

January 14, 2020

Texas Commission on Environmental Quality (TCEQ)
Air Permits Initial Review Team (APIRT), MC-161
P.O. Box 13087
Austin, TX 78711-3087

Submitted electronically via STEERS

**RE: Permit by Rule Registration
30 TAC §§106.352(l), 106.511, 106.512
Permian Highway Pipeline, LLC, CN605732726
Praha Compressor Station
Lavaca County, Texas
Permit Registration No. TBD**

Dear APIRT,

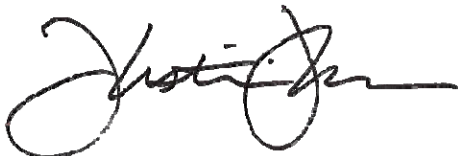
On behalf of Permian Highway Pipeline, LLC (PHP LLC), DiSorbo Consulting, LLC (DiSorbo), is submitting the attached Permit by Rule (PBR) application to register and certify the proposed facilities at the Praha Compressor Station located in Lavaca County, Texas under the 30 Texas Administrative Code §§106.352(l), 106.511, 106.512.

Note that at the time of this PBR submittal in STEERS, the 106.512 Engines and Turbines section had an internal limit in the system that engines and turbines could not input a horsepower (HP) value greater than 20,000. The turbines represented in this application are each rated at 32,981 HP; however, each turbine is listed in STEERS as 20,000 HP.

If you have any questions or require additional information, please contact me at 512-961-4965 or by email at kparsons@disorboconsult.com.

Sincerely,

DiSorbo Consulting LLC (TBPE #15665)



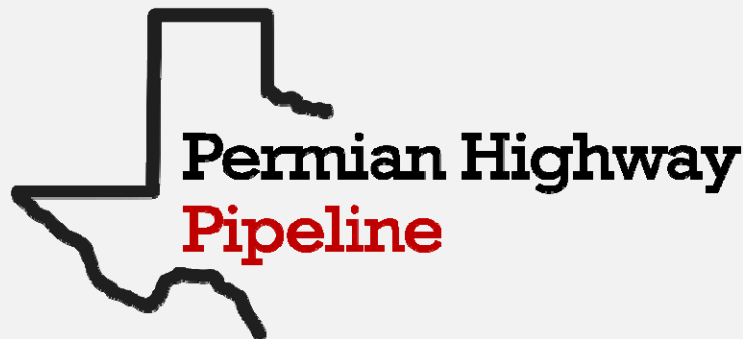
Kristin Parsons
Senior Staff Consultant

cc: Mr. Paul Witkowski, PE, Air Quality Engineer, Permian Highway Pipeline, LLC
Via email: paul.witkowski@kindermorgan.com

Registration for Permits by Rule

30 TAC §§106.352(I), 106.511, 106.512

Permit Registration No. TBD



Permian Highway Pipeline, LLC
Praha Compressor Station
Moulton, Lavaca County, Texas

CN605732726; RN-TBD

January 2020



DiSorbo
Environmental Consulting Firm

8501 North Mopac Expy
512.693.4190 (P)

Suite 300
512.279.3118 (F)

Austin, TX 78759
www.disorboconsult.com

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Section 1

Project Information

1.1 Introduction

Permian Highway Pipeline, LLC (PHP LLC) owns the Praha Compressor Station (Site) in Lavaca County, Texas. The Site is a natural gas compressor station designed to increase the discharge pressure of the gas in the pipeline to overcome the effect of frictional losses in the pipeline upstream of the Site. The Site consists of filter separators, turbines, a condensate tank, fuel gas heater, emergency generators, sumps, miscellaneous storage tanks, and associated piping. PHP LLC wishes to authorize the proposed facilities under PBR.

1.2 Project Description

The purpose of this application is to register and certify the emissions from the Site under the following PBR(s):

- 30 TAC §PBR-106.352(I)
- §106.511
- §106.512

At the end of this section, the following summary tables are presented:

- Table 1-1 presents a summary of the project emissions compared to the applicable emission limits. As shown in Table 1-1, the project emissions meet the applicable emissions limits; however, the projected potential-to-emit (PTE) NO_x and CO emissions are expected to exceed major source thresholds. PHP LLC will submit an initial Title V application before the start of operation of the Site.
- Table 1-2 presents a summary of the Site's general information, including project information, site location, contact information, and site-wide throughput information.
- Table 1-3 presents a summary of the basis for the proposed tank emissions cap.

This application provides all of the information necessary to demonstrate compliance with all applicable state and federal standards and authorization being claimed.

1.3 Application Organization

This application is organized into the following sections:

- Section 1: Identifies the project scope, presents the organization of the registration, a summary of site-wide emissions, and a summary of the general information of the Site.
- Section 2: No administrative forms are required with this submittal.

-
- Section 3: Contains an Area Map and a description of the Site location.
 - Section 4: Contains a process description and process flow diagram of the Site.
 - Section 5: Details the calculation methods used to determine routine and maintenance emissions from the sources associated with this project.
 - Section 6: Includes the PBR general requirement applicability analysis that addresses how the project satisfies the general requirements in 30 TAC Chapter 106 and the specific requirements of each PBR being claimed.
 - Section 7: Compliance demonstration with applicable air quality standards (NAAQS, ESL, or State Property Line).
 - Section 8: Includes a review of potentially applicable state and federal requirements.
 - Appendix A: Includes detailed routine emission calculations for the facilities included in this registration.
 - Appendix B: Includes detailed planned MSS emission calculations for the facilities included in this registration.
 - Appendix C: Includes the TCEQ Tables.
 - Appendix D: Includes supporting documentation: Table D-1 (a list of acronyms and abbreviations used throughout the document), lab analyses, equipment specification sheets, and model reports, as applicable.

Table 1-1

Emissions Summary and Compliance with Limits

Permian Highway Pipeline, LLC - Praha Compressor Station
January 2020

EPN	FIN	Source Name	Table No.	Total VOC ^[1]		NO _x		CO		PM ₁₀		PM _{2.5}		SO ₂		Total HAPs	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
FUG1	FUG1	Piping Fugitive Emissions	A-1	0.55	2.41	--	--	--	--	--	--	--	--	--	--	0.02	0.09
TURB1, TURB2	TURB1, TURB2	Solar Titan 250 Turbines	A-2	1.44	6.29	24.70	108.20	25.07	109.81	1.94	8.49	0.78	3.43	1.40	6.14	0.40	1.74
GEN1, GEN2	GEN1, GEN2	Emergency Generator Engines	A-3	3.50	1.53	5.00	2.19	10.01	4.38	0.20	0.09	<0.01	<0.01	0.01	0.01	3.10	1.36
HTR1	HTR1	Fuel Gas Heater	A-4	0.02	0.08	0.34	1.48	0.28	1.25	0.03	0.11	0.02	0.08	<0.01	0.01	0.01	0.03
TK-COND	TK-COND	Condensate Tank	A-5	58.19	0.30	--	--	--	--	--	--	--	--	--	--	2.34	0.01
TK-CAP	Various	Miscellaneous Storage Tank Emissions CAP ^[2]	1-3	0.16	<0.01	--	--	--	--	--	--	--	--	--	--	0.01	<0.01
TRKLOAD	TRKLOAD	Truck Loading	A-6	101.34	0.51	--	--	--	--	--	--	--	--	--	--	4.08	0.02
MSS	Various	MSS Emissions Cap ^[3]	B-1	86.78	6.04	7.00	0.14	207.00	2.20	--	--	--	--	--	--	--	--
Total Emissions and Limits																	
Total Emissions				250.52	17.17	30.05	112.02	217.01	117.63	2.16	8.69	0.80	3.52	1.42	6.15	9.97	3.25
PBR-106.4 Emission Limits					25.0		250.0		250.0		15.0		10.0		25.0		25.0
Meets PBR Limits?				--	Yes	--	Yes	--	Yes	--	Yes	--	Yes	--	Yes	--	Yes
Title V Major Source Threshold					100		100		100		100		100		100		25
Emissions Below Major Source Threshold?				--	Yes	--	No	--	No	--	Yes	--	Yes	--	Yes	--	Yes

[1] Total VOC includes HAPs.

[2] EPN: TK-CAP includes emissions from grouped tank FINs: TK-COND, TK-SLOP, SLUMP-SLOP, SUMP-TURB, TK-MISC. Table 1-3 includes a summary of tanks.

[3] Total hourly emission rates from planned MSS represent the worst-case emissions that could occur in one hour. Table B-1 includes a summary of MSS activities.

Table 1-2

General Site and Project Information

Site General Information			
Company Name	Permian Highway Pipeline, LLC		
Site Name	Praha Compressor Station		
Street Address	1619 FM 1295		
Nearest City, State	Moulton, Texas		
Zipcode	77975		
Latitude / Longitude	29.597455 / -97.047197		
Distance to Nearest Property Line	≥ 50 ft		
Distance to Nearest Receptor	≥ 2,000 ft		
Primary SIC Code	1311	Primary NAICS Code	486210
Permit/Registration Number	TBD		
TCEQ Customer Number	CN605732726		
TCEQ Regulated Entity Number	RN-TBD		
Authorization Type(s)	PBR-106.352(l), 106.511, 106.512		
Project Type	Registration (Initial)		
County	Lavaca ◀ Attainment County		
TCEQ Region	Region 14, Corpus Christi		
City, State for Met Data	San Antonio, TX		

Company Contact Information		
	Technical Contact	Responsible Official
Contact	Mr. Paul Witkowski, PE	Mr. Steve Romano
Organization	Permian Highway Pipeline, LLC	Permian Highway Pipeline, LLC
Title	Air Quality Engineer	Vice President Operations
Mailing Address	1001 Louisiana St, Suite 1000	1001 Louisiana St, Suite 1000
City	Houston	Houston
State	TX	TX
Zipcode	77002	77002
Telephone	713-420-2045	713-420-6244
Email Address	paul_witkowski@kindermorgan.com	Steven_Romano@kindermorgan.com

Table 1-3
Fixed Roof Tank Emissions Cap Basis Summary

Permian Highway Pipeline, LLC - Praha Compressor Station
 January 2020

Proposed MAERT Emission Cap Contribution Basis ^[1]								
EPN	FIN	Source Name	Product	Annual Throughput	Breathing/ Standing Losses	Working Losses	Total Losses	
				bbbls/yr	lb/hr	lb/hr	lb/hr	tpy
TK-CAP	TK-SLOP	Used Slop Tank	Slop (Oil/Cond.)	1,786	0.00	0.15	0.15	<0.01
TK-CAP	SLUMP-SLOP	Slop Sump	Slop (Oil/Cond.)	286	0.00	0.05	0.05	<0.01
TK-CAP	SUMP-TURB	Turbine Skid Oil Sump	Slop (Oil/Cond.)	1,143	0.00	0.06	0.06	0.00
TK-CAP	TK-MISC	Miscellaneous Tanks	Misc. Chemical	100	0.01	0.15	0.16	0.00
TK-CAP	Storage Tank Cap Contribution Totals			3,314	0.02	0.41	0.16	<0.01

Proposed Total Cap Emissions ^[2]	Vapor Comp ^[2]	lb/hr	tpy
TK-CAP Total Emissions	100.00% wt%	0.16	<0.01
TK-CAP Total VOC Emissions	100.00% wt%	0.16	<0.01
TK-CAP Total H ₂ S Emissions	--	--	--
TK-CAP Total HAPs Emissions	4.03% wt%	0.01	<0.01

Note:

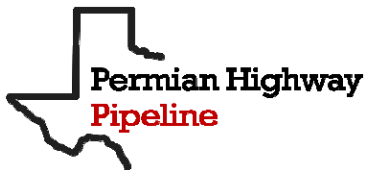
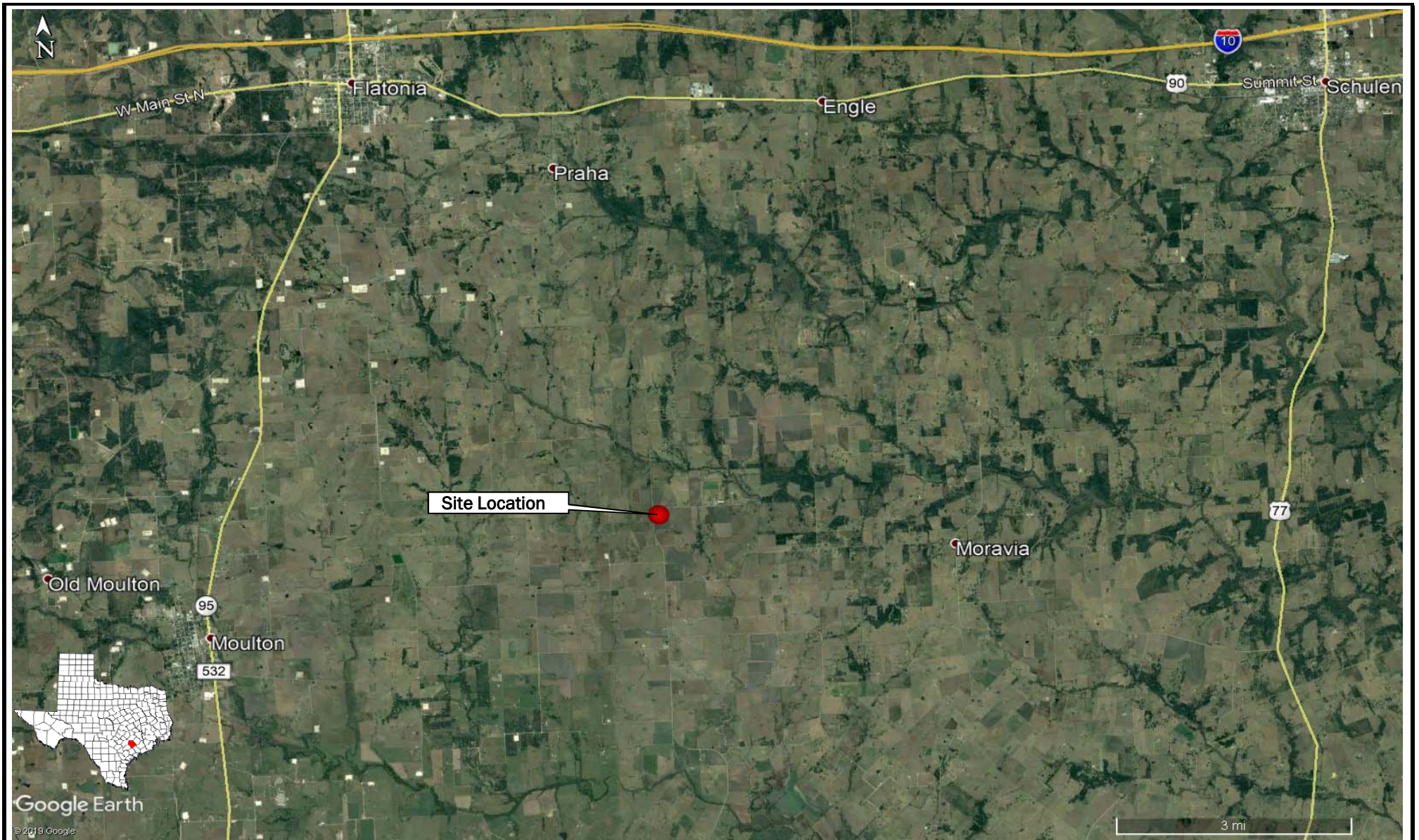
[1] As part of this permitting action, Ingleside Terminal proposes to establish a storage tank emissions cap which will allow for the operational flexibility needed to meet current market demands. The storage tanks may operate in more of the operational mode noted above depending on market demands and will manage such that compliance with the proposed short-term and annual emissions cap is maintained at all times.

[2] See Analyses in Appendix D for basis of vapor composition weight percents.

Section 3

Location Information

Praha Compressor Station is located in Lavaca County, approximately 5.9 miles east-northeast of Moulton, Texas. A scaled area map which shows the location of the Site is included as Figure 3-1 in this section.



Permian Highway Pipeline, LLC
 Praha Compressor Station
 Lavaca County, Texas
 29.597455°N, 97.047197°W

Figure 3-1
 Area Map



Section 4

Process Description

4.1 Routine Operations

PHP LLC's Praha Compressor Station is designed to increase the discharge pressure of the gas in the pipeline to overcome the effect of frictional losses in the pipeline upstream of the station. A simplified process flow diagram is included as Figure 4-1 at the end of this section.

Natural gas enters the site through the inlet separators via pipeline where any residual condensate is separated from the gas. The separated gas is routed through a suction header to the compressors which are driven by Solar turbines (EPNs: TURB1, TURB2); the compressed gas is then routed off-site via pipeline.

Condensate separated at the inlet separators is routed to and stored in a condensate tank (EPN: TK-COND). Additional storage tanks at the Site include a used slop oil tank, turbine skid oil tanks, which collect organic liquids from the turbines' sumps, and other miscellaneous tanks. These tanks and sumps are grouped under a tank emissions cap (EPN: TK-CAP). Oil/condensate from the condensate and used slop oil tanks are removed from the Site via tank truck (EPN: TRKLOAD).

Other sources of emissions at the Site include fuel gas line heater (EPN: HTR1) used to heat the fuel gas for the turbines, emergency generators powered by natural gas-fired engines (EPNs: GEN1, GEN2), and piping fugitive components (EPN: FUG1).

