

**DRAFT**  
**Engineering Evaluation Report**  
**Duggan's Mission Chapel**  
**Application # 29716; Plant #2315**  
**525 West Napa Street, Sonoma, CA 95476**

**Background**

The Duggan's Mission Chapel is applying for an Authority to Construct and Permit to Operate for the following equipment:

**S-2 Human Crematory Retort with Integral Afterburner;  
 American Crematory Equipment Company, Model: A-250-WH  
 Natural gas fired, 2.25 MMBtu/hr**

These sources will be located at 525 West Napa Street, Sonoma, CA 95476 and will replace the following equipment:

**S-1 Crematory retort, "All I" Crematory Retort, Model L-1701 Burns Natural gas, 2.12 MMBTU/hr**

There is no throughput limit on the current crematory retort (S-1). The proposed S-2 is permitted and established a throughput limit for up to 1,040 bodies per year. S-2 is controlled air units with primary and secondary chamber burners. The secondary chamber burner functions as an afterburner.

**Emission Summary**

Criteria air pollutants emissions were estimated using the emission factors for natural gas combustion in AP-42 Table 1.4-1 and 1.4-2, emission factors for the combustion of the body and case wrappings were from EPA FIRE database (for PM<sub>10</sub>) and medical waste incineration in AP-42 Table 2.3-1 and 2.3-2

Basis for proposed S-2:

- Crematory retort rating = 2.25 MMBtu/hr
- Proposed cases/year = 1040
- Average body weight = 150 lbs
- Cremation Rate = 150 lb/hr
- Annual throughput = 1040 bodies/yr x 150 lb/body = 156,000 lb/yr = 78 tons/yr
- Hours of operation = (8 hr/day) (5 day/week) (52 weeks/yr) = 2080 hr/yr
- Natural Gas Therms = 2080 hr/yr x 2.25 MMBtu/hr x 1,000,000 Btu/MMBtu / 100,000 Btu/Therm = 46,800 Therms Natural Gas/yr

Hourly emissions for natural gas combustion in primary and secondary chambers are based on the total natural gas firing rate of 2.25 MMBtu/hr of this cremator. Daily natural gas combustion emissions are based on 8 hours (8:30AM to 5PM) of cremator operation per day. Emissions for body cremation are based on cremation of 4 bodies per day and 1040 bodies per year for this facility. With these emission factors, the total criteria pollutant potential to emit from Natural Gas Combustion for this facility is listed in Table 1.

**Table 1. Emissions from S-2 Human Crematory Retort**

Pollutant	Emissions from Natural Gas Combustion			
	Emission Factor <sup>1</sup> [lb/MM cu ft]	Daily [lb/day]	Annual [lb/year]	Annual [TPY]
PM <sub>10</sub>	7.6	0.067	17.44	0.009
NO <sub>x</sub>	100	0.882	229.41	0.115
CO	84	0.741	192.71	0.096
SO <sub>2</sub>	0.6	0.005	1.38	0.001

	POC	5.5	0.049	12.62	0.006
Pollutant	Emissions from Body and Case Combustion				
	Emission Factor <sup>2,3</sup> [lb/body]	Daily [lb/day]	Annual [lb/year]	Annual [TPY]	
PM <sub>10</sub>	0.085	0.340	88.40	0.044	
NO <sub>x</sub>	0.267	1.068	277.68	0.139	
CO	0.221	0.884	229.84	0.115	
SO <sub>2</sub>	0.163	0.652	169.52	0.085	
POC	0.022	0.090	23.30	0.012	

**Table 2. Total Criteria Pollutant Emission from Natural Gas, Body and Case Combustion at S-2**

Pollutant	Total Criteria Pollutant Emissions from Natural Gas, Body and Case Combustion		
	Daily [lb/day]	Annual [lb/year]	Annual [TPY]
PM <sub>10</sub>	0.407	105.84	0.053
NO <sub>x</sub>	1.950	507.09	0.254
CO	1.625	422.55	0.211
SO <sub>2</sub>	0.657	170.90	0.085
POC	0.138	35.91	0.018

**Plant Cumulative Increase Emissions**

The existing S-1 Cremators was permitted in 1987 under permit application #31781.

