On Wednesday, April 9, 2025, 4:14 PM, Kearney, Darren <Darren.Kearney@state.sd.us> wrote:

Bruce,

First, I want to reiterate that there is no standard in law or rule under the PUC's jurisdiction that sets specific sound limits. Second, I want to emphasize that the information contained here-in is **not an endorsement by Commission Staff or the Commission** for specific sound limits for data centers, generators, or other industrial noise sources. I am simply providing this information to you as reference material.

The only experience I have with a permit limit for low-frequency noise is for the Astoria Station power plant that has natural gas combustion turbines. Based on past conversations with Staff's sound expert (Mr. David Hessler), it is my understanding that low-frequency noise is fairly unique to gas turbines and other noise sources typically don't produce problematic levels of low-frequency noise.

As mentioned during our phone call, the Commission approved a settlement between Staff and Otter Tail Power Company for the Astoria Station Project (Docket EL17-042) https://puc.sd.gov/Dockets/Electric/2017/el17-042.aspx that included a permit limit for low-frequency noise. That permit condition is provided below, with the C-weighted limit intended to address low frequency sound.

29. The noise levels exclusively associated with the Project shall not exceed the following standards at the nearest occupied, existing residences (determined on the date the permit is issued) not owned by the Applicant:

a. a day-night average (Ldn) sound level of 55 dB(A), which includes a nighttime penalty of 10 decibels; and

b. a maximum (Lmax) C-weighted sound level of 65 dB(C) applicable at all times.

Finally, below is a link to a paper on low frequency noise that may be informative.

[PDF] Proposed criteria in residential communities for low-frequency noise emissions from industrial sources

J Hessler, F George

Noise Control Engineering Journal, 2004•Citeseer

This paper proposes C-weighted overall level limits necessary to avoid, or at least minimize, resident complaints from low-frequency industrial sources. The proposed limits are developed mainly from experience at problem installations using open-cycle combustion turbines for peak power generation. Figure 1 shows two types of turbine models.

In an open-cycle operation, combustion turbine exhaust gases are discharged directly into the atmosphere through a silencer/stack system, as pictured. Low-frequency noise problems are typically associated with exhaust stack emissions from open-cycle turbine plants as opposed to closed-cycle service. In a closed cycle, exhaust gases are directed into a massive heat recovery steam generator (HRSG). Power companies use open-cycle plants to drive generators for peak

Hopefully this provides a starting point for your research,

Darren

Darren Kearney

Utility Analyst

South Dakota Public Utilities Commission

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From: bruce mack <brucejohnmack@yahoo.com>
Sent: Friday, April 11, 2025 8:37 AM
To: mcphersondoe@valleytel.net
Subject: Fw: Follow Up on Phone Call Regarding Low-Frequency Noise

Proposed criteria in residential communities for low-frequency noise emissions from industrial sources

George F. Hessler Jr.[a)]

(Revised 2004 June 11; accepted 2004 June 15)

Excessive low-frequency noise from open-cycle combustion turbine power plants has been recognized as a serious noise and vibration problem since the early 1970s. Yet, the problem still occurs, mainly because siting and specifying agencies are largely uninformed about the problem and because there are no standardized noise criteria in the U.S. to consult for guidance in avoiding low-frequency noise problems. Detailed sound pressure level measurements from five low-frequency problem sites are analyzed for support of a proposed criterion. The data are compared to noise and vibration thresholds. In addition, a small sampling of responses from residents to varied levels of low-frequency noise immissions is presented. This paper proposes a "C" weighted overall sound level criterion. The proposed criterion should be applicable to most industrial sources of steady low-frequency noise in addition to combustion turbines. ***© 2004 Institute of Noise Control Engineering*****.**

Primary subject classification: 69.3; Secondary subject classification: 14.5.3

1. INTRODUCTION

This paper proposes C-weighted overall level limits necessary to avoid, or at least minimize, resident complaints from low-frequency industrial sources. The proposed limits are developed mainly from experience at problem installations using open-cycle combustion turbines for peak power generation. Figure 1 shows two types of turbine models.

In an open-cycle operation, combustion turbine exhaust gases are discharged directly into the atmosphere through a silencer/stack system, as pictured. Low-frequency noise problems are typically associated with exhaust stack emissions from *open-cycle* turbine plants as opposed to *closed-cycle* service. In a closed cycle, exhaust gases are directed into a massive heat recovery steam generator (HRSG). Power companies use open-cycle plants to drive generators for peak

Fig. 1– An aero-derivative combustion turbine (unit with dual stacks) rated at 50 MW next to an industrial combustion turbine rated at 120 MW. Hooded assemblies are combustion air inlets. Vertical rectangular stack assemblies are turbine exhaust silencers venting to atmosphere.

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load applications and to drive compressors for gas and liquid pipelines.

Peak electrical loads usually occur during very hot summer months and/or very cold winter months. Typically the units may operate daily during these periods, starting in early afternoon and shutting down by midnight. Units operate 24/7 for pipeline applications.

As early as 1971, ANSI B133.8, "Gas Turbine Installation Sound Emissions," was drafted and included Appendix B that recommends a limit of 75 to 80 dB(C) to minimize the problem of low-frequency noise or infrasound problems that were surfacing at that time. Experience since then has shown that this recommendation is woefully inadequate, and that the problem continues to occur for combustion turbine open-cycle plants.

It will be shown that turbine exhaust stack emissions are tonal in nature as are most sources of low-frequency noise. For purposes of this paper, tonal is defined as a sound spectra containing one or more peak values of pressure level as measured with an FFT analyzer in narrow frequency band regions. It is believed that the proposed limits would also be valid for other steady and tonal sources of low-frequency noise, such as compressor stations, wind turbines, diesel generators, and others. The criteria are not intended for impulsive sources of infrasound.

It will also be shown that the standardized C-weighted overall level is an excellent metric for regulation purposes.

2. PURPOSE OF PROPOSED CRITERIA

The proposed criteria apply to C-weighted noise levels measured outdoors but close to residential structures. The intent is to propose levels that should prevent both a detectible fingertip feel of vibrations on the structure windows and walls, as well as the adverse sensation of sensing a low-frequency disturbance.

The main complaint from low-frequency sources is perceptible vibration, mostly inaudible unless the intensity is high enough to cause a rattling noise. These complaints are often described as a feeling in the body as opposed to the more normal audible noise problem. One could easily surmise from these descriptions that this type of problem is independent of both ambient noise quality in the area and the duration of the noise.

