Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9 – Air and Noise Quality

October 2025

Mountain Valley Pipeline Project
Resource Report 9 – Air and Noise Quality

Resource Report 9 Filing Requirements per 18 CFR § 380.12	
Information	**Location in Resource Report**
Minimum Filing Requirements	
1. Describe the existing air quality, including background levels of nitrogen dioxide and other criteria pollutants that may be emitted above EPA-identified significance levels. (§ 380.12(k)(1))	Section 9.1.1
2. Quantitatively describe existing noise levels at noise-sensitive areas, such as schools, hospitals, or residences and include any areas covered by relevant state or local noise ordinances. (i) Report existing noise levels as the Leq (day), Leq (night), and Ldn and include the basis for the data or estimates. (ii) For existing compressor stations, include the results of a sound level survey at the site property line and nearby noise-sensitive areas while the compressors are operated at full load. (iii) For proposed new compressor station sites, measure or estimate the existing ambient sound environment based on current land uses and activities. (iv) Include a plot plan that identifies the locations and duration of noise measurements, the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement. (§ 380.12(k)(2))	Section 9.2.4, and Appendices 9-G, 9-H, 9-I and 9-J
3. Estimate the impact of the project on air quality, including how existing regulatory standards would be met. (i) Provide the emission rate of nitrogen oxides from existing and proposed facilities, expressed in pounds per hour and tons per year for maximum operating conditions, include supporting calculations, emission factors, fuel consumption rates, and annual hours of operation. (ii) For major sources of air emissions (as defined by the Environmental Protection Agency), provide copies of applications for permits to construct (and operate, if applicable) or for applicability determinations under regulations for the prevention of significant air quality deterioration and subsequent determinations. (§ 380.12(k)(3))	Sections 9.1.2 and 9.1.4, and Appendices 9-B, 9-C, 9-D, 9-E and 9-F
4. Provide a quantitative estimate of the impact of the project on noise levels at noise-sensitive areas, such as schools, hospitals, or residences. (i) Include step-by-step supporting calculations or identify the computer program used to model the noise levels, the input and raw output data and all assumptions made when running the model, far-field sound level data for maximum facility operation, and the source of the data. (ii) Include sound pressure levels for unmuffled engine inlets and exhausts, engine casings, and cooling equipment; dynamic insertion loss for all mufflers; sound transmission loss for all compressor building components, including walls, roof, doors, windows and ventilation openings; sound attenuation from the station to nearby noise-sensitive areas; the manufacturer's name, the model number, the performance rating; and a description of each noise source and noise control component to be employed at the proposed compressor station. For proposed compressors the initial filing must include at least the proposed horsepower, type of compression, and energy source for the compressor. (iii) Far-field sound level data measured from similar units in service elsewhere, when available, may be substituted for manufacturer's far-field sound level data. (iv) If specific noise control equipment has not been chosen, include a schedule for submitting the data prior to certification.	Section 9.2.5 and Appendices 9-G, 9-H, 9-I and 9-J

Resource Report 9 Filing Requirements per 18 CFR § 380.12	
Information	**Location in Resource Report**
Minimum Filing Requirements	
(v) The estimate must demonstrate that the project will comply with applicable noise regulations and show how the facility will meet the following requirements: (A) The noise attributable to any new compressor station, compression added to an existing station, or any modification, upgrade or update of an existing station, must not exceed a day- night sound level (Ldn) of 55 dBA at any pre-existing noise-sensitive area (such as schools, hospitals, or residences). (B) New compressor stations or modifications of existing stations shall not result in a perceptible increase in vibration at any noise-sensitive area. (§ 380.12(k)(4))	
5. Describe measures and manufacturer's specifications for equipment proposed to mitigate impact to air and noise quality, including emission control systems, installation of filters, mufflers, or insulation of piping and buildings, and orientation of equipment away from noise-sensitive areas. (§ 380.12(k)(5))	Section 9.1.6 and 9.2.5
Minimum Filing Requirements – Appendix A to Part 380 [Note: May overlap with requirements above.]	
1. Describe existing air quality in the vicinity of the project. (§ 380.12(k)(1))	Section 9.1.1
2. Quantify the existing noise levels (daynight sound level (L_{dn}) and other applicable noise parameters) at noise-sensitive areas and at other areas covered by relevant state and local noise ordinances. (§ 380.12(k)(2))	Section 9.2.4, and Appendices 9-G, 9-H, 9-I and 9-J
3. Quantify existing and proposed emissions of compressor equipment, plus construction emissions, including nitrogen oxides (NO_x) and carbon monoxide (CO), and the basis for these calculations. Summarize anticipated air quality impacts for the project. (§ 380.12(k)(3))	Sections 9.1.2 and 9.1.4, and Appendices 9-A, 9-B, 9-C, 9-D, 9-E, and 9-F
4. Describe the existing compressor units at each station where new, additional, or modified compressor units are proposed, including the manufacturer, model number, and horsepower of the compressor units. For proposed new, additional, or modified compressor units include the horsepower, type, and energy source. (§ 380.12(k)(4)).	Section 9.1.2 and Appendices 9-C, 9-D and 9-E
5. Identify any nearby noise-sensitive area by distance and direction from the proposed compressor unit building/enclosure. (§ 380.12(k)(4))	Sections 9.2.4 and 9.2.5, and Appendices 9-G, 9-H, 9-I and 9-J
6. Identify any applicable state or local noise regulations. (§ 380.12(k)(4))	Section 9.2.3
7. Calculate the noise impact at noise-sensitive areas of the proposed compressor unit modifications or additions, specifying how the impact was calculated, including manufacturer’s data and proposed noise control equipment. (§ 380.12(k)(4))	Section 9.2.5 Appendices 9-G, 9-H, 9-I and 9-J

RESOURCE REPORT 9
AIR AND NOISE QUALITY

TABLE OF CONTENTS

INTRODUCTION 9-1
ENVIRONMENTAL RESOURCE REPORT ORGANIZATION 9-1
9.1 AIR QUALITY 9-1
9.1.1 Existing Air Quality 9-2
9.1.2 Project Emissions 9-10
9.1.3 Air Permitting Requirements 9-18
9.1.4 Regulatory Review and Applicability 9-18
9.1.5 General Conformity 9-28
9.1.6 Air Quality Mitigation Measures 9-28
9.2 NOISE 9-31
9.2.1 Background Information on Sound and Noise 9-31
9.2.2 Background Information on Vibration 9-32
9.2.3 Regulatory Background 9-33
9.2.4 Existing Sound Environment 9-35
9.2.5 Noise Quality Impacts 9-42
9.2.6 Post Construction Sound Survey 9-55
9.2.7 Vibration Analysis 9-55
9.2.8 Excavation Blasting 9-56
9.3 REFERENCES 9-59

LIST OF TABLES

Table 9.1-1 Climate Parameters at the Compressor Station Locations 9-3
Table 9.1-2 National Ambient Air Quality Standards for Criteria Pollutants 9-3
Table 9.1-3 Existing Ambient Background Levels in the Vicinity of the Existing Bradshaw Compressor Station 9-5
Table 9.1-4 Existing Ambient Background Levels in the Vicinity of the Existing Harris Compressor Station 9-6
Table 9.1-5 Existing Ambient Background Levels in the Vicinity of the Existing Stallworth Compressor Station 9-7
Table 9.1-6 Existing Ambient Background Levels in the Vicinity of the Proposed Swann Compressor Station 9-8
Table 9.1-7 Federal Class I Areas Closest to the Existing Bradshaw Compressor Station 9-9
Table 9.1-8 Federal Class I Areas Closest to the Existing Harris Compressor Station 9-9
Table 9.1-9 Federal Class I Areas Closest to the Existing Stallworth Compressor Station 9-9
Table 9.1-10 Federal Class I Areas Closest to the Proposed Swann Compressor Station 9-10

Table 9.1-11 Estimated Construction Emissions from the Project – 2027 9-11
Table 9.1-12 Estimated Construction Emissions from the Project – 2028 9-13
Table 9.1-13 Operations Emissions Summary (tons per year) a/ 9-17
Table 9.1-14 Emissions from Compressor Stations versus NSR Major Source Thresholds 9-18
Table 9.2-1 Typical Levels of Groundborne Vibration 9-33
Table 9.2-2 FTA Construction Damage Criteria 9-34
Table 9.2-3 Noise Level Limits for Counties with Noise Ordinances Crossed by the Project 9-35
Table 9.2-4 Vibration Level Limits for Montgomery County, Virgina 9-35
Table 9.2-5 Existing Sound Level Measurement Results – Bradshaw Compressor Station 9-37
Table 9.2-6 Existing Sound Level Measurement Results – Harris Compressor Station 9-38
Table 9.2-7 Existing Sound Level Measurement Results – Stallworth Compressor Station 9-40
Table 9.2-8 Existing Sound Level Measurement Results – Swann Compressor Station 9-41
Table 9.2-9 Predicted Temporary Sound Levels Due to Construction 9-42
Table 9.2-10 Predicted Temporary Sound Levels Due to Construction 9-43
Table 9.2-11 Equipment at Each Compressor Station 9-44
Table 9.2-12 Modeled Sound Power and Pressure Levels – Titan 130e Unit 9-45
Table 9.2-13 Modeled Sound Power Levels – Titan 250 Unit 9-46
Table 9.2-14 Modeled Sound Power Levels – Titan 350 Unit 9-47
Table 9.2-15 Modeled Sound Power Levels – Auxiliary Equipment 9-47
Table 9.2-16 Modeled Noise Control Treatments (Dynamic Insertion Loss (DIL) or Transmission Loss (TL) – Titan 130e Unit 9-48
Table 9.2-17 Modeled Noise Control Treatments (DIL / TL) – Titan 250 Units 9-49
Table 9.2-18 Modeled Noise Control Treatments (DIL / TL) – Titan 350 Units 9-49
Table 9.2-19 Predicted Sound Levels – Bradshaw Compressor Station 9-50
Table 9.2-20 Predicted Sound Levels – Harris Compressor Station 9-51
Table 9.2-21 Predicted Sound Levels – Stallworth Compressor Station 9-52
Table 9.2-22 Predicted Sound Levels – Swann Compressor Station 9-53
Table 9.2-23 Predicted Temporary Sound Levels Due to Unit Venting 9-54
Table 9.2-24 Predicted Temporary Sound Levels Due to Emergency Shutdown 9-55
Table 9.2-25 Virginia and West Virginia Maximum Blasting Overpressure Levels Limits 9-56
Table 9.2-26 Virginia and West Virginia Maximum Ground Vibration Levels 9-57
Table 9.2-27 Calculated Vibration and Overpressure at Compressor Station Noise-Sensitive Areas (NSAs) 9-59

LIST OF FIGURES

Figure 9.2-1 Sound Pressure Levels (Lp) 9-32
Figure 9.2-2 Montgomery County, Virginia Maximum Ground Vibration Levels 9-58

LIST OF APPENDICES

Appendix 9-A Construction Emissions Calculations
Appendix 9-B Operating Emissions Calculations

Appendix 9-C Bradshaw Compressor Station Air Quality Modeling Report
Appendix 9-D Harris Compressor Station Air Quality Modeling Report
Appendix 9-E Stallworth Compressor Station Air Quality Modeling Report
Appendix 9-F Swann Compressor Station Air Quality Modeling Report
Appendix 9-G Bradshaw Compressor Pre-Construction Noise Study Report
Appendix 9-H Harris Compressor Pre-Construction Noise Study Report
Appendix 9-I Stallworth Compressor Pre-Construction Noise Study Report
Appendix 9-J Swann Compressor Station Pre-Construction Noise Study Report

RESOURCE REPORT 9
AIR AND NOISE QUALITY

LIST OF ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
BACT	Best Available Control Technology
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CSR	West Virginia Code of State Rules
dB	Decibel
dBA	A-weighted decibel
EPA	U.S. Environmental Protection Agency
ESD	emergency shutdown
FERC	Federal Energy Regulatory Commission
FTA	Federal Transit Administration
GHG	greenhouse gases
HAP	hazardous air pollutant
hp	horsepower
Hz	Hertz
ISO	isometric
kW	kilowatt
lb	pounds
L_d	daytime sound level
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
L_n	nighttime sound level
L_P	sound pressure level
L_W	sound power level
MACT	Maximum Available Control Technology
ML	measurement location
MMBtu/hr	million British thermal units per hour
MRR	Greenhouse Gas Mandatory Reporting Rule
MVP	Mountain Valley Pipeline, LLC
MVP Mainline	the existing Mountain Valley Pipeline mainline
MWh	megawatt-hour
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NNSR	Non-attainment New Source Review

NO_x	nitrogen oxides
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
O_2	oxygen
PM_{10}	particulate matter with a diameter of 10 microns or less
$PM_{2.5}$	fine particulate matter with a diameter of 2.5 microns or less
ppb	parts per billion
ppm	parts per million
PPV	peak particle velocity
Project	Mountain Valley Pipeline Boost Project
PSD	Prevention of Significant Deterioration
rms	root mean square
SIP	State Implementation Plan
SO_2	sulfur dioxide
tpy	ton per year
VAC	Virginia Administrative Code
VdB	vibration dB
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound

RESOURCE REPORT 9
AIR AND NOISE QUALITY

Introduction

Mountain Valley Pipeline, LLC (MVP) is seeking a Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission (FERC) pursuant to Section 7(c) of the Natural Gas Act authorizing MVP to construct and operate the proposed Mountain Valley Pipeline Boost Project (Project) located in Wetzel, Braxton, and Fayette Counties, West Virginia; and Montgomery County, Virginia. MVP plans to expand three existing compressor stations and construct one new compressor station to provide timely and cost-effective access to the growing demand for natural gas for use by local distribution companies, industrial users, and power generation in the Mid-Atlantic and Southeastern markets, as well as potential markets in the Appalachian region.

The Project will include a total addition of approximately 265,750 horsepower (hp) of compression at isometric (ISO) conditions from the proposed modifications and operation at the existing Bradshaw, Harris, and Stallworth Compressor Stations, and the construction of the new Swann Compressor Station, including ancillary facilities required for safe and reliable operations. The Project will create approximately 600,000 dekatherms per day of incremental natural gas capacity on the existing Mountain Valley Pipeline mainline (MVP Mainline).

Resource Report 1 provides a complete summary of the Project facilities (see Table 1.2-1) and a general location map of the Project facilities (Figure 1.2-1). For purposes of this Resource Report, the Project area is defined to be the limits of disturbance for construction at the Bradshaw, Harris, Stallworth, and Swann Compressor Station sites, including ancillary facilities and offsite laydown yards.

Environmental Resource Report Organization

Resource Report 9 includes discussion of Air Quality and Noise in the Project area and potential Project impacts. Resource Report 9 is prepared and organized according to the FERC *Guidance Manual for Environmental Report Preparation* (FERC 2017). Air quality resources and potential impacts from the Project are discussed in Section 9.1, including a summary of the regional climate and existing air quality in Section 9.1.1, a discussion of Project related emissions in 9.1.2, an overview of the permitting requirements in Section 9.1.3, a discussion of applicable regulatory requirements in Section 9.1.4, an analysis of General Conformity in Section 9.1.5, and a summary of air quality mitigation measures in Section 9.1.6. Noise quality resources and potential impacts from the Project are discussed in Section 9.2. Section 9.2.1 provides background information on noise, Section 9.2.2 provides background information on vibration, Section 9.2.3 provides a description of the applicable regulatory requirements applicable to noise, Section 9.2.4 identifies the existing in-air acoustic conditions and presents noise modeling results, Section 9.2.5 discusses potential noise impacts, Section 9.2.6 discusses the post-construction sound survey, Section 9.2.7 discusses vibration analysis, and Section 9.2.8 discusses excavation blasting.

9.1 AIR QUALITY

Both the short-term/temporary and long-term air quality impacts associated with the Project have been analyzed. Short-term and temporary air quality impacts will result from construction activities necessary to build the Swann Compressor Station and add equipment to the existing Bradshaw, Harris, and Stallworth Compressor Stations. Long-term impacts will result from the operation of the turbines and other equipment.

From a regulatory standpoint, the emissions and associated air quality impacts are addressed in two separate ways:

1. Stationary Source Air Permitting – Stationary source air permitting addresses the emissions and associated impacts from the operational equipment and sources at the proposed facilities. Depending on the status and the location of the Project, Prevention of Significant Deterioration (PSD), Nonattainment New Source Review (NSR), and associated state permitting programs ensure that the proposed installation of new air emissions sources (i.e., operational equipment) meet required emission levels, incorporate appropriate control technologies, and meet other regulatory requirements, where appropriate. A pollutant that triggers the "major" PSD and/or Nonattainment NSR (NNSR) programs will be subject to additional reviews and requirements. The regulatory applicability of permitting programs to the Project is discussed in Section 9.1.4.

2. General Conformity – General Conformity addresses the sources of emissions not covered by permitting actions (e.g., construction activities or an increase in traffic to the sites) and ensures that they conform to the applicable State Implementation Plan(s) (SIP). Generally, these include the short-term/temporary emissions from construction activities and new emissions increases from non-permitted emission sources such as mobile sources. General Conformity, discussed in Section 9.1.5, is only applicable in maintenance/non-attainment areas. All counties that are impacted by the Project are in attainment for all criteria pollutants. As such, General Conformity does not apply.

9.1.1 Existing Air Quality

9.1.1.1 Climate

The Project is located in the states of West Virginia and Virginia. Among the nine climate regions defined in the contiguous United States, defined by the National Centers for Environmental Information, West Virginia falls under the Ohio Valley (Central) climate region and Virginia is in the Southeast climate region. West Virginia has a humid continental climate that is defined by hot summers and cold winters, while Virginia has a humid subtropical climate.

Monthly climatological data for the compressor station locations is referenced from the most representative nearby meteorological stations (National Weather Service cooperative stations located in Morgantown Hart Field, West Virginia; Elkins-Randolph County Regional Airport, West Virginia; Raleigh County Memorial Airport, West Virginia; and Blacksburg National Weather Service Office, Virginia). Meteorological data for the compressor stations was obtained from the National Climatic Data Center for the period of 1991 to 2020 (NCEI 2025). The annual average temperatures and average precipitation data for these areas are presented in Table 9.1-1.

Table 9.1-1

Climate Parameters at the Compressor Station Locations

Compressor Station	Monitor	ID	Approximate Distance and Direction from Station	Average Daily Minimum Temperature – January (degrees Fahrenheit [°F])	Average Daily Maximum Temperature – July (°F)	Annual Precipitation (inches)
Bradshaw	Morgantown Hart Field, WV	GHCND: USW00013736	33 miles NE	26.1	82.8	43.15
Harris	Elkins-Randolph County Regional Airport, WV	GHCND: USW00013729	36 miles NE	22.0	81.8	47.21
Stallworth	Beckley Raleigh County Airport, WV	GHCND: USW00003872	20 miles SW	26.2	79.5	43.54
Swann	Blacksburg NWSO, VA	GHCND: USC00440766	11 miles SW	23.8	80.8	42.64

Note:
NWSO = National Weather Service Office, VA = Virginia, WV = West Virginia
NE= northeast, SW = southwest

9.1.1.2 National Ambient Air Quality Standards

Table 9.1-2 summarizes the National Ambient Air Quality Standards (NAAQS) that are currently in effect. Any geographic area that does not meet the NAAQS for the corresponding pollutant is known as a non-attainment area. All counties in which the Project is located are classified as in attainment with all NAAQS. The federal NAAQS apply to sources in both states, and neither state has separate State Ambient Air Quality Standards. Per West Virginia Code of State Regulations (CSR), Title 45 section 8 (45 CSR 8) and per Title 9, Section 5, Chapter 30 of the Virginia Administrative Code (VAC) (9VAC5-30), both states adopt the NAAQS as they are updated.[1]

Table 9.1-2

National Ambient Air Quality Standards for Criteria Pollutants

Pollutant	Primary Standards	Averaging Times	Secondary Standards
Carbon Monoxide (CO)	9 parts per million (ppm) (10,000 micrograms per cubic meter [µg/m^3])	8-hour	None
	35 ppm (40,000 µg/m^3)	1-hour	None
Lead	0.15 µg/m^3	Rolling 3-month Average	Same as Primary
Nitrogen Dioxide (NO_2)	53 parts per billion (ppb) (100 µg/m^3)	Annual (Arithmetic Mean)	Same as Primary
	100 ppb (188 µg/m^3)	1-hour	None

[1] Virginia has not adopted the NAAQS by reference but the ambient air quality standards are the same as the NAAQS.

Table 9.1-2

National Ambient Air Quality Standards for Criteria Pollutants

Pollutant	Primary Standards	Averaging Times	Secondary Standards
Particulate Matter (PM_{10})	150 µg/m^3	24-hour	Same as Primary
Particulate Matter ($PM_{2.5}$)	9 µg/m^3	Annual (Arithmetic Mean)	15 µg/m^3
	35 µg/m^3	24-hour	Same as Primary
Ozone (O_3)	0.070 ppm	8-hour	Same as Primary
Sulfur Dioxide (SO_2) a/	None	Annual (Arithmetic Mean)	10 ppb
	75 ppb (196 µg/m^3)	1-hour	None

Source: EPA 2025a
Note:
a/ The existing annual and 24-hour primary SO_2 standards were revoked one year after the effective dates in areas with designated status for the revised SO_2 NAAQS.

9.1.1.3 Section 107 Attainment Status Designations

The Project is located in the counties of Wetzel, Braxton, and Fayette, West Virginia, and Montgomery, Virginia. All counties listed are in attainment for all criteria pollutants.

9.1.1.4 Existing Ambient Background Levels

Existing ambient background concentrations for criteria air pollutants are presented in Table 9.1-3 through Table 9.1-6 below. As mentioned above, all counties in which the Project is located are in attainment for all criteria pollutants.

Table 9.1-3

Existing Ambient Background Levels in the Vicinity of the Existing Bradshaw Compressor Station

Pollutant	Averaging Period	Monitoring Station	AQS Site ID	County	State	Approx. Distance from Facility (km)	Background Concentration	Primary NAAQS	Units
O_3	8-hour	Holbrook	42-059-0002	Greene	PA	38	0.063	0.07	ppm
NO_2	1-hour	Charleroi Waste Treatment Plant	42-125-0005	Washington	PA	87	33.0	100.0	ppb
NO_2	Annual	Charleroi Waste Treatment Plant	42-125-0005	Washington	PA	87	7.7	53.0	ppb
$PM_{2.5}$	24-hour	Holbrook	42-059-0002	Greene	PA	38	15.7	35.0	$\mu g/m^3$
$PM_{2.5}$	Annual	Holbrook	42-059-0002	Greene	PA	38	6.6	9.0	$\mu g/m^3$
CO	1-hour	North Braddock	42-003-1301	Allegheny	PA	109	9.6	35.0	ppm
CO	8-hour	North Braddock	42-003-1301	Allegheny	PA	109	4.6	9.0	ppm
PM_{10}	24-hr	Weirton – Summit Circle	54-029-0009	Hancock	WV	100	74.0	150.0	$\mu g/m^3$
SO_2	1-hour	Morgantown - Airport US	54-061-0003	Monongalia	WV	54	9.3	75.0	ppb
SO_2	Annual	Morgantown - Airport US	54-061-0003	Monongalia	WV	54	1.1	10.0	ppb

Note:
AQS= Air Quality System, CO = carbon monoxide, km = kilometer, $\mu g/m^3$ = micrograms per cubic meter, NAAQS = National Ambient Air Quality Standards, NO_2 = nitrogen dioxide, O_3 = ozone, PA = Pennsylvania, PM_{10} = particulate matter with a diameter of 10 microns or less, $PM_{2.5}$ = particulate matter with a diameter of 2.5 microns or less, ppb = parts per billion by volume, ppm = parts per million by volume, SO_2 = sulfur dioxide, WV = West Virginia.

Table 9.1-4

Existing Ambient Background Levels in the Vicinity of the Existing Harris Compressor Station

Pollutant	Averaging Period	Monitoring Station	AQS Site ID	County	State	Approx. Distance from Facility (km)	Background Concentration	Primary NAAQS	Units
O_3	8-hour	Parsons	54-093-9991	Tucker	WV	82	0.061	0.07	ppm
NO_2	1-hour	Rockingham Co. VDOT	51-165-0003	Rockingham	VA	149	35.7	100.0	ppb
NO_2	Annual	Rockingham Co. VDOT	51-165-0003	Rockingham	VA	149	8.6	53.0	ppb
$PM_{2.5}$	24-hour	Washington Irving Junior High School	54-033-0003	Harrison	WV	64	16.3	35.0	$\mu g/m^3$
$PM_{2.5}$	Annual	Washington Irving Junior High School	54-033-0003	Harrison	WV	64	7.1	9.0	$\mu g/m^3$
CO	1-hour	Dixie St.	54-039-0020	Kanawha	WV	106	1.3	35.0	ppm
CO	8-hour	Dixie St.	54-039-0020	Kanawha	WV	106	0.9	9.0	ppm
PM_{10}	24-hr	Weirton - Summit Circle	54-029-0009	Hancock	WV	189	74	150.0	$\mu g/m^3$
SO_2	1-hour	Dixie St.	54-039-0020	Kanawha	WV	106	4.3	75.0	ppb
SO_2	Annual	Dixie St.	54-039-0020	Kanawha	WV	106	0.6	10.0	ppb

Note:
AQS = Air Quality System, CO = carbon monoxide, km = kilometer, $\mu g/m^3$ = micrograms per cubic meter, NAAQS = National Ambient Air Quality Standards, NO_2 = nitrogen dioxide, O_3 = ozone, PM_{10} = particulate matter with a diameter of 10 microns or less, $PM_{2.5}$ = particulate matter with a diameter of 2.5 microns or less, ppb = parts per billion by volume, ppm = parts per million by volume, SO_2 = sulfur dioxide, VA = Virginia, VDOT= Virginia Department of Transportation, WV = West Virginia.

Table 9.1-5

Existing Ambient Background Levels in the Vicinity of the Existing Stallworth Compressor Station

Pollutant	Averaging Period	Monitoring Station	AQS Site ID	County	State	Approx. Distance from Facility (km)	Background Concentration	Primary NAAQS	Units
O_3	8-hour	Sam Black Church - DOH Garage	54-025-0003	Greenbrier	WV	12	0.057	0.07	ppm
NO_2	1-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	101	46.7	100.0	ppb
NO_2	Annual	East Vinton Elementary School	51-161-1004	Roanoke	VA	101	4.9	53.0	ppb
$PM_{2.5}$	24-hour	Salem High School	51-775-0011	Salem City	VA	87	16.0	35.0	$\mu g/m^3$
$PM_{2.5}$	Annual	Salem High School	51-775-0011	Salem City	VA	87	6.9	9.0	$\mu g/m^3$
CO	1-hour	Dixie St.	54-039-0020	Kanawha	WV	92	1.3	35.0	ppm
CO	8-hour	Dixie St.	54-039-0020	Kanawha	WV	92	0.9	9.0	ppm
PM_{10}	24-hr	Gladeville Elementary School	51-035-0001	Carroll	VA	135	44.0	150.0	$\mu g/m^3$
SO_2	1-hour	Dixie St.	54-039-0020	Kanawha	WV	92	4.3	75.0	ppb
SO_2	Annual	Dixie St.	54-039-0020	Kanawha	WV	92	0.6	10.0	ppb

Note:
AQS = Air Quality System, CO = carbon monoxide, km = kilometer, $\mu g/m^3$ = micrograms per cubic meter, NAAQS = National Ambient Air Quality Standards, NO_2 = nitrogen dioxide, O_3 = ozone, PM_{10} = particulate matter with a diameter of 10 microns or less, $PM_{2.5}$ = particulate matter with a diameter of 2.5 microns or less, ppb = parts per billion by volume, ppm = parts per million by volume, SO_2 = sulfur dioxide, VA = Virginia, WV = West Virginia.

Table 9.1-6

Existing Ambient Background Levels in the Vicinity of the Proposed Swann Compressor Station

Pollutant	Averaging Period	Monitoring Station	AQS Site ID	County	State	Approx. Distance from Facility (km)	Background Concentration	Primary NAAQS	Units
O_3	8-hour	Blue Grass Trail	51-071-9992	Giles	VA	25	0.063	0.07	ppm
NO_2	1-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	30	30.9	100.0	ppb
NO_2	Annual	East Vinton Elementary School	51-161-1004	Roanoke	VA	30	4.9	53.0	ppb
$PM_{2.5}$	24-hour	Salem High School	51-775-0011	Salem City	VA	14	15.7	35.0	$\mu g/m^3$
$PM_{2.5}$	Annual	Salem High School	51-775-0011	Salem City	VA	14	6.9	9.0	$\mu g/m^3$
CO	1-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	30	0.9	35.0	ppm
CO	8-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	30	0.8	9.0	ppm
PM_{10}	24-hr	Gladeville Elementary School	51-035-0001	Carroll	VA	84	29.0	150.0	$\mu g/m^3$
SO_2	1-hour	East Vinton Elementary School	51-161-1004	Roanoke	VA	30	3.0	75.0	ppb
SO_2	Annual	East Vinton Elementary School	51-161-1004	Roanoke	VA	30	1.0	10.0	ppb

Note:
AQS = Air Quality System, CO = carbon monoxide, km = kilometer, $\mu g/m^3$ = micrograms per cubic meter, NAAQS = National Ambient Air Quality Standards, NO_2 = nitrogen dioxide, O_3 = ozone, PM_{10} = particulate matter with a diameter of 10 microns or less, $PM_{2.5}$ = particulate matter with a diameter of 2.5 microns or less, ppb = parts per billion by volume, ppm = parts per million by volume, SO_2 = sulfur dioxide, VA = Virginia.

9.1.1.5 Federal Class I Areas

Federal Class I areas are certain areas established by Congress, such as wilderness areas and national parks, that are afforded special protection under the Clean Air Act (CAA). Once designated as a Class I area, an area cannot be re-designated to another (lower) classification. Class I areas are allowed the smallest degree of air quality deterioration through NSR/PSD permitting, and special considerations must be made in the NSR permitting process when a Class I area is located close to a proposed site. Detailed Project emission calculations show that the emissions quantities are not large enough to trigger PSD for any regulated PSD pollutant. As a result, the Project is a minor source that does not require Class I modeling for PSD. Regardless, the Class I areas nearest to the locations of the Bradshaw, Harris, and Stallworth Compressor Stations, and proposed Swann Compressor Station have been identified and are listed in Table 9.1-7, Table 9.1-8, Table 9.1-9, and Table 9.1-10.

Table 9.1-7

Federal Class I Areas Closest to the Existing Bradshaw Compressor Station

Class I Area	Managing Agency	Direction from Bradshaw	Distance to Compressor Station	
			Kilometers	Miles
Otter Creek, West Virginia	U.S. Forest Service	Southeast of Bradshaw	~98	~61
Dolly Sods, West Virginia	U.S. Forest Service	Southeast of Bradshaw	~117	~73
Shenandoah, Virginia	National Park Service	Southeast of Bradshaw	~211	~131
James River, Virginia	U.S. Forest Service	Southeast of Bradshaw	~236	~147

Table 9.1-8

Federal Class I Areas Closest to the Existing Harris Compressor Station

Class I Area	Managing Agency	Direction from Harris	Distance to Compressor Station	
			Kilometers	Miles
Otter Creek, West Virginia	U.S. Forest Service	Northeast of Harris	~82	~52
Dolly Sods, West Virginia	U.S. Forest Service	Northeast of Harris	~103	~64
Shenandoah, Virginia	National Park Service	Southeast of Harris	~166	~103
James River, Virginia	U.S. Forest Service	Southeast of Harris	~156	~97

Table 9.1-9

Federal Class I Areas Closest to the Existing Stallworth Compressor Station

Class I Area	Managing Agency	Direction from Stallworth	Distance to Compressor Station	
			Kilometers	Miles
Otter Creek, West Virginia	U.S. Forest Service	Northeast of Stallworth	~159	~99
Dolly Sods, West Virginia	U.S. Forest Service	Northeast of Stallworth	~174	~108

Table 9.1-9 Federal Class I Areas Closest to the Existing Stallworth Compressor Station				
Class I Area	Managing Agency	Direction from Stallworth	Distance to Compressor Station	
			Kilometers	Miles
Shenandoah, Virginia	National Park Service	Northeast of Stallworth	~189	~117
James River, Virginia	U.S. Forest Service	Southeast of Stallworth	~120	~75

Table 9.1-10 Federal Class I Areas Closest to the Proposed Swann Compressor Station				
Class I Area	Managing Agency	Direction from Swann	Distance to Compressor Station	
			Kilometers	Miles
Otter Creek, West Virginia	U.S. Forest Service	North of Swann	~195	~121
Dolly Sods, West Virginia	U.S. Forest Service	North of Swann	~205	~127
Shenandoah, Virginia	National Park Service	Northeast of Swann	~150	~93
James River, Virginia	U.S. Forest Service	Northeast of Swann	~74	~46
Linville Gorge, North Carolina	U.S. Forest Service	Southwest of Swann	~208	~129

9.1.2 Project Emissions

9.1.2.1 Construction

Construction activities will result in temporary increases in emissions of some pollutants due to the use of mobile equipment powered by diesel fuel or gasoline engines; the temporary generation of fugitive dust due to disturbance of the ground surface, vegetation clearing, and other dust generating actions; and indirect emissions attributable to workers commuting to and from work sites during construction.

These sources are not considered stationary sources, and their impacts will generally be temporary and localized. Therefore, the emissions are not subject to the PSD or NNSR major source determination analysis. Furthermore, the emissions from construction activities are not expected to cause or significantly contribute to an exceedance of the NAAQS.

The use of equipment to construct the Project will result in temporary, short-term emissions of air pollutants that will be restricted to the construction period and will terminate once construction has been completed. Construction for the Project is expected to take place from 2027 to 2028.

Construction activities can generally be categorized into the following activities:

- Construction Equipment Engines – emissions from air compressors, backhoes, cranes, and other construction equipment;
- On-Road Vehicle Travel – emissions from commuter buses, passenger vehicles, and diesel or gasoline trucks;

- Off-Road Vehicle Travel – emissions from dump trucks, light/medium duty trucks, and water/fuel trucks;
- Earthmoving Fugitives – emissions resulting from bulldozing, grading, and land disturbance; and
- Wind Erosion – emissions resulting from soil piles.

Emissions from these source categories were calculated using emission factors and U.S. Environmental Protection Agency (EPA) models from the following sources:

- EPA MOVES5 Vehicle Emission Modeling Software (EPA 2024);
- 2023 Climate Registry Default Emission Factors, June 2023 (TCR 2023);
- Western Regional Air Partnership Fugitive Dust Handbook, Countess Environmental, September 2006 (WRAP 2006); and
- AP 42, Fifth Edition, Volume I Section 13.2.2 Unpaved Roads (EPA 2006).

Construction emissions from the four compressor stations were estimated based on the type of construction activity occurring and the length of time that type of activity was expected to last at each location. Construction emissions for criteria pollutants, hazardous air pollutants (HAPs), and greenhouse gasses (GHGs) from the Project were estimated for the construction period. The results of these calculations are summarized in Table 9.1-11 and Table 9.1-12. Back-up calculations are provided for construction emissions in Appendix 9-A. Additional discussion of potential emissions from construction of the Project is presented as part of the General Conformity analysis in Section 9.1.5. None of the pollutants are subject to General Conformity requirements, as all counties in which construction will take place are in attainment for all criteria pollutants. Therefore, no numerical thresholds apply to the construction emissions (40 Code of Federal Regulations [CFR] § 93.153(b)).

Table 9.1-11

Estimated Construction Emissions from the Project – 2027

Source	2027 Construction Emissions (tons per year)							
	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_2e	Total HAPs
Bradshaw Compressor Station:								
Construction Equipment Engines	22.40	10.84	0.02	2.31	1.54	1.49	6,786.35	0.94
On-Road Vehicle Travel	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	76.07	7.61	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--
Bradshaw Total	**22.40**	**10.84**	**0.02**	**2.31**	**77.61**	**9.10**	**6,786.35**	**0.94**
Harris Compressor Station:								
Construction Equipment Engines	22.40	10.84	0.02	2.31	1.54	1.49	6,786.35	0.94
On-Road Vehicle Travel	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	73.26	7.33	--	--

Table 9.1-11

Estimated Construction Emissions from the Project – 2027

Source	2027 Construction Emissions (tons per year)							
	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_2e	Total HAPs
Earthmoving Fugitives	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--
Harris Total	**22.40**	**10.84**	**0.02**	**2.31**	**74.80**	**8.82**	**6,786.35**	**0.94**
Stallworth Compressor Station:								
Construction Equipment Engines	22.40	10.84	0.02	2.31	1.54	1.49	6,786.35	0.94
On-Road Vehicle Travel	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	79.04	7.90	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--
Stallworth Total	**22.40**	**10.84**	**0.02**	**2.31**	**80.58**	**9.40**	**6,786.35**	**0.94**
Swann Compressor Station:								
Construction Equipment Engines	35.20	22.28	0.03	4.38	2.77	2.69	10,594.40	1.72
On-Road Vehicle Travel	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	95.01	9.50	--	--
Earthmoving Fugitives	--	--	--	--	1.67	0.17	--	--
Wind Erosion	--	--	--	--	0.24	0.02	--	--
Swann Compressor Station Suction and Discharge Facility:								
Construction Equipment Engines	5.91	3.08	0.01	0.64	0.36	0.35	3,564.28	0.19
On-Road Vehicle Travel	0.11	0.97	0.00	0.07	0.01	0.01	244.63	0.00
Off-Road Vehicle Travel	--	--	--	--	48.44	4.84	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--
Swann Total	**41.22**	**26.33**	**0.04**	**5.09**	**148.50**	**17.58**	**14,403.31**	**1.91**
2027 Total	**108.42**	**58.86**	**0.10**	**12.03**	**381.48**	**44.89**	**34,762.35**	**4.73**

Note:
CO = carbon monoxide, CO_2e = carbon dioxide equivalent, HAP = hazardous air pollutant, NO_2 = nitrogen dioxide, NO_x = nitrogen oxides, PM_{10} = particulate matter with a diameter of 10 microns or less, $PM_{2.5}$ = particulate matter with a diameter of 2.5 microns or less, SO_2 = sulfur dioxide, VOC = volatile organic compounds.

Table 9.1-12

Estimated Construction Emissions from the Project – 2028

Source	2028 Construction Emissions (tpy)							
	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_2e	Total HAPs
Bradshaw Compressor Station:								
Construction Equipment Engines	33.71	16.84	0.03	3.59	2.32	2.25	9,909.46	1.47
On-Road Vehicle Travel	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	76.07	7.61	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--
Bradshaw Total	**33.71**	**16.84**	**0.03**	**3.59**	**78.38**	**9.85**	**9,909.46**	**1.47**
Harris Compressor Station:								
Construction Equipment Engines	33.71	16.84	0.03	3.59	2.32	2.25	9,909.45	1.47
On-Road Vehicle Travel	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	73.26	7.33	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--
Harris Total	**33.71**	**16.84**	**0.03**	**3.59**	**75.58**	**9.57**	**9,909.45**	**1.47**
Stallworth Compressor Station:								
Construction Equipment Engines	33.71	16.84	0.03	3.59	2.32	2.25	9,909.45	1.47
On-Road Vehicle Travel	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	79.04	7.90	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--
Stallworth Total	**33.71**	**16.84**	**0.03**	**3.59**	**81.36**	**10.15**	**9,909.45**	**1.47**
Swann Compressor Station:								
Construction Equipment Engines	40.06	19.77	0.03	4.35	2.79	2.71	11,914.91	1.75
On-Road Vehicle Travel	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	95.01	9.50	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--
Swann Compressor Station Suction and Discharge Facility								
Construction Equipment Engines	--	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--
Earthmoving Fugitives	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--
Swann Total	**40.06**	**19.77**	**0.03**	**4.35**	**97.79**	**12.21**	**11,914.91**	**1.75**

Table 9.1-12

Estimated Construction Emissions from the Project – 2028

Source	2028 Construction Emissions (tpy)							
	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO_2e	Total HAPs
2028 Total	**141.19**	**70.31**	**0.12**	**15.13**	**333.12**	**41.78**	**41,643.27**	**6.17**

Note:
CO = carbon monoxide, CO_2e = carbon dioxide equivalent, HAP = hazardous air pollutant, NO_2 = nitrogen dioxide, NO_x = nitrogen oxides, PM_{10} = particulate matter with a diameter of 10 microns or less, $PM_{2.5}$ = particulate matter with a diameter 2.5 microns or less, SO_2 = sulfur dioxide, VOC = volatile organic compounds.

9.1.2.2 Operation (Including Maintenance)

The following four sections list the existing emissions sources that are currently permitted and authorized, as well as the proposed new equipment to be permitted and installed at each compressor station. Emission calculations have been performed and presented in Appendix 9-B for these emission sources. The results of these calculations are summarized in Table 9.1-13.

Bradshaw Compressor Station Expansion

The emissions sources permitted at the existing Bradshaw Compressor Station include:

- Four Solar Titan 130E natural gas-fired turbines each rated at 23,378 hp at site-specific conditions (ISO rating at 23,470 hp each);
- Fourteen Capstone C200 natural gas-fired microturbines each rated at 200 kilowatts (kW);
- Two natural gas-fired fuel gas heaters each rated at 1.54 million British thermal units per hour (MMBtu/hr);
- One natural gas-fired office building heater rated at 0.12 MMBtu/hr;
- Two storage tanks (one for produced fluids and one for oil) with capacities less than 15,000 gallons; and
- Associated piping, fugitive components, and equipment.

The modified air permit application will include the following changes:

- Installing one Solar Titan 130E natural gas-fired turbine rated at 23,483 hp at site-specific conditions (ISO rating at 23,470 hp);
- Installing one Capstone C200 natural gas-fired microturbine rated at 200 kW[2];
- Adding natural gas-fired fuel gas heater(s) rated at 1.54 MMBtu/hr; and
- Associated piping, fugitive components, and equipment.

[2] The FERC Certificate authorization for the MVP Mainline includes 14 microturbines. Of these, 10 are currently installed on-site, and MVP plans to install 5 additional units. This will result in a net increase of 1 microturbine. The existing fuel gas heater ratings have also been adjusted to the lower, as-built conditions. The existing turbine ratings have been adjusted to reflect as-built conditions.

Harris Compressor Station Expansion

The emissions sources permitted at the existing Harris Compressor Station include:

- Two Solar Titan 130 natural gas-fired turbines each rated at 20,609 hp at site-specific conditions (ISO rating at 20,500 hp each);
- Nine Capstone C200 natural gas-fired microturbines each rated at 200 kW;
- Two natural gas-fired fuel gas heaters each rated at 1.54 MMBtu/hr;
- One natural gas-fired office building heater rated at 0.12 MMBtu/hr;
- Two storage tanks (one for produced fluids and one for oil) with capacities less than 15,000 gallons; and
- Associated piping, fugitive components, and equipment.

The modified air permit application will include the following changes:

- One Solar Titan 350 natural gas-fired turbine rated at 56,590 hp at site-specific conditions (ISO rating at 52,500 hp).
- Natural gas-fired fuel gas heater(s) rated at 1.54 MMBtu/hr;
- Four Capstone C200 natural gas-fired microturbines each rated at 200 kW[3]; and
- Associated piping, fugitive components, and equipment.

Stallworth Compressor Station Expansion

The emissions sources permitted at the existing Stallworth Compressor Station include:

- Two Solar Titan 130 natural gas-fired turbines each rated at 19,614 hp at site-specific conditions (ISO rating at 20,500 hp each);
- Ten Capstone C200 natural gas-fired microturbines each rated at 200 kW;
- Two natural gas-fired fuel gas heaters each rated at 1.54 MMBtu/hr;
- One natural gas-fired office building heater rated at 0.12 MMBtu/hr;
- Two storage tanks (one for produced fluids and one for oil) with capacities less than 15,000 gallons; and
- Associated piping, fugitive components, and equipment.

[3] The FERC Certificate authorization for the MVP Mainline include 9 microturbines. Of these, 8 are currently installed on site, and MVP plans to install 5 additional units. This will result in a net increase of 4 microturbines. The existing fuel gas heater ratings have also been adjusted to the lower, as-built conditions. The existing turbine ratings have been adjusted to reflect as-built conditions.

The modified air permit application will include the following changes:

- Converting the existing Solar Titan 130 natural gas-fired turbines to Solar Titan 130E natural gas-fired turbines rated at 22,374 hp at site-specific conditions (ISO rating at 23,470 hp). The compressors (C45-3) associated with the turbines will remain the same.
- Installing two Solar Titan 130E natural gas-fired turbines rated at 22,374 hp at site-specific conditions (ISO rating at 23,470 hp).
- Installing three Capstone C200 natural gas-fired microturbines each rated at 200 kW[4].
- Adding natural gas-fired fuel gas heater(s) rated at 1.54 MMBtu/hr.
- Installing associated piping, fugitive components, and equipment.

Swann Compressor Station

The proposed Swann Compressor Station will involve the installation of:

- Two Solar Titan 350 natural gas-fired turbines, each rated at 56,834 hp at site-specific conditions (ISO rating at 52,500 hp each);
- One Solar Titan 250 natural gas-fired turbine rated at 32,493 hp at site-specific conditions (ISO rating at 31,900 hp);
- Fifteen Capstone C200 natural gas-fired microturbine generators, each rated at 200 kW;
- Natural gas-fired fuel gas heaters, with a combined rating of 4.62 MMBtu/hr;
- Two storage tanks (one for produced fluids and one for oil) with capacities less than 15,000 gallons; and
- Associated piping, fugitive components, and equipment.

[4] The FERC Certificate authorization for the MVP Mainline includes 10 microturbines. Of these, 8 are currently installed on site, and MVP plans to install 5 additional units. This will result in a net increase of 3 microturbines. The existing fuel gas heater ratings have also been adjusted to the lower, as-built conditions. The existing turbine ratings have been adjusted to reflect as-built conditions.

Table 9.1-13

Operations Emissions Summary (tons per year) a/

Facility	VOC	NO_X	CO	SO_2	$PM_{2.5}$ / PM_{10}	CO_2e	HCHO	Total HAPs
Bradshaw Compressor Station								
Existing	40.46	177.69	197.28	10.97	47.42	427,797	8.99	10.06
Proposed	5.32	26.89	6.97	2.67	7.85	101,159	0.45	0.72
Total	45.78	204.57	204.25	13.64	55.27	528,957	9.44	10.77
Harris Compressor Station								
Existing	20.40	86.25	96.65	4.95	21.35	201,062	3.97	4.53
Proposed	10.40	58.17	61.77	5.83	17.05	211,113	4.85	5.41
Total	30.79	144.42	158.42	10.78	38.4	412,175	8.82	9.94
Stallworth Compressor Station								
Existing	19.75	79.26	90.79	4.74	20.26	190,260	3.79	4.27
Proposed	10.13	26.13	24.45	5.74	10.37	215,316	4.80	5.35
Total	29.88	105.39	115.24	10.48	30.63	405,576	8.59	9.62
Swann Compressor Station								
Existing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Proposed	22.72	54.99	46.57	15.21	44.36	555,597	2.60	4.06
Total	22.72	54.99	46.57	15.21	44.36	555,597	2.60	4.06

Note:

CO = carbon monoxide, CO_2e = carbon dioxide equivalent, HAP = hazardous air pollutant, HCHO =formaldehyde, NO_2 = nitrogen dioxide, NO_x = nitrogen oxides, PM_{10} = particulate matter with a diameter of 10 microns or less, $PM_{2.5}$ = particulate matter with a diameter of 2.5 microns or less, SO_2 = sulfur dioxide, VOC = volatile organic compounds.

a/ For the existing Bradshaw, Harris, and Stallworth Compressor Stations the emissions during operation present the existing emissions units, the proposed new emission units, and the total emissions for the existing source following completion of the Project.

9.1.2.3 Decommissioning

MVP currently has no plans to decommission the Project. MVP will obtain the necessary state and federal permits for decommissioning at the end of the useful project life.

9.1.3 Air Permitting Requirements

The CSR and VAC require sources of air emissions to notify the state and receive a permit to construct, modify, relocate, and operate the stationary source, unless otherwise exempt. MVP will submit the necessary air permit applications and other relevant documentation prior to construction. Copies of West Virginia air permit applications and the Virginia minor source air permit application will be provided to FERC when available.

The CSR and VAC contain regulations that fall under two main categories: those regulations that are generally applicable (e.g., permitting requirements), and those that have specific applicability (e.g., sulfur compound emissions from combustion units). The generally applicable requirements are straightforward (e.g., filing of emission statements) and, as such, are not discussed in further detail. The specific requirements associated with the Project are discussed in the following section.

9.1.4 Regulatory Review and Applicability

This section lists applicable air quality regulations at both the federal and state levels.

9.1.4.1 Prevention of Significant Deterioration Source Classification

Federal construction permitting programs regulate new major sources and major modifications at existing sources of regulated NSR pollutants. PSD regulations apply when a new major source or major modification to an existing source causes a significant net emission increase. Following completion of the Project, the Bradshaw, Harris, Stallworth, and Swann Compressor Stations will not trigger PSD and will be minor sources, as shown in Table 9.1-14.

Table 9.1-14

Emissions from Compressor Stations versus NSR Major Source Thresholds

Pollutant	Bradshaw Compressor Station Site-Wide PTE (tpy) a/	Harris Compressor Station Site-Wide PTE (tpy) a/	Stallworth Compressor Station Site-Wide PTE (tpy) a/	Swann Compressor Station Site-Wide PTE (tpy)	Major Source Threshold (tpy)	NSR Program	Subject to Major NSR?
PM_{10}	55.27	38.41	30.63	44.36	250	PSD	No
$PM_{2.5}$	55.17	38.37	30.52	44.35	250	PSD	No
SO_2	13.64	10.78	10.48	15.21	250	PSD	No
CO	204.25	158.42	115.24	46.57	250	PSD	No
NO_X	204.57	144.42	105.39	54.99	250	PSD	No
VOC	45.78	30.79	29.88	22.72	250	PSD	No

Note:
CO = carbon monoxide, NO_x = nitrogen oxides, NSR = New Source Review, PM_{10} = particulate matter with a diameter of 10 microns or less, $PM_{2.5}$ = particulate matter with a diameter 2.5 microns or less, PTE = potential to emit, SO_2 = sulfur dioxide, tpy = tons per year, VOC = volatile organic compounds,
a/ Potential to emit includes emissions from fugitive sources.

Please note that while not a regulatory requirement, MVP has modeled the emissions of all criteria pollutants resulting from the Project and has exhibited that all NAAQS standards will be met after completion of the Project. The modeling approach and results are discussed in detail in Appendices 9-E, 9-F, 9-G and 9-H (Air Quality Modeling Reports) and are not reviewed further as part of the regulatory requirements and compliance demonstrations of Sections 9.1.4 and 9.1.5.

9.1.4.2 Title V Operating Permit Program

40 CFR Part 70 establishes the Federal Title V operating permit program. West Virginia has incorporated the provisions of this federal program in its Title V operating permit program (45 CSR 30). Virginia has incorporated the provisions of this federal program in its Title V operating permit program in Title 9 Chapter 80 Article 1 of the VAC.

The major source thresholds with respect to the West Virginia and Virginia Title V operating permit program regulations are 10 tons per year (tpy) of a single HAP, 25 tpy of any combination of HAP, and 100 tpy of all other regulated pollutants. The applicability of the Title V operating permit program to each station is outlined below.

Bradshaw Compressor Station

The Bradshaw Compressor Station is currently a major source with respect to the Title V operating permit program. After addition of the additional compressor unit, the Bradshaw Station will continue to have the potential to emit greater than 100 tpy of nitrogen oxides (NO_X) and carbon monoxide (CO). As such, the Bradshaw Compressor Station will remain a major source with respect to the Title V permit program.

Harris Compressor Station

The Harris Compressor Station is currently a minor source not subject to the Title V operating permit program. The proposed Project will increase the Harris Compressor Station the potential to emit to greater than 100 tpy of NO_X and CO, which exceeds the respective major source thresholds under the Title V permit program. As such, the Harris Compressor Station will become a Title V major source.

Stallworth Compressor Station

The Stallworth Compressor Station is currently a minor source not subject to the Title V operating permit program. The proposed Project will increase the Stallworth Compressor Station potential to emit to greater than 100 tpy of NO_X and CO, which exceeds the respective major source thresholds under the Title V permit program. As such, the Stallworth Compressor Station will become a Title V major source.

Swann Compressor Station

The Swann Compressor Station will have the potential to emit less than 100 tpy for all regulated air pollutants. The Swann Compressor Station will be a minor source not subject to the Title V permit program.

9.1.4.3 New Source Performance Standards

New Source Performance Standards (NSPS), located in 40 CFR Part 60, require new, modified, or reconstructed sources to control emissions to the level achievable by the best demonstrated technology as specified in the applicable provisions. Moreover, any source subject to NSPS is also subject to the general provisions of NSPS Subpart A, except where expressly noted. The following is a summary of applicability

and non-applicability determinations for NSPS regulations of relevance to the proposed equipment to be installed at the facilities.

NSPS Subpart Dc – Steam Generating Units

This subpart applies to steam-generating units of various sizes, all greater than 10 MMBtu/hr. The Project does not include any steam-generating units with a heat input greater than 10 MMBtu/hr. Therefore, the requirements of these subparts do not apply.

NSPS Subpart GG – Stationary Gas Turbines

This subpart applies to stationary gas turbines with a heat input at peak load equal to or greater than 10 MMBtu/hr, based on the lower heating value of the fuel, commencing construction after October 3, 1977. The Solar Turbines (both proposed and existing) meet this heat input threshold; however, they are subject to Subpart KKKK. Per 40 CFR § 60.4305(b), if stationary combustion turbines are subject to Subpart KKKK, they are exempt from the requirements outlined in Subpart GG. Therefore, this rule does not apply to either proposed or existing units.

NSPS Subpart Kc – Volatile Organic Compound Storage Vessels

40 CFR Part 60 Subpart Kc establishes standards of performance for volatile organic liquid storage vessels (including petroleum liquid storage vessels) with capacities greater than or equal to 20,000 gallons for which construction, reconstruction, or modification commenced after October 4, 2023.

The facilities will not operate any volatile organic liquid storage vessels with capacities greater than 20,000 gallons. NSPS Subpart Kc is not applicable.

NSPS Subparts KKKK, KKKKa – Stationary Combustion Turbines

40 CFR Part 60 Subpart KKKK establishes standards of performance for stationary combustion turbines with a heat input at peak load equal to or greater than 10 MMBtu/hr on a higher heating value basis and for which construction, modification, or reconstruction commenced after February 18, 2005. All microturbine generators will have a heat input (higher heating value) at peak load of less than 10 MMBtu/hr and are therefore exempt from the requirements of this subpart. However, the larger Solar gas turbines meet the applicability criteria for NSPS KKKK unless Subpart KKKKa applies to the turbines, as discussed below. At present, Subpart KKKKa would be applicable as proposed because NSPS regulations apply to sources that have not commenced construction as of the date of publication of the proposed NSPS. However, as the rule is not final, a review of Subpart KKKK is included.

NSPS KKKK establishes emission standards for NO_X and sulfur dioxide (SO_2). New natural gas-fired turbines that have a rated heat input capacity of between 50 and 850 MMBtu/hr must meet an NO_X emission standard of 25 parts per million (ppm) (15 percent oxygen [O_2]), equivalent to 1.2 pounds per megawatt-hour (lb/MWh). If operated at less than 75 percent of peak load, a NO_X emission standard of 96 ppm (15 percent O_2) applies, equivalent to 4.7 lb/MWh. SO_2 emissions must be kept below 0.9 lb/MWh, as discharged to the atmosphere, or the turbines must only burn fuel that contains total potential SO_2 emissions of less than or equal to 0.060 lb/MMBtu heat input.

The Solar turbines that will be installed at the stations will be equipped with lean pre-mix combustion technology, guaranteed by the manufacturer to emit a maximum of 9 ppm NO_X at 15 percent O_2 under variable load conditions when firing natural gas. This vendor guarantee complies with the NSPS KKKK

standard. MVP will perform annual performance tests in accordance with 40 CFR § 60.4340 and 40 CFR § 60.4400 to demonstrate compliance with the NO_X emission limitations, or as an alternative, will continuously monitor the appropriate parameter(s) to determine whether the turbines are operating in low-NO_X mode in accordance with 40 CFR § 60.4340(b)(2)(ii) and 40 CFR § 60.4355(a).

MVP will comply with the SO_2 requirements by the exclusive use of natural gas which contains total potential sulfur emissions less than 0.060 lb SO_2/MMBtu heat input in accordance with 40 CFR § 60.4330(a)(2).

In 2024, the EPA published a proposed rule for new, modified, or reconstructed combustion turbines under 40 CFR Part 60, Subpart KKKKa. Under the proposed rule, combustion turbines constructed, modified, or reconstructed after December 13, 2024, must meet more stringent NOx emission standards. The Proposed Rule applies to the larger turbines; however, EPA has announced that it will release a final version of Subpart KKKKa by the end of November 2025. MVP will evaluate the requirements of Subpart KKKKa after EPA releases the final rule.

NSPS Subparts OOOO, OOOOa, OOOOb – Crude Oil and Natural Gas Facilities

Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, applies to affected facilities that were constructed, reconstructed, or modified after August 23, 2011, and before September 15, 2015. As the proposed Project will be constructed outside of these applicability dates, Subpart OOOO is not applicable.

Subpart OOOOa – Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC), GHGs (as methane), and SO_2 emissions from affected facilities in the crude oil and natural gas production source category that commence construction, modification, or reconstruction after September 18, 2015, and on or before December 6, 2022. As the proposed Project will be constructed outside of these applicability dates, Subpart OOOOa is not applicable.

Subpart OOOOb applies to affected facilities that were constructed, reconstructed, or modified on or after December 6, 2022. The following sections discuss the applicability of Subpart OOOOb to the proposed Project. The EPA has recently issued an interim final rule to Subpart OOOOb and is reconsidering certain aspects of the final rule.

Centrifugal Compressors

As part of the proposed Project, new dry-seal centrifugal compressors will be subject to Subpart OOOOb. MVP will comply with the requirements as outlined in § 60.5380b by either:

- Making initial and periodic measurements of volumetric flow to show it does not exceed 10 standard cubic feet per minute per seal or changing or replacing the unit within 90 days after a measurement that exceeds 10 standard cubic feet per minute per seal and measuring flow to confirm repair; or
- Replacing the seals on or before 8,760 hours of operation after startup, or every 8,760 hours after the previous flow rate measurement, or on or before 8,760 hours of operation after the date of the most recent dry-seal replacement.

Process Controllers and Pumps

There are no natural gas-driven process controllers or pumps as part of the proposed Project. Therefore, Subpart OOOOb is not applicable to this equipment category for the proposed Project.

Storage Vessels

The proposed Project does not include construction of new tanks at existing facilities (the Bradshaw, Harris, and Stallworth Compressor Stations). As such, the storage vessels are not affected facilities under Subpart OOOOb. Additionally, the proposed Project will not result in an increase in water throughput through the existing pipeline fluids storage vessel beyond the original potential throughput. As such, the storage vessels will not be modified.[5]

With respect to new storage vessels, this Subpart is applicable to storage vessels with potential VOC emissions greater than or equal to 6 tpy or those with methane emissions greater than or equal to 20 tpy. The used oil and produced fluids storage tanks to be installed at the Swann Compressor Station are not affected facilities under this Subpart because they will not have VOC emissions greater than 6 tpy or methane emissions greater than 20 tpy.

Fugitive Components

Subpart OOOOb standards for equipment leaks at natural gas compressor stations apply to the group of all fugitive components at a natural gas compressor station. The addition of compressors will modify the existing compressor station with respect to fugitive components. MVP will monitor all fugitive emission components with an optical gas imaging device and repair all sources of fugitive emissions in accordance with § 60.5397b. MVP will develop a monitoring plan, conduct surveys on a quarterly basis, and comply with the applicable recordkeeping and reporting requirements of the rule.

9.1.4.4 National Emission Standards for Hazardous Air Pollutants

Regulatory requirements for facilities subject to National Emission Standards for Hazardous Air Pollutants (NESHAP) standards, otherwise known as Maximum Available Control Technology (MACT) Standards for source categories, are contained in 40 CFR Part 63. 40 CFR Part 61 NESHAP standards are defined for specific pollutants while Part 63 NESHAPs are defined for source categories where allowable emission limits are established on the basis of a MACT determination for a particular major source. A major source of HAP is defined as having potential emissions in excess of 25 tpy for total HAP and/or potential emissions in excess of 10 tpy for any individual HAP. Area sources are defined as sources that are not major sources of HAP; therefore, emitting less than 10 tpy of a single HAP, and less than 25 tpy of total HAPs. Part 63 NESHAPs apply to sources in specifically regulated industrial source categories (CAA Section 112(d)) or on a case-by-case basis (CAA Section 112(g)) for facilities not regulated as a specific industrial source type.

Once in operation, each compressor station will be an area source of HAP emissions.

The potential applicability of specific MACT standards to each compressor station is discussed below.

[5] Note that the throughput modification definition in §60.5365b(e)(3)(ii)(D) is not effective until January 22, 2027.

NESHAP Subpart HH – Natural Gas Production Facilities

This standard applies to sources at natural gas production facilities that are major or area sources of HAP emissions. The compressor stations are transmission facilities; therefore, the facilities are not subject to Subpart HH.

NESHAP Subpart HHH – Natural Gas Transmission and Storage Facilities

This standard applies to sources at natural gas transmission and storage facilities that are major sources of HAP emissions located downstream of the point-of-custody transfer (after processing and/or treatment in the production sector), but upstream of the distribution sector. Although the compressor stations are transmission facilities, they are area sources of HAP emissions. Therefore, Subpart HHH is not applicable.

NESHAP Subpart YYYY – Stationary Combustion Turbines.

Stationary combustion turbines located at facilities that are major sources of HAPs are potentially subject to Subpart YYYY, NESHAP for Stationary Combustion Turbines. Subpart YYYY establishes emissions and operating limitations for lean premix gas-fired, lean premix oil-fired, diffusion flame gas-fired and diffusion flame oil-fired stationary combustion turbines. The compressor stations are area sources of HAP and therefore are not subject to the requirements of this subpart.

NESHAP Subpart DDDDD – Industrial, Commercial, and Institutional Boilers and Process Heaters (Major Source Boiler MACT)

This standard applies to boilers and process heaters at facilities that are major sources of HAPs. The compressor stations are area sources of HAPs and therefore are not subject to the requirements of this subpart.

NESHAP Subpart JJJJJJ – Industrial, Commercial, and Institutional Boilers (Area Source Boiler MACT)

This standard applies to industrial, commercial, and institutional boilers of various sizes and fuel types at area sources of HAP. The units at the compressor stations are gas-fired boilers as defined by the rule and therefore are not subject to the requirements of this subpart, per §63.11195(e).

9.1.4.5 Greenhouse Gas Reporting Rule

Per 40 CFR § 98.2(a)(2), facilities that contain a source category listed in Table A-4 and emit 25,000 metric tons per year of carbon dioxide equivalent (CO_2e) in combined emissions from stationary fuel combustion units, miscellaneous uses of carbonate, and all applicable source categories in Tables A-3 and A-4 are subject to reporting under the Greenhouse Gas Mandatory Reporting Rule (MRR). Table A-4 of 40 CFR Part 98 Subpart A includes Petroleum and Natural Gas Systems.

Actual emissions will be calculated annually following the 40 CFR Part 98, Subparts C and W applicability and calculation methodology and compared against the reporting threshold to address the potential applicability of the rule. The Project will meet all requirements of the MRR, as applicable. No other subparts under the MRR are applicable to the Project facilities. The EPA has proposed to reconsider the MRR. MVP will track the outcome of this rulemaking and its impact on the Project facilities.

9.1.4.6 West Virginia Air Quality Regulations

The existing compressor stations (Bradshaw, Harris, and Stallworth Compressor Stations) are potentially subject to regulations contained in the CSR Title 45.

45 CSR 2: To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers

45 CSR 2 applies to fuel-burning units, defined as equipment burning fuel "for the primary purpose of producing heat or power by indirect heat transfer". The proposed fuel heaters at each station are fuel-burning units and therefore must comply with this regulation. Per 45 CSR 2-3, opacity of emissions from this unit shall not exceed 10 percent.

45 CSR 4: To Prevent and Control the Discharge of Air Pollutants into the Air Which Causes or Contributes to an Objectionable Odor

According to 45 CSR 4-3:

> *No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public.*

The compressor stations are generally subject to this requirement. MVP will operate all equipment in a manner as to avoid causing or contributing to an objectionable odor at any location occupied by the public.

45 CSR 6: Control of Air Pollution from the Combustion of Refuse

45 CSR 6 applies to activities involving incineration of refuse, defined as:

> *…the destruction of combustible refuse by burning in a furnace designed for that purpose. For the purposes of this rule, the destruction of any combustible liquid or gaseous material by burning in a flare or flare stack, thermal oxidizer or thermal catalytic oxidizer stack shall be considered incineration.*

The facilities will not operate any incinerators under this definition and, as such, have no requirements under this rule.

45 CSR 10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides

This rule applies to specific emission sources that are listed by name in the rule, to sulfuric acid manufacturing plants, and to sources that combust any refinery process gas stream or any other process gas stream that contains hydrogen sulfide in a concentration greater than 50 grains per 100 cubic feet. The compressor stations do not meet any of the categories subject to the rule, and as such are not subject to the rule.

45 CSR 13: Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, Permission to Commence Construction, and Procedures for Evaluation

This rule establishes procedures for permitting and reporting of stationary sources. MVP will comply with the requirements of this rule by complying with the applicable general provisions in the facility's construction and operating permits.

45 CSR 16: Standards of Performance for New Stationary Sources

45 CSR 16-1 incorporates the federal CAA standards of performance for new stationary sources set forth in 40 CFR Part 60 by reference. As noted above, the facility will comply with all applicable NSPS subparts.

45 CSR 17: To Prevent and Control Particulate Matter Air Pollution from Materials Handling, Preparation, Storage and Other Sources of Fugitive Particulate Matter

According to 45 CSR 17-3.1:

> *No person shall cause, suffer, allow or permit fugitive particulate matter to be discharged beyond the boundary lines of the property lines of the property on which the discharge originates or at any public or residential location, which causes or contributes to statutory air pollution.*

Due to the nature of the activities at the compressor stations, it is unlikely that fugitive particulate matter emissions will be emitted under normal operating conditions. However, MVP will take measures to ensure any fugitive particulate matter emissions will not cross the property boundary should any such emissions occur.

45 CSR 21: To Prevent and Control Air Pollution from the Emission of Volatile Organic Compounds

45 CSR 21 applies only to sources located in Putnam County, Kanawha County, Cabell County, Wayne County, and Wood County, West Virginia. The compressor stations are not located in any of these counties. Therefore, the requirements of this section do not apply to the Project.

45 CSR 22: Air Quality Management Fee Program

This regulation establishes a program to collect fees for certificates to operate and for permits to construct, modify or relocate sources of air pollution. MVP will comply with this rule by paying all required permitting fees.

45 CSR 30: Requirements for Operating Permits

45 CSR 30 implements the operating permit set forth in 40 CFR Part 70. As noted above, each West Virginia facility will be a Title V major source. Operating permit applications will be submitted within 1 year of start of operations of the Project.

45 CSR 34: Emissions Standards for Hazardous Air Pollutants

45 CSR 34-1 incorporates the federal CAA NESHAPs as set forth in 40 CFR Parts 61 and 63 by reference. As noted above, no NESHAPs are applicable to the station.

Non-Applicability of Other SIP Rules

A thorough examination of the West Virginia SIP rules with respect to applicability at the compressor stations reveals many SIP regulations that do not apply or impose additional requirements on operations. Such SIP rules include those specific to a particular type of industrial operation that is categorically not applicable to the compressor stations.

9.1.4.7 Virginia Air Quality Regulations

The proposed Swann Compressor Station is potentially subject to regulations contained in 9VAC5.

9VAC5-40 – Existing Stationary Source Regulations

Chapter 40 regulations (9VAC5-40) are applicable to stationary sources located within Virginia that were either a) constructed, modified, or relocated on or before March 17, 1972, or b) reconstructed on or before December 10, 1976. The Swann Compressor Station will have no sources meeting the definition of an existing source under Chapter 40; however, the provisions of 9VAC5-50-10 and 9VAC5-80-1100 provide that Chapter 40 standards may still apply if specifically provided otherwise, or if those standards are found to be more restrictive than the provisions of 9VAC5 Chapters 50 or 80. This most commonly occurs in cases in which no federal NSPS/NESHAP standards are found to be applicable.

The three larger Solar gas turbines will be subject to NSPS KKKK, and the compressors and fugitive components will be subject to NSPS OOOOb. These emission standards are presumed to be more restrictive than the requirements of Chapter 40. As such, Chapter 40 standards have therefore not been assessed for the Solar turbines, compressors, or fugitive components.

9VAC5-40 Article 8 – Fuel Burning Equipment (Rule 4-8)

Chapter 40 Article 8 establishes standards for particulate matter and SO_2 from fuel-burning equipment operated throughout Virginia. Exemption is provided for fuel-burning equipment using gaseous fuel with a maximum heat input of less than 10 MMBtu/hr.

Microturbine generators and fuel gas preheaters will combust natural gas and are individually rated to capacities below 10 MMBtu/hr. These sources are exempt from Rule 4-8.

9VAC5-40 Article 37 – Petroleum Liquid Storage and Transfer Operations (Rule 4-37)

Chapter 40 Article 37 sets VOC emission standards for operations involving the storage or transfer of petroleum liquids. This article is applicable to sources located within a VOC emissions control area designated in 9VAC5-20-206. The Swann Compressor Station will not be located within a defined emissions control area for VOCs and is therefore not subject to the requirements of Rule 4-37.

9 VAC 5-50 – New and Modified Stationary Source Regulations

Chapter 50 regulations (9VAC5-50) are applicable to stationary sources located within Virginia for which construction, modification, or relocation commenced after March 17, 1972, or for which reconstruction commenced on or after December 10, 1976. All emission sources at the Swann Compressor Station are subject to the general requirements for new or modified source rules in 9VAC5-50 because they are not subject to an Article 6 permitting exemption. This section highlights several regulations under Chapter 50 which are generally applicable to the Project.

General Maintenance (9VAC5-50-20.E)

At all times, including periods of startup, shutdown, and malfunction, owners shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with air pollution control practices for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Virginia Department of Environmental Quality (VDEQ), which may include, but is not limited to,

monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.

MVP will demonstrate compliance with these provisions by operating and performing maintenance on facility equipment in accordance with, at a minimum, the manufacturer's recommended practices. Operators will be trained on proper equipment use, including identification of and response to equipment malfunction.

VOC Storage and Disposal (9VAC5-50-20.F)

At all times, the disposal of VOCs shall be accomplished by taking measures, to the extent practicable, consistent with air pollution control practices for minimizing emissions. Pursuant to this regulation, VOCs shall not be intentionally spilled, discarded in sewers that are not connected to a treatment plant, or stored in open containers or handled in any other manner that would result in evaporation beyond that consistent with air pollution control practices for minimizing emissions.

MVP will store, handle, and discard petroleum liquids in accordance with these requirements.

Standards for Visible Emissions and Fugitive Dust Emissions (9VAC5-50-80 & 90)

This Article generally requires that sources restrict emissions to 20 percent opacity, except for one 6-minute period per hour not to exceed 30 percent opacity. Water vapor is not included in the opacity measurement. This Article does not prohibit a more restrictive opacity limit from being imposed for a source based on review of state Best Available Control Technology (BACT) or other procedures followed by VDEQ in their boilerplate requirements.

This Article additionally includes work practice requirements for prevention of fugitive dust. These work practice requirements may include the use of water or chemicals to suppress dust, paving of dirt roads, use of fans and fabric filters to enclose certain operations, and prompt removal of spilled or tracked dirt from paved streets. Minimal fugitive dust emissions are anticipated under normal operation.

Standards for Odorous Emissions (9VAC5-50-140)

No owner or other person shall cause or permit to be discharged into the atmosphere from any affected facility any odorous emissions in excess of that resultant from using best available control technology, as reflected in any condition that may be placed upon the permit approval for the facility. Note that this standard is not federally enforceable.

No odorous emissions are expected beyond the facility's property boundary. Any nuisance complaints regarding odor will be promptly addressed.

Standards for Stationary Sources (9VAC5-50-260)

BACT is defined in 9VAC5-50-250.C as an emission limit based on the maximum degree of emissions reduction for a pollutant, which VDEQ has determined achievable for the source after consideration of energy, environmental, and economic impacts. 9VAC5-50-260.C requires BACT to be applied to each pollutant for which the uncontrolled emission rate is above the new source exemption thresholds in 9VAC5-80-1105.C.1. Uncontrolled emissions from the proposed facility exceed Article 6 new source exemption thresholds for particulate matter (PM), PM_{10}, $PM_{2.5}$, NO_X, VOC, and CO. Therefore, BACT must be assessed for these pollutants. MVP is proposing BACT as part of the Article 6 permit application.

9VAC5-80-1100: Construction Permits

An Article 6 permit must be issued before the construction of a new or modified source. The Swann Compressor Station will be subject to the permitting requirements in Article 6.

9VAC5-130-40: Open Burning

Open burning is permitted on-site for the destruction of clean-burning waste and debris waste resulting from the development or modification of roads and highways, pipelines, buildings, or any other clearing operations. Open burning is prohibited from May 1 through September 30. There is no planned open burning as part of the Project.

9.1.5 General Conformity

Under the CAA, a General Conformity analysis is required for any project that requires federal action. General Conformity applies to those emission-generating activities resulting from the Project that are not already covered by permitting and located in an area that is designated as nonattainment or a maintenance area (40 CFR § 93.153(b)). The counties of Wetzel, Braxton, and Fayette, West Virginia, and Montgomery County, Virginia are each in attainment for all criteria pollutants (EPA 2025b, 2025c). Therefore, a General Conformity analysis is not required for the construction and/or modification at the Bradshaw, Harris, Stallworth, and Swann Compressor Stations. Construction emissions are presented in Section 9.1.2.1 per FERC's guidance manual for resource reports, even though the Project is not required to undergo a full General Conformity analysis.

9.1.6 Air Quality Mitigation Measures

9.1.6.1 Construction Emissions

The construction emissions associated with the Project are temporary in nature and are expected to have minimal impact on the air quality in the surrounding area. However, MVP will implement various mitigation measures to minimize construction emissions. These include:

- MVP will follow the manufacturer's operating recommendations regarding good combustion practices to ensure that fuel efficiency is maximized and engines are operated such that emissions are minimized.
- MVP will implement fugitive dust control as described below.
- MVP will avoid idling of the construction equipment to the extent possible.
- MVP will either haul away or mulch the slash piles from clearing generated during construction to ensure particulate matter emissions are minimized.

Fugitive dust control measures include the following specific measures to be taken during construction:

- Fugitive dust emissions from vegetation removal, clearing and grading, cutting and filling, topsoil removal, trenching, backfilling, and stockpile storage will be controlled to a great extent by following the construction sequencing and disturbing limited areas at a time.
- Fugitive dust emissions generated by motorized equipment and miscellaneous vehicle traffic will be controlled by wet suppression as necessary.

- Fugitive dust emissions from paved roads will be controlled with a combination of water trucks, power washers, sweeping, and/or vacuuming.
- Trackout of loose materials will be controlled using rock construction entrances on access roads that begin at a junction with paved roads.
- When environmental conditions are dry, inspection of dust control measures will be conducted daily.

9.1.6.2 Operational Emissions

Emissions from operating the equipment at the existing Bradshaw, Harris, and Stallworth Compressor Stations and proposed new Swann Compressor Station are a result of combustion of natural gas of the turbines at the stations. The main emission sources at each compressor station are natural gas fired turbines, microturbines, and heaters.

Emissions of all pollutants have been minimized through the selection of the most efficient turbines. Larger turbines, with greater hp output, are more efficient. More efficient models use less fuel and produce fewer emissions for the same hp output. The compressor stations will utilize the largest, most efficient turbines that meet the pipeline operational requirements. Each of the turbines is equipped with Solar's SoLoNOx technology, which is a combustion technology that reduces NO_X and CO emissions. The proposed turbine at the Bradshaw Compressor Station will be equipped with an oxidation catalyst. The proposed turbines at the Swann Compressor Station will be equipped with both selective catalytic reduction and oxidation catalysts.

The microturbines that will be installed as part of the Project have very low emissions compared to viable alternatives such as reciprocating internal combustion engines. MVP will mitigate these emissions through compliance with the manufacturer's recommendations for good combustion practices. Proper operation and preventative maintenance activities will ensure that emissions from the turbines will be minimized and continue to meet the emission standards.

MVP has also performed a complete air dispersion modeling analysis as presented in Appendix 9-C through 9-F to ensure that the concentration levels from the emission sources at the compressor stations will not exceed the NAAQS. As noted previously, the modeling results demonstrate compliance with the NAAQS.

9.1.6.3 Climate Change and Greenhouse Gases

Construction activities will result in temporary increases in GHG emissions due to the use of non-stationary equipment powered by diesel fuel or gasoline engines and indirect emissions attributable to workers commuting to and from work sites during construction. These sources are not considered stationary sources and their impacts will generally be temporary and localized. MVP will, to the extent practical, employ good management practices to limit these emissions.

Compliance with the federal new source performance standards includes the implementation of measures to reduce methane (and VOC) emissions. MVP will implement a leak detection and repair program consistent with NSPS Subpart OOOOb. Additionally, MVP will comply with the compressor measurement and repair/replacement requirements in NSPS Subpart OOOOb. These measures are designed to minimize emissions of methane to the atmosphere.

Through the use of good management practices and energy efficient design, MVP has employed measures to minimize GHG emissions.

9.2 NOISE

This section provides an overview of the proposed noise-generating equipment for the Project, the noise study approach for each compressor station, a discussion of typical noise mitigation methods for this type of equipment, and noise associated with construction. Environmental noise will be generated during construction and operation of the compressor stations associated with the Project. The Project is in compliance with FERC sound level requirements.

9.2.1 Background Information on Sound and Noise

A sound source is defined by a sound power level (L_W), which is the rate at which acoustical energy is radiated outward and is expressed in units of watts. A sound pressure level (L_P) is a measure of this fluctuation at a given receiver location and can be obtained through the use of a microphone or calculated from information about the source sound power level and the surrounding environment. Sound power cannot be measured directly but rather calculated from measurements of sound intensity or sound pressure at a given distance from the source. The perception of sound as "noise" is influenced by several technical factors such as intensity, sound quality, tonality, duration, and existing background levels. Sound levels are presented on a logarithmic scale to account for the large range of acoustic pressures that the human ear is exposed to and are expressed in units of decibels (dB). Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is used to determine tonal characteristics. The unit of frequency is Hertz (Hz), measuring the cycles per second of the sound pressure waves, and typically the frequency analysis examines 11 octave (or 33 1/3 octave) bands ranging from 16 Hz (low) to 16,000 Hz (high). One-third (1/3) octave bands take these 11 octave bands and split them into three, giving a higher resolution and a more detailed description of the frequency content of the sound. Because the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter.

The A-weighted filter is applied to compensate for the frequency response of the human auditory system and sound exposure in acoustic assessments and is designated in A-weighted decibels (dBA). Environmental noise is commonly described in terms of equivalent sound level (L_{eq}). The L_{eq} value, conventionally expressed in dBA, is the energy-averaged, A-weighted sound level for the complete time period represented as a steady, continuous sound level.

The L_d is the daytime average sound level, or the L_{eq} averaged over daytime hours. Daytime hours are defined as the hours between 7:00 a.m. and 10:00 p.m., which is the interval used by FERC and the U.S. Department of Housing and Urban Development. The L_n is the nighttime average sound level or the L_{eq} averaged over nighttime hours (10:00 p.m. and 7:00 a.m.).

Another common noise descriptor used when assessing environmental noise is the day-night sound level (L_{dn}), which is calculated by averaging the 24-hour hourly L_{eq} levels at a given location and adding 10 dB to noise emitted during the nighttime period (10:00 p.m. to 7:00 a.m.) to account for the increased sensitivity of people to noises that occur at night. The L_{max} is the maximum instantaneous sound level as measured during a specified time period. It can also be used to quantify the time-varying maximum instantaneous sound pressure level (as generated by equipment or an activity) or a manufacturer maximum source emission level. Estimates of common noise sources and outdoor acoustic environments, and the comparison of relative loudness, are presented in Figure 9.2-1.

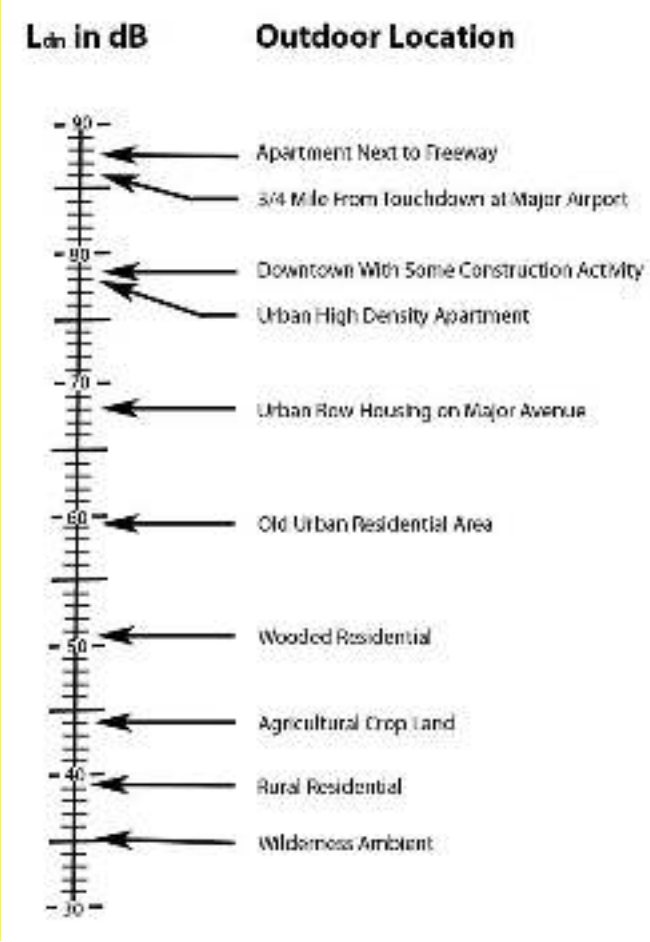

Figure 9.2-1 Sound Pressure Levels (Lp)

9.2.2 Background Information on Vibration

Vibration is an oscillatory motion that is described in terms of displacement, velocity, or acceleration. Velocity is the most common descriptor used when evaluating human perception or structural damage. Velocity represents the instantaneous speed of movement and more accurately describes the response of humans, buildings, and equipment to vibrations.

Peak particle velocity (PPV) and root mean square (rms) velocity are typically metrics used to describe vibration levels in units of inches per second in the United States. However, to evaluate and describe vibration levels from transit operations, the vibration dB (VdB) notation is commonly used. The decibel notation acts to compress the range of numbers required to describe vibration. In the United States, the accepted velocity reference for converting to dB is $1x10^{-6}$ inches per second. The abbreviation "VdB" is used for vibration dB to reduce the potential for confusion with sound decibels.

In contrast to airborne noise, ground-borne vibration is not an everyday occurrence for humans. The background vibration velocity levels within residential areas are usually 50 VdB or lower, which is well below the human perception threshold of approximately 65 VdB. However, human response to vibration is not usually significant unless the vibration exceeds 70 VdB. Outdoor sources that generate perceptible ground-borne vibrations are typically construction equipment, steel-wheeled trains, and traffic on rough

roadways. Table 9.2-1 provides common vibration sources as well as human and structural response to ground-borne vibrations.

Table 9.2-1

Typical Levels of Groundborne Vibration

Human/Structural Response	PPV (inches/second)	Velocity Level (VdB) a/	Typical sources (50 feet from source)
Threshold, Minor Cosmetic Damage, Fragile Buildings	0.4	100	Blasting from Construction Projects
	0.17-0.2	92-94	Heavy Tracked Construction Equipment
Difficulty with Tasks, Such as Reading a Computer Screen	0.125	90	
	0.074	85	Commuter Rail, Upper Range
Residential Annoyance, Infrequent Events	0.04	80	Rapid Transit, Upper Range
	0.013	75	Commuter Rail, Typical
Residential Annoyance, Frequent Events	0.023	72	Bus or Truck Bump Over
	0.013	70	Rapid Transit, Typical
Approximate Threshold of Human Perception	0.007	65	
	0.005	62	Bus or Truck, Typical
	0.0013	50	Typical Background Vibration Levels

Note:
a/ Root mean square (rms) Vibration Velocity in VdB reference to 10^{-6} inches/second
Source: FTA 2018

The degree of annoyance cannot always be explained by the magnitude of the vibrations alone. Phenomena, such as ground-borne noise and rattling, visual effects, such as movement of hanging objects, and time of day, all influence the response of individuals. The American National Standards Institute (ANSI) and the International Organization for Standardization has developed criteria for evaluation of human exposure to vibrations. The recommendations of these standards and other studies evaluating human response to vibrations have been incorporated into the Federal Transit Administration's (FTA's) Transit Noise and Vibration Impact Assessment Manual (2018). The criteria within this manual are used to assess noise and vibration impacts from transit operations.

9.2.3 Regulatory Background

The Project is located in three counties in West Virginia and one county in Virginia. MVP reviewed noise regulations at the federal, state, county, and local levels to identify possible regulations that are applicable to the Project.

The lead federal agency for the Project, FERC, has developed requirements to assess potential noise impacts, which are codified in 18 CFR § 380.12(k)(2). In addition, vibration is assessed using guidance from the FTA.

9.2.3.1 FERC Requirements

FERC's noise regulations, set forth in 18 CFR § 380.12(k)(2) require an applicant to identify existing noise sensitive areas (NSAs) (e.g., residences, schools, churches) and quantitatively describe existing sound levels at NSAs and at other areas covered by relevant state and local noise ordinances. The following stipulations are given:

- If new compressor station sites are proposed, measure or estimate the existing ambient sound environment based on current land uses and activities;
- For existing compressor stations, include the results of a sound level survey at the site property line and nearby NSAs while the compressors are operated at full load;
- Include a plot plan that identifies the locations and duration of noise measurements; and
- All surveys must identify the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement.

In addition, FERC's requirement for noise quality, in the absence of any applicable state or local noise regulation, is that the noise attributable to any new compressor station or any modification, upgrade, or update of an existing station must not exceed an L_{dn} of 55 dBA at any pre-existing NSA such as schools, hospitals, or residences. This criterion limits the sound level contribution from the Project at any pre-existing NSA to 55 dBA (L_{dn}). An L_{dn} of 55 dBA is equivalent to a continuous noise level of 48.6 dBA L_{eq} for facilities that operate at a constant level of noise.

9.2.3.2 Federal Transit Administration Guidelines

FTA guidelines define a vibration damage criterion involving considerable construction equipment operations. The purpose of this criterion is to avoid vibration damage. FTA guidelines state that a vibration level of 65 VdB is the threshold of perceptibility for humans. Vibration levels must exceed 80 VdB for an annoyance impact to occur. The threshold for damage to structures is 90 VdB. Table 9.2-2 summarizes construction vibration damage criteria.

Table 9.2-2

FTA Construction Damage Criteria

Building Category	PPV (inches/second) a/	Approximate VdB b/
Reinforced-concrete, steel or timber (no plaster)	0.5	102
Engineered concrete and masonry (no plaster)	0.3	98
Non-engineered timber and masonry buildings	0.2	94
Buildings extremely susceptible to vibration damage	0.12	90

Notes:
a/ Peak Particle Velocity
b/ Root mean square (rms) velocity in decibels (VdB) relative to 1 micro-inch/second

9.2.3.3 County Limits

The Project will be located in two counties that have noise ordinances. Table 9.2-3 provides a summary of these limits. These county limits are measured at the receiving property line, rather than at the NSA structure, so they cannot be directly compared to FERC's sound level requirements. The Stallworth Compressor Station is located in Fayette County, West Virginia, and the Swann Compressor Station is

located in Montgomery County, Virginia; the sound levels from these stations have been evaluated against both FERC and county sound level requirements.

Table 9.2-3

Noise Level Limits for Counties with Noise Ordinances Crossed by the Project

County	Daytime	Nighttime
Fayette County, West Virginia	65 dBA L_{eq} (7 a.m. – 6 p.m.)	55 dBA L_{eq} (6 p.m. – 7 a.m.)
Montgomery County, Virginia	57 dBA L_{eq} (7 a.m. – 10 p.m.)	52 dBA L_{eq} (10 p.m. – 7 a.m.)

Note:
dBA = A-weighted decibel, L_{eq} = equivalent sound level

In addition, Montgomery County, Virginia has vibration limits, as provided in Table 9.2-4 below.

Table 9.2-4

Vibration Level Limits for Montgomery County, Virgina

Land Use	Type of Vibration	At Residential District Boundaries (PPV) a/	At Other Lot Lines Within District (PPV)
Light Intensity (all districts except M-1 and M-L)	Continuous	0.003	0.015
	Impulsive (100 per minute or fewer)	0.006	0.030
	Fewer than 8 pulses per 24 hours	0.015	0.075
Heavy Intensity (M-1 district)	Continuous	0.003	0.030
	Impulsive (100 per minute or fewer)	0.006	0.060
	Fewer than 8 pulses per 24 hours	0.015	0.150

Note:
a/ Between the hours of 8 p.m. and 7 a.m., all of the permissible vibration levels indicated above at residential district boundaries shall be reduced to one-half the indicated values.

9.2.4 Existing Sound Environment

The existing sound environment surrounding each proposed compressor station has been quantified during an existing conditions/baseline environmental sound level survey in the vicinity of each proposed station. Detailed accounts of the methodology, measurement survey, durations, equipment used, and results are provided in Appendix 9-G, Appendix 9-H, Appendix 9-I and Appendix 9-J, for the Bradshaw, Harris, Stallworth, and Swann Compressor Stations, respectively.

Table 9.2-5, Table 9.2-6, and Table 9.2-7 show the measured daytime sound levels (L_d, dBA) for the Bradshaw, Harris, and Stallworth Compressor Stations, as well as the equivalent L_{dn} (dBA). The results presented are the equivalent continuous levels (L_{eq}) for daytime (L_d) between the hours of 7:00 a.m. to 10:00 p.m., and the nighttime (L_n) between the hours of 10:00 p.m. and 7:00 a.m., and the 24-hour day-night average (L_{dn}), which adds a 10-decibel penalty for sound generated during nighttime hours. All of these are the L_{eq} sound level metric, which is inclusive of all sounds measured during the given time period.

The L_{dn} values were calculated by adding 6.4 dB to the short-term L_{eq} during a daytime period that was free from extraneous noise sources, such as passing vehicles. The overall L_{eq} is inclusive of all environmental noise sources, such as birds and insects. Table 9.2-8 shows the measured L_d (dBA), measured nighttime level (L_n, dBA), as well as the equivalent L_{dn} (dBA) for the Swann Compressor Station. Nighttime sound level measurements were not collected at the existing compressor stations (Bradshaw, Harris, and Stallworth); however, the daytime measurements were collected and the compressor stations were practically inaudible at each measurement location. Therefore, the nighttime sound levels are expected to be similar to the measured daytime sound levels.

