STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

APPLICATION OF THE NEW MEXICO OIL CONSERVATION DIVISION, THROUGH THE ENVIRONMENTAL BUREAU CHIEF, FOR ADOPTION OF AN AMENDMENT TO 19.15.39 NMAC ADDING NEW SECTIONS TO BE CODIFIED AT 19.15.39.9 AND 19.15.39.10 NMAC ADDRESSING SPECIAL PROVISIONS FOR SANTA FE COUNTY AND THE GALISTEO BASIN; SANTA FE, SANDOVAL AND SAN MIGUEL COUNTIES

CASE NO. 14255

TESTIMONY OF WILLIAM V JONES

My name is William V. Jones. I work for the State of New Mexico in the Engineering Bureau of the Oil Conservation Division and have been here for approximately 7 years. I am an engineer with a State title of "Petroleum Specialist".

The majority of my time as an engineer in the Engineering Bureau is spent assisting operators by processing their administrative applications for commingling, injection, or disposal. The engineers also conduct examiner hearings on a rotational schedule, and make recommendations to the Director based on those hearings. I have Bachelor of Science degrees in Geological Engineering and in Civil Engineering from New Mexico State University and an Information Technology degree from Denver Technical College (DeVry University.)

I have been a registered Professional Petroleum Engineer since the mid-1980's and have about 11 years of work experience in New Mexico. I worked 20 years as a petroleum engineer with Texaco and a couple of years as a hired consultant engineer for other oil and gas and consulting firms. For experience relevant to this Case, I worked 10 years as an engineer in oil and gas exploration over most of the United States, completed a semester of sedimentary (geology) field training in and around the Galesteo Basin at the University of New Mexico in 1977, and have experience reviewing injection/disposal applications for compliance with the rules of the Oil Conservation Division and Underground Injection Control (US-EPA).

I have testified several times before the Oil Conservation Division and Commission and have been accepted as an expert in Petroleum Engineering by both the Division and the Commission.

My engineering testimony in this case will address 19.15.39.9.B(7) NMAC, the proposed plans for "drilling program" and "mud-logging program", and 19.15.39.10.B NMAC concerning logging, mudlogging, isolating fresh water, casing and cementing, and the temporary abandonment of wells awaiting pipeline connection.

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19.15.39.9.B Application for Exploration and Development Plan.

(7)(b) a drilling program describing the air drilling program or mud program to be used;

This section of the rule is asking the applicant to be detailed as to its drilling method or drilling fluid to be used.

Deep holes are typically drilled with rotary rigs, circulating either "mud" or compressed "air". Air drilling is a drilling technique whereby gases (typically compressed air or nitrogen) are used to cool the drill bit and lift cuttings out of the wellbore. Some advantages of air drilling are (i) the hole is drilled much faster than with mud, (ii) it reduces lost circulation problems, and (iii) formation damage is minimized. Some disadvantages to air drilling are the inability to control the influx of formation fluid into the wellbore and the destabilization of the borehole wall.

Mud drilling with a rotary rig is the most versatile and dependable method of drilling and is necessary in many basins. The advantages seen in mud rotary drilling are that mud characteristics can be controlled so that formations are stabilized, pressures are controlled, and inflow, invasion, or cross-flow are minimized.

Detection and protection of "fresh" water is important and a carefully planned drilling program will help do this by preventing invasion or formation crossflow. If mud drilling is necessary, fresh water intervals are better protected by drilling with "fresh water" based muds, and preferably not with "salt water" based muds.

Normally operators use Form C-101 to submit proposed APD details. The details of the mud program envisioned here would be similar to the detail required for drilling on federal lands.

(7)(c) a mudlogging program, including a copy of the mudlog sheet and a description of the mudlogger's daily report, which shall include at a minimum the total depth reached, the footage drilled in the preceding 24 hours, oil and gas intervals, fresh water zones, and mud parameters including mud weight, chlorides, funnel viscosity and filtrate properties;

This section asks the operator to disclose the details of its intended mudlog program – including an example "description". This is requested to ensure the operator (i) has a geologist watching the details of the drilling and (ii) reports these details to the State. This proposed regulation is needed to prompt the operator to gather valuable, interpreted information while the well is drilled in order to better ensure potential oil, gas, and water intervals are detected and recorded.