4.2 Planned MSS Activities

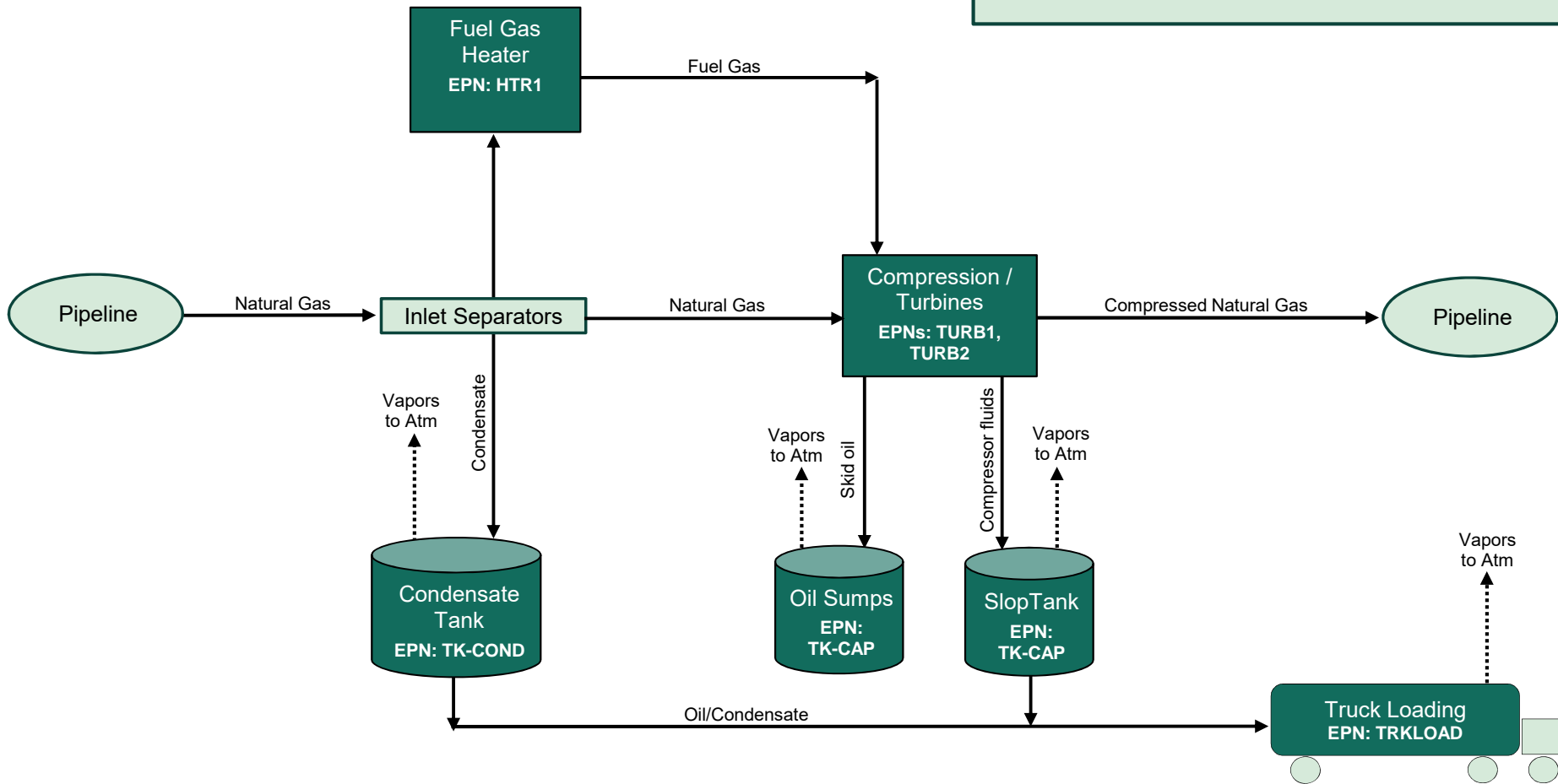
This application includes estimated worst-case emissions from planned MSS activities at the Site. The basis of the emission calculations (i.e. frequency, volume, pressure, etc.) for each activity should not be interpreted as representations of a specific facility or MSS activity condition under 30 TAC §116.116(a). The actual annual frequency of each MSS activity required to maintain good working order of facilities may vary.

Detailed emission calculations from the following planned MSS activities are included in Appendix B of this application.

- Pipeline Pigging
- Turbine shutdowns and start-ups
- Turbine blowdowns
- Miscellaneous venting during planned general maintenance

Additional emission sources at the site include:

- Piping Fugitive components (EPN: FUG1)
- Emergency Generator Engines (EPNs: GEN1, GEN2)
- Planned MSS Activities (EPNs: MSS-TURB-SS, MSS-MISC, MSS-PIG, MSS-TURB)



Permian Highway Pipeline, LLC
 Praha Compressor Station
 Lavaca County, Texas

Figure 4-1
 Process Flow
 Diagram



Section 5 Emissions Data

This section outlines the emission sources and calculation methods used to determine the emission rates associated with each emission source category. A summary of the proposed emissions is included in Section 1, Table 1-1. Detailed emission calculations are presented in Appendices A and B of this document.

5.1 Routine Emissions

The following describes the emission calculations associated with each routine emission source category in this document. Detailed emission calculations are presented in Appendix A of this application.

5.1.1 Fugitives

Emissions from fugitive components are calculated using appropriate stream compositions and emission factors from TCEQ's *Air Permit Guidance for Chemical Sources: Fugitive Guidance*, June 2018. Each fugitive component was classified first by equipment type (valve, pump, relief valve, etc.) and then by material type (gas/vapor, light liquid, heavy liquid). Total emission rates are estimated by multiplying the number of fugitive components by the appropriate emission factor for each equipment type.

5.1.2 Storage Tanks - Fixed Roof

Storage tanks emissions are estimated using the emission calculations methods in *Compilation of Air Pollutant Emission Factors: Volume I Stationary Point and Area Sources* (AP-42, Fifth Edition, US EPA, November 2019 (hereafter referred to in this application as AP-42) Section 7.1 and TCEQ's Air Permit Reviewer Reference Guide, Estimating Short-term Emission Rates from Fixed Roof Tanks (APDG 6250v1, TCEQ, February 2018).

Short-term and annual emission rates are calculated using maximum and annual average temperatures, respectively, throughputs specified in Table A-5, and correlating vapor pressures based on meteorological data for San Antonio, TX. Vapors from tanks are vented to atmosphere.

For purposes of determining vapor pressure of the liquid stored, properties of the specified petroleum liquids (from TANKS 4.0.9d and/or US EPA's AP-42 Ch. 7 Table 7.1-2) are used to represent storage tank contents. These properties are used in conjunction with the vapor pressure equation 1-25 from AP-42 Ch. 7. The A and B constants used in equation 1-25 are either calculated from equations presented in Figures 7.1-15 or 7.1-16 or provided in Table 7.1-2.

5.1.3 Natural Gas-Fired Engines

Emissions from the natural gas-fired engines, including NO_x, CO, VOC, SO₂, PM, HCHO, benzene, and other HAPs, are calculated using emission factors from manufacturer's specification sheets, applicable NSPS JJJJ emission standards, the appropriate emission factors from US EPA's AP-42 Ch. 3.2 tables, maximum rated horsepower, and brake specific fuel consumption. Annual emissions from the emergency generators are based on 10% operation (876 hr/yr per engine).

5.1.4 Turbine(s)

The natural gas-fired Solar Titan turbines at this Site are all equipped with Solar SoLoNO_xTM dry low NO_x combustion technology. Annual emissions from the turbines are based on continuous operation (8,760 hours/year) and the maximum site-specific horsepower and brake-specific fuel consumption.

The NO_x, CO, and VOC emissions are based on the most conservative site-specific emission factors from Solar Turbines, Titan 250 Predicted Emission Performance Data Sheet. Per Solar Turbines Product Information Letter (PIL), *PIL 168, Rev 4, May 14, 2012*, the VOC emissions are based on 10% of the unburned hydrocarbon (UHC) emission rate, which is deemed as a conservative estimate.

The emissions SO₂, PM, HCHO, and other HAPs are calculated based on the appropriate emission factors from US EPA's AP-42 Ch. 3.1 tables, maximum site-specific horsepower, and brake specific fuel consumption.

5.1.5 Heaters/Boilers

Emissions are estimated based on the maximum boiler rating, heating value of the fuel gas, and emission factors from US EPA's AP-42 Ch. 1.4 tables. For heaters/boilers utilizing fuel gas with >0 ppm_v H₂S, SO₂ emissions are calculated using a sulfur material balance based on the assumption that 100% of H₂S is converted to SO₂ during combustion.

5.1.6 Truck Loading

Emissions from oil/condensate loading are calculated per US EPA's AP-42 Ch. 5.2, using an annual throughput. Maximum hourly loading rate is based on loading the volume the tank truck. Vapors produced during loading operations are vented to atmosphere.

5.2 Planned Maintenance, Startup, and Shutdown Emissions

Planned MSS activities and associated emissions will occur to support the Site's routine operations. The following describes the calculations used to determine the emissions associated with each planned MSS activity included in this application.

Detailed emission calculations are presented in Appendix B of this application.

5.2.1 Blowdowns/Purging

The volume of gas vented due to a blowdown is estimated based on the potential volume of gas contained in the unit line/piping/vessel that would be released following the shutdown of the unit and prior to the startup. Emissions are estimated based on the volume of gas, the vapor composition, molecular weight, and ideal gas constant.

5.2.2 Pipeline Pigging

Pigging may be required to clean and maintain product pipelines. Emissions associated with pigging maintenance include uncontrolled degassing of the pig receiver and venting of residual vapor. The volume of gas vented is estimated based on the actual volume of the receiver and the volume of gas contained in the piping at line pressure that would be released at atmospheric ambient conditions. Emissions are estimated based on the volume of gas, the vapor composition, molecular weight, and ideal gas constant.

5.2.3 Turbine MSS

Estimated planned MSS emissions, including start-up, shutdown, and blowdowns, for the turbines located at the Site are included with this application.

During turbine startup, the turbines may emit high levels of CO emissions until the turbine stabilizes within the proper operational envelope. Typical start-up and shutdown sequences are less than 10 minutes each. Start-up and shutdown emissions are estimated using factors from Solar Turbines PIL 170, Rev 9, September 10, 2018, Tables 2 and 3.

During turbine blowdowns, gas is vented prior to planned maintenance. The volume of gas vented due to a blowdown is estimated based on the potential volume of gas contained in the turbine that would be released following the shutdown of the turbine and prior to the startup. Emissions are estimated based on the volume of gas, the vapor composition, molecular weight, and ideal gas constant.

5.2.4 General/Miscellaneous Planned Maintenance

The volume of gas released due to general planned maintenance is estimated based on similar operations. Emissions are estimated based on the volume of gas released, the vapor composition, molecular weight, and ideal gas constant.

Section 6

Permit by Rule Requirements

6.1 PBR General Requirements

The Site must comply with all applicable provisions of 30 TAC Chapter 106. The emissions from the facilities included in this application will satisfy the conditions for facilities authorized by PBR, which is covered under 30 TAC Chapter §116.110(d)(1). This section presents a review of the general requirements potentially applicable to the Site.

6.1.1 30 TAC Chapter 106 – General Requirements

The project will comply with the applicable provisions of 30 TAC Chapter 106 as follows:

- §106.4 Requirements for Permitting by Rule
The total project emissions, shown in Table 1-1 demonstrate compliance with the limits listed in §106.4(a)(1) and (4). PHP LLC will ensure compliance the applicable requirements of this section.
- §106.6 Registration of Emissions
With this registration, PHP LLC is certifying the maximum emission rates from facilities permitted by rule are below the emission limitations in §106.4. PHP LLC will revise the certified registration prior to implementing any change at the site that will result in increased emissions.
- §106.8 Recordkeeping
PHP LLC will maintain records, in accordance with §106.8(c), containing sufficient information to demonstrate compliance with all applicable general requirements and PBR conditions.
- §106.50 Registration Fees for Permits by Rule
PHP LLC is submitting this registration for review via STEERS and has paid the appropriate fee based on the criteria outlined in §106.50(a). A PI-7 Form is no longer required as all administrative and technical information needed by the APD to evaluate PBR claims is entered in STEERS.

6.2 PBR Specific Requirements - 30 TAC Chapter 106

This section addresses applicable requirements for each applicable PBR being claimed.

6.2.1 §106.352(l) – Oil and Gas Handling and Production Facilities

The Site is a compressor station operating new and/or modified facilities except those specified in §106.352(a)(1). There are no facilities at the handling sour gas.

6.2.2 §106.359 – Planned MSS at Oil and Gas Handling and Production Facilities

This registration includes emissions from planned MSS activities; however, PHP LLC is not requesting authorization of planned MSS activities associated with the facilities at the site under §106.359. Planned MSS activities are authorized under §106.352(I).

6.2.3 §106.511 – Portable and Emergency Engines and Turbines

The engines at this site are used only for emergency operation/service. The maximum operating hours of each engine will not exceed 10% of the normal annual operating schedule, or 876 hours annually.

6.2.3 §106.512 – Stationary Engines and Turbines

The stationary internal combustion reciprocating turbines at this Site are rated 500 hp or greater. The turbines will maintain compliance with the emissions standards, testing, and recordkeeping requirements of this PBR.

Section 7 Impacts Evaluation

In accordance with 30 TAC §101.21 and §112.32, authorized emission sources must be able to demonstrate compliance with the applicable NAAQS and State Property Line Standards.

US EPA's SCREEN3 screening model was used to demonstrate compliance for NO₂ with the relevant NAAQS at the nearest property line. The maximum modeled impacts are shown at distances beyond the property line. Table 7-1 includes the input parameters and the evaluation results are presented in Table(s) 7-2.

Impacts evaluations for SO₂, Benzene, and H₂S were not conducted as the concentrations are not expected to exceed any applicable standard. An impacts evaluation can be provided upon request.

Table 7-1

Impacts Evaluation - Modeling Parameters

Permian Highway Pipeline, LLC - Praha Compressor Station

January 2020

EPN	FIN	Stack Parameters (for SCREEN3)					SCREEN3 Results	
		Heat Release	Stack Height	Stack Diameter	Exit Temp	Exit Velocity	Distance to Max (Off-Property)	G _{hourly}
		MMBtu/hr	ft	ft	°F	ft ³ /min	m	(µg/m ³) per (lb/hr)
TURB1, TURB2	TURB1, TURB2		41	7.0	786	311,815	1,294	0.1487
GEN1, GEN2	GEN1, GEN2		23	0.8	1,261	7,432	161	6.3180
HTR1	HTR1	3.456	20	1	400	951	110	53.8100

Table 7-2

Impacts Evaluation - NO₂ Impacts Review

Permian Highway Pipeline, LLC - Praha Compressor Station

January 2020

EPN	FIN	NO _x		NO ₂ /NO _x ratio ^[1]	NO ₂		SCREEN3 Evaluation	
		lb/hr	tpy		lb/hr	tpy	G _{hourly}	
							(µg/m ³) per (lb/hr) ^[2]	µg/m ³
TURB1, TURB2	TURB1, TURB2	24.70	108.20	0.9	22.23	97.38	0.15	3.31
GEN1, GEN2	GEN1, GEN2	5.00	2.19	0.2	1.00	0.44	6.32	6.32
HTR1	HTR1	0.34	1.48	0.9	0.30	1.34	53.81	16.41
Site-wide Totals		30.05	111.87		23.54	99.15	Project Impacts (µg/m³)	26.04
Background ^[3] (µg/m³)							70	
Total Impacts (µg/m³)							96.04	
P, Applicable Standard ^[4] (µg/m³)							188	
Pass?							Yes	

Notes

[1]. NO₂/NO_x ratio determined in accordance with the TCEQ APDG 6232v4 Air Quality Modeling Guidelines (09/2018), and with paragraph (k)(4)(A) of 30 TAC §106.352 for engines.

[2]. Each EPN is modeled in SCREEN3 using a unit emission rate of 1 lb/hr. The SCREEN3 generic impact, G_{hourly} (µg/m³) / (lb/hr), is determined for each EPN. Emission rates from each source are multiplied by G_{hourly}. Maximum impacts are summed and evaluated

[3]. Source: TCEQ, Interim 1-Hour NO₂ Screening Background Concentrations, July 22, 2010.

[4]. P: applicable standard - lesser of NAAQS, 30 TAC 112 limit, and ESL (as applicable) (µg/m³)

[5]. The stack gas flow rate for heater/boilers is determined using the following formula: $Q = Fd * [20.9/(20.9-\%O_2)] * Hin/60$, where Fd = Fuel factor, dry basis (from EPA Method 19) = dscf/MMBtu for natural gas; %O₂ = Measured oxygen concentration, dry basis = 3%; and Hin = Heat input rate in MMBtu/hr (Preferred and Alternative Methods for Estimating Air Emissions from Boilers, EPA, January 2001, Volume II, Chapter 2).

Section 8

Rule Applicability Analysis

8.1 State Requirements

Pursuant to 30 TAC §106.4(c), PHP LLC proposes to meet the rules and regulations of the TCEQ and the intent of the TCAA, including protection of the health and property of the public. This section addresses the potentially applicable state requirements.

8.1.1 Chapter 101 – General Air Quality Rules

The Site is located in Lavaca County which is currently classified as attainment or unclassified for all criteria pollutants and is not a major source of emissions. PHP LLC will comply with any special inventory requests received from the TCEQ in accordance with 30 TAC §101.10.

