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Subject: ***Hermantown Industrial – Noise Modeling Report***
City of Hermantown, Saint Louis County, Minnesota

Executive Summary

Kimley-Horn modeled noise emissions from the proposed Hermantown Industrial data center campus in Saint Louis County, Minnesota. Modeling included normal operations, daytime generator testing, and emergency operations scenarios. Normal operations are the controlling scenario for mitigation because the facility is proposed to operate during nighttime hours and will be evaluated against the project proposer's voluntary nighttime threshold of 47 dBA at adjacent sensitive receptors. Generator testing would be limited to daytime hours and is therefore evaluated against the Minnesota state daytime threshold of 60 dBA. Additionally, because the project is not proposing full back-up generation, the modeled emergency operations scenario is quieter than normal operations. With the recommended mitigation measures, the project is anticipated to comply with the voluntary nighttime threshold of 47 dBA during normal operations and the Minnesota state daytime threshold of 60 dBA during generator testing.

Project Description

Kimley-Horn modeled and analyzed the noise emission levels from the proposed operational equipment for Hermantown Industrial (the project), in support of campus planning. The project is located on undeveloped and rural residential land that is zoned Business Light Manufacturing (BLM) in the city of Hermantown, Saint Louis County, Minnesota (the project site). The project site is bounded to the north by Morris Thomas Road, to the east by Midway Road, and to the west by Solway Road. The southern boundary of the project site extends parallel to Saint Louis River Road, approximately 0.25 miles to the north. The project will consist of 3 data center buildings and an office building. While the final operational requirements of the buildings are not yet finalized or certain (the final equipment layout depends on upcoming interconnection requirements, reliability standards, and site design), the primary operational noise sources are anticipated to be approximately 144 dry coolers at each building; 24 water-cooled chillers at each building; 6 rooftop heating, ventilation, and air conditioning units (RTUs) at each building, and 4 substation transformers at each building. Note that up to four emergency back-up generators at each building are also proposed as part of the project; however, the generators are only expected to operate during maintenance and testing as well as during emergency conditions.

Existing Noise Conditions

The existing ambient noise sources in the vicinity of the project site consist mainly of surrounding transportation infrastructure. Three county roads are located immediately north, east and south of the site (Morris Thomas Road, Midway Road, and St. Louis River Road) and all contribute to the existing ambient noise. The northeastern extent of the project site is located roughly 1,520 feet from United

States Highway 2. This roadway is a three-lane two-way truck route and contributes to existing ambient noise. The Duluth, Missabe, and Iron Range Railroad is located roughly 440 feet from the northeastern extent of the project site and is roughly 700 feet from the southeastern extent of the project site. The railroad is active and can carry up to 20 trains per day and has intermittent contributions to ambient noise. Other sources of ambient noise include environmental noise such as wind, birdsong, and insects.