Due to significant insect activity and bird chirps during the survey at three sites (Bradshaw, Harris, and Stallworth), measurement results were filtered to remove noise from these environmental sources. This was completed by correcting all sound energy at and above the 1,600-Hz one-third octave band in accordance with ANSI/Acoustical Society of America S3/SC1.100-2014 (ASA 2014). Data are presented with and without filtering applied.

9.2.4.1 Existing Bradshaw Compressor Station

An existing conditions sound level survey was conducted in the vicinity of the existing Bradshaw Compressor Station in Wetzel County, West Virginia. The area surrounding the existing compressor station primarily comprises remote, hilly, wooded areas. Significant insect activity and bird chirps were present during the survey.

Two NSAs (residences) were identified near the site. The existing environmental sound levels were monitored at two measurement locations (MLs) representative of the acoustical environment at the NSAs for a short daytime duration. The NSAs and their approximate distances from the compressor building, as well as the MLs, and the results of a sound level survey are shown in Table 9.2-5 and Appendix 9-G.

During the measurement survey, Unit 2 was offline, and Units 1, 3, and 4 were operating at full load. Appendix 9-G includes a plot plan that identifies the locations and duration of noise measurements, the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement. The filtered sound levels at the Bradshaw Compressor Station ranged from 44.2 to 44.6 dBA L_{dn} at the measurement locations.

9.2.4.2 Existing Harris Compressor Station

An existing conditions sound level survey was conducted in the vicinity of the existing Harris Compressor Station in Braxton County, West Virginia. The area surrounding the existing compressor station primarily comprises remote, wooded areas. Significant insect activity and bird chirps were present during the survey.

Four NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored at four MLs representative of the acoustical environment at the NSAs for a short daytime duration. The NSAs and their approximate distances from the compressor building, as well as the MLs, and the results of a sound level survey are shown in Table 9.2-6 and Appendix 9-H.

Both the compressors at the station were operating at full load. Appendix 9-H includes a plot plan that identifies the locations and duration of noise measurements, the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement. The filtered sound levels at the Harris Compressor Station ranged from 40.7 to 45.6 dBA L_{dn} at the measurement locations.

Table 9.2-5

Existing Sound Level Measurement Results – Bradshaw Compressor Station

Measurement Location	Nearest NSA a/	Distance from Compressor Building to NSA	Direction from Compressor Station to NSA	Measurement Duration	Measured Sound Level, Unfiltered			Measured Sound Level, Filtered to Remove Noise from Birds, Insects, and Traffic		
					dBA			dBA b/		
		Feet		MM:SS (minutes:seconds)	Day, L_d	Night, L_n c/	Day-Night, L_{dn} d/	Day, L_d	Night, L_n c/	Day-Night, L_{dn} d/
ML 1	3	3,105	WSW	05:00	42.4	42.4	48.8	38.2	38.2	44.6
ML 2	4	3,030	SE	02:46	39.4	39.4	45.8	37.8	37.8	44.2

Notes:

dBA = A-weighted decibel, L_d = daytime sound level, L_n = nighttime sound level, L_{dn} = day-night sound level, ML = measurement location, NSA = Noise-sensitive area, WSW= west southwest, SE = southeast

a/ NSAs 1, 2 and 5 from the previous study have since then been either demolished or acquired by MVP and are no longer being considered NSAs.

b/ Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.

c/ Nighttime sound levels were assumed to be equal to measured daytime sound levels since the measurements were collected during periods free from extraneous noise sources and the compressor stations were practically inaudible during the measurements.

d/ L_{dn} was calculated by adding 6.4 dB to the short duration L_{eq} measured.

Table 9.2-6

Existing Sound Level Measurement Results – Harris Compressor Station

Measurement Location	Nearest NSA	Distance from Compressor Building to NSA	Direction from Compressor Station to NSA	Measurement Duration (minutes:seconds)	Measured Sound Level, Unfiltered			Measured Sound Level, Filtered to Remove Noise from Birds, Insects, and Traffic		
					dBA			dBA b/		
		Feet		MM:SS	Day, L_d	Night, L_n b/	Day-Night, L_{dn} c/	Day L_d	Night, L_n b/	Day-Night, L_{dn} c/
ML 1	1	1,445	N	04:59	44.4	44.4	50.8	39.2	39.2	45.6
ML 3	2	1,825	SW	04:59	35.0	35.0	41.4	34.3	34.3	40.7
	3	1,965	SSE							
ML 2	4	3,340	WSW	06:04	38.8	38.8	45.2	36.3	36.3	42.7

Notes:
dBA = A-weighted decibel, L_d = daytime sound level, L_n = nighttime sound level, L_{dn} = day-night sound level, ML = measurement location, NSA = Noise-sensitive area N=north, SW=southwest, SSE=south southeast, WSW=west southwest
a/ Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
b/ Nighttime sound levels were assumed to be equal to measured daytime sound levels since the measurements were collected during periods free from extraneous noise sources and the compressor stations were practically inaudible during the measurements.
c/ L_{dn} was calculated by adding 6.4 dB to the short duration L_{eq} measured.

9.2.4.3 Existing Stallworth Compressor Station

An existing conditions sound level survey was conducted in the vicinity of the existing Stallworth Compressor Station in Fayette County, West Virginia. The area surrounding the existing compressor station primarily comprises remote, wooded areas. Significant insect activity and bird chirps were present during the survey.

Five NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored at five MLs representative of the acoustical environment at the NSAs for a short daytime duration. The NSAs and their approximate distances from the compressor building, as well as the MLs, and the results of a sound level survey while the compressors were operating at full load are shown in Table 9.2-7 and Appendix 9-I.

Appendix 9-I includes a plot plan that identifies the locations and duration of noise measurements, the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement. The filtered sound levels at the Stallworth Compressor Station ranged from 40.9 to 46.0 dBA L_{dn} at the measurement locations.

9.2.4.4 Proposed Swann Compressor Station

A baseline sound level survey was conducted in the vicinity of the proposed Swann Compressor Station in Montgomery County, Virginia. The area surrounding the proposed site is mixed use, consisting of agricultural and residential properties east and west of the compressor station site, commercial properties to the north, and forest to the south. The results of the baseline sound level survey for the existing ambient sound environment based on current land uses and activities is provided in the Swann Compressor Station Pre-Construction Noise Study in Appendix 9-J.

Five NSAs, which include the three closest residences, a fire station, and a church, were identified near the site. An overnight sound level measurement was conducted at one location selected to quantify existing sound levels near the NSAs. The dominant environmental noise source in the area is from traffic along U.S. Route 460/11.

Table 9.2-8 shows the measured L_d, L_n, as well as the equivalent L_{dn} (dBA). The measurements at the proposed Swann Compressor Station site were conducted in January 2025. The results in Table 9.2-8 do not include filtering applied. The existing sound level near the proposed Swann Compressor Station was 43.9 to 49.1 dBA L_{dn} at the measurement location.

Table 9.2-7

Existing Sound Level Measurement Results – Stallworth Compressor Station

Measurement Location	Nearest NSA a/	Distance from Compressor Building to NSA	Direction from Compressor Station to NSA	Measurement Duration	Measured Sound Level, Unfiltered			Measured Sound Level, Filtered to Remove Noise from Birds, Insects, and Traffic		
					dBA			dBA b/		
		Feet		MM:SS (minutes:seconds)	Day, L_d	Night, L_n c/	Day-Night, L_{dn} d/	Day, L_d	Night, L_n c/	Day-Night, L_{dn} d/
ML 1	1	2,835	WNW	04:08	40.5	40.5	46.9	35.0	35.0	41.4
ML 2	2	1,985	W	04:48	43.1	43.1	49.5	39.6	39.6	46.0
ML 3	3	2,085	SW	05:03	38.6	38.6	45.0	38.6	38.6	45.0
ML 4	4	1,465	SSW	04:12	37.3	37.3	43.7	36.1	36.1	42.5
ML 5	6	2,755	ESE	04:15	37.6	37.6	44.0	34.5	34.5	40.9

Notes:
dBA = A-weighted decibel, L_d = daytime sound level, L_n = nighttime sound level, L_{dn} = day-night sound level, ML = measurement location, NSA = Noise-sensitive area WNW= west northwest, W=west, SW=southwest, SSW= south southwest, ESE= east southeasta/ NSA 5 from the previous studies has since then been acquired by MVP and demolished and is no longer considered an NSA.
b/ Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
c/ Nighttime sound levels were assumed to be equal to measured daytime sound levels since the measurements were collected during periods free from extraneous noise sources and the compressor stations were practically inaudible during the measurements
d/ L_{dn} was calculated by adding 6.4 dB to the short duration L_{eq} measured.

Table 9.2-8

Existing Sound Level Measurement Results – Swann Compressor Station

Monitoring Location	Nearest NSA	Measurement Duration a/	Measured Day Average	Measured Night Average	Measured Day-Night Average
		HH:MM (hours: minutes)	Day, L_d dBA	Night, L_n dBA	Day-Night, L_{dn} dBA
ML 1	1, 2, 3, 5	22:47	45.8	41.9	49.1
ML 1 adjusted a/	4	-	40.6	36.7	43.9

Notes: dBA = A-weighted decibel, L_d = daytime sound level, L_n = nighttime sound level, L_{dn} = day-night sound level, ML = measurement location, NSA = Noise-sensitive area

a/ As the sound level monitoring location was at the proposed Swann Compressor Station site and NSA 4 is further from the road than the monitoring location, a distance adjustment was applied to the measurement at NSA 1 to estimate the traffic sound levels at the façade of the dwelling, rather than at the measurement location.

9.2.5 Noise Quality Impacts

Potential impacts from the Project could be caused by short-term increases in noise during construction and long-term increases in noise due to operation of the Project. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. This variation is caused in part by changing weather conditions, duration of construction or operation, and other contributing factors.

9.2.5.1 Short-Term Impacts (Construction)

Potential impacts from the Project could include short-term increases in sound levels during construction at the existing and proposed compressor station sites. Only standard equipment will be used during construction, with no dynamic compaction or pile driving expected. In general, construction activities will occur six days per week from 7:00 a.m. to 7:00 p.m. or daylight hours. In spring, summer, and fall, when sunset occurs later in the evening, construction activities may continue after 7:00 p.m. but will be limited to daylight hours. Construction sound calculations were performed with the CadnaA propagation model, which accounts for local topography. Equipment usage factors were used per the Federal Highway Administration's Roadway Construction Noise Model version 1.1 (FWHA 2006). Usage factor is the percentage of time a given piece of equipment typically operates during a given hour. Table 9.2-9 presents the construction equipment, quantities, assumed usage factors, and adjusted sound pressure level at 50 feet.

Table 9.2-9

Predicted Temporary Sound Levels Due to Construction

Equipment	Quantity	Usage Factor	Quantity and Usage Factor Adjusted Sound Pressure Level at 50 Feet, dBA
Air Compressor	4	0.4	80
Bobcat	3	0.4	80
Compactor	4	0.2	82
Compactor, Vibratory	2	0.2	76
Concrete Mixer Truck (main pours)	10	0.4	85
Concrete Mixer Truck (small pours)	4	0.4	81
20-Ton Wheeled Crane	2	0.16	77
250-Ton Wheeled Crane	2	0.16	76
Hydrotest Truck	1	0.4	81
Dump Truck	4	0.4	78
Excavator	4	0.4	83
Forklift	2	0.2	71
Generators	3	0.5	83
Light Tower	4	0.25	62
Man Lift	8	0.2	77
Scissor Lift	2	0.2	71
Tandem Truck	4	0.4	78
Water/Fuel Truck	4	0.4	76
Welding Machine	10	0.4	80

Table 9.2-9 Predicted Temporary Sound Levels Due to Construction			
Equipment	**Quantity**	**Usage Factor**	**Quantity and Usage Factor Adjusted Sound Pressure Level at 50 Feet, dBA**
Welding Rig	10	0.4	80
X-Ray Truck/Machine	2	0.4	75
Total Sound Power Level, L_w, dBA			**127.5**
Note: dBA = A-weighted decibel			

The total calculated sound power level for the construction equipment listed above is 127.5 dBA. This yields a very conservative result, as it is extremely unlikely that all of this equipment will operate simultaneously.

Based on this collection of equipment, the predicted maximum short-term sound level during construction was calculated for each of the three existing and one new compressor station. Detailed accounts of the construction equipment types, quantities, usage factors, equipment sound levels, and received sound levels at the closest NSAs in each geographical direction relative to a given facility are provided in Appendix 9-G, Appendix 9-H, Appendix 9-I, and Appendix 9-J for the Bradshaw, Harris, Stallworth, and Swann Compressor Stations, respectively. Table 9.2-10 shows a summary of the predicted short-term sound levels at the worst-case NSAs for each of the compressor station sites. The worst-case NSAs are not necessarily the closest NSAs due to terrain shielding between the stations and NSAs.

Based on the predicted construction sound levels in Table 9.2-10 and the temporary and generally daytime-only nature of the construction activities, no special noise mitigation or noise monitoring program will be implemented during the construction phase.

Table 9.2-10 Predicted Temporary Sound Levels Due to Construction		
Compressor Station	**Worst Case NSA**	**Predicted Sound Level (dBA L_{eq})**
Bradshaw	NSA 4	47.9
Harris	NSA 3	57.2
Stallworth	NSA 3	53.2
Swann	NSA 2	53.4
Note: dBA = A-weighted decibel, L_{eq} = equivalent sound level, NSA = noise-sensitive area.		

9.2.5.2 Long-Term Impacts (Compressor Station Operation)

MVP has developed noise models for the Bradshaw, Harris, Stallworth, and Swann Compressor Stations using the most current station designs and manufacturers' specifications.

The following equipment items were considered significant sound sources in the acoustic model analyses for each facility:

- Noise from the turbine exhaust, including the exhaust outlet and noise radiated from the exhaust ductwork, expansion joints, and silencer shell.
- Noise from the turbine air inlet system, including the inlet opening and noise radiated from the silencer/ductwork shell and any duct joints.
- Turbine casing noise that radiates to the exterior of the building/enclosure and through building/enclosure ventilation openings.
- Compressor casing noise that radiates from the package or to the exterior of the building and through building ventilation openings.
- Noise from the lube oil cooler/auxiliary cooler and gas aftercooler.
- Noise radiated by aboveground station gas piping.
- Noise from auxiliary sources such as microturbines.

Table 9.2-11 shows existing and proposed compression at each of the four compressor stations.

Table 9.2-11

Equipment at Each Compressor Station

Compressor Station	Existing Compression	Proposed New Compression
Bradshaw	(4) Solar Titan 130e	(1) Solar Titan 130e
Harris	(2) Solar Titan 130	(1) Solar Titan 350
Stallworth	(2) Solar Titan 130	New - (2) Solar Titan 130e Upgrade – (2) Solar Titan 130 to 130e
Swann	-	(2) Solar Titan 350, (1) Solar Titan 250

Noise Model Methodology

The existing three-dimensional computer noise models were updated to analyze the noise contributions expected from the proposed expansion/new equipment. The models were developed using CadnaA, version 2025 MR1 (build: 211.5558), a commercial noise modeling package developed by DataKustik GmbH. The software considers spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces, and other sound propagation properties. The software is based on published engineering standards. The International Organization for Standardization 9613-2 (International Organization for Standardization 2024) standard was used for air absorption and other noise propagation calculations.

Ground absorption for the surrounding area in each model was set to G = 0.8, representing a fairly absorptive ground. The station pad grounds were modeled as reflective, with a G = 0.1 absorption coefficient.

Due to the dense forest around the Harris Compressor Station, foliage was included in the model. To be conservative, foliage was not included in the Bradshaw, Stallworth, and Swann Compressor Station models. The terrain was modeled based on U.S. Geological Survey topographical data at a resolution of 10 x 10

meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations.

The noise models include both the existing equipment for the Bradshaw, Harris, and Stallworth Compressor Stations, and the proposed expansion/new equipment. Sound levels for the existing equipment are derived from sound level measurements of the operating station equipment and sound levels for the proposed equipment are taken from manufacturer data.

Noise Model Assumptions

All proposed/new equipment was modeled based on the latest site plans. The following assumptions were made for each of the existing sites:

- Bradshaw Compressor Station and Stallworth Compressor Station (Solar Titan 130e units):
    - Turbine exhaust and intake silencers/filters were assumed to have the same performance as the existing equipment.
    - Lube oil cooler sound levels were assumed to be identical to the existing units.
    - Additional microturbine units were assumed to be identical to the existing units.
    - Compressor building walls, roofs, and ventilation were assumed to have the same performance as the existing buildings.
- Harris Compressor Station (Solar Titan 350 unit):
    - All components of the turbine packages, less the enclosure, were designed to achieve 45 dBA at a distance of 200 feet.
    - Additional microturbine units were assumed to be identical to the existing units.
- Swann Compressor Station (Solar Titan 250 and Titan 350 units):
    - All components of the turbine packages, less the enclosure, were designed to achieve 45 dBA at a distance of 200 feet.
    - Microturbine units were assumed to be identical to the existing units at the Bradshaw Compressor Station.

Noise Model Inputs

Sound power and sound pressure level data for the equipment in the noise model were taken from manufacturer data (if available) or from measurements of similar equipment at other compressor stations. Sound pressure and power levels for existing and Project equipment are provided in Appendix 9-G, Appendix 9-H, Appendix 9-I and Appendix 9-J, for the Bradshaw, Harris, Stallworth, and Swann Compressor Stations, respectively. Table 9.2-12 through Table 9.2-15 present the modeled sound pressure and sound power levels used as input to the noise model.

Table 9.2-12

Modeled Sound Power and Pressure Levels – Titan 130e Unit

Source	Linear L_w or L_p at Octave Center Frequency (Hertz)									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Levels, L_w, dB										
Solar Titan 130e Turbine Air Intake, Unsilenced, L_w a/	115	115	115	120	125	130	137	149	144	151
Solar Titan 130e Turbine Exhaust Outlet, Unsilenced, L_w a/	125	128	127	130	137	135	123	113	102	138
Solar Titan 130e Suction Piping, Uninsulated, L_w b/	94	96	95	90	91	96	111	100	90	113
Solar Titan 130e Discharge Piping, Uninsulated, L_w b/	96	92	92	98	103	96	108	100	89	110
Compressor Building Ridge Vent, L_w b/	111	106	103	98	97	94	93	96	92	102
Solar Titan 130e Turbine Exhaust Duct Breakout, L_w a/	97	99	96	96	90	88	97	96	85	101
Solar Titan 130e Turbine Air Intake Duct Breakout, L_w a/	107	95	93	98	88	86	88	95	81	98
Solar Titan 130e Lube Oil Cooler, L_w a/	94	101	99	91	86	83	79	76	71	90
Sound Pressure Levels, L_p, dB										
Compressor Building – Interior (Bradshaw) b/	94	90	90	90	87	88	85	99	94	101
Compressor Building – Interior (Stallworth) L_p b/	92	88	90	89	91	94	91	95	93	100

Notes:
dBA = A-weighted decibel, L_w=sound power level, L_p = sound pressure level
a/ From manufacturers' data
b/ From SLR diagnostic measurements from MVP sites.

Table 9.2-13

Modeled Sound Power Levels – Titan 250 Unit

Source	Linear L_w or L_p at Octave Center Frequency (Hertz)									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Turbine Air Intake, Unsilenced Part Load, L_w a/	116	115	128	134	134	142	153	160	151	162
Turbine Exhaust Outlet, Unsilenced, L_w a/	127	130	132	134	138	133	125	116	107	138
Compressor Enclosure Inlet/Outlet Ventilation Duct, L_w a/	104	107	103	97	93	92	99	113	108	115
Suction Piping, Uninsulated, L_w a/	77	73	78	79	86	97	110	110	96	114
Discharge Piping, Uninsulated, L_w a/	77	73	77	79	86	92	108	107	94	112
Turbine Exhaust Duct Breakout, L_w a/	90	94	95	100	107	102	103	85	64	108
Compressor Enclosure Inlet Fan, L_w a/	92	92	96	102	104	103	98	92	87	107
Enclosure, L_w a/	113	111	110	106	103	99	95	97	89	106

Table 9.2-13 Modeled Sound Power Levels – Titan 250 Unit										
Compressor Enclosure Outlet Fan, L_w a/	99	99	96	97	101	102	100	96	88	106
Compressor Casing, L_w a/	83	80	83	85	90	90	98	95	84	102
Turbine Exhaust Duct Expansion Joint, L_w a/	110	112	104	87	82	89	90	80	73	95
Lube Oil Cooler, L_w a/	95	102	99	92	87	84	80	76	71	90
Turbine Air Intake Duct Breakout, L_w a/	64	74	85	90	74	62	66	54	32	82
Notes: dBA = A-weighted decibel, L_w=sound power level, L_p = sound pressure level a/ From manufacturers' data.										

Table 9.2-14 Modeled Sound Power Levels – Titan 350 Unit										
Source	**Linear L_w or L_p at Octave Center Frequency (Hertz)**									**Total**
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
Turbine Air Intake, Unsilenced Part Load, L_w a/	115	117	121	121	127	133	162	153	152	164
Turbine Exhaust Outlet, Unsilenced, L_w a/	128	133	131	132	133	130	125	116	98	135
Compressor Enclosure Inlet/Outlet Ventilation Duct, L_w a/	110	107	104	100	102	98	128	115	114	130
Suction Piping, Uninsulated, L_w a/	73	65	69	72	84	99	111	113	100	116
Discharge Piping, Uninsulated, L_w a/	71	61	67	70	82	94	109	110	96	114
Enclosure, L_w a/	122	120	112	106	103	99	107	98	98	110
Compressor Enclosure Outlet Fan, L_w a/	94	94	101	105	106	103	97	91	86	107
Compressor Enclosure Inlet Fan, L_w a/	104	104	97	98	101	101	99	91	85	105
Compressor Casing, L_w a/	87	80	83	86	90	91	100	99	87	104
Turbine Exhaust Duct Expansion Joint, L_w a/	114	115	106	85	82	92	94	76	73	98
Lube Oil Cooler, L_w a/	95	102	99	92	87	84	80	76	71	90
Turbine Exhaust Duct Breakout, L_w a/	78	90	86	76	69	54	46	42	4	73
Note: a/ From manufacturers' data										

Table 9.2-15

Modeled Sound Power Levels – Auxiliary Equipment

Source	Linear L_w or L_p at Octave Center Frequency, (Hertz)									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Gas Cooler, per fan, L_w a/	112	109	102	96	90	84	81	82	69	93
Capstone C1000 Microturbine Enclosure Exhaust, L_w a/	81	101	92	94	82	81	80	86	77	91
Capstone C1000 Microturbine Exhaust, L_w a/	92	96	82	85	78	78	66	58	54	82
Capstone C1000 Microturbine Enclosure Intake, L_w a/	81	78	83	78	73	74	75	72	71	81
Compressor Building Ridge Vent, L_w a/	111	106	103	98	97	94	93	96	92	102
Compressor Building Wall-Mounted Supply Fan, L_w a/	97	97	101	97	96	96	93	88	81	100

Notes:
dBA = A-weighted decibel, L_w=sound power level, L_p = sound pressure level
a/ From SLR diagnostic measurements from MVP sites

Noise Control Treatments

The noise models include certain noise control treatments as part of each compressor station design. However, there are many different combinations of noise control mitigation measures that would provide similar noise control. Noise mitigation treatments will be added as needed to ensure each station operates in compliance with FERC requirements. Noise control treatments included in the noise model, along with descriptions, are provided in Appendix 9-G, Appendix 9-H, Appendix 9-I, and Appendix 9-J for the Bradshaw, Harris, Stallworth, and Swann Compressor Stations, respectively. Table 9.2-16 through Table 9.2-18 show a summary of the modeled noise control treatments for each type of unit.

Table 9.2-16

Modeled Noise Control Treatments (Dynamic Insertion Loss (DIL) or Transmission Loss (TL) – Titan 130e Unit

Source	Treatment Description	Required Treatment Performance, decibels (dB)								
		31.5	63	125	250	500	1k	2k	4k	8k
T130e Turbine Intake	Total Silencing (Intake Silencer and Filters), DIL	1	3	18	27	54	89	93	96	96
T130e Compressor Building	STC-39 Wall and Roof System, TL	10	16	17	24	44	49	55	55	58
Personnel Door	STC-32 Personnel Door, TL	9	17	23	27	32	32	31	41	41
Equipment Door	STC-21 Insulated Roll-up Door, TL	2	7	12	17	18	19	22	30	35
Building Ventilation	3ft Silencers and Lined Hoods, DIL	1	5	10	18	22	26	30	35	25
T130e Turbine Exhaust	Custom Exhaust Silencer, DIL	6	14	29	39	46	49	46	45	32
T130e Suction and Discharge Gas Piping	Type ISO B2 Lagging, IL	-	-	-	-	6	15	24	33	42

Table 9.2-17

Modeled Noise Control Treatments (DIL / TL) – Titan 250 Units

Source	Treatment Description	Required Treatment Performance, dB								
		31.5	63	125	250	500	1k	2k	4k	8k
Turbine Intake	Total Silencing (Intake Silencer and Filters), DIL	0	10	28	51	59	64	67	69	73
Compressor Casing	Compressor Casing Blankets, IL	0	2	4	6	8	9	10	10	10
Exhaust Duct	Interior Duct Lining, IL	2	5	9	14	17	20	24	7	12
Enclosure Inlet Ventilation	Silencers and Lined Hoods, DIL	0	1	5	12	24	33	36	34	22
Enclosure Outlet Ventilation	Silencers and Lined Hoods, DIL	1	2	4	9	17	24	29	29	27
Turbine Exhaust	Custom Exhaust Silencer, DIL	10	20	31	44	50	53	50	45	40
Suction and Discharge Gas Piping	Type ISO C3 Lagging, IL	-	-	1	9	17	26	34	38	42

Note:
dB= decibels, DIL = Dynamic Insertion Loss, TL = Transmission Loss

Table 9.2-18

Modeled Noise Control Treatments (DIL / TL) – Titan 350 Units

Source	Treatment Description	Required Treatment Performance, dB								
		31.5	63	125	250	500	1k	2k	4k	8k
Turbine Intake	Total Silencing (Intake Silencer and Filters), DIL	3	16	34	57	65	70	73	75	79
Compressor Casing	Compressor Casing Blankets, IL	0	2	4	6	8	9	10	10	10
Exhaust Duct	Interior Duct Lining, IL	2	5	9	14	17	20	24	7	12
Enclosure Inlet Ventilation	Silencers and Lined Hoods, DIL	24	28	31	35	38	39	40	39	39
Enclosure Outlet Ventilation	Silencers and Lined Hoods, DIL	11	12	16	22	32	39	43	41	32
T350 Turbine Exhaust	Custom Exhaust Silencer, DIL	21	25	32	43	51	53	50	45	44
T350 Suction and Discharge Gas Piping	Type ISO C3 Lagging, IL	0	0	1	9	17	26	34	38	42

Note:
dB= decibels, DIL = Dynamic Insertion Loss, TL = Transmission Loss

Noise Modeling Results

The predicted sound levels from the acoustic modeling for the Bradshaw, Harris, Stallworth, and Swann Compressor Stations are shown in figures included in Appendix 9-G, Appendix 9-H, Appendix 9-I, and Appendix 9-J. Predicted noise impacts on the nearest NSAs to each station are presented in Table 9.2-19 through Table 9.2-22. Site locations, layouts, and modeled equipment were determined from the best available information and incorporated site-specific sound mitigation measures for these compressor stations such as acoustical building enclosures, turbine intake and exhaust silencers.

Table 9.2-19

Predicted Sound Levels – Bradshaw Compressor Station

A	B	C	D	E	F	G	H	I	J
						(E + F)	(D – E)	(G + H)	(I – D)
NSA a/	Distance from Compressor Building to NSA	Direction from Compressor Station to NSA	Measured Existing Sound Level b/ c/	Predicted Station Contribution from Existing Equipment	Predicted Proposed Equipment Only d/	Combined Total Station Contribution (Existing+ Proposed)	Calculated Ambient Sound Level	Total Complete Station Contribution + Calculated Ambient Sound Level	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
3	3,105	WSW	44.6	26.0	21.2	**27.6**	44.5	44.6	0.0
4	3,030	SE	44.2	43.1	34.8	**43.7**	37.7	44.7	0.5

Notes:

dBA = A-weighted decibel, L_{dn} = day-night sound level, NSA = noise-sensitive area

a/ NSAs 1, 2 and 5 from the previous study have since then been either demolished or acquired by MVP and are no longer being considered NSAs.

b/ Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.

c/ L_{dn} was calculated by adding 6.4 dB to the short duration daytime measurement.

d/ Assumes all proposed future equipment in operation at full load.

Table 9.2-20

Predicted Sound Levels – Harris Compressor Station

A	B	C	D	E	F	G
NSA	Distance from Compressor Building to NSA	Direction from Compressor Station to NSA	Measured Existing Sound Level a/ b/	Predicted Proposed Equipment	(D+E) Total Complete Station Contribution + Measured Ambient Sound Level c/	(F – D) Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
1	1,445	N	45.6	42.0	**47.2**	1.6
2	1,825	SW	40.7	42.3	**44.6**	3.9
3	1,965	SSE	40.7	42.1	**44.5**	3.8
4	3,340	WSW	42.7	35.9	**43.5**	0.8

Notes:

dBA = A-weighted decibel, L_{dn} = day-night sound level, NSA = noise-sensitive area

a/ Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.

b/ L_{dn} was calculated by adding 6.4 dB to the short-duration daytime measurement.

c/ Measured existing sound levels include the sound level contribution of the existing Harris Compressor Station operating at full load.

Table 9.2-21

Predicted Sound Levels – Stallworth Compressor Station

A	B	C	D	E	F	G	H	I	J
						(E + F)	(D – E)	(G + H)	(I – D)
NSA a/	Distance from Compressor Building to NSA	Direction from Compressor Station to NSA	Measured Existing Sound Level b/ c/	Predicted Station Contribution from Existing Equipment	Predicted Proposed Equipment Only d/	Combined Total Station Contribution (Existing+ Proposed)	Calculated Ambient Sound Level	Total Complete Station Contribution + Calculated Ambient Sound Level	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
1	2,835	WNW	41.4	40.0	37.9	**42.1**	35.8	43.0	1.6
2	1,985	W	46.0	41.4	39.4	**43.5**	44.2	46.9	0.9
3	2,085	SW	45.0	42.0	40.8	**44.5**	42.0	46.4	1.4
4	1,465	SSW	42.5	36.6	39.5	**41.3**	41.2	44.3	1.8
5	*Property was acquired by MVP and is no longer an NSA*								
6	2,755	ESE	40.9	38.9	38.4	**41.7**	36.6	42.8	1.9

Notes:

dBA = A-weighted decibel, L_{dn} = day-night sound level, NSA = noise-sensitive area

a/ NSA 5 from the previous studies has since then been acquired by MVP and demolished and is no longer considered an NSA.

b/ Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.

c/ L_{dn} was calculated by adding 6.4 dB to the short duration daytime measurement.

d/ Assumes all proposed future equipment in operation at full load.

Table 9.2-22

Predicted Sound Levels – Swann Compressor Station

A	B	C	D	E	F	G
					(D + E)	(F – D)
NSA	Distance from Compressor Station to NSA	Direction from Compressor Station to NSA	Measured Existing Sound Level	Predicted Station Contribution from Proposed Equipment (FERC 55 dBA L_{dn} Limit)	Total Combined Future station + Calculated Ambient Sound Level	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
1	1,445	WNW	49.1	**48.1**	51.6	2.5
2	1,890	NNE		**49.4**	52.3	3.2
3	2,810	ENE		**43.6**	50.2	1.1
4	2,450	ESE	43.9	**33.9**	44.3	0.4
5	1,530	WSW	49.1	**49.0**	52.1	3.0

Note:
dBA = A-weighted decibel, L_{dn} = day-night sound level, NSA = noise-sensitive area

With all proposed noise control treatments, all sites are predicted to be compliant with FERC requirements with all equipment operating at full load.

9.2.5.3 Compressor Station Unit Venting Noise and Mitigation

Under certain circumstances, the pressure in the compressor casing and unit piping must be released in a controlled manner. These events are commonly called "venting" and occur when a unit is shut down for an extended period. This may occur up to 12 times per year per unit. During unit venting, the high-pressure gas in the system is released in a controlled fashion through a vent silencer. Unit venting events may cause a temporary increase in sound level that usually lasts for about 5 minutes.

Compressor units will vent through silencers to limit the noise during unit venting events. The predicted short-term sound levels at the NSAs during unit venting for each site are included within the detailed noise impact studies provided in Appendix 9-G, Appendix 9-H, Appendix 9-I and Appendix 9-J, for the Bradshaw, Harris, Stallworth, and Swann Compressor Stations, respectively. Table 9.2-23 presents the predicted worst-case sound levels during venting.

Table 9.2-23

Predicted Temporary Sound Levels Due to Unit Venting

Compressor Station	Worst Case NSA	Predicted Sound Level (dBA L_{eq})
Bradshaw	NSA 4	48.3
Harris	NSA 3	51.4
Stallworth	NSA 2	51.0
Swann	NSA 1	50.0

Note:
dBA = A-weighted decibel, L_{eq} = equivalent sound level, NSA = noise-sensitive area

9.2.5.4 Emergency Shutdown Noise and Mitigation

Each compressor station has an emergency shutdown (ESD) system that automatically halts operation of the station in the event of an irregularity. This results in a full station venting, during which the gas from all station piping is released in a controlled manner. These events are extremely rare and take place only in the event of an emergency or when the system is tested once every year. Both the ESD and unit vent silencers would be in operation at their rated sound levels during an ESD event.

An ESD scenario will vent all station gas through silencer(s) to limit the noise during ESD events. The predicted short-term sound levels at the NSAs during an ESD event for each site are included within the detailed noise impact studies provided in Appendix 9-G, Appendix 9-H, Appendix 9-I and Appendix 9-J, for the Bradshaw, Harris, Stallworth, and Swann Compressor Stations, respectively. Table 9.2-24 presents the predicted worst-case sound levels during an ESD event.

Table 9.2-24

Predicted Temporary Sound Levels Due to Emergency Shutdown

Compressor Station	Worst Case NSA	Predicted Sound Level (dBA L_{eq})
Bradshaw	NSA 4	51.4
Harris	NSA 3	54.3
Stallworth	NSA 2	58.9
Swann	NSA 5	56.4

Note:
dBA = A-weighted decibel, L_{eq} = equivalent sound level, NSA = noise-sensitive area

9.2.6 Post Construction Sound Survey

As per FERC requirements, MVP will undertake post-construction sound level testing at all four compressor stations within 60 days of the stations being placed into service. The testing will consist of sound level measurements at the closest NSAs with the station equipment in full-load operation. If full-load operation is not possible, then appropriate adjustments will be applied to the measured levels to estimate the sound levels under full-load conditions. The measured levels, along with the measurement methodology, measurement equipment used, station operating and weather conditions during the testing will be included in a report that will be submitted to FERC. If the station sound level contributions are found to exceed FERC's sound level limits, then the reports will include the noise mitigation or equipment modifications that will be implemented to bring the station sound level contributions to below 55 dBA L_{dn}.

9.2.7 Vibration Analysis

Construction of the facilities and site grading would require the use of equipment that could generate vibration. Possible sources of vibration may include bulldozers, dump trucks, backhoes, rollers, and other construction equipment that produces vibration. However, due to the large distances between the construction activities and the NSAs, no significant ground vibration is expected from construction activities. Construction vibration levels at the NSAs are expected to be below the Montgomery County, Virginia vibratory limits. No pile driving or dynamic compaction will be required for construction.

Operation of the equipment associated with the Project facilities would not generate vibration. The major equipment for aboveground facilities associated with the Project consists primarily of gas-fired turbines, centrifugal compressors, and air-cooled heat exchangers. This equipment operates at a high rotational speed and is balanced to extremely high tolerances during the manufacturing process. Any out-of-balance force significant enough to cause ground vibration would result in serious damage to the equipment. Therefore, no perceptible ground-borne vibration is expected from the operation of any of the Project equipment. Operation vibration levels at the NSAs are expected to be below the Montgomery County, Virginia vibratory limits.

Turbine exhausts can be a source of low-frequency noise. Low-frequency noise can result in acoustically induced vibrations in typical residential structures if the sound pressure level is above 75 to 80 dB in the 31.5 Hz or 63 Hz octave bands (ANSI 2005). Predicted low-frequency sound levels from the new equipment at the four compressor stations are well below these criteria for low-frequency noise induced vibration and are not expected to cause any noticeable change in low-frequency noise or induced vibration.

9.2.8 Excavation Blasting

Surface excavation blasting uses the release of energy from a confined explosive to break up rocks to facilitate removal. Most of the energy released goes towards rock breakage and movement, but a small portion passes outside the intended work zone in the form of ground or air vibrations. Air vibrations are pressure waves generated by the blast, referred to as "overpressure" or "air blast." Higher-frequency pressure waves may be heard by people or wildlife as sound, while lower-frequency pressure waves may be felt rather than heard, similar to a gust of wind. In general, surface detonations involving unconfined or poorly confined blasts will cause louder, higher-frequency noise, while well-confined blasts, such as those used to excavate rock, generate lower-frequency effects with overpressure energy predominantly at very low frequencies (often less than 10 Hz, below the range of human hearing).

Construction blasting also generates ground vibration that can propagate outside of the construction area. Generally, surface detonations involving unconfined or poorly confined blasts will cause lower levels of ground vibration that do not propagate far from the blasting site, while well-confined blasts will cause higher levels of ground vibration that can propagate farther away from the blasting.

9.2.8.1 Assessment Criteria

Project compressor stations are located in Virginia and West Virginia. Both states regulate blasting in statute. For Virginia, regulatory limits are outlined in 4VAC25-130-816.67 "Use of explosives; control of adverse effects[6]" and for West Virginia are outlined in §22-4-13. "Blasting restrictions; blasting formula; filing preplan; site specific blasting requirements; penalties; notice[7]." The limits for overpressure and ground vibration appear to be identical in both regulations.

In addition to the state regulations, Montgomery County, Virginia also outlines regulations for blasting activities in Section 10-46 of the Municipal Code of Montgomery County, Virginia[8], with overpressure maximum limits matching the state regulations.

9.2.8.2 Overpressure from Blasting

Table 9.2-25 shows a summary of both states blasting overpressure criteria.

Table 9.2-25

Virginia and West Virginia Maximum Blasting Overpressure Levels Limits

Lower frequency limit of measuring system, in Hertz [Hz] (±3 decibels [dB])	Maximum level, in dB
0.1 Hz or lower - flat response a/	134 peak
2 Hz or lower - flat response	133 peak
6 Hz or lower - flat response b/	129 peak b/
C-weighted - slow response a/	105 peak dBC

Note:
a/ Only when approved by the division.
b/ Montgomery County maximum limit.

[6] Virginia Administrative Code § 4 VAC 25-130-816.67**.** *Blasting: Control of Adverse Effects.* Virginia Department of Energy.
[7] West Virginia Code § 22-4-13**.** *Blasting Restrictions and Performance Standards.* West Virginia Legislature
[8] Montgomery Municipal Code § 10-46. *Performance Standards.*

There are no other known applicable local, state, or federal blasting overpressure regulations.

9.2.8.3 State Regulations

Limits for ground vibration from blasting are identical in Virginia and West Virginia and are outlined in Table 9.2-26 below.

Table 9.2-26

Virginia and West Virginia Maximum Ground Vibration Levels

Distance from the blasting site (feet)	Maximum allowable peak particle velocity (Vmax) for ground vibration (inches/second) a/	Scaled distance factor to be applied without seismic monitoring (Ds) b/
0 to 300	1.25	50
301 to 5,000	1.00	55
5,001 and beyond	0.75	65

a/ Ground vibration shall be measured as the particle velocity. Particle velocity shall be recorded in three mutually perpendicular directions. The maximum allowable peak particle velocity shall apply to each of the three measurements.

b/ Applicable to the scaled-distance equation of Paragraph (d)(3)(i) of this section.

9.2.8.4 Montgomery County Regulations

Figure 9.2-2 below show the maximum PPV limits in the Montgomery County Regulations from Section 10-46.

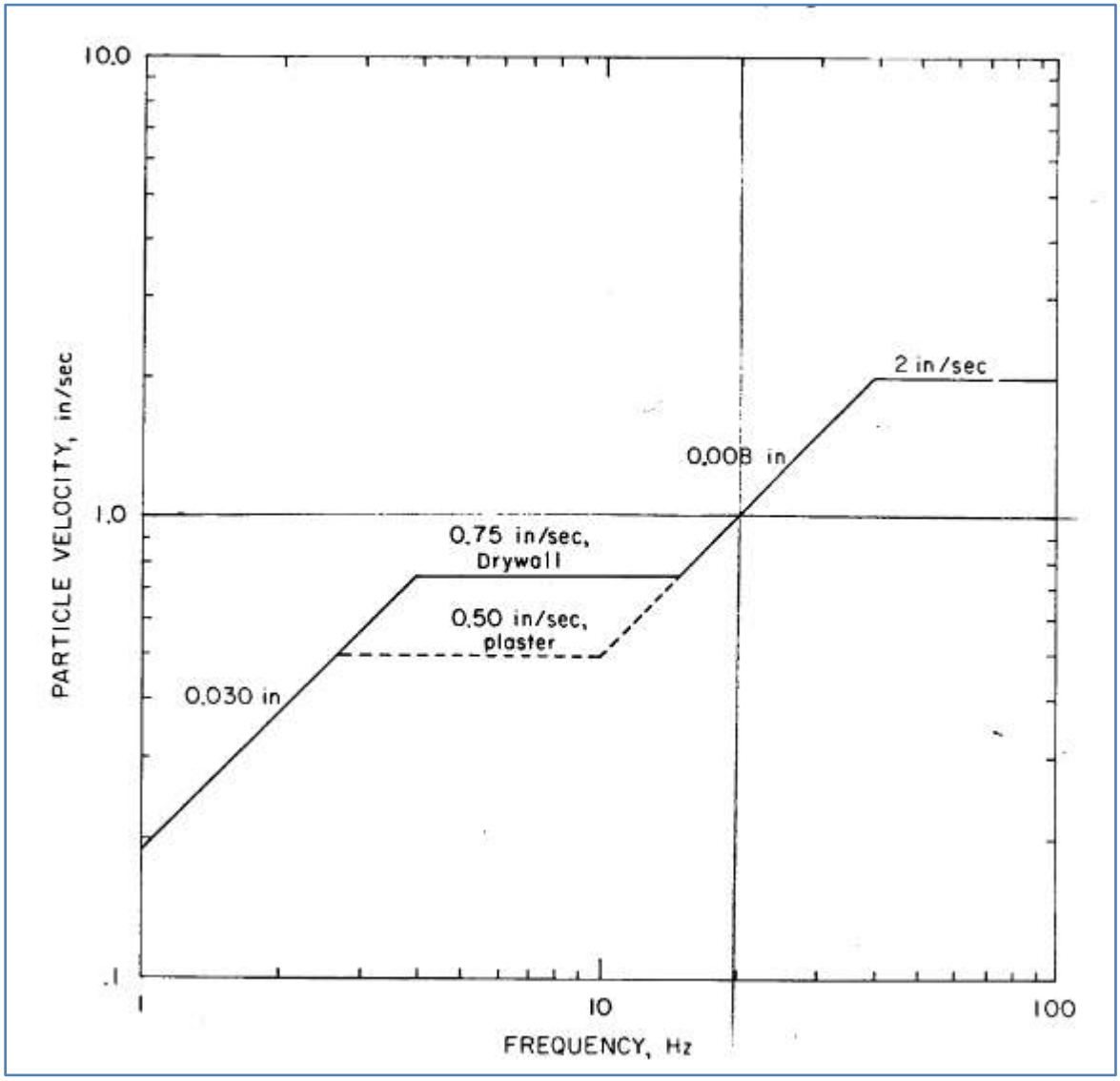

Figure 9.2-2 Montgomery County, Virginia Maximum Ground Vibration Levels

There are no other known applicable local, state, or federal blasting ground vibration regulations.

9.2.8.5 Construction Blasting Impacts

Blasting Charge Weights

Shallow bedrock that may require blasting is present at the Harris and Swann Compressor Station sites. Specific blasting locations and contractor blasting plans are not available; however, MVP's Blasting Plan for the Project is provided in Appendix 6-A of Resource Report 6. To determine a conservative charge weight estimate for the Project, MVP reviewed blasting logs from the construction of the MVP Mainline. For the analysis of the construction blasting impact, a charge weight of 30 pounds per delay was used to determine sound levels from blasting events as this was the maximum charge weight used for the construction of the MVP Mainline.

Estimated Levels at Project NSAs

Several NSAs are located around the Swann and Harris Compressor Stations. The International Society of Explosives Engineers outlines calculation methods for ground vibration and overpressure from blasting in the 18th revision of "The Blaster's Handbook" (ISEE 2011). The handbook includes several different best-fit curves for different types of blasting. Based on review of the blasting monitoring results for the MVP Mainline, the General construction - upper bound highly-confined curve for ground vibration and the best fit curve for general construction blasting for overpressure were selected. These curves both predicted ground vibration and overpressure that encompassed more than 95 percent of the results from blasting. Results from this analysis are shown in Table 9.2-27.

Table 9.2-27

Calculated Vibration and Overpressure at Compressor Station Noise-Sensitive Areas (NSAs)

Compressor Station	NSA	Description	Approximate Distance from Station to NSA, (feet)	Calculated Vibration Level due to 30 lbs Charge Weight per Delay (inches/second) Virgina/West Virginia Limit = 1.0 inches/second	Calculated Peak Overpressure Level due to 30 lbs Charge Weight per Delay (dB Linear) Virgina/West Virginia Limit = 129 dB
Harris Compressor Station	1	Residence	1,445	0.08	112.1
	2	Residence	1,825	0.06	109.8
	3	Residence	1,965	0.05	109.1
	4	Residence	3,340	0.02	104.1
Swann Compressor Station	1	Fire Station	1,445	0.08	112.1
	2	Residence	1,890	0.05	109.5
	3	Church	2,810	0.03	105.7
	4	Residence	2,450	0.03	107.0
	5	Residence	1,530	0.07	111.5

As shown in Table 9.2-27, ground vibration and overpressure levels are predicted to be significantly below the limits for ground vibration and overpressure levels due to blasting activities as outlined in the Virginia, West Virginia, and Montgomery County regulations.

9.3 References

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Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9

Appendix 9-A
Construction Emissions Calculations

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 1. Estimated Construction Criteria Emissions from the Project - 2027

Source	NO_X (tons)	CO (tons)	SO_2 (tons)	VOC (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO2e (tons)	Total HAPs (tons)
Bradshaw Compressor Station:											
Construction Equipment Engines	22.40	10.84	0.02	2.31	1.54	1.49	6,678.63	0.13	0.39	6,786.35	0.94
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	76.07	7.61	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--
Bradshaw Total	**22.40**	**10.84**	**0.02**	**2.31**	**77.61**	**9.10**	**6,678.63**	**0.13**	**0.39**	**6,786.35**	**0.94**
Harris Compressor Station:											
Construction Equipment Engines	22.40	10.84	0.02	2.31	1.54	1.49	6,678.63	0.13	0.39	6,786.35	0.94
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	73.26	7.33	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--
Harris Total	**22.40**	**10.84**	**0.02**	**2.31**	**74.80**	**8.82**	**6,678.63**	**0.13**	**0.39**	**6,786.35**	**0.94**
Stallworth Compressor Station:											
Construction Equipment Engines	22.40	10.84	0.02	2.31	1.54	1.49	6,678.63	0.13	0.39	6,786.35	0.94
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	79.04	7.90	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--
Stallworth Total	**22.40**	**10.84**	**0.02**	**2.31**	**80.58**	**9.40**	**6,678.63**	**0.13**	**0.39**	**6,786.35**	**0.94**
Swann Compressor Station:											
Construction Equipment Engines	35.20	22.28	0.03	4.38	2.77	2.69	10,425.47	0.23	0.61	10,594.40	1.72
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	95.01	9.50	--	--	--	--	--
Earthmoving	--	--	--	--	1.67	0.17	--	--	--	--	--
Wind Erosion	--	--	--	--	0.24	0.02	--	--	--	--	--
Swann Total	**35.20**	**22.28**	**0.03**	**4.38**	**99.68**	**12.38**	**10,425.47**	**0.23**	**0.61**	**10,594.40**	**1.72**
Pipeline:											
Construction Equipment Engines	5.91	3.08	0.01	0.64	0.36	0.35	3,508.79	0.03	0.21	3,564.28	0.19
On-Road Vehicle Travel	0.11	0.97	0.00	0.07	0.01	0.01	240.71	0.01	0.01	244.63	0.00
Off-Road Vehicle Travel	--	--	--	--	48.44	4.84	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--
Pipeline Total	**6.02**	**4.06**	**0.01**	**0.71**	**48.81**	**5.20**	**3,749.50**	**0.04**	**0.22**	**3,808.91**	**0.19**
Total	**108.42**	**58.86**	**0.10**	**12.03**	**381.48**	**44.89**	**34,210.85**	**0.67**	**2.01**	**34,762.35**	**4.73**

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 2. Estimated Construction Criteria Emissions from the Project - 2028

Source	NO_X (tons)	CO (tons)	SO_2 (tons)	VOC (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO2e (tons)	Total HAPs (tons)
Bradshaw Compressor Station:											
Construction Equipment Engines	33.71	16.84	0.03	3.59	2.32	2.25	9,751.54	0.22	0.57	9,909.46	1.47
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	76.07	7.61	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--
Bradshaw Total	**33.71**	**16.84**	**0.03**	**3.59**	**78.38**	**9.85**	**9,751.54**	**0.22**	**0.57**	**9,909.46**	**1.47**
Harris Compressor Station:											
Construction Equipment Engines	33.71	16.84	0.03	3.59	2.32	2.25	9,751.53	0.22	0.57	9,909.45	1.47
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	73.26	7.33	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--
Harris Total	**33.71**	**16.84**	**0.03**	**3.59**	**75.58**	**9.57**	**9,751.53**	**0.22**	**0.57**	**9,909.45**	**1.47**
Stallworth Compressor Station:											
Construction Equipment Engines	33.71	16.84	0.03	3.59	2.32	2.25	9,751.53	0.22	0.57	9,909.45	1.47
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	79.04	7.90	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--
Stallworth Total	**33.71**	**16.84**	**0.03**	**3.59**	**81.36**	**10.15**	**9,751.53**	**0.22**	**0.57**	**9,909.45**	**1.47**
Swann Compressor Station:											
Construction Equipment Engines	40.06	19.77	0.03	4.35	2.79	2.71	11,725.62	0.24	0.69	11,914.91	1.75
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	95.01	9.50	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--
Swann Total	**40.06**	**19.77**	**0.03**	**4.35**	**97.79**	**12.21**	**11,725.62**	**0.24**	**0.69**	**11,914.91**	**1.75**
Pipeline:											
Construction Equipment Engines	--	--	--	--	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--
Pipeline Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Total	**141.19**	**70.31**	**0.12**	**15.13**	**333.12**	**41.78**	**40,980.23**	**0.89**	**2.41**	**41,643.27**	**6.17**

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 3. Estimated Construction HAP Emissions from the Project - 2027

Source	Acetaldehyde (tons)	Acrolein (tons)	Ammonia (tons)	Benzene (tons)	1,3-Butadiene (tons)	Formaldehyde (tons)	Hexane (tons)	Naphthalene (tons)	Ethyl Benzene (tons)	Styrene (tons)	Toluene (tons)	Xylene (tons)	2,2,4-Trimethylpentane (tons)	Total HAPs (tons)
Bradshaw Compressor Station:														
Construction Equipment Engines	0.21	0.05	0.05	0.09	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bradshaw Total	**0.21**	**0.05**	**0.05**	**0.09**	**0.00**	**0.59**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.94**
Harris Compressor Station:														
Construction Equipment Engines	0.21	0.05	0.05	0.09	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Harris Total	**0.21**	**0.05**	**0.05**	**0.09**	**0.00**	**0.59**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.94**
Stallworth Compressor Station:														
Construction Equipment Engines	0.21	0.05	0.05	0.09	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Stallworth Total	**0.21**	**0.05**	**0.05**	**0.09**	**0.00**	**0.59**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.94**
Swann Compressor Station:														
Construction Equipment Engines	0.38	0.09	0.09	0.16	0.01	1.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.72
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Swann Total	**0.38**	**0.09**	**0.09**	**0.16**	**0.01**	**1.08**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.72**
Pipeline:														
Construction Equipment Engines	0.04	0.01	0.03	0.02	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
On-Road Vehicle Travel	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pipeline Total	**0.04**	**0.01**	**0.05**	**0.02**	**0.00**	**0.12**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.19**
Total	**1.06**	**0.25**	**0.30**	**0.45**	**0.02**	**2.96**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.73**

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 4. Estimated Construction HAP Emissions from the Project - 2028

Source	Acetaldehyde (tons)	Acrolein (tons)	Ammonia (tons)	Benzene (tons)	1,3-Butadiene (tons)	Formaldehyde (tons)	Hexane (tons)	Naphthalene (tons)	Ethyl Benzene (tons)	Styrene (tons)	Toluene (tons)	Xylene (tons)	2,2,4-Trimethylpentane (tons)	Total HAPs (tons)
Bradshaw Compressor Station:														
Construction Equipment Engines	0.33	0.08	0.08	0.14	0.01	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.47
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bradshaw Total	**0.33**	**0.08**	**0.08**	**0.14**	**0.01**	**0.92**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.47**
Harris Compressor Station:														
Construction Equipment Engines	0.33	0.08	0.08	0.14	0.01	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.47
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Harris Total	**0.33**	**0.08**	**0.08**	**0.14**	**0.01**	**0.92**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.47**
Stallworth Compressor Station:														
Construction Equipment Engines	0.33	0.08	0.08	0.14	0.01	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.47
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Stallworth Total	**0.33**	**0.08**	**0.08**	**0.14**	**0.01**	**0.92**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.47**
Swann Compressor Station:														
Construction Equipment Engines	0.39	0.09	0.10	0.16	0.01	1.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.75
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Swann Total	**0.39**	**0.09**	**0.10**	**0.16**	**0.01**	**1.09**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.75**
Pipeline:														
Construction Equipment Engines	--	--	--	--	--	--	--	--	--	--	--	--	--	--
On-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Off-Road Vehicle Travel	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Earthmoving	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wind Erosion	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pipeline Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Total	**1.38**	**0.32**	**0.34**	**0.59**	**0.03**	**3.86**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.17**

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 5. Estimated Nonroad Contruction Criteria Emissions, Swann Compressor Station, Montgomery County - 2027

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																				
			Operations			Emission Factor[1] (g/hp-hr)									Emissions (tons)								
			Quantity	Hours/Week	Weeks Used	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O[2]	CO_2	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O	CO_2
Air Compressor A	Air Compressors	150	4	60	24	1.46	0.28	0.00	0.05	0.04	0.04	0.01	0.03	574.24	1.39	0.27	0.00	0.05	0.04	0.04	0.01	0.03	546.90
Bobcat	Skid Steer Loaders	150	3	60	24	4.60	4.53	0.00	0.86	0.64	0.62	0.04	0.04	692.61	3.28	3.23	0.00	0.62	0.46	0.44	0.03	0.03	494.73
Compactor	Plate Compactors	200	2	40	7.5	4.06	2.20	0.00	0.68	0.23	0.22	0.06	0.03	588.43	0.54	0.29	0.00	0.09	0.03	0.03	0.01	0.00	77.84
Compactor, Vibratory	Plate Compactors	100	2	60	2.5	4.06	2.20	0.00	0.68	0.23	0.22	0.06	0.03	588.43	0.13	0.07	0.00	0.02	0.01	0.01	0.00	0.00	19.46
Concrete Mixer Truck (main pours)	Off-highway Trucks	150	10	60	9.5	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	1.31	0.06	0.00	0.03	0.02	0.02	0.00	0.03	505.88
Concrete Mixer Truck (small pours)	Off-highway Trucks	250	4	60	2.5	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.23	0.01	0.00	0.00	0.00	0.00	0.00	0.01	88.75
Crane, Wheeled (20 ton)	Cranes	185	2	60	5	0.52	0.12	0.00	0.03	0.02	0.02	0.00	0.03	533.27	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	65.25
Crane, Wheeled (250 ton)	Cranes	350	2	40	3	0.52	0.12	0.00	0.03	0.02	0.02	0.00	0.03	533.27	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	49.38
Dump Truck	Dumpers/Tenders	20	4	40	5	4.50	4.03	0.00	0.88	0.58	0.56	0.04	0.04	683.33	0.08	0.07	0.00	0.02	0.01	0.01	0.00	0.00	12.05
Excavator	Excavators	950	4	60	12	0.34	0.06	0.00	0.02	0.01	0.01	0.00	0.03	541.91	1.03	0.19	0.00	0.05	0.04	0.04	0.00	0.10	1634.35
Fork Lift	Forklifts	250	2	40	7	1.04	0.08	0.00	0.02	0.01	0.01	0.00	0.03	574.00	0.16	0.01	0.00	0.00	0.00	0.00	0.00	0.01	88.58
Generators	Generator Sets	200	3	80	24	2.47	0.84	0.00	0.20	0.13	0.13	0.01	0.03	568.70	3.14	1.06	0.00	0.26	0.17	0.16	0.02	0.04	722.18
Light Tower	Other Construction Equipment	250	4	24	5	1.21	0.48	0.00	0.07	0.07	0.06	0.00	0.03	537.65	0.16	0.06	0.00	0.01	0.01	0.01	0.00	0.00	71.12
Man Lift A	Aerial Lifts	405	8	60	12	3.17	1.84	0.00	0.41	0.26	0.25	0.02	0.04	694.53	8.15	4.72	0.01	1.05	0.67	0.65	0.04	0.10	1785.96
Pickup Trucks	Off-highway Trucks	200	25	40	5	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	1.53	0.07	0.00	0.03	0.02	0.02	0.00	0.03	591.67
Tandem Truck	Off-highway Trucks	12	4	40	2.5	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84
Water / Fuel Truck	Off-highway Trucks	200	2	60	2.5	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.50
Welding Machine	Welders	250	10	60	9.5	3.18	1.81	0.00	0.39	0.26	0.25	0.02	0.04	693.69	5.00	2.84	0.00	0.61	0.40	0.39	0.03	0.06	1089.64
Welding Rig	Welders	35	10	60	9.5	3.18	1.81	0.00	0.39	0.26	0.25	0.02	0.04	693.69	0.70	0.40	0.00	0.08	0.06	0.05	0.00	0.01	152.55
X-Ray Truck/Machine	Off-highway Trucks	40	1	40	7	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.63
"Feller-buncher"/clearing equipment	Crawler Tractor/Dozers	800	1	50	2	0.55	0.10	0.00	0.02	0.02	0.02	0.00	0.03	539.76	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	47.60
Tandem Truck	Off-highway Trucks	12	1	50	2	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71
Chipper	Shredders > 6 HP	100	1	50	2	2.61	267.34	0.01	8.58	0.11	0.10	0.71	0.06	1048.33	0.03	2.95	0.00	0.09	0.00	0.00	0.01	0.00	11.56
Articulated Dumptruck	Dumpers/Tenders	320	4	50	16	4.50	4.03	0.00	0.88	0.58	0.56	0.04	0.04	683.33	5.08	4.55	0.00	1.00	0.65	0.63	0.05	0.05	771.32
Dozer	Crawler Tractor/Dozers	300	2	50	16	0.55	0.10	0.00	0.02	0.02	0.02	0.00	0.03	539.76	0.29	0.05	0.00	0.01	0.01	0.01	0.00	0.02	285.59
Excavator	Excavators	950	2	50	16	0.34	0.06	0.00	0.02	0.01	0.01	0.00	0.03	541.91	0.57	0.10	0.00	0.03	0.02	0.02	0.00	0.05	907.97
Compactor	Plate Compactors	200	2	50	16	4.06	2.20	0.00	0.68	0.23	0.22	0.06	0.03	588.43	1.43	0.78	0.00	0.24	0.08	0.08	0.02	0.01	207.56
(Blasting) Drill	Bore/Drill Rigs	130	1	50	2	3.56	0.96	0.00	0.24	0.17	0.16	0.01	0.03	539.66	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	7.73
Bobcat	Skid Steer Loaders	150	1	40	12	4.60	4.53	0.00	0.86	0.64	0.62	0.04	0.04	692.61	0.36	0.36	0.00	0.07	0.05	0.05	0.00	0.00	54.97
Backhoe	Tractors/Loaders/Backhoes	75	1	40	12	2.20	1.57	0.00	0.34	0.25	0.24	0.02	0.04	665.05	0.09	0.06	0.00	0.01	0.01	0.01	0.00	0.00	26.39
Tandem Truck	Off-highway Trucks	12	1	40	12	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.41
Pickup Truck	Off-highway Trucks	200	1	40	12	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	56.80
Hydroseeding Equipment	Other Lawn & Garden Eqp. (com)	100	1	40	1	3.69	1.43	0.00	0.31	0.22	0.21	0.02	0.03	589.46	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	2.60
														2027 Nonroad Emissions	**35.20**	**22.28**	**0.03**	**4.38**	**2.77**	**2.69**	**0.23**	**0.61**	**10425.47**

TABLE 6. Estimated Nonroad Contruction Criteria Emissions, Pipeline, Montgomery County - 2027

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																				
			Operations			Emission Factor[1] (g/hp-hr)									Emissions (tons)								
			Quantity	Hours/Week	Weeks Used	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O[2]	CO_2	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O	CO_2
Air Compressor A	Air Compressors	150	2	40	8	1.46	0.28	0.00	0.05	0.04	0.04	0.01	0.03	574.24	0.15	0.03	0.00	0.01	0.00	0.00	0.00	0.00	60.77
All Terrain Vehicle (ATV)	All Terrain Vehicles	18	1	60	8	0.52	37.48	0.00	4.16	0.07	0.06	0.25	0.01	234.72	0.00	0.36	0.00	0.04	0.00	0.00	0.00	0.00	2.24
Chain Saw	Chain Saws < 6 HP (com)	3	6	50	2	1.64	262.96	0.01	73.57	9.51	8.75	1.34	0.04	733.10	0.00	0.52	0.00	0.15	0.02	0.02	0.00	0.00	1.45
Concrete Mixer Truck (main pours)	Off-highway Trucks	150	2	30	2	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.65
Dozers	Crawler Tractor/Dozers	300	6	60	8	0.55	0.10	0.00	0.02	0.02	0.02	0.00	0.03	539.76	0.53	0.09	0.00	0.02	0.02	0.02	0.00	0.03	514.07
Dump Truck	Dumpers/Tenders	20	6	30	6	4.50	4.03	0.00	0.88	0.58	0.56	0.04	0.04	683.33	0.11	0.10	0.00	0.02	0.01	0.01	0.00	0.00	16.27
Excavator	Excavators	950	6	60	8	0.34	0.06	0.00	0.02	0.01	0.01	0.00	0.03	541.91	1.03	0.19	0.00	0.05	0.04	0.04	0.00	0.10	1634.35
Fork Lift	Forklifts	250	1	30	8	1.04	0.08	0.00	0.02	0.01	0.01	0.00	0.03	574.00	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	37.96
Generators	Generator Sets	200	2	20	8	2.47	0.84	0.00	0.20	0.13	0.13	0.01	0.03	568.70	0.17	0.06	0.00	0.01	0.01	0.01	0.00	0.00	40.12
Hydrotest Truck	Off-highway Trucks	600	1	30	3	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.95
Light Tower	Other Construction Equipment	250	4	40	3	1.21	0.48	0.00	0.07	0.07	0.06	0.00	0.03	537.65	0.16	0.06	0.00	0.01	0.01	0.01	0.00	0.00	71.12
Man Lift A	Aerial Lifts	405	1	20	4	3.17	1.84	0.00	0.41	0.26	0.25	0.02	0.04	694.53	0.11	0.07	0.00	0.01	0.01	0.01	0.00	0.00	24.81
Pipe Beveling Machine	Other Construction Equipment	150	2	60	6	1.21	0.48	0.00	0.07	0.07	0.06	0.00	0.03	537.65	0.14	0.06	0.00	0.01	0.01	0.01	0.00	0.00	64.01
Pipe Tractor Trailer	Off-highway Trucks	800	4	60	4	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	1.18	0.06	0.00	0.02	0.02	0.02	0.00	0.03	454.40
Portable Pipe Bender	Other Construction Equipment	20	1	60	8	1.21	0.48	0.00	0.07	0.07	0.06	0.00	0.03	537.65	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	5.69
SideBoom	Cranes	100	4	60	8	0.52	0.12	0.00	0.03	0.02	0.02	0.00	0.03	533.27	0.11	0.02	0.00	0.01	0.00	0.00	0.00	0.01	112.86
Skid Steer Loader	Skid Steer Loaders	488	2	30	8	4.60	4.53	0.00	0.86	0.64	0.62	0.04	0.04	692.61	1.19	1.17	0.00	0.22	0.16	0.16	0.01	0.01	178.84
Sweeper	Sweepers/Scrubbers	200	1	20	8	0.70	0.10	0.00	0.02	0.02	0.02	0.00	0.03	553.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.51
Water / Fuel Truck	Off-highway Trucks	200	4	30	8	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.29	0.01	0.00	0.01	0.00	0.00	0.00	0.01	113.60
Welding Rig	Welders	35	8	60	8	3.18	1.81	0.00	0.39	0.26	0.25	0.02	0.04	693.69	0.47	0.27	0.00	0.06	0.04	0.04	0.00	0.01	102.77
X-Ray Truck/Machine	Off-highway Trucks	40	1	60	8	1.39	0.07	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.36
														2027 Nonroad Emissions	**5.91**	**3.08**	**0.01**	**0.64**	**0.36**	**0.35**	**0.03**	**0.21**	**3508.79**

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 7. Estimated Nonroad Contruction Criteria Emissions, Stallworth Compressor Station, Fayette County - 2027

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																				
			Operations			Emission Factor[1] (g/hp-hr)									Emissions (tons)								
			Quantity	Hours/Week	Weeks Used	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O[2]	CO_2	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O	CO_2
Air Compressor A	Air Compressors	150	4	60	20	1.49	0.28	0.00	0.05	0.04	0.04	0.01	0.03	574.22	1.18	0.23	0.00	0.04	0.03	0.03	0.00	0.03	455.74
Bobcat	Skid Steer Loaders	150	3	60	20	3.66	2.95	0.00	0.57	0.42	0.41	0.03	0.04	693.45	2.18	1.76	0.00	0.34	0.25	0.24	0.02	0.02	412.78
Compactor	Plate Compactors	200	2	40	6	4.06	2.18	0.00	0.68	0.23	0.22	0.06	0.03	588.43	0.43	0.23	0.00	0.07	0.02	0.02	0.01	0.00	62.27
Compactor, Vibratory	Plate Compactors	100	2	60	2	4.06	2.18	0.00	0.68	0.23	0.22	0.06	0.03	588.43	0.11	0.06	0.00	0.02	0.01	0.01	0.00	0.00	15.57
Concrete Mixer Truck (main pours)	Off-highway Trucks	150	10	60	8	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	1.10	0.05	0.00	0.02	0.01	0.01	0.00	0.03	426.00
Concrete Mixer Truck (small pours)	Off-highway Trucks	250	4	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.18	0.01	0.00	0.00	0.00	0.00	0.00	0.00	71.00
Crane, Wheeled (20 ton)	Cranes	185	2	60	4	0.46	0.10	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	52.20
Crane, Wheeled (250 ton)	Cranes	350	2	40	2	0.46	0.10	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	32.92
Dump Truck	Dumpers/Tenders	20	4	40	4	3.58	2.69	0.00	0.59	0.38	0.37	0.03	0.04	683.46	0.05	0.04	0.00	0.01	0.01	0.01	0.00	0.00	9.64
Excavator	Excavators	950	4	60	10	0.34	0.06	0.00	0.02	0.01	0.01	0.00	0.03	541.91	0.86	0.16	0.00	0.04	0.03	0.03	0.00	0.08	1361.98
Fork Lift	Forklifts	250	2	40	6	1.04	0.08	0.00	0.02	0.01	0.01	0.00	0.03	573.95	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	75.92
Generators	Generator Sets	200	3	80	20	2.55	0.88	0.00	0.21	0.14	0.13	0.01	0.03	568.71	2.70	0.94	0.00	0.22	0.15	0.14	0.02	0.04	601.81
Light Tower	Other Construction Equipment	250	4	24	4	0.87	0.33	0.00	0.05	0.05	0.05	0.00	0.03	537.75	0.09	0.04	0.00	0.01	0.01	0.01	0.00	0.00	56.91
Man Lift A	Aerial Lifts	405	8	60	10	3.32	2.06	0.00	0.44	0.28	0.27	0.02	0.04	694.48	7.12	4.42	0.00	0.94	0.60	0.58	0.05	0.09	1488.20
Pickup Trucks	Off-highway Trucks	200	25	40	4	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	1.22	0.06	0.00	0.02	0.02	0.02	0.00	0.03	473.34
Tandem Truck	Off-highway Trucks	12	4	40	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.27
Water / Fuel Truck	Off-highway Trucks	200	2	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.40
Welding Machine	Welders	250	10	60	8	3.24	1.88	0.00	0.38	0.26	0.25	0.02	0.04	693.65	4.28	2.49	0.00	0.51	0.34	0.33	0.03	0.05	917.54
Welding Rig	Welders	35	10	60	8	3.24	1.88	0.00	0.38	0.26	0.25	0.02	0.04	693.65	0.60	0.35	0.00	0.07	0.05	0.05	0.00	0.01	128.46
X-Ray Truck/Machine	Off-highway Trucks	40	1	40	6	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.68
														2027 Nonroad Emissions	**22.40**	**10.84**	**0.02**	**2.31**	**1.54**	**1.49**	**0.13**	**0.39**	**6678.63**

TABLE 8. Estimated Nonroad Contruction Criteria Emissions, Harris Compressor Station, Braxton County - 2027

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																				
			Operations			Emission Factor[1] (g/hp-hr)									Emissions (tons)								
			Quantity	Hours/Week	Weeks Used	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O[2]	CO_2	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O	CO_2
Air Compressor A	Air Compressors	150	4	60	20	1.49	0.28	0.00	0.05	0.04	0.04	0.01	0.03	574.22	1.18	0.23	0.00	0.04	0.03	0.03	0.00	0.03	455.74
Bobcat	Skid Steer Loaders	150	3	60	20	3.66	2.95	0.00	0.57	0.42	0.41	0.03	0.04	693.45	2.18	1.76	0.00	0.34	0.25	0.24	0.02	0.02	412.78
Compactor	Plate Compactors	200	2	40	6	4.06	2.18	0.00	0.68	0.23	0.22	0.06	0.03	588.43	0.43	0.23	0.00	0.07	0.02	0.02	0.01	0.00	62.27
Compactor, Vibratory	Plate Compactors	100	2	60	2	4.06	2.18	0.00	0.68	0.23	0.22	0.06	0.03	588.43	0.11	0.06	0.00	0.02	0.01	0.01	0.00	0.00	15.57
Concrete Mixer Truck (main pours)	Off-highway Trucks	150	10	60	8	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	1.10	0.05	0.00	0.02	0.01	0.01	0.00	0.03	426.00
Concrete Mixer Truck (small pours)	Off-highway Trucks	250	4	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.18	0.01	0.00	0.00	0.00	0.00	0.00	0.00	71.00
Crane, Wheeled (20 ton)	Cranes	185	2	60	4	0.46	0.10	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	52.20
Crane, Wheeled (250 ton)	Cranes	350	2	40	2	0.46	0.10	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	32.92
Dump Truck	Dumpers/Tenders	20	4	40	4	3.58	2.69	0.00	0.59	0.38	0.37	0.03	0.04	683.46	0.05	0.04	0.00	0.01	0.01	0.01	0.00	0.00	9.64
Excavator	Excavators	950	4	60	10	0.34	0.06	0.00	0.02	0.01	0.01	0.00	0.03	541.91	0.86	0.16	0.00	0.04	0.03	0.03	0.00	0.08	1361.98
Fork Lift	Forklifts	250	2	40	6	1.04	0.08	0.00	0.02	0.01	0.01	0.00	0.03	573.95	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	75.92
Generators	Generator Sets	200	3	80	20	2.55	0.88	0.00	0.21	0.14	0.13	0.01	0.03	568.71	2.70	0.94	0.00	0.22	0.15	0.14	0.02	0.04	601.81
Light Tower	Other Construction Equipment	250	4	24	4	0.87	0.33	0.00	0.05	0.05	0.05	0.00	0.03	537.74	0.09	0.04	0.00	0.01	0.01	0.01	0.00	0.00	56.91
Man Lift A	Aerial Lifts	405	8	60	10	3.32	2.06	0.00	0.44	0.28	0.27	0.02	0.04	694.48	7.12	4.42	0.00	0.94	0.60	0.58	0.05	0.09	1488.20
Pickup Trucks	Off-highway Trucks	200	25	40	4	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	1.22	0.06	0.00	0.02	0.02	0.02	0.00	0.03	473.34
Tandem Truck	Off-highway Trucks	12	4	40	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.27
Water / Fuel Truck	Off-highway Trucks	200	2	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.40
Welding Machine	Welders	250	10	60	8	3.24	1.88	0.00	0.38	0.26	0.25	0.02	0.04	693.65	4.28	2.49	0.00	0.51	0.34	0.33	0.03	0.05	917.54
Welding Rig	Welders	35	10	60	8	3.24	1.88	0.00	0.38	0.26	0.25	0.02	0.04	693.65	0.60	0.35	0.00	0.07	0.05	0.05	0.00	0.01	128.46
X-Ray Truck/Machine	Off-highway Trucks	40	1	40	6	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.68
														2027 Nonroad Emissions	**22.40**	**10.84**	**0.02**	**2.31**	**1.54**	**1.49**	**0.13**	**0.39**	**6678.63**

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 9. Estimated Nonroad Contruction Criteria Emissions, Bradshaw Compressor Station, Wetzel County - 2027

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																				
			Operations			Emission Factor[1] (g/hp-hr)									Emissions (tons)								
			Quantity	Hours/Week	Weeks Used	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O[2]	CO_2	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O	CO_2
Air Compressor A	Air Compressors	150	4	60	20	1.49	0.28	0.00	0.05	0.04	0.04	0.01	0.03	574.22	1.18	0.23	0.00	0.04	0.03	0.03	0.00	0.03	455.74
Bobcat	Skid Steer Loaders	150	3	60	20	3.66	2.95	0.00	0.57	0.42	0.41	0.03	0.04	693.45	2.18	1.76	0.00	0.34	0.25	0.24	0.02	0.02	412.78
Compactor	Plate Compactors	200	2	40	6	4.06	2.18	0.00	0.68	0.23	0.22	0.06	0.03	588.43	0.43	0.23	0.00	0.07	0.02	0.02	0.01	0.00	62.27
Compactor, Vibratory	Plate Compactors	100	2	60	2	4.06	2.18	0.00	0.68	0.23	0.22	0.06	0.03	588.43	0.11	0.06	0.00	0.02	0.01	0.01	0.00	0.00	15.57
Concrete Mixer Truck (main pours)	Off-highway Trucks	150	10	60	8	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	1.10	0.05	0.00	0.02	0.01	0.01	0.00	0.03	426.00
Concrete Mixer Truck (small pours)	Off-highway Trucks	250	4	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.18	0.01	0.00	0.00	0.00	0.00	0.00	0.00	71.00
Crane, Wheeled (20 ton)	Cranes	185	2	60	4	0.46	0.10	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	52.20
Crane, Wheeled (250 ton)	Cranes	350	2	40	2	0.46	0.10	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	32.92
Dump Truck	Dumpers/Tenders	20	4	40	4	3.58	2.69	0.00	0.59	0.38	0.37	0.03	0.04	683.46	0.05	0.04	0.00	0.01	0.01	0.01	0.00	0.00	9.64
Excavator	Excavators	950	4	60	10	0.34	0.06	0.00	0.02	0.01	0.01	0.00	0.03	541.91	0.86	0.16	0.00	0.04	0.03	0.03	0.00	0.08	1361.98
Fork Lift	Forklifts	250	2	40	6	1.04	0.08	0.00	0.02	0.01	0.01	0.00	0.03	573.95	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	75.92
Generators	Generator Sets	200	3	80	20	2.55	0.88	0.00	0.21	0.14	0.13	0.01	0.03	568.71	2.70	0.94	0.00	0.22	0.15	0.14	0.02	0.04	601.81
Light Tower	Other Construction Equipment	250	4	24	4	0.87	0.33	0.00	0.05	0.05	0.05	0.00	0.03	537.75	0.09	0.04	0.00	0.01	0.01	0.01	0.00	0.00	56.91
Man Lift A	Aerial Lifts	405	8	60	10	3.32	2.06	0.00	0.44	0.28	0.27	0.02	0.04	694.48	7.12	4.42	0.00	0.94	0.60	0.58	0.05	0.09	1488.20
Pickup Trucks	Off-highway Trucks	200	25	40	4	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	1.22	0.06	0.00	0.02	0.02	0.02	0.00	0.03	473.34
Tandem Truck	Off-highway Trucks	12	4	40	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.27
Water / Fuel Truck	Off-highway Trucks	200	2	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.40
Welding Machine	Welders	250	10	60	8	3.24	1.88	0.00	0.38	0.26	0.25	0.02	0.04	693.65	4.28	2.49	0.00	0.51	0.34	0.33	0.03	0.05	917.54
Welding Rig	Welders	35	10	60	8	3.24	1.88	0.00	0.38	0.26	0.25	0.02	0.04	693.65	0.60	0.35	0.00	0.07	0.05	0.05	0.00	0.01	128.46
X-Ray Truck/Machine	Off-highway Trucks	40	1	40	6	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.75	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.68
														2027 Nonroad Emissions	**22.40**	**10.84**	**0.02**	**2.31**	**1.54**	**1.49**	**0.13**	**0.39**	**6678.63**

Notes:

1. Emission Factors per MOVES5.
2. N_2O emission factor is based on 2023 Climate Registry Default Emission Factors, Released: June 2023, Tables 2.1 and 2.7. Emission Factors for Diesel-fired Industrial/Commercial Equipment ratioed based on CO_2 emission factor from EPA MOVES5.
   https://theclimateregistry.org/wp-content/uploads/2023/06/2023-Default-Emission-Factors-Final.pdf
3. EPA MOVES5.0 Model does not contain Emission Factors for some equipment types. Used Emission Factors for Other Construction Equipment as a substitution when equipment-specific emissions factors were not available.

Company Name: **EQT Corporation**
Project Location: **Mountain Valley Pipeline**
Project Description: **MVP Boost Project Construction Emissions**

TABLE 10. Estimated Nonroad Contruction HAP Emissions, Swann Compressor Station, Montgomery County - 2027

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																											
			Operations			Emission Factor[1] (g/hp-hr)													Emissions (tons)												
			Quantity	Hours/Week	Weeks Used	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane
Air Compressor A	Air Compressors	150	4	60	24	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bobcat	Skid Steer Loaders	150	3	60	24	0.08	0.02	0.01	0.03	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.02	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	Plate Compactors	200	2	40	7.5	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	Plate Compactors	100	2	60	2.5	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (	Off-highway Trucks	150	10	60	9.5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (	Off-highway Trucks	250	4	60	2.5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (20 ton	Cranes	185	2	60	5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 to	Cranes	350	2	40	3	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	Dumpers/Tenders	20	4	40	5	0.08	0.02	0.01	0.03	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavators	950	4	60	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	Forklifts	250	2	40	7	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	Generator Sets	200	3	80	24	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.01	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	Other Construction Equipment	250	4	24	5	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	Aerial Lifts	405	8	60	12	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.02	0.01	0.03	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	Off-highway Trucks	200	25	40	5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	Off-highway Trucks	12	4	40	2.5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	Off-highway Trucks	200	2	60	2.5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	Welders	250	10	60	9.5	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.01	0.02	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Rig	Welders	35	10	60	9.5	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-Ray Truck/Machine	Off-highway Trucks	40	1	40	7	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
"Feller-buncher"/clearing	Crawler Tractor/Dozers	800	1	50	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	Off-highway Trucks	12	1	50	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chipper	Shredders > 6 HP	100	1	50	2	0.04	0.00	0.01	0.32	0.05	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Articulated Dumptruck	Dumpers/Tenders	320	4	50	16	0.08	0.02	0.01	0.03	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.02	0.01	0.04	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	Crawler Tractor/Dozers	300	2	50	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavators	950	2	50	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	Plate Compactors	200	2	50	16	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(Blasting) Drill	Bore/Drill Rigs	130	1	50	2	0.02	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bobcat	Skid Steer Loaders	150	1	40	12	0.08	0.02	0.01	0.03	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	Tractors/Loaders/Backhoes	75	1	40	12	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	Off-highway Trucks	12	1	40	12	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Truck	Off-highway Trucks	200	1	40	12	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydroseeding Equipmen	Other Lawn & Garden Eqp. (co	100	1	40	1	0.03	0.01	0.00	0.01	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
																		2027 Nonroad Emissions	**0.38**	**0.09**	**0.09**	**0.16**	**0.01**	**1.08**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

TABLE 11. Estimated Nonroad Contruction HAP Emissions, Pipeline, Montgomery County - 2027

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																											
			Operations			Emission Factor[1] (g/hp-hr)													Emissions (tons)												
			Quantity	Hours/Week	Weeks Used	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane
Air Compressor A	Air Compressors	150	2	40	8	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Terrain Vehicle (ATV	All Terrain Vehicles	18	1	60	8	0.01	0.00	0.00	0.15	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain Saw	Chain Saws < 6 HP (com)	3	6	50	2	0.21	0.03	0.01	1.23	0.17	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (	Off-highway Trucks	150	2	30	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozers	Crawler Tractor/Dozers	300	6	60	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	Dumpers/Tenders	20	6	30	6	0.08	0.02	0.01	0.03	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavators	950	6	60	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	Forklifts	250	1	30	8	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	Generator Sets	200	2	20	8	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrotest Truck	Off-highway Trucks	600	1	30	3	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	Other Construction Equipment	250	4	40	3	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	Aerial Lifts	405	1	20	4	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Beveling Machine	Other Construction Equipment	150	2	60	6	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe Tractor Trailer	Off-highway Trucks	800	4	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Portable Pipe Bender	Other Construction Equipment	20	1	60	8	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SideBoom	Cranes	100	4	60	8	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Skid Steer Loader	Skid Steer Loaders	488	2	30	8	0.08	0.02	0.01	0.03	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00
Sweeper	Sweepers/Scrubbers	200	1	20	8	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	Off-highway Trucks	200	4	30	8	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Rig	Welders	35	8	60	8	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
X-Ray Truck/Machine	Off-highway Trucks	40	1	60	8	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
																		2027 Nonroad Emissions	**0.04**	**0.01**	**0.03**	**0.02**	**0.00**	**0.11**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Company Name: **EQT Corporation**
Project Location: **Mountain Valley Pipeline**
Project Description: **MVP Boost Project Construction Emissions**

TABLE 12. Estimated Nonroad Contruction HAP Emissions, Stallworth Compressor Station, Fayette County - 2027

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																										
			Operations			Emission Factor[1] (g/hp-hr)													Emissions (tons)												
			Quantity	Hours/Week	Weeks Used	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane
Air Compressor A	Air Compressors	150	4	60	20	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bobcat	Skid Steer Loaders	150	3	60	20	0.05	0.01	0.01	0.02	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.01	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	Plate Compactors	200	2	40	6	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	Plate Compactors	100	2	60	2	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (n	Off-highway Trucks	150	10	60	8	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (s	Off-highway Trucks	250	4	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (20 ton	Cranes	185	2	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton	Cranes	350	2	40	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	Dumpers/Tenders	20	4	40	4	0.05	0.01	0.01	0.02	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavators	950	4	60	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	Forklifts	250	2	40	6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	Generator Sets	200	3	80	20	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	Other Construction Equipment	250	4	24	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	Aerial Lifts	405	8	60	10	0.04	0.01	0.01	0.02	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.02	0.01	0.03	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	Off-highway Trucks	200	25	40	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	Off-highway Trucks	12	4	40	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	Off-highway Trucks	200	2	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	Welders	250	10	60	8	0.04	0.01	0.01	0.02	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.01	0.02	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Rig	Welders	35	10	60	8	0.04	0.01	0.01	0.02	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-Ray Truck/Machine	Off-highway Trucks	40	1	40	6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
																		2027 Nonroad Emissions	**0.21**	**0.05**	**0.05**	**0.09**	**0.00**	**0.59**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

TABLE 13. Estimated Nonroad Contruction HAP Emissions, Harris Compressor Station, Braxton County - 2027

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																										
			Operations			Emission Factor[1] (g/hp-hr)													Emissions (tons)												
			Quantity	Hours/Week	Weeks Used	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane
Air Compressor A	Air Compressors	150	4	60	20	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bobcat	Skid Steer Loaders	150	3	60	20	0.05	0.01	0.01	0.02	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.01	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	Plate Compactors	200	2	40	6	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	Plate Compactors	100	2	60	2	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (n	Off-highway Trucks	150	10	60	8	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (s	Off-highway Trucks	250	4	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (20 ton	Cranes	185	2	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 ton	Cranes	350	2	40	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	Dumpers/Tenders	20	4	40	4	0.05	0.01	0.01	0.02	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavators	950	4	60	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	Forklifts	250	2	40	6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	Generator Sets	200	3	80	20	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	Other Construction Equipment	250	4	24	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	Aerial Lifts	405	8	60	10	0.04	0.01	0.01	0.02	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.02	0.01	0.03	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	Off-highway Trucks	200	25	40	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	Off-highway Trucks	12	4	40	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	Off-highway Trucks	200	2	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	Welders	250	10	60	8	0.04	0.01	0.01	0.02	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.01	0.02	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Rig	Welders	35	10	60	8	0.04	0.01	0.01	0.02	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-Ray Truck/Machine	Off-highway Trucks	40	1	40	6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
																		2027 Nonroad Emissions	**0.21**	**0.05**	**0.05**	**0.09**	**0.00**	**0.59**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 14. Estimated Nonroad Contruction HAP Emissions, Bradshaw Compressor Station, Wetzel County - 2027

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																											
			Operations			Emission Factor[1] (g/hp-hr)													Emissions (tons)												
			Quantity	Hours/Week	Weeks Used	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane
Air Compressor A	Air Compressors	150	4	60	20	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bobcat	Skid Steer Loaders	150	3	60	20	0.05	0.01	0.01	0.02	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.01	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	Plate Compactors	200	2	40	6	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	Plate Compactors	100	2	60	2	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (n	Off-highway Trucks	150	10	60	8	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (s	Off-highway Trucks	250	4	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (20 ton	Cranes	185	2	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 to	Cranes	350	2	40	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	Dumpers/Tenders	20	4	40	4	0.05	0.01	0.01	0.02	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavators	950	4	60	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	Forklifts	250	2	40	6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	Generator Sets	200	3	80	20	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	Other Construction Equipment	250	4	24	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	Aerial Lifts	405	8	60	10	0.04	0.01	0.01	0.02	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.02	0.01	0.03	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	Off-highway Trucks	200	25	40	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	Off-highway Trucks	12	4	40	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	Off-highway Trucks	200	2	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	Welders	250	10	60	8	0.04	0.01	0.01	0.02	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.01	0.02	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Rig	Welders	35	10	60	8	0.04	0.01	0.01	0.02	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-Ray Truck/Machine	Off-highway Trucks	40	1	40	6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
																		2027 Nonroad Emissions	**0.21**	**0.05**	**0.05**	**0.09**	**0.00**	**0.59**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Notes:

1. Emission Factors per MOVES5.

2. EPA MOVES5.0 Model does not contain Emission Factors for some equipment types. Used Emission Factors for Other Construction Equipment as a substitution when equipment-specific emissions factors were not available.

