



NOISE MITIGATION PLAN
SUBMITTED WITH FORM 2A APPLICATION FOR:
LARAMIE 29-01
MESA COUNTY, COLORADO
Latitude 39.254781 Longitude -107.784158

PREPARED BY:



OCTOBER 1, 2023

IN ACCORDANCE WITH ECMC RULE 423. NOISE
ADOPTED JANUARY 15, 2021

INTRODUCTION

Laramie Energy, LLC (Laramie) and The Environmental and Natural Resources Group, Inc. (ENRG) have prepared a Noise Mitigation Plan (NMP) for the Laramie 0993-29-01 “Laramie 29-01” location. Per the Colorado Energy & Carbon Management Commission (ECMC)’s previously adopted 400-Series Noise Ordinance, ENRG is submitting this NMP for review as part of the application process for the Laramie 29-01 location. This Ordinance requires oil and gas operators drilling within Colorado to submit a NMP detailing how sound regulations will be met.

SITE DESCRIPTION

The Laramie 29-01 pad is located at approximately Latitude 39.254781 Longitude -107.784158 (Figure 1). According to Google Earth maps and visual observation, the proposed padsite is located approximately 4,858 feet south Highway 330 E in Mesa County, Colorado (NENE of Section 29, Township 9 South, Range 93 West, 6th P.M). The Mesa County zoning map indicates the Laramie 29-01 padsite is located in an Agricultural, Forestry, Transitional District (AFT) zoned area. The surrounding properties are primarily utilized for farming/ranching or oil and gas development. Land or properties within ¼ mile the Laramie 29-01 pad consists of steep cliffs and valleys on the northern flank of the Grand Mesa.

There are no residential building units (RBU’s) within 2,000 feet of the permanent equipment currently anticipated (i.e., wells, facilities) on the Laramie 29-01 location. However, the Laramie 29-01 location is located within a Colorado Parks and Wildlife (CPW) High Priority Habitat (HPH). The approximate elevation at the proposed location is 7,461 feet above sea level (Figure 2). The elevation within one (1) mile of the proposed drill site ranges from 7,428 – 7,986 feet (Figure 3). The average slope from north to south (A-A’) is 12.4% and west to east (B-B’) is 13.4% (Figure 4).

72-HOUR AMBIENT SOUND MONITORING

For the 72-Hr ambient sound level report, ENRG will utilize our Noise Monitoring Terminal (NMT) which is equipped with a Type I Bruel & Kjaer (B&K) 3639 or 2250 noise level meter. At the time the NMT is mobilized to the site, it will be calibrated, programmed for decibel (dB) readings with both “A” and “C” frequency weightings (human ear) and installed at the site by ENRG personnel. Initial and final readings will be verified with a calibration device to ensure accuracy during and after the test. The objective will be to measure and document the site’s ambient sound levels. The NMT will be placed where no obstructions are allowed to block the meter from measuring and recording accurate ambient sound levels. ENRG is proposing one (1) NMT at the Laramie 29-01 location for both ambient and continuous sound monitoring (if required) for the required phases. The proposed ambient location, referred to as the South, is indicated on Figures 1 and 2.

SOUND ALLOWABLES

A - Scale Allowables – Laramie 29-01

Based on the ECMC 423.b.(2)A. regulation, the allowable during drilling and completion operations for the Laramie 29-01 location will be 65.0 dBA during the day and 60.0 dBA at night as referenced in the regulation excerpt below:

(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.;

Additionally, and with regard to A-scale allowables during production, the allowable will be 60.0 dBA during the day and 55.0 dBA at night as specified in 423.b.(1) and Table 423-1 shown below:

(1) 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 Director may require Operators to comply with a lower maximum permissible noise level based on the consultation process with Relevant and Proximate Local Governments, CDPHE, or CPW pursuant to Rules 302.g, 309.e, & 309.f.

Table 423-1 – 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 Areas	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)

The regulations go on to state the following:

(6) Unless otherwise required by Rule 423.b.(7), during the hours between 7:00 a.m. and the next 7:00 p.m. the maximum permissible noise levels listed in Table 423-1 may be increased 10 dB(A) for a period not to exceed 15 minutes in any 1-hour period. The increase is permissible only for a 1 - hour period during any 12 hours.

The above regulation permits the allowable of 60.0 dBA during daytime hours to be increased to 70.0 dBA for a period of 15 minutes in any 1-hour period not to exceed a total of 60 minutes during the course of any 12-hour daytime period.

C - Scale Allowables – Laramie 29-01

The ECMC 423.b.(2)B. regulation states the following in regard to “C” weighted data:

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

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.

Based on the ECMC 423.b.(2)B. regulation, the allowable for drilling and completions at the Laramie 29-01 location will be 65.0 dBC during the day and 65.0 dBC at night as referenced in the regulation excerpt above.

Conversely, the allowable during production will be guided by ECMC Table 423-1. The Laramie 29-01 allowable for both daytime and nighttime will be 60.0 dBC as shown on Table 423-1 below:

Table 423-1 – 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 Areas	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)

Web-Based Continuous Sound Monitoring

Although Laramie is not planning to conduct continuous sound monitoring at the Laramie 29-01 location, a graphical description of ENRG’s continuous monitoring technology can be seen on Figure 5.

SOUND MITIGATION OPTIONS

Sound mitigation requirements and Best Management Practices (BMPs) used to reduce the amount of sound emitted beyond the Laramie oil and gas operations lease boundary can be managed in numerous ways, both on behalf of the operator, as well as contractors performing work on-site. See Exhibit A (after Figure 14) for a list of BMPs.

SOUND FROM DRILLING & COMPLETIONS OPERATIONS

Figures 6, 7, and 8 show the layout of the drilling, completions, and production operations stages. Table 1.1 and Table 1.2 indicate typical sound levels generated during construction, oil and gas drilling, and completions operations.

ENGINE SOUND

Some engines can operate at a constant number of revolutions per minute (RPM), which reduces the often annoying, fluctuating sound caused by engines that speed up and slow down. Mufflers, like those used for automobile engines, can be used to minimize engine sound.

COMPRESSOR SOUND

Sound from compressors can be mitigated most effectively by treating each significant sound source: Abatement may involve changing the blades on fans, which can change the frequency of sound emitted, thereby removing the annoying tones. Engine sounds can be muffled using automotive-type mufflers, or by housing the engines in acoustically insulated structures. The entire compressor can also be housed in an acoustically insulated building.

SOUND WALLS AND ANTICIPATED PHASE DURATIONS

Sound mitigation measures to be utilized during the various stages of the Laramie 29-01 location include the following:

- The construction phase is scheduled to last, at this time, approximately 50 days.
- Because of the environmental considerations at the Laramie 29-01 location, sound walls are not anticipated to be used at this time.
- At the time of this NMP, Ensign 157 or similar is scheduled to be utilized for the drilling of the Laramie 29-01 location. Rigs have been designed and equipped with sound mitigating equipment including devices to minimize squeaking from the draw works brakes. The drill phase is scheduled to last approximately 72 days.
- A standard hydraulic fracturing fleet will be used during the completion phase. The completions phase is scheduled to last for approximately 40 days.
- The production phase is scheduled to last, at this time, approximately up to 30 years.

SOUND MODELING

By modeling with existing sound signatures emitted from equipment similar to that which will be utilized on a location, equipment sound levels to be taken into consideration when determining allowable sound levels for oil and gas operations. ENRG utilized the EMS Bruel and Kjaer V2023 Predictor - LimA software with sound signatures from Ensign 140, a standard Cal-Frac fleet and production equipment standardly used on oil and gas locations. ENRG has modeled the drilling, completions and production phases of the Laramie 29-01 pad with-out mitigation as indicated on Figures 9, 10, 11, 12, 13, and 14.

- Figure 9 presents anticipated dBA drilling sound levels
- Figure 10 presents anticipated dBA completions sound levels
- Figure 11 presents anticipated dBA production sound levels
- Figure 12 presents anticipated dBC drilling sound levels
- Figure 13 presents anticipated dBC completions sound levels
- Figure 14 presents anticipated dBC production sound levels

LOCAL GOVERNMENT REGULATIONS & REQUIREMENTS

The Laramie 29-01 padsite is located at approximately Latitude 39.254781 Longitude -107.784158 (Figure 1). According to Google Earth maps and visual observation, the proposed padsite is located approximately 4,858 feet south Highway 330 E within Mesa County, Colorado. The Mesa County zoning map indicates the Laramie 29-01 padsite is located in an Agricultural, Forestry, Transitional District (AFT) zoned area.

