

Norman Gaume, P.E. (ret.)

44 Canoncito Dr NE • [Albuquerque, New Mexico](#) 87122 • 505 690-7768 • normgaume@gmail.com

May 26, 2021; ([Rev. May 31, 2021](#))

Oil Conservation Commission
Ms. Florene Davidson, Commission Clerk
3rd Floor, Wendell Chino Building
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Deleted: .

Re: Technical Testimony Pertaining to the Matter of Proposed Amendments to the Commission's Rules on Produced Water, 19.15.29, New Mexico Administrative Code—with [minor revisions](#)

Dear Oil Conservation Commission Members and Staff,

This letter presents my technical testimony pertaining to the proposed amendments to the oil and gas industry release rules. It is submitted on behalf of Intervenor the Sierra Club – Rio Grande Chapter, Pueblo Action Alliance, NAVA Education Project, Citizens Caring for the Future, and Amigos Bravos, and on behalf of my children and grandchildren.

I am a retired licensed professional water engineer. I was educated at Hobbs High School and New Mexico State University, where I earned Bachelor of Science in Electrical Engineering and Master of Science in Civil Engineering degrees. All my professional employment in New Mexico over 37 years (1978 through 2014) required a New Mexico professional engineering license. I have professional experience in water and wastewater facilities management, design, construction, operations, and maintenance and water resources management, planning and administration. My resume is attached.

Introduction

This technical testimony is organized in six parts:

1. Introduction
2. Support of amendments to 19.15.29 NMAC set forth in the joint petition of WildEarth Guardians and the Oil Conservation Division
3. Presentation of compiled Oil Conservation Division website data
4. Compiled website data interpretations and conclusions
5. Changes and additions to the proposed rule amendments of 19.15.29 NMAC that are within the scope of this rulemaking
6. Additional requirements needed to prevent spills

Support of Consensus Petition

The Intervenor and I urge the Oil Conservation Commission (Commission or OCC) [to](#) adopt the jointly proposed amendments of WildEarth Guardians and the Oil Conservation Division (Division or OCD) to the release rules set forth in 19.15.29 NMAC. We strongly support [these](#) amendments that would prohibit major and minor spills of crude oil, liquid oil field wastes, natural gas liquids, brine, frac fluids, and chemicals and clarify the OCD's enforcement. These proposed amendments are a basic and necessary but insufficient step to protect public health, the environment, and fresh water resources from an average of 3.5 liquid spills per day as OCD on-line data shows occurred in 2020. The vast majority of spills are due to causes that my professional experience indicates are preventable.

Deleted: the

I urged in July 2020 testimony before the Commission that the OCC and OCD “promulgate and enforce regulations that are more protective of public health, the environment, and fresh water resources from inadequacies in the disposition, handling, transport, storage, recycling, treatment, and disposal of produced water within the oil field [because] the status quo is not acceptable.” One year later—at the initiative of the WildEarth Guardians and with the Division's subsequent support—the Commission will decide whether or not it will exercise its discretionary authority to prohibit releases pursuant to 72.21.12.B (15), (21) and (22) [NMSA](#).

Deleted:).

Please adopt the WildEarth [Guardians'](#) and Oil Conservation Division's jointly proposed amendments as the [Commission's](#) and the Division's necessary material step to address the unacceptable status quo pursuant to its discretionary authority to regulate produced water and releases “in a manner that protects public health, the environment, and fresh water resources.”

Deleted: Guardians

Deleted: Commission

Deleted: as a

Summary of Oil Conservation Division Data

Division data posted on its statistics web page report a plethora of releases, spills and leaks of toxic oil and gas liquids and liquid oil field wastes to the surface environment. These releases and the data describing them are self-reported by oil and gas operators. The data provide compelling support for the WildEarth Guardians' and the Division's jointly proposed amendments to prohibit releases.

[My](#) analyses [of production and spills data](#) are summarized below, including conclusions drawn directly from the data. The Exhibits [include and summarize](#) a 2017 through 2019 produced water spills analyses.

