

**MARYLAND DEPARTMENT OF THE ENVIRONMENT**

**AIR AND RADIATION ADMINISTRATION  
APPLICATION FOR A PERMIT TO CONSTRUCT**

**SUPPLEMENT B TO  
DOCKET #09-20**

COMPANY: Vaughn Greene Funeral Services, PA

LOCATION: 4905 York Road  
Baltimore MD 21212

APPLICATION: Installation of a Matthews Environmental Solutions Power-Pak II Plus human crematory.

<u>ITEM</u>	<u>DESCRIPTION</u>
1	Notice of Tentative Determination, Public Hearing, and Opportunity to Submit Written Comments
2	Environmental Justice (EJ) Information - EJ Fact Sheet and MDE Score and Screening Report
3	Fact Sheet and Tentative Determination
4	Draft Permit to Construct and Conditions
5	Supplemental Information References
6	Privilege Log – Not Applicable

**DEPARTMENT OF THE ENVIRONMENT  
AIR AND RADIATION ADMINISTRATION**

**NOTICE OF TENTATIVE DETERMINATION, PUBLIC HEARING, AND  
OPPORTUNITY TO SUBMIT WRITTEN COMMENTS**

**FIRST NOTICE**

The Department of the Environment, Air and Radiation Administration (ARA) has completed its review of an application for a Permit to Construct submitted by Vaughn Greene Funeral Services, PA on June 8, 2020 for the installation of a Matthews Environmental Solutions Power-Pak II Plus human crematory. The proposed installation will be located at 4905 York Road, Baltimore, Maryland 21212.

The issuance of the Permit-to-Construct for this facility will be the subject of a Public Hearing to be held on August 7, 2024 at 5:30 p.m. at the Huber Memorial Church, 5700 Loch Raven Boulevard, Baltimore, MD 21239.

Pursuant to Section 1-604, of the Environment Article, Annotated Code of Maryland, the Department has made a tentative determination that the Permit-to-Construct can be issued. A final determination on issuance of the permit will only be made after review of all pertinent information presented at the public hearing or received in written comments. Copies of the Department's tentative determination, the application, the draft permit to construct with conditions, and other supporting documents are available for public inspection on the Department's website. Look for Docket #09-20 at the following link:

<https://mde.maryland.gov/vaughn-greene>

In accordance with HB 1200/Ch. 588 of 2022, an environmental justice (EJ) Score was determined for the census tract in which the project is located using the Maryland EJ Screening Tool. The EJ Score, expressed as a statewide percentile, was shown to be 95%. This score considers three demographic indicators, minority population above 50%, poverty rate above 25% and limited English proficiency above 15%, to identify underserved communities, and multiple environmental health indicators to identify overburdened communities. The Department's review of the environmental and socioeconomic indicators contributing to that EJ score is included in the tentative determination that is available for public inspection.

Persons who wish to make a statement concerning this application at the hearing are requested to provide the Department with a copy of their statement. A public request for a one time 60-day extension to the 30-day comment period has been granted. In lieu of oral statements at the hearing, written comments may be submitted at the time of the hearing or to the Department no later than October 22, 2024.

All written comments should be directed to the attention of Ms. Shannon Heafey by email to [shannon.heafey@maryland.gov](mailto:shannon.heafey@maryland.gov) or by mail to the Air and Radiation Administration, 1800 Washington Boulevard, Baltimore, Maryland 21230.

The Department will provide an interpreter for deaf and hearing impaired persons provided that a request is made for such service at least ten (10) days prior to the hearing.

Further information may be obtained by calling Ms. Shannon Heafey at 410-537-4433.

Christopher R. Hoagland, Director  
Air and Radiation Administration



# The Applicant's Guide to Environmental Justice and Permitting

## What You Need to Know

This fact sheet is designed to provide guidance to applicants on incorporating environmental justice screening requirements pursuant to House Bill 1200, effective October 1, 2022.

### What is Environmental Justice?

---

The concept behind the term environmental justice (EJ) is that regardless of race, color, national origin, or income, all Maryland residents and communities should have an equal opportunity to enjoy an enhanced quality of life. How to assess whether equal protection is being applied is the challenge.

Communities surrounded by a disproportionate number of polluting facilities puts residents at a higher risk for health problems from environmental exposures. It is important that residents who may be adversely affected by a proposed source be aware of the current environmental issues in their community in order to have meaningful involvement in the permitting process. Resources may be available from government and private entities to ensure that community health is not negatively impacted by a new source located in the community.

Extensive research has documented that health disparities exist between demographic groups in the United States, such as differences in mortality and morbidity associated with factors that include race/ethnicity, income, and educational attainment. House Bill 1200 adds to MDE's work incorporating diversity, equity and inclusion into our mission to help overburdened and underserved communities with environmental issues.

### What is House Bill 1200 and what does it require?

---

Effective October 1, 2022, House Bill 1200 requires a person applying for a permit from the Department under §1-601 of the Environment Article of the Annotated Code of Maryland or any permit requiring public notice and participation to include in the application an EJ Score for the census tract where the applicant is seeking the permit; requiring the Department, on receiving a certain permit application to review the EJ Score; and requiring notices to include information related to EJ Scores and generally relating to environmental permits and environmental justice screenings.

### What is a "Maryland EJ Tool"?

---

The term "Maryland EJ Tool" means a publicly available state mapping tool that allows users to: (1) explore layers of environmental justice concern; (2) determine an overall EJ score for census tracts in the state; and (3) view additional context layers relevant to an area. The MDE EJ Screening Tool is considered a Maryland EJ Tool.

### What is an "EJ Score"?

---

The term "EJ Score" means an overall evaluation of an area's environment and environmental justice indicators, as defined by MDE in regulation, including: (1) pollution burden exposure; (2) pollution burden environmental effects; (3) sensitive populations; and (4) socioeconomic factors.

The MDE EJ Screening Tool considers three demographic indicators, minority population above 50%, poverty rate above 25% and limited English proficiency above 15%, to identify underserved communities, and multiple environmental health indicators to identify overburdened communities. The tool uses these indicators to calculate a



# The Applicant's Guide to Environmental Justice and Permitting

## What You Need to Know

Final EJ Score Percentile, statewide. It is that score, linked to the census tract where the project is to be located, that needs to be reported to MDE as part of your permit application.

### What does the application require?

---

The link for the MDE EJ Screening Tool is located on the Department's website, [www.mde.maryland.gov](http://www.mde.maryland.gov). Click on the Environmental Justice header at the top of the Department's home page, then select EJ Screening Tool from the menu on the left. Click on Launch the EJ Screening Tool. After you open the tool, click okay on the opening screen. At the top right, please click the first button for the MDE Screening Report. Input the address of the proposed installation in the address bar. Click on the Report button. Once the report has been generated select the print icon and save it in a .pdf format.

The applicant needs to include the MDE Screening Report with the EJ Score from the MDE EJ Screening Tool as part of the permit application upon submission. An application will not be considered complete without the report.

The applicant is encouraged to provide the Department with a discussion about the environmental exposures in the community. This will provide pertinent information about how the applicant should proceed with engaging with the community. Residents of a community with a high indicator score and a high degree of environmental exposure should be afforded broader opportunities to participate in the permit process and understand the impacts a project seeking permit approval may have on them.

### Questions

---

For air quality permits, please call 410-537-3230.

For water permits, please call 410-537-4145.

For land permits pertaining to Solid Waste, please call 410-537-3098. For land permits pertaining to Oil Control, please call 410-537-3483.

For land permits pertaining to Animal Feeding Operations, please call 410-537-4423.

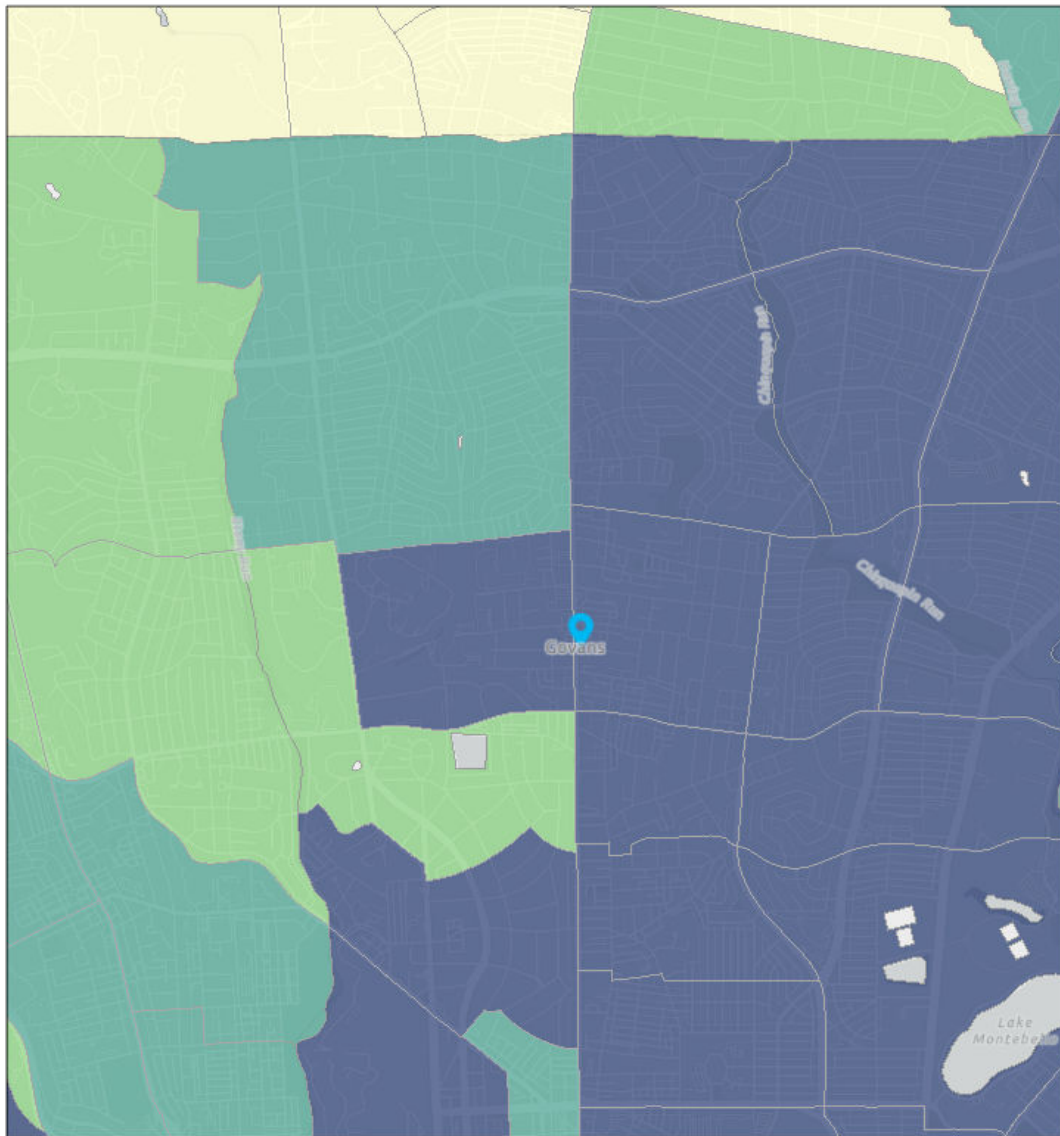
For land permits pertaining to Biosolids, please call 410-537-3403.