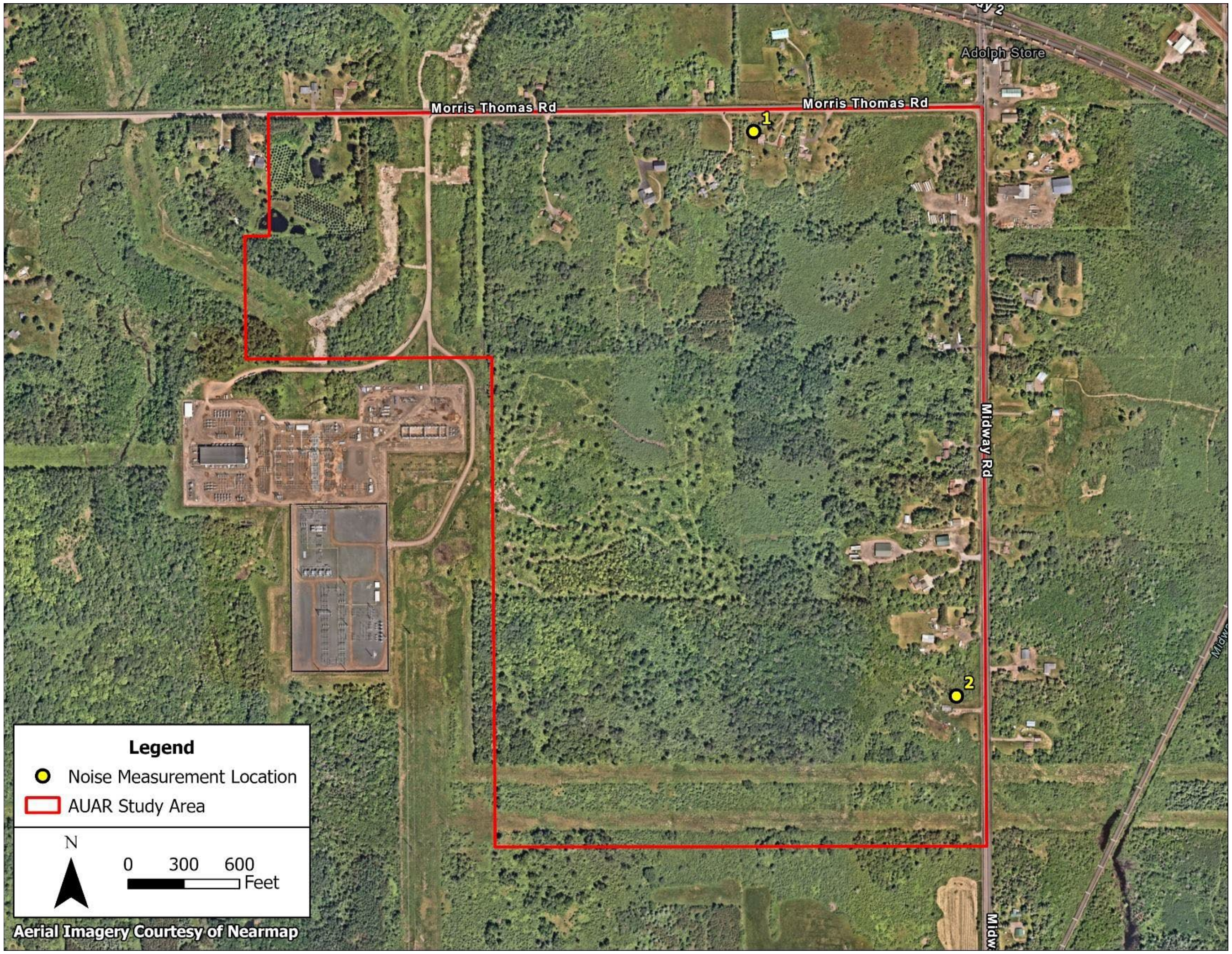
Kimley-Horn conducted ambient sound pressure measurements in May 2025 for the project. The two measurement locations represent existing sound pressure levels at noise-sensitive land uses adjacent to the project site. The measurements were taken at five vertical feet above ground elevations because that is the typical height of the human ear. Measurement data for the three locations is included in Table 1 and the measurement locations are depicted in Figure 1.

Table 1. Existing Ambient Sound Pressure Measurements

Measurement Location	Description	Measurement Period	Sound Levels (dBA)				Sound Levels (dBC)	
			Daytime		Nighttime		Daytime	Nighttime
			L_{10}	L_{50}	L_{10}	L_{50}	LC_{eq}	LC_{eq}
1	Northern portion of the study area, approximately 100 feet south of Morris Thomas Road.	10:00 AM (5/12) – 10:00 AM (5/13)	63	59	63	53	70	66
2	Southeast portion of the study area, approximately 150 feet west of Midway Road.	10:30 AM (5/12) – 10:30 AM (5/13)	60	55	60	49	74	69

The existing L_{10} at the 2 measurement locations ranged from 60 to 63 dBA during the day and at night. The L_{50} ranged from 55 to 59 dBA during the day and 49 to 53 dBA at night. The existing LC_{eq} at the 2 measurement locations ranged from 70 to 74 dBC during the day and 66 to 69 dBC at night.