Deleted: These

Deleted: provide a summary of 2020 releases data and

[2020 releases](#). The Division provides the functionality to download an Excel spreadsheet [entitled](#) “spills” from the “Statistics” webpage.¹ Of 1,543 unauthorized releases self-

Deleted: of

Deleted: data

¹<https://www.wapps.emnrd.state.nm.us/ocd/ocdpermitting/Data/Spills/SpillSearchResults.aspx?IncidentIdSearchClause=BeginsWith&Severity=All&OperatorSearchClause=BeginsWith&FacilityIdSearchClause=BeginsWith>

reported by oil and gas operators in 2020, 1,294 were spills of liquids. The other 249 were natural gas releases. These liquid spills, an average of 3.5 each day in 2020, are currently allowed but would not be under the WEG/OCD jointly proposed amendments. Preventable causes—labeled equipment failure, corrosion, human error, overflows of storage tanks and pits, and normal operations—caused 1,040 of the 1,259, or 82%, of these self-reported spills. The 2020 total reported liquid spills volumes total 26.5 acre-foot. The actual total spilled volume is higher because 404 of the 1,259 spills were reported to have spilled zero barrels, even though 208 of these zero volume spills were self-reported as having “major” severity with 40 additional spills having [a blank](#) “severity” value reported.

Deleted: no

Normalized Produced Water Spill Rates by Operator 2017-2019. An exhibit I prepared for the Commission’s July 2020 rulemaking hearing presented compiled Division data demonstrating that four operators were responsible for over half of all produced water [release incidents](#) reported in 2019. My 2020 testimony before the Commission identified XTO Energy, Inc., COG Operating LLC, Devon Energy Production Co., and OXY USA, Inc. as the four operators responsible for more than half of all 2019 spills of “incident type” equal to “produced water [release](#).” They are listed in order of the decreasing percentage of the total spills in 2019 that they reported.

Deleted: spills

Deleted: ”

Deleted: .

Subsequently, [Peter Coho](#), a colleague, and I compiled produced water spills and energy production data for the three years from 2017 through 2019 for all registered oil and gas operators in order to calculate normalized rates of spills for all operators.²

The downloaded data and our analyses of these data are contained in an Excel workbook that I provided [on March 15, 2021](#), to Division Director and Commission Chair Adrienne Sandoval. Exhibit 1 is this 3.9 MB Excel workbook [with updated release note sheets](#). It is submitted as a link to a Dropbox copy of the file [and as an attached file](#) to support this technical testimony and for this hearing record. It is the basis of the summaries and conclusions herein.

Deleted: we have

Deleted: .

Deleted: (

Deleted:)

Exhibit 2, attached, is a portion of the sheet in Exhibit 1 entitled “2017-19 Operator AnnualProd-full.” It presents the Division’s data and [our](#) calculation of the normalized rates of spills per million barrels of oil equivalents (BOE) produced by the 50 oil and gas producers that reported the most energy production from 2017 through 2019. The normalized rates of spills are shown in the color-coded column labeled “Number of wastewater spills per million barrels BOE produced.” Exhibit 1 includes the normalized rates of spills for all registered oil and gas producers.

Deleted: my

Deleted: Note that

nsWith&FacilityNameSearchClause=BeginsWith&WellNameSearchClause=BeginsWith&Incident_DateRangeStart=01/01/2020&Incident_DateRangeEnd=12/31/2020&Section=00

² Mr. Coho has a Bachelor of Arts in Mathematics degree. He worked 35 years for Intel where his duties included use of Excel to analyze large data sets. He prepared Exhibit 1 to produce calculations that I specified and independently prepared alternative views of the OCD data using Excel pivot table functionality.

Exhibit 3, attached, is a graphic also included in Exhibit 1 in the sheet entitled “Chart TOP 40 prods BOE-spills.” It compares the total energy reported to have been produced by the top 40 [energy](#) producers with the normalized [rates](#) of spills for [these operators](#).

Deleted: rate

Deleted: each operator

Exhibits 2 and 3 show the four operators that together were responsible for more than half of all produced water spills in 2019 are ranked 11th, 2nd, 4th, and 5th for their respective total barrels of oil equivalents production during 2017 through 2019.

EOG Resources, Inc., the top ranked energy producer, reported a normalized rate of spills equal to 0.26 produced water spills per million BOE. The table below presents relevant data and my calculations to enable direct comparisons of the spills frequencies of the four operators that were responsible for more than half of the total produced water spills in 2019, compared to EOG Resources, the top-ranked producer.

