Gunter, Jason

From: Seabourne, Rocky <rseabourne@doerun.com>
Sent: Monday, August 31, 2015 3:33 PM
To: Gunter, Jason
Cc: Yingling, Mark; Neaville, Chris; Montgomery, Michael; Ty Morris
Subject: Rivermines July 2015 Progress Report
Attachments: Rivermines_ProgressReport_07-31.pdf; 6 - Remediation Air Report - June 2015.pdf; 2015-07-09 RM NPDES Pace Lab Report.pdf

Categories: Red Category

Jason,
Please find the attached Rivermines Progress Report for the reporting period of July 1, 2015-July 31, 2015. If you should have any questions please let me know.

Sincerely,

ROCKY SEABOURNE
General Supervisor Land & Remediation
Office: 573-244-8136
Cell: 573-325-5425
Fax: 573-244-8179

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THE
DOE RUN
COMPANY
Remediation Group

Rocky Seabourne
General Supervisor Land & Remediation rseabourne@doerun.com

August 31, 2015

Mr. Jason Gunter Remedial Project Manager U.S. Environmental Protection Agency Region 7 - Superfund Branch 11201 Renner Blvd.
Lenexa, KS 66219

Re: The Doe Run Company - Elvins/Rivermines Mine Tailings Site Monthly Progress Report

Dear Mr. Gunter:

As required by Article VI, Section 56 of the Unilateral Administrative Order (UAO) (CERCLA-07- 2005-0169) for the referenced project and on behalf of The Doe Run Company, the progress report for the period July 1, 2015 through July 31, 2015 is enclosed. If you have any questions or comments, please call me at 573-244-8136.

Sincerely,

Rocky Seabourne

General Supervisor Land & Remediation

c: Mark Yingling - TDRC (electronic only)
Chris Neaville - TDRC (electronic only) Michael Montgomery - TDRC (electronic only) Brandon Wiles - MDNR Ty Morris - Barr Engineering

35 Iron County Rd. #1, Viburnum, MO 65566
Telephone: (573) 244-8136

Elvins/Rivermines Mine Tailings Site
Park Hills, Missouri
Removal Action - Monthly Progress Report
Period: July 1, 2015 - July 31, 2015

1. Actions Performed and Problems Encountered This Period:
   a. Work continued on the development of the Post-Removal Site Control Plan for the site.
   b. Given the nature of the work remaining at the site, The Doe Run Company would like to request a reduction in the frequency of the progress reports to quarterly. The next progress report that would be submitted for this site would be for July, August, and September.
   c. Monthly water samples were taken during the removal action activities. These samples have been continued since the completion of the removal action activities. The analytical results, which have been included in the progress reports, have shown little variation. As a result Doe Run would like to request a reduction in the frequency of the sampling to quarterly.

2. Analytical Data and Results Received This Period:
   a. During this period, water samples were collected from just upstream of Old Missouri Highway 32, as well as from upstream and downstream of the confluence of the site discharge with Flat River. The analytical results for this event are included with this progress report.
   b. During this period, the ambient air monitoring samples for June were processed and the Ambient Air Monitoring Report for June 2015 was completed and is attached.

3. Developments Anticipated and Work Scheduled for Next Period:
   a. Complete the water sampling activities.
   b. Complete air monitoring activities as described in the Removal Action Work Plan.
   c. Continue developing the Post-Removal Site Control Plan.

4. Issues or Problems Arising This Period:
   a. None.

5. Resolution of Issues or Problems Arising This Period:
   a. None.

Monthly Ambient Air Monitoring Report

The Doe Run Company
Old Lead Belt Sites:
Federal, Rivermines, National, and Leadwood

June-2015

SUITE 300
1801 PARK 270 DRIVE
ST. LOUIS, MO 63146

Federal Site

Sample Results for **June-2015**

	St. Joe (Ballfields)		Big River#4		Water Treatment Plant	
Sample Date	**TSP** ug/m3	**Lead** ug/m3	**TSP** ug/m3	**Lead** ug/m3	**TSP** ug/m3	**Lead** ug/m3
6/1/15	23	0.007	28	0.007	25	0.007
6/2/15	invalid	invalid	15	0.007	12	0.048
6/3/15	22	0.007	17	0.007	19	0.007
6/4/15	19	0.007	16	0.007	20	0.000
6/5/15	19	0.007	19	0.007	23	0.007
6/8/15	23	0.007	22	0.007	20	0.021
6/9/15	30	0.007	30	0.007	invalid	invalid
6/10/15	32	0.007	26	0.007	34	0.007
6/11/15	40	0.007	34	0.007	39	0.007
6/12/15	30	0.014	18	0.007	35	0.028
6/15/15	16	0.007	14	0.007	19	0.000
6/16/15	19	0.007	15	0.027	5	0.021
6/17/15	45	0.007	30	0.007	35	0.007
6/18/15	32	0.007	31	0.000	32	0.007
6/19/15	17	0.000	17	0.007	15	0.000
6/22/15	72	0.007	73	0.007	76	0.014
6/23/15	46	0.021	44	0.021	49	0.056
6/24/15	70	0.007	61	0.007	63	0.021
6/25/15	44	0.049	31	0.007	35	0.014
6/26/15	16	0.007	13	0.007	14	0.007
6/29/15	34	0.021	22	0.021	56	0.056
6/30/15	48	0.014	51	0.020	49	0.021

Monthly Avg. TSP	33	28	32
Monthly Avg. Pb	0.011	0.009	0.017
May-15	0.008	0.009	0.011
Apr-15	0.011	0.035	0.027
Rolling 3-Month	**0.010**	**0.018**	**0.018**

Three month rolling average must be less than 0.15 ug/m3

	Big River QA	
Sample Date	**TSP** ug/m3	**Lead** ug/m3
6/2/15	15	0.007
6/5/15	18	0.007
6/9/15	30	0.007
6/11/15	37	0.007
6/16/15	13	0.007
6/18/15	32	0.007
6/23/15	44	0.021
6/25/15	33	0.007
6/30/15	37	0.021

Notes

St. Joe:
6/2, <23hr run time.

Water Treatment Plant:
6/9, <23hr run time, GFI shorted out.