**Table 3. Past three years (2016-2018) throughputs**

	Annual Natural Gas Usage		Bodies/year
	Therms	MMscf	
2016	14,472	1.42	232
2017	25,459	2.50	417
2018	26,506	2.60	611
Average	22,146	2.17	420

**Table 4. Actual Emissions from S-1 Human Crematory Retort (Based on the Data in Table 3)**

Pollutant	Emissions from Natural Gas Combustion			
	Emission Factor <sup>1</sup> [lb/MM cu ft]	Daily [lb/day]	Annual [lb/year]	Annual [TPY]
PM <sub>10</sub>	7.6	0.067	16.49	0.008
NO <sub>x</sub>	100	0.882	217.00	0.109
CO	84	0.741	182.28	0.091
SO <sub>2</sub>	0.6	0.005	1.30	0.001
POC	5.5	0.049	11.94	0.006

Pollutant	Emissions from Body and Case Combustion			
	Emission Factor <sup>2,3</sup> [lb/body]	Daily [lb/day]	Annual [lb/year]	Annual [TPY]
PM <sub>10</sub>	0.085	0.340	35.70	0.018
NO <sub>x</sub>	0.267	1.068	112.14	0.056
CO	0.221	0.884	92.82	0.046
SO <sub>2</sub>	0.163	0.652	68.46	0.034
POC	0.022	0.090	9.41	0.005

**Table 5. Cumulative Increase for P# 2315**

Pollutant	Emission Reductions S-1	Permitted Emissions (Since April 5, 1991)	Emissions Increases S-2	Net Cumulative Emission Increase
	[TPY]	[TPY]	[TPY]	[TPY]
PM <sub>10</sub>	0.026	0.000	0.053	0.027
NO <sub>x</sub>	0.165	0.000	0.254	0.089
CO	0.138	0.000	0.211	0.074
SO <sub>2</sub>	0.035	0.000	0.085	0.051
POC	0.011	0.000	0.018	0.007

### Toxic Emissions from Natural Gas Combustion and Crematory Operations

Emissions factors for benzene and toluene from natural gas combustion are from AP-42 Table 1.4-3.

$$\text{Benzene} = (0.0021 \text{ lb/MMscf}) / (1020 \text{ MMBtu}/10^6 \text{ ft}^3) = 2.06 \times 10^{-6} \text{ lb/MMBtu}$$

$$\text{Toluene} = (0.0034 \text{ lb/MMscf}) / (1020 \text{ MMBtu}/10^6 \text{ ft}^3) = 3.33 \times 10^{-6} \text{ lb/MMBtu}$$

Per the BAAQMD Permit Handbook Chapter 11.6, formaldehyde and acetaldehyde are calculated from 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. The mercury emission factor is based on BAAQMD report, "Mercury Emissions from the Cremation of Human Remains", September 24, 2012. All other Toxic Air Contaminants (TAC) emission factors for cremation are from EPA's Factor Information Retrieval (FIRE) database.

Table 3 summarizes the maximum hourly and annual average TAC emissions from S-1 at the proposed throughput 1,040 bodies/year for this facility.