PHP LLC will report emissions events or scheduled MSS activity exceeding or expected to exceed the reportable quantities defined in this chapter. Records of all emissions events will be maintained in accordance with §101.201 & §101.211.

8.1.2 Chapter 111 – Visible Emissions and Particulate Matter

Facilities included in this registration are subject to and will operate in compliance with this chapter.

The stationary vent(s) at this Site shall not exceed the opacity limit of 20% averaged over a six-minute period. PHP LLC will maintain compliance with this paragraph in accordance with the provisions of this rule.

8.1.3 Chapter 112 – Sulfur Compounds

Facilities that are emission sources of SO₂ or H₂S included in this application are subject to and will operate in compliance with all applicable requirements of 30 TAC Chapter 112.

8.1.4 Chapter 113 – Toxic Materials

This chapter addresses the control of HAP. The Site will comply with applicable standards of performance for HAPs as addressed in the Federal Requirements section.

8.1.5 Chapter 115 – VOC

This chapter addresses the control of air pollution from VOC in the Beaumont/Port Arthur, Dallas/Fort Worth, El Paso, and Houston/Galveston areas. The Site is located in Lavaca County, which is not an affected county under Chapter 115.

8.1.6 Chapter 116 – New Construction or Modification

This chapter addresses the authorization requirements for new or modified facilities that emit air contaminants. This application satisfies the requirements of §116.110(a)(2)(A) for facilities permitted by rule under 30 TAC Chapter 106.

8.1.7 Chapter 117 – Nitrogen Compounds

This chapter addresses control of air pollution from nitrogen compounds in the Beaumont/Port Arthur, Dallas/Fort Worth, and Houston/Galveston ozone nonattainment areas; gas-fired reciprocating internal combustion engines in East Texas; and utility electric generation in East and Central Texas.

The Site is located in Lavaca County, which is not an affected county under Chapter 117.

8.1.8 Chapter 122 – Federal Operating Permits

This chapter addresses the requirements of any site that is defined as a major source as defined in §122.10. The site is a major source for Title V purposes; therefore, PHP LLC is required to obtain a federal operating permit pursuant to this chapter. PHP LLC will submit an initial Title V application before the start of operation of the Site.

8.2 Federal Requirements

This section addresses the potential applicability of federal air quality regulations, in accordance with 30 TAC §106.4(a)(6), for the facilities represented in this registration. PHP LLC will comply with the applicable provisions of the regulations presented.

8.2.1 NSPS – 40 CFR Part 60

Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984.

The storage tanks at this Site commenced construction after July 23, 1984; however, each tank used to store volatile organic liquids has a design capacity less than 75 m³; therefore, this subpart does not apply per §60.110b(a).

Subpart GG – Standards of Performance for Stationary Gas Turbines.

This Site operates a stationary gas turbine which commenced construction after October 3, 1977; however, per 60.4305(b), stationary combustion turbines regulated under NSPS KKKK are exempt from the requirements of subpart GG. There are no further requirements under this subpart.

Subpart KKK – Standards of Performance for Equipment Leaks of VOC From Onshore Natural Gas Processing Plants for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011.

This Site does not meet the definition of natural gas processing plant as defined in 40 CFR §60.631; therefore, this subpart does not apply.

Subpart LLL – Standards of Performance for SO₂ Emissions From Onshore Natural Gas Processing for Which Construction, Reconstruction, or Modification Commenced after January 20, 1984, and on or before August 23, 2011.

This Site does not operate an affected facility under this subpart; therefore, this subpart does not apply.

Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engine.

This Site does not operate an affected facility under this subpart; therefore, this subpart does not apply.

Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

The stationary spark-ignited internal combustion engines at the Site are emergency engines > 25 hp and were manufactured after January 1, 2009 and are, therefore, subject to this subpart per 60.4230(a)(2)(ii). Compliance with the applicable testing, reporting, monitoring, and recordkeeping requirements of this subpart will be maintained.

Subpart KKKK – Standards of Performance for Stationary Combustion Turbines

This Site operates stationary combustion turbine(s) with a maximum load ≥ 10 MMBtu/hr and commenced construction, modification, or reconstruction after February 18, 2005; therefore, the turbine(s) are subject to this subpart per §60.4305(a). Compliance with the applicable testing, reporting, monitoring, and recordkeeping requirements of this subpart will be maintained.

Subpart 0000 – Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution for which Construction, Modification or Reconstruction Commenced After August 23, 2011, and on or before September 18, 2015.

This subpart covers gas wells, compressors, pneumatic controllers, storage vessels, and process equipment at onshore natural gas processing plants. Any potentially affected facilities were constructed after September 18, 2015; therefore, there are no requirements under this subpart.

Subpart 0000a – Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015.

This subpart covers oil and gas wells, compressors, pneumatic controllers, pneumatic pumps, storage vessels, process equipment at onshore natural gas processing plants, and fugitive components at a well site or compressor station.

The potentially affected storage vessels at this Site were constructed after September 18, 2015. The storage vessels do not have the potential to emit ≥ 6 tpy VOC and are, therefore, not affected facilities per §60.5365a(e) of this subpart.

The centrifugal compressors at this Site were constructed after September 18, 2015; however, they utilize dry seals and are not affected facilities under this subpart.

This Site is a compressor station as defined in §60.5430a constructed after the applicability date; therefore, the collection of fugitive emissions components at this Site is an affected facility per §60.5365a(j). Compliance with the applicable requirements will be maintained.

No other potentially affected facilities are operated at this Site; therefore, there are no requirements under this subpart.

8.2.2 NESHAP – 40 CFR Part 61

The Site is an area source of HAP and the facilities included in this application are not subject to the requirements of the NESHAP.

8.2.3 NESHAP for Source Categories – 40 CFR Part 63

The Site is an area source of HAP and the facilities included in this application are not subject to the maximum achievable control technology standards of the NESHAP for source categories, also referred to as MACT.

Subpart HH – National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities

This Site does not operate an affected facility under this subpart; therefore, this subpart does not apply.

Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines

This Site operates stationary combustion turbine(s) located an area source of HAP, which is not an affected facility under this subpart per §63.6085; therefore, this subpart does not apply.

Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

The engines are new stationary RICE located at an area source of HAPs and are affected sources. Per §63.6590(c)(1), the engines meet the requirements of this part by meeting the requirements of NSPS JJJJ or IIII, as applicable.

Appendix A
Routine Emission Calculations

Table A-1

Fugitive Emissions

Permian Highway Pipeline, LLC - Praha Compressor Station

January 2020

FIN/EPN:	FUG1
Name:	Piping Fugitive Emissions

Component Type	Service Stream Type	Emission Factors: ^[1] Oil and Gas Production	LDAR Program: None	Component Count ^[2]	TOC Emissions	
			Control Efficiency ^[3]		lb/hr	tpy
Valves	Gas	0.00992	0%	225	2.23	9.78
Valves	Light Liquid	0.0055	0%	69	0.38	1.66
Valves	Water/Oil	0.000216	NA	34	0.01	0.03
Connectors	Gas	0.00044	0%	647	0.28	1.25
Connectors	Light Liquid	0.000463	0%	189	0.11	0.50
Connectors	Water/Oil	0.000243	NA	106	0.03	0.11
Flanges	Gas	0.00086	0%	5	4.30E-03	0.02
Flanges	Light Liquid	0.000243	0%	41	0.01	0.04
Open-ended Lines	Gas	0.00	0%	30	0.13	0.58
Compressor	Gas	0.02	0%	2	0.04	0.17
Pressure Relief Valves	Gas	0.02	NA	18	0.35	1.53
Total by Service Stream Type: Gas				927	3.04	13.32
Total by Service Stream Type: Light Liquid				439	0.54	2.35
Total:					3.58	15.67

Stream Composition (Wt%) ^{[4], [5]}

Stream Type	TOC	VOC	Total HAPs	H ₂ S
Gas	96.51%	0.49%	0.00%	0.0000%
Light Liquid	100.00%	100.00%	4.03%	0.0000%

Total Emission Rates

Stream Type	VOC		Total HAPs		H ₂ S	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Gas	0.02	0.07	--	--	--	--
Light Liquid	0.54	2.35	0.02	0.09	--	--
Total:	0.55	2.41	0.02	0.09	--	--

Notes:

- VOC emission leak factors (lb/hr TOC per component) from Air Permit Technical Guidance for Chemical Sources: Fugitive Guidance for Oil and Gas Production Operations, APDG 6422v2, TCEQ, June 2018, which are based on US EPA's Protocol for Equipment Leak Emission Estimates, November 1995.
- Component counts estimated based on 40 CFR 98 Subpart W, Table W-1B/C counts for Western US Onshore natural gas and oil production.
- No required or voluntary LDAR program has been implemented at this site; therefore, no program reductions have been applied.
- Gas service stream composition based on Representative PHP Gas Composition sample.
- Light Liquid service stream(s) composition based on Conservative Liquid Analysis (Assumed 100% VOC) sample.
- See Analyses in Appendix D for basis of stream composition weight percents.

Table A-2

Turbine Emissions

Permian Highway Pipeline, LLC - Praha Compressor Station

January 2020

EPNs	TURB1, TURB2	FINs	TURB1, TURB2
Names	Solar Titan 250 Turbines		

Basis	
Fuel Type:	Natural Gas
Number of Units:	2
Manufacturer:	Solar
Model No.:	Titan 250 E (31900S)
Unit Type:	Turbine
Application:	Gas Compression
Manufacture Date:	2019
Horsepower Rating:	32,981 HP
Fuel Consumption:	6,249 Btu/hp-hr
Emission Control Method:	Low-NOx Combustors
Annual Operation:	8,760 hr/yr

Discharge/Stack Parameters		
Height :	41.00	ft
Diameter:	7.00	ft
Temperature:	786	°F
Flowrate :	311,815	cfm

Constants		
Ideal Gas Law =	385.33	scf/lb-mol
MW S =	32.06	lb/lb-mol
MW SO2 =	64.06	lb/lb-mol

Fuel Data		
Sulfur Content:	0.06	grains/100scf
H2S Content*	0.0001%	mol%

*Fuel H2S content is based on Solar Turbine Fuel Gas sample.

Emissions Rates

Pollutant	Emission Factors [1]			Emissions Rates, (per Unit)		Total Emissions (All Units)	
	Value	units	Source of EF	lb/hr	tpy	lb/hr	tpy
VOC (w/HCHO)	0.0035	lb/MMBtu	Manufacturer Data [2]	0.72	3.14	1.44	6.29
NOx	0.0599	lb/MMBtu	Manufacturer Data	12.35	54.10	24.70	108.20
CO	0.0608	lb/MMBtu	Manufacturer Data	12.53	54.90	25.07	109.81
PM ₁₀	0.0047	lb/MMBtu	AP-42,Table 3.1-2a	0.97	4.24	1.94	8.49
PM _{2.5}	0.0019	lb/MMBtu	AP-42,Table 3.1-2a	0.39	1.72	0.78	3.43
SO ₂	0.0034	lb/MMBtu	AP-42,Table 3.1-2a	0.70	3.07	1.40	6.14
HAP Emissions							
Acetaldehyde	0.0000	lb/MMBtu	AP-42,Table 3.1-3	0.01	0.04	0.02	0.07
Acrolein	0.0000	lb/MMBtu	AP-42,Table 3.1-3	1.32E-03	0.01	2.64E-03	0.01
Benzene	0.0000	lb/MMBtu	AP-42,Table 3.1-3	2.47E-03	0.01	4.95E-03	0.02
Formaldehyde (HCHO)	0.0007	lb/MMBtu	AP-42,Table 3.1-3	0.15	0.64	0.29	1.28
Toluene	0.0001	lb/MMBtu	AP-42,Table 3.1-3	0.03	0.12	0.05	0.23
Xylenes	0.0001	lb/MMBtu	AP-42,Table 3.1-3	0.01	0.06	0.03	0.12
Total HAPs				0.20	0.87	0.40	1.74

Equations used:

- (lb/hr) = EF (g/hp-hr) × HP / 453.59 (g/lb)
- (lb/hr) = EF (lb/MMBtu) × Fuel Consumption (Btu/hp-hr) × HP / 1,000,000 (Btu/MMBtu)
- (lb/hr) = (hp) × Fuel Consumption (Btu/hp-hr) / Fuel HHV (Btu/scf) × Fuel H₂S content (mol%) / Ideal Gas Law (scf/lb-mol) × MW SO₂ (lb/lb-mol)
- (tpy) = Hourly Emission Rate (lb/hr) × Annual operation (hrs/yr) / 2,000 (lb/ton)

Notes:

[1] Emissions from the turbine, including NO_x, CO, VOC, SO₂, PM, HCHO, benzene, and other HAPs, are calculated using the appropriate emissions factors as indicated above (i.e. from manufacturer's specification sheets, applicable emission standards for natural gas-fired turbines, and/or emission factors from US EPA's AP 42 Ch. 3.1 tables), maximum rated HP, and brake specific fuel consumption.

[2] VOC emissions are based on 10% of the unburned hydrocarbon (UHC) emission rate per Solar Turbines PIL 168, Rev 4, May 14, 2012.

Table A-3

Natural Gas Engine Emissions

Permian Highway Pipeline, LLC - Praha Compressor Station

January 2020

EPNs	GEN1, GEN2	FINs	GEN1, GEN2
Names	Emergency Generator Engines		

Basis	
Fuel Type:	Natural Gas
Number of Units:	2
Manufacturer:	Cummins
Model No.:	GTA50E
Unit Type:	4SLB
Application:	Emergency
Manufacture Date:	TBD
Horsepower Rating:	1,135 HP
Power Output:	700 kWm
Fuel Consumption:	8,919 Btu/hp-hr
Emission Control Method:	Other
Annual Operation:	876 hr/yr

Discharge/Stack Parameters		
Height :	23.00	ft
Diameter:	0.83	ft
Temperature:	1,261	°F
Flowrate :	7,432	cfm

Constants		
Ideal Gas Law =	385.33	scf/lb-mol
MW S =	32.06	lb/lb-mol
MW SO ₂ =	64.06	lb/lb-mol

Fuel Data		
Heat Value:	939	Btu/scf
Sulfur Content:	0.06	grains/100scf
H ₂ S Content*	0.0001%	mol%

*Fuel H₂S content is based on Solar Turbine Fuel Gas sample.

Emissions Rates

Pollutant	Emission Factors [1]			Emissions Rates, (per Unit)		Total Emissions (All Units)	
	Value	units	Source of EF	lb/hr	tpy	lb/hr	tpy
VOC (w/HCHO)	0.7000	g/hp-hr	NSPS JJJJ	1.75	0.77	3.50	1.53
NO _x	1.0000	g/hp-hr	NSPS JJJJ	2.50	1.10	5.00	2.19
CO	2.0000	g/hp-hr	NSPS JJJJ	5.00	2.19	10.01	4.38
PM ₁₀	0.0099	lb/MMBtu	AP-42,Table 3.2-2	0.10	0.04	0.20	0.09
PM _{2.5}	0.0001	lb/MMBtu	AP-42,Table 3.2-2	7.80E-04	3.42E-04	1.56E-03	6.84E-04
SO ₂	0.0006	lb/MMBtu	AP-42,Table 3.2-2	0.01	2.61E-03	0.01	0.01
HAP Emissions							
Acetaldehyde	0.0084	lb/MMBtu	AP-42,Table 3.2-2	0.08	0.04	0.17	0.07
Acrolein	0.0051	lb/MMBtu	AP-42,Table 3.2-2	0.05	0.02	0.10	0.05
Benzene	0.0004	lb/MMBtu	AP-42,Table 3.2-2	4.45E-03	1.95E-03	0.01	3.90E-03
Formaldehyde (HCHO)	0.5600	g/hp-hr	Manufacturer Data	1.40	0.61	2.80	1.23
Toluene	0.0004	lb/MMBtu	AP-42,Table 3.2-2	4.13E-03	1.81E-03	0.01	3.62E-03
Xylenes	0.0002	lb/MMBtu	AP-42,Table 3.2-2	1.86E-03	8.16E-04	3.73E-03	1.63E-03
Total HAPs				1.55	0.68	3.10	1.36

Equations used:

- (lb/hr) = EF (g/hp-hr) × HP / 453.59 (g/lb)
- (lb/hr) = EF (lb/MMBtu) × Fuel Consumption (Btu/hp-hr) × HP / 1,000,000 (Btu/MMBtu)
- (lb/hr) = (hp) × Fuel Consumption (Btu/hp-hr) / Fuel HHV (Btu/scf) × Fuel H₂S content (mol%) / Ideal Gas Law (scf/lb-mol) × MW SO₂ (lb/lb-mol)
- (tpy) = Hourly Emission Rate (lb/hr) × Annual operation (hrs/yr) / 2,000 (lb/ton)

Notes:

[1] Emissions from the natural gas-fired engines, including NO_x, CO, VOC, SO₂, PM, HCHO, benzene, and other HAPs, are calculated using emission factors as indicated above (i.e. from manufacturer's specification sheets and the most stringent applicable emission standard, the appropriate emission factors from US EPA's AP-42 Ch. 3.2 tables), maximum rated HP, and brake specific fuel consumption.

