BTEC Inc.

Dump House Dust Collector Emission Test Summary Report

Prepared for:

DTE Energy

Monroe, Michigan

DTE Monroe Power Plant
3500 E Front St.
Monroe, MI 48161

Project No. 049AS-28828
January 26, 2017

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

BTEC Inc.

EXECUTIVE SUMMARY

BT Environmental Consulting, Inc. (BTEC) was retained by DTE Energy (DTE) to evaluate air pollutant emission rates at the DTE Monroe Power Plant (MONPP) facility located in Monroe, Michigan. The test program consisted of the evaluation of particulate matter emission rates from the two outlets associated with the Dumper House Dust Collector (DC-24) at the DTE Monroe Power Plant. Testing for this project was conducted on December 4-7, 2017. The DTE Monroe Power Plant emissions are regulated by State of Michigan Permit to Install No. MI-PTI-27-13B.

Testing consisted of triplicate approximate 120 minute test runs for particulate matter at each source. Sampling and analysis was performed utilizing United States Environmental Protection Agency (USEPA) 40 CFR 60, Appendix A Reference Test Methods. The average results of the emissions test program are summarized by Table I.

Table I
Overall Emission Summary
Test Date: December 4-7th, 2017

Source Identification	Particulate Matter ($PM_{2.5}$) (lbs/hr)
DC-24 South Outlet	0.080
DC-24 North Outlet	0.094

1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by DTE Energy (DTE) to evaluate air pollutant emission rates at the DTE Monroe Power Plant (MONPP) facility located in Monroe, Michigan. The test program consisted of the evaluation of particulate matter emission rates from the two outlets associated with the Dumper House Dust Collector (DC-24) at the DTE Monroe Power Plant. Testing for this project was conducted on December 4-7, 2017. The DTE Monroe Power Plant emissions are regulated by State of Michigan Permit to Install No. MI-PTI-27-13B.

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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 December 4-7, 2017 at the DTE Monroe Power Plant in Monroe, MI. The test program included evaluation of $PM_{2.5}$ particulate matter emissions.

1.b Purpose of Testing

The DTE Monroe Power Plant emissions are regulated by State of Michigan Permit to Install No. MI-PTI-27-13B. Table 1 describes the emission limits of the Dumper House Dust Collection System.

Table 1
Emission Limits
DTE Monroe Power Plant
Monroe, Michigan

Facility	Pollutant	PM Emission Limit
Dumper House Dust Collect (DC-24)	$PM_{2.5}$	6.44 lbs/hr

1.c Source Description

Coal is delivered to the plant primarily by rail car, unloaded and transferred to fuel supply. There are various coal handling stages and emissions are controlled by dust collectors. The Dumper house is a coal receiving and conveying facility for the coal (fuel) handling system. Coal that is unloaded at the Dumper House travels on feeder belts to dumper conveyor C2. The Dumper House is equipped with a baghouse dust collector (DC-24) to maintain a safe operating environment for workers inside the Dumper House and to minimize fire or explosion hazards from accumulated dust. The baghouse dust collector removes dust that results from coal dumping operations inside the Dumper House. Normal operation of DC-24 allows for a differential pressure across the dust collector of 0-10 inches of water. The Dumper House dust collection system is capable of collecting air entrained with dust at a rate of 150,000 cubic feet per minute (cfm). The Dumper House dust collector (SV-DC24) has a two (2) - 63" diameter exhaust stacks.

1.d Test Program Contacts

The contact for the source and test report is:

Mr. Barry Boulianne
Senior Project Manager
BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, MI 48073
bboulianne@montrose-env.com
Office-(248)548-8072

Names and affiliations for personnel who were present during the testing program are summarized by Table 2.

Table 2
Test Personnel

Name and Title	Affiliation	Telephone
Mr. Andrew Dillon Senior Engineer	DTE Energy Monroe 3500 East Front Street Monroe, MI 48161	(734) 384-2312
Mr. Mason Sakshaug Field Technician	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070
Mr. Jake Zott Environmental Technician	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070

2. Summary of Results

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

2.a Operating Data

Operating data is included as Appendix E.

