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Pinellas County
ENVIRONMENT AND INFRASTRUCTURE
Solid Waste

RECEIVED
AUG 17 2012
DIVISION OF AIR
RESOURCE MANAGEMENT

August 13, 2012

Al Linero, P.E.
Office of Permitting and Compliance
Department of Environmental Protection
Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Project No. 1030117-009-AC
Pinellas County Resource Recovery Facility
PM $_{2.5}$ BACT Review

Dear Mr. Linero:

Enclosed please find one copy of the BACT Review for $PM_{2.5}$ for the Pinellas County Resource Recovery Facility in support of the above-referenced permit modification. I have included updated pages for the permit modification application package reflecting the addition of $PM_{2.5}$, along with the Professional Engineer Certification and Responsible Official Certification. In this package, I have also included the results of testing that was performed to screen for $PM_{2.5}$. Only the report text is included with the hard copy of this letter; however, the full report including appendices is included with the electronic transmittal.

Please contact me at (727) 464-7514 if the Department has any additional questions regarding this submittal.

Sincerely,

Kelsi Oswald

Kelsi Oswald
WTE Program Manager, Division of Solid Waste
Department of Environment and Infrastructure

APPLICATION INFORMATION

Professional Engineer Certification

1. Professional Engineer Name: Christopher C. Tilman, P.E.
Registration Number: 61903

2. Professional Engineer Mailing Address.
Organization/Firm: Malcolm Pirnie, the Water Division of ARCADIS
Street Address: 14025 Riveredge Drive, Suite 600
City: Tampa State: FL Zip Code: 33637

3. Professional Engineer Telephone Numbers...
Telephone: (239) 738-3303 ext. Fax: (239) 275-2127

4. Professional Engineer E-mail Address: christopher.tilman@arcadis-us.com

5. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this application for air permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

(3) If the purpose of this application is to obtain a Title V air operation permit (check here ☐*, if so), I further certify that each emissions unit described in this application for air permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance plan and schedule is submitted with this application.*

(4) If the purpose of this application is to obtain an air construction permit (check here ☐*, if so) or concurrently process and obtain an air construction permit and a Title V air operation permit revision or renewal for one or more proposed new or modified emissions units (check here* ☐*, if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.*

(5) If the purpose of this application is to obtain an initial air operation permit or operation permit revision or renewal for one or more newly constructed or modified emissions units (check here , if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

61903 8-10-12

Signature
(seal)

8-10-12
Date

* Attach any exception to certification statement.

Pinellas County Resource Recovery Facility **Title V Permit No: 1030117-008-AV**

Facility Location:
3001 - 110th Avenue North
St. Petersburg, FL 33716
Pinellas County

Mailing Address:
David Scott, Executive Director
Pinellas County Dept. of Env and Infrastucture
14 South Fort Harrison Avenue, 5th Floor
Clearwater, FL 33756

Attached Document(s): PM 2.5 BACT Analysis

RESPONSIBLE OFFICIAL CERTIFICATION

I, the undersigned, am the responsible official as defined in Chapter 62-213, F.A.C., of the Title V source for which this document is being submitted. I hereby certify, based on the information and belief formed after reasonable inquiry, that the statements made and data contained in this document are true, accurate, and complete.

Robert Hauser	August 13, 2012
Signature	Date
Robert Hauser	Director, Solid Waste Division
Name	Title

BACT Review for $PM_{2.5}$
for the
Pinellas County Resource Recovery Facility

August 10, 2012

At the request of the Florida Department of Environmental Protection (FDEP), Pinellas County (County) prepared this BACT analysis concerning the $PM_{2.5}$ emissions from the Pinellas County Resource Recovery Facility (PCRRF). This BACT analysis supplements the modeling reports and other information that already has been submitted to the FDEP in support of the County's application for a PSD permit modification for the PCRRF.

Non-precursor Emissions

Electrostatic precipitators (ESPs) and baghouses (Fabric Filters-FF) are the most widely used control systems for reducing particulate matter emissions from municipal waste combustor (MWC) units. In the United States, wet scrubbers have been used for the reduction of particulate and sulfur dioxide emissions from coal-fired boilers, but wet scrubbers have rarely been used for particulate matter control on MWC facilities. Wet scrubbers normally are not used at MWC facilities because of the problems associated with wet sludge and wastewater discharges, high energy requirements, and the total system costs for wet scrubbers, especially as a retrofit technology. At most modern MWC facilities, ESPs or FFs are used to control particulate matter because ESPs and FFs are the most effective types of control that have been demonstrated to operate reliably on MWC facilities.