Table A-4

Heater/Boiler Emissions

Permian Highway Pipeline, LLC - Praha Compressor Station

January 2020

EPN	HTR1	FIN	HTR1
Name	Fuel Gas Heater		

Basis		
Fuel Type:	Natural Gas	
Number of Units:	1	(Model HH3500)
Heater/Boiler Rating	3.46	MMBtu/hr
Fuel Heat Value (HHV):	939	Btu/scf
Fuel H ₂ S content ^[1] :	0.0001%	mol%
Stack Height:	20	ft
Annual Operation:	8,760	hours/year

[1] Fuel H₂S Content is based on Solar Turbine Fuel Gas sample.

Pollutant	Emission Factor			Emission Rates	
	lb/MMscf	lb/MMBtu	Source of Emission Factor	lb/hr	tpy
Total VOC	5.5	5.39E-03	AP-42, Table 1.4-2	0.02	0.08
NO _x	100	9.80E-02	AP-42, Table 1.4-1	0.34	1.48
CO	84	8.24E-02	AP-42, Table 1.4-1	0.28	1.25
PM ₁₀	7.6	7.45E-03	AP-42, Table 1.4-2	0.03	0.11
PM _{2.5}	5.7	5.59E-03	AP-42, Table 1.4-2	0.02	0.08
SO ₂	0.6	5.88E-04	AP-42, Table 1.4-2	2.03E-03	0.01
HAP Emissions					
Benzene	0.0021	2.06E-06	AP-42, Table 1.4-3	7.12E-06	3.12E-05
Formaldehyde	0.075	7.35E-05	AP-42, Table 1.4-3	2.54E-04	1.11E-03
n-Hexane	1.800	1.76E-03	AP-42, Table 1.4-3	0.01	0.03
Toluene	0.003	3.33E-06	AP-42, Table 1.4-3	1.15E-05	5.05E-05
Total HAPs				0.01	0.03

Equations Used:

- Hourly emissions (lb/hr) = EF (lb/MMscf) / 1,020 (Btu/scf) × Heater/Boiler Rating (MMBtu/hr)
- Annual emission rate (tpy) = Hourly Emission Rate (lb/hr) × Hours of operation per year (hrs/yr) / 2,000 (lb/ton)
- Hourly Emissions (lb/hr) = Heater/Boiler Rating (MMBtu/hr) × 10⁶ (Btu/MMBtu) / Fuel Heat Value (Btu/scf) × Fuel H₂S content (mol%) / Ideal Gas Law (scf/lb-mol) × MW SO₂ (lb/lb-mol)

**Table A-5
Fixed Roof Tank Losses**

Permian Highway Pipeline, LLC - Praha Compressor Station
January 2020

FIN				TK-COND		TK-SLOP		
FIN Name				Condensate Tank		Used Slop Tank		
EPN				TK-COND		TK-CAP		
Parameter Name & Variable		Units	Reference					
Tank and Product Data	Product Stored Category			Oil/Condensate		Slop (Oil/Cond.)		
	Product Stored Type			Crude		Crude		
	Tank Type			VFR		VFR		
	Fixed Roof Type		N/A for horizontal tanks	Cone		Cone		
	Constant-Level Tank?		Yes/No	No		No		
	Tank Capacity		bbl	100		100		
	Number of Tanks			1		1		
	Height (VFR) / Effective Height (HFR)	H _S / H _E	ft	Eq. 1-15	8.0		8.0	
	Annual Sum of Liquid Level Increases	ΣH _{QI}	ft/yr	Eq. 1-37	77.6		138.5	
	Turnovers	N	-	Eq. 1-36	12.9		23.1	
	Annual Throughput	Q	bbl/yr		1,000		1,786	
	Net Working Loss Throughput	V _Q	ft ³ /yr	Eq. 1-38	5,614.0		10,025.0	
	Average Liquid Height	H _L	ft		4.0		4.0	
	Diameter/Effective Diameter (HFR only)	D / D _e	ft		9.6		9.6	
	Tank Max Liquid Volume		gal		4,200		4,200	
	Maximum Hourly Throughput Rate	V _Q	bbl ft ³	Eq. 1-38	100	561	100	561
	Roof Outage / Vapor Space Outage	H _{RO} / H _{VO}	ft	Eq. 1-16, 17, 18, or 20	0.10	4.10	0.10	4.10
	Breather Vent Vacuum / Pressure Setting	P _{BV} / P _{BP}	psig	Eq. 1-10	-0.03	0.03	-0.03	0.03
	Paint Color Paint Paint Condition			Tbl. 7.1-6	White	Average	White	Average
	Solar Absorptance	α		Tbl. 7.1-6	0.25		0.25	
	AP-42 or OTHER Defined Liquid				Gasoline (RVP 15)		No. 2 Fuel Oil (Diesel)	
	Vapor Pressure Calculation Method				RVP Correlation Eqn		RVP Correlation Eqn	
	Vapor Molecular Weight	M _V	lb/lb-mole		60.00		130.00	
	Reid Vapor Pressure	RVP	psi		15.000		--	
Vapor Pressure Constant	A	dimensionless	Fig. 7.1-15 or 7.1-16	11.466		12.101		
Vapor Pressure Constant	B	°C	Fig. 7.1-15 or 7.1-16	4860.7		8907.0		
Parameter Name & Variable		Units	AP-42 Ch. 7 Reference	Short-term	Annual	Short-term	Annual	
Climatological & Calculated Product Data	Daily Total Solar Insolation Factor	I		2081.00	1477.00	2081.00	1477.00	
	Atmospheric Pressure			14.27	14.27	14.27	14.27	
	Daily Maximum Ambient Temperature	T _{AX}	°F	95.00	79.80	95.00	79.80	
	Daily Minimum Ambient Temperature	T _{AN}	°F	75.30	59.50	75.30	59.50	
	Daily Ambient Temp. Change	ΔT _A	°R	Eq. 1-11	19.70	20.30	19.70	20.30
	Daily Avg. Ambient Temperature	T _{AA}	°R	Eq. 1-30	544.82	529.32	544.82	529.32
	Liquid Bulk Temperature	T _B	°R	Eq. 1-31	546.38	530.43	546.38	530.43
	Daily Avg. Liquid Surface Temperature	T _{LA}	°R	Eq. 1-28	548.36	531.83	548.36	531.83
	Daily Max. Avg. Liq. Surf. Temp.	T _{LX}	°R	Fig. 7.1-17	554.67	537.23	554.67	537.23
	Daily Min. Avg. Liq. Surf. Temp.	T _{LN}	°R	Fig. 7.1-17	542.31	526.43	542.31	526.43
	Avg. Vapor Temperature	T _V	°R	Eq. 1-33	549.97	532.98	549.97	532.98
	Daily Vapor Temperature Range	ΔT _V	°R	Eq. 1-7	24.20	21.60	24.20	21.60
	True Vapor Pressure @ T _{LA}	P _{VA}	psia	Eq. 1-25	13.49	10.24	0.02	0.01
	True Vapor Pressure @ T _{LX}	P _{VX}	psia	Eq. 1-25	14.92	11.22	0.02	0.01
	True Vapor Pressure @ T _{LN}	P _{VN}	psia	Eq. 1-25	12.22	9.32	0.01	0.01
	Daily Vapor Pressure Range	ΔP _V	psia	Eq. 1-9	2.70	1.90	0.01	0.00
	Vapor Space Expansion Factor	K _E		Eq. 1-5 or 1-12	0.04	0.04	0.04	0.04
	Vented Vapor Saturation Factor	K _S	dimensionless	Eq. 1-21	0.25	0.31	1.00	1.00
	Working Loss Product Factor Turnover Factor	K _P K _N	dimensionless	Eq. 1-35	0.75	1.00	0.75	1.00
	Vent Setting Correction Factor	K _B	dimensionless	Eq. 1-41	1.00	1.00	1.00	1.00
	Vapor Space Volume	V _V	ft ³	Eq. 1-3	296.77		296.77	
	Vapor Density	W _V	lb/ft ³	Eq. 1-22	0.14	0.11	0.00	0.00
	Breathing/Working Emissions Calculations				lb/hr	tpy	lb/hr	tpy
	Total Stream Uncontrolled, Standing Emissions	L _S		Eq. 1-2	0.45	0.07	4.51E-03	4.59E-04
Total Stream Uncontrolled, Working Emissions	L _W		Eq. 1-35	57.73	0.23	0.15	8.21E-04	
Total Stream Uncontrolled Emissions	L_T		Eq. 1-1	58.19	0.30	0.15	1.28E-03	
Breathing/Working Vapor Composition ^{[1], [2]}	TOC		(wt%)	100.00%		100.00%		
Breathing/Working Vapor Composition ^{[1], [2]}	Total VOC		(wt%)	100.00%		100.00%		
Breathing/Working Vapor Composition ^{[1], [2]}	H ₂ S		(wt%)	0.00%		0.00%		
Breathing/Working Vapor Composition ^{[1], [2]}	Total HAPs		(wt%)	4.03%		4.03%		
Uncontrolled Breathing/Working Emissions ^[3]			Total VOC	58.19	0.30	0.15	1.28E-03	
Uncontrolled Breathing/Working Emissions ^[3]			Total HAPs	2.34	0.01	0.01	5.16E-05	
Total Uncontrolled Emissions			Total VOC	58.19	0.30	0.15	1.28E-03	
Total Uncontrolled Emissions			Total HAPs	2.34	0.01	0.01	5.16E-05	

[1] Stream composition(s) based on Conservative Liquid Analysis (Assumed 100% VOC) sample.

[2] See Analyses in Appendix D for basis of stream composition weight percents.

[3] Total VOC includes HAPs.

**Table A-5
Fixed Roof Tank Losses**

Permian Highway Pipeline, LLC - Praha Compressor Station
January 2020

FIN				SLUMP-SLOP		SUMP-TURB		
FIN Name				Slop Sump		Turbine Skid Oil Sump		
EPN				TK-CAP		TK-CAP		
Parameter Name & Variable		Units	Reference					
Tank and Product Data	Product Stored Category			Slop (Oil/Cond.)		Slop (Oil/Cond.)		
	Product Stored Type			Crude		Crude		
	Tank Type			VFR		VFR		
	Fixed Roof Type		N/A for horizontal tanks	Cone		Cone		
	Constant-Level Tank?	Yes/No		No		No		
	Tank Capacity	bbl		101		61		
	Number of Tanks			1		2		
	Height (VFR) / Effective Height (HFR)	H _S / H _E	ft	Eq. 1-15	12.0		8.0	
	Annual Sum of Liquid Level Increases	ΣH _{QI}	ft/yr	Eq. 1-37	36.3		166.7	
	Turnovers	N	-	Eq. 1-36	3.6		27.8	
	Annual Throughput	Q	bbl/yr		286		1,143	
	Net Working Loss Throughput	V _Q	ft ³ /yr	Eq. 1-38	1,604.0		6,416.0	
	Average Liquid Height	H _L	ft		6.0		4.0	
	Diameter/Effective Diameter (HFR only)	D / D _e	ft		7.5		7.0	
	Tank Max Liquid Volume		gal		4,242		2,562	
	Maximum Hourly Throughput Rate	V _Q	bbl ft ³	Eq. 1-38	101	567	61	342
	Roof Outage / Vapor Space Outage	H _{RO} / H _{VO}	ft	Eq. 1-16, 17, 18, or 20	0.08	6.08	0.07	4.07
	Breather Vent Vacuum / Pressure Setting	P _{BV} / P _{BP}	psig	Eq. 1-10	-0.03	0.03	-0.03	0.03
	Paint Color Paint Paint Condition			Tbl. 7.1-6	Green, Dark	Average	Green, Dark	Average
	Solar Absorptance	α		Tbl. 7.1-6	0.9		0.9	
	AP-42 or OTHER Defined Liquid				No. 6 Fuel Oil		No. 6 Fuel Oil	
	Vapor Pressure Calculation Method				RVP Correlation Eqn		RVP Correlation Eqn	
	Vapor Molecular Weight	M _V	lb/lb-mole		130.00		130.00	
	Reid Vapor Pressure	RVP	psi		--		--	
Vapor Pressure Constant	A	dimensionless	Fig. 7.1-15 or 7.1-16	10.781		10.781		
Vapor Pressure Constant	B	°C	Fig. 7.1-15 or 7.1-16	8933.0		8933.0		
Parameter Name & Variable		Units	AP-42 Ch. 7 Reference	Short-term	Annual	Short-term	Annual	
Climatological & Calculated Product Data	Daily Total Solar Insolation Factor	I		2081.00	1477.00	2081.00	1477.00	
	Atmospheric Pressure			14.27	14.27	14.27	14.27	
	Daily Maximum Ambient Temperature	T _{AX}	°F	95.00	79.80	95.00	79.80	
	Daily Minimum Ambient Temperature	T _{AN}	°F	75.30	59.50	75.30	59.50	
	Daily Ambient Temp. Change	ΔT _A	°R	Eq. 1-11	19.70	20.30	19.70	20.30
	Daily Avg. Ambient Temperature	T _{AA}	°R	Eq. 1-30	544.82	529.32	544.82	529.32
	Liquid Bulk Temperature	T _B	°R	Eq. 1-31	550.44	533.31	550.44	533.31
	Daily Avg. Liquid Surface Temperature	T _{LA}	°R	Eq. 1-28	557.56	538.36	557.56	538.36
	Daily Max. Avg. Liq. Surf. Temp.	T _{LX}	°R	Fig. 7.1-17	570.37	548.56	570.37	548.56
	Daily Min. Avg. Liq. Surf. Temp.	T _{LN}	°R	Fig. 7.1-17	544.74	528.16	544.74	528.16
	Avg. Vapor Temperature	T _V	°R	Eq. 1-33	563.36	542.48	563.36	542.48
	Daily Vapor Temperature Range	ΔT _V	°R	Eq. 1-7	51.25	40.80	51.25	40.80
	True Vapor Pressure @ T _{LA}	P _{VA}	psia	Eq. 1-25	0.01	0.00	0.01	0.00
	True Vapor Pressure @ T _{LX}	P _{VX}	psia	Eq. 1-25	0.01	0.00	0.01	0.00
	True Vapor Pressure @ T _{LN}	P _{VN}	psia	Eq. 1-25	0.00	0.00	0.00	0.00
	Daily Vapor Pressure Range	ΔP _V	psia	Eq. 1-9	0.00	0.00	0.00	0.00
	Vapor Space Expansion Factor	K _E		Eq. 1-5 or 1-12	0.09	0.07	0.09	0.07
	Vented Vapor Saturation Factor	K _S	dimensionless	Eq. 1-21	1.00	1.00	1.00	1.00
	Working Loss Product Factor Turnover Factor	K _P K _N	dimensionless	Eq. 1-35	0.75	1.00	0.75	1.00
	Vent Setting Correction Factor	K _B	dimensionless	Eq. 1-41	1.00	1.00	1.00	1.00
	Vapor Space Volume	V _V	ft ³	Eq. 1-3	268.52		156.74	
	Vapor Density	W _V	lb/ft ³	Eq. 1-22	0.00	0.00	0.00	0.00
	Breathing/Working Emissions Calculations				lb/hr	tpy	lb/hr	tpy
	Total Stream Uncontrolled, Standing Emissions	L _S		Eq. 1-2	2.82E-03	2.42E-04	3.29E-03	2.83E-04
Total Stream Uncontrolled, Working Emissions	L _W		Eq. 1-35	0.05	4.05E-05	0.06	3.24E-04	
Total Stream Uncontrolled Emissions	L_T		Eq. 1-1	0.05	2.82E-04	0.06	6.07E-04	
Breathing/Working Vapor Composition ^{[1], [2]}	TOC		(wt%)	100.00%		100.00%		
Breathing/Working Vapor Composition ^{[1], [2]}	Total VOC		(wt%)	100.00%		100.00%		
Breathing/Working Vapor Composition ^{[1], [2]}	H ₂ S		(wt%)	0.00%		0.00%		
Breathing/Working Vapor Composition ^{[1], [2]}	Total HAPs		(wt%)	4.03%		4.03%		
Uncontrolled Breathing/Working Emissions ^[3]			Total VOC	0.05	2.82E-04	0.06	6.07E-04	
Uncontrolled Breathing/Working Emissions ^[3]			Total HAPs	2.07E-03	1.14E-05	2.49E-03	2.44E-05	
Total Uncontrolled Emissions			Total VOC	0.05	2.82E-04	0.06	6.07E-04	
Total Uncontrolled Emissions			Total HAPs	2.07E-03	1.14E-05	2.49E-03	2.44E-05	

[1] Stream composition(s) based on Conservative Liquid Analysis (Assumed 100% VOC) sample.

[2] See Analyses in Appendix D for basis of stream composition weight percents.

[3] Total VOC includes HAPs.

