics – Part 2 Guide.*



Export Data Map Example

A	B
Scribe Fields (Destination)	Import Fields (Source)
Samp_No	Sample Number
Result_Units	RUnits
Analyte	Analyte
Analysis	Analysis
Result_Qualifier	Result_Qualifier
Result	Result
Reportable_Result	Reportable_Result
MDL_Units	MDL_Units
MDL	MDL
Lab_Samp_No	Lab_Samp_No
Lab_Result_Qualifier	Lab_Result_Qualifier
Lab_Name	Lab_Name
Date_Analyzed	Date_Analyzed
Analytical_Method	Analytical_Method
Basis	
CAS_NO	
CLP_Sample_No	

Custom Data

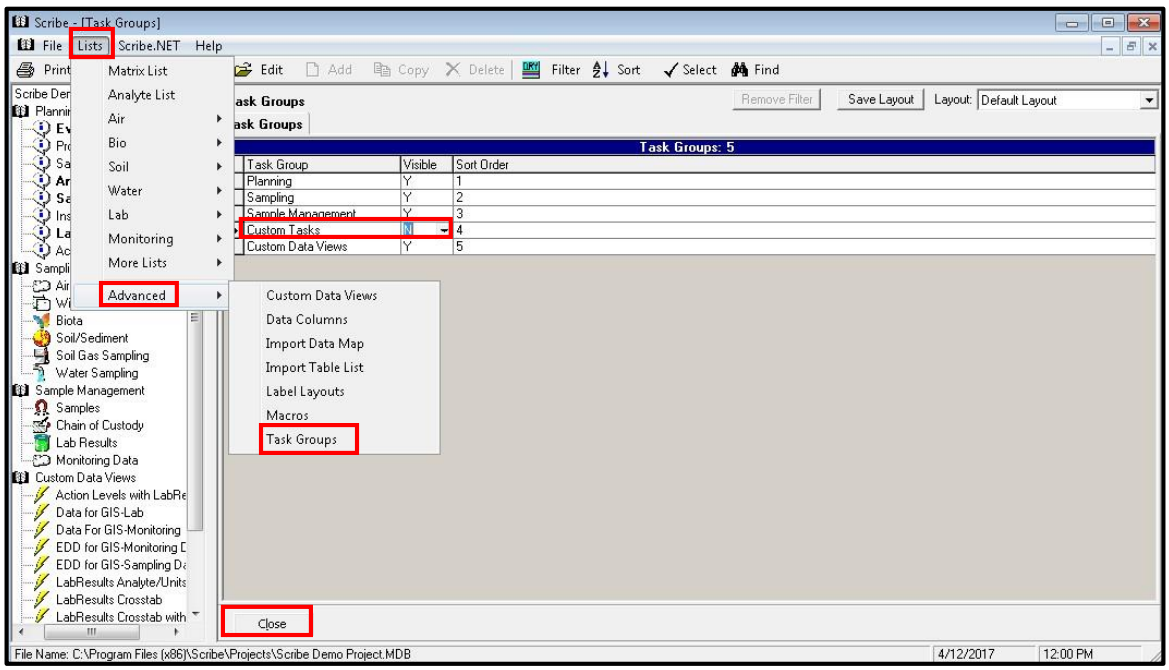
Custom Tasks and Custom Data Views are Scribe advanced features that allow users to either import or reference data external to the Scribe database. It can also be used for providing a one-click access to commonly used queries. The user must possess an understanding of Microsoft Access to create new tables for use in Custom Tasks or write a query that Scribe can then use in Custom Data Views. Scribe is the User Interface (UI) for the new database elements. Once created, the new database elements can be imported into Scribe as a new table (Custom Task) or query (Custom Data View). Below describes how to add these database elements to your Scribe project.

For additional information on creating Custom Tasks and Custom Data Views please refer to the Custom Tasks Guide and Custom Data Views Guide or contact ertsupport at 1-800-999-6990 or ertsupport@epa.gov.

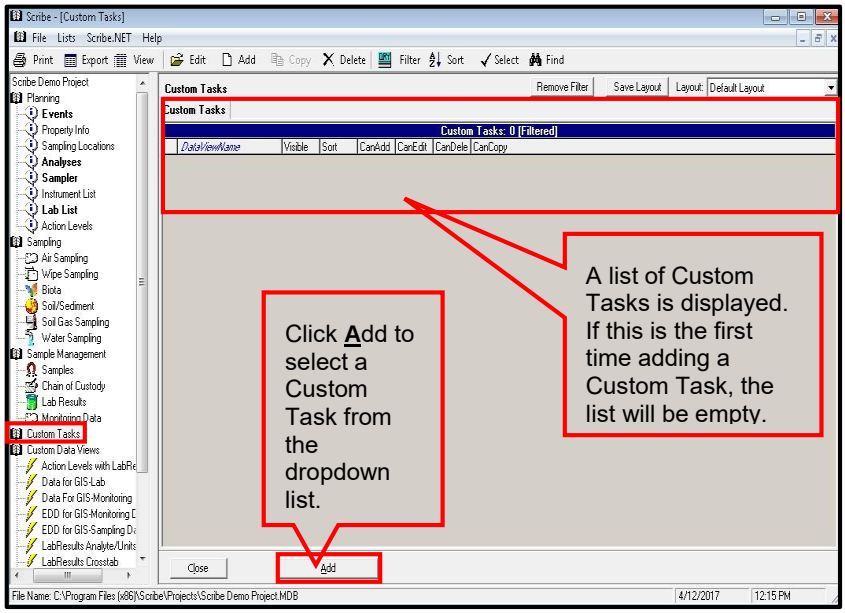
Adding Custom Tasks

When users have identified data that needs to be captured in their Scribe Project that is not native to the Scribe Database, it may be necessary to add a new table (Custom Task) to the database using MS Access. By adding this table to the database and exposing it in the Scribe User Interface (UI), users will be able to utilize many of the data functions available in Scribe (e.g., Data Entry, Import, Find, Filter and Sort). ***Note: To expose the Custom Task in your Scribe project, you must have already created the table, through MS Access in the Scribe project.***

Click on 'Lists' from the top menu bar and select the 'Advanced' option.
Then select the 'Task Group's option. A list of Task Groups is displayed.
Modify the Visibility of the Custom Tasks Column to **'Y'** by clicking on the down arrow.
Click Close.

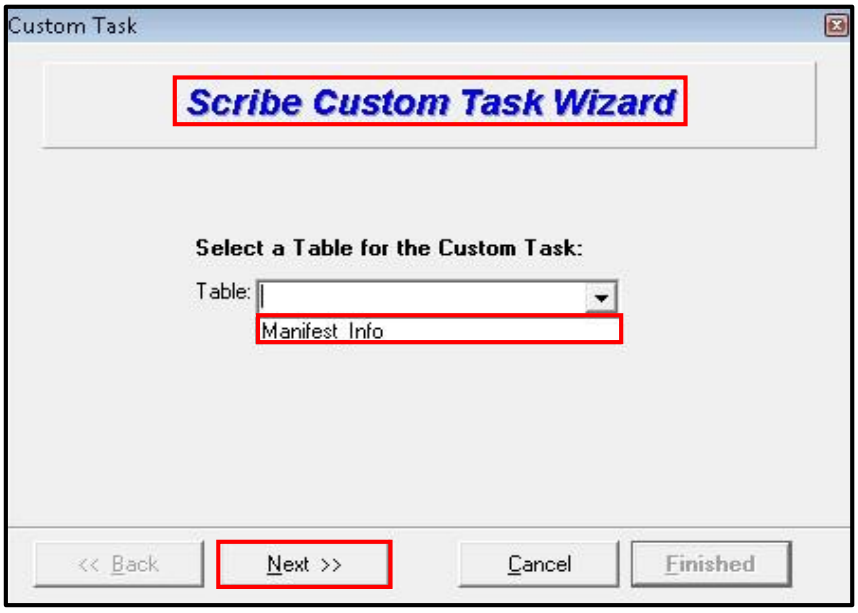


The Custom Tasks option will now be available in the Navigation Pane, below Sample Management. Click Add



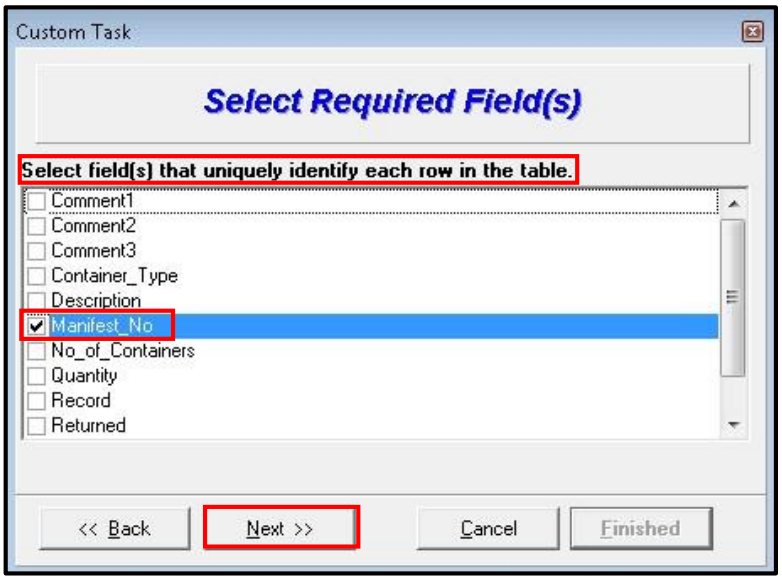
In this example, we created a Manifest table in MS Access to track Manifest data for the project. ***NOTE:*** *After adding a new database element to a Scribe project .mdb, the associated Scribe template file must also be updated with the new database element if additional data will be added using Scribe's Import wizard. If the default Scribe3.mdb template is updated, the new database element will appear in every subsequent new Scribe project created with that template.* **See Modify Scribe Template section**.

The Scribe Custom Task Wizard will display. Select the Manifest_Info table and click Next

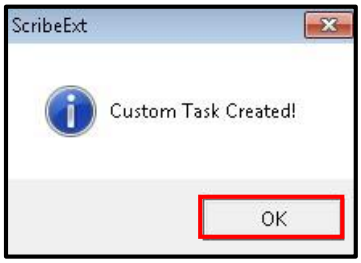


In our example, the Primary Key in the Manifest table was defined with an AutoNumber field in MS Access. Scribe, however requires that the table be defined with unique fields other than the Primary Key. The field/fields that make up a unique record in the custom table must be defined before the table is added to Scribe's user interface.

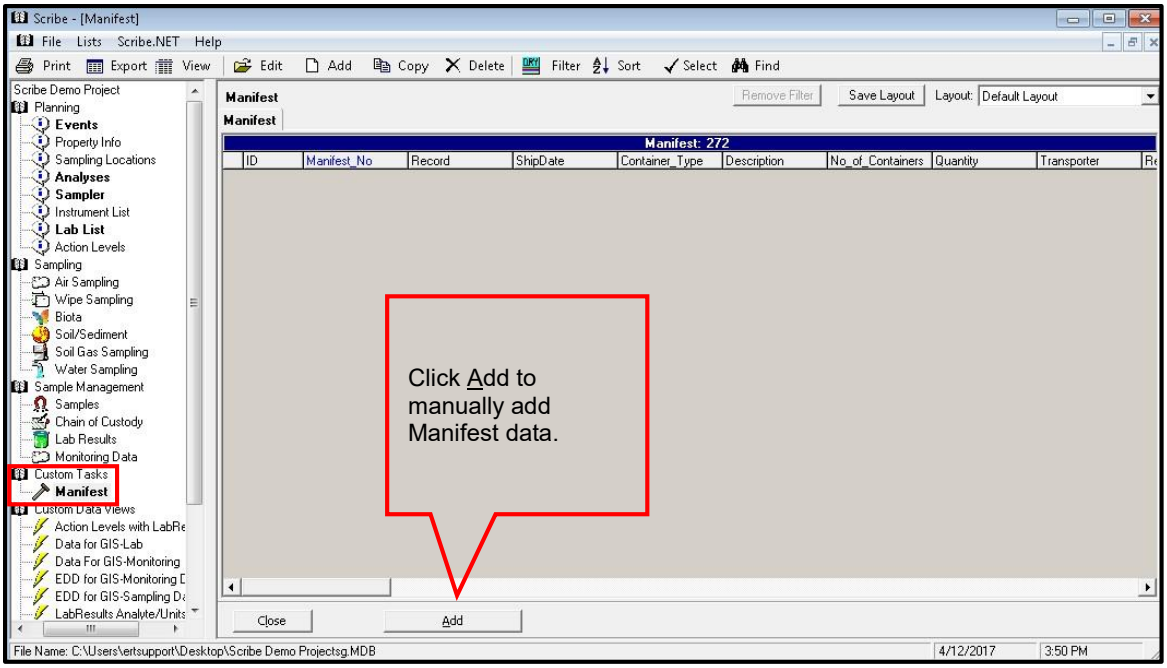
Check the 'Manifest_No" field to uniquely identify each row in the table. Click the Next button to continue.



Enter a name for the Custom Task and Click Finished. Click OK.



The Manifest Task is now listed under Custom Tasks. Access to the Manifest table is now available in the Scribe UI by clocking on Manifest under Custom Tasks. The field from the Manifest table are displayed, but there are no records in the table yet.



If additional data will be added using Scribe's Import wizard, the Scribe template file must be updated with the new database element. **Please see Update Scribe Template section of this guide.**

Add a Custom Data View

When users have identified data that needs to be provided over and over again and creating filters and sorts become cumbersome, an advanced feature would be to create a Custom Data View (query) that would provide a one-click option to answer the same commonly asked question over and over again. The user must possess an understanding of Microsoft Access to write a query that Scribe can use in Custom Data Views. Scribe is the User Interface (UI) for the new database elements. Once created, the new database elements can be imported in Scribe as a new query (Custom Data View). Below describes how to add these database elements to your Scribe project. ***Note: To expose the Custom Data View in your Scribe project, you must have already created the query, through MS Access in the Scribe project.***

For additional information on creating Custom Tasks and Custom Data Views please refer to the Custom Tasks Guide and Custom Data Views Guide or contact ertsupport at 1-800-999-6990 or ertsupport@epa.gov.

Update/Modify Scribe Template

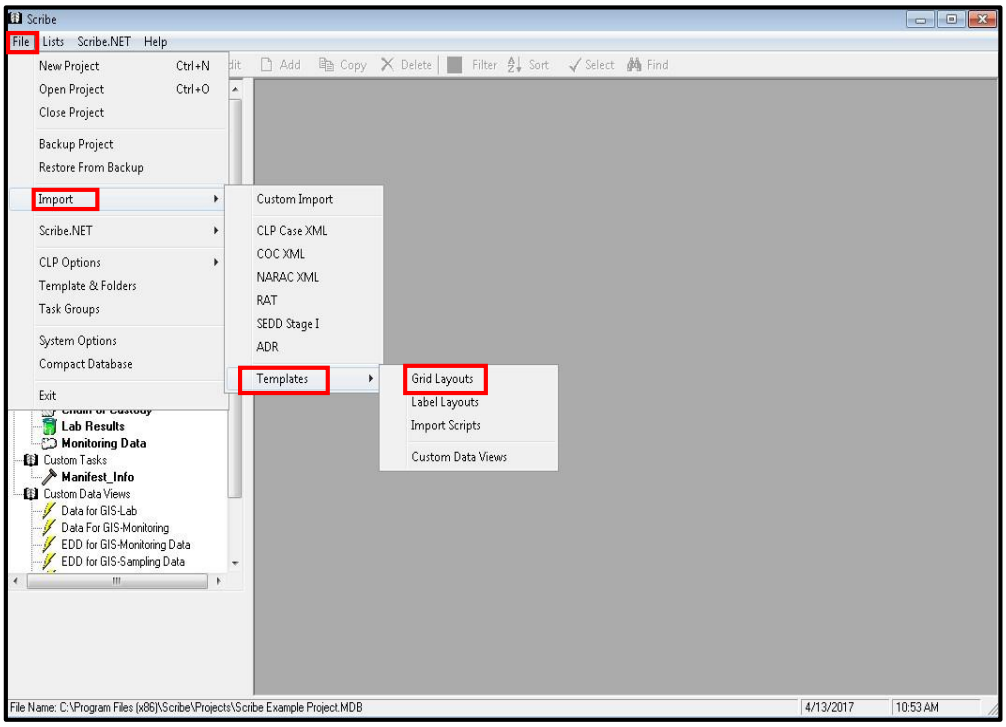
After adding a new table (Custom Task) or adding new database elements to an existing Scribe project table. The associated Scribe template file must also be updated if additional data will be added using Scribe's Import wizard.

Import Templates

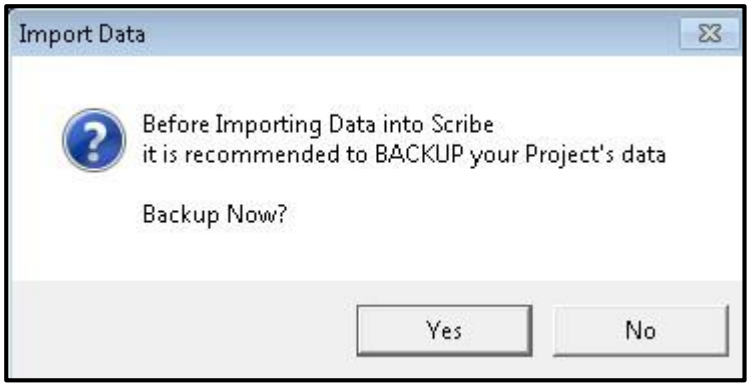
Customized layouts that were saved in previous Scribe projects can be imported into other Scribe projects. This section will describe how to import your Grid and Label layouts, Import Scripts and Custom Data Views into other Scribe projects.

Grid Layout

Click on File | Import | Templates and select Grid Layouts



A prompt to Backup your project will display. Click Yes or No. (*See Custom Import | Backup your Project*)

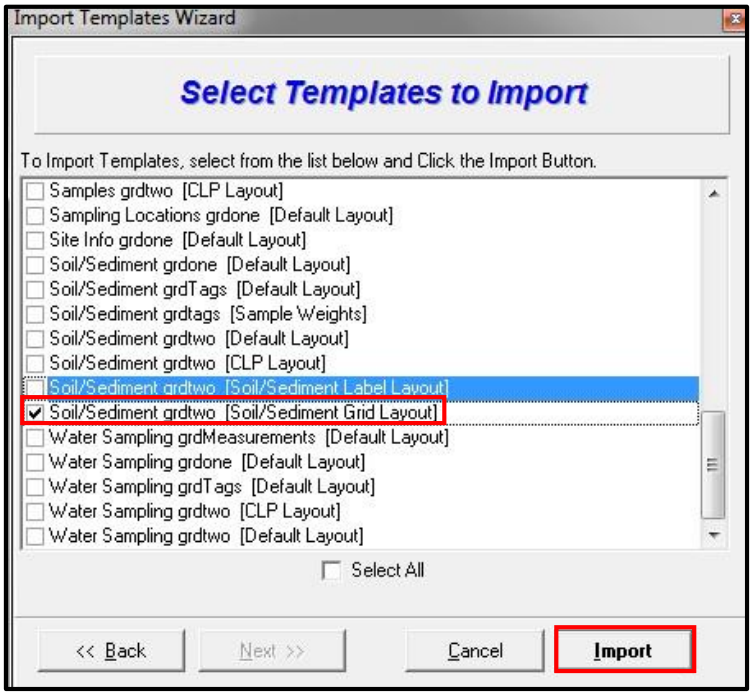


The Scribe Import Templates Wizard will display.

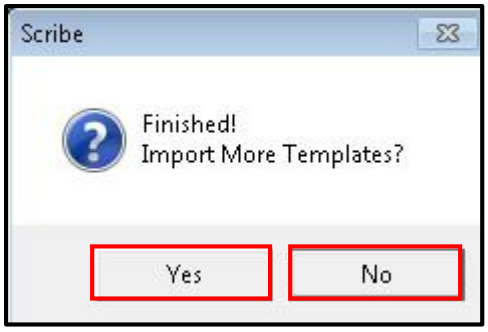
Browse to the Scribe project that you are importing templates from.

Click Next.

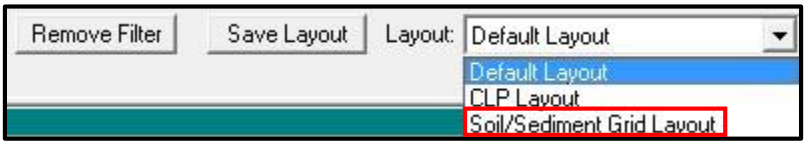
Select the Grid Layout(s) to be imported. Click Import.



When finished, you will be prompted to Import More Templates? Click Yes or No.



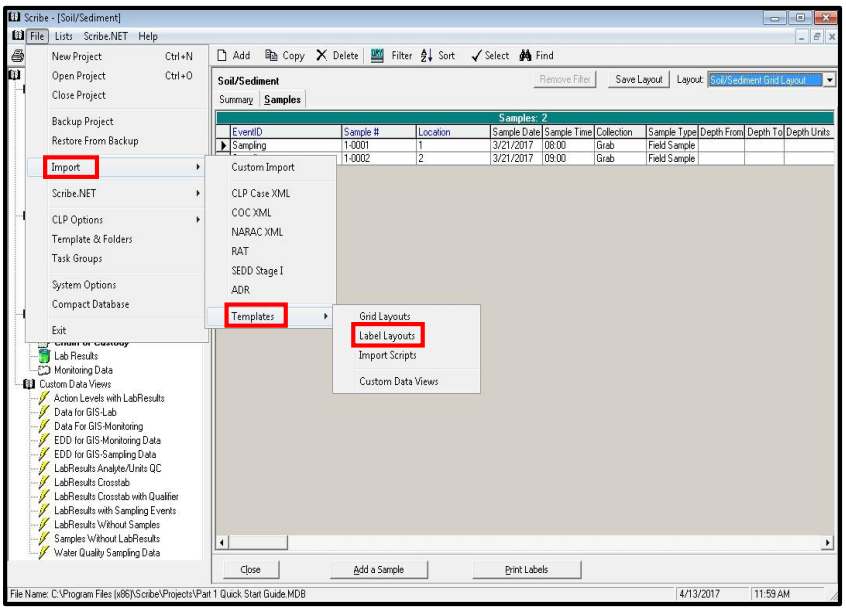
The Grid Layout is now available in the dropdown.



