

ENVIRONMENTAL NOISE CONTROL

286 Lakeview Drive
Winchendon, MA 01475
(978) 515-7895

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Dominion Energy Transmission, Inc.
925 White Oaks Blvd
Bridgeport, WV 26330

Attention: Mr. John H. Curry

Subject: ENC Report No. 617:
Sound Survey and Noise Analysis for the Borger Compressor Station
ENC Project No. 20-01

Gentlemen:

At the request of Dominion Energy Transmission, Inc., Environmental Noise Control (ENC) conducted a sound survey and a noise analysis for the abandoning in place of two existing Dresser Clark Model DC 990 turbine compressor units (Units 2 and 3) and the installation of two Solar Centaur 50 compressor units (Units 5 and 6) and additional station modifications at the Borger Compressor Station.

1.0 PURPOSE

The purpose of the sound survey was to document the existing sound levels before the installation of two Solar Centaur 50 compressor units (Units 5 and 6) and additional station modifications including two lube oil coolers, three additional microturbines and heat recovery systems, remodeling of the Solar Taurus Model 70 compressor unit (Unit 4) exhaust system, replacement of the existing steam boiler with an EPA-certified glycol heating boiler, addition of a roll-up garage door and ramp to the existing auxiliary building, replacement of two ESD exhaust vents with two ESD blowdown silencers, and additional associated pipes, valves, and fittings at the Borger Compressor Station. Presented below are descriptions of the sound survey measurement locations, the existing sound levels, and the predicted increases in the existing sound levels due to the installation of the of two Solar Centaur 50 compressor units (Units 5 and 6) and additional station modifications.

1.1 STATION DESCRIPTION

The Borger Compressor Station is located on the north side of Ellis Hollow Creek Road between State Route 79 and State Route 366 about five miles east of Ithaca, Tompkins County, New York. This compressor station consists of two Dresser Clark Model DC 990 turbine compressor units (Units 2 and 3) that were installed in 1982 and one Solar Taurus Model 70 turbine compressor unit (Unit 4) that was installed in 2010. One Dresser Clark Model DC 990 turbine compressor unit (Unit 1) was abandoned in place when Unit 4 was installed. Units 1, 2 and 3 are in one compressor

building and Unit 4 is in a separate acoustically insulated compressor building directly east of the Units 1, 2 and 3 compressor building. Two station discharge gas coolers are located about 225 feet east of the Unit 4 compressor building. Units 5 and 6 are to be installed between the Unit 4 compressor building and the two station discharge gas coolers.

The land uses surrounding the station are residential and forested lands. The NSAs around the station are all residences. These residences are approximately 4200 feet north-northeast, 1300 feet east, 3400 feet south-southeast, 4450 feet south-southwest, 3400 feet southwest, 1200 and 2500 feet west-southwest, 930 feet west, and 1350 and 1700 feet northwest of the Units 5 and 6 compressor buildings (See the attached plot plan drawing). There are also three company houses located approximately 400 feet south-southwest, and 550 and 600 feet west-southwest.

1.2 SOUND SURVEY MEASUREMENTS

The baseline full station sound survey measurements were conducted at the property lines, NSAs, and company houses on 1 December 2017 with Units 2 through 4 operating at an average of 92% of full rated load. This sound survey was the post installation sound survey for the two station discharge gas coolers that were installed for the New Market Project and was reported in ENC Report No. 585: Post Installation Sound Survey at the Borger Compressor Station. The Borger Compressor Station was audible at the property lines, company houses, and NSAs S2, S3, S10, and S11. The weather conditions were a temperature of 39 degrees F, a relative humidity of 60%, cloudy skies, and light southwest winds (2 to 4 mph) changing to light northwest winds (2 to 5 mph). The L_{eq} sound levels were measured to the greatest extent possible when sound sources other than the Borger Compressor Station were not audible. Audible sources of sound other than the station (ambient sound sources) were local traffic, distant traffic, birds, airplanes, a gunshot at S1, a dog barking in the house at S8, wind blowing in the trees at P4, S10, S12, and S13, water flowing in the stream at S10, and a distant chainsaw at S10 and S11.

