Appendix E

Noise Assessment

NOISE IMPACT ASSESSMENT

Midwater BESS Project

Freeborn County, Minnesota

SEPTEMBER 17, 2024

PREPARED FOR:
Midwater BESS, LLC

spearmint energy

PREPARED BY:
Westwood

Westwood

Noise Impact Assessment

Midwater BESS Project

Freeborn County, Minnesota

Prepared For:
Midwater BESS, LLC
2916 N. Miami Avenue
Suite 830
Miami, FL 33127

Prepared By:
Westwood Professional Services, Inc.
12701 Whitewater Drive
Suite 300
Minnetonka, MN 55343

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Executive Summary

Westwood Professional Services, Inc. (Westwood) was contracted to conduct an operational noise impact analysis for the Midwater BESS Project located in Freeborn County, Minnesota. The Project will include a battery energy storage system (BESS), Project substation, O&M facility, and associated equipment/infrastructure.

As required under the Power Plant Siting Act (Minnesota Statutes Chapter 216E) and Minnesota Public Utilities Commission (MPUC), an operational noise impact assessment was conducted in support of the Site Permit Application (SPA). A noise propagation model was run for the proposed Project layout, and resultant levels at receptors within 3200' of the Project boundary were compared to the relevant noise level limits set forth within Minnesota Rules Chapter 7030.

Noise propagation for each BESS container was modeled using spectral noise data for a typical BESS unit in the absence of equipment model selection and manufacturer provided noise data. The model assumes BESS equipment to be integrated units containing both power conversion systems (inverters) and batteries.

If a final equipment selection includes separate batteries and power conversion systems, or the final equipment selection for each BESS unit is rated at a sound power level greater than 87 dBA, additional noise analysis will be necessary and further mitigation measures will likely be required to comply with Minnesota Rules Chapter 7030.

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1.0 Site Description

The proposed Project is located in Freeborn County, Minnesota (Figure 1). The Project area consists of a battery energy storage system (BESS), substation, an O&M building and associated equipment. The primary land uses in the Project area are agricultural and rural residential. Additional noise sources in the Project vicinity include US-65, the Dakota, Minnesota, & Eastern (DME) Railroad, local road traffic, the existing substation, and agricultural activity.

FIGURE 1: PROJECT OVERVIEW

2.0 Regulatory Setting & Noise Level Requirements

Minnesota Rules Chapter 7030 sets forth noise limits according to land use and time of day. Noise sensitive areas in the Project Area consist of residential. Households are classified as Noise Area Classification 1 (NAC 1) per MN Rules 7030.0050, Subp. 2. NAC 1 has the lowest noise limits of the three classifications, these limits are listed in Table 1. Daytime is defined as 7 am – 10 pm and nighttime is defined as 10 pm – 7 am. MN Rules 7030 refers to total noise – ambient plus Project generated noise.

Table 1 MN Rules 7030 NAC 1 Noise Limits

Metric	Daytime Limit	Nighttime Limit
L_{50}	60 dB(A)	50 dB(A)
L_{10}	65 dB(A)	55 dB(A)

These limits are expressed in the L_{50} and L_{10} metrics, which represent the level that is exceeded 50% and 10% of the measurement period, respectively.

Noise modeling is most accurate predicting L_{eq} levels, which is the overall logarithmic average of a measurement period. L_{10} levels are on average 3 dBA above L_{eq}, while L_{50} values are lower than L_{eq}. Thus, modeled L_{eq} can be compared to the L_{50} limits to ensure full compliance and conservatism.

The relationship between the L_{50}, L_{10}, and L_{eq} metrics is shown in Figure 2 below.

