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Compliance Test Report
Non-methane Organic Compound Mass Emission Rate

City Sand and Landfill, Inc.
Belleville, Michigan
SRN: M4510

January 28, 2014

Prepared for:
Waste Management, Inc.
Closed Sites – Midcast
Heritage Office Park, West
3965 Okemos Road, Suite B4
Okemos, Michigan 48864

Prepared by:
Air Quality Specialist, Inc.
672 N. Milford Road, Suite 152
Highland, Michigan 48357
248.887.7565

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EXECUTIVE SUMMARY

Waste Management, Inc. retained Air Quality Specialist, Inc. (AQSI) to conduct non-methane organic compound (NMOC) tests at City Sand and Landfill, Inc. in Belleville, Michigan. The west utility flare (Flare No. 2) supplied vacuum to control landfill gas (LFG) emissions from City Sand and Landfill, Inc. during this test event (No. 3 of 3). The facility is a closed municipal solid waste (MSW) landfill.

The purpose of the test program is to demonstrate that NMOC produced by the landfill is less than 50 megagrams (Mg) per year, on three successive test dates. A successful demonstration will satisfy one of three criteria that will allow the facility to be relieved of NSPS monitoring and reporting requirements, pursuant to 60.752(b)(2)(v).

AQSI conducted the fieldwork on December 10, 2013, and in accordance with the Test Plan dated February 22, 2013. Mr. Andrew Secord and Mr. Andrew Karg conducted the tests. Mr. Brad Norton with Waste Management, Inc. provided on-site coordination of the tests with landfill operations. Michigan Department of Environmental Quality (MDEQ) did not elect to witness the test program. The results of this NMOC test event were:

Parameter	Applicable Requirement	Average Test Result
NMOC Mass Emission Rate	<50 Mg/yr [1]	4.8 Mg/yr

Mg/yr: megagrams per year

[1] 40 CFR 60.752(b)(2)(v)(C)

1.0 INTRODUCTION

Waste Management, Inc. retained Air Quality Specialist, Inc. (AQSI) to conduct non-methane organic compound (NMOC) tests at City Sand and Landfill, Inc. in Belleville, Michigan. The west utility flare (Flare No. 2) supplied vacuum to control landfill gas (LFG) emissions from City Sand and Landfill, Inc. during this test event (No. 3 of 3). The facility is a closed municipal solid waste (MSW) landfill.

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AQSI conducted the test program with methodologies outlined in 40 CFR 60.754(b).

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The name, address, and telephone number of the primary contact for further information about the tests and this test report is:

Name and Title	Company	Telephone/Fax
Mr. Andrew Secord Environmental Scientist	Air Quality Specialist, Inc. 672 N. Milford Road, Suite 152 Highland, Michigan 48357	(248) 887-7565 (248) 887-3913

The name, address, and telephone number of the primary contact for further information about the flare and associated operations is:

Name and Title	Company	Telephone
Mr. Kent Bainbridge Senior District Manager	Waste Management, Inc. Closed Sites – Mideast Heritage Office Park, West 3965 Okemos Road, Suite B4 Okemos, Michigan 48864	(517) 381-0211

2.0 SUMMARY OF RESULTS

On December 10, 2013, the west utility flare (Flare No. 2) at City Sand and Landfill, Inc. operated at an average inlet volumetric flow rate of approximately 419 standard cubic feet per minute (scfm) as measured by USEPA Methods 1 and 2, or 429 scfm as averaged from recorded process flow meter data. The average NMOC concentration obtained from the landfill gas header (before flare skid condensate knockout pot and blower) was 1,286 parts per million (ppm) as carbon, or 214 ppm, as hexane.

The average NMOC mass emission rate is calculated as 4.8 megagrams per year (Mg/yr), using the equation in 60.754(b). The limit is a NMOC mass emission rate of less than 50 Mg/yr per 60.752(b)(2)(v)(C). The test results demonstrate that the calculated NMOC gas produced by the closed landfill is less than 50 Mg/yr for this test event (No. 3 of 3).