Producer	ORGID #	BOE Production 2017-2019	Produced Water Spills 2017-2019	Normalized Spill Rate-- Number of spills/million BOE)	Relative Frequency of Spills Compared to EOG as Benchmark
EOG Resources	7377	168,218,160	43	0.26	1.0
XTO Energy	5380	41,175,900	211	5.12	20.0
COG Operating	229137	139,741,068	342	2.45	9.6
Devon Energy	6137	107,137,848	270	2.52	9.9
OXY USA	16696	97,895,442	199	2.03	8.0

This table shows that XTO Energy reported 20 times as many spills per million barrels of oil equivalents as EOG Resources. The other three top produced water spillers had normalized spill rates approximately an order of magnitude higher than EOG. Exhibit 2 indicates the top 50 energy producers were responsible for [96% of the total energy production and](#) 88% of the [total self-reported](#) produced water spills.

Volatile OCD Historical Data. In the process of compiling the OCD data for the purpose of generating the Excel workbook that is Exhibit 1, Peter Coha, observed that Division production data [initially](#) downloaded at 13:36 on January 27, 2021, were different than production data downloaded at approximately 16:50 on February 3, 2021. The differences are summarized in the sheet entitled “ReleaseNotes-Background Rev1” of Exhibit 1. The differences for 2019 oil production, gas production, produced water production, and produced water injection changed materially over that one-week period. I have inquired of the Division but have not received an answer regarding the reason(s) for these changes or for how these changes relate to collection of amounts payable by oil and gas producers to the State of New Mexico and to the State’s annual budgeting process.

Deleted: my colleague

Deleted: ³

Deleted: initial

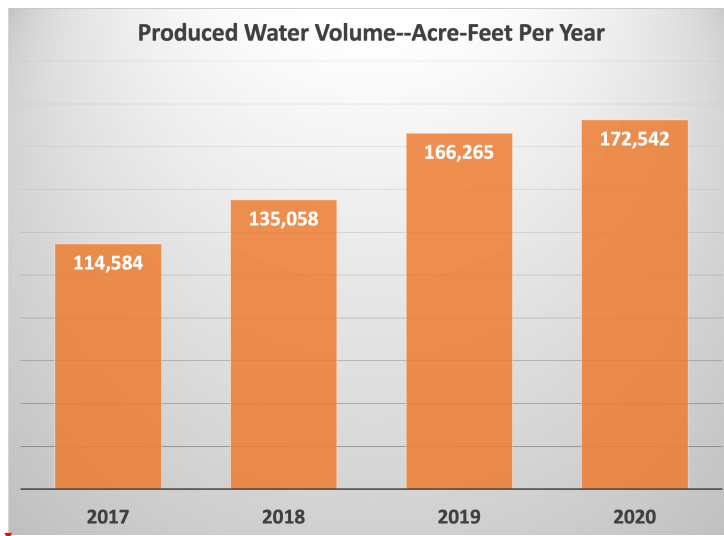
These changes were discovered through our quality control checks of our downloads and analyses. We found we could not repeat the January 27, 2021, download which led Mr.

Coha's completion of a record-by-record review of the downloaded data for 2017. He identified 13 registered operator production records from 2017 that had changed over the one-week period in 2021 between downloads. I make no statement or conclusion in this testimony other than to observe that important historical public data maintained and posted by the Division appears to be volatile and unreliable and to emphasize that the Exhibits reflect the data as ~~they~~ existed when downloaded on January 27, 2021.

Deleted: it

Deleted: they were

Volumes of Produced Water Continue to Increase. Division website data regarding production of oil, gas, and produced water and produced water injection show the huge volumes of produced water requiring safe disposal to protect the public health, the environment, and fresh water resources. Produced water increased in 2020 to 172,542 acre-feet, a 4% increase over 2019 despite the pandemic.



Deleted: ¶

Compiled Website Data Interpretations and Conclusions

New Mexico spills and produced water regulations and management are failing to protect public health, the environment, and freshwater resources from preventable releases of produced water and liquid oil field wastes, products, and chemicals. Oil and gas operators prevention of spills is voluntary. Some operators choose to prevent most spills. Others choose to have a much worse frequency of spills. That is unacceptable and, in my view, violates the public's constitutional rights for control of pollution and despoilment of the air, water, and other natural resources of this state.

