

# CE Pad

## Form 2A Noise Mitigation and Monitoring Plan

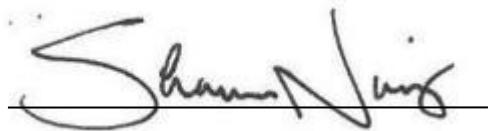
April 28, 2023

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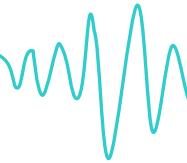
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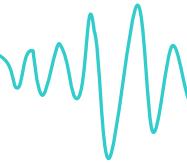


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### 1. Executive Summary

The following Form 2A Noise Mitigation Plan (2A NMP) was prepared by Behrens and Associates Environmental Noise Control (BAENC) for the planned operations associated with the proposed CE Pad operated by MRG, LP (MRG). Predictive noise models representing the planned operations for the site were developed and assessed against the maximum permissible noise levels described in Rule 423 of the Colorado Oil and Gas Conservation Commission (COGCC) noise regulations. The following tasks were completed during development of the 2A NMP:

- Completion of a 3-location, 72-hour Ambient sound level survey at the site
- Development of a site-specific drilling noise model representing the Ensign 161 rig
- Development of a site-specific completions noise model representing a Liberty Quiet Fleet crew
- Development of a site-specific production noise model

The ambient sound level survey was conducted to document the existing ambient sound levels at the site and determine if an increase in maximum permissible sound levels was appropriate per Rule 423.d.(2).

The site-specific noise models were developed to predict the future noise impact of the proposed operations and determine what noise mitigation measures, if any, would be required to demonstrate compliance with the COGCC maximum permissible noise levels. The noise modeling results were calculated utilizing the ISO 9613-2 standard and include the effects of local topography, buildings, barriers, and ground cover. Both A-weighted (dBA) and C-weighted (dBc) noise levels were measured during the ambient survey and considered during the noise modeling assessment.

Additionally, the area surrounding the site was evaluated to establish noise points of compliance per Rule 423.a.(5). The need for continuous noise monitoring was also evaluated per Rule 423.c.(1). Table 1-1 below summarizes the analysis and mitigation findings in the Form 2A and presents them in the form of best management practices.

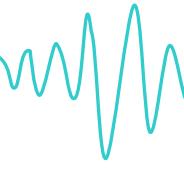
**Table 1-1 Site Mitigation and Best Management Practices**

Task	Result of Analysis/Recommended Action
Ambient Survey	<ul style="list-style-type: none"><li>• Ambient survey conducted to document noise levels in area around the site (May 2021)</li><li>• Max permissible noise levels not adjusted</li></ul>
Drilling Noise Model	<ul style="list-style-type: none"><li>• Developed noise model representing drilling to assess operational noise levels against COGCC allowable dBA and dBc noise levels</li><li>• Recommended perimeter mitigation includes 32-foot-high sound wall with minimum STC-25 rating installed on the east side of the pad</li></ul>
Completions Noise Model	<ul style="list-style-type: none"><li>• Developed noise model representing completions to assess operational noise levels against COGCC allowable dBA and dBc noise levels</li><li>• Recommended perimeter mitigation includes 32-foot-high sound wall with minimum STC-25 rating installed on the east side of the pad</li></ul>



Production Noise Model	<ul style="list-style-type: none"><li>• Developed noise model representing production to assess operational noise levels against COGCC allowable dBA and dBC noise levels</li><li>• Recommended perimeter mitigation includes 20-foot-high sound wall with minimum STC-40 rating installed on the southwest perimeter of the pad</li></ul>
Land Use Evaluation	<ul style="list-style-type: none"><li>• Residential building units located within 2,000 ft</li><li>• Agricultural limits applied</li></ul>
Continuous Monitoring Evaluation	<ul style="list-style-type: none"><li>• Noise points of compliance proposed</li><li>• Continuous monitoring proposed at 1 location</li></ul>

Based on the noise modeling analysis, with the implementation of the best management practices outlined in Table 1-1 the drilling, completions, and production operations are predicted to comply with the COGCC dBA and dBC noise limits.



## 2. Introduction

The following report provides a noise modeling assessment of the proposed activities at the CE Pad operated by MRG, LP in relation to the Colorado Oil and Gas Conservation Commission (COGCC) noise regulations. The assessment includes a modeling analysis of the Ensign 161 drilling rig, Liberty Quiet Fleet completion crew and CE production facility. The CE Pad (40.415438, -104.965948) is located approximately 0.3 miles southeast of the intersection of Kinston Parkway and North County Road 3 in Larimer County, Colorado as shown in Figure 2-2. The Larimer County GIS portal indicates that the parcel in question, parcel # 8511105017, has been assigned a zoning designation of agricultural by Larimer County, and an image depicting the parcel as defined by Larimer County is shown in Figure 2-2 below. For the purpose of this noise assessment, agricultural noise limits were applied to this site.

To assess the operational noise levels of the proposed CE Pad, file noise level data previously measured and typical of the Ensign 161 production rig, and Liberty Quiet Fleet completion crew and production facility equipment were utilized in the noise modeling. The noise models were developed using SoundPLAN 8.2 software.

The following is provided in this report:

- Documentation of ambient sound level survey results
- A review of applicable COGCC noise standards
- A discussion of noise modeling methodology
- An assessment of the predicted operational noise levels in relation to the COGCC noise limits
- Proposed continuous noise monitoring procedure

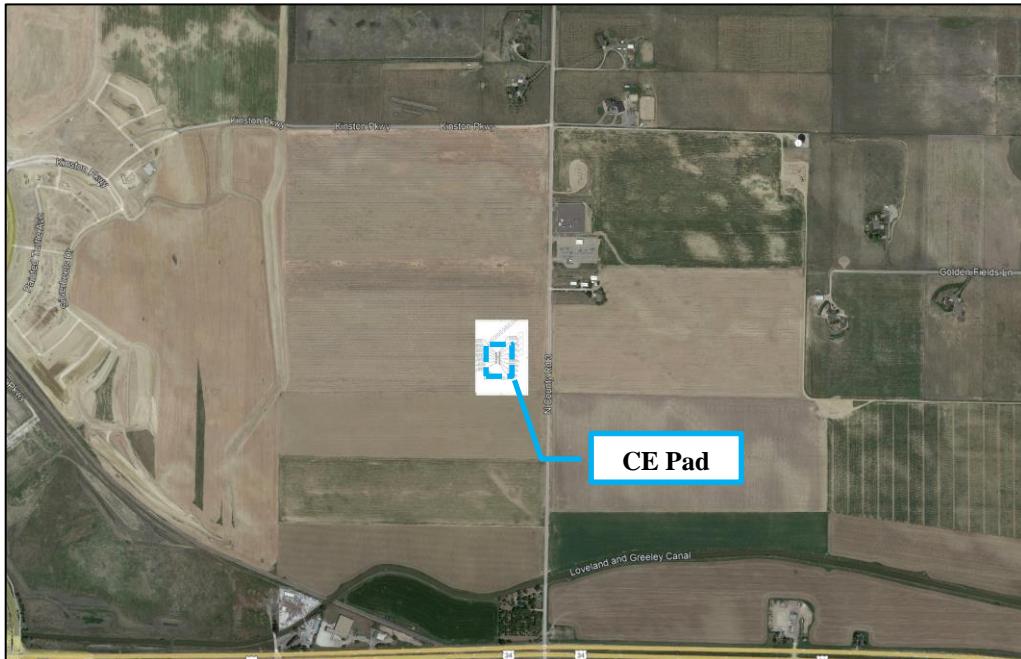


Figure 2-1 CE Pad Location

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## Environmental Noise Control

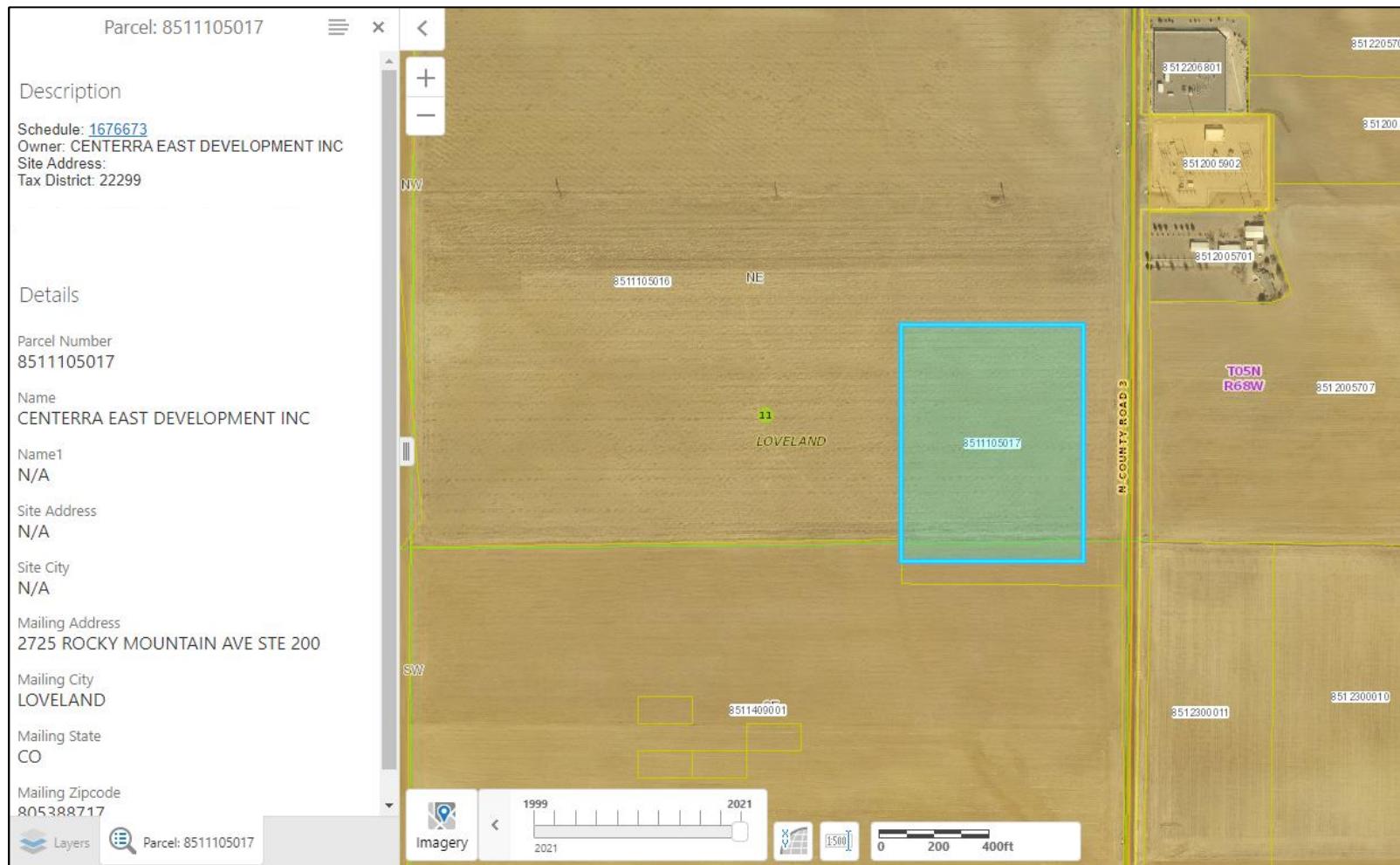
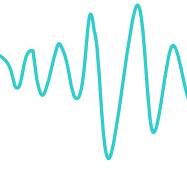


Figure 2-2 Larimer County Geographic Information Systems (GIS) Parcel # 8511105017



### 3. 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 3-1.

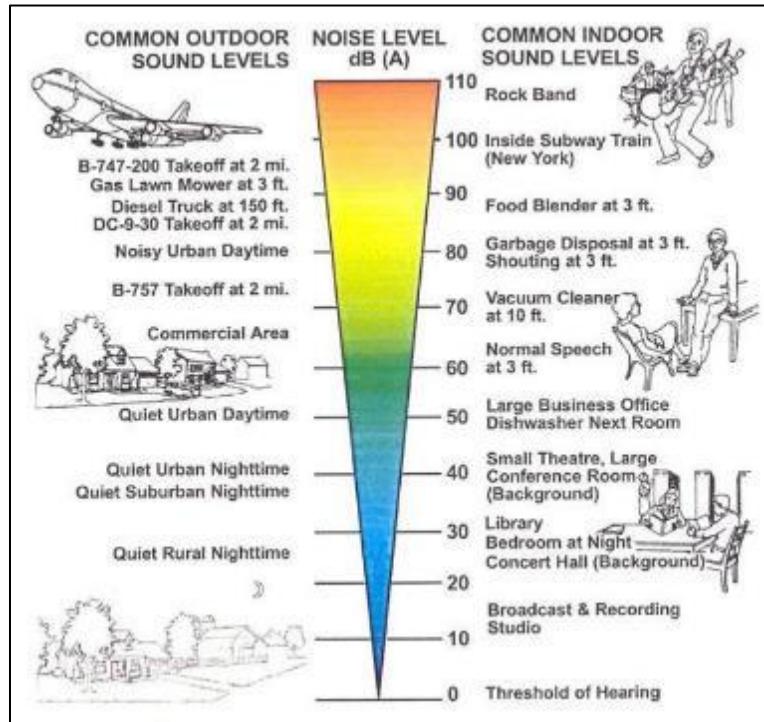
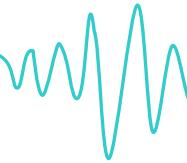


Figure 3-1 Typical Indoor and Outdoor A-Weighted Sound Levels



## 4. Noise Standards

The pad is located in the state of Colorado and is subject to the regulations of the Colorado Oil and Gas Conservation Commission (COGCC). The COGCC publishes rules regulating oil and gas operations with rules relating to noise found in Rule 423. The summarized COGCC rules below became effective on January 15, 2021.

### 4.1 Colorado Oil and Gas Conservation Commission (COGCC)

The COGCC Code lists 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 4-1.

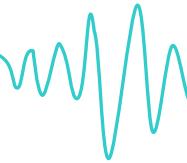
**Table 4-1 COGCC Table 423-1 – Maximum Permissible Noise Levels**

Zone	7:00 am to next 7:00 pm	7:00 pm to next 7:00 am
Residential / Rural / State Parks & State Wildlife Areas	55 dBA	50 dBA
Commercial / Agricultural	60 dBA	55 dBA
Light Industrial	70 dBA	65 dBA
Industrial	80 dBA	75 dBA
All Zones	60 dBC	60 dBC

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



To demonstrate compliance with the sound level limits, Rule 423.c.(2).A states:

A. In response to a complaint or at the Director's request, Operators will measure sound levels at 25 feet from the complainant's occupied structure towards the noise source for low frequency (dBc) indicated issues. For high frequency (dBA) measurement will be at the nearest point of compliance. For equipment installed at Oil and Gas Locations subject to a Form 2A approved prior to January 15, 2021, after the Commencement of Production Operations, no single piece of equipment will exceed the maximum permissible noise levels listed in Table 423-1 as measured at a point 350 feet from the equipment generating the noise in the direction from which the complaint was received.

Defining noise points of compliance, Rule 423.a.(5) states:

(5) 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. Operators will identify noise points of compliance using the following criteria:

A. Provide one noise point of compliance in each direction in which a Residential Building Unit is located within 2,000 feet of the proposed Working Pad Surface.

B. Noise points of compliance will be located at least 350 feet from the Working Pad Surface, and no less than 25 feet from the exterior wall of the Residential Building Unit that is closest to the Working Pad Surface. If a Surface Owner or tenant refuses to provide the Operator with access to install a noise monitor, then the noise point of compliance will be located at either the next-closest Residential Building Unit or an alternative location approximately the same distance and direction from the Working Pad Surface.

With regards to adjusting maximum permissible noise levels based on measured ambient sound levels, Rule 423.d. states:

d. Cumulative Noise. All noise measurements will be cumulative.

(1) Noise measurements taken at noise points of compliance designated pursuant to Rule 423.a.(5) will take into account ambient noise, rather than solely the incremental increase of noise from the facility targeted for measurement.

(2) At new or substantially modified Oil and Gas Locations where ambient noise levels at noise points of compliance designated pursuant to Rule 423.a.(5) already exceed the noise thresholds identified in Table 423-1, then Operators will be considered in compliance with Rule 423, unless at any time their individual noise contribution, measured pursuant to Rule 423.c, increases noise above ambient levels by greater than 5 dBc and 5 dBA between 7:00 p.m. and 7:00 a.m. or 7 dBc and 7 dBA between 7:00 a.m. and 7:00 p.m. This Rule 423.d.(2) does not allow Operators to increase noise above the maximum cumulative noise thresholds specified in Table 423-2 after the Commencement of Production Operations.



(3) After the Commencement of Production Operations, if ambient noise levels already exceed the maximum permissible noise thresholds identified in Table 423-1, under no circumstances will new Oil and Gas Operations or a significant modification to an existing Oil and Gas Operations raise cumulative ambient noise above:

**Table 423-2 – Maximum Cumulative Noise Levels**

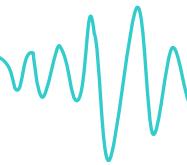
LAND USE	7:00 am to next 7:00 pm	7:00 pm to next 7:00 am
Residential /Rural/State Parks/State Wildlife Areas	65 db(A)	60 db(A)
Commercial/Agricultural	70 db(A)	65 db(A)
Light Industrial	80 db(A)	75 db(A)
Industrial	90 db(A)	85 db(A)
All Zones	75 db(C)	70 db(C)

## 4.2 Summary of COGCC Maximum Permissible Noise Levels

Notwithstanding any influence or adjustments due to ambient noise or maximum cumulative noise levels of Rule 423 – Table 423-2, based on COGCC Rule 423, the allowable noise level limits applicable to the site are as follows:

**Table 4-2 Unadjusted Maximum Permissible Noise Levels**

Operation	Applicable Zoning	Noise Limits (dBA)	Noise Limits (dBc)
Drilling	Agricultural/Commercial	65 day / 60 night	65 day and night
Completions	Agricultural/Commercial	65 day / 60 night	65 day and night
Production	Residential / Rural	55 day / 50 night	60 day and night



## 5. Ambient Sound Level Survey

### 5.1 Ambient Sound Level Survey Procedure

Two Type 1 SVANTEK SVAN 971 sound level meters were utilized to conduct an ambient sound level survey adjacent to the CE Pad. The sound level meters conform to Type 1 as per ANSI S1.4 Specification for Sound Level Meters. The sound level meters were calibrated prior to deployment. The sound level monitoring period began on Friday, May 6, 2022 with the meters programmed to continuously monitor and record A-weighted and C-weighted sound levels. The monitoring period ended on Monday, May 9, 2022. The locations of the sound level meters used to conduct the ambient sound level survey can be seen in Figure 5-1 below. Weather data was collected using a Larson Davis Technologies Vantage Vue Weather Station.

