BTEC Inc.

Hydroset Particulate Matter Emissions Test Report

Prepared for:

LafargeHolcim

Presque Isle Quarry
11351 East Grand Lake Road
Presque Isle, Michigan 49777

Project No. 17-5065.00
August 25, 2017

BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, Michigan 48073
(248) 548-8070

EXECUTIVE SUMMARY

Lafarge North America (Lafarge) retained BT Environmental Consulting, Inc. (BTEC) to measure particulate matter emission rates from a single Hydroset exhaust stack at the Lafarge Presque Isle Quarry located in Presque Isle, Michigan. BTEC also measured visible emissions from the building that encloses the crusher. The test program was conducted on August 3, 2017.

The objective of the emissions test program was to demonstrate compliance with emission limitations for the Hydroset exhaust stack and visible emissions from the building that encloses the crusher. The table below summarizes the results of the test program.

Table E-1
Overall Emissions Summary

Emission Unit	Pollutant	Average Emission Rate	Emission Limit
Hydroset	Particulate Matter (PM)	0.001 lb/1,000 lbs of gas	0.02 lb/1,000 lbs of gas
	PM_{10}*	0.03 lb/hr	1.1 lb/hr
Building that encloses the crusher	Visible Emissions	0%	0%

*Total PM measured using Method 17 and reported as PM_{10}

1. Introduction

Lafarge North America (Lafarge) retained BT Environmental Consulting, Inc. (BTEC) to measure particulate matter emission rates from a single Hydroset exhaust stack at the Lafarge Presque Isle Quarry located in Presque Isle, Michigan. BTEC also measured visible emissions from the building that encloses the crusher. The test program was conducted on August 3, 2017.

AQD has published a guidance document entitled "Format for Submittal of Source Emission Test Plans and Reports" (December 2013). The following is a summary of the emissions test program and results in the format suggested by the aforementioned document.

1.a Identification, Location, and Dates of Test

Sampling and analysis for the emission test program was conducted on August 3, 2017 at the Lafarge facility located in Presque Isle, Michigan.

1.b Purpose of Testing

The objective of the emissions test program was to demonstrate compliance with emission limitations for the stacks for filterable particulate matter concentrations to 0.02 lb/1,000 lbs of gas and particulate matter less than 10 microns (PM_{10}) emission rates to 1.1 lb/hr. The hydroset is enclosed in a building and has an opacity limited of no visible emissions.

1.c Source Description

The control device is a Carter Day (pulse) Dust Collector – referred to in Air Permit 186-99A, as the central baghouse associated with the C-500 Hazmag Crusher and the 2 Symons 7 inch Short Head Cone Crusher

1.d Test Program Contacts

The contacts for the source and test report are:

Mrs. Vicki McCoy
Environmental Specialist
Lafarge Holcim
Lafarge North America – Presque Isle Quarry
11351 East Grand Lake Road
Presque Isle, Michigan 49777
(989) 595-6101 x-268

Mr. Barry Boulianne
Senior Project Manager
BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, Michigan 48073
(313) 449-2361

Names and affiliations for personnel who were present during the testing program are summarized by Table 1.

Table 1
Test Personnel

Name and Title	Affiliation	Telephone
Mr. Brandon Chase Senior Environmental Engineer	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070
Mr. Mike Nummer Environmental Technician	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070
Mrs. Vicki McCoy LafargeHolcim – Environmental Specialist	Lafarge – Presque Isle Quarry 11351 East Grand Lake Road Presque Isle, Michigan 49777	(989) 595-6101 x-268
Mr. George Roznowski LafargeHolcim – Plant Supervisor	Lafarge – Presque Isle Quarry 11351 East Grand Lake Road Presque Isle, Michigan 49777	(989) 595-6101 x-239
Mr. Jeremy Howe MDEQ	MDEQ Air Quality Division	(231) 876-4416

2. Summary of Results

Sections 2.a through 2.d summarize the results of the emissions compliance test program.

2.a Operating Data

Kiln production rate and baghouse pressure drop is available in Appendix E.