Rivermines

Sample Results for **June-2015**

	Big River #4		Rivermines South #1		Rivermines North #2		Rivermines East #3	
Sample Date	**TSP** ug/m3	**Lead** ug/m3	**TSP** ug/m3	**Lead** ug/m3	**TSP** ug/m3	**Lead** ug/m3	**TSP** ug/m3	**Lead** ug/m3
6/1/15	28	0.007	35	0.098	16	0.007	25	0.007
6/2/15	15	0.007	16	0.027	11	0.000	12	0.048
6/3/15	17	0.007	17	0.007	14	0.014	19	0.007
6/4/15	16	0.007	invalid	invalid	20	0.028	20	0.000
6/5/15	19	0.007	invalid	invalid	19	0.007	23	0.007
6/8/15	22	0.007	16	0.007	22	0.050	20	0.021
6/9/15	30	0.007	37	0.095	26	0.021	invalid	invalid
6/10/15	26	0.007	22	0.007	34	0.113	34	0.007
6/11/15	34	0.007	35	0.007	33	0.057	39	0.007
6/12/15	18	0.007	invalid	invalid	26	0.021	35	0.028
6/15/15	14	0.007	15	0.007	18	0.057	19	0.000
6/16/15	15	0.027	18	0.034	20	0.014	5	0.021
6/17/15	30	0.007	31	0.007	36	0.007	35	0.007
6/18/15	31	0.000	30	0.007	30	0.007	32	0.007
6/19/15	17	0.007	invalid	invalid	16	0.000	15	0.000
6/22/15	73	0.007	74	0.007	69	0.014	76	0.014
6/23/15	44	0.021	55	0.118	34	0.007	49	0.056
6/24/15	61	0.007	69	0.083	55	0.028	63	0.021
6/25/15	31	0.007	invalid	invalid	invalid	invalid	35	0.014
6/26/15	13	0.007	invalid	invalid	invalid	invalid	14	0.007
6/29/15	22	0.021	46	0.082	18	0.014	56	0.056
6/30/15	51	0.020	48	0.014	40	0.014	49	0.021

Monthly Avg. TSP	28	35	28	32
Monthly Avg. Pb	0.009	0.038	0.024	0.017
May-15	0.009	0.049	0.033	0.011
Apr-15	0.035	0.060	0.019	0.027
Rolling 3-Month	**0.018**	**0.049**	**0.025**	**0.018**

Three month rolling average must be less than 0.15 ug/m3

	Big River QA	
Sample Date	**TSP** ug/m3	**Lead** ug/m3
6/2/15	15	0.007
6/5/15	18	0.007
6/9/15	30	0.007
6/11/15	37	0.007
6/16/15	13	0.007
6/18/15	32	0.007
6/23/15	44	0.021
6/25/15	33	0.007
6/30/15	37	0.021

Notes

Rivermines South:
6/4, 6/5, 6/12, 6/19, 6/26, >25hr run time.
6/25, <23hr run time.

Rivermines North #2:
6/25, >25hr run time, 6/26, <23hr run time.

Rivermines East #3:
6/9, <23hr run time, GFI shorted out.

Federal Site

Sample Results for **June-2015**

	St. Joe (Ballfields)	Big River#4	Water Treatment
Sample Date	**PM10** (ug/m3)	**PM10** (ug/m3)	**PM10** (ug/m3)
6/2/15	12	13	11
6/5/15	12	13	29
6/8/15	16	16	17
6/11/15	21	21	20
6/14/15	14	17	12
6/17/15	30	56	21
6/20/15	13	21	7
6/23/15	45	39	41
6/26/15	15	10	8
6/29/15	28	30	27

Compliance with NAAQS is less than 150 ug/m3

Monthly Avg. PM10	21	23	19

	Big River QA
Sample Date	**PM10** (ug/m3)
6/5/15	9
6/11/15	1
6/17/15	19
6/23/15	38
6/29/15	15

Notes:

Rivermines

Sample Results for **June-2015**

Sample Date	Big River #4 **PM10** (ug/m3)	Rivermines South #1 **PM10** (ug/m3)	Rivermines North #2 **PM10** (ug/m3)	Rivermines East #3 **PM10** (ug/m3)
6/2/15	13	40	12	11
6/5/15	13	24	7	29
6/8/15	16	42	16	17
6/11/15	21	20	19	20
6/14/15	17	19	11	12
6/17/15	56	21	16	21
6/20/15	21	invalid	15	7
6/23/15	39	45	35	41
6/26/15	10	11	8	8
6/29/15	30	55	25	27

Compliance with NAAQS is less than 150 ug/m3

Monthly Avg. PM10	23	31	17	19

Sample Date	Big River QA **PM10** (ug/m3)
6/5/15	9
6/11/15	1
6/17/15	19
6/23/15	38
6/29/15	15

Notes:

Rivermines South #1:

6/20, <23hr run time, did not run.

Meterological Data - Old Lead Belt
June-2015

24hr average

Date	Wind Speed (MPH)	Wind Direction	Sigma-Theta	Temperature (C)	Air Pressure (mmHg)	Rain (Inches)	Power Supply (Volts)
01-Jun-15	2.5	359	22.70	14.5	748	0	13.37
02-Jun-15	1.8	60	31.12	16.3	747	0	13.35
03-Jun-15	2.7	178	35.11	19.1	745	0	13.28
04-Jun-15	1.4	209	30.86	20.2	745	0.27	13.27
05-Jun-15	1.8	260	34.85	22.7	745	0.03	13.23
06-Jun-15	1.9	38	33.80	23.2	745	0	13.20
07-Jun-15	4.8	207	22.69	26.5	741	0	13.17
08-Jun-15	2.7	240	34.69	23.9	741	1.05	13.20
09-Jun-15	1.5	231	31.47	24.5	741	0	13.18
10-Jun-15	2.4	203	31.01	25.8	741	0	13.16
11-Jun-15	3.9	201	23.33	26.6	741	0	13.15
12-Jun-15	4.6	209	32.19	27.1	741	0.07	13.14
13-Jun-15	5.7	195	23.28	25.7	744	0	13.17
14-Jun-15	4.5	205	24.98	24.6	744	0.78	13.19
15-Jun-15	3.9	215	26.63	25.5	745	0.8	13.17
16-Jun-15	1.8	248	41.22	23.9	746	2.74	13.19
17-Jun-15	1.9	211	29.13	24.3	745	0.12	13.19
18-Jun-15	2.2	177	25.74	23.2	745	0.07	13.22
19-Jun-15	4.5	20	30.42	22.1	741	2.8	13.25
20-Jun-15	3.3	234	36.66	26.1	742	0	13.17
21-Jun-15	2.7	218	32.34	27.5	744	0	13.14
22-Jun-15	4.2	219	27.39	28.1	744	0	13.14
23-Jun-15	2.4	289	35.71	26.4	746	0	13.15
24-Jun-15	3.4	172	29.72	26.0	747	0	13.15
25-Jun-15	3.7	234	32.79	28.6	744	0.05	13.12
26-Jun-15	3.0	279	36.75	23.3	742	0	13.18
27-Jun-15	4.0	327	25.78	21.3	744	0.02	13.19
28-Jun-15	2.8	225	30.40	22.4	743	0.02	13.21
29-Jun-15	2.4	265.6	33.14	24.5	740	0	13.17
30-Jun-15	1.3	242.1	32.19	23.9	742	0	13.19

INQUEST
ENVIRONMENTAL INC.

