Gelman Sciences Inc.
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CASE NARRATIVE

Monthly Data Gelman Sciences
Project: 1,4-Dioxane Remediation
Date: November 2021

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition, all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Gelman Sciences Inc. attests to the validity of the laboratory data generated by Gelman Sciences Ann Arbor, Michigan Environmental Laboratory facilities reported herein. All analyses performed by Gelman Science's Environmental Laboratory facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Gelman Science's Environmental group has reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

At the end of the month some of the 1,4-dioxane samples were sent to Ann Arbor Technical Services for analysis due to a reproducibility problem. The balance of the samples was analyzed for 1,4-dioxane at Gelman Science's Environmental Laboratory. All bromate samples were analyzed by Gelman Science's Environmental Laboratory. The test results in this report meet all NELAP requirements for parameters for which accreditation are required or available. Any exceptions to NELAP requirements are noted in this report. All exceptions are noted per laboratory standard operating procedure based on EPA Method 1624c. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results. The odd even rule is used for rounding. Holding times were met for all samples analyzed. Proper preservation was observed on all samples unless otherwise detailed in the individual sections below.

RECEIPT/ STORAGE

The samples were received on the days noted in the report for the Month; the samples arrived in good condition, properly preserved and on ice when necessary. Samples that require 1,4-dioxane analysis are collected in hydrochloric HCl acid-preserved vials to a pH of ≤2, except for the Pall ozone treatment samples. These samples have chemicals that, when mixed with the HCl acid, cause interferences and trap damage. Every attempt is made to analyze these samples within 24 hours of receipt.

Samples that require Bromate analysis are collected and preserved in the laboratory with ethylene di-amine and refrigerated.

Samples that are delivered to the laboratory the same day as they are collected are likely not to have reached a fully chilled temperature. This is acceptable as long as there is evidence that chilling has begun. All samples are iced or refrigerated at 4°C (±2°C) from the time of collection until sample preparation or analysis.

1,4-Dioxane (GC-MS)

All ground water and treated water samples were analyzed for 1,4-Dioxane (GC-MS) in accordance with EPA 1624C, which has been modified to enhance detection limits. Samples that were diluted to bring them within the calibrated range of the instrument are noted with a "D" under the Qualifier Code section of the data report. Reporting limits were adjusted based on each dilution.

Reporting limit for undiluted samples is 1ppb (part per billion, micrograms per liter, µg/L). All quality control parameters were within the acceptance limits for reported samples unless indicated.

GELMAN Sciences Inc.

Bromate (Ion Chromatography)

All surface water and treated samples were analyzed for Bromate (Ion Chromatography) in accordance with EPA 300.1. Surrogates are added to all samples. All quality control parameters were within the acceptance limits with the balance of sample analyzed.

The reporting limit for treated samples is 5.0ppb and for surface samples is 2.0ppb.

Qualifiers

1,4-Dioxane Qualifier Codes:

Qualifier Code	*Description*
nd:	The compound was analyzed for, but not detected at or above the detection limit indicated.
D:	Analyte value quantified from a dilution; reporting limit is raised to reflect dilution.
E:	The compound result is greater than the upper quantitation limit in the associated calibration curve, reported as estimate.
B:	The sample vials contained air bubbles larger than 5mm, which may affect compound results.
J:	The compound was positively identified; the associated numerical value is the approximate concentration.
M:	Matrix effects, sample required dilution.
R:	The reported value is unusable and rejected due to variance from quality control criteria.
V:	The reported value is considered estimated due to variance from quality control criteria.
H:	Sample was analyzed past 14-day hold time, but within 45 days.
O:	Samples analyzed in outside laboratory.
S:	Samples split with DEQ.

Bromate Qualifier Codes:

Qualifier Code	*Description*
nd:	The compound was analyzed but was not detected at or above the detection limit indicated.
E:	The compound result is greater than the upper quantitation limit in the associated calibration curve.
J:	The compound was positively identified; the associated numerical value is the approximate concentration.
R:	The reported value is unusable and rejected due to variance from quality control criteria.
V:	The reported value is considered estimated due to variance from quality control criteria.
H:	Sample was analyzed past 28-day hold time

Analyst: *Gage M. Trendel* _____ Date: _____

Report Checked by: *Ray Woods* _____ Date: 12/10/21

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Sample Analysis Report

November, 2021

Analyst Initials: _____
Date: _____

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
Extraction Wells								
C3								
DOLPH-11-12-21-11:40-1	130	2.0						O, D
TW-20-11-12-21-11:45-1	770	20.0						O, D
D2								
LB-4-11-11-21-10:55-1	400	10.0						O, D
TW-21-11-12-21-11:25-1	220	10.0						O, D
TW-5-11-12-21-11:55-1	710	20.0						O, D
E								
TW-11-11-12-21-12:00-1	150	10.0						O, D
TW-17-11-12-21-11:50-1	65	2.0						O, D
TW-18-11-12-21-11:30-1	220	10.0						O, D
TW-23-11-12-21-10:35-1	370	10.0						O, D
TW-29-11-12-21-10:50-1	280	10.0						O, D
Marshy								
PW-1-11-12-21-11:35-1	710	10.0						O, D
SW								
TW-22-11-12-21-12:05-1	430	10.0						O, D
TW-28-11-12-21-12:10-1	610	10.0						O, D
Monitoring Wells								

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
D0								
A2 Cleaning Supply-11-23-21-08:45-1	35	1.0						O
MW-53d-11-18-21-15:20-1	nd	1.0						O
MW-53d-11-30-21-13:15-1	nd	1.0						O
MW-53i-11-18-21-13:55-1	31	1.0						O
MW-53s-11-18-21-12:35-1	nd	1.0						O
D2								
175 Jackson Plaza-11-24-21-14:07-1	900	40.0						O, D
MW-113-11-15-21-10:16-1	130	2.0						O, D
MW-118-11-24-21-12:50-1	56	1.0						O
MW-120s-11-01-21-11:15-1	nd	1.0						O
MW-123s-11-10-21-10:46-1	nd	1.0						O
MW-130i-11-10-21-14:30-1	6	1.0						O
MW-130s-11-10-21-13:20-1	nd	1.0						O
MW-133i-11-24-21-10:26-1	2	1.0						O
MW-133s-11-24-21-09:11-1	2	1.0						O
MW-BE-1d-11-15-21-11:35-1	350	10.0						O, D
MW-BE-1s-11-15-21-12:44-1	550	10.0						O, D
E								
MW-101-11-23-21-13:50-1	86	1.0						O
MW-103d-11-22-21-14:21-1	3	1.0						O
MW-103s-11-22-21-15:34-1	73	1.0						O
MW-106s-11-29-21-10:02-1	250	20.0						O, D
MW-108d-11-15-21-15:22-1	460	10.0						O, D
MW-108s-11-15-21-14:14-1	240	5.0						O, D
MW-112d-11-22-21-11:26-1	1	1.0						O

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
MW-112i-11-22-21-12:36-1	9	1.0						O
MW-112s-11-22-21-10:16-1	3	1.0						O
MW-115-11-23-21-12:23-1	440	10.0						O, D
MW-116-11-23-21-10:55-1	680	10.0						O, D
MW-119-11-01-21-12:48-1	25	1.0						O
MW-120d-11-01-21-09:45-1	nd	1.0						O
MW-123d-11-10-21-09:20-1	nd	1.0						O
MW-130d-11-10-21-12:08-1	nd	1.0						O
MW-133d-11-24-21-11:33-1	4	1.0						O
MW-76i-11-19-21-09:30-1	86	2.0						O, D
MW-76s-11-18-21-11:00-1	230	10.0						O, D
MW-84s-11-18-21-17:15-1	440	10.0						O, D
MW-85-11-01-21-14:07-1	410	10.0						O, D
Surface Water								
Not Applicable								
HC/HR-11-01-21-10:00-1			nd	2.0				
HC/HR-11-02-21-09:45-1			nd	2.0				
HC/HR-11-03-21-10:38-1			nd	2.0				
HC/HR-11-04-21-09:55-1			nd	2.0				
HC/HR-11-05-21-08:50-1			nd	2.0				
HC/HR-11-08-21-10:00-1			nd	2.0				
HC/HR-11-09-21-09:05-1			nd	2.0				
HC/HR-11-10-21-10:15-1			nd	2.0				
HC/HR-11-11-21-10:10-1			nd	2.0				
HC/HR-11-12-21-10:10-1			nd	2.0				
HC/HR-11-15-21-09:50-1			nd	2.0				
HC/HR-11-16-21-10:30-1			nd	2.0				

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
HC/HR-11-17-21-12:00-1			nd	2.0				
HC/HR-11-18-21-09:10-1			nd	2.0				
HC/HR-11-19-21-10:50-1			nd	2.0				
HC/HR-11-22-21-10:20-1			nd	2.0				
HC/HR-11-23-21-09:50-1			nd	2.0				
HC/HR-11-24-21-09:55-1			nd	2.0				
HC/HR-11-29-21-10:50-1			nd	2.0				
HC/HR-11-30-21-10:20-1			nd	2.0				
Treatment System								
OUTFALL-11-01-21-2			13	5.0				
OUTFALL-11-01-21-1	7	1.0						O
OUTFALL-11-02-21-2			7.2	5.0				
OUTFALL-11-02-21-1	7	1.0						O
OUTFALL-11-03-21-2			6.6	5.0				
OUTFALL-11-03-21-1	8	1.0						O
OUTFALL-11-04-21-2			8.2	5.0				
OUTFALL-11-04-21-1	7	1.0						O
OUTFALL-11-07-21-2			10	5.0				
OUTFALL-11-07-21-1	7	1.0						O
OUTFALL-11-08-21-2			9.6	5.0				
OUTFALL-11-08-21-1	6	1.0						O
OUTFALL-11-09-21-2			9.0	5.0				
OUTFALL-11-09-21-1	6	1.0						O
OUTFALL-11-10-21-2			7.8	5.0				
OUTFALL-11-10-21-1	6	1.0						O
OUTFALL-11-11-21-2			9.2	5.0				
OUTFALL-11-11-21-1	7	1.0						O

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
OUTFALL-11-14-21-2			9.2	5.0				
OUTFALL-11-14-21-1	6	1.0						O
OUTFALL-11-15-21-2			11	5.0				
OUTFALL-11-15-21-1	6	1.0						O
OUTFALL-11-16-21-2			8.7	5.0				
OUTFALL-11-16-21-1	6	1.0						O
OUTFALL-11-17-21-2			7.7	5.0				
OUTFALL-11-17-21-1	7	1.0						O
OUTFALL-11-18-21-2			9.3	5.0				
OUTFALL-11-18-21-1	7	1.0						O
OUTFALL-11-21-21-2			6.5	5.0				
OUTFALL-11-21-21-1	7	1.0						O
OUTFALL-11-22-21-2			8.0	5.0				
OUTFALL-11-22-21-1	6	1.0						O
OUTFALL-11-23-21-2			7.0	5.0				
OUTFALL-11-23-21-1	7	1.0						O
OUTFALL-11-24-21-2			7.8	5.0				
OUTFALL-11-24-21-1	6	1.0						O
OUTFALL-11-25-21-			7.7	5.0				
OUTFALL-11-25-21-1	7	1.0						O
OUTFALL-11-28-21-			7.6	5.0				
OUTFALL-11-28-21-1	6	1.0						O
OUTFALL-11-29-21-2			7.6	5.0				
OUTFALL-11-29-21-1	6	1.0						O
OUTFALL-11-30-21-2			8.2	5.0				
OUTFALL-11-30-21-1	6	1.0						O
Red Pond-11-01-21-07:00-1	300	40						o,d

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
Red Pond-11-02-21-07:10-1	330	40.0						O, D
Red Pond-11-03-21-09:05-1	320	40.0						O, D
Red Pond-11-04-21-07:05-1	330	40.0						O, D
Red Pond-11-05-21-06:55-1	300	40.0						O, D
Red Pond-11-08-21-07:20-1	330	40.0						O, D
Red Pond-11-09-21-07:25-1	320	40.0						O, D
Red Pond-11-10-21-06:55-1	320	40.0						O, D
Red Pond-11-11-21-07:10-1	340	40.0						O, D
Red Pond-11-12-21-07:30-1	340	40.0						O, D
Red Pond-11-15-21-07:05-1	310	40.0						O, D
Red Pond-11-16-21-07:05-1	330	40.0						O, D
Red Pond-11-17-21-07:30-1	330	40.0						O, D
Red Pond-11-18-21-06:55-1	320	40.0						O, D
Red Pond-11-19-21-07:15-1	310	40.0						O, D
Red Pond-11-22-21-07:30-1	290	40.0						O, D
Red Pond-11-23-21-07:00-1	290	40.0						O, D
Red Pond-11-24-21-07:20-1	340	40.0						O, D
Red Pond-11-29-21-07:05-1	310	40.0						O, D
Red Pond-11-30-21-07:35-1	300	40.0						O, D

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1102211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
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ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1102211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 12 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/02/21, and associated matrix-specific QA/QC.