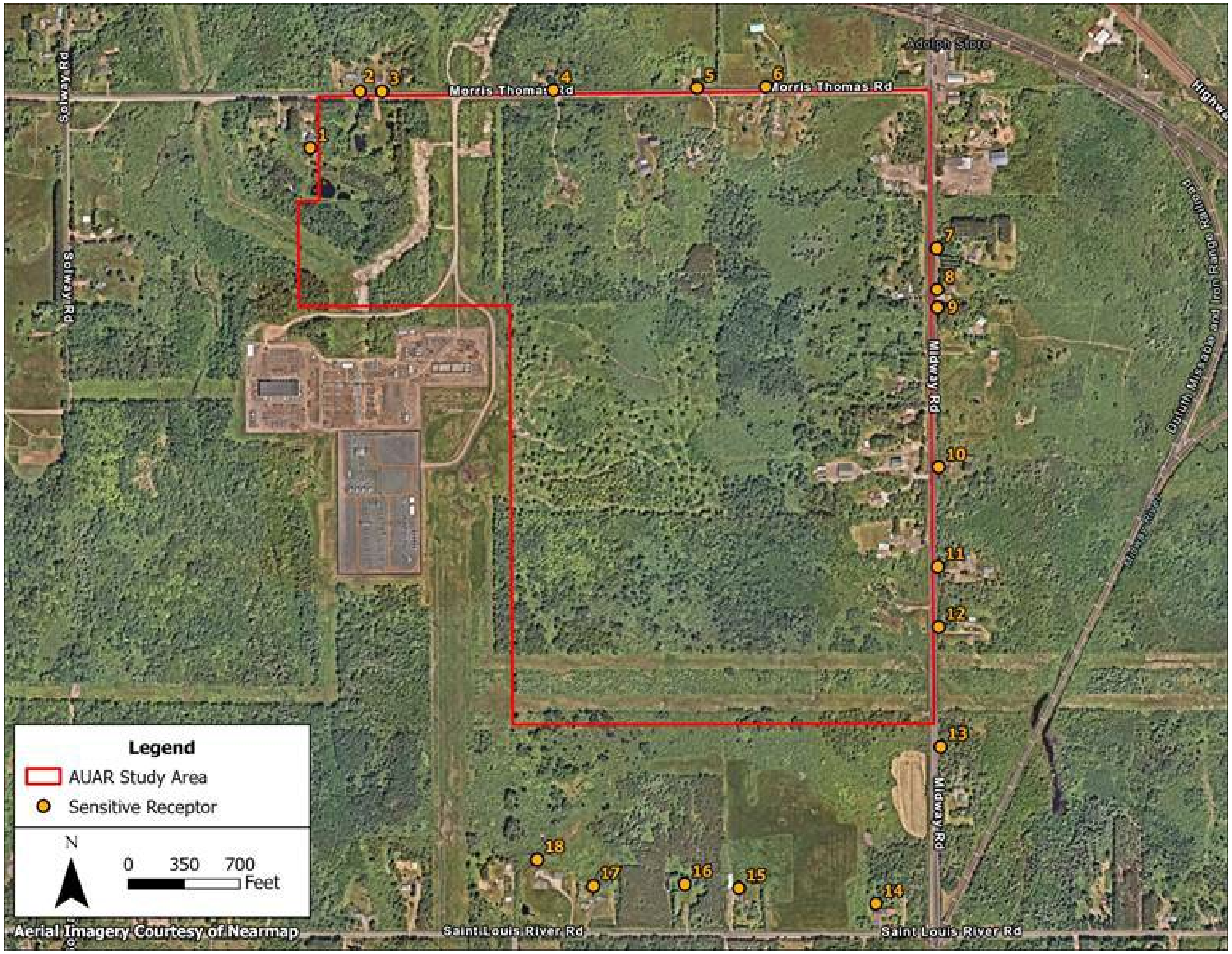
Figure 1. Ambient Noise Measurement Locations



Adjacent Noise Receptors

Kimley-Horn selected 18 noise receptors to represent noise-sensitive land uses near the project. These receptors are all residential land uses. The noise receptors range from approximately 30 to 1,100 feet in distance from the project site. The noise receptors are depicted in Figure 2.