3.0 SOURCE DESCRIPTION

City Sand and Landfill, Inc. is a closed municipal solid waste (MSW) landfill. Anaerobic bacteria decompose the emplaced waste. The primary by-products of decomposition are methane (~40 – 50 %, typical) and carbon dioxide (~20 – 30%, typical), with the remainder balance gases and nitrogen (30 – 35%, typical), oxygen (< 5%), and trace amounts of non-methane organic compounds.

City Sand and Landfill, Inc. employs a gas collection and control system to meet the requirements of Subpart WWW. Gas collection wells are installed in a grid pattern about the landfill. The wells are connected to a common header system. A blower produces a vacuum on the well field. Collected gas is routed to a third party owned and operated landfill-gas-to-energy (LFGTE) plant for landfill gas control. City Sand and Landfill, Inc. owns and operates two (2) utility flares (Nos. 1 and 2) as back-up control devices for use in the event that the LFGTE experiences prolonged downtime. The LFGTE plant was shutdown for this test event, and AQSI collected samples at the common landfill gas header inlet to Flare No. 2 (west flare). Flare No. 1 was not in operation.

Flare No. 2 is designed to meet the requirements of 60.752(b)(2)(iii)(A) at a flow rate up to 750 scfm. The landfill gas flow rate to the flare for this NMOC test event was expected to be approximately 400 to 500 scfm, based on the flow rate observed during the first and second NMOC test events conducted on April 2, 2013, and August 6, 2013, respectively. The tested flow rate on December 10, 2013 (~ 420 scfm) represents the current, normal maximum sustainable flow rate (per LFGTE plant operations data).

The landfill gas flow rate is variable, and depends on gas production in the landfill. The composition of the landfill gas varies over time, but the average Method 3C values obtained on December 10, 2013, may be considered 'typical:' methane, 44.5%; carbon dioxide, 22.7%; oxygen, 4.5%; and nitrogen, 31.5%.

4.0 SAMPLE AND ANALYTICAL PROCEDURES

AQSI conducted measurements in accordance with USEPA Reference Test Methods, as presented in 40 CFR 60, Appendix A. The sample collection and analytical methods used in the test program are listed in the table below.

Sample Method	Parameter	Analysis
USEPA Methods 1A & 2C	Stack Gas Velocity and Volumetric Flow Rate	Field Data
USEPA Method 3C	Carbon Dioxide, Methane, Nitrogen, Oxygen, and moisture fraction	Gas Chromatography / Thermal Conductivity Detector (GC/TCD)
USEPA Method 25C	Non-methane Organic Compound concentration	Gas Chromatography / Flame Ionization Detector (GC/FID)

4.1 Stack Gas Velocity and Volumetric Flow Rate (USEPA Methods 1A and 2C)

AQSI used Method 1A to determine the appropriate number and location of traverse points on the utility flare inlet duct. AQSI selected traverse points based on division of the stack cross-section into equal areas, and the number of upstream and downstream stack diameters from the sample ports to the nearest flow disturbance. Figure 1 depicts the flare traverse ports. Figure 2 depicts the flare inlet cross-section and traverse point locations.

AQSI used Method 2C to measure stack gas velocity pressure and temperature at each traverse point. AQSI positioned a standard pitot tube, with a baseline coefficient of 0.99, at each traverse point. The velocity pressure and temperature were measured and recorded. Velocity pressure measurements were read from a digital manometer with increments of 0.1 inches of water column. The raw field data, and computer-generated velocity and volumetric flow rate spreadsheets are presented in Appendix A.

The average stack gas velocity is a function of the average velocity pressure, absolute stack gas pressure, average stack gas temperature, stack gas wet molecular weight, and pitot tube coefficient. AQSI derived the average stack gas velocity from equations presented in Method 2. AQSI calculated the stack gas flow rate by multiplication of the stack gas velocity and the cross-sectional area of the stack.

AQSI used the measured inlet flow rate from each individual test to calculate the corresponding exhaust gas exit velocity for that test.

4.2 Determination of Carbon Dioxide, Methane, Nitrogen, and Oxygen from Stationary Sources (USEPA Method 3C) and Determination of Non-methane Organic Compounds in Landfill Gases (USEPA Method 25C)

AQSI used Methods 3C and 25C to determine landfill gas composition and NMOC concentration. AQSI collected three, 30-minute (minimum), integrated tank samples of landfill gas from the inlet to the utility flare (upstream of the condensate knockout pot and blower). Figure 3 depicts the NMOC sample location.