# MDE Screening Report

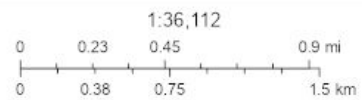
## Area of Interest (AOI) Information

Feb 2 2024 17:23:28 Eastern Standard Time



MDE Final EJ Score (%ile score)

- 0% - 24.9th %ile
- 25% - 49.9th %ile
- 50% - 74.9th %ile
- 75% - 100th %ile



MDE, OS, OIMT, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

## Summary

Name	Count	Area(mi <sup>2</sup> )	Length(mi)
MDE Final EJ Score (%ile score)	1	N/A	N/A
Overburdened Communities Combined Score	1	N/A	N/A
Overburdened Pollution Environmental Score (%ile score)	1	N/A	N/A
Overburdened Exposure Score (%ile score)	1	N/A	N/A
Overburdened Sensitive Population (%ile score)	1	N/A	N/A
Socioeconomic/Demographic Score 2020 (Percentile score) (Underserved Community)	1	N/A	N/A
Air Emissions Facilities	0	N/A	N/A
Sulfur Dioxide (2010)	0	N/A	N/A
Ozone (2015)	1	N/A	N/A
Fine Particles (2012)	1	N/A	N/A
Biosolids FY 2020 and Current Permit Details	0	N/A	N/A
Biosolids FY2010 - 2014 Permit Details	0	N/A	N/A
Biosolids FY2009 Expired Permit Details	0	N/A	N/A
Biosolids FY 2020 and Current Permits Distribution By Acreage	0	N/A	N/A
Biosolids FY2015 - 2019 Permits Distribution By Acreage	1	N/A	N/A
Biosolids FY2010 - 2014 Permits Distribution By Acreage	1	N/A	N/A
Biosolids FY2009 Permits Expired Distribution By Acreage	1	N/A	N/A
Biosolids FY 2020 and Current Permit Distribution By Percent Coverage	1	N/A	N/A
Biosolids FY2015 - 2019 Permit Distribution By Percent Coverage	1	N/A	N/A
Biosolids FY2010 - 2014 Permit Distribution By Percent Coverage	1	N/A	N/A
Biosolids FY2009 Expired Permit Distribution By Percent Coverage	1	N/A	N/A
Concentrated Animal Feeding Operations (CAFOs)	0	N/A	N/A
Composting Facilities	0	N/A	N/A
Food Scrap Acceptors	0	N/A	N/A
Landfills	0	N/A	N/A
Correctional Facilities	0	N/A	N/A
Industrial Food Suppliers	0	N/A	N/A
Residential Colleges	0	N/A	N/A
Non-Residential Colleges	0	N/A	N/A
Hospitals	0	N/A	N/A
High Schools	0	N/A	N/A

Grocery Stores	0	N/A	N/A
10 Miles from Landfill	13	N/A	N/A
10 Miles from Composting Facility	0	N/A	N/A
General Composting Facilities Tier 2 (MD)	0	N/A	N/A
Commercial Anaerobic Digester (MD)	0	N/A	N/A
Out of State Facilities	0	N/A	N/A
30 mile buffer (Maryland)	3	N/A	N/A
30 Mile Buffer (Out of State)	0	N/A	N/A
Land Restoration Facilities	0	N/A	N/A
Determinations (points)	0	N/A	N/A
Determinations (areas)	0	N/A	N/A
Entities	0	N/A	N/A
Active Coal Mine Sites	0	N/A	N/A
Historic Mine Facilities	0	N/A	N/A
All Permitted Solid Waste Acceptance Facilities	0	N/A	N/A
Municipal Solid Waste Acceptance Facilities	0	N/A	N/A
Maryland Dam Locations	0	N/A	N/A
Maryland Pond Locations	0	N/A	N/A
Surface Water Intakes	0	N/A	N/A
Wastewater Discharge Facilities	0	N/A	N/A
Drinking Water	0	N/A	N/A
Clean Water	0	N/A	N/A

### MDE Final EJ Score (%ile score)

#	Census tract identifier	Geographic Area Name	Total Population	Final EJ Score Percent (for this tract)	Final EJ Score Percentile (Distribution across Maryland)	Area(mi <sup>2</sup> )
1	24510271002	Census Tract 2710.02, Baltimore city, Maryland	3904	42.84	95.28	N/A

### Overburdened Communities Combined Score

#	GEOID20	Geographic_Area_Name	TotalPop	Overburd_Exposure_Percent	Overburd_Exposure_Percentile
1	24510271002	Census Tract 2710.02, Baltimore city, Maryland	3,904	50.00	81.82

#	Overburd_Poll_Enviro_Percent	Overburd_Poll_Enviro_Percentile	Sensitive_Population_Percent	Sensitive_Population_Percentile	OverburdenedAIIPercent	OverburdenedAIIPercentile	Area(mi <sup>2</sup> )
1	19.63	91.66	68.87	71.16	92.96	96.58	N/A

### Overburdened Pollution Environmental Score (%ile score)



#	GEOID20	Geographic_Area_Name	RentalsOccupiedPre79 Percent	Percentile	PercentRMP
1	24510271002	Census Tract 2710.02, Baltimore city, Maryland	26.45	74.16	28.76

#	PercentRMPEJ	PercentHazWaste	PercentHazWasteEJ	PercentSuperFundNPL	PercentSuperFundNPL EJ
1	75.58	33.35	76.88	8.74	64.78

#	PercentHazWW	PercentHazWWEJ	BrownFPercent	Percentile_1	PercentPowerPlants
1	79.35	94.23	0.00	0.00	0.00

#	Percentile_12	PercentCAFOS	Percentile_12_13	PercentActiveMines	Percentile_12_13_14
1	0.00	0.00	0.00	0.00	0.00

#	PollutionEnvironmentalPercent	PollnEnvironmentalPercentile	Area(mi²)
1	19.63	91.66	N/A

### Overburdened Exposure Score (%ile score)

#	GEOID20	Geographic_Area_Name	Total_Pop	PercentNATA_Cancer	Percentile_NATA_Cancer
1	24510271002	Census Tract 2710.02, Baltimore city, Maryland	3,904.00	80.00	81.94

#	PercentNATA_Resp_HI	Percentile_NATA_Resp_HI	PercentNATA_Diesel	Percentile_NATA_Diesel	PercentNATA_PM25
1	80.00	78.20	34.76	64.40	98.95

#	PercentileNATA_PM25	PercentOzone	PercentileOzone	PercentTraffic	PercentileTraffic
1	74.94	98.24	75.90	8.04	65.28

#	PercentTRI	PercentileTRI	PercentHazWasteLF	Percentile_Haz WasteLF	PollutionExposurePercent	PollutionExposurePercentile	Area(mi²)
1	0.00	0.00	0.00	0.00	50.00	81.82	N/A

### Overburdened Sensitive Population (%ile score)

#	GEOID20	Geographic_Area_Name	PerAstma	PercentileAst	PerMyo
1	24510271002	Census Tract 2710.02, Baltimore city, Maryland	65.90	64.80	42.00

#	PercentileMyo	PerLow	PercentileLow	PercentBroad	PercentileBroad
1	44.43	88.10	83.39	20.51	85.51

#	PercentSens	PercentileSens	Area(mi²)
1	54.13	69.53	N/A

### Socioeconomic/Demographic Score 2020 (Percentile score) (Underserved Community)

#	Census tract identifier	Geographic Area Name	Total Population	Percent Poverty	Percent Minority
1	24510271002	Census Tract 2710.02, Baltimore city, Maryland	3,904	44.90	97.08

#	Percent Limited English Proficiency	Demographic Score (Percent for this tract)	Demographic Score (Percentile Distribution across Maryland)	Area(mi <sup>2</sup> )
1	0.88	47.62	92.60	N/A

### Ozone (2015)

#	STATEFP10	COUNTYFP10	COUNTYNS10	GEOID10	NAME10
1	24	510	01702381	24510	Baltimore

#	Ozone NAA Area	8-Hr Ozone (2015) Designation	8-HR Ozone (2015) Classification	8-Hr Ozone (2015) Status	Area(mi <sup>2</sup> )
1	Baltimore, MD	Nonattainment	Moderate	No Data	N/A

### Fine Particles (2012)

#	STATEFP10	COUNTYFP10	COUNTYNS10	GEOID10	NAME10	PM2.5 (2012) Status	Area(mi <sup>2</sup> )
1	24	510	01702381	24510	Baltimore	Attainment/Unclassifiable	N/A

### Biosolids FY2015 - 2019 Permits Distribution By Acreage

#	County Name	FY2015to2019	Area(mi <sup>2</sup> )
1	Baltimore City	No Data	N/A

### Biosolids FY2010 - 2014 Permits Distribution By Acreage

#	County Name	FY2010to2014	Area(mi <sup>2</sup> )
1	Baltimore City	No Data	N/A

### Biosolids FY2009 Permits Expired Distribution By Acreage

#	County Name	FY2009	Area(mi <sup>2</sup> )
1	Baltimore City	No Data	N/A

### Biosolids FY 2020 and Current Permit Distribution By Percent Coverage

#	County Name	FY2020andAfter	Area(mi <sup>2</sup> )
1	Baltimore City	No Data	N/A

### Biosolids FY2015 - 2019 Permit Distribution By Percent Coverage

#	County Name	FY2015to2019	Area(mi <sup>2</sup> )
1	Baltimore City	No Data	N/A

### Biosolids FY2010 - 2014 Permit Distribution By Percent Coverage

#	County Name	FY2010to2014	Area(mi <sup>2</sup> )
1	Baltimore City	No Data	N/A

### Biosolids FY2009 Expired Permit Distribution By Percent Coverage

#	County Name	FY2009	Area(mi <sup>2</sup> )
1	Baltimore City	No Data	N/A

## 10 Miles from Landfill

#	County	Type	Facility_N	ADDRESS	FILL
1	ANNEARUNDEL	WPT	Curtis Creek PF & TS	23 Stahl Point Road, Baltimore MD 21226.	-
2	BALTIMORE	WRF	Honeygo Run Rubble LandfillSE	10710 Philadelphia Road, Perry Hall MD 21128.	77
3	BALTIMORE	WPF	Recovermat Mid-Atlantic, LLCPF	2202 Halethorpe Farm Road, Halethorpe MD 21227.	-
4	BALTIMORE	WTS	Western Acceptance FacilityTS	3310 Transway Road, Halethorpe MD 21227.	6
5	BALTIMORECITY	WPT	Baltimore Processing & TransferCntr.	5800 Chemical Road, Baltimore MD 21226.	-
6	BALTIMORECITY	WPT	Baltimore Recycling CenterPF&TS	1030 Edison Highway, Baltimore MD 21213.	-
7	BALTIMORECITY	WPT	Daniels SharpsmartPF&TS	6611 Chandlery Street, Baltimore MD 21224	-
8	BALTIMORECITY	WPF	L & J ProcessingFacility	222 North Calverton Road, Baltimore MD 21223.	-
9	BALTIMORECITY	WTS	Northwest TransferStation	5030 Reisterstown Road, Baltimore MD 21215.	-
10	BALTIMORECITY	WMF	Quarantine Road MunicipalLF	6100 Quarantine Road, Baltimore MD 21226.	126
11	BALTIMORECITY	WTE	Southwest ResourceRecovery	1801 Annapolis Road, Baltimore MD 21230.	-
12	BALTIMORECITY	WPT	Stericycle Medical WastePF&TS	5901 Chemical Road, Baltimore MD 21226.	-
13	BALTIMORECITY	WIF	W.R. Grace & Co. - Conn.	5500 Chemical Road, Baltimore MD 21226.	10.7