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/02/21				
Outfall 001	11/1/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/2/21	Urgent	1,4-Dioxane	Water
Eff-OC-1A	11/2/21	Urgent	1,4-Dioxane	Water
Eff-OC-2A	11/2/21	Urgent	1,4-Dioxane	Water
BP-1	11/2/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/2/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/2/21	Urgent	1,4-Dioxane	Water
Red Pond	11/2/21	Urgent	1,4-Dioxane	Water
MW-119	11/1/21	Standard	1,4-Dioxane	Water
MW-85	11/1/21	Standard	1,4-Dioxane	Water
MW-120S	11/1/21	Standard	1,4-Dioxane	Water
MW-120D	11/1/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	8 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
1,4-Dioxane (USEPA 1624) – Standard TAT	4 Sample

Consultants in Chemistry & Environmental Science
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Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (IS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, IIPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/2/21

Mark DeLong

/ December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/ December 6, 2021

Philip B. Simon (Laboratory Director)

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1102211	Preparation Date	11/02/2021
Client Sample ID	Outfall 001	Analysis Date	11/02/2021 12:07:22
Laboratory Sample ID	1102211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/01/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1102211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.007	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.
Sample analyzed at native pH.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1102211	Preparation Date	11/02/2021
Client Sample ID	Red Pond	Analysis Date	11/02/2021 10:26:32
Laboratory Sample ID	1102211-6	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/02/2021 7:10	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1102211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.33	0.040		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1102211	Preparation Date	11/02/2021
Client Sample ID	MW-119	Analysis Date	11/02/2021 21:37:57
Laboratory Sample ID	1102211-9	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/01/2021 12:40	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1102211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.025	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1102211
SDG: 1102211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 1102211	11/22/2021	12:26:14	1,4-Dioxane	123-91-1		0.010	0.0095	mg/L	Wet	95.3	85	115	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates derived reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21				
ATS SDG Number	1102211	Percent Moisture	100.0		
Client Sample ID	MW-1D	Preparation Date	11/02/2021		
Laboratory Sample ID	1102211-1D	Analysis Date	11/02/2021 22:11:48		
Matrix	Water	Instrument	7000D		
Sample Date	11/01/2021 14:07	Subsample (mL)	0.0000		
Analytical Method (USEPA)	USEPA 1624	Final Volume (mL)	0.000		
Preparation Method (USEPA)	USEPA 1624	Dilution Factor	1		
QC Batch Number	QCORG1102211	Units	Wet		
			mg/L		

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.41	0.010		M

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates derived reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1102211
SDG: 1102211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1102211-6 MS	11/22/2021	20:10:33	1,4-Dioxane	123-91-1	0.33	0.40	0.69	mg/L	Wet	88.7	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates derived reporting limit based upon sample dilution.

Ann Arbor Technical Services, Inc.
305 South Wagner Road
Ann Arbor, Michigan 48103

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21				
ATS SDG Number	1102211	Percent Moisture	100.0		
Client Sample ID	MW-1D	Preparation Date	11/02/2021		
Laboratory Sample ID	1102211-1D	Analysis Date	11/02/2021 23:56:22		
Matrix	Water	Instrument	7000D		
Sample Date	11/01/2021 14:07	Subsample (mL)	0.0000		
Analytical Method (USEPA)	USEPA 1624	Final Volume (mL)	0.000		
Preparation Method (USEPA)	USEPA 1624	Dilution Factor	1		
QC Batch Number	QCORG1102211	Units	Wet		
			mg/L		

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	ND	0.0010		U

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates derived reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1102211
SDG: 1102211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1102211-6 MSD	11/22/2021	20:54:09	1,4-Dioxane	123-91-1	0.33	0.40	0.69	mg/L	Wet	90.9	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates derived reporting limit based upon sample dilution.

Ann Arbor Technical Services, Inc.
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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21				
ATS SDG Number	1102211	Percent Moisture	100.0		
Client Sample ID	MW-1D	Preparation Date	11/02/2021		
Laboratory Sample ID	1102211-1D	Analysis Date	11/02/2021 23:40:32		
Matrix	Water	Instrument	7000D		
Sample Date	11/01/2021 14:07	Subsample (mL)	0.0000		
Analytical Method (USEPA)	USEPA 1624	Final Volume (mL)	0.000		
Preparation Method (USEPA)	USEPA 1624	Dilution Factor	1		
QC Batch Number	QCORG1102211	Units	Wet		
			mg/L		

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	ND	0.0010		U

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates derived reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1102211
SDG: 1102211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
1102211-6 MS	11/22/2021	20:10:33	1,4-Dioxane	123-91-1	0.69		mg/L	Wet			
1102211-6 MSD	11/22/2021	20:54:09	1,4-Dioxane	123-91-1	0.69	0.69	mg/L	Wet	1.3	20	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates derived reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1102211
SDG: 1102211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 1110131	11/01/2021	11:12:05	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates derived reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS

1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1103211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1103211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 11 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/03/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/03/21				
Outfall 001	11/2/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/5/21	Urgent	1,4-Dioxane	Water
DIE-OC-1A	11/5/21	Urgent	1,4-Dioxane	Water
DIE-OC-2A	11/5/21	Urgent	1,4-Dioxane	Water
BP-1	11/5/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/5/21	Urgent	1,4-Dioxane	Water
Outfall Tap	11/5/21	Urgent	1,4-Dioxane	Water
Red Pond	11/5/21	Urgent	1,4-Dioxane	Water
TB-21-01 (50'-60')	11/2/21	Urgent	1,4-Dioxane	Water
TB-21-01 (65'-70')	11/2/21	Urgent	1,4-Dioxane	Water
TB-21-01 (105'-115')	11/2/21	Urgent	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
• 1,4-Dioxane (USEPA 1624) – Urgent TAT	• 11 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 ISDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (IV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/5/21

Mark T. DeLong

/ December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/ December 6, 2021

Philip B. Simon (Laboratory Director)

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1103211	Preparation Date	11/03/2021
Client Sample ID	Outfall 001	Analysis Date	11/03/2021 10:45:42
Laboratory Sample ID	1103211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/02/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1103211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.007	0.0010		

Comments
Calculations performed using US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon limited calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.
Sample analyzed at native pH.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1103211	Preparation Date	11/03/2021
Client Sample ID	Red Pond	Analysis Date	11/03/2021 20:15:53
Laboratory Sample ID	1103211-6	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/03/2021 9:05	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1103211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.32	0.040		M

Comments
Calculations performed using US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon limited calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.
QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QC/QC Batch Number: QCORG1103211
SDG: 1103211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1103211	11/03/2021	09:45:58	1,4-Dioxane	123-91-1		mg/L	Wet		0.001	

Comments
Calculations performed using US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Analytes detected at or below the reporting limit are reported.
Analytes detected at or below method detection limit are reported.
M indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GCDIG1103211
SDG: 1103211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemist Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Recov	Percent Recovery	LC.	UC.	Comments
LFB1103211	11/03/2021	08:07:19	1,4-Dioxane	123-91-1		0.510	0.0207	ug/L	104	81.3	60	115	

Comments:
Analytical Method is 1,4-Dioxane, Method 1624 Modified
Reported Concentration is in ug/L
Recovery Limits are based on laboratory control sample data
Recovery Limits are based on laboratory control sample data
Recovery Limits are based on laboratory control sample data

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GCDIG1103211
SDG: 1103211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemist Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Recov	Percent Recovery	LC.	UC.	Comments
1103211A-02	11/03/2021	22:53:34	1,4-Dioxane	123-91-1	0.23	0.42	0.65	ug/L	104	97.6	52	125	

Comments:
Analytical Method is 1,4-Dioxane, Method 1624 Modified
Reported Concentration is in ug/L
Recovery Limits are based on laboratory control sample data
Recovery Limits are based on laboratory control sample data
Recovery Limits are based on laboratory control sample data

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GCDIG1103211
SDG: 1103211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemist Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Recov	Percent Recovery	LC.	UC.	Comments
1103211A-03	11/03/2021	21:42:28	1,4-Dioxane	123-91-1	0.23	0.42	0.67	ug/L	106	97.3	52	125	

Comments:
Analytical Method is 1,4-Dioxane, Method 1624 Modified
Reported Concentration is in ug/L
Recovery Limits are based on laboratory control sample data
Recovery Limits are based on laboratory control sample data
Recovery Limits are based on laboratory control sample data

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GCDIG1103211
SDG: 1103211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemist Name	CAS	Found	Mean	Units	Recov	RPD	Control Limit	Comments
1103211A-02	11/03/2021	22:53:34	1,4-Dioxane	123-91-1	0.65		ug/L	104			
1103211A-03	11/03/2021	21:42:28	1,4-Dioxane	123-91-1	0.67	0.66	ug/L	106	4.0	32	

Comments:
Analytical Method is 1,4-Dioxane, Method 1624 Modified
Reported Concentration is in ug/L
Recovery Limits are based on laboratory control sample data
Recovery Limits are based on laboratory control sample data
Recovery Limits are based on laboratory control sample data

ORGANIC ANALYSIS

1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1104211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1104211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 11 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/04/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/04/21				
Outfall 001	11/3/21	Urgent	1,4-Dioxane	Water
Comb Iff	11/4/21	Urgent	1,4-Dioxane	Water
IDF-OC-1A	11/4/21	Urgent	1,4-Dioxane	Water
IDF-OC-2A	11/4/21	Urgent	1,4-Dioxane	Water
DP-1	11/4/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/4/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/4/21	Urgent	1,4-Dioxane	Water
Red Pond	11/4/21	Urgent	1,4-Dioxane	Water
TB-21-01 (117'-127')	11/3/21	Urgent	1,4-Dioxane	Water
TB-21-01 (127'-137')	11/3/21	Urgent	1,4-Dioxane	Water
TB-21-01 (137'-147')	11/3/21	Urgent	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
• 1,4-Dioxane (USEPA 1624)--Urgent TAT	• 11 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (IS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Rad Pond 11/4/21

Mark T. DeLong (Quality Assurance Coordinator) / December 6, 2021

Philip B. Silver (Laboratory Director) / December 6, 2021

6664 NB3 ACN / 1MS11.xls

Ann Arbor Technical Services, Inc.
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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21		
ATS SDG Number	1104211		
Client Sample ID	Outlet 4001		
Laboratory Sample ID	1104211-1		
Matrix	Water		
Sample Date	11/04/2021 0a		
Analytical Method (USEPA)	USEPA 1624		
Preparation Method (USEPA)	USEPA 1624		
QC Batch Number	QCORG1104211		
Parameter	Chemical Identifier	Result	MDL
1,4-Dioxane	123-91-1	0.008	0.0010

Percent Moisture	100.0	
Preparation Date	11/04/2021	
Analysis Date	11/04/2021 20:13:07	
Instrument	7890/5977	
Initial Volume (mL)	250.00	
Final Volume (mL)	5.000	
Dilution Factor	1.000	
Units	ug/L	
PQL	Goal	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1104211
SDG: 1104211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 11/4/21	11/04/2021	16:33:39	1,4-Dioxane	123-91-1		0.010	0.0087	mg/L	Wet	87.1	85	115	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1104211
SDG: 1104211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1104211-8 MS	11/05/2021	02:52:10	1,4-Dioxane	123-91-1	0.33	0.40	0.76	mg/L	Wet	106	80	120	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21		
ATS SDG Number	1104211		
Client Sample ID	Rad Pond 11/4/21		
Laboratory Sample ID	1104211-4		
Matrix	Water		
Sample Date	11/04/2021 7:55		
Analytical Method (USEPA)	USEPA 1624		
Preparation Method (USEPA)	USEPA 1624		
QC Batch Number	QCORG1104211		
Parameter	Chemical Identifier	Result	MDL
1,4-Dioxane	123-91-1	0.33	0.040

Percent Moisture	100.0	
Preparation Date	11/04/2021	
Analysis Date	11/04/2021 18:18:34	
Instrument	7890/5977	
Initial Volume (mL)	0.0000	
Final Volume (mL)	0.000	
Dilution Factor	40.00	
Units	mg/L	
PQL	Goal	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1104211
SDG: 1104211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1104211-8 MSD	11/05/2021	03:40:47	1,4-Dioxane	123-91-1	0.33	0.40	0.72	mg/L	Wet	94.2	80	120	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1104211
SDG: 1104211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
1104211-8 MS	11/05/2021	02:52:10	1,4-Dioxane	123-91-1	0.76		mg/L	Wet			
1104211-8 MSD	11/05/2021	03:40:47	1,4-Dioxane	123-91-1	0.72	0.74	mg/L	Wet	4.4	30	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1104211
SDG: 1104211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 11/4/21	11/04/2021	17:17:32	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1105211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1105211 / 1105122
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 11 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/05/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/05/21				
Outfall 001	11/4/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/5/21	Urgent	1,4-Dioxane	Water
Eff-OC-1A	11/5/21	Urgent	1,4-Dioxane	Water
Eff-OC-2A	11/5/21	Urgent	1,4-Dioxane	Water
BP-1	11/5/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/5/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/5/21	Urgent	1,4-Dioxane	Water
Red Pond	11/5/21	Urgent	1,4-Dioxane	Water
Th-21-02 (36'-40')	11/5/21	Urgent	1,4-Dioxane	Water
Th-21-02 (137'-137')	11/5/21	Urgent	1,4-Dioxane	Water
Th-21-02 (142'-147')	11/5/21	Urgent	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
• 1,4-Dioxane (USEPA 1624) – Urgent TAT	• 11 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Dell Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA RS EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/5/21

Mark Delong
/December 6, 2021
Mark T. DeLong (Quality Assurance Coordinator)

/December 6, 2021
Philip B. Simon (Laboratory Director)

