Hornet 0136 Pad
Weld County, Colorado
5/7/2024

304.c.(2): Noise Mitigation Plan

Verdad Resources LLC

Contents

Article I. Introduction

Facility Information

This document provides site-specific information for the Hornet 0136 Pad. The information in this document relates specifically to the time during the construction, drilling, completions flowback and production of the nine (9) proposed horizontal wells on this location.

The proposed location is in the Ag-rural planning area for Weld County with current land use as rangeland. The location is north of WCR 96 with an existing access from WCR 96. The pad will be in the NWSW of Section 6, Township 8 North, Range 60 West zoned AG. A 1041 pre-application meeting was held January 3, 2024 and pre-application notifications were sent on January 17, 2024.

The proposed Pad will be approximately 12 acres, reduced to 4.33 acres after interim reclamation. The Pad is on Parcel 054106000001 owned by Kenneth W. Hunt. The location is currently used as rangeland.

The proposed production facility equipment for the Hornet 0136 Pad will be located within the Working Pad Surface and will consist of 1 oil tank, 3 water tanks, 4 separators, 2 heater treaters, 1 gas lift compressors, 1 ECD, 3 Vapor Recovery Units, 1 Surge Vessels, 1 Instrument Air, and 2 LACT Units.

Phase	Duration (Days)	Estimated Start
Construction	14	Q4 December 2024
Drilling	49	Q1 March 2025
Completion	39	Q3 August 2025
Flowback	27	Q4 October 2025
Production	30 Years	Q4 December 2025

Article II. Noise Standards and Regulations

Weld County Code 21-5-435 A.-Noise

The Weld County Code list noise limits for oil and gas operations. All oil and gas operations will comply with the following maximum permissible noise levels in Table 435 A.1 unless otherwise required by Rule 435.The Hornet Pad is located in Ag-rural planning areas and must comply with NL-4 for construction phase operations and NL-1 for the production phase. The noise limits are provided in table II-1.

Table II-1-Noise Level Standards Weld County 435 A.1

Land Use Designation	**7:00 am to next 7:00 pm**	**7:00 pm to next 7:00 am**
NL-1	55 db(A)	50 db(A)
NL-2	60 db(A)	55 db(A)
NL-3	65 db(A)	60 db(A)
NL-4	70 db(A)	65 db(A)
All Zones (C-scale)	65 db(C)	65 db(C)

Energy and Carbon Management Commission (ECMC)

Noise associated with oil and gas development is regulated by the Energy and Carbon Management Commission (ECMC) Rule 423. Operators will submit a noise mitigation plan that demonstrates one or more proposed methods of meeting the maximum permissible noise levels described by this Rule 423 as an attachment to their Form 2As, as required by Rule 304.c.(2). The ECMC rules list noise limits for oil and gas operations. "All oil and gas operations will comply with the following maximum permissible noise levels in Table 423-1 unless otherwise required by Rule 423". The noise limits are provided in table II-2.

Table II-2- Maximum Permissible Noise Levels

Land Use Designation	**7:00 am to next 7:00 pm**	**7:00 pm to next 7:00 am**
Residential/ Rural/State Parks & State Wildlife Area	55 db(A)	50 db(A)
Commercial/ Agricultural	60 db(A)	55 db(A)
Light Industrial	70 db(A)	65 db(A)
Industrial	80 db(A)	75 db(A)
All Zones	60 db(C)	60 db(C)

Exceptions to the noise limits above are given in Rule 423.b(2)

(2) Unless otherwise required by Rule 423, drilling or completion operations, including Flowback

A. In Residential/Rural or Commercial/Agricultural, maximum permissible noise levels will be 60 db(A) in the 7:00 p.m. to 7:00 a.m. nighttime hours and 65 db(A) in the daylight 7:00 a.m. to 7:00 p.m.; and

B. In all zones maximum permissible noise levels will be 65 bd(C) in the hours between 7:00 p.m. to 7:00 a.m. and 65 db(C) in the hours between 7:00 a.m. and 7:00 p.m.

Table II-3 displays estimated noise levels as defined by Rule 423.a.(2)

Table II.3- Estimated Noise Levels at 2000 ft.

Phase	Duration (Days)	Estimated Noise Levels at Compliance Points
Construction	14	<50 db(A),<60 db(C)
Drilling	49	<45 db(A),<65 db(C)
Completion	39	<60 db(A),<65 db(C)
Flowback	27	<60 db(A),<65 db(C)
Production	30 Years	<50 db(A),<60 db(C)

Estimates are based on generic modeling of noise level data previously measured for Precision Drilling 464 drilling rig, Haliburton e-fleet, Zeus 1, and production facility utilizing SoundPlan 9.0 Software. Verdad will use an electrified hydraulic frac fleet. Pumps used for hydraulic fracturing are powered by electricity generated either off-site or by on-site natural gas-powered reciprocating engines and turbines. There may be a number (3-4) of support engines for pump down and blenders that will be Tier 4 dual fuel engines.

Model demonstrates mitigated sound estimates at various distances. See attached Modeling report.

Article III. Ambient Sound Survey

For proposed Oil and Gas Locations with a Working Pad Surface within 2,000 feet of one or more Residential Building Units, an ambient noise survey will be run. The proposed Hornet Pad location does not meet the ECMC requirements for an ambient sound survey as defined in ECMC 423.a.(5).

If requested, a background ambient survey will be conducted prior to commencement in accordance with Weld County code 21-5-435.

21-5-435. Noise.

b. When required, the 1041 WOGLA Permit will include a condition of approval requiring the Operator to conduct the background ambient noise survey not more than ninety (90) days, nor less than thirty (30) days, prior to the Construction Phase. Such survey results shall be submitted to the OGED Director for review and possible action. If necessary, the noise mitigation plan shall be updated accordingly based on the survey results and submitted to the OGED Director for approval via the 1041 WOGLA Sundry Form.

c. When an Operator conducts a background ambient survey the Operator will follow the same approach as outlined in Section 21-5-435.B and over a 72-hour period, including at least 24 hours between 10:00 p.m. on a Friday and 4:00 a.m. on a Monday. A single cumulative daytime ambient noise level and a single cumulative nighttime ambient noise level will be established by taking the logarithmic average of all daytime or nighttime one (1)-hour Leq values measured and in accordance with the sound level data collection requirements pursuant to the maximum permissible noise levels found in Table 435 A.1.

d. Sound levels shall be measured at a distance of 350 feet from the Oil and Gas Location, at minimum in four (4) directions.

Article IV. Points of Compliance

For proposed Oil and Gas Locations with a Working Pad Surface within 2,000 feet of one or more Residential Building Units, at least one, and no more than six noise points of compliance where monitors will be located. Rules defined in ECMC 423.a.(5) series noise regulations are not applicable for Hornet location.

Weld County Code states if a location is within a Near Urban planning area and there is a Building Unit Owner within 1041 WOGLA zone, a noise impact study by a qualified sound expert may be required and if there are existing industrial or commercial activities within the 1041 WOGLA zone, a baseline ambient noise survey may also be required. The Hornet pad is located in Ag-rural, there are no residential building units within the WOGLA and a noise impact study is not required.

Article V. Mitigation Measures and Best Management Practices

Best Management Practices and best engineering practices for measuring and mitigating noise levels shall include but not be limited to:

1. Operator will comply with the maximum permissible noise levels specified in Rule 423.b.(1).
2. The direction of prevailing winds is considered when planning the location in order to mitigate odor and noise from being a nuisance to the surrounding residents and occupied structures. In order to minimize sound levels during drilling operations at nearby residences, rig generators will be located as far as possible from the residence by rig orientation.

3. This location will have sound walls on the south side of the pad. Sound walls are 32 feet high, approximately 820 feet long made of vinyl and sound absorbing non-woven fiber. They will be on location during drilling, completion and flowback operations.

Complaints

Operator shall provide and post 24-hour, 7 days per week contact information to deal with all noise complaints arising due to Operator's oil and gas facilities. If a noise complaint is made to either Operator directly, or to the ECMC or the Local Government Designee and Operator is notified of the complaint, noise levels will be measured within forty-eight (48) hours of Operator's receipt of the complaint. Operator will contact the concerned party (if contact information is available) to discuss the complaint and the results of the noise measurements.

Contacts

Should a noise complaint be filed with the ECMC or the Local Government Designee, the complaint should be forwarded to the following address or emailed to the below:

Verdad Resources LLC

1125 17th St Suite 550

Denver CO 80202

Attention: Mike Cugnetti

Mike Cugnetti 720-845-6901

Regulatory@verdadresources.com

Article VI. Exhibits/References/Appendices

A background ambient noise survey will be provided if requested by Weld County.

Verdad Resources - Generic Noise Modeling Report

November 1, 2023

Prepared for:

Verdad Resources, LLC
1125 17th Street, Suite 550
Denver, CO 80202

Prepared by:

Behrens and Associates, Inc.
2320 Alaska Avenue
El Segundo California, 90245

Shaun Norris
Senior Acoustical Engineer

Jason Peetz
Engineering Manager

1. Introduction

The following report provides a study of the noise impact at distance due to the proposed activities at a generic drilling, completions, and production pad operated by Verdad Resources, LLC. The modeled sound levels were evaluated at receivers directly to the north, east, west and south of the generic pad at distances between 350 feet and 2,500 feet from the center of the pad. File noise level data previously measured and typical of a Precision Drilling 464 drilling rig, Halliburton Zeus Electric Fleet completions crew, and a production facility were utilized in the noise modeling. The noise model was developed using SoundPLAN 9.0 software.

The following is provided in this report:

- A brief discussion of the fundamentals of noise
- Discussion of the noise modeling methodology and results.

Figure 1-1 Typical Halliburton Zeus Electric Fleet

2. Noise Fundamentals

Sound is most commonly experienced by people as pressure waves passing through air. These rapid fluctuations in air pressure are processed by the human auditory system to produce the sensation of sound. The rate at which sound pressure changes occur is called the frequency. Frequency is usually measured as the number of oscillations per second or Hertz (Hz). Frequencies that can be heard by a healthy human ear range from approximately 20 Hz to 20,000 Hz. Toward the lower end of this range are low-pitched sounds, including those that might be described as a "rumble" or "boom". At the higher end of the range are high-pitched sounds that might be described as a "screech" or "hiss".

Environmental noise generally derives, in part, from a combination of distant noise sources. Such sources may include common experiences such as distant traffic, wind in trees, and distant industrial or farming activities. These distant sources create a low-level "background noise" in which no particular individual source is identifiable. Background noise is often relatively constant from moment to moment, but varies slowly from hour to hour as natural forces change or as human activity follows its daily cycle.

Superimposed on this low-level, slowly varying background noise is a succession of identifiable noisy events of relatively brief duration. These events may include the passing of single-vehicles, aircraft flyovers, screeching of brakes, and other short-term events. The presence of these short-term events causes the noise level to fluctuate. Typical indoor and outdoor A-weighted sound levels are shown in Figure 2-1. Detailed acoustical definitions have been provided in Appendix A – Glossary of Acoustical Terms.

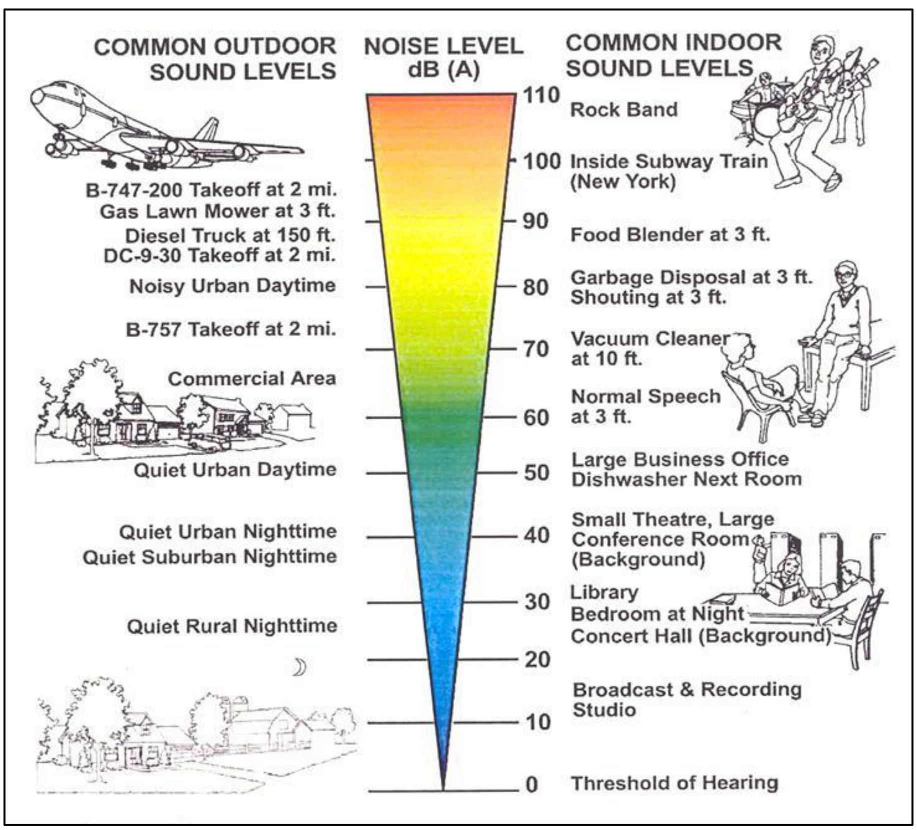

Figure 2-1 Typical Indoor and Outdoor A-Weighted Sound Levels

3. Noise Modeling

3.1 Noise Modeling Methodology

The noise modeling was completed with use of three-dimensional computer noise modeling software. All models in this report were developed with SoundPLAN 9.0 software using the ISO 9613-2 standard. Noise levels are predicted based on the locations, noise levels and frequency spectra of the noise sources, and the geometry and reflective properties of the local terrain, buildings and barriers. To ensure a conservative assessment and compliance with ISO 9613-2 standards, light to moderate winds are assumed to be blowing from the source to receptor. The predicted noise levels represent only the contribution of the drilling, completions, and production operations and do not include ambient noise or noise from other facilities. Actual field sound level measurements may vary from the modeled noise levels due to other noise sources such as traffic, other facilities, other human activity, or environmental factors. The modeled environmental conditions can be seen in Table 3-1.

