



**DEPARTMENT OF ENVIRONMENTAL QUALITY  
AIR QUALITY DIVISION**

**Permit Application Analysis  
AP-16737**

**July 29, 2015**

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**NAME OF FIRM:** RKI Exploration & Production, LLC

**NAME OF FACILITY:** Cottonwood Draw Unit 12 Pad

**FACILITY LOCATION:** SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> of Section 12, T38N, R72W  
Lat: 43.27704° Long: -105.44418°  
Converse County, Wyoming

**TYPE OF OPERATION:** Oil & Gas Production

**RESPONSIBLE OFFICIAL:** Mr. Jeffrey L. Ingerson, Senior Air Permitting Engineer

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**TELEPHONE NUMBER:** (405) 987-2181

**REVIEWING ENGINEER:** Richard Jacoby, Air Quality Scientist

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**1. PURPOSE OF APPLICATION**

On July 31, 2014, the Division of Air Quality received an application from RKI Exploration & Production, LLC to install two (2) 1,953 hp Cummins QSK60G generator engines to supply power at the Cottonwood Draw Unit 12 Pad. The Cottonwood Draw Unit 12 Pad is located in the SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> of Section 12, T38N, R72W, approximately ten (10) miles west-northwest of Bill, Converse County, Wyoming.

A map of the facility location is attached as Appendix A.

**2. PERMIT HISTORY**

On March 11, 2013, RKI Exploration & Production, LLC was issued Air Quality Permit CT-14071 to construct a new sweet crude oil and natural gas production facility, known as the Cottonwood Draw Unit 38-72 12-1H, with a smokeless enclosed combustion device and a smokeless flare to control volatile organic compounds and hazardous air pollutant emissions associated with the oil tanks, active produced water tanks and produced gas.

### 3. ESTIMATED EMISSIONS

All of the engines will be field gas fired. The major pollutants emitted from gas combustion include nitrogen oxides (NO<sub>x</sub>) with some carbon monoxide (CO) from incomplete combustion. Volatile organic compounds (VOCs) including some hazardous air pollutants (HAPs) will also be emitted from the engines. Emission factors for the engine types and the estimated emissions are shown in the following tables:

Table 1: Engine Emission Factors (g/hp-hr)						
Engine	hp	Controls	NO <sub>x</sub>	CO	VOC	Formaldehyde
Cummins QSK60G	1,953	Lean Burn w/ Oxidation Catalyst	0.7	0.17	0.48	0.04

Table 2: Engine Emissions								
Engine	NO <sub>x</sub>		CO		VOC		Formaldehyde <sup>1</sup>	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Cummins QSK60G	3.0	13.2	0.7	3.2	2.1	9.1	0.17	0.75

<sup>1</sup> Formaldehyde is the only significant HAP emitted from the engines

Estimated emissions from the facility are shown in the following table:

Table 3: Cottonwood Draw Unit 12 Pad Emissions									
ID	Source	NO <sub>x</sub>		CO		VOC		HAPs <sup>1</sup>	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
<b>Permitted under CT-14071</b>									
Total Emissions		2.0	8.6	1.1	4.8	6.4	28.1	0.32	1.40
<b>Proposed Emissions</b>									
E1	Cummins QSK60G	3.0	13.2	0.7	3.2	2.1	9.1	0.17	0.75
E2	Cummins QSK60G	3.0	13.2	0.7	3.2	2.1	9.1	0.17	0.75
<b>Change in Emissions</b>		<b>6.0</b>	<b>26.4</b>	<b>1.4</b>	<b>6.4</b>	<b>4.2</b>	<b>18.2</b>	<b>0.34</b>	<b>1.50</b>
<b>Facility Total</b>		<b>8.0</b>	<b>35.0</b>	<b>2.5</b>	<b>11.2</b>	<b>10.6</b>	<b>46.3</b>	<b>0.66</b>	<b>2.90</b>

<sup>1</sup> Formaldehyde is the only significant HAP emitted from the engines

### 4. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

In accordance with Chapter 6, Section 2(c), a best available control technology (BACT) analysis is required for NO<sub>x</sub>, CO, VOC, and HAPs because the proposed project results in a physical change in, or change in the method of operation of, an affected facility which increases the amount of any air pollutant.

