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Rockies Express Pipeline

ROCKIES EXPRESS PIPELINE - EAST PROJECT

Resource Report No. 9
Air and Noise

Draft

Prepared by

NATURAL RESOURCE GROUP, INC.

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ROCKIES EXPRESS PIPELINE-EAST PROJECT
Rockies Express Pipeline LLC
Resource Report 9

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9.0 RESOURCE REPORT 9 – AIR QUALITY AND NOISE

Table 9-1 lists the filing requirements found in Title 18 of the Code of Federal Regulations (CFR) § 380.12 applicable to Resource Report 9 and the locations where they are addressed in this report are identified.

TABLE 9-1

Rockies Express Pipeline-East Project
Resource Report 9 Filing Requirements Checklist

Filing Requirement	Requirement Addressed	Location within this Document
18 CFR § 380.12 (k) Air and Noise Quality	✓	Section 9.0
18 CFR § 380.12 (k)(1) Existing Air Quality	✓	Section 9.1.2
18 CFR § 380.12 (k)(2) Noise Level – Quantitative Description	✓	Section 9.2.1
18 CFR § 380.12 (k)(2)(i) Day / Night Noise Levels 18 CFR § 380.12 (k)(2)(ii) Existing Compressor Station Full Load Noise Level Survey 18 CFR § 380.12 (k)(2) (iii) Existing Ambient Sound 18 CFR § 380.12 (k)(2)(iv) Noise Measurement Plot Plan	✓	Section 9.2.3
18 CFR § 380.12 (k)(3) Impact on Air Quality	✓	Section 9.1.3
18 CFR § 380.12 (k)(4) Noise Impact Quantitative Estimate 18 CFR § 380.12 (k)(4)(i) Noise Impact Quantitative Estimate – Supporting Calculations 18 CFR § 380.12 (k)(4)(ii) Sound Pressure Levels 18 CFR § 380.12 (k)(4)(iii) Far Field Sound Level Data 18 CFR § 380.12 (k)(4)(iv) Noise Control Equipment	✓	Section 9.2.3
18 CFR § 380.12 (k)(4)(v) Compliance with Applicable Regulations	✓	Sections 9.1.4 and 9.2.2
18 CFR § 380.12 (k)(5) Air and Noise Quality Mitigation Measures	✓	Sections 9.1.3 and 9.2.3

9.1 AIR QUALITY

9.1.1 Local Climate

The following sections summarize the characteristics of the local climate along the pipeline route and at the proposed compressor stations associated with the Rockies Express Pipeline-East (REX-East) Project. The milepost locations of these facilities are listed in table 9.1.1-1. Topographic maps and aerial photographs showing the locations of these facilities are included in Volume 2 of the Application filing.

TABLE 9.1.1-1

Rockies Express Pipeline-East Project
Proposed Compressor Station Locations

Facility Name	Milepost	County/State
Arlington Compressor Station	237.0 [a]	Carbon County, Wyoming
Bertrand Compressor Station	286.8 [b]	Phelps County, Nebraska
Mexico Compressor Station	0.0	Audrain County, Missouri
Blue Mound Compressor Station	143.9	Christian County, Illinois
Bainbridge Compressor Station	279.0	Putnam County, Indiana

TABLE 9.1.1-1

Rockies Express Pipeline-East Project
Proposed Compressor Station Locations

Facility Name	Milepost	County/State
Hamilton Compressor Station	432.0	Butler County, Ohio
Chandlersville Compressor Station	573.8	Muskingum County, Ohio

[a] Milepost represents location along the REX-Entrega pipeline route.
[b] Milepost represents location along the REX-West pipeline route.

9.1.1.1 Arlington Compressor Station – Carbon County, Wyoming

The specific characterization of the local weather at the Arlington Compressor Station site is based on data from Rawlins, Wyoming, which indicated an average annual temperature of 42 degrees Fahrenheit, an average annual maximum temperature of 55 degrees Fahrenheit, an average annual minimum temperature of 30 degrees Fahrenheit, an average annual precipitation of 7.7 inches, and an average annual snowfall of 38.9 inches. A representative station in Cheyenne, Wyoming with wind observations from 1930 to 1996 indicated that the predominant wind direction is west-northwest with an annual average wind speed of 13 miles per hour.

9.1.1.2 Bertrand Compressor Station – Phelps County, Nebraska

The specific characterization of the local weather at the Bertrand Compressor Station site is based on data from Holdrege, Nebraska, which indicated an average annual temperature of 50 degrees Fahrenheit, an average annual maximum temperature of 63 degrees Fahrenheit, an average annual minimum temperature of 38 degrees Fahrenheit, an average annual precipitation of 21.7 inches, and an average annual snowfall of 28.2 inches. A representative station in Grand Island, Nebraska with wind observations from 1930 to 1996 indicated that the predominant wind direction is south with an annual average wind speed of 12 miles per hour.

9.1.1.3 Mexico Compressor Station – Audrain County, Missouri

The specific characterization of the local weather at the Mexico Compressor Station site is based on data from Mexico, Missouri, which indicated an average annual temperature of 52.8 degrees Fahrenheit, an average annual maximum temperature of 63.9 degrees Fahrenheit, an average annual minimum temperature of 41.5 degrees Fahrenheit, an average annual precipitation of 40.2 inches, and an average annual snowfall of 22.1 inches. A representative station in Columbia, Missouri with wind observations from 1930 to 1996 indicated that the predominant wind direction is south with an annual average wind speed of 10 miles per hour.

9.1.1.4 Blue Mound Compressor Station – Christian County, Illinois

The specific characterization of the local weather at the Blue Mound Compressor Station site is based on data from Decatur, Illinois, which indicated an average annual temperature of 53 degrees Fahrenheit, an average annual maximum temperature of 64 degrees Fahrenheit, an average annual minimum temperature of 43 degrees Fahrenheit, an average annual precipitation of 36.9 inches, and an average annual snowfall of 20.1 inches. A representative

station in Springfield, Illinois with wind observations from 1930 to 1996 indicated that the predominant wind direction is south with an annual average wind speed of 11 miles per hour.

9.1.1.5 Bainbridge Compressor Station – Putnam County, Indiana

The specific characterization of the local weather at the Bainbridge Compressor Station site is based on data from Greencastle, Indiana, which indicated an average annual temperature of 52.4 degrees Fahrenheit, an average annual maximum temperature of 62.7 degrees Fahrenheit, an average annual minimum temperature of 41.9 degrees Fahrenheit, an average annual precipitation of 43.6 inches, and an average annual snowfall of 29.4 inches. A representative station in Indianapolis, Indiana with wind observations from 1930 to 1996 indicated that the predominant wind direction is southwest with an annual average wind speed of 10 miles per hour.

9.1.1.6 Hamilton Compressor Station – Butler County, Ohio

The specific characterization of the local weather at the Hamilton Compressor Station site is based on data from Middletown, Ohio, which indicated an average annual temperature of 53 degrees Fahrenheit, an average annual maximum temperature of 62 degrees Fahrenheit, an average annual minimum temperature of 44 degrees Fahrenheit, an average annual precipitation of 40.9 inches, and an average annual snowfall of 27.2 inches. A representative station in Cincinnati, Ohio with wind observations from 1930 to 1996 indicated that the predominant wind direction is south-southwest with an annual average wind speed of 9 miles per hour.

9.1.1.7 Chandlersville Compressor Station – Muskingum County, Ohio

The specific characterization of the local weather at the Chandlersville Compressor Station site is based on data from Zanesville, Ohio, which indicated an average annual temperature of 51 degrees Fahrenheit, an average annual maximum temperature of 63 degrees Fahrenheit, an average annual minimum temperature of 40 degrees Fahrenheit, an average annual precipitation of 36.7 inches, and an average annual snowfall of 23.5 inches. A representative station in Columbus, Ohio with wind observations from 1930 to 1996 indicated that the predominant wind direction is south with an annual average wind speed of 8 miles per hour.

9.1.2 Existing Air Quality

Federal and state air regulations are designed to ensure that ambient air quality, including background, existing, and new sources, is in compliance with the ambient standards of criteria air pollutants (CAP). CAPs consist of sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for these pollutants. The NAAQS were set at levels the EPA believed were necessary to protect human health (primary standards) and human welfare (secondary standards). The state standards established by the Wyoming Department of Environmental Quality (WDEQ), Nebraska Department of Environmental Quality (NDEQ), Missouri Department of Natural Resources (MDNR), Illinois Environmental Protection Agency (IEPA), Indiana Department of Environmental Management (IDEM), and Ohio Environmental Protection Agency (OEPA) are the same as the federal NAAQS for criteria pollutants, except for WDEQ standards

for SO_2 24-hour and annual averaging periods. The standards are listed in tables 9.1.2-1 through 9.1.2-3.

TABLE 9.1.2-1

Rockies Express Pipeline-East Project
Ambient Air Quality Standards for Wyoming and Nebraska [a]

			Wyoming		Nebraska	
Air Pollutant	Averaging Period	Federal NAAQS	WDEQ Standards	Background Concentrations	NDEQ Standards	Background Concentrations
SO_2	3-Hour	1,300	1,300	0.011 ppm [b]	1,300	0.128 ppm [h]
	24-Hour	365	260	0.003 ppm [b]	365	0.049 ppm [h]
	Annual	80	60	0.001 ppm [b]	80	0.003 ppm [h]
CO	1-Hour	40,000	40,000	5.0 ppm [c]	40,000	4.1 ppm [i]
	8-Hour	10,000	10,000	2.4 ppm [c]	10,000	2.8 ppm [i]
NO_2	Annual	100	100	0.005 ppm [d]	100	0.017 ppm [j]
O_3	1-Hour	235	---	0.074 ppm [e]	235	0.067 ppm [i]
	8-Hour	157	157	0.066 ppm [e]	157	0.063 ppm [i]
PM_{10}	24-Hour	150	150	51 ug/m^3 [f]	150	86 ug/m^3 [k]
	Annual	50	50	26 ug/m^3 [f]	50	36 ug/m^3 [k]
$PM_{2.5}$	24-Hour	65	65	8 ug/m^3 [d]	65	23 ug/m^3 [l]
	Annual	15	15	3.2 ug/m^3 [d]	15	8.3 ug/m^3 [l]
Lead	3-Month	1.5	1.5	0.18 ug/m^3 [g]	1.5	0.18 ug/m^3 [g]

[a] Federal and state National Ambient Air Quality Standards (NAAQS) values presented in micrograms per cubic meter. All information was obtained from the U.S. Environmental Protection Agency's AirData website for 2005. Concentrations for averaging periods of 1-hr, 3-hr, 8-hr, and 24-hr are based on the second highest concentration.
[b] Background concentrations for Fremont County, WY.
[c] Background concentrations for Larimer County, CO.
[d] Background concentrations for Converse County, WY.
[e] Background concentrations for Campbell County, WY.
[f] Background concentrations for Albany County, WY.
[g] Background concentrations for Denver County, CO.
[h] Background concentrations for Douglas County, NE.
[i] Background concentrations for Lancaster County, NE.
[j] Background concentrations for Wyandotte County, KS.
[k] Background concentrations for Dawson County, NE.
[l] Background concentrations for Hall County, NE.

$\mu g/m^3$ = micrograms per cubic meter
ppm = parts per million
NDEQ = Nebraska Department of Environmental Quality
WDEQ = Wyoming Department of Environmental Quality
SO_2 = sulfur dioxide
CO = carbon monoxide
NO_2 = nitrogen dioxide
O_3 = ozone
PM_{10} = Particulate matter having an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = Particulate matter having an aerodynamic diameter less than or equal to 2.5 microns

TABLE 9.1.2-2

Rockies Express Pipeline-East Project
Ambient Air Quality Standards for Missouri and Illinois [a]

			Missouri		Illinois	
Air Pollutant	Averaging Period	Federal NAAQS	MDNR Standards	Background Concentrations	IEPA Standards	Background Concentrations
SO_2	3-Hour	1,300	1,300	0.014 ppm [b]	1,300	0.037 ppm [f]
	24-Hour	365	365	0.010 ppm [b]	365	0.019 ppm [f]
	Annual	80	80	0.002 ppm [b]	80	0.004 ppm [f]
CO	1-Hour	40,000	40,000	4.7 ppm [c]	40,000	3.7 ppm [g]
	8-Hour	10,000	10,000	3.0 ppm [c]	10,000	1.4 ppm [g]
NO_2	Annual	100	100	0.009 ppm [d]	100	0.015 ppm [h]
O_3	1-Hour	235	235	0.09 ppm [b]	235	0.08 ppm [i]
	8-Hour	157	157	0.080 ppm [b]	157	0.075 ppm [i]
PM_{10}	24-Hour	150	150	35 ug/m^3 [b]	150	48 ug/m^3 [j]
	Annual	50	50	17 ug/m^3 [b]	50	22 ug/m^3 [j]
$PM_{2.5}$	24-Hour	65	65	37 ug/m^3 [e]	65	37 ug/m^3 [k]
	Annual	15	15	12.9 ug/m^3 [e]	15	12.9 ug/m^3 [k]
Lead	3-Month	1.5	1.5	0.05 ug/m^3 [c]	1.5	0.01 ug/m^3 [j]

[a] Federal and state National Ambient Air Quality Standards (NAAQS) values presented in micrograms per cubic meter. All information was obtained from the U.S. Environmental Protection Agency's AirData website for 2005. Concentrations for averaging periods of 1-hr, 3-hr, 8-hr, and 24-hr are based on the second highest concentration.
[b] Background concentrations for Monroe County, MO.
[c] Background concentrations for St. Louis County, MO.
[d] Background concentrations for St. Charles County, MO.
[e] Background concentrations for Boone County, MO.
[f] Background concentrations for Macon County, IL.
[g] Background concentrations for Sangamon County, IL.
[h] Background concentrations for St. Clair County, IL.
[i] Background concentrations for Effingham County, IL.
[j] Background concentrations for Macoupin County, IL.
[k] Background concentrations for Macon County, IL.

