



1250 West Century Avenue
Mailing Address:
P.O. Box 5601
Bismarck, ND 58506-5601
(701) 530-1600

August 4, 2022

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, D.C. 20426

Re: WBI Energy Transmission, Inc.
Docket Nos. CP20-52-000, CP20-52-001
North Bakken Expansion Project
Post-construction Noise Surveys

Dear Ms. Bose:

On April 1, 2022, WBI Energy Transmission, Inc. (WBI Energy) filed an interim noise survey for its Tioga and Elkhorn Creek Compressor Stations in accordance with Environmental Condition Nos. 18 and 19 of the Appendix to the Federal Energy Regulatory Commission's (FERC or Commission) June 1, 2021 Order Issuing Certificate in the above-referenced dockets. WBI Energy indicated in the filing, in accordance with the Environmental Conditions noted above, that it would complete a second noise survey for each station and file the results within six months of in-service, or by August 1, 2022.

On July 12 and 13, 2022, a second post-construction noise survey was completed for each station. However, due to a data failure with one of the analyzers used to measure sound pressure levels, WBI Energy had incomplete data and was unable to report the results of the survey. On July 25, 2022, FERC staff verbally granted WBI Energy a one-week extension to file the required post-construction noise survey results and WBI Energy filed an update in the above-referenced dockets indicating it would file the required noise survey by August 5, 2022.

WBI Energy is herein filing a full-load post construction noise survey conducted on July 27, 2022 for the Elkhorn Creek Compressor Station and a second interim post construction noise survey conducted on July 26, 2022 for the modified Tioga Compressor Station. Please see the Post-Construction Noise Survey Report and the associated appendices for the survey results.

WBI Energy hereby requests a one-year extension of time to submit a full-load noise survey for the modified Tioga Compressor Station as WBI Energy did not achieve full-load conditions during the survey conducted on July 26, 2022. WBI Energy does not anticipate pipeline conditions will necessitate operation of the Tioga Compressor Station at full load capacity for the foreseeable future. Due to the coordination efforts required to fully load the station and to limit operation of compressor units for survey and testing purposes to the extent possible, WBI Energy is proposing to conduct a full-load noise survey for the Tioga Compressor Station in conjunction with required emissions testing to be performed in 2023. For these reasons, WBI Energy respectfully requests an extension until August 1, 2023, to submit a full-load post construction noise survey for the Tioga Compressor Station.

Should you have any questions or comments regarding this filing, please call the undersigned at (701) 530-1563.

Sincerely,

/s/ Lori Myerchin

Lori Myerchin
Director, Regulatory Affairs and
Transportation Services

Attachment

Courtesy Copies:

Dawn Ramsey, FERC Environmental Project Manager (via email)
Shannon Crosley, FERC Environmental Deputy Project Manager (via email)
Official Service List



WBI ENERGY TRANSMISSION, INC.

North Bakken Expansion Project

Post-Construction Noise Survey and Acoustical Analysis

**Docket Nos.
CP20-52-000
CP20-52-001**

August 2022

August 2022

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**WBI Energy Transmission, Inc.
North Bakken Expansion Project
Post-Construction Noise Survey Report
McKenzie and Williams Counties, North Dakota**

1.0 INTRODUCTION

Between July 26 and 27, 2022, Environmental Resources Management, Inc. (ERM) conducted post-construction noise surveys at select sites located near Noise Sensitive Areas (NSAs) adjacent to WBI Energy Transmission, Inc.'s. (WBI Energy) North Bakken Expansion Project (Project) located in northwest North Dakota (see Figures 1 and 2 in Appendix A). This report presents the results of the post-construction noise surveys.

The Project involved the construction and operation of a new 3,750 horsepower compressor station (Elkhorn Creek Compressor Station) at the new interconnect in McKenzie County; as well as the addition of 11,250 horsepower to the existing compressor station (Tioga Compressor Station) in Williams County. The Federal Energy Regulatory Commission (FERC) included the following Environmental Conditions in the Project Order related to operation of the compressor stations:

- *Environmental Condition 18: WBI Energy shall file a noise survey with the Secretary **no later than 60 days** after placing the authorized units at the modified Tioga Compressor Station in service. If a full-load condition noise survey is not possible, WBI Energy shall provide an interim survey at the maximum possible horsepower load and provide the full-load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at the Tioga Compressor Station under interim or full horsepower load conditions exceeds an Ldn of 55 dBA at any nearby NSAs, WBI Energy shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in- service date. WBI Energy shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. (Section B.8.2)*
- *Environmental Condition 19: WBI Energy shall file a noise survey with the Secretary **no later than 60 days** after placing the Elkhorn Creek Compressor Station in service. If a full-load condition noise survey is not possible, WBI Energy shall provide an interim survey at the maximum possible horsepower load and provide the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at the Elkhorn Creek Compressor Station under interim or full horsepower load conditions exceeds an Ldn of 55 dBA at any nearby NSAs, WBI Energy shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. WBI Energy shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. (Section B.8.2)*

The additional units at the Tioga Compressor Station and the new Elkhorn Creek Compressor Station were placed into service on February 1, 2022. The purpose of this noise survey was to measure noise levels at existing NSAs near the two operational compressor stations and evaluate compliance with FERC's noise criteria of 55 dBA L_{dn} .

An interim post-construction noise survey was completed in March 2022, the results of which were reported to FERC on April 1, 2022 under accession number 20220401-5071. Because WBI was unable to reach full load capacity for the Tioga and Elkhorn Creek Compressor Stations during the March 2022 noise survey, a follow-up survey was scheduled within 6 months of placing the units into service. ERM initially collected post-construction noise data on July 12 and 13, 2022; however, due to data failure, WBI Energy was unable to report the results of this survey. On July 25, 2022, FERC staff verbally granted a 1-week extension of the August 1, 2022 deadline to complete a full-load survey and WBI Energy submitted an update under accession number 20220726-5129 indicating it would file the required noise survey by August 5, 2022. The results of the noise survey completed on July 26 and 27, 2022 at the Tioga and Elkhorn Creek Compressor Stations, respectively, are provided below.

2.0 NOISE SURVEY METHODS AND LOCATIONS

2.1 Noise Measurement Equipment and Methodology

Sound pressure levels were measured using two Casella – CEL 633 hand-held analyzers (Serial numbers 1239532 and 1367992) equipped with an internal microphone with a windscreen. Field calibration was performed before and after monitoring using a Casella – CEL calibrator (Serial numbers 5060609 and 490297) (see Appendix B for calibration certificate). All equipment has current certificate of calibration from the manufacturer. Sound measurements were recorded at 1-second intervals for a period of one hour during daytime (7:00 am to 10:00 pm) measurements and 15 minutes during nighttime (10:00 pm to 7:00 am) measurements. An additional 30 minutes of near-field sound data was collected from each compressor station to verify sound contribution from the operation of the compressor station at the nearby NSAs.

For quality control purposes, instantaneous sound pressure levels were also recorded manually every 15 minutes. Unweighted octave band center and an A-weighted time-equivalent sound pressure levels (L_{eq}) were measured on both slow and fast response with the sound level meter set at a height of approximately 4 feet above ground level.

2.2 Location Descriptions

2.2.1 Compressor Stations

The Elkhorn Creek Compressor Station is located in McKenzie County, North Dakota approximately 9 miles southeast of Watford City. The nearest NSAs to the approximate center of the compressor station site are:

NSA #1: Residence located on County Road 34, approximately 4,253 feet to the southwest;

NSA #2: Residence located on 125th Avenue Northwest, approximately 3,465 feet to the east;

NSA #3: Residence located on 125th Avenue Northwest, approximately 3,895 feet to the northeast.