FFs have an advantage over ESPs at those MWC facilities that use a spray dryer/absorber (SDA) to control acid gas emissions. With a FF/SDA system, the filter cake builds up on the fabric bags, thus providing reaction sites for acid gas removal and enhanced particulate recovery. The removal of SO_2 and other sulfur species reduces the subsequent downwind formation of $PM_{2.5}$.

It has been demonstrated repeatedly in individual applications for MWC units, and it was officially acknowledged by the U.S. Environmental Protection Agency

(USEPA) when USEPA promulgated the 2006 MACT standards for new and existing MWC units (70 FR 75351, 2005), that a SDA combined with a FF provides the highest level of consistent control for the emissions of particulate matter (including $PM_{2.5}$) from a modern MWC facility. In this case, the PCRRF already is equipped with a SDA/FF system for the control of PM and $PM_{2.5}$ emissions.

Precursor Emissions

The PCRRF may emit gaseous compounds that are precursors to the formation of $PM_{2.5}$. The primary gaseous precursor compounds potentially emitted in a significant amount by the PCRRF by the requested PSD modification are oxidized sulfur species, predominately SO_2. These gaseous precursor compounds have the ability to eventually react downwind of the PCRRF and form fine particulate matter, including $PM_{2.5}$.

A BACT analysis for SO_2 was submitted to the FDEP with the County's application for a PSD permit modification on December 7, 2011. The BACT analysis concluded that an SO_2 emission limit of 24 ppmdv @ 7% O_2, based on a 24 hour geometric mean, represents BACT for the PCRRF. The proposed BACT limit for SO_2 should minimize the potential for $PM_{2.5}$ to be generated from the PCRRF's SO_2 emissions.

Please note that the proposed BACT limit of 24 ppmdv is lower than the current PSD permit limit of 29 ppmdv. Consequently, if the proposed BACT limit for SO_2 is adopted in the PSD permit modification, the potential for $PM_{2.5}$ to be created from the PCRRF's emissions of SO_2 will be less than it is now.

Selection of BACT for $PM_{2.5}$

Unfortunately, there is very little data available concerning the $PM_{2.5}$ emissions from MWC facilities. None of the existing MWC facilities have permit limits for $PM_{2.5}$. The only proposed emission limit for $PM_{2.5}$ is contained in a draft permit (dated May 8, 2012) for the Arecibo Puerto Rico Renewable Energy Project (Arecibo). The proposed Arecibo facility will be comprised of two MWC units, which will burn refuse-derived fuel at a maximum design rate of 2106 tons per day. The proposed $PM_{2.5}$ emission limit for Arecibo is 90 tons per year, which is equivalent to 22 mg/dscm @ 7 % O_2. Compliance with the proposed emission limit will be determined by using the average of three test runs, according to Section X.A.8. of the draft permit.

In the draft permit for the Arecibo facility, EPA candidly acknowledges that the proposed $PM_{2.5}$ emission limit may need to be raised after stack test data are collected for the Arecibo facility, because EPA does not have sufficient data at this time to determine an appropriate emission limit. Section X.A.8.d.i of the draft permit for Arecibo provides:

> d. Special PM2.5 Emission Limit Provisions.
> i. Because condensable PM2.5 emissions from municipal waste combustors have not been widely quantified, there is a possibility that the actual condensable portion of PM2.5 would cause the above emission limits to be exceeded. In the event that the Permittee cannot meet the 22 mg/dscm @ 7% O2 because of the condensable PM2.5, EPA may adjust the PM2.5 emissions to a level not to exceed 30 mg/dscm @7% O2, 15.28 lb/hr, and 61 TPY *(per unit)* based on EPA's review of the stack test results. This change in the permit will be accomplished administratively.

Please note that the $PM_{2.5}$ emission limit for Arecibo is proposed for a new MWC facility, not an existing MWC facility, like the PCRRF. Also note that the $PM_{2.5}$ emission limit for Arecibo is based on vendor estimates, rather than stack test data.