$\mu g/m^3$ = micrograms per cubic meter
ppm = parts per million
MDNR = Missouri Department of Natural Resources
IEPA = Illinois Environmental Protection Agency
SO_2 = sulfur dioxide
CO = carbon monoxide
NO_2 = nitrogen dioxide
O_3 = ozone
PM_{10} = Particulate matter having an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = Particulate matter having an aerodynamic diameter less than or equal to 2.5 microns

TABLE 9.1.2-3

Rockies Express Pipeline-East Project
Ambient Air Quality Standards for Indiana and Ohio [a]

Air Pollutant	Averaging Period	Federal NAAQS	Indiana		Ohio		
			IDEM Standards	Background Concentrations	OEPA Standards	Background Concentrations [b]	Background Concentrations [c]
SO_2	3-Hour	1,300	1,300	0.043 ppm [d]	1,300	0.054 ppm [f]	0.178 ppm [h]
	24-Hour	365	365	0.016 ppm [d]	365	0.026 ppm [f]	0.036 ppm [h]
	Annual	80	80	0.004 ppm [d]	80	0.006 ppm [f]	0.008 ppm [h]
CO	1-Hour	40,000	40,000	1.7 ppm [d]	40,000	3.2 ppm [g]	4.2 ppm [i]
	8-Hour	10,000	10,000	1.2 ppm [d]	10,000	1.8 ppm [g]	2.0 ppm [i]
NO_2	Annual	100	100	0.013 ppm [d]	100	0.021 ppm [g]	0.022 ppm [j]
O_3	1-Hour	235	235	0.091 ppm [d]	235	0.103 ppm [f]	0.099 ppm [k]
	8-Hour	157	157	0.081 ppm [d]	—	0.098 ppm [f]	0.090 ppm [k]
PM_{10}	24-Hour	150	150	52 ug/m3 [d]	150	56 ug/m^3 [f]	85 ug/m^3 [i]
	Annual	50	50	23 ug/m3 [d]	50	27 ug/m^3 [f]	35 ug/m^3 [i]
$PM_{2.5}$	24-Hour	65	65	53 ug/m3 [e]	---	54 ug/m^3 [f]	33 ug/m^3 [l]
	Annual	15	15	19.1 ug/m3 [e]	—	17.9 ug/m^3 [f]	13.3 ug/m^3 [l]
Lead	3-Month	1.5	1.5	0.03 ug/m3 [e]	1.5	0.03 ug/m^3 [f]	0.01 ug/m^3 [m]

[a] Federal and state National Ambient Air Quality Standards (NAAQS) values presented in micrograms per cubic meter. All information was obtained from the U.S. Environmental Protection Agency's AirData website for 2005. Concentrations for averaging periods of 1-hr, 3-hr, 8-hr, and 24-hr are based on the second highest concentration.
[b] Concentrations are for representative stations for the Hamilton Compressor Station.
[c] Concentrations are for representative stations for the Chandlersville Compressor Station.
[d] Background concentrations for Hendricks County, IN.
[e] Background concentrations for Marion County, IN.
[f] Background concentrations for Butler County, OH.
[g] Background concentrations for Hamilton County, OH.
[h] Background concentrations for Morgan County, OH.
[i] Background concentrations for Franklin County, OH.
[j] Background concentrations for Cuyahoga County, OH.
[k] Background concentrations for Knox County, OH.
[l] Background concentrations for Athens County, OH.
[m] Background concentrations for Washington County, OH.

$\mu g/m^3$ = micrograms per cubic meter
ppm = parts per million
IDEM = Indiana Department of Environmental Management
OEPA = Ohio Environmental Protection Agency
SO_2 = sulfur dioxide
CO = carbon monoxide
NO_2 = nitrogen dioxide
O_3 = ozone
PM_{10} = Particulate matter having an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$ = Particulate matter having an aerodynamic diameter less than or equal to 2.5 microns

The EPA has designated all areas of the United States as "attainment," "non-attainment," or "unclassified" with respect to ambient air quality standards. All but one of the proposed compressor stations are planned to be located in counties that are currently designated as attainment for all criteria pollutants. The Hamilton Compressor Station will be located in Butler County, Ohio, which is currently designated as non-attainment for 8-hour O_3 and $PM_{2.5}$.

Although there are no compressor stations proposed for these counties, the pipeline route will cross Hendricks, Morgan, and Johnson Counties, Indiana and Warren, Greene, Fairfield, and Belmont Counties, Ohio, which are currently designated non-attainment for both O_3 and $PM_{2.5}$. Also, the pipeline route will cross Shelby County, Indiana and Clinton County, Ohio, which are designated non-attainment for O_3.

9.1.3 Air Quality Impacts

The primary new air emission sources associated with the proposed compressor stations are listed in table 9.1.3-1 and include compressors and ancillary equipment. The location and layout of the compressor stations are provided in Volume 2 as "Non-Internet Public."

TABLE 9.1.3-1

Rockies Express Pipeline-East Project
Emission Source Information [a]

Compressor Station	Make/Model	Total Horsepower	Additional Equipment
Arlington	(3) Cat 16CM34	19,794	850 kW stand-by generator; 750 MBTU/hr fuel gas heater
Bertrand	(2) Cat 12CM34; (3) 16CM34	34,210	850 kW stand-by generator; 750 MBTU/hr fuel gas heater
Mexico	(2) Solar Titan 130 20502S	41,000	350 kW stand-by generator; 750 MBTU/hr fuel gas heater
Blue Mound	(2) Cat 12CM34; (3) 16CM34	35,174	850 kW stand-by generator; 750 MBTU/hr fuel gas heater
Bainbridge	(2) Solar Titan 130 20502S	41,000	350 kW stand-by generator; 750 MBTU/hr fuel gas heater
Hamilton	Electric driven centrifugal	35,000	250 kW stand-by generator; 750 MBTU/hr fuel gas heater
Chandlersville	(2) Cat 12CM34; (1) 16CM34	19,538	850 kW stand-by generator; 750 MBTU/hr fuel gas heater

[a] Based on preliminary engineering design and site-specific equipment specifications.

kW = kilowatt
MBTU/hr= thousand British thermal units per hour

9.1.3.1 Construction Emissions

Construction of the REX-East Project facilities will result in intermittent and short-term fugitive air emissions. Emissions associated with construction activities generally include fugitive dust from soil disruption during land clearing, grading, excavation, and vehicular traffic, and combustion emissions from the operation of gasoline and diesel fueled construction equipment. The quantity of fugitive dust emissions will depend on the type of construction activity, moisture content and texture of the soils that will be disturbed, and the number and types of vehicles traveling over the construction areas. Rockies Express will apply dust control to minimize fugitive emissions where necessary. Dust control measures may include application of water to the construction area and spoil storage piles and maintaining reduced speed zones in the construction area. Emissions from the gasoline and diesel engines are minimized because the engines must be built to meet the standards for mobile sources established by the EPA mobile source emission regulations (Title 40 CFR 85). In addition, the EPA is requiring that the maximum sulfur content of diesel fuel for highway vehicles be reduced from 500 part per million by weight (ppmw) to 15 ppmw beginning June 1, 2006, making lower sulfur diesel available nationwide.

Due to the geographic spread of construction activities, their temporary and transient nature, the emissions generated are not expected to cause or contribute to any significant air quality impacts. The emissions estimates resulting from construction of the REX-East Project are being developed and will be filed along with supporting emission calculations in Rockies Express' application in April 2007.

9.1.3.2 Operation Emissions

The only operation emissions from the proposed REX-EAST Project will be generated by the stationary sources at the compressor stations. Preliminary emissions estimates resulting from the operation of the proposed compressor stations are shown in table 9.1.3-3. Supporting emission calculations for the REX-East Project compressor stations are included in Appendix 9A.

TABLE 9.1.3-3

Rockies Express Pipeline-East Project
Compressor Station Operating Emissions Summary [a, b]

Facility/Emission Unit (Quantity)	NO_X		CO		SO_X		$PM_{10}/PM_{2.5}$		VOC		HAP	
	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Arlington Compressor Station												
Engines (3)	32.73	143.4	5.24	22.94	0.07	0.30	0.01	0.04	14.84	64.99	TBD	TBD
Heater (1)	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
Stand-by Generator (1)	30.73	3.84	2.39	0.30	0.00	0.00	0.00	0.00	0.89	0.11	TBD	TBD
Total	63.53	147.5	7.69	23.51	0.07	0.31	0.02	0.06	15.73	65.12	TBD	TBD
Bertrand Compressor Station												
Engines (5)	54.30	237.9	9.05	39.64	0.12	0.52	0.02	0.07	25.64	112.3	TBD	TBD
Heater (1)	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
Stand-by Generator (1)	30.73	3.84	2.39	0.30	0.00	0.00	0.00	0.00	0.89	0.11	TBD	TBD
Total	85.11	242.0	11.50	40.21	0.12	0.52	0.02	0.09	26.54	112.5	TBD	TBD
Mexico Compressor Station												
Turbines (2)	32.81	143.7	37.47	164.1	0.98	4.29	1.90	8.33	1.07	4.69	TBD	TBD
Heater (1)	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
Stand-by Generator (1)	12.65	3.16	0.98	0.25	0.00	0.00	0.00	0.00	0.37	0.09	TBD	TBD
Total	45.53	147.2	38.51	164.6	0.98	4.29	1.91	8.35	1.44	4.80	TBD	TBD
Blue Mound Compressor Station												
Engines (3)	55.83	244.6	9.31	40.76	0.12	0.53	0.02	0.07	26.37	115.5	TBD	TBD
Heater (1)	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
Stand-by Generator (1)	30.73	3.84	2.39	0.30	0.00	0.00	0.00	0.00	0.89	0.11	TBD	TBD
Total	86.64	248.7	11.75	41.33	0.13	0.53	0.02	0.09	27.26	115.6	TBD	TBD
Bainbridge Compressor Station												
Turbines (2)	32.81	143.7	37.47	164.1	0.98	4.29	1.90	8.33	1.07	4.69	TBD	TBD
Heater (1)	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
Stand-by Generator (1)	12.65	3.16	0.98	0.25	0.00	0.00	0.00	0.00	0.37	0.09	TBD	TBD
Total	45.53	147.2	38.51	164.6	0.98	4.29	1.91	8.35	1.44	4.80	TBD	TBD
Hamilton Compressor Station												
Electric centrifugal (x)	–	–	–	–	–	–	–	–	–	–	–	–
Heater (1)	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
Stand-by Generator (1)	10.39	2.60	2.25	0.56	0.69	0.17	0.74	0.18	0.84	0.21	TBD	TBD
Total	10.46	2.92	2.31	0.83	0.69	0.17	0.74	0.21	0.84	0.23	TBD	TBD

TABLE 9.1.3-3

Rockies Express Pipeline-East Project
Compressor Station Operating Emissions Summary [a, b]

Facility/Emission Unit (Quantity)	NO_X		CO		SO_X		$PM_{10}/PM_{2.5}$		VOC		HAP	
	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Chandlersville Compressor Station												
Engines (3)	32.31	141.5	5.17	22.64	0.07	0.29	0.01	0.04	14.85	64.15	TBD	TBD
Heater (1)	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
Stand-by Generator (1)	30.73	3.84	2.39	0.30	0.00	0.00	0.00	0.00	0.89	0.11	TBD	TBD
Total	63.11	145.7	7.62	23.21	0.07	0.30	0.01	0.06	15.54	64.27	TBD	TBD

[a] Based on preliminary engineering design and site-specific equipment specifications.
[b] Annual emissions rates are based on units operating 8,760 hours per year, except for the stand-by generators, which have been assumed to operate a maximum of 500 hours per year (250 kilowatt (kW) and 350 kW units) and 250 hours per year (850 kW units).

PM_{10} = Particulate Matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$ = Particulate Matter less than 2.5 microns in aerodynamic diameter
SO_2 = Sulfur Dioxide
NO_X = Nitrogen Oxides
CO = Carbon Monoxide
VOC = Volatile Organic Compound
HAP = Hazardous Air Pollutant (values presented are for Formaldehyde only)
lbs/hr = pounds per hour
tpy = tons per year

9.1.4 Regulatory Requirements for Air Quality

The Clean Air Act (CAA) of 1970, 42 United States Code (USC) §§ 7401 *et seq.*, amended in 1977 and 1990, is the basic federal statute governing air quality. The provisions of the CAA that are potentially applicable to the construction and operation of the proposed compressor stations are:

- Prevention of Significant Deterioration (PSD)/Non-Attainment New Source Review (NNSR);
- Federal Class I Area Protection;
- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants (NESHAP);
- Title V Operating Permits;
- General Conformity; and
- state regulations.

