

**CASE NARRATIVE****Monthly Data Pall Life Sciences****Project: 1,4-Dioxane Remediation****Date: November 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.

Two samples were split with the DEQ Laboratory: MW-103s and MW-129d. All other 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 samples analyzed in September. 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 when necessary.

Samples that require 1,4-dioxane analysis are collected in hydrochloric HCl acid-preserved vials to a pH of  $\leq 2$ , 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  $4^{\circ}\text{C}$  ( $\pm 2^{\circ}\text{C}$ ) from the time of collection until sample preparation or analysis.

A new Field Sampling Technique is being investigated for 1,4-dioxane samples. Samples taken with the prospective technique are labeled "BAG" in the comment section. Until validation of the sampling technique is completed these data will be considered experimental values only.

## 1,4-Dioxane (GC-MS)

Ground water and treated water samples that were analyzed at PLS for 1,4-Dioxane were done so in accordance with EPA 1624C, which has been modified to minimize 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.

One batch of samples was not reported due to a leak in the sample introduction system that developed during the last run before the analyst's vacation. Where possible these samples were reanalyzed or resampled and reanalyzed. One sample could not be resampled: Red Pond 10/05/2015, this sample was reanalyzed and reported with a Qualifier (H) and an explanation of the issue in the comment section. 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.

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## Qualifiers

### 1,4-Dioxane Qualifier Codes:

<u>Qualifier Code</u>	<u>Description</u>
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:

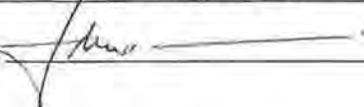
<u>Qualifier Code</u>	<u>Description</u>
nd:	The compound was analyzed for, but was not detected at or above the detection limit indicated.
E:	The compound result is greater than the upper quantitation limit in the associated calibration curve.
J:	The compound was positively identified; the associated 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



Date: 12-9-15

Report Checked by: Cristian Dumas



Date: 12-9-15



# Sample Analysis Report

November, 2015

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Analyst Initials: S.EOP  
Date: 12-9-15