The fact that the Commission and the Division allow operators to have normalized rates of produced water spills that are 20 and 18 times higher than the normalized spill rate of

industry leader EOG Resources per the calculations reported in Exhibit 2 indicates that the Legislature, the Commission, and the Division are violating the New Mexico Constitution, which states in Article XX, Sec. 21, “The protection of the state’s beautiful and healthful environment is hereby declared to be of fundamental importance to the public interest, health, safety and the general welfare. The legislature shall provide for control of pollution and control of despoilment of the air, water and other natural resources of this state, consistent with the use and development of these resources for the maximum benefit of the people.” The fact that EOG Resources has a superior normalized rate of spills and is the top-ranked New Mexico oil and gas producer demonstrates that prevention of spills and development of oil and gas resources are compatible.

The Division’s data demonstrate that prevention of spills is voluntary. EOG Resources, Inc., New Mexico’s top ranked oil and gas producer has a relatively low rate of spills. Rep. Nathan Small, sponsor of HB546 (2019), the Produced Water Act of 2019, requested that I meet with an employee of EOG Resources in the context of SB86 (2021). I asked that employee to tell me why EOG Resources, Inc. has a low rate of spills. He responded that EOG Resources is accountable to its stockholders, who demand a higher level of environmental performance than New Mexico requires. He said that prevention of spills requires investments in facilities, instrumentation and automation, and training that EOG Resources chooses to make. He said, and the record indicates, that other operators choose not to make voluntary expenditures to prevent spills.

Deleted: resources

EOG Resources also utilizes moderately treated produced water for fracking rather than scarce fresh water resources. The EOG Resources employee told me that over 98% of EOG Resources water requirements are met by moderately treated produced water. Other operators use imported water, which is then contaminated by its oil and gas uses. Use of imported water increases the liquid oil field waste volumes in an amount equal to the imported fresh, brackish or saline surface or fresh water volumes used for deep drilling, well completion, and fracking as well as depleting New Mexico’s statutorily protected water resources.

My experience as a professional engineer managing water and wastewater facilities operations and maintenance is the basis for my professional opinion that the vast majority of spills are preventable. Equipment failure indicates that the equipment was not designed to operate without failure under foreseeable operations conditions or has not been maintained adequately or replaced with sufficient frequency. Corrosion indicates that equipment and facilities materials were not selected to withstand the highly corrosive conditions that are to be expected when handling highly corrosive liquid oil field wastes or that investments to maintain or replace equipment were not made to prevent corrosion failures. Human error indicates that the responsible human was not properly trained or supervised or was expected to perform tasks that could be automated with superior reliability. Overflows of tanks and pits is negligent. The fact that “normal operations” is the cause for spills indicates the Commission and the Division have been willing to accept spills as “normal.”

Deleted: made

Deleted: cited

Deleted: many

The spills record of EOG resources demonstrates that “control of pollution and control of despoilment of the air, water and other natural resources of this state, consistent with the use and development of these resources for the maximum benefit of the people,” which is currently voluntary [pursuant to existing OCC regulations](#), is both practical and profitable. Without effective release prohibitions, other operators choose to not invest in the control of pollution and prevention of the despoilment of the air, water and other natural resources of this state, thereby imposing costs and health impacts on New Mexicans who have the misfortune of living within or near oil fields, on the New Mexico public, and on future generations.

Deleted: ”

Division data posted on its website for public information and use are deficient. The data are poor quality. The Division tolerates incomplete and inadequate reporting of data that are pertinent to environmental protection. Director and Chair Sandoval told me that my interpretation of Exhibit 3 is faulty because low rates of spills may indicate operators’ failure to report spills rather than superior performance compared to other operators.

Many spill records over the 2017 through 2019 time period do not show completion of a final report. If a final report is not required, the spill record should indicate “not applicable” rather than a blank for the final report date.

Missing data are reported as zero rather than blanks. For example, the division requires reporting [of the depth to groundwater](#) on the spill reporting form C-141. Spill data records for the 1,259 reported liquid spills in 2020 contain [no non-zero values](#) for the depth to groundwater. [Of the 4913 spills records in the sheet entitled “spills-3” in Exhibit 1, 70 records show a non-zero depth to groundwater.](#)

Deleted: of the depth to groundwater.