**Table A-5
Fixed Roof Tank Losses**

Permian Highway Pipeline, LLC - Praha Compressor Station
January 2020

FIN				TK-MISC		
FIN Name				Miscellaneous Tanks		
EPN				TK-CAP		
Parameter Name & Variable		Units	Reference			
Tank and Product Data	Product Stored Category			Misc. Chemical		
	Product Stored Type			Refined		
	Tank Type			VFR		
	Fixed Roof Type		N/A for horizontal tanks	Cone		
	Constant-Level Tank?		Yes/No	No		
	Tank Capacity		bbl	12		
	Number of Tanks			4		
	Height (VFR) / Effective Height (HFR)	H_S / H_E	ft	Eq. 1-15	6.0	
	Annual Sum of Liquid Level Increases	$\sum H_{QI}$	ft/yr	Eq. 1-37	50.8	
	Turnovers	N	-	Eq. 1-36	12.7	
	Annual Throughput	Q	bbl/yr		100	
	Net Working Loss Throughput	V_Q	ft ³ /yr	Eq. 1-38	561.4	
	Average Liquid Height	H_L	ft		3.0	
	Diameter/Effective Diameter (HFR only)	D / D_e	ft		3.8	
	Tank Max Liquid Volume		gal		504	
	Maximum Hourly Throughput Rate	V_Q	bbl ft ³	Eq. 1-38	12	67
	Roof Outage / Vapor Space Outage	H_{RO} / H_{VO}	ft	Eq. 1-16, 17, 18, or 20	0.04	3.04
	Breather Vent Vacuum / Pressure Setting	P_{BV} / P_{BP}	psig	Eq. 1-10	-0.03	0.03
	Paint Color Paint Paint Condition			Tbl. 7.1-6	Green, Dark	Average
	Solar Absorptance	α		Tbl. 7.1-6	0.9	
	AP-42 or OTHER Defined Liquid				Jet Kerosene (Jet A)	
	Vapor Pressure Calculation Method				RVP Correlation Eqn	
	Vapor Molecular Weight	M_V	lb/lb-mole		130.00	
	Reid Vapor Pressure	RVP	psi		--	
Vapor Pressure Constant	A	dimensionless	Fig. 7.1-15 or 7.1-16	12.390		
Vapor Pressure Constant	B	°C	Fig. 7.1-15 or 7.1-16	8933.0		
Parameter Name & Variable		Units	AP-42 Ch. 7 Reference	Short-term	Annual	
Climatological & Calculated Product Data	Daily Total Solar Insolation Factor	I	Btu/ft ²	2081.00	1477.00	
	Atmospheric Pressure		psia	14.27	14.27	
	Daily Maximum Ambient Temperature	T_{AX}	°F	95.00	79.80	
	Daily Minimum Ambient Temperature	T_{AN}	°F	75.30	59.50	
	Daily Ambient Temp. Change	ΔT_A	°R	Eq. 1-11	19.70	20.30
	Daily Avg. Ambient Temperature	T_{AA}	°R	Eq. 1-30	544.82	529.32
	Liquid Bulk Temperature	T_B	°R	Eq. 1-31	550.44	533.31
	Daily Avg. Liquid Surface Temperature	T_{LA}	°R	Eq. 1-28	557.56	538.36
	Daily Max. Avg. Liq. Surf. Temp.	T_{LX}	°R	Fig. 7.1-17	570.37	548.56
	Daily Min. Avg. Liq. Surf. Temp.	T_{LN}	°R	Fig. 7.1-17	544.74	528.16
	Avg. Vapor Temperature	T_V	°R	Eq. 1-33	563.36	542.48
	Daily Vapor Temperature Range	ΔT_V	°R	Eq. 1-7	51.25	40.80
	True Vapor Pressure @ T_{LA}	P_{VA}	psia	Eq. 1-25	0.03	0.01
	True Vapor Pressure @ T_{LX}	P_{VX}	psia	Eq. 1-25	0.04	0.02
	True Vapor Pressure @ T_{LN}	P_{VN}	psia	Eq. 1-25	0.02	0.01
	Daily Vapor Pressure Range	ΔP_V	psia	Eq. 1-9	0.02	0.01
	Vapor Space Expansion Factor	K_E		Eq. 1-5 or 1-12	0.09	0.07
	Vented Vapor Saturation Factor	K_S	dimensionless	Eq. 1-21	1.00	1.00
	Working Loss Product Factor Turnover Factor	$K_P K_N$	dimensionless	Eq. 1-35	1.00	1.00
	Vent Setting Correction Factor	K_B	dimensionless	Eq. 1-41	1.00	1.00
	Vapor Space Volume	V_V	ft ³	Eq. 1-3	33.57	
Vapor Density	W_V	lb/ft ³	Eq. 1-22	0.00	0.00	
Breathing/Working Emissions Calculations				lb/hr	tpy	
Total Stream Uncontrolled, Standing Emissions		L_S	Eq. 1-2	0.01	6.04E-04	
Total Stream Uncontrolled, Working Emissions		L_W	Eq. 1-35	0.15	3.78E-04	
Total Stream Uncontrolled Emissions		L_T	Eq. 1-1	0.16	9.82E-04	
Breathing/Working Vapor Composition ^{[1], [2]}		TOC	(wt%)	100.00%		
Breathing/Working Vapor Composition ^{[1], [2]}		Total VOC	(wt%)	100.00%		
Breathing/Working Vapor Composition ^{[1], [2]}		H ₂ S	(wt%)	0.00%		
Breathing/Working Vapor Composition ^{[1], [2]}		Total HAPs	(wt%)	4.03%		
Uncontrolled Breathing/Working Emissions ^[3]		Total VOC		0.16	9.82E-04	
Uncontrolled Breathing/Working Emissions ^[3]		Total HAPs		0.01	3.96E-05	
Total Uncontrolled Emissions		Total VOC		0.16	9.82E-04	
Total Uncontrolled Emissions		Total HAPs		0.01	3.96E-05	

[1] Stream composition(s) based on Conservative Liquid Analysis (Assumed 100% VOC) sample.

[2] See Analyses in Appendix D for basis of stream composition weight percents.

[3] Total VOC includes HAPs.

Table A-6 Loading Emissions

Permian Highway Pipeline, LLC - Praha Compressor Station
January 2020

Basis			
	FIN	TRKLOAD	
	Name	Truck Loading	
	Loading Type [1]	Truck Loading - dedicated normal service	
	Product Loaded	Oil/Condensate	
	Truck Loading: Tank Truck Volume (gallons)	8,400	
	Annual Throughput Product Loaded (bbl/yr)	2,786	
Control Device			
	Primary Control Device	None (uncontrolled/vented)	
Loading Loss Calculation			
		Hourly Annual	
	S, Saturation Factor	0.6	
	M, Molecular Weight of Vapors (lb/lb-mole)	60.0	
	P, True vapor pressure of liquid loaded (psia)	14.92 10.24	
	T, Temperature of bulk liquid loaded (°F)	95.00 70.76	
	Loading Loss, L_L (lb _{TOC} /1,000 gal loaded)	12.064 8.659	
	Loading Rate (gal)	8,400 117,000	
Emission Calculations			
		lb/hr tpy	
	Total Stream Uncontrolled Emissions [2]	101.34 0.51	
Stream Composition [3] (Wt %)	TOC	100.00%	
	Total VOC	100.00%	
	Total HAPs	4.03%	
Emissions Summary		Truck Loading	
Total Emissions			
		lb/hr tpy	
	FIN/EPN	TRKLOAD/TRKLOAD	
	Total VOC	101.34 0.51	
	Total HAPs	4.08 0.02	

[1] Emissions from tank truck loading are calculated in accordance with US EPA's AP-42 Ch. 5.2 and TCEQ's Guidance APDG 6217 V2, November 2013 for submerged loading: dedicated normal service (S=0.6), using annual average throughput. Maximum hourly loading rate is based on the volume of the tank truck.

[2] Total Stream Uncontrolled Emissions are based on Loading Loss / TOC Wt%.

[3] See Analyses in Appendix D for basis of vapor composition weight percents.

Calculation Method

$$L_L = 12.46 \times S \times P \times M / T$$

L_L = loading loss, lbs TOC/1,000 gals of liquid loaded (AP-42, Chapter 5, Section 5.2-4)

S = saturation factor from AP-42, Table 5.2-1

P = true vapor pressure of liquid loaded (psia)

M = molecular weight of vapors (lb/lb-mole)

T = temperature of bulk liquid loaded (°R)

$M_v, T_{LX}, T_B, P_{vX}, P_{vA}$, from AP-42 Tanks Calculations
Per TCEQ Guidance APDG6217v2, hourly emissions use T_{LX} in place of bulk liquid temperature (minimum of 95°F). Annual emissions use annual average T_B .

Appendix B
MSS Emission Calculations

Table B-1

Planned MSS Emissions Summary

Permian Highway Pipeline, LLC - Praha Compressor Station

January 2020

Source Name	MSS Emissions Cap
Emission Cap EPN	MSS

MSS Activity Description	FIN	Table No.	Emission Rates					
			VOC		NOx		CO	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Turbine Start-up & Shutdown	MSS-TURB-SS	B-2	21.00	0.18	7.00	0.14	207.00	2.20
MSS Miscellaneous/General Maintenance	MSS-MISC	B-3	20.64	2.06	--	--	--	--
Pipeline Pigging, Turbine Blowdowns	MSS-PIG, MSS-TURB	B-4	86.78	3.80	--	--	--	--
Totals			86.78	6.04	7.00	0.14	207.00	2.20

Notes:

- The basis of these emission calculations (i.e. volume, stream composition, frequency) are conditions used to establish a potential to emit and should not be interpreted as representations of a specific activity or condition under 30 TAC §116.116(a). Individual activities performed in this MSS category may have slight variations in procedure or equipment configuration.
- The MSS emission calculations included in this permit application are for cap calculation purposes only. These emission calculations are not to be considered enforceable representations as to the magnitude, duration, and/or frequency of individual activities.
- The total hourly emission represented are the maximum emissions from MSS activities that could potentially occur in the same hour.

Table B-2

Planned MSS Emissions - Turbine Start-up & Shutdown

Permian Highway Pipeline, LLC - Praha Compressor Station

January 2020

Calculation Basis: The turbines are shutdown periodically for planned maintenance. The emissions released during the shutdown and start-up of the turbines based on manufacturer's data are presented here.

$$\text{Annual Emissions (tpy)} = \text{Emission rate (lb/event)} \times \text{Number of Events} \times \text{Number of Turbines} / 2,000 \text{ lb/ton}$$

FIN	MSS-TURB-SS	EPN	MSS-TURB-SS
Name	MSS Turbine Start-up/Shutdown Events		

Basis		
Turbine Model	Titan 250	Totals
Total Number of Turbines	2	
Annual Events (per Turbine)	36	
Event Duration (hr)	1	
Total Number of Events	72	72
Start-up Emissions ^[1]		
NOx (lb/event)	2.0	3
CO (lb/event)	38.0	93
VOC (lb/event)	3.0	10
Shutdown Emissions ^[1]		
NOx (lb/event)	2.0	4
CO (lb/event)	23.0	114
VOC (lb/event)	2.0	11

[1] Start-up and Shutdown emissions are from Tables 2 and 3 of Solar Turbines Product Information Letter (PIL170 Revision 9, Sep 10, 2018)

Emissions Calculations

Pollutant	Start-up/Shutdown Titan 250	Total Emissions	
	lb/yr	lb/hr ^[2]	tpy
NOx	288.00	7.00	0.14
CO	4,392.00	207.00	2.20
VOC	360.00	21.00	0.18

[2] Conservatively assumes that the start-up and shutdown of all turbines would occur in the same hour.

Note: The basis of these emission calculations (i.e. volume, stream composition, frequency) are conditions used to establish a potential to emit and should not be interpreted as representations of a specific activity or condition under 30 TAC §116.116(a). Individual activities performed in this MSS category may have slight variations in procedure or equipment configuration.

Table B-3

Planned MSS Emissions - Miscellaneous Venting

Permian Highway Pipeline, LLC - Praha Compressor Station

January 2020

Calculation Basis: The volume of gas released and vented to atmosphere due to planned maintenance. Estimated emissions are based on gas flowrate, composition, molecular weight, ideal gas constant.

$$\text{Annual Emissions (tpy)} = \text{Annual Venting Volume (scf/yr)} \times \text{MW (lb/lb-mol)} / \text{Ideal Gas Law Constant (scf/lb-mol)} / 2,000 \text{ lb/ton}$$

$$\text{Ideal Gas Law (scf/lb-mol)} = R \times (459.67 \text{ }^\circ\text{R} + \text{Atm. Temperature (}^\circ\text{F)}) / \text{Atm Pressure (psia)}$$

FIN	MSS-MISC	EPN	MSS-MISC
Name	MSS Miscellaneous/General Maintenance		

Constants Used in Emission Calculations		
R, Ideal Gas Constant =	10.73159	(ft ³)(psi)/(lb-mol)(°R)
Ideal Gas Law =	398.07	scf/lb-mol @ ambient conditions
Annual Average Temperature =	69.65	°F (Based on MET data from San Antonio, TX)
Atmospheric Pressure =	14.27	psia (Based on MET data from San Antonio, TX)

Basis		
Hourly Venting Volume	100,000	scf/hr
Total Annual Vented Volume	20,000,000	scf/yr
MW of Gas ^[1]	16.83	lb/lb-mol

Emissions Calculations

Pollutant	Pollutant Wt.% ^[1]	Emission Rates	
		lb/hr	tpy
Total Emissions	100.00%	4,228.81	422.88
Total VOC	0.49%	20.64	2.06

[1] Gas MW and pollutant speciation taken from Representative PHP Gas Composition sample. See Analyses in Appendix D for basis of gas composition weight %.

Note: The basis of these emission calculations (i.e. volume, stream composition, frequency) are conditions used to establish a potential to emit and should not be interpreted as representations of a specific activity or condition under 30 TAC §116.116(a). Individual activities performed in this MSS category may have slight variations in procedure or equipment configuration.

Table B-4

Planned MSS - Pigging, Purging, and Blowdowns

Permian Highway Pipeline, LLC - Praha Compressor Station

January 2020

Calculation Basis & Method:

Emissions from blowdowns of compressors, piping, storage tanks, or process vessels, are due to vapors released when depressurizing the equipment from operating to atmospheric conditions. Emissions are calculated based on the Ideal Gas Law, with an estimated volume vented or sent to flare at the venting temperature and pressure.

$$\text{Total Vapor Volumetric Flowrate (scf/activity)} = \left(\frac{\text{Fraction of Empty Vessel Volume} \times \text{Volume [acf]} \times \text{Ambient Temp [}^\circ\text{R]} / \text{Max Operating Temp [}^\circ\text{R]} \times \text{Venting Pressure (venting pressure [psig] + \text{Atm Pressure [psia])} / \text{Atm Pressure [psia]} \right)$$

$$\text{Vapor Mass Flowrate (lb/activity)} = \text{Total Vapor Volumetric Flowrate [scf/activity]} / \text{Ideal Gas Law Constant [scf/lb-mol]} \times \text{Vent Gas MW [lb/lb-mol]} \times (1 - \% \text{ Reduc. for PW as Oil/Condensate})$$

$$\text{Ideal Gas Law (scf/lb-mol)} = R \times (459.67^\circ\text{R} + \text{Atm. Temperature (}^\circ\text{F)}) / \text{Atm Pressure (psia)}$$

Constants Used in Emission Calculations		
R, Ideal Gas Constant =	10.73159	(ft ³)(psi)/(lb-mol)(°R)
Ideal Gas Law =	420.89	scf/lb-mol @ ambient conditions
Daily Maximum Temperature	100.00	°F (Based on MET data from San Antonio, TX)
Atmospheric Pressure	14.27	psia (Based on MET data from San Antonio, TX)

Basis					
MSS Activity/Source Name		Pipeline Pigging	Turbine Blowdowns		
Material Type		Natural Gas	Natural Gas		
FIN(s)		MSS-PIG	MSS-TURB		
Hourly Events	events/hr	1	1		
Annual Events	events/yr	36	72		
Equipment/Vessel Length	ft	3,000	153		
Equipment/Vessel Diameter	inches	16	60		
Volume of Vented Equipment/Vessel	ft ³	4,189	3,000		
Gas Temperature Before Venting	°F	100	100		
Gas Pressure Before Venting	psig	1,500	1,500		
Liquid Heel/Clingage	%	0%	0%		
Routed to Combustion Control?	Yes/No	No	No		
Stored Material Properties					
Vapor Molecular Weight (MW)	lb/lb-mol	16.83	16.83		
Total VOC	Wt%	0.49%	0.49%		
Total HAPs	Wt%	0.00%	0.00%		
Emission Calculations					
Vapor Volume per event	scf/event	444,496.10	318,370		
Vapor Volumetric Flowrate - Annual	Mscf/yr	16,001.86	22,922.66		
Vapor Mass per event	lb/event	17,777.42	12,733.08		
Vapor Mass Flowrate - Annual	tpy	319.99	458.39		
Vented/Uncontrolled Emissions		lb/hr	tpy	lb/hr	tpy
Total VOC		86.78	1.56	62.16	2.24

[1] Vapor MW and speciation taken from the Representative PHP Gas Composition sample(s). See Analyses in Appendix D for basis of vapor composition weight %.

Note: The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific facility or activity condition under 116.116(a). Individual activities in this MSS category which are performed may have slight variations in procedure or equipment configuration.