Table 3-1 Modeled Environmental Conditions

Weather Parameter	Modeled Input
Temperature	10° C
Relative Humidity	70%
Air Pressure	1013.3 mbar
Wind Velocity	Per ISO 9613-2
Wind Direction	Source to receptor
Foliage	Not Included
Ground Absorption	0.5 for working pad 0.7 for general ground cover

The sound level data utilized in the drilling model was based on measured file data of a Precision Drilling 464 (PD464) drilling rig completions crew collected by BAENC. The V door faces south with the backyard equipment positioned to the north. The predicted modeling results are dependent on equipment and mitigation orientation as indicated and only inclusive of the equipment listed in Table 3-3.

Table 3-2 PD464 Major Noise Emitting Equipment Included in Model

Equipment	Quantity
Centrifuge	2
Drawworks	1
Generator	3
HPU	1
Mud Pump	3
Shaker	3
Top Drive	1

The sound level data utilized in the completions model was based on measured file data of a Halliburton Zeus Electric Fleet completions crew collected by BAENC. The model consists of 8 completions trucks and 9 generators positioned north of the well heads (on the north side of the generic pad). The predicted modeling results are dependent on equipment and mitigation orientation as indicated and only inclusive of the equipment listed in Table 3-3.

Table 3-3 Halliburton Zeus Electric Fleet Major Noise Emitting Equipment Included in Model

Equipment	Quantity
Blender	1
Chem Truck	1
Generator	9
Pump Down	2
Pump Truck	8
Transfer Pump	1

The sound level data utilized in the production model was based on measured file data of a typical production facility collected by BAENC. Other auxiliary/temporary equipment or smaller equipment not anticipated to generate significant noise was not included in the production model. The predicted modeling results are dependent on equipment and mitigation orientation as indicated and only inclusive of the equipment listed in Table 3-3.

Table 3-4 Production Facility Noise Emitting Equipment Included in Model

Equipment	Quantity
Air Compressor	1
Electrical Panel/Box	2
LACT Building	3
Gas Lift Compressor	2
Separator	3
Bulk Separator	4
VOC Combustor	1
Flogistix FX12 VRU	7

The noise modeling results are dependent on the drilling, completions, and production equipment layout and operating conditions at the time the equipment was surveyed. Changes or additions to any equipment (e.g., Generators, mud pumps, pump trucks, VRUs, separators, etc.) or enclosures housing equipment may result in operational noise levels that are inconsistent with the modeling results. It is therefore recommended equipment surveys of completions equipment be conducted whenever changes are made to equipment being used in the field.

3.2 Unmitigated Noise Modeling Results

The results are reported as noise contour maps utilizing both the A-weighted and C-weighted decibel scales. The A-weighted filter is applied to instrument-measured sound levels in effort to account for the relative loudness perceived by the human ear. As the human ear is less sensitive to low frequencies, the A-weighted filter correspondingly discounts low frequency sound observed during measurements and is widely utilized for environmental noise measurements. The C-weighted filter is applied to instrument-measured sound levels to provide an indication of the low frequency content of the measured sound.

Figure 3-1 and Figure 3-2 show the Unmitigated PD 464 Noise Contour Map in dBA and dBC respectively. Figure 3-3 and Figure 3-4 show the Unmitigated Halliburton Zeus Electric Fleet Noise Contour Map in dBA and dBC respectively. Figure 3-5 and Figure 3-6 show the Unmitigated Production Facility Noise Contour Map in dBA and dBC respectively. These contours are provided in 5 dB increments with the color scale indicating the sound level of each contour. The modeled noise levels are shown at the specified receiver points to the north, east, south and west at distances of 350 to 2,500 feet from the center of the pad.

Figure 3-7 shows the unmitigated PD464 noise levels versus distance graph for both the A-weighted and C-weighted decibel scales. Figure 3-8 shows the unmitigated Halliburton Zeus Electric Fleet noise levels versus distance graph for both the A-weighted and C-weighted decibel scales. Figure 3-9 shows the unmitigated Production Facility noise levels versus distance graph for both the A-weighted and C-weighted decibel scales. The sound pressure level at each receiver point is listed in Appendix B - Tabulated Predicted Noise Levels vs. Distance. The production facility equipment list and equipment orientation were supplied by Verdad Resources and can be seen Appendix C. The predicted modeling results are dependent on equipment and orientation as indicated.

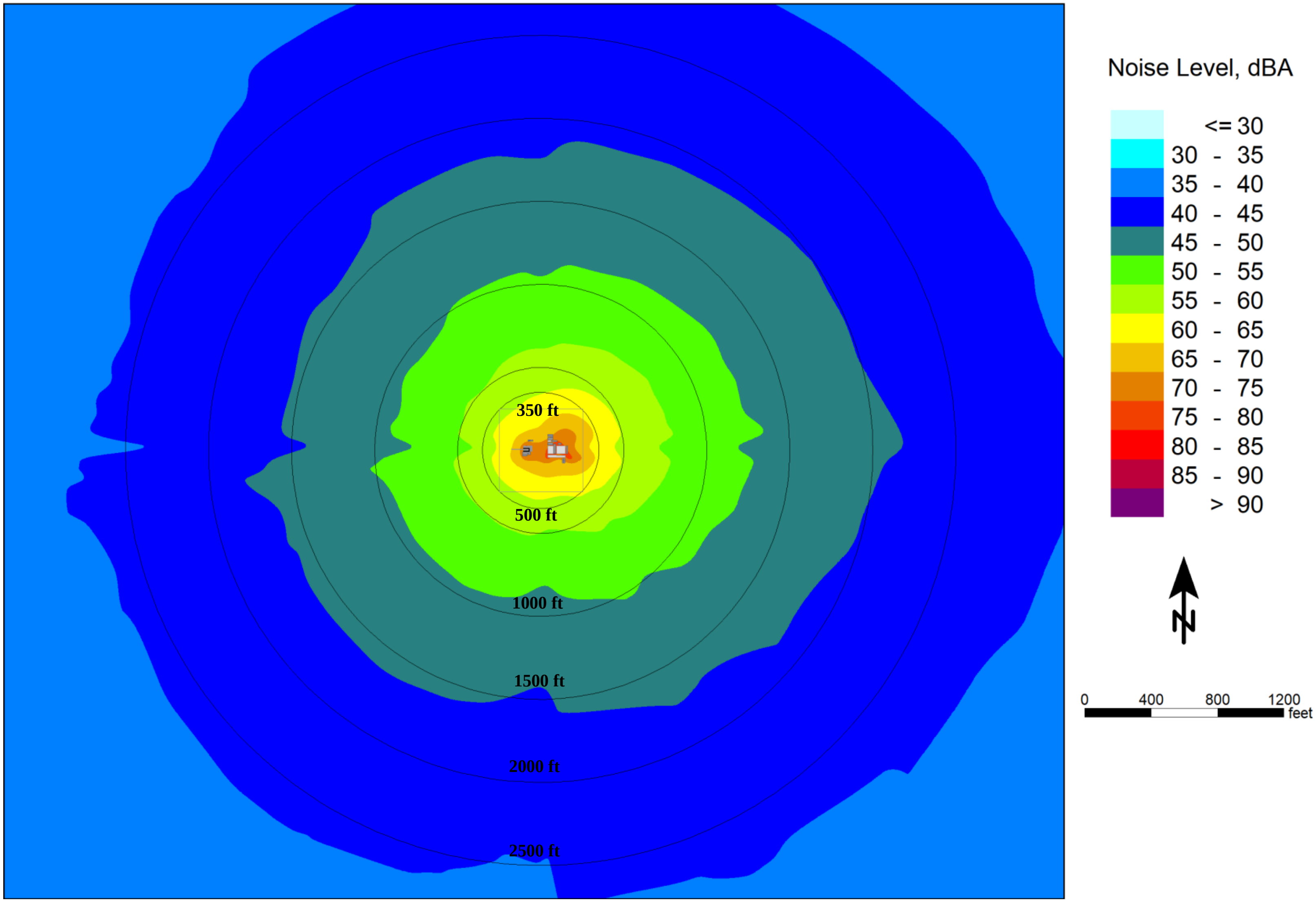

Figure 3-1 Unmitigated PD464 Noise Contour Map (dBA)

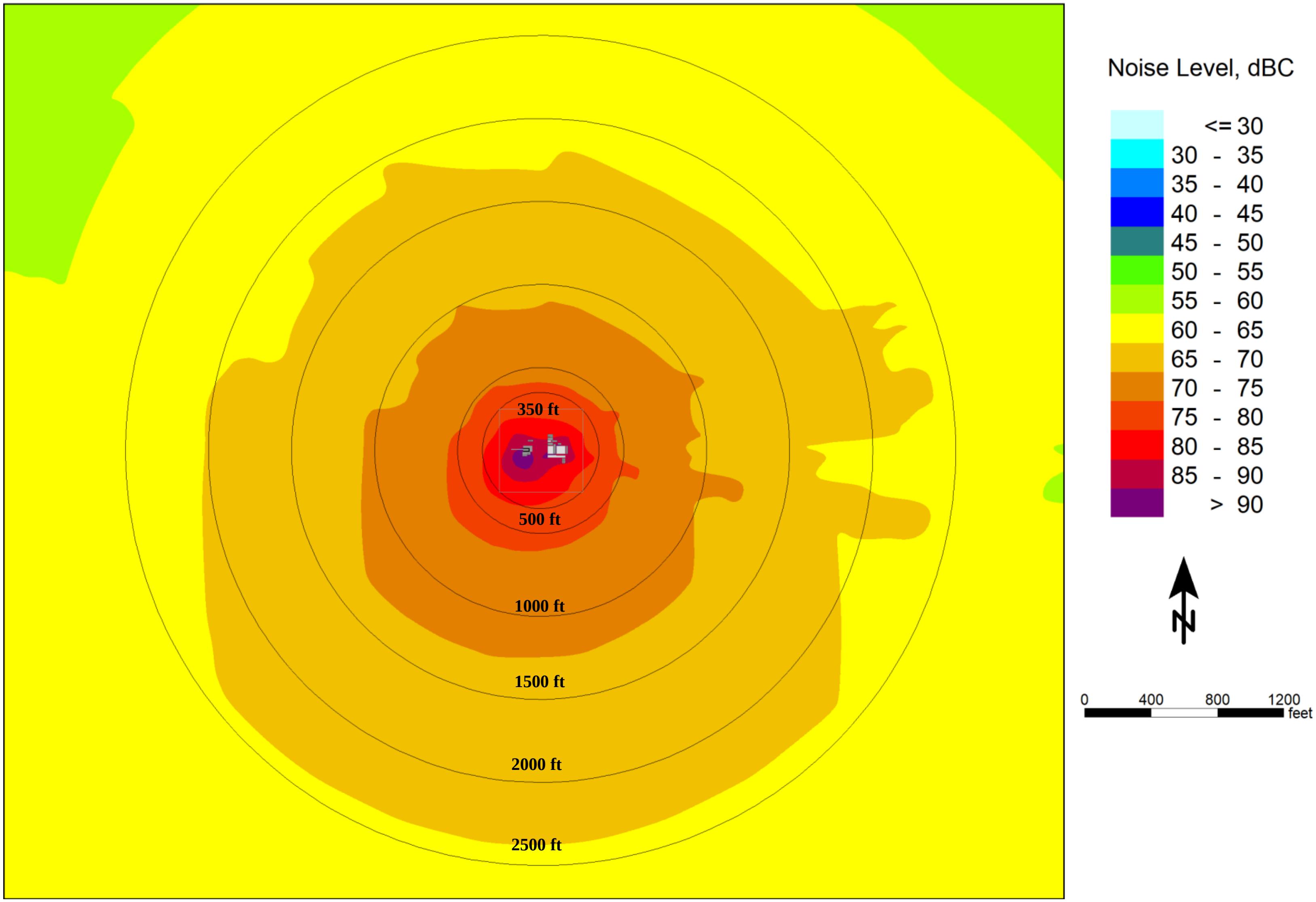

Figure 3-2 Unmitigated PD464 Noise Contour Map (dBC)