During the field visit, ERM staff confirmed that no new NSAs had been added since the completion of the pre-construction noise survey. The locations of the NSAs associated with the Elkhorn Creek Compressor Station are provided on Figure 1 in Appendix A.

The Tioga Compressor station is located in Williams County, North Dakota, approximately one mile east of Tioga and one mile north of the Tioga Municipal Airport. The nearest NSAs to the approximate center of the existing Tioga compressor station site are:

NSA #1: Residence located on 69th Street Northwest, approximately 3,974 feet to the north;

NSA #2: Residence located on 102nd Avenue Northwest, approximately 4,076 feet to the northeast;

NSA #3: Residence located on 102nd Avenue Northwest, approximately 4,920 feet to the east;

NSA #4: Residence located on County Highway 10, approximately 2,221 feet to the east;

NSA #5: Residence located on County Highway 10, approximately 4,940 feet to the southeast;

NSA #6: Residence located on State Highway 40, approximately 5,229 feet to the west; and

NSA #7: Residence located on State Highway 40, approximately 4,862 feet to the northwest.

During the field visit, ERM staff confirmed that no new NSAs had been added since the completion of the pre-construction noise survey. The locations of the NSAs associated with the Tioga Compressor Station are provided on Figure 2 in Appendix A.

Noise monitoring locations for the post-construction noise survey were consistent with monitoring locations used during the pre-construction noise survey. Near-field data was collected from the Elkhorn Creek and Tioga compressor stations to verify operational sound levels associated with the two compressor stations.

2.3 Weather Conditions During the Noise Survey

The weather conditions for the survey period are summarized in table 1 and included on the Field Monitoring Forms attached as Appendix C.

TABLE 1			
Summary of Weather Conditions during Field Survey			
Condition	Minimum	Maximum	Average
Elkhorn Creek Compressor Station			
Temperature °F	54	66	60
Relative Humidity %	64	100	82
Wind Direction	--	--	SW to NW
Wind Speed (miles per hour)	Calm	12	6
Barometric Pressure in. Hg	30.00	30.03	30.01
Tioga Compressor Station			
Temperature °F	55	66	60
Relative Humidity %	78	100	89
Wind Direction	--	--	NW
Wind Speed (miles per hour)	5	12	8.2
Barometric Pressure in. Hg	29.99	30.03	30.01

3.0 NOISE REGULATIONS

In 1974, the U.S. Environmental Protection Agency (EPA) published its document entitled “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. As set forth in that publication, 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 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 a 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}).

The Elkhorn Creek and Tioga Compressor Stations must 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 an L_{dn} of 55 dBA at any pre-existing NSAs 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)).

North Dakota does not have noise regulations that apply to the compressor stations. The state regulates noise using public nuisance laws, but does not impose NSA property-line decibel noise limits for new facilities.

McKenzie County does not have any pertinent noise regulations regarding the Elkhorn Creek Compressor Station.

Williams County maintains the following general noise regulations that would pertain to the Tioga Compressor Station:

1) Maximum Noise Standards by District

Zone of Property Receiving Noise	Maximum Noise Level dB
Residential Districts: Urban Residential (UR), Rural Residential (RR)	60
Commercial Districts: Urban Commercial (UC), Rural Commercial (RC)	65
Industrial Districts: Light Industrial (LI), Heavy Industrial (HI)	70
Planned Development:	PUD In accordance with base district

2) Duration and Timing

The noise standards above shall be modified as follows to account for the effects of time and duration on the impact of noise levels:

- a. In the UR and RR districts, the noise standards shall be 5 dB lower between 10:00 p.m. and 7:00 a.m.
- b. Noise that is produced for no more than a cumulative period of five minutes in any hour may exceed the standards above by 10 dB (Williams County, 2015).

ERM previously established that the Williams County noise regulation is less strict than FERC regulations; therefore, compliance with the FERC standard is sufficient to demonstrate compliance with Williams County noise regulations.

4.0 NOISE SURVEY RESULTS AND ACOUSTICAL ANALYSIS

Elkhorn Creek Compression Station

The Elkhorn Creek Compressor Station was operating at 99% capacity during the post-construction noise survey completed on July 27, 2022. The results of the operational sound level analysis for the Elkhorn Creek Compressor Station are summarized in Table 2. Field notes are included in Appendix C and calculation details are included in Appendix D.

Station and Closest NSA(s)	Distance and Direction of NSA	Pre-Construction Surveyed Ambient L_{dn} (dBA)	Post-Construction Surveyed Ambient L_{dn} (dBA)	Estimated L_{dn} of Station (dBA) at NSA ¹	Observed Increase Above Ambient (dB) ²
NSA 1 (House)	4,253 feet SW	55.6	51.2	42.6	-4.4
NSA 2 (House)	3,465 feet E	41.0	49.0	45.4	8.0
NSA 3 (House)	3,895 feet NE	41.0	49.0	43.8	8.0

¹ Based upon near-field compressor station operational noise data.
² Based upon the observed difference between pre-construction and post-construction surveyed ambient L_{dn} .

Based on the post-construction noise survey, the operational noise of the Elkhorn Creek Compressor Station ranged from 42.6 to 45.4 dBA L_{dn} and was less than 55 dBA L_{dn} at each of the closest NSAs.

Tioga Compressor Station

During the post-construction noise survey completed on July 26, 2022, the existing 750 horsepower (hp) electric unit was operating at 64% capacity and the three new natural gas units totaling 11,250 hp were operating between 83-85% capacity. The results of the operational sound level analysis for the Tioga Compressor Station are summarized in Table 3. Field notes are included in Appendix C and calculation details are included in Appendix D.

Station and Closest NSA(s)	Distance and Direction of NSA	Pre-Construction Surveyed Ambient L _{dn} (dBA)	Post-Construction Surveyed Ambient L _{dn} (dBA)	Estimated L _{dn} of Station (dBA) at NSA ¹	Observed Increase Above Ambient (dB) ²
NSA 1 (House)	3,974 feet N	57.2	59.2	39.0	2.0
NSA 2 (House)	4,076 feet NE	58.2	53.4	38.7	-4.8
NSA 3 (House)	4,920 feet E	54.0	62.1	36.4	8.1
NSA 4 (House)	2,221 feet E	55.6	61.6	46.5	6.0
NSA 5 (House)	4,940 feet SE	54.0	62.1	36.3	8.1
NSA 6 (House)	5,229 feet W	61.3	61.4	35.6	0.1
NSA 7 (House)	4,862 feet NW	61.3	61.4	36.5	0.1

¹ Based upon near-field compressor station operational noise data.
² Based upon the observed difference between pre-construction and post-construction surveyed ambient L_{dn}.

Based on the post-construction noise survey, the operational noise of the expanded Tioga Compressor Station ranged from 35.6 to 46.5 dBA L_{dn} and was less than 55 dBA L_{dn} at each of the closest NSAs.

5.0 ACOUSTICAL ANALYSIS METHODOLOGY

Compressor Stations

Predicted noise contributions due to compressor station operations were estimated based on the near-field operational sound data collected from each operating compressor station, which was then attenuated for distance according to a hemispherical sound propagation model using the following equation:

$$L_{eq, NSA} = L_{w, Facility} - 20 * \log (D_{NSA}) - 0.7$$

Where L_{eq, NSA} is the sound pressure level associated with all equipment at the NSA distance (D_{NSA}) from the compressor station.

