

Equitrans Expansion Project

# Docket No. PF15-22

**Resource Report 9 – Air Quality and Noise** 

Draft

July 2015

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# Equitrans Expansion Project Draft Resource Report 9 – Air Quality and Noise

	Resource Report 9 Filing Requirements				
	Information	Location in Resource Report			
Mi	nimum 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 9.1.2.2			
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:				
	<ul> <li>Report existing noise levels as the L<sub>eq</sub> (day), L<sub>eq</sub> (night), and L<sub>dn</sub> and include the basis for the data or estimates.</li> </ul>				
	<ul> <li>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.</li> </ul>	Section 9.2.3 and Appendix A			
	<ul> <li>For proposed new compressor station sites, measure or estimate the existing ambient sound environment based on current land uses and activities.</li> </ul>				
	<ul> <li>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)(i-iv))</li> </ul>				
3.	Estimate the impact of the project on air quality, including how existing regulatory standards would be met.				
	• 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.	Will be provided in the final version of			
	<ul> <li>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)(2)(i-ii))</li> </ul>	Resource Report 9			
4.	Provide a quantitative estimate of the impact of the project on noise levels at noise- sensitive areas, such as schools, hospitals, or residences.				
	<ul> <li>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.</li> </ul>				
	<ul> <li>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.</li> </ul>	final version of Resource Report 9			



Resource Report 9 Filing Requirements				
Information	Location in Resource Report			
<ul> <li>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.</li> </ul>				
<ul> <li>If specific noise control equipment has not been chosen, include a schedule for submitting the data prior to certification.</li> </ul>				
<ul> <li>The estimate must demonstrate that the project will comply with applicable noise regulations and show how the facility will meet the following requirements:</li> </ul>				
<ul> <li>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).</li> </ul>				
<ul> <li>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)(i-v))</li> </ul>				
<ol> <li>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))</li> </ol>	Will be provided in the final version of Resource Report 9			

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#### DRAFT RESOURCE REPORT 9 AIR QUALITY AND NOISE

#### LIST OF ACRONYMS AND ABBREVIATIONS

BAT	Best Available Technology
bbl	barrel
CFR	Code of Federal Regulations
CO	carbon monoxide
CO <sub>2</sub> e	carbon dioxide equivalent
CSR	Code of State Rules
dB	decibel
dBA	"A-weighted" decibel
Dscfm	dry standard cubic feet per minute
Equitrans	Equitrans, L.P.
FERC	Federal Energy Regulatory Commission
GHG	Greenhouse gas
gr/dscf	grains per dry standard cubic foot
HAP	hazardous air pollutant
HDD	horizontal directional drilling
Hz	hertz
km	kilometer
L <sub>dn</sub>	day-night average (or time-weighted) sound level
L <sub>eq</sub>	equivalent sound level
MACT	Maximum Achievable Control Technology
MMBtu/hr	Million British thermal unit per hour
MRR	Greenhouse Gas Mandatory Reporting Rule
MVP	Mountain Valley Pipeline
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emissions Standards for Hazardous Air Pollutants
$NO_2$	nitrogen dioxide
NO <sub>x</sub>	nitrogen oxides
NNSR	Nonattainment New Source Review
NSA	Noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
OTR	Ozone Transport Region
PADEP	Pennsylvania Department of Environmental Protection
PM <sub>2.5</sub>	Particulate matter, less than or equal to 2.5 micrometer ( $\mu$ m)
$PM_{10}$	Particulate matter, less than or equal to $10 \ \mu m$
ppb	parts per billion
ppm	parts per million
ppmvd	parts per million volumetric dry
Project	Equitrans Expansion Project
PSD	Prevention of Significant Deterioration

- RACT Reasonably Available Control Technology
- SIP State Implementation Plan(s)
- SO<sub>2</sub> sulfur dioxide
- TEG tri-ethylene glycol
- tpy tons per year
- VOC volatile organic compounds

### RESOURCE REPORT 9 AIR QUALITY AND NOISE

#### INTRODUCTION

Equitrans, L.P. (Equitrans) 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 it to construct and operate the proposed Equitrans Expansion Project (Project), which is located in three counties in Pennsylvania and in one county in West Virginia. In addition, Equitrans is seeking authorization to abandon an existing compressor station (which will be replaced by a new compressor station) pursuant to Section 7(b) of the Natural Gas Act. Equitrans plans to construct approximately 7.4 miles of pipeline (at two separate locations), a new compressor station, an interconnect with the proposed Mountain Valley Pipeline (MVP), and ancillary facilities to provide timely, cost-effective access to the growing demand for natural gas for use by local distribution companies, industrial users, and power generation in northeastern, Mid-Atlantic, and southeastern markets, as well as potential markets in the Appalachian region.

The Project is designed to transport natural gas from the northern portion of the Equitrans system south to the interconnection with MVP, as well as to existing interconnects with Texas Eastern Transmission, LP and Dominion Transmission, Inc. The Project will provide shippers with the flexibility to transport additional natural gas produced in the central Appalachian Basin to meet the growing demand by local distribution companies, industrial users, and power generation facilities located in local, northeastern, Mid-Atlantic, and southeastern regions of the United States. The Project will also increase system reliability, efficiency, and operational flexibility for the benefit of all Equitrans' customers. The Project is designed to add up to 600,000 dekatherms per day of north-south firm capacity on the Equitrans system.

#### ENVIRONMENTAL RESOURCE REPORT ORGANIZATION

Resource Report 9 includes a 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 2002), issued August 2002. 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 9.1.2, a discussion of Project-related impacts in Section 9.1.3, an overview of the permitting requirements in Section 9.1.4, and a discussion of potential applicable regulations Section 9.2.2 describes existing noise sensitive areas, Section 9.2.3 identifies the existing in-air acoustic conditions, and Section 9.2.4 estimates the construction and operational noise impacts.

#### 9.1 AIR QUALITY

#### 9.1.1 Air Quality Overview

The proposed equipment at the Redhook Compressor Station is listed below:

- Two natural gas-fired reciprocating engines equipped with oxidation catalysts;
- Two natural gas-fired turbines;
- One tri-ethylene glycol (TEG) dehydration unit equipped with an associated reboiler and a thermal oxidizer;
- Five natural gas-fired Capstone C-200 microturbines;
- Two natural gas-fired fuel/start gas heaters;
- One 210 barrel (bbl) storage vessel;
- One 100 bbl storage vessel;
- Six 50 bbl storage vessels; and,
- Other equipment to be determined.

The scope of the Project covered in this resource report will involve the removal of the Pratt Compressor Station and the construction of the Redhook Compressor Station. In addition to the new compressor station, Equitrans plans to construct approximately 7.4 miles of pipeline, an interconnect with the proposed MVP, and ancillary facilities.

#### 9.1.2 **Project Air Quality Impacts**

Upon completion of the Project design, Equitrans will quantify the impact to ambient air quality due to the Project. Project environmental impacts are required to be addressed through avoidance, minimization, or offset through mitigation measures. Upon identifying these impacts, measures will be proposed to avoid, minimize, and/or mitigate any potential adverse impacts from noise and air emissions, or other potential environmental impacts. The impacts of the construction and operation of the Project on air quality are summarized in the following sections.

In addition to meeting requirements of FERC, Equitrans is required to obtain a number of other clearances and permits as will be set forth in Exhibit J to the application. Equitrans will comply with applicable permit requirements, so that the Redhook Compressor Station operates in a manner that protects human health and the environment. Equitrans will submit a Plan Approval application to the Pennsylvania Department of Environmental Protection (PADEP) for the Redhook Compressor Station. The PADEP will review this application and will issue the necessary permits in accordance with its rules and regulations. Construction will not commence on the Project until the Plan Approval has been issued.

#### 9.1.2.1 Climate

The Redhook Compressor Station is located in Greene County, Pennsylvania, which has a temperate climate. Table 9.1-1 summarizes a selection of climate parameters for Greene County.

Table 9.1-1						
		Climate Parameters	for Greene County			
MonitorCOOP IDApproximate Distance and Direction from Station/ TerminalAverage Daily Minimum Temperature – January (°F) a/Average Daily Maximum Temperature – July (°F) a/						
Waynesburg 1 E	WYNP1	2.4 miles SW	17.1	83.4	34.6	
Point Marion Lock 8         PMRP1         16.9 miles SE         19.0         84.2         41.8						
Source: Pennsylvania State Climatologist Website <u>a</u> / Calculated from average of data from 2012, 2013 and 2014						

 $\overline{b}$ / Daily precipitation calculated using: Daily Precipitation (in.) = Daily Rainfall (in.) + (Daily Snowfall (in.) /10)

c/ Data calculated from average annual precipitation of 2012, 2013 and 2014

#### 9.1.2.2 Existing Air Quality

Table 9.1-2 summarizes the National Ambient Air Quality Standards (NAAQS) that are currently in effect. Note that Pennsylvania also has State Ambient Air Quality Standards (SAAQS) for Beryllium, Fluorides, and Hydrogen Sulfide. Redhook Compressor Station is not expected to be a source of these pollutants and as such, the standards have not been presented. Any area that does not meet the NAAQS for the corresponding pollutant is known as a non-attainment area. The Redhook Compressor Station is located in Greene County, which is classified as in attainment with all NAAQS except for ozone and fine particulate matter (PM<sub>2.5</sub>). The Commonwealth of Pennsylvania is in the Ozone Transport Region (OTR), and therefore, the entire state is classified as moderate nonattainment for the 1997 and 2006 PM<sub>2.5</sub> NAAQS; all other portions of Greene County are designated as attainment with the annual and 24-hour PM<sub>2.5</sub> NAAQS. The Redhook Compressor Station is not located in Monongahela Township and is therefore located in a PM<sub>2.5</sub> attainment area.

Table 9.1-2						
Nat	National Ambient Air Quality Standards for Criteria Pollutants a					
Pollutant	Primary Standards	Averaging Times	Secondary Standards			
Carbon Manavida (CO)	9 ppm (10,000 µg/m <sup>3</sup> )	8-hour	None			
Carbon Monoxide (CO)	35 ppm (40,000 μg/m <sup>3</sup> )	1-hour	None			
Lead	0.15 μg/m³	Rolling 3-month Average	Same as Primary			
Nitragon Diovido (NO.)	53 ppb (100 μg/m³)	Annual (Arithmetic Mean)	Same as Primary			
Nitrogen Dioxide (NO2)	100 ppb (188 µg/m³)	1-hour	None			
Particulate Matter (PM10)	150 µg/m³	24-hour	Same as Primary			
Porticulate Matter (DM. )	12 µg/m³	Annual (Arithmetic Mean)	15 µg/m <sup>3</sup>			
	35 µg/m³	24-hour	Same as Primary			

Table 9.1-2					
Nat	ional Ambient Air Quality	Standards for Criteria Polluta	ants ª/		
Ozone 75 ppb 8-hour Same as Prima					
	0.03 ppm (80 µg/m <sup>3</sup> )	Annual (Arithmetic Mean)	0.02 ppm		
Sulfur Diovido (SOs) b/	0.14 ppm (365 µg/m <sup>3</sup> )	24-hour	None		
	None	3-hour	0.5 ppm (1,300 µg/m³)		
	75 ppb (196 μg/m³)	1-hour	None		
Source: EPA NAAQS Website (2015)					

 $\underline{a}$ / Greene County is in attainment for all criteria pollutants except ozone and PM<sub>2.5</sub>. However, the only township that is not in attainment for PM<sub>2.5</sub> is Pittsburgh-Beaver Valley.

 $\underline{b}$ / The existing annual and 24-hour SO<sub>2</sub> standards will be revoked one year after the effective dates in areas with designated status for the revised SO<sub>2</sub> NAAQS.

#### 9.1.2.3 Monitoring Data

Ambient air quality monitoring data is collected by state and federal agencies to determine ambient air quality for a regional area. This data is then used by the regulatory agencies to compare an area's air quality to the NAAQS. Table 9.1-3 presents existing ambient air quality data for the Redhook Compressor Station site. These stations were chosen due to their proximity to the Redhook Compressor Station, similarity in land use and topography between the monitor sites and the station, and quality and quantity of available data.