#### 4.1 Cummins QSK60G Generator Engines

The Cummins QSK60G generator engines will be controlled through lean burn technology to the levels listed in Table 1 and have a baseline emission rate of 0.7 g/hp-hr NO<sub>x</sub>. This emission rate is equivalent to the NO<sub>x</sub> emission rate given to a well controlled rich-burn engine that demonstrates BACT. Given that the Cummins QSK60G generator engines can meet an emission rate of 0.7 g/hp-hr without any add-on control equipment such as SCR, the Division will consider lean burn technology to represent BACT for the Cummins QSK60G generator engines at this time.

The proposed Cummins QSK60G generator engines will be equipped with an oxidation catalyst which aids in the destruction of CO, VOCs, formaldehyde and other HAPs. The Division considers the installation of an oxidation catalyst meeting emission rates as listed in Table 1 as representing BACT for this engine type.

## **5. CHAPTER 6, SECTION 3 APPLICABILITY**

The facility is not a “major source” as defined by Chapter 6, Section 3 of the Wyoming Air Quality Standards and Regulations (WAQSR). Therefore, RKI Exploration & Production, LLC shall obtain an operating permit in accordance with Chapter 6, Section 2 of the WAQSR.

## **6. NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (MACT)**

EPA’s current promulgated NESHAP rules under 40 CFR part 63, subpart ZZZZ apply to major sources of HAP emissions, as well as area sources of HAP emissions. Since the Cottonwood Draw Unit 12 Pad has the potential to emit less than 10 tpy of any individual HAP, or 25 tpy of any combination of HAPs, the facility is considered an area source of HAPs, and engines at this facility will be subject to all applicable requirements of 40 CFR part 63, subpart ZZZZ - *National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*.

## **7. PREVENTION OF SIGNIFICANT DETERIORATION (PSD)**

The Cottonwood Draw Unit 12 Pad is not a “major stationary source” as defined by Chapter 6, Section 4 of the WAQSR. Therefore, the Cottonwood Draw Unit 12 Pad is not subject to PSD review under Chapter 6, Section 4.

## **8. NEW SOURCE PERFORMANCE STANDARDS (NSPS)**

The engines at this facility are potentially subject to applicable requirements of 40 CFR part 60, subpart JJJJ - *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines* based on the manufacture date of the engines.

## **9. PROJECT IMPACT ON EXISTING AMBIENT AIR QUALITY**

### **9.1 MODELING INPUTS AND RESULTS**

The Division has reviewed the applicant’s ambient air quality impact analysis for the Cottonwood Draw Unit 12 Pad. Included in the modeling analysis were emissions and stack parameters for the proposed generator engines, which are the most significant sources of NO<sub>x</sub> at the facility, along with additional sources within twenty (20) km of the facility.

The applicant used a meteorological dataset that included five (5) years of surface data collected from January 1, 2008 through December 31, 2012 at the Automated Surface Observing System (ASOS) meteorological tower at the Douglas-Converse County Airport near Douglas, Wyoming and upper air data from Riverton, WY.