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1105211	Preparation Date	11/05/2021
Client Sample ID	Outfall 001	Analysis Date	11/05/2021 11:50:06
Laboratory Sample ID	1105211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/04/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1105211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.057	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Method specific reporting limit (MRL) based upon lowest calibration standard.
U - Indicates analyte was not detected and assed upon sample dilution.
(sample analyzed at native pH)

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1105211	Preparation Date	11/05/2021
Client Sample ID	Red Pond	Analysis Date	11/05/2021 17:28:58
Laboratory Sample ID	1105211-8	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/05/2021 6:55	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1105211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.38	0.040		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Method specific reporting limit (MRL) based upon lowest calibration standard.
M - Indicates standard reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.
QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1105211
SDG: 1105211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LB-111021	11/05/2021	10:28:28	1,4-Dioxane	123-91-1		ug/L	Wet	0.021		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Method specific reporting limit (MRL) based upon lowest calibration standard.
Final sample aliquot and pH (for lower aqueous level volatiles analysis) recorded in the raw data for each sample in the SDG.
Method specific reporting limits (MRL) based upon lowest calibration standard.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCOFG1110211
SDG: 1108211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Recov.	Percent Recovery	LCL	UCL	Comments
LFB1110211	11/02/2021	12:28:19	1,4-Dioxane	123-91-1		0.510	0.510	ug/L	100	100	85	115	

Comments:
Samples analyzed on a DB-624 capillary column (Phenomenex 30 m x 0.25 mm ID x 1.4 um film).
Calculations performed using Thermo Xcalibur software version 2.2 SP1.
Calculations performed using Microsoft Excel version 2010.
▶ Indicates exceedance of QC limit per service order.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCOFG1110211
SDG: 1108211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Recov.	Percent Recovery	LCL	UCL	Comments
1108214 MS	11/02/2021	18:17:28	1,4-Dioxane	123-91-1	2.20	0.42	2.73	ug/L	1.2	120	85	115	

Comments:
Samples analyzed on a DB-624 capillary column (Phenomenex 30 m x 0.25 mm ID x 1.4 um film).
Calculations performed using Thermo Xcalibur software version 2.2 SP1.
Calculations performed using Microsoft Excel version 2010.
▶ Indicates exceedance of QC limit per service order.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCOFG1110211
SDG: 1108211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Recov.	Percent Recovery	LCL	UCL	Comments
1108214 MSD	11/02/2021	18:18:18	1,4-Dioxane	123-91-1	2.20	0.42	2.72	ug/L	1.2	119	85	115	

Comments:
Samples analyzed on a DB-624 capillary column (Phenomenex 30 m x 0.25 mm ID x 1.4 um film).
Calculations performed using Thermo Xcalibur software version 2.2 SP1.
Calculations performed using Microsoft Excel version 2010.
▶ Indicates exceedance of QC limit per service order.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCOFG1110211
SDG: 1108211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Found	Mean	Units	Relative Error	RPD	Control Limit	LCL	UCL	Comments
1108214 MS	11/02/2021	18:17:28	1,4-Dioxane	123-91-1	2.73	2.73	ug/L	####	1.8		20		
1108214 MSD	11/02/2021	18:18:18	1,4-Dioxane	123-91-1	2.72		ug/L	####					

Comments:
Samples analyzed on a DB-624 capillary column (Phenomenex 30 m x 0.25 mm ID x 1.4 um film).
Calculations performed using Thermo Xcalibur software version 2.2 SP1.
Calculations performed using Microsoft Excel version 2010.
▶ Indicates exceedance of QC limit per service order.

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS

1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1108211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1108211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 8 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/08/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/08/21				
Outfall 001	11/07/21	Urgent	1,4-Dioxane	Water
Comb PH	11/8/21	Urgent	1,4-Dioxane	Water
DP-OC-1A	11/8/21	Urgent	1,4-Dioxane	Water
DP-OC-2A	11/8/21	Urgent	1,4-Dioxane	Water
BP-1	11/8/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/8/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/8/21	Urgent	1,4-Dioxane	Water
Red Proof	11/8/21	Urgent	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	8 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate

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290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0895 Fax 734/995-3731

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (IS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Not Prep 1 (3/21)

Mark T. DeLang (Quality Assurance Coordinator) / December 6, 2021

Philip B. Stoner (Laboratory Director) / December 6, 2021

G001-002.21 (CN) - 11/05/11 (aw)

Ann Arbor Technical Services, Inc.
555 Wixom Road
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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1105211
Client Sample ID	1105211-1
Laboratory Sample ID	1105211-1
Matrix	Water
Sample Date	11/01/2021 1w
Analytical Method (USEPA)	1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	GCORG1105211

Parameter	Chemical Number	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.007	0.0015		

Percent Moisture	100.0		
Preparation Date	11/05/2021		
Analysis Date	11/05/2021 14:41:00		
Instrument	3100GC		
Initial Volume (mL)	0.0000		
Subsample (mL)	0.0000		
Final Volume (mL)	1.000		
Dilution Factor	1.000		
Units	Wet		
	mg/L		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1105211
Client Sample ID	1105211-2
Laboratory Sample ID	1105211-2
Matrix	Water
Sample Date	11/01/2021 1w
Analytical Method (USEPA)	1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	GCORG1105211

Parameter	Chemical Number	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.33	0.040		M

Percent Moisture	100.0		
Preparation Date	11/05/2021		
Analysis Date	11/05/2021 16:23:24		
Instrument	3100GC		
Initial Volume (mL)	0.0000		
Subsample (mL)	0.0000		
Final Volume (mL)	1.000		
Dilution Factor	40.00		
Units	Wet		
	mg/L		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GCORG1105211
SDG: 1105211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1105211	11/05/2021	11:22:44	1,4-Dioxane	123-91-1		0.010	0.0086	mg/L	Wet	85.4	63	113	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GCORG1105211
SDG: 1105211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1105211-6 MS	11/05/2021	20:25:09	1,4-Dioxane	123-91-1	0.33	0.40	0.73	mg/L	Wet	99.8	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GCORG1105211
SDG: 1105211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1105211-6 MSD	11/05/2021	21:10:09	1,4-Dioxane	123-91-1	0.33	0.40	0.68	mg/L	Wet	89.8	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GCORG1105211
SDG: 1105211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
1105211-6 MS	11/05/2021	20:25:09	1,4-Dioxane	123-91-1	0.73		mg/L	Wet			
1105211-6 MSD	11/05/2021	21:10:09	1,4-Dioxane	123-91-1	0.68	0.71	mg/L	Wet	5.8	20	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GCORG1105211
SDG: 1105211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1105211	11/05/2021	10:30:12	1,4-Dioxane	123-91-1		mg/L	Wet	0.015		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1109211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1109211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 10 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/09/21, and associated matrix-specific QA/QC.

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/09/21				
Outfall 001	11/8/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/9/21	Urgent	1,4-Dioxane	Water
BP-OC-1A	11/9/21	Urgent	1,4-Dioxane	Water
BP-OC-2A	11/9/21	Urgent	1,4-Dioxane	Water
BP-1	11/9/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/9/21	Urgent	1,4-Dioxane	Water
Outfall Tow	11/9/21	Urgent	1,4-Dioxane	Water
Red Pond	11/9/21	Urgent	1,4-Dioxane	Water
TB-21-02 (197'-202')	11/8/21	Urgent	1,4-Dioxane	Water
TB-21-02 (187'-192')	11/8/21	Urgent	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
• 1,4-Dioxane (USEPA 1624) – Urgent TAT	• 10 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate

G001-002.21/CN_1109211.doc

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1109211.doc

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1109211.doc

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/9/21
- TB-21-002 (197'-202')
- TB-21-002 (187'-192')

Mark T. DeLong / December 6, 2021
Mark T. DeLong (Quality Assurance Coordinator)

Philip H. Simon / December 6, 2021
Philip H. Simon (Laboratory Director)

G001-002.21/CN_1109211.doc

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1109211	Preparation Date	11/09/2021
Client Sample ID	Outfall 001	Analysis Date	11/09/2021 13:14:37
Laboratory Sample ID	1109211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/08/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1109211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.006	0.0010		

Comments
All methods, reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon based calibration standard.
Results reported to project specific MDL based upon sample dilution.
Sample analyzed at native pH.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1109211	Preparation Date	11/09/2021
Client Sample ID	Red Pond	Analysis Date	11/09/2021 18:22:18
Laboratory Sample ID	1109211-6	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/09/2021 7:25	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1109211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.32	0.040		M

Comments
All methods, reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon based calibration standard.
M - Indicates elevated reporting limit to each upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.
QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1109211
SDG: 1109211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analyte Type	Chemical name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-111521	11/09/2021	03 1/32	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Results reported to project specific MDL based upon sample dilution.
Results reported to project specific MDL based upon sample dilution.
Results reported to project specific MDL based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QAQC Batch Number: QCOR1110211
SDG: 1110211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemist Name	CAS	Spike Concentration	Spike Added	Measured Concentration	Units	Recov.	Accepted Recovery	LCL	UCL	Comments
LFB-111021	11/10/2021	02:27:29	1-4-Dioxane	123-91-1	0.32	0.40	0.301	mg/L	94.0	84.2	63	112	

Comments:
Analytical Method 1624 (EPA method 8260 in brown text).
Fortified Blank Spiking Mix (FBS) used as lab control sample.
Fortified Blank Spiking Mix (FBS) used as lab fortified blank.
P=Pressure control spiking mix used as spike solution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QAQC Batch Number: QCOR1110211
SDG: 1110211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemist Name	CAS	Spike Concentration	Spike Added	Measured Concentration	Units	Recov.	Accepted Recovery	LCL	UCL	Comments
1110211-1-MS	11/10/2021	02:45:54	1-4-Dioxane	123-91-1	0.32	0.40	0.35	mg/L	94.0	84.4	63	112	

Comments:
Analytical Method 1624 (EPA method 8260 in brown text).
Fortified Blank Spiking Mix (FBS) used as lab control sample.
Fortified Blank Spiking Mix (FBS) used as lab fortified blank.
P=Pressure control spiking mix used as spike solution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QAQC Batch Number: QCOR1110211
SDG: 1110211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemist Name	CAS	Spike Concentration	Spike Added	Measured Concentration	Units	Recov.	Accepted Recovery	LCL	UCL	Comments
1110211-1-MSD	11/10/2021	03:02:20	1-4-Dioxane	123-91-1	0.32	0.40	0.37	mg/L	94.0	89.9	63	112	

Comments:
Analytical Method 1624 (EPA method 8260 in brown text).
Fortified Blank Spiking Mix (FBS) used as lab control sample.
Fortified Blank Spiking Mix (FBS) used as lab fortified blank.
P=Pressure control spiking mix used as spike solution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QAQC Batch Number: QCOR1110211
SDG: 1110211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemist Name	CAS	RPD	Max	Units	Recov	RPD	Accepted RPD	LCL	UCL	Comments
1110211-1-MS	11/10/2021	02:45:54	1-4-Dioxane	123-91-1	1.70	25	mg/L	94.0	94.0	8.2	0	25	
1110211-1-MSD	11/10/2021	03:02:20	1-4-Dioxane	123-91-1	2.67	0.58	mg/L	94.0	89.9	8.2	0	25	

Comments:
Analytical Method 1624 (EPA method 8260 in brown text).
Fortified Blank Spiking Mix (FBS) used as lab control sample.
Fortified Blank Spiking Mix (FBS) used as lab fortified blank.
P=Pressure control spiking mix used as spike solution.

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1110211

Prepared By:
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Ann Arbor, MI 48103

ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1110211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 10 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/10/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identifications	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/10/21				
Outfall 001	11/9/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/10/21	Urgent	1,4-Dioxane	Water
Eff-OC-1A	11/10/21	Urgent	1,4-Dioxane	Water
Eff-OC-3A	11/10/21	Urgent	1,4-Dioxane	Water
Eff-1	11/10/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/10/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/10/21	Urgent	1,4-Dioxane	Water
Red Pond	11/10/21	Urgent	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	8 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate

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Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Bat Pool 11/10/21

Mark T. DeLong (Quality Assurance Coordinator) / December 6, 2021

Philip B. Simon (Laboratory Director) / December 6, 2021

GM14623 ICN_11102114.xls

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21				
ATS BDG Number	1110211	Percent Moisture		100.0	
Client Sample ID	Outfall 001	Preparation Date		11/10/2021	
Laboratory Sample ID	1110211-1	Analysis Date		11/10/2021 16:32:03	
Matrix	Water	Initial Volume (mL)		375.0	
Sample Date	11/10/2021 1:00	Aliquot (mL)		5.00000	
Analytical Method (USEPA)	USEPA 1624	Final Volume (mL)		5.000	
Preparation Method (USEPA)	USEPA 1624	Dilution Factor		1.00	
QC Batch Number	QCORG1110211	Units		Wet	
				mg/L	
Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.005	0.0010		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1110211
SDG: 1110211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 11/10/21	11/10/2021	08:56:00	1,4-Dioxane	123-91-1		0.010	0.0093	mg/L	Wet	93.1	85	115	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1110211
SDG: 1110211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1110211-8 MS	11/10/2021	16:52:40	1,4-Dioxane	123-91-1	0.32	0.40	0.69	mg/L	Wet	93.1	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21				
ATS BDG Number	1110211	Percent Moisture		100.0	
Client Sample ID	Bat Pool	Preparation Date		11/10/2021	
Laboratory Sample ID	1110211-8	Analysis Date		11/10/2021 16:52:40	
Matrix	Water	Initial Volume (mL)		375.0	
Sample Date	11/10/2021 8:55	Aliquot (mL)		5.00000	
Analytical Method (USEPA)	USEPA 1624	Final Volume (mL)		5.000	
Preparation Method (USEPA)	USEPA 1624	Dilution Factor		1.00	
QC Batch Number	QCORG1110211	Units		Wet	
				mg/L	
Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.32	0.040		M