Table 9.1-3							
Ambient Air Quality for the Redhook Compressor Station							
			Distance from Station	Year of Data	Averaging Times		
Pollutant	Site	Monitor ID			Averaging Period	Value (µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )
Carbon	Charleroi Waste			2012-2014	8-hour	1,718.4	10,000
Monoxide (CO)	Treatment Plant Charleroi, PA	421250005	19.9 mi. NE	2012-2014	1-hour	2,864.0	40,000
Lead	US 119 & Airport Blvd. Morgantown, WV	540610003	21.4 mi. SE	2012-2014	Rolling 3-month Average	0.02	0.15
Nitrogen	Charleroi Waste Treatment Plant Charleroi, PA	421250005	19.9 mi. NE	2014	Annual	16.1	100
Dioxide (NO <sub>2</sub> )				2012-2014	1-hour	68.4	188
Particulate Matter (PM <sub>10</sub> )	Charleroi Waste Treatment Plant Charleroi, PA	421250005	19.9 mi. NE	2012	24-hour	34.0	150
Particulate	US 119 & Airport Blvd. Morgantown, WV	540610003	21.4 mi. SE	2012-2014	Annual	8.8	12
Matter (PM <sub>2.5</sub> )				2012-2014	24-hour	18.0	35
_	4.8 km SE of			2012-2014	8-hour	133.5	147
Ozone	Holbrook, PA Not in a City	420590002	10.4 mi. SW	2012	1-hour	188.5	236
				2013	Annual	91.7	80
Sulfur Dioxide	4.8 km SE of	420590002	10.4 mi. SW	2014	24-hour	20.7	365
(SO <sub>2</sub> )	Not in a City			2014	3-hour	47.2	1,300
				2012-2014	1-hour	43.7	196

#### 9.1.2.4 Class 1 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. Once designated as a Class I area, that area cannot be redesignated to another (lower) classification. Class I areas are allowed the smallest degree of air quality deterioration through New Source Review (NSR) / Prevention of Significant Deterioration (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. NSR applicability will be evaluated once all aspects of the Project are finalized, and Class I modeling requirements will be reviewed if the Project requires PSD review. However, triggering Class I modeling is unlikely based on Equitrans' experience with similar projects in the past and the fact that the Redhook Compressor Station is a significant distance from all Class I areas. Regardless, Equitrans will inform the managing agencies of the Project and will seek their input. The Class I areas nearest to the proposed location of the Redhook Compressor Station have been identified in Table 9.1-4.

Table 9.1-4						
F	Federal Class I Areas Closest to the Redhook Compressor Station					
	Managing Aganov	Direction from Station	Distance	to Station		
Class I Alea	Area Managing Agency	Direction from Station	Kilometers	Miles		
Dolly Sods, WV	National Forest Service	Southeast of Redhook	~122	~76		
Otter Creek, WV	National Forest Service	Southeast of Redhook	~110	~68		
Shenandoah, VA	National Forest Service	Southeast of Redhook	~220	~137		

#### 9.1.3 Air Quality Impacts and Mitigation

Both the short-term/temporary and long-term air quality impacts associated with the Project will be analyzed. Short-term and temporary air quality impacts will result from construction activities necessary to install the pipeline, and the turbines, engines, heaters, and other equipment at the Redhook Compressor Station. Long-term impacts will result from the operation of the turbines, engines, and other equipment at the Redhook Compressor Station. From a regulatory standpoint, the emissions and associated air quality impacts are addressed in two separate ways:

1. Pre-Construction Permitting – Pre-Construction (and operation) permitting addresses the emissions and associated impacts from the operational equipment and sources at the facilities. Depending on the major/minor source status of the Redhook Compressor Station and the location of the Project, PSD, Nonattainment NSR (NNSR), and/or associated state permitting programs would ensure that the installation of new air emissions sources (i.e., operational equipment) would meet required emission levels through the installation of appropriate control technologies, and meet other regulatory requirements, where appropriate. A pollutant that triggers a PSD and/or NNSR major source threshold will be subject to additional review and requirements. The potential regulatory applicability of permitting programs to the Project is discussed in Sections 9.1.4 and 9.1.5. Please note that while air dispersion modeling may not be a regulatory requirement, Equitrans will model the emissions of all criteria pollutants resulting from the Redhook Compressor Station to ensure that all NAAQS standards will be met upon startup of the sources at the Station. The modeling approach and results will be provided in the final version of Resource Report 9 and will not be

reviewed further in this document that addresses the regulatory requirements and compliance demonstrations.

 General Conformity – General Conformity addresses the sources of emissions not covered by permitting actions (e.g., construction activities) 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.

Sections 9.1.4 and 9.1.5 discuss air quality permitting requirements. Section 9.1.6 discusses the General Conformity analysis.

#### 9.1.4 Air Permitting Requirements

Title 25, Chapter 127, Section 11 of the Pennsylvania Code (25 Pa Code 127.11) requires certain stationary sources of air pollutant emissions to receive a permit before construction, modification, reactivation or installation of such source. Emissions from construction of the pipeline are temporary and do not require a Plan Approval. However, the air pollutant emission sources to be installed at the Redhook Compressor Station will require a Plan Approval issued by the PADEP to authorize construction. The Plan Approval requires demonstration that Best Available Technology (BAT) will be employed for the proposed new source of air pollution, and includes a detailed regulatory applicability study. The construction permit application for the Redhook Compressor Station is currently being prepared, and will be submitted to FERC as part of the Resource Report 9. The federal and state regulations that generally apply to the construction of the Redhook Compressor Station and the pipeline are discussed in the following section.

The Pennsylvania Code contains 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.

#### 9.1.5 Regulatory Applicability

This section lists air quality regulations that may be applicable to the Project pending the final design. This section will be updated once the design is final and included in the final version of Resource Report 9.

#### 9.1.5.1 Federal Air Quality Regulations

#### 9.1.5.1.1 Major New Source Review and Title V Operating Permit

The federal NSR program applies to major stationary sources. The NSR program regulates the installation of new major sources or major modifications to existing major sources and is comprised of two distinct preconstruction permitting programs: 1) PSD and 2) NNSR.

The Commonwealth of Pennsylvania is in the OTR, and therefore, the entire state is classified as moderate nonattainment for ozone. As a result, the NNSR major source thresholds are 100 tons per year (tpy) for nitrogen oxides (NO<sub>X</sub>) and 50 tpy for volatile organic compounds (VOC), per 25 Pa Code 127.201(c). The Project is located in an area of Greene County that is in attainment for all other criteria pollutants. Natural gas compressor stations are not one of the 28 source categories with a PSD major source threshold of 100 tpy (40 CFR 52.21(b)(1)(i)), and as such, the PSD threshold for the Project will be 250 tpy. The design of

the Project is still in preliminary phases, and Equitrans will present final emissions and detailed NSR analysis in the final version of Resource Report 9 after the design is complete.

The Title V major source permitting thresholds are 100 and 50 tpy for  $NO_X$  and VOC, respectively, 100 tpy for the remaining criteria pollutants, 10 tpy for a single hazardous air pollutant (HAP), and 25 tpy for total HAPs. The need for obtaining a Title V operating permit will also be evaluated after the finalization of the design and presented in the final version of Resource Report 9.

The pipeline associated with this Project is not a stationary emission source and is not subject to the preconstruction permitting requirements of the NSR and Title V Operating Permit programs.

#### 9.1.5.1.2 National Emission Standards for Hazardous Air Pollutants (NESHAP or MACT)

The potential HAP emissions at the Redhook Compressor Station are not yet known, and as a result, a complete NESHAP applicability cannot be presented. However, it is unlikely that the Redhook Compressor Station will be a major source of HAP emissions. Potentially applicable subparts are presented below.

#### **NESHAP Subpart HH – Oil and Natural Gas Production Facilities**

Because the Redhook Compressor Station does not meet the definition of a natural gas production facility per 40 CFR 63.761, the requirements of this subpart do not apply.

#### **NESHAP Subpart HHH – Natural Gas Transmission and Storage Facilities**

This subpart is potentially applicable to the station, but its applicability and specific requirements will be determined and presented in the final version of Resource Report 9.

#### **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. It is highly unlikely that the Redhook Compressor Station will be a major source of HAPs and as such, this regulation has not been reviewed further.

#### NESHAP Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines

The Redhook Compressor Station will include natural gas-fired engines. These engines will be subject to NESHAP Subpart ZZZZ, but the specific requirements will be included in the final version of Resource Report 9 after the design is complete and major or area source status of the facilities is determined.

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

This MACT standard applies to industrial, commercial, and institutional boilers of various sizes and fuel types at major sources. It is highly unlikely that the Redhook Compressor Station will be a major source of HAPs and as such, this regulation has not been reviewed further.

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

This MACT standard applies to industrial, commercial, and institutional boilers of various sizes and fuel types. The proposed units are natural gas-fired and are therefore exempt from this subpart. Therefore, the requirements of this subpart will not apply.

#### 9.1.5.1.3 New Source Performance Standards (NSPS)

#### **NSPS Subpart Dc**

The heaters at the Redhook Compressor Station will meet the definition under this subpart of a 'steam generating unit.' However, Equitrans does not anticipate the rated heat input of these units to exceed the Subpart Dc applicability threshold of 10 million British thermal unit per hour (MMBtu/hr). Therefore, Subpart Dc is not expected to apply to the Redhook Compressor Station.

#### NSPS Subparts K, Ka, and Kb

Based on the preliminary design and general tank sizes at other Equitrans compressor stations, the proposed tanks at the Redhook Compressor Station will have a capacity of 10,000 gallons or less. As such, Subparts K, Ka, and Kb do not apply to the storage tanks at the Redhook Compressor Station.

#### NSPS Subpart GG – Stationary Gas Turbines

NSPS Subpart GG was promulgated in 1979. The applicability of Subpart KKKK, promulgated in 2006, is similar to that of Subpart GG and applies to stationary combustion turbines that commence construction after February 18, 2005. Turbines subject to Subpart KKKK are specifically exempt from the requirements of Subpart GG, per 40 CFR 60.4305(b). The combustion turbines to be installed at the Redhook Compressor Station will be subject to Subpart KKKK and, as such, this subpart does not apply. The microturbines will not be subject to Subpart KKKK and therefore may potentially be subject to this Subpart. However, it is anticipated that the microturbines will have a rating of 200 kilowatts, which is equivalent to 0.72 gigajoules per hour. Since Subpart GG only applies to units with a rating of 10.7 g igajoules or greater, the microturbines are expected to be exempt from Subpart GG.

#### NSPS Subpart IIII – Stationary Compression Ignition Internal Combustion Engines

As noted in Section 9.1.1, there are no compression ignition engines in the preliminary design. Therefore, the requirements of this subpart do not apply.

#### NSPS Subpart JJJJ – Stationary Spark Ignition Internal Combustion Engines

The Redhook Compressor Station will include two natural gas-fired compressor engines. These compressor engines will be considered affected facilities subject to NSPS Subpart JJJJ. Equitrans will provide more details on compliance with the applicable requirements of this regulation in the final version of Resource Report 9 after the specifics for each engine is known.

#### NSPS Subpart KKKK – Stationary Combustion Turbines

Subpart KKKK, Standards of Performance for Stationary Combustion Turbines, applies to stationary combustion units with a heat input at peak load equal to or greater than 10 MMBtu/hr, based on the higher heating value of the fuel, commencing construction after February 18, 2005.

It is expected that the microturbines will have a heat input lower than 10 MMBtu/hr, and as such, NSPS Subpart KKKK will not apply to these microturbines.

The turbines designed for compression and transmission of natural gas will have a heat input at peak load greater than 10 MMBtu/hr and will therefore be subject to this subpart. Equitrans will comply with all applicable requirements under this subpart for the turbines, which includes emission limitations for NO<sub>X</sub> (40 CFR 60.4320(a)) and SO<sub>2</sub> (40 CFR 60.4330(a)), monitoring (40 CFR 60.4340, 60.4365, and 60.4370), reporting (40 CFR 60.4375) and performance testing (40 CFR 60.4400). Equitrans will provide more details

on compliance with the applicable requirements of this regulation in the final version of Resource Report 9 after the specifics for each turbine is known.

#### NSPS Subpart OOOO – Oil & Natural Gas Sector

The Redhook Compressor Station will not be considered a gas wellhead, nor a natural gas processing plant. The Redhook Compressor Station is part of the transmission segment of the oil and gas sector. Therefore, the only potentially applicable requirements for the proposed equipment at these facilities are those for new storage vessels where construction commenced after August 23, 2011.

The compressor station will have storage vessels (as defined in Subpart OOOO) installed as a result of this Project. However, since VOC emissions are not anticipated to exceed 6 tpy, the tanks will likely not be considered storage vessel affected facilities under the rule, per 40 CFR 60.5365(e), and therefore, the rule will not be applicable. The applicability of Subpart OOOO will be reevaluated when the design and emission calculations are finalized.