Per COGCC Rule 423.c.(2), the measurements were conducted at an approximate height of 5 feet. When calculating the ambient average sound levels shown in Table 5-1, the weather data collected during the survey was used to exclude periods from the calculation when winds exceeded 5 mph. The graphed ambient survey results show the measurement data before periods of wind above 5 mph were removed.

### 5.2 Ambient Sound Level Survey Results

The measured A-weighted and C-weighted hourly average Leq for each monitoring location can be seen in Figure 5-2 and Figure 5-3. The measured A-weighted and C-weighted daytime and nighttime average sound levels for Monitoring Locations 1 and 2 are shown in Table 5-1 below.

**Table 5-1 Ambient Sound Level Survey Results**

Day	Location 1				Location 2			
	Daytime Leq Ambient Noise Levels		Nighttime Leq Ambient Noise Levels		Daytime Leq Ambient Noise Levels		Nighttime Leq Ambient Noise Levels	
	dBA	dbc	dBA	dbc	dBA	dbc	dBA	dbc
5/6 – 5/7	53	66	49	59	50	62	53	60
5/7 – 5/8	51	65	44	64	52	65	52	59
5/8 – 5/9	46	59	50	60	51	59	55	60
5/9	52	63	-	-	51	62	-	-
Overall Leq	51	63	49	60	52	62	54	60

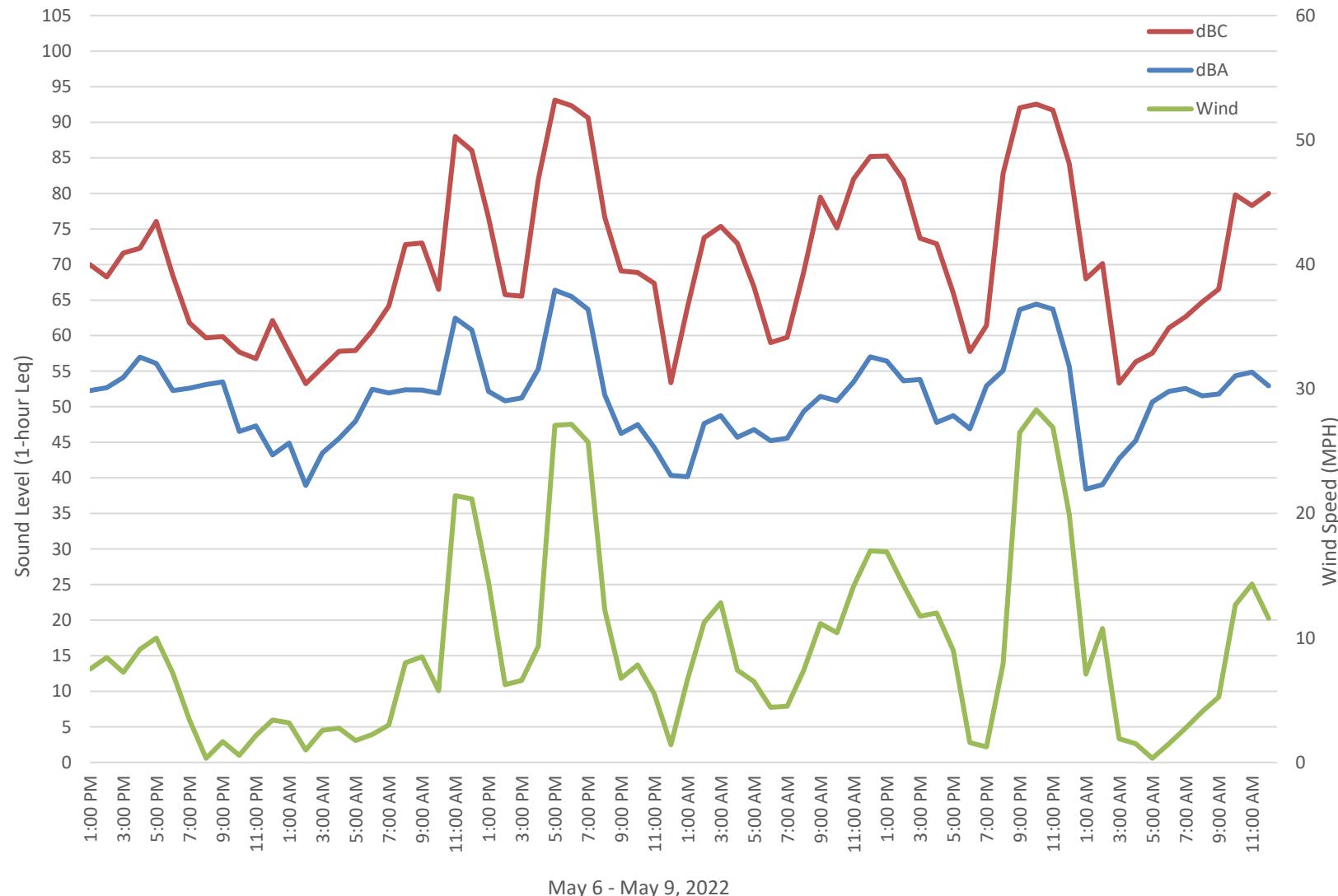
Note: The Daytime value on 5/6 is an L<sub>eq</sub> from 1pm until 7pm and the Daytime value on 5/9 is an L<sub>eq</sub> from 7am until 1pm.



**Figure 5-1** Ambient Monitoring Locations

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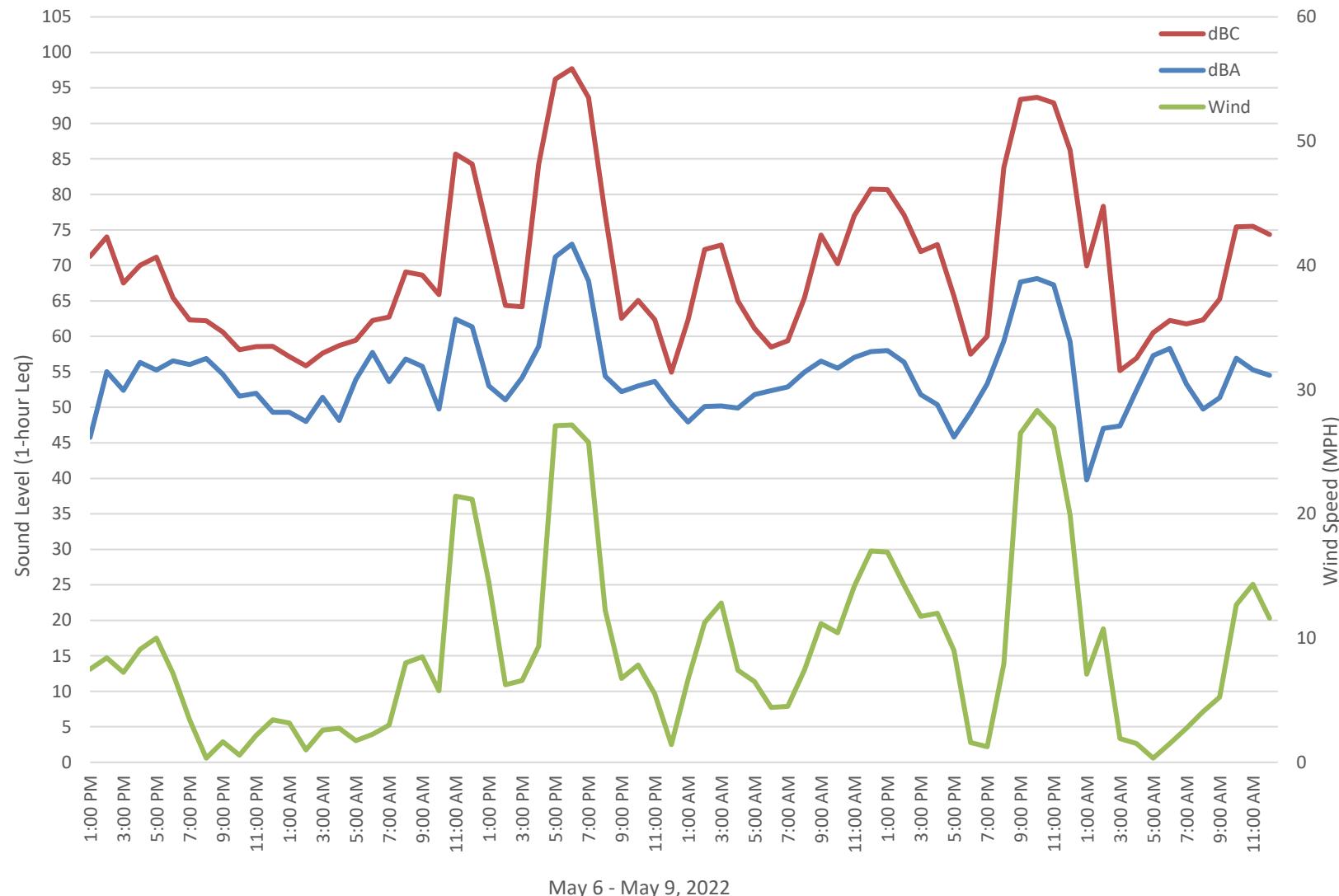
## Environmental Noise Control



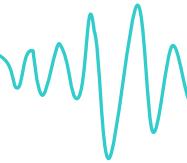
**Figure 5-2 Ambient Sound Level Data for Measurement Location 1**

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## Environmental Noise Control



**Figure 5-3 Ambient Sound Level Data for Measurement Location 2**



## **6. CE Pad Noise Modeling**

### **6.1 Noise Modeling Methodology**

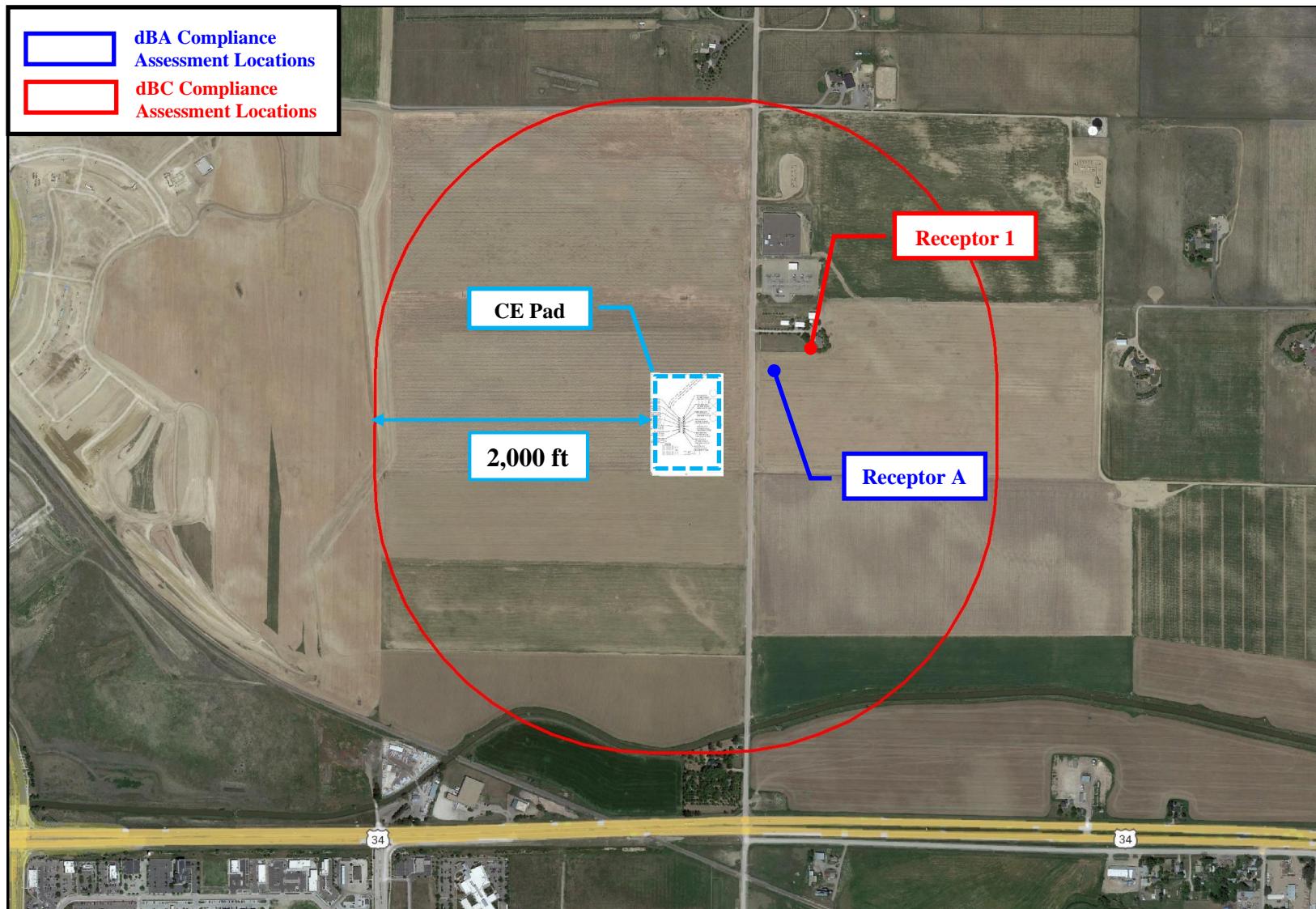
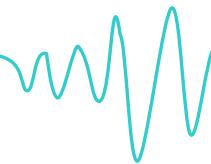
The noise modeling was completed with use of three-dimensional computer noise modeling software. All models in this report were developed with SoundPLAN 8.1 software using the ISO 9613-2 standard. Noise levels are predicted based on the locations, noise levels and frequency spectra of the noise sources, 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 facility equipment 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.

Sound level data utilized in the surface drilling model was based on file data of the Ensign 161 rig collected by BAENC. The V door faces north with the backyard equipment positioned to the south. Rig placement and orientation was coordinated with MRG and oriented to minimize noise impact when possible. The predicted modeling results are dependent on equipment and mitigation orientation as indicated.

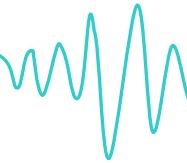
Sound level data utilized in the completions model was based on file data of the Liberty Quiet Fleet completions crew collected by BAENC. The model consists of 12 completions trucks positioned south of the well heads. Completions equipment placement and orientation was coordinated with MRG and oriented to minimize noise impact when possible. The predicted modeling results are dependent on equipment and mitigation orientation as indicated.

### **6.2 Noise Sensitive Receptors**

The noise sensitive receptors utilized in the drilling and completions modeling were positioned to be consistent with the requirements of the COGCC noise standards. The requirements state that dBA noise levels shall comply with the applicable noise limits as measured at 350 feet from the working pad surface and no less than 25 feet from the exterior wall of the Residential Building Unit that is within 2,000 ft. and closest to the drill pad surface. Receptor points used in the modeling can represent multiple closely located RBU's. The requirements state that dBC noise levels shall comply with the applicable noise limits as measured at 25 feet from the exterior wall of nearby residences or occupied structures. Figure 6-1 shows the dBA and dBC noise sensitive receptor locations



**Figure 6-1** Noise Sensitive Receptor Locations



### 6.3 Unmitigated Drilling and Completions Noise Modeling Results

The unmitigated modeling is based off of current drilling and completions plans and does not include sound walls or other third-party acoustical mitigation measures. The results of the unmitigated drilling noise modeling are presented in Table 6-1 and Table 6-2. The locations in the tables correspond to the locations identified in Figure 6-1. The predicted noise levels represent only the contribution of the project operations and do not include ambient noise or noise from other facilities. Figure 6-2 and Figure 6-3 shows the Unmitigated Ensign 161 Noise Contour Map in dBA and dBC respectively. Figure 6-4 and Figure 6-5 shows the Unmitigated Liberty Quiet Fleet Noise Contour Map in dBA and dBC respectively. The noise contours are provided in 5 dB increments with the color scale indicating the sound level of each contour.