2.b Applicable Permit

The DTE Monroe Power Plant emissions are regulated by State of Michigan Permit to Install No. MI-PTI-27-13B.

2.c Results

See section 5a.

3. Source Description

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

3.a Process Description

Coal is delivered to the plant primarily by rail car, unloaded and transferred to fuel supply. There are various coal handling stages and emissions are controlled by dust collectors. The Dumper house is a coal receiving and conveying facility for the coal (fuel) handling system. Coal that is unloaded at the Dumper House travels on feeder belts to dumper conveyor C2. The Dumper House is equipped with a baghouse dust collector (DC-24) to maintain a safe operating environment for workers inside the Dumper House and to minimize fire or explosion hazards from accumulated dust. The baghouse dust collector removes dust that results from coal dumping operations inside the Dumper House. Normal operation of DC-24 allows for a differential pressure across the dust collector of 0-10 inches of water. The Dumper House dust collection system is capable of collecting air entrained with dust at a rate of 150,000 cubic feet per minute (cfm). The Dumper House dust collector (SV-DC24) has a two (2) - 63" diameter exhaust stacks.

3.b Process Flow Diagram

Due to the simplicity of the dust collector, a process flow diagram is not necessary.

3.c Raw and Finished Materials

The Monroe Power Plant produces electricity used throughout SE Michigan. The typical coal blend contains low-sulfur western (LSW) and mid-sulfur eastern (MSE).

3.d Process Capacity

The dust collector is designed to capture and collect particulate matter from the coal handling process and is rated to be greater than 99% efficient.

3.e Process Instrumentation

Process data monitored during the test is available in Appendix E.

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

Sampling and analysis procedures followed the methodologies specified by the following methods codified at 40 CFR 60, Appendix A:

- Method 1 - *"Sample and Velocity Traverses for Stationary Sources"* was used to determine the velocity traverse points
- Method 2 - *"Determination of Stack Gas Velocity and Volumetric Flowrate"* was used to determine exhaust gas velocity
- Method 3 - *"Gas Analysis for the Determination of Dry Molecular Weight" (Fyrite Procedure)* was used to determine exhaust gas molecular weight
- Method 4 - *"Determination of Moisture Content in Stack Gases"* was used to determine exhaust gas moisture content
- Method 201A- *"Determination of PM_{10} and $PM_{2.5}$ Emissions from Stationary Sources"* was used to determine particulate matter $PM_{2.5}$ concentrations and emission rates.

Stack gas velocity traverses were conducted in accordance with the procedures outlined in Method 1 and Method 2. S-type pitot tubes with thermocouple assemblies, calibrated in accordance with Method 2, Section 10, were used to measure exhaust gas velocity pressures (using a manometer) and temperatures during testing. Diagrams of the sample points are provided as Figures 1-2.

Cyclonic flow checks were performed at the exhaust stack. 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 angles is greater than 20 degrees, cyclonic flow exists. The null angle was determined to be less than 20 degrees at each sampling point.

Molecular weight was measured according to Method 3. 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.

40 CFR 51, Appendix M, Method 201A, *"Determination of PM_{10} and $PM_{2.5}$ Emissions From Stationary Sources"* was used to measure filterable particulate matter ($PM_{2.5}$) concentrations and emission rates (see Figure 3 for a schematic of the sampling train). Sampling consisted of triplicate approximate 120-minute test runs conducted on the South and North Exhausts of the Dumper House Dust Collector.

BTEC's Environmental Supply® modular isokinetic stack sampling system consisted of (1) a stainless-steel nozzle, (2) a stainless-steel $PM_{2.5}$ head, (3) an in stack stainless-steel filter housing with 47mm glass fiber filter, (4) a stainlesss steel probe, (5) a set of four Greenburg-Smith (GS) design impingers with the first two impingers filled with 100 ml of deionized water, a third empty impinger, and a fourth modified GS impinger containing approximately 300 g of silica gel desiccant, (6) a length of sample line, and (7) a Environmental Supply® control case equipped with a pump, dry gas meter, and calibrated orifice.