Deleted: exactly one

Deleted: value

The New Mexico Water Data Act was signed into law in 2019. It names the Energy Minerals and Natural Resources Department as one of four directing agencies. Directing agencies all generate public water data germane to New Mexico’s future. New Mexico Bureau of Geology Associate Director Timmons, who is New Mexico’s principal for implementation of the Water Data Act and who participating in drafting the bill that passed, describes the Oil Conservation Division’s energy-related water data as the reason the Department is a directing agency.

The public data reported by the Division do not meet the criteria for public data sets as set forth in the Water Data Act implementation standards. Division data should be collected, compiled, described by metadata, and managed for public purposes commensurate with implementation standards adopted for New Mexico Water Data Act implementation. <https://newmexicowaterdata.org>

Deleted: <https://newmexicowaterdata.org>

Changes and Additions Proposed by Intervenors to the Proposed Rule Amendments of 19.15.29 NMAC That Are Within the Scope and Notice of this Rulemaking

The principal matter of this rulemaking is to prohibit releases. Effective prohibition of releases, as measured by stopping spills and unauthorized releases, will require more than reversing the past regulatory policy of allowing them. A suite of changes is required to

level the playing field among operators, stop releases, and protect public health, the environment and fresh water resources. Three minor changes are proposed by the Intervenor. Each is within the scope of this rulemaking to prohibit spills and will help dissuade operators with high normalized rates of releases to take actions and spend a fraction of their gross revenues to stop unauthorized releases. They:

1. Require that the responsible party characterize and better document the source of releases as part of the immediate response in order to inform remediation requirements,
2. Require that entities in close proximity of a release be notified of the release and of its remediation, and
3. Establish a rebuttable presumption that a violation of the release rule presents a risk to public health or safety or a significant environmental harm.

Better Characterization. It makes scientific and regulatory sense to collect samples of the source of release for laboratory analysis as part of the initial response before the liquid wastes are recovered and disposed of. Proper remediation design requires knowledge of the contaminant released. As has been the case with the Commission first requiring data before considering new rules to regulate use of moderately treated produced water, fresh water, and other imported water for fracking, the Intervenor expects the commission will require data before strengthening remediation standards.

Addition of total dissolved solids to the list of analytes is integrated with the proposed characterization requirement. Chloride is the element that Commission rules rely on for determining the adequacy of remediation. However, remediation of massive total dissolved solids contamination requires knowledge of the total dissolved solids concentrations of the liquid release source. Chloride doesn't adequately inform regulators or the public of contamination by total salts.

A 2016 produced water salinity spatial variability characterization report published by the New Mexico Water Resources Research Center says the researchers rejected samples for their analysis that included major ions but did not include a value for total dissolved solids. They report high maximum average TDS values with high variability, from 15% to more than 22% salt by weight.⁵ These salt loads are approximately 4 to 6 times more saline than sea water. The massive amounts of salt in spilled produced water poison the

⁵ Chaudhary, Binod K., Willman, Spencer E., Carroll, Kenneth C., Spatial Variability and Geochemistry of Produced Water in Southeastern New Mexico, USA, 2016. From the abstract: "Information on spatial variability of salinity and inorganic constituents of produced water in western Permian Basin is lacking despite an increased stream of wastewater generated from oil and gas production. Variability and geochemistry of produced water by geologic formation from Guadalupian (Late Permian) to Ordovician ages were investigated in western half of the Permian Basin (Delaware Basin, Central Basin Platform and Northwest Shelf). The total dissolved solids (TDS) of produced water increased with depth in the Delaware Basin and Central Basin Platform to Delaware and Wolfcamp formations with maximum average TDS of 225 g/L and 154 g/L respectively, and then decreased with further increases in depth. In contrast, the salinity of produced water decreased with depth below Guadalupian age formations in the Northwest Shelf with a maximum average TDS of 205 g/L in Artesia formation."

Deleted: 4

Deleted: 10

Deleted: 40

Formatted: Footnote Reference, Font color: Auto

Deleted: 3

Deleted: 12

Deleted: higher

land surface. The Commission should order that characterization of the sources of releases include total dissolved solids pursuant to the Intervenor's proposed language.