#### 9.1.5.1.4 Greenhouse Gas Reporting Rule

Per 40 CFR 98.2(a)(2), facilities which contain a source category listed in Table A-4 of the code and emit 25,000 metric tons per year of carbon dioxide equivalent (CO<sub>2</sub>e) in combined emissions from stationary fuel combustion units, miscellaneous uses of carbonate, and all applicable source categories in Tables A-3 and A-4 of the code are subject to reporting under the Greenhouse Gas Mandatory Reporting Rule (MRR). Table A-4 of 40 CFR 98 Subpart A includes Petroleum and Natural Gas Systems. Greenhouse gas (GHG) emissions from the Redhook compressor station will be calculated and compared with the 25,000 metric tons per year of CO<sub>2</sub>e when the design is final to address the applicability of the rule. Equitrans currently reports GHG emissions under Subpart W for similar facilities, and will meet all requirements of the MRR for the new compressor station, if applicable. No other subparts under the MRR are applicable to the facilities.

#### 9.1.5.2 Pennsylvania Air Quality Regulations

The Redhook Compressor Station is potentially subject to regulations contained in the Pennsylvania Code, Title 25 (Pa Code). The specific requirements associated with this Project are discussed in the following sections. Since the design is in preliminary phases, the requirements that generally apply to the Project have been discussed in section 9.1.5.2. However, after the compressor station design is finalized, the regulatory applicability will be reevaluated to ensure that specific requirements that could be applicable to the compressor station are properly addressed.

# 25 Pa Code §123.1 and 123.2: Prohibition of Certain Fugitive Emissions and Fugitive Particulate Matter

25 Pa Code §123.1 and 123.2 state exceptions to fugitive emissions sources and methods for controlling fugitive emissions. Due to the nature of the activities at the Redhook Compressor Station, it is unlikely that fugitive particulate matter emissions will be emitted under normal operating conditions. However, Equitrans will take measures to ensure any fugitive particulate matter emissions will not cross the property boundary should any such emissions occur. Particulate emissions from the pipeline will result from its construction, but will be temporary in nature. Equitrans will take all measures necessary to ensure compliance with this requirement and will follow its fugitive dust control plan that will be provided in the final version of Resource Report 9.

#### 25 Pa Code §123.11 and 123.13: Particulate Emissions: Combustion Units

25 Pa Code §123.11 and 123.13 defines particulate matter emissions for combustion units. Combustion units are defined in §121.1 as stationary equipment used to burn fuel primarily for the purpose of producing power or heat by indirect heat transfer such as boilers. This definition does not apply to the Redhook Compressor Station. As such, the particulate matter emissions limitations for processes in 25 Pa Code §123.13 Particulate Emissions: Processes apply to these units instead.

25 Pa Code 23.13 defines particulate matter emissions limitations for processes. For processes excluded from Table 1 of 23.13(b), particulate emissions are limited to 0.04 grains per dry standard cubic foot (gr/dscf) and 0.02 gr/dscf for exhaust flowrates less than 150,000 dry standard cubic feet per minute (dscfm) and greater than 300,000 dscfm, respectively. Particulates from equipment with exhaust flowrates between 150,000 dscfm and 300,000 dscfm are limited to the allowable emission rate calculated using the formula in 23.13(c)(1)(ii). Particulate emissions from the turbines, engines, fuel gas heaters, and other combustion equipment will comply with these requirements.

#### 25 Pa Code §123.21: Sulfur Compound Emissions: General

25 Pa Code §123.21 states that the concentration of sulfur oxides in the effluent gas may not exceed 500 parts per million (ppmvd). The proposed combustion equipment at the Redhook Compressor Station will combust pipeline quality natural gas exclusively, and the sulfur oxide emissions are expected to be well below this concentration level in the combustion exhaust.

#### 25 Pa Code §123.31: Odor Emissions

25 Pa Code §123.31 prohibits the emissions of malodorous air contaminants from any source that are detectable outside the facility fence line. The Redhook Compressor Station is generally subject to this requirement. However, due to the nature of the process at the compressor station, the production of objectionable odor from the facility is unlikely. Note that there will be odor emissions from the dehydrator but these emissions are directed to a thermal oxidizer which will eliminate the odor.

The pipeline is generally subject to this requirement. However, emissions from the pipeline will result from its construction, will be temporary in nature, and the production of objectionable odor from these operations is unlikely.

#### 25 Pa Code §123.41 and 123.43: Visible Emissions: Limitations

25 Pa Code §123.41 states that a facility may not emit visible emissions equal to or greater than 20% for a period or periods aggregating more than 3 minutes in any 1 hour, or equal to or greater than 60% at any time. The use of natural gas as fuel, as well as the minimal emissions expected from turbine startup and shutdown events (which are anticipated to be infrequent and short-duration events), will ensure compliance with this requirement.

#### 25 Pa Code §129: Standards for Sources

25 Pa Code §129.91 establishes control standards for major stationary sources of NO<sub>X</sub> and VOC under the Reasonably Available Control Technology (RACT) program. Major stationary sources of NO<sub>X</sub> and VOC are defined in 25 PA Code §121.1. The Redhook Compressor Station is located in the OTR, and therefore the applicable major source thresholds are 100 tons per year of NO<sub>X</sub> and 50 tons per year of VOC. Maximum potential emissions from the Redhook Compressor Station will be evaluated against these major source thresholds once design is finalized.

Further, 25 Pa Code \$129.202 and \$129.203 contain additional NO<sub>X</sub> requirements for stationary combustion turbines, and internal combustion engines, respectively. However, these additional requirements do not apply to such equipment in Greene County. Nevertheless, the units will demonstrate that they meet BAT requirements for NO<sub>X</sub> and VOC, which will otherwise meet or exceed potentially applicable RACT requirements.

#### 9.1.5.3 West Virginia Air Quality Regulations

The proposed pipeline is potentially subject to regulations contained in the West Virginia Code of State Rules, Chapter 45 (Code of State Rules, or CSR). The specific requirements associated with this Project are discussed in the following sections. Since the design is in preliminary phases, the requirements that generally apply to the Project have been discussed in this section.

# 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 pipeline will be generally subject to this requirement. However, emissions from the pipeline which may result from its construction will be temporary in nature, and the production of objectionable odor from these operations is unlikely.

# **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.

Particulate emissions from the pipeline may result from its construction, but any such emissions will be temporary in nature. Equitrans will take all measures necessary to ensure compliance with this requirement and will follow its fugitive dust control plan that will be provided in the final version of Resource Report 9.

#### 9.1.6 General Conformity

Under the Clean Air Act, 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 county of Wetzel, West Virginia, is in attainment for all criteria pollutants. However, the Commonwealth of Pennsylvania is in the OTR and therefore the entire state is classified as moderate nonattainment for ozone. In addition, the counties of Washington and Allegheny, Pennsylvania are designated as nonattainment for PM<sub>2.5</sub> and parts of Allegheny County are designated as nonattainment for SO<sub>2</sub>. As such, a General Conformity analysis is required for the Project. Equitrans is currently collecting the information necessary for the General Conformity analysis and will provide the analysis in the final version of Resource Report 9.

#### 9.1.7 Mitigation Measures

Equitrans will address the air quality impact assessment with regard to construction emissions, operating emissions, and GHG impacts in the final version of Resource Report 9 after the design is final, and potential emissions will be calculated to allow for a comprehensive assessment. General mitigation measures are addressed in this report.

#### 9.1.7.1 Construction and Operational Emissions

The construction emissions associated with the compressor station and pipeline are expected to have minimal impact on the air quality in the surrounding area. However, Equitrans will implement various mitigation measures to minimize construction emissions. These include:

- Unnecessary construction activities leading to increased emissions will be avoided, where possible;
- Equitrans will follow manufacturer's operating recommendations regarding good c ombustion practices to ensure that fuel efficiency is maximized and engines are operated such that emissions are minimized;
- Equitrans will require contractors to follow all local, state, and federal emission standards and air quality regulations applicable to their fleet and equipment; and,
- Equitrans will implement a fugitive dust control plan and will utilize certain dust control measures such as water suppression, enclosures, or other techniques.

Emissions from operating the equipment at the new Redhook Compressor Station result from combustion of natural gas in the turbines and other combustion equipment at the station. While the design is not yet final, similar to other Equitrans compressor stations, Equitrans will purchase turbines and other equipment that meet the emission limitations found in the applicable NSPS sections. Further, Equitrans will perform a BAT analysis in the Plan Approval application and will install units compatible with the BAT emission limits agreed to by PADEP. Equitrans will mitigate these emissions through the development and implementation of an operation and maintenance plan that is in line with the manufacturer's recommendations for good combustion practices. Proper operation and preventative maintenance activities will ensure that emissions from the turbines and other equipment will be minimized and continue to meet the emission standards.

Fugitive GHG (and to a lesser extent, VOC) leaks will be minimized by adhering to good operating and maintenance practices. Despite the lack of federal or PADEP guidance on conducting control technology reviews for GHGs, Equitrans believes the proposed project is designed to reduce GHG emissions where technically and economically feasible.

#### 9.2 NOISE

Sound is caused by vibrations that generate waves of minute pressure fluctuations in the surrounding air. Sound levels are typically measured using a logarithmic decibel (dB) scale. Sound that causes disturbance or annoyance, or unwanted sound, is often called "noise." The terms sound and noise are used interchangeably in this analysis.

Human hearing varies in sensitivity for different sound frequencies. The ear is most sensitive to sound frequencies between 800 and 8,000 Hertz (Hz) and is least sensitive to sound frequencies below 400 Hz or above 12,500 H z. Consequently, several different frequency weighting schemes have been used to

approximate the way the human ear responds to noise levels. The "A-weighted" decibel scale (dBA) is the most widely used for this purpose. A list of typical sound levels for example sound sources is presented in Figure 9.2-1.



Figure 9.2-1. Sound Levels of Typical Noise Sources

Source: Caltrans 2014

Varying sound levels often are described in terms of an equivalent constant decibel level. Equivalent sound levels ( $L_{eq}$ ) are not a simple averaging of decibel values but are based on the cumulative acoustical energy associated with the variable sound levels.  $L_{eq}$  values sometimes are referred to as energy-averaged sound levels. As a consequence of the calculation procedure, high dB events contribute more to the  $L_{eq}$  value than do low dB events.  $L_{eq}$  values are used to develop single-value descriptions of average sound exposure over various periods of time. Such average sound exposure ratings often include additional weighting factors for potential annoyance due to time of day or other considerations. The  $L_{eq}$  data used for average sound exposure descriptors are generally based on A-weighted sound level measurements (expressed as dBA), which include adjustments to the unweighted values to account for the variation in human hearing sensitivity across the audible frequencies.

Average sound exposure over a 24-hour period is often presented as a day-night average, or time-weighted, sound level ( $L_{dn}$ ).  $L_{dn}$  values are calculated in the units of dBA from hourly  $L_{eq}$  values, with the  $L_{eq}$  values for the nighttime period (10 p.m. to 7 a.m.) increased by 10 dBA to reflect the greater disturbance potential from nighttime sounds.

Certain statistical noise values are sometimes used to describe the allowable sound levels, or limits, at noise sensitive areas (NSAs). The  $L_1$ ,  $L_{10}$ , and  $L_{50}$  statistical noise level descriptors are the noise levels that are equaled or exceeded a stated percentage of the time during a given hour. For example, an  $L_{10} = 60$  dBA implies that in any hour of the day, a noise level of 60 dBA is equaled or exceeded 10 percent of the time, or for 6 minutes. The  $L_{50}$ , the noise level exceeded 50 percent of the time, is commonly known as the "median noise level."

Sound intensity attenuates with distance as it propagates over a larger area, generally in a spherical spreading pattern, away from a point source where the sound waves were generated. Generally speaking, the sound pressure level emitted from a point source decreases by approximately 6 dBA for each doubling of distance. Sound emitted from a line of point sources attenuates in a cylindrical spreading pattern and decreases approximately 3 dBA for each doubling of distance.

#### 9.2.1 Applicable Noise Regulations

FERC noise analysis guidelines require that any applicable federal, state or local noise regulations or standards be identified and compared with the anticipated noise levels from the Project. It is further required to specify how the addition of the compressor station will meet the applicable regulations.

The FERC standard for noise quality can be found at 18 CFR 380.12 (k)(4)(v)(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 ( $L_{dn}$ ) of 55 dBA at any preexisting noise-sensitive area (such as schools, hospitals, or residences).

Because the Project includes a new compressor station, the FERC noise standard applicable to the Project is to demonstrate that the noise level at any preexisting NSA attributable only to the Redhook Compressor Station does not exceed 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.