A sampling train leak test was conducted before and after each test run. After completion of the final leak test for each test run, the filter was recovered, and the nozzle, $PM_{2.5}$ head, 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, $PM_{2.5}$, greater than $PM_{2.5}$, 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 carried all samples to BTEC's laboratory (for filter and acetone gravimetric analysis) in Royal Oak, Michigan.

4.b Recovery and Analytical Procedures

See section 4.a.

4.c Sampling Ports

A diagram of the stack showing sampling ports in relation to upstream and downstream disturbances is included as Figures 1-2.

4.d Traverse Points

A diagram of the stack indicating traverse point locations and stack dimensions is included as Figures 1-2.

5. Test Results and Discussion

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

5.a Results Tabulation

The overall results of the emissions test program are summarized by Table 3. Detailed results for the emissions test program are summarized by Tables 4-5.

Table 3
Overall Emission Summary
Test Date: December 4-7, 2017

Source Identification	Particulate Matter ($PM_{2.5}$) (lbs/hr)
DC-24 South Outlet	0.080
DC-24 North Outlet	0.094

5.b Discussion of Results

The $PM_{2.5}$ concentration and emission rates are within the corresponding limits.

5.c Sampling Procedure Variations

The $PM_{2.5}$ results for runs 2 and 3 of the DC-24 South Exhaust and run 1 of the DC-24 North Exhaust were below the detectable limit of 0.5 mg. 0.5 mg was used in the reporting of data and is noted in the data tables.

Run 1 on the North Exhaust was paused when the coal supply was depleted and the process was shut down. Run 1 was resumed and completed the next day.

Method 202 was not used because the average stack temperature was below 80 degrees Fahrenheit.

5.d Process or Control Device Upsets

No upset conditions occurred during testing.

5.e Control Device Maintenance

There was no control equipment maintenance performed during the emissions test program.

5.f Re-Test

This 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 4
Particulate Matter Emission Rates

Company	**DTE Energy**			
Source Designation	**Dust Collector South**			
Test Date	**12/4/2017**	**12/4/2017**	**12/6/2017**	
Meter/Nozzle Information	P-1	P-2	P-3	Average
Meter Temperature Tm (F)	55.3	66.4	46.2	56.0
Meter Pressure - Pm (in. Hg)	29.6	29.6	29.3	29.5
Measured Sample Volume (Vm)	44.6	45.2	43.4	44.4
Sample Volume (Vm-Std ft3)	45.0	44.7	44.3	44.7
Sample Volume (Vm-Std m3)	1.28	1.27	1.25	1.27
Condensate Volume (Vw-std)	0.472	0.519	0.236	0.409
Gas Density (Ps(std) lbs/ft3) (wet)	0.0742	0.0742	0.0744	0.0743
Gas Density (Ps(std) lbs/ft3) (dry)	0.0745	0.0745	0.0745	0.0745
Total weight of sampled gas (m g lbs) (wet)	3.38	3.36	3.31	3.35
Total weight of sampled gas (m g lbs) (dry)	3.36	3.33	3.30	3.33
Nozzle Size - An (sq. ft.)	0.000161	0.000161	0.000161	0.000161
Isokinetic Variation - I	96.1	96.1	95.5	95.9
Stack Data				
Average Stack Temperature - Ts (F)	57.7	60.8	49.3	55.9
Molecular Weight Stack Gas- dry (Md)	28.8	28.8	28.8	28.8
Molecular Weight Stack Gas-wet (Ms)	28.7	28.7	28.8	28.7
Stack Gas Specific Gravity (Gs)	0.992	0.991	0.994	0.992
Percent Moisture (Bws)	1.04	1.15	0.53	0.90
Water Vapor Volume (fraction)	0.0104	0.0115	0.0053	0.0090
Pressure - Ps ("Hg)	29.5	29.5	29.3	29.4
Average Stack Velocity -Vs (ft/sec)	41.6	41.7	41.0	41.4
Area of Stack (ft2)	21.6	21.6	21.6	21.6
Exhaust Gas Flowrate				
Flowrate ft^3(Actual)	54,001	54,144	53,221	53,788
Flowrate ft^3 (Standard Wet)	54,308	54,121	54,022	54,150
Flowrate ft^3 (Standard Dry)	53,746	53,501	53,736	53,661
Flowrate m^3 (standard dry)	1,522	1,515	1,522	1,520
Total Particulate Weights (mg)				
Nozzle/Filter	0.5	*0.5*	*0.5*	0.5
Total Particulate Concentration				
lb/1000 lb (wet)	0.0003	0.0003	0.0003	0.0003
lb/1000 lb (dry)	0.0003	0.0003	0.0003	0.0003
mg/dscm (dry)	0.4	0.4	0.4	0.4
gr/dscf	0.0002	0.0002	0.0002	0.0002
Total Particulate Emission Rate				
lb/ hr	0.079	0.079	0.081	0.080