Pinellas County has performed some preliminary testing of the $PM_{2.5}$ emissions from two of the MWC units at the PCRRF. The test report is attached hereto. During the stack testing, Unit 1 was equipped with 10 ounce fiberglass bags with an EPTFE membrane and Unit 3 was equipped with standard 10 ounce fiberglass bags. Although the testing was very limited, the testing suggests that the PCRRF's emissions were not significantly affected by the type of bags used. The test results may be summarized as follows:

$PM_{2.5}$ Stack Test Results

	mg/dscm@7%O_2	*lb/hr*
Unit 1		
Filterable <2.5	6.75	2.95
Condensible <2.5	15.30	6.69
Total	**22.05**	**9.64**
Unit 3		
Filterable <2.5	6.35	2.58
Condensible <2.5	13.75	5.59
Total	**20.10**	**8.17**
Average	21.08	8.91

These test results demonstrate that EPA's proposed emission limit for the new boilers at the Arecibo facility is not appropriate for the existing boilers at the PCRRF. The measured $PM_{2.5}$ emissions from PCRRF Boiler 1 were 22.05 mg/dscm, which exceeds the proposed Arecibo limit of 22 mg/dscm. The test results suggest that PCRRF Boiler 1 will violate the Arecibo limit.

The County recognizes that the PCRRF's test results will be averaged when determining whether the PCRRF is in compliance with the $PM_{2.5}$ emission limit. Nonetheless, the County and FDEP do not have sufficient data at this time to demonstrate that the $PM_{2.5}$ emissions from the PCRRF boilers will comply with the proposed Arecibo emission limit, regardless of how the test results are averaged.

It must be emphasized that there are only two data points concerning the $PM_{2.5}$ emissions from the PCRRF. Consequently, we cannot perform a statistical analysis or otherwise account for the normal variability that would be expected in the PCRRF's operations and emissions. The $PM_{2.5}$ emission limit for the PCRRF should not be set at a level that is so low it apparently cannot be met by one of the PCRRF boilers, especially when the proposed limit has not been demonstrated to provide a margin of safety to account for the facility's normal variability.

Pinellas also investigated the effect of 2 different testing temperatures on the filterable PM_{10} levels. This testing demonstrated that the cooler temperature resulted in higher PM_{10} levels, primarily in the probe wash. When this data was compared to the $PM_{2.5}$ levels measured during the same sampling event (but not concurrently) the $PM_{2.5}$ levels were 1.3 to 1.6 times higher than the PM_{10} levels.

	Unit	PM_{10}	$PM_{2.5}$	Ratio
April 2012	1	17.5	22.05	1.3
	2	16.9		
	3	12.7	20.1	1.6

Given the extremely limited data set for the PCRRF, it would be prudent to use a safety factor when establishing the proposed permit limit for the PCRRF. Accordingly, the proposed BACT emission limit for $PM_{2.5}$ emissions from the PCRRF is 30 mg/dscm @ 7% O_2 (approximately 1.42 times the average $PM_{2.5}$ measured during the stack test) subject to the same condition for an administrative change that was proposed by EPA for Arecibo:

> Special $PM_{2.5}$ Emission Limit Provisions.
> Because condensable $PM_{2.5}$ emissions from municipal waste combustors have not been widely quantified, there is a possibility that the actual condensable portion of $PM_{2.5}$ will cause the above emission limit for $PM_{2.5}$ to be exceeded. In the event that the Permittee cannot meet the emission limit of 30 mg/dscm @ 7% O_2 because of the condensable $PM_{2.5}$, FDEP will increase the emission limit for $PM_{2.5}$ to a level not to exceed 35 mg/dscm @7% O_2, based on FDEP's review of the stack test results. This change in the permit will be accomplished administratively.

The proposed limit of 30 mg/dscm is consistent with the manufacturer's performance representation for a new baghouse as provided in the Arecibo BACT analysis. In addition, the PCRRF uses a shaker type baghouse that is not as comparable to the newer reverse air type proposed for Arecibo. The 35 mg/dscm level is approximately 1.66 times the measured level of $PM_{2.5}$ during the April 2012 stack tests.

FACILITY INFORMATION

List of Pollutants Emitted by Facility

1. Pollutant Emitted	2. Pollutant Classification	3. Emissions Cap [Y or N]?
PM10	A – Major pollutant	
$PM_{2.5}$	A – Major pollutant	
NO_x	A – Major pollutant	
CO	A – Major pollutant	
PM	A – Major pollutant	
SO_2	A – Major pollutant	
FL	B – Facility-regulated pollutant, not major or synthetic	
D/F	B – Facility-regulated pollutant, not major or synthetic	
H027	B – Facility-regulated pollutant, not major or synthetic	
H106	B – Facility-regulated pollutant, not major or synthetic	
H114	B – Facility-regulated pollutant, not major or synthetic	
VOC	B – Facility-regulated pollutant, not major or synthetic	
PB	B – Facility-regulated pollutant, not major or synthetic	

