Oil and Natural Gas Produced Water Governance in the State of New Mexico—Draft White Paper

November 9, 2018

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Partial List of Abbreviations and Acronyms

bbl	barrel (= 42 US liquid gallons)
BLM	Bureau of Land Management
BPJ	best professional judgment
CBM	coalbed methane
CFR	Code of Federal Regulations
CWA	Clean Water Act
CWT	centralized waste treatment
E&P	exploration and production
ELGs	effluent limitation guidelines and standards
EPA	United States Environmental Protection Agency
EMNRD	Energy, Minerals and Natural Resources Department (New Mexico)
EOR	enhanced oil recovery
mg/L	milligrams per liter
MOU	memorandum of understanding
MS4	municipal separate storm sewer system
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMSA	New Mexico Statutes Annotated
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OCC	Oil Conservation Commission (New Mexico)
OCD	Oil Conservation Division (New Mexico)
OSE	Office of the State Engineer (New Mexico)
POTW	publicly owned treatment works
RCRA	Resource Conservation and Recovery Act
SDWA	Safe Drinking Water Act
SLO	State Land Office (New Mexico)
TDS	total dissolved solids
UIC	underground injection control
USDA	United States Department of Agriculture
USDM	United States Drought Monitor
USDW	underground source of drinking water
WQCC	Water Quality Control Commission (New Mexico)
WQS	water quality standards

Introduction: Water in New Mexico—Scarcity and Abundance

New Mexico is an arid state. According to the National Oceanic and Atmospheric Administration (NOAA), it tends to rank as the fifth driest state in the nation, receiving just under 15 inches of rainfall per year.

The spring of 2018 marked one of the lowest runoff seasons along the Rio Grande and Pecos Rivers in decades. Government water managers had to broker agreements to keep the river flowing through central New Mexico while stretches in the south had gone dry. Given that drought is no stranger to New Mexico, decisions about water are growing ever more complicated and meaningful.

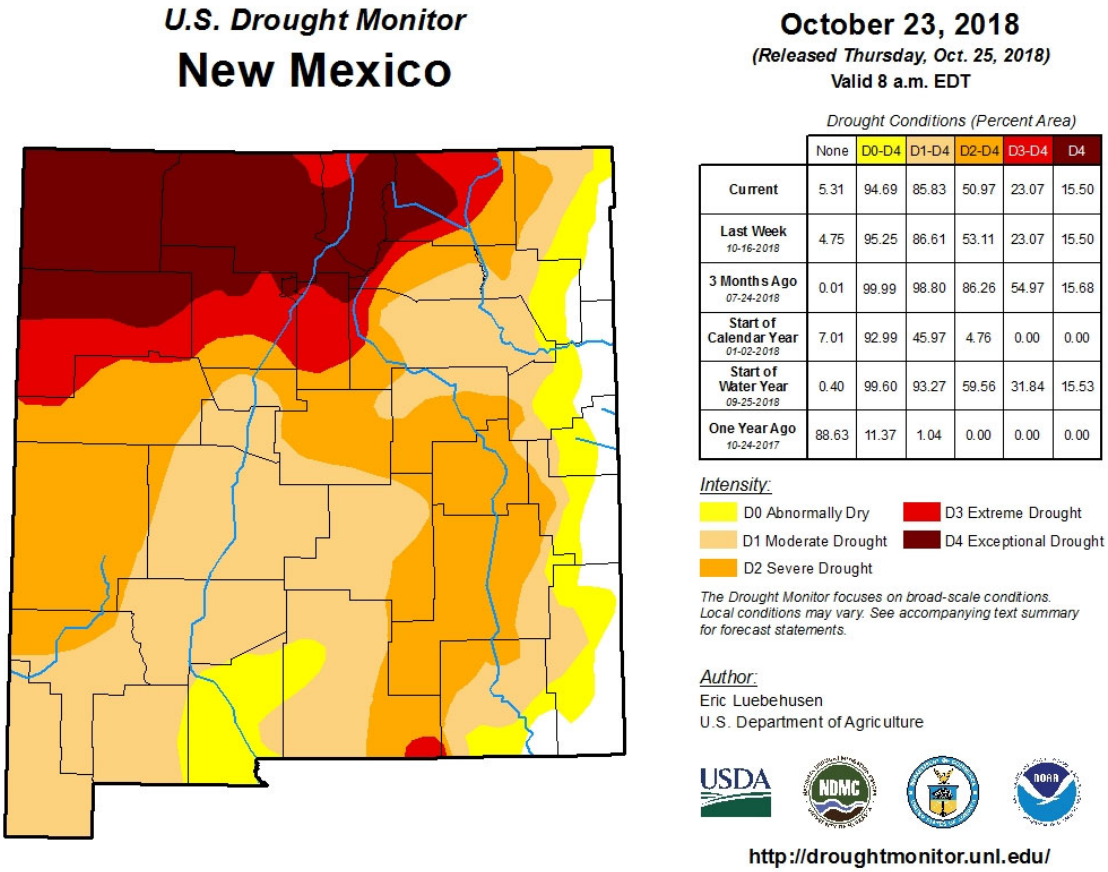
According to NOAA, droughts in New Mexico are projected to become more intense. Recent droughts have harmed communities across the state. For example, the extreme drought in the Chihuahuan Desert caused grasslands to die, decreasing grazing resources for livestock. In another example, the U.S. Department of Agriculture (USDA) designated 12 counties in New Mexico as primary natural disaster areas due to losses and damages caused by drought. Droughts not only challenge New Mexico's agricultural industry but also increase the frequency and severity of wildfires and dust storms. Many New Mexicans understand such impacts all too well.[1]

About 95% of New Mexico is currently in a drought, compared to 11.4% a year ago.

About 95% of New Mexico is currently in a drought compared to 11.4% a year ago. Figure 1 illustrates the current drought conditions as tracked by the U.S. Drought Monitor (USDM). The USDM is a partnership between the National Drought Mitigation Center at the University of Nebraska–Lincoln, the USDA, and the NOAA. The USDM releases a weekly map showing parts of the United States that are in drought. It uses five categories, as shown in Figure 1's map and table: D0 (for abnormally dry areas that may be going into or are coming out of drought), D1 (moderate drought), D2 (severe drought), D3 (extreme drought) and D4 (exceptional drought).

[1] See https://statesummaries.ncics.org/nm.

Figure 1: New Mexico Drought Conditions



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	5.31	94.69	85.83	50.97	23.07	15.50
Last Week 10-16-2018	4.75	95.25	86.61	53.11	23.07	15.50
3 Months Ago 07-24-2018	0.01	99.99	98.80	86.26	54.97	15.68
Start of Calendar Year 01-02-2018	7.01	92.99	45.97	4.76	0.00	0.00
Start of Water Year 09-25-2018	0.40	99.60	93.27	59.56	31.84	15.53
One Year Ago 10-24-2017	88.63	11.37	1.04	0.00	0.00	0.00

New Mexico has 16 water planning regions, each with its own water plan. New Mexico also has a state water plan. The regional and state water plans are vital tools intended to guide water management to best meet the needs of all the state's water users. Looking toward the future, all regional water plans from around the state anticipate the need for new sources of water.

The New Mexico Office of the State Engineer (OSE) is charged with administering the state's water resources. The OSE is dedicated to protecting existing water rights, enhancing the state's public welfare, and ensuring that water use is not contrary to conservation while supporting the use of alternative water resources. Beyond the OSE, many stakeholders invest significant time and resources into promoting water conservation. Private citizens, interest groups, academia, industry, tribes, local government, federal agencies and the media all help meaningfully protect the state's water resources.

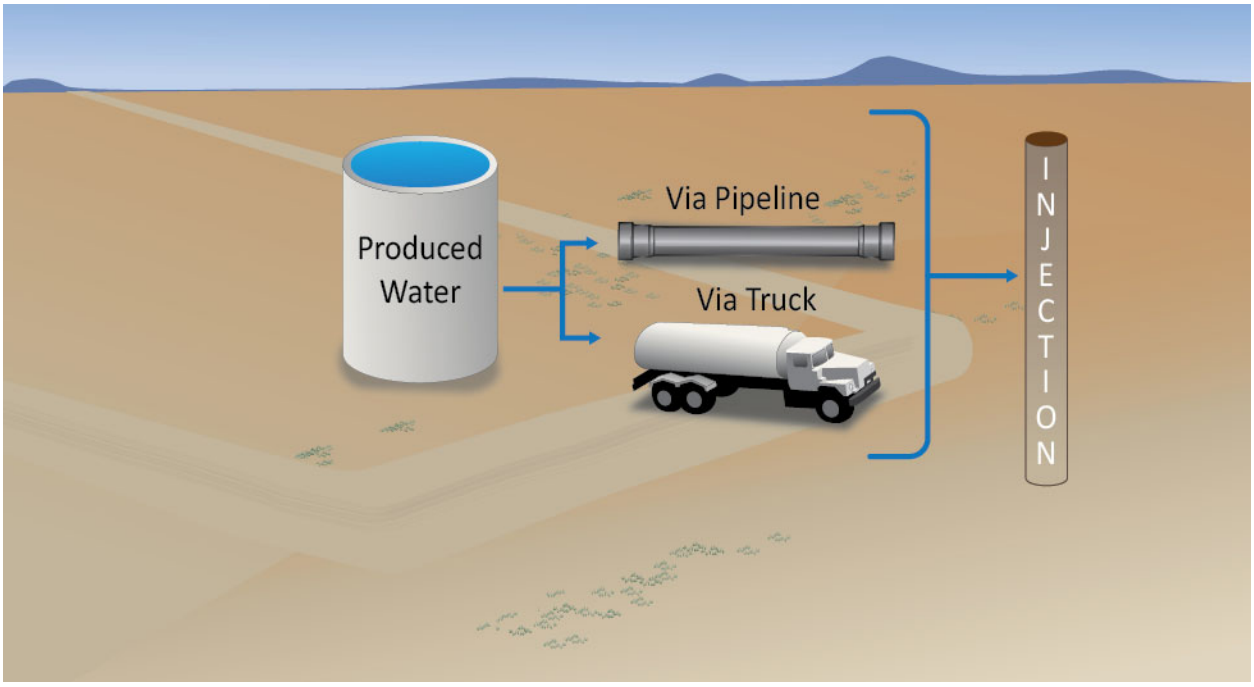
While conservation plays an important role in managing the state's limited water resources, it is not enough. Managing water scarcity has always been important in New Mexico, but never more important than now. *"Revolutionary ideas are needed to ensure [water] demand can be balanced in the future,"* observed Tom Blaine, the New Mexico State Engineer. The New Mexico State Engineer has authority over the appropriation and distribution of all surface and groundwater in New Mexico.

In 2018, New Mexico became the third largest oil producer in the United States. Oil and natural gas wells generate large volumes of water known as produced water. Produced water is the fluid brought up from

the hydrocarbon-bearing strata during the extraction of oil and natural gas, and includes, where present, formation water, injection water, and any chemicals added downhole or constituents released from the formation. Produced water is generated in large quantities over long periods. As oil and natural gas production diminishes from a given well, produced water volumes can continue to increase. For every barrel of oil, four or five barrels of produced water may be generated: an estimated 168 to 210 gallons of produced water for every 42 gallons of oil produced. In 2017, oil and natural gas production in New Mexico generated 900 million barrels, or 37.8 billion gallons of produced water. As oil and gas production volumes continue to grow in New Mexico, so will the amount of produced water.

Traditionally, produced water has been considered a waste product of oil and natural gas industry. Produced water has been considered a waste, because it commonly contains levels of total dissolved solids (TDS) and other constituents (organic chemicals, inorganic chemicals, metals and naturally occurring radioactive materials). Produced water is often managed in storage tanks, then trucking or piping to underground injection wells (see Figure 2). The underground injection wells, sometimes referred to as salt water disposal wells, dispose of the produced water deep underground. In other instances, produced water may be used in active exploration and production (E&P) reservoirs for enhanced oil recovery (EOR) processes or reused in the oilfield as make up water for drilling and stimulation activities. Advances in water treatment technology have shown promise in turning this wastewater into a future water resource. However, there remain important scientific questions related to the human health and environmental implications of using treated produced water for applications outside the oil and natural gas industry.

Figure 2: Generalized Approach to Produced Water Management



Western states facing water scarcity and prolonged periods of drought are focusing on this potential resource. Such challenges have led to a national dialogue on produced water management and opportunities. Organizations like the Environmental Council of the States, the Interstate Oil and Gas Compact Commission, the Groundwater Protection Council, the National Governors Association Center for Best Practices and others have advanced this topic from a policy perspective. Industry, environmental

nongovernmental organizations and academia have greatly contributed to these efforts to fill crucial data gaps for state and federal policymakers.