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 15. Estimated Nonroad Contruction Criteria Emissions, Swann Compressor Station, Montgomery County - 2028

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																			
			Operations			Emission Factor[1] (g/hp-hr)									Emissions (tons)							
			Quantity	Hours/Week	Weeks Used	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O[2]	CO_2	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O	CO_2
Air Compressor A	Air Compressors	150	4	60	24	1.39	0.24	0.00	0.04	0.04	0.04	0.00	0.03	574.25	1.33	0.23	0.00	0.04	0.04	0.03	0.00	0.03	546.92
Bobcat	Skid Steer Loaders	150	3	60	24	4.30	4.08	0.00	0.77	0.57	0.55	0.04	0.04	692.88	3.07	2.92	0.00	0.55	0.40	0.39	0.03	0.03	494.92
Compactor	Plate Compactors	200	4	60	5	4.05	2.19	0.00	0.68	0.23	0.22	0.06	0.03	588.43	1.07	0.58	0.00	0.18	0.06	0.06	0.02	0.01	155.67
Compactor, Vibratory	Plate Compactors	100	2	60	9.5	4.05	2.19	0.00	0.68	0.23	0.22	0.06	0.03	588.43	0.51	0.27	0.00	0.09	0.03	0.03	0.01	0.00	73.94
Concrete Mixer Truck (	Off-highway Trucks	150	10	60	1	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	53.25
Concrete Mixer Truck (	Off-highway Trucks	250	4	60	2.5	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.23	0.01	0.00	0.00	0.00	0.00	0.00	0.01	88.75
Crane, Wheeled (20 tor	Cranes	185	2	60	4	0.45	0.10	0.00	0.02	0.02	0.02	0.00	0.03	533.28	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	52.20
Crane, Wheeled (250 to	Cranes	350	2	40	3	0.45	0.10	0.00	0.02	0.02	0.02	0.00	0.03	533.28	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	49.38
Dump Truck	Dumpers/Tenders	20	4	40	7	4.19	3.56	0.00	0.79	0.50	0.49	0.04	0.04	683.61	0.10	0.09	0.00	0.02	0.01	0.01	0.00	0.00	16.88
Excavator	Excavators	950	4	60	18	0.32	0.05	0.00	0.01	0.01	0.01	0.00	0.03	541.91	1.46	0.24	0.01	0.06	0.05	0.05	0.00	0.14	2451.54
Fork Lift	Forklifts	250	2	60	5	1.04	0.08	0.00	0.02	0.01	0.01	0.00	0.03	574.00	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.01	94.91
Generators	Generator Sets	200	3	80	24	2.37	0.78	0.00	0.19	0.12	0.12	0.01	0.03	568.75	3.01	0.99	0.00	0.24	0.15	0.15	0.02	0.04	722.23
Hydrotest Truck	Off-highway Trucks	600	1	60	5	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.27	0.01	0.00	0.01	0.00	0.00	0.00	0.01	106.50
Light Tower	Other Construction Equipment	250	4	24	5	1.07	0.41	0.00	0.06	0.06	0.06	0.00	0.03	537.67	0.14	0.05	0.00	0.01	0.01	0.01	0.00	0.00	71.12
Man Lift A	Aerial Lifts	405	8	60	24	3.04	1.63	0.00	0.36	0.23	0.22	0.02	0.04	694.67	15.62	8.36	0.01	1.86	1.17	1.13	0.09	0.21	3572.64
Pickup Trucks	Off-highway Trucks	200	25	40	5	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	1.52	0.06	0.00	0.03	0.02	0.02	0.00	0.03	591.67
Scissor Lift	Aerial Lifts	10	2	60	5	3.04	1.63	0.00	0.36	0.23	0.22	0.02	0.04	694.67	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	4.59
Tandem Truck	Off-highway Trucks	12	4	40	2.5	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84
Water / Fuel Truck	Off-highway Trucks	200	4	60	2.5	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.18	0.01	0.00	0.00	0.00	0.00	0.00	0.00	71.00
Welding Machine	Welders	250	10	60	19	3.09	1.65	0.00	0.35	0.23	0.22	0.02	0.04	693.80	9.71	5.17	0.01	1.10	0.73	0.71	0.06	0.13	2179.62
Welding Rig	Welders	35	10	60	19	3.09	1.65	0.00	0.35	0.23	0.22	0.02	0.04	693.80	1.36	0.72	0.00	0.15	0.10	0.10	0.01	0.02	305.15
X-Ray Truck/Machine	Off-highway Trucks	40	2	60	7	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.88
													2028 Nonroad Emissions		**40.06**	**19.77**	**0.03**	**4.35**	**2.79**	**2.71**	**0.24**	**0.69**	**11725.62**

TABLE 16. Estimated Nonroad Contruction Criteria Emissions, Stallworth Compressor Station, Fayette County - 2028

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																			
			Operations			Emission Factor[1] (g/hp-hr)									Emissions (tons)							
			Quantity	Hours/Week	Weeks Used	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O[2]	CO_2	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O	CO_2
Air Compressor A	Air Compressors	150	4	60	20	1.41	0.24	0.00	0.05	0.04	0.04	0.01	0.03	574.24	1.12	0.19	0.00	0.04	0.03	0.03	0.00	0.03	455.75
Bobcat	Skid Steer Loaders	150	3	60	20	3.42	2.60	0.00	0.50	0.36	0.35	0.03	0.04	693.67	2.04	1.55	0.00	0.30	0.22	0.21	0.02	0.02	412.90
Compactor	Plate Compactors	200	4	60	4	4.05	2.16	0.00	0.68	0.22	0.22	0.06	0.03	588.43	0.86	0.46	0.00	0.14	0.05	0.05	0.01	0.01	124.54
Compactor, Vibratory	Plate Compactors	100	2	60	8	4.05	2.16	0.00	0.68	0.22	0.22	0.06	0.03	588.43	0.43	0.23	0.00	0.07	0.02	0.02	0.01	0.00	62.27
Concrete Mixer Truck (	Off-highway Trucks	150	10	60	1	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	53.25
Concrete Mixer Truck (	Off-highway Trucks	250	4	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.18	0.01	0.00	0.00	0.00	0.00	0.00	0.00	71.00
Crane, Wheeled (20 tor	Cranes	185	2	60	3	0.41	0.09	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	39.15
Crane, Wheeled (250 to	Cranes	350	2	40	2	0.41	0.09	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	32.92
Dump Truck	Dumpers/Tenders	20	4	40	6	3.35	2.39	0.00	0.52	0.33	0.32	0.03	0.04	683.64	0.07	0.05	0.00	0.01	0.01	0.01	0.00	0.00	14.47
Excavator	Excavators	950	4	60	15	0.32	0.06	0.00	0.01	0.01	0.01	0.00	0.03	541.92	1.22	0.21	0.01	0.05	0.04	0.04	0.00	0.12	2042.97
Fork Lift	Forklifts	250	2	60	4	1.04	0.08	0.00	0.02	0.01	0.01	0.00	0.03	573.95	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	75.92
Generators	Generator Sets	200	3	80	20	2.46	0.83	0.00	0.19	0.13	0.12	0.01	0.03	568.74	2.60	0.88	0.00	0.20	0.14	0.13	0.01	0.04	601.85
Hydrotest Truck	Off-highway Trucks	600	1	60	4	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.22	0.01	0.00	0.00	0.00	0.00	0.00	0.01	85.20
Light Tower	Other Construction Equipment	250	4	24	4	0.77	0.29	0.00	0.04	0.04	0.04	0.00	0.03	537.76	0.08	0.03	0.00	0.00	0.00	0.00	0.00	0.00	56.91
Man Lift A	Aerial Lifts	405	8	60	20	3.18	1.84	0.00	0.39	0.25	0.24	0.02	0.04	694.63	13.62	7.88	0.01	1.67	1.06	1.03	0.09	0.17	2977.02
Pickup Trucks	Off-highway Trucks	200	25	40	4	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	1.21	0.05	0.00	0.02	0.02	0.01	0.00	0.03	473.34
Scissor Lift	Aerial Lifts	10	2	60	4	3.18	1.84	0.00	0.39	0.25	0.24	0.02	0.04	694.63	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	3.68
Tandem Truck	Off-highway Trucks	12	4	40	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.27
Water / Fuel Truck	Off-highway Trucks	200	4	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	56.80
Welding Machine	Welders	250	10	60	16	3.16	1.74	0.00	0.35	0.24	0.23	0.02	0.04	693.74	8.35	4.60	0.01	0.93	0.63	0.61	0.06	0.11	1835.32
Welding Rig	Welders	35	10	60	16	3.16	1.74	0.00	0.35	0.24	0.23	0.02	0.04	693.74	1.17	0.64	0.00	0.13	0.09	0.09	0.01	0.02	256.95
X-Ray Truck/Machine	Off-highway Trucks	40	2	60	6	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.04
													2028 Nonroad Emissions		**33.71**	**16.84**	**0.03**	**3.59**	**2.32**	**2.25**	**0.22**	**0.57**	**9751.53**

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 17. Estimated Nonroad Contruction Criteria Emissions, Harris Compressor Station, Braxton County - 2028

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																			
			Operations			Emission Factor[1] (g/hp-hr)									Emissions (tons)								
			Quantity	Hours/Week	Weeks Used	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O[2]	CO_2	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O	CO_2
Air Compressor A	Air Compressors	150	4	60	20	1.41	0.24	0.00	0.05	0.04	0.04	0.01	0.03	574.24	1.12	0.19	0.00	0.04	0.03	0.03	0.00	0.03	455.75
Bobcat	Skid Steer Loaders	150	3	60	20	3.42	2.60	0.00	0.50	0.36	0.35	0.03	0.04	693.66	2.04	1.55	0.00	0.30	0.22	0.21	0.02	0.02	412.90
Compactor	Plate Compactors	200	4	60	4	4.05	2.16	0.00	0.68	0.22	0.22	0.06	0.03	588.43	0.86	0.46	0.00	0.14	0.05	0.05	0.01	0.01	124.54
Compactor, Vibratory	Plate Compactors	100	2	60	8	4.05	2.16	0.00	0.68	0.22	0.22	0.06	0.03	588.43	0.43	0.23	0.00	0.07	0.02	0.02	0.01	0.00	62.27
Concrete Mixer Truck (	Off-highway Trucks	150	10	60	1	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	53.25
Concrete Mixer Truck (	Off-highway Trucks	250	4	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.18	0.01	0.00	0.00	0.00	0.00	0.00	0.00	71.00
Crane, Wheeled (20 tor	Cranes	185	2	60	3	0.41	0.09	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	39.15
Crane, Wheeled (250 to	Cranes	350	2	40	2	0.41	0.09	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	32.92
Dump Truck	Dumpers/Tenders	20	4	40	6	3.35	2.39	0.00	0.52	0.33	0.32	0.03	0.04	683.64	0.07	0.05	0.00	0.01	0.01	0.01	0.00	0.00	14.47
Excavator	Excavators	950	4	60	15	0.32	0.06	0.00	0.01	0.01	0.01	0.00	0.03	541.92	1.22	0.21	0.01	0.05	0.04	0.04	0.00	0.12	2042.97
Fork Lift	Forklifts	250	2	60	4	1.04	0.08	0.00	0.02	0.01	0.01	0.00	0.03	573.95	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	75.92
Generators	Generator Sets	200	3	80	20	2.46	0.83	0.00	0.19	0.13	0.12	0.01	0.03	568.74	2.60	0.88	0.00	0.20	0.14	0.13	0.01	0.04	601.86
Hydrotest Truck	Off-highway Trucks	600	1	60	4	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.22	0.01	0.00	0.00	0.00	0.00	0.00	0.01	85.20
Light Tower	Other Construction Equipment	250	4	24	4	0.77	0.29	0.00	0.04	0.04	0.04	0.00	0.03	537.76	0.08	0.03	0.00	0.00	0.00	0.00	0.00	0.00	56.91
Man Lift A	Aerial Lifts	405	8	60	20	3.18	1.84	0.00	0.39	0.25	0.24	0.02	0.04	694.63	13.62	7.88	0.01	1.67	1.06	1.03	0.09	0.17	2977.03
Pickup Trucks	Off-highway Trucks	200	25	40	4	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	1.21	0.05	0.00	0.02	0.02	0.01	0.00	0.03	473.34
Scissor Lift	Aerial Lifts	10	2	60	4	3.18	1.84	0.00	0.39	0.25	0.24	0.02	0.04	694.63	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	3.68
Tandem Truck	Off-highway Trucks	12	4	40	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.27
Water / Fuel Truck	Off-highway Trucks	200	4	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	56.80
Welding Machine	Welders	250	10	60	16	3.16	1.74	0.00	0.35	0.24	0.23	0.02	0.04	693.74	8.35	4.60	0.01	0.93	0.63	0.61	0.06	0.11	1835.32
Welding Rig	Welders	35	10	60	16	3.16	1.74	0.00	0.35	0.24	0.23	0.02	0.04	693.74	1.17	0.64	0.00	0.13	0.09	0.09	0.01	0.02	256.95
X-Ray Truck/Machine	Off-highway Trucks	40	2	60	6	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.04
														2028 Nonroad Emissions	**33.71**	**16.84**	**0.03**	**3.59**	**2.32**	**2.25**	**0.22**	**0.57**	**9751.53**

TABLE 18. Estimated Nonroad Contruction Criteria Emissions, Bradshaw Compressor Station, Wetzel County - 2028

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																			
			Operations			Emission Factor[1] (g/hp-hr)									Emissions (tons)								
			Quantity	Hours/Week	Weeks Used	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O[2]	CO_2	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O	CO_2
Air Compressor A	Air Compressors	150	4	60	20	1.41	0.24	0.00	0.05	0.04	0.04	0.01	0.03	574.24	1.12	0.19	0.00	0.04	0.03	0.03	0.00	0.03	455.75
Bobcat	Skid Steer Loaders	150	3	60	20	3.42	2.60	0.00	0.50	0.36	0.35	0.03	0.04	693.67	2.04	1.55	0.00	0.30	0.22	0.21	0.02	0.02	412.90
Compactor	Plate Compactors	200	4	60	4	4.05	2.16	0.00	0.68	0.22	0.22	0.06	0.03	588.43	0.86	0.46	0.00	0.14	0.05	0.05	0.01	0.01	124.54
Compactor, Vibratory	Plate Compactors	100	2	60	8	4.05	2.16	0.00	0.68	0.22	0.22	0.06	0.03	588.43	0.43	0.23	0.00	0.07	0.02	0.02	0.01	0.00	62.27
Concrete Mixer Truck (	Off-highway Trucks	150	10	60	1	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	53.25
Concrete Mixer Truck (	Off-highway Trucks	250	4	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.18	0.01	0.00	0.00	0.00	0.00	0.00	0.00	71.00
Crane, Wheeled (20 tor	Cranes	185	2	60	3	0.41	0.09	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	39.15
Crane, Wheeled (250 to	Cranes	350	2	40	2	0.41	0.09	0.00	0.02	0.02	0.02	0.00	0.03	533.29	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	32.92
Dump Truck	Dumpers/Tenders	20	4	40	6	3.35	2.39	0.00	0.52	0.33	0.32	0.03	0.04	683.64	0.07	0.05	0.00	0.01	0.01	0.01	0.00	0.00	14.47
Excavator	Excavators	950	4	60	15	0.32	0.06	0.00	0.01	0.01	0.01	0.00	0.03	541.92	1.22	0.21	0.01	0.05	0.04	0.04	0.00	0.12	2042.98
Fork Lift	Forklifts	250	2	60	4	1.04	0.08	0.00	0.02	0.01	0.01	0.00	0.03	573.95	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	75.92
Generators	Generator Sets	200	3	80	20	2.46	0.83	0.00	0.19	0.13	0.12	0.01	0.03	568.74	2.60	0.88	0.00	0.20	0.14	0.13	0.01	0.04	601.85
Hydrotest Truck	Off-highway Trucks	600	1	60	4	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.22	0.01	0.00	0.00	0.00	0.00	0.00	0.01	85.20
Light Tower	Other Construction Equipment	250	4	24	4	0.77	0.29	0.00	0.04	0.04	0.04	0.00	0.03	537.76	0.08	0.03	0.00	0.00	0.00	0.00	0.00	0.00	56.91
Man Lift A	Aerial Lifts	405	8	60	20	3.18	1.84	0.00	0.39	0.25	0.24	0.02	0.04	694.63	13.62	7.88	0.01	1.67	1.06	1.03	0.09	0.17	2977.03
Pickup Trucks	Off-highway Trucks	200	25	40	4	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	1.21	0.05	0.00	0.02	0.02	0.01	0.00	0.03	473.34
Scissor Lift	Aerial Lifts	10	2	60	4	3.18	1.84	0.00	0.39	0.25	0.24	0.02	0.04	694.63	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	3.68
Tandem Truck	Off-highway Trucks	12	4	40	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.27
Water / Fuel Truck	Off-highway Trucks	200	4	60	2	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	56.80
Welding Machine	Welders	250	10	60	16	3.16	1.74	0.00	0.35	0.24	0.23	0.02	0.04	693.74	8.35	4.60	0.01	0.93	0.63	0.61	0.06	0.11	1835.33
Welding Rig	Welders	35	10	60	16	3.16	1.74	0.00	0.35	0.24	0.23	0.02	0.04	693.74	1.17	0.64	0.00	0.13	0.09	0.09	0.01	0.02	256.95
X-Ray Truck/Machine	Off-highway Trucks	40	2	60	6	1.38	0.06	0.00	0.03	0.02	0.02	0.00	0.03	536.76	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.04
														2028 Nonroad Emissions	**33.71**	**16.84**	**0.03**	**3.59**	**2.32**	**2.25**	**0.22**	**0.57**	**9751.54**

Notes:

1. Emission Factors per MOVES5.
2. N_2O emission factor is based on 2023 Climate Registry Default Emission Factors, Released: June 2023, Tables 2.1 and 2.7. Emission Factors for Diesel-fired Industrial/Commercial Equipment ratioed based on CO_2 emission factor from EPA MOVES5.
   https://theclimateregistry.org/wp-content/uploads/2023/06/2023-Default-Emission-Factors-Final.pdf
3. EPA MOVES5.0 Model does not contain Emission Factors for some equipment types. Used Emission Factors for Other Construction Equipment as a substitution when equipment-specific emissions factors were not available.

Company Name: **EQT Corporation**
Project Location: **Mountain Valley Pipeline**
Project Description: **MVP Boost Project Construction Emissions**

TABLE 19. Estimated Nonroad Contruction HAP Emissions, Swann Compressor Station, Montgomery County - 2028

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																											
			Operations			Emission Factor[1] (g/hp-hr)													Emissions (tons)												
			Quantity	Hours/Week	Weeks Used	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane
Air Compressor A	Air Compressors	150	4	60	24	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bobcat	Skid Steer Loaders	150	3	60	24	0.07	0.02	0.01	0.03	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.02	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	Plate Compactors	200	4	60	5	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	Plate Compactors	100	2	60	9.5	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (n	Off-highway Trucks	150	10	60	1	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (s	Off-highway Trucks	250	4	60	2.5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (20 ton	Cranes	185	2	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 to	Cranes	350	2	40	3	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	Dumpers/Tenders	20	4	40	7	0.07	0.02	0.01	0.03	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavators	950	4	60	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	Forklifts	250	2	60	5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	Generator Sets	200	3	80	24	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Hydrotest Truck	Off-highway Trucks	600	1	60	5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	Other Construction Equipment	250	4	24	5	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	Aerial Lifts	405	8	60	24	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.04	0.03	0.06	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	Off-highway Trucks	200	25	40	5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	Aerial Lifts	10	2	60	5	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	Off-highway Trucks	12	4	40	2.5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	Off-highway Trucks	200	4	60	2.5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	Welders	250	10	60	19	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.02	0.02	0.04	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.00
Welding Rig	Welders	35	10	60	19	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
X-Ray Truck/Machine	Off-highway Trucks	40	2	60	7	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
																		2028 Nonroad Emissions	**0.39**	**0.09**	**0.10**	**0.16**	**0.01**	**1.09**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

TABLE 20. Estimated Nonroad Contruction HAP Emissions, Stallworth Compressor Station, Fayette County - 2028

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																											
			Operations			Emission Factor[1] (g/hp-hr)													Emissions (tons)												
			Quantity	Hours/Week	Weeks Used	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane
Air Compressor A	Air Compressors	150	4	60	20	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Bobcat	Skid Steer Loaders	150	3	60	20	0.04	0.01	0.01	0.02	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.01	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	Plate Compactors	200	4	60	4	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	Plate Compactors	100	2	60	8	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (n	Off-highway Trucks	150	10	60	1	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (s	Off-highway Trucks	250	4	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (20 ton	Cranes	185	2	60	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 to	Cranes	350	2	40	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	Dumpers/Tenders	20	4	40	6	0.05	0.01	0.01	0.02	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavators	950	4	60	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	Forklifts	250	2	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	Generator Sets	200	3	80	20	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00
Hydrotest Truck	Off-highway Trucks	600	1	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	Other Construction Equipment	250	4	24	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	Aerial Lifts	405	8	60	20	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.04	0.02	0.06	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	Off-highway Trucks	200	25	40	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	Aerial Lifts	10	2	60	4	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	Off-highway Trucks	12	4	40	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	Off-highway Trucks	200	4	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	Welders	250	10	60	16	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.02	0.02	0.04	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
Welding Rig	Welders	35	10	60	16	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
X-Ray Truck/Machine	Off-highway Trucks	40	2	60	6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
																		2028 Nonroad Emissions	**0.33**	**0.08**	**0.08**	**0.14**	**0.01**	**0.92**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Company Name: **EQT Corporation**
Project Location: **Mountain Valley Pipeline**
Project Description: **MVP Boost Project Construction Emissions**

TABLE 21. Estimated Nonroad Contruction HAP Emissions, Harris Compressor Station, Braxton County - 2028

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																											
			Operations			Emission Factor[1] (g/hp-hr)													Emissions (tons)												
			Quantity	Hours/Week	Weeks Used	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane
Air Compressor A	Air Compressors	150	4	60	20	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bobcat	Skid Steer Loaders	150	3	60	20	0.04	0.01	0.01	0.02	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.01	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	Plate Compactors	200	4	60	4	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	Plate Compactors	100	2	60	8	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (n	Off-highway Trucks	150	10	60	1	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (s	Off-highway Trucks	250	4	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (20 ton	Cranes	185	2	60	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 to	Cranes	350	2	40	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	Dumpers/Tenders	20	4	40	6	0.05	0.01	0.01	0.02	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavators	950	4	60	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	Forklifts	250	2	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	Generator Sets	200	3	80	20	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrotest Truck	Off-highway Trucks	600	1	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	Other Construction Equipment	250	4	24	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	Aerial Lifts	405	8	60	20	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.04	0.02	0.06	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	Off-highway Trucks	200	25	40	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	Aerial Lifts	10	2	60	4	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	Off-highway Trucks	12	4	40	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	Off-highway Trucks	200	4	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	Welders	250	10	60	16	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.02	0.02	0.04	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Rig	Welders	35	10	60	16	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-Ray Truck/Machine	Off-highway Trucks	40	2	60	6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
																		2028 Nonroad Emissions	**0.33**	**0.08**	**0.08**	**0.14**	**0.01**	**0.92**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

TABLE 22. Estimated Nonroad Contruction HAP Emissions, Bradshaw Compressor Station, Wetzel County - 2028

Equipment Name	MOVES Equipment Classification	Rated Engine Load (hp)	Construction Emissions																											
			Operations			Emission Factor[1] (g/hp-hr)													Emissions (tons)												
			Quantity	Hours/Week	Weeks Used	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane
Air Compressor A	Air Compressors	150	4	60	20	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bobcat	Skid Steer Loaders	150	3	60	20	0.04	0.01	0.01	0.02	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.01	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00
Compactor	Plate Compactors	200	4	60	4	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Compactor, Vibratory	Plate Compactors	100	2	60	8	0.07	0.01	0.00	0.04	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (n	Off-highway Trucks	150	10	60	1	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Mixer Truck (s	Off-highway Trucks	250	4	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (20 ton	Cranes	185	2	60	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Wheeled (250 to	Cranes	350	2	40	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	Dumpers/Tenders	20	4	40	6	0.05	0.01	0.01	0.02	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	Excavators	950	4	60	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Fork Lift	Forklifts	250	2	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	Generator Sets	200	3	80	20	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00
Hydrotest Truck	Off-highway Trucks	600	1	60	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Tower	Other Construction Equipment	250	4	24	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Man Lift A	Aerial Lifts	405	8	60	20	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.04	0.02	0.06	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks	Off-highway Trucks	200	25	40	4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Scissor Lift	Aerial Lifts	10	2	60	4	0.03	0.01	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tandem Truck	Off-highway Trucks	12	4	40	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water / Fuel Truck	Off-highway Trucks	200	4	60	2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Welding Machine	Welders	250	10	60	16	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.02	0.02	0.04	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
Welding Rig	Welders	35	10	60	16	0.03	0.01	0.01	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
X-Ray Truck/Machine	Off-highway Trucks	40	2	60	6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
																		2028 Nonroad Emissions	**0.33**	**0.08**	**0.08**	**0.14**	**0.01**	**0.92**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Notes:
1. Emission Factors per MOVES5.
2. EPA MOVES5.0 Model does not contain Emission Factors for some equipment types. Used Emission Factors for Other Construction Equipment as a substitution when equipment-specific emissions factors were not available.

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 23. Estimated On-road Contruction Criteria Emissions, Pipeline, Montgomery County - 2027

Equipment Name	MOVES Equipment Classification	Fuel Type	Construction Emissions																				
			Operations				Emission Factor[1] (g/mi)									Emissions (tons)								
			Quantity	Trip Length	Trips Per Day	Days Used	NO_x	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O[2]	CO_2	NO_X	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	CH_4	N_2O	CO_2
Light-Duty Gasoline Truck	Light Commercial Truck	Gasoline	20	50	4	56	0.17	3.01	0.01	0.20	0.01	0.01	0.02	0.04	621.77	0.04	0.74	0.00	0.05	0.00	0.00	0.00	0.01	153.53
Light-Duty Gasoline Vehicle	Light Commercial Truck	Gasoline	5	50	4	56	0.17	3.01	0.01	0.20	0.01	0.01	0.02	0.04	621.77	0.01	0.19	0.00	0.01	0.00	0.00	0.00	0.00	38.38
Heavy Duty Diesel Vehicle	Light Commercial Truck	Diesel	3	50	2	56	0.78	1.08	0.00	0.12	0.04	0.04	0.02	0.04	705.15	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	13.06
Fuel Delivery	Light Commercial Truck	Diesel	1	50	2	56	0.78	1.08	0.00	0.12	0.04	0.04	0.02	0.04	705.15	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	4.35
School Bus	School Bus	Diesel	2	50	4	56	1.61	0.76	0.00	0.15	0.08	0.08	0.02	0.07	1271.40	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	31.39
														2027 Onroad Emissions		**0.11**	**0.97**	**0.00**	**0.07**	**0.01**	**0.01**	**0.01**	**0.01**	**240.71**

Notes:

1. Emission Factors per MOVES5.
2. N_2O emission factor is based on 2023 Climate Registry Default Emission Factors, Released: June 2023, Tables 2.1 and 2.7, ratioed based on CO_2 emission factor from EPA MOVES5.
3. EPA MOVES5.0 Model does not contain Emission Factors for some equipment types. Used Emission Factors for Other Construction Equipment as a substitution when equipment-specific emissions factors were not available.
4. Light-duty Gasoline Trucks and Vehicles were conservatively modeled as Light Comercial Trucks in MOVES.

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 24. Estimated On-road Contruction HAP Emissions, Pipeline, Montgomery County - 2027

Equipment Name	MOVES Equipment Classification	Fuel Type	Construction Emissions																											
			Operations				Emission Factor[1] (g/mi)													Emissions (tons)											
			Quantity	Trip Length	Trips Per Day	Days Used	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Ammonia	Benzene	1,3-Butadiene	Formaldehyde	Hexane	Naphthalene	Ethyl Benzene	Styrene	Toluene	Xylene	2,2,4-Trimethylpentane
Light-Duty Gasoline Truck	Light Commercial Truck	Gasoline	20	50	4	56	0.00	0.00	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light-Duty Gasoline Vehicle	Light Commercial Truck	Gasoline	5	50	4	56	0.00	0.00	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heavy Duty Diesel Vehicle	Light Commercial Truck	Diesel	3	50	2	56	0.01	0.00	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel Delivery	Light Commercial Truck	Diesel	1	50	2	56	0.01	0.00	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
School Bus	School Bus	Diesel	2	50	4	56	0.01	0.00	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
																			2027 Onroad Emissions	**0.00**	**0.00**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Notes:
1. Emission Factors per MOVES5.
2. EPA MOVES5.0 Model does not contain Emission Factors for some equipment types. Used Emission Factors for Other Construction Equipment as a substitution when equipment-specific emissions factors were not available.
3. Light-duty Gasoline Trucks and Vehicles were conservatively modeled as Light Comercial Trucks in MOVES.

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 25. Estimated Off-road Vehicle Emissions, Pipeline, Montgomery County - 2027

Vehicle Type	2027				Total Miles Per Year	Mean Vehicle Weight (tons)	Emission Factor[1] PM_{10} (lb/VMT)	Emission Factor[1] $PM_{2.5}$ (lb/VMT)	Control Efficiency[2] (%)	2027 Emissions PM_{10} (tpy)	2027 Emissions $PM_{2.5}$ (tpy)
	Quantity	Trip Length (miles)	Trips per day	Total Days							
All Terrain Vehicle (ATV)	1	3	5	56	840	0.5	0.33	0.03	75%	0.03	0.00
Dump Trucks	6	50	5	56	84000	10	1.27	0.13	75%	13.31	1.33
Light Duty Trucks	10	50	5	56	140000	3	0.74	0.07	75%	12.91	1.29
Medium Duty Trucks	10	50	5	56	140000	10	1.27	0.13	75%	22.19	2.22
										48.44	**4.84**

Notes:

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

Unpaved Roads: $E = k(s/12)^a(W/3)^b*[(365-p)/365]$

k Factor (PM_{10}, $PM_{2.5}$) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	11.7	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	181.4		Average Yearly Precipitation for Elliston, VA.
a (PM_{10}, $PM_{2.5}$)	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM_{10}, $PM_{2.5}$)	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Control Efficiency obtained from Figure 6-1 of WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1 for Wet Supression assuming a moisture ratio of 2.
3. Conservatively included all heavy duty vehicles type, including water trucks.

TABLE 26. Estimated Off-road Vehicle Emissions, Swann Compressor Station, Montgomery County - 2027

Vehicle Type	2027				Total Miles Per Year	Mean Vehicle Weight (tons)	Emission Factor[1] PM_{10} (lb/VMT)	Emission Factor[1] $PM_{2.5}$ (lb/VMT)	Control Efficiency[2] (%)	2027 Emissions PM_{10} (tpy)	2027 Emissions $PM_{2.5}$ (tpy)
	Quantity	Trip Length (miles)	Trips per day	Total Days							
Dump Trucks	10	50	4	168	336000	10	1.27	0.13	75%	53.25	5.33
Medium Duty Trucks	30	50	1	168	252000	10	1.27	0.13	75%	39.94	3.99
Water / Fuel Truck	1	50	1	168	8400	20	1.73	0.17	75%	1.82	0.18
										95.01	**9.50**

Notes:

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

Unpaved Roads: $E = k(s/12)^a(W/3)^b*[(365-p)/365]$

k Factor (PM_{10}, $PM_{2.5}$) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	11.7	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	181.4		Average Yearly Precipitation for Elliston, VA.
a (PM_{10}, $PM_{2.5}$)	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM_{10}, $PM_{2.5}$)	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Control Efficiency obtained from Figure 6-1 of WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1 for Wet Supression assuming a moisture ratio of 2.
3. Conservatively included all heavy duty vehicles type, including water trucks.

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 27. Estimated Off-road Vehicle Emissions, Stallworth Compressor Station, Fayette County - 2027

Vehicle Type	2027				Total Miles Per Year	Mean Vehicle Weight (tons)	Emission Factor[1] PM_{10} (lb/VMT)	Emission Factor[1] $PM_{2.5}$ (lb/VMT)	Control Efficiency[2] (%)	2027 Emissions PM_{10} (tpy)	2027 Emissions $PM_{2.5}$ (tpy)
	Quantity	Trip Length (miles)	Trips per day	Total Days							
Dump Trucks	10	50	4	140	280000	10	1.27	0.13	75%	44.30	4.43
Medium Duty Trucks	30	50	1	140	210000	10	1.27	0.13	75%	33.23	3.32
Water / Fuel Truck	1	50	1	140	7000	20	1.73	0.17	75%	1.51	0.15
										79.04	**7.90**

Notes:

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

Unpaved Roads: $E = k(s/12)^a(W/3)^b*[(365-p)/365]$

k Factor (PM_{10}, $PM_{2.5}$) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	11.7	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	181.7		Average Yearly Precipitation for Shawver, WV.
a (PM_{10}, $PM_{2.5}$)	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM_{10}, $PM_{2.5}$)	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Control Efficiency obtained from Figure 6-1 of WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1 for Wet Supression assuming a moisture ratio of 2.
3. Conservatively included all heavy duty vehicles type, including water trucks.

TABLE 28. Estimated Off-road Vehicle Emissions, Harris Compressor Station, Braxton County - 2027

Vehicle Type	2027				Total Miles Per Year	Mean Vehicle Weight (tons)	Emission Factor[1] PM_{10} (lb/VMT)	Emission Factor[1] $PM_{2.5}$ (lb/VMT)	Control Efficiency[2] (%)	2027 Emissions PM_{10} (tpy)	2027 Emissions $PM_{2.5}$ (tpy)
	Quantity	Trip Length (miles)	Trips per day	Total Days							
Dump Trucks	10	50	4	140	280000	10	1.17	0.12	75%	41.06	4.11
Medium Duty Trucks	30	50	1	140	210000	10	1.17	0.12	75%	30.80	3.08
Water / Fuel Truck	1	50	1	140	7000	20	1.60	0.16	75%	1.40	0.14
										73.26	**7.33**

Notes:

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

Unpaved Roads: $E = k(s/12)^a(W/3)^b*[(365-p)/365]$

k Factor (PM_{10}, $PM_{2.5}$) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	11.7	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	195.1		Average Yearly Precipitation for Gregory, WV.
a (PM_{10}, $PM_{2.5}$)	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM_{10}, $PM_{2.5}$)	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Control Efficiency obtained from Figure 6-1 of WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1 for Wet Supression assuming a moisture ratio of 2.
3. Conservatively included all heavy duty vehicles type, including water trucks.

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 29. Estimated Off-road Vehicle Emissions, Bradshaw Compressor Station, Wetzel County - 2027

Vehicle Type	2027				Total Miles Per Year	Mean Vehicle Weight (tons)	Emission Factor[1] PM_{10} (lb/VMT)	Emission Factor[1] $PM_{2.5}$ (lb/VMT)	Control Efficiency[2] (%)	2027 Emissions PM_{10} (tpy)	2027 Emissions $PM_{2.5}$ (tpy)
	Quantity	Trip Length (miles)	Trips per day	Total Days							
Dump Trucks	10	50	4	140	280000	10	1.22	0.12	75%	42.63	4.26
Medium Duty Trucks	30	50	1	140	210000	10	1.22	0.12	75%	31.98	3.20
Water / Fuel Truck	1	50	1	140	7000	20	1.66	0.17	75%	1.46	0.15
										76.07	**7.61**

Notes:

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

Unpaved Roads: $E = k(s/12)^a(W/3)^b*[(365-p)/365]$

k Factor (PM_{10}, $PM_{2.5}$) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	11.7	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	188.6		Average Yearly Precipitation for Hazel, WV.
a (PM_{10}, $PM_{2.5}$)	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM_{10}, $PM_{2.5}$)	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Control Efficiency obtained from Figure 6-1 of WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1 for Wet Supression assuming a moisture ratio of 2.
3. Conservatively included all heavy duty vehicles type, including water trucks.

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 30. Estimated Off-road Vehicle Emissions, Swann Compressor Station, Montgomery County - 2028

Vehicle Type	2028				Total Miles Per Year	Mean Vehicle Weight	Emission Factor[1]		Control Efficiency[2]	2028 Emissions	
							PM_{10}	$PM_{2.5}$		PM_{10}	$PM_{2.5}$
	Quantity	Trip Length (miles)	Trips per day	Total Days		(tons)	(lb/VMT)	(lb/VMT)	(%)	(tpy)	(tpy)
Dump Trucks	10	50	4	168	336000	10	1.27	0.13	75%	53.25	5.33
Medium Duty Trucks	30	50	1	168	252000	10	1.27	0.13	75%	39.94	3.99
Water / Fuel Truck	1	50	1	168	8400	20	1.73	0.17	75%	1.82	0.18
										95.01	**9.50**

Notes:

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

Unpaved Roads: $E = k(s/12)^a(W/3)^b*[(365-p)/365]$

k Factor (PM_{10}, $PM_{2.5}$) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	11.7	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	181.4		Average Yearly Precipitation for Elliston, VA.
a (PM_{10}, $PM_{2.5}$)	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM_{10}, $PM_{2.5}$)	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Control Efficiency obtained from Figure 6-1 of WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1 for Wet Supression assuming a moisture ratio of 2.
3. Conservatively included all heavy duty vehicles type, including water trucks.

TABLE 31. Estimated Off-road Vehicle Emissions, Stallworth Compressor Station, Fayette County - 2028

Vehicle Type	2028				Total Miles Per Year	Mean Vehicle Weight	Emission Factor[1]		Control Efficiency[2]	2028 Emissions	
							PM_{10}	$PM_{2.5}$		PM_{10}	$PM_{2.5}$
	Quantity	Trip Length (miles)	Trips per day	Total Days		(tons)	(lb/VMT)	(lb/VMT)	(%)	(tpy)	(tpy)
Dump Trucks	10	50	4	140	280000	10	1.27	0.13	75%	44.30	4.43
Medium Duty Trucks	30	50	1	140	210000	10	1.27	0.13	75%	33.23	3.32
Water / Fuel Truck	1	50	1	140	7000	20	1.73	0.17	75%	1.51	0.15
										79.04	**7.90**

Notes:

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

Unpaved Roads: $E = k(s/12)^a(W/3)^b*[(365-p)/365]$

k Factor (PM_{10}, $PM_{2.5}$) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	11.7	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	181.7		Average Yearly Precipitation for Shawver, WV.
a (PM_{10}, $PM_{2.5}$)	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM_{10}, $PM_{2.5}$)	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Control Efficiency obtained from Figure 6-1 of WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1 for Wet Supression assuming a moisture ratio of 2.
3. Conservatively included all heavy duty vehicles type, including water trucks.

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

TABLE 32. Estimated Off-road Vehicle Emissions, Harris Compressor Station, Braxton County - 2028

Vehicle Type	2028				Total Miles Per Year	Mean Vehicle Weight (tons)	Emission Factor[1] PM_{10} (lb/VMT)	Emission Factor[1] $PM_{2.5}$ (lb/VMT)	Control Efficiency[2] (%)	2028 Emissions PM_{10} (tpy)	2028 Emissions $PM_{2.5}$ (tpy)
	Quantity	Trip Length (miles)	Trips per day	Total Days							
Dump Trucks	10	50	4	140	280000	10	1.17	0.12	75%	41.06	4.11
Medium Duty Trucks	30	50	1	140	210000	10	1.17	0.12	75%	30.80	3.08
Water / Fuel Truck	1	50	1	140	7000	20	1.60	0.16	75%	1.40	0.14
										73.26	**7.33**

Notes:

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

Unpaved Roads: $E = k(s/12)^a(W/3)^b*[(365-p)/365]$

k Factor (PM_{10}, $PM_{2.5}$) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	11.7	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	195.1		Average Yearly Precipitation for Gregory, WV.
a (PM_{10}, $PM_{2.5}$)	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM_{10}, $PM_{2.5}$)	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Control Efficiency obtained from Figure 6-1 of WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1 for Wet Supression assuming a moisture ratio of 2.
3. Conservatively included all heavy duty vehicles type, including water trucks.

TABLE 33. Estimated Off-road Vehicle Emissions, Bradshaw Compressor Station, Wetzel County - 2028

Vehicle Type	2028				Total Miles Per Year	Mean Vehicle Weight (tons)	Emission Factor[1] PM_{10} (lb/VMT)	Emission Factor[1] $PM_{2.5}$ (lb/VMT)	Control Efficiency[2] (%)	2028 Emissions PM_{10} (tpy)	2028 Emissions $PM_{2.5}$ (tpy)
	Quantity	Trip Length (miles)	Trips per day	Total Days							
Dump Trucks	10	50	4	140	280000	10	1.22	0.12	75%	42.63	4.26
Medium Duty Trucks	30	50	1	140	210000	10	1.22	0.12	75%	31.98	3.20
Water / Fuel Truck	1	50	1	140	7000	20	1.66	0.17	75%	1.46	0.15
										76.07	**7.61**

Notes:

1. Emission factors calculated in accordance with AP-42 Section 13.2.2:

Unpaved Roads: $E = k(s/12)^a(W/3)^b*[(365-p)/365]$

k Factor (PM_{10}, $PM_{2.5}$) (lb/VMT)	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	11.7	%	AP-42 Table 13.2.2-1 (Final, 11/06)
Number of Rain Days, p	188.6		Average Yearly Precipitation for Hazel, WV.
a (PM_{10}, $PM_{2.5}$)	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b (PM_{10}, $PM_{2.5}$)	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

2. Control Efficiency obtained from Figure 6-1 of WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1 for Wet Supression assuming a moisture ratio of 2.
3. Conservatively included all heavy duty vehicles type, including water trucks.

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

Table 34. Earthmoving Emissions

Site	Emission Factor (ton/acre-month)		Duration[4] (months)	Construction Area[4] (acres)	Uncontrolled Emissions (tons)		Controlled Emissions[3] (tons)	
					2027		2027	
	PM_{10}[1]	$PM_{2.5}$[2]	2027		PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Swann Compressor Station - Montgomery County	0.11	0.011	3	10.1	3.33	0.33	1.67	0.17

1. WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Table 3-2, level 1, average conditions.
2. $PM_{2.5}/PM_{10}$ = 0.10 (WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1)
3. Assume 50% control from water and other approved dust suppressants. (WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1)
4. Based on data provided by client.

Company Name: EQT Corporation
Project Location: Mountain Valley Pipeline
Project Description: MVP Boost Project Construction Emissions

Table 35. Wind Erosion Emissions

Site	Emission Factor (ton/acre-month)		Duration[4] (months)	Construction Area[4] (acres)	Uncontrolled Emissions (tons)		Controlled Emissions[3] (tons)	
					2027		2027	
	PM_{10}[1]	$PM_{2.5}$[2]	2027		PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Swann Compressor Station - Montgomery County	0.02	0.002	3	10.1	0.48	0.05	0.24	0.02

1. WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Table 11-6, wind erosion of exposed areas (seeded land, stripped or graded overburden) 0.38 ton TSP/acre-yr.
2. PM_{10}/TSP = 0.50 (WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 9.3).
3. $PM_{2.5}$/PM_{10} = 0.10 (WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1).
4. Assume 50% control from water and other approved dust suppressants. (WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1)

Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9

Appendix 9-B
Operational Emissions Calculations

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 1. Potential Atmospheric Emissions from Project Sources

Source	Pollutants																	
	VOC		NO_X		CO		PM_{10}		$PM_{2.5}$		SO_2		HCHO		Total HAPs		GHG (CO_2e)	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Turbine 5 (S027)	0.41	1.91	5.91	25.90	1.20	5.47	1.77	7.74	1.77	7.74	0.60	2.63	0.10	0.45	0.16	0.69	20,875	91,564
Microturbine 15 (S029)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Fuel Gas Heater (S028)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Fugitives (S024)	0.03	0.12	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	64	280
Blowdowns (S026)	0.72	3.17	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	1,680	7,359
Total	**1.19**	**5.32**	**6.14**	**26.89**	**1.54**	**6.97**	**1.79**	**7.85**	**1.79**	**7.85**	**0.61**	**2.67**	**0.10**	**0.45**	**0.16**	**0.72**	**23066**	**101159**

Notes:

1. Project total is the sum of new equipment and the difference between the exisiting and proposed emissions from modified equipment..
2. Global Warming Potential (40 CFR 98 Subpart A Table A-1).

CO_2	1
CH_4	28
N_2O	265

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 2. Turbine Emissions Calculations

Turbine Information:

Source ID:	S027
Manufacturer:	Solar
Model No.:	Titan 130 - 23502S
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf):	947
Rated Horsepower (site-specific bhp):	23,483
Maximum Fuel Consumption (scf/hr):	173,176
Heat Input (MMBtu/hr)	164.05
Control Device:	SoloNOx/Ox Cat
Oxidation Catalyst CO Control Efficiency	80%
Oxidation Catalyst VOC Control Efficiency	40%
Oxidation Catalyst HCHO Control Efficiency	80%

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	1,517.03
Potential Startup/Shutdown Events (per year):	12

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_X	5.910	lb/hr	Manufacturer
CO	1.200	lb/hr	Manufacturer with catalyst control
SO_2	3.66E-03	lb/MMBtu	AP-42, Table 3.1-2a
PM_{10}	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
$PM_{2.5}$	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
VOC	0.413	lb/hr	20% of UHC per Manufacturer with catalyst control
Formaldehyde	0.001	lb/MMBtu	Manufacturer, PIL 168 with catalyst control
CO_2	126.72	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	2.752	lb/hr	80% of UHC per Manufacturer
N_2O	2.4E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1026 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Pollutant Emission Rates:

Pollutant	Potential Emissions (lb/hr)[1]	(tpy)[2]
NO_X	5.91	25.90
CO	1.20	5.47
SO_2	0.60	2.63
PM_{10}	1.77	7.74
$PM_{2.5}$	1.77	7.74
VOC	0.41	1.91
Formaldehyde	0.10	0.45
CO_2	20,788	91,061
CH_4	2.75	16.34
N_2O	0.04	0.17
GHG (CO_2e)	20,875	91,564

*Annual emissions shown above include startup/shutdown events.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 2. Turbine Emissions Calculations

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[3]	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2,4]
HAPs:			
Acetaldehyde	4.31E-05	7.07E-03	3.09E-02
Acrolein	6.89E-06	1.13E-03	4.95E-03
Benzene	1.29E-05	2.12E-03	9.28E-03
1,3-Butadiene	4.63E-07	7.60E-05	3.33E-04
Propylene Oxide	2.90E-05	4.76E-03	2.08E-02
Ethylbenzene	3.45E-05	5.65E-03	2.48E-02
Toluene	1.40E-04	2.30E-02	1.01E-01
Xylene	6.89E-05	1.13E-02	4.95E-02
Naphthalene	1.40E-06	2.30E-04	1.01E-03
PAH	2.37E-06	3.89E-04	1.70E-03
Total HAP (Including HCHO)		**0.16**	**0.69**

1. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)

2. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable

3. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV of 1020. Therefore, they were converted to LHV by multiplying by (HHV/LHV).

4. Emission calculations are based on maximum operating load of 100%, ambient temperature 0°F and site elevation. The turbine rating can vary with ambient conditions. Each Turbine is ISO rated at 23,470 HP

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[a] (lbs/event)	Shutdown Emissions[a] (lbs/event)	Emission Factor Source
NO_X	1.0	1.0	Manufacturer
CO	16.0	19.0	Manufacturer
VOC	4.0	4	Manufacturer
CO_2	767	869	Manufacturer

[a] Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer. Emissions were using PIL 170 Revision 11.

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	9	lbs/startup
CO_2 Purged (Per Startup)	5	lbs/startup
CH_4 Purged (Per Startup)	715	lbs/startup
Density of natural gas:	0.04	lb/ft^3

*Current design includes electric motor starts, but pneumatic starts have been included as a conservative measure.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 3. Microturbine Emissions Calculations

Microturbine Unit Information:

Engine ID:	S029
Manufacturer:	Capstone
Model No.:	C200
Number of Units:	14

Microturbine Fuel Information:

	Per Unit
Fuel Type:	Natural Gas
Rated Electrical Power Output (kW):	200
Rated Electrical Power Output (MW):	0.2
Rated Horsepower (bhp):	268.2
Heat Input (MMBtu/hr)	2.28
Potential Fuel Consumption (MMBtu/yr):	19,973
Max. Annual Hours of Operation (hr/yr):	8,760

Microturbine Emissions Data:

Pollutant	**Emission Factors**	**Units**	**Maximum Potential Emissions Per Unit**		**Estimation Basis / Emission Factor Source**
			lbs/hr	**tpy**	
NO_X	0.40	lb/MWhe	0.0800	0.3504	Manufacturer's Specifications
VOC	0.10	lb/MWhe	0.0200	0.0876	Manufacturer's Specifications
CO	1.10	lb/MWhe	0.2200	0.9636	Manufacturer's Specifications
SO_X	0.0034	lb/MMBtu	0.0078	0.0340	AP-42, Table 3.1-2a (Apr-2000)
PM_{10}	0.0066	lb/MMBtu	0.0150	0.0659	AP-42, Table 3.1-2a (Apr-2000)
$PM_{2.5}$	0.0066	lb/MMBtu	0.0150	0.0659	AP-42, Table 3.1-2a (Apr-2000)
GHG (CO_2e)	See Table Below		266	1,166	Manufacturer's Specifications / 40 CFR 98, Table C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this engine type.

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	**Emission Factor**	**Units**	**Maximum Potential Emissions Per Unit**		**Estimation Basis / Emission Factor Source**
			lbs/hr	**tpy**	
GHGs:					
CO_2	1330	lb/MWhe	266	1,165	Manufacturer's Specifications
CH_4	0.001	kg/MMBtu	0.01	0.02	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**266**	**1,166**	
HAPs:					
1,3-Butadiene	4.3E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acetaldehyde	4.0E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acrolein	6.4E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Benzene	1.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Ethylbenzene	3.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Formaldehyde	7.1E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)
Naphthalene	1.3E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
PAH	2.2E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Propylene oxide	2.9E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Toluene	1.3E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Xylene	6.4E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Total HAP			**0.002**	**0.010**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 4. Fuel Gas Heater Emissions Calculations

Fuel Gas Heater Information:

Source ID:	S028
Number of Units:	1

Fuel Gas Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	1.54
Potential Fuel Consumption (MMBtu/yr):	13,477
Max. Fuel Consumption (MMscf/hr):	0.0015
Max. Fuel Consumption (MMscf/yr):	12.8
Max. Annual Hours of Operation (hr/yr):	8,760

Fuel Gas Heater Emission:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.15	0.64	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.01	0.04	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.12	0.54	AP-42, Table 1.4-1 (Jul-1998)
SO_X	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		180	789	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 4. Fuel Gas Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	180.00	788	40 CFR 98, Table C-1
CH_4	0.001	kg/MMBtu	0.00	0.01	40 CFR 98, Table C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			**180**	**789**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.01	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.003**	**0.01**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 5. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	556	0.0004	Table 2-4	0.25	1.18	0.01	0.00
Flanges	155	0.0009	Table 2-4	0.13	0.64	0.01	0.00
Open-Ended Lines	5	0.0044	Table 2-4	0.02	0.11	0.00	0.00
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00
Valves	196	0.0099	Table 2-4	1.94	9.37	0.10	0.00
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00
Total				**2.34**	**11.30**	**0.12**	**0.00**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station assuming 25% of existing count for the addition of a new turbine.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential CH_4 Emissions	Potential CO_2 Emissions	Potential CO_2e Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)	(tpy)
Connectors	556	0.0004	Table 2-4	0.25	1.18	1.05	0.01	29.30
Flanges	155	0.0009	Table 2-4	0.13	0.64	0.57	0.00	15.93
Open-Ended Lines	5	0.0044	Table 2-4	0.02	0.11	0.09	0.00	2.63
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00	0.00
Valves	196	0.0099	Table 2-4	1.94	9.37	8.30	0.06	232.36
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00	0.00
Total				**2.34**	**11.30**	**10.01**	**0.07**	**280.22**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station assuming 25% of existing count for the addition of a new turbine.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. CO2 and CH4 emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions	
	lbs/hr	tpy
VOC	0.03	0.12
HAPs	0.00	0.00
GHG (CO_2e)	64	280

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 6. Blowdown Emission Calculations

[1]Mole fractions of CH_4, VOC, HAP and CO_2 based on gas analysis:

CH_4: 93.83% CO_2: 0.24% VOC 0.39% HAP 0.00%

[2]Weight fractions of CH_4 , VOC, HAP and CO_2 based on gas analysis:

CH_4: 88.56% CO_2: 0.61% VOC 1.07% HAP 0.00%

[3] Carbon equivalent emissions (CO_2e) are based on the following Global Warming Potentials (GWP) from 40 CFR Part 98, Table A-1:

Carbon Dioxide (CO_2): 1

Methane (CH_4): 28

Emissions from Compressor Seal:

Number of Compressors[1,2]	Number of Seals Per Compressor	Leak Rate (scf/hr/compressor)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
1	2	600	10,512,000	2.51	0.00	1.44	208.75	5,846
Total				**2.51**	**0.00**	**1.44**	**208.75**	**5,846**

1. Leak rate for the new unit was estimated by using the max dry seal compressor leak rate from NSPS OOOOb. Emission factor is per seal.
2. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton
3. GHG emissions calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
Sample calculation: Volume vented (scf/yr) x density of GHG (kg/scf) x mol % VOC x 2.2 lb/kg / 2000 lb/ton

VOC and HAP Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Station ESD Vent	1,600,000	0	0	0.00	0.00
Compressor Unit Blowdowns	170,000	16	2,720,000	0.65	0.00
Main Gas Filter Changes	91,000	0	0	0.00	0.00
Total				**0.65**	**0.00**

1. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton

GHG Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Station ESD Vent	1,600,000	0	0	0.00	0.00	0
Compressor Unit Blowdowns	170,000	16	2,720,000	54.01	0.37	1,513
Main Gas Filter Changes	91,000	0	0	0.00	0.00	0
Total				**54.0**	**0.37**	**1,513**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 6. Blowdown Emission Calculations

Pigging Emissions:

Segment Name	Pigging Events (#/yr)	Diameter (in)	Length of pipeline (ft)	Volume of Gas Occupied in Pipeline* (acf)	Pipeline Operating Pressure (psig)	Event Duration[1] (hr/event)	Total Gas Volume per Event (scf/event)	Gas Volume to Atmosphere per Year (scf/yr)
Pig Receiver 42"	0	42	20.5	197	1,480	0.017	20,014	0
Pig Receiver 48"	0	48	22	276	1,480	0.017	28,054	0
Pig Launcher 42"	0	42	9.5	91	1,480	0.017	9,275	0
Pig Launcher 48"	0	48	21.6	271	1,480	0.017	27,544	0
Total							**84,887**	**0**

[1] Assumes pigging event duration of approximately 1 minute.

VOC and HAP Vented Pigging Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Pig Receiver 42"	20,014	0	0	0.00	0.00
Pig Receiver 48"	28,054	0	0	0.00	0.00
Pig Launcher 42"	9,275	0	0	0.00	0.00
Pig Launcher 48"	27,544	0	0	0.00	0.00
Total				**0.00**	**0.00**

GHG Vented Pigging Emissions

Segment Name	Vented Gas Volume Per Pigging Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Pig Receiver 42"	20,014	0	0	0.00	0.00	0
Pig Receiver 48"	28,054	0	0	0.00	0.00	0
Pig Launcher 42"	9,275	0	0	0.00	0.00	0
Pig Launcher 48"	27,544	0	0	0.00	0.00	0
Total				**0.0**	**0.00**	**0**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Blowdowns Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	0.72	3.17	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
HAPs	0.00	0.00	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
GHG (CO_2e)	1,680	7,359	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis

Hourly emissions are annualized (i.e., assume 8,760 hours per year).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 1. Potential Atmospheric Emissions from Each Source at the Facility

Source	Pollutants																	
	VOC		NO_X		CO		PM_{10}		$PM_{2.5}$		SO_2		HCHO		Total HAPs		GHG (CO_2e)	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Turbine 1 (S001)	1.14	5.07	9.80	42.95	9.90	45.67	2.64	11.57	2.64	11.57	0.60	2.62	0.51	2.22	0.56	2.47	20,863	91,516
Turbine 2 (S002)	1.14	5.07	9.80	42.95	9.90	45.67	2.64	11.57	2.64	11.57	0.60	2.62	0.51	2.22	0.56	2.47	20,863	91,516
Turbine 3 (S003)	1.14	5.07	9.80	42.95	9.90	45.67	2.64	11.57	2.64	11.57	0.60	2.62	0.51	2.22	0.56	2.47	20,863	91,516
Turbine 4 (S004)	1.14	5.07	9.80	42.95	9.90	45.67	2.64	11.57	2.64	11.57	0.60	2.62	0.51	2.22	0.56	2.47	20,863	91,516
Turbine 5 (S027)	0.41	1.91	5.91	25.90	1.20	5.47	1.77	7.74	1.77	7.74	0.60	2.63	0.10	0.45	0.16	0.69	20,875	91,564
Microturbine 1 (S005)	0.02	0.09	0.08		0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 2 (S006)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 3 (S007)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 4 (S008)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 5 (S009)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 6 (S010)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 7 (S011)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 8 (S012)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 9 (S013)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 10 (S014)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 11 (S015)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 12 (S016)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 13 (S017)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 14 (S018)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 15 (S029)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Fuel Gas Heater (S019)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Fuel Gas Heater (S020)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Fuel Gas Heater (S028)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Produced Fluids Tank (S021)	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	3	15
Used Oil Tank (S022)	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	--	--
Office Building Heater (S023)	0.00	0.00	0.01	0.05	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	62
Fugitives (S024)	0.14	0.60	--	--	--	--	0.03	0.11	0.00	0.01	--	--	--	--	0.00	0.00	320	1,401
Liquid Loading (S025)	0.01	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blowdowns (S026)	4.91	21.50	--	--	--	--	--	--	--	--	--	--	--	--	0.01	0.03	11,413	49,990
Total	**10.36**	**45.78**	**46.76**	**204.57**	**44.48**	**204.25**	**12.62**	**55.27**	**12.60**	**55.17**	**3.11**	**13.64**	**2.16**	**9.44**	**2.46**	**10.77**	**120,614**	**528,957**

Notes:

1. PM_{10} and $PM_{2.5}$ emissions are filterable + condensable.
2. Fugitive emissions include haul road emissions.
3. Global Warming Potential (40 CFR 98 Subpart A Table A-1).

CO_2	1
CH_4	28
N_2O	265

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 2. Turbine Emissions Calculations

Turbine Information:

Source ID:	S001-S004
Manufacturer:	Solar
Model No.:	Titan 130- 22402S
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf):	979
Rated Horsepower (site-specific bhp)[1]:	23,378
Maximum Fuel Consumption (scf/hr):	172,654
Heat Input (MMBtu/hr)	169.08
Control Device:	SoloNOx Technology

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	1,512.45
Potential Startup/Shutdown Events (per year):	12

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_X	9.800	lb/hr	Manufacturer
CO	9.900	lb/hr	Manufacturer
SO_2	3.54E-03	lb/MMBtu	AP-42, Table 3.1-2a
PM_{10}	0.016	lb/MMBtu	Manufacturer, PIL 171 Rev 5
$PM_{2.5}$	0.016	lb/MMBtu	Manufacturer, PIL 171 Rev 5
VOC	1.140	lb/hr	20% of UHC per Manufacturer
Formaldehyde	0.003	lb/MMBtu	Manufacturer, PIL 168
CO_2	122.58	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	4.560	lb/hr	80% of UHC per Manufacturer
N_2O	2.3E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1026 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Pollutant Emission Rates:

Pollutant	Potential Emissions (lb/hr)[2]	(tpy)[3]
NO_X	9.80	42.95
CO	9.90	45.67
SO_2	0.60	2.62
PM_{10}	2.64	11.57
$PM_{2.5}$	2.64	11.57
VOC	1.14	5.07
Formaldehyde	0.51	2.22
CO_2	20,725	90,791
CH_4	4.56	24.26
N_2O	0.04	0.17
GHG (CO_2e)	20,863	91,516

*Annual emissions shown above include startup/shutdown events.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 2. Turbine Emissions Calculations

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[3]	Potential Emissions (lb/hr)[2]	Potential Emissions (tpy)[3,5]
HAPs:			
Acetaldehyde	4.17E-05	7.04E-03	3.09E-02
Acrolein	6.67E-06	1.13E-03	4.94E-03
Benzene	1.25E-05	2.11E-03	9.26E-03
1,3-Butadiene	4.48E-07	7.57E-05	3.32E-04
Propylene Oxide	2.90E-05	4.90E-03	2.15E-02
Ethylbenzene	3.33E-05	5.64E-03	2.47E-02
Toluene	1.35E-04	2.29E-02	1.00E-01
Xylene	6.67E-05	1.13E-02	4.94E-02
Naphthalene	1.35E-06	2.29E-04	1.00E-03
PAH	2.29E-06	3.87E-04	1.70E-03
Total HAP (Including HCHO)		**0.56**	**2.47**

1. The existing turbine ratings are being updated based on revised site-specific conditions. No changes to the turbines or emission limits are being proposed with this application.
2. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)
3. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable
4. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV of 1020. Therefore, they were converted to LHV by multiplying by (HHV/LHV).
5. Emission calculations are based on maximum operating load of 100%, ambient temperature 0°F and site elevation. The turbine rating can vary with ambient conditions. Each Turbine is ISO rated at 23,470 HP.

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[a] (lbs/event)	Shutdown Emissions[a] (lbs/event)	Emission Factor Source
NO_X	1.9	2.4	Manufacturer
CO	176.9	207.6	Manufacturer
VOC	2.0	2.38	20% of UHC per Manufacturer
CO_2	1161	1272	Manufacturer

[a] Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer. Emissions were using PIL 170 Revision 5.

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	9	lbs/startup
CO_2 Purged (Per Startup)	5	lbs/startup
CH_4 Purged (Per Startup)	715	lbs/startup
Density of natural gas:	0.04	lb/ft^3

*Current design includes electric motor starts, but pneumatic starts have been included as a conservative measure.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 3. Turbine Emissions Calculations

Turbine Information:

Source ID:	S027
Manufacturer:	Solar
Model No.:	Titan 130 - 23502S
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf):	947
Rated Horsepower (site-specific bhp):	23,483
Maximum Fuel Consumption (scf/hr):	173,176
Heat Input (MMBtu/hr)	164.05
Control Device:	SoloNOx/Ox Cat
Oxidation Catalyst CO Control Efficiency	80%
Oxidation Catalyst VOC Control Efficiency	40%
Oxidation Catalyst HCHO Control Efficiency	80%

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	1,517.03
Potential Startup/Shutdown Events (per year):	12

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_X	5.910	lb/hr	Manufacturer
CO	1.200	lb/hr	Manufacturer with catalyst control
SO_2	3.66E-03	lb/MMBtu	AP-42, Table 3.1-2a
PM_{10}	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
$PM_{2.5}$	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
VOC	0.413	lb/hr	20% of UHC per Manufacturer with catalyst control
Formaldehyde	0.001	lb/MMBtu	Manufacturer, PIL 168 with catalyst control
CO_2	126.72	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	2.752	lb/hr	80% of UHC per Manufacturer
N_2O	2.4E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1026 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Pollutant Emission Rates:

Pollutant	Potential Emissions (lb/hr)[1]	(tpy)[2]
NO_X	5.91	25.90
CO	1.20	5.47
SO_2	0.60	2.63
PM_{10}	1.77	7.74
$PM_{2.5}$	1.77	7.74
VOC	0.41	1.91
Formaldehyde	0.10	0.45
CO_2	20,788	91,061
CH_4	2.75	16.34
N_2O	0.04	0.17
GHG (CO_2e)	20,875	91,564

*Annual emissions shown above include startup/shutdown events.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 3. Turbine Emissions Calculations

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[3]	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2,4]
HAPs:			
Acetaldehyde	4.31E-05	7.07E-03	3.09E-02
Acrolein	6.89E-06	1.13E-03	4.95E-03
Benzene	1.29E-05	2.12E-03	9.28E-03
1,3-Butadiene	4.63E-07	7.60E-05	3.33E-04
Propylene Oxide	2.90E-05	4.76E-03	2.08E-02
Ethylbenzene	3.45E-05	5.65E-03	2.48E-02
Toluene	1.40E-04	2.30E-02	1.01E-01
Xylene	6.89E-05	1.13E-02	4.95E-02
Naphthalene	1.40E-06	2.30E-04	1.01E-03
PAH	2.37E-06	3.89E-04	1.70E-03
Total HAP (Including HCHO)		**0.16**	**0.69**

1. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)

2. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable

3. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV of 1020. Therefore, they were converted to LHV by multiplying by (HHV/LHV).

4. Emission calculations are based on maximum operating load of 100%, ambient temperature 0°F and site elevation. The turbine rating can vary with ambient conditions. Each Turbine is ISO rated at 23,470 HP

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[a] (lbs/event)	Shutdown Emissions[a] (lbs/event)	Emission Factor Source
NO_X	1.0	1.0	Manufacturer
CO	16.0	19.0	Manufacturer
VOC	4.0	4	Manufacturer
CO_2	767	869	Manufacturer

[a] Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer. Emissions were using PIL 170 Revision 11.

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	9	lbs/startup
CO_2 Purged (Per Startup)	5	lbs/startup
CH_4 Purged (Per Startup)	715	lbs/startup
Density of natural gas:	0.04	lb/ft^3

*Current design includes electric motor starts, but pneumatic starts have been included as a conservative measure.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 4. Microturbine Emissions Calculations

Microturbine Unit Information:

Engine ID:	S005-S018, S029
Manufacturer:	Capstone
Model No.:	C200
Number of Units:	15

Microturbine Fuel Information:

	Per Unit
Fuel Type:	Natural Gas
Rated Electrical Power Output (kW):	200
Rated Electrical Power Output (MW):	0.2
Rated Horsepower (bhp):	268.2
Heat Input (MMBtu/hr)	2.28
Potential Fuel Consumption (MMBtu/yr):	19,973
Max. Annual Hours of Operation (hr/yr):	8,760

Microturbine Emissions Data:

Pollutant	**Emission Factors**	**Units**	**Maximum Potential Emissions Per Unit**		**Estimation Basis / Emission Factor Source**
			lbs/hr	**tpy**	
NO_X	0.40	lb/MWhe	0.08	0.35	Manufacturer's Specifications
VOC	0.10	lb/MWhe	0.02	0.09	Manufacturer's Specifications
CO	1.10	lb/MWhe	0.22	0.96	Manufacturer's Specifications
SO_X	0.0034	lb/MMBtu	0.01	0.03	AP-42, Table 3.1-2a (Apr-2000)
PM_{10}	0.0066	lb/MMBtu	0.02	0.07	AP-42, Table 3.1-2a (Apr-2000)
$PM_{2.5}$	0.0066	lb/MMBtu	0.02	0.07	AP-42, Table 3.1-2a (Apr-2000)
GHG (CO_2e)	See Table Below		266	1,166	Manufacturer's Specifications / 40 CFR 98, Table C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this engine type.

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	**Emission Factor**	**Units**	**Maximum Potential Emissions Per Unit**		**Estimation Basis / Emission Factor Source**
			lbs/hr	**tpy**	
GHGs:					
CO_2	1330	lb/MWhe	266	1,165	Manufacturer's Specifications
CH_4	0.001	kg/MMBtu	0.01	0.02	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**266**	**1,166**	
HAPs:					
1,3-Butadiene	4.3E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acetaldehyde	4.0E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acrolein	6.4E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Benzene	1.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Ethylbenzene	3.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Formaldehyde	7.1E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)
Naphthalene	1.3E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
PAH	2.2E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Propylene oxide	2.9E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Toluene	1.3E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Xylene	6.4E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Total HAP			**0.002**	**0.010**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 5. Fuel Gas Heater Emissions Calculations

Fuel Gas Heater Information:

Source ID:	S019-S020, S028
Number of Units:	3

Fuel Gas Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	1.54
Potential Fuel Consumption (MMBtu/yr):	13,477
Max. Fuel Consumption (MMscf/hr):	0.0015
Max. Fuel Consumption (MMscf/yr):	12.8
Max. Annual Hours of Operation (hr/yr):	8,760

Fuel Gas Heater Emission:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.15	0.64	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.01	0.04	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.12	0.54	AP-42, Table 1.4-1 (Jul-1998)
SO_X	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		180	789	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 5. Fuel Gas Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	180.00	788	40 CFR 98, Table C-1
CH_4	0.001	kg/MMBtu	0.00	0.01	40 CFR 98, Table C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			**180**	**789**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.01	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.003**	**0.01**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 6. Storage Tank Emissions Calculations - Produced Fluids Tank

Storage Tank Information:

Source ID:	S021
Tank Capacity (gallons):	10,080
Tank Contents:	Produced Fluids
Annual Throughput (gallons/year):	126,000
Daily Throughput (bbl/day)	8.22
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Controlled Emissions		Emissions Estimation Method
	lbs/hr	tpy	lbs/hr	tpy	
VOC	0.00	0.00	0.00	0.00	ProMax
HAPs	0.00	0.00	0.00	0.00	ProMax
GHG (CO2e)	3.36	14.72	3.36	14.72	ProMax

Notes:
1. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).

Promax Tanks Emissions Data:

Pollutant	Total Emissions (Working + Breathing + Flashing)			Total Emissions		
	lbs/hr	lbs/yr	tpy	lbs/hr	lbs/yr	tpy
VOC	0.00	9.06	0.00	0.00	9.06	0.00
HAPs	0.00	0.19	0.00	0.00	0.19	0.00
Carbon Dioxide	0.02	148.82	0.07	0.02	148.82	0.07
Methane	0.12	1,046.30	0.52	0.12	1,046.30	0.52
GHG (CO_2e)	3.36	29,445.30	14.72	3.36	29,445.30	14.72

Notes:
1. Emissions estimated using BR&E ProMax software.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 7. Storage Tank Emissions Calculations - Used Oil Tank

Storage Tank Information:

Source ID:	S022
Tank Capacity (gallons):	4,200
Tank Contents:	Used Oil
Annual Throughput (gallons/year):	12,600
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	1.22E-05	5.36E-05	ProMax
HAPs	1.22E-05	5.36E-05	ProMax
GHG (CO_2e)	N/A	N/A	N/A

ProMax Emissions Data - Used Oil Tank:

Pollutant	Working Losses	Breathing Losses	Flashing Losses	Total Emissions		
	tpy	tpy	tpy	lbs/hr	lbs/yr	tpy
VOC	3.67E-06	4.99E-05	N/A	0.00	0.11	5.36E-05
HAPs	3.67E-06	4.99E-05	N/A	0.00	0.11	5.36E-05

Notes:

1. Emissions estimated using ProMax software.
2. This tank does not contain hydrocarbons that would be expected to be flashed off at tank operating conditions.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 8. Office Building Heater Emissions Calculations

Office Building Heater Information:

Source ID:	S023
Number of Units:	1

Office Building Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	0.12
Potential Fuel Consumption (MMBtu/yr):	1,051
Max. Fuel Consumption (MMscf/hr):	0.0001
Max. Fuel Consumption (MMscf/yr):	1.0
Max. Annual Hours of Operation (hr/yr):	8,760

Office Building Heater Emission:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.0114	0.0500	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.0006	0.0027	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.0096	0.0420	AP-42, Table 1.4-1 (Jul-1998)
SO_X	0.6	lb/MMScf	0.0001	0.0003	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.0009	0.0038	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.0009	0.0038	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.0000	0.0000	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		14	62	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.00	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 8. Office Building Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	14.04	61	40 CFR 98, Table C-1
CH_4	0.001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			**14**	**62**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.000**	**0.00**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 9. Liquid Loading Emissions Calculations

Liquid Loading Information:

Parameter	Value	Description
S	1.45	saturation factor for splash loading (AP-42 Table 5.2-1)
Collection Efficiency	0.0%	
Control Efficiency	0%	
P	0.21	true vapor pressure of liquid loaded (psia) - assume octane
M	114.23	molecular weight of vapors (lb/lb-mol) - assume octane
T	516.4	temperature of liquids loaded (deg R) - TANKS Data

Description	Loading Losses	Maximum Throughput[2]	VOC Emissions	
	(lb/10^3 gal)[1]	(gal)	(lb/hr)	(tpy)
Liquids Hauling	0.8	126,000	0.01	0.05

Notes:

1. Uncontrolled Loading Losses: L_L (lb/10^3 gal) = 12.46 (SPM)/T
2. Hourly emissions assume continuous operation (i.e., 8760 hr/yr).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 10. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	2,781	0.0004	Table 2-4	1.23	5.91	0.06	0.00
Flanges	775	0.0009	Table 2-4	0.67	3.21	0.03	0.00
Open-Ended Lines	23	0.0044	Table 2-4	0.10	0.49	0.01	0.00
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00
Valves	981	0.0099	Table 2-4	9.73	46.89	0.50	0.00
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00
Total				**11.73**	**56.50**	**0.60**	**0.00**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station plus 25% for the addition of a new turbine.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential CH_4 Emissions	Potential CO_2 Emissions	Potential CO_2e Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)	(tpy)
Connectors	2,781	0.0004	Table 2-4	1.23	5.91	5.23	0.04	146.53
Flanges	775	0.0009	Table 2-4	0.67	3.21	2.84	0.02	79.63
Open-Ended Lines	23	0.0044	Table 2-4	0.10	0.49	0.43	0.00	12.12
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00	0.00
Valves	981	0.0099	Table 2-4	9.73	46.89	41.53	0.29	1162.99
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00	0.00
Total				**11.73**	**56.50**	**50.03**	**0.34**	**1401.27**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station plus 25% for the addition of a new turbine.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. CO2 and CH4 emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions	
	lbs/hr	tpy
VOC	0.14	0.60
HAPs	0.00	0.00
GHG (CO_2e)	320	1,401

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 11. Haul Road Emission Calculations

Unpaved Road Information:

Unpaved Roads: $E\ (lb/VMT) = k(s/12)^a(W/3)^b)*[(365-p)/365]$

	PM		PM_{10}	$PM_{2.5}$	
k Factor (lb/VMT)	4.9		1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	4.8	%			AP-42 Table 13.2.2-1 (11/06), for Sand and Gravel Processing
Number of Rain Days, p	150				AP-42 Figure 13.2.1-2
a	0.7		0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b	0.45		0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

Description	Weight of Empty Truck (tons)	Weight of Truck w/ Max Load (tons)	Mean Vehicle Weight (tons)	Length of Unpaved Road Traveled (mile/trip)	Trips Per Year	Mileage Per Year	Control (%)	Emissions (tpy) PM	PM_{10}	$PM_{2.5}$
Service Truck	4	4	4	0.75	365	274	0	0.24	0.06	0.01
Liquids Hauling - Vendor Fluid	12	20	16	0.75	4	3	0	0.00	0.00	0.00
Liquids Hauling - Produced Fluid	20	32	26	0.75	24	18	0	0.04	0.01	0.00
Employee Vehicles	2	2	2	0.75	365	274	0	0.17	0.04	0.00
Total Potential Emissions								**0.45**	**0.11**	**0.01**

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 12. Blowdown Emission Calculations

[1]Mole fractions of CH_4, VOC, HAP and CO_2 based on gas analysis:

CH_4: 93.83% CO_2: 0.24% VOC 0.39% HAP 0.00%

[2]Weight fractions of CH_4 , VOC, HAP and CO_2 based on gas analysis:

CH_4: 88.56% CO_2: 0.61% VOC 1.07% HAP 0.00%

[3] Carbon equivalent emissions (CO_2e) are based on the following Global Warming Potentials (GWP) from 40 CFR Part 98, Table A-1:

Carbon Dioxide (CO_2): 1
Methane (CH_4): 28

Emissions from Compressor Seal:

Number of Compressors[1,2]	Number of Seals Per Compressor	Leak Rate (scf/hr/compressor)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
4	--	1560	54,662,400	13.08	0.02	7.46	1,085.50	30,402
1	2	600	10,512,000	2.51	0.00	1.44	208.75	5,846
Total				**15.59**	**0.02**	**8.90**	**1,294.25**	**36,248**

1. Leak rate for existing units and seal information from Solar Turbines PIL 251. Conservatively used C45 compressor at 1500 psig suction pressure (highest leak rate). Emission factor is total for compressor
2. Leak rate for the new unit was estimated by using the max dry seal compressor leak rate from NSPS OOOOb. Emission factor is per seal.
3. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton
4. GHG emissions calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
Sample calculation: Volume vented (scf/yr) x density of GHG (kg/scf) x mol % VOC x 2.2 lb/kg / 2000 lb/ton

VOC and HAP Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Station ESD Vent	1,600,000	4	6,400,000	1.53	0.00
Compressor Unit Blowdowns	170,000	80	13,600,000	3.25	0.00
Main Gas Filter Changes	91,000	48	4,368,000	1.04	0.00
Total				**5.83**	**0.01**

1. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton

GHG Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Station ESD Vent	1,600,000	4	6,400,000	127.09	0.87	3,559
Compressor Unit Blowdowns	170,000	80	13,600,000	270.07	1.86	7,564
Main Gas Filter Changes	91,000	48	4,368,000	86.74	0.60	2,429
Total				**483.9**	**3.33**	**13,553**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 12. Blowdown Emission Calculations

Pigging Emissions:

Segment Name	Pigging Events (#/yr)	Diameter (in)	Length of pipeline (ft)	Volume of Gas Occupied in Pipeline* (acf)	Pipeline Operating Pressure (psig)	Event Duration[1] (hr/event)	Total Gas Volume per Event (scf/event)	Gas Volume to Atmosphere per Year (scf/yr)
Pig Receiver 42"	4	42	20.5	197	1,480	0.017	20,014	80,057
Pig Receiver 48"	4	48	22	276	1,480	0.017	28,054	112,215
Pig Launcher 42"	4	42	9.5	91	1,480	0.017	9,275	37,100
Pig Launcher 48"	4	48	21.6	271	1,480	0.017	27,544	110,175
Total							**84,887**	**339,547**

[1] Assumes pigging event duration of approximately 1 minute.

VOC and HAP Vented Pigging Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Pig Receiver 42"	20,014	4	80,057	0.02	0.00
Pig Receiver 48"	28,054	4	112,215	0.03	0.00
Pig Launcher 42"	9,275	4	37,100	0.01	0.00
Pig Launcher 48"	27,544	4	110,175	0.03	0.00
Total				**0.08**	**0.00**

GHG Vented Pigging Emissions

Segment Name	Vented Gas Volume Per Pigging Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Pig Receiver 42"	20,014	4	80,057	1.59	0.01	45
Pig Receiver 48"	28,054	4	112,215	2.23	0.02	62
Pig Launcher 42"	9,275	4	37,100	0.74	0.01	21
Pig Launcher 48"	27,544	4	110,175	2.19	0.02	61
Total				**6.7**	**0.05**	**189**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Blowdowns Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	4.91	21.50	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
HAPs	0.01	0.03	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
GHG (CO_2e)	11,413	49,990	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis

Hourly emissions are annualized (i.e., assume 8,760 hours per year).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Bradshaw Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 13. Site-Specific Gas Analysis

Sample Location: MVP Pipeline
HHV (Btu/scf): 1,052.08

Constituent	Natural Gas Stream Speciation (Vol. %)	Natural Gas Stream Speciation (Wt. %)	Molar Weight
Nitrogen	0.356	0.587	0.100
Oxygen	0.003	0.005	0.001
Methane	93.831	88.558	15.050
Carbon Dioxide	0.235	0.610	0.104
Ethane	5.184	9.172	1.559
Propane	0.335	0.869	0.148
Isobutane	0.020	0.067	0.011
n-Butane	0.029	0.100	0.017
Isopentane	0.004	0.016	0.003
n-Pentane	0.002	0.009	0.002
Cyclopentane	0.000	0.001	0.000
Isohexane	0.000	0.002	0.000
n-Hexane	0.000	0.001	0.000
Benzene	0.000	0.000	0.000
Cyclohexane	0.000	0.000	0.000
Isoheptanes	0.000	0.000	0.000
Heptanes	0.000	0.000	0.000
Toluene	0.000	0.000	0.000
Methylcyclohexane	0.000	0.001	0.000
2,2,4 Trimethylpentane	0.000	0.000	0.000
Octanes	0.000	0.000	0.000
Ethylbenzene	0.000	0.000	0.000
Xylenes	0.000	0.000	0.000
Isononanes	0.000	0.000	0.000
n-Nonane	0.000	0.000	0.000
Isodecanes	0.000	0.000	0.000
n-Decane	0.000	0.000	0.000
Isoundecanes+	0.000	0.000	0.000
Totals	100.000	100.000	16.995

TOC (Total)	99.41	98.80
VOC (Total)	0.39	1.07
HAP (Total)	0.00	0.00

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 1. Potential Atmospheric Emissions from Project Sources

Source	Pollutants																	
	VOC		NO_X		CO		PM_{10}		$PM_{2.5}$		SO_2		HCHO		Total HAPs		GHG (CO_2e)	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Turbine 3 (S021)	1.49	6.70	12.81	56.13	13.00	57.38	3.82	16.74	3.82	16.74	1.30	5.69	1.10	4.82	1.22	5.35	45,164	197,951
Microturbine 10 (S023)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 11 (S024)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 12 (S025)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 13 (S026)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Fuel Gas Heater (S022)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Fugitive Leaks (S018)	0.03	0.15	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	80	348
Blowdowns (S020)	0.72	3.17	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	1,680	7,359
Total	**2.34**	**10.40**	**13.28**	**58.17**	**14.00**	**61.77**	**3.89**	**17.05**	**3.89**	**17.05**	**1.33**	**5.83**	**1.11**	**4.85**	**1.23**	**5.41**	**48,169**	**211,113**

Notes:

1. Project total is the sum of new equipment and the difference between the exisiting and proposed emissions from modified equipment..
2. Global Warming Potential (40 CFR 98 Subpart A Table A-1).

CO_2	1
CH_4	28
N_2O	265

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 2. Turbine Emissions Calculations

Turbine Information:

Source ID:	S021
Manufacturer:	Solar
Model No.:	Titan 350 - 52500S
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf):	947
Rated Horsepower (bhp at site conditions):	56590
Maximum Fuel Consumption at 100% Load (scf/hr):	374,665
Heat Input (MMBtu/hr)	354.92
Control Device:	SoloNOx Technology

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	3,282.06
Potential Startup/Shutdown Events (per year):	12

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_X	12.810	lb/hr	Manufacturer
CO	13.000	lb/hr	Manufacturer
SO_2	3.66E-03	lb/MMBtu	AP-42, Table 3.1-2a
PM_{10}	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
$PM_{2.5}$	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
VOC	1.490	lb/hr	20% of UHC per Manufacturer
Formaldehyde	0.003	lb/MMBtu	Manufacturer, PIL 168
CO_2	126.72	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	5.960	lb/hr	80% of UHC per Manufacturer
N_2O	2.4E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1026 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Pollutant Emission Rates:

Pollutant	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2]
NO_X	12.81	56.13
CO	13.00	57.38
SO_2	1.30	5.69
PM_{10}	3.82	16.74
$PM_{2.5}$	3.82	16.74
VOC	1.49	6.70
Formaldehyde	1.10	4.82
CO_2	44,974	197,001
CH_4	5.96	30.39
N_2O	0.08	0.37
GHG (CO2e)	45,164	197,951

*Annual emissions shown above include startup/shutdown events.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 2. Turbine Emissions Calculations

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[3]	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2,4]
HAPs:			
Acetaldehyde	4.31E-05	1.53E-02	6.70E-02
Acrolein	6.89E-06	2.45E-03	1.07E-02
Benzene	1.29E-05	4.59E-03	2.01E-02
1,3-Butadiene	4.63E-07	1.64E-04	7.20E-04
Propylene Oxide	2.90E-05	1.03E-02	4.51E-02
Ethylbenzene	3.45E-05	1.22E-02	5.36E-02
Toluene	1.40E-04	4.97E-02	2.18E-01
Xylene	6.89E-05	2.45E-02	1.07E-01
Naphthalene	1.40E-06	4.97E-04	2.18E-03
PAH	2.37E-06	8.41E-04	3.68E-03
Total HAP (Including HCHO)		**1.22**	**5.35**

1. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)

2. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable

3. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV of 1020. Therefore, they were converted to LHV by multiplying by (HHV/LHV).

4. Emission calculations are based on maximum operating load of 100% load, ambient temperature 0°F and site elevation. The turbine ratings can vary with ambient conditions. Each Turbine is ISO rated at 52,500 HP

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[a] (lbs/event)	Shutdown Emissions[a] (lbs/event)	Emission Factor Source
NO_X	2.0	2	Manufacturer
CO	37.0	36	Manufacturer
VOC	10.0	10	20% of UHC per Manufacturer
CO_2	1172	1036	Manufacturer

a. Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer. Emissions are using the highest value from PIL 170 Revision 11. Conservatively used highest values of all start up / shut down emissions, since T350 units are not incorporated into the PIL

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	9	lbs/startup
CO_2 Purged (Per Startup)	5	lbs/startup
CH_4 Purged (Per Startup)	715	lbs/startup
Density of natural gas:	0.04	lb/ft^3

*Current design includes electric motor starts, but pneumatic starts have been included as a conservative measure.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 3. Microturbine Emissions Calculations

Microturbine Unit Information:

Engine ID:	S023-S026
Manufacturer:	Capstone
Model No.:	C200
Number of Units:	4

Microturbine Fuel Information:

	Per Unit
Fuel Type:	Natural Gas
Rated Electrical Power Output (kW):	200
Rated Electrical Power Output (MW):	0.2
Rated Horsepower (bhp):	268.2
Heat Input (MMBtu/hr)	2.28
Potential Fuel Consumption (MMBtu/yr):	19,973
Max. Annual Hours of Operation (hr/yr):	8,760

Microturbine Emissions Data:

Pollutant	Emission Factors	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	0.40	lb/MWhe	0.08	0.35	Manufacturer's Specifications
VOC	0.10	lb/MWhe	0.02	0.09	Manufacturer's Specifications
CO	1.10	lb/MWhe	0.22	0.96	Manufacturer's Specifications
SO_X	0.0034	lb/MMBtu	0.01	0.03	AP-42, Table 3.1-2a (Apr-2000)
PM_{10}	0.0066	lb/MMBtu	0.02	0.07	AP-42, Table 3.1-2a (Apr-2000)
$PM_{2.5}$	0.0066	lb/MMBtu	0.02	0.07	AP-42, Table 3.1-2a (Apr-2000)
GHG (CO_2e)	See Table Below		266	1,166	Manufacturer's Specifications / 40 CFR 98, Table C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this engine type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 3. Microturbine Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	1330	lb/MWhe	266	1,165	Manufacturer's Specifications
CH_4	0.001	kg/MMBtu	0.01	0.02	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**266**	**1,166**	
HAPs:					
1,3-Butadiene	4.3E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acetaldehyde	4.0E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acrolein	6.4E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Benzene	1.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Ethylbenzene	3.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Formaldehyde	7.1E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)
Naphthalene	1.3E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
PAH	2.2E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Propylene oxide	2.9E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Toluene	1.3E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Xylene	6.4E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Total HAP			**0.002**	**0.010**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 4. Fuel Gas Heater Emissions Calculations

Fuel Gas Heater Information:

Source ID:	S022
Number of Units:	1

Fuel Gas Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	1.54
Potential Fuel Consumption (MMBtu/yr):	13,477
Max. Fuel Consumption (MMscf/hr):	0.0015
Max. Fuel Consumption (MMscf/yr):	12.8
Max. Annual Hours of Operation (hr/yr):	8,760

Fuel Gas Heater Information:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.15	0.64	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.01	0.04	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.12	0.54	AP-42, Table 1.4-1 (Jul-1998)
SO_X	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		180	789	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 4. Fuel Gas Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	180.00	788	40 CFR 98, Table C-1
CH_4	0.001	kg/MMBtu	0.00	0.01	40 CFR 98, Table C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			**180**	**789**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.01	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.003**	**0.01**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 5. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	700	0.0004	Table 2-4	0.31	1.49	0.02	0.00
Flanges	193	0.0009	Table 2-4	0.17	0.80	0.01	0.00
Open-Ended Lines	7	0.0044	Table 2-4	0.03	0.15	0.00	0.00
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00
Valves	243	0.0099	Table 2-4	2.41	11.62	0.12	0.00
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00
Total				**2.92**	**14.05**	**0.15**	**0.00**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station assuming 50% of existing count for the addition of a new turbine
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential CH_4 Emissions	Potential CO_2 Emissions	Potential CO_2e Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)	(tpy)
Connectors	700	0.0004	Table 2-4	0.31	1.49	1.32	0.01	36.88
Flanges	193	0.0009	Table 2-4	0.17	0.80	0.71	0.00	19.83
Open-Ended Lines	7	0.0044	Table 2-4	0.03	0.15	0.13	0.00	3.69
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00	0.00
Valves	243	0.0099	Table 2-4	2.41	11.62	10.29	0.07	288.08
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00	0.00
Total				**2.92**	**14.05**	**12.44**	**0.09**	**348.48**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station assuming 50% of existing count for the addition of a new turbine
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. CO2 and CH4 emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions	
	lbs/hr	tpy
VOC	0.03	0.15
HAPs	0.00	0.00
GHG (CO_2e)	80	348

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 6. Blowdown Emission Calculations

[1]Mole fractions of CH_4,VOC, HAP and CO_2 based on gas analysis:

CH_4: 93.83% CO_2: 0.24% VOC 0.39% HAP 0.00%

[2]Weight fractions of CH_4 , VOC, HAP and CO_2 based on gas analysis:

CH_4: 88.56% CO_2: 0.61% VOC 1.07% HAP 0.00%

[3] Carbon equivalent emissions (CO_2e) are based on the following Global Warming Potentials (GWP) from 40 CFR Part 98, Table A-1:

Carbon Dioxide (CO_2): 1

Methane (CH_4): 28

Emissions from Compressor Seal:

Number of Compressors[1]	Number of Seals Per Compressor	Leak Rate (scf/hr/compressor)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
1	2	600	10,512,000	2.51	0.00	1.44	208.75	5,846
Total				**2.51**	**0.00**	**1.44**	**208.75**	**5,846**

1. Leak rate for the new unit was estimated by using the max dry seal compressor leak rate from NSPS OOOOb.

2. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)

Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton

3. GHG emissions calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Sample calculation: Volume vented (scf/yr) x density of GHG (kg/scf) x mol % VOC x 2.2 lb/kg / 2000 lb/ton

VOC and HAP Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Station ESD Vent	1,100,000	0	0	0.00	0.00
Unit Shutdown	170,000	16	2,720,000	0.65	0.00
Main Gas Filter Changes	91,000	0	0	0.00	0.00
Total				**0.65**	**0.00**

1. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)

Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton

GHG Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Station ESD Vent	1,100,000	0	0	0.00	0.00	0.00
Unit Shutdown	170,000	16	2,720,000	54.01	0.37	1512.78
Main Gas Filter Changes	91,000	0	0	0.00	0.00	0.00
Total				**54.0**	**0.37**	**1513**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 6. Blowdown Emission Calculations

Pigging Emissions:

Segment Name	Pigging Events (#/yr)	Diameter (in)	Length of pipeline (ft)	Volume of Gas Occupied in Pipeline (acf)	Pipeline Operating Pressure (psig)	Event Duration[1] (hr/event)	Total Gas Volume per Event (scf/event)	Gas Volume to Atmosphere per Year (scf/yr)
Pig Receiver 42"	0	42	20.5	197	1,480	0.017	20,014	0
Pig Receiver 48"	0	48	22	276	1,480	0.017	28,054	0
Pig Launcher 42"	0	42	9.5	91	1,480	0.017	9,275	0
Pig Launcher 48"	0	48	21.6	271	1,480	0.017	27,544	0
Total							**84,887**	**0**

[1] Assumes pigging event duration of approximately 1 minute.

VOC and HAP Vented Pigging Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Pig Receiver 42"	20,014	0	0	0.00	0.00
Pig Receiver 48"	28,054	0	0	0.00	0.00
Pig Launcher 42"	9,275	0	0	0.00	0.00
Pig Launcher 48"	27,544	0	0	0.00	0.00
Total				**0.00**	**0.00**

GHG Vented Pigging Emissions

Segment Name	Vented Gas Volume Per Pigging Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Pig Receiver 42"	20,014	0	0	0.00	0.00	0
Pig Receiver 48"	28,054	0	0	0.00	0.00	0
Pig Launcher 42"	9,275	0	0	0.00	0.00	0
Pig Launcher 48"	27,544	0	0	0.00	0.00	0
Total				**0.0**	**0.00**	**0**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Total Blowdown/Venting Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	0.72	3.17	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
HAPs	0.00	0.00	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
GHG (CO_2e)	1,680	7,359	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis

Hourly emissions are annualized (i.e., assume 8,760 hours per year).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 1. Potential Atmospheric Emissions from Each Source at the Facility

Source	Pollutants																	
	VOC		NO_X		CO		PM_{10}		$PM_{2.5}$		SO_2		HCHO		Total HAPs		GHG (CO_2e)	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Turbine 1 (S001)	1.03	4.61	8.90	39.01	9.03	41.86	2.32	10.17	2.32	10.17	0.53	2.30	0.45	1.95	0.49	2.17	18,339	80,458
Turbine 2 (S002)	1.03	4.61	8.90	39.01	9.03	41.86	2.32	10.17	2.32	10.17	0.53	2.30	0.45	1.95	0.49	2.17	18,339	80,458
Turbine 3 (S021)	1.49	6.70	12.81	56.13	13.00	57.38	3.82	16.74	3.82	16.74	1.30	5.69	1.10	4.82	1.22	5.35	45,164	197,951
Microturbine 1 (S003)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 2 (S004)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 3 (S005)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 4 (S006)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 5 (S007)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 6 (S008)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 7 (S009)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 8 (S010)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 9 (S011)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 10 (S023)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 11 (S024)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 12 (S025)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 13 (S026)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Fuel Gas Heater (S012)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Fuel Gas Heater (S013)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Fuel Gas Heater (S022)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Office Building Heater (S014)	0.00	0.00	0.01	0.05	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	62
WB Pipeline Heater (S015)	0.05	0.21	0.86	3.75	0.72	3.15	0.07	0.28	0.07	0.28	0.01	0.02	0.00	0.00	0.02	0.07	1,054	4,617
Produced Fluids Tank (S016)	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	3	14
Used Oil Tank (S017)	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	--	--
Fugitive Leaks (S018)	0.10	0.45	--	--	--	--	0.01	0.04	0.00	0.00	--	--	--	--	0.00	0.00	238	1,044
Liquid Loading (S019)	0.01	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blowdowns (S020)	2.95	12.92	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.02	6,859	30,044
Total	**6.96**	**30.79**	**32.96**	**144.42**	**35.02**	**158.42**	**8.77**	**38.41**	**8.76**	**38.37**	**2.46**	**10.78**	**2.01**	**8.82**	**2.27**	**9.94**	**94,012**	**412,175**

Notes:

1. PM_{10} and $PM_{2.5}$ emissions are filterable + condensable.
2. Fugitive emissions include haul road emissions.
3. Global Warming Potential (40 CFR 98 Subpart A Table A-1).