The L_{dn} was then calculated for ambient noise measurements and predicted noise contribution of the compressor stations using the following formula:

$$L_{dn} = 10 * \log \left(\frac{15}{24} * 10^{L_{eq, day}/10} + \frac{9}{24} * 10^{(L_{eq, night} + 10)/10} \right)$$

The two L_{dn} values were logarithmically added to obtain the predicted day-night noise level at each NSA while the compressor station is in operation.

Note that attenuation from foliage, obstructions, and atmospheric absorption are not included in the predicted noise levels, but would likely provide additional attenuation of noise in higher frequency ranges.

6.0 CONCLUSION

Based on the measured operational data (see tables 2 and 3), the Elkhorn Creek Compressor Station and expanded Tioga Compressor Station operating at conditions detailed above do not contribute to an exceedance of FERC's 55 dBA L_{dn} noise limit.

7.0 REFERENCES

Federal Energy Regulatory Commission. WBI Energy Transmission, Inc. Docket Nos. CP20-52-000 and CP20-52-001, Order Issuing Certificate for North Bakken Expansion Project. June 1, 2021.

Federal Energy Regulatory Commission. "Guidance Manual for Environmental Report Preparation". February 2017.

Williams County. "Zoning Ordinance and Subdivision Regulations. September 15, 2015.
<https://www.williamsnd.com/usrfiles/dept/122/forms/Zoning%20Ordinance%20and%20Subdivision%20Regulations%20Final.pdf>

NORTH BAKKEN EXPANSION PROJECT

**Post-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota**

**APPENDIX A
Figures**

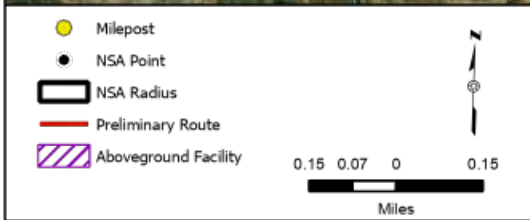


Figure 1
NSAs within 1.0 mile of
Elkhorn Creek Compressor Station
North Bakken Expansion Project
 McKenzie County, North Dakota





Figure 2
NSAs within 1.0 mile of
Tioga Compressor Station
North Bakken Expansion Project
 Williams County, North Dakota



● Milepost
 ● NSA Point
 ○ NSA Radius
 — Preliminary Route
 ▨ Aboveground Facility

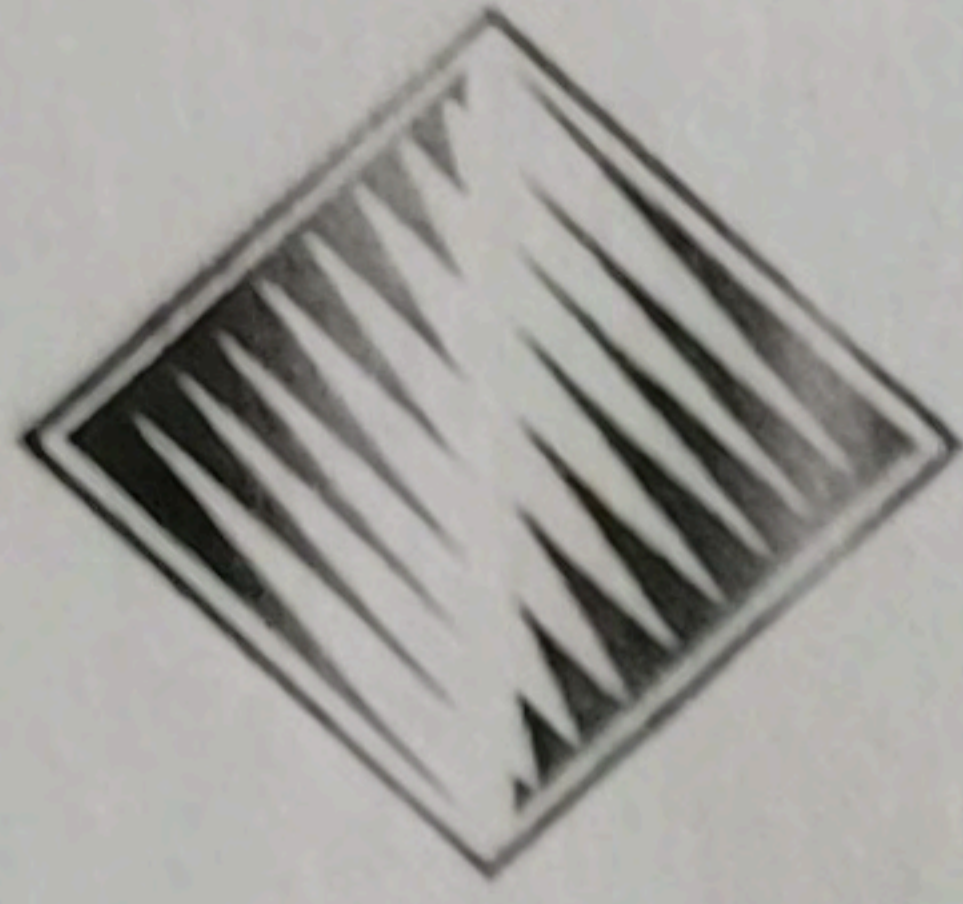
0.15 0.07 0 0.15

Miles

NORTH BAKKEN EXPANSION PROJECT

**Post-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota**

**APPENDIX B
Sound Level Meter Calibration Certificate**



FIELD ENVIRONMENTAL INSTRUMENTS, INC.

www.fieldenvironmental.com

301 Brushton Ave
Suite A
Pittsburgh, PA 15221
Toll Free (800) 393-4009
Local (412) 436-2600
Fax (412) 436-2616

Casella Compliance Certificate

Calibration Pass?

IR Cable Tested?

Old Data Deleted?

Setting Written to Unit?
(N/A for 240 & 633)

350: Battery Charged?
633/240: Spare Alkalines Included?

Model	CEL 633
S/N	1239532
Barcode	U71709X

633 Microphone S/N if applicable	3042.00
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Acoustic Calibrator

Model	CEL Type 1
Serial Number	5060609

Order #	490297
Calibrated By	Megan Grindeland
Date of Calibration	7/8/2022



FIELD ENVIRONMENTAL INSTRUMENTS, INC.

www.fieldenvironmental.com

301 Brushton Ave
Suite A
Pittsburgh, PA 15221
Toll Free (800) 393-4009
Local (412) 436-2600
Fax (412) 436-2616

Casella Compliance Certificate

Calibration Pass?

IR Cable Tested?

Old Data Deleted?

Setting Written to Unit?

(N/A for 240 & 633)

350: Battery Charged?

633/240: Spare Alkalines Included?