Equitrans reviewed state and local rules and ordinances for noise standards potentially applicable to the Redhook Compressor Station, and the HDD operations. The results of the review are summarized in Table 9.2-1.

Table 9.2-1						
	Summary of Applicable Noise Standards					
Noise Source	Regulatory Agency	Noise Standard	Comments			
Redhook	FERC	L <sub>dn</sub> , 55 dBA	Maximum allowable impact from the Redhook Compressor Station as predicted at the nearest NSA			
Compressor Station	PADEP	None	No applicable noise policy or regulations identified			
	Greene County	None	No applicable noise policy or regulations identified			

Table 9.2-1				
	Summary of Applicable Noise Standards			
	Franklin Township	60 decibels (dB) at 20 – 300 Hertz (Hz); 40 dB at 300 – 2,400 Hz; 30 dB at 2,400 Hz and above.	Five decibels can be deducted from the measurements for noises of periodic character. Standards apply at all time and are applicable at the property line and from the station alone. Per the ordinance: "the determination of the existence of the nuisance elements of noise, vibration, glare, and dust shall be made at the property lines of the use creating same"	
	FERC	55 dBA for nighttime operations	_	
HDD Operations	Jefferson Township	80 dBA at the property line; 60 dBA in any district between 7:00 PM – 7:00 AM	_	
	Union Township	60 dBA in the "residential" district category beyond the property line	Construction or maintenance activities between 7:00 AM – 9:00 PM are exempt from the noise standard	

#### 9.2.2 Existing Noise Sensitive Areas

Aerial and field surveys of the area surrounding the Redhook Compressor Station were conducted to identify residences, schools, churches, hospitals and other potential NSAs. The noise survey was conducted on July 8, 2015 at the four identified NSAs that were closest to the Redhook Compressor Station. Detailed information on the existing NSAs and baseline noise levels are presented in the noise monitoring survey report which is included in Attachment 9-A of this report.

#### 9.2.3 Existing Sound Environment

FERC rules at 18 CFR 380.12(k)(2)(ii) state that environmental reports for Natural Gas Act applications require the applicant to quantitatively describe existing noise levels at existing NSAs. Equitrans has quantified the existing noise levels at NSAs near the Redhook Compressor Station and also near the sites where pipeline installation is proposed using the horizontal directional drill (HDD) technique.

#### 9.2.3.1 Redhook Compressor Station

With respect to the Redhook Compressor Station, the ambient sound levels at four existing NSAs were determined during the sound monitoring survey performed on July 8, 2015. The results of the ambient sound measurements are described in the sound monitoring survey included as Appendix 9-A of this report. A summary of the measurements is included in Table 9.2-2 below. Figure 9.2-2 shows the locations of the NSAs in comparison with the proposed Redhook Compressor Station.

	Table 9.2-2			
	Summary of Sound Measurement at the Pre-Existing NSAs			
		Background (July 2015)		
Location	Direction and Distance	Daytime/Nighttime Measurements (L <sub>eq</sub> , dBA)	L <sub>dn</sub> (dBA)	
	SW – 3,300 ft	45.3	50.5	
N5A-1		43.9		
	SW – 2,300 ft	52.6	50.4	
N5A-2		48.9	56.1	
	NW – 1,900 ft	47.9	47.0	
N5A-3		36.1	47.3	
	E – 850 ft	65.3	66.6	
NOA-4		58.1	0.00	



Figure 9.2-2. Locations of the NSAs in Comparison with the Redhook Compressor Station

Final results of acoustic modeling will include detailed sound level information about major pieces of equipment within the compressor station, and proposed sound mitigation as needed to ensure the final modeled sound levels at NSAs are below the county and FERC limits. Design measures that will be considered to reduce noise from compressor station operation as needed will include:

- Acoustically insulated compressor station buildings, including building walls, turbine housing packages, doors, windows, and vent louvers;
- Use of silencers for compressor turbine air inlets, and placement of air inlets inside of the compressor building if possible;
- Use of exhaust silencers for turbines, and use of lagging for the exhaust breach stack and muffler; and
- Use of lagging (acoustic pipe insulation) for aboveground piping outside the compressor station building.

Final results of noise modeling will be included with final Resource Report 9 filed with Equitrans' application to FERC.

#### 9.2.3.2 HDD Locations

Equitrans is planning to perform HDD at two locations and the existing sound level was surveyed close to the entry and exit of each HDD location.

#### HDD 316

The results of the ambient sound measurements are described in the sound monitoring survey included as Appendix 9-A of this report. A summary of the measurements is included in Tables 9.2-3 and 9.2-4 below. Figures 9.2-3 and 9.2-4 show the locations of the NSAs in comparison with the HDD 316 entry and exit points.

Table 9.2-3			
Summary of Sound Measurement at the Pre-Existing NSAs (HDD 316 Entry Point)			
Location	Direction and Distance	Background (July 2015)	
		Nighttime Measurements (L <sub>eq</sub> , dBA)	
NSA-W	W – 1,100 ft	41.2	
NSA-N	NE – 800 ft	37.5	
NSA-E	E – 1,100 ft	35.9	
Entry Point	0 ft	46.2 (day time)	
		34.9 (night time)	



	Table 9.2-4 Summary of Sound Measurement at the Pre-Existing NSAs (HDD 316 Exit Point)		
Su			
Location	Direction and Distance	Background (July 2015)	
Location		Nighttime Measurements (Leq, dBA)	
NSA-N	N – 800 ft	34.3	
NSA-SW	SW – 1,400 ft	44.4	



Figure 9.2-3. Locations of the NSAs in Comparison with the HDD 316 Entry Point

July 2015





Figure 9.2-4. Locations of the NSAs in Comparison with the HDD 316 Exit Point

#### MON HDD

The results of the ambient sound measurements are described in the sound monitoring survey included as Appendix 9-A of this report. A summary of the measurements is included in Tables 9.2-5 and 9.2-6 below. Figures 9.2-5 and 9.2-6 show the locations of the NSAs in comparison with the Mon HDD entry and exit points.

Table 9.2-5			
Summary of Sound Measurement at the Pre-Existing NSAs (Mon HDD Entry Point)			
Location	Direction and Distance	Background (July 2015)	
Location		Nighttime Measurements (L <sub>eq</sub> , dBA)	
NSA-W	W - 200 ft	44.6	
Entry Point	0 ft	45.6	



Table 9.2-6			
Su	Summary of Sound Measurement at the Pre-Existing NSAs (Mon HDD Exit Point)		
Location	Direction and Distance	Background (July 2015)	
Location	Direction and Distance	Nighttime Measurements (Leq, dBA)	
NSA-N	N – 900 ft	37.5	
NSA-N2	N - 500 ft	42.4	
NSA-S	S – 200 ft	45.4	



Figure 9.2-5. Locations of the NSAs in Comparison with the Mon HDD Entry Point



Figure 9.2-5. Locations of the NSAs in Comparison with the Mon HDD Exit Point

#### 9.2.4 Noise Impacts and Mitigation

This section reviews the noise impacts associated with the construction of the Project and the operation of the Redhook Compressor Station.

#### 9.2.4.1 Construction Noise Impacts and Mitigation

Construction of the compressor station will consist of earth work (e.g., site grading), construction of the buildings, and installation of the equipment. The noise impact at the NSAs from construction activities will be dependent on the type of equipment used, the duration of use for each piece of equipment, and the quantity of construction equipment operating simultaneously. Construction equipment will be conventional in type (e.g., front end loaders, backhoes, dump trucks) and will be primarily operated during daytime hours on an as-needed basis. The construction activities will be of limited duration (i.e., that necessary to complete the Project components).

Construction of the pipeline using HDD could result in noise radiation that would be consistent and could take a few days or weeks. Equitrans is currently planning to limit any HDD to daytime hours. The ambient

sound has been surveyed at the existing NSAs around the HDD sites, and in case Equitrans decides to extend the HDD operations to nighttime hours, the ambient sound will be used to determine the noise impact on the existing NSAs. Regardless, Equitrans will use noise mitigation measures, as necessary, to reduce the noise at the existing NSAs. The mitigation measures include but are not limited to sound barriers and equipment and work area enclosures.

#### 9.2.4.2 Operational Noise Impacts and Mitigation

The design of the Redhook Compressor Station is currently in its preliminary phases. Operational noise impacts will be evaluated for the Redhook Compressor Station when the design is final and pertinent noise information for the turbines, engines, and microturbines can be reviewed.

#### 9.3 REFERENCES

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# **Equitrans Expansion Project**

# Docket No. PF15-22

**Resource Report 9** 

Appendix 9-A Noise Survey Report This page intentionally left blank



# AMBIENT SOUND MONITORING REPORT Equitrans, LP > Redhook Compressor Station

Prepared By:

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July 2015

Project 152101.0029



Environmental solutions delivered uncommonly well

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Equitrans, LP (Equitrans) is planning to construct a new natural gas transmission facility in Franklin Township, Greene County, Pennsylvania (Redhook Compressor Station). It is anticipated that the Redhook Compressor Station will be comprised of two (2) natural gas-fired compressor engines, two (2) natural gas-fired turbines, five (5) microturbines, and other miscellaneous units. In addition to the construction related to the compressor station, two (2) nearby locations have been selected for horizontal directional drilling (HDD) related to pipelines. These locations are referred to as the H316 HDD site and the Monongahela ("Mon" or H318) HDD site.

Equitrans contacted Trinity Consultants (Trinity) to measure the ambient sound levels at noise sensitive areas (NSAs, such as schools, hospitals, or residences) near the station and the HDD sites. This sound level measurement was performed in July 2015. The goal of this activity was to characterize the existing ambient sound quality at NSAs near the proposed location of the Redhook Compressor Station. The ambient sound quality characterization is required by Title 18, Part 380, Section 12(k)(2) of the Code of Federal Regulations [18 CFR 380.12(k)(2)], and is a mandatory component of Resource Report 9, part of the application to the Federal Energy Regulatory Commission (FERC) for certification of the Redhook Compressor Station. This activity also characterized the existing ambient sound quality at NSAs near the two (2) proposed HDD locations. This report summarizes the results of this monitoring effort.

## 1.1. COMPRESSOR STATION APPLICABLE REGULATORY STANDARDS

The ambient sound measurements at NSAs near the Redhook Compressor Station were conducted to establish the preconstruction baseline per 18 CFR 380.12(k)(2). The federal and local standards that will apply to the Redhook Compressor Station upon start of operation are identified below.

## 1.1.1. FERC Standards

The FERC requirement at 18 CFR 157.206(b)(5)(i) states that the noise attributable to a new compressor station must not exceed a day-night level ( $L_{dn}$ ) of 55 decibels A-weighting (dBA) at any pre-existing NSA.

## 1.1.2. Local Regulations

The Redhook Compressor Station is located in Franklin Township that has a noise ordinance as part of its zoning ordinance. The Franklin Township noise ordinance is dependent upon the frequency at which the noise was measured, as follows:

- 60 decibels (dB) at 20 300 Hertz (Hz);
- 40 dB at 300 2,400 Hz; and,
- > 30 dB at 2,400 Hz and above.

Per the standard, for noises of periodic character, 5 dB can be deducted from the measurement. The standards in the Franklin Township noise ordinance are based on the noise impact from the facility alone at the property line (i.e., baseline sound levels are not relevant to the standard).

There are no county- or state-level noise ordinance or regulations that apply to the Redhook Compressor Station.

## 1.2. H316 HDD APPLICABLE REGULATORY STANDARDS

The ambient sound measurements at NSAs near the H316 HDD entry and exit were conducted to establish a baseline. The federal and local standards that will apply to the H316 HDD site are identified below.

## 1.2.1. FERC Standards

The FERC requirement at 18 CFR 157.206(b)(5)(iii) states that the sound emitted from any horizontal directional drilling or drilling of wells must not exceed a night level ( $L_n$ ) of 55 dBA at any pre-existing NSA. Equitrans is not currently planning to perform drilling during the nighttime hours. However, measurements were conservatively taken at a few points around the HDD entry and exit points.

## 1.2.2. Local Regulations

Horizontal drilling operations located in Jefferson Township are also subject to the noise regulations in the Jefferson Morgan Multi-Municipal Zoning Ordinance, Section 5.27(c). This regulation states that it is unlawful to cause noise to the extent that the one-hour average sound level exceeds 60 dB in any district between the hours of 7:00 pm and 7:00 am. It also states that the noise measured must not exceed 80 dBA at any property line of the property from which the noise source is located.<sup>1</sup> The multi-municipality ordinance also requires that the noise be measured at an elevation of not less than four (4) feet above ground level and measurements be made at the property line.

