VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office
INTRA-AGENCY MEMORANDUM
Engineering Analysis

Permit Writer	Anita Walthall			
Air Permit Manager	Paul Jenkins			
Memo To	Air Permit File	**Date**	**DRAFT**	
Facility Name	MVP Southgate Project – Lambert Compressor Station			
Registration Number	**21652**	**Application #**		**1**
Date Fee Paid	11/8/2018	**Amount ($)**		3,000.00
Distance to Class I Areas	173.12	**SNP (km)**	65.68	**JRF (km)**
FLM Notification (Y/N)	N	**Required if less than 10K (minor), 100K (state major)**		
Application Fee Classification **(Title V, Synthetic Minor, True Minor)**	True Minor	**Before permit action**	True Minor	**After permit action**
Permit Writer Signature				
Permit Manager Signature				

I. Introduction & Background

Mountain Valley Pipeline, LLC ("the applicant") of Pittsburgh, PA submitted an application dated November 5, 2018 (received November 8, 2018) to construct and operate a natural gas compressor station, known as Lambert Compressor Station ("LCS", or "Station") in Pittsylvania County, Virginia. The Lambert Compressor Station will be located at 987 Transco Road in Chatham, Virginia (off Route 57). The site was visited by DEQ Air Compliance and an initial site suitability evaluation reported on August 8, 2020.

The operating equipment in Section II will be powered by natural gas supplied by the Mountain Valley pipeline. The application proposes to construct a natural gas pipeline (H-650) to, according to the applicant, provide access to new natural gas supplies to meet the growing needs of natural gas users in the southeastern United States, including a local distribution company serving customers in North Carolina. Additional material was submitted dated December 12, 2018 (received 12/14/2018) and April 24, 2019 (received April 25, 2019); a modeling protocol dated October 19, 2018; a revised modeling protocol and report dated June 30, 2020; and revised application information dated June 2, 2020 (received June 30, 2020), August 12, 2020 (received August 13, 2020) and September 2, 2020 (received September 16, 2020). The application was deemed complete September 16, 2020.

As part of the application, new sources are required to submit a local governing body form to the county's zoning official for approval. The Pittsylvania County Board of Supervisors determined the Lambert Compressor Station to be exempt according to Pittsylvania County zoning ordinance PCC §35-50.

Site Suitability

The Lambert Compressor Station will be located on a site that is considered suitable from an air pollution perspective. The immediate area is evidenced by industrial and residential usage. The site is approximately 4,000 feet from an existing station (Transco). The nearest school is located in Chatham, Virginia, approximately 4 miles west. The nearest medical center and nursing home are also in Chatham.

A screening report was generated using EPA's EJSCREEN utility.[1] The report was based on a radii of 1, 2, and 5 mile from the proposed Station (Attachment 3). The report indicates the air quality EJ indices for $PM_{2.5}$ and ozone ranked from 53 to 62 percentile for the State as the distance from the plant site increased to five miles. The Station is considered a true minor source of air pollutant emissions (uncontrolled emissions <100 tpy). Controls were required in accordance with the BACT determination and the applicant voluntarily proposed controls for pollutants not subject to BACT (Section V). DEQ requested that an environmental justice study be conducted by the source. The applicant's study included a 4-month environmental justice investigation conducted by an independent consultant identifying citizens in the area and fielding responses to the proposed construction and operation of the Station (Section XI). A copy of the applicant's study was sent to DEQ and was reviewed.

Section X describes the public participation and outreach that the proposed permit will undergo that will allow the public to comment and request information regarding the proposed project. No part of the permit decision can be finalized until DEQ has considered each of the comments received from the public on this permit action. Additional discussion of public participation can be found in Section X.

As noted in Sections V (BACT) and VII (Dispersion Modeling), the new source complies with all applicable requirements and National Ambient Air Quality Standards (NAAQS). The EPA established the NAAQS according to Sections 108 and 109 of the U.S. Clean Air Act. These sections require the EPA to list widespread air pollutants that reasonably may be expected to endanger public health or welfare, to issue air quality criteria for them that assess the latest available scientific information on nature and effects of ambient exposure to them and to set primary NAAQS to protect human health with adequate margin of safety and to set secondary NAAQS to protect against welfare effects (e.g. effects on vegetation, ecosystems, visibility, etc.). The proposed facility is not a major source for hazardous air pollutants (HAPs), however it is subject to Virginia's State Air Toxics regulations (9VAC5-60-300 et seq.) for formaldehyde emissions. Air toxics are regulated by both the EPA and Virginia. The EPA regulates these toxics as "HAPs" (see MACT section IV.E) and Virginia regulates these toxics as "State Air Toxics" (see State Only Enforceable (SOE) Requirements section IV.F). Therefore a toxic pollutant would be regulated both as a HAP and a State Air Toxic.

There are abundant regulatory and technical considerations in the application review and drafting of the air permit that require significant technical education and experience. Attachment 1 is provided as an attempt to convey a number of standard concepts and terms within the field. The information in the attachment does not reflect all of the statutory, regulatory, and legal implications but is

[1] United States Environmental Protection Agency.2019.EJSCREEN.Retrieved: 10/07/2020 from https://www.epa.gov/ejscreen.

provided as a basic explanation of some of the technical terms associated with air permit application reviews.

II. Emission Units / Process Description

The Lambert Compressor Station will consist of the following emissions/emission units:

Combustion Turbines
To provide pressure for this station, the applicant proposed to construct and operate the following natural gas-fired compressor turbines:

- One 16,610 hp (140.84 MMBtu/hr), Solar Mars 100 combustion turbine (CT-01)
- One 11,146 hp (93.03 MMBtu/hr), Solar Taurus 70 combustion turbine (CT-02)

Note: The turbine horsepower rating is based on 100% load, ambient temperature of 0ºF (and 60% relative humidity).

Combustion turbines work by converting the energy in the fuel gas to mechanical energy that then powers the pipeline gas compressors. The compressors increase the pressure of the pipeline gas to enable it to move from one location to another, as the gas will flow from higher pressure to lower pressure in the pipeline. The turbines will generate mechanical energy from the combustion of natural gas fuel. Fresh atmospheric air flows through an air compressor, bringing it to higher pressure. Energy is then added by spraying fuel (pipeline natural gas) into the compressed air and igniting it so the combustion generates a high-temperature flow. This high-temperature, high-pressure gas enters a turbine, where it expands, turning a shaft that powers both the turbine's air compressor and other large centrifugal compressors that pressurize the pipeline gas.

The proposed lean-premix staged turbines are expected to emit Nitrogen Oxides (NO_X), Carbon Monoxide (CO), Volatile Organic Compounds (VOCs), particulate matter (PM, PM_{10}, $PM_{2.5}$), Sulfur Dioxide (SO_2) and State Air Toxics. They are equipped with Solar's dry low-NOx combustion system known as SoLoNOx™, which limits the formation of NO_X by pre-mixing air and fuel prior to combustion. This system limits NO_X emissions when the turbine is operating at an ambient temperature of 0 ºF or greater and at a load equal to or greater than 50%. This technology reduces nitrogen oxide (NO_X) emissions by operating at a lean burn fuel ratio (fuel to air ratios of less than 1:1). The SoLoNOx™ system does not operate during start-up or shutdown. SoLoNOx™ efficiency is diminished at low loads (less than 50% of capacity), as well as at loads greater than or equal to 50% for ambient temperatures below 0 ºF. SoLoNOx™ is operating optimally when pilot active control is in "minimum" pilot mode.[2] The draft permit specifies that the combustion turbines cannot operate below 50% load, except during start-up or shutdown.

In addition to the use of SoLoNOx™, the applicant plans to voluntary install control technology to further reduce emissions from the combustion turbines. Selective catalytic reduction (SCR) technology system (70% control efficiency) is planned to achieve a NO_X exit concentration of 2.70 ppmv. Likewise, voluntary installation of an oxidation catalyst system is proposed to control CO at

[2] Solar's product information letter, (PIL-220 page dated June 4, 2020).

92% efficiency and VOCs (including State Air Toxics that are organic compounds) at 90% efficiency. The SCR system reduces NO_X emissions by injecting ammonia (NH_3) into the exhaust gas upstream of a catalyst. The compounds NO_X, NH_3, and O_2 react on the catalyst surface to form nitrogen (N_2) and water (H_2O). Oxidation catalyst systems are typically used on turbines to achieve a reduction in CO and VOC emissions. The oxidation catalyst system promotes the oxidation of CO and VOC to carbon dioxide (CO_2) and water (H_2O) as the emission stream passes through the catalyst bed. Catalyst systems need to operate above minimum temperatures to achieve the intended reactions for NO_X, CO, or VOC. Neither catalyst system will be at temperature during start-up. During shutdown, the oxidation catalyst system will remain above the reaction temperature (until the temperature of the turbine and associated equipment begins to cool). The SCR system is more complicated (i.e., requires ammonia injection at the correct stoichiometric rate as well as higher temperatures) and will not operate during shutdown.

Due to the technical considerations for operating the SoLoNOx™ system and the inability to operate the control systems during start-up and shutdown[3], there are three operating modes for the turbines:

- Normal operating mode (50%-100%), at or above 0ºF inlet air temperature (Steady-state)
- Low temperature mode, operating at temperatures below 0ºF (Low Temperature)
- Start-up and Shutdown mode, when power is being energized or de-energized (SUSD)

Compressor Fugitive Emissions (FUG)
Fugitive emissions at natural gas compressor stations include leaks from piping components (valves, flanges, connectors and open-ended lines). These emissions were estimated using EPA emission factors and Interstate Natural Gas Association of America (INGAA) guidelines. Because piping components have a potential for leaks, the constituents in natural gas namely, VOCs and air toxics are also expected to be released into the atmosphere.

Venting and Blowdowns (BDE)
Natural gas blowdown events occur as a result of depressurization activities associated with combustion turbine start-ups and shutdowns. Pig launching and receiving events are also included with BDE activities. This event involves launching a device known as a 'pig' through the pipeline for inspection and/or cleaning. Pigging operations are expected to only occur once every five to seven years as part of normal inspection and equipment maintenance operations. The emission points during a pig launch or receiving event consist of opening valves on the launcher/receiver piping following an event in order to depressurize the piping. The cause for depressurization results in releases of natural gas during turbine start-up, turbine shutdown, pigging and, site-wide emergency shutdown (ESD) testing. VOCs and air toxics are released into the atmosphere during these events.

Microturbines

- Five, 200 kW Capstone microturbines used for facility electrical power (MT-01 to MT-05) The pollutants expected to be released from the microtubines are NO_X, CO, VOC, particulate matter ($PM_{2.5}$), and toxics.

[3] The oxidation catalyst will operate above the minimum temperature for the entirety of the shutdown sequence. Therefore, control of emissions will occur during that period.

Fuel Gas Heater

- One 0.77 MMBtu/hr gas-fired heater to preheat natural gas above dew point before combustion (HT-01)

Tanks

- Two, 10,000 gal "produced fluids" (natural gas liquids and water) storage tanks (TK-01, TK-02)
- Two, 1,000 gal (ea.) vertical high pressure aqueous ammonia storage tanks for use by each turbine's (T-70, M-100) SCR control system.