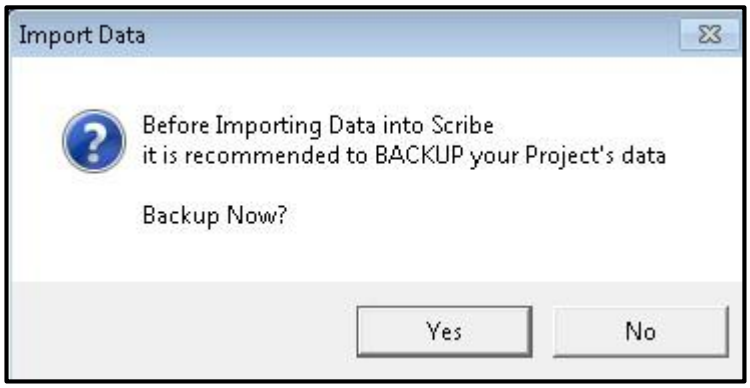
Note: *Layouts (Grid and Labels) are only imported to the section of Scribe they were created in. In this example, we are importing the Soil/Sediment Grid Layout that will import to the Soil/Sediment section in Scribe.*

Label Layout

Click on File | Import | Templates and select Label Layouts



A prompt to Backup your project will display. Click Yes or No. See Custom Import | Backup your Project.

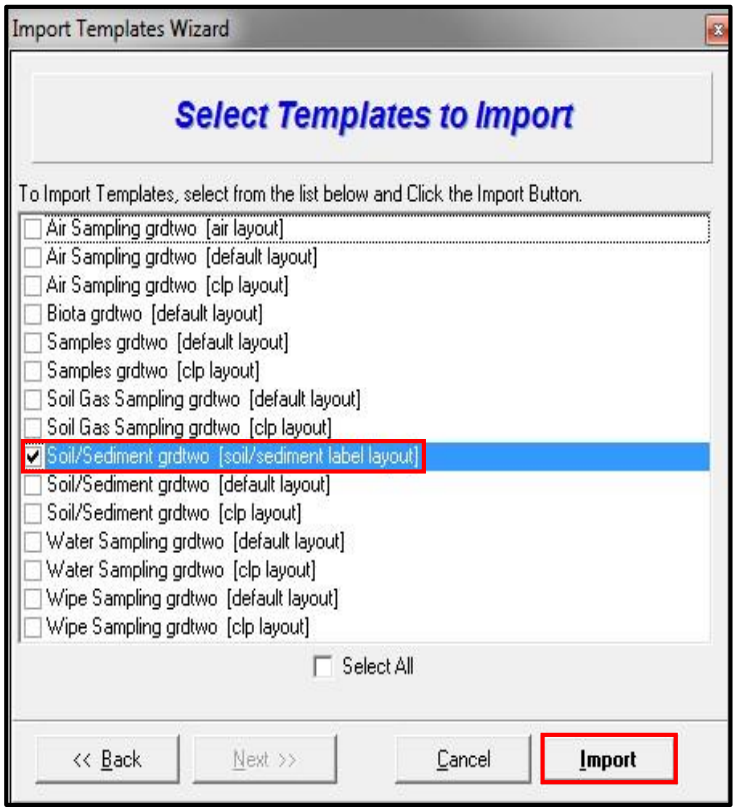


The Scribe Import Templates Wizard will display.

Browse to the Scribe project that that you are importing templates from.

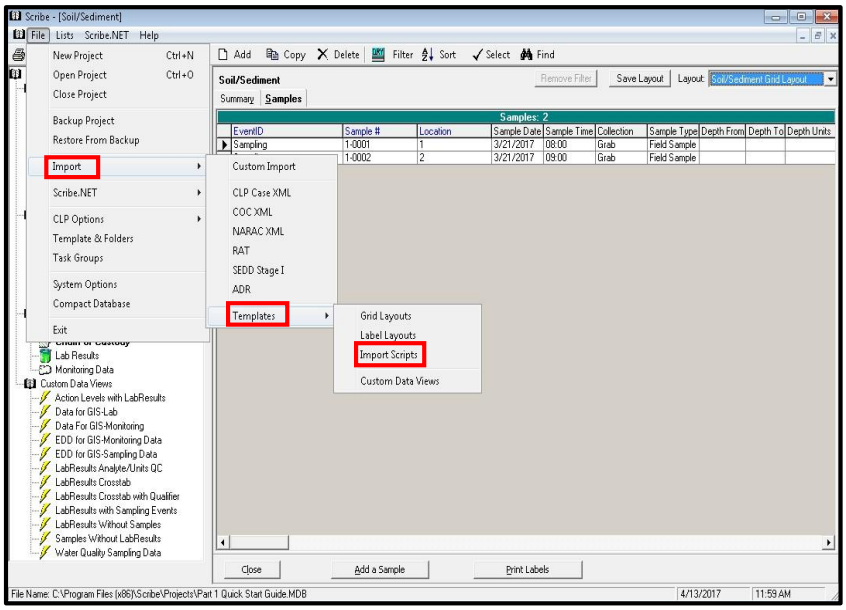
Click Next.

Select the Label Layout(s) to be imported. ***Note:*** *Layouts (Grid and Labels) are only imported to the section of Scribe they were created in. In this example, we are importing the Soil/Sediment Grid Layout that will import to the Soil/Sediment section in Scribe.* Click Import

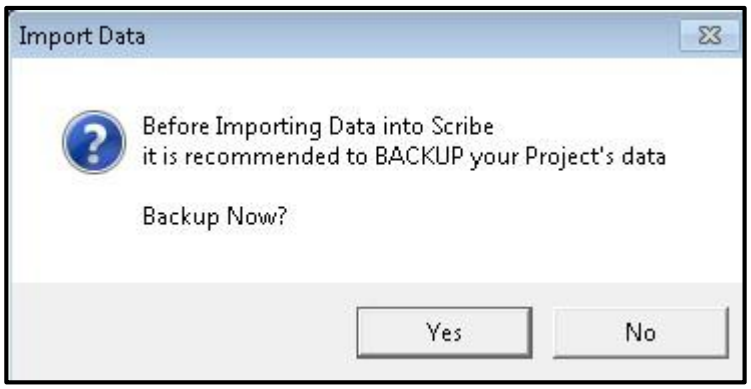


Import Scripts

Click on File | Import | Templates and select Import Scripts



A prompt to Backup your project will display. Click Yes or No. See Custom Import | Backup your Project.

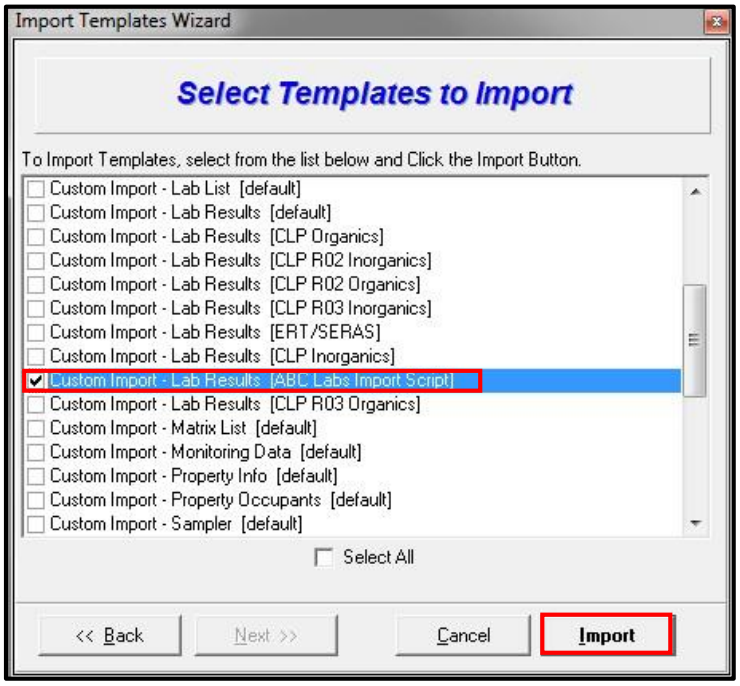


The Scribe Import Templates Wizard will display.

Browse to the Scribe project that that you are importing templates from.

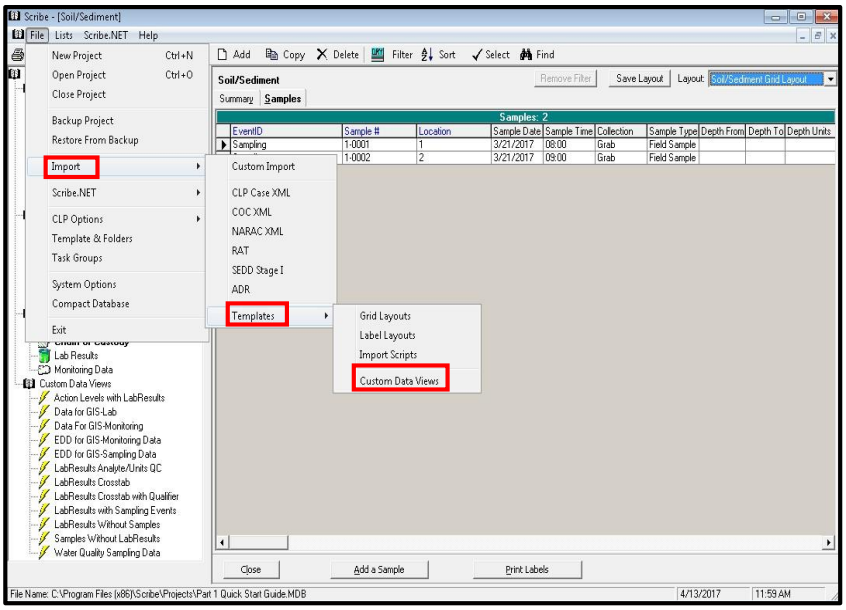
Click Next.

Select the Import Script(s) to be imported. Click Import

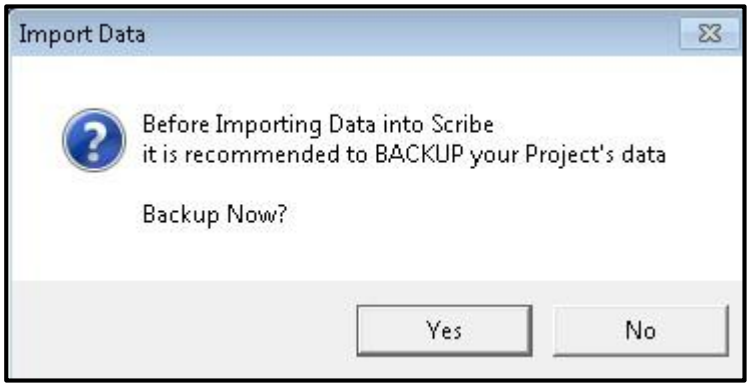


Custom Data Views

Click on File | Import | Templates and select Label Layouts



A prompt to Backup your project will display. Click Yes or No. See Custom Import | Backup your Project.

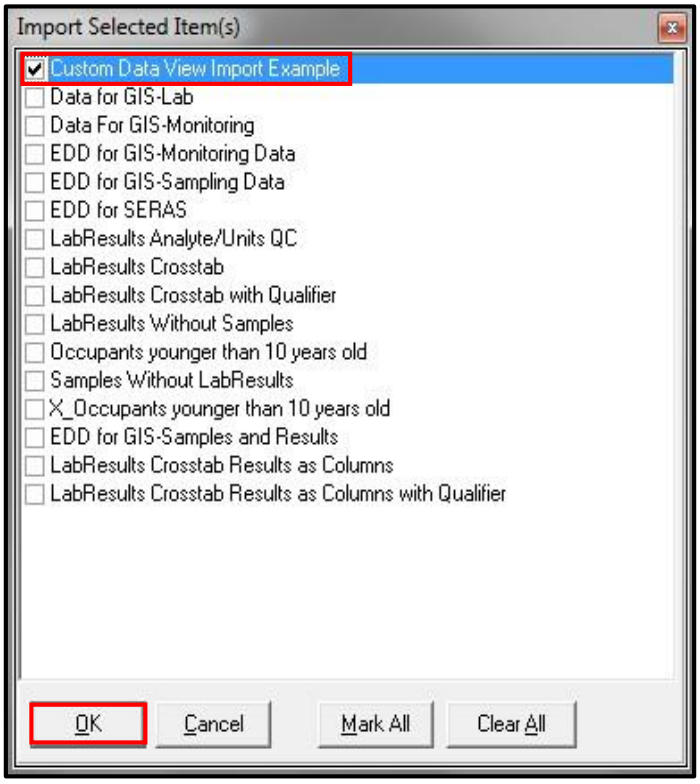


The Scribe Import Templates Wizard will display.

Browse to the Scribe project that that you are importing templates from.

Click Next.

Select the Custom Data View(s) to be imported. Click OK.



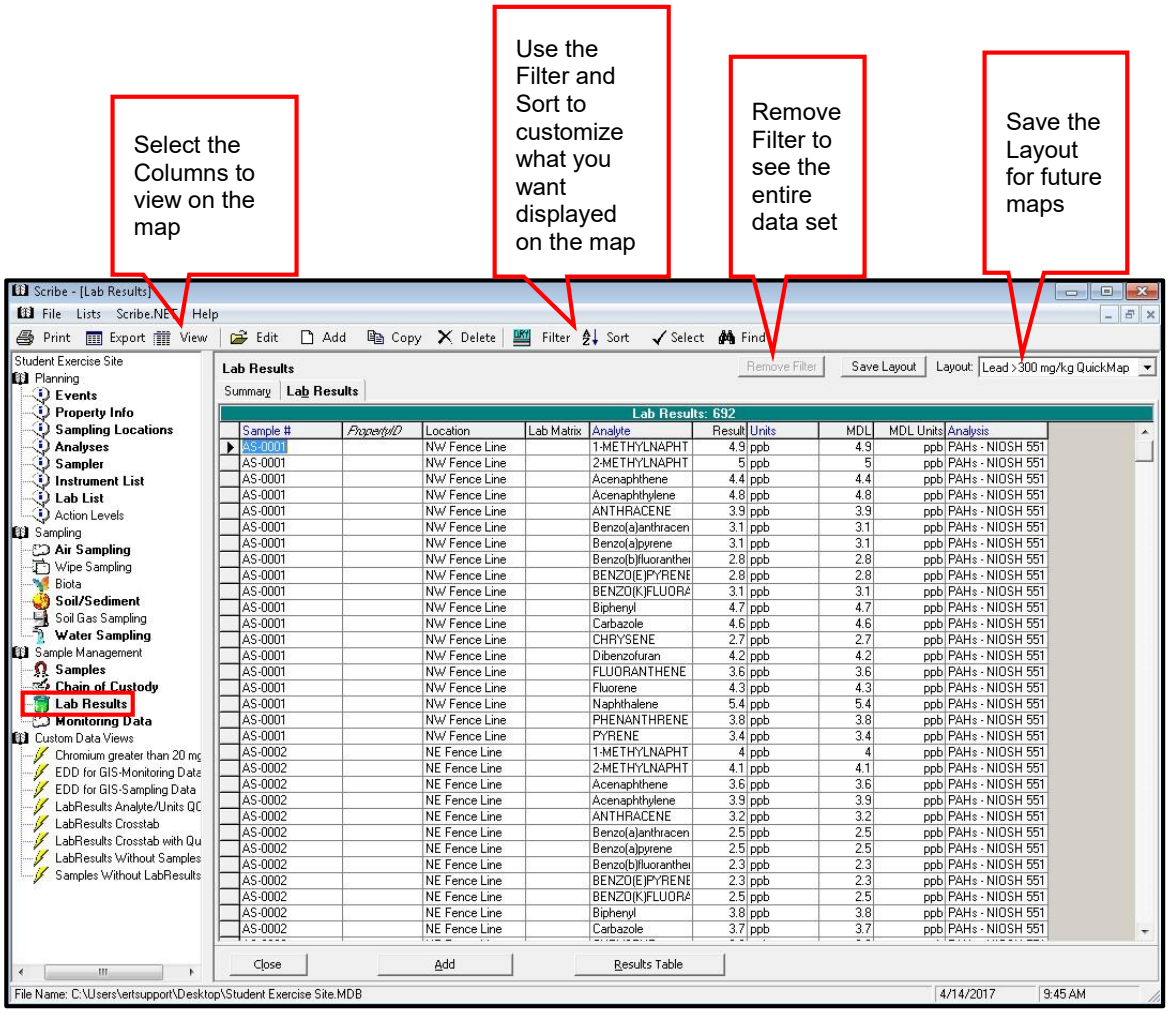
QuickMap

The option to export to a Quickmap (powered by Google Earth) is available in any section of Scribe than can display (view) longitude and latitude (e.g. Sampling Locations, Property Info, Samples task and the EDD to GIS custom data views). To use the Quickmap option an internet connection is required. To download Google Earth visit http://earth.google.com/download-earth.html.

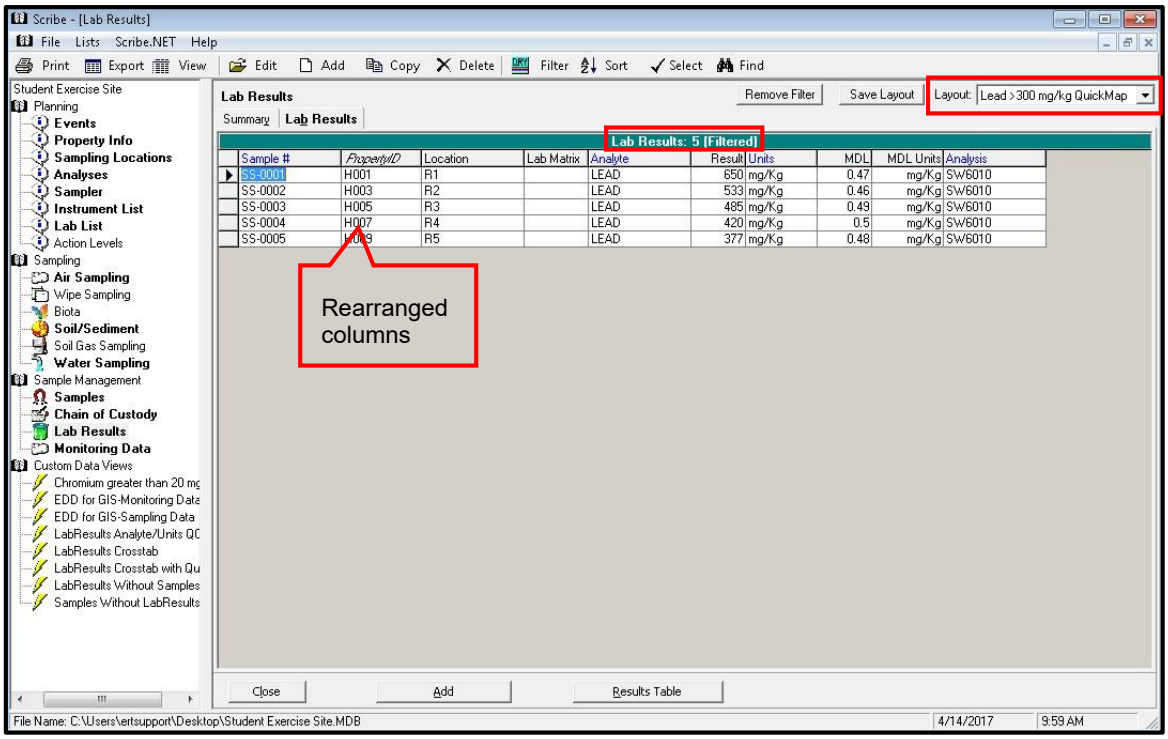
Creating a QuickMap

The Scribe grid screens are ideal for creating QuickMaps for reporting purposes. In the example below, a grid layout will be created for all Lead Levels above 300 and generate a QuickMap to display the data in Google Earth. The QuickMap will be generated from the Lab Results table of our project.

Click on Lab Results and click the 'Remove Filter' button so the entire data set is available. Use Scribes Filter, Sorts, etc. to display the data that will be displayed on the QuickMap.



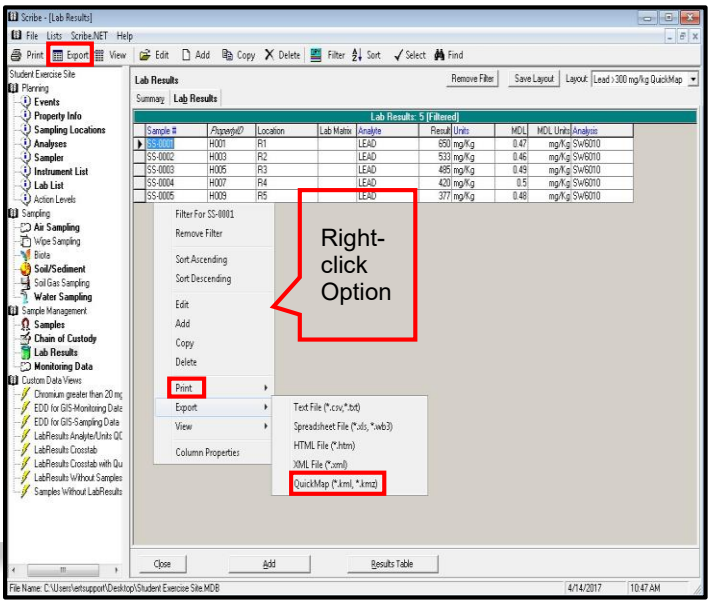
In this example, we Filtered for Lead >300 mg/kg in Ascending Sort order, limited our view to specific columns, moved (rearranged) the column order and created a Layout.