#	SITE__ACRE	AI_No_	Owner_Type	MD_GRID__E	PERMITNUMB	EXPIRATION	Area(mi <sup>2</sup> )
1	12.80	23,330.00	PRI	917 /500	2013-WPT-0539	12/18/2018, 7:00 PM	N/A
2	117.00	20,643.00	PRI	958 /564	2014-WRF-0579A	10/12/2019, 8:00 PM	N/A
3	8.50	18,296.00	PRI	888 /506	2010-WPF-0341	12/25/2015, 7:00 PM	N/A
4	6.00	10,889.00	CTY	905 /510	2015-WTS-0599	5/10/2020, 8:00 PM	N/A
5	15.60	10,299.00	PRI	921 /499	2013-WPT-0627	2/23/2019, 7:00 PM	N/A
6	12.50	63,585.00	PRI	920 /535	2014-WPT-0631	12/27/2019, 7:00 PM	N/A
7	1.00	63,950.00	PRI	950 /525	2015-WPT-0633	2/8/2020, 7:00 PM	N/A
8	1.00	64,649.00	PRI	896/531	2008-WPF-0634	6/28/2016, 8:00 PM	N/A
9	6.60	23,220.00	MUN	855 /550	2010-WTS-0038	1/16/2016, 7:00 PM	N/A
10	153.00	13,670.00	MUN	922 /502	2014-WMF-0325	11/8/2019, 7:00 PM	N/A
11	15.00	472.00	PRI	904 /523	2011-WTE-0030	10/5/2016, 8:00 PM	N/A
12	2.40	8,713.00	PRI	921 /501	2014-WPT-0591	12/9/2019, 7:00 PM	N/A
13	157.00	2,102.00	PRI	921 /500	2012-WIF-0613	1/29/2017, 7:00 PM	N/A

### 30 mile buffer (Maryland)

#	Facility_Name_1	Facility_Contact_1	Contact_Phone	Contact_Email_1	Contact_2
1	Bioenergy DEVCO - Maryland Organics Recycling Facility	Vinnie Bevivino	(202) 360-1805	Vbevivino@bioenergydevco.com	Mike Manna
2	Veteran Compost - Aberdeen	Justen Garrity	(443) 584-3478	info@veterancompost.com	No Data
3	Composting Facility at Alpha Ridge Landfill	Bureau of Environmental Services	(410) 313-6444	No Data	No Data

#	Contact_2_Phone	Contact_2_Email	URL	Area(mi <sup>2</sup> )
1	(609) 744-2819	mmanna@bioenergydevco.com	<a href="https://www.bioenergydevco.com/maryland-organics-recycling-facility/">https://www.bioenergydevco.com/maryland-organics-recycling-facility/</a>	N/A
2	No Data	No Data	<a href="https://www.veterancompost.com/">https://www.veterancompost.com/</a>	N/A
3	No Data	No Data	<a href="https://www.howardcountymd.gov/public-works/composting-facility">https://www.howardcountymd.gov/public-works/composting-facility</a>	N/A

**MARYLAND DEPARTMENT OF ENVIRONMENT  
AIR AND RADIATION ADMINISTRATION**

**FACT SHEET AND TENTATIVE DETERMINATION  
VAUGHN GREENE FUNERAL SERVICES, P.A.**

**PROPOSED INSTALLATION OF ONE (1) HUMAN CREMATORY**

**I. INTRODUCTION**

The Maryland Department of the Environment (the "Department") received an application from Vaughn Greene Funeral Services, P.A. (the "Applicant") on June 8, 2020 for a Permit to Construct for the installation of one (1) new Matthews Environmental Solutions PowerPak II Plus human crematory. The proposed installation will be located at 4905 York Road, Baltimore, Maryland 21212.

A notice was placed in The Baltimore Sun on October 20, 2020 and again on October 26, 2020 announcing scheduled virtual and in-person informational meetings to discuss the application for a Permit to Construct. The virtual informational meeting was held at 7 pm on November 2, 2020. The in-person informational meeting was held at the Chapel at Vaughn Greene Funeral Services, P.A. at 7 pm on November 9, 2020. As required by law, all public notices were also provided to elected officials in all State, county, and municipality legislative districts located within a one-mile radius of the facility's property boundary.

Following the informational meetings, the Department received a large volume of letters and e-mails expressing concern about the proposed project from surrounding neighborhood associations including, but not limited to, Woodbourne-McCabe, Guilford, Rosebank, Bellona, Brackenridge, Lake Evesham, and Radnor-Winston (including Winston-Govans). An additional virtual community meeting with association leaders and local elected officials was held on June 3, 2021.

Community associations challenged the zoning approval received by Vaughn Greene Funeral Services for the installation of a human crematory. On January 4, 2022, the Baltimore City Board of Municipal and Zoning Appeals (BMZA) granted approval for Vaughn Greene Funeral Services, P.A. to install a crematory and on May 16, 2023, the Baltimore City Circuit Court upheld the BMZA zoning decision.

On December 13, 2023, a community meeting was scheduled to provide the public with an update on the status of the air quality permit to construct application submitted by Vaughn Greene. The in-person meeting was held at 7 pm at Sharp Hall at Govans Presbyterian Church, 5828 York Road, Baltimore, Maryland 21212.

The Department has reviewed the application and has made a tentative determination that the proposed facility is expected to comply with all applicable air quality regulations. An in-person public hearing has been scheduled for August 6, 2024 at 5:30 p.m. at the Huber Memorial Church, 5700 Loch Raven Boulevard, Baltimore MD 21239 to provide interested parties with an opportunity to comment on the Department's tentative determination and draft permit conditions, and/or to present other pertinent concerns about the proposed facility.

Notices concerning the date, time and location of the public hearings will be published in the legal section of a newspaper with circulation in general area of the proposed facility and posted on the Department website at <https://mde.maryland.gov/vaughn-greene>. Interested parties may also submit written comments.

If the Department does not receive any comments that are adverse to the tentative determination, the tentative determination will automatically become a final determination. If adverse comments are received, the Department will review the comments, and will then make a final determination with regard to issuance or denial of the permit. A formal response to comments document will be prepared and published with the final determination. A notice of final determination will be published in a newspaper of general circulation in the affected area and posted on the Department website at <https://mde.maryland.gov/vaughn-greene>. The final determination may be subject to judicial review pursuant to Section 1-601 of the Environment Article, Annotated Code of Maryland. Notices will also be sent out to all state and local elected officials in the district where the source is located, state and local elected officials in districts within 1-mile of the source, and all who are considered interested parties by virtue of their participation in past public meetings or who have asked the Department to be listed as an interested party.

## **II. CURRENT STATUS AND PROPOSED INSTALLATION**

### **A. Current Status**

Vaughn Greene Funeral Services, P.A. currently operates a funeral home located at 4905 York Road in Baltimore, Maryland 21212. This location is in Area III as defined in the Code of Maryland Regulations (“COMAR”) 26.11.01.03C.

### **B. Proposed Installation**

Vaughn Greene Funeral Services, P.A. is proposing to install one (1) new Matthews Environmental Solutions PowerPak II Plus, 175 pounds per hour, human crematory in an existing structure at their facility.

The human crematory will be equipped with a secondary combustion chamber capable of meeting at least a 1.0 second retention time and a minimum operating temperature of 1600 °F. The crematory must be equipped with temperature sensors and monitors to continuously measure and record the temperature of the secondary combustion chamber. Exhaust gases must be vented out of a stack at a height of at least 40 feet from the ground to ensure proper dispersion of exhaust gases.

The human crematory will also be equipped with an opacity sensor interlocked with a control system that continuously monitors the stack gases for visible emissions during operation and adjusts cremation operations to prevent visible emissions from exiting the crematory stack.

### III. APPLICABLE REGULATIONS

The proposed installation is subject to all applicable Federal and State air quality control regulations, including, but not limited to the following:

- (a) COMAR 26.11.01.07C, which requires that the Permittee report to the Department occurrences of excess emissions.
- (b) COMAR 26.11.02.04D, which states that notwithstanding COMAR 26.11.02.04B and C, the Department may issue a temporary start-up State permit to operate for a source or emission unit within the source for a period not to exceed 90 days. In the case of a newly constructed or modified source, the Department may issue a temporary start-up State permit to operate for a period not to exceed 1 year.
- (c) COMAR 26.11.02.09, which requires a permit to construct for all sources of air pollution, including installations and air pollution control equipment, except as listed in COMAR 26.11.02.10.
- (d) COMAR 26.11.02.13A(1), which requires that the Permittee obtain from the Department, and maintain and renew as required, a valid State permit-to-operate.
- (e) COMAR 26.11.02.19C & D, which require that the Permittee submit to the Department annual certifications of emissions, and that the Permittee maintain sufficient records to support the emissions information presented in the submittals.
- (f) COMAR 26.11.06.08 and 26.11.06.09, which generally prohibit the discharge of emissions beyond the property line in such a manner that a nuisance or air pollution is created.
- (g) COMAR 26.11.08.01B(9-1) – a “Crematory” means a furnace where a human or animal corpse is burned with:
  - (1) The container or bag in which the human or animal corpse is placed or transported; and
  - (2) The animal bedding, if applicable.
- (h) COMAR 26.11.08.04B, which prohibits visible emissions other than uncombined water.

Exceptions. The requirements do not apply to emissions during start-up, or adjustments or occasional cleaning of control equipment if:

- (1) The visible emissions are not greater than 40 percent opacity; and
  - (2) The visible emissions do not occur for more than 6 consecutive minutes in any 60-minute period.
- (i) COMAR 26.11.08.05B(2)(a), which limits the concentration of particulate matter in any exhaust gases to not more than 0.10 grains per standard cubic foot of dry exhaust gas.
  - (j) COMAR 26.11.15.05, which requires that the Permittee implement “Best Available Control Technology for Toxics” (T – BACT) to control emissions of toxic air pollutants.
  - (k) COMAR 26.11.15.06, which prohibits the discharge of toxic air pollutants to the extent that such emissions would unreasonably endanger human health.

#### **IV. GENERAL AIR QUALITY**

The U.S. Environmental Protection Agency (EPA) has established primary and secondary National Ambient Air Quality Standards (NAAQS) for six (6) criteria pollutants, i.e., sulfur dioxide, particulate matter, carbon monoxide, nitrogen dioxide, ozone, and lead. The primary standards were established to protect public health, and the secondary standards were developed to protect against non-health effects such as damage to property and vegetation.

The Department utilizes a statewide air monitoring network, operated in accordance with EPA guidelines, to measure the concentrations of criteria pollutants in Maryland’s ambient air. The measurements are used to project statewide ambient air quality, and currently indicate that Baltimore City complies with the NAAQS for sulfur dioxide, particulate matter, carbon monoxide, nitrogen dioxide, and lead.

For several decades, ground-level ozone presented a problem for the entire Baltimore metropolitan area. In 2023, for the first time in over 30 years, Maryland measured ozone at levels that complied with the federal ambient air quality standard. Maintaining that status is an on-going endeavor. The primary contributors to the formation of ozone are emissions of oxides of nitrogen, primarily from combustion equipment, including large power plants west of Maryland, and emissions of volatile organic compounds (VOC) such as paint solvents and gasoline vapors. Small combustion sources, collectively, also contribute to ozone formation. In this regard, while the federal Clean Air Act (and state regulatory requirements that flow from that Act) does not prohibit new or modified small pollution sources from being constructed, such sources may need to meet pollution control requirements established to reasonably control emissions through the use of applicable equipment technology.