At the NSAs, the measured baseline full station L_{eq} sound levels ranged from 36.5 to 46.3 dBA with calculated L_{dn} sound levels ranging from 42.9 to 52.7 dBA.

A sound survey of Unit 4 and the two station discharge gas coolers was conducted at the property lines, NSAs, and company houses on 13 January 2020 to represent the sound levels of the existing station equipment that will remain after installation of Units 5 and 6 and the abandoning in place of Units 2 and 3. Unit 4 was operating at an average of 99% of full rated load. Unit 4 was audible at the property lines, company houses, and NSAs S2 and S9 through S13. The weather conditions were a temperature of 36 degrees F, a relative humidity of 65% increasing to 70%, cloudy skies, and west winds (3 to 9 mph). The L_{eq} sound levels were measured to the greatest extent possible when sound sources other than Unit 4 were not audible. Audible sources of sound other than Unit 4 (ambient sound sources) were local traffic, birds, distant traffic at S2, S3, S7 and S8, wind blowing in the trees at P3, S1, S3, S7 through S10, S12, and S13, water flowing in the stream at S2 and S10, and a dog barking at S13.

At the NSAs, the Unit 4 L_{eq} sound levels ranged from 32.4 to 43.1 dBA with calculated L_{dn} sound levels ranging from 38.8 to 49.5 dBA. The measured sound levels at NSAs S1 through S3, S7

through S9, S12, and S13 were corrected to remove contributions from birds and wind blowing in the trees.

2.0 NOISE ANALYSIS OF THE BORGER COMPRESSOR STATION

The station sound levels at the NSAs will be the sum of the sound levels from the installation of two Solar Centaur 50 compressor units (Units 5 and 6) and additional station modifications with the sound levels from Unit 4, three existing microturbines, and the two station discharge gas coolers measured on 13 January 2020. Presented below are the predicted sound levels from the two new compressor units and additional station modifications, the noise control measures/specifications necessary to reduce the sound levels from the two new compressor units and additional station modifications, and the total sound levels predicted after the installation of the two new compressor units and the additional station modifications at the Borger Compressor Station.

2.1 PREDICTED SOUND LEVELS FROM THE NEW EQUIPMENT AT THE BORGER COMPRESSOR STATION

The two Solar Centaur 50 compressor units (Units 5 and 6) and additional station modifications have been designed so that the continuous sound from this new equipment will not significantly increase the sound levels at the NSAs.

2.2 NOISE CONTROL MEASURES/SPECIFICATIONS FOR THE NEW EQUIPMENT AT THE BORGER COMPRESSOR STATION

Implementation of the following noise control measures/specifications is necessary to ensure that the sound from the two Solar Centaur 50 compressor units (Units 5 and 6) and additional station modifications will not significantly increase the sound levels at the NSAs.

1. A muffler must be installed on the exhaust of each Solar Centaur Model 50 turbine. This turbine exhaust muffler must have minimum Dynamic Insertion Loss (DIL) values as follows:

	Turbine Exhaust Muffler Minimum DIL in dB								
	Octave Band Center Frequency in Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
dB	11	19	27	35	48	44	39	28	21

2. The exhaust pipe of each Solar Centaur Model 50 turbine must be internally lined or acoustically insulated from the compressor building wall to the exhaust muffler flange (including expansion joints). The maximum A-weighted sound level from the exhaust pipe of each Solar Centaur Model 50 turbine must not exceed 63 dBA at 3 feet.
3. An air cleaner/silencer must be installed on the air intake of each Solar Centaur Model 50 turbine. This turbine air intake cleaner/silencer must have minimum Dynamic Insertion Loss (DIL) values as follows:

Turbine Air Intake Cleaner/Silencer Minimum DIL in dB									
Octave Band Center Frequency in Hz									
	31.5	63	125	250	500	1000	2000	4000	8000
dB	3	15	29	39	46	50	54	79	73