Appendix C
TCEQ Tables

Texas Commission on Environmental Quality
Table 31
Combustion Turbines

Equipment Information	
Manufacturer:	Solar
Model No.:	Titan 250 E (31900S)
Serial No.:	TBD
Emission Point Number (EPN) From Table 1(a):	TURB1, TURB2
Turbine Application	
<input type="checkbox"/> Electric Generation	<input type="checkbox"/> Base Load
<input type="checkbox"/> Other (specify):	<input type="checkbox"/> Peaking
	<input type="checkbox"/> Load Following
	<input checked="" type="checkbox"/> Gas Compression
Cycle	
<input checked="" type="checkbox"/> Simple Cycle: 8760 hr/yr	<input type="checkbox"/> Regenerative Cycle
	<input type="checkbox"/> Cogeneration
	<input type="checkbox"/> Combined Cycle
Model represented is based on (<i>see 30 TAC § 116.116(a)</i>):	
<input checked="" type="checkbox"/> Preliminary Design	<input type="checkbox"/> Contract Award
	<input type="checkbox"/> Other (specify):
Nominal Power Output at Baseload, ISO:	32,981
	<input type="checkbox"/> MW
	<input checked="" type="checkbox"/> HP
Manufacturer's rated gross heat rate at baseload at expected conditions (efficiency in BTU/hp-hr):	
	6,249
Fuel Data	
Primary Fuels:	
<input checked="" type="checkbox"/> Natural Gas (Sulfur content	<u>0.06</u> gr S/100 dscf; LHV <u>939</u> Btu/scf)
<input type="checkbox"/> Process Offgas	<input type="checkbox"/> Landfill/Digester Gas
<input type="checkbox"/> Other (specify):	<input type="checkbox"/> Fuel Oil
	<input type="checkbox"/> Refinery Gas
Backup Fuels:	
<input checked="" type="checkbox"/> Not Provided	<input type="checkbox"/> Process Offgas
	<input type="checkbox"/> Ethane
	<input type="checkbox"/> Fuel Oil
	<input type="checkbox"/> Refinery Gas
	<input type="checkbox"/> Other (specify):
If using fuels other than natural gas, attach fuel analyses, including maximum sulfur content, heating value (specify LHV or HHV) and mole percent of gaseous constituents.	
Emissions Data	
Attach manufacturer's information showing emissions of NO _x , CO, VOC, SO _x , and PM for each proposed fuel at turbine loads and site ambient temperatures representative of the range of proposed operation. The information must be sufficient to determine maximum hourly and annual emission rates. Annual emissions may be based on a conservatively low approximation of site annual average temperature. Provide emissions in pounds per hour and except for PM, parts per million by volume at actual conditions and corrected to dry, 15% oxygen conditions. In Table 1(a), provide speciation of PM/PM ₁₀ /PM _{2.5} .	
Method of Emission Control:	
<input type="checkbox"/> Lean Premix Combustors	<input type="checkbox"/> Oxidation Catalyst
<input checked="" type="checkbox"/> Low-NO _x Combustors	<input type="checkbox"/> SCR Catalyst
<input type="checkbox"/> Other (specify):	<input type="checkbox"/> Water Injection
	<input type="checkbox"/> Steam Injection

**Texas Commission on Environmental Quality
Table 29 Reciprocating Engines**

I. Engine Data					
Manufacturer: Cummins	Model No. GTA50E	Serial No. tbd	Manufacture Date: TBD		
Rebuild Date:	No. of Cylinders	Compression Ratio:	EPN: GEN1, GEN2		
Application: <input type="checkbox"/> Gas Compression <input type="checkbox"/> Spark Ignited <input type="checkbox"/> Naturally Aspirated <input type="checkbox"/> Carbureted <input checked="" type="checkbox"/> 4 Stroke Cycle <input type="checkbox"/> Electric Generation <input type="checkbox"/> Rich Burn <input type="checkbox"/> I.C. Water Temperature <input type="checkbox"/> Dual Fuel <input type="checkbox"/> 2 Stroke Cycle <input type="checkbox"/> Refrigeration <input checked="" type="checkbox"/> Lean Burn <input type="checkbox"/> Turbo Chrg and I.C. <input type="checkbox"/> Fuel Inject. <input type="checkbox"/> Intercooled <input checked="" type="checkbox"/> Emergency/ Stand by <input type="checkbox"/> Diesel <input type="checkbox"/> Blower/Pump Scavenge <input type="checkbox"/> Turbo Chrg					
Ignition/Injection Timing: Fixed:		Variable:			
Manufacture Horsepower Rating: 1,135		Proposed Horsepower Rating: 1,135			
Discharge Parameters					
Stack Height (Feet)	Stack Diameter (Feet)	Stack Temperature (°F)	Exit Flowrate (cfm)		
23.00	0.83	1261	7,432		
II. Fuel Data					
Type of Fuel: <input type="checkbox"/> Field Gas <input checked="" type="checkbox"/> Natural Gas <input type="checkbox"/> Digester Gas					
<input type="checkbox"/> Landfill Gas <input type="checkbox"/> LP Gas <input type="checkbox"/> Diesel					
Fuel Consumption (BTU/bhp-hr): 8,919		Heat Value: 939 Btu/scf (HHV) (LHV)			
Sulfur Content (grains/100 scf - weight %): 0.06					
III. Emission Factors (Before Control)					
NOx	CO	SO ₂	VOC	Formaldehyde	PM ₁₀
g/hp-hr	g/hp-hr	lb/MMBtu	g/hp-hr	g/hp-hr	lb/MMBtu
1.000	2.000	0.001	0.700	0.560	0.000
Source of Emission Factors: <input type="checkbox"/> Manufacturer Data <input checked="" type="checkbox"/> AP-42 <input checked="" type="checkbox"/> Other (specify): NSPS JJJJ Limits.					
IV. Emission Factors (Post Control)					
NOx	CO	SO ₂	VOC	Formaldehyde	PM ₁₀
g/hp-hr	g/hp-hr	lb/MMBtu	g/hp-hr	g/hp-hr	lb/MMBtu
1.000	2.160	0.001	0.980	0.980	0.000
Method of Emission Control: <input type="checkbox"/> NSCR Catalyst <input checked="" type="checkbox"/> Lean Operation <input type="checkbox"/> Parameter Adjustment					
<input type="checkbox"/> Stratified Charge <input type="checkbox"/> JLCC Catalyst <input checked="" type="checkbox"/> Other (specify): Catalyst					
<i>Note: Must submit a copy of any manufacturer control information that demonstrates control efficiency.</i>					
Is Formaldehyde included in the VOCs? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
V. Federal and State Standards (Check all that apply)					
<input checked="" type="checkbox"/> NSPS JJJJ <input checked="" type="checkbox"/> MACT ZZZZ <input type="checkbox"/> NSPS IIII <input type="checkbox"/> 30 TAC 117- County:					
VI. Additional Information					
1. Submit a copy of the engine manufacturer's site rating or general rating specification data.					
2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents.					
3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).					

Appendix D
Supporting Documentation

Table D-1
List of Acronyms and Abbreviations

°C	Degrees Celsius
°F	Degrees Fahrenheit
30 TAC	Title 30 of the Texas Administration Code
40 CFR	Title 40 of the United States Code of Federal Regulations
µg/m ³	Microgram per cubic meter
acfm	Actual cubic feet per minute
AP-42	Air Pollutant Emissions Factors, 5 th ed
APD	Air Permits Division
APIRT	Air Permits Initial Review Team
BACT	Best Available Control Technology
bbbl	Barrel
bbbl/day	Barrels per day
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
Btu/scf	British thermal unit per standard cubic foot
C ₃	VOC with three Carbons (i.e. Propane)
C ₄₊	VOCs with four or more Carbons
cfm	Cubic feet per minute
CO ₂	Carbon dioxide
DRE	Destruction rate efficiency
dscf	Dry standard cubic foot
EPN	Emission point number
ESL	Effects Screening Level
FIN	Facility Identification Number
ft	Feet
ft/sec	Feet per second
gal/yr	Gallon(s) per year
H ₂ S	Hydrogen sulfide
HAP	Hazardous Air Pollutant
hp	Horsepower
hr	Hour
ICE	Internal combustion engine
lb	Pound
lb/hr	Pound(s) per hour

Table D-1**List of Acronyms and Abbreviations**

lb/MMBtu	Pounds per million British thermal units
lb/day	Pound(s) per day
MMBtu/hr	Million British thermal units per hour
MMscfd	Million standard cubic feet per day
MSS	Maintenance, Start-up, and Shutdown
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standards for Hazardous Air Pollutants
NNSR	Nonattainment New Source Review
NO ₂	Nitrogen dioxide
NO _x	Nitrogen oxides
NSR	New Source Review
NSPS	New Source Performance Standard
OGS	Oil and gas site
PBR	Permit(s) by Rule
PM	Particulate Matter
PM ₁₀	Particulate matter ≤ 10 microns
PM _{2.5}	Particulate matter ≤ 2.5 microns
ppm _v	Parts per million by volume
ppm _w	Parts per million by weight
PSD	Prevention of Significant Deterioration
psi	Pound per square inch
psia	Pound per square inch, absolute
psig	Pound per square inch, gage
PTE	Potential to emit
RICE	Reciprocating Internal Combustion Engine
RQ	Reportable Quantity
RVP	Reid Vapor Pressure
scfh	Standard cubic feet per hour
scfm	Standard cubic feet per minute
SCREEN3	Air dispersion model screening tool, based on US EPA's ISC3 air dispersion model
SI	Spark ignited
SIC	Standard Industrial Classification System
SO ₂	Sulfur dioxide

Table D-1

List of Acronyms and Abbreviations

TAC	Texas Administrative Code
TCAA	Texas Clean Air Act
TCEQ	Texas Commission on Environmental Quality
THSC	Texas Health and Safety Code
tpy	Tons per year
US EPA	United States Environmental Protection Agency
VFR	Vertical fixed roof
VOC	Volatile organic compounds

Appendix D - Gas Analysis

Permian Highway Pipeline, LLC - Praha Compressor Station

Gas Composition				
Analysis Identifier/Name	Solar Turbine Fuel Gas			
Site-specific or Representative?	Site-specific Sample			
Who analyzed the sample?	--			
Date of sample	--			
Temperature (F)	--	Pressure (psig)		--
Component	mole %	Molecular Weight (grams/mole)	Net Heating Value (Btu/scf)	Weight % of Total Sample
hydrogen	0.00%	2.02	273.93	0.00%
helium	0.00%	4.00	0	0.00%
nitrogen	1.51%	28.01	0	2.45%
CO2	0.44%	44.01	0	1.12%
H2S	0.0001%	34.08	586.8	0.00%
methane (C1)	92.79%	16.04	909.4	86.09%
ethane (C2)	4.16%	30.07	1618.7	7.23%
propane (C3)	0.84%	44.10	2314.9	2.14%
iso-butane (C4)	0.00%	58.12	3000.4	0.00%
n-butane (C4)	0.18%	58.12	3010.8	0.61%
iso-pentane (C5)	0.00%	72.15	3699	0.00%
n-pentane (C5)	0.04%	72.15	3703.9	0.17%
hexanes (C6)	0.04%	86.17	4403.9	0.20%
heptanes (C7)	0.00%	100.20	5100.3	0.00%
octanes (C8)	0.00%	114.23	5796.2	0.00%
nonanes (C9)	0.00%	128.26	6493.6	0.00%
decanes (C10+)	0.00%	142.29	7189.9	0.00%
n-hexanes	0.00%	86.17	4403.9	0.00%
2,2,4-trimethylpentane	0.00%	114.23	5559.2	0.00%
benzene	0.00%	78.11	3590.9	0.00%
toluene	0.00%	92.14	4273.6	0.00%
ethylbenzene	0.00%	106.17	4970.5	0.00%
xylenes (M,P,O)	0.00%	106.17	4958.2	0.00%
TOTALS:	100.00%			100.00%

Molecular Weight (lb/lb-mol)	17.29
Net Heating Value (Btu/scf)	939.3
Gross Heating Value <i>dry basis</i> (Btu/scf)	n/a
Specific Gravity*	0.60

TOC wt%	96.43%
Total VOC wt%	3.11%
VOC (C ₄₊) wt%	0.97%
Total HAPs wt%	0.00%

H2S Concentration	1 ppmv (Sweet)	0.1 grains/100 scf	0.0002 wt%

Notes:

- See Solar Turbines emission performance sheet.

Constants: 28.97 MWair (lb/lb-mol) 453.59237 mol/lb-mol
 398.07 scf/lb-mol* 0.06479891 grams/grain
 *Ideal Gas Law in San Antonio, TX = 10.73159 scf/psi / (°R/lb-mol) x (459.67 °R + TAX °F) / atm P (psia)

Appendix D - Gas Analysis

Permian Highway Pipeline, LLC - Praha Compressor Station

Gas Composition				
Analysis Identifier/Name	Representative PHP Gas Composition			
Site-specific or Representative?	Representative Sample (See notes below)			
Who analyzed the sample?	--			
Date of sample	--			
Temperature (F)	--		Pressure (psig)	--
Component	mole %	Molecular Weight (lb/lb-mol)	Net Heating Value (Btu/scf)	Weight % of Total Sample
hydrogen	0.00%	2.02	273.93	0.00%
helium	0.00%	4.00	0	0.00%
nitrogen	1.95%	28.01	0	3.25%
CO2	0.09%	44.01	0	0.24%
H2S	0.0000%	34.08	586.8	0.00%
methane (C1)	94.36%	16.04	909.4	89.92%
ethane (C2)	3.42%	30.07	1618.7	6.10%
propane (C3)	0.18%	44.10	2314.9	0.47%
iso-butane (C4)	0.00%	58.12	3000.4	0.01%
n-butane (C4)	0.00%	58.12	3010.8	0.01%
iso-pentane (C5)	0.00%	72.15	3699	0.00%
n-pentane (C5)	0.00%	72.15	3703.9	0.00%
hexanes (C6)	0.00%	86.17	4403.9	0.00%
heptanes (C7)	0.00%	100.20	5100.3	0.00%
octanes (C8)	0.00%	114.23	5796.2	0.00%
nonanes (C9)	0.00%	128.26	6493.6	0.00%
decanes (C10+)	0.00%	142.29	7189.9	0.00%
n-hexanes	0.00%	86.17	4403.9	0.00%
2,2,4-trimethylpentane	0.00%	114.23	5559.2	0.00%
benzene	0.00%	78.11	3590.9	0.00%
toluene	0.00%	92.14	4273.6	0.00%
ethylbenzene	0.00%	106.17	4970.5	0.00%
xylenes (M,P,O)	0.00%	106.17	4958.2	0.00%
TOTALS:	100.00%			100.00%

Molecular Weight (lb/lb-mol)	16.83
Net Heating Value (Btu/scf)	917.7
Gross Heating Value <i>dry basis</i> (Btu/scf)	n/a
Specific Gravity*	0.58

TOC wt%	96.51%
Total VOC wt%	0.49%
VOC (C₄₊) wt%	0.02%
Total HAPs wt%	0.00%

H2S Concentration	0 ppmv (Sweet)	0.0 grains/100 scf	0.0 wt%

Notes:

- Expected representative composition of gas which originates from the same basin as the gas that will be processed at the Praha Compressor Station.

Constants: 28.97 MWair (lb/lb-mol) 453.59237 mol/lb-mol
 398.07 scf/lb-mol* 0.06479891 grams/grain
 *Ideal Gas Law in San Antonio, TX = 10.73159 scf/psi / (°R/lb-mol) x (459.67 °R + TAX °F) / atm P (psia)

Customer KM-PS4	
Job ID PD 4B042	
Inquiry Number	
Run By Aileen D Fahme	Date Run 6-Sep-19

Engine Model TITAN 250-31900S CS/MD 59F MATCH	
Fuel Type SD NATURAL GAS	Water Injection NO
Engine Emissions Data REV. 1.1	

NOx EMISSIONS

CO EMISSIONS

UHC EMISSIONS

1	32981 HP	100.0% Load	Elev. 500 ft	Rel. Humidity 60.0%	Temperature 0 Deg. F
----------	-----------------	--------------------	---------------------	----------------------------	-----------------------------

PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	54.10	54.90	31.44
lbm/MMBtu (Fuel LHV)	0.060	0.061	0.035
lbm/(MW-hr)	0.50	0.51	0.29
(gas turbine shaft pwr) lbm/hr	12.35	12.53	7.18

2	33030 HP	100.0% Load	Elev. 500 ft	Rel. Humidity 60.0%	Temperature 25.0 Deg. F
----------	-----------------	--------------------	---------------------	----------------------------	--------------------------------

PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	54.32	55.12	31.57
lbm/MMBtu (Fuel LHV)	0.060	0.061	0.035
lbm/(MW-hr)	0.50	0.51	0.29
(gas turbine shaft pwr) lbm/hr	12.40	12.58	7.21

3	31703 HP	100.0% Load	Elev. 500 ft	Rel. Humidity 60.0%	Temperature 50.0 Deg. F
----------	-----------------	--------------------	---------------------	----------------------------	--------------------------------

PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	52.29	53.06	30.39
lbm/MMBtu (Fuel LHV)	0.060	0.061	0.035
lbm/(MW-hr)	0.51	0.51	0.29
(gas turbine shaft pwr) lbm/hr	11.94	12.11	6.94

Notes

- For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
- Solar's SoLoNOx warranty, for ppm values, is available for greater than -20 deg F, and between 40% and 100% load for gas fuel.
- Fuel must meet Solar standard fuel specification ES 9-98. Emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
- If needed, Solar can provide Product Information Letters to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
- Solar can provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
- Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

Customer KM-PS4	
Job ID PD 4B042	
Inquiry Number	
Run By Aileen D Fahme	Date Run 6-Sep-19

Engine Model TITAN 250-31900S CS/MD 59F MATCH	
Fuel Type SD NATURAL GAS	Water Injection NO
Engine Emissions Data REV. 1.1	

