ROVER PIPELINE
An ENERGY TRANSFER Company

ROVER PIPELINE LLC

Rover Pipeline Project

RESOURCE REPORT 9
Air and Noise Quality

FERC Docket No. CP15-___-000

February 2015

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LIST OF ACRONYMS

BHp	brake-horsepower
CAA	Clean Air Act
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent (expressed in tpy)
dB	decibel
dBA	A-weighted decibel
DEP	Department of Environmental Protection
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
GHG	greenhouse gas
HAP	hazardous air pollutant
Hz	hertz
HDD	horizontal directional drills
hp	horsepower
IC	internal combustion
INGAA	Interstate Natural Gas Association of America
ISO	International Organization for Standardization
L_{eq}	equivalent sound level
L_{dn}	day-night average sound level
Mainline CS1	Mainline Compressor Station 1
Mainline CS2	Mainline Compressor Station 2
Mainline CS3	Mainline Compressor Station 3
MI	Michigan
MLV	mainline valve
MSS	maintenance, start-up and shut down
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NESHAP	National Emission Standards for Hazardous Air Pollutants
NRC	noise reduction coefficient
NSR	New Source Review
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
N_2O	nitrous oxide
NSA	noise sensitive area
NSPS	New Source Performance Standards
OAC	Ohio Administrative Code
OH	Ohio

O_3	ozone
PA	Pennsylvania
Pb	lead
PM	Particulate matter
$PM_{2.5}$	particulate matter with a nominal aerodynamic diameter of 2.5 microns or less
PM_{10}	particulate matter with a nominal aerodynamic diameter of 10 microns or less
ppmvd	parts per million volumetric dry
Project	Rover Pipeline Project
PSD	Prevention of Significant Deterioration
Rover	Rover Pipeline LLC
STC	sound transmission class
SIP	State Implementation Plan
SO_2	sulfur dioxide
tpy	tons per year
USEPA	United States Environmental Protection Agency
VFD	variable frequency drive
VOC	volatile organic compounds
WV	West Virginia

RESOURCE REPORT 9 – AIR AND NOISE QUALITY	
Filing Requirement	**Location in Environmental Report**
• Describe existing air quality, including background levels of nitrogen dioxide and other criteria pollutants which may be emitted above EPA-identified significance levels. (18 CFR § 380.12(k)(1))	Section 9.1.2 and Appendix 9A, Tables 9A-4, 9A-5A and 9A-5B
• 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. (18 CFR § 380.12 (k)(2)). (i) Report existing noise levels as the L_{eq} (day), L_{eq} (night), and L_{dn} and include the basis for the data or estimates. (ii) For existing compressor stations, include the results of a sound level survey at the site property line and nearby noise-sensitive areas while the compressors are operated at full load. (iii) For proposed new compressor station sites, measure or estimate the existing ambient sound environment based on current land uses and activities. (iv) Include a plot plan that identifies the locations and duration of noise measurements, the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement.	Section 9.2 and Appendices 9A and 9B.
• Estimated the impact of the project on air quality, including how existing regulatory standards would be met. (18 CFR § 380.12(k)(3)) (i) Provide the emission rate of nitrogen oxides from existing and proposed facilities, expressed in pounds per hour and tons per year for maximum operating conditions, include supporting calculations, emission factors, fuel consumption rates, and annual hours of operation. (ii) For major sources of air emissions (as defined by the Environmental Protection Agency), provide copies of applications for permits to construct (and operate, if applicable) or for applicability determinations under regulations for the prevention of significant air quality deterioration and subsequent determinations.	Section 9.1.4 and Appendix 9A
• Provide a quantitative estimate of the impact of the project on noise levels at noise-sensitive areas, such as schools, hospitals, or residences. (18 CFR § 380.12(k)(4)) (i) Include step-by-step supporting calculations or identify the computer program used to model the noise levels, the input and raw output data and all assumptions made when running the model, far-field sound level data for maximum facility operation, and the source of the data. (ii) Include sound pressure levels for unmuffled engine inlets and exhausts, engine casings, and cooling equipment; dynamic insertion loss for all mufflers; sound transmission loss for all compressor building components, including walls, roof, doors, windows and ventilation openings; sound attenuation from the station to nearby noise-sensitive areas, the manufacturer's name, the model number, the performance rating; and a description of each noise source and noise control component to be employed at the proposed compressor station. For proposed compressors the initial filing must include at least the proposed horsepower, type of	Section 9.2; Appendices 9A and 9B.

RESOURCE REPORT 9 – AIR AND NOISE QUALITY	
Filing Requirement	**Location in Environmental Report**
compression, and energy source for the compressor.	

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Filing Requirement	**Location in Environmental Report**
(iii) Far-field sound level data measured from similar units in service elsewhere, when available, may be substituted for manufacturer's far-field sound level data. (iv) If specific noise control equipment has not been chosen, include a schedule for submitting the data prior to certification. (v) The estimate must demonstrate that the project will comply with applicable noise regulations and show how the facility will meet the following requirements: (A) The noise attributable to any new compressor station, compression added to an existing station, or any modification, upgrade or update of an existing station, must not exceed a day-night sound level (L_{dn}) of 55 dBA at any pre-existing noise-sensitive area (such as schools, hospitals, or residences). (B) New compressor stations or modifications of existing stations shall not result in a perceptible increase in vibration at any noise sensitive area.	
• 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. (18 CFR § 380.12(k)(5))	Sections 9.1.5, and 9.2

9.0 PROJECT DESCRIPTION

Rover Pipeline LLC (Rover) is seeking authorization from the Federal Energy Regulatory Commission (FERC) pursuant to Section 7(c) of the Natural Gas Act to construct, own, and operate the proposed Rover Pipeline Project (Project). The Rover Pipeline Project, as currently proposed, is a new natural gas pipeline system that will consist of approximately 711.2 miles of Mainlines and Supply Laterals, 10 compressor stations, and associated meter stations and other aboveground facilities that will be located in parts of West Virginia (WV), Pennsylvania (PA), Ohio (OH), and Michigan (MI). The Project will include 509.1 miles of proposed right-of-way, extending from the vicinity of New Milton, Doddridge County, West Virginia to the vicinity of Howell, Livingston County, Michigan, and will include approximately 202.1 miles of dual pipelines.

The Project as currently proposed will consist of the following components and facilities:

- Supply Laterals:
  - eight supply laterals consisting of approximately 199.7 miles of 24-, 30-, 36-, and 42-inch-diameter pipeline in West Virginia, Pennsylvania and Ohio,
  - two parallel supply laterals, each consisting of approximately 18.8 miles (for a total of approximately 37.6 miles) of 42-inch-diameter pipeline (Supply Connector Lateral Line A and Line B in Ohio),
  - approximately 72,645 horsepower (hp) at six new compressor stations to be located in Doddridge and Marshall counties, West Virginia; Washington County, Pennsylvania; and Noble, Monroe and Harrison counties, Ohio and
  - two new delivery, 11 new receipt, and two new bidirectional meter stations on the Supply Laterals.

- Mainlines A and B:
  - approximately 190.6 miles of 42-inch-diameter pipeline (Mainline A) in Ohio,
  - approximately 183.3 miles of adjacent 42-inch-diameter pipeline (Mainline B) in Ohio,
  - approximately 114,945 hp at three new compressor stations to be located in Carroll, Wayne and Crawford counties, Ohio, and
  - two new delivery meter stations in Defiance County, Ohio.

- Market Segment:
  - approximately 100.0 miles of 42-inch diameter pipeline in Ohio and Michigan,
  - approximately 25,830 hp at one new compressor station to be located in Defiance County, Ohio, and
  - two new delivery meter stations in Washtenaw and Livingston counties, Michigan.

Resource Report 9 describes the ambient air and noise conditions in the Project area, and provides an assessment of Project construction and operation impacts on those environments. This report also provides an assessment of noise impacts associated with the horizontal directional drills (HDD).

A general location map of the Project facilities is shown on Figure 9B-A in Appendix 9A.

9.1 AIR QUALITY

9.1.1 Compressor Stations

Rover proposes to construct three new Mainline compressor stations, one Market Segment compressor station and six Supply Lateral compressor stations, as described below. Aerial maps and U.S. Geological Survey topographic maps and Compressor Station Plot Plans for each compressor station are found in Volume II-B, Resource Report 1, Attachment 1A and Volume III-CEII, Attachment 1A, respectively.

9.1.1.1 Mainline and Market Segment Compressor Stations

Mainline Compressor Station 1

The Mainline Compressor Station 1 (CS1) will be located in a rural area about 1.2 miles west of Leesville and north of State Road 22 in Orange Township, Carroll County, Ohio. The area around the CS 1 Compressor Station site is relatively flat, consisting mostly of forest, agricultural areas, and scattered residences.

Mainline Compressor Station 2

The Mainline Compressor Station 2 (CS2) will be located in a rural area about 2.6 miles northeast of Funk and 0.4 miles north of State Road 30 in Plain Township, Wayne County, Ohio. The area around the CS 2 Compressor Station site is relatively sloped from east to the west, consisting mostly of agricultural land, patchy forest, and scattered residences.

Mainline Compressor Station 3

The Mainline Compressor Station 3 (CS3) will be located in a rural area about 2.3 miles northwest of Chatfield Township, Crawford County, Ohio. The area around the Mainline CS3 Compressor Station site is relatively flat, consisting mostly of agricultural land, patchy forest, and scattered residences.

Defiance Compressor Station

The Defiance Compressor Station will be located in a rural area about 4.7 miles north of Defiance, in Defiance County, Ohio. The area is in the northwest corner of the intersection of State Road 70 and State Road 66. The area around the Defiance Compressor Station site is relatively flat, consisting mostly of agricultural land, patchy forest, and scattered residences.

9.1.1.2 Supply Laterals Compressor Stations

Sherwood Compressor Station

The Sherwood Compressor Station will be located in a rural area about 1.0 mile northeast of Blandville, Doddridge County, West Virginia. The topography of the area is sloped to the northwest. The area around the Sherwood Compressor Station site is slightly rolling hills, consisting mostly of forest and scattered residences.

Majorsville Compressor Station

The Majorsville Compressor Station will be located in a rural area about 3.8 miles south of Dallas, Marshall

County, West Virginia. The topography of the area is sloped to the northeast direction. The area around the Majorsville Compressor Station site is slightly rolling hills, consisting mostly of forest and an existing facility to the north.

Seneca Compressor Station

The Seneca Compressor Station will be located in a rural area 0.8 miles north of Summerfield, Noble County, Ohio. The topography of the area is sloped to the southeast direction. The area around the Seneca Compressor Station site is slightly rolling hills, consisting mostly of forest and scattered residences.

Clarington Compressor Station

The Clarington Compressor Station will be located in a rural area about 1.4 miles north of Switzerland, Monroe County, Ohio. The topography of the area is sloped to the northwest direction. The area around the Clarington Compressor Station site is slightly rolling hills consisting mostly of forest, scattered residences and a gas station.

Cadiz Compressor Station

The Cadiz Compressor Station will be located in a rural area about 2.1 miles southwest of Cadiz, Harrison County, Ohio. The topography of the area is sloped to the northeast direction. The area around the Cadiz Compressor Station site is slightly rolling hills, consisting mostly of patchy forests, open land, coal mine operations in the far northwest direction and scattered residences.

Burgettstown Compressor Station

The Burgettstown Compressor Station will be located in a rural area about 2.8 miles northeast of Burgettstown, Washington County, Pennsylvania. The area is to the south of State Road 22. The area around the Burgettstown Compressor Station site is relatively flat, but slightly sloped to the east direction, consisting mostly of forest, coal mine operations and scattered residences.

9.1.1.3 Station Facilities and Compression

Facilities at each compressor station site will include natural gas-fired compressors, a compressor building (with acoustic mitigation if required), an office/control/utility building, a storage/maintenance building, gas and utility piping, separators, gas coolers and heaters (at some locations), safety equipment, an emergency generator and parking areas.

