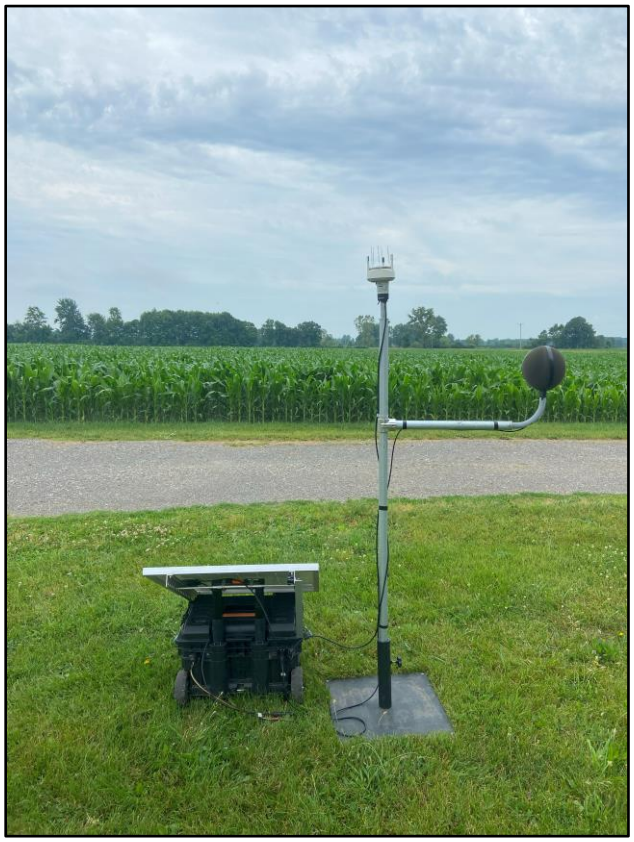
Appendix C:
POST CONSTRUCTION SOUND MONITORING PROTOCOL

Post-Construction Sound Monitoring Protocol

for the proposed

Riverbend Wind Energy Facility

May 22, 2025



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1. Introduction

This report describes the post-construction sound monitoring equipment, measurement and analysis procedures, and documentation that MI Energy Developments, LLC commits to pursuant to its application for a Renewable Energy or Storage Siting Certificate under the provisions of Michigan Compiled Laws (MCL) 460.1226(7)(g) for the Riverbend Wind Energy Facility (Project, Facility). The Project is expected to produce up to 300 megawatts (MW) of electrical power using up to 50 wind turbines, all of which are to be located in Sanilac County, Michigan. Figure 1-1 shows the general location of the Project, which is approximately 60 miles northeast of Detroit. This report addresses the requirements of Section D1.4, Post-Construction Sound Monitoring Protocol, of the Application Filing Instructions and Procedures (October 2024), including:

- Timing of sound monitoring,
- Sound monitoring locations,
- Sound monitoring equipment,
- Data collection,
- Data analysis methods to be employed,
- Facility sound level analysis,
- Documentation to be submitted,
- Noise complaint resolution process.

