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 2015

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. 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.

Due to analyst's illness one sample was sent to Brighton Analytical for analysis. Brighton Analytical, L.L.C., is a NELAP, TNI, and MDEQ Drinking Water Accredited Laboratory. The sample analyzed by Brighton Analytical, L.L.C. was the Outfall from June 29, 2015. This sample was also analyzed at Pall upon return of analyst and both data are reported.

The balance of the samples were analyzed by PLS'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 but one sample that expired during time off due to illness. Proper preservation noted for the methods performed on these 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.

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 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.

No other difficulties were encountered during the 1,4-dioxane analyses. Reporting limit for undiluted samples is 1ppb (part per billion, micrograms per liter, µg/L). All quality control parameters were within the acceptance limits.

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 and standards and analyzed by Ion Chromatography utilizing background ion suppression and a conductivity detector. No difficulties were encountered during the Bromate analyses. All quality control parameters were within the acceptance limits.

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 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

Analyst: *Susan E.O. Peters* Susan E O Peters Date: 07-08-15

Report Checked by: *Cristian Dumas* Date: 7-8-15

PALL Life Sciences

Sample Analysis Report

June, 2015

642 South Wagner Road
Ann Arbor, MI 48103-9019 US
734.436.4025 phone

Analyst Initials: SEOP
Date: 07-08-15

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-06-16-15-11:04-1	260	10.0						D
TW-20-06-16-15-10:26-1	950	25.0						D
TW-6-06-09-15-09:50-1	92	5.0						D
D2								
LB-4-06-16-15-10:22-1	440	10.0						D
TW-21-06-16-15-10:26-1	130	5.0						D
E								
TW-16-06-17-15-09:39-1	920	25.0						D
TW-18-06-16-15-11:05-1	280	10.0						D
TW-19-06-17-15-09:40-1	680	25.0						D
Marshy								
PW-1-06-16-15-11:07-1	500	50.0						D
SW								
TW-22-06-16-15-10:50-1	590	25.0						D
TW-8-06-16-15-10:49-1	700	10.0						D
Monitoring Wells								
C3								
MW-1 Replacement-06-10-15-14:18-1	2300	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)
MW-125-06-05-15-13:52-1	230	10.0						D
MW-127s-06-05-15-10:52-1	nd	1.0						
MW-128s-06-04-15-09:53-1	nd	1.0						
MW-75-06-17-15-11:14-1	1300	50.0						D
D0								
A2 Cleaning Supply-06-02-15-09:23-1	53	1.0						
MW-53d-06-02-15-10:23-1	nd	1.0						
MW-53i-06-02-15-11:22-1	75	1.0						
MW-53s-06-02-15-10:39-1	nd	1.0						
MW-93-06-02-15-11:49-1	3	1.0						
D2								
175 Jackson Plaza-06-08-15-14:00-1	1000	50.0						D
456 Clarendon-06-09-15-14:26-1	740	25.0						D
593 Allison-06-09-15-13:39-1	110	5.0						D
MW-107-06-04-15-14:32-1	700	10.0						D
MW-117-06-03-15-14:37-1	nd	1.0						
MW-124s-06-03-15-09:59-1	nd	1.0						
MW-47d-06-03-15-13:06-1	nd	1.0						
MW-47s-06-03-15-13:24-1	nd	1.0						
MW-4d-06-08-15-14:31-1	1100	100.0						D
MW-92-06-04-15-13:14-1	25	1.0						
MW-94s-06-10-15-11:12-1	180	10.0						D
MW-BE-1d-06-10-15-12:09-1	490	5.0						D
MW-BE-1s-06-10-15-11:37-1	870	25.0						D
E								
IW-2-06-11-15-10:56-1	1800	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)
MW-100-06-08-15-11:36-1	2100	100.0						D
MW-101-06-04-15-14:00-1	150	10.0						D
MW-103s-06-02-15-14:20-1	69	1.0						
MW-108d-06-11-15-13:55-1	1500	100.0						D
MW-108s-06-11-15-13:10-1	420	25.0						D
MW-112i-06-02-15-13:58-1	8	1.0						
MW-112s-06-02-15-13:15-1	nd	1.0						
MW-124d-06-03-15-09:35-1	nd	1.0						
MW-127d-06-05-15-11:50-1	nd	1.0						
MW-128d-06-04-15-09:33-1	nd	1.0						
MW-135-06-03-15-14:08-1	nd	1.0						
MW-71-06-11-15-14:49-1	2100	100.0						D
MW-76i-06-04-15-11:04-1	91	5.0						D
MW-76s-06-04-15-11:23-1	280	5.0						D
MW-81-06-08-15-09:40-1	330	10.0						D
MW-84s-06-04-15-12:01-1	88	10.0						D
MW-85-06-08-15-10:28-1	1000	50.0						D
MW-94d-06-10-15-10:54-1	2	1.0						
MW-95-06-09-15-11:51-1	28	1.0						
MW-96-06-09-15-10:42-1	120	5.0						D
Saginaw Forest Cabin #1-06-05-15-10:17-1	15	1.0						
Saginaw Forest Cabin #2-06-05-15-09:11-1	nd	1.0						
SH								
MW-5d-06-12-15-08:42-1	11000	1000						D
SW								