Compression for the Project will be provided by a combination of Caterpillar G16CM34, Caterpillar G3520B, Caterpillar G3606, Caterpillar G3612 and Caterpillar G3616 natural gas-fired internal combustion (IC) engines. The rated outputs of these engines are:

- Caterpillar G16CM34 = 8,180 brake-horsepower (BHp);
- Caterpillar G3520B = 1,725 BHp
- Caterpillar G3606 = 1,775 BHp
- Caterpillar G3612 = 3,550 BHp
- Caterpillar G3616 = 4,735 BHp

The number of new compression engines and approximate total station BHp at each compressor station is summarized in Table 9A-1. (All air quality tables in Resource Report 9 are included in Appendix 9A.)

9.1.2 Existing Air Quality

9.1.2.1 Attainment Status

Air emissions are regulated under the federal Clean Air Act (CAA) and state law administered by the Ohio Environmental Protection Agency (EPA) Division of Air Pollution Control, the West Virginia Department of Environmental Protection (DEP) and the Pennsylvania DEP Bureau of Air Quality.

The U.S. EPA (USEPA) has promulgated ambient air quality standards to protect the public health and welfare. The National Ambient Air Quality Standards (NAAQS) include Primary Standards, which are designed to protect human health. The NAAQS also contain Secondary Standards designed to protect public welfare, including economic interests, visibility, vegetation, animal species, and other non-health related concerns. The NAAQS apply to six criteria air pollutants: particulate matter with a nominal aerodynamic diameter of less than or equal to 10 microns (PM_{10}) and 2.5 microns ($PM_{2.5}$); sulfur dioxide (SO_2); nitrogen dioxide (NO_2); carbon monoxide (CO); ozone (O_3); and lead (Pb). Primary NAAQS are summarized in Table 9A-2. Secondary NAAQS are summarized in Table 9A-3.

The Ohio EPA Division of Air Pollution Control, West Virginia DEP Division of Air Quality and the Pennsylvania DEP Bureau of Air Quality have adopted the federal NAAQS.

The current attainment status of each county in which a compressor station is proposed as part of the Project is summarized in Table 9A-4. All of the counties in Ohio in which new compressor stations are proposed are classified as attainment. The proposed Burgettstown Compressor Station will be located in Washington County, Pennsylvania, which is designated as nonattainment for the 8-hour O_3 standard and the 24-hour $PM_{2.5}$ Standard. The proposed Majorsville Compressor Station will be located in Marshall County, West Virginia. Parts of Marshall County are designated nonattainment for SO_2; however, the Majorsville Compressor Station will be located in the attainment portion of the county. Marshall County is also ~~a~~ designated as a maintenance area for O_3 and $PM_{2.5}$.

9.1.2.2 Background Levels of Criteria Pollutants

Ambient air concentrations of pollutants measured at the nearest monitoring stations to the proposed compressor stations are summarized in Tables 9A-5A and 9A-5B. The estimated distance between the monitoring station and proposed compressor stations is also included in these tables. The data were obtained from USEPA's Air Data website (USEPA, 2014). It should be noted that the closest monitors for NO_2 for the proposed Defiance Compressor Station are over 100 miles from the proposed compressor station and might not be representative of air quality in the vicinity of this station. It should further be noted that some of the background monitors are source-oriented or sited to obtain highest concentrations in an area and therefore may not be representative of general background values. The monitoring stations for Ohio, West Virginia, Indiana and Pennsylvania in the vicinity of the proposed compressor stations are shown in Figure 9B-B, Figure 9B-C, Figure 9B-D, and Figure 9B-E, respectively.

9.1.2.3 Prevention of Significant Deterioration (PSD) Class I Areas

The federal PSD rules provide additional protection for Class I areas. Class I areas are geographical locations of special national or regional natural, scenic, recreational, or historic value, such as national parks or wildlife protection areas. The nearest Class I area to the Project is the Otter Creek Wilderness Area near Bowden, WV. Table 9A-6 provides the distance from each compressor station to the Otter Creek Wilderness area.

9.1.3 Meteorological Information

The most recent 30-year normal temperature and precipitation data for the period (1971-2000) were obtained from the National Climatic Data Center (NCDC, 2005).

Table 9A-7A and Table 9A-7B provide temperature and precipitation data for several weather stations in the vicinity of the proposed Mainline and Supply Lateral compressor stations, respectively. There are no significant variations in average temperatures or precipitation among these sites. Snow is relatively common in this area, with a mean annual snowfall of 23 to 32 inches in Ohio, 16 to 24 inches in West Virginia, and 40 inches in Pennsylvania. Maps for the meteorological monitoring stations in the vicinity of the proposed compressor stations in Ohio, West Virginia and Pennsylvania are shown in Figures 9B-F, 9B-G and 9B-H, respectively.

Table 9A-8 provides the mean annual number of days of various temperature and precipitation events. Additional climatic data is based on National Oceanic and Atmospheric Administration “Comparative Climatic Data” for the U.S. through 2012. These data show a mean wind speed of about 10 miles per hour with prevailing winds from the south and southwest. The maximum wind speed is about 70 miles per hour with prevailing winds from the south and southwest. Figures 9B-I, 9B-J, and 9B-K show the prevailing wind directions for Akron, Ohio, Toledo, Ohio, and Pittsburgh, Pennsylvania, respectively.

9.1.4 Air Quality Impacts

Air emissions from the Project will result during construction of the pipeline, compressor stations, and other ancillary facilities. Operational emissions will occur at each compressor station from specific operational equipment, primarily the compressor engines. Estimates of Project emissions along with air regulatory requirements are presented in this section.

9.1.4.1 Emission Rates

Tables 9A-9A through 9A-18A with A designations summarize the maximum potential annual air emissions of criteria pollutants, and greenhouse gases (GHG) as carbon dioxide equivalent (CO_2e) expressed in tons per year (tpy) from the compressor engines and other sources. Emissions from the compressor engines are based on either emission specifications from the engine vendor (for nitrogen oxides (NO_x)); emission specifications from the engine vendor and the oxidation catalyst (CO, volatile organic compounds (VOC), and formaldehyde); or from USEPA’s AP-42 (USEPA, 2005a) emission factors (particulate matter (PM), SO_2, and other hazardous air pollutants (HAPs)). Other emission sources include a small heater, an emergency generator, fugitive leak emissions, storage tanks, truck loading and maintenance start-up, and shut down (MSS) (VOC and GHG only). Detailed emission calculations are provided in Attachment 3 of the Air Permit Applications, which are included as Appendix 9C.

Methane (CH_4), nitrous oxide (N_2O) and carbon dioxide (CO_2) are GHG emissions associated with operational activities at the compressor stations. The USEPA requires Mandatory Greenhouse Gas Reporting (40 Code of Federal Regulations (CFR) Part 98) for several source categories, including General Stationary Fuel Combustion Sources (Subpart C) and Petroleum and Natural Gas Systems (Subpart W). GHG emission factors, methodologies and equations relating to compressor stations were obtained from these subparts.

CO_2, CH_4 and N_2O emissions from natural gas combustion at the compressor engines were calculated using emission factors from Subpart C. CH_4 and N_2O emissions were adjusted to CO_2e, using global warming potential factors of 25 and 298, respectively.

CH_4 emissions from "Other" activities include fugitives and MSS. Fugitive emissions were calculated based on the mole percent CH_4 in the total hydrocarbon emissions from vapor service equipment and piping. MSS emissions were based on venting (blowdown) activities estimated for the station. In some cases, the air emission calculations used more conservative assumptions to provide a worst case potential to emit estimate.

Tables 9A-9B through 9A-18B with a B designation summarize the potential annual HAP emissions from the compressor engines and other sources at each station. The HAPs included are: formaldehyde, acetaldehyde, acrolein, benzene, toluene, ethylbenzene, xylene, and n-hexane.

9.1.4.2 Federal Regulations

Potential air emissions from all compressor stations are below major source thresholds for Prevention of Significant Deterioration and Nonattainment New Source Review (NSR) for those compressor stations located in nonattainment areas. Therefore, the Project does not have any major sources for Federal New Source Review purposes.

Potential air emissions from the Mainline compressor stations are above major source thresholds for Title V (40 CFR Part 70). As a result, Rover will apply for major source permits to install and operate for the Mainline and Market Segment compressor stations, as required under Ohio EPA air permitting regulations, Ohio Administrative Code (OAC) Chapters 3745-31 and 3745-77. All other compressor stations will apply for minor source permits in the states where they are located, as defined in the sections below.
The compressor engines will be subject to the Federal New Source Performance Standards (NSPS) promulgated for stationary spark ignition IC engines under 40 CFR Part 60, Subpart JJJJ. The compressor stations will comply with all requirements of Subpart JJJJ as they apply to the engines. Applicability of Subpart JJJJ is based on the order date and manufacture date of the engine. In this case, all of the engines at the sites will be subject to this regulation. Emission standards are based on specific engine hp ratings and manufacture dates as identified in Table 1 of the regulation. For engines not certified by the manufacturer, performance tests to demonstrate compliance with the Table 1 emission limits will be required. For engines certified by the manufacturer, compliance with the standards is demonstrated by keeping records of

maintenance conducted in accordance with manufacturer's emission-related written instructions (40 CFR § 60.4243(a)(1)).

The engines at all compressor stations are also considered affected sources under National Emissions Standards for Hazardous Air Pollutants (NESHAP) in 40 CFR Part 63, Subpart ZZZZ, because they are classified as "new" and are located at a major source (Mainline compressor stations) or an area source (Supply Lateral compressor stations) of HAPs.

Engines at the Mainline compressor stations must meet the operating limits in Table 2b of Subpart ZZZZ. The engines will need to conduct compliance tests to demonstrate either 93% CO control, or formaldehyde emissions less than 14 parts per million, volumetric dry (ppmvd) at 15% O_2.

For engines at the Supply Lateral compressor stations (area sources), 40 CFR § 63.6590(c) specifies that the applicable engines "… must meet the requirements of this part by meeting the requirements of 40 CFR part 60 subpart IIII, for compression ignition engines or 40 CFR 60 subpart JJJJ, for spark ignition engines. No further requirements apply for such engines under this part." By being in compliance with Subpart JJJJ, there are no additional requirements under NESHAP Subpart ZZZZ that apply to the IC engines at the Supply Lateral compressor stations.

As noted above, USEPA requires Mandatory Greenhouse Gas Reporting (40 CFR Part 98) for several source categories, including General Stationary Fuel Combustion Sources (Subpart C) and Petroleum and Natural Gas Systems (Subpart W). The required GHG reports will be filed annually, once operations begin.

General Conformity

The General Conformity Rule establishes conformity in coordination with and as part of the *National Environmental Policy Act of 1969* process. The 1990 amendments to the CAA require federal agencies to conform to State Implementation Plans (SIPs) in non-attainment areas. SIPs are state air quality regulations that provide for the implementation, maintenance, and enforcement of the NAAQS and include emission limitations and control measures to attain and maintain the NAAQS. Federal agencies are required to determine if proposed actions conform to the applicable SIP. The rule affects air pollution emissions associated with actions that are federally funded, licensed, permitted, or approved and ensures that emissions do not contribute to air quality degradation or prevent the achievement of state and federal air quality goals. The purpose of the General Conformity requirement is to ensure that federal agencies consult with state and local air quality districts so that these regulatory entities are aware of the expected impacts of the federal action and therefore can include expected emissions in their SIP emissions budget.

The USEPA has developed two conformity regulations for transportation and non-transportation projects. Transportation projects are governed by the "transportation conformity" regulations (40 CFR Parts 51 and 93). Non-transportation projects are governed by the "general conformity" regulations (40 CFR Parts 6, 51, and 93) described in the final rule for *Determining Conformity of General Federal Actions to State or Federal Implementation Plans.* Since the proposed Project is a non-transportation project under 40 CFR Parts 51 and 93, only the general conformity rule applies.

General Conformity Process

The process to determine conformity for a proposed action involves two distinct steps: applicability and determination. An applicability evaluation is required for any action that is federally funded, licensed, permitted, or approved where the total direct and indirect emissions for criteria pollutants in a non-attainment or maintenance area exceed the rates listed in 40 CFR §§ 93.153(b)(1) and (2). If emissions exceed these rates, a General Conformity Determination is required. The General Conformity Review process is not necessary for a new source or existing source modification that is subject to NSR.

If the Conformity Rule is determined to be applicable for the proposed action, an evaluation must be performed to determine whether the action conforms to the SIP. Positive conformity can be shown through state emission budgets, emission offsets, air quality models, or any combination of these.