While the national dialogue on produced water continues, clarifying the state and federal regulatory frameworks associated with produced water re-use and recycling is of the utmost importance to New Mexico. To address whether the existing regulatory framework and associated policies adequately contemplate and facilitate the utilization of treated produced water, the State of New Mexico engaged the U.S. Environmental Protection Agency (EPA) to collaborate on this specific topic.

This white paper is a product of the cooperative process outlined in a memorandum of understanding (MOU) that the State of New Mexico and the EPA entered into on July 16, 2018 (*see* Appendix A). The purpose of the MOU was to embark on a state and federal effort to clarify the existing regulatory and permitting frameworks related to the way produced water can be re-used, recycled and renewed for purposes in New Mexico.

Scope

The scope of this white paper is to:

- highlight for state, local and federal decisionmakers how the use of treated produced water could help alleviate water scarcity issues in New Mexico;
- provide a roadmap for stakeholders navigating the existing federal and state regulatory landscapes; and
- identify policy gaps and opportunities to streamline existing frameworks.

Section 1: The Produced Water Regulatory Framework

This section provides an overview of the existing regulations and the primary agencies that administer them. Section 2 discusses several hypothetical scenarios related to produced water management, treatment and potential uses. (Section 2 presents a more tailored discussion of the existing state and federal regulations, by respective agency.) Section 3 discusses regulatory and other policy gaps with respect to the governance of produced water in New Mexico.

New Mexico State Regulations Governing Produced Water

Before discussing the regulatory framework at the state level, it is helpful to understand the three New Mexico agencies that are primarily responsible for implementing the regulations governing produced water, treated produced water, and water more generally:[2]

- The New Mexico Oil Conservation Division.
- The New Mexico Environment Department.
- The New Mexico Office of the State Engineer.

New Mexico Oil Conservation Division

The New Mexico Oil Conservation Division (OCD) is part of the New Mexico Energy, Minerals and Natural Resources Department (EMNRD). The EMNRD's mission is to position New Mexico as a national leader in the energy and natural resources areas for which the department is responsible. In accordance with that mission, the OCD regulates oil and natural gas activities on all state and private lands. The OCD collects production data; issues permits for new oil, gas, and certain injection wells; and enforces its rules and the state's oil and natural gas statute. The OCD also makes certain that abandoned wells are properly plugged and ensures that land used in oil and natural gas operations is restored responsibly.

In addition to regulating E&P activities, the OCD administers and enforces regulations pertaining to natural gas processing plants, geothermal installations, carbon dioxide facilities, natural gas transmission lines, and oil refineries pursuant to the New Mexico Oil and Gas Act and the New Mexico Water Quality Act.

One cannot obtain a water right for the disposition or use of produced water in New Mexico.

The New Mexico Oil and Gas Act defines "produced water" as water that is "an incidental byproduct from drilling for or the production of oil and gas" (*see* 70-2-33(K) NMSA) and specifically states that "no permit shall be required from the state engineer for the disposition of produced water in accordance with rules promulgated . . .by the [OCD]" (*see* 70-2-12.1 NMSA). This language makes it clear that produced water is

[2] While the New Mexico State Land Office (SLO) regulatory framework related to produced water is not discussed in this white paper, it is important to acknowledge that the SLO is responsible for administering nine million acres of surface and 13 million acres of subsurface estate for the beneficiaries of the state land trust, which includes schools, universities, hospitals and other important public institutions. The SLO optimizes revenues from state lands, including oil and natural gas leasing, while protecting the health of the land for New Mexicans. As discussed in Section 3, future engagement with the SLO related to produced water governance is recommended.

not water subject to appropriation via a permit from the OSE. One cannot obtain a water right for the disposition or use of produced water in New Mexico.

Related to the management and treatment of produced water, the Oil Conservation Commission (OCC)[3] enacted regulations that:

- govern the use of produced water pits, closed loop systems, below grade tanks and sumps (*see* 19.15.17 NMAC);
- govern recycling facilities (*see* 19.15.34 NMAC); and
- govern surface waste management facilities (*see* 19.15.36 NMAC).

In addition, the OCD regulates the underground injection of fluids, including produced water, in a manner consistent with state law (*see* 19.15.26 NMAC) and the state's primacy agreement under the Safe Drinking Water Act (SDWA).

New Mexico Environment Department

The mission of the New Mexico Environment Department (NMED) is to protect and restore the environment, and to foster a healthy and prosperous New Mexico for present and future generations. The NMED manages information and regulatory programs to protect air and water quality, manage waste, protect health and safety, and oversee environmental cleanups.

The basic authority for water quality management in New Mexico is provided through the New Mexico Water Quality Act, which establishes the Water Quality Control Commission (WQCC). The WQCC adopts water quality standards (WQS) for surface and groundwaters, and promulgates regulations to prevent and abate water pollution. It is also the state water pollution control agency for purposes of the federal Clean Water Act (CWA) and portions of the SDWA. The New Mexico Environmental Improvement Board is responsible for rules relating to water supply and capacity development.

The NMED administers several programs that may be relevant to the management and treatment of produced water, as well as the prospective uses of treated produced water.

The NMED administers several programs that may be relevant to the management and treatment of produced water, as well as the prospective uses of treated produced water. Described below are the primary NMED programs for the protection of drinking water, groundwater quality, and surface water quality.

Drinking Water Protection

The NMED Drinking Water Bureau oversees water system compliance with the federal SDWA and the state drinking water regulations to ensure the treatment and delivery of safe drinking water. The Drinking Water

[3] Per the New Mexico Oil and Gas Act, the OCC was established to have concurrent jurisdiction and authority with the OCD. In addition, any hearing on any matter may be held before the commission if the OCD division director determines that the OCC shall hear the matter. The OCC is composed of a designee of the commissioner of public lands, a designee of the secretary of the EMNRD, and the director of the OCD.

Bureau provides technical, managerial and financial assistance to water systems, and houses the Utility Operator Certification Program. The bureau's approval would be required for any use of treated produced water as a drinking water source by a public water system.

Groundwater Protection

The WQCC adopted groundwater quality standards and regulations to protect water quality and abate water pollution (*see* 20.6.2 NMAC). The OCD administers these regulations as they pertain to "discharges from facilities for the production, refinement, pipeline transmission of oil and gas or products thereof, the oil field service industry, oil field brine production wells, geothermal installations and carbon dioxide facilities" (*see* 20.6.2.1201.A NMAC).

Discharges from other types of facilities that could affect groundwater quality are regulated by the NMED's Ground Water Quality Bureau. A discharge of treated produced water onto the land or into the subsurface would require a Ground Water Discharge Permit from the bureau, if outside the areas noted above. The bureau issues permits for various purposes, including irrigation of cropland and urban green spaces, construction, and fire suppression. A discharge into an underground injection control (UIC) Class V well, such as for an aquifer recharge, also requires a Ground Water Discharge Permit.

Surface Water Quality

The NMED's Surface Water Quality Bureau is responsible for setting WQS (*see* 20.6.4 NMAC) based on designated uses of waterbodies across the state, as well as the monitoring and assessment of those surface waters. The Surface Water Bureau also oversees discharges to surface water and assists the EPA with the issuance of CWA National Pollutant Discharge Elimination System (NPDES) permits. The Surface Water Quality Bureau also performs antidegradation reviews and certifies that federally issued CWA NPDES permits adequately protect New Mexico's WQS.

New Mexico Office of the State Engineer

The New Mexico OSE (OSE) administers the state's water resources and has authority over the supervision, measurement, appropriation, and distribution of both surface and groundwater in New Mexico. New Mexico's water resources are administered under the Prior Appropriation Doctrine (*see* Article 16, Section 2 of the New Mexico State Constitution), where the user who first puts water to beneficial use becomes the senior water right owner to those who subsequently put water to beneficial use from the same source. In times of a shortage, a senior water right owner has priority over junior water right owners.

The OSE implements state statutes, rules and regulations governing the appropriation of groundwater (*see* NMSA 1978, Sections 72-12-1 through 28, and NMAC 19.27.1 through 39). However, permitting authority over the disposition of water produced or used in connection with the drilling or production of oil and natural gas is assigned to the OCD under NMSA 1978, Section 70-2-12(B)(15). NMSA 1978, Section 70-2-12.1 (passed in 2004), states that no permit from the OSE is required for the disposition of produced water. This clarifies that no water right is acquired through the disposition by use of produced water at any time, regardless of the type of use or whether the produced water is treated.

A former oil and natural gas well may be used for the diversion of water, assuming the well owner follows the applicable sections of NMSA 1978 (72-12-1 through 72-12-28). Specifically, if the well owner desires to use the former oil and natural gas well to appropriate any unappropriated water that does not meet the requirements of 72-12-25, they must file an application with the OSE (*see* NMSA 1978, Sections 72-12-1 through 72-12-3) and comply with any additional requirements of Sections 72-12-4 through 72-12-24. If

the well owner seeks to use a former oil and natural gas well to appropriate non-potable water from a deep saline aquifer that meets the requirement of 72-12-25, they must file, with the OSE, a Notice of Intent to drill or recomplete the well (*see* NMSA 1978, Section 72-12-26) and follow any additional requirements under NMSA 1978, Section 72-12-25 through 72-12-28.

Water appropriated from deep saline aquifers may be used in oil and natural gas drilling and for other uses. Deep saline aquifers containing non-potable water, for purposes of Section 72-12-25, are aquifers with a total dissolved solids concentration greater than 1,000 mg/L, typically found 2,500 feet or further below ground surface. The OSE may also require additional data to be filed for each well for appropriations from deep saline aquifers (*see* NMSA 1978, Section 72-12-27).

U.S. Environmental Protection Agency

The EPA's mission is to protect human health and the environment. Within New Mexico, the EPA directly implements the CWA regulations governing discharges to waters of the United States (in this report: "surface waters") in New Mexico. The EPA also oversees the state's implementation of the state's primacy program related to the underground injection of various fluids under the SDWA.

Clean Water Act and NPDES Permits

The CWA establishes the basic structure for regulating discharges into waters of the United States. Under the CWA, it is unlawful to discharge any pollutant from a point source into surface waters except as authorized by a NPDES permit (*see* CWA sections 301 and 402) or by certain other specified statutory provisions. The NPDES program aims to protect and restore the quality of water bodies (e.g., rivers, lakes and coastal waters) through permit requirements by monitoring and controlling pollutants discharged from point sources. The EPA's NPDES permit regulations require permittees to report compliance with NPDES permit limits via periodic Discharge Monitoring Reports submitted to the permitting authority. The EPA Regional Office in Dallas, Texas (EPA Region VI) is the permitting authority for New Mexico.

A NPDES permit must include technology-based effluent limitations (TBELs) and, if there is a reasonable potential to cause or contribute to an instream excursion above state WQS, additional water quality-based effluent limitations (WQBELs). Technology-based effluent limitations (also known as effluent guidelines and standards or ELGs) are nationally applicable standards for industrial categories, based on the performance of specified levels of treatment and control technologies. Where the EPA has not established ELGs for a particular industry, permitting authorities develop permit-specific technology-based requirements according to their best professional judgement (BPJ). Discharge permits to surface waters also include WQBELS which are permit specific, designed to protect the quality of the receiving surface water, and are defined by applicable state WQS. Discharges are also subject to NPDES regulations found in 40 CFR parts 122 through 125.

Based on the information available on the composition of produced water from the formations in New Mexico, the EPA anticipates that produced water discharged to surface water will likely require treatment before discharge.

Produced water in New Mexico usually contains elevated levels of TDS and other constituents (i.e., organic chemicals, inorganic chemicals, metals and possibly naturally occurring radioactive materials). Some of these constituents in produced water are potentially harmful to human health and the environment if released prior to treatment. Based on the information available on the composition of produced water from the formations in New Mexico, the EPA anticipates that produced water discharged to surface water will likely require treatment before discharge (as well as prior to the other uses described in Section 2 of this white paper). A NPDES permit is needed if produced water is treated and subsequently discharged to a surface water. Treated produced water that is used in a specific application, such as irrigation by the agricultural industry, without discharge to surface water is unlikely to need a NPDES permit but is likely to require an NMED Ground Water Discharge Permit as previously discussed. Similarly, treated (or untreated) produced water that is used within the oilfield, such as for EOR or re-use in fracturing another well, does not need an NPDES permit nor would it require an OCD or NMED permit. However, such uses may require a SDWA Class II Underground Injection Control permit, as described below.