**Table 3. Maximum Hourly and Annual Average TAC Emissions**

Pollutant	Emission factor	Toxic emissions		Acute Trigger Level	Chronic Trigger Level	Exceed Acute Triggered?	Exceed Chronic Triggered?
	[lb/body]	[lbs/hr]	[lbs/yr]	[lbs/hr]	[lbs/yr]		
Acetaldehyde	1.30E-04	1.30E-04	1.35E-01	1.00E+00	2.90E+01	No	No
Arsenic	3.00E-05	3.00E-05	3.12E-02	4.40E-04	1.60E-03	No	Yes
Benzene		4.63E-06	9.64E-03	6.00E-02	2.90E+00	No	No
Beryllium	1.40E-06		1.46E-03	None	3.40E-02	No	No
Cadmium	1.10E-05		1.14E-02	None	1.90E-02	No	No
Chromium, hexavalent	1.40E-05		1.46E-02	None	5.10E-04	No	Yes
Copper	2.70E-05	2.70E-05	2.81E-02	2.20E-01	None	No	No
Formaldehyde	3.40E-05	3.40E-05	3.54E-02	1.20E-01	1.40E+01	No	No
Hydrogen chloride	7.20E-02	7.20E-02	7.49E+01	4.60E+00	3.50E+02	No	No
Hydrogen fluoride	6.60E-04	6.60E-04	6.86E-01	5.30E-01	5.80E+01	No	No
Lead	6.60E-05		6.86E-02	None	2.90E-01	No	No
Mercury	3.40E-03	3.40E-03	3.54E+00	1.30E-03	2.10E-01	Yes	Yes
Nickel	3.80E-05	3.80E-05	3.95E-02	3.10E-05	3.10E-01	Yes	No
Selenium	4.40E-05		4.58E-02	None	8.00E+00	No	No
Toluene		5.00E-04	1.04E+00	8.20E+01	1.20E+04	No	No
Zinc	3.50E-04		3.64E-01	None	None	No	No
Chlorinated dibenzodioxins and furans	1.40E-09		1.46E-06	None	4.40E-08	No	Yes
PAHs (benzo(a)pyrene equivalents)	4.90E-08		5.10E-05	None	3.30E-03	No	No

**Statement of Compliance**

**Regulation 1: General Provisions and Definitions**

The facility is subject to Regulation 1, Section 301, which prohibits discharge of air contaminants resulting in public nuisance. The facility is expected to comply with this requirement.

**Regulation 2, Rule 1: Permits – General Requirements**

California Environmental Quality Act (CEQA) Regulation 2, Rule 1, Section 310

Regulation 2, Rule 1, Section 310 specifies that all proposed new and modified sources subject to District permit requirements must be reviewed in accordance with CEQA requirements, except for ministerial projects or projects exempt from CEQA under Section 2-1-312. The engineering review for this project requires only the application of standard permit conditions and standard emission factors in accordance with Permit Handbook Chapter 11.6: Crematories. Therefore, this application is considered to be ministerial and is exempt from CEQA review.

The Air District has determined that the issuance of this Authority to Construct is exempt from CEQA because the Air District's approval was "ministerial" and, therefore, exempt from CEQA under CEQA § 21080(b)(1); CEQA Guidelines Section 15268(a). In addition, the Air District has determined that the permit action for the crematory retort replacement is exempt from CEQA because the new equipment constitutes replacement of an existing facility (CEQA §21084; CEQA Guidelines §15302(c)).

The Air District's action is ministerial because regulatory requirements that govern the approval of this project involved objective numerical standards outlined in the Permit Handbook Chapter 11.6 and BACT/TBACT Workbook Document #53.1, which did not allow for or require any subjective judgment or discretion to interpret or apply. In addition, the Cremator is a replacement of an existing equipment. Health Risk Assessment was completed to estimate the potential health risks. Health impacts were evaluated based on total proposed throughput rates and emissions for the new retort (S-2). In accordance with District's Regulation 2-5-302, this project is considered acceptable, provided S-2 satisfied the Regulation 2-5-301 Best Available Control Technology for Toxics (TBACT). All the criteria for approval of ministerial permit applications were met pursuant to Regulation 2-1-428, including the criteria for the TBACT determination. Because the approval is ministerial, the project is exempt from CEQA.