For the purpose of sound compliance levels for the Laramie 29-01 pad, ENRG has based allowables in accordance with the ECMC 400 Series regulations adopted on January 15, 2021. There is no difference in the proposed allowables between the ECMC and Mesa County. Please reference the allowables as described above.

SUMMARY

ENRG is proposing the following allowables for dBA & dBC during drilling, completions, and production operations at the Laramie 29-01 monitoring locations for the purpose of compliance for the ECMC and Mesa County:

dBA –

Based ECMC 423.b.(2)A., the dBA allowable will be 65.0 dBA during the day and 60.0 dBA at night during drilling and completions. The allowable during production will be 60.0 dBA during the day and 55.0 dBA at night. Taking into account the sound propagation models and the distance to the nearest point of compliance, it is ENRG's opinion that the ECMC dBA allowables can be met 100% of the time.

dBC –

Based ECMC 423.b.(2)B., the dBC allowable will be 65.0 dBC during the day and 65.0 dBC at night during drilling and completions. The allowable during production will be 60.0 dBC during the day and 60.0 dBC at night. Taking into account the sound propagation models and the distance to the nearest point of compliance, it is ENRG's opinion that the ECMC dBC allowables can be met 100% of the time.

Additional sound modeling, if desired, can be completed by an ENRG representative and may require an ENRG representative to complete a site visit/tour to collect field information needed to complete a model. The sound model may be used to project sounds emitted from specific equipment at a well pad, facility, or pipeline based on engine specifications, periods of operations, and surrounding geographic setting. This type of modeling may aid in the determination of the number of engines that may be placed at a location and permissible RPM levels. To request a model, please contact Laramie, who can contact the appropriate ENRG representative.

Sincerely,



Chrystie Carter
Operations Manager
The Environmental & Natural Resources Group, Inc.

Attachments

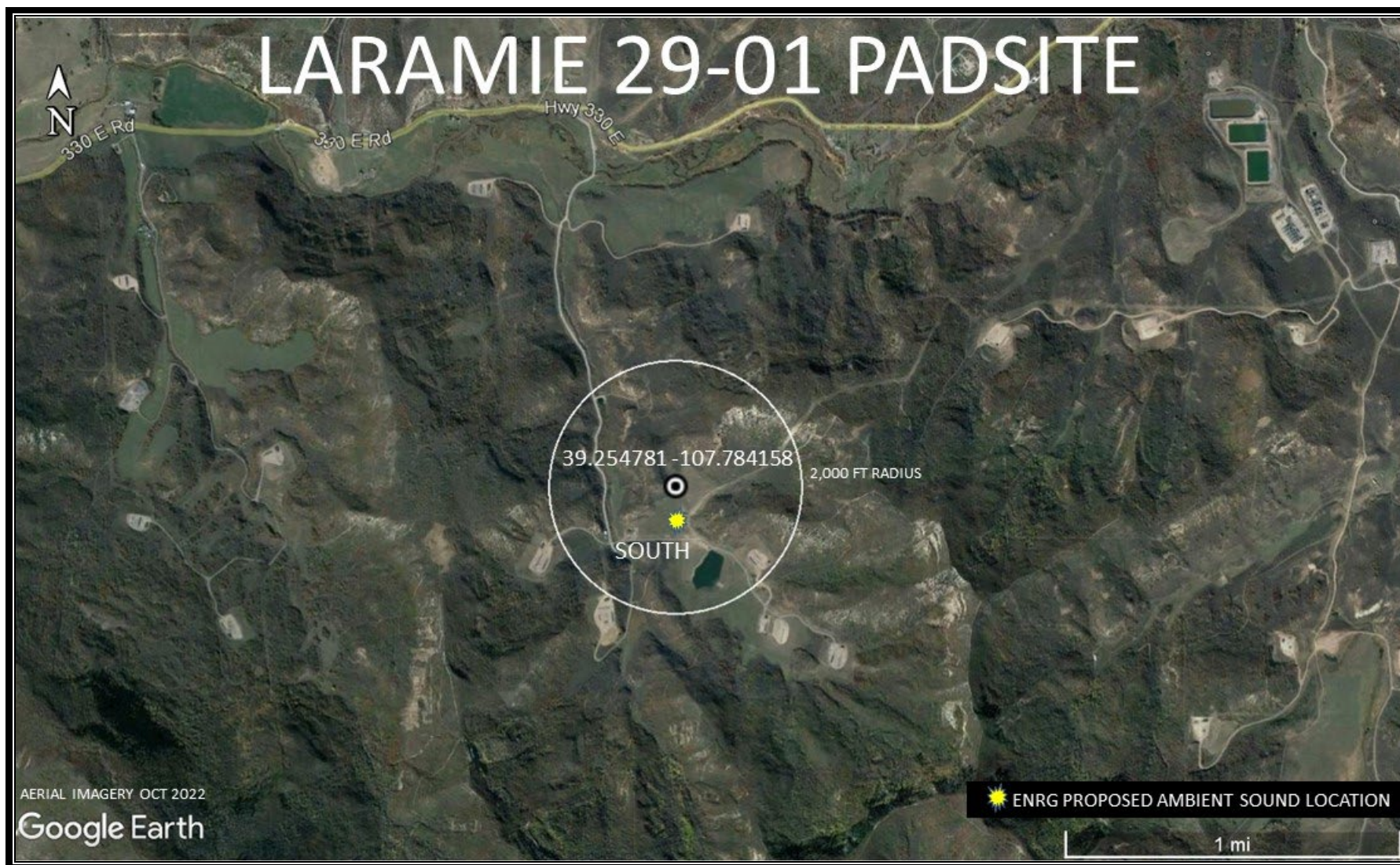


FIGURE 1. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
LARAMIE 29-01 PADSITE & AMBIENT LOCATION