Photo documentation of the release as part of the immediate response will also help inform the public of the nature, source, and extent of the release and inform appropriate corrective action and remediation design.

Notification. The Commission should require responsible parties to provide notification within 24 hours of any major or minor release (a release greater than 5 barrels) to any land owners, residences, institutions, and businesses within 1000 feet distance of the point of release and area impacted by the release. Notification should be provided within a week to neighbors within a one-half mile radius. These neighbors also should receive notification when remediation is complete.

Deleted: ¶

The lack of notification of contamination and communication with persons impacted directly by spills has been a factor that has driven the notoriety of recent spills. Persons impacted or potentially impacted by spills through their misfortune to be located nearby deserve prompt information that an illegal release has occurred. The Intervenor's request that the Commission adopt requirements to notify affected and potentially affected persons rather than limit notification to only the Division as set forth in proposed amendments to the notification rule 19.15.29.10 (A).

The Commission requires increased stringency for remediation of liquid releases "within 1000 feet of any fresh water well or spring." 19.15.29.12.(C) NMAC. Colorado requires a 1000-foot setback of oil and gas facilities to occupied structures. These distances adopted by New Mexico and Colorado are the basis for the 24-hour notification requirement for affected or potentially affected persons.

Rebuttable Presumption. Energy, Minerals and Natural Resources Department and OCD officials describe the requirement for enforcement of Commission rules and the difficulty of enforcement in the absence of adequate enforcement staff. Division Director and Commission Chair Sandoval during her cross examination of me in a Commission rulemaking hearing in July 2020 stressed this problem and asked my opinion about how these real limitations could be overcome.

The Division's statutorily required October 1, 2020, report⁶ to the Water and Natural Resources Committee demonstrates the Division's lack of enforcement capability. Only two notices of violation were issued in FY2020 and resulted in a total of \$14,200 in penalties. Only four notices of violation were issued in the first quarter of FY2021. None were resolved as of the date of the Division report.

⁶The annual enforcement report is required by statute to be posted on the Division's website. A through search did not reveal that it is.

One way to help overcome budget and staffing limitations would be to put the burden of proof on responsible parties to show any violation of the Commission's release rule does not [present](#) either a risk to the health or safety of the public or a risk of causing significant environmental harm. The present scheme puts the burden to demonstrate those risks on the inadequate numbers of the Division's enforcement staff, leading to ineffective enforcement of regulations to protect the public and the environment. Division staff and budgets are a third and a fourth, respectively, compared to North Dakota and Oklahoma, respectively, to regulate similar amounts of oil and gas production and similar numbers of wells, respectively.

Deleted: presents

Additional Requirements to Prevent Spills Not Addressed in This Rulemaking

Additional requirements are needed to prevent spills that are not within the scope of this rulemaking or the Sierra Club's proposal in intervention. The Intervenors are not privy to Commission and Division plans to fulfill their duty to protect public health, the environment and fresh water resources by stopping releases that will become illegal pursuant to the Commission's release rule amendments proposed by the WildEarth Guardians and the Division and strongly supported by the Intervenors.

The Division and the Commission should consider and adapt additional rules to provide for the following:

- Mandatory use of recycled produced water for fracking and limitation of imported fresh water with a TDS concentration of 10,000 or less for fracking
- Minimum facility and performance requirements to ensure the safe and environmentally protective handling and transportation of liquid oil field wastes to stop preventable spills
- Tracking of liquid oil field wastes through its production, treatment, reuse, and environmentally safe disposal
- Registered operator reporting that is accurate, complete and timely
- Improved data quality meeting the implementation standards for the Water Data Act
- More stringent requirements for remediation to prevent leaching of salts and toxins to underlying groundwater
- Effective enforcement

The Intervenors look forward to learning the Division's and the Commission's plans for implementing and enforcing regulations to protect public health, the environment, and fresh water resources that will satisfy the public's constitutional rights to a healthful environment of fundamental importance to the public interest, health, safety and the general welfare.

Sincerely,

Deleted: 1

/s/

Norm Gaume, P.E. (ret.)