3609 Mojave Ct., Ste E ◆ COLUMBIA, MO 65202
(573) 474-8110 ◆ FAX: (573) 474-8371

April 15, 2015

Mr. Greg Henson
Chemist
The Doe Run Company
881 Main Street
Herculaneum, Missouri 63048

RE: 2nd Quarter 2015 Lead/PM10 Samplers Performance Audit Report.

Dear Mr. Henson,

Please find enclosed the worksheets detailing the Lead/PM10 sampler's one-point flow verifications and multi-point flow calibrations that were recently performed on the Doe Run Park Hills Monitoring Network. A copy of the current certifications for the audit device that was used has also been enclosed.

All of the flow checks and calibrations were found to be within expected guidelines.

After reviewing the enclosed information, please feel free to call with any comments or questions. Thank you for your business.

Sincerely,

John A. Kunkel
Inquest Environmental, Inc.

PM10 Sampler Verifications

INQUEST
Environmental, Inc.

PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 7, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Big River	Intercept (Qa)	-0.00876
Sampler	#4 Primary PM10	Temperature	21.9 °C 295.1 °K
Flow Controller	P2952	Station Pressure	29.13 "Hg 739.9 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.20	1.094	25.10	46.88	0.937	1.129	**3.20**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
25.00	46.69	0.937	1.129	1.093	**-3.27**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.00	1.059	35.50	66.30	0.910	1.095	**3.40**	± 4%
3.05	1.068	32.30	60.33	0.918	1.105	**3.46**	± 4%
3.15	1.085	26.00	48.56	0.934	1.125	**3.69**	± 4%
3.20	1.094	25.10	46.88	0.937	1.129	**3.20**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

INQUEST
Environmental, Inc.

PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 7, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Big River	Intercept (Qa)	-0.00876
Sampler	#4 QA PM10	Temperature	21.9 °C 295.1 °K
Flow Controller	P1019	Station Pressure	29.13 "Hg 739.9 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.30	1.111	25.20	47.06	0.936	1.143	**2.88**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
25.30	47.25	0.936	1.143	1.110	**-1.77**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.30	1.111	25.20	47.06	0.936	1.143	**2.88**	± 4%
3.40	1.127	24.90	46.50	0.937	1.148	**1.86**	± 4%
3.45	1.135	21.70	40.53	0.945	1.155	**1.76**	± 4%
3.50	1.143	19.70	36.79	0.950	1.161	**1.57**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

INQUEST
Environmental, Inc.

PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Leadwood (South)	Intercept (Qa)	-0.00876
Sampler	#1 PM10	Temperature	23.7 °C 296.9 °K
Flow Controller	P1500	Station Pressure	29.04 "Hg 737.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.35	1.124	25.50	47.63	0.935	1.141	**1.51**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
25.40	47.44	0.936	1.143	1.126	**-0.35**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.25	1.107	34.90	65.18	0.912	1.127	**1.81**	± 4%
3.30	1.116	29.70	55.47	1.130	1.145	**2.60**	± 4%
3.35	1.124	25.50	47.63	0.935	1.141	**1.51**	± 4%
3.50	1.149	19.30	36.05	0.951	1.162	**1.13**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

INQUEST
Environmental, Inc.

PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Leadwood (School)	Intercept (Qa)	-0.00876
Sampler	#2 PM10	Temperature	23.7 °C 296.9 °K
Flow Controller	P6071	Station Pressure	29.04 "Hg 737.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.30	1.116	23.60	44.08	0.940	1.159	**3.85**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
23.80	44.45	0.940	1.159	1.114	**-1.42**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.15	1.090	30.90	57.71	0.922	1.138	**4.40**	± 4%
3.25	1.107	27.90	52.11	0.929	1.145	**3.43**	± 4%
3.30	1.116	23.60	44.08	0.940	1.159	**3.85**	± 4%
3.40	1.132	19.80	36.98	0.950	1.172	**3.53**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

INQUEST
Environmental, Inc.

PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Leadwood (Mill St)	Intercept (Qa)	-0.00876
Sampler	#3 PM10	Temperature	23.7 °C 296.9 °K
Flow Controller	P1018	Station Pressure	29.04 "Hg 737.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.30	1.116	23.60	44.08	0.940	1.149	**2.96**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
23.90	44.64	0.939	1.148	1.114	**-1.42**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.10	1.082	32.60	60.89	0.917	1.145	**5.82**	± 4%
3.20	1.099	28.50	53.23	0.928	1.134	**3.18**	± 4%
3.30	1.116	23.60	44.08	0.940	1.149	**2.96**	± 4%
3.40	1.132	20.80	38.85	0.947	1.158	**2.30**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

INQUEST
Environmental, Inc.

PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Rivermines (Quarry)	Intercept (Qa)	-0.00876
Sampler	#1 PM10	Temperature	25.0 °C 298.2 °K
Flow Controller	P4601	Station Pressure	29.05 "Hg 737.9 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.10	1.084	24.80	46.32	0.937	1.104	**1.85**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
24.50	45.76	0.938	1.104	1.084	**-4.07**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
2.90	1.048	32.30	60.33	0.918	1.079	**2.96**	± 4%
3.00	1.066	25.60	47.81	0.935	1.102	**3.38**	± 4%
3.20	1.101	22.80	42.58	0.942	1.110	**0.82**	± 4%
3.30	1.118	19.00	35.49	0.952	1.123	**0.45**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

INQUEST
Environmental, Inc.

PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Rivermines (Wood St)	Intercept (Qa)	-0.00876
Sampler	#2 PM10	Temperature	25.0 °C 298.2 °K
Flow Controller	P4507	Station Pressure	29.05 "Hg 737.9 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.20	1.101	25.20	47.06	0.936	1.123	**2.00**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
25.40	47.44	0.936	1.123	1.101	**-2.57**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.00	1.066	31.90	59.58	0.919	1.103	**3.47**	± 4%
3.10	1.084	29.40	54.91	0.926	1.110	**2.40**	± 4%
3.20	1.101	25.20	47.06	0.936	1.123	**2.00**	± 4%
3.30	1.118	20.20	37.73	0.949	1.139	**1.88**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

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PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Rivermines (Wtr Plnt)	Intercept (Qa)	-0.00876
Sampler	#3 PM10	Temperature	25.0 °C 298.2 °K
Flow Controller	P2951	Station Pressure	29.08 "Hg 738.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.20	1.100	24.20	45.20	0.939	1.135	**3.18**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
24.20	45.20	0.939	1.135	1.099	**-2.74**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.10	1.083	28.20	52.67	0.929	1.121	**3.51**	± 4%
3.20	1.100	24.40	45.57	0.938	1.135	**3.18**	± 4%
3.30	1.117	19.30	36.05	0.951	1.150	**2.95**	± 4%
3.40	1.134	15.90	29.70	0.960	1.162	**2.47**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

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PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 7, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Ozark Insulation	Intercept (Qa)	-0.00876
Sampler	#1 PM10	Temperature	21.9 °C 295.1 °K
Flow Controller	P2950	Station Pressure	29.13 "Hg 739.9 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.20	1.094	24.70	46.13	0.938	1.130	**3.29**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
24.70	46.13	0.938	1.130	1.093	**-3.27**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.10	1.077	34.20	63.87	0.914	1.100	**2.14**	± 4%
3.20	1.094	24.70	46.13	0.938	1.130	**3.29**	± 4%
3.30	1.111	24.30	45.38	0.939	1.131	**1.80**	± 4%
3.40	1.127	21.40	39.97	0.946	1.140	**1.15**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

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PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Hanley Park	Intercept (Qa)	-0.00876
Sampler	#2 PM10	Temperature	25.0 °C 298.2 °K
Flow Controller	P2949	Station Pressure	29.08 "Hg 738.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.15	1.092	24.60	45.94	0.938	1.127	**3.21**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
24.60	45.94	0.938	1.127	1.091	**-3.45**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.00	1.066	32.80	61.26	0.917	1.103	**3.47**	± 4%
3.15	1.092	24.60	45.94	0.938	1.127	**3.21**	± 4%
3.20	1.100	21.40	39.97	0.946	1.137	**3.36**	± 4%
3.30	1.117	17.80	33.24	0.955	1.149	**2.86**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

INQUEST Environmental, Inc.

PM10 Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	St Joe Park	Intercept (Qa)	-0.00876
Sampler	#4 PM10	Temperature	25.0 °C 298.2 °K
Flow Controller	P4353	Station Pressure	29.08 "Hg 738.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.10	1.083	24.90	46.50	0.937	1.120	**3.42**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Design % Difference	Acceptable Range
25.00	46.69	0.937	1.120	1.082	**-4.25**	± 10%

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Flow Rate Percent Difference	Acceptable Range
Manometer "H_2O	Flow Rate* m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
2.95	1.057	33.00	61.63	0.917	1.096	**3.69**	± 4%
3.10	1.083	24.90	46.50	0.937	1.120	**3.42**	± 4%
3.20	1.100	21.00	39.22	0.947	1.132	**2.91**	± 4%
3.30	1.117	19.00	35.49	0.952	1.139	**1.97**	± 4%

*At least 3 of 4 orifice flow rates must be between 1.13 ± 10% (1.02 and 1.24)

Calculations:

Pressure mmHg (Pf) - ("H_2O/13.6) * 25.4

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Flow Rate Percent Difference- (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Percent Difference)/100)