General Conformity Applicability - The General Conformity Rule applies only to federal actions occurring in air quality regions designated as being in non-attainment areas for the NAAQS or attainment areas subject to maintenance plans (maintenance areas). Federal actions occurring in attainment areas are not subject to the conformity rules. As discussed in section 9.1.2.1, all compressor stations except Burgettstown will be located in attainment areas.

A General Conformity evaluation is also not required for proposed actions that fall under an NSR Program or Operating Permit Program. As noted earlier, air permits are being obtained for the compressor stations, so are not required to conduct a conformity analysis.

Emissions from the Burgettstown and Majorsville Compressor Stations are below the applicability de minimus thresholds. Burgettstown emissions compared to the General Conformity de minimus thresholds are as follows: VOC emissions (O_3 non-attainment) emissions are 15 tpy versus a threshold of 50 tpy; and $PM_{2.5}$ emissions are 1.82 tpy compared to a threshold of 100 tpy. For the Majorsville compressor station VOC emissions (O_3 maintenance) emissions are 28 tpy versus a threshold of 50 tpy; $PM_{2.5}$ emissions are 2.26 tpy compared to a threshold of 100 tpy, and SO_2 emissions are 0.17 tpy versus a threshold of 100 tpy.

9.1.4.3 State Regulations

Ohio Compressor Stations

Rover is submitting applications for air permits for each of the compressor stations located in Ohio. For the Mainline compressor stations, Permits to Install and Title V Operating Permits are required. For Supply Lateral compressor stations located in Ohio, Rover is applying for combined permits to install and operate under OAC Chapter 3745-31. The air permit applications include the demonstration of compliance with applicable state regulations; including applicable PM, SO_2, CO, NO_x, and VOC emission limits, and compliance testing and monitoring obligations. In Ohio, each significant emission source is also required to install the Best Available Technology for reducing emissions. The Ohio permit applications include air dispersion modeling to demonstrate that the Project air quality impacts comply with requirements to protect the NAAQS and state level impact increments. A summary of the state regulations is provided in Attachment 5 of the Air Permit Applications, which are included in Appendix 9C.

West Virginia Compressor Stations

Rover has prepared applications for general permits (G30-D) under the West Virginia DEP regulations at Title 45, Code of State Rules, Part 13, for Supply Lateral compressor stations located in West Virginia. The air permit applications include the demonstration of compliance with the general permit requirements, and applicable state regulations for PM, SO_2, CO, NO_x, and VOC emission limits, and compliance testing and monitoring obligations. Facilities that qualify for General Permits are not required to complete a detailed air quality impact analysis.

A summary of the state regulations is provided in Attachment D of the Air Permit Applications, which are included in Appendix 9C.

Pennsylvania Compressor Station

Rover has prepared an application for a general permit (GP-5) under the Pennsylvania DEP air permitting regulations Chapter 25, subchapter 127.621 for the Burgettstown Compressor Station located in Washington County, Pennsylvania. The air permit application includes the demonstration of compliance with the general permit requirements, and applicable state regulations for PM, SO_2, CO, NO_x, and VOC emission limits, and compliance testing and monitoring obligations. Facilities that qualify for General Permits are not required to complete a detailed air quality impact analysis.

A summary of the state regulations is provided in Attachment 2 of the Air Permit Application, which is included in Appendix 9C.

9.1.4.4 Air Quality Impact Analysis

Emissions from the compressor engines will be controlled by Oxidation Catalysts, which significantly reduce emissions of CO, VOC, and volatile HAPs, including formaldehyde. Emissions of these and other pollutants are also minimized by the use of Caterpillar's lean burn combustion technology, clean fuel (natural gas), combustion controls, and proper operation and maintenance procedures.

Air dispersion modeling of compressor engines emissions was conducted as part of the Ohio air permit application process. In accordance with Ohio EPA guidance, SCREEN3 modeling was conducted and the results of the modeling demonstrate that the compressor stations will be in compliance with the NAAQS.

Although not required as part of the permitting process, air dispersion modeling of compressor engines emissions was also conducted for the West Virginia and Pennsylvania compressor stations. The SCREEN3 model was also used for these compressor stations. The results of the modeling demonstrate that the compressor stations will be in compliance with the NAAQS.

A summary of the dispersion modeling results is provided in Table 9A-19. For the Ohio stations, the modeling reports including the SCREEN3 output files are included as Attachment 6 of the Air Permit Applications, which are included in Appendix 9C. For the West Virginia and Pennsylvania stations, the modeling results including the SCREEN3 output files are included in Appendix 9D.

9.1.4.5 Fugitive Pipeline Emissions

Fugitive emissions from the pipeline (not associated with the Compressor Stations) have also been estimated, and are included in Table 9A-20 in Appendix 9A. The Interstate Natural Gas Association of America (INGAA) Greenhouse Gas Emission Estimation Guidelines for Natural Gas and Storage; Volume 1 - GHG Estimation Methodologies and Procedures provides the methodology and emission factors for estimating these emissions. The Rover Pipeline Project emission estimates are based on Table 4-4 of this document; the Tier 3 Emission Factors for Fugitive Emissions from Transmission for Protected Steel Pipeline. The INGAA emission factors are based on an assumed methane percentage in natural gas. The emission factors have been adjusted based on the projected gas composition for the Project.

9.1.4.6 Construction Emissions

Pipeline, compressor station, and other construction activities for this Project will result in combustion emissions from diesel-fueled and gasoline-fueled vehicles used in earth moving and construction activities. Combustion-related emissions will include NO_x, CO, VOC, SO_2, PM, and small amounts of HAPs. The amount of HAP emissions is expected to be insignificant, and therefore has not been quantified. Combustion by-product HAP emissions are typically less than VOC emissions by an order of magnitude or more. Given the temporary and sporadic nature of construction HAP emissions, they would not be expected to result in any acute impacts.

Construction based land activities such as land clearing, grading, excavation, and vehicle traffic on both paved and unpaved roads will generate particulate matter less than PM_{10} and less than $PM_{2.5}$ in the form of fugitive dust. The amount of dust generated would be a function of construction activities, soil type, moisture content, wind speed, frequency of precipitation, vehicle traffic, vehicle types, and roadway characteristics. Emissions would be greater during dry periods and in areas of fine-textured soils subject to surface activity.

A summary table of the estimated construction emissions by pipeline segment and compressor station is provided in Table 9A-21. Construction emissions were estimated based on proposed site size and construction schedule. The summary table includes compressor station and pipeline construction activities. Table 9A-22 provides the estimated construction emissions by county. All construction activity and associated construction emissions for compressor stations are expected to occur in 2016.

Open burning to dispose of cleared vegetation will be offered to the contractors as an option, where it is allowed and approved by the relevant agencies. Open burning of cleared vegetation is allowed in each of the four states (Ohio, West Virginia, Pennsylvania, and Michigan) under certain conditions. In general, open burning would not cause a nuisance or violate any other air pollution rules, and requires either notification to or permission from the regulatory agencies. Further, open burning is restricted to certain locations. For example, in Ohio, open burning is prohibited inside city limits. In Michigan, open burning cannot be conducted within 1400 feet of an incorporated city or village limit, and is prohibited within listed Priority I and Priority II areas. In Pennsylvania, the conditions for open burning are different when conducted inside and outside of air basins. When inside an air basin, an air curtain destructor must be used, its use must be approved by the PA DEP, and the approval is good for three months, but may be extended. WV rules do not identify specific location restrictions, but approval from WV DEP is required, and distance to nearest residence is a factor in the approval.

Any local ordinances or requirements will be addressed during local construction permitting. Emissions from open burning by Project element are estimated and included in Table 9A-22, and estimated emissions by county are provided in Table 9A-23.

Detailed spreadsheets illustrating the basis for the summary tables are provided in Tables 9A-25 through 9A1-30.The construction phase of the Project will result in intermittent and short-term air emissions that will be temporary and limited to the immediate vicinity of the construction area.

9.1.5 MITIGATION MEASURES

Mitigation measures will be implemented to address potential air quality impacts from construction and operational activities.

9.1.5.1 Construction

As previously discussed, Project construction emissions will result from various construction equipment (fuel combustion in equipment engines, and movement of equipment on construction sites) along with activities such as land clearing and open burning; dirt excavation, storage, and backfilling; and traffic-related emissions from workforce commuting and truck deliveries. These emissions will be highly variable, depending on the specific equipment being operated at any given time. Construction emissions are localized and temporary, and the impacts will be small relative to those of continuous station operation.

Mitigation measures to address construction-related impacts will include:

- All fossil fuel-fired construction equipment engines will be maintained in accordance with manufacturers' recommendations to minimize construction-related combustion emissions.
- Combustion emissions will be controlled using engines that meet engine manufacturing requirements for both mobile sources (40 CFR Part 85) and portable equipment such as air compressors.
- Water trucks will be present at each construction site and will be utilized as necessary to reduce fugitive dust from construction activities.
- Rover will limit the speed of vehicles at the construction sites and all pipeline ROW during construction to reduce the amount of fugitive dust generated.
- Open burning will comply with all applicable state and local regulatory requirements, including acquiring all necessary open burning permits. Project procedures include using on-site equipment to prevent the spread of fire and specifications on the level of attention required by contractor personnel during burning.

9.1.5.2 Operations

The primary emission sources at the proposed compressor stations will be the equipment used to provide natural gas compression (large natural gas-fired engines). Ancillary equipment at the station will also have air emissions; however, these emissions will be small relative to the emissions from compression engines. Operational emissions will begin with the compressor station startup, and will continue throughout the operational life of the compressor station.

Primary mitigation measures for the compressor station's operational emissions will include:

- Each compressor engine and the emergency generators will meet the emission standards in the NSPS for stationary spark ignition IC engines (40 CFR Part 60, Subpart JJJJ). Emission rates will be supported by guarantees provided by the engine manufacturer and the oxidation catalyst supplier, as well as any required performance tests.
- All units will follow the manufacturer's recommended operation and maintenance procedures to maintain emissions at the required levels.
- SO_2 and PM_{10}/$PM_{2.5}$ emissions will be reduced through combustion of inherently clean natural gas.
- Venting of natural gas during start-up, shut down, and malfunctions will be minimized through preventative maintenance and standard operating procedures for these events.

9.2 NOISE

This section provides an overview of the proposed noise generating equipment for the Project, the noise study approach for each compressor station, a discussion of typical noise mitigation methods for this type of equipment, and noise associated with construction and HDD work. Environmental noise will be generated during construction and operation of the compressor stations associated with the project. There will also be construction noise associated with the meter stations, pipeline sections, and HDD work, but operational noise is not typically an issue for these sources.

9.2.1 Applicable Noise Regulations

9.2.1.1 Federal Regulations

The FERC guidelines for compressor stations stipulate the use of a "day-night average sound level," denoted as L_{dn} as the sound level metric. The FERC limits sound levels attributable to a compressor station to an L_{dn} of 55 A-weighted decibels (dBA) at any noise-sensitive area (NSA) such as a school, hospital, or residence (18 CFR Part 157). The L_{dn} is defined as the energy average of the measured 24-hour equivalent sound level (L_{eq}), with 10 decibels (dB) added to sound levels occurring during nighttime hours (between 10 p.m. and 7 a.m). The 10-dB adjustment is intended to compensate for increased nighttime sensitivity to noise.

The compressor stations will operate continuously; therefore, meeting the L_{dn} limit of 55 dBA requires the short term L_{eq} to be low enough during both daytime and nighttime hours to compensate for the increased nighttime sensitivity imposed by the FERC standard.

The nearest NSAs out to a cutoff radius of one mile in each major direction from the stations were considered in the evaluations. The NSA designations used in the sections below may refer to individual residences or other sensitive receptors, or to small local groups of receptors in a given area.

9.2.1.2 State Regulations

West Virginia

The State of West Virginia has a noise ordinance, but it is unlikely to apply to the Sherwood or Majorsville Compressor Stations. The ordinance does not include any quantitative limits and is associated with things like vehicle noise and amplified music, and excludes noise associated with business or commerce that is otherwise in compliance with all other applicable noise regulations. There are no known vibration regulations in West Virginia.

Ohio

The State of Ohio has a noise control law; however, natural gas compressor stations are exempt from this regulation. There are no known vibration regulations in Ohio.