4. The turbine air intake duct of each Solar Centaur Model 50 turbine must be acoustically insulated from the building wall to the air cleaner housing (including expansion joints). The maximum A-weighted sound level from the air intake duct of each Solar Centaur Model 50 turbine must not exceed 69 dBA at 3 feet.
5. The wall and roof panels of the Unit 5 and Unit 6 compressor buildings must have a minimum Sound Transmission Class (STC) of 49 and a minimum Noise Reduction Coefficient (NRC) of 0.90. In addition, these panels must have minimum Sound Transmission Loss (TL) values as follows:

Compressor Building Wall and Roof Panel Minimum TL in dB									
Octave Band Center Frequency in Hz									
	31.5	63	125	250	500	1000	2000	4000	8000
dB	9	15	22	38	46	48	52	53	54

6. The Borger Unit 5 and Unit 6 compressor buildings personnel doors must be STC 30 insulated, metal doors with full weather-stripping. Any windows in these doors must be double glazed using minimum ¼-inch thick glass or acrylic panels separated by a minimum ½-inch airspace.
7. The Borger Station compressor buildings equipment doors must be insulated, metal doors with full weather-stripping.
8. The Borger Station compressor buildings must have ventilation systems installed to provide adequate cooling of each of the buildings to allow full load operation of each compressor unit with all doors closed.
- 8A. The Unit 5 and Unit 6 compressor buildings ventilation systems can each have a maximum of one air handling unit. The maximum A-weighted sound level from each air handling unit must not exceed 70 dBA at 3 feet when measured outside of each air handling unit in all directions with maximum octave band sound pressure levels (SPL) as follows:

Air Handling Unit Maximum SPL at 3 feet in dB									
Octave Band Center Frequency in Hz									
	31.5	63	125	250	500	1000	2000	4000	8000
dB	92	89	79	71	64	60	55	54	54

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- 8B. A ventilation air inlet muffler must be located in the air paths between each air handling unit and the compressor buildings wall penetrations to reduce the sound from each compressor unit that escapes through these openings. Each air handling unit muffler must have minimum Dynamic Insertion Loss (DIL) values as follows:

Air Handling Unit Muffler Minimum DIL in dB									
Octave Band Center Frequency in Hz									
	31.5	63	125	250	500	1000	2000	4000	8000
dB	4	12	20	23	42	48	45	38	21

- 8C. A ventilation air outlet muffler must be located inside each air discharge louver opening in the compressor buildings walls to reduce the sound from each compressor unit that escapes through these opening. Each air discharge louver muffler must have minimum Dynamic Insertion Loss (DIL) values as follows:

Air Discharge Louver Muffler Minimum DIL in dB									
Octave Band Center Frequency in Hz									
	31.5	63	125	250	500	1000	2000	4000	8000
dB	3	9	17	25	39	46	45	40	25

9. The maximum noise from each lube oil cooler for the compressor units must not exceed an A-weighted sound level of 50 dBA at 50 feet from the centerline of the cooler with all fans running at maximum speed. Each lube oil cooler (including all fans, motors and drives) must have maximum octave band sound pressure levels (SPL) as follows:

Lube Oil Cooler Maximum SPL at 50 feet in dB									
Octave Band Center Frequency in Hz									
	31.5	63	125	250	500	1000	2000	4000	8000
dB	54	61	58	51	46	43	39	35	30

10. The maximum noise from each microturbine must not exceed an A-weighted sound level of 79 dBA at 10 feet inside the auxiliary building. These microturbines must have maximum octave band sound pressure levels (SPL) as follows:

Microturbine Maximum SPL at 10 feet in dB									
Octave Band Center Frequency in Hz									
	31.5	63	125	250	500	1000	2000	4000	8000
dB	79	69	73	73	72	71	67	73	74