Safe Drinking Water Act and Underground Injection Control Regulations

The SDWA is the main federal law that protects drinking water supplies in the United States (*see* 42 U.S.C. § 300f et seq., 2006). This law authorizes the EPA to establish minimum standards and requirements to protect public water supplies and underground sources of drinking water (USDWs). Through the SDWA, the EPA has established minimum standards to protect USDWs from the underground injection of fluids, including produced water. The UIC regulations protect USDWs by regulating the construction, operation and maintenance, and closure of injection wells.

The UIC regulations establish six classes of injection wells, each based on the fluid type, the depth of the injection activity, and the risk potential for the injection activity to result in the endangerment of a USDW.

- Class I wells manage radioactive waste or hazardous and nonhazardous industrial waste and municipal waste, and they must inject below the lowermost USDW.
- Class II wells are used to manage fluids associated with oil and natural gas production. As well as being used to manage and dispose of produced water, Class II wells are used to inject fluids for enhanced recovery of oil or natural gas or liquid hydrocarbon storage.
- Class III wells inject fluids for extraction of minerals.
- Class IV wells inject hazardous or radioactive fluid into or above USDWs. They are prohibited unless they are a part of a cleanup action approved per the Comprehensive Environmental Response, Compensation, and Liability Act or the Resource Conservation and Recovery Act (RCRA).
- Class V wells are those wells that are not captured in the definitions of Classes I, II, III, IV, or VI. They can include wells used for aquifer recharge, agricultural drainage or large capacity septic systems.
- Class VI injection wells are used for the geologic sequestration of carbon dioxide.

The SDWA gives states and tribes a path to apply for and receive EPA approval to administer the UIC program. Once the EPA approves its UIC regulations, a state, tribe or territory is said to have primary enforcement authority, or primacy. The effective date of New Mexico's primacy for the management of UIC Class II wells was March 7, 1982 (*see* 40 CFR part 147.1600). The OCD administers the UIC Class II injection well program in New Mexico, except on Indian lands. The state's authority for the UIC Class II program is found in the New Mexico Oil and Gas Act (*see* NMSA 1978, Section 70-2-12(B)) and the regulations of the OCD (*see* 19.15.26 NMAC). UIC Class II wells are designated specifically for management

of fluids associated with oil and gas production. These wells have specific construction requirements and are used for enhanced recovery, disposal or hydrocarbon storage.

The State of New Mexico also has primacy for UIC Class I, III, IV and V wells, except on Indian lands. The effective date of New Mexico's primacy for these well classes was August 10, 1983 (*see* 40 CFR part 147.1601). The state's authority for Class I, III, IV and V wells is found in the Water Quality Act (*see* NMSA 1978, Section 74-6-4) and the regulations of the WQCC, which are administered by the OCD and NMED (*see* 20.6.2 NMAC).

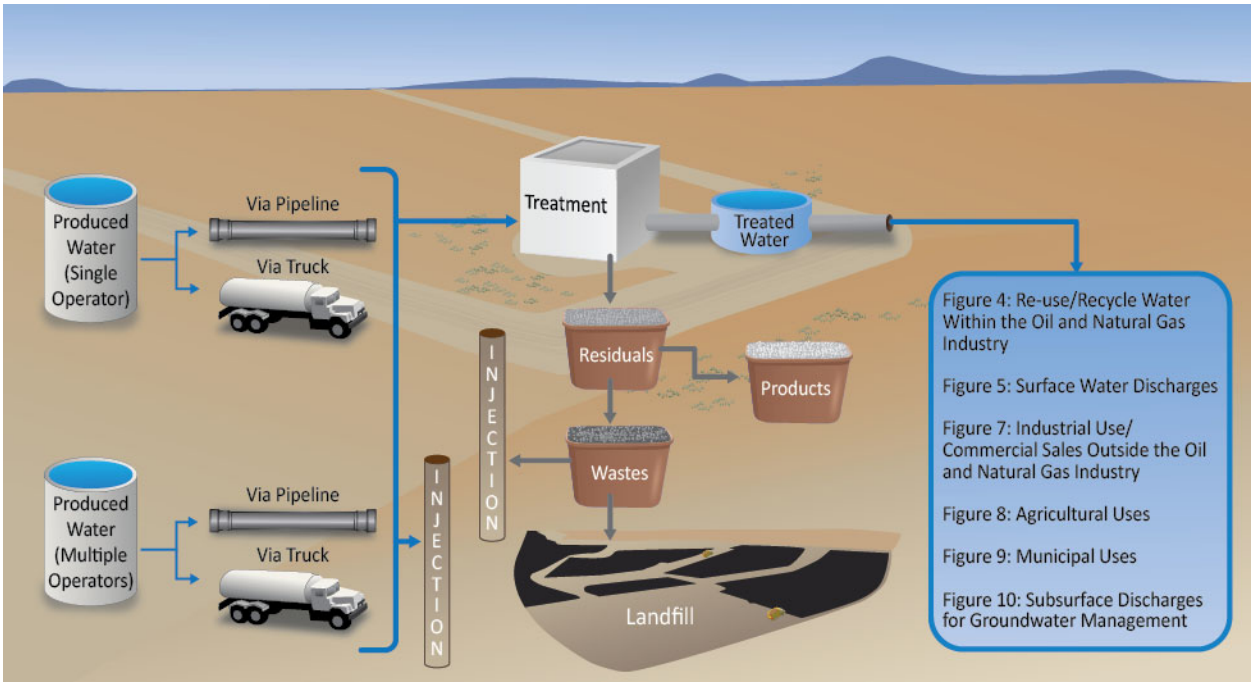
Section 2: Re-Use, Recycling and Renewable Water Scenarios

This section presents several scenarios that illustrate opportunities for re-used, recycled and renewable water in New Mexico. Discussion focuses on produced water as it leaves its point of generation, is treated, and is then reused either within or outside the oil and natural gas industry. A secondary focus is related to the products, residuals and wastes resulting from produced water treatment. Figure 3 shows all five re-use, recycling and renewable water scenarios; following is a more focused discussion of each scenario.

For this white paper, re-use, recycling and renewable water are generally defined as follows:

- *Re-use water* is any fluid that is generated from an oil and natural gas well, undergoes minimal treatment, and is used again in an oil or natural gas well before disposal in an underground injection well.
- *Recycled water* is any water that is generated from an oil or natural gas well, undergoes significant treatment, and is used again in an oil or natural gas well before disposal in an underground injection well.
- *Renewable water* is fluid that is generated from an oil or natural gas well that undergoes significant treatment and is used outside the oil and natural gas industry and is added to the hydrologic cycle, as opposed to disposed of in an underground injection well.

Figure 3: Re-use, Recycling and Renewable Water Scenarios



Discussion

The OCD regulates the transportation, recycling, re-use, treatment and disposal of produced water in connection with the development or production of oil or natural gas (*see* Title 19, Chapter 15, Part 34 NMAC).[4] Regarding the disposal of produced water, this includes underground injection, disposition for re-

[4] The OCD also regulates the transportation of drilling fluids and liquid oil field waste (*see* Part 34 NMAC).

use in oil and natural gas production and associated activities, or transport to a treatment facility where the treated water is intended for use outside of oil and natural gas production activities.

Transportation

As Figure 3 shows, produced water is transported from an oil and natural gas storage tank to either a UIC Class II disposal well or a produced water treatment facility. The owner/operator of the produced water cannot transport produced water, drilling fluids or other liquid oilfield wastes via truck/vehicle without an approved Form C-133 (*see* 19.15.34.17.A NMAC). An approved transporter must transport and dispose of produced water in compliance with 19.15.34.20 NMAC, which generally prohibits transport or disposal in a manner that would present a risk to fresh water, public health or the environment. The owner/operator of the produced water need not acquire its own approved form C-133; it may employ a transportation company that is operating under an approved Form C-133. (*See* 19.15.34.18 NMAC for the detailed criteria pertaining to C-133 approval/denial.)

Movement of produced water via pipeline is not contemplated by Form C-133 or otherwise regulated by the OCD, unless produced water is released on state or private land, at which point the OCD assumes regulatory jurisdiction over the release under 19.15.29 NMAC. Regulation of pipeline transport of produced water falls under varying jurisdictions depending on surface ownership—i.e., private land owners; federal surface owners, which can include the Bureau of Land Management, U.S. Forest Service, National Park Service, Bureau of Reclamation, etc.; and state surface owners, which can include the New Mexico State Land Office, the New Mexico Game and Fish Department, New Mexico State Parks Division, New Mexico Department of Transportation, etc.

Recycling, Re-use and Treatment

To help conserve water resources, the OCD encourages the recycling, re-use, and responsible disposition of produced water. Per state statute, the OCD oversees the direct surface or subsurface disposal of produced water, including disposition by use, in a manner that affords reasonable protection against contamination of fresh water supplies (*see* NMSA 1978 Section 70-2-12(B)(15)).

The New Mexico Oil and Gas Act designates the OCD as the primary regulatory authority in New Mexico over the use and disposal of produced water.

The OCD encourages recycling and re-use of produced water within oil and natural gas production and associated activities by specifically exempting from permitting the disposition of produced water for use in "drilling, completion, producing, secondary recovery, pressure maintenance or plugging of wells" (*see* 19.15.34 NMAC).[5] The New Mexico Oil and Gas Act designates the OCD as the primary regulatory authority in New Mexico over the use and disposal of produced water.

In an effort to conserve water resources and incentivize the recycling and re-use of produced water in the oil and natural gas industry, the OCD Director issued a notice in 2013 that further clarifies when permits are needed for the re-use of produced water. The notice states:

[5] This exemption applies only with respect to state permitting requirements for water usage; it does not provide an exemption to applicable SDWA UIC requirements for the underground injection of produced water.

> "No OCD permit or authorization is required for the re-use of produced water, drilling fluids or other oil field liquids as a drilling or completion fluid or other type of oil field fluid, including makeup water, fracturing fluid or drilling mud, at a permitted drilling, production or plugging operation. However, the re-use of produced water is NOT permitted for any use which involves contact with fresh water zones. No permit is required for the delivery of produced water to permitted salt-water disposal facilities, secondary recovery, pressure maintenance or EOR projects, surface waste management facilities, or to well sites for use in drilling, completion, or plugging operations. Produced water must be stored and re-used in a manner that protects fresh water, public health, and the environment. Produced water, brine makeup water, or frac flowback water can be stored in permanent pits or in temporary multi-well fluid management pits when used only on wells identified in the multi-well fluid management pit permit."

The disposition by use of produced water outside the oil and natural gas industry requires prior approval from the OCD.

The OCD promulgated rules addressing produced water recycling, re-use, transportation, and disposal (*see* 19.15.34 NMAC). These rules contain provisions that encourage more produced water re-use and recycling. Specifically, the OCD does not require a permit or registration for the disposition of produced water by use for drilling, completion, producing, secondary recovery, pressure maintenance or plugging of wells (*see* 19.15.34.8.A(1) NMAC).[6] The disposition by use of produced water outside of the oil and natural gas industry requires prior approval from the OCD (*see* 19.15.34.8.A(2) NMAC), and also requires approval from the NMED or the EPA if the use includes a potential discharge to ground or surface waters.

Under state law, a produced water recycling facility must register with the OCD or obtain a permit, depending on the physical makeup of the facility (*see* 19.15.34.9 NMAC). State law identifies seven types of recycling facilities that need only to register with the OCD. It is possible to simplify the universe of facilities requiring only a registration as those facilities that do not use "recycling containment" (*See* 19.15.34.9.B NMAC).

State law defines "recycling containment" as "a storage containment which incorporates a synthetic liner as the primary and secondary containment device and is used solely in conjunction with a recycling facility for the storage, treatment or recycling of produced water only for the purpose of drilling, completion, production or plugging of wells used in connection with the development of oil or gas or both" (*see* 19.15.34.7.B NMAC).

[6] This exemption applies only with respect to state permitting requirements for water usage; it does not provide an exemption to applicable SDWA UIC requirements for the underground injection of produced water.

Practically speaking, at this point there is a jurisdictional handoff of produced water from the OCD to the NMED and/or the EPA.

Beyond produced water disposition by use within oil and natural gas operations, the OCD's jurisdiction ceases at the point where produced water is transferred to a treatment/recycling facility (*see* 19.15.34 NMAC). The OCD requires that any disposition by use (beyond a use within the oil and natural gas sector) obtain "prior approval by the appropriate division district office on Form C-147" and that "[a]pproval requirements will be determined by the district office based upon the proposed use" (*see* 19.15.34.8.A(2) NMAC). The OCD approves disposition by use of produced water upon the registration of the treatment facility with the OCD *and* upon a demonstration that the owner/operator of the produced water treatment facility obtained the necessary authorizations from the NMED and/or the EPA. Practically speaking, at this point there is a jurisdictional handoff of produced water from the OCD to the NMED and/or the EPA.[7]

The terms "treatment" and "recycling facility" are defined as follows (*see* 19.15.34 NMAC):

- Treatment: "the reconditioning of produced water to a reusable form and may include mechanical and chemical processes."
- Recycling facility: "a stationary or portable facility used exclusively for the treatment, re-use or recycling of produced water intended for disposition by use…"

The OCD requires that a recycling facility that is not part of a permitted operation for the drilling, completing, producing or plugging of oil and natural gas wells, be *registered* or *permitted* (*see* 19.15.34 NMAC). OCD Form C-147 is used for both registration and permitting. A difference between registration and permitting is as follows.