Pennsylvania

There are no state noise or vibration regulations in Pennsylvania that are known to apply to the Burgettstown Station.

Michigan

There are no state noise or vibration regulations in Michigan that are known to apply to the Project.

9.2.1.3 County and Local Regulations

Washington County, Pennsylvania has a noise ordinance that may be applicable to the Burgettstown Station, but it does not include any quantitative limits. Specifically, it prohibits the "creation of any unreasonably loud, disturbing and unnecessary noise…" This is inherently vague; the terms "unreasonable" and "disturbing" are subjective in nature. As such, these are not practical engineering design criteria.

There are no county or local noise or vibration regulations that are known to apply to the Project.

9.2.2 Compressor Station Noise

Operational noise will be produced at the compressor stations. The methods used to quantify the existing and predict the future noise levels at the compressor stations are discussed in the following sections.

9.2.2.1 Compressor Station Equipment

Table 9.2.2-1 below shows a summary of the engine drivers that Rover plans to install at the ten proposed compressor stations.

TABLE 9.2.2-1
Summary of Proposed Compressor Stations and Equipment

Compressor Station		Location	Station Horsepower	Quantity and Type of Engine Drivers	Gas Aftercoolers
#	**Name**	**County, State**	**(hp)**	**Quantity, Engine Type**	**Quantity**
1	Sherwood	Doddridge, WV	14,205	3 G3616 (4,735 hp each)	3
2	Seneca	Noble, OH	18,940	4 G3616 (4,735 hp each)	4
3	Clarington	Monroe, OH	11,245	1 G3606 (1,775 hp each) 2 G3616 (4,735 hp each)	3
4	Majorsville	Marshall, WV	7,100	2 G3612 (3,550 hp each)	2
5	Cadiz	Harrison, OH	15,980	1 G3606 (1,775 hp each) 3 G3616 (4,735 hp each)	4
6	Burgettstown	Washington, PA	5,175	3 G3520B (1,725 hp each)	3
7	Mainline CS1	Carroll, OH	42,190	2 G3616 (4,735 hp each) 4 G16CM34 (8,180 hp each)	6
8	Mainline CS2	Wayne, OH	38,745	3 G3616 (4,735 hp each) 3 G16CM34 (8,180 hp each)	0
9	Mainline CS3	Crawford, OH	34,010	2 G3616 (4,735 hp each) 3 G16CM34 (8,180 hp each)	0
10	Defiance	Defiance, OH	25,830	2 G3616 (4,735 hp each) 2 G16CM34 (8,180 hp each)	4

Other noise generating equipment that has been included in the noise analysis for each station includes:

- Gas coolers (Mainline CS 2 and Mainline CS 3 do not include gas cooling),
- Utility coolers (engine and compressor cooling),
- Suction and discharge piping,
- Fuel gas regulation skid,
- Engine combustion air intakes,
- Engine exhaust systems (outlet to atmosphere, silencer body),
- Engine and compressor casings in a single acoustically insulated compressor building, and
- Blowdown vents.

9.2.2.2 Station Noise Evaluation Methodology

For each compressor station, a noise evaluation has been conducted. Each evaluation addresses the noise-generating equipment, the existing (baseline) environmental noise levels, noise impact, and required noise mitigation measures.

<u>Existing Environmental Sound Levels</u>

A baseline environmental sound level survey has been conducted in the vicinity of each proposed station. Sound levels were measured at accessible locations near the NSAs at each proposed station site. Observations of the primary existing environmental sound sources were documented.

Type 1 sound level instrumentation was used, with field calibration before and after each measurement. Windscreens were installed on all microphones. Weather conditions during each survey have been recorded. The measurements were taken during weather periods appropriate for environmental sound level surveys.

Noise Impact Evaluation

Three-dimensional computer noise models were constructed to analyze the noise contributions expected from the proposed equipment at each compressor station. The models were developed using CadnaA 4.4.145, a commercial noise modeling package developed by DataKustik GmbH. The software takes into account spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces, and other sound propagation properties. The software is based on published engineering standards. The International Organization for Standardization (ISO) 9613 standard was used for air absorption, weather conditions, and other noise propagation calculation parameters.

Terrain was included in each noise model and was imported from the most recently available US Geological Survey database, with the exception of Cadiz. There were significant discrepancies between the project-supplied terrain elevations and the USGS terrain data for the Cadiz Compressor Station site, so it has been modeled as completely flat. This will be conservative as any actual terrain effects at this site would tend to reduce the predicted levels at the NSAs.

The ground inside each compressor station was modeled as highly reflective, with an absorption coefficient of 0.2. Ground outside of the station areas was modeled with a 0.5 absorption coefficient. No foliage effects are included in the noise models.

Manufacturer noise data and sound measurements of similar units in operation at other compressor stations were used to determine sound power levels for the proposed station equipment and for the sound pressure levels inside the compressor buildings. The utility and gas cooler sound power levels were based on the best available manufacturer data and estimates.

Each noise model was used to predict the sound level contribution of the new station equipment at the closest NSAs, along with a prediction of the changes in environmental sound levels expected after the addition of the new compressor station equipment, including any proposed noise control treatments. The predicted sound levels at each station are shown as color noise isopleths in Contours 9.2.1 through 9.2.10 in the attached Appendix 9B.

Noise Mitigation Measures

Noise mitigation treatments are necessary in order for the equipment at each station to comply with the FERC sound level requirements. The noise mitigation measures have been determined based on the results of the noise modeling for each individual compressor station. There are many different combinations of noise control mitigation measures that will provide similar noise control. As the station designs are developed, including noise mitigation treatments, the mitigation design will be modified if necessary to account for these design changes while maintaining compliance with the FERC sound level requirements.
The noise mitigation treatments described for each station are typical measures that have been used successfully on similar pipeline projects.

The individual station noise models confirm that all of these stations will require acoustical compressor buildings in order to meet the FERC sound level requirements. For each station compressor building, the evaluation determined the sound transmission loss and acoustical performance requirements for:

- the building wall and roof system,
- building interior acoustical treatments, seals, and penetrations,
- equipment doors,
- personnel doors, and
- building ventilation openings and fans.

Each evaluation also addresses the insertion loss performance recommendations for the engine exhaust silencers for each station, and for engine combustion air intake systems, including any inlet air filter insertion losses.

Noise from aboveground piping at each compressor station was modeled, based on detailed sound intensity measurements of piping at similar compressor stations. Where necessary, piping treatments such as noise barriers, acoustical pipe lagging, or compressor building extensions have been indicated.

Section 9.2.13 provides more information regarding the application of the noise control treatment recommendations. For each compressor station, the noise treatments provided represent one of many possible combinations of treatments that can achieve the project noise goals. All treatment options are being evaluated. Section 9.2.13 discusses a range of potential noise control treatments that would achieve the overall sound level targets required for this project. The combinations of noise control treatments included in the individual noise model for each compressor station are discussed below.

9.2.3 Sherwood Compressor Station

9.2.3.1 Sherwood Compressor Station - Existing Noise Levels at Station Site

A baseline sound level survey was conducted in the vicinity of the proposed Sherwood Compressor Station in Sherwood County, West Virginia. The area surrounding the proposed site is primarily comprised of hilly wooded areas with undeveloped land alongside heavy industrial and residential land uses. Audible sound sources in the area included traffic from Highway 50, birds, and insects.

Five NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored for several hours, including daytime and nighttime periods. The baseline measurements show that the existing average ambient sound levels in the area ranged from 41.5 to 53.2 dBA L_{dn}.

The NSAs and their approximate distances from the proposed compressor building are shown in Figure 9.2.1 in Appendix 9B. The measurement locations are also shown on the figure.

Equipment used during the site survey consisted of the following:

- Larson Davis Model 824 Sound Level Monitor, Serial Numbers A0298, A0301, A0404, and A3253

- Larson Davis Model CAL200 Calibrator, Serial Number 7078

Equipment was field calibrated before and after the measurements. Windscreens were installed on all microphones. All instrumentation has current laboratory certification.
Table 9.2.1-1 in Appendix 9A shows the weather conditions at the start of the environmental sound level survey.

Table 9.2.1-2 in Appendix 9A shows the measured or estimated daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The table also shows the distances and directions from the approximate center of the compressor building to the NSAs.

9.2.3.2 Sherwood Compressor Station - Noise Impact Evaluation

The noise model for this station includes all features as described in Section 9.2.2. The specific attributes of this station include the following:

- The building dimensions assumed in the model were 70 feet by 150 feet, with a 35-foot eave height.
- Equipment was arranged per the latest available plot plan, with the engine intakes, exhausts, and the utility coolers on the south side of the compressor building.
- The gas coolers were modeled on the north side of the compressor building.
- The engine exhausts were modeled at a height of 55 feet above grade.

Table 9.2.1-3 in Appendix 9A shows the interior sound levels and the untreated sound power levels used in the model for the proposed compressor units.

Table 9.2.1-4 in Appendix 9A shows a summary of the predicted sound level contribution of the station equipment at the NSAs, along with a prediction of the overall environmental sound levels after the addition of the compressor station equipment, with the modeled combination of noise control treatments. The table indicates that, with the proposed noise control treatments discussed below, the compressor station noise contributions at all of the nearest NSAs will be below the FERC criterion of 55 dBA L_{dn}.

9.2.3.3 Sherwood Compressor Station – Noise Mitigation Measures

Table 9.2.1-5 in Appendix 9A gives a summary of the acoustical attenuations used in the computer model for one possible set of noise control treatments. The noise mitigation measures shown are based on the most current station design, and represent one potential set of possible mitigation measures.

9.2.3.4 Sherwood Compressor Station – Noise Quality Summary

Environmental baseline sound level measurements were collected near the closest NSAs to the proposed greenfield site for the Sherwood Compressor Station. The baseline measurements show that the existing average ambient sound levels in the area ranged from 41.5 to 53.2 dBA L_{dn}. Computer noise modeling predicts that the sound level contributions from the compressor station at the NSAs will comply with the

FERC sound level limit of 55 dBA L_{dn} after the addition of the proposed compressor station equipment with noise control treatments equivalent to those described herein.

9.2.4 Seneca Compressor Station

9.2.4.1 Seneca Compressor Station - Existing Noise Levels at Station Site

A baseline sound level survey was conducted in the vicinity of the proposed Seneca Compressor Station in Noble County, Ohio. The area surrounding the proposed site is primarily comprised of hilly wooded areas, residential, and commercial land uses. Audible sound sources in the area included local traffic on Batesville Road and Glady Road, plus birds, cattle and dogs.

Seven NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored for several hours, including daytime and nighttime periods. The baseline measurements show that the existing average ambient sound levels in the area ranged from 41.4 to 66.6 dBA, L_{dn}. There were no suitable locations to leave a sound monitor overnight near NSAs 2 and 4, so short-term daytime measurements were made at these locations. The nighttime levels at these NSAs were reasonably assumed to be 8 dBA quieter than the measured daytime level.

The NSAs and their approximate distances from the proposed compressor building are shown on Figure 9.2.2 in Appendix 9B. The measurement locations are also shown on the figure.

Equipment used during the site survey consisted of the following:

- Larson Davis Model 824 Sound Level Monitor, Serial Number A0404, A3253, A0298
- Larson Davis Model CAL200 Calibrator, Serial Number 7078

Equipment was field calibrated before and after the measurements. Windscreens were installed on all microphones. All instrumentation has current laboratory certification.

Table 9.2.2-1 in Appendix 9A shows the weather conditions at the start of the environmental sound level survey.

Table 9.2.2-2 in Appendix 9A shows the measured or estimated daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The table also shows the distances and directions from the approximate center of the compressor building to the NSAs.

9.2.4.2 Seneca Compressor Station - Noise Impact Evaluation

The noise model for this station includes all features as described in Section 9.2.2. The specific attributes of this station include the following:

- The building dimensions assumed in the model were 70 feet by 210 feet, with a 35-foot eave height.

- Equipment was arranged per the latest available plot plan, with the engine intakes, exhausts, and the utility coolers on the southwest side of the compressor building.
- The gas coolers were modeled on the northeast side of the compressor building.
- The engine exhausts were modeled at a height of 55 feet above grade.

Table 9.2.2-3 in Appendix 9A shows the interior sound levels and the untreated sound power levels used in the model for the proposed compressor units.