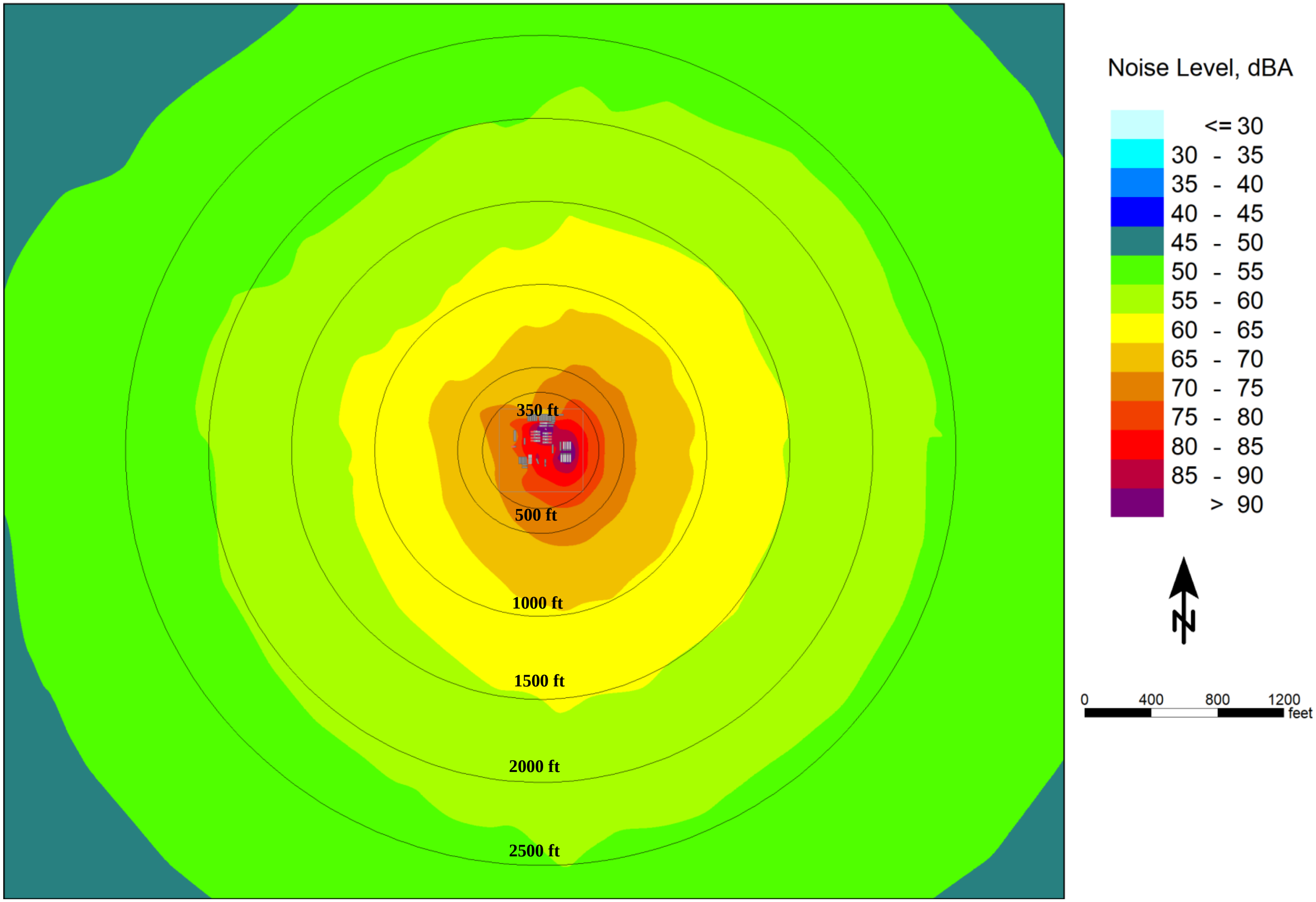

Figure 3-3 Unmitigated Halliburton Zeus Electric Fleet Noise Contour Map (dBA)

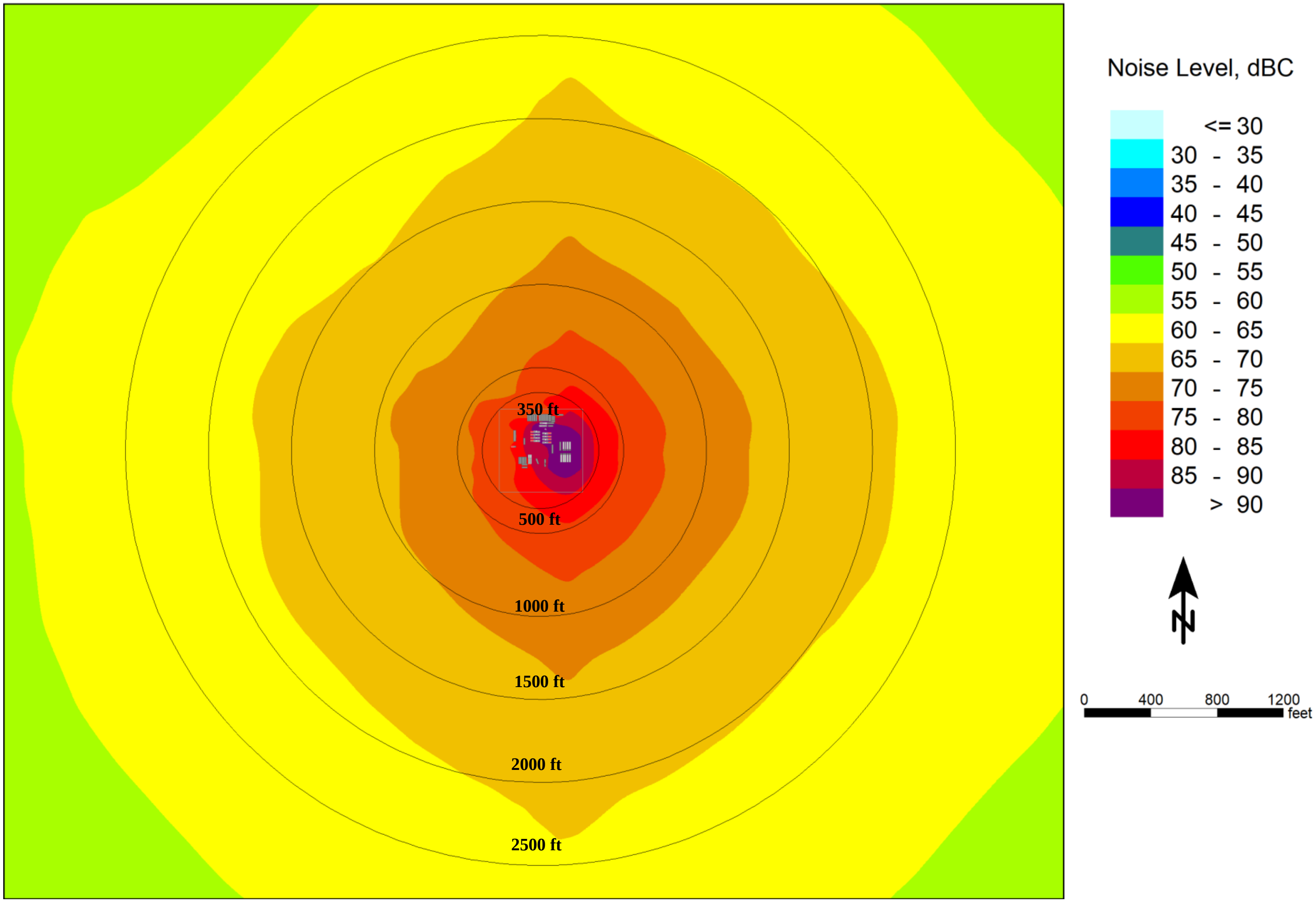

Figure 3-4 Unmitigated Halliburton Zeus Electric Fleet Noise Contour Map (dBC)

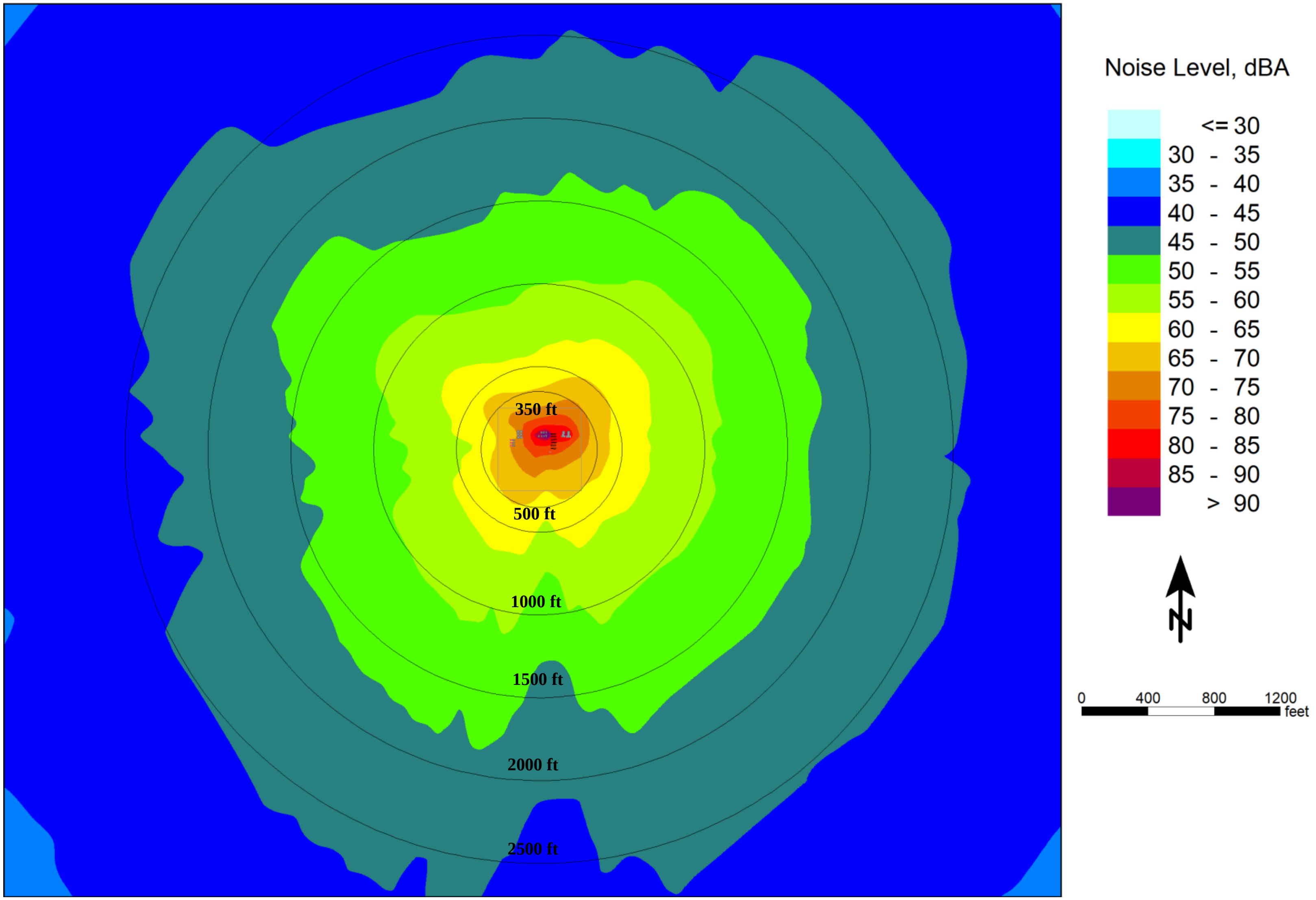

Figure 3-5 Unmitigated Production Noise Contour Map (dBA)

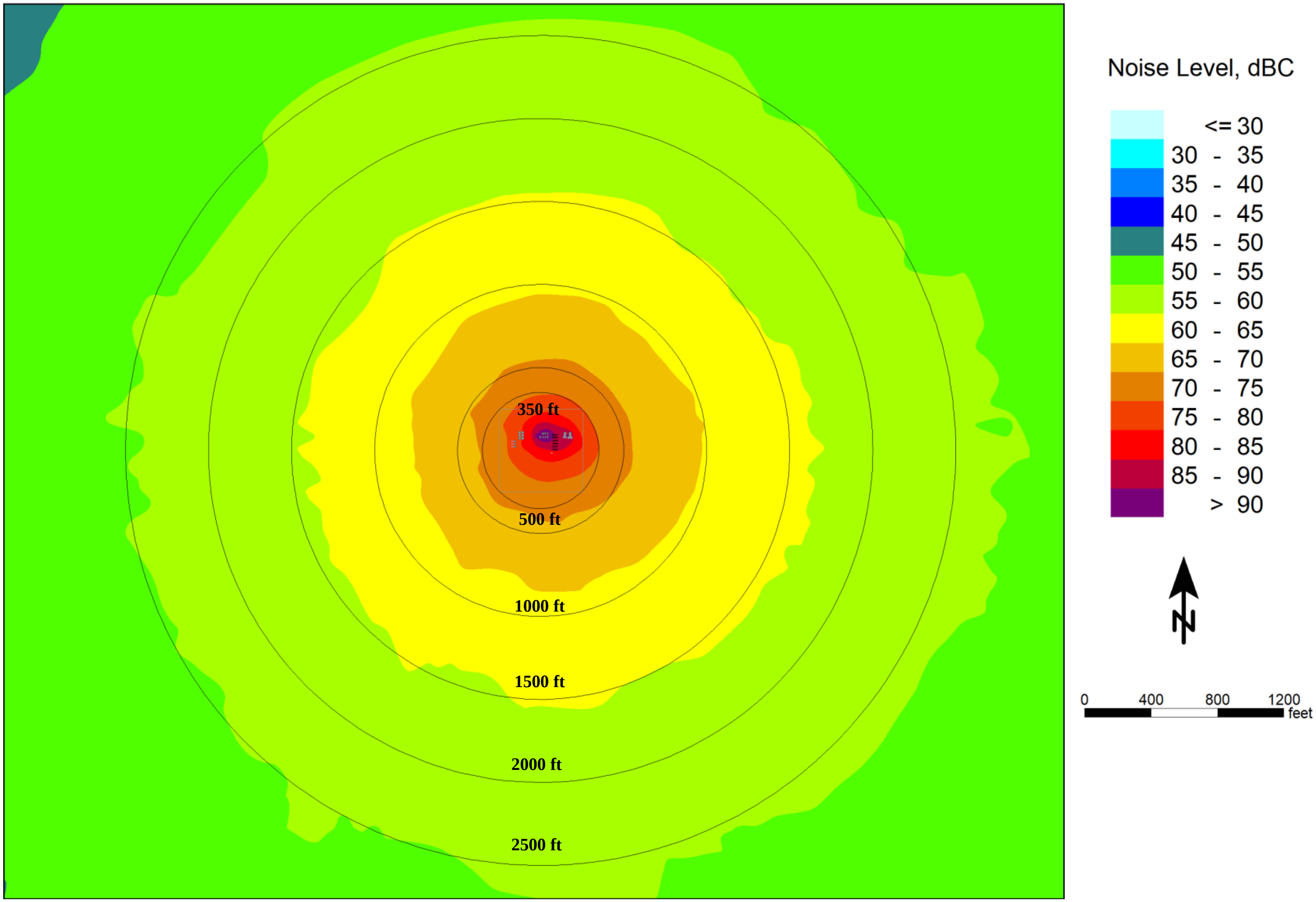

Figure 3-6 Unmitigated Production Noise Contour Map (dBC)