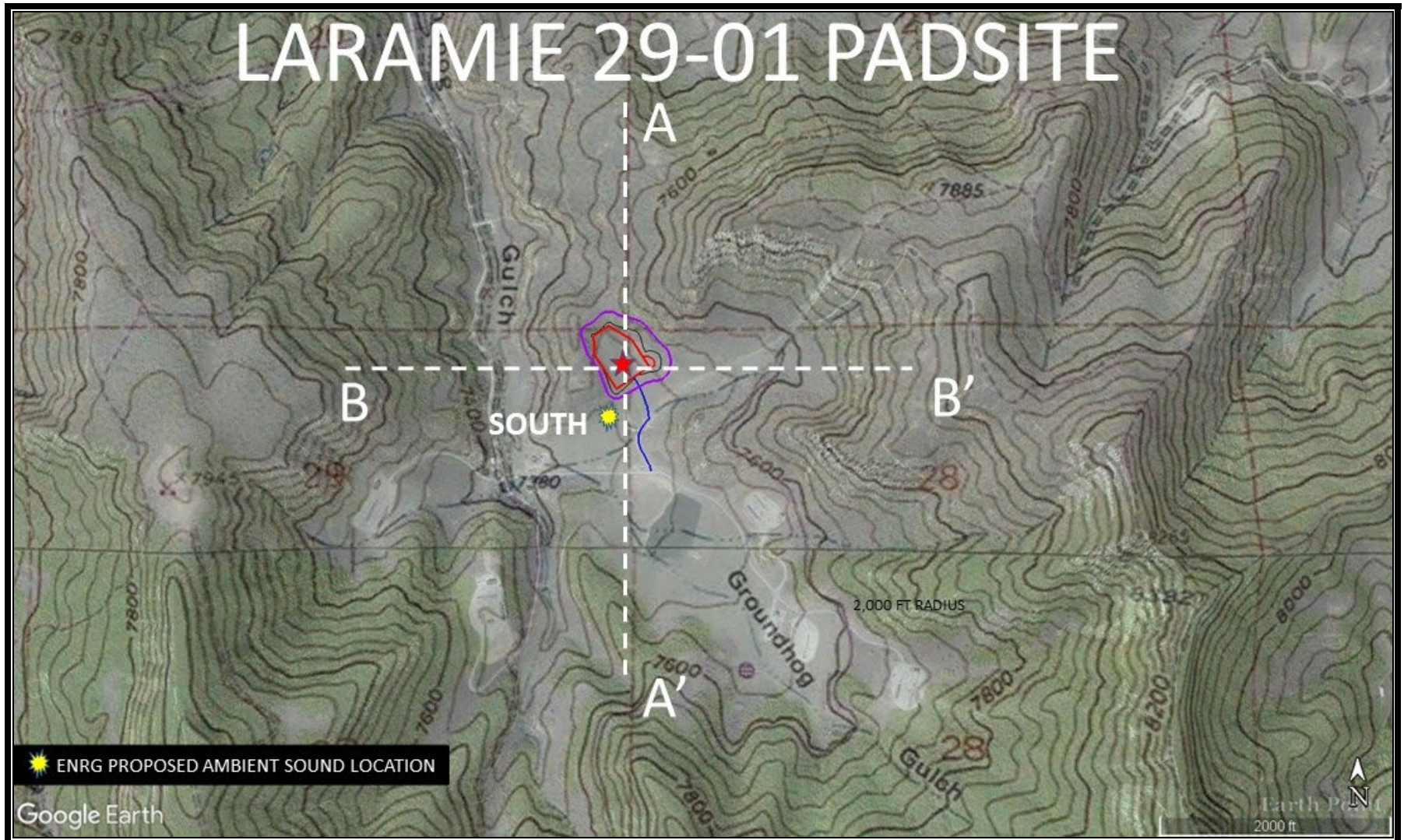


FIGURE 2. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
TOPOGRAPHIC MAP

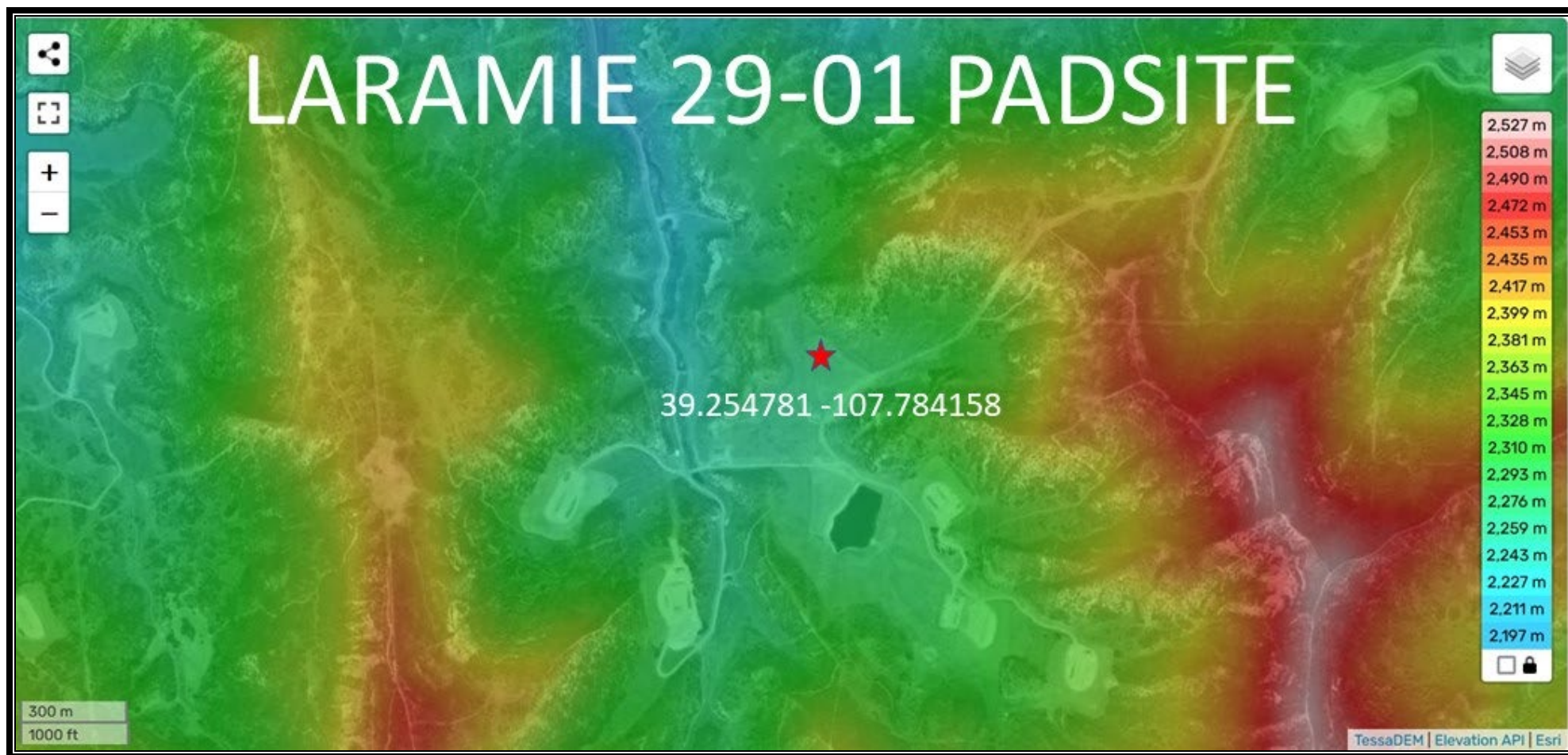


FIGURE 3. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
COLOR CODED RELIEF MAP

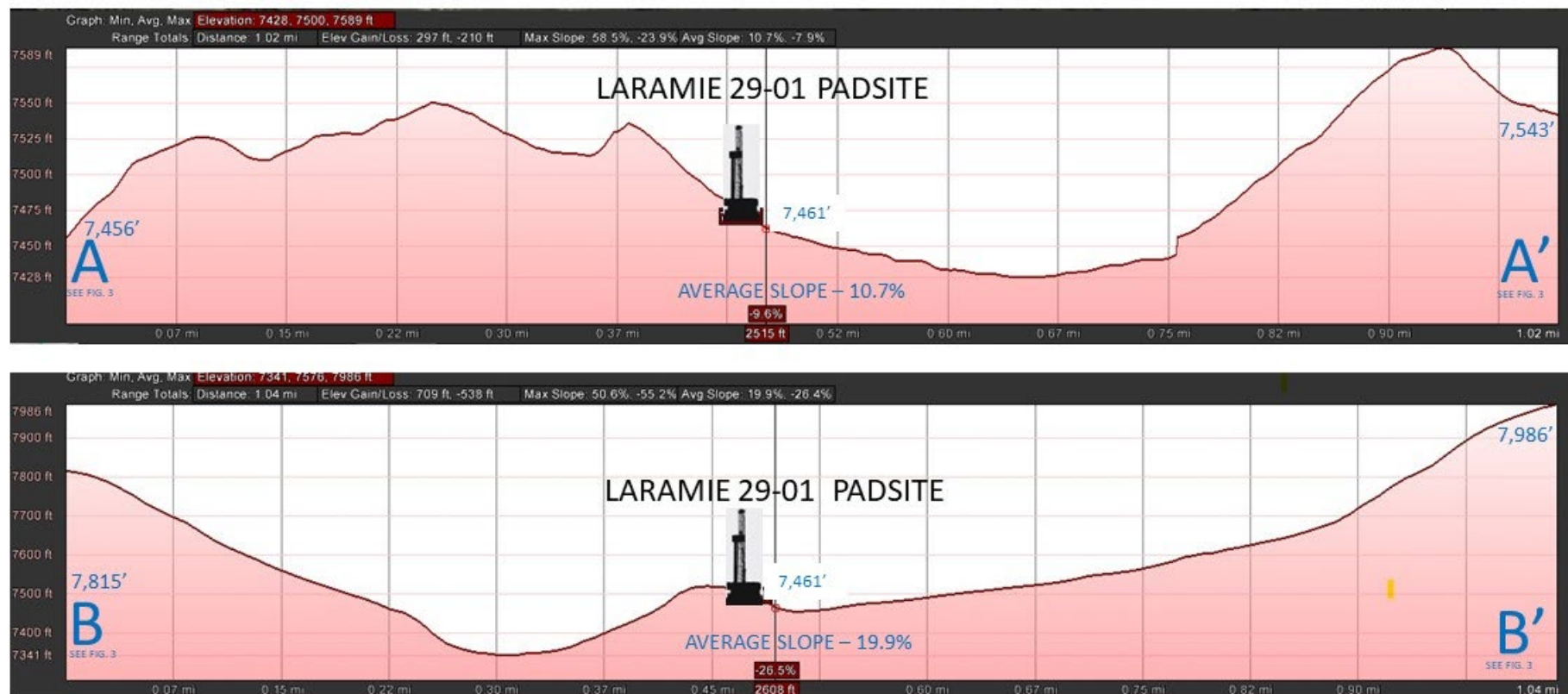


FIGURE 4. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
CROSS – SECTIONAL ELEVATION PROFILE



FIGURE 5. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
ENRG NOISE MONITORING TERMINAL