Registration is required for the circumstances listed below and is completed using the C-147 "Short" Form (*see* 19.15.34.9.B NMAC):

1. when the recycling facility is an addition to a surface waste management facility permitted under 19.15.36 NMAC;
2. when the recycling facility is an addition to the secondary recovery of oil and natural gas, EOR of oil and natural gas, or pressure maintenance projects permitted under 19.15.26 NMAC;
3. when the recycling facility is an addition to a salt water disposal well permitted under 19.15.26 NMAC;
4. when the recycling facility is an addition to pits permitted or below-grade tanks registered in accordance with 19.15.17 NMAC;
5. when the recycling facility is used with a closed loop system that only delivers fluid for drilling or completion purposes;

[7] No NPDES permit is required from EPA prior to sending produced water to a treatment/recycling facility, as long as there is no discharge to surface waters.

6. when the recycling facility is used with dedicated above-ground, unlined, hard-sided tanks used in accordance with the manufacturer's standards that are externally visually inspected weekly when holding fluids and a log is kept of the inspections made available to the division upon request; or
7. When the recycling facility is used with a recycling containment registered in accordance with 19.15.34 NMAC.

Any recycling operation not listed in 1–7 above, or any case in which the treated produced water is intended for use outside oil and natural gas operations, must be permitted using C-147 "Long" Form. In such instances, the OCD recognizes that authorization from the relevant governing entity (or entities) is required (*see* 19.15.34.9 NMAC).

Containment/Impoundments

When not related to oil and natural gas production, the storage of produced water, treated or untreated, in an impoundment may require a Ground Water Discharge Permit from the NMED, because the impoundment may result in a discharge (*see* 20.6.2.3104 NMAC). Such a permit would impose liner construction and maintenance requirements, sampling of the impounded fluid, and other necessary requirements. The requirement for a Ground Water Discharge Permit does not generally apply to an above-ground storage tank. Additionally, the OSE may require a permit for impoundments that involve dams over a certain height or storage capacity, pursuant to NMSA § 72-5-32.

As discussed above, the OCD regulates "recycling containments," defined as "a storage containment which incorporates a synthetic liner as the primary and secondary containment device and is used solely in conjunction with a recycling facility for the storage, treatment or recycling of produced water only for the purpose of drilling, completion, production or plugging of wells used in connection with the development of oil or gas or both" (*see* 19.15.34 NMAC). The definition makes clear that the only type of containment that the OCD regulation applies to is a containment that stores produced water intended to be disposed of by re-use in oil and natural gas production and associated activities. The regulation is not applicable to containments that store produced water where the water is intended to be treated and used in non–oil and natural gas applications.

All recycling containments must be sited per OCD requirements and shall not be located where there is a risk of surface water or groundwater contamination (*see* 19.15.34.11 NMAC). They must meet all operational requirements and inspections (*see* 19.15.34.13 NMAC). They must also adhere to financial assurance requirements (*see* 19.15.34.15 NMAC). As noted above, because the definition of recycling containment at 19.15.34.7.B is limited to containments holding water intended to be re-used in oil and natural gas operations, the financial assurance requirements do not extend to containments that store produced water intended for other uses.

Disposal

Currently there are two main pathways for managing produced water in New Mexico: 1) the use of Class II injection wells, and 2) recycling/re-use within the oil and natural gas industry. The former was the most common approach historically. It still is, but in recent years produced water recycling and re-use have grown in technical feasibility within the oil and natural gas industry. Produced water is now used for drilling, drilling muds, mixing of hydraulic fracturing fluids, cementing, workovers, secondary recovery, pressure maintenance, EOR in waterfloods and plugging operations.

The UIC Class II injection program is a vital part of managing produced water within the state. The OCD has primary enforcement authority for the Class II UIC program (oil and natural gas–related wells), which is regulated under the New Mexico Oil and Gas Act. Class II wells are used for both disposal and enhanced recovery.

The OCD regulates the disposal of produced water via injection into Class II wells (*see* 19.15.26 NMAC). The OCD requires that an owner/operator of a Class II well obtain a permit before injecting any gas or fluid, whether for enhanced recovery or disposal (*see* 19.15.26.8 NMAC). An application to inject is made using OCD Form C-108 complete with attachments. The permit may be granted administratively when the water to be disposed of is unfit for domestic, stock, irrigation or other general uses; the receiving formation is older than Triassic; and there is no objection to the application. If these criteria are not met or if the receiving zone contains water with 10,000 mg/L TDS or less, then the application for permit to inject requires both notice and a hearing (*see* 19.15.26.8.E NMAC).

Ensuring proper characterization of materials entering produced water treatment/recycling facilities is important, as RCRA hazardous wastes are not permitted for management in Class II injection wells.

The treatment/recycling of produced water may result in a residual effluent stream, as Figure 3 shows. This stream may be disposed of by injection. If the wastewater stream entering the treatment facility originates entirely from oil and natural gas production and associated activity, the effluent associated with the treatment/recycling can be managed using Class II wells, as illustrated in Figure 4. However, if the waste water stream is mixed with other non–oil and natural gas fluids, the effluent associated with the produced water treatment/recycling facility may be managed using Class I injection wells or Class II enhanced recovery wells. Ensuring proper characterization of materials entering produced water treatment/recycling facilities is important, as RCRA hazardous wastes are not permitted in Class II injection wells.

The disposal of sludge produced by the treatment/recycling facility also falls under the jurisdiction of the OCD, which regulates the disposal of oilfield wastes (*see* 19.15.35 and 19.15.36 NMAC). The OCD regulations authorize the disposal of certain oilfield wastes at a solid waste facility without the OCD's prior approval and without testing (*see* 19.15.35.8.C(1) NMAC). Prior authorization and testing are both required before this disposal (*see* 19.15.35.8.C(2) and (3) NMAC). Part 36 regulates surface waste management facilities.

If the influent into the treatment/recycling facility does not consist solely of produced water, however, the sludge may fall under the jurisdiction of the NMED's Solid Waste Bureau—not the OCD. Such a sludge produced by this treatment/recycling facility, if a non-hazardous waste, may be considered a "special waste" under the New Mexico Solid Waste Rules (*see* 20.9.2.7.S(7) and (13) NMAC). As such it must be disposed of at a solid waste facility authorized to accept special waste (*see* 20.9.8.9 NMAC), and it may only be transported by a registered hauler (*see* 20.9.3.31 NMAC).

Products

In New Mexico, the treatment of produced water for use outside the oil and natural gas industry will likely result in various commodity products for sale in interstate commerce. These products may include rare

earth metals, various salts, heavy brines, etc. Some of them may be commodity feedstocks for other industries, while others may have more direct use in commercial or residential applications.

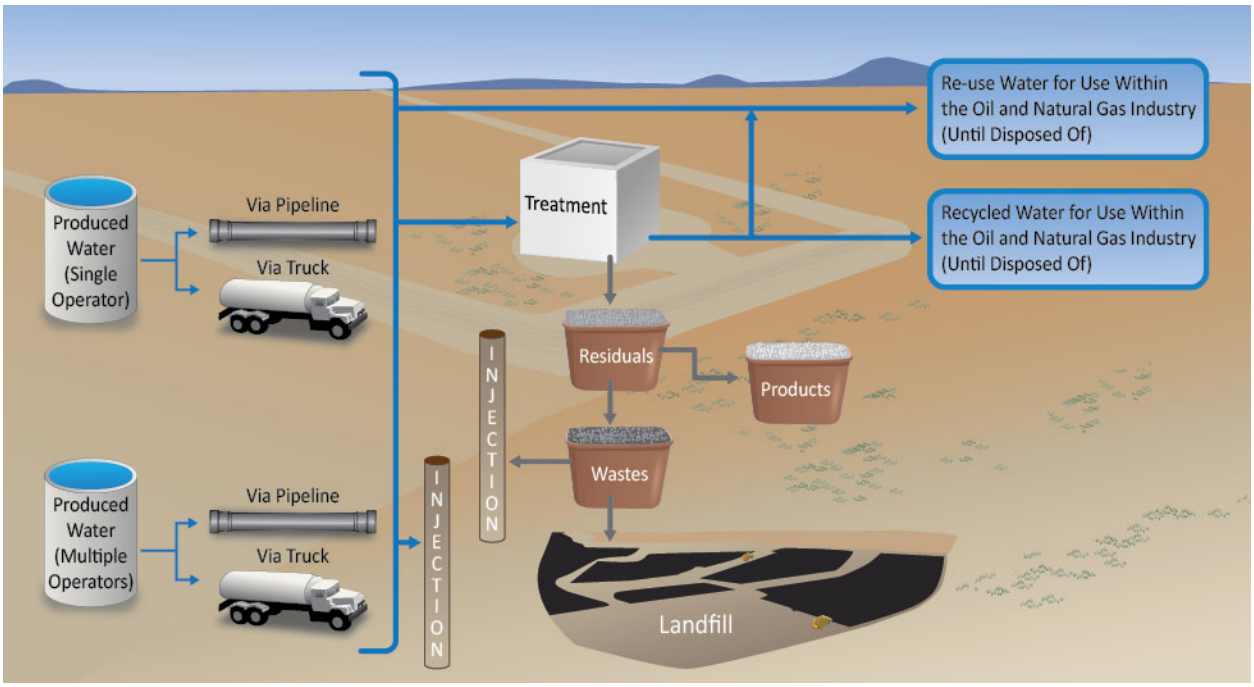
Water Rights

Generally, all disposition of produced water, including disposition by use, does not require OSE permitting and a water right is not developed by the re-use. To develop a water right, one must apply to the OSE for a permit to appropriate water (*see* NMSA §72-12-2 or NMSA 72-12-25 through §72-12-28).

Re-Use/Recycle Water Within the Oil and Natural Gas Industry

Figure 4 depicts produced water re-use and/or recycling for use in the oil and natural gas industry. In this scenario, produced water is generated from E&P activities.

Figure 4: Re-use/Recycle Water Within the Oil and Natural Gas Industry



Discussion

In this scenario, produced water is managed in storage vessels and piped or trucked to either a treatment plant or a UIC Class II injection well. The OCD regulates produced water at this stage, as there is no discharge to surface waters that would require an NPDES permit. The produced water entering the treatment plant undergoes the necessary treatment to ensure the quality of the effluent is sufficient for the desired use or application. In this case, the treated produced water is re-used or recycled for use in the oil and natural gas industry, so the OCD, not the NMED, regulates the treatment plant.

The residuals are those materials that are generated from the treatment process. The residuals may be a commodity product sold to another party. Generally speaking, the OCD, the NMED and the EPA do not regulate products. Wastes from such a process are managed in the appropriate UIC injection well or otherwise disposed of as oilfield wastes regulated by the OCD.

Current industry practices in New Mexico include re-use and recycling of produced water in oil and natural gas activities such as: drilling, drilling muds, mixing of hydraulic fracturing fluids, cementing, workovers, secondary recovery, pressure maintenance, EOR in waterfloods and plugging operations.

The intended end use dictates the quality of the treated produced water and therefore the treatment itself.

In some cases, produced water must be treated to ensure that it is compatible with the use of water in the proposed application. (For example, it may need to be treated before a formation is hydraulically fractured.) In other applications, produced water may need to be treated to ensure it is compatible with the formation water when used for pressure maintenance and in EOR operations. In still other re-use and recycling cases, the produced water is already compatible with water for the intended purpose, and there is no need to treat the produced water. The intended end use dictates the quality of the treated produced water and therefore the treatment itself. This concept of ensuring "fit for purpose" applies to all proposed treated produced water uses.