However, experience over the years indicates that residents located in very quiet rural environments are much more distressed by a new intrusive source of noise because of the loss of a formerly peaceful and tranquil sound environment. Conversely, there is also some greater tolerance of excessive low-frequency noise from open-cycle peaking plants that essentially operate only during very hot or very cold periods, shut down at nighttime, and do not operate for extended periods of the year.

The proposed C- weighted levels should supplement the normal A-weighted site criteria. If the C-A weighted level exceeds 20 dB, the spectrum is said to be unbalanced or the low-frequency content is excessive. Therefore, if one is considering a very quiet site requiring A-weighted levels below 40 dB, one should also consider reducing the C-weighted levels in Table 1 to not exceed 20 dB above the A-weighted level.

Lastly, the proposed criteria are derived from investigating a valid but relatively small sampling of problem sites by a single investigator. The user may want to conservatively reduce the levels by a small number to account for the variable nature of human response to low-frequency sounds.

3. PROPOSED CRITERIA

The limits tabulated in Table 1 are proposed for two classifications of ambient quality and two durations of equipment operation.

TABLE 1 – Maximum allowable C-weighted sound level, dB(C), at residential areas to minimize infrasound noise and vibration problems.

	For Normal Suburban/ Urban Residential Areas, Daytime Residual Level, L_{90}>40 dB(A)	For Very Quiet Suburban or Rural Residential Areas, Daytime Residual Level, L_{90}<40 dB(A)
For Intermittent Daytime Only or Seasonal Source Operation	70	65
Extensive or 24/7 Source Operation	65	60

4. EXPERIENCE AT PROBLEM SITES

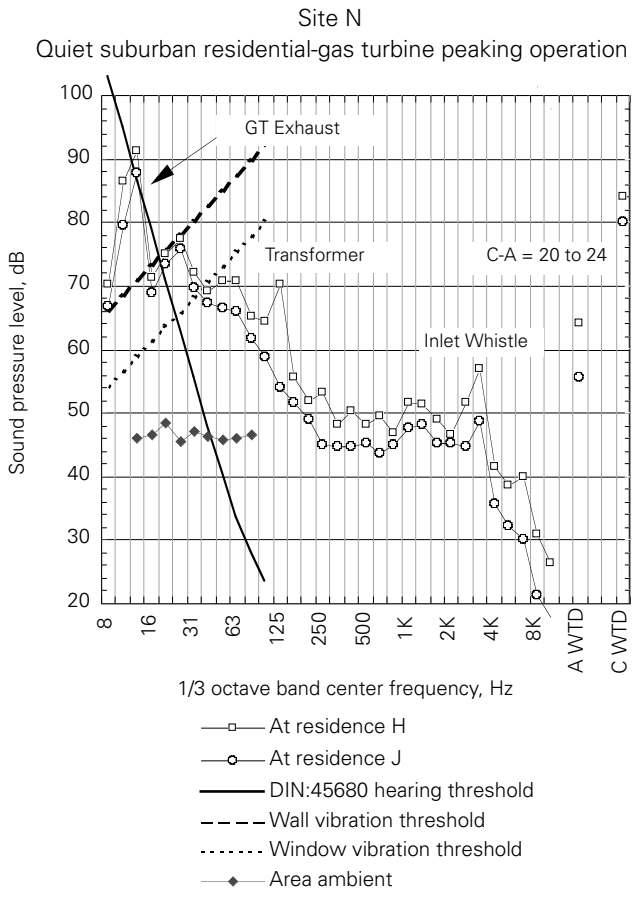
Results of investigations at five sites experiencing low-frequency noise complaints are offered to support the levels proposed in Table 1. Figures 2a through 2d plot the measured outdoor, one-third octave band spectra close to the nearest complaining residence at four turbine problem sites located throughout the United States. For evaluation and comparison purposes, the spectra for the thresholds of perception for audible low-frequency noise and tactile fingertip feel for vibration are included on all of the graphs.

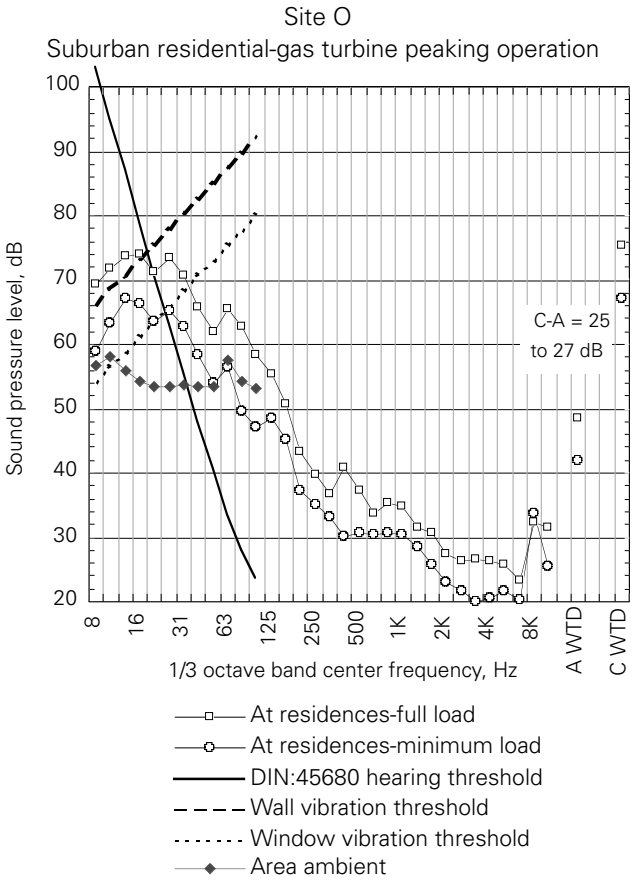
The noise threshold is from the German standard DIN: 45680, 1997, which extrapolates the threshold of hearing from the ISO standard[1] from 20 Hz down to 8 Hz. The vibration threshold curves are from reference 2. The plots also include the measured C-A weighted overall level difference.