The Mud Logger (normally a geologist) samples rock cuttings and writes an interpretation of the rocks drilled. The mud log also includes formation tops, oil and gas "shows", and drilling rate-of-penetration. Mud parameters such as weight, chlorides and viscosity are often added to this rock description. The mudlog is used in combination with the electric logs run on the well to make a decision about whether to complete the hole (try to produce oil or gas from it) or "plug" the well. The mudlog accurately identifies the lithology or type of rocks which is needed when interpreting the electric logs. Running mudlogs will aide in interpretation of electric logs and will aide in identifying thick, clean, high porosity intervals that may contain water and will ensure hydrocarbons are not bypassed - causing "waste".

19.15.39.10 Additional requirements for applications to drill, re-enter, or deepen wells subject to an Exploration and Development Plan:

Division Rules, Part 14 contain the requirements to obtain approvals to drill, including reference to the required forms C-101 and C-102. In addition, the rules allow the Division the "impose conditions" on drilling. The approvals to drill are normally processed in the district offices by district personnel. Each district has standardized practices of permitting wells that is unique to that district because of the unique nature of the geology, protectable water, or other conditions in that district.

These proposed rules for the Galisteo Basin are intended to be more specific in order to prevent waste and protect the environment.

B. Unless otherwise specified in an approved exploration and development plan, an application for permit to drill, re-enter, or deepen a well that requires an Exploration and Development Plan shall be subject to the following conditions:

(3) the operator shall run logs from total depth to surface that will determine porosity and water saturation;

This section requires the operator to design and run an electric logging program ("logs") with the purpose of determining critical parameters such as porosity and water saturation from the well's total-depth to the surface. The intent is to not only detect the presence and extent of hydrocarbons, but to detect all waters, water bearing sands, and (geologic) lithology or rock types and thicknesses.

Currently, the Division does not require electric logs to be run, but does require these to be submitted to the Division if they are run – Division Rule 7.16 (Form C-105).

Porosity is the percentage of void space or pore volume within a rock. Effective porosity is the interconnected pore volume in a rock that contributes to fluid flow in a reservoir. The porosity or "voids" contain fluids such as various gases or liquids (water

or hydrocarbons). Porosity is estimated by the mudlogger, and measured in cores, but the preferred measurement of porosity in the reservoir is from running and interpreting modern electric logs.

Water saturation is the fraction of the pore volume occupied by formation water and (1-Sw) is the fraction of the pore volume occupied by hydrocarbons. Water saturation determinations are done using data from mud properties and formation resistivity logs.

Electric wireline logging gives the best understanding of the reservoir or what's below ground. Both open hole and cased hole logging tools and techniques are available and provide state-of the-art formation evaluation.

Wireline logs are normally run by an operator, focused on the potential hydrocarbon pay interval. Requiring these logs to be run from the bottom to the top in these wells in the Galesteo Basin will help determine the location and extent of fresh water intervals; which can then be protected. The requirement to run a well designed and thorough electric logging suite will ensure the reservoir and reservoir fluids are understood and will prevent waste and protect potential sources of drinking water.

(4) a mud-logger shall be on site during drilling from surface to total-depth and shall submit the logs and a written report daily to the supervisor of the appropriate district office;

This section requiring the mud-logging of the entire well and the daily report from that mud-logger is intended to ensure geological and drilling data are gathered and available to both the company paying for the well and to the Division. Mudlog information is used to make decisions on the well, such as where to stop and set protective casing, or even whether to complete a well and where to complete it.

Currently mudlogging is not required and if it is done, the reports are not required to be submitted to the Division. If they are voluntarily submitted to the Division, it is after the well is finished drilling.

(5) the operator shall isolate all fresh water zones and aquifers throughout their vertical extent with at least two cemented casing strings;

This section puts the responsibility on the operator to protect all fresh waters with at least two cemented casing strings. The two casing strings are a best practice in the Division or a normal result of drilling a well and casing off fresh water as it normally occurs above any hydrocarbon bearing interval. However, sometimes fresh "protectable" water occurs below hydrocarbon intervals. Requiring a double cement sheath or cement to be circulated on two casings covering "fresh water", no matter where this water occurs, is a necessary protective measure.