Design Percent Difference- (Corrected Flow Rate-1.13)/1.13*100

Lead/TSP Sampler Verifications

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 7, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Big River #4	Intercept (Qa)	-0.00876
Sampler	QA TSP	Temperature	21.9 °C 295.1 °K
Flow Controller	P4558	Station Pressure	29.13 "Hg 739.9 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.70	1.175	21.30	39.80	0.946	1.232	**4.85**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
21.40	39.98	0.946	1.232	**1.172**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.50	1.143	30.60	57.17	0.923	1.200	**4.99**	± 5%
3.60	1.160	26.40	49.32	0.933	1.214	**4.66**	± 5%
3.70	1.175	21.30	39.80	0.946	1.232	**4.85**	± 5%
3.80	1.191	18.90	35.31	0.952	1.240	**4.11**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Big River	Intercept (Qa)	-0.00876
Sampler	#4 Primary TSP	Temperature	21.9 °C 295.1 °K
Flow Controller	P4557	Station Pressure	29.13 "Hg 739.9 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.90	1.207	22.30	41.66	0.944	1.234	**2.24**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
22.50	42.04	0.943	1.234	**1.206**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.70	1.175	27.00	50.44	0.932	1.218	**3.66**	± 5%
3.90	1.207	22.30	41.66	0.944	1.234	**2.24**	± 5%
4.00	1.222	16.90	31.57	0.957	1.252	**2.45**	± 5%
4.10	1.237	13.00	24.29	0.967	1.266	**2.34**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Leadwood (South)	Intercept (Qa)	-0.00876
Sampler	#1 TSP	Temperature	23.7 °C 296.9 °K
Flow Controller	P4559	Station Pressure	29.04 "Hg 737.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.80	1.197	21.60	40.36	0.945	1.241	**3.68**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
21.90	40.92	0.945	1.241	**1.195**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.70	1.181	25.80	48.20	0.935	1.228	**3.98**	± 5%
3.80	1.197	21.60	40.36	0.945	1.241	**3.68**	± 5%
3.85	1.204	17.70	33.07	0.955	1.255	**4.24**	± 5%
3.90	1.212	14.30	26.72	0.964	1.268	**4.62**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Leadwood (School)	Intercept (Qa)	-0.00876
Sampler	#2 TSP	Temperature	23.7 °C 296.9 °K
Flow Controller	P6793	Station Pressure	29.04 "Hg 737.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.70	1.181	21.70	40.54	0.945	1.222	**3.47**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
21.70	40.54	0.945	1.222	**1.180**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.50	1.149	30.60	57.17	0.922	1.194	**3.92**	± 5%
3.60	1.165	25.30	47.27	0.936	1.210	**3.86**	± 5%
3.70	1.181	21.70	40.54	0.945	1.222	**3.47**	± 5%
3.80	1.197	16.50	30.83	0.958	1.240	**3.59**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Leadwood (Mill St)	Intercept (Qa)	-0.00876
Sampler	#3 TSP	Temperature	23.7 °C 296.9 °K
Flow Controller	P4476	Station Pressure	29.04 "Hg 737.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.80	1.197	21.10	39.42	0.947	1.233	**3.01**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
21.30	39.80	0.946	1.230	**1.193**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.60	1.165	29.80	55.68	0.925	1.199	**2.92**	± 5%
3.70	1.181	25.80	48.20	0.935	1.211	**2.54**	± 5%
3.80	1.197	21.10	39.42	0.947	1.227	**2.51**	± 5%
3.90	1.212	16.80	31.39	0.957	1.241	**2.39**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Rivermines (Quarry)	Intercept (Qa)	-0.00876
Sampler	#1 TSP	Temperature	25.0 °C 298.2 °K
Flow Controller	P2940	Station Pressure	29.05 "Hg 737.9 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.70	1.183	22.00	41.10	0.944	1.228	**3.80**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
22.00	41.10	0.944	1.228	**1.181**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.50	1.151	28.70	53.62	0.927	1.208	**4.95**	± 5%
3.60	1.167	25.70	48.02	0.935	1.215	**4.11**	± 5%
3.70	1.183	22.00	41.10	0.944	1.228	**3.80**	± 5%
3.80	1.199	19.60	36.62	0.950	1.236	**3.09**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Rivermines Wood St	Intercept (Qa)	-0.00876
Sampler	#2 TSP	Temperature	25.0 °C 298.2 °K
Flow Controller	P2941	Station Pressure	29.05 "Hg 737.9 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.70	1.183	22.30	41.66	0.944	1.229	**3.89**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
22.00	41.10	0.944	1.229	**1.181**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.60	1.167	31.90	59.60	0.919	1.195	**2.40**	± 5%
3.65	1.175	27.10	50.63	0.931	1.212	**3.15**	± 5%
3.70	1.183	22.30	41.66	0.944	1.229	**3.89**	± 5%
3.80	1.199	19.00	35.50	0.952	1.240	**3.42**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Rivermines Wtr Plnt	Intercept (Qa)	-0.00876
Sampler	#3 TSP	Temperature	25.0 °C 298.2 °K
Flow Controller	P4475	Station Pressure	29.08 "Hg 738.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.70	1.183	21.40	39.98	0.946	1.225	**3.55**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
21.60	40.36	0.945	1.224	**1.181**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.45	1.142	33.30	62.22	0.916	1.189	**4.12**	± 5%
3.50	1.150	31.80	59.41	0.920	1.193	**3.74**	± 5%
3.60	1.167	26.50	49.51	0.933	1.207	**3.43**	± 5%
3.70	1.183	21.40	39.98	0.946	1.225	**3.55**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 7, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Ozark Insulation	Intercept (Qa)	-0.00876
Sampler	#1 TSP	Temperature	21.9 °C 295.1 °K
Flow Controller	P2939	Station Pressure	29.13 "Hg 739.9 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.70	1.175	21.30	39.80	0.946	1.233	**4.94**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
21.30	39.80	0.946	1.233	**1.172**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.50	1.143	30.90	57.73	0.922	1.199	**4.90**	± 5%
3.60	1.160	27.70	51.75	0.930	1.211	**4.40**	± 5%
3.70	1.175	21.30	39.80	0.946	1.233	**4.94**	± 5%
3.80	1.191	20.30	37.93	0.949	1.237	**3.86**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	Hanley Park (Crane St.)	Intercept (Qa)	-0.00876
Sampler	#2 TSP	Temperature	25.0 °C 298.2 °K
Flow Controller	P4474	Station Pressure	29.08 "Hg 738.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.70	1.183	22.00	41.10	0.944	1.216	**2.79**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
22.00	41.10	0.944	1.216	**1.182**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.60	1.167	28.80	53.81	0.927	1.194	**2.31**	± 5%
3.70	1.183	22.00	41.10	0.944	1.216	**2.79**	± 5%
3.80	1.198	19.10	35.68	0.952	1.227	**2.42**	± 5%
3.90	1.214	16.80	31.39	0.958	1.235	**1.73**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

INQUEST
Environmental, Inc.

Lead Sampler Audit
Volumetric Flow Control

3609 Mojave Court, Suite E
Columbia, Missouri 65202
573-474-8110

Date	April 8, 2015	Auditor	John Kunkel
Operator	The Doe Run Company	Transfer Orifice	1882
Location	Park Hills Network	Slope (Qa)	1.04094
Station	St Joe Park	Intercept (Qa)	-0.00876
Sampler	#4 TSP	Temperature	25.0 °C 298.2 °K
Flow Controller	P6792	Station Pressure	29.08 "Hg 738.6 mmHg

Flow Rate Audit

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.70	1.183	21.30	39.80	0.946	1.229	**3.89**	± 7%

Sampler Operating Flow Rate

Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min	Corrected Flow Rate	Acceptable Range
21.50	40.17	0.946	1.229	**1.181**	1.10 - 1.70

Multi-point Flow Rate Verification

Transfer Orifice		Sampler				Calibration Error %	Acceptable Range
Manometer "H_2O	Flow Rate m^3/min	Manometer "H_2O	Pressure (Pf)	Press. Ratio (Po/Pa)	Flow Rate m^3/min		
3.60	1.167	26.40	49.32	0.933	1.211	**3.77**	± 5%
3.70	1.183	21.30	39.80	0.946	1.229	**3.89**	± 5%
3.75	1.190	18.30	34.19	0.954	1.239	**4.12**	± 5%
3.80	1.198	14.90	27.84	0.962	1.250	**4.34**	± 5%

Calculations:

Pressure mmHg (Pf) - "H_2O * 1.86832

Pressure Ratio (Po/Pa) - 1-Pf/Pa

Orifice Flow Rate (Qa) - 1/Slope*(Sqrt("H2O*(Ta/Pa))-Intercept)

Sampler Flow Rate (Qa) - Taken from the look-up tables

Calibration Error - (Sampler Flow-Orifice Flow)/Orifice Flow*100

Corrected Flow Rate - Operating Flow*((100-Calibration Error)/100)

Calibration Orifice Certification Worksheet

TISCH Environmental

TISCH ENVIRONMENTAL, INC.
145 SOUTH MIAMI AVE
VILLAGE OF CLEVES, OH
45002
513.467.9000
877.263.7610 TOLL FREE
513.467.9009 FAX

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5028A

Date - Jan 13, 2015 Rootsmeter S/N 9833620 Ta (K) - 292
Operator Tisch Orifice I.D. - 1882 Pa (mm) - 765.81