Equitrans is not currently planning any nighttime drilling and the "property line" standard would not apply to horizontal directional drilling. However, to gather baseline measurements related to future compliance with these regulations, in a conservative manner, measurements were taken at and near the H316 HDD entry and exit.

There are no county- or state-level noise ordinance or regulations that apply to the H316 HDD sites.

## **1.3. MON HDD APPLICABLE REGULATORY STANDARDS**

The ambient sound measurements at NSAs near the Mon HDD were conducted to demonstrate compliance with the requirements of the FERC and local regulations, as described below.

## 1.3.1. FERC Standards

The FERC requirement at 18 CFR 157.206(b)(5)(iii) states that the sound emitted from any horizontal directional drilling or drilling of wells must not exceed an  $L_n$  of 55 dBA at any pre-existing NSA. Equitrans is not currently planning to perform drilling during the nighttime hours. However, measurements were conservatively taken at a few points around the HDD entry and exit points.

## 1.3.2. Local Regulations

It has been determined that there are no local regulations that apply to HDD activities at the township -,county-, or state-level for the Mon HDD entry point (Forward Township, Allegheny County, PA).<sup>2</sup> The related activities therefore must only comply with the FERC standards.

 $<sup>^{1}\,</sup>http://www.jeff-morgcog.org/Jefferson\_Morgan\_Multi\_Municipal\_Zoning\_Ordinance\_updated\_5-08-13.pdf$ 

 $<sup>^2</sup>$  Forward Township has a general noise ordinance for objectionable noise but has established no numerical standards (Page 18 of Forward Township ordinance:

http://elibrary.pacounties.org/Documents/Allegheny\_County/77;%20Forward%20Township/4200326896mzo.pdf)

There are potentially local noise regulations which may apply to HDD activities related to the Mon HDD exit point (Union Township, Washington County, PA). The Union Township Zoning Ordinance includes provisions regulating noise in the form of numerical sound level limits which vary by 'district'. As it is believed that most NSAs in the area around the exit point would fall into the 'residential' district category (the most restrictive), the ordinance would dictate that "At no point beyond the boundary of any lot within these districts shall the exterior noise level resulting from any use or activity located on such lot exceed a maximum of sixty (60) dBA" (pg. 116 of the ordinance). However, there is an exemption from these regulations regarding "Noises emanating from construction or maintenance activities between 7:00 A.M. and 9:00 P.M." (pg. 117 of the ordinance), which would include HDD activities. There are no county- or state-level noise ordinance or regulations that apply to the exit point.

Equitrans is not currently planning any nighttime drilling and as such, there are no applicable standards. However, to gather baseline measurements related to future compliance with these regulations, in a conservative manner, measurements were taken at and near the Mon HDD entry and exit.

## 2.1. COMPRESSOR STATION MONITORING METHODOLOGY

Ambient sound level measurements were performed using a Larson Davis Model 831 Sound Level Meter (SLM). In accordance with the FERC regulations, the four (4) NSAs nearest to the Redhook Compressor Station were identified for background ambient sound monitoring. Figure 2-1 shows these locations. The list of these NSAs and their respective distances from the station is provided in Table 2-1.

NSA #	Description	Distance from the Station	Measurement Status
NSA-1	Residence	3,300 feet	Daytime and nighttime measurements
NSA-2	Residence	2,300 feet	Daytime and nighttime measurements
NSA-3	Animal Hospital	1,900 feet	Daytime and nighttime measurements
NSA-4	Residence	850 feet	Daytime and nighttime measurements

Table	2-1 Noise	Sensitive	Areas	in the	Vicinity	of the Station
I abie	2-1. NUISC	Sensitive	ni cas	in the	vicinity	of the station

At least one (1) 30-minute daytime (7AM-10PM) and one (1) 30-minute nighttime (10PM-7AM) measurement was performed at each NSA. The Equivalent Continuous A-Weighted Sound Pressure Level ( $L_{Aeq}$ ) was measured at the NSAs using the SLM. Intermittent and continuous sources of sound were carefully noted during each measurement and were correlated with the time-history sound data obtained during the test.

An additional monitoring point was originally included in the list of NSAs. This point was located near the structures in the wooded area to the east of NSA-4. However, landowner permission was not obtained for this point. ;



Figure 2-1 Map of NSAs Near the Redhook Compressor Station

## 2.2. H316 HDD MONITORING METHODOLOGY

Ambient sound level measurements were performed using a Larson Davis Model 831 SLM. Three (3) NSAs nearest to the proposed H316 HDD entry and two (2) NSAs nearest to the proposed H316 HDD exit were identified for background ambient sound monitoring. In addition, measurements were taken at the proposed H316 HDD entry site. Figures 2-2 and 2-3 show the NSAs and the 316 HDD entry and exit locations. The lists of these NSAs and their respective distances are provided in Table 2-2 and Table 2-3.

NSA #	Description	Distance from the Entry Point	Measurement Status
NSA-W	Residence	1,100 feet	Nighttime measurements
NSA-N	Residence	800 feet	Nighttime measurements
NSA-E	Residence	1,100 feet	Nighttime measurements
Entry	H316 HDD Entry Point	N/A	Daytime and nighttime
			measurements

Table	2-2	Noise	Sensitive	Areas	in	the	Vicinity	of	the	H316	HDD	Fntry
I abic	<u> </u>	110130	JUISITIVE	ni cas		une	VICIIILY	UI	uic	11210	πυυ	LIIUY

NSA #	Description	Distance from the Exit Point	Measurement Status
NSA-N	Residence	800 feet	Nighttime measurements
NSA-SW	Residence	1,400 feet	Nighttime measurements

At least one (1) 15-minute nighttime (10PM-7AM) measurement was performed at each NSA. An additional 15minute daytime (7AM-10PM) measurement was performed at the entry point. The  $L_{Aeq}$  was measured at the NSAs using the SLM. Intermittent and continuous sources of noise were carefully noted during each measurement and were correlated with the time-history noise data obtained during the test.



Figure 2-2. Map of NSAs Near the H316 HDD Entry



Figure 2-3. Map of NSAs Near the H316 HDD Exit

## 2.3. MON HDD MONITORING METHODOLOGY

Ambient sound level measurements were performed using a Larson Davis Model 831 SLM. One (1) NSA nearest to the proposed Mon HDD entry and three (3) NSAs nearest to the Mon HDD exit were identified for background ambient noise monitoring. In addition, measurements were taken at the proposed Mon HDD entry site. Figures 2-4 and 2-5 show the NSAs and the Mon HDD entry and exit locations. The list of these NSAs and their respective distances is provided in Table 2-4 and Table 2-5.

Table 2-4. Noise Sensitive Areas in the Vicinity of the Mon HDD En	try
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NSA #	Description	Distance from the Entry Point	Measurement Status
NSA-W (entry)	Residence	200 feet	Nighttime measurements
Entry	Mon HDD Entry Point	N/A	Nighttime measurements

NSA #	Description	Distance from the Exit Point	Measurement Status
NSA-N (exit)	Residence	900 feet	Nighttime measurements
NSA-N2 (exit)	Residence	500 feet	Nighttime measurements
NSA-S (exit)	Residence	200 feet	Nighttime measurements

Table 2-5. Noise Sensitive	Areas in the Vicinity	of the Mon HDD Exit
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At least one (1) 30-minute nighttime (10PM-7AM) measurement was performed at each NSA.  $L_{Aeq}$  was measured at the NSAs using the SLM. Intermittent and continuous sources of noise were carefully noted during each measurement and were correlated with the time-history noise data obtained during the test.

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Figure 2-4. Map of NSAs Near the Mon HDD Entry



Figure 2-5. Map of NSAs Near the Mon HDD Exit

Measurements at the four (4) NSAs near the compressor station were performed for a period of at least 30 minutes during the daytime hours (7 AM – 10 PM) and 30 minutes during the nighttime hours (10 PM – 7 AM). The results of the measurements at the four (4) NSAs are presented in Table 3-1. Measurements at each NSA near the HDD entries and exits were performed for a period of at least 15 minutes during nighttime hours. The results of the measurements at the HDD NSAs are presented in Table 3-2 through Table 3-5. The time-history sound pressure level data is included in the charts attached in Appendix A.

As described in Table 3-1 through 3-5, there were often loud sources of noise that were not considered ambient noise, such as road traffic, dogs barking and airplanes passing in the sky. Noise originating from these intermittent sources can clearly be seen in the time-history data in Appendix A as sharp peaks in the measured sound pressure level. During the measurements, surveyors entered into their field notes (attached in Appendix B) the apparent source of noise that were not ambient noise.

The pre-existing NSAs nearby the proposed Redhook Compressor Station are significantly impacted by the road traffic. This impact is particularly clear at NSA-4, where there were numerous cars passing every minute and the road traffic is the major source of noise. While the other NSAs were not as substantially impacted by road traffic, the impact of road traffic was present during all measurements, as noted in the field sheets. Trinity did not exclude these additional sources of noise from the dataset, due to the continuous presence of the noise source. Other than road traffic, the noise from compressor stations to the northeast of the location of the proposed Redhook Compressor Station that was mostly unrecognizable from the road noise, and humming of pumps and engines (unrelated to the compressor stations) nearby may have impacted the ambient sound levels. A well pad was also observed nearby NSA-2 and the activities related to the well pad are noted in the field sheets. Other stations with gas equipment and piping were also observed around the H316 HDD.

Point ID	Start Time	Duration	Meteorological Conditions	LA <sub>eq</sub> (dBA)	Sources of Noise
NSA-1	12:18	32 min	68 deg F Winds NNW at 0 mph No measurable rain	45.3	Background included cars/trucks and chirping birds. Vehicle traffic and bird chirping sounds were constant.
	22:38	32 min	68.9 deg F Winds NNW at 0 mph No measurable rain	43.9	Traffic from nearby road was predominant noise source; Background included cars/trucks and insects. Vehicle traffic and insect sounds were constant.
NGA 2	11:18	37 min	68.2 deg F Winds W at 1 mph No measurable rain	52.6	Traffic from nearby road was predominant sound source; Background included cars/trucks, 4-wheelers, and birds. Vehicle traffic and bird chirping sounds were constant.
NSA-2	22:02	31 min	69.1 deg F Winds NNW at 0 mph No measurable rain	48.9	Traffic from nearby road and engine by nearby creek was predominant sound source; Background included cars/trucks and an engine. Vehicle traffic and engine sounds were constant.
	11:03	32 min	68.2 deg F Winds NW at 0 mph No measurable rain	47.9	Birds chirping were the predominant sound source; Background included cars/trucks, insects, planes, hammering, wind and trains. Bird and insect chirping noise was constant.
NSA-3	22:44	33 min	68.9 deg F Winds NNW at 0 mph No measurable rain	36.1	Dogs barking were the predominant sound source; Background included cars/trucks, insects, dripping water, planes, AC unit, leaves and horses. Cricket chirping and dripping water was constant.

Table 3-1. Results of Sound Level Measurements at Compressor Station NSAs

Point ID	Start Time	Duration	Meteorological Conditions	LA <sub>eq</sub> (dBA)	Sources of Noise
NSA-4	11:51	31 min	68.3 deg F Winds W at 1 mph No measurable rain	65.3	Traffic from nearby road was predominant sound source; Background included cars/trucks, planes, construction and birds. Heavy truck traffic and the hum of an industrial engine was constant.
	22:01	32 min	69.1 deg F Winds NNW at 0 mph No measurable rain	58.1	Traffic from nearby road was predominant sound source; Background included cars/trucks, insects, industry and dogs. Hum from industry motors and chirping insect sounds were constant.

## Table 3-2. Results of Sound Level Measurements at H316 HDD Entry NSAs

Point ID	Start Time	Duration	Meteorological Conditions	LA <sub>eq</sub> (dBA)	Sources of Noise
NSA-W	02:08	17 min	69.9 deg F Winds SE at 0 mph No measurable rain	41.2	Background included cars/trucks, rain, AC unit, wind, and owls. Vehicle traffic and rain sounds were constant.
NSA-N	00:57	18 min	70.6 deg F Winds SE at 0 mph No measurable rain	37.5	Background included cars/trucks, doors opening and closing, horses, insects and nearby highway (or compressor station, could not be confirmed). Nearby highway (or compressor station) and insect noise was constant.
NSA-E	01:31	16 min	69.9 deg F Winds SE at 0 mph No measurable rain	35.9	Background included cars/trucks, birds chirping and nearby highway (or compressor station, could not be confirmed). Nearby highway (or compressor station) noise was constant.