E. EMISSIONS UNIT POLLUTANTS

List of Pollutants Emitted by Emissions Unit

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
CO			
D/F			
H027 (Cadmium compounds)	**016**		
H106 (Hydrogen Chloride)	**041**	**016**	
H114 (Mercury)	**048**	**016**	
HAPS			
NO_x	**107**		
PB	**016**		
PM	**016**		
PM10	**016**		
$PM_{2.5}$	**016**		
SO_x	**041**	**016**	
VOC			

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

<u>Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions</u>

1. Pollutant Emitted: $PM_{2.5}$ – Particulate Matter	2. Total Percent Efficiency of Control:
3. Potential Emissions: 15.71 lb./hour 68.8 tons/year	4. Synthetically Limited? ☐ Yes ☑ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: 30 mg/dscm @ 7% O_2 Reference: BACT	7. Emissions Method Code:
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: $\frac{30\ \text{mg}}{\text{dscm}} * \frac{139{,}792\ \text{dscf @ } 7\%\ O_2}{\text{min}} * \frac{1\ \text{m}^3}{35.3147\ \text{ft}^3} * \frac{1\text{g}}{1000\text{mg}} * \frac{1\ \text{lb.}}{453.59\text{g}} * \frac{60\ \text{min}}{\text{hr}} = 15.71\ \text{lb./hr}$ $\frac{15.71\ \text{lb}}{\text{hr}} * \frac{1\ \text{ton}}{2{,}000\ \text{lb.}} * \frac{8{,}760\ \text{hr}}{\text{yr}} = 68.8\ \text{tons/yr}$	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: Rule	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units: 30 mg/dscm @ 7% O_2	4. Equivalent Allowable Emissions: 15.71 lb/hour 68.8 tons/year
5. Method of Compliance: Stack Test (PM)	
6. Allowable Emissions Comment (Description of Operating Method): BACT	

Allowable Emissions Allowable Emissions __ of __

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions __ of __

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

E. EMISSIONS UNIT POLLUTANTS

List of Pollutants Emitted by Emissions Unit

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
CO			
D/F			
H027 (Cadmium compounds)	**016**		
H106 (Hydrogen Chloride)	**041**	**016**	
H114 (Mercury)	**048**	**016**	
HAPS			
NO_x	**107**		
PB	**016**		
PM	**016**		
PM10	**016**		
$PM_{2.5}$	**016**		
SO_x	**041**	**016**	
VOC			

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: $PM_{2.5}$ – Particulate Matter
2. Total Percent Efficiency of Control:
3. Potential Emissions: 15.71 lb./hour 68.8 tons/year
4. Synthetically Limited? ☐ Yes ☑ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year
6. Emission Factor: 30 mg/dscm @ 7% O_2
   Reference: BACT
7. Emissions Method Code:

8.a. Baseline Actual Emissions (if required): tons/year

8.b. Baseline 24-month Period: From: To:

9.a. Projected Actual Emissions (if required): tons/year

9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years

10. Calculation of Emissions:

$$\frac{30\ \text{mg}}{\text{dscm}} * \frac{139{,}792\ \text{dscf @ 7\% }O_2}{\text{min}} * \frac{1\ \text{m}^3}{35.3147\ \text{ft}^3} * \frac{1\text{g}}{1000\text{mg}} * \frac{1\ \text{lb.}}{453.59\text{g}} * \frac{60\ \text{min}}{\text{hr}} = 15.71\ \text{lb./hr}$$

$$\frac{15.71\ \text{lb}}{\text{hr}} * \frac{1\ \text{ton}}{2{,}000\ \text{lb.}} * \frac{8{,}760\ \text{hr}}{\text{yr}} = 68.8\ \text{tons/yr}$$

11. Potential, Fugitive, and Actual Emissions Comment:

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

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5. Method of Compliance: Stack Test (PM)	
6. Allowable Emissions Comment (Description of Operating Method): BACT	

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3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions __ of ___

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

E. EMISSIONS UNIT POLLUTANTS

List of Pollutants Emitted by Emissions Unit

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
CO			
D/F			
H027 (Cadmium compounds)	**016**		
H106 (Hydrogen Chloride)	**041**	**016**	
H114 (Mercury)	**048**	**016**	
HAPS			
NO_x	**107**		
PB	**016**		
PM	**016**		
PM10	**016**		
$PM_{2.5}$	**016**		
SO_x	**041**	**016**	
VOC			