Table 9.2.2-4 in Appendix 9A shows a summary of the predicted sound level contribution of the station equipment at the NSAs, along with a prediction of the overall environmental sound levels after the addition of the compressor station equipment, with the modeled combination of noise control treatments. The table indicates that, with the proposed noise control treatments discussed below, the compressor station noise contributions at all of the nearest NSAs will be below the FERC criterion of 55 dBA, L_{dn}.

9.2.4.3 Seneca Compressor Station – Noise Mitigation Measures

Table 9.2.2-5 in Appendix 9A gives a summary of the acoustical attenuations used in the computer model for one possible set of noise control treatments. The noise mitigation measures shown are based on the most-current station design, and represent one potential set of possible mitigation measures.

9.2.4.4 Seneca Compressor Station – Noise Quality Summary

Environmental baseline sound level measurements were collected near the closest NSAs to the proposed greenfield site for the Seneca Compressor Station. The baseline measurements show that the existing average ambient sound levels in the area ranged from 41.4 to 66.6 dBA, L_{dn}. Computer noise modeling predicts that the sound level contributions from the compressor station at the NSAs will comply with the FERC sound level limit of 55 dBA, L_{dn} after the addition of the proposed compressor station equipment with noise control treatments equivalent to those described herein.

9.2.5 Clarington Compressor Station

9.2.5.1 Clarington Compressor Station - Existing Noise Levels at Station Site

A baseline sound level survey was conducted in the vicinity of the proposed Clarington Compressor Station in Monroe County, Ohio. The area surrounding the proposed site is primarily comprised of hilly wooded areas. Audible sound sources in the area included traffic on German Ridge Road, creek and cattle.

Four NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored for several hours, including daytime and nighttime periods. The baseline measurements show that the existing average ambient sound levels in the area ranged from 41.6 to 47.8 dBA, L_{dn}. The NSAs and their approximate distances from the proposed compressor building are shown on Figure 9.2.3 in Appendix 9B. The measurement locations are also shown on the figure.

Equipment used during the site survey consisted of the following:

- Larson Davis Model 824 Sound Level Monitor, Serial Number A0301, A0298, and A0404
- Larson Davis CAL200 Calibrator, Serial Number 7078

Equipment was field calibrated before and after the measurements. Windscreens were installed on all microphones. All instrumentation has current laboratory certification.
Table 9.2.3-1 in Appendix 9A shows the weather conditions at the start of the environmental sound level survey.

Table 9.2.3-2 in Appendix 9A shows the measured or estimated daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The table also shows the distances and directions from the approximate center of the compressor building to the NSAs.

9.2.5.2 Clarington Compressor Station - Noise Impact Evaluation

The noise model for this station includes all features as described in Section 9.2.2. The specific attributes of this station include the following:

- The building dimensions assumed in the model were 70 feet by 150 feet, with a 35-foot eave height.
- Equipment was arranged per the latest available plot plan, with the engine intakes, exhausts, and the utility coolers on the south side of the compressor building.
- The gas coolers were modeled on the north side of the compressor building.
- The engine exhausts were modeled at a height of 55 feet above grade.

Table 9.2.3-3 in Appendix 9A shows the interior sound levels and the untreated sound power levels used in the model for the proposed compressor units.

Table 9.2.3-4 in Appendix 9A shows a summary of the predicted sound level contribution of the station equipment at the NSAs, along with a prediction of the overall environmental sound levels after the addition of the compressor station equipment, with the modeled combination of noise control treatments. The table indicates that, with the proposed noise control treatments discussed below, the compressor station noise contributions at all of the nearest NSAs will be below the FERC criterion of 55 dBA, L_{dn}.

9.2.5.3 Clarington Compressor Station – Noise Mitigation Measures

Table 9.2.3-5 in Appendix 9A gives a summary of the acoustical attenuations used in the computer model for one possible set of noise control treatments. The noise mitigation measures shown are based on the most-current station design, and represent one potential set of possible mitigation measures.

9.2.5.4 Clarington Compressor Station – Noise Quality Summary

Environmental baseline sound level measurements were collected near the closest NSAs to the proposed greenfield site for the Clarington Compressor Station. The baseline measurements show that the existing average ambient sound levels in the area ranged from 41.6 to 47.8 dBA, L_{dn}. Computer noise modeling predicts that the sound level contributions from the compressor station at the NSAs will comply with the

FERC sound level limit of 55 dBA, L_{dn} after the addition of the proposed compressor station equipment with noise control treatments equivalent to those described herein.

9.2.6 Majorsville Compressor Station

9.2.6.1 Majorsville Compressor Station - Existing Noise Levels at Station Site

A baseline sound level survey was conducted in the vicinity of the proposed Majorsville Compressor Station in Marshall County, West Virginia. The area surrounding the proposed site is primarily comprised of hilly wooded areas, along with some residential and industrial land uses. Audible sound sources in the area included occasional traffic from the Ohio County Mine, local traffic, along with existing natural gas facilities in the area.

Four NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored for several hours, including daytime and nighttime periods. The baseline measurements show that the existing average ambient sound levels in the area ranged from 49.8 to 69.6 dBA, L_{dn}. There was no suitable location to leave a sound monitor overnight near NSA 2, so a short-term daytime measurement was made there. The nighttime level at NSA 2 was reasonably assumed to be 8 dBA quieter than the measured daytime level.

The NSAs and their approximate distances from the proposed compressor building are shown on Figure 9.2.4 in Appendix 9B. The measurement locations are also shown on the figure.

Equipment used during the site survey consisted of the following:

- Larson Davis Model 824 Sound Level Monitor, Serial Number A0301, A0298
- Larson Davis, Model CAL200 Calibrator, Serial Number 7078

Equipment was field calibrated before and after the measurements. Windscreens were installed on all microphones. All instrumentation has current laboratory certification.

Table 9.2.4-1 in Appendix 9A shows the weather conditions at the start of the environmental sound level survey.

Table 9.2.4-2 in Appendix 9A shows the measured or estimated daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The table also shows the distances and directions from the approximate center of the compressor building to the NSAs.

9.2.6.2 Majorsville Compressor Station - Noise Impact Evaluation

The noise model for this station includes all features as described in Section 9.2.2. The specific attributes of this station include the following:

- The building dimensions assumed in the model were 70 feet by 100 feet, with a 35-foot eave height.

- Equipment was arranged per the latest available plot plan, with the engine intakes, exhausts, and the utility coolers on the southwest side of the compressor building.
- The gas coolers were modeled on the northeast side of the compressor building.
- The engine exhausts were modeled at a height of 55 feet above grade.

Table 9.2.4-3 in Appendix 9A shows the interior sound levels and the untreated sound power levels used in the model for the proposed compressor units.

Table 9.2.4-4 in Appendix 9A shows a summary of the predicted sound level contribution of the station equipment at the NSAs, along with a prediction of the overall environmental sound levels after the addition of the compressor station equipment, with the modeled combination of noise control treatments. The table indicates that, with the proposed noise control treatments discussed below, the compressor station noise contributions at all of the nearest NSAs will be below the FERC criterion of 55 dBA, L_{dn}.

9.2.6.3 Majorsville Compressor Station – Noise Mitigation Measures

Table 9.2.4-5 in Appendix 9A gives a summary of the acoustical attenuations used in the computer model for one possible set of noise control treatments. The noise mitigation measures shown are based on the most-current station design, and represent one potential set of possible mitigation measures.

9.2.6.4 Majorsville Compressor Station – Noise Quality Summary

Environmental baseline sound level measurements were collected near the closest NSAs to the proposed greenfield site for the Majorsville Compressor Station. The baseline measurements show that the existing average ambient sound levels in the area ranged from 49.8 to 69.6 dBA, L_{dn}. Computer noise modeling predicts that the sound level contributions from the compressor station at the NSAs will comply with the FERC sound level limit of 55 dBA, L_{dn} after the addition of the proposed compressor station equipment with noise control treatments equivalent to those described herein.

9.2.7 Cadiz Compressor Station

9.2.7.1 Cadiz Compressor Station - Existing Noise Levels at Station Site

A baseline sound level survey was conducted in the vicinity of the proposed Cadiz Compressor Station in Harrison County, Ohio. The area surrounding the proposed site is primarily comprised of rolling, grassy hills. Land uses include an industrial park, small airport, and distant neighborhoods. Audible sound sources in the area included local traffic on Freeman Road, birds, and distant construction work.

Three NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored for several hours, including daytime and nighttime periods. The baseline measurements show that the existing average ambient sound levels in the area ranged from 50.6 to 58.0 dBA, L_{dn}. There was no suitable location to leave a sound monitor overnight near NSA 1, so a short-term daytime measurement was made there. The nighttime level at NSA 1 was reasonably assumed to be 8 dBA quieter than the measured daytime level.

The NSAs and their approximate distances from the proposed compressor building are shown on Figure 9.2.5 in Appendix 9B. The /measurement locations are also shown on the figure.
Equipment used during the site survey consisted of the following:

- Larson Davis Model 824 Sound Level Monitor, Serial Number A0298 and A0606
- Larson Davis Model CAL200 Calibrator, Serial Number 7078

Equipment was field calibrated before and after the measurements. Windscreens were installed on all microphones. All instrumentation has current laboratory certification.

Table 9.2.5-1 in Appendix 9A shows the weather conditions at the start of the environmental sound level survey.

Table 9.2.5-2 in Appendix 9A shows the measured or estimated daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The table also shows the distances and directions from the approximate center of the compressor building to the NSAs.

9.2.7.2 Cadiz Compressor Station - Noise Impact Evaluation

The noise model for this station includes all features as described in Section 9.2.2. The specific attributes of this station include the following:

- The building dimensions assumed in the model were 70 feet by 190 feet, with a 35-foot eave height.
- Equipment was arranged per the latest available plot plan, with the engine intakes, exhausts, and the utility coolers on the south side of the compressor building.
- The gas coolers were modeled on the north side of the compressor building.
- The engine exhausts were modeled at a height of 55 feet above grade.

Table 9.2.5-3 in Appendix 9A shows the interior sound levels and the untreated sound power levels used in the model for the proposed compressor units.

Table 9.2.5-4 in Appendix 9A shows a summary of the predicted sound level contribution of the station equipment at the NSAs, along with a prediction of the overall environmental sound levels after the addition of the compressor station equipment, with the modeled combination of noise control treatments. The table indicates that, with the proposed noise control treatments discussed below, the compressor station noise contributions at all of the nearest NSAs will be below the FERC criterion of 55 dBA, L_{dn}.

9.2.7.3 Cadiz Compressor Station – Noise Mitigation Measures

Table 9.2.5-5 in Appendix 9A gives a summary of the acoustical attenuations used in the computer model for one possible set of noise control treatments. The noise mitigation measures shown are based on the most-current station design, and represent one potential set of possible mitigation measures.

9.2.7.4 Cadiz Compressor Station – Noise Quality Summary

Environmental baseline sound level measurements were collected near the closest NSAs to the proposed greenfield site for the Cadiz Compressor Station. The baseline measurements show that the existing average ambient sound levels in the area ranged from 50.6 to 58.0 dBA, L_{dn}. Computer noise modeling predicts that the sound level contributions from the compressor station at the NSAs will comply with the FERC sound level limit of 55 dBA, L_{dn} after the addition of the proposed compressor station equipment with noise control treatments equivalent to those described herein.

9.2.8 Burgettstown Compressor Station

9.2.8.1 Burgettstown Compressor Station - Existing Noise Levels at Station Site

A baseline sound level survey was conducted in the vicinity of the proposed Burgettstown Compressor Station in Washington County, Pennsylvania. The area surrounding the proposed site is primarily comprised of hilly wooded areas including residential and industrial land uses. Audible sound sources in the area included local traffic on Point Pleasant Road, distant traffic on Highway 22, hunting activities, cattle noises, and leaf rustle.

Four NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored for several hours, including daytime and nighttime periods. The baseline measurements show that the existing average ambient sound levels in the area ranged from 51.4 to 56.9 dBA, L_{dn}. The NSAs and their approximate distances from the proposed compressor building are shown on Figure 9.2.6 in Appendix 9B. The monitoring/measurement locations are also shown on the figure.