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)
<b>Residential Wells</b>								
<b>D0</b>								
4601 Park 4 inch-11-03-15-13:44-1	2	1.0						
4601 Park 6 inch-11-03-15-14:28-1	2	1.0						
<b>Extraction Wells</b>								
<b>C3</b>								
DOLPH-11-02-15-08:35-1	320	5.0						D
TW-20-11-02-15-09:52-1	920	10.0						D
<b>D2</b>								
LB-4-11-02-15-09:41-1	500	10.0						D
TW-21-11-02-15-09:46-1	150	1.0						
<b>E</b>								
TW-16-11-02-15-09:31-1	960	10.0						D
TW-18-11-02-15-08:37-1	310	5.0						D
TW-19-11-02-15-09:32-1	710	10.0						D
<b>Marshy</b>								
PW-1-11-02-15-08:39-1	940	10.0						D
<b>SW</b>								
TW-22-11-02-15-11:38-1	620	10.0						D
TW-8-11-02-15-11:36-1	740	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)
<b>Monitoring Wells</b>								
<b>C2</b>								
MW-25s-11-17-15-14:54-1	100	5.0						D
<b>C3</b>								
MW-1 Replacement-11-09-15-13:03-1	3200	50.0					Bag	D
MW-1 Replacement-11-09-15-13:19-1	3600	50.0						D
MW-1 Replacement-11-30-15-10:41-1	4000	100.0					BAG	D
MW-125-11-10-15-12:45-1	260	5.0						D
MW-127s-11-10-15-11:42-1	nd	1.0						
MW-128s-11-10-15-15:17-1	nd	1.0						
MW-18d-11-17-15-14:32-1	170	5.0						D
MW-22-11-09-15-14:22-1	330	5.0						D
MW-2d-11-30-15-13:53-1	35	1.0						
MW-2s-11-30-15-13:40-1	5	1.0						
MW-32-11-13-15-14:19-1	14	1.0						
MW-35-11-13-15-13:57-1	4	1.0						
MW-37-11-10-15-15:41-1	290	5.0						D
MW-75-11-18-15-08:56-1	1500	100.0						D
<b>D0</b>								
A2 Cleaning Supply-11-05-15-09:43-1	63	1.0						
MW-41d-11-16-15-07:28-1	30	1.0					Artesian	
MW-41s-11-16-15-07:26-1	18	1.0					Artesian	
MW-51-11-03-15-11:27-1	1	1.0						
MW-53d-11-05-15-10:37-1	nd	1.0						
MW-53i-11-05-15-11:42-1	60	1.0						
MW-53s-11-05-15-10:55-1	nd	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)
MW-61d-11-05-15-13:40-1	2	1.0						
MW-61s-11-05-15-13:57-1	14	1.0						
MW-93-11-03-15-10:48-1	7	1.0						
<b>D2</b>								
2819 Dexter Rd-11-09-15-10:36-1	190	5.0					Bag	D
2819 Dexter Rd-11-09-15-11:18-1	400	5.0						D
2819 Dexter Rd-11-30-15-10:58-1	110	10.0					BAG	D
3161 Dexter Rd-11-19-15-11:30-1	nd	1.0						
373 Pinewood Shallow-11-19-15-10:16-1	300	10.0						D
456 Clarendon-11-19-15-15:01-1	760	25.0						D
465 Dupont-11-19-15-13:23-1	1500	100.0						D
593 Allison-11-23-15-10:07-1	160	1.0					Well being Abandoned	
MW-107-11-19-15-15:24-1	790	25.0						D
MW-113-11-20-15-10:05-1	62	1.0						
MW-117-11-12-15-11:34-1	nd	1.0						
MW-118-11-06-15-14:17-1	54	1.0						
MW-11d-11-17-15-13:17-1	280	10.0						D
MW-120s-11-11-15-11:43-1	nd	1.0						
MW-122s-11-11-15-10:17-1	120	1.0						
MW-123s-11-12-15-10:08-1	nd	1.0						
MW-124s-11-12-15-14:12-1	nd	1.0						
MW-129i-11-12-15-10:49-1	nd	1.0						
MW-129s-11-12-15-11:05-1	nd	1.0						
MW-130i-11-11-15-14:24-1	2	1.0						
MW-130s-11-11-15-13:47-1	nd	1.0						
MW-47d-11-13-15-09:06-1	nd	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)
MW-47s-11-13-15-09:22-1	nd	1.0						
MW-4d-11-30-15-13:21-1	1200	50.0						D
MW-54d-11-17-15-10:30-1	82	1.0						
MW-54s-11-17-15-09:52-1	nd	1.0						
MW-55-11-19-15-12:06-1	30	1.0						
MW-77-11-19-15-14:03-1	1800	100.0						D
MW-92-11-20-15-09:21-1	28	1.0						
MW-BE-1d-11-20-15-14:09-1	810	5.0						D
MW-BE-1s-11-20-15-14:27-1	940	25.0						D
MW-KD-1d-11-17-15-11:24-1	210	5.0						D
MW-KD-1s-11-17-15-10:56-1	52	1.0						
<b>E</b>								
373 Pinewood Deep-11-19-15-09:45-1	nd	1.0						
IW-2-11-24-15-10:44-1	2000	100.0						D
MW-100-11-24-15-11:41-1	2400	100.0						D
MW-101-11-20-15-11:30-1	160	5.0						D
MW-103s-11-03-15-10:16-1	76	1.0					split sample with sate	S
MW-104-11-18-15-13:21-1	7	1.0						
MW-110-11-18-15-13:53-1	66	1.0						
MW-112i-11-06-15-10:12-1	9	1.0						
MW-112s-11-06-15-09:28-1	nd	1.0						
MW-119-11-20-15-10:48-1	86	1.0						
MW-120d-11-11-15-11:22-1	nd	1.0						
MW-122d-11-11-15-09:39-1	nd	1.0						
MW-123d-11-12-15-09:43-1	nd	1.0						
MW-124d-11-12-15-13:46-1	nd	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)
MW-127d-11-10-15-11:29-1	nd	1.0						
MW-128d-11-10-15-15:01-1	nd	1.0						
MW-129d-11-03-15-09:40-1	1	1.0					split sample with state	S
MW-130d-11-11-15-13:34-1	nd	1.0						
MW-135-11-17-15-09:16-1	nd	1.0						
MW-64-11-17-15-14:13-1	46	1.0						
MW-65d-11-18-15-11:44-1	28	1.0						
MW-65i-11-18-15-09:49-1	2	1.0						
MW-65s-11-18-15-10:26-1	11	1.0						
MW-66-11-13-15-13:45-1	1	1.0						
MW-68-11-13-15-11:50-1	nd	1.0						
MW-76i-11-06-15-11:01-1	110	1.0						
MW-76s-11-06-15-11:14-1	290	5.0						D
MW-81-11-24-15-09:29-1	330	10.0						D
MW-84s-11-06-15-11:51-1	310	5.0						D
MW-85-11-30-15-12:47-1	880	50.0						D
MW-88-11-20-15-13:16-1	130	1.0						
MW-90-11-18-15-14:23-1	30	1.0						
MW-91-11-20-15-12:35-1	250	5.0						D
MW-98d-11-13-15-10:21-1	15	1.0						
Saginaw Forest Cabin #1-11-10-15-09:01-1	18	1.0						
Saginaw Forest Cabin #2-11-10-15-10:10-1	2	1.0						
<b>SH</b>								
MW-5d-11-30-15-14:36-1	10200	200.0						D
<b>SW</b>								

