ENVIRONMENTAL HEALTH & SAFETY

Application for RDE Air Compressor Diesel Engine at

2420 Alamo Ave SE Albuquerque, NM 87106

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2. INTRODUCTION

The following is the University of New Mexico's application for an Air Quality Permit for a diesel powered air compressor engine and a rotating detonating engine (RDE) at 2420 Alamo Ave SE, Albuquerque, NM 87106. The diesel compressor will provide process air for the RDE to perform experiments. This application is for a permit to place a diesel powered air compressor engine and a rotating detonating engine. The included application contains all the required information, including emissions data.

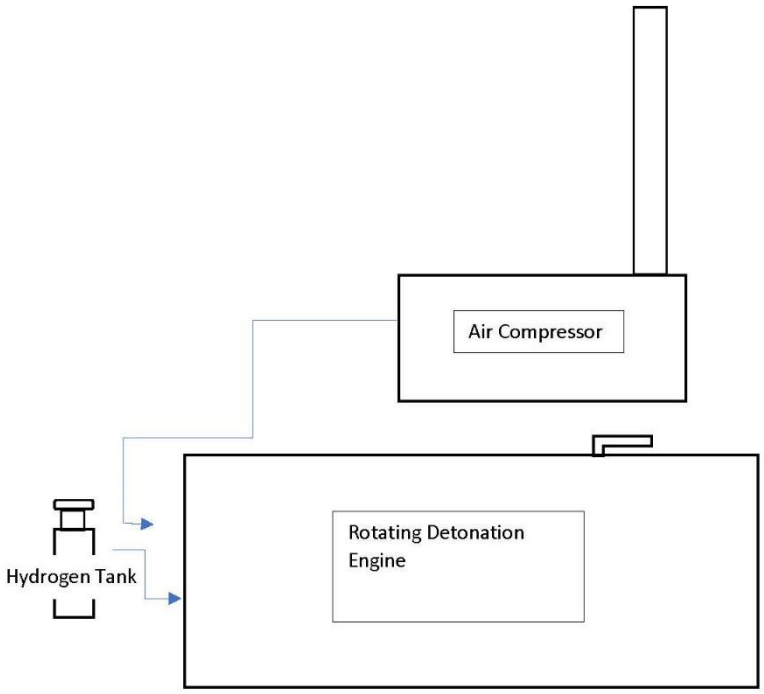
Air Compressor Diesel Powered Engine

Manufacturer	Model #	Serial #	Date of Manufacture	Date of Installation	Process Rate
Caterpillar	C13	KWJ04248	12/2013	TBD	475HP

Rotating Hydrogen Rotating Detonating Engine

Manufacturer	Model #	Serial #	Date of Manufacture	Date of Installation	Process Rate
Aerojet Rocketdyne	Experimental RDE	Experimental RDE	TBD	TBD	0.4kg/s

3. PROCESS FLOW DIAGRAM



4. EMISSION INFORMATION

The emissions rate value for HAPS is taken as a sum of the HAPS in AP-42 Section 3.3-2. The NOx, CO, VOC, and PM emissions are calculated using NSPS Subpart IIII Tier 4. The KW/hr value comes from the manufacturer's spec sheet, shown in the appendix for NOx, CO, VOC, and PM. For the sulfur lb/hr emissions, note that conversion factors of 7000 Btu/Hp-hr and 137000 Btu/Gallon of diesel are taken from AP-42 Chapter 3.3. The specific gravity (density) of diesel (0.845) is taken from the SDS available in the appendix. A concentration of 15 ppm sulfur in Ultra-low Sulfur Diesel is based on 40 CFR 80. In order to calculate this, an assumption is made that all sulfur in fuel is converted to SO_2 during combustion.

	Air Compressor Diesel Engine Controlled Emissions								
Source	**Pollutant**	**g/kw/hr**	**lb/KW-hr**	**KW**	**lb/hr**	**hr/year**	**ton/year**		
NSPS Subpart IIII Tear 4. KW from engine spec sheet	**NOx**	3.8	8.38E-03	354	2.965608466	300	0.44484127		
NSPS Subpart IIII Tear 4. KW from engine spec sheet	**CO**	3.5	7.72E-03	354	2.731481481	300	0.409722222		
NSPS Subpart IIII Tear 4. KW from engine spec sheet	**VOC**	0.2	4.41E-04	354	0.156084656	300	0.023412698		
NSPS Subpart IIII Tear 4. KW from engine spec sheet	**PM 10**	0.02	4.41E-05	354	0.015608466	300	0.00234127		
NSPS Subpart IIII Tear 4. KW from engine spec sheet	**PM 2.5**	0.02	4.41E-05	354	0.015608466	300	0.00234127		
Source	**Pollutant**	**lb/MMBTU**	**BTU/MMBTU**	**BTU/hp-hr**	**lb/hp-hr**	**hp**	**lb/hr**	**hr/year**	**ton/year**
Sum of HAPS in AP-42 Section 3.3-2	**HAPS**	0.00662	1000000	7000	4.63E-05	475	0.0220115	300	0.00330173
Source	**Pollutant**	**gal/hr**	**mg S/kg Diese**	**g S/hr**	**g SO2/hr**	**lb SO2/hr**	**hr/year**	**ton/year**	
Gal/hr is from the engine spec sheet. 15 PPM sulfur in Ultra-low Sulfur Diesel is based on 40 CFR 80	**SO2**	23.6	15	1.13E+00	2.262154276	0.004987223	300	0.000748	

	Air Compressor Diesel Engine Uncontrolled Emissions								
Source	**Pollutant**	**g/kw/hr**	**lb/KW-hr**	**KW**	**lb/hr**	**hr/year**	**ton/year**		
NSPS Subpart IIII Tear 4. KW from engine spec sheet	**NOx**	3.8	8.38E-03	354	2.965608466	8760	12.98936508		
NSPS Subpart IIII Tear 4. KW from engine spec sheet	**CO**	3.5	7.72E-03	354	2.731481481	8760	11.96388889		
NSPS Subpart IIII Tear 4. KW from engine spec sheet	**VOC**	0.2	4.41E-04	354	0.156084656	8760	0.683650794		
NSPS Subpart IIII Tear 4. KW from engine spec sheet	**PM 10**	0.02	4.41E-05	354	0.015608466	8760	0.068365079		
NSPS Subpart IIII Tear 4. KW from engine spec sheet	**PM 2.5**	0.02	4.41E-05	354	0.015608466	8760	0.068365079		
Source	**Pollutant**	**lb/MMBTU**	**BTU/MMBTU**	**BTU/hp-hr**	**lb/hp-hr**	**hp**	**lb/hr**	**hr/year**	**ton/year**
Sum of HAPS in AP-42 Section 3.3-2	**HAPS**	0.00662	1.00E+06	7000	4.63E-05	475	2.20E-02	8760	0.09641037
Source	**Pollutant**	**gal/hr**	**mol S/kg Diese**	**g S/hr**	**g SO2/hr**	**lb SO2/hr**	**hr/year**	**ton/year**	
gal/hr is from the engine spec sheet. 15 PPM sulfur in Ultra-low Sulfur Diesel is based on 40 CFR 80	**SO2**	23.6	15	1.13220705	2.262154276	0.004987223	8760	0.021844	

				RDE Controlled					
Source	**Pollutant**	**kg/s**	**mol air/s**	**mol NOx/s**	**g No2/s**	**g NO2/hr**	**lb /hr**	**hr/year**	**ton/year**
Please see page 8 of the application for source information	**NOx**	0.4	13.79310345	0.000137931	0.006344828	22.84137931	0.050356663	300	0.0075535
	Controlled Compressor + RDE								
Pollutant	**lb/hr**	**ton/year**							
NOx	3.015965	0.452394769							

				RDE Uncontrolled					
Source	**Pollutant**	**kg/s**	**mol air/s**	**mol NOx/s**	**g No2/s**	**g NO2/hr**	**lb /hr**	**hr/year**	**ton/year**
Please see page 8 of the application for source information	**NOx**	0.4	13.79310345	0.000137931	0.006344828	22.84137931	0.050356663	8760	0.22056218
	Uncontrolled Compressor + RDE								
Pollutant	**lb/hr**	**ton/year**							
NOx	3.015965	13.20992726							

5. EXAMPLE CALCULATIONS

For the example calculation of sulfur lb/hr, note that the gal/hr value is from the engine spec sheet. The specific gravity (density) of diesel (0.845) is taken from the SDS available in the appendix. A concentration of 15 ppm sulfur in Ultra-low Sulfur Diesel is based on 40 CFR 80. In order to calculate this, an assumption is made that all sulfur in fuel is converted to SO_2 during combustion. The emissions rate value for HAPS is taken as a sum of the HAPS in AP-42 Section 3.3-2. The NOx, CO, VOC, and PM emissions are calculated using NSPS Subpart IIII Tier 4. The KW/hr value comes from the manufacturer's spec sheet, shown in the appendix for NOx, CO, VOC, and PM.

Diesel Powered Air Compressor Engine

NOx

$$\frac{3.8\ g\ NOx}{kw} \times \frac{354\ kw}{HR} = \frac{1345.2\ g\ NOx}{hr} \times \frac{1\ lb}{453.6\ g} = 2.96 \frac{lb}{hr}\ NOx\ Emissions$$

$$2.96 \frac{lb}{hr} \times 8760 \frac{hr}{yr} \times \frac{1\ ton}{2000\ lb} = 12.98\ \frac{tons}{yr}\ Uncontrolled\ NOx\ Emissions$$

$$2.96 \frac{lb}{hr} \times 300 \frac{hr}{yr} \times \frac{1\ ton}{2000\ lb} = 0.44\ \frac{tons}{yr}\ Controlled\ NOx\ Emissions$$

CO

$$\frac{3.5\ g\ CO}{kw} \times \frac{353\ kw}{HR} = \frac{1{,}235.5\ g\ CO}{hr} \times \frac{1\ lb}{453.6\ g} = 2.73 \frac{lb}{hr} CO\ Emissions$$

$$2.73 \frac{lb}{hr} \times 8760 \frac{hr}{yr} \times \frac{1\ ton}{2000\ lb} = 11.96 \frac{tons}{yr}\ Uncontrolled\ CO\ Emissions$$

$$2.73\frac{lb}{hr}\times 300\frac{hr}{yr}\times\frac{1\ ton}{2000\ lb}=0.40\frac{tons}{yr}\ Controlled\ CO\ Emissions$$

VOC

$$\frac{0.2\ g\ VOC}{kw}\times\frac{354\ kw}{HR}=\frac{70.8\ g\ VOC}{hr}\times\frac{1\ lb}{453.6\ g}=0.15\frac{lb}{hr}\ VOC\ Emissions$$

$$0.15\frac{lb}{hr}\times 8760\frac{hr}{yr}\times\frac{1\ ton}{2000\ lb}=0.68\frac{tons}{yr}\ Uncontrolled\ VOC\ Emissions$$

$$0.15\frac{lb}{hr}\times 300\frac{hr}{yr}\times\frac{1\ ton}{2000\ lb}=0.023\frac{tons}{yr}\ Controlled\ VOC\ Emissions$$

PM 10 & 2.5

$$\frac{0.02\ g\ PM}{kw}\times\frac{354\ kw}{HR}=\frac{7.08\ g\ PM}{hr}\times\frac{1\ lb}{453.6\ g}=0.015\frac{lb}{hr}PM\ Emission$$

$$0.015\frac{lb}{hr}\times 8760\frac{hr}{yr}\times\frac{1\ ton}{2000\ lb}=0.06\frac{tons}{yr}\ Uncontrolled\ PM\ Emissions$$

$$0.015\frac{lb}{hr}\times 300\frac{hr}{yr}\times\frac{1\ ton}{2000\ lb}=0.002\frac{tons}{yr}\ Controlled\ PM\ Emissions$$

HAPS

$$\frac{6.62\times 10^{-3}lb}{MMBTU}\times\frac{1\ MMBTU}{1.0\ \times 10^{6}BTU}\times\frac{7{,}000\ BTU}{hp-hr}=4.63\times 10^{-5}\frac{lb}{hp-hr}\ HAPS\ Emissions$$

$$4.63\times 10^{-5}\frac{lb}{hp-hr}\times 475\ hp=0.022\frac{lb}{hr}\times 8760\frac{hr}{yr}\times\frac{1\ ton}{2000\ lb}$$

$$=0.096\frac{tons}{yr}Uncontrolled\ HAPS\ Emissions$$

$$0.22\frac{lb}{hr}\times 475\ hp\times 300\frac{hr}{yr}\times\frac{1\ ton}{2000\ lb}=0.0033\frac{tons}{yr}\ Controlled\ HAPS\ Emissions$$

SO2

$$23.6\frac{gal}{hr}\times 3.785\frac{L}{gal}\times 0.845\frac{kg\ Diesel}{L\ Diesel}\times 15\frac{mg\ Sulfur}{kg\ Diesel}\times\frac{1\ g}{1000\ mg}=1.132\frac{g\ S}{hr}$$

$$1.132\frac{g\ S}{hr}\times\frac{1\ mol\ S}{32.065\ g\ S}\times\frac{1\ mol\ SO_2}{1\ mol\ S}\times\frac{64.066\ g\ SO_2}{mol\ SO_2}=2.262\frac{gSO_2}{hr}$$

$$2.262\ \frac{g\ SO_2}{hr}\times\frac{1\ lb}{453.6\ g}=0.0049\frac{lb\ SO_2}{hr}$$

$$0.0049\,\frac{lb}{hr} \times 8760\,\frac{hr}{yr} \times \frac{1\ ton}{2000\ lb} = 0.021\,\frac{ton}{yr} Uncontrolled\ SO2\ Emissions$$

$$0.0049\,\frac{lb}{hr} \times 300\,\frac{hr}{yr} \times \frac{1\ ton}{2000\ lb} = 0.00074\ \frac{ton}{yr} Controlled\ SO2\ Emissions$$

RDE

The RDE process rate of 0.4 kg/s is the mass flow rate of the entire effluent stream exiting the unit. To convert the mass flow rate of the effluent stream to lb/hr of NO_x, we convert the flow rate to the moles of air exiting the unit. Then the mole ratio of 10 x 10^{-6} mol NO_x / 1 mol air, equivalent to 10 ppmv, is used to get a mol/s emission rate. We used an estimate based on figure 6 of the paper in the application, an RDE using pure H_2 and air appears to have an approximate NO_x concentration of 10ppmv, when corrected for 15% O_2. Once we have the moles NO_x per second emission rate, that is converted to a mass emission rate using the molar mass of NO_2. Please note the emissions rate of 0.38g NO_x / min is equivalent to 0.05 lb/hr NO_x.

NOx

$$0.4\ \frac{kg\ air}{s} \times \frac{1000\ g}{kg} \times \frac{mol\ air}{29\ g} = 13.79\,\frac{mol\ air}{s} \times \frac{10\ \times\ 10^{-6} NOx}{1\ mol\ air} = 1.3 \times 10^{-4}\,\frac{mol\ NOx}{s}$$

$$1.3 \times 10^{-4}\,\frac{mol}{s} \times \frac{46g}{1\ mol\ NO_2} = \frac{6.343 \times 10^{-3}\ g\ NO_2}{s} \times \frac{60\ s}{min} \times \frac{60\ min}{hr} = 22.83\ \frac{g\ NO_2}{hr}$$

$$22.83\ \frac{g}{hr} \times \frac{1\ lb}{453.592}\ = 0.05\,\frac{lb\ NO_2}{hr}$$

$$0.05\,\frac{lb}{hr} \times 8760\,\frac{hr}{yr} \times \frac{1\ ton}{2000\ lb} = 0.22\,\frac{tons}{yr}\ Uncontrolled\ NOx\ Emissions$$

$$0.05\,\frac{lb}{hr} \times 300\,\frac{hr}{yr} \times \frac{1\ ton}{2000\ lb} = 0.0075\,\frac{tons}{yr}\ Controlled\ NOx\ Emissions$$

5.1. Supporting Information

5.1.1. AP-42 Table 3.3-2 below

Table 3.3-2. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR UNCONTROLLED DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (Fuel Input) (lb/MMBtu)
Benzene[b]	9.33 E-04
Toluene[b]	4.09 E-04
Xylenes[b]	2.85 E-04
Propylene	2.58 E-03
1,3-Butadiene[b,c]	<3.91 E-05
Formaldehyde[b]	1.18 E-03
Acetaldehyde[b]	7.67 E-04
Acrolein[b]	<9.25 E-05
Polycyclic aromatic hydrocarbons (PAH)	
Naphthalene[b]	8.48 E-05
Acenaphthylene	<5.06 E-06
Acenaphthene	<1.42 E-06
Fluorene	2.92 E-05
Phenanthrene	2.94 E-05
Anthracene	1.87 E-06
Fluoranthene	7.61 E-06
Pyrene	4.78 E-06
Benzo(a)anthracene	1.68 E-06
Chrysene	3.53 E-07
Benzo(b)fluoranthene	<9.91 E-08
Benzo(k)fluoranthene	<1.55 E-07
Benzo(a)pyrene	<1.88 E-07
Indeno(1,2,3-cd)pyrene	<3.75 E-07
Dibenz(a,h)anthracene	<5.83 E-07
Benzo(g,h,l)perylene	<4.89 E-07
TOTAL PAH	1.68 E-04

[a] Based on the uncontrolled levels of 2 diesel engines from References 6-7. Source Classification Codes 2-02-001-02, 2-03-001-01. To convert from lb/MMBtu to ng/J, multiply by 430.
[b] Hazardous air pollutant listed in the *Clean Air Act*.
[c] Based on data from 1 engine.

5.1.2. Total HAPS

HAPs	Emission Factor lb/MMBtu)
Benzene	9.33E-04
Toluene	4.09E-04
Xylenes	2.85E-04
Propylene	2.58E-03
1,3-Butadiene	3.91E-05
Formaldehyde	1.18E-03
Acetaldehyde	7.67E-04
Acroleinb	9.25E-05
Naphthaleneb	8.49E-05
Acenaphthylene	5.06E-06
Acenaphthene	1.42E-06
Fluorene	2.92E-05
Phenanthrene	2.94E-05
Anthracene	1.87E-06
Fluoranthene	7.61E-06
Pyrene	4.78E-06
Benzo(a)anthracene	1.68E-06
Chrysene	3.53E-07
Benzo(b)fluoranthene	9.91E-08
Benzo(k)fluoranthene	1.55E-07
Benzo(a)pyrene	1.88E-07
Indeno(1,2,3-cd)pyrene	3.75E-07
Dibenz(a,h)anthracene	5.83E-07
Benzo(g,h,i)perylene	4.89E-07
TOTAL PAH	1.68E-04
SUM	6.62E-03

5.2. Basis of Control

Emissions control is based on limiting the operating hours of the RDE. The diesel engine is used to run an air compressor that will provide process air to the RDE. The experiments are less than a minute in duration and may run a few times a week at most. In total, it is anticipated that the

diesel compressor engine will run less than 1 hour per week. However, to give a margin of error, we are requesting 300 hours a year.

5.3. Stack Exhaust

The vertical stack for the compressor diesel engine release height is 20.6ft above grade, has a 300°F exit temp, and a flow rate of 2,600 cfm, and is 0.4 ft in diameter. The RDE stack is horizontal at 3.9 ft, releasing inside the building behind a barrier.

5.4. Fuel Data

The compressor uses #2 ultra low sulfur diesel. The RDE uses UHP hydrogen gas.

6. Operational Schedule

The diesel powered air compressor engine will provide process air to the RDE for experiments. The experiments will, at most, run 3 days a week for 10-15 minutes per run, totaling 45 minutes of use per week. UNM is requesting an operational maximum of 300 hours per year. UNM will monitor the engine hour meter monthly and report any incident of the air compressor engine running over 300 hours in any 12-month rolling period under the excess emissions reporting requirements of NMAC 20.11.41.

7. Operations and Maintenance Strategy

The diesel powered air compressor engine located at 2420 Alamo Ave SE, Albuquerque, NM, will implement the following O&M strategy to mitigate emissions. Pursuant to 20.11.41.13.E.(5) NMAC UNM will:

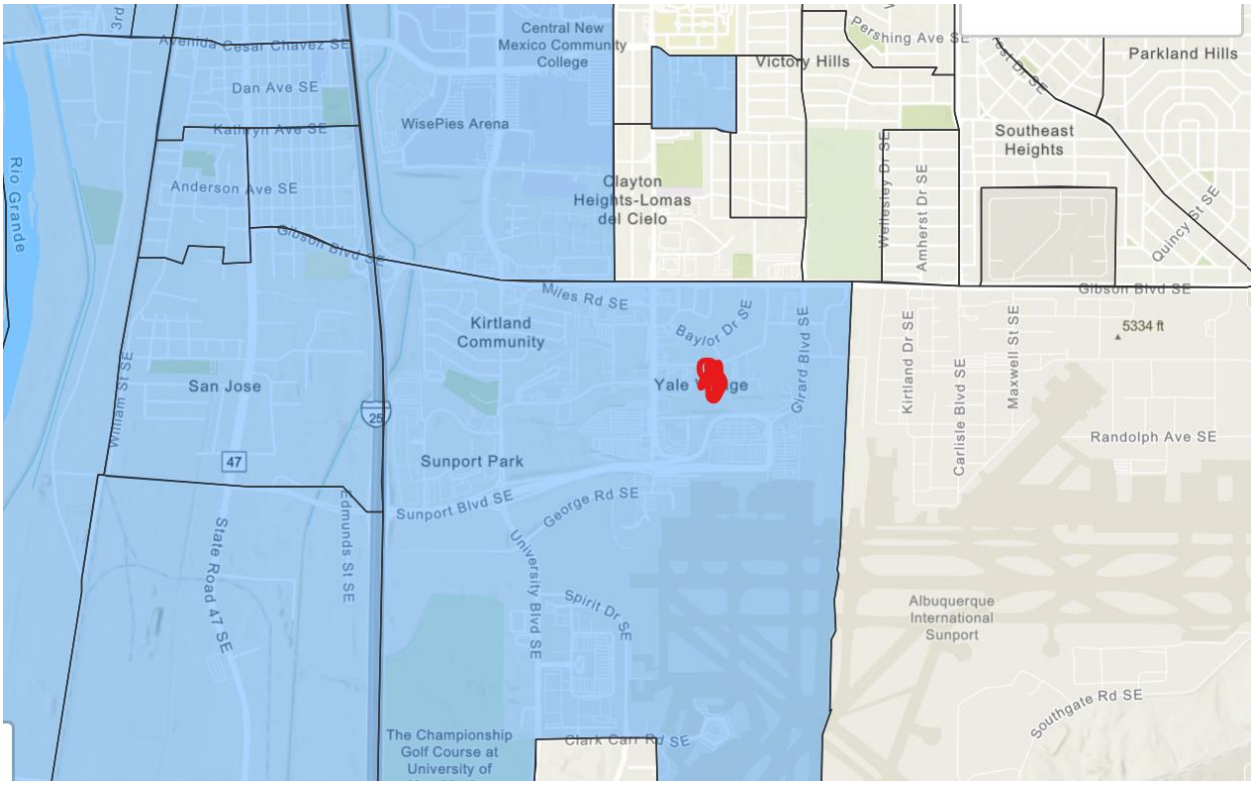
(a) In the case of a malfunction that causes excess emissions, RDE operators report the malfunction to Environmental Health and Safety. The exceedance is then reported to the City of Albuquerque EHD. A root cause of the exceedance will then be identified and repaired as quickly as practicable.
(b) Emissions of particulate matter are higher during startup and shutdown due to low engine temperature, leading to incomplete combustion during the internal combustion cycle. This unit is not equipped with any control equipment.
(c) The engine will be maintained in accordance with the manufacturer's requirements, including regular maintenance to reduce emissions during startup and shutdown.