Equipment used during the site survey consisted of the following:

- Larson Davis Model 824 Sound Level Monitor, Serial Number A2845, A3269, A0335, and A0975
- Brüel & Kjær Type 4231 Calibrator, Serial Number 2022565

Equipment was field calibrated before and after the measurements. Windscreens were installed on all microphones. All instrumentation has current laboratory certification.

Table 9.2.6-1 in Appendix 9A shows the weather conditions at the start of the environmental sound level survey.

Table 9.2.6-2 in Appendix 9A shows the measured or estimated daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The table also shows the distances and directions from the approximate center of the compressor building to the NSAs.

9.2.8.2 Burgettstown Compressor Station - Noise Impact Evaluation

The noise model for this station includes all features as described in Section 9.2.2. The specific attributes of this station include the following:

- The building dimensions assumed in the model were 70 feet by 160 feet, with a 35-foot eave height.
- Equipment was arranged per the latest available plot plan, with the engine intakes, exhausts, and the utility coolers on the south side of the compressor building.
- The gas coolers were modeled on the north side of the compressor building.
- The engine exhausts were modeled at a height of 55 feet above grade.

Table 9.2.6-3 in Appendix 9A shows the interior sound levels and the untreated sound power levels used in the model for the proposed compressor units.

Table 9.2.6-4 in Appendix 9A shows a summary of the predicted sound level contribution of the station equipment at the NSAs, along with a prediction of the overall environmental sound levels after the addition of the compressor station equipment, with the modeled combination of noise control treatments. The table indicates that, with the proposed noise control treatments discussed below, the compressor station noise contributions at all of the nearest NSAs will be below the FERC criterion of 55 dBA, L_{dn}.

9.2.8.3 Burgettstown Compressor Station – Noise Mitigation Measures

Table 9.2.6-5 in Appendix 9A gives a summary of the acoustical attenuations used in the computer model for one possible set of noise control treatments. The noise mitigation measures shown are based on the most-current station design, and represent one potential set of possible mitigation measures.

9.2.8.4 Burgettstown Compressor Station – Noise Quality Summary

Environmental baseline sound level measurements were collected near the closest NSAs to the proposed greenfield site for the Burgettstown Compressor Station. The baseline measurements show that the existing average ambient sound levels in the area ranged from 51.4 to 56.9 dBA, L_{dn}. Computer noise modeling predicts that the sound level contributions from the compressor station at the NSAs will comply with the FERC sound level limit of 55 dBA, L_{dn} after the addition of the proposed compressor station equipment with noise control treatments equivalent to those described herein.

9.2.9 Mainline CS 1 Compressor Station

9.2.9.1 Mainline CS 1 Compressor Station - Existing Noise Levels at Station Site

A baseline sound level survey was conducted in the vicinity of the proposed Mainline CS 1 Compressor Station in Carroll County, Ohio. The area surrounding the proposed site is primarily comprised of rolling, wooded hills with a mix of residential and undeveloped land uses. Audible sound sources in the area included traffic on County Road 22, birds, and leaf rustle.

Five NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored for several hours, including daytime and nighttime periods. The baseline measurements show that the existing average ambient sound levels in the area ranged from 59.5 to 61.7 dBA, L_{dn}. NSAs 1, 2, 3, and 5 were located along County Road 22 and a single measurement point was used to characterize the levels at these four NSAs.

The NSAs and their approximate distances from the proposed compressor building are shown on Figure 9.2.7 in Appendix 9B. The measurement locations are also shown on the figure.

Equipment used during the site survey consisted of the following:

- Larson Davis Model 824 Sound Level Monitor, Serial Number A0301 and A0404
- Larson Davis Model CAL200 Calibrator, Serial Number 7078

Equipment was field calibrated before and after the measurements. Windscreens were installed on all microphones. All instrumentation has current laboratory certification.

Table 9.2.7-1 in Appendix 9A shows the weather conditions at the start of the environmental sound level survey.

Table 9.2.7-2 in Appendix 9A shows the measured or estimated daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The table also shows the distances and directions from the approximate center of the compressor building to the NSAs.

9.2.9.2 Mainline CS 1 Compressor Station - Noise Impact Evaluation

The noise model for this station includes all features as described in Section 9.2.2. The specific attributes of this station include the following:

- The building dimensions assumed in the model were 80 feet by 360 feet, with a 35-foot eave height.
- Equipment was arranged per the latest available plot plan, with the engine intakes, exhausts, and the utility coolers on the south side of the compressor building.
- The gas coolers were modeled on the north side of the compressor building.
- The G3616 engine exhausts were modeled at a height of 55 feet above grade and the G16CM34 engine exhausts were modeled at a height of 70 feet above grade.

Table 9.2.7-3 in Appendix 9A shows the interior sound levels and the untreated sound power levels used in the model for the proposed compressor units.

Table 9.2.7-4 in Appendix 9A shows a summary of the predicted sound level contribution of the station equipment at the NSAs, along with a prediction of the overall environmental sound levels after the addition of the compressor station equipment, with the modeled combination of noise control treatments. The table indicates that, with the proposed noise control treatments discussed below, the compressor station noise contributions at all of the nearest NSAs will be below the FERC criterion of 55 dBA, L_{dn}.

9.2.9.3 Mainline CS 1 Compressor Station – Noise Mitigation Measures

Table 9.2.7-5 in Appendix 9A gives a summary of the acoustical attenuations used in the computer model for one possible set of noise control treatments. The noise mitigation measures shown are based on the most-current station design, and represent one potential set of possible mitigation measures.

9.2.9.4 Mainline CS 1 Compressor Station – Noise Quality Summary

Environmental baseline sound level measurements were collected near the closest NSAs to the proposed greenfield site for the Mainline CS 1 Compressor Station. The baseline measurements show that the existing average ambient sound levels in the area ranged from 59.5 to 61.7 dBA, L_{dn}. Computer noise modeling predicts that the sound level contributions from the compressor station at the NSAs will comply with the FERC sound level limit of 55 dBA, L_{dn} after the addition of the proposed compressor station equipment with noise control treatments equivalent to those described herein.

9.2.10 Mainline CS 2 Compressor Station

9.2.10.1 Mainline CS 2 Compressor Station - Existing Noise Levels at Station Site

A baseline sound level survey was conducted in the vicinity of the proposed Mainline CS 2 Compressor Station in Wayne County, Ohio. The area surrounding the proposed site is relatively flat with a mix of residential, agricultural, and undeveloped land uses. Audible sound sources in the area included traffic on Highway 30 to the south and County Road 149, as well as birds and leaf rustle.

Four NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored for several hours, including daytime and nighttime periods. The baseline measurements show that the existing average ambient sound levels in the area ranged from 53.6 to 62.5 dBA, L_{dn}. The NSAs and their approximate distances from the proposed compressor building are shown on Figure 9.2.8 in Appendix 9B. The monitoring/measurement locations are also shown on the figure.

Equipment used during the site survey consisted of the following:

- Larson Davis Model 824 Sound Level Monitor, Serial Number A0335, A2845, and A3269
- Brüel & Kjær Type 4231 Calibrator, Serial Number 2022565

Equipment was field calibrated before and after the measurements. Windscreens were installed on all microphones. All instrumentation has current laboratory certification.

Table 9.2.8-1 in Appendix 9A shows the weather conditions at the start of the environmental sound level survey.

Table 9.2.8-2 in Appendix 9A shows the measured or estimated daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The table also shows the distances and directions from the approximate center of the compressor building to the NSAs.

9.2.10.2 Mainline CS 2 Compressor Station - Noise Impact Evaluation

The noise model for this station includes all features as described in Section 9.2.2. The specific attributes of this station include the following:

- The building dimensions assumed in the model were 80 feet by 340 feet, with a 35-foot eave height.
- Equipment was arranged per the latest available plot plan, with the engine intakes, exhausts, and the utility coolers on the south side of the compressor building.
- There is no gas cooling at this station.
- The G3616 engine exhausts were modeled at a height of 55 feet above grade and the G16CM34 engine exhausts were modeled at a height of 70 feet above grade.

Table 9.2.8-3 in Appendix 9A shows the interior sound levels and the untreated sound power levels used in the model for the proposed compressor units.

Table 9.2.8-4 in Appendix 9A shows a summary of the predicted sound level contribution of the station equipment at the NSAs, along with a prediction of the overall environmental sound levels after the addition of the compressor station equipment, with the modeled combination of noise control treatments. The table indicates that, with the proposed noise control treatments discussed below, the compressor station noise contributions at all of the nearest NSAs will be below the FERC criterion of 55 dBA, L_{dn}.

9.2.10.3 Mainline CS 2 Compressor Station – Noise Mitigation Measures

Table 9.2.8-5 in Appendix 9A gives a summary of the acoustical attenuations used in the computer model for one possible set of noise control treatments. The noise mitigation measures shown are based on the most-current station design, and represent one potential set of possible mitigation measures.

9.2.10.4 Mainline CS 2 Compressor Station – Noise Quality Summary

Environmental baseline sound level measurements were collected near the closest NSAs to the proposed greenfield site for the Mainline CS 2 Compressor Station. The baseline measurements show that the existing average ambient sound levels in the area ranged from 53.6 to 62.5 dBA, L_{dn}. Computer noise modeling predicts that the sound level contributions from the compressor station at the NSAs will comply with the FERC sound level limit of 55 dBA, L_{dn} after the addition of the proposed compressor station equipment with noise control treatments equivalent to those described herein.

9.2.11 Mainline CS 3 Compressor Station

9.2.11.1 Mainline CS 3 Compressor Station - Existing Noise Levels at Station Site

A baseline sound level survey was conducted in the vicinity of the proposed Mainline CS 3 Compressor Station in Crawford County, Ohio. The area surrounding the proposed site is relatively flat with a mix of residential and agricultural land uses. Audible sound sources in the area included local traffic on Albaugh, New Washington, Brillhart, and Ross Roads, and birds.

Seven NSAs (all residences) were identified near the site. The existing environmental sound levels were monitored for several hours, including daytime and nighttime periods. The baseline measurements show that the existing average ambient sound levels in the area ranged from 47.4 to 57.1 dBA, L_{dn}. The NSAs and their approximate distances from the proposed compressor building are shown on Figure 9.2.9 in Appendix 9B. The monitoring/measurement locations are also shown on the figure.

Equipment used during the site survey consisted of the following:

- Larson Davis Model 824 Sound Level Monitor, Serial Number A0335, A0975, A3269, and A2845
- Brüel & Kjær Type 4231 Calibrator, Serial Number 2022565

Equipment was field calibrated before and after the measurements. Windscreens were installed on all microphones. All instrumentation has current laboratory certification.

Table 9.2.9-1 in Appendix 9A shows the weather conditions at the start of the environmental sound level survey.

Table 9.2.9-2 in Appendix 9A shows the measured or estimated daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The table also shows the distances and directions from the approximate center of the compressor building to the NSAs.

9.2.11.2 Mainline CS 3 Compressor Station - Noise Impact Evaluation

The noise model for this station includes all features as described in Section 9.2.2. The specific attributes of this station include the following:

- The building dimensions assumed in the model were 80 feet by 310 feet, with a 35-foot eave height.
- Equipment was arranged per the latest available plot plan, with the engine intakes, exhausts, and the utility coolers on the south side of the compressor building.
- There is no gas cooling at this station.
- The G3616 engine exhausts were modeled at a height of 55 feet above grade and the G16CM34 engine exhausts were modeled at a height of 70 feet above grade.

Table 9.2.9-3 in Appendix 9A shows the interior sound levels and the untreated sound power levels used in the model for the proposed compressor units.

Table 9.2.9-4 in Appendix 9A shows a summary of the predicted sound level contribution of the station equipment at the NSAs, along with a prediction of the overall environmental sound levels after the addition of the compressor station equipment, with the modeled combination of noise control treatments. The table indicates that, with the proposed noise control treatments discussed below, the compressor station noise contributions at all of the nearest NSAs will be below the FERC criterion of 55 dBA, L_{dn}.

9.2.11.3 Mainline CS 3 Compressor Station – Noise Mitigation Measures

Table 9.2.9-5 in Appendix 9A gives a summary of the acoustical attenuations used in the computer model for one possible set of noise control treatments. The noise mitigation measures shown are based on the most-current station design, and represent one potential set of possible mitigation measures.