Generate a QuickMap

If your data contains latitude and longitude values, you can generate the QuickMap to display in Google Earth.

Click the Export button from the Toolbar (or use the right-click option). Select QuickMap (*.kml, *.kmz)

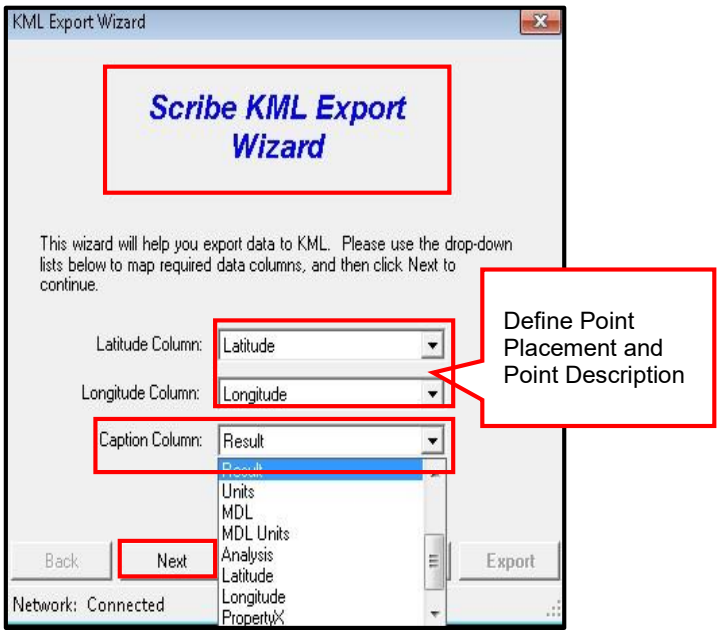


The Scribe KML Export Wizard will launch. Latitude and Longitude fields are mapped automatically.

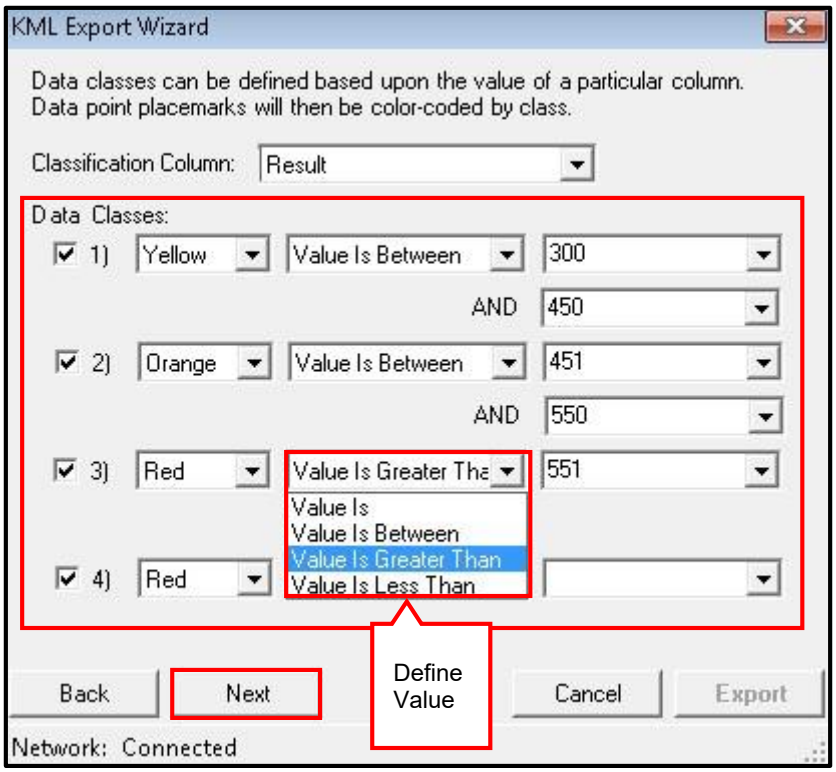
Click the down arrow to display a picklist of fields available based on your grid data (discussed above).

Select the field that will be used to identify (label) the individual data points on the map (e.g. Result or SampleID). In this example, we are using the Result field.

Click Next.

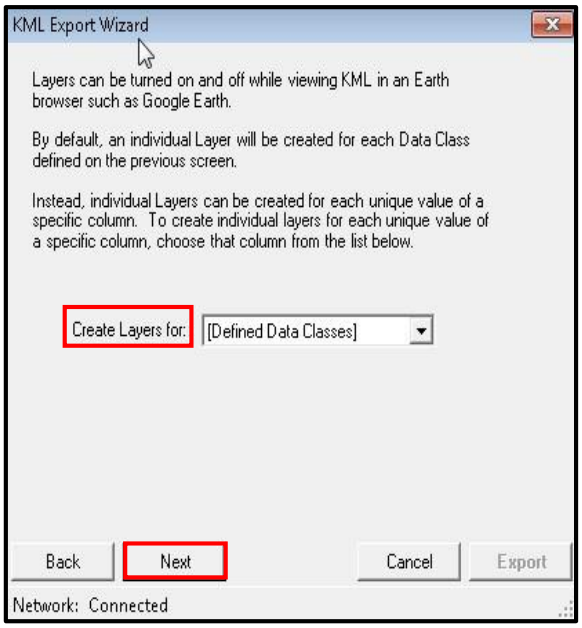


Define the Data classes of the data points. When the map is displayed, the property colors will be based on the result value. In this example, we've classified each data point based on the Results value greater than.
Click Next.



This screen allows you to create additional layers to turn on and off in Google Earth.

For example, if you used Sublocation to define front yards and backyards, you could define a layer for Sublocation and turn the yard info on and off in Google Earth.
Click Next.

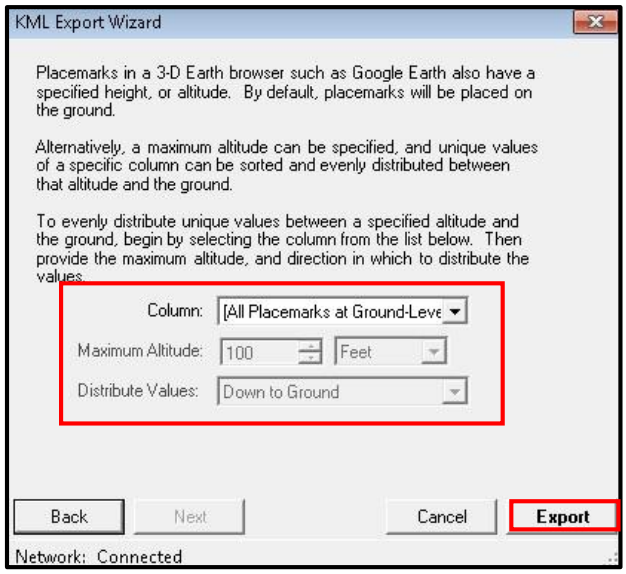


This screen allows you to define Placemarks. Datapoints can be displayed in a 3D format based on a value allowing the user to stack data points.

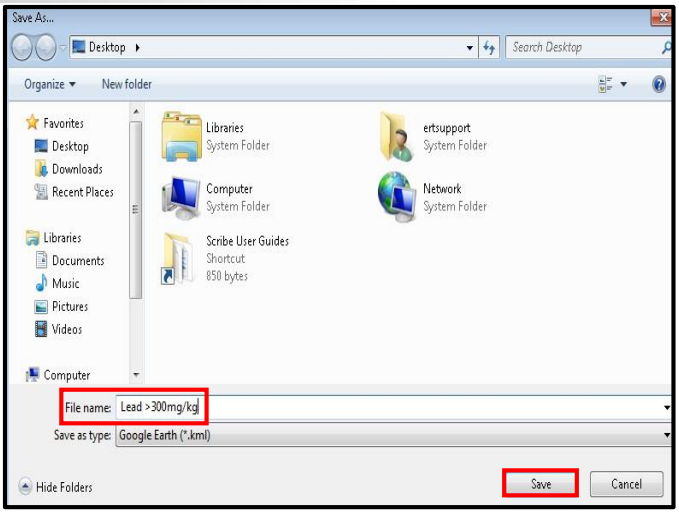
By default, all data points will be placed at ground level. To stack datapoints, select the field on which to base the stacked points i.e. Depth or Result.

Define the Maximum Altitude and Distribute Values. Data in Google Earth based on altitude.

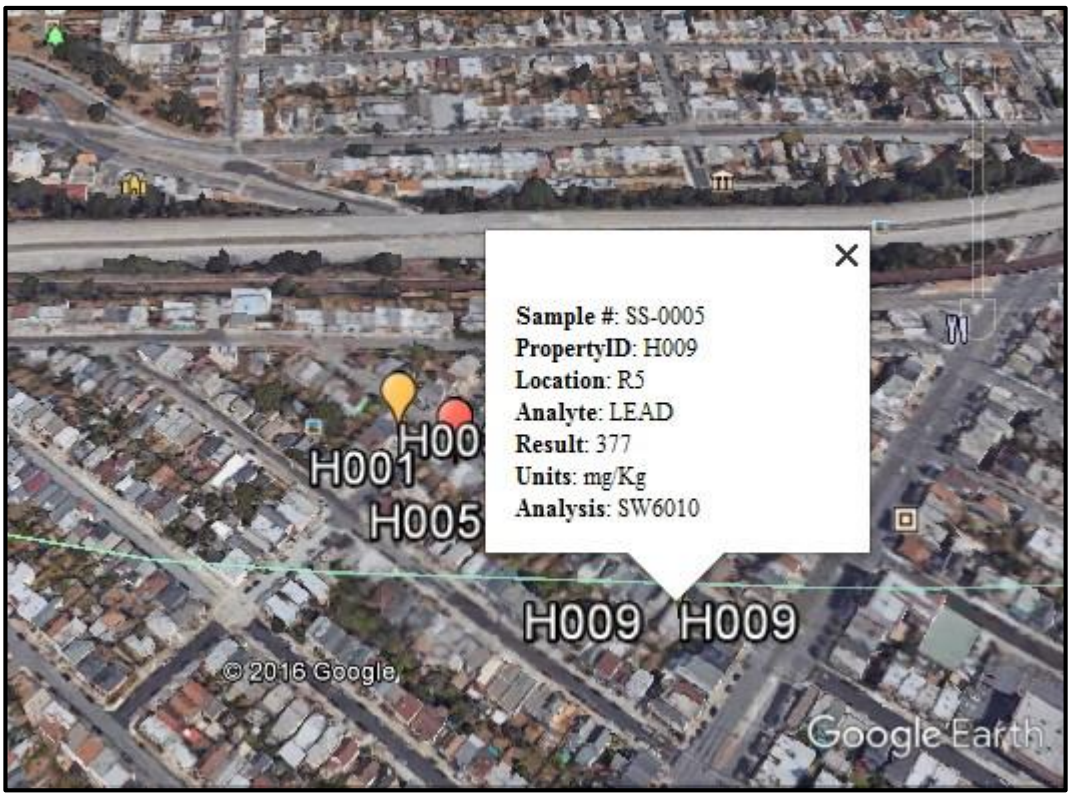
Click Export.



Name the *.kml file and click 'Save'. If Google Earth does not automatically launch and display the lab results, run Google Earth and open the .kml file.



An image similar to the one below should display in Google Earth. Notice the Property IDs are displayed by color using the value ranges specified in the Wizard. Also notice the additional information displayed when a pin is selected. Additional pin information could be displayed by turning those columns on in Scribe before creating the QuickMap export.



Scribe.NET

Scribe.NET provides a method of storing and sharing Scribe projects in a controlled environment. Using Scribe.NET, Scribe projects can be shared between Scribe desktop clients and/or enterprise Oracle/SQL database clients. Scribe projects are "Published" from the Scribe desktop client, and other desktop/enterprise users "Subscribe" to the published projects. Users can subscribe to individual or multiple projects. Regional or global subscriptions can also be created for sharing entire sets of published projects.

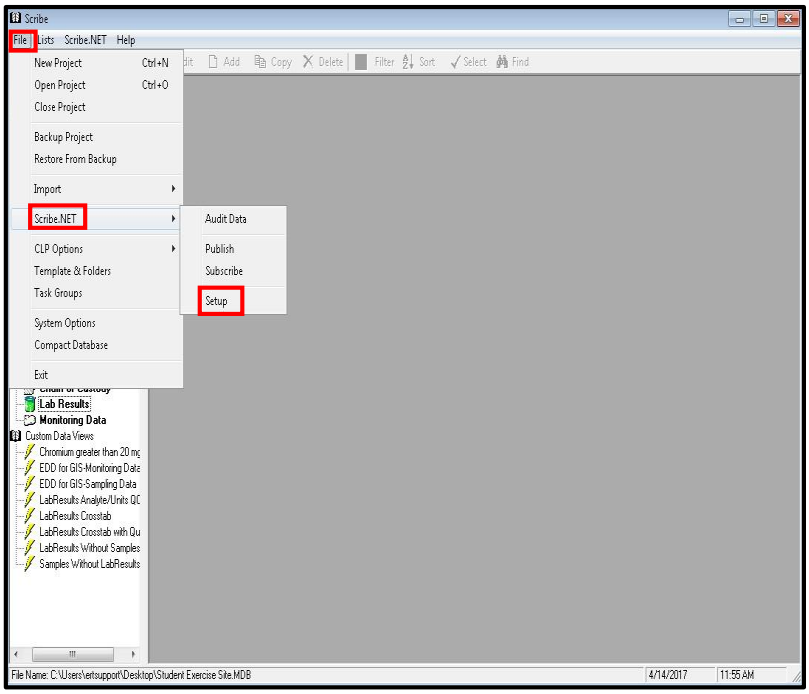
By default, Scribe desktop clients have access to generic publisher accounts in order to quickly and easily publish their project to Scribe.NET. Subscriptions, however, are managed on the server to provide secure access to the published data. An end user must have the subscription ID and Password before they can access the published project(s). The configuration of the subscription will determine which projects a user will acquire when they use a particular subscription ID. Subscriptions function differently for desktop clients than enterprise SQL clients.

An Internet Connection is required to Publish or Subscribe.

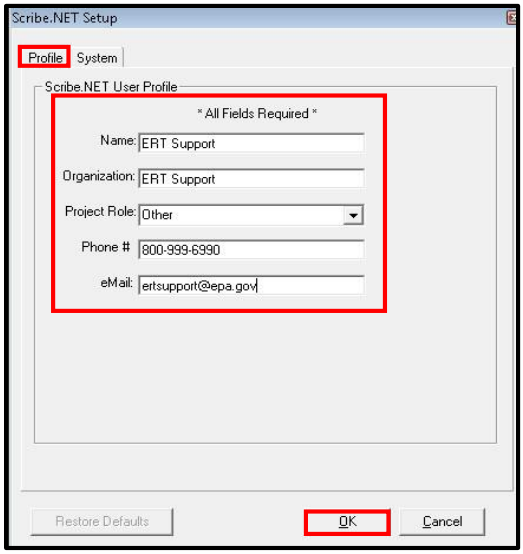
Scribe.NET Setup

The first time you use Scribe.NET, you will be prompted for some basic user identification information. This data is only used to attach ownership of the project and to ensure data integrity of published project files and is not publicly displayed.

Click on File | Scribe.NET | Setup



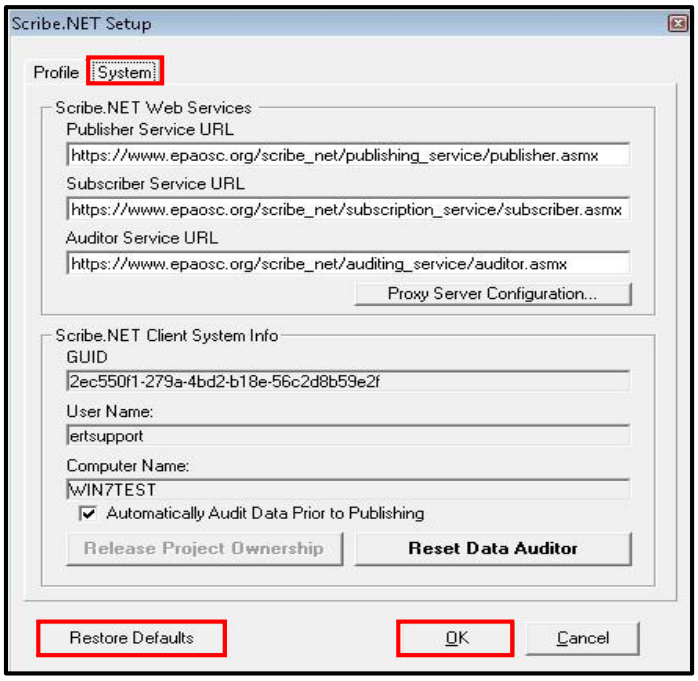
Fill in the fields on the Profile tab and click OK



The information on the System tab does not need to be modified.

To restore system default settings, click on the 'Restore Default's' button.

Click OK

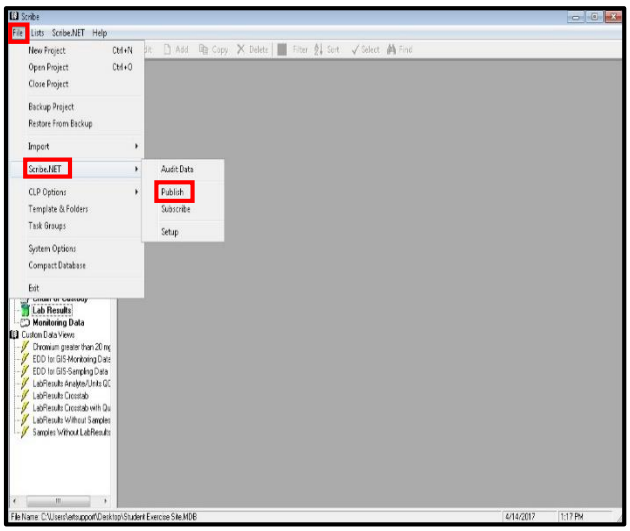


Publish to Scribe.NET

Publishing a project(s) to Scribe.NET stores your project(s) on a secure web server. By Publishing, your data can then be shared through a Subscription. By publishing to Scribe.NET, you have a backup of your project in the event something happens to the data (hard drive crash, lost computer, etc.). Scribe.NET updates the Scribe project each time the project is published.

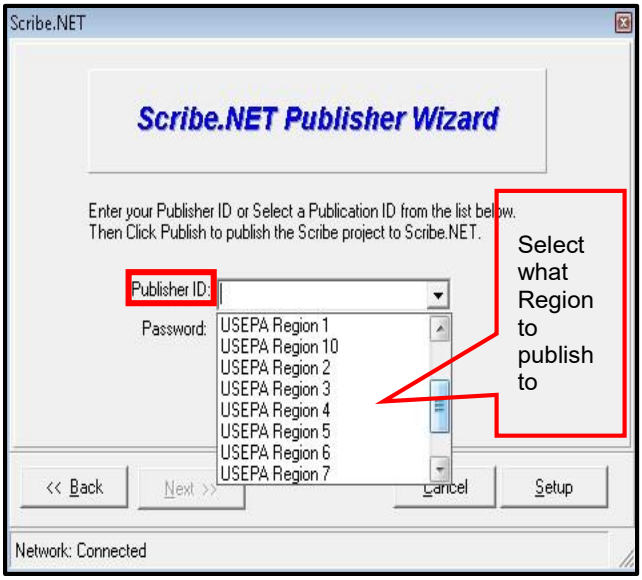
Once your project has been published to Scribe.NET, the computer it was published from becomes the 'owner' of the project. Any subsequent publishing of the project must be done from that computer. In the event the computer is damaged or the owner is no longer responsible for the project and publishing, ownership will need to be released. ***See Release Project Ownership***.

To publish a project to Scribe.NET, click on File | Scribe.NET | Publish

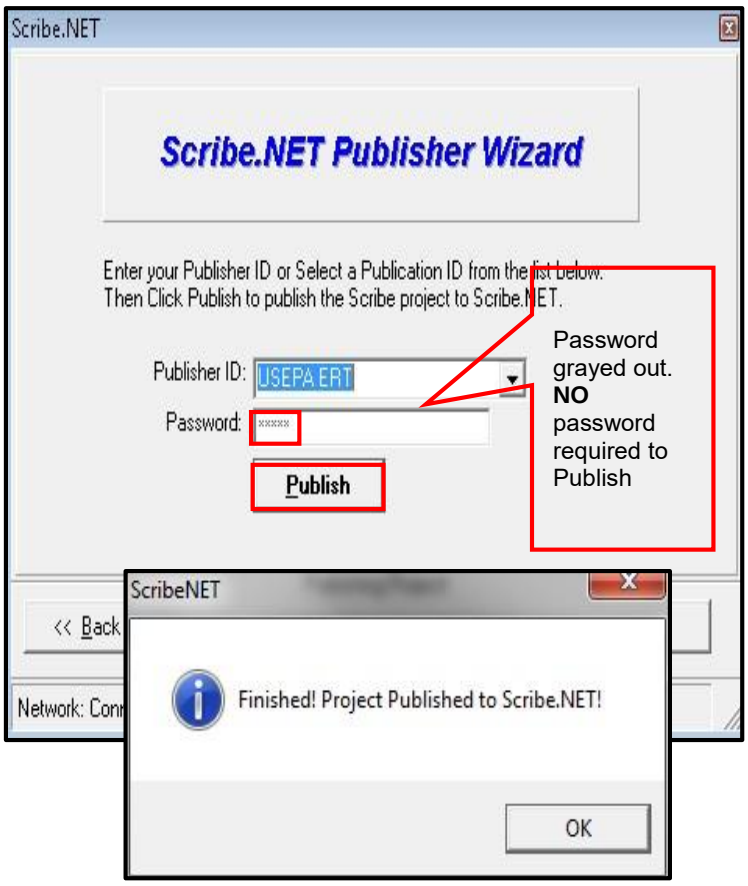


The Scribe.NET Publisher Wizard screen is displayed. Click Next.