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

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5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: 30 mg/dscm @ 7% O_2 Reference: BACT	7. Emissions Method Code:
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years

10. Calculation of Emissions:

$$\frac{30\ \text{mg}}{\text{dscm}} * \frac{139{,}792\ \text{dscf @ 7\% } O_2}{\text{min}} * \frac{1\ \text{m}^3}{35.3147\ \text{ft}^3} * \frac{1\text{g}}{1000\text{mg}} * \frac{1\ \text{lb.}}{453.59\text{g}} * \frac{60\ \text{min}}{\text{hr}} = 15.71\ \text{lb./hr}$$

$$\frac{15.71\ \text{lb}}{\text{hr}} * \frac{1\ \text{ton}}{2{,}000\ \text{lb.}} * \frac{8{,}760\ \text{hr}}{\text{yr}} = 68.8\ \text{tons/yr}$$

11. Potential, Fugitive, and Actual Emissions Comment:

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: Rule	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units: 30 mg/dscm @ 7% O_2	4. Equivalent Allowable Emissions: 15.71 lb/hour 68.8 tons/year
5. Method of Compliance: Stack Test (PM)	
6. Allowable Emissions Comment (Description of Operating Method): BACT	

Allowable Emissions Allowable Emissions __ of ___

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions __ of ___

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

The Air Compliance Group, LLC

5075 Hollins Road
Roanoke, VA 24019
Phone: (540) 265-1987
Fax: (540) 265-0082

Engineering Air Emissions Test Report For $PM_{2.5}$ Testing Conducted on Units 1 and 3 at Pinellas County Resource Recovery Facility in St. Petersburg, Florida

Facility ID No. 1030117

Prepared for
Veolia ES Pinellas, Inc.
St. Petersburg, Florida

Test Dates: April 14 and 23, 2012

Report Date: July 10, 2012

ACG Contract Number V12934

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1.0 Introduction

1.1 Background

An engineering air emissions test program was conducted for Veolia ES Pinellas, Inc. (Veolia) at the Pinellas County Resource Recovery Facility (PCRRF) in St. Petersburg, Florida. The plant is owned by Pinellas County and operated by Veolia. The plant consists of three municipal waste combustor units, designated Unit 1, Unit 2, and Unit 3. The test program was conducted April 14 and 23, 2012 by The Air Compliance Group, LLC (ACG) of Roanoke, Virginia. The following personnel participated in the test program:

Name	Affiliation	Test Program Position
Rebecca Macionski	Veolia	Overall Program Manager
Kenley Houtz	ACG	Project Manager
Tony Underwood	ACG	Project Manager
Michael Wilson	ACG	Field Technician
Mike Henry	ACG	Field Technician

1.2 Objective

The objective of the test program was to perform particulate matter (PM) emissions tests for PM less than 2.5 microns in diameter ($PM_{2.5}$), including both filterable and condensable PM. The data are to be used by the facility for engineering purposes.

1.3 Test Program

One EPA Method 201A/202 test run of approximately 120-minutes in length was performed on each of Units 1 and 3. The testing was conducted at each exhaust duct prior to entering the common stack. Each test included measurements for average gas temperature, moisture content, molecular weight, gas velocity and volumetric flow rate.

2.0 Summary of Results

Table 1 summarizes the results for Unit 1. Table 2 summarizes the results for Unit 3. Additional data are contained in Appendix B. The raw field data is found in Appendix D.

3.0 Field Test Changes and Problems

No significant problems were encountered during the tests. A test protocol was not developed for the test program.

4.0 Process Description

PCRRF consists of three 1,050 tons per day (nominal based 52-week rolling average) municipal waste fired combustors. Each combustor consists of a Riley Stoker water wall boiler with a reciprocating grate stoker system. Each combustor is equipped with a spray dryer absorber (SDA), a fabric filter (FF), a Selective Non-Catalytic Reduction (SNCR) NOx control system, and a powdered activated carbon injection system (PACIS) supplied by Wheelabrator Air Pollution Control, Inc. Combustion gases exit the boiler economizer and pass through the SDA and FF, then to an induced draft fan prior to entering separate flues in a common stack.

Figure 1 (see Appendix A) presents a general flow arrangement of the process. Figure 2 (see Appendix A) depicts a cross-section of the FF Outlet test locations. The test locations meet EPA Methods 1 and 2 minimum criteria for upstream (2.0) and downstream (0.5) dimensions.