Figure 2. Noise-sensitive Receptors



Minnesota State Noise Standards

The State of Minnesota regulates noise in Minnesota Rules, part 7030.0040. This rule establishes the noise standards in Table 2 based on Noise Area Classification (NAC). A NAC is based on the land use of the location where a person may hear noise, not parcel boundaries. For example, a residence on a farmstead would fall under NAC 1 on a front porch and under NAC 3 in an agricultural field, even if both locations are within the same parcel. Further, noise from the project would be regulated according to the NAC of surrounding receptors, even though the project would fall under NAC 3.

Table 2. Minnesota State Noise Standards

Noise Area Classification	Daytime		Nighttime	
	L_{10}	L_{50}	L_{10}	L_{50}
1: Residential housing, religious activities, camping and picnicking areas, health services, hotels, educational services	65	60	55	50
2: Retail, business and government services, recreational activities, transit passenger terminals	70	65	70	65
3: Manufacturing, fairgrounds and amusement parks, agricultural and forestry activities	80	75	80	75
4: Undeveloped and unused land	N/A	N/A	N/A	N/A

Local Noise Regulations

During the development of a data center facility, the city of Hermantown requires proposers to submit an application for a special use permit. Once the project's final site configuration has been determined, the conditions of the special use permit would require the preparation of a noise model that demonstrates project compliance with state noise regulations, Chapter 4 – 480.10 of the City of Hermantown Code of Ordinances, and Chapter 5 – 535.04.12.4 of the City of Hermantown Zoning Code. In the Hermantown Industrial AUAR, the proposer also committed to modeling backup generator noise to ensure compliance with state noise regulations during maintenance and testing. All noise models would be reviewed and approved by the City of Hermantown. If necessary, backup generator maintenance and testing shall be performed only between 8:00 a.m. and 5:00 p.m., Monday-Friday. No backup generators would be located within 100 feet of a residential dwelling.

Voluntary Commitment

In addition to complying with the nighttime L_{50} threshold of 50 dBA, the project proposer is committing to mitigating project-related noise levels so the nighttime L_{50} does not exceed 47 dBA at adjacent sensitive receptors. A difference of 3 dBA is just perceptible to the human ear; therefore, this additional mitigation commitment would provide a small but noticeable decrease in project-related noise levels beyond what is required by state standards.

Low-Frequency Noise

Low-frequency noise (typically defined as sound below approximately 200 Hz) and infrasound (sound below 20 Hz) have been the subject of ongoing research for several decades. Existing studies indicate that low-frequency noise can contribute to annoyance or disturbance under certain conditions, particularly in quiet environments or when prominent tonal characteristics are present.[1] However, scientific literature does not establish a consistent causal relationship between low-frequency noise or infrasound and serious adverse health effects. Current research remains limited, and many published studies note substantial uncertainty due to individual sensitivity, exposure conditions, and the mechanisms by which low-frequency sound can influence human responses.[2] Although data centers contain equipment capable of producing low-frequency sound, the available scientific literature does not identify data center operations as a source of low-frequency noise or infrasound associated with established serious health effects.

At present, there is no broadly accepted international consensus regarding appropriate exposure thresholds for low-frequency noise or infrasound from industrial facilities. Various jurisdictions and researchers have proposed different evaluation methods and criteria, including octave-band limits, low-frequency C-weighted metrics, and G-weighted infrasound metrics.[3][4] The existence of multiple assessment approaches reflects the evolving nature of research on low-frequency noise and the absence of a universally accepted standard.

Published research also indicates that annoyance and community response are influenced by numerous factors beyond measured sound levels, including background sound conditions, spectral content, tonal characteristics, and individual sensitivity.[5] Accordingly, contemporary industrial noise assessments typically focus on demonstrating compliance with applicable local noise regulations and accepted acoustical engineering practices, while also evaluating potential low-frequency characteristics where warranted. Similarly, this project will comply with the applicable state and local noise regulations while implementing cross-frequency attenuation to the extent practicable.