Exhibit 1: Excel Workbook [attached and hyperlinked](#)

<https://www.dropbox.com/s/tbcg3qqbhze9j0/2017-2019%20oil%20production%20and%20spills%20analysis-r0e-3.xlsx?dl=0>

Formatted: Centered

Deleted: ¶

Deleted: <https://www.dropbox.com/s/tbcg3qqbhze9j0/2017-2019%20oil%20production%20and%20spills%20analysis-r0e-3.xlsx?dl=0>

Exhibit 2

Top 50 of 434 Producers--Oil and Gas Production and Produced Wastewater Spills--2017-2019																										
Oil and Gas Producer	Operator	Total oil production 2017-2019 (bbl)	Total gas production 2017-2019 (Mcf)	Total 3-year BOE production 2017-2019 (barrel)	Total produced wastewater (bbl)	Total injected water to BOE (bbl)	Ratio Produced water to BOE	Number of wastewater spills with material spilled equal to or greater than 1 barrel	Number of wastewater spills per million barrels of oil produced	Frequency of spills with OEG Resource 2.06 million bbl or more	2017			2018			2019			Major Spills	Minor Spills	Blank Spills				
											Rank	Spills	Volume	Rank	Spills	Volume	Rank	Spills	Volume							
116,651,094	7177	309,402,416	168,131,156	1,388,138,156	273,988,811	21,343,349	1.64	43	2.45	0.35	1	2	2,40	36	10	3										
87,250,192	3177	274,704,114	149,711,068	1,221,748,931	168,027,109	1,60	342	2.45	9.6	3	2	2	256	127	143	3										
73,211	7137	253,251,410	127,217,844	6,813,704	9,118,346	0.05	36	2.52	9.9	4	1	3	4	252	126	105	6									
66,157,261	3717	241,037,959	107,137,848	166,627,545	72,371,590	1,56	270	2.52	9.9	4	1	3	4	252	126	105	6									
68,005,048	16696	218,862,341	97,895,442	186,987,618	38,390,290	1,91	199	2.03	8.0	6	3	5	6	275	81	66	3									
54,029,345	14744	200,997,254	92,528,887	14,915,534	86,451,894	1,57	18	0.19	0.08	6.1	3	5	6	268	15	1	1									
27,453,903	28597	159,120,904	44,325,720	8,701,351	7,743,132	1,15	10	0.15	0.07	1.1	6	8	9	238	13	20	0									
22,869,221	22899	125,911,209	44,325,720	8,701,351	7,743,132	1,15	10	0.15	0.07	1.1	6	8	9	238	13	20	0									
43,249	7778	257,738,027	43,388,587	16,723,306	3,434,064	0.39	4	0.09	0.4	27.4	60	10	11	38,69	7	6	0									
22,254,597	5380	113,527,818	41,175,900	175,016,179	145,842,647	4,25	211	5.12	20.0	5	1	17	17	786	92	81	0									
22,974,793	8713	101,379,989	39,971,458	175,868,531	131,183,149	4,41	47	1.18	4.6	23	8	12	12	765	14	13	1									
11,910,771	17817	114,188,821	31,137,825	14,128,031	10,703,977	3,67	54	0.73	6.8	20	14	13	13	942	13	8	2									
15,408,263	15794	85,674,076	25,353,942	39,411,066	376,759,368	15,55	12	0.47	1.9	91	11	15	15	255	9	2	0									
13,593,256	73208	140,948,238	61,698,486	48,109,376	2,384,366	2,20	59	2.69	10.5	19	12	16	16	354	27	22	5									
9,438,896	162693	102,685,940	20,722,038	27,623,982	17,532,202	1,33	22	1.06	4.2	50	17	17	23	14	5	0	0									
10,773,551	26027	147,110,089	47,311,108	18,449,607	53,585,288	37,937,927	2,87	56	3.00	11.7	20	16	19	438	29	21	0									
7,149,103	73215	105,038,904	16,322,254	4,952,356	481,509	0.28	13	no inclcd of 0.80	no inclcd of 0.80	31	84	21	21	0,64	3	6	3									