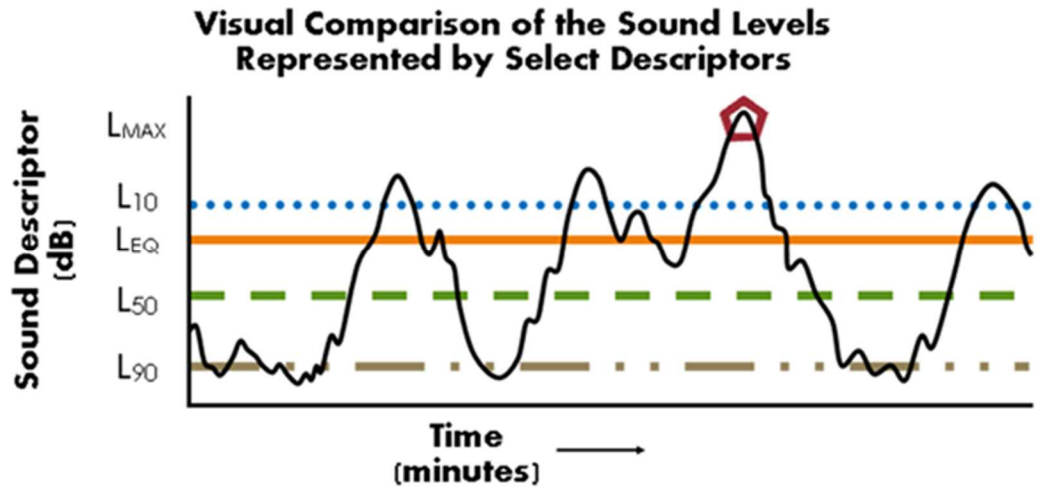


FIGURE 2: SOUND LEVEL METRICS COMPARISON

3.0 Modeling Methodology & Parameters

Noise sensitive receptors/areas (NSAs) were identified within 3200' of the Project boundary. Note that receptor locations have not been field verified and are based upon aerial imagery only. Receptor location coordinates can be found in Appendix A.

Additionally, receptors were categorized by distance from the Project boundary, shown in Table 2 below.

Table 2 NSA Distance Distribution

Distance from Project Boundary	# of NSAs
<50'	0
50' - 100'	0
100' - 200'	1
200' - 400'	0
400' - 800'	4
800' - 1600'	3
1600' - 3200'	60

A noise propagation model was developed and run for the Project. CADNA-A (a noise modeling software in compliance with ISO 9613-2) was used to calculate cumulative Project noise at all noise sensitive receptors/areas (NSAs) within 3200' of the Project boundary. The following modeling parameters were assumed:

- Ground absorption factor of G=0
- Receptor height of 1.5 m above ground level
- No other model adjustments
- Assumed meteorological conditions of 10ºC and 70% humidity

The proposed BESS containers, substation transformer, HVAC equipment (associated with the O&M building), and auxiliary transformers were modeled as point sources, with noise source data taken from manufacturer cut sheets and NEMA (National Electrical Manufacturers Association) standards. The model assumed all equipment to be operating at the loudest noise emission levels, which, in combination with the other parameters, ensures a "worst case" scenario.

Noise propagation for each BESS container was modeled using spectral noise data for a typical BESS unit in the absence of equipment model selection and manufacturer provided noise data. The model assumes BESS equipment to be integrated units containing both power conversion systems (inverters) and batteries. If a final equipment selection includes separate batteries and power conversion systems, additional noise analysis will be necessary.

Project equipment and layout configuration details are shown below in Table 3. Unweighted octave-band sound power levels for Project equipment is listed in Table 4 along with overall A-weighted sound power levels.

Table 3 Project Equipment & Layout Configuration

Noise Source	# of Units	Equipment Model/Reference	Source Height AGL
Substation Transformer	1	NEMA TR-1	4.0 m
Auxiliary Transformer	48	NEMA TR-1	2.0 m
O&M HVAC	2	Trane Voyager 3 (30 ton)	3.0 m
BESS Container	192	87 dBA Sound Power Level Integrated BESS Unit	2.8 m

Table 4 Project Equipment Spectral & Overall Data (CADNA-A Inputs)

Noise Source	Unweighted Octave Band (Hz) Sound Power Levels (dB L_w)								Broadband Sound Power Level (Single Unit)
	63	125	250	500	1000	2000	4000	8000	
Substation Transformer	100.6	102.6	97.6	97.6	91.6	86.6	81.6	74.6	98 dBA
Auxiliary Transformer	71.6	73.6	68.6	68.6	62.6	57.6	52.6	45.6	69 dBA
O&M HVAC	88.7	89.6	83.6	83.4	84.3	82.0	77.0	73.0	89 dBA
BESS Container	79.8	91.3	88.3	85.0	81.1	77.0	72.7	66.9	87 dBA

An ambient noise level of 45 dBA was assumed based on the day-night average sound level ranges listed in ANSI/ASA S12.9-2013 Part 3 Annex C. The high end of the range for rural residential/quiet suburban ambient noise was used, as a higher assumed ambient level is more conservative in the context of MN Rules 7030.