The following sections include a description of these regulations and their requirements.

9.1.4.1 Prevention of Significant Deterioration/Non-attainment New Source Review

The CAA requires any new major stationary source of air pollution, or existing source proposing major modification, to obtain an air pollution permit before commencing construction. Air construction permits for major sources or modifications in an attainment area are issued under the Prevention of Significant Deterioration (PSD) regulations, whereas air construction

permits for major sources in a non-attainment area are issued under the Nonattainment New Source Review (NNSR) regulations. The entire program, including both PSD and NNSR permitting, is referred to as the NSR program.

The NSR program requires that an applicant conduct an applicability determination for any proposed source (either new source or modification of an existing source) to see if it qualifies for PSD or NNSR. The following criteria, as outlined in the EPA's New Source Review Manual, are considered in the applicability determination:

- definition of the source;
- definition of the applicability threshold(s) for major source;
- definition of project emissions; and
- assessment of local area attainment status

The emissions generating stationary sources at the proposed compressor stations will collectively be defined as the source for NSR review.

PSD Review

Natural gas transmission or compressor stations are not among the 28 industrial source categories listed in the PSD rule as a major stationary source; therefore, the compressor stations located in attainment areas will be considered major sources if they emit 250 tons per year (tpy) or more of any criteria pollutant. As shown in table 9.1.3-3, the potential emissions from the proposed Arlington, Bertrand, Mexico, Blue Mound, Bainbridge, and Chandlersville Compressor Stations, which are located in attainment areas, are expected to be below the 250 tpy major source thresholds for all criteria pollutants; therefore, they will not be subject to federal PSD review.

Non-attainment NSR

The Hamilton Compressor Station will be located in Butler County, Ohio. Butler County is currently designated as non-attainment for the O_3 and $PM_{2.5}$ standards and attainment for the remaining criteria pollutants. As such, the proposed compressor station will be considered a major source for NNSR if emissions of NO_x, volatile organic compounds (VOC) (O_3 precursors), and/or $PM_{2.5}$ exceed 100 tpy. As shown in table 9.1.3-3, the potential emissions from the electrically-driven Hamilton Compressor Station are expected to be well below 100 tpy for all criteria pollutants and will not be subject to federal NNSR or PSD.

9.1.4.2 Federal Class I Area Protection

U.S. Congress designated certain lands as Class I areas in 1977. Class I areas were designated because the air quality was considered a special feature of the area (e.g., national parks or wilderness areas). These Class I areas are given special protection under the PSD program. The PSD program establishes air pollution increment increases that are allowed by new or modified air pollution sources. If the new source is required to demonstrate compliance with the PSD program requirements and is near a Class I area, the facility is required to demonstrate compliance with the PSD Class I increments. The source is also required to notify the appropriate federal land managers for the nearby Class I areas.

As discussed in section 9.1.4.1, none of the compressor stations located in attainment counties are subject to the PSD regulations because each facility's potential emissions are expected to be below 250 tpy for each attainment pollutant.

Although not expected to be subject to PSD, the Arlington Compressor Station in Carbon County, Wyoming is located within 100 kilometers of two Class I areas. The Mount Zirkel Wilderness area is located approximately 88 kilometers south-southwest of the proposed compressor station and the Rawah Wilderness area is located approximately 95 kilometers south-southeast of proposed compressor station. A third Class I area, Rocky Mountain National Park, is located approximately 133 kilometers south-southeast of the proposed compressor station.

The federal Class I Area reporting requirements do not apply to this project and the proposed compressor stations are not required to demonstrate compliance with the PSD Class I increments.

9.1.4.3 New Source Performance Standards

New Source Performance Standards (NSPS), codified in Title 40 CFR 60, establish pollutant emission limits and monitoring, reporting, and recordkeeping requirements for various emission sources based on source type and size. The NSPS apply to new, modified, or reconstructed sources. The federal NSPS have been incorporated into Wyoming, Nebraska, Missouri, Illinois, and Indiana state regulations; Ohio has not incorporated the federal NSPS. The potentially applicable NSPS are described below.

NSPS Subpart Kb applies to volatile organic liquid storage tanks constructed, reconstructed, or modified after July 23, 1984 having a storage capacity of 75 cubic meters (19,813 gallons) or greater. However, NSPS Subpart Kb only applies to storage tanks that are larger than 75 cubic meters and less than 151 cubic meters (39,891 gallons) storing a liquid with a maximum true vapor pressure greater than 15 kilopascals (kPa) (2.18 pounds per square inch (psi)) and storage tanks larger than 151 cubic meters storing a liquid with a maximum true vapor pressure greater than 3.5 kPa (0.51 psi). The preliminary engineering design indicates that the storage tanks at the proposed compressor stations will be 10,000 gallons in capacity or less; therefore, Subpart Kb does not apply.

NSPS Subpart KKK applies to VOC emissions from equipment leaks at onshore natural gas processing plants. Natural gas processing plants are defined under Subpart KKK as any processing site engaged in the extraction of natural gas liquids from field gas, fractionation of mixed natural gas liquids, or both. The REX-East Project compressor stations do not meet the definition of an onshore natural gas processing plant; therefore, Subpart KKK does not apply.

NSPS Subpart LLL applies to sweetening units and sulfur recovery units at onshore natural gas processing plants. Sweetening units are defined by Subpart LLL as process devices that separate the hydrogen sulfide (H_2S) and carbon dioxide (CO_2) contents from the sour natural gas. Sulfur recovery units are defined as process devices that recover elemental sulfur from the H_2S and CO_2 generated by a sweetening unit. No equipment will be installed at the proposed REX-EAST Project compressor stations to remove H_2S or CO_2 from the gas; therefore, Subpart LLL does not apply.

NSPS Subpart KKKK applies to new, modified, or reconstructed stationary gas turbines with a heat input at peak load of greater than or equal to 10 million British thermal units per hour (MMBtu/hr). There are two turbines proposed for installation at both the Mexico and Bainbridge Compressor Stations, each of which has a total heat input of 144 MMBtu/hr. The stations will comply with applicable NSPS Subpart KKKK requirements.

9.1.4.4 National Emissions Standard Hazardous Air Pollutant

The National Emissions Standard Hazardous Air Pollutant (NESHAP), codified in Title 40 CFR Parts 61 and 63, regulates HAP emissions. Part 61 defines requirements for industries that emit specific Hazardous Air Pollutants (HAPs). Part 61 was promulgated prior to the 1990 CAA Amendments and may be superseded in Part 63. Natural gas transmission or compressor stations are not among the industries listed in Part 61 and do not emit any pollutants listed in Part 61. Therefore, the REX-East Project compressor stations are not subject to 40 CFR 61 of the NESHAP requirements.

The 1990 CAA Amendments established a list of 189 HAPs (currently 187 HAPs), resulting in the promulgation of Part 63. Part 63, also known as Maximum Achievable Control Technology (MACT) standards, defines major source categories that emit HAPs above Title V major source threshold. The major source threshold is 10 tpy of any single HAP or 25 tpy for all combined HAP emissions. HAP emissions estimates are being prepared for the proposed compressor stations but are not yet complete. It is anticipated that all of the REX-East Project compressor stations will be below the major source levels and not subject to any MACT standards. In the event one or more of the stations is determined to be a major source of HAPs, the potentially applicable MACT regulations will be reviewed, requirements identified, and compliance demonstrated. The federal NESHAP requirements have been incorporated into Wyoming, Nebraska, Missouri, Illinois, Indiana, and Ohio state regulations. Potentially applicable NESHAP regulations are described below.

NESHAP Subpart HH applies to oil and natural gas production facilities. The REX-East Project compressor stations do not meet the definition of a production facility; therefore, Subpart HH does not apply.

NESHAP Subpart HHH applies to natural gas transmission and storage facilities. The proposed compressor stations will transport natural gas prior to delivery to a final end user; therefore the facilities are potentially subject to Subpart HHH. There will not be glycol dehydration units at any of the proposed compressor stations.

NESHAP Subpart YYYY applies to stationary combustion turbines. The rule limits emissions of a number of toxic air pollutants such as formaldehyde, toluene, acetaldehyde, and benzene from new stationary combustion turbines (built after January 14, 2003) from facilities, including compressor stations, which are major stationary sources of HAPs. The Mexico and Bainbridge Compressor Stations are expected to utilize stationary combustion turbines. It is anticipated that these stations will not be major sources of HAPs; therefore, Subpart YYYY will not apply.

NESHAP Subpart ZZZZ applies to reciprocating internal combustion engines (RICE). The Arlington, Bertrand, Blue Mound, and Chandlersville Compressor Stations will utilize compressor engines potentially subject to Subpart ZZZZ. Subpart ZZZZ limits the amount of air pollution that may be released from exhaust stacks of all new stationary RICE (built after

December 19, 2002) above 500 horsepower that are located at major industrial sources of HAPs. The REX-East Project compressor stations subject to Subpart ZZZZ will be required to reduce formaldehyde emissions by 76 percent or more from the compressor engines.

9.1.4.5 Title V Operating Permit

Title V of the CAA requires states to establish an air operating permit program. The requirements of Title V are outlined in Title 40 CFR 70 and the permits required by these regulations are often referred to as Part 70 permits. Wyoming, Nebraska, Missouri, Illinois, Indiana, and Ohio have incorporated the Title V program into their state regulations. If a facility's potential to emit exceeds the criteria pollutant or HAP thresholds, the facility is considered a major source. The major source threshold level for an air emission source is 100 tpy for criteria pollutants. The major source HAP thresholds for a source are 10 tpy of any single HAP or 25 tpy of all HAPs in aggregate.

As shown in table 9.1.3-3, the emissions associated with each of the REX-East Project compressor stations will exceed the thresholds for NO_x and VOC, except for the Hamilton Compressor Station, which will not exceed 100 tpy for any criteria pollutant. A Title V Operating Permit will be required for each of the compressor stations exceeding the major source thresholds. Rockies Express will apply for these permits from the appropriate state agency.

9.1.4.6 Conformity of General Federal Actions

A conformity analysis must be conducted by the lead federal agency if a federal action will result in the generation of emissions that will exceed the conformity threshold levels (*de minimis*) of the pollutant(s) for which an air basin is in non-attainment. According to section 176(c)(1) of the CAA (Title 40 CFR section 51.853), a federal agency cannot approve or support any activity that does not conform to an approved state implementation plan (SIP). Conforming activities or actions should not, through additional air pollutant emissions:

- cause or contribute to new violations of the NAAQS in any area;
- increase the frequency or severity of any existing violation of any NAAQS; or
- delay timely attainment of any NAAQS or interim emission reductions.

A conformity analysis must show that the emissions will conform to the currently applicable SIP and will not reduce air quality in the air basin, which can be demonstrated through offsets, SIP provisions, or modeling. Emissions subject to federal NNSR permitting requirements are exempt and are deemed to conform. The requirements for conformity analyses are codified in Title 40 CFR Parts 6, 51, and 93. Table 9.1.4-1 includes a listing of the counties crossed by the project and their attainment status.

TABLE 9.1.4-1

Rockies Express Pipeline-East Project
Attainment Status of the Affected Counties [a]

State	County	County Attainment Status (A=Attainment, N=Non-attainment)						
		O_3 (1hr)	O_3 (8hr) [b]	CO	NO_2	SO_2	PM_{10}	$PM_{2.5}$
Missouri	Audrain	A	A	A	A	A	A	A
	Ralls	A	A	A	A	A	A	A
	Pike	A	A	A	A	A	A	A
Illinois	Pike	A	A	A	A	A	A	A
	Scott	A	A	A	A	A	A	A
	Morgan	A	A	A	A	A	A	A
	Sangamon	A	A	A	A	A	A	A
	Christian	A	A	A	A	A	A	A
	Macon	A	A	A	A	A	A	A
	Moultrie	A	A	A	A	A	A	A
	Douglas	A	A	A	A	A	A	A
	Edgar	A	A	A	A	A	A	A
Indiana	Vermillion	A	A	A	A	A	A	A
	Parke	A	A	A	A	A	A	A
	Putnam	A	A	A	A	A	A	A
	Hendricks	A	**N (S1B)**	A	A	A	A	**N**
	Morgan	A	**N (S1B)**	A	A	A	A	**N**
	Johnson	A	**N (S1B)**	A	A	A	A	**N**
	Shelby	A	**N (S1B)**	A	A	A	A	A
	Decatur	A	A	A	A	A	A	A
	Franklin	A	A	A	A	A	A	A
Ohio	Butler	A	**N (S1B)**	A	A	A	A	**N**
	Warren	A	**N (S1B)**	A	A	A	A	**N**
	Clinton	A	**N (S1B)**	A	A	A	A	A
	Greene	A	**N (S1B)**	A	A	A	A	**N**
	Fayette	A	A	A	A	A	A	A
	Pickaway	A	A	A	A	A	A	A
	Fairfield	A	**N (S1B)**	A	A	A	A	**N**
	Perry	A	A	A	A	A	A	A
	Muskingum	A	A	A	A	A	A	A
	Guernsey	A	A	A	A	A	A	A
	Noble	A	A	A	A	A	A	A
	Belmont	A	**N (S1B)**	A	A	A	A	**N**
	Monroe	A	A	A	A	A	A	A
Wyoming	Carbon	A	A	A	A	A	A	A
Nebraska	Phelps	A	A	A	A	A	A	A

[a] County attainment status based on EPA's Green Book (http://www.epa.gov/air/oaqps/greenbk/index.html).
[b] All of the counties listed as non-attainment for the 8-hr ozone standard are designated Subpart 1, which is referred to as "Basic," non-attainment.