Click the dropdown arrow and select the Publisher ID (which Region to publish it to).
Note: You must have an Internet Connection to publish toScribe.NET.

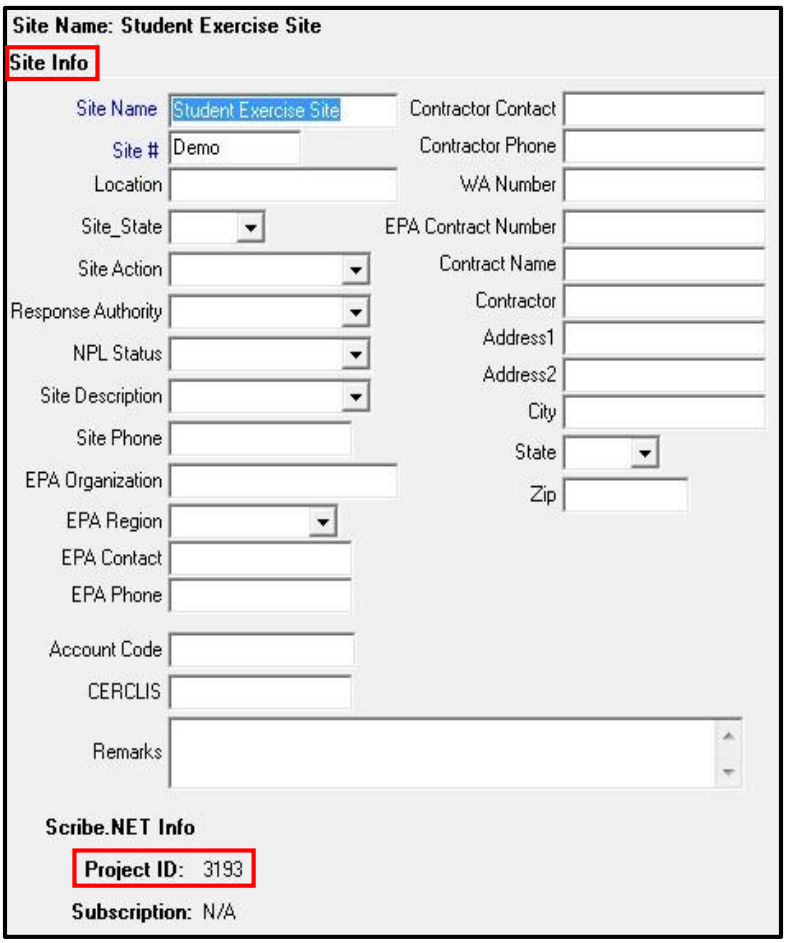


Click Publish. *Note: The password box is grayed out.* ***NO*** *password is required to publish a project to Scribe.NET*



Your project has now been Published to Scribe.NET. When a project has been Published, the project will be stamped with a ProjectID Number which can be located in the Site Info table in your Scribe project.

To request a Subscription, please email ertsupport@epa.gov with the Project ID.

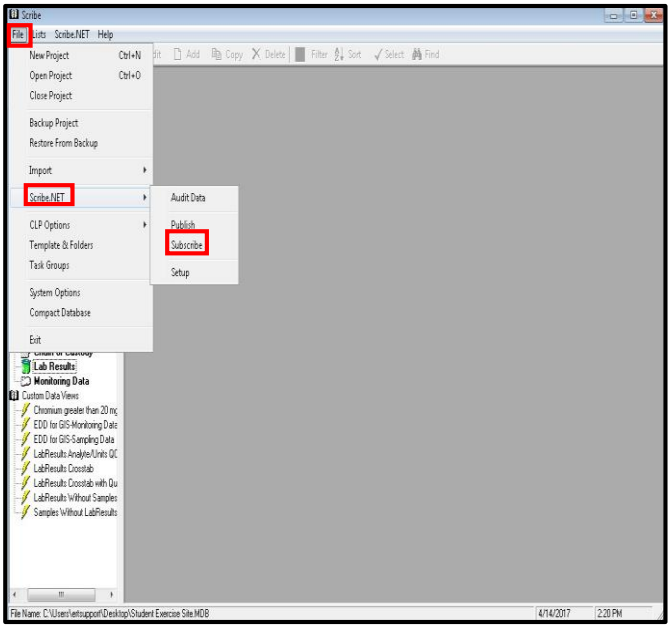


Subscribe to a Project

Subscribing/downloading a published project(s) from Scribe.NET requires a Subscription ID and password. To request a SubscriptionID and password, please contact **ERT Support at 1-800-999-6990 or via email at ertsupport@epa.gov.**

Note: There are several types of Subscriptions that can be setup (database subscription, multiple project subscriptions, etc.**). Please contact ERT Support at 1-800-999-6990 or email at ertsupport@epa.gov for additional information**

To Subscribe to a project from Scribe.NET, click on File | Scribe.NET | Subscribe

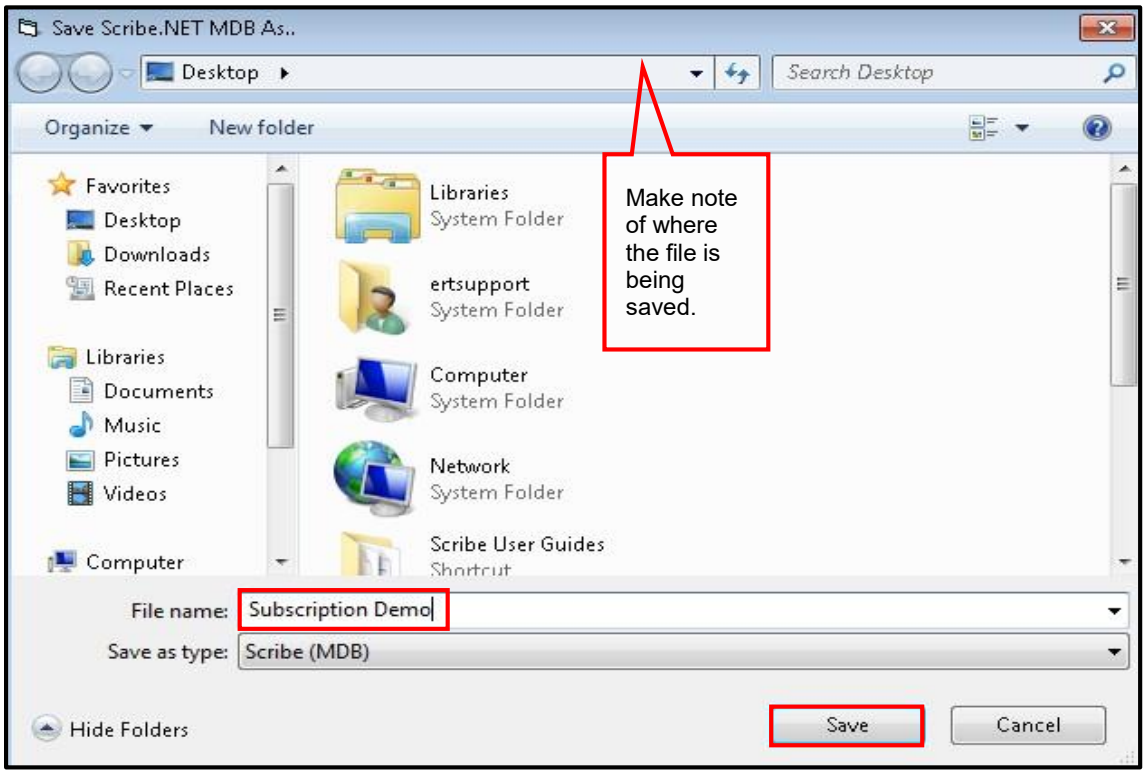


The Scribe.NET Subscriber Wizard screen is displayed. Click Next.

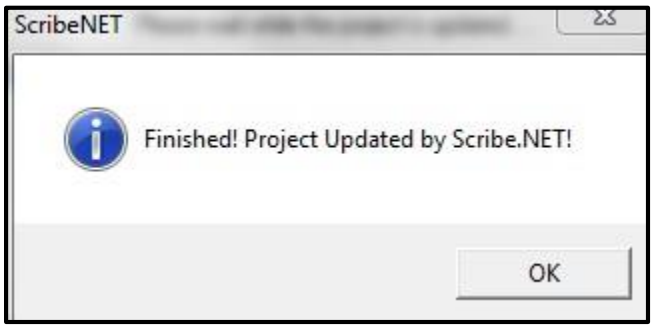
Enter the SubscriptionID and password. Click on the Subscribe button to begin downloading. **Note: You must have an Internet Connection to subscribe to a Scribe.NET project.**

First Time Subscribing

If this is the first time subscribing to this project, you will be prompted to enter a file name. Enter a filename and click Save.



Below are some screenshots of the Subscribing process

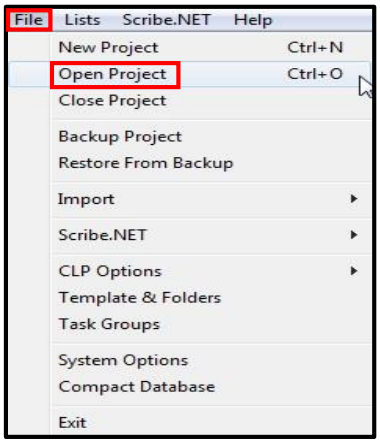


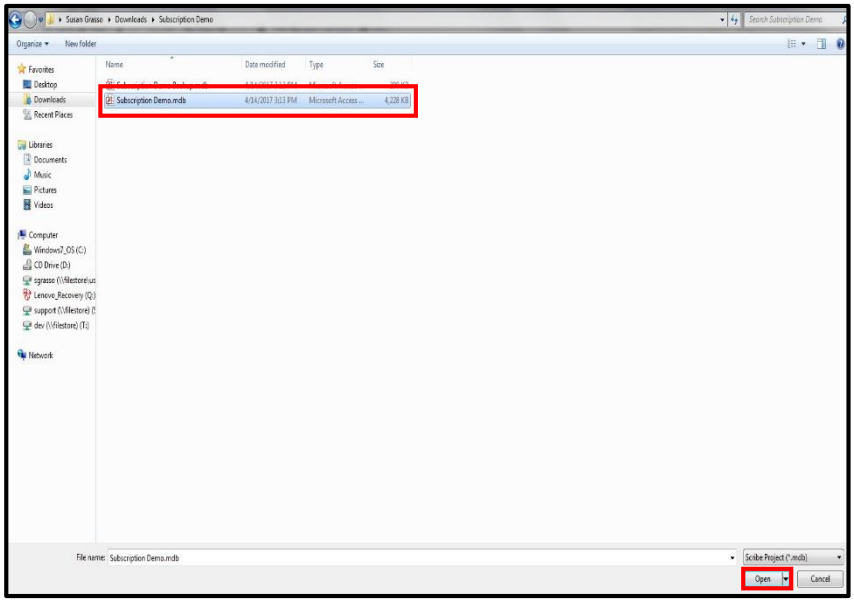
Updating Existing Subscriptions

When Scribe projects have been updated and republished to Scribe.NET, the subscription is automatically updated. A user must **re-subscribe** to update the existing local project file.

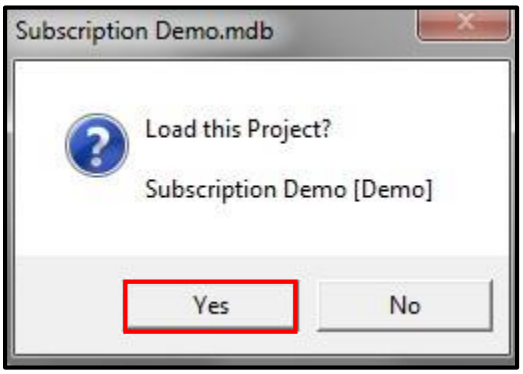
Prior to re-subscribing, open Scribe and **Open** the Scribe project that you will be updating/replacing.

File | Open Project. Browse to the project and Click Open

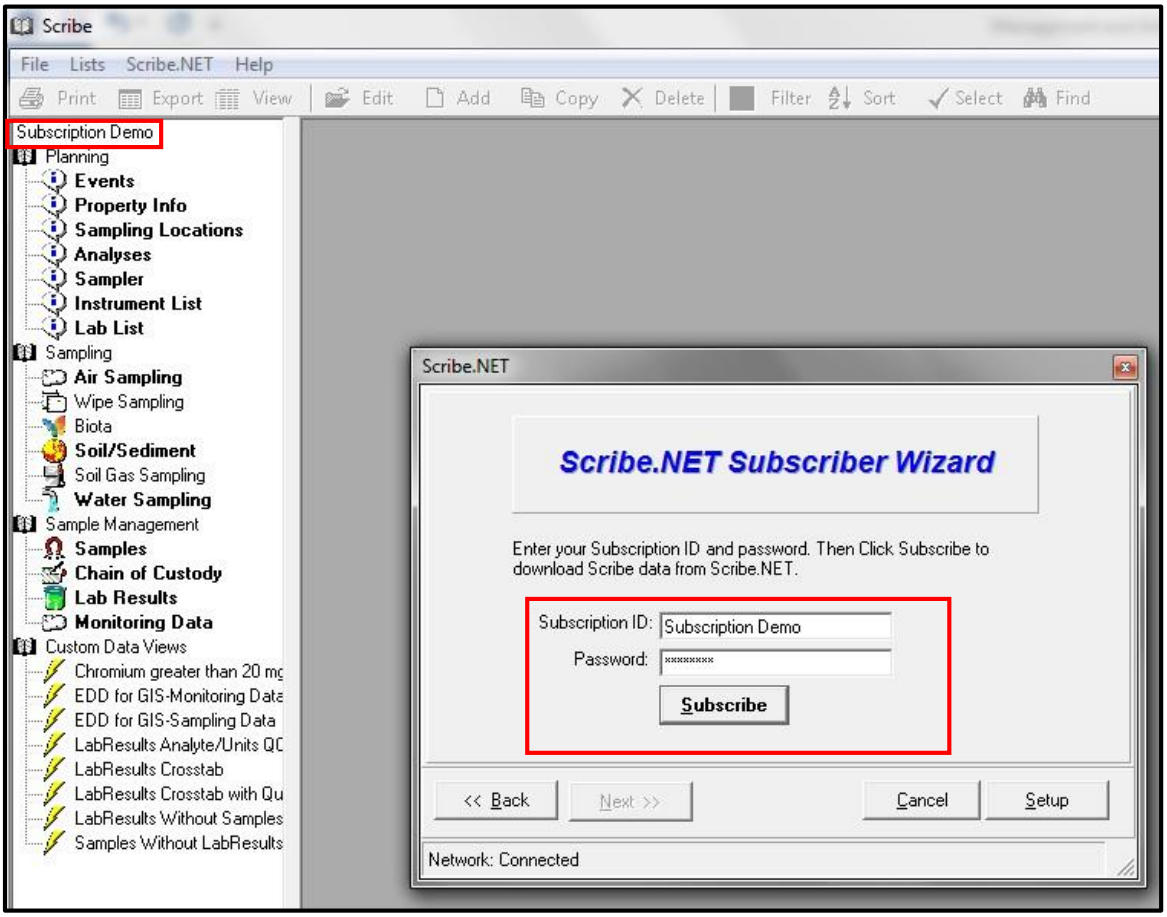




Click Yes to Load this Project.



Verify that you are in the project and click on File | Scribe.NET | Subscribe.
Enter the SubscriptionID and Password.
Click Subscribe.

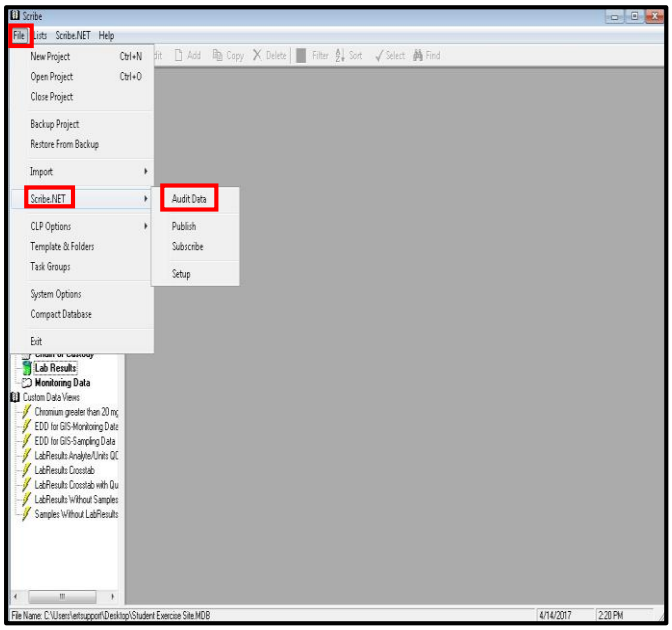


Audit Data

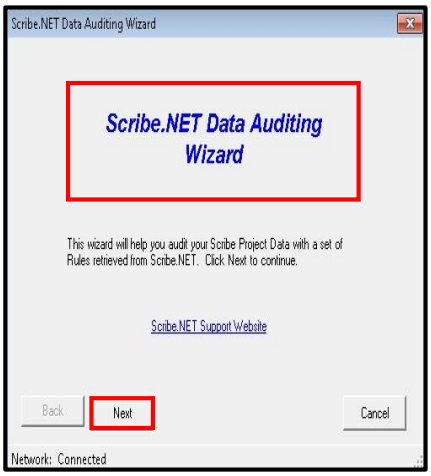
The data Auditor is a tool that allows you to audit the data in a Scribe project against a set of valid values. Valid Values can be established on a site specific basis, as a regionally based set or on a national level. Auditing is done by comparing the data in Scribe project to one or many 'rules'. A Scribe project can be audited against any set of rules uploaded to Scribe.NET. In order to audit a Scribe project, the Scribe project must be open in Scribe and the computer must have an active internet connection.

Please contact ERT Support at 1-800-999-6990 or ertsupport@epa.gov for additional information on creating an Auditor Ruleset. Users must have a working knowledge of creating queries in MS Access, as well as knowledge of the table names and field names in their Scribe Projects.

To Audit a Scribe project, click on File | Scribe.NET | Audit Data



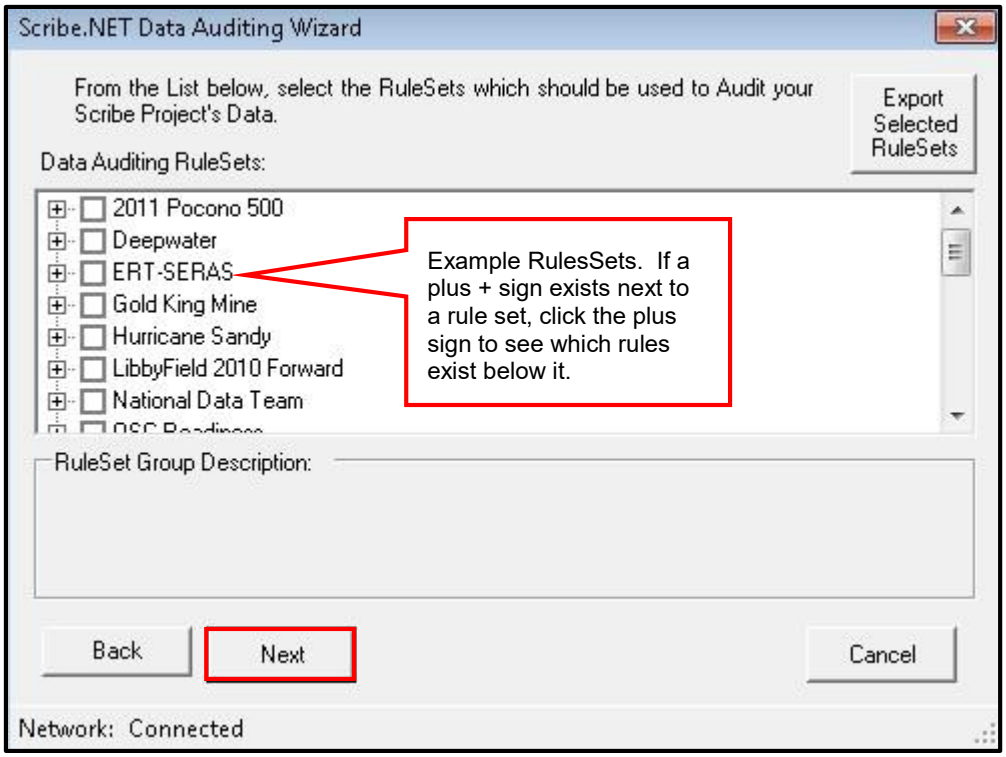
The Scribe.NET Data Auditing Wizard will display. Click Next. The RuleSets will begin downloading.

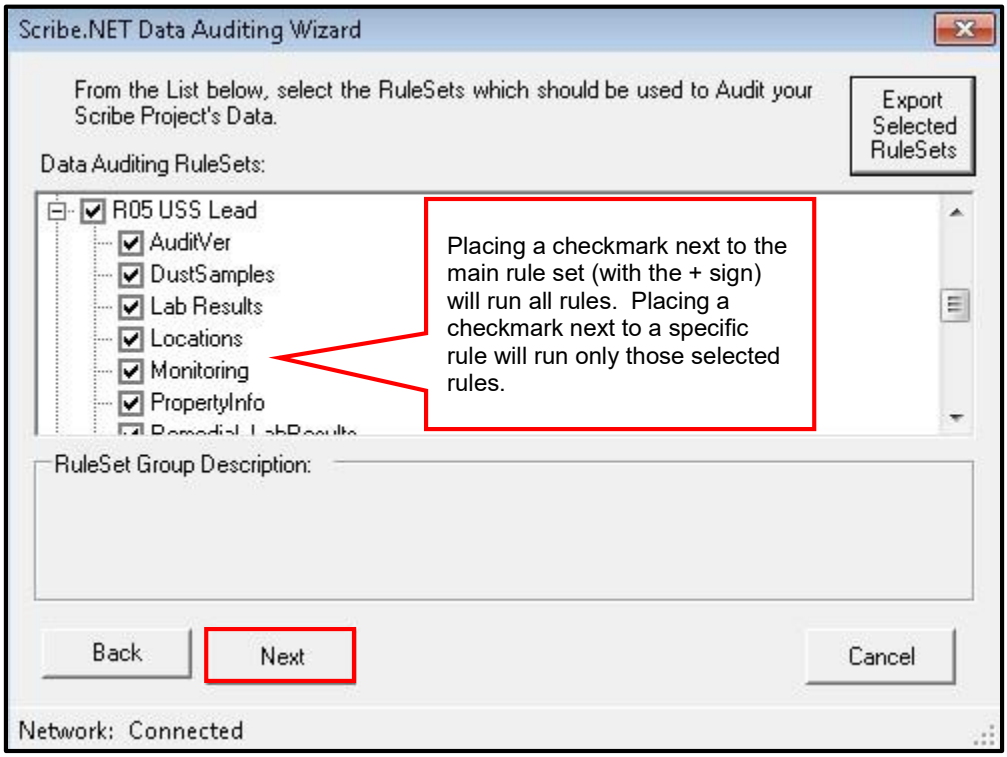


A list of all the RuleSets that have been uploaded to Scribe.NET will display.