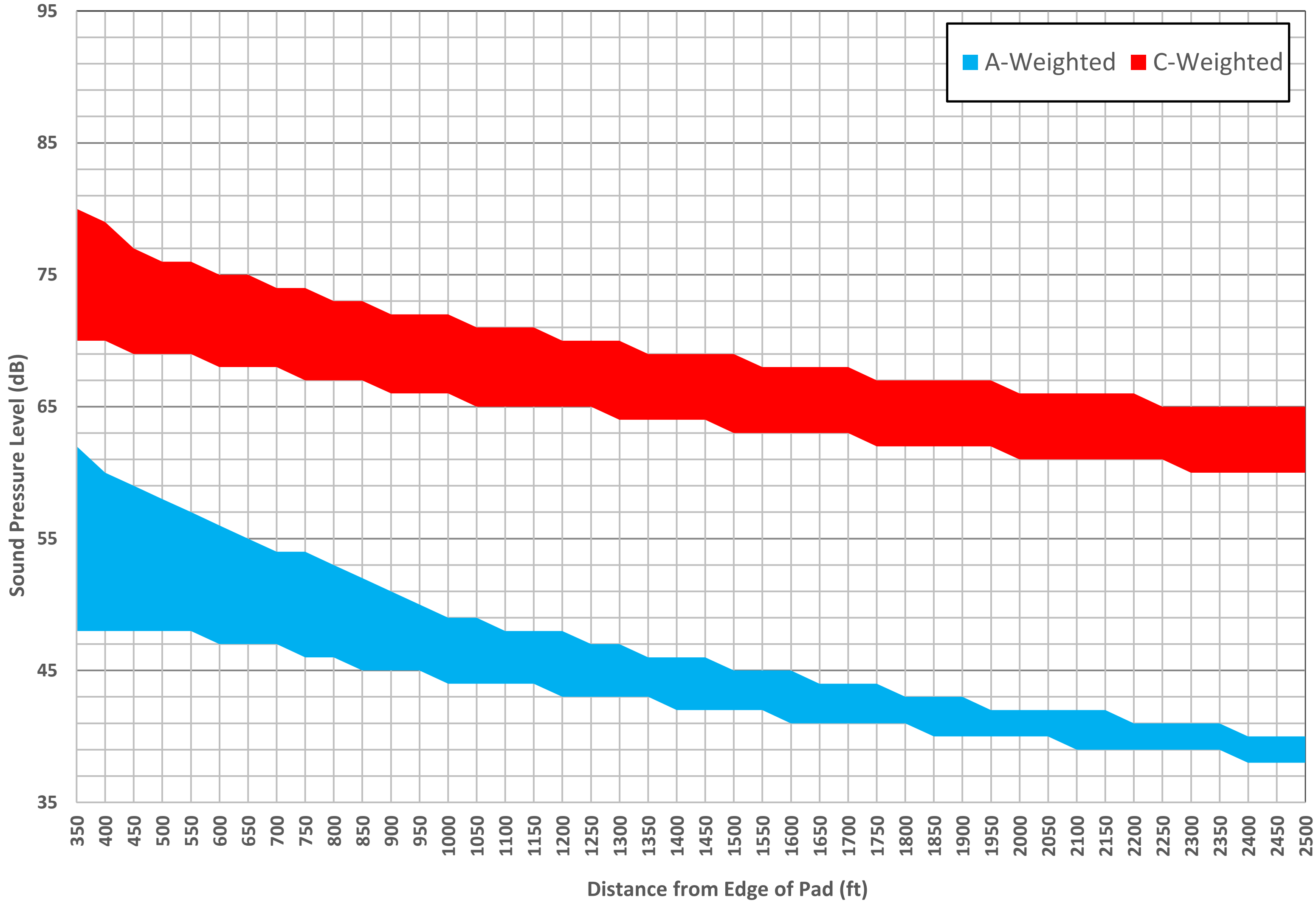

Figure 3-7 Unmitigated PD464 Noise Level vs. Distance Graph

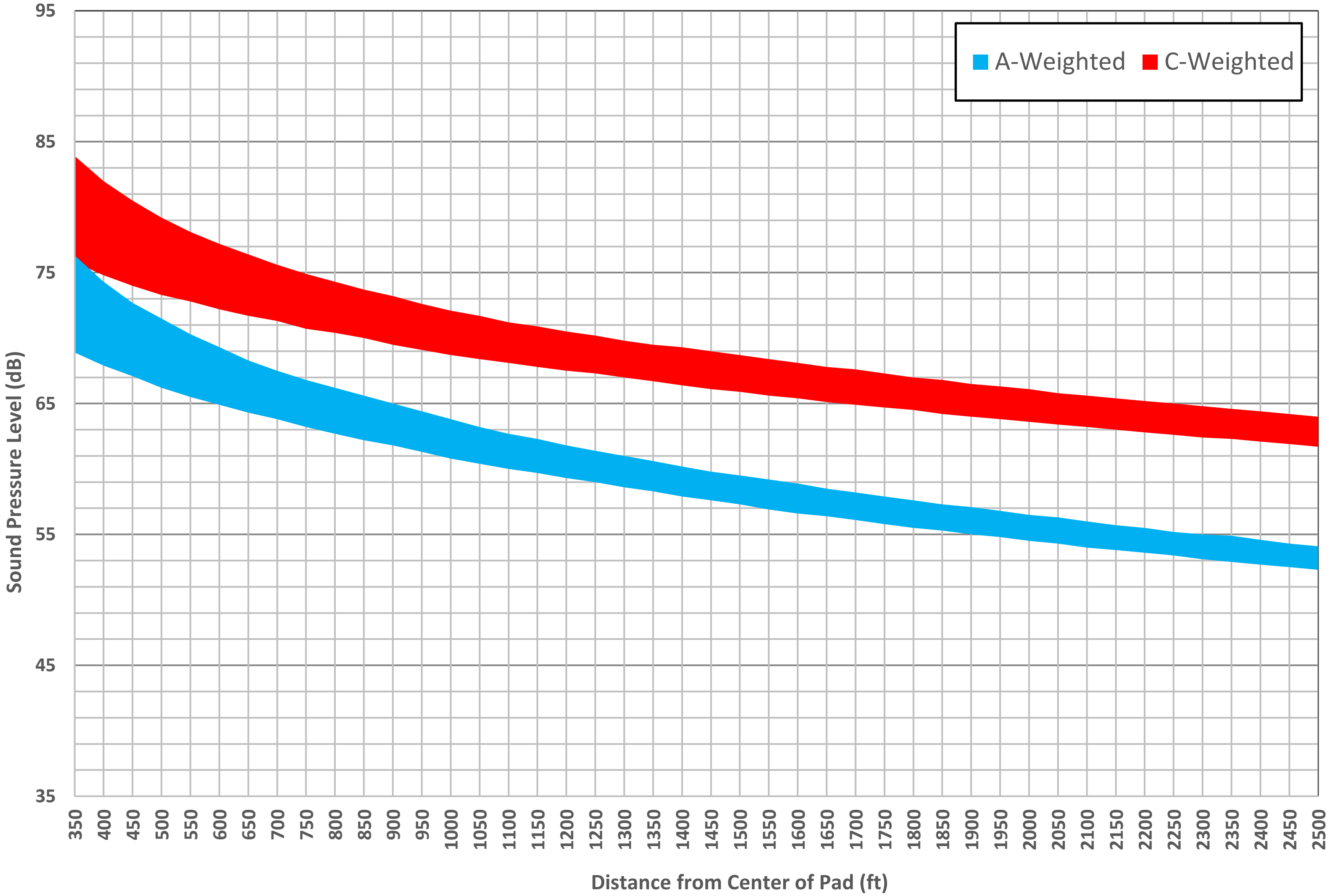

Figure 3-8 Unmitigated Halliburton Zeus Electric Fleet Noise Level vs. Distance Graph

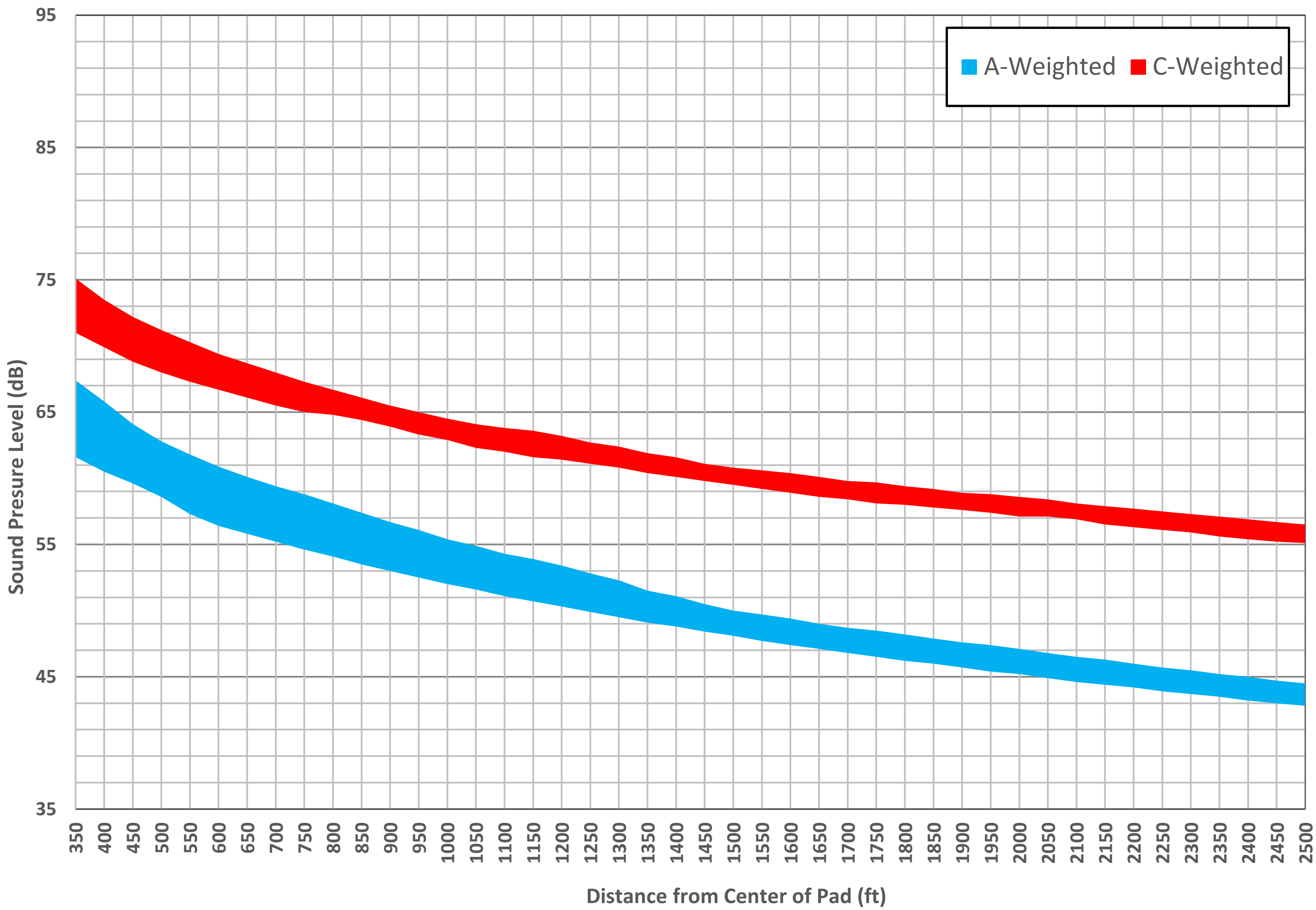

Figure 3-9 Unmitigated Production Noise Level vs. Distance Graph

3.3 PD 464 & Halliburton Zeus Electric Fleet Mitigated Modeling Results

Noise mitigation for the PD 464 Drilling Rig and Halliburton Zeus Electric Fleet operations has been included in the modeling to reduce noise levels in the surrounding environment. The noise mitigation included in the modeling is described below:

- Approximately 880 total linear feet of 32-foot-high, Sound Transmission Class (STC) 25 acoustical wall installed on the north, west, and east side of the pad.

The layout for the modeled mitigation scenario is shown in Figure 3-10.