PLATE OR VDC #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3360	4.3	1.50
2	NA	NA	1.00	1.0560	6.8	2.50
3	NA	NA	1.00	0.9570	8.2	3.00
4	NA	NA	1.00	0.8870	9.5	3.50
5	NA	NA	1.00	0.6670	16.5	6.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
1.0225	0.7654	1.2420		0.9943	0.7443	0.7563
1.0191	0.9651	1.6034		0.9910	0.9385	0.9763
1.0173	1.0630	1.7564		0.9892	1.0337	1.0695
1.0155	1.1449	1.8972		0.9875	1.1133	1.1552
1.0061	1.5084	2.4840		0.9784	1.4668	1.5125

Qstd slope (m) = 1.66236
intercept (b) = -0.01438
coefficient (r) = 0.99927

Qa slope (m) = 1.04094
intercept (b) = -0.00876
coefficient (r) = 0.99927

y axis = SQRT[H2O(Pa/760)(298/Ta)] y axis = SQRT[H2O(Ta/Pa)]

CALCULATIONS

Vstd = Diff. Vol[(Pa-Diff. Hg)/760](298/Ta)
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]
Qa = Va/Time

For subsequent flow rate calculations:

Qstd = 1/m{[SQRT(H2O(Pa/760)(298/Ta))]- b}
Qa = 1/m{[SQRT H2O(Ta/Pa)]- b}

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

July 17, 2015

Amy Sanders
The Doe Run Company
P. O. Box 500
Viburnum, MO 65566

RE: Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

Dear Amy Sanders:
Enclosed are the analytical results for sample(s) received by the laboratory on July 10, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jamie Church
jamie.church@pacelabs.com
Project Manager

Enclosures

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

Kansas Certification IDs
9608 Loiret Boulevard, Lenexa, KS 66219
WY STR Certification #: 2456.01
Arkansas Certification #: 13-012-0
Illinois Certification #: 003097
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212008A
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407
Utah Certification #: KS00021

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SAMPLE SUMMARY

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60198124001	**34518 / RIVERMINES DOWNSTREAM**	Water	07/09/15 11:55	07/10/15 09:00
60198124002	**34519 / RIVERMINES UPSTREAM**	Water	07/09/15 12:24	07/10/15 09:00
60198124003	**34520 / RIVERMINES 001**	Water	07/09/15 12:10	07/10/15 09:00

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SAMPLE ANALYTE COUNT

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60198124001	**34518 / RIVERMINES DOWNSTREAM**	EPA 200.7	NDJ	6	PASI-K
		EPA 200.7	SMW	3	PASI-K
		SM 2540D	LJS	1	PASI-K
		EPA 300.0	AJM	1	PASI-K
60198124002	**34519 / RIVERMINES UPSTREAM**	EPA 200.7	NDJ	6	PASI-K
		EPA 200.7	SMW	3	PASI-K
		SM 2540D	LJS	1	PASI-K
		EPA 300.0	AJM	1	PASI-K
60198124003	**34520 / RIVERMINES 001**	EPA 200.7	NDJ	3	PASI-K
		SM 2540D	LJS	1	PASI-K
		SM 2540F	LJS	1	PASI-K
		EPA 300.0	AJM	1	PASI-K

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ANALYTICAL RESULTS

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

Sample: 34518 / RIVERMINES DOWNSTREAM **Lab ID: 60198124001** Collected: 07/09/15 11:55 Received: 07/10/15 09:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Cadmium	ND	ug/L	5.0	0.56	1	07/13/15 15:15	07/14/15 09:57	7440-43-9	
Calcium	**29200**	ug/L	100	5.2	1	07/13/15 15:15	07/14/15 09:57	7440-70-2	
Lead	**8.2**	ug/L	5.0	1.9	1	07/13/15 15:15	07/14/15 09:57	7439-92-1	
Magnesium	**15000**	ug/L	50.0	13.3	1	07/13/15 15:15	07/14/15 09:57	7439-95-4	
Total Hardness by 2340B	**135000**	ug/L	500		1	07/13/15 15:15	07/14/15 09:57		
Zinc	**293**	ug/L	50.0	2.6	1	07/13/15 15:15	07/14/15 09:57	7440-66-6	
200.7 Metals, Dissolved (LF)	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Cadmium, Dissolved	ND	ug/L	5.0	0.56	1	07/15/15 14:00	07/17/15 12:41	7440-43-9	
Lead, Dissolved	ND	ug/L	5.0	1.9	1	07/15/15 14:00	07/17/15 12:41	7439-92-1	
Zinc, Dissolved	**193**	ug/L	50.0	2.6	1	07/15/15 14:00	07/17/15 12:41	7440-66-6	
2540D Total Suspended Solids	Analytical Method: SM 2540D								
Total Suspended Solids	**27.0**	mg/L	5.0	5.0	1		07/15/15 11:37		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**21.7**	mg/L	2.0	0.47	2		07/15/15 14:36	14808-79-8	

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ANALYTICAL RESULTS

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

Sample: 34519 / RIVERMINES UPSTREAM **Lab ID: 60198124002** Collected: 07/09/15 12:24 Received: 07/10/15 09:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Cadmium	ND	ug/L	5.0	0.56	1	07/13/15 15:15	07/14/15 10:01	7440-43-9	
Calcium	**24900**	ug/L	100	5.2	1	07/13/15 15:15	07/14/15 10:01	7440-70-2	
Lead	**3.5J**	ug/L	5.0	1.9	1	07/13/15 15:15	07/14/15 10:01	7439-92-1	
Magnesium	**14100**	ug/L	50.0	13.3	1	07/13/15 15:15	07/14/15 10:01	7439-95-4	
Total Hardness by 2340B	**120000**	ug/L	500		1	07/13/15 15:15	07/14/15 10:01		
Zinc	**4.9J**	ug/L	50.0	2.6	1	07/13/15 15:15	07/14/15 10:01	7440-66-6	
200.7 Metals, Dissolved (LF)	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Cadmium, Dissolved	ND	ug/L	5.0	0.56	1	07/15/15 14:00	07/17/15 12:44	7440-43-9	
Lead, Dissolved	**5.0**	ug/L	5.0	1.9	1	07/15/15 14:00	07/17/15 12:44	7439-92-1	D9
Zinc, Dissolved	**17.0J**	ug/L	50.0	2.6	1	07/15/15 14:00	07/17/15 12:44	7440-66-6	B
2540D Total Suspended Solids	Analytical Method: SM 2540D								
Total Suspended Solids	**15.0**	mg/L	5.0	5.0	1		07/15/15 11:38		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**10.4**	mg/L	1.0	0.24	1		07/14/15 19:33	14808-79-8	