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1110211
SDG: 1110211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1110211-8 MSD	11/10/2021	17:43:28	1,4-Dioxane	123-91-1	0.32	0.40	0.70	mg/L	Wet	96.8	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1110211
SDG: 1110211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 11/10/21	11/10/2021	08:41:52	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1110211
SDG: 1110211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
1110211-8 MS	11/10/2021	16:52:40	1,4-Dioxane	123-91-1	0.69		mg/L	Wet			
1110211-8 MSD	11/10/2021	17:43:28	1,4-Dioxane	123-91-1	0.70	0.70	mg/L	Wet	2.2	20	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1111211

Prepared By:
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ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1111211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 13 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/11/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/11/21				
Outfall 001	11/10/21	Urgent	1,4-Dioxane	Water
Comb HF	11/11/21	Urgent	1,4-Dioxane	Water
HF-OC-1A	11/11/21	Urgent	1,4-Dioxane	Water
HF-OC-2A	11/11/21	Urgent	1,4-Dioxane	Water
HF-1	11/11/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/11/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/11/21	Urgent	1,4-Dioxane	Water
Red Pond	11/11/21	Urgent	1,4-Dioxane	Water
MW-13H	11/10/21	Standard	1,4-Dioxane	Water
MW-13HS	11/10/21	Standard	1,4-Dioxane	Water
MW-13HD	11/10/21	Standard	1,4-Dioxane	Water
MW-12S	11/10/21	Standard	1,4-Dioxane	Water
MW-12D	11/10/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	8 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
1,4-Dioxane (USEPA 1624) – Standard TAT	5 Samples

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Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (ITS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported in project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/11/21

Mark T. DeLong / December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

Philip B. Simon / December 6, 2021

Philip B. Simon (Laboratory Director)

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1111211	Preparation Date	11/11/2021
Client Sample ID	Outfall 001	Analysis Date	11/11/2021 10:14:11
Laboratory Sample ID	1111211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/10/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1111211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.056	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
U - indicates elevated reporting limit based upon sample dilution.
Sample analyzed at native pH.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1111211	Preparation Date	11/11/2021
Client Sample ID	Red Pond	Analysis Date	11/11/2021 16:22:57
Laboratory Sample ID	1111211-6	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/11/2021 7:10	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1111211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	5.34	0.040		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1111211	Preparation Date	11/11/2021
Client Sample ID	MW-13D	Analysis Date	11/11/2021 20:02:22
Laboratory Sample ID	1111211-9	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/10/2021 14:30	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1111211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.066	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
U - indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Ann Arbor Technical Services, Inc.
200 South Wagner Road
Ann Arbor, Michigan 48103

Office: 734-995-0995
Fax: 734-995-3731

Method: USEPA 1624
QA/QC Batch Number: QCORG1111211
SDG: 1111211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1111121	11/11/2021	09:35:42	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1111211
Client Sample ID	MW-1S01
Laboratory Sample ID	1111211-1
Matrix	Water
Sample Date	11/10/2021 13:30
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1625
QC Batch Number	QCORG1111211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	ND	0.0010	0.0100	U

Percent Moisture	100.0
Preparation Date	11/11/2021
Analysis Date	11/11/2021 22:45:15
Dilution Factor	1.0000
Subsample (mL)	5.0000
Final Volume (mL)	5.000
Units	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Ann Arbor Technical Services, Inc.
200 South Wagner Road
Ann Arbor, Michigan 48103

Office: 734-995-0995
Fax: 734-995-3731

Method: USEPA 1624
QA/QC Batch Number: QCORG1111211
SDG: 1111211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1111121	11/11/2021	08:51:44	1,4-Dioxane	123-91-1		0.010	0.0086	mg/L	Wet	86.0	65	115	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1111211
Client Sample ID	MW-1S02
Laboratory Sample ID	1111211-2
Matrix	Water
Sample Date	11/10/2021 15:30
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1625
QC Batch Number	QCORG1111211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	ND	0.0010	0.0100	U

Percent Moisture	100.0
Preparation Date	11/11/2021
Analysis Date	11/11/2021 23:38:58
Dilution Factor	1.0000
Subsample (mL)	5.0000
Final Volume (mL)	5.000
Units	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Ann Arbor Technical Services, Inc.
200 South Wagner Road
Ann Arbor, Michigan 48103

Office: 734-995-0995
Fax: 734-995-3731

Method: USEPA 1624
QA/QC Batch Number: QCORG1111211
SDG: 1111211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1111211-8 MS	11/11/2021	17:06:52	1,4-Dioxane	123-91-1	0.34	0.40	0.72	mg/L	Wet	94.8	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1111211
Client Sample ID	MW-1S03
Laboratory Sample ID	1111211-3
Matrix	Water
Sample Date	11/10/2021 16:45
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1625
QC Batch Number	QCORG1111211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	ND	0.0010	0.0100	U

Percent Moisture	100.0
Preparation Date	11/11/2021
Analysis Date	11/11/2021 22:13:37
Dilution Factor	1.0000
Subsample (mL)	5.0000
Final Volume (mL)	5.000
Units	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Ann Arbor Technical Services, Inc.
200 South Wagner Road
Ann Arbor, Michigan 48103

Office: 734-995-0995
Fax: 734-995-3731

Method: USEPA 1624
QA/QC Batch Number: QCORG1111211
SDG: 1111211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1111211-8 MSD	11/11/2021	17:50:47	1,4-Dioxane	123-91-1	0.34	0.40	0.73	mg/L	Wet	95.7	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1111211
Client Sample ID	MW-1S04
Laboratory Sample ID	1111211-4
Matrix	Water
Sample Date	11/10/2021 17:30
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1625
QC Batch Number	QCORG1111211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	ND	0.0010	0.0100	U

Percent Moisture	100.0
Preparation Date	11/11/2021
Analysis Date	11/11/2021 23:07:42
Dilution Factor	1.0000
Subsample (mL)	5.0000
Final Volume (mL)	5.000
Units	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1111211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Perc.R	Mean	Units	Limits	RPD	Limit	Comments
1111211-6 MS	11/11/2021	17:36:49	1,4-Dioxane	123-91-1	5.72	5.73	ug/L	1-47	3.3	23	
1111211-6 MSD	11/11/2021	17:55:47	1,4-Dioxane	123-91-1	5.73						

Comments:
Calculated according to QC Chemical Limits (Reference report)
Percent Recovery (%R) = [(Sample Concentration - Sample Blank Concentration) / Spike Concentration] x 100
Relative Percent Difference (RPD) = [Sample Concentration - Duplicate Concentration] / [(Sample Concentration + Duplicate Concentration) / 2] x 100

ATS
ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1112211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

ATS
ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1112211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 9 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/12/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received: 11/12/21				
Outfall 001	11/11/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/12/21	Urgent	1,4-Dioxane	Water
EffGC-1A	11/12/21	Urgent	1,4-Dioxane	Water
EffGC-2A	11/12/21	Urgent	1,4-Dioxane	Water
BP-1	11/12/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/12/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/12/21	Urgent	1,4-Dioxane	Water
Red Pond	11/12/21	Urgent	1,4-Dioxane	Water
LB-4	11/11/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	8 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
1,4-Dioxane (USEPA 1624) – Standard TAT	1 Sample

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, HPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

ATS

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

ATS

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/12/21
- LB-4 11/11/21

Mark A. DeLong

/December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/December 6, 2021

Philip B. Simon (Laboratory Director)

ATS

ATS

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1112211	Preparation Date	11/12/2021
Client Sample ID	Outfall 001	Analysis Date	11/12/2021 16:26:38
Laboratory Sample ID	1112211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/11/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1112211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.007	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates estimated reporting limit based upon sample dilution.
Sample analyzed at native pH.

ATS

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1112211	Preparation Date	11/12/2021
Client Sample ID	Red Pond	Analysis Date	11/12/2021 22:17:06
Laboratory Sample ID	1112211-6	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/12/2021 7:30	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1112211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.34	0.040		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates estimated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1112211	Preparation Date	11/12/2021
Client Sample ID	LS-4	Analysis Date	11/13/2021 00:28:21
Laboratory Sample ID	1112211-9	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/11/2021 10:55	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	10
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QC0RG1112211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.40	0.010		M

Comments
All methods references (40 CFR methods unless otherwise noted).
Calculations performed in accordance to the method.
Prep batch requires reporting limit (MRL) based upon lowest calibration standard.
M - Analyses elevated reporting limit based upon sample dilution.

Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, Michigan 48103

Office: 734-995-0995
Fax: 734-995-3731

ANN ARBOR TECHNICAL SERVICES, INC.
QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QAQC Batch Number: QC0RG1112211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1111121	11/12/2021	08:47:33	1,4-Dioxane	123-91-1		ug/L	Wet	0.261		

Comments
Analytical Methods USEPA 1624 unless otherwise noted.
Calculations performed in accordance to the method.
Prep batch requires reporting limit (MRL) based upon lowest calibration standard.
M Analyses elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.
QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QAQC Batch Number: QC0RG1112211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Added Amount	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1111121	11/12/2021	12:28:14	1,4-Dioxane	123-91-1		0.110	0.272	ug/L	Wet	123	83	112	

Comments
Analytical Methods USEPA 1624 unless otherwise noted.
Calculations performed in accordance to the method.
M Analyses elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.
QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QAQC Batch Number: QC0RG1112211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Added Amount	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1112211-9MS	11/13/2021	23:58:43	1,4-Dioxane	123-91-1	0.34	0.110	0.452	mg/L	Wet	101.1	83	112	

Comments
Analytical Methods USEPA 1624 unless otherwise noted.
Calculations performed in accordance to the method.
M Analyses elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.
QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QAQC Batch Number: QC0RG1112211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Added Amount	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1112211-9MS	11/13/2021	23:58:43	1,4-Dioxane	123-91-1	0.34	0.110	0.452	mg/L	Wet	101.1	83	112	

Comments
Analytical Methods USEPA 1624 unless otherwise noted.
Calculations performed in accordance to the method.
M Analyses elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.
QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QAQC Batch Number: QC0RG1112211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
1112211-9MS	11/13/2021	23:58:43	1,4-Dioxane	123-91-1	0.45	0.74	mg/L	Wet	8.8	21	
1112211-9MSD	11/14/2021	23:44:41	1,4-Dioxane	123-91-1	0.74		mg/L	Wet			

Comments
Analytical Methods USEPA 1624 unless otherwise noted.
Calculations performed in accordance to the method.
Prep batch requires reporting limit (MRL) based upon lowest calibration standard.
M Analyses elevated reporting limit based upon sample dilution.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1115211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
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LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1115211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 20 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/15/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/15/21				
Outfall 001	11/14/21	Urgent	1,4-Dioxane	Water
Bad Pool	11/15/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/15/21	Urgent	1,4-Dioxane	Water
Eff-OC-1A	11/15/21	Urgent	1,4-Dioxane	Water
Eff-OC-2A	11/15/21	Urgent	1,4-Dioxane	Water
BP-1	11/15/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/15/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/15/21	Urgent	1,4-Dioxane	Water
TW-23	11/12/21	Standard	1,4-Dioxane	Water
TW-20	11/12/21	Standard	1,4-Dioxane	Water
TW-21	11/12/21	Standard	1,4-Dioxane	Water
TW-18	11/12/21	Standard	1,4-Dioxane	Water
PW-1	11/12/21	Standard	1,4-Dioxane	Water
DOI PH	11/12/21	Standard	1,4-Dioxane	Water
TW-30	11/12/21	Standard	1,4-Dioxane	Water
TW-17	11/12/21	Standard	1,4-Dioxane	Water
TW-5	11/12/21	Standard	1,4-Dioxane	Water
TW-11	11/12/21	Standard	1,4-Dioxane	Water
TW-22	11/12/21	Standard	1,4-Dioxane	Water
TW-28	11/12/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	8 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
1,4-Dioxane (USEPA 1624) – Standard TAT	12 Samples

G001-002.21/CN_1115211.doc

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/15/21
- TW-23 11/12/21
- TW-29 11/12/21
- TW-21 11/12/21
- TW-18 11/12/21
- TW-20 11/12/21
- TW-17 11/12/21
- PW-1 11/12/21
- DOLPH 11/12/21
- TW-5 11/12/21
- TW-11 11/12/21
- TW-22 11/12/21
- TW-28 11/12/21

/December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/December 6, 2021

Philip B. Simon (Laboratory Director)