**Table 6-1 Unmitigated Noise Modeling Results (dBA)**

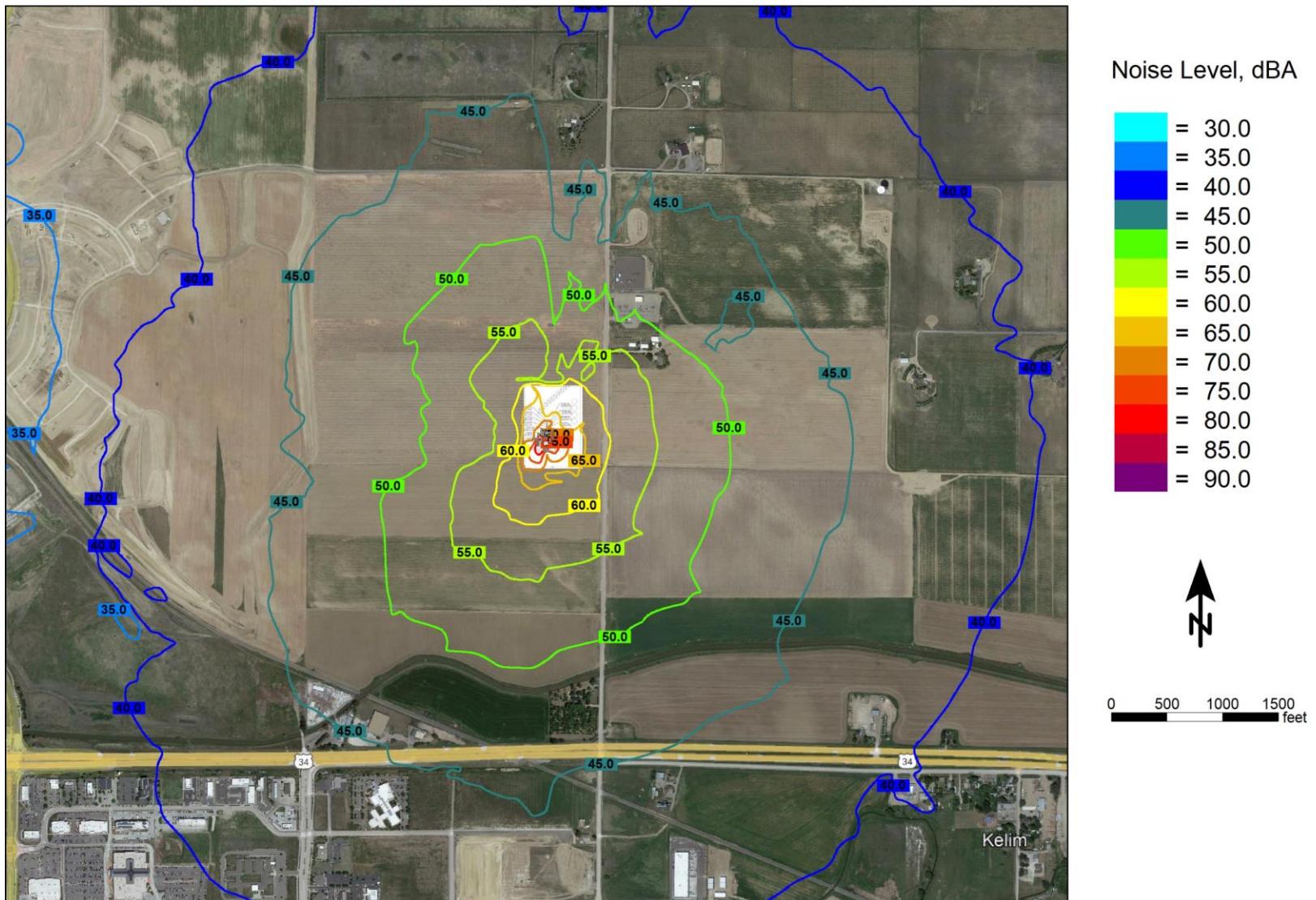
Receptor	Location Description	Ensign 161	Liberty Quiet Fleet
Location A	350 Feet Northeast	57	61
<b>COGCC Noise Limit</b>	<b>350 ft. from the working pad surface</b>	<b>65 Day / 60 Night</b>	<b>65 Day / 60 Night</b>

**Table 6-2 Unmitigated Noise Modeling Results (dBC)**

Receptor	Location Description	Ensign 161	Liberty Quiet Fleet
Location 1	2490 North County Road 3	70	66
<b>COGCC Noise Limit</b>	<b>25 ft. from the exterior wall of a residence or occupied structure towards the noise source</b>	<b>65</b>	<b>65</b>

The results of the unmitigated noise modeling indicate that the drilling operations will comply with the COGCC A-weighted noise level limits. However, the results of the unmitigated noise modeling indicate that the drilling operations are predicted to exceed the COGCC C-weighted noise level limits. Therefore, mitigation will be recommended for drilling operations.

The results of the unmitigated noise modeling indicate that the completions operations will exceed the COGCC A-weighted and C-weighted noise level limits. Therefore, mitigation will be recommended for completions operations.



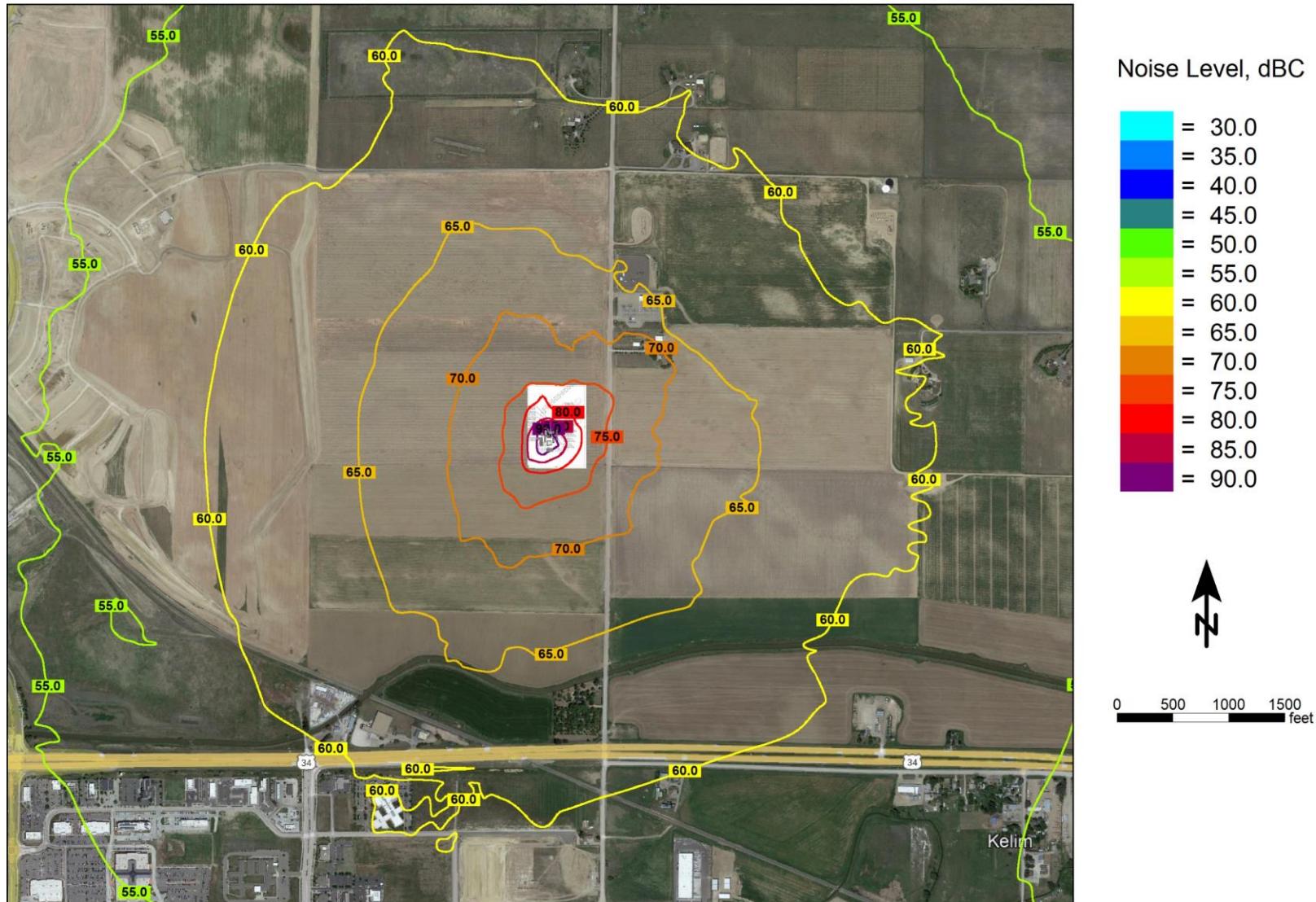
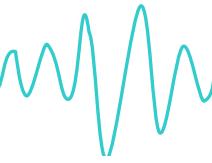
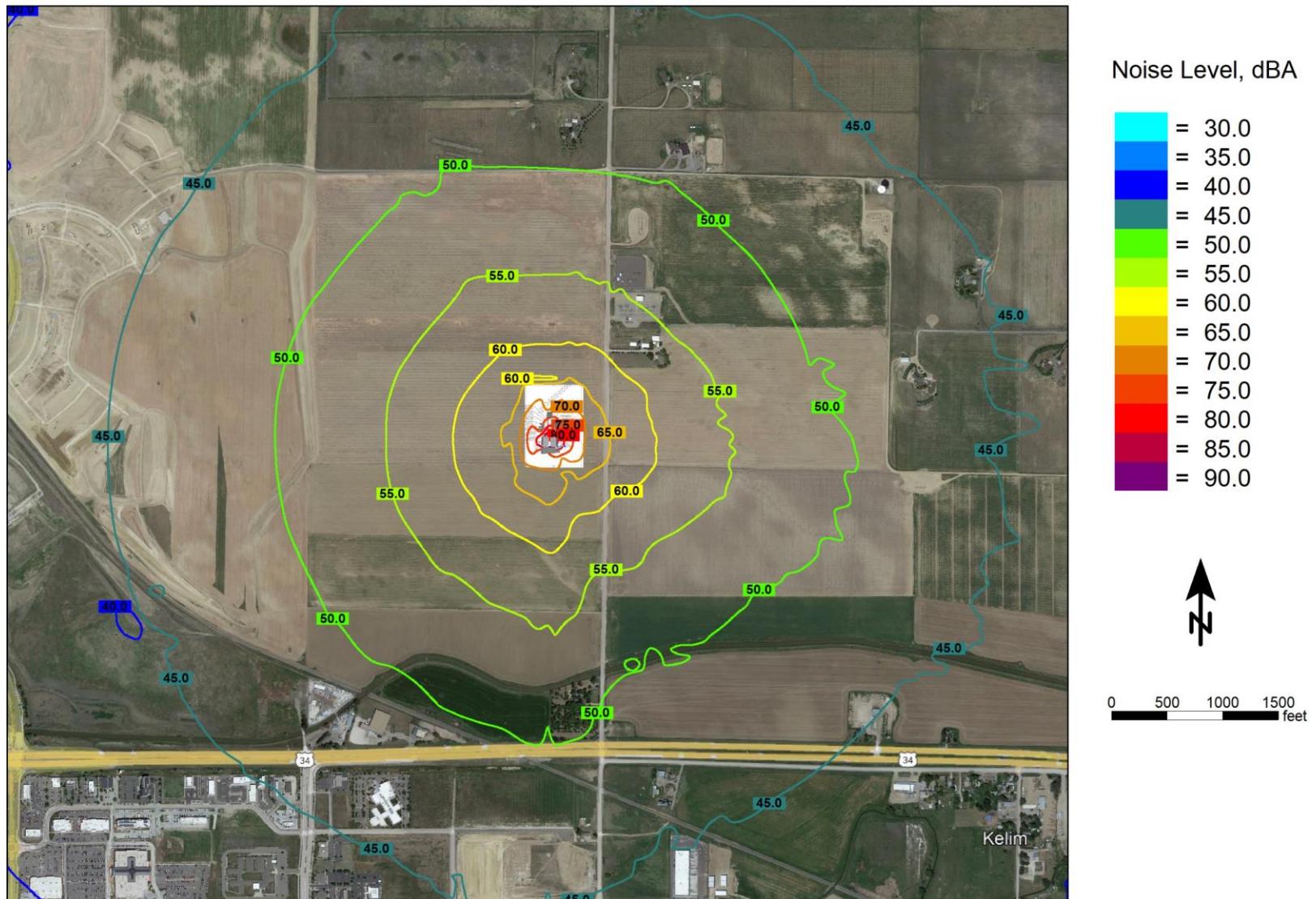
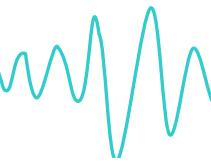
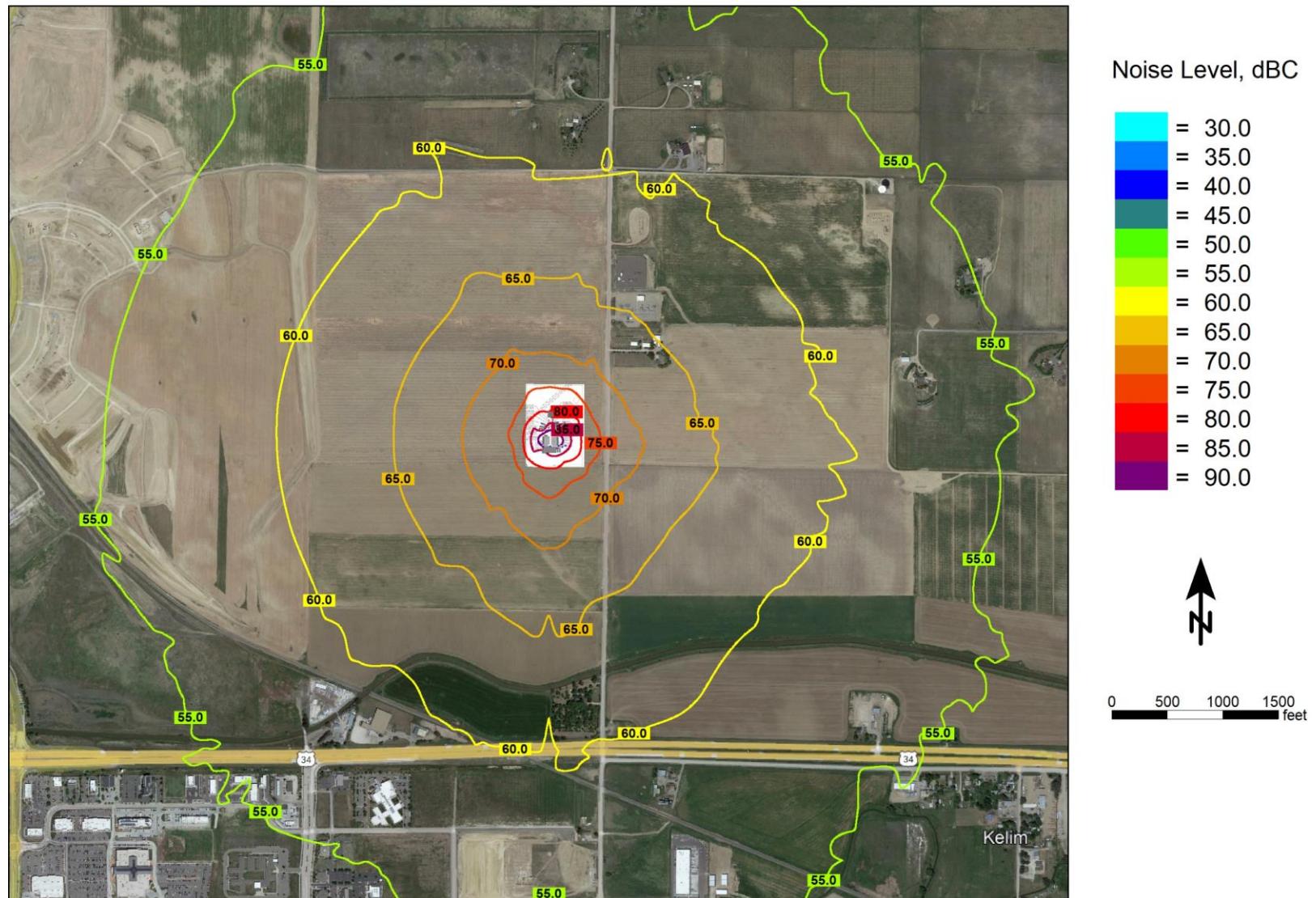
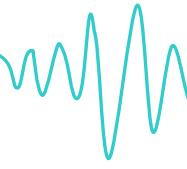


Figure 6-3 Unmitigated Ensign 161 Noise Contour Map (dBc)





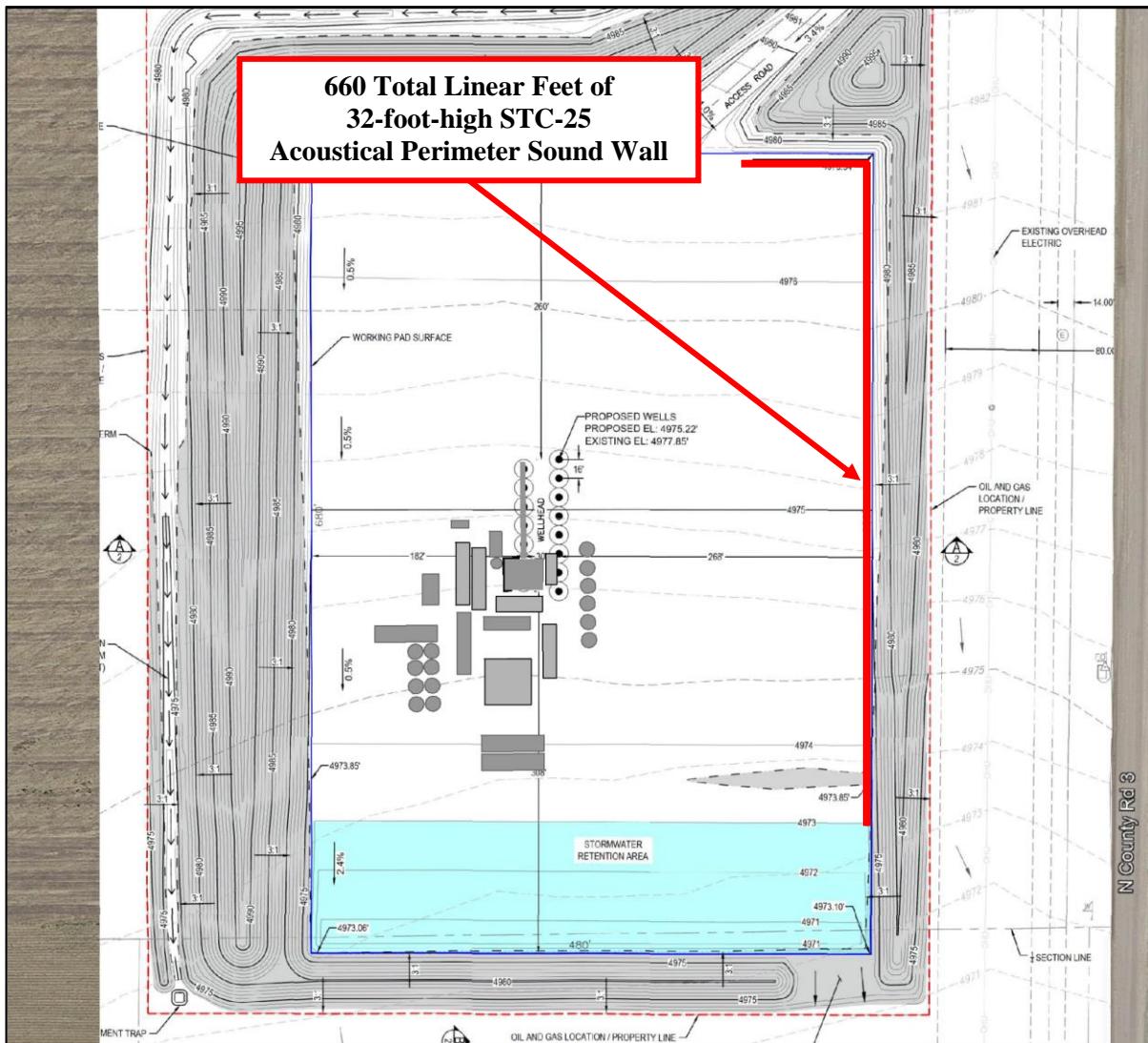


## 6.4 Drilling Mitigated Modeling Results

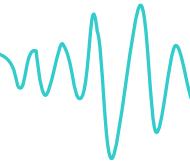
Noise mitigation for drilling operations has been included in the modeling to reduce noise levels in the surrounding environment. The noise mitigation included in the modeling is described below:

- Approximately 660 total linear feet of 32-foot-high, Sound Transmission Class (STC) 25 acoustical wall installed on the north and east perimeter of the site.