TABLE 1

SUMMARY OF METHOD 201A/202 TESTING
VEOLIA PINELLAS
UNIT 1 EXHAUST

RUN I.D.	**U1O-M201A/202-R1**
DATE	04/23/12
TIME STARTED	12:45
TIME ENDED	14:43
SAMPLING PARAMETERS	
Metered Volume (dcf)	37.538
Corrected Volume (dscf)	36.189
Corrected Volume (dscm)	1.025
Total Test Time (min)	118.3
% Isokinetics	97.3
GAS PARAMETERS	
Gas Temperature (deg F)	301
Oxygen (%)	9.2
Carbon Dioxide (%)	10.8
Moisture (%)	19.3
GAS FLOWRATE	
Velocity (ft/sec)	44.24
Actual Volume (acfm)	255506
Standard Volume (dscfm)	138675
FILTERABLE $PM_{2.5}$ EMISSIONS	
Concentration (gr/dscf)	0.0025
Concentration (gr/dscf @ 7%O2)	0.0029
Concentration (mg/dscm)	5.68
Concentration (mg/dscm @ 7%O2)	6.75
Mass Rate (lb/hr)	2.95
FILTERABLE PM>2.5 µ EMISSIONS	
Concentration (gr/dscf)	0.0038
Concentration (gr/dscf @ 7%O2)	0.0045
Concentration (mg/dscm)	8.59
Concentration (mg/dscm @ 7%O2)	10.20
Mass Rate (lb/hr)	4.46
TOTAL FILTERABLE PM	
Concentration (gr/dscf)	0.0062
Concentration (gr/dscf @ 7%O2)	0.0074
Concentration (mg/dscm)	14.27
Concentration (mg/dscm @ 7%O2)	16.95
Mass Rate (lb/hr)	7.41
CONDENSABLE PM (< 2.5 µ EMISSIONS)	
Concentration (gr/dscf)	0.0056
Concentration (gr/dscf @ 7%O2)	0.0067
Concentration (mg/dscm)	12.88
Concentration (mg/dscm @ 7%O2)	15.3029
Mass Rate (lb/hr)	6.69

TABLE 2

SUMMARY OF METHOD 201A/202 TESTING
VEOLIA PINELLAS
UNIT 3 EXHAUST

RUN I.D.	**U3O-M201A/202-R1**
DATE	04/14/12
TIME STARTED	9:45
TIME ENDED	11:42
SAMPLING PARAMETERS	
Metered Volume (dcf)	38.149
Corrected Volume (dscf)	37.521
Corrected Volume (dscm)	1.062
Total Test Time (min)	115.5
% Isokinetics	102.1
GAS PARAMETERS	
Gas Temperature (deg F)	302
Oxygen (%)	10.2
Carbon Dioxide (%)	8.9
Moisture (%)	17.1
GAS FLOWRATE	
Velocity (ft/sec)	43.32
Actual Volume (acfm)	250178
Standard Volume (dscfm)	140429
FILTERABLE $PM_{2.5}$ EMISSIONS	
Concentration (gr/dscf)	0.0021
Concentration (gr/dscf @ 7%O2)	0.0028
Concentration (mg/dscm)	4.91
Concentration (mg/dscm @ 7%O2)	6.35
Mass Rate (lb/hr)	2.58
FILTERABLE PM>2.5 µ EMISSIONS	
Concentration (gr/dscf)	0.0026
Concentration (gr/dscf @ 7%O2)	0.0033
Concentration (mg/dscm)	5.93
Concentration (mg/dscm @ 7%O2)	7.67
Mass Rate (lb/hr)	3.12
TOTAL FILTERABLE PM	
Concentration (gr/dscf)	0.0047
Concentration (gr/dscf @ 7%O2)	0.0061
Concentration (mg/dscm)	10.84
Concentration (mg/dscm @ 7%O2)	14.02
Mass Rate (lb/hr)	5.70
CONDENSABLE PM (< 2.5 µ EMISSIONS)	
Concentration (gr/dscf)	0.0046
Concentration (gr/dscf @ 7%O2)	0.0060
Concentration (mg/dscm)	10.64
Concentration (mg/dscm @ 7%O2)	13.7521
Mass Rate (lb/hr)	5.59

5.0 Sampling and Analytical Procedures

All sampling and analytical procedures followed those recommended by the U.S. Environmental Protection Agency (EPA), Title 40, Part 60, Appendix A of the *Code of Federal Regulations* (40 CFR 60). The following specific methods were used:

- EPA Method 1 for sampling and traverse points determination;
- EPA Method 2 for flow determination;
- EPA Method 3 (sampling procedure) and 3A (analytical procedure) for determining flue gas composition and molecular weight;
- EPA Method 4 for determining moisture content;
- EPA Method 201A for determining filterable particulate emissions; and
- EPA Method 202 for determining condensable particulate emissions.