8. Best Available Control Technology (BACT)

20.11.72 NMAC – Health, Environment and Equity Impacts

This regulation establishes additional permitting requirements for new or modified stationary sources of air pollution located within a one-mile radius of an overburdened area, as defined in 20.11.72.7.D NMAC. Per 20.11.72.8.C NMAC, the Department shall require every new or modified stationary source subject to permitting under 20.11.41 NMAC that is located in or within a one-mile radius of an overburdened area—based on the Overburdened Areas Map in effect as of the permit application date—to apply Best Available Control Technology (BACT).

The facility is within an overburdened community as shown in the map below, therefore a BACT analysis is required.



BACT Analysis

The proposed diesel engine driving an air compressor will have two controls that represent the Best Available Control Technologies for this unit. The controls are:

1. Limiting Run hours to 300 hours per year
2. Using good combustion practices

Limiting the run time of the engine from 8760 hours per year to under 300 hours a year will reduce all pollutant emissions by 96.5% for no cost. Run time will be monitored and recorded monthly in order to ensure compliance with this limit.

UNM will follow all manufacturers and EPA 40 CFR 60 Subpart IIII recommendations for the engine. This will ensure that the engine continues to meet the certified emission values. The anticipated cost of this control will not exceed normal maintenance costs.

Lastly, searching the EPA RACT/BACT/LAER Clearing House yielded only a single diesel engine driving a compressor, see attached Clearing House entry. The BACT determination for that unit was using an EPA Tier 4 emission certified engine.

The proposed engine is Tier 4 interim, not Tier 4 final. The emissions for CO and PM are identical however, the NOx emissions are above those of a Tier 4 final engine. The emissions standard for the engine is 2 g/kW-hr vs 0.4 g/kW-hr for a Tier 4 final engine. The 300-hour controlled emissions are 0.234 tons/yr and 0.0168 tons/yr for the Tier 4 interim and final engines, respectively. The difference in price is approximately $295,000 between the used Tier 4 interim and New Tier 4 Final engine. The cost per ton of NO_x reduction is therefore $1.58 million.

Given the information above, the proposed engine meets the threshold for the best available control technology.

9. Applicable Regulations

9.1. Applicable City of Albuquerque Regulations

20.11.41 NMAC- Construction permits

9.2. Applicable Federal Regulations

40 CFR 60 – "New Source Performance Standards" (NSPS)

40 CFR 60 Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

10. Air Dispersion Modeling Analysis

The following pages contain the information below regarding air dispersion modeling analysis for the diesel engine to be constructed at 2420 Alamo Ave SE Albuquerque NM, 87106:

Air Dispersion Modeling Report from EA

Email from CABQ of Approval of the Submitted Modeling Protocol

University of New Mexico
Air Quality Impact Modeling Report

Prepared for
The University of New Mexico
Albuquerque, NM 87131

Prepared by
EA Engineering, Science, and Technology, Inc., PBC
320 Gold Avenue SW, Suite 1300
Albuquerque, NM 87102
505-224-9013

EA Project No. 1626604 November 2025

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LIST OF APPENDICES

1. INTRODUCTION

The University of New Mexico (UNM) intends to install a used Caterpillar C13 diesel engine to power a compressor for process equipment. The engine is rated at 354 kW and is certified to meet EPA and CARB Tier 4 non-road diesel engine standards. This report presents the results of ambient air impact analysis using AERMOD to evaluate compliance with NAAQS and NMAAQS for carbon monoxide (CO), nitrogen dioxide (NO_2), and particulate matter (PM_{10}, and $PM_{2.5}$). The unit is expected to operate up to 300 hours per calendar year. This refined air modeling analysis used conservative assumptions for emissions and operating conditions. The facility is located at 2420 Alamo Ave SE Albuquerque, NM 87106 and is located in a commercial area north of the Albuquerque International Airport terminal, bordering businesses and public spaces. A map showing the location and coordinates of the source is presented in Appendix A.

2. EMISSIONS CALCULATIONS

The estimated emissions from the UNM facility were calculated based on the following assumptions:

- EPA and CARB Tier 4 non-road diesel engine certification
- Usage of ultra-low sulfur diesel (ULSD) required by 40 CFR 60 Subpart IIII

Stack Emissions from Equipment: Emissions from the engine were modeled as being discharged from a single point source. Stack parameters, including exhaust flow rate, stack diameter, exit temperature, and release height were provided by the facility.

Table 1, below, presents pollutant emission estimates from the source at the UNM facility.

Table 1. Pollutant Emission Rate

Pollutant	Max. Emission Rate[1] (g/s)
CO	0.344
NO_x	0.374
PM (total)[2]	0.002
SO_2[3]	0.00064

1. Emission rates of CO, NO_x and PM were estimated using Interim Tier 4 emission factors for a 354-kW engine with an assumed 95%/5% split for NOx/NMHC standard in accordance with CARB guidance.
2. PM-10 and PM-2.5 emissions are conservatively modeled as equivalent to total PM emissions.
3. A waiver for modeling SO_2 was granted by AQP based on the low emission rate.

3. REFINED AIR DISPERSION MODELING

For this air quality analysis, the current version of EPA's Guideline refined air dispersion model AERMOD (Version 24142), was utilized to estimate ground-level concentrations of criteria pollutants emitted from the proposed process engine. Modeling was conducted for PM_{10}, $PM_{2.5}$,

NO_2, and CO for applicable averaging periods. Although the engine is limited to 300 hours of operation per year and is expected to operate for fewer than 16 hours in any single day, modeling was conservatively performed assuming continuous operation (8,760 hours/year) to evaluate maximum potential downwind concentrations and maintain maximum operational flexibility.

The AERMOD modeling system incorporates several components to account for source characteristics, terrain, and meteorological conditions. These include AERMET (Version 23132) for meteorological data processing and AERMAP for terrain preprocessing using pre-processed National Elevation Dataset (NED) files provided by the City of Albuquerque Air Quality Program (AQP).

3.1 AIR DISPERSION MODELING

AERMOD (version 24142) was used to predict the ambient air concentrations of pollutants emitted from the emergency generator stack. Input parameters included stack height, gas exit temperature, flow rate, and exit velocity. All modeling procedures followed the latest version of User's Guide for AERMOD and the U.S. EPA's Guideline on Air Quality Models (Appendix W to 40 CFR Part 51).

In accordance with the City of Albuquerque Air Dispersion Modeling Guidelines, land use classification for this analysis was conducted using Auer (1978) methodology. A land use survey within a 3-kimometer radius of the facility identified a mix of open space, residential areas, and recreational land uses. Based on this distribution, the area does not meet the criteria for urban classification; therefore, rural dispersion coefficients were applied for this modeling analysis.

To demonstrate compliance with National Ambient Air Quality Standards (NAAQS) and New Mexico Ambient Air Quality Standards (NMAAQS), Significant Impact Level (SIL) modeling was performed for each pollutant and averaging period.

3.2 METEOROLOGICAL DATA

The most recent five-year dataset of AERMOD-ready meteorological data, paired with ozone background data (2014 - 2018), was used for the analysis, supplied by AQP with surface and upper air data from Albuquerque International Airport. Meteorological data was obtained and processed using AERMET version 22112, the AERMOD meteorological data processor.

3.3 BUILDING DOWNWASH

The building housing the emission unit and nearby structures were included in the building downwash analysis. The Plume Rise Model Enhancement (PRIME) version of the building Profile Input Program (BPIPPRM, Version 04274) was used to determine stack height and building influence parameters for every 10-degree azimuth.

Table 2, below, lists the dimensions of each building incorporated into the modeling. See Attachment A for building labels.

Table 2. List of Buildings

Building ID	Height (ft)	Length (ft)	Width (ft)
Building A	18.5	275	100
Building B	18.5	156	115
Building C	18.5	205	100
Building D	18.5	275	120
Building E	18	160	140
Building F	40	162	68

3.4 TERRAIN AND LAND USE ANALYSIS

The site is classified as rural, based on the Auer (1987) method as required by Appendix W and the City of Albuquerque Air Dispersion Modeling Guidelines. Terrain elevations for all modeled receptors were determined using pre-processed NED files provided by the City of Albuquerque Air Quality Program. These files are at 1 arc-second (approximately 30 meters) and are compatible with the AERMOD terrain preprocessor, AERMAP. AERMAP was used to assign elevations to all sources and receptors and to calculate hill height scales by evaluating terrain features surrounding each recapture to represent the topographic influences on pollutant dispersion.

3.5 RECEPTORS

To evaluate ambient air concentrations, a multi-tier Cartesian receptor grid was employed to evaluate ground-level concentrations surrounding the modeled emission source. The site does not have a perimeter fence; therefore, the exterior perimeter of the building serves as the ambient air boundary. Receptors were placed beginning at the building perimeter (no interior receptors) with the following Cartesian grid spacing:

- 25-meter spacing around the building perimeter
- 25-meter spacing out to 100 meters
- 50-meter spacing from 100 to 400 meters
- 100-meter spacing from 400 to 1,100 meters.

3.6 EMISSION POINT SOURCES

The emission unit was modeled as a single point source located on the facility's rooftop. Stack parameters including location, height, diameter, exit temperature, and exit velocity are provided both in Table 3 below. The unit will combust ultra-low sulfur diesel (ULSD, 15ppm sulfur). Emission rates were estimated using EPA Tier 4 emissions factors for CO, NO_2, and PM. PM_{10} and $PM_{2.5}$ were conservatively modeled as equivalent to total PM. A modeling waiver for SO_2 was granted by AQP due to negligible emissions associated with ULSD combustion.

NO_2 concentrations were estimated using the Plume Volume Molar Ratio Method (PVMRM) with an in-stack NO_2/NOx ratio of 0.15, which is generally accepted by AQP for diesel-fired RICE engines, and a default equilibrium ratio of 0.9, as recommended by AQP.

The physical stack parameters for the model runs are provided in Table 3, below:

Table 3. Stack Parameters

Source	Stack Height (m)	Inside Diameter (m)	Exhaust Temp (K), Minimum	Flow Rate (cfm), Minimum[1]
Emission Unit 1	6.279	0.125	422	2,600

1. The modeling protocol provided to AQP contained an incorrect flow rate volume of 8,528 cfm.

3.7 MODELING RESULTS

The AERMOD dispersion model was used to calculate maximum ground-level concentrations of CO, NO_2, PM_{10} and $PM_{2.5}$ associated with emissions from the proposed diesel generator. The modeling used five years (2014-2018) of AERMOD-ready meteorological data provided by the AQP and incorporated pre-processed 1 arc-second resolution NED terrain data to account for local topography. Receptors were placed to evaluate air quality concentrations surrounding the facility in accordance with EPA and AQP guidelines. Emissions were modeled using interim Tier 4 standards for nonroad diesel engines.

Modeling was first conducted to determine whether predicted pollutant concentrations exceeded applicable SILs, which indicate whether the unit's emissions may contribute to broader ambient air quality. Table 4 summarizes the maximum modeled concentrations for each pollutant and averaging period compared against the corresponding SIL. For short-term averaging periods, the maximum concentration is the highest 1st high concentration during the 5-year period. For annual averaging periods, the maximum concentration is the highest annual concentration for any single year in the 5-year period.

For those pollutants and averaging periods where modeled impacts exceeded the SIL (NO_2 1-hour, 24-hour, and annual; $PM_{2.5}$ 24-hour and annual) a cumulative modeling analysis was conducted by adding background concentrations, provided by AQP for use in 2025, from the Del Norte High School Air Monitoring Station (AQS ID: 350010021) to the modeled results, following the level and form of each standard. This was performed to assess whether the combined impacts from project emissions and existing ambient pollutant levels remain below NAAQS and NMAAQS. Surrounding source emissions are not proposed to be modeled because impacts from the generator are localized, and there are no large industrial sources nearby, meaning there are no surrounding sources that would impact compliance with the NAAQS or NMAAQS. The modeled concentration for the 1-hour NO_2 NAAQS standard is the 8th highest 1-hour daily maximum concentration, averaged over the five years of meteorological data. The modeled concentration for the annual NO_2 NAAQS standard is the highest annual concentration for any single year in the 5-year period. There is no separate modeling requirement for the 24-hour NO_2 NMAAQS, and in accordance with AQP guidance, demonstration of compliance with the 1-hour NO_2 NAAQS standard demonstrates compliance with the 24-hour NO_2 NMAAQS standard. The modeled concentration for the 24-hour $PM_{2.5}$ NAAQS standard is the 8th highest

24-hour daily maximum concentration, averaged over the five years of meteorological data. The modeled concentration for the annual $PM_{2.5}$ NAAQS standard is the maximum of the modeled annual averages over the 5-year period, providing a conservative estimate. Table 5 presents modeled concentrations, representative background levels, total cumulative impacts, and compliance findings.

3.7.1 SIL ANALYSIS

A SIL analysis was performed for the emission unit using the emissions estimates presented in Table 1. The results of the modeling are presented in Table 4 below:

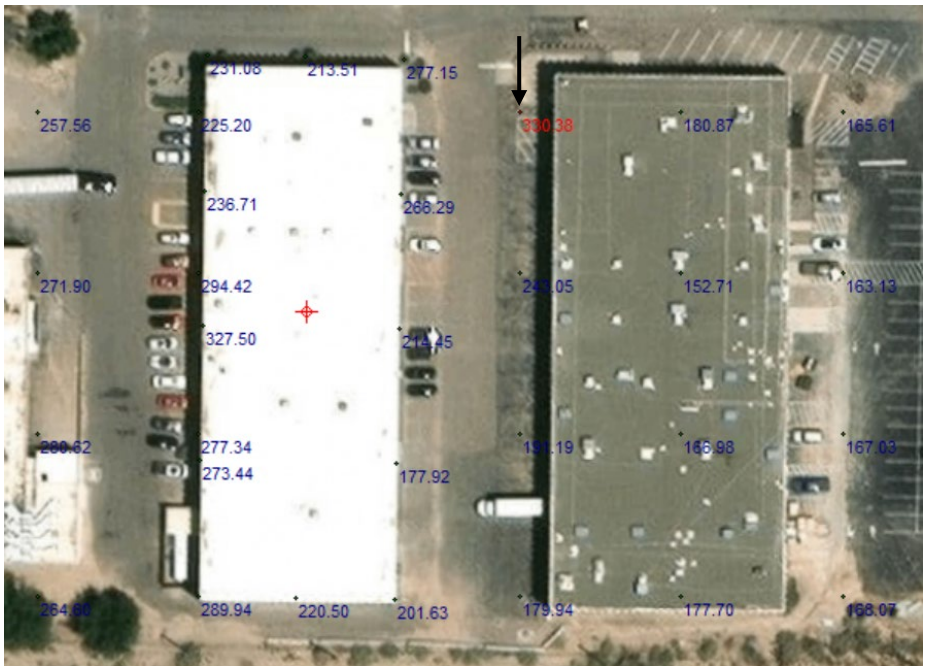
Table 4. Modeled Concentrations with Significant Impact Levels; Units: (µg/m^3)

Pollutant	Averaging Period	SIL	Modeled Max. Concentration	Compliance
CO	1-hour	2,000	330.38	Yes
	8-hour	500	261.6	Yes
NO_2	1-hour	7.52	208.72	See Table 5
	24-hour	5.0	59.56	See Table 5
	Annual	1.0	13.17	See Table 5
PM_{10}	24-hour	5.0	1.22	Yes
$PM_{2.5}$	24-hour	1.2	1.22	See Table 5
	Annual	0.13	0.47	See Table 5

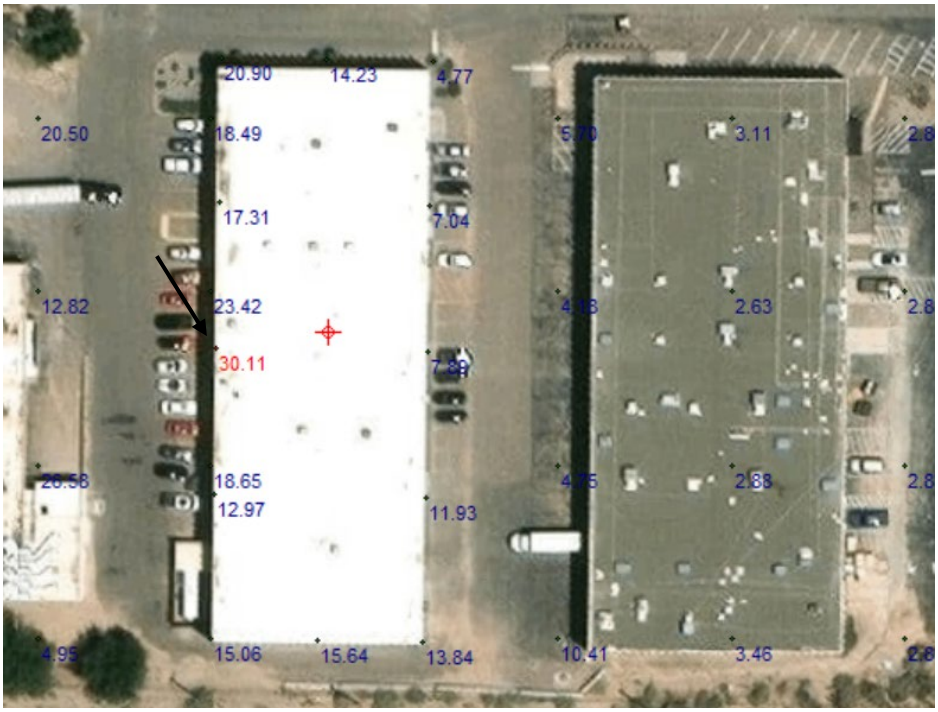
1. Table 4 demonstrates cumulative modeling concentrations not evaluated in Table 3.

As shown in Table 4, modeled concentrations for CO (1-hour and 8-hour) and PM_{10} (24-hour) were below their respective SILs, confirming that emissions from the proposed generator are not expected to cause significant impacts for those pollutants. Therefore, no cumulative modeling was required for those pollutants. For NO_2 (1-hour, 24-hour, and annual) and $PM_{2.5}$ (24-hour and annual), modeled concentrations exceeded SIL thresholds, triggering the need for cumulative analysis. Except for the CO 1-hour averaging period, the maximum concentration for each averaging period of each pollutant occurred at the western edge of the facility building exterior. The maximum concentration for the CO 1 hour-averaging period occurred at the east of the north end of the facility building, just east of the property boundary. The images below show the location of the maximum modeled concentration for each scenario.

Location of Maximum Concentration for CO 1-hour Averaging Period



Location of Maximum Concentration for All Other Scenarios



3.7.2 NAAQS / NMAAQS Analysis

Based on the SIL analysis results presented in section 3.7.1 above, a cumulative modeling analysis was performed to demonstrate compliance with the NO_2 NAAQS and NMAAQS and the $PM_{2.5}$ NAAQS. The analysis was performed using the emission estimates presented in Table 1. The modeled results are based on the level and form of each standard, and are presented in Table 5 below:

Table 5. Cumulative Modeled Concentrations with NAAQS and NMAAQS; Units: (µg/m^3)

Pollutant	Averaging Period	NMAAQS	NAAQS	Modeled Max. Concentration	Background Concentration[1]	Cumulative Concentration	Compliance
NO_2	1-hour		188.03	51.41	83.1	134.51	Yes
	24-hour[2]	188.03					Yes
	Annual	94.02	99.66	12.79	18	30.79	Yes
$PM_{2.5}$	24-hour		35	0.95	14.3	15.25	Yes
	Annual		9.0	0.45	5.4	5.85	Yes

1. Background concentration from Del Norte High School Air Monitoring Station provided by AQP (AQS ID: 350010021). Background concentrations in ambient air represent the contributions from natural sources, non-industrial human activities, and distant industrial facilities in the vicinity of the site.
2. Per AQP guidelines, demonstration of compliance with the 1-hour NO_2 NAAQS demonstrates compliance with the 24-hour NO_2 NMAAQS

Table 5 presents the results of cumulative modeling, which demonstrates that total concentrations for pollutants and averaging periods remain below NAAQS and NMAAQS thresholds. The maximum concentration for all averaging periods occurred on the western edge of the facility building exterior, in the same location as the SIL modeling. This confirms that the project is not expected to cause or contribute to any exceedance of appliable air quality standards.

4. CONCLUSION

The air quality impact analysis demonstrates that impacts from CO and PM_{10} were below SIL levels, demonstrating compliance with all ambient air quality standards. Impacts of NO_2 and $PM_{2.5}$ were above SIL levels, so a cumulative modeling analysis with background concentrations was performed, where the cumulative impacts of NO_2 and $PM_{2.5}$ are below their respective NAAQS and NMAAQS, demonstrating compliance with all ambient air quality standards. Based on the results of this modeling analysis conducted in accordance with EPA and AQP guidelines, installation and operation of the Caterpillar C13 process engine will not adversely affect air quality, and an air construction permit can be issued with no restrictions on operating hours necessitated by the results of air dispersion modeling.