The layout for the modeled mitigation scenario is shown in Figure 6-6.



## Figure 6-6 Recommended Mitigation Layout



The mitigated modeling includes the acoustical mitigation recommendations shown in Figure 6-6. The results of the mitigated noise modeling are presented in Table 6-3 and Table 6-4. The locations in the tables correspond to the locations identified in Figure 6-1. The predicted noise levels represent only the contribution of the drilling 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.

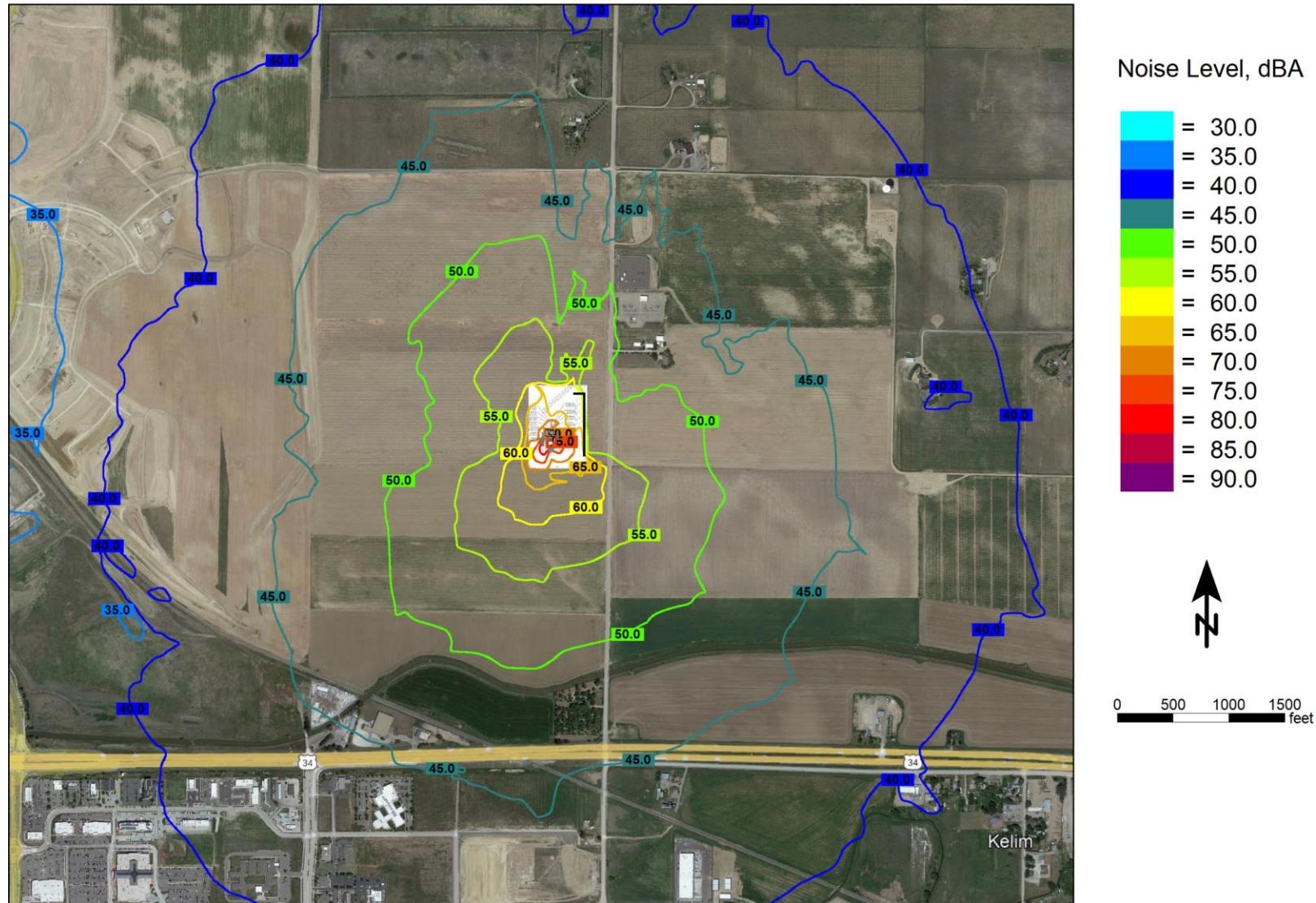
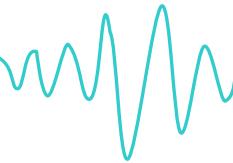
**Table 6-3 Mitigated Noise Modeling Results (dBA)**

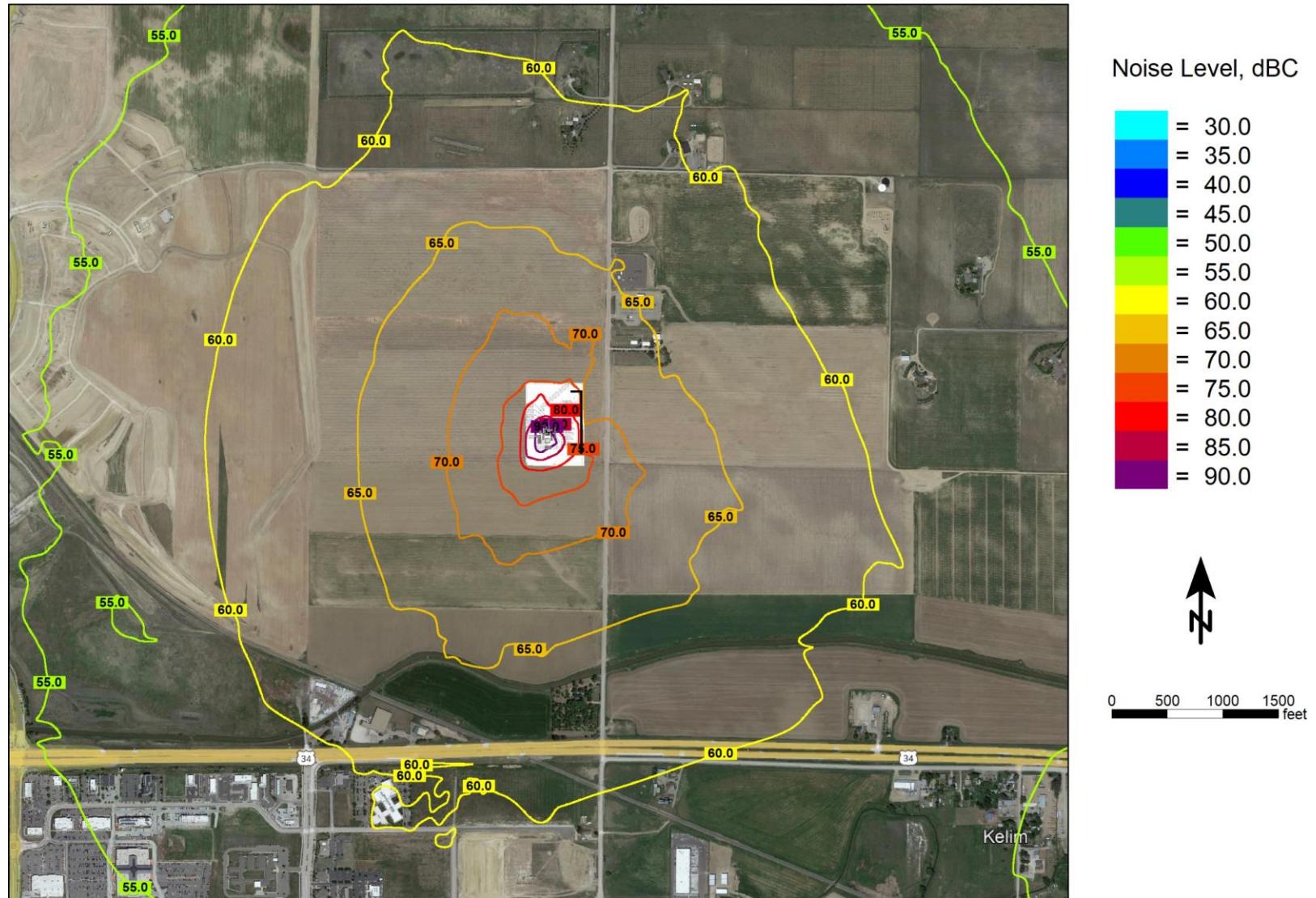
<b>Receptor</b>	<b>Location Description</b>	<b>Ensign 161</b>
Location A	350 Feet Northeast	50
<b>COGCC Noise Limit</b>	<b>350 ft. from the working pad surface</b>	<b>65 Day / 60 Night</b>

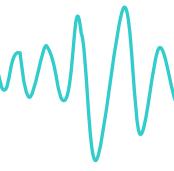
**Table 6-4 Mitigated Noise Modeling Results (dBc)**

<b>Receptor</b>	<b>Location Description</b>	<b>Ensign 161</b>
Location 1	2490 North County Road 3	65
<b>COGCC Noise Limit</b>	<b>25 ft. from the exterior wall of a residence or occupied structure towards the noise source</b>	<b>65</b>

The results of the mitigated noise modeling indicate that with the implementation of the recommended mitigation the proposed drilling operations are predicted to comply with the allowable COGCC A-weighted and C-weighted noise limits. The results of the mitigated noise modeling are also shown as noise contour maps. Figure 6-7 shows the Mitigated Ensign 161 Noise Contour Map in the A-weighted scale Figure 6-8 shows the Mitigated Ensign 161 Noise Contour Map in the C-weighted scale.







### 6.5 Completions Mitigated Modeling Results

Noise mitigation for completions 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 660 total linear feet of 32-foot-high, Sound Transmission Class (STC) 25 acoustical wall installed on the north and east perimeter of the site.

The layout for the modeled mitigation scenario is shown in Figure 6-9.

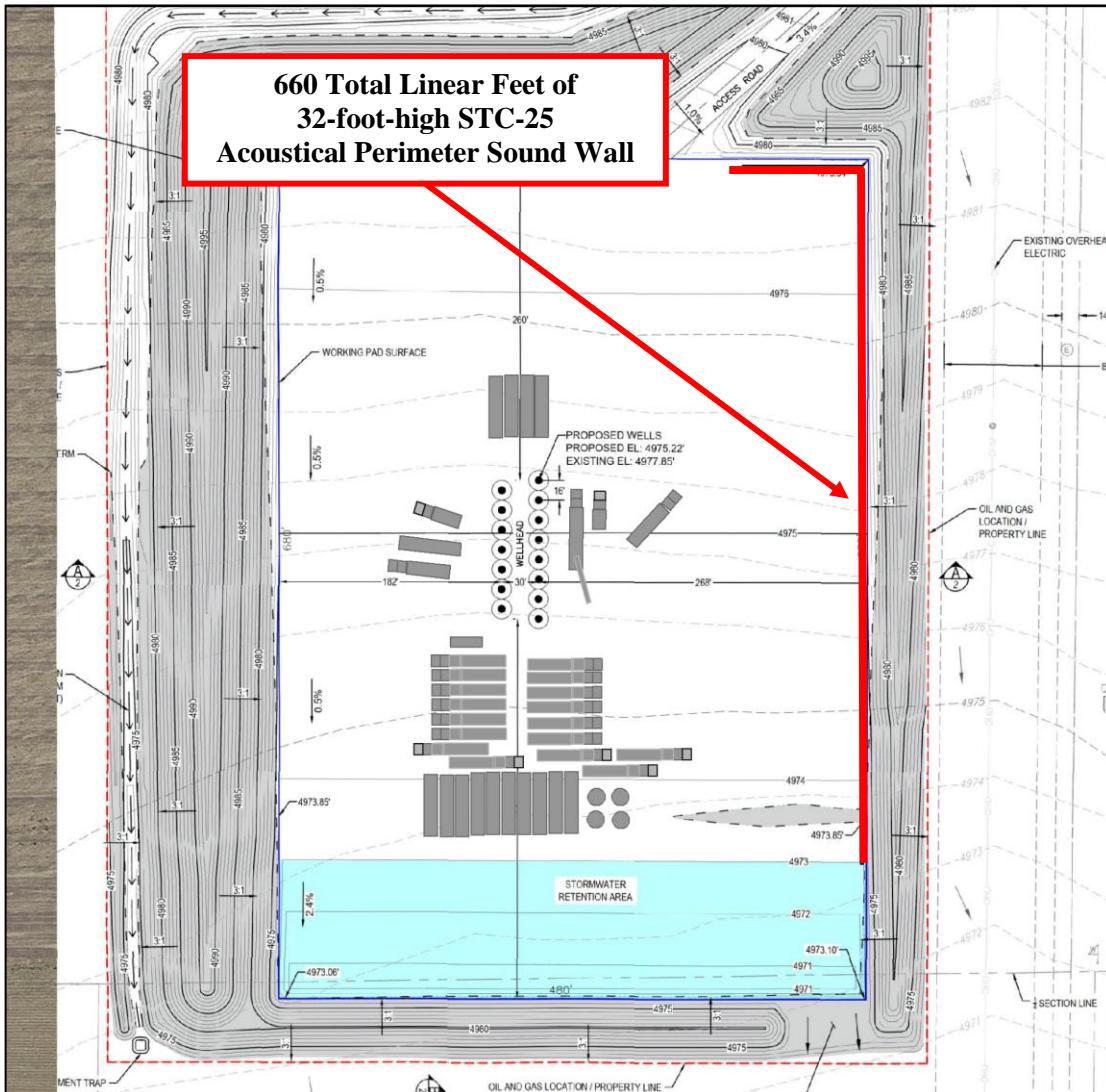
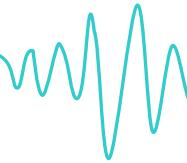


Figure 6-9 Recommended Mitigation Layout



The mitigated modeling includes the acoustical mitigation recommendations shown in Figure 6-9. The results of the mitigated noise modeling are presented in Table 6-5 and Table 6-6. The locations in the tables correspond to the locations identified in Figure 6-1. The predicted noise levels represent only the contribution of the 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.

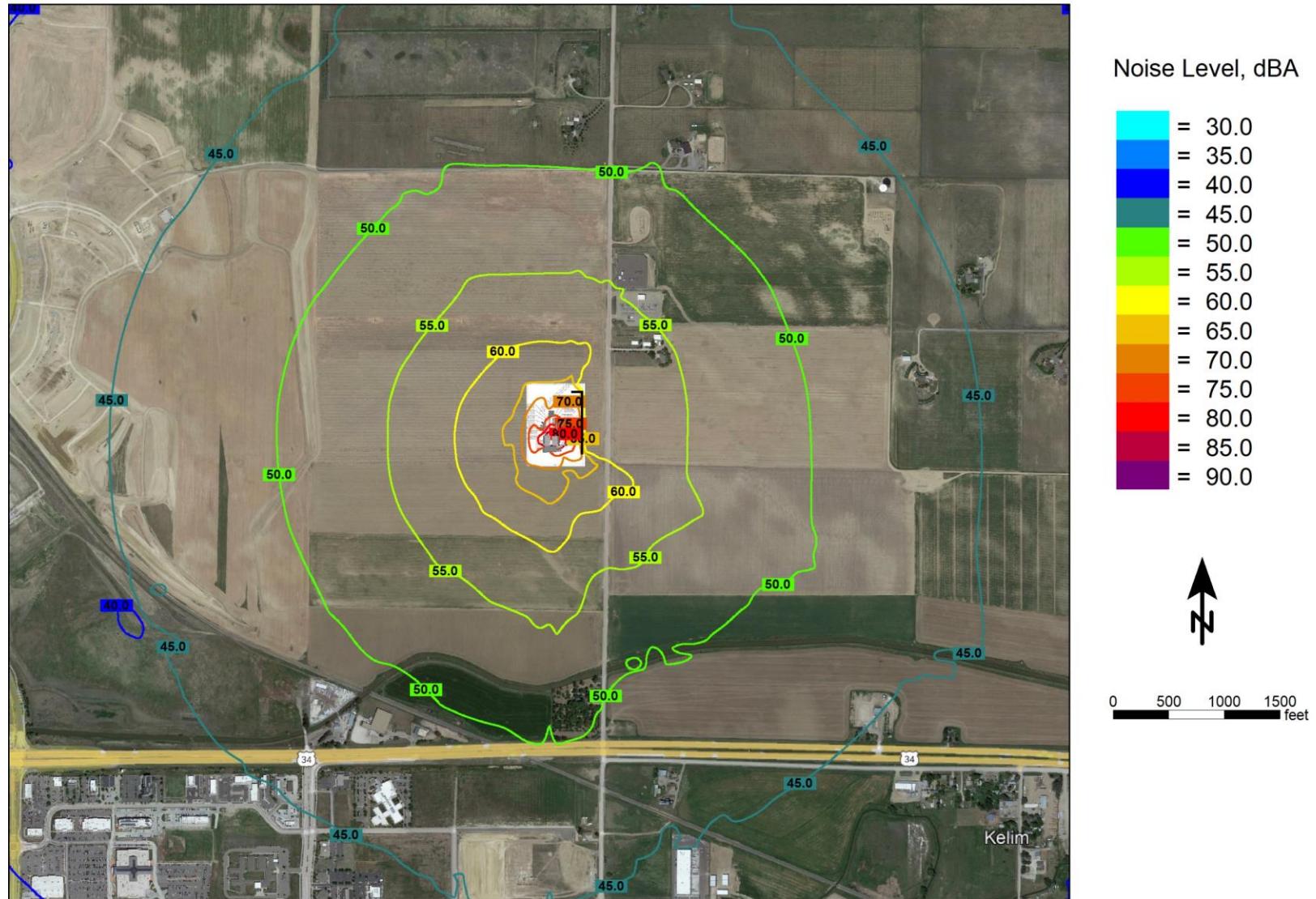
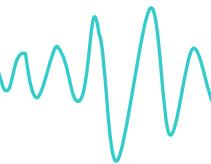
**Table 6-5 Mitigated Noise Modeling Results (dBA)**