III. Emission Calculations

The application included air emission calculations for the proposed Lambert Compressor Station in Appendix B of the permit application. Those calculations have been reviewed by DEQ. Note that the applicant assumed the emission rate for PM to equal the emission rates for PM_{10} and $PM_{2.5}$ emissions. Emission calculations are shown in Attachment B (source application).

The primary pollutants emitted by combustion turbines are NO_X, CO and unburned hydrocarbons (UHC). Sulfur dioxide (SO_2), particulate matter (PM, PM_{10}, and $PM_{2.5}$) and trace levels of air toxic pollutants are a function of fuel content.[4] Emissions rates for NO_X, CO, and unburned hydrocarbons (UHC) are guaranteed by the vendor. Emission estimates for VOC (and methane) emissions are 20% of the UHC emissions[5]. The proposed facility's uncontrolled emissions are evaluated in Sections IV A and B.

The applicant determined annual permitted emissions for the combustion turbines, based on the following:

- Combustion turbines operating at 8,718.68 hours per year (each) in steady-state mode
- Low temperature emissions (for temperatures below 0ºF) are estimated to occur for 24 hours per year for each turbine, and
- SUSD emissions having a total duration of 17.32 hours for each turbine (8.66 hours for SU and 8.66 hours for SD, each turbine).[6]

IV. Regulatory Review

A. 9VAC5 Chapter 80, Part II, Article 6 – Minor New Source Review

The provisions of Article 6 apply throughout Virginia to (i) the construction of any new stationary source, (ii) the construction of any project (which includes the affected emissions units), and (iii) the reduction of any stack outlet elevation at any stationary source.

9VAC5-80-1105 B through D:

The application requests approval for the construction of a new stationary source. To be exempt from permitting, the regulations require that an emissions unit cannot be subject to the provisions

[4] https://www.netl.doe.gov/sites/default/files/gas-turbine-handbook/3-2-1-2.pdf.
[5] Solar Turbines PIL 168.
[6] SUSD emissions = 52 events x 10 min/event x 1hr/60min x 2 = 17.32 hrs (each combustion turbine).

of 9VAC5-80-1105 B through D as a group, nor subject to the provisions of 9VAC5-80-1105 E and F. The proposed fuel heater (HT-01) is exempt from permitting as an external fuel combustion unit using gaseous fuel as its maximum heat input is less than 50 MMBtu/hr (9VAC5-80-1105 B.1.a(4)). Both "produced fluids" storage tanks (TK-01, TK-02) are exempt from permitting as petroleum liquids storage operations having capacity of 40,000 gallons or less (9VAC5-80-1105-B.4.b). There is an ammonia storage tank proposed for each combustion turbine (T-70, M-100). The tanks are exempt from permitting since ammonia is not a regulated air pollutant. The applicant stated no other truck loading operations will be performed at this site.

The remaining process/emissions units (combustion turbines, microturbines, BDE, and FUG) are considered in order to determine the uncontrolled emission rate (UER) from the new stationary source. For minor NSR permit applicability, the UER of criteria pollutants for a new stationary source is the sum of the new uncontrolled emissions (NUE) minus the sum of the current uncontrolled emissions (CUE) for each unit included in the project (UER = NUE – CUE) and cannot be less than zero. The combined UER is compared to the criteria pollutant exemptions levels in 9VAC5-80-1105 C.1. If the UER exceeds the exemption level for any one criteria pollutant, the project is subject to the permitting requirements of 9VAC5 Chapter 80, Article 6. For this permit action, all of the process/emissions units are new, CUE equals zero.

Combustion Turbines (CT-01, CT-02)
The proposed turbines are new emission units. The NUE is based on manufacture data for uncontrolled emissions of NO_X, CO, and VOC pollutants at maximum load and >0°F. Emissions of PM, PM_{10}, $PM_{2.5}$ and SO_2 are determined using manufacturer supplied data. The NUE for all pollutants are based on 8,760 hours per year.

Microturbines (MT-01 – MT-05)
The proposed microturbines are new emission units. The NUE for pollutants emitted by the microturbines is based on 8760 hours of operation a year. Emission factors for NO_X, CO, and VOC are vendor supplied. Emissions of PM, PM_{10}, $PM_{2.5}$ and SO_2 are based on emission factors from AP-42 Table 3.1-2a.

Venting/Blowdowns (BDE)
Blowdown or vented emissions are emissions which pass through a stack or vent. A compressor may be vented during startup, shutdown, pigging or maintenance filter activities. The NUE from venting and blowdowns are based on worst-case natural gas volume released during compressor and piping blowdown, and assumes one annual ESD system test per year. Emissions estimates considers the frequency of each operation as well as natural gas characteristics. The pollutants emitted during BDE operations are VOCs (and GHGs).

Station Fugitives (FUG)
NUE is based on leaks from the number of valves, flanges, and other gas transmission components at the proposed Station. Emissions were based on EPA emission factors (Protocol for Equipment Leak Emission Estimates" for oil and gas production operations, 11/95 (EPA-453 / R-95-017), Table 2-4, Page 2-15 and Interstate Natural Gas Association of America (INGAA) guidelines.

As shown in the summary table below, the UER for $PM_{2.5}$ exceeds the respective permitting thresholds; therefore the facility is subject to permitting requirements of Article 6. State BACT applies to $PM_{2.5}$ (see Section V).

Table 1: Project Uncontrolled Emission Rate (UER)[7]

Pollutant	UER (tpy)	Exemption Rate (tpy)	Exempt? (Y/N)
Carbon Monoxide	67.39	100	Y
Nitrogen Oxides	34.73	40	Y
Sulfur Dioxide	5.37	40	Y
PM	10.34	25	Y
PM_{10}	10.34	15	Y
$PM_{2.5}$	10.34	10	N
Volatile Organic Compounds[8]	8.95	25	Y
Lead	<0.06	0.6	Y

9VAC5-80-1105E&F:
Based on the applicant's calculations, the facility will emit two State Air Toxic pollutants of concern for compressor stations, namely hexane and formaldehyde. Potential hexane emissions were determined to be less than the exemption rates, while formaldehyde's emissions are expected to exceed the exemption thresholds according to 9VAC5-60-300. Therefore, formaldehyde is subject to minor NSR permitting and BACT, while hexane is exempt.

Table 2: Potential Emission of Toxic Pollutants

Pollutant (CAS #)	Emissions Rate (lb/hr)	Exemption Rate (lb/hr)	Emissions Rate (tpy)	Exemption Rate (tpy)	Triggers Permitting?
Formaldehyde (50-00-0)	8.990	0.0825	0.822	0.174	Yes
Hexane (110-54-3)	2.4	11.616	0.093	25.52	No

Other State Air Toxics are emitted from the combustion turbines, line heaters and storage tanks to be located at the proposed facility. However, the potential to emit of each of these pollutants does not exceed the respective individual hourly and annual exemption thresholds (Table B-12); therefore the emission are not subject to permitting requirements. See section VIIB for discussion and modeling performed.

B. 9VAC5 Chapter 80, Part II, Article 8 and Article 9 – PSD Major New Source Review and Non-Attainment Major New Source Review
The Prevention and Significant Deterioration (PSD) permit program is for major stationary sources (defined in the Regulations) located in areas that are in compliance with the National

[7] Table B-1 of June 30, 2020 submittal (uncontrolled). Note HT-01 is exempt from permitting (emissions not included).
[8] Value includes emissions from non-exempt project equipment and fugitives releases (leaking components and venting).

Ambient Air Quality Standards (NAAQS). Areas that are meeting the NAAQS are designated as "PSD areas". Areas that have ambient air concentrations higher than the NAAQS are designated as "nonattainment areas". An area's classification is determined for each pollutant with a NAAQS. These pollutants are referred as "criteria pollutants". The PSD program also applies to certain other pollutants that are regulated under the Clean Air Act.[9]

Pittsylvania County is a PSD area for all pollutants as designated in 9VAC5-20-205. LCS is not in a source category with a 100 tpy PSD threshold; therefore, the major stationary source threshold is 250 tpy. After issuance of this permit, the facility will not have a PTE of any regulated NSR pollutant at major stationary source thresholds. PSD review does not apply.

Greenhouse Gases (9VAC5 Chapters 80 and 85)
As of January 2, 2011, GHG is subject to regulation for a major modification if the project causes a significant emissions increase (SEI) and significant net emissions increase (SNEI) for GHG in addition to one other criteria pollutant.[10] GHG is not subject to regulation due to the project not having a criteria pollutant that exceeds the SNEI threshold.

C. 9VAC5 Chapter 50, Part II, Article 5 – (NSPS)
Requirements of NSPS Subparts KKKK and OOOOa are applicable to the affected equipment (or process) as identified in this section. These rules contain federally enforceable requirements that a source must comply with, regardless of their inclusion in a permit.

The proposed combustion turbines (CT-01 and CT-02) are subject to 40 CFR 60, Subpart KKKK "Standards of Performance for Stationary Combustion Turbines". This subpart establishes emission standards and compliance schedules for the control of NO_X and SO_2 emissions from stationary combustion turbines that commenced construction, modification or reconstruction after February 18, 2005 (§60.4300-§60.4420). NSPS Subpart KKKK requires a NO_X emission limit of 15 ppm @15% O_2 (§60.4320) for each turbine. The permit's limit for NO_X is more stringent than the subpart's 15 ppm limit (see Section V). Monitoring, testing, and recordkeeping requirements for NO_X are required (§60.4333, §60.4340). The turbines are also subject to the fuel sulfur monitoring requirements (§60.4360).

NSPS Subpart OOOOa, "Crude Oil and Natural Gas Facilities for Which Construction, Modification, or Reconstruction Commenced after September 18, 2015" (§60.5360a-§60.5432a) applies to select equipment for the collection of fugitive emissions (60.5365a(j)). This subpart sets standards for VOCs (as well as GHGs) that require leak testing for methane and other VOC emissions. NSPS OOOOa requires a fugitive emissions monitoring plan (§60.5397a (b) through (j)); monitoring surveys (§60.5397a (f) and §60.5397a (g) (2)) and repair/replacement timeframes (§60.5397a (h)). The monitoring plan required by this permit is at least as stringent as the requirements in this rule (see Section V).

D. 9VAC5 Chapter 60, Part II, Article 1 – NESHAPS
The facility is not subject to any Part 61 (40 CFR 61) emission standards.

[9] BACT review for GHG emissions is required if a PSD permit is required for a criteria pollutant (6/23/14 SCOTUS decision).
[10] CO_2e is the emission rate of each GHG species multiplied by its respective global warming potential (40CFR Part 98).

E. 9VAC5 Chapter 60, Part II, Article 2 – MACT

The facility does not have the potential to emit (PTE) of any single HAP or combination of HAPs in excess of the major source threshold; therefore, it is an area source of HAPs and not subject to the "Stationary Combustion Turbine MACT" per 40 CFR Subpart YYYY. Subpart YYYY establishes emission limitations and operating limitations for HAPs emitted from stationary combustion turbines located at major sources for HAP emissions. There are no area source MACT requirements that apply to the combustion turbines and the microturbines.