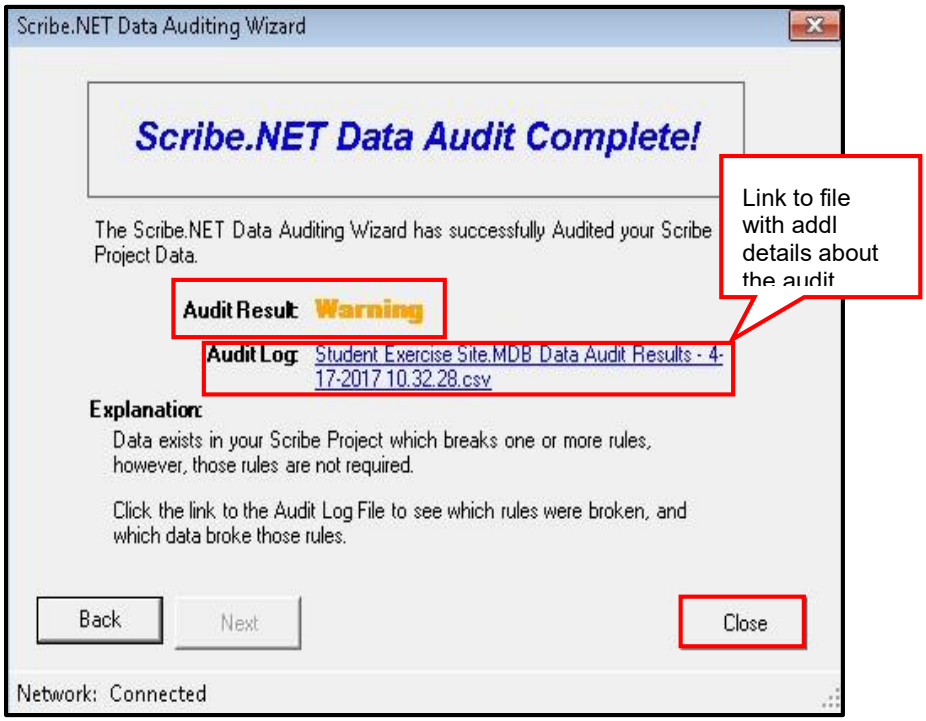
Select which RuleSet and which Rule(s) will be used to Audit your Scribe Project's Data.

Click Next.





When auditing is complete, a dialog box will display. This dialog box will indicate the error severity (Warning or Error) of any issues found and will provide a link to a file containing additional details about the audit results.



Note: *The error severity determines if a Scribe project can be published to Scribe.NET. An Audit Result of Warning indicates that some records don't meet the data requirement, but* ***can*** *be published to Scribe.NET.*

An Audit Result of Error indicates that some records don't meet the data requirements and ***cannot*** *be published to Scribe.NET until the issues are corrected.*

Scribe.NET Data Audit - 4/17/2017 10:50:02 AM

ProjectFilePath: C:\Users\sgrasso.CAMELOT\Downloads\Subscription Demo\Subscription Demo.mdb

Auditing Data Against RULESET "[551]Location Table" - RULE "[3725]Location_Lat_Long_Blank":
Warning: The following records do not contain Latitude and/or Longitude

LocationID	Site_No	Location	PropertyID	LocationD	LocationZ	Latitude	Longitude	Altitude	GPS_PDO
21	Demo	B1							
22	Demo	B2							
23	Demo	B3							
24	Demo	B4							
25	Demo	B5							
6	Demo	NE Fence Line							
7	Demo	NW Fence Line							
8	Demo	SE Fence Line							
9	Demo	SW Fence Line							

Example of data not containing a Latitude and/or Longitude. These records don't meet the data requirements.

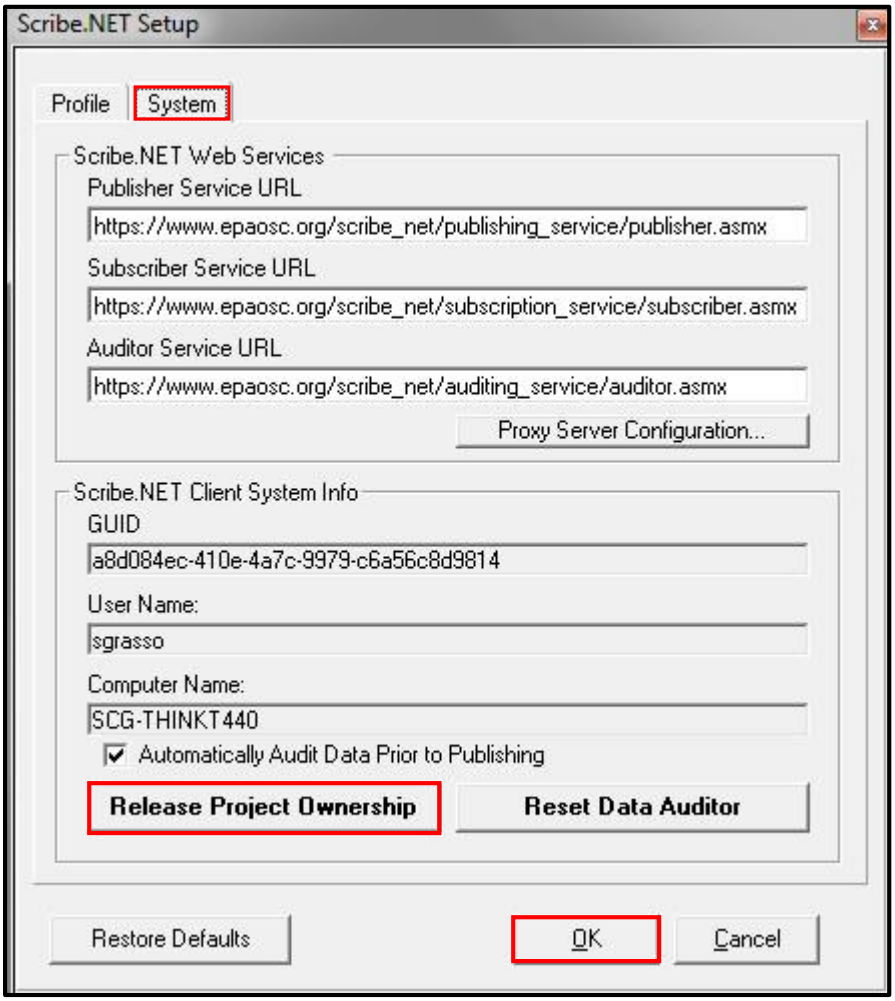
Auditing Data Against RULESET "[552]Samples Table" - RULE "[3726]Samples_Matrix_Blank": Data OK.

Example of how data is displayed in the audit report

Release Project Ownership

Once a Scribe project has been published to Scribe.NET, the computer it was published from becomes the 'owner' of the project. Any subsequent publishing of the project must be done from that computer. In the event the computer is damaged or the owner is no longer responsible for the project and publishing, ownership will need to be released.

Click on File | Scribe.NET | Setup. Click on the System tab. Click on Release Project Ownership.



Note: *If Project Ownership cannot be released from the computer, please contact ERT Support at 1-800-999-6990 or email at ertsupport@epa.gov.*

ERT

User Manual
for
Scribe CLP Sampling

V3.10

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INTRODUCTION

The intent of this User Guide is to provide a basic overview of how to use Scribe to create a new sampling project and manage samples collected for the EPA's Contract Lab Program (CLP). Scribe provides support for CLP sample documentation including the CLP Chain of Custody (COC) reports and the CLP XML file. This document also assumes that the user is already familiar with the Scribe application for sampling. Otherwise, please refer to the Scribe User guides for detailed Scribe application instructions.

Create a New Project

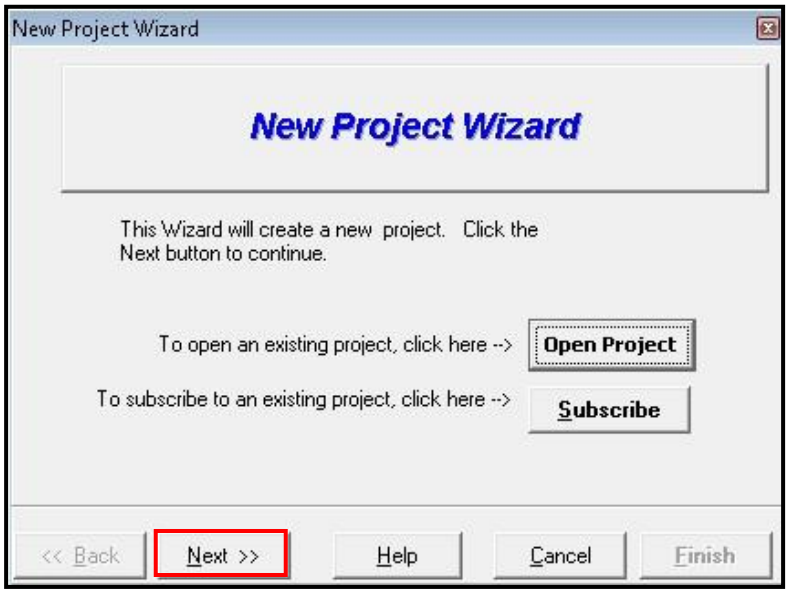
New Project Wizard

If you are starting Scribe for the first time after installation, the New Project Wizard will run automatically. You can open the 'Scribe Example Project' with Demo data. Otherwise, to create a new project in Scribe:

1. Click on '**File**'.

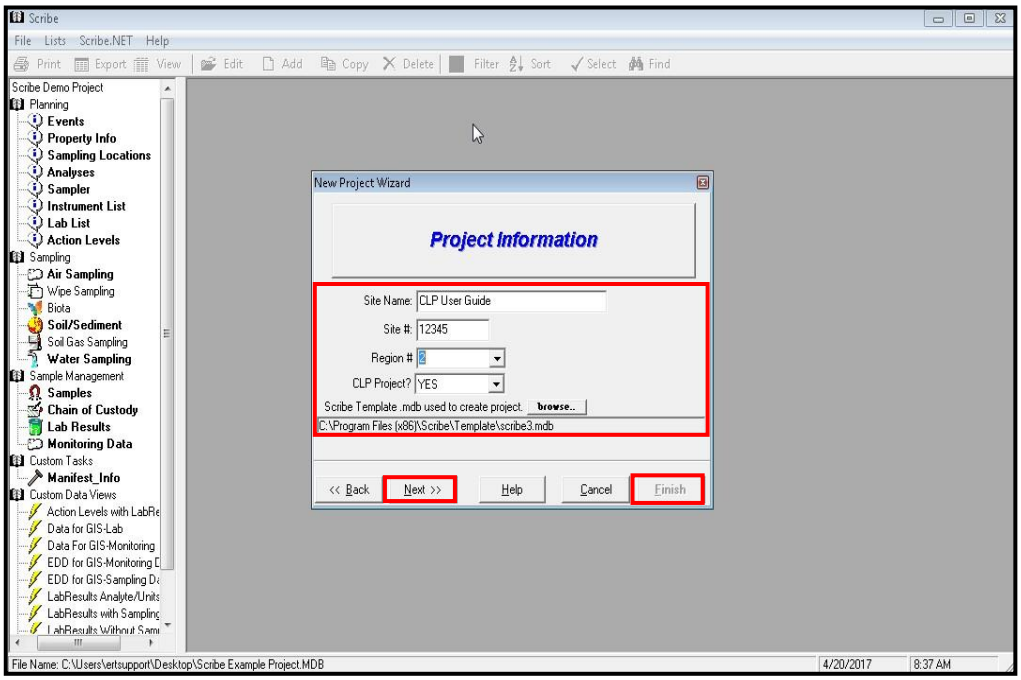
2. Select '**New Project**'.

3. A New Project Wizard window is displayed.

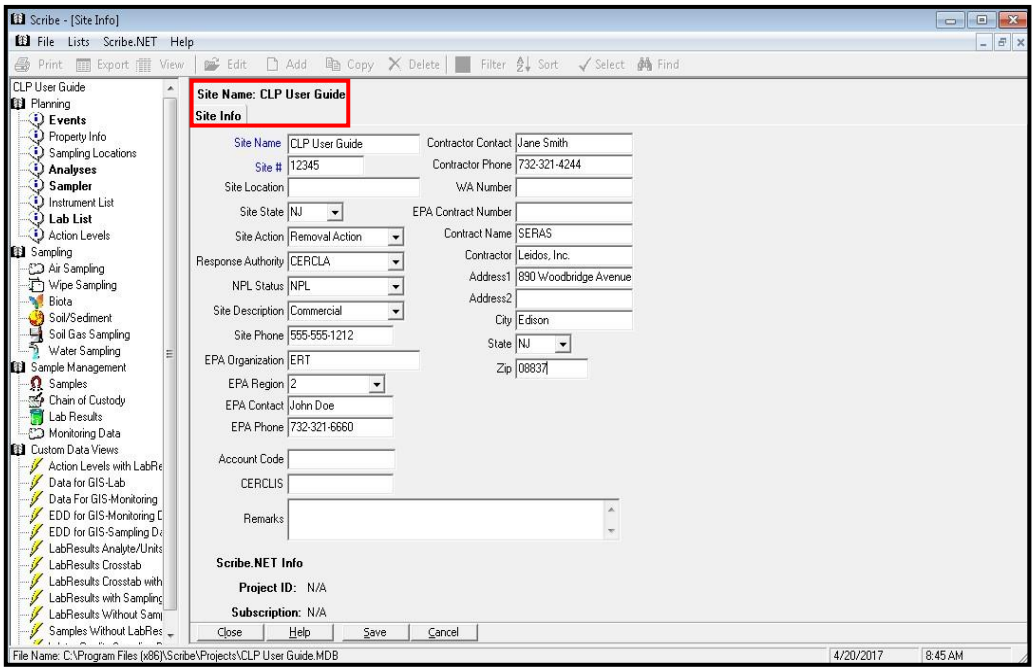


4. Click '**Next**' to continue.

5. Enter the **Site Name**, **Site #** (Common ID for Project Data Management), **EPA Region #, CLP Project (if YES, all layouts (grid and label) will default to CLP format),** and the **Scribe Template (default template is Scribe3.mdb).** *NOTE: Users are advised to NOT include any site identifying information in the Site # field i.e. address, etc..*



6. Click '**Next**' and then click '**Finish**' to create the new project.



The New Project Wizard closes and the "**Site Info**" screen displays. ONLY the field names in **BLUE** are required, however it is recommended that you complete as many fields as possible.

CLP SAMPLING IN SCRIBE

CLP Samples

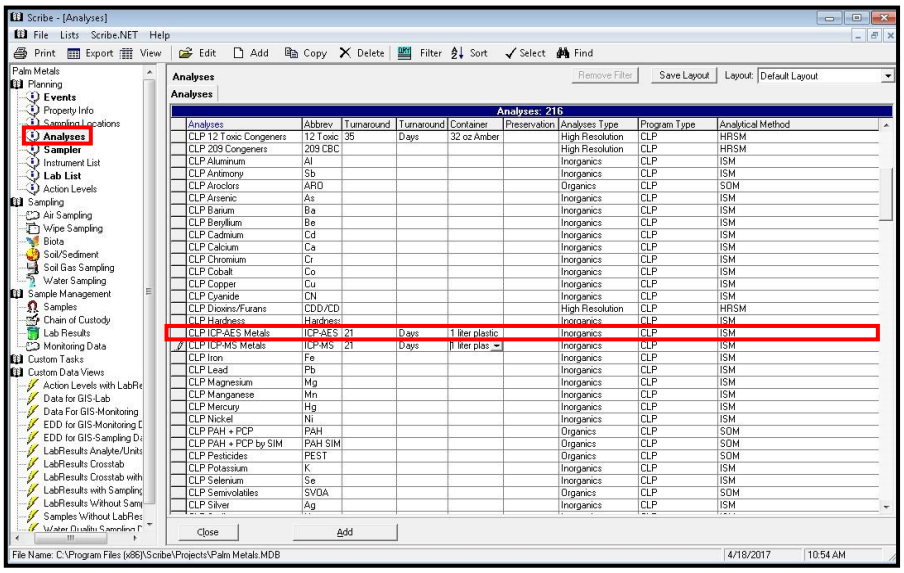
CLP Analyses

The Scribe Analyses List includes default CLP Analyses. The analyses in this list are available to be assigned to a sample when sample details are entered. If only a few analyses will be needed for the sampling effort, removing the unwanted analyses will speed the selection process at the time sample information is entered. At a minimum, Turnaround Time, Container and Preservation should be populated for the required analyses so they populate when adding an analysis(es) to your sample(s) and will print on the Chain of Custody (COC). This list can be modified as needed to customize the pick list selections when entering Sample information. Below describes how to modify, add and delete the list of analyses for your specific sampling effort. ***Note:*** *Abbreviation and Turnaround Time are required for CLP Analyses and must appear on the Chain of Custody.*

To **MODIFY** an analysis(es):

1. Click on "**Analyses**" under Planning in the Navigation Pane.

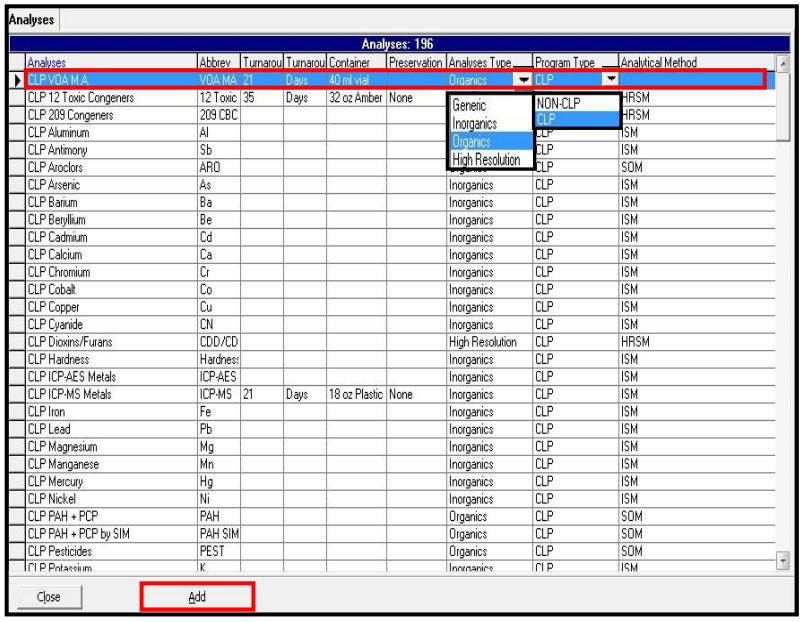
2. Select the analysis and modify the name or enter Turnaround, Container, Preservation etc.



NOTE: *If you add or modify a CLP Analysis, you* ***MUST*** *provide the analysis name, abbreviation, turnaround time, Analysis Type of either* ***Inorganic, Organic or High Resolution*** *and the* ***Program Type of CLP****, in order to correctly assign a CLP sample number and print the CLP Chain of Custody.*

To **ADD** an analysis:

1. Click on Add.
2. Replace the #New01# with the new analysis name, and enter the Abbreviation, Turnaround, Container and Preservation. Select the Analysis Type and select the Program Type of CLP from the dropdown.

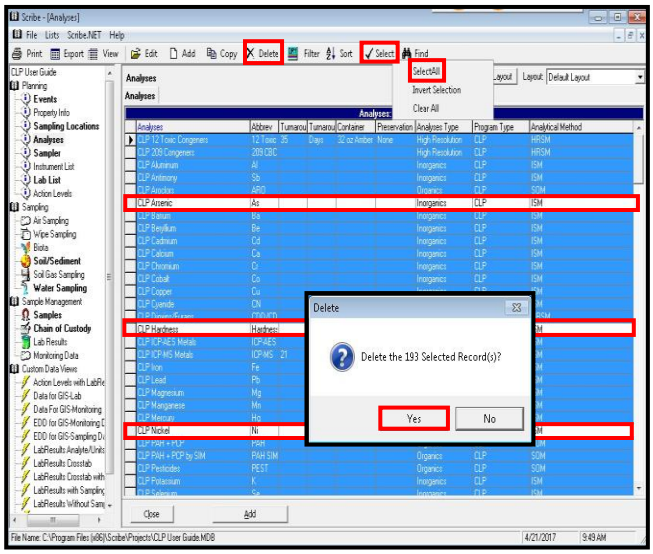


NOTE: *If you add or modify a new CLP Analysis, you* ***MUST*** *provide the analysis name, abbreviation, turnaround time, and Analysis Type of either* ***Inorganic, Organic or High Resolution*** *and the* ***Program Type of CLP****, in order to correctly assign a CLP sample number and CLP Chain of Custody.*

Also, when entering a modified analysis, please use the abbreviation **MA** when possible in the Analysis name and abbreviation (for example: "CLP VOA by MA 1301.0" – abbreviated as "VOA MA"

To **DELETE** an analysis(es):

1. Click the **'Select'** button on the Toolbar and click '**Select All'**.
2. De-select the analysis(es) by holding the Ctrl (control) key and clicking on each analysis.
3. Click the '**Delete'** button.
4. Click **'Yes'** when prompted to delete the selected records.