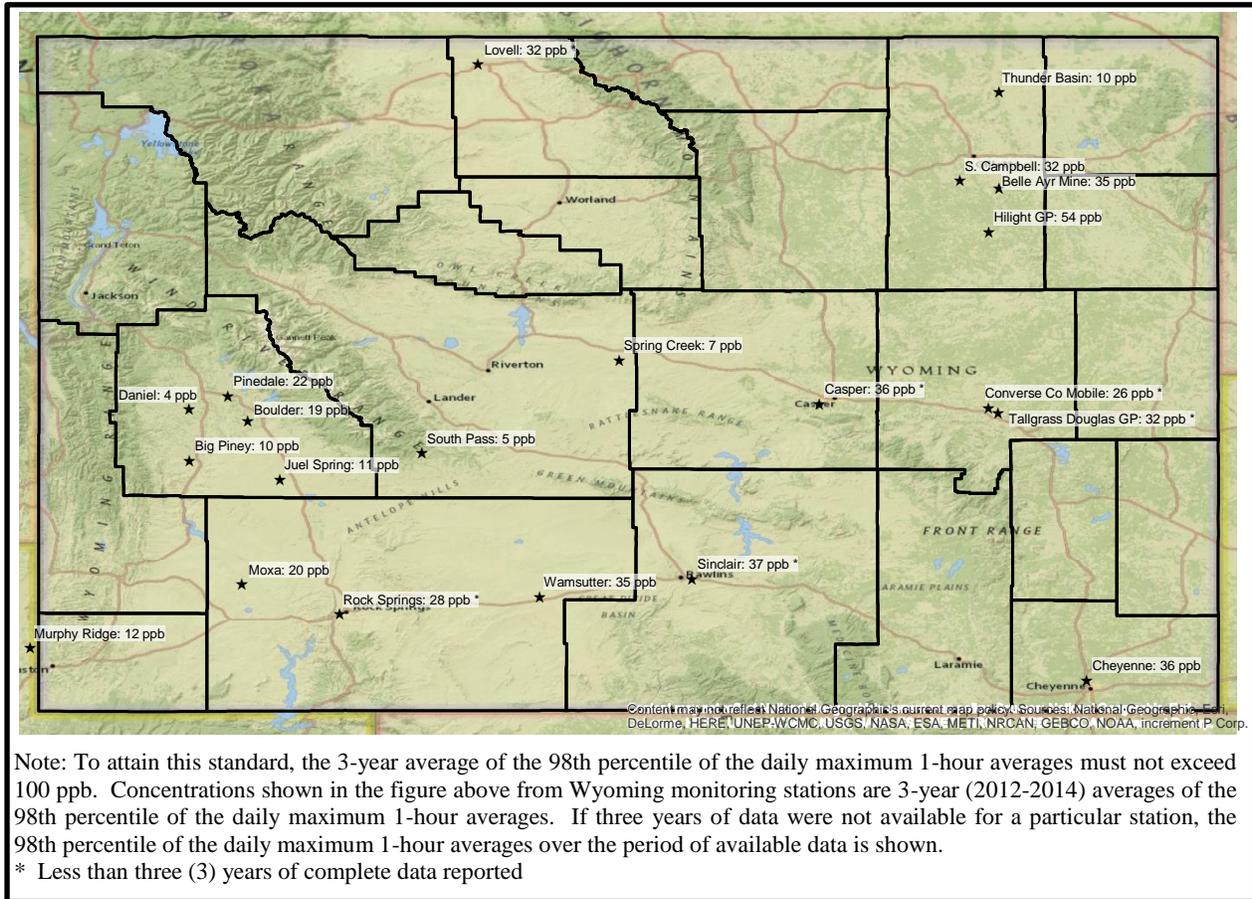
According to the Division's results of the modeling analysis, the maximum modeled annual NO<sub>x</sub> concentration was 6.7 µg/m<sup>3</sup>. Supplement C to the Guideline on Air Quality Models allows the use of the ambient ratio method, which provides for a twenty-five percent (25%) reduction in modeled NO<sub>x</sub> concentrations for purposes of estimating nitrogen dioxide (NO<sub>2</sub>) concentrations. Multiplying the maximum annual model predicted NO<sub>x</sub> concentration by 0.75 yields an annual NO<sub>2</sub> concentration of 5.0 µg/m<sup>3</sup>. When a background concentration of 14.0 µg/m<sup>3</sup> is added, the total WAAQS concentration is 19.0 µg/m<sup>3</sup>, which is well below the annual WAAQS standard of 100 µg/m<sup>3</sup>. Hence, the modeling analysis shows compliance with the annual WAAQS for NO<sub>2</sub> and the PSD increment of 25 µg/m<sup>3</sup>.

Maximum annual formaldehyde concentrations were estimated to be 0.38 µg/m<sup>3</sup>, according to the applicant's analysis. Using this concentration to estimate the associated cancer risk from the facility and surrounding sources, the cumulative inhalation risk assessment equates to approximately 4.9/million people. It must be noted that this estimate is extremely conservative based on the assumption that the sampled population will be exposed to the maximum model predicted concentration of the carcinogen of interest for twenty-four (24) hours per day over the course of a lifetime (seventy (70) years).