NOx EMISSIONS

CO EMISSIONS

UHC EMISSIONS

4	28352 HP	100.0% Load	Elev. 500 ft	Rel. Humidity 60.0%	Temperature 75.0 Deg. F
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PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	47.71	48.41	27.73
lbm/MMBtu (Fuel LHV)	0.059	0.060	0.034
lbm/(MW-hr)	0.52	0.52	0.30
(gas turbine shaft pwr) lbm/hr	10.89	11.05	6.33

5	24317 HP	100.0% Load	Elev. 500 ft	Rel. Humidity 60.0%	Temperature 100.0 Deg. F
----------	-----------------	--------------------	---------------------	----------------------------	---------------------------------

PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	42.35	42.97	24.61
lbm/MMBtu (Fuel LHV)	0.059	0.059	0.034
lbm/(MW-hr)	0.53	0.54	0.31
(gas turbine shaft pwr) lbm/hr	9.67	9.81	5.62

6	23588 HP	100.0% Load	Elev. 500 ft	Rel. Humidity 60.0%	Temperature 105.0 Deg. F
----------	-----------------	--------------------	---------------------	----------------------------	---------------------------------

PPMvd at 15% O2	15.00	25.00	25.00
ton/yr	41.36	41.97	24.04
lbm/MMBtu (Fuel LHV)	0.058	0.059	0.034
lbm/(MW-hr)	0.54	0.54	0.31
(gas turbine shaft pwr) lbm/hr	9.44	9.58	5.49

Notes

- For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
- Solar's SoLoNOx warranty, for ppm values, is available for greater than -20 deg F, and between 40% and 100% load for gas fuel.
- Fuel must meet Solar standard fuel specification ES 9-98. Emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
- If needed, Solar can provide Product Information Letters to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
- Solar can provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
- Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

Customer KM-PS4	
Job ID PD 4B042	
Run By Aileen D Fahme	Date Run 6-Sep-19
Engine Performance Code REV. 4.20.1.23.12	Engine Performance Data REV. 1.1

Model TITAN 250-31900S
Package Type CS/MD
Match 59F MATCH
Fuel System GAS
Fuel Type SD NATURAL GAS

DATA FOR NOMINAL PERFORMANCE

Elevation	feet	500
Inlet Loss	in H2O	4.0
Exhaust Loss	in H2O	4.0
Accessory on GP Shaft	HP	42.0

		1	2	3	4	5	6
Engine Inlet Temperature	deg F	0	25.0	50.0	75.0	100.0	105.0
Relative Humidity	%	60.0	60.0	60.0	60.0	60.0	60.0
Driven Equipment Speed	RPM	6529	6619	6583	6399	6151	6104
Specified Load	HP	FULL	FULL	FULL	FULL	FULL	FULL
Net Output Power	HP	32981	33030	31703	28352	24317	23588
Fuel Flow	mmBtu/hr	206.09	207.10	199.94	183.62	165.28	162.08
Heat Rate	Btu/HP-hr	6249	6270	6307	6476	6797	6871
Therm Eff	%	40.718	40.580	40.346	39.287	37.435	37.029
Engine Exhaust Flow	lbm/hr	595527	578624	556304	514716	462651	452682
PT Exit Temperature	deg F	786	835	861	888	927	936
Exhaust Temperature	deg F	786	835	861	888	927	936

Fuel Gas Composition (Volume Percent)	Methane (CH4)	92.79
	Ethane (C2H6)	4.16
	Propane (C3H8)	0.84
	N-Butane (C4H10)	0.18
	N-Pentane (C5H12)	0.04
	Hexane (C6H14)	0.04
	Carbon Dioxide (CO2)	0.44
	Hydrogen Sulfide (H2S)	0.0001
	Nitrogen (N2)	1.51

Fuel Gas Properties	LHV (Btu/Scf)	939.2	Specific Gravity	0.5970	Wobbe Index at 60F	1215.6
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This performance was calculated with a basic inlet and exhaust system. Special equipment such as low noise silencers, special filters, heat recovery systems or cooling devices will affect engine performance. Performance shown is "Expected" performance at the pressure drops stated, not guaranteed.

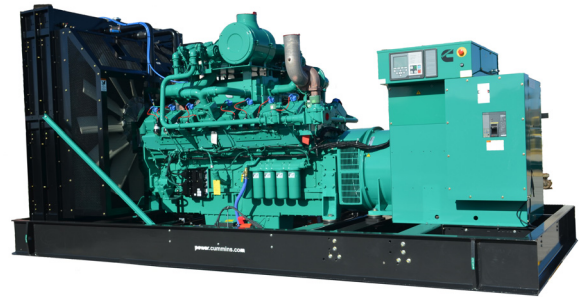


Specification sheet

Gaseous Fuel Generator Set

GTA50E Engine Series

600 kW - 750 kW 60 Hz



Description

The Cummins GTA50E-series commercial Generator Set boasts an EPA-certified, fully-integrated power generation system providing optimum performance, reliability, and versatility for stationary emergency standby power applications.

Features

- Cost-saving EPA-Certified GenSet - No Site Emissions Testing
- Accepts 100% Rated Load in a Single Step.
- Surge Rating - 110% of Nameplate
- Standard Power Command® Control (PCC) 3300 with Paralleling Capability
- Meets NFPA 110 Level 1 Type 10 Requirements for 10-Second Ready-To-Load

UL 2200 Certification - This Cummins GenSet has been designed, tested, and certified to UL 2200 standards. (See Fuel Installation Requirements on page 4.)

Warranty and Service - Backed by a comprehensive warranty and global distributor network.

Cummins Heavy-Duty Engine - Rugged 4-cycle industrial spark-ignited engine, with electronic controls, delivers reliable power, low emissions, and quick response to load changes.

Alternator - Several alternator sizes offer selectable motor-starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads, fault-clearing short-circuit capability, and class H insulation.

Control System - The PCC electronic control provides total GenSet system integration, including automatic remote starting/stopping, precise voltage regulation, alarm and status message display, AmpSentry™ protective relay, output metering, and auto-shutdown at fault detection.

National Fire Protection Association (NFPA) - The GenSet accepts full rated load in a single step in accordance with NFPA 110 Type 10 (ten seconds) for Level 1 and Level 2 Emergency or Standby Power Supply Systems (EPSSs).

Model	Standby Power Rating*		Emissions Compliance	Engine Data sheet
	60 Hz			
	kW (kVa)			
C600N6	600 (750)		EPA SI NSPS Stationary Emergency Certified	FR60378
C650N6	650 (813)		EPA SI NSPS Stationary Emergency Certified	
C750N6	750 (937)		EPA SI NSPS Stationary Emergency Certified	

* Tested at 0.8 power factor (PF) per NFPA 110.

GenSet Specifications

Voltage Regulation, No Load to Full Load	±1%
Random Voltage Variation	±1% (Three-phase only.)
Frequency Regulation	Isochronous
Random Frequency Variation	±0.5%
Radio Frequency Interference	Optional PMG excitation operates in compliance with BS800 and VDE level G and N. Addition of RFI protection kit allows operation per MIL-STD-461 and VDE level K.

Engine Specifications

Base Engine	Cummins Model GTA50E
Displacement	50.3 L (3069 in ³)
Overspeed Limit	2100 rpm
Regenerative Power	TBD
Cylinder Block Configuration	Cast iron with replaceable wet cylinder liners
Cranking Current	1800 CCA at ambient temperature of 0 °C (32 °F)
Battery Charging Alternator	43 amps
Battery Type	8D (x4)
Starting Voltage	24-volt, negative ground
Standard Cooling System	See derates on Engine Data Sheet
Lube Oil Filter Types	Four spin-on canisters-combination full flow with bypass

Alternator Specifications

Design	Brushless, 4-pole, drip-proof revolving field
Stator	2/3 pitch
Rotor	Direct-coupled by flexible disc
Insulation System	Class H per NEMA MG1-1.65 or better
Standard Temperature Rise *	125 °C
Exciter Type	Permanent Magnet Generator (PMG)
Phase Rotation	A (U), B (V), C (W)
Alternator Cooling	Direct-drive centrifugal blower

* For UL 1004 ratings, refer to temperature rise at 120 °C or below, and ambient temperature up to 40 °C.

Full-load Amperage (FLA) at Rated Voltage

Model	Fuel Type	Voltage								
		120/240 (1 Ph)	120/208	127/220	139/240	220/380	240/416	254/440	277/480	347/600
C600N6	NG	N/A	2082	1968	1804	1140	1041	984	902	722
C650N6	NG	N/A	2255	2132	1955	1235	1128	1066	977	782
C750N6	NG	N/A	2602	2460	2255	1424	1301	1230	1128	902

Rated Load Fuel Consumption in Standard Cubic Feet per Hour (CFH)*

Model	Fuel Type	Load			
		1/4	1/2	3/4	Full
C600N6	NG	3358	5424	7226	9557
C650N6	NG	3591	5359	7707	10224
C750N6	NG	3872	6081	8724	11401

*See Fuel Installation Requirements on page 4.

Fuel inlet pressure, measured at the regulator inlet, must be 356 to 508 mm WC (14 to 20 in. WC).

PowerCommand® 3.3 Control System



An integrated microprocessor based generator set control system providing voltage regulation, engine protection, alternator protection, operator interface and isochronous governing. Refer to document S-1570 for more detailed information on the control.

AmpSentry™ - Includes integral AmpSentry™ protection, which provides a full range of alternator protection functions that are matched to the alternator provided.

Power management - Control function provides battery monitoring and testing features and smart starting control system.

Advanced control methodology - Three-phase sensing, full wave rectified voltage regulation, with a PWM output for stable operation with all load types.

Communications interface - Control comes standard with PCCNet and Modbus® interface.

Regulation compliant - Prototype tested: UL, CSA and CE compliant.

Service - InPower™ PC-based service tool available for detailed diagnostics, setup, data logging and fault simulation.

Easily upgradeable - PowerCommand® controls are designed with common control interfaces.

Reliable design - The control system is designed for reliable operation in harsh environment.

Multi-language support - English, Spanish, French (standard); other languages (optional).

Operator Panel Features

Operator/Display Panel

- Displays paralleling breaker status.
- 320 x 240 pixels graphic LED backlight LCD.
- Provides direct control of the paralleling breaker.
- Alphanumeric display with pushbuttons.
- Auto, manual, start, stop, fault reset, and lamp test/panel lamp switches.
- LED lamps indicating GenSet running, remote start, not in auto, common shutdown, common warning, manual run mode, auto mode and stop.

Paralleling Control Functions

- First Start Sensor System selects first genset to close to bus.
- Phase Lock Loop Synchronizer with voltage matching.
- Sync check relay.
- Isochronous kW and kVar load sharing.
- Load govern control for utility paralleling.
- Extended Paralleling (baseload/peak shave) Mode.
- Digital power transfer control, for use with a breaker pair to provide open transition, closed transition, ramping closed transition, peaking and base load functions.

Other Control Features

- 150 watt anti-condensation heater.
- DC distribution panel.
- AC auxiliary distribution panel.

Alternator Data

- Line-to-neutral and line-to-line AC volts.
- Three-phase AC current.
- Frequency.
- kW, kVar, and power factor kVa (three-phase and total).
- Winding temperature (optional).
- Bearing temperature (optional).

Engine Data

- DC voltage and engine speed.
- Lube oil pressure and temperature.
- Coolant temperature.
- Comprehensive FAE data.

Other Display Data

- GenSet model data.
- Start attempts, starts, running hours, kW hours.
- Load profile (operating hours at % load in 5% increments).
- Fault history – up to 32 events.
- Data logging and fault simulation (requires InPower™).
- Air cleaner restriction indication.
- Exhaust temperature in each cylinder.

Standard Control Functions

Digital Governing

- Temperature dynamic governing.
- Integrated digital electronic isochronous governing.

Digital Voltage Regulation

- Configurable torque matching.
- 3-phase, 4 wire line-to-line sensing.
- Integrated digital electronic voltage regulator.

AmpSentry™ AC Protection

- AmpSentry™ protective relay.
- Over current and short circuit shutdown.
- Over current warning.
- Single and three-phase fault regulation.
- Low oil pressure warning and shutdown.
- High coolant temperature warning and shutdown.
- Low coolant level warning and shutdown.
- Low coolant temperature warning.
- Over and under voltage shutdown.
- Over and under frequency shutdown.
- Overload warning with alarm contact.
- Reverse power and reverse var shutdown.
- Field overload shutdown.
- Fuel-in-rupture-basin warning or shutdown.
- Full authority electronic engine protection.
- AMM arc flash provision

Engine Protection

- Cranking lockout; overspeed shutdown; and battleshort.
- Sensor failure indication.
- Low fuel level warning or shutdown.
- Fail to start (overcrank) and fail to crank shutdown.
- Full authority electronic engine protection.
- Battery voltage monitoring, protection, and testing.

Control Functions

- Data logging and cycle cranking.
- Load shed.
- Remote emergency stop.
- Time delay start and cooldown.
- Configurable inputs and outputs (20).
- Real time clock for fault and event time stamping.
- Exerciser clock and time of day start/stop.

GenSet options and accessories

NOTE: This GenSet may be purchased as a standard unit, a UL-listed unit, and/or a CSA-certified unit.

Engine

- 240/480 V, 4000 W coolant heaters (2)
- 240 V, 300 W lube oil heater

Alternator

- 80 °C rise
- 105 °C rise

Fuel System (See Fuel Installation Requirements on this page.)

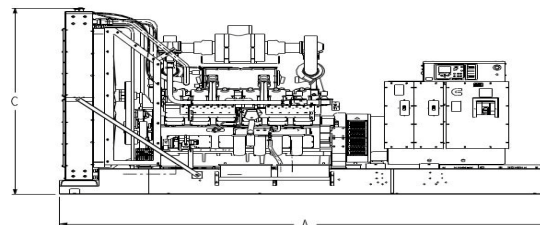
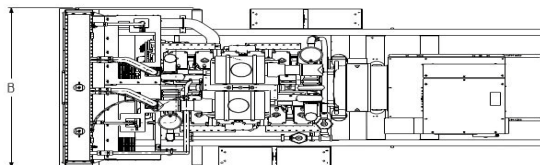
- Flexible fuel connector and fuel strainer
- UL-listed gas train
- Engineered for CSA site compliance

Exhaust System

- GenSet mounted muffler (enclosure models, only)

Generator Set

- Batteries and battery charger
- Main line circuit breaker
- PowerCommand® Network Aux 101, 102 module
- Modbus® to BACnet™ Module
- Weather protective enclosure (F001) with silencer
- Level I and Level II enclosure w/silencer
- Audible alarm
- Remote drains and remote annunciator panel
- Spring isolators
- Two-year standby warranty
- Five-year basic power warranty



This outline drawing is for reference only.

Do not use for installation design.

	Dim "A" mm (in.)	Dim "B" mm (in.)	Dim "C" mm (in.)
All Models	5182 (204)	2286 (90)	2721 (107)

NOTE: Consult drawings for applicable weights. Contact the factory for additional information. See enclosure Specification Sheet for enclosure dimensions.

Codes and Standards



The Prototype Test Support (PTS) program verifies the performance integrity of the GenSet design. Products bearing the PTS symbol have been subjected to demanding tests in accordance with NFPA 110 to verify the design integrity and performance under both normal and abnormal operating conditions. These conditions include: short circuit, endurance, temperature rise, torsional vibration, and transient response, as well as full load pickup.



Underwriters Laboratory (UL) is a world leader in product safety testing and certification. This GenSet is certified to UL2200 as open set, weather enclosure, and sound-attenuated enclosure configurations. The generator is certified to UL1004. The PowerCommand® Control System is certified to UL508. (See Fuel Installation Requirements on this page.)



Coming Soon

(See Fuel Installation Requirements on this page.)



Engine is certified to Stationary Emergency U.S. EPA New Source Performance Standards (NSPS), 40 CFR 60 subpart JJJJ. U.S. applications must be applied per this EPA regulation.



This product has been manufactured under the controls established by a Bureau Veritas Certification approved management system that conforms with ISO 9001:2015.

Fuel Installation Requirements

Gas supply pressure is specified at the inlet to the on-engine Maxitrol® regulator or the electronic pressure regulator (EPR). As standard equipment, one fuel shut-off (FSO) valve is located upstream from the regulator on this unit. Additional options added to the fuel train, such as those for CSA or UL compliance, and/or flexible fuel connections or strainers, add restriction that must be considered when determining gas supply pressure.



GTA 50E Cooling and Air Data 60 Hz C750N6

Cooling Data @ Full Load

Jacket Water Heat Rejection to Coolant	1018 kW	(57886 BTU/min)
Aftercooler Heat Rejection to Coolant	97 kW	(5509 BTU/min)
Heat Rejection to Room	90 kW	(5143 BTU/min)
Jacket Water Coolant Capacity (w/radiator)	86 USG	(326 L)
Jacket Water Coolant Flow Rate @ 3.5 psi	1832 L/min	(484 GPM)
Aftercooler Coolant Capacity (w/radiator)	48 USG	(182 L)
Aftercooler Coolant Flow Rate @ 2.5 psi	397 L/min	(105 GPM)
Jacket Water Max Coolant Friction Head	34 kPa	(5 psi)
Jacket Water Max Coolant Static Head	18.3 m	(60 ft)
Radiator Fan Load	66.4 kW	(89 hp)

Air Data @ Full Load

Radiator Cooling Air	31927 L/sec	(67650 cfm)
Maximum Total External Restriction at Radiator (static)	12.7 mm H ₂ O	(0.5 in H ₂ O)
Alternator Cooling Air	1614 L/sec	(3420 cfm)

Engine Data @ Full Load

Combustion Air	890 L/sec	(1886 cfm)
Maximum Air Cleaner Restriction (Dirty)	381 mm H ₂ O	(15 in H ₂ O)
Exhaust Gas Flow	3508 L/sec	(7432 cfm)
Maximum Gas Temperature – Dry Stack	683 °C	(1261 °F)
Total System Back Pressure Allowed (After Catalyst)	51 mm Hg	(2 in Hg)
Catalyst Back Pressure	7.4 mm Hg	(.29 in Hg)
Silencer Back Pressure (Factory Enclosed Units Only)	39 mm Hg	(1.55 in Hg)

Ratings Definitions

Emergency Standby Power (ESP):

Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power is in accordance with ISO 3046, AS 2789, DIN 6271, and BS 5514.

