

**Consent Decree (90-5-2-1-10811) – 1:15-cv-00841 RBJ**

**Second End of Phase Report for Tank Systems  
included in the Cross-Section Sampling Analysis**

**March 18, 2016**

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## Introduction and Purpose

Consistent with the requirements of Paragraph 59 of the Consent Decree (“CD”) between the United States, the State of Colorado (“State”), and Noble Energy, Inc. (“Noble”), Civil Action No. 1:15-cv-00841-RBJ, entered by the U.S. District Court for the District of Colorado as final judgment on June 2, 2015, Noble has prepared this second End of Phase Report (“Second End of Phase Report”) for Tank Systems<sup>1</sup> that were included in the Cross-Section Sampling Analysis and had an Engineering Evaluation deadline of July 1, 2015.

The Consent Decree requires an End of Phase Report after the Engineering Evaluation deadline for each group of Tank Systems to provide a public summary of useful information gleaned from Engineering Evaluations, and any modifications to improve capture and control achieved by Vapor Control Systems.

Noble submitted its first End of Phase Report (“First Report”) on July 30, 2015. The First Report addressed Tanks Systems<sup>2</sup> that had, as of September 2014, actual uncontrolled annual volatile organic compound (“VOC”) emissions of 50 tons per year (“TPY”) or more with an Engineering Evaluation deadline of May 1, 2015. Following EPA’s review and consultation with the State, Noble received approval of its First Report on December 14, 2015 and in turn made it publically available at [noblecolorado.com](http://noblecolorado.com).

In some instances, information provided by Noble in its approved First Report remains applicable to this Second End of Phase Report.<sup>3</sup> Where appropriate, Noble has included notations directing the reader to the First Report instead of including identical details in this Second End of Phase Report.

As noted in the First Report:

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<sup>1</sup> Pursuant to Section III of the CD, “Tank System” shall mean one or more tanks that store Condensate and share a common Vapor Control System.

<sup>2</sup> Pursuant to Section III of the CD, “Tank System” shall mean one or more tanks that store Condensate and share a common Vapor Control System.

<sup>3</sup> This is primarily a result of a short reporting period (May1 – July 1), a limited number of Tank Systems with Vapor Control Systems requiring Engineering Evaluations (65), and no material differences in the design and selection of equipment to control Tank System vapors compared to the previous report.

1. An Engineering Evaluation is the process of applying an appropriate Engineering Design Standard<sup>4</sup> to determine if the existing Vapor Control System<sup>5</sup> at each Tank System is adequately designed and sized to handle the Potential Peak Instantaneous Vapor Flow Rate ("PPIVFR");<sup>6</sup>
2. Noble's oil and natural gas production operations in the Denver-Julesburg ("D-J") Basin include the use of Condensate<sup>7</sup> tanks, which have the potential to produce vapors from flashing<sup>8</sup> and working and breathing<sup>9</sup> losses. Working and breathing losses are vapors that may be released from Condensate due to liquid level changes and temperature fluctuations;
3. Noble's operations also include the use of produced water storage tanks that may also produce vapors from flashing and working and breathing losses such that the associated emissions are considered by the Engineering Evaluations when they are connected to a Tank System's Vapor Control System;
4. Vapor Control Systems are installed on Noble Tank Systems to route vapors from a Tank System to an emission control device; and
5. Where flashing, breathing, and/or working emissions have the potential to exceed Vapor Control System capacity, Vapor Control System modifications are necessary to ensure proper capture and control of emissions.

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<sup>4</sup> Pursuant to Section III of the CD, "Engineering Design Standard" shall mean an engineering standard developed by Noble pursuant to Paragraph 9 (Engineering Design Standard).

<sup>5</sup> Pursuant to Section III of the CD, "Vapor Control System" shall mean the system used to contain, convey, and control vapors from Condensate (including flashing, working, breathing, and standing losses, as well as any unintentional gas carry-through to Condensate tanks) at a Tank System. A Vapor Control System includes a Tank System, piping to convey vapors from a Tank System to a combustion device and/or vapor recovery unit, fittings, connectors, liquid knockout vessels or vapor control piping, openings on Condensate tanks (such as pressure relief valves ("PRVs") and thief hatches), and emission control devices.

<sup>6</sup> Pursuant to Section III of the CD, "Potential Peak Instantaneous Vapor Flow Rate" shall mean the maximum instantaneous amount of vapors routed to a Vapor Control System during Normal Operations (defined as all periods of operation, excluding Malfunctions, and explicitly including, for storage tanks at well production facilities, liquid dumps from the Separator), including flashing, working, breathing, and standing losses, as determined using the Modeling Guideline (defined as the modeling guideline developed by Noble pursuant to Paragraph 8 (Development of a Modeling Guideline)).