11. The maximum noise from the six heat recovery units combined must not exceed an A-weighted sound level of 60 dBA at 25 feet outside the auxiliary building. The six heat recovery units combined must have maximum octave band sound pressure levels (SPL) as follows:

Six Heat Recovery Units Maximum SPL at 25 feet in dB									
Octave Band Center Frequency in Hz									
	31.5	63	125	250	500	1000	2000	4000	8000
dB	69	65	64	61	52	53	49	53	50

12. The maximum A-weighted sound level from each silenced unit blowdown vent must not exceed 60 dBA at 50 feet.
13. The remodeled exhaust pipe of the Unit 4 Solar Taurus Model 70 turbine must be internally lined or acoustically insulated from the compressor building wall to the exhaust muffler flange (including expansion joints). The maximum A-weighted sound level from the remodeled exhaust pipe of the Unit 4 turbine must not exceed 63 dBA at 3 feet.
14. The Borger Station auxiliary building additional overhead equipment door must be an insulated, metal doors with full weather-stripping.
15. The maximum A-weighted sound level from the glycol heating boiler must not exceed 75 dBA at 3 ft inside the auxiliary building.
16. The maximum A-weighted sound level from the glycol heating boiler exhaust must not exceed 65 dBA at 3 feet outside the auxiliary building.

2.3 PREDICTED STATION SOUND LEVELS

The octave band sound pressure levels and A-weighted sound levels predicted at the nearest NSA (S11) approximately 930 feet west from the station are shown in Table 1.0. Sheets 1 and 2 of this table present the calculations that predict the sound levels from the installation of the two Solar Centaur 50 compressor units (Units 5 and 6) and additional station modifications. Detailed line item descriptions are presented on Sheets 3 through 6 of this table. The attached noise control analysis for this new equipment indicates a predicted continuous L_{eq} sound level of 34 dBA at the nearest NSA with a corresponding L_{dn} sound level of 40.4 dBA. At the NSAs approximately 1200 to 4450 feet from the station, the L_{eq} sound levels are predicted to range from 17 to 32 dBA, with corresponding L_{dn} sound levels ranging from 23.4 to 38.4 dBA.

Table 2.0 presents the sound levels at the NSAs. Shown are:

- the baseline full station L_{dn} sound levels measured on 1 December 2017,
- the Unit 4, three microturbines, and station discharge gas cooler L_{dn} sound levels measured on 13 January 2020,
- the predicted L_{dn} sound levels from the two Solar Centaur 50 compressor units (Units 5 and 6) and additional station modifications,

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- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the two Solar Centaur 50 compressor units (Units 5 and 6) and additional station modifications with the Unit 4, three microturbines, and station discharge gas cooler L_{dn} sound levels,
- the predicted increase in the baseline full station L_{dn} sound levels due to the installation of the two Solar Centaur 50 compressor units (Units 5 and 6) and additional station modifications.

At the NSAs, the predicted total L_{dn} sound levels range from 38.9 to 50.2 dBA. These total L_{dn} sound levels are below the FERC requirement of 55 dBA at all the NSAs around the station. Comparison of these total L_{dn} sound levels with the baseline L_{dn} sound levels show reductions ranging from 0.8 to 4.3 dBA at the NSAs.

Sincerely yours,
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William E. Biker
Principal Engineer
Noise and Vibration Control

TABLE 1.0

COMPONENT NOISE ANALYSIS FOR BORGER COMPRESSOR STATION

Sound Pressure Levels (SPL) in dB re 20 microPa
 Sound Power Levels (PWL) in dB re 10⁻¹² watts