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	Outfall 001	Analysis Date	11/15/2021 13:30:44
Laboratory Sample ID	1115211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/14/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.006	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates standard reporting limit based upon sample dilution.
Sample analyzed at native pH.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	Red Pond	Analysis Date	11/15/2021 14:14:36
Laboratory Sample ID	1115211-2	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/15/2021 7:05	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.31	0.040		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates standard reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	TW-23	Analysis Date	11/15/2021 22:16:33
Laboratory Sample ID	1115211-9	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/12/2021 10:35	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	10
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.37	0.010		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates standard reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	TW-20	Analysis Date	11/15/2021 23:00:07
Laboratory Sample ID	1115211-10	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/12/2021 10:50	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	10
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.28	0.010		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates standard reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	TW-21	Analysis Date	11/15/2021 23:43:46
Laboratory Sample ID	1115211-11	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/12/2021 11:25	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	10
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.22	0.010		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates standard reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	TW-18	Analysis Date	11/16/2021 00:37:20
Laboratory Sample ID	1115211-12	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/12/2021 11:30	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	10
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCDRG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.22	0.010		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	PW-1	Analysis Date	11/16/2021 01:10:55
Laboratory Sample ID	1115211-13	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/12/2021 11:35	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	10
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCDRG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.71	0.010		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	Dup1	Analysis Date	11/16/2021 01:54:32
Laboratory Sample ID	1115211-14	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/12/2021 11:40	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	2
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCDRG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.13	0.0020		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	TW-20	Analysis Date	11/16/2021 02:38:07
Laboratory Sample ID	1115211-15	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/12/2021 11:45	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	10
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCDRG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.77	0.010		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	TW-17	Analysis Date	11/16/2021 03:21:42
Laboratory Sample ID	1115211-16	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/12/2021 11:50	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	2
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCDRG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.085	0.0020		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1115211	Preparation Date	11/15/2021
Client Sample ID	TW-5	Analysis Date	11/16/2021 04:05:18
Laboratory Sample ID	1115211-17	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/12/2021 11:55	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	20
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCDRG1115211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.71	0.020		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method:	USEPA 1624
QA/QC Batch Number:	QCORG1115211
SDG	1115211
Project Number:	G001-002.21
Report Date:	12/5/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 11/15/21	11/15/2021	10:34:49	1,4-Dioxane	123-91-1		0.010	0.010	mg/L	Wet	104	85	113	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1115211
Client Sample ID	TW-1A
Laboratory Sample ID	1115211-1B
Matrix	Water
Sample Date	11/12/2021 12:00
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1115211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.43	0.010	100.0	M

Percent Moisture	
Preparation Date	11/15/2021
Analysis Date	11/15/2021 14:48:53
Instrument	3100V
Subsample (mL)	5.0000
Final Volume (mL)	5.0000
Dilution Factor	10
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method:	USEPA 1624
QA/QC Batch Number:	QCORG1115211
SDG	1115211
Project Number:	G001-002.21
Report Date:	12/5/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1115211-2 MS	11/15/2021	14:58:28	1,4-Dioxane	123-91-1	0.31	0.40	0.72	mg/L	Wet	103	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1115211
Client Sample ID	TW-2A
Laboratory Sample ID	1115211-2B
Matrix	Water
Sample Date	11/12/2021 13:15
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1115211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.43	0.010	100.0	M

Percent Moisture	
Preparation Date	11/15/2021
Analysis Date	11/15/2021 15:32:31
Instrument	3100V
Subsample (mL)	5.0000
Final Volume (mL)	5.0000
Dilution Factor	10
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method:	USEPA 1624
QA/QC Batch Number:	QCORG1115211
SDG	1115211
Project Number:	G001-002.21
Report Date:	12/5/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1115211-2 MSD	11/15/2021	15:42:20	1,4-Dioxane	123-91-1	0.31	0.40	0.68	mg/L	Wet	90.8	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1115211
Client Sample ID	TW-3A
Laboratory Sample ID	1115211-3B
Matrix	Water
Sample Date	11/12/2021 13:15
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1115211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.81	0.010	100.0	M

Percent Moisture	
Preparation Date	11/15/2021
Analysis Date	11/15/2021 16:15:37
Instrument	3100V
Subsample (mL)	5.0000
Final Volume (mL)	5.0000
Dilution Factor	10
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method:	USEPA 1624
QA/QC Batch Number:	QCORG1115211
SDG	1115211
Project Number:	G001-002.21
Report Date:	12/5/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
1115211-2 MS	11/15/2021	14:58:28	1,4-Dioxane	123-91-1	0.72		mg/L	Wet			
1115211-2 MSD	11/15/2021	15:42:20	1,4-Dioxane	123-91-1	0.68	0.69	mg/L	Wet	6.2	20	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method:	USEPA 1624
QA/QC Batch Number:	QCORG1115211
SDG	1115211
Project Number:	G001-002.21
Report Date:	12/5/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 11/15/21	11/15/2021	09:52:48	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS

1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1116211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1116211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 13 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/16/21, and associated matrix-specific QA/QC.

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/17/21				
Outfall 001	11/15/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/16/21	Urgent	1,4-Dioxane	Water
Eff-OC-1A	11/16/21	Urgent	1,4-Dioxane	Water
Eff-OC-2A	11/16/21	Urgent	1,4-Dioxane	Water
BP-1	11/16/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/16/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/16/21	Urgent	1,4-Dioxane	Water
Red Pond	11/16/21	Urgent	1,4-Dioxane	Water
MW-BE-1S	11/15/21	Standard	1,4-Dioxane	Water
MW-BE-1D	11/15/21	Standard	1,4-Dioxane	Water
MW-108D	11/15/21	Standard	1,4-Dioxane	Water
MW-108S	11/15/21	Standard	1,4-Dioxane	Water
MW-113	11/15/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	8 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
1,4-Dioxane (USEPA 1624) – Standard TAT	5 Samples

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290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/16/21
- MW-BE-1S 11/15/21
- MW-BE-1D 11/15/21
- MW-108D 11/15/21
- MW-108S 11/15/21
- MW-113 11/15/21

Mark DeLong

/ December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/ December 6, 2021

Philip D. Simon (Laboratory Director)

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1116211	Preparation Date	11/16/2021
Client Sample ID	Outfall 001	Analysis Date	11/16/2021 11:20:52
Laboratory Sample ID	1116211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/15/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1116211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.006	0.0010		

Comments
All methods referenced US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates estimated reporting limit based upon sample dilution.
Sample analyzed at neither pH.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1116211	Preparation Date	11/16/2021
Client Sample ID	Red Pond	Analysis Date	11/16/2021 17:17:05
Laboratory Sample ID	1116211-8	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/16/2021 7:45	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1116211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.33	0.040		M

Comments
All methods referenced US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates estimated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1116211	Preparation Date	11/16/2021
Client Sample ID	MW-BE-1S	Analysis Date	11/16/2021 20:50:07
Laboratory Sample ID	1116211-6	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/15/2021 12:44	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	10
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1116211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.55	0.010		M

Comments
All methods referenced US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates estimated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method:	USEPA 1624
QA/QC Batch Number:	QCORG1116211
SDG:	1116211
Project Number:	G001-002.21
Report Date:	12/5/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 11/16/21	11/16/2021	13:18:37	1,4-Dioxane	123-91-1		mg/L	Wet	0.021		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1116211
Client Sample ID	MW-09D
Laboratory Sample ID	1116211-11
Matrix	Water
Sample Date	11/10/2021 12:45
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1116211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.36	0.015		M

Percent Moisture	100.0
Preparation Date	11/16/2021
Analysis Date	11/17/2021 20:14:07
Instrument	2100V
Subsample (mL)	2.0000
Final Volume (mL)	2.0000
Dilution Factor	10
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method:	USEPA 1624
QA/QC Batch Number:	QCORG1116211
SDG:	1116211
Project Number:	G001-002.21
Report Date:	12/5/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 11/16/21	11/16/2021	09:37:42	1,4-Dioxane	123-91-1		0.010	0.0086	mg/L	Wet	85.7	60	115	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1116211
Client Sample ID	MW-10D
Laboratory Sample ID	1116211-12
Matrix	Water
Sample Date	11/10/2021 14:14
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1116211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.48	0.016		M

Percent Moisture	100.0
Preparation Date	11/16/2021
Analysis Date	11/17/2021 22:52:43
Instrument	2100V
Subsample (mL)	2.0000
Final Volume (mL)	2.0000
Dilution Factor	10
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method:	USEPA 1624
QA/QC Batch Number:	QCORG1116211
SDG:	1116211
Project Number:	G001-002.21
Report Date:	12/5/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1116211-8 MS	11/16/2021	18:20:08	1,4-Dioxane	123-91-1	0.33	0.40	0.73	mg/L	Wet	99.8	60	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1116211
Client Sample ID	MW-11D
Laboratory Sample ID	1116211-13
Matrix	Water
Sample Date	11/10/2021 15:14
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1116211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.24	0.0020		M

Percent Moisture	100.0
Preparation Date	11/16/2021
Analysis Date	11/17/2021 23:01:24
Instrument	2100V
Subsample (mL)	2.0000
Final Volume (mL)	2.0000
Dilution Factor	10
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method:	USEPA 1624
QA/QC Batch Number:	QCORG1116211
SDG:	1116211
Project Number:	G001-002.21
Report Date:	12/5/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1116211-8 MSD	11/16/2021	18:44:18	1,4-Dioxane	123-91-1	0.33	0.40	0.73	mg/L	Wet	99.4	60	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1116211
Client Sample ID	MW-13D
Laboratory Sample ID	1116211-15
Matrix	Water
Sample Date	11/10/2021 16:16
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1116211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.13	0.0020		M

Percent Moisture	100.0
Preparation Date	11/16/2021
Analysis Date	11/17/2021 23:50:24
Instrument	2100V
Subsample (mL)	2.0000
Final Volume (mL)	2.0000
Dilution Factor	10
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1116311
SDG: 1116211
Project Number: G001-002.21
Report Date: 11/5/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Compound Name	Old	Conc	Mass	Units	Type	RPD	Control Limit	Comments
1116311-MS	11/05/2021	16:05:18	1,4-Dioxane	123-91-1	0.33	0.29	mg/L	Wet	8.11	20	
1116311-MSD	11/05/2021	16:44:43	1,4-Dioxane	123-91-1	0.33	0.29	mg/L	Wet			

Comments:
All methods reference US EPA methods unless noted otherwise noted.
Calculations performed prior to rounding.
Reported results are based on wet weight unless otherwise noted.
Sample analyzed at native pH.

ORGANIC ANALYSIS

1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1117211

Prepared By:
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LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1117211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 10 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/17/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received: 11/17/21				
Outfall 001	11/16/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/17/21	Urgent	1,4-Dioxane	Water
FIE-OC-1A	11/17/21	Urgent	1,4-Dioxane	Water
FIE-OC-2A	11/17/21	Urgent	1,4-Dioxane	Water
BP-1	11/17/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/17/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/17/21	Urgent	1,4-Dioxane	Water
Red Pond	11/17/21	Urgent	1,4-Dioxane	Water
TB-21 (53-57)	11/16/21	Urgent	1,4-Dioxane	Water
TB-21 (106-110)	11/16/21	Urgent	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
• 1,4-Dioxane (USEPA 1624) – Urgent TAT	• 10 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate

G001-002.21/CN_1117211.doc

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Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly in ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1117211.doc

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1117211.doc

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/17/21
- TB-21 (106'-110')

Mark T. DeLong

/ December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/ December 6, 2021

Philip B. Simon (Laboratory Director)

G001-002.21/CN_1117211.doc

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1117211	Preparation Date	11/17/2021
Client Sample ID	Outfall 001	Analysis Date	11/17/2021 14:27:52
Laboratory Sample ID	1117211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/16/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1117211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.006	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MQL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.
Sample analyzed at native pH.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1117211	Preparation Date	11/17/2021
Client Sample ID	Red Pond	Analysis Date	11/17/2021 21:02:46
Laboratory Sample ID	1117211-6	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/17/2021 7:30	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1117211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.33	0.040		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MQL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCOR11117211
SDG: 1117211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1117211	11/17/2021	09:42:19	1,4-Dioxane	123-91-1		ng/L	Wet	2.81		

Comments:
Analysis performed on EPA method 1624 Dioxane mode.
Chemical results are reported in ng/L.
Final sample reporting limit (FRL) based upon lowest calibration standard.
N = Indicates analyte spiking into blank upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCOR11117211
SDG: 1117211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1117211	11/17/2021	10:28:18	1,4-Dioxane	123-91-1		2.5	2.503	ng/L	Wet	100.1	88	113	

Comments:
Analysis performed on EPA method 1624 Dioxane mode.
Chemical results are reported in ng/L.
N = Indicates analyte spiking into blank upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCOR11117211
SDG: 1117211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1117211-4 MS	11/17/2021	21:42:32	1,4-Dioxane	123-91-1	0.33	2.5	2.72	ng/L	Wet	95.5	83	123	

Comments:
Analysis performed on EPA method 1624 Dioxane mode.
Chemical results are reported in ng/L.
N = Indicates analyte spiking into blank upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCOR11117211
SDG: 1117211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1117211-4 MSD	11/17/2021	22:20:21	1,4-Dioxane	123-91-1	0.33	2.5	2.68	ng/L	Wet	82.2	83	123	

Comments:
Analysis performed on EPA method 1624 Dioxane mode.
Chemical results are reported in ng/L.
N = Indicates analyte spiking into blank upon sample dilution.