## **9.2 1-Hour Nitrogen Dioxide (NO<sub>2</sub>) NAAQS**

Statewide monitoring of NO<sub>2</sub> on the basis of a 1-hour averaging period indicates that the 1-hour NAAQS of 100 ppb is not threatened at any of twenty-one (21) monitoring sites through 2014 (see Figure 9-1 below). Several of the Wyoming monitors are located in areas of concentrated industrial development. County-wide NO<sub>x</sub> emissions in Sweetwater County were an estimated 38,280 tons in 2011. Multiple monitors are also located in Campbell County (estimated 44,420 tons of NO<sub>x</sub> in 2011), Converse County (estimated 19,280 tons in 2011) and Sublette County (estimated 4,970 tons NO<sub>x</sub> in 2011). Based on the current statewide 1-hour NO<sub>2</sub> monitoring and the minor-source NO<sub>x</sub> emissions total from the Cottonwood Draw Unit 12 Pad, the Division is satisfied that the operation of the Cottonwood Draw Unit 12 Pad will not prevent the attainment or maintenance of the 1-hour NAAQS for NO<sub>2</sub>.

**Figure 9-1: Monitoring for 1-Hour NO<sub>2</sub> in Wyoming (ppb)**



### 9.3 SUMMARY

The modeling analysis indicates that the model predicted annual concentrations of NO<sub>2</sub> are below all applicable Wyoming Ambient Air Quality Standards. Based on results of this analysis, the Cottonwood Draw Unit 12 Pad is expected to be in compliance with all applicable ambient standards.

## 10. PROPOSED PERMIT CONDITIONS

The Division proposes to issue an Air Quality Permit to RKI Exploration & Production, LLC for the Cottonwood Draw Unit 12 Pad with the following conditions:

1. That authorized representatives of the Division of Air Quality be given permission to enter and inspect any property, premise or place on or at which an air pollution source is located or is being constructed or installed for the purpose of investigating actual or potential sources of air pollution and for determining compliance or non-compliance with any rules, standards, permits or orders.
2. That all substantive commitments and descriptions set forth in the application for this permit, unless superseded by a specific condition of this permit, are incorporated herein by this reference and are enforceable as conditions of this permit.
3. That a permit to operate, in accordance with Chapter 6, Section 2(a)(iii) of the WAQSR, is required after a 120 day start-up period in order to operate this facility.
4. That all notifications, reports and correspondences associated with this permit shall be submitted to the Stationary Source Compliance Program Manager, Air Quality Division, 122 West 25<sup>th</sup> Street, Cheyenne, WY 82002 and a copy shall be submitted to the District Engineer, Air Quality Division, 152 N. Durbin Street, Suite 100, Casper, WY 82601. Submissions may also be done electronically through <https://airimpact.wyo.gov> to satisfy requirements of this permit.
5. That written notification of the actual date of initial start-up for each engine is required fifteen (15) days after start-up in accordance with Chapter 6, Section 2(i)(ii) of the WAQSR. Such notification shall be submitted on a complete Engine Installation/Removal form. The form can be downloaded from the Air Quality website <http://deq.wyoming.gov/aqd/> or obtained from the Air Quality Division.
6. That upon shutdown and removal of an engine from the facility, written notification is required within fifteen (15) days of removal. Such notification shall be submitted on a complete Engine Installation/Removal form.
7. Unless engine replacement is specifically authorized for a unit in this permit, once an engine is removed from the facility, an engine cannot be installed and operated in its place unless authorized by an appropriate permit modification.
8. That the date of commencement of construction shall be reported to the Administrator within thirty (30) days of commencement. In accordance with Chapter 6, Section 2(h) of the WAQSR, approval to construct or modify shall become invalid if construction is not commenced within twenty-four (24) months after receipt of such approval or if construction is discontinued for a period of twenty-four (24) months or more. The Administrator may extend the period based on satisfactory justification of the requested extension.
9. That performance tests be conducted, in accordance with Chapter 6, Section 2(j) of the WAQSR, within thirty (30) days of achieving a maximum design rate but not later than ninety (90) days following initial start-up, and a written report of the results be submitted. The operator shall provide fifteen (15) days prior notice of the test date. If a maximum design rate is not achieved within ninety (90) days of start-up, the Administrator may require testing be done at the rate achieved and again when a maximum rate is achieved.

10. Initial performance tests, as required by Condition 9 of this permit, shall be conducted on the following sources:

i. Cummins QSK60G generator engines (E1-E2)

NO<sub>x</sub>, CO, and VOC Emissions: Testing shall follow 40 CFR part 60, subpart JJJ §60.4244, except that §60.8 only applies to engines subject to 40 CFR part 60, subpart JJJ. For the initial performance test, testing shall not consist of Method 19 or ASTM Methods.

