Gelman Sciences, Inc. d/b/a
Pall Life Sciences
642 South Wagner Road
Ann Arbor, MI 48103
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CASE NARRATIVE
Monthly Data Pall Life Sciences
Project: 1,4-Dioxane Remediation
Date: June 2016

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 instrumentation. 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. d/b/a Pall Life Sciences (PLS) attests to the validity of the laboratory data generated by PLS's Ann Arbor, Michigan Environmental Laboratory facilities reported herein. All analyses performed by PLS's Environmental Laboratory facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. PLS'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.

Samples were sent to Ann Arbor Technical Services, Inc. (ATS) for analysis for two days during PLS laboratory staff vacation time. These samples included: three Outfall001 samples and two HC/HR samples. Outfall001 samples were analyzed for 1,4-Dioxane (EPA 1624m) and bromate (EPA 300.1); HC/HR samples were analyzed for bromate by EPA 300.1; and one additional Outfall001 grab sample was analyzed for Barium, by EPA 6010C. The reporting limit for their bromate analysis using Dionex Equipment is 3ppb and is listed as such on the analysis sheet. Barium analysis by EPA 6010C yielded a concentration of 290ppb as total barium.

The ATS is a Michigan DEQ Drinking Water Accredited Laboratory. In addition they have extensive experience analyzing 1,4-dioxane samples, developing and validating analytical methods.

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 at PLS 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, with the exception of the PLS 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.

The one Barium sample was collected per EPA method 200.7 and sent to ATS the same day collected.

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.

PLS 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.

PLS 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 PLS 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 was 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 28 days.
O:	Samples analyzed in outside laboratory.
S:	Samples split with DEQ.

Bromate Qualifier Codes:

Qualifier Code	*Description*
nd:	The compound was analyzed for, 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
O:	Samples analyzed in outside laboratory.

Analyst: *Susan E.O. Peters* Susan EO Peters Date: 07-12-16

Report Checked by: *Laurel Beyer* Date: 7-12-16

PALL Life Sciences
642 South Wagner Road
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Sample Analysis Report

June, 2016

Analyst Initials: BEOP
Date: 07-12-16

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)
Residential Wells								
D0								
5005 Jackson Rd-06-17-16-11:05-1	18	1.0						
Miscellaneous Wells								
Not Determined								
Bethlehem Cemetery-06-07-16-15:23-1	nd	1.0						
Extraction Wells								
C3								
DOLPH-06-01-16-07:53-1	100	10.0						D
TW-1-06-07-16-14:30-1	78	1.0						
TW-20-06-01-16-08:10-1	920	10.0						D
TW-3-06-07-16-14:49-1	nd	1.0						
TW-6-06-22-16-1	100	1.0						
D2								
LB-4-06-01-16-08:50-1	480	10.0						D
TW-21-06-01-16-09:08-1	160	1.0						
E								
TW-16-06-01-16-10:00-1	860	25.0						D
TW-18-06-01-16-07:55-1	280	5.0						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)
TW-19-06-01-16-09:57-1	720	25.0						D
Marshy								
PW-1-06-01-16-10:50-1	550	25.0						D
SW								
TW-22-06-01-16-09:35-1	530	25.0						D
TW-8-06-01-16-09:37-1	740	25.0						D
Monitoring Wells								
C3								
MW-1 Replacement-06-23-16-1	3800	100.0						D
MW-22-06-16-16-15:24-1	320	5.0						D
MW-34s-06-24-16-1	nd	1.0						
MW-75-06-23-16-1	1100	100.0						D
D0								
A2 Cleaning Supply-06-02-16-15:09-1	76	5.0						D
MW-41d-06-07-16-15:44-1	23	1.0						
MW-41s-06-07-16-15:50-1	16	1.0						
MW-53d-06-02-16-15:37-1	nd	1.0						
MW-53i-06-02-16-16:03-1	56	5.0						D
MW-53s-06-02-16-15:05-1	nd	1.0						
D2								
175 Jackson Plaza-06-23-16-1	850	50.0						D
2819 Dexter Rd-06-24-16-1	340	10.0						D
3161 Dexter Rd-06-08-16-14:46-1	nd	1.0						
456 Clarendon-06-30-16-16:00-1	520	25.0						D
465 Dupont-06-22-16-1	1300	50.0						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)
HZ-S-06-23-16-13:40-1	860	25.0						D
MW-107-06-24-16-1	720	25.0						D
MW-117-06-24-16-1	1.5	1.0						
MW-121s-06-06-16-10:46-1	nd	1.0						
MW-129i-06-03-16-14:31-1	nd	1.0						
MW-129s-06-03-16-15:10-1	nd	1.0						
MW-34d-06-24-16-1	nd	1.0						
MW-38d-06-30-16-13:35-1	50	5.0						D
MW-4d-06-16-16-16:15-1	1200	50.0						D
MW-55-06-08-16-15:17-1	26	1.0						
MW-77-06-23-16-1	1500	100.0						D
E								
IW-2-06-23-16-1	310	50.0						D
MW-100-06-23-16-1	1500	100.0						D
MW-103s-06-06-16-13:32-1	52	1.0						
MW-112i-06-03-16-11:47-1	7.2	1.0						
MW-112s-06-03-16-11:11-1	nd	1.0						
MW-121d-06-06-16-11:30-1	1.2	1.0						
MW-129d-06-03-16-15:45-1	1.0	1.0						
MW-71-06-22-16-1	900	50.0						D
MW-72d-06-08-16-16:50-1	1100	50.0						D
MW-72s-06-08-16-16:08-1	2.5	1.0						
MW-76i-06-06-16-15:24-1	97	1.0						
MW-76s-06-06-16-15:51-1	220	10.0						D
MW-84s-06-08-16-13:36-1	66	5.0						D
Marshy								