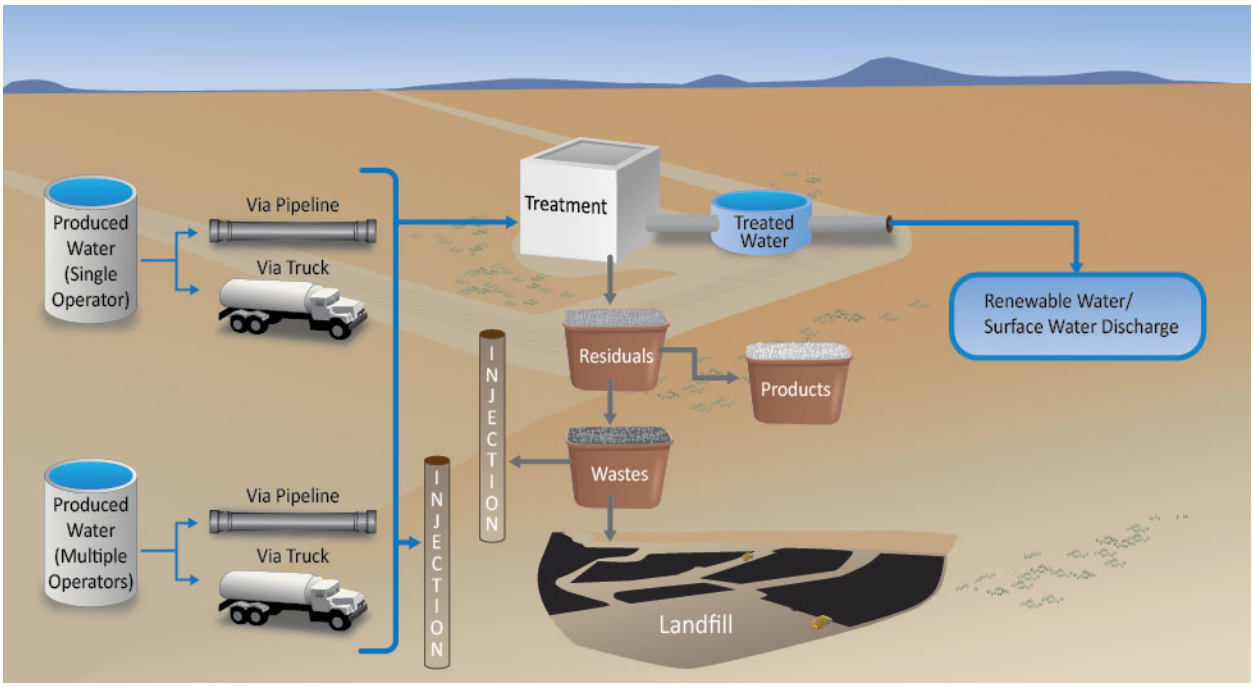
As previously discussed, the OCD encourages the re-use of produced water by eliminating permitting or registration requirements for the disposition by use of produced water for drilling, completion, producing, secondary recovery, pressure maintenance or plugging of wells (See 19.15.34 NMAC). In any one of these disposition by use activities, the only permit necessary for the re-use of produced water is the OCD permit required to drill, complete, produce, or plug the well. Provided there is no disposition by use outside of the oilfield and no discharge to surface waters, the treated produced water is not subject to the EPA and the NMED permitting requirements.[8] Therefore, the primary regulatory agency governing the scenario illustrated in Figure 4 is the OCD.

[8] Treated produced water is not subject to CWA NPDES permitting requirements but its use may still be subject to SDWA UIC permitting requirements.

Surface Water Discharges

Figure 5 depicts treated produced water discharged to surface waters.

Figure 5: Surface Water Discharges



Discussion

In this scenario, produced water is managed in storage vessels and piped or trucked to either a treatment plant or a UIC Class II injection well. The OCD regulates produced water at this stage, as there is no discharge to surface waters that would require an NPDES permit. Upon disposition by use to the treatment plant, the OCD regulation of the produced water ends. In addition, the NMED may exercise jurisdiction through the requirement of a Ground Water Discharge Permit related to the storage of influent and effluent waters. Produced water entering the treatment plant undergoes the necessary treatment to ensure the quality of the effluent is sufficient for the desired use or application. In this case, the treated produced water is discharged to a surface water. While the quality of the effluent is regulated by the EPA, the receiving water body's water quality is established by the NMED through its EPA-approved WQS, which is reflected in the NPDES permit. Additionally, the OSE regulates water quantity in New Mexico; therefore, once water is discharged into a New Mexico surface water, a permit is required from the OSE to appropriate and divert that water from that surface water.

The residuals are those materials that are generated from the treatment process. The residuals may be a commodity product sold to another party. Generally speaking, the OCD, the NMED and the EPA do not regulate products. Wastes from such a process are managed in the appropriate UIC injection well or otherwise disposed of as oilfield wastes regulated by the OCD.

As previously stated, where treated produced water is intended for discharge to surface waters, the entity that plans to discharge the treated produced water to the surface waters is required to obtain a NPDES permit. Currently, the EPA issues such permits in New Mexico. Given the information available to the EPA on the composition of produced water from formations in New Mexico, the EPA anticipates that produced

water discharged to surface water will require treatment prior to discharge, in order to meet technology-based and/or water-quality-based requirements. As the permitting authority, the EPA is unlikely to permit untreated produced water discharges to surface waters in New Mexico. Further, under existing law, there are limited options for obtaining such a permit (discussed below).

A NPDES permit must include TBELs and additional WQBELs. For oil and natural gas produced water discharges to surface waters, the source of TBELs is found in 40 CFR parts 435 or 437. See Table 1.

Table 1: On-Shore Oil and Natural Gas Wastewater (Except Coalbed Methane)

Discharging Facility	Surface Discharge Purpose	Applicable ELGs	TBELs
On-shore oil and natural gas extraction facility	General discharge	40 CFR part 435, subpart C	No discharge of pollutants to surface waters
On-shore oil and natural gas extraction facility	West of the 98th meridian for specific uses in livestock or wildlife watering	40 CFR part 435, subpart E	Must be of good enough quality; also, daily maximum effluent limit for oil and grease of 35 mg/L
Stripper wells	General discharge	40 CFR part 435, subpart F	No specified limitations; TBELs developed by permitting authority on a BPJ basis
Coalbed methane (CBM) extraction facility	General discharge	40 CFR part 435, subpart H	No specified limitations; TBELs developed by permitting authority on a BPJ basis
Centralized waste treatment (CWT) facility	N/A	40 CFR part 437	For specific pollutant and limitations, see 40 CFR part 437

As Table 1 indicates, there are five applicable ELGs related to the treatment and discharge of produced water.

- The first ELG, 40 CFR part 435, subpart C, bans the discharge of oil and natural gas pollutants to surface water. Oil and natural gas operators typically meet this "zero-discharge requirement" by managing produced water through the use of UIC wells, re-use or recycling within the oilfield, or sending the produced water to privately owned treatment facilities known as CWT facilities (discussed below).
- The second ELG listed in Table 1, 40 CFR part 435, subpart E allows for the discharge of produced water for agricultural and wildlife water but only applies to those onshore facilities located in the continental United States and west of the 98th meridian. It requires that the produced water be of good enough quality to be used for wildlife or livestock watering or agricultural uses and that the discharge be put to such uses and includes a limitation for oil and grease. As previously stated, the quality of the produced water generated from oil and natural gas formations in New Mexico is unlikely to meet this standard without treatment.
- The third ELG listed in Table 1, 40 CFR part 435, subpart F, allows for the discharge of produced water from stripper wells. Stripper wells are limited to crude oil wells producing 10 barrels per well per calendar day or less of crude oil. Natural gas wells are not included and stripper wells cannot produce more than 15,000 cubic feet of gas per 1 barrel of oil. The regulation does not specify

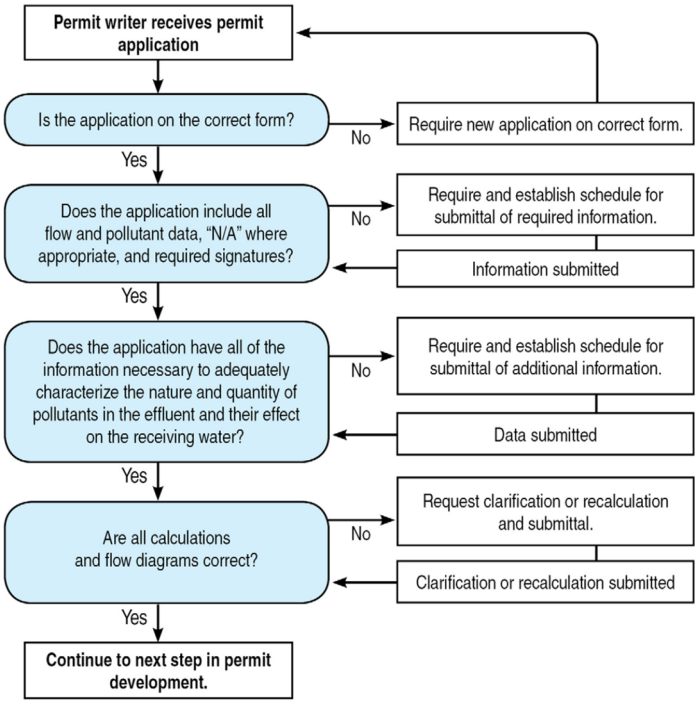
discharge requirements, so TBELs must be developed by the permitting authority using BPJ based on the factors specified in 40 CFR 125.3(c)(2).

- The fourth ELG listed in Table 1, 40 CFR part 435, subpart H, allows for the discharge of produced water from CBM extraction. The regulation does not specify discharge requirements, so TBELs must be developed by the permitting authority using BPJ based on the factors specified in 40 CFR 125.3(c)(2).
- The fifth ELG listed in Table 1, 40 CFR part 437, allows for a privately owned CWT facility to treat and discharge wastewater generated off-site, including produced water. 40 CFR part 437 contains numerical discharge standards for discharges to surface waters and POTWs from such facilities.

The first step in pursuing a NPDES permit from the EPA is to complete an application. Through the application and development process, the EPA gains an understanding of the proposed discharge and effluent characteristics—necessary to develop appropriate permit limitations and conditions. Concurrently, the NMED Surface Water Quality Bureau should be consulted in accordance with the antidegradation requirements of the CWA (*see* 20.6.4.8 NMAC). This process will help to inform any potential WQBELs, discussed below.

The EPA's regulations require that such applications be submitted at least 180 days in advance of the date on which the discharge is planned to commence. At a minimum, the owner/operator of the proposed treatment facility must submit a Form 1 and either Form 2C or 2E. Form 1 requests general information on the applicant such as name, address, and contact information. Form 2C/E requests information related to the discharge such as outfall location, treatment technologies, discharge water characteristics, etc. After the application is submitted, the EPA will determine the completeness of the application. Figure 6 provides a schematic of the NPDES permit application review process.

Figure 6: NPDES Permit Application Flowchart



Following submission of a complete NPDES permit application, permit conditions are based on the applicable technology standard (in this case, 40 CFR part 435 or part 437) and the WQS for the receiving water body. The limitations derived from technology standards are TBELs; those from WQS are WQBELs. For surface discharges of treated produced water, the TBELs will vary depending on the applicant and the nature of the discharge. These differences can be significant, so it is important for the owner/operator of the produced water treatment facility to understand the applicable requirements as described above and outlined in Table 1.[9]

Next, the EPA considers the impact of the proposed discharge on the quality of the specified receiving water to ensure that any discharge will be protective of New Mexico's WQS. If the EPA finds TBELs alone are insufficient to achieve each applicable WQS, the EPA then develops WQBELs. The derived TBELs and WQBELs form the permit conditions. It is possible that a permit will have technology-based limitations for some parameters and water-quality-based limitations for others. The EPA also develops appropriate monitoring and reporting requirements and facility-specific special conditions. The EPA also develops appropriate monitoring and reporting requirements, addresses facility-specific special conditions, and includes standard conditions that are the same for all permits.

Since the EPA issues NPDES permits for New Mexico, it must consider other federal laws, in addition to the CWA, during the NPDES permit application process. These include the Endangered Species Act, the National Environmental Policy Act, and the National Historic Preservation Act. For more information on these other federal laws that may be applicable to NPDES permits issued in New Mexico, see Chapter 11 of the *NPDES Permit Writers' Manual*.

Once a draft permit is developed, the EPA solicits public comment on it and offers the ability to request a public hearing on the draft permit. Furthermore, since EPA Region VI is the NPDES permitting authority in New Mexico, the State of New Mexico must certify that the EPA-developed permit complies with its WQS. The certification is provided by the NMED pursuant to Section 401 of the CWA. After taking public comments into consideration and addressing any state certification requirements, the EPA will grant or deny the NPDES permit to the applicant. Most NPDES permits typically are issued for a period of five years, with a requirement to reapply for the permit 180 days before the expiration date.

While not shown in Figure 3 ("Re-use, Recycling and Renewable Water Scenarios") and 5 ("Surface Water Discharges"), indirect discharges to POTWs are also subject to categorical pretreatment standards in 40 CFR part 435 or 437. The categorical pretreatment standard in 40 CFR part 435, Subpart C, prohibits sending produced water from unconventional oil and natural gas[10] operations to POTWs, although no such categorical prohibition applies with respect to conventional oil and natural gas produced water. Indirect discharges of produced water are also subject to the General Pretreatment Regulations (*see* 40 CFR part 403) in addition to the requirements of 40 CFR part 435.