F. State Only Enforceable (SOE) Requirements (9VAC5-80-1120 F)

Several Virginia regulations are enforceable only by the State Air Pollution Control Board and its designee, DEQ. One example is 9VAC5-60-300 *et seq*., also known as the "State Air Toxics rule." The State Air Toxics rule was developed as a health-based "stopgap" regulation to cover emissions of HAPs by sources until EPA made a determination regarding emissions from those source types. Once EPA has made a determination, the State Air Toxics no longer applies.

As noted in Table 2 of Section IV.A, the potential hourly and annual formaldehyde emission rates exceed the exemption thresholds contained in 9VAC5-60-300C. Formaldehyde emissions from the compressor turbines (CT-01, CT-02) will be limited in the permit to ensure the facility complies with the significant ambient air concentration (SAAC) for formaldehyde. As discussed in Section V, the facility is implementing an oxidation catalyst for VOC, as well as Vent Gas Reduction System (VGRS) and capped ESD testing. Formaldehyde is also a VOC, therefore the control requirements in the permit for VOC are considered BACT for formaldehyde (oxidation catalyst system).

Formaldehyde (CAS 50-00-0) emission limitations and associated requirements are included in the permit as SOE to implement the requirements of 9VAC5-60-300 *et. seq*. Neither the inclusion of SOE requirements in this permit nor any resulting comment period make these terms federally enforceable.

Emissions of hexane (CAS 110-54-3) were less than the exemption threshold. However the applicant modeled hexane (conservatively, at twice the estimated hexane content expected in the natural gas) and emissions were found to be in compliance with the SAAC. SOE requirement for hexane include natural gas content analysis. Neither the inclusion of SOE requirements in this permit nor any resulting comment period make these terms federally enforceable.

V. Best Available Control Technology Review (BACT)

BACT review is required for pollutants that trigger permitting (i.e., $PM_{2.5}$ and formaldehyde in this case) through the use of available reduction techniques (i.e., control devices, adjustments to prevent pollution formation, work practices, etc.) as applied to each affected emissions unit in the project proposed by the applicant (9VAC5-80-1190.1.a, 9VAC5-50-240A, and 9VAC5-50-260). BACT applies to each affected emissions unit and one of DEQ's obligations for issuing a permit approval is to ensure each emissions unit is designed to comply with BACT. This does not provide for wholesale replacement of an emissions unit, or a fundamental alteration of the emissions unit in the

application under review.[11] For this permit action, the affected emissions units subject to BACT are the natural gas-fired combustion turbines (CT-01, CT-02) and the five natural gas-fired microturbines (MT-01 – MT-05).

The applicant provided supplemental information (dated June 30, 2020) that includes an evaluation of the feasibility of using electric compressor turbines (ECT) over natural gas-fired combustion turbines and a consideration of the pollution possibility for electric compression technology. This information demonstrates that the electrical transmission infrastructure required for the use of ECTs at the proposed Station does not exist. Therefore, if the substitution of ECTs for the proposed combustion turbines was considered as a control technique in the context of a BACT determination, the use of such ECTs at the proposed Station is not an available option for consideration. An electric compressor station may or may not be an inherently lower pollutant process than a natural gas-fired compressor station. This scenario is dependent upon the fuel source for electric generation on the grid from which electric compressor station receives its electricity. If the source of the electric compressor station's electricity comes from a coal-fired power plant, the overall air pollution impact of the electric compressor station is worse than that of a natural gas-fired compressor station. However, if the electricity comes from a natural gas-fired power plant, the overall air pollution impact of an electric compressor station is likely to be approximately equal to that of a natural gas-fired compressor station. The parameters in question, electric turbines with electric transmission, are believed to fundamentally redefine the BACT approach for the proposed combustion turbines and therefore BACT does not apply. DEQ does not substitute alternative equipment for the affected emission units as part of the BACT review.

A BACT requirement considers whether an emission reduction meets BACT using various factors including the cost of the control system divided by the amount of pollutant reduced; called 'cost effectiveness'. BACT review is relative to a specific pollutant and a specific type of operation. Generally, for BACT, sources undergo a review to compare the relative level of control with other similar Virginia sources. Based on the potential impacts to the surrounding communities, the source was also related to similar projects in other states.

BACT applicability is determined pollutant-by-pollutant, based on the corresponding permit applicability thresholds. For a new stationary source, BACT shall apply for each pollutant with an increase in the UER equal to or greater than the levels in 9VAC5-80-1105C. In addition, sources subject to the State Air Toxics Regulation that exceed the corresponding exemption threshold level for a particular air toxic, must also apply BACT to minimize air toxic emissions. For the proposed project, BACT is applicable for $PM_{2.5}$ and formaldehyde.

The applicant submitted a Best Available Control Technology review for all units not exempted under 9VAC5-80-1105B (see Section 5 of the application). Although a "top down" BACT review is not required for minor NSR permits (required for PSD permits), the applicant utilized this approach and prepared a "top down" BACT review for $PM_{2.5}$ and formaldehyde emissions. The applicant also provided a BACT review for NO_x emissions even though BACT is not applicable to NOx for this source. For this application, the primary affected emissions units are the natural gas-

[11] Air Permitting Guidance Memo No. APG-350-Ch8 – "Air Permit Guidance for Control Technology Standards", August 31, 2020.

fired combustion turbines and microturbines.

Each affected emissions unit emitting a pollutant that is subject to permitting shall apply BACT for that pollutant (9VAC5-50-260C). Under the minor NSR program, BACT is applicable for $PM_{2.5}$ and formaldehyde emissions. The applicant provided a control technology review for each pollutant. DEQ considers the control technology selected in the application to be valid (see Section 5 of the current application).

Combustion Turbines & Microturbines

$PM_{2.5}$ Emissions:
The Solar Taurus 70 combustion turbine, Solar Mars 100 combustion turbine, and the Capstone C200 microturbines will each generate $PM_{2.5}$ emissions. Main sources of particulate emissions are derivatives from the conversion of fuel sulfur to sulfates and ammonium sulfates; and from unburned hydrocarbons. $PM_{2.5}$ emissions include filterable and condensable particles with the condensable materials accounting for a significant portion of $PM_{2.5}$ emissions.[12] Condensable particles are unable to be captured with add-on filter controls.

The applicant proposes pre-combustion control technologies such as use of clean-burning, low-sulfur fuel, good combustion practices, and high efficiency inlet filters as BACT for all turbines. Natural gas fuel contains fewer sulfur particles when compared to other fossil fuels (oil, coal) making it a cleaner burning fuel. Good combustion practice ensures proper air/fuel mixing rations in order to achieve complete combustion by reducing emissions of unburned hydrocarbons that can lead to formation of $PM_{2.5}$ emissions. The use of high efficiency inlet filtration on the inlet air will minimize the entrainment of particulate matter into the turbine exhaust stream. The permit establishes a visible emissions limit not to exceed 5% from natural gas combustion turbine.

Formaldehyde:
The Solar Taurus 70 combustion turbine, Solar Mars 100 combustion turbine, Capstone C200 microturbines, and gas heater are expected to emit formaldehyde. Formaldehyde is an organic compound formed during incomplete combustion of fuel then released as a combustion byproduct. The Solar combustion turbines are the largest contributor of uncontrolled formaldehyde emissions. However, the combustion turbines (CT-01, CT-02) will employ oxidation catalyst for the destruction of CO and VOCs at 92% and 90% respectively. Since formaldehyde is an organic HAP, the use of oxidation catalyst technology is also considered BACT to control formaldehyde emissions.

The uncontrolled formaldehyde emissions from the microturbines and gas heater are much lower at 0.15 tpy and 0.00025 tpy, respectively. Based on the low emission rates and small capacity of the units, the applicant determined add-on control technologies to be technically infeasible for formaldehyde (VOC) emissions.

Additional Controls Not Required by BACT (9VAC5-50-260):

[12]Air Permitting Guidance Memo No. APG-110 – "Air Permit Guidance for Condensable Emissions in Particulate Pollutants", 8/28/2020.

Although exempt from permitting and thus BACT review is not required, the facility has voluntarily proposed the following control measures to further reduce NOx, CO, and VOC emissions that have been included in the permit:

NO_x

The applicant plans to further reduce NO_x emissions from the combustion turbines through the use of SCR control technology at 70 percent efficiency. The proposed control device is expected to achieve a NO_X exit concentration of 2.70 ppmv.

CO/VOC

An oxidation catalyst system will be employed to provide control for CO emissions at 92 percent efficiency and VOC emissions at 90 percent efficiency. The proposed control device is expected to achieve CO and VOC exit concentrations of 2.0 and 0.50 ppmv, respectively.

Fugitive Leak Components

Natural gas contains VOCs. Fugitive emissions will be monitored by daily auditory/visual/olfactory (AVO) and quarterly leak detection and repair (LDAR) techniques in accordance with Method 21 (or an optical gas-imaging camera).

Natural Gas Venting (Blowdown)

Natural gas contains VOCs. The Lambert Station has three anticipated activities or events that result in releases of natural gas: turbine start-up; turbine shutdown; and site-wide emergency shutdown (ESD) testing. The application included 52 startups and 52 shutdowns per turbine per year (208 total events for both turbines), utilizing capped ESD testing practices and one site-wide ESD testing event per year.[13] Although permitting was not triggered for VOC, DEQ reviewed the emissions from these operational practices and requested that the applicant review additional controls for emissions generated during blowdown operations. Based on the applicants review of start-up and shutdown, and other control options, the facility proposes a vent gas reduction system (VGRS) to reduce emissions of VOC due to turbine venting related to start-up and shutdown. The applicant revised the PTE emission estimates for planned depressurization events. Maintaining the estimated 208 startup and shutdowns combustion events, the facility also maintains performing 24 blowdowns (12 each turbine) after startup, shutdown, or maintenance activity but "assumes" the use of vent gas reduction (VGR). The VGRS is capable of reducing the system pressure to 30 psig prior to atmospheric depressurization. The applicant proposed capped tests using block valves to ensure negligible gas escapes during ESD testing. The use of VGRS and capped ESD testing can decrease emissions by approximately 75% for GHG alone. While not the subject of Article 6 permitting, a reduction in venting emissions also significantly reduces the amount of Methane emitted by more than 75% as CO_2e (126,349 tpy to 972 tpy).

Sulfur

A sulfur content of the natural gas of 1.1 grains per 100 scf has been established as a limitation in the permit for the natural gas quality. The limitation is used as a means of demonstrating compliance with the sulfur dioxide emission limitations established in the permit. This limit is

[13] Emission calculations assume one event per year for potential to emit.

consistent with compressor stations recently permitted by DEQ.

VI. Summary of Potential Emissions Increase

As a new stationary source, the increase in potential emissions is equal to the permitted PTE. After issuance of a permit, the PTE of the facility is summarized in the following table:

Table 3: Facility Potential to Emit

Pollutant	Past PTE (tpy)	Proposed PTE (tpy)	Change in PTE (tpy)
NO_X	0	12.37	+12.37
CO	0	17.28	+17.28
VOC	0	3.33	+3.33
SO_2	0	5.39	+5.39
$PM/PM_{10}/PM_{2.5}$	0	10.36	+10.36
HAP (total)	0	4.53	+4.53

The table above represents total facility-wide emissions. Note that the annual emission limits for pollutants whose emission rates are less than 0.5 tpy are not listed in the permit. This is the case for the annual emission rates of VOC, SO_2 and $PM_{2.5}$ for the microturbines.