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ANALYTICAL RESULTS

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

Sample: 34520 / RIVERMINES 001 **Lab ID: 60198124003** Collected: 07/09/15 12:10 Received: 07/10/15 09:00 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Cadmium	**18.9**	ug/L	5.0	0.56	1	07/13/15 15:15	07/14/15 10:03	7440-43-9	
Lead	**33.2**	ug/L	5.0	1.9	1	07/13/15 15:15	07/14/15 10:03	7439-92-1	
Zinc	**13800**	ug/L	50.0	2.6	1	07/13/15 15:15	07/14/15 10:03	7440-66-6	
2540D Total Suspended Solids	Analytical Method: SM 2540D								
Total Suspended Solids	**7.0**	mg/L	5.0	5.0	1		07/15/15 11:39		
2540F Total Settleable Solids	Analytical Method: SM 2540F								
Total Settleable Solids	ND	mL/L/hr	0.20	0.20	1		07/10/15 15:50		
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**550**	mg/L	50.0	11.8	50		07/14/15 19:46	14808-79-8	

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QUALITY CONTROL DATA

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

QC Batch: MPRP/32501 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 Metals, Total
Associated Lab Samples: 60198124001, 60198124002, 60198124003

METHOD BLANK: 1599934 Matrix: Water
Associated Lab Samples: 60198124001, 60198124002, 60198124003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Cadmium	ug/L	ND	5.0	07/14/15 09:43	
Calcium	ug/L	7.8J	100	07/14/15 09:43	
Lead	ug/L	ND	5.0	07/14/15 09:43	
Magnesium	ug/L	ND	50.0	07/14/15 09:43	
Total Hardness by 2340B	ug/L	ND	500	07/14/15 09:43	
Zinc	ug/L	ND	50.0	07/14/15 09:43	

LABORATORY CONTROL SAMPLE: 1599935

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Cadmium	ug/L	1000	962	96	85-115	
Calcium	ug/L	10000	9660	97	85-115	
Lead	ug/L	1000	990	99	85-115	
Magnesium	ug/L	10000	9590	96	85-115	
Total Hardness by 2340B	ug/L		63600			
Zinc	ug/L	1000	970	97	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1599936 1599937

Parameter	Units	60198123001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Cadmium	ug/L	ND	1000	1000	986	1010	99	101	70-130	3	20	
Calcium	ug/L	123000	10000	10000	135000	134000	123	107	70-130	1	20	
Lead	ug/L	5.8	1000	1000	976	1000	97	100	70-130	3	20	
Magnesium	ug/L	57200	10000	10000	68600	67700	114	106	70-130	1	20	
Total Hardness by 2340B	ug/L	542000			620000	612000				1		
Zinc	ug/L	286	1000	1000	1240	1260	95	97	70-130	1	20	

MATRIX SPIKE SAMPLE: 1599938

Parameter	Units	60198124001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Cadmium	ug/L	ND	1000	998	100	70-130	
Calcium	ug/L	29200	10000	38500	92	70-130	
Lead	ug/L	8.2	1000	1020	101	70-130	
Magnesium	ug/L	15000	10000	24400	95	70-130	
Total Hardness by 2340B	ug/L	135000		197000			
Zinc	ug/L	293	1000	1270	98	70-130	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

QC Batch: MPRP/32524 | Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 | Analysis Description: 200.7 Metals, Dissolved
Associated Lab Samples: 60198124001, 60198124002

METHOD BLANK: 1601066 | Matrix: Water
Associated Lab Samples: 60198124001, 60198124002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Cadmium, Dissolved	ug/L	ND	5.0	07/17/15 12:30	
Lead, Dissolved	ug/L	ND	5.0	07/17/15 12:30	
Zinc, Dissolved	ug/L	4.3J	50.0	07/17/15 12:30	

LABORATORY CONTROL SAMPLE: 1601067

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Cadmium, Dissolved	ug/L	1000	986	99	85-115	
Lead, Dissolved	ug/L	1000	935	93	85-115	
Zinc, Dissolved	ug/L	1000	967	97	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1601068 1601069

Parameter	Units	60198279001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Cadmium, Dissolved	ug/L	14.4	1000	1000	1030	1030	101	101	70-130	0	20	
Lead, Dissolved	ug/L	2.2J	1000	1000	943	940	94	94	70-130	0	20	
Zinc, Dissolved	ug/L	16.3J	1000	1000	985	978	97	96	70-130	1	20	

MATRIX SPIKE SAMPLE: 1601070

Parameter	Units	60198281001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Cadmium, Dissolved	ug/L	ND	1000	1020	102	70-130	
Lead, Dissolved	ug/L	2.6J	1000	934	93	70-130	
Zinc, Dissolved	ug/L	ND	1000	962	96	70-130	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

QC Batch: WET/55961 Analysis Method: SM 2540D
QC Batch Method: SM 2540D Analysis Description: 2540D Total Suspended Solids
Associated Lab Samples: 60198124001, 60198124002, 60198124003

METHOD BLANK: 1600753 Matrix: Water
Associated Lab Samples: 60198124001, 60198124002, 60198124003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	5.0	07/15/15 11:34	

SAMPLE DUPLICATE: 1600754

Parameter	Units	60198095001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	1240	1250	1	10	

SAMPLE DUPLICATE: 1600755

Parameter	Units	60198124001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	27.0	26.0	4	10	

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QUALITY CONTROL DATA

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

QC Batch: WETA/34987 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 60198124001, 60198124002, 60198124003

METHOD BLANK: 1600122 Matrix: Water
Associated Lab Samples: 60198124002, 60198124003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	1.0	07/14/15 18:10	

METHOD BLANK: 1600751 Matrix: Water
Associated Lab Samples: 60198124001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	1.0	07/15/15 13:41	

LABORATORY CONTROL SAMPLE: 1600123

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	5.0	99	90-110	

LABORATORY CONTROL SAMPLE: 1600752

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	5	4.8	96	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1600124 1600125

Parameter	Units	60198124001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	21.7	10	10	30.3	30.3	86	87	80-120	0	15	

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REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K	Pace Analytical Services - Kansas City

ANALYTE QUALIFIERS

B	Analyte was detected in the associated method blank.
D9	Dissolved result is greater than the total. Data is within laboratory control limits.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: NPDES (RIVERMINES)
Pace Project No.: 60198124