<sup>7</sup> Pursuant to Section III of the CD, "Condensate" shall mean hydrocarbon liquids that remain liquid at standard conditions (68 degrees Fahrenheit and 29.92 inches mercury) and are formed by condensation from, or produced with, natural gas, and which have an American Petroleum Institute gravity ("API gravity") of 40 degrees or greater.

<sup>8</sup> Flashing occurs when Condensate or produced water is dumped from pressurized two-phase and three-phase Separators (Pursuant to Section III of the CD, a "Separator" is a pressurized vessel used for separating a well stream into gaseous and liquid components) into storage tanks, at or near atmospheric pressure, causing vapors to be released or "flashed" into a gaseous state as a result of the pressure drop.

<sup>9</sup> Working and breathing losses are vapors that may be released from Condensate due to liquid level changes and temperature fluctuations.

For purposes of the Tank Systems covered by this Second End of Phase Report, Noble did not create a general Engineering Design Standard for use at multiple Tank Systems. Rather, Noble used a site-specific Engineering Design Standard to ensure a Vapor Control System was designed and adequately sized for the PPIVFR of the Tank System.

This Second End of Phase Report covers 56 Tank Systems included<sup>10</sup> in the Cross-Section Sampling Analysis study.

As was the case with the First Report, this Second End of Phase Report is also divided into five (5) sections that, based on the best currently available information, address the following:

- Section 1: An overview of the Engineering Design Standard considerations identified in Paragraph 9 of the CD;
- Section 2: A discussion of requirements, constraints, and limitations of operation and/or design parameters for the Tank Systems and Vapor Control Systems;
- Section 3: A summary of design and implementation challenges;
- Section 4: A summary of Vapor Control Systems operations; and
- Section 5: A discussion of any other significant observations associated with the Tank Systems and Vapor Control Systems.

## **1. Engineering Design Standard Overview**

During this reporting period, Noble did not develop a Three Line Pressure Grouping or subset grouping Engineering Design Standard for the Tank Systems. Instead, Noble developed individual site-specific Engineering Design Standards for those Tank Systems covered during this reporting period.

For additional details, please refer to the First Report.

### **1.1 Vapor Control Technologies**

As these considerations did not change, please refer to the First Report.

### **1.2 Site-specific Construction Constraints**

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<sup>10</sup> 35 of the 100 Cross Section Sampling and Analysis Tank Systems had greater than 50 TPY annual uncontrolled VOC emissions and were previously reported in the First End of Phase Report. Of the 65 Tank Systems remaining that were included in the Certification of Completion Report for Tank Systems included in the Cross Section Sampling and Analysis, 56 were certified as complete and 9 were certified as shut in.

As these considerations did not change, please refer to the First Report.

**1.3     Tank-to-combustor piping system design considerations**

As these considerations did not change, please refer to the First Report.

**1.4     Separator liquid dump characteristics**

As these considerations did not change, please refer to the First Report.

**1.5     Storage tank headspace**

As these considerations did not change, please refer to the First Report.

**1.6     Other Vapor Control System design considerations**

As these considerations did not change, please refer to the First Report.

**2.   Requirements, Constraints, and Limitations of Operation and/or Design Parameters**

As these considerations did not change, please refer to the First Report.

**3.   Summary of Design or Implementation Challenges Encountered**

As these considerations did not change, please refer to the First Report.

**4.   Summary of Vapor Control System Operations**

A review of available information supports the conclusion that the modified Vapor Control Systems have effectively controlled tank vapors. Pursuant to Paragraph 12.a. of the CD, Noble was required to conduct an IR camera inspection of each Tank System during and immediately after a dump event to confirm the Vapor Control System is adequately designed and not emitting VOCs. IR camera verifications and operator reports for the modified Tank Systems covered by this reporting period did not observe gas venting from storage tank PRVs or thief hatches. Accordingly, there are no corrective actions to report at this time.

**5.   Summary of Other Significant Observations**

For this reporting period, there were no other significant observations associated with the Tank Systems and Vapor Control Systems.

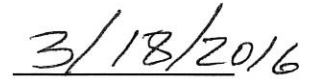
## 6. Certification

Pursuant to Paragraph 63 of the Noble Energy Consent Decree, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Mark Patteson

Vice President, DJ Basin Business Unit



Date