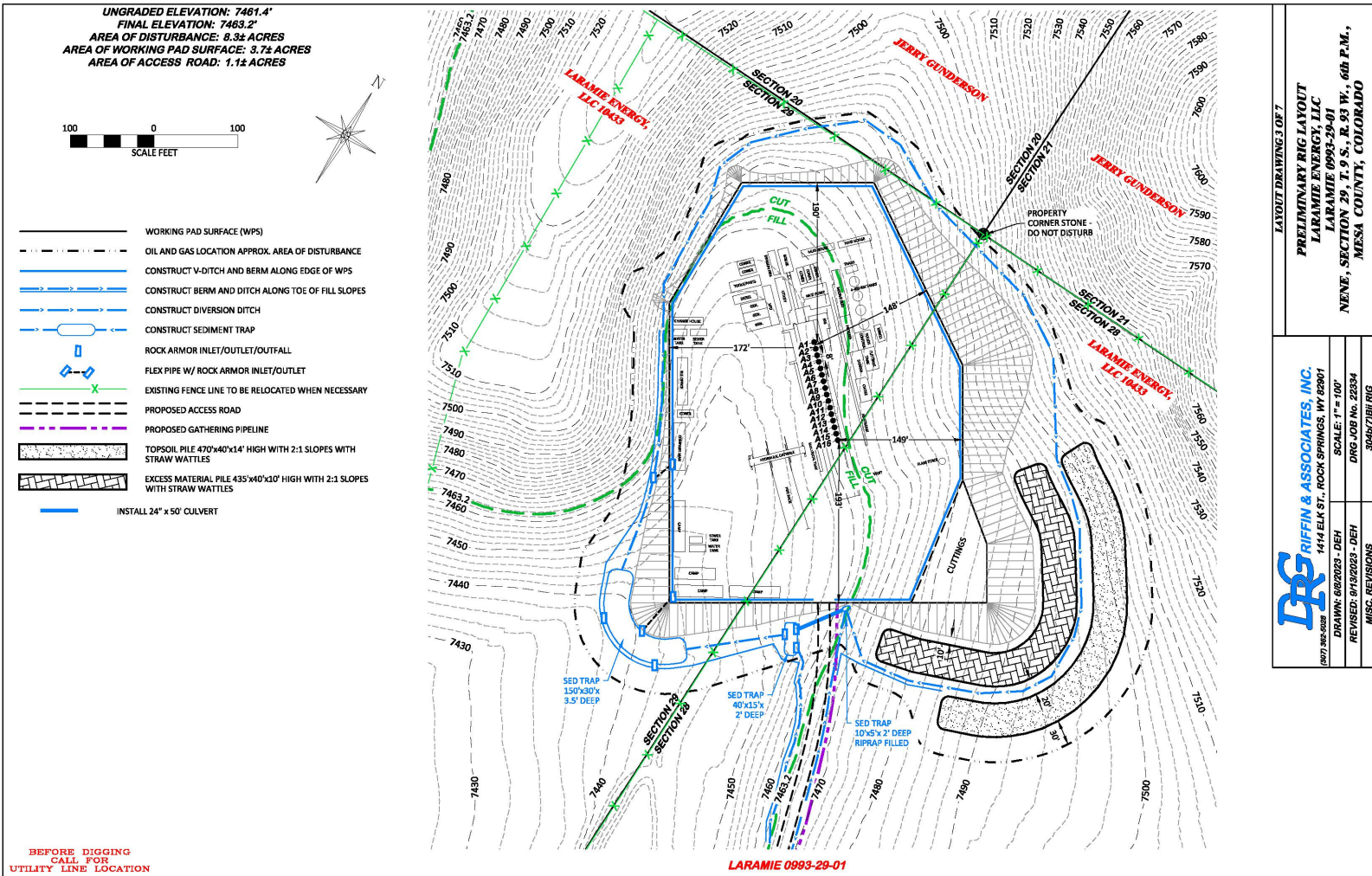


FIGURE 6. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
DRILLING RIG LAYOUT

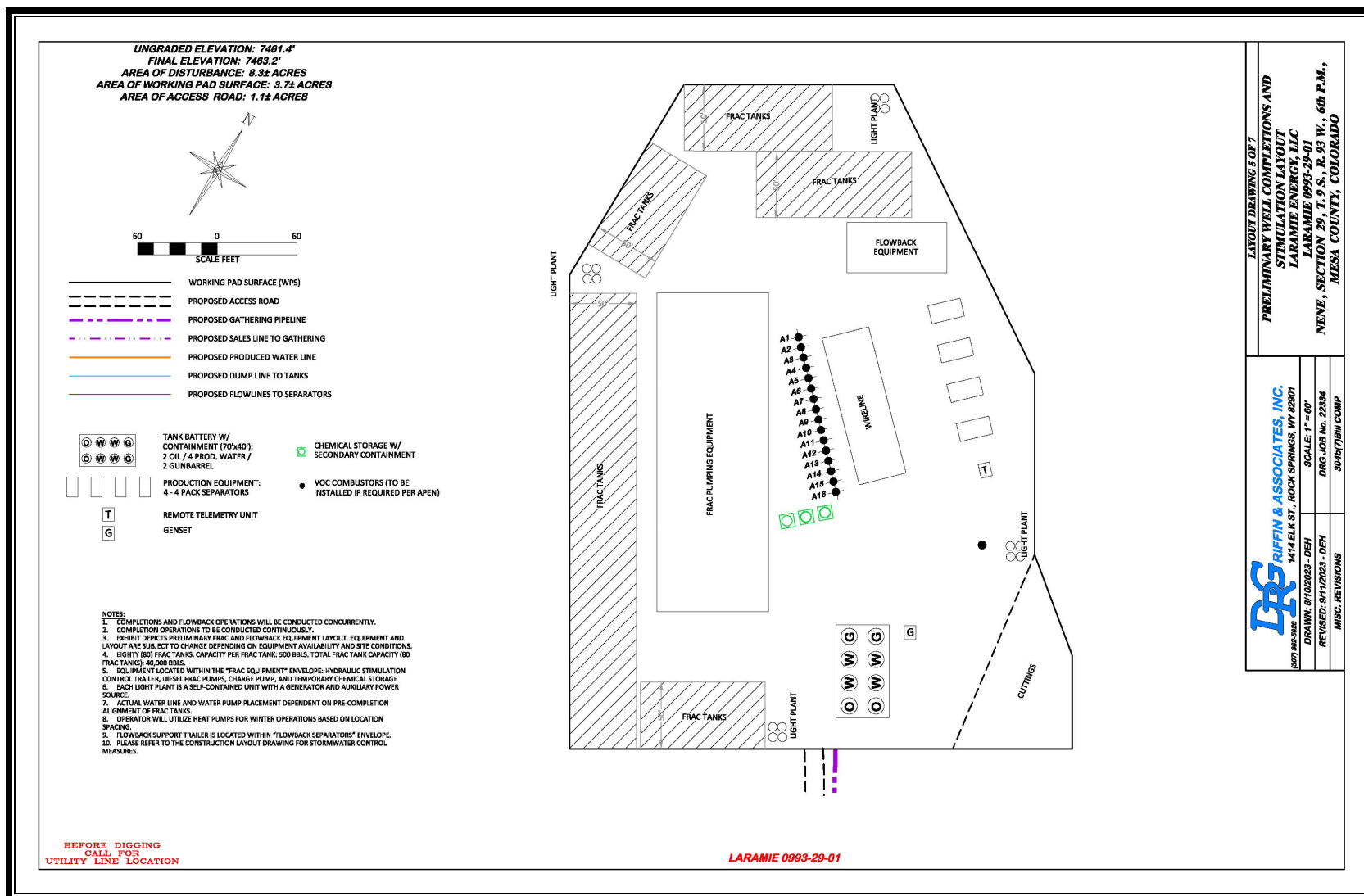


FIGURE 7. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
WELL COMPLETIONS LAYOUT