2.b Applicable Permit

Michigan Permit to Install No. 186-99A.

2.c Results

The overall results of the emission test program are summarized by Table 2 (see Section 5.a). Detailed results for each run can be found in Table 3.

3. Source Description

Sections 3.a through 3.e provide a detailed description of the process.

3.a Process Description

NAICS Code 212312 crushed and broken limestone mining and quarrying.

3.b Process Flow Diagram

A process flow diagram is available on request.

3.c Raw and Finished Materials

Raw material is limestone, processed at approximately 6.5 million tons per year.

3.d Process Capacity

The rate capacity varies between 1300 and 2000 tons per hour from the primary crusher. Uses 124RF10 filters. 2435 sq. ft of cloth bags with a 15,000 ACFM 400 hp fan.

3.e Process Instrumentation

Carter Day (pulse) Dust Collector as the central baghouse associated with the C-500 Hazmag Crusher and the 2 Symons 7 inch short head cone crushers.

4. Sampling and Analytical Procedures

Sections 4.a through 4.d provide a summary of the sampling and analytical procedures used.

4.a Sampling Train and Field Procedures

Measurement of exhaust gas velocity, molecular weight, and moisture content were conducted using the following reference test methods codified at Title 40, Part 60, Appendix A of the Code of Federal Regulations (40 CFR 60, Appendix A):

- Method 1 - *"Sample and Velocity Traverses for Stationary Sources"*
- Method 2 - *"Determination of Stack Gas Velocity and Volumetric Flowrate"*
- Method 3 - *"Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources" (Fyrite)*
- Method 4 - *"Determination of Moisture Content in Stack Gases"*

Stack gas velocity traverses were conducted in accordance with the procedures outlined in Method 1 and Method 2 (see Figure 2 for a schematic of the sampling location). S-type pitot tubes with thermocouple assemblies, calibrated in accordance with Method 2, Section

4.1.1, were used to measure exhaust gas velocity pressures (using a manometer) and temperatures during testing. The S-type pitot tube dimensions were within specified limits, therefore, a baseline pitot tube coefficient of 0.84 (dimensionless) was assigned.

A cyclonic flow check was performed at the sampling location. The existence of cyclonic flow is determined by measuring the flow angle at each sample point. The flow angle is the angle between the direction of flow and the axis of the stack. If the average of the absolute values of the flow angle is greater than 20 degrees, cyclonic flow exists. The average null angle was determined to be less than 20 degrees.

Molecular weight was determined according to USEPA Method 3, "Gas Analysis for the Determination of Dry Molecular Weight." The equipment used for this evaluation consisted of a one-way squeeze bulb with connecting tubing and a set of Fyrite® combustion gas analyzers. Carbon dioxide and oxygen content were analyzed using the Fyrite® procedure.

Exhaust gas moisture content was evaluated using Method 4. Exhaust gas was extracted as part of the PM sampling trains and passed through the impinger configuration (see Figure 1). Exhaust gas moisture content was then determined gravimetrically.

4.b Particulate Matter (USEPA Method 17)

40 CFR 60, Appendix A, Method 17, *"Determination of Particulate Emissions from Stationary Sources"* was used to measure PM concentrations and calculate PM emission rates (see Figure 1 for a schematic of the sampling train). Triplicate 60-minute test runs were conducted.

BTEC's Nutech® Model 2010 modular isokinetic stack sampling system consisted of (1) a stainless-steel button-hook nozzle, (2) a stainless steel in stack filter holder with a tarred glass fiber filter (3) steel sample probe, (4) a set of four Greenburg-Smith (GS) impingers with the first and third modified and second standard GS impingers each containing 100 ml of deionized water, and a fourth modified GS impinger containing approximately 300 g of silica gel desiccant, (5) a length of sample line, and (6) a Nutech® control case equipped with a pump, dry gas meter, and calibrated orifice.

A sampling train and pitot tube leak test was conducted before and after each test run. Upon completion of the final leak check for each test run, the filter was recovered, and the nozzle and the front half of the filter holder assembly were brushed and triple rinsed with acetone. The acetone rinses were collected in a pre-cleaned sample container.