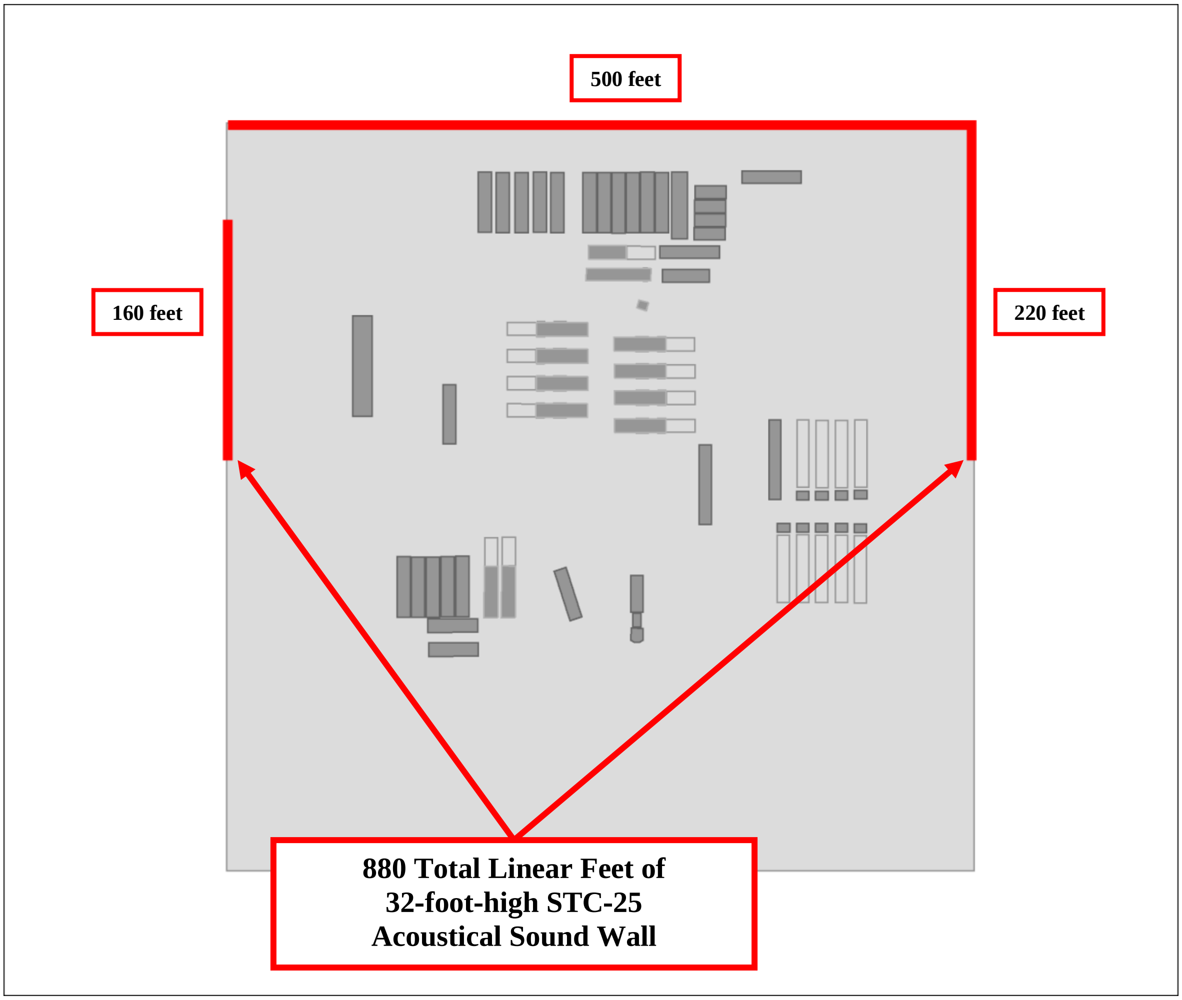

Figure 3-10 Mitigation Layout

The mitigated modeling includes the acoustical mitigation shown in Figure 3-10. The predicted noise levels represent only the contribution of the drilling and completions operations and do not include ambient noise or noise from other facilities. Actual field sound level measurements may vary from the modeled noise levels due to other noise sources such as traffic, other facilities, other human activity, or environmental factors.

Figure 3-11 and Figure 3-12 show the Mitigated PD 464 Drilling Rig Noise Contour Map in dBA and dBC respectively. Figure 3-13 and Figure 3-14 show the Mitigated Halliburton Zeus Electric Fleet Noise Contour Map in dBA and dBC respectively. These contours are provided in 5 dB increments with the color scale indicating the sound level of each contour. The modeled noise levels are shown at the specified receiver points to the north, east, south and west at distances of 350 to 2,500 feet from the center of the pad. Figure 3-15 shows the mitigated PD 464 Drilling Rig noise levels versus distance graph for both the A-weighted and C-weighted decibel scales. Figure 3-16 shows the mitigated Halliburton Zeus Electric Fleet noise levels versus distance graph for both the A-weighted and C-weighted decibel scales. The sound pressure level at each receiver point are listed in Appendix B - Tabulated Predicted Noise Levels vs. Distance. The predicted modeling results are dependent on equipment and orientation as indicated.

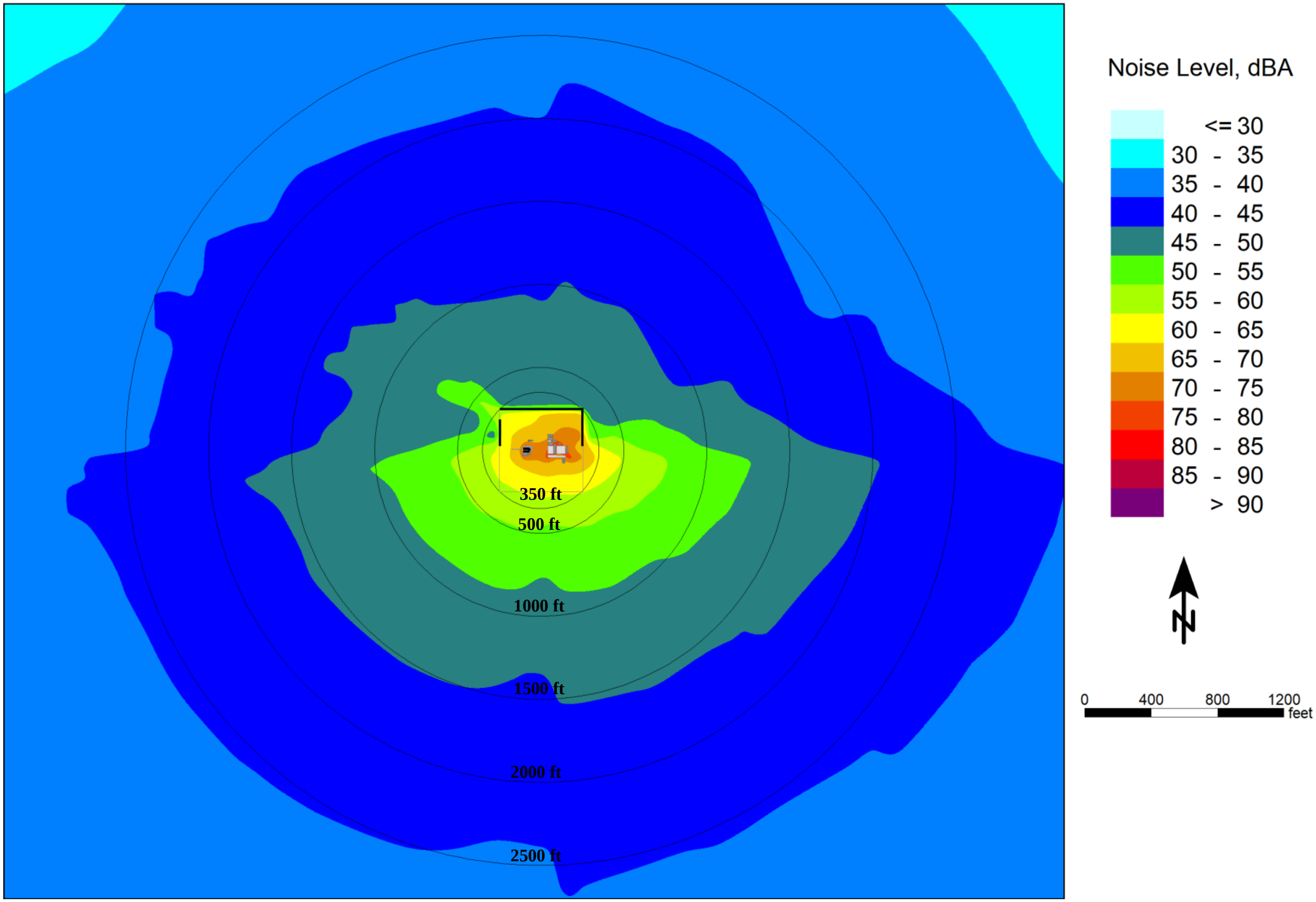

Figure 3-11 Mitigated PD 464 Drilling Rig Noise Contour Map (dBA)

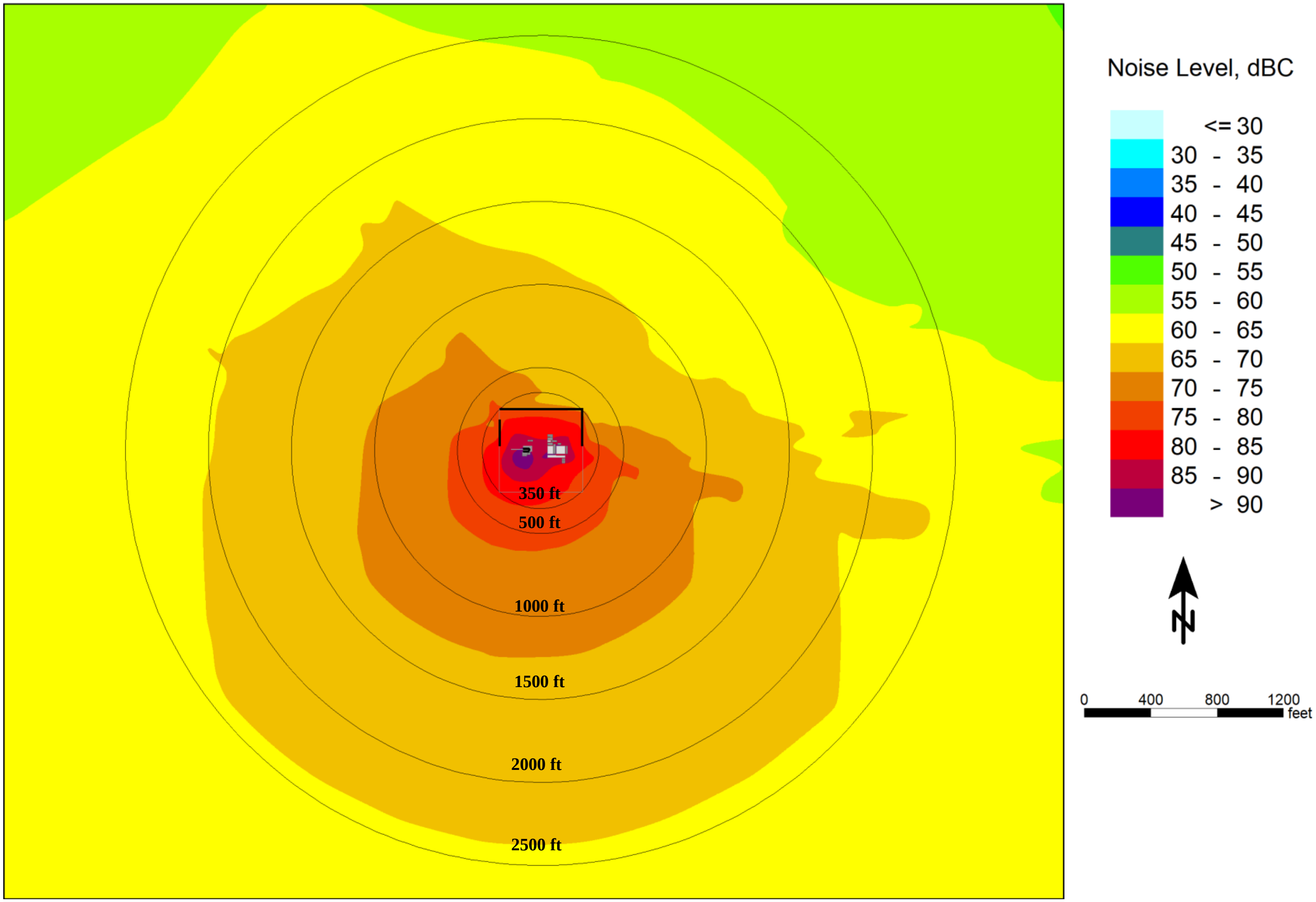

Figure 3-12 Mitigated PD 464 Drilling Rig Noise Contour Map (dBC)