CO_2	1
CH_4	28
N_2O	265

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 2. Turbine Emissions Calculations

Turbine Information:

Source ID:	S001-S002
Manufacturer:	Solar
Model No.:	Titan 130 - 20502S
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf):	979
Rated Horsepower (bhp at site conditions)[1]:	20,609
Maximum Fuel Consumption at 100% Load (scf/hr):	151,731
Heat Input (MMBtu/hr)	148.59
Control Device:	SoloNOx Technology

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	1,329.16
Potential Startup/Shutdown Events (per year):	12

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_X	8.900	lb/hr	Manufacturer
CO	9.030	lb/hr	Manufacturer
SO_2	3.54E-03	lb/MMBtu	AP-42, Table 3.1-2a
PM_{10}	0.016	lb/MMBtu	Manufacturer, PIL 171 Rev 5
$PM_{2.5}$	0.016	lb/MMBtu	Manufacturer, PIL 171 Rev 5
VOC	1.034	lb/hr	20% of UHC per Manufacturer
Formaldehyde	0.003	lb/MMBtu	Manufacturer, PIL 168
CO_2	122.58	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	4.136	lb/hr	80% of UHC per Manufacturer
N_2O	2.3E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1026 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Pollutant Emission Rates:

Pollutant	Potential Emissions (lb/hr)[2]	(tpy)[3]
NO_X	8.90	39.01
CO	9.03	41.86
SO_2	0.53	2.30
PM_{10}	2.32	10.17
$PM_{2.5}$	2.32	10.17
VOC	1.03	4.61
Formaldehyde	0.45	1.95
CO_2	18,214	79,790
CH_4	4.14	22.40
N_2O	0.03	0.15
GHG (CO2e)	18,339	80,458

*Annual emissions shown above include startup/shutdown events.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 2. Turbine Emissions Calculations

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[4]	Potential Emissions (lb/hr)[2]	Potential Emissions (tpy)[3,5]
HAPs:			
Acetaldehyde	4.17E-05	6.19E-03	2.71E-02
Acrolein	6.67E-06	9.90E-04	4.34E-03
Benzene	1.25E-05	1.86E-03	8.13E-03
1,3-Butadiene	4.48E-07	6.65E-05	2.91E-04
Propylene Oxide	2.90E-05	4.31E-03	1.89E-02
Ethylbenzene	3.33E-05	4.95E-03	2.17E-02
Toluene	1.35E-04	2.01E-02	8.81E-02
Xylene	6.67E-05	9.90E-03	4.34E-02
Naphthalene	1.35E-06	2.01E-04	8.81E-04
PAH	2.29E-06	3.40E-04	1.49E-03
Total HAP (Including HCHO)		**0.49**	**2.17**

1. The existing turbine ratings are being updated based on revised site-specific conditions. No changes to the turbines or emission limits are being proposed with this application.
2. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)
3. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable
4. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV of 1020. Therefore, they were converted to LHV by multiplying by (HHV/LHV).
5. Emission calculations are based on maximum operating load of 100% load, ambient temperature 0°F and site elevation. The turbine ratings can vary with ambient conditions. Each Turbine is ISO rated at 20,500 HP

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[a] (lbs/event)	Shutdown Emissions[a] (lbs/event)	Emission Factor Source
NO_X	1.9	2.4	Manufacturer
CO	176.9	207.6	Manufacturer
VOC	2.0	2.38	20% of UHC per Manufacturer
CO_2	1161	1272	Manufacturer

a. Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer. Emissions are using the highest value from PIL 170 Revision 5.

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	9	lbs/startup
CO_2 Purged (Per Startup)	5	lbs/startup
CH_4 Purged (Per Startup)	715	lbs/startup
Density of natural gas:	0.04	lb/ft^3

*Current design includes electric motor starts, but pneumatic starts have been included as a conservative measure.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 3. Turbine Emissions Calculations

Turbine Information:

Source ID:	S021
Manufacturer:	Solar
Model No.:	Titan 350 - 52500S
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf):	947
Rated Horsepower (bhp at site conditions):	56590
Maximum Fuel Consumption at 100% Load (scf/hr):	374,665
Heat Input (MMBtu/hr)	354.92
Control Device:	SoloNOx Technology

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	3,282.06
Potential Startup/Shutdown Events (per year):	12

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_X	12.810	lb/hr	Manufacturer
CO	13.000	lb/hr	Manufacturer
SO_2	3.66E-03	lb/MMBtu	AP-42, Table 3.1-2a
PM_{10}	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
$PM_{2.5}$	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
VOC	1.490	lb/hr	20% of UHC per Manufacturer
Formaldehyde	0.003	lb/MMBtu	Manufacturer, PIL 168
CO_2	126.72	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	5.960	lb/hr	80% of UHC per Manufacturer
N_2O	2.4E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1026 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Pollutant Emission Rates:

Pollutant	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2]
NO_X	12.81	56.13
CO	13.00	57.38
SO_2	1.30	5.69
PM_{10}	3.82	16.74
$PM_{2.5}$	3.82	16.74
VOC	1.49	6.70
Formaldehyde	1.10	4.82
CO_2	44,974	197,001
CH_4	5.96	30.39
N_2O	0.08	0.37
GHG (CO2e)	45,164	197,951

*Annual emissions shown above include startup/shutdown events.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 3. Turbine Emissions Calculations

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[3]	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2,4]
HAPs:			
Acetaldehyde	4.31E-05	1.53E-02	6.70E-02
Acrolein	6.89E-06	2.45E-03	1.07E-02
Benzene	1.29E-05	4.59E-03	2.01E-02
1,3-Butadiene	4.63E-07	1.64E-04	7.20E-04
Propylene Oxide	2.90E-05	1.03E-02	4.51E-02
Ethylbenzene	3.45E-05	1.22E-02	5.36E-02
Toluene	1.40E-04	4.97E-02	2.18E-01
Xylene	6.89E-05	2.45E-02	1.07E-01
Naphthalene	1.40E-06	4.97E-04	2.18E-03
PAH	2.37E-06	8.41E-04	3.68E-03
Total HAP (Including HCHO)		**1.22**	**5.35**

1. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)

2. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable

3. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV of 1020. Therefore, they were converted to LHV by multiplying by (HHV/LHV).

4. Emission calculations are based on maximum operating load of 100% load, ambient temperature 0°F and site elevation. The turbine ratings can vary with ambient conditions. Each Turbine is ISO rated at 52,500 HP

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[a] (lbs/event)	Shutdown Emissions[a] (lbs/event)	Emission Factor Source
NO_X	2.0	2	Manufacturer
CO	37.0	36	Manufacturer
VOC	10.0	10	20% of UHC per Manufacturer
CO_2	1172	1036	Manufacturer

a. Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer. Emissions are using the highest value from PIL 170 Revision 11. Conservatively used highest values of all start up / shut down emissions, since T350 units are not incorporated into the PIL

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	9	lbs/startup
CO_2 Purged (Per Startup)	5	lbs/startup
CH_4 Purged (Per Startup)	715	lbs/startup
Density of natural gas:	0.04	lb/ft^3

*Current design includes electric motor starts, but pneumatic starts have been included as a conservative measure.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 4. Microturbine Emissions Calculations

Microturbine Unit Information:

Engine ID:	S003-S011, S023-S026
Manufacturer:	Capstone
Model No.:	C200
Number of Units:	13

Microturbine Fuel Information:

	Per Unit
Fuel Type:	Natural Gas
Rated Electrical Power Output (kW):	200
Rated Electrical Power Output (MW):	0.2
Rated Horsepower (bhp):	268.2
Heat Input (MMBtu/hr)	2.28
Potential Fuel Consumption (MMBtu/yr):	19,973
Max. Annual Hours of Operation (hr/yr):	8,760

Microturbine Emissions Data:

Pollutant	**Emission Factors**	**Units**	**Maximum Potential Emissions Per Unit**		**Estimation Basis / Emission Factor Source**
			lbs/hr	**tpy**	
NO_X	0.40	lb/MWhe	0.08	0.35	Manufacturer's Specifications
VOC	0.10	lb/MWhe	0.02	0.09	Manufacturer's Specifications
CO	1.10	lb/MWhe	0.22	0.96	Manufacturer's Specifications
SO_X	0.0034	lb/MMBtu	0.01	0.03	AP-42, Table 3.1-2a (Apr-2000)
PM_{10}	0.0066	lb/MMBtu	0.02	0.07	AP-42, Table 3.1-2a (Apr-2000)
$PM_{2.5}$	0.0066	lb/MMBtu	0.02	0.07	AP-42, Table 3.1-2a (Apr-2000)
GHG (CO_2e)	See Table Below		266	1,166	Manufacturer's Specifications / 40 CFR 98, Table C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this engine type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 4. Microturbine Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	1330	lb/MWhe	266	1,165	Manufacturer's Specifications
CH_4	0.001	kg/MMBtu	0.01	0.02	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**266**	**1,166**	
HAPs:					
1,3-Butadiene	4.3E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acetaldehyde	4.0E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acrolein	6.4E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Benzene	1.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Ethylbenzene	3.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Formaldehyde	7.1E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)
Naphthalene	1.3E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
PAH	2.2E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Propylene oxide	2.9E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Toluene	1.3E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Xylene	6.4E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Total HAP			**0.002**	**0.010**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 5. Fuel Gas Heater Emissions Calculations

Fuel Gas Heater Information:

Source ID:	S012-S013, S022
Number of Units:	3

Fuel Gas Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	1.54
Potential Fuel Consumption (MMBtu/yr):	13,477
Max. Fuel Consumption (MMscf/hr):	0.0015
Max. Fuel Consumption (MMscf/yr):	12.8
Max. Annual Hours of Operation (hr/yr):	8,760

Fuel Gas Heater Emissions:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.15	0.64	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.01	0.04	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.12	0.54	AP-42, Table 1.4-1 (Jul-1998)
SO_X	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		180	789	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 5. Fuel Gas Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	180.00	788	40 CFR 98, Table C-1
CH_4	0.001	kg/MMBtu	0.00	0.01	40 CFR 98, Table C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			**180**	**789**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.01	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.003**	**0.01**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 6. Office Building Heater Emissions Calculations

Office Building Heater Information:

Source ID:	S014
Number of Units:	1

Office Building Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	0.12
Potential Fuel Consumption (MMBtu/yr):	1,051
Max. Fuel Consumption (MMscf/hr):	0.0001
Max. Fuel Consumption (MMscf/yr):	1.0
Max. Annual Hours of Operation (hr/yr):	8,760

Office Building Heater Emissions:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.01	0.05	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.01	0.04	AP-42, Table 1.4-1 (Jul-1998)
SO_X	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		14	62	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.00	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 6. Office Building Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	14.04	61	40 CFR 98, Table C-1
CH_4	0.001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			**14**	**62**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.000**	**0.00**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 7. WB Interconnect Line Heater (off station)

WB Line Heater Information:

Source ID:	S015
Number of Units:	1

WB Line Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	9.00
Potential Fuel Consumption (MMBtu/yr):	78,840
Max. Fuel Consumption (MMscf/hr):	0.0086
Max. Fuel Consumption (MMscf/yr):	74.9
Max. Annual Hours of Operation (hr/yr):	8,760

WB Line Heater Emissions:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.86	3.75	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.05	0.21	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.72	3.15	AP-42, Table 1.4-1 (Jul-1998)
SO_X	0.6	lb/MMScf	0.01	0.02	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.07	0.28	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.07	0.28	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		1,054	4,617	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.02	0.07	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 7. WB Interconnect Line Heater (off station)

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	1052.98	4,612	40 CFR 98, Table C-1
CH_4	0.001	kg/MMBtu	0.02	0.09	40 CFR 98, Table C-2
N_2O	0.0001	kg/MMBtu	0.00	0.01	40 CFR 98, Table C-2
GHG (CO_2e)			**1,054**	**4,617**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.02	0.07	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.016**	**0.07**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 8. Storage Tank Emissions Calculations - Produced Fluids Tank

Storage Tank Information:

Source ID:	S016
Tank Capacity (gallons):	10,080
Tank Contents:	Produced Water
Annual Throughput (gallons/year):	126,000
Daily Throughput (bbl/day)	8.22
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Controlled Emissions		Emissions Estimation Method
	lbs/hr	tpy	lbs/hr	tpy	
VOC	0.00	0.00	0.00	0.00	ProMax
HAPs	0.00	0.00	0.00	0.00	ProMax
GHG (CO2e)	3.13	13.72	3.13	13.72	ProMax

Notes:

1. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).

Promax Tanks Emissions Data:

Pollutant	Total Emissions (Working + Breathing + Flashing)			Total Emissions		
	lbs/hr	lbs/yr	tpy	lbs/hr	lbs/yr	tpy
VOC	0.00	8.11	0.00	0.00	8.11	0.00
HAPs	0.00	0.18	0.00	0.00	0.18	0.00
Carbon Dioxide	0.02	132.41	0.07	0.02	132.41	0.07
Methane	0.11	974.99	0.49	0.11	974.99	0.49
GHG (CO_2e)	3.13	27,432.10	13.72	3.13	27,432.10	13.72

Notes:

1. Emissions estimated using BR&E ProMax software.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 9. Storage Tank Emissions Calculations - Used Oil Tank

Storage Tank Information:

Source ID:	S017
Tank Capacity (gallons):	4,200
Tank Contents:	Used Oil
Annual Throughput (gallons/year):	3,150
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	1.16E-05	5.09E-05	ProMax
HAPs	1.16E-05	5.09E-05	ProMax
GHG (CO_2e)	N/A	N/A	N/A

ProMax Emissions Data - Used Oil Tank:

Pollutant	Working Losses	Breathing Losses	Flashing Losses	Total Emissions		
	tpy	tpy	tpy	lbs/hr	lbs/yr	tpy
VOC	9.18E-07	4.99E-05	N/A	0.00	0.10	5.09E-05
HAPs	9.18E-07	4.99E-05	N/A	0.00	0.10	5.09E-05

Notes:

1. Emissions estimated using ProMax software.
2. This tank does not contain hydrocarbons that would be expected to be flashed off at tank operating conditions.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 10. Liquid Loading Emissions Calculations

Liquid Loading Information:

Parameter	Value	Description
S	1.45	saturation factor for splash loading (AP-42 Table 5.2-1)
Collection Efficiency	0.0%	
Control Efficiency	0%	
P	0.21	true vapor pressure of liquid loaded (psia) - assume octane
M	114.23	molecular weight of vapors (lb/lb-mol) - assume octane
T	516.4	temperature of liquids loaded (deg R) - TANKS Data

Description	Loading Losses	Maximum Throughput[2]	VOC Emissions	
	(lb/10^3 gal)[1]	(gal)	(lb/hr)	(tpy)
Liquids Hauling	0.8	126,000	0.01	0.05

Notes:

1. Uncontrolled Loading Losses: L_L (lb/10^3 gal) = 12.46 (SPM)/T
2. Hourly emissions assume continuous operation (i.e., 8760 hr/yr).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 11. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	2,100	0.0004	Table 2-4	0.93	4.46	0.05	0.00
Flanges	578	0.0009	Table 2-4	0.50	2.39	0.03	0.00
Open-Ended Lines	21	0.0044	Table 2-4	0.09	0.45	0.00	0.00
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00
Valves	728	0.0099	Table 2-4	7.22	34.80	0.37	0.00
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00
Total				**8.74**	**42.10**	**0.45**	**0.00**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station plus 50% for the addition of a new turbine
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential CH_4 Emissions	Potential CO_2 Emissions	Potential CO_2e Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)	(tpy)
Connectors	2,100	0.0004	Table 2-4	0.93	4.46	3.95	0.03	110.65
Flanges	578	0.0009	Table 2-4	0.50	2.39	2.12	0.01	59.39
Open-Ended Lines	21	0.0044	Table 2-4	0.09	0.45	0.40	0.00	11.06
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00	0.00
Valves	728	0.0099	Table 2-4	7.22	34.80	30.82	0.21	863.06
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00	0.00
Total				**8.74**	**42.10**	**37.28**	**0.26**	**1044.16**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station plus 50% for the addition of a new turbine
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. CO2 and CH4 emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions	
	lbs/hr	tpy
VOC	0.10	0.45
HAPs	0.00	0.00
GHG (CO_2e)	238	1,044

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 12. Haul Road Emission Calculations

Unpaved Road Information:

Unpaved Roads: $E\ (lb/VMT) = k(s/12)^a(W/3)^b)*[(365-p)/365]$

	PM		PM_{10}	$PM_{2.5}$	
k Factor (lb/VMT)	4.9		1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	4.8	%			AP-42 Table 13.2.2-1 (11/06), for Sand and Gravel Processing
Number of Rain Days, p	150				AP-42 Figure 13.2.1-2
a	0.7		0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b	0.45		0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

Description	Weight of Empty Truck (tons)	Weight of Truck w/ Max Load (tons)	Mean Vehicle Weight (tons)	Length of Unpaved Road Traveled (mile/trip)	Trips Per Year	Mileage Per Year	Control (%)	Emissions (tpy) PM	PM_{10}	$PM_{2.5}$
Service Truck	4	4	4	0.25	365	91	0	0.08	0.02	0.00
Liquids Hauling - Vendor Fluid	12	20	16	0.25	2	1	0	0.00	0.00	0.00
Liquids Hauling - Produced Fluid	20	32	26	0.25	32	8	0	0.02	0.00	0.00
Employee Vehicles	2	2	2	0.25	365	91	0	0.06	0.01	0.00
Total Potential Emissions								**0.15**	**0.04**	**0.00**

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 13. Blowdown Emission Calculations

[1]Mole fractions of CH_4, VOC, HAP and CO_2 based on gas analysis:

CH_4: 93.83% CO_2: 0.24% VOC 0.39% HAP 0.00%

[2]Weight fractions of CH_4 , VOC, HAP and CO_2 based on gas analysis:

CH_4: 88.56% CO_2: 0.61% VOC 1.07% HAP 0.00%

[3] Carbon equivalent emissions (CO_2e) are based on the following Global Warming Potentials (GWP) from 40 CFR Part 98, Table A-1:

Carbon Dioxide (CO_2): 1

Methane (CH_4): 28

Emissions from Compressor Seal:

Number of Compressors[1,2]	Number of Seals Per Compressor	Leak Rate (scf/hr/compressor)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
2	--	1560	27,331,200	6.54	0.01	3.73	542.75	15,201
1	2	600	10,512,000	2.51	0.00	1.44	208.75	5,846
Total				**9.05**	**0.01**	**5.17**	**751.50**	**21,047**

1. Leak rate for existing units and seal information from Solar Turbines PIL 251. Conservatively used C45 compressor at 1500 psig suction pressure (highest leak rate).

2. Leak rate for the new unit was estimated by using the max dry seal compressor leak rate from NSPS OOOOb.

3. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)

Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton

4. GHG emissions calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Sample calculation: Volume vented (scf/yr) x density of GHG (kg/scf) x mol % VOC x 2.2 lb/kg / 2000 lb/ton

VOC and HAP Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Station ESD Vent	1,100,000	4	4,400,000	1.05	0.00
Unit Shutdown	170,000	48	8,160,000	1.95	0.00
Main Gas Filter Changes	91,000	36	3,276,000	0.78	0.00
Total				**3.79**	**0.01**

1. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton

GHG Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Station ESD Vent	1,100,000	4	4,400,000	87.38	0.60	2447.15
Unit Shutdown	170,000	48	8,160,000	162.04	1.11	4538.34
Main Gas Filter Changes	91,000	36	3,276,000	65.06	0.45	1822.01
Total				**314.5**	**2.16**	**8808**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 13. Blowdown Emission Calculations

Pigging Emissions:

Segment Name	Pigging Events (#/yr)	Diameter (in)	Length of pipeline (ft)	Volume of Gas Occupied in Pipeline (acf)	Pipeline Operating Pressure (psig)	Event Duration[1] (hr/event)	Total Gas Volume per Event (scf/event)	Gas Volume to Atmosphere per Year (scf/yr)
Pig Receiver 42"	4	42	20.5	197	1,480	0.017	20,014	80,057
Pig Receiver 48"	4	48	22	276	1,480	0.017	28,054	112,215
Pig Launcher 42"	4	42	9.5	91	1,480	0.017	9,275	37,100
Pig Launcher 48"	4	48	21.6	271	1,480	0.017	27,544	110,175
Total							**84,887**	**339,547**

[1] Assumes pigging event duration of approximately 1 minute.

VOC and HAP Vented Pigging Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Pig Receiver 42"	20,014	4	80,057	0.02	0.00
Pig Receiver 48"	28,054	4	112,215	0.03	0.00
Pig Launcher 42"	9,275	4	37,100	0.01	0.00
Pig Launcher 48"	27,544	4	110,175	0.03	0.00
Total				**0.08**	**0.00**

GHG Vented Pigging Emissions

Segment Name	Vented Gas Volume Per Pigging Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Pig Receiver 42"	20,014	4	80,057	1.59	0.01	45
Pig Receiver 48"	28,054	4	112,215	2.23	0.02	62
Pig Launcher 42"	9,275	4	37,100	0.74	0.01	21
Pig Launcher 48"	27,544	4	110,175	2.19	0.02	61
Total				**6.7**	**0.05**	**189**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Total Blowdown/Venting Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	2.95	12.92	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
HAPs	0.00	0.02	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
GHG (CO_2e)	6,859	30,044	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis

Hourly emissions are annualized (i.e., assume 8,760 hours per year).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Harris Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 14. Site-Specific Gas Analysis

Sample Location: MVP Pipeline
HHV (Btu/scf): 1,052.08

Constituent	Natural Gas Stream Speciation (Vol. %)	Natural Gas Stream Speciation (Wt. %)	Molar Weight
Nitrogen	0.356	0.587	0.100
Oxygen	0.003	0.005	0.001
Methane	93.831	88.558	15.050
Carbon Dioxide	0.235	0.610	0.104
Ethane	5.184	9.172	1.559
Propane	0.335	0.869	0.148
Isobutane	0.020	0.067	0.011
n-Butane	0.029	0.100	0.017
Isopentane	0.004	0.016	0.003
n-Pentane	0.002	0.009	0.002
Cyclopentane	0.000	0.001	0.000
Isohexane	0.000	0.002	0.000
n-Hexane	0.000	0.001	0.000
Benzene	0.000	0.000	0.000
Cyclohexane	0.000	0.000	0.000
Isoheptanes	0.000	0.000	0.000
Heptanes	0.000	0.000	0.000
Toluene	0.000	0.000	0.000
Methylcyclohexane	0.000	0.001	0.000
2,2,4 Trimethylpentane	0.000	0.000	0.000
Octanes	0.000	0.000	0.000
Ethylbenzene	0.000	0.000	0.000
Xylenes	0.000	0.000	0.000
Isononanes	0.000	0.000	0.000
n-Nonane	0.000	0.000	0.000
Isodecanes	0.000	0.000	0.000
n-Decane	0.000	0.000	0.000
Isoundecanes+	0.000	0.000	0.000
Totals	100.000	100.000	16.995

TOC (Total)	99.41	98.80
VOC (Total)	0.39	1.07
HAP (Total)	0.00	0.00

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 1. Potential Atmospheric Emissions from Project Sources

Source	Pollutants																	
	VOC		NO_X		CO		PM_{10}		$PM_{2.5}$		SO_2		HCHO		Total HAPs		GHG (CO_2e)	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Modified Turbine 1 (S001)	0.66	2.97	5.64	24.72	5.72	25.26	1.68	7.38	1.68	7.38	0.57	2.51	0.48	2.12	0.54	2.36	19,901	87,295
Modified Turbine 2 (S002)	0.66	2.97	5.64	24.72	5.72	25.26	1.68	7.38	1.68	7.38	0.57	2.51	0.48	2.12	0.54	2.36	19,901	87,295
Existing Turbine 1 (S001)	0.99	4.35	8.49	37.21	8.61	40.02	2.21	9.69	2.21	9.69	0.50	2.20	0.42	1.86	0.47	2.06	17,502	76,782
Existing Turbine 2 (S002)	0.99	4.35	8.49	37.21	8.61	40.02	2.21	9.69	2.21	9.69	0.50	2.20	0.42	1.86	0.47	2.06	17,502	76,782
Turbine 3 (S021)	0.66	2.97	5.64	24.72	5.72	25.26	1.68	7.38	1.68	7.38	0.57	2.51	0.48	2.12	0.54	2.36	19,901	87,295
Turbine 4 (S022)	0.66	2.97	5.64	24.72	5.72	25.26	1.68	7.38	1.68	7.38	0.57	2.51	0.48	2.12	0.54	2.36	19,901	87,295
Microturbine 11 (S024)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 12 (S025)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 13 (S026)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Fuel Gas Heater (S023)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Fugitives (S018)	0.07	0.30	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	159	694
Blowdowns (S020)	1.45	6.33	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.01	3,360	14,718
Total	**2.23**	**10.13**	**5.97**	**26.13**	**6.44**	**24.45**	**2.37**	**10.37**	**2.37**	**10.37**	**1.31**	**5.74**	**1.10**	**4.80**	**1.22**	**5.35**	**49,098**	**215,316**

Notes:

1. Project total is the sum of new equipment and the difference between the exisiting and proposed emissions from modified equipment..
2. Global Warming Potential (40 CFR 98 Subpart A Table A -1)

CO_2	1
CH_4	28
N_2O	265

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 2. Turbine Emissions Calculations

Turbine Information:

Source ID:	S001-S002, S021-S022
Manufacturer:	Solar
Model No.:	Titan 130 - 23502S
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf):	947.3
Rated Horsepower (bhp at site conditions):	22374
Maximum Fuel Consumption at 100% Load (scf/hr):	165090
Heat Input (MMBtu/hr)	156.39
Control Device:	None
Stack Designation:	TBD

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	1,446.19
Potential Startup/Shutdown Events (per year):	12

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_X	5.640	lb/hr	Manufacturer
CO	5.720	lb/hr	Manufacturer
SO_2	3.66E-03	lb/MMBtu	AP-42, Table 3.1-2a
PM_{10}	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
$PM_{2.5}$	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
VOC	0.656	lb/hr	20% of UHC per Manufacturer
Formaldehyde	0.003	lb/MMBtu	Manufacturer, PIL 168
CO_2	126.72	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	2.624	lb/hr	80% of UHC per Manufacturer
N_2O	2.4E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1026 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 2. Turbine Emissions Calculations

Pollutant Emission Rates:

Pollutant	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2]
NO_X	5.64	24.72
CO	5.72	25.26
SO_2	0.57	2.51
PM_{10}	1.68	7.38
$PM_{2.5}$	1.68	7.38
VOC	0.66	2.97
Formaldehyde	0.48	2.12
CO_2	19,817	86,810
CH_4	2.62	15.78
N_2O	0.04	0.16
GHG (CO2e)	19,901	87,295

*Annual emissions shown above include startup/shutdown events.

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[3]	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2,4]
HAPs:			
Acetaldehyde	4.31E-05	6.74E-03	2.95E-02
Acrolein	6.89E-06	1.08E-03	4.72E-03
Benzene	1.29E-05	2.02E-03	8.85E-03
1,3-Butadiene	4.63E-07	7.24E-05	3.17E-04
Propylene Oxide	2.90E-05	4.54E-03	1.99E-02
Ethylbenzene	3.45E-05	5.39E-03	2.36E-02
Toluene	1.40E-04	2.19E-02	9.59E-02
Xylene	6.89E-05	1.08E-02	4.72E-02
Polycyclic Organic Matter:			
Naphthalene	1.40E-06	2.19E-04	9.59E-04
PAH	2.37E-06	3.70E-04	1.62E-03
Total HAP (Including HCHO)		**0.54**	**2.36**

1. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)

2. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable

3. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV of 1020. Therefore, they were converted to LHV by multiplying by (HHV/LHV).

4. Emission calculations are based on maximum operating load of 100% load, ambient temperature 0°F and site elevation. The turbine ratings can vary with ambient conditions. Each Turbine is ISO rated at 23,470 HP

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 2. Turbine Emissions Calculations

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[a] (lbs/event)	Shutdown Emissions[a] (lbs/event)	Emission Factor Source
NO_X	1.0	1	Manufacturer
CO	16.0	19	Manufacturer
VOC	4.0	4	Manufacturer
CO_2	767	869	Manufacturer

[a] Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer. Emissions were using PIL 170 Revision 11.

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	9	lbs/startup
CO_2 Purged (Per Startup)	5	lbs/startup
CH_4 Purged (Per Startup)	715	lbs/startup
Density of natural gas:	0.04	lb/ft^3

*Current design includes electric motor starts, but pneumatic starts have been included as a conservative measure.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 3. Microturbine Emissions Calculations

Microturbine Unit Information:

Engine ID:	S024-S026
Manufacturer:	Capstone
Model No.:	C200
Number of Units:	3

Microturbine Fuel Information:

	Per Unit
Fuel Type:	Natural Gas
Rated Electrical Power Output (kW):	200
Rated Electrical Power Output (MW):	0.2
Rated Horsepower (bhp):	268.2
Heat Input (MMBtu/hr)	2.28
Potential Fuel Consumption (MMBtu/yr):	19,973
Max. Annual Hours of Operation (hr/yr):	8,760

Microturbine Emissions Data:

Pollutant	**Emission Factors**	**Units**	**Maximum Potential Emissions Per Unit**		**Estimation Basis / Emission Factor Source**
			lbs/hr	**tpy**	
NO_X	0.40	lb/MWhe	0.08	0.35	Manufacturer's Specifications
VOC	0.10	lb/MWhe	0.02	0.09	Manufacturer's Specifications
CO	1.10	lb/MWhe	0.22	0.96	Manufacturer's Specifications
SO_2	0.0034	lb/MMBtu	0.01	0.03	AP-42, Table 3.1-2a (Apr-2000)
PM_{10}	0.0066	lb/MMBtu	0.02	0.07	AP-42, Table 3.1-2a (Apr-2000)
$PM_{2.5}$	0.0066	lb/MMBtu	0.02	0.07	AP-42, Table 3.1-2a (Apr-2000)
GHG (CO_2e)	See Table Below		266	1,166	Manufacturer's Specifications / 40 CFR 98, Table C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this engine type.

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	**Emission Factor**	**Units**	**Maximum Potential Emissions Per Unit**		**Estimation Basis / Emission Factor Source**
			lbs/hr	**tpy**	
GHGs:					
CO_2	1330	lb/MWhe	266	1,165	Manufacturer's Specifications
CH_4	0.001	kg/MMBtu	0.01	0.02	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**266**	**1,166**	
HAPs:					
1,3-Butadiene	4.3E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acetaldehyde	4.0E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acrolein	6.4E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Benzene	1.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Ethylbenzene	3.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Formaldehyde	7.1E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)
Naphthalene	1.3E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
PAH	2.2E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Propylene oxide	2.9E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Toluene	1.3E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Xylene	6.4E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Total HAP			**0.002**	**0.010**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 4. Fuel Gas Heater Emissions Calculations

Fuel Gas Heater Information:

Source ID:	S023
Number of Units:	1

Fuel Gas Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	1.54
Potential Fuel Consumption (MMBtu/yr):	13,477
Max. Fuel Consumption (MMscf/hr):	0.0015
Max. Fuel Consumption (MMscf/yr):	12.8
Max. Annual Hours of Operation (hr/yr):	8,760

Fuel Gas Heater Information:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.15	0.64	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.01	0.04	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.12	0.54	AP-42, Table 1.4-1 (Jul-1998)
SO_2	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		180	789	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 4. Fuel Gas Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	180.00	788	40 CFR 98, Tables C-1 & C-2
CH_4	0.001	kg/MMBtu	0.00	0.01	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**180**	**789**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.01	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.003**	**0.01**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 5. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	1,375	0.0004	Table 2-4	0.61	2.92	0.03	0.00
Flanges	385	0.0009	Table 2-4	0.33	1.59	0.02	0.00
Open-Ended Lines	14	0.0044	Table 2-4	0.06	0.30	0.00	0.00
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00
Valves	485	0.0099	Table 2-4	4.81	23.18	0.25	0.00
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00
Total				**5.81**	**28.00**	**0.30**	**0.00**

Notes:

1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station assuming 100% of exsiting count for the addition of 2 new turbines.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential CH_4 Emissions	Potential CO_2 Emissions	Potential CO_2e Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)	(tpy)
Connectors	1,375	0.0004	Table 2-4	0.61	2.92	2.59	0.02	72.45
Flanges	385	0.0009	Table 2-4	0.33	1.59	1.41	0.01	39.56
Open-Ended Lines	14	0.0044	Table 2-4	0.06	0.30	0.26	0.00	7.38
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00	0.00
Valves	485	0.0099	Table 2-4	4.81	23.18	20.53	0.14	574.98
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00	0.00
Total				**5.81**	**28.00**	**24.79**	**0.17**	**694.36**

Notes:

1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station assuming 100% of exsiting count for the addition of 2 new turbines.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. CO_2 and CH_4 emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions	
	lbs/hr	tpy
VOC	0.07	0.30
HAPs	0.00	0.00
GHG (CO_2e)	159	694

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 6. Blowdown Emission Calculations

[1]Mole fractions of CH_4, VOC, HAP and CO_2 based on gas analysis:

CH_4: 93.83% CO_2: 0.24% VOC 0.39% HAP 0.00%

[2]Weight fractions of CH_4 , VOC, HAP and CO_2 based on gas analysis:

CH_4: 88.56% CO_2: 0.61% VOC 1.07% HAP 0.00%

[3] Carbon equivalent emissions (CO_2e) are based on the following Global Warming Potentials (GWP) from 40 CFR Part 98, Table A-1:

Carbon Dioxide (CO_2): 1
Methane (CH_4): 28

Emissions from Compressor Seal:

Number of Compressors[1]	Number of seals Per Compressor	Leak Rate (scf/hr/seal)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
2	2	600	21,024,000	5.03	0.01	2.87	417.50	11,693
Total				**5.03**	**0.01**	**2.87**	**417.50**	**11,693**

1. Leak rate for the new unit was estimated by using the max dry seal compressor leak rate from NSPS OOOOb.
2. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton
3. GHG emissions calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
Sample calculation: Volume vented (scf/yr) x density of GHG (kg/scf) x mol % VOC x 2.2 lb/kg / 2000 lb/ton

VOC and HAP Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Station ESD Vent	1,100,000	0	0	0.00	0.00
Compressor Unit Blowdowns	170,000	32	5,440,000	1.30	0.00
Main Gas Filter Changes	91,000	0	0	0.00	0.00
Total				**1.30**	**0.00**

1. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton

GHG Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Station ESD Vent	1,100,000	0	0	0.00	0.00	0
Compressor Unit Blowdowns	170,000	32	5,440,000	108.03	0.74	3026
Main Gas Filter Changes	91,000	0	0	0.00	0.00	0
Total				**108.0**	**0.74**	**3,026**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 6. Blowdown Emission Calculations

Pigging Emissions:

Segment Name	Pigging Events (#/yr)	Diameter (in)	Length of pipeline (ft)	Volume of Gas Occupied in Pipeline* (acf)	Pipeline Operating Pressure (psig)	Event Duration[1] (hr/event)	Total Gas Volume per Event (scf/event)	Gas Volume to Atmosphere per Year (scf/yr)
Pig Receiver 42"	0	42	20.5	197	1,480	0.017	20,014	0
Pig Receiver 48"	0	48	22	276	1,480	0.017	28,054	0
Pig Launcher 42"	0	42	9.5	91	1,480	0.017	9,275	0
Pig Launcher 48"	0	48	21.6	271	1,480	0.017	27,544	0
Total							**84,887**	**0**

[1] Assumes pigging event duration of approximately 1 minute.

VOC and HAP Vented Pigging Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Pig Receiver 42"	20,014	0	0	0.00	0.00
Pig Receiver 48"	28,054	0	0	0.00	0.00
Pig Launcher 42"	9,275	0	0	0.00	0.00
Pig Launcher 48"	27,544	0	0	0.00	0.00
Total				**0.00**	**0.00**

GHG Vented Pigging Emissions

Segment Name	Vented Gas Volume Per Pigging Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Pig Receiver 42"	20,014	0	0	0.00	0.00	0
Pig Receiver 48"	28,054	0	0	0.00	0.00	0
Pig Launcher 42"	9,275	0	0	0.00	0.00	0
Pig Launcher 48"	27,544	0	0	0.00	0.00	0
Total				**0.00**	**0.00**	**0**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Blowdowns Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	1.45	6.33	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
HAPs	0.00	0.01	Engineering Estimates, Manufacturer Data, and Site-Specific Gas
GHG (CO_2e)	3,360	14,718	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis

Hourly emissions are annualized (i.e., assume 8,760 hours per year).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 1. Potential Atmospheric Emissions from Each Source at the Facility

Source	Pollutants																	
	VOC		NO_X		CO		PM_{10}		$PM_{2.5}$		SO_2		HCHO		Total HAPs		GHG (CO_2e)	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Turbine 1 (S001)	0.66	2.97	5.64	24.72	5.72	25.26	1.68	7.38	1.68	7.38	0.57	2.51	0.48	2.12	0.54	2.36	19,901	87,295
Turbine 2 (S002)	0.66	2.97	5.64	24.72	5.72	25.26	1.68	7.38	1.68	7.38	0.57	2.51	0.48	2.12	0.54	2.36	19,901	87,295
Turbine 3 (S021)	0.66	2.97	5.64	24.72	5.72	25.26	1.68	7.38	1.68	7.38	0.57	2.51	0.48	2.12	0.54	2.36	19,901	87,295
Turbine 4 (S022)	0.66	2.97	5.64	24.72	5.72	25.26	1.68	7.38	1.68	7.38	0.57	2.51	0.48	2.12	0.54	2.36	19,901	87,295
Microturbine 1 (S003)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 2 (S004)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 3 (S005)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 4 (S006)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 5 (S007)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 6 (S008)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 7 (S009)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 8 (S010)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 9 (S011)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 10 (S012)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 11 (S024)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 12 (S025)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Microturbine 13 (S026)	0.02	0.09	0.08	0.35	0.22	0.96	0.02	0.07	0.02	0.07	0.01	0.03	0.00	0.01	0.00	0.01	266	1,166
Fuel Gas Heater (S013)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Fuel Gas Heater (S014)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Fuel Gas Heater (S023)	0.01	0.04	0.15	0.64	0.12	0.54	0.01	0.05	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.01	180	789
Produced Fluids Tank (S015)	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	3	14
Used Oil Tank (S016)	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00	--	--
Office Building Heater (S017)	0.00	0.00	0.01	0.05	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	62
Fugitives (S018)	0.14	0.60	--	--	--	--	0.03	0.12	0.00	0.01	--	--	--	--	0.00	0.00	317	1,389
Liquid Loading (S019)	0.01	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blowdowns (S020)	3.67	16.09	--	--	--	--	--	--	--	--	--	--	--	--	0.01	0.02	8,539	37,403
Total	**6.73**	**29.88**	**24.05**	**105.39**	**26.12**	**115.24**	**6.99**	**30.63**	**6.97**	**30.52**	**2.39**	**10.48**	**1.96**	**8.59**	**2.20**	**9.62**	**92,479**	**405,576**

Notes:

1. PM_{10} and $PM_{2.5}$ emissions are filterable + condensable.
2. Fugitives emissions include haul road emissions.
3. Global Warming Potential (40 CFR 98 Subpart A Table A -1)

CO_2	1
CH_4	28
N_2O	265

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 2. Turbine Emissions Calculations

Turbine Information:

Source ID:	S001-S002, S021-S022
Manufacturer:	Solar
Model No.:	Titan 130 - 23502S
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf):	947.3
Rated Horsepower (bhp at site conditions):	22374
Maximum Fuel Consumption at 100% Load (scf/hr):	165090
Heat Input (MMBtu/hr)	156.39
Control Device:	None
Stack Designation:	TBD

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	1,446.19
Potential Startup/Shutdown Events (per year):	12

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_X	5.640	lb/hr	Manufacturer
CO	5.720	lb/hr	Manufacturer
SO_2	3.66E-03	lb/MMBtu	AP-42, Table 3.1-2a
PM_{10}	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
$PM_{2.5}$	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
VOC	0.656	lb/hr	20% of UHC per Manufacturer
Formaldehyde	0.003	lb/MMBtu	Manufacturer, PIL 168
CO_2	126.72	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	2.624	lb/hr	80% of UHC per Manufacturer
N_2O	2.4E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1026 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 2. Turbine Emissions Calculations

Pollutant Emission Rates:

Pollutant	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2]
NO_X	5.64	24.72
CO	5.72	25.26
SO_2	0.57	2.51
PM_{10}	1.68	7.38
$PM_{2.5}$	1.68	7.38
VOC	0.66	2.97
Formaldehyde	0.48	2.12
CO_2	19,817	86,810
CH_4	2.62	15.78
N_2O	0.04	0.16
GHG (CO2e)	19,901	87,295

*Annual emissions shown above include startup/shutdown events.

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[3]	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2,4]
HAPs:			
Acetaldehyde	4.31E-05	6.74E-03	2.95E-02
Acrolein	6.89E-06	1.08E-03	4.72E-03
Benzene	1.29E-05	2.02E-03	8.85E-03
1,3-Butadiene	4.63E-07	7.24E-05	3.17E-04
Propylene Oxide	2.90E-05	4.54E-03	1.99E-02
Ethylbenzene	3.45E-05	5.39E-03	2.36E-02
Toluene	1.40E-04	2.19E-02	9.59E-02
Xylene	6.89E-05	1.08E-02	4.72E-02
Polycyclic Organic Matter:			
Naphthalene	1.40E-06	2.19E-04	9.59E-04
PAH	2.37E-06	3.70E-04	1.62E-03
Total HAP (Including HCHO)		**0.54**	**2.36**

1. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)

2. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable

3. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV of 1020. Therefore, they were converted to LHV by multiplying by (HHV/LHV).

4. Emission calculations are based on maximum operating load of 100% load, ambient temperature 0°F and site elevation. The turbine ratings can vary with ambient conditions. Each Turbine is ISO rated at 23,470 HP

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 2. Turbine Emissions Calculations

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[a] (lbs/event)	Shutdown Emissions[a] (lbs/event)	Emission Factor Source
NO_X	1.0	1	Manufacturer
CO	16.0	19	Manufacturer
VOC	4.0	4	Manufacturer
CO_2	767	869	Manufacturer

[a] Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer. Emissions were using PIL 170 Revision 11.

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	9	lbs/startup
CO_2 Purged (Per Startup)	5	lbs/startup
CH_4 Purged (Per Startup)	715	lbs/startup
Density of natural gas:	0.04	lb/ft^3

*Current design includes electric motor starts, but pneumatic starts have been included as a conservative measure.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 3. Microturbine Emissions Calculations

Microturbine Unit Information:

Engine ID:	S003-S012, S024-S026
Manufacturer:	Capstone
Model No.:	C200
Number of Units:	13

Microturbine Fuel Information:

	Per Unit
Fuel Type:	Natural Gas
Rated Electrical Power Output (kW):	200
Rated Electrical Power Output (MW):	0.2
Rated Horsepower (bhp):	268.2
Heat Input (MMBtu/hr)	2.28
Potential Fuel Consumption (MMBtu/yr):	19,973
Max. Annual Hours of Operation (hr/yr):	8,760

Microturbine Emissions Data:

Pollutant	**Emission Factors**	**Units**	**Maximum Potential Emissions Per Unit**		**Estimation Basis / Emission Factor Source**
			lbs/hr	**tpy**	
NO_X	0.40	lb/MWhe	0.0800	0.3504	Manufacturer's Specifications
VOC	0.10	lb/MWhe	0.0200	0.0876	Manufacturer's Specifications
CO	1.10	lb/MWhe	0.2200	0.9636	Manufacturer's Specifications
SO_2	0.0034	lb/MMBtu	0.0078	0.0340	AP-42, Table 3.1-2a (Apr-2000)
PM_{10}	0.0066	lb/MMBtu	0.0150	0.0659	AP-42, Table 3.1-2a (Apr-2000)
$PM_{2.5}$	0.0066	lb/MMBtu	0.0150	0.0659	AP-42, Table 3.1-2a (Apr-2000)
GHG (CO_2e)	See Table Below		266.2740	1166.2801	Manufacturer's Specifications / 40 CFR 98, Table C-2
Other (Total HAP)	See Table Below		0.0023	0.0103	AP-42, Table 3.1-3 (Apr-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this engine type.

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	**Emission Factor**	**Units**	**Maximum Potential Emissions Per Unit**		**Estimation Basis / Emission Factor Source**
			lbs/hr	**tpy**	
GHGs:					
CO_2	1330	lb/MWhe	266	1,165	Manufacturer's Specifications
CH_4	0.001	kg/MMBtu	0.01	0.02	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**266**	**1,166**	
HAPs:					
1,3-Butadiene	4.3E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acetaldehyde	4.0E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acrolein	6.4E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Benzene	1.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Ethylbenzene	3.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Formaldehyde	7.1E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)
Naphthalene	1.3E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
PAH	2.2E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Propylene oxide	2.9E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Toluene	1.3E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Xylene	6.4E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Total HAP			**0.002**	**0.010**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 4. Fuel Gas Heater Emissions Calculations

Fuel Gas Heater Information:

Source ID:	S013-S014, S023
Number of Units:	3

Fuel Gas Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	1.54
Potential Fuel Consumption (MMBtu/yr):	13,477
Max. Fuel Consumption (MMscf/hr):	0.0015
Max. Fuel Consumption (MMscf/yr):	12.8
Max. Annual Hours of Operation (hr/yr):	8,760

Fuel Gas Heater Emission Data:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.15	0.64	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.01	0.04	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.12	0.54	AP-42, Table 1.4-1 (Jul-1998)
SO_2	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.01	0.05	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		180	789	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 4. Fuel Gas Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	180.00	788	40 CFR 98, Tables C-1 & C-2
CH_4	0.001	kg/MMBtu	0.00	0.01	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**180**	**789**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.01	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.003**	**0.01**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 5. Storage Tank Emissions Calculations - Produced Fluids Tank

Storage Tank Information:

Source ID:	S015
Tank Capacity (gallons):	10,080
Tank Contents:	Produced Water
Annual Throughput (gallons/year):	126,000
Daily Throughput (bbl/day)	8.22
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Controlled Emissions		Emissions Estimation Method
	lbs/hr	tpy	lbs/hr	tpy	
VOC	0.00	0.00	0.00	0.00	ProMax
HAPs	0.00	0.00	0.00	0.00	ProMax
GHG (CO2e)	3.13	13.72	3.13	13.72	ProMax

Notes:

1. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).

Promax Tanks Emissions Data:

Pollutant	Total Emissions (Working + Breathing + Flashing)			Total Emissions		
	lbs/hr	lbs/yr	tpy	lbs/hr	lbs/yr	tpy
VOC	0.00	8.11	0.00	0.00	8.11	0.00
HAPs	0.00	0.18	0.00	0.00	0.18	0.00
Carbon Dioxide	0.02	132.42	0.07	0.02	132.42	0.07
Methane	0.11	974.99	0.49	0.11	974.99	0.49
GHG (CO_2e)	3.13	27,432.23	13.72	3.13	27,432.23	13.72

Notes:

1. Emissions estimated using BR&E ProMax software.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 6. Storage Tank Emissions Calculations - Used Oil Tank

Storage Tank Information:

Source ID:	S016
Tank Capacity (gallons):	4,200
Tank Contents:	Used Oil
Annual Throughput (gallons/year):	3,150
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	1.59E-05	6.97E-05	ProMax
HAPs	1.59E-05	6.97E-05	ProMax
GHG (CO_2e)	N/A	N/A	N/A

ProMax Emissions Data - Used Oil Tank:

Pollutant	Working Losses	Breathing Losses	Flashing Losses	Total Emissions		
	tpy	tpy	tpy	lbs/hr	lbs/yr	tpy
VOC	1.13E-06	6.86E-05	N/A	0.00	0.14	6.97E-05
HAPs	1.13E-06	6.86E-05	N/A	0.00	0.14	6.97E-05

Notes:

1. Emissions estimated using ProMax software.
2. This tank does not contain hydrocarbons that would be expected to be flashed off at tank operating conditions.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 7. Office Building Heater Emissions Calculations

Office Building Heater Information:

Source ID:	S017
Number of Units:	1

Office Building Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	0.12
Potential Fuel Consumption (MMBtu/yr):	1,051
Max. Fuel Consumption (MMscf/hr):	0.0001
Max. Fuel Consumption (MMscf/yr):	1.0
Max. Annual Hours of Operation (hr/yr):	8,760

Office Building Heater Emissions Data:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.01	0.05	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.01	0.04	AP-42, Table 1.4-1 (Jul-1998)
SO_2	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Formaldehyde (HCHO)	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
GHG (CO_2e)	See Table Below		14	62	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.00	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 7. Office Building Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	14.04	61	40 CFR 98, Tables C-1 & C-2
CH_4	0.001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**14**	**62**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.000**	**0.00**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 8. Liquid Loading Emissions Calculations

Liquid Loading Information:

Parameter	Value	Description
S	1.45	saturation factor for splash loading (AP-42 Table 5.2-1)
Collection Efficiency	0.0%	
Control Efficiency	0%	
P	0.21	true vapor pressure of liquid loaded (psia) - assume octane
M	114.23	molecular weight of vapors (lb/lb-mol) - assume octane
T	516.4	temperature of liquids loaded (deg R) - TANKS Data

Description	Loading Losses	Maximum Throughput[2]	VOC Emissions	
	($lb/10^3$ gal)[1]	(gal)	(lb/hr)	(tpy)
Liquids Hauling	0.8	126,000	0.01	0.05

Notes:

1. Uncontrolled Loading Losses: L_L ($lb/10^3$ gal) = 12.46 (SPM)/T
2. Hourly emissions assume continuous operation (i.e., 8760 hr/yr).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 9. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	2,750	0.0004	Table 2-4	1.21	5.84	0.06	0.00
Flanges	770	0.0009	Table 2-4	0.66	3.19	0.03	0.00
Open-Ended Lines	28	0.0044	Table 2-4	0.12	0.59	0.01	0.00
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00
Valves	970	0.0099	Table 2-4	9.62	46.36	0.49	0.00
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00
Total				**11.62**	**55.99**	**0.60**	**0.00**

Notes:

1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station plus 100% for the addition of 2 new turbines.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential CH_4 Emissions	Potential CO_2 Emissions	Potential CO_2e Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)	(tpy)
Connectors	2,750	0.0004	Table 2-4	1.21	5.84	5.17	0.04	144.90
Flanges	770	0.0009	Table 2-4	0.66	3.19	2.82	0.02	79.11
Open-Ended Lines	28	0.0044	Table 2-4	0.12	0.59	0.53	0.00	14.75
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00	0.00
Valves	970	0.0099	Table 2-4	9.62	46.36	41.06	0.28	1149.95
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00	0.00
Total				**11.62**	**55.99**	**49.58**	**0.34**	**1388.72**

Notes:

1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station plus 100% for the addition of 2 new turbines.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. CO_2 and CH_4 emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions	
	lbs/hr	tpy
VOC	0.14	0.60
HAPs	0.00	0.00
GHG (CO_2e)	317	1,389

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 10. Haul Road Emission Calculations

Unpaved Road Information:

Unpaved Roads: $E\ (lb/VMT) = k(s/12)^a(W/3)^b)*[(365-p)/365]$

	PM	PM_{10}	$PM_{2.5}$	
k Factor (lb/VMT)	4.9	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	4.8 %			AP-42 Table 13.2.2-1 (11/06), for Sand and Gravel Processing
Number of Rain Days, p	150			AP-42 Figure 13.2.1-2
a	0.7	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b	0.45	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

Description	Weight of Empty Truck (tons)	Weight of Truck w/ Max Load (tons)	Mean Vehicle Weight (tons)	Length of Unpaved Road Traveled (mile/trip)	Trips Per Year	Mileage Per Year	Control (%)	Emissions (tpy) PM	PM_{10}	$PM_{2.5}$
Service Truck	4	4	4	0.75	365	274	0	0.24	0.06	0.01
Liquids Hauling - Vendor Fluid	12	20	16	0.75	2	2	0	0.00	0.00	0.00
Liquids Hauling - Produced Fluid	20	32	26	0.75	32	24	0	0.05	0.01	0.00
Employee Vehicles	2	2	2	0.75	365	274	0	0.17	0.04	0.00
Total Potential Emissions								**0.46**	**0.12**	**0.01**

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 11. Blowdown Emission Calculations

[1]Mole fractions of CH_4, VOC, HAP and CO_2 based on gas analysis:

CH_4: 93.83% CO_2: 0.24% VOC 0.39% HAP 0.00%

[2]Weight fractions of CH_4 , VOC, HAP and CO_2 based on gas analysis:

CH_4: 88.56% CO_2: 0.61% VOC 1.07% HAP 0.00%

[3] Carbon equivalent emissions (CO_2e) are based on the following Global Warming Potentials (GWP) from 40 CFR Part 98, Table A-1:

Carbon Dioxide (CO_2): 1
Methane (CH_4): 28

Emissions from Compressor Seal:

Number of Compressors[1,2]	Number of seals Per Compressor	Leak Rate (scf/hr/seal)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
2	--	1560	27,331,200	6.54	0.01	3.73	542.75	15,201
2	2	600	21,024,000	5.03	0.01	2.87	417.50	11,693
Total				**11.57**	**0.02**	**6.60**	**960.25**	**26,894**

1. Leak rate for existing units and seal information from Solar Turbines PIL 251. Conservatively used C45 compressor at 1500 psig suction pressure (highest leak rate).
2. Leak rate for the new unit was estimated by using the max dry seal compressor leak rate from NSPS OOOOb.
3. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton
4. GHG emissions calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
Sample calculation: Volume vented (scf/yr) x density of GHG (kg/scf) x mol % VOC x 2.2 lb/kg / 2000 lb/ton

VOC and HAP Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Station ESD Vent	1,100,000	4	4,400,000	1.05	0.00
Compressor Unit Blowdowns	170,000	64	10,880,000	2.60	0.00
Main Gas Filter Changes	91,000	36	3,276,000	0.78	0.00
Total				**4.44**	**0.01**

1. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton

GHG Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Station ESD Vent	1,100,000	4	4,400,000	87.38	0.60	2447
Compressor Unit Blowdowns	170,000	64	10,880,000	216.06	1.49	6051
Main Gas Filter Changes	91,000	36	3,276,000	65.06	0.45	1822
Total				**368.5**	**2.53**	**10,320**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 11. Blowdown Emission Calculations

Pigging Emissions:

Segment Name	Pigging Events (#/yr)	Diameter (in)	Length of pipeline (ft)	Volume of Gas Occupied in Pipeline* (acf)	Pipeline Operating Pressure (psig)	Event Duration[1] (hr/event)	Total Gas Volume per Event (scf/event)	Gas Volume to Atmosphere per Year (scf/yr)
Pig Receiver 42"	4	42	20.5	197	1,480	0.017	20,014	80,057
Pig Receiver 48"	4	48	22	276	1,480	0.017	28,054	112,215
Pig Launcher 42"	4	42	9.5	91	1,480	0.017	9,275	37,100
Pig Launcher 48"	4	48	21.6	271	1,480	0.017	27,544	110,175
Total							**84,887**	**339,547**

[1] Assumes pigging event duration of approximately 1 minute.

VOC and HAP Vented Pigging Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Pig Receiver 42"	20,014	4	80,057	0.02	0.00
Pig Receiver 48"	28,054	4	112,215	0.03	0.00
Pig Launcher 42"	9,275	4	37,100	0.01	0.00
Pig Launcher 48"	27,544	4	110,175	0.03	0.00
Total				**0.08**	**0.00**

GHG Vented Pigging Emissions

Segment Name	Vented Gas Volume Per Pigging Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Pig Receiver 42"	20,014	4	80,057	1.59	0.01	45
Pig Receiver 48"	28,054	4	112,215	2.23	0.02	62
Pig Launcher 42"	9,275	4	37,100	0.74	0.01	21
Pig Launcher 48"	27,544	4	110,175	2.19	0.02	61
Total				**6.74**	**0.05**	**189**

1. Calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

Blowdowns Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	3.67	16.09	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
HAPs	0.01	0.02	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis
GHG (CO_2e)	8,539	37,403	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis

Hourly emissions are annualized (i.e., assume 8,760 hours per year).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Stallworth Compressor Station
Project Description: Resource Report 9 - Operational Emissions

TABLE 12. Site-Specific Gas Analysis

Sample Location: MVP Pipeline
HHV (Btu/scf): 1,052.08

Constituent	Natural Gas Stream Speciation (Vol. %)	Natural Gas Stream Speciation (Wt. %)	Molar Weight
Nitrogen	0.356	0.587	0.100
Oxygen	0.003	0.005	0.001
Methane	93.831	88.558	15.050
Carbon Dioxide	0.235	0.610	0.104
Ethane	5.184	9.172	1.559
Propane	0.335	0.869	0.148
Isobutane	0.020	0.067	0.011
n-Butane	0.029	0.100	0.017
Isopentane	0.004	0.016	0.003
n-Pentane	0.002	0.009	0.002
Cyclopentane	0.000	0.001	0.000
Isohexane	0.000	0.002	0.000
n-Hexane	0.000	0.001	0.000
Benzene	0.000	0.000	0.000
Cyclohexane	0.000	0.000	0.000
Isoheptanes	0.000	0.000	0.000
Heptanes	0.000	0.000	0.000
Toluene	0.000	0.000	0.000
Methylcyclohexane	0.000	0.001	0.000
2,2,4 Trimethylpentane	0.000	0.000	0.000
Octanes	0.000	0.000	0.000
Ethylbenzene	0.000	0.000	0.000
Xylenes	0.000	0.000	0.000
Isononanes	0.000	0.000	0.000
n-Nonane	0.000	0.000	0.000
Isodecanes	0.000	0.000	0.000
n-Decane	0.000	0.000	0.000
Isoundecanes+	0.000	0.000	0.000
Totals	100.000	100.000	16.995

TOC (Total)	99.41	98.80
VOC (Total)	0.39	1.07
HAP (Total)	0.00	0.00

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 1. Potential Atmospheric Emissions from Each Source at the Facility

Source	Pollutants																			
	VOC		NO_X		CO		PM		PM_{10}		$PM_{2.5}$		SO_2		HCHO		Total HAPs		GHG (CO_2e)	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Turbine 1 (S001)	0.90	4.10	4.25	18.63	2.61	11.87	3.84	16.81	3.84	16.81	3.84	16.81	1.30	5.72	0.22	0.97	0.34	1.50	45,355	198,787
Turbine 2 (S002)	0.90	4.10	4.25	18.63	2.61	11.87	3.84	16.81	3.84	16.81	3.84	16.81	1.30	5.72	0.22	0.97	0.34	1.50	45,355	198,787
Turbine 3 (S003)	0.51	2.30	2.41	10.56	1.48	6.76	2.19	9.59	2.19	9.59	2.19	9.59	0.74	3.26	0.13	0.55	0.20	0.86	25,887	113,516
Microturbine 1 (S004)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 2 (S005)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 3 (S006)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 4 (S007)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 5 (S008)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 6 (S009)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 7 (S010)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 8 (S011)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 9 (S012)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 10 (S013)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 11 (S014)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 12 (S015)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 13 (S016)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 14 (S017)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Microturbine 15 (S018)	0.02	0.09	0.08	0.35	0.22	0.96	4.33E-03	0.02	0.02	0.07	0.02	0.07	7.75E-03	0.03	1.62E-03	7.09E-03	2.34E-03	0.01	266	1,166
Fuel Gas Heater (S019)	4.02E-03	0.02	0.07	0.32	0.06	0.27	1.39E-03	6.08E-03	5.56E-03	0.02	5.56E-03	0.02	4.39E-04	1.92E-03	5.48E-05	2.40E-04	1.38E-03	6.06E-03	90	395
Fuel Gas Heater (S020)	4.02E-03	0.02	0.07	0.32	0.06	0.27	1.39E-03	6.08E-03	5.56E-03	0.02	5.56E-03	0.02	4.39E-04	1.92E-03	5.48E-05	2.40E-04	1.38E-03	6.06E-03	90	395
Fuel Gas Heater (S021)	4.02E-03	0.02	0.07	0.32	0.06	0.27	1.39E-03	6.08E-03	5.56E-03	0.02	5.56E-03	0.02	4.39E-04	1.92E-03	5.48E-05	2.40E-04	1.38E-03	6.06E-03	90	395
Fuel Gas Heater (S028)	6.03E-03	0.03	0.11	0.48	0.09	0.40	2.08E-03	9.13E-03	8.34E-03	0.04	8.34E-03	0.04	6.58E-04	2.88E-03	8.23E-05	3.60E-04	2.08E-03	9.09E-03	135	592
Fuel Gas Heater (S029)	6.03E-03	0.03	0.11	0.48	0.09	0.40	2.08E-03	9.13E-03	8.34E-03	0.04	8.34E-03	0.04	6.58E-04	2.88E-03	8.23E-05	3.60E-04	2.08E-03	9.09E-03	135	592
Produced Fluids Tank (S022)	3.34E-03	0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.91E-05	2.15E-04	11	50
Used Oil Tank (S023)	1.20E-05	5.26E-05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.20E-05	5.26E-05	--	--
Used Oil Tank (S024)	1.20E-05	5.26E-05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.20E-05	5.26E-05	--	--
Fugitives (S025)	0.10	0.45	--	--	--	--	0.01	0.05	3.19E-03	0.01	3.19E-04	1.40E-03	--	--	--	--	1.56E-04	6.83E-04	238	1,044
Liquid Loading (S026)	0.04	0.19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blowdowns (S027)	2.31	10.13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.52E-03	0.02	5,377	23,552
Total	**5.09**	**22.72**	**12.54**	**54.99**	**10.37**	**46.57**	**9.95**	**43.59**	**10.13**	**44.36**	**10.13**	**44.35**	**3.47**	**15.21**	**0.59**	**2.60**	**0.93**	**4.06**	**126,758**	**555,597**

Notes:
1. PM_{10} and $PM_{2.5}$ emissions are filterable + condensable.
2. Fugitives emissions include piping component and haul road emissions.
3. Global Warming Potential (40 CFR 98 Subpart A Table A -1)

CO_2	1
CH_4	28
N_2O	265

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 2. Turbine Emissions Calculations

Turbine Information:

Source ID:	S001-S002
Manufacturer:	Solar
Model No.:	Titan 350-52500S
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf) (LHV):	947.30
Rated Horsepower (bhp at ISO conditions):	52,500
Maximum Fuel Consumption at 100% Load (scf/hr):	376248
Heat Input (MMBtu/hr) (LHV)	356.42
Control Device:	Oxidation Catalyst
CO Control Efficiency	80%
VOC Control Efficency	40%
Formaldehyde Control Efficiency	80%
Control Device:	SCR
NOx Control Efficiency	67%
Stack Designation:	ST1-ST2

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	3,295.93
Potential Startup/Shutdown Events (per year):	12

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 2. Turbine Emissions Calculations

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_X	12.87	lb/hr	Manufacturer - 9ppm
CO	13.05	lb/hr	Manufacturer - 15 ppm
SO_2	3.66E-03	lb/MMBtu	AP-42, Table 3.1-2a
PM	0.011	lb/MMBtu	Assume PM=PM_{10}.
PM_{10}	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
$PM_{2.5}$	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
VOC	1.496	lb/hr	20% of UHC per Manufacturer
Formaldehyde	0.003	lb/MMBtu	Manufacturer, PIL 168
CO_2	126.72	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	5.984	lb/hr	80% of UHC per Manufacturer
N_2O	2.4E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1026 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Pollutant Emission Rates:

Pollutant	Pre-control Emissions		Post-control Emissions	
	(lb/hr)[1]	(tpy)[2]	(lb/hr)	(tpy)
NO_X	12.87	56.39	4.25	18.63
CO	13.05	57.60	2.61	11.87
SO_2	1.30	5.72	1.30	5.72
PM	3.84	16.81	3.84	16.81
PM_{10}	3.84	16.81	3.84	16.81
$PM_{2.5}$	3.84	16.81	3.84	16.81
VOC	1.50	6.72	0.90	4.10
Formaldehyde	1.11	4.84	0.22	0.97
CO_2	45,165	197,834	45,165	197,834
CH_4	5.98	30.50	5.98	30.50
N_2O	0.09	0.37	0.09	0.37
GHG (CO2e)	45,355	198,787	45,355	198,787

*Annual emissions shown above include startup/shutdown events.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 2. Turbine Emissions Calculations

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[3]	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2,4]
HAPs:			
Acetaldehyde	4.31E-05	1.54E-02	6.72E-02
Acrolein	6.89E-06	2.46E-03	1.08E-02
Benzene	1.29E-05	4.61E-03	2.02E-02
1,3-Butadiene	4.63E-07	1.65E-04	7.23E-04
Propylene Oxide	2.90E-05	1.03E-02	4.53E-02
Ethylbenzene	3.45E-05	1.23E-02	5.38E-02
Toluene	1.40E-04	4.99E-02	2.19E-01
Xylene	6.89E-05	2.46E-02	1.08E-01
Naphthalene	1.40E-06	4.99E-04	2.19E-03
PAH	2.37E-06	8.44E-04	3.70E-03
Total HAP (Including HCHO)		**0.34**	**1.50**

1. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)

2. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable

3. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV of 1020. Therefore, they were converted to LHV by multiplying by (HHV/LHV).

4. Emission calculations are based on maximum operating load of 100% load, ambient temperature 0°F and site elevation. The turbine ratings can vary with ambient conditions. Each Turbine is ISO rated at 52,500 HP

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[a] (lbs/event)	Shutdown Emissions[a] (lbs/event)	Emission Factor Source
NO_X	2.0	2	Manufacturer
CO	37.0	36	Manufacturer
VOC	10.0	10	Manufacturer
CO_2	1172	1036	Manufacturer

a. Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer. Emissions are using the highest value from PIL 170 Revision 11. Conservatively used highest values of all start up / shut down emissions, since T350 units are not incorporated into the PIL

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	9	lbs/startup
CO_2 Purged (Per Startup)	5	lbs/startup
CH_4 Purged (Per Startup)	715	lbs/startup
Site specific density of natural gas:	0.04	lb/ft^3

*Current design includes electric motor starts, but pneumatic starts have been included as a conservative measure.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 3. Turbine Emissions Calculations

Turbine Information:

Source ID:	S003
Manufacturer:	Solar
Model No.:	Titan 250-31900S
Fuel Used:	Natural Gas
Fuel Heating Value (Btu/scf) (LHV):	947.40
Rated Horsepower (bhp at ISO conditions):	31,900
Maximum Fuel Consumption at 100% Load (scf/hr):	214,756
Heat Input (MMBtu/hr) (LHV)	203.46
Control Device:	Oxidation Catalyst
CO Control Efficiency	80%
VOC Control Efficency	40%
Formaldehyde Control Efficiency	80%
Control Device:	SCR
NOx Control Efficiency	67%
Stack Designation:	ST3

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	1,881.26
Potential Startup/Shutdown Events (per year):	12

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 3. Turbine Emissions Calculations

Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Emission Factor Source
NO_X	7.30	lb/hr	Manufacturer - 9ppm
CO	7.41	lb/hr	Manufacturer - 15 ppm
SO_2	3.66E-03	lb/MMBtu	AP-42, Table 3.1-2a
PM	0.011	lb/MMBtu	Assume PM=PM_{10}.
PM_{10}	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
$PM_{2.5}$	0.011	lb/MMBtu	Manufacturer, PIL 171 Rev 11
VOC	0.848	lb/hr	20% of UHC per Manufacturer
Formaldehyde	0.003	lb/MMBtu	Manufacturer, PIL 168
CO_2	126.70	lb/MMBtu	40 CFR 98, Subpart C, Table C-1
CH_4	3.392	lb/hr	80% of UHC per Manufacturer
N_2O	2.4E-04	lb/MMBtu	40 CFR 98, Subpart C, Table C-2

*Emission factors from AP-42 and Subpart C are based on HHV. To calculate a LHV emission factor, emissions are multiplied by (HHV/LHV). For AP-42 HHV is 1020 Btu/scf, for Subpart C HHV is 1026 Btu/scf. PM and HCHO emission factors are provided in HHV in the specifications and were converted to LHV using a HHV value of 1020 Btu/scf.

Pollutant Emission Rates:

Pollutant	Pre-control Emissions		Post-control Emissions	
	(lb/hr)[1]	(tpy)[2]	(lb/hr)	(tpy)
NO_X	7.30	31.99	2.41	10.56
CO	7.41	32.73	1.48	6.76
SO_2	0.74	3.26	0.74	3.26
PM	2.19	9.59	2.19	9.59
PM_{10}	2.19	9.59	2.19	9.59
$PM_{2.5}$	2.19	9.59	2.19	9.59
VOC	0.85	3.79	0.51	2.30
Formaldehyde	0.63	2.76	0.13	0.55
CO_2	25,779	112,924	25,779	112,924
CH_4	3.39	19.15	3.39	19.15
N_2O	0.05	0.21	0.05	0.21
GHG (CO2e)	25887	113516	25887	113516

*Annual emissions shown above include startup/shutdown events.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 3. Turbine Emissions Calculations

Hazardous Air Pollutant (HAP) Emission Rates:

Pollutant	Emission Factor (lb/MMBtu)[3]	Potential Emissions (lb/hr)[1]	Potential Emissions (tpy)[2,4]
HAPs:			
Acetaldehyde	4.31E-05	8.76E-03	3.84E-02
Acrolein	6.89E-06	1.40E-03	6.14E-03
Benzene	1.29E-05	2.63E-03	1.15E-02
1,3-Butadiene	4.63E-07	9.42E-05	4.13E-04
Propylene Oxide	2.90E-05	5.90E-03	2.58E-02
Ethylbenzene	3.45E-05	7.01E-03	3.07E-02
Toluene	1.40E-04	2.85E-02	1.25E-01
Xylene	6.89E-05	1.40E-02	6.14E-02
Naphthalene	1.40E-06	2.85E-04	1.25E-03
PAH	2.37E-06	4.82E-04	2.11E-03
Total HAP (Including HCHO)		**0.20**	**0.86**

1. Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr) × Emission Factor (lb/MMBtu)

2. Emission Rate (tpy) = Emission Rate (lb/hr) × Hours of Operation (hr/yr) / 2000 (tons/lb) + SU/SD emissions, as applicable

3. Emission factors from AP-42 Section 3.1, Table 3.1-3 "Emission Factors for HAPs from Natural Gas Fired Stationary Gas Turbines", April 2000. Factors are based on HHV. Therefore, they were converted to LHV by multiplying by (HHV/LHV).

4. Emission calculations are based on maximum operating load of 100% load, ambient temperature 0°F and site elevation. The turbine ratings can vary with ambient conditions. Each Turbine is ISO rated at 31,900 HP

Startup/Shutdown Combustion Emission Factors:

Pollutant	Startup Emissions[a] (lbs/event)	Shutdown Emissions[a] (lbs/event)	Emission Factor Source
NO_X	1.0	1.0	Manufacturer
CO	24.0	21.0	Manufacturer
VOC	2.0	2.0	Manufacturer
CO_2	987	880.0	Manufacturer

a. Each startup and shutdown event is estimated to last approximately 10 minutes, per manufacturer. Emissions are using the highest value from PIL 170 Revision 11.

Pneumatic Start Venting Emissions		
Natural Gas Purged During Startup	4500	scfm
Duration of Normal Purge	4.0	min
Total Gas Purged (Per Startup)	18000	scf
VOC Purged (Per Startup)	9	lbs/startup
CO_2 Purged (Per Startup)	5	lbs/startup
CH_4 Purged (Per Startup)	715	lbs/startup
Site specific density of natural gas:	0.04	lb/ft^3

*Current design includes electric motor starts, but pneumatic starts have been included as a conservative measure.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 4. Microturbine Emissions Calculations

Microturbine Unit Information:

Engine ID:	S004-S018
Manufacturer:	Capstone
Model No.:	C200
Number of Units:	15

Microturbine Fuel Information:

	Per Unit
Fuel Type:	Natural Gas
Rated Electrical Power Output (kW):	200
Rated Electrical Power Output (MW):	0.2
Rated Horsepower (bhp):	268.2
Heat Input (MMBtu/hr)	2.28
Potential Fuel Consumption (MMBtu/yr):	19,973
Max. Annual Hours of Operation (hr/yr):	8,760

Microturbine Emissions Data:

Pollutant	Emission Factors	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	0.40	lb/MWhe	0.08	0.35	Manufacturer's Specifications
VOC	0.10	lb/MWhe	0.02	0.09	Manufacturer's Specifications
CO	1.10	lb/MWhe	0.22	0.96	Manufacturer's Specifications
SO_X	0.0034	lb/MMBtu	0.01	0.03	AP-42, Table 3.1-2a (Apr-2000)
PM	0.0019	lb/MMBtu	0.00	0.02	AP-42, Table 3.1-2a (Apr-2000)
PM_{10}	0.0066	lb/MMBtu	0.02	0.07	AP-42, Table 3.1-2a (Apr-2000)
$PM_{2.5}$	0.0066	lb/MMBtu	0.02	0.07	AP-42, Table 3.1-2a (Apr-2000)
GHG (CO_2e)	See Table Below		266	1,166	Manufacturer's Specifications / 40 CFR 98, Table C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this engine type.

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	1330	lb/MWhe	266	1,165	Manufacturer's Specifications
CH_4	0.001	kg/MMBtu	0.01	0.02	40 CFR 98, Tables C-1 & C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Tables C-1 & C-2
GHG (CO_2e)			**266**	**1,166**	
HAPs:					
1,3-Butadiene	4.3E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acetaldehyde	4.0E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Acrolein	6.4E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Benzene	1.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Ethylbenzene	3.2E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Formaldehyde	7.1E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.1-3 (Apr-2000)
Naphthalene	1.3E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
PAH	2.2E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Propylene oxide	2.9E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Toluene	1.3E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Xylene	6.4E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.1-3 (Apr-2000)
Total HAP			**0.002**	**0.010**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 5. Fuel Gas Heater Emissions Calculations

Fuel Gas Heater Information:

Source ID:	S019-S021
Number of Units:	3

Fuel Gas Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	0.77
Potential Fuel Consumption (MMBtu/yr):	6,738
Max. Fuel Consumption (MMscf/hr):	0.0007
Max. Fuel Consumption (MMscf/yr):	6.4
Max. Annual Hours of Operation (hr/yr):	8,760

Fuel Gas Heater Information:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.07	0.32	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.00	0.02	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.06	0.27	AP-42, Table 1.4-1 (Jul-1998)
SO_X	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM	1.9	lb/MMScf	0.00	0.01	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.01	0.02	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.01	0.02	AP-42, Table 1.4-2 (Jul-1998)
GHG (CO_2e)	See Table Below		90	395	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 5. Fuel Gas Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	90.00	394	40 CFR 98, Table C-1
CH_4	0.001	kg/MMBtu	0.00	0.01	40 CFR 98, Table C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			**90**	**395**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Formaldehyde	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.01	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.001**	**0.01**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 6. Fuel Gas Heater Emissions Calculations

Fuel Gas Heater Information:

Source ID:	S028-S029
Number of Units:	2

Fuel Gas Heater Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,052
Heat Input (MMBtu/hr)	1.15
Potential Fuel Consumption (MMBtu/yr):	10,108
Max. Fuel Consumption (MMscf/hr):	0.0011
Max. Fuel Consumption (MMscf/yr):	9.6
Max. Annual Hours of Operation (hr/yr):	8,760

Fuel Gas Heater Information:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
NO_X	100	lb/MMScf	0.11	0.48	AP-42, Table 1.4-1 (Jul-1998)
VOC	5.5	lb/MMScf	0.01	0.03	AP-42, Table 1.4-2 (Jul-1998)
CO	84	lb/MMScf	0.09	0.40	AP-42, Table 1.4-1 (Jul-1998)
SO_X	0.6	lb/MMScf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
PM	1.9	lb/MMScf	0.00	0.01	AP-42, Table 1.4-2 (Jul-1998)
PM_{10}	7.6	lb/MMScf	0.01	0.04	AP-42, Table 1.4-2 (Jul-1998)
$PM_{2.5}$	7.6	lb/MMScf	0.01	0.04	AP-42, Table 1.4-2 (Jul-1998)
GHG (CO_2e)	See Table Below		135	592	40 CFR 98, Tables C-1 & C-2
Other (Total HAP)	See Table Below		0.00	0.01	AP-42, Tables 1.4-3 & 1.4-4 (Jul-1998)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 6. Fuel Gas Heater Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	135.00	591	40 CFR 98, Table C-1
CH_4	0.001	kg/MMBtu	0.00	0.01	40 CFR 98, Table C-2
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			**135**	**592**	
Organic HAPs:					
2-Methylnaphthalene	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
3-Methylchloranthrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Acenapthylene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Anthracene	2.40E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benz(a)anthracene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzene	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(a)pyrene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Chrysene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dibenzo(a,h)anthracene	1.20E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Dichlorobenzene	1.20E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluoranthene	3.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Fluorene	2.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Formaldehyde	0.08	lb/MMScf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
n-Hexane	1.80E+00	lb/MMscf	0.00	0.01	AP-42, Table 1.4-3 (Jul-1998)
Indeno(1,2,3-c,d)pyrene	1.80E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Naphthalene	6.10E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Phenanthrene	1.70E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Pyrene	5.00E-06	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Toluene	3.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-3 (Jul-1998)
Metal HAPs:					
Arsenic	2.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Beryllium	4.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cadmium	1.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Chromium	1.40E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Cobalt	8.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Lead	5.00E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-2 (Jul-1998)
Manganese	3.80E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Mercury	2.60E-04	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Nickel	2.10E-03	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Selenium	2.40E-05	lb/MMscf	0.00	0.00	AP-42, Table 1.4-4 (Jul-1998)
Total HAP			**0.002**	**0.01**	

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 7. Storage Tank Emissions Calculations - Produced Fluids Tank

Storage Tank Information:

Source ID:	S022
Tank Capacity (gallons):	8,820
Tank Contents:	Produced Fluids
Annual Throughput (gallons/year):	458,640
Daily Throughput (bbl/day)	29.92
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Controlled Emissions		Emissions Estimation Method
	lbs/hr	tpy	lbs/hr	tpy	
VOC	0.00	0.01	0.00	0.01	ProMax
HAPs	0.00	0.00	0.00	0.00	ProMax
GHG (CO2e)	11.40	49.92	11.40	49.92	ProMax

Notes:

1. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 28) + N_2O (GWP = 265).

Promax Tanks Emissions Data:

Pollutant	Total Emissions (Working + Breathing + Flashing)			Total Emissions		
	lbs/hr	lbs/yr	tpy	lbs/hr	lbs/yr	tpy
VOC	0.00	29.29	0.01	0.00	29.29	0.01
HAPs	0.00	0.43	0.00	0.00	0.43	0.00
Carbon Dioxide	0.06	481.96	0.24	0.06	481.96	0.24
Methane	0.41	3,548.76	1.77	0.41	3,548.76	1.77
GHG (CO_2e)	11.40	99,847.23	49.92	11.40	99,847.23	49.92

Notes:

1. Emissions estimated using BR&E ProMax software.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 8. Storage Tank Emissions Calculations - Used Oil Tank

Storage Tank Information:

Source ID:	S023-S024
Tank Capacity (gallons):	3,000
Tank Contents:	Used Oil
Annual Throughput (gallons/year):	9,000
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	1.20E-05	5.26E-05	ProMax
HAPs	1.20E-05	5.26E-05	ProMax
GHG (CO_2e)	N/A	N/A	N/A

ProMax Emissions Data - Used Oil Tank:

Pollutant	Working Losses	Breathing Losses	Flashing Losses	Total Emissions		
	tpy	tpy	tpy	lbs/hr	lbs/yr	tpy
VOC	2.62E-06	4.99E-05	N/A	0.00	0.11	5.26E-05
HAPs	2.62E-06	4.99E-05	N/A	0.00	0.11	5.26E-05

Notes:

1. Emissions estimated using ProMax software.
2. This tank does not contain hydrocarbons that would be expected to be flashed off at tank operating conditions.

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 9. Liquid Loading Emissions Calculations

Liquid Loading Information:

Parameter	Value	Description
S	1.45	saturation factor for splash loading (AP-42 Table 5.2-1)
Collection Efficiency	0.0%	
Control Efficiency	0%	
P	0.21	true vapor pressure of liquid loaded (psia) - assume octane
M	114.23	molecular weight of vapors (lb/lb-mol) - assume octane
T	516.4	temperature of liquids loaded (deg R) - annual average temperature

Description	Loading Losses	Maximum Throughput[2]	VOC Emissions	
	(lb/10^3 gal)[1]	(gal)	(lb/hr)	(tpy)
Liquids Hauling	0.8	458,640	0.04	0.19

Notes:

1. Uncontrolled Loading Losses: L_L (lb/10^3 gal) = 12.46 (SPM)/T
2. Hourly emissions assume continuous operation (i.e., 8760 hr/yr).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 10. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	2,100	0.0004	Table 2-4	0.93	4.46	0.05	0.00
Flanges	578	0.0009	Table 2-4	0.50	2.39	0.03	0.00
Open-Ended Lines	21	0.0044	Table 2-4	0.09	0.45	0.00	0.00
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00
Valves	728	0.0099	Table 2-4	7.22	34.77	0.37	0.00
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00
Total				**8.73**	**42.07**	**0.45**	**0.00**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential CH_4 Emissions	Potential CO_2 Emissions	Potential CO_2e Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)	(tpy)
Connectors	2,100	0.0004	Table 2-4	0.93	4.46	3.95	0.03	110.65
Flanges	578	0.0009	Table 2-4	0.50	2.39	2.12	0.01	59.34
Open-Ended Lines	21	0.0044	Table 2-4	0.09	0.45	0.40	0.00	11.06
Pump Seals	0	0.0053	Table 2-4	0.00	0.00	0.00	0.00	0.00
Valves	728	0.0099	Table 2-4	7.22	34.77	30.79	0.21	862.46
Other	0	0.0194	Table 2-4	0.00	0.00	0.00	0.00	0.00
Total				**8.73**	**42.07**	**37.26**	**0.26**	**1043.51**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is based on the current design of the station.
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE.
4. CO2 and CH4 emissions are based on fractions of these pollutants in the site-specific gas analysis.
5. Emission factors are from EPA's Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017)

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	0.10	0.45	EPA Protocol, Table 2-4 & Site-Specific Gas Analysis
HAPs	0.00	0.00	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
GHG (CO_2e)	238	1,044	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 11. Blowdown Emission Calculations

[1]Mole fractions of CH_4 VOC, HAP and CO_2 based on gas analysis:

CH_4: 93.83% CO_2: 0.24% VOC 0.39% HAP 0.00%

[2]Weight fractions of CH_4 , VOC, HAP and CO_2 based on gas analysis:

CH_4: 88.56% CO_2: 0.61% VOC 1.07% HAP 0.00%

[3] Carbon equivalent emissions (CO_2e) are based on the following Global Warming Potentials (GWP) from 40 CFR Part 98, Table A-1:

Carbon Dioxide (CO_2): 1
Methane (CH_4): 28

Emissions from Compressor Seal:

Number of Compressors	Number of Seals Per Compressor	Leak Rate (scf/hr/compressor)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
3	2	600	31,536,000	7.54	0.01	4.31	626.25	17,539
Total				**7.54**	**0.01**	**4.31**	**626.25**	**17,539**

1. Leak rate was estimated by using the max dry seal compressor leak rate from NSPS OOOOb.
2. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)
Sample calculation: Volume vented (scf/yr) x density of natural gas (lb/scf) x wt % VOC / 2000 lb/ton
3. GHG emissions calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
Sample calculation: Volume vented (scf/yr) x density of GHG (kg/scf) x mol % VOC x 2.2 lb/kg / 2000 lb/ton

VOC and HAP Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Station ESD Vent	1,825,278	1	1,825,278	0.44	0.00	36.25	0.25	1,015
Compressor Unit 1 Blowdowns	240,241	12	2,882,896	0.69	0.00	57.25	0.39	1,603
Compressor Unit 2 Blowdowns	240,241	12	2,882,896	0.69	0.00	57.25	0.39	1,603
Compressor Unit 3 Blowdowns	150,747	12	1,808,958	0.43	0.00	35.92	0.25	1,006
Gas Filter Changes (All filters)	113,958	12	1,367,496	0.33	0.00	27.16	0.19	761
Total				**2.58**	**0.00**	**213.8**	**1.47**	**5,989**

1. GHG emissions calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
2. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)

VOC and HAP Vented Pigging Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Pig Suction Receiver Barrel	14,618	1	14,618	0.00	0.00	0.29	0.00	8
Pig Suction Receiver Kicker	5,956	1	5,956	0.00	0.00	0.12	0.00	3
Pig Suction Launcher Barrel	14,618	1	14,618	0.00	0.00	0.29	0.00	8
Pig Suction Launcher Kicker	7,461	1	7,461	0.00	0.00	0.15	0.00	4
Total				**0.01**	**0.00**	**0.85**	**0.01**	**23.72**

1. GHG emissions calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.
2. Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)

Blowdowns Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	2.31	10.13	Engineering Estimates, Manufacturer Data, and Site-
HAPs	0.00	0.02	Engineering Estimates, Manufacturer Data, and Site-
GHG (CO_2e)	5,377	23,552	Engineering Estimates, Manufacturer Data, and Site-Specific Gas Analysis

Hourly emissions are annualized (i.e., assume 8,760 hours per year).

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 12. Haul Road Emission Calculations

Unpaved Road Information:

Unpaved Roads: $E\ (lb/VMT) = k(s/12)^a(W/3)^b*[(365-p)/365]$

	PM	PM_{10}	$PM_{2.5}$	
k Factor (lb/VMT)	4.9	1.5	0.15	AP-42 Table 13.2.2-2 (Final, 11/06)
Silt content, s	4.8 %			AP-42 Table 13.2.2-1 (11/06), for Sand and Gravel Processing
Number of Rain Days, p	150			AP-42 Figure 13.2.1-2
a	0.7	0.9	0.9	AP-42 Table 13.2.2-2 (Final, 11/06)
b	0.45	0.45	0.45	AP-42 Table 13.2.2-2 (Final, 11/06)

Description	Weight of Empty Truck (tons)	Weight of Truck w/ Max Load (tons)	Mean Vehicle Weight (tons)	Length of Unpaved Road Traveled (mile/trip)	Trips Per Year	Mileage Per Year	Control (%)	Emissions (tpy) PM	PM_{10}	$PM_{2.5}$
Service Truck	4	4	4	0.07	365	26	0	0.02	0.01	0.00
Liquids Hauling - Vendor Fluid	12	20	16	0.07	4	0	0	0.00	0.00	0.00
Liquids Hauling - Produced Fluid	20	32	26	0.07	115	8	0	0.02	0.00	0.00
Employee Vehicles	2	2	2	0.07	365	26	0	0.02	0.00	0.00
Total Potential Emissions								**0.05**	**0.01**	**0.00**

Company Name: Mountain Valley Pipeline, LLC
Facility Name: Swann Compressor Station
Project Description: Resource Report 9 - Project Operational Emissions

TABLE 13. Site-Specific Gas Analysis

Sample Location: MVP Pipeline
HHV (Btu/scf): 1,052.08

Constituent	Natural Gas Stream Speciation (Vol. %)	Natural Gas Stream Speciation (Wt. %)	Molar Weight
Nitrogen	0.356	0.587	0.100
Oxygen	0.003	0.005	0.001
Methane	93.831	88.558	15.050
Carbon Dioxide	0.235	0.610	0.104
Ethane	5.184	9.172	1.559
Propane	0.335	0.869	0.148
Isobutane	0.020	0.067	0.011
n-Butane	0.029	0.100	0.017
Isopentane	0.004	0.016	0.003
n-Pentane	0.002	0.009	0.002
Cyclopentane	1.60E-04	0.001	0.000
Isohexane	3.60E-04	0.002	0.000
n-Hexane	2.40E-04	0.001	0.000
Benzene	5.00E-05	2.30E-04	0.000
Cyclohexane	7.00E-05	3.47E-04	0.000
Isoheptanes	6.00E-05	3.54E-04	0.000
Heptanes	3.00E-05	1.77E-04	0.000
Toluene	2.00E-05	1.08E-04	0.000
Methylcyclohexane	1.10E-04	0.001	0.000
2,2,4 Trimethylpentane	1.00E-05	6.72E-05	0.000
Octanes	1.00E-05	6.72E-05	0.000
Ethylbenzene	0.000	0.000	0.000
Xylenes	0.000	0.000	0.000
Isononanes	0.000	0.000	0.000
n-Nonane	0.000	0.000	0.000
Isodecanes	0.000	0.000	0.000
n-Decane	0.000	0.000	0.000
Isoundecanes+	0.000	0.000	0.000
Totals	100.000	100.000	16.995

TOC (Total)	99.41	98.80
VOC (Total)	0.39	1.07
HAP (Total)	0.00	0.00

Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9

Appendix 9-C
Bradshaw Compressor Station Air Quality Modeling Report

FEDERAL ENERGY REGUALTORY COMMISSION
AIR DISPERSION MODELING REPORT
Bradshaw Compressor Station

Mountain Valley Pipeline
Wetzel, West Virginia

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Project 253901.0130

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TABLE OF CONTENTS

1. INTRODUCTION 1-1

2. DISPERSION MODELING ANALYSIS 2-1
   - 2.1 Model Selection 2-1
   - 2.2 Coordinate System and Facility Location 2-1
   - 2.3 Receptor Grids 2-3
   - 2.4 Building Downwash and GEP Analysis 2-6
     - *2.4.1 GEP Height Analysis 2-6*
   - 2.5 Elevated Terrain 2-7
   - 2.6 Meteorological Data 2-7
   - 2.7 Rural/Urban Option Selection in AERMOD 2-8
   - 2.8 Source Parameters 2-9
     - *2.8.1 Combustion Turbines 2-9*
     - *2.8.2 Microturbines 2-9*
     - *2.8.3 Fuel Gas Heaters 2-10*
   - 2.9 Ambient Ratio Method Version 2 (ARM2) 2-10
   - 2.10 Background Concentrations 2-10
   - 2.11 Secondary PM2.5 and Ozone Formation 2-11
   - 2.12 Modeling Results 2-12

APPENDIX A. MODEL INPUTS

1. INTRODUCTION

Mountain Valley Pipeline, LLC (MVP) is proposing an expansion at an existing natural gas compressor station (Bradshaw Compressor Station) located on Bear Run Road in Smithfield (Wetzel County), West Virginia. The Bradshaw Compressor Station compresses and transports pipeline quality natural gas through an interstate natural gas pipeline, the Mountain Valley Pipeline, extending from northwestern West Virginia to southern Virginia.

The facility currently includes the following permitted emission sources:

- Four Solar Titan 130E natural gas-fired turbines each rated at 23,378 horsepower (hp) at site-specific conditions (ISO rating at 23,470 hp each);
- Fourteen Capstone C200 natural gas-fired microturbines each rated at 200 kW;
- Two (2) natural gas-fired, fuel gas heaters each rated at 1.54 million British thermal units per hour (MMBtu/hr);
- One (1) natural gas-fired, office building heater rated at 0.12 MMBtu/hr; and
- Two storage tanks (one for produced fluids and one for oil) with capacities less than 15,000 gallons.