BTEC labeled each container with the test number, test location, and test date, and marked the level of liquid on the outside of the container. In addition blank samples of the acetone and filter were collected. BTEC personnel transported the filters and acetone fractions to BTEC's laboratory in Royal Oak, Michigan for gravimetric analysis.

4.c Recovery and Analytical Procedures

Filterable particulate matter samples were processed at BTEC's laboratory in Royal Oak, Michigan.

4.d Sampling Ports

Diagrams of the stacks showing sampling ports in relation to upstream and downstream disturbances are included as Figure 2.

4.e Traverse Points

Diagrams of the stacks indicating traverse point locations and stack dimensions are included as Figure 2.

5. Test Results and Discussion

Sections 5.a through 5.k provide a summary of the test results.

5.a Results Tabulation

The results of the emissions test program are summarized by Table 2.

Table 2
Overall Emissions Summary

Emission Unit	Pollutant	Average Emission Rate	Emission Limit
Hydroset	Particulate Matter (PM)	0.001 lb/1,000 lbs of gas	0.02 lb/1,000 lbs of gas
	PM_{10}*	0.03 lb/hr	1.1 lb/hr
Building that encloses the crusher	Visible Emissions	0%	0%

*Total PM measured using Method 17 and reported as PM_{10}

Detailed data for each test run can be found in Table 3.

5.b Discussion of Results

The objective of the emissions test program was to demonstrate compliance with emission limitations for each stack for filterable particulate matter 0.02 lb/1,000 lbs of gas. The pounds per hour of PM was also below the PM_{10} limit of 1.1 lb/hr.

All emission results are below the corresponding limits for all sources tested.

5.c Sampling Procedure Variations

There were no variations.

5.d Process or Control Device Upsets

There were no process or control device upsets during the testing.

5.e Control Device Maintenance

No control device maintenance was performed on the kilns during the test program.

5.f Re-Test

The emissions test program was not a re-test.

5.g Audit Sample Analyses

No audit samples were collected as part of the test program.

5.h Calibration Sheets

Relevant equipment calibration documents are provided in Appendix B.

5.i Sample Calculations

Sample calculations are provided in Appendix C.

5.j Field Data Sheets

Field documents relevant to the emissions test program are presented in Appendix A.

5.k Laboratory Data

Laboratory analytical results for this test program are presented in Appendix D.