Detailed emission calculations and vendor data provided by the applicant are included in the source application, Appendix B.

VII. Dispersion Modeling

A. Criteria Pollutants

A cumulative air quality analysis via dispersion modeling was conducted to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) for NO_2 (1-hour and annual averaging periods), CO (1-hour and 8-hour averaging periods), PM_{10} (24-hour averaging period) and $PM_{2.5}$ (24-hour and annual averaging periods).

For the impact of the VOC emissions, a quantitative analysis was performed in accordance with current EPA guidance.

Modeling was completed by the applicant and the protocol submitted to the Office of Air Quality Assessments for analysis. The NAAQS analysis included emissions from LCS, emissions from existing sources from Virginia, and representative ambient background concentrations of NO_2, CO, PM_{10}, and $PM_{2.5}$. The modeling analysis was approved on July 9, 2020 and demonstrated compliance with the applicable NAAQS. The table below summarizes the criteria pollutant modeling analysis results:

Pollutant (averaging period)	Total Modeled Concentration ($\mu g/m^3$)	Ambient Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
NO_2 (1-hr)	178.8	---(1)	178.8	188
NO_2 (annual)	21.8	13.2	35.0	100
CO (1-hr)	2,151	1,955	4,106	40,000
CO (8-hr)	1,106	1,495	2,601	10,000
$PM_{2.5}$ (24-hr)	5.8	17	23.0(2)	35
$PM_{2.5}$ (annual)	1.0	6.9	7.9(2)	12
PM_{10} (24-hr)	9.1	22	31.1	150

(1) Season and hour of day varying.
(2) Total concentration includes the contribution from secondary $PM_{2.5}$ formation.

B. State Air Toxic Pollutants

Modeling is also required if potential State Air Toxic pollutant emissions (after issuance of the permit) exceed the exemption thresholds included in 9VAC5-60-300 C. Based on toxic pollutant emission calculations, after controls there are no toxic pollutants from the proposed project whose emissions exceeded exemption thresholds or that require modeling. Due to Virginia's recent permit activities for compressor stations, DEQ requested that the applicant include a modeling analysis for formaldehyde and hexane in order to determine the Predicted Ambient Air Concentration (PAAC) and to compare those values against their respective Significant Ambient Air Concentration (SAAC).

Modeling was completed by the applicant and protocol submitted to the Office of Air Quality Assessments for review. The modeling analysis was approved on July 9, 2020 and demonstrates compliance with the applicable SAAC. The table below summarizes the toxic pollutant modeling analysis results:

Air Toxic Pollutant (averaging period)	**Scenario**	**Modeled Concentration (PAAC) ($\mu g/m^3$)**	**SAAC ($\mu g/m^3$)**
Formaldehyde (1-hour)	50% Load	2.8	62.5
Formaldehyde (1-hour)	75% Load	2.8	62.5
Formaldehyde (1-hour)	100% Load	2.8	62.5

Air Toxic Pollutant (averaging period)	**Scenario**	**Modeled Concentration (PAAC) ($\mu g/m^3$)**	**SAAC ($\mu g/m^3$)**
Formaldehyde (1-hour)	Startup (blended with 50% load)	11.2	62.5
Formaldehyde (1-hour)	Shutdown (blended with 50% load)	8.6	62.5
Formaldehyde (annual)	50% Load	0.050	2.4
Formaldehyde (annual)	75% Load	0.050	2.4
Formaldehyde (annual)	100% Load	0.050	2.4
Hexane (1-hour)	Unit Blowdown (with Pigging)	1,298	8,800
Hexane (1-hour)	Emergency Shutdown [(1)] (with Pigging)	5,435	8,800
Hexane (annual)	Unit Blowdown (with Pigging)	0.276	352
Hexane (annual)	Emergency Shutdown (with Pigging)	0.228	352

[(1)]The emergency shutdown scenario reflects an actual emergency scenario. These testing events are capped to limit the amount of gas released into the atmosphere. Even though emergency conditions are not typically required to be modeled, these data are provided as part of the analysis for informational purposes only.

C. Other Modeling Considerations:

Ozone

An assessment to estimate the impact on ozone from the proposed facility's NO_X and VOC emissions was conducted. The calculated impact was approximately 0.05 parts per billion (ppb) of ozone. The monitored ozone design value for the area is approximately 59 ppb for the period 2017 through 2019. This results in a total design value equal to 59.05 ppb which is well below the 8-hour ozone NAAQS of 70 ppb.

A copy of the Air Quality Analysis Memorandum is provided as Attachment 2.

D. Environmental Justice Considerations

Environmental Justice is defined by the Virginia Environmental Justice Act (VEJA) as "the fair treatment and meaningful involvement of every person, regardless of race, color, national origin, faith, disability, or income, in the development, implementation, and enforcement of environmental laws, regulations, and policies." Va. Code §2.2-234. Recent changes to the State Air Pollution Control Law also expressly make it a purpose of DEQ to "further environmental justice" in permitting actions. Va. Code § 10.1-1183. Similarly, environmental Justice is

defined by the EPA as the fair treatment and meaningful involvement of all people regardless of race, color, faith, national origin, or income, in the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA defines fair treatment to mean no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. Executive Order 29 (issued by Governor Northam on January 22, 2019) uses the same definition and established the Virginia Council on Environmental Justice (VCEJ).

DEQ requested that the applicant conduct an environmental justice review. The applicant submitted a supplement to the application dated 9/17/2020 with this review. To help identify potential impacts on minority and low-income populations, the applicant used both desk-top information, such as census data obtained from the Environmental Protection Agency's environmental justice screening and mapping tool, "EJSCREEN" and field studies to confirm the results. The applicant's review concludes that a low-income community exists within the 1-mile radius, and the potential exists for a community of color within a very small area at the edge of the 1-mile radius. EJSCREEN's demographic index is a block group which exceeds 50 percent minority population and/or exceeds 50 percent population whose household income is below twice the federally defined poverty threshold.

The review describes the applicant's community engagement efforts to enhance meaningful involvement by environmental justice community members. Further, the review provides an evaluation of impacts from the proposed Station, and concludes that no environmental justice community bears a disproportionate share of any such impacts. Impacts analyzed include: air emissions and health impacts, cumulative exposures from other sources of pollution, cultural and historic resources, noise, dust, traffic and emergency services, safety, and other perceived impacts based on comments from community members during outreach.

DEQ has taken several actions in pursuit of the environmental justice principles of fair treatment and meaningful involvement.

Land & Heritage Consulting Study

The applicant also contracted with a third party consulting agency to supplement and expand upon its environmental justice review.

Meaningful Involvement

Using broader definitions than those in VEJA, Land & Heritage Consulting identified multiple communities throughout Pittsylvania County who meet the criteria for designation as Environmental Justice communities were identified. The study indicated limitations such as travel, pandemic confines and community protests (e.g., social issues on a national level) having an impact on the time spent "ground-truthing" the study. The review indicated having the following goals: (1) identify potential environmental justice communities and ways in which they anticipate impact; and (2) identify potential actions community members believe could be taken to ensure fair treatment and meaningful involvement in the impact and outcome of the proposed Station".[14] The community impact assessment lasted from May 2020 through August

[14] Land & Heritage Consulting, LLC, "Community Impact Assessment of Lambert Compressor Station", Appendix A, MVP

of 2020.

The review involved a desktop geospatial analysis that spanned a 10 mile radius, followed by an outreach/interview approach to increase available participants. The report covered topics such as: geographical context, methods of parameter and scope (census tracts, analysis criteria), cultural community identification, techniques and approaches to spatial data analysis, community interview collection, results, conclusion and recommendations.

Disproportionate Impact
The study states that, based on expanded environmental justice definitions, all census tracts within a 10-mile radius were considered environmental justice communities. It suggests that planning and siting activities require special consideration towards the needs and concerns of the communities in these areas. Most of the respondents were not familiar with the proposed Station, but those who were expressed comfort with the proposed location, citing its proximity to another existing compressor station and appreciated the applicant's use of existing corridors and already impacted landscapes. Other respondents focused on issues such as discovery of sensitive artifacts or remains, landscape issues, and expressed discomfort with the proposed pipeline, having concerns about the risk of further degradation of community health, as well as ecosystem and water quality associated with the project.

Respondents expressed some level of discomfort, distrust or skepticism about the parent company, MVP. The distrust was lower among both Indigenous and non-Indigenous respondents who currently worked in fields related to construction, engineering, or transportation. In an attempt to reach all communities, at the time of this review, a response was not received from an African-American community of "Freedmen" descendants dispersed throughout Chatham and the broader census tracts approximately 14 miles south of the proposed Station.

The report summarized replies according to Indigenous and non-Indigenous community respondents from the 10-mile radius. The areas of concern for non-Indigenous respondents were categorized as: 1) Critical Service Provision, 2) Safety & Policing, and 3) Recreation, Landscape and Way of Life Preservation. The areas of concern from Indigenous respondents were classified as: 1) Landscape, Artifacts, and Sense of Place, 2) Identity, Livelihood & Sense of Community, 3) Language & Governance, and 4) Spirituality, Ceremony & Traditional Knowledge. For more details regarding the responses, refer to Appendix A of the supplement to the application received 9/16/2020.

VIII. Compliance Demonstration

Turbines (CT-01, CT-02)
For proper operation of the SCR system, the permit requires monitoring of the turbine inlet air temperature, ammonia injection rate, catalyst bed inlet gas temperature, pilot operating point, turbine load, and catalyst bed differential pressure. For the oxidation catalyst system, the permit requires monitoring of catalyst bed inlet temperature and catalyst bed differential pressure.

supplemental application, September 2020.

The applicant must develop a monitoring plan for the turbine monitoring parameters. The turbines must also be tested bi-annually for CO, PM_{10}, $PM_{2.5}$ and VOC. The time between bi-annual tests must not exceed 26 calendar months. The applicant is required to validate the monitoring ranges during each performance test. Continuous emission monitoring system (CEMS) will be used to demonstrate NO_X emissions. Performance evaluations of the CEMS shall be conducted in accordance with 40 CFR Part 60, Appendix B, and take place during the performance test or within 30 days thereafter. The inlet filters will be maintained in accordance with the manufacturer's recommendations.

The VGRS allows for 'pressurized hold' by maintaining a seal gas pressure sufficiently higher than the compressor case pressure. A test to determine the appropriate range for each turbine is required using Method 21 or an optical gas imaging camera to ensure no leakage. Records of the daily AVO and quarterly LDAR surveys are also required, as well as corrective actions taken.

Microturbines (MT-01 – MT-05)
The applicant must develop a monitoring plan for the microturbines' monitoring parameters. The microturbines are relatively small units, each having a heat input rating of 2.28 MMBtu/hr. The highest pollutant emission rate is NO_x a combined total of 0.4 tpy for all five units. Based on their small size and low emissions, an initial performance test is required to establish estimated emission limits. Continuing compliance will be demonstrated through visible emission observation, evaluations and recordkeeping

Other Records
Records of fuel combusted, venting events, and scheduled and unscheduled maintenance must be maintained for each unit. Records must also be maintained for exempt equipment in accordance with 9VAC5-80-1105A.4.