ORGANIC ANALYSIS

1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1118211

Prepared By:
Ann Arber Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1118211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 11 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/18/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/18/21				
Outfall 001	11/17/21	Urgent	1,4-Dioxane	Water
Comb FF	11/18/21	Urgent	1,4-Dioxane	Water
FIE-OC-1A	11/18/21	Urgent	1,4-Dioxane	Water
FIE-OC-2A	11/18/21	Urgent	1,4-Dioxane	Water
BP-1	11/18/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/18/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/18/21	Urgent	1,4-Dioxane	Water
Med Pond	11/18/21	Urgent	1,4-Dioxane	Water
TB-21-03 (117-127')	11/17/21	Urgent	1,4-Dioxane	Water
TB-21-03 (131-134')	11/17/21	Urgent	1,4-Dioxane	Water
TB-21-03 (141-144')	11/17/21	Urgent	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
• 1,4-Dioxane (USEPA 1624) – Urgent TAT	• 11 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate

G001-002.21/CN_1118211.doc

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as ng/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1118211.doc

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentration beyond the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Bad Trout 11/16/21
- TS-2-B(141-146')

Mark T. DeLong (Quality Assurance Coordinator) /December 6, 2021

Philip B. Stoner (Laboratory Director) /December 6, 2021

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1118211
SDG: 1118211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 11/16/21	11/16/2021	09:37:07	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibrator standard.
M - Indicates elevated reporting limit based upon sample dilution.

G001-002.21CN_111611.xlsx

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1118211
SDG: 1118211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 11/16/21	11/16/2021	12:18:33	1,4-Dioxane	123-91-1		0.010	0.0095	mg/L	Wet	94.7	85	115	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibrator standard.
M - Indicates elevated reporting limit based upon sample dilution.

G001-002.21CN_111611.xlsx

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1118211
SDG: 1118211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
ATS Tap 11/16/21 MS	11/16/2021	03:31:30	1,4-Dioxane	123-91-1		0.010	0.010	mg/L	Wet	120	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibrator standard.
M - Indicates elevated reporting limit based upon sample dilution.

Ann Arbor Technical Services, Inc.
200 South Wagner Road
Ann Arbor, Michigan 48103
Office: 734-665-6855
Fax: 734-665-2231

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1118211	Preparation Date	11/16/2021
Client Sample ID	TS-2-B(141-146')	Analysis Date	11/16/2021 21:36:57
Laboratory Sample ID	1118211-01	Initial Sample (g)	5.0000
Matrix	Water	Extract Volume (mL)	5.000
Sample Date	11/12/2021	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Units	mg/L
QC Batch Number	QCORG1118211		

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.007	0.0010	0.040	M

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibrator standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1118211	Preparation Date	11/16/2021
Client Sample ID	Bad Trout	Analysis Date	11/16/2021 19:20:42
Laboratory Sample ID	1118211-14	Initial Sample (g)	5.0000
Matrix	Water	Extract Volume (mL)	5.000
Sample Date	11/10/2021 8:50	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Units	mg/L
QC Batch Number	QCORG1118211		

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.32	0.042	0.160	M

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibrator standard.
M - Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1118211
SDG: 1118211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
ATS Tap 11/16/21 MSD	11/16/2021	01:15:30	1,4-Dioxane	123-91-1		0.010	0.010	mg/L	Wet	121	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibrator standard.
M - Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QC Batch Batch Number: QCORG1118211
SDG: 1119211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Comment Items	CAS	Result	MS/P	Units	Basis	RPD	Control Limit	Comments
ATS Test 1119211 MS	11/19/2021	05:31:00	1,4-Dioxane	123-91-1	0.010	0.010	ug/L	Wet	18	22	
ATS Test 1119211 MSD	11/19/2021	01:10:30	1,4-Dioxane	123-91-1	0.010	0.010	ug/L	Wet			

Comments
Results are reported in ug/L unless otherwise noted.
Calculations performed after rounding.
Results are reported to the MDL.
Results are reported to the PQL if detected.
M - Indicates detected reporting limit based upon sample dilution.

ORGANIC ANALYSIS

1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1119211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1119211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 11 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/19/21, and associated matrix-specific QA/QC.

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/19/21				
Outfall 001	11/18/21	Urgent	1,4-Dioxane	Water
Red Pond	11/19/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/19/21	Urgent	1,4-Dioxane	Water
Eff-OC-1A	11/19/21	Urgent	1,4-Dioxane	Water
Eff-OC-2A	11/19/21	Urgent	1,4-Dioxane	Water
SP-1	11/19/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/19/21	Urgent	1,4-Dioxane	Water
Outfall Trap	11/19/21	Urgent	1,4-Dioxane	Water
TB-21-03 (157'-162')	11/18/21	Urgent	1,4-Dioxane	Water
TB-21-03 (172'-177')	11/18/21	Urgent	1,4-Dioxane	Water
TB-21-03 (182'-187')	11/18/21	Urgent	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	11 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate

G001-002.21/CN_1119211.doc

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Full Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported in project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1119211.doc

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1119211.doc

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/19/21
- TB-21-03 (157'-162')
- TB-21-03 (172'-177')
- TB-21-03 (182'-187')

Mark A DeLong

/December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/December 6, 2021

Philip B. Simon (Laboratory Director)

G001-002.21/CN_1119211.doc

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1119211	Preparation Date	11/19/2021
Client Sample ID	Outfall 001	Analysis Date	11/19/2021 09:37:10
Laboratory Sample ID	1119211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/18/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1119211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.007	0.0010		

Comments
All methods referenced are EPA methods unless otherwise noted.
Calculations performed after rounding.
Results are reported to the MDL.
Project specific reporting limit (PQL) based upon lowest calibration standard.
M - Indicates detected reporting limit based upon sample dilution.
Sample analyzed at native pH.

Ann Arbor Technical Services, Inc.
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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1119211	Preparation Date	11/19/2021
Client Sample ID	Red Pond	Analysis Date	11/19/2021 15:58:10
Laboratory Sample ID	1119211-2	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/19/2021 7:15	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1119211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.31	0.040		M

Comments
All methods referenced are EPA methods unless otherwise noted.
Calculations performed after rounding.
Results are reported to the MDL.
Project specific reporting limit (PQL) based upon lowest calibration standard.
M - Indicates detected reporting limit based upon sample dilution.

Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, Michigan 48103

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GC/QC/111211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Practical Quantitation Limit	Comments
LB-111121	11/21/2021	11:10:28	1,4-Dioxane	123-91-1		ug/L	Wet	0.83		

Comments:
Analytical sequence LB-111121 contains one chemical name.
Chemical name(s) reported in this analytical sequence:
1,4-Dioxane
= Indicates an result reporting limit based upon sample dilution or moisture content.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GC/QC/111211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LF2-111121	11/21/2021	23:54:33	1,4-Dioxane	123-91-1	0.010	2.000	2.328	ug/L	Wet	113	68	118	

Comments:
Analytical sequence LF2-111121 contains one chemical name.
Chemical name(s) reported in this analytical sequence:
1,4-Dioxane
= Indicates an result reporting limit based upon sample dilution or moisture content.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GC/QC/111211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
ATS Tp-111121 MS	11/21/2021	22:42:20	1,4-Dioxane	123-91-1	0.010	2.000	2.328	ug/L	Wet	113	12	123	

Comments:
Analytical sequence ATS Tp-111121 contains one chemical name.
Chemical name(s) reported in this analytical sequence:
1,4-Dioxane
= Indicates an result reporting limit based upon sample dilution or moisture content.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GC/QC/111211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
ATS Tp-111121 MSD	11/21/2021	12:25:12	1,4-Dioxane	123-91-1	0.010	2.000	2.036	ug/L	Wet	99.0	12	123	

Comments:
Analytical sequence ATS Tp-111121 contains one chemical name.
Chemical name(s) reported in this analytical sequence:
1,4-Dioxane
= Indicates an result reporting limit based upon sample dilution or moisture content.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: GC/QC/111211
SDG: 1112211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	RPD	Control Limit	Comments
ATS Tp-111121 MS	11/21/2021	22:42:20	1,4-Dioxane	123-91-1	0.0087	ug/L	Wet	3.5	20	
ATS Tp-111121 MSD	11/21/2021	12:25:12	1,4-Dioxane	123-91-1	0.0084	0.0100	ug/L	Wet	3.5	20

Comments:
Analytical sequence ATS Tp-111121 contains one chemical name.
Chemical name(s) reported in this analytical sequence:
1,4-Dioxane
= Indicates an result reporting limit based upon sample dilution or moisture content.

ATS ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1122211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

ATS ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1122211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 16 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/22/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/22/21				
Outfall 001	11/21/21	Urgent	1,4-Dioxane	Water
Red Pond	11/22/21	Urgent	1,4-Dioxane	Water
Crash Pit	11/22/21	Urgent	1,4-Dioxane	Water
TH-OC-1A	11/22/21	Urgent	1,4-Dioxane	Water
TH-OC-2A	11/22/21	Urgent	1,4-Dioxane	Water
BP-1	11/22/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/22/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/22/21	Urgent	1,4-Dioxane	Water
TB-21-03 (102-107)	11/19/21	Urgent	1,4-Dioxane	Water
TB-21-03 (202-207)	11/19/21	Urgent	1,4-Dioxane	Water
MW-53S	11/18/21	Standard	1,4-Dioxane	Water
MW-53I	11/18/21	Standard	1,4-Dioxane	Water
MW-53D	11/18/21	Standard	1,4-Dioxane	Water
MW-84S	11/18/21	Standard	1,4-Dioxane	Water
MW-76I	11/19/21	Standard	1,4-Dioxane	Water
MW-76S	11/19/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	10 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
1,4-Dioxane (USEPA 1624) – Standard TAT	6 Samples

G001-002.21/CN_1122211.doc

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA RS EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1122211.doc

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1122211.doc

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/22/21
- MW-84S 11/18/21
- MW-76I 11/19/21
- MW-76S 11/19/21
- TB-21-03 (192'-197') 11/19/21
- TB-21-03 (202'-207') 11/19/21

/ December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/ December 6, 2021

Philip B. Simon (Laboratory Director)

G001-002.21/CN_1122211.doc

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1122211	Preparation Date	11/22/2021
Client Sample ID	Quitted 001	Analysis Date	11/22/2021 18:12:47
Laboratory Sample ID	1122211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/21/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1122211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.007	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
Sample analyzed at native pH.

Ann Arbor Technical Services, Inc.
390 South Wagner Road
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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1122211	Preparation Date	11/22/2021
Client Sample ID	Red Pond	Analysis Date	11/22/2021 19:06:39
Laboratory Sample ID	1122211-2	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/21/2021 7:30	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1122211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.20	0.040		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1122211	Preparation Date	11/22/2021
Client Sample ID	MW-53S	Analysis Date	11/23/2021 02:58:00
Laboratory Sample ID	1122211-9	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/18/2021 12:35	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1122211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	ND	0.0010		XMpU

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1122211	Preparation Date	11/22/2021
Client Sample ID	MW-53	Analysis Date	11/23/2021 03:39:28
Laboratory Sample ID	1122211-10	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/18/2021 13:55	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1122211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.031	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1122211	Preparation Date	11/22/2021
Client Sample ID	MW-93	Analysis Date	11/23/2021 04:23:01
Laboratory Sample ID	1122211-11	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/18/2021 15:30	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1122211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	ND	0.0010		U

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1122211	Preparation Date	11/22/2021
Client Sample ID	MW-94S	Analysis Date	11/23/2021 05:08:27
Laboratory Sample ID	1122211-12	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/18/2021 17:15	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	10
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1122211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.44	0.010		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1122211

Prepared By:
Ann Arbor Technical Services, Inc.
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Ann Arbor, MI 48103

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1122211
Client Sample ID	MW-1R
Laboratory Sample ID	1122211-13
Matrix	Water
Sample Date	11/19/2021 9:35
Analytical Method (SW846)	USEPA 1624
Preparation Method (SW846)	USEPA 1624
QC Batch Number	QCORG1122211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.086	0.0020	0.0100	M

Percent Moisture	100.0
Preparation Date	11/22/2021 10:30:00
Analysis Date	11/23/2021 18:24:00
Instrument	3100V
Subsample (mL)	0.0000
Final Volume (mL)	4.000
Dilution Factor	2
Batch	Total
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS SDG Number	1122211
Client Sample ID	MW-7RR
Laboratory Sample ID	1122211-14
Matrix	Water
Sample Date	11/19/2021 11:05
Analytical Method (SW846)	USEPA 1624
Preparation Method (SW846)	USEPA 1624
QC Batch Number	QCORG1122211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.33	0.010	0.050	M

Percent Moisture	100.0
Preparation Date	11/22/2021 10:30:00
Analysis Date	11/23/2021 18:33:39
Instrument	3100V
Subsample (mL)	4.0000
Final Volume (mL)	5.000
Dilution Factor	10
Batch	Total
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1122211
SDG: 1122211
Project Number: G001-002.21
Report Date: 12/5/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1122211-2 MS	11/22/2021	18:40:24	1,4-Dioxane	123-91-1	0.29	0.40	0.68	mg/L	Wet	96.8	85	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1122211
SDG: 1122211
Project Number: G001-002.21
Report Date: 12/5/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1122211-2 MSD	11/22/2021	20:24:53	1,4-Dioxane	123-91-1	0.29	0.40	0.68	mg/L	Wet	91.8	85	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1122211
SDG: 1122211
Project Number: G001-002.21
Report Date: 12/5/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 11/23/21	11/23/2021	00:45:31	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1122211
SDG: 1122211
Project Number: G001-002.21
Report Date: 12/5/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
1122211-2 MS	11/22/2021	18:40:24	1,4-Dioxane	123-91-1	0.68		mg/L	Wet			
1122211-2 MSD	11/22/2021	20:24:53	1,4-Dioxane	123-91-1	0.66	0.67	mg/L	Wet	3.2	20	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1122211
SDG: 1122211
Project Number: G001-002.21
Report Date: 12/5/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 11/23/21	11/23/2021	00:02:08	1,4-Dioxane	123-91-1		0.510	0.513	mg/L	Wet	102	85	115	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M = Indicates elevated reporting limit based upon sample dilution.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1123211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 13 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/23/21, and associated matrix-specific QA/QC.