As noted in table 9.1.4-1, there are ten counties designated as non-attainment for the 8-hour ozone NAAQS and eight of those counties are also designated as non-attainment for the $PM_{2.5}$ NAAQS. As a result, information on the direct and indirect emissions of the O_3

precursors, NO_x and VOC, and $PM_{2.5}$ generated from the construction and operation of the project in those counties will be developed for comparison to the General Conformity thresholds and will be provided to the Commission when complete. It is expected that the project emissions will be below the applicable thresholds and the requirements of General Conformity will not apply.

9.1.4.7 State Regulations

The following sections summarize the state regulations potentially applicable to the construction and operation of the proposed project.

Missouri

Air emissions are regulated in Missouri by the MDNR through Title 10 of the Code of State Regulations (CSR) Division 10, Chapter 6: Air Quality Standards, Definitions, Sampling and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri. 10 CSR 10-6 contains the potentially applicable Missouri state regulations that differ from, or have been written pursuant to, the federal regulations.

Illinois

Air emissions are regulated in Illinois by the IEPA through Title 35 of the Illinois Administrative Code (IAC) Subtitle B: Air Pollution. Potentially applicable Illinois state regulations that differ from, or have been written pursuant to, the federal regulations include:

- Chapter I, Subchapter a: Permits and General Provisions
- Chapter I, Subchapter c: Emission Standards and Limitation for Stationary Sources
- Chapter I, Subchapter e: Peremptory Rules
- Chapter I, Subchapter f: Toxic Air Contaminants
- Chapter I, Subchapter I: Air Quality Standards and Episodes
- Chapter II, Part 255: General Conformity: Criteria and Procedures

Indiana

Air emissions are regulated in Indiana by the IDEM through Indiana Administrative Code (IAC) Title 326 Air Pollution Control Board. Potentially applicable Indiana state regulations that differ from, or have been written pursuant to, the federal regulations include:

- Article 1. General Provisions
- Article 2. Permit Review Rules
- Article 6. Particulate Rules
- Article 6.5. Particulate Matter Limitations Except Lake County
- Article 7. Sulfur Dioxide Rules
- Article 8. Volatile Organic Compound Rules
- Article 9. Carbon Monoxide Emission Rules
- Article 10. Nitrogen Oxides Rules
- Article 12. New Source Performance Standards
- Article 14. Emission Standards for Hazardous Air Pollutants

- Article 20. Hazardous Air Pollutants

Ohio

Air emissions are regulated in Ohio by the OEPA through Ohio Administrative Code (OAC). Potentially applicable Ohio state regulations that differ from, or have been written pursuant to, the federal regulations include:

- OAC 3745-15 General Provisions on Air Pollution Control
- OAC 3745-16 Stack Height Requirements
- OAC 3745-17 Particulate Matter Standards
- OAC 3745-18 Sulfur Dioxide Regulations
- OAC 3745-21 Carbon Monoxide, Photochemically Reactive Materials, Hydrocarbons, and Related Material Standards
- OAC 3745-23 Nitrogen Oxide Standards
- OAC 3745-31 Permit to Install New Sources
- OAC 3745-35 Air Permits to Operate and Variances
- OAC 3745-77 Title V Permit Rules
- OAC 3745-78 Air Pollution Control Fees
- OAC 3745-102 General Conformity Rules

Wyoming

Air emissions are regulated in Wyoming by the WDEQ through Wyoming Air Quality Standards and Regulations (WAQS&R). Potentially applicable WAQS&R that differ from, or have been written pursuant to, the federal regulations include:

- Chapter 1, Common Provisions
- Chapter 2, Ambient Standards
- Chapter 3, General Emission Standards
- Chapter 5, National Emission Standards
- Chapter 6, Permitting Requirements
- Chapter 7, Monitoring Regulations

Nebraska

Air emissions are regulated in Nebraska by the NDEQ through Nebraska Administrative Code (NAC) Title 129. Potentially applicable Nebraska state regulations that differ from, or have been written pursuant to, the federal regulations include:

- Chapter 4, Ambient Air Quality Standards
- Chapter 5, Operating Permits
- Chapter 16, Stack Heights
- Chapter 17, Construction Permits
- Chapter 18, New Source Performance Standards
- Chapter 19, Prevention of Significant Deterioration of Air Quality
- Chapter 20, Particulate Emissions; Limitations and Standards
- Chapter 23, Hazardous Air Pollutants: Emissions Standards

- Chapter 27, Hazardous Air Pollutants: Maximum Achievable Control Technologies (MACT)
- Chapter 28, Hazardous Air Pollutants: Emission Standards
- Chapter 29, Operating Permit Emission Fees
- Chapter 40, General Conformity
- Chapter 41, General Provisions

Specific requirements of each state's air regulations potentially apply to the construction and operation of the REX-East Project. Compliance with these requirements will be demonstrated through the air permitting process. Rockies Express will apply for and obtain the required air permits for each of the proposed compressor stations in order to construct and operate them as required by the applicable federal and state regulations.

9.2 NOISE QUALITY

At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. Variation is caused in part by changing weather conditions, the effects of seasonal vegetative cover, and human activities. Two measures used by federal agencies for the time-varying quality of environmental noise known to affect people are the 24-hour equivalent sound level ($L_{eq(24)}$) and the day-night equivalent sound level (L_{dn}). The $L_{eq(24)}$ is the level of steady sound with the same total (equivalent) energy as the time-varying sound of concern, averaged over a 24-hour period. The L_{dn} is the $L_{eq(24)}$ with 10 decibels of the A-weighted scale (dBA) added to nighttime sound levels between the hours of 10 p.m. and 7 a.m. to account for people's greater sensitivity to sound during nighttime hours.

Noise associated with construction of the proposed facilities will be intermittent. Neighbors in the vicinity of the construction areas will hear the construction noise, but the overall impact will be temporary. Nighttime noise due to construction will normally be absent since most, if not all, construction will be limited to daytime hours. During operation, noise impacts will be limited to the vicinity of the compressor stations.

9.2.1 Existing Noise Levels

The proposed compressor stations, as identified in table 9.1.1-1, will be located in generally sparsely populated, rural areas with few noise sources in the immediate vicinity. Based on available EPA information, a typical outdoor ambient L_{dn} for this land use category is expected to be 40 to 45 dBA. Rockies Express conducted site-specific sound surveys to identify noise-sensitive areas (NSAs) near the proposed compressor stations. The locations of the nearest NSAs are summarized in table 9.2.1-1. The nearest NSA within 1 mile of the compressor station sites are shown in the figures included in Volume 2 ("Non-Internet Public").

TABLE 9.2.1-1

Rockies Express Pipeline-East Project
Locations of Noise-Sensitive Areas

Compressor Station/Noise-Sensitive Area (NSA)	Approximate Distance (feet) / Direction from the Compressor Station to NSA [a]
Arlington Compressor Station	
NSA1	No NSA within one mile radius of proposed site
Bertrand Compressor Station [b]	
NSA1	2,300 / west
NSA2	2,300 / east
Mexico Compressor Station	
NSA1	1,220 / north-northeast
NSA2	1,280 / southeast
NSA3	1,620 / west-southwest
Blue Mound Compressor Station	
NSA1	910 / north-northwest
NSA2	1,380 / south
NSA3	2,030 / south
Bainbridge Compressor Station	
NSA1	1,100 / west
NSA2	1,620 / west
NSA3	1,740 / west-southwest
Hamilton Compressor Station	
NSA1	170 / south
NSA2	300 / southwest
NSA3	380 / south
Chandlersville Compressor Station	
NSA1	170 / east
NSA2	340 / north
NSA3	690 / north

[a] Listed NSA locations for the Mexico, Blue Mound, and Chandlersville Compressor Stations are based on a review of preliminary compressor station site location aerial maps dated October 25, 2006. Field verification will be performed to confirm the listed NSAs.

[b] NSA locations based on a June 5, 2006 report entitled "Ambient Site Sound Survey and Acoustical Analyses for a New Natural Gas Compressor Station Associated with the Rockies Express Pipeline – East Project" prepared by Hoover and Keith Inc.

TBD = To Be Determined

9.2.2 Noise Regulations

9.2.2.1 Federal

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety*. This publication evaluated the effects of environmental noise with respect to health and safety. The EPA has determined that noise levels should not exceed an L_{dn} of 55 dBA, which is the level that protects the public from indoor and outdoor activity interference. This noise level has been useful for state and federal agencies to establish noise limitations for various noise sources. A 55 dBA L_{dn} noise level equates to an L_{eq} of 48.6 dBA (i.e., a facility that does not exceed a continuous noise impact of 48.6 dBA will not exceed 55 dBA L_{dn}).

Rockies Express' proposed compressor stations will comply with the FERC's noise regulations for interstate pipelines. These regulations state:

(1) 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 NSA such as schools, hospitals, or residences.

(2) New compressor stations or modifications of existing stations shall not result in a perceptible increase in vibration at any NSA (18 CFR § 380.12(k)(4)(v)).

9.2.2.2 State and Local

Based a review of state regulations, there were no applicable noise regulations identified for natural gas compressor station facilities constructed and operated in Wyoming, Nebraska, Missouri, Illinois, Indiana, and Ohio. In addition, no applicable local (i.e., township, city, county) noise regulations were identified for facilities associated with this project.

9.2.3 Construction and Operation Impacts and Mitigation

Noise will be generated during the construction and operation of the proposed project facilities. Construction equipment will be operated on an as-needed basis during this period. While individuals in the immediate vicinity of the construction activities will experience an increase in noise, this effect will be temporary and local. Nighttime noise associated with construction will be minimized by limiting most construction activities to daytime hours.

Primary operational noise sources at the proposed compressor stations will be reciprocating engines, gas turbines, fuel gas heaters, associated intakes and exhausts. The noise from emergency generators proposed for installation at the compressor stations are not included in the noise assessment due to the very temporary and rare operation of these units. A variety of noise mitigation measures such as those listed below are currently being evaluated for implementation at the proposed compressor stations:

- noise control measures applied to the building enclosing the turbine(s), engine(s);
- motor(s) and associated compressor(s) rather than to the equipment themselves, including the use of appropriate building materials;
- adequate muffler for turbine exhaust systems or engine exhaust systems;
- acoustical insulation for aboveground piping, if necessary to meet the applicable sound criteria;
- silencer for the engine or turbine air intake system, if necessary, to meet the applicable sound criteria;
- air ventilation system for electric motors designed and specified to meet stringent noise requirements; and
- blowdown silencer.

Noise mitigation measures for construction activities at the new compressor stations, existing facilities, and along the pipeline route are not anticipated.

A detailed noise assessment that includes both a site ambient sound survey and an acoustical analysis was performed at the Bertrand Compressor Station as part of the REX-West Project. The results of the noise assessments are shown in table 9.2.3-1 and included in Appendix 9B. The proposed Bertrand Compressor Station with noise mitigation measures in place is expected to comply with the FERC 55 dBA L_{dn} noise limit at the nearest NSAs. Rockies Express will also perform a detailed noise assessment that includes both a site ambient sound survey and an acoustical analysis for each of the remaining proposed compressor stations. The site ambient survey will identify the location of NSAs and quantify the existing acoustical environment. The acoustical analysis will be performed to project the sound contribution of each of the proposed compressor stations and identify noise control measures to meet applicable sound level criteria.

TABLE 9.2.3-1

Rockies Express Pipeline-East Project
Estimated Noise Levels at Noise-Sensitive Areas [a]

Location / Noise-Sensitive Area (NSA)	Ambient L_{eq} (dBA)	L_{eq} Attributable to New Station (dBA)	L_{dn} Attributable to New Station (dBA)	Post-Construction L_{dn} (dBA)	Noise Increase at NSA (dBA)
Bertrand Compressor Station [b]					
NSA1	37.8	44.6	51.0	51.2	13.4
NSA2	41.2	44.6	51.0	51.4	10.2

[a] A site sound survey and acoustical analyses for each compressor station will be conducted and the results will be documented and filed with the FERC when completed.

[b] NSAs based on a June 5, 2006 report entitled "Ambient Site Sound Survey and Acoustical Analyses for a New Natural Gas Compressor Station Associated with the Rockies Express Pipeline – East Project" prepared by Hoover and Keith Inc.

dBA = decibels of the A-weighted scale
L_{eq} = equivalent sound level
L_{dn} = day-night equivalent sound level

Rockies Express' proposed facilities are not expected to have a perceptible increase in vibration at any NSA because a detailed evaluation will be performed to ensure that the system will operate properly once complete. Upon completing the final noise assessment including planned mitigation measures, Rockies Express will file this information, including the final noise mitigation plans for each compressor station, with the FERC.

9.3 REFERENCES

U.S. Environmental Protection Agency. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety, Office of Noise Abatement and Control.