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Appendix A

Facility Location Map


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352300
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352600
3880300
3880200
3880100
3880000
Alamo Ave SE
Alamo Ave SE
F
B
C
Property Boundary
Yale Village
A
D
E
Engine Stack
Sunport Ct
Sunport Blvd SE
Sunport Blvd

Appendix B

Description of Modeling Files

List of Modeling Files

The input and output files for AERMOD and BPIP will be transmitted to AQP along with the modeling results report. Below is a list and description of the modeling file folders transmitted.

- The UNM Generator NO2 folder contains the modeling files for comparison of maximum NO_2 concentrations to the SIL for each applicable averaging period.
- The UNM Generator NO2 NAAQS folder contains files for the cumulative modeling of the NO_2 NMAAQS and NAAQS
- The UNM Generator CO SIL folder contains the modeling files for comparison of maximum CO concentrations to the SIL for each applicable averaging period.
- The UNM Generator PM-10 SIL folder contains the modeling files for comparison of maximum PM-10 concentrations to the SIL for the 24-hour averaging period.
- The UNM Generator PM-25 SIL folder contains the modeling files for comparison of maximum PM-2.5 concentrations to the SIL for each applicable averaging period.
- The UNM Generator PM-25 NAAQS folder contains the files for cumulative modeling of the PM-2.5 NAAQS.

Each folder provided contains the following files:

- The .ADI file contains the main AERMOD inputs
- The .ADO file contains the main AERMOD outputs
- The .bpi file contains the BPIPPRM inputs
- The .err file contains the error logs
- The .pro file contains the BPIPPRM outputs
- The .ROU file contains the receptor outputs
- The .SOU file contains the source outputs
- The .sum file contains the AERMOD summary
- The .sup file contains the BPIPPRM summary
- The .PLT files contain the concentration results

Outlook

UNM RDE Facility Modeling Protocol Approval

From Tumpane, Kyle <ktumpane@cabq.gov>
Date Thu 6/12/2025 3:57 PM
To Casey Hall <cbhall4@unm.edu>; Lauren Bell <lbell01@unm.edu>
Cc McKinstry, Michael W. <mmckinstry@cabq.gov>; Stonesifer, Jeff W. <JStonesifer@cabq.gov>

1 attachment (23 KB)
CABQ-EHD_Current Backgrounds_2025-1-3.docx;

[EXTERNAL]

Mr. Hall and Ms. Bell,
The City of Albuquerque Air Quality Program (AQP) has finished reviewing the revised modeling protocol submitted on June 11, 2025 on behalf of the University of New Mexico for the proposed new permit for an engine to power an air compressor at the RDE facility, 2420 Alamo Ave. SE. The modeling protocol is approved.

- SO_2 modeling can be waived based on the very low emission rate of 0.00064 g/s (0.0051 lb/hr) presented in Table 2 of the revised modeling protocol.
- Modeling background values for 2025 are attached to this email as requested.

The AQP agrees with the modeling protocol that no surrounding sources need to be included in the modeling.

Let us know if you have any questions.

Thank you,

KYLE TUMPANE
senior environmental health scientist | environmental health department
o 505.768.2872
m 505.366.9985
cabq.gov/airquality

FORMS AND CHECKLISTS

Below are the following application forms and checklist:

- Application Form
- Permit Application Review Fee Checklist
- Permit Application Checklist
- Compliance History Disclosure Form
- Pre Permit Application Meeting Request Form
- Pre Permit Application Meeting Agenda Checklist
- Public Notice Sign Guide and Notice of Intent
- Email To Neighborhood Association
- Zoning Requirements Cover Letter and Certificate

City of Albuquerque – Environmental Health Department
Air Quality Program

Please mail this application to **P.O. Box 1293, Albuquerque, NM 87103**
or hand deliver between 8:00 am – 5:00 pm Monday – Friday to:
3rd Floor, Suite 3023 – One Civic Plaza NW, Albuquerque, NM 87102
(505) 768-1972 aqd@cabq.gov

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

Submittal Date:

Owner/Corporate Information ☐ **Check here and leave this section blank if information is exactly the same as Facility Information below.**

Company Name: **University of New Mexico**			
Mailing Address: **MSC07 4100** **1 University of New Mexico**	City: **Albuquerque**	State: **NM**	Zip: **87131**
Company Phone: **(505) 277-0305**	Company Contact: **Casey Hall**		
Company Contact Title: **Director, EHS**	Phone: **(505) 277-0305**	E-mail: **cbhall4@unm.edu**	

Stationary Source (Facility) Information: **Provide a plot plan (legal description/drawing of the facility property) with overlay sketch of facility processes, location of emission points, pollutant type, and distances to property boundaries.**

Facility Name: **COSMIAC**			
Facility Physical Address: **2420 Alamo Ave SE**	City: **Albuquqerque**	State: **NM**	Zip: **87106**
Facility Mailing Address (if different):	City:	State:	Zip:
Facility Contact: **Casey Hall**	Title: **Director, EHS**		
Phone: **(505) 277-0305**	E-mail: **cbhall4@unm.edu**		
Authorized Representative Name[1]:	Authorized Representative Title:		

Billing Information ☒ **Check here if same contact and mailing address as corporate** ☐ **Check here if same as facility**

Billing Company Name:			
Mailing Address:	City:	State:	Zip:
Billing Contact:	Title:		
Phone:	E-mail:		

Preparer/Consultant(s) Information ☐ **Check here and leave section blank if no Consultant used or Preparer is same as Facility Contact.**

Name:	Title:		
Mailing Address:	City:	State:	Zip:
Phone:	Email:		

1. See 20.11.41.13(E)(13) NMAC.

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

General Operation Information (if any question does not pertain to your facility, type N/A on the line or in the box)

Permitting action being requested (please refer to the definitions in 20.11.40 NMAC or 20.11.41 NMAC):			
☒ New Permit	☐ Permit Modification Current Permit #:	☐ Technical Permit Revision Current Permit #:	☐ Administrative Permit Revision Current Permit #:
☐ New Registration Certificate	☐ Modification Current Reg. #:	☐ Technical Revision Current Reg. #:	☐ Administrative Revision Current Reg. #:
UTM coordinates of facility (Zone 13, NAD 83): **Zone 13N Northing 3880190 Easting 352409**			
Facility type (*i.e.*, a description of your facility operations): **Higher Education**			
Standard Industrial Classification (SIC Code #): **8221**		North American Industry Classification System (NAICS Code #): **611310**	
Is this facility currently operating in Bernalillo County? **No**		If **YES**, list date of original construction: If **NO**, list date of planned startup: **10/30/2025**	
Is the facility permanent? **Yes**		If **NO**, list dates for requested temporary operation: From Through	
Is the facility a portable stationary source? **No**		If **YES**, is the facility address listed above the main permitted location for this source?	
Is the application for a physical or operational change, expansion, or reconstruction (*e.g.*, altering process, or adding, or replacing process or control equipment, etc.) to an existing facility? **No**			
Provide a description of the requested changes:			
What is the facility's operation? ☐ Continuous ☒ Intermittent ☐ Batch			

Estimated percent of production/operation:	Jan-Mar: **25**	Apr-Jun: **25**	Jul-Sep: **25**	Oct-Dec: **25**
Requested operating times of facility:	**0.5** hours/day	**3** days/week	**4** weeks/month	**12** months/year

Will there be special or seasonal operating times other than shown above? This includes monthly- or seasonally-varying hours. **No**
If **YES**, please explain:
List raw materials processed: **Diesel and Hydrogen.**
List saleable item(s) produced:

USE INSTRUCTIONS: For the forms on the following pages, please do not alter or delete the existing footnotes or page breaks. If additional footnotes are needed then add them to the end of the existing footnote list for a given table. Only update the rows and cells within tables as necessary for your project. Unused rows can be deleted from tables. If multiple scenarios will be represented then the Uncontrolled and Controlled Emission Tables, and other tables as needed, can be duplicated and adjusted to indicate the different scenarios.

Regulated Emission Sources Table

(*E.g.*, Generator-Crusher-Screen-Conveyor-Boiler-Mixer-Spray Guns-Saws-Sander-Oven-Dryer-Furnace-Incinerator-Haul Road-Storage Pile, etc.) Match the Units listed on this Table to the same numbered line if also listed on Emissions Tables & Stack Table.

Unit Number and Description[1]		Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date[2]	Process Rate or Capacity (Hp, kW, Btu, ft^3, lbs, tons, yd^3, etc.)[3]	Fuel Type
Ex. 1.	Generator	Unigen	B-2500	A567321C	7/1996	7/1997	11/2020	250 Hp/HR	Diesel
Ex. 2.	Spray Gun	HVLP Systems	Spra-N-Stay 1100	K26-56-95	01/2017	11/2017	N/A	0.25 gal./HR	Electric Compressor
1	**Air Compressor Diesel Engine**	**Caterpillar**	**C13**	**KWJ04248**	**12/2013**	**TBD**	**N/A**	**354 KW/2100 RPM**	**Diesel**
2	**Rotating Detonation Engine**	**Aerojet Rocketdyne**	**Custome Experimental RDE**	**Custome Experimental RDE**	**TBD**	**TBD**	**N/A**	**0.4kg/s**	**Hydrogen**
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Unit Number and Description[1]		Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date[2]	Process Rate or Capacity (Hp, kW, Btu, ft^3, lbs, tons, yd^3, etc.)[3]	Fuel Type
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NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.
2. To determine whether a unit has been modified, evaluate if changes have been made to the unit that impact emissions or that trigger modification as defined in 20.11.41.7(U) NMAC. If not, put N/A.
3. Basis for Equipment Process Rate or Capacity (*e.g.*, Manufacturer's Data, Field Observation/Test, etc.) _____
   Submit information for each unit as an attachment.

Emissions Control Equipment Table

Control Equipment Units listed on this Table should either match up to the same Unit number as listed on the Regulated Emission Sources, Controlled Emissions and Stack Parameters Tables (if the control equipment is integrated with the emission unit) or should have a distinct Control Equipment Unit Number and that number should then also be listed on the Stack Parameters Table.

Control Equipment Unit Number and Description		Controlling Emissions for Unit Number(s)	Manufacturer	Model # | Serial #	Date Installed	Controlled Pollutant(s)	% Control Efficiency[1]	Method Used to Estimate Efficiency	Rated Process Rate or Capacity or Flow
Ex. 8b	Baghouse	3,4,5	Best Baghouses	C-12010 | A16925	11/12/2019	PM_{10}, $PM_{2.5}$	99%	Manufacturer's Data	1,500 ACFM
N/A	**N/A**	**N/A**	**N/A**	**N/A |**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
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NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Basis for Control Equipment % Efficiency (*e.g.*, Manufacturer's Data, Field Observation/Test, AP-42, etc.). _____
   Submit information for each unit as an attachment.

Exempted Sources and Exempted Activities Table

See 20.11.41 NMAC for exemptions.

Unit Number and Description		Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date[1]	Process Rate or Capacity (Hp, kW, Btu, ft^3, lbs, tons, yd^3, etc.)[2]	Fuel Type
Ex. 1.	Boiler	Unigen	B-2500	A567321C	7/1996	7/1997	11/2020	3.5 MMBtu/HR	Natural Gas
Ex. 2.	Hot Water Heater	HVLP Systems	6500A	K26-56-95	01/2017	11/2017	N/A	80 gal./HR	Natural Gas
N/A	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N?A**	**N/A**	**N/A/**	**N/A**
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NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. To determine whether a unit has been modified, evaluate if changes have been made to the unit that impact emissions or that trigger modification as defined in 20.11.41.7(U) NMAC. Also, consider if any changes that were made alter the status from exempt to non-exempt. If not, put N/A.
2. Basis for Equipment Process Rate or Capacity (*e.g.*, Manufacturer's Data, Field Observation/Test, etc.) _____
   Submit information for each unit as an attachment.

Uncontrolled Emissions Table

(Process potential under physical/operational limitations during a 24 hr/day and 365 day/year = 8760 hrs)

Regulated Emission Units listed on this Table should match up to the same numbered line and Unit as listed on the Regulated Emissions and Controlled Tables. List total HAP values per Emission Unit if overall HAP total for the facility ≥ 1 ton/yr.

Unit Number*	Nitrogen Oxides (NO_X)		Carbon Monoxide (CO)		Nonmethane Hydrocarbons/Volatile Organic Compounds (NMHC/VOCs)		Sulfur Dioxide (SO_2)		Particulate Matter ≤ 10 Microns (PM_{10})		Particulate Matter ≤ 2.5 Microns ($PM_{2.5}$)		Hazardous Air Pollutants (HAPs)		Method(s) used for Determination of Emissions (AP-42, Material Balance, Field Tests, etc.)
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	
Example 1.	27.7	121.3	9.1	39.9	1.3	5.7	0.5	2.2	2.0	8.8	0.2	0.4	0.2	0.4	AP-42 Section 3.3
1	**2.96**	**12.98**	**2.73**	**11.96**	**0.15**	**0.68**	**0.0049**	**0.021**	**0.015**	**0.068**	**0.015**	**0.068**	**0.022**	**0.094**	**AP-42 Section 3.3, NSPS Subpart iiii Tier 4,Manufacture'ss spec sheet.**
2	**0.05**	**0.22**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**NSPS Sunpart iiii Tier 4, Manufactur's spec sheet.**

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

Unit Number*	Nitrogen Oxides (NO_X)		Carbon Monoxide (CO)		Nonmethane Hydrocarbons/Volatile Organic Compounds (NMHC/VOCs)		Sulfur Dioxide (SO_2)		Particulate Matter ≤ 10 Microns (PM_{10})		Particulate Matter ≤ 2.5 Microns ($PM_{2.5}$)		Hazardous Air Pollutants (HAPs)		Method(s) used for Determination of Emissions (AP-42, Material Balance, Field Tests, etc.)
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	
Totals of Uncontrolled Emissions	**3.01**	**13.20**	**2.73**	**11.96**	**0.15**	**0.68**	**0.0049**	**0.021**	**0.015**	**0.068**	**0.015**	**0.068**	**0.022**	**0.094**	

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

*A permit is required and this application along with the additional checklist information requested on the Permit Application checklist must be provided if:

(1) any one of these process units or combination of units, has an uncontrolled emission rate greater than or equal to (≥) 10 lbs/hr or 25 tons/yr for any of the above pollutants, excluding HAPs, based on 8,760 hours of operation; or

(2) any one of these process units or combination of units, has an uncontrolled emission rate ≥ 2 tons/yr for any single HAP or ≥ 5 tons/yr for any combination of HAPs based on 8,760 hours of operation; or

(3) any one of these process units or combination of units, has an uncontrolled emission rate ≥ 5 tons/yr for lead (Pb) or any combination of lead and its compounds based on 8,760 hours of operation; or

(4) any one of the process units or combination of units is subject to an Air Board or federal emission limit or standard.

* If all of these process units, individually and in combination, have an uncontrolled emission rate less than (<) 10 lbs/hr or 25 tons/yr for all of the above pollutants (based on 8,760 hours of operation), but > 1 ton/yr for any of the above pollutants, then a source registration is required. A Registration is required, at minimum, for any amount of HAP emissions. Please complete the remainder of this form.

Controlled Emissions Table

(Based on current operations with emission controls OR requested operations with emission controls)

Regulated Emission Units listed on this Table should match up to the same numbered line and Unit as listed on the Regulated Emissions and Uncontrolled Tables. List total HAP values per Emission Unit if overall HAP total for the facility is ≥ 1 ton/yr.

Unit Number	Nitrogen Oxides (NO_X)		Carbon Monoxide (CO)		Nonmethane Hydrocarbons/Volatile Organic Compounds (NMHC/VOCs)		Sulfur Dioxide (SO_2)		Particulate Matter ≤ 10 Microns (PM_{10})		Particulate Matter ≤ 2.5 Microns ($PM_{2.5}$)		Hazardous Air Pollutants (HAPs)		Control Method	% Efficiency[1]
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr		
Example 1.	27.7	55.4	9.1	18.2	1.3	2.6	0.5	1.0	2.0	4.0	0.2	0.088	0.2	0.088	Operating Hours	N/A
1	**2.96**	**0.44**	**2.73**	**0.40**	**0.15**	**0.023**	**0.0049**	**0.00074**	**0.015**	**0.0023**	**0.015**	**0.0023**	**0.022**	**0.0033**	**Operating Hours**	**N/A**
2	**0.050**	**0.0075**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**Operating Hours**	**N/A**

Unit Number	Nitrogen Oxides (NO_X)		Carbon Monoxide (CO)		Nonmethane Hydrocarbons/Volatile Organic Compounds (NMHC/VOCs)		Sulfur Dioxide (SO_2)		Particulate Matter ≤ 10 Microns (PM_{10})		Particulate Matter ≤ 2.5 Microns ($PM_{2.5}$)		Hazardous Air Pollutants (HAPs)		Control Method	% Efficiency[1]
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr		
Totals of Controlled Emissions	**3.01**	**0.45**	**2.73**	**0.40**	**0.15**	**0.023**	**0.0049**	**0.00074**	**0.015**	**0.0023**	**0.015**	**0.0023**	**0.022**	**0.0033**		

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Basis for Control Method % Efficiency (*e.g.*, Manufacturer's Data, Field Observation/Test, AP-42, etc.). _____
   Submit information for each unit as an attachment.

Hazardous Air Pollutants (HAPs) Emissions Table

Report the Potential Emission Rate for each HAP from each source on the Regulated Emission Sources Table that emits a given HAP. Report individual HAPs with ≥ 1 ton/yr total emissions for the facility on this table. Otherwise, report total HAP emissions for each source that emits HAPs and report individual HAPs in the accompanying application package in association with emission calculations. If this application is for a Registration solely due to HAP emissions, report the largest HAP emissions on this table and the rest, if any, in the accompanying application package.

Unit Number	Total HAPs		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Example 1.	6.3	18.2	3.2	8.5	2.3	7.7	0.5	1.0	0.3	1.0	N/A	N/A	N/A	N/A	N/A	N/A
1	**0.022**	**0.0033**														
Totals of HAPs for all units:	**0.022**	**0.0033**														

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

Use Instructions: Copy and paste the HAPs table here if need to list more individual HAPs.

Purchased Hazardous Air Pollutant Table*

Product Categories (Coatings, Solvents, Thinners, etc.)	Hazardous Air Pollutant (HAP), or Volatile Hazardous Air Pollutant (VHAP) Primary To The Representative As Purchased Product	Chemical Abstract Service (CAS) Number of HAP or VHAP from Representative As Purchased Product	HAP or VHAP Concentration of Representative As Purchased Product (pounds/gallon, or %)	Concentration Determination (CPDS, SDS, etc.)[1]	Total Product Purchases For Category	(-)	Quantity of Product Recovered & Disposed For Category	(=)	Total Product Usage For Category
Example 1. Surface Coatings	Xylene	1330207	4.0 lbs/gal	SDS	lb/yr 100 gal/yr	(-)	lb/yr 0 gal/yr	(=)	lb/yr 100 gal/yr
Example 2. Cleaning Solvents	Toluene	108883	70%	Product Label	lb/yr 200 gal/yr	(-)	lb/yr 50 gal/yr	(=)	lb/yr 150 gal/yr
1. N/A	**N/A**	**N/A**	**N/A**	**N/A**	**N/A** lb/yr gal/yr	(-)	**N/A** lb/yr gal/yr	(=)	**N/A** lb/yr gal/yr
2.					lb/yr gal/yr	(-)	lb/yr gal/yr	(=)	lb/yr gal/yr
3.					lb/yr gal/yr	(-)	lb/yr gal/yr	(=)	lb/yr gal/yr
4.					lb/yr gal/yr	(-)	lb/yr gal/yr	(=)	lb/yr gal/yr
5.					lb/yr gal/yr	(-)	lb/yr gal/yr	(=)	lb/yr gal/yr
6.					lb/yr gal/yr	(-)	lb/yr gal/yr	(=)	lb/yr gal/yr
7.					lb/yr gal/yr	(-)	lb/yr gal/yr	(=)	lb/yr gal/yr
8.					lb/yr gal/yr	(-)	lb/yr gal/yr	(=)	lb/yr gal/yr
9.					lb/yr gal/yr	(-)	lb/yr gal/yr	(=)	lb/yr gal/yr
.					lb/yr gal/yr	(-)	lb/yr gal/yr	(=)	lb/yr gal/yr
TOTALS					lb/yr gal/yr	(-)	lb/yr gal/yr	(=)	lb/yr gal/yr

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

NOTE: Product purchases, recovery/disposal and usage should be converted to the units listed in this table. If units cannot be converted please contact the Air Quality Program prior to making changes to this table.

1. Submit, as an attachment, information on one (1) product from each Category listed above which best represents the average of all the products purchased in that Category. CPDS = Certified Product Data Sheet; SDS = Safety Data Sheet

*** A Registration is required, at minimum, for any amount of HAP or VHAP emission.**
Emissions from purchased HAP usage should be accounted for on previous tables as appropriate.
A permit may be required for these emissions if the source meets the requirements of 20.11.41 NMAC.

Material and Fuel Storage Table

(*E.g.*, Tanks, barrels, silos, stockpiles, etc.)

Storage Equipment		Product Stored	Capacity (bbls, tons, gals, acres, etc.)	Above or Below Ground	Construction (Welded, riveted) & Color	Installation Date	Loading Rate[1]	Offloading Rate[1]	True Vapor Pressure	Control Method	Seal Type	% Eff.[2]
Ex. 1.	Tank	Diesel Fuel	5,000 gal.	Below	Welded/Brown	3/1993	3,000 gal/hr	500 gal/hr	N/A	N/A	N/A	N/A
Ex. 2.	Barrels	Solvent	55 gal. drum	Above	Welded/Green	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1	**Tank**	**Diesel Fuel**	**236 gal.**	**Above**	**Welded/Gray**	**TBD**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Basis for Loading/Offloading Rate (*e.g.*, Manufacturer's Data, Field Observation/Test, etc.). _____
   Submit information for each unit as an attachment.
2. Basis for Control Method % Efficiency (*e.g.*, Manufacturer's Data, Field Observation/Test, AP-42, etc.). _____
   Submit information for each unit as an attachment.