AQSI submitted the samples to Triangle Environmental Services, Inc. (TES), Durham, North Carolina for analysis. TES analyzed each tank for carbon dioxide, methane, nitrogen, oxygen, and NMOC concentration, and moisture fraction. Figure 4 depicts the Method 3C/25C sample train.

TES followed the analytical procedures of Method 3C by using a gas chromatograph (GC), with appropriate separation column for the expected parameters, equipped with a thermal conductivity detector (TCD) to measure carbon dioxide, methane, nitrogen, and oxygen concentrations. TES used a GC equipped with a flame ionization detector (FID) for NMOC analysis. The TES laboratory analytical report is presented in Appendix B.

AQSI used the Method 3C analytical results to calculate stack gas molecular weight (for use in stack gas velocity and volumetric flow rate calculations). TES used the Method 3C analytical results to oxygen-correct the raw NMOC concentration data.

AQSI calculated the dry molecular weight of the stack gas based on the assumption that the primary constituents were methane, carbon dioxide, nitrogen, and oxygen (other compounds present have a negligible relative concentration). The stack gas dry molecular weight is equal to the sum of stack gas constituent concentrations (%) multiplied by the corresponding molecular weight of that constituent.

TES calculated stack gas moisture content by Equation 3C-1 of Method 3C.

TES reported the NMOC concentration as carbon. AQSI converted the laboratory results to "as hexane" [$NMOC_{(hexane)}$] by dividing the raw NMOC concentration by six, pursuant to 60.754(b)(2). The individual $NMOC_{(hexane)}$ data from the three test runs was used in the equation from 60.754(b) to calculate NMOC mass emission rate from the landfill.

5.0 RESULTS AND DISCUSSION

The calculated NMOC mass emission rate from City Sand and Landfill, Inc. for the December 10, 2013 test event was 4.8 Mg/yr.

The results demonstrate that the calculated NMOC gas produced by the landfill is less than 50 Mg/yr for this test event (No. 3 of 3), and is in agreement with the prior two test events.

AQSI did not note any variations and/or anomalies in normal sample collection procedures.

AQSI did not note any control equipment upset conditions over the test period.

MDEQ did not elect to witness the test program. AQSI quality assurance (QA) procedures included:

1) Leak-check of the velocity measurement system (pitot tube through manometer)
2) Verification of sufficient evacuation of each Method 3C canister prior to initiation of each sample collection, and
3) Leak-check of the Method 3C/25C train prior to each sample collection

Raw field and computer-calculated data used in the determination of the utility flare velocity and volumetric flow rate, and recorded process flow meter data, are presented in Appendix A. The Method 3C/25C laboratory analytical results and chain-of-custody forms are presented in Appendix B. Sample calculations, including the determination of NMOC mass emission rate, are presented in Appendix C.

This report prepared by: _____
Andrew D. Secord
Environmental Scientist

This report reviewed by: _____
Dana A. Oleniacz
President

January 28, 2014

AQS Inc.

TABLE

Table 1

Non-methane Organic Compound Emission Rate Test Results
City Sand and Landfill, Inc.
Landfill Gas Header
Belleville, Michigan
December 10, 2013

Test No.	Molecular Weight	Concentration (ppmv)	Flow Rate (scfm)	Flow Rate (m^3/min)	Emission Rate (Mg/yr)
1	86.18	140	435.0	12.32	3.2
2	86.18	243	419.9	11.89	5.5
3	86.18	260	402.8	11.41	5.6
Averages:		**214**	**419.2**	**11.87**	**4.8**

ppmv: parts per million (volume), as hexane

scfm: standard cubic feet per minute

m^3/min: cubic meters per minute

Mg/yr: megagrams per year

Equations

m^3/min = scfm / (35.31 ft^3 / m^3)

Constant = 1.89×10^{-3} from 40 CFR 60, §60.754(b).

Mg/yr = 1.89×10^{-3} * m^3/min * ppm

AQS Inc.