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-46-06-10-15-13:18-1	90	5.0						D
MW-48-06-17-15-10:39-1	64	5.0						D
MW-50-06-10-15-13:52-1	670	50.0						D
MW-57-06-01-15-13:18-1	3	1.0						
MW-78-06-05-15-13:30-1	27	1.0						
Surface Water								
Not Applicable								
HC/HR-06-01-15-07:46-1			nd	2.0				
HC/HR-06-02-15-07:53-1			nd	2.0				
HC/HR-06-03-15-08:00-1			nd	2.0				
HC/HR-06-04-15-07:48-1			nd	2.0				
HC/HR-06-05-15-07:40-1			nd	2.0				
HC/HR-06-08-15-08:12-1			nd	2.0				
HC/HR-06-09-15-08:19-1			nd	2.0				
HC/HR-06-10-15-07:44-1			nd	2.0				
HC/HR-06-11-15-08:00-1			nd	2.0				
HC/HR-06-12-15-07:50-1			nd	2.0				
HC/HR-06-15-15-08:15-1			nd	2.0				
HC/HR-06-16-15-08:55-1			nd	2.0				
HC/HR-06-17-15-08:12-1			nd	2.0				
HC/HR-06-18-15-08:30-1			nd	2.0				
HC/HR-06-19-15-08:02-1			nd	2.0				
HC/HR-06-22-15-08:24-1			nd	2.0				
HC/HR-06-23-15-08:16-1			nd	2.0				
HC/HR-06-24-15-07:54-1			nd	2.0				
HC/HR-06-25-15-08:35-1			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-06-26-15-07:26-1			nd	2.0				
HC/HR-06-29-15-08:11-1			nd	2.0				
HC/HR-06-30-15-08:16-1			nd	2.0				
Treatment System								
OUTFALL-06-01-15-1	6	1.0					Brighton Analytical Lab, instrument repair	O
OUTFALL-06-01-15-2			7	5.0			Brighton Analytical Lab, instrument repair	
OUTFALL-06-02-15-1	5	1.0						
OUTFALL-06-02-15-2			nd	5.0				
OUTFALL-06-03-15-1	5	1.0						
OUTFALL-06-03-15-2			7	5.0				
OUTFALL-06-04-15-1	6	1.0						
OUTFALL-06-04-15-2			6	5.0				
OUTFALL-06-07-15-1	5	1.0						
OUTFALL-06-07-15-2			6	5.0				
OUTFALL-06-08-15-1	6	1.0						
OUTFALL-06-08-15-2			6	5.0				
OUTFALL-06-09-15-1	5	1.0						
OUTFALL-06-09-15-2			5	5.0				
OUTFALL-06-10-15-1	5	1.0						
OUTFALL-06-10-15-2			nd	5.0				
OUTFALL-06-11-15-1	5	1.0						
OUTFALL-06-11-15-2			5	5.0				
OUTFALL-06-14-15-1	5	1.0						
OUTFALL-06-14-15-2			5	5.0				
OUTFALL-06-15-15-1	5	1.0						