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)
NMW-1s-06-22-16-14:20-1	2300	50.0						D
NMW-2s-06-22-16-14:32-1	1500	50.0						D
SW								
MW-10d-06-09-16-15:44-1	1000	50.0						D
MW-48-06-17-16-11:50-1	56	1.0						
MW-52s-06-09-16-15:00-1	470	10.0						D
TW-4-06-09-16-14:36-1	48	1.0						
Surface Water								
Not Applicable								
HC/HR-06-01-16-08:30-1			nd	2.0				
HC/HR-06-02-16-09:30-1			nd	2.0				
HC/HR-06-03-16-09:20-1			nd	2.0				
HC/HR-06-06-16-09:15-1			nd	2.0				
HC/HR-06-07-16-08:25-1			nd	2.0				
HC/HR-06-08-16-08:35-1			nd	2.0				
HC/HR-06-09-16-09:35-1			nd	2.0				
HC/HR-06-10-16-08:30-1			nd	2.0				
HC/HR-06-13-16-08:00-1			nd	2.0				
HC/HR-06-14-16-08:40-1			nd	2.0				
HC/HR-06-15-16-08:10-1			nd	2.0				
HC/HR-06-16-16-09:50-1			nd	2.0				
HC/HR-06-17-16-08:15-1			nd	2.0				
HC/HR-06-20-16-08:30-1			nd	2.0				
HC/HR-06-21-16-09:00-1			nd	2.0				
HC/HR-06-22-16-07:56-1			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-06-23-16-08:40-1			nd	3.0			Ann Arbor Technical Services	O
HC/HR-06-24-16-08:42-1			nd	3.0			Ann Arbor Technical Services	O
HC/HR-06-27-16-09:25-1			nd	2.0				
HC/HR-06-28-16-08:40-1			nd	2.0				
HC/HR-06-29-16-08:30-1			nd	2.0				
HC/HR-06-30-16-08:30-1			nd	2.0				
Treatment System								
OUTFALL-06-01-16-1	5.4	1.0						
OUTFALL-06-01-16-2			5.6	5.0				
OUTFALL-06-02-16-1	5.7	1.0						
OUTFALL-06-02-16-2			nd	5.0				
OUTFALL-06-05-16-1	5.1	1.0						
OUTFALL-06-05-16-2			6.5	5.0				
OUTFALL-06-06-16-1	4.8	1.0						
OUTFALL-06-06-16-2			5.7	5.0				
OUTFALL-06-07-16-1	4.4	1.0						
OUTFALL-06-07-16-2			5.3	5.0				
OUTFALL-06-08-16-1	4.4	1.0						
OUTFALL-06-08-16-2			5.4	5.0				
OUTFALL-06-09-16-1	4.2	1.0						
OUTFALL-06-09-16-2			5.8	5.0				
OUTFALL-06-12-16-1	5.8	1.0						
OUTFALL-06-12-16-3			5.9	5.0				
OUTFALL-06-13-16-1	5.2	1.0						
OUTFALL-06-13-16-2			5.3	5.0				