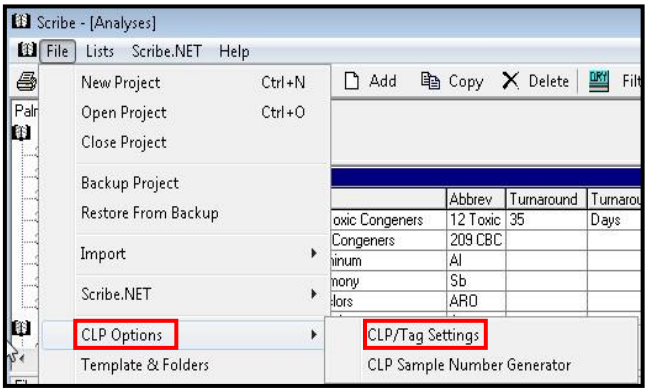


CLP/Tag Settings

Scribe allows users to configure the starting CLP Sample numbers and numeric Tag numbers (if applicable). When a CLP Analysis is selected for a sample, Scribe will assign a CLP Sample number starting with the configured CLP Sample number. The numbers auto-increment as samples are added using the CLP business rules.

To configure the settings for CLP Sample Numbers and Tags:

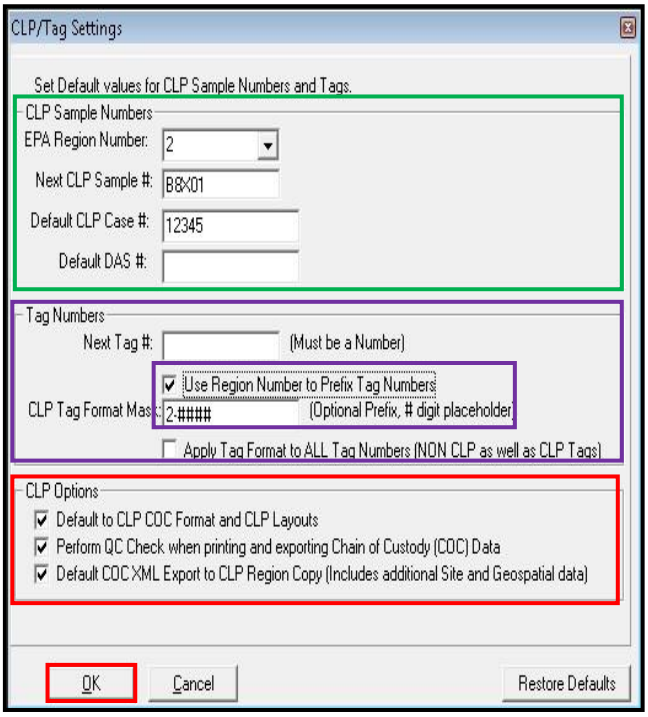
1. Click on **File | CLP Options | CLP/Tag Settings**. The window for CLP/Tag Settings is displayed.



2. In the **CLP Sample Numbers** section, the Region Number will default to what you entered when you first created the project. Enter a starting CLP Sample #, a Case # and/or a DAS # as needed.

3. In the **Tag Numbers** section, enter the Next Tag # if you are assigning specific numeric tag numbers. If no specific Tag Number is required, Scribe will auto-generate the first **Tag Number** of 1000 and increment by 1.

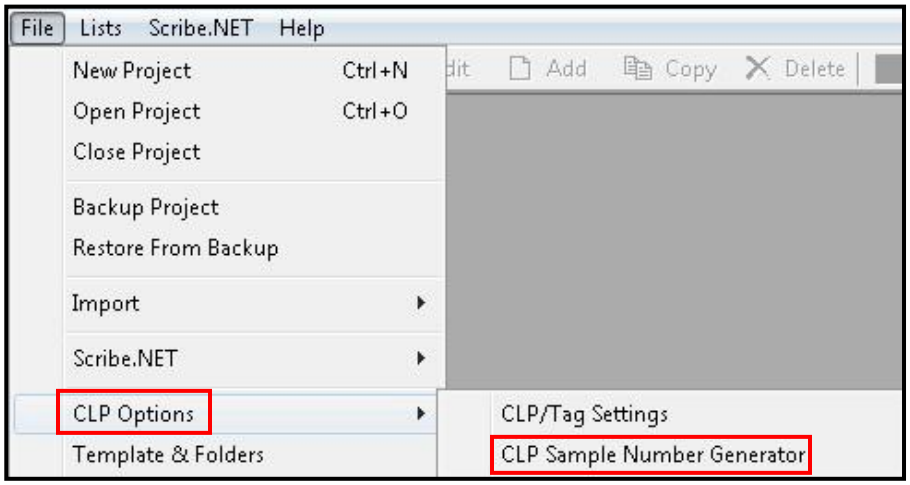
4. If a checkmark is placed in the 'Use Region Number to Prefix Tag Numbers', the CLP Tag Format Mask will populate with Region # and four (4) # digit placeholders (2--####). The **Tag #** will print 2-1000, 2-1001, etc. If a checkmark is in Apply Tag Format to ALL Tag Numbers (NON CLP as well as CLP Tags), all analyses will follow that specified Tag Format.



5. Under the **CLP Options**, Scribe performs a QC Check when printing and exporting Chain of Custody (COC) data. This check ensures that Turnaround Time (TAT), Turnaround Time Units, Analysis, Abbreviations, etc. are included on the COC and in the XML file. This feature is **ON** by default. In addition, Scribe will default to the CLP COC Format and CLP Layouts, as well as the COC XML Export to CLP Region Copy when YES is answered as a CLP Project at the Project Information screen. Click **OK** to Save and Close.

CLP Sample Number Generator

Also included with the CLP Options, is the ability to generate a list of CLP Sample Numbers that follow the CLP business rules. This list can be exported to a spreadsheet. Follow the steps below to build and export a list of CLP Sample Numbers.



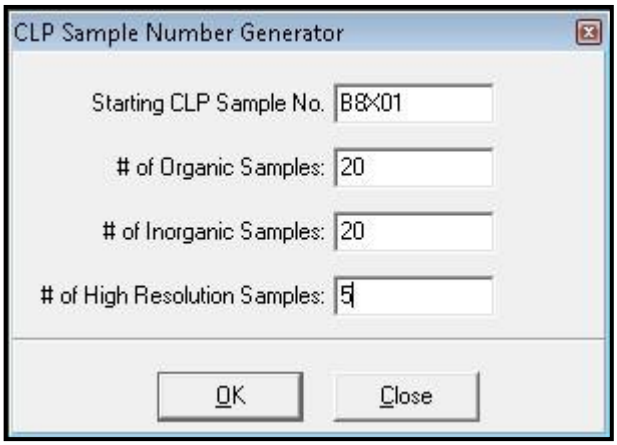
1. Click on **File | CLP Options | CLP Sample Number Generator.**

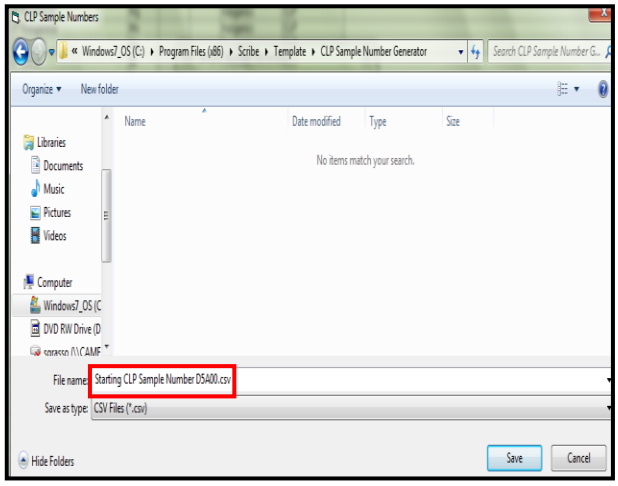
2. Enter the Starting CLP Sample No., # of Organic Samples, # of Inorganic Samples, # of High Resolution Samples.

3. Click **OK.**

4. A dialog box will open asking for a file name. By default, Scribe saves the file as a .csv (comma separated file) that can be opened up in MS Excel.

5. Click **Save.**



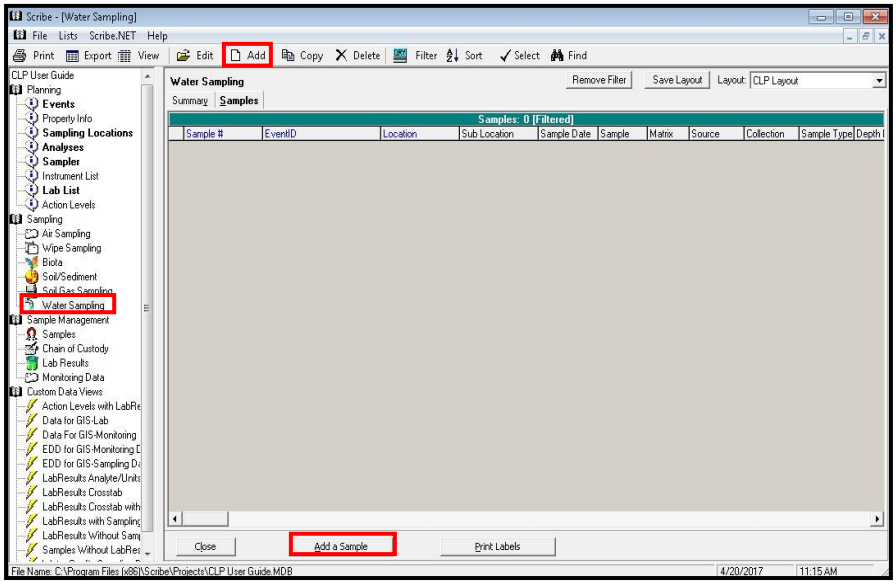


A
CLP Sample No
PB8X01
PB8X02
PB8X03
MB8X01
MB8X02
MB8X03
B8X01
B8X02
B8X03

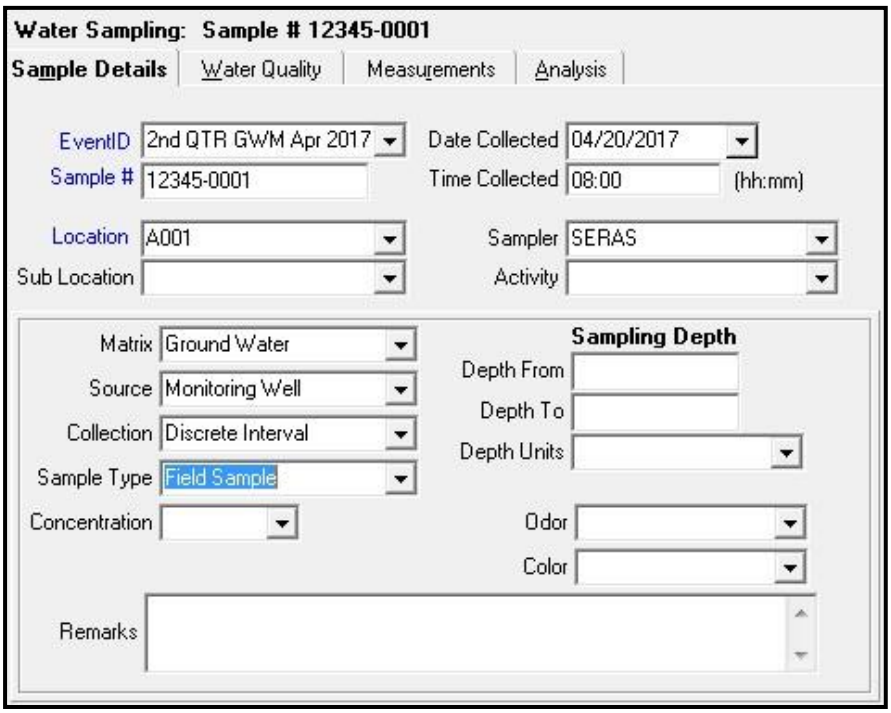
Adding CLP Samples

Depending on the type of sampling you will be performing, click on the appropriate sampling task under Sampling in the Navigation Pane. For example:

1. Click on 'Water Sampling'.
2. Click the '**Add**' button on the top menu or the **'Add a Sample'** button on the bottom.



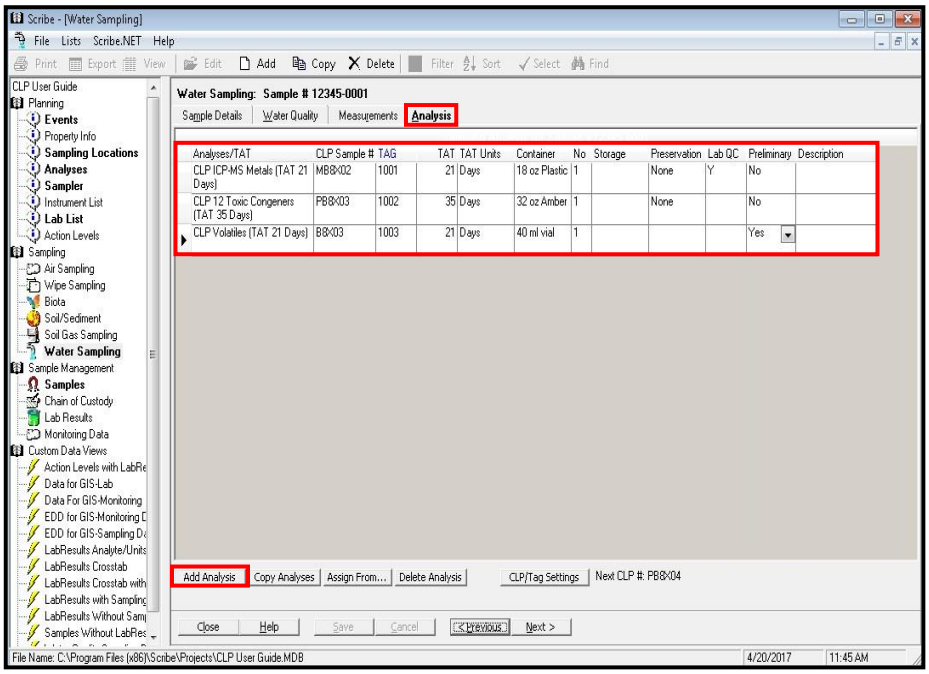
3. Enter sample information into the "**Sample Details"** screen.



Note: *The Water Sampling task contains a Water Quality and Measurements tab. The tabs will vary by Sampling Task.*

Assigning Analyses

1. Select the **Analysis** tab.
2. Click in the **Analyses/TAT** field.
3. Click the **down arrow** for the list of CLP Analyses.
4. Select the analysis to be performed on this sample.
5. Click in the CLP Sample # field to display the CLP Sample # and Tag number based on the CLP/Tag Settings.
6. To assign additional Analyses, click '**Add Analysis'.**



7. When all analyses have been added, click the '**Close**' button on the bottom of the window to save and close.

NOTE: CLP Volatile analysis for Soil/Sediment samples may require sample weights to be recorded. Right-click in the Analyses grid and pick "Select Columns" to include the sample weight columns. Otherwise, this information can be recorded in the COC section by selecting the "Sample Weight Layout".

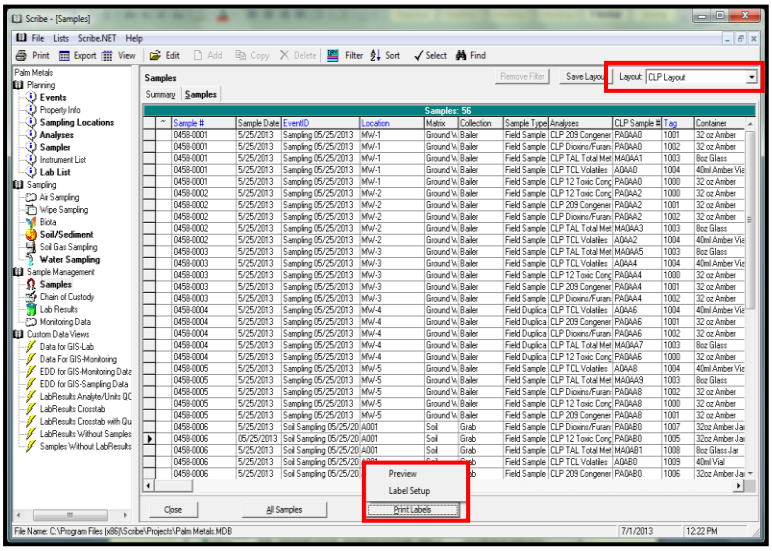
LABELS AND CHAIN OF CUSTODY

CLP Sample Labels

Print Sample Labels

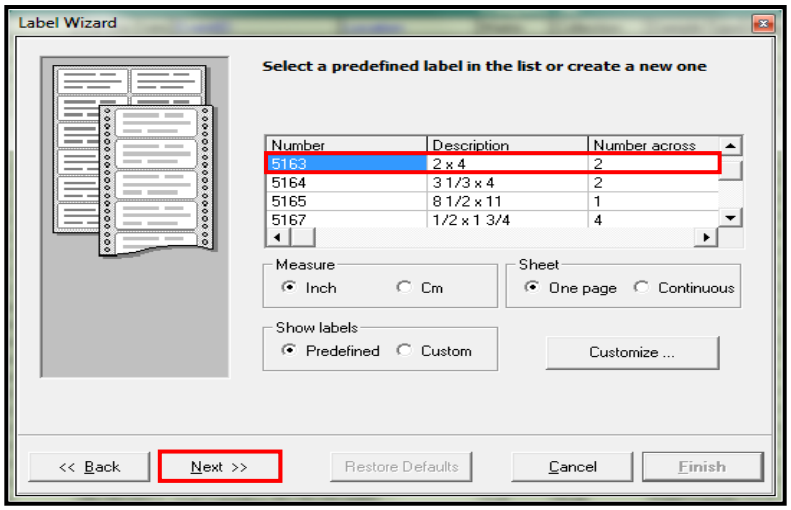
Sample Label options are available on the individual Sampling Task view (e.g. Soil/Sediment, Water, etc) or in the Samples section under Sample Management in the Navigation Pane. All samples shown on the screen are available to be printed on labels. You can apply Filters, Finds and Sorts to limit which labels will print. Before printing labels, make sure the CLP Layout is loded (upper right corner of the screen).

To configure your labels and print:



1. Click on the '**Print Labels'** button on the bottom.

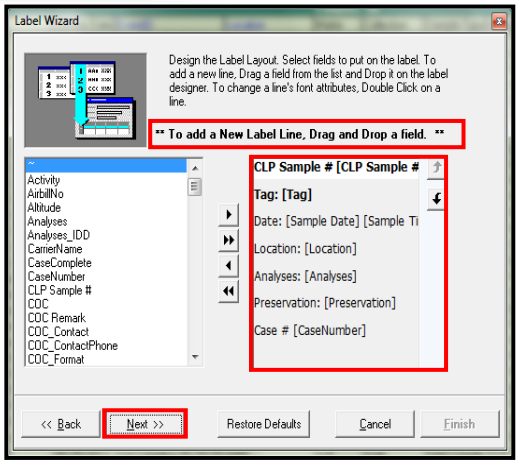
2. Select '**Label Setup'**.



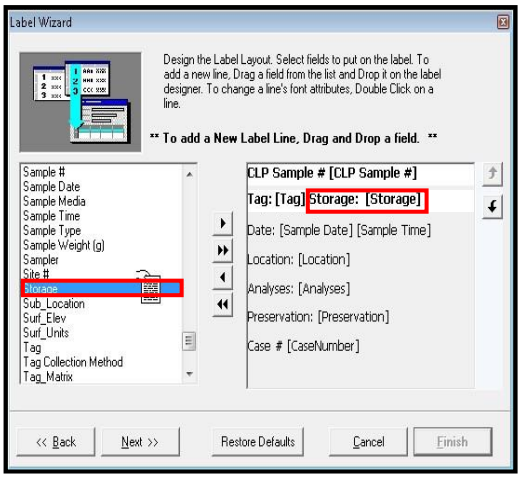
3. Select a pre-defined label format that matches your labels or create a customized label.

4. Click **Next.**

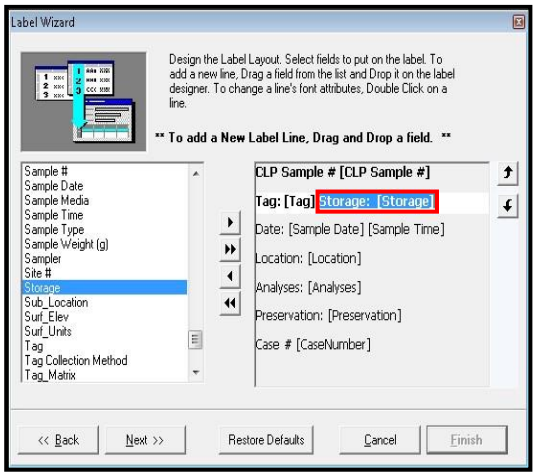
5. Use the default CLP label design or design your label by adding/removing label lines.



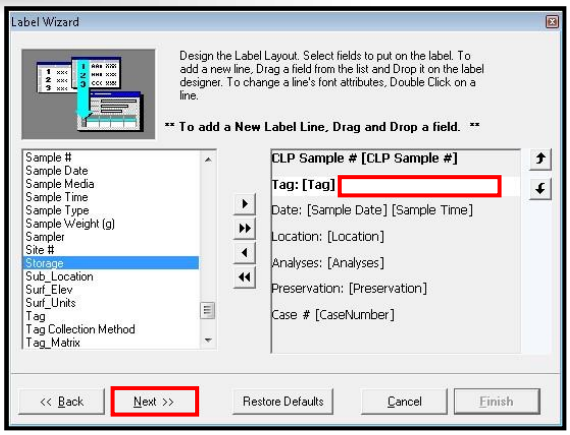
6. To Add a new Label Line, select the field (on the left), hold the mouse down, and drag and drop the field onto the label. Enter a caption name (e.g. Storage).