5.1 Sampling Procedures

5.1.1 Particulate and Velocity Sampling Point Determination - EPA Method 1

All particulate and velocity measurements were conducted in accordance with EPA Method 1. At each FF Outlet, thirty sampling and traverse points (five for each of six ports – see Figure 2 in Appendix A) were used for all isokinetic pollutant sampling and gas flow rate measurements.

5.1.2 Volumetric Measurements - EPA Method 2

EPA Reference Method 2 was used to determine the velocity and volumetric flow rates of the stack gases at the traverse points shown in Figure 2 (see Appendix A). Stainless steel type-S pitot tubes were used. The pitot tubes were assigned a baseline coefficient of 0.84, as allowed by EPA Method 2.

Calibrated type-K thermocouples were used to determine gas temperatures. Velocity and temperature measurements were made at the traverse points identified for the test location in conjunction with the pollutant sampling runs described below.

5.1.3 Molecular Weight Determination - EPA Method 3

Gas compositional measurements (O_2 and CO_2) for determining the average molecular weight of the stack gases, and for correction of pollutant emissions to 7% O_2, were conducted in accordance with EPA Reference Method 3. Multipoint, integrated sampling was used to obtain a constant-rate sample of flue gas concurrent with the pollutant testing. Sampling was of the same duration as the pollutant testing.

A stainless steel probe affixed to the pollutant sampling probe was used for this purpose, and a peristaltic pump was used to fill a Tedlar bag. Moisture was removed from the sample gas by an air-cooled condenser located prior to the pump. Figure 3 (see Appendix A) shows a schematic of the Method 3 sampling train.

5.1.4 Particulate Sampling - EPA Methods 201A and 202

Filterable and condensable particulate emissions were measured in accordance with EPA Method 201A, coupled with a back-half analysis in accordance with EPA Method 202.

5.1.4.1 Sampling Train Description

Figure 4 (see Appendix A) shows the major components of the Method 201A/202 sampling train. The sampling train employed an in-stack cyclone which separated particles with nominal diameters of greater than and less than 2.5 microns. The cyclone separator was manufactured by Andersen Samplers, Inc., in strict accordance with the design specifications found in Method 201A. These in-stack components were attached to a heated glass-lined steel probe followed by a heated glass fiber filter. After the filter, the sample gas passed through a water-cooled glass condenser capable of cooling the stack gas to below 85 °F and a series of glass impingers. The first two impingers were initially clean and empty. Impinger 1 was a condensate dropout impinger without a bubbler tube and Impinger 2 was a modified Greenburg Smith impinger. The sample gas then passed through the condensable particulate matter (CPM) Teflon filter, maintained > 65°F and ≤ 85°F, and was subsequently passed through moisture traps. The moisture traps consisted of a modified Greenburg Smith impinger (Impinger 3) containing 100 ml of water followed by an impinger (Impinger 4) containing approximately 250 grams of silica gel. The moisture trap impingers were maintained in an ice bath to keep the gas temperature below 68° F at the exit of the impinger train.

5.1.4.2 Sampling Train Operation

Sampling was done in accordance with EPA Method 201A/202 procedures and specifications, including leak checking, isokinetic sampling rate and stack traversing. Sampling was conducted at each of the 30 traverse points (see Figure 2). Each test run had duration of approximately 120-minutes, excluding the time required to change ports. A sample volume of greater than 30 dry standard cubic feet was acquired during each test run.

5.1.4.3 Sample Recovery and Clean-Up

The probe and hot filter was disconnected from the condenser and impinger train and a post-test purge was performed with ultra-pure Nitrogen. The purge was performed whether or not water was collected in the first impinger. The moisture collected in the first impinger was measured and transferred to the second impinger. The purge was performed through the train for 60 minutes at a rate of 14 liters per minute.

Sample recovery proceeded as follows:

1. **Front half acetone rinse**: Recovery of the front-half of the sampling train (nozzle, cyclone, and filter) was performed at a cleanup site in accordance with EPA Method 201A procedures. The filter was removed from the filter holder and placed in a labeled petri dish (Container 1). The front half of the filter holder, the tube and fittings connecting the cyclone to the filter holder were brushed and rinsed with at least 100 ml of acetone into a labeled glass sample jar (Container 2). The remainder of the interior of the cyclone, including the nozzle was brushed and rinsed with at least 100 ml of acetone into a separate labeled glass sample jar (Container 3). Containers 1 and 2 were analyzed gravimetrically for $PM_{2.5}$, and Container 3 was analyzed gravimetrically for the $> PM_{2.5}$ fraction.