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APPENDIX 9A
Operation Emissions Calculations

TABLE 9A-1
Proposed Compressor Station Emissions Summary Table
Rockies Express Pipeline-East Project

Compressor Station	Equipment	NO_x		CO		SO_2		$PM/PM_{10}/PM_{2.5}$		VOC		HAP	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Arlington	Recips	32.73	143.35	5.24	22.94	0.07	0.30	0.01	0.04	14.84	64.99	TBD	TBD
(19794 hp)	Fuel gas heater	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
	Standby generator	30.73	3.84	2.39	0.30	0.00	0.00	0.00	0.00	0.89	0.11	TBD	TBD
	TOTAL	**63.53**	**147.52**	**7.69**	**23.51**	**0.07**	**0.31**	**0.02**	**0.06**	**15.73**	**65.12**	**TBD**	**TBD**
Bertrand	Recips	54.30	237.85	9.05	39.64	0.12	0.52	0.02	0.07	25.64	112.32	TBD	TBD
(34210 hp)	Fuel gas heater	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
	Standby generator	30.73	3.84	2.39	0.30	0.00	0.00	0.00	0.00	0.89	0.11	TBD	TBD
	TOTAL	**85.11**	**242.01**	**11.50**	**40.21**	**0.12**	**0.52**	**0.02**	**0.09**	**26.54**	**112.45**	**TBD**	**TBD**
Mexico [2]	Turbines	32.81	143.7	37.47	164.1	0.98	4.29	1.90	8.33	1.07	4.69	TBD	TBD
(41000 hp)	Fuel gas heater	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
	Standby generator	12.65	3.16	0.98	0.25	0.00	0.00	0.00	0.00	0.37	0.09	TBD	TBD
	TOTAL	**45.53**	**147.19**	**38.51**	**164.62**	**0.98**	**4.29**	**1.91**	**8.35**	**1.44**	**4.80**	**TBD**	**TBD**
Blue Mound	Recips	55.83	244.55	9.31	40.76	0.12	0.53	0.02	0.07	26.37	115.48	TBD	TBD
(35174 hp)	Fuel gas heater	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
	Standby generator	30.73	3.84	2.39	0.30	0.00	0.00	0.00	0.00	0.89	0.11	TBD	TBD
	TOTAL	**86.64**	**248.71**	**11.75**	**41.33**	**0.13**	**0.53**	**0.02**	**0.09**	**27.26**	**115.61**	**TBD**	**TBD**
Bainbridge [2]	Turbines	32.81	143.7	37.47	164.1	0.98	4.29	1.90	8.33	1.07	4.69	TBD	TBD
(41000 hp)	Fuel gas heater	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
	Standby generator	12.65	3.16	0.98	0.25	0.00	0.00	0.00	0.00	0.37	0.09	TBD	TBD
	TOTAL	**45.53**	**147.19**	**38.51**	**164.62**	**0.98**	**4.29**	**1.91**	**8.35**	**1.44**	**4.80**	**TBD**	**TBD**
Hamilton	Electric centrifugal	–	–	–	–	–	–	–	–	–	–	TBD	TBD
	Fuel gas heater	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
	Standby generator	10.39	2.60	2.25	0.56	0.69	0.17	0.74	0.18	0.84	0.21	TBD	TBD
	TOTAL	**10.46**	**2.92**	**2.31**	**0.83**	**0.69**	**0.17**	**0.74**	**0.21**	**0.84**	**0.23**	**TBD**	**TBD**
Chandlersville	Recips	32.31	141.50	5.17	22.64	0.07	0.29	0.01	0.04	14.65	64.15	TBD	TBD
(19538 hp)	Fuel gas heater	0.07	0.32	0.06	0.27	0.00	0.00	0.01	0.02	0.00	0.02	neg.	neg.
	Standby generator	30.73	3.84	2.39	0.30	0.00	0.00	0.00	0.00	0.89	0.11	TBD	TBD
	TOTAL	**63.11**	**145.66**	**7.62**	**23.21**	**0.07**	**0.30**	**0.01**	**0.06**	**15.54**	**64.27**	**TBD**	**TBD**

NOTES:

[1] Emission rates presented above based on detailed information documented in site/equipment specific emission calculation tables, TABLE 9B-2 through TABLE 9B-9.

[2] Site/equipment specific documentation for the turbines is not yet available; therefore, emission rates listed for the proposed turbines were based on information in the REX-West RR9 for the Steele City Compressor Station, which will be equipped with identical turbine equipment. Updated emissions data will be provided when site/equipment specific factors become available.

ROCKIES EXPRESS PIPELINE-EAST PROJECT

Resource Report 9

APPENDIX 9B
Sound Survey and Acoustical Analyses Reports

COMPRESSOR STATION NO. 3
(PHELPS COUNTY, NEBRASKA)

RESULTS OF AN AMBIENT SITE SOUND SURVEY AND ACOUSTICAL ANALYSES FOR A NEW NATURAL GAS COMPRESSOR STATION ASSOCIATED WITH THE ROCKIES EXPRESS PIPELINE–EAST PROJECT

H&K Report No. 1975

H&K Job No. 3790

Date of Report: June 5, 2006

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COMPRESSOR STATION NO. 3 (PHELPS COUNTY, NE)
RESULTS OF AN AMBIENT SOUND SURVEY AND ACOUSTICAL ANALYSES FOR A NEW COMPRESSOR STATION ASSOCIATED WITH REX-EAST PIPELINE

REPORT SUMMARY

This report includes the results of acoustical analyses for **Compressor Station No. 3** (abbreviated **CS No. 3**), a grass roots natural gas compressor station to be located in Phelps County, Nebraska, associated with the proposed **Rockies Express Pipeline–East Project** (i.e., REX-East Pipeline). In addition, the results of an ambient sound survey at the proposed site of **CS No. 3** (i.e., referred to as "Station" in the report) are included.

The purpose of the site ambient sound survey was to locate the noise-sensitive areas (NSAs) and to quantify the existing acoustical environment. The purpose of the acoustical analyses is to project the sound contribution of the Station and determine noise control measures to meet applicable sound level criteria. In addition, the analyses address the noise at the closest NSA resulting from construction activities at the site of the Station and the potential noise contribution due to a unit blowdown event at the Station.

The following table summarizes the measured ambient noise environment around the site of the Station and the estimated sound contribution of the proposed Station at the closest NSAs during full load operation of the Station. The results in this table are defined as the "Noise Quality Analysis".

Noise Quality Analysis for CS No. 3 associated with the REX-East Pipeline Project

Closest NSAs	Distance & Direction of NSA to Site Center	Meas'd Ambient Ld	Est'd Ambient Ln*	Calc'd Ambient Ldn	Est'd Ldn of the Station	Ldn of Station Noise plus Ambient Noise	Potential Noise Increase
NSA #1	2,300 feet (West)	31.4 dBA	31.4 dBA*	37.8 dBA	51.0 dBA	51.2 dBA	13.4 dB
NSA #2	2,300 feet (East)	34.8 dBA	31.4 dBA*	41.2 dBA	51.0 dBA	51.4 dBA	10.2 dB

*Nighttime levels assumed to be similar to the meas'd daytime levels although nighttime levels were not measured

The acoustical analysis of the Station indicates that if the recommended noise control measures are successfully implemented, the noise attributable to the proposed **CS No. 3** is estimated to be lower than **55 dBA** (L_{dn}) at the nearby NSAs, which is the anticipated FERC sound level requirement for this Station. In addition, the analyses indicate that the noise resulting from a gas blowdown event should have minimum noise impact on the surrounding environment but the noise associated with construction activities could have some noise impact on the surrounding environment. Also, since noise sources at the Station that could cause perceptible vibration should be adequately mitigated, there should not be any perceptible increase in vibration at any NSA during operation of the Station equipment.

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1.0 INTRODUCTION

In this report, we present the results of acoustical analyses for **Compressor Station No. 4** (abbreviated **CS No. 3**), a grass roots natural gas compressor station associated with the proposed **Rockies Express Pipeline–East Project** (i.e., REX-East Pipeline). In addition, the results of an ambient sound survey around the proposed site of **CS No. 3** (i.e., referred to as "Station" in the report) are included. The following describes the purpose of the ambient sound survey and the acoustical analyses:

(1) Document the existing acoustic environment and locate noise-sensitive areas (NSAs), such as residences, hospitals or schools, around the proposed site of the Station.
(2) Estimate the sound contribution of the Station at the nearby NSAs surrounding the site and at the closest property line assuming full-load operation of Station equipment.
(3) Determine noise mitigation measures and equipment sound requirements to insure that applicable sound criteria are not exceeded due to the operation of the Station.
(4) Project the noise at nearby NSAs resulting from construction activities at the site of the Station and estimate the noise contribution due to a gas blowdown event.

2.0 DESCRIPTION OF THE SITE AND STATION

Figure 1 (**Appendix**, p. 10) shows the NSAs (i.e., primarily residences) around the Station and reported sound measurement locations used for the ambient sound survey. The Station will be located in a rural area of Phelps County, Nebraska, approximately 10 miles WNW of Holdrege, NE and approximately 6 miles SE of Bertrand, NE. The land immediately surrounding the site is agricultural. There are two (2) residences located within 1 mile of the proposed site, and the closest NSAs consist of a home located approximately 2,300 feet west and 2,300 feet east of the site center (i.e., anticipated location of the Compressor Building).

The Station will include five (5) engine-driven compressor units, each consisting of a 7,362 HP Caterpillar Model 16CM34 engine driving a "high-speed" reciprocating gas compressor (i.e., total Station horsepower of 36,810 HP). It is assumed that the engines and compressors for all units will be installed inside a single insulated metal building (i.e., Compressor Building). The following describes the anticipated auxiliary equipment associated with the Station:

- Jacket-water (JW) cooler associated with each unit;
- A engine exhaust system with muffler and vertical exhaust stack for each unit;
- Engine air intake filter system for each unit;
- Outdoor aboveground gas piping, inlet filter separators and associated piping components;
- Station blowdown/silencer system (i.e., unit blowdown vented via a blowdown silencer).

3.0 MEASUREMENT LOCATIONS AND METHODOLOGY

3.1 Sound Measurement Locations and Measurement Conditions

Ambient sound levels were measured only at the closest NSAs surrounding the Station. The following is a description of the closest NSAs and the selected/reported sound measurement positions during the ambient sound survey:

Pos. 1: NSA #1, consisting of a home along 735 Road, located approximately 2,300 feet west of the Station site center (i.e., anticipated location of the Compressor Building).

Pos. 2: NSA #2, consisting of a home along 735 Road, located approximately 2,300 feet east of the Station site center.

Sound measurements around the site of the Station were performed by Larry Lengyel of H&K during the daytime of April 6, 2006. During the daytime sound tests, the temperature was 72-74 deg. F. with a clear sky and the wind was blowing primarily from the southeast.

3.2 Measurement Equipment and Data Acquisition

At the sound measurement positions, the equivalent A-wt. sound level (i.e., L_{eq}) and unweighted octave-band (O.B.) sound pressure levels (i.e., SPLs) were measured at 5 feet above ground. Typically, several sample periods of the ambient noise were measured at each sound measurement position. The acoustical measurement system consisted of a Rion Model NA-27 Sound Level Meter (a Type 1 SLM per ANSI S1.4 & S1.11) equipped with a Rion Model UC-53A 1/2-inch condenser microphone/preamplifier with a windscreen. The SLM was calibrated with a microphone calibrator (calibrated within 1 year of the sound test date).

4.0 MEASUREMENT RESULTS AND OBSERVATIONS

Table A (Appendix, p. 11) summarizes the measured daytime L_{eq} (i.e., L_d) at the NSA measurement locations along with the average of the measured L_d since more than one (1) sample of the sound level was measured. In addition, **Table A** includes an estimated nighttime L_{eq} (i.e., L_n) along with the day-night average sound level (i.e., L_{dn}), as calculated from the measured L_d and estimated L_n. Meteorological conditions during the survey are summarized in **Table B (Appendix**, p. 11). The measured ambient L_d and unweighted ambient O.B. SPLs at the NSA sound measurement positions are provided in **Table C (Appendix**, p. 11).

The following **Table 1** summarizes the measured ambient L_d, the estimated ambient L_n and the calculated L_{dn} (via the measured L_d and estimated L_n) at the closest NSAs, noting that the estimated L_n was assumed to be similar to the measured L_d.

Meas. Pos.	Description of Sound Measurement Location And Associated NSA	Meas'd Ambient Ld	Est'd Ambient Ln	Calc'd Ldn (via Meas'd Ld & Est'd Ln)
Pos. 1	NSA #1: approx. 2,300 feet west of the site center	31.4 dBA	31.4 dBA	37.8 dBA
Pos. 2	NSA #2: approx. 2,300 feet east of the site center	34.8 dBA	34.8 dBA	41.2 dBA

Table 1: Summary of the Meas'd L_d, Est'd L_n and the Calc'd L_{dn} at the NSA Measurement Positions

At the NSA sound measurement positions, the noise of wind blowing in the grass/trees and the sound of birds/cattle were the observed noise sources that significantly influenced the measured daytime sound levels. During the nighttime, the ambient levels should be approximately equal to the measured daytime levels. Consequently, the estimated nighttime levels were assumed to be similar to the measured daytime levels were included to provide a more accurate representation of the ambient L_{dn}, although ambient nighttime sound levels were not measured.