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-06-15-15-2			6	5.0				
OUTFALL-06-16-15-1	6	1.0						
OUTFALL-06-16-15-2			5	5.0				
OUTFALL-06-17-15-1	5	1.0						
OUTFALL-06-17-15-2			6	5.0				
OUTFALL-06-18-15-1	6	1.0						
OUTFALL-06-18-15-2			6	5.0				
OUTFALL-06-21-15-1	5	1.0						
OUTFALL-06-21-15-2			5	5.0				
OUTFALL-06-22-15-1	6	1.0						
OUTFALL-06-22-15-2			nd	5.0				
OUTFALL-06-23-15-1	7	1.0						
OUTFALL-06-23-15-2			nd	5.0				
OUTFALL-06-24-15-1	7	1.0						
OUTFALL-06-24-15-2			nd	5.0				
OUTFALL-06-25-15-1	6	1.0						
OUTFALL-06-25-15-2			nd	5.0				
OUTFALL-06-28-15-1	6	1.0						
OUTFALL-06-28-15-2			nd	5.0				
OUTFALL-06-29-15-3	7	1.0					Brighton Analytical Labs, analysist ill	O
OUTFALL-06-29-15-1	6	1.0					analyzed upon return from illness	
OUTFALL-06-29-15-2			nd	5.0			analyzed upon return from illness	
OUTFALL-06-30-15-1	6	1.0						
OUTFALL-06-30-15-2			nd	5.0				
Red Pond-06-01-15-08:00-1	450	1.0						D
Red Pond-06-08-15-08:30-1	430	1.0						D
Red Pond-06-15-15-07:35-1	450	10.0						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)
Red Pond-06-22-15-08:30-1	450	10.0						D
Red Pond-06-29-15-08:20-1	440	10.0						D

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

Brighton Analytical, L.L.C.
2105 Pless Drive
Brighton, Michigan 48116
Phone: (810) 229-7575 FAX: (810) 229-8650
e-mail: bai-brighton@sbcglobal.net

To: Pall Corp.
600 S. Wagner
Bldg. 4
Ann Arbor, MI 48103

Sample Date: 6/1/2015
Submit Date: 6/2/2015
Report Date: 6/3/2015

BA Report Number: **34694**
BA Sample ID: **CB05618**

Project Name:
Project Number:
Sample ID: **Outfall**

Parameters	Results	Units	DL	Method Reference	Analyst	Analysis Date
1,4-Dioxane(SIM)						
1,4-Dioxane (SIM)	**6**	ug/L	1	EPA 1624(SIM)	CW	6/2/2015

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve MDNR designated target detection limits (TDL).

Released by:

Date: 6/3/15

GC/MS
VOLATILE METHOD 1624 SIM
REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: June 2, 2015 Spike Std. ID: 2449.1 Inst./Detec: Vol 6 GC/MS

Laboratory ID: CB05554 Matrix: Water Analyst: CW

	Matrix Spike - Precision				Matrix spike - Accuracy					
	Spike 1	Spike 2	Relative Percent Difference	Spk Conc ug/L	% Recovery	% Recovery	Range (%)	Sample background	Method Blank	LCS
1,4 Dioxane	49.8	50.9	2.2	10	88	99	78-130	41	<1	86%

ug/L is equivalent to ppb

Comments:

Brighton Analytical, L.L.C.
2105 Pless Drive
Brighton, Michigan 48116
Phone: (810) 229-7575 FAX: (810) 229-8650
e-mail: bai-brighton@sbcglobal.net

To: Pall Corp.
600 S. Wagner
Bldg. 4
Ann Arbor, MI 48103

Sample Date: 6/29/2015
Submit Date: 6/30/2015
Report Date: 6/30/2015

BA Report Number: **35032**
BA Sample ID: **CB06707**

Project Name: **1,4 d**
Project Number:
Sample ID: **Outfall 001**

Parameters	Results	Units	DL	Method Reference	Analyst	Analysis Date
1,4-Dioxane(SIM)						
1,4-Dioxane (SIM)	7	ug/L	1	EPA 1624(SIM)	CW	6/30/2015

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve MDNR designated target detection limits (TDL).

Released by:

Date: 6/30/15