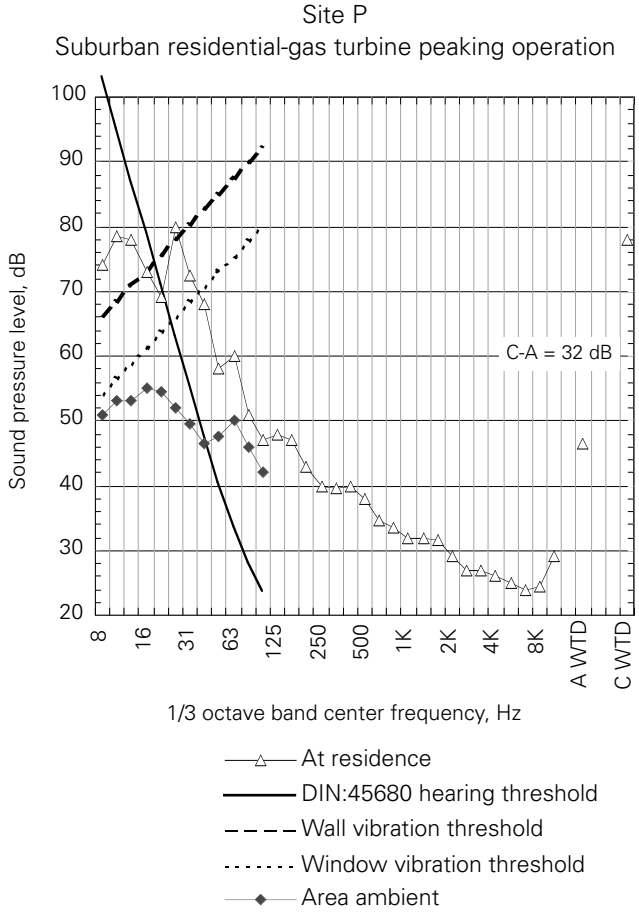
The first observation at all sites from Fig. 2 is that the commonly used indicator of C−A => 20 dB is indeed a useful barometer for detecting a spectrum with potentially excessive low-frequency noise since the difference is greater than 20 dB in all cases except one. In the one case where the C-A level difference was 19 dB (site G), the residents volunteered that the level was just acceptable although very noticeable.

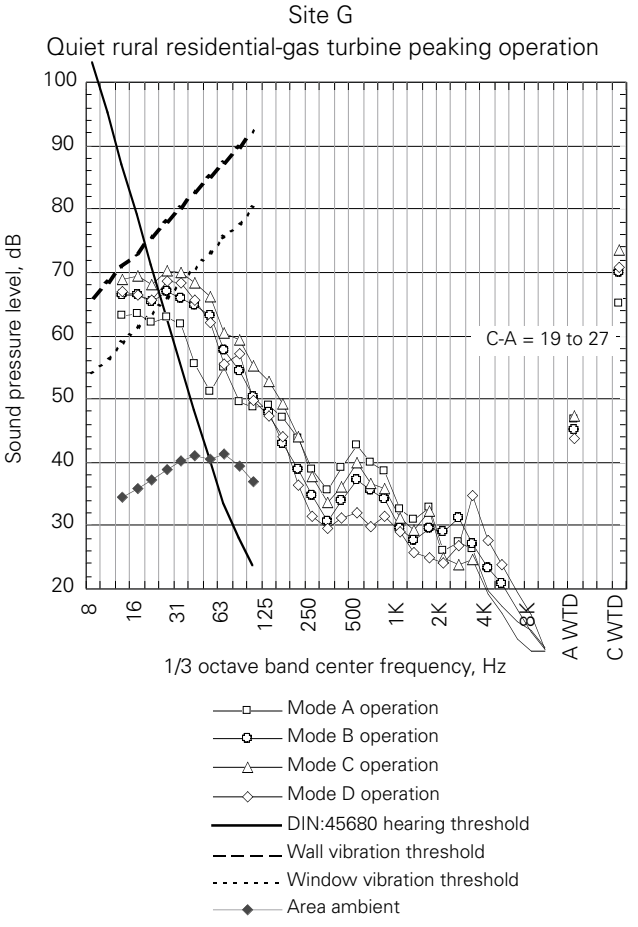
Another common factor is that the threshold for perceiving window vibration is exceeded at all of the sites; at three of the four sites, the threshold for perceiving wall vibration is also exceeded. Lastly, the offending airborne noise is essentially inaudible below about 20 Hz at all sites.

Each site is unique and additional narrow band data are



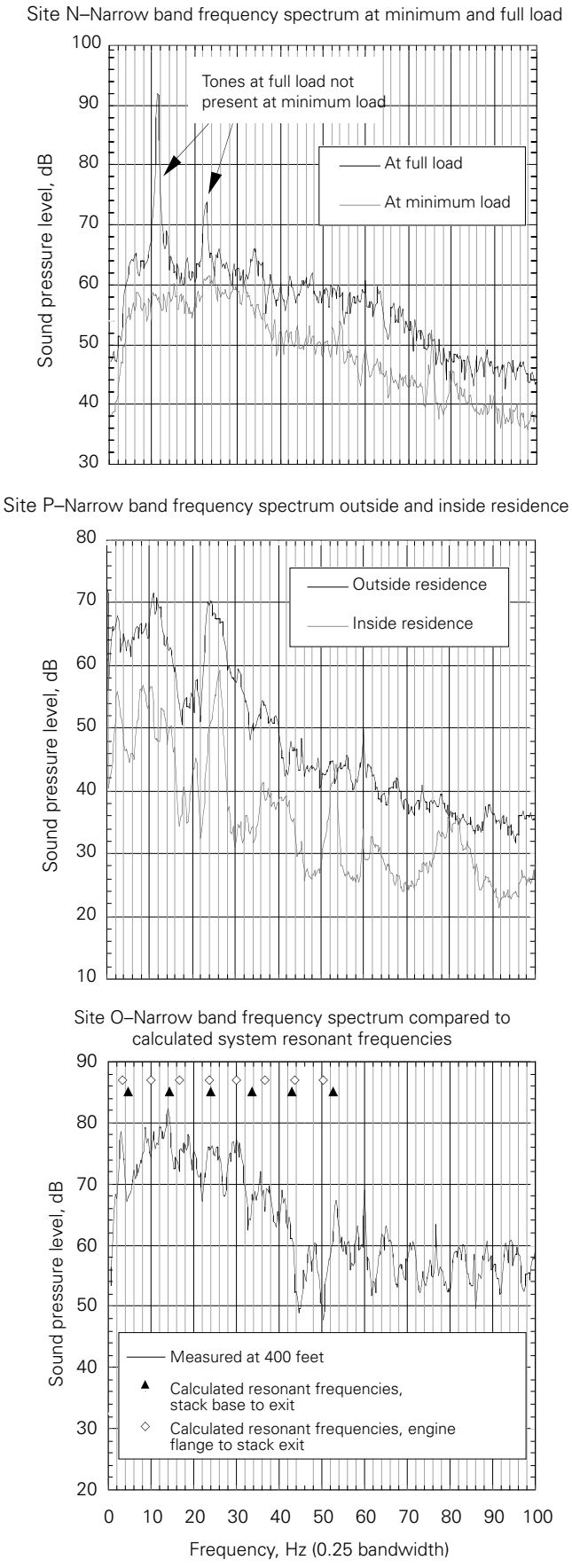






Figs. 2a and 2b– One-third octave band spectra for sites N and P.