5.0 SOUND CRITERIA

Certificate conditions of the Office of Energy Projects (OEP) of the Federal Energy Regulatory Commission (FERC) typically require that the sound attributable to a new natural gas compressor station not exceed an L_{dn} of **55 dBA** at any nearby NSA. FERC guidelines also require that a new compressor station not result in a perceptible increase in vibration at any NSA. In addition, a sound level of **55 dBA** (L_{dn}) can be used as a "benchmark noise criterion" for assessing the noise impact of temporary or intermittent noise sources such as the noise of site construction activities or the noise of a gas blowdown event at the Station. There appears to be no applicable state or local noise regulations although any local noise regulations, if required, will be addressed during the permitting process.

The L_{dn} is an energy average of the measured daytime L_{eq} (i.e., L_d) and measured nighttime L_{eq} (i.e., L_n) plus **10 dB**. The **10-dB** adjustment to the L_n is intended to compensate for nighttime sensitivity. As such, the L_{dn} is not a true measure of the sound level but represents a skewed average that correlates generally with past sound surveys that attempted to relate environmental sound levels with physiological reaction and physiological effects. For a steady sound source, such as a compressor station, that operates continuously over a 24-hour period and controls the environmental sound level, an L_{dn} is approximately **6.4 dB** above the measured L_{eq}. Consequently, an L_{dn} of **55 dBA** corresponds to an L_{eq} (A-wt. sound level) of **48.6 dBA**.

6.0 ACOUSTICAL ANALYSIS (COMPRESSOR STATION)

The following section addresses the estimated sound contribution of the Station if operated at full load conditions along with an assessment of the noise associated with a unit gas blowdown.

6.1 Sound Contribution of the Station at the Closest NSAs

The acoustical analysis of the Station considers the noise produced by all continuous-operating equipment for the Station that could impact the sound contribution at the NSAs. For the analysis, we have estimated the Station sound contribution at the closest NSAs (i.e., NSA #1 & NSA #2) along with the total Station noise at the closest NSAs (i.e., sound contribution of the Station plus the ambient noise level). The following stationary noise sources were considered significant:

- Noise generated by the engines/compressors that penetrates the Compressor Building;
- Noise of the engine exhaust (i.e., noise source that could generate perceptible vibration);
- Noise radiated from aboveground gas piping and associated components;
- Noise of the outdoor JW cooler for each unit;
- Noise generated by the air intake system for each engine;
- Noise radiated from the outdoor exhaust ducting of the engine exhaust system.

Table D (Appendix, p. 12) shows the spreadsheet calculation of the estimated A-wt. sound level and unweighted O.B. SPLs at the closest NSA (i.e., NSA #1) contributed by the Station noise sources based on standard day conditions (i.e., no wind, 59 deg. F., 70% R.H.) along with the estimated total Station noise at NSA #1 (i.e., noise of the Station plus the ambient noise). The analysis includes the effect of the anticipated and/or recommended noise control measures.

Table E (Appendix, p. 13) provides the estimated A-wt. sound level and unweighted O.B. SPLs at the next closest NSA (i.e., NSA #2), based on the sound contribution at NSA #1, along with the estimated total Station noise at NSA #2 (i.e., noise of the Station plus ambient noise).

The following **Table 2** summarizes the calculated sound contribution of the proposed Station at the closest NSAs assuming full load operation of the primary Station equipment, noting that the estimated A-wt. sound level (i.e., L_{eq}) was used to calculate the representative L_{dn}.

Station Operating Condition and Associated NSA	Est'd A-Wt. Leq	Calc'd Ldn (via Est'd Leq)	FERC Requirement
Est'd sound contribution of Station during full load operation at NSA #1	44.6 dBA	51.0 dBA	55 dBA (Ldn)
Est'd sound contribution of Station during full load operation at NSA #2	44.6 dBA	51.0 dBA	55 dBA (Ldn)

Table 2: Est'd Sound Contribution of the Station at the Closest NSAs (i.e., NSA #1 & NSA #2)

A description of the methodology for the Station acoustical analysis and the source of sound data for the Station acoustical analysis are provided in the **Appendix** (pp. 14-15).

6.2 Sound Contribution of the Station at the Closest Property Line

Table F (Appendix, p. 16) provides a spreadsheet analysis that shows the calculation of the estimated A-wt. sound level and unweighted O.B. SPLs at the closest property line of the Station for standard day propagating conditions. The predicted Station sound contribution at this property line was performed only at the property line closest to the Station equipment (i.e., property line with potentially the highest sound level due to the Station equipment). The following **Table 3** shows the estimated Station sound contribution (i.e., A-wt. sound level) at the closest property line of the Station assuming full load operation of all Station equipment.

Location of the Closest Station Property Line	Est'd A-Wt. Level Station
Closest property line of Station, approx. 400 feet west of anticipated location of Compressor Bldg.	59.1 dBA

Table 3: Est'd Sound Level Contribution of the Station at the Closest Property Line to the Site Center

6.3 Sound Contribution of a Blowdown Event at the Station

The sound level of gas blowdown venting via a silencer or separator/silencer system should meet an A-wt. sound level of **60 dBA** at a distance of 300 feet. If this sound requirement is achieved, the noise of a gas blowdown will be approximately **41 dBA** (i.e., L_{dn} of approximately **47 dBA**) at the closest NSA, located 2,300 feet from the blowdown, which would be lower than **55 dBA** (L_{dn}). Consequently, although the noise of a gas blowdown event could be audible at the nearby NSAs, it is not expected to present a significant noise impact, noting also that a unit blowdown event occurs infrequently for a short time frame (e.g., 1 to 5 minute period) and Station/ESD blowdown rarely occurs. A description of the acoustical analysis methodology and source of sound data related to blowdown noise are provided in the **Appendix** (p. 15)

7.0 ACOUSTICAL ANALYSIS (SITE CONSTRUCTION ACTIVITIES)

The acoustical analysis of the construction-related activities at the Station considers the noise produced by any significant sound sources associated with the primary construction equipment that could impact the sound contribution at the nearby NSAs. The predicted sound contribution of construction activities was performed only for the closest NSA (i.e., NSA #1). Construction of the Station will consist of earth work (e.g., site grading, clearing & grubbing) and construction of the site buildings, and it is assumed that the highest level of construction noise would occur during site earth work (i.e., time frame when the largest amount of construction equipment would operate). **Table F (Appendix**, p. 17) shows the calculation of the maximum A-wt. sound level at the closest NSA contributed by the construction activities at the Station for standard day propagating conditions. A description of the analysis methodology and source of sound data for the analysis of construction noise are provided in the **Appendix** (p. 18). The analysis indicates that the maximum A-wt. noise level of construction activities at the closest NSA would be equal to or less than **52 dBA** (i.e., L_{dn} of **52 dBA**, *since nighttime construction is not anticipated*).

8.0 NOISE CONTROL MEASURES

The following section provides the recommended noise control measures and equipment sound requirements associated with the Station equipment along with other assumptions that may affect the noise and vibration generated by the Station. Note that these noise control measures and sound requirements are based on the current/preliminary design of the facility.

8.1 *Building Enclosing the Engines/Compressors*

We understand that the engines/compressors associated with the compressor units will be installed inside a single metal building. The following describes any sound requirements and/or other items related to the building structure and ventilation.

- As a *minimum*, walls/roof of the building should be constructed with exterior steel of 22 gauge and an interior layer of 4-inch thick unfaced mineral wool (e.g., 6.0-8.0 pcf uniform density) covered with 26-gauge perforated liner.

- No windows or louvers should be installed in the building walls although a minimum number of skylights could be installed in the building roof to provide natural light. The large access door (i.e., "roll-up" door) should seal well when closed and should consist of an insulated-type door (e.g., 22-ga. exterior facing, 24-ga. backskin with insulation core).

- It is assumed that forced-air ventilation system will employ wall-mounted air-supply fans (i.e., installed on the inside of walls) and exhaust air would be vented through roof openings and/or a roof ridge vent. The sound level for each supply fan should not exceed **50 dBA** at **50 feet** from each supply fan hood, which will require that fans employ an exterior silencer.

8.2 Engine Exhaust System

The exhaust system of each engine should include a muffler system that provides the following dynamic sound insertion loss (DIL) values at the rated operating conditions (i.e., O.B. DIL values if a single muffler system is employed):

DIL Values in dB per O.B. Center Frequency for the Engine Exhaust System

31.5	63	125	250	500	1000	2000	4000	8000
18	25	35	40	40	35	32	25	20

If only a single outdoor exhaust muffler (e.g., single outdoor vertical silencer, possibly designed with an integrated catalytic converter) is employed to achieve the recommended DIL values, the following are other items associated with the exhaust system that should be addressed:

- Exhaust piping located between the building and muffler should be completely covered with an acoustical lagging consisting of a heavy-gauge steel jacketing (min. 20-ga.) along with a 3-inch thick inner layer of insulation.

- Exhaust pipe expansion joint (if located outside the enclosure) and flanges should be covered with a removable/reusable acoustical blanket material. The blanket material should consist of a core of 2.0-in thick needled fiber mat (6.0-8.0 pcf), a liner material of mass-loaded vinyl (surface wt. of 1.0-1.25 psf) covered with a coated fiberglass cloth, and inner layer of insulation should be covered with a stainless steel mesh instead of fiberglass cloth.

8.3 Aboveground Gas Piping and associated Components

The analysis indicates that noise control measures, such as acoustical insulation, may be required for aboveground gas piping even if the gas piping is inserted underground soon after exiting the Compressor Building. The following noise-related items for the gas piping:

- Outdoor aboveground gas piping should be inserted underground soon after exiting the building. For example, it is recommended that a maximum of 20 feet of suction piping be above ground and a maximum of 20 feet of discharge piping be above ground.

- All gas piping should be completely separated from other metal structure(s) such as metal gratings, walkways and stairs located around the piping.

- It is recommended that the suction pipe strainer for the compressor addition be removed soon after the Station is placed in service, if feasible.

8.4 Jacket Water Cooler

The sound level generated by the JW cooler should not exceed **65 dBA** at **50 feet** at the full rated operating conditions (i.e., all fans/motors at full speed), which is equivalent to a PWL of approximately **97-98 dBA**.

8.5 Engine Air Intake System

The air intake system for each engine should include an air filter/cleaner system that provides the following recommended DIL values, and a CAT "heavy-duty" air filter/cleaner system (i.e., air filter system with a "pre-cleaner") should be capable of meeting the above DIL values.

DIL Values in dB per O.B. Center Frequency for the Engine Air Intake System

31.5	63	125	250	500	1000	2000	4000	8000
5 dB	8 dB	15 dB	20 dB	30 dB	35 dB	35 dB	30 dB	20 dB

8.6 Gas Blowdown

The sound level generated during gas venting from the unit blowdown event (i.e., vented via a blowdown separator system) should be equal to or less than **60 dBA** at **300 feet** from the outlet of the blowdown silencer.

9.0 SUMMARY AND FINAL COMMENT

The following **Table 4** summarizes the measured ambient noise environment around the proposed site of the Station and the estimated sound contribution of the proposed Station at the closest NSAs. The results in this table are defined as the "Noise Quality Analysis" for the Station.

Closest NSAs	Distance & Direction of NSA to Site Center	Meas'd Ambient Ld	Est'd Ambient Ln	Calc'd Ambient Ldn	Est'd Ldn of the Station	Ldn of Station Noise plus Ambient Noise	Potential Noise Increase
NSA #1	2,300 feet (West)	31.4 dBA	31.4 dBA	37.8 dBA	51.0 dBA	51.2 dBA	13.4 dB
NSA #2	2,300 feet (East)	34.8 dBA	31.4 dBA	41.2 dBA	51.0 dBA	51.4 dBA	10.2 dB

Table 4: Noise Quality Analysis for the CS No. 3 associated with REX-East Pipeline Project

The acoustical analysis of the Station indicates that if the recommended noise control measures are successfully implemented, the noise attributable to the proposed **CS No. 3** is estimated to be lower than **55 dBA** (L_{dn}) at the nearby NSAs, which is the anticipated FERC sound level requirement for this Station. In addition, the analyses indicate that the noise resulting from a gas blowdown event should have minimum noise impact on the surrounding environment but the noise associated with construction activities could have some noise impact on the surrounding environment. Also, since noise sources at the Station that could cause perceptible vibration should be adequately mitigated, there should not be any perceptible increase in vibration at any NSA during operation of the Station equipment.