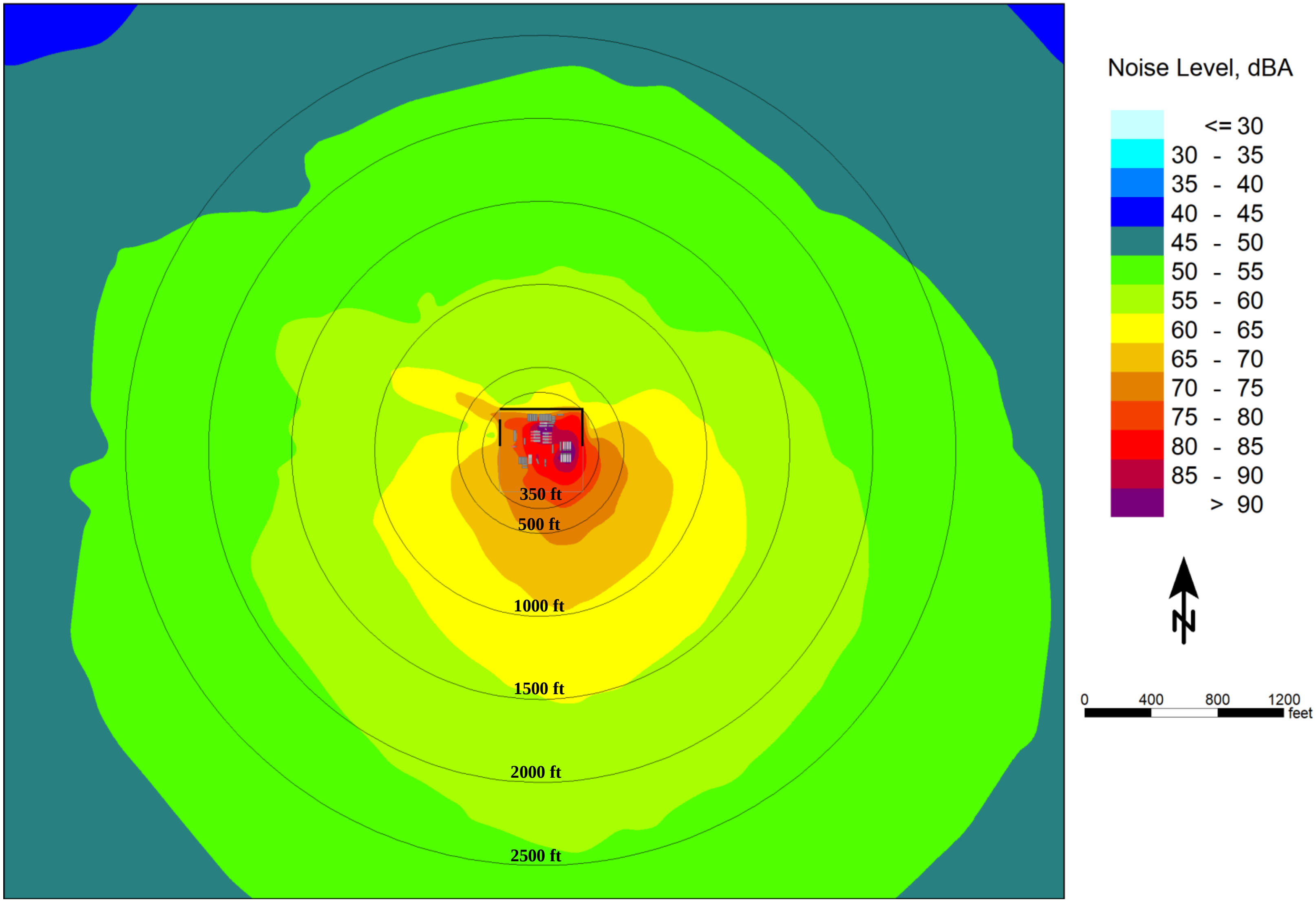

Figure 3-13 Mitigated Halliburton Zeus Electric Fleet Noise Contour Map (dBA)

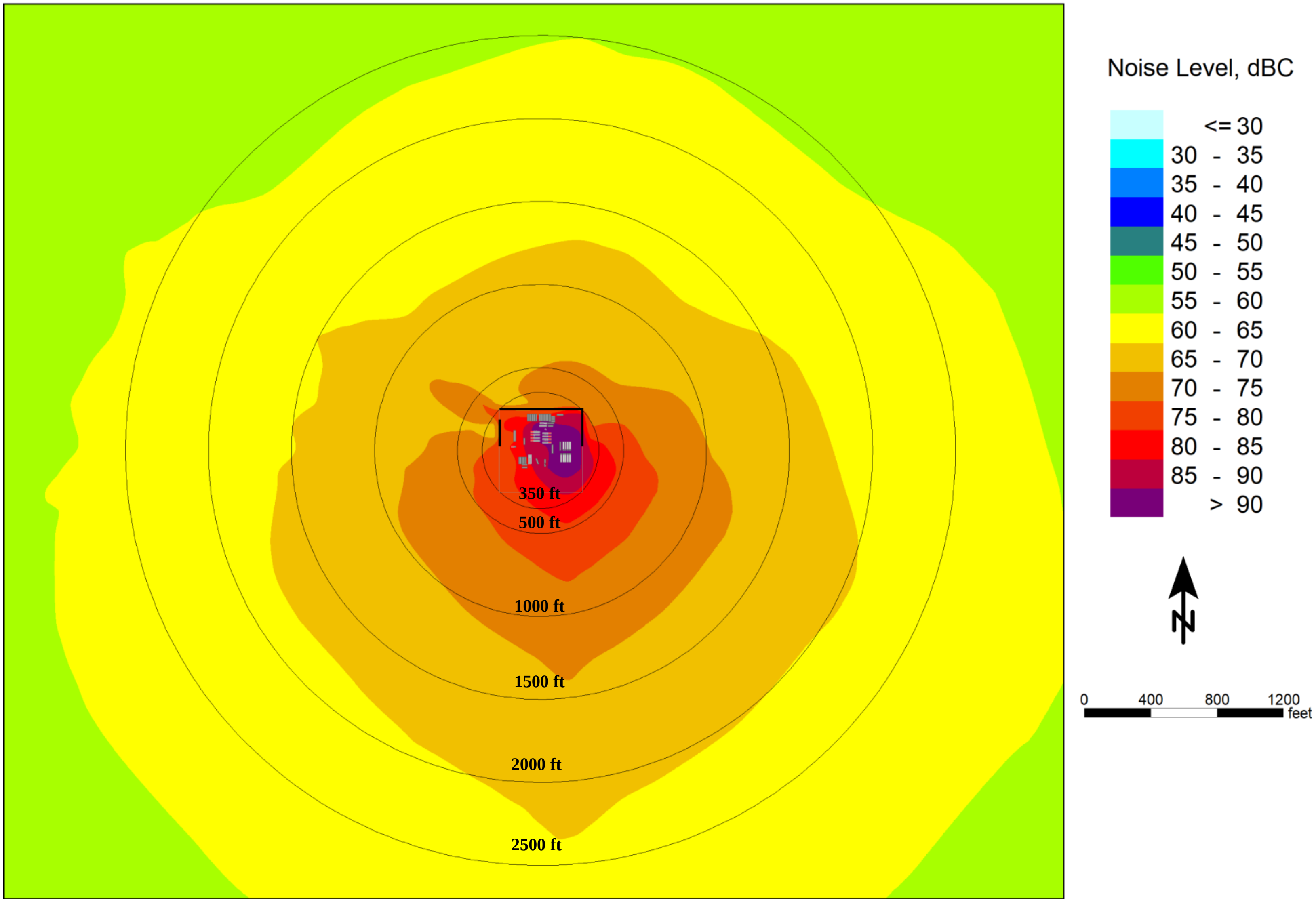

Figure 3-14 Mitigated Halliburton Zeus Electric Fleet Noise Contour Map (dBC)

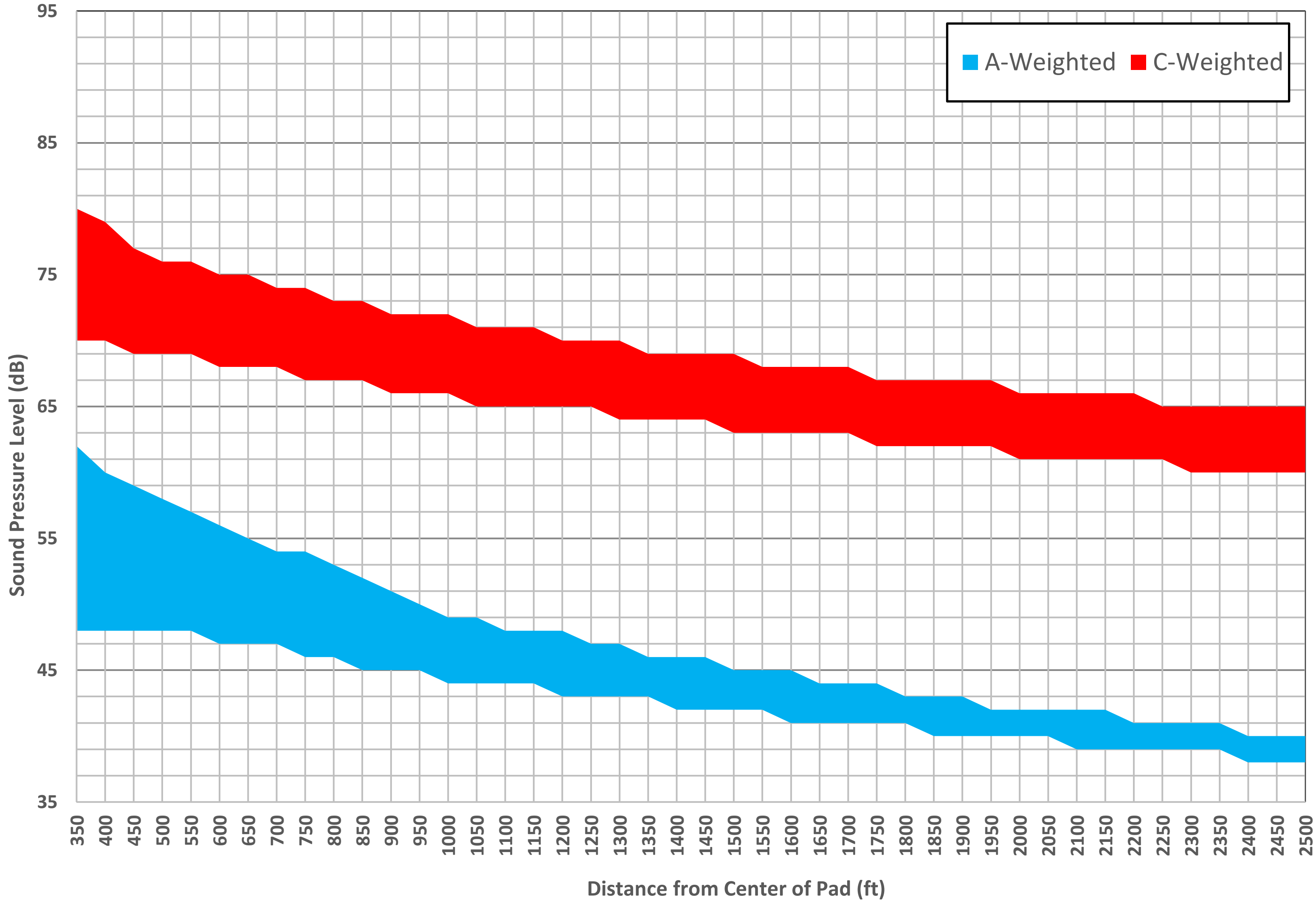

Figure 3-15 PD 464 Drilling Rig Mitigated Noise Level vs. Distance Graph

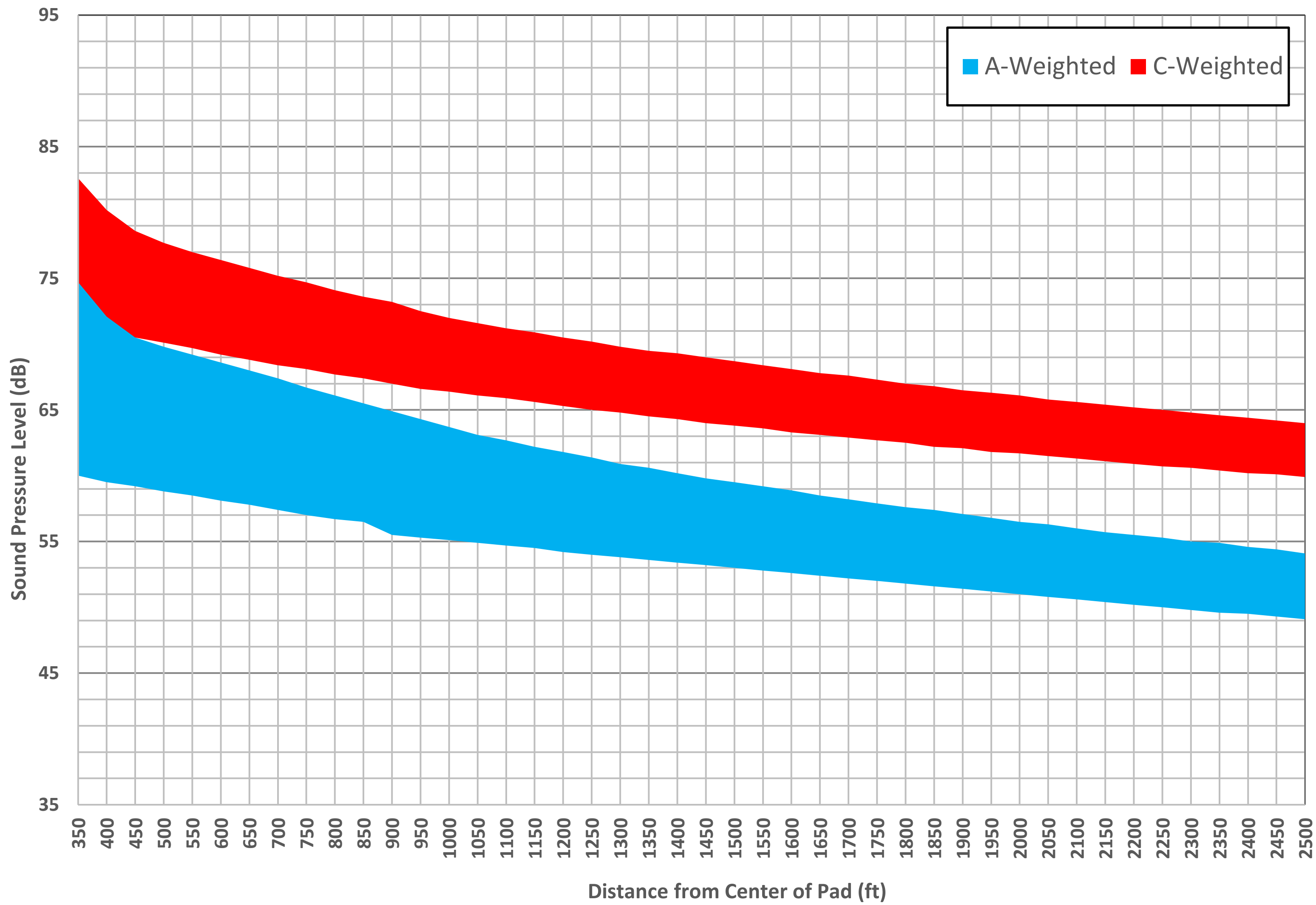

Figure 3-16 Halliburton Zeus Electric Fleet Mitigated Noise Level vs. Distance Graph

4. Conclusion

A generic noise model was created to predict the noise impact at distance due to the PD464 drilling. Halliburton Zeus Electric Fleet, and production operations per request by Verdad Resources. The modeled sound levels were evaluated at receivers directly to the north, east, west and south of the generic pad at distances between 350 feet and 2,500 feet from the center of the pad. Results were presented as noise contour maps, a predicted noise levels versus distance graph, and tabulated predicted sound pressure levels versus distance.