Stack Parameters Table

If any equipment from the Regulated Emission Sources Table is also listed in this Stack Table, use the same numbered line for the emission unit on both tables to show the association between the Process Equipment and its stack.

Unit Number and Description		Pollutant (CO, NOx, PM_{10}, etc.)	UTM Easting (m)	UTM Northing (m)	Stack Height (ft)	Stack Exit Temp. (°F)	Stack Velocity (fps)	Stack Flow Rate (acfm)	Stack Inside Diameter (ft)	Stack Type
Ex. 1.	Generator	CO, NOx, PM_{10}, $PM_{2.5}$, SO_2	349430.28	3884014.64	18	900 °F	150 fps	4524 acfm	0.8	Rain Cap
Ex. 2.	Spray Gun	PM_{10}, xylene, toluene	348540.1	3882928.5	9.2	Ambient	50 fps	589 acfm	0.5	Vertical
1	**Compression - Ignition Engine**	**NOx,CO, SO2,** PM_{10}, $PM_{2.5}$	**352418.850**	**3880170.140**	**20.6 ft**	**300** °F	**328 fps**	**2,600 cfm**	**0.4 ft**	**Vertical**
2	**RDE**	**NOx**	**352418.850**	**3880170.140**	**4 ft**	**1480** °F	**3,280 fps**	**13,974 cfm**	**0.3 ft**	**Horizontal**
										Select
										Select
										Select

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

Certification

NOTICE REGARDING SCOPE OF A PERMIT: The Environmental Health Department's issuance of an air quality permit only authorizes the use of the specified equipment pursuant to the air quality control laws, regulations and conditions. Permits relate to air quality control only and are issued for the sole purpose of regulating the emission of air contaminants from said equipment. Air quality permits are not a general authorization for the location, construction and/or operation of a facility, nor does a permit authorize any particular land use or other form of land entitlement. It is the applicant's/permittee's responsibility to obtain all other necessary permits from the appropriate agencies, such as the City of Albuquerque Planning Department or Bernalillo County Department of Planning and Development Services, including but not limited to site plan approvals, building permits, fire department approvals and the like, as may be required by law for the location, construction and/or operation of a facility. For more information, please visit the City of Albuquerque Planning Department website at https://www.cabq.gov/planning and the Bernalillo County Department of Planning and Development Services website at https://www.bernco.gov/planning.

NOTICE REGARDING ACCURACY OF INFORMATION AND DATA SUBMITTED: Any misrepresentation of a material fact in this application and its attachments is cause for denial of a permit or revocation of part or all of the resulting registration or permit, and revocation of a permit for cause may limit the permitee's ability to obtain any subsequent air quality permit for ten (10) years. Any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained under the Air Quality Control Act, NMSA 1978 §§ 74-2-1 to 74-2-17, is guilty of a misdemeanor and shall, upon conviction, be punished by a fine of not more than ten thousand dollars ($10,000) per day per violation or by imprisonment for not more than twelve months, or by both.

I, the undersigned, hereby certify that I have knowledge of the information and data represented and submitted in this application and that the same is true and accurate, including the information and date in any and all attachments, including without limitation associated forms, materials, drawings, specifications, and other data. I also certify that the information represented gives a true and complete portrayal of the existing, modified existing, or planned new stationary source with respect to air pollution sources and control equipment. I understand that there may be significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations. I also understand that the person who has applied for or has been issued an air quality permit by the Department is an obligatory party to a permit appeal filed pursuant to 20.11.81 NMAC. Further, I certify that I am qualified and authorized to file this application, to certify the truth and accuracy of the information herein, and bind the source. Moreover, I covenant and agree to comply with any requests by the Department for additional information necessary for the Department to evaluate or make a final decision regarding the application.

Signed this 11th day of December, 20 25

Teresa Costantinidis
Print Name

Executive Vice President
Print Title

Teresa Costantinidis
Signature

Role: ☐ Owner ☐ Operator
☑ Other Authorized Representative

City of Albuquerque
Environmental Health Department
Air Quality Program

Permit Application Review Fee Checklist Instructions

All source registration and construction permit applications for stationary or portable sources shall be charged an application review fee according to the fee schedule in 20.11.2 NMAC. These filing fees are required for both new construction, reconstruction, and permit modification/revision applications. Most air quality notification (AQN) applications shall be charged an application review fee according to 20.11.39 NMAC. Qualified small businesses as defined in 20.11.2 NMAC may be eligible to pay one-half of the application review fees and 100% of all applicable federal program review fees.

Please fill out the permit application review fee checklist completely and submit with a check or money order payable to the "City of Albuquerque Fund 242" and:

1. Deliver it in person to the Albuquerque Environmental Health Department, 3rd floor, Room 3023, Albuquerque-Bernalillo County Government Center, south building, One Civic Plaza NW, Albuquerque, NM 87102; or

2. Mail it to Albuquerque Environmental Health Department, Air Quality Program, Permitting Division, P.O. Box 1293, Albuquerque, NM 87103; or

3. Online fee payments are now accepted as well. Application must be submitted first, then Department will provide invoice for online payment. Fill out form completely and mark check box below fee amount due on last page to request an invoice to pay the fee online.

The Department will provide a receipt of payment to the applicant. The person delivering or filing a submittal shall attach a copy of the receipt of payment to the submittal as proof of payment. Application review fees shall not be refunded without the written approval of the manager. If a refund is requested, a reasonable professional service fee to cover the costs of staff time involved in processing such requests shall be assessed. Please refer to 20.11.2 NMAC (effective January 10, 2011) for more detail concerning the "Fees" regulation as this checklist does not relieve the applicant from any applicable requirement of the regulation.

City of Albuquerque
Environmental Health Department
Air Quality Program

Permit Application Review Fee Checklist Effective January 1, 2025 – December 31, 2025

Please completely fill out the information in each section. Incompleteness of this checklist may result in the Albuquerque Environmental Health Department not accepting the application review fees. If you have any questions concerning this checklist, please call (505) 768-1972.

I. COMPANY INFORMATION:

Company Name	University of New Mexico		
Company Address	1 University of New Mexico Albuqerque NM 87131		
Facility Name	COSMIAC		
Facility Address	2420 Alamo Ave SE Albuquerque NM		
Contact Person	Casey Hall		
Contact Person Phone Number	(505) 277-0305	**Email**	cbhall4@unm.edu
Are these application review fees for an existing permitted source located within the City of Albuquerque or Bernalillo County?	**Yes** ☐	**No** ☒	
If yes, what is the current permit/registration/AQN number for this facility?	**Permit #**		
Is this application review fee for a Qualified Small Business as defined in 20.11.2 NMAC? (See Definition of Qualified Small Business on Page 4)	**Yes** ☐	**No** ☒	

II. STATIONARY SOURCE APPLICATION REVIEW FEES:

If the application is for a new stationary source facility, please check all that apply. If this application is for a modification to an existing permit please see Section III. For revisions or relocations please see Sections IV or V.

Check All That Apply	Stationary Sources	Review Fee	Program Element
	Air Quality Notifications		
☐	AQN New Application	$701.00	2801
☐	AQN Technical Amendment	$383.00	2802
☐	AQN Transfer of a Prior Authorization	$383.00	2803
☒	*Not Applicable*	*See Sections Below*	
	Stationary Source Review Fees (Not Based on Proposed Allowable Emission Rate)		
☐	Source Registration required by 20.11.40 NMAC	$715.00	2401
☒	A Stationary Source that requires a permit pursuant to 20.11.41 NMAC or other board regulations and are not subject to the below proposed allowable emission rates	$1,429.00	2301
☐	*Not Applicable*	*See Sections Below*	
	Stationary Source Review Fees (Based on the Proposed Allowable Emission Rate for the single highest fee pollutant)		
☐	Proposed Allowable Emission Rate equal to or greater than 1 tpy and less than 5 tpy	$1,072.00	2302
☐	Proposed Allowable Emission Rate equal to or greater than 5 tpy and less than 25 tpy	$2,144.00	2303
☐	Proposed Allowable Emission Rate equal to or greater than 25 tpy and less than 50 tpy	$4,288.00	2304
☐	Proposed Allowable Emission Rate equal to or greater than 50 tpy and less than 75 tpy	$6,432.00	2305
☐	Proposed Allowable Emission Rate equal to or greater than 75 tpy and less than 100 tpy	$8,577.00	2306
☐	Proposed Allowable Emission Rate equal to or greater than 100 tpy	$10,721.00	2307
☒	*Not Applicable*	*See Sections Below*	

Federal Program Review Fees for each subpart (In addition to the Stationary Source Application Review Fees above)			
☒	40 CFR 60 – "New Source Performance Standards" (NSPS)	$1,429.00	2308
☐	40 CFR 61 – "National Emission Standards for Hazardous Air Pollutants" (NESHAPs)	$1,429.00	2309
☐	40 CFR 63 – (NESHAPs) Promulgated Standards	$1,429.00	2310
☐	20.11.64 – (NESHAPs) Case-by-Case MACT Review (Major HAP sources)	$14,294.00	2311
☐	20.11.61 NMAC – Prevention of Significant Deterioration (PSD) Permit	$7,147.00	2312
☐	20.11.60 NMAC – Non-Attainment Area Permit	$7,147.00	2313
☐	*Not Applicable*	*Not Applicable*	

III. MODIFICATION TO EXISTING PERMIT APPLICATION REVIEW FEES:

If the application is for a modification to an existing permit, please check all that apply. If this application is for a new stationary source facility, please see Section II. For revisions or relocations please see Sections IV or V.

Check All That Apply	Modifications	Review Fee	Program Element
Modification Application Review Fees (Not Based on Proposed Allowable Emission Rate)			
☐	Proposed modification to an existing Source Registration required by 20.11.40 NMAC	$715	2401
☐	Proposed modification to an existing stationary source that requires a permit pursuant to 20.11.41 NMAC or other board regulations and are not subject to the below proposed allowable emission rates	$1,429	2321
☒	*Not Applicable*	*See Sections Below*	
Modification Application Review Fees (Based on the Proposed Allowable Emission Rate for the single highest fee pollutant)			
☐	Proposed Allowable Emission Rate equal to or greater than 1 tpy and less than 5 tpy	$1,072.00	2322
☐	Proposed Allowable Emission Rate equal to or greater than 5 tpy and less than 25 tpy	$2,144.00	2323
☐	Proposed Allowable Emission Rate equal to or greater than 25 tpy and less than 50 tpy	$4,288.00	2324
☐	Proposed Allowable Emission Rate equal to or greater than 50 tpy and less than 75 tpy	$6,432.00	2325
☐	Proposed Allowable Emission Rate equal to or greater than 75 tpy and less than 100 tpy	$8,577.00	2326
☐	Proposed Allowable Emission Rate equal to or greater than 100 tpy	$10,721.00	2327
☒	*Not Applicable*	*See Sections Below*	
Major Modifications Review Fees (In addition to the Modification Application Review Fees above)			
☐	20.11.60 NMAC – Permitting in Non-Attainment Areas	$7,147.00	2333
☐	20.11.61 NMAC – Prevention of Significant Deterioration	$7,147.00	2334
☒	*Not Applicable*	*Not Applicable*	
Federal Program Review Fees for each subpart (This section applies only if a Federal Program Review is triggered by the proposed modification) (These fees are in addition to the Modification and Major Modification Application Review Fees above)			
☐	40 CFR 60 – "New Source Performance Standards" (NSPS)	$1,429.00	2328
☐	40 CFR 61 – "National Emission Standards for Hazardous Air Pollutants" (NESHAPs)	$1,429.00	2329
☐	40 CFR 63 – (NESHAPs) Promulgated Standards	$1,429.00	2330
☐	20.11.64 – (NESHAPs) Case-by-Case MACT Review (Major HAP sources)	$14,294.00	2331
☐	20.11.61 NMAC – Prevention of Significant Deterioration (PSD) Permit	$7,147.00	2332
☐	20.11.60 NMAC – Non-Attainment Area Permit	$7,147.00	2333
☒	*Not Applicable*	*Not Applicable*	

IV. ADMINISTRATIVE AND TECHNICAL REVISION APPLICATION REVIEW FEES:

If the application is for an administrative or technical revision of an existing permit issued pursuant to 20.11.40 or 20.11.41 NMAC, please check one that applies.

Check One	Revision Type	Review Fee	Program Element
☐	Administrative Revisions	$250.00	2340
☐	Technical Revisions	$500.00	2341
☒	*Not Applicable*	*See Sections II, III or V*	

V. PORTABLE STATIONARY SOURCE RELOCATION FEES:

If the application is for a portable stationary source relocation of an existing permit, please check one that applies.

Check One	Portable Stationary Source Relocation Type	Review Fee	Program Element
☐	No New Air Dispersion Modeling Required	$500.00	2501
☐	New Air Dispersion Modeling Required	$750.00	2502
☒	*Not Applicable*	*See Sections II, III or IV*	

VI. Please submit payment in the amount shown for the total application review fee.

Section Totals	Review Fee Amount
Section II Total	$2,858.00
Section III Total	$
Section IV Total	$
Section V Total	$
Total Application Review Fee	**$2,858.00**

☐ **Check here if an invoice is requested so Application Review Fee can be paid online.**

I, the undersigned, a responsible officer of the applicant company, certify that to the best of my knowledge, the information stated on this checklist gives a true and complete representation of the permit application review fees which are being submitted. I also understand that an incorrect submittal of permit application reviews may cause an incompleteness determination of the submitted permit application and that the balance of the appropriate permit application review fees shall be paid in full prior to further processing of the application.

Signed this 11th day of December, 20 25

Teresa Costantinidis
Print Name

Executive Vice President
Print Title

Teresa Costantinidis
Signature

Definition of Qualified Small Business as defined in 20.11.2 NMAC:
"Qualified small business" means a business that meets all of the following requirements:

(1) a business that has 100 or fewer employees;
(2) a small business concern as defined by the federal Small Business Act;
(3) a source that emits less than 50 tons per year of any individual regulated air pollutant, or less than 75 tons per year of all regulated air pollutants combined; and
(4) a source that is not a major source or major stationary source.

Note: Beginning January 1, 2011, and every January 1 thereafter, an increase based on the consumer price index shall be added to the application review fees. The application review fees established in Subsection A through D of 20.11.2.18 NMAC shall be adjusted by an amount equal to the increase in the consumer price index for the immediately-preceding year. Application review fee adjustments equal to or greater than fifty cents ($0.50) shall be rounded up to the next highest whole dollar. Application review fee adjustments totaling less than fifty cents ($0.50) shall be rounded down to the next lowest whole dollar. The department shall post the application review fees on the city of Albuquerque environmental health department air quality program website.

City of Albuquerque
Environmental Health Department
Air Quality Program

Air Quality
Compliance History Disclosure Form

The Albuquerque-Bernalillo County Joint Air Quality Program ("Program") administers and enforces local air quality laws for the City of Albuquerque ("City") and Bernalillo County ("County") on behalf of the City Environmental Health Department, including the New Mexico Air Quality Control Act ("AQCA"), NMSA 1978, Sections 74-2-1 to -17. In accordance with Sections 74-2-7(P) and (S) of the AQCA, the Program may deny any permit application or revoke any permit issued pursuant to the AQCA if, within ten years immediately preceding the date of submission of the permit application, the applicant or permittee meets any one of the criteria outlined in the AQCA. The Program requires applicants to file this Compliance History Disclosure Form in order for the Program to deem an air permit application administratively complete, or issue an air permit for those permits without an initial administrative completeness determination process. Additionally, an existing permit holder (permits issued prior to the Effective Date of this Form) shall provide this Compliance History Disclosure Form to the Program upon the Program's request. Note: Program Staff can answer basic questions about this Compliance History Disclosure Form but cannot provide specific guidance or legal advice.

Instructions

1. Applications filed pursuant to the following regulations shall include this Compliance History Disclosure Form, in accordance with Section 74-2-7(S) of the AQCA: *Construction Permits* (20.11.41 NMAC); *Operating Permits* (20.11.42 NMAC); *Nonattainment Areas* (20.11.60 NMAC); *Prevention of Significant Deterioration* (20.11.61 NMAC); *Acid Rain* (20.11.62 NMAC); and *Fugitive Dust* (20.11.20 NMAC) except this Form shall not be required for asbestos notifications under 20.11.20.22 NMAC.
2. This Compliance History Disclosure Form is not site specific: responses shall be based on the applicant/permittee as an entity and not be limited to the application, site, facility or source.
3. The permittee identified on this Compliance History Disclosure Form shall match the permittee in the existing permit or new application. If the information in an existing permit needs to be changed, please contact the Program about revisions and ownership transfers.
4. Answer every question completely and truthfully, and do not leave any blank spaces. If there is nothing to disclose in answer to a particular question, check the box labeled "No" except for Question 5b. Failure to provide any of the information requested in this Compliance History Disclosure Form may constitute grounds for an incompleteness determination, application denial, or permit revocation.
5. Be especially careful not to leave out information in a way that might create an impression that you are trying to hide it. Omitting information, even unintentionally, may result in application denial or permit revocation.
6. For any required explanations, be sure to identify the question to which the explanation is responsive. If you submit any document in connection with your answer to any question, refer to it as, "Exhibit No._", and attach it after the explanation(s) at the end of the Compliance History Disclosure Form, consecutively numbering each additional page at the top right corner.
7. The Program may require additional information to make a thorough review of an application. At all times before the Program has made a final decision regarding the application, an applicant has a duty to promptly supplement and correct information the applicant has submitted in an application to the Program. The applicant's duty to supplement and correct the application includes, but is not limited to, relevant information acquired after the applicant has submitted the application and additional information the applicant otherwise determines is relevant to the application and the Program's review and decision. While the Program is processing an application, regardless of whether the Program has determined the application is administratively complete, if the Program determines that additional information is necessary to evaluate or make a final decision regarding the application, the Program may request additional information and the applicant shall provide the requested additional information.
8. Supplementary information required by the Program may include responses to public comment received by the Program during the application review process.
9. Any fees submitted for processing an application that has been denied will not be refunded. If the Program denies an application, a person may submit a new application and the fee required for a new application. The applicant has the burden of demonstrating that a permit should be issued.

COMPLIANCE HISTORY		
A. Applicant/Permittee Name: University of New Mexico		*Check Applicable Box*: ☒ Applicant ☐ Permittee
B. Time Period of Compliance Reporting (10 Years): September 08, 2015 to September 08, 2025 *Instructions: For applicants, answer the following questions with information from within the 10 years preceding the current application. For existing permit holders requested to submit this form by the Program outside of an application, answer the following questions with information from within the 10 years preceding the Program's issuance of each permit.*		
C. Questions		
1	Knowingly misrepresented a material fact in an application for a permit?	☐ Yes ☒ No
2	Refused to disclose information required by the provisions of the New Mexico Air Quality Control Act?	☐ Yes ☒ No
3	Been convicted in any court of any state or the United States of a felony related to environmental crime?	☐ Yes ☒ No
4	Been convicted in any court of any state or the United States of a crime defined by state or federal statute as involving or being in restraint of trade, price fixing, bribery, or fraud?	☐ Yes ☒ No
5a	Constructed or operated any facility for which a permit was sought, including the current application, without the required air quality permit(s) under 20.11.41 NMAC, 20.11.42 NMAC, 20.11.60 NMAC, 20.11.61 NMAC, or 20.11.62 NMAC?	☐ Yes ☒ No
5b	If "No" to question 5a, mark N/A and go to question 6. If "Yes" to question 5a, state whether each facility that was constructed or operated without the required air quality permit met at least one of the following exceptions: i. The unpermitted facility was discovered after acquisition during a timely environmental audit that was authorized by the Program or the New Mexico Environment Department; or ii. The operator of the facility, using good engineering practices and established approved calculation methodologies, estimated that the facility's emissions would not require an air permit, **and** the operator applied for an air permit within 30 calendar days of discovering that an air permit was required for the facility.	☐ Yes ☐ No ☒ N/A
6	Had any permit revoked or permanently suspended for cause under the environmental laws of any state or the United States?	☐ Yes ☒ No
7	For each "yes" answer, or "no" to 5b, please attach an explanation and supporting documentation.	

I, the undersigned, hereby certify under penalty of law that this Compliance History Disclosure Form (Form) 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. I have knowledge of the information in this Form and it is, to the best of my knowledge and belief, true, accurate, and complete. I understand that there are significant penalties for submitting false information, including denial of the application or revocation of a permit, as well as fines and imprisonment for knowing violations. If I filed an application, I covenant and agree to promptly supplement and correct information in this Form until the Program makes a final decision regarding the application. Further, I certify that I am qualified and authorized to file this Form, to certify to the truth and accuracy of the information herein, and bind the permittee and source.

Signed on

Teresa Costantinidis
Print Name

Executive Vice President
Print Title

Signature

University of New Mexico
Company Name

City of Albuquerque
Environmental Health Department
Air Quality Program

Pre-Permit Application Meeting Request Form

Please complete appropriate boxes and email to aqd@cabq.gov or mail to:

Environmental Health Department
Air Quality Program
Permitting Division
P.O. Box 1293
Albuquerque, NM 87103

A copy of this form must be included as part of the application package.

Company/Organization: Current Permit #:	**UNM**				
Point of Contact: (phone number and email): Preferred form of contact (check one): ☐Phone ☐E-mail	Name: Casey Hall Phone: (505) 277-0305 Email: **cbhall4@unm.edu**				
Preferred meeting dates/times: (provide several dates/times when applicant/consultant are available in the 1-2 weeks after submitting this form)	1st date/ time(s) May 7th 11:00AM	2nd date/ time(s) May 7th 2:00PM	3rd date/ time(s) May 9th 2:00PM	4th date/ time(s)	5th date/ time(s)
Preferred meeting type (Zoom/In Person):	**Zoom**				
Description of Project:	**Installation of diesel powered air compressor for a rotating detonating engine(RDE).**				

City of Albuquerque
Environmental Health Department
Air Quality Program

Construction Permit (20.11.41 NMAC)
Pre-Permit Application Meeting Agenda Checklist & Public Notice Sign Guidelines Checklist

This entire document, including both completed checklists, must be included as part of the application package.

Any person seeking a new permit, a permit modification, or an emergency permit under 20.11.41 NMAC (Construction Permits) shall do so by filing a written application with the Albuquerque-Bernalillo County Joint Air Quality Program, which administers and enforces local air quality laws for the City of Albuquerque ("City") and Bernalillo County ("County"), on behalf of the City Environmental Health Department ("Department").