IX. Title V Review – 9VAC5 Chapter 80 Part II Article 1

After issuance of this permit, the facility does not have a PTE for any pollutant greater than the respective Title V major source threshold. The facility is not in a category required to obtain a Title V permit regardless of emission rate. Title V permitting does not apply.

X. Public Participation and Notifications

9VAC5-80-1170D states that prior to a decision of the board, minor NSR permit applications that have the potential for public interest concerning air quality, as determined by the board, shall be subject to a public comment period of at least 30 days. At the end of the public comment period, a public hearing shall be held according to 9VAC5-80-1170E.

§10.1-1307.01 B of the Air Pollution Control Board law requires that before granting a permit for a new fossil fuel fired compressor station facility used to transport natural gas if the Board finds that there is a locality particularly affected by such a permit. [15] Pittsylvania County has been determined to be a

[15]Code of Virginia: "locality particularly affected" means any locality that bears any identified disproportionate material air

locality particularly affected by the proposed facility because the locality bears an identified disproportionate material air quality impact that would not be experienced by other localities. For purposes of applicability of this regulation, DEQ is conservatively assuming that an increase in emissions greater than 1.0 $\mu g/m^3$ is considered an "identified disproportionate material air quality impact". The dispersion modeling results were compared to the NAAQS and SAAC and those comparisons demonstrate that the air quality impact of all pollutants is lower than the NAAQS and SAAC (see Section VII and Attachment 2).

The following steps will be taken regarding soliciting public comment and participation for the proposed facility:

- DEQ shall publish a public notice in the *Chatham Star-Tribune* to notify the public of an Informational Briefing on this proposed permit, at least 15 days prior to the date of the briefing. The public notice was published on ENTER DATE.
- DEQ shall hold an Informational Briefing on ENTER DATE to share information about the proposed permit.
- DEQ shall publish a public notice in the *Chatham Star-Tribune* to notify the public of a Public Hearing to be held at least 30 days after the publication date of the public notice. In addition, the notice will include a notification of a public comment period to start on the date of the publication and ending no earlier than 30 days after the Public Hearing. The public notice was published on ENTER DATE, the Public Hearing was held on ENTER DATE and the public comment period ended on ENTER DATE.
- DEQ shall post such copies of these notices on the agency's website and social media accounts and will send copies to local civic groups, churches, schools, and libraries including the following: tribal communities, medical centers, chief elected officials of Chatham and Pittsylvania County government, chief administrative officer of Pittsylvania County, Pittsylvania County administrators, local planning commission, regional planning district commission, and Pittsylvania County district representatives from the Virginia General Assembly.
- The applicant shall publish a notice in the *Chatham Star-Tribune* at least 60 days prior to the close of any public comment period. Copies of the notice shall also be sent to: the chief elected official of, chief administrative officer of, and planning district commission for Pittsylvania County; every public library and public school located within five miles of the Station; and the owner of each parcel of real property that is depicted as adjacent to the facility on the current real estate tax assessment maps of the locality. The public notice was published on ENTER DATE.

Public comments will be reviewed and responded to by DEQ, a copy of those comments and responses will be included in Attachment 4.

XI. Other Considerations

None.

XII. Recommendations

Approval of the draft permit is recommended.

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quality impact that would not be experienced by other localities (§ 10.1-1307.01).

Attachments

- Attachment 1 – Frequently Used Permitting Terms
- Attachment 2 – Air Quality Modeling Memorandum
- Attachment 3 – DEQ EJ SCREEN Report
- Attachment 4 – Responses to Public Comments

ATTACHMENTS

Frequently Used Terms

@15% O_2 – A notation indicating that the concentration is mathematically corrected from the actual stack conditions to a comparable set of conditions. This prevents a source from adding additional ambient air just prior to the testing instrumentation to dilute the concentration of the pollutant being measured. This is not an issue with a mass emission rate since dilution does not change the mass of the pollutant emitted. The pound per million (ppm) limitations for Station 165 are corrected to 15% O_2.

Blowdown – A venting event where piping at the facility must be emptied of natural gas; a site-wide blowdown is when all piping at the facility must be emptied.

Catalyst – A substance that changes the reaction speed but does not participate in the reaction.

CO – Carbon monoxide, a pollutant with a NAAQS.

Fugitive – Describes a type of emissions that occur but cannot be reasonably collected.

CO_2e – "Carbon dioxide equivalent", a term to describe different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2e signifies the amount of CO2 which would have the equivalent global warming impact.

GHG – "Greenhouse gas", gases consisting of carbon dioxide, methane, nitrous oxide and fluorinated compounds that trap heat in the atmosphere. The proposed Titan 130 combustion turbines will emit CO_2, CH_4, and N_2O.

ISO conditions – Properties of a gas change based on the gas temperature and pressure exerted on the gas. In order to have a meaningful discussion regarding any gases, these variables must be defined. While several methods exist to define these variables, the International Organization for Standardization (ISO) defines the conditions as 59°F and 14.7 pounds per square inch (psi).

LDAR – Leak Detection and Repair – usually refers to a program a source uses to monitor various pieces of equipment at a facility that may be prone to leaking and fix leaks as detected

MACT – Maximum Achievable Control Technology; federal regulations for certain types of equipment; used in this analysis to refer to such standards promulgated in 40 CFR Part 63, which are technology based.

MMBtu – Million British thermal units – a measure of energy

NAAQS – National Ambient Air Quality Standard; a federal standard for the maximum concentration of a certain air pollutant in the ambient air in the country that is protective of human health. CO, O_3, NO_2, PM_{10}, $PM_{2.5}$, SO_2, and lead are the pollutants with NAAQS.

NESHAPS – National Emission Standards for Hazardous Air Pollutants; federal regulations for certain types of equipment; used in this analysis to refer to such standards promulgated

in 40 CFR Part 61, which are risk based.

NO_X – Nitrogen oxides or oxides of nitrogen – a surrogate for the amount of NO_2 (a pollutant with a NAAQS) being emitted; a pollutant that forms ozone when the atmosphere has favorable conditions (hot and dry with enough VOC).

NSPS – New Source Performance Standard; federal regulations for certain types of equipment.

Open flare – A stack-like device with a continuous flame at the tip, such that when a flammable gas flows, the 'pilot flame' ignites the gas prior to exiting the flare stack; also described as a candlestick flare for its similarity in appearance to a large candle.

Pigging – The method of removing liquids from the piping; liquids can be generated due to the high pressure of the gas causing some components to condense in the piping. No pigging operations are performed at this site.

PM – Particulate matter of a certain size that only includes the portion that can be filtered when emitted.

PM_{10} and $PM_{2.5}$ – Particulate matter of a certain size that includes both the portion that can be filtered when emitted and the portion that is a gas when emitted and later condenses; both pollutants have a NAAQS.

pph, lb/hr – pound per hour – a short-term mass emission rate

ppm – parts per million – A concentration that can be converted to a mass emission rate.

ppmvd – parts per million, volumetric dry.

PSD – Prevention of Significant Deterioration; a pre-construction permitting program that applies to large sources.

PTE – potential to emit – the maximum ability of a source to emit pollutants considering permit limitations

Stoichiometric – Chemical reactions rely on the correct amount of each chemical. The ideal amount of each chemical is the 'stoichiometric' amount or ratio.

TPY, tpy, ton/yr – ton per year – a long-term mass emission rate

Vent Gas Reduction System (VGRS) – A system, including an electrically-driven compressor, which reduces the amount of natural gas released to the atmosphere during combustion turbine shutdowns by maintain sufficient pressure to ensure that the compressor seal remains intact during combustion turbine shutdowns.

VOC – Volatile Organic Compounds – A group of chemicals that form ozone when the atmosphere has favorable conditions (hot and dry with enough NO_X).

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Office of Air Quality Assessments

1111 East Main Street, Richmond, VA 23219
22nd Floor **804/698-4000**

To: Paul Jenkins, Air Permit Manager (BRRO)

From: Office of Air Quality Assessments (AQA)

Date: July 9, 2020

Subject: Air Quality Analysis – MVP Southgate Lambert Compressor Station

I. Project Background

Mountain Valley Pipeline, LLC (MVP) is proposing to construct and operate the MVP Southgate Lambert Compressor Station (LCS) in Pittsylvania County, Virginia, near the town of Chatham. The proposed facility will consist of two natural gas-driven turbines, one Solar Taurus 70 compressor turbine (11,146 horsepower (hp)) and one Solar Mars 100 compressor turbine (16,610 hp), five Capstone microturbines rated at 200 kilowatts each, one 0.77 MMBtu/hr natural gas-fired heater, two 10,000 gallon produced fluid tanks, gas filter/separators, gas coolers, inlet air filters, exhaust silencers, and blowdown silencers.

The proposed LCS meets the definition of minor source under 9 VAC 5 Chapter 80, Article 6 (Permits for New and Modified Stationary Sources) of the Commonwealth of Virginia Regulations for the Control and Abatement of Air Pollution. The DEQ required an air quality analysis in order to assess the potential impacts to ambient air quality. Modeling was conducted for nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter having an aerodynamic diameter equal to or less than 2.5 microns ($PM_{2.5}$), and particulate matter having an aerodynamic diameter equal to or less than 10 microns (PM_{10}).

Toxics modeling was also conducted for hourly and annual formaldehyde and hexane emissions to demonstrate compliance with their respective Significant Ambient Air Concentrations (SAAC) as defined in 9 VAC 5 Chapter 60, Article 5 (Emission Standards for Toxic Pollutants from New and Modified Sources) of the Commonwealth of Virginia Regulations for the Control and Abatement of Air Pollution (9VAC5-60-300 et al).

II. Modeling Methodology

The air quality modeling analysis conforms to 40 CFR Part 51, Appendix W - Guideline on Air Quality Models and was performed in accordance with approved modeling methodology. The air quality model used for the analyses was AERMOD (Version 19191). AERMOD is the preferred EPA-approved regulatory model for near-field applications.

Additional details on the modeling methodology are available in the applicant's June 2020 air quality dispersion modeling report.

III. Modeling Results

A. NAAQS Analysis

A cumulative modeling analysis was conducted to assess compliance with the National Ambient Air Quality Standards (NAAQS) for the pollutants and averaging periods listed in Table 1. The NAAQS analysis included emissions from the proposed facility, emissions from existing sources from Virginia, and representative ambient background concentrations. The ambient background concentrations in Table 1 have been updated to the most recent design values (2017-2019). The results of the NAAQS analysis are presented in Table 1 and demonstrate modeled compliance with the applicable NAAQS.

