On-Site Water Recycling Program Summary
DP207 and DP209
Noble Energy, Inc.
September 21, 2018

This document provides a summary of Noble Energy, Inc.'s (Noble) plan to use third-party mobile recycling units for recycling exploration and production (E&P) waste. The recycling will support development areas, for the Noble proposed pads LD15-17 Pad, LD 15-09 Pad, LD07-04 Pad, LD 07-01 Multi Pad, LD05-13 Pad and the LD05-15 Pad; also known throughout this document as Development Project (DP) 207 (LD07-04 Pad, LD 07-01 Multi Pad, LD05-13 Pad and the LD05-15 Pad) and Development Project (DP) 209 (LD15-17 Pad, LD 15-09 Pad); in the Denver-Julesburg (DJ) Basin. This plan is submitted in accordance with the Colorado Oil and Gas Conservation Commission (COGCC) Rule 907.a.(3). Noble will treat E&P waste generated from their operations and use the treated water in the development of DP207 and DP209. These mobile treatment systems will not accept wastes from third parties.

E&P waste will be treated to remove oils, grease, and solids and to adjust chemical parameters such as pH, so that it can be used as hydraulic fracturing feed water. The treated water is suitable for hydraulic fracturing, but has a high concentration of total dissolved solids (TDS). TDS removal is not currently planned.

The following bullets provide additional information about the third party mobile treatment systems that will be used by Noble for treating E&P wastes.

- Mobile treatment systems will be placed on existing, permitted oil and gas locations. The mobile treatment system(s) will stay on each location for 3-12 months. If recycling facilities are on an approved location for more than 12 months, the appropriate air emissions permits will be obtained. The treatment systems will be located on sites that do not require sound barriers or where sound barriers are already provided as part of other operations.
- Each mobile recycling unit has varying equipment and flow rate capabilities. Typically, these mobile units will treat between 5,000 to 10,000 barrels per day, with some units treating up to 15,000 barrels per day. Noble anticipates utilizing one to three mobile units as needed for managing flowback and produced water.
- The mobile treatment systems will primarily be used to manage produced water, but will also be used to recycle flowback water and minimal amounts of coil cleanout water, as needed. An estimated 80% of the system capacity is expected to be used to

manage produced water; however, the ratio of produced water treated will vary to accommodate operations.