2. **Aqueous Liquid Impinger**: The liquid from the dropout and impinger prior to the CPM filter was measured and transferred to clean glass or plastic sample bottle. The condenser, Impingers 1 and 2, connecting glassware, and the front half of the CPM filter housing was rinsed twice with water. The rinses were collected into the same bottle, Container 4.
3. **CPM Organic Rinses**: After the water rinse, the condenser, Impingers 1 and 2, connecting glassware, and the front half of the CPM filter housing was rinsed with acetone, followed by two rinses of hexane. The organic rinses were collected together into Container 5.
4. **CPM Filter**: The filter was removed from the CPM filter housing and placed into a Petri Dish.
5. **Cold Impinger Water**: The volume of the contents of the cold water impinger was measured onsite and discarded.
6. **Silica Gel**: The silica gel was transferred back to its original container and weighed.

5.1.4.4 Blanks

A field blank was collected by assembling and recovering a sampling train in the same manner that it was used for testing, but without exposure to the sample gas.

5.2 Analytical Procedures

5.2.1 Molecular Weight Determination - EPA Method 3A Flue gas compositional analysis for molecular weight determination was conducted using instrumental analyzers set up and operated in general accordance with EPA Method 3A. The instruments were calibrated before each analysis with EPA Protocol 1 calibration gas standards. Data for the O_2 and CO_2 analyses are included in Appendix B.

5.2.2 Moisture Content - EPA Method 4

Moisture contents were determined in accordance with Method 4 by measuring the volume gained in the liquid impingers and the mass gained by the silica gel.

5.2.3 Filterable Particulate Analyses - EPA Method 201A Analyses of the filters and cyclone acetone rinses from the EPA Method 201A sampling trains were performed gravimetrically in accordance with EPA Method 201A procedures. The filter was analyzed gravimetrically to a constant weight. The $PM_{2.5}$ and > $PM_{2.5}$ acetone rinses were evaporated and analyzed gravimetrically to a constant weight. The total filterable $PM_{2.5}$ catch equaled the sum of the mass gains of the $PM_{2.5}$ acetone rinse and the filter. The > $PM_{2.5}$ catch equaled the mass gain of the > $PM_{2.5}$ acetone rinse. The gravimetric data are included in Appendix E.

5.2.4 Condensable Particulate Analysis - EPA Method 202

Condensable particulate matter was determined in accordance with EPA Method 202 procedures. The water soluble CPM was extracted from the CPM filter and the aqueous extract combined with the contents of Container 4. The organic soluble CPM was extracted from the CPM filter and the organic extract was combined with the contents of Container 5. The aqueous impinger contents were placed in a separatory funnel and extracted three times with 30 ml of hexane. This organic extract was combined with the organic train rinse in Container 5.

The organic phase extracts and rinses were placed in a beaker and the volume reduced to less than 10 mL at room temperature. The beaker contents were the transferred to a pre-weighed tin and evaporated to dryness at room temperature. Following evaporation, the organic fraction was desiccated for 24 hours, and then weighed at 6-hour intervals to a constant weight.

The contents of the inorganic fraction were transferred to a clean beaker and the volume reduced to less than 10 mL at 105°C, and then allowed to dry at room temperature. Following evaporation, the inorganic fraction was desiccated for 24 hours, and then weighed at 6-hour intervals to a constant weight. If the residue could not be weighed to a constant weight, then it was re-dissolved in 100 mL of deionized, distilled ultra-filtered water and titrated with NH_4OH to subtract out NH_4^+ retained in the sample. Following titration, the volume of the aqueous phase was reduced to about 10 mL at 105°C, and then allowed to dry at room temperature and pressure. Following evaporation, the inorganic fraction was desiccated for 24 hours, and then weighed at 6-hour intervals to a constant weight. The back-half condensable particulate catch equaled the organic residue plus the inorganic residue.

5.3 Data Analysis

Calculations related to the pollutant sampling are given in Appendix C.

5.4 Equipment Calibration

Field equipment was calibrated in accordance with the requirements of the applicable EPA Methods, with additional consideration given to those recommended within the *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III* (EPA/600/R-94/038c, September 1994).