Model	CEL 633
S/N	1367992
Barcode	U86164X

633 Microphone S/N if applicable	4813.00
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Acoustic Calibrator

Model

Serial Number

Order #

Calibrated By

Date of Calibration

NORTH BAKKEN EXPANSION PROJECT

**Post-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota**

**APPENDIX C
Field Monitoring Forms**

North



South



East



West





Noise Survey Data Sheet

Location: Tioga CS NSA 1 – Day
(48.416102, -102.907314)

Investigator Name: Jeremy House

Date: 07/26/2022

Meter Manufacturer and Model Number: Casella CEL-63X

Serial Number: 1367992

Calibrator Manufacturer, Model, and dB: Casella, CEL-120/2, 114 dB

Calibrator Serial Number: 5230624

Initial Calibration: 114 dB (started at 116.2 dB, deviation +2.2 dB)

Final Calibration: 114 dB (ended 114.3 dB, deviation +0.3 dB)

Meteorological Conditions

Wind Speed: 8 - 12 mph, Gusts up to 17 mph

Direction: Northwest

Temperature: 59 - 63°F

RH %: 100 - 88%

Barometric Pressure in mmHg: 762.76 mmHg

Predominant noise source(s): Passing cars and trucks, Wind, Birds, Distant traffic, noise from oil well to the northwest

Other noise source(s): 5 pickup trucks/cars and 1 semi-truck passed immediately next to monitor

Time start: 0849

Time end: 0949

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
0903	10.0	23.9	31.3	30.8	26.5	23.7	24.8	23.7	24.4	20.4	15.6	41.1
0918	11.0	24.0	29.9	27.9	23.6	21.0	21.4	22.0	24.4	20.3	15.5	39.3
0933	3.4	16.6	20.9	19.4	16.1	20.7	21.2	27.7	35.4	14.3	4.8	40.6
0948	1.8	15.9	26.7	43.2	40.1	47.9	47.2	39.9	39.3	34.1	18.0	57.1

North



South



East



West



North



South



East



West





Noise Survey Data Sheet

Location: Tioga CS NSA 2 – Day
(48.408438, -102.885868)

Investigator Name: Ally Davis

Date: 07/26/2022

Meter Manufacturer and Model Number: Casella CEL-63X

Serial Number: 1239532

Calibrator Manufacturer, Model, and dB: Casella, CEL-120/1, 114 dB

Calibrator Serial Number: 5060609

Initial Calibration: 114 dB (ended 116.5 dB, deviation +2.5 dB)

Final Calibration: 114 dB (ended 114 dB, deviation 0 dB)

Meteorological Conditions

Wind Speed: 8 - 12 mph

Direction: Northwest

Temperature: 63 - 66°F

RH %: 78 - 88%

Barometric Pressure in mmHg: 762.76 mmHg

Predominant noise source(s): Extremely loud field pump running for the duration of the survey right next to monitoring location (see attached photos)

Other noise source(s): 1 car drove right by the meter, 1 train in distance, birds and wind

Time start: 0950 (shows up incorrectly on meter as 0850)

Time end: 1050 (shows up incorrectly on meter as 0950)

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
1004	3.9	15.2	20.4	27.0	28.7	32.8	39.8	44.0	39.6	30.3	20.8	51.3
1019	2.2	13.7	20.7	28.5	29.3	34.3	41.9	44.0	38.9	28.8	17.0	51.9
1034	7.2	17.9	23.2	27.6	27.7	32.2	39.3	41.4	37.3	28.5	24.4	49.5
1049	7.5	19.8	24.5	28.0	28.0	32.8	40.0	41.3	37.6	29.1	23.4	49.9

North



South



East



West





North



South



East



West







Noise Survey Data Sheet

Location: Tioga CS NSA 3&5 – Day
(48.402277, -102.885672)

Investigator Name: Ally Davis

Date: 07/26/2022

Meter Manufacturer and Model Number: Casella CEL-63X

Serial Number: 1239532

Calibrator Manufacturer, Model, and dB: Casella, CEL-120/1, 114 dB

Calibrator Serial Number: 5060609

Initial Calibration: 114 dB (ended 116.5 dB, deviation +2.5 dB)

Final Calibration: 114 dB (ended 114 dB, deviation 0 dB)

Meteorological Conditions

Wind Speed: 5 - 6 mph

Direction: Southwest, shifted to northwest

Temperature: 59 - 63°F

RH %: 100%

Barometric Pressure in mmHg: 762.76 mmHg

Predominant noise source(s): Compressor station operation, wind, birds, bugs

Other noise source(s): Vehicle traffic noise in distance from adjacent road (4 trucks, and 2 semi-trucks), small prop plane overhead, train passed just to the west of adjacent road

Time start: 0841 (shows up incorrectly on meter as 0750)

Time end: 0941 (shows up incorrectly on meter as 0850)

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
0855	21.7	32.6	36.5	36.4	34.9	36.5	38.5	40.4	35.3	30.4	27.1	50.5
0910	21.7	31.8	40.6	43.4	46.8	51.2	53.1	48.0	40.7	34.8	27.8	61.9
0925	18.5	28.6	32.4	30.9	25.8	24.1	27.9	27.9	28.5	27.8	24.7	43.2
0940	12.0	22.8	27.0	25.4	20.5	24.1	28.3	26.0	28.4	22.9	19.7	40.6







Noise Survey Data Sheet

Location: Tioga CS NSA 4 – Day
(48.401452, -102.893174)

Investigator Name: Ally Davis

Date: 07/26/2022

Meter Manufacturer and Model Number: Casella CEL-63X

Serial Number: 1239532

Calibrator Manufacturer, Model, and dB: Casella, CEL-120/1, 114 dB

Calibrator Serial Number: 5060609

Initial Calibration: 114 dB (ended 116.5 dB, deviation +2.5 dB)

Final Calibration: 114 dB (ended 114.1 dB, deviation +0.1 dB)

Meteorological Conditions

Wind Speed: 8 - 12 mph

Direction: Northwest

Temperature: 55 - 59°F

RH %: 100%

Barometric Pressure in mmHg: 762.25 mmHg

Predominant noise source(s): Compressor station operation, wind, birds, bugs

Other noise source(s): Vehicle traffic noise from 14 cars/trucks and 2 semi-trucks that passed by.

Time start: 0732 (shows up incorrectly on meter as 0632)

Time end: 0832 (shows up incorrectly on meter as 0732)

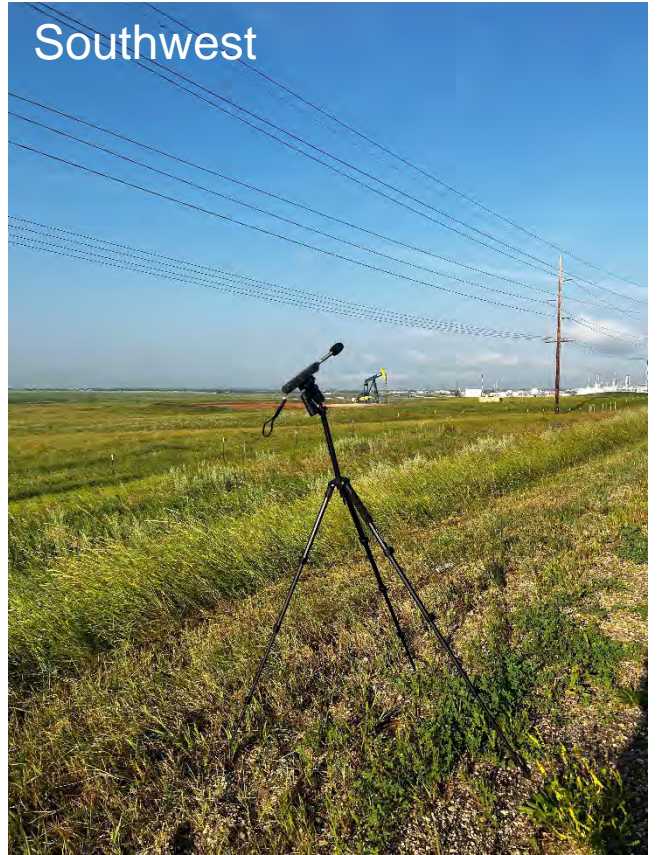
Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
0746	18.9	30.5	36.1	33.9	35.4	35.8	38.2	37.8	31.7	28.1	25.1	49.8
0801	17.2	28.8	34.3	30.8	34.0	36.6	33.1	32.0	29.5	26.6	23.3	47.5
0816	20.4	31.9	40.3	54.9	52.2	57.7	64.1	58.5	50.2	40.8	26.5	71.3
0831	16.4	27.8	33.0	29.0	30.9	34.8	33.0	31.1	28.2	25.9	22.8	46.5