Modeling Assumptions and Methodology

Kimley-Horn modeled the project using the assumptions in Table 3.

Table 3. Modeling Assumptions and Methodology

Category	Assumption/Methodology
Modeling Software	SoundPLANnoise 9.1
Modeling Standard	ISO 9613-2:2024-01
Terrain	Proposed grading was modeled within the project site and elevation data from USGS was modeled outside of the project site
Structures	On-site buildings were modeled including three data center buildings and one office building.

[1] Yonemura, Miki, Hyojin Lee, and Shinichi Sakamoto. (2021). Subjective Evaluation on the Annoyance of Environmental Noise Containing Low-Frequency Tonal Components.
[2] Persson Waye, Kerstin. (2011). Noise and Health - Effects of Low Frequency Noise and Vibrations: Environmental and Occupational Perspectives.
[3] Hessler, George F. (2004). Proposed criteria in residential communities for low-frequency noise emissions from industrial sources.
[4] Jakobsen, Jorgen. (2001). Danish guidelines on environmental low frequency noise, infrasound and vibration.
[5] Job, R.F. Soames. (1996). Sources and effects of low frequency noise.

Category	Assumption/Methodology
Ground Absorption Factor	Hard ground within the project site: 0 Ground within the existing substation west of the project site: 0 Ground surrounding the project site (lawns, wooded areas, wetland): 0.5
Foliage	Not modeled
Meteorology	Downwind propagation was modeled in all directions; wind speed was modeled at 5 meters per second
Temperature	50 degrees Fahrenheit
Relative Humidity	70%

While the final operational requirements of the buildings are not yet finalized or certain (the final equipment layout depends on upcoming interconnection requirements, reliability standards, and site design), the project anticipates the following approximate equipment quantity at each of the three buildings:

- 144 dry coolers
- 24 water-cooled chillers
- 6 RTUs
- 4 substation transformers
- 4 generators

Results

Using all the assumptions discussed above, Kimley-Horn modeled the operational scenarios included in Table 4.

Table 4. Modeled Operational Scenarios

Scenario	Description
Normal Operations	All dry coolers, all chillers, all RTUs, and all substation transformers are operating under worst-case ambient temperature and 100% loads
Generator Testing	All dry coolers, all chillers, all RTUs, all substation transformers, and two of the four generators at each building are operating under worst-case ambient temperature and 100% loads
Emergency Operations	This project is not proposing full back-up generation; therefore, this scenario only includes 6 dry coolers per building, 1 chiller per building, all RTUs, and all generators operating under worst-case ambient temperature and 100% loads

The results of the modeled scenarios are included in Table 5.

Table 5. Modeled Sound Levels

Residential Receptor			Sound Pressure Level					
ID	Daytime Threshold (dBA)	Voluntary Nighttime Threshold (dBA)	Normal Operations		Generator Testing		Emergency Operations	
			dBA	dBC	dBA	dBC	dBA	dBC
R-01	60	47	61	72	61	72	49	59
R-02	60	47	61	72	61	72	49	59
R-03	60	47	61	73	61	73	50	60
R-04	60	47	65	74	65	74	55	63
R-05	60	47	66	75	66	75	60	66
R-06	60	47	64	74	64	74	54	62
R-07	60	47	61	73	61	73	51	60
R-08	60	47	63	74	63	74	54	62
R-09	60	47	64	75	64	75	54	62
R-10	60	47	63	74	63	74	49	61
R-11	60	47	60	73	60	73	48	59
R-12	60	47	60	72	60	72	48	59
R-13	60	47	59	71	59	71	47	58
R-14	60	47	58	70	58	70	46	57
R-15	60	47	59	70	59	70	48	58
R-16	60	47	60	71	60	71	49	58
R-17	60	47	59	70	59	71	49	58
R-18	60	47	59	71	59	71	49	58

Under the normal operations model scenario, sound pressure levels at surrounding receptors ranged from 58 to 66 dBA and 70 to 75 dBC. Under the generator testing model scenario, sound pressure levels at surrounding receptors ranged from 58 to 66 dBA and 70 to 75 dBC. Under the emergency operations model scenario, sound pressure levels at surrounding receptors ranged from 46 to 60 dBA and 57 to 66 dBC. Unmitigated noise levels under all three scenarios are exceeding applicable standards; therefore, mitigation is recommended for the project.