Point ID	Start Time	Duration	Meteorological Conditions	LA <sub>eq</sub> (dBA)	Sources of Noise
	13:12	18 min	69.7 deg F Winds NNW at 1 mph No measurable rain	46.2	Traffic from nearby road was predominant sound source; Background included birds. Bird chirping was constant.
Entry	02:17	16 min	70 deg F Winds SE at 1 mph No measurable rain	34.9	Background included trains, highway (or compressor station, could not be confirmed) and wind knocking water off leaves. Nearby highway (or compressor station) noise was constant.

#### Table 3-3. Results of Sound Level Measurements at H316 HDD Exit NSAs

Point ID	Start Time	Duration	Meteorological Conditions	LA <sub>eq</sub> (dBA)	Sources of Noise
NSA-N	00:51	17 min	70.6 deg F Winds SE at 0 mph No measurable rain	34.3	Background included cars/trucks, planes, crickets, rain and chirping birds. Distant traffic and cricket sounds were constant.
NSA-SW	01:31	15 min	69.9 deg F Winds SE at 0 mph No measurable rain	44.4*	Background included cars/trucks, rain, motor, train, dripping and crickets. Rain, cricket and distant traffic sounds were constant.

\*This LA<sub>eq</sub> value is corrected due to the run being restarted after the windscreen was added. Some of the data were also excluded because the landowner vehicle approached.

Point ID	Start Time	Duration	Meteorological Conditions	LA <sub>eq</sub> (dBA)	Sources of Noise
NSA-W	22:07	18 min	71.1 deg F Winds S at 8.1 mph No measurable rain	44.6	Traffic from nearby road was predominant sound source; Background included residents talking and coughing, dog barking, water dripping, and industrial equipment. Sounds from industrial equipment, traffic, and water dripping of leaves were constant.
Entry	22:41	20 min	71.1 deg F Winds S at 6.9 mph No measurable rain	45.6	Traffic from nearby road was predominant sound source; Background included planes, water dripping, water flow in nearby creek and industrial equipment. Sounds from industrial equipment, traffic, the creek and water dripping of leaves were constant.

### Table 3-4. Results of Sound Level Measurements at Mon HDD Entry NSAs

#### Table 3-5. Results of Sound Level Measurements at Mon HDD Exit NSAs

Point ID	Start Time	Duration	Meteorological Conditions	LA <sub>eq</sub> (dBA)	Sources of Noise
NSA-N	22:45	17 min	71.1 deg F Winds S at 6.9 mph No measurable rain	37.5	Traffic from nearby road was predominant sound source; Background included cars/trucks, planes and chirping insects.
NSA-N2	22:20	17 min	71.1 deg F Winds S at 8.1 mph No measurable rain	42.4	Background included cars/trucks, insects chirping, water dripping from leaves, motor, trains, and a distant boom.

Point ID	Start Time	Duration	Meteorological Conditions	LA <sub>eq</sub> (dBA)	Sources of Noise
NSA-S	21:56	20 min	71.1 deg F Winds SSW at 8.1 mph No measurable rain	45.4	Background included cars/trucks, insects chirping, water dripping from leaves, trains, planes, a falling branch, and a distant boom. Rain patter and insect noise were constant.

### 4.1. LDN CALCULATIONS FOR THE REDHOOK COMPRESSOR STATION

In order to determine the baseline ambient sound levels at the NSAs, the  $L_{dn}$  were calculated from the sound measurements made at the NSAs.  $L_{dn}$  values are calculated from the daytime and nighttime  $L_{Aeq}$  values, with the  $L_{Aeq}$  values for the nighttime period (10 PM to 7 AM) increased by 10 dB to reflect the greater disturbance potential from nighttime sounds. The  $L_{dn}$  was calculated for each of the four (4) NSA nearest to the compressor station from the daytime and nighttime  $L_{Aeq}$  values according to the formula below. The results of this calculation are shown in Table 4-1.

$$L_{dn} = 10 \log_{10} \left( \frac{15}{24} * 10^{\frac{L_{Aeq(day)}}{10}} + \frac{9}{24} * 10^{\frac{L_{Aeq(night)} + 10}{10}} \right)$$

	Background (July 2015)		
Location	Daytime/Nighttime		
LOCATION	Measurements (L <sub>eq</sub> ,	L <sub>dn</sub> (dBA)	
	dBA)		
NCA 1	45.3		
NSA-1	43.9	50.5	
NCA 2	52.6	FC 1	
INSA-2	48.9	50.1	
NCA 2	47.9	47.0	
NSA-3	36.1	47.3	
NCA 4	65.3		
NSA-4	58.1	66.6	

Table 4-1. L<sub>dn</sub> at Each Noise Sensitive Area

Once the Redhook Compressor Station is constructed and commences operation, a second noise measurement assessment will occur within 60 days, per 18 CFR 157.206(b)(5)(ii). Measurements from the second assessment will be compared to the baseline measurements to determine if the presence of the compressor station resulted in a change in ambient sound at the NSAs. However, at least two of the NSAs are already above the 55 dBA standard, mostly due to the road traffic.

### 4.2. HDD MEASUREMENTS

The federal noise standards related to HDD are all based on  $L_n$  measurements. The results of the measurements performed at the HDD entry and exit points are presented in Tables 3-2 through 3-5.

### 4.3. CONCLUSIONS

As discussed in Section 3, vehicular traffic was the predominant source of noise measured at all NSAs. Equitrans has no control over the road traffic. Other frequent sounds included planes, nearby industrial activities, dogs barking, trains, birds chirping, and insects.

Equitrans has characterized the ambient noise that is related to the NSAs surrounding the Redhook Compressor Station, as well as the two (2) HDD sites. Several locations receive significant impact from road traffic. In particular, it has been found that the  $L_{dn}$  at two (2) of the NSAs associated with the compressor station are already above the FERC standard of 55 dBA.

The results of the HDD measurements were also presented in this report. However, Equitrans is not planning to perform nighttime drilling and the baseline data were only taken as a conservative measure.

## APPENDIX A: COMPRESSOR STATION NSA TIME HISTORY DATA



Figure A-1. NSA-1 - 2015 Daytime Measurement

Figure A-2.NSA-1-2015 Nighttime Measurement





Figure A-4. NSA-2 - 2015 Nighttime Measurement





Figure A- 5. NSA-3 - 2015 Daytime Measurement





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Figure A-7. NSA-4 – 2015 Daytime Measurement





# APPENDIX B: FIELD NOTES

MON HDD

Location	Mon HAD Entry
NSA #	Entry Point
Description of Location (incl. vegetation/ground surface)	woods & tall grass
Latitude/Longitude	23 g - 23
Date	7/7/2015
Start Time	10:41 PM
End Time	11 5 01 PM
Duration	~15 min
Approximate distance(s) to nearby structures	~50 ft to road that NSA-W is on
Was NSA occupied?	N/A YES NO
Types of activities taking place in nearby area	have cars driving by
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	no precip
Engine Load Conditions or N/A	W/A (File 831-data. 010)
Background noise	min dripping off trees, nearby rodds, hum of industrial equipment, planes
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
10:46 PM	plane werhead	Constant (temp.)	moderate
duration	hum of industrial equipment	constant	faint
duration	Cars on distant highway	Constant	faint
10:47 PM	Car on hearby road	rare	faint
10:49 PM	animal in woods by meter	pare	mol.
10249 PM	aur driving by on road	rare	loud
10:50 PM	car on hearby road	fast rare	taint
10:53 PM	plane overhead	constant (femp.)	faint
Quation	min du pping off trees	Constant	tacet
duration	water flow in nearby creek	constant	faint
10:51 PM	car driving by on road	bare	loud
10:58 PM	car driving by on road	Vare	loud
11:00 PM	car on nearby road	vare	lova
			1
Lc.			

Location	Mon HDD Entry
NSA #	West (W)
Description of Location (incl. vegetation/ground surface)	lawn
Latitude/Longitude	24) 
Date	7/7/2015
Start Time	10:07 PM
End Time	10=25 PM
Duration	~ 15 min
Approximate distance(s) to nearby structures	~ 50 At to NSA residence
Was NSA occupied?	(YES) NO (ravs in duraway)
Types of activities taking place in nearby area	nearby residents talking, cars driving by
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	no precip
Engine Load Conditions or N/A	n/a @ File 831-data,009
Background noise	rain dripping off trees, roots nearby roads, hum of industrial equipment, planes overhead
Pictures Taken?	YES (NO)

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
10:08 PM	nearby residents walk outside	rare	moderate
10:09 PM	Car on newspy road	intermillent	faint -moderate
10:12 PM	hearby resident coughing	inter mitlen t	faint - mod
10-13 PM	nearby resident talking (coughing	rave	faint -mod
10:15 PM	nearby residents coughing	interm.	faint
10 216 PM	car on nearby mad, res. Coughing	rare-int-	faint -mod
10-16 PM	dog burking	have	mod-
10:17 PM	nearby resident talloing / cary hing	thermit.	faint - mod
10:18 PM	car on neurby road	the have	mod-
duration	hum of industrial equipment	Constant	faint
duration	cars on distant high way	constant	faint
10:20 PM	car on nearby road	have	mod.
(0:21 PM	twee on nearby road	hre	mod-loud
10:23 PM	nearby residents talking	Intermit	faint - mod
10=23 PM	car on hearby road	have	mod.
10-24 PM	neurby resilent coupling	Intermit	faint-mod
(0:25 PM	rearby res. talking/coughing	julern.	statut - mod
Amation	hain dripping off trees	Constant	faint
	5		
		1.1.2	
	1		

200000	131 - Data. 004
Location	Mon HDD EXIH - NSA - N
NSA #	NSAN
Description of Location (incl. vegetation/ground surface)	Field across steet grass yard with shrubs; sometall they interpresed
Latitude/Longitude	~ 40° 14'51" N 79° 57'20" W Close to Gugle Earth Coorde
Date	7/7/15
Start Time	22:45
End Time	23.07
Duration	17:04
Approximate distance(s) to nearby structures	~30ft from house
Was NSA occupied?	YES / NO
Types of activities taking place in nearby area	Traffic from nearby road/highwacy (both) Rusking leaves in field nearby
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	No precip humid light breeze, if any
Engine Load Conditions or N/A	MA
Background noise	Cars from nearby free way Pathrof rain on leaves
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
22:46	Plane overhead	Rone	moderate
22:48	Nearby Car	Internitlent	moderate
22:49	Neer by Car	Rare	moderate
22:50	Car accelerating	Rove	Ion
07:53	Plane overhead	Rare	Jow
22:55	Nearby car	Rave	low
22:54	Nearby car	Rove	moderate
22:58	Nearby car	Intermident	molerark
22.59	Nearby Car	Rone	moderale
23:01	Insect Chivping	Rone	Ion
	. 9		

Location	831-Deta.005
Location	33 Saw Mill Rd
NSA #	Mon HDDEXIH-NSA-NQ
Description of Location (incl. vegetation/ground surface)	Grassy yard with Suromoling Forest
Latitude/Longitude	40" 14'51" N 790 57' 69" W
Date	7/7/15 Closer to 40° 14'51"N, 79°57'24"W pe Gægle Earth
Start Time	29:30
End Time	23:37
Duration	17:11
Approximate distance(s) to nearby structures	~ 100 feet from house
Was NSA occupied?	YES / NO
Types of activities taking place in nearby area	
Weather Notes: Precipitation Temperature Wind Direction Wind Speed	Not varining; leaves are dripping humid, no wind
Engine Load Conditions or N/A	NA
Background noise	Distant engine humming (ACUNIT?) Pathrof water on leaves Insects Chirping
Pictures Taken?	YES / NO

1

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
22:22	Cardoar shuts	Rare	moderaile
22.22	Siren in distance	Rave	low
22:22	Constant Patkof rain onlean	s constant	moderate
22:23	in sects chirping	Constant	to mod.
22.23	Plane overhead	roure findernitly t	low
22.23	lowhun of motor	constant	moderate
22:27	Distant train whistle	Rove	low
22:28	Car accelerating in distance	Rove	low
22:28	Distant boom (firewark?)	Rare	low
22.29	plane overhead	Ka Rave	moderate
22:35	Train whistle	Interrittert	molerate
	· · · · · · · · · · · · · · · · · · ·		
1.1.1.1.1.1.1			
	1		