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)
OUTFALL-06-14-16-1	5.4	1.0						
OUTFALL-06-14-16-2			5.8	5.0				
OUTFALL-06-15-16-1	5.8	1.0						
OUTFALL-06-15-16-2			5.6	5.0				
OUTFALL-06-16-16-1	5.3	1.0						
OUTFALL-06-16-16-2			5.6	5.0				
OUTFALL-06-19-16-1	6.3	1.0						
OUTFALL-06-19-16-2			5.7	5.0				
OUTFALL-06-20-16-2			nd	5.0				
OUTFALL-06-20-16-1	6.4	1.0						
OUTFALL-06-21-16-1	6.3	1.0						
OUTFALL-06-21-16-2			nd	5.0				
OUTFALL-06-22-16-1	6	1.0					Ann Arbor Technical Services	O
OUTFALL-06-22-16-2			nd	5.0			Ann Arbor Technical Services	O
OUTFALL-06-23-16-1	6	1.0					Ann Arbor Technical Services	O
OUTFALL-06-23-16-2			nd	5.0			Ann Arbor Technical Services	O
OUTFALL-06-26-16-2			nd	5.0				
OUTFALL-06-26-16-1	5.3	1.0						
OUTFALL-06-27-16-2			5.6	5.0				
OUTFALL-06-27-16-1	4.9	1.0						
OUTFALL-06-28-16-2			6.2	5.0				
OUTFALL-06-28-16-1	4.2	1.0						
OUTFALL-06-29-16-2			6.0	5.0				
OUTFALL-06-29-16-1	4.4	1.0						
OUTFALL-06-30-16-2			5.9	5.0				

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)
OUTFALL-06-30-16-1	4.4	1.0						
Red Pond-06-06-16-07:10-1	380	10.0						D
Red Pond-06-13-16-07:20-1	470	10.0						D
Red Pond-06-20-16-08:15-1	480	5.0						D
Red Pond-06-27-16-10:18-1	420	10.0						D

PLS Qualifier Codes:

nd: The compound was analyzed for, but was not detected at or above the detection limit indicated.
D: Analyte value quantified from a dilution, reporting limit is raised to reflect dilution
O: Sample analyzed by and outside laboratory specified in the comment section

290 South Wagner Road
Ann Arbor, Michigan 48103
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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Inorganic Analysis
Data Summary Sheet

For: Ms. Sue Peters
Pall Corporation
642 South Wagner Road
Ann Arbor, MI 48103

ATS Project: Pall Corporation #G001-002
Report Date: 7/11/16
ATS SRF: 0624161

Sample Identification: Outfall 001

Sample Date: 6/24/16
Sample Time: 7:50 AM
Sampled By: Client
Laboratory Receipt Date: 6/24/16
Sample Matrix: Water

Parameter	Method	Units	Result	Reporting Limit	Analysis Date	Analysis Time	Analyzed By
Metals Analysis							
Total Barium	EPA 6010C	mg/L	0.29	0.001	6/24/16	17:25	SLS

Comments

All methods reference USEPA methods unless otherwise noted.

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Wisconsin Laboratory ID: 998321720

Organic Analysis
Data Summary Sheet

For: Ms. Sue Peters
Pall Corporation
642 South Wagner Road
Ann Arbor, MI 48103

ATS Project: Pall Corporation #G001-002
Report Date: 6/24/16
ATS SRF: 0624161 (Rush)

Sample Identification: Outfall 001 (1,4-D)

Sample Date: 6/22/16
Sample Time: na
Sampled By: Client
Laboratory Receipt Date: 6/24/16
Sample Matrix: Water

Parameter	Method	Units	Result	Reporting Limit	Analysis Date	Analysis Time	Analyzed By
Organic Analysis							
1,4-Dioxane	EPA 1624	mg/L	0.006	0.001	6/24/16	10:44	JEB

Comments

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na - Indicates not available.