MVP is proposing to authorize the following changes:

- One Solar Titan 130E natural gas-fired turbine rated at 23,483 hp at site-specific conditions (ISO rating at 23,470 hp) with associated compressor;
- One natural gas-fired, fuel gas heater rated at 1.54 MMBtu/hr;
- One Capstone C200 natural gas-fired microturbine rated at 200 kW; and
- Associated piping, fugitive components, and equipment.

Air dispersion modeling was completed using AERMOD (v24142), using all regulatory default options, to assess impacts to ambient air from operation of the proposed compressor station. Impacts for criteria pollutants were compared against both Class II Significant Impact Levels (SILs) and National Ambient Air Quality Standards (NAAQS).

SILs and NAAQS are atmospheric concentrations established by U.S. EPA for criteria pollutants. SILs are used to assess whether a project is significant – that is, whether impacts from the source may be anticipated to cause or significantly contribute to a potential exceedance of an ambient air quality standard (i.e., NAAQS). Exceedance of a SIL does not, on its own, indicate the exceedance of a federal air quality standard; instead, it conveys that further analysis should be completed. Primary NAAQS are standards set by U.S. EPA under the Clean Air Act to protect public health and define regulatory limits for an area to be designated "attainment". Thresholds for each of these standards are summarized in Tables 1-1 and 1-2.

Table 1-1. Significant Impact Levels (SIL)

Pollutant	Averaging Period	Form of Standard, As Modeled	Class II SIL (µg/m^3)
NO_2	1-Hr	Maximum of the 5-year average of the highest 1-hr impacts	7.5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1
PM_{10}	24-hr	H1H from a 5-year MET data set	5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1
$PM_{2.5}$	24-hr	Highest 5-year Average of the 1st High Impacts	1.2
	Annual	Highest 5-year Average of Annual Arithmetic Mean	0.13
CO	1-Hr	H1H from a 5-year MET data set	2,000
	8-Hr	H1H from a 5-year MET data set	500
SO2	1-Hr	Maximum of the 5-year average of the highest 1-hr impacts	7.8
	3-Hr	H1H from a 5-year MET data set	25
	24-Hr	H1H from a 5-year MET data set	5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1

Table 1-2. National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Period	Form of Standard, As Modeled	Primary NAAQS (µg/m^3)
NO_2	1-Hr	5-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations	188
	Annual	Maximum annual impacts from a 5-year MET data set	100
PM_{10}	24-hr	H6H from a 5-year MET data set	150
$PM_{2.5}$	24-hr	Highest 5-year average of the 8th high impacts	35
	Annual	Highest 5-year average of annual arithmetic mean	9
CO	1-Hr	Maximum individual year's H2H from a 5-year MET data set	40,000
	8-Hr	Maximum individual year's H2H from a 5-year MET data set	10,000
SO2	1-Hr	5-year average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations	196
Ozone	8-Hr	3-Year Average of annual 4th highest daily maximum 8-hr concentrations	70 ppb

2. DISPERSION MODELING ANALYSIS

In general, the air dispersion modeling analyses were carried out in accordance with applicable state and EPA guidance documents, including the following:

- EPA's *Guideline on Air Quality Models*, 40 CFR Part 51, Appendix W (Revised, November 29, 2024)
- EPA's *AERMOD Implementation Guide* (Revised, November 2024)
- EPA's User's Guide for the AMS/EPA Regulatory Model – AERMOD (Revised, November 2024)

Following this modeling guidance, the remainder of this section provides an overview of the modeling methods which were applied.

2.1 Model Selection

The EPA-approved version of the AERMOD modeling system (v24142) was used to estimate maximum ground-level concentrations over the full modeling domain. AERMOD is a refined, steady-state, multiple source, Gaussian dispersion model and is the preferred model for use by industrial sources for this type of air quality analysis.

The AERMOD modeling system is composed of three modular components: AERMAP, the terrain preprocessor; AERMET, the meteorological preprocessor; and AERMOD, the control module and modeling processor. AERMAP is the terrain pre-processor that is used to import terrain elevations for selected model objects and to generate the receptor hill height scale data that are used by AERMOD to drive advanced terrain processing algorithms. National Elevation Dataset (NED) data available from the United States Geological Survey (USGS) were utilized to interpolate surveyed elevations onto user specified receptor grids and for building and source locations in the absence of more accurate site-specific (i.e., site surveys, GPS analyses, etc.) elevation data.

AERMET generates a separate surface file and vertical profile file to pass meteorological observations and turbulence parameters to AERMOD. AERMET meteorological data are refined for a particular analysis based on the choice of micrometeorological parameters that are linked to the land use and land cover (LULC) around the meteorological site shown to be representative of the application site.

AERMOD was run using all regulatory default options.

2.2 Coordinate System and Facility Location

In all modeling analyses conducted for the compressor station, the location of emission sources, structures, and receptors were represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central 500 km meridian of each UTM zone, where the world is divided into 36 north-south zones). The datum for modeling of the compressor station was based on North American Datum 1983 (NAD 83). UTM coordinates for this analysis all resided within UTM Zone 17N, which served as the reference point for all facility source data, as well as all receptors. The approximate central location of the property is 540,136.3 meters easting and 4,376,042.2 meters northing [UTM Zone 17N]. The location of the proposed facility, projected in the UTM coordinate system, is provided in Figure 2-1 for reference.

Figure 2-1. Bradshaw Compressor Station Area Map

2.3 Receptor Grids

Ground-level concentrations were calculated from the property boundary out to 10 km using a series of nested receptor grids. Anticipating that impacts for the NO_2 1-hr and NO_2 annual standards (SIL, NAAQS) may extend beyond 10 km, the nested receptor grid was extended out to 30 km from the center of the property for these specific models.

Receptors were excluded from the fenced area contained within the property boundary. The fence serves as a physical boundary which restricts public access to the property. Air within the fence line is therefore not considered to be "ambient" and does not need to be assessed for compliance with the NAAQS.

Discrete receptors were placed along the ambient air boundary, as well as within a nested cartesian grid extending the facility center, as follows:

- **Boundary**: Receptors spaced at 25 meters (except at corners) placed along the ambient air boundary of the Manassas Facility,
- **Fine Cartesian Grid**: A "fine" grid containing 50-meter spaced receptors beginning at the ambient air boundary and extending to 1 km from the center of the property,
- **Medium-Fine Cartesian Grid**: A "medium-fine" grid containing 100-meter spaced receptors extending from 1 km to 3 km from the center of the property, exclusive of receptors on the fine grid,
- **Coarse Cartesian Grid**: A "coarse" grid containing 250-meter spaced receptors extending from 3 km to 10 km from the center of the facility, exclusive of receptors on the fine and medium-fine grids.
- **Very Coarse Cartesian Grid (NO_2 Only)**: A "very coarse" grid containing 500-meter spaced receptors extending from 10 km to 30 km from the center of the facility, exclusive of receptors on the fine, medium-fine and coarse grids. This nested receptor grid was used exclusively with the NO_2 1-Hr and NO_2 Annual models.

Note that maximum impacts identified from the modeling analyses were determined to have occurred at the property boundary or within bounds of the Fine Cartesian Grid. The receptor grid, as designed, was therefore determined to have appropriately captured maximum impacts.

The receptor grid and the approximate ambient air boundary are shown visually in Figures 2-2 and 2-3.

Figure 2-2. Receptor Grid (Zoomed Extent)

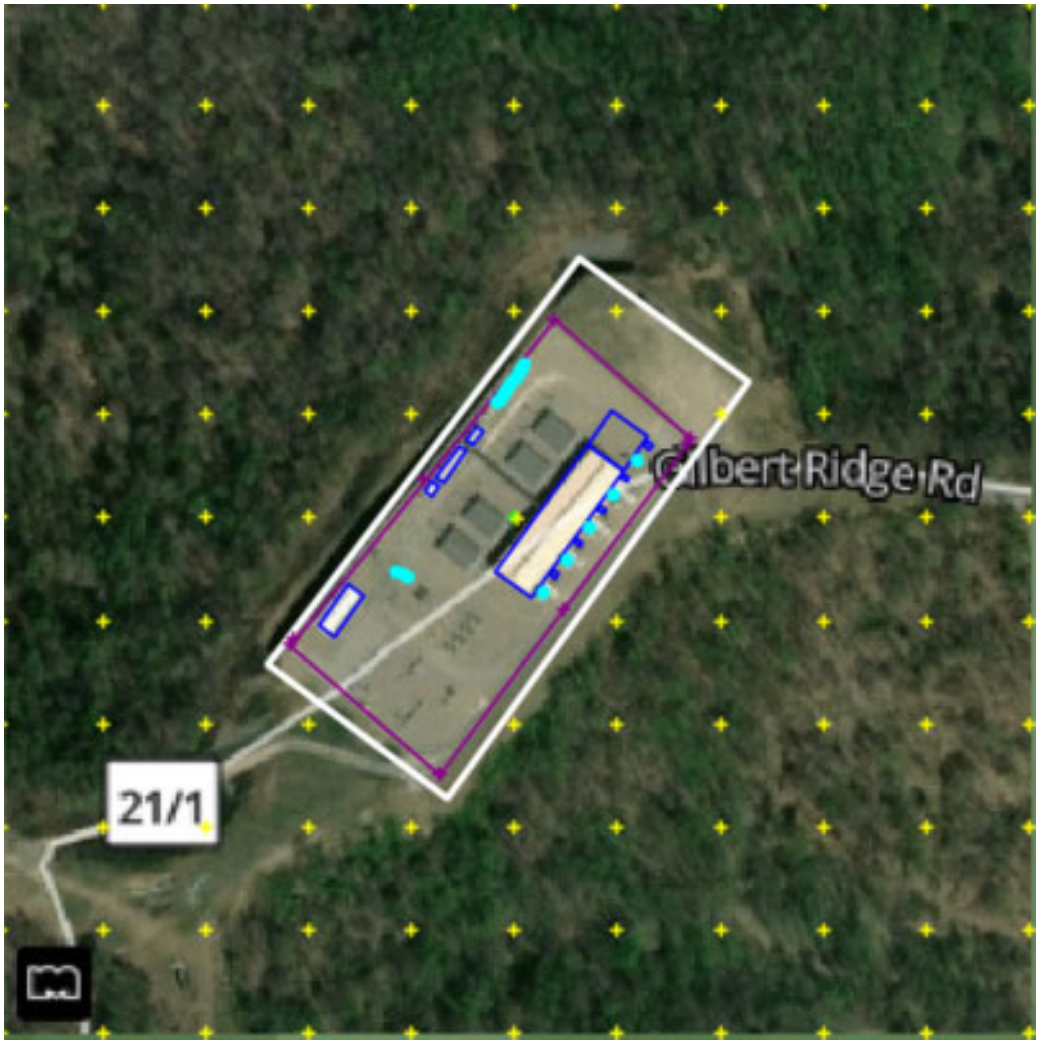
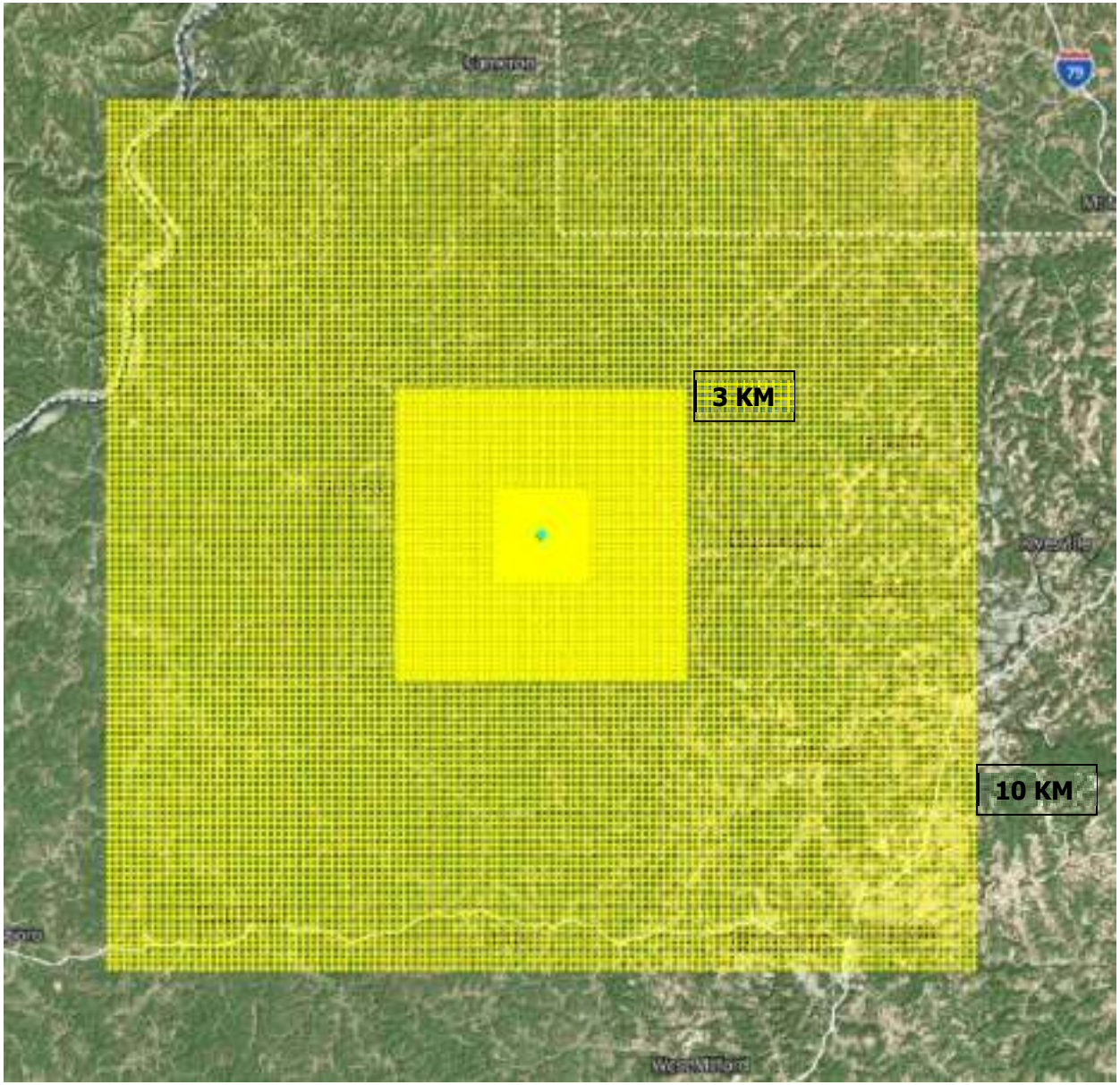


Figure 2-3. Receptor Grid (Full Extent)



2.4 Building Downwash and GEP Analysis

Stacks modeled for the compressor station are subject to building downwash effects. These effects are caused by air flow over and around buildings and structures disrupting the free flow movement of the wind. The result of this phenomenon is increased turbulence near buildings and structures. Downwash effects were addressed through the implementation of the Plume Rise Model Enhancements (PRIME) program found within the regulatory version of AERMOD.

Direction-specific building downwash dimensions (height and width of each influencing building or structure) were determined using the Building Profile Input Program, PRIME version (BPIP PRIME), v04274, and used in the AERMOD Model. BPIP PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document and the Building Downwash Guidance document, while incorporating the PRIME enhancements to improve prediction of ambient impacts in building cavities (very near the buildings) and wake regions (farther from the buildings).

Locations and dimensions for buildings and other structures at the facility were primarily determined though use of engineering design documents for the proposed facility. Structures were excluded if their dimensions were determined insignificant, or if the design of the structure would allow for air to pass through with minimal disruption. Where information could not be directly determined based on available reference documents, professional judgement was used for estimation of structure parameters.

Buildings and significant structures which were included in the model are shown in Figure 2-2, for reference.

2.4.1 GEP Height Analysis

EPA has promulgated stack height regulations that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP height is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

$H_{GEP} = H + 1.5\ L$, where:

H_{GEP} = minimum GEP stack height,
H = structure height, and
L = lesser dimension of the structure (height or predicted width)

This equation is limited to stacks located within 5L of a structure. Stacks located at a distance greater than 5L are not subject to the wake effects of the structure. The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP. In general, the lowest GEP stack height for any source is 65 m by default.[1]

No stack at the Bradshaw Compressor Station will have a height above grade exceeding GEP height. Therefore, stacks were modeled at their actual heights.

[1] 40 CFR 81.100(ii)

2.5 Elevated Terrain

Receptor elevations (excluding property boundary receptors) were determined from USGS National Elevation Dataset (NED) elevation data, using 1/3 arc second resolution files. Receptors were assigned base elevations using NED data, as interpolated through the AERMAP terrain preprocessor (v24142). The NED consists of arrays of regularly spaced elevations at 10-meter intervals. Elevations are assigned by AERMAP based upon the maximum terrain elevation associated with the four NED points surrounding the specified object. For all modeled receptors, AERMAP additionally derived an effective hill height scale, which determined the magnitude of interactions between each source plume and elevated terrain features.

Elevations for buildings, sources and property boundary receptors were assigned based on the anticipated graded elevation of the facility, which is approximately 1,500 ft (~450 m).

2.6 Meteorological Data

Site-specific dispersion models require a sequential hourly record of dispersion meteorology, representative of the region in which the source is located. In the absence of site-specific measurements, the U.S. EPA guidelines recommend the use of readily available data from the closest and most representative National Weather Service (NWS) station. Regulatory air dispersion modeling using AERMOD requires five years of quality-assured meteorological data, incorporating both surface and upper air observations.

Surface and upper-air meteorological data were processed through the latest version of AERMET (v24142), using data for the following meteorological stations, which were selected as representative based on their proximity to the site and similar land cover:

- Surface Station
  - Morgantown, West Virginia [MGW] (Station Number 13736)
  - Approximate Distance from Proposed Facility: 82.5 km
- Upper Air Station
  - Morgantown, West Virginia [MGW] (Station Number 72520)
  - Approximate Distance from Proposed Facility: 82.5 km

Meteorological data was processed for a 5-year period extending from 2020-2024.

Figure 2-4. Meteorological Station Location

2.7 Rural/Urban Option Selection in AERMOD

As stated in Section 7.2.1.1, Dispersion Coefficients, of the Guideline on Air Quality Models, for any dispersion modeling exercise, the "urban" or "rural" determination of the location surrounding the source is important in determining the applicable boundary layer characteristics that affect a model's calculation of ambient concentrations. Thus, a determination was made of whether the area around the Bradshaw Compressor Station is urban or rural.

The "land use procedure", as discussed in the Guideline on Air Quality Models (Section 7.2.1.1(b)(i) of Appendix W), is typically used to assess the predominant land use characterization of the surrounding area when rural vs urban determination cannot be made visually. The guidance says that when urban land use types account for 50% or more of the circumscribed area, urban dispersion coefficients should be used; otherwise, rural dispersion coefficients are appropriate.

As this facility is located in very rural area of West Virigina, a visual determination method was used. Using Google Earth, the distance to the closest town of Smithfield was identified at over 3.5 km. Additionally, the image of the facility shows that the site is surrounded entirely by West Virginia mountains and forests. Therefore, a fair determination would be that this facility is rural and will use rural dispersion coefficients.

2.8 Source Parameters

The AERMOD dispersion model allows for emission units to be represented as point, area, or volume sources. Emissions from all modeled sources at the Bradshaw compressor station will emanate from clearly discernable emission points (e.g., stacks). Stack parameters for all sources are provided in Appendix A. This section provides additional narrative on how stack parameters were derived.

2.8.1 Combustion Turbines

The facility will operate five (5) combustion turbines. Turbine stacks were modeled as point sources with unobstructed vertical orientation. All combustion turbines were modeled as operating simultaneously. Turbine stack parameters and emission rates are representative of a 0 °F ambient temperature condition. In general, a low ambient temperature condition represents a worst-case emission scenario for combustion turbines, due to the increased fuel input (MMBtu/hr) required at reduced ambient temperatures. Emission rates for annual models considered continuous turbine operation (i.e., 8,760 hrs/yr), inclusive of potential emissions from startup and shutdown cycles.

Anticipating potential variability for impacts as a result of turbine operating load, models were separately carried out representing turbine operation at the following load conditions: 100% load, 75% load and 50% load. Under each load condition, all turbines were simultaneously modeled as operating at that load. Startup/shutdown conditions, while accounted for in emission rates for annual models, were not assessed as a separate load condition for short-term (1-hr, 3-hr, 8-hr, 24-hr) models due to the intermittent nature of unit startup and shutdown.

2.8.2 Microturbines

The facility will operate fifteen (15) microturbines. Microturbines were modeled as point sources with unobstructed vertical orientation. All microturbines were modeled as operating simultaneously. Apart from exit velocity, as detailed below, microturbines were otherwise modeled according to their design stack exit parameters. Emission rates for short-term models used the maximum hourly potential emission rate of each microturbine, based on its rated heat input capacity. Emission rates for annual models considered continuous operation (i.e., 8,760 hrs/yr) of all microturbines.

A weather rain flap will be installed on each microturbine, which will open to a 45° angle when the units are in operation. The non-vertical exit of the stacks resulting from the rain flaps has been accounted for by modeling each source as an angled stack – that is, taking credit only for the vertical component of the exit velocity when exhausting at a 45° above horizontal. The function used to derive the vertical exit velocity is shown below:

$$Vvert = Vact\ x\ \sin\left(angle\ of\ stack\ from\ horizontal\right)$$

Where:
V_{vert} = Vertical component of exit velocity (m/s), as input into the model
V_{act} = Actual exit velocity of the stack (m/s)

At an angle of 45° from horizontal, the vertical component of the exit velocity is equivalent to approximately 70.7% of the actual exit velocity of the stack.

2.8.3 Fuel Gas Heaters

The facility will operate three (3) fuel gas heaters. Fuel gas heaters will operate without rain caps and were modeled as point sources with unobstructed vertical orientation. Fuel heaters were modeled according to their anticipated design exit parameters.

All fuel gas heaters were modeled as operating simultaneously. Emission rates for short-term models used the maximum hourly potential emission rate of each fuel gas heater, based on its rated heat input capacity. Emission rates for annual models considered continuous operation (i.e., 8,760 hrs/yr) of all heaters.

2.9 Ambient Ratio Method Version 2 (ARM2)

NO_X emissions from combustion sources at the facility will primarily be released in the form of nitric oxide (NO), whereas NAAQS standards are established for nitrogen dioxide (NO_2). With this considered, in the "Models for Nitrogen Dioxide" section of the Guideline (Section 4.2.3.4), U.S. EPA recommends a tiered screening approach for estimating NO_2 impacts from combustion point sources. Use of the tiered approach for NO_2 modeling, described briefly below, was considered for the Bradshaw Compressor Station.

1. Under the initial and most conservative Tier 1 screening level, all NO_X emitted is modeled as NO_2. This assumes total conversion of NO (main chemical form of NO_X) to NO_2.
2. For the Tier 2 screening level, U.S. EPA recommends multiplying the Tier 1 results by the Ambient Ratio Method 2 (ARM2). ARM2 provides estimates of representative equilibrium ratios of NO_2/NO_X based on ambient levels of NO_2 and NO_X, derived from national data from the U.S. EPA's Air Quality System (AQS). The ARM2 function is a default regulatory option within the latest version of AERMOD.
3. Since the impact of an individual NO_X source on ambient NO_2 depends on the chemical environment into which the source's plume is emitted, modeling techniques that account for this atmospheric chemistry such as the Ozone Limiting Method (OLM), the Plume Volume Molar Ratio Method (PVMRM), or Generic Reaction Set Method (GRSM) can be considered under the most accurate and refined Tier 3 approach identified by U.S. EPA. Additional model inputs required for the use of OLM, PVMRM, or GRSM could include source-specific in-stack NO_2/NO_X ratios, ambient equilibrium NO_2/NO_X ratios, background ozone concentrations, and background NO_X/NO_2 concentrations.

For the 1-hour and annual NO_2 standards, MVP employed a Tier 2 NO_2 modeling approach, utilizing the ARM2 function in AERMOD. The regulatory-approved U.S. EPA default settings were used, including a minimum ambient NO_2/NO_X ratio of 0.5 and maximum ambient ratio of 0.9.

2.10 Background Concentrations

Background concentrations, quantifying the existing ambient air quality of the surrounding area, were obtained using data (2022-2024) from representative air quality monitors maintained by U.S. EPA. Air monitors were determined to be representative based on a number of criteria, including their distance to the facility, surrounding land cover and data availability. Monitors located within close proximity to large industrial sources were not considered due to the influence of these sources on monitoring values. In general, the monitors located closest to the proposed facility were determined to be representative. Note that no exclusions were made for smoke events (ex. fireworks, wildfires) when processing $PM_{2.5}$ monitoring data.

Background concentrations are summarized in Table 2-1. Background Concentration Data. Background pollutant concentrations were added to modeled impacts for NAAQS models in order to determine potential cumulative impacts on ambient air.

Table 2-1. Background Concentration Data

Pollutant	Averaging Period	Concentration (µg/m³)	Monitoring Station	Site ID	Distance from Station (km)
NO_2	1-hour	62.09	Charleroi Waste Treatment Plant	42-125-0005	87
	Annual	14.54	Charleroi Waste Treatment Plant	42-125-0005	87
PM_{10}	24-hour	74.00	Weirton Summit Circle	54-029-0009	100
$PM_{2.5}$	24-hour	15.67	Holbrook	42-059-0002	38
	Annual	6.60	Holbrook	42-059-0002	38
CO	1-hour	10,994	North Braddock	42-003-1301	109
	8-hour	5,268	North Braddock	42-003-1301	109
SO_2	1-Hr	24.43	Morgantown - Airport US	54-061-0003	54
Ozone	8-hour	63 ppb	Holbrook	42-059-0002	38

2.11 Secondary PM2.5 and Ozone Formation

The current guideline model for Class II Area air dispersion modeling, AERMOD, does not account for many of the complex atmospheric physical and chemical mechanisms which can influence the formation of secondary $PM_{2.5}$ and ozone. Secondary $PM_{2.5}$ and ozone were therefore separately assessed following U.S. EPA's Modeled Emission Rates for Precursors (MERPs) guidance. MERPs is a Tier 1 demonstration tool. Following this guidance, sources are compared against representative hypothetical stacks, which have been modeled by EPA for downwind secondary air quality impacts. The intent of MERPs is to establish a technically credible relationship between emission rates for precursor pollutants and their secondary impacts.

Secondary $PM_{2.5}$ formation was assessed as generated from NO_X and SO_2 precursors, and ozone from NO_X and VOC precursors. Total facility-wide potential emissions of these precursor pollutants from the Bradshaw Compressor Station were considered. MVP used pre-established MERPs values based on EPA photochemical grid modeling as the primary indicator that the project is not expected to cause or contribute to a violation of the NAAQS for ozone. Similarly, secondary $PM_{2.5}$ impacts determined from the MERPs assessment were added to cumulative impacts modeled for the $PM_{2.5}$ 24-hr and $PM_{2.5}$ annual Significance and NAAQS analyses.

Hypothetical sources were identified using the U.S. EPA's MERPs View Qlik website. Based on proximity, climate zone and terrain/land use, the Ashe County, North Carolina MERPs source was determined to be representative. Hypothetical stacks modeled at the Ashe County location (10 m height, 500 tpy emission rate) which were most closely aligned with the stacks that will be constructed at the Bradshaw Compressor Station were used to carry out the MERPs analysis. Secondary impacts for the $PM_{2.5}$ 24-hr averaging period are estimated at 0.029 µg/m³, secondary impacts for the $PM_{2.5}$ annual averaging period are estimated at 0.0018 µg/m³ and secondary impacts for the ozone 8-hr averaging period are estimated at 0.748 ppb (less than the ozone SIL of 1 ppb).

2.12 Modeling Results

Results from the dispersion modeling, following the methodology outlined in the previous section, are summarized in Table 2-4 and Table 2-5. The results presented in the tables include the project impacts, as well as facility-wide impacts compared to applicable thresholds.

Table 2-2. Summary of Modeling Results, SIL

Pollutant	Averaging Period	Facility Total	Project	SIL Standard (µg/m³)	Below SIL	Significant Impact Area [STA] (km)
NO_2	1-Hr	78.43	17.99	7.5	No	2.19
	Annual	3.36	0.46	1	No	0.87
PM_{10}	24-hr	7.70	0.62	5	No	0.11
	Annual	0.63	0.06	1	Yes	--
$PM_{2.5}$	24-hr	7.70	0.62	1.2	No	0.65
	Annual	0.60	0.06	0.13	No	5.22
CO	1-Hr	233.24	22.07	2,000	Yes	--
	8-Hr	173.37	12.56	500	Yes	--
SO_2	1-Hr	7.74	1.08	7.8	Yes	--
	3-Hr	6.26	0.56	25	Yes	--
	24-Hr	3.89	0.31	5	Yes	--
	Annual	0.29	0.02	1	Yes	--
Ozone	8-Hr	0.75 ppb		1 ppb	Yes	--

[1] Maximum modeled impact and estimated secondary impacts from precursor pollutants for $PM_{2.5}$ and ozone.

As shown in Table 2-4, modeled impacts exceed the significant impact levels (SIL) for NO_2 (1-hr, Annual), PM_{10} (24-hr), and $PM_{2.5}$ (24-hr, Annual). The significant impact areas (SIA) shown for these pollutants represent the maximum distance at which a receptor was found to be above the SIL. Nominal differences for maximum impacts and SIAs were noted when comparing results across variable turbine operating loads. Note that SIL results are provided for general reference and do not, on their own, indicate an exceedance of a federal ambient air quality standard.

As shown in Table 2-5, maximum cumulative impacts from operation of the compressor station are not anticipated to cause an exceedance of the NAAQS for any pollutant or averaging period. Negligible differences for maximum impacts were noted when comparing results across variable turbine loads.

Table 2-3. Summary of Modeling Results, NAAQS

Pollutant	Averaging Period	Rank	Facility (µg/m³)	Project (µg/m³)	Background (µg/m³)	Facility Total (µg/m³)	Project Total (µg/m³)	Primary NAAQS (µg/m³)	Below NAAQS?	% of NAAQS (Project Total)
NO_2	1-Hr	H8H	65.79	14.24	62.09	127.88	76.33	188	Yes	68.0%
	Annual	H1H	3.36	0.46	14.54	17.90	15.00	100	Yes	17.9%
PM_{10}	24-hr	H6H	3.52	0.31	74.00	77.52	74.31	150	Yes	51.7%
$PM_{2.5}$	24-hr	H8H	3.14	0.24	15.67	18.81	15.91	35	Yes	53.7%
	Annual	H1H	0.60	0.06	6.60	7.20	6.66	9	Yes	80.0%
CO	1-Hr	H2H	214.33	20.17	10,994	11,208	11,014	40,000	Yes	28.0%
	8-Hr	H2H	161.10	12.15	5,268	5,429	5,280	10,000	Yes	54.3%
SO_2	1-Hr	H4H	6.59	0.53	24.43	31.02	24.96	196	Yes	15.8%
Ozone	8-Hr	-	0.75 ppb		63.0 ppb	63.75 ppb		70 ppb	Yes	91.1%

a. Includes maximum modeled impact, background concentrations (refer to Table 2-3) and estimated secondary impacts from precursor pollutants for $PM_{2.5}$ and ozone. Regional sources were not considered for purposes of this modeling assessment.

APPENDIX A. MODEL INPUTS

Mountain Valley Pipeline, LLC
FERC Resource Report 9 Modeling
Appendix A: Source Parameters and Emission Rates

Table A-1. Summary of Modeled Point Source Emission Rates

Point Sources

Emission Point ID	Description	NO_2		SO_2		CO	PM_{10}		$PM_{2.5}$		NO_2		SO_2		CO	PM_{10}		$PM_{2.5}$	
		ST (lb/hr)	LT (tpy)	ST (lb/hr)	LT (tpy)	ST (lb/hr)	ST (lb/hr)	LT (tpy)	ST (lb/hr)	LT (tpy)	ST (g/s)	LT (g/s)	ST (g/s)	LT (g/s)	ST (g/s)	ST (g/s)	LT (g/s)	ST (g/s)	LT (g/s)
S001	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine	9.80	42.95	0.60	2.62	9.90	2.64	11.57	2.64	11.57	1.234779	1.235521	0.075443	0.075443	1.247379	0.332837	0.332837	0.332837	0.332837
S001_75	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine, 75%	7.80	34.19	0.52	2.26	7.90	2.27	9.96	2.27	9.96	0.982783	0.983526	0.064917	0.064917	0.995383	0.286399	0.286399	0.286399	0.286399
S001_50	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine, 50%	5.10	22.36	0.43	1.89	5.20	1.90	8.32	1.90	8.32	0.642589	0.643331	0.054240	0.054240	0.655189	0.239293	0.239293	0.239293	0.239293
S002	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine	9.80	42.95	0.60	2.62	9.90	2.64	11.57	2.64	11.57	1.234779	1.235521	0.075443	0.075443	1.247379	0.332837	0.332837	0.332837	0.332837
S002_75	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine, 75%	7.80	34.19	0.52	2.26	7.90	2.27	9.96	2.27	9.96	0.982783	0.983526	0.064917	0.064917	0.995383	0.286399	0.286399	0.286399	0.286399
S002_50	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine, 50%	5.10	22.36	0.43	1.89	5.20	1.90	8.32	1.90	8.32	0.642589	0.643331	0.054240	0.054240	0.655189	0.239293	0.239293	0.239293	0.239293
S003	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine	9.80	42.95	0.60	2.62	9.90	2.64	11.57	2.64	11.57	1.234779	1.235521	0.075443	0.075443	1.247379	0.332837	0.332837	0.332837	0.332837
S003_75	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine, 75%	7.80	34.19	0.52	2.26	7.90	2.27	9.96	2.27	9.96	0.982783	0.983526	0.064917	0.064917	0.995383	0.286399	0.286399	0.286399	0.286399
S003_50	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine, 50%	5.10	22.36	0.43	1.89	5.20	1.90	8.32	1.90	8.32	0.642589	0.643331	0.054240	0.054240	0.655189	0.239293	0.239293	0.239293	0.239293
S004	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine	9.80	42.95	0.60	2.62	9.90	2.64	11.57	2.64	11.57	1.234779	1.235521	0.075443	0.075443	1.247379	0.332837	0.332837	0.332837	0.332837
S004_75	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine, 75%	7.80	34.19	0.52	2.26	7.90	2.27	9.96	2.27	9.96	0.982783	0.983526	0.064917	0.064917	0.995383	0.286399	0.286399	0.286399	0.286399
S004_50	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine, 50%	5.10	22.36	0.43	1.89	5.20	1.90	8.32	1.90	8.32	0.642589	0.643331	0.054240	0.054240	0.655189	0.239293	0.239293	0.239293	0.239293
S005	Microturbine 1: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S006	Microturbine 2: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S007	Microturbine 3: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S008	Microturbine 4: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S009	Microturbine 5: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S010	Microturbine 6: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S011	Microturbine 7: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S012	Microturbine 8: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S013	Microturbine 9: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S014	Microturbine 10: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S015	Microturbine 11: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S016	Microturbine 12: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S017	Microturbine 13: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S018	Microturbine 14: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S019	Fuel Gas Heater 1	0.15	0.64	0.00	0.00	0.12	0.01	0.05	0.01	0.05	0.018425	0.018425	0.000111	0.000111	0.015477	0.001400	0.001400	0.001400	0.001400
S020	Fuel Gas Heater 2	0.15	0.64	0.00	0.00	0.12	0.01	0.05	0.01	0.05	0.018425	0.018425	0.000111	0.000111	0.015477	0.001400	0.001400	0.001400	0.001400
S027	Turbine 5: Solar Titan 130 Centrifugal Compressor Turbine	5.91	25.90	0.60	2.63	1.20	1.77	7.74	1.77	7.74	0.744647	0.744993	0.075671	0.075671	0.151197	0.222563	0.222563	0.222563	0.222563
S027_75	Turbine 5: Solar Titan 130 Centrifugal Compressor Turbine, 75%	5.23	22.92	0.53	2.33	5.31	1.56	6.85	1.56	6.85	0.658969	0.659314	0.066963	0.066963	0.669049	0.196949	0.196949	0.196949	0.196949
S027_50	Turbine 5: Solar Titan 130 Centrifugal Compressor Turbine, 50%	4.30	18.85	0.44	1.91	4.36	1.28	5.63	1.28	5.63	0.541791	0.542136	0.055048	0.055048	0.549351	0.161906	0.161906	0.161906	0.161906
S028	Microturbine 15: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S029	Fuel Gas Heater 3	0.15	0.64	0.00	0.00	0.12	0.01	0.05	0.01	0.05	0.018425	0.018425	0.000111	0.000111	0.015477	0.001400	0.001400	0.001400	0.001400

Mountain Valley Pipeline, LLC
FERC Resource Report 9 Modeling
Appendix A: Source Parameters and Emission Rates

Table A-2. Summary of Point Source Parameters

Point Sources

Emission Point ID	Description	UTM East	UTM North	Elevation	Stack Height	Stack Temperature	Exit Velocity	Stack Diameter
		m	m	m	m	K	m/s	m
S001	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine	540150.3	4376006.1	448.67	15.01	758.71	36.18	2.751
S001_75	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine 75	540150.3	4376006.1	448.67	15.01	746.48	35.11	2.751
S001_50	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine 50	540150.3	4376006.1	448.67	15.01	750.93	31.14	2.751
S002	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine	540161.7	4376021.8	448.67	15.01	758.71	36.18	2.751
S002_75	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine 75	540161.7	4376021.8	448.67	15.01	746.48	35.11	2.751
S002_50	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine 50	540161.7	4376021.8	448.67	15.01	750.93	31.14	2.751
S003	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine	540173	4376037.4	448.67	15.01	758.71	36.18	2.751
S003_75	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine 75	540173	4376037.4	448.67	15.01	746.48	35.11	2.751
S003_50	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine 50	540173	4376037.4	448.67	15.01	750.93	31.14	2.751
S004	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine	540184.4	4376053.1	448.67	15.01	758.71	36.18	2.751
S004_75	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine 75	540184.4	4376053.1	448.67	15.01	746.48	35.11	2.751
S004_50	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine 50	540184.4	4376053.1	448.67	15.01	750.93	31.14	2.751
S005	Microturbine 1: Capstone C200 Generator Turbine	540136.6	4376109.9	448.67	3.73	552.59	20.19	0.305
S006	Microturbine 2: Capstone C200 Generator Turbine	540137.5	4376111.2	448.67	3.73	552.59	20.19	0.305
S007	Microturbine 3: Capstone C200 Generator Turbine	540138.3	4376112.5	448.67	3.73	552.59	20.19	0.305
S008	Microturbine 4: Capstone C200 Generator Turbine	540139.3	4376113.9	448.67	3.73	552.59	20.19	0.305
S009	Microturbine 5: Capstone C200 Generator Turbine	540140.2	4376115.2	448.67	3.73	552.59	20.19	0.305
S010	Microturbine 6: Capstone C200 Generator Turbine	540131.9	4376103.5	448.67	3.73	552.59	20.19	0.305
S011	Microturbine 7: Capstone C200 Generator Turbine	540130.8	4376102.2	448.67	3.73	552.59	20.19	0.305
S012	Microturbine 8: Capstone C200 Generator Turbine	540129.9	4376100.8	448.67	3.73	552.59	20.19	0.305
S013	Microturbine 9: Capstone C200 Generator Turbine	540129	4376099.5	448.67	3.73	552.59	20.19	0.305
S014	Microturbine 10: Capstone C200 Generator Turbine	540127.9	4376098.3	448.67	3.73	552.59	20.19	0.305
S015	Microturbine 11: Capstone C200 Generator Turbine	540132.8	4376104.8	448.67	3.73	552.59	20.19	0.305
S016	Microturbine 12: Capstone C200 Generator Turbine	540135.6	4376108.7	448.67	3.73	552.59	20.19	0.305
S017	Microturbine 13: Capstone C200 Generator Turbine	540133.7	4376106.1	448.67	3.73	552.59	20.19	0.305
S018	Microturbine 14: Capstone C200 Generator Turbine	540134.7	4376107.4	448.67	3.73	552.59	20.19	0.305
S019	Fuel Gas Heater 1	540078.5	4376016.3	448.67	5.49	727.59	5.10	0.305
S020	Fuel Gas Heater 2	540081.7	4376015	448.67	5.49	727.59	5.10	0.305
S027	Turbine 5: Solar Titan 130 Centrifugal Compressor Turbine	540196.1	4376069.8	448.67	15.01	730.93	37.12	2.751
S027_75	Turbine 5: Solar Titan 130 Centrifugal Compressor Turbine 75	540196.1	4376069.8	448.67	15.01	737.59	35.34	2.751
S027_50	Turbine 5: Solar Titan 130 Centrifugal Compressor Turbine 50	540196.1	4376069.8	448.67	15.01	742.04	31.04	2.751
S028	Microturbine 15: Capstone C200 Generator Turbine	540141.4	4376116.4	448.67	3.73	552.59	20.19	0.305
S029	Fuel Gas Heater 3	540084.5	4376013.7	448.67	5.49	727.59	5.10	0.305

Notes:

All coordinates are Universal Transverse Mercator (UTM) coordinates based on North American Datum 1983 (NAD 83) and reside within UTM Zone 17.

Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9

Appendix 9-D
Harris Compressor Station Air Quality Modeling Report

FEDERAL ENERGY REGUALTORY COMMISSION
AIR DISPERSION MODELING REPORT
Harris Compressor Station

Mountain Valley Pipeline
Braxton County, West Virginia

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Project 253901.0130

TABLE OF CONTENTS

1. INTRODUCTION 1-1

2. DISPERSION MODELING ANALYSIS 2-1
   - 2.1 Model Selection 2-1
   - 2.2 Coordinate System and Facility Location 2-1
   - 2.3 Receptor Grids 2-3
   - 2.4 Building Downwash and GEP Analysis 2-6
     - *2.4.1 GEP Height Analysis 2-6*
   - 2.5 Elevated Terrain 2-7
   - 2.6 Meteorological Data 2-7
   - 2.7 Rural/Urban Option Selection in AERMOD 2-8
   - 2.8 Source Parameters 2-9
     - *2.8.1 Combustion Turbines 2-9*
     - *2.8.2 Microturbines 2-9*
     - *2.8.3 Fuel Gas Heaters 2-10*
   - 2.9 Ambient Ratio Method Version 2 (ARM2) 2-10
   - 2.10 Background Concentrations 2-10
   - 2.11 Secondary PM2.5 and Ozone Formation 2-11
   - 2.12 Modeling Results 2-12

APPENDIX A. MODEL INPUTS

1. INTRODUCTION

Mountain Valley Pipeline, LLC (MVP) is proposing the construction and operation of a new turbine at an existing natural gas compressor station (Harris Compressor Station) located on County Route 24/5 in Flatwoods (Braxton County), West Virginia. The Harris Compressor Station compresses and transports pipeline quality natural gas through an interstate natural gas pipeline, the Mountain Valley Pipeline, extending from northwestern West Virginia to southern Virginia.

The facility currently includes the following permitted emission sources:

- Two (2) Solar Titan 130 natural gas-fired turbines each rated at 20,609 horsepower (hp) at site-specific conditions (ISO rating at 20,500 hp each)1;
- Nine (9) Capstone C200 natural gas-fired microturbines each rated at 200 kW;
- Two natural gas-fired, fuel gas heaters each rated at 1.54 million British thermal units per hour (MMBtu/hr);
- One (1) natural gas-fired, office building heater rated at 0.12 MMBtu/hr; and
- Two (2) storage tanks (one for produced fluids and one for oil) with capacities less than 15,000 gallons.

There is one natural gas-fired, pipeline heater rated at 9.0 MMBtu/hr, located at an interconnect near the Harris station (i.e., within approximately ¼ mile). This unit has been included as part of the Harris Compressor Station. There are no other facilities located within ¼ mile of the Harris Compressor Station.

MVP is proposing to authorize the following equipment:

- One (1) Solar Titan 350 natural gas-fired turbines rated at 56,590 hp at site-specific conditions (ISO rating at 52,500 hp);
- One (1) natural gas-fired fuel gas heater rated at 1.54 MMBtu/hr;
- Four (4) Capstone C200 natural gas-fired microturbines rated at 200 kW; and
- Associated piping, fugitive components, and equipment.

Air dispersion modeling was completed using AERMOD (v24142), using all regulatory default options, to assess impacts to ambient air from operation of the proposed compressor station. Impacts for criteria pollutants were compared against both Class II Significant Impact Levels (SILs) and National Ambient Air Quality Standards (NAAQS).

SILs and NAAQS are atmospheric concentrations established by U.S. EPA for criteria pollutants. SILs are used to assess whether a project is significant – that is, whether impacts from the source may be anticipated to cause or significantly contribute to a potential exceedance of an ambient air quality standard (i.e., NAAQS). Exceedance of a SIL does not, on its own, indicate the exceedance of a federal air quality standard; instead, it conveys that further analysis should be completed. Primary NAAQS are standards set by U.S. EPA under the Clean Air Act to protect public health and define regulatory limits for an area to be designated "attainment". Thresholds for each of these standards are summarized in Tables 1-1 and 1-2.

Table 1-1. Significant Impact Levels (SIL)

Pollutant	Averaging Period	Form of Standard, As Modeled	Class II SIL (µg/m^3)
NO_2	1-Hr	Maximum of the 5-year average of the highest 1-hr impacts	7.5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1
PM_{10}	24-hr	H1H from a 5-year MET data set	5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1
$PM_{2.5}$	24-hr	Highest 5-year Average of the 1st High Impacts	1.2
	Annual	Highest 5-year Average of Annual Arithmetic Mean	0.13
CO	1-Hr	H1H from a 5-year MET data set	2,000
	8-Hr	H1H from a 5-year MET data set	500
SO2	1-Hr	Maximum of the 5-year average of the highest 1-hr impacts	7.8
	3-Hr	H1H from a 5-year MET data set	25
	24-Hr	H1H from a 5-year MET data set	5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1

Table 1-2. National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Period	Form of Standard, As Modeled	Primary NAAQS (µg/m^3)
NO_2	1-Hr	5-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations	188
	Annual	Maximum annual impacts from a 5-year MET data set	100
PM_{10}	24-hr	H6H from a 5-year MET data set	150
$PM_{2.5}$	24-hr	Highest 5-year average of the 8th high impacts	35
	Annual	Highest 5-year average of annual arithmetic mean	9
CO	1-Hr	Maximum individual year's H2H from a 5-year MET data set	40,000
	8-Hr	Maximum individual year's H2H from a 5-year MET data set	10,000
SO2	1-Hr	5-year average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations	196
Ozone	8-Hr	3-Year Average of annual 4th highest daily maximum 8-hr concentrations	70 ppb

2. DISPERSION MODELING ANALYSIS

In general, the air dispersion modeling analyses were carried out in accordance with applicable state and EPA guidance documents, including the following:

- EPA's *Guideline on Air Quality Models*, 40 CFR Part 51, Appendix W (Revised, November 29, 2024)
- EPA's *AERMOD Implementation Guide* (Revised, November 2024)
- EPA's User's Guide for the AMS/EPA Regulatory Model – AERMOD (Revised, November 2024)

Following this modeling guidance, the remainder of this section provides an overview of the modeling methods which were applied.

2.1 Model Selection

The EPA-approved version of the AERMOD modeling system (v24142) was used to estimate maximum ground-level concentrations over the full modeling domain. AERMOD is a refined, steady-state, multiple source, Gaussian dispersion model and is the preferred model for use by industrial sources for this type of air quality analysis.

The AERMOD modeling system is composed of three modular components: AERMAP, the terrain preprocessor; AERMET, the meteorological preprocessor; and AERMOD, the control module and modeling processor. AERMAP is the terrain pre-processor that is used to import terrain elevations for selected model objects and to generate the receptor hill height scale data that are used by AERMOD to drive advanced terrain processing algorithms. National Elevation Dataset (NED) data available from the United States Geological Survey (USGS) were utilized to interpolate surveyed elevations onto user specified receptor grids and for building and source locations in the absence of more accurate site-specific (i.e., site surveys, GPS analyses, etc.) elevation data.

AERMET generates a separate surface file and vertical profile file to pass meteorological observations and turbulence parameters to AERMOD. AERMET meteorological data are refined for a particular analysis based on the choice of micrometeorological parameters that are linked to the land use and land cover (LULC) around the meteorological site shown to be representative of the application site.

AERMOD was run using all regulatory default options.

2.2 Coordinate System and Facility Location

In all modeling analyses conducted for the compressor station, the location of emission sources, structures, and receptors were represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central 500 km meridian of each UTM zone, where the world is divided into 36 north-south zones). The datum for modeling of the compressor station was based on North American Datum 1983 (NAD 83). UTM coordinates for this analysis all resided within UTM Zone 17N, which served as the reference point for all facility source data, as well as all receptors. The approximate central coordinate of the property is 543,230 meters easting and 4,286,092 meters northing [UTM Zone 17N]. The location of the proposed facility, projected in the UTM coordinate system, is provided in Figure 2-1. Harris Compressor Station Area Map for reference.

Figure 2-1. Harris Compressor Station Area Map

2.3 Receptor Grids

Ground-level concentrations were calculated from the property boundary out to 10 km using a series of nested receptor grids. Anticipating that impacts for the NO_2 1-hr and NO_2 annual standards (SIL, NAAQS) may extend beyond 10 km, the nested receptor grid was extended out to 30 km from the center of the property for these specific models.

Receptors were excluded from the fenced area contained within the property boundary. The fence serves as a physical boundary which restricts public access to the property. Air within the fence line is therefore not considered to be "ambient" and does not need to be assessed for compliance with the NAAQS.

Discrete receptors were placed along the ambient air boundary, as well as within a nested cartesian grid extending the facility center, as follows:

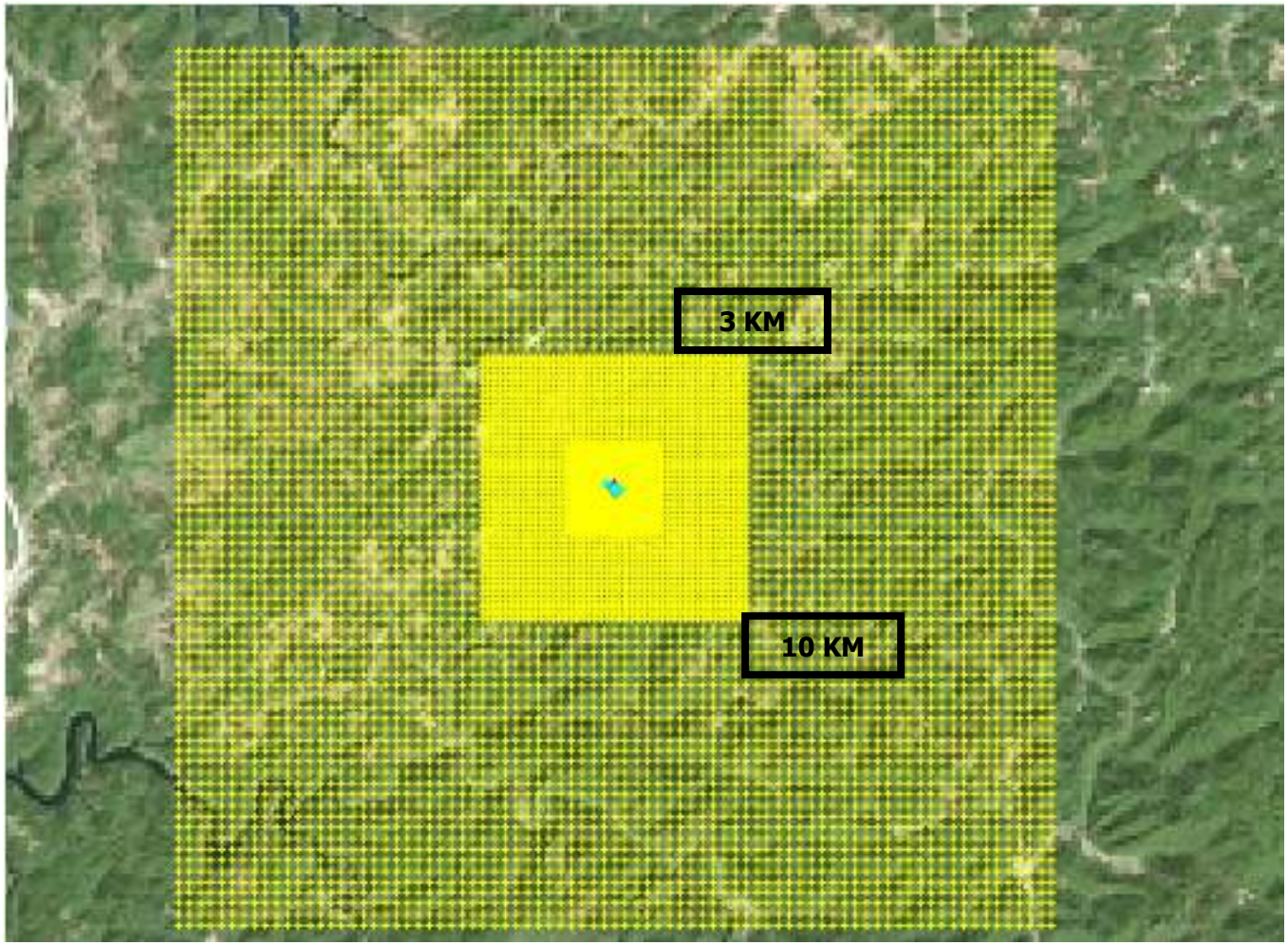
- **Boundary**: Receptors spaced at 25 meters (except at corners) placed along the ambient air boundary of the Manassas Facility,
- **Fine Cartesian Grid**: A "fine" grid containing 50-meter spaced receptors beginning at the ambient air boundary and extending to 1 km from the center of the property,
- **Medium-Fine Cartesian Grid**: A "medium-fine" grid containing 100-meter spaced receptors extending from 1 km to 3 km from the center of the property, exclusive of receptors on the fine grid,
- **Coarse Cartesian Grid**: A "coarse" grid containing 250-meter spaced receptors extending from 3 km to 10 km from the center of the facility, exclusive of receptors on the fine and medium-fine grids.
- **Very Coarse Cartesian Grid (NO_2 Only)**: A "very coarse" grid containing 500-meter spaced receptors extending from 10 km to 30 km from the center of the facility, exclusive of receptors on the fine, medium-fine and coarse grids. This nested receptor grid was used exclusively with the NO_2 1-Hr and NO_2 Annual models.

Note that maximum impacts identified from the modeling analyses were determined to have occurred at the property boundary or within bounds of the Fine Cartesian Grid. The receptor grid, as designed, was therefore determined to have appropriately captured maximum impacts.

The receptor grid and the approximate ambient air boundary are shown visually in Figure 2-2. Receptor Grid (Zoomed Extent) and Figure 2-3. Receptor Grid (Full Extent).

Figure 2-2. Receptor Grid (Zoomed Extent)

Figure 2-3. Receptor Grid (Full Extent)



2.4 Building Downwash and GEP Analysis

Stacks modeled for the compressor station are subject to building downwash effects. These effects are caused by air flow over and around buildings and structures disrupting the free flow movement of the wind. The result of this phenomenon is increased turbulence near buildings and structures. Downwash effects were addressed through the implementation of the Plume Rise Model Enhancements (PRIME) program found within the regulatory version of AERMOD.

Direction-specific building downwash dimensions (height and width of each influencing building or structure) were determined using the Building Profile Input Program, PRIME version (BPIP PRIME), v04274, and used in the AERMOD Model. BPIP PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document and the Building Downwash Guidance document, while incorporating the PRIME enhancements to improve prediction of ambient impacts in building cavities (very near the buildings) and wake regions (farther from the buildings).

Locations and dimensions for buildings and other structures at the facility were primarily determined though use of engineering design documents for the proposed facility. Structures were excluded if their dimensions were determined insignificant, or if the design of the structure would allow for air to pass through with minimal disruption. Where information could not be directly determined based on available reference documents, professional judgement was used for estimation of structure parameters.

Buildings and significant structures which were included in the model are shown in Figure 2-2. Receptor Grid (Zoomed Extent) for reference.

2.4.1 GEP Height Analysis

EPA has promulgated stack height regulations that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP height is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

$H_{GEP} = H + 1.5\ L$, where:

H_{GEP} = minimum GEP stack height,
H = structure height, and
L = lesser dimension of the structure (height or predicted width)

This equation is limited to stacks located within 5L of a structure. Stacks located at a distance greater than 5L are not subject to the wake effects of the structure. The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP. In general, the lowest GEP stack height for any source is 65 m by default.[1]

No stack at the Harris Compressor Station will have a height above grade exceeding GEP height. Therefore, stacks were modeled at their actual heights.

[1] 40 CFR 81.100(ii)

2.5 Elevated Terrain

Receptor elevations (excluding property boundary receptors) were determined from USGS National Elevation Dataset (NED) elevation data, using 1/3 arc second resolution files. Receptors were assigned base elevations using NED data, as interpolated through the AERMAP terrain preprocessor (v24142). The NED consists of arrays of regularly spaced elevations at 10-meter intervals. Elevations are assigned by AERMAP based upon the maximum terrain elevation associated with the four NED points surrounding the specified object. For all modeled receptors, AERMAP additionally derived an effective hill height scale, which determined the magnitude of interactions between each source plume and elevated terrain features.

Elevations for buildings, sources and property boundary receptors were assigned based on the anticipated graded elevation of the facility, 1,449.02 ft (441.6 m).

2.6 Meteorological Data

Site-specific dispersion models require a sequential hourly record of dispersion meteorology, representative of the region in which the source is located. In the absence of site-specific measurements, the U.S. EPA guidelines recommend the use of readily available data from the closest and most representative National Weather Service (NWS) station. Regulatory air dispersion modeling using AERMOD requires five years of quality-assured meteorological data, incorporating both surface and upper air observations.

Surface and upper-air meteorological data were processed through the latest version of AERMET (v24142), using data for the following meteorological stations, which were selected as representative based on their proximity to the site and similar land cover:

- Surface Station
  - Clarksburg, West Virginia [CKB] (Station Number 3802)
  - Approximate Distance from Proposed Facility: 67 km
- Upper Air Station
  - Clarksburg, West Virginia [CKB] (Station Number 72318)
  - Approximate Distance from Proposed Facility: 67 km

Meteorological data was processed for a 5-year period extending from 2020-2024.

Figure 2-4. Meteorological Station Locations

2.7 Rural/Urban Option Selection in AERMOD

As stated in Section 7.2.1.1, Dispersion Coefficients, of the Guideline on Air Quality Models, for any dispersion modeling exercise, the "urban" or "rural" determination of the location surrounding the source is important in determining the applicable boundary layer characteristics that affect a model's calculation of ambient concentrations. Thus, a determination was made of whether the area around the Harris Compressor Station is urban or rural.

The "land use procedure", as discussed in the Guideline on Air Quality Models (Section 7.2.1.1(b)(i) of Appendix W), is typically used to assess the predominant land use characterization of the surrounding area when rural vs urban determination cannot be made visually. The guidance says that when urban land use types account for 50% or more of the circumscribed area, urban dispersion coefficients should be used; otherwise, rural dispersion coefficients are appropriate.

As this facility is located in very rural area of West Virigina, a visual determination method was used. Using Google Earth, there are no towns or urban areas within a 10 km radius of the site. Additionally, the image of the facility shows that the site is surrounded entirely by West Virginia mountains and forests. Therefore, a fair determination would be that this facility is rural and will use rural dispersion coefficients.

2.8 Source Parameters

The AERMOD dispersion model allows for emission units to be represented as point, area, or volume sources. Emissions from all modeled sources at the Harris compressor station will emanate from clearly discernable emission points (e.g., stacks). Stack parameters for all sources are provided in Appendix A. This section provides additional narrative on how stack parameters were derived.

2.8.1 Combustion Turbines

The facility will operate three (3) combustion turbines. Turbine stacks were modeled as point sources with unobstructed vertical orientation. All combustion turbines were modeled as operating simultaneously. Turbine stack parameters and emission rates are representative of a 0 °F ambient temperature condition. In general, a low ambient temperature condition represents a worst-case emission scenario for combustion turbines, due to the increased fuel input (MMBtu/hr) required at reduced ambient temperatures. Emission rates for annual models considered continuous turbine operation (i.e., 8,760 hrs/yr), inclusive of potential emissions from startup and shutdown cycles.

Anticipating potential variability for impacts as a result of turbine operating load, models were separately carried out representing turbine operation at the following load conditions: 100% load, 75% load and 50% load. Under each load condition, all turbines were simultaneously modeled as operating at that load. Startup/shutdown conditions, while accounted for in emission rates for annual models, were not assessed as a separate load condition for short-term (1-hr, 3-hr, 8-hr, 24-hr) models due to the intermittent nature of unit startup and shutdown.

2.8.2 Microturbines

The facility will operate thirteen (13) microturbines. Microturbines were modeled as point sources with unobstructed vertical orientation. All microturbines were modeled as operating simultaneously. Apart from exit velocity, as detailed below, microturbines were otherwise modeled according to their design stack exit parameters. Emission rates for short-term models used the maximum hourly potential emission rate of each microturbine, based on its rated heat input capacity. Emission rates for annual models considered continuous operation (i.e., 8,760 hrs/yr) of all microturbines.

A weather rain flap will be installed on each microturbine, which will open to a 45° angle when the units are in operation. The non-vertical exit of the stacks resulting from the rain flaps has been accounted for by modeling each source as an angled stack – that is, taking credit only for the vertical component of the exit velocity when exhausting at a 45° above horizontal. The function used to derive the vertical exit velocity is shown below:

$$Vvert = Vact\ x\ \sin\left(angle\ of\ stack\ from\ horizontal\right)$$

Where:
V_{vert} = Vertical component of exit velocity (m/s), as input into the model
V_{act} = Actual exit velocity of the stack (m/s)

At an angle of 45° from horizontal, the vertical component of the exit velocity is equivalent to approximately 70.7% of the actual exit velocity of the stack.

2.8.3 Fuel Gas Heaters

The facility will operate three (3) fuel gas heaters. Fuel gas heaters will operate without rain caps and were modeled as point sources with unobstructed vertical orientation. Fuel heaters were modeled according to their anticipated design exit parameters.

All fuel gas heaters were modeled as operating simultaneously. Emission rates for short-term models used the maximum hourly potential emission rate of each fuel gas heater, based on its rated heat input capacity. Emission rates for annual models considered continuous operation (i.e., 8,760 hrs/yr) of all heaters.

2.9 Ambient Ratio Method Version 2 (ARM2)

NO_X emissions from combustion sources at the facility will primarily be released in the form of nitric oxide (NO), whereas NAAQS standards are established for nitrogen dioxide (NO_2). With this considered, in the "Models for Nitrogen Dioxide" section of the Guideline (Section 4.2.3.4), U.S. EPA recommends a tiered screening approach for estimating NO_2 impacts from combustion point sources. Use of the tiered approach for NO_2 modeling, described briefly below, was considered for the Harris Compressor Station.

1. Under the initial and most conservative Tier 1 screening level, all NO_X emitted is modeled as NO_2. This assumes total conversion of NO (main chemical form of NO_X) to NO_2.
2. For the Tier 2 screening level, U.S. EPA recommends multiplying the Tier 1 results by the Ambient Ratio Method 2 (ARM2). ARM2 provides estimates of representative equilibrium ratios of NO_2/NO_X based on ambient levels of NO_2 and NO_X, derived from national data from the U.S. EPA's Air Quality System (AQS). The ARM2 function is a default regulatory option within the latest version of AERMOD.
3. Since the impact of an individual NO_X source on ambient NO_2 depends on the chemical environment into which the source's plume is emitted, modeling techniques that account for this atmospheric chemistry such as the Ozone Limiting Method (OLM), the Plume Volume Molar Ratio Method (PVMRM), or Generic Reaction Set Method (GRSM) can be considered under the most accurate and refined Tier 3 approach identified by U.S. EPA. Additional model inputs required for the use of OLM, PVMRM, or GRSM could include source-specific in-stack NO_2/NO_X ratios, ambient equilibrium NO_2/NO_X ratios, background ozone concentrations, and background NO_X/NO_2 concentrations.

For the 1-hour and annual NO_2 standards, MVP employed a Tier 2 NO_2 modeling approach, utilizing the ARM2 function in AERMOD. The regulatory-approved U.S. EPA default settings were used, including a minimum ambient NO_2/NO_X ratio of 0.5 and maximum ambient ratio of 0.9.

2.10 Background Concentrations

Background concentrations, quantifying the existing ambient air quality of the surrounding area, were obtained using data (2022-2024) from representative air quality monitors maintained by U.S. EPA. Air monitors were determined to be representative based on a number of criteria, including their distance to the facility, surrounding land cover and data availability. Monitors located within close proximity to large industrial sources were not considered due to the influence of these sources on monitoring values. In general, the monitors located closest to the proposed facility were determined to be representative. Note that no exclusions were made for smoke events (ex. fireworks, wildfires) when processing $PM_{2.5}$ monitoring data.

Background concentrations are summarized in Table 2-1. Background pollutant concentrations were added to modeled impacts for NAAQS models in order to determine potential cumulative impacts on ambient air.

Table 2-1. Background Concentration Data

Pollutant	Averaging Period	Concentration (µg/m³)	Site Location	Site ID	Distance from Station (km)
NO_2	1-hour	67.10	Rockingham Co. VDOT	51-165-0003	149
	Annual	16.09	Rockingham Co. VDOT	51-165-0003	149
PM_{10}	24-hour	74.00	WEIRTON - SUMMIT CIRCLE	54-029-0009	189
$PM_{2.5}$	24-hour	16.33	Washington Irving Junior High School	54-033-0003	64
	Annual	7.13	Washington Irving Junior High School	54-033-0003	64
CO	1-hour	1489	Dixie St.	54-039-0020	106
	8-hour	1031	Dixie St.	54-039-0020	106
SO_2	1-Hr	11.34	Dixie St.	54-039-0020	106
Ozone	8-hour	61 ppb	Parsons	54-093-9991	82

2.11 Secondary PM2.5 and Ozone Formation

The current guideline model for Class II Area air dispersion modeling, AERMOD, does not account for many of the complex atmospheric physical and chemical mechanisms which can influence the formation of secondary $PM_{2.5}$ and ozone. Secondary $PM_{2.5}$ and ozone were therefore separately assessed following U.S. EPA's Modeled Emission Rates for Precursors (MERPs) guidance. MERPs is a Tier 1 demonstration tool. Following this guidance, sources are compared against representative hypothetical stacks, which have been modeled by EPA for downwind secondary air quality impacts. The intent of MERPs is to establish a technically credible relationship between emission rates for precursor pollutants and their secondary impacts.

Secondary $PM_{2.5}$ formation was assessed as generated from NO_X and SO_2 precursors, and ozone from NO_X and VOC precursors. Total facility-wide potential emissions of these precursor pollutants from the Harris Compressor Station were considered. MVP used pre-established MERPs values based on EPA photochemical grid modeling as the primary indicator that the project is not expected to cause or contribute to a violation of the NAAQS for ozone. Similarly, secondary $PM_{2.5}$ impacts determined from the MERPs assessment were added to cumulative impacts modeled for the $PM_{2.5}$ 24-hr and $PM_{2.5}$ annual Significance and NAAQS analyses.

Hypothetical sources were identified using the U.S. EPA's MERPs View Qlik website. Based on proximity, climate zone and terrain/land use, the Ashe County, North Carolina MERPs source was determined to be representative. Hypothetical stacks modeled at the Ashe County location (10 m height, 500 tpy emission rate) which were most closely aligned with the stacks that will be constructed at the Harris Compressor Station were used to carry out the MERPs analysis. Secondary impacts for the PM2.5 24-hr averaging period are estimated at 0.021 µg/m3, secondary impacts for the PM2.5 annual averaging period are estimated at 0.0013 µg/m3 and secondary impacts for the ozone 8-hr averaging period are estimated at 0.528 ppb (less than the ozone SIL of 1 ppb).

2.12 Modeling Results

Results from the dispersion modeling, following the methodology outlined in the previous section, are summarized in Table 2-2 and Table 2-3. The results presented in the tables include the project impacts, as well as facility-wide impacts compared to applicable thresholds

Table 2-2. Summary of Modeling Results, SIL

Pollutant	Averaging Period	Facility Total	Project	SIL Standard (µg/m³)	Below SIL	Significant Impact Area [STA] (km)
NO_2	1-Hr	86.31	28.34	7.5	No	15.57
	Annual	2.84	0.89	1	No	0.64
PM_{10}	24-hr	4.53	1.09	5	Yes	--
	Annual	0.400	0.124	1	Yes	--
$PM_{2.5}$	24-hr	3.27	0.87	1.2	No	0.46
	Annual	0.37	0.12	0.13	No	0.65
CO	1-Hr	148.42	51.36	2,000	Yes	--
	8-Hr	69.97	22.10	500	Yes	--
SO_2	1-Hr	4.37	1.47	7.8	Yes	--
	3-Hr	3.64	1.29	25	Yes	--
	24-Hr	1.94	0.56	5	Yes	--
	Annual	0.15	0.05	1	Yes	--
Ozone	8-Hr	0.53 ppb		1.0 ppb	Yes	--

[1] Maximum modeled impact and estimated secondary impacts from precursor pollutants for $PM_{2.5}$ and ozone.

As shown in Table 2-2, modeled impacts exceed the significant impact levels (SIL) for NO_2 (1-hr, Annual), PM_{10} (24-hr), and $PM_{2.5}$ (24-hr, Annual). The significant impact areas (SIA) shown for these pollutants represent the maximum distance at which a receptor was found to be above the SIL. Nominal differences for maximum impacts and SIAs were noted when comparing results across variable turbine operating loads. Note that SIL results are provided for general reference and do not, on their own, indicate an exceedance of a federal ambient air quality standard.

Table 2-3. Summary of Modeling Results, NAAQS

Pollutant	Averaging Period	Rank	Facility (µg/m³)	Project (µg/m³)	Background (µg/m³)	Facility Total (µg/m³)	Project Total (µg/m³)	Primary NAAQS (µg/m³)	Below NAAQS?	% of NAAQS (Project Total)
NO_2	1-Hr	H8H	86.31	28.34	67.10	144.69	93.23	188	Yes	77.0%
	Annual	H1H	2.84	0.89	16.09	18.93	16.98	100	Yes	18.9%
PM_{10}	24-hr	H6H	4.53	1.09	74.9	76.78	74.78	150	Yes	51.2%
$PM_{2.5}$	24-hr	H8H	0.400	0.124	16.33	17.93	16.86	35	Yes	51.2%
	Annual	H1H	3.27	0.87	7.13	7.50	7.25	9	Yes	83.4%
CO	1-Hr	H2H	0.37	0.12	1489	1633.34	1536.70	40,000	Yes	4.1%
	8-Hr	H2H	148.42	51.36	1031	1094.54	1050.02	10,000	Yes	10.9%
SO_2	1-Hr	H4H	69.97	22.10	11.34	15.52	12.70	196	Yes	7.9%
Ozone	8-Hr	-	0.53 ppb		61 ppb	61.53 ppb		70 ppb	Yes	87.9%

1 Includes maximum modeled impact, background concentrations (refer to Table 2-1) and estimated secondary impacts from precursor pollutants for $PM_{2.5}$ and ozone. Regional sources were not considered for purposes of this modeling assessment.

As shown in Table 2-3, maximum cumulative impacts from operation of the compressor station are not anticipated to cause an exceedance of the NAAQS for any pollutant or averaging period. Negligible differences for maximum impacts were noted when comparing results across variable turbine loads.

APPENDIX A. MODEL INPUTS

Mountain Valley Pipeline, Inc.
FERC Resource Report 9 Modeling
Appendix A: Source Parameters and Emission Rates

Table A-1. Summary of Modeled Point Source Emission Rates

Point Sources

Emission Point ID	Description	NO_2		SO_2		CO	PM_{10}		$PM_{2.5}$		NO_2		SO_2		CO	PM_{10}		$PM_{2.5}$	
		ST (lb/hr)	LT (tpy)	ST (lb/hr)	LT (tpy)	ST (lb/hr)	ST (lb/hr)	LT (tpy)	ST (lb/hr)	LT (tpy)	ST (g/s)	LT (g/s)	ST (g/s)	LT (g/s)	ST (g/s)	ST (g/s)	LT (g/s)	ST (g/s)	LT (g/s)
S001	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine	8.90	39.01	0.53	2.30	9.03	2.32	10.17	2.32	10.17	1.121381	1.122123	0.066300	0.066300	1.137761	0.292502	0.292502	0.292502	0.292502
S001_75	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine, 75%	7.83	34.32	0.46	2.03	7.94	2.04	8.94	2.04	8.94	0.986563	0.987306	0.058296	0.058296	1.000423	0.257187	0.257187	0.257187	0.257187
S001_50	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine, 50%	6.58	28.85	0.39	1.70	6.68	1.72	7.52	1.72	7.52	0.829066	0.829808	0.049019	0.049019	0.841666	0.216261	0.216261	0.216261	0.216261
S002	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine	8.90	39.01	0.53	2.30	9.03	2.32	10.17	2.32	10.17	1.121381	1.122123	0.066300	0.066300	1.137761	0.292502	0.292502	0.292502	0.292502
S002_75	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine, 75%	7.83	34.32	0.46	2.03	7.94	2.04	8.94	2.04	8.94	0.986563	0.987306	0.058296	0.058296	1.000423	0.257187	0.257187	0.257187	0.257187
S002_50	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine, 50%	6.58	28.85	0.39	1.70	6.68	1.72	7.52	1.72	7.52	0.829066	0.829808	0.049019	0.049019	0.841666	0.216261	0.216261	0.216261	0.216261
S003	Microturbine 1: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S004	Microturbine 2: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S005	Microturbine 3: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S006	Microturbine 4: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S007	Microturbine 5: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S008	Microturbine 6: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S009	Microturbine 7: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S010	Microturbine 8: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S011	Microturbine 9: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S012	Fuel Gas Heater 1	0.22	0.96	0.00	0.01	0.18	0.02	0.07	0.02	0.07	0.027637	0.027637	0.000166	0.000166	0.023215	0.002100	0.002100	0.002100	0.002100
S013	Fuel Gas Heater 2	0.22	0.96	0.00	0.01	0.18	0.02	0.07	0.02	0.07	0.027637	0.027637	0.000166	0.000166	0.023215	0.002100	0.002100	0.002100	0.002100
S015	WB Pipeline Heater	0.86	3.75	0.01	0.02	0.72	0.07	0.28	0.07	0.28	0.107785	0.107785	0.000647	0.000647	0.090539	0.008192	0.008192	0.008192	0.008192
S021	Turbine 3: Solar Titan 350 Centrifugal Compressor Turbine	12.81	56.13	1.30	5.69	13.00	3.82	16.74	3.82	16.74	1.614033	1.614723	0.163714	0.163714	1.637972	0.481511	0.481511	0.481511	0.481511
S021_75	Turbine 3: Solar Titan 350 Centrifugal Compressor Turbine, 75%	10.63	46.58	1.11	4.86	10.79	3.27	14.30	3.27	14.30	1.339357	1.340048	0.139880	0.139880	1.359517	0.411412	0.411412	0.411412	0.411412
S021_50	Turbine 3: Solar Titan 350 Centrifugal Compressor Turbine, 50%	8.73	38.26	0.93	4.09	8.86	2.75	12.03	2.75	12.03	1.099961	1.100652	0.117674	0.117674	1.116341	0.346101	0.346101	0.346101	0.346101
S022	Microturbine 10: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S023	Microturbine 11: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S024	Microturbine 12: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S025	Microturbine 13: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S028	Fuel Gas Heater 3	0.22	0.96	0.00	0.01	0.18	0.02	0.07	0.02	0.07	0.027637	0.027637	0.000166	0.000166	0.023215	0.002100	0.002100	0.002100	0.002100

Mountain Valley Pipeline, Inc.
FERC Resource Report 9 Modeling
Appendix A: Source Parameters and Emission Rates

Table A-2. Summary of Point Source Parameters

Point Sources

Emission Point ID	Description	UTM East m	UTM North m	Elevation m	Stack Height m	Stack Temperature K	Exit Velocity m/s	Stack Diameter m
S001	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine	543205.20	4286067.60	441.66	15.01	754.82	32.94	2.751
S001_75	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine, 75%	543205.20	4286067.60	441.66	15.01	755.37	31.08	2.751
S001_50	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine, 50%	543205.20	4286067.60	441.66	15.01	759.26	27.49	2.751
S002	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine	543216.60	4286051.40	441.66	15.01	754.82	32.94	2.751
S002_75	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine, 75%	543216.60	4286051.40	441.66	15.01	755.37	31.08	2.751
S002_50	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine, 50%	543216.60	4286051.40	441.66	15.01	759.26	27.49	2.751
S003	Microturbine 1: Capstone C200 Generator Turbine	543312.30	4286057.20	441.66	3.73	552.59	20.19	0.305
S004	Microturbine 2: Capstone C200 Generator Turbine	543313.20	4286055.90	441.66	3.73	552.59	20.19	0.305
S005	Microturbine 3: Capstone C200 Generator Turbine	543314.00	4286054.50	441.66	3.73	552.59	20.19	0.305
S006	Microturbine 4: Capstone C200 Generator Turbine	543315.00	4286053.10	441.66	3.73	552.59	20.19	0.305
S007	Microturbine 5: Capstone C200 Generator Turbine	543315.80	4286051.70	441.66	3.73	552.59	20.19	0.305
S008	Microturbine 6: Capstone C200 Generator Turbine	543307.80	4286064.20	441.66	3.73	552.59	20.19	0.305
S009	Microturbine 7: Capstone C200 Generator Turbine	543307.00	4286065.60	441.66	3.73	552.59	20.19	0.305
S010	Microturbine 8: Capstone C200 Generator Turbine	543306.20	4286067.00	441.66	3.73	552.59	20.19	0.305
S011	Microturbine 9: Capstone C200 Generator Turbine	543305.20	4286068.40	441.66	3.73	552.59	20.19	0.305
S022	Microturbine 10: Capstone C200 Generator Turbine	543303.80	4286070.30	441.66	3.73	552.59	20.19	0.305
S023	Microturbine 11: Capstone C200 Generator Turbine	543303.20	4286070.90	441.66	3.73	552.59	20.19	0.305
S024	Microturbine 12: Capstone C200 Generator Turbine	543302.20	4286072.30	441.66	3.73	552.59	20.19	0.305
S025	Microturbine 13: Capstone C200 Generator Turbine	543301.40	4286073.40	441.66	3.73	552.59	20.19	0.305
S012	Fuel Gas Heater 1	543234.60	4286117.10	441.66	5.49	727.59	5.10	0.305
S013	Fuel Gas Heater 2	543237.50	4286118.40	441.66	5.49	727.59	5.10	0.305
S015	WB Pipeline Heater	543037.50	4286212.20	475.45	4.27	727.59	31.24	0.305
S021	Turbine 3: Solar Titan 350 Centrifugal Compressor Turbine	543231.30	4286036.90	441.66	21.06	739.82	78.59	2.637
S021_75	Turbine 3: Solar Titan 350 Centrifugal Compressor Turbine, 75%	543231.30	4286036.90	441.66	21.06	718.71	73.65	2.637
S021_50	Turbine 3: Solar Titan 350 Centrifugal Compressor Turbine, 50%	543231.30	4286036.90	441.66	21.06	738.15	65.06	2.637
S028	Fuel Gas Heater 3	543240.2	4286120.1	441.66	5.49	727.59	5.10	0.305

Notes:
All coordinates are Universal Transverse Mercator (UTM) coordinates based on North American Datum 1983 (NAD 83) and reside within UTM Zone 17.

Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9

Appendix 9-E
Stallworth Compressor Station Air Quality Modeling Report

FEDERAL ENERGY REGUALTORY COMMISSION
AIR DISPERSION MODELING REPORT
Stallworth Compressor Station

Mountain Valley Pipeline
Fayette County, West Virginia

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Project 253901.0130

Trinity Consultants

TABLE OF CONTENTS

1. INTRODUCTION 1-1

2. DISPERSION MODELING ANALYSIS 2-1
   - 2.1 Model Selection 2-1
   - 2.2 Coordinate System and Facility Location 2-1
   - 2.3 Receptor Grids 2-3
   - 2.4 Building Downwash and GEP Analysis 2-6
     - *2.4.1 GEP Height Analysis 2-6*
   - 2.5 Elevated Terrain 2-7
   - 2.6 Meteorological Data 2-7
   - 2.7 Rural/Urban Option Selection in AERMOD 2-8
   - 2.8 Source Parameters 2-9
     - *2.8.1 Combustion Turbines 2-9*
     - *2.8.2 Microturbines 2-9*
     - *2.8.3 Fuel Gas Heaters 2-10*
   - 2.9 Ambient Ratio Method Version 2 (ARM2) 2-10
   - 2.10 Background Concentrations 2-10
   - 2.11 Secondary PM2.5 and Ozone Formation 2-11
   - 2.12 Modeling Results 2-12

APPENDIX A. MODEL INPUTS

1. INTRODUCTION

Mountain Valley Pipeline, LLC (MVP) is proposing an expansion at an existing natural gas compressor station (Stallworth Compressor Station) located on Dawson-Springdale Road in Meadow Bridge (Fayette County), West Virginia. The Stallworth Compressor Station compresses and transports pipeline quality natural gas through an interstate natural gas pipeline, the Mountain Valley Pipeline, extending from northwestern West Virginia to southern Virginia.

The facility currently includes the following permitted emission sources:

- Two (2) Solar Titan 130 natural gas-fired turbines each rated at 19,483 horsepower (hp) at site-specific conditions (ISO rating at 20,500 hp each);
- Ten (10) Capstone C200 natural gas-fired microturbines each rated at 200 kW;
- Two (2) natural gas-fired, fuel gas heaters each rated at 1.54 million British thermal units per hour (MMBtu/hr);
- One (1) natural gas-fired, office building heater rated at 0.12 MMBtu/hr; and
- Two (2) storage tanks with capacities less than 15,000 gallons.

MVP is proposing to authorize the following changes:

- Converting the existing Solar Titan 130 natural gas-fired turbines to Solar Titan 130E (Titan 130-23502S) natural gas-fired turbines rated at 22,374 horsepower (hp) at site-specific conditions (ISO rating at 23,470 hp). The compressors (C45-3) associated with the turbines will remain the same;
- Installing two Solar Titan 130E (Titan 130-23502S) natural gas-fired turbines rated at 22,374 horsepower (hp) at site-specific conditions (ISO rating at 23,470 hp);
- Installing one natural gas-fired fuel gas heater rated at 1.54 MMBtu/h;
- Adding three Capstone C200 natural gas-fired microturbine rated at 200 kW; and
- Installing associated piping, fugitive components, and equipment.

Air dispersion modeling was completed using AERMOD (v24142), using all regulatory default options, to assess impacts to ambient air from operation of the proposed compressor station. Impacts for criteria pollutants were compared against both Class II Significant Impact Levels (SILs) and National Ambient Air Quality Standards (NAAQS).

SILs and NAAQS are atmospheric concentrations established by U.S. EPA for criteria pollutants. SILs are used to assess whether a project is significant – that is, whether impacts from the source may be anticipated to cause or significantly contribute to a potential exceedance of an ambient air quality standard (i.e., NAAQS). Exceedance of a SIL does not, on its own, indicate the exceedance of a federal air quality standard; instead, it conveys that further analysis should be completed. Primary NAAQS are standards set by U.S. EPA under the Clean Air Act to protect public health and define regulatory limits for an area to be designated "attainment". Thresholds for each of these standards are summarized in Tables 1-1 and 1-2.

Table 1-1. Significant Impact Levels (SIL)

Pollutant	Averaging Period	Form of Standard, As Modeled	Class II SIL (µg/m^3)
NO_2	1-Hr	Maximum of the 5-year average of the highest 1-hr impacts	7.5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1
PM_{10}	24-hr	H1H from a 5-year MET data set	5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1
$PM_{2.5}$	24-hr	Highest 5-year Average of the 1st High Impacts	1.2
	Annual	Highest 5-year Average of Annual Arithmetic Mean	0.13
CO	1-Hr	H1H from a 5-year MET data set	2,000
	8-Hr	H1H from a 5-year MET data set	500
SO2	1-Hr	Maximum of the 5-year average of the highest 1-hr impacts	7.8
	3-Hr	H1H from a 5-year MET data set	25
	24-Hr	H1H from a 5-year MET data set	5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1

Table 1-2. National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Period	Form of Standard, As Modeled	Primary NAAQS (µg/m^3)
NO_2	1-Hr	5-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations	188
	Annual	Maximum annual impacts from a 5-year MET data set	100
PM_{10}	24-hr	H6H from a 5-year MET data set	150
$PM_{2.5}$	24-hr	Highest 5-year average of the 8th high impacts	35
	Annual	Highest 5-year average of annual arithmetic mean	9
CO	1-Hr	Maximum individual year's H2H from a 5-year MET data set	40,000
	8-Hr	Maximum individual year's H2H from a 5-year MET data set	10,000
SO2	1-Hr	5-year average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations	196
Ozone	8-Hr	3-Year Average of annual 4th highest daily maximum 8-hr concentrations	70 ppb

2. DISPERSION MODELING ANALYSIS

In general, the air dispersion modeling analyses were carried out in accordance with applicable state and EPA guidance documents, including the following:

- EPA's *Guideline on Air Quality Models*, 40 CFR Part 51, Appendix W (Revised, November 29, 2024)
- EPA's *AERMOD Implementation Guide* (Revised, November 2024)
- EPA's User's Guide for the AMS/EPA Regulatory Model – AERMOD (Revised, November 2024)

Following this modeling guidance, the remainder of this section provides an overview of the modeling methods which were applied.

2.1 Model Selection

The EPA-approved version of the AERMOD modeling system (v24142) was used to estimate maximum ground-level concentrations over the full modeling domain. AERMOD is a refined, steady-state, multiple source, Gaussian dispersion model and is the preferred model for use by industrial sources for this type of air quality analysis.

The AERMOD modeling system is composed of three modular components: AERMAP, the terrain preprocessor; AERMET, the meteorological preprocessor; and AERMOD, the control module and modeling processor. AERMAP is the terrain pre-processor that is used to import terrain elevations for selected model objects and to generate the receptor hill height scale data that are used by AERMOD to drive advanced terrain processing algorithms. National Elevation Dataset (NED) data available from the United States Geological Survey (USGS) were utilized to interpolate surveyed elevations onto user specified receptor grids and for building and source locations in the absence of more accurate site-specific (i.e., site surveys, GPS analyses, etc.) elevation data.

AERMET generates a separate surface file and vertical profile file to pass meteorological observations and turbulence parameters to AERMOD. AERMET meteorological data are refined for a particular analysis based on the choice of micrometeorological parameters that are linked to the land use and land cover (LULC) around the meteorological site shown to be representative of the application site.

AERMOD was run using all regulatory default options.

2.2 Coordinate System and Facility Location

In all modeling analyses conducted for the compressor station, the location of emission sources, structures, and receptors were represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central 500 km meridian of each UTM zone, where the world is divided into 36 north-south zones). The datum for modeling of the compressor station was based on North American Datum 1983 (NAD 83). UTM coordinates for this analysis all resided within UTM Zone 17N, which served as the reference point for all facility source data, as well as all receptors. The approximate central location of the property is 521,318 meters easting and 4,191,170 meters northing [UTM Zone 17N]. The location of the proposed facility, projected in the UTM coordinate system, is provided in Figure 2-1. Stallworth Compressor Station Area Map for reference.

Figure 2-1. Stallworth Compressor Station Area Map

2.3 Receptor Grids

Ground-level concentrations were calculated from the property boundary out to 10 km using a series of nested receptor grids. Anticipating that impacts for the NO_2 1-hr and NO_2 annual standards (SIL, NAAQS) may extend beyond 10 km, the nested receptor grid was extended out to 30 km from the center of the property for these specific models.

Receptors were excluded from the fenced area contained within the property boundary. The fence serves as a physical boundary which restricts public access to the property. Air within the fence line is therefore not considered to be "ambient" and does not need to be assessed for compliance with the NAAQS.

Discrete receptors were placed along the ambient air boundary, as well as within a nested cartesian grid extending the facility center, as follows:

- **Boundary**: Receptors spaced at 25 meters (except at corners) placed along the ambient air boundary of the Manassas Facility,
- **Fine Cartesian Grid**: A "fine" grid containing 50-meter spaced receptors beginning at the ambient air boundary and extending to 1 km from the center of the property,
- **Medium-Fine Cartesian Grid**: A "medium-fine" grid containing 100-meter spaced receptors extending from 1 km to 3 km from the center of the property, exclusive of receptors on the fine grid,
- **Coarse Cartesian Grid**: A "coarse" grid containing 250-meter spaced receptors extending from 3 km to 10 km from the center of the facility, exclusive of receptors on the fine and medium-fine grids.
- **Very Coarse Cartesian Grid (NO_2 Only)**: A "very coarse" grid containing 500-meter spaced receptors extending from 10 km to 30 km from the center of the facility, exclusive of receptors on the fine, medium-fine and coarse grids. This nested receptor grid was used exclusively with the NO_2 1-Hr and NO_2 Annual models.

Note that maximum impacts identified from the modeling analyses were determined to have occurred at the property boundary or within bounds of the Fine Cartesian Grid. The receptor grid, as designed, was therefore determined to have appropriately captured maximum impacts.

The receptor grid and the approximate ambient air boundary are shown visually in Figures 2-2 and 2-3.