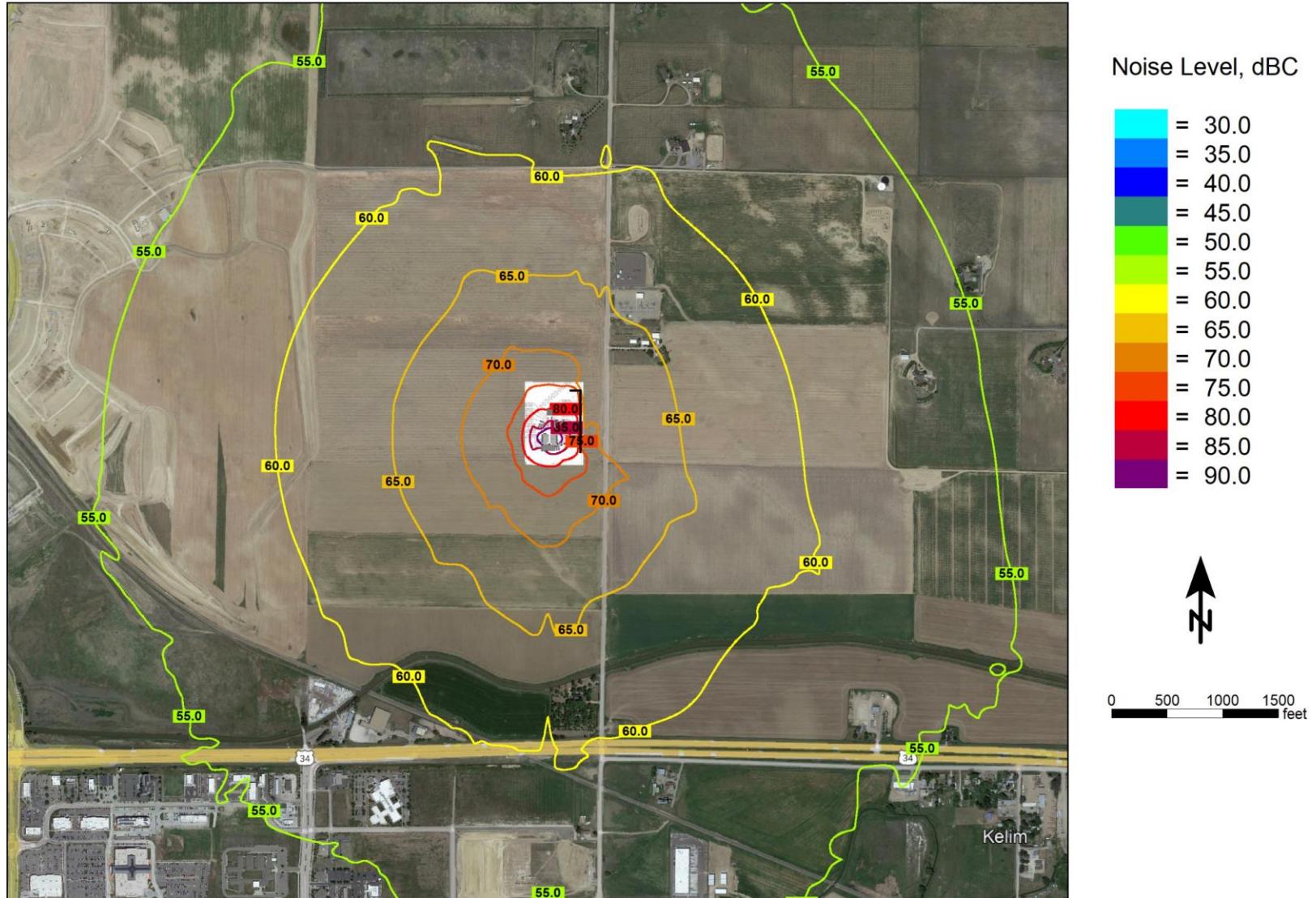
<b>Receptor</b>	<b>Location Description</b>	<b>Liberty Quiet Fleet</b>
Location A	350 Feet Northeast	58
<b>COGCC Noise Limit</b>	<b>350 ft. from the working pad surface</b>	<b>65 Day / 60 Night</b>

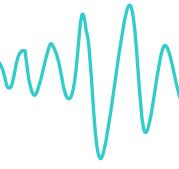
**Table 6-6 Mitigated Noise Modeling Results (dBc)**

<b>Receptor</b>	<b>Location Description</b>	<b>Liberty Quiet Fleet</b>
Location 1	2490 North County Road 3	65
<b>COGCC Noise Limit</b>	<b>25 ft. from the exterior wall of a residence or occupied structure towards the noise source</b>	<b>65</b>

The results of the mitigated noise modeling indicate that with the implementation of the recommended mitigation the proposed completions operations are predicted to comply with the allowable COGCC A-weighted and C-weighted noise limits. The results of the mitigated noise modeling are also shown as noise contour maps. Figure 6-10 shows the Mitigated Liberty Noise Contour Map in the A-weighted scale Figure 6-11 shows the Mitigated Liberty Noise Contour Map in the C-weighted scale.



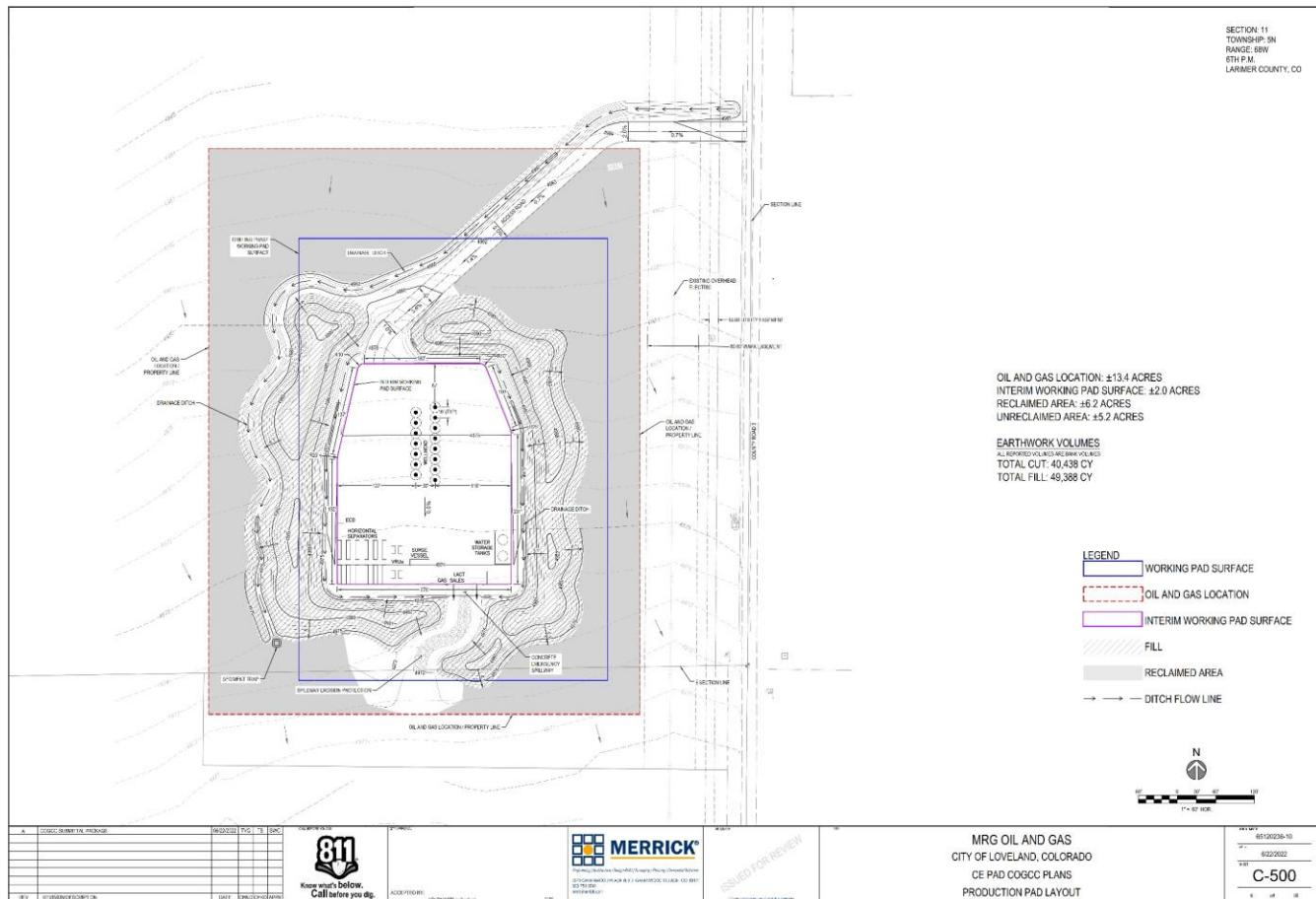




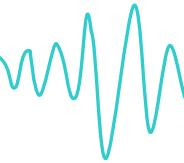
## 7. CE Pad Production Facility Noise Modeling

## 7.1 Unmitigated Production Facility Noise Modeling Results

The unmitigated modeling is based off current production site plans and does not include sound walls or other third-party acoustical mitigation measures. The production facility operational noise model was created to predict the constant, steady-state noise levels at the CE Pad and adjacent surroundings. The production facility was modeled assuming all listed equipment was operating simultaneously to represent the loudest operating scenario. Sound level data utilized in the production model was based on file data previously collected by BAENC at another production facility with similar equipment operating. The production facility equipment list and equipment orientation were supplied by MRG and can be seen Figure 7-1. The predicted modeling results are dependent on equipment and orientation as indicated.



**Figure 7-1 Modeled CE Production Facility Layout (6/22/2022)**



The equipment list and layout were scrutinized to determine the major noise emitting sources planned for the site. These major noise sources, listed in Table 7-1, were included in the production modeling. Other auxiliary/temporary equipment or smaller equipment not anticipated to generate significant noise was not included in the production model.

The noise sensitive receptors utilized in the production modeling were positioned to be consistent with the requirements of the COGCC noise standards. The requirements state that dBA noise levels shall comply with the applicable noise limits as measured at 350 feet from the working pad surface and no less than 25 feet from the exterior wall of the Residential Building Unit that is within 2,000 ft. and closest to the production pad surface. The requirements state that dBC noise levels shall comply with the applicable noise limits as measured at 25 feet from the exterior wall of nearby residences or occupied structures. Figure 7-2 shows the dBA and dBC noise sensitive receptor locations.

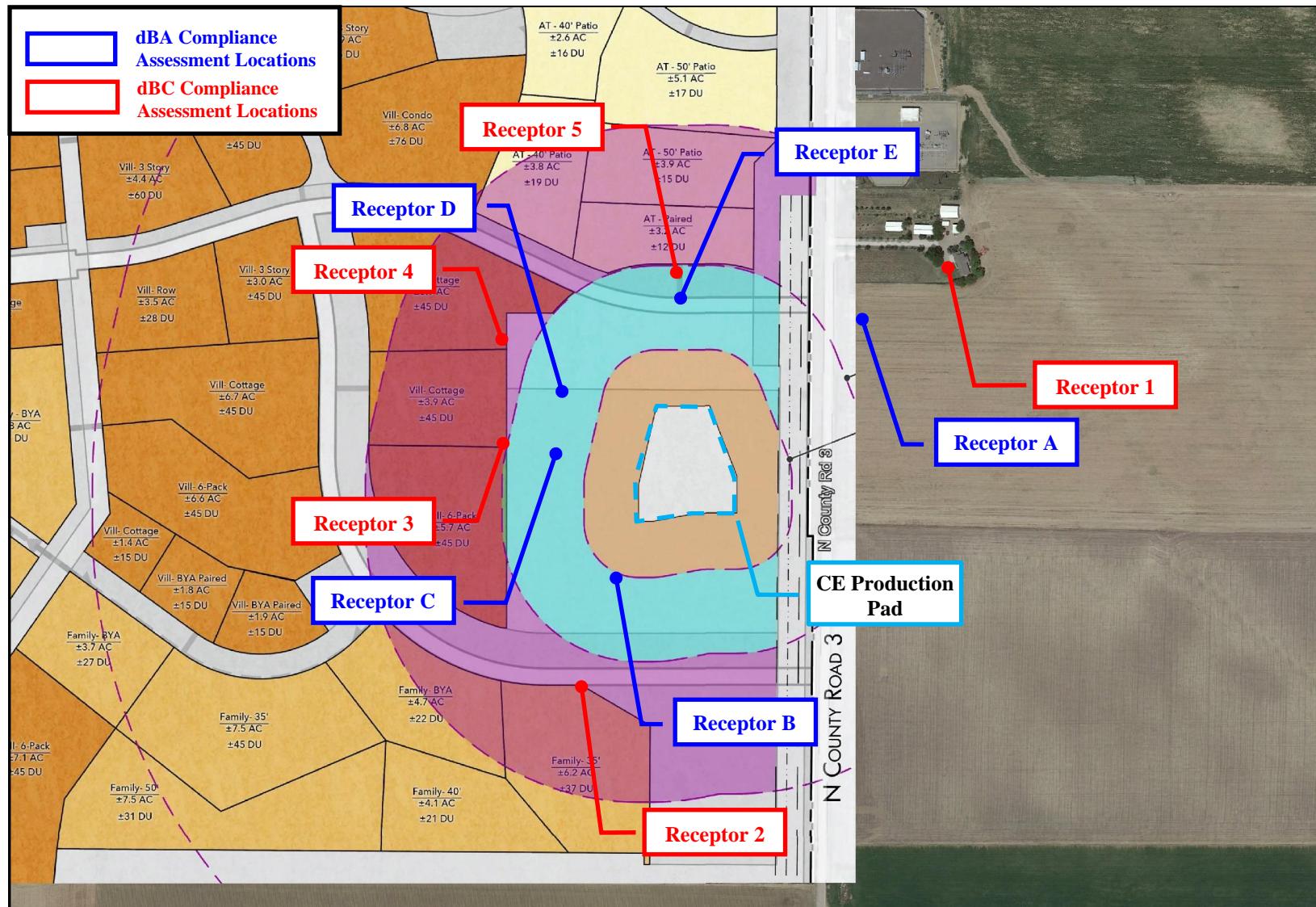
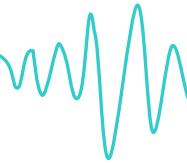


Figure 7-2 Noise Sensitive Receptor Location



The predicted modeling results are dependent on equipment and mitigation orientation as indicated and are only inclusive of the equipment listed in Table 7-1.

**Table 7-1 Production Facility Major Noise Emitting Equipment Included in Model**

Equipment	Quantity
Electrical Panel/Box	1
LACT Skid	1
Separator	12
Separator Burner	12
VRU	4
VOC Combustor	1

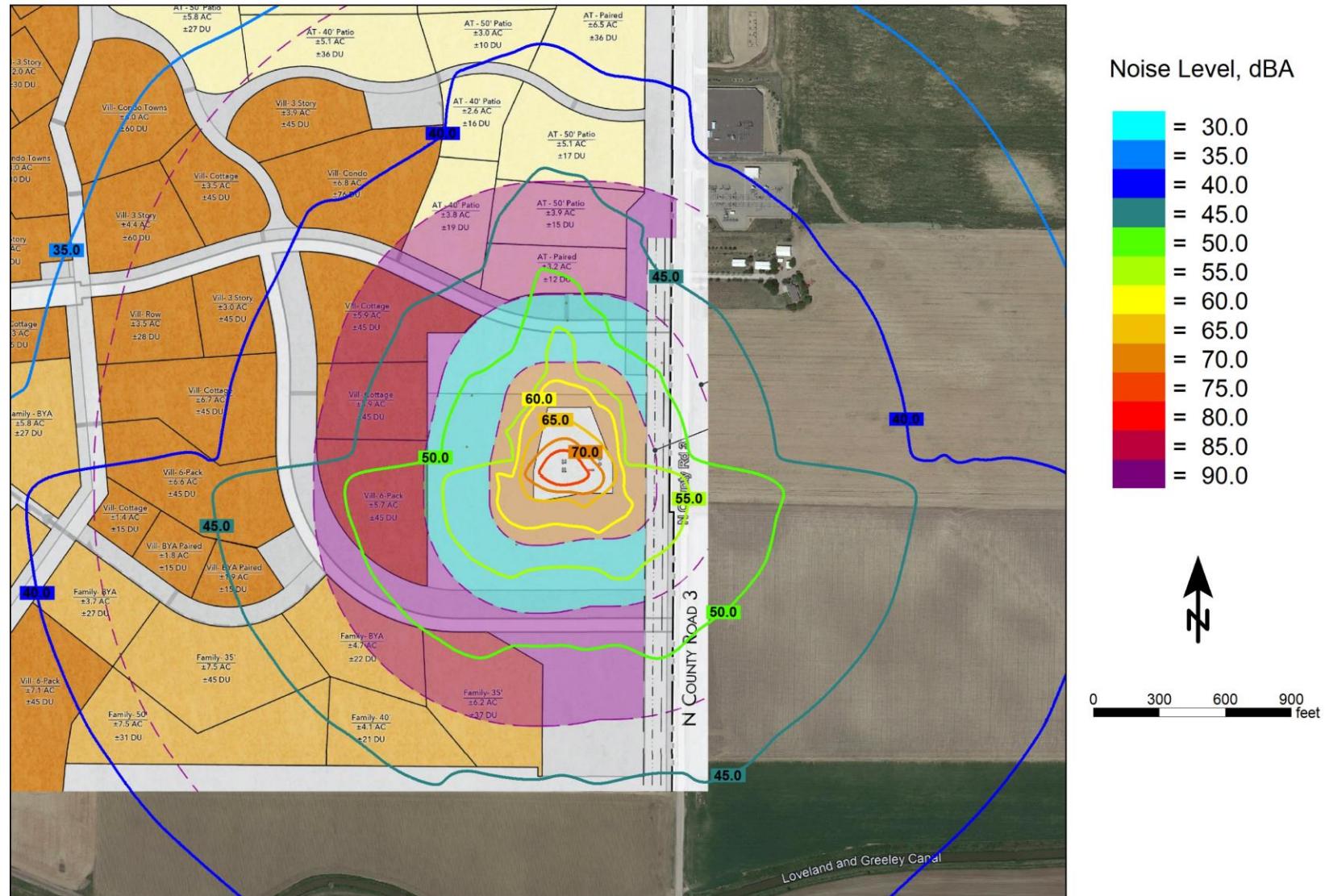
The results of the unmitigated production facility noise modeling are presented in Table 7-2 and Table 7-3. The locations in the tables correspond to the locations identified in Figure 7-2. The predicted noise levels represent only the contribution of the production operations and do not include ambient noise or noise from other facilities. Figure 7-3 and Figure 7-4 shows the Unmitigated Production Facility Noise Contour Map in dBA and dBC respectively. The noise contours are provided in 5 dB increments with the color scale indicating the sound level of each contour. The results of the unmitigated noise modeling indicate that the production operations will comply with the COGCC C-weighted level limits but will exceed the COGCC A-weighted level limits. Therefore, mitigation will be recommended for production operation.