"Fresh Water" is defined by the Division in Rule 7F.(3) and is to be protected from oil production operations by casing wells as described above. Waters defined as "fresh", even if deep in a well or of low capacity (yield) for production are to be protected (see Rule 7F.(3)) "except for which, after notice and hearing, it is found there is no present or reasonably foreseeable beneficial use which would be impaired by contamination of such waters."

Division Rules Part 16.9 requires the well to be designed to prevent movement of fluids, confine and prevent downhole contamination of water, and seal off water with cement.

(6) the operator shall circulate cement to surface on all casing strings, except that the smallest diameter casing shall have cement to at least 100 feet above the casing shoe of the next larger diameter casing;

This section requires the operator to design a cement job in order to protect all installed casing from total-depth of the well to the surface with a cement sheath in order to prevent casing corrosion and vertical migration of fluids from one formation into another; preventing waste and protecting fresh waters.

Division Rules 16.10 provides details as to the method and extent of cementing. This rule requires cement coverage but allows exceptions so cement is only placed over the lowermost portions of intermediate and production casing.

The proposed rule would prevent any casing to be exposed to the formation without coverage of a cement sheath.

(7) the operator shall run cement bond logs acceptable to the Division after each casing string is cemented and file the logs with the appropriate district office;

This section requires cement bond logs after all primary cementing jobs. This is intended to aid in identifying not only the cement top, but to identify thief zones and high and low permeability zones in the well. A Cement Bond Log ("CBL") is an electric wireline log run in casing after the casing has been cemented in place. The CBL is typically a variety of series of sonic-type tools and gives a detailed, 360-degree view of the integrity of the cement job. It is a representation of the cement job, and shows whether the cement is adhering to the outside of the casing and to the formation.

Requiring cement bond logs after cement jobs will provide information as to not only the cement top, but also the cement quality and possible formation permeability; adding a level of protection to the well and protecting potential sources of drinking water.

Existing Division rules allow for flexibility in verifying cement tops. In practice, when cement does not circulate, the Division requires a survey to be done to determine the cement top. The survey could be a temperature survey or any type of cement bond log.

(8) the operator shall place a well that requires gas pipeline connection on approved temporary abandonment status while awaiting pipeline connection.

This portion of the proposed rule was intended to allow normal and necessary testing of wells but require inactive wells to be temporarily abandoned by placing bridge plugs above any perforations.

I recommend that the Commission change the language in numbered paragraph (8) as follows:

> The operator shall place a well that requires gas pipeline connection on approved temporary abandonment status while awaiting pipeline connection with a bridge plug above any open perforations.

The normal limits of 19.15.25.8 NMAC would apply; the operator would have to place an inactive well on approved temporary abandonment status within 150 days after suspension of drilling operations or plug and abandon.

The existing rules allow wells to be approved for temporary abandonment without placing plugs above the perforations. Rule 25.14 allows the operator to demonstrate "internal mechanical integrity", which is necessary prior to approving temporary abandonment, by demonstrating that the well has been completed for less than five years and has not been connected to a pipeline.

The existing rules clearly give the Division some discretion in methods of demonstrating mechanical integrity and therefore in approving temporary abandonment. This sometimes results in wells being approved for temporary abandonment without placing a bridge plug above the perforations and circulating the well with corrosion resistant fluid.

As an example, the Black Ferrill Well No. 1 was "temporarily abandoned" for many years with the tubing in the hole and (probably) no plug set above the perforations. After twenty years, re-entry of the well was difficult and the 4-1/2 inch casing in the well was badly corroded. Tecton repaired the problem by running an internal "scab" liner.

Division Rule 18.12 limits flaring or venting time to 60 days following the well's "completion", but allows application for exception to this time limit (form C-129). Flaring or venting hydrocarbon gases is a "waste" and exceptions to allow an operator to flare or vent for long periods of time should be minimized.

I, William V. Jones, swear that the foregoing is true and correct.

William V. Jones
Petroleum Specialist
Oil Conservation Division

Subscribed and sworn to before me this 3rd day of December 2008, by William V. Jones.

Notary Public

My commission expires:

1-09-2012