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60198124001	**34518 / RIVERMINES DOWNSTREAM**	EPA 200.7	MPRP/32501	EPA 200.7	ICP/24038
60198124002	**34519 / RIVERMINES UPSTREAM**	EPA 200.7	MPRP/32501	EPA 200.7	ICP/24038
60198124003	**34520 / RIVERMINES 001**	EPA 200.7	MPRP/32501	EPA 200.7	ICP/24038
60198124001	**34518 / RIVERMINES DOWNSTREAM**	EPA 200.7	MPRP/32524	EPA 200.7	ICP/24059
60198124002	**34519 / RIVERMINES UPSTREAM**	EPA 200.7	MPRP/32524	EPA 200.7	ICP/24059
60198124001	**34518 / RIVERMINES DOWNSTREAM**	SM 2540D	WET/55961		
60198124002	**34519 / RIVERMINES UPSTREAM**	SM 2540D	WET/55961		
60198124003	**34520 / RIVERMINES 001**	SM 2540D	WET/55961		
60198124003	**34520 / RIVERMINES 001**	SM 2540F	WET/55900		
60198124001	**34518 / RIVERMINES DOWNSTREAM**	EPA 300.0	WETA/34987		
60198124002	**34519 / RIVERMINES UPSTREAM**	EPA 300.0	WETA/34987		
60198124003	**34520 / RIVERMINES 001**	EPA 300.0	WETA/34987		

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Sample Condition Upon Receipt

WO#: 60198124
60198124

Client Name: Doc Run

Optional
Proj Due Date:
Proj Name:

Courier: FedEx ☒ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Other ☐ Client ☐

Tracking #: 7740 1349 5300 Pace Shipping Label Used? Yes ☐ No ☐

Custody Seal on Cooler/Box Present: Yes ☒ No ☐ Seals intact: Yes ☒ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☒ Other ☐

Thermometer Used: CF +1.4 T-239 / CF -0.5 T-262 **Type of Ice:** Wet Blue None ☐ Samples received on ice, cooling process has begun.
(circle one)

Cooler Temperature: 1.5

Temperature should be above freezing to 6°C

Date and initials of person examining contents: JB 7/10

Chain of Custody present:	☒Yes ☐No ☐N/A	1.
Chain of Custody filled out:	☒Yes ☐No ☐N/A	2.
Chain of Custody relinquished:	☒Yes ☐No ☐N/A	3.
Sampler name & signature on COC:	☒Yes ☐No ☐N/A	4.
Samples arrived within holding time:	☒Yes ☐No ☐N/A	5.
Short Hold Time analyses (<72hr):	☒Yes ☐No ☐N/A	6. SS
Rush Turn Around Time requested:	☐Yes ☒No ☐N/A	7.
Sufficient volume:	☒Yes ☐No ☐N/A	8.
Correct containers used:	☒Yes ☐No ☐N/A	
Pace containers used:	☒Yes ☐No ☐N/A	9.
Containers intact:	☒Yes ☐No ☐N/A	10.
Unpreserved 5035A soils frozen w/in 48hrs?	☐Yes ☐No ☒N/A	11.
Filtered volume received for dissolved tests?	☐Yes ☐No ☒N/A	12.
Sample labels match COC:	☒Yes ☐No ☐N/A	
Includes date/time/ID/analyses Matrix: WT		13.
All containers needing preservation have been checked.	☒Yes ☐No ☐N/A	
All containers needing preservation are found to be in compliance with EPA recommendation.	☒Yes ☐No ☐N/A	14.
Exceptions: VOA, Coliform, O&G, WI-DRO (water)	☐Yes ☒No	Initial when completed / Lot # of added preservative
Trip Blank present:	☐Yes ☐No ☒N/A	
Pace Trip Blank lot # (if purchased):		15.
Headspace in VOA vials (>6mm):	☐Yes ☐No ☒N/A	16.
Project sampled in USDA Regulated Area:	☐Yes ☐No ☒N/A	17. List State:
Additional labels attached to 5035A vials in the field?	☐Yes ☐No ☒N/A	18.

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: _____

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately

THE DOE RUN COMPANY

Section A — Required Client Information:

Company: The Doe Run Company
Address: PO Box 500
Email To: asanders@doerun.com
Phone: (573) 689-4535 Fax: (573) 244-8179
Requested Due Date/TAT: 5 To 7 Days

Section B — Required Project Information:

Report To: Amy Sanders
Copy To:
Purchase Order No.:
Project Name: NPDES (Rivermines)
Project Number

Section C — Invoice Information:

Attention: Amy Sanders
Company Name: The Doe Run Company
Address: PO Box 500, Viburnum, MO 6558
Pace Quote Reference:
Pace Project Manager:
Pace Profile #

REGULATORY AGENCY: ☐ NPDES ☐ GROUND WATER ☐ UST ☐ RCRA

Site Location STATE: MO

Page: 1 of 1

COC#: 2329 60198124

Requested Analysis Filtered (Y/N)

Section C — Required Sample Information

Valid Matrix Codes: MATRIX (WATER, WASTE WATER, SOIL/SOLID) — CODE (WT, WW, SL)

ITEM #	SAMPLE ID (A-Z, 0-9 / -) Sample IDs MUST BE UNIQUE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COMPOSITE START DATE (mm/dd/yy)	COMPOSITE START TIME (Military)	COMPOSITE END / GRAB DATE (mm/dd/yy)	COMPOSITE END / GRAB TIME (Military)	SAMPLE TEMP AT COLLECTION	Total # OF CONTAINERS	250 mL Unpreserved	500 mL Unpreserved	1 L Unpreserved	250 mL Nitric	250 mL Amber Glass H_2SO_4	250 mL Plastic H_2SO_4	1000 mL Amber HCL	250 mL ZnAc/NaOH	500 mL Amber Glass H_2SO_4	*See Additional Comments Below — Analysis Test	SEMO Lab Project No / Lab I.D.
1	34518 BP2N BP3N	WT	G			07/09/15	1135		2		1		1						CD-D, PB-D, ZN-D, HARD, SO4, CD-T, PB-T, TSS-T, ZN-T	Rivermines Downstre 01
2																				
3	34519	WT	G			07/09/15	1224		2		1		1						CD-D, PB-D, ZN-D, HARD, SO4, CD-T, PB-T, TSS-T, ZN-T	Rivermines Upstream 02
4																				
5	34520 BP1N	WW	G			07/09/15	1210		3	1		1	1						SO4, SS, TSS, CD-T PB-T, ZN-T	Rivermines 001 03
6																				
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ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME (Military)	ACCEPTED BY / AFFILIATION	DATE	TIME (Military)	SAMPLE CONDITIONS: Temp in °C	pH in SU	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)
200.7 Total Recoverable and Dissolved Metals	Larry Hopkins DRC	7/9/15	1315	[signature]	7/10	0900	1.5		Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Larry Hopkins

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7/9/15