**Table 7-2 Unmitigated Noise Modeling Results (dBA)**

Receptor	Location Description	Production Facility
Location A	350 Feet Northeast	49
Location B	350 Feet Southwest	58
Location C	350 Feet West	52
Location D	350 Feet Northwest	51
Location E	350 Feet North	54
<b>COGCC Noise Limit</b>	<b>350 ft. from the working pad surface</b>	<b>55 Day / 50 Night</b>

**Table 7-3 Unmitigated Noise Modeling Results (dBC)**

Receptor	Location Description	Production Facility
Location 1	2490 North County Road 3	54
Location 2	Southwest of CE Production Pad	56
Location 3	West of CE Production Pad	56
Location 4	Northwest of CE Production Pad	55
Location 5	North of CE Production Pad	58
<b>COGCC Noise Limit</b>	<b>25 ft. from the exterior wall of a residence or occupied structure towards the noise source</b>	<b>60</b>



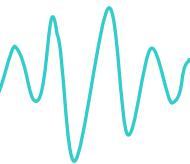
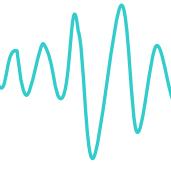


Figure 7-4 Unmitigated Production Facility Noise Contour Map (dBc)

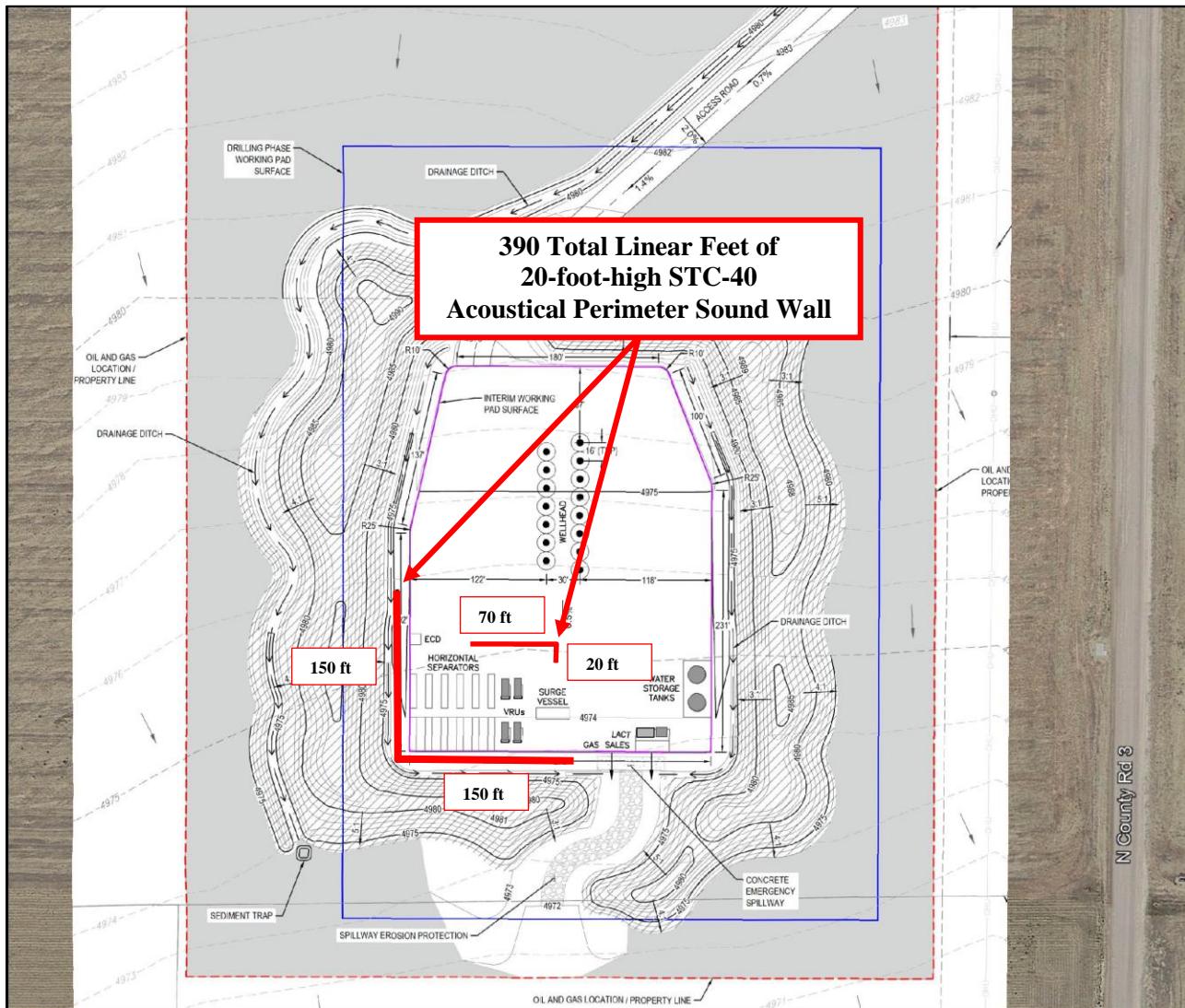


## 7.2 Production Mitigated Modeling Results

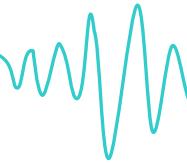
Noise mitigation for production operations has been included in the modeling to reduce noise levels in the surrounding environment. The noise mitigation included in the modeling is described below:

- Approximately 390 total linear feet of 20-foot-high, Sound Transmission Class (STC) 40 acoustical wall installed on the south, west, and north perimeter of the production site.

The layout for the modeled mitigation scenario is shown in Figure 7-5.



**Figure 7-5 Recommended Mitigation Layout**



The mitigated modeling includes the acoustical mitigation recommendations shown in Figure 7-5. The results of the mitigated noise modeling are presented in Table 7-4 and Table 7-5. The locations in the tables correspond to the locations identified in Figure 7-2. The predicted noise levels represent only the contribution of the 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.

**Table 7-4 Mitigated Noise Modeling Results (dBA)**

<b>Receptor</b>	<b>Location Description</b>	<b>Production Facility</b>
Location A	350 Feet Northeast	47
Location B	350 Feet Southwest	48
Location C	350 Feet West	46
Location D	350 Feet Northwest	46
Location E	350 Feet North	44
<b>COGCC Noise Limit</b>	<b>350 ft. from the working pad surface</b>	<b>55 Day / 50 Night</b>

**Table 7-5 Mitigated Noise Modeling Results (dBc)**

<b>Receptor</b>	<b>Location Description</b>	<b>Production Facility</b>
Location 1	2490 North County Road 3	52
Location 2	Southwest of CE Production Pad	51
Location 3	West of CE Production Pad	53
Location 4	Northwest of CE Production Pad	52
Location 5	North of CE Production Pad	55
<b>COGCC Noise Limit</b>	<b>25 ft. from the exterior wall of a residence or occupied structure towards the noise source</b>	<b>60</b>

The results of the mitigated noise modeling indicate that with the implementation of the recommended mitigation the proposed production operations are predicted to comply with the allowable COGCC A-weighted and C-weighted noise limits. The results of the mitigated noise modeling are also shown as noise contour maps. Figure 7-6 shows the Mitigated Production Noise Contour Map in the A-weighted scale. Figure 7-7 shows the Mitigated Production Noise Contour Map in the C-weighted scale.

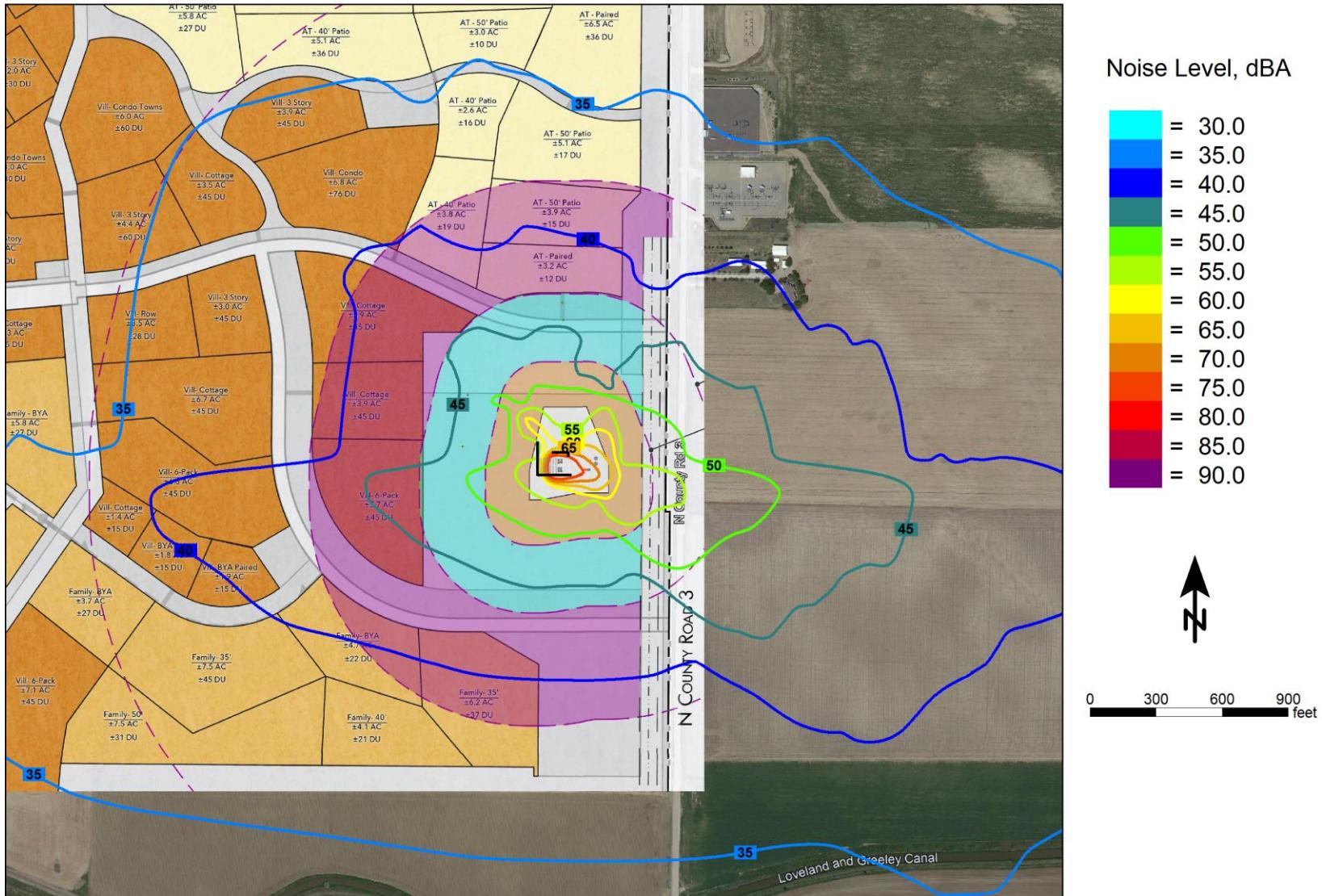


Figure 7-6 Mitigated Production Facility Noise Contour Map (dBA)

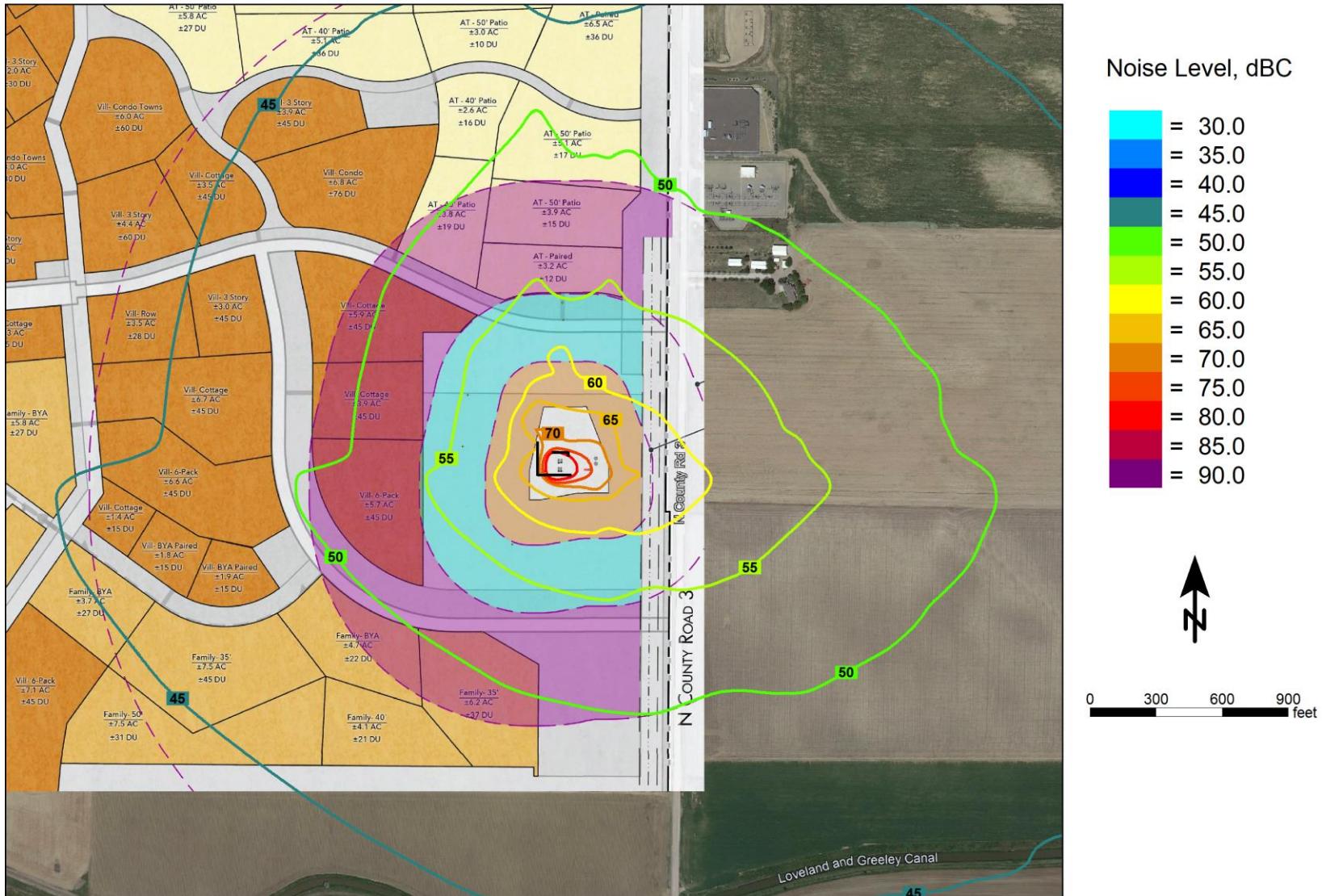
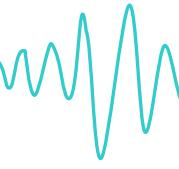


Figure 7-7 Mitigated Production Facility Noise Contour Map (dB)



### 7.3 Unmitigated Production Facility Noise Modeling Results – Future Gas Lift Compressors

The unmitigated modeling is based off future production site plans and does not include sound walls or other third-party acoustical mitigation measures. The production facility operational noise model was created to predict the constant, steady-state noise levels at the CE Pad and adjacent surroundings. The production facility was modeled assuming all listed equipment was operating simultaneously to represent the loudest operating scenario. Sound level data utilized in the production model was based on file data previously collected by BAENC at another production facility with similar equipment operating. The production facility equipment list and equipment orientation were supplied by MRG and can be seen Figure 7-8. The predicted modeling results are dependent on equipment and orientation as indicated.