With regard to toxic air pollutants (TAPs), screening levels (i.e., acceptable ambient concentrations for toxic air pollutants) are generally established at 1/100 of allowed worker exposure levels (TLVs)<sup>1</sup>. The Department has also developed additional screening levels for carcinogenic compounds. The additional screening levels are established such that continuous exposure to the subject TAP at the screening level for a period of 70 years is expected to cause an increase in lifetime cancer risk of no more than 1 in 100,000.

## **V. ENVIRONMENTAL JUSTICE ANALYSIS**

The concept behind the term environmental justice (EJ) is that regardless of race, color, national origin, or income, all Maryland residents and communities should have an equal opportunity to enjoy an enhanced quality of life. How to assess whether equal protection is being applied is the challenge.

Communities surrounded by a disproportionate number of polluting facilities puts residents at a higher risk for health problems from environmental exposures. Extensive research has documented that health disparities exist between demographic groups in the United States, such as differences in mortality and morbidity associated with factors that include race/ethnicity, income, and educational attainment. It is important that residents who may be adversely affected by a proposed source be aware of the current environmental issues in their community in order to have meaningful involvement in the permitting process. Resources may be available from government and private entities to ensure that community health is not negatively impacted by a new source located in the community.

The Maryland General Assembly passed HB 1200, effective October 1, 2022, as Chapter 588 of the Laws of 2022, which amends the requirements of specific sections of Title 1 of the Environment Article related to the processing of permit applications. The law enhances the efforts that MDE is already doing to incorporate diversity, equity and inclusion into our mission to help overburdened and underserved communities with environmental issues. In accordance with the requirements of HB 1200/Ch. 588 of 2022, the an environmental justice (EJ) Score was determined for the census tract in which the proposed source is located using the Maryland EJ Screening Tool. The EJ Score, expressed as a statewide percentile, was shown to be 95%. This score considers three demographic indicators, minority population above 50%, poverty rate above 25% and limited English proficiency above 15%, to identify underserved communities. Multiple environmental health indicators are used to identify overburdened communities.

An EJ Score of 95% indicates that the proposed installation would be located in an area that is disproportionately impacted by environmental and public health hazards resulting in a higher risk of health problems from environmental exposures.

---

<sup>1</sup> TLVs are threshold limit values (exposure limits) established for toxic materials by the American Conference of Governmental Industrial Hygienists (ACGIH). Some TLVs are established for short-term exposure (TLV – STEL), and some are established for longer-term exposure (TLV – TWA), where TWA is an acronym for time-weight average.

As a result, the Department has included a number of additional protective measures in the draft air quality permit to construct for the proposed crematory to further ensure compliance with applicable air quality standards. In addition to minimum retention time, temperature, and stack height requirements to ensure complete combustion of human remains and proper dispersion of combustion gases, the draft permit for Vaughn Greene Funeral Services, P.A. includes the following:

- (1) A requirement that the crematory be equipped with an opacity sensor interlocked with a control system that continuously monitors the stack gases for visible emissions during operation and adjusts cremation operations to prevent visible emissions from exiting the crematory stack.
- (2) A requirement to develop and maintain an Operations and Maintenance Plan approved by the Department. A properly operated and maintained crematory will not result in smoke, odors, or excess emissions.
- (3) A requirement to comply with all local zoning conditions as specified by the Baltimore City Board of Municipal and Zoning Appeals (BMZA) limiting the type of human remains that can be processed in the crematory unit to only those remains owned, operated, or controlled by Vaughn Greene Funeral Services, P.A. and only human remains that have had all teeth containing mercury amalgams removed.
- (4) A requirement to conduct a Method 9 opacity observation for a modified period of one hour during a cremation to assess the effectiveness the crematory's opacity sensor and to determine when operations require adjustments to ensure compliance with applicable visible emissions standards.
- (5) A requirement to conduct stack emissions testing to demonstrate compliance with applicable particulate matter and metal toxic air pollutant standards. In lieu of stack testing, the Applicant may provide a stack testing report demonstrating compliance that was conducted within the last five years by a third party stack testing company on an identical crematory unit.

## **VI. COMPLIANCE DEMONSTRATION AND ANALYSIS**

The proposed installation must comply with all State imposed emissions limitations and screening levels, as well as the NAAQS. The Department has conducted an engineering and air quality review of the application. A detailed summary of methods used in analysis is included in the attached Appendix.

**A. Estimated Emissions** - The maximum emissions of criteria pollutants and volatile organic compounds from the proposed installation, are listed in Table I. Criteria pollutant and volatile organic compound emissions occur from the combustion of natural gas in the burners used to heat the crematory. These emissions are also emitted from the cremation process itself. Worst case criteria pollutant emissions from the crematory are well below major source emissions thresholds applicable in Baltimore City.

- B. Compliance with National Ambient Air Quality Standards** – The maximum ground level concentrations for the criteria pollutants regulated under the Clean Air Act by the NAAQS—particulate matter, sulfur dioxide, oxides of nitrogen, and carbon monoxide based on the emissions from the proposed installation are listed in column 2 of Table II. The combined impact of the proposed installation, and the ambient background concentration for each pollutant shown in column 3 of Table II, is less than the NAAQS for each pollutant shown in column 4. Emissions of oxides of nitrogen and volatile organic compounds from the proposed crematory are each less than 1 ton per year, much less than the federal major source threshold of 25 tons per year. Emissions from the proposed crematory will not significantly impact the local ground level ozone concentration. Ground level ozone concentrations are most influenced by regional emissions of ozone precursor emissions from sources throughout much of Maryland and large emission sources, such as power plants located in other states that are west and northwest of Maryland.
- C. Compliance with Air Toxics Regulations** – The premises wide toxic air pollutants of concern that would be emitted from this facility are listed in column 1 of Table III. The predicted maximum off-site ambient concentrations of these toxic air pollutants are shown in column 4 of Table III, and in each case the maximum concentration is less than the corresponding screening level for the toxic air pollutant shown in column 3.

Although all mercury amalgams will be required to be removed from human remains prior to cremation, the Department has conservatively assumed each cremation still contains mercury as a worst-case operating scenario. This significantly limits the amount of cremations the facility can conduct in any 8-hour period and annually.

In order to maintain compliance with Maryland's toxic air pollutant ambient impact requirements, Vaughn Greene Funeral Services, P.A. must comply with the following premises wide operational limits:

- (a) The Permittee shall only cremate human remains in the Matthews Environmental Solutions, PowerPak II Plus, 175 pounds per hour, crematory.
- (b) The Permittee shall not cremate more than 2 human remains during any 8-hour period.
- (c) The Permittee shall not combust any halogenated plastics, including polyvinyl chloride (PVC) body bags or PVC pipes.
- (d) The Permittee shall not combust any hazardous waste, or hospital, medical, and infectious waste as defined in COMAR 26.11.08.01B(18).

## **VI. TENTATIVE DETERMINATION**

Based on the above information, the Department has concluded that the proposed installation will comply with all applicable Federal and State air quality control requirements. In accordance with Section 1-604 of the Environment Article, Annotated Code of Maryland, the Department has made a tentative determination to issue the Permit to Construct.

**TABLE I  
PROJECTED MAXIMUM EMISSIONS FROM THE PROPOSED INSTALLATION**

POLLUTANT	PROJECTED MAXIMUM EMISSIONS		MAJOR SOURCE THRESHOLD
	(lbs/day)	(tons/year)	(tons/year)
Oxides of Nitrogen (NO <sub>x</sub> ) (includes Nitrogen Dioxide – NO <sub>2</sub> )	2.9	0.5	25
Carbon Monoxide (CO)	2.4	0.4	100
Sulfur Dioxide (SO <sub>2</sub> )	1.0	0.2	100
Total Particulate Matter (PM) (includes PM-10 and PM-2.5)	1.5	0.3	100
Volatile Organic Compounds (VOC)	1.4	0.3	25

**TABLE II  
PROJECTED IMPACT OF EMISSIONS OF CRITERIA POLLUTANTS FROM THE  
PROPOSED INSTALLATION ON AMBIENT AIR QUALITY**

POLLUTANTS	MAXIMUM OFF-SITE GROUND LEVEL CONCENTRATIONS CAUSED BY EMISSIONS FROM PROPOSED PROCESS (µg/m <sup>3</sup> )	BACKGROUND AMBIENT AIR CONCENTRATIONS (µg/m <sup>3</sup> )	NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) (µg/m <sup>3</sup> )
Nitrogen Dioxide (NO <sub>2</sub> )	annual avg → 0.8	annual avg → 17	annual avg → 100
Carbon Monoxide (CO)	1-hour max → 7.8 8-hour max → 5.4	1-hour max. → 2177 8-hour max. → 1489	1-hour max. → 40,000 8-hour max. → 10,000
Sulfur Dioxide (SO <sub>2</sub> )	24-hour max → 1.3 annual avg → 0.3	24-hour max → 4.2 annual avg → 0.8	24-hour max → 366 annual avg → 78.5
Particulate Matter (PM <sub>10</sub> )	24-hour max → 1.8	24-hour max → 23	24-hour max → 150
Particulate Matter (PM <sub>2.5</sub> )	24-hour max → 1.2 annual avg → 0.2	24-hour max → 24 annual avg → 7	24-hour max → 35 annual avg → 12

**TABLE III  
PREDICTED MAXIMUM OFF-SITE AMBIENT CONCENTRATIONS FOR  
TOXIC AIR POLLUTANTS EMITTED FROM THE FACILITY**

<b>Toxic Air Pollutant</b>	<b>PROJECTED WORST-CASE FACILITY-WIDE EMISSIONS (lbs/hr)</b>	<b>SCREENING LEVELS (µg/m<sup>3</sup>)</b>	<b>PREDICTED MAXIMUM OFF-SITE GROUND LEVEL CONCENTRATIONS (µg/m<sup>3</sup>)</b>
Acenaphthene (CAS No. 83329)	0.0000001	20.3 (8-hr)	0.000002 (8-hr)
Acenaphthylene (CAS No. 208968)	0.0000007	24.6 (8-hr)	0.000009 (8-hr)
Acetaldehyde (CAS No. 75070)	0.0001	450 (1-hr) 2300 (8-hr) 5 (annual)	0.01 (1-hr) 0.002 (8-hr) 0.0002 (annual)
Anthracene (CAS No. 120127)	0.0000003	20 (8-hr)	0.000004 (8-hr)
Antimony (CAS No. 7440360)	0.00003	5 (8-hr)	0.0004 (8-hr)
Arsenic (CAS No. 7440382)	0.00006	0.1 (8-hr) 0.002 (annual)	0.0008 (8-hr) 0.0001 (annual)
Barium (CAS No. 7440393)	0.00003	5 (8-hr)	0.0004 (8-hr)
Benzo (g,h,i) perylene (CAS No. 191242)	0.00000004	20 (8-hr)	0.0000006 (8-hr)
Beryllium (CAS No. 7440417)	0.000003	0.0005 (8-hr) 0.004 (annual)	0.00004 (8-hr) 0.000004 (8-hr)
Cadmium (CAS No. 7440439)	0.0002	0.02 (8-hr) 0.006 (annual)	0.003 (8-hr) 0.0003 (annual)
Chromium (CAS No. 7440473)	0.00003	5 (8-hr)	0.0004 (8-hr)
Chromium VI (CAS No. 18540299)	0.00001	0.01 (8-hr) 0.0008 (annual)	0.0002 (8-hr) 0.00002 (annual)
Cobalt (CAS No. 7440484)	0.00001	0.2 (8-hr)	0.0002 (8-hr)
Copper (CAS No. 7440508)	0.00003	2 (8-hr)	0.0004 (8-hr)
Fluoranthene (CAS No. 206440)	0.0000002	82 (8-hr)	0.000003 (8-hr)
Fluorene (CAS No. 86737)	0.000006	20 (8-hr)	0.0000004 (8-hr)
Formaldehyde (CAS No. 50000)	0.00003	20.3 (8-hr) 0.8 (annual)	0.0005 (8-hr) 0.00005 (annual)
Hydrogen Chloride (CAS No. 7647010)	0.3	29.8 (1-hr) 165 (8-hr)	23.4 (1-hr) 4 (8-hr)
Hydrogen Fluoride (CAS No. 7664393)	0.001	16.4 (1-hr) 4.1 (8-hr)	0.09(1-hr) 0.02 (8-hr)
Lead (CAS No. 7439921)	0.002	0.5 (8-hr)	0.02 (8-hr)
Mercury (CAS No. 7439976)	0.00002	0.1 (8-hr)	0.07 (8-hr)
Molybdenum (CAS No. 7439987)	0.0002	5 (8-hr)	0.0002 (8-hr)
Naphthalene (CAS No. 91203)	0.00007	786 (1-hr) 524 (8-hr)	0.005 (1-hr) 0.0009 (8-hr)
Nickel (CAS No. 7440020)	0.00004	1 (8-hr)	0.0005 (8-hr)