Description*	OCTAVE BAND CENTER FREQUENCIES IN Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
1. SPL	86	88	88	87	94	88	82	70	61
2. + DT	32	32	32	32	32	32	32	32	32
3. = PWL	118	120	120	119	126	120	114	102	93
4. - DIL	11	19	27	35	48	44	39	28	21
5. = PWL	107	101	93	84	78	76	75	74	72
6. SPL	75	81	87	88	89	91	94	118	110
7. + DT	32	32	32	32	32	32	32	32	32
8. = PWL	107	113	119	120	121	123	126	150	142
9. - DIL	3	15	29	39	46	50	54	79	73
10. = PWL	104	98	90	81	75	73	72	71	69
11. SPL	81	81	84	86	86	81	79	78	79
12. + DT	32	32	32	32	32	32	32	32	32
13. = PWL	113	113	116	118	118	113	111	110	111
14. - TL	9	14	22	32	36	36	37	37	37
15. = PWL	104	99	94	86	82	77	74	73	74
16. SPL	92	89	79	71	64	60	55	54	54
17. + DT	8	8	8	8	8	8	8	8	8
18. = PWL	100	97	87	79	72	68	63	62	62
19. SPL	101	98	100	101	101	96	94	93	95
20. + AT	1	1	1	1	1	1	1	1	1
21. = PWL	102	99	101	102	102	97	95	94	96
22. - DIL	4	12	20	23	42	48	45	38	21
23. = PWL	98	87	81	79	60	49	50	56	75

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TABLE 1.0 (cont.)
 COMPONENT NOISE ANALYSIS FOR BORGER COMPRESSOR STATION

Sheet 2 of 6

Sound Pressure Levels (SPL) in dB re 20 microPa
 Sound Power Levels (PWL) in dB re 10⁻¹² watts

Description*	OCTAVE BAND CENTER FREQUENCIES IN Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
24. SPL	101	98	100	101	101	96	94	93	95
25. + AT	4	4	4	4	4	4	4	4	4
26. = PWL	105	102	104	105	105	100	98	97	99
27. - DIL	3	9	17	25	39	46	45	40	25
28. = PWL	102	93	87	80	66	54	53	57	74
29. SPL	54	61	58	51	46	43	39	35	30
30. + DT	32	32	32	32	32	32	32	32	32
31. = PWL	86	93	90	83	78	75	71	67	62
32. = PWL	111	106	99	91	85	82	80	78	80
33. + NF	3	3	3	3	3	3	3	3	3
34. = PWL	114	109	102	94	88	85	83	81	83
35. SPL	79	69	73	73	72	71	67	73	74
36. + DT	18	18	18	18	18	18	18	18	18
37. = PWL	97	87	91	91	90	89	85	91	92
38. + NF	5	5	5	5	5	5	5	5	5
39. = PWL	102	92	96	96	95	94	90	96	97
40. - TL	5	13	18	22	26	30	30	30	34
41. = PWL	97	79	78	74	69	64	60	66	63
42. SPL	69	65	64	61	52	53	49	53	50
43. + DT	26	26	26	26	26	26	26	26	26
44. = PWL	95	91	90	87	78	79	75	79	76
45. PWL	114	109	102	95	89	86	83	83	84
46. - DT	58	58	58	58	58	60	62	67	74
47. = SPL 34 dBA	56	51	44	37	31	26	21	16	10
48. L _{dn} 40.4 dBA									

* Detailed Line Item Descriptions are listed on Sheets 3 through 6.

TABLE 1.0 (cont.)