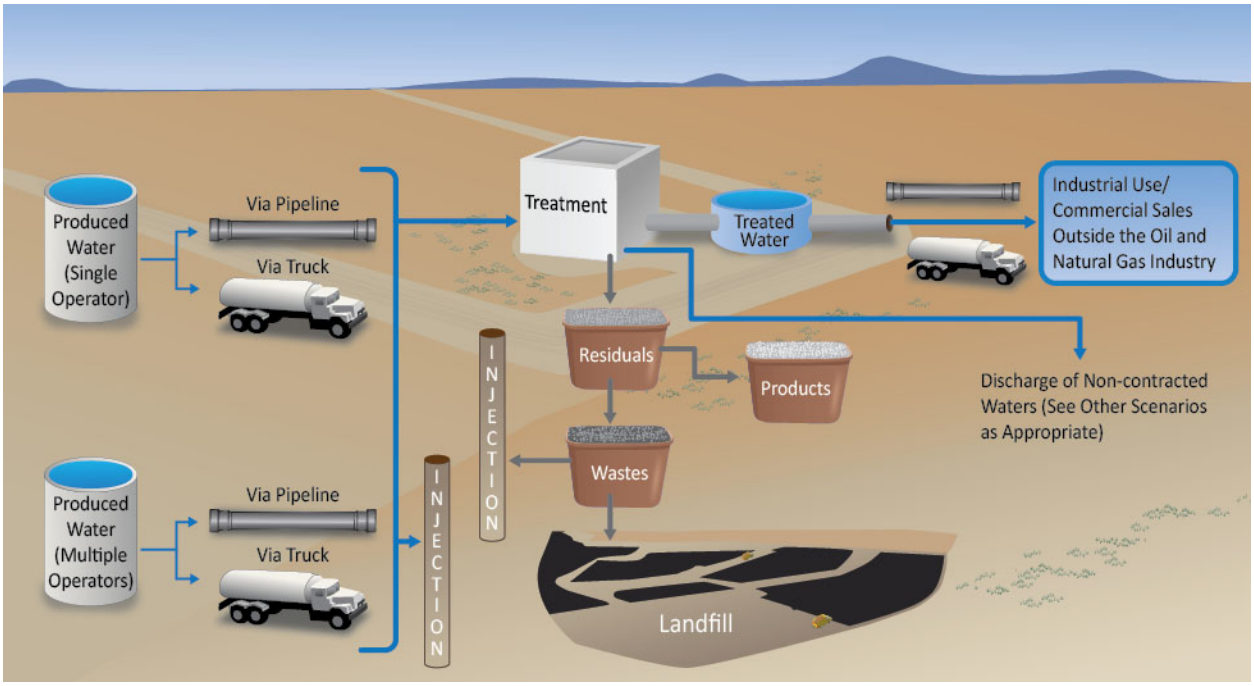
[9] As described in Section 1, the EPA determines technology-based requirements for discharges from CBM extraction or onshore oil extraction from stripper wells using BPJ. For more information, see Chapter 5 of the *NPDES Permit Writer's Manual.*

[10] For purposes of the categorical pretreatment standard, "unconventional oil and gas" means "crude oil and natural gas produced by a well drilled into a shale or tight formation…"

Industrial Use/Commercial Sales Outside the Oil and Natural Gas Industry

Figure 7 depicts treated produced water sales for industrial/commercial use outside of the oil and natural gas industry.

Figure 7: Industrial Use/Commercial Sales Outside the Oil and Natural Gas Industry



Discussion

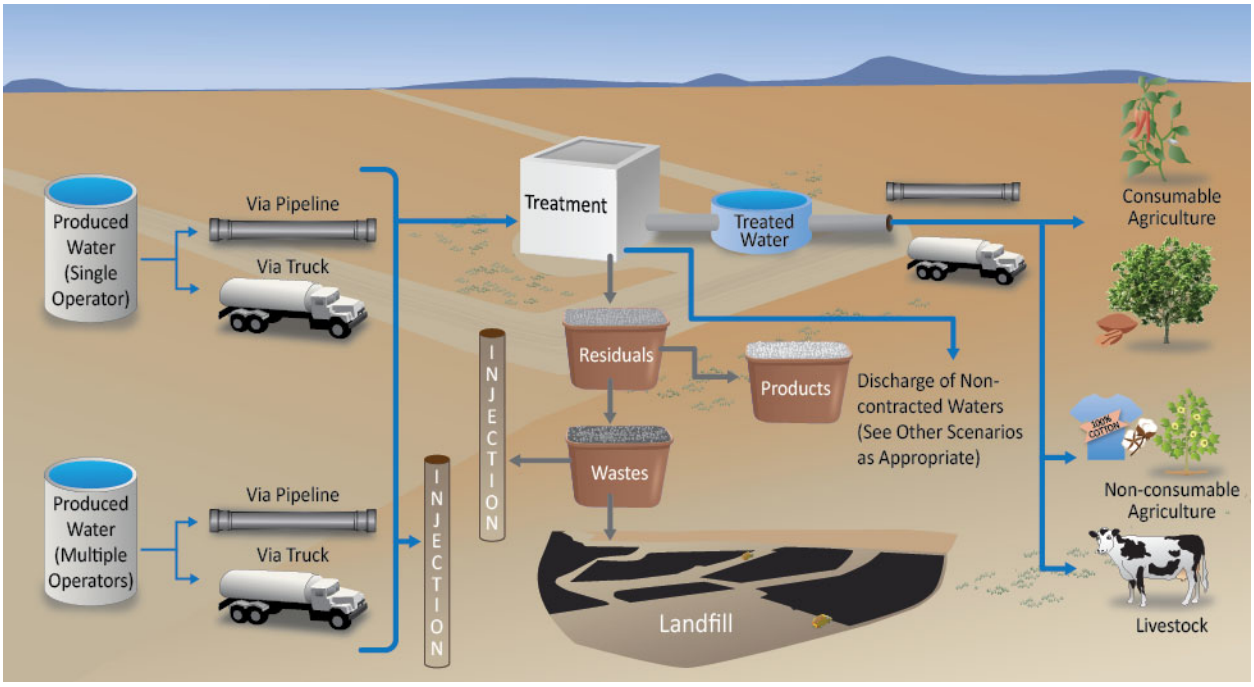
In this scenario, produced water is managed in storage vessels and piped or trucked to either a treatment plant or a UIC Class II injection well. The OCD regulates produced water at this stage, as there is no discharge to surface waters. Upon disposition by use to the treatment plant, the OCD regulatory jurisdiction over the produced water ends. The NMED may require a Ground Water Discharge Permit for the treatment facility if onsite impoundments or stockpiled materials could result in a discharge of water contaminants to the subsurface. Produced water entering the treatment plant undergoes the necessary treatment to ensure the quality of the effluent is sufficient for the desired use or application. In this example, the treated produced water is sold to industrial/commercial users outside the oil and natural gas industry. Given that there are no surface water discharges from the treatment facility, the facility is not subject to EPA NPDES permit requirements. The quality of the effluent is likely dictated by the industrial/commercial user specifications and possibly other government agencies.

The residuals are those materials that are generated from the treatment process. The residuals may be a commodity product sold to another party. Generally speaking, the OCD, the NMED and the EPA do not regulate products. Wastes from such a process are managed in the appropriate UIC injection well or otherwise disposed of as oilfield wastes regulated by the OCD.

Agricultural Uses

Figure 8 depicts the use of treated produced water for an agricultural purpose, such as irrigation of crops, washdown of an agricultural facility, processing of an agricultural product, or livestock watering (herein collectively referred to as “agricultural uses”).

Figure 8: Agricultural Uses



Discussion

In this scenario, produced water is managed in storage vessels and piped or trucked to either a treatment plant or a UIC Class II injection well. The OCD regulates produced water at this stage, as there is no discharge to surface water. Upon disposition by use to the treatment plant, the OCD regulation of the produced water ends, and the NMED regulation begins. Produced water entering the treatment plant undergoes the necessary treatment to ensure the quality of the effluent is sufficient for the desired use or application. In this case, the water is treated for an agricultural use. As with industrial use/commercial sales outside the oil and natural gas industry, the quality of the water may be dictated by industry standards and/or a federal or state agency other than the EPA or the NMED. The quality of the treated water may also be regulated by a Ground Water Discharge Permit if used for irrigation or another agricultural use that could affect groundwater quality. Use of the treated produced water does not require a permit from the OSE. However, a permit to appropriate treated produced water that has been returned to the public waters would require a permit from the OSE.

The residuals are those materials that are generated from the treatment process. The residuals may be a commodity product sold to another party. Generally speaking, the OCD, the NMED and the EPA do not

regulate products. Wastes from such a process are managed in the appropriate UIC injection well or otherwise disposed of as oilfield wastes regulated by the OCD.

To ensure that the treated water meets the specifications of the agricultural user's Ground Water Discharge Permit, the produced water treatment facility also obtains a Ground Water Discharge Permit from the NMED.

As mentioned above, the use of the treated produced water for irrigation requires a Ground Water Discharge Permit from the NMED (*see* 20.6.2 NMAC). This is also true when any treated industrial or municipal effluent is used for irrigation. To ensure that the treated water meets the specifications of the agricultural user's Ground Water Discharge Permit, the produced water treatment facility also obtains a Ground Water Discharge Permit from the NMED.

The regulations for approving Ground Water Discharge Permits are not prescriptive. Instead, the applicant proposes for NMED approval a plan for protecting groundwater quality. For irrigation, the plan's important aspects include describing the quality of the water used; minimizing the potential for leaching contaminants through the soil; and using appropriate irrigation practices that avoid ponding, overwatering, etc.

Before submitting an application for a Ground Water Discharge Permit, the owner/operator of a produced water treatment facility and the agricultural user should each submit a Notice of Intent to Discharge that describes the proposed operation. The NMED will respond as to whether a Ground Water Discharge Permit is needed for the specific scenario described.

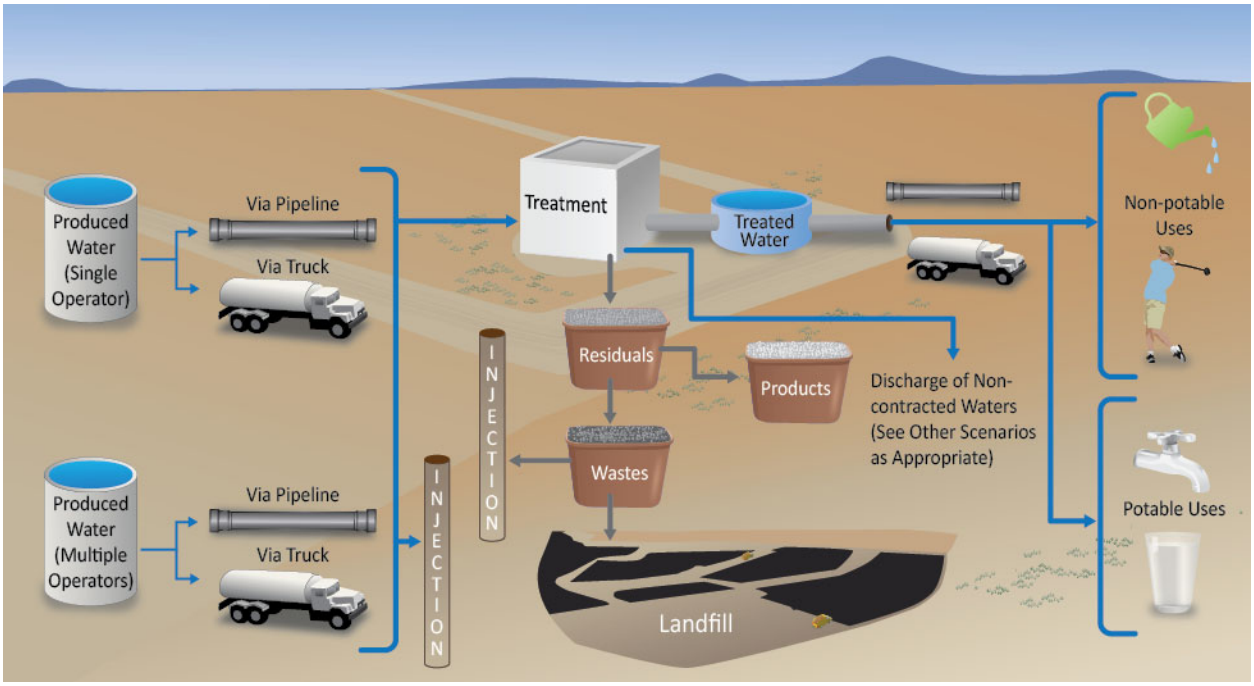
The Notice of Intent form and Ground Water Discharge Permit application form can be accessed from the NMED website. The processing of a Ground Water Discharge Permit application includes a two-step public notice process. First, public notice is provided by the applicant and the NMED that an application has been received. The NMED then publishes a second notice when the draft permit is available, and a 30-day comment period ensues. Applicants should consider six months as a minimum time frame for receiving approval for a Ground Water Discharge Permit. If a hearing is requested and granted (hearings are granted if the NMED Secretary determines there is substantial public interest), this time frame could be significantly longer.