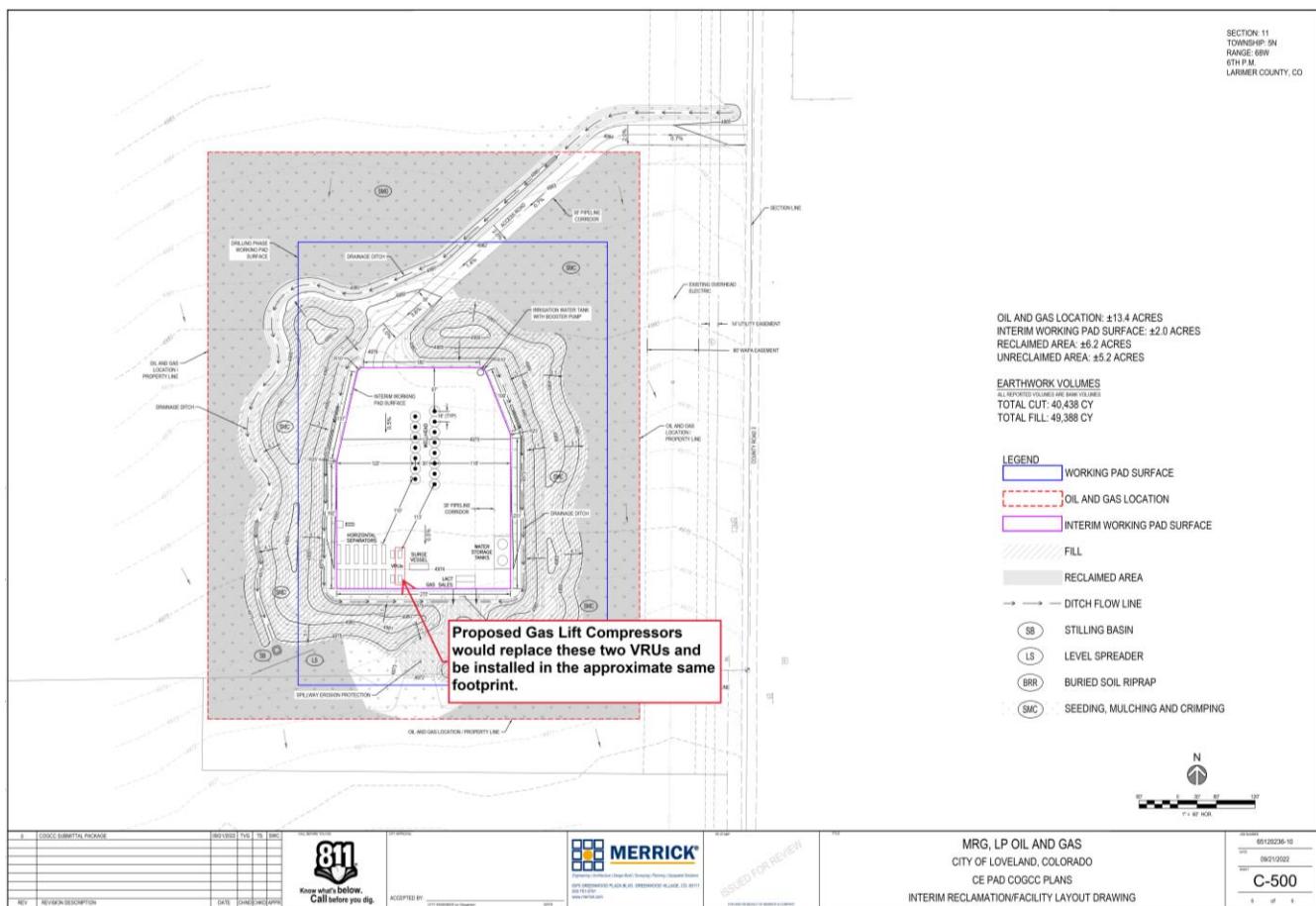
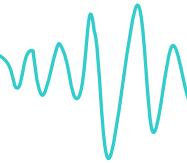


Figure 7-8 Modeled CE Production Facility Layout with Gas Lift Compressors (9/21/2022)



The equipment list and layout were scrutinized to determine the major noise emitting sources planned for the site. These major noise sources, listed in Table 7-6, were included in the production modeling. Other auxiliary/temporary equipment or smaller equipment not anticipated to generate significant noise was not included in the production model.

The noise sensitive receptors utilized in the production modeling were positioned to be consistent with the requirements of the COGCC noise standards. The requirements state that dBA noise levels shall comply with the applicable noise limits as measured at 350 feet from the working pad surface and no less than 25 feet from the exterior wall of the Residential Building Unit that is within 2,000 ft. and closest to the production pad surface. The requirements state that dBC noise levels shall comply with the applicable noise limits as measured at 25 feet from the exterior wall of nearby residences or occupied structures. Figure 7-2 shows the dBA and dBC noise sensitive receptor locations.

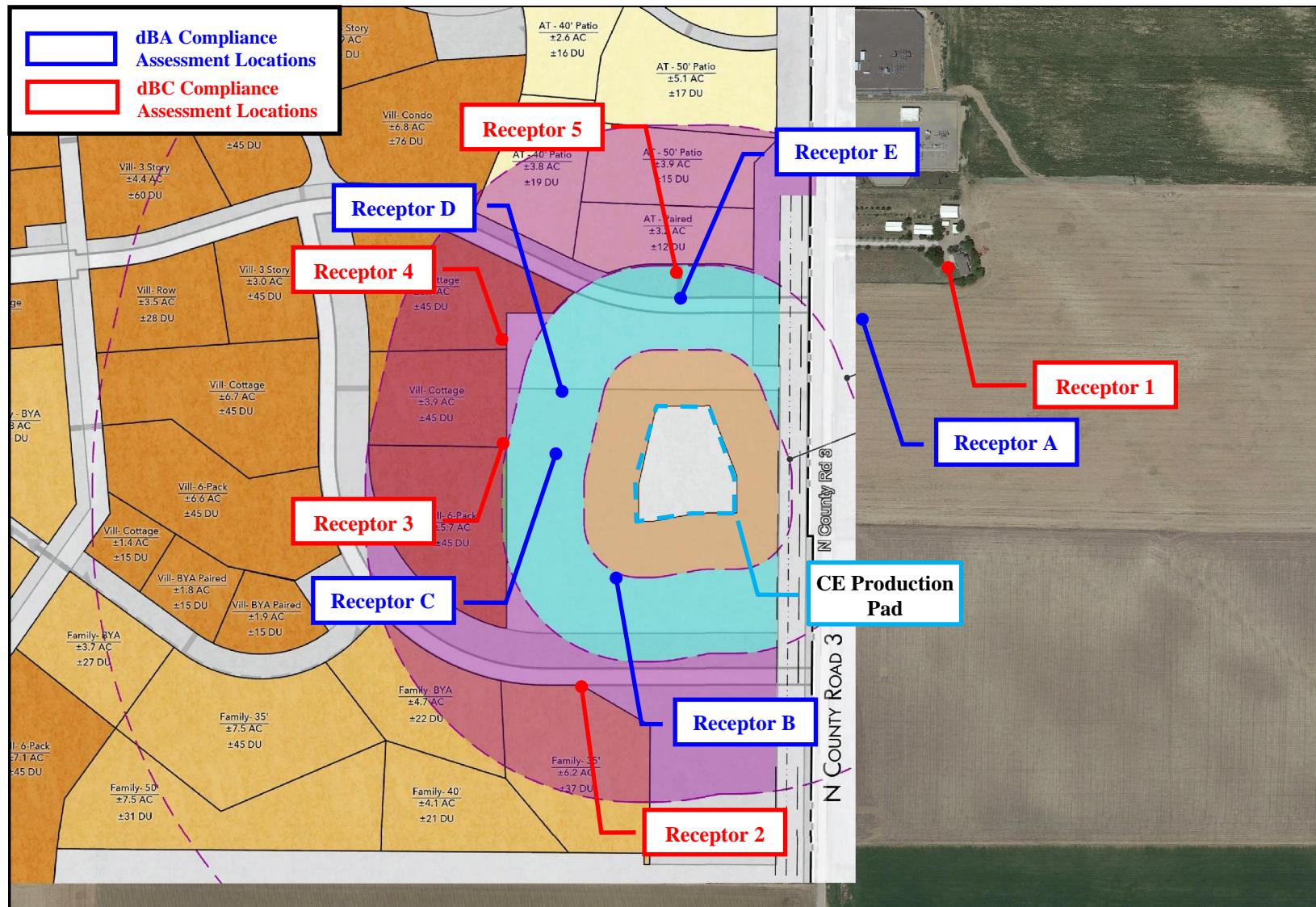
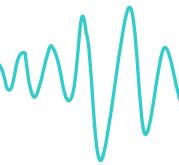


Figure 7-9 Noise Sensitive Receptor Location



The predicted modeling results are dependent on equipment and mitigation orientation as indicated and are only inclusive of the equipment listed in Table 7-6. In the future two of the VRUs may need to be replaced with gas lift compressors. Therefore, two of the VRUs will be replaced in the noise model with two gas lift compressors for future production operations.

**Table 7-6 Production Facility Major Noise Emitting Equipment Included in Model**

Equipment	Quantity
200 hp Electric Compressor Package	2
Electrical Panel/Box	1
LACT Skid	1
Separator	12
Separator Burner	12
VRU	2
VOC Combustor	1

The results of the unmitigated production facility noise modeling are presented in Table 7-7 and Table 7-8. The locations in the tables correspond to the locations identified in Figure 7-9. The predicted noise levels represent only the contribution of the production operations and do not include ambient noise or noise from other facilities. Figure 7-10 and Figure 7-11 shows the Unmitigated Production Facility Noise Contour Map in dBA and dBC respectively. The noise contours are provided in 5 dB increments with the color scale indicating the sound level of each contour. The results of the unmitigated noise modeling indicate that the production operations will exceed the COGCC A-weighted and C-weighted level limits. Therefore, mitigation will be recommended for future production operations.

**Table 7-7 Unmitigated Noise Modeling Results – Future Gas Lift Compressors (dBA)**

Receptor	Location Description	Production Facility
Location A	350 Feet Northeast	49
Location B	350 Feet Southwest	57
Location C	350 Feet West	52
Location D	350 Feet Northwest	51
Location E	350 Feet North	53
<b>COGCC Noise Limit</b>	<b>350 ft. from the working pad surface</b>	<b>55 Day / 50 Night</b>

**Table 7-8 Unmitigated Noise Modeling Results – Future Gas Lift Compressors (dBC)**

Receptor	Location Description	Production Facility
Location 1	2490 North County Road 3	55
Location 2	Southwest of CE Production Pad	59
Location 3	West of CE Production Pad	58
Location 4	Northwest of CE Production Pad	58
Location 5	North of CE Production Pad	62
<b>COGCC Noise Limit</b>	<b>25 ft. from the exterior wall of a residence or occupied structure towards the noise source</b>	<b>60</b>

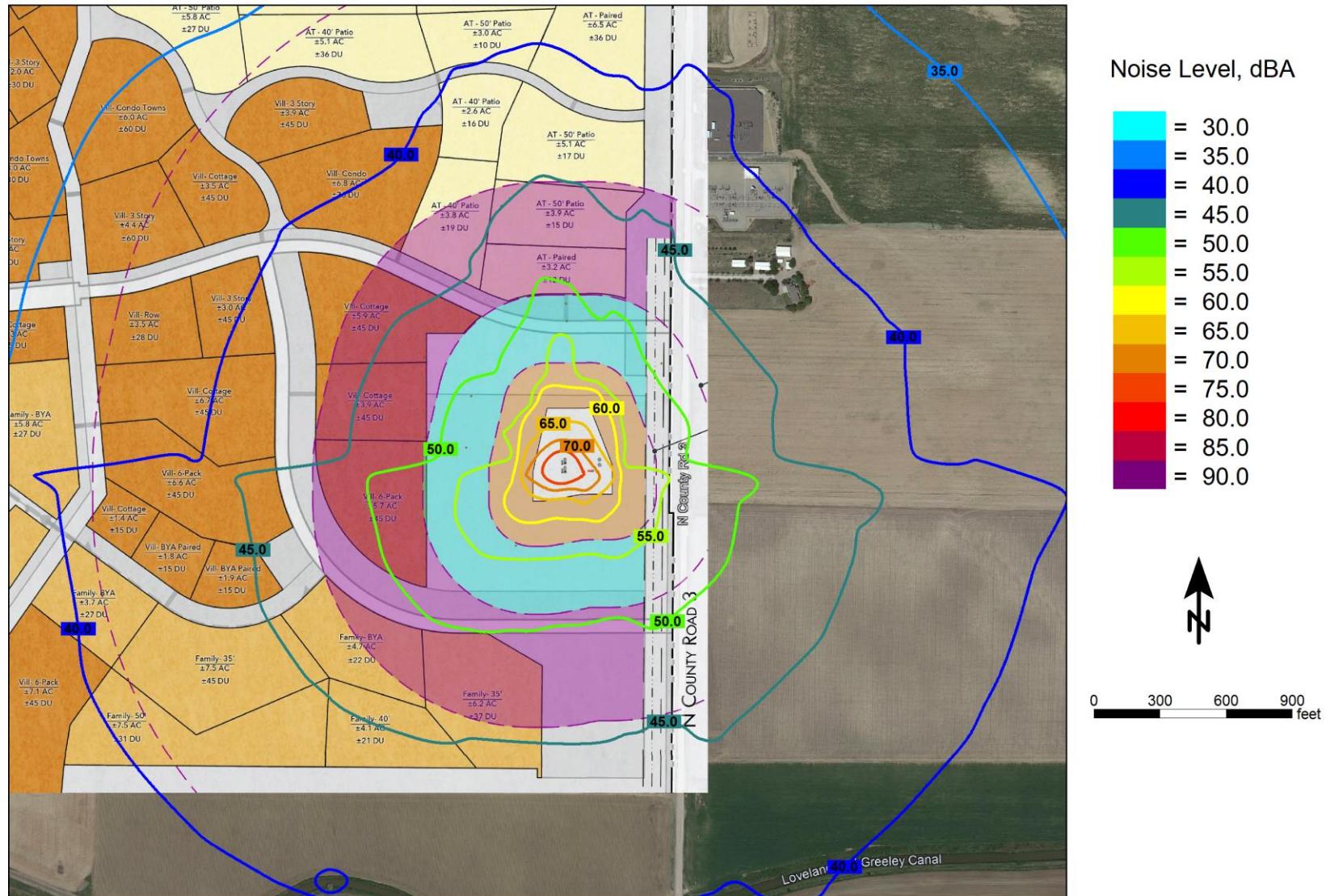
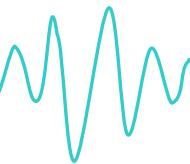
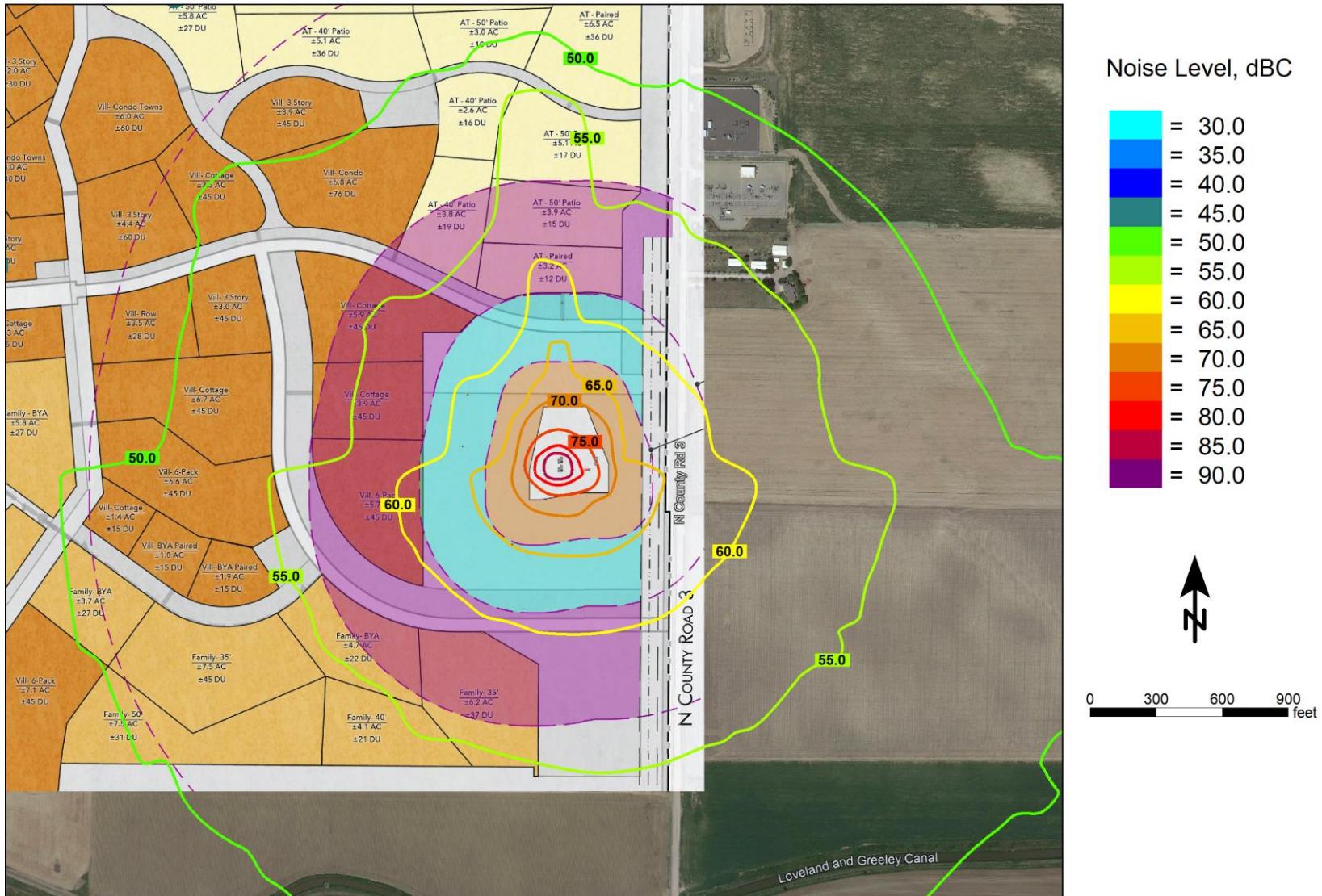
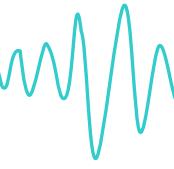


Figure 7-10 Unmitigated Production Facility Noise Contour Map – Future Gas Lift Compressors (dBA)



**Figure 7-11 Unmitigated Production Facility Noise Contour Map – Future Gas Lift Compressors (dBc)**



### 7.4 Production Mitigated Modeling Results – Future Gas Lift Compressors

Noise mitigation for production 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 390 total linear feet of 20-foot-high, Sound Transmission Class (STC) 40 acoustical wall installed on the south, west, and north perimeter of the production site.

The layout for the modeled mitigation scenario is shown in Figure 7-12.