Prior to submitting an application, per 20.11.41.13(A) NMAC, the applicant (or their consultant) shall contact the Department in writing and submit a Pre-Permit Application Meeting Request Form to request a pre-application meeting. The Pre-Permit Application Meeting Request Form is available at https://www.cabq.gov/airquality/air-quality-permits/air-quality-application-forms. The purpose of the pre-application meeting is for the Department to provide the applicant with information regarding the contents of the application and the application process.

This pre-application meeting agenda checklist is provided to aid the Department and applicant in ensuring that in the pre-permit application meeting all information regarding the contents of the application and the application process are communicated to the applicant. This is because applications that are ruled incomplete because of missing information will delay any determination or the issuance of the permit. The Department reserves the right to request additional relevant information prior to ruling the application complete in accordance with 20.11.41 NMAC.

Also included in this document is the Public Notice Sign Guidelines Checklist, which contains requirements for how the applicant must display the required weather-proof sign.

The applicant should fill out and have this agenda checklist available at the pre-application meeting to be sure all items are covered. Check the boxes to acknowledge that each item from the agenda was discussed and that requirements for the weather-proof sign were followed.

Pre-Permit Application Meeting Agenda Checklist

Applicant Company Name: **University of New Mexico**
Facility Name: **COSMIAC**

☒ Fill out and submit a Pre-Permit Application Meeting Request form
Available online at https://www.cabq.gov/airquality/air-quality-permits/air-quality-application-forms/air-quality-application-forms

I. ☒ Discuss Project:
   a. Facility Location
   b. Facility Description
   c. Main Processes
   d. Equipment
   e. Proposed Schedule

II. ☒ Discuss the requirement for a zoning certification or verifications for new permits and permit modifications. The Zoning Requirement Cover Page form is a required component of this part of the submittal:
   a. For projects on property subject to City or County zoning laws (*i.e.*, **not** located on federal land, **not** located on State of New Mexico land, **not** located on Tribal land), a zoning certification from the appropriate planning department is required.
      i. City Planning Form: https://www.cabq.gov/planning/code-enforcement-zoning
      ii. County Planning Form: https://www.bernco.gov/planning/planning-and-land-use/applications-forms/
   b. If the project's property is not subject to City or County zoning jurisdiction, a zoning verification from both planning departments is required.
      i. City Planning Form: https://www.cabq.gov/planning/code-enforcement-zoning
      ii. County Planning Form: https://www.bernco.gov/planning/planning-and-land-use/applications-forms/
   c. The zoning certification or verifications **must** be obtained from the appropriate Planning Department, either City of Albuquerque or Bernalillo County. For more information, please visit the City's Planning Department website at https://www.cabq.gov/planning or Bernalillo County's Planning Department website at the https://www.bernco.gov/planning/.

III. ☒ Discuss the requirement for a Compliance History Disclosure Form as of Nov. 6, 2023 for permit application submittals except for Administrative Revisions that are not transfers of ownership.

IV. ☒ Discuss the potential requirement for a BACT Analysis for new permits and permit modifications per 20.11.72 NMAC.
   a. Required if new or modifying stationary source is within a one-mile radius of an overburdened area, as described in 20.11.72.8(C) NMAC; or
   b. Required if new or modifying stationary source emits any one, or combination of, the fifteen hazardous air pollutants (HAPs) listed in 20.11.72.8(D) NMAC.

V. ☒ If permit modification or revision, review current permit:
   a. Review Process Equipment Table and Emissions Table and discuss changes
   b. Request information about the replacement or new equipment (for example, if it is an engine, we need to know if it is new, what year, fuel type, etc…) to give them an idea of the changes that will be needed
   c. Discuss possible changes in permit conditions

VI. ☒ Air Dispersion modeling process, procedures and options:
   a. When modeling is required and possibility of waivers
   b. Protocol process, purpose, and time frame
   c. Preliminary review, purpose, and time frame
   d. Full review and time frame
   e. Peer reviews
   f. Assumptions in the modeling become permit conditions
   g. NED data should be used instead of DEM data for assigning elevations to receptors, sources, buildings, etc.

VII. ☒ Applicant's public notice requirements
   a. During the same month application package will be submitted, ask Department for memo of neighborhood associations/coalitions within ½ mile of facility
   b. Fill out and send Notice of Intent to Construct form as attachment, with Applicant Notice Cover Letter as email body, to neighborhood associations/coalitions listed in memo: https://www.cabq.gov/airquality/air-quality-permits/air-quality-application-forms
   c. Post and maintain a weather-proof sign. Signs are available in the downtown Program office. The Public Notice Sign Guidelines Checklist can be found on the next page of this document.

VIII. ☒ Regulatory timelines
   a. 30 days to rule application complete
   b. 90 days after ruled complete for permitting decision
   c. 30-day public comment period after application deemed complete
   d. If public interest in application:
      i. 30-day review of technical analysis
      ii. 90-day extension for permitting decision
   e. Request for Public Information Hearing - 90-day extension for permitting decision
   f. Complex technical issues in application - 90-day extension for permitting decision
   g. If application ruled incomplete it stops timeline and restarts at beginning with updated submittal

IX. ☒ Department Policies
   a. One original hard copy must be submitted along with a duplicate copy. The duplicate copy should be a high-quality electronic duplicate submitted on thumb drive as one complete PDF with all application contents found in the hardcopy, including pages with signatures. However, do not include financial information, such as a copy of a check, in the electronic PDF. The electronic submittal should also include emission calculations Excel-compatible file(s) and modeling files, if applicable.
   b. Applications will be ruled incomplete if any parts from Permit Application Checklist are missing
   c. Review fees paid in full are part of the application package (Except as noted above)
   d. Discuss payment format (by check, credit card or online)
   e. Use the most recent Permit Application Checklist, found under Part 41 Implementation on this page: https://www.cabq.gov/airquality/air-quality-permits/air-quality-application-forms
   f. After three tries, permit application denied and application must start over including repayment of fees

X. ☐ Additional Questions?

City of Albuquerque
Environmental Health Department
Air Quality Program

Public Notice Sign Guidelines

Any person seeking a permit under 20.11.41 NMAC, Construction Permits, shall do so by filing a written application with the Department. *Prior to submitting an application, the applicant shall post and maintain a weather-proof sign provided by the department. The applicant shall keep the sign posted until the department takes final action on the permit application; if an applicant can establish to the department's satisfaction that the applicant is prohibited by law from posting, at either location required, the department may waive the posting requirement and may impose different notification requirements.* **A copy of this form must be submitted with your application.**

Applications that are ruled incomplete because of missing information will delay any determination or the issuance of the permit. The Department reserves the right to request additional relevant information prior to ruling the application complete in accordance with 20.11.41 NMAC.

Applicant Company Name: **University of New Mexico**
Facility Name: **COSMIAC**

☒ The sign must be posted at the more visible of either the proposed or existing facility entrance (or, if approved in advance and in writing by the department, at another location on the property that is accessible to the public)

- ☒ The sign shall be installed and maintained in a condition such that members of the public can easily view, access, and read the sign at all times.
- ☒ The lower edge of the sign board should be mounted a minimum of 2 feet above the existing ground surface to facilitate ease of viewing

☒ Include at least two pictures of the completed, properly posted sign in the application package immediately following this document. One picture should show the location of the posted sign and the other should be close enough to the sign for the posted information to be legible in the picture.

☐ **Check here if the department has waived the sign posting requirement.**
Alternative public notice details:

NOTICE FROM THE APPLICANT

Notice of Intent to Apply for Air Quality Construction Permit

You are receiving this notice because the New Mexico Air Quality Control Act (20.11.41.13B NMAC) requires any owner/operator proposing to construct or modify a facility subject to air quality regulations to provide public notice by certified mail or electronic mail to designated representatives of recognized neighborhood associations and coalitions within 0.5-mile of the property on which the source is or is proposed to be located.

This notice indicates that the owner/operator intends to apply for an Air Quality Construction Permit from the Albuquerque – Bernalillo County Joint Air Quality Program. Currently, no application for this proposed project has been submitted to the Air Quality Program. Applicants are required to include a copy of this form and documentation of mailed notices with their Air Quality Construction Permit Application.

Proposed Project Information

Applicant's name and address:
Nombre y domicilio del solicitante: University of New Mexico

Owner / operator's name and address:
Nombre y domicilio del propietario u operador: 1 University of New Mexico, Albuquerque, NM 87131

Contact for comments and inquires:
Datos actuales para comentarios y preguntas:

Name *(Nombre)*: Casey Hall
Address *(Domicilio)*: 1801 Tucker Ave NE.
Phone Number *(Número Telefónico)*: (505) 277-0305
E-mail Address *(Correo Electrónico)*: cbhall@unm.edu

Actual or estimated date the application will be submitted to the department:
Fecha actual o estimada en que se entregará la solicitud al departamento: November 7, 2025

Description of the source:
Descripción de la fuente: 475 Horsepower Diesel Compressor Engine

Exact location of the source or proposed source:
Ubicación exacta de la fuente o fuente propuesta: 2420 Alamo Ave SE, Albuquerque NM 87106

Nature of business:
Tipo de negocio: Higher Education

Process or change for which the permit is requested:
Proceso o cambio para el cuál de solicita el permiso: Construction of diesel compressor engine for process equipment

Maximum operating schedule:
Horario máximo de operaciones: 300 hours per year

Normal operating schedule:
Horario normal de operaciones: Intermittent when process equipment is needed for expermient

Preliminary estimate of the maximum quantities of each regulated air contaminant the source will emit:
Estimación preliminar de las cantidades máximas de cada contaminante de aire regulado que la fuente va a emitir:

Air Contaminant *Contaminante de aire*	**Proposed Construction Permit** *Permiso de Construcción Propuesto*		**Net Changes (for permit modification or technical revision)** *Cambio Neto de Emisiones (para modificación de permiso o revisión técnica)*	
	pounds per hour *libras por hora*	tons per year *toneladas por año*	pounds per hour *libras por hora*	tons per year *toneladas por año*
NO_x	1.56	0.23		
CO	2.73	0.40		
VOC	0.14	0.022		
SO_2	0.0051	0.00076		
PM_{10}	0.015	0.0023		
$PM_{2.5}$	0.015	0.0023		
HAP	0.022	0.0033		

NOTE: To add extra rows for H_2S or Pb in Word, click in a box in the last row. Click the plus (+) sign that appears on the right of the row to add a row.

Questions or comments regarding this Notice of Intent should be directed to the Applicant. Contact information is provided with the Proposed Project Information on the first page of this notice. To check the status of an Air Quality Construction Permit application, call 311 and provide the Applicant's information, or visit www.cabq.gov/airquality/air-quality-permits.

The Air Quality Program will issue a Public Notice announcing a 30-day public comment period on the permit application for the proposed project when the application is deemed complete. The Air Quality Program does not process or issue notices on applications that are deemed incomplete. More information about the air quality permitting process is attached to this notice.

Air Quality Construction Permitting Overview

This is the typical process to obtain an Air Quality Construction Permit for Synthetic Minor and Minor sources of air pollution from the Albuquerque – Bernalillo County Joint Air Quality Program.

Step 1: Pre-application Meeting: The Applicant and their consultant must request a meeting with the Air Quality Program to discuss the proposed action. If air dispersion modeling is required, Air Quality Program staff discuss the modeling protocol with the Applicant to ensure that all proposed emissions are considered.

> **Notice of Intent from the Applicant:** Before submitting their application, the Applicant is required to notify all nearby neighborhood associations and interested parties that they intend to apply for an air quality permit or modify an existing permit. The Applicant is also required to post a notice sign at the facility location.

Step 2: Administrative Completeness Review and Preliminary Technical Review: The Air Quality Program has 30 days from the day the permit is received to review the permit application to be sure that it is administratively complete. This means that all application forms must be signed and filled out properly, and that all relevant technical information needed to evaluate any proposed impacts is included. If the application is not complete, the permit reviewer will return the application and request more information from the Applicant. Applicants have three opportunities to submit an administratively complete application with all relevant technical information.

> **Public Notice from the Department:** When the application is deemed complete, the Department will issue a Public Notice announcing a 30-day public comment period on the permit application. This notice is distributed to the same nearby neighborhood associations and interested parties that the Applicant sent notices to, and published on the Air Quality Program's website.
>
> During this 30-day comment period, individuals have the opportunity to submit written comments expressing their concerns or support for the proposed project, and/or to request a Public Information Hearing. If approved by the Environmental Health Department Director, Public Information Hearings are held after the technical analysis is complete and the permit has been drafted.

Step 3: Technical Analysis and Draft Permit: Air Quality Program staff review all elements of the proposed operation related to air quality, and review outputs from advanced air dispersion modeling software that considers existing emission levels in the area surrounding the proposed project, emission levels from the proposed project, and meteorological data. The total calculated level of emissions is compared to state and federal air quality standards and informs the decision on whether to approve or deny the Applicant's permit.

Draft Permit: The permit will establish emission limits, standards, monitoring, recordkeeping, and reporting requirements. The draft permit undergoes an internal peer review process to determine if the emissions were properly evaluated, permit limits are appropriate and enforceable, and the permit is clear, concise, and consistent.

> **Public Notice from the Department:** When the technical analysis is complete and the permit has been drafted, the Department will issue a second Public Notice announcing a 30-day public comment period on the technical analysis and draft permit. This second Public Notice, along with the technical analysis documentation and draft permit, will be published on the Air Quality Program's website, and the public notice for availability of the technical analysis and draft permit will only be directly sent to those who requested further information during the first comment period.

During this second 30-day comment period, residents have another opportunity to submit written comments expressing their concerns or support for the proposed project, and/or to request a Public Information Hearing.

Possible Public Information Hearing: The Environmental Health Department Director may decide to hold a Public Information Hearing for a permit application if there is significant public interest and a significant air quality issue. If a Public Information Hearing is held, it will occur after the technical analysis is complete and the permit has been drafted.

Step 4: Public Comment Evaluation and Response: The Air Quality Program evaluates all public comments received during the two 30-day public comment periods and Public Information Hearing, if held, and updates the technical analysis and draft permit as appropriate. The Air Quality Program prepares a response document to address the public comments received, and when a final decision is made on the permit application, the comment response document is published on the Air Quality Program's website and distributed to the individuals who participated in the permit process. If no comments are received, a response document is not prepared.

Step 5: Final Decision on the Application: After public comments are addressed and the final technical review is completed, the Environmental Health Department makes a final decision on the application. If the permit application meets all applicable requirements set forth by the New Mexico Air Quality Control Act and the federal Clean Air Act, the permit is approved. If the permit application does not meet all applicable requirements, it is denied.

Notifications of the final decision on the permit application and the availability of the comment response document is published on the Air Quality Program's website and distributed to the individuals who participated in the permit process.

The Department must approve a permit application if the proposed action will meet all applicable requirements and if it demonstrates that it will not result in an exceedance of ambient air quality standards. Permit writers are very careful to ensure that estimated emissions have been appropriately identified or quantified and that the emission data used are acceptable.

The Department must deny a permit application if it is deemed incomplete three times, if the proposed action will not meet applicable requirements, if estimated emissions have not been appropriately identified or quantified, or if the emission data are not acceptable for technical reasons.

For more information about air quality permitting, visit www.cabq.gov/airquality/air-quality-permits


COSMIAC
LaunchPad
2420 Alamo Ave. SE
Suite 101
2420

Proposed Air Quality Construction Permit

Permiso de Construcción de Calidad del Aire Propuesto

1. **Applicant's Name:** *Nombre del solicitante:* The University of New Mexico (UNM)
   Owner or Operator's Name: *Nombre del Propietario u Operador:* UNM
2. **Actual or Estimated Date the Application will be Submitted to the Department:** *Fecha Actual o Estimada en que se Entregará la Solicitud al Departamento:* 4/30/2025
3. **Exact Location of the Source or Proposed Source:** *Ubicación Exacta de la Fuente o Fuente Propuesta:* 2420 Alamo Ave SE, Albuquerque NM 87106
4. **Description of the Source:** *Descripción de la Fuente:* Diesel compressor engine
   Nature of Business: *Tipo de Negocio:* Higher Education
   Process or change for which a permit is requested: *Proceso o cambio para el cual se solicita el permiso:* Diesel compresser engine for process equipment

Preliminary estimate of the maximum quantities of each regulated air contaminant the source will emit:
Estimación preliminar de las cantidades máximas de cada contaminante de aire regulado que la fuente va a emitir:

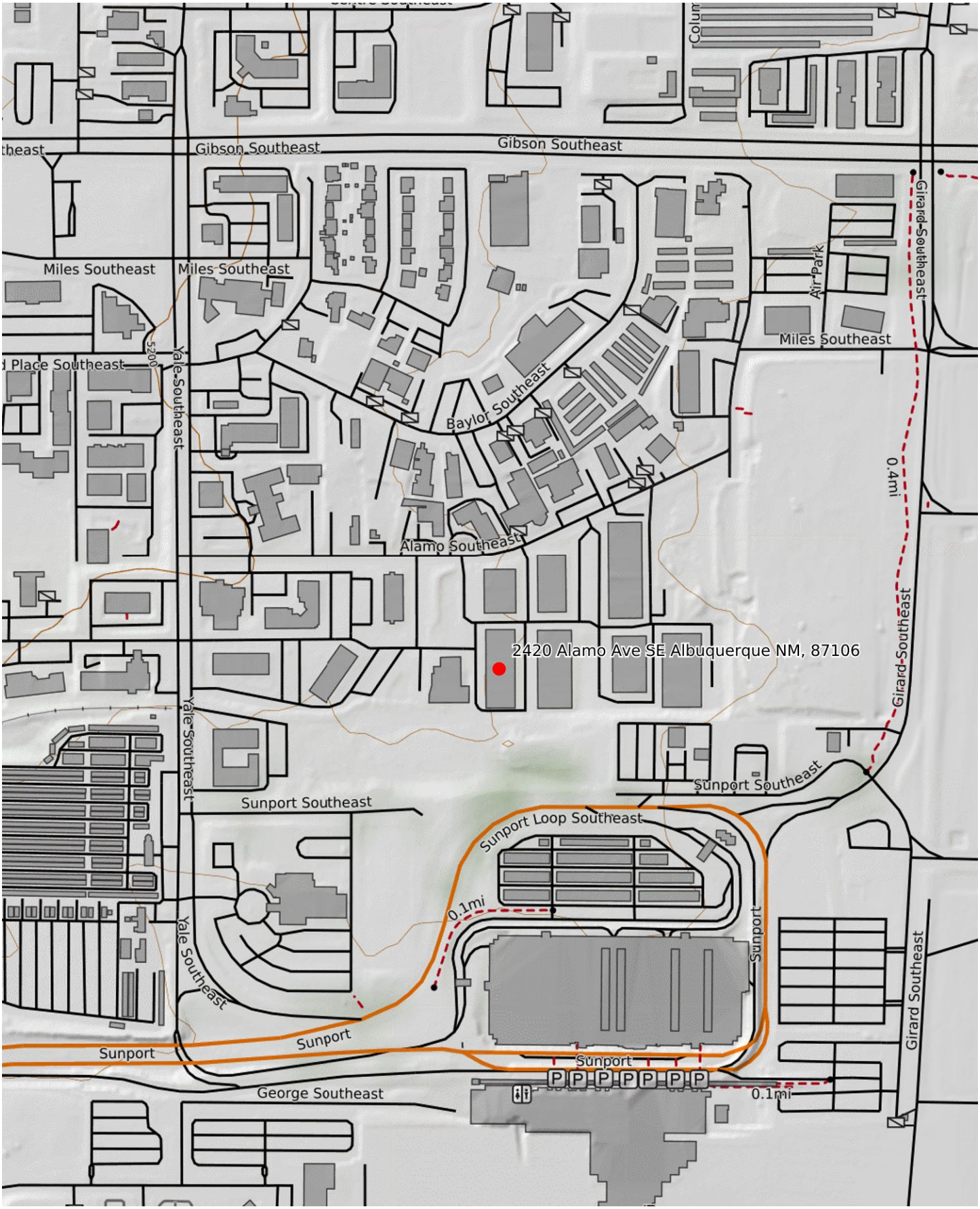
Air Contaminant *Contaminante de Aire*	Proposed Construction Permit *Permiso de Construcción Propuesto*		Net Change Emissions (for permit modification or technical revision) *Cambio Neto de Emisiones (para modificación de permiso o revisión técnica)*	
	Pounds per hour *libras por hora*	Tons per year *toneladas por año*	Pounds per hour *libras por hora*	Tons per year *toneladas por año*
NO_x	0.31	0.04		
CO	2.73	0.40		
VOC	0.14	0.02		
SO_2	0.00	0.00		
PM_{10}	0.01	0.00		
$PM_{2.5}$	0.01	0.00		
HAP	0.02	0.00		

5. **Maximum Operating Schedule:** *Horario Máximo de Operaciones:* 300 hours per year
   Normal Operation Schedule: *Horario Normal de Operaciones:* Intermittent when process equipment is needed
6. **Current Contact Information for Comments and Inquiries** *Datos actuales para Comentarios y Preguntas*
   Name *(Nombre):* Casey Hall
   Address *(Domicilio):* 1801 Tucker Ave NE
   Phone Number *(Número Telefónico):* (505) 277-0505
   Email Address *(Correo Electrónico):* cbhall@unm.edu

Call 311 for additional information concerning this project, the Air Quality Program, or to file a complaint.
Llame al 311 para obtener información adicional sobre este proyecto, del Programa de Calidad del Aire, o para presenter una queja.
Gọi 311 để biết thêm thông tin hoặc để khiếu nại về dự án này, Chương Trình Chất Lượng Không Khí

City of Albuquerque, Environmental Health Department, Air Quality Program – Stationary Source Permitting
Ciudad de Albuquerque, Departamento de Salud Ambiental, Programa de Calidad del Aire - Permisos para Fuentes Inmóviles
(505) 768-1972, aqd@cabq.gov

THIS SIGN SHALL REMAIN POSTED UNTIL THE DEPARTMENT TAKES FINAL ACTION ON THE PERMIT APPLICATION
ESTE AVISO DEBERÁ DE MANTENERSE PUESTO HASTA QUE EL DEPARTAMENTO TOME UNA DECISIÓN SOBRE LA SOLICITUD DE PERMISO