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/23/21				
Outfall 001	11/22/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/23/21	Urgent	1,4-Dioxane	Water
Eff-OC-1A	11/23/21	Urgent	1,4-Dioxane	Water
Eff-OC-2A	11/23/21	Urgent	1,4-Dioxane	Water
BP-1	11/23/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/23/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/23/21	Urgent	1,4-Dioxane	Water
Red Pond	11/23/21	Urgent	1,4-Dioxane	Water
MW-112S	11/23/21	Standard	1,4-Dioxane	Water
MW-112D	11/23/21	Standard	1,4-Dioxane	Water
MW-112I	11/23/21	Standard	1,4-Dioxane	Water
MW-103D	11/23/21	Standard	1,4-Dioxane	Water
MW-103S	11/23/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	8 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
1,4-Dioxane (USEPA 1624) – Standard TAT	5 Samples

Consultants in Chemistry & Environmental Science
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Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/23/21

Mark T. DeLong / December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

Philip B. Simon / December 6, 2021

Philip B. Simon (Laboratory Director)

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1123211	Preparation Date	11/23/2021
Client Sample ID	Outfall 001	Analysis Date	11/23/2021 10:10:51
Laboratory Sample ID	1123211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/22/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1123211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.006	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.
Sample analyzed at native pH.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1123211	Preparation Date	11/23/2021
Client Sample ID	Red Pond	Analysis Date	11/23/2021 19:20:25
Laboratory Sample ID	1123211-6	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/22/2021 7:00	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	4
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1123211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.29	0.0040		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1123211	Preparation Date	11/23/2021
Client Sample ID	MW-112S	Analysis Date	12/01/2021 20:28:11
Laboratory Sample ID	1123211-9	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/23/2021 10:16	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1123211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.003	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1123211	Preparation Date	11/23/2021
Client Sample ID	MW-112D	Analysis Date	12/01/2021 21:11:54
Laboratory Sample ID	1123211-10	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/23/2021 11:26	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1123211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.001	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1123211
SDG 1123211
Project Number: G001-002.21
Report Date: 12/5/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 11/23/21	11/23/2021	08:00:58	1,4-Dioxane	123-91-1		0.010	0.0098	mg/L	Wet	97.8	85	115	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicate elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS BOD Number	1123211	Preparation Date	11/22/2021
Client Sample ID	MW-103	Analysis Date	11/23/2021
Laboratory Sample ID	1123211-13	Instrument	5975C
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/22/2021 14:30	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1123211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.229	0.0010		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicate elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1123211
SDG 1123211
Project Number: G001-002.21
Report Date: 12/5/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
ATS Tap 11/23/21 MS	11/23/2021	09:44:41	1,4-Dioxane	123-91-1		0.010	0.0088	mg/L	Wet	90.3	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicate elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS BOD Number	1123211	Preparation Date	11/22/2021
Client Sample ID	MW-103D	Analysis Date	11/23/2021 22:32:27
Laboratory Sample ID	1123211-14	Instrument	5975C
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/22/2021 14:31	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1123211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.203	0.0010		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicate elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1123211
SDG 1123211
Project Number: G001-002.21
Report Date: 12/5/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
ATS Tap 11/23/21 MSD	11/23/2021	09:28:28	1,4-Dioxane	123-91-1		0.010	0.0091	mg/L	Wet	91.0	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicate elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS BOD Number	1123211	Preparation Date	11/22/2021
Client Sample ID	MW-103S	Analysis Date	11/23/2021 22:23:58
Laboratory Sample ID	1123211-15	Instrument	5975C
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/22/2021 14:32	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1123211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.223	0.0010		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicate elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1123211
SDG 1123211
Project Number: G001-002.21
Report Date: 12/5/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
ATS Tap 11/23/21 MS	11/23/2021	09:44:41	1,4-Dioxane	123-91-1	0.0088		mg/L	Wet			
ATS Tap 11/23/21 MSD	11/23/2021	09:28:28	1,4-Dioxane	123-91-1	0.0091	0.0089	mg/L	Wet	9.2	20	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicate elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1123211
SDG 1123211
Project Number: G001-002.21
Report Date: 12/5/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 11/23/21	11/23/2021	07:12:22	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicate elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1124211

Prepared By:
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ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1124211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 12 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/24/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Revised 11/24/21				
Outfall 001	11/23/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/24/21	Urgent	1,4-Dioxane	Water
HHEOC-2A	11/24/21	Urgent	1,4-Dioxane	Water
TJEOC-2A	11/24/21	Urgent	1,4-Dioxane	Water
BP-1	11/24/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/24/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/24/21	Urgent	1,4-Dioxane	Water
Red Pond	11/24/21	Urgent	1,4-Dioxane	Water
MW-116	11/23/21	Standard	1,4-Dioxane	Water
A2 Cleaning Supply	11/23/21	Standard	1,4-Dioxane	Water
MW-101	11/23/21	Standard	1,4-Dioxane	Water
MW-115	11/23/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
• 1,4-Dioxane (USEPA 1624) – Urgent TAT	• 8 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
• 1,4-Dioxane (USEPA 1624) – Standard TAT	• 4 Samples

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Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as ug/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/24/21
- MW-116 11/23/21
- MW-101 11/23/21
- MW-115 11/23/21

Mark T. DeLong / December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

Philip B. Simon / December 6, 2021

Philip B. Simon (Laboratory Director)

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1124211	Preparation Date	11/24/2021
Client Sample ID	Outfall 001	Analysis Date	11/24/2021 10:04:12
Laboratory Sample ID	1124211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/23/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1124211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.007	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed after to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.
Sample analyzed at native pH.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1124211	Preparation Date	11/24/2021
Client Sample ID	MW-116	Analysis Date	12/02/2021 23:48:51
Laboratory Sample ID	1124211-6	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/23/2021 10:55	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	10
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1124211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.68	0.010		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed after to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1124211	Preparation Date	11/24/2021
Client Sample ID	A2 Cleaning Supply	Analysis Date	12/03/2021 00:32:39
Laboratory Sample ID	1124211-8	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/23/2021 8:45	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1124211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.035	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed after to reporting.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1124211
SDG: 1124211
Project Number: G001-002.21
Report Date: 12/5/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 1124121	11/24/2021	08:38:27	1,4-Dioxane	123-91-1		0.810	0.5355	mg/L	Wet	84.7	80	115	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS GCG Number	1124211
Client Sample ID	MW-101
Laboratory Sample ID	1124211-10
Matrix	Water
Sample Date	11/22/2021 13:58
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1124211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.595	0.0030	0.100	M

Percent Moisture	100.0
Preparation Date	11/24/2021
Analysis Date	12/05/2021 11:10:53
Instrument	3100V
Bottlewight (mL)	0.0000
Final Volume (mL)	3.000
Dilution Factor	2
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1124211
SDG: 1124211
Project Number: G001-002.21
Report Date: 12/5/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1124211-12 MS	11/24/2021	15:12:54	1,4-Dioxane	123-91-1	0.34	0.40	0.78	mg/L	Wet	109	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS GCG Number	1124211
Client Sample ID	MW-101
Laboratory Sample ID	1124211-11
Matrix	Water
Sample Date	11/22/2021 13:23
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1124211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.44	0.0030	0.100	M

Percent Moisture	100.0
Preparation Date	11/24/2021
Analysis Date	12/05/2021 01:54:40
Instrument	3100V
Bottlewight (mL)	0.0000
Final Volume (mL)	3.000
Dilution Factor	2
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1124211
SDG: 1124211
Project Number: G001-002.21
Report Date: 12/5/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1124211-13 MSD	11/24/2021	16:56:44	1,4-Dioxane	123-91-1	0.34	0.40	0.78	mg/L	Wet	106	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS GCG Number	1124211
Client Sample ID	Inlet Trend
Laboratory Sample ID	1124211-12
Matrix	Water
Sample Date	11/22/2021 7:28
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1124211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.34	0.0040	0.100	M

Percent Moisture	100.0
Preparation Date	11/24/2021
Analysis Date	12/05/2021 10:29:03
Instrument	3100V
Bottlewight (mL)	0.0000
Final Volume (mL)	3.000
Dilution Factor	40
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1124211
SDG: 1124211
Project Number: G001-002.21
Report Date: 12/5/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
1124211-12 MS	11/24/2021	15:12:54	1,4-Dioxane	123-91-1	0.78		mg/L	Wet			
1124211-13 MSD	11/24/2021	16:56:44	1,4-Dioxane	123-91-1	0.78	0.77	mg/L	Wet	2.6	20	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21
ATS GCG Number	1124211
Client Sample ID	Laboratory Blank
Laboratory Sample ID	1124211-01
Matrix	Water
Sample Date	N/A
Analytical Method (USEPA)	USEPA 1624
Preparation Method (USEPA)	USEPA 1624
QC Batch Number	QCORG1124211

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	ND	0.0040	0.100	M

Percent Moisture	100.0
Preparation Date	11/24/2021
Analysis Date	12/05/2021
Instrument	3100V
Bottlewight (mL)	0.0000
Final Volume (mL)	3.000
Dilution Factor	40
Basis	Wet
Units	mg/L

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCORG1124211
SDG: 1124211
Project Number: G001-002.21
Report Date: 12/5/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 1124121	11/24/2021	07:54:32	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ORGANIC ANALYSIS

1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1129211

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LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1129211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 15 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/29/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 11/29/21				
Outfall 001	11/24/21	Urgent	1,4-Dioxane	Water
Outfall 001	11/23/21	Urgent	1,4-Dioxane	Water
Outfall 001	11/26/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/29/21	Urgent	1,4-Dioxane	Water
Eff-OC-1A	11/29/21	Urgent	1,4-Dioxane	Water
Eff-OC-2A	11/24/21	Urgent	1,4-Dioxane	Water
HP-1	11/29/21	Urgent	1,4-Dioxane	Water
Outfall Grab	11/29/21	Urgent	1,4-Dioxane	Water
Outfall Tmt	11/29/21	Urgent	1,4-Dioxane	Water
Red Pond	11/29/21	Urgent	1,4-Dioxane	Water
175 Jackson Plaza	11/24/21	Standard	1,4-Dioxane	Water
MW-11R	11/24/21	Standard	1,4-Dioxane	Water
MW-113D	11/24/21	Standard	1,4-Dioxane	Water
MW-113I	11/24/21	Standard	1,4-Dioxane	Water
MW-113S	11/24/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analysis.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	10 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
1,4-Dioxane (USEPA 1624) – Standard TAT	5 Samples

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Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/29/21
- 175 Jackson Plaza 11/24/21

Mark A DeLong

/December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/December 6, 2021

Philip H. Simon (Laboratory Director)

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1129211	Preparation Date	11/29/2021
Client Sample ID	Outfall 001	Analysis Date	11/29/2021 11:29:36
Laboratory Sample ID	1129211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/24/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	GCORG1129211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.006	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (PRL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.
Sample analyzed at native pH.

Ann Arbor Technical Services, Inc.
290 South Wagner Road
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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1129211	Preparation Date	11/29/2021
Client Sample ID	Outfall 001	Analysis Date	11/29/2021 12:13:26
Laboratory Sample ID	1129211-2	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/23/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	GCORG1129211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.007	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (PRL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.
Sample analyzed at native pH.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1129211	Preparation Date	11/29/2021
Client Sample ID	Outfall 001	Analysis Date	11/29/2021 12:57:11
Laboratory Sample ID	1129211-3	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/26/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	GCORG1129211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.006	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (PRL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.
Sample analyzed at native pH.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1129211	Preparation Date	11/29/2021
Client Sample ID	Red Pond	Analysis Date	11/30/2021 17:34:27
Laboratory Sample ID	1129211-10	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/29/2021 7:55	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1129211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.31	0.040		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1129211	Preparation Date	11/29/2021
Client Sample ID	175 Jackson Plaza	Analysis Date	12/03/2021 02:43:13
Laboratory Sample ID	1129211-11	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/24/2021 14:07	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1129211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.90	0.040		M

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1129211	Preparation Date	11/29/2021
Client Sample ID	MW-118	Analysis Date	12/03/2021 03:20:45
Laboratory Sample ID	1129211-12	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/24/2021 12:50	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1129211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.058	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1129211	Preparation Date	11/29/2021
Client Sample ID	MW-133D	Analysis Date	12/03/2021 04:10:24
Laboratory Sample ID	1129211-13	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/24/2021 11:35	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1129211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.004	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1129211	Preparation Date	11/29/2021
Client Sample ID	MW-133D	Analysis Date	12/03/2021 04:54:01
Laboratory Sample ID	1129211-14	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/24/2021 10:26	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1129211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.002	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1129211	Preparation Date	11/29/2021
Client Sample ID	MW-133S	Analysis Date	12/03/2021 05:37:37
Laboratory Sample ID	1129211-15	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/24/2021 9:11	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1129211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.003	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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ANN ARBOR TECHNICAL SERVICES, INC.
QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QAQC Batch Number: QCORG1129211
SDG: 1129211
Project Number: G001-002.21
Report Date: 12/5/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1129211	11/30/2021	08:47:58	1,4-Dioxane	123-91-1		mg/L	Wet		0.001	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.
QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QAQC Batch Number: QCORG1129211
SDG: 1129211
Project Number: G001-002.21
Report Date: 12/5/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1129211	11/30/2021	10:31:28	1,4-Dioxane	123-91-1		0.010	0.0095	mg/L	Wet	95.2	82	119	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QC0001132211
SDG: 1130211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1132211-1-MS	11/30/2021	18:18:20	1,4-Dioxane	123-91-1	0.31	0.40	0.74	mg/L	Wet	106	88	120	

Comments
All analytical reference CCV QC is within criteria unless noted.
Results are reported on a wet weight basis unless otherwise noted.
Blank results reported on a dry weight basis unless otherwise noted.
N = Indicates analyte spiking did meet spike acceptance criteria.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QC0001132211
SDG: 1130211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1132211-1-MSD	11/30/2021	18:20:10	1,4-Dioxane	123-91-1	0.31	0.40	0.87	mg/L	Wet	141	88	120	

Comments
All analytical reference CCV QC is within criteria unless noted.
Results are reported on a wet weight basis unless otherwise noted.
Blank results reported on a dry weight basis unless otherwise noted.
N = Indicates analyte spiking did meet spike acceptance criteria.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QC0001132211
SDG: 1130211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Unit	Units	Basis	RPD	Control Limit	Comments
1132211-1-MS	11/30/2021	18:18:20	1,4-Dioxane	123-91-1	0.74	mg/L	Wet	Wet	13	20	
1132211-1-MSD	11/30/2021	18:20:10	1,4-Dioxane	123-91-1	0.87	mg/L	Wet	Wet			

Comments
All analytical reference CCV QC is within criteria unless noted.
Results are reported on a wet weight basis unless otherwise noted.
Blank results reported on a dry weight basis unless otherwise noted.
N = Indicates analyte spiking did meet spike acceptance criteria.