Northeast



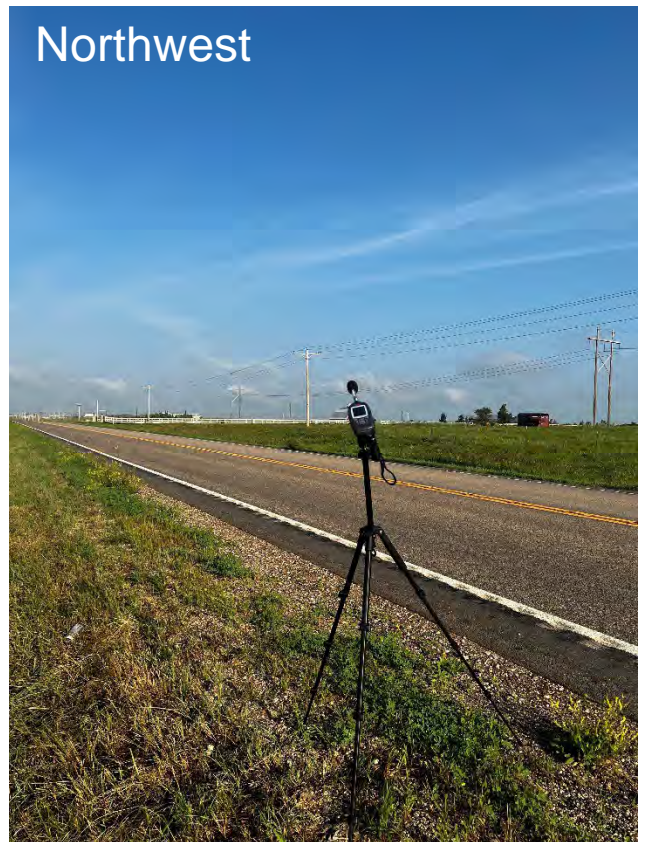
Southwest



Southeast



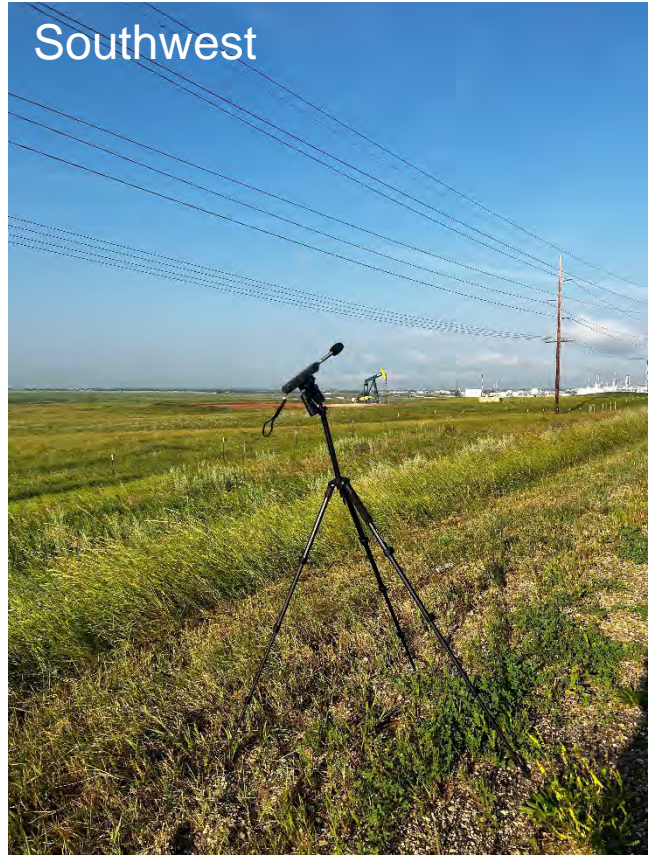
Northwest



Northeast



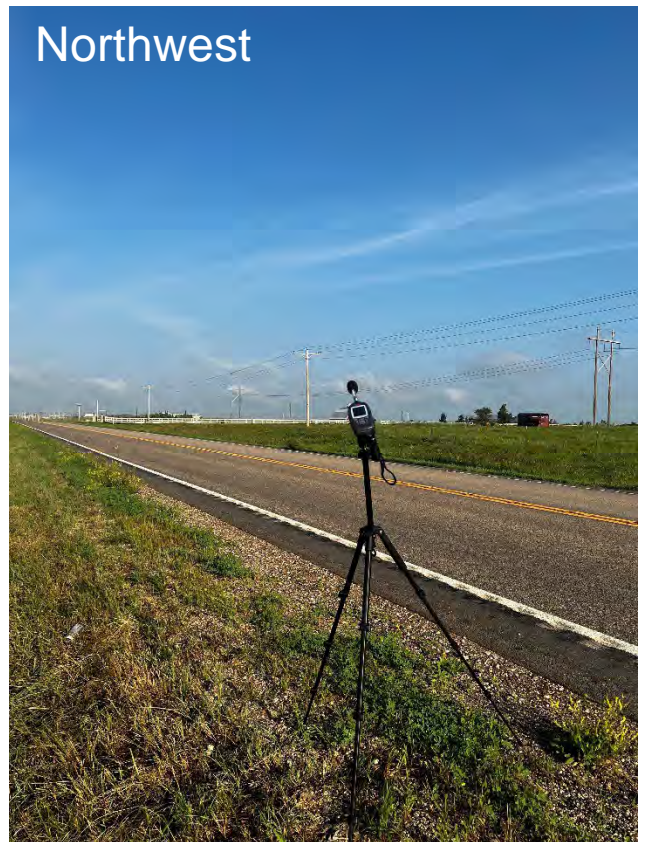
Southwest



Southeast



Northwest





Noise Survey Data Sheet

Location: Tioga CS NSAs 6&7 – Day
(48.408735, -102.928209)

Investigator Name: Jeremy House

Date: 07/26/2022

Meter Manufacturer and Model Number: Casella CEL-63X

Serial Number: 1367992

Calibrator Manufacturer, Model, and dB: Casella, CEL-120/2, 114 dB

Calibrator Serial Number: 5230624

Initial Calibration: 114 dB (started at 116.3 dB, deviation +2.3 dB)

Final Calibration: 114 dB (ended 114.0 dB, deviation 0 dB)

Meteorological Conditions

Wind Speed: 8 - 12 mph

Direction: Northwest

Temperature: 55 - 59°F

RH %: 100%

Barometric Pressure in mmHg: 762.25 mmHg

Predominant noise source(s): Traffic on adjacent road and in the distance,
Wind, Bugs, Birds, distant trains

Other noise source(s): 168 pickup trucks/cars and 37 semi-truck
passed on adjacent road

Time start: 0730

Time end: 0830

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
0744	7.2	19.9	36.1	32.8	37.3	47.5	51.9	47.7	39.6	32.1	12.6	59.5
0759	7.0	20.3	32.2	36.8	44.0	52.4	54.5	49.3	40.8	27.8	10.1	62.3
0814	8.3	21.4	29.1	31.6	33.9	41.9	50.0	45.8	36.2	23.7	11.6	56.7
0829	5.6	16.9	23.9	27.7	28.3	38.6	45.9	40.7	36.7	18.2	6.2	52.4