4.0 Noise Level Estimates & Impact Assessment

A predictive model was run using the inputs above to predict Project generated noise and total noise for all noise sensitive receptors within 3200' of the Project boundary. As BESS facilities potentially operate at all hours, predicted total noise levels were compared to the nighttime total noise level limits. If the selected BESS containers have a sound power level at or less than 87 dBA, no further mitigation measures are required to meet MN Rule 7030 nighttime limits.

Predicted nighttime noise levels for the Project given the stated equipment assumptions can be found in Appendix B. Note that compliance is contingent upon selection of an integrated BESS unit rated at a maximum sound power level of 87 dBA.

If the equipment selection for each unit is rated at a sound power level greater than 87 dBA, additional mitigation measures will be needed. Additional mitigation measures may include equipment silencers, layout changes, noise barriers, equipment operational capacity limitations, or a combination of these methods. If needed, noise barriers should be provided as or similar to IAC Noishield, Noise Barriers QuietLine, or Kinetics Noise Control NoiseBlock. These products are comprised of solid insulated metal panels with solid outer face and perforated, absorptive inner face. Note that the extent of necessary mitigation measures is dependent on equipment selection; additional analysis and a re-issued noise study will be required following final design and equipment selection.

Appendix A NSA Locations

Receptor ID	UTM Zone 15N Coordinates (m)		
	Easting	Northing	Elevation ASML
NSR01	479815.6	4822794.1	375.5
NSR02	479821.8	4822860.9	375.5
NSR03	479378.0	4822734.9	375.5
NSR04	479193.2	4822811.1	375.9
NSR05	479218.2	4822954.4	376.5
NSR06	477522.4	4822838.1	378.5
NSR07	477432.7	4823319.5	381.5
NSR08	477502.7	4823412.9	377.5
NSR09	477431.4	4823558.2	376.6
NSR10	477494.4	4823620.0	376.5
NSR11	477612.7	4823690.7	374.8
NSR12	477606.2	4823720.1	375.5
NSR13	477574.1	4823722.5	375.4
NSR14	477734.4	4823849.8	376.5
NSR15	478163.3	4823618.7	375.3
NSR16	478102.4	4823684.6	376.5
NSR17	478428.7	4823727.4	373.1
NSR18	478066.7	4823120.4	375.6
NSR19	478771.4	4823419.8	373.0
NSR20	478717.2	4823340.6	372.5
NSR21	478975.3	4823096.3	373.5
NSR22	479912.6	4822778.6	375.7
NSR23	479905.5	4822171.0	382.0
NSR24	479890.0	4821933.1	381.9
NSR25	479815.4	4821945.6	378.9
NSR26	477429.6	4822264.3	373.8
NSR27	477423.5	4822475.4	373.3
NSR28	479897.2	4823326.4	381.5
NSR29	477611.8	4823773.1	376.5
NSR30	477579.8	4823765.2	376.5
NSR31	477536.7	4823763.9	375.8
NSR32	477536.9	4823807.2	376.5
NSR33	477561.0	4823806.1	376.5
NSR34	477610.5	4823805.5	376.5
NSR35	477607.6	4823852.3	376.5
NSR36	477580.9	4823852.4	376.5
NSR37	477560.5	4823854.4	376.5
NSR38	477536.4	4823853.5	376.5
NSR39	477607.7	4823898.5	376.5