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1130211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1130211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 10 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 11/30/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Revised 11/30/21				
Outfall 001	11/29/21	Urgent	1,4-Dioxane	Water
Comb Eff	11/30/21	Urgent	1,4-Dioxane	Water
Eff-OC-1A	11/30/21	Urgent	1,4-Dioxane	Water
Eff-OC-2A	11/30/21	Urgent	1,4-Dioxane	Water
BP-1	11/30/21	Urgent	1,4-Dioxane	Water
Outfall Comb	11/30/21	Urgent	1,4-Dioxane	Water
Outfall Test	11/30/21	Urgent	1,4-Dioxane	Water
MW-144 (92-96')	11/29/21	Urgent	1,4-Dioxane	Water
Red Pond	11/30/21	Urgent	1,4-Dioxane	Water
MW-106S	11/29/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	9 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
1,4-Dioxane (USEPA 1624) – Standard TAT	1 Samples

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Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported in project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 11/30/21
- MW-106S 11/29/21

Mark T. DeLong

/December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/December 6, 2021

Philip D. Simon (Laboratory Director)

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCDRG1130211
SDG: 1130211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 1130211	11/30/2021	18:22:47	1,4-Dioxane	123-91-1		0.012	0.0108	mg/L	Wet	90.1	68	115	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Found specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1130211	Preparation Date	11/30/2021
Client Sample ID	Outlet 001	Analysis Date	11/30/2021 18:46:52
Laboratory Sample ID	1130211-1	Instrument	210MV
Sample Date	11/30/2021	Initial Volume (mL)	0.000
Analytical Method (USEPA)	1624	Final Volume (mL)	0.000
Preparation Method (USEPA)	USEPA 1624	Dilution Factor	1
QC Batch Number	QCDRG1130211	Basis	Wet
		Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.006	0.0012	0.010	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Found specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCDRG1130211
SDG: 1130211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1130211-12 MS	12/01/2021	01:35:07	1,4-Dioxane	123-91-1	0.30	0.40	0.72	mg/L	Wet	105	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Found specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

Ann Arbor Technical Services, Inc.
399 South Wagner Road
Ann Arbor, Michigan 48103
Office: 734-995-0900
Fax: 734-995-3731

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1130211	Preparation Date	12/01/2021
Client Sample ID	MW-206S	Analysis Date	12/01/2021 00:22:32
Laboratory Sample ID	1130211-9	Instrument	210MV
Sample Date	11/30/2021	Initial Volume (mL)	0.000
Analytical Method (USEPA)	1624	Final Volume (mL)	0.000
Preparation Method (USEPA)	USEPA 1624	Dilution Factor	20
QC Batch Number	QCDRG1130211	Basis	Wet
		Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.30	0.020	0.200	M

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Found specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCDRG1130211
SDG: 1130211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1130211-12 MSD	12/01/2021	02:13:39	1,4-Dioxane	123-91-1	0.30	0.40	0.68	mg/L	Wet	90.4	80	120	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Found specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1130211	Preparation Date	12/01/2021
Client Sample ID	Red Point	Analysis Date	12/01/2021 00:51:30
Laboratory Sample ID	1130211-13	Instrument	210MV
Sample Date	11/30/2021 7:30	Initial Volume (mL)	0.000
Analytical Method (USEPA)	1624	Final Volume (mL)	0.000
Preparation Method (USEPA)	USEPA 1624	Dilution Factor	40
QC Batch Number	QCDRG1130211	Basis	Wet
		Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.30	0.040	0.400	M

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Found specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCDRG1130211
SDG: 1130211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
1130211-12 MS	12/01/2021	01:35:07	1,4-Dioxane	123-91-1	0.72		mg/L	Wet			
1130211-12 MSD	12/01/2021	02:13:39	1,4-Dioxane	123-91-1	0.68	0.69	mg/L	Wet	8.4	20	

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Found specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QCDRG1130211
SDG: 1130211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 1130211	11/30/2021	18:06:39	1,4-Dioxane	123-91-1		mg/L	Wet	0.001		

Comments:
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Found specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

ORGANIC ANALYSIS
1,4-Dioxane by GC/MS
USEPA 1624

ATS Project Number: G001-002.21

ATS SDG: 1201211

Prepared By:
Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, MI 48103

G001-002.21/CN_1201211.doc

ANN ARBOR TECHNICAL SERVICES, INC.

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 12/6/21
SRF / SDG Number(s): 1201211
Client PO Number: 4504963225

Case Narrative Summary

This case narrative applies to the following 11 samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 12/01/21, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Requested Turn Around Time	Analysis	Matrix
Received 12/01/21				
Outfall 001	11/30/21	Urgent	1,4-Dioxane	Water
Comb BF	12/01/21	Urgent	1,4-Dioxane	Water
BIS-OC-1A	12/01/21	Urgent	1,4-Dioxane	Water
BIS-OC-2A	12/01/21	Urgent	1,4-Dioxane	Water
BP-1	12/01/21	Urgent	1,4-Dioxane	Water
Outfall Comb	12/01/21	Urgent	1,4-Dioxane	Water
Outfall Test	12/01/21	Urgent	1,4-Dioxane	Water
MW-144 (102-107)	11/30/21	Urgent	1,4-Dioxane	Water
MW-144 (112-117)	11/30/21	Urgent	1,4-Dioxane	Water
Red Pond	12/01/21	Urgent	1,4-Dioxane	Water
MW-53D	11/30/21	Standard	1,4-Dioxane	Water

Upon receipt samples were scheduled for the following analyses.

Analysis	Number of Samples
1,4-Dioxane (USEPA 1624) – Urgent TAT	10 Samples + 1 Matrix Spike + 1 Matrix Spike Duplicate
1,4-Dioxane (USEPA 1624) – Standard TAT	1 Samples

G001-002.21/CN_1201211.doc

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies, if any, are either presented in the "Sample Receipt" section of this report or in the comments on individual data sheets. All samples were prepared and analyzed within 45 days with the following exceptions:

- None

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedures (SOPs) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package; other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed by purge and trap GC/MS in accordance with USEPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits. Samples were reported as mg/L.

Anomalies Noted:

- None

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the analysis of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- None

Instrument Blanks

Low system background was demonstrated through the analysis of instrument blanks at a minimum of every 12 hours. All instrument blanks met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1201211.doc

QA/QC Batch Summary

Internal Standards

Internal standards areas and retention times met the acceptance criteria with the following exceptions:

- None

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- None

Laboratory Fortified Blanks / Laboratory Control Samples

A laboratory fortified blank (LFB) was analyzed with each QA/QC batch. The LFB's met the acceptance criteria with the following exceptions:

- None

Matrix Spikes and Spike Duplicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD's met the acceptance criteria with the following exceptions:

- None

Matrix Replicates

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The replicates met the acceptance criteria with the following exceptions:

- None

G001-002.21/CN_1201211.doc

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted for 1,4-Dioxane:

- Red Pond 12/1/21

Mark T. DeLong

/ December 6, 2021

Mark T. DeLong (Quality Assurance Coordinator)

/ December 6, 2021

Philip B. Simon (Laboratory Director)

G001-002.21/CN_1201211.doc

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1201211	Preparation Date	12/01/2021
Client Sample ID	Outfall 001	Analysis Date	12/01/2021 12:26:00
Laboratory Sample ID	1201211-1	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/30/2021 na	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1201211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.006	0.0010		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.
Sample analyzed at native pH.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1201211	Preparation Date	12/01/2021
Client Sample ID	MW-53D	Analysis Date	12/01/2021 19:44:28
Laboratory Sample ID	1201211-6	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	11/30/2021 13:15	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	1
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1201211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	ND	0.0010		U

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

1,4-Dioxane by GC/MS
Data Summary Sheet

ATS Project Number	G001-002.21	Percent Moisture	100.0
ATS SDG Number	1201211	Preparation Date	12/01/2021
Client Sample ID	Red Pond	Analysis Date	12/01/2021 17:32:55
Laboratory Sample ID	1201211-11	Instrument	2100V
Matrix	Water	Subsample (mL)	5.0000
Sample Date	12/01/2021 7:30	Final Volume (mL)	5.000
Analytical Method (USEPA)	USEPA 1624	Dilution Factor	40
Preparation Method (USEPA)	USEPA 1624	Basis	Wet
QC Batch Number	QCORG1201211	Units	mg/L

Parameter	Chemical Identifier	Result	MDL	PQL	Qual
1,4-Dioxane	123-91-1	0.34	0.040		M

Comments
All methods referencing US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY PRECISION SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QC0RG1201211
SDG 1201211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Mean	Units	Basis	RPD	Control Limit	Comments
1201211-11 MS	12/01/2021	18:18:49	1,4-Dioxane	123-91-1	0.71		mg/L	Wet			
1201211-11 MSD	12/01/2021	18:55:41	1,4-Dioxane	123-91-1	0.73	0.72	mg/L	Wet	4.1	30	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY BLANK SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QC0RG1201211
SDG 1201211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Reagent Blank (LRB) / Method Blank (MB)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Result	Units	Basis	Method Detection Limit	Reporting Detection Limit	Comments
LRB-1 12/1/21	12/01/2021	09:53:43	1,4-Dioxane	123-91-1		mg/L	Wet	0.051		

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QC0RG1201211
SDG 1201211
Project Number: G001-002.21
Report Date: 12/6/2021

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
LFB-1 12/1/21	12/01/2021	09:09:04	1,4-Dioxane	123-91-1		0.210	0.0190	mg/L	Wet	90.1	85	115	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QC0RG1201211
SDG 1201211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike (MS)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1201211-11 MS	12/01/2021	18:18:49	1,4-Dioxane	123-91-1	0.34	0.40	0.71	mg/L	Wet	90.5	80	120	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

ANN ARBOR TECHNICAL SERVICES, INC.

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY
LABORATORY ACCURACY SUMMARY

Method: USEPA 1624
QA/QC Batch Number: QC0RG1201211
SDG 1201211
Project Number: G001-002.21
Report Date: 12/6/2021

Matrix Spike Duplicate (MSD)

Lab Sample ID	Analysis Date	Analysis Time	Chemical Name	CAS	Sample Concentration	Spike Added	Measured Concentration	Units	Basis	Percent Recovery	LCL	UCL	Comments
1201211-11 MSD	12/01/2021	18:55:41	1,4-Dioxane	123-91-1	0.34	0.40	0.73	mg/L	Wet	97.8	80	120	

Comments
All methods reference US EPA methods unless otherwise noted.
Calculations performed prior to rounding.
Project specific reporting limit (MDL) based upon lowest calibration standard.
M - Indicates elevated reporting limit based upon sample dilution.

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Wisconsin Laboratory ID: 999117132

Data Transmittal Cover Page

Project Name: Pall Corporation
ATS Project Number: G001-002
ATS Report Number(s): Inorg_SWF_NOV_PO3225
Client PO Number: 4504463235
Project Description: This data report contains the results of 235 water samples, received by ATS during the months of November and December, to be analyzed for 1,4-Dioxane.

We certify that the samples analyzed for this report have been conducted in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written Standard Operating Procedure specific to the ATS Laboratories, as required by USEPA. Laboratory data sheets, Standard Operating Procedures and Method Detection Limit studies are available upon request. Any deviations from the specified method or procedure, or any other anomalies affecting the quality of the data, are specifically noted on the data report, all applicable sample preservation and holding time requirements have been met.

Recipient: Mr. Gaga Tsindzi **Email:** gtsindzi@ne.rpcorp@ne.com
FAX Number:

No. of Pages (including cover pg.): 457

From: Sarah Stobbelfield, Client Coordinator / Lab Manager
Email: Sarah.Stobbelfield@AnnArborTechnicalServices.com
FAX Number: 734-995-0018

Additional Message:

Date: 12/6/21 **Signed:**

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