Table 1
NAAQS Modeling - Cumulative Impact Results

Pollutant	Averaging Period	Total Modeled Concentration ($\mu g/m^3$)	Ambient Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
NO_2	1-hour	178.8	--(1)	178.8	188
NO_2	Annual	21.8	13.2	35.0	100
CO	1-hour	2,151	1,955	4,106	40,000
CO	8-hour	1,106	1,495	2,601	10,000
$PM_{2.5}$	24-hour	5.8	17	23.0(2)	35
$PM_{2.5}$	Annual	1.0	6.9	7.9(2)	12
PM_{10}	24-hour	9.1	22	31.1	150

(1) Season and hour of day varying.
(2) Total concentration includes the contribution from secondary $PM_{2.5}$ formation.

A source contribution analysis of the maximum 1-hour NO2 total concentration of 178.8 µg/m3 from the NAAQS analysis is provided in Table 2. The table clearly illustrates that the contribution from the proposed LCS to this concentration is relatively small when compared to the adjacent Transco Compressor Station 165. DEQ has required that Transco Station 165 install and operate an NO2 ambient

monitor as close as possible to the maximum modeled impact in order to ensure continuing compliance with the 1-hour NO2 NAAQS. This requirement is detailed in Condition 49 of the NSR permit issued to Transco Station 165 on January 28, 2020.

Table 2
Source Contribution Analysis - Maximum 1-Hour NO_2 Concentration

Contributing Source	Concentration ($\mu g/m^3$)
Transco Compressor Station 165	116.85
Lambert Compressor Station	1.04
Other Modeling Inventory Sources	0.04
Background Air Quality	60.86
Total Concentration	**178.8**

Additionally, Table 3 presents the maximum modeled design concentrations from the proposed LCS sources only at any location within the modeling domain. As shown in the table, the LCS has a relatively small overall impact relative to the NAAQS and the total modeled concentrations presented in Table 1.

Table 3
NAAQS Modeling – Lambert Compressor Station Sources Only Impact Results

Pollutant	Averaging Period	Modeled Design Concentration - LCS Sources Only(1) ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	% of NAAQS
NO_2	1-hour	17.48	188	9.3
NO_2	Annual	1.36	100	1.4
CO	1-hour	156.37	40,000	0.4
CO	8-hour	47.74	10,000	0.5
$PM_{2.5}$	24-hour	0.79(2)	35	2.3
$PM_{2.5}$	Annual	0.14(2)	12	1.2
PM_{10}	24-hour	1.27	150	0.8

(1) Design concentrations are based on model output in the form of the NAAQS from the LCS sources only.
(2) Includes the contribution from secondary $PM_{2.5}$ formation from the LCS sources only.

B. Toxics Analysis

The proposed facility is subject to the state toxics regulations at 9VAC5-60-300 et al. An analysis was conducted in accordance with the regulations and the predicted concentrations

for each modeled toxic pollutant were below their respective SAAC. Table 4 summarizes the toxic pollutant modeling analysis results.

Table 4
Toxics Analysis Maximum Predicted Concentrations

Toxic Pollutant	Averaging Period	Scenario	Modeled Concentration ($\mu g/m^3$)	SAAC ($\mu g/m^3$)
Formaldehyde	1-hour	50% Load	2.8	62.5
Formaldehyde	1-hour	75% Load	2.8	62.5
Formaldehyde	1-hour	100% Load	2.8	62.5
Formaldehyde	1-hour	Startup (blended with 50% load)	11.2	62.5
Formaldehyde	1-hour	Shutdown (blended with 50% load)	8.6	62.5
Formaldehyde	Annual	50% Load	0.050	2.4
Formaldehyde	Annual	75% Load	0.050	2.4
Formaldehyde	Annual	100% Load	0.050	2.4
Hexane	1-hour	Unit Blowdown (with Pigging)	1,298	8,800
Hexane	1-hour	Emergency Shutdown(1) (with Pigging)	5,435	8,800
Hexane	Annual	Unit Blowdown (with Pigging)	0.276	352
Hexane	Annual	Emergency Shutdown(1) (with Pigging)	0.228	352

(1) The emergency shutdown scenario reflects an actual emergency scenario. These testing events are capped to limit the amount of gas released into the atmosphere. Even though emergency conditions are not typically required to be modeled, these data are provided as part of the analysis for informational purposes only.

C. Other Modeling Considerations

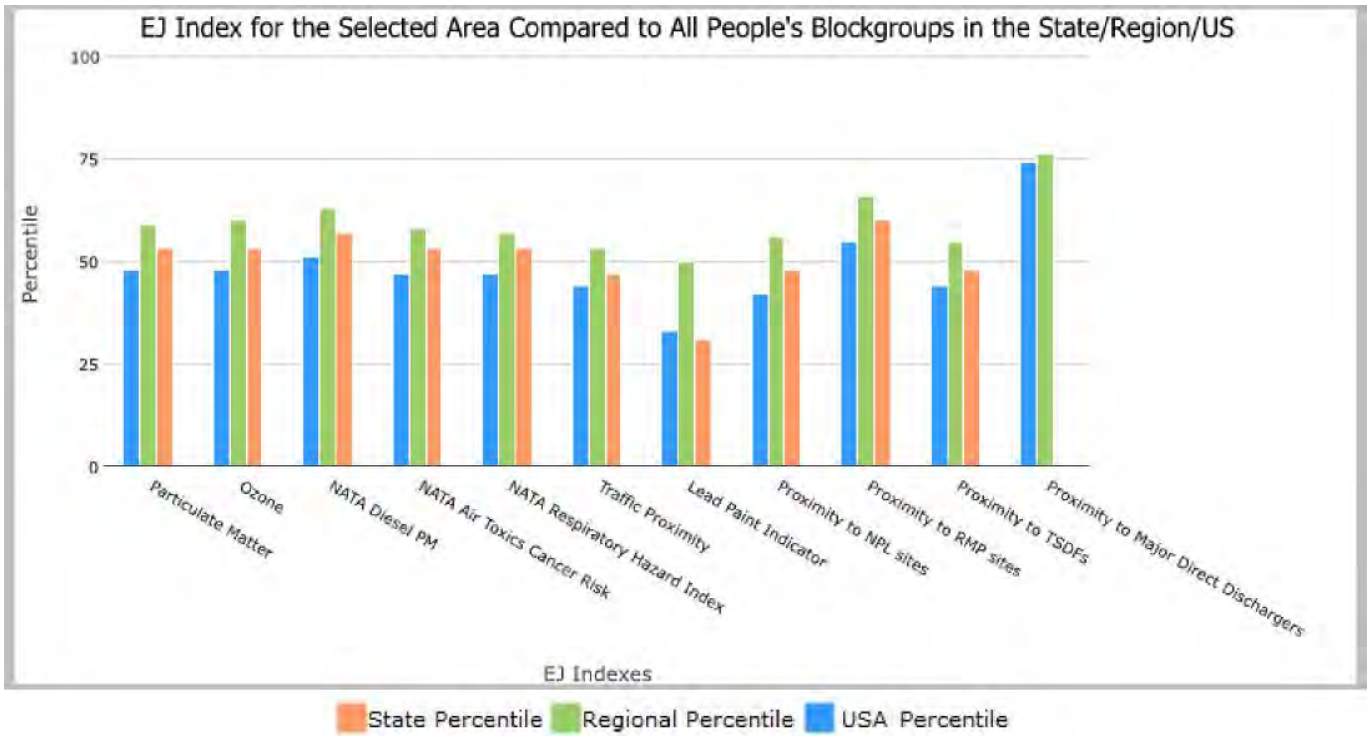
Ozone

An assessment to estimate the impact on ozone from the proposed facility's NO_X and VOC emissions was conducted. The conservatively calculated impact was approximately 0.05 parts per billion (ppb) of ozone. The monitored ozone design value for the area is approximately 59 ppb for the period 2017 through 2019. This results in a total design value equal to 59.05 ppb which is well below the 8-hour ozone NAAQS of 70 ppb.

EJSCREEN Report (Version 2019)

1 miles Ring Centered at 36.832436,-79.336099, VIRGINIA, EPA Region 3
Approximate Population: 49
Input Area (sq. miles): 3.14
Lambert Station

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	53	59	48
EJ Index for Ozone	53	60	48
EJ Index for NATA* Diesel PM	57	63	51
EJ Index for NATA* Air Toxics Cancer Risk	53	58	47
EJ Index for NATA* Respiratory Hazard Index	53	57	47
EJ Index for Traffic Proximity and Volume	47	53	44
EJ Index for Lead Paint Indicator	31	50	33
EJ Index for Superfund Proximity	48	56	42
EJ Index for RMP Proximity	60	66	55
EJ Index for Hazardous Waste Proximity	48	55	44
EJ Index for Wastewater Discharge Indicator	N/A	76	74

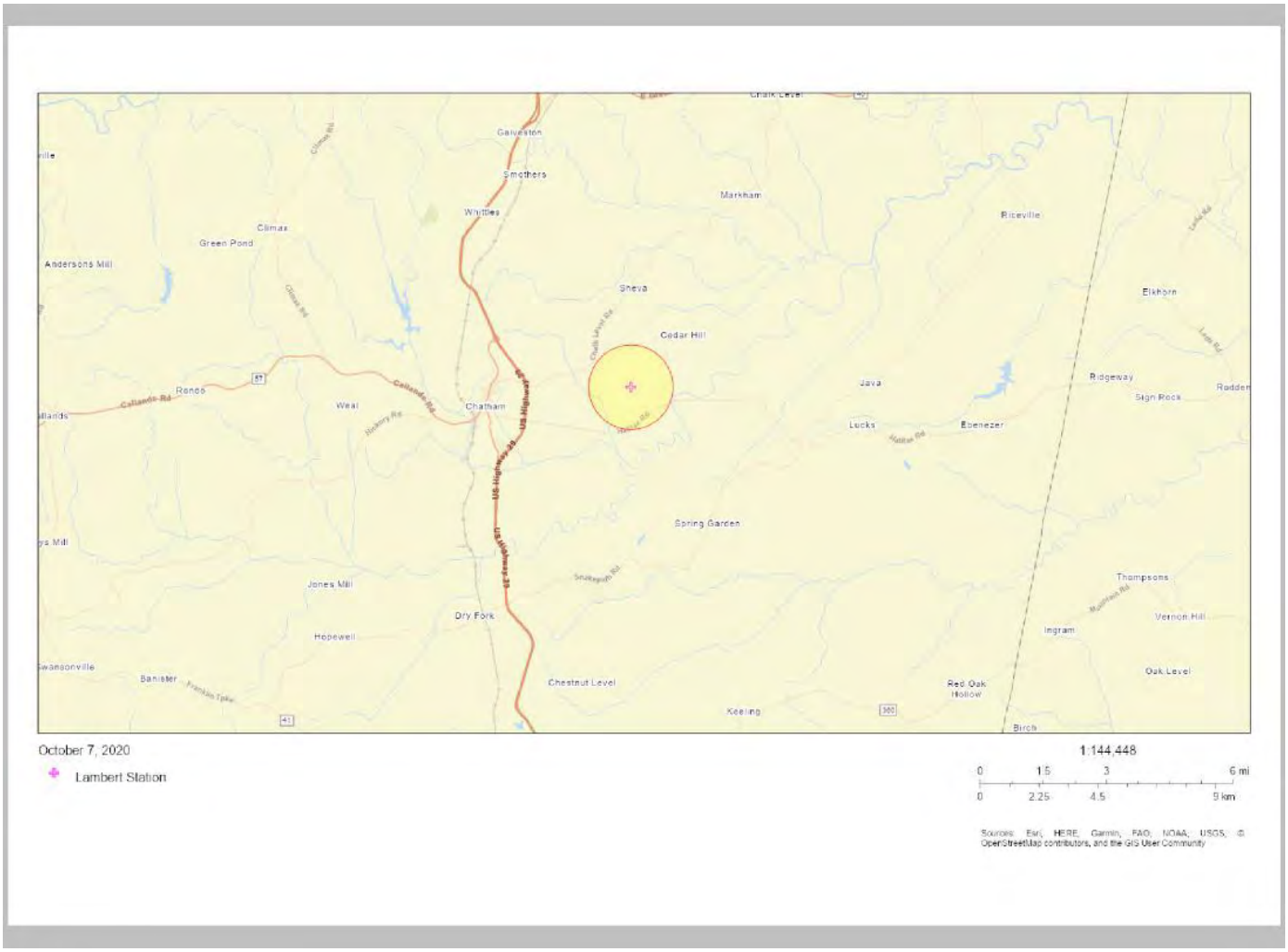


This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJSCREEN Report (Version 2019)