9.2.11.4 Mainline CS 3 Compressor Station – Noise Quality Summary

Environmental baseline sound level measurements were collected near the closest NSAs to the proposed greenfield site for the Mainline CS 3 Compressor Station. The baseline measurements show that the existing average ambient sound levels in the area ranged from 47.4 to 57.1 dBA, L_{dn}. Computer noise modeling predicts that the sound level contributions from the compressor station at the NSAs will comply with the FERC sound level limit of 55 dBA, L_{dn} after the addition of the proposed compressor station equipment with noise control treatments equivalent to those described herein.

9.2.12 Defiance Compressor Station

9.2.12.1 Defiance Compressor Station - Existing Noise Levels at Station Site

A baseline sound level survey was conducted in the vicinity of the proposed Defiance Compressor Station in Defiance County, Ohio. The area surrounding the proposed site is flat with a mix of residential, commercial, and agricultural land uses. Audible sound sources in the area included local traffic on Banner School Road and SR 66N, along with birds and light wind noise.

Four NSAs (all residences) were identified near the site. NSA 2, to the southeast of the station site, appears to be an abandoned residence and may not actually be classified as an NSA. We have included it in the analysis for completeness but it may be removed from future analysis if further research finds that it is unoccupied.

NSA 1 is located 1,990 feet northeast of the center of the compressor building, along SR66N. Measurement position 1 was located near a building closer to the Defiance station. This building had the appearance of a house, but it has been identified as a business rather than a residence. Therefore, this building has not been regarded as an NSA in the present study. Even so, as shown in Contour 9.2.10 in Appendix 9C, the computer noise model predicts that, with the proposed noise control treatments discussed below, the compressor station noise contributions at this location will be below 55 dBA, L_{dn}.

The existing environmental sound levels were monitored for several hours, including daytime and nighttime periods. The baseline measurements show that the existing average ambient sound levels in the area ranged from 59.4 to 71.6 dBA, L_{dn}. The NSAs and their approximate distances from the proposed compressor building are shown on Figure 9.2.10 in Appendix 9B. The monitoring/measurement locations are also shown on the figure.

Equipment used during the site survey consisted of the following:

- Larson Davis Model 824 Sound Level Monitor, Serial Number A0335, A3269, and A2845
- Brüel & Kjær Type 4231 Calibrator, Serial Number 2022565

Equipment was field calibrated before and after the measurements. Windscreens were installed on all microphones. All instrumentation has current laboratory certification.

Table 9.2.10-1 in Appendix 9A shows the weather conditions at the start of the environmental sound level survey.

Table 9.2.10-2 in Appendix 9A shows the measured or estimated daytime and nighttime sound levels (L_{eq}, dBA) as well as the equivalent day-night sound levels (L_{dn}, dBA). The table also shows the distances and directions from the approximate center of the compressor building to the NSAs.

9.2.12.2 Defiance Compressor Station - Noise Impact Evaluation

The noise model for this station includes all features as described in Section 9.2.2. The specific attributes of this station include the following:

- The building dimensions assumed in the model were 80 feet by 250 feet, with a 35-foot eave height.
- Equipment was arranged per the latest available plot plan, with the engine intakes, exhausts, and the utility coolers on the south side of the compressor building.
- The gas coolers were modeled on the north side of the compressor building.
- The G3616 engine exhausts were modeled at a height of 55 feet above grade and the G16CM34 engine exhausts were modeled at a height of 70 feet above grade.

Table 9.2.10-3 in Appendix 9A shows the interior sound levels and the untreated sound power levels used in the model for the proposed compressor units.

Table 9.2.10-4 in Appendix 9A shows a summary of the predicted sound level contribution of the station equipment at the NSAs, along with a prediction of the overall environmental sound levels after the addition of the compressor station equipment, with the modeled combination of noise control treatments. The table indicates that, with the proposed noise control treatments discussed below, the compressor station noise contributions at all of the nearest NSAs will be below the FERC criterion of 55 dBA, L_{dn}.

9.2.12.3 Defiance Compressor Station – Noise Mitigation Measures

Table 9.2.10-5 in Appendix 9A gives a summary of the acoustical attenuations used in the computer model for one possible set of noise control treatments. The noise mitigation measures shown are based on the most-current station design, and represent one potential set of possible mitigation measures.

9.2.12.4 Defiance Compressor Station – Noise Quality Summary

Environmental baseline sound level measurements were collected near the closest NSAs to the proposed greenfield site for the Defiance Compressor Station. The baseline measurements show that the existing average ambient sound levels in the area ranged from 59.4 to 71.6 dBA, L_{dn}. Computer noise modeling predicts that the sound level contributions from the compressor station at the NSAs will comply with the FERC sound level limit of 55 dBA, L_{dn} after the addition of the proposed compressor station equipment with noise control treatments equivalent to those described herein.

9.2.13 Compressor Station Noise Mitigation

The noise treatments described in this section apply in common to all ten of the compressor stations. The performance recommendations for the individual stations are given respectively in Tables 9.2.1-5, through 9.2.10-5 for the Sherwood, Seneca, Clarington, Majorsville, Cadiz, Burgettstown, Mainline CS1, Mainline CS2, Mainline CS3, and Defiance Compressor Stations, respectively. These tables will be referred to as Table 9.2.X-5 in this section.

<u>Compressor Buildings</u>

The compressor building at each station was modeled as having a wall and roof system with the transmission loss performance shown in the relevant version of Table 9.2.X-5, and with the other construction details noted in this section. The compressor building supplier should supply laboratory test results for their proposed wall system that demonstrate that the transmission loss performance is equal to or greater than the designated performance in each octave band. The compressor buildings will not have windows, skylights, or translucent panels.

The interior surface of the compressor building walls will be acoustically absorptive, having a noise reduction coefficient (NRC) of at least 0.8. The inside of the compressor building can be lined with perforated metal of at least 23 percent open area for insulation protection, if so desired. The building will be well sealed with no cracks or gaps. All piping penetrations through the building walls will be well insulated, flashed, and caulked.

Equipment doors will be supplied with a high-quality roll-up door such as an Overhead Door series 625 insulated door. The performance shown in each version of Table 9.2.X-5 is the estimated performance of a single door having a similar construction to this model door.

The personnel doors should be sound transmission class (STC) of STC-32 or better industrial metal doors with good perimeter seals. Small glass windows in these doors are acceptable as long as the door STC rating is achieved.

All building ventilation openings including roof gravity relief exhausts should include standard acoustical louvers or silencers such that the total sound pressure level contribution of each opening does not exceed 65 dBA at 12 feet from the opening. The sound pressure level calculated for the interior of each building due to the engine and compressor equipment is shown in the relevant version of Table 9.2.X-3. The sound level target for each ventilation opening includes the sound level contribution of both the mechanical equipment inside the building along with the sound levels due to any required ventilation fans. The ventilation system supplier should submit the sound power level of the proposed building ventilation fans during the bidding process for review.

The approximate ventilation silencer performance requirements are shown in the versions of Table 9.2.X-5. The final performance requirements of these silencers will depend on the size, number, and type of ventilation fans used in the design. The sound pressure level target should be the primary design criterion, as it can be field-tested after installation.

Engine Exhausts and Intakes

The recommended insertion loss performance for the engine exhaust systems are shown in the relevant versions of Table 9.2.X-5 for each station. These insertion loss values are calculated in order to meet the overall project sound level targets. These are not based on a specific manufacturer or silencer model. These values should be used during the exhaust system specification process.

Exhaust systems typically radiate significant sound from the silencer, catalyst, and piping associated with the exhaust system. This noise is commonly referred to as shell-radiated noise or “breakout”. The relevant versions of Table 9.2.X-5 show the sound pressure level limit recommended for the exhaust system breakout noise. This information can be used by the exhaust system supplier during the system specification and design stage to ensure that the system is designed appropriately. It is recommended that all exhaust system expansion joints be treated with acoustical blankets.

The recommended insertion loss performance for the engine intake systems are also shown in the tables. These values are the insertion loss performance of the entire intake system, including any inlet air filter insertion losses. If possible, all intake silencers should be located inside the compressor building. If the silencers are located outside of the building, all intake piping between the silencer and the building should be treated with ISO Type A2 acoustical lagging (or similar) having the performance shown in Table 9.2.10-5.

Utility Coolers (Engine Coolers) and Gas Aftercoolers

The sound power level of the Utility Coolers and the Gas Aftercoolers for each unit is based on manufacturer data for the currently planned coolers for the proposed stations. At some of the stations, additional noise control is recommended for the coolers as outlined in the relevant version of Table 9.2.X-5.

Potential noise control for the coolers includes the use of quieter fans or variable frequency drive (VFD) fan controllers. VFD systems are very effective noise control for coolers as they allow for reduced-speed and quieter operation of the cooler fans during the more sensitive night-time hours. For those stations for which additional noise control is recommended, approximately an 8 dB reduction is shown in Table 9.2.X-5. This would be achievable with a 50% reduction in fan speed during nighttime hours using a VFD control system, the use of fans with a sound power level 8 dB lower than those currently planned, or some combination of a VFD control system and quieter fans. It is also possible to use barriers, berms, or cooler enclosure systems as noise control for coolers.

Station Piping

The sound power levels of the aboveground piping at each compressor station are based on detailed sound intensity measurements of the piping at Energy Transfer’s Grimes Compressor Station. The piping layout and equipment used at this station is very similar to each of the proposed compressor stations.

At several of the stations, acoustical treatments are recommended for the above ground piping. There are a few different options for acoustical treatments that would be appropriate for the suction and discharge header piping. Due to the low-frequency nature of the sound radiated by these sections of piping, traditional acoustical insulation or pipe lagging will probably not be an effective noise control treatment.

Potential treatments for these piping sections include enclosing the pipe headers in a full or partial building extension of the main compressor building, or adding berms or barriers between the piping and the nearest NSAs. The building extension would consist of an independent space adjacent to the compressor building. The recommended performance for the compressor building would not change, and a dividing wall is recommended between the compression equipment and the piping sections of the building. The sound levels in the piping extension area would be expected to be lower than in the compressor building portion, so it is likely that the general wall construction of the piping building could be of lower acoustical performance than the main compressor building.

Another potential noise control treatment would be the use of barriers or berms between the piping and the closest NSAs. The performance of barriers or berms is dependent on the location of the barrier/berm with respect to the station equipment and the closest NSAs along with the height of the barrier. As Rover progresses through the station engineering process, the potential piping treatments can be evaluated with regard to the recommended acoustical performance, personnel safety, maintenance, and operations considerations.

If used for noise control, any barriers for this project could be fabricated from plastic, sheet metal, wood, plywood, brick, or concrete masonry unit, as long as the sound transmission class of the barrier is STC-30 or higher, and there are no cracks, gaps, or open seams. The bottom of the barrier must be flush with the ground. The equipment side of the barrier should be lined with an acoustically absorptive material having an NRC of 0.8 or greater. There are many barrier layouts or configurations that would provide similar acoustical benefits, and they could be evaluated as the Project design progresses.

For those stations at which piping treatments are recommended, acoustical pipe lagging that meets the requirements of ISO-15665:2003 Type A or Type C is recommended for any piping that extends outside of the barrier or enclosure to the gas after-coolers, if present. The recommended lagging type is shown in the relevant version of Table 9.2.X-5.

<u>Fuel Gas Skid</u>

The noise radiated by the fuel gas skids is highly dependent on the supply gas pressure and the valve selection for the skid. The sound power level used for this skid in the noise models is quite high, and represents an upper bound of the actual installed sound levels. Based on this conservative estimate, some type of acoustical treatment for the fuel gas skid is recommended for almost all of the stations. The primary recommendation for reducing noise from the fuel gas skids is to use “Whisper-Trim” low-noise valve trims for the control valves on the skids. Manufacturer calculations indicate that the Whisper-Trim valve trim is expected to reduce the sound levels from the skid by about 15 dB. At a few stations, some additional noise control is recommended. This additional noise control could take the form of either a noise barrier between the fuel gas skid and the closest NSAs or the use of ISO-15665:2003 Type A pipe lagging or acoustical blankets on the fuel gas skid piping and vessels.