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Organic Analysis
Data Summary Sheet

For: Ms. Sue Peters
Pall Corporation
642 South Wagner Road
Ann Arbor, MI 48103

ATS Project: Pall Corporation #G001-002
Report Date: 6/24/16
ATS SRF: 0624161 (Rush)

Sample Identification: Outfall 001 (1,4-D)

Sample Date: 6/23/16
Sample Time: na
Sampled By: Client
Laboratory Receipt Date: 6/24/16
Sample Matrix: Water

Parameter	Method	Units	Result	Reporting Limit	Analysis Date	Analysis Time	Analyzed By
Organic Analysis							
1,4-Dioxane	EPA 1624	mg/L	0.006	0.001	6/24/16	12:46	JEB

Comments

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na - Indicates not available.

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Inorganic Analysis
Data Summary Sheet

For: Ms. Sue Peters
Pall Corporation
642 South Wagner Road
Ann Arbor, MI 48103

ATS Project: Pall Corporation #G001-002
Report Date: 6/24/16
ATS SRF: 0624161 (Rush)

Sample Identification: Outfall 001 (Bromate)

Sample Date: 6/23/16
Sample Time: na
Sampled By: Client
Laboratory Receipt Date: 6/24/16
Sample Matrix: Water

Parameter	Method	Units	Result	Reporting Limit	Analysis Date	Analysis Time	Analyzed By
Inorganic Analysis							
Bromate	EPA 300.1	mg/L	<0.003	0.003	6/24/16	11:28	SLS

Comments

All methods reference USEPA methods unless otherwise noted.
na - Indicates not available.

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Inorganic Analysis
Data Summary Sheet

For: Ms. Sue Peters
Pall Corporation
642 South Wagner Road
Ann Arbor, MI 48103

ATS Project: Pall Corporation #G001-002
Report Date: 6/24/16
ATS SRF: 0624161 (Rush)

Sample Identification: Outfall 001 (Bromate)

Sample Date: 6/22/16
Sample Time: na
Sampled By: Client
Laboratory Receipt Date: 6/24/16
Sample Matrix: Water

Parameter	Method	Units	Result	Reporting Limit	Analysis Date	Analysis Time	Analyzed By
Inorganic Analysis							
Bromate	EPA 300.1	mg/L	<0.003	0.003	6/24/16	10:45	SLS

Comments

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na - Indicates not available.

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Inorganic Analysis
Data Summary Sheet

For: Ms. Sue Peters
Pall Corporation
642 South Wagner Road
Ann Arbor, MI 48103

ATS Project: Pall Corporation #G001-002
Report Date: 6/24/16
ATS SRF: 0624161 (Rush)

Sample Identification: HC/HR

Sample Date: 6/23/16
Sample Time: 8:40 AM
Sampled By: Client
Laboratory Receipt Date: 6/24/16
Sample Matrix: Water

Parameter	Method	Units	Result	Reporting Limit	Analysis Date	Analysis Time	Analyzed By
Inorganic Analysis							
Bromate	EPA 300.1	mg/L	<0.003	0.003	6/24/16	12:01	SLS

Comments

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Inorganic Analysis
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For: Ms. Sue Peters
Pall Corporation
642 South Wagner Road
Ann Arbor, MI 48103

ATS Project: Pall Corporation #G001-002
Report Date: 6/24/16
ATS SRF: 0624161 (Rush)

Sample Identification: HC/HR

Sample Date: 6/24/16
Sample Time: 8:42 AM
Sampled By: Client
Laboratory Receipt Date: 6/24/16
Sample Matrix: Water

Parameter	Method	Units	Result	Reporting Limit	Analysis Date	Analysis Time	Analyzed By
Inorganic Analysis							
Bromate	EPA 300.1	mg/L	<0.003	0.003	6/24/16	12:36	SLS

Comments
All methods reference USEPA methods unless otherwise noted.