Table 3
Hydroset Exhaust Particulate Matter Emission Rates

Company	**Lafarge Presque Isle**			
Source Designation	**Hydroset Exhaust**			
Test Date	**8/3/2017**	**8/3/2017**	**8/3/2017**	
Meter/Nozzle Information	Run 1	Run 2	Run 3	Average
Meter Temperature Tm (F)	71.3	75.0	77.7	74.7
Meter Pressure - Pm (in. Hg)	29.6	29.6	29.6	29.6
Measured Sample Volume (Vm)	35.5	39.2	40.2	38.3
Sample Volume (Vm-Std ft3)	35.3	38.7	39.5	37.8
Sample Volume (Vm-Std m3)	1.00	1.10	1.12	1.07
Condensate Volume (Vw-std)	0.707	0.519	0.754	0.660
Gas Density (Ps(std) lbs/ft3) (wet)	0.0740	0.0742	0.0740	0.0740
Gas Density (Ps(std) lbs/ft3) (dry)	0.0745	0.0745	0.0745	0.0745
Total weight of sampled gas (m g lbs) (wet)	2.66	2.91	2.98	2.85
Total weight of sampled gas (m g lbs) (dry)	2.63	2.88	2.95	2.82
Nozzle Size - An (sq. ft.)	0.000187	0.000187	0.000187	0.000187
Isokinetic Variation - I	99.4	100.0	99.8	99.7
Stack Data				
Average Stack Temperature - Ts (F)	72.7	73.4	75.1	73.7
Molecular Weight Stack Gas- dry (Md)	28.8	28.8	28.8	28.8
Molecular Weight Stack Gas-wet (Ms)	28.6	28.7	28.6	28.6
Stack Gas Specific Gravity (Gs)	0.988	0.991	0.989	0.989
Percent Moisture (Bws)	1.96	1.32	1.87	1.72
Water Vapor Volume (fraction)	0.0196	0.0132	0.0187	0.0172
Pressure - Ps ("Hg)	29.5	29.5	29.5	29.5
Average Stack Velocity -Vs (ft/sec)	55.1	59.8	61.7	58.9
Area of Stack (ft2)	4.1	4.1	4.1	4.1
Exhaust Gas Flowrate				
Flowrate ft^3(Actual)	13,509	14,642	15,119	14,424
Flowrate ft^3 (Standard Wet)	13,207	14,293	14,713	14,071
Flowrate ft^3 (Standard Dry)	12,947	14,104	14,437	13,830
Flowrate m^3 (standard dry)	367	399	409	392
Total Particulate Weights (mg)				
Nozzle/Probe/Filter	0.8	0.5	0.6	0.6
Total Particulate Concentration				
lb/1000 lb (wet)	0.001	0.000	0.000	0.000
lb/1000 lb (dry)	0.00067	0.000	0.000	0.001
mg/dscm (dry)	0.8	0.5	0.5	0.6
gr/dscf	0.0003	0.0002	0.0002	0.0003
Total Particulate Emission Rate				
lb/ hr	0.04	0.02	0.03	0.03

Rev. 14.0
3-20-15 BC

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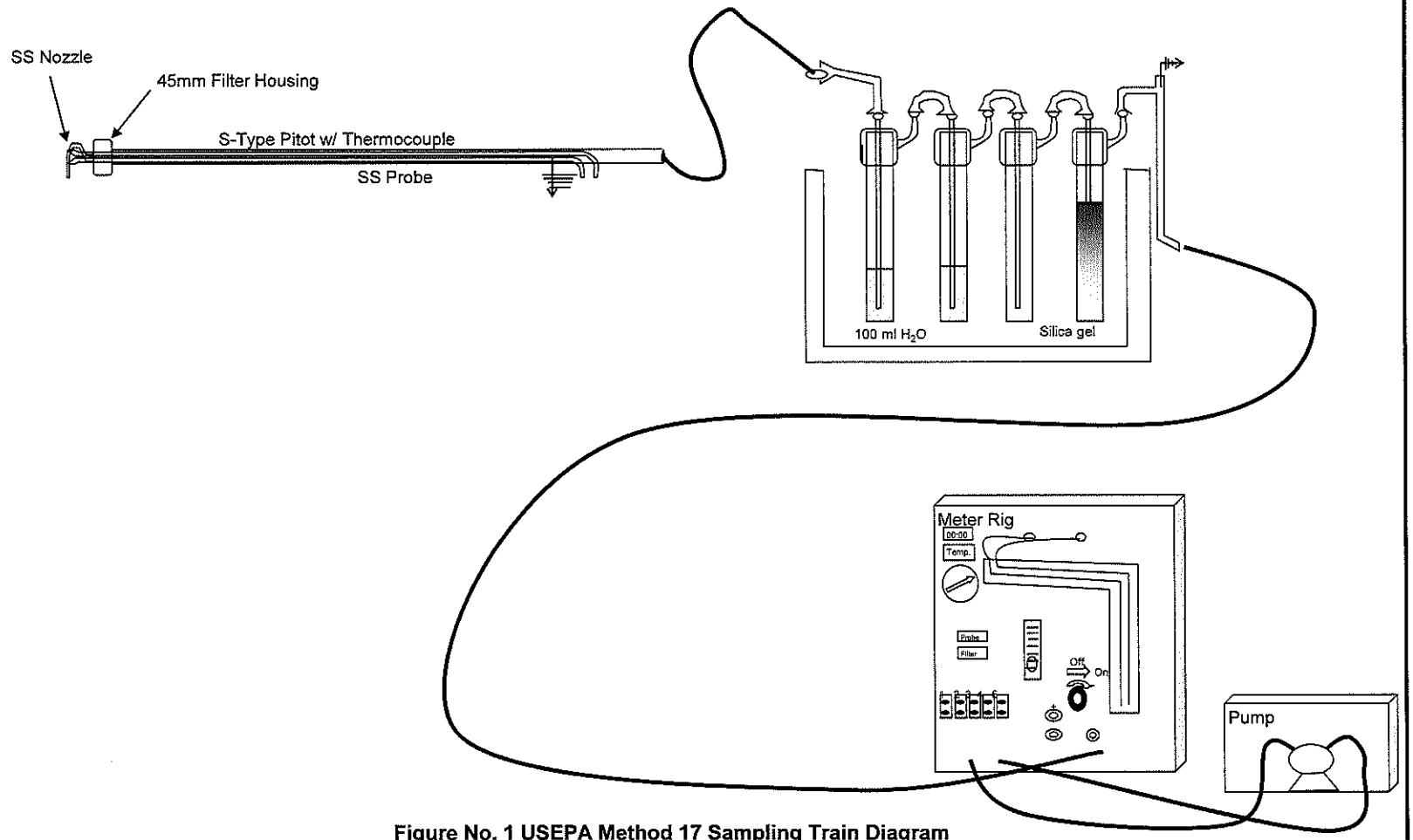