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-48-11-09-15-14:02-1	71	1.0						
MW-52d-11-09-15-09:34-1	nd	1.0						
MW-52d-11-09-15-09:17-1	nd	1.0					Bag	
MW-52d-11-30-15-09:56-1	nd	1.0					BAG	
MW-52i-11-09-15-09:31-1	16	1.0					Bag	
MW-52i-11-09-15-09:53-1	17	1.0						
MW-52i-11-30-15-10:07-1	16	1.0					BAG	
MW-52s-11-09-15-09:46-1	600	10.0					Bag	D
MW-52s-11-09-15-10:11-1	500	10.0						D
MW-52s-11-30-15-10:18-1	590	10.0					BAG	D
MW-57-11-09-15-13:44-1	4	1.0						
MW-58d-11-10-15-13:43-1	21	1.0						
MW-58s-11-10-15-13:58-1	200	5.0						D
MW-78-11-10-15-12:20-1	28	1.0						

## Surface Water

### Not Applicable

HC/HR-11-02-15-08:17-1			nd	2.0				
HC/HR-11-03-15-07:34-1			nd	2.0				
HC/HR-11-04-15-07:41-1			nd	2.0				
HC/HR-11-05-15-08:12-1			nd	2.0				
HC/HR-11-06-15-07:59-1			nd	2.0				
HC/HR-11-09-15-07:54-1			nd	2.0				
HC/HR-11-10-15-07:30-1			nd	2.0				
HC/HR-11-11-15-08:16-1			nd	2.0				
HC/HR-11-12-15-08:05-1			nd	2.0				
HC/HR-11-13-15-08:05-1			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-11-16-15-07:59-01			nd	2.0				
HC/HR-11-17-15-08:12-1			nd	2.0				
HC/HR-11-18-15-08:24-1			nd	2.0				
HC/HR-11-19-15-08:09-1			nd	2.0				
HC/HR-11-20-15-08:25-1			nd	2.0				
HC/HR-11-23-15-08:31-1			nd	2.0				
HC/HR-11-24-15-08:23-1			nd	2.0				
HC/HR-11-25-15-08:10-1			nd	2.0				
HC/HR-11-30-15-07:56-1			nd	2.0				

### Treatment System

OUTFALL-11-01-15-1	5	1.0						
OUTFALL-11-01-15-2			6	5.0				
OUTFALL-11-02-15-1	5	1.0						
OUTFALL-11-02-15-2			7	5.0				
OUTFALL-11-03-15-1	5	1.0						
OUTFALL-11-03-15-2			7	5.0				
OUTFALL-11-04-15-1	6	1.0						
OUTFALL-11-04-15-2			6	5.0				
OUTFALL-11-05-15-1	6	1.0						
OUTFALL-11-05-15-2			6	5.0				
OUTFALL-11-08-15-1	5	1.0						
OUTFALL-11-08-15-2			7	5.0				
OUTFALL-11-09-15-1	5	1.0						
OUTFALL-11-09-15-2			7	5.0				
OUTFALL-11-10-15-1	5	1.0						
OUTFALL-11-10-15-2			7	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-11-11-15-1	5	1.0						
OUTFALL-11-11-15-2			7	5.0				
OUTFALL-11-12-15-1	5	1.0						
OUTFALL-11-12-15-2			7	5.0				
OUTFALL-11-15-15-1	5	1.0						
OUTFALL-11-15-15-02			6	5.0				
OUTFALL-11-16-15-1	5	1.0						
OUTFALL-11-16-15-2			7	5.0				
OUTFALL-11-17-15-1	5	1.0						
OUTFALL-11-17-15-2			7	5.0				
OUTFALL-11-18-15-1	5	1.0						
OUTFALL-11-18-15-2			7	5.0				
OUTFALL-11-19-15-1	5	1.0						
OUTFALL-11-19-15-2			7	5.0				
OUTFALL-11-22-15-1	4	1.0						
OUTFALL-11-22-15-2			7	5.0				
OUTFALL-11-23-15-1	5	1.0						
OUTFALL-11-23-15-2			7	5.0				
OUTFALL-11-24-15-1	4	1.0						
OUTFALL-11-24-15-2			7	5.0				
OUTFALL-11-26-15-1	4	1.0						
OUTFALL-11-26-15-2			7	5.0				
OUTFALL-11-27-15-1	4	1.0						
OUTFALL-11-27-15-2			7	5.0				
OUTFALL-11-29-15-1	4	1.0						
OUTFALL-11-29-15-2			7	5.0				
OUTFALL-11-30-15-1	4	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-11-30-15-2			7	5.0				
Red Pond-11-02-15-08:30-1	510	10.0						D
Red Pond-11-09-15-08:10-1	500	10.0						D
Red Pond-11-16-15-08:25-01	500	10.0						D
Red Pond-11-23-15-08:25-1	490	10.0						D
Red Pond-11-30-15-08:45-1	480	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

**S:** Samples split with DEQ