Any potential human or animal health implications posed by the uptake of residual constituents in this treated water by irrigated crops are not under the NMED's jurisdiction. Ground Water Discharge Permits focus on protecting groundwater quality, not food safety. Similarly, the NMED does not have jurisdiction over water quality for livestock consumption, so it would not require a permit for that activity so long as no discharge to surface or groundwater occurs. Provided there is no discharge to surface waters, the EPA would not require a NPDES permit.

Municipal Uses

Figure 9 shows the use of treated produced water for municipal purposes. There are two general options for municipal use: non-potable water systems and potable water systems.

Figure 9: Municipal Uses



Discussion

In this scenario, produced water is managed in storage vessels and piped or trucked to either a treatment plant or a UIC Class II injection well. The OCD regulates the produced water at this stage. Upon disposition by use to the treatment plant, the OCD regulation of the produced water ends. For municipal non-potable water systems, the NMED and possibly the EPA may have regulatory jurisdiction (see discussion below). If treated produced water was used in a municipal potable water system, the NMED would have regulatory authority (see discussion below). Produced water entering the treatment plant undergoes the necessary treatment to ensure the quality of the effluent is sufficient for the desired use or application. In this case, the treated produced water is used for non-potable or potable uses.

The residuals are those materials that are generated from the treatment process. The residuals may be a commodity product sold to another party. Generally speaking, the OCD, the NMED and the EPA do not regulate products. Wastes from such a process are managed in the appropriate UIC injection well or otherwise disposed of as oilfield wastes regulated by the OCD.

Many communities in New Mexico already have a separate distribution system for the re-use of reclaimed domestic (or industrial) water. Typical uses of reclaimed water include irrigation of parks, golf courses, athletic fields, and cemeteries; firefighting; aesthetic ponds; dust suppression; construction; and street cleaning. The water is distributed via pipe, and in some cases the water can be obtained at a standpipe for approved uses. Such re-use of reclaimed wastewater requires a Ground Water Discharge Permit, as would using treated produced water for these non-potable purposes (*see* 20.6.2.3104 NMAC).

The produced water treatment facility would need to obtain its own Ground Water Discharge Permit to be authorized to provide water for a municipality's re-use system.

In terms of the regulatory framework, this type of re-use is similar to agricultural uses (Figure 8) previously described. The focus of the permit is on protecting groundwater by limiting the concentration of contaminants in the water, managing the water properly, and monitoring. Minimizing public exposure to potential pathogens potentially contained in reclaimed water is also a priority. The produced water treatment facility would need to obtain its own Ground Water Discharge Permit to be authorized to provide water for a municipality's re-use system.

If the municipality already has a Ground Water Discharge Permit for the use of reclaimed water, a modification may be necessary to add the new water. Moreover, the use of treated produced water for irrigation that runs off into a municipal separate storm sewer system (MS4) could trigger NPDES permit requirements. The EPA regulations require that an MS4 permittee address landscape irrigation or irrigation water if they identify irrigation as a significant contributor of pollutants to the MS4 (*see* 40 CFR part 122.34(b)(3)(ii)). As such, the MS4 and the permitting authority would likely need information on the composition of the treated produced water to be used for irrigation to evaluate whether it complies with the permit. Additionally, if treated produced water is commingled with a municipal water right that has a return flow credit, modification of the OSE permit may be required.

Adding treated produced water into a public water system for potable uses would fall under the authority of the NMED's Drinking Water Bureau. The treated produced water would need to meet the requirements of the SDWA. The NMED currently does not have specific drinking water regulations that address the use of treated produced water (or reclaimed domestic water) for a potable supply, so such proposed projects would be considered on a case-by-case basis.

Any public water system intending to use treated produced water would need to submit an application to the NMED's Drinking Water Bureau (*see* Sections 20.7.10.200.A and 20.7.10.201 of New Mexico's Drinking Water Regulations). Once the water is being served, the NMED's Drinking Water Bureau would require point of entry sampling, that is, at the location where the treated produced water enters the distribution system, to ensure that the water meets the primary maximum contaminant levels in accordance with the National Primary Drinking Water Regulations (*see* 40 CFR part 141). Additionally, if sampling results indicated an exceedance of a regulatory contaminant, additional treatment may be required to be implemented to comply with the SDWA. By incorporating a new source, the public water system may become subject to revised sampling and compliance protocols.

If contaminants from the treated produced water were discharged into the wastewater collection system, it is possible that wastewater permits could also be affected. It would be advisable to evaluate treated produced water for both National Primary Drinking Water Regulations as well as the possible requirements for discharge to surface water or groundwater to guard against downstream WQS exceedances.

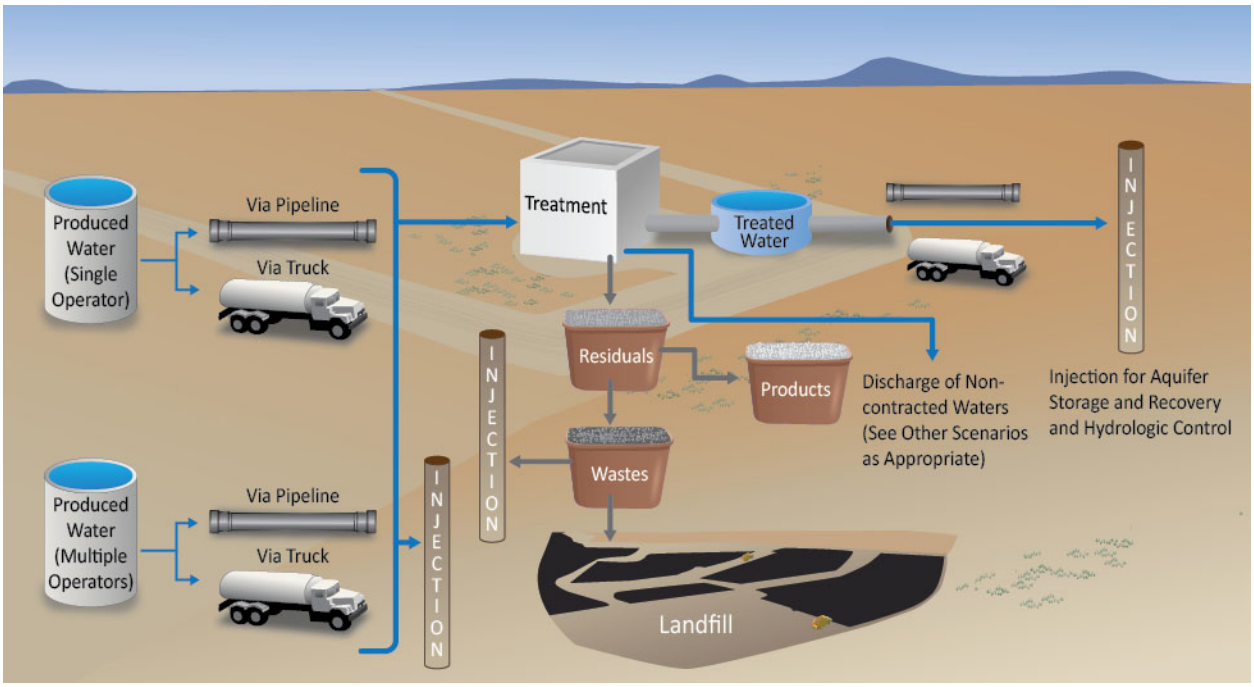
Treated produced water could contain chemical constituents that may harm human health, but that are not regulated by the National Primary Drinking Water Regulations. The NMED Drinking Water Bureau

currently has no mechanism to require testing for contaminants except as required by the regulations. The NMED anticipates that a municipality considering the use of treated produced water would develop a significant public involvement program to engage and educate the public about this new source of water, whether for potable or non-potable uses. Voluntary sampling for unregulated contaminants of concern could be a part of such a program.

Subsurface Discharges for Groundwater Management

Figure 10 depicts treated produced water discharged into groundwater for an intended purpose, such as for managing underground hydrologic conditions, or for storage and recovery. It does not address discharges to groundwater solely for disposal.

Figure 10: Subsurface Discharges for Groundwater Management



Discussion

In this scenario, produced water is managed in storage vessels and piped or trucked to either a treatment plant or a UIC Class II injection well. The OCD regulates produced water at this stage, as there is no discharge to surface water. Upon disposition by use to the treatment plant, the OCD regulation of the produced water ends. The NMED requires a Ground Water Discharge Permit for this disposition of treated produced water. Produced water entering the treatment plant undergoes the necessary treatment to ensure the quality of the effluent is sufficient for the desired use or application. In this case, the treated produced water is discharged to groundwater for managing underground hydrologic conditions, or for storage and recovery. A permit to appropriate the treated produced water returned to the public groundwaters would be required from the OSE.

The residuals are those materials that are generated from the treatment process. The residuals may be a commodity product sold to another party. Generally speaking, the OCD, the NMED and the EPA do not regulate products. Wastes from such a process are managed in the appropriate UIC injection well or otherwise disposed of as oilfield wastes regulated by the OCD.

Discharge of treated produced water into groundwater for a groundwater management purpose would occur through a Class V UIC well, whether it is a constructed well, drainfield, or infiltration basin, and would be subject to the applicable Class V UIC requirements.

Given that the discharge would not be an oil and natural gas production activity, the NMED—not the OCD—would issue such a permit. An OSE permit would be required to appropriate treated produced water returned to the public groundwaters.

Regardless of the intended purpose for the injected water, it becomes "groundwater" as defined by 20.6.2 NMAC and its quality must be protected for all uses, that is, it must meet all groundwater standards. For water quality protection, such a discharge is subject to the state's UIC program and requires a Ground Water Discharge Permit (*see* 20.6.2 NMAC). Given that the discharge would not be an oil and natural gas production activity, the NMED—not the OCD—would issue such a permit. An OSE permit would be required to appropriate treated produced water returned to the public groundwaters.

The NMED can issue a Ground Water Discharge Permit for "barrier wells" and "recharge wells" only if the fluid being injected does not contain any contaminants that would result in exceedance of a primary drinking water maximum contaminant level in the groundwater (See 20.6.2.5004.A(4) NMAC). This is in addition to the standard requirement that Ground Water Discharge Permit applicants must demonstrate that a proposed discharge will not result in exceedance of any groundwater standards (*see* 20.6.2.3109.C(2) NMAC). (See the "Agricultural Uses" section for a broader discussion of Ground Water Discharge Permits and their requirements.)

Barrier wells would include some discharges intended for managing hydrologic conditions, and the NMED interprets recharge wells to be Class V wells used for aquifer storage and recovery projects. While many of the drinking water and groundwater standards overlap, an applicant should take note of the differences. Aquifer storage and recovery projects must also demonstrate that the injection fluid is geochemically compatible with the aquifer.

As in the surface water discharge scenario, someone wishing to return treated produced water to an aquifer that is the public waters of the state, and then later have a water right to divert and use this water, must file an application for new appropriation pursuant to Section 72-12-3, or a Notice of Intent pursuant to Section 72-12-26 depending on the characteristics of the aquifer. The OSE would have to approve this application. Given the nature of returning this produced water into an aquifer for later recovery and beneficial use, many of the principles in the Groundwater Storage and Recovery Act, Sections 72-5A-1 through 17, would be considered.

Any entity considering using treated produced water for an aquifer recharge and recovery projects is strongly encouraged to communicate with both the NMED and the OSE early in planning.

Section 3: Improving the Quantity and Quality of Water in New Mexico

This section identifies gaps in the regulatory and policy framework related to the governance of produced water and/or treated produced water. These gaps present opportunities for federal and state officials to streamline the existing framework to facilitate processes related to produced water management that improve the quantity and quality of water in New Mexico.

To give stakeholder an accurate roadmap for navigating the existing federal and state regulatory landscapes related to produced water/treated produced water, regulators must articulate their respective regulatory overlays with clarity. Seeking such clarity, through the process of developing this white paper, the State of New Mexico and the EPA identified the following opportunities to streamline existing regulations, bridge regulatory gaps, and generally improve the regulatory landscape.