North



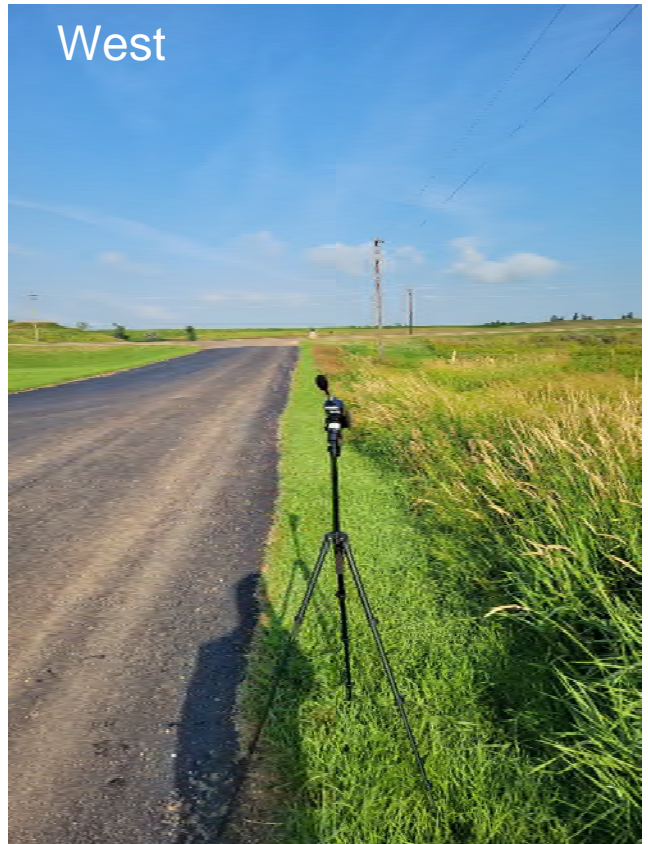
South



East



West



North



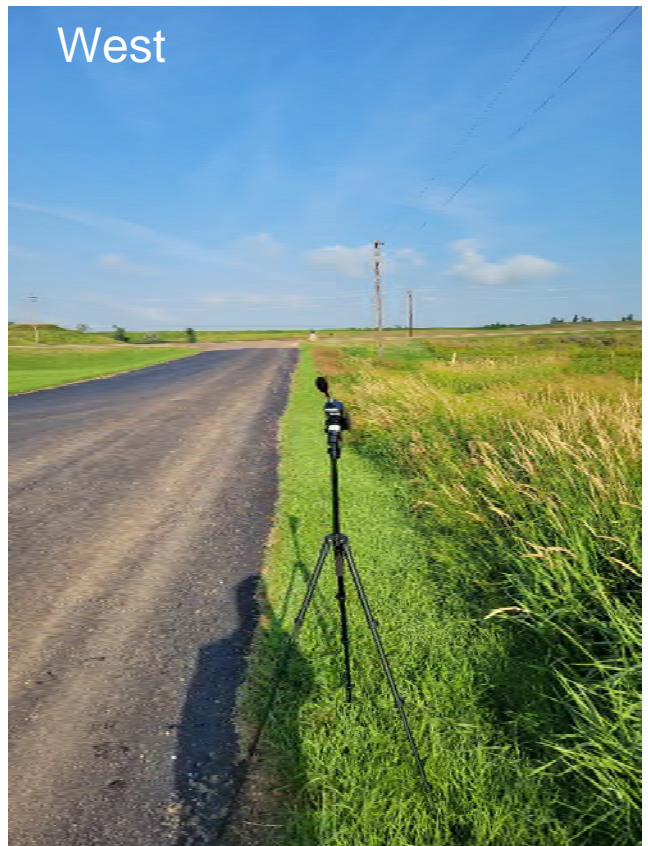
South



East



West



North



South



East



West





Noise Survey Data Sheet

Location: Elkhorn Creek CS NSA 1 – Day
(47.6715275, -103.2380392)

Investigator Name: Jeremy House

Date: 07/27/2022

Meter Manufacturer and Model Number: Casella CEL-63X

Serial Number: 1367992

Calibrator Manufacturer, Model, and dB: Casella, CEL-120/2, 114 dB

Calibrator Serial Number: 5230624

Initial Calibration: 114 dB (started at 116.4 dB, deviation +2.4 dB)

Final Calibration: 114 dB (ended 114.1 dB, deviation +0.1 dB)

Meteorological Conditions

Wind Speed: 0 - 5 mph

Direction: Calm, then west shifting to north

Temperature: 55 - 63°F

RH %: 100 - 77%

Barometric Pressure in mmHg: 762.51 mmHg

Predominant noise source(s): Facility to the north making constant low noise, oil well to the east making a screeching noise every time it is lowered, Minor wind, birds, bugs, cows, traffic

Other noise source(s): 18 pickup trucks/cars (1 passed immediately next to monitor) and 3 semi-trucks passed on adjacent road

Time start: 0731

Time end: 0831

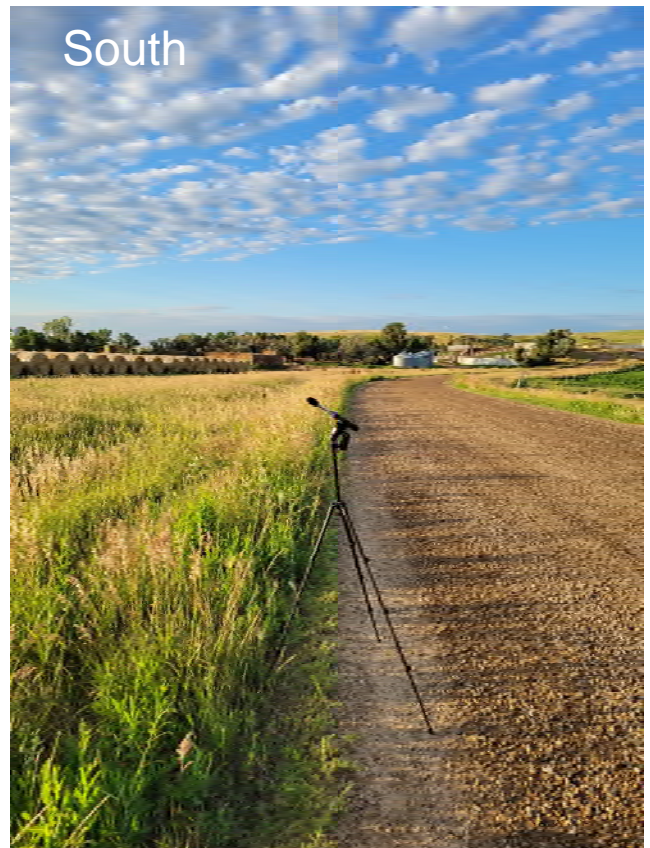
Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
0745	0.0	9.4	25.4	30.5	31.2	27.0	25.3	17.6	17.2	19.8	29.3	41.5
0800	0.0	11.9	22.9	29.6	29.9	33.3	38.7	29.6	26.4	24.6	29.3	47.0
0815	0.0	8.6	29.4	36.5	45.0	43.6	43.6	36.8	27.5	16.1	12.1	54.4
0900	9.7	21.5	26.2	26.6	25.4	22.6	22.5	27.7	21.6	30.2	36.3	45.4