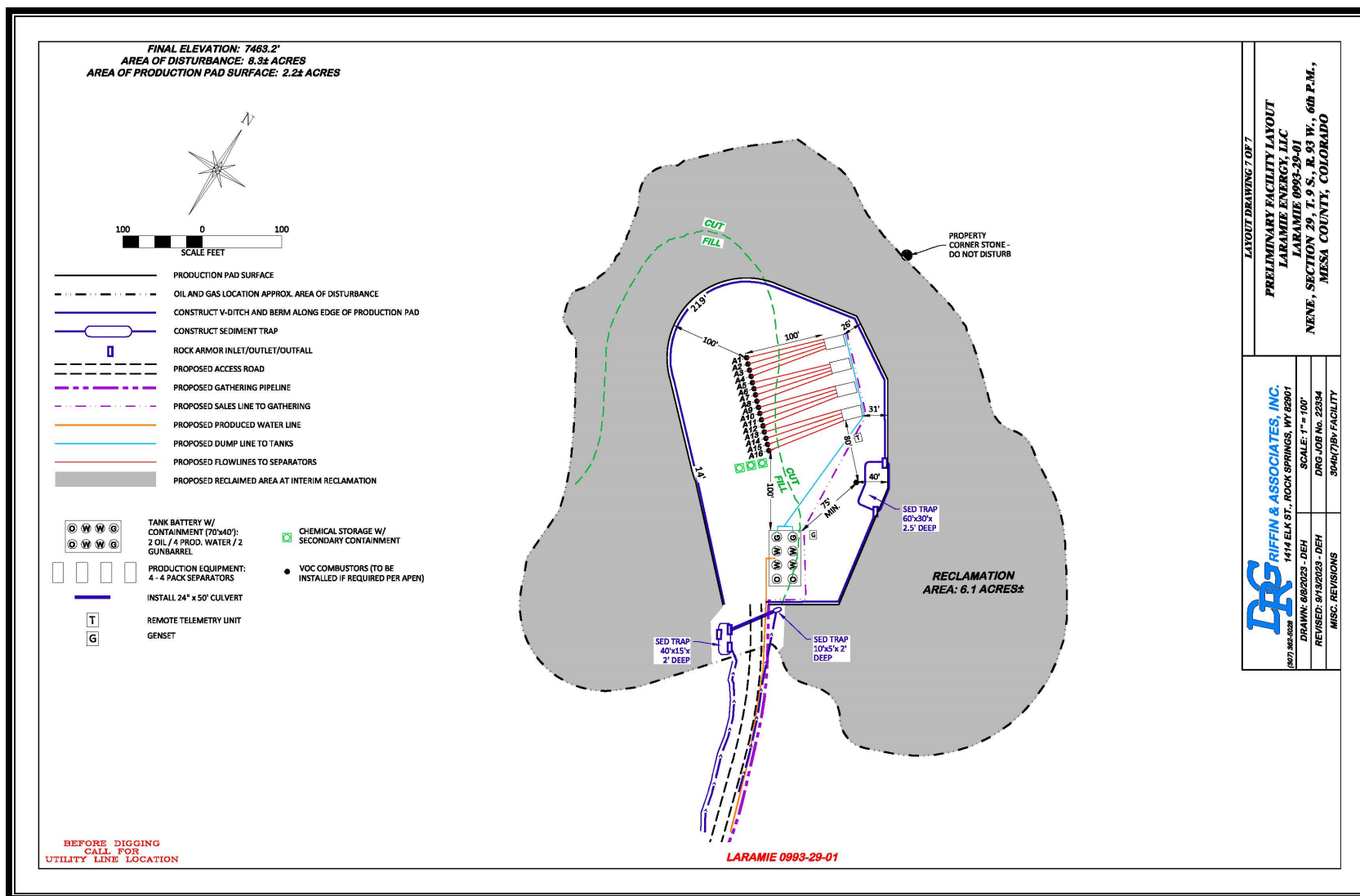


FIGURE 8. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
FACILITY LAYOUT



Category	Distance [m]	Average [dBA]	Range [dBA]	Data type	Reference
General works	<15	–	70–90	measurement	BoLM, 2016 [3]
Access road construction	15	89	–	estimation	NYSDEC FSGEIS, 2015 [28]
	76	75			
	152	69			
	305	63			
	457	59			
	610	57			
Site preparation	191	58–69	–	measurement	McCawley, 2013 [23]
Well pad preparation	15	84	–	estimation	NYSDEC FSGEIS, 2015 [28]
	76	70			
	152	64			
	305	58			
	458	55			
	610	52			
Truck traffic	<152	–	65–85	estimation	Garfield County, Colorado, 2011 [8]
	191		56–73	measurement	McCawley, 2013 [23]
Horizontal drilling	15	76	–	estimation	NYSDEC FSGEIS, 2015 [28]
	76	62			
	152	56			
	305	50			
	457	47			
	610	44			
Vertical drilling	191	54	–	measurement	McCawley, 2013 [23]
Drilling (unspecified)	100	57.4–62		estimation	Ambrose and Florian, 2014 [1]
	300	52.5		measurement	
	1055	36.9			
	2300	30.4			
	191	75–80			

From Hayes et al (2017)

**TABLE 1.1. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
TYPICAL DRILLING AND COMPLETIONS SOUND LEVELS**



Category	Distance [m]	Average [dBA]	Range [dBA]	Data type	Reference
Drilling (unspecified)	30	–	75–87	measurement	behrens and Associates, Inc., 2006 [2]
	61		71–79		
	91		65–74		
	122		60–71		
	152		56–68		
	183		54–59		
	213		51–55		
	244		51–54		
Hydraulic fracturing	15	99–104	–	estimation	NYSDEC FSGEIS, 2015 [28]
	76	85–90			
	152	79–84			
	305	73–78			
	457	69–74			
	610	67–72			
	191	52	47–60	measurement	McCawley, 2013 [23]
Hydraulic fracturing/ flowback	191	58	55–61	measurement	McCawley, 2013 [23]
Compressor station(s)	<305	63.15	35.3–94.8	measurement	MifAEH, 2014 [22]
	305–610	55.48	35.3–77.6		
	610–762	54.09	35.3–80.3		
	>1067	51.50	35.3–74.1		
	On-site	69–86	–	measurement	BoFM, 2006 [3]
	1609	58–75			
	2012	54			
	100	53,8		estimation	Ambrose and Florian, 2014 [1]
	140	50,9		measurement	

From Hayes et al (2017)