Mercator Projection
WGS84
UTM Zone 13S

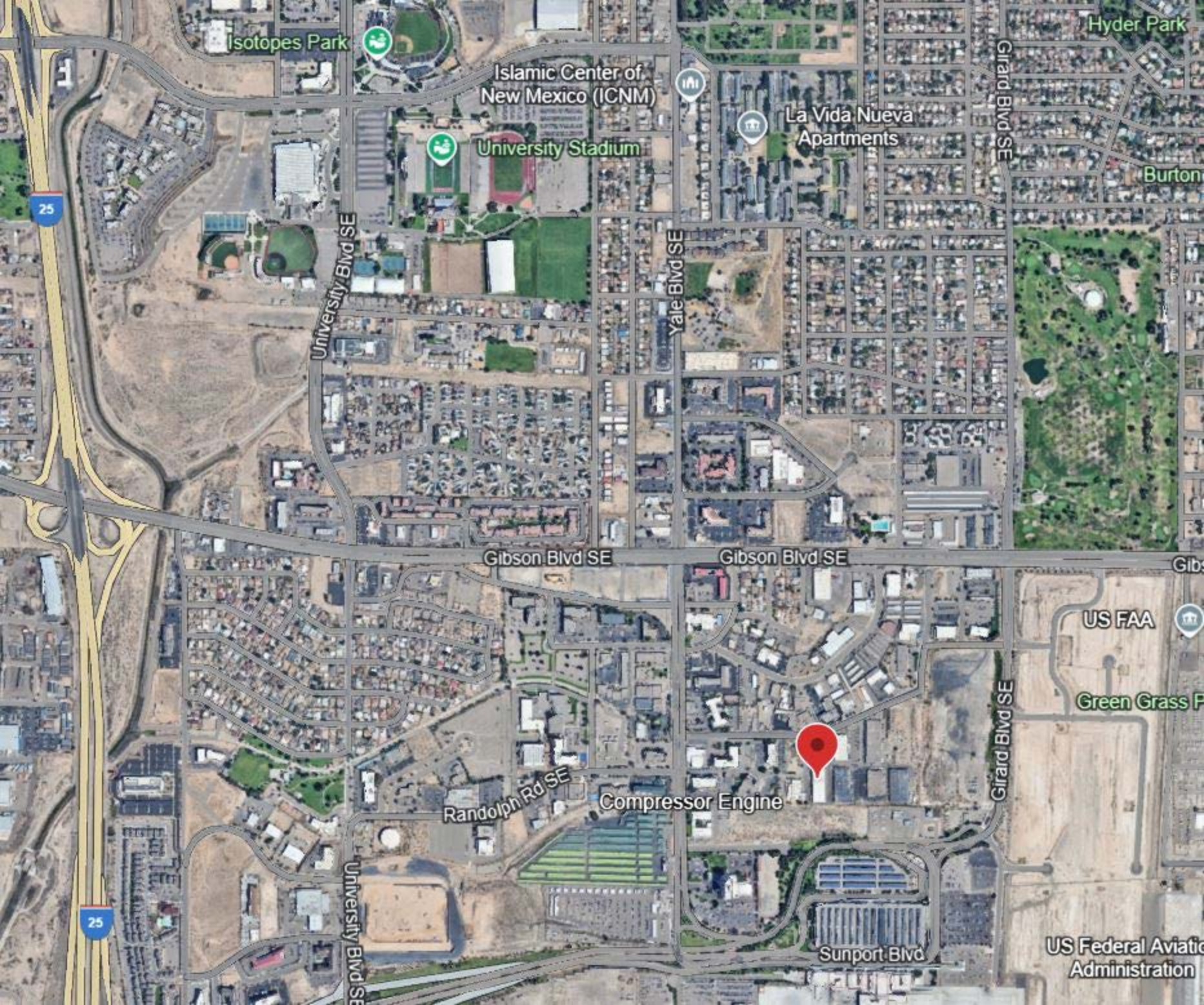
CALTOPO

0.1 0.2 0.3 0.4 0.5 0.6 km

0.1 0.2 0.3 mi

Scale **1:5458** 1 inch = 455 feet

MN
7.9º


Isotopes Park
Islamic Center of New Mexico (ICNM)
University Stadium
La Vida Nueva Apartments
Hyder Park
Girard Blvd SE
Burton
25
University Blvd SE
Yale Blvd SE
Gibson Blvd SE
Gibson Blvd SE
US FAA
Green Grass P
Girard Blvd SE
Randolph Rd SE
Compressor Engine
University Blvd SE
25
Sunport Blvd
US Federal Aviatio
Administration

Timothy M. Keller,
Mayor

Public Participation

List of Neighborhood Associations and Neighborhood Coalitions
MEMORANDUM

To: Lauren Bell
From: Michael McKinstry, Environmental Health-Air Quality Permitting Manager
Subject: Determination of Neighborhood Associations and Coalitions within 0.5 mile of 2420 Alamo Avenue SE, Bernalillo County, NM.
Date: November 7, 2025

DETERMINATION:

On November 7, 2025, I used the City of Albuquerque Zoning Advanced Map Viewer (http://coagisweb.cabq.gov/) to verify which City of Albuquerque Neighborhood Associations (NA), Homeowner Associations (HOA) and Neighborhood Coalitions (NC) are located within 0.5 mile of 2420 Alamo Avenue SE in Bernalillo County, NM.

I then used the City of Albuquerque Office (COA) of Neighborhood Coordination's Monthly Master NA List dated November 2025 and the Bernalillo County (BC) Monthly Neighborhood Association November 2025 Excel file to determine the contact information for each NA and NC located within 0.5 mile of 2420 Alamo Avenue SE in Bernalillo County, NM.

The table below contains the contact information, which will be used in the City of Albuquerque Environmental Health Department's public notice. Duplicates have been deleted.

COA/BC Association or Coalition	Name	Email or Mailing Address*
Clayton Heights Lomas Del Cielo, NA	Eloisa Molina-Dodge Isabel Cabrera	e_molinadodge@yahoo.com boyster2018@gmail.com
District 6 Coalition	M. Ryan Kious Patricia Willson	m.ryankious@gmail.com info@willsonstudio.com
Kirtland Community Assoc.	Elizabeth Aikin Kimberly Brown	bakieaikin@comcast.net kande0@yahoo.com
Yale Village NA	Donald Love Kim Love Association Email	donaldlove08@comcast.net klove726@gmail.com yalevillage@comcast.net

Timothy M. Keller,
Mayor

Public Participation

List of Neighborhood Associations
and Neighborhood Coalitions
MEMORANDUM

Victory Hills NA	Althea Atherton Patricia Willson Association Email	altheatherton@gmail.com info@willsonstudio.com victoryhills505@gmail.com

If email address is not listed, provide public notice via certified mail and include a copy of each mail receipt with the application submittal.

Lauren Bell
To: Lauren Bell
Cc: Casey Hall
Bcc: e_molinadodge@yahoo.com; boyster2018@gmail.com; m.ryankious@gmail.com; info@willsonstudio.com; bakieaikin@comcast.net; kande0@yahoo.com; donaldlove08@comcast.net; **+4 others**

Reply Reply all Forward

Tue 11/11/2025 8:39 AM

Notice of Intent.pdf
134 KB

Dear Neighborhood Association/Coalition Representative(s),

Why did I receive this public notice?
You are receiving this notice in accordance with New Mexico Administrative Code (NMAC) 20.11.41.13.B(1) which requires any applicant seeking an Air Quality Construction Permit pursuant to 20.11.41 NMAC to provide public notice by certified mail or electronic mail to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are within one-half mile of the exterior boundaries of the property on which the source is or is proposed to be located.

What is the Air Quality Permit application review process?
The City of Albuquerque, Environmental Health Department, Air Quality Program (Program) is responsible for the review and issuance of Air Quality Permits for any stationary source of air contaminants within Bernalillo County. Once the application is received, the Program reviews each application and rules it either complete or incomplete. Complete applications will then go through a 30-day public comment period. Within 90 days after the Program has ruled the application complete, the Program shall issue the permit, issue the permit subject to conditions, or deny the requested permit or permit modification. The Program shall hold a Public Information Hearing pursuant to 20.11.41.15 NMAC if the Director determines there is significant public interest and a significant air quality issue is involved.

What do I need to know about this proposed application?

Applicant Name	University of New Mexico
Site or Facility Name	COSMIAC
Site or Facility Address	2420 Alamo Ave SE, Albuquerque NM 87106
New or Existing Source	NEW
Anticipated Date of Application Submittal	November 7, 2025
Summary of Proposed Source to Be Permitted	The application is to construct a 475 horsepower, EPA Tier 4 diesel compressor engine. The application seeks to restrict the unit to 300 hours per year of operation. The diesel engine is used to run an air compressor that will provide process air to a rotating detonating engine.

What emission limits and operating schedule are being requested?
See attached Notice of Intent to Construct form for this information.

How do I get additional information regarding this proposed application?
For inquiries regarding the proposed source, contact:

- Casey Hall
- cbhall@unm.edu

City of Albuquerque
Environmental Health Department
Air Quality Program

Construction Permit (20.11.41 NMAC)
Zoning Requirement Cover Letter

This Cover Letter Must Be Returned With The Application Along With All Required Attachments

The Albuquerque-Bernalillo County Joint Air Quality Program, which administers and enforces local air quality laws for the City of Albuquerque ("City") and Bernalillo County ("County"), on behalf of the City Environmental Health Department ("Department").

Any person seeking a new air quality permit or a permit modification under 20.11.41 NMAC (Construction Permits) shall provide documentary proof that the proposed air quality permitted use of the facility's subject property is allowed by the zoning designation of the City or County zoning laws, as applicable. Sufficient documentation may include (i) a zoning certification from the City Planning Department or County Department of Planning and Development Services, as applicable, if the applicant is subject to City or County zoning jurisdiction; or (ii) a zoning verification from both planning departments if the applicant is not subject to City or County zoning jurisdiction. A zone atlas map shall not be sufficient. At this time, applicants are not required to submit documentation for the subject property's zoning designation when applying for a relocation of a portable stationary source, or a technical or administrative revision to an existing permit.

The Department will rule an application administratively incomplete if it is missing or has incorrect information. If the Department has ruled an application administratively incomplete three (3) times, the Department will deny the permit application. Any fees submitted for processing an application that has been denied will not be refunded. If the Department denies an application, a person may submit a new application and the fee required for a new application. The applicant has the burden of demonstrating that a permit should be issued.

The Department may require additional information that is necessary to make a thorough review of an application. At all times before the Department has made a final decision regarding the application, an applicant has a duty to promptly supplement and correct information the applicant has submitted in an application to the Department. The applicant's duty to supplement and correct the application includes, but is not limited to, relevant information acquired after the applicant has submitted the application and additional information the applicant otherwise determines is relevant to the application and the Department's review and decision. While the Department is processing an application, regardless of whether the Department has determined the application is administratively complete, if the Department determines that additional information is necessary to evaluate or make a final decision regarding the application, the Department may request additional information and the applicant shall provide the requested additional information.

NOTICE REGARDING SCOPE OF A PERMIT: The Department's issuance of an air quality permit only authorizes the use of the specified equipment pursuant to the air quality control laws, regulations and conditions. Permits relate to air quality control only and are issued for the sole purpose of regulating the emission of air contaminants from said equipment. Air quality permits are not a general authorization for the location, construction and/or operation of a facility, nor does a permit authorize any particular land use or other form of land entitlement. It is the applicant's/permittee's responsibility to obtain all other necessary permits from the appropriate agencies, such as the City Planning Department or County Department of Planning and Development Services, including but not limited to site plan approvals, building permits, fire department approvals and the like, as may be required by law for the location, construction and/or operation of a facility. For more information, please visit the City Planning Department website at https://www.cabq.gov/planning and the County Department of Planning and Development Services website at https://www.bernco.gov/planning.

Corporate and Facility Information: This information shall match the information in the permit application**.**

Air Quality Permit Applicant Company Name: **University of New Mexico**			
Facility Name: **COSMIAC**			
Facility Physical Address: **2420 Alamo Ave SE**	City: **Albuquerque**	State: **NM**	Zip: **87106**
Facility Legal Description: **Higher education research facility.**			

General Operation Information: This information shall match the information in the permit application.

Permitting action being requested (please refer to the definitions in 20.11.41 NMAC):
☒ New Permit ☐ Permit Modification, Current Permit #:

Attachment Information: The location information provided to the City Planning Department or County Department of Planning and Development Services, as applicable, and reflected in the zoning certification or verifications, as applicable, shall be the same as the Facility location information provided to the Department in the air quality construction permit application.

☒ Zoning Certification Provided by: Choose an item. *This is a use-specific certification.* **City Planning Form**: https://www.cabq.gov/planning/code-enforcement-zoning **County Planning Form**: https://www.bernco.gov/planning/planning-and-land-use/applications-forms/	☐ City Zoning Verification ☐ County Zoning Verification **City Planning Form**: https://www.cabq.gov/planning/code-enforcement-zoning **County Planning Form**: https://www.bernco.gov/planning/planning-and-land-use/applications-forms/

CITY OF ALBUQUERQUE

CODE ENFORCEMENT
Plaza Del Sol Building, Suite 500
600 2nd Street NW
Albuquerque, NM 87102
Tel: (505) 924-3850 Fax: (505) 924-3847

Date: April 3, 2025

VIA Email, **lbell01@unm.edu**
Lauren Bell
1801 Tucker Ave
Albuquerque, NM 87131

RE: **2420 ALAMO AVE SE** – the "property".
UPC: **101605510834920110**

To Whom It May Concern:

This letter will certify that according to the map on file in this office on April 3, 2025, the property located at: **2420 ALAMO AVE SE, ALBUQUERQUE NM 87106**, legally described as: **TR Z-6 AIRPORT PARK PLAT OF TRS Z-1 THROUGH Z-7 AIRPORT PARK A REPLAT OF TR Z AIRPORT PARK CONT 1.2575 AC M/L**, Albuquerque, Bernalillo County, New Mexico, is Zoned: NR-BP Non-residential - Buisiness Park Zone District. **This property is within the (APO) - Airport Protection Overlay Zone (3-3) (Airport) Air Space Protection Sub-area**

If you have any questions regarding this matter please feel free to contact code enforcement by email at codeenforcement@cabq.gov

Sincerely:

Angelo Metzgar
Code Compliance Manager

BACT Supporting Information

Below is the email quote for a 2025 XRVS 1000 CD8 T4F compressor.

Outlook

RE: [EXTERNAL]RE: Form submission - sent to CRM

From Mike Walsh <walsh_michael@wagnerequipment.com>
Date Fri 10/31/2025 9:34 AM
To Lauren Bell <lbell01@unm.edu>

You don't often get email from walsh_michael@wagnerequipment.com. Learn why this is important

[EXTERNAL]

Hi Lauren,

Below is the current pricing for a brand-new machine. Please let me know if you have any questions.

Atlas Copco doesn't post cost on website because they only sell units to authorized dealers.

Let me know what the purchase time frame is and I can work on a hard copy quote.

XRVS 1000 CD T4F
Part # 8972 4227 50
Lead Time = 1 in stock, 2 more units in Nov. (subject to change)
Price: $395,249

Thank you,

Mike Walsh | Power Systems Rental & Sales Rep
Wagner Equipment Co.
Cell: (505) 379-7438
walsh_mike@wagnerequipment.com
Power | Compressed Air | Temperature Control

One Professional Team creating a premier customer experience with market-leading solutions.
Safety • Integrity • Adaptability • Empowerment

Fill out one of these questionnaire forms:

Power Generation Questionnaire
Compressed Air Questionnaire

From: Derek Miller <derek.miller@atlascopco.com>
Sent: Wednesday, October 29, 2025 3:30 PM

RDE Supporting Information

Attached below is a peer reviewed paper on the experimental measurement of NOx emissions in a rotating detonation engine.

AIAA SciTech Forum
6-10 January 2020, Orlando, FL
AIAA Scitech 2020 Forum

10.2514/6.2020-0204

Experimental Measurements of NOx Emissions in a Rotating Detonation Engine

Don Ferguson[1] , Bridget O'Meara[2], Arnab Roy[3], Todd Sidwell[4], Kristyn Johnson[5]
National Energy Technology Laboratory, Morgantown, WV 26507

An experimental study of NOx emissions in a rotating detonation engine is presented in this paper. Rotating detonation engines produce a pressure gain in the combustion process which leads to increased efficiency compared to conventional constant pressure, deflagration based combustion. However, in order for rotating detonation engines to become a viable alternative to conventional combustion, they must meet NOx emissions regulations. Emissions from rotating detonation engines are not currently well understood. A parametric study was performed to determine time averaged NOx emissions in a rotating detonation engine over a range of operating conditions. The effects of inlet pre-heat, equivalence ratio, flow rate, and fuel composition are investigated.

I. Introduction

PRESSURE gain combustion is a promising technology for improving gas turbine efficiency. The theoretical efficiency for pressure gain combustion has been shown to be greater than conventional constant pressure combustion[1–4]. Unlike conventional combustion which is achieved through deflagration, pressure gain combustion is generally achieved through detonation. Although various methods exist to implement detonative combustion, two common types of detonative engines are the Pulse Detonation Engine (PDE) and Rotating Detonation Engine (RDE). RDEs are the focus of the current work because they offer several advantages over PDEs. For example, PDEs require continuous filling and purging of the combustion chamber and require initiation for each cycle. Direct exhaust flow from a PDE exhibits a large variation in time whereas the rapid progress of the detonation wave in an RDE may reduce the impact of unsteady flow on turbine performance for gas turbine applications[5]. Additional advantages include continuous detonation after initial ignition, as well as a relatively simple and compact design compared to a PDE.

Although considerable progress has been made in the understanding of various aspects associated with the fundamental operation of RDE's[6–11], only a few studies have considered the formation of combustion products produced by RDEs. Some studies have used diode laser sensors to study combustion products including H_2O, CO, and CO_2 in pulse detonation combustion[12–15]. The availability of literature on emissions of Oxides of Nitrogen (NOx) in PDE's and RDE's is fairly limited. Yungster et al.[16] and Yungster et al.[17] studied the formation of NOx gas species in both hydrogen and hydrocarbon fueled PDE's, respectively. Both studies exhibited a strong dependence of NOx emissions on both equivalence ratio and residence time, similar to trends observed in NOx studies associated with conventional gas turbine combustors[18–21]. Although under fuel-lean conditions residence time may have less of an impact[19].

Frolov et al[22]. measured NOx emissions in a laboratory pulse detonation burner running on natural gas-air. Results from this study were found to closely match NOx concentrations obtained in an accompanying computational study. The modeling effort also suggested that immediately behind the detonation wave, emissions of N2O briefly surpassed those of NO prior to being consumed downstream ultimately adding to the NO concentration. The authors also

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[3] Research Engineer, West Virginia University Research Corporation, AIAA Member, arnab.roy@netl.doe.gov
[4] Research Mechanical Engineer, AIAA Member, todd.sidwell@netl.doe.gov
[5] Post-Graduate Research Associate, Kristyn.johnson@netl.doe.gov

suggested that the relatively short residence time for combustion and the rapid expansion of gases from an RDE could result in NOx emissions lower than that experienced in conventional burners. In a recent computational study by Schwer and Kailasanath[23] using a 12-species, 28-step kinetic mechanisms optimized for SCRAMJET/PDE's, parametric studies examining the influence of injection pressure, equivalence ratio and residence time (RDE geometry) supported a strong influence by equivalence ratio with fuel-lean operation producing significantly lower NOx emissions. Some influence of injection pressure was also noted. A unique finding associated with RDE's was also noted as the authors observed a reduction in NOx emissions with multi-wave modes compared to single wave.

The work presented in this paper is an initial effort to experimentally measure NOx production in an RDE. NOx formation in an RDE is investigated over a range of equivalence ratio and fuel composition including Hydrogen (H_2)-Air and H_2/Natural Gas (95/5%)-Air. Results from these tests will provide a baseline for understanding NOx production in an RDE and help guide future research for improving emissions performance in RDEs.

II. Experimental Set Up

Experiments were conducted using the RDE configuration illustrated in **Error! Reference source not found.**. This radial air injection RDE is based on the 6-inch Air Force Research Laboratory (AFRL) geometry that has been widely examined in many academic studies. The combustor annulus has an outer diameter of 149 mm with a combustor gap width of 5 mm and an air injector (Station 3.1) to combustor (Station 3.2) area ratio of 0.2 ($A_{3.1}/A_{3.2}$). While the internal geometries and dimensions of the AFRL and NETL design are largely identical, the NETL RDC was modified to enable integration with the NETL facility, operation at elevated pressure, and addition of instrumentation ports in the fuel and air plena. The NETL RDE consists of an enclosed exhaust duct (Figure 2a) that creates a challenge for thrust measurements (not performed) but provides the ability to control the pre-combustion operating pressure independent of the combustor exit geometry. The combustor is and exhaust duct of the rig used in this study were uncooled thus limiting the run times to six seconds in order to prevent hardware damage. The NETL facility is configured to enable RDE operation at pressures to 1.76 MPa. Combustion air can be provided with a maximum flow rate of 1.15 kg/s at a maximum pre-heat temperature of 425°C (although temperatures were limited to 250ºC to protect sensitive instrumentation). The RDE is fueled by hydrogen or mixtures of natural gas and hydrogen, which are available at maximum flow rates of 55 g/s and 13 g/s, respectively. A natural gas-air burner is located approximately 0.5 m downstream from the exit of the RDE to prevent a combustible mixture building in the exhaust duct during start-up and in the event of blow-out in the combustor. This burner also provides ignition of the RDE, as opposed to a commonly used detonation tube, as the combustion wave quickly transitions to detonation for the conditions considered in this study.

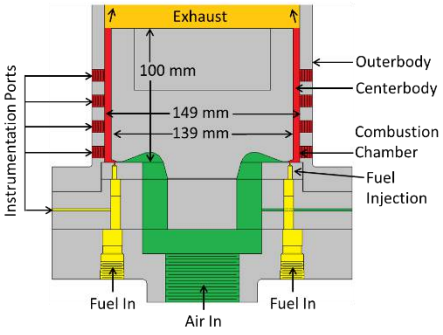

Figure 1: AFRL 6-inch radial air Injection RDE geometry.