Figure No. 1 USEPA Method 17 Sampling Train Diagram

Site: **USEPA Method 17** **Lafarge** **Presque Isle, Michigan**	**Sampling Date:** **August 3, 2017**	**BT Environmental Consulting, Inc.** **4949 Fernlee Avenue** **Royal Oak, Michigan 48073**

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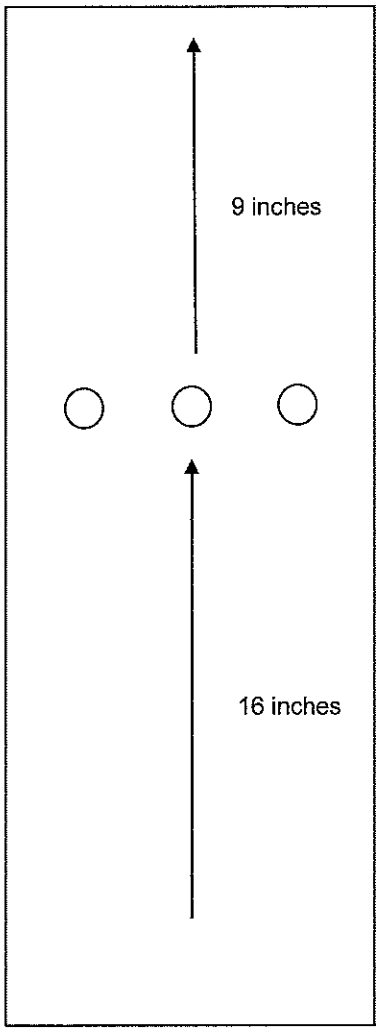
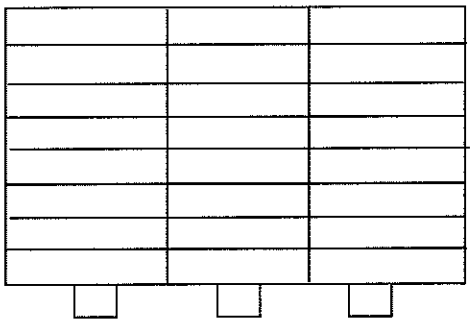
Stack Dimensions: 28W" X 21D"





Not to Scale

Points	Distance "
1	1.3
2	3.9
3	6.6
4	9.2
5	11.8
6	14.4
7	17.1
8	19.7

Figure No. 2

Site: **Hydroset Exhaust** **Lafarge** **Presque Isle, Michigan**	**Sampling** **August 3, 2017**	**BT Environmental Consulting, Inc.** **4949 Fernlee** **Royal Oak, Michigan**