Detailed Line Item Descriptions
To Support Noise Analysis on Sheets 1 and 2

1. Unmuffled exhaust sound pressure levels (SPL) at 50 feet and 90 degrees to stack axis of one (1) Solar Centaur Model 50 turbine. These data were supplied by Solar Turbines Incorporated.
2. Distance Term (DT) to convert turbine exhaust SPL at 50 feet to turbine exhaust sound power levels (PWL) of one (1) Solar Centaur Model 50 turbine.
3. Unmuffled exhaust PWL of one (1) Solar Centaur Model 50 turbine.
4. Specified Dynamic Insertion Loss (DIL) of the turbine exhaust muffler (Noise Control Measure/Specification No. 1).
5. Muffled exhaust PWL of one (1) Solar Centaur Model 50 turbine: result of lines 1 through 4.
6. Unmuffled intake SPL at 50 feet of one (1) Solar Centaur Model 50 turbine. These data were supplied by Solar Turbines Incorporated.
7. Distance Term (DT) to convert turbine intake SPL at 50 feet to turbine intake PWL of one (1) Solar Centaur Model 50 turbine.
8. Unmuffled intake PWL of one (1) Solar Centaur Model 50 turbine.
9. Specified Dynamic Insertion Loss (DIL) of the turbine intake air cleaner/silencer (Noise Control Measure/Specification No. 3).
10. Muffled intake PWL of one (1) Solar Centaur Model 50 turbine: result of lines 6 through 9.
11. Casing SPL at 50 feet of one (1) Solar Centaur Model 50 turbine. These data were supplied by Solar Turbines Incorporated.
12. Distance Term (DT) to convert turbine casing SPL at 50 feet to turbine casing PWL of one (1) Solar Centaur Model 50 turbine.
13. Casing PWL of one (1) Solar Centaur Model 50 turbine.

TABLE 1.0 (cont.)

Detailed Line Item Descriptions
To Support Noise Analysis on Sheets 1 and 2

14. Composite sound transmission loss (TL) of the Unit 5 and Unit 6 compressor building walls, roof and doors using the specified STC 49 wall and roof panels, the specified STC 30 personnel doors and the specified equipment doors (Noise Control Measures/ Specifications Nos. 5, 6, and 7).
15. PWL of Unit 5 and Unit 6 compressor buildings radiated casing noise from one (1) Solar Centaur Model 50 turbine: result of lines 11 through 14.
16. Specified maximum SPL at three (3) feet for one (1) air handling unit (Noise Control Measure/Specification No. 8A).
17. Distance Term (DT) to convert maximum air handling unit SPL at three (3) feet to PWL.
18. PWL of one (1) air handling unit: result of lines 16 and 17.
19. SPL calculated at the walls of each of the Unit 5 and Unit 6 compressor buildings with one (1) Solar Centaur Model 50 turbine operating in each building. This is based upon the amount of sound absorption provided by the compressor building walls and roof, and upon the distance from each compressor unit to the walls of each compressor building.
20. Conversion of SPL in line 19 to represent the PWL of turbine casing noise at the one (1) air handling unit penetration in each of the Unit 5 and Unit 6 compressor building walls.
21. PWL of the turbine casing noise at the one (1) air handling unit penetration in each of the Unit 5 and Unit 6 compressor building walls.
22. Specified Dynamic Insertion Loss (DIL) of each air handling unit muffler (Noise Control Measure/Specification No. 8B).
23. PWL of the turbine casing noise at the one (1) air handling unit penetration in each of the Unit 5 and Unit 6 compressor building walls with mufflers: result of lines 19 through 22.
24. SPL calculated at the walls of each of the Unit 5 and Unit 6 compressor buildings with one (1) Solar Centaur Model 50 turbine operating in each building. This is based upon the amount of sound absorption provided by the compressor building walls and roof, and upon the distance from each compressor unit to the walls of the compressor building.
25. Conversion of SPL in line 24 to represent the PWL of the turbine casing noise at the one (1) air discharge louver opening in the walls of each of the Unit 5 and Unit 6 compressor buildings.

TABLE 1.0 (cont.)