Figure 2-2. Receptor Grid (Zoomed Extent)

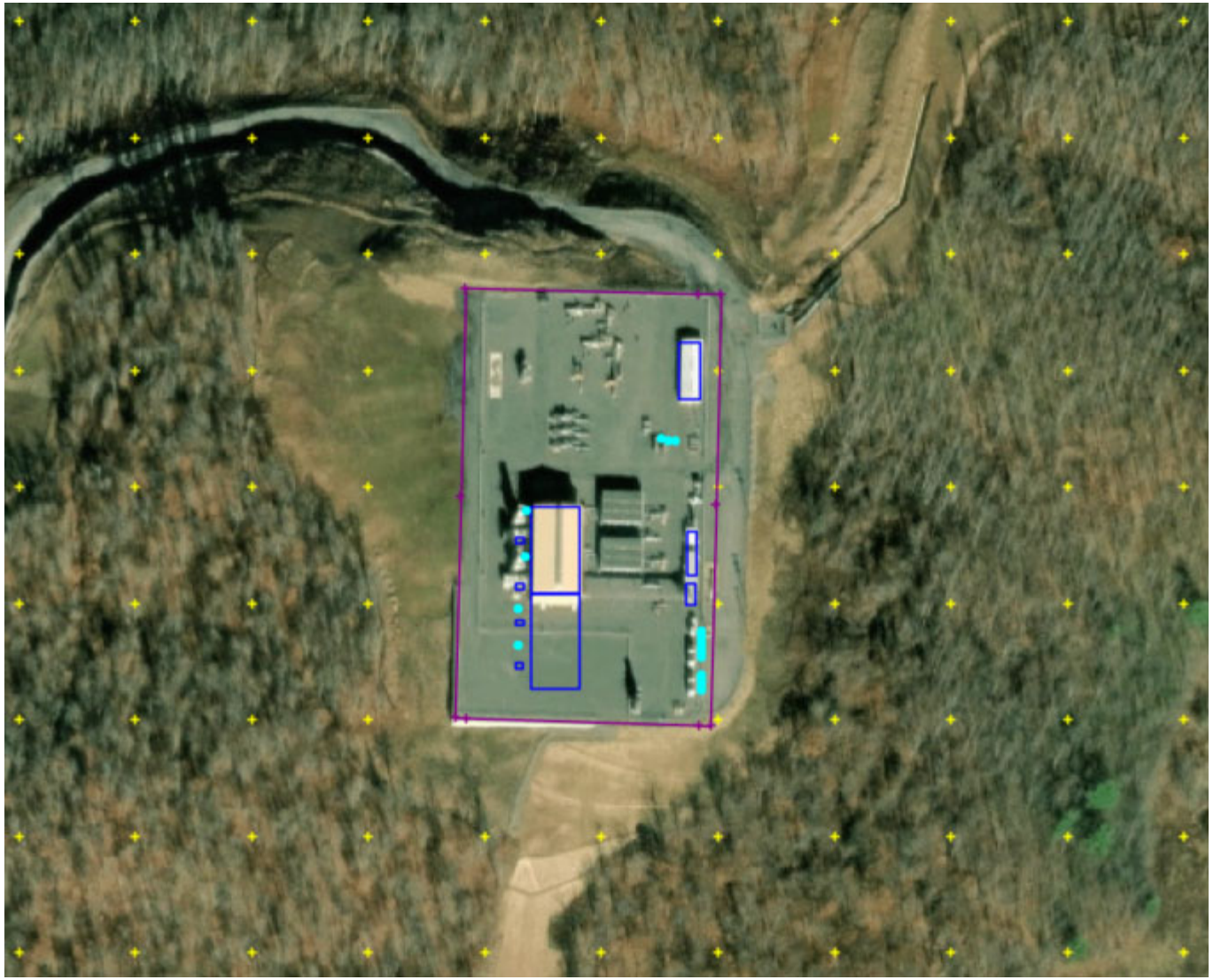
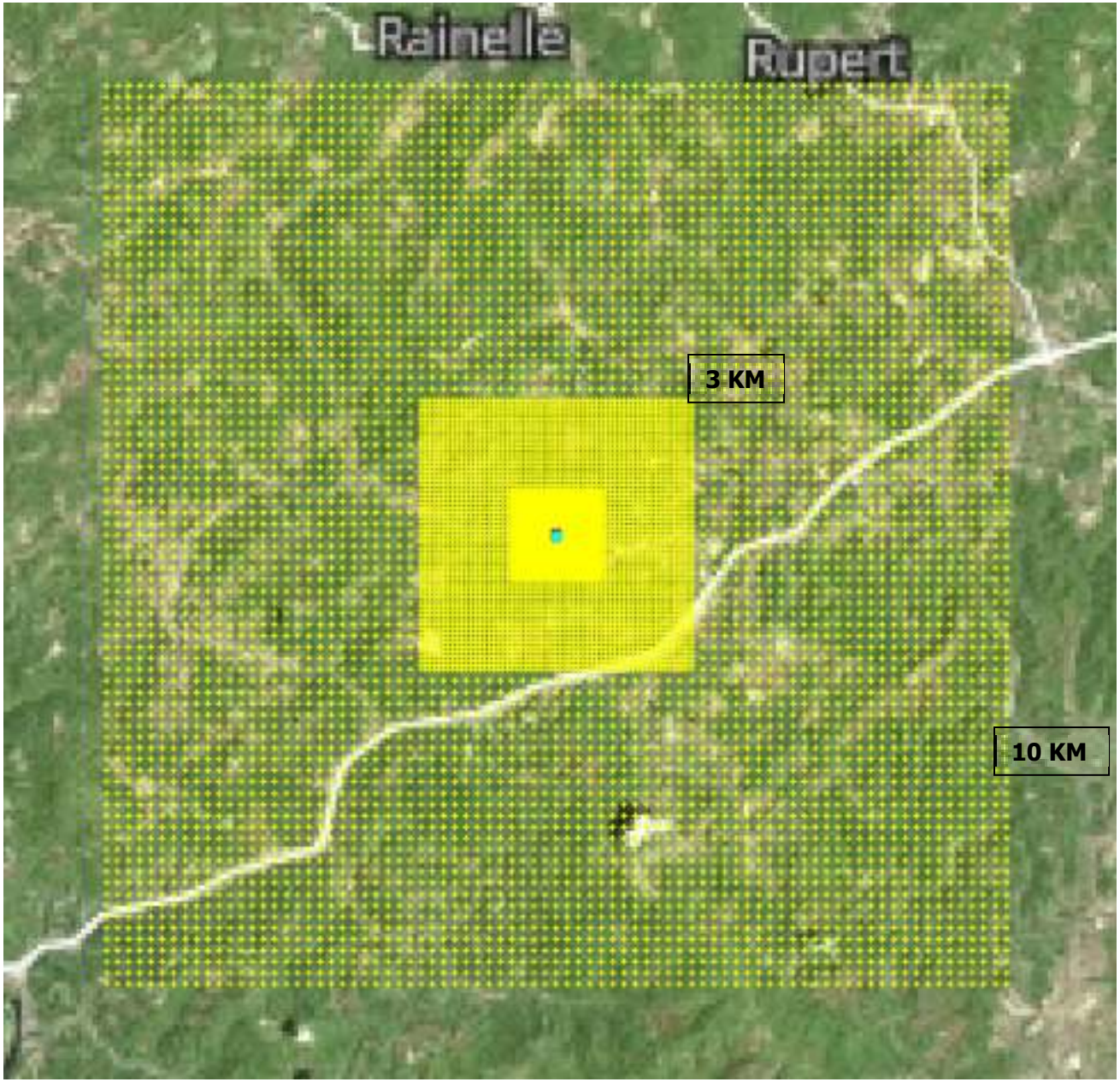


Figure 2-3. Receptor Grid (Full Extent)



2.4 Building Downwash and GEP Analysis

Stacks modeled for the compressor station are subject to building downwash effects. These effects are caused by air flow over and around buildings and structures disrupting the free flow movement of the wind. The result of this phenomenon is increased turbulence near buildings and structures. Downwash effects were addressed through the implementation of the Plume Rise Model Enhancements (PRIME) program found within the regulatory version of AERMOD.

Direction-specific building downwash dimensions (height and width of each influencing building or structure) were determined using the Building Profile Input Program, PRIME version (BPIP PRIME), v04274, and used in the AERMOD Model. BPIP PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document and the Building Downwash Guidance document, while incorporating the PRIME enhancements to improve prediction of ambient impacts in building cavities (very near the buildings) and wake regions (farther from the buildings).

Locations and dimensions for buildings and other structures at the facility were primarily determined though use of engineering design documents for the proposed facility. Structures were excluded if their dimensions were determined insignificant, or if the design of the structure would allow for air to pass through with minimal disruption. Where information could not be directly determined based on available reference documents, professional judgement was used for estimation of structure parameters.

Buildings and significant structures which were included in the model are shown in Figure 2-2. Receptor Grid (Zoomed Extent), for reference.

2.4.1 GEP Height Analysis

EPA has promulgated stack height regulations that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP height is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

$H_{GEP} = H + 1.5\ L$, where:

H_{GEP} = minimum GEP stack height,
H = structure height, and
L = lesser dimension of the structure (height or predicted width)

This equation is limited to stacks located within 5L of a structure. Stacks located at a distance greater than 5L are not subject to the wake effects of the structure. The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP. In general, the lowest GEP stack height for any source is 65 m by default.[1]

No stack at the Stallworth Compressor Station will have a height above grade exceeding GEP height. Therefore, stacks were modeled at their actual heights.

[1] 40 CFR 81.100(ii)

2.5 Elevated Terrain

Receptor elevations (excluding property boundary receptors) were determined from USGS National Elevation Dataset (NED) elevation data, using 1/3 arc second resolution files. Receptors were assigned base elevations using NED data, as interpolated through the AERMAP terrain preprocessor (v24142). The NED consists of arrays of regularly spaced elevations at 10-meter intervals. Elevations are assigned by AERMAP based upon the maximum terrain elevation associated with the four NED points surrounding the specified object. For all modeled receptors, AERMAP additionally derived an effective hill height scale, which determined the magnitude of interactions between each source plume and elevated terrain features.

Elevations for buildings, sources and property boundary receptors were assigned based on the anticipated graded elevation of the facility, 2,768.96 ft (844.0 m).

2.6 Meteorological Data

Site-specific dispersion models require a sequential hourly record of dispersion meteorology, representative of the region in which the source is located. In the absence of site-specific measurements, the U.S. EPA guidelines recommend the use of readily available data from the closest and most representative National Weather Service (NWS) station. Regulatory air dispersion modeling using AERMOD requires five years of quality-assured meteorological data, incorporating both surface and upper air observations.

Surface and upper-air meteorological data were processed through the latest version of AERMET (v24142), using data for the following meteorological stations, which were selected as representative based on their proximity to the site and similar land cover:

- Surface Station
  - Beckley, West Virginia [BKW] (Station Number 3872)
  - Approximate Distance from Proposed Facility: 44 km
- Upper Air Station
  - Beckley, West Virginia [BKW] (Station Number 72318)
  - Approximate Distance from Proposed Facility: 44 km

Meteorological data was processed for a 5-year period extending from 2020-2024.

Figure 2-4. Meteorological Station Location

2.7 Rural/Urban Option Selection in AERMOD

As stated in Section 7.2.1.1, Dispersion Coefficients, of the Guideline on Air Quality Models, for any dispersion modeling exercise, the "urban" or "rural" determination of the location surrounding the source is important in determining the applicable boundary layer characteristics that affect a model's calculation of ambient concentrations. Thus, a determination was made of whether the area around the Stallworth Compressor Station is urban or rural.

The "land use procedure", as discussed in the Guideline on Air Quality Models (Section 7.2.1.1(b)(i) of Appendix W), is typically used to assess the predominant land use characterization of the surrounding area when rural vs urban determination cannot be made visually. The guidance says that when urban land use types account for 50% or more of the circumscribed area, urban dispersion coefficients should be used; otherwise, rural dispersion coefficients are appropriate.

As this facility is located in very rural area of West Virigina, a visual determination method was used. Using Google Earth, the distance to the closest town of Vale was identified at over 3.5 km. Additionally, the image of the facility shows that the site is surrounded entirely by West Virginia mountains and forests. Therefore, a fair determination would be that this facility is rural and will use rural dispersion coefficients.

2.8 Source Parameters

The AERMOD dispersion model allows for emission units to be represented as point, area, or volume sources. Emissions from all modeled sources at the Stallworth compressor station will emanate from clearly discernable emission points (e.g., stacks). Stack parameters for all sources are provided in Appendix A. This section provides additional narrative on how stack parameters were derived.

2.8.1 Combustion Turbines

The facility will operate four (4) combustion turbines. Turbine stacks were modeled as point sources with unobstructed vertical orientation. All combustion turbines were modeled as operating simultaneously. Turbine stack parameters and emission rates are representative of a 0 °F ambient temperature condition. In general, a low ambient temperature condition represents a worst-case emission scenario for combustion turbines, due to the increased fuel input (MMBtu/hr) required at reduced ambient temperatures. Emission rates for annual models considered continuous turbine operation (i.e., 8,760 hrs/yr), inclusive of potential emissions from startup and shutdown cycles.

Anticipating potential variability for impacts as a result of turbine operating load, models were separately carried out representing turbine operation at the following load conditions: 100% load, 75% load and 50% load. Under each load condition, all turbines were simultaneously modeled as operating at that load. Startup/shutdown conditions, while accounted for in emission rates for annual models, were not assessed as a separate load condition for short-term (1-hr, 3-hr, 8-hr, 24-hr) models due to the intermittent nature of unit startup and shutdown.

2.8.2 Microturbines

The facility will operate thirteen (13) microturbines. Microturbines were modeled as point sources with unobstructed vertical orientation. All microturbines were modeled as operating simultaneously. Apart from exit velocity, as detailed below, microturbines were otherwise modeled according to their design stack exit parameters. Emission rates for short-term models used the maximum hourly potential emission rate of each microturbine, based on its rated heat input capacity. Emission rates for annual models considered continuous operation (i.e., 8,760 hrs/yr) of all microturbines.

A weather rain flap will be installed on each microturbine, which will open to a 45° angle when the units are in operation. The non-vertical exit of the stacks resulting from the rain flaps has been accounted for by modeling each source as an angled stack – that is, taking credit only for the vertical component of the exit velocity when exhausting at a 45° above horizontal. The function used to derive the vertical exit velocity is shown below:

$$Vvert = Vact\ x \sin(angle\ of\ stack\ from\ horizontal)$$

Where:
V_{vert} = Vertical component of exit velocity (m/s), as input into the model
V_{act} = Actual exit velocity of the stack (m/s)

At an angle of 45° from horizontal, the vertical component of the exit velocity is equivalent to approximately 70.7% of the actual exit velocity of the stack.

2.8.3 Fuel Gas Heaters

The facility will operate three (3) fuel gas heaters. Fuel gas heaters will operate without rain caps and were modeled as point sources with unobstructed vertical orientation. Fuel heaters were modeled according to their anticipated design exit parameters.

All fuel gas heaters were modeled as operating simultaneously. Emission rates for short-term models used the maximum hourly potential emission rate of each fuel gas heater, based on its rated heat input capacity. Emission rates for annual models considered continuous operation (i.e., 8,760 hrs/yr) of all heaters.

2.9 Ambient Ratio Method Version 2 (ARM2)

NO_X emissions from combustion sources at the facility will primarily be released in the form of nitric oxide (NO), whereas NAAQS standards are established for nitrogen dioxide (NO_2). With this considered, in the "Models for Nitrogen Dioxide" section of the Guideline (Section 4.2.3.4), U.S. EPA recommends a tiered screening approach for estimating NO_2 impacts from combustion point sources. Use of the tiered approach for NO_2 modeling, described briefly below, was considered for the Stallworth Compressor Station.

1. Under the initial and most conservative Tier 1 screening level, all NO_X emitted is modeled as NO_2. This assumes total conversion of NO (main chemical form of NO_X) to NO_2.
2. For the Tier 2 screening level, U.S. EPA recommends multiplying the Tier 1 results by the Ambient Ratio Method 2 (ARM2). ARM2 provides estimates of representative equilibrium ratios of NO_2/NO_X based on ambient levels of NO_2 and NO_X, derived from national data from the U.S. EPA's Air Quality System (AQS). The ARM2 function is a default regulatory option within the latest version of AERMOD.
3. Since the impact of an individual NO_X source on ambient NO_2 depends on the chemical environment into which the source's plume is emitted, modeling techniques that account for this atmospheric chemistry such as the Ozone Limiting Method (OLM), the Plume Volume Molar Ratio Method (PVMRM), or Generic Reaction Set Method (GRSM) can be considered under the most accurate and refined Tier 3 approach identified by U.S. EPA. Additional model inputs required for the use of OLM, PVMRM, or GRSM could include source-specific in-stack NO_2/NO_X ratios, ambient equilibrium NO_2/NO_X ratios, background ozone concentrations, and background NO_X/NO_2 concentrations.

For the 1-hour and annual NO_2 standards, MVP employed a Tier 2 NO_2 modeling approach, utilizing the ARM2 function in AERMOD. The regulatory-approved U.S. EPA default settings were used, including a minimum ambient NO_2/NO_X ratio of 0.5 and maximum ambient ratio of 0.9.

2.10 Background Concentrations

Background concentrations, quantifying the existing ambient air quality of the surrounding area, were obtained using data (2022-2024) from representative air quality monitors maintained by U.S. EPA. Air monitors were determined to be representative based on a number of criteria, including their distance to the facility, surrounding land cover and data availability. Monitors located within close proximity to large industrial sources were not considered due to the influence of these sources on monitoring values. In general, the monitors located closest to the proposed facility were determined to be representative. Note that no exclusions were made for smoke events (ex. fireworks, wildfires) when processing $PM_{2.5}$ monitoring data.

Background concentrations are summarized in Table 2-1. Background Concentration Data. Background pollutant concentrations were added to modeled impacts for NAAQS models in order to determine potential cumulative impacts on ambient air.

Table 2-1. Background Concentration Data

Pollutant	Averaging Period	Concentration (µg/m³)	Site Location	Site ID	Distance from Station (km)
NO_2	1-hour	58.14	Roanoke County, VA	51-161-1004	113.5
	Annual	8.93	Roanoke County, VA	51-161-1004	113.5
PM_{10}	24-hour	29.00	Caroll County, VA	51-035-0001	132.7
$PM_{2.5}$	24-hour	15.73	Salem City, VA	51-775-0011	101.4
	Annual	6.88	Salem City, VA	51-775-0011	101.4
CO	1-hour	1,489	Kanawha County, WV	54-039-0020	92
	8-hour	1,031	Kanawha County, WV	54-039-0020	92
SO_2	1-Hr	11.34	Kanawha County, WV	54-039-0020	92
Ozone	8-hour	57.33 ppb	Greenbrier County, WV	54-025-0003	12

2.11 Secondary PM2.5 and Ozone Formation

The current guideline model for Class II Area air dispersion modeling, AERMOD, does not account for many of the complex atmospheric physical and chemical mechanisms which can influence the formation of secondary $PM_{2.5}$ and ozone. Secondary $PM_{2.5}$ and ozone were therefore separately assessed following U.S. EPA's Modeled Emission Rates for Precursors (MERPs) guidance. MERPs is a Tier 1 demonstration tool. Following this guidance, sources are compared against representative hypothetical stacks, which have been modeled by EPA for downwind secondary air quality impacts. The intent of MERPs is to establish a technically credible relationship between emission rates for precursor pollutants and their secondary impacts.

Secondary $PM_{2.5}$ formation was assessed as generated from NO_X and SO_2 precursors, and ozone from NO_X and VOC precursors. Total facility-wide potential emissions of these precursor pollutants from the Stallworth Compressor Station were considered. MVP used pre-established MERPs values based on EPA photochemical grid modeling as the primary indicator that the project is not expected to cause or contribute to a violation of the NAAQS for ozone. Similarly, secondary $PM_{2.5}$ impacts determined from the MERPs assessment were added to cumulative impacts modeled for the $PM_{2.5}$ 24-hr and $PM_{2.5}$ annual Significance and NAAQS analyses.

Hypothetical sources were identified using the U.S. EPA's MERPs View Qlik website. Based on proximity, climate zone and terrain/land use, the Ashe County, North Carolina MERPs source was determined to be representative. Hypothetical stacks modeled at the Ashe County location (10 m height, 500 tpy emission rate) which were most closely aligned with the stacks that will be constructed at the Stallworth Compressor Station were used to carry out the MERPs analysis. Secondary impacts for the $PM_{2.5}$ 24-hr averaging period are estimated at 0.017 µg/m³, secondary impacts for the $PM_{2.5}$ annual averaging period are estimated at 0.0010 µg/m³ and secondary impacts for the ozone 8-hr averaging period are estimated at 0.386 ppb (less than the ozone SIL of 1 ppb).

2.12 Modeling Results

Results from the dispersion modeling, following the methodology outlined in the previous section, are summarized in Table 2-2. Summary of Modeling Results, SIL (SIL analyses) and Table 2-3. Summary of Modeling Results, NAAQS (NAAQS analyses). The results presented in the tables include the project impacts, as well as facility-wide impacts compared to applicable thresholds.

Table 2-2. Summary of Modeling Results, SIL

Pollutant	Averaging Period	Facility Total	Project	SIL Standard (µg/m³)	Below SIL	Significant Impact Area [STA] (km)
NO_2	1-Hr	129.07	38.64	7.5	No	13.50
	Annual	7.64	2.18	1	No	0.46
PM_{10}	24-hr	9.81	6.37	5	No	0.28
	Annual	0.86	0.25	1	Yes	
$PM_{2.5}$	24-hr	7.45	4.27	1.2	No	1.46
	Annual	0.71	0.21	0.13	No	0.64
CO	1-Hr	157.50	79.28	2,000	Yes	
	8-Hr	85.83	49.87	500	Yes	
SO_2	1-Hr	5.66	3.88	7.8	Yes	
	3-Hr	5.42	3.88	25	Yes	
	24-Hr	3.33	2.16	5	Yes	
	Annual	0.18	0.08	1	Yes	
Ozone	8-Hr	0.39 ppb		1.0 ppb	Yes	

[1] Maximum modeled impact and estimated secondary impacts from precursor pollutants for $PM_{2.5}$ and ozone.

As shown in Table 2-2. Summary of Modeling Results, SIL, modeled impacts exceed the significant impact levels (SIL) for NO_2 (1-hr, Annual), PM_{10} (24-hr), $PM_{2.5}$ (24-hr, Annual) and SO_2 (1-hr). The significant impact areas (SIA) shown for these pollutants represent the maximum distance at which a receptor was found to be above the SIL. Nominal differences for maximum impacts and SIAs were noted when comparing results across variable turbine operating loads. Note that SIL results are provided for general reference and do not, on their own, indicate an exceedance of a federal ambient air quality standard.

As shown in Table 2-3. Summary of Modeling Results, NAAQS, maximum cumulative impacts from operation of the compressor station are not anticipated to cause an exceedance of the NAAQS for any pollutant or averaging period. Negligible differences for maximum impacts were noted when comparing results across variable turbine loads.

Table 2-3. Summary of Modeling Results, NAAQS

Pollutant	Averaging Period	Rank	Facility (µg/m³)	Project (µg/m³)	Background (µg/m³)	Facility Total (µg/m³)	Project Total (µg/m³)	Primary NAAQS (µg/m³)	Below NAAQS?	% of NAAQS (Project Total)
NO_2	1-Hr	H8H	121.47	28.40	58.14	179.61	86.54	188	Yes	46.0%
	Annual	H1H	7.64	2.18	8.93	16.57	11.11	100	Yes	11.1%
PM_{10}	24-hr	H6H	6.67	3.59	29.00	35.67	32.59	150	Yes	21.7%
$PM_{2.5}$	24-hr	H8H	3.39	2.11	15.73	19.12	17.84	35	Yes	51.0%
	Annual	H1H	0.71	0.21	6.88	7.59	7.09	9	Yes	78.8%
CO	1-Hr	H2H	151.47	79.11	1,489	1067	1,568	40,000	Yes	3.9%
	8-Hr	H2H	67.33	48.20	1,098	869	1,079	10,000	Yes	10.8%
SO_2	1-Hr	H4H	5.15	3.50	11.34	13.00	11.35	196	Yes	7.6%
Ozone	8-Hr	-	0.39 ppb		57.33 ppb	57.72 ppb		70 ppb	Yes	82.5%

a. Includes maximum modeled impact, background concentrations (refer to Table 2-1. Background Concentration Data) and estimated secondary impacts from precursor pollutants for $PM_{2.5}$ and ozone. Regional sources were not considered for purposes of this modeling assessment.

APPENDIX A. MODEL INPUTS

Mountain Valley Pipeline, LLC
FERC Resource Report 9 Modeling
Appendix B: Source Parameters and Emission Rates

Table A-1. Summary of Modeled Point Source Emission Rates

Point Sources

Emission Point ID	Description	NO_2		SO_2		CO	PM_{10}		$PM_{2.5}$		NO_2		SO_2		CO	PM_{10}		$PM_{2.5}$	
		ST (lb/hr)	LT (tpy)	ST (lb/hr)	LT (tpy)	ST (lb/hr)	ST (lb/hr)	LT (tpy)	ST (lb/hr)	LT (tpy)	ST (g/s)	LT (g/s)	ST (g/s)	LT (g/s)	ST (g/s)	ST (g/s)	LT (g/s)	ST (g/s)	LT (g/s)
S001	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine	5.64	24.72	0.57	2.51	5.72	1.68	7.37	1.68	7.37	0.710628	0.710973	0.072130	0.072130	0.720708	0.212148	0.212148	0.212148	0.212148
S001_75	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine, 75%	4.99	21.87	0.51	2.22	5.06	1.49	6.53	1.49	6.53	0.628729	0.629075	0.063840	0.063840	0.637549	0.187764	0.187764	0.187764	0.187764
S001_50	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine, 50%	4.10	17.97	0.42	1.82	4.16	1.23	5.37	1.23	5.37	0.516591	0.516937	0.052483	0.052483	0.524151	0.154363	0.154363	0.154363	0.154363
S002	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine	5.64	24.72	0.57	2.51	5.72	1.68	7.37	1.68	7.37	0.710628	0.710973	0.072130	0.072130	0.720708	0.212148	0.212148	0.212148	0.212148
S002_75	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine, 75%	4.99	21.87	0.51	2.22	5.06	1.49	6.53	1.49	6.53	0.628729	0.629075	0.063840	0.063840	0.637549	0.187764	0.187764	0.187764	0.187764
S002_50	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine, 50%	4.10	17.97	0.42	1.82	4.16	1.23	5.37	1.23	5.37	0.516591	0.516937	0.052483	0.052483	0.524151	0.154363	0.154363	0.154363	0.154363
S003	Microturbine 1: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S004	Microturbine 2: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S005	Microturbine 3: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S006	Microturbine 4: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S007	Microturbine 5: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S008	Microturbine 6: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S009	Microturbine 7: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S010	Microturbine 8: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S011	Microturbine 9: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S012	Microturbine 10: Capstone C200 Generator Turbine	0.08	0.35	0.01	0.03	0.22	0.02	0.07	0.02	0.07	0.010080	0.010080	0.000977	0.000977	0.027720	0.001896	0.001896	0.001896	0.001896
S013	Fuel Gas Heater 1	0.22	0.96	0.00	0.01	0.18	0.02	0.07	0.02	0.07	0.027637	0.027637	0.000166	0.000166	0.023215	0.002100	0.002100	0.002100	0.002100
S014	Fuel Gas Heater 2	0.22	0.96	0.00	0.01	0.18	0.02	0.07	0.02	0.07	0.027637	0.027637	0.000166	0.000166	0.023215	0.002100	0.002100	0.002100	0.002100
S021	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine	5.64	24.72	0.57	2.51	5.72	1.68	7.37	1.68	7.37	0.710628	0.710973	0.072130	0.072130	0.720708	0.212148	0.212148	0.212148	0.212148
S021_75	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine, 75%	4.99	21.87	0.51	2.22	5.06	1.49	6.53	1.49	6.53	0.628729	0.629075	0.063840	0.063840	0.637549	0.187764	0.187764	0.187764	0.187764
S021_50	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine, 50%	4.10	17.97	0.42	1.82	4.16	1.23	5.37	1.23	5.37	0.516591	0.516937	0.052483	0.052483	0.524151	0.154363	0.154363	0.154363	0.154363
S022	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine	5.64	24.72	0.57	2.51	5.72	1.68	7.37	1.68	7.37	0.710628	0.710973	0.072130	0.072130	0.720708	0.212148	0.212148	0.212148	0.212148
S022_75	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine, 75%	4.99	21.87	0.51	2.22	5.06	1.49	6.53	1.49	6.53	0.628729	0.629075	0.063840	0.063840	0.637549	0.187764	0.187764	0.187764	0.187764
S022_50	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine, 50%	4.10	17.97	0.42	1.82	4.16	1.23	5.37	1.23	5.37	0.516591	0.516937	0.052483	0.052483	0.524151	0.154363	0.154363	0.154363	0.154363
S023	Fuel Gas Heater 3	0.22	0.96	0.00	0.01	0.18	0.02	0.07	0.02	0.07	0.027637	0.027637	0.000166	0.000166	0.023215	0.002100	0.002100	0.002100	0.002100

Mountain Valley Pipeline, LLC
FERC Resource Report 9 Modeling
Appendix A: Source Parameters and Emission Rates

Table A-2. Summary of Point Source Parameters

Point Sources

Emission Point ID	Description	UTM East	UTM North	Elevation	Stack Height	Stack Temperature	Exit Velocity	Stack Diameter
		m	m	m	m	K	m/s	m
S001	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine	521287.30	4191164.60	844.60	15.01	730.93	19.56	2.75
S001_75	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine 75%	521287.30	4191164.60	844.60	15.01	737.59	18.79	2.75
S001_50	Turbine 1: Solar Titan 130 Centrifugal Compressor Turbine 50%	521287.30	4191164.60	844.60	15.01	742.59	16.62	2.75
S002	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine	521287.00	4191144.90	844.60	15.01	730.93	19.56	2.75
S002_75	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine 75%	521287.00	4191144.90	844.60	15.01	737.59	18.79	2.75
S002_50	Turbine 2: Solar Titan 130 Centrifugal Compressor Turbine 50%	521287.00	4191144.90	844.60	15.01	742.59	16.62	2.75
S003	Microturbine 1: Capstone C200 Generator Turbine	521362.40	4191094.40	844.60	3.66	562.37	32.18	0.30
S004	Microturbine 2: Capstone C200 Generator Turbine	521362.50	4191092.80	844.60	3.66	562.37	32.18	0.30
S005	Microturbine 3: Capstone C200 Generator Turbine	521362.40	4191091.10	844.60	3.66	562.37	32.18	0.30
S006	Microturbine 4: Capstone C200 Generator Turbine	521362.40	4191089.40	844.60	3.66	562.37	32.18	0.30
S007	Microturbine 5: Capstone C200 Generator Turbine	521362.40	4191087.80	844.60	3.66	562.37	32.18	0.30
S008	Microturbine 6: Capstone C200 Generator Turbine	521362.50	4191101.90	844.60	3.66	562.37	32.18	0.30
S009	Microturbine 7: Capstone C200 Generator Turbine	521362.50	4191103.60	844.60	3.66	562.37	32.18	0.30
S010	Microturbine 8: Capstone C200 Generator Turbine	521362.50	4191105.10	844.60	3.66	562.37	32.18	0.30
S011	Microturbine 9: Capstone C200 Generator Turbine	521362.50	4191106.80	844.60	3.66	562.37	32.18	0.30
S012	Microturbine 10: Capstone C200 Generator Turbine	521362.50	4191108.40	844.60	3.66	562.37	32.18	0.30
S013	Fuel Gas Heater 1	521348.30	4191194.70	844.60	5.49	659.59	0.60	0.51
S014	Fuel Gas Heater 2	521351.20	4191194.80	844.60	5.49	659.59	0.60	0.51
S021	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine	521283.8	4191122.8	844.60	15.01	730.93	19.56	2.75
S021_75	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine, 75%	521283.8	4191122.8	844.60	15.01	737.59	18.79	2.75
S021_50	Turbine 3: Solar Titan 130 Centrifugal Compressor Turbine, 50%	521283.8	4191122.8	844.60	15.01	742.59	16.62	2.75
S022	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine	521283.8	4191107.1	844.60	15.01	730.93	19.56	2.75
S022_75	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine, 75%	521283.8	4191107.1	844.60	15.01	737.59	18.79	2.75
S022_50	Turbine 4: Solar Titan 130 Centrifugal Compressor Turbine, 50%	521283.8	4191107.1	844.60	15.01	742.59	16.62	2.75
S023	Fuel Gas Heater 3	521345.4	4191195.8	844.60	5.49	659.59	0.60	0.51

Notes:

All coordinates are Universal Transverse Mercator (UTM) coordinates based on North American Datum 1983 (NAD 83) and reside within UTM Zone 17.

Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9

Appendix 9-F
Swann Compressor Station Air Quality Modeling Report

FEDERAL ENERGY REGUALTORY COMMISSION
AIR DISPERSION MODELING REPORT
Swann Compressor Station

Mountain Valley Pipeline
Montgomery County, Virginia

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Project 253901.0130

TABLE OF CONTENTS

1. INTRODUCTION 1-1

2. DISPERSION MODELING ANALYSIS 2-1
   - 2.1 Model Selection 2-1
   - 2.2 Coordinate System and Facility Location 2-1
   - 2.3 Receptor Grids 2-3
   - 2.4 Building Downwash and GEP Analysis 2-6
     - *2.4.1 GEP Height Analysis 2-6*
   - 2.5 Elevated Terrain 2-7
   - 2.6 Meteorological Data 2-7
   - 2.7 Rural/Urban Option Selection in AERMOD 2-8
   - 2.8 Source Parameters 2-11
     - *2.8.1 Combustion Turbines 2-11*
     - *2.8.2 Microturbines 2-11*
     - *2.8.3 Fuel Gas Heaters 2-12*
   - 2.9 Ambient Ratio Method Version 2 (ARM2) 2-12
   - 2.10 Background Concentrations 2-12
   - 2.11 Secondary PM2.5 and Ozone Formation 2-13
   - 2.12 Modeling Results 2-14

APPENDIX A. MODEL INPUTS

1. INTRODUCTION

Mountain Valley Pipeline, LLC (MVP) is proposing the construction and operation of a greenfield compressor station (Swann Compressor Station) located on Roanoke Road in Lafayette (Montgomery County), Virginia. The Swann Compressor Station will compress and transport pipeline quality natural gas through an interstate natural gas pipeline, the Mountain Valley Pipeline, extending from northwestern West Virginia to southern Virginia.

Primary emission units which will be installed at the facility include the following:

- Two (2) Solar Titan 350-52500S natural gas-fired turbines, each rated at 52,500 bhp (at ISO conditions)
- One (1) Solar Titan 250-31900S natural gas-fired turbine rated at 31,900 bhp (at ISO conditions)
- Fifteen (15) Capstone C300 natural gas-fired microturbine generators, each rated at 200 kilowatts (kW)
- Three (3) natural gas-fired fuel gas heaters, each rated at 0.77 million British thermal units per hour (MMBtu/hr) heat input
- Two (2) natural gas-fired fuel gas heaters, each rated at 1.15 million British thermal units per hour (MMBtu/hr) heat input

Air dispersion modeling was completed using AERMOD (v24142), using all regulatory default options, to assess impacts to ambient air from operation of the proposed compressor station. Impacts for criteria pollutants were compared against both Class II Significant Impact Levels (SILs) and National Ambient Air Quality Standards (NAAQS).

SILs and NAAQS are atmospheric concentrations established by U.S. EPA for criteria pollutants. SILs are used to assess whether a project is significant – that is, whether impacts from the source may be anticipated to cause or significantly contribute to a potential exceedance of an ambient air quality standard (i.e., NAAQS). Exceedance of a SIL does not, on its own, indicate the exceedance of a federal air quality standard; instead, it conveys that further analysis should be completed. Primary NAAQS are standards set by U.S. EPA under the Clean Air Act to protect public health and define regulatory limits for an area to be designated "attainment". Thresholds for each of these standards are summarized in Tables 1-1 and 1-2.

Table 1-1. Significant Impact Levels (SIL)

Pollutant	Averaging Period	Form of Standard, As Modeled	Class II SIL (µg/m^3)
NO_2	1-Hr	Maximum of the 5-year average of the highest 1-hr impacts	7.5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1
PM_{10}	24-hr	H1H from a 5-year MET data set	5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1
$PM_{2.5}$	24-hr	Highest 5-year Average of the 1st High Impacts	1.2
	Annual	Highest 5-year Average of Annual Arithmetic Mean	0.13
CO	1-Hr	H1H from a 5-year MET data set	2,000
	8-Hr	H1H from a 5-year MET data set	500
SO2	1-Hr	Maximum of the 5-year average of the highest 1-hr impacts	7.8
	3-Hr	H1H from a 5-year MET data set	25
	24-Hr	H1H from a 5-year MET data set	5
	Annual	Maximum Annual Impacts from a 5-year MET data set	1

Table 1-2. National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Period	Form of Standard, As Modeled	Primary NAAQS ($\mu g/m^3$)
NO_2	1-Hr	5-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations	188
	Annual	Maximum annual impacts from a 5-year MET data set	100
PM_{10}	24-hr	H6H from a 5-year MET data set	150
$PM_{2.5}$	24-hr	Highest 5-year average of the 8th high impacts	35
	Annual	Highest 5-year average of annual arithmetic mean	9
CO	1-Hr	Maximum individual year's H2H from a 5-year MET data set	40,000
	8-Hr	Maximum individual year's H2H from a 5-year MET data set	10,000
SO2	1-Hr	5-year average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations	196
Ozone	8-Hr	3-Year Average of annual 4th highest daily maximum 8-hr concentrations	70 ppb

2. DISPERSION MODELING ANALYSIS

In general, the air dispersion modeling analyses were carried out in accordance with applicable state and EPA guidance documents, including the following:

- DEQ's Virginia Modeling Guideline for Air Quality Permits (March 2015)
- EPA's *Guideline on Air Quality Models*, 40 CFR Part 51, Appendix W (Revised, November 29, 2024)
- EPA's *AERMOD Implementation Guide* (Revised, November 2024)
- EPA's User's Guide for the AMS/EPA Regulatory Model – AERMOD (Revised, November 2024)

Following this modeling guidance, the remainder of this section provides an overview of the modeling methods which were applied.

2.1 Model Selection

The EPA-approved version of the AERMOD modeling system (v24142) was used to estimate maximum ground-level concentrations over the full modeling domain. AERMOD is a refined, steady-state, multiple source, Gaussian dispersion model and is the preferred model for use by industrial sources for this type of air quality analysis.

The AERMOD modeling system is composed of three modular components: AERMAP, the terrain preprocessor; AERMET, the meteorological preprocessor; and AERMOD, the control module and modeling processor. AERMAP is the terrain pre-processor that is used to import terrain elevations for selected model objects and to generate the receptor hill height scale data that are used by AERMOD to drive advanced terrain processing algorithms. National Elevation Dataset (NED) data available from the United States Geological Survey (USGS) were utilized to interpolate surveyed elevations onto user specified receptor grids and for building and source locations in the absence of more accurate site-specific (i.e., site surveys, GPS analyses, etc.) elevation data.

AERMET generates a separate surface file and vertical profile file to pass meteorological observations and turbulence parameters to AERMOD. AERMET meteorological data are refined for a particular analysis based on the choice of micrometeorological parameters that are linked to the land use and land cover (LULC) around the meteorological site shown to be representative of the application site.

AERMOD was run using all regulatory default options.

2.2 Coordinate System and Facility Location

In all modeling analyses conducted for the compressor station, the location of emission sources, structures, and receptors were represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central 500 km meridian of each UTM zone, where the world is divided into 36 north-south zones). The datum for modeling of the compressor station was based on North American Datum 1983 (NAD 83). UTM coordinates for this analysis all resided within UTM Zone 17N, which served as the reference point for all facility source data, as well as all receptors. The approximate central coordinate of the property is 570,500 meters easting and 4,120,300 meters northing [UTM Zone 17N]. The location of the proposed facility, projected in the UTM coordinate system, is provided in Figure 2-1 for reference.

Figure 2-1. Swann Compressor Station Area Map

2.3 Receptor Grids

Ground-level concentrations were calculated from the property boundary out to 10 km using a series of nested receptor grids. Anticipating that impacts for the NO_2 1-hr and NO_2 annual standards (SIL, NAAQS) may extend beyond 10 km, the nested receptor grid was extended out to 30 km from the center of the property for these specific models.

Receptors were excluded from the fenced area contained within the property boundary. The fence serves as a physical boundary which restricts public access to the property. Air within the fenceline is therefore not considered to be "ambient" and does not need to be assessed for compliance with the NAAQS.

Discrete receptors were placed along the ambient air boundary, as well as within a nested cartesian grid extending the facility center, as follows:

- **Boundary**: Receptors spaced at 25 meters (except at corners) placed along the ambient air boundary of the Manassas Facility,
- **Fine Cartesian Grid**: A "fine" grid containing 50-meter spaced receptors beginning at the ambient air boundary and extending to 1 km from the center of the property,
- **Medium-Fine Cartesian Grid**: A "medium-fine" grid containing 100-meter spaced receptors extending from 1 km to 3 km from the center of the property, exclusive of receptors on the fine grid,
- **Coarse Cartesian Grid**: A "coarse" grid containing 250-meter spaced receptors extending from 3 km to 10 km from the center of the facility, exclusive of receptors on the fine and medium-fine grids.
- **Very Coarse Cartesian Grid (NO_2 Only)**: A "very coarse" grid containing 500-meter spaced receptors extending from 10 km to 30 km from the center of the facility, exclusive of receptors on the fine, medium-fine and coarse grids. This nested receptor grid was used exclusively with the NO_2 1-Hr and NO_2 Annual models.

Note that maximum impacts identified from the modeling analyses were determined to have occurred at the property boundary or within bounds of the Fine Cartesian Grid. The receptor grid, as designed, was therefore determined to have appropriately captured maximum impacts.

The receptor grid and the approximate ambient air boundary are shown visually in Figures 2-2 and 2-3.

Figure 2-2. Receptor Grid (Zoomed Extent)

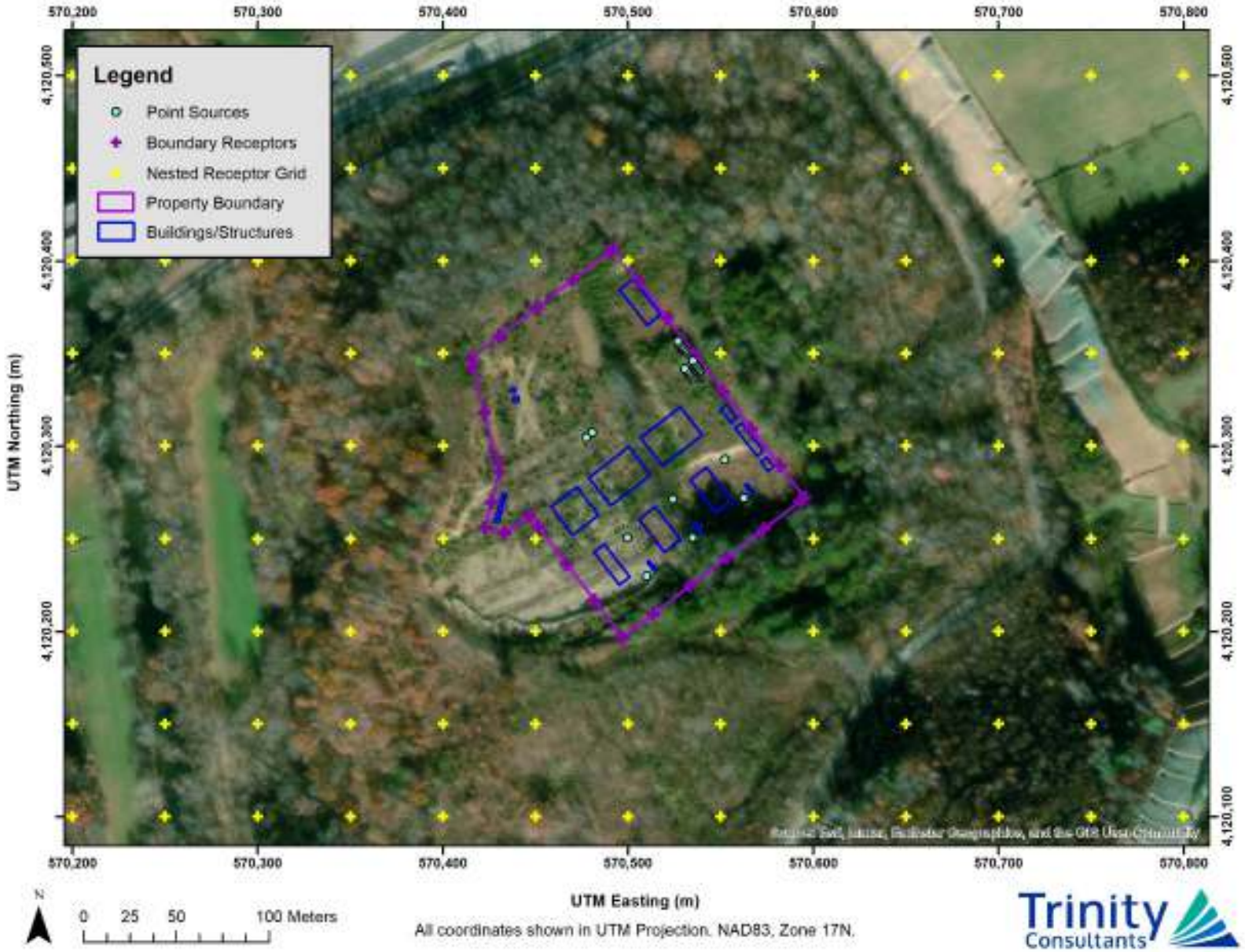
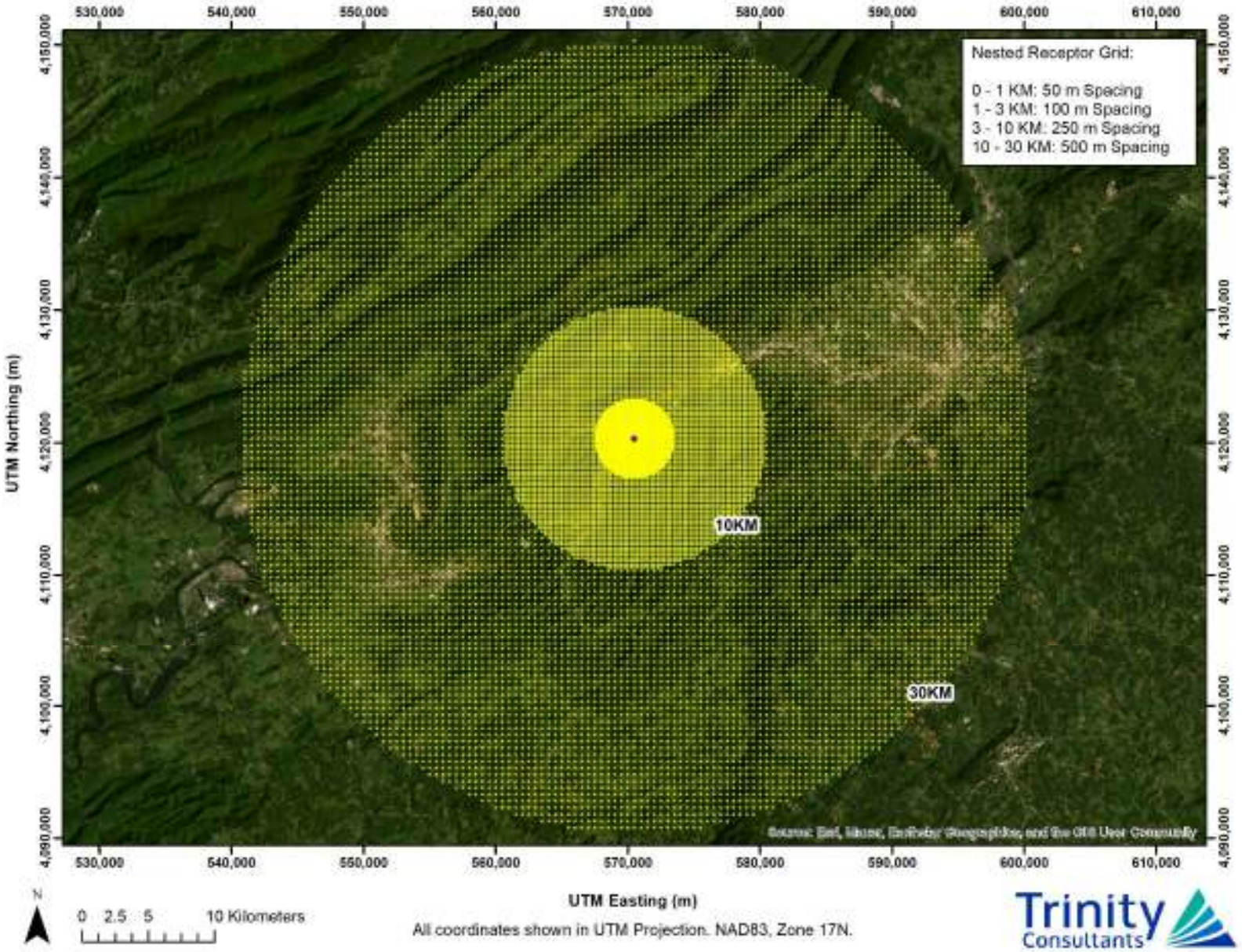


Figure 2-3. Receptor Grid (Full Extent)



2.4 Building Downwash and GEP Analysis

Stacks modeled for the compressor station are subject to building downwash effects. These effects are caused by air flow over and around buildings and structures disrupting the free flow movement of the wind. The result of this phenomenon is increased turbulence near buildings and structures. Downwash effects were addressed through the implementation of the Plume Rise Model Enhancements (PRIME) program found within the regulatory version of AERMOD.

Direction-specific building downwash dimensions (height and width of each influencing building or structure) were determined using the Building Profile Input Program, PRIME version (BPIP PRIME), v04274, and used in the AERMOD Model. BPIP PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document and the Building Downwash Guidance document, while incorporating the PRIME enhancements to improve prediction of ambient impacts in building cavities (very near the buildings) and wake regions (farther from the buildings).

Locations and dimensions for buildings and other structures at the facility were primarily determined though use of engineering design documents for the proposed facility. Structures were excluded if their dimensions were determined insignificant, or if the design of the structure would allow for air to pass through with minimal disruption. Where information could not be directly determined based on available reference documents, professional judgement was used for estimation of structure parameters.

Buildings and significant structures which were included in the model are shown in Figure 2-2, for reference.

2.4.1 GEP Height Analysis

EPA has promulgated stack height regulations that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP height is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

$H_{GEP} = H + 1.5\ L$, where:

H_{GEP} = minimum GEP stack height,
H = structure height, and
L = lesser dimension of the structure (height or predicted width)

This equation is limited to stacks located within 5L of a structure. Stacks located at a distance greater than 5L are not subject to the wake effects of the structure. The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP. In general, the lowest GEP stack height for any source is 65 m by default.[1]

No stack at the Swann Compressor Station will have a height above grade exceeding GEP height. Therefore, stacks were modeled at their actual heights.

[1] 40 CFR 81.100(ii)

2.5 Elevated Terrain

Receptor elevations (excluding property boundary receptors) were determined from USGS National Elevation Dataset (NED) elevation data, using 1/3 arc second resolution files. Receptors were assigned base elevations using NED data, as interpolated through the AERMAP terrain preprocessor (v24142). The NED consists of arrays of regularly spaced elevations at 10-meter intervals. Elevations are assigned by AERMAP based upon the maximum terrain elevation associated with the four NED points surrounding the specified object. For all modeled receptors, AERMAP additionally derived an effective hill height scale, which determined the magnitude of interactions between each source plume and elevated terrain features.

Elevations for buildings, sources and property boundary receptors were assigned based on the anticipated graded elevation of the facility, 1,340 ft (408.43 m).

2.6 Meteorological Data

Site-specific dispersion models require a sequential hourly record of dispersion meteorology, representative of the region in which the source is located. In the absence of site-specific measurements, the U.S. EPA guidelines recommend the use of readily available data from the closest and most representative National Weather Service (NWS) station. Regulatory air dispersion modeling using AERMOD requires five years of quality-assured meteorological data, incorporating both surface and upper air observations.

Surface and upper-air meteorological data were processed through the latest version of AERMET (v24142), using data for the following meteorological stations, which were selected as representative based on their proximity to the site and similar land cover:

- Surface Station
  - Station: Roanoke Regional Airport [ROA] (Station Number 13741)
  - Approximate Distance from Proposed Facility: 23 km
- Upper Air Station
  - Station: Roanoke Virginia NWS Station, Located in Blacksburg, VA [ROA] (Station Number 53829)
  - Approximate Distance from Proposed Facility: 19 km

Meteorological data was processed for a 5-year period extending from 2020-2024.

Figure 2-4. Meteorological Station Locations

2.7 Rural/Urban Option Selection in AERMOD

As stated in Section 7.2.1.1, Dispersion Coefficients, of the Guideline on Air Quality Models, for any dispersion modeling exercise, the "urban" or "rural" determination of the location surrounding the source is important in determining the applicable boundary layer characteristics that affect a model's calculation of ambient concentrations. Thus, a determination was made of whether the area around the Swann Compressor Station is urban or rural.

The "land use procedure", as discussed in the Guideline on Air Quality Models (Section 7.2.1.1(b)(i) of Appendix W), was used to assess the predominant land use characterization of the surrounding area. Following this guidance, 2024 NLCD land use data were obtained from the U.S. Geological Survey and overlayed onto the area circumscribed by a 3 km radius circle about the facility center. Where urban land use types account for 50% or more of the circumscribed area, urban dispersion coefficients should be used; otherwise, rural dispersion coefficients are appropriate.

ArcGIS was used for processing of the vector data and for extraction of the land-use values in the domain. The results of the land use analysis evaluation are described herein. Each USGS NLCD 2024 land use class was compared to the most appropriate Auer land use category listed in Table 2-1 to quantify the total urban and rural area. NLCD land use types 23 (Developed, Medium Intensity) and 24 (Developed, High Intensity) correspond with Auer classifications for urban land use.

Table 2-2 shows the results of this land categorization process. As approximately 97.2% of the area can be classified as rural, the urban model option in AERMOD was not used.

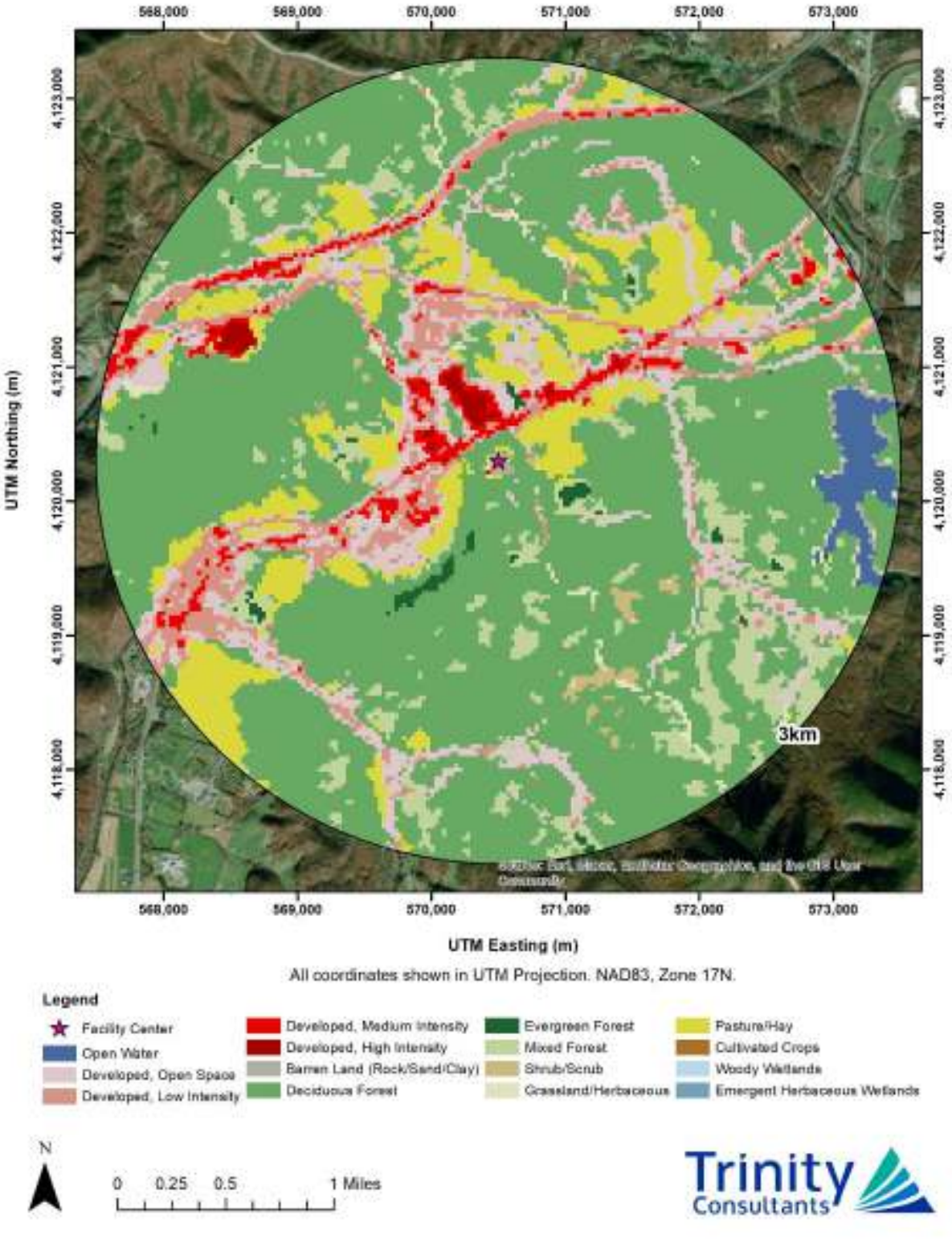
Table 2-1. Urban/Rural Categories

2024 NLCD Land cover Classification		Auer Land Use Classification		Rural or Urban
11	Open Water	A5	Water Surfaces	Rural
12	Perennial Snow/Ice	A5	Water Surfaces	Rural
21	Developed, Open Space	A1	Metropolitan Natural	Rural
22	Developed, Low Intensity	R1	Common Residential	Rural
23	Developed, Medium Intensity	I1, I2, C1, R2, R3	Industrial/Commercial/Compact Residential	Urban
24	Developed, High Intensity	I1, I2, C1, R2, R3	Industrial/Commercial/Compact Residential	Urban
31	Barren Land	A3	Undeveloped (Grasses/Shrub)	Rural
41	Deciduous Forest	A4	Undeveloped (Wooded)	Rural
42	Evergreen Forest	A4	Undeveloped (Wooded)	Rural
43	Mixed Forest	A4	Undeveloped (Wooded)	Rural
52	Shrub/Scrub	A3	Undeveloped (Grasses/Shrub)	Rural
71	Herbaceous	A3	Undeveloped (Grasses/Shrub)	Rural
81	Hay/Pasture	A2	Agricultural	Rural
82	Cultivated Crops	A2	Agricultural	Rural
90	Woody Wetlands	A4	Undeveloped (Wooded)	Rural
95	Emergent Herbaceous Wetland	A3	Undeveloped (Grasses/Shrub)	Rural

Table 2-2. Land Cover Summary, 3 km Radius

Category ID	Category Description	Percent
11	Open Water	1.5
12	Perennial Snow/Ice	0.0
21	Developed, Open Space	10.2
22	Developed, Low Intensity	7.1
23	Developed, Medium Intensity	2.3
24	Developed, High Intensity	0.5
31	Barren Land	0.3
41	Deciduous Forest	58.6
42	Evergreen Forest	0.6
43	Mixed Forest	7.5
52	Shrub/Scrub	0.6
71	Herbaceous	0.8
81	Hay/Pasture	10.0
82	Cultivated Crops	0.0
90	Woody Wetlands	0.0
95	Emergent Herbaceous Wetland	0.0
	Total	**100**
	Urban	**2.8**
	Rural	**97.2**

Figure 2-5. Land Use Distribution, NLCD 2024



2.8 Source Parameters

The AERMOD dispersion model allows for emission units to be represented as point, area, or volume sources. Emissions from all modeled sources at the Swann compress station will emanate from clearly discernable emission points (e.g., stacks). Stack parameters for all sources are provided in Appendix A. This section provides additional narrative on how stack parameters were derived.

2.8.1 Combustion Turbines

The facility will operate three (3) combustion turbines. Turbine stacks were modeled as point sources with unobstructed vertical orientation. All combustion turbines were modeled as operating simultaneously. Model inputs were set according to the stack exit parameters for the turbines as exhausting from oxidation catalyst and selective catalytic reduction (SCR) add-on controls. Turbine stack parameters and emission rates are representative of a 0 °F ambient temperature condition. In general, a low ambient temperature condition represents a worst-case emission scenario for combustion turbines, due to the increased fuel input (MMBtu/hr) required at reduced ambient temperatures. Emission rates for annual models considered continuous turbine operation (i.e., 8,760 hrs/yr), inclusive of potential emissions from startup and shutdown cycles.

Anticipating potential variability for impacts as a result of turbine operating load, models were separately carried out representing turbine operation at the following load conditions: 100% load, 75% load and 50% load. Under each load condition, all three (3) turbines were simultaneously modeled as operating at that load. Startup/shutdown conditions, while accounted for in emission rates for annual models, were not assessed as a separate load condition for short-term (1-hr, 3-hr, 8-hr, 24-hr) models due to the intermittent nature of unit startup and shutdown.

2.8.2 Microturbines

The facility will operate fifteen (15) microturbines. Microturbines were modeled as point sources with unobstructed vertical orientation. All microturbines were modeled as operating simultaneously. Apart from exit velocity, as detailed below, microturbines were otherwise modeled according to their design stack exit parameters. Emission rates for short-term models used the maximum hourly potential emission rate of each microturbine, based on its rated heat input capacity. Emission rates for annual models considered continuous operation (i.e., 8,760 hrs/yr) of all microturbines.

A weather rain flap will be installed on each microturbine, which will open to a 45° angle when the units are in operation. The non-vertical exit of the stacks resulting from the rain flaps has been accounted for by modeling each source as an angled stack – that is, taking credit only for the vertical component of the exit velocity when exhausting at a 45° above horizontal. The function used to derive the vertical exit velocity is shown below:

$$Vvert = Vact\ x \sin(angle\ of\ stack\ from\ horizontal)$$

Where:
V_{vert} = Vertical component of exit velocity (m/s), as input into the model
V_{act} = Actual exit velocity of the stack (m/s)

At an angle of 45° from horizontal, the vertical component of the exit velocity is equivalent to approximately 70.7% of the actual exit velocity of the stack.

2.8.3 Fuel Gas Heaters

The facility will operate five (5) fuel gas heaters. Fuel gas heaters will operate without rain caps and were modeled as point sources with unobstructed vertical orientation. Fuel heaters were modeled according to their anticipated design exit parameters.

All fuel gas heaters were modeled as operating simultaneously. Emission rates for short-term models used the maximum hourly potential emission rate of each fuel gas heater, based on its rated heat input capacity. Emission rates for annual models considered continuous operation (i.e., 8,760 hrs/yr) of all heaters.

2.9 Ambient Ratio Method Version 2 (ARM2)

NO_X emissions from combustion sources at the facility will primarily be released in the form of nitric oxide (NO), whereas NAAQS standards are established for nitrogen dioxide (NO_2). With this considered, in the "Models for Nitrogen Dioxide" section of the Guideline (Section 4.2.3.4), U.S. EPA recommends a tiered screening approach for estimating NO_2 impacts from combustion point sources. Use of the tiered approach for NO_2 modeling, described briefly below, was considered for the Swann Compressor Station.

1. Under the initial and most conservative Tier 1 screening level, all NO_X emitted is modeled as NO_2. This assumes total conversion of NO (main chemical form of NO_X) to NO_2.
2. For the Tier 2 screening level, U.S. EPA recommends multiplying the Tier 1 results by the Ambient Ratio Method 2 (ARM2). ARM2 provides estimates of representative equilibrium ratios of NO_2/NO_X based on ambient levels of NO_2 and NO_X, derived from national data from the U.S. EPA's Air Quality System (AQS). The ARM2 function is a default regulatory option within the latest version of AERMOD.
3. Since the impact of an individual NO_X source on ambient NO_2 depends on the chemical environment into which the source's plume is emitted, modeling techniques that account for this atmospheric chemistry such as the Ozone Limiting Method (OLM), the Plume Volume Molar Ratio Method (PVMRM), or Generic Reaction Set Method (GRSM) can be considered under the most accurate and refined Tier 3 approach identified by U.S. EPA. Additional model inputs required for the use of OLM, PVMRM, or GRSM could include source-specific in-stack NO_2/NO_X ratios, ambient equilibrium NO_2/NO_X ratios, background ozone concentrations, and background NO_X/NO_2 concentrations.

For the 1-hour and annual NO_2 standards, MVP employed a Tier 2 NO_2 modeling approach, utilizing the ARM2 function in AERMOD. The regulatory-approved U.S. EPA default settings were used, including a minimum ambient NO_2/NO_X ratio of 0.5 and maximum ambient ratio of 0.9.

2.10 Background Concentrations

Background concentrations, quantifying the existing ambient air quality of the surrounding area, were obtained using data (2022-2024) from representative air quality monitors maintained by U.S. EPA. Air monitors were determined to be representative based on a number of criteria, including their distance to the facility, surrounding land cover and data availability. Monitors located within close proximity to large industrial sources were not considered due to the influence of these sources on monitoring values. In general, the monitors located closest to the proposed facility were determined to be representative. Note that no exclusions were made for smoke events (ex. fireworks, wildfires) when processing $PM_{2.5}$ monitoring data.

Background concentrations are summarized in Table 2-3. Background pollutant concentrations were added to modeled impacts for NAAQS models in order to determine potential cumulative impacts on ambient air.

Table 2-3. Background Concentration Data

Pollutant	Averaging Period	Concentration (µg/m³)	Site Location	Site ID	Distance from Station (km)
NO_2	1-hour	58.13	Roanoke County, VA	51-161-1004	29.1
	Annual	9.23	Roanoke County, VA	51-161-1005	29.1
PM_{10}	24-hour	29.00	Caroll County, VA	51-035-0001	83.7
$PM_{2.5}$	24-hour	15.73	Salem City, VA	51-775-0011	13.6
	Annual	6.88	Salem City, VA	51-775-0011	13.6
CO	1-hour	1030.67	Roanoke County, VA	51-161-1004	29.1
	8-hour	916.16	Roanoke County, VA	51-161-1005	29.1
SO_2	1-Hr	8.29	Roanoke County, VA	51-161-1005	29.1
Ozone	8-hour	63 ppb	Giles County, VA	51-071-9992	24.7

2.11 Secondary PM2.5 and Ozone Formation

The current guideline model for Class II Area air dispersion modeling, AERMOD, does not account for many of the complex atmospheric physical and chemical mechanisms which can influence the formation of secondary $PM_{2.5}$ and ozone. Secondary $PM_{2.5}$ and ozone were therefore separately assessed following U.S. EPA's Modeled Emission Rates for Precursors (MERPs) guidance. MERPs is a Tier 1 demonstration tool. Following this guidance, sources are compared against representative hypothetical stacks, which have been modeled by EPA for downwind secondary air quality impacts. The intent of MERPs is to establish a technically credible relationship between emission rates for precursor pollutants and their secondary impacts.

Secondary $PM_{2.5}$ formation was assessed as generated from NO_X and SO_2 precursors, and ozone from NO_X and VOC precursors. Total facility-wide potential emissions of these precursor pollutants from the Swann Compressor Station were considered. MVP used pre-established MERPs values based on EPA photochemical grid modeling as the primary indicator that the project is not expected to cause or contribute to a violation of the NAAQS for ozone. Similarly, secondary $PM_{2.5}$ impacts determined from the MERPs assessment were added to cumulative impacts modeled for the $PM_{2.5}$ 24-hr and $PM_{2.5}$ annual Significance and NAAQS analyses.

Hypothetical sources were identified using the U.S. EPA's MERPs View Qlik website.[2] Based on proximity, climate zone and terrain/land use, the Ashe County, North Carolina MERPs source was determined to be representative. Hypothetical stacks modeled at the Ashe County location (10 m height, 500 tpy emission rate) which were most closely aligned with the stacks that will be constructed at the Swann Compressor Staiton were used to carry out the MERPs analysis. Secondary impacts for the $PM_{2.5}$ 24-hr averaging period are estimated at 0.014 µg/m³, secondary impacts for the $PM_{2.5}$ annual averaging period are estimated at 0.0007 µg/m³ and secondary impacts for the ozone 8-hr averaging period are estimated at 0.202 ppb (less than the ozone SIL of 1 ppb).

[2] https://www.epa.gov/scram/merps-view-qlik

2.12 Modeling Results

Results from the dispersion modeling, following the methodology outlined in the previous section, are summarized in Table 2-4 and Table 2-5.

Table 2-4. Summary of Modeling Results, SIL

Pollutant	Averaging Period	Maximum Impact[1] (µg/m³)				SIL Standard (µg/m³)	Below SIL?	Significant Impact Area [SIA] (km)
		100% Load	75% Load	50% Load	Maximum			
NO_2	1-Hr	68.98	68.98	68.98	**68.98**	7.5	**No**	4.75
	Annual	5.04	5.04	5.04	**5.04**	1	**No**	0.49
PM_{10}	24-hr	9.33	9.33	9.33	**9.33**	5	**No**	0.36
	Annual	0.91	0.91	0.90	**0.91**	1	Yes	-
$PM_{2.5}$	24-hr	8.31	8.31	8.31	**8.31**	1.2	**No**	2.48
	Annual	0.87	0.87	0.87	**0.87**	0.13	**No**	2.97
CO	1-Hr	213.02	213.02	213.02	**213.02**	2,000	Yes	-
	8-Hr	186.20	186.20	186.20	**186.20**	500	Yes	-
SO_2	1-Hr	9.28	8.92	8.13	**9.28**	7.8	**No**	1.20
	3-Hr	6.96	6.95	6.95	**6.96**	25	Yes	-
	24-Hr	4.80	4.80	4.80	**4.80**	5	Yes	-
	Annual	0.43	0.43	0.43	**0.43**	1	Yes	-
Ozone	8-Hr	**0.20 ppb**				1.0 ppb	Yes	-

[1] Maximum modeled impact and estimated secondary impacts from precursor pollutants for $PM_{2.5}$ and ozone.

As shown in Table 2-4, modeled impacts exceed the significant impact levels (SIL) for NO_2 (1-hr, Annual), PM_{10} (24-hr), $PM_{2.5}$ (24-hr, Annual) and SO_2 (1-hr). The significant impact areas (SIA) shown for these pollutants represent the maximum distance at which a receptor was found to be above the SIL. Nominal differences for maximum impacts and SIAs were noted when comparing results across variable turbine operating loads. Note that SIL results are provided for general reference and do not, on their own, indicate an exceedance of a federal ambient air quality standard.

Table 2-5. Summary of Modeling Results, NAAQS

Pollutant	Averaging Period	Rank	Cumulative Impact[1] (µg/m³)				Primary NAAQS (µg/m³)	Below NAAQS?	% of NAAQS
			100% Load	75% Load	50% Load	Maximum			
NO_2	1-Hr	H8H	121.44	121.44	121.44	**121.44**	188	Yes	64.6%
	Annual	H1H	14.27	14.27	14.27	**14.27**	100	Yes	14.3%
PM_{10}	24-hr	H6H	36.84	36.84	36.84	**36.84**	150	Yes	24.6%
$PM_{2.5}$	24-hr	H8H	21.29	21.29	21.29	**21.29**	35	Yes	60.8%
	Annual	H1H	7.75	7.75	7.75	**7.75**	9	Yes	86.1%
CO	1-Hr	H2H	1,241	1,241	1,241	**1,241**	40,000	Yes	3.1%
	8-Hr	H2H	1,090	1,090	1,090	**1,090**	10,000	Yes	10.9%
SO2	1-Hr	H4H	16.37	16.04	15.41	**16.37**	196	Yes	8.4%
Ozone	8-Hr	-	**63.20 ppb**				70 ppb	Yes	90.3%

1 Includes maximum modeled impact, background concentrations (refer to Tabel 2-3) and estimated secondary impacts from precursor pollutants for $PM_{2.5}$ and ozone. Regional sources were not considered for purposes of this modeling assessment.

As shown in Table 2-5, maximum cumulative impacts from operation of the compressor station are not anticipated to cause an exceedance of the NAAQS for any pollutant or averaging period. Negligible differences for maximum impacts were noted when comparing results across variable turbine loads.

APPENDIX A. MODEL INPUTS

Mountain Valley Pipeline, LLC
FERC Resource Report 9 Modeling
Appendix A: Source Parameters and Emission Rates

Table A-1. Summary of Modeled Point Source Emission Rates

Point Sources

Emission Point ID	Description	NO_2		CO	PM_{10}		$PM_{2.5}$		SO_2		NO_2		CO	PM_{10}		$PM_{2.5}$		SO_2	
		ST (lb/hr)	LT (tpy)	ST (lb/hr)	ST (lb/hr)	LT (tpy)	ST (lb/hr)	LT (tpy)	ST (lb/hr)	LT (tpy)	ST (g/s)	LT (g/s)	ST (g/s)	ST (g/s)	LT (g/s)	ST (g/s)	LT (g/s)	ST (g/s)	LT (g/s)
S001_100	Turbine 1 - Solar Titan 350-52500S, 100% Load	4.25	18.63	2.61	3.84	16.81	3.84	16.81	1.30	5.72	0.535126	0.535816	0.328854	0.483546	0.483546	0.483546	0.483546	0.164406	0.164406
S001_75	Turbine 1 - Solar Titan 350-52500S, 75% Load	3.52	15.45	2.17	3.28	14.36	3.28	14.36	1.11	4.88	0.443651	0.444342	0.272911	0.413162	0.413162	0.413162	0.413162	0.140475	0.140475
S001_50	Turbine 1 - Solar Titan 350-52500S, 50% Load	2.89	12.70	1.78	2.76	12.08	2.76	12.08	0.94	4.11	0.364650	0.365341	0.224276	0.347567	0.347567	0.347567	0.347567	0.118173	0.118173
S002_100	Turbine 2 - Solar Titan 350-52500S, 100% Load	4.25	18.63	2.61	3.84	16.81	3.84	16.81	1.30	5.72	0.535126	0.535816	0.328854	0.483546	0.483546	0.483546	0.483546	0.164406	0.164406
S002_75	Turbine 2 - Solar Titan 350-52500S, 75% Load	3.52	15.45	2.17	3.28	14.36	3.28	14.36	1.11	4.88	0.443651	0.444342	0.272911	0.413162	0.413162	0.413162	0.413162	0.140475	0.140475
S002_50	Turbine 2 - Solar Titan 350-52500S, 50% Load	2.89	12.70	1.78	2.76	12.08	2.76	12.08	0.94	4.11	0.364650	0.365341	0.224276	0.347567	0.347567	0.347567	0.347567	0.118173	0.118173
S003_100	Turbine 3 - Solar Titan 250-31900S, 100% Load	2.41	10.56	1.48	2.19	9.59	2.19	9.59	0.74	3.26	0.303529	0.303874	0.186729	0.276000	0.276000	0.276000	0.276000	0.093840	0.093840
S003_75	Turbine 3 - Solar Titan 250-31900S, 75% Load	2.11	9.25	1.30	1.92	8.40	1.92	8.40	0.65	2.85	0.265692	0.266037	0.163293	0.241503	0.241503	0.241503	0.241503	0.082111	0.082111
S003_50	Turbine 3 - Solar Titan 250-31900S, 50% Load	1.73	7.57	1.06	1.57	6.88	1.57	6.88	0.53	2.34	0.217460	0.217805	0.133558	0.197850	0.197850	0.197850	0.197850	0.067269	0.067269
S004	Microturbine 1 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S005	Microturbine 2 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S006	Microturbine 3 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S007	Microturbine 4 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S008	Microturbine 5 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S009	Microturbine 6 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S010	Microturbine 7 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S011	Microturbine 8 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S012	Microturbine 9 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S013	Microturbine 10 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S014	Microturbine 11 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S015	Microturbine 12 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S016	Microturbine 13 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S017	Microturbine 14 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S018	Microturbine 15 - Capstone C200	0.08	0.35	0.22	0.02	0.07	0.02	0.07	0.01	0.03	0.010080	0.010080	0.027720	0.001896	0.001896	0.001896	0.001896	0.000977	0.000977
S019	Fuel Gas Pre-Heater #1 (0.50 MMBtu Output)	0.07	0.32	0.06	0.01	0.02	0.01	0.02	0.00	0.00	0.009212	0.009212	0.007738	0.000700	0.000700	0.000700	0.000700	0.000055	0.000055
S020	Fuel Gas Pre-Heater #2 (0.50 MMBtu Output)	0.07	0.32	0.06	0.01	0.02	0.01	0.02	0.00	0.00	0.009212	0.009212	0.007738	0.000700	0.000700	0.000700	0.000700	0.000055	0.000055
S021	Fuel Gas Heater, Turbine #3 (0.50 MMBtu Output)	0.07	0.32	0.06	0.01	0.02	0.01	0.02	0.00	0.00	0.009212	0.009212	0.007738	0.000700	0.000700	0.000700	0.000700	0.000055	0.000055
S028	Fuel Gas Heater, Turbine #1 (0.75 MMBtu Output)	0.11	0.48	0.09	0.01	0.04	0.01	0.04	0.00	0.00	0.013819	0.013819	0.011608	0.001050	0.001050	0.001050	0.001050	0.000083	0.000083
S029	Fuel Gas Heater, Turbine #2 (0.75 MMBtu Output)	0.11	0.48	0.09	0.01	0.04	0.01	0.04	0.00	0.00	0.013819	0.013819	0.011608	0.001050	0.001050	0.001050	0.001050	0.000083	0.000083

Mountain Valley Pipeline, LLC
FERC Resource Report 9 Modeling
Appendix A: Source Parameters and Emission Rates

Table A-2. Summary of Point Source Parameters

Point Sources

Emission Point ID	Description	UTM East	UTM North	Elevation	Stack Height	Stack Temperature	Vertical Exit Velocity	Stack Diameter
		m	m	m	m	K	m/s	m
S001_100	Turbine 1 - Solar Titan 350-52500S, 100% Load	570,562.6	4,120,271.9	408.43	16.764	712.039	27.682	3.267
S001_75	Turbine 1 - Solar Titan 350-52500S, 75% Load	570,562.6	4,120,271.9	408.43	16.764	690.928	25.172	3.267
S001_50	Turbine 1 - Solar Titan 350-52500S, 50% Load	570,562.6	4,120,271.9	408.43	16.764	710.372	22.863	3.267
S002_100	Turbine 2 - Solar Titan 350-52500S, 100% Load	570,534.9	4,120,250.5	408.43	16.764	712.039	27.682	3.267
S002_75	Turbine 2 - Solar Titan 350-52500S, 75% Load	570,534.9	4,120,250.5	408.43	16.764	690.928	25.172	3.267
S002_50	Turbine 2 - Solar Titan 350-52500S, 50% Load	570,534.9	4,120,250.5	408.43	16.764	710.372	22.863	3.267
S003_100	Turbine 3 - Solar Titan 250-31900S, 100% Load	570,510.1	4,120,229.9	408.43	16.764	672.039	26.526	2.579
S003_75	Turbine 3 - Solar Titan 250-31900S, 75% Load	570,510.1	4,120,229.9	408.43	16.764	680.928	25.480	2.579
S003_50	Turbine 3 - Solar Titan 250-31900S, 50% Load	570,510.1	4,120,229.9	408.43	16.764	698.706	22.769	2.579
S004	Microturbine 1 - Capstone C200	570,534.7	4,120,336.7	408.43	3.734	552.594	20.186	0.305
S005	Microturbine 2 - Capstone C200	570,533.7	4,120,338.0	408.43	3.734	552.594	20.186	0.305
S006	Microturbine 3 - Capstone C200	570,532.7	4,120,339.3	408.43	3.734	552.594	20.186	0.305
S007	Microturbine 4 - Capstone C200	570,531.7	4,120,340.6	408.43	3.734	552.594	20.186	0.305
S008	Microturbine 5 - Capstone C200	570,530.7	4,120,341.9	408.43	3.734	552.594	20.186	0.305
S009	Microturbine 6 - Capstone C200	570,539.0	4,120,340.9	408.43	3.734	552.594	20.186	0.305
S010	Microturbine 7 - Capstone C200	570,537.9	4,120,342.3	408.43	3.734	552.594	20.186	0.305
S011	Microturbine 8 - Capstone C200	570,537.0	4,120,343.5	408.43	3.734	552.594	20.186	0.305
S012	Microturbine 9 - Capstone C200	570,536.0	4,120,344.8	408.43	3.734	552.594	20.186	0.305
S013	Microturbine 10 - Capstone C200	570,535.0	4,120,346.1	408.43	3.734	552.594	20.186	0.305
S014	Microturbine 11 - Capstone C200	570,531.0	4,120,351.3	408.43	3.734	552.594	20.186	0.305
S015	Microturbine 12 - Capstone C200	570,530.0	4,120,352.7	408.43	3.734	552.594	20.186	0.305
S016	Microturbine 13 - Capstone C200	570,529.0	4,120,354.0	408.43	3.734	552.594	20.186	0.305
S017	Microturbine 14 - Capstone C200	570,528.0	4,120,355.3	408.43	3.734	552.594	20.186	0.305
S018	Microturbine 15 - Capstone C200	570,527.1	4,120,356.6	408.43	3.734	552.594	20.186	0.305
S019	Fuel Gas Pre-Heater #1 (0.50 MMBtu Output)	570,480.8	4,120,307.2	408.43	5.486	727.594	2.550	0.305
S020	Fuel Gas Pre-Heater #2 (0.50 MMBtu Output)	570,477.6	4,120,304.6	408.43	5.486	727.594	2.550	0.305
S021	Fuel Gas Heater, Turbine #3 (0.50 MMBtu Output)	570,499.7	4,120,250.6	408.43	5.486	727.594	2.550	0.305
S028	Fuel Gas Heater, Turbine #1 (0.75 MMBtu Output)	570,552.2	4,120,292.7	408.43	5.486	727.594	3.825	0.305
S029	Fuel Gas Heater, Turbine #2 (0.75 MMBtu Output)	570,524.2	4,120,271.3	408.43	5.486	727.594	3.825	0.305

Notes:
All coordinates are Universal Transverse Mercator (UTM) coordinates based on North American Datum 1983 (NAD 83) and reside within UTM Zone 17.

Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9

Appendix 9-G
Bradshaw Compressor Station Pre-Construction Noise Study Report

MVP Bradshaw Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

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SLR Project No.: 135.000097.00001

October 1, 2025

Revision: 0

Revision Record

Revision	Status	Date	Prepared By	Checked By	Authorized By
0	Issued for Information	October 1, 2025	SMG	JTR	DMJ

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Executive Summary

As part of the Mountain Valley Pipeline Boost Project (MVP Boost), SLR International Corporation (SLR) has prepared a pre-construction noise study at the request of Mountain Valley Pipeline, LLC, (MVP) for the Bradshaw Compressor Station (Bradshaw CS) near Smithfield in Wetzel County, West Virginia. This report presents the results from SLR's sound level survey of the existing operational sound levels following commissioning of the site. The existing compressor station consists of four (4) Solar Titan 130e turbine-driven compressor packages. The Project proposes to add one (1) additional Solar Titan 130e turbine-driven compressor package and associated equipment to the site.

An operational sound survey for the station was conducted by SLR on July 8, 2025. Sound levels were measured at the two closest noise sensitive areas (NSAs) surrounding the station site. Unit 2 was offline, and Units 1, 3, and 4 were operating at full load during the measurement survey.

The operating station was practically inaudible at the measurement locations, and the measured sound levels are controlled by other environmental noise sources, such as birds and insects. Insect-filtered, measured sound levels near the NSAs ranged from 44.2 to 44.6 dBA L_{dn}, significantly lower than the applicable FERC sound level requirement of 55 dBA L_{dn}. **Table A** summarizes the results from the measurement survey. Greater details about the sound survey are presented within the report.

A computer noise model was updated to include the proposed MVP Boost equipment. Predicted future and total station contribution sound levels are presented in **Table A**, along with the potential increase over existing sound level.

Table A: Compressor Station Sound Level Predictions

A	B	C	D	E	F	G	H	I	J
						(E + F)	(D – E)	(G + H)	(I – D)
NSA [a]	Distance from Compressor Building to NSA	Direction from CS to NSA	Measured Existing Sound Level [b,c]	Predicted Station Contribution from Existing Equipment	Predicted Proposed Equipment Only [d]	Combined Total Station Contribution (Existing+ Proposed)	Calculated Ambient Sound Level	Total Complete Station Contribution + Calculated Ambient Sound Level	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
3	3,105	WSW	44.6	26.0	21.2	**27.6**	44.5	44.6	0.0
4	3,030	SE	44.2	43.1	34.8	**43.7**	37.7	44.7	0.5

a. NSAs 1, 2 and 5 from the previous study have since then been either demolished or acquired by MVP and are no longer being considered NSAs.
b. Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
c. L_{dn} was calculated by adding 6.4 dB to the short duration daytime measurement.
d. Assumes all proposed future equipment in operation at full load.

Table A shows that A-weighted sound levels from the Bradshaw CS equipment, including proposed MVP Boost equipment, are expected to be lower than the Federal Energy Regulatory Commission (FERC) noise limit of 55 dBA L_{dn}, with a potential increase over existing sound levels ranging between 0.0 and 0.5 dBA.

Table of Contents

Limitations ..... **ii**
Executive Summary ..... **iii**
Acronyms and Abbreviations ..... **vi**
1.0 Introduction **1**
2.0 Sound Level Criteria **1**
3.0 Description of Site and Facility **1**
3.1 Description of Site 1
3.2 Description of Station Equipment 1
4.0 Post-Construction Sound Level Survey **2**
4.1 Closest Noise Sensitive Areas 2
4.2 Measurement Equipment 2
4.3 Weather Conditions 2
4.4 Measurement Methodology 3
4.5 Sound Level Measurements Results 3
4.6 Results 4
5.0 Proposed Equipment Noise Impact Assessment **5**
5.1 Significant Sound Sources 5
5.2 Noise Model Development 5
5.3 Data and Assumptions 5
5.4 Noise Model Results 7
5.4.1 Proposed MVP Boost Equipment – Normal Operation 7
5.5 Unit Venting 8
5.6 Emergency Shutdown (ESD) 8
5.7 MVP Boost Equipment Construction 9
6.0 Noise Control Treatments **11**
6.1 Compressor Building Walls and Roof 11
6.2 Compressor Building Doors 12
6.3 Compressor Building Ventilation 12
6.4 Turbine Exhausts 12
6.4.1 Silencer Performance 12
6.4.2 Exhaust Duct and Shell Noise 12
6.5 Turbine Air Intake 13

6.6 Turbine Lube Oil Cooler 13
6.7 Gas Aftercooler 13
6.8 Station Above-Ground Gas Piping 13
6.8.1 Piping Isolation 13
7.0 Conclusions 14
8.0 Closure 14

Tables

Table 4-1: Summary of Noise Sensitive Areas (NSAs) 2
Table 4-2: Summary of Weather Conditions 3
Table 4-3: Summary of Measurement Locations 3
Table 4-4: Summary of Sound Level Measurements 4
Table 5-1: Sound Power (L_w) and Sound Pressure (L_p) levels for Existing Station Equipment 6
Table 5-2: Sound Power (L_w) and Sound Pressure (L_p) levels for Proposed Station Equipment 7
Table 5-3: Compressor Station Sound Level Predictions 8
Table 5-4: Proposed Construction Equipment Sound Levels 10
Table 6-1: Required Noise Control Treatments 11

Figures

Figure B-1: Aerial Image Showing Measurement Locations and Noise Sensitive Areas B-1
Figure B-2: Noise Contour – Existing + Proposed MVP Boost – Normal Operation – dBA L_{dn} B-2
Figure C-1: Weather Data – July 8, 2025 ..... C-1

Appendices

Appendix A Glossary of Common Acoustical Terminology
Appendix B Figures
Appendix C Weather Data

Acronyms and Abbreviations

°F	Degrees Fahrenheit
ANSI	American National Standards Institute
CS	Compressor Station
dB	Decibel
dBA	A-Weighted Decibel
DIL	Dynamic Insertion Loss
FERC	Federal Energy Regulatory Commission
FWHA	Federal Highway Administration
G	Ground Absorption Coefficient
HP	Horsepower
Hz	Hertz
IL	Insertion Loss
ISO	International Organization for Standardization
kHz	Kilohertz
L_d	Daytime Average Sound Level
L_{dn}	Day-Night Sound Level
L_{eq}	Equivalent Continuous Sound Level
L_p	Sound Pressure Level
L_w	Sound Power Level
ML	Measurement Location
mph	Miles per hour
MVP	Mountain Valley Pipeline
NRC	Noise Reduction Coefficient
NSA	Noise Sensitive Area
RCNM	Roadway Construction Noise Model
s/n	Serial Number
SLM	Sound Level Meter
SLR	SLR International Corporation
STC	Sound Transmission Class
TL	Transmission Loss
USGS	United States Geological Survey

1.0 Introduction

As part of the Mountain Valley Pipeline Boost Project (MVP Boost), SLR International Corporation (SLR) has prepared a pre-construction noise study at the request of Mountain Valley Pipeline, LLC, (MVP) for the Bradshaw Compressor Station (Bradshaw CS) near Smithfield in Wetzel County, West Virginia. This report presents the results from SLR's sound level survey of the existing operational sound levels following commissioning of the site. The existing compressor station consists of four (4) Solar Titan 130e turbine-driven compressor packages. The Project proposes to add one (1) additional Solar Titan 130e turbine-driven compressor package and associated equipment to the site.

2.0 Sound Level Criteria

The environmental sound level contributions from the Bradshaw CS are subject to the Federal Energy Regulatory Commission (FERC) noise regulation, which governs interstate gas transmission compressor stations. The FERC noise regulation is receptor based, and limits compressor station noise contributions to no more than 55 dBA day-night average (L_{dn}) or, equivalently, no more than a continuous 48.6 dBA equivalent average (L_{eq}) at the surrounding noise-sensitive areas (NSAs). NSAs are typically residences, schools, churches, or hospitals.

A glossary of common acoustical terminology and metrics is included in **Appendix A**.

There are no other known state, county, or local regulations that would apply to this compressor station site.

3.0 Description of Site and Facility

3.1 Description of Site

The Bradshaw CS site is located off of Bear Run Road, approximately 2.8 miles northeast of Smithfield, West Virginia. The area surrounding the station is rural and sparsely populated, consisting primarily of cleared fields and forest.

3.2 Description of Station Equipment

The existing Bradshaw CS equipment consists of four (4) Solar Titan 130e turbine-driven compressor units enclosed in an acoustically insulated compressor building. Each turbine is rated at 23,470 HP at standard ISO conditions and drives a centrifugal compressor. All ISO power ratings are at 59 degrees Fahrenheit, sea level, and 60% relative humidity. Associated equipment (located outdoors) is as follows:

- Gas aftercoolers
- Turbine lube oil coolers
- Turbine inlet and exhaust openings
- Station suction and discharge piping and suction separators
- Fuel gas skid
- Capstone microturbine generators

- Control valves

The proposed MVP Boost equipment will consist of one (1) additional Solar Titan 130e turbine-driven compressor unit enclosed within the same building (the building will be lengthened to accommodate the additional unit). Associated equipment will be the same as the existing units. An additional Capstone microturbine is also proposed.

4.0 Post-Construction Sound Level Survey

4.1 Closest Noise Sensitive Areas

Two NSAs were identified by SLR using aerial imagery and field observations. They consist of the two closest residences to the Bradshaw CS site. The NSAs are summarized in **Table 4-1**. The distance and direction from the site to the NSAs are shown. Distances reference the approximate center of the site location. The NSAs and measurement locations are shown in **Figure B-1**.

Table 4-1: Summary of Noise Sensitive Areas (NSAs)

Noise Sensitive Area	Measurement Location (ML)	Description	Approximate Distance from Station to NSA	Direction to NSA
			Feet	
NSA 1	No Longer an NSA [a]			
NSA 2	No Longer an NSA [a]			
NSA 3	ML 1	Residence	3,105	WSW
NSA 4	ML 2	Residence	3,030	SE
NSA 5	No Longer an NSA [a]			

a. NSAs 1, 2 and 5 from the previous study have since then been either demolished or acquired by MVP and are no longer being considered NSAs.