**Public Notification Regulation 2-1-412**

The public notification requirements of Regulation 2-1-412 apply to applications which result in any increase in toxic air contaminant or hazardous air contaminant emissions at facilities within 1,000 feet of the boundary of a K-12 school. This source is located within 1,000 feet of a school: Sassarini Elementary School (652 Fifth Street West, Sonoma, CA 95476) and St. Francis Solano (342 West Napa Street, Sonoma, CA 95476). In accordance with Regulation 2-1-412, the Air District is required to prepare and distribute a public notice to the parents or guardians of children enrolled in any school within one-quarter mile of the source and to each address located within 1,000 feet of the source. The Air District will receive comments on this project for 30 days after publication of the notice will consider all comments before making a final decision on this project.

**Regulation 2, Rule 2: Permits – New Source Review**

**Best Available Control Technology (BACT) Regulation 2-2-301**

In accordance with Regulation 2, Rule 2, Section 301, BACT is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, NOx, CO, SO2 or PM10.

Base on the emission calculation above, the owner/operator of S-2 is not subject to BACT.

**Offsets Regulation 2-2-302**

Offsets must be provided for any new or modified source at a facility that emits more than 10 tons/year of POC or NOx per Regulation 2-2-302. Based on the emission calculation above, offsets are not required for this project.

**Regulation 2, Rule 5: Permits – New Source Review of Toxic Air Contaminants**

**Health Risk Assessment (HRA):** The District's regulation concerning toxic air contaminant emissions is codified in Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants (TAC). The TAC emissions from new and modified sources are subject to risk assessment review, if the emissions of any individual TAC exceed either the acute or chronic emission thresholds defined in Table 2-5-1.

**Maximum Hourly and Annual TAC Emissions**

Pollutant	Emission factor	Toxic emissions		Acute Trigger Level	Chronic Trigger Level	Exceed Acute Triggered?	Exceed Chronic Triggered?
	[lb/body]	[lbs/hr]	[lbs/yr]	[lbs/hr]	[lbs/yr]		
Acetaldehyde	1.30E-04	1.30E-04	1.35E-01	1.00E+00	2.90E+01	No	No
Arsenic	3.00E-05	3.00E-05	3.12E-02	4.40E-04	1.60E-03	No	Yes
Benzene		4.63E-06	9.64E-03	6.00E-02	2.90E+00	No	No
Beryllium	1.40E-06		1.46E-03	None	3.40E-02	No	No
Cadmium	1.10E-05		1.14E-02	None	1.90E-02	No	No
Chromium, hexavalent	1.40E-05		1.46E-02	None	5.10E-04	No	Yes
Copper	2.70E-05	2.70E-05	2.81E-02	2.20E-01	None	No	No
Formaldehyde	3.40E-05	3.40E-05	3.54E-02	1.20E-01	1.40E+01	No	No

Hydrogen chloride	7.20E-02	7.20E-02	7.49E+01	4.60E+00	3.50E+02	No	No
Hydrogen fluoride	6.60E-04	6.60E-04	6.86E-01	5.30E-01	5.80E+01	No	No
Lead	6.60E-05		6.86E-02	None	2.90E-01	No	No
Mercury	3.40E-03	3.40E-03	3.54E+00	1.30E-03	2.10E-01	Yes	Yes
Nickel	3.80E-05	3.80E-05	3.95E-02	3.10E-05	3.10E-01	Yes	No
Selenium	4.40E-05		4.58E-02	None	8.00E+00	No	No
Toluene		5.00E-04	1.04E+00	8.20E+01	1.20E+04	No	No
Zinc	3.50E-04		3.64E-01	None	None	No	No
Chlorinated dibenzodioxins and furans	1.40E-09		1.46E-06	None	4.40E-08	No	Yes
PAHs (benzo(a)pyrene equivalents)	4.90E-08		5.10E-05	None	3.30E-03	No	No

Since the TAC emissions for this project will exceed risk screen trigger levels, and HRA is required for this project pursuant to Regulation 2-5-401. The Air District conducted an HRA for this project in accordance with the BAAQMD HRA Guidelines. The following HRA table shows that these risk levels are considered acceptable. A detailed HRA report is enclosed. This project will comply with Regulation 2-5-302.