Detailed Line Item Descriptions
To Support Noise Analysis on Sheets 1 and 2

26. PWL of the turbine casing noise from one (1) Solar Centaur Model 50 at the one (1) air discharge louver opening in the walls of each of the Unit 5 and Unit 6 compressor buildings.
27. Specified Dynamic Insertion Loss (DIL) of each louver opening muffler (Noise Control Measure/Specification No. 8C).
28. PWL of the turbine casing noise at the one (1) air discharge louver opening in the walls of each of the Unit 5 and Unit 6 compressor buildings with mufflers: result of lines 24 through 27.
29. Specified maximum SPL at 50 feet of one (1) lube oil cooler with the fan(s) running at full speed (Noise Control Measure/Specification No. 9)
30. Distance Term (DT) to convert maximum lube oil cooler SPL at 50 feet to PWL.
31. PWL of one (1) lube oil cooler with the fan(s) running at maximum speed: result of lines 29 and 30.
32. PWL of one (1) Solar Centaur Model 50 turbine, one (1) air handling unit, one (1) air discharge louver opening in one (1) compressor building and one (1) lube oil cooler: logarithmic sum of lines 5, 10, 15, 18, 23, 28, and 31.
33. Number Factor (NF) to account for two (2) compressor buildings each with one (1) Solar Centaur Model 50 turbine, one (1) air handling unit, one (1) air discharge louver opening in the compressor building and one (1) lube oil cooler.
34. Total PWL of two (2) compressor buildings each with one (1) Solar Centaur Model 50 turbine, one (1) air handling unit, one (1) air discharge louver opening in the compressor building and one (1) lube oil cooler: result of lines 32 and 33.
35. Specified maximum SPL at 10 feet from one (1) microturbine (Noise Control Measure/Specification No. 10).
36. Distance Term (DT) to convert maximum microturbine SPL at 10 feet to PWL.
37. PWL of one (1) microturbine.
38. Number factor (NF) to account for three (3) microturbines.
39. PWL of three (3) microturbines.

TABLE 1.0 (cont.)

Detailed Line Item Descriptions
To Support Noise Analysis on Sheets 1 and 2

40. Composite sound transmission loss (TL) of the auxiliary building walls, windows, roof and doors.
41. PWL of three (3) microturbines: result of lines 35 through 40.
42. Specified maximum SPL at 25 feet from six (6) heat recovery units (Noise Control Measure/Specification No. 11).
43. Distance Term (DT) to convert maximum heat recovery units SPL at 25 ft to PWL.
44. PWL of six (6) heat recovery units: result of lines 42 and 43.
45. Total PWL of two (2) compressor buildings each with one (1) Solar Centaur Model 50 turbine, one (1) air handling unit, one (1) louver opening in the compressor building and one (1) lube oil cooler; and three (3) microturbines, six (6) heat recovery units and the remodeled Unit 4 exhaust system: logarithmic sum of lines 34, 41, and 44.
46. Distance Term (DT) to convert total PWL to SPL at the nearest NSA (S11) 930 feet west of two (2) compressor buildings each with one (1) Solar Centaur Model 50 turbine, one (1) air handling unit, one (1) louver opening in the compressor building and one (1) lube oil cooler; and three (3) microturbines, six (6) heat recovery units and the remodeled Unit 4 exhaust system.
47. Total SPL (L_{eq}) at the nearest NSA (S11) 930 feet west of two (2) compressor buildings each with one (1) Solar Centaur Model 50 turbine, one (1) air handling unit, one (1) louver opening in the compressor building and one (1) lube oil cooler; and three (3) microturbines, six (6) heat recovery units and remodeled Unit 4 exhaust system.
48. Day-night sound level (L_{dn}) at the nearest NSA (S11) 930 feet west of two (2) compressor buildings each with one (1) Solar Centaur Model 50 turbine, one (1) air handling unit, one (1) louver opening in the compressor building and one (1) lube oil cooler; and three (3) microturbines, six (6) heat recovery units and the remodeled Unit 4 exhaust system.

TABLE 2.0

Sheet 1 of 2

**NOISE QUALITY ANALYSIS FOR THE
BORGER COMPRESSOR STATION**

Baseline Full Station Sound Levels, Unit 4 Sound Levels, Predicted Sound Levels
from the New Equipment, and Predicted Total Sound Levels