The rig is equipped with a number of diagnostics common to detonation in order to characterize the combustion process. This includes axially distributed capillary tube average pressure (CTAP) probes to measure static pressure within the combustor, axially and radially distributed infinite tube pressure (ITP) probes to quantify dynamic pressure, radially distributed ion probes, and a UV bandpass filtered photomultiplier (with coupled fiberoptic) to record OH* chemiluminescence along the detonation plane (Figure 2b). The dynamic transducers including pressure, flame/chemical-ionic emission and OH* chemiluminescence are used to ascertain detonation wave speed and mode. Detonation wave behavior is also recorded through a 50 mm viewport incorporated in the elbow section of the ducted exhaust using a Photron FASTCAM SA-Z high-speed camera with UG-11 bandpass filter, Nikkor 105mm UV lens and Invisible Vision 2550 UVi intensifier. The imaging system utilizes a fixed mirror arrangement allowing the camera to be mounted off-axis to protect it in the event of viewport failure.

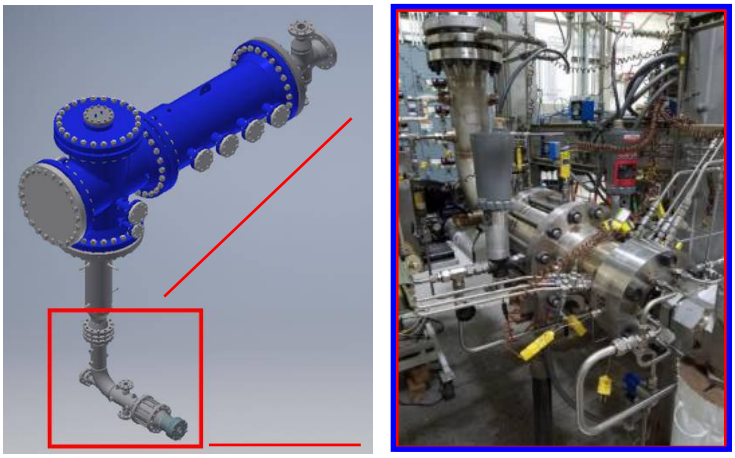

Figure 2: NETL Rotating Detonation Engine test facility with ducted exhuast (A) and instrumented RDE (B).

Table 1: Operating Conditions

Air Flow Rates (kg/s)	Eq. Ratio	Inlet Air Temperature (°C)	Pre-Combustion Pressure (kPa)	Nat. Gas Blend (%)
0.275	**0.65 – 1.1**	**125**	**170**	**0 - 5**

The major focus of this study was to define a baseline for NOx emissions while operating on H_2-Air and 5% Natural Gas / 95% H_2 in air. This will provide a proof-of-concept for the sampling system as well as a general baseline for comparison to conventional can combustor configurations and future testing over a wider range of operating conditions. The operating conditions considered for this study are outlined in Table 1.

Exhaust gas was sampled from two location in the RDE and exhaust duct. The primary location was in the RDE through a flush mounted port located 65 mm downstream of the injection plane as shown in Figure 3A (point "6"). The second location was 1.5 m downstream of the RDE exit. When sampling at the downstream location the downstream burner was turned off after ignition of the RDE. Sampling at the two locations produced similar results for the test conditions considered in this study, so only results from the sample port in the RDE will be discussed. Approximately 1.5 seconds after the main fuel valve to the RDE opens (start of test) and ignition occurs, a solenoid valve in the gas sampling systems opens to begin the flow of exhaust gas from the sampling port through a heated sample line to a series of three 3.8-liter heated sampling cylinder as shown in Figure 3B. Prior to the start of a test series, the cylinders were evacuated with a vacuum pump. Due to the low volume of gas extracted during each six second test, the cylinders were filled during two consecutive tests at the same operating condition with the sampling valve closed between each run. After the second test, the gas sample was pulled from the sample cylinders through the gas sampling system composed of a heated filter and sampling pump, NO_2 to NO (NOx) converter, thermoelectric cooler and gas analyzers. This system prevents condensation and thus loss of any water-soluble nitrogen dioxide (NO_2) prior to the external NOx converter. After water is removed (dry NOx), the sample is supplied to a Rosemount Analytical NGA 2000 Chemiluminescent NOx analyzer and California Analytical Model 110P Paramagnetic Oxygen (O_2) analyzer. Prior to the start and at the end of each day of testing the analyzers are calibrated (zero/span). Sampling O_2 provides a measure of combustion efficiency as well as providing a means of corrected the reported NOx emissions to the industry standard 15% O_2.

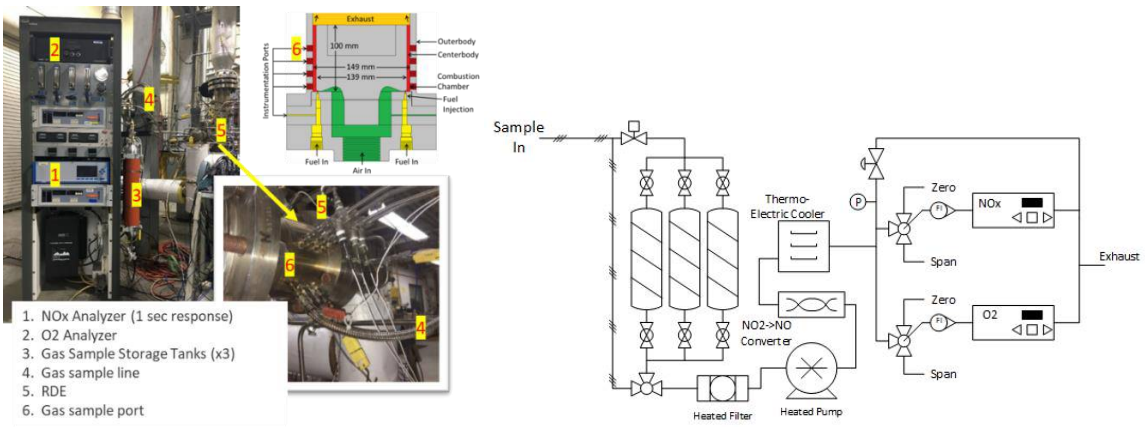

Figure 3: A) Gas sampling port (6) in RDE and image of the gas sampling cart. B) Graphic illustration of the gas sampling system.

III. **Results**

Both H_2 fueled and H_2/NG fueled operation of the RDE were considered over equivalence ratios ranging from 0.7 – 1.0. General performance considerations with regards to operating modes are exhibited in Figure 4. Here it is observed that the H_2-Air RDE operated primarily with two waves except at stoichiometric conditions. Note that each data point consists of the average of two tests run of the RDE as two runs were combined in order to collect an adequate gas sample for emissions analysis. The H_2/NG-Air tests resulted in the RDE operating primarily in a single wave mode except for a two-wave mode at a phi of 0.8. Although there is limited data presented at each operating condition, one can begin to explore the potential impact of the wave mode on NOx emissions as proposed by Schwer and Kailasanath[23].

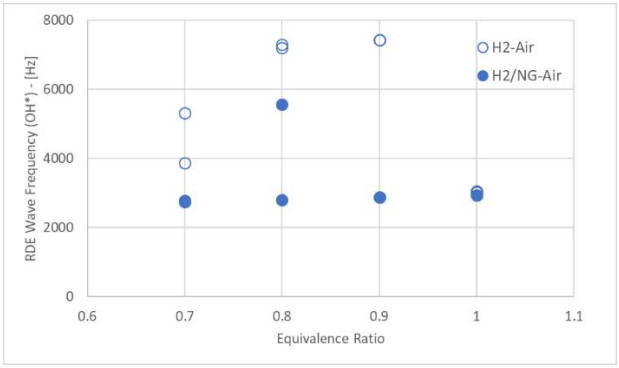

Figure 4: RDE Operating Frequency for both H2-Air and H2/NG-Air.

Figure 5 provides a measure of the O_2 concentration for both H2-Air and H2/NG-Air over the range of equivalence ratios considered. As previously noted, the O_2 concentration provides a means of ascertaining combustion efficiency by comparing the measured value to the calculated value based on equilibrium conditions. One should first note that at all but one test at a phi = 1.0, the O_2 concentration was higher than projected equilibrium values for both fuels. A reduction in combustion efficiency would also constitute a lower than expected flame temperature which would have an impact on NOx emissions when comparing to computational values. Variation in the results makes it somewhat difficult to identify a particular bias for fuel type or equivalence ratio, however the for phi = 0.7 – 0.9 there is a relatively consistent difference between measured and equilibrium value of approximately 4%.

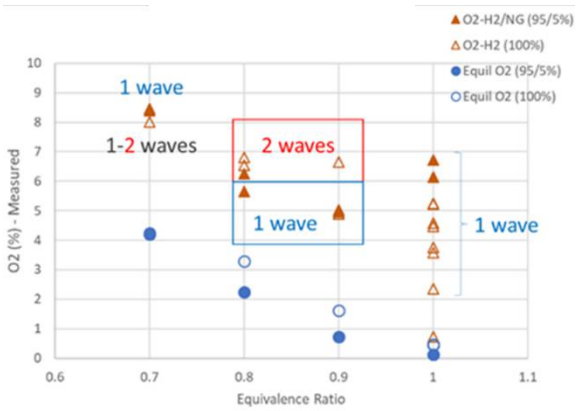

Figure 5: Measured and calculated equilibrium concentration of exhaust O2 for H2-Air and H2/NG-Air operation of the RDE.

To some degree there is less variation in the NOx emissions presented in Figure 6. Utilizing the measured O_2 concentration it was possible to correct to the industry standardized NOx corrected to 15% O_2. In general, there is a consistent variation in NOx for the H2-Air versus the H2/NG-Air cases with higher NOx reported when operating on H2/NG-Air. NOx emissions are relatively flat for the RDE operating on H2-Air while there is a slight increase with equivalence ratio for H2/NG-Air. The measured values were somewhat lower than those measured in Yunster et al.[16] in a H2-Air fueled PDE. Although the concentrations are close to those obtained in the shorter PDE tested. This would support the hypothesis presented by Frolov et al.[22] that suggests the although detonation temperatures may be high, the RDE may have an NOx advantage due to short residence times inside the combustor. Without a larger dataset, it would be difficult to identify a significant influence on wave number.

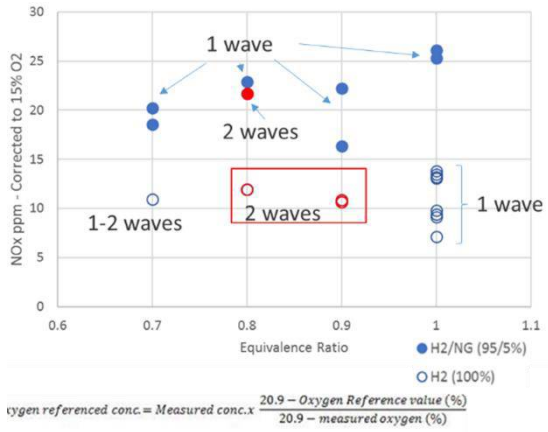

Figure 6: Measured NOx concentrations from an RDE operating on H2-Air and H2/NG-Air

IV. Conclusions

This study represents an initial step to better understand the formation of NOx emissions in an experimental RDE operating on both H_2-Air and H_2/NG-Air. Tests were performed on a range of equivalence ratios for both fuels while holding the air flow rate, and inlet air temperature and pressure constant. The wave speed as determined by a point measurement of OH* chemiluminescence suggest that the RDE operated in both single and double wave modes. Comparison of the measured oxygen

concentration with calculated equilibrium values suggest the RDE was not operating at peak combustion efficiency which support lower than expected flame temperatures. Additional combustion efficiencies were similar between H2-Air and H2/NG-Air, there was a significant different in NOx emissions. Tere was insufficient data to draw any significant conclusions with regards to the influence of wave number on NOx concentration. Measured NOx emissions were low, consistent with the hypothesis that short residence times at high flame temperatures in the RDE may help to reduce NOx emissions.

V. References

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DIESEL COMPRESSOR ENGINE SUPPORTING INFORMATION

Attached below is the CARB emission statement for the diesel compressor engine. Emission data for the Co, NOx, PM, and VOC calculations in sections 4 and 5 in the application can be found in the attached document. Also, below are the specs for the XRVS 1000 CD8 T4F compressor that the diesel engine will power.

California Environmental Protection Agency AIR RESOURCES BOARD	CATERPILLAR INC.	EXECUTIVE ORDER U-R-001-0455 New Off-Road Compression-Ignition Engines

Pursuant to the authority vested in the Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	DISPLACEMENT (liters)	FUEL TYPE	USEFUL LIFE (hours)
2013	DCPXL12.5HPB	12.5	Diesel	8000

SPECIAL FEATURES & EMISSION CONTROL SYSTEMS	TYPICAL EQUIPMENT APPLICATION
Electronic Direct Injection, Turbocharger, Charge Air Cooler, Oxidation Catalyst, Engine Control Module, Exhaust Gas Recirculation, Periodic Trap Oxidizer	Loader, Tractor, Excavator, Agriculture Combine, Commercial Equipment

The engine models and codes are attached.

The following are the exhaust certification standards (STD), or family emission limit(s) (FEL) as applicable, and certification levels (CERT) for hydrocarbon (HC), oxides of nitrogen (NOx), or non-methane hydrocarbon plus oxides of nitrogen (NMHC+NOx), carbon monoxide (CO), and particulate matter (PM) in grams per kilowatt-hour (g/kw-hr), and the opacity-of-smoke certification standards and certification levels in percent (%) during acceleration (Accel), lugging (Lug), and the peak value from either mode (Peak) for this engine family (Title 13, California Code of Regulations, (13 CCR) Section 2423):

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			HC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
130 ≤ kW ≤ 560	Interim Tier 4/ ALT NOx	STD	0.19	2.0	N/A	3.5	0.02	N/A	N/A	N/A
		FEL	N/A	1.8	N/A	N/A	0.01	N/A	N/A	N/A
		CERT	0.05	1.6	--	1.4	0.002	--	--	--

BE IT FURTHER RESOLVED: That the family emission limit(s) (FEL) is an emission level declared by the manufacturer for use in any averaging, banking and trading program and in lieu of an emission standard for certification. It serves as the applicable emission standard for determining compliance of any engine within this engine family under 13 CCR Sections 2423 and 2427.

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed at El Monte, California on this 27 day of July 2012.

Annette Hebert, Chief
Mobile Source Operations Division

ATTACHMENT 1 OF 1

Engine Model Summary Template

U-R-001-0455

7/19/2012

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
DCPXL12.5HPB	Cert Test 1	C13	500@1900	275	175	1738@1500	337	170	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	Cert Test 2	C13	503@1500	334	169	NA	NA	NA	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	1 - 500/1900	C13	500@1900	279	178	1735@1500	342	173	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	2 - 425/1800	C13	371@1870	209	132	1345@1650	260	144	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	3 - 425/1800	C13	371@1870	217	136	1345@1650	262	145	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	4 - 402/1600	C13	280@2200	159	118	1529@1300	297	159	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	5 - 443/1900	C13	443@1900	242	155	1509@1400	293	138	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	6 - 475/2100	C13	207@2300	117	90	1603@1400	313	147	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	7 - 520/2100	C13	226@2300	121	93	1755@1400	344	162	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	8 - 408/1700	C13	323@2100	183	129	1555@1300	296	129	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	9 - 385/2100	C13	167@2300	107	83	1300@1400	257	130	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	10 - 415/2100	C13	180@2300	108	84	1401@1400	275	130	DFI,TC,ECM,CAC,EGR,PTOX,OC
DCPXL12.5HPB	11 - 440/2100	C13	191@2300	210	102	1485@1400	295	143	DFI,TC,ECM,CAC,EGR,PTOX,OC

PERFORMANCE DATA [KWJ04248]

(PENDING AFTERTREATMENT SERIAL NUMBER(S))

FEBRUARY 15, 2025

For Help Desk Phone Numbers Click here

Perf No: EM0190 **Change Level:** 06

General | Heat Rejection | Emissions | Regulatory | Altitude Derate | Cross Reference | Supplementary Data | Perf Param Ref

View PDF

SALES MODEL:	C13	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	2,100
MACHINE SALES MODEL:		**PEAK TORQUE SPEED (RPM):**	1,400
ENGINE POWER (BHP):	475	**TORQUE RISE (%):**	35
PEAK TORQUE (FT-LB):	1,603.5	**ASPIRATION:**	TA
COMPRESSION RATIO:	17	**AFTERCOOLER TYPE:**	ATAAC
RATING LEVEL:	INDUSTRIAL D	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, ATAAC
PUMP QUANTITY:	1	**INLET MANIFOLD AIR TEMP (F):**	122
FUEL TYPE:	DIESEL	**JACKET WATER TEMP (F):**	192.2
MANIFOLD TYPE:	DRY	**TURBO CONFIGURATION:**	SINGLE
GOVERNOR TYPE:	ELEC	**TURBO QUANTITY:**	1
ELECTRONICS TYPE:	ADEM4	**TURBOCHARGER MODEL:**	GTB4594-87HPI-0.75
CAMSHAFT TYPE:	STANDARD	**CERTIFICATION YEAR:**	2011
IGNITION TYPE:	CI	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	2,163.4
INJECTOR TYPE:	EUI		
REF EXH STACK DIAMETER (IN):	5		
MAX OPERATING ALTITUDE (FT):	8,199		

INDUSTRY	SUB INDUSTRY	APPLICATION
INDUSTRIAL	GENERAL INDUSTRIAL	INDUSTRIAL
INDUSTRIAL	CONSTRUCTION	INDUSTRIAL
INDUSTRIAL	MATERIAL HANDLING	INDUSTRIAL
INDUSTRIAL	MINING	INDUSTRIAL
INDUSTRIAL	AGRICULTURE	INDUSTRIAL
INDUSTRIAL	FORESTRY	INDUSTRIAL

General Performance Data Top

Note(s)

INLET MANIFOLD AIR TEMPERATURE ("INLET MFLD TEMP") FOR THIS CONFIGURATION IS MEASURED AT THE OUTLET OF THE AFTERCOOLER.

ENGINE SPEED	ENGINE POWER	ENGINE TORQUE	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)
RPM	BHP	LB-FT	PSI	LB/BHP-HR	LB/BHP-HR	GAL/HR	GAL/HR
2,100	475	1,187	235	0.353	0.348	23.6	23.3
2,000	475	1,247	246	0.349	0.344	23.3	23.0
1,900	475	1,312	259	0.347	0.342	23.2	22.9
1,800	475	1,385	274	0.345	0.340	23.1	22.8
1,700	470	1,452	287	0.345	0.340	22.8	22.5
1,600	460	1,509	298	0.339	0.335	22.0	21.7
1,500	446	1,561	308	0.340	0.335	21.4	21.1
1,400	427	1,604	317	0.341	0.337	20.6	20.3
1,350	408	1,586	313	0.342	0.337	19.6	19.4
1,300	385	1,556	308	0.344	0.339	18.7	18.4
1,200	345	1,509	298	0.351	0.346	17.1	16.8
1,100	299	1,426	282	0.360	0.355	15.2	14.9
1,000	249	1,307	258	0.368	0.363	12.9	12.7

CAT® SER. NO. KWJ04248
CERT. NO.
ENGINE MODEL C13
ENGINE SALES MODEL:
MODIFICATION NO. PQ9228 – 12
MAX 2499 M
AR. NO. 4315088
ALT 8199 FT
CORE AR. 4315088
ELECTRONICS GP
ECM SOFTWARE 4346956
OEM NO.
PERF. SPEC 3498897
FLS (INTERCEPT) 14
FTS (SLOPE) – 13
ADV 475 HP 354.0 kW AT 2100 RPM
USE SERVICE TOOL TO VERIFY CURRENT ENGINE SETTINGS
2802065$7
280-2065 Fulfills 115-5852 or 350-8616

KWJ04248

CONTROL INFORMATION

DISPLACEMENT: 12.5 L

130 < KW < = 560

DATE OF MANUFACTURE: DEC 2013

REGULATIONS FOR 2013 NONROAD AND STATIONARY DIESEL ENGINES.

LOW SULFUR FUEL ONLY.

DIRECTIVE 97/68/EC FOR NONROAD ENGINES (<560kW). EC TYPE APPROVAL NO: e11*97/68LA*2010/26*1265*01

DIRECTIVE 97/68/EC FOR LOCOMOTIVE ENGINES (>130kW). EC TYPE APPROVAL NO: e11*97/68RB*2010/26*1506*00

PM FEL (g/kW-HR) 0.01 NOx FEL (g/kW-HR): 1.8 NOx + NMHC FEL (g/kW-HR): N/A

000130

3847088$7

384-7088 fulfills 7E-8050 or 350-8619

350-1686

2

SAFETY DATA SHEETS

Below are the SDS for diesel and hydrogen.

SAFETY DATA SHEET

Hydrogen

Section 1. Identification

GHS product identifier : Hydrogen

Chemical name : hydrogen

Other means of identification : Not available.

Product type : Gas.

Product use : Synthetic/Analytical chemistry.

SDS # : 001026

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253
Inside the US: 1-800-424-9300 (Chemtrec, 24 hours)
Outside the US: 1-703-527-3887 (Chemtrec, 24 hours)

24-hour telephone : Airgas Emergency Response Center 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Compressed gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : H220 - Extremely flammable gas.
H280 - Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.
Burns with invisible flame.
May form explosive mixtures with air.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Approach suspected leak area with caution.

Prevention : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.

Storage : P410 + P403 - Protect from sunlight. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : hydrogen

Other means of identification : Not available.

Product code : 001026

Ingredient name	%	CAS number
Hydrogen	100	1333-74-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : No specific data.

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Use only non-sparking tools. Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment.

Section 7. Handling and storage

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
hydrogen	**California PEL for Chemical Contaminants (*Table AC-1*) (United States)** Oxygen depletion [asphyxiant].

Biological exposure indices

No exposure indices known.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Section 8. Exposure controls/personal protection

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Compressed gas.]

Color : Colorless.

Odor : Odorless.

Odor threshold : Not available.

pH : Not applicable.

Melting point/freezing point : -259.15°C (-434.5°F)

Boiling point or initial boiling point and boiling range : -253°C (-423.4°F)

Flash point : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 4%
Upper: 76%

Vapor pressure : Not available.