Figs. 2c and 2d– One-third octave band spectra for sites O and G.



Figs. 3a, 3b and 3c – Narrow band spectra for sites N, P and O.

presented in Figs. 3a, 3b, and 3c to supplement the one-third octave band spectra. All indoor measurements are made in the room center and outdoor measurements are at least 15 m from any building surface. All measurements are made at a height of 1.5 m. Specific information learned at each site is described in the following section.

A. At site N

This site is rural but near a major roadway, and the two closest residences are less than 120 m from the 20 MW aero-derivative combustion turbine. The unit only operates about 200 hours per year. At partial and full load, moving reflections in mirrors, rattling doors, and a sensation or feeling of "something" was obvious inside the residence. A low-frequency noise component was less obvious but easily detectable outside of the residence.

Narrow band measurements given in Fig. 3 for this site indicate an intense tone at 11 Hz and a harmonic tone at 22 Hz, which is created at some load point beyond minimum load. All of the adverse low-frequency effects disappeared immediately when the load was reduced to minimum for the turbine, even though the audible flow generated noise is not substantially lower. This demonstrated that such very low-frequency discrete tones can and do excite the structure and cause severe disturbance.

Inspection of the engine showed erosion in the hot section combustor area. When a spare engine was installed, the offending tones were no longer created at any load, which proved that the tone was attributable to wear in the combustor cans that, in turn, created a combustor pulsation. Observations at many sites show that combustor-related pulsations typically are very narrow band, well defined tones that do not change frequency with load as the exhaust gas temperature varies. In contrast, resonant tones or peaks associated with an aerodynamic source of excitation are broader and do shift frequency with changing wavelength caused by a change in temperature of the exhaust gases at different turbine loads.

B. At sites P and O

The combustion turbines at these two sites are located on the order of 400 to 900 m from suburban residential areas with ambient noise character including local traffic and other low-level industrial sources. Both sites have 1998 or newer models of modern, high-capacity industrial combustion turbines from two different manufacturers in the range of 120 to 160 MW capacity. Such turbines have extremely complex combustors designed to minimize air emissions. Some combustor designs allow water injection both to reduce air emissions and create additional load capability by increasing the mass of the combustion gases.

The narrow band spectra for sites P and O in Fig. 3 show the more normal case of excessive low-frequency noise from large turbine exhaust systems. Note that the tones or peaks are more broadband compared to the narrow combustor tone at site N. All spectra were measured with a portable RION SA77 signal analyzer with a bandwidth of 0.25 Hz.

Kudernatsch[3] was the first to document with measurements that this tonal behavior is a function of the downstream exhaust

geometry rather than the combustion turbine source. He showed that frequency peaks change and correlate with turbine exhaust gas temperature (variable speed of sound) and also with variable stack height geometry.

The resonant longitudinal modes of the silencer/stack systems can be calculated and matched to the spectra, which was done on the graph of site O. The calculation assumes a long tube with plane wave propagation, closed at one end and open at the other. Tones can be created in these systems with tall stacks (30 m in this case) as low as 3 Hz or even lower for taller stacks.

These examples show that most turbine site spectra are tonal in nature as opposed to a purely broadband aerodynamic flow noise.

At site O, the turbines are operated at minimum load for extended periods of time. This is not a common operational mode since fuel efficiency is poor at minimum load. Here, however, it is offset by a spinning reserve credit. The C-weighted level in the community was measured at 67 dB at minimum load and increased to 75 dB at full load, as shown in Fig. 2, site O.

There were few, if any, complaints at minimum load, even though turbine operation is easily detectable by listening. At full load (75 dB), the turbine low-frequency noise is easily noticeable and complaints ensue. From this experience, it was deduced that a C-weighted level of 70 dB for this type of environment is the maximum recommended level for avoiding low-frequency noise problems at sites with sporadic or seasonal operation. For extended operation in such environments, a C-weighted level of 65 dB is proposed.

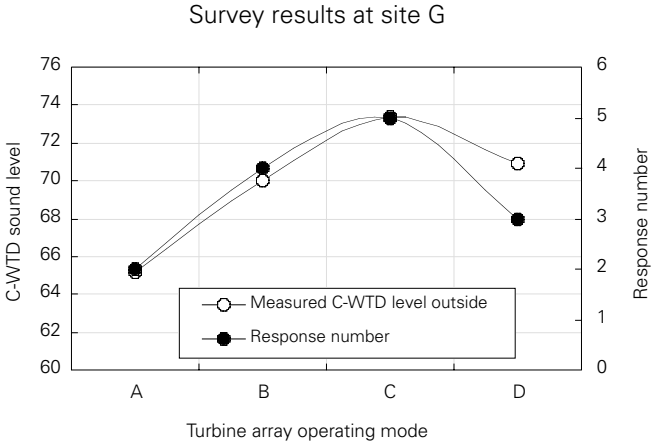
C. At site G

Site G is located in a very rural, quiet area with no nearby environmental noise sources. Complaints ensued immediately from a large widespread area during turbine operation. The site has two different turbine models and optional water injection for power augmentation. Therefore, it was possible to operate the two different turbine types to produce four operating modes that varied both the spectra and level arriving at the residence as shown in Fig. 2, site G.

The measured outdoor C-weighted level varied from 65 to 73 dB at the closest home, approximately 800 m away. The two residents at this home completed a response survey form that had five subjective degrees of response ranging from acceptable to not acceptable for each of the four immission levels.

The results are shown in the graphic titled "Survey Results at Site G." The five response degrees are numbered and plotted on the graphic. The plotted subjective response mirrors the measured C-weighted level. The technicians, consultants, and plant owner subjectively concurred with the resident's responses.

It was concluded from this very minimal survey that a C-weighted level of 65 dB is the maximum level that should be allowed for peaking turbine sites in quiet rural communities. Notice that at 65 dB, the source will be noticeable but judged to be just acceptable. For extended operation in such environments, a C-weighted level of 60 dB is proposed.