Appendix A – Glossary of Acoustical Terms

Ambient Noise
The all-encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources both near and far.

Average Sound Level
See Equivalent-Continuous Sound Level

A-Weighted Sound Level, dB(A)
The sound level obtained by use of A-weighting. Weighting systems were developed to measure sound ina way that more closely mimics the ear's natural sensitivity relative to frequency so that the instrument is less sensitive to noise at frequencies where the human ear is less sensitive and more sensitive at frequencies where the human ear is more sensitive.

C-Weighted Sound Level, dBC
The sound level obtained by use of C-weighting. Follows the frequency sensitivity of the human ear at very high noise levels. The C-weighting scale is quite flat and therefore includes much more of the low-frequency range of sounds than the A and B scales. In some jurisdictions, C-weighted sound limits are used to limit the low-frequency content of noise sources.

Community Noise Equivalent Level (CNEL)
A 24-hour A-weighted average sound level which takes into account the fact that a given level of noise may be more or less tolerable depending on when it occurs. The CNEL measure of noise exposure weights average hourly noise levels by 5 dB for the evening hours (between 7:00 pm and 10:00 pm), and 10 dB between 10:00 pm and 7:00 am, then combines the results with the daytime levels to produce the final CNEL value. It is measured in decibels, dB.

Day-Night Average Sound Level (Ldn)
A measure of noise exposure level that is similar to CNEL except that there is no weighting applied to the evening hours of 7:00 pm to 10:00 pm. It is measured in decibels, dB.

Daytime Average Sound Level
The time-averaged A-weighted sound level measured between the hours of 7:00 am to 7:00 pm. It is measured in decibels, dB.

Decibel (dB)
The basic unit of measurement for sound level.

Direct Sound
Sound that reaches a given location in a direct line from the source without any reflections.

Divergence
The spreading of sound waves from a source in a free field, resulting in a reduction in sound pressure level with increasing distance from the source.

Energy Basis
This refers to the procedure of summing or averaging sound pressure levels on the basis of their squared pressures. This method involves the conversion of decibels to pressures, then performing the necessary arithmetic calculations, and finally changing the pressure back to decibels.

Equivalent-Continuous Sound Level (Leq)
The average sound level measured over a specified time period. It is a single-number measure of time-varying noise over a specified time period. It is the level of a steady sound that, in a stated time period and at a stated location, has the same A-Weighted sound energy as the time-varying sound. For example, a person who experiences an Leq of 60 dB(A) for a period of 10 minutes standing next to a busy street is exposed to the same amount of sound energy as if he had experienced a constant noise level of 60 dB(A) for 10 minutes rather than the time-varying traffic noise level.

Fast Response
A setting on the sound level meter that determines how sound levels are averaged over time. A fast sound level is always more strongly influenced by recent sounds, and less influenced by sounds occurring in the distant past, than the corresponding slow sound level. For the same non-steady sound, the maximum fast sound level is generally greater than the corresponding maximum slow sound level. Fast response is typically used to measure impact sound levels.

Field Impact Insulation Class (FIIC)
A single number rating similar to the impact insulation class except that the impact sound pressure levels are measured in the field.

Field Sound Transmission Class (FSTC)
A single number rating similar to sound transmission class except that the transmission loss values used to derive this class are measured in the field.

Flanking Sound Transmission
The transmission of sound from a room in which a source is located to an adjacent receiving room by paths other than through the common partition. Also, the diffraction of noise around the ends of a barrier.

Frequency
The number of oscillations per second of a sound wave

Hourly Average Sound Level (HNL)
The equivalent-continuous sound level, Leq, over a 1-hour time period.

Impact Insulation Class (IIC)
A single number rating used to compare the effectiveness of floor/ceiling assemblies in providing reduction of impact-generated sound such as the sound of a person's walking across the upstairs floor.

Impact Noise
The noise that results when two objects collide.

Impulse Noise
Noise of a transient nature due to the sudden impulse of pressure like that created by a gunshot or balloon bursting.

Insertion Loss
The decrease in sound power level measured at the location of the receiver when an element (e.g., a noise barrier) is inserted in the transmission path between the sound source and the receiver.

Inverse Square Law
A rule by which the sound intensity varies inversely with the square of the distance from the source. This results in a 6dB decrease in sound pressure level for each doubling of distance from the source.

L_n Sound Level
Time-varying noise environments may be expressed in terms of the noise level that is exceeded for a certain percentage of the total measurement time. These statistical noise levels are denoted L_n, where n is the percent of time. For example, the L_{50} is the noise level exceeded for 50% of the time. For a 1-hour measurement period, the L_{50} would be the noise level exceeded for a cumulative period of 30 minutes in that hour.

Masking
The process by which the threshold of hearing for one sound is raised by the presence of another sound.

Maximum Sound Level (Lmax)
The greatest sound level measured on a sound level meter during a designated time interval or event.

NC Curves (Noise Criterion Curves)
A system for rating the noisiness of an occupied indoor space. An actual octave-band spectrum is compared with a set of standard NC curves to determine the NC level of the space.

Noise Reduction
The difference in sound pressure level between any two points.

Noise Reduction Coefficient (NRC)
A single number rating of the sound absorption properties of a material. It is the average of the sound absorption coefficients at 250, 500, 1000, and 2000 Hz, rounded to the nearest multiple of 0.05.

Octave
The frequency interval between two sounds whose frequency ratio is 2. For example, the frequency interval between 500 Hz and 1,000 Hz is one octave.

Octave-Band Sound Level
For an octave frequency band, the sound pressure level of the sound contained within that band.

One-Third Octave
The frequency interval between two sounds whose frequency ratio is 2^(1/3). For example, the frequency interval between 200 Hz and 250 Hz is one-third octave.

One-Third-Octave-Band Sound Level
For a one-third-octave frequency band, the sound pressure level of the sound contained within that band.

Outdoor-Indoor Transmission Class (OITC)
A single number rating used to compare the sound insulation properties of building façade elements. This rating is designed to correlate with subjective impressions of the ability of façade elements to reduce the overall loudness of ground and air transportation noise.

Peak Sound Level (Lpk)
The maximum instantaneous sound level during a stated time period or event.

Pink Noise
Noise that has approximately equal intensities at each octave or one-third-octave band.

Point Source
A source that radiates sound as if from a single point.

RC Curves (Room Criterion Curves)
A system for rating the noisiness of an occupied indoor space. An actual octave-band spectrum is compared with a set of standard RC curves to determine the RC level of the space.

Real-Time Analyzer (RTA)
An instrument for the determination of a sound spectrum.

Receiver
A person (or persons) or equipment which is affected by noise.

Reflected Sound
Sound that persists in an enclosed space as a result of repeated reflections or scattering. It does not include sound that travels directly from the source without reflections.

Reverberation
The persistence of a sound in an enclosed or partially enclosed space after the source of the sound has stopped, due to the repeated reflection of the sound waves.

Room Absorption
The total absorption within a room due to all objects, surfaces and air absorption within the room. It is measured in Sabins or metric Sabins.

Slow Response
A setting on the sound level meter that determines how measured sound levels are averaged over time. A slow sound level is more influenced by sounds occurring in the distant past that the corresponding fast sound level.

Sound
A physical disturbance in a medium (e.g., air) that is capable of being detected by the human ear.

Sound Absorption Coefficient
A measure of the sound-absorptive property of a material.

Sound Insulation
The capacity of a structure or element to prevent sound from reaching a receiver room either by absorption or reflection.

Sound Level Meter (SLM)
An instrument used for the measurement of sound level, with a standard frequency-weighting and standard exponentially weighted time averaging.

Sound Power Level
A physical measure of the amount of power a sound source radiates into the surrounding air. It is measured in decibels.

Sound Pressure Level
A physical measure of the magnitude of a sound. It is related to the sound's energy. The terms sound pressure level and sound level are often used interchangeably.

Sound Transmission Class (STC)
A single number rating used to compare the sound insulation properties of walls, floors, ceilings, windows, or doors. This rating is designed to correlate with subjective impressions of the ability of building elements to reduce the overall loudness of speech, radio, television, and similar noise sources in offices and buildings.

Source Room
A room that contains a noise source or sources

Spectrum
The spectrum of a sound wave is a description of its resolution into components, each of different frequency and usually different amplitude.

Tapping Machine
A device used in rating different floor constructions against impacts. It produces a series of impacts on the floor under test, 10 times per second.

Tone
A sound with a distinct pitch

Transmission Loss (TL)
A property of a material or structure describing its ability to reduce the transmission of sound at a particular frequency from one space to another. The higher the TL value the more effective the material or structure is in reducing sound between two spaces. It is measured in decibels.

White Noise
Noise that has approximately equal intensities at all frequencies.

Windscreen
A porous covering for a microphone, designed to reduce the noise generated by the passage of wind over the microphone.

Appendix B - Tabulated Predicted Noise Levels vs. Distance

Table B-1 Unmitigated PD464 Drilling Sound Pressure Levels

Distance from Center of Pad (ft.)	East (dBA)	South (dBA)	West (dBA)	North (dBA)
350	62	59	57	60
400	60	57	56	59
450	59	56	55	58
500	58	55	54	57
550	57	54	53	56
600	56	53	52	55
650	55	52	51	54
700	54	51	51	54
750	54	51	50	53
800	53	50	50	52
850	52	49	49	52
900	52	49	49	51
950	51	48	48	51
1000	51	48	48	50
1050	50	47	47	50
1100	50	47	47	49
1150	49	47	46	49
1200	49	46	46	48
1250	48	46	46	48
1300	48	46	45	48
1350	48	45	45	47
1400	47	45	45	47
1450	47	45	44	47
1500	47	44	44	46
1550	46	44	44	46
1600	46	44	44	46
1650	46	44	43	45
1700	45	43	43	45
1750	45	43	43	45
1800	45	43	42	45
1850	44	43	42	44
1900	44	42	42	44
1950	44	42	42	44
2000	44	42	42	43
2050	43	42	41	43
2100	43	41	41	43
2150	43	41	41	43
2200	43	41	41	42
2250	42	41	40	42
2300	42	41	40	42
2350	42	40	40	42
2400	42	40	40	42
2450	41	40	40	41
2500	41	40	39	41

Table B-2 Unmitigated PD464 Drilling Sound Pressure Levels

Distance from Center of Pad (ft.)	East (dBC)	South (dBC)	West (dBC)	North (dBC)
350	77	79	80	76
400	76	78	79	75
450	76	77	77	74
500	75	76	76	74
550	74	76	75	73
600	74	75	74	73
650	73	75	74	72
700	73	74	73	72
750	72	74	73	71
800	72	73	72	71
850	71	73	72	71
900	71	73	71	70
950	71	72	71	70
1000	70	72	71	70
1050	70	71	70	69
1100	70	71	70	68
1150	69	71	70	68
1200	69	70	69	68
1250	69	70	69	67
1300	68	70	69	67
1350	68	70	68	67
1400	68	69	68	67
1450	67	69	68	66
1500	67	69	67	66
1550	67	68	67	66
1600	67	68	67	65
1650	66	68	67	65
1700	66	68	66	65
1750	65	68	66	65
1800	65	67	66	65
1850	64	67	66	64
1900	63	67	66	64
1950	63	67	65	64
2000	63	66	65	64
2050	63	66	65	64
2100	63	66	65	63
2150	63	66	65	63
2200	63	66	64	63
2250	62	66	64	63
2300	62	65	64	63
2350	62	65	64	62
2400	62	65	64	62
2450	62	65	63	62
2500	62	65	63	62

Table B-3 Unmitigated Halliburton Zeus Electric Fleet Sound Pressure Levels

Distance from Center of Pad (ft.)	East (dBA)	South (dBA)	West (dBA)	North (dBA)
350	76	73	69	71
400	74	72	68	70
450	73	72	67	69
500	72	71	66	68
550	70	70	66	67
600	69	69	65	67
650	68	68	64	66
700	68	68	64	65
750	67	67	63	64
800	66	66	63	64
850	65	66	62	64
900	65	65	62	63
950	64	64	61	63
1000	64	64	61	62
1050	63	63	60	62
1100	63	63	60	61
1150	62	62	60	61
1200	62	62	59	60
1250	61	61	59	60
1300	61	61	59	59
1350	60	61	58	59
1400	60	60	58	59
1450	60	60	58	58
1500	59	60	57	58
1550	59	59	57	58
1600	59	59	57	57
1650	58	59	56	57
1700	58	58	56	57
1750	58	58	56	57
1800	57	58	56	56
1850	57	57	55	56
1900	57	57	55	56
1950	57	57	55	55
2000	56	57	55	55
2050	56	56	54	55
2100	56	56	54	55
2150	56	56	54	54
2200	55	56	54	54
2250	55	55	53	54
2300	55	55	53	54
2350	55	55	53	54
2400	54	55	53	53
2450	54	54	53	53
2500	54	54	52	53