**TABLE 1.2. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
TYPICAL DRILLING AND COMPLETIONS SOUND LEVELS**

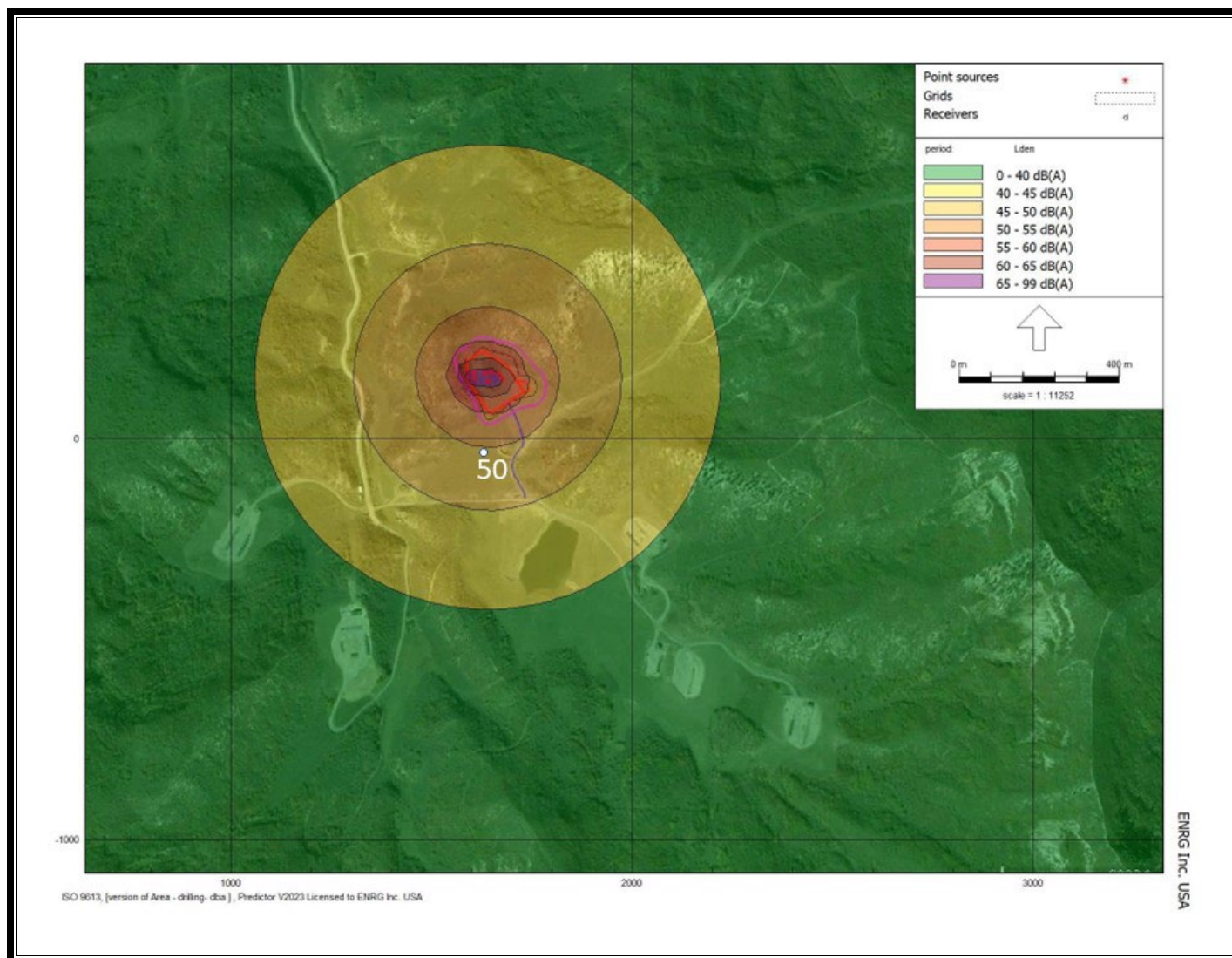


FIGURE 9. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
dBA UN-MITIGATED DRILLING SOUND LEVELS