Ref, response number:
1–OK with level, acceptable
2–Noticeable, but still acceptable
3–Very noticeable, marginally acceptable
4–Annoying, not acceptable
5–Very annoying, definitely not acceptable

D. At site A

Measurements at site A shown in Figs. 4a and 4b are such that one would not suspect a severe problem with low-frequency noise. The one-third octave band spectra at the nearest complaining residence approximately 800 m (1/2 mile) from a multiple reciprocating compressor station is plotted in the top portion of the figure. A C-weighted level of 60 dB and a C-A quantity of just 13 dB would not seem problematic. Yet, the resident moved to escape the noise. Before moving, the resident would crouch behind a masonry fireplace in one corner with ear protection (cupped ears) in place to escape the noise.

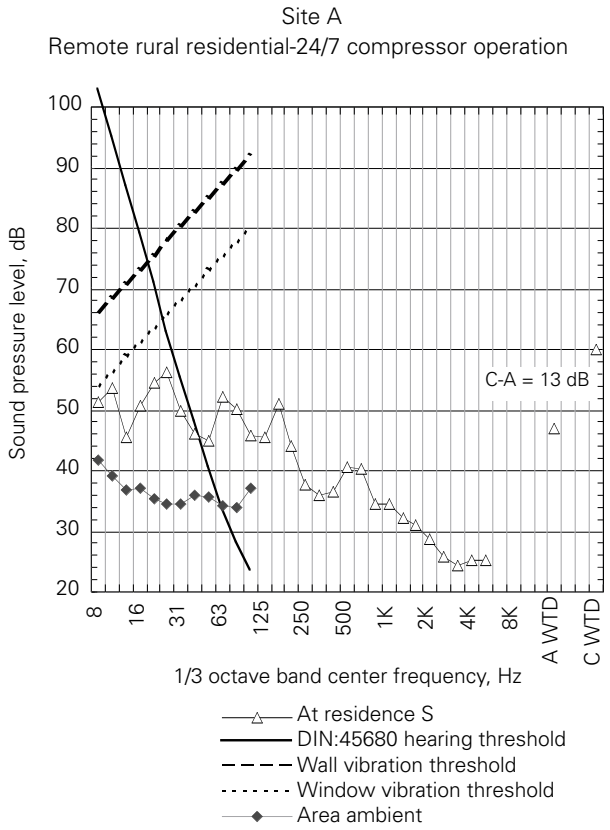
Narrow band measurements at the bottom of Fig. 4 show that the compressor tones inside the home in the 16 to 20 Hz frequency regions were nearly as high as the outdoor measurements. Since there is little sound transmission loss at very low frequencies, the spectrum inside can become unbalanced as higher frequency noise is attenuated by the house structure.

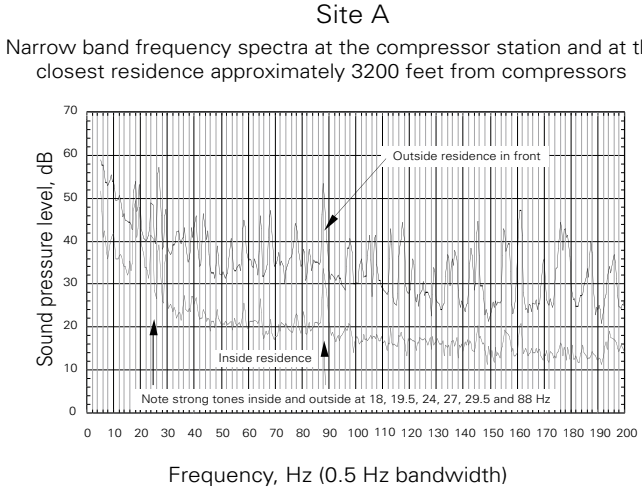
It should be noted that measurements at this site were limited to one sunny afternoon when sound propagation conditions over the long path were not favorable. It is likely that compressor noise is significantly higher at other times when atmospheric conditions are different.

It was concluded that this site study represents the worst-case scenario. The tonal compressors operate on a 24/7 schedule and the area is very rural and remote from daily sources of environmental noise. Daytime A-weighted residual levels were in the 25 to 30 dB range.

In addition, only one resident, obviously possessing a very acute sense of response, experienced such severe suffering.

Nevertheless, a new source of noise with a C-weighted level of 60 dB can sound quite loud and threatening to residents accustomed to very quiet surroundings.





Figs. 4a and 4b – One-third octave band and narrow band spectra for site A.

5. USE OF C- WEIGHTED METRIC COMPARED TO FREQUENCY CRITERIA

Most low-frequency noise criteria are expressed in terms of one-third octave band spectra near the ISO 226 definition of the threshold of audible noise. Leventhall[4] provides an excellent summary on the low-frequency noise problem that contains the control limits in use throughout the world. It is evident that a greater awareness of the problem and remedial action on low-frequency noise is happening in Europe and in Japan.

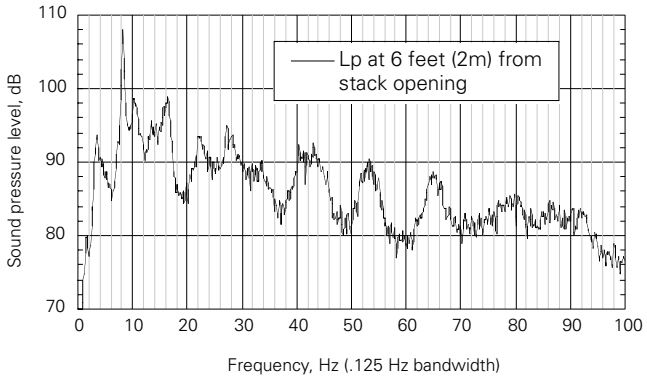
While detailed spectra shape is the preferred technical metric for understanding low-frequency noise, there are great advantages to using the simple C-weighted overall level for criterion and regulation purposes. Many of the same advantages have led to the nearly universal use of the A-weighted level for noise ordinances.

Some difficulties of using one-third octave band spectra for regulation purposes that are avoided by using the C-weighed level are:

- One-third octave analysis requires instrumentation and expertise well beyond the resources of officials responsible for enforcement.
- Low-frequency tones may fall right on a band frequency range limit. This occurred at site N at 11 Hz, which is the upper and lower limit of the 10 and 12.5 Hz one-third octave bands. This complicates the usual approach of limiting an increase in any one band above the values in adjacent bands.
- There may be multiple tones falling into a one-third octave as illustrated by the spectra of site A.

The standardized frequency weightings for sound level meter (SLM) networks are cut-off at 10 Hz. We have shown that there may be troublesome tones lower than 10 Hz and possibly, this could be a problem using the C-weighted network of a SLM with an undefined response below 10 Hz.