FIGURES

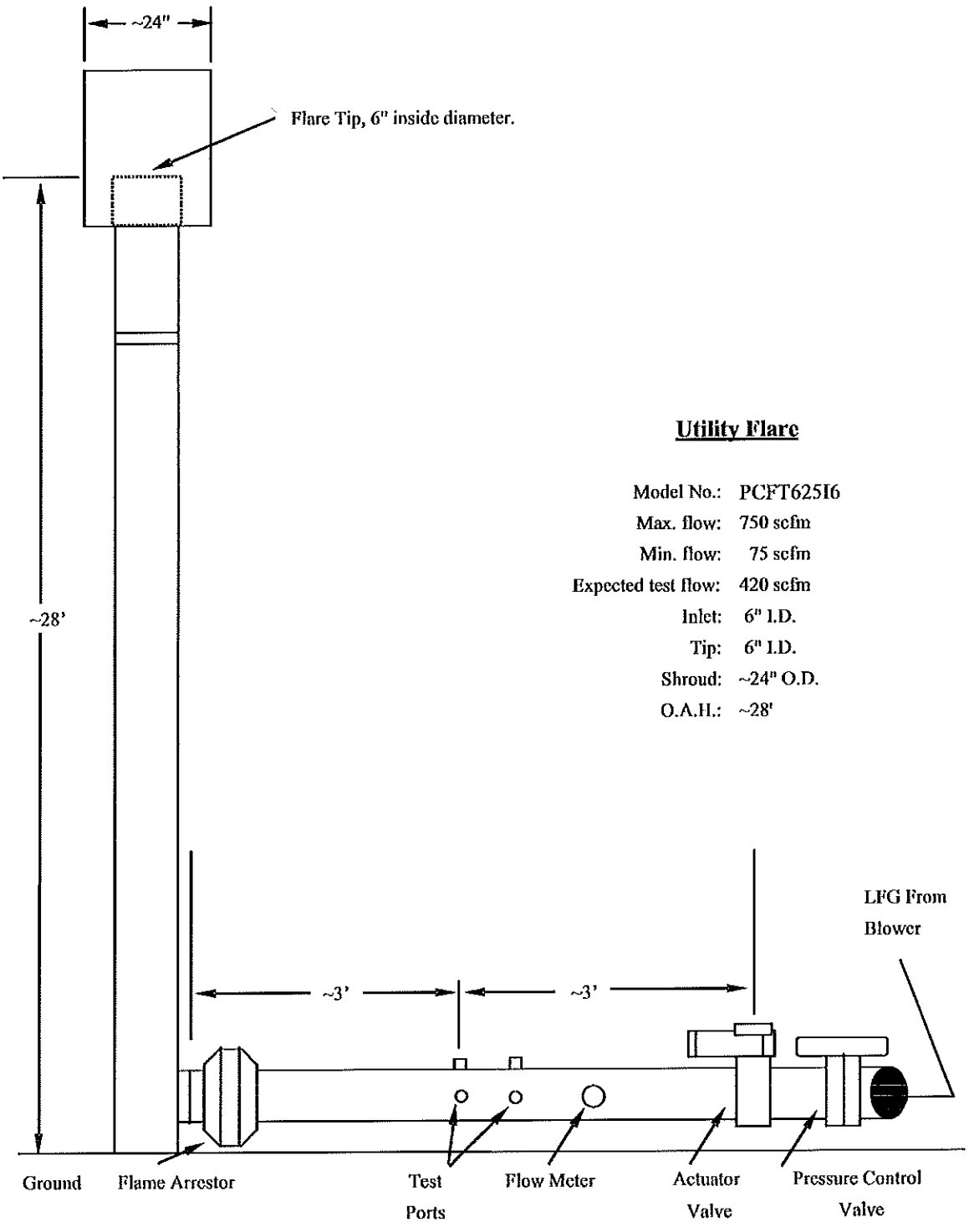
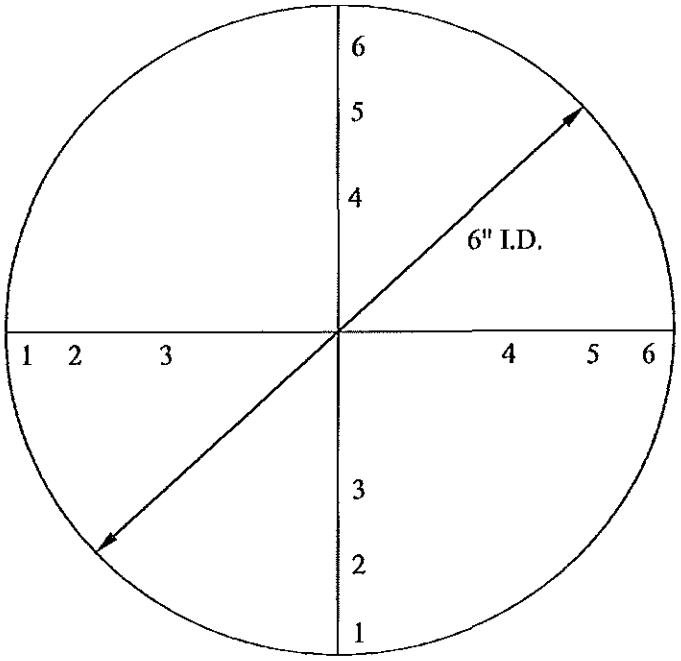