Recommended Mitigation

Since modeled normal operations noise levels could occur during nighttime hours, normal operations is subject to the voluntary nighttime threshold of 47 dBA; therefore, normal operations is the controlling scenario for mitigation design. Generator testing produces similar modeled levels but would be limited to daytime hours and is therefore evaluated against the less restrictive 60 dBA daytime threshold. Additionally, since this project is not proposing full back-up generation, the emergency operations scenario is modeled to be quieter than the normal operations and generator testing scenarios; therefore, the mitigation measures described below are intended to demonstrate compliance with nighttime thresholds during normal operations, with generator testing evaluated separately against daytime thresholds.

Table 6. Options for Mitigation

Mitigation Measure	Description
Attenuation from Mechanical Building	The water-cooled chillers are located inside of a mechanical building, beneath the dry cooler units. Kimley-Horn recommends constructing this mechanical building out of a material with a Sound Transmission Class (STC) rating of 35 or greater (e.g. double layer of sheet steel) and lining the inside with absorptive material that has a Noise Reduction Coefficient (NRC) of 1 (e.g. 5 inches of absorptive fiber).
Acoustical Blankets	Install acoustic blankets over the water-cooled chillers
Noise Walls	Install up to 35-foot precast noise walls (STC 47) along the northern and eastern property boundaries as depicted in Figure 3.
Acoustic Enclosures	Install acoustic enclosures on the RTUs that provide 8 dBA of attenuation.

Based on modeling results (see Table 7 below), Kimley-Horn anticipates the above mitigation measures would bring the normal operations scenario into compliance with the voluntary nighttime threshold of 47 dBA and the generator testing scenario into compliance with the state daytime threshold of 60 dBA. The mitigation measures modeled represent one potential compliance scenario for the current design assumptions and modeled equipment sound power levels. As design progresses, equivalent compliance may be achieved through other mitigation strategies, including further optimization of future mechanical systems, selection of lower-noise equipment as technology advances, reduced building or equipment density, and extended or modified noise walls. Any alternative mitigation approach should be supported by updated noise modeling demonstrating compliance with the applicable noise thresholds at the time of City building permit review.

Table 7. Project Noise Levels with Mitigation

Residential Receptors			Sound Pressure Level			
			Normal Operations		Generator Testing	
ID	Daytime Threshold (dBA)	Voluntary Nighttime Threshold (dBA)	dBA	dBC	dBA	dBC
R-01	60	47	47	60	47	60
R-02	60	47	47	60	47	60
R-03	60	47	47	60	47	60

Residential Receptors			Sound Pressure Level			
			Normal Operations		Generator Testing	
ID	Daytime Threshold (dBA)	Voluntary Nighttime Threshold (dBA)	dBA	dBC	dBA	dBC
R-04	60	47	47	60	47	60
R-05	60	47	44	59	45	59
R-06	60	47	44	58	44	59
R-07	60	47	43	58	43	58
R-08	60	47	45	59	46	59
R-09	60	47	46	60	46	60
R-10	60	47	46	60	46	60
R-11	60	47	47	60	47	60
R-12	60	47	47	60	48	60
R-13	60	47	46	59	46	59
R-14	60	47	44	58	44	58
R-15	60	47	46	59	46	59
R-16	60	47	46	59	46	59
R-17	60	47	46	59	46	59
R-18	60	47	47	59	47	59

Figure 3. Project Noise Levels under Normal Operations with and without Mitigation