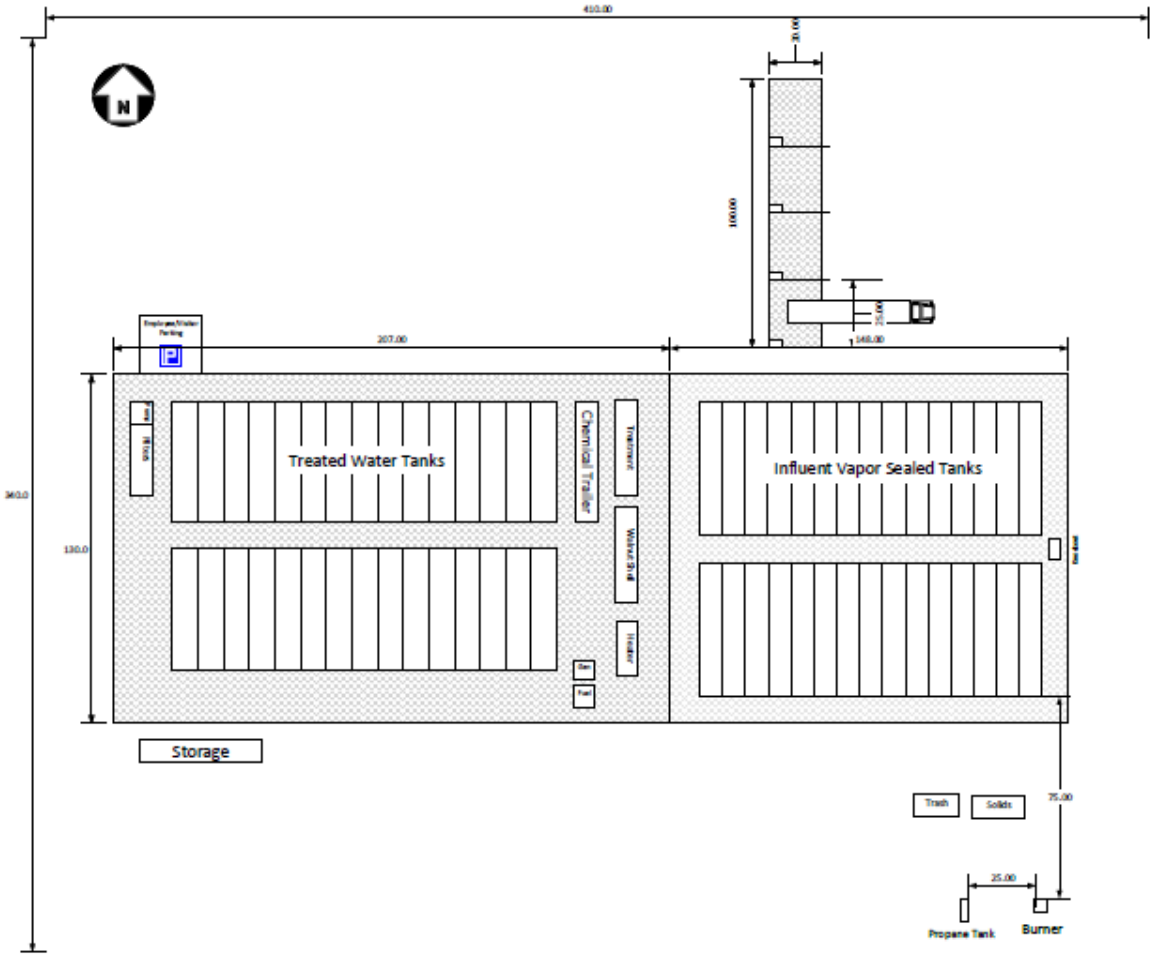
- The mobile treatment systems will also help eliminate truck traffic by piping the recycled water directly to operations.
- Produced and flowback water will first be collected in vapor-sealed frac tanks to equilibrate. The goal of water treatment will be to remove oil and grease, break and remove emulsions, settle solids, and remove bacteria. Treatment will be carried out by several processes, which may include oil/water separators, chemical addition (pH adjustment), mixing, reaction tanks, dissolved air flotation (DAF) or dissolved gas flotation (DGF), filtration, sludge dewatering, and similar treatment processes.
- The treated water will be transferred to a frac site for reuse. Bag filters will be sent to an approved landfill. Any sludge generated through treatment will be collected in a tank where the solids are dewatered for landfill application. The water from the dewatering process is recirculated back in the treatment train. No other wastes are anticipated.
- Treated water will be stored in frac tanks. E&P waste will not be stored in pits or modular large volume tanks (MLVTs).
- Best management practices will be incorporated for above ground piping carrying recycled water to oil and gas wells. The majority of piping will be above ground to easily evaluate for leaks. Additionally, fused HDPE pipe will be utilized to carry produced and flowback water, as this is considered best practice in the industry and minimizes leaks around joints. Finally all road crossings will be bored to mitigate the risk of getting hit by traffic.
- Spill Controls will be implemented as follows: Each tank and system will be API compliant for storage of E&P liquids (like frac tanks). All joints will have "duck ponds" around them to catch potential leaks from jointing. Additionally, the entire treatment area will be within lined secondary containment. Finally, the entire process takes place on a pad with an approved SPCC plan in place.
- Noble has developed a waste management plan, that identifies a waste register for documentation of the type of waste, when and where it is hauled, and volume from each site. In addition, the manifests of each waste stream are monitored and tracked for invoicing purposes. Waste documentation will be maintained in accordance with COGCC rule 907.b.
- Noble may collect treated and untreated water samples to ensure the viability of using recycled water during frac operations. For the first five weeks, a weekly sample will be collected. After this initial sampling period, samples will be collected monthly. Samples will be submitted to a 3rd party certified laboratory and will be analyzed for

the following analytes: oil & grease, iron, bacterial counts, TSS, pH, and ORP. Noble will share the data with the COGCC upon request.

- Appendix 1 shows the general equipment layout for the on-site mobile treatment systems.

Appendix 1: General Equipment Layout

Potential Equipment Layout 1



Potential Equipment Layout 2