*Run 2 and 3 were below the reportable detection limit of 0.5 mg. 0.5 mg has been used for calculations.

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Table 5
Particulate Matter Emission Rates

Company	**DTE Monroe**			
Source Designation	**Dust Collector North**			
Test Date	**12/6-7/2017**	**12/7/2017**	**12/7/2017**	
Meter/Nozzle Information	P-1	P-2	P-3	Average
Meter Temperature Tm (F)	55.4	45.3	49.3	50.0
Meter Pressure - Pm (in. Hg)	29.4	29.5	29.5	29.4
Measured Sample Volume (Vm)	44.1	43.4	45.3	44.3
Sample Volume (Vm-Std ft3)	44.2	44.5	46.2	45.0
Sample Volume (Vm-Std m3)	1.25	1.26	1.31	1.27
Condensate Volume (Vw-std)	0.377	0.424	0.424	0.409
Gas Density (Ps(std) lbs/ft3) (wet)	0.0743	0.0743	0.0743	0.0743
Gas Density (Ps(std) lbs/ft3) (dry)	0.0745	0.0745	0.0745	0.0745
Total weight of sampled gas (m g lbs) (wet)	3.31	3.34	3.46	3.37
Total weight of sampled gas (m g lbs) (dry)	3.29	3.32	3.44	3.35
Nozzle Size - An (sq. ft.)	0.000161	0.000161	0.000161	0.000161
Isokinetic Variation - I	93.3	93.4	89.6	92.1
Stack Data				
Average Stack Temperature - Ts (F)	51.2	44.7	44.9	46.9
Molecular Weight Stack Gas- dry (Md)	28.8	28.8	28.8	28.8
Molecular Weight Stack Gas-wet (Ms)	28.7	28.7	28.7	28.7
Stack Gas Specific Gravity (Gs)	0.992	0.992	0.993	0.992
Percent Moisture (Bws)	0.85	0.94	0.91	0.90
Water Vapor Volume (fraction)	0.0085	0.0094	0.0091	0.0090
Pressure - Ps ("Hg)	29.3	29.4	29.4	29.4
Average Stack Velocity -Vs (ft/sec)	42.3	41.9	43.6	42.6
Area of Stack (ft2)	21.6	21.6	21.6	21.6
Exhaust Gas Flowrate				
Flowrate ft^3(Actual)	54,850	54,337	56,577	55,255
Flowrate ft^3 (Standard Wet)	55,478	55,876	58,151	56,502
Flowrate ft^3 (Standard Dry)	55,009	55,349	57,621	55,993
Flowrate m^3 (standard dry)	1,558	1,567	1,632	1,586
Total Particulate Weights (mg)				
Nozzle/Filter	*0.5*	0.6	0.6	0.6
Total Particulate Concentration				
lb/1000 lb (wet)	0.0003	0.0004	0.0004	0.0004
lb/1000 lb (dry)	0.0003	0.0004	0.0004	0.0004
mg/dscm (dry)	0.4	0.5	0.5	0.4
gr/dscf	0.0002	0.0002	0.0002	0.0002
Total Particulate Emission Rate				
lb/ hr	0.083	0.099	0.099	0.094

*Run 1 was below the reportable detection limit of 0.5 mg. 0.5 mg has been used for calculations.