Prime Power (PRP):

Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271, and BS 5514.

Base Load (Continuous) Power (COP):

Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271, and BS 5514.

Demand Response Power Rating— Spark Ignited Gas (DRP):

Applicable for supplying electrical power in parallel with commercially available power in variable and non-variable load applications. This fuel rating is intended for use in situations where power outages are contracted, such as in utility power curtailment. Engine operation is limited to a total of 500 hours per year. Engines may be operated in parallel to the public utility up to 500 hours per year, with an average load factor no greater than 80% of rated Demand Response Power. Engines with Standby Power ratings available can be run in Emergency Standby applications up to the Standby Power rating for up to 50 hours per year. The customer should be aware, however, that the life of any engine will be reduced by constant high load operation.

Warning: Backfeed to a utility system can cause electrocution and/or property damage. Do not connect GenSets to any building electrical system except through an approved device or after the building main disconnect is open. Neutral connection must be bonded in accordance with National Electrical Code.

Specifications are subject to change without notice.

Power You Can Rely On

To order, contact centralregionorders@cummins.com



Cummins Sales and Service
875 Lawrence Drive
DePere, Wisconsin 54115

power.cummins.com

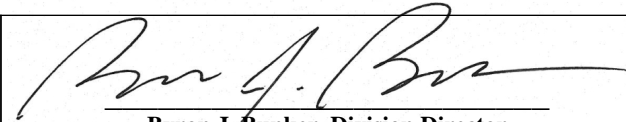


**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2019 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT**

**OFFICE OF TRANSPORTATION
AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105**

Certificate Issued To: Cummins Inc.
(U.S. Manufacturer or Importer)
Certificate Number: KCEXB38.0AAA-013

Effective Date:
12/18/2018
Expiration Date:
12/31/2019


Byron J. Bunker, Division Director
Compliance Division

Issue Date:
12/18/2018
Revision Date:
N/A

Manufacturer: Cummins Inc.
Engine Family: KCEXB38.0AAA
Mobile/Stationary Certification Type: Stationary
Fuel : Natural Gas (CNG/LNG)
LPG/Propane
Emission Standards :
Stationary Part 1048
NMHC + NOx (g/kW-hr) : 2.7
HC + NOx (g/kW-hr) : 2.7
CO (g/kW-hr) : 4.4
Part 60 Subpart JJJJ Table 1
NOx (g/Hp-hr) : 1.0
VOC (g/Hp-hr) : 0.7
CO (g/Hp-hr) : 2.0
Emergency Use Only : N

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR Part 60, 1065, 1068, and 60 (stationary only and combined stationary and mobile) and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following nonroad engines, by engine family, more fully described in the documentation required by 40 CFR Part 60 and produced in the stated model year.

This certificate of conformity covers only those new nonroad spark-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 60 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 60. This certificate of conformity does not cover nonroad engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 60. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 60.

This certificate does not cover large nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

01/10/20
15:42:05

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

Praha CS - TITAN 250

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 0.126000
STACK HEIGHT (M) = 12.4968
STK INSIDE DIAM (M) = 2.1336
STK EXIT VELOCITY (M/S) = 41.1599
STK GAS EXIT TEMP (K) = 692.0389
AMBIENT AIR TEMP (K) = 293.1500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 0.0000
MIN HORIZ BLDG DIM (M) = 0.0000
MAX HORIZ BLDG DIM (M) = 0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BOUY. FLUX = 264.765 M**4/S**3; MOM. FLUX = 816.722 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	0.000	1	1.0	1.0	1096.8	1095.83	7.57	7.56	NO
100.	0.1463E-01	6	1.0	1.1	10000.0	164.56	43.64	43.51	NO
200.	0.1505E-01	6	1.0	1.1	10000.0	164.56	44.13	43.64	NO
300.	0.1558E-01	6	1.0	1.1	10000.0	164.56	44.87	43.81	NO
400.	0.1621E-01	6	1.0	1.1	10000.0	164.56	45.85	44.01	NO
500.	0.1693E-01	6	1.0	1.1	10000.0	164.56	47.01	44.25	NO
600.	0.4472E-01	1	3.0	3.0	960.0	373.61	149.51	168.50	NO
700.	0.8756E-01	1	3.0	3.0	960.0	373.61	170.19	226.44	NO
800.	0.1050	1	3.0	3.0	960.0	373.61	190.44	294.93	NO
900.	0.1198	4	20.0	20.7	6400.0	65.71	63.28	32.30	NO
1000.	0.1376	4	20.0	20.7	6400.0	65.71	69.59	35.09	NO
1100.	0.1455	4	20.0	20.7	6400.0	65.71	75.83	37.33	NO

1200.	0.1481	4	20.0	20.7	6400.0	65.71	81.86	39.16	NO
1300.	0.1487	4	20.0	20.7	6400.0	65.71	87.84	40.93	NO
1400.	0.1480	4	20.0	20.7	6400.0	65.71	93.79	42.66	NO
1500.	0.1464	4	20.0	20.7	6400.0	65.71	99.71	44.36	NO
1600.	0.1440	4	20.0	20.7	6400.0	65.71	105.59	46.02	NO
1700.	0.1412	4	20.0	20.7	6400.0	65.71	111.45	47.66	NO
1800.	0.1379	4	20.0	20.7	6400.0	65.71	117.27	49.27	NO
1900.	0.1345	4	20.0	20.7	6400.0	65.71	123.07	50.85	NO
2000.	0.1309	4	20.0	20.7	6400.0	65.71	128.84	52.40	NO
2100.	0.1272	4	20.0	20.7	6400.0	65.71	134.59	53.94	NO
2200.	0.1235	4	20.0	20.7	6400.0	65.71	140.31	55.45	NO
2300.	0.1199	4	20.0	20.7	6400.0	65.71	146.00	56.94	NO
2400.	0.1163	4	20.0	20.7	6400.0	65.71	151.68	58.41	NO
2500.	0.1127	4	20.0	20.7	6400.0	65.71	157.33	59.86	NO
2600.	0.1093	4	20.0	20.7	6400.0	65.71	162.96	61.30	NO
2700.	0.1060	4	20.0	20.7	6400.0	65.71	168.56	62.72	NO
2800.	0.1027	4	20.0	20.7	6400.0	65.71	174.15	64.11	NO
2900.	0.9962E-01	4	20.0	20.7	6400.0	65.71	179.72	65.50	NO
3000.	0.9660E-01	4	20.0	20.7	6400.0	65.71	185.26	66.87	NO
3500.	0.8691E-01	4	15.0	15.5	4800.0	83.44	213.15	74.30	NO
4000.	0.8226E-01	5	4.5	4.9	10000.0	125.15	181.93	59.27	NO
4500.	0.8561E-01	5	4.0	4.3	10000.0	129.66	201.88	62.53	NO
5000.	0.8857E-01	5	3.0	3.2	10000.0	141.45	221.94	66.79	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 1294. 0.1487 4 20.0 20.7 6400.0 65.71 87.43 40.81 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** INVERSION BREAK-UP FUMIGATION CALC. ***
 CONC (UG/M**3) = 0.2472
 DIST TO MAX (M) = 11617.42

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	0.1487	1294.	0.
INV BREAKUP FUMI	0.2472	11617.	--

01/07/20
16:05:22

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

Praha CS-GENS

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 0.126000
STACK HEIGHT (M) = 7.0104
STK INSIDE DIAM (M) = 0.2438
STK EXIT VELOCITY (M/S) = 75.1111
STK GAS EXIT TEMP (K) = 955.9278
AMBIENT AIR TEMP (K) = 293.1500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 0.0000
MIN HORIZ BLDG DIM (M) = 0.0000
MAX HORIZ BLDG DIM (M) = 0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BOUY. FLUX = 7.588 M**4/S**3; MOM. FLUX = 25.709 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	0.000	1	1.0	1.0	320.0	104.97	2.50	2.47	NO
100.	3.795	3	10.0	10.0	3200.0	16.81	12.61	7.69	NO
200.	5.983	3	8.0	8.0	2560.0	19.26	23.88	14.46	NO
300.	5.671	4	10.0	10.0	3200.0	16.81	22.78	12.41	NO
400.	5.069	4	8.0	8.0	2560.0	19.26	29.66	15.66	NO
500.	4.360	4	5.0	5.0	1600.0	26.60	36.58	19.13	NO
600.	4.069	4	5.0	5.0	1600.0	26.60	43.08	21.94	NO
700.	3.698	4	4.5	4.5	1440.0	28.78	49.58	24.83	NO
800.	3.385	4	4.0	4.0	1280.0	31.50	56.01	27.68	NO
900.	3.118	4	3.5	3.5	1120.0	35.00	62.40	30.53	NO
1000.	2.886	4	3.5	3.5	1120.0	35.00	68.59	33.07	NO

1100.	2.691	4	3.0	3.0	960.0	39.66	74.89	35.38	NO
1200.	2.515	4	3.0	3.0	960.0	39.66	80.98	37.28	NO
1300.	2.352	4	2.5	2.5	800.0	46.19	87.24	39.62	NO
1400.	2.231	4	2.5	2.5	800.0	46.19	93.23	41.40	NO
1500.	2.160	5	1.0	1.0	10000.0	65.43	75.56	32.54	NO
1600.	2.232	5	1.0	1.0	10000.0	65.43	79.91	33.54	NO
1700.	2.290	5	1.0	1.0	10000.0	65.43	84.24	34.53	NO
1800.	2.335	5	1.0	1.0	10000.0	65.43	88.56	35.50	NO
1900.	2.368	5	1.0	1.0	10000.0	65.43	92.86	36.47	NO
2000.	2.392	5	1.0	1.0	10000.0	65.43	97.14	37.42	NO
2100.	2.396	5	1.0	1.0	10000.0	65.43	101.41	38.27	NO
2200.	2.437	6	1.0	1.0	10000.0	55.49	70.79	26.66	NO
2300.	2.484	6	1.0	1.0	10000.0	55.49	73.59	27.14	NO
2400.	2.525	6	1.0	1.0	10000.0	55.49	76.39	27.61	NO
2500.	2.560	6	1.0	1.0	10000.0	55.49	79.17	28.08	NO
2600.	2.591	6	1.0	1.0	10000.0	55.49	81.94	28.54	NO
2700.	2.616	6	1.0	1.0	10000.0	55.49	84.71	28.99	NO
2800.	2.637	6	1.0	1.0	10000.0	55.49	87.47	29.44	NO
2900.	2.654	6	1.0	1.0	10000.0	55.49	90.22	29.89	NO
3000.	2.667	6	1.0	1.0	10000.0	55.49	92.96	30.32	NO
3500.	2.635	6	1.0	1.0	10000.0	55.49	106.56	32.12	NO
4000.	2.571	6	1.0	1.0	10000.0	55.49	119.97	33.80	NO
4500.	2.489	6	1.0	1.0	10000.0	55.49	133.22	35.39	NO
5000.	2.399	6	1.0	1.0	10000.0	55.49	146.33	36.90	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
161. 6.318 3 10.0 10.0 3200.0 16.81 19.64 11.87 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 6.318	----- 161.	----- 0.

01/07/20
16:07:52

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

Praha CS-HTR3456MMBTU

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 0.126000
STACK HEIGHT (M) = 6.0960
STK INSIDE DIAM (M) = 0.3048
STK EXIT VELOCITY (M/S) = 6.1511
STK GAS EXIT TEMP (K) = 477.5944
AMBIENT AIR TEMP (K) = 293.1500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 0.0000
MIN HORIZ BLDG DIM (M) = 0.0000
MAX HORIZ BLDG DIM (M) = 0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BOUY. FLUX = 0.541 M**4/S**3; MOM. FLUX = 0.539 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	0.000	1	1.0	1.0	320.0	19.61	0.68	0.56	NO
100.	53.48	3	2.5	2.5	800.0	11.50	12.56	7.60	NO
200.	49.45	4	2.0	2.0	640.0	12.85	15.68	8.72	NO
300.	45.05	4	1.5	1.5	480.0	15.11	22.76	12.36	NO
400.	39.48	4	1.0	1.0	320.0	19.61	29.71	15.75	NO
500.	34.04	4	1.0	1.0	320.0	19.61	36.35	18.70	NO
600.	28.68	4	1.0	1.0	320.0	19.61	42.89	21.56	NO
700.	24.14	4	1.0	1.0	320.0	19.61	49.34	24.34	NO
800.	20.46	4	1.0	1.0	320.0	19.61	55.71	27.06	NO
900.	17.51	4	1.0	1.0	320.0	19.61	62.00	29.72	NO
1000.	17.13	6	1.0	1.0	10000.0	26.20	34.37	15.09	NO

1100.	17.34	6	1.0	1.0	10000.0	26.20	37.41	15.89	NO
1200.	17.32	6	1.0	1.0	10000.0	26.20	40.43	16.68	NO
1300.	17.14	6	1.0	1.0	10000.0	26.20	43.42	17.44	NO
1400.	16.84	6	1.0	1.0	10000.0	26.20	46.40	18.19	NO
1500.	16.47	6	1.0	1.0	10000.0	26.20	49.37	18.92	NO
1600.	16.04	6	1.0	1.0	10000.0	26.20	52.31	19.64	NO
1700.	15.58	6	1.0	1.0	10000.0	26.20	55.24	20.34	NO
1800.	15.10	6	1.0	1.0	10000.0	26.20	58.15	21.03	NO
1900.	14.61	6	1.0	1.0	10000.0	26.20	61.05	21.71	NO
2000.	14.13	6	1.0	1.0	10000.0	26.20	63.93	22.38	NO
2100.	13.63	6	1.0	1.0	10000.0	26.20	66.80	22.94	NO
2200.	13.16	6	1.0	1.0	10000.0	26.20	69.66	23.49	NO
2300.	12.71	6	1.0	1.0	10000.0	26.20	72.51	24.04	NO
2400.	12.27	6	1.0	1.0	10000.0	26.20	75.34	24.57	NO
2500.	11.86	6	1.0	1.0	10000.0	26.20	78.16	25.09	NO
2600.	11.46	6	1.0	1.0	10000.0	26.20	80.97	25.60	NO
2700.	11.09	6	1.0	1.0	10000.0	26.20	83.77	26.11	NO
2800.	10.73	6	1.0	1.0	10000.0	26.20	86.56	26.61	NO
2900.	10.38	6	1.0	1.0	10000.0	26.20	89.33	27.10	NO
3000.	10.06	6	1.0	1.0	10000.0	26.20	92.10	27.58	NO
3500.	8.660	6	1.0	1.0	10000.0	26.20	105.81	29.54	NO
4000.	7.562	6	1.0	1.0	10000.0	26.20	119.31	31.37	NO
4500.	6.681	6	1.0	1.0	10000.0	26.20	132.63	33.07	NO
5000.	5.963	6	1.0	1.0	10000.0	26.20	145.78	34.69	NO
5500.	5.369	6	1.0	1.0	10000.0	26.20	158.80	36.22	NO
6000.	4.869	6	1.0	1.0	10000.0	26.20	171.67	37.67	NO
6500.	4.445	6	1.0	1.0	10000.0	26.20	184.43	39.07	NO
7000.	4.082	6	1.0	1.0	10000.0	26.20	197.08	40.41	NO
7500.	3.774	6	1.0	1.0	10000.0	26.20	209.62	41.56	NO
8000.	3.506	6	1.0	1.0	10000.0	26.20	222.06	42.67	NO
8500.	3.270	6	1.0	1.0	10000.0	26.20	234.41	43.74	NO
9000.	3.060	6	1.0	1.0	10000.0	26.20	246.67	44.77	NO
9500.	2.874	6	1.0	1.0	10000.0	26.20	258.86	45.77	NO
10000.	2.707	6	1.0	1.0	10000.0	26.20	270.96	46.74	NO
15000.	1.672	6	1.0	1.0	10000.0	26.20	388.47	55.18	NO
20000.	1.204	6	1.0	1.0	10000.0	26.20	500.98	60.57	NO
25000.	0.9316	6	1.0	1.0	10000.0	26.20	609.78	65.11	NO
30000.	0.7551	6	1.0	1.0	10000.0	26.20	715.61	69.08	NO
40000.	0.5486	6	1.0	1.0	10000.0	26.20	920.24	74.71	NO
50000.	0.4281	6	1.0	1.0	10000.0	26.20	1117.44	79.40	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
110. 53.81 3 2.5 2.5 800.0 11.50 13.81 8.33 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 53.81	----- 110.	----- 0.