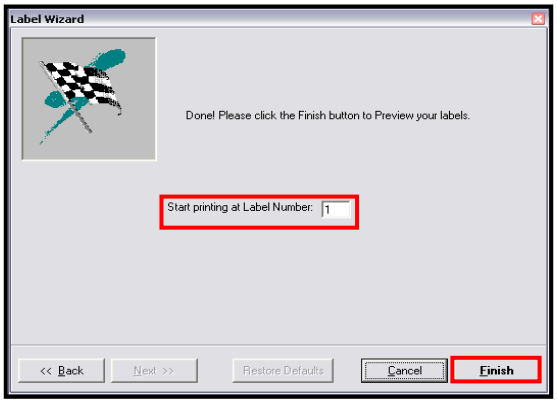
7. To Remove a Label Line, highlight the field (on the right), and click the delete key.



8. When the Label Layout is complete, click **Next.**

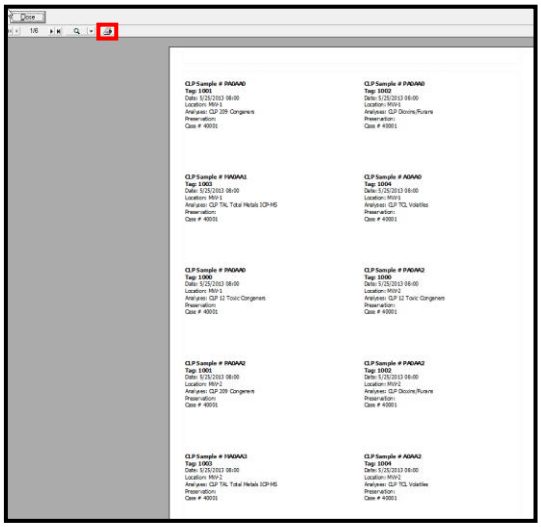


9. Click **Finish.** (If you need to print on half a sheet of labels, use this option to select which label to print on first).



10. A preview of the labels to be printed is displayed.

11. To print, click the Printer icon.



CLP Chain of Custody

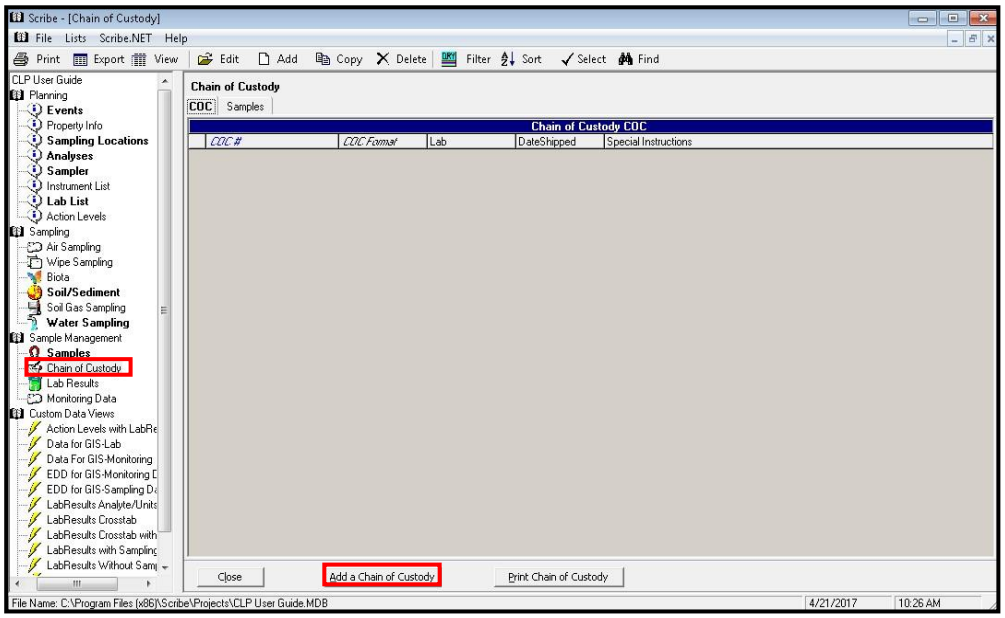
When creating a CLP Chain of Custody (COC) in Scribe, multiple analysis types can be added to the same COC. For example, Inorganic, Organic, High Resolution and non-CLP analysis can all be placed on the same chain by selecting the "CLP Generic COC" format when creating a new COC or by removing the filter when on the Samples Tab of the COC section. As a convenience, Scribe contains functionality to group analyses by type when creating a COC. By selecting one of the CLP types (Organic, Inorganic, High Resolution) from the COC Format list, Scribe will filter the Samples for that specific analysis type. Remember, if multiple analysis types need to be added to the same COC, simply remove the filter and a complete list of analysis(es) will be available.

Note: After submitting samples to the CLP labs, it is recommended that users request the labs to return lab results in electronic format i.e. a spreadsheet (.xls) or a comma-separated text (.csv). Scribe has a Custom Import feature that will import lab result data and marry them up with your sampling data already in Scribe. This effectively eliminates transcription errors and reduces data processing time. See the "Scribe Manual Advanced Part III" for importing details.

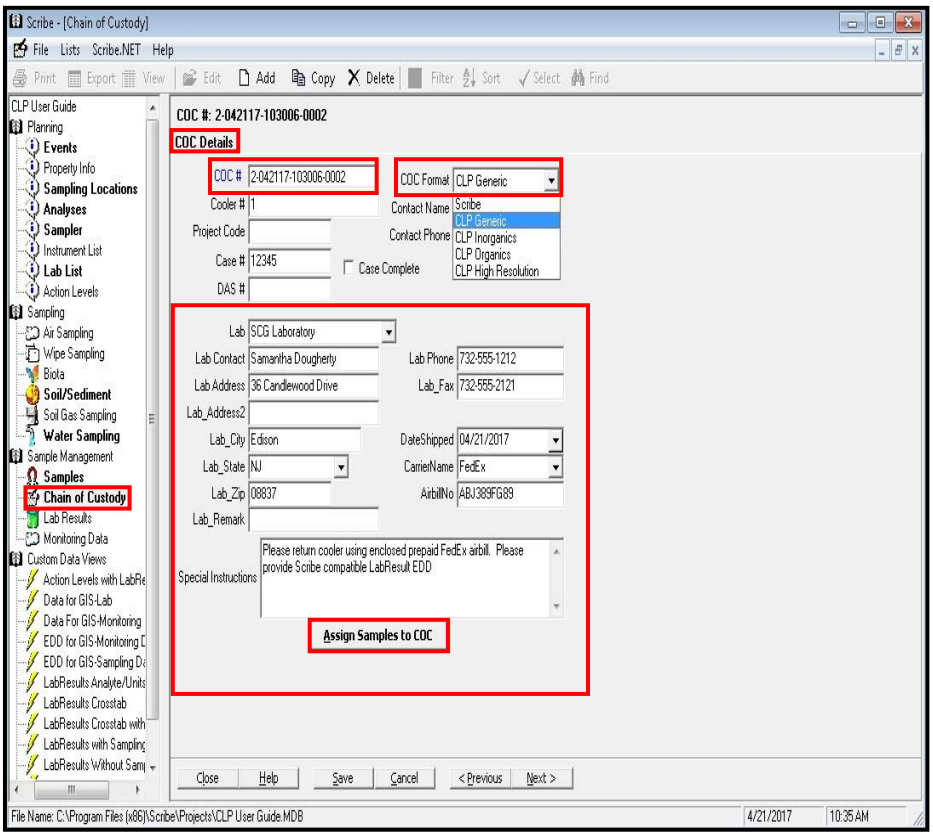
Create COC and Assign Samples

To manage and print a Chain of Custody (COC), a COC needs to be created and then samples have to be assigned to the COC:

1. Select '**Chain of Custody**' under Sample Management in the Navigation Pane.
2. Click the '**Add a Chain of Custody**' button on the bottom of the window.



3. The "**COC Details**" screen is displayed. By default, Scribe assigns a unique generic COC # across projects. The COC number auto-increments based on the COC ID# Mask. The COC number and mask can be changed at any time.



4. Complete the form selecting the Lab and entering other fields such as the Cooler #, COC Format, Date Shipped and any Special Instructions.

5. Select the correct **COC Format** based on the type of Samples you are packing. All CLP COCs are identical, however, selecting a COC Format is a convenience option that filters the samples based on the format selected (i.e., Inorganic Format will filter for Inorganic Analyses). However, if a COC needs to contain multiple Anayses types, (Organics and Inorganics) Select the CLP Generic and all samples will be available to be placed on the COC.

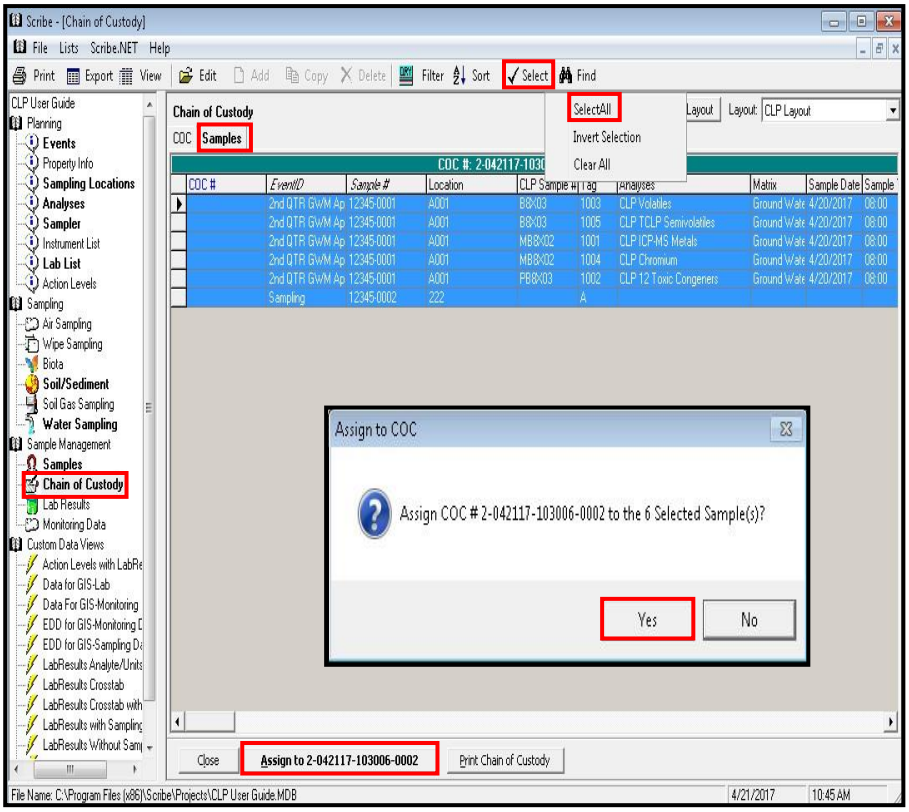
6. Click '**Assign Samples to the COC'** to continue.

7. The '**Chain of Custody Samples'** tab is displayed and lists samples that have not yet been assigned to a COC.

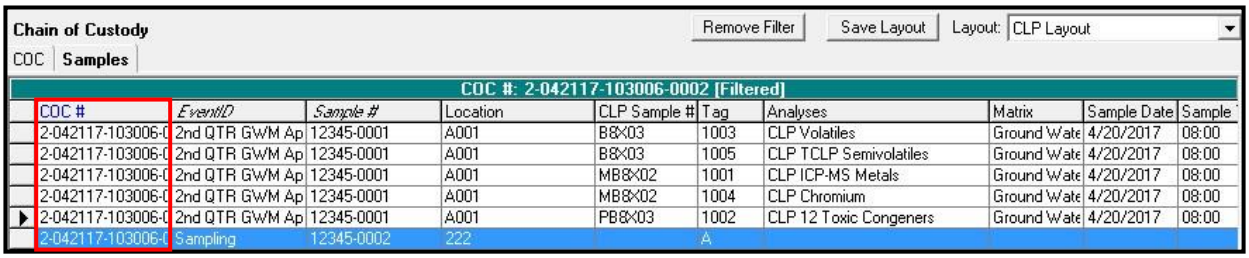
8. Select the samples to assign to the Chain of Custody by using the Select Button on the toolbar or by holding down the Shift key or Ctrl key while clicking on the first column before COC# of the samples you wish to assign to the COC.

9. Click **'Assign to'** button on the bottom of the window to assign the samples to the Chain of Custody.

10. Click '**Yes'** to assign the selected samples to the COC.



11. The selected samples are assigned to the COC.



Chain of Custody — Remove Filter | Save Layout | Layout: CLP Layout

COC | Samples

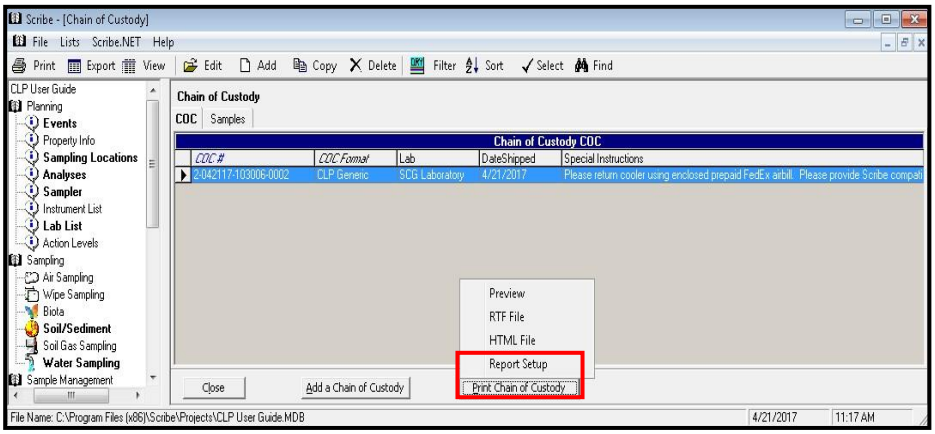
COC #: 2-042117-103006-0002 [Filtered]

COC #	EventID	Sample #	Location	CLP Sample #	Tag	Analyses	Matrix	Sample Date	Sample
2-042117-103006-(	2nd QTR GWM Ap	12345-0001	A001	B8X03	1003	CLP Volatiles	Ground Wate	4/20/2017	08:00
2-042117-103006-(	2nd QTR GWM Ap	12345-0001	A001	B8X03	1005	CLP TCLP Semivolatiles	Ground Wate	4/20/2017	08:00
2-042117-103006-(	2nd QTR GWM Ap	12345-0001	A001	MB8X02	1001	CLP ICP-MS Metals	Ground Wate	4/20/2017	08:00
2-042117-103006-(	2nd QTR GWM Ap	12345-0001	A001	MB8X02	1004	CLP Chromium	Ground Wate	4/20/2017	08:00
2-042117-103006-(	2nd QTR GWM Ap	12345-0001	A001	PB8X03	1002	CLP 12 Toxic Congeners	Ground Wate	4/20/2017	08:00
2-042117-103006-(	Sampling	12345-0002	222		A				

Configure and Print COC

To configure and print a COC:

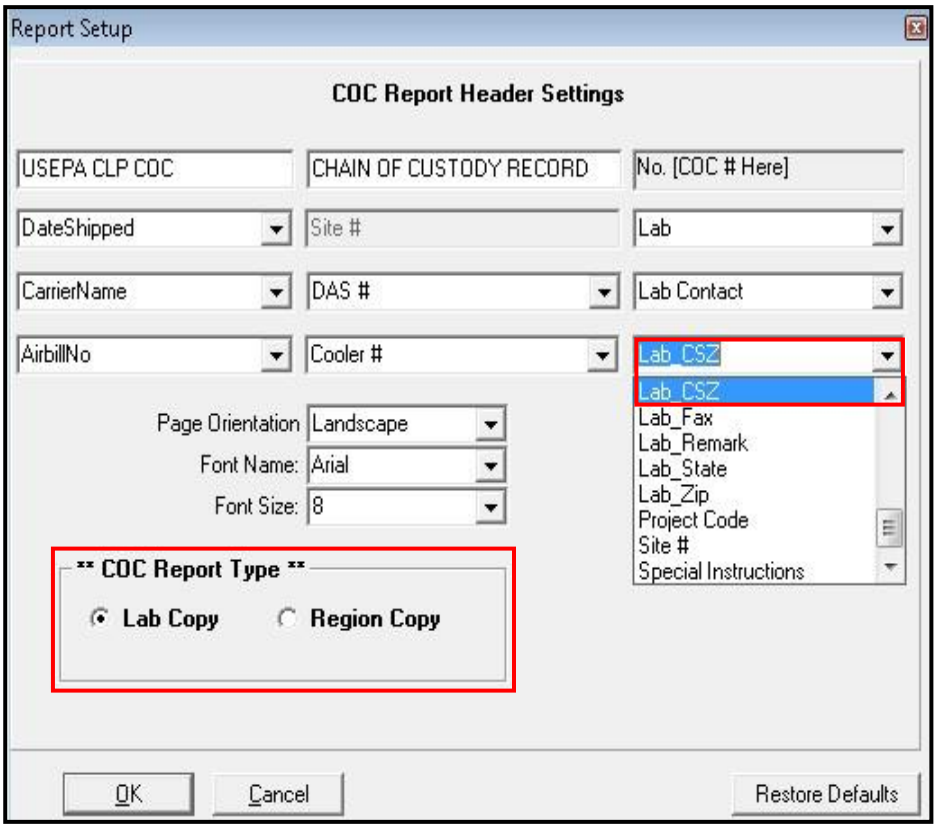
1. Click '**Print Chain of Custody**' button on the bottom of the Chain of Custody window.



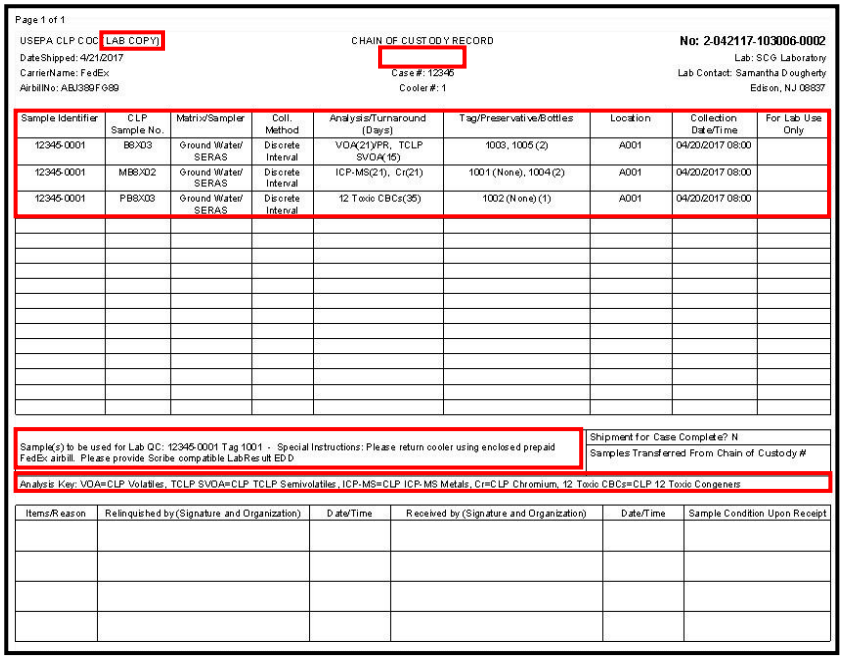
2. Select '**Report Setup**'.