Receptor	NAD 83 UTM Coordinates (meters)		Cancer Risk (in a million)	Chronic HI	Acute HI
	Easting (x)	Northing (y)			
Resident	546,571	4,238,532	3.2	0.2	NA
Worker	546,459	4,238,468	3.1	0.5	NA
Student <sup>1</sup>	546,507	4,238,220	0.39	0.02	NA
Student <sup>2</sup>	546,784	4,238,513	0.18	0.01	NA
PMI (Max 1-hour)	546,459	4,238,468	NA	NA	0.55

1. Student at Sassari Elementary School  
652 Fifth Street West, Sonoma, CA 95476
2. Student at St. Francis Solano  
342 West Napa Street, Sonoma, CA 95476

**Regulation 2, Rule 5 Section 301: Best Available Control Technology for Toxics (TBACT)**

TBACT for a cremator as per District's BACT/TBACT Guideline: Crematory, Document #53.1 Revision: 1, Date: 9/12/2007 is firing with natural gas and the operating temperature in the secondary chamber at or above 1650 degree Fahrenheit with set point at 1600 degree Fahrenheit. This proposed cremator will meet the TBACT requirements.

**Regulation 6, Rule 1: Particulate Matter – General Requirements**

Pursuant to Regulation 6-1-301, a person shall not emit from any source for a period or aggregate periods of more than 3 minutes in any hour, a visible emission that is as dark or darker than No. 1 on the Ringelmann Chart, or of such opacity as to obscure an observer's view to an equivalent or greater degree.

A person shall not emit from any source for a period or aggregate periods of more than three minutes in any hour an emission equal to greater than 20% opacity per Regulation 6-1-302.

Regulation 6-1-311 limits the Total Suspended Particulate (TSP) Weight Limits.

The process weight rate for S-2= 150 lb/hour

The TSP Emissions are 0.051 lb/hour for S-2.

**Table 6-1-311.1: Process Weight Rate vs. Allowable TSP Emission Limits**

Process Weight Rate		TSP Emission Limit	
kg/hour	lb/hour	kg/hour	lb/hour
250 or less	551 or less	0.81	1.78

Effective July 1, 2020:

**Table 6-1-311.2: Process Weight Rate vs. Allowable TSP Emission Limits**

Process Weight Rate		TSP Emission Limit	
kg/hour	lb/hour	kg/hour	lb/hour
100 or less	220 or less	0.45	0.99

S-2 will be in compliance with Regulation 6-1-311.1 and 6-1-311.2 TSP Weight limits and expected to meet the requirement of the applicable sections of Regulation 6-1.

**Regulation 9, Rule 1: Inorganic Gaseous Pollutants – Sulfur Dioxide**

The cremators are subject to and will comply with Regulation 9, Rule 1, "Inorganic Gaseous Pollutants, Sulfur Dioxide," by restricting fuel use to natural gas only. Based on the following calculation, combustion of natural gas is expected to produce a SO<sub>2</sub> concentration of less than 1 ppmv, thereby meeting the requirement of a maximum outlet concentration of 300 ppmv of SO<sub>2</sub> prescribed in Regulation 9, Rule 1-302.

$$\text{SO}_2 \text{ ppmv} = (0.00057 \text{ lb/MMBtu}) * (385.5 \text{ ft}^3 \text{ SO}_2/\text{lb mol SO}_2)/(1 \text{ ft}^3 \text{ SO}_2/10^6 \text{ sdcft}^3 \text{ flue})/[(20.9)/(20.9-3)]/(64.0588 \text{ lb SO}_2/\text{lb mol SO}_2)/(8710 \text{ sdcft}^3 \text{ flue/MMBtu}) = 0.338 \text{ ppmv at } 3\% \text{ O}_2$$

**New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAPs)**

This source (S-2) is not subject to any NSPS or NESHAP requirements.