The measured spectrum below shows a maximum peak level tone at 8 Hz from the exhaust stack opening at site G. The 8 Hz tone is created by water injection into the combustor. The more broadband system tailpipe resonant modes discussed above are also evident. It can be shown for this spectrum that the C-weighted level calculated by simply extrapolating the weighting network down to 8 Hz is only 0.2 dB higher than the current standard cut off at 10 Hz, even though the peak level occurs below 10 Hz. This occurs because C-weighting becomes increasingly greater at lower frequencies. So, for practical purposes, the current weighting standard is not a problem. However, it should not be a difficult task to extend the standard weighting curve down to 1 Hz.



6. CONCLUSIONS

There is a need in the United States for some federal or prominent standards organization to publish limits in residential areas for low-frequency noise from industrial sources. This

paper proposes maximum limits based on experience in investigating and solving low-frequency noise problems, principally from open-cycle combustion turbine installations. The author believes these problems have occurred over the past 30 years in large measure because there has been no national standard defining permissible low-frequency airborne noise in the United States.

The author and others have designed exhaust systems that greatly reduce the emission of low-frequency noise for new installations. Retrofits have also been engineered to correct problem sites, although at much greater expense compared to new sites. Nevertheless, it can be unequivocally stated that present technology is available to avoid or solve such low-frequency problems.

It is frustrating to continually witness great community distress and ill will towards a plant owner that could have been avoided. Hopefully, greater awareness of the problem and standardized limits for low-frequency noise immissions will minimize such problems.

7. REFERENCES

1 *Acoustics-Normal Equal Loudness Level Contours*, International Standard ISO 226: 2003 (International Organization for Standardization, Geneva, Switzerland, 2003).

2 Stephens, Shepard, Hubbard & Grosveld, "Guide to the evaluation of human exposure to noise from large wind turbines," NASA Technical Memorandum 83288, March 1982.

3 G. Kudernatsch, "Combustion Turbine Exhaust Systems-Low Frequency Noise Reduction," Proc. INTER-NOISE 2000, edited by Didier Cassereau (Noise Control Foundation, Poughkeepsie, New York, 2000).

4 G. Leventhall, "A Review of Published Research on Low Frequency Noise and its Effects," Report for Department for Environment, Food and Rural Affairs, London, UK, May 2003

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION OF OTTER TAIL POWER COMPANY FOR AN ENERGY CONVERSION FACILITY PERMIT FOR THE CONSTRUCTION OF A COMBUSTION TURBINE GENERATOR AND ASSOCIATED INFRASTRUCTURE INCLUDING A NATURAL GAS PIPELINE AND ELECTRIC TRANSMISSION LINE NEAR ASTORIA, SOUTH DAKOTA	* * * * * * * * * *	**SETTLEMENT STIPULATION** **EL17-042**

It is stipulated and agreed by and between Otter Tail Power Company (the "Applicant") and the South Dakota Public Utilities Commission Staff ("Staff") (who may be referred to separately as "Party" or collectively as "Parties"), that the following Settlement Stipulation ("Stipulation") may be adopted by the Public Utilities Commission of the State of South Dakota ("Commission") in the above-captioned matter. In support of its Application to the Commission for a Facility Permit ("Facility Permit"), the Applicant does hereby offer this Stipulation, the Application dated October 5, 2017, as amended and supplemented ("the Application"), and all responses by the Applicant to the Staff's data requests, conditioned upon the Commission accepting the following Stipulation and the Terms and Conditions without any material condition or modification.

I. INTRODUCTION

The Applicant proposes to develop, construct, own, operate, and maintain an approximate 250 megawatt simple-cycle natural gas fired energy conversion facility and related components, which is known as the Astoria Station Project ("the Project"). Related components include a short segment (less than 1,000 feet) of approximately 10-inch diameter natural gas pipeline necessary to connect to the Northern Border Pipeline, a short segment (less than 0.5 miles) of a 345 kilovolt (kV) generation-tie electric transmission line necessary to interconnect to the Big Stone South to Brookings County 345 kV electric transmission line, and a short segment (less than 1,500 feet) of approximately 5-inch diameter water pipe necessary to supply process water and potable water. Otter Tail owns the real property on which the energy conversion facility will be located along with the short segments of natural gas pipeline and water pipeline associated with the Project. Otter Tail has also acquired the easement necessary for the 345 kV generation-tie electric transmission line from a single landowner.

II. PURPOSE

This Stipulation has been prepared and executed by the Parties for the sole purpose of stating the Parties' agreement regarding the issuance of a Facility Permit in Docket No. EL17-042. In consideration of the mutual promises hereinafter set forth, the Parties agree as follows:

1. Upon execution of the Stipulation, the Parties shall file this Stipulation with the Commission together with a joint motion requesting that the Commission issue an order approving this Stipulation in its entirety, without condition or modification.

2. This Stipulation includes all terms and conditions of settlement and is submitted with the condition that, in the event the Commission imposes any material changes or conditions to this Stipulation, which are unacceptable to any Party, this Stipulation may, at the option of any Party, be withdrawn and shall not constitute any part of the record in this proceeding or any other proceeding, nor be used for any other purpose.

3. This Stipulation shall become binding upon execution by the Parties, provided however, that if this Stipulation does not become effective in accordance with Paragraph 2 above, it shall be null and void. This Stipulation is intended to relate only to the specific matter referred to herein; no Party waives any claim or right, which it may otherwise have, with respect to any matter not expressly provided for herein. No Party or a representative thereof shall directly or indirectly refer to this Stipulation as precedent in any other current or future proceeding before the Commission.

4. The terms and conditions contained in this Stipulation shall inure to the benefit of and be binding upon the respective successors, affiliates, owners, stockholders, partners, parents, subsidiaries, directors, officers, agents, employees, representatives, attorneys, and assigns of the Applicant. In addition, the terms and conditions of this Stipulation, including all facts leading up to the signing of this Stipulation, shall bind the Parties, including consultants, contractors, and retained professionals.

5. This Stipulation constitutes the entire agreement between the Parties and shall be deemed to supersede any other understandings or agreements, whether written, oral, expressed or implied, relating to the Application. This Stipulation may not be amended, modified, or supplemented, and waivers or consents to departures from the terms and conditions of this Stipulation may not be given without the written consent thereto executed by all Parties.

6. This Stipulation shall be interpreted and construed in accordance with the laws of the State of South Dakota.

7. This Stipulation may be executed by electronic mail or facsimile and in multiple counterparts, each of which shall be deemed an original and all of which together shall constitute one and the same document.