Formaldehyde Emissions: Each engine shall be tested for formaldehyde. Testing shall consist of three (3) 1-hour tests following EPA Reference Methods and a Division-approved formaldehyde test method.

A test protocol shall be submitted for review and approval prior to testing. Engine horsepower, inlet temperature to the catalyst, pressure drop across the catalyst and other operating conditions shall be recorded during each test run and submitted with the test report. Results shall be submitted to this Division within forty-five (45) days of completion.

11. That emissions from each engine shall be limited as follows:

Engine	ID	NO <sub>x</sub>			CO			VOC			Formaldehyde	
		g/hp-hr	lb/hr	tpy	g/hp-hr	lb/hr	tpy	g/hp-hr	lb/hr	tpy	lb/hr	tpy
Cummins QSK60G	E1-E2	0.7	3.0	13.2	0.2	0.7	3.2	0.5	2.1	9.1	0.17	0.75

12. That the engine configuration for the Cottonwood Draw Unit 12 Pad shall be limited to two (2) engines consisting of the following:

E1-E2: Cummins QSK60G generator engine equipped with an oxidation catalyst.

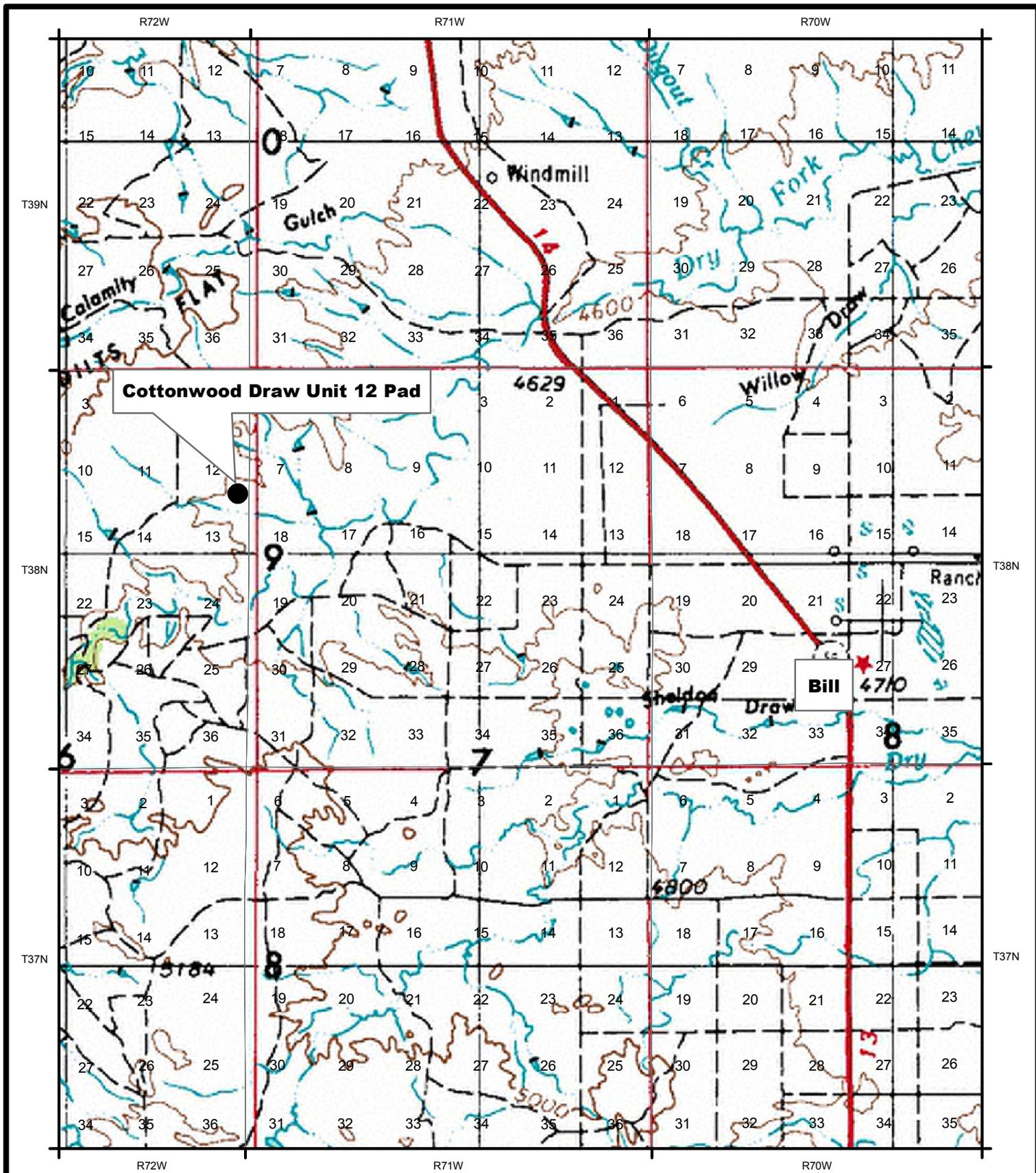
13. That RKI Exploration & Production, LLC shall follow the testing requirements as follows for engines E1-E2:
  - i. That every twelve (12) calendar months, the engines E1-E2 shall be tested to verify compliance with the NO<sub>x</sub>, CO, VOC, and formaldehyde limits set forth in this permit. Periodic tests for each engine are required within twelve (12) calendar months after completion of the initial performance test or the last periodic test. Testing for NO<sub>x</sub>, CO and VOCs shall follow 40 CFR part 60, subpart JJJJ §60.4244, except that §60.8 only applies to engines subject to 40 CFR part 60, subpart JJJJ. Testing for formaldehyde shall follow EPA reference methods and a Division-approved formaldehyde test method. Formaldehyde emissions in terms of lb/hr shall be calculated using the methodology in Sections 10.1.1.1 and 10.1.1.2 of the State of Wyoming's Portable Analyzer Protocol. Notification of the test date shall be provided to the Division fifteen (15) days prior to testing. Results of the tests shall be submitted to the Division within forty-five (45) days of completing the tests.
  - ii. The Air Quality Division shall be notified within twenty-four (24) hours of any engine where the testing/monitoring required by (i) of this condition shows operation outside the permitted emission limits. By no later than seven (7) calendar days of such testing/monitoring event, the owner or operator shall repair and retest/monitor the affected engine to demonstrate that the engine has been returned to operation within the permitted emission limits. Compliance with this permit condition regarding repair and retesting/monitoring shall not be deemed to limit the authority of the Air Quality Division to cite the owner or operator for an exceedance of the permitted emission limits for any testing/monitoring required by (i) of this condition which shows noncompliance.
  