4.2 Measurement Equipment

Sound level equipment used during the noise survey included the following instruments:

- Brüel & Kjær Model 2270 SLM; Type 1; s/n 2630388, 3031451
- Brüel & Kjær Model 4231 Calibrator; s/n 3001195

A windscreen was used on the measurement microphones. The sound level meters were field calibrated before and after measurement intervals, showing no significant change in sensitivity over the survey period. All instruments have current laboratory certification that can be provided upon request. Measurements were conducted five feet above the ground.

4.3 Weather Conditions

Weather conditions were appropriate for an outdoor sound level study. A summary of the weather conditions is shown in **Table 4-2**.

Table 4-2: Summary of Weather Conditions

Date	July 8, 2025
Temperature Range	75°F – 85°F
Relative Humidity Range	89 %
Wind Speed (Average)	2-7 mph
Wind From	NW
Sky Condition	Partly Sunny
Ground Condition	Dry

Complete weather data from the measurement survey were obtained from a nearby station using WeatherUnderground [1] and are shown in **Appendix C**.

4.4 Measurement Methodology

Sound levels were measured using the slow meter response and A-weighting (dBA). Data were collected in 1/1 and 1/3-octave bands and recorded in 1-second sampling periods for a five-minute duration.

4.5 Sound Level Measurements Results

The sound study was performed on July 8, 2025, by Steve Gronsky and Valen Li of SLR. Short-term, attended sound level measurements were conducted at two locations selected to quantify existing sound levels near the two closest NSAs. The survey began around 12:00 p.m. and ended around 1:00 p.m. During the survey, three of four existing turbines were operating between 95% to 97% load, which is considered full load under available pipeline conditions.

Observations at the measurement locations are summarized in **Table 4-3**.

Table 4-3: Summary of Measurement Locations

NSA	Measurement Location (ML)	Measurement Duration MM:SS	Source Observations During Measurements
3	ML 1	05:00	Audible sound sources included birds, insects, a light breeze, and water flowing nearby. The Bradshaw CS was not audible during the sound level measurements.
4	ML 2	02:46 [a]	Audible sound sources included birds, insects, construction noise, and a nearby stream. The Bradshaw CS was not audible during the sound level measurements.

a. Construction noise was removed from the measured data, and the information presented in the following sections is representative of environmental sounds only.

[1] https://www.wunderground.com/dashboard/pws/KWVMANNI7/graph/2025-07-8/2025-07-8/daily

4.6 Results

The noise survey measurement results are summarized in **Table 4-4**. The measured sound levels for the daytime equivalent average (L_d) and the day-night average (L_{dn}) are shown. The L_{dn} values were calculated by adding 6.4 decibels (dB) to the short term L_{eq} during a daytime period that was free from extraneous noise sources, such as passing vehicles. The overall L_{eq} is inclusive of all environmental noise sources, such as birds, and insects. Nighttime sound level measurements were not collected at the existing Bradshaw compressor station, however, the daytime measurements were collected during periods free from extraneous noise sources, and the compressor station was practically inaudible at each measurement location. Therefore, the nighttime sound levels are expected to be similar to the measured daytime sound levels.

Due to significant insect activity and bird chirps during the survey, measurement results were filtered to remove noise from these environmental sources. This was completed by correcting all sound energy at and above the 1,600 Hz one-third (1/3) octave band in accordance with ANSI/ASA S3/SC1.100-2014[2]. Sound from the Bradshaw CS was inaudible at all measurement locations. Data are presented with and without the filtering applied.

Table 4-4: Summary of Sound Level Measurements

Measurement Location	Nearest NSA [a]	Distance from CS to NSA	Direction from CS to NSA	Measurement Duration	Measured Sound Level, Unfiltered			Measured Sound Level, Filtered to Remove Noise from Birds, Insects, and Traffic		
					dBA			dBA [b]		
		Feet		MM:SS	L_d	L_n [d]	L_{dn} [c]	L_d	L_n [d]	L_{dn} [c]
ML 1	3	3,105	WSW	05:00	42.4	42.4	48.8	38.2	38.2	**44.6**
ML 2	4	3,030	SE	02:46	39.4	39.4	45.8	37.8	37.8	**44.2**

a. NSAs 1, 2 and 5 from the previous study have since then been either demolished or acquired by MVP and are no longer being considered NSAs.
b. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
c. L_{dn} was calculated by adding 6.4 dB to the short duration L_{eq} measured.
d. Nighttime sound levels were assumed to be equal to measured daytime sound levels since the measurements were collected during periods free from extraneous noise sources and the compressor station was practically inaudible during the measurements.

The filtered sound levels ranged from 44.2 to 44.6 dBA L_{dn} at the measurement locations.

[2] "Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas", ANSI/ASA S3/SC1.100-2014.

5.0 Proposed Equipment Noise Impact Assessment

5.1 Significant Sound Sources

The following proposed Project sound sources are considered significant:

- Noise from the turbine exhaust, including the exhaust outlet and noise radiated from the exhaust ductwork, expansion joints, and silencer shell.
- Noise from the turbine air inlet system, including the inlet opening and noise radiated from the silencer/ductwork shell and any duct joints.
- Turbine/compressor casing noise that radiates to the exterior of the building and through building ventilation openings.
- Noise from the lube oil cooler / auxiliary cooler and gas aftercooler.
- Noise radiated by aboveground station gas piping.

5.2 Noise Model Development

The existing three-dimensional computer noise model was updated to analyze the noise contributions expected from the proposed expansion equipment. The model was developed using CadnaA, version 2025 MR1 (build: 211.5558), a commercial noise modeling package developed by DataKustik GmbH. The software considers spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613-2 standard was used for air absorption and other noise propagation calculations.

Ground absorption for the surrounding area was set to G = 0.8, representing a fairly absorptive ground. The station pad ground was modeled as reflective, with a G = 0.1 absorption coefficient.

To be conservative, foliage was not included in the model. The terrain was modeled based on USGS topographical data at a resolution of 10 by 10 meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations.

The noise model includes both the existing Bradshaw CS equipment and the proposed expansion equipment. Sound levels for the existing equipment are derived from sound level measurements of the operating station equipment.

5.3 Data and Assumptions

The proposed MVP Boost equipment includes lengthening the building to make room for the additional unit within. All proposed equipment was arranged as per the latest site plans, and the additional turbine unit equipment is planned to be laid out in the same orientation as the existing units. A new Capstone microturbine is also proposed to be located near the existing microturbines.

Table 5-1 shows the sound power levels used as input to the model for the existing equipment. Manufacturer data (as available) and/or sound power levels derived from measurements of the equipment were used in the computer noise model. The table also presents the measured sound pressure level inside of the compressor building. **Table 5-2** presents the same information for the proposed MVP Boost equipment.

Table 5-1: Sound Power (L_w) and Sound Pressure (L_p) levels for Existing Station Equipment

Source	Linear L_w or L_p at Octave Center Frequency, Hz									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Levels, L_w, dB										
Compressor Building Ridge Vent, L_w [1]	111	106	103	98	97	94	93	96	92	102
Solar Titan 130e Turbine Exhaust Duct Breakout, L_w [2]	97	99	96	96	90	88	97	96	85	101
Compressor Building Wall-Mounted Supply Fan, L_w [2]	97	97	101	97	96	96	93	88	81	100
Solar Titan 130e Turbine Air Intake Duct Breakout, L_w [2]	107	95	93	98	88	86	88	95	81	98
Solar Titan 130e Turbine Air Intake, Silenced, L_w [2]	113	117	107	99	73	40	39	66	58	96
Solar Titan 130e Discharge Piping, Insulated, L_w [2]	105	101	101	101	97	81	84	67	47	96
Solar Titan 130e Turbine Exhaust Outlet, Silenced, L_w [2]	119	116	99	92	91	83	82	73	76	94
Gas Cooler, per fan, L_w [2]	112	109	102	96	90	84	81	82	69	93
Solar Titan 130e Suction Piping, Insulated, L_w [2]	103	105	104	93	85	81	87	67	48	93
Solar Titan 130e Lube Oil Cooler, L_w [2]	94	101	99	91	86	83	79	76	71	90
Capstone C1000 Microturbine Enclosure Exhaust, L_w [2]	81	101	92	94	82	81	80	86	77	91
Capstone C1000 Microturbine Exhaust, L_w [2]	92	96	82	85	78	78	66	58	54	82
Capstone C1000 Microturbine Enclosure Intake, L_w [2]	81	78	83	78	73	74	75	72	71	81
Sound Pressure Levels, L_p, dB										
Compressor Building – Interior, L_p [2]	94	90	90	90	87	88	85	99	94	101

[1] From empirical calculations

[2] From SLR diagnostic measurements from MVP sites

Table 5-2: Sound Power (L_w) and Sound Pressure (L_p) levels for <u>Proposed</u> Station Equipment

Source	Linear L_w or L_p at Octave Center Frequency, Hz									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Levels, L_w, dB										
Solar Titan 130e Turbine Air Intake, Unsilenced, L_w [1]	115	115	115	120	125	130	137	149	144	151
Solar Titan 130e Turbine Exhaust Outlet, Unsilenced, L_w [1]	125	128	127	130	137	135	123	113	102	138
Solar Titan 130e Suction Piping, Uninsulated, L_w [2]	94	96	95	90	91	96	111	100	90	113
Solar Titan 130e Discharge Piping, Uninsulated, L_w [2]	96	92	92	98	103	96	108	100	89	110
Compressor Building Ridge Vent, L_w [2]	111	106	103	98	97	94	93	96	92	102
Solar Titan 130e Turbine Exhaust Duct Breakout, L_w [2]	97	99	96	96	90	88	97	96	85	101
Compressor Building Wall-Mounted Supply Fan, L_w [2]	97	97	101	97	96	96	93	88	81	100
Solar Titan 130e Turbine Air Intake Duct Breakout, L_w [2]	107	95	93	98	88	86	88	95	81	98
Gas Cooler, per fan, L_w [2]	112	109	102	96	90	84	81	82	69	93
Solar Titan 130e Lube Oil Cooler, L_w [2]	94	101	99	91	86	83	79	76	71	90
Capstone C1000 Microturbine Enclosure Exhaust, L_w [2]	81	101	92	94	82	81	80	86	77	91
Capstone C1000 Microturbine Exhaust, L_w [2]	92	96	82	85	78	78	66	58	54	82
Capstone C1000 Microturbine Enclosure Intake, L_w [2]	81	78	83	78	73	74	75	72	71	81
Sound Pressure Levels, L_p, dB										
Compressor Building – Interior, L_p [2, 3]	94	90	90	90	87	88	85	99	94	101

[1] From manufacturer data

[2] From SLR diagnostic measurements from MVP sites

[3] For conservatism, this pressure level indicates four units in the building

5.4 Noise Model Results

5.4.1 Proposed MVP Boost Equipment – Normal Operation

Table 5-3 shows a summary of the calculated sound level contribution from the proposed MVP Boost equipment at each NSA. The table also shows the overall sound levels at each NSA, including the proposed MVP Boost expansion equipment contribution and the operational sound level of the existing equipment.

The table indicates that, with the proposed noise control treatments discussed in **Section 6.0**, the compressor station noise contributions at all of the nearest NSAs will be below the FERC sound level limit of 55 dBA L_{dn}. The FERC sound level limits apply only to the sound level contribution of the compressor station equipment, and do not include the influence of the existing ambient sound levels.

The highest Project equipment sound level contribution is 34.8 dBA L_{dn} at NSA 4. When combined with the sound levels from the existing equipment, the overall Bradshaw CS sound levels range from 27.2 to 43.7 dBA L_{dn}, which are well below the FERC noise limit of 55 dBA L_{dn}. The predicted increases above the existing sound levels range from 0.0 to 0.5 dBA, which would be considered imperceptible to most people.

Table 5-3: Compressor Station Sound Level Predictions

A	B	C	D	E	F	G	H	I	J
						(E + F)	(D – E)	(G + H)	(I – D)
NSA [a]	Distance from Compressor Building to NSA	Direction from CS to NSA	Measured Existing Sound Level [b,c]	Predicted Station Contribution from Existing Equipment	Predicted Proposed Equipment Only [d]	Combined Total Station Contribution (Existing+ Proposed)	Calculated Ambient Sound Level	Total Complete Station Contribution + Calculated Ambient Sound Level	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
3	3,105	WSW	44.6	26.0	21.2	**27.6**	44.5	44.6	0.0
4	3,030	SE	44.2	43.1	34.8	**43.7**	37.7	44.7	0.5

a. NSAs 1, 2 and 5 from the previous study have since then been either demolished or acquired by MVP and are no longer being considered NSAs.
b. Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
c. L_{dn} was calculated by adding 6.4 dB to the short duration daytime measurement.
d. Assumes all proposed future equipment in operation at full load.

5.5 Unit Venting

Under certain circumstances, the pressure in the compressor casing and unit piping must be released in a controlled manner. These events are called “Unit Venting” and occur when the unit is shut down for an extended period. During unit venting, high-pressure gas in the system is released in a controlled fashion through a silencer. Unit venting causes a temporary increase in sound level that usually lasts for approximately five minutes.

A compressor unit venting scenario was modeled using a single silencer specified to limit the venting sound levels to a maximum of **95 dBA at 50 feet**. During this event, predicted sound levels range from 39.2 to 48.3 dBA L_{eq} at the NSAs.

5.6 Emergency Shutdown (ESD)

The station has an emergency shutdown (ESD) system that automatically halts operation of the station in the event of an irregularity. This results in full station venting during which the gas from all station piping is released in a controlled manner. These events are extremely rare and take place only in the event of an emergency. The station ESD system was modeled with a maximum sound level of **95 dBA at 50 feet.**

The predicted short-term sound levels at NSAs due to an ESD event range from 41.8 to 51.4 dBA L_{eq} at the NSAs, which is near the predicted full load operational sound level of the existing station. This is a reasonable sound level for an event that will only occur in emergency situations. The ESD blowdown duration is typically less than ten minutes.

5.7 MVP Boost Equipment Construction

Only standard equipment will be used during construction, with no dynamic compaction or pile driving expected. Most construction will take place during daytime working hours of 7:00 a.m. to 7:00 p.m. Construction sound calculations were performed with the CadnaA propagation model, which accounts for local topography. Equipment usage factors were used per the Federal Highway Administration's Roadway Construction Noise Model version 1.1 (FWHA, 2006). Usage factor is the percentage of time a given piece of equipment typically operates during a given hour. **Table 5-4** presents the equipment that was included in the construction evaluation for the MVP Boost expansion equipment.

Table 5-4: Proposed Construction Equipment Sound Levels

Equipment	Quantity	Usage Factor	Quantity and Usage Factor Adjusted Sound Pressure Level at 50-Feet, dBA
Air Compressor	4	0.4	80
Bobcat	3	0.4	80
Compactor	4	0.2	82
Compactor, Vibratory	2	0.2	76
Concrete Mixer Truck (main pours)	10	0.4	85
Concrete Mixer Truck (small pours)	4	0.4	81
20-Ton Wheeled Crane	2	0.16	77
250-Ton Wheeled Crane	2	0.16	76
Hydrotest Truck	1	0.4	81
Dump Truck	4	0.4	78
Excavator	4	0.4	83
Forklift	2	0.2	71
Generators	3	0.5	83
Light Tower	4	0.25	62
Man Lift	8	0.2	77
Scissor Lift	2	0.2	71
Tandem Truck	4	0.4	78
Water / Fuel Truck	4	0.4	76
Welding Machine	10	0.4	80
Welding Rig	10	0.4	80
X-Ray Truck / Machine	2	0.4	75
Total Sound Power Level, L_w, dBA			**127.5**

The construction equipment in the **Table 5-4** represents all of the proposed equipment operating simultaneously, which is a very conservative approach. In reality, equipment will be used in phases, and construction sound levels will be significantly lower than the modeled results during each construction phase.

Calculated construction sound levels at the NSAs range from 31.0 to 47.9 dBA L_{eq}. If major construction activity is limited to daytime hours, then there is no specific sound level limit for construction activities. Nighttime construction work is not planned, but if the need arises, a nighttime noise management plan will be created.

6.0 Noise Control Treatments

A summary of the modeled performance of one possible set of noise control treatments is shown in **Table 6-1**. The following subsections describe the treatments. The noise mitigation shown applies to future expansion equipment only.

The noise mitigation measures shown are based on the most current station design and represent one potential set of possible mitigation. There are many different combinations of noise control measures that will provide similar noise control. As the station design is finalized, the mitigation design may be modified to account for these design changes while maintaining compliance with the FERC noise requirements.

All mitigations to the proposed Solar Titan 130e turbine-driven compressor inlet and exhaust and compressor building were assumed to have the same performance as the existing units.

Table 6-1: Required Noise Control Treatments

Source	Treatment Description	Required Treatment Performance								
		31.5	63	125	250	500	1k	2k	4k	8k
T130e Turbine Intake	Total Silencing (Intake Silencer and Filters), DIL	1	3	18	27	54	89	93	96	96
T130e Compressor Building Extension	STC-39 Wall and Roof System, TL	10	16	17	24	44	49	55	55	58
Personnel Door	STC-32 Personnel Door, TL	9	17	23	27	32	32	31	41	41
Equipment Door	STC-21 Insulated Roll-up Door, TL	2	7	12	17	18	19	22	30	35
Building Ventilation	3ft Silencers and Lined Hoods, DIL	1	5	10	18	22	26	30	35	25
T130e Turbine Exhaust	Custom Exhaust Silencer, DIL	6	14	29	39	46	49	46	45	32
T130e Suction and Discharge Gas Piping	Type ISO B2 Lagging, IL	-	-	-	-	6	15	24	33	42

6.1 Compressor Building Walls and Roof

The extension to the compressor building to enclosure the proposed additional unit should consist of the same materials used for the existing building, but should have a sound transmission class (STC) rating and transmission loss (TL) performance shown in **Table 6-1**. The compressor building extension should have no windows, skylights, or translucent panels.

The interior surface of the compressor building walls and roof should be acoustically absorptive, having a noise reduction coefficient (NRC) of at least NRC 0.8. The inside of the building can be lined with perforated metal of at least 23 percent open area for insulation protection, if so

desired. The building should be well sealed with no cracks or gaps. All piping penetrations through the building walls should be well-insulated, flashed, and caulked.

6.2 Compressor Building Doors

The expanded compressor building is assumed to have one additional 14-foot by 14-foot equipment door. A standard insulated overhead door will be sufficient. The performance shown in **Table 6-1** is the required transmission loss performance for the equipment door.

The personnel doors should achieve the sound transmission loss and STC rating shown in **Table 6-1**. These are industrial metal doors with good perimeter seals. Small glass windows in the personnel doors are acceptable as long as the overall STC rating is achieved.

6.3 Compressor Building Ventilation

The ventilation for the proposed expansion to the compressor building was assumed to consist of the same noise mitigation as the existing building. The intake vents on the walls should have the overall performance shown in **Table 6-1**. This may consist of a 3-foot silencer with lined hood, or similar.

Similarly, the ridge vent should continue across the roof of the proposed expansion and shall have the same performance as the currently installed exhaust ventilation system for the compressor building.

6.4 Turbine Exhausts

For the operation of dual-shaft SoLoNox turbines, Solar notes that sound levels during partial-load operation can be higher than sound levels during full-load operation. In an analysis of manufacturer data for these turbines, increases of up to 7 dB at 1 kHz have been noted by Solar for Titan 130e exhausts and increases of up to 13 dB at 2 kHz for Titan 130e inlets. Silencer specification and bidding should be developed with such potential variability in mind in order to satisfy the noise targets for all steady-state operational conditions.

6.4.1 Silencer Performance

The proposed additional turbine will include an exhaust silencer system achieving the dynamic insertion loss (DIL, in decibels) shown in **Table 6-1**. Due to the complexities involved with the field verification of silencer insertion loss, the vendor should bid to match the existing silencers for Units 1 through 4.

6.4.2 Exhaust Duct and Shell Noise

In large turbine-powered installations it is common for a significant amount of sound energy to radiate from the exhaust system ductwork, expansion joints, and exhaust silencer shell. This sound energy is often termed “shell-radiated” noise. Shell-radiated noise is not necessarily calculated by exhaust system manufacturers, but it can be a dominant noise source for NSAs close to the station. The exhaust breakout was modeled based on measurements taken at the existing Bradshaw CS, and the modeled breakout noise sound power levels are shown in **Table 5-2.**

6.5 Turbine Air Intake

The proposed additional unit was assumed to consist of the same turbine intake system as the existing Bradshaw CS equipment. The total performance of the intake silencing system, including silencer and pulse updraft filter is provided in **Table 6-1**.

6.6 Turbine Lube Oil Cooler

The sound power level of the turbine lube oil cooler should not exceed the sound power levels provided in **Table 5-2**. This is the total sound power level for the entire cooler (i.e. not just a single fan). The sound power level in **Table 5-2** is representative of the 90 dBA sound power level cooler offered by Solar.

6.7 Gas Aftercooler

The proposed additional unit should have a gas aftercooler with a fan sound power level (per fan) rating as provided in **Table 5-2**. This was assumed to be equal to the existing gas aftercooler fans at the Bradshaw CS.

6.8 Station Above-Ground Gas Piping

The proposed additional unit should have suction and discharge piping insulated to match the extent of the existing station piping. The performance of the insulation should achieve the insertion loss (IL) provided in **Table 6-1**.

All above-ground suction piping on the cooler-side of the building should be insulated, as well any above-ground discharge piping between the compressor building and gas aftercooler flanges.

6.8.1 Piping Isolation

To limit radiation from structural supports, the compressor piping should be isolated from the pipe supports and other structural contacts using at least one-quarter inch (1/4) neoprene bearing pads. The stiffness of the neoprene should be chosen so that the static deflection of the pads under the piping loads is about one-sixteenth inch (1/16). Secondary steel elements such as cable trays, pipe racks, walkways, and conduit supports should not be connected to the pipe supports and/or piping.

7.0 Conclusions

SLR has completed a post-construction noise survey near the Mountain Valley Pipeline, LLC Bradshaw Compressor Station, located near Smithfield in Wetzel County, West Virginia. Measurements were conducted near the closest NSAs. After filtering out insect, bird, and traffic sounds, the measured sound levels ranged from 44.2 to 44.6 dBA L_{dn}.

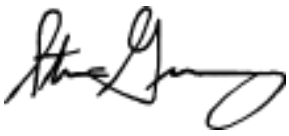
Modeling results from the proposed MVP Boost equipment (addition of one (1) Solar Titan-130e turbine-driven compressor package and associated equipment) indicate that the contribution from the new equipment will range from 21.2 to 34.8 dBA L_{dn} at the NSAs. With the proposed expansion equipment in operation, overall sound levels from the Bradshaw CS are expected to range from 27.2 to 43.7 dBA L_{dn}, yielding a potential increase in existing sound level of 0.0 to 0.5 dBA. These results indicate that the sound levels due to the existing Bradshaw CS and proposed expansion equipment will be lower than 55 dBA L_{dn} at all nearby NSAs and that the station will continue to operate in full compliance with FERC noise requirements.

8.0 Closure

This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.

Sincerely,

SLR International Corporation



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Appendix A Glossary of Common Acoustical Terminology

MVP Bradshaw Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 1, 2025

A-weighting: a weighting scale in which sound pressure levels in individual frequency bands are adjusted to match the response for the human ear. The reference adjustment is 0 dB at 1,000 Hz. The human ear is much less responsive at low frequencies. An A-weighted sound level is the total contribution from all sound frequencies, with the appropriate weighting factors applied and is designated as dBA.

C-weighting: a weighting scale that is relatively flat from 31.5 Hz to 8,000 Hz with a roll-off higher and lower than those frequencies. The adjustment is 0 dB from 200 Hz to 1,250 Hz. A C-weighted sound level is the total contribution from all sound frequencies, with the appropriate weighting factors applied and is designated as dBC.

Hertz (Hz): the unit of measure of frequency or the speed of vibration of a sound wave. Also referred to as “cycles per second”.

Insertion Loss (IL): the decrease (in decibels, dB) in sound power level measured at the location of the receiver when a sound attenuator (e.g., muffler), barrier, or other sound reduction element is inserted in the transmission path between the source and receiver.

L_d: the daytime average sound level. The L_{eq} averaged over daytime hours. Daytime hours may be defined differently by various ordinances and regulations. The hours between 7:00 am and 10:00 pm is the interval used by the U.S. Federal Energy Regulatory Commission (FERC) and the U.S. Department of Housing and Urban Development (HUD).

L_{dn} (also DNL): the day-night average sound level, a metric used by many regulatory bodies (including FERC and HUD) as an overall representation of the sound at a measurement location. The L_{dn} is calculated by averaging the sound measured over a 24-hour period, with 10 decibels added to sound levels measured during nighttime hours.

L_{eq}: the equivalent-continuous sound level is a time-average sound level for a specified time period. It is the most commonly used form of sound level averaging. Specifically, the Leq is the level of a steady sound that has the same sound energy as a time-varying sound during a stated time period and at a stated location.

L_n: the nighttime average sound level. The L_{eq} averaged over nighttime hours. Nighttime hours may be defined differently by various ordinances and regulations. The hours between 10:00 pm and 7:00 am is the interval used by the U.S. Federal Energy Regulatory Commission (FERC) and the U.S. Department of Housing and Urban Development (HUD).

L_{90}: a statistical parameter (percentile) that describes the sound level that is exceeded 90 percent of the time during a stated time period. For example, for a stated hourly L_{90} of 45 dBA, the sound level at the measurement location has a 90% chance of being greater than 45 dBA and a 10% chance of being less than or equal to 45 dBA. The L_{90} is often used as the “background” or “ambient” sound level for a given measurement period. Other percentile values are defined similarly (e.g., L_{50}, L_{10}, etc.).

Sound Power Level (PWL or L_w): a logarithmic parameter that describes the power characteristics of a noise source, relative to a reference power value, expressed in decibels, dB or dBA. The sound power level should not be confused with the sound pressure level. The sound power level is a characteristic of a noise source analogous to the wattage rating of a light bulb, and it is independent of the surroundings. It is calculated from measurements of the sound pressure level. A 75-watt light bulb will look much brighter in a white, reflective room than in a black, absorptive one. A noise source rated with a sound power level if 95 dBA will produce a much higher sound pressure level (will be much louder) in a small hard box than outside in a soft grass meadow.

Sound Pressure Level (SPL or L_p): a logarithmic parameter that describes the quantity of sound relative to a reference pressure value, expressed in decibels, dB or dBA. The SPL is the quantity that is measured with a sound level meter, and it is dependent upon the surroundings of a noise source.

Sound Transmission Class (STC): a single number rating for describing sound transmission loss of a wall or partition. A rating system designed to facilitate comparison of the sound transmission characteristics of various architectural materials and constructions.

Transmission Loss (TL): the difference (in decibels) between sound power incident upon a sound reduction element (wall or muffler) to that transmitted. The less sound energy is transmitted, the higher the TL value.

Appendix B Figures

MVP Bradshaw Compressor Station

Pre-Construction Noise Survey – MVP Boost

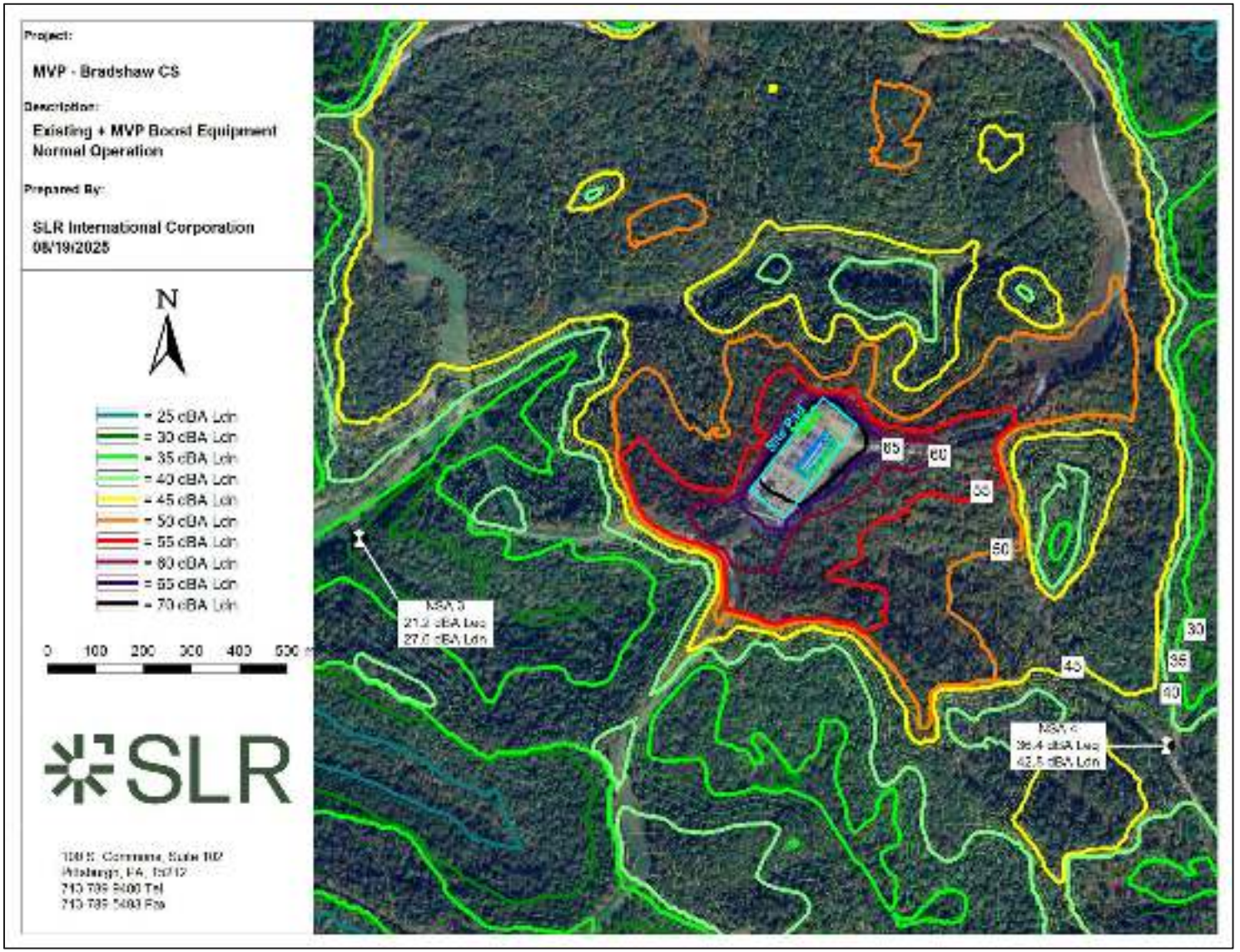
Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 1, 2025

Figure B-1: Aerial Image Showing Measurement Locations and Noise Sensitive Areas

Figure B-2: Noise Contour – Existing + Proposed MVP Boost – Normal Operation – dBA L_{dn}



Appendix C Weather Data

MVP Bradshaw Compressor Station

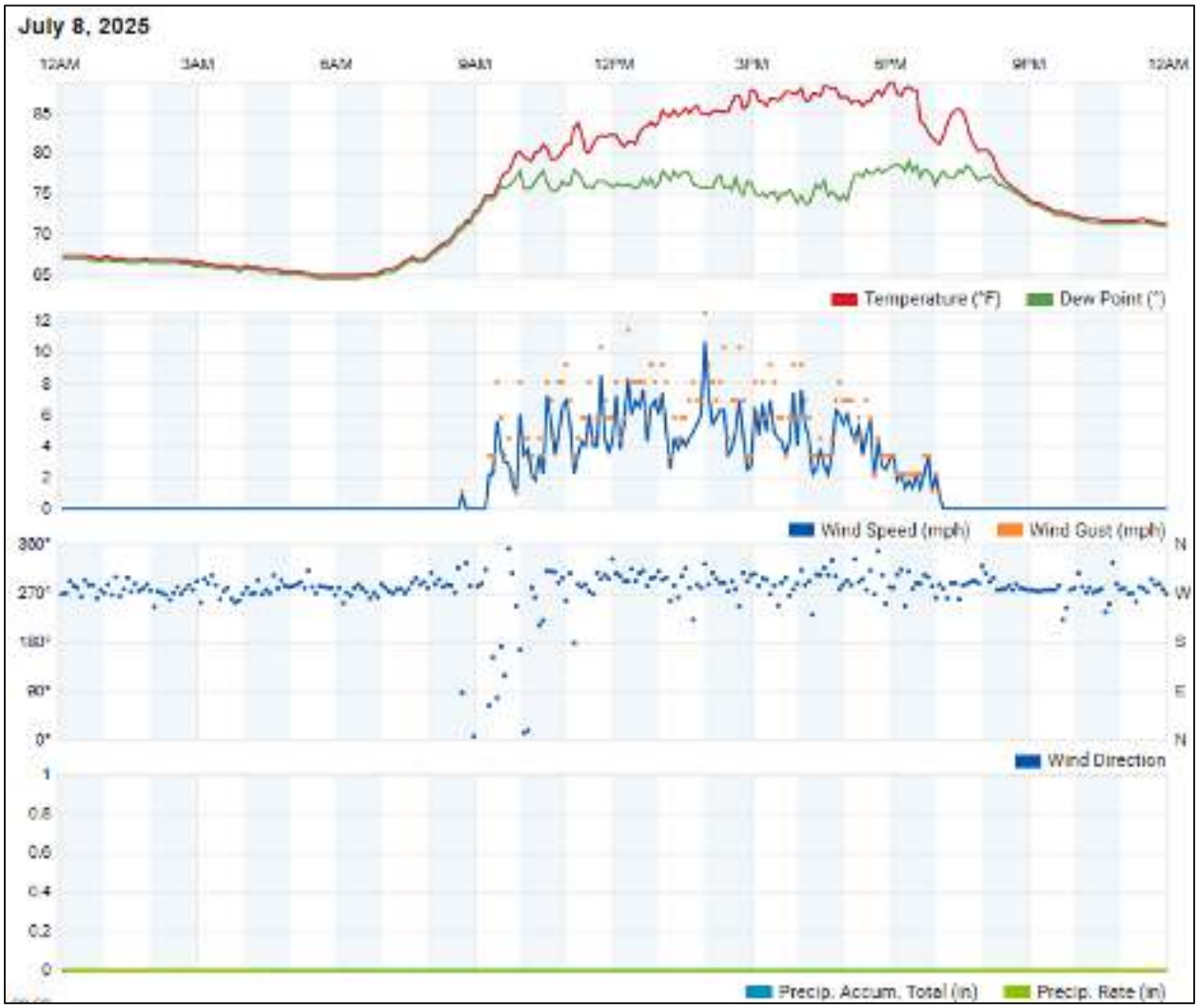
Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 1, 2025

Figure C-1: Weather Data – July 8, 2025



Making Sustainability Happen

Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9

Appendix 9-H
Harris Compressor Station Pre-Construction Noise Study Report

MVP Harris Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

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SLR Project No.: 135.000097.00001

October 1, 2025

Revision: 0

Revision Record

Revision	Status	Date	Prepared By	Checked By	Authorized By
0	Issued for Information	October 1, 2025	JTR	SMG	DMJ

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Executive Summary

As part of the Mountain Valley Pipeline Boost Project (MVP Boost), SLR International Corporation (SLR) has prepared a pre-construction noise study at the request of Mountain Valley Pipeline, LLC, (MVP) for the Harris Compressor Station (Harris CS) near Flatwoods in Braxton County, West Virginia. This report presents the results from SLR's sound level survey of the existing operational sound levels following commissioning of the site. The existing compressor station consists of two (2) Solar Titan 130 turbine-driven compressor packages. The Project proposes to add one (1) Solar Titan 350 turbine-driven compressor package, installed in an enclosure, and associated equipment to the site.

An operational sound survey for the station was conducted by SLR on July 7, 2025. Sound levels were measured at the four closest noise sensitive areas (NSAs) surrounding the station site. Both existing units were operating at full-load during the measurement survey.

The operating station was audible at measurement location 2, and the measured sound levels are controlled by other environmental noise sources, such as birds and insects. The station was audible at measurement locations 1 and 3, with measurement location 3 used for NSAs 2 and 3. Insect-filtered, measured sound levels near the NSAs were taken with the existing Harris CS operating at full load and ranged from 40.7 to 45.6 dBA L_{dn}, significantly lower than the applicable FERC sound level requirement of 55 dBA L_{dn}. **Table A** summarizes the results from the measurement survey. Greater details about the sound survey are presented within the report.

A computer noise model was updated to include the proposed MVP Boost equipment. Predicted future and total station contribution sound levels are presented in **Table A**, along with the potential increase over existing sound level.

Table A: Compressor Station Sound Level Predictions

A	B	C	D	E	F	G
					(D+E)	(F – D)
NSA	Distance from Compressor Building to NSA	Direction from CS to NSA	Measured Existing Sound Level [a, b]	Predicted Proposed Equipment	Total Complete Station Contribution + Measured Ambient Sound Level [c]	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
1	1,445	N	45.6	42.0	**47.2**	1.6
2	1,825	SW	40.7	42.3	**44.6**	3.9
3	1,965	SSE	40.7	42.1	**44.5**	3.8
4	3,340	WSW	42.7	35.9	**43.5**	0.8

a. Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
b. L_{dn} was calculated by adding 6.4 dB to the short-duration daytime measurement.
c. Measured existing sound levels include the sound level contribution of the existing Harris CS operating at full load.

Table A shows that A-weighted sound levels from the Harris CS equipment, including proposed MVP Boost equipment, are expected to be lower than the Federal Energy Regulatory Commission (FERC) noise limit of 55 dBA L_{dn}, with a potential increase over existing sound levels ranging between 0.8 and 3.9 dBA.

Table of Contents

Limitations ..... **ii**
Executive Summary ..... **iii**
Acronyms and Abbreviations ..... **vi**
1.0 Introduction **1**
2.0 Sound Level Criteria **1**
3.0 Description of Site and Facility **1**
3.1 Description of Site 1
3.2 Description of Station Equipment 1
4.0 Pre-Construction Sound Level Survey **2**
4.1 Closest Noise Sensitive Areas 2
4.2 Measurement Equipment 2
4.3 Weather Conditions 2
4.4 Measurement Methodology 3
4.5 Sound Level Measurements Results 3
4.6 Results 4
5.0 Proposed Equipment Noise Impact Assessment **5**
5.1 Significant Sound Sources 5
5.2 Noise Model Development 5
5.3 Data and Assumptions 5
5.4 Noise Model Results 6
5.4.1 Proposed MVP Boost Equipment – Normal Operation 6
5.5 Unit Venting 7
5.6 Emergency Shutdown (ESD) 7
5.7 MVP Boost Equipment Construction 8
6.0 Noise Control Treatments **9**
6.1 Compressor Enclosure 10
6.2 Compressor Enclosure Ventilation 10
6.3 Turbine Exhausts 10
6.3.1 Silencer Performance 10
6.3.2 Exhaust Duct and Shell Noise 10
6.4 Turbine Air Intake 10
6.5 Turbine Lube Oil Cooler 11

6.6 Gas Aftercooler 11
6.7 Station Above-Ground Gas Piping 11
6.7.1 Piping Isolation 11
7.0 Conclusions 12

Tables

Table 4-1: Summary of Noise Sensitive Areas (NSAs) 2
Table 4-2: Summary of Weather Conditions 3
Table 4-3: Summary of Measurement Locations 3
Table 4-4: Summary of Sound Level Measurements 4
Table 5-1: Sound Power (L_w) and Sound Pressure (L_p) levels for the Proposed MVP Boost Equipment 6
Table 5-2: Compressor Station Sound Level Predictions 7
Table 5-3: Proposed Construction Equipment Sound Levels 8
Table 6-1: Required Noise Control Treatments 9

Figures

Figure B-1: Aerial Image Showing Measurement Locations and Noise Sensitive Areas B-1
Figure B-2: Noise Contour – Proposed MVP Boost Only – Normal Operation – FERC Assessment – dBA L_{dn} B-2
Figure C-1: Weather Data – July 7, 2025 ..... C-1

Appendices

Appendix A Glossary of Common Acoustical Terminology
Appendix B Figures
Appendix C Weather Data

Acronyms and Abbreviations

°F	Degrees Fahrenheit
ANSI	American National Standards Institute
CS	Compressor Station
dB	Decibel
dBA	A-Weighted Decibel
DIL	Dynamic Insertion Loss
FERC	Federal Energy Regulatory Commission
FWHA	Federal Highway Administration
G	Ground Absorption Coefficient
HP	Horsepower
Hz	Hertz
IL	Insertion Loss
ISO	International Organization for Standardization
kHz	Kilohertz
L_d	Daytime Average Sound Level
L_{dn}	Day-Night Sound Level
L_{eq}	Equivalent Continuous Sound Level
L_p	Sound Pressure Level
L_w	Sound Power Level
ML	Measurement Location
mph	Miles per hour
MVP	Mountain Valley Pipeline
NRC	Noise Reduction Coefficient
NSA	Noise Sensitive Area
RCNM	Roadway Construction Noise Model
s/n	Serial Number
SLM	Sound Level Meter
SLR	SLR International Corporation
STC	Sound Transmission Class
TL	Transmission Loss
USGS	United States Geological Survey

1.0 Introduction

As part of the Mountain Valley Pipeline Boost Project (MVP Boost), SLR International Corporation (SLR) has prepared a pre-construction noise study at the request of Mountain Valley Pipeline, LLC, (MVP) for the Harris Compressor Station (Harris CS) near Flatwoods in Braxton County, West Virginia. This report presents the results from SLR's sound level survey of the existing operational sound levels following commissioning of the site. The existing compressor station consists of two (2) Solar Titan 130 turbine-driven compressor packages. The Project proposes to add one (1) Solar Titan 350 turbine-driven compressor package and associated equipment to the site.

2.0 Sound Level Criteria

The environmental sound level contributions from the Harris CS are subject to the Federal Energy Regulatory Commission (FERC) noise regulation, which governs interstate gas transmission compressor stations. The FERC noise regulation is receptor based, and limits compressor station noise contributions to no more than 55 dBA day-night average (L_{dn}) or, equivalently, no more than a continuous 48.6 dBA equivalent average (L_{eq}) at the surrounding noise-sensitive areas (NSAs). NSAs are typically residences, schools, churches, or hospitals.

A glossary of common acoustical terminology and metrics is included in **Appendix A**.

There are no other known state, county, or local regulations that would apply to this compressor station site.

3.0 Description of Site and Facility

3.1 Description of Site

The Harris CS site is located off Milroy Road about eight miles east of Flatwoods, West Virginia. The area surrounding the station consists primarily of rolling hills covered with dense deciduous forests and agricultural fields.

3.2 Description of Station Equipment

The existing Harris CS equipment consists of two (2) Solar Titan 130 turbine-driven compressor units enclosed in an acoustically insulated compressor building. Each turbine is rated at 20,500 HP at standard ISO conditions and drives a centrifugal compressor. All ISO power ratings are at 59 degrees Fahrenheit, sea level, and 60% relative humidity. Associated equipment (located outdoors) is as follows:

- Gas aftercoolers
- Turbine lube oil coolers
- Turbine inlet and exhaust openings
- Station suction and discharge piping and suction separators
- Fuel gas skid
- Capstone microturbine generators

- Control valves

The proposed MVP Boost equipment will consist of adding one (1) Solar Titan 350 turbine-driven compressor unit inside an enclosure, one (1) new Capstone microturbine.

4.0 Pre-Construction Sound Level Survey

4.1 Closest Noise Sensitive Areas

Four NSAs were identified by SLR using aerial imagery and field observations. They consist of the four closest residences to the Harris CS site. The NSAs are summarized in **Table 4-1**. The distance and direction from the site to the NSAs are shown. Distances reference the approximate center of the site location. The NSAs and measurement locations are shown in **Figure B-1**.

Table 4-1: Summary of Noise Sensitive Areas (NSAs)

Noise Sensitive Area	Measurement Location (ML)	Description	Approximate Distance from Station to NSA	Direction to NSA
			Feet	
NSA 1	ML 1	Residence	1,445	North
NSA 2	ML 3	Residence	1,825	Southwest
NSA 3	ML 3	Residence	1,965	SSE
NSA 4	ML 2	Residence	3,340	WSW

4.2 Measurement Equipment

Sound level equipment used during the noise survey included the following instruments:

- Brüel & Kjær Model 2270 SLM; Type 1; s/n 303145
- Brüel & Kjær Model 4231 Calibrator; s/n 3001195

A windscreen was used on the measurement microphone. The sound level meter was field calibrated before and after measurement intervals, showing no significant change in sensitivity over the survey period. All instruments have current laboratory certification that can be provided upon request. Measurements were conducted five feet above the ground.

4.3 Weather Conditions

Weather conditions were appropriate for an outdoor sound level study. A summary of the weather conditions is shown in **Table 4-2.**

Table 4-2: Summary of Weather Conditions

Date	July 7, 2025
Temperature Range	70°F – 97°F
Relative Humidity Range	94 %
Wind Speed (Average)	0-11 mph
Wind From	SSE
Sky Condition	Partly Sunny
Ground Condition	Dry

Complete weather data from the measurement survey were obtained from a nearby station using WeatherUnderground [1] and are shown in **Appendix C**.

4.4 Measurement Methodology

Sound levels were measured using the slow meter response and A-weighting (dBA). Data were collected in 1/1 and 1/3-octave bands and recorded in 1-second sampling periods for a five-minute duration.

4.5 Sound Level Measurements Results

The sound study was performed on July 7, 2025, by Steve Gronsky and Valen Li of SLR. Short-term, attended sound level measurements were conducted at three locations selected to quantify existing sound levels near the four closest NSAs. The survey began around 12:30 p.m. and ended around 4:00 p.m. During the survey, the existing turbines were operating at 100% load.

Observations at the measurement locations are summarized in **Table 4-3**.

Table 4-3: Summary of Measurement Locations

NSA	Measurement Location (ML)	Measurement Duration MM:SS	Source Observations During Measurements
1	ML 1	05:00	Audible sound sources included birds, and insects. The Harris CS was audible during the sound level measurements.
2	ML 3	06:05	Audible sound sources included birds, insects, and a light breeze. The Harris CS was audible during the sound level measurements.
3			
4	ML 2	05:00	Audible sound sources included limited birds, insects, a light breeze, and a nearby compressor station. The Harris CS was not audible during the sound level measurements.

[1] https://wunderground.com/dashboard/pws/KWVFLATW2/graph/2025-07-7/2025-07-7/daily

4.6 Results

The noise survey measurement results are summarized in **Table 4-4**. The measured sound levels for the daytime equivalent average (L_d) and the day-night average (L_{dn}) are shown. The L_{dn} values were calculated by adding 6.4 decibels (dB) to the short term L_{eq} during a daytime period that was free from extraneous noise sources, such as passing vehicles. The overall L_{eq} is inclusive of all environmental noise sources, such as birds, and insects. Nighttime sound level measurements were not collected at the existing Harris compressor station, however, the daytime measurements were collected during periods free from extraneous noise sources, and the compressor station was practically inaudible at each measurement location. Therefore, the nighttime sound levels are expected to be similar to the measured daytime sound levels.

Due to significant insect activity and bird chirps during the survey, measurement results were filtered to remove noise from these environmental sources. This was completed by correcting all sound energy at and above the 1,600 Hz one-third (1/3) octave band in accordance with ANSI/ASA S3/SC1.100-2014[2]. Sound from the Harris CS was not audible at measurement location 2 and barely audible at measurement locations 1 and 3. Data are presented with and without the filtering applied.

Table 4-4: Summary of Sound Level Measurements

Measurement Location	Nearest NSA	Distance from CS to NSA	Direction from CS to NSA	Measurement Duration	Measured Sound Level, Unfiltered			Measured Sound Level, Filtered to Remove Noise from Birds, Insects, and Traffic		
					dBA			dBA [a]		
		Feet		MM:SS	L_d	L_n [c]	L_{dn} [b]	L_d	L_n [c]	L_{dn} [b]
ML 1	1	1,445	N	04:59	44.4	50.8	50.8	39.2	39.2	**45.6**
ML 3	2	1,825	SW	04:59	35.0	41.4	41.4	34.3	34.3	**40.7**
	3	1,965	SSE							
ML 2	4	3,340	WSW	06:04	38.8	45.2	45.2	36.3	36.3	**42.7**

a. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
b. L_{dn} was calculated by adding 6.4 dB to the short duration L_{eq} measured.
c. Nighttime sound levels were assumed to be equal to measured daytime sound levels since the measurements were collected during periods free from extraneous noise sources and the compressor station was practically inaudible during the measurements.

The filtered sound levels ranged from 40.7 to 45.6 dBA L_{dn} at the measurement locations.

[2] "Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas", ANSI/ASA S3/SC1.100-2014.

5.0 Proposed Equipment Noise Impact Assessment

5.1 Significant Sound Sources

The following proposed Project sound sources are considered significant:

- Noise from the turbine exhaust, including the exhaust outlet and noise radiated from the exhaust ductwork, expansion joints, and silencer shell.
- Noise from the turbine air inlet system, including the inlet opening and noise radiated from the silencer/ductwork shell and any duct joints.
- Turbine/compressor casing noise that radiates to the exterior of the building and through building ventilation openings.
- Noise from the lube oil cooler / auxiliary cooler and gas aftercooler.
- Noise radiated by aboveground station gas piping.

5.2 Noise Model Development

The existing three-dimensional computer noise model was updated to analyze the noise contributions expected from the proposed expansion equipment. The model was developed using CadnaA, version 2025 MR1 (build: 211.5558), a commercial noise modeling package developed by DataKustik GmbH. The software considers spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613-2 standard was used for air absorption and other noise propagation calculations.

Ground absorption for the surrounding area was set to G = 0.8, representing a fairly absorptive ground. The station pad ground was modeled as reflective, with a G = 0.1 absorption coefficient.

The effects of foliage were included in the noise model as per standard ISO 9613-2 calculation methods. The terrain was modeled based on USGS topographical data at a resolution of 10 by 10 meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations.

The noise model includes the proposed expansion equipment. Sound levels for the existing equipment are included in the sound level measurements of the existing condition.

5.3 Data and Assumptions

The proposed MVP Boost equipment includes a new compressor package installed in an enclosure. All proposed equipment was arranged as per the latest site plans, and the additional turbine unit equipment is planned to be laid out in the same orientation as the existing units. A new Capstone microturbine is also proposed to be located near the existing microturbines.

Table 5-1 shows the sound power levels used as input to the model for the proposed MVP Boost equipment. Manufacturer data (as available) and/or sound power levels derived from measurements of the equipment were used in the computer noise model.

Table 5-1: Sound Power (L_w) and Sound Pressure (L_p) levels for the Proposed MVP Boost Equipment

Source	Linear L_w or L_p at Octave Center Frequency, Hz									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Levels, L_w, dB										
Solar Titan 350 Sound Levels										
Turbine Air Intake, Unsilenced Part Load, L_w [1]	115	117	121	121	127	133	162	153	152	164
Turbine Exhaust Outlet, Unsilenced, L_w [1]	128	133	131	132	133	130	125	116	98	135
Compressor Enclosure Inlet/Outlet Ventilation Duct, L_w [1]	110	107	104	100	102	98	128	115	114	130
Suction Piping, Uninsulated, L_w [1]	73	65	69	72	84	99	111	113	100	116
Discharge Piping, Uninsulated, L_w [1]	71	61	67	70	82	94	109	110	96	114
Enclosure, L_w [1]	122	120	112	106	103	99	107	98	98	110
Compressor Enclosure Outlet Fan, L_w [1]	94	94	101	105	106	103	97	91	86	107
Compressor Enclosure Inlet Fan, L_w [1]	104	104	97	98	101	101	99	91	85	105
Compressor Casing, L_w [1]	87	80	83	86	90	91	100	99	87	104
Turbine Exhaust Duct Expansion Joint, L_w [1]	114	115	106	85	82	92	94	76	73	98
Gas Cooler, per fan, L_w [3]	112	109	102	96	90	84	81	82	69	93
Lube Oil Cooler, L_w [1]	95	102	99	92	87	84	80	76	71	90
Turbine Exhaust Duct Breakout, L_w [1]	78	90	86	76	69	54	46	42	4	73
Capstone C1000 Microturbine Sound Levels										
Microturbine Enclosure Exhaust, L_w [3]	81	101	92	94	82	81	80	86	77	91
Microturbine Exhaust, L_w [3]	92	96	82	85	78	78	66	58	54	82
Microturbine Enclosure Intake, L_w [3]	81	78	83	78	73	74	75	72	71	81

[1] From manufacturer data.
[2] From MVP specification, the manufacturer will meet 45 dBA at 200 ft.
[3] From SLR diagnostic measurements from MVP sites.

5.4 Noise Model Results

5.4.1 Proposed MVP Boost Equipment – Normal Operation

Table 5-2 shows a summary of the calculated sound level contribution from the proposed MVP Boost equipment at each NSA. The table also shows the overall sound levels at each NSA, including the proposed MVP Boost expansion equipment contribution and the operational sound level of the existing equipment.

The table indicates that, with the proposed noise control treatments discussed in **Section 6.0**, the compressor station noise contributions at all of the nearest NSAs will be below the FERC sound level limit of 55 dBA L_{dn}. The FERC sound level limits apply only to the sound level contribution of the compressor station equipment, and do not include the influence of the existing ambient sound levels.

The highest Project equipment sound level contribution is 42.3 dBA L_{dn} at NSA 2. When combined with the measured existing sound levels (which includes sound from ambient sources including the Harris CS), the overall Harris CS plus ambient sound levels range from 43.5 to 47.2 dBA L_{dn}, which are well below the FERC noise limit of 55 dBA L_{dn}. This demonstrates that even while including the existing ambient sound levels, the Harris CS sound levels will be lower than the FERC noise limit of 55 dBA L_{dn}. The predicted increases above the existing sound levels range from 0.8 to 3.9 dBA.

Table 5-2: Compressor Station Sound Level Predictions

A	B	C	D	E	F	G
					(D+E)	(F – D)
NSA	Distance from Compressor Building to NSA	Direction from CS to NSA	Measured Existing Sound Level [a, b]	Predicted Proposed Equipment	Total Complete Station Contribution + Measured Ambient Sound Level [c]	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
1	1,445	N	45.6	42.0	**47.2**	1.6
2	1,825	SW	40.7	42.3	**44.6**	3.9
3	1,965	SSE	40.7	42.1	**44.5**	3.8
4	3,340	WSW	42.7	35.9	**43.5**	0.8

a. Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
b. L_{dn} was calculated by adding 6.4 dB to the short-duration daytime measurement.
c. Measured existing sound levels include the sound level contribution of the existing Harris CS operating at full load.

5.5 Unit Venting

Under certain circumstances, the pressure in the compressor casing and unit piping must be released in a controlled manner. These events are called “Unit Venting” and occur when the unit is shut down for an extended period. During unit venting, high-pressure gas in the system is released in a controlled fashion through a silencer. Unit venting causes a temporary increase in sound level that usually lasts for approximately five minutes.

A compressor unit venting scenario was modeled using a single silencer specified to limit the venting sound levels to a maximum of **85 dBA at 50 feet**. During this event, predicted sound levels range from 40.3 to 51.4 dBA L_{eq} at the NSAs.

5.6 Emergency Shutdown (ESD)

The station has an emergency shutdown (ESD) system that automatically halts operation of the station in the event of an irregularity. This results in full station venting during which the gas from all station piping is released in a controlled manner. These events are extremely rare and take place only in the event of an emergency. The station ESD system was modeled with a maximum sound level of **85 dBA at 50 feet,** per vent, with both vents operating simultaneously**.**

The predicted short-term sound levels at NSAs due to an ESD event range from 43.2 to 54.3 dBA L_{eq} at the NSAs, which is near the predicted full load operational sound level of the existing station. This is a reasonable sound level for an event that will only occur in emergency situations. The ESD blowdown duration is typically less than ten minutes.

5.7 MVP Boost Equipment Construction

Only standard equipment will be used during construction, with no dynamic compaction or pile driving expected. Most construction will take place during daytime working hours of 7:00 a.m. to 7:00 p.m. Construction sound calculations were performed with the CadnaA propagation model, which accounts for local topography. Equipment usage factors were used per the Federal Highway Administration's Roadway Construction Noise Model version 1.1 (FWHA, 2006). Usage factor is the percentage of time a given piece of equipment typically operates during a given hour. **Table 5-3** presents the equipment that was included in the construction evaluation for the MVP Boost expansion equipment.

Table 5-3: Proposed Construction Equipment Sound Levels

Equipment	Quantity	Usage Factor	Quantity and Usage Factor Adjusted Sound Pressure Level at 50-Feet, dBA
Air Compressor	4	0.4	80
Bobcat	3	0.4	80
Compactor	4	0.2	82
Compactor, Vibratory	2	0.2	76
Concrete Mixer Truck (main pours)	10	0.4	85
Concrete Mixer Truck (small pours)	4	0.4	81
20-Ton Wheeled Crane	2	0.16	77
250-Ton Wheeled Crane	2	0.16	76
Hydrotest Truck	1	0.4	81
Dump Truck	4	0.4	78
Excavator	4	0.4	83
Forklift	2	0.2	71
Generators	3	0.5	83
Light Tower	4	0.25	62
Man Lift	8	0.2	77
Scissor Lift	2	0.2	71
Tandem Truck	4	0.4	78
Water / Fuel Truck	4	0.4	76
Welding Machine	10	0.4	80
Welding Rig	10	0.4	80
X-Ray Truck / Machine	2	0.4	75
Total Sound Power Level, L_w, dBA			**127.5**

The construction equipment in the **Table 5-3** represents all of the proposed equipment operating simultaneously, which is a very conservative approach. In reality, equipment will be

used in phases, and construction sound levels will be significantly lower than the modeled results during each construction phase.

Calculated construction sound levels at the NSAs range from 49.5 to 57.2 dBA L_{eq}. If major construction activity is limited to daytime hours, then there is no specific sound level limit for construction activities. Nighttime construction work is not planned, but if the need arises, a nighttime noise management plan will be created.

6.0 Noise Control Treatments

The MVP project has specified all major equipment, less the Titan 350 turbine enclosure, at the Harris CS each meet a sound level target of 45 dBA or less at 200 feet. A summary of the modeled performance of one possible set of noise control treatments is shown in **Table 6-1**. The following subsections describe the treatments. Note that the noise mitigation performance of several of these treatments are higher performance than standard manufacturer (Solar) supplied mitigation.

The noise mitigation measures shown are based on the most current station design and represent one potential set of possible mitigation. There are many different combinations of noise control measures that will provide similar noise control. As the station design is finalized, the mitigation design may be modified to account for these design changes while maintaining compliance with the FERC noise requirements.

Table 6-1: Required Noise Control Treatments

Source	Treatment Description	Required Treatment Performance								
		31.5	63	125	250	500	1k	2k	4k	8k
Turbine Intake	Total Silencing (Intake Silencer and Filters), DIL	3	16	34	57	65	70	73	75	79
Compressor Casing	Compressor Casing Blankets, IL	0	2	4	6	8	9	10	10	10
Exhaust Duct	Interior Duct Lining, IL	2	5	9	14	17	20	24	7	12
Enclosure Inlet Ventilation	Silencers and Lined Hoods, DIL	24	28	31	35	38	39	40	39	39
Enclosure Outlet Ventilation	Silencers and Lined Hoods, DIL	11	12	16	22	32	39	43	41	32
T350 Turbine Exhaust	Custom Exhaust Silencer, DIL	21	25	32	43	51	53	50	45	44
T350 Suction and Discharge Gas Piping	Type ISO C32 Lagging, IL	0	0	1	9	17	26	34	38	42

6.1 Compressor Enclosure

The compressor enclosures were modeled as having the total sound power levels as shown in **Table 5-1.**

6.2 Compressor Enclosure Ventilation

The enclosure inlet and outlet ventilation openings should have silencers installed with the overall performance shown in **Table 6-1**. The specified silencer performance is greater than the standard Solar supplied silencer.

Similarly, the ridge vent should continue across the roof of the proposed expansion and shall have the same performance as the currently installed exhaust ventilation system for the compressor building.

6.3 Turbine Exhausts

The turbine should include a custom exhaust silencer system that results in the insertion loss shown in **Table 6-1**. The exhaust silencer should be located as close to the compressor enclosure as possible. The specified silencer performance is greater than the standard Solar supplied silencer.

6.3.1 Silencer Performance

The proposed additional turbine will include an exhaust silencer system achieving the dynamic insertion loss (DIL, in decibels) shown in **Table 6-1**. Due to the complexities involved with the field verification of silencer insertion loss, the vendor should bid to match the existing silencers for Units 1 and 2.

6.3.2 Exhaust Duct and Shell Noise

In large turbine-powered installations it is common for a significant amount of sound energy to radiate from the exhaust system ductwork, expansion joints, and exhaust silencer shell. This sound energy is often termed “shell-radiated” noise. Shell-radiated noise is not necessarily calculated by exhaust system manufacturers, but it can be a dominant noise source for NSAs close to the station. These levels were based on in duct sound power levels provided by Solar. An internally lined exhaust duct was included within the model with the performance described in **Table 6-1. The ducting should be either internally lined or externally lagged provided that the performance of the lining shown in Table 6-1.** The maximum allowable exhaust breakout sound power level should be provided to the manufacturer in the exhaust system specification.

6.4 Turbine Air Intake

The proposed additional unit was assumed to consist of the same turbine intake system as the existing Harris CS equipment. The total performance of the intake silencing system, including silencer and pulse updraft filter is provided in **Table 6-1**.

6.5 Turbine Lube Oil Cooler

The sound power level of the turbine lube oil cooler should not exceed the sound power levels provided in **Table 5-1**. This is the total sound power level for the entire cooler (i.e. not just a single fan). The sound power level in **Table 5-1** is representative of the 90 dBA sound power level cooler offered by Solar.

6.6 Gas Aftercooler

The proposed additional unit should have a gas aftercooler with a fan sound power level (per fan) rating as provided in **Table 5-1**. This was assumed to be equal to the existing gas aftercooler fans at the Harris CS.

6.7 Station Above-Ground Gas Piping

The proposed additional unit should have suction and discharge piping insulated to match the extent of the existing station piping. The performance of the insulation should achieve the insertion loss (IL) provided in **Table 6-1**.

All above-ground suction piping on the cooler-side of the building should be insulated, as well any above-ground discharge piping between the compressor building and gas aftercooler flanges.

6.7.1 Piping Isolation

To limit radiation from structural supports, the compressor piping should be isolated from the pipe supports and other structural contacts using at least one-quarter inch (1/4) neoprene bearing pads. The stiffness of the neoprene should be chosen so that the static deflection of the pads under the piping loads is about one-sixteenth inch (1/16). Secondary steel elements such as cable trays, pipe racks, walkways, and conduit supports should not be connected to the pipe supports and/or piping.

7.0 Conclusions

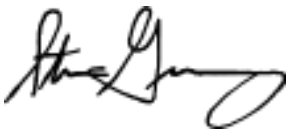
SLR has completed a post-construction noise survey near the Mountain Valley Pipeline, LLC Harris Compressor Station, located near Flatwoods in Braxton County, West Virginia. Measurements were conducted near the closest NSAs. After filtering out insect, bird, and traffic sounds, the measured sound levels ranged from 40.7 to 45.6 dBA L_{dn}.

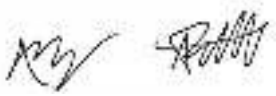
Modeling results from the proposed MVP Boost equipment (the addition of one (1) Solar Titan-350 turbine-driven compressor package) indicate that the contribution from the new equipment will range from 35.9 to 42.3 dBA L_{dn} at the NSAs, yielding a potential increase in existing sound level of 0.8 to 3.9 dBA. These results indicate that the sound levels due to the existing Harris CS (including the existing ambient levels) and proposed expansion equipment will be lower than 55 dBA L_{dn} at all nearby NSAs and that the station will continue to operate in full compliance with FERC noise requirements.

This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.

Sincerely,

SLR International Corporation





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Appendix A Glossary of Common Acoustical Terminology

MVP Harris Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 1, 2025

A-weighting: a weighting scale in which sound pressure levels in individual frequency bands are adjusted to match the response for the human ear. The reference adjustment is 0 dB at 1,000 Hz. The human ear is much less responsive at low frequencies. An A-weighted sound level is the total contribution from all sound frequencies, with the appropriate weighting factors applied and is designated as dBA.

C-weighting: a weighting scale that is relatively flat from 31.5 Hz to 8,000 Hz with a roll-off higher and lower than those frequencies. The adjustment is 0 dB from 200 Hz to 1,250 Hz. A C-weighted sound level is the total contribution from all sound frequencies, with the appropriate weighting factors applied and is designated as dBC.

Hertz (Hz): the unit of measure of frequency or the speed of vibration of a sound wave. Also referred to as “cycles per second”.

Insertion Loss (IL): the decrease (in decibels, dB) in sound power level measured at the location of the receiver when a sound attenuator (e.g., muffler), barrier, or other sound reduction element is inserted in the transmission path between the source and receiver.

L_d: the daytime average sound level. The L_{eq} averaged over daytime hours. Daytime hours may be defined differently by various ordinances and regulations. The hours between 7:00 am and 10:00 pm is the interval used by the U.S. Federal Energy Regulatory Commission (FERC) and the U.S. Department of Housing and Urban Development (HUD).

L_{dn} (also DNL): the day-night average sound level, a metric used by many regulatory bodies (including FERC and HUD) as an overall representation of the sound at a measurement location. The L_{dn} is calculated by averaging the sound measured over a 24-hour period, with 10 decibels added to sound levels measured during nighttime hours.

L_{eq}: the equivalent-continuous sound level is a time-average sound level for a specified time period. It is the most commonly used form of sound level averaging. Specifically, the Leq is the level of a steady sound that has the same sound energy as a time-varying sound during a stated time period and at a stated location.

L_n: the nighttime average sound level. The L_{eq} averaged over nighttime hours. Nighttime hours may be defined differently by various ordinances and regulations. The hours between 10:00 pm and 7:00 am is the interval used by the U.S. Federal Energy Regulatory Commission (FERC) and the U.S. Department of Housing and Urban Development (HUD).

L_{90}: a statistical parameter (percentile) that describes the sound level that is exceeded 90 percent of the time during a stated time period. For example, for a stated hourly L_{90} of 45 dBA, the sound level at the measurement location has a 90% chance of being greater than 45 dBA and a 10% chance of being less than or equal to 45 dBA. The L_{90} is often used as the “background” or “ambient” sound level for a given measurement period. Other percentile values are defined similarly (e.g., L_{50}, L_{10}, etc.).

Sound Power Level (PWL or L_w): a logarithmic parameter that describes the power characteristics of a noise source, relative to a reference power value, expressed in decibels, dB or dBA. The sound power level should not be confused with the sound pressure level. The sound power level is a characteristic of a noise source analogous to the wattage rating of a light bulb, and it is independent of the surroundings. It is calculated from measurements of the sound pressure level. A 75-watt light bulb will look much brighter in a white, reflective room than in a black, absorptive one. A noise source rated with a sound power level if 95 dBA will produce a much higher sound pressure level (will be much louder) in a small hard box than outside in a soft grass meadow.

Sound Pressure Level (SPL or L_p): a logarithmic parameter that describes the quantity of sound relative to a reference pressure value, expressed in decibels, dB or dBA. The SPL is the quantity that is measured with a sound level meter, and it is dependent upon the surroundings of a noise source.

Sound Transmission Class (STC): a single number rating for describing sound transmission loss of a wall or partition. A rating system designed to facilitate comparison of the sound transmission characteristics of various architectural materials and constructions.

Transmission Loss (TL): the difference (in decibels) between sound power incident upon a sound reduction element (wall or muffler) to that transmitted. The less sound energy is transmitted, the higher the TL value.

Appendix B Figures

MVP Harris Compressor Station

Pre-Construction Noise Survey – MVP Boost

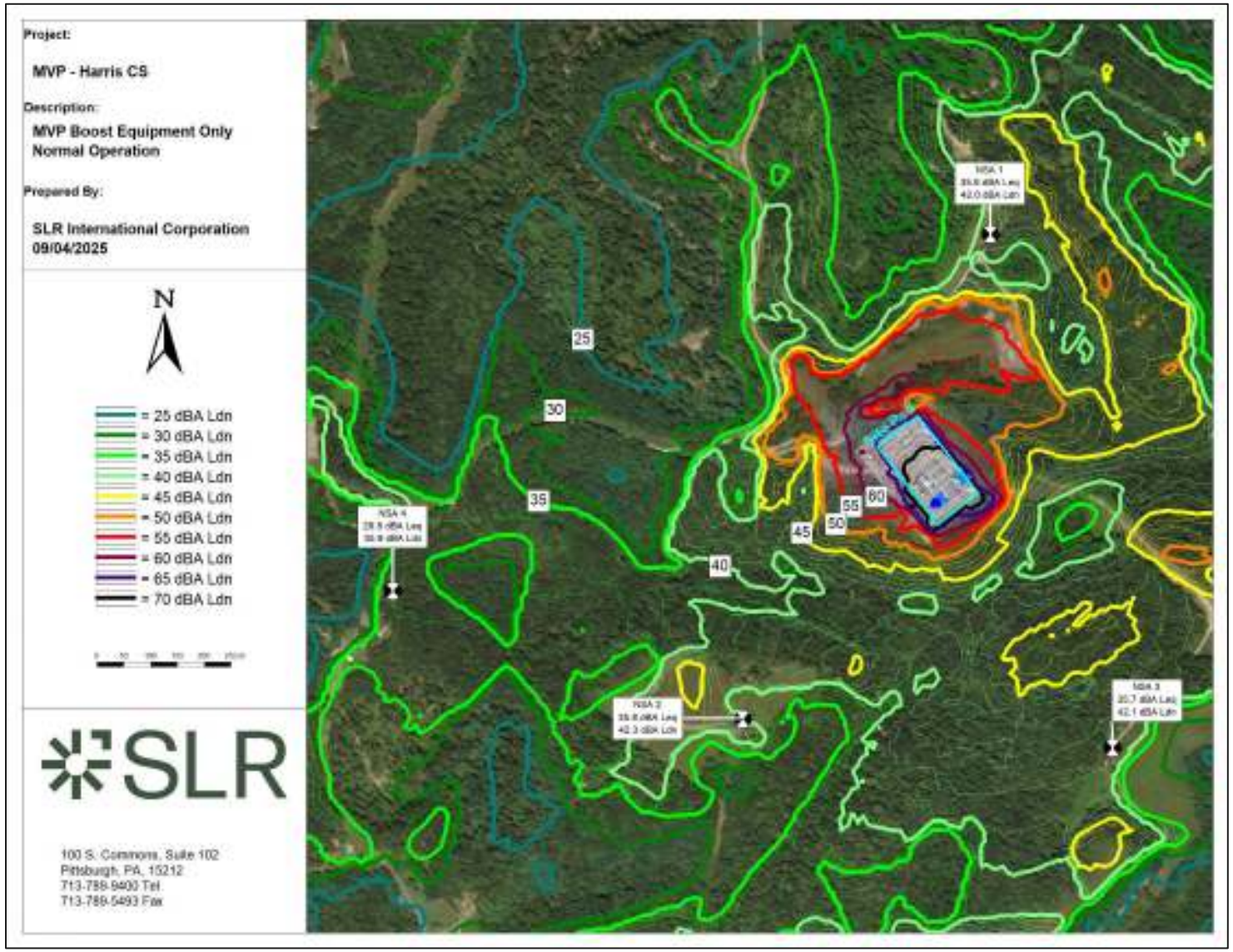
Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 1, 2025

Figure B-1: Aerial Image Showing Measurement Locations and Noise Sensitive Areas

Figure B-2: Noise Contour – Proposed MVP Boost Only – Normal Operation – FERC Assessment – dBA L_{dn}



Appendix C Weather Data

MVP Harris Compressor Station

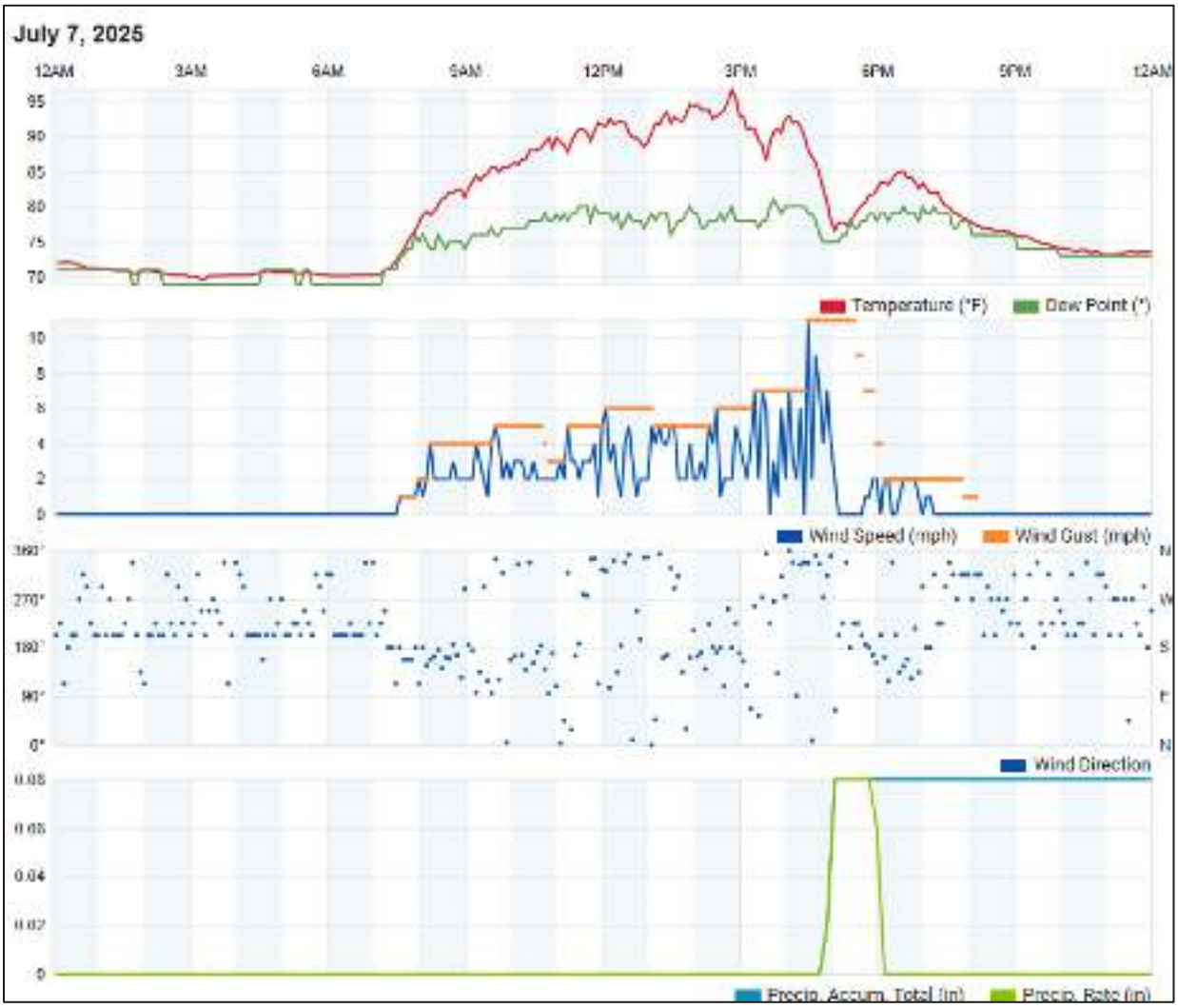
Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 1, 2025

Figure C-1: Weather Data – July 7, 2025



Making Sustainability Happen

Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9

Appendix 9-I
Stallworth Compressor Station Pre-Construction Noise Study Report

MVP Stallworth Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

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Executive Summary

As part of the Mountain Valley Pipeline Boost Project (MVP Boost), SLR International Corporation (SLR) has prepared a pre-construction noise study at the request of Mountain Valley Pipeline, LLC, (MVP) for the Stallworth Compressor Station (Stallworth CS) near Spring Dale in Fayette County, West Virginia. This report presents the results from SLR's sound level survey of the existing operational sound levels following commissioning of the site. The existing compressor station consists of two (2) Solar Titan 130 turbine-driven compressor packages. The Project proposes to add two (2) additional Solar Titan 130e turbine-driven compressor packages and associated equipment to the site, as well as upgrading the existing units to Titan 130e turbine-driven compressor packages.

An operational sound survey for the station was conducted by SLR on July 8, 2025. Sound levels were measured at the five closest noise sensitive areas (NSAs) surrounding the station site. Each existing unit was operating at full-load during the measurement survey.

The operating station was practically inaudible at the measurement locations, and the measured sound levels are controlled by other environmental noise sources, such as birds and insects. Insect-filtered, measured sound levels near the NSAs ranged from 40.9 to 46.0 dBA L_{dn}, significantly lower than the applicable FERC sound level requirement of 55 dBA L_{dn}. **Table A** summarizes the results from the measurement survey. Greater details about the sound survey are presented within the report.

A computer noise model was updated to include the proposed MVP Boost equipment. Predicted future and total station contribution sound levels are presented in **Table A**, along with the potential increase over existing sound level.

Table A: Compressor Station Sound Level Predictions

A	B	C	D	E	F	G	H	I	J
						(E + F)	(D – E)	(G + H)	(I – D)
NSA [a]	Distance from Compressor Building to NSA	Direction from CS to NSA	Measured Existing Sound Level [b,c]	Predicted Station Contribution from Existing Equipment	Predicted Proposed Equipment Only [d]	Combined Total Station Contribution (Existing+ Proposed)	Calculated Ambient Sound Level	Total Complete Station Contribution + Calculated Ambient Sound Level	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
1	2,835	WNW	**41.4**	40.0	37.9	**42.1**	35.8	43.0	1.6
2	1,985	W	**46.0**	41.4	39.4	**43.5**	44.2	46.9	0.9
3	2,085	SW	**45.0**	42.0	40.8	**44.5**	42.0	46.4	1.4
4	1,465	SSW	**42.5**	36.6	39.5	**41.3**	41.2	44.3	1.8
5	*Property was acquired by MVP and is no longer an NSA*								
6	2,755	ESE	**40.9**	38.9	38.4	**41.7**	36.6	42.8	1.9

a. NSA 5 from the previous studies has since then been acquired by MVP and demolished and is no longer considered an NSA.
b. Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
c. L_{dn} was calculated by adding 6.4 dB to the short duration daytime measurement.
d. Assumes all proposed future equipment in operation at full load.

Table A shows that A-weighted sound levels from the Stallworth CS equipment, including proposed MVP Boost equipment, are expected to be lower than the Federal Energy Regulatory Commission (FERC) noise limit of 55 dBA L_{dn}, with a potential increase over existing sound levels ranging between 0.9 and 1.9 dBA.

Table of Contents

Limitations ..... **ii**
Executive Summary ..... **iii**
Acronyms and Abbreviations ..... **vii**
1.0 Introduction **1**
2.0 Sound Level Criteria **1**
3.0 Description of Site and Facility **1**
3.1 Description of Site 1
3.2 Description of Station Equipment 1
4.0 Pre-Construction Sound Level Survey **2**
4.1 Closest Noise Sensitive Areas 2
4.2 Measurement Equipment 2
4.3 Weather Conditions 3
4.4 Measurement Methodology 3
4.5 Sound Level Measurements Results 3
4.6 Results 4
5.0 Proposed Equipment Noise Impact Assessment **5**
5.1 Significant Sound Sources 5
5.2 Noise Model Development 5
5.3 Data and Assumptions 6
5.4 Noise Model Results 8
5.4.1 Proposed MVP Boost Equipment – Normal Operation 8
5.5 Property Line Assessment for Fayette County 9
5.6 Unit Venting 9
5.7 Emergency Shutdown (ESD) 10
5.8 MVP Boost Equipment Construction 10
6.0 Noise Control Treatments **12**
6.1 Compressor Building Walls and Roof 12
6.2 Compressor Building Doors 13
6.3 Compressor Building Ventilation 13
6.4 Turbine Exhausts 13
6.4.1 Silencer Performance 13
6.4.2 Exhaust Duct and Shell Noise 13

6.5 Turbine Air Intake 14
6.6 Turbine Lube Oil Cooler 14
6.7 Gas Aftercooler 14
6.8 Station Above-Ground Gas Piping 14
6.8.1 Piping Isolation 14
7.0 Conclusions 15
8.0 Closure 15

Tables

Table 4-1: Summary of Noise Sensitive Areas (NSAs) 2
Table 4-2: Summary of Weather Conditions 3
Table 4-3: Summary of Measurement Locations 3
Table 4-4: Summary of Sound Level Measurements 5
Table 5-1: Sound Power (L_w) and Sound Pressure (L_p) levels for Existing Station Equipment 7
Table 5-2: Sound Power (L_w) and Sound Pressure (L_p) levels for Proposed Station Equipment 8
Table 5-3: Compressor Station Sound Level Predictions 9
Table 5-4: Proposed Construction Equipment Sound Levels 11
Table 6-1: Required Noise Control Treatments 12

Figures

Figure B-1: Aerial Image Showing Measurement Locations and Noise Sensitive Areas B-1
Figure B-2: Noise Contour – Existing + MVP Boost – Normal Operation – FERC Assessment – dBA L_{dn} B-2
Figure B-3: Noise Contour – Existing + MVP Boost – Normal Operation – PL Assessment – dBA, L_n B-3
Figure C-1: Weather Data – July 8, 2025 ..... C-1

Appendices

Appendix A Glossary of Common Acoustical Terminology
Appendix B Figures
Appendix C Weather Data

Acronyms and Abbreviations

°F	Degrees Fahrenheit
ANSI	American National Standards Institute
CS	Compressor Station
dB	Decibel
dBA	A-Weighted Decibel
DIL	Dynamic Insertion Loss
FERC	Federal Energy Regulatory Commission
FWHA	Federal Highway Administration
G	Ground Absorption Coefficient
HP	Horsepower
Hz	Hertz
IL	Insertion Loss
ISO	International Organization for Standardization
kHz	Kilohertz
L_d	Daytime Average Sound Level
L_{dn}	Day-Night Sound Level
L_{eq}	Equivalent Continuous Sound Level
L_p	Sound Pressure Level
L_w	Sound Power Level
ML	Measurement Location
mph	Miles per hour
MVP	Mountain Valley Pipeline
NRC	Noise Reduction Coefficient
NSA	Noise Sensitive Area
RCNM	Roadway Construction Noise Model
s/n	Serial Number
SLM	Sound Level Meter
SLR	SLR International Corporation
STC	Sound Transmission Class
TL	Transmission Loss
USGS	United States Geological Survey

1.0 Introduction

As part of the Mountain Valley Pipeline Boost Project (MVP Boost), SLR International Corporation (SLR) has prepared a pre-construction noise study at the request of Mountain Valley Pipeline, LLC, (MVP) for the Stallworth Compressor Station (Stallworth CS) near Spring Dale in Fayette County, West Virginia. This report presents the results from SLR's sound level survey of the existing operational sound levels following commissioning of the site. The existing compressor station consists of two (2) Solar Titan 130 turbine-driven compressor packages. The Project proposes to add two (2) additional Solar Titan 130e turbine-driven compressor packages and associated equipment to the site, as well as upgrading the existing units to Titan 130e turbine-driven compressor packages.

2.0 Sound Level Criteria

The environmental sound level contributions from the Stallworth CS are subject to the Federal Energy Regulatory Commission (FERC) noise regulation, which governs interstate gas transmission compressor stations. The FERC noise regulation is receptor based, and limits compressor station noise contributions to no more than 55 dBA day-night average (L_{dn}) or, equivalently, no more than a continuous 48.6 dBA equivalent average (L_{eq}) at the surrounding noise-sensitive areas (NSAs). NSAs are typically residences, schools, churches, or hospitals.

The Fayette County Unified Development Code (Section Nine: Article 9000 – Development Standards, II. Noise Standards, 2009) includes a noise limit that applies at receiving residential property lines. The Code limits noise at the receiving residential property lines to 65 dBA between 7:00 a.m. and 6:00 p.m., and 55 dBA between 6:00 p.m. and 7:00 a.m.

A glossary of common acoustical terminology and metrics is included in **Appendix A**.

There are no other known state, county, or local regulations that would apply to this compressor station site.

3.0 Description of Site and Facility

3.1 Description of Site

The Stallworth CS site is located off of Dawson-Springdale Road (Route 29) about two and a half miles east of Spring Dale, West Virginia. The area surrounding the station consists primarily of rolling hills covered with dense forests and agricultural fields.

3.2 Description of Station Equipment

The existing Stallworth CS equipment consists of two (2) Solar Titan 130 turbine-driven compressor units enclosed in an acoustically insulated compressor building. Each turbine is rated at 20,500 HP at standard ISO conditions and drives a centrifugal compressor. All ISO power ratings are at 59 degrees Fahrenheit, sea level, and 60% relative humidity. Associated equipment (located outdoors) is as follows:

- Gas aftercoolers
- Turbine lube oil coolers
- Turbine inlet and exhaust openings

- Station suction and discharge piping and suction separators
- Fuel gas skid
- Capstone microturbine generators
- Control valves

The proposed MVP Boost equipment will consist of adding two (2) Solar Titan 130e turbine-driven compressor units enclosed within a new building, a new Capstone microturbine, and upgrading the two (2) existing units from Titan 130 to Titan 130e turbine-driven compressor packages. Associated equipment will be specified to be the same as the existing units.

4.0 Pre-Construction Sound Level Survey

4.1 Closest Noise Sensitive Areas

Two NSAs were identified by SLR using aerial imagery and field observations. They consist of the five closest residences to the Stallworth CS site. The NSAs are summarized in **Table 4-1**. The distance and direction from the site to the NSAs are shown. Distances reference the approximate center of the site location. The NSAs and measurement locations are shown in **Figure B-1**.

Table 4-1: Summary of Noise Sensitive Areas (NSAs)

Noise Sensitive Area	Measurement Location (ML)	Description	Approximate Distance from Station to NSA	Direction to NSA
			Feet	
NSA 1	ML 1	Residence	2,835	WNW
NSA 2	ML 2	Residence	1,985	W
NSA 3	ML 3	Residence	2,085	SW
NSA 4	ML 4	Residence	1,465	SSW
NSA 5	*Property was acquired by MVP and is no longer an NSA*			
NSA 6	ML 5	Residence	2,755	ESE

NSA 5 from previous studies has since been acquired by MVP and the structure has been demolished, thus, that location has been removed from the assessment.

4.2 Measurement Equipment

Sound level equipment used during the noise survey included the following instruments:

- Brüel & Kjær Model 2270 SLM; Type 1; s/n 3000938
- Brüel & Kjær Model 4231 Calibrator; s/n 2586696

A windscreen was used on the measurement microphone. The sound level meter was field calibrated before and after measurement intervals, showing no significant change in sensitivity over the survey period. All instruments have current laboratory certification that can be provided upon request. Measurements were conducted five feet above the ground.

4.3 Weather Conditions

Weather conditions were appropriate for an outdoor sound level study. A summary of the weather conditions is shown in **Table 4-2**.

Table 4-2: Summary of Weather Conditions

Date	July 8, 2025
Temperature Range	71°F – 82°F
Relative Humidity Range	94 %
Wind Speed (Average)	6-12 mph
Wind From	SSW
Sky Condition	Partly Sunny
Ground Condition	Dry

Complete weather data from the measurement survey were obtained from a nearby station using WeatherUnderground [1] and are shown in **Appendix C**.

4.4 Measurement Methodology

Sound levels were measured using the slow meter response and A-weighting (dBA). Data were collected in 1/1 and 1/3-octave bands and recorded in 1-second sampling periods for a five-minute duration.

4.5 Sound Level Measurements Results

The sound study was performed on July 8, 2025, by Joy Rathod of SLR. Short-term, attended sound level measurements were conducted at five locations selected to quantify existing sound levels near the two closest NSAs. The survey began around 10:00 a.m. and ended around 11:30 p.m. During the survey, the existing turbines were operating at 93% load, which is considered full load under available pipeline conditions.

Observations at the measurement locations are summarized in **Table 4-3**.

Table 4-3: Summary of Measurement Locations

NSA	Measurement Location (ML)	Measurement Duration MM:SS	Source Observations During Measurements
1	ML 1	04:08	Audible sound sources included birds, and insects. The Stallworth CS was not audible during the sound level measurements.
2	ML 2	04:48	Audible sound sources included birds, an aircraft flyover, and a light breeze. The Stallworth CS was not audible during the sound level measurements.

[1] https://www.wunderground.com/dashboard/pws/KWVRAINE19/graph/2025-07-8/2025-07-8/daily

NSA	Measurement Location (ML)	Measurement Duration MM:SS	Source Observations During Measurements
3	ML 3	05:03	Audible sound sources included limited bird chirps. The Stallworth CS was not audible during the sound level measurements.
4	ML 4	04:12	Audible sound sources included birds, and an unknown mechanical buzzing to the east. The Stallworth CS was not audible during the sound level measurements.
6	ML 5	04:15	Audible sound sources included birds. The Stallworth CS faintly audible during the sound level measurements.

4.6 Results

The noise survey measurement results are summarized in **Table 4-4**. The measured sound levels for the daytime equivalent average (L_d) and the day-night average (L_{dn}) are shown. The L_{dn} values were calculated by adding 6.4 decibels (dB) to the short term L_{eq} during a daytime period that was free from extraneous noise sources, such as passing vehicles. The overall L_{eq} is inclusive of all environmental noise sources, such as birds, and insects.

Due to significant insect activity and bird chirps during the survey, measurement results were filtered to remove noise from these environmental sources. This was completed by correcting all sound energy at and above the 1,600 Hz one-third (1/3) octave band in accordance with ANSI/ASA S3/SC1.100-2014[2]. Sound from the Stallworth CS was practically inaudible at all measurement locations. Data are presented with and without the filtering applied.

[2] "Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas", ANSI/ASA S3/SC1.100-2014.

Table 4-4: Summary of Sound Level Measurements

Measurement Location	Nearest NSA [a]	Distance from CS to NSA	Direction from CS to NSA	Measurement Duration	Measured Sound Level, Unfiltered			Measured Sound Level, Filtered to Remove Noise from Birds, Insects, and Traffic		
					dBA			dBA [b]		
		Feet		MM:SS	L_d	L_n [d]	L_{dn} [c]	L_d	L_n [d]	L_{dn} [c]
ML 1	1	2,835	WNW	04:08	40.5	40.5	46.9	35.0	35.0	**41.4**
ML 2	2	1,985	W	04:48	43.1	43.1	49.5	39.6	39.6	**46.0**
ML 3	3	2,085	SW	05:03	38.6	38.6	45.0	38.6	38.6	**45.0**
ML 4	4	1,465	SSW	04:12	37.3	37.3	43.7	36.1	36.1	**42.5**
ML 5	6	2,755	ESE	04:15	37.6	37.6	44.0	34.5	34.5	**40.9**

a. NSA 5 from the previous studies has since then been acquired by MVP and demolished and is no longer considered an NSA.
b. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
c. L_{dn} was calculated by adding 6.4 dB to the short duration L_{eq} measured.
d. Nighttime sound levels were assumed to be equal to measured daytime sound levels since the measurements were collected during periods free from extraneous noise sources and the compressor station was practically inaudible during the measurements.

The filtered sound levels ranged from 40.9 to 46.0 dBA L_{dn} at the measurement locations.