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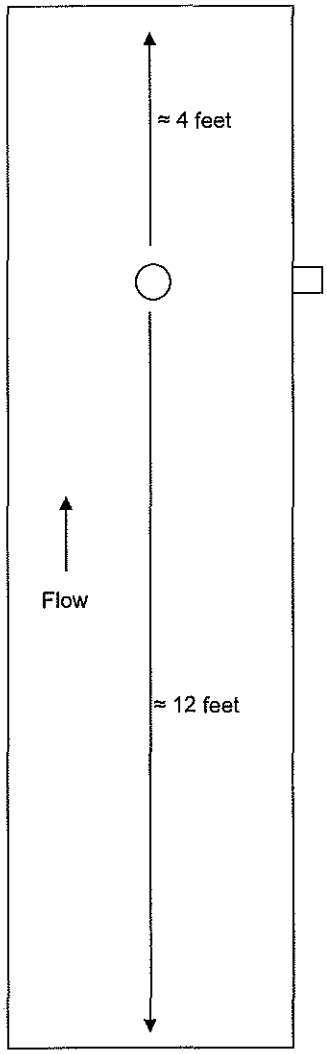
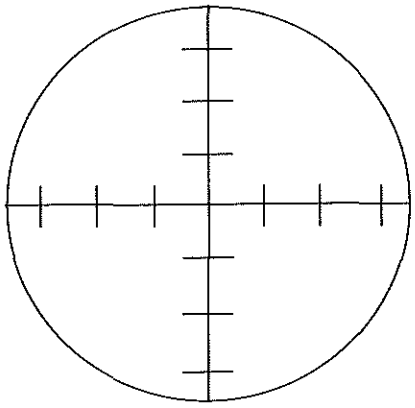
diameter = 63 inches





Not to Scale

Points	Distance "
1	2.8
2	9.2
3	18.6
4	44.4
5	53.8
6	60.2

Figure No. 1

Site: **Dust Collector South** **DTE Energy** **Monroe, Michigan**	**Sampling Date:** **December 4-7, 2017**	**BT Environmental Consulting, Inc.** **4949 Fernlee Avenue** **Royal Oak, Michigan 48073**

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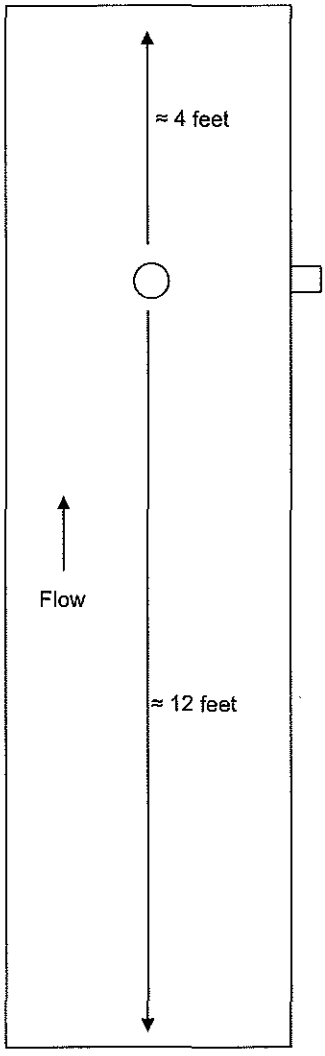
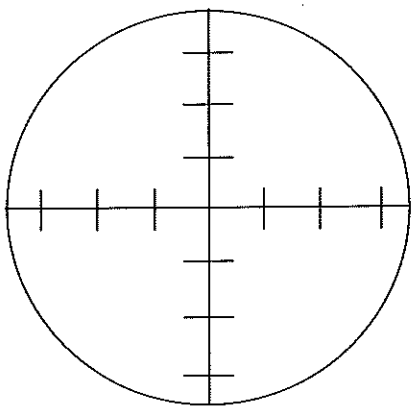
diameter = 63 inches





Not to Scale

Points	Distance "
1	2.8
2	9.2
3	18.6
4	44.4
5	53.8
6	60.2

Figure No. 2

Site: **Dust Collector North** **DTE Energy** **Monroe, Michigan**	**Sampling Date:** **December 4-7, 2017**	**BT Environmental Consulting, Inc.** **4949 Fernlee Avenue** **Royal Oak, Michigan 48073**