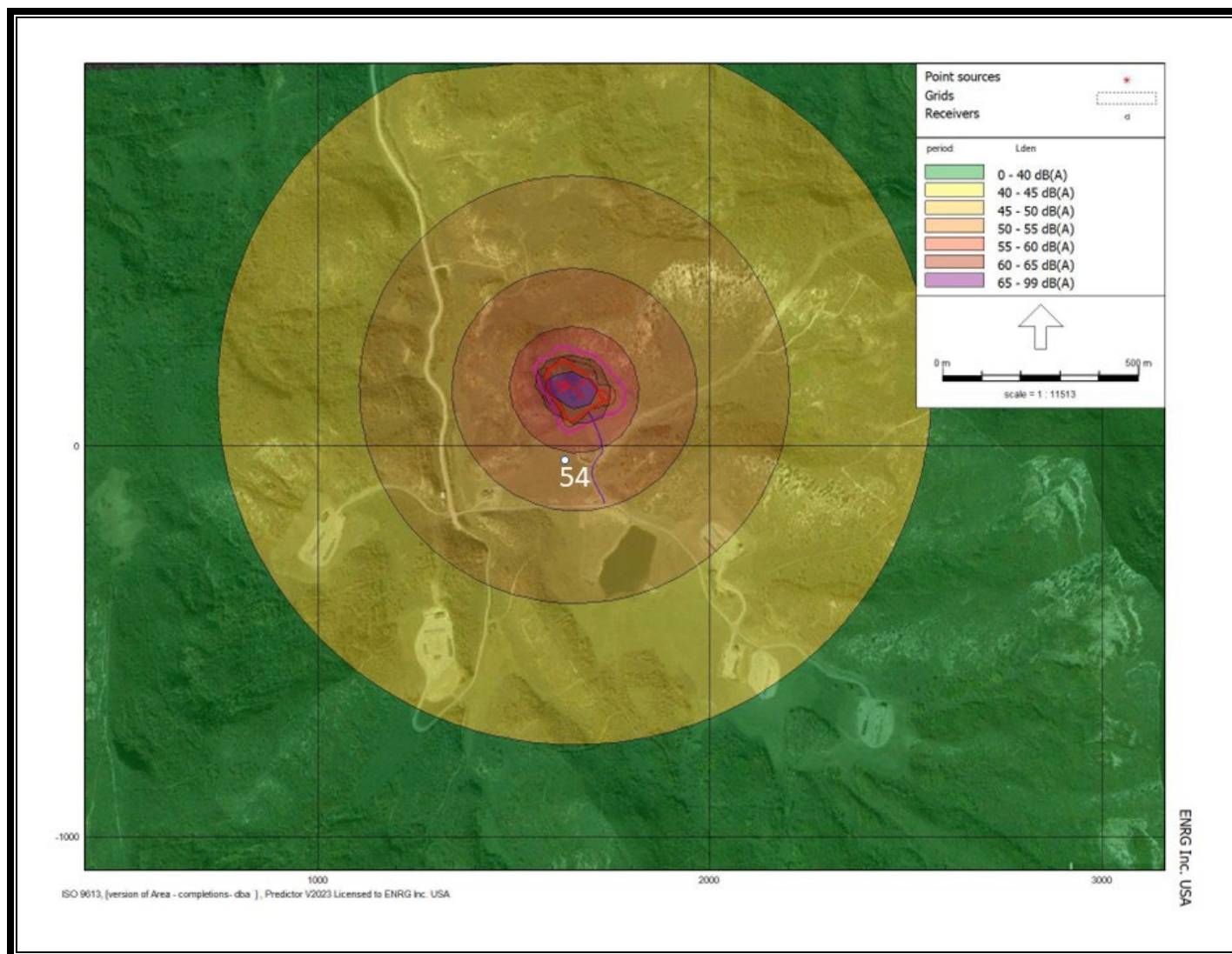


FIGURE 10. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
dBA UN-MITIGATED COMPLETIONS SOUND LEVELS

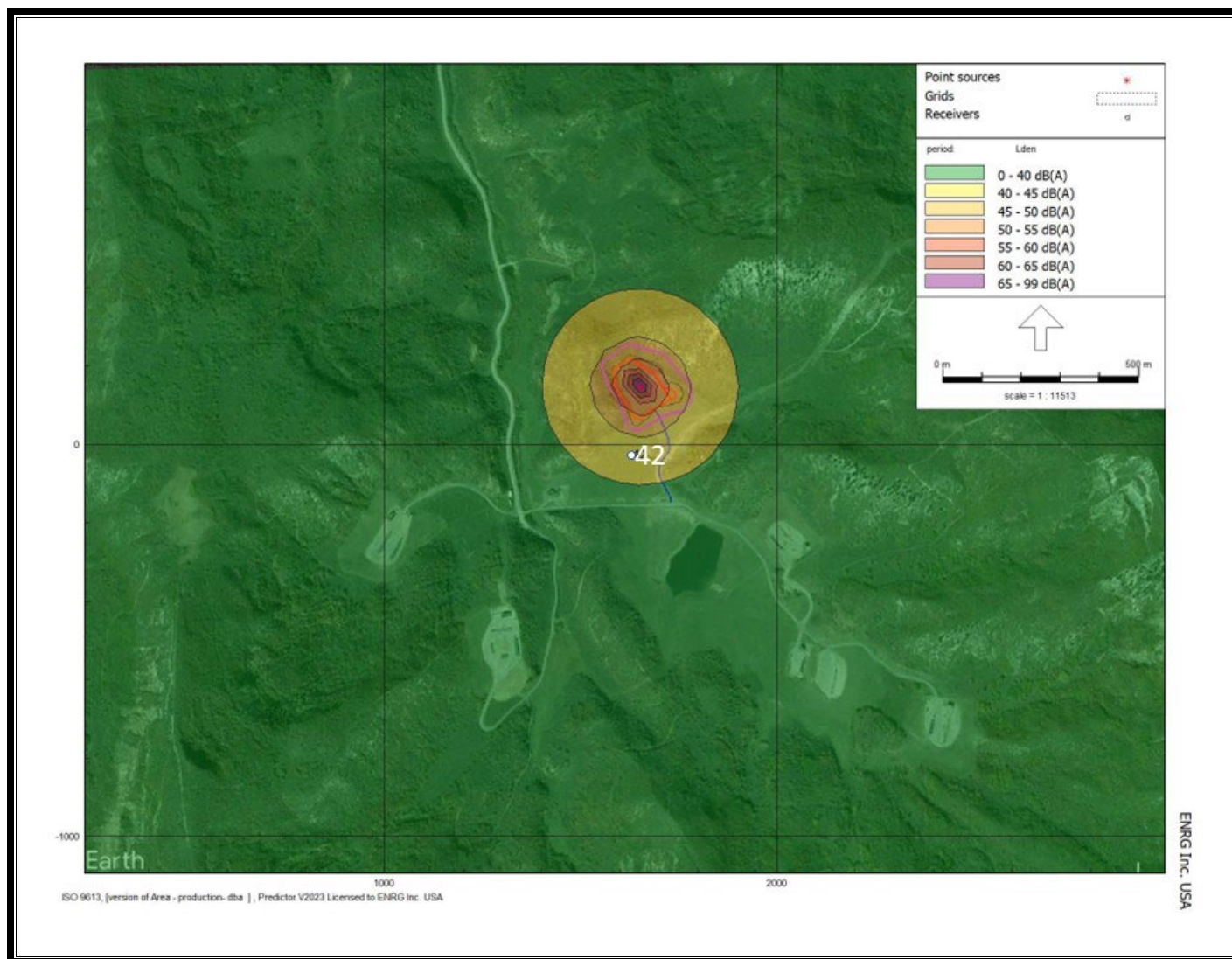


FIGURE 11. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
dba UN-MITIGATED PRODUCTION SOUND LEVELS

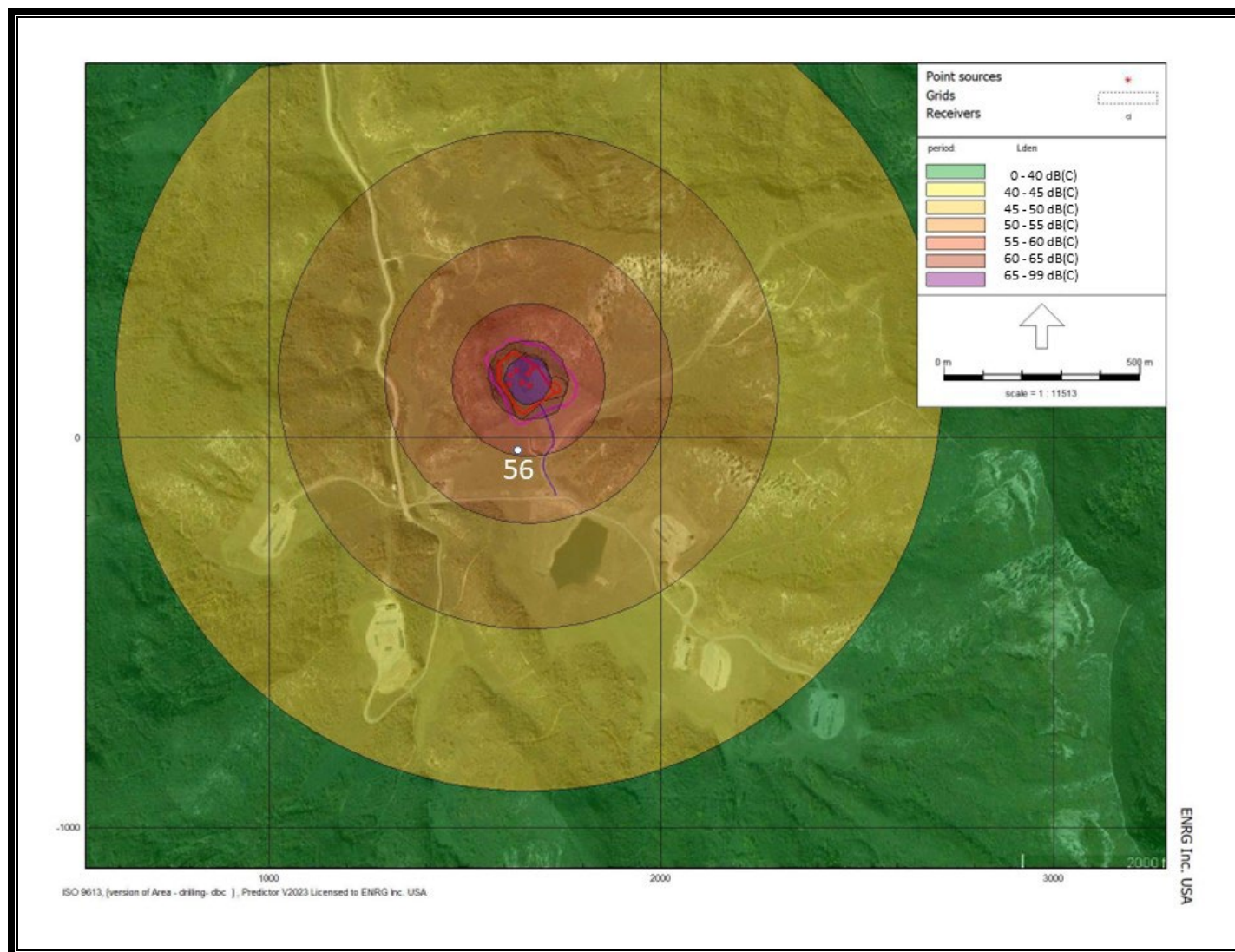


FIGURE 12. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
dB(C) UN-MITIGATED DRILLING SOUND LEVELS