5.0 Proposed Equipment Noise Impact Assessment

5.1 Significant Sound Sources

The following proposed Project sound sources are considered significant:

- Noise from the turbine exhaust, including the exhaust outlet and noise radiated from the exhaust ductwork, expansion joints, and silencer shell.
- Noise from the turbine air inlet system, including the inlet opening and noise radiated from the silencer/ductwork shell and any duct joints.
- Turbine/compressor casing noise that radiates to the exterior of the building and through building ventilation openings.
- Noise from the lube oil cooler / auxiliary cooler and gas aftercooler.
- Noise radiated by aboveground station gas piping.

5.2 Noise Model Development

The existing three-dimensional computer noise model was updated to analyze the noise contributions expected from the proposed expansion equipment. The model was developed using CadnaA, version 2025 MR1 (build: 211.5558), a commercial noise modeling package developed by DataKustik GmbH. The software considers spreading losses, ground and

atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613-2 standard was used for air absorption and other noise propagation calculations.

Ground absorption for the surrounding area was set to G = 0.8, representing a fairly absorptive ground. The station pad ground was modeled as reflective, with a G = 0.1 absorption coefficient.

To be conservative, foliage was not included in the model. The terrain was modeled based on USGS topographical data at a resolution of 10 by 10 meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations.

The noise model includes both the existing Stallworth CS equipment and the proposed expansion equipment. Sound levels for the existing equipment are derived from sound level measurements of the operating station equipment.

5.3 Data and Assumptions

The proposed MVP Boost equipment includes a new compressor building for the proposed units. All proposed equipment was arranged as per the latest site plans, and the additional turbine unit equipment is planned to be laid out in the same orientation as the existing units. A new Capstone microturbine is also proposed to be located near the existing microturbines.

According to manufacturer (Solar) data, the A-weighted sound power levels of the existing Titan 130 units and the proposed Titan 130e units are very similar and no significant changes in sound level are expected with the upgrade to the Titan 130e.

Table 5-1 shows the sound power levels used as input to the model for the existing equipment. Manufacturer data (as available) and/or sound power levels derived from measurements of the equipment were used in the computer noise model. The table also presents the measured sound pressure level inside of the compressor building. **Table 5-2** presents the same information for the proposed MVP Boost equipment.

Table 5-1: Sound Power (L_w) and Sound Pressure (L_p) levels for Existing Station Equipment

Source	Linear L_w or L_p at Octave Center Frequency, Hz									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Levels, L_w, dB										
Compressor Building Ridge Vent, L_w [1]	111	106	103	98	97	94	93	96	92	102
Solar Titan 130 Turbine Exhaust Duct Breakout, L_w [2]	96	98	95	95	89	87	96	95	84	100
Compressor Building Wall-Mounted Supply Fan, L_w [2]	97	97	101	97	96	96	93	88	81	100
Solar Titan 130 Turbine Air Intake Duct Breakout, L_w [2]	106	94	92	97	87	85	87	94	80	97
Solar Titan 130 Turbine Exhaust Outlet, Silenced, L_w [2]	116	118	104	95	95	86	79	65	55	97
Solar Titan 130 Turbine Air Intake, Silenced, L_w [2]	113	117	107	100	73	40	39	66	58	96
Solar Titan 130 Discharge Piping, Insulated, L_w [2]	104	100	100	100	96	80	83	66	46	96
Gas Cooler, per fan, L_w [2]	112	109	102	96	90	84	81	82	69	93
Solar Titan 130 Suction Piping, Insulated, L_w [2]	103	105	104	93	85	81	87	67	48	92
Solar Titan 130 Lube Oil Cooler, L_w [2]	94	101	99	92	87	84	80	76	71	90
Capstone C1000 Microturbine Enclosure Exhaust, L_w [2]	81	101	92	94	82	81	80	86	77	91
Capstone C1000 Microturbine Exhaust, L_w [2]	92	96	82	85	78	78	66	58	54	82
Capstone C1000 Microturbine Enclosure Intake, L_w [2]	81	78	83	78	73	74	75	72	71	81
Sound Pressure Levels, L_p, dB										
Compressor Building – Interior, L_p [2]	92	88	90	89	91	94	91	95	93	100

[1] From empirical calculations

[2] From SLR diagnostic measurements from MVP sites

Table 5-2: Sound Power (L_w) and Sound Pressure (L_p) levels for <u>Proposed</u> Station Equipment

Source	Linear L_w or L_p at Octave Center Frequency, Hz									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Levels, L_w, dB										
Solar Titan 130e Turbine Air Intake, Unsilenced, L_w [1]	115	115	115	120	125	130	137	149	144	151
Solar Titan 130e Turbine Exhaust Outlet, Unsilenced, L_w [1]	125	128	127	130	137	135	123	113	102	138
Solar Titan 130e Suction Piping, Uninsulated, L_w [2]	94	96	95	90	91	96	111	100	90	112
Solar Titan 130e Discharge Piping, Uninsulated, L_w [2]	95	91	91	97	102	95	107	99	88	110
Compressor Building Ridge Vent, L_w [2]	111	106	103	98	97	94	93	96	92	102
Solar Titan 130e Turbine Exhaust Duct Breakout, L_w [2]	96	98	95	95	89	87	96	95	84	100
Compressor Building Wall-Mounted Supply Fan, L_w [2]	97	97	101	97	96	96	93	88	81	100
Solar Titan 130e Turbine Air Intake Duct Breakout, L_w [2]	106	94	92	97	87	85	87	94	80	97
Gas Cooler, per fan, L_w [2]	112	109	102	96	90	84	81	82	69	93
Solar Titan 130e Lube Oil Cooler, L_w [2]	94	101	99	91	86	83	79	76	71	90
Capstone C1000 Microturbine Enclosure Exhaust, L_w [2]	81	101	92	94	82	81	80	86	77	91
Capstone C1000 Microturbine Exhaust, L_w [2]	92	96	82	85	78	78	66	58	54	82
Capstone C1000 Microturbine Enclosure Intake, L_w [2]	81	78	83	78	73	74	75	72	71	81
Sound Pressure Levels, L_p, dB										
Compressor Building – Interior, L_p [2]	94	90	90	90	87	88	85	99	94	101

[1] From manufacturer data

[2] From SLR diagnostic measurements from MVP sites

5.4 Noise Model Results

5.4.1 Proposed MVP Boost Equipment – Normal Operation

Table 5-3 shows a summary of the calculated sound level contribution from the proposed MVP Boost equipment at each NSA. The table also shows the overall sound levels at each NSA, including the proposed MVP Boost expansion equipment contribution and the operational sound level of the existing equipment.

The table indicates that, with the proposed noise control treatments discussed in **Section 6.0**, the compressor station noise contributions at all of the nearest NSAs will be below the FERC

sound level limit of 55 dBA L_{dn}. The FERC sound level limits apply only to the sound level contribution of the compressor station equipment, and do not include the influence of the existing ambient sound levels.

The highest Project equipment sound level contribution is 40.8 dBA L_{dn} at NSA 3. When combined with the sound levels from the existing equipment, the overall Stallworth CS sound levels range from 41.3 to 44.5 dBA L_{dn}, which are well below the FERC noise limit of 55 dBA L_{dn}. The predicted increases above the existing sound levels range from 0.9 to 1.9 dBA, which would be considered imperceptible to most people.

Table 5-3: Compressor Station Sound Level Predictions

A	B	C	D	E	F	G	H	I	J
						(E + F)	(D – E)	(G + H)	(I – D)
NSA [a]	Distance from Compressor Building to NSA	Direction from CS to NSA	Measured Existing Sound Level [b,c]	Predicted Station Contribution from Existing Equipment	Predicted Proposed Equipment Only [d]	Combined Total Station Contribution (Existing+ Proposed)	Calculated Ambient Sound Level	Total Complete Station Contribution + Calculated Ambient Sound Level	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
1	2,835	WNW	41.4	40.0	37.9	**42.1**	35.8	43.0	1.6
2	1,985	W	46.0	41.4	39.4	**43.5**	44.2	46.9	0.9
3	2,085	SW	45.0	42.0	40.8	**44.5**	42.0	46.4	1.4
4	1,465	SSW	42.5	36.6	39.5	**41.3**	41.2	44.3	1.8
5	*Property was acquired by MVP and is no longer an NSA*								
6	2,755	ESE	40.9	38.9	38.4	**41.7**	36.6	42.8	1.9

a. NSA 5 from the previous studies has since then been acquired by MVP and demolished and is no longer considered an NSA.
b. Based on daytime measurements conducted in July 2025 with the station in operation. Post-processed to remove noise from birds, insects, and passing vehicles; the existing compressor station equipment is practically inaudible at the NSAs, so these levels are controlled by traffic, leaf rustle, and other environmental noises.
c. L_{dn} was calculated by adding 6.4 dB to the short duration daytime measurement.
d. Assumes all proposed future equipment in operation at full load.

5.5 Property Line Assessment for Fayette County

Fayette County limits sound from the compressor station to 55 dBA during nighttime hours (6:00 p.m. to 7:00 a.m.) at the receiving residential property line. Compressor stations are a constant noise source, and operate during both day and night hours, so the 55 dBA nighttime limit would apply to sound from the Stallworth CS. As shown on **Figure B-3**, the red line indicating the 55 dBA L_n contour clearly stays within the property boundary of the Stallworth CS, indicating that after the installation of the proposed MVP Boost equipment, the Stallworth CS would continue to operate in compliance with the Fayette County noise limit during all hours of the day and night.

5.6 Unit Venting

Under certain circumstances, the pressure in the compressor casing and unit piping must be released in a controlled manner. These events are called “Unit Venting” and occur when the unit is shut down for an extended period. During unit venting, high-pressure gas in the system is released in a controlled fashion through a silencer. Unit venting causes a temporary increase in sound level that usually lasts for approximately five minutes.

A compressor unit venting scenario was modeled using a single silencer specified to limit the venting sound levels to a maximum of **85 dBA at 50 feet**. During this event, predicted sound levels range from 39.6 to 51.0 dBA L_{eq} at the NSAs.

5.7 Emergency Shutdown (ESD)

The station has an emergency shutdown (ESD) system that automatically halts operation of the station in the event of an irregularity. This results in full station venting during which the gas from all station piping is released in a controlled manner. These events are extremely rare and take place only in the event of an emergency. The station ESD system was modeled with a maximum sound level of **90 dBA at 50 feet.**

The predicted short-term sound levels at NSAs due to an ESD event range from 45.6 to 58.9 dBA L_{eq} at the NSAs, which is near the predicted full load operational sound level of the existing station. This is a reasonable sound level for an event that will only occur in emergency situations. The ESD blowdown duration is typically less than ten minutes.

5.8 MVP Boost Equipment Construction

Only standard equipment will be used during construction, with no dynamic compaction or pile driving expected. Most construction will take place during daytime working hours of 7:00 a.m. to 7:00 p.m. Construction sound calculations were performed with the CadnaA propagation model, which accounts for local topography. Equipment usage factors were used per the Federal Highway Administration's Roadway Construction Noise Model version 1.1 (FWHA, 2006). Usage factor is the percentage of time a given piece of equipment typically operates during a given hour. **Table 5-4** presents the equipment that was included in the construction evaluation for the MVP Boost expansion equipment.

Table 5-4: Proposed Construction Equipment Sound Levels

Equipment	Quantity	Usage Factor	Quantity and Usage Factor Adjusted Sound Pressure Level at 50-Feet, dBA
Air Compressor	4	0.4	80
Bobcat	3	0.4	80
Compactor	4	0.2	82
Compactor, Vibratory	2	0.2	76
Concrete Mixer Truck (main pours)	10	0.4	85
Concrete Mixer Truck (small pours)	4	0.4	81
20-Ton Wheeled Crane	2	0.16	77
250-Ton Wheeled Crane	2	0.16	76
Hydrotest Truck	1	0.4	81
Dump Truck	4	0.4	78
Excavator	4	0.4	83
Forklift	2	0.2	71
Generators	3	0.5	83
Light Tower	4	0.25	62
Man Lift	8	0.2	77
Scissor Lift	2	0.2	71
Tandem Truck	4	0.4	78
Water / Fuel Truck	4	0.4	76
Welding Machine	10	0.4	80
Welding Rig	10	0.4	80
X-Ray Truck / Machine	2	0.4	75
Total Sound Power Level, L_w, dBA			**127.5**

The construction equipment in the **Table 5-4** represents all of the proposed equipment operating simultaneously, which is a very conservative approach. In reality, equipment will be used in phases, and construction sound levels will be significantly lower than the modeled results during each construction phase.

Calculated construction sound levels at the NSAs range from 44.4 to 53.2 dBA L_{eq}. If major construction activity is limited to daytime hours, then there is no specific sound level limit for construction activities. Nighttime construction work is not planned, but if the need arises, a nighttime noise management plan will be created.

6.0 Noise Control Treatments

A summary of the modeled performance of one possible set of noise control treatments is shown in **Table 6-1**. The following subsections describe the treatments. The noise mitigation shown applies to future expansion equipment only.

The noise mitigation measures shown are based on the most current station design and represent one potential set of possible mitigation. There are many different combinations of noise control measures that will provide similar noise control. As the station design is finalized, the mitigation design may be modified to account for these design changes while maintaining compliance with the FERC noise requirements.

All mitigations to the proposed Solar Titan 130e turbine-driven compressor inlet and exhaust and compressor building were assumed to have the same performance as the existing units.

Table 6-1: Required Noise Control Treatments

Source	Treatment Description	Required Treatment Performance								
		31.5	63	125	250	500	1k	2k	4k	8k
T130e Turbine Intake	Total Silencing (Intake Silencer and Filters), DIL	1	3	18	27	54	89	93	96	96
T130e Compressor Building Extension	STC-39 Wall and Roof System, TL	10	16	17	24	44	49	55	55	58
Personnel Door	STC-32 Personnel Door, TL	9	17	23	27	32	32	31	41	41
Equipment Door	STC-21 Insulated Roll-up Door, TL	2	7	12	17	18	19	22	30	35
Building Ventilation	3ft Silencers and Lined Hoods, DIL	1	5	10	18	22	26	30	35	25
T130e Turbine Exhaust	Custom Exhaust Silencer, DIL	6	14	29	39	46	49	46	45	32
T130e Suction and Discharge Gas Piping	Type ISO B2 Lagging, IL	-	-	-	-	6	15	24	33	42

6.1 Compressor Building Walls and Roof

The extension to the compressor building to enclosure the proposed additional unit should consist of the same materials used for the existing building, but should have a sound transmission class (STC) rating and transmission loss (TL) performance shown in **Table 6-1**. The compressor building extension should have no windows, skylights, or translucent panels.

The interior surface of the compressor building walls and roof should be acoustically absorptive, having a noise reduction coefficient (NRC) of at least NRC 0.8. The inside of the building can be lined with perforated metal of at least 23 percent open area for insulation protection, if so

desired. The building should be well sealed with no cracks or gaps. All piping penetrations through the building walls should be well-insulated, flashed, and caulked.

6.2 Compressor Building Doors

The expanded compressor building is assumed to have one additional 14-foot by 14-foot equipment door. A standard insulated overhead door will be sufficient. The performance shown in **Table 6-1** is the required transmission loss performance for the equipment door.

The personnel doors should achieve the sound transmission loss and STC rating shown in **Table 6-1**. These are industrial metal doors with good perimeter seals. Small glass windows in the personnel doors are acceptable as long as the overall STC rating is achieved.

6.3 Compressor Building Ventilation

The ventilation for the proposed expansion to the compressor building was assumed to consist of the same noise mitigation as the existing building. The intake vents on the walls should have the overall performance shown in **Table 6-1**. This may consist of a 3-foot silencer with lined hood, or similar.

Similarly, the ridge vent should continue across the roof of the proposed expansion and shall have the same performance as the currently installed exhaust ventilation system for the compressor building.

6.4 Turbine Exhausts

For the operation of dual-shaft SoLoNox turbines, Solar notes that sound levels during partial-load operation can be higher than sound levels during full-load operation. In an analysis of manufacturer data for these turbines, increases of up to 7 dB at 1 kHz have been noted by Solar for Titan 130e exhausts and increases of up to 13 dB at 2 kHz for Titan 130e inlets. Silencer specification and bidding should be developed with such potential variability in mind in order to satisfy the noise targets for all steady-state operational conditions.

6.4.1 Silencer Performance

The proposed additional turbine will include an exhaust silencer system achieving the dynamic insertion loss (DIL, in decibels) shown in **Table 6-1**. Due to the complexities involved with the field verification of silencer insertion loss, the vendor should bid to match the existing silencers for Units 1 and 2.

6.4.2 Exhaust Duct and Shell Noise

In large turbine-powered installations it is common for a significant amount of sound energy to radiate from the exhaust system ductwork, expansion joints, and exhaust silencer shell. This sound energy is often termed “shell-radiated” noise. Shell-radiated noise is not necessarily calculated by exhaust system manufacturers, but it can be a dominant noise source for NSAs close to the station. The exhaust breakout was modeled based on measurements taken at the existing Stallworth CS, and the modeled breakout noise sound power levels are shown in **Table 5-2.**

6.5 Turbine Air Intake

The proposed additional unit was assumed to consist of the same turbine intake system as the existing Stallworth CS equipment. The total performance of the intake silencing system, including silencer and pulse updraft filter is provided in **Table 6-1**.

6.6 Turbine Lube Oil Cooler

The sound power level of the turbine lube oil cooler should not exceed the sound power levels provided in **Table 5-2**. This is the total sound power level for the entire cooler (i.e. not just a single fan). The sound power level in **Table 5-2** is representative of the 90 dBA sound power level cooler offered by Solar.

6.7 Gas Aftercooler

The proposed additional unit should have a gas aftercooler with a fan sound power level (per fan) rating as provided in **Table 5-2**. This was assumed to be equal to the existing gas aftercooler fans at the Stallworth CS.

6.8 Station Above-Ground Gas Piping

The proposed additional unit should have suction and discharge piping insulated to match the extent of the existing station piping. The performance of the insulation should achieve the insertion loss (IL) provided in **Table 6-1**.

All above-ground suction piping on the cooler-side of the building should be insulated, as well any above-ground discharge piping between the compressor building and gas aftercooler flanges.

6.8.1 Piping Isolation

To limit radiation from structural supports, the compressor piping should be isolated from the pipe supports and other structural contacts using at least one-quarter inch (1/4) neoprene bearing pads. The stiffness of the neoprene should be chosen so that the static deflection of the pads under the piping loads is about one-sixteenth inch (1/16). Secondary steel elements such as cable trays, pipe racks, walkways, and conduit supports should not be connected to the pipe supports and/or piping.

7.0 Conclusions

SLR has completed a post-construction noise survey near the Mountain Valley Pipeline, LLC Stallworth Compressor Station, located near Spring Dale in Fayette County, West Virginia. Measurements were conducted near the closest NSAs. After filtering out insect, bird, and traffic sounds, the measured sound levels ranged from 40.9 to 46.0 dBA L_{dn}.

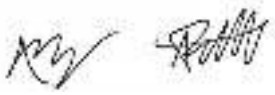
Modeling results from the proposed MVP Boost equipment (addition of two (2) Solar Titan-130e turbine-driven compressor package and associated equipment and upgrades to two existing units) indicate that the contribution from the new equipment will range from 37.9 to 40.8 dBA L_{dn} at the NSAs. With the proposed expansion equipment in operation, overall sound levels from the Stallworth CS are expected to range from 41.3 to 44.5 dBA L_{dn} yielding a potential increase in existing sound level of 0.9 to 1.9 dBA. These results indicate that the sound levels due to the existing Stallworth CS and proposed expansion equipment will be lower than 55 dBA L_{dn} at all nearby NSAs and that the station will continue to operate in full compliance with FERC noise requirements.

8.0 Closure

This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.

Sincerely,

SLR International Corporation



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Appendix A Glossary of Common Acoustical Terminology

MVP Stallworth Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 1, 2025

A-weighting: a weighting scale in which sound pressure levels in individual frequency bands are adjusted to match the response for the human ear. The reference adjustment is 0 dB at 1,000 Hz. The human ear is much less responsive at low frequencies. An A-weighted sound level is the total contribution from all sound frequencies, with the appropriate weighting factors applied and is designated as dBA.

C-weighting: a weighting scale that is relatively flat from 31.5 Hz to 8,000 Hz with a roll-off higher and lower than those frequencies. The adjustment is 0 dB from 200 Hz to 1,250 Hz. A C-weighted sound level is the total contribution from all sound frequencies, with the appropriate weighting factors applied and is designated as dBC.

Hertz (Hz): the unit of measure of frequency or the speed of vibration of a sound wave. Also referred to as “cycles per second”.

Insertion Loss (IL): the decrease (in decibels, dB) in sound power level measured at the location of the receiver when a sound attenuator (e.g., muffler), barrier, or other sound reduction element is inserted in the transmission path between the source and receiver.

L_d: the daytime average sound level. The L_{eq} averaged over daytime hours. Daytime hours may be defined differently by various ordinances and regulations. The hours between 7:00 am and 10:00 pm is the interval used by the U.S. Federal Energy Regulatory Commission (FERC) and the U.S. Department of Housing and Urban Development (HUD).

L_{dn} (also DNL): the day-night average sound level, a metric used by many regulatory bodies (including FERC and HUD) as an overall representation of the sound at a measurement location. The L_{dn} is calculated by averaging the sound measured over a 24-hour period, with 10 decibels added to sound levels measured during nighttime hours.

L_{eq}: the equivalent-continuous sound level is a time-average sound level for a specified time period. It is the most commonly used form of sound level averaging. Specifically, the Leq is the level of a steady sound that has the same sound energy as a time-varying sound during a stated time period and at a stated location.

L_n: the nighttime average sound level. The L_{eq} averaged over nighttime hours. Nighttime hours may be defined differently by various ordinances and regulations. The hours between 10:00 pm and 7:00 am is the interval used by the U.S. Federal Energy Regulatory Commission (FERC) and the U.S. Department of Housing and Urban Development (HUD).

L_{90}: a statistical parameter (percentile) that describes the sound level that is exceeded 90 percent of the time during a stated time period. For example, for a stated hourly L_{90} of 45 dBA, the sound level at the measurement location has a 90% chance of being greater than 45 dBA and a 10% chance of being less than or equal to 45 dBA. The L_{90} is often used as the “background” or “ambient” sound level for a given measurement period. Other percentile values are defined similarly (e.g., L_{50}, L_{10}, etc.).

Sound Power Level (PWL or L_w): a logarithmic parameter that describes the power characteristics of a noise source, relative to a reference power value, expressed in decibels, dB or dBA. The sound power level should not be confused with the sound pressure level. The sound power level is a characteristic of a noise source analogous to the wattage rating of a light bulb, and it is independent of the surroundings. It is calculated from measurements of the sound pressure level. A 75-watt light bulb will look much brighter in a white, reflective room than in a black, absorptive one. A noise source rated with a sound power level if 95 dBA will produce a much higher sound pressure level (will be much louder) in a small hard box than outside in a soft grass meadow.

Sound Pressure Level (SPL or L_p): a logarithmic parameter that describes the quantity of sound relative to a reference pressure value, expressed in decibels, dB or dBA. The SPL is the quantity that is measured with a sound level meter, and it is dependent upon the surroundings of a noise source.

Sound Transmission Class (STC): a single number rating for describing sound transmission loss of a wall or partition. A rating system designed to facilitate comparison of the sound transmission characteristics of various architectural materials and constructions.

Transmission Loss (TL): the difference (in decibels) between sound power incident upon a sound reduction element (wall or muffler) to that transmitted. The less sound energy is transmitted, the higher the TL value.

Appendix B Figures

MVP Stallworth Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 1, 2025

Figure B-1: Aerial Image Showing Measurement Locations and Noise Sensitive Areas

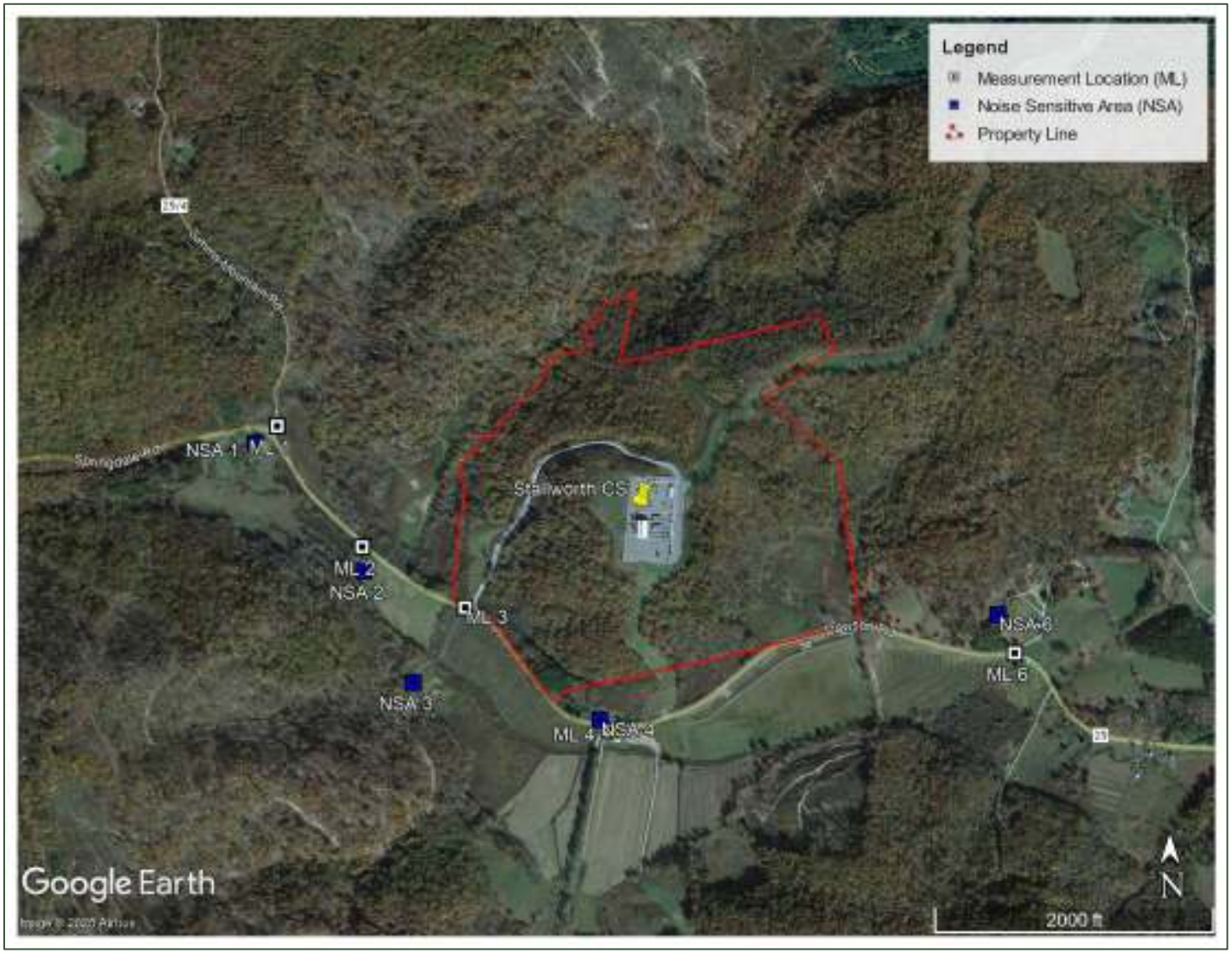


Figure B-2: Noise Contour – Existing + MVP Boost – Normal Operation – FERC Assessment – dBA L_{dn}

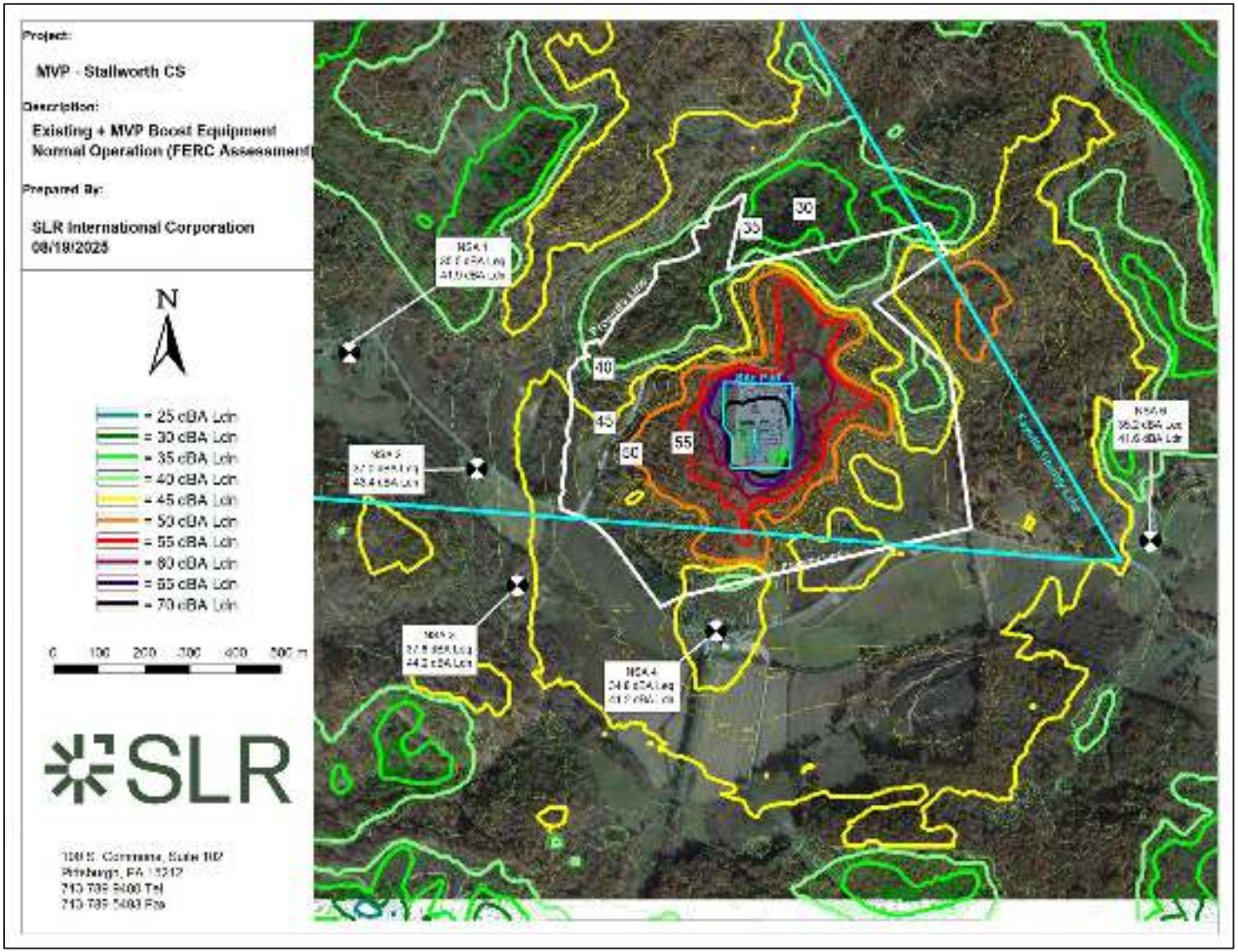
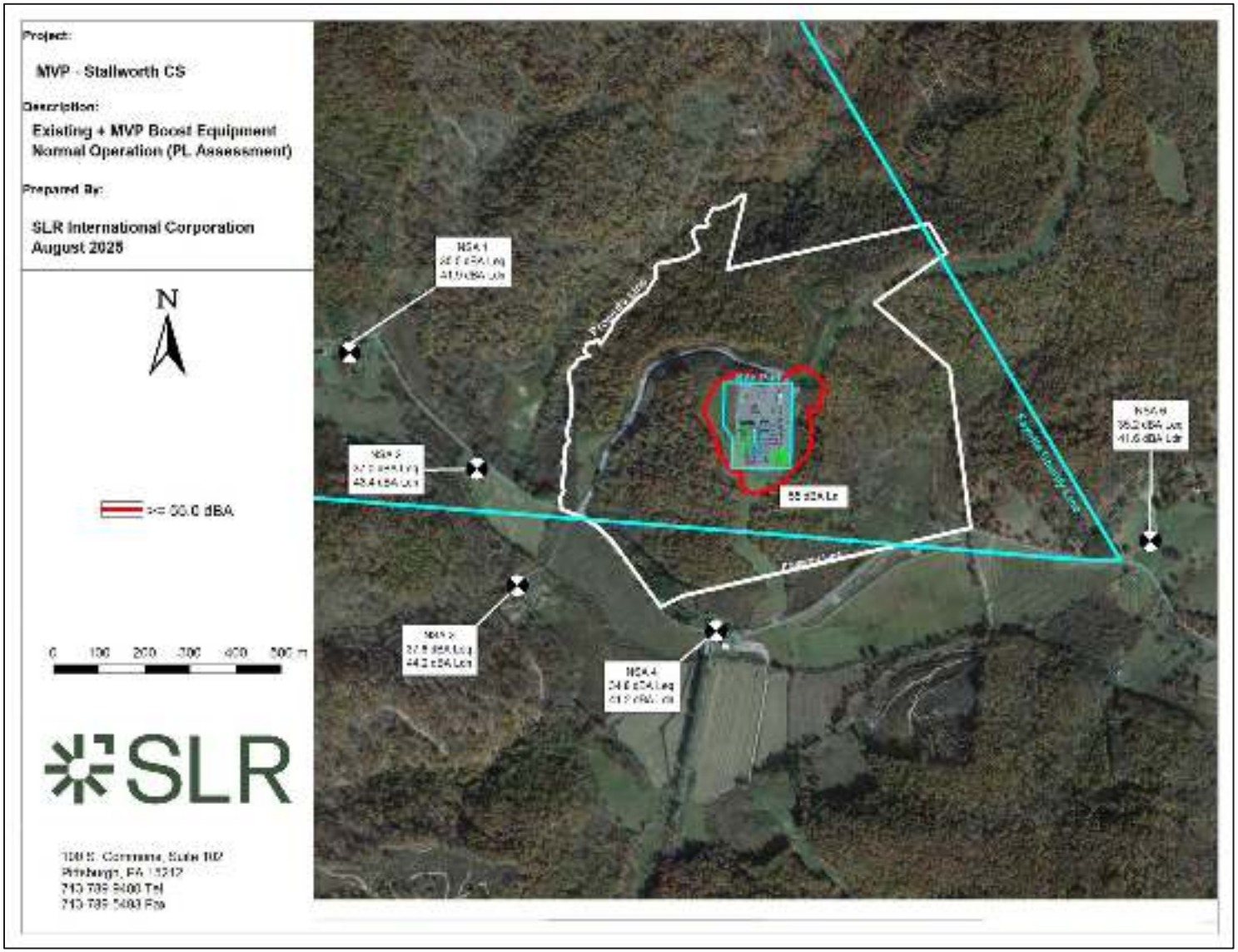


Figure B-3: Noise Contour – Existing + MVP Boost – Normal Operation – PL Assessment – dBA, L_n



Appendix C Weather Data

MVP Stallworth Compressor Station

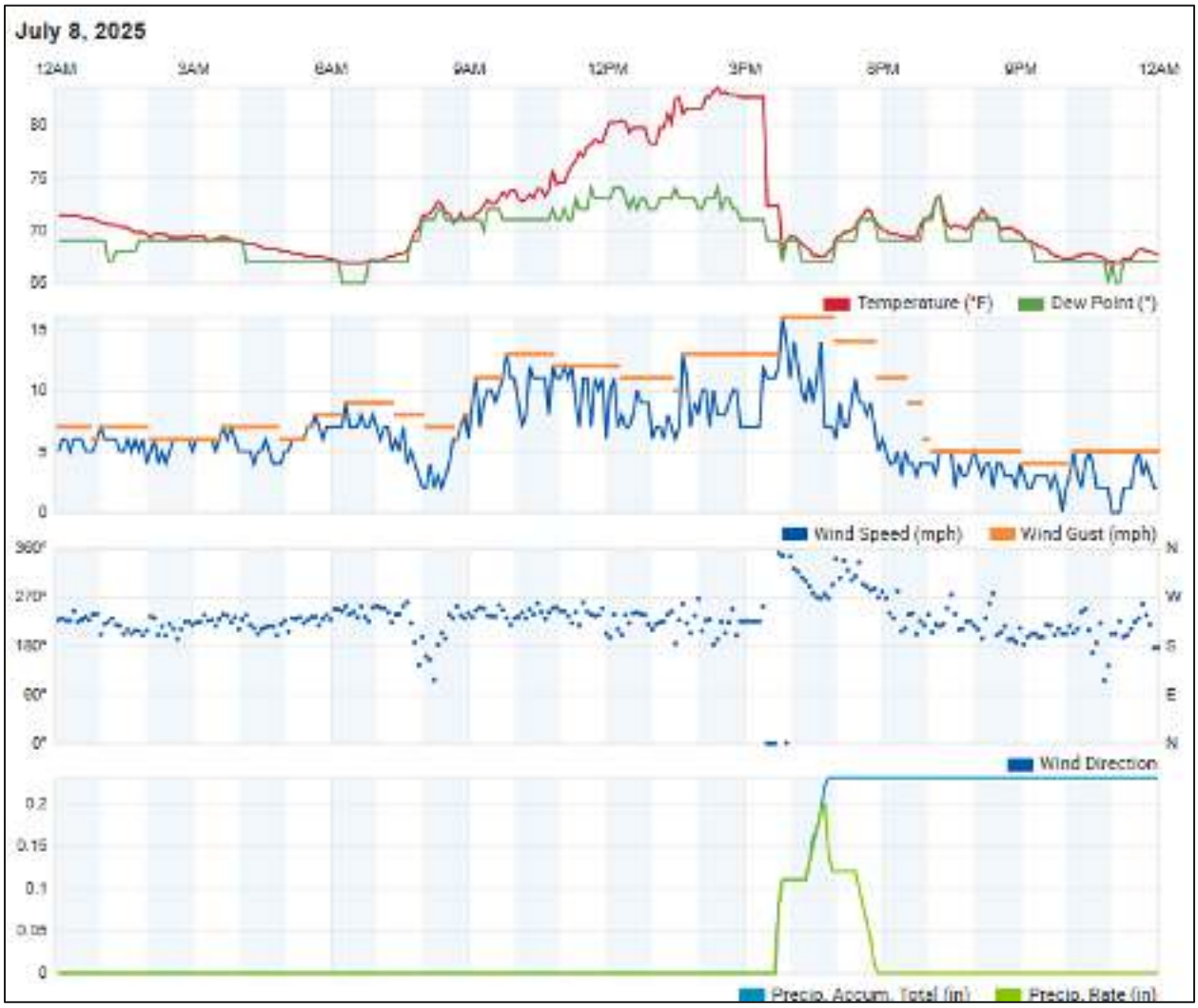
Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 1, 2025

Figure C-1: Weather Data – July 8, 2025



Making Sustainability Happen

Mountain Valley Pipeline Boost Project

Docket No. CP26-__-000

Resource Report 9

Appendix 9-J
Swann Compressor Station Pre-Construction Noise Study Report

MVP Swann Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

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SLR Project No.: 135.000097.00001

October 14, 2025

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0	Issued for Information	October 1, 2025	JTR	SMG	DMJ
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Executive Summary

As part of the Mountain Valley Pipeline Boost Project (MVP Boost), SLR International Corporation (SLR) has prepared a pre-construction noise study at the request of Mountain Valley Pipeline, LLC, (MVP) for the Swann Compressor Station (Swann CS), a greenfield compressor station proposed for a site near Elliston, Montgomery County, Virginia. This report presents the results from SLR's sound level survey of the existing ambient sound levels along with predicted sound levels from the proposed Swann CS equipment. The Project proposes to install two (2) Solar Titan 350 and one (1) Solar Titan 250 turbine-driven compressor package and associated equipment at the site.

An ambient sound survey for the proposed site was conducted by SLR on January 23-24, 2025. Sound levels were measured at the proposed station site to quantify sound levels at the five nearest Noise Sensitive Areas (NSAs). The measured sound levels were controlled by noise sources such as traffic, trains, insects, and birds. Measured sound levels near the NSAs were 49.1 dBA L_{dn}. **Table A** summarizes the results from the measurement survey. Greater details about the sound survey are presented within the report.

A computer noise model was created to estimate sound level contribution due to the proposed MVP Boost equipment. Predicted total station contribution sound levels are presented in **Table A**, along with the potential increase over existing sound level.

Table A: Compressor Station Sound Level Predictions

A	B	C	D	E	F	G
					(D + E)	(F – D)
NSA	Distance from Compressor Station to NSA	Direction from CS to NSA	Measured Existing Sound Level	Predicted Station Contribution from Proposed Equipment (FERC 55 dBA L_{dn} Limit)	Total Combined Future station + Calculated Ambient Sound Level	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
1	1,445	WNW	49.1	**48.1**	51.6	2.5
2	1,890	NNE		**49.4**	52.3	3.2
3	2,810	ENE		**43.6**	50.2	1.1
4	2,450	ESE	43.9	**33.9**	44.3	0.4
5	1,530	WSW	49.1	**49.0**	52.1	3.0

Table A shows that A-weighted sound levels from the proposed MVP Boost equipment at Swann CS are expected to be lower than the Federal Energy Regulatory Commission (FERC) noise limit of 55 dBA L_{dn}, with a potential increase over existing sound levels ranging between 0.4 and 3.2 dBA. This is a small, predicted increase and would be considered barely noticeable by most people.

Table of Contents

Limitations ..... **ii**
Executive Summary ..... **iii**
Acronyms and Abbreviations ..... **vi**
1.0 Introduction **1**
2.0 Sound Level Criteria **1**
3.0 Description of Site and Facility **1**
3.1 Description of Site 1
3.2 Description of Station Equipment 1
4.0 Pre-Construction Sound Level Survey **2**
4.1 Closest Noise Sensitive Areas 2
4.2 Measurement Equipment 2
4.3 Weather Conditions 2
4.4 Measurement Methodology 3
4.5 Measurement Results 3
5.0 Proposed Equipment Noise Impact Assessment **5**
5.1 Significant Sound Sources 5
5.2 Noise Model Development 5
5.3 Data and Assumptions 5
5.4 Noise Model Results 8
5.4.1 Proposed MVP Boost Equipment – Normal Operation 8
5.5 Property Line Assessment for Montgomery County 8
5.6 Unit Venting 9
5.7 Emergency Shutdown (ESD) 9
5.8 MVP Boost Equipment Construction 9
6.0 Noise Control Treatments **11**
6.1 Compressor Enclosure 12
6.2 Compressor Enclosure Ventilation 12
6.3 Turbine Exhausts 12
6.3.1 Silencer Performance 12
6.3.2 Exhaust Duct and Shell Noise 13
6.4 Turbine Air Intake 13
6.5 Turbine Lube Oil Cooler 13

6.6 Gas Aftercooler 13
6.7 Station Above-Ground Gas Piping 13
6.7.1 Piping Isolation 13
7.0 Conclusions 14

Tables

Table 4-1: Summary of Noise Sensitive Areas (NSAs) 2
Table 4-2: Summary of Weather Conditions 3
Table 4-3: Summary of Ambient Sound Level Measurements 4
Table 5-1: Sound Power (L_w) and Sound Pressure (L_p) levels for Proposed Titan 350 Compressor Package 6
Table 5-2: Sound Power (L_w) and Sound Pressure (L_p) levels for Proposed Titan 250 Compressor Package and Capstone Microturbines 7
Table 5-3: Compressor Station Sound Level Predictions 8
Table 5-4: Proposed Construction Equipment Sound Levels 10
Table 6-1: Solar Titan 250 Compressor Package Required Noise Control Treatments 11
Table 6-2: Solar Titan 350 Compressor Package Required Noise Control Treatments 12

Figures

Figure B-1: Aerial Image Showing Measurement Location and Noise Sensitive Areas B-1
Figure B-2: Noise Contour – Proposed MVP Swann CS – Normal Operation – 24-Hour Day-Night Level, dBA L_{dn} B-2
Figure B-3: Noise Contour – Proposed MVP Swann CS – Normal Operation – PL Assessment – Nighttime Level, dBA, L_n B-3
Figure C-1: Weather Data – January 23, 2025 ..... C-1
Figure C-2: Weather Data – January 24, 2025 ..... C-2

Appendices

Appendix A Glossary of Common Acoustical Terminology
Appendix B Figures
Appendix C Weather Data

Acronyms and Abbreviations

°F	Degrees Fahrenheit
ANSI	American National Standards Institute
CS	Compressor Station
dB	Decibel
dBA	A-Weighted Decibel
DIL	Dynamic Insertion Loss
FERC	Federal Energy Regulatory Commission
FWHA	Federal Highway Administration
G	Ground Absorption Coefficient
HP	Horsepower
Hz	Hertz
IL	Insertion Loss
ISO	International Organization for Standardization
kHz	Kilohertz
L_d	Daytime Average Sound Level
L_{dn}	Day-Night Sound Level
L_{eq}	Equivalent Continuous Sound Level
L_p	Sound Pressure Level
L_w	Sound Power Level
ML	Measurement Location
mph	Miles per hour
MVP	Mountain Valley Pipeline
NRC	Noise Reduction Coefficient
NSA	Noise Sensitive Area
RCNM	Roadway Construction Noise Model
s/n	Serial Number
SLM	Sound Level Meter
SLR	SLR International Corporation
STC	Sound Transmission Class
TL	Transmission Loss
USGS	United States Geological Survey

1.0 Introduction

As part of the Mountain Valley Pipeline Boost Project (MVP Boost), SLR International Corporation (SLR) has prepared a pre-construction noise study at the request of Mountain Valley Pipeline, LLC, (MVP) for the Swann Compressor Station (Swann CS), a greenfield compressor station proposed for a site near Elliston, Montgomery County, Virginia. This report presents the results from SLR's sound level survey of the existing ambient sound levels along with predicted sound levels from the proposed Swann CS equipment. The Project proposes to install two (2) Solar Titan 350 and one (1) Solar Titan 250 turbine-driven compressor package and associated equipment to the site.

2.0 Sound Level Criteria

The environmental sound level contributions from the Swann CS are subject to the Federal Energy Regulatory Commission (FERC) noise regulation, which governs interstate gas transmission compressor stations. The FERC noise regulation is receptor based, and limits compressor station noise contributions to no more than 55 dBA day-night average (L_{dn}) or, equivalently, no more than a continuous 48.6 dBA equivalent average (L_{eq}) at the surrounding noise-sensitive areas (NSAs). NSAs are typically residences, schools, churches, or hospitals.

The Montgomery County Code (Section 7-80) includes a noise limit that applies at the receiving residential and agricultural property lines. The Code limits noise at the receiving property lines to 57 dBA between 7:00 a.m. and 10:00 p.m., and 52 dBA between 10:00 p.m. and 7:00 a.m.

A glossary of common acoustical terminology and metrics is included in **Appendix A**.

There are no other known state, county, or local regulations that would apply to this compressor station site.

3.0 Description of Site and Facility

3.1 Description of Site

The Swann CS site is located off of US Route 460 in Elliston, Virginia. The area surrounding the station is mixed use, consisting of agricultural and residential properties east and west of the station, commercial properties to the north, and forest to the south.

3.2 Description of Station Equipment

The proposed Swann CS location is a greenfield site with no existing equipment. The proposed equipment consists of two (2) Solar Titan 350 and (1) Solar titan 250 turbine-driven compressor units each installed within an enclosure. The two Titan 350 turbines are rated at 52,500 HP, each. The Titan 250 turbine is rated at 31,900 HP. Each turbine drives one compressor. All turbine horsepower ratings are at standard ISO conditions (59 degrees Fahrenheit, sea level, and 60% relative humidity). Associated equipment (located outdoors) is as follows:

- Gas aftercoolers
- Turbine lube oil coolers
- Turbine inlet and exhaust openings

- Station suction and discharge piping and suction separators
- Fuel gas skid
- Capstone microturbine generators
- Control valves

4.0 Pre-Construction Sound Level Survey

4.1 Closest Noise Sensitive Areas

Five NSAs were identified by SLR using aerial imagery and field observations. They consist of the closest residences, a fire station, and a church. The NSAs are summarized in **Table 4-1**. The distance and direction from the site to the NSAs are shown. Distances reference the approximate center of the site location. The NSAs and measurement locations are shown in **Figure B-1**.

Table 4-1: Summary of Noise Sensitive Areas (NSAs)

Noise Sensitive Area	Measurement Location (ML)	Description	Approximate Distance from Station to NSA	Direction to NSA
			Feet	
NSA 1	ML 1	Fire Station	1,445	WNW
NSA 2		Church	1,890	NNE
NSA 3		Residence	2,810	ENE
NSA 4		Residence	2,450	ESE
NSA 5		Residence	1,530	WSW

4.2 Measurement Equipment

Sound level equipment used during the noise survey included the following instruments:

- Larson Davis Model 831C SLM; Type 1; s/n 0001737
- Larson Davis Model Cal200 Calibrator; s/n 5731

A windscreen was used on the measurement microphones. The sound level meters were field calibrated before and after measurement intervals, showing no significant change in sensitivity over the survey period. All instruments have current laboratory certification that can be provided upon request. Measurements were conducted five feet above the ground.

4.3 Weather Conditions

Weather conditions were appropriate for an outdoor sound level study. A summary of the weather conditions is shown in **Table 4-2**.

Table 4-2: Summary of Weather Conditions

Date	January 23 - 24, 2025
Temperature Range	8°F – 40°F
Relative Humidity Range	40 - 85 %
Wind Speed (Average)	0.4 - 13 mph
Wind From	SW
Sky Condition	Partly Cloudy
Ground Condition	Dry

Complete weather data from the measurement survey were obtained from a nearby station using WeatherUnderground [1],[2] and are shown in **Appendix C**.

4.4 Measurement Methodology

The sound study was performed by Rhianna Spong of SLR. An overnight sound level measurement was conducted at one location selected to quantify existing sound levels near the NSAs. The survey began around 4:30 p.m. on January 23, 2025 and ended around 3:20 p.m the following day.

The selected measurement location is appropriate as an estimate of the existing ambient sound levels at the NSAs. The dominant environmental noise source in the area is from traffic along Highway 460, and the measurement location is a similar distance to or slightly farther from Highway 460 than NSAs 1, 2, 3, and 5. NSA 4 is farther from Highway 460 than the measurement location, and a distance adjustment has been used to estimate the ambient sound levels at NSA 4.

Sound levels were measured using the slow meter response and A-weighting (dBA). Data were collected in 1/1 and 1/3-octave bands and recorded in 1-second sampling periods for a five-minute duration.

4.5 Measurement Results

The measured sound levels for daytime (L_d), nighttime (L_n), and the equivalent day-night sound level (L_{dn}) are shown. The FERC noise regulation is based on a descriptor called the day-night average sound level, or L_{dn}. The L_{dn} is expressed as an A-weighted sound level (dBA) and is used to represent the overall daily sound exposure at a location. The formula used to calculate the L_{dn} is shown below.

$$L_{dn} = 10 \log_{10}\left[\frac{15 \times 10^{Leq(day)/10} + 9 \times 10^{(Leq(night)+10)/10}}{24}\right]$$

[1] https://www.wunderground.com/ history/daily/us/va/blacksburg/KROA/date/2025-1-23

[2] https://www.wunderground.com/ history/daily/us/va/blacksburg/KROA/date/2025-1-24

The L_{dn} can be viewed as the daily sound exposure, where the L_{eq} term shown in the formula above is the "energy equivalent-continuous sound level." L_{eq} is the time-averaged sound level for a specified period. It is the most commonly used form of sound level averaging. The L_{dn} calculation divides the 24-hour day into $L_{eq(Day)}$ (the 15 hours from 7 a.m. to 10 p.m.) and $L_{eq(Night)}$ (the 9 hours from 10 p.m. to 7 a.m.). A nighttime penalty of 10 dBA is added to the $L_{eq(Night)}$, to account for greater human sensitivity to sounds occurring at night.

As the sound level monitoring location was at the proposed Swann CS site and NSA 4 is further from the road than the monitoring location, a distance adjustment was applied to the measurement at NSA 1 to estimate the traffic sound levels at the façade of the dwelling, rather than at the measurement location. The distance adjustment was calculated using the following line source spreading formula:

$$L_{eq} = 10 * \log_{10}\left(\frac{D_1}{D_2}\right)$$

Where D1 is the distance from the road centerline to the residence (2,938 feet) and D2 is the distance from the road centerline to the measurement location (888 feet). This is a line source propagation estimate, as roadways are linear sources and sound from roads is expected to experience a three-decibel reduction per doubling of distance. The calculated adjustment value is 5.2 decibels and was subtracted from the measured ambient data to estimate the sound levels at the residences.

The as-measured sounds level measurement results and observations at the measurement location is summarized in **Table 4-3**.

The measured sound levels for the daytime equivalent average (L_d) and the day-night average (L_{dn}) are shown. The overall L_{eq} is inclusive of all environmental noise sources, such as birds, and insects.

Table 4-3: Summary of Ambient Sound Level Measurements

NSAs	Measurement Location (ML)	Measurement Duration HH:MM	Source Observations During Measurements	Measured Sound Level, dBA		
				L_d	L_n	L_{dn}
1,2, 3, 5	ML 1	22:47	Audible sound sources included birds, insects, a light breeze, trains, and traffic along US Route 460.	45.8	41.9	49.1
4	ML 1 Adjusted	-	Distance adjusted from ML 1 using line source adjustment	40.6	36.7	43.9

5.0 Proposed Equipment Noise Impact Assessment

5.1 Significant Sound Sources

The following proposed Project sound sources are considered significant:

- Noise from the turbine exhaust, including the exhaust outlet and noise radiated from the exhaust ductwork, expansion joints, and silencer shell.
- Noise from the turbine air inlet system, including the inlet opening and noise radiated from the silencer/ductwork shell and any duct joints.
- Turbine/compressor casing noise that radiates to the exterior of the enclosure and through ventilation openings.
- Noise from the lube oil cooler / auxiliary cooler and gas aftercooler.
- Noise radiated by aboveground station gas piping.

5.2 Noise Model Development

A three-dimensional computer noise model was created to analyze the noise contributions expected from the proposed expansion equipment. The model was developed using CadnaA, version 2025 MR1 (build: 211.5558), a commercial noise modeling package developed by DataKustik GmbH. The software considers spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces and other sound propagation properties. The software is based on published engineering standards. The ISO 9613-2 standard was used for air absorption and other noise propagation calculations.

Ground absorption for the surrounding area was set to G = 0.8, representing a fairly absorptive ground. The station pad ground was modeled as reflective, with a G = 0.1 absorption coefficient.

To be conservative, foliage was not included in the model. The terrain was modeled based on USGS topographical data at a resolution of 10 by 10 meters. A temperature of 20 degrees Celsius and 70 percent relative humidity were used for the atmospheric absorption calculations.

5.3 Data and Assumptions

The proposed approximate unit locations and dimensions were used in the noise model. The proposed compressor station footprint was located as per the provided plot plan.

Table 5-1 and **Table 5-2** shows the sound power levels used as input to the model for the proposed equipment. Manufacturer data (as available) and/or sound power levels derived from measurements of the equipment were used in the computer noise model.

Table 5-1: Sound Power (L_w) and Sound Pressure (L_p) levels for Proposed Titan 350 Compressor Package

Source	Linear L_w or L_p at Octave Center Frequency, Hz									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Levels, L_w, dB										
Turbine Air Intake, Unsilenced Part Load, L_w [1]	115	117	121	121	127	133	162	153	152	164
Turbine Exhaust Outlet, Unsilenced, L_w [1]	128	133	131	132	133	130	125	116	98	135
Compressor Enclosure Inlet/Outlet Ventilation Duct, L_w [1]	110	107	104	100	102	98	128	115	114	130
Suction Piping, Uninsulated, L_w [1]	73	65	69	72	84	99	111	113	100	116
Discharge Piping, Uninsulated, L_w [1]	71	61	67	70	82	94	109	110	96	114
Enclosure, L_w [1]	122	120	112	106	103	99	107	98	98	110
Compressor Enclosure Outlet Fan, L_w [1]	94	94	101	105	106	103	97	91	86	107
Compressor Enclosure Inlet Fan, L_w [1]	104	104	97	98	101	101	99	91	85	105
Compressor Casing, L_w [1]	87	80	83	86	90	91	100	99	87	104
Turbine Exhaust Duct Expansion Joint, L_w [1]	114	115	106	85	82	92	94	76	73	98
Gas Cooler, per fan, L_w [3]	112	109	102	96	90	84	81	82	69	93
Lube Oil Cooler, L_w [1]	95	102	99	92	87	84	80	76	71	90
Turbine Exhaust Duct Breakout, L_w [1]	78	90	86	76	69	54	46	42	4	73

[1] From manufacturer data.

[2] From MVP specification, the manufacturer will meet 45 dBA at 200 ft.

[3] From SLR diagnostic measurements from MVP sites.

Table 5-2: Sound Power (L_w) and Sound Pressure (L_p) levels for Proposed Titan 250 Compressor Package and Capstone Microturbines

Source	Linear L_w or L_p at Octave Center Frequency, Hz									Total
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Levels, L_w, dB										
Solar Titan 250 Sound Levels										
Turbine Air Intake, Unsilenced Part Load, L_w [1]	116	115	128	134	134	142	153	160	151	162
Turbine Exhaust Outlet, Unsilenced, L_w [1]	127	130	132	134	138	133	125	116	107	138
Compressor Enclosure Inlet/Outlet Ventilation Duct, L_w [1]	104	107	103	97	93	92	99	113	108	115
Suction Piping, Uninsulated, L_w [1]	77	73	78	79	86	97	110	110	96	114
Discharge Piping, Uninsulated, L_w [1]	77	73	77	79	86	92	108	107	94	112
Turbine Exhaust Duct Breakout, L_w [1]	90	94	95	100	107	102	103	85	64	108
Compressor Enclosure Inlet Fan, L_w [1]	92	92	96	102	104	103	98	92	87	107
Compressor Enclosure Outlet Fan, L_w [1]	99	99	96	97	101	102	100	96	88	106
Enclosure, L_w [1]	113	111	110	106	103	99	95	97	89	106
Compressor Casing, L_w [1]	83	80	83	85	90	90	98	95	84	102
Turbine Exhaust Duct Expansion Joint, L_w [1]	110	112	104	87	82	89	90	80	73	95
Gas Cooler, per fan, L_w [3]	112	109	102	96	90	84	81	82	69	93
Lube Oil Cooler, L_w [1]	95	102	99	92	87	84	80	76	71	90
Turbine Air Intake Duct Breakout, L_w [1]	64	74	85	90	74	62	66	54	32	82
Capstone C1000 Microturbine Sound Levels										
Microturbine Enclosure Exhaust, L_w [3]	81	101	92	94	82	81	80	86	77	91
Microturbine Exhaust, L_w [3]	92	96	82	85	78	78	66	58	54	82
Microturbine Enclosure Intake, L_w [3]	81	78	83	78	73	74	75	72	71	81

[1] From manufacturer data
[2] From MVP specification, the manufacturer will meet 45 dBA at 200 ft.
[3] From SLR diagnostic measurements from MVP sites

5.4 Noise Model Results

5.4.1 Proposed MVP Boost Equipment – Normal Operation

Table 5-3 shows a summary of the calculated sound level contribution from the proposed MVP Boost equipment at each NSA. The table also shows the overall sound levels at each NSA, including the future station and existing sources.

The table indicates that, with the proposed noise control treatments discussed in **Section 6.0**, the compressor station noise contributions at all of the nearest NSAs will be below the FERC sound level limit of 55 dBA L_{dn}. The FERC sound level limits apply only to the sound level contribution of the compressor station equipment, and do not include the influence of the existing ambient sound levels.

The highest Project equipment sound level contribution is 49.4 dBA L_{dn} at NSA 2, which is well below the FERC noise limit of 55 dBA L_{dn}. The predicted increases above the existing sound levels range from 0.4 to 3.2 dBA.

Table 5-3: Compressor Station Sound Level Predictions

A	B	C	D	E	F	G
					(D + E)	(F – D)
NSA	Distance from Compressor Station to NSA	Direction from CS to NSA	Measured Existing Sound Level	Predicted Station Contribution from Proposed Equipment (FERC 55 dBA L_{dn} Limit)	Total Combined Future station + Calculated Ambient Sound Level	Potential Increase Over Existing Sound Level
	Feet		dBA, L_{dn}	dBA, L_{dn}	dBA, L_{dn}	dBA
1	1,445	WNW	49.1	**48.1**	51.6	2.5
2	1,890	NNE		**49.4**	52.3	3.2
3	2,810	ENE		**43.6**	50.2	1.1
4	2,450	ESE	43.9	**33.9**	44.3	0.4
5	1,530	WSW	49.1	**49.0**	52.1	3.0

5.5 Property Line Assessment for Montgomery County

Montgomery County limits sound from the compressor station to 52 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.) at the receiving residential property line. Compressor stations are a constant noise source, and operate during both day and night hours, so the 52 dBA limit would apply to sound from the Swann CS. As shown on **Figure B-3**, the red line indicating 52 dBA L_n contour stays within the property boundary of the Swann CS except for a small portion along the east property line.

There is uncertainty in any calculation protocol or method, including the industry standard ISO 9613-2 standard used for this model. This ISO standard estimates that there is a three-decibel uncertainty in calculations using the standard. Sound level measurements will be performed after construction and, if station sound levels at the property line are found to be above the 52 dBA Montgomery County limit, then noise mitigation can be optimized at that time.

5.6 Unit Venting

Under certain circumstances, the pressure in the compressor casing and unit piping must be released in a controlled manner. These events are called “Unit Venting” and occur when the unit is shut down for an extended period. During unit venting, high-pressure gas in the system is released in a controlled fashion through a silencer. Unit venting causes a temporary increase in sound level that usually lasts for approximately five minutes.

A compressor unit venting scenario was modeled using a single silencer specified to limit the venting sound levels to a maximum of **85 dBA at 50 feet**. During this event, predicted sound levels range from 36.6 to 50.0 dBA L_{eq} at the NSAs.

5.7 Emergency Shutdown (ESD)

The station has an emergency shutdown (ESD) system that automatically halts operation of the station in the event of an irregularity. This results in full station venting during which the gas from all station piping is released in a controlled manner. These events are extremely rare and take place only in the event of an emergency. The Swann CS site layout drawing shows two ESD vents. The station ESD system was modeled with a maximum sound level of **85 dBA at 50 feet** per vent, with both vents operating simultaneously**.**

The predicted short-term sound levels at NSAs due to an ESD event range from 39.5 to 56.4 dBA L_{eq} at the NSAs. This is a reasonable sound level for an event that will only occur in emergency situations. The ESD blowdown duration is typically less than ten minutes.

5.8 MVP Boost Equipment Construction

Only standard equipment will be used during construction, with no dynamic compaction or pile driving expected. Most construction will take place during daytime working hours of 7:00 a.m. to 7:00 p.m. Construction sound calculations were performed with the CadnaA propagation model, which accounts for local topography. Equipment usage factors were used per the Federal Highway Administration’s Roadway Construction Noise Model version 1.1 (FWHA, 2006). Usage factor is the percentage of time a given piece of equipment typically operates during a given hour. **Table 5-4** presents the equipment that was included in the construction evaluation for the MVP Boost expansion equipment.

Table 5-4: Proposed Construction Equipment Sound Levels

Equipment	Quantity	Usage Factor	Quantity and Usage Factor Adjusted Sound Pressure Level at 50-Feet, dBA
Air Compressor	4	0.4	80
Bobcat	3	0.4	80
Compactor	4	0.2	82
Compactor, Vibratory	2	0.2	76
Concrete Mixer Truck (main pours)	10	0.4	85
Concrete Mixer Truck (small pours)	4	0.4	81
20-Ton Wheeled Crane	2	0.16	77
250-Ton Wheeled Crane	2	0.16	76
Hydrotest Truck	1	0.4	81
Dump Truck	4	0.4	78
Excavator	4	0.4	83
Forklift	2	0.2	71
Generators	3	0.5	83
Light Tower	4	0.25	62
Man Lift	8	0.2	77
Scissor Lift	2	0.2	71
Tandem Truck	4	0.4	78
Water / Fuel Truck	4	0.4	76
Welding Machine	10	0.4	80
Welding Rig	10	0.4	80
X-Ray Truck / Machine	2	0.4	75
Total Sound Power Level, L_w, dBA			**127.5**

The construction equipment in the **Table 5-4** represents all of the proposed equipment operating simultaneously, which is a very conservative approach. In reality, equipment will be used in phases, and construction sound levels will be significantly lower than the modeled results during each construction phase.

Calculated construction sound levels at the NSAs range from 33.8 to 53.4 dBA L_{eq}. If major construction activity is limited to daytime hours, then there is no specific sound level limit for construction activities. Nighttime construction work is not planned, but if the need arises, a nighttime noise management plan will be created.

6.0 Noise Control Treatments

The MVP project has specified that each major equipment source at Swann CS meet 45 dBA at 200 ft. A summary of the modeled performance of one possible set of noise control treatments that meet the MVP specification is shown in **Table 6-1** and **Table 6-2**. The following subsections describe the treatments that would meet the MVP requirement. Note that the noise mitigation performance of several of these treatments are higher performance that standard manufacturer (Solar) supplied mitigation.

The noise mitigation measures shown are based on the most current station design and represent one potential set of possible mitigation. There are many different combinations of noise control measures that will provide similar noise control. As the station design is finalized, the mitigation design may be modified to account for these design changes while maintaining compliance with the FERC noise requirements.

Table 6-1: Solar Titan 250 Compressor Package Required Noise Control Treatments

Source	Treatment Description	Required Treatment Performance								
		31.5	63	125	250	500	1k	2k	4k	8k
Turbine Intake	Total Silencing (Intake Silencer and Filters), DIL	0	10	28	51	59	64	67	69	73
Compressor Casing	Compressor Casing Blankets, IL	0	2	4	6	8	9	10	10	10
Exhaust Duct	Interior Duct Lining, IL	2	5	9	14	17	20	24	7	12
Enclosure Inlet Ventilation	Silencers and Lined Hoods, DIL	0	1	5	12	24	33	36	34	22
Enclosure Outlet Ventilation	Silencers and Lined Hoods, DIL	1	2	4	9	17	24	29	29	27
Turbine Exhaust	Custom Exhaust Silencer, DIL	10	20	31	44	50	53	50	45	40
Suction and Discharge Gas Piping	Type ISO C3 Lagging, IL	-	-	1	9	17	26	34	38	42

Table 6-2: Solar Titan 350 Compressor Package Required Noise Control Treatments

Source	Treatment Description	Required Treatment Performance								
		31.5	63	125	250	500	1k	2k	4k	8k
Turbine Intake	Total Silencing (Intake Silencer and Filters), DIL	3	16	34	57	65	70	73	75	79
Compressor Casing	Compressor Casing Blankets, IL	0	2	4	6	8	9	10	10	10
Exhaust Duct	Interior Duct Lining, IL	2	5	9	14	17	20	24	7	12
Enclosure Inlet Ventilation	Silencers and Lined Hoods, DIL	24	28	31	35	38	39	40	39	39
Enclosure Outlet Ventilation	Silencers and Lined Hoods, DIL	11	12	16	22	32	39	43	41	32
T350 Turbine Exhaust	Custom Exhaust Silencer, DIL	21	25	32	43	51	53	50	45	44
T350 Suction and Discharge Gas Piping	Type ISO C3 Lagging, IL	0	0	1	9	17	26	34	38	42

6.1 Compressor Enclosure

The compressor enclosures were modeled as having the total sound power levels as shown in **Table** 5-1 **and Table 5-2**.

6.2 Compressor Enclosure Ventilation

The enclosure inlet and outlet ventilation openings should have silencers installed with the overall performance shown in **Table 6-1** and **Table 6-2**. The specified silencer performance is greater than the standard Solar supplied silencer.

6.3 Turbine Exhausts

The turbine should include a custom exhaust silencer system that results in the insertion loss shown in **Table 6-1** and **Table 6-2**. The exhaust silencer should be located as close to the compressor enclosure as possible. The specified silencer performance is greater than the standard Solar supplied silencer.

6.3.1 Silencer Performance

The proposed additional turbine will include an exhaust silencer system achieving the dynamic insertion loss (DIL, in decibels) shown in **Table 6-1** and **Table 6-2**. Due to the complexities

involved with the field verification of silencer insertion loss, the vendor should bid to meet a sound pressure level target of **45 dBA at 200 feet** from the exhaust opening, measured horizontally from the edge of the exhaust stack outlet with the turbine in any steady-state operational condition, including partial and full load.

6.3.2 Exhaust Duct and Shell Noise

In large turbine-powered installations it is common for a significant amount of sound energy to radiate from the exhaust system ductwork, expansion joints, and exhaust silencer shell. This sound energy is often termed “shell-radiated” noise. Shell-radiated noise is not necessarily calculated by exhaust system manufacturers, but it can be a dominant noise source for NSAs close to the station. These levels were based on in duct sound power levels provided by Solar. An internally lined exhaust duct was included within the model with the performance described in **Table 6-1** and **Table 6-2. The ducting should be either internally lined or externally lagged provided that the performance of the lining shown in Table 6-1 and Table 6-2 are met.** The maximum allowable exhaust breakout sound power level should be provided to the manufacturer in the exhaust system specification.

6.4 Turbine Air Intake

The proposed units will include the Solar barrier filter and a custom intake silencer. The total performance of the intake silencing system, including silencer and pulse updraft filter is provided in **Table 6-1** and **Table 6-2**.

6.5 Turbine Lube Oil Cooler

The sound power level of the turbine lube oil cooler should not exceed the sound power levels provided in **Table 5-1** and **Table 5-2**. This is the total sound power level for the entire cooler (i.e. not just a single fan). The sound power level in **Table 5-1** and **Table 5-2** is representative of the 90 dBA sound power level cooler offered by Solar.

6.6 Gas Aftercooler

The proposed station should have a gas aftercooler with a fan sound power level (per fan) rating as provided in **Table 5-1** and **Table 5-2**. This was assumed to be equal to the gas aftercooler fans at other existing MVP Compressor Stations.

6.7 Station Above-Ground Gas Piping

Noise from centrifugal compressors can cause significant noise radiation from connected piping. To the extent practical, all suction and discharge piping should be run underground. All outdoor above ground piping between the compressor and the separators on the suction side, and the compressor and the gas cooler on the discharge side, should be acoustically lagged with insulation having the acoustical performance shown in **Table 6-1** and **Table 6-2**.

6.7.1 Piping Isolation

To limit radiation from structural supports, the compressor piping should be isolated from the pipe supports and other structural contacts using at least one-quarter inch (1/4) neoprene bearing pads. The stiffness of the neoprene should be chosen so that the static deflection of the pads under the piping loads is about one-sixteenth inch (1/16). Secondary steel elements such

as cable trays, pipe racks, walkways, and conduit supports should not be connected to the pipe supports and/or piping.

7.0 Conclusions

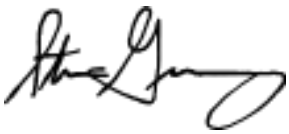
SLR has completed a pre-construction noise survey near the Mountain Valley Pipeline, LLC Swann Compressor Station, located near Elliston in Montgomery County, Virginia. Measurements were conducted near the closest NSAs. The measured sound level was 49.1 dBA L_{dn} for NSA 1, 2, 3, and 5 and were estimated at 43.9 dBA L_{dn} at NSA 4.

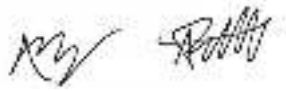
Modeling results from the proposed Swann CS equipment (two (2) Solar Titan 350 and one (1) Solar titan 250 turbine-driven compressor packages and associated equipment) indicate that the contribution from the new CS equipment will range from 33.9 to 49.4 dBA L_{dn} at the NSAs, yielding a potential increase in existing sound level of 0.4 to 3.2 dBA. These results indicate that the sound levels due to the proposed Swann CS equipment will be lower than 55 dBA L_{dn} at all nearby NSAs and that the station will be in full compliance with FERC noise requirements.

This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.

Sincerely,

SLR International Corporation





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Appendix A Glossary of Common Acoustical Terminology

MVP Swann Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 14, 2025

A-weighting: a weighting scale in which sound pressure levels in individual frequency bands are adjusted to match the response for the human ear. The reference adjustment is 0 dB at 1,000 Hz. The human ear is much less responsive at low frequencies. An A-weighted sound level is the total contribution from all sound frequencies, with the appropriate weighting factors applied and is designated as dBA.

C-weighting: a weighting scale that is relatively flat from 31.5 Hz to 8,000 Hz with a roll-off higher and lower than those frequencies. The adjustment is 0 dB from 200 Hz to 1,250 Hz. A C-weighted sound level is the total contribution from all sound frequencies, with the appropriate weighting factors applied and is designated as dBC.

Hertz (Hz): the unit of measure of frequency or the speed of vibration of a sound wave. Also referred to as “cycles per second”.

Insertion Loss (IL): the decrease (in decibels, dB) in sound power level measured at the location of the receiver when a sound attenuator (e.g., muffler), barrier, or other sound reduction element is inserted in the transmission path between the source and receiver.

L_d: the daytime average sound level. The L_{eq} averaged over daytime hours. Daytime hours may be defined differently by various ordinances and regulations. The hours between 7:00 am and 10:00 pm is the interval used by the U.S. Federal Energy Regulatory Commission (FERC) and the U.S. Department of Housing and Urban Development (HUD).

L_{dn} (also DNL): the day-night average sound level, a metric used by many regulatory bodies (including FERC and HUD) as an overall representation of the sound at a measurement location. The L_{dn} is calculated by averaging the sound measured over a 24-hour period, with 10 decibels added to sound levels measured during nighttime hours.

L_{eq}: the equivalent-continuous sound level is a time-average sound level for a specified time period. It is the most commonly used form of sound level averaging. Specifically, the Leq is the level of a steady sound that has the same sound energy as a time-varying sound during a stated time period and at a stated location.

L_n: the nighttime average sound level. The L_{eq} averaged over nighttime hours. Nighttime hours may be defined differently by various ordinances and regulations. The hours between 10:00 pm and 7:00 am is the interval used by the U.S. Federal Energy Regulatory Commission (FERC) and the U.S. Department of Housing and Urban Development (HUD).

L_{90}: a statistical parameter (percentile) that describes the sound level that is exceeded 90 percent of the time during a stated time period. For example, for a stated hourly L_{90} of 45 dBA, the sound level at the measurement location has a 90% chance of being greater than 45 dBA and a 10% chance of being less than or equal to 45 dBA. The L_{90} is often used as the “background” or “ambient” sound level for a given measurement period. Other percentile values are defined similarly (e.g., L_{50}, L_{10}, etc.).

Sound Power Level (PWL or L_w): a logarithmic parameter that describes the power characteristics of a noise source, relative to a reference power value, expressed in decibels, dB or dBA. The sound power level should not be confused with the sound pressure level. The sound power level is a characteristic of a noise source analogous to the wattage rating of a light bulb, and it is independent of the surroundings. It is calculated from measurements of the sound pressure level. A 75-watt light bulb will look much brighter in a white, reflective room than in a black, absorptive one. A noise source rated with a sound power level if 95 dBA will produce a much higher sound pressure level (will be much louder) in a small hard box than outside in a soft grass meadow.

Sound Pressure Level (SPL or L_p): a logarithmic parameter that describes the quantity of sound relative to a reference pressure value, expressed in decibels, dB or dBA. The SPL is the quantity that is measured with a sound level meter, and it is dependent upon the surroundings of a noise source.

Sound Transmission Class (STC): a single number rating for describing sound transmission loss of a wall or partition. A rating system designed to facilitate comparison of the sound transmission characteristics of various architectural materials and constructions.

Transmission Loss (TL): the difference (in decibels) between sound power incident upon a sound reduction element (wall or muffler) to that transmitted. The less sound energy is transmitted, the higher the TL value.

Appendix B Figures

MVP Swann Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 14, 2025

Figure B-1: Aerial Image Showing Measurement Location and Noise Sensitive Areas

Figure B-2: Noise Contour – Proposed MVP Swann CS – Normal Operation – 24-Hour Day-Night Level, dBA L_{dn}

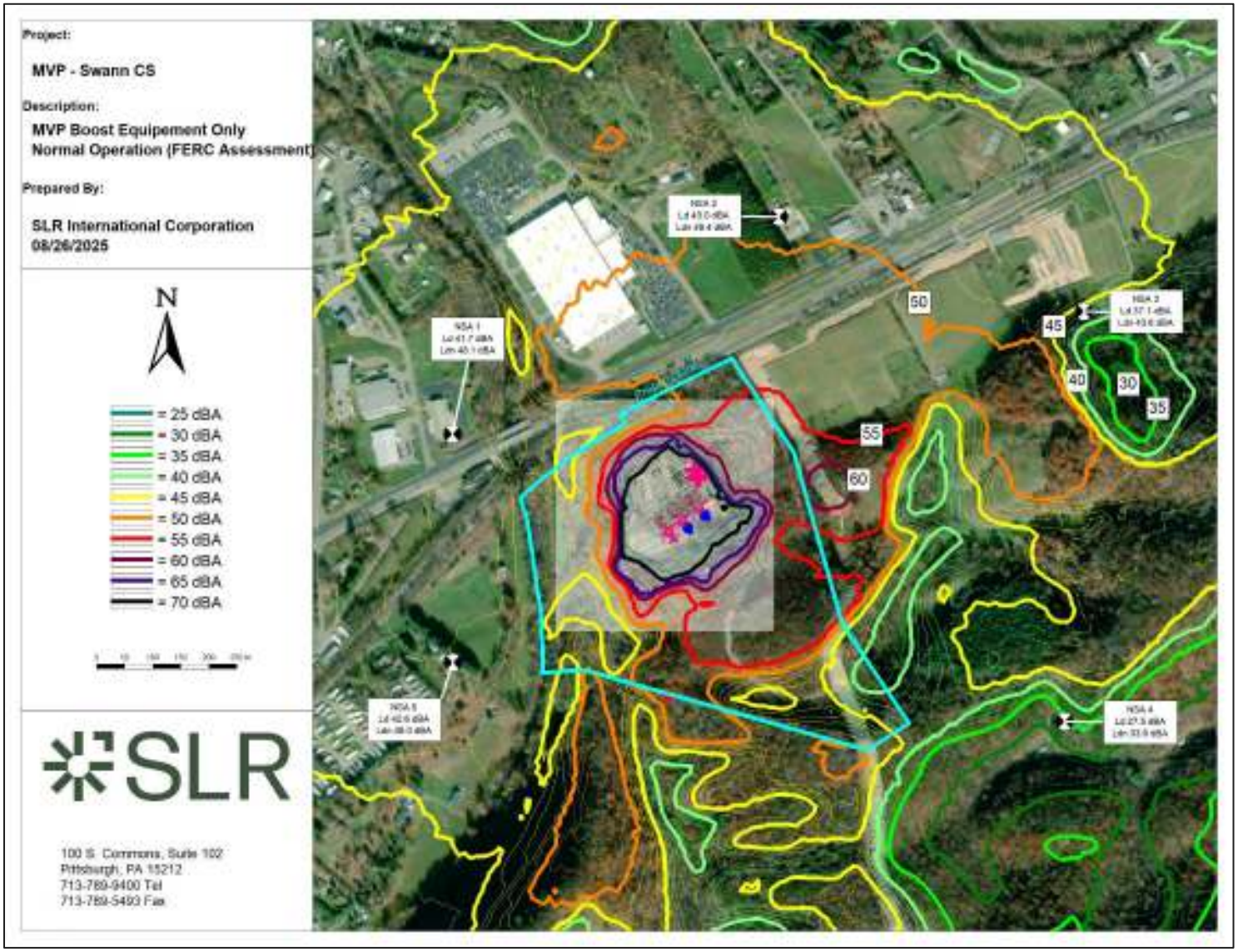
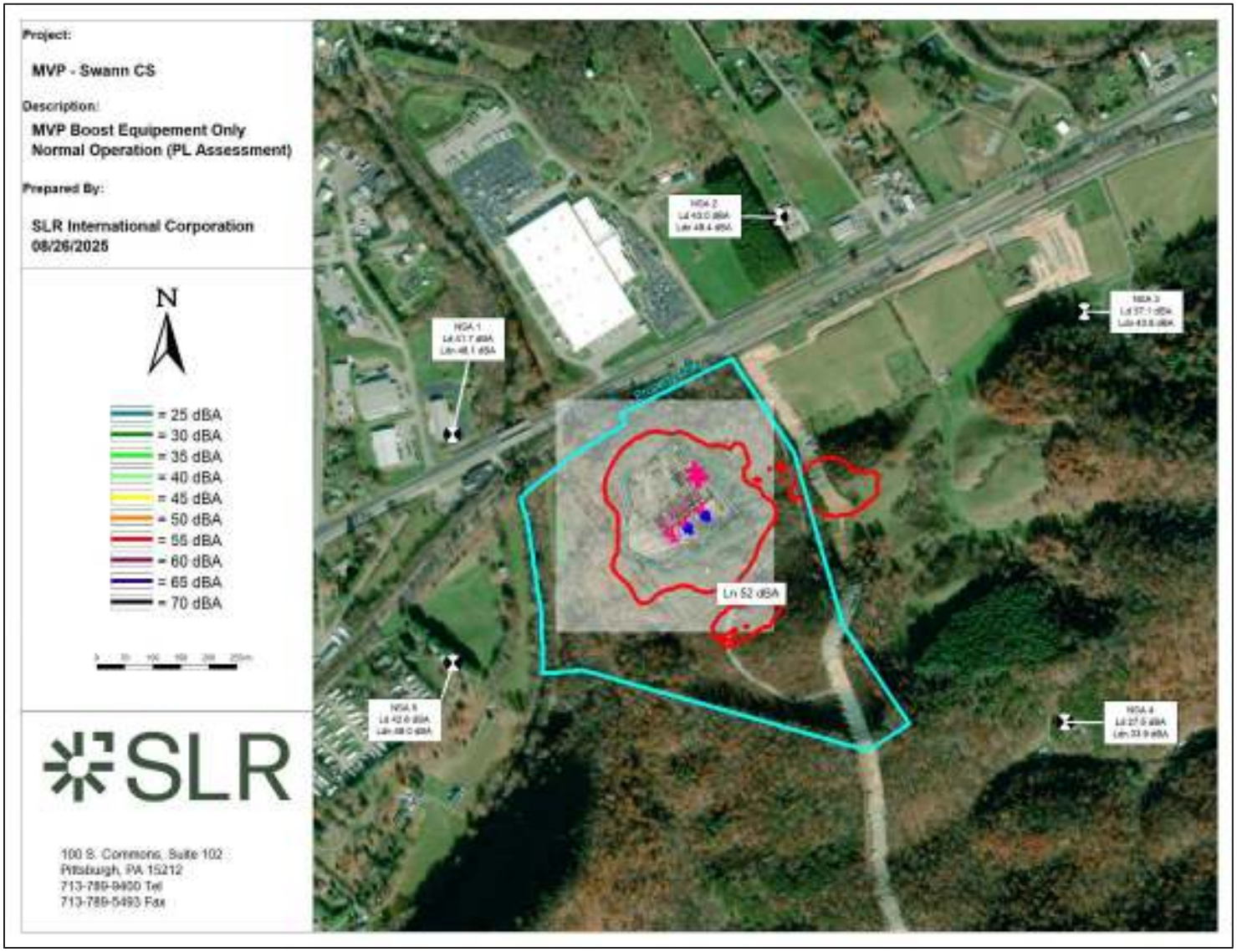


Figure B-3: Noise Contour – Proposed MVP Swann CS – Normal Operation – PL Assessment – Nighttime Level, dBA, L_n



Appendix C Weather Data

MVP Swann Compressor Station

Pre-Construction Noise Survey – MVP Boost

Mountain Valley Pipeline, LLC

SLR Project No.: 135.000097.00001

October 14, 2025

Figure C-1: Weather Data – January 23, 2025

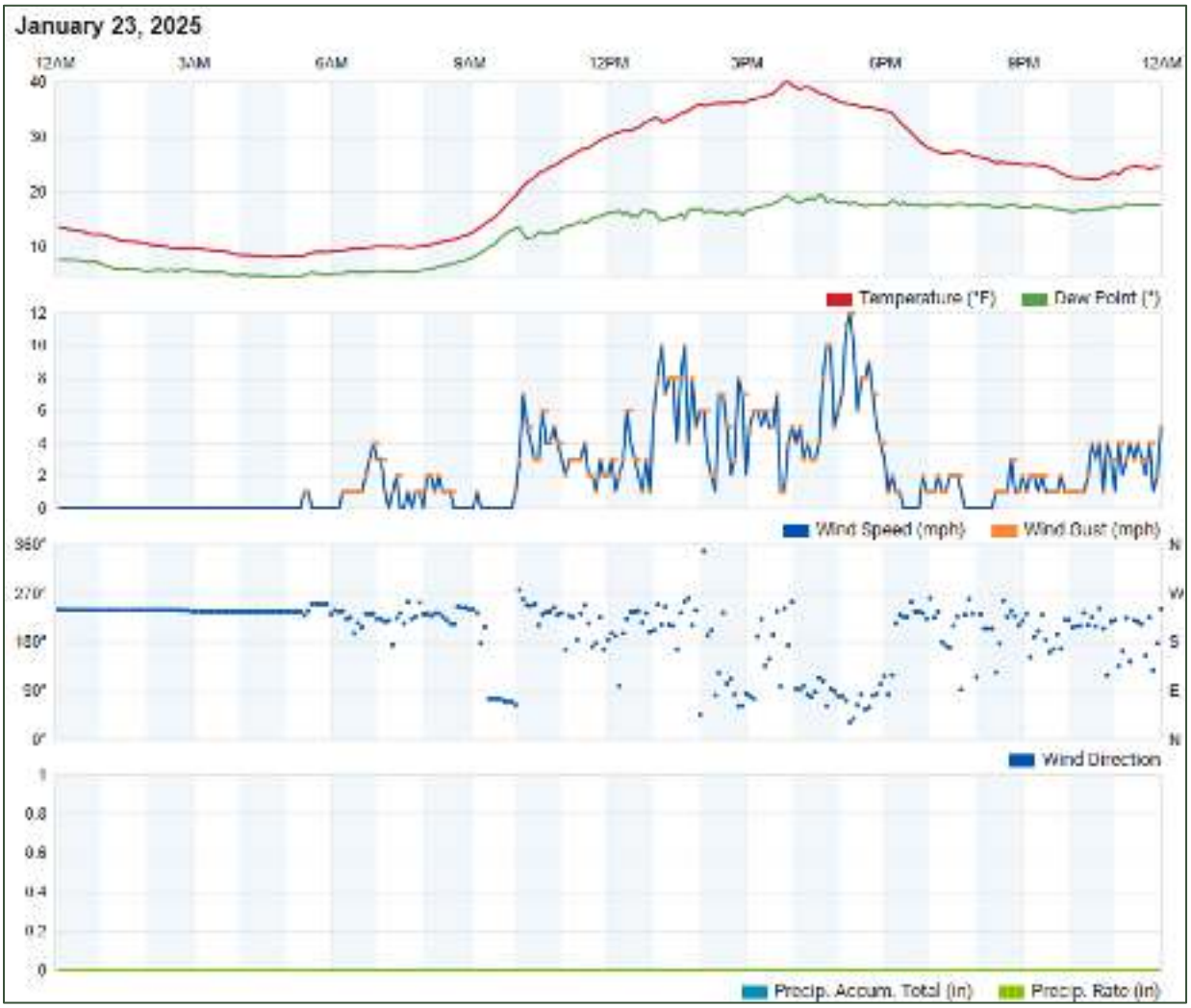
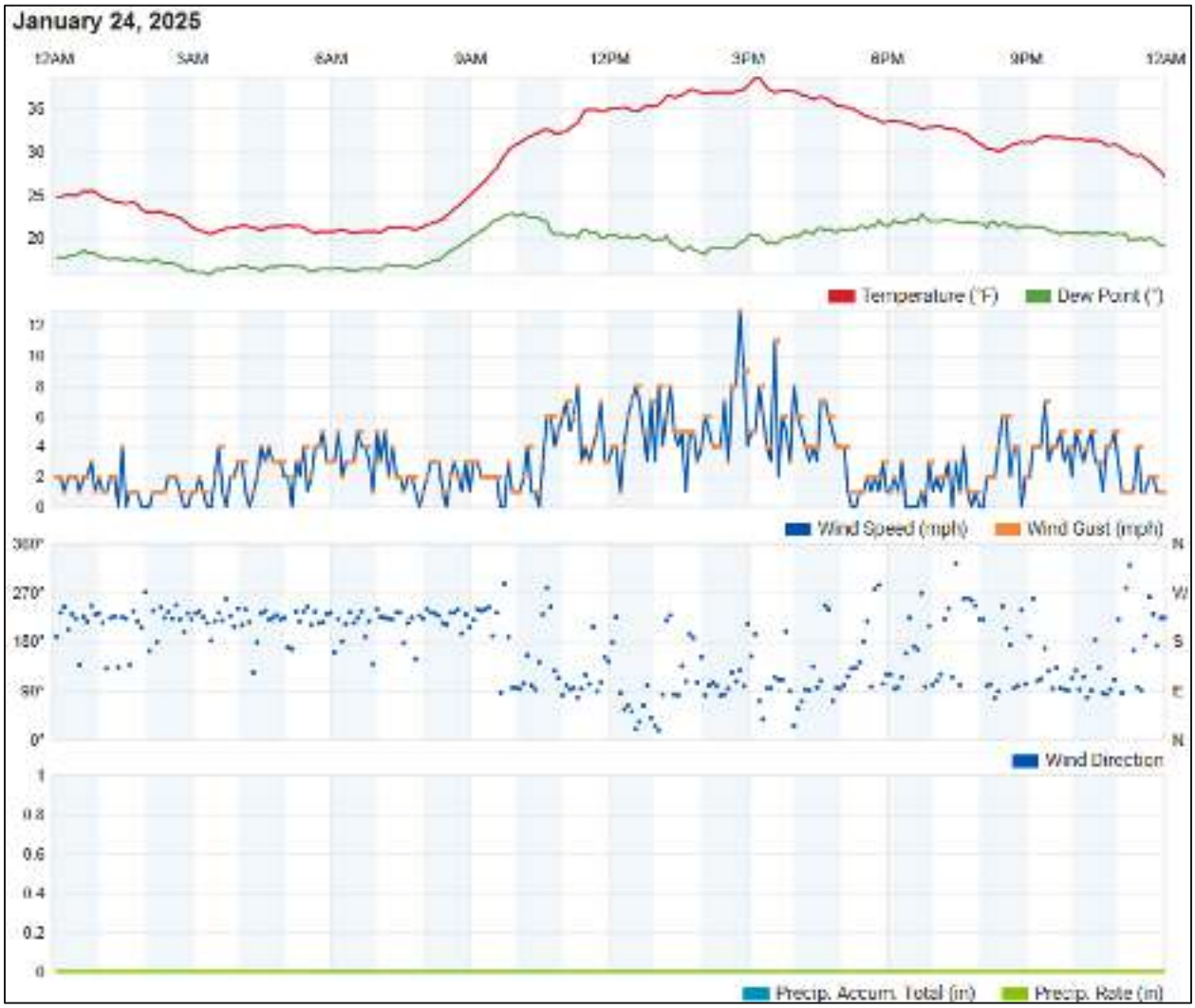


Figure C-2: Weather Data – January 24, 2025



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