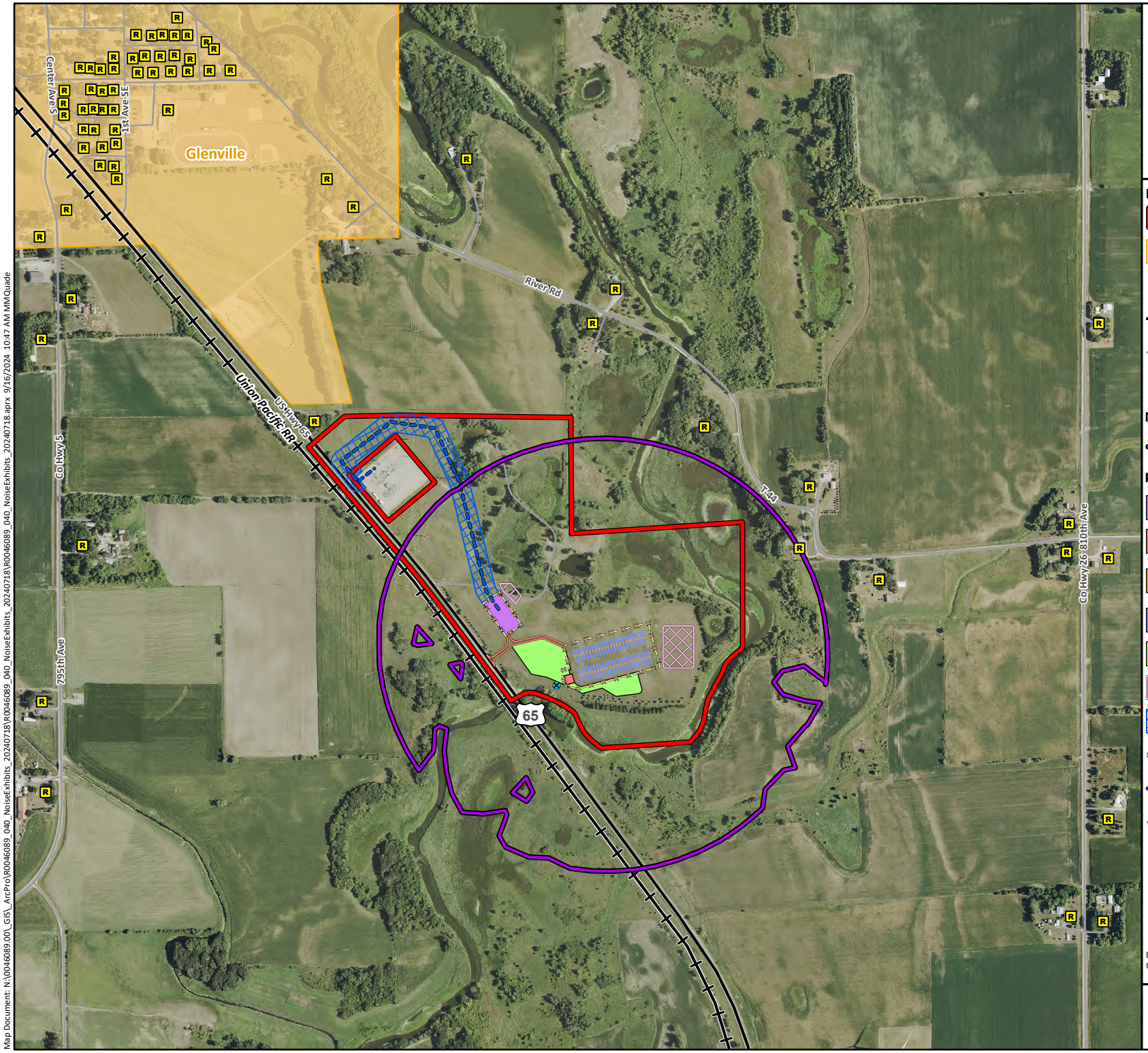
NSR40	477581.4	4823896.4	376.5
NSR41	477555.4	4823900.1	376.5
NSR42	477491.6	4823841.4	376.2
NSR43	477490.8	4823868.7	376.2
NSR44	477493.4	4823898.0	376.5
NSR45	477530.8	4823951.1	376.6
NSR46	477554.8	4823950.1	376.6
NSR47	477577.4	4823947.0	376.7
NSR48	477609.0	4823947.8	376.7
NSR49	477608.9	4823974.7	376.8
NSR50	477664.6	4823938.3	376.6
NSR51	477700.6	4823937.6	376.5
NSR52	477742.0	4823940.0	376.5
NSR53	477781.5	4823940.0	376.5
NSR54	477786.9	4823968.0	376.5
NSR55	477750.8	4823977.0	376.5
NSR56	477717.2	4823975.0	376.5
NSR57	477681.5	4823976.7	376.6
NSR58	477653.4	4823971.1	376.8
NSR59	477661.9	4824025.9	377.0
NSR60	477698.5	4824023.6	376.6
NSR61	477722.8	4824025.2	376.5
NSR62	477751.6	4824023.7	376.5
NSR63	477781.4	4824024.0	376.5
NSR64	477825.8	4824007.2	376.5
NSR65	477843.1	4823990.6	376.5
NSR66	477831.9	4823940.4	376.5
NSR67	477880.7	4823940.5	376.5
NSR68	477758.3	4824065.0	376.5