APPENDIX

- **FIGURE 1: GENERAL AREA LAYOUT SHOWING THE NEARBY NSAs AND SOUND MEASUREMENT POSITIONS NEAR THE CLOSEST NSAs**
- **SUMMARY OF THE MEASURED AMBIENT SOUND DATA**
- **ACOUSTICAL ANALYSIS (COMPRESSOR STATION)**
- **ANALYSIS METHODOLOGY (NOISE ATTRIBUTABLE TO THE STATION AND A BLOWDOWN EVENT) AND THE SOURCE OF SOUND DATA**
- **ACOUSTICAL ANALYSIS (CONTRUCTION ACTIVITIES)**
- **DESCRIPTION OF THE ANALYSES METHODOLOGY (CONTRUCTION ACTIVITIES) AND THE SOURCE OF SOUND DATA**

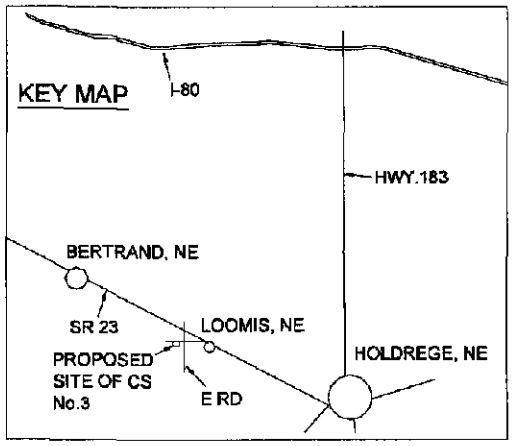

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Figure 1: CS No. 3 for REX-East Pipeline: Area/Site Layout Showing the Location of the Nearby NSAs and Chosen Sound Measurement Positions in the Vicinity of the Nearby NSAs.

Measurement Set		Measured A-Wt. Sound Levels (dBA)					
Meas. Pos. & NSA	Time/Date of Test	Day-time Leq(Ld)	Avg'd of Ld	Night-time Leq(Ln)	Avg'd of Ln	Calc'd Ldn Note (1)	Notes/Observations
Pos. 1 (NSA #1) House located off of 735 Road, west of the Station Site	2:42 PM (4/6/06) 2:44 PM (4/6/06) 2:47 PM (4/6/06)	34.4 29.9 30.3	31.4	Not Meas'd Note (1)	—	37.8 Note (1)	Primarily, the ambient noise was dominated by wind-related noise. At times, the sound of distant cattle and the sound of birds.
Pos. 2 (NSA #2) House located off of 735 Road, east of the Station Site	2:50 PM (4/6/06) 2:52 PM (4/6/06) 2:54 PM (4/6/06)	35.7 35.2 33.8	34.8	Not Meas'd Note (1)	—	41.2 Note (1)	Primarily, the ambient noise was dominated by wind-related noise. At times, the sound of distant cattle, sound of birds and at times, distant vehicle traffic.

Table A: **CS No. 3 for REX-West Pipeline: Summary of the Meas'd Daytime Leq (i.e., Ld) at the Closest NSAs around the Site as Measured on April 6, 2006.**

Note (1): Ambient Ldn calculated from the measured Ld since the Ld was considered representative of nighttime levels, consequently, nighttime ambient sound levels were not measured.

Measurement Set		Temp.	R.H.	Wind	Wind	Peak	
Meas. Pos.	Time Frame of Tests	(°F)	(%)	Direction	Speed	Wind	Sky Conditions
Meas. Pos. 1 & 2	2:00 PM to 3:00 PM	72-74	20-25	Wind primarily from the SE	3-6 mph	6-10 mph	Mostly clear conditions

Table B: **CS No. 3 for REX-West Pipeline: Summary of the Meteorological Conditions during the Sound Survey Measurements around the Site on April 6, 2006.**

Measurement Set		Sound Pressure Level (SPL) in dB per Octave-Band Frequency (in Hz)									A-Wt.
Meas. Pos. & NSA	Time/Date of Test	31.5	63	125	250	500	1000	2000	4000	8000	Level
Pos. 1 (NSA #1)	2:42 PM (4/6/06)	62.1	53.0	43.7	35.9	28.0	26.1	19.7	16.7	17.1	34.4
House located off	2:44 PM (4/6/06)	58.3	48.1	39.0	30.3	24.2	21.6	16.5	14.2	15.6	29.9
of 735 Road, west	2:47 PM (4/6/06)	58.0	50.6	40.7	28.7	24.7	19.0	13.8	13.8	15.2	30.3
of the Station Site	**Average SPL**	**59.5**	**50.6**	**41.1**	**31.6**	**25.6**	**22.2**	**16.7**	**14.9**	**16.0**	**31.4**
Pos. 2 (NSA #2)	2:50 PM (4/6/06)	49.3	42.3	36.2	34.6	33.8	31.2	25.8	21.3	16.3	35.7
House located off	2:52 PM (4/6/06)	43.5	39.4	35.3	35.2	32.4	30.1	26.2	24.4	15.9	35.2
of 735 Road, east	2:54 PM (4/6/06)	42.1	37.4	33.9	33.5	30.2	27.9	25.0	25.7	15.5	33.8
of the Station Site	**Average SPL**	**45.0**	**39.7**	**35.1**	**34.4**	**32.1**	**29.7**	**25.7**	**23.8**	**15.9**	**34.8**

Table C: **CS No. 3 for REX-West Pipeline: Meas'd A-Wt. Sound Levels (i.e., Ld) and the Unweighted Octave-Band (O.B.) SPLs at the Closest NSAs as Measured on April 6, 2006.**

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Source No. & Dist (Ft)	Noise Sources and Other Conditions/Factors associated with Acoustical Analysis	PWL or SPL in dB Per Octave-Band (O.B.) Center Freq. (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level	
1)	PWL of Engines/Comprs inside Building	120	125	126	125	122	122	122	120	115	128	
	Attenuation of the Building	-8	-12	-18	-22	-28	-35	-38	-40	-40		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
2300	Hemispherical Radiation	-65	-65	-65	-65	-65	-65	-65	-65	-65		
2300	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	0	0	0		
2300	Source Sound Level Contribution	47	48	43	38	29	22	19	15	10	33	
2)	PWL of Unsilenced Engine Exhaust (1 Unit)	128	125	140	135	132	135	133	120	110	139	
	PWL of Unsilenced Exhaust for 5 Units (+7 dB)	135	132	147	142	139	142	140	127	117	146	
	Atten. of Noise Control (Muffler System)	-20	-28	-36	-42	-42	-40	-38	-35	-25		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
2300	Hemispherical Radiation	-65	-65	-65	-65	-65	-65	-65	-65	-65		
2300	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	0	0	0		
2300	Source Sound Level Contribution	50	39	46	35	32	37	37	27	27	42	
3)	PWL of Exhaust Muffler Body & Piping (1 Unit)	106	105	102	98	98	98	100	92	90	104	
	PWL of Muffler Body & Piping for 5 Units (+7 dB)	113	112	109	105	105	105	107	99	97	111	
	NR of Noise Control (Piping Insulation)	0	0	-2	-5	-10	-15	-16	-18	-18		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
2300	Hemispherical Radiation	-65	-65	-65	-65	-65	-65	-65	-65	-65		
2300	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	0	0	0		
2300	Source Sound Level Contribution	48	47	42	35	30	25	26	16	14	34	
4)	PWL of Air Intake w/"Heavy-Duty" Filter (1 Unit)	85	80	78	75	75	78	82	88	80	91	
	PWL of Engine Air Intakes for 5 Units (+7 dB)	92	87	85	82	82	85	89	95	87	98	
	NR of Noise Control	0	0	0	0	0	0	0	0	0		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
2300	Hemispherical Radiation	-65	-65	-65	-65	-65	-65	-65	-65	-65		
2300	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-2	0	0	0	0	0		
2300	Source Sound Level Contribution	27	22	20	15	17	20	24	30	22	33	
5)	PWL of Outdoor Gas Piping for 1 Unit	105	102	98	95	92	90	88	85	82	96	
	PWL of Outdoor Gas Piping for 5 Units (+7 dB)	112	109	105	102	99	97	95	92	89	103	
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
2300	Hemispherical Radiation	-65	-65	-65	-65	-65	-65	-65	-65	-65		
2300	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	0	0	0		
2300	Source Sound Level Contribution	47	44	40	37	34	32	30	27	24	38	
6)	PWL of JW Cooler for 1 Unit	105	100	96	92	90	88	85	82	80	93	
	PWL of 5 JW Coolers (+7 dB)	112	107	103	99	97	95	92	89	87	100	
	NR of Noise Control	0	0	0	0	0	0	0	0	0		
	Misc. Atten.	0	0	-1	-2	-3	-4	-5	-6	-6		
2300	Hemispherical Radiation	-65	-65	-65	-65	-65	-65	-65	-65	-65		
2300	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	0	0	0		Calc'd
2300	Source Sound Level Contribution	47	42	37	32	29	28	22	18	16	32	Ldn
Est'd Total Sound Contribution of Station Sources at NSA #1		55	52	50	43	38	39	38	33	30	44.6	51.0

Measured Ambient Sound Level at NSA #1: Note (1)	**37.8**
Sound Contirbution of Existing Station Plus Ambient Sound Level	51.2
Potential Increase above the Ambient Noise (dB)	**13.4**

Table D: CS No. 3 for REX-West Pipeline: Est'd Sound Contribution of the Station at Closest NSAs (i.e., NSA #1, located approx. 2,300 Ft. West of the Anticipated Location of the Compressor Building). Also, the Est'd Increase above the Ambient Noise as a Result of the Station during Full Load Operation.

Note (1): Ambient sound level based on the measured data from the recent sound survey on 4/6/06 around the site of the Station.

NOTE: Muffler DIL & Equipment PWL values on this spreadsheet should not be used as the specified values. Refer to "Noise Control Measures" section in report or other company specifications for actual specified values.

Source No. & Dist (Ft)	Noise Sources and Other Conditions/Factors associated with Acoustical Analysis	SPL in dB Per O.B. Center Frequency (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level	
	Est'd SPLs of Station at 2300 Ft. (RE: Table D)	55	52	50	43	38	39	38	33	30	44.6	
2300	Hemisph Radiation [20*log(2300/2300) = 0.0 dB]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Calc'd
2300	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	0	0	0		Ldn
Est'd Total Sound Contribution of Station Sources at NSA #2		**55**	**52**	**50**	**43**	**38**	**39**	**38**	**33**	**30**	**44.6**	**51.0**

Measured Ambient Sound Level at NSA #2: Note (1)	**41.2**
Sound Contirbution of Existing Station Plus Ambient Sound Level	51.4
Potential Increase above the Ambient Noise (dB)	**10.2**

Table E: CS No. 3 for REX-West Pipeline: Est'd Sound Contribution of Station at next closest NSA (i.e., NSA #2; located approx. 2,300 Ft. East of the Anticipated Location of the Compressor Building). Also, the Est'd Increase above the Ambient Noise as a Result of the Station during Full Load Operation.

Note (1): Ambient sound level based on the measured data from the recent sound survey on 4/6/06 around the site of the Station.

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ANALYSIS METHODOLOGY (NOISE ATTRIBUTABLE TO COMPRESSOR STATION)

In general, the predicted sound level contributed by the Station equipment was calculated as a function of frequency from estimated unweighted octave-band (O.B.) sound power levels (PWLs) for each significant sound source. The following summarizes the acoustical analysis procedure for the Station:

- Initially, unweighted O.B. PWL values of the significant noise sources were determined from equipment manufacturer's sound data and/or actual sound level measurements performed by H&K at similar type of equipment/components expected for this gas compressor facility.

- Then, expected noise reduction (NR) or attenuation in dB per O.B. frequency due to any noise control measures, hemispherical sound propagation (discussed in more detail below*) and atmospheric sound absorption (discussed in more detail below**) were subtracted from the unweighted octave-band PWLs to obtain the unweighted O.B. SPLs of each noise source. Since sound shielding by buildings can influence the sound level contributed at the NSAs, we also included the sound shielding due to buildings, if appropriate. The sound attenuation effect due to foliage or land contour was not considered in the analysis although there probably will be some attenuation due to foliage/trees.

- Finally, the resulting estimated unweighted O.B. SPLs for all noise sources associated with the Station (with noise control and other sound attenuation effects) were logarithmically summed, and the total O.B. SPLs for all noise sources were corrected for A-weighting to provide the estimated overall A-wt. sound level contributed by the Station at the closest NSA. The predicted sound contribution of the Station at the closest NSA was utilized to estimate the Station noise contribution at the other nearby NSAs that are more distant that the closest NSA.

*Attenuation due to hemispherical sound propagation: Sound propagates outwards in all directions (i.e., length, width, height) from a point source, and the sound energy of a noise source decreases with increasing distance from the source. In the case of hemispherical sound propagation, the source is located on a flat continuous plane/surface (e.g., ground), and the sound radiates hemispherically (i.e., outward, over and above the surface) from the sound source. The following equation is the theoretical decrease of sound energy when determining the resulting SPL values of a noise source at a specific distance ("r") of a receiver from the estimated PWL values:

> Decrease in SPL ("hemispherical propagation") from a noise source = **20*log(r) – 2.3 dB**
> where "r" is distance of the receiver from the noise source.

Attenuation due to air absorption: Air absorbs sound energy, and the amount of absorption ("attenuation") is dependent on the temperature and relative humidity (R.H.) of air and frequency of sound. For example, the attenuation due to air absorption for 1000 Hz O.B. SPL is approximately **1.5 dB per 1,000 feet for standard day conditions (i.e., no wind, 60 deg. F. and 70% R.H.).

ANALYSIS METHODOLOGY (NOISE ATTRIBUTABLE TO A BLOWDOWN EVENT)

The noise resulting from a gas blowdown event was estimated by using the "inverse-square law" and included some attenuation due to atmospheric sound absorption. Consequently, the estimated noise of a blowdown event at the receptor (closest NSA) was calculated as follows:

SPL (receptor)= (Blowdown SPL at R1) – 20*log(R2/R1)– Atm. Atten.= **60 dBA**– 20*log (2300/300) – **1 dB = 41 dBA**

Where: R1 = Distance of Specified Blowdown Noise Level Requirement (i.e., 300 ft.)
R2 = Distance of the Closest Receptor from the Blowdown Silencer (2,300 ft.)