1. Responding to the potential market value of produced water and treated produced water
   As described above in this white paper, the OCD streamlined the regulatory burden to industry in an effort to conserve water resources and incentivize the re-use and recycling of produced water. This resulted in off-setting the use of fresh water with re-use or recycled produced water. Additional regulatory and policy incentives should be explored with stakeholders and policymakers that encourage additional re-use of produced water and treated produced water, both within the oil and gas industry and within other industries.
2. Continuity of financial assurance
   As produced water is managed by state and federal agencies, financial assurance is not a continuous and affirmative requirement under state and federal laws. For example, the OCD requires financial assurance with respect to certain facilities engaged in the management and treatment of produced water. However, if the OCD approves a disposition by use to a treatment facility regulated by the NMED, the OCD's financial assurance requirement no longer applies. The NMED may elect to seek financial assurance for groundwater discharges per WQCC regulations. If the OCD approves disposition by use to a treatment facility regulated by the EPA (i.e., surface water discharge), the CWA does not require financial assurance for such a facility. The potential lack of financial assurance may pose a risk to the state and other parties, including surface owners. Pertaining to the transport of produced water by pipeline, none of the EPA, OCD, NMED, or OSE require financial assurance for pipelines.
3. Delegation of CWA NPDES permitting program
   The CWA gives states the opportunity to seek authority from the EPA to administer NPDES permitting program under state law. If the State of New Mexico were to seek delegation of the CWA NPDES permitting program for all discharges to surface waters or a limited delegation over discharges from oil and natural gas operations to surface waters, this could have the effect of streamlining the permitting process, increasing synchronization between the OCD and the NMED, and potentially reducing permit approval times.
4. Permit-by-rule for disposition by use
   Current OCD regulations generally address and contemplate approving dispositions by use outside oil and gas re-use on a case-by-case basis. The OCD should consider adjusting its regulatory approach to reviewing non–oil and natural gas dispositions by use by establishing a permit by rule scheme. Under such an approach, the OCD would include in its regulation a list of required

submittals and necessary conditions, which when met would result in the approval of the proposed disposition by use.

5. National produced water study
   In April 2018, the EPA commenced a national produced water study to consider available ways to manage wastewater from both conventional and unconventional oil and gas extraction at onshore facilities. The EPA's study will address questions such as how existing federal approaches to produced water management under the CWA can interact more effectively with state and tribal regulations, requirements or policy needs, and whether potential federal regulations that may allow for broader discharge of treated produced water to surface waters are supported. Once the EPA determines a path forward, the State of New Mexico can develop regulatory or policy approaches necessary to complement the current or future federal direction.

6. Produced water characterization
   As described above in this white paper, when produced water enters a treatment plant it undergoes necessary treatment to ensure the quality of the effluent is sufficient for the desired use or application. Data gaps currently exist regarding chemical constituents in produced water that may make it challenging to ensure the quality of the effluent is sufficient for the desired use. The State of New Mexico and the EPA are interested in encouraging greater scientific understanding of the constituents in produced water, the development of analytical methods, and the treatment effectiveness for broad groups of chemical compounds found in produced water generated in New Mexico.

7. Potable water from treated produced water
   If produced water is pursued as a potential source of potable water, the NMED will need to develop additional expertise in this area and clarify its authority to oversee the treatment of produced water for potable uses. The EPA, the OCD and the NMED should continue to engage and educate stakeholders and maintain transparency on the presence and treatment of contaminants.

8. Clarifying responsibility and control of produced water
   An opportunity exists to clarify the responsibility and control of produced water to facilitate broader re-use outside oil and natural gas operations. Generating produced water and the re-use of produced water do not require a permit for a water right from the OSE. While this reduces regulatory burdens associated with the re-use of produced water, it also results in uncertainty regarding responsibility and control of produced water. One approach to remedying this uncertainty may be to clarify that while the State of New Mexico retains its public trust ownership of produced water, the surface owner has a right of possession, which like a water right can be contracted or leased.

9. Clarifying responsibility and control of treated produced water
   Introducing treated produced water to groundwater or surface water requires a discharge permit from the NMED or the EPA. Diverting treated produced water from public waters requires a permit from the OSE. Oil and natural gas well operators who seek to introduce treated produced water into public waters, and later divert that treated produced water from public waters, or contract with others who wish to divert the treated produced water, should consult the OSE regarding what is required to:

   a. demonstrate the amount of water they wish to divert is indeed in the groundwater or surface water; and

b. apply for the appropriate OSE permit.

10. Continue collaboration among the OCD, NMED, OSE and EPA
    The state and federal agencies that oversee produced water and treated produced water should continue to meet periodically to ensure their regulations and policies properly incentivize re-use, recycling and renewable water.

11. Expand collaboration among government agencies
    While the OCD, NMED, OSE and EPA are principal agencies that regulate produced water and treated produced water in New Mexico; a broader coalition of state and federal agencies should be consulted. These agencies include the New Mexico State Land Office, the New Mexico Water Trust Board, the New Mexico Finance Authority, the Bureau of Reclamation, etc.

12. Stakeholder engagement
    New Mexicans are concerned about water scarcity and protecting water quality. Having described the existing regulatory landscape in this white paper, the state should now reach out to stakeholders regarding how the governance of produced water and treated produced water could be improved while maintaining appropriate safeguards. Outreach efforts could also focus on engaging with the public about the nature of produced water, available treatment technologies, fiscal implications, short and long-term benefits, and risks.

13. Clarify liability
    Ability to comprehensively assess liability associated with the treatment and use of produced water varies on a case-by-case basis.

Appendix A: New Mexico/EPA MOU

MEMORANDUM OF UNDERSTANDING
BETWEEN
The State of New Mexico AND
The U.S. Environmental Protection Agency

Section 1: Purpose and Scope

This document is a Memorandum of Understanding (MOU) between the State of New Mexico, through the New Mexico Energy, Minerals and Natural Resources Department (NM EMNRD), the New Mexico Environment Department (NMED), the New Mexico Office of the State Engineer (NM OSE), and the United States Environmental Protection Agency (EPA) through Region 6 and the Office of Water.

Recognizing the shared responsibilities of the parties to conserve and protect New Mexico's and the United States' natural resources, the parties enter into this MOU to facilitate greater collaboration and achieve greater success in the effort to protect human health and the environment, and to foster resource conservation and economic opportunity. In the spirit of cooperative federalism, the parties recognize that this outcome cannot be fully realized by any single entity operating alone. Rather, the balance is achieved when states, in conjunction with affected communities, work together with the EPA to build partnerships rooted in trust and respect.

The scope of the MOU pertains to proactively clarifying and understanding the existing regulatory and permitting frameworks, and associated policy decisions among the parties related to the re-use, recycling, and beneficial use of waters originating from oil and natural gas activities (produced water).

Whereas, the NM EMNRD is a state agency with the responsibility of leading New Mexico's efforts to develop reliable supplies of energy and energy efficient technologies and practices; and

Whereas, the NMED is a state agency with the responsibility of protecting and restoring the environment, and fostering a healthy and prosperous New Mexico for present and future generations; and

Whereas, the NM OSE is a state agency charged with administering the state's water resources, including the measurement, appropriation, and distribution of ground and surface water; and

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Whereas, Governor Martinez identified in her 2015 Energy Policy & Implementation Plan the state's policy to encourage water conservation and reuse; and

Whereas, the EPA is a federal agency with the responsibility of protecting human health and the environment; and

Whereas, the EPA's strategic plan recognizes that protecting the nation's waters relies on cooperation among states and local communities to protect and improve water quality and strong partnerships that facilitate achieving water quality goals while supporting robust economic growth; and

Whereas, the parties to this MOU recognize that regulatory and permitting certainty, achieved through federal and state collaboration, can help achieve positive economic and environmental outcomes for all stakeholders.

Section 2: Definitions as used within the MOU:

Effective date means the last date the document is fully executed by all parties.

Produced water is the fluid brought up from the hydrocarbon bearing strata during the extraction of oil and natural gas, and includes, where present, formation water, injection water, and any chemicals added downhole or constituents released from the formation.

Recycled water is any water that is generated from an oil or natural gas well, undergoes significant treatment, and is used again in an oil or natural gas well prior to disposal in an underground injection well.

Renewable water is fluid that is generated from an oil or natural gas well that undergoes significant treatment and is added to the hydrologic cycle as opposed to disposed of in an underground injection well.

Re-use water is any fluid that is generated from an oil and natural gas well, undergoes minimal treatment, and is used again in an oil or natural gas well prior to disposal in an underground injection well.

Section 3: Authorities and Limitations

1. Nothing in this MOU alters the statutory authorities or responsibilities of any party.

2. This MOU does not supersede, clarify or otherwise change existing agreements or restrict any future agreements between any of the parties with each other or any other entity.

3. This MOU does not, in and of itself, obligate any party to expend funds. Any commitments made pursuant to this MOU are subject to the availability of appropriated funds. Any endeavor involving reimbursement, contribution, or financial assistance between the parties to this MOU will be handled according to applicable laws, regulations, and procedures, including policies relating to competition for contracts and assistance agreements, and subject to separate agreements. No party will submit a claim for compensation to another party for activities carried out pursuant to this MOU.

   This MOU is a voluntary agreement that expresses the good faith intention of the parties. This MOU is not legally binding on any of the parties, and does not create any contractual obligations, rights or benefits, substantive or procedural, enforceable at law or equity by any person against the parties, any of the parties' officers or employees, or any other person. This MOU does not apply to any person outside of the parties.

4. The EPA enters into this MOU pursuant to section 1442(a) of the Safe Drinking Water Act, section 104 of the Clean Water Act, section 103 of the Clean Air Act, section 8001 of the Solid Waste Disposal Act, and section 102(2)(G) of the National Environmental Policy Act.

5. Under Federal ethics rules, the EPA may not endorse products or services provided by private entities. Nothing in this MOU constitutes an endorsement by any party of the products, services, and/or fundraising activities of another party. NM EMNRD, NMED, and NM OSE agree not to make statements to the public at workshops and meetings, promotional literature, on its web sites or through other media that imply that EPA endorses its products or services. In addition, NM EMNRD, NMED, and NM OSE agree not to make statements that imply that EPA supports state efforts to raise public or private funds. Any statements or promotional materials prepared by the parties that describe this MOU must be approved in advance by EPA.

Section 4: Responsibilities

1. The parties agree to form a collaborative workgroup to explore the further clarification and understanding of the existing regulatory and permitting frameworks and associated policy decisions among the parties associated with produced water.

2. The workgroup will undertake the development of a white paper related to produced water opportunities under state and federal law in New Mexico. The white paper will: (a) synthesize the regulatory and permitting frameworks related to produced water; (b) identify data gaps/policy gaps with respect to use of such water; (c) identify possible uses of renewable water, re-use water, and recycled water; and (d) identify any process or other improvement opportunities with respect to such uses.

3. The workgroup is expected to develop the white paper related to produced water opportunities under state and federal law in New Mexico within six months of the effective date of this MOU.

4. In addition to the white paper, the workgroup will meet on a regular and ad hoc basis, as necessary, focusing on issue-oriented policy matters. Matters dictated by federal and/or state statutes and regulations involving a public process (such as permitting processes) are not a subject of the MOU.

5. On a quarterly basis, the signatories of the MOA will convene a meeting of the workgroup. The workgroup will provide updates to the signatories on the white paper and related topics.

6. Each of the parties to this MOU is expected to appoint at least one member to the workgroup. Appointees are expected to be knowledgeable about the oil and natural gas sector, the water law or policy, frameworks at the federal/state levels, and /or associated policy topics.

Section 5: Duration and Signatures

This MOU is to take effect on the last date the signatures of the parties are affixed to this MOU and remains in effect through the end of 2018 or upon completion of the white paper, whichever is later. At that time, this MOU will terminate unless the parties agree to extend it for an additional period. Any party may terminate its participation in this MOU by providing written notice to the other parties at least ninety (90) days prior to the desired termination date.

For the U.S. Environmental Protection Agency:

Signature

David P. Ross
Assistant Administrator
Office of Water
U.S. EPA

June 29, 2018
Date

Signature

Anne Idsal
Regional Administrator
U.S. EPA Region 6

July 5, 2018
Date

For the State of New Mexico:

Signature

Ken McQueen
Secretary
New Mexico Energy, Minerals and Natural Resources Department

July 13, 2018
Date

Signature

Butch Tongate
Secretary
New Mexico Environment Department

July 13, 2018
Date

Signature

Tom Blaine
State Engineer
New Mexico Office of the State Engineer

July 16, 2018
Date

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