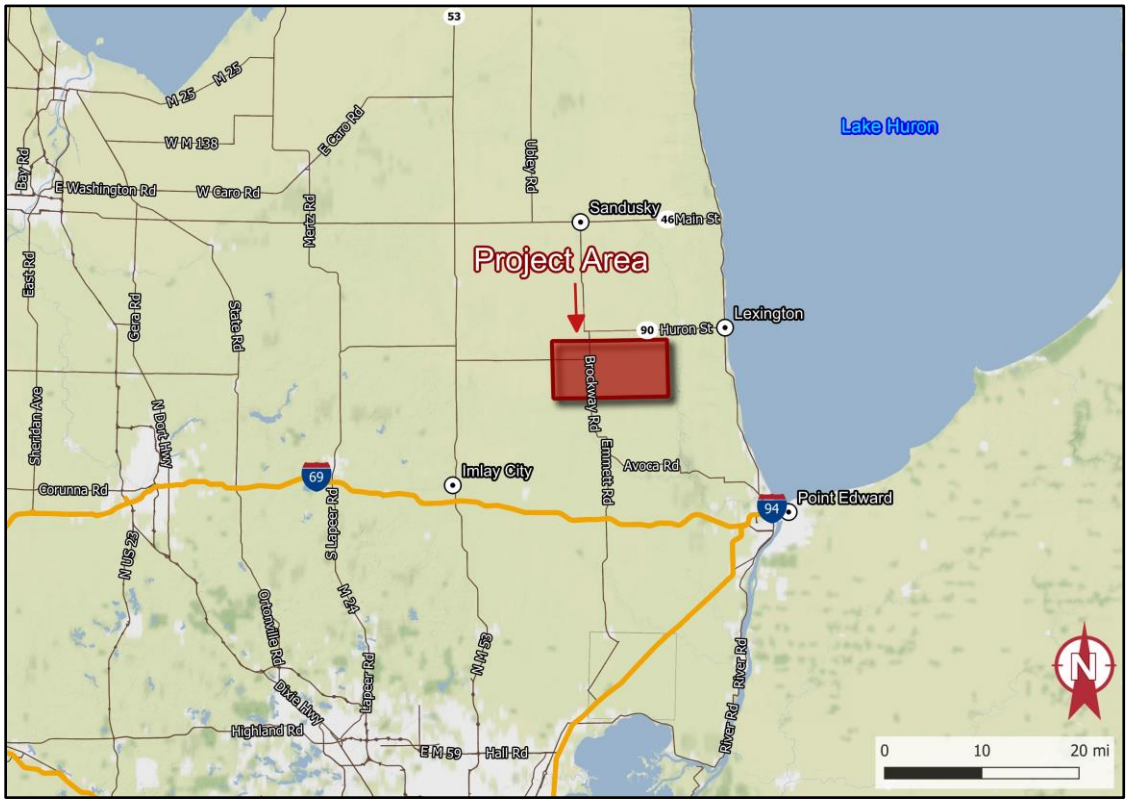

Figure 1-1. General Location of the Proposed Riverbend Wind Energy Facility

2. Timing of Sound Monitoring

- The post-construction sound measurements will be conducted within one year of the Project achieving commercial operation.
- The measurements will be conducted during either the spring (approximately March to May) or fall (approximately September to October). It is during these timeframes that weather conditions are generally suitable for wind turbine project post-construction sound monitoring, as wind conditions are sufficient to operate the Project at full capacity, ambient temperatures and relative humidity levels are within the specifications of the sound measurement equipment, and there is little to no snow on the ground.
- The sound level monitors will be operated for at least 10 days or until sufficient valid data (as described below) is obtained, whichever is greater.

3. Siting of Sound Monitoring Locations

- Monitors will be sited at two non-participating dwellings with the highest modeled sound level.
    - If site access is denied by the landowner to measure near or on the dwelling, the sound monitor will be sited at the closest property line or at a nearby location with a similar modeled sound level. If a location with a similar sound level cannot be obtained, then an additional sound level correction will be extrapolated to the dwelling through use of sound propagation modeling.
- Additional monitors for residences with formal noise complaints regarding Facility operation will have monitoring equipment deployed. Up to three additional sound monitoring locations will be identified for monitoring, representing areas where any noise complaints were received.
    - If more than three locations have received complaints, then three will be selected based on the modeled sound levels of each location and how well a site can represent other complaint locations.
- Consideration of whether monitoring will be done at a location will also be based on:
    - The type of complaint,
    - Whether the complaint was due to a continuing operational issue or a non-recurring event,
    - Whether the modeled free-field sound level is above 44 dBA,
    - Whether the landowner cooperates with the study.
- Sound level meter microphones will be placed outside, approximately 1.5 m above the ground.
    - The microphone will not be placed such that any structure blocks the line of sight between the microphone and otherwise visible Facility components.
- The monitoring will be conducted at least 25 feet from any building façade or other large reflective objects.
- The monitoring equipment will be placed away from dense vegetation or other contributing sources of transient and consistent sound.

4. Equipment Setup

- Sound levels will be measured using monitors that meet ANSI/IEC Class 1 specifications (e.g., IEC 61672-1 and ANSI S1.4).
- A 7-inch diameter hydrophobic windscreen will be fitted to each microphone.
- Sound level meters will be coupled with audio recorders to aid in sound source identification and soundscape characterization.
- Each sound level meter will be field calibrated using an acoustical calibrator meeting IEC 60942 Class 1 specifications immediately before and after the monitoring campaign. Any calibration drift will be noted and addressed in accordance with ANSI S12.18.
- Each sound level meter and calibrator will be calibrated within two years/one year, respectively, of the completion of monitoring, by a National Institute of Standard and Technology traceable facility.
- The monitors will be mounted at least 25 feet from any vertical reflecting surfaces.
- Anemometers will be located adjacent to the monitoring station at approximate microphone height.
- A representative sound monitoring system is shown in Figure 4-1.