Relative vapor density : 0.07 [Air = 1]

Specific Volume (ft^3/lb) : 12.0482

Gas Density (lb/ft^3) : 0.00523

Relative density : Not applicable.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 500 to 571°C (932 to 1059.8°F)

Decomposition temperature : Not available.

Flow time (ISO 2431) : Not available.

Molecular weight : 2.02 g/mole

Aerosol product

Heat of combustion : -116486080 J/kg

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Section 10. Stability and reactivity

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Not available.

Conclusion/Summary [Product] : Not available.

Skin corrosion/irritation

Not available.

Conclusion/Summary [Product] : Not available.

Serious eye damage/eye irritation

Not available.

Conclusion/Summary [Product] : Not available.

Respiratory corrosion/irritation

Not available.

Conclusion/Summary [Product] : Not available.

Respiratory or skin sensitization

Not available.

Skin

Conclusion/Summary [Product] : Not available.

Respiratory

Conclusion/Summary [Product] : Not available.

Germ cell mutagenicity

Not available.

Conclusion/Summary [Product] : Not available.

Carcinogenicity

Section 11. Toxicological information

Not available.

Conclusion/Summary [Product] : Not available.

Reproductive toxicity

Not available.

Conclusion/Summary [Product] : Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure

Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

Conclusion/Summary [Product] : Not available.

Section 11. Toxicological information

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

N/A

Section 12. Ecological information

Toxicity

Not available.

Conclusion/Summary [Product] : Not available.

Persistence and degradability

Not available.

Conclusion/Summary [Product] : Not available.

Bioaccumulative potential

Not available.

Mobility in soil

Soil/Water partition coefficient : Not available.

Other adverse effects

No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty pressure vessels should be returned to the supplier. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1049	UN1049	UN1049	UN1049	UN1049
UN proper shipping name	HYDROGEN, COMPRESSED	HYDROGEN, COMPRESSED	Hydrogen, compressed	HYDROGEN, COMPRESSED	HYDROGEN, COMPRESSED
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : **Limited quantity** Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).
Explosive Limit and Limited Quantity Index 0.125
ERAP Index 3000
Passenger Carrying Vessel Index Forbidden
Passenger Carrying Road or Rail Index Forbidden

IATA : **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to IMO instruments : Not available.

Section 15. Regulatory information

U.S. Federal regulations :

TSCA 8(a) CDR Exempt/Partial exemption: This material is listed or exempted.
Clean Air Act (CAA) 112 regulated flammable substances: hydrogen

TSCA 12(b) - Chemical export notification

Not applicable.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

Section 15. Regulatory information

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

California Prop. 65

This product does not require a Safe Harbor warning under California Prop. 65.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Eurasian Economic Union : **Russian Federation inventory**: Not determined.

Japan : **Japan inventory (CSCL)**: Not determined.
Japan inventory (ISHL): Not determined.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Thailand : This material is listed or exempted.

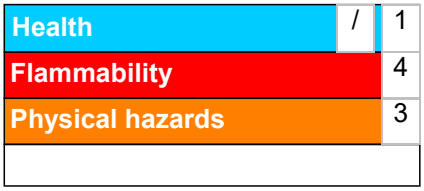
Turkey : Not determined.

United States : This material is active or exempted.

Viet Nam : This material is listed or exempted.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Compressed gas	Expert judgment According to package

History

Date of printing : 4/11/2025

Date of issue/Date of revision : 4/11/2025

Date of previous issue : 4/11/2025

Version : 8.02

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Notice to reader

Section 16. Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

SDS ID NO.: 0290MAR019 **Revision date** 10/01/2020

1. IDENTIFICATION

Product Name Marathon Petroleum No. 2 Diesel

Synonym No. 2 Ultra Low Sulfur Diesel (15 ppm Sulfur Max); No. 2 Low Sulfur Diesel (500 ppm Sulfur Max); ULSD No. 2; ULSD No. 2, dyed; ULSD No. 2 with Additives; ULSD No. 2 w/o Additives; ULSD No. 2 Winter Blends; No 2 MV15 CFI; Export Diesel; No. 2 Fuel Oil; Heating Oil; No. 2 Non-Road Locomotive Marine, Dyed; MGO; ULSD; LSD; NRLM; CARB Diesel

Product code 0290MAR019

Chemical family Complex Hydrocarbon Substance

Recommended use Fuel.

Restrictions on use All others.

Manufacturer, Importer, or Responsible Party Name and Address

MARATHON PETROLEUM COMPANY LP
539 South Main Street
Findlay, OH 45840

SDS Information 1-419-421-3070 (M-F; 8-5 EST)

24 Hour Emergency Telephone CHEMTREC: 1-800-424-9300 (CCN# 13740)

2. HAZARD IDENTIFICATION

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Classification

Flammable liquids	Category 3
Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Skin corrosion/irritation	Category 2
Carcinogenicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Specific target organ toxicity (repeated exposure)	Category 2
Aspiration toxicity	Category 1
Chronic aquatic toxicity	Category 2

Hazards Not Otherwise Classified (HNOC)
Static accumulating flammable liquid

Label Elements

Danger

FLAMMABLE LIQUID AND VAPOR
May accumulate electrostatic charge and ignite or explode
May be fatal if swallowed and enters airways
Harmful if inhaled
Causes skin irritation
May cause respiratory irritation

May cause drowsiness or dizziness
Suspected of causing cancer
May cause damage to organs (thymus, liver, bone marrow) through prolonged or repeated exposure
Toxic to aquatic life with long lasting effects

Appearance Yellow to Red Liquid **Physical State** Liquid **Odor** Hydrocarbon

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use only non-sparking tools.
Use explosion-proof electrical/ventilating/lighting/equipment
Take precautionary measures against static discharge
Do not breathe mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Wash hands and any possibly exposed skin thoroughly after handling
Avoid release to the environment

Precautionary Statements - Response
IF exposed or concerned: Get medical attention
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
If skin irritation occurs: Get medical attention
Wash contaminated clothing before reuse
If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a poison center or doctor if you feel unwell
If swallowed: Immediately call a poison center or doctor
Do NOT induce vomiting
In case of fire: Use water spray, fog or regular foam for extinction
Collect spillage

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Keep cool
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

May contain up to 5% Biodiesel.

Composition Information

Name	CAS Number	% Concentration
No. 2 Diesel Fuel	68476-34-6	50-100
Kerosine (petroleum)	8008-20-6	0-50

Fuels, Diesel, C9-18-Alkane Branched and Linear	1159170-26-9	0-5
Alkanes, C10-C20 branched and linear	928771-01-1	0-5
Naphthalene	91-20-3	0.3-2.6

All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

4. FIRST AID MEASURES

First aid measures

General advice

In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation

Remove to fresh air. If not breathing, utilize bag valve mask or other form of barrier device to institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest. Get immediate medical attention.

Skin contact

Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. May be absorbed through the skin in harmful amounts. Get medical attention if irritation persists. Any injection injury from high pressure equipment should be evaluated immediately by a physician as potentially serious (See NOTES TO PHYSICIAN).

Place contaminated clothing in closed container until cleaned or discarded. If clothing is to be laundered, inform the person performing the operation of contaminant's hazardous properties. Destroy contaminated, non-chemical resistant footwear.

Eye contact

Flush immediately with large amounts of water for at least 15 minutes. Gently remove contacts while flushing. Eyelids should be held away from the eyeball to ensure thorough rinsing. Gently remove contacts while flushing. Get medical attention if irritation persists.

Ingestion

Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest. Get immediate medical attention.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse effects

Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Prolonged or repeated exposure may cause adverse effects to the thymus, liver, and bone marrow. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Indication of any immediate medical attention and special treatment needed

Notes to physician

INHALATION: This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

SKIN: Leaks or accidents involving high-pressure equipment may inject a stream of material through the skin and initially produce an injury that may not appear serious. Only a small puncture wound may appear on the skin surface but, without proper treatment and depending on the nature, original pressure, volume, and location of the injected material, can compromise blood supply to an affected body part. Prompt surgical debridement of the wound may be necessary to prevent irreversible loss of function and/or the affected body part. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES.

INGESTION: This material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam or water spray can be used. For large fires, water spray, fog or foam can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media

Do not use straight water streams to avoid spreading fire.

Specific hazards arising from the chemical

This product has been determined to be a flammable liquid per the OSHA Hazard Communication Standard and should be handled accordingly. May accumulate electrostatic charge and ignite or explode. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information, see NFPA 30 or the Emergency Response Guidebook 128.

Hazardous combustion products

Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data

Sensitivity to mechanical impact: No.

Sensitivity to static discharge: Yes.

Special protective equipment and precautions for firefighters

Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Avoid using straight water streams. Water spray and foam must be applied carefully to avoid frothing and from as far a distance as possible. Avoid excessive water spray application. Keep surrounding area cool with water spray from a distance and prevent further ignition of combustible material. Keep run-off water out of sewers and water sources.

Additional firefighting tactics

FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA	Health 1	Flammability 2	Instability 0	Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. All contaminated surfaces will be slippery.

Protective equipment

Use personal protection measures as recommended in Section 8.

Emergency procedures

Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.

Environmental precautions

Avoid release to the environment. Avoid subsoil penetration.

Methods and materials for containment	Contain liquid with sand or soil. Prevent spilled material from entering storm drains, sewers, and open waterways.
Methods and materials for cleaning up	Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers. When recovering free liquids ensure all equipment is grounded and bonded. Use only non-sparking tools.

7. HANDLING AND STORAGE

Safe handling precautions

NEVER SIPHON THIS PRODUCT BY MOUTH. Use appropriate grounding and bonding practices. Static accumulating flammable liquid. Bonding and grounding may be insufficient to eliminate the hazard from static electricity. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Vapors may travel along the ground or be moved by ventilation. Flashback may occur along vapor trails. No smoking. Use only non-sparking tools. Avoid breathing fumes, gas, or vapors. Use only with adequate ventilation. Avoid repeated and prolonged skin contact. Use personal protection measures as recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements.

Hydrocarbons are basically non-conductors of electricity and can become electrostatically charged during mixing, filtering, pumping at high flow rates or loading and transfer operations. If this charge reaches a sufficiently high level, sparks can form that may ignite the vapors of flammable liquids. Sudden release of hot organic chemical vapors or mists from process equipment operating under elevated temperature and pressure, or sudden ingress of air into vacuum equipment may result in ignition of vapors or mists without the presence of obvious ignition sources. Nozzle spouts must be kept in contact with the containers or tank during the entire filling operation.

Portable containers should never be filled while in or on a motor vehicle or marine craft. Containers should be placed on the ground. Static electric discharge can ignite fuel vapors when filling non-grounded containers or vehicles on trailers. The nozzle spout must be kept in contact with the container before and during the entire filling operation. Use only approved containers.

A buildup of static electricity can occur upon re-entry into a vehicle during fueling especially in cold or dry climate conditions. The charge is generated by the action of dissimilar fabrics (i.e., clothing and upholstery) rubbing across each other as a person enters/exits the vehicle. A flash fire can result from this discharge if sufficient flammable vapors are present. Therefore, do not get back in your vehicle while refueling.

Cellular phones and other electronic devices may have the potential to emit electrical charges (sparks). Sparks in potentially explosive atmospheres (including fueling areas such as gas stations) could cause an explosion if sufficient flammable vapors are present. Therefore, turn off cellular phones and other electronic devices when working in potentially explosive atmospheres or keep devices inside your vehicle during refueling.

High-pressure injection of any material through the skin is a serious medical emergency even though the small entrance wound at the injection site may not initially appear serious. These injection injuries can occur from high-pressure equipment such as paint spray or grease or guns, fuel injectors, or pinhole leaks in hoses or hydraulic lines and should all be considered serious. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES (See First Aid Section 4).

Storage conditions	Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Do not store near an open flame, heat or other sources of ignition.
Incompatible materials	Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Name	ACGIH TLV	OSHA PELS	NIOSH IDLH
No. 2 Diesel Fuel 68476-34-6	100 mg/m³ TWA Skin - potential significant contribution to overall exposure by the cutaneous route	-	-
Kerosine (petroleum) 8008-20-6	200 mg/m³ TWA Skin - potential significant contribution to overall exposure by the cutaneous route	-	-
Naphthalene 91-20-3	10 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm TWA: 50 mg/m³	250 ppm

Notes: No further information available.

Engineering measures Local or general exhaust required in an enclosed area or with inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof.

Personal protective equipment

Eye protection Use goggles or face-shield if the potential for splashing exists.

Skin and body protection Wear neoprene, nitrile or PVA gloves to prevent skin contact. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.

Respiratory protection Use a NIOSH approved organic vapor chemical cartridge or supplied air respirators when there is the potential for airborne exposures to exceed permissible exposure limits or if excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.

Hygiene measures Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance Yellow to Red Liquid
Physical State Liquid
Color Yellow to Red
Odor Hydrocarbon
Odor Threshold No data available.

Property	Values (method)
pH	Not applicable
Melting Point / Freezing Point	No data available.
Initial Boiling Point / Boiling Range	154-366 °C / 310-691 °F (ASTM D86)
Flash Point	58-76 °C / 136-168 °F (ASTM D93)
Evaporation Rate	No data available.
Flammability (solid, gas)	Not applicable.
Flammability Limit in Air (%):	
Upper Flammability Limit:	No data available.
Lower Flammability Limit:	No data available.
Explosion Limits	No data available.
Vapor Pressure	No data available.
Vapor Density	No data available.
Specific Gravity / Relative Density	0.82-0.86

Water Solubility	No data available.
Partition Coefficient	No data available.
Autoignition Temperature	No data available.
Decomposition Temperature	No data available.
Kinematic Viscosity	1.7-4.1 cSt @ 40°C (ASTM D445)
VOC Content (%)	No data available.

10. STABILITY AND REACTIVITY

Reactivity The product is non-reactive under normal conditions.

Chemical stability The material is stable at 70°F (21°C), 760 mmHg pressure.

Possibility of hazardous reactions None under normal processing.

Hazardous polymerization Will not occur.

Conditions to avoid Excessive heat, sources of ignition, open flame.

Incompatible materials Strong oxidizing agents.

Hazardous decomposition products None known under normal conditions of use. However, use in an area without adequate ventilation may result in hazardous levels of carbon monoxide and carbon dioxide.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation Harmful if inhaled. May cause irritation of respiratory tract. May cause drowsiness or dizziness. Breathing high concentrations of this material in a confined space or by intentional abuse can cause irregular heartbeats which can cause death.

Eye contact Exposure to vapor or contact with liquid may cause mild eye irritation, including tearing, stinging, and redness.

Skin contact Irritating to skin. Effects may become more serious with repeated or prolonged contact. May be absorbed through the skin in harmful amounts.

Ingestion May be fatal if swallowed or vomited and enters airways. May cause irritation of the mouth, throat and gastrointestinal tract.

Acute toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
No. 2 Diesel Fuel 68476-34-6	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	>1 - <5 mg/L (Rat) 4 h
Kerosine (petroleum) 8008-20-6	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.28 mg/L (Rat) 4 h
Fuels, Diesel, C9-18-Alkane Branched and Linear 1159170-26-9	-	-	>1 - <5 mg/l (Rat) 4 h
Alkanes, C10-C20 branched and linear 928771-01-1	-	-	>1 - <5 mg/l (Rat) 4 h
Naphthalene 91-20-3	533 mg/kg (Mouse)	> 2000 mg/kg (Rabbit)	> 340 mg/m³ (Rat) 1 h

Immediate and delayed effects as well as chronic effects from short and long-term exposure

PETROLEUM MIDDLE DISTILLATES: Petroleum derived middle distillates have produced skin tumors in mice after repeated and prolonged skin contact. Additional studies indicated prolonged skin irritation contributes to tumor development. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and weight, and increased fetal resorptions at doses

toxic to the mother. Inhalation exposure to high concentrations resulted in respiratory tract irritation, lung changes/infiltration/accumulation, and reduction in lung function. Repeated dermal application of petroleum gas oils resulted in decreased liver, thymus, and spleen weights, and altered bone marrow function. Microscopic alterations included liver hypertrophy and necrosis, decreased hematopoiesis and lymphocyte depletion. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffer's Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline.

NAPHTHALENE: Excessive exposure to naphthalene may cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin. Lifetime inhalation exposure of laboratory rodents to naphthalene resulted in cancers of the respiratory tract in male and female rats. A small increase in cancer of the lung was observed in female mice, but no evidence of lung cancer was observed in male mice. Long-term exposure to excessive airborne naphthalene concentrations may result in destruction of red blood cells, a condition referred to as hemolytic anemia.

DIESEL EXHAUST: The combustion of diesel fuels produces gases including carbon monoxide, carbon dioxide, oxides of nitrogen and/or sulfur, and hydrocarbons that can be irritating and hazardous with overexposure. Long-term occupational overexposure to diesel exhaust and diesel exhaust particulate matter has been associated with an increased risk of respiratory disease, including lung cancer, and is characterized as a “known human carcinogen” by the International Agency for Research on Cancer (IARC), as “a reasonably anticipated human carcinogen” by the National Toxicology Program, and as “likely to be carcinogenic to humans” by the EPA, based upon animal and occupational exposure studies. However, uncertainty exists with these classifications because of deficiencies in the supporting occupational exposure/epidemiology studies, including reliable exposure estimates. Lifetime animal inhalation studies with pulmonary overloading exposure concentrations of diesel exhaust emissions have produced tumors and other adverse health effects. However, in more recent long-term animal inhalation studies of diesel exhaust emissions, no increase in tumor incidence and in fact a substantial reduction in adverse health effects along with significant reductions in the levels of hazardous material emissions were observed and are associated with fuel composition alterations coupled with new technology diesel engines.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and symptoms Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking. Prolonged or repeated exposure may cause damage to organs.

Acute toxicity Harmful if inhaled.

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation None known.

Sensitization None known.

Mutagenic effects None known.

Carcinogenicity Suspected of causing cancer.

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
No. 2 Diesel Fuel 68476-34-6	Confirmed animal carcinogen (A3)	Not Classifiable (3)	Not Listed	Not Listed
Kerosine (petroleum) 8008-20-6	Confirmed animal carcinogen (A3)	Not Classifiable (3)	Not Listed	Not Listed
Naphthalene 91-20-3	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not Listed

Reproductive toxicity None known.

Specific Target Organ Toxicity (STOT) - single exposure May cause respiratory irritation. May cause drowsiness or dizziness.

Specific Target Organ Toxicity May cause damage to organs (thymus, liver, bone marrow) through prolonged or repeated

(STOT) - repeated exposure exposure.

Aspiration hazard May be fatal if swallowed or vomited and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product should be considered toxic to aquatic organisms, with the potential to cause long lasting adverse effects in the aquatic environment.

Name	Fish	Crustacea	Algae/aquatic plants
No. 2 Diesel Fuel 68476-34-6	96-hr LC50 = 35 mg/l Fathead minnow (flow-through)	48-hr EL50 = 6.4 mg/l Daphnia magna	-
Kerosine (petroleum) 8008-20-6	96-hr LL50 = 18-25 mg/l Fish	48-hr EL50 = 1.4-21 mg/l Invertebrates	72-hr EL50 = 5.0-11 mg/l Algae
Naphthalene 91-20-3	96-hr LC50 = 0.91-2.82 mg/l Rainbow trout (static) 96-hr LC50 = 1.99 mg/l Fathead minnow (static)	48-hr LC50 = 1.6 mg/l Daphnia magna	-

Persistence and degradability Expected to be inherently biodegradable.

Bioaccumulation Has the potential to bioaccumulate.

Mobility in soil May partition into air, soil and water.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of waste residues This material may be a flammable liquid waste.

Safe handling of wastes Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of wastes / methods of disposal The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Contaminated packaging disposal Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT

UN/Identification No: NA 1993
UN Proper Shipping Name: Diesel Fuel
Transport Hazard Class(es): 3
Packing Group: III

IATA

UN/Identification No: UN 1202
UN Proper Shipping Name: Diesel Fuel
Transport Hazard Class(es): 3
Packing Group: III
ERG code: 3L

IMDG

UN/Identification No: UN 1202

UN Proper Shipping Name:	Diesel Fuel
Transport Hazard Class(es):	3
Packing Group:	III
EmS No:	F-E, S-E
Marine Pollutant:	Yes

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

15. REGULATORY INFORMATION

Regulatory Information

US TSCA Chemical Inventory This product and/or its components are listed on the TSCA Chemical Inventory or are exempt.

Canada DSL/NDSL Inventory This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

EPA Superfund Amendment & Reauthorization Act (SARA)

SARA Section 302 This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List above the de minimis threshold.

SARA Section 304 This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	Hazardous Substances RQs
Naphthalene 91-20-3	100 lb 45.4 kg

SARA Section 311/312 The following EPA hazard categories apply to this product:

Flammable
Hazard Not Otherwise Classified (HNOC)-Physical
Acute toxicity
Skin corrosion or irritation
Carcinogenicity
Specific target organ toxicity
Aspiration hazard

SARA Section 313 This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting
Naphthalene 91-20-3	0.1 % de minimis concentration

U.S. State Regulations

California Proposition 65 This product can expose you to chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm.

Name	California Proposition 65
No. 2 Diesel Fuel 68476-34-6	Engine exhaust, Carcinogen, initial date 10/01/90
Naphthalene 91-20-3	Carcinogen, initial date 04/19/02

For more information, go to www.P65Warnings.ca.gov.

State Right-To-Know Regulations The following component(s) of this material are identified on the regulatory lists below:

Name	New Jersey Right-To-Know	Pennsylvania Right-To-Know	Massachusetts Right-To Know
No. 2 Diesel Fuel 68476-34-6	Listed	Listed	Not Listed
Kerosine (petroleum) 8008-20-6	Listed	Listed	Listed
Naphthalene 91-20-3	Listed	Listed	Listed

16. OTHER INFORMATION

Prepared by Toxicology & Product Safety

NFPA

Revision Notes

Revision date 10/01/2020
Previous publish date 06/01/2016
Revised sections The following sections (§) have been updated:
3. COMPOSITION/INFORMATION ON INGREDIENTS
8. EXPOSURE CONTROLS/PERSONAL PROTECTION
14. TRANSPORT INFORMATION
15. REGULATORY INFORMATION

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.