8. The Parties agree that subject to the four elements of proof under SDCL 49-41B-22, the Commission has the authority to grant, deny, or grant upon terms, conditions, or modifications, a permit for the development, construction, ownership, operation, and maintenance of the Project. The Parties further agree that the Applicant has met its burden of proof pursuant to SDCL § 49-41B-22 and is entitled to a permit to construct the Project as provided in SDCL § 49-41B-24, subject to the following:

III. TERMS AND CONDITIONS OF THE SETTLEMENT STIPULATION

1. The Applicant will obtain all governmental permits which reasonably may be required by any township, county, state or federal agency or any other governmental unit for construction and operation activity prior to engaging in the particular activity covered by that permit. Copies of any permits obtained by the Applicant shall be sent to the Commission.

2. The terms and conditions of the Facility Permit shall be made a uniform condition of construction, subject only to an affirmative written request for an exemption addressed to the Commission. A request to an exemption shall clearly state which particular condition should not be applied to the property in question and the reason for the requested exemption. The Commission shall evaluate such requests on a case-by-case basis which evaluation shall be completed within 60 days unless exigent circumstances require action sooner.

3. If construction of the Project commences more than four years after the date the permit is granted, the Applicant must certify to the Commission before the construction commences that such facilities will meet the permit conditions pursuant to SDCL 49-41B-27.

4. The Permit granted by the Order in this matter shall not be transferable without the approval of the Commission pursuant to SDCL 49-41B-29.

5. The Applicant shall develop, construct, own, operate, and maintain the Project in a manner consistent with:

    a. Descriptions in the Application,
    b. Application supplements,
    c. Responses to any data requests,
    d. The Terms and Conditions of the Permit to Construct Facilities,

e. All applicable laws and rules, including all requirements of SDCL Chapter 49-41B and ARSD 20:10:22,
f. Any applicable industry standards, and
g. Any permits issued by a Federal, State, or Local agency.

6. Applicant agrees that the Commission's complaint process as set forth in ARSD 20:10:01 shall be available to landowners, other persons sustaining or threatened with damage as the result of Applicant's failure to abide by the conditions of the Permit or otherwise having standing to seek enforcement of the conditions of the Permit.

7. The Applicant shall provide the following information to the landowner on whose property the 345 kV generation-tie electric transmission line is to be constructed:
   a. A copy of the Commission Order Granting Permit to Construct Facilities;
   b. Detailed safety information describing:
      i. Reasonable safety precautions for existing activities on or near the Project,
      ii. Known activities or uses that are presently prohibited near the Project, and
      iii. Other known potential dangers or limitations near the Project;
   c. Construction/maintenance damage compensation plans and procedures;
   d. The Commission's address, website and phone number; and
   e. Contact person for Applicant, including name, e-mail address, and phone number.

8. In order to ensure compliance with the terms and conditions of this Permit pursuant to SDCL 49-41B-33, it is necessary for the enforcement of this Order that all employees, contractors, and agents of Applicant involved in this Project be made aware of the terms and conditions of this Permit.

9. Except as otherwise provided in the conditions of this Stipulation, Applicant shall comply with all mitigation measures set forth in the Application, Application Supplements, and Applicant responses to Staff data requests. Material modifications to the mitigation measures shall be subject to prior approval of the Commission.

10. Not later than one month prior to commencement of construction, Applicant shall commence contacts with state, county and municipal emergency response, law enforcement and highway, road and other infrastructure management agencies serving the Project area in order to educate such agencies concerning the planned construction schedule and the measures that such agencies should begin taking to prepare for construction impacts and the commencement of Project operations.

11. Applicant will negotiate road use agreements with Deuel County and any affected townships, if required. Applicant will follow the terms of all road use agreements. Applicant shall take

appropriate action to mitigate wind-blown particles created throughout the construction process, including but not limited to implementation of dust control measures such as road watering, covering of open haul trucks when transporting material subject to being windblown, and the removal of any soils or mud deposits by construction equipment when necessary.

12. Applicant shall comply with the following conditions regarding road protection:
    a. Applicant shall acquire all necessary permits authorizing the crossing of federal, state, county, and township roads.
    b. Applicant shall coordinate road closures with federal, state, and local governments and emergency responders.
    c. Applicant shall implement a regular program of road maintenance and repair through the active construction period to keep paved and gravel roads in an acceptable condition for residents and the public.
    d. After construction Applicant shall repair and restore deteriorated roads resulting from construction traffic, or compensate governmental entities for their repair and restoration of deteriorated roads, such that the roads are returned to their preconstruction condition.
    e. Privately owned areas used as temporary roads during construction will be restored to their preconstruction condition, except as otherwise requested or agreed to by the landowner.
    f. Should Applicant need to widen any existing roadways during construction of the Project, the Applicant shall return the roadways back to original width after completion of the Project, unless agreed upon otherwise with the federal, state, county, or township entities, or the landowner.
    g. Applicant shall use appropriate preventative measures to prevent damage to paved roads and to remove excess soil or mud from such roadways. Before commencing construction, the Applicant shall furnish an indemnity bond in the amount of $250,000 to comply with the requirements of SDCL 49-41B-38. Such bond shall be issued in favor of, and for the benefit of, Scandinavia Township and Deuel County. The bond shall remain in effect until released by the Commission, which release shall not be unreasonably denied following completion of the construction and repair period. Applicant shall give notice of the existence and amount of this bond to Scandinavia Township and Deuel County.

13. Applicant will provide signage that identifies road closures and disturbances resulting from the Project in accordance with the most recent editions of the Manual of Uniform Traffic Control Devices as published by the Federal Highway Administration.

14. Applicant shall promptly report to the Commission the presence of any critical habitat of threatened or endangered species in the siting area that Applicant becomes aware of and that was not previously reported to the Commission.

15. Applicant agrees to avoid cultural resources sites not evaluated, eligible for listing on, or already listed on the National Register of Historic Places (NRHP). When NRHP not evaluated, eligible, or listed sites cannot be avoided, Applicant shall notify the State Historic Preservation Office (SHPO) and the Commission of the reasons that complete avoidance cannot be achieved in order to coordinate minimization and/or treatment measures.

16. If during construction Applicant discovers what may be a cultural resource, human skeletal remains, or associated funerary objects, Applicant or its agent shall immediately cease work at the location and notify the landowner(s), the SHPO, and other authorities as appropriate (per SDCL 34-27-25 and SDCL 34-27-28 in the case of human burials). If it is determined, in coordination with SHPO, that a significant resource is present, Applicant shall develop a plan that is acceptable to the landowner and SHPO that minimizes the impact or threat to the resource.