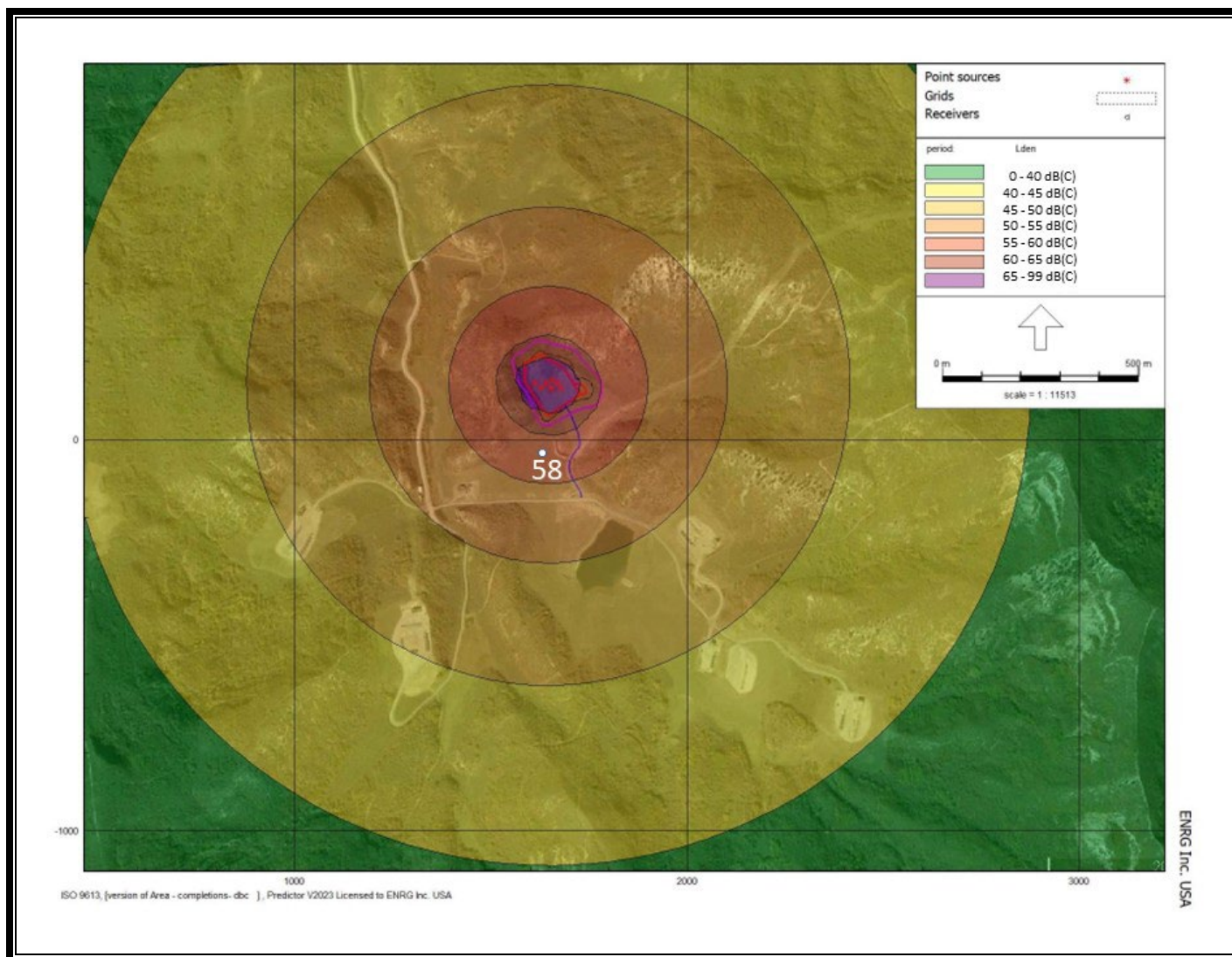


FIGURE 13. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
dB(C) UN-MITIGATED COMPLETIONS SOUND LEVELS

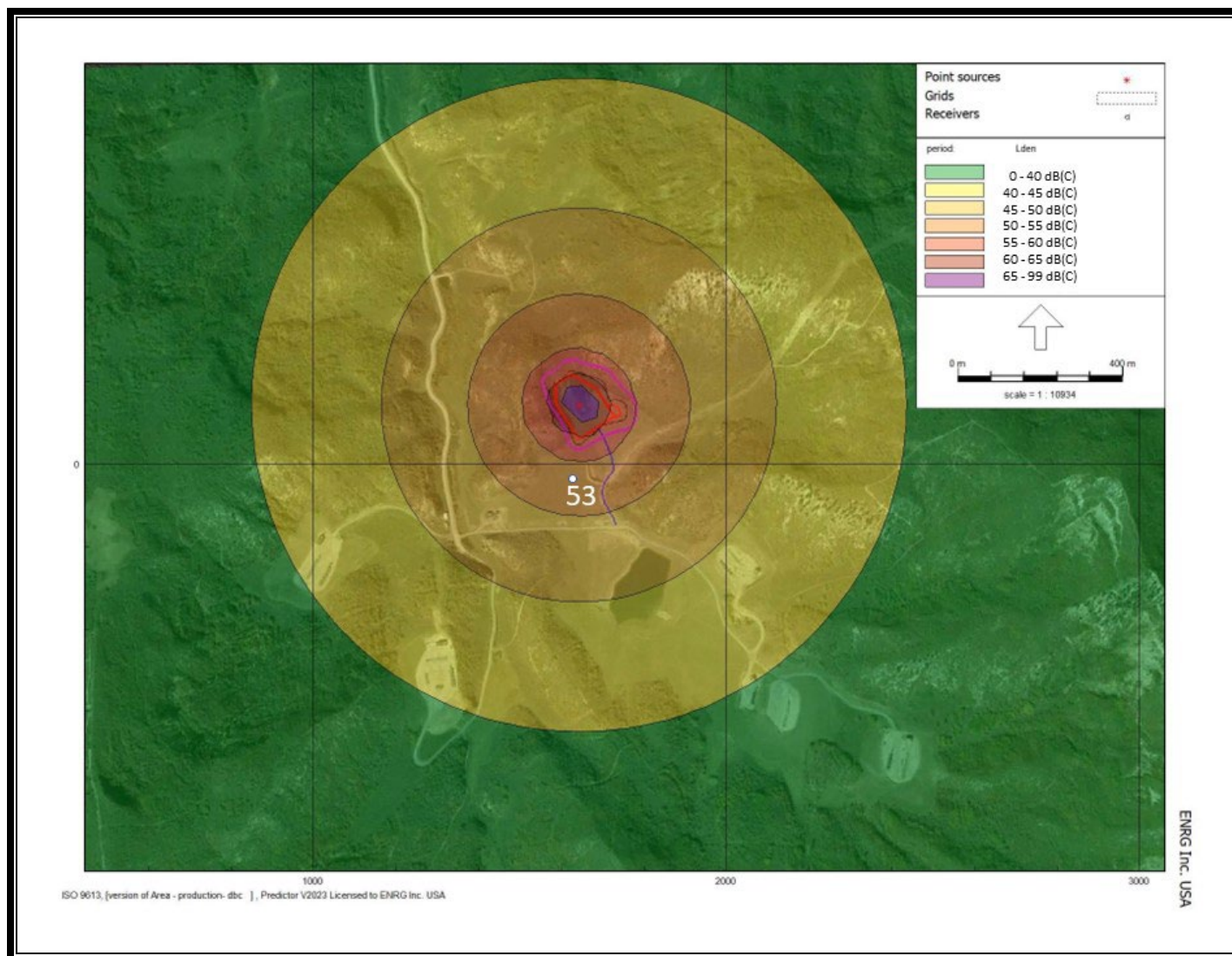


FIGURE 14. LARAMIE ENERGY, LLC. – LARAMIE 29-01 PADSITE
NOISE MITIGATION PLAN
dB(C) UN-MITIGATED PRODUCTION SOUND LEVELS



EXHIBIT A

BEST MANAGEMENT PRACTICES:

LARAMIE 29-01

MESA COUNTY, COLORADO

Latitude 39.254128 Longitude -107.784009

PREPARED BY:



OCTOBER 1, 2023



Best Management Practices (BMPs)

- Idling Equipment – While idling engine/equipment, maintain at the lowest frequency possible, as well as, in a position/location that will prevent sound from carrying to nearby residents.
- Unnecessary Sounds – Unnecessary sounds such as honking the horn, revving vehicle engines, loud music, and unwarranted metal hammering/banging are all examples of sound that can create nuisance; failure to eliminate unnecessary sound from location will be subject to an internal compliance assessment if reported by a landowner.
- The construction phase is scheduled to last, at this time, approximately 50 days.
- Because of the environmental considerations at the 0993-29-01 location, sound walls are not anticipated to be used at this time.
- At the time of this NMP, Ensign 157 or similar is scheduled to be utilized for the drilling of the 0993-29-01 location. Rigs have been designed and equipped with sound mitigating equipment including devices to minimize squeaking from the draw works brakes. The drill phase is scheduled to last approximately 72 days.
- A standard hydraulic fracturing fleet will be used during the completion phase. The completions phase is scheduled to last for approximately 40 days.
- The production phase is scheduled to last, at this time, approximately up to 30 years.

➤ **dBA Allowables** –

Southeast

Drilling and Completions - Based ECMC 423.b.(2)A., the dBA allowable will be 65.0 dBA during the day and 60.0 dBA at night during drilling and completions. The allowable during production will be 60.0 dBA during the day and 55.0 dBA at night. Taking into account the sound propagation models and the distance to the nearest points of compliance, it is ENRG's opinion that the ECMC dBA allowables can be met 100% of the time.

➤ **dBc Allowables** –

Southeast

Drilling and Completions - Based ECMC 423.b.(2)B., the dBc allowable will be 65.0 dBc during the day and 65.0 dBc at night during drilling and completions. The allowable during production will be 60 dBc during the day and 60 dBc at night. Taking into account the sound propagation models and the distance to the nearest points of compliance, it is ENRG's opinion that the ECMC dBc allowables can be met 100% of the time.