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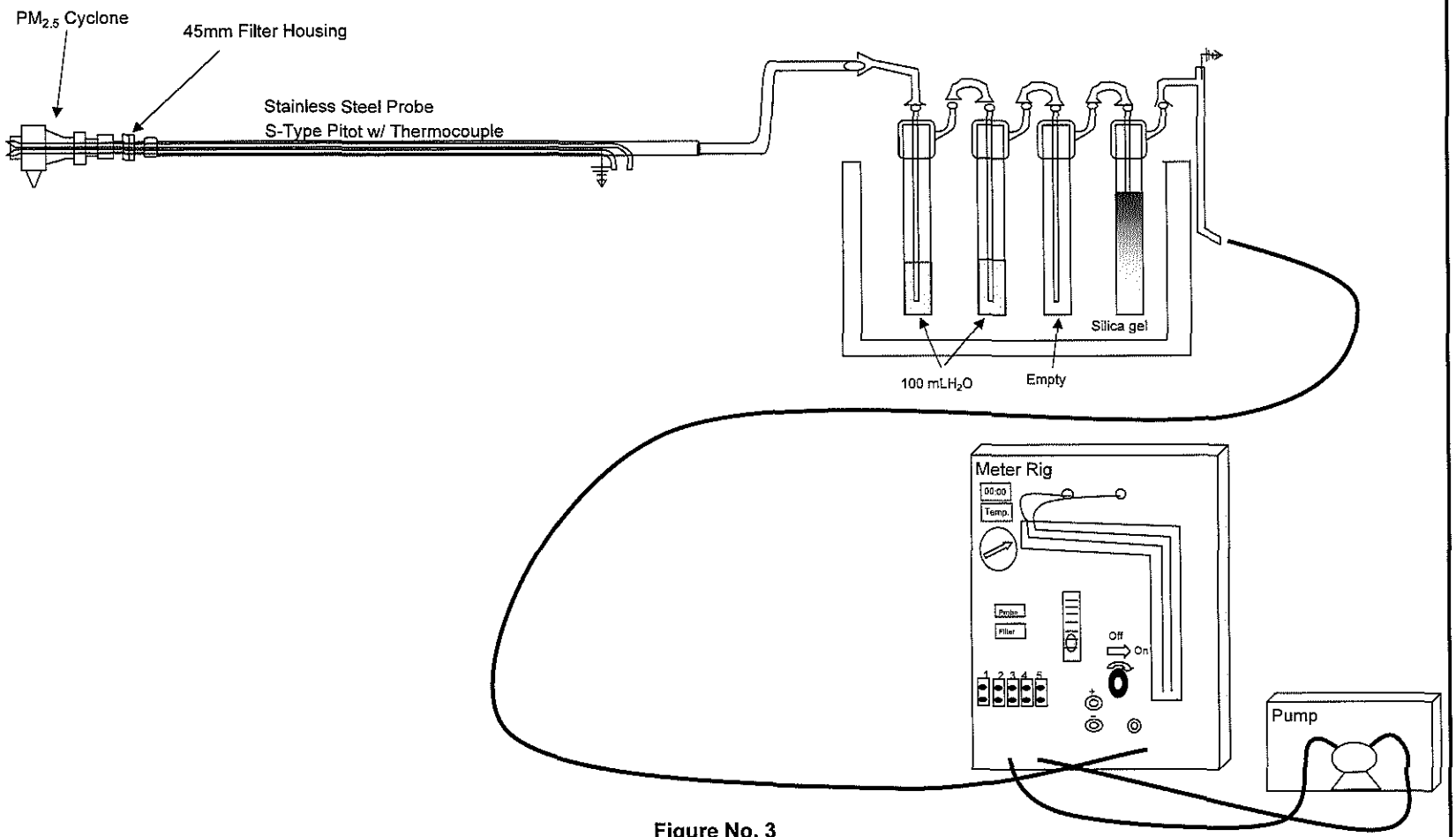

Figure No. 3

Site: **USEPA Method 201A** **DTE Energy** **Monroe, Michigan**	**Sampling Date:** **December 4-7, 2017**	**BT Environmental Consulting Inc.** **4949 Fernlee Avenue** **Royal Oak, Michigan 48073**