North



South



East



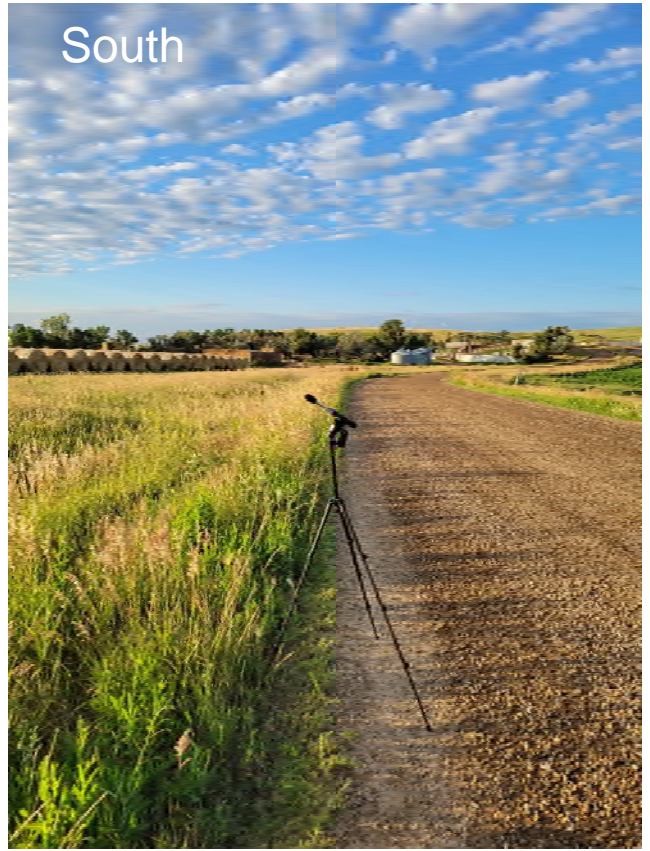
West



North



South



East



West





Noise Survey Data Sheet

Location: Elkhorn CS NSA 2&3 – Day
(47.674509, -103.207512)

Investigator Name: Ally Davis

Date: 07/27/2022

Meter Manufacturer and Model Number: Casella CEL-63X

Serial Number: 1239532

Calibrator Manufacturer, Model, and dB: Casella, CEL-120/1, 114 dB

Calibrator Serial Number: 5060609

Initial Calibration: 114 dB (ended 116.5 dB, deviation +2.5 dB)

Final Calibration: 114 dB (ended 114.1 dB, deviation +0.1 dB)

Meteorological Conditions

Wind Speed: 0 - 5 mph

Direction: West then shifted north

Temperature: 55 - 63°F

RH %: 77 - 100%

Barometric Pressure in mmHg: 762.51 mmHg

Predominant noise source(s): Compressor station operation, vehicle traffic
in the distance, wind, birds, bugs

Other noise source(s): Work truck backup alarm in distance (coming
from station)

Time start: 0735

Time end: 0835

Comments:

Time	Unweighted Sound Pressure Level (dB) at each Octave Band Center Frequency (Hz)											LAeq (dBA)
	16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
0749	4.1	15.4	21.6	19.2	12.6	17.0	26.3	24.6	27.6	16.8	10.7	37.5
0804	0.5	12.1	20.0	18.7	13.2	17.1	22.7	22.1	21.7	10.5	4.4	33.6
0819	0.0	9.5	18.0	16.4	11.1	19.6	21.1	18.3	27.7	11.0	5.7	33.6
0834	1.6	13.6	21.9	21.8	26.5	28.8	32.6	27.9	29.7	21.5	23.2	42.0

North



South



East



West



North



South



East



West



NORTH BAKKEN EXPANSION PROJECT

**Post-Construction Noise Survey and Acoustical Analysis
McKenzie and Williams Counties, North Dakota**

APPENDIX D

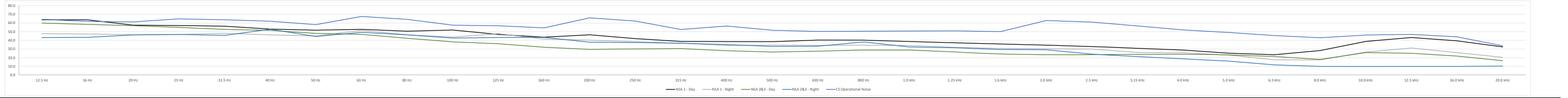
Noise Calculations for Compressor Station Sound Power Levels

Elkhorn Creek Compressor Station Data Summary

Overall Location	LAeq	LAmax	Parameter			
			Lmin	LA10	LA50	LAdn
NSA 1 - Day	48.7	73.6	35	57.1	40.0	51.2
NSA 1 - Night	43.6	60.7	34.7	47.0	36.9	—
NSA 2&3 - Day	37.8	53.8	28.2	41.0	32.1	49.0
NSA 2&3 - Night	43.0	59.2	31.8	46.6	36.9	—
CS Operational Noise (at 280 ft)	68.3	72.0	65.9	69.6	66.9	74.7
CS Contribution at NSA 1	36.2	—	—	—	—	62.6
CS Contribution at NSA 2	39.0	—	—	—	—	45.4
CS Contribution at NSA 3	37.4	—	—	—	—	43.8

* Contribution at receptor calculated according to hemispherical attenuation with distance and atmospheric attenuation according to ISO 9613-1.

1/3 Octaves Leq	Frequency																																	
	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1.0 kHz	1.25 kHz	1.6 kHz	2.0 kHz	2.5 kHz	3.15 kHz	4.0 kHz	5.0 kHz	6.3 kHz	8.0 kHz	10.0 kHz	12.5 kHz	16.0 kHz	20.0 kHz	
NSA 1 - Day	63.8	63.8	57.5	57.2	56.4	53.0	51.7	52.7	50.5	52.0	46.8	43.7	46.5	42.0	38.8	38.6	38.5	40.4	40.3	38.7	37.1	35.9	34.6	32.8	30.8	28.8	25.2	23.4	28.2	38.8	38.8	43.3	39.4	32.5
NSA 1 - Night	47.7	47.4	46.5	46.8	48.1	46.4	45.0	51.6	46.5	43.8	47.7	41.5	40.2	38.5	36.7	34.1	34.5	34.2	34.4	34.1	32.0	30.7	30.3	29.9	26.1	25.7	23.0	17.6	17.5	26.5	31.2	25.9	20.4	—
NSA 2&3 - Day	60.0	58.5	56.9	55.0	52.6	51.5	48.0	46.9	42.4	38.3	36.1	32.0	29.6	30.1	30.5	28.0	26.6	27.5	28.8	28.8	26.7	24.4	23.4	23.5	23.8	24.0	23.2	21.4	18.0	25.8	25.1	21.8	18.6	—
NSA 2&3 - Night	48.2	43.5	46.2	46.8	45.8	42.8	44.5	49.3	46.3	42.6	43.3	37.8	37.5	36.7	35.1	33.0	33.0	32.2	32.2	32.3	31.5	29.4	29.1	28.1	21.3	18.7	16.0	11.7	10.0	9.9	9.9	10.0	10.4	—
CS Operational Noise	64.3	61.9	61.3	64.8	63.8	62.0	58.2	67.6	64.3	57.5	56.9	54.4	66.0	62.3	52.5	56.5	51.6	50.2	50.5	50.7	51.0	50.1	56.2	61.1	56.7	52.1	49.1	45.5	43.0	46.2	46.9	44.0	33.7	—
CS Contribution at NSA 1	40.6	38.3	37.7	41.2	40.1	38.4	34.4	43.9	40.4	33.5	32.7	30.0	41.2	37.1	26.8	30.2	24.7	22.6	22.2	21.4	20.4	17.4	17.2	20.9	9.2	-7.5	-28.1	-60.0	-108.1	-169.8	23.3	20.4	10.1	—
CS Contribution at NSA 2	42.4	40.1	39.5	43.0	41.9	40.2	36.2	45.7	42.2	35.4	34.6	31.9	43.2	39.2	29.0	32.5	27.1	25.2	24.9	24.3	23.6	21.0	31.4	26.0	15.7	1.4	-15.7	-42.0	-81.0	-129.9	25.0	22.2	11.9	—
CS Contribution at NSA 3	41.4	39.0	38.4	42.0	40.9	39.1	35.2	44.6	41.2	34.3	33.5	30.8	42.1	38.0	27.8	31.2	25.7	23.7	23.4	22.7	21.8	19.0	29.1	23.2	12.1	-3.5	-22.5	-51.9	-95.8	-151.7	24.0	21.3	10.9	—