1 miles Ring Centered at 36.832436,-79.336099, VIRGINIA, EPA Region 3

Approximate Population: 49
Input Area (sq. miles): 3.14
Lambert Station



Sites reporting to EPA

Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJSCREEN Report (Version 2019)

1 miles Ring Centered at 36.832436,-79.336099, VIRGINIA, EPA Region 3

Approximate Population: 49
Input Area (sq. miles): 3.14
Lambert Station

Selected Variables	Value	State Avg.	%ile in State	EPA Region	%ile in EP	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m³)	8.05	7.79	64	8.64	29	8.3	40
Ozone (ppb)	41.2	42.5	33	44.9	11	43	35
NATA* Diesel PM (µg/m³)	0.174	0.425	11	0.477	<50th	0.479	<50th
NATA* Cancer Risk (lifetime risk per million)	30	31	43	31	<50th	32	<50th
NATA* Respiratory Hazard Index	0.39	0.41	41	0.4	<50th	0.44	<50th
Traffic Proximity and Volume (daily traffic count/distance to	53	570	30	640	25	750	25
Lead Paint Indicator (% Pre-1960 Housing)	0.24	0.21	68	0.36	46	0.28	56
Superfund Proximity (site count/km distance)	0.055	0.11	44	0.15	34	0.13	45
RMP Proximity (facility count/km distance)	0.041	0.38	2	0.62	2	0.74	3
Hazardous Waste Proximity (facility count/km distance)	0.23	0.66	47	1.3	34	4	38
Wastewater Discharge Indicator (toxicity-weighted concentration/m distance)	0	0.8	N/A	30	22	14	37
Demographic Indicators							
Demographic Index	28%	32%	49	30%	57	36%	46
Minority Population	22%	27%	34	32%	50	39%	41
Low Income Population	33%	26%	67	28%	66	33%	56
Linguistically Isolated Population	4%	3%	76	3%	78	4%	66
Population With Less Than High School Education	3%	11%	22	11%	20	13%	19
Population Under 5 years of age	3%	6%	25	6%	26	6%	24
Population over 64 years of age	25%	14%	88	16%	87	15%	88

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice

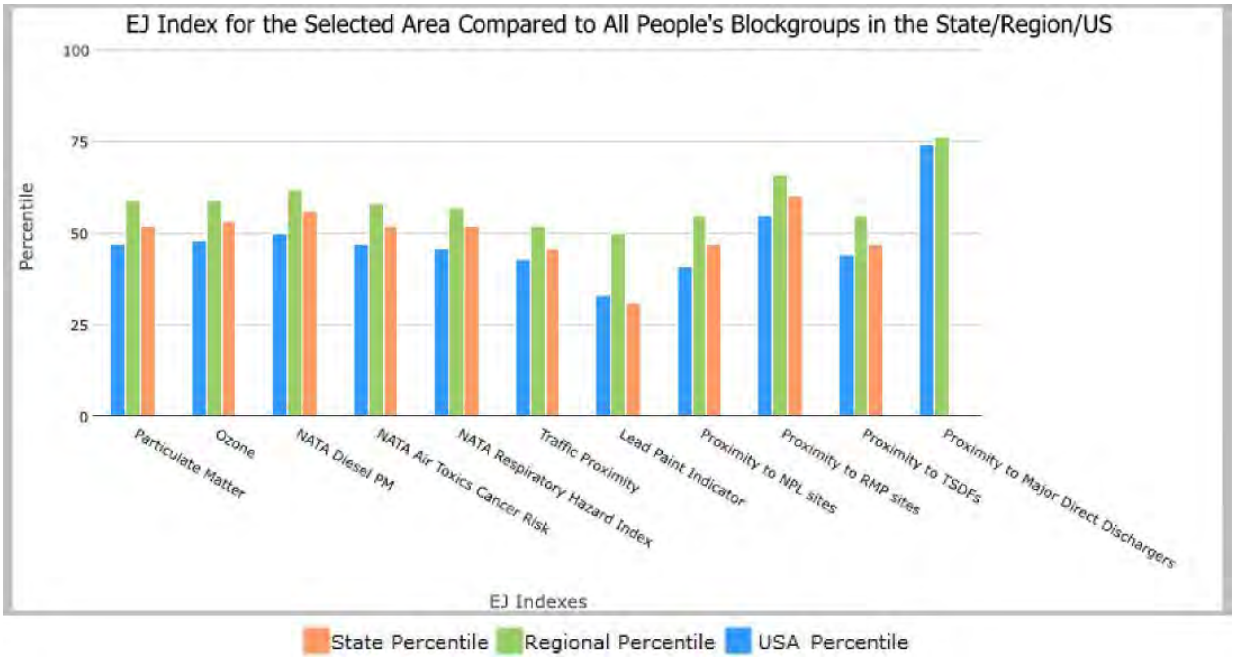
EJSCREEN Report (Version 2019)

2 miles Ring Centered at 36.832436,-79.336099, VIRGINIA, EPA Region 3

Approximate Population: 481

Input Area (sq. miles): 12.56
Lambert Station

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ			
EJ Index for PM2.5	52	59	47
EJ Index for Ozone	53	59	48
EJ Index for NATA* Diesel PM	56	62	50
EJ Index for NATA* Air Toxics Cancer Risk	52	58	47
EJ Index for NATA* Respiratory Hazard Index	52	57	46
EJ Index for Traffic Proximity and Volume	46	52	43
EJ Index for Lead Paint Indicator	31	50	33
EJ Index for Superfund Proximity	47	55	41
EJ Index for RMP Proximity	60	66	55
EJ Index for Hazardous Waste Proximity	47	55	44
EJ Index for Wastewater Discharge Indicator	N/A	76	74



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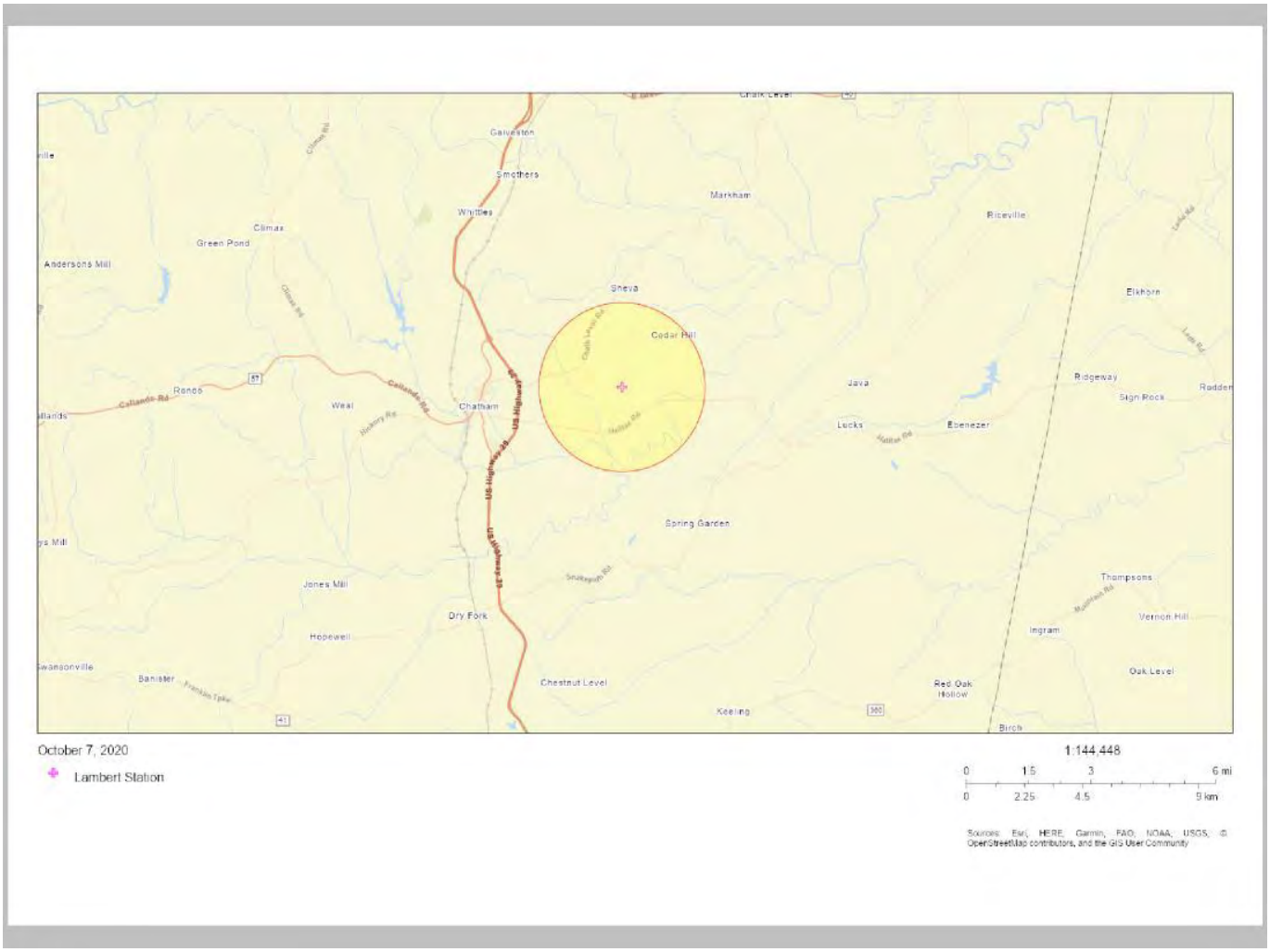
EJSCREEN Report (Version 2019)

2 miles Ring Centered at 36.832436,-79.336099, VIRGINIA, EPA Region 3

Approximate Population: 481
Input Area (sq. miles): 12.56
Lambert Station



Sites reporting to EPA

Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJSCREEN Report (Version 2019)