<b>Toxic Air Pollutant</b>	<b>PROJECTED WORST-CASE FACILITY-WIDE EMISSIONS (lbs/hr)</b>	<b>SCREENING LEVELS (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>PREDICTED MAXIMUM OFF-SITE GROUND LEVEL CONCENTRATIONS (<math>\mu\text{g}/\text{m}^3</math>)</b>
Phenanthrene (CAS No. 85018)	0.000002	9.8 (8-hr)	0.00003 (8-hr)
Pyrene (CAS No. 129000)	0.0000002	20 (8-hr)	0.000002 (8-hr)
Selenium (CAS No. 7782492)	0.00004	2 (8-hr)	0.0006 (8-hr)
Silver (CAS No. 7440224)	0.000007	0.1 (8-hr)	0.0001 (8-hr)
Thallium (CAS No. 7440280)	0.00009	0.2 (8-hr)	0.001 (8-hr)
Vanadium (CAS No. 7440622)	0.00006	0.5 (8-hr)	0.0008(8-hr)
Zinc (CAS No. 7440666)	0.0004	1000 (1-hr) 500 (8-hr)	0.03 (1-hr) 0.006 (8-hr)
Total Dioxins and Furans (CAS No. 174016)	0.000000001	0.0008 (8-hr)	0.00000002 (8-hr)

## APPENDIX

### EMISSIONS METHODOLOGY FOR TABLE I PROJECTED MAXIMUM EMISSIONS FROM THE PROPOSED INSTALLATION

#### Combustion Emissions from Natural Gas Fired Burners

U.S. EPA approved AP-42 emissions factors, Table 1.4-1 and Table 1.4-1, for natural gas combustion were used to calculate worst-case emissions from the burners. Total maximum rated heat input for the burners is 2.2 million Btu per hour.

#### Combustion Emissions from the Cremation Process

For emissions from the cremation process, the most conservative emissions factors were used from the following sources:

1. The U.S. EPA's 2020 National Emissions Inventory Technical Support Document for Cremation for emissions of total particulate matter.
2. The Bay Area Air Quality Management District, Engineering Division – Permit Manual, pages 203-206, for emissions of oxides of nitrogen.
3. U.S. EPA WebFIRE approved emissions factors for cremation for emissions of oxides of sulfur, carbon monoxide, and volatile organic compounds.

### MODELING METHODOLOGY FOR TABLE II PROJECTED IMPACT OF EMISSIONS OF CRITERIA POLLUTANTS FROM THE PROPOSED INSTALLATION ON AMBIENT AIR QUALITY

The U.S. EPA's SCREEN3 computer model, which provides conservative estimations concerning the impact of pollutants on ambient air quality, was used to predict the maximum concentration of each pollutant listed in Table II beyond the facility's nearest property boundary. As 2023 complete monitoring data is not yet finalized, background ambient concentrations from 2022 were obtained from the Department's air quality network as follows:

NO<sub>2</sub> and PM<sub>10</sub> and PM<sub>2.5</sub> → Lake Montebello Air Monitoring Station, 3900 Hillen Road, Baltimore City

CO and SO<sub>2</sub> → Essex Monitoring Station, 600 Dorsey Avenue, Baltimore County

### EMISSIONS AND MODELING METHODOLOGY FOR TABLE III PREDICTED MAXIMUM OFF-SITE AMBIENT CONCENTRATIONS FOR TOXIC AIR POLLUTANTS EMITTED FROM THE FACILITY

The values in Table III represent maximum facility-wide emissions of toxic air pollutants during any 1-hour period of facility operation. For emissions of toxic air pollutants that would be emitted from the cremation process, the most conservative emissions factors were used from the following sources:

1. The U.S. EPA's 2020 National Emissions Inventory Technical Support Document for Cremation for emissions of acenaphthylene, arsenic, benzo (g,h,i) perylene, cadmium, chromium (VI), cobalt, hydrogen chloride, and naphthalene.
2. The Bay Area Air Quality Management District, Engineering Division – Permit Manual, pages 203-206, for emissions of acetaldehyde and formaldehyde.
3. The Bay Area Air Quality Management District, Engineering Division – Addendum to Mercury Emissions from Cremation of Human Remains, for emissions of mercury.

The U.S. EPA's SCREEN3 computer model was used to predict the maximum concentration of each toxic air pollutant listed in Table III beyond the facility's nearest property boundary. This concentration was then compared to the Department's air toxics screening levels for each toxic air pollutant.

**DRAFT PERMIT**

Wes Moore

Serena McIlwain

**Air and Radiation Administration**  
1800 Washington Boulevard, Suite 720  
Baltimore, MD 21230

---

Construction Permit

Operating Permit

---

PERMIT NO.:  
510-3791-1-0478

DATE ISSUED:  
TBD

PERMIT FEE:  
\$1500.00 (PAID)

EXPIRATION DATE:  
In accordance with COMAR 26.11.02.04B

---

**LEGAL OWNER & ADDRESS**

Vaughn Greene Funeral Services, P.A.  
4905 York Rd  
Baltimore, MD 21212  
Attention: Mr. Bill Miller, Managing Member

**SITE**

Vaughn Greene Funeral Services, P.A.  
Vaughn Greene Funeral Services, P.A.  
4905 York Rd  
Baltimore, MD 21212  
AI # 1077

**SOURCE DESCRIPTION**

---

Installation of one (1) human crematory unit.

This source is subject to the conditions described on the attached pages.

---

\_\_\_\_\_  
Program Manager

\_\_\_\_\_  
Director, Air and Radiation Administration



**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

**INDEX**

- Part A – General Provisions
- Part B – Applicable Regulations
- Part C – Construction Conditions
- Part D – Operating and Monitoring Conditions
- Part E – Notification and Testing Requirements
- Part F – Record Keeping and Reporting Requirements
- Part G – Temporary Permit-To-Operate Requirements

This permit covers the following registered installations:

<b>ARA Registration No.</b>	<b>Description</b>	<b>Installation Date</b>
510-3791-1-0478	Matthews Environmental Solutions PowerPak II Plus, 175 pounds per hour, human crematory	To be installed

**Part A – General Provisions**

- (1) The following Air and Radiation Administration (ARA) permit-to-construct applications and supplemental information are incorporated into this permit by reference:
  - (a) Application for Processing or Manufacturing Equipment (Form 5) received June 8, 2020 and revised on November 11, 2020.
  - (b) Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration (Forms 5A and 5T) received June 8, 2020.
  - (c) Emission Point Data (Form 5EP) received June 8, 2020.
  - (d) Supplemental Information – Emissions calculations, screen modeling results, plot plan, and equipment specifications received June 8, 2020.

If there are any conflicts between representations in this permit and representations in the applications, the representations in the permit shall govern. Estimates of dimensions, volumes, emissions rates, operating rates, feed rates and hours of operation included in the applications do not constitute enforceable numeric limits beyond the extent necessary for compliance with applicable requirements.

**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

- (2) Upon presentation of credentials, representatives of the Maryland Department of the Environment (“MDE” or the “Department”) and the Baltimore City Health Department shall at any reasonable time be granted, without delay and without prior notification, access to the Permittee’s property and permitted to:
  - (a) inspect any construction authorized by this permit;
  - (b) sample, as necessary to determine compliance with requirements of this permit, any materials stored or processed on-site, any waste materials, and any discharge into the environment;
  - (c) inspect any monitoring equipment required by this permit;
  - (d) review and copy any records, including all documents required to be maintained by this permit, relevant to a determination of compliance with requirements of this permit; and
  - (e) obtain any photographic documentation or evidence necessary to determine compliance with the requirements of this permit.
- (3) The Permittee shall notify the Department prior to increasing quantities and/or changing the types of any materials referenced in the application or limited by this permit. If the Department determines that such increases or changes constitute a modification, the Permittee shall obtain a permit-to-construct prior to implementing the modification.
- (4) Nothing in this permit authorizes the violation of any rule or regulation or the creation of a nuisance or air pollution.
- (5) If any provision of this permit is declared by proper authority to be invalid, the remaining provisions of the permit shall remain in effect.
- (6) Subsequent to issuance of this permit, the Department may impose additional and modified requirements that are incorporated into a State permit-to-operate issued pursuant to COMAR 26.11.02.13.

**Part B – Applicable Regulations**

- (1) This source is subject to all applicable federal air pollution control requirements.
- (2) This source is subject to all applicable federally enforceable State air pollution control requirements including, but not limited to, the following regulations:

**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

- (a) COMAR 26.11.01.07C, which requires that the Permittee report to the Department occurrences of excess emissions.
- (b) COMAR 26.11.02.04B, which states that a permit to construct or an approval expires if, as determined by the Department:
  - (i) Substantial construction or modification is not commenced within 18 months after the date of issuance of the permit or approval, unless the Department specifies a longer period in the permit or approval;
  - (ii) Construction or modification is substantially discontinued for a period of 18 months after the construction or modification has commenced; or
  - (iii) The source for which the permit or approval was issued is not completed within a reasonable period after the date of issuance of the permit or approval.
- (c) COMAR 26.11.02.04D, which states that notwithstanding COMAR 26.11.02.04B and C, the Department may issue a temporary start-up State permit to operate for a source or emission unit within the source for a period not to exceed 90 days. In the case of a newly constructed or modified source, the Department may issue a temporary start-up State permit to operate for a period not to exceed 1 year.
- (d) COMAR 26.11.02.09A, which requires that the Permittee obtain a permit-to-construct if an installation is to be modified in a manner that would cause changes in the quantity, nature, or characteristics of emissions from the installation as referenced in this permit.
- (e) COMAR 26.11.08.01B(9-1) – a “Crematory” means a furnace where a human or animal corpse is burned with:
  - (i) The container or bag in which the human or animal corpse is placed or transported; and
  - (ii) The animal bedding, if applicable.
- (f) COMAR 26.11.08.04B, which prohibits visible emissions other than uncombined water in Areas III and IV. The Permittee is located in Area III as defined in COMAR 26.11.01.03C.