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Baseline L _{dn} ⁽¹⁾	Unit 4 L _{dn} ⁽²⁾	Predicted L _{dn} ⁽³⁾	Total L _{dn} ⁽⁴⁾	Noise ⁽⁵⁾ Increase
P1. Prop. Line	615 ft SW	53.5	51.3	44.4	52.1	-1.4
P2. Prop. Line	650 ft WSW	58.8	50.7	44.4	51.6	-7.2
P3. Prop. Line	400 ft NW	64.7	61.4	49.4	61.7	-3.0
P4. Prop. Line	800 ft E	53.9	49.5	42.4	50.3	-3.6
S1. Residence	4200 ft NNE	43.2	38.8	23.4	38.9	-4.3
S2. Residence	1300 ft E	46.7	42.3	37.4	43.5	-3.2
S3. Residence	3400 ft SSE	44.4	40.0	26.4	40.2	-4.2
S4. Co. House	400 ft SSW	65.0	58.7	49.4	59.2	-5.8
S5. Co. House	550 ft WSW	64.9	58.7	46.4	59.0	-5.9
S6. Co. House	600 ft WSW	62.2	56.4	45.4	56.7	-5.5
S7. Residence	4450 ft SSW	45.7	43.5	23.4	43.5	-2.2
S8. Residence	3400 ft SW	48.2	46.0	26.4	46.0	-2.2
S9. Residence	2500 ft WSW	46.0	43.8	30.4	44.0	-2.0
S10. Residence	1200 ft WSW	52.7	49.9	38.4	50.2	-2.5
S11. Residence	930 ft W	50.8	49.5	40.4	50.0	-0.8
S12. Residence	1350 ft NW	44.1	40.8	36.4	42.1	-2.0
S13. Residence	1700 ft NW	42.9	39.6	34.4	40.7	-2.2

TABLE 2.0

Sheet 2 of 2

**NOISE QUALITY ANALYSIS FOR THE
BORGER COMPRESSOR STATION**

- (1) The baseline full station sound survey measurements were conducted at the property lines, NSAs, and company houses on 1 December 2017 with Units 2 through 4 operating at an average of 92% of full rated load. This sound survey was the post installation sound survey for the two station discharge gas coolers that were installed for the New Market Project and was reported in ENC Report No. 585: Post Installation Sound Survey at the Borger Compressor Station. The Borger Compressor Station was audible at the property lines, company houses, and NSAs S2, S3, S10, and S11. The weather conditions were a temperature of 39 degrees F, a relative humidity of 60%, cloudy skies, and light southwest winds (2 to 4 mph) changing to light northwest winds (2 to 5 mph).
- (2) The sound survey of Unit 4, three microturbines, and the two station discharge gas coolers was conducted at the property lines, NSAs, and company house on 13 January 2020 to represent the sound levels of the existing station equipment that will remain after installation of Units 5 and 6 and the abandoning in place of Units 2 and 3. Unit 4 was operating at an average of 99% of full rated load. The Borger Compressor Station was audible at the property lines, company houses, and NSAs S2 and S9 through S13. The weather conditions were a temperature of 36 degrees F, a relative humidity of 65% increasing to 70%, cloudy skies, and west winds (3 to 9 mph). The measured sound levels at NSAs S1 through S3, S7 through S9, S12, and S13 were corrected to remove contributions from birds and wind blowing in the trees.
- (3) Predicted L_{dn} sound levels of two (2) compressor buildings each with one (1) Solar Centaur Model 50 turbine, one (1) air handling unit, one (1) air discharge louver opening in the compressor building and one (1) lube oil cooler, and additional station modifications with Noise Control Measures/Specifications Nos. 1 through 16 installed.
- (4) Predicted total $L_{dn} = 10 \log (10^{(\text{Unit 4 } L_{dn} / 10)} + 10^{(\text{Predicted } L_{dn} / 10)})$.
- (5) Predicted increase of baseline full station L_{dn} sound levels due to the addition of two (2) compressor buildings each with one (1) Solar Centaur Model 50 turbine, one (1) air handling unit, one (1) air discharge louver opening in the compressor building and one (1) lube oil cooler, and additional station modifications at the Borger Compressor Station.

ENVIRONMENTAL NOISE CONTROL

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Figure 1: Borger Compressor Station Sound Survey Measurement Locations