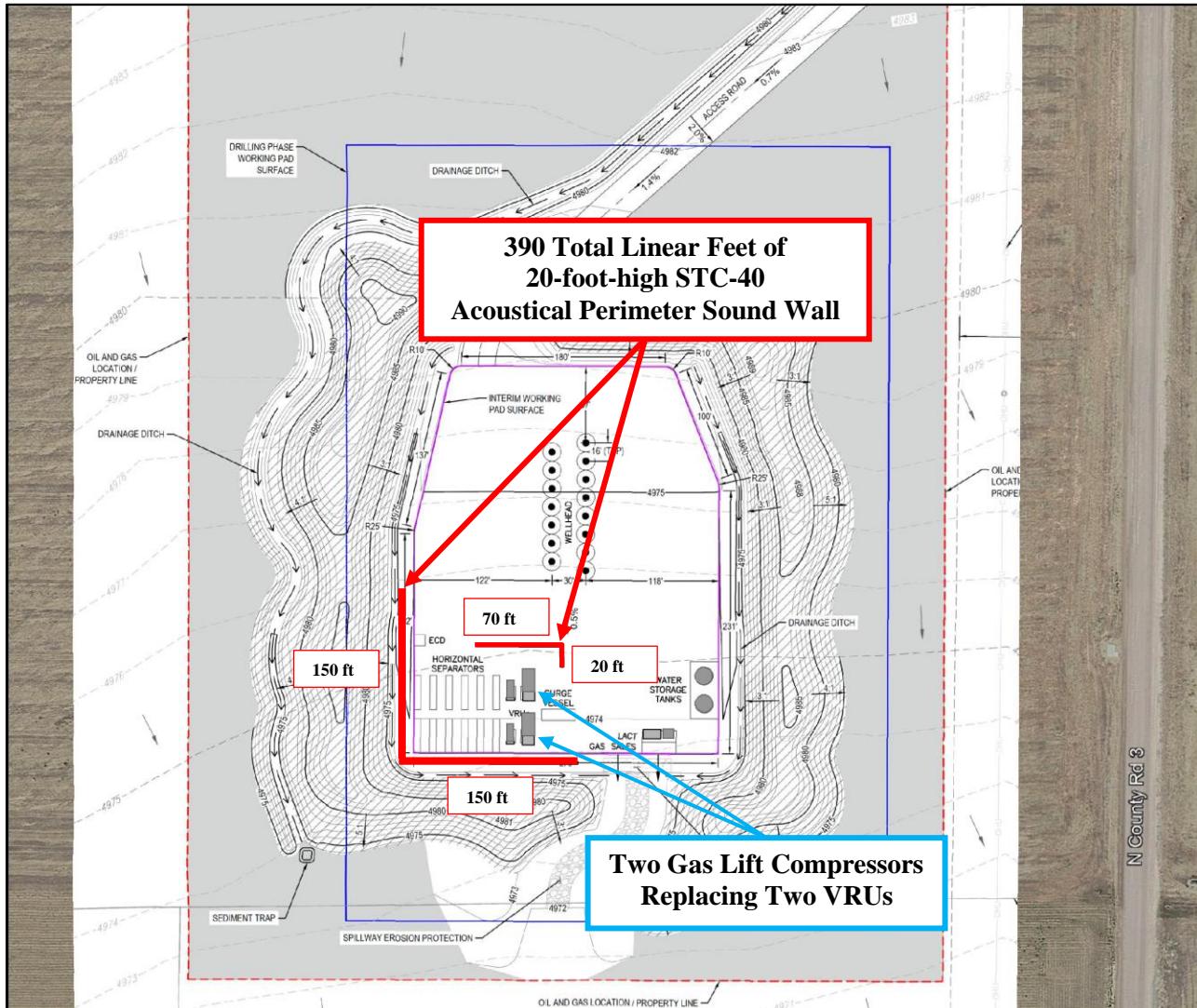
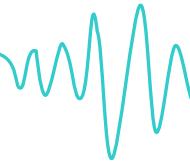


Figure 7-12 Recommended Mitigation Layout for Future Production Operations



The mitigated modeling includes the acoustical mitigation recommendations shown in Figure 7-12. The results of the mitigated noise modeling are presented in Table 7-9 and Table 7-10. The locations in the tables correspond to the locations identified in Figure 7-9. The predicted noise levels represent only the contribution of the 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.

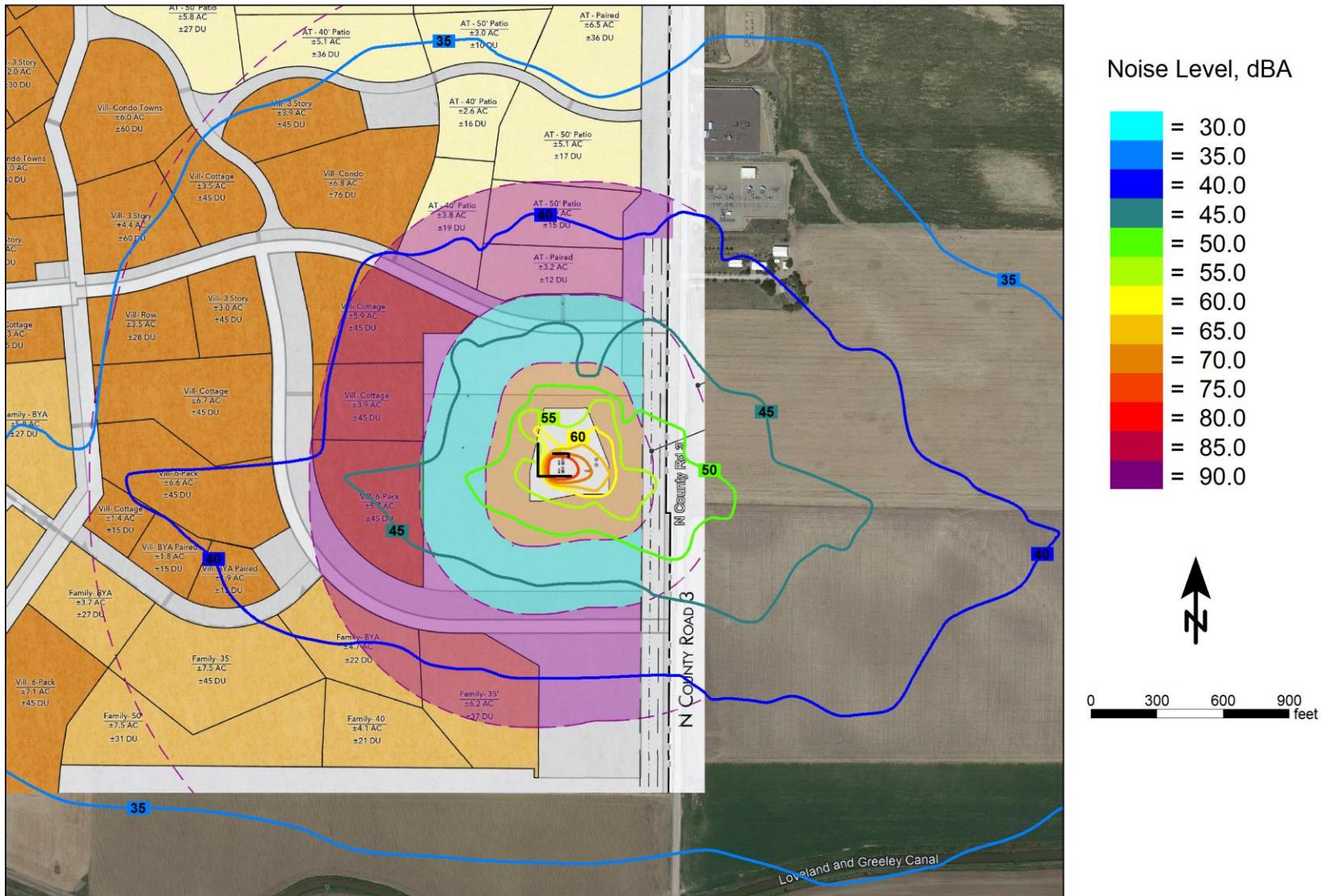
**Table 7-9 Mitigated Noise Modeling Results – Future Gas Lift Compressors (dBA)**

<b>Receptor</b>	<b>Location Description</b>	<b>Production Facility</b>
Location A	350 Feet Northeast	47
Location B	350 Feet Southwest	48
Location C	350 Feet West	46
Location D	350 Feet Northwest	45
Location E	350 Feet North	45
<b>COGCC Noise Limit</b>	<b>350 ft. from the working pad surface</b>	<b>55 Day / 50 Night</b>

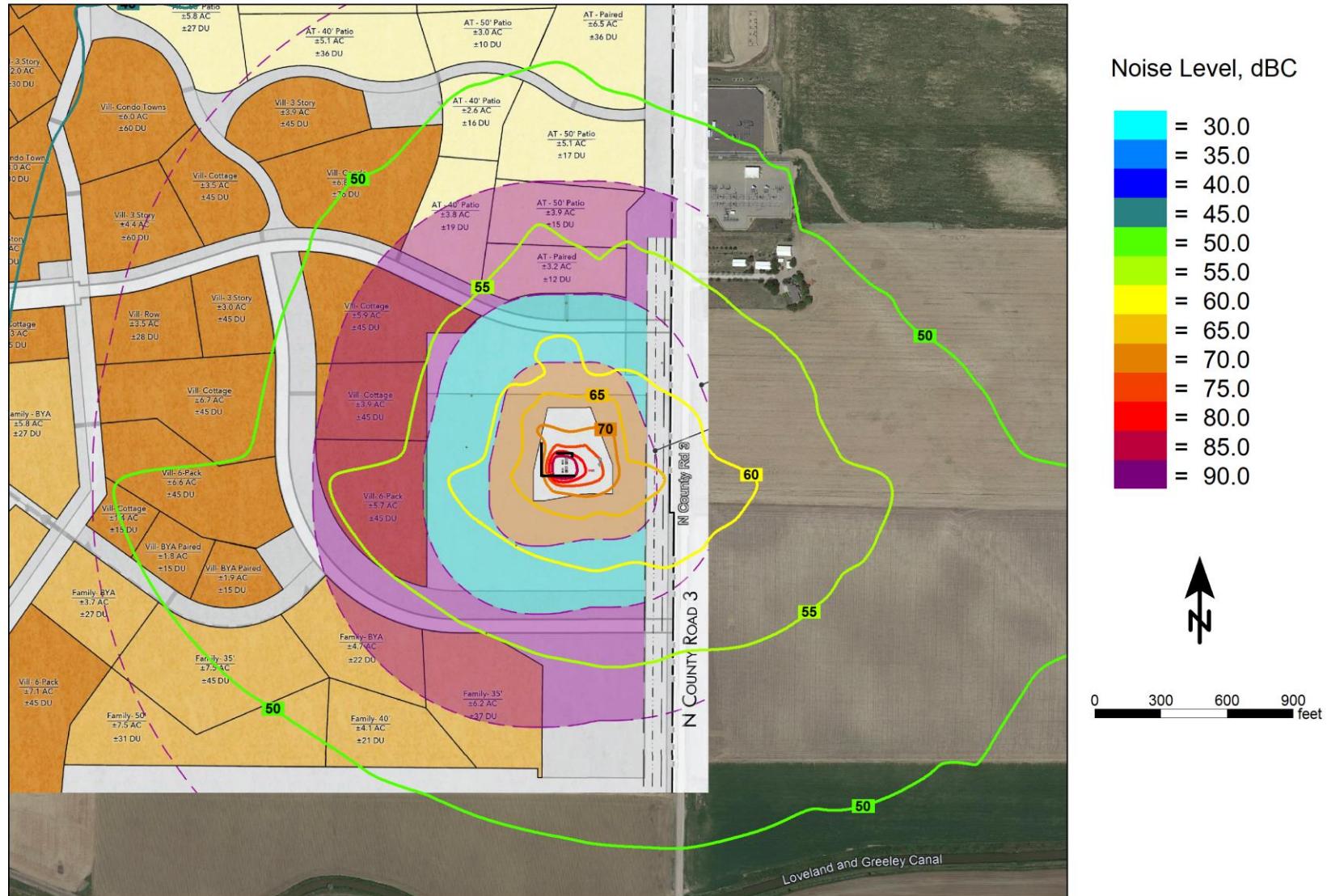
**Table 7-10 Mitigated Noise Modeling Results – Future Gas Lift Compressors (dBc)**

<b>Receptor</b>	<b>Location Description</b>	<b>Production Facility</b>
Location 1	2490 North County Road 3	54
Location 2	Southwest of CE Production Pad	55
Location 3	West of CE Production Pad	56
Location 4	Northwest of CE Production Pad	55
Location 5	North of CE Production Pad	57
<b>COGCC Noise Limit</b>	<b>25 ft. from the exterior wall of a residence or occupied structure towards the noise source</b>	<b>60</b>

The results of the mitigated noise modeling indicate that with the implementation of the recommended mitigation the proposed future production operations are predicted to comply with the allowable COGCC A-weighted and C-weighted noise limits. The results of the mitigated noise modeling are also shown as noise contour maps. Figure 7-13 shows the Mitigated Production Noise Contour Map in the A-weighted scale Figure 7-14 shows the Mitigated Production Noise Contour Map in the C-weighted scale.



**Figure 7-13 Mitigated Production Facility Noise Contour Map – Future Gas Lift Compressors (dBA)**





## **8. Noise Points of Compliance and Continuous Noise Monitoring**

### **8.1 Continuous Monitoring Procedure**

The following continuous monitoring procedures are proposed to ensure compliance with the monitoring procedures outlined in COGCC Rule 423.c.(2). To demonstrate compliance with COGCC noise regulations, pre-production activities and ongoing operations lasting longer than 24 consecutive hours will require continuous monitoring measurements from each noise point of compliance designated. According to Section 423. Noise (c), to demonstrate compliance with Tables 423-1 and 423-2 Operators will measure sound levels according to the following standards:

- (1) During pre-production activities and ongoing operations lasting longer than 24 consecutive hours such as drilling, completion, recompletion, Stimulation, and Well maintenance, in areas zoned residential or within 2,000 feet of a Building Unit, Operators will take continuous sound measurements from each noise point of compliance designated pursuant to Rule 423.a.(5).

Figure 8-1 shows an aerial view of the proposed pad with an approximate 2,000 ft. radius from the working pad surface. There is a Residential Building Unit (RBU) within the 2,000 ft. radius. Proposed noise point of compliance is detailed in Table 8-1.

Residential Building Units (RBU) may be exempt to continuous monitoring due to rule 423.b.(5) if an agreement is made between the surface owner and operator and subsequently accepted by the COGCC.

**Table 8-1 Proposed Continuous Monitoring Locations**

<b>Location</b>	<b>Description</b>	<b>Notes</b>
Noise Point of Compliance 1	25 feet from exterior of RBU	<ul style="list-style-type: none"><li>• Located on private land, measurement location can be adjusted if access is not granted</li></ul>



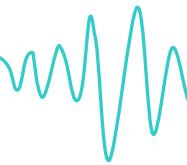
**Figure 8-1** Proposed Continuous Monitoring Locations



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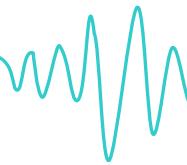
## **Appendix A - Ambient Data**

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**Table A-8-2 Recorded Hourly Average Ambient Sound Levels Location 1 (1-hr dBA L<sub>eq</sub>)**

MRG, LP - CEPad					
Location 1 - Hourly L <sub>eq</sub>					
Time	dBA	dBc	Time	dBA	dBc
1:00 PM	52	70	1:00 AM	40	64
2:00 PM	53	68	2:00 AM	48	74
3:00 PM	54	72	3:00 AM	49	75
4:00 PM	57	72	4:00 AM	46	73
5:00 PM	56	76	5:00 AM	47	67
6:00 PM	52	68	6:00 AM	45	59
7:00 PM	53	62	7:00 AM	46	60
8:00 PM	53	60	8:00 AM	49	69
9:00 PM	54	60	9:00 AM	51	79
10:00 PM	47	58	10:00 AM	51	75
11:00 PM	47	57	11:00 AM	54	82
Sat 7-May	43	62	12:00 PM	57	85
1:00 AM	45	58	1:00 PM	56	85
2:00 AM	39	53	2:00 PM	54	82
3:00 AM	44	56	3:00 PM	54	74
4:00 AM	46	58	4:00 PM	48	73
5:00 AM	48	58	5:00 PM	49	66
6:00 AM	52	61	6:00 PM	47	58
7:00 AM	52	64	7:00 PM	53	61
8:00 AM	52	73	8:00 PM	55	83
9:00 AM	52	73	9:00 PM	64	92
10:00 AM	52	66	10:00 PM	64	93
11:00 AM	62	88	11:00 PM	64	92
12:00 PM	61	86	Mon 9-May	56	84
1:00 PM	52	77	1:00 AM	38	68
2:00 PM	51	66	2:00 AM	39	70
3:00 PM	51	66	3:00 AM	43	53
4:00 PM	55	82	4:00 AM	45	56
5:00 PM	66	93	5:00 AM	51	58
6:00 PM	65	92	6:00 AM	52	61
7:00 PM	64	91	7:00 AM	53	63
8:00 PM	52	77	8:00 AM	52	65
9:00 PM	46	69	9:00 AM	52	67
10:00 PM	47	69	10:00 AM	54	80
11:00 PM	44	67	11:00 AM	55	78
Sun 8-May	40	53	12:00 PM	53	80



**Table A-8-3 Recorded Hourly Average Ambient Sound Levels Location 2 (1-hr dBA L<sub>eq</sub>)**

MRG, LP - CEPad					
Location 2 - Hourly L <sub>eq</sub>					
Time	dBA	dBc	Time	dBA	dBc
1:00 PM	46	71	1:00 AM	48	62
2:00 PM	55	74	2:00 AM	50	72
3:00 PM	52	68	3:00 AM	50	73
4:00 PM	56	70	4:00 AM	50	65
5:00 PM	55	71	5:00 AM	52	61
6:00 PM	57	65	6:00 AM	52	58
7:00 PM	56	62	7:00 AM	53	59
8:00 PM	57	62	8:00 AM	55	65
9:00 PM	55	61	9:00 AM	57	74
10:00 PM	52	58	10:00 AM	56	70
11:00 PM	52	59	11:00 AM	57	77
Sat 7-May	49	59	12:00 PM	58	81
1:00 AM	49	57	1:00 PM	58	81
2:00 AM	48	56	2:00 PM	56	77
3:00 AM	51	58	3:00 PM	52	72
4:00 AM	48	59	4:00 PM	50	73
5:00 AM	54	59	5:00 PM	46	66
6:00 AM	58	62	6:00 PM	49	57
7:00 AM	54	63	7:00 PM	53	60
8:00 AM	57	69	8:00 PM	59	84
9:00 AM	56	69	9:00 PM	68	93
10:00 AM	50	66	10:00 PM	68	94
11:00 AM	62	86	11:00 PM	67	93
12:00 PM	61	84	Mon 9-May	59	86
1:00 PM	53	74	1:00 AM	40	70
2:00 PM	51	64	2:00 AM	47	78
3:00 PM	54	64	3:00 AM	47	55
4:00 PM	59	84	4:00 AM	52	57
5:00 PM	71	96	5:00 AM	57	61
6:00 PM	73	98	6:00 AM	58	62
7:00 PM	68	94	7:00 AM	53	62
8:00 PM	54	77	8:00 AM	50	62
9:00 PM	52	63	9:00 AM	51	65
10:00 PM	53	65	10:00 AM	57	75
11:00 PM	54	62	11:00 AM	55	76
Sun 8-May	51	55	12:00 PM	55	74