Table B-4 Unmitigated Halliburton Zeus Electric Fleet Sound Pressure Levels

Distance from Center of Pad (ft.)	East (dBC)	South (dBC)	West (dBC)	North (dBC)
350	84	81	76	79
400	82	79	75	78
450	81	79	74	77
500	79	78	73	77
550	78	77	73	76
600	77	76	72	75
650	76	76	72	75
700	76	75	71	74
750	75	75	71	73
800	74	74	70	73
850	74	74	70	73
900	73	73	70	72
950	73	73	69	72
1000	72	72	69	71
1050	72	72	68	71
1100	71	71	68	70
1150	71	71	68	70
1200	70	71	68	70
1250	70	70	67	69
1300	70	70	67	69
1350	69	70	67	69
1400	69	69	66	69
1450	69	69	66	68
1500	68	69	66	68
1550	68	68	66	68
1600	68	68	65	68
1650	67	68	65	67
1700	67	68	65	67
1750	67	67	65	67
1800	67	67	65	67
1850	66	67	64	66
1900	66	67	64	66
1950	66	66	64	66
2000	66	66	64	66
2050	65	66	63	65
2100	65	66	63	65
2150	65	65	63	65
2200	65	65	63	65
2250	64	65	63	64
2300	64	65	62	64
2350	64	65	62	64
2400	64	64	62	64
2450	64	64	62	64
2500	64	64	62	64

Table B-5 Unmitigated Production Facility Sound Pressure Levels

Distance from Center of Pad (ft.)	East (dBA)	South (dBA)	West (dBA)	North (dBA)
350	67	62	62	65
400	66	61	62	64
450	64	60	60	62
500	63	59	59	62
550	62	58	57	61
600	61	57	56	60
650	60	56	56	59
700	59	55	55	59
750	59	55	55	58
800	58	54	55	57
850	58	54	54	57
900	57	53	54	56
950	56	53	53	55
1000	55	52	53	55
1050	55	52	52	54
1100	54	51	52	54
1150	54	51	51	53
1200	53	50	51	53
1250	53	50	51	52
1300	52	50	50	52
1350	52	49	50	51
1400	51	49	50	51
1450	51	48	49	50
1500	50	48	49	50
1550	50	48	49	50
1600	49	47	48	49
1650	49	47	48	49
1700	49	47	48	48
1750	49	47	48	48
1800	48	46	47	48
1850	48	46	47	47
1900	48	46	47	47
1950	48	45	47	47
2000	47	45	46	47
2050	47	45	46	46
2100	47	45	46	46
2150	46	44	46	46
2200	46	44	45	45
2250	46	44	45	45
2300	46	44	45	45
2350	45	44	44	45
2400	45	43	44	45
2450	45	43	44	44
2500	45	43	44	44

Table B-6 Unmitigated Production Facility Sound Pressure Levels

Distance from Center of Pad (ft.)	East (dBC)	South (dBC)	West (dBC)	North (dBC)
350	75	72	71	75
400	74	71	70	73
450	72	70	69	72
500	71	69	68	71
550	70	68	67	70
600	69	68	67	69
650	69	67	66	69
700	68	67	66	68
750	67	66	65	67
800	67	66	65	67
850	66	65	64	66
900	65	65	64	66
950	65	64	63	65
1000	64	64	63	65
1050	64	63	62	64
1100	64	63	62	64
1150	64	63	62	63
1200	63	62	61	63
1250	63	62	61	62
1300	62	61	61	62
1350	62	61	60	62
1400	62	61	60	61
1450	61	61	60	61
1500	61	60	60	60
1550	61	60	59	60
1600	60	60	59	60
1650	60	59	59	60
1700	60	59	58	59
1750	60	59	58	59
1800	59	59	58	59
1850	59	58	58	58
1900	59	58	58	58
1950	59	58	57	58
2000	59	58	57	58
2050	58	57	57	57
2100	58	57	57	57
2150	58	57	57	57
2200	58	57	56	57
2250	58	57	56	56
2300	57	56	56	56
2350	57	56	56	56
2400	57	56	55	56
2450	57	56	55	56
2500	57	56	55	55

Table B-7 Mitigated Halliburton Zeus Electric Fleet Sound Pressure Levels

Distance from Center of Pad (ft.)	East (dBA)	South (dBA)	West (dBA)	North (dBA)
350	75	73	66	60
400	72	72	65	60
450	70	71	65	59
500	69	70	64	59
550	68	69	63	59
600	67	69	62	58
650	66	68	61	58
700	65	67	61	57
750	64	67	60	57
800	63	66	60	57
850	62	66	59	57
900	62	65	58	56
950	61	64	58	55
1000	61	64	57	55
1050	60	63	57	55
1100	60	63	57	55
1150	59	62	57	55
1200	59	62	56	54
1250	58	61	56	54
1300	58	61	56	54
1350	57	61	55	54
1400	57	60	55	53
1450	57	60	55	53
1500	56	60	55	53
1550	56	59	54	53
1600	56	59	54	53
1650	55	59	54	52
1700	55	58	54	52
1750	55	58	53	52
1800	55	58	53	52
1850	54	57	53	52
1900	54	57	53	51
1950	54	57	52	51
2000	53	57	52	51
2050	53	56	52	51
2100	53	56	52	51
2150	53	56	52	50
2200	53	56	51	50
2250	52	55	51	50
2300	52	55	51	50
2350	52	55	51	50
2400	52	55	51	50
2450	51	54	50	49
2500	51	54	50	49

Table B-8 Mitigated Halliburton Zeus Electric Fleet Sound Pressure Levels

Distance from Center of Pad (ft.)	East (dBC)	South (dBC)	West (dBC)	North (dBC)
350	83	80	75	71
400	80	79	74	71
450	79	78	73	71
500	77	78	72	70
550	76	77	72	70
600	75	76	71	69
650	74	76	71	69
700	74	75	70	68
750	73	75	69	68
800	72	74	69	68
850	72	74	69	67
900	71	73	68	67
950	71	73	68	67
1000	70	72	68	66
1050	70	72	67	66
1100	69	71	67	66
1150	69	71	67	66
1200	69	71	67	65
1250	68	70	66	65
1300	68	70	66	65
1350	67	70	66	65
1400	67	69	65	64
1450	67	69	65	64
1500	67	69	65	64
1550	66	68	65	64
1600	66	68	64	63
1650	66	68	64	63
1700	65	68	64	63
1750	65	67	64	63
1800	65	67	63	63
1850	65	67	63	62
1900	64	67	63	62
1950	64	66	63	62
2000	64	66	63	62
2050	64	66	62	62
2100	63	66	62	61
2150	63	65	62	61
2200	63	65	62	61
2250	63	65	62	61
2300	63	65	62	61
2350	62	65	61	60
2400	62	64	61	60
2450	62	64	61	60
2500	62	64	61	60

Table B-9 Mitigated PD464 Drilling Sound Pressure Levels

Distance from Center of Pad (ft.)	East (dBA)	South (dBA)	West (dBA)	North (dBA)
350	62	58	57	48
400	60	57	56	48
450	59	55	55	48
500	58	54	54	48
550	57	53	53	48
600	56	52	52	47
650	55	51	51	47
700	54	51	51	47
750	54	50	50	46
800	53	49	49	46
850	52	49	49	45
900	51	48	48	45
950	50	48	48	45
1000	49	47	47	44
1050	49	47	47	44
1100	48	47	47	44
1150	48	46	46	44
1200	48	46	46	43
1250	47	45	45	43
1300	47	45	45	43
1350	46	45	45	43
1400	46	44	44	42
1450	46	44	44	42
1500	45	44	44	42
1550	45	44	44	42
1600	45	43	43	41
1650	44	43	43	41
1700	44	43	43	41
1750	44	43	43	41
1800	43	42	42	41
1850	43	42	42	40
1900	43	42	42	40
1950	42	42	42	40
2000	42	41	41	40
2050	42	41	41	40
2100	42	41	41	39
2150	42	41	40	39
2200	41	41	40	39
2250	41	40	40	39
2300	41	40	40	39
2350	41	40	40	39
2400	40	40	39	38
2450	40	40	39	38
2500	40	39	39	38

Table B-10 Mitigated PD464 Drilling Sound Pressure Levels

Distance from Center of Pad (ft.)	East (dBC)	South (dBC)	West (dBC)	North (dBC)
350	77	79	80	70
400	76	78	79	70
450	76	77	77	69
500	75	76	76	69
550	74	76	75	69
600	73	75	74	68
650	73	75	74	68
700	72	74	73	68
750	72	74	73	67
800	72	73	72	67
850	71	73	72	67
900	71	72	71	66
950	70	72	71	66
1000	70	72	70	66
1050	69	71	70	65
1100	69	71	70	65
1150	69	71	69	65
1200	68	70	69	65
1250	68	70	69	65
1300	68	70	68	64
1350	68	69	68	64
1400	67	69	68	64
1450	67	69	68	64
1500	67	69	67	63
1550	67	68	67	63
1600	66	68	67	63
1650	66	68	67	63
1700	66	68	66	63
1750	65	67	66	62
1800	64	67	66	62
1850	64	67	66	62
1900	63	67	65	62
1950	63	67	65	62
2000	63	66	65	61
2050	62	66	65	61
2100	62	66	65	61
2150	62	66	64	61
2200	62	66	64	61
2250	62	65	64	61
2300	62	65	64	60
2350	62	65	64	60
2400	61	65	63	60
2450	61	65	63	60
2500	61	65	63	60

Appendix C – Production Facility Layout

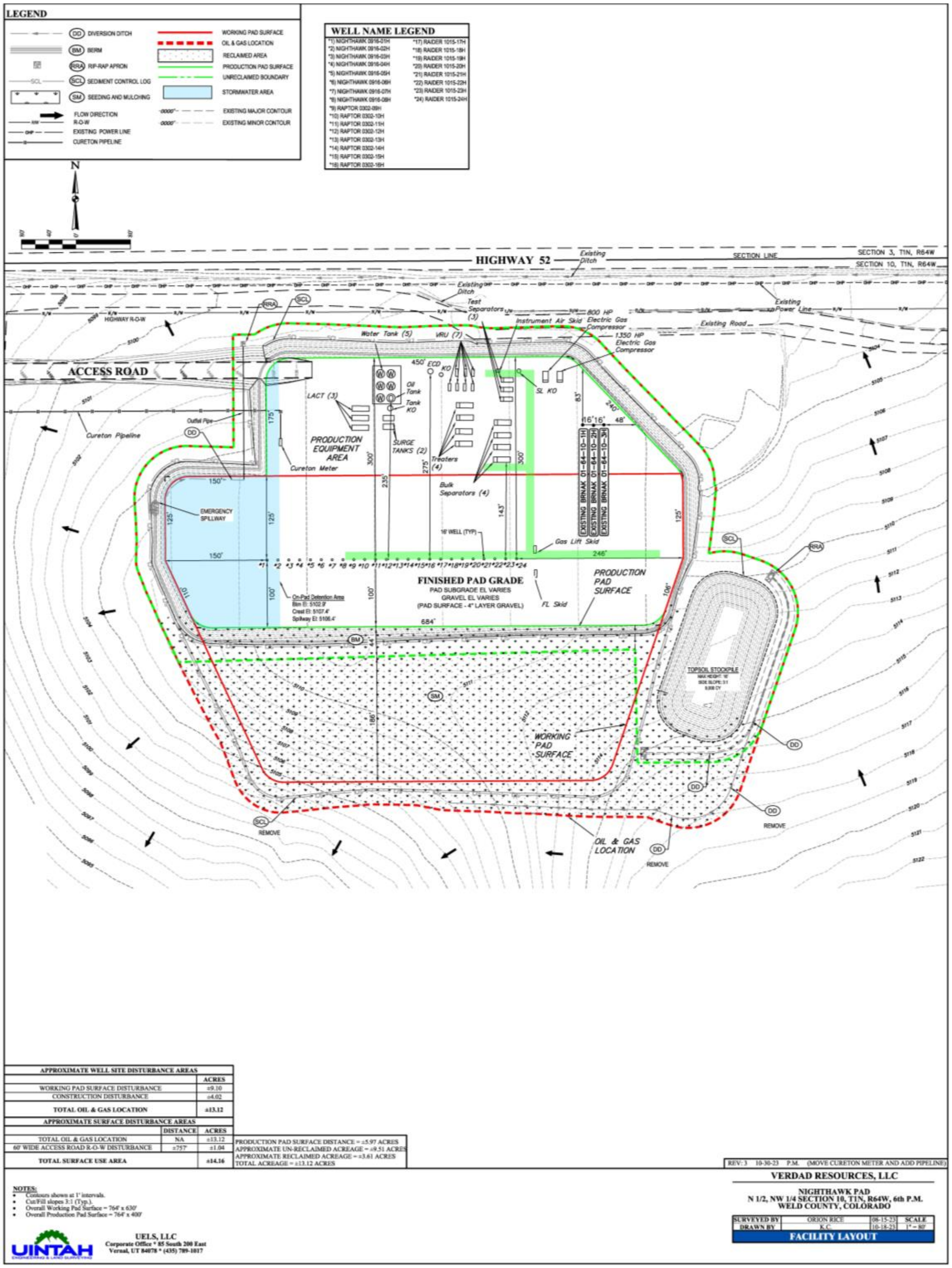

Figure 4-1 Modeled Production Facility Layout