17. Applicant shall provide the Stormwater Pollution Prevention Plan (SWPPP), for both Project construction and operation, to the Commission when Applicant has a final design for the Project. The SWPPP will outline the water and soil conservation practices that will be used during construction to prevent or minimize erosion and sedimentation. The SWPPP will be completed before submittal of an application for a National Pollutant Discharge Elimination System (NPDES) general permit for construction activities. All contractors will be given a copy of the SWPPP and requirements will be reviewed with them prior to the start of construction.

18. Applicant will repair and restore areas disturbed by construction or maintenance of the Project. Except as otherwise agreed to by the landowner, restoration will include replacement of original pre-construction topsoil or equivalent quality topsoil to its original elevation, contour, and compaction and re-establishment of original vegetation as close thereto as reasonably practical. In order to facilitate compliance with this Condition, the Applicant shall:
    a. Strip topsoil to the actual depth of the topsoil, or as otherwise agreed to by the landowner in writing, in all areas disturbed by the Project;
    b. Store topsoil separate from subsoil in order to prevent mixing of the soil types;
    c. Remove all excess soils generated during project construction from the site, unless the landowner requests, and/or agrees, otherwise;
    d. When revegetating non-cultivated grasslands not owned by the Applicant, the Applicant shall use a seed mix that is recommended by the Natural Resource

Conservation Service (NRCS), or other land management agency, and agreed upon by the landowner in writing; and

e. Work closely with impacted landowners or land management agencies, such as the NRCS, to determine a plan to control noxious weeds.

19. Applicant's obligation with respect to reclamation and maintenance of the 345 kV generation-tie electric transmission line right of way shall continue throughout the life of the transmission line for disturbances caused by Applicant's or its agent's actions.

20. Applicant shall stage construction materials in a manner that minimizes the adverse impact to landowners and land users as agreed upon between the Applicant and landowner. All excess construction materials and debris shall be removed upon completion of the Project, unless the landowner agrees to otherwise.

21. In order to mitigate interference with agricultural operations during and after construction, Applicant shall locate all structures in the 345 kV generation-tie electric transmission line right of way, to the extent feasible and prudent, to minimize adverse impacts and interferences with agricultural operations, shelterbelts and other land uses or activities. Applicant shall take appropriate precautions to protect livestock and crops during construction. Applicant shall repair all fences and gates removed or damaged during construction or maintenance unless otherwise agreed with the landowner or designee. Applicant shall be responsible for the repair of private roads damaged when moving equipment or when obtaining access to the right-of-way.

22. Applicant shall repair or replace all property removed or damaged during all phases of construction, including but not limited to, all fences, gates and utility, water supply, irrigation or drainage systems. Applicant shall fully compensate the owners for damages or losses that cannot be fully remedied by repair or replacement, such as lost productivity and crop and livestock losses. All repair, replacement and/or compensation described above shall be in accordance with the terms and conditions of written agreements between Applicant and affected landowners where such agreements exist.

23. Applicant shall indemnify, defend and hold harmless the landowner, from and against any third-party claims for loss or damage to property or for any injury or death of any person occurring as a result of the Applicants' negligent installation, maintenance, operation, or removal of the transmission lines and facilities upon the easement area, except to the extent such claims are caused by the negligent or otherwise wrongful act of omission of the Landowner.

24. Applicant shall notify the Commission prior to making any material deviations to the Project and afford the Commission the opportunity to review and approve such modifications. For purposes of this paragraph, the term "material deviations" shall mean any action or activity outside the reasonable parameters of this Permit (such as, for example, if the Project is constructed differently than described in the Application).

25. If the Project causes interference with radio, television, or any other licensed communication transmitting or receiving equipment, Applicant shall take all appropriate action to minimize any such interference and shall make a good faith effort to restore or provide reception levels equivalent to reception levels in the immediate areas just prior to construction of the Project. This mitigation requirement shall not apply to any dwellings or other structures built after completion of the Project.

26. If requested, Applicant will provide Global Positioning System (GPS) coordinates of structure locations to affected landowners at any time during the life of the Project. Coordinates will be provided in writing to landowners within 30 days of a request.

27. Not less than 30 days prior to commencement of construction work in the field, Applicant will provide to Staff the most current preconstruction design, layout and plans of the energy conversion facility and 345 kV generation-tie electric transmission line. Applicant will also provide such additional Project preconstruction information as Staff requests.

28. Within 90 days of the Project's completion, Applicant shall submit a report to the Commission that provides the following information:
    a. As-built location of the energy conversion facility and related Project components;
    b. The status of remedial activities for road damage, landowner property damage, crop damage, environmental damage, or any other damage resulted from construction activities; and
    c. A summary of known landowner complaints and Applicant's plan for resolving those complaints.

29. The noise levels exclusively associated with the Project shall not exceed the following standards at the nearest occupied, existing residences (determined on the date the permit is issued) not owned by the Applicant:
    a. a day-night average (Ldn) sound level of 55 dB(A), which includes a nighttime penalty of 10 decibels; and
    b. a maximum (Lmax) C-weighted sound level of 65 dB(C) applicable at all times.

30. A post-construction operational noise assessment shall be completed based on measurements by an independent third-party noise consultant, approved by Staff, to show compliance with

the noise standards. The noise assessment shall be performed in accordance with American National Standards Institute (ANSI) B133.8 – Gas Turbine Installation Sound Emissions.

31. Applicant shall seek local input to properly and effectively coordinate an emergency response plan consistent with local resources and response abilities. Upon completion of construction, the initial draft of the Project's emergency response plan shall be filed with the Commission for public availability.

32. If the Project is decommissioned, Applicant will follow the decommissioning plan laid out in Section 26.0 of the Application. The Commission shall be notified prior to any decommissioning action.

33. The Applicant shall work with Scandinavia Township to improve approximately ½ mile of 482nd Avenue from SD Highway 28 north to the Astoria Station plant entrances for construction and plant access.

34. The Applicant shall assess the use of Brookings-Deuel Rural Water System as recommended by the Local Review Committee and submit the assessment to the Commission 30 days prior to construction. The assessment shall include justification for not pursuing the use of Brookings-Deuel Rural Water System for the Astoria Station water supply if the Applicant elects to utilize on-site wells.

[Signature Page Follows]

Otter Tail Power Company

By: J. Boyd Thu

Its: President

Dated: 7/11/18

South Dakota Public Utilities Commission Staff

By: [signature]

Its: Staff Attorney

Dated: 7/12/2018

[SIGNATURE PAGE TO SETTLEMENT STIPULATION DOCKET NO. EL17-042]