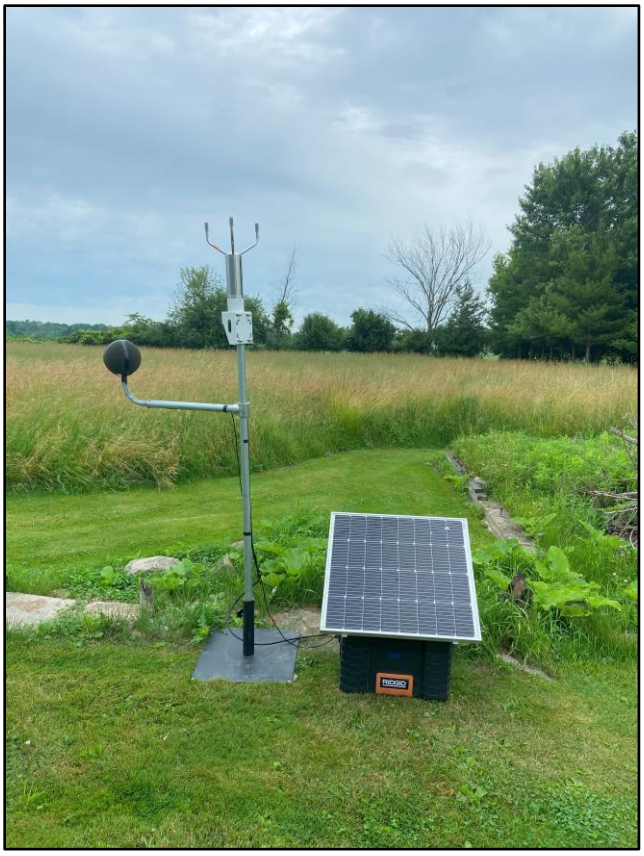

Figure 4-1. Representative Sound Monitoring Setup

5. Data Collection

- To the extent possible, the sound monitoring will conform to IEC TS 61400-11-2.
- Sound levels will be collected in terms of the A-weighted overall level (L_{eq}) and unweighted one-third octave band levels.
- In addition, statistical levels (L_{10}, L_{50}, L_{90}) will be collected both in terms of A-weighted overall levels and unweighted one-third octave band levels.
- All sound level, ground wind, hub-height wind, and turbine operations data will be logged in 10-minute intervals. In addition, all sound level and ground wind data will also be logged in 10-second intervals to facilitate filtering per ANSI S12.9 Part 3 and IEC TS 61400-11-2.
- Wind speeds near ground level (2 meters above the ground) will be collected at each sound monitoring location. Both average and maximum wind gust speeds will be measured and recorded.
- Hub-height wind speed data will be obtained from the anemometers atop the turbines of interest, or from the Project's on-site meteorological tower(s) if that data is collected at hub-height.
- Hub-height (or approximate) wind direction data will be obtained from the Project's on-site meteorological tower(s).
- Temperature and relative humidity will be obtained from the nearest National Weather Service station.
- Operations data on a 10-minute interval basis will be collected for each of the nearest four turbines to each sound monitoring location, including total electrical power output and rotor speed.
- All of the above-described data will be collected continuously throughout the survey.
- The audio recorders associated with each sound monitor will either be run continuously or triggered to record above a level of 44 dBA.
- Shut-down testing: All wind turbines within 1.5 miles of each monitor location will be shut down approximately four times per night for at least 20 minutes at a time.

6. Data Analysis

The measured sound, wind, and turbine operations data will be analyzed as follows:

- Maximum wind turbine sound will be assessed at night when non-turbine noise is typically lowest and meteorological conditions are favorable for the propagation of sound.
- All measured data, including overall and one-third octave band sound levels, ground wind speed, hub-height wind speed and direction, turbine operations, and weather conditions will be assembled into a single database and aligned in time. From the logged data for each monitor, each 10-minute period will be aggregated to determine overall A-weighted $L_{eq,}$ one-third octave band $L_{eq,}$ maximum wind gust near the ground, average wind speed near the ground, wind direction hub-height wind speed, wind turbine power production, and Facility operational state.
- 10-minute periods during which any of the following conditions occur will be excluded from analysis:
    - High wind gust speeds, which are defined as ground-level wind gust speeds above 5 m/s (11.2 mph),
    - High average wind speeds, which are defined as ground-level 10-minute average wind speeds above 4 m/s (9.0 mph),
    - Wind turbines within 1.5 miles operating at less than 1 dB of their maximum sound power output, expressed as an arithmetic average of those wind turbines,
    - The wind direction being either outside of an azimuth of ±45 degrees downwind relative to the closest wind turbines or ±45 degrees of the prevailing wind direction,
    - Precipitation being present, which is defined as snow, rain, and thunderstorm events identified through regional data and inspection of acoustic data,
    - Anomalies present in the sound data, which are defined as the presence of short-term contaminating sound caused by human or other activity that is atypical of the site,
    - Ambient temperature or humidity outside the specification of the sound level meter or microphone.
- For any remaining data containing a notable quantity of biogenic sound the dBAi metric will be calculated according to ANSI S12.100.
- The presence of prominent discrete tones will be assessed by comparing the total sound level in a given one-third octave band to the adjacent one-third octave bands for each minute according to ANSI Sl2.9 Part 4-2005 Annex C. Any one-minute period with prominent discrete tones will have a tonal penalty of 5 dB applied to the data if the tone is audible.
- 6 dBA will be added to each sound level to account for façade pressure doubling.
- The remaining data will be aggregated into one-hour intervals. One hour time periods containing less than three 10-minute periods will be eliminated from the analysis.