14. That RKI Exploration & Production, LLC shall follow the monitoring and maintenance requirements as follows for engines E1-E2 equipped with an oxidation catalyst:
  - i. Operate and maintain the engine, air pollution control equipment, and monitoring equipment according to good air pollution control practices at all times, including startup, shutdown, and malfunction.
  - ii. Install a thermocouple to measure the inlet catalyst temperature.
    - a. The inlet temperature shall be recorded at least monthly. If the temperature is outside of the range listed below, corrective action shall be taken.

Oxidation Catalyst: 450 °F to 1350 °F
  - iii. Install a device to measure the pressure drop across the catalyst.
    - a. The pressure drop across the catalyst shall be recorded at least monthly. If the pressure changes by more than two (2) inches of water at one-hundred percent (100%) load, plus or minus ten percent (10%), from the pressure drop as determined below, corrective action shall be taken.

1. During the initial performance test required by this permit, the reference pressure drop shall be established. When the catalyst is replaced, the reference pressure drop shall be reestablished during the subsequent periodic testing required by this permit.
  - iv. Records of catalyst inlet temperature, pressure drop, and any maintenance or corrective actions shall be kept and maintained for a period of five (5) years and shall be made available to the Division upon request.
15. Compliance with 40 CFR part 63, subpart ZZZZ §63.6605 and §63.6640 can be used in lieu of the monitoring and maintenance requirements in Condition 14.
16. That the stack height for the engines shall be a minimum of seventeen (17) feet.
17. RKI Exploration & Production, LLC shall comply with all applicable requirements of 40 CFR part 60, subpart JJJJ.
18. RKI Exploration & Production, LLC shall comply with all applicable requirements of 40 CFR part 63, subpart ZZZZ.

# **Appendix A**

## Facility Location



**RKI Exploration & Production, LLC**  
**Cottonwood Draw Unit 12 Pad**  
**SE1/4SE1/4 of Section 12, T38N, R72W**  
**Converse County, Wyoming**