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Location	Last house on Saw Mill Rol (S side) 831-Data, 004	
NSA #	Mon HDD Exit - PB Note that this is now being	
Description of Location (incl. vegetation/ground surface)	drivelibly; trees on either	
Latitude/Longitude	~40° 14' 51" N 79 57' 11" W Shows these	
Date	7/7/15 0f driveway. Achel sample loc. 4 ~40'14'47" N, 79°57'12"W per	
Start Time	Coogle Earth.	
End Time	22:16	
Duration	20 minutes	
Approximate distance(s) to nearby structures		
Was NSA occupied?	Unable to tell yes / NO	
Types of activities taking place in nearby area	None	
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	Light rain	
Engine Load Conditions or N/A	NA	
Background noise	Consistent patter of light rain on trees insects chirping Starting at 12:13 low distant motor (constant)	
Pictures Taken?	FCA YES / NO	

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
20:01	Plane overhead	Rove	low
22:01	Police siven (distant)	Rove	low
22:07	Rain phys on car root	Internitkit	Moderate
20:02	Rain path on leaves	constant	moderate
22:02	Insects Chipping	Constant	10w-moderade
22.09	Carindistance	Rove	faint
22:09	Vehille rumbling indistance	Rave	faint
22:11	Plane overhead	voure	faint
22:12	Branch falling in woods	rare	laud
22:12	Distant boom	Rave	moderate
22:13	Plani overhead ordist.	Bacare Intermittent	Bacolande
	1110103		

H316 HDD

Location	316 HOD Entry		
NSA #	Entry Point		
Description of Location (incl. vegetation/ground surface)	field w/ woods on edges		
Latitude/Longitude	and the second of the second o		
Date	7/8/2015		
Start Time	1=12 PM		
End Time	1:30 PM		
Duration	~15 min .		
Approximate distance(s) to nearby structures	meter at entry point		
Was NSA occupied?	NA YESTNO		
Types of activities taking place in nearby area	none		
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	no precip		
Engine Load Conditions or N/A	N/A File 831-data.018		
Background noise	birds chiping		
Pictures Taken?	YES /NO		

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
1:16 PM	can on nearby road	vare	moderate
Auntion	birds chirping	constant	Frint - motivate
1-20 PM	car on nearly road	rare	faint - mod.
1:22 PM	Car on nearby roul	mre	faint
1:23 PM	Car on newby road	rare	moderate
1:24 PM	car on nearly road	have	Aint -mod.
1=26 pm	car on nearby road	nre	faint
	And the second s		
		*D. <sup>~~</sup>	
	12.5	7 54	
	the second se	1. The second se	
	1	1.50.00	
Location	316 HOD ENTRy		
--	---		
NSA #	Entry Point		
Description of Location (incl. vegetation/ground surface)	field staar w/ woods on edges		
Latitude/Longitude			
Date	7/8/2015		
Start Time	2:17 AM		
End Time	2:33 AM		
Duration	$\sim$ 15 min		
Approximate distance(s) to nearby structures	meter at entry point		
Was NSA occupied?	N/A YES/NO		
Types of activities taking place in nearby area	none		
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	no precip (very very light drizzle)		
Engine Load Conditions or N/A	N/A (File 831-data.015)		
Background noise	insects, train in distance (whistle), noise in distance ? either high way OR compressor station operating to west of NSA		
Pictures Taken?	YES /NO		

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
2=17 AM	train whistle in distance	Inter mittent	faint
duration	highway or compressor station	Constant	first - moderate
Pas 2:2	3 AM wind knocks water off leaves	nre	faint - mod.
2:26 AM	wind knocks water off leaves	vare	faint
	+		
	a		
	$-\chi - \chi - \chi - \chi$		
	the west of the	21-0	
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10000	dente and the second second		
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	and the second second second second	15	
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	er - real made	1	
	and the second of the second o		
1			

Location	316 HDD Entry
NSA #	E (East)
Description of Location (incl. vegetation/ground surface)	yard
Latitude/Longitude	
Date	7/8/2015
Start Time	FERRA 1:31 AM
End Time	1=47 AM
Duration	~15 min
Approximate distance(s) to nearby structures	~ 100 feet to residence, on driveway
Was NSA occupied?	(YES / NO (tant in (landou diversion) aniver
Types of activities taking place in nearby area	hone starte
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	no precip (very hight driezele)
Engine Load Conditions or N/A	N/A (file 831-data.013
Background noise	noise in distance : cither high way OR Compressor station operating to west of NSA
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
HEREN	the second		
1=34 AM	birds chirping	nie	faint
duration	nearby compressor station or highray	constant	faint to slightly
1=41 AM	cur in distance	rave	fain-mod. Modern
	SIGL <sup>A</sup> = I <sub>2</sub>		
	the state of the s		
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A. 90 14. 40	a suitair a suitair an	1.02.42	
	5.0x		

	Location	316 HDD Entry
	NSA #	N2 (North 2) Note that this is now being referred to as NSA-N.
	Description of Location (incl. vegetation/ground surface)	yard
	Latitude/Longitude	about 1 and produce and an and a state
1.1.4	Date	7/8/2015
	Start Time	12:57 AM
	End Time	1:15 AM
	Duration	$\sim 15$ min
	Approximate distance(s) to nearby structures	~ 50 ft to residence
	Was NSA occupied?	(YES/ NO (Cars interray)
	Types of activities taking place in nearby area	None (and owner)
	Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	no precip (very very light drizzle)
	Engine Load Conditions or N/A	N/A (file 831-data.011)
	Background noise	insects, talk thereby in distance west/sw of west/sw nich
	Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
12:58 AM	Landowner opens door	have	Farm
duration	insects chirping	constant	fuint
1:02 AM	landowner closes door	vare	faint
1:03 AM	horse shorts	rare	faint -moderate
1:05 AM	horse trotting in hearby field	Intermit	faint
duration	hearby compressor station	con stunt	slightly more than thin sometimes molerate
1:14 AM	car in distance	rure	faint
		87 27	
l			
	the second s		
	$T_{ij}$		
11	and the second		
	21	phenological Sciences and Sciences	

	831-Data.009
Location	280 Antram Rd
NSA #	316 HDD Entry - NSA-W
Description of Location (incl. vegetation/ground surface)	Stoped grassy area where line above road
Latitude/Longitude	39° 54' 10" N, 80° 5' 34" W GPS signal during
Date	7/8/15 reading
Start Time	2:08
End Time	2:25
Duration	#17
Approximate distance(s) to nearby structures	~20 Fa to house
Was NSA occupied?	Unknown YES / NO
Types of activities taking place in nearby area	
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	Light rain ( orizzle) Light wind
Engine Load Conditions or N/A	MA
Background noise	Rocin patter, racin hitting stuctures light wind Distant traffic
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
2:10	wind blows		
Diration	Racin pecter	constant	Iow/mod.
Direction	Rain on Car roof	Constant	moderate
2:12	Duralpeotor On 1 hout	Rane	low
Duration	Distant freeivary traffic	constant	low
2:13	Distant passing Car	rare	low
2:14	Ac unit turned on	constant	moderate
2:15	wind blows	intermittent	moderate
2:19	wind blows	internitiont	Iow
9.91	Rustle in bushes	rove	low
2:27	plane overhead	vare	low
2:23	Wind Blows	rare	moderate
2.23	Rain patter	internitient	moderate
2:25	Distant car	rave	low
		1	
			9.29 S

Location	294 Homeville Rd 831-Data.007
NSA #	316 HDDEXIT - NSA NQ Note that this is now being referred to as NSA-N.
Description of Location (incl. vegetation/ground surface)	grassy lawn up some tall trees
Latitude/Longitude	39° 54' 52"N 80° 05' 33" W shows mese con to be on S side
Date	7/8/15 ariveway, but measurement was tak
Start Time	OU: 512 UDD OF WEWAY)
End Time	1:05
Duration	10:41
Approximate distance(s) to nearby structures	~30 fa tohouse ~50 fa tobarn
Was NSA occupied?	Unknown YES / NO
Types of activities taking place in nearby area	
Weather Notes: Precipitation Temperature Wind Direction Wind Speed	Autration Light voin began around 1.62
Engine Load Conditions or N/A	MA
Background noise	Distant free way sounds Crickets
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
Duration	Distant traffic horse	constant	Jon
0:59	Plane Overhead	roure	low
Duration	Crickos Chirping	ink medicate	moderate
Dration	Roun drops on leaves	internitient	low
1:02	bird chirping	rave	low
102 m	light patter of vain	Constant	muderate
1:07	plane overhead	rove	low
1:07	Distart Car	rore	ION

Location	831-Data.008
Location	174-210 CreekRd
NSA #	316 HDD EXIT - NSA-SW
Description of Location	0
(incl. vegetation/ground surface)	Grassy laws whereby the cover
Latitude/Longitude	0 Approximate-No
Lutture/ Longiture	39°54'35" N, 80°5'49" GPS signal during
Date	reading
	/10/15
Start Time	
	T. 23 Kestarted 1:31 (targot wind screen)
End Time	112n 1:11
	N.D. 1.90
Duration	Inche 22:05 Alle exclude first & minutes of
	10.910 05 -00000 10st 1 01044
Approximate distance(s) to	~ 50 A to house minut
near by structures	Con ke ha
Was NSA occupied?	SPORE TO (YES)/ NO
	land owner
Types of activities taking place in nearby area	
photo in noursy wou	
Weather Notes:	Light voun
<ul> <li>Precipitation</li> <li>Temperature</li> </ul>	Crickets
Wind Direction	
Wind Speed	
Engine Load Conditions	
OF N/A	MA
N/A	Que plicipt vais a const
	Forther of "grin racen on leaves
Background noise	Crickets chirping
	Report in the most i pools
	Distant cars on francia
	Mision II Cons off Meening
Pictures Taken?	YES /(NO)

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
Duration	Rain potter	Constant	moderate
Puration	Crickets	constart	low
Duration	distant traffic	constant	low
1:31	Distant Whine of motor	in rareconstant	low
1.33	Train whistle	rone	low
1:34	Rustle of branches	rove	low
1:40	Loud drip	nara intermittent	moderate
1.42	Lova distant motor	rare/intermittent	moderate
1:44	Lovel drip		moderate
1:496	Cardrove up-Convolu	rove	loud
	landowner		
	4		

Redhook Compressor Station



Location	Red Hook Compressor Station
NSA #	MSA-1 MA (Address: 185 Shope Rd)
Description of Location (incl. vegetation/ground surface)	yard, surrounded by fields / woods
Latitude/Longitude	
Date	7/8/2015
Start Time	12:18 PM
End Time	12:50 pM
Duration	~ 30 min
Approximate distance(s) to nearby structures	~ 30 ff from NSA
Was NSA occupied?	(YES) NO (witnessed kills on 4-wheelers pulling rubo
Types of activities taking place in nearby area	Vehicles on Highway 188 drivening)
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	no precip (very very light drizzle)
Engine Load Conditions or N/A	N/A File 831=data.017)
Background noise	highway 188
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
dumtion	highway 188 vehicles (esp. trucks)	Constant-	faint - moderate
duration	birds chiliping	Constant	First - moderate
	and all a stranger of		
	and the second		
	1774 - 17		
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	and and the state		
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1.277.9	12 4 1 1997 P		
	CARGE BOAT OF LAND		
		e en que contra	

Location	Red Hook Compressor Station
NSA #	NSA-1 (185 Strope Road)
Description of Location (incl. vegetation/ground surface)	yard, surrounded by fields /woods
Latitude/Longitude	
Date	7/8/2015
Start Time	10:38 PM
End Time	11=10 PM
Duration	~ 30 min
Approximate distance(s) to nearby structures	~ 30 Ft From NSA
Was NSA occupied?	(YES / NO (Some lights on , appeared to be)
Types of activities taking place in nearby area	Vehicles on highway 188
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	no precip (very very tight drizzle)
Engine Load Conditions or N/A	N/A Filename : 831-data.020
Background noise	highway 188
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
duction	Highway 188 (esp. large twees)	carstant	moderate
duration	insects	constant	faint
10:51 PM	truck bruking up in distance	constant (semponery)	) moderate
11:05 PM	twok backing up in distance	constant (but temporary	) for moderate
		7	
		1/-	