**Permit Conditions**

1. The owner/operator shall decommission S-1 within 90 days of start-up of S-2 Cremator. (basis: Cumulative Increase)
2. The owner/operator of S-2 Cremator shall not perform more than a total of 1,040 cremations in any consecutive twelve-month period. (basis: Cumulative Increase; Regulation 2-5)
3. The owner/operator shall maintain the operating temperature in the secondary chamber of the S-2 Cremator at or above 1650 degree Fahrenheit during the cremation mode. Any temperature excursion below 1600 degrees Fahrenheit during the cremation mode will be considered a violation of this permit condition. The owner/operator shall equip the cremator with a District approved continuous temperature monitoring and recording device to ensure compliance with this condition. The location of the thermocouple shall be approved by the Source Test Section of the District. Natural gas input to the secondary chamber burner shall be increased, if necessary, to increase temperature sufficiently to control odor and visible plume. (basis: Regulation 6-1-301, 6-1-310; TBACT)
4. After shutdown, the owner/operator shall not cremate until the S-2 Cremator has been preheated so that the temperature in the secondary chamber is at least 1650 degree Fahrenheit. (basis: Regulation 6-1-301, 6-1-310; TBACT)

5. The owner/operator shall fire the S-2 Cremator with natural gas only. (basis: Cumulative Increase; TBACT)
6. The owner/operator shall use the S-2 Cremator to cremate only human remains. No other material contaminated with toxic air contaminants as listed by Air Resources Board, including radioactive and biohazardous waste shall be incinerated in this cremator without prior approval of the District. (basis: Cumulative Increase; Regulation 2-5)
7. The District may require the owner/operator of the cremator to conduct a District approved source test to determine particulate matter, hydrocarbon, NOX, CO, O2, HCL, and toxic emissions under unusual conditions, such as: obese case, disaster bags. The Source Test Section shall be notified at least 7 days in advance of any expected source test. A copy of the source test report for each test shall be provided to the District within 30 days of the source test date. (basis: Cumulative Increase; Regulation 2-5)
8. The owner/operator shall have the S-2 Cremator equipped with sampling ports and platforms, the location of which shall have the approval of the Source Test Section of the District. (basis: Regulation 6-1-301)
9. The owner/operator shall have an operator present at all times during cremations. (basis: Regulation 6-1-301)
10. The owner/operator shall keep the S-2 Cremator in good working condition. The date and the detailed description of the type of maintenance done on the cremator shall be recorded in a district approved logbook. (basis: Regulation 6-1-301, 6-1-310)
11. To determine compliance with the above conditions, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above conditions, including but not limited to daily record of the following information:
  - a. Operating hours
  - b. Weight of human remains
  - c. Processing rate  
(basis: Regulation 1-441, Cumulative Increase, TBACT, Regulation 2-5)
12. The owner/operator shall keep all monitoring, source test, and maintenance records as required per parts 3, 7, 10, and 11 on site for at least two years from the date of data entry, and the records shall be made available to the District staff for inspection. These recordkeeping requirements shall not replace the recordkeeping requirements contained in any applicable District regulations. (basis: Cumulative Increase, TBACT; Regulation 6-1-301, 6-1-310)

### **Recommendation**

The District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of District, state and federal air quality-related regulations. The preliminary recommendation is to issue an Authority to Construct/Permit to Operate for the sources listed below. However, the proposed sources will be located within 1,000 feet of a school, which triggers the public



Application #29716; Plant #2315  
Duggan's Mission Chapel  
August 16, 2019  
Page 9 of 9

notification requirements of District Regulation 2-1-412. After comments are received and reviewed, the District will make a final determination on the permit.

I recommend that the District initiate a public notice and consider any comments received prior to taking any final action on issuance of an Authority to Construct/Permit to Operate for the following sources:

**S-2 Human Crematory Retort with Integral Afterburner;  
American Crematory Equipment Company, Model: A-250-WH  
Natural gas fired, 2.25 MMBtu/hr**

By: \_\_\_\_\_  
Flora Chan  
Senior Air Quality Engineer

Date \_\_\_\_\_

DRAFT