**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

Exceptions. The requirements do not apply to emissions during start-up, or adjustments or occasional cleaning of control equipment if:

- (1) The visible emissions are not greater than 40 percent opacity; and
  - (2) The visible emissions do not occur for more than 6 consecutive minutes in any 60-minute period.
- (g) COMAR 26.11.08.05B(2)(a), which limits the concentration of particulate matter in any exhaust gases to not more than 0.10 grains per standard cubic foot of dry exhaust gas.
- (3) This source is subject to all applicable State-only enforceable air pollution control requirements including, but not limited to, the following regulations:
- (a) COMAR 26.11.02.13A(1), which requires that the Permittee obtain from the Department, and maintain and renew as required, a valid State permit-to-operate.
  - (b) COMAR 26.11.02.19C & D, which require that the Permittee submit to the Department annual certifications of emissions, and that the Permittee maintain sufficient records to support the emissions information presented in such submittals.
  - (c) COMAR 26.11.06.08 and 26.11.06.09, which generally prohibit the discharge of emissions beyond the property line in such a manner that a nuisance or air pollution is created.
  - (d) COMAR 26.11.15.05, which requires that the Permittee implement "Best Available Control Technology for Toxics" (T – BACT) to control emissions of toxic air pollutants.
  - (e) COMAR 26.11.15.06, which prohibits the discharge of toxic air pollutants to the extent that such emissions would unreasonably endanger human health.

**Part C – Construction Conditions**

- (1) Except as otherwise provided in this part, the Matthews Environmental Solutions, PowerPak II Plus, 175 pounds per hour, human crematory shall be constructed in accordance with specifications included in the incorporated applications and in accordance with the specifications provided by the vendor and manufacturer.

**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

- (2) The crematory shall be designed to limit particulate matter emissions to no more than 0.10 grains per standard cubic foot dry, adjusted to 12 percent carbon dioxide.
- (3) The crematory shall be equipped with a secondary combustion chamber capable of achieving a retention time of at least 1.0 second, and an operating temperature of at least 1600 °F.
- (4) The crematory shall be equipped with temperature sensors and recorders to continuously monitor and record the temperature of the secondary combustion chamber during operation.
- (5) The crematory shall be equipped with an opacity sensor interlocked with a control system that continuously monitors the stack gases for visible emissions during operation and adjusts cremation operations to prevent visible emissions from exiting the crematory stack.
- (6) The stack height of the crematory stack shall be at least 40 feet above the ground.
- (7) The crematory stack shall be equipped with sampling ports designed to provide access to stack gases in order to perform EPA or other Department approved stack emissions testing methods.

**Part D – Operating and Monitoring Conditions**

- (1) Except as otherwise provided in this part, the Matthews Environmental Solutions, PowerPak II Plus, 175 pounds per hour, human crematory authorized by this permit shall be operated in accordance with specifications included in the application and any operating procedures recommended by equipment vendors unless the Permittee obtains from the Department written authorization for alternative operating procedures.
- (2) The Permittee shall comply with the following premises-wide operational limitations unless the Permittee can demonstrate, to the satisfaction of the Department, that compliance with all applicable air quality regulations and standards can be achieved under other operational conditions:
  - (a) The Permittee shall only cremate human remains in the Matthews Environmental Solutions, PowerPak II Plus, 175 pounds per hour, crematory.

**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

- (b) The Permittee shall not cremate more than 2 human remains during any 8-hour period.
  - (c) The Permittee shall not combust any halogenated plastics, including polyvinyl chloride (PVC) body bags or PVC pipes.
  - (d) The Permittee shall not combust any hazardous waste, or hospital, medical, and infectious waste as defined in COMAR 26.11.08.01B(18).
- (3) Prior to the initiation of cremation in the primary chamber, the secondary chamber shall be preheated until the gases leaving the secondary chamber attain a temperature of at least 1600 °F.
  - (4) While remains are being cremated, the secondary chamber temperature shall be maintained at 1600 °F or higher.
  - (5) While remains are cremated, the temperature of the flue gases at the outlet of the secondary combustion chamber shall be continuously monitored and recorded on a chart recorder or other continuous record keeping device. The records shall show the dates and times of all recorded temperature readings.
  - (6) The Permittee shall comply with the following local zoning conditions as specified by the Baltimore City Board of Municipal and Zoning Appeals (BMZA) unless the Permittee obtains approval from the BMZA to operate at other conditions:
    - (a) Only human remains from funeral homes owned, operated, or controlled by Vaughn Greene Funeral Services may be cremated on the premises;
    - (b) Vaughn Greene Funeral Services will remove all teeth containing mercury amalgams prior to cremation; and
    - (c) Vaughn Greene Funeral Services will comply with all applicable federal, state, and local laws.
  - (7) The Permittee shall develop and maintain an Operations and Maintenance (O&M) Plan for the crematory, reviewed and approved by the Department, that incorporates all of the following:

**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

- (a) Information that is sufficient to demonstrate that air emissions from the crematory can be expected to comply with all applicable regulatory requirements during periods of normal operation. Examples of types of information that could be included to support the required demonstrations would be design criteria, vendor specifications and performance guarantees, approved computer modeling studies, and results of testing programs in which approved test methods and procedures were utilized.
- (b) Procedures that provide for proper operation and maintenance of the crematory and associated operating and monitoring equipment.
- (c) Provisions for periodic monitoring of operating parameters as necessary to determine that the crematory is functioning properly.
- (d) Descriptions of procedures to be followed and corrective actions to be taken when monitoring information indicates that the crematory is not functioning properly.
- (e) Provisions for developing written or printable electronic records that will show whether prescribed operating, maintenance and monitoring procedures are consistently followed, and whether timely and appropriate corrective actions are taken when malfunctions occur.

**Part E – Notification and Testing Requirements**

- (1) Within 15 calendar days following initial startup, the Permittee shall submit written or electronic notification to the Department of the initial startup date of the crematory.
- (2) Within 120 days after initial startup, the Permittee shall conduct a modified EPA Method 9 opacity observation of the crematory stack to demonstrate compliance with the requirements of COMAR 26.11.08.04B, to assess the effectiveness of the crematory's opacity sensor, and to determine when operations require adjustments to ensure compliance.
  - (a) The opacity observation shall be conducted for a one-hour period while human remains are cremated.
  - (b) During the opacity observation, the Permittee shall make adjustments to the opacity sensor equipment and crematory operations as needed to ensure that visible emissions do not occur during normal operation.

**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

- (c) If visible emissions are observed during the opacity observation, the Permittee shall take corrective actions to bring the crematory into compliance.
  - (d) At least 30 days prior to conducting the modified Method 9 opacity observation, the Permittee shall notify the Department of the intended date of the observation to allow for an inspector to be present.
  - (e) Within 30 days after conducting a modified Method 9 opacity observation, the Permittee shall submit the results and a description of adjustments or corrective actions made during the observations to the Department.
- (3) Within 120 days after initial startup, the Permittee shall conduct performance tests on the crematory stack to determine emissions of particulate matter (as PM-10) using EPA Method 5 and emissions of metals using EPA Method 29.
- (a) At least 30 days prior to the performance tests, the Permittee shall submit to the Department a test protocol for review and approval.
  - (b) Within 45 days following the performance tests, the Permittee shall submit to the Department the performance test results.
  - (c) In lieu of conducting performance tests, the Permittee may submit Method 5 and Method 29 performance test results conducted within the last five years by a third-party stack testing company on an identical crematory unit.
  - (d) The performance test results shall include a demonstration of compliance with applicable particulate matter and metal toxic air pollutant requirements.

**Part F – Record Keeping and Reporting**

- (1) The Permittee shall maintain for at least five (5) years, and shall make available to the Department upon request, records of the following information for the crematory:



**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

- (a) Charts or other continuous records of the flue gas temperature at the outlet of the secondary combustion chamber. The records must show the date and start time of each cremation.
  - (b) A log of the following information for each cremation performed:
    - (i) the date and start time of each cremation;
    - (ii) the approximate weight of each charge;
    - (iii) the duration of each cremation cycle;
    - (iv) description of remains, including place of origin and record of receipt demonstrating that only remains from funeral homes owned, operated, or controlled by Vaughn Greene Funeral Services, and accompanying materials to be cremated; and
    - (v) identification of materials removed from remains prior to cremation to comply with the requirements of Part D(2) and Part D(6) of this permit.
  - (c) Records of all maintenance performed on the crematory including the date and description of the maintenance performed and actions taken.
  - (d) A copy of the required Operations and Maintenance (O&M) Plan.
  - (e) Records of the results of all modified Method 9 opacity observations and Method 5 and Method 29 performance tests.
- (2) The Permittee shall maintain at the facility for at least five (5) years, and shall make available to the Department upon request, records necessary to support annual certifications of emissions and demonstrations of compliance for toxic air pollutants. Such records shall include, if applicable, the following:
- (a) mass emissions rates for each regulated pollutant, and the total mass emissions rate for all regulated pollutants for each registered source of emissions;
  - (b) accounts of the methods and assumptions used to quantify emissions;
  - (c) all operating data, including operating schedules and production data, that were used in determinations of emissions;

**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

- (d) amounts, types, and analyses of all fuels used;
  - (e) any records, the maintenance of which is required by this permit or by State or federal regulations, that pertain to the operation and maintenance of continuous emissions monitors, including:
    - (i) all emissions data generated by such monitors;
    - (ii) all monitor calibration data;
    - (iii) information regarding the percentage of time each monitor was available for service; and
    - (iv) information concerning any equipment malfunctions.
  - (f) information concerning operation, maintenance, and performance of air pollution control equipment and compliance monitoring equipment, including:
    - (i) identifications and descriptions of all such equipment;
    - (ii) operating schedules for each item of such equipment;
    - (iii) accounts of any significant maintenance performed;
    - (iv) accounts of all malfunctions and outages; and
    - (v) accounts of any episodes of reduced efficiency.
  - (g) limitations on source operation or any work practice standards that significantly affect emissions; and
  - (h) other relevant information as required by the Department.
- (3) The Permittee shall submit to the Department by April 1 of each year a certification of emissions for the previous calendar year. The certifications shall be prepared in accordance with requirements, as applicable, adopted under COMAR 26.11.01.05 – 1 and COMAR 26.11.02.19D.
- (a) Certifications of emissions shall be submitted on forms obtained from the Department.

**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

- (b) A certification of emissions shall include mass emissions rates for each regulated pollutant, and the total mass emissions rate for all regulated pollutants for each of the facility's registered sources of emissions.
- (c) The person responsible for a certification of emissions shall certify the submittal to the Department in the following manner:

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”
- (4) The Permittee shall submit to the Department by April 1 of each year a written certification of the results of an analysis of emissions of toxic air pollutants from the Permittee's facility during the previous calendar year. Such analysis shall include either:
  - (a) a statement that previously submitted compliance demonstrations for emissions of toxic air pollutants remain valid; or
  - (b) a revised compliance demonstration, developed in accordance with requirements included under COMAR 26.11.15 & 16, that accounts for changes in operations, analytical methods, emissions determinations, or other factors that have invalidated previous demonstrations.
- (5) The Permittee shall report, in accordance with requirements under COMAR 26.11.01.07, occurrences of excess emissions to the Compliance Program of the Air and Radiation Administration.

**Part G – Temporary Permit-to-Operate Requirements**

- (1) This permit-to-construct shall also serve as a temporary permit-to-operate that confers upon the Permittee authorization to operate the Matthews Environmental Solutions, PowerPak II Plus, 175 pounds per hour, human crematory for a period of up to 180 days after initiating operation of the crematory.