2 miles Ring Centered at 36.832436,-79.336099, VIRGINIA, EPA Region 3

Approximate Population: 481

Input Area (sq. miles): 12.56

Lambert Station

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m³)	8.05	7.79	64	8.64	29	8.3	40
Ozone (ppb)	41.2	42.5	33	44.9	11	43	35
NATA* Diesel PM (µg/m³)	0.173	0.425	11	0.477	<50th	0.479	<50th
NATA* Cancer Risk (lifetime risk per million)	30	31	43	31	<50th	32	<50th
NATA* Respiratory Hazard Index	0.39	0.41	40	0.4	<50th	0.44	<50th
Traffic Proximity and Volume (daily traffic count/distance to	53	570	30	640	25	750	25
Lead Paint Indicator (% Pre-1960 Housing)	0.24	0.21	68	0.36	46	0.28	56
Superfund Proximity (site count/km distance)	0.057	0.11	46	0.15	35	0.13	46
RMP Proximity (facility count/km distance)	0.042	0.38	3	0.62	2	0.74	3
Hazardous Waste Proximity (facility count/km distance)	0.23	0.66	47	1.3	34	4	38
Wastewater Discharge Indicator (toxicity-weighted concentration/m distance)	0	0.8	N/A	30	22	14	37
Demographic Indicators							
Demographic Index	27%	32%	49	30%	57	36%	45
Minority Population	22%	37%	33	32%	49	39%	40
Low Income Population	33%	26%	67	28%	66	33%	56
Linguistically Isolated Population	3%	3%	75	3%	77	4%	65
Population With Less Than High School Education	4%	11%	26	11%	25	13%	23
Population Under 5 years of age	4%	6%	25	6%	27	6%	25
Population over 64 years of age	24%	14%	88	16%	86	15%	88

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

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United States Environmental Protection Agency

EJSCREEN Report (Version 2019)

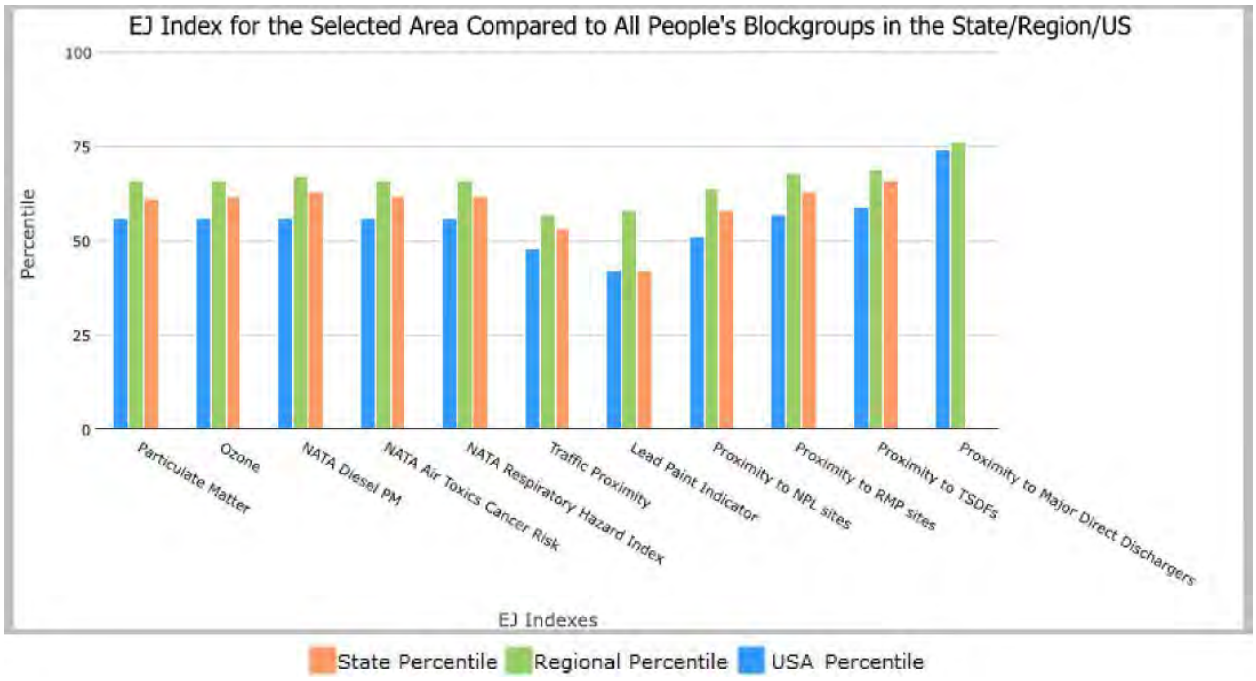
5 miles Ring Centered at 36.832436,-79.336099, VIRGINIA, EPA Region 3

Approximate Population: 4,323

Input Area (sq. miles): 78.53

Lambert Station

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	61	66	56
EJ Index for Ozone	62	66	56
EJ Index for NATA* Diesel PM	63	67	56
EJ Index for NATA* Air Toxics Cancer Risk	62	66	56
EJ Index for NATA* Respiratory Hazard Index	62	66	56
EJ Index for Traffic Proximity and Volume	53	57	48
EJ Index for Lead Paint Indicator	42	58	42
EJ Index for Superfund Proximity	58	64	51
EJ Index for RMP Proximity	63	68	57
EJ Index for Hazardous Waste Proximity	66	69	59
EJ Index for Wastewater Discharge Indicator	N/A	76	74



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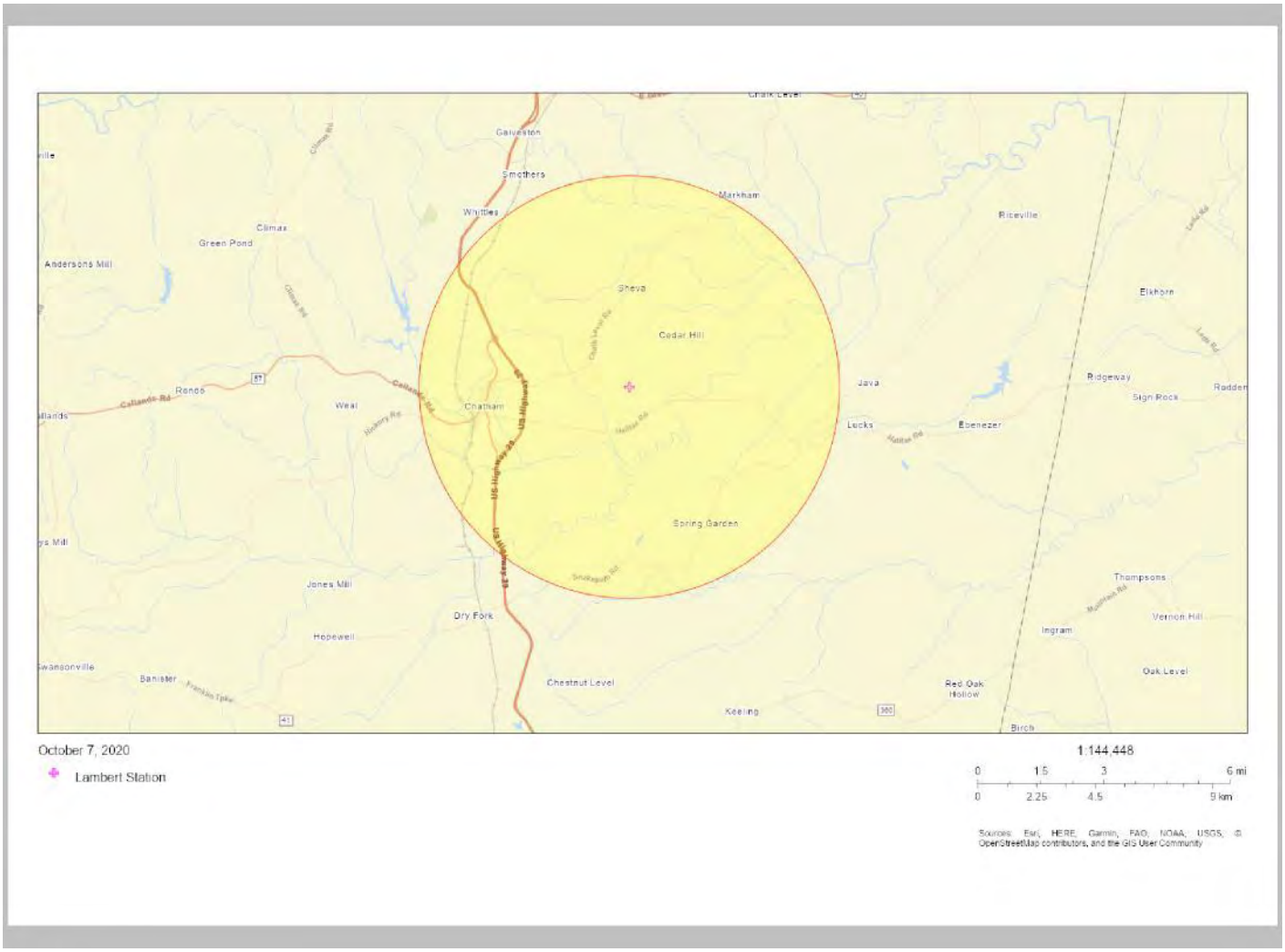
EJSCREEN Report (Version 2019)

5 miles Ring Centered at 36.832436,-79.336099, VIRGINIA, EPA Region 3

Approximate Population: 4,323
Input Area (sq. miles): 78.53
Lambert Station



Sites reporting to EPA

Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJSCREEN Report (Version 2019)

5 miles Ring Centered at 36.832436,-79.336099, VIRGINIA, EPA Region 3

Approximate Population: 4,323

Input Area (sq. miles): 78.53

Lambert Station

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m³)	8.06	7.79	65	8.64	29	8.3	40
Ozone (ppb)	41.2	42.5	32	44.9	10	43	34
NATA* Diesel PM (µg/m³)	0.167	0.425	10	0.477	<50th	0.479	<50th
NATA* Cancer Risk (lifetime risk per million)	30	31	43	31	<50th	32	<50th
NATA* Respiratory Hazard Index	0.39	0.41	40	0.4	<50th	0.44	<50th
Traffic Proximity and Volume (daily traffic count/distance to	52	570	29	640	25	750	25
Lead Paint Indicator (% Pre-1960 Housing)	0.39	0.21	82	0.36	62	0.28	69
Superfund Proximity (site count/km distance)	0.058	0.11	47	0.15	37	0.13	47
RMP Proximity (facility count/km distance)	0.044	0.38	3	0.62	2	0.74	3
Hazardous Waste Proximity (facility count/km distance)	0.25	0.66	50	1.3	37	4	40
Wastewater Discharge Indicator (toxicity-weighted concentration/m distance)	0	0.8	N/A	30	22	14	37
Demographic Indicators							
Demographic Index	33%	32%	59	30%	64	36%	54
Minority Population	30%	37%	46	32%	59	39%	50
Low Income Population	35%	26%	69	28%	68	33%	58
Linguistically Isolated Population	2%	3%	65	3%	68	4%	55
Population With Less Than High School Education	13%	11%	67	11%	69	13%	62
Population Under 5 years of age	4%	6%	25	6%	28	6%	25
Population over 64 years of age	21%	14%	79	16%	76	15%	80

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Response to Public Comments