Appendix B Nighttime Modeling Results

Receptor ID	Mitigated Project Noise (L_{eq} dBA)	Mitigated Total Noise assuming 45 dBA ambient (L_{eq} dBA)
NSR01	40.8	46.4
NSR02	40.6	46.3
NSR03	46.0	48.5
NSR04	48.3	50.0
NSR05	47.1	48.9
NSR06	42.5	46.1
NSR07	40.2	45.7
NSR08	40.2	45.7
NSR09	39.1	45.6
NSR10	39.2	45.6
NSR11	39.3	45.6
NSR12	39.1	45.6
NSR13	39.0	45.6
NSR14	38.9	45.6
NSR15	42.1	46.2
NSR16	41.4	46.0
NSR17	41.8	46.2
NSR18	46.0	47.2
NSR19	45.0	47.3
NSR20	46.1	47.7
NSR21	48.0	49.2
NSR22	40.0	46.2
NSR23	41.9	46.1
NSR24	41.4	45.9
NSR25	42.0	46.1
NSR26	36.9	45.3
NSR27	37.2	45.3
NSR28	39.1	45.8
NSR29	38.9	45.6
NSR30	38.8	45.5
NSR31	38.6	45.5
NSR32	38.4	45.5
NSR33	38.5	45.5
NSR34	38.7	45.5
NSR35	38.4	45.5
NSR36	38.3	45.5

NSR37	38.2	45.5
NSR38	38.1	45.5
NSR39	38.1	45.5
NSR40	38.1	45.5
NSR41	38.0	45.5
NSR42	38.0	45.5
NSR43	37.9	45.4
NSR44	37.7	45.4
NSR45	37.6	45.4
NSR46	37.7	45.4
NSR47	37.8	45.4
NSR48	37.9	45.5
NSR49	37.7	45.4
NSR50	38.1	45.5
NSR51	38.2	45.5
NSR52	38.4	45.5
NSR53	38.5	45.5
NSR54	38.4	45.5
NSR55	38.2	45.5
NSR56	38.1	45.5
NSR57	37.9	45.5
NSR58	37.9	45.5
NSR59	37.6	45.4
NSR60	37.8	45.5
NSR61	37.8	45.5
NSR62	37.9	45.5
NSR63	38.0	45.5
NSR64	38.3	45.5
NSR65	38.4	45.5
NSR66	38.7	45.6
NSR67	38.8	45.6
NSR68	37.7	45.5

Appendix C Predicted Noise Level Contour Figure



Westwood
Toll Free (888) 937-5150 westwoodps.com

Midwater Energy Storage Project

Shell Rock Township,
Freeborn County, Minnesota

50 dBA Total Noise Level Contour
(Assumed 45 dBA Ambient + Project Generated Noise)

Figure 1 (September, 2024)

Legend

- Project Area
- Municipal Boundary
- Receptor
- Major Road
- Road
- Railroad

Noise Contours [dB(A)]

- 50

Proposed Site Features

- Proposed Substation
- Proposed O&M Facility
- Proposed Auxiliary Transformer
- Proposed BESS Unit
- Proposed Laydown Yard
- Proposed Basin Area
- Proposed HVTL Route
- Proposed Fence Line
- Proposed Tap Line
- Proposed Access Road
- Proposed Leach Field

Data Source(s): Westwood (2024); NAIP (2023); MNDOT (2024); U.S. Census Bureau (2021 & 2023).

N

0 1,000 Feet

Map Document: N:\0046089.00_GIS_ArcPro\R0046089_040_NoiseExhibits_20240718\R0046089_040_NoiseExhibits_20240718\R0046089_040_NoiseExhibits_20240718.aprx 9/16/2024 10:47 AM MMQuade