**VAUGHN GREENE FUNERAL SERVICES, P.A.**  
**PERMIT-TO-CONSTRUCT CONDITIONS**  
**PERMIT No. 510-3791-1-0478**

- (2) During the effective period of the temporary permit-to-operate the Permittee shall operate the new installation as required by the applicable terms and conditions of this permit-to-construct, and in accordance with operating procedures and recommendations provided by equipment vendors.
- (3) During the effective period of the temporary permit-to-operate the Permittee shall comply with all required notification, opacity observation, and performance test requirements as specified in Part E of this permit.
- (4) The Permittee shall submit to the Department an application for a State permit-to-operate no later than 60 days prior to expiration of the effective period of the temporary permit-to-operate. With the application for a State permit-to-operate, the Permittee shall submit a proposed Operations and Maintenance Plan required by Part D(7) of this permit for review and approval by the Department.

# MARYLAND DEPARTMENT OF THE ENVIRONMENT

## AIR AND RADIATION ADMINISTRATION

### SUPPLEMENTAL INFORMATION REFERENCES

The Code of Maryland Regulations (COMAR) is searchable by COMAR citation at the following Division of State Documents website:

<https://dsd.maryland.gov/Pages/COMARHome.aspx>

The Code of Federal Regulations (CFR), including New Source Performance Standards (NSPS) at 40 CFR, Part 60 and National Emission Standards for Hazardous Air Pollutants (NESHAP) at 40 CFR, Parts 61 and 63, is searchable by CFR citation at the following U.S. Government Publishing Office website:

<http://www.ecfr.gov>

Information on National Ambient Air Quality Standards (NAAQS) is located at the following U.S. Environmental Protection Agency (EPA) website:

<https://www.epa.gov/criteria-air-pollutants/naaqs-table>

Information on Maryland's Ambient Air Monitoring Program is located at the following Maryland Department of the Environment website:

<http://mde.maryland.gov/programs/Air/AirQualityMonitoring/Pages/index.aspx>

Information on the U.S. EPA's Screen3 computer model and other EPA-approved air dispersion models is located at the following U.S. EPA website:

[http://www.epa.gov/scram001/dispersion\\_screening.htm](http://www.epa.gov/scram001/dispersion_screening.htm)

Information on the U.S. EPA TANKS Emission Estimation Software is located at the following U.S. EPA website:

<http://www.epa.gov/ttn/chief/software/tanks/index.html>

Information on the U.S. EPA Emission Factors and AP-42 is located at the following U.S. EPA website:

<https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emission-factors>

Information on the 2020 National Emissions Inventory Technical Support Document for Cremation:

[https://www.epa.gov/system/files/documents/2023-04/NEI2020\\_TSD\\_Section29\\_Cremation.pdf](https://www.epa.gov/system/files/documents/2023-04/NEI2020_TSD_Section29_Cremation.pdf)

Crematory emissions information excerpt from the Bay Area Air Quality Management District, Engineering Division – Permit Manual, pages 203-206, and Addendum to Mercury Emissions from Cremation of Human Remains, attached.



**BAY AREA AIR QUALITY MANAGEMENT DISTRICT**  

---

**Engineering Division**

**Permit Handbook**

ENGINEERING DIVISION

# Permit Handbook

---

Bay Area Air Quality Management District  
375 Beale Street, Suite 600  
San Francisco, CA 94105  
Phone (415) 749-5000

---

## 11.6 CREMATORIES

August 9, 2021

### Process Description

Cremation is the act of reducing a corpse by burning, generally in a crematorium furnace or crematory fire. A multiple chamber incinerator is generally used to cremate human and pet animal remains. An incinerator with two chambers, namely primary and secondary, is the most widely used type of cremator. The secondary chamber is heated first by igniting the afterburner and heating to an operating temperature of at or above 1500° F. A "cremation case charge" (human or animal remains enclosed in a wooden casket/cardboard casket or a body bag) is introduced in the primary chamber, called a retort, and the retort door is closed. The charge is placed on the hearth in a manner that provides for maximum exposure to the flame of the primary burner. Control timers are set, and an opacity monitor and power switch are activated. The low fire ignition burner in the primary chamber is activated. Within approximately 30 minutes, the high fire cremation burner in the primary chamber begins a controlled cycling range of 1750 to 1800° F. This cycling continues until the cremation process is complete. During the cremation process, a large part of the body (especially the organs) and other soft tissue are vaporized and oxidized due to the heat, and the gases are discharged through the exhaust system. All that remains after cremation are dry bone fragments (mostly calcium phosphates and minor minerals). The approximate time for complete cremation is 2 hours, which may vary depending on charge weight.

After the incineration is completed, the bone fragments are swept out of the retort and the operator uses a pulverizer called a cremulator to process them into what are known as cremains which exhibit the appearance of grains of sand and recognizable chips of very dry bone.

### Completeness Determination

The following District forms should be completed and fees provided for cremators. Use the [Completeness Determination Checklist](#) to verify completeness. Use the [Data Form Guidance](#) to ensure that the forms are completed correctly. Use the [Fee Calculation Guidance](#) to ensure that the fees are calculated accurately.

1. Form 101-B (one for facility).
2. Form G (one per source).
3. Source Description: Crematory Retort with Integral Afterburner
4. Process Code: 8011 (crematory retort)  
Material Code: 791 (bodies - human) and Usage Unit: tons
5. or Material Code: 498 (Animal carcasses) and Usage Unit: pounds
6. Form C (one per Retort and Afterburner).
7. Form A (only if applicant chooses to control emissions with abatement equipment other than an afterburner in secondary chamber of a crematory retort).
8. Form P (one per stack).
9. If Health Risk Screening is triggered, Form HRSA (one per source).
10. Fees, calculated per Regulation 3 (Schedule G-1 for incinerators - crematory).
11. Any emission data available for the proposed crematory retort, or use standard emission factors indicated in Emission Calculations section.

### Emission Calculations

Crematory retort can produce emissions of flyash, smoke, gases, and odor. Odor and visible emissions can be objectionable to many people on aesthetic grounds. A poorly designed retort with inadequate turbulence, temperatures, and residence time can result in the objectionable emissions. The visible and odor emissions can best be controlled by good retort design. An afterburner in the secondary chamber of the retort compensates for deficiencies, if any, in the design of the primary chamber to minimize air contaminants.

Almost all crematory retorts use natural gas as the fuel to cremate "cremation case charge." A "cremation case charge" is a body in a casket or a bag. As a result, the emission factors available for natural gas combustion in [AP-42 Chapter 1.4 \(Tables 1.4-1 and 1.4-2\)](#) can be used to estimate particulate matter (PM10), nitrogen oxides (NOx), carbon monoxide (CO), sulfur dioxide (SO2), and precursor organic compounds (POC) emissions from the combustion of natural gas in the crematory retort. The emission factors for natural gas combustion are as follows:



**NATURAL GAS COMBUSTION EMISSION FACTORS<sup>18</sup>**

Pollutant	Emission Factor (lb/MM cu ft)
PM10	7.6
NOx	100
CO	84
SO2	0.6
POC (VOC, not including methane)	5.5

In addition to natural gas combustion, there are also emissions attributed to the combustion of the casket and body. According to EPA’s FIRE Program<sup>19</sup>, the PM10 emission factor associated with the combustion of body and the wrapping material is  $8.5 \times 10^{-2}$  pounds per each body burned<sup>20</sup>. In deriving the PM10 emission factor, the average weight per body incinerated was approximately 150 lbs (rounded up). In calculating the other criteria pollutants, the emission factors available for medical waste incineration in [AP-42 Chapter 2.3 \(Table 2.3-1 and 2.3-2\)](#) can be used to estimate NOx, CO, SO2, and POC emissions. In summary, the following are the emission factors for the combustion of the body and its case:

**BODY AND CASE COMBUSTION EMISSION FACTORS**

Pollutant	Emission Factor (lb/ton) – used in human emissions calculation	Emission Factor (lb/body) <sup>21</sup> – used in animal emissions calculation	Reference
PM10	1.13	8.50E-02	FIRE
NOx	3.56	2.67E-01	AP-42 Table 2.3-1
CO	2.95	2.21E-01	AP-42 Table 2.3-1
SO2	2.17	1.63E-01	AP-42 Table 2.3-1
POC	0.299	2.24E-02	AP-42 Table 2.3-2

**TOXICS**

For toxic emissions, emissions factors for crematories from FIRE database were also obtained:

**TOXICS EMISSION FACTORS<sup>22</sup>**

Pollutant	Emission Factor (lb/body)
Acetaldehyde <sup>23</sup>	1.3 E-04
Arsenic	3.0 E-05
Antimony	3.0 E-05
Beryllium	1.4 E-06
Cadmium	1.1 E-05

<sup>18</sup> Emission factor is for uncontrolled natural gas boilers less than 100 MMBTU/hr.

<sup>19</sup> The [Factor Information REtrieval \(FIRE\) Data System](#) is a database containing EPA’s emission estimation factors for criteria and hazardous air pollutants in an easy to use Windows program.

<sup>20</sup> Standard Classification Code (SCC) = 31502101 for Crematoriums from [Emissions Testing of a Propane Fired Incinerator at a Crematorium](#), October 29, 1992.

<sup>21</sup> The average weight of a body (including casing) is 150 lbs.

<sup>22</sup> Except for mercury, formaldehyde and acetaldehyde, pollutant emission factors are from EPA’s FIRE database for crematoriums (SCC = 31502101).

<sup>23</sup> Formaldehyde and acetaldehyde emission factors are calculated based on the data in CARB’s Test Report No. C-90-004, “Evaluation Test on Two Propane Fired Crematories Camellia Memorial Lawn Cemetery”, October 29, 1992.

Pollutant	Emission Factor (lb/body)
Chromium, hexavalent	1.4 E-05
Copper	2.7 E-05
Formaldehyde <sup>6</sup>	3.4 E-05
Hydrogen chloride	7.2 E-02
Hydrogen fluoride	6.6 E-04
Lead	6.6 E-05
Mercury <sup>24</sup>	3.4 E-03 (annual average); 1.3E-02 (acute)
Nickel	3.8 E-05
Selenium	4.4 E-05
Zinc	3.5 E-04
Chlorinated dibenzodioxins and furans (expressed as 2,3,7,8 TCDD equivalents) <sup>25</sup>	1.4 E-09
Polycyclic Aromatic Hydrocarbons (PAHs) [expressed as benzo(a)pyrene equivalent] <sup>26</sup>	4.9 E-08

A [crematories spreadsheet](#) has been developed with worksheets to calculate emissions from human and animal cremations using all the emissions indicated above.

**Applicable Requirements**

District Rules and Regulations

In general, a permit is required for each crematory retort. The [cremulator](#) is exempt from permitting requirements per Regulation 2-1-121.

Crematory retorts are subject to the operating standards of Regulation 6-1 and Regulation 8-2. The visible and odor emissions can best be controlled by good retort design. The permit conditions for crematories include parts which will ensure compliance with Regulation 6-1. The permit engineer calculated emissions for POCs should be compared to the operating standards of Regulation 8-2 to determine compliance.

Best Available Control Technology (BACT)

BACT for the crematory retorts are specified in the BACT/TBACT Workbook. The following are applicable BACT requirements for:

---

<sup>24</sup> The mercury emission factors are from “Mercury Emissions from the Cremation of Human Remains” September 24, 2012, by Jane Lundquist . This factor should only be applied for human cremations.

<sup>25</sup> Using the latest FIRE factors (dated 3/6/2008), the dioxin/furan emission factor was calculated based on the equivalency factors in the 2003 OEHHEA risk assessment guidelines (see Note 1 of [Crematories spreadsheet](#)).

<sup>26</sup> Using the latest FIRE factors (dated 3/6/2008), the PAH emission factor was calculated based on the equivalency factors in the 2003 OEHHEA risk assessment guidelines (see Note 2 of [Crematories spreadsheet](#)).

*Crematories**- Crematory*

Inform the BACT Coordinator of updates to the BACT/TBACT Workbook.