		Contribution at NSA 1																																	
Contributing Measurement		Max																																	
ISO 9613-1, A-weighting	Location	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz	
	F (Hz/atm)	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000	
	a (dB/m)	4.98E-06	8.15E-06	1.27E-05	1.98E-05	3.14E-05	5.04E-05	7.81E-05	1.22E-04	1.94E-04	2.94E-04	4.40E-04	6.71E-04	9.54E-04	1.31E-03	1.74E-03	2.24E-03	2.73E-03	3.27E-03	3.91E-03	4.66E-03	5.71E-03	7.45E-03	9.89E-03	1.36E-02	1.97E-02	2.97E-02	4.42E-02	6.76E-02	1.05E-01	1.59E-01	2.38E-01	3.65E-01	5.24E-01	
	att (dB/ft)	1.52E-06	2.48E-06	3.88E-06	6.05E-06	9.57E-06	1.53E-05	2.38E-05	3.73E-05	5.90E-05	8.96E-05	1.34E-04	2.04E-04	2.91E-04	3.99E-04	5.31E-04	6.82E-04	8.32E-04	9.96E-04	1.19E-03	1.42E-03	1.74E-03	2.27E-03	3.01E-03	4.16E-03	6.01E-03	9.04E-03	1.35E-02	2.06E-02	3.21E-02	4.84E-02	7.24E-02	1.11E-01	1.60E-01	
	Atmospheric Absorption (dB)	0.09	0.15	0.23	0.36	0.53	0.81	1.16	1.59	2.11	2.71	3.30	3.96	4.73	5.65	6.72	7.97	9.42	11.07	12.92	14.97	17.32	20.00	23.02	26.39	30.14	34.28	38.82	43.76	49.10	54.84	60.98	67.52	74.46	
	Distance Attenuation (dB)	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63	23.63
	R(A)	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.04	0.06	0.09	0.12	0.17	0.23	0.29	0.37	0.46	0.55	0.64	0.72	0.81	0.91	1.02	1.14	1.27	1.41	1.56	1.72	1.89	2.07	2.26	2.45	2.65	2.85	3.07
	A-weighting Factor	-63.59	-56.43	-50.39	-44.82	-39.53	-34.54	-30.28	-26.22	-22.40	-18.15	-16.19	-13.24	-10.85	-8.67	-6.64	-4.77	-3.25	-1.91	-0.79	0.00	0.58	0.99	1.20	1.27	1.20	0.96	0.55	-0.12	-1.15	-2.49	-4.25	-6.71	-9.35	
	A-weighted Octave Band	-22.96	-18.15	-12.72	-8.62	0.61	3.84	4.17	17.63	18.00	14.37	16.53	16.72	30.36	28.40	20.16	25.41	21.42	20.72	21.37	21.44	21.00	18.43	28.44	22.20	10.37	-6.52	-27.54	-60.14	-109.25	-172.30	19.00	13.70	0.76	
	10*(LA/10)	0.01	0.02	0.06	0.43	1.15	2.42	2.61	57.95	63.16	27.32	44.03	46.94	1085.24	691.62	103.73	347.31	138.58	118.01	137.21	139.25	126.02	69.61	698.36	166.06	10.88	0.22	0.00	0.00	0.00	0.00	79.44	23.44	1.19	
LAeq	36.22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

		Contribution at NSA 2																																	
Contributing Measurement		Max																																	
ISO 9613-1, A-weighting	Location	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1000 Hz	1250 Hz	1600 Hz	2000 Hz	2500 Hz	3150 Hz	4000 Hz	5000 Hz	6300 Hz	8000 Hz	10000 Hz	12500 Hz	16000 Hz	20000 Hz	
	F (Hz/atm)	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000	
	a (dB/m)	4.98E-06	8.15E-06	1.27E-05	1.98E-05	3.14E-05	5.04E-05	7.81E-05	1.22E-04	1.94E-04	2.94E-04	4.40E-04	6.71E-04	9.54E-04	1.31E-03	1.74E-03	2.24E-03	2.73E-03	3.27E-03	3.91E-03	4.66E-03	5.71E-03	7.45E-03	9.89E-03	1.36E-02	1.97E-02	2.97E-02	4.42E-02	6.76E-02	1.05E-01	1.59E-01	2.38E-01	3.65E-01	5.24E-01	
	att (dB/ft)	1.52E-06	2.48E-06	3.88E-06	6.05E-06	9.57E-06	1.53E-05	2.38E-05	3.73E-05	5.90E-05	8.96E-05	1.34E-04	2.04E-04	2.91E-04	3.99E-04	5.31E-04	6.82E-04	8.32E-04	9.96E-04	1.19E-03	1.42E-03	1.74E-03	2.27E-03	3.01E-03	4.16E-03	6.01E-03	9.04E-03	1.35E-02	2.06E-02	3.21E-02	4.84E-02	7.24E-02	1.11E-01	1.60E-01	
	Atmospheric Absorption (dB)	0.08	0.12	0.19	0.29	0.43	0.65	0.93	1.27	1.69	2.17	2.65	3.17	3.79	4.53	5.54	6.73	8.10	9.64	11.36	13.24	15.24	17.36	19.60	22.00	24.54	27.22	30.04	32.99	36.06	39.34	42.84	46.56	50.49	
	Distance Attenuation (dB)	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	21.85	
	R(A)	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.04	0.06	0.09	0.12	0.17	0.23	0.29	0.37	0.46	0.55	0.64	0.72	0.81	0.91	1.02	1.14	1.27	1.41	1.56	1.72	1.89	2.07	2.26	2.45	2.65	2.85	3.07
	A-weighting Factor	-63.59	-56.43	-50.39	-44.82	-39.53	-34.54	-30.28	-26.22	-22.40	-18.15	-16.19	-13.24	-10.85	-8.67	-6.64	-4.77	-3.25	-1.91	-0.79	0.00	0.58	0.99	1.20	1.27	1.20	0.96	0.55	-0.12	-1.15	-2.49	-4.25	-6.71	-9.35	
	A-weighted Octave Band	-21.18	-16.37	-10.94	-6.82	2.39	5.62	5.97	19.44	19.83	16.22	18.41	18.66	30.49	22.36	27.72	23.85	23.28	24.09	24.36	24.16	22.00	32.60	27.26	16.88	2.38	-15.14	-42.12	-82.18	-132.37	20.78	15.48	2.54		
	10*(LA/10)	0.01	0.02	0.08	0.65	1.73	3.65	3.96	87.90	96.17	41.84	69.35	73.39	1723.53	1120.23	172.09	592.21	242.77	213.00	256.57															