9.2.14 Station Blowdown Noise

Noise from gas blowdown events was considered for the compressor stations. Unit blowdowns are routine gas blowdowns, vented via a silencer, that can occur when a compressor is stopped and gas between the suction/discharge valves & compressor(s) is vented to the atmosphere through a blowdown silencer.

Because of the short duration (typically less than one minute) and irregular timing of blowdown events, they have almost no influence on the 24-hour L_{dn} values for a facility. The blowdown silencer allowable sound level at 300 feet has been calculated and is shown in Table 9.2.11 in Appendix 9A. The design target was a sound level of no more than 55 dBA, L_{eq} at the closest NSAs during standard blowdown events. This level was chosen to reduce annoyance and startle effects from blowdown events, and is roughly equivalent to the peak sound received from a typical car passing by 200 feet away at 35 to 40 mph.

The estimated A-weighted sound level of a unit blowdown event at the closest NSAs for each station is shown in Table 9.2.11 in Appendix 9A. Although the noise of an individual blowdown event may be audible at nearby NSAs, this is not expected to present a significant noise impact, given the blowdown silencer performance values that have been designed for the Project.

9.2.15 Construction Noise

Noise associated with pipeline construction activities will be intermittent and temporary. Construction equipment will be operated on an as-needed basis and mostly during daylight hours. The most significant noise sources associated with the construction work will be internal combustion engines used to move and operate the equipment. The noise impacts will be temporary and will fall as the construction progresses along the pipeline segments. Neighbors may hear construction noise as the work moves into and out of their vicinity, but the overall impact will be insignificant. Contractors will be instructed to keep equipment in good repair and to use high-quality engine exhaust mufflers wherever possible on engines. If noise concerns or complaints arise, temporary barriers would be used as needed. The pipeline construction is not expected to expose the community to excessive or long-term noise or vibration levels.

Standard construction equipment will be expected to be used in the construction of the stations, and most construction will take place during daytime working hours of 7:00 am until 7:00 pm. Emergencies or other unusual circumstances may necessitate nighttime work, but the bulk of activity will take place during daylight hours.

The highest sound levels during construction are expected during the early earthmoving phase. Equipment that may be operating during this phase would include bulldozers, graders, backhoes, dump trucks, generators, etc. The magnitude of the noise effects would depend on the type of construction activity, noise level generated by various construction equipment, duration of the construction phase, and the distance between the noise source and the receiver. Sound levels of typical construction equipment range from approximately 65 dBA to 95 dBA at 50 feet from the source, with an average sound pressure level of 89 dBA at 50 feet during the noisiest activities. Assuming one of each type of equipment working simultaneously, maximum short-term sound power level of the construction equipment will be about 123 dBA. Based on this worst-case sound power level, the predicted maximum short-term sound level at the closest NSAs has been calculated for each compressor station site.

A question from the public under Scoping Comments raised concern for the effect of construction noise on training, disposition, and health of show horses located near construction. No specific studies are known regarding the effect of temporary construction noise on show horses. One study (Huybregts, 2008) indicated that thoroughbred horses are exposed to levels of 65 to 70 dBA in stalls and 70 to 90 dBA when moving in and out of stalls. Show horses may encounter similar levels during training and events. Construction noise contributions depend on the actual type of work required at a given location, but it is unlikely to exceed the levels noted.

The predicted worst-case construction noise level at the closest NSAs for each compressor station is shown in Table 9.2.12 in Appendix 9A.

9.2.16 Acoustical Analysis of Horizontal Directional Drilling (HDD) Noise

9.2.16.1 HDD Noise Goals and Background Information

HDD methods will be utilized at specific sites along the Project, including locations such as highways, rivers, and sensitive wetlands. A noise evaluation has been conducted for each proposed HDD site, including:

- identification of the closest NSAs within one-half mile of the HDD work areas;
- measurement of the existing sound environment in the vicinity of the areas;
- prediction of the HDD noise contribution at each NSA location, using a computer noise model and the best available information about the proposed equipment at each site;
- calculation of the expected noise impact of the HDD equipment, with a target 24-hour day-night equivalent sound level limit of 55 dBA, L_{dn};
- design of noise control treatments such as temporary noise barriers or equipment modifications for each HDD work area where the HDD equipment is predicted to contribute more than the nighttime noise limit. If no practical noise control options are available, the project may consider a compensation/relocation plan for NSAs where the noise goal may be exceeded. This secondary plan will reimburse the residents of each NSA for each night of HDD activities, as compensation for temporary hotel accommodations and general inconvenience.

9.2.16.2 HDD Equipment Data

The HDD entry and exit sites will have several sound sources in operation during the temporary construction work. On the entry side, this will include the drilling rig itself, mud pumps, generators, drilling mud mixers, shale shakers, light plants, and the driving engines associated with this equipment, as well as mobile equipment such as cranes, front-end loaders, forklifts, and trucks. On the exit side, less equipment is required, typically including a backhoe or bulldozer, and possibly a generator and light plant. The actual equipment used, and the site layout and configuration, will depend on the drilling contractors selected for the Project, the site conditions, and other factors. Typical sound power levels for peak HDD construction operations based on measurements of previous operations are shown below in Table 9.2.4-1. These levels have been used in all calculations in this study.

These values represent conservative estimates without the assumption of any additional noise control treatments. These levels do assume that all original equipment manufacturer noise control treatments are correctly installed and that all operating equipment is well-maintained and in good operating condition. These levels also assume some slight typical shielding and screening effects from the tanks and trailers that are used in HDD operations.

TABLE 9.2.4-1
Sound Power Levels of HDD Equipment

	Unweighted Sound Power Level at Octave Band Center Frequency									Total
Octave Band Center Frequency, Hz	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dBA**
HDD Entry Site	118	115	112	114	112	109	108	106	98	115.2
HDD Exit Site	110	108	105	102	100	98	95	92	88	103.2

9.2.16.3 HDD Operations Schedule

The current drilling operations plan is to perform HDD activities whenever dictated by schedule or operations, 24-hours per day if necessary. As such, all calculations are based on the maximum HDD activity sound power levels shown in Table 9.2.4-1 without any adjustment for reduced activities during nighttime hours. The durations of HDD crossing drills will vary from 2 to 8 months. The individual crossing durations are provided in Table 1A-7, Resource Report 1, Appendix 1A.

9.2.16.4 Calculations

A noise model was used to calculate the expected temporary sound level contributions due to the HDD equipment. The ISO 9613-2 standard was used to calculate the divergence, atmospheric absorption, foliage, and ground absorption for the path from the HDD entry or exit site to the closest NSA. The calculations were performed for the closest NSA within a one-half mile search radius. A temperature of 60° F and a relative humidity of 70% were used for the atmospheric absorption calculations. A summary of the calculation results for all of the NSAs is included in the evaluation for each HDD site.

A figure is provided for each HDD work area showing the distance and direction to each NSA from the HDD entries and exits included in the evaluation. See Appendix 9B, where the figures are designated by the name of the HDD site. For example, Figure 9B-HDD-*ML-P4-18* shows the HDD crossing designated as ML-P4-18 in this Project.

9.2.16.5 Predicted Temporary Sound Level

The predicted HDD equipment sound level contribution for each NSA has been calculated in the evaluation. The calculated level was combined with the existing ambient sound level near each NSA to determine the overall sound level L_{dn} (ambient plus predicted HDD) at each NSA during the temporary HDD activity. The difference between this overall sound level and the current sound level is the calculated increase due to the temporary HDD activity. For most of the crossings, there are two NSAs considered, with one closest to the Entry, and one closest to the Exit. For ML-P4-01, ML-P4-17, ML-P4-19, and SW-P4-41, there is only one NSA as depicted in the associated figures. For every crossing, the noise contribution from both the Entry and the Exit is included in the NSA calculations.

HDD crossing data, including locations, distances, baseline ambient data, and the calculation results for the HDD crossings are presented in tables in Appendix 9A. The tables include:

- Table 9.2-13 Summary of Proposed HDD Crossings
- Table 9.2-14 Summary of NSAs and Baseline Sound Level Measurement Data
- Table 9.2-15 Calculated HDD Sound Level Contributions at Nearest NSAs

The calculation methods are illustrated in Appendix 9E for the Entries and Exits of each HDD crossing. This is given in tables designated in the format Table 9.2-HDD-*XX-XX-XX*. For example, Table 9.B-HDD-*ML-P4-18**X*** illustrates the calculations for E**x**it of the HDD crossing designated as ML-P4-18 in this project. Similarly, Table 9.B-HDD-*ML-P4-18**N*** provides the calculations for the E**n**try.

9.2.16.6 Noise Mitigation for HDD Sites

For those HDD sites where the predicted sound levels at the NSAs are greater than 55 dBA, L_{dn}, noise mitigation for the HDD equipment or compensation/relocation will be needed to achieve the noise goals. For noise mitigation on HDD equipment, engine exhaust and barrier treatments will be used as the primary method to reduce the sound level contribution to less than 55 dBA, L_{dn}. Typically, all engines on power units, gensets, etc. would be fitted with residential-grade exhaust mufflers, and temporary barriers would be installed between the HDD site and the nearest NSAs, based on the general barrier guidelines noted below.

1. The barrier should be constructed of at least ¾-inch plywood, lined on the HDD equipment side with 2 inches of medium-weight fiberglass board insulation such as Owens Corning 703 or Knauf Insulation Board, 2-inch thickness, 3 pounds per cubic foot. The insulation can be covered with thin plastic sheeting for weather protection. Commercially available mass-loaded vinyl barriers or portable barriers may also be appropriate for this use.
2. There should be as few cracks and gaps in the barriers as possible.
3. There should be no space between the bottom of the barriers and the ground.
4. The barrier should break the line-of-sight between the HDD equipment and the listed NSAs, with a minimum height of 12 feet. In locations where there is a long line of NSAs close to the HDD site, it may be necessary to wrap the barrier around the edges of the HDD site.

Secondary noise control treatments may be required, depending on the actual equipment and site layout used.

As an alternative to these primary and/or secondary noise control treatments, the Project may consider offering the residents compensation or temporary relocation as a means of reducing the temporary HDD construction noise impact.

9.2.17 Acoustical Analysis of Meter Station Sites

Per a recent FERC request, acoustical analyses of the meter station sites are underway, and results will be provided in April 2015.

9.2.18 Acoustical Analysis of MLV Sites

Per a recent FERC request, Rover will also study the potential noise effects associated with mainline valves (MLVs), including the likelihood, cause, and frequency of a blowdown event, the approximate time it would take to evacuate gas from the pipeline, and the distance to NSAs from the noise source. This analysis of MLV sites with pipeline blowdowns is underway, and results will be provided in April 2015.

A comment from the public during Pre-Filing (C838) raised concern for the effect of relief valve noise on commodity production (such as milk and eggs). No specific studies are known regarding the effects of relief valve noise on poultry or dairy cattle, but a U.S. Air Force study (Manci, et al, 1988) indicated that jet overflight noise reactions were minimal in livestock. Single short aircraft noise stresses did not affect poultry egg production, and there was no evidence of effects on dairy cow milk production. Pipeline blowdowns are typically used only during extremely rare emergency conditions, and are therefore unlikely to cause problems with production.

9.2.19 Ground-Borne Vibration

It is expected that the project equipment will not cause a perceptible increase in ground-borne vibration at any NSA. All selected equipment is fundamentally well-balanced and smoothly operating. Based on ground vibration measurements and observations of similar operating equipment, no perceptible increase in ground-borne vibration is expected at the NSA distances of more than 500 feet from the operating equipment.

9.3 WASTE HEAT COGENERATION

INGAA released a white paper on February 29, 2008 titled *Waste Heat Opportunities for Interstate Natural Gas Pipelines*, analyzing the current status and future potential for three energy efficiency applications – power generation from waste heat recovered from compressor drives, turbo-expander systems that generate power from pressure reduction at city gates, and inlet air cooling technologies – in terms of applicability on interstate pipeline systems.

As a result, an evaluation of Rover’s proposed compressor stations and the equipment to be installed was conducted. Per INGAA's "Waste Heat Recovery Opportunities: Pipelines Present Energy Efficient Proposal" White Paper's finding, internal combustion engines are not well-suited for waste heat recovery generation. Because internal combustion engines are the proposed drivers at all compressor stations, Rover Pipeline is not a viable candidate for waste heat recovery opportunity.

9.4 REFERENCES

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