California Environmental Quality Act (CEQA)

Permit applications which are reviewed following the specific procedures, fixed standards and objective measurements set forth in this chapter (11.5) are classified as ministerial and will accordingly be exempt from CEQA review per Regulation 2-1-311.

In addition to the above-mentioned source-specific applicable requirements, other requirements may also be applicable depending on the facility, its application emissions, and its source location:

- |  |  |
|--|--|
| <input type="checkbox"/> Offsets                                 | <input type="checkbox"/> School Notification     |
| <input type="checkbox"/> Prevention of Significant Deterioration | <input type="checkbox"/> Risk Screening Analysis |

**Permit Conditions**

Standardized conditions for human and animal crematories are available from the [Permit Condition Guidance](#). Refer to the [Evaluation Report Template Guidance](#) to obtain the Microsoft Word formatted permit conditions for this source category.

Addendum to  
Mercury Emissions from Cremation of Human Remains

August 3, 2021

Bay Area Air Quality Management District

Prepared By: Davis Zhu, Senior Air Quality Engineer  
Flora Chan, Senior Air Quality Engineer  
Simrun Dhoot, Supervising Air Quality Engineer  
Engineering Division

# Addendum to Mercury Emissions from Cremation of Human Remains

## Executive Summary

The purpose of this Addendum is to update the emission factor used by the District to estimate mercury emissions from the cremation of human remains. The previous emission factor was derived from the 2012 Bay Area Air Quality Management District report, “Mercury Emissions from the Cremation of Human Remains.” In this report, mercury emission factors are based on a mass balance analysis which accounts for the variation in the amount of dental amalgam by age group.

Data used in the 2012 District report is derived from data on dental restorations of over 27,000 individuals during the years 1999 through 2004. The District report acknowledges that the decreasing popularity of dental amalgam, a trend that has been observed since 1979, will result in fewer mercury emissions from cremations over time. Therefore, the mercury emission factors in the District Permit Handbook shall be updated periodically.

The mercury emission factors for human cremations in the District’s Permit Handbook, Chapter 11.6 Crematories, should be updated with the values in the table below.

Updated Mercury Emission Factors (lb/body)	
Annual Average	Acute
1.5E-03	5.3E-03

## 1. Background

In the 2012 District report, maximum and average mercury emissions per cremation are estimated using the following factors: mass balance of dental restoration statistics by age group, death statistics, estimated weight of amalgam in dental restorations and the estimated amounts of mercury in dental amalgam. Popularity of amalgam as restorative material is decreasing due to concerns regarding health effects, environmental pollution, and aesthetics.<sup>1</sup> Developments in operative dentistry, including a progressive shift to the use of resin composites, has also contributed to the decline of dental amalgam usage for restoration of posterior teeth.<sup>2</sup> As referenced in the 2012 District report, a 2007 Public Health Report study, analyzed trends for amalgam placements and concluded that, “the mean percent of decline in the number of amalgams inserted per year for the past 12 years was 3.7%. This rate of decline did not vary by age group or year...It is expected that this trend will continue into the foreseeable future.”<sup>3</sup> The downward trend of amalgam usage in dental procedures will directly result in fewer mercury emissions during cremation as fewer bodies with amalgam are cremated.

## 2. Data and Assumptions

The data on the number of restored surfaces per tooth for each individual by age was obtained from the National Health and Nutrition Examination Survey (NHANES) demographics and oral health data sets for the periods 1999-2004. NHANES data collected after 2004 was not used because the latter data sets did not have information on the number of restored surfaces.

---

<sup>1</sup> Dunne SM, Grainsford ID, Wilson NH. Current materials and techniques for direct restorations in posterior teeth. Part 1: Silver amalgam. *Int Dent J.* 1997;47:123–36.

<sup>2</sup> Lynch C D, Opdam N J, Hickel R et al. Guidance on the use of resin composites for direct restoration of posterior teeth: Academy of Operative Dentistry European Section. *J Dent* 2014; 42: 377–383

<sup>3</sup> Beazoglou T, Eklund S, Heffley D, Meiers J, Brown LJ, Bailit H, Economic Impact of Regulating the Use of Amalgam Restorations, Public Health Reports 2007 September-October; vol. 122, 657  
<http://www.publichealthreports.org/issueopen.cfm?articleID=1934>

## Addendum to Mercury Emissions from Cremation of Human Remains

The average life expectancy in the United States in the year 2020 was 77.8 years. Therefore, nearly two decades after the NHANES data was collected from 1999-2004, it is expected that the people in the age group of “Over 85” and “75-84” are deceased. As a result, Table 3, Estimating Amounts of Dental Amalgam in Deceased, of Section 3, Calculation Method and Results, of the 2012 District report is updated with the following changes:

1. Age groups 75 years old and older from the 1999-2004 data are removed;
2. The sum for dental amalgam in deceased at the 95%-tile, grams is recalculated; and
3. The sum for average dental amalgam in deceased, grams is recalculated.

Table 3 - Estimating Amounts of Dental Amalgam in Deceased						
Age group, years	Number of individuals in the age group	Dental amalgam in NHANES individual at 95%-tile, grams	Average dental amalgam in NHANES individual, grams	Fraction of deaths in the Bay Area	Weighted amalgam in individual at 95%-tile, grams	Weight average amalgam in individual, grams
65-74	1942	14.73	3.78	0.143	2.10	0.54
55-64	1907	14.94	4.32	0.115	1.72	0.50
45-54	2162	13.47	4.31	0.074	1.00	0.32
35-44	2435	10.40	3.29	0.031	0.32	0.10
25-34	2512	7.39	2.23	0.015	0.11	0.03
15-24	5643	4.62	1.07	0.012	0.06	0.01
5--14	6523	3.66	0.72	0.002	0.01	0.00
Under 5	2045	0.49	0.16	0.011	0.01	0.00
Sum for Dental Amalgam in deceased (<75) at the 95%-tile, grams					<b>5.32</b>	
Sum for Average Dental Amalgam in deceased (<75), grams						<b>1.51</b>

To substantiate that the data prepared by NHANES is accurate, District staff reviewed research conducted by the University of Minnesota School of Dentistry in 2015. In this research, it was determined that the average dental amalgam from 1,000 patient samples (ages 63-79) is 5.03 g per person.<sup>4</sup> Considering that 14% of California’s population lack dental benefits,<sup>5</sup> the 5.03 g amalgam would be equal to an average of 4.33 g amalgam per person in the age group of 63-79. These results are almost identical to the 55-64 age group’s average amalgam 4.32 g in the NHANES 1999-2004 data, as shown in the Table 3.

### 3. Calculation Methods and Results

As indicated in the District report, mercury emissions from the cremation of human remains for acute health impacts are based on the amount of dental amalgam present in the deceased representing the highest amount at the 95th percentile and the emissions for chronic impacts are based on the average amount of dental amalgam present in the deceased. Estimated mercury emissions for determining acute and chronic impacts are calculated using a dental amalgam mercury content of 45 weight percent. Table 4, Mercury Emission Rates for the Cremation of Human Remains, of Section 3, Calculation Method and Results, of the District report is updated as follows:

<sup>4</sup> <https://www.pca.state.mn.us/sites/default/files/aq-ei2-07b.pdf>

<sup>5</sup> <https://www.sacbee.com/news/california/article231786583.html>

## Addendum to Mercury Emissions from Cremation of Human Remains

Table 4 - Mercury Emission Rates for the Cremation of Human Remains		
Acute Impacts (95% tile)	2.4 g/human cremated	0.00528 lb/human cremated
Chronic Impacts (average)	0.7 g/human cremated	0.00149 lb/human cremated

### 4. Comparison with Other Estimates

#### 4.1 Comparison to CATEF, EPA WebFire, and Literature

Table 6, Comparison of Estimates of Mercury Emissions from Human Cremations, of Section 5, Comparison with Other Estimates, of the District report is updated to show a comparison of the mercury emission estimates from human cremations from this updated analysis, the California Air Toxics Emission Factor Database (CATEF), the EPA WebFire database, and EPA’s Locating and Estimating Air Emissions from Sources of Mercury and Mercury Compounds (1997 version) (L&E). The WebFire and L&E emission rates all came from a 1992 CARB source test in a Sacramento crematory. It is expected that proposed annual average 0.00149 lb per body (0.7 g per body) is much lower than 0.0033 lb per body (1.5 g per body) from the 1992 source test since it is only a snap-shot of the mercury emissions from the crematory in a single source test. Considering that age-specific rates of restorations have been declining in the older age groups over the last 20 years since the 1992 source test, mercury emissions are expected to be less than the single source test results.

Table 6 - Comparison of Estimates of Mercury Emissions from Human Cremations, lbs/body				
Reference for Emission Estimate	Average	Low	High	Basis
Estimated in this report	0.00149	not estimated	0.0052	1999-2004 Dental restoration statistics for age groups under 75 years old, more than 27,000 individuals and filling size data for the number of surfaces restored
EPA WebFire	0.0033	not estimate	not estimated	CARB 1992 source test reported to EPA
California Toxics Emission Factor Database <sup>6</sup>	0.0048	0.0047	0.0049	No data on the number or size of fillings
Locating and Estimating Air Emissions from Sources of Mercury and Mercury Compounds <sup>7</sup>	0.0033	0.0013	0.0048	CARB 1992 source test reported to EPA, same average EF in WebFire

<sup>6</sup> CATEF - California Air Toxics Emission Factor Database. California EPA Air Resources Board.

[https://ww2.arb.ca.gov/sites/default/files/classic//research/apr/past/96-333\\_1\\_pt2.pdf](https://ww2.arb.ca.gov/sites/default/files/classic//research/apr/past/96-333_1_pt2.pdf), page 128

<sup>7</sup> Locating and Estimating Air Emissions from Sources of Mercury and Mercury Compounds. EPA-454/R-97-012, December 1997. <https://www3.epa.gov/ttnchie1/le/mercury.pdf>

## Addendum to Mercury Emissions from Cremation of Human Remains

### 4.2 Comparison with Bay Area Source Tests

Comparisons of source test results from crematories in the Bay Area are listed in the Table below. All reported average mercury emission rates are less than the proposed annual average 0.00149 lb per body (0.7 g per body). All reported maximum mercury emission rates are less than the proposed maximum 1-hr 0.00528 lb per body (2.4 g per body).

Comparison of Source Test Mercury Emissions from Human Cremations in Bay Area								
Facility #	Facility	City	Source/Date	Test 1	Test 2	Test 3	Average	
4134	Irvington Memorial Crematory	Fremont	S-5, 2007	0.576	1.198	0.00445	0.593*	g/hr
3576	Catholic Cremation Services	Hayward	S-2, 2009	0.253	0.0031	1.598	0.618	g/cremation
6390	Evergreen Cemetary	Oakland	S-4, 2008	0.0021	0.0155	1.76	0.593	g/hr
6390	Evergreen Cemetary	Oakland	S-4, 2014	0.0428	0.0133	0.0022	0.0194	g/hr

\* This value was approved the District's Source Test Section. However, the facility has disputed these results. The calculations are currently being investigated.

### 5. Conclusion

The mercury emission factors derived from mass balance in the 2012 District report are a conservative estimate of mercury emissions from data collected during the years 1999-2004. For the reasons described in this Addendum, the use of dental amalgam is on a continued decline. Therefore, the mercury emission factors for human cremations in the District Permit Handbook under Chapter 11.6 Crematories should be updated to reflect the values in the table below.

Updated Mercury Emission Factors (lb/body)	
Annual Average	Acute
1.5E-03	5.3E-03