Figure 1
Flare No. 2 duct and stack arrangement, approximate dimensions, and, test port locations at City Sand and Landfill, Inc. in Belleville, Michigan.

Air Quality Specialist, Inc.
December 10, 2013



Traverse Point Number	Distance From Wall (inches)
1	0.50
2	0.88
3	1.78
4	4.22
5	5.12
6	5.50

Figure 2
Traverse point numbers and locations on the Flare No. 2 inlet at City Sand and Landfill, Inc. in Belleville, Michigan.

Air Quality Specialist, Inc.
December 10, 2013

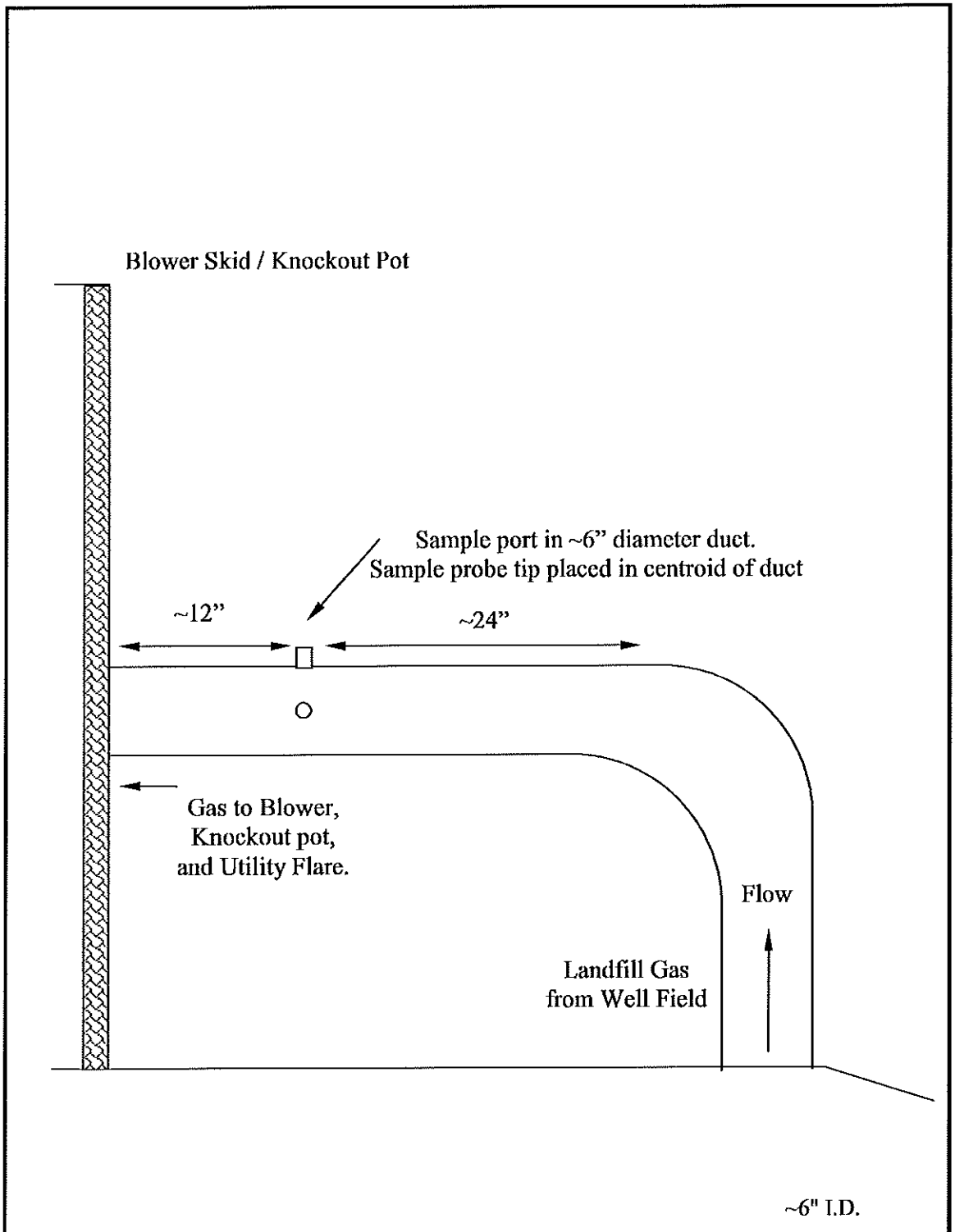


Figure 3
NMOC sample port and probe tip location, Flare No. 2 blower inlet at City Sand and Landfill, Inc. in Belleville, Michigan.

Air Quality Specialist, Inc.
December 10, 2013

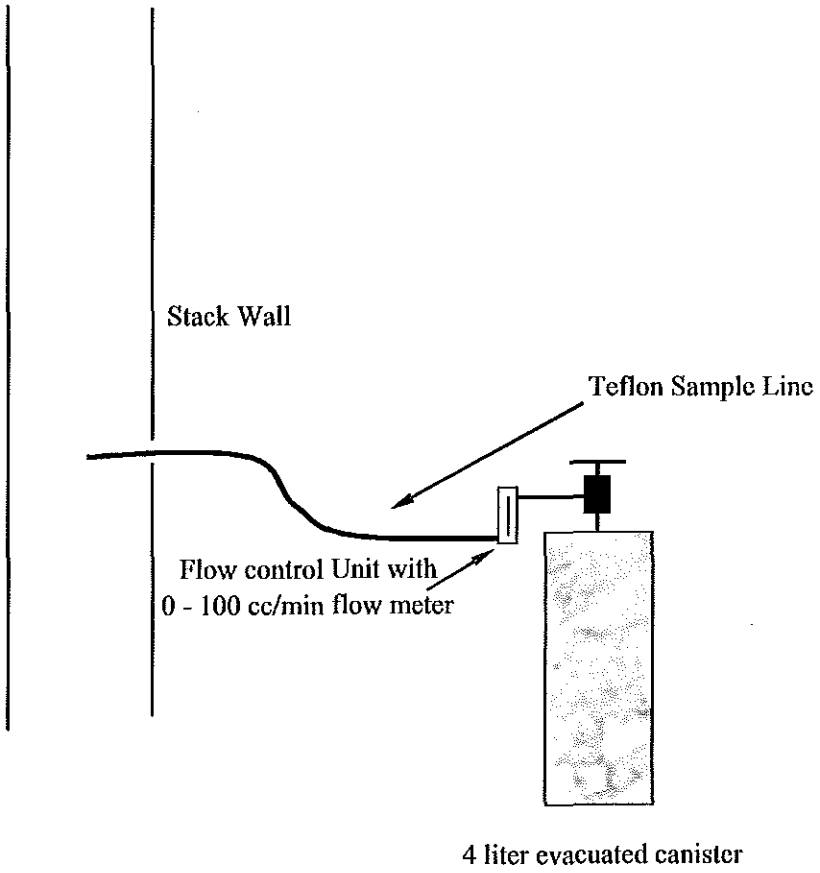


Figure 4
USEPA Method 3C sample train for the Flare No. 2 inlet duct at City Sand and Landfill, Inc. in Belleville, Michigan.

Air Quality Specialist, Inc.
December 10, 2013