3. The COC Report Header Settings are displayed. The Report Header can be customized by clicking on the down arrows and selecting different Report Header criteria (i.e., Lab_CSZ – City/State/Zip)

4. The COC Report Type (Lab or Region Copy) can also be selected. ***Note:*** *The Lab Copy does not include any Site or Project names, as well as Sample Type.*



5. Click '**OK**' to preview and click on the Printer icon on the top to print the Chain of Custody.



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USEPA CLP COC LAB COPY)
DateShipped: 4/21/2017
CarrierName: FedEx
AirbillNo: ABJ389FG89

CHAIN OF CUSTODY RECORD
Case #: 12345
Cooler #: 1

No: 2-042117-103006-0002
Lab: SCG Laboratory
Lab Contact: Samantha Dougherty
Edison, NJ 08837

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
12345-0001	B8X03	Ground Water/ SERAS	Discrete Interval	VOA(21)/PR, TCLP SVOA(15)	1003, 1005 (2)	A001	04/20/2017 08:00	
12345-0001	MB8X02	Ground Water/ SERAS	Discrete Interval	ICP-MS(21), Cr(21)	1001 (None), 1004 (2)	A001	04/20/2017 08:00	
12345-0001	PB8X03	Ground Water/ SERAS	Discrete Interval	12 Toxic CBCs(35)	1002 (None) (1)	A001	04/20/2017 08:00	

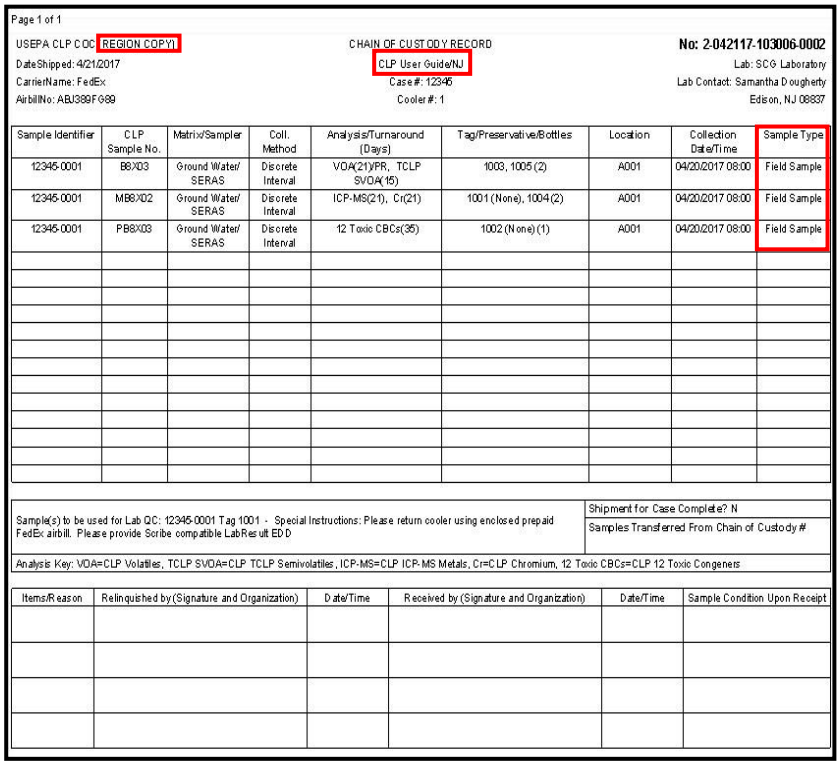
Sample(s) to be used for Lab QC: 12345-0001 Tag 1001 - Special Instructions: Please return cooler using enclosed prepaid FedEx airbill. Please provide Scribe compatible LabResult EDD

Shipment for Case Complete? N
Samples Transferred From Chain of Custody #

Analysis Key: VOA=CLP Volatiles, TCLP SVOA=CLP TCLP Semivolatiles, ICP-MS=CLP ICP-MS Metals, Cr=CLP Chromium, 12 Toxic CBCs=CLP 12 Toxic Congeners

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

CLP Generic Lab Copy



Page 1 of 1

USEPA CLP COC REGION COPY)
DateShipped: 4/21/2017
CarrierName: FedEx
AirbillNo: ABJ389FG89

CHAIN OF CUSTODY RECORD
CLP User Guide/NJ
Case #: 12345
Cooler #: 1

No: 2-042117-103006-0002
Lab: SCG Laboratory
Lab Contact: Samantha Dougherty
Edison, NJ 08837

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
12345-0001	B8X03	Ground Water/ SERAS	Discrete Interval	VOA(21)/PR, TCLP SVOA(15)	1003, 1005 (2)	A001	04/20/2017 08:00	Field Sample
12345-0001	MB8X02	Ground Water/ SERAS	Discrete Interval	ICP-MS(21), Cr(21)	1001 (None), 1004 (2)	A001	04/20/2017 08:00	Field Sample
12345-0001	PB8X03	Ground Water/ SERAS	Discrete Interval	12 Toxic CBCs(35)	1002 (None) (1)	A001	04/20/2017 08:00	Field Sample

Sample(s) to be used for Lab QC: 12345-0001 Tag 1001 - Special Instructions: Please return cooler using enclosed prepaid FedEx airbill. Please provide Scribe compatible LabResult EDD

Shipment for Case Complete? N
Samples Transferred From Chain of Custody #

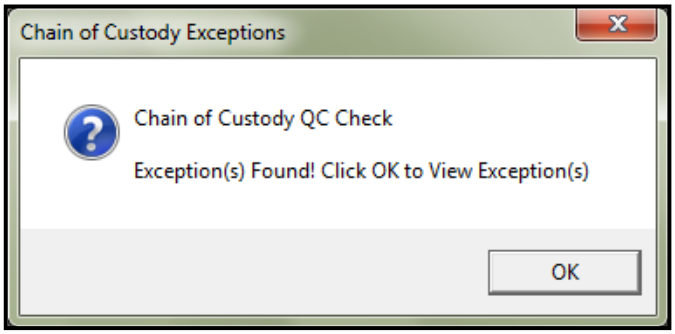
Analysis Key: VOA=CLP Volatiles, TCLP SVOA=CLP TCLP Semivolatiles, ICP-MS=CLP ICP-MS Metals, Cr=CLP Chromium, 12 Toxic CBCs=CLP 12 Toxic Congeners

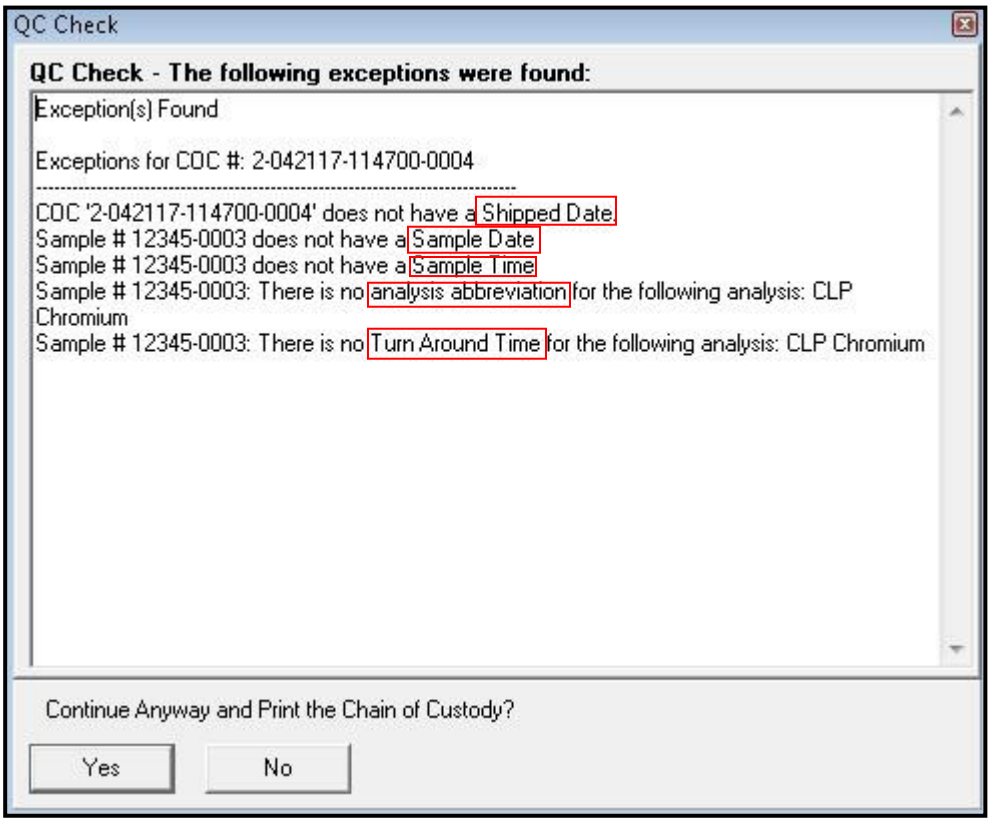
Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

CLP Generic Region Copy

COC QC Check

Scribe performs a QC Check for the COC hardcopy and .XML export. The QC check will generate a Chain of Custody Exceptions notification and a log indicating what information is missing from which samples. Examples of missing information are shown below. Users should correct the missing information prior to continuing with the COC. *Note: Users can continue and print the COC; however, the .XML may be rejected by the Sample Management Office (SMO). All information identified in the QC Check that is not resolved prior to providing the COC to the laboratory, will most likely result in a discrepancy and potential delay in the laboratory being able to log and process the samples.*

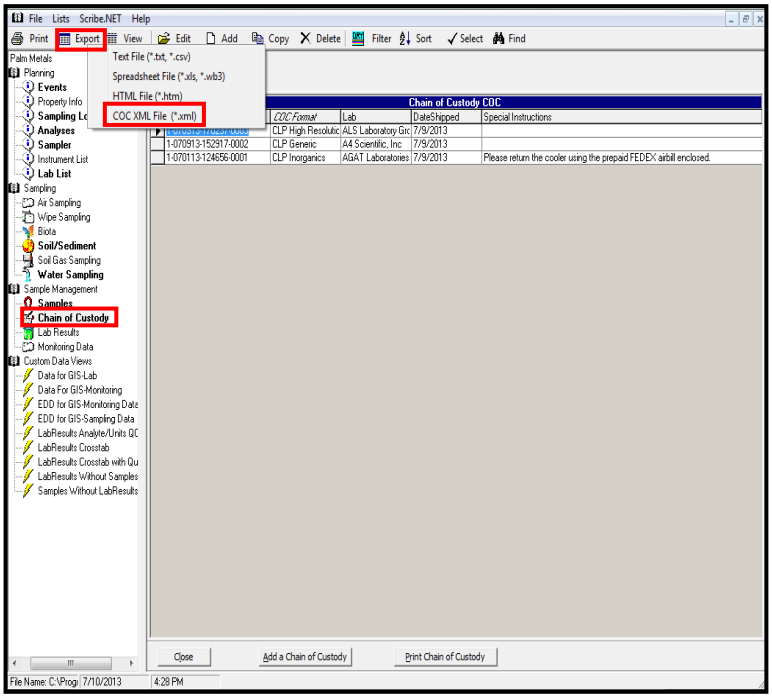




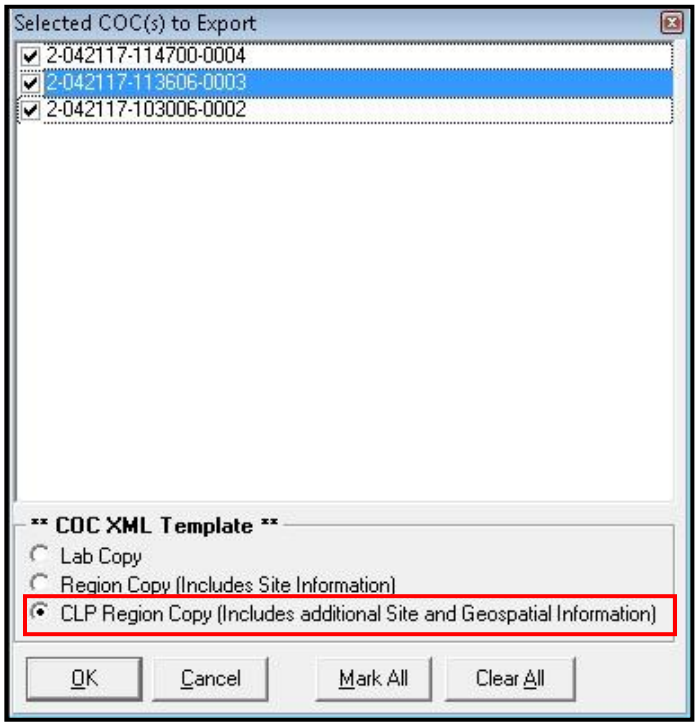
Export to XML File

Export COC to XML

To export the COC to an XML file:



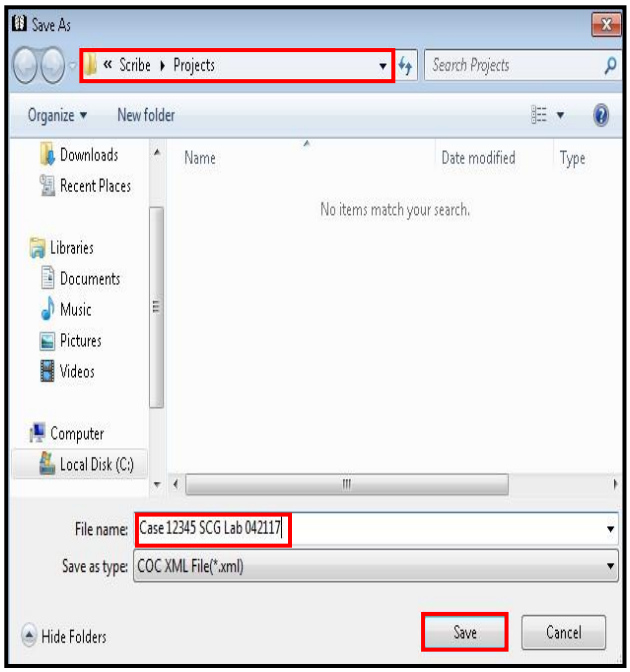
1. Click on **Chain of Custody** under Sample Management in the left Navigation bar.
2. Click the '**Export'** button on the menu bar.
3. Select '**COC XML File (*.xml)**' option.



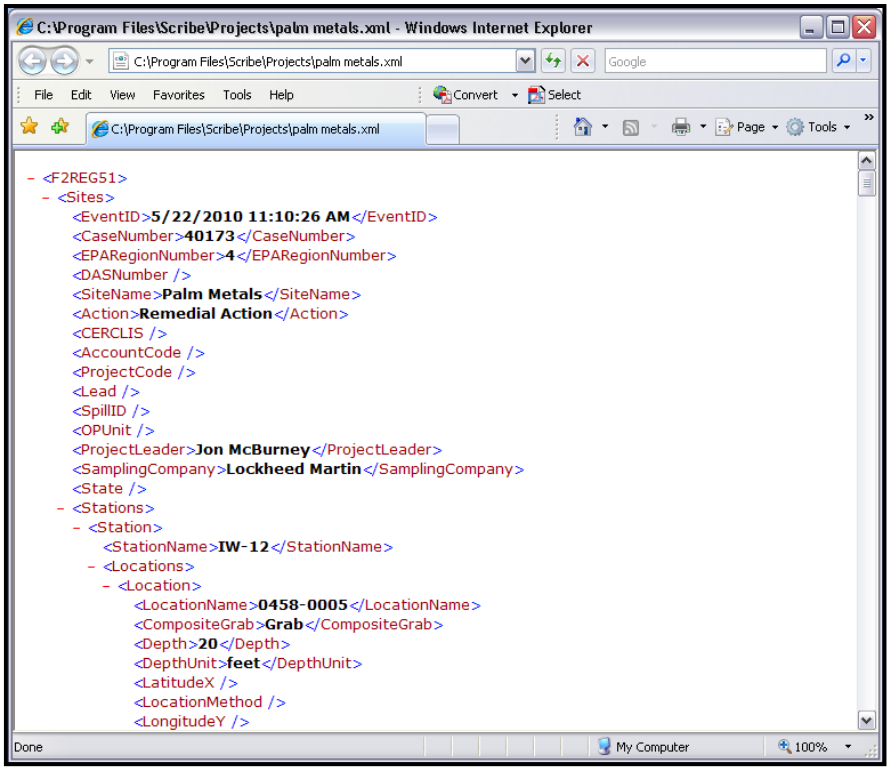
4. Select the Chain(s) of Custody records to export by checking the individual records or click the **'Mark All'** button to select all COCs.

   Note: *By default, the CLP Region Copy is selected. This format should be used for uploading to the SMO portal. If the .xml is uploaded into something other than the SMO portal and is rejected, try the Lab Copy (Legacy .XML) or the Region Copy instead.*

5. Select your file location and provide a filename and click '**Save**'.



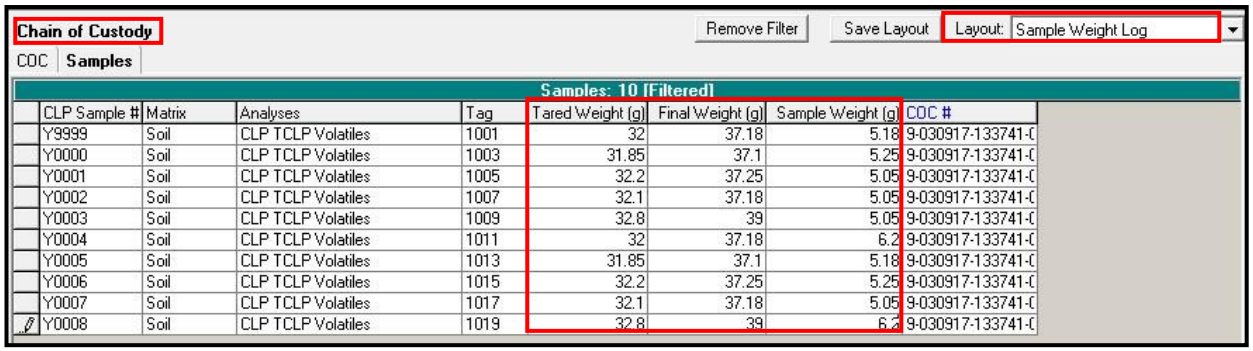
6. The .XML file may open in Windows Internet Explorer while the file is created and saved.



Sample Weight Log

Worksheet reports are also useful for creating the Sample Weight Log. After assigning the samples to a chain of custody, switch to the Sample Weight Log layout and follow the instructions above to select samples, configure the report header and generate the worksheet report. In addition, after displaying the samples with weight information, you can export the list to Microsoft Excel and configure a custom header outside of Scribe using MS Excel.

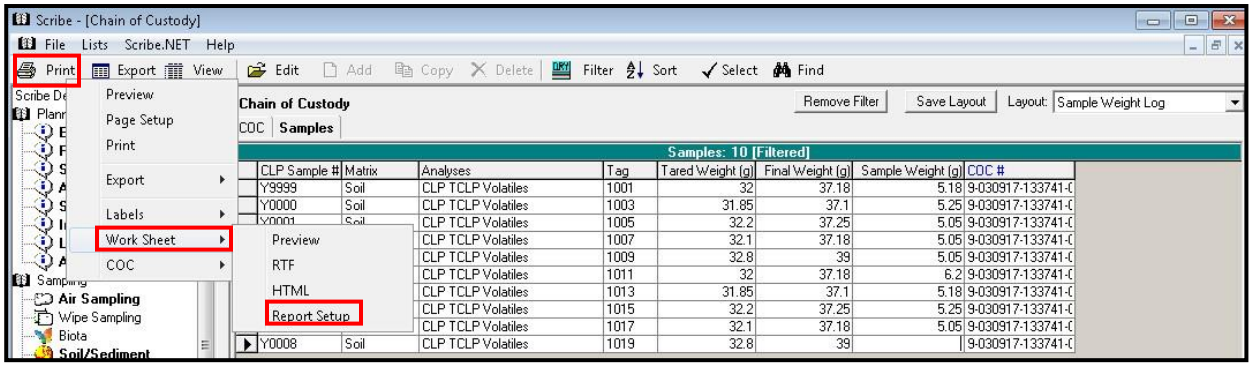
1. In the Chain of Custody section, switch to the Sample Weight Log layout.



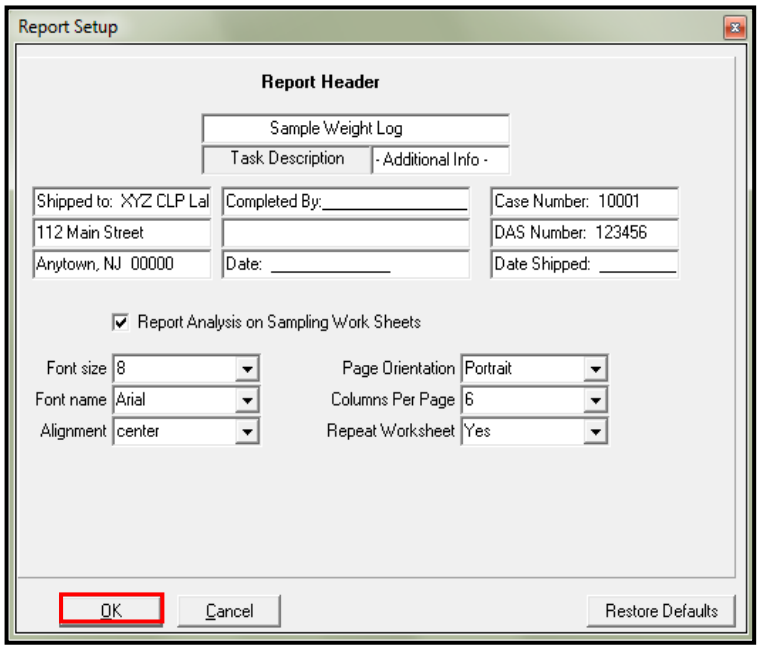
CLP Sample #	Matrix	Analyses	Tag	Tared Weight (g)	Final Weight (g)	Sample Weight (g)	COC #
Y9999	Soil	CLP TCLP Volatiles	1001	32	37.18	5.18	9-030917-133741-(
Y0000	Soil	CLP TCLP Volatiles	1003	31.85	37.1	5.25	9-030917-133741-(
Y0001	Soil	CLP TCLP Volatiles	1005	32.2	37.25	5.05	9-030917-133741-(
Y0002	Soil	CLP TCLP Volatiles	1007	32.1	37.18	5.05	9-030917-133741-(
Y0003	Soil	CLP TCLP Volatiles	1009	32.8	39	5.05	9-030917-133741-(
Y0004	Soil	CLP TCLP Volatiles	1011	32	37.18	6.2	9-030917-133741-(
Y0005	Soil	CLP TCLP Volatiles	1013	31.85	37.1	5.18	9-030917-133741-(
Y0006	Soil	CLP TCLP Volatiles	1015	32.2	37.25	5.25	9-030917-133741-(
Y0007	Soil	CLP TCLP Volatiles	1017	32.1	37.18	5.05	9-030917-133741-(
Y0008	Soil	CLP TCLP Volatiles	1019	32.8	39	6.2	9-030917-133741-(

2. Enter the Tared, Final and Sample Weight.

3. Click on the **'Print'** | Work Sheet | Report Setup.



4. Configure the Report Header fields to reflect the information that will be displayed at the top of the report.



5. Click **'OK'** and the Sample Weight Log report is generated.

Page 1 of 1

Sample Weight Log

Chain of Custody - Additional Info -

Shipped to: XYZ CLP Lab
112 Main Street
Anytown, NJ 00000

Completed By:_____

Date: _____

Case Number: 10001
DAS Number: 123456
Date Shipped: _____

CLP Sample #	A0AB0	A0AB2	A0AB4	A0AB6	A0AC4
Matrix	Soil	Soil	Soil	Soil	Soil
Analyses	CLP TCL Volatiles	CLP TCL Volatiles	CLP TCL Volatiles	CLP TCL Volatiles	CLP TCL Volatiles
Preservative					
Tag	1009	1009	1009	1009	1009
Tared Weight (g)	32	31.85	32.2	32.1	32.8
Final Weight (g)	37.18	37.1	37.25	37.18	39
Sample Weight (g)	5.18	5.25	5.05	5.05	6.2
COC #	1-071113-163043-0004	1-071113-163043-0004	1-071113-163043-0004	1-071113-163043-0004	1-071113-163043-0004