Location	Red Hook Compressor Station
NSA #	NSA-2 (Addiess: 215 Strope Rd)
Description of Location (incl. vegetation/ground surface)	yard, woods hearby
Latitude/Longitude	and the set of the set
Date	7/8/2015
Start Time	11:18 AM
End Time	11355 AM
Duration	~30 min
Approximate distance(s) to nearby structures	~30 ft from NSA
Was NSA occupied?	(YES) NO (talked to resident)
Types of activities taking place in nearby area	vehicles on highway 188, potentially contraction act helated to nearby wellpad (witnessed vehicles driving on wellpad road), and a m construction which opening in
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	No precip possibly a l wher put
Engine Load Conditions or N/A	N/A (File 831-data, 016)
Background noise	highway 188, the distant windling of equip
Pictures Taken?	YES NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
11:19 AM	4-wheeler on road	Vare	loud
duration	highway 188 vehicles (esp.	constant	modernite - lou
dynation	birds chipping (incl. crows)	Constant	moderate
11:23 AM	4 - wheder in nearby field	mre	moderate
11:24 AM	4-wheeler on road	nre	moderate
11:26 AM	4-wheeter goes up NSA drive way	hire	loud
	A. 201)		
	1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -		
	titori colta di in		
14	$L = -\epsilon_{F_{\alpha}} e_{\alpha}$		
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al merery	$\mathcal{A}^{N}(\mathbf{f}_{0})^{h_{0}}N) \simeq \mathcal{O}(\mathbf{f}_{0})^{h_{0}}N) = \mathcal{O}(\mathbf{f}_{0})^{h_{0}}N$		
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Location	Rad Hook Compressor Station
NSA #	NSA-2 (215 Strope Poud)
Description of Location (incl. vegetation/ground surface)	yard, woods hearby
Latitude/Longitude	
Date	7/8/2015
Start Time	10:02 PM
End Time	10=33 PM
Duration	~ 30 min
Approximate distance(s) to nearby structures	~ 30 feet from NSA
Was NSA occupied?	YES/ NO
Types of activities taking place in nearby area	Vehicles on highway 88, potentially activities related to nearby wellpad (sounds like same machine as daytime test)
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	no precip
Engine Load Conditions or N/A	NIA (filename 831-data.019)
Background noise	highway 88, distant windling of equipment
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
dominion	Highway 188 (esp. large twees)	Constant	frint -moderate
duration	engine in nearby creek (pump?)	construct	moderate
· · · · · ·			

Location	831 - Date.016
Constraint of the	Braden Run Animal Hospital
NSA #	Red HOOK NSA-3
Description of Location (incl. vegetation/ground surface)	Gravel lot close to road up surounding thee 39° 55' 12" N; 80° 08' 05" W
Latitude/Longitude	7 Google Earth Shows coards. in field but measurement was taken on border of field t
Date	7/8/15 Parking lot (~39°55'11.84"N 80°8"4.68" W per Boogk
Start Time	11:03 11:03
End Time	11:35
Duration	37:34
Approximate distance(s) to nearby structures	20 fect to hospital building; 100 for to house
Was NSA occupied?	Spoketo Megan + (YES)/ NO
Types of activities taking place in nearby area	
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	light derizzle
Engine Load Conditions or N/A	MA
Background noise	Birdy Chirping light breeze insects
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
Duration	birds chirping	Constart	moderate
Duration	in sects chirping (crickets)	constart	low
11:00	Crow cawing &	intermittent	moderate
11.07	Plane overhead	rane	low
11:09	Bird Chirping	intermittent	maleate
11:12	Bird	intermittent	mog).
1112	Cor in distance	rone	low
11:12	Train whistle	rare	low
11°B	wind through trees	int.	low-mod.
11-14	Carinaistance	rare	low
11:14	Train whistle	rore	low
11:14	wind through trees	intermittert	low
11:16	Bird Chirping	internittent	mool.
11:17	Eq Hammering in distance	int.	lon
11:18	wind 0	int.	low
11:21	Crows Cawing	int.	moderate
11:22	Distant car 0	rare	low
11:23	Birds Chirping	ivt.	mod
11.24	Bira chirping	int	mod.
11:25	Crow Cawing	Vare	mod
11:27	Distant siren	raire	low
11:99	Bird	int.	mod.
11:31	Birds	int.	low
11:34	Bird/cnw	int	moderate
	N		

Noise Study	<b>Field Sheet</b>
Trinity Co	nsultants

	Trinity Consultants $p_{0} \downarrow p \neq 2$	
Location	Braden Run Animal Hospital	
NSA #	Red Hook NSA-3	
Description of Location (incl. vegetation/ground surface)	Gravel lot close to road up Surrounding trees	
Latitude/Longitude	39° 55' 11.84" N, 80° 8' 4.68" W per Goog	
Date	7/8/15 Earth	
Start Time	22:44	
End Time	23:17	
Duration	33.03	
Approximate distance(s) to nearby structures	~20FA to haspital; ~100 fa to house	
Was NSA occupied?	Velevas YES / NO	
Types of activities taking place in nearby area	r	
Weather Notes: Precipitation Temperature Wind Direction Wind Speed	No rain none to low wind	
Engine Load Conditions or N/A	MA	
Background noise	Dripping sound (constant) Iow volume ouistant traffic Dog barking in distance intermitknither for deration of run	
Pictures Taken?	(Day time) (FES / NO	

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
22:45	Dag barking industance	internitient	low-modurate
Adre	0 0		
Duration	drip of water	internitlent	10W-maderate
22:44	plaine everhead	reve	low
22:46	AC unit running at neats	house constant	low to mod
29:47	Dog borking inside hospital	int.	low
Duration	Crickets Chirping	Constant	low
22:47	horse neighing	vare	moderate
Duration	Distant traffic	internitlent	low
22:50	Dog barking in distance	int.	moderate
22:51	plane overhead	vore	low
22:51	Dog barking in distance	int.	mod.
22:53	Distant traffic	rone	low
22:54	Dog borking in distance	int	moderate
22:55	plane overhead	rane	low
22:55	horse neighing	rane	mool.
22:54	Dog barking in Distance	int	low-mod
22:57	horse heigh	reve	low-mode.
22:51	barrow in distance	int.	mod
22:59	Dog barking in distance	int.	mod
23.01	horse neigh	reve	moderate
23:02/03	Dog barking in pustance	int.	mad
23:03	Rustle in bushes	rare	low
23:04	Dog borking in distance	int	low
23:05	plane overhead	reve	100
23:0le	Dog borking indistance	int	Vare
23:07	Rumble of Elistant tattic	int.	low
23:08	Rustle of leaves	rave	low
23:09	Horse neighing	rove	mod.
23:10	Horse neighing	have	mad.

**Noise Study Field Sheet** 

	Trinity Consultants
Location	19 auto.
NSA #	Red HOOK NSA-3
Description of Location (incl. vegetation/ground surface)	
Latitude/Longitude	4
Date	
Start Time	
End Time	
Duration	
Approximate distance(s) to nearby structures	
Was NSA occupied?	YES / NO
Types of activities taking place in nearby area	
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	
Engine Load Conditions or N/A	
Background noise	
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
23:10/11	Dog barking indistance	intermitlet	low
23:15	Dog barking in oustance	int	mod.
			· · · · · · · · · · · · · · · · · · ·

Pglof 2

Location	End of Brain Run Road 831-Data.011
NSA #	Red HOOK NSA-4
Description of Location (incl. vegetation/ground surface)	Small grassy yard near road up trees around a
Latitude/Longitude	39° 54' 58"N, 80° 07' 36"W
Date	7/8/15 Closer to Google Earth Coordinates of: 39° 54' 57.77" N, 80" 7'36.90" W
Start Time	11:51
End Time	12:23
Duration	31:53
Approximate distance(s) to nearby structures	~ 30 ft to garage
Was NSA occupied?	YES (NO (?)
Types of activities taking place in nearby area	Busy road up lots of heavy truck traffic Nearby industrial equipment across street
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	No rouin Light mist ~ 12:11
Engine Load Conditions or N/A	NA
Background noise	Loud traffic from nearby road; lots of heavy trucks Birds chivping Insects
Pictures Taken?	(YES)/ NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
Diration	Heavy truck traffic		
11:55	Construction sound indist.	int.	low
11:55	Passing cars	constant/int.	loud
Avation	birds Chirping	internitlent	moderate
11:57	Cars passing	int.	land
11:57	truck passing	int.	loud
11:58	Cars passing	int.	lova
11:59	cas passivy	int.	loud
12.00	heavy truckspassing	int	loud
12:01	Car truck passing	int.	loud
12:02	birds chirping	int.	mod
19:02	truck passing carspassing	int.	lova
12:04	Passing cars of	int.	1000
12:05	trucks passing, motorcyd	e int	loud
12:06	Cars passing	int	loud
12:07	Birds Chirping	int	moderate
12:07	trucks	int	lord
12:08	Carspassing	īnt	loud
12:09	(as heavy trucks	int.	loud
12:10	Crow cawine;	int.	moderate
12:10	heavy truck; scar	int	1000
12:11	Cars passing	int	loud
12:12	trucks passing	int	lovol
12:13	car; heavy fruck	int	1000
12:14	heavy truck	int.	1000
12:14	Rustle i bushes	rare	mod
12:15	Car pulling out of nearby road	rove	mod.
12:15	cars passing heavy truk	int.	lord
12:11e	Cars passing	int	loua
12:17	Car passing	1 177	mod

Location	
NSA #	Red Hook NSA-4 Por 2 of 2
Description of Location (incl. vegetation/ground surface)	
Latitude/Longitude	
Date	
Start Time	
End Time	
Duration	
Approximate distance(s) to nearby structures	
Was NSA occupied?	YES / NO
Types of activities taking place in nearby area	
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	
Engine Load Conditions or N/A	
Background noise	

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
12:18	heavy truck possing	int.	1002
12:19	cars passing	int.	mod
12:20	cars passing	int.	mod
12:20	birds Chirping	int	mod.
12:21	cars passive	int.	mod.
12:22	trucks passing	int.	1000
Duration	industrial engine hum	constant	mool.

	Noise Study Field Sheet Trinity Consultants
	Pg-10t2
Location	Juffron Rd 831-Data.012
NSA #	Red Hook NSA-4
Description of Location (incl. vegetation/ground surface)	Grassy area near road up that surrouping
Latitude/Longitude	39°34'57.77"N, 80°7'36.90" W (per Google
Date	7/8/15 Earth)
Start Time	22:01
End Time	20:33
Duration	32:27
Approximate distance(s) to nearby structures	NSDER to roadhaly
Was NSA occupied?	YES (NO
Types of activities taking place in nearby area	Industry across street Traffic from adjacent road way
Weather Notes: • Precipitation • Temperature • Wind Direction • Wind Speed	No rain; hone to low wind
Engine Load Conditions or N/A	NA
Background noise	Industry across Street-humofengines Crickets
Pictures Taken?	(YES/ NO Day time

	Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
_	22:03	Carspassing	intermittent	moderate
106	0123.021:04	Distant motor	rare	low
	22:05	Cars passing	int	moderaile
	22:06	Caspassing	int.	mool.
	22:07	Car passing	int.	mool.
	22:08	cars passing	int.	mool.
	2209	Capassing	int	mod
	22:11	Car passing	int.	mod.
	Diration	crickets/ insects chirping	Constant	low
	Diration	motor/hum from industry	constart	low-mod
		a cross st. o		
	22:12	cars passing	int.	mod
	22:13	Caropassing	int.	mod
	22:14	Car passing	int.	mod
	22:15	Carpassing	int.	mod
	20:16	Car passing	int.	mod.
	22:18	car passing	int.	mool.
	22:19	Car passing	int.	mod.
	22:20	Car passing d	int.	mool.
	22:21	Cars passing	int-	mod
	22:22	in sect chirping lovady	rane	ADDOCE. low
	22:23	car passing	int.	moa.
	22:25	plistant Ganging	reine	low
	22:25	trucks passing	int.	lad
	22:26	Car passing	int.	mod.
	22:27	truck passing	111-	loud
	22:27/28	Cars passing d	int.	mod-
	22:28	dog barking indistance	rove	1000
	22:29	truck passing	int	lova
	22:29	cors passing	in+	mod.

	Trinity Consultants
Location	13 00.00
NSA #	
Description of Location (incl. vegetation/ground surface)	Red Hook NBA-4
Latitude/Longitude	
Date	
Start Time	
End Time	
Duration	
Approximate distance(s) to nearby structures	
Was NSA occupied?	YES / NO
Types of activities taking place in nearby area	
Weather Notes: Precipitation Temperature Wind Direction Wind Speed	
Engine Load Conditions or N/A	
Background noise	
Pictures Taken?	YES / NO

Time	Noise Type	Frequency: Rare / Intermittent / Constant	Noise Volume
22:30	cor passing	int-	mod.
22:30	truck passing	pougl. int.	loud
22:31	tated cas passing	int.	mod-loug
22:31	the branch shap	rove	mod
		-	