SOURCE OF SOUND DATA (COMPRESSOR STATION)

The following describes the source of sound data used for estimating the source sound levels and/or the source PWLs for the station (e.g., turbine/compressor and equipment/components associated with the compressor installations).

(1) Estimated PWL values of equipment inside the building (i.e., engines, compressors and other equipment inside the building) was calculated from sound data measured by H&K on a similar type of compressor installation.

(2) Exhaust PWL values were calculated from field sound data measured by H&K on a similar type of engines to be utilized at this facility. The DIL values for the exhaust muffler are generally lower than the recommended values in order that the analysis incorporates a "margin of safety."

(3) Noise radiated from aboveground piping is primarily a result the noise generated by the gas compressors. Consequently, measurement of both near field and far field sound data on gas piping is presumed to be an accurate method of quantifying the noise associated with the piping, and estimated PWL values for piping in the analysis were determined from near field and far field sound data by H&K on a similar type of compressor to that of the proposed compressor unit.

(4) The estimated PWL values for the JW cooler were designated to meet the design noise goal and the estimated PWL values for the cooler utilized in the acoustical analysis assumes some noise associated with piping associated with the coolers. The noise level for the cooler used in the acoustical analysis is generally higher than the sound level requirement in order that the noise design analysis incorporates an acoustical "margin of safety." In addition, there can be other noise associated with the cooler that is not directly related to the operation of the cooler fans.

(5) The estimated PWL values for the engine air intake were calculated from measured sound data in the field tests by H&K on similar engine that will be employed.

(5) The estimated A-wt. sound level of a gas blowdown event was calculated from sound data measured by H&K on similar type of blowdown operations, and assumes that the Station blowdown includes a silencer that meets the specified noise level and/or assumes that the gas venting via the unit blowdown separator meets the specified noise level.

Source No. & Dist (Ft)	SOURCE PWL & ESTIMATED SOUND LEVEL CONTRIBUTIONS AT SPECIFIED DISTANCE	PWL or SPL in dB Per Octave-Band Center Frequency (Hz)									A-Wt. Level
		31.5	63	125	250	500	1000	2000	4000	8000	
1)	PWL of Engines/Comprs inside Building	120	125	126	125	122	122	122	120	115	128
	Attenuation of the Building	-8	-12	-18	-22	-28	-35	-38	-40	-40	
	Misc. Atten.	0	0	0	0	0	0	0	0	0	
400	Hemispherical Radiation	-50	-50	-50	-50	-50	-50	-50	-50	-50	
400	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-3	-5	
400	Source Sound Level Contribution	62	63	58	53	44	37	33	27	20	46
2)	PWL of Unsilenced Engine Exhaust (1 Unit)	128	125	140	135	132	135	133	120	110	139
	PWL of Unsilenced Exhaust for 5 Units (+7 dB)	135	132	147	142	139	142	140	127	117	146
	Atten. of Noise Control (Muffler System)	-20	-28	-36	-42	-42	-40	-38	-35	-25	
	Misc. Atten.	0	0	0	0	0	0	0	0	0	
400	Hemispherical Radiation	-50	-50	-50	-50	-50	-50	-50	-50	-50	
400	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-3	-5	
400	Source Sound Level Contribution	65	54	61	50	47	52	51	39	37	56
3)	PWL of Exhaust Muffler Body & Piping (1 Unit)	106	105	102	98	98	98	100	92	90	104
	PWL of Muffler Body & Piping for 5 Units (+7 dB)	113	112	109	105	105	105	107	99	97	111
	NR of Noise Control (Piping Insulation)	0	0	-2	-5	-10	-15	-16	-18	-18	
	Misc. Atten.	0	0	0	0	0	0	0	0	0	
400	Hemispherical Radiation	-50	-50	-50	-50	-50	-50	-50	-50	-50	
400	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-3	-5	
400	Source Sound Level Contribution	63	62	57	50	45	40	40	28	24	46
4)	PWL of Air Intake w/"Heavy-Duty" Filter (1 Unit)	85	80	78	75	75	78	82	88	80	91
	PWL of Engine Air Intakes for 5 Units (+7 dB)	92	87	85	82	82	85	89	95	87	98
	NR of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten.	0	0	0	0	0	0	0	0	0	
400	Hemispherical Radiation	-50	-50	-50	-50	-50	-50	-50	-50	-50	
400	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-2	0	-1	-1	-3	-5	
400	Source Sound Level Contribution	42	37	35	30	32	35	38	42	32	45
5)	PWL of Outdoor Gas Piping for 1 Unit	105	102	98	95	92	90	88	85	82	96
	PWL of Outdoor Gas Piping for 5 Units (+7 dB)	112	109	105	102	99	97	95	92	89	103
	Atten. of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten.	0	0	0	0	0	0	0	0	0	
400	Hemispherical Radiation	-50	-50	-50	-50	-50	-50	-50	-50	-50	
400	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-3	-5	
400	Source Sound Level Contribution	62	59	55	52	49	47	44	39	34	52
6)	PWL of JW Cooler for 1 Unit	105	100	96	92	90	88	85	82	80	93
	PWL of 5 JW Coolers (+7 dB)	112	107	103	99	97	95	92	89	87	100
	NR of Noise Control	0	0	0	0	0	0	0	0	0	
	Misc. Atten.	0	0	0	0	0	0	0	0	0	
400	Hemispherical Radiation	-50	-50	-50	-50	-50	-50	-50	-50	-50	
400	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-3	-5	
400	Source Sound Level Contribution	62	57	53	49	47	45	41	36	32	50
Est'd Contribution at the Closest Property Line of Station		70	67	65	58	54	54	53	45	40	59.1

Table F: CS No. 3 for REX-West Pipeline: Est'd Station Sound Contribution at the Property Line closest to Station Equipment (Closest *Property Line located approx. 400 feet West of Compressor Bldg.*) Assuming Full Load Operation of the Engine-Driven Compressor Units at the Station.

NOTE: Muffler DIL & Equipment PWL values on this spreadsheet should not be used as the specified values. Refer to "Noise Control Measures" section in report or other company specifications for actual specified values.

Type of Equipment	Equipment Power Rating or Capacity	Est'd Number Required	Est'd A-Wt. Sound Level at 50 Ft.: Note (1)	Resulting A-Wt. PWL of Single Piece of Equip.	Assumed Max. No. Operating at One Time	Est'd Max. A-Wt. PWL or Sound Level of Equip.	
Diesel Generator	250 to 400 HP	1 to 2	81 dBA	113 dBA	1	113	
Bulldozer	250 to 700 HP	1 to 2	85 dBA	117 dBA	1	117	
Grader	450 to 600 HP	1 to 2	85 dBA	117 dBA	1	117	
Backhoe	130 to 210 HP	1 to 2	80 dBA	112 dBA	1	112	
Front End Loader	150 to 250 HP	1 to 2	85 dBA	117 dBA	1	117	
Truck Loaded	40 Ton	As needed	82 dBA	115 dBA	1	115	
	Est'd Total Maximum A-Wt. PWL (dBA) of All Construction Site Equipment					123	Calc'd Ldn Note (4)
	Atten. (dB) due to Hemispherical Sound Propagation (2300 Ft.): Note (2)					-65	
	Est'd Attenuation (in dB) due to Air Absorption and/or Foliage: Note (3)					-6	
	Est'd Sound Level (dBA) at the Closest NSA Considering a Maximum Number of Equipment Operating at One Time					52 dBA	52 dBA

Table G: **CS No. 3 for REX-West Pipeline: Est'd Sound Contribution at the Closest NSA (i.e., NSA #1, approx. 2,300 Ft. West of the Site Center) during Construction Activity at the proposed Station. Sound Contribution assumes Operation of the "Loudest" Equipment during a Time Frame with the Largest Amount of Equipment Operating (e.g., Site Grading & Clearing/Grubbing)**

Note (1): Noise Emission Levels of construction equipment based on an EPA Report (meas'd sound data for a railroad construction project) and measured sound data in the field by H&K or other published sound data.

Note (2): Noise attenuation due to hemispherical sound propagation: Sound propagates outwards in all directions (i.e., length, width, height) from a point source, and the sound energy of a noise source decreases with increasing distance from the source. In the case of hemispherical sound propagation, the source is located on a flat continuous plane/surface (e.g., ground), and the sound radiates hemispherically from the source.

The following equation is the theoretical decrease of sound energy when determining the resulting SPL of a noise source at a specific distance ("r") of a receiver from a source sound power level (PWL):

Decrease in SPL ("hemispherical propagation") from a noise source = 20*log(r) – 2.3 dB, where "r" is distance of the receiver from the noise source. For example, if the distance "r" is 2300 feet between the site and closest NSA, the "hemispherical propagation" = **20*log(2300) – 2.3 dB = 65 dB.**

Note (3): Noise attenuation due to air absorption & foliage: Air absorbs sound energy, and the amount of absorption ("attenuation") is dependent on temperature and relative humidity (R.H.) of the air and the frequency of sound. For standard day conditions (i.e., no wind, 60 deg. F. and 50% R.H.), the attenuation due to air absorption for the medium frequency" (i.e., 1000 Hz O.B. SPL) is approximately **1.5 dB** per 1,000 feet. In addition, foliage such as forest/trees between the Station site and nearby NSAs can have a sound attenuation effect depending on the amount/thickness of the foliage.

Note (4): Calc'd Ldn equal to the est'd A-wt. sound level since construction activities will occur only during daytime.

ANALYSIS METHODOLOGY AND SOURCE OF SOUND DATA (CONTRUCTION ACTIVITIES)

The predicted sound level contributed by the construction-related activity (i.e., construction of the compressor station) was calculated from estimated A-wt. PWL of noise sources (i.e., construction equipment noise) that typically operate during the specific construction activity. The following summarizes the acoustical analysis procedure utilized for the construction activity at the site:

- Initially, the A-wt. PWL of noise sources associated with the construction activity were determined from published sound data and/or actual sound level measurements by H&K, and the total PWL of each noise source (equipment) was based on the anticipated number of equipment operating.

- Next, A-wt. PWL of all sources were logarithmically summed to provide the overall A-wt. PWL contributed by construction activity. It is assumed that the highest level of construction noise would occur during site earth work (i.e., time frame when the largest amount of equipment would operate).

- Finally, the estimated A-wt. sound level of the construction activity at the specific distance was determined by compensating for sound attenuation due to propagation (hemispherical radiation), atmospheric sound absorption and sound attenuation effect of foliage/forest***.

  The noise levels of construction equipment were based on an EPA Report (i.e., measured sound data from railroad construction equipment taken during the Northeast Corridor Improvement Project) that was summarized in a 1995 Report to the Federal Transit Administration as prepared by Harris Miller Miller & Hanson Inc. Also, construction equipment noise levels listed in an article in the Journal of Noise Control Engineering and sound data measured by H&K was utilized. The following list some references used by H&K to determine construction equipment noise emission levels:

  (1) "Transit Noise and Vibration Impact Assessment", dated April 1995, prepared by Harris Miller Miller & Hanson Inc. for the Office of Planning of the Federal Transit Administration.
  (2) Erich Thalheimer, "Construction Noise Control Program and Mitigation Strategy at the Central Artery/Tunnel Project", J of Noise Control Eng., 48 (5), pp. 157-165 (2000 Sep-Oct).
  (3) "Noise Control for Building Manufacturing Plant Equipment and Products", course handout notes for a noise course given each year by Hoover & Keith Inc.

  ***Discussion of noise attenuation due to foliage: Since there will be some forest/trees between the Station and nearby NSAs, the sound attenuation effect of foliage was included. Based on experience and ISO Standard[1], the "medium-frequency" attenuation (i.e., 1000 Hz) due to forest/trees greater than 500 feet thick is approximately **10 dB**. Consequently, for this Station (i.e., distance of 700 feet from closest NSA), the "medium-frequency" air absorption attenuation would be approximately **3 dB**, (i.e., 1.5 dB x 2300/1000 = 3 dB). Then, adding the attenuation due to foliage (assumed to be approx. **3 dB** since will have a minimum amount of forest/trees between the site and closest NSA to the air absorption attenuation, an attenuation of **6 dB** was estimated due to air absorption/foliage.

End of Report

[1] ISO Standard 9613-1: 1993 (E), entitled "Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere, and Part 2: General method of calculation"

Rockies Express Pipeline

ROCKIES EXPRESS PIPELINE-EAST PROJECT

Resource Report 13
Additional Information Related to LNG Plants

Draft

Prepared by

NATURAL RESOURCE GROUP INC.

January 2007

13.0 RESOURCE REPORT 13 – ADDITIONAL INFORMATION RELATED TO LNG PLANTS

The Rockies Express Pipeline-East Project will not involve the construction or recommissioning of any liquefied natural gas (LNG) facility. Therefore, in accordance with Federal Energy Regulatory Commission guidance provided in Title 18 Code of Federal Regulations 380.12(o), Resource Report 13, addressing additional information related to LNG facilities, is not required.