7. Facility Sound Level Analysis

The sound levels attributable to the Facility (Facility sound) will be determined in accordance with the applicable portions of ANSI S12.9 Part 3 and, to the extent possible, the applicable portions of IEC TS 61400-11-2.

- Facility sound will be determined by an operational shutdown-based methodology and will be calculated from the total (Facility + background) sound by quantifying the background sound immediately before or after a period of Facility operation at the same location. The Facility sound will be determined by subtracting, on an energy basis, the background sound level from the total sound level, by one-third octave band.
- All wind turbines within 1.5 miles of a monitor location will be shut down four times per night for 20 minutes at a time. One-hour periods of wind turbine operation before and after each shutdown shall be evaluated in 10-minute intervals.
- The temporal filtering method will be applied. This method assumes that wind speeds do not substantively change in the 20 minutes the facility is shut down. This will be confirmed qualitatively by comparing the turbine power production prior to the shutdown to the power production afterward. Alternatively, ground wind speeds measured at each monitor may be evaluated. If they are sufficiently similar, the background period can be assumed to be representative of the background conditions during the adjacent one-hour turbine operational periods. Otherwise, the one-hour periods around the background measurement will not be used to calculate the facility L_{1h}.
- For measurement methodologies that involve sound source shutdowns to establish the background sound levels, the compliance measurement period will be from one hour before the shutdown to one hour after the shutdown. Otherwise, the compliance measurement periods would consist of all valid periods under the protocol for each compliance measurement period.
- At least three valid one-hour facility one-hour sound levels will be collected for each monitoring location. The highest valid Facility one-hour sound level will be used for comparison to the MI MCL 450.1226 noise limit.

8. Documentation

- A sound monitoring report will be submitted within 60 calendar days of the end of field data collection.
- The report will include the following:
    - A Facility site map identifying relevant project components and nearby features of interest, including the nearest dwellings and monitor locations,
    - Identification of monitoring location with pictures,
    - A narrative of monitoring results including soundscape characteristics and effects of site conditions on measurements as derived from site visits and monitored data, as well as any significant features of the data,
    - Time history results including ground-level wind speed and rainfall, Facility operational data (power output and shutdown dates/times if used) and overall A-weighted hourly sound level time histories for L_{10min}, L_{1h} and optionally one-hour L_{90}, L_{50}, and L_{10} sound level metrics.
    - Details for each compliance measurement period:
        - 10-minute power output for individual sound sources,
        - Hub-height wind speed and wind direction for each wind turbine within 1.5 miles of the measurement location,
        - Average wind speed and maximum wind gust from the monitor anemometer for each 10-minute period,
        - Temperature and relative humidity,
        - Unweighted one-third octave band and overall A-weighted sound levels for each 10-minute period,
        - Determination of whether the period is valid and if not, the reasoning,
        - If the period is valid, the background-corrected Facility one-third octave band and overall A-weighted sound level for each 10-minute period and for the entire one-hour period.
    - Presence of icing as indicated through icing alarms or visual observation,
    - If results of the postconstruction study indicate that the Facility sound levels exceed the noise limit, mitigation measures will be detailed in the report along with a schedule of implementation.
- Upon the request of MPSC Staff, all sound monitoring data and results will be submitted in electronic format. If necessary, confidential data will be submitted with a confidential protective order.

9. Complaint Resolution Process

Riverbend Wind will maintain a Complaint Resolution Process for the life of the facility. If the Plant Manager receives a complaint related to noise, the Plant Manager will make reasonable efforts to respond to the complaint within two (2) business days of receipt of the complaint. The complaint will be added to the Complaint Log. If after review of the complaint by the Plant Manager it is determined that an immediate resolution cannot be delivered, a timeline and measures to be taken will be provided to the complainant. These measures may include setting up monitoring equipment at the complainant's place of residence to collect sound levels.

If substation noise from the Project is the subject of a noise complaint, then the substation sound will be measured in accordance with the General Procedures of Section 2.3 outlined in Attachment D of MPSC Certificate for Solar Energy, Wind Energy, and Energy Storage Facilities Application Filing Instructions and Procedures.