1,936,486	2	1,936,486	903,453,526	15,777,074	18,660,964	4,116,693	1.18	8	0.51	2.1	137	36	22	9,64	3	2	3									
246,849	WOG Energy Permian, LLC	42,319,714	14,847,171	40,493,676	270,993	2,73	70	4.51	18.4	16	19	23	520	28	34	2	3									
24,0974	LEGACY RESOURCES OPERATING, LP	29,030,318	14,362,897	66,396,688	54,644,413	3,56	20	1.40	5.5	15	18	24	705	14	1	1	1									
7,737,253	194943	92,358,869	13,613,731	20,795,438	8,053,889	1,53	16	1.18	4.6	68	20	25	269	5	6	1	1									
6,633,844	73215	105,038,904	16,322,254	4,952,356	481,509	0.28	13	no inclcd of 0.80	no inclcd of 0.80	31	84	21	21	0,64	3	6	3									
73,717	TRIFORM ENERGY OPERATING, LLC	13,731,116	10,759,365	10,759,365	21,319,321	10,740,367	1.00	20	no inclcd of 0.80	no inclcd of 0.80	22	22	321	22	321	22	22									
32,827	CHISHOLM ENERGY OPERATING, LLC	19,281,364	10,759,365	16,912,986	16,912,986	937,816	1.95	10	1.15	4.5	110	24	28	310	7	0	0									
5,452,602	300097	AP PRODUCTION COMPANY, LLC	8,614,151	16,912,986	22,887,636	0.37	1	0.12	0.5	1095	377	29	0	0	0	0	0									
28,327	ARCANA OIL & GAS (USA), INC.	27,191,571	7,845,595	9,965,488	9,965,488	0.12	1	0.13	0.5	1095	377	29	0	0	0	0	0									
3,313,666	372165	CENTINELA RESOURCE PRODUCTION, LLC	7,325,236	12,473,966	156,077	1,70	4	0.55	2.1	774	23	31	215	4	1	0	0									
5,789,184	246999	COCA OPERATING, LLC	9,216,251	6,893,941	2,453,152	1,52	7	0.99	4.0	274	26	32	126	2	1	0	0									
1,109,813	148199	INVEST RESOURCES LLC	32,033,513	5,688,965	1,581,905	298,122	0.28	13	no inclcd of 0.80	no inclcd of 0.80	67	34	452	34	452	34	452									
350,043	148199	INVEST RESOURCES LLC	32,033,513	5,688,965	1,581,905	298,122	0.28	13	no inclcd of 0.80	no inclcd of 0.80	67	34	452	34	452	34	452									
3,342,779	1334	241,491	5,459,694	30,090,710	29,961,394	5,42	5	0.90	3.5	219	31	35	900	5	0	0	0									
3,828,942	172361	KASER-FRANCIS OIL CO	5,605,946	5,051,618	7,599,327	1,092,860	1.39	1	0.18	0.7	1095	27	36	138	1	0	0									
3,71755	PERMISSION PETROLEUM OPERATING, LLC	7,666,078	5,095,944	16,509,961	15,343,809	3,24	13	2.55	10.0	84	28	37	36	138	1	0	0									
1,980	BURNETT OIL CO	27,717,911	13,950,705	5,043,029	8,712,900	8,581,437	1.73	15	2.97	11.6	73	34	38	321	8	6	0									
1,488,199	246999	COCA OPERATING, LLC	9,216,251	6,893,941	2,453,152	1,52	7	0.99	4.0	274	26	32	126	2	1	0	0									
1,488,199	246999	COCA OPERATING, LLC	9,216,251	6,893,941	2,453,152	1,52	7	0.99	4.0	274	26	32	126	2	1	0	0									
3,742,249	ADVANCE ENERGY PARTNERS HESS, LLC	4,657,887	4,657,887	4,657,887	10,086,112	1,422,719	2.23	10	2.21	8.7	110	29	41	269	7	2	0									
65,515	DUGAN PRODUCTION COMPANY	25,556,248	3,450,998	17,880,873	16,119,180	3,97	3	0.67	2.6	365	75	42	7400	1	0	0	0									
241,623	372043	TAP ROCK OPERATING, LLC	8,334,394	3,447,861	6,172,792	808,835	1.42	1	0.23	0.9	1095	33	43	209	3	3	3									
2,958,775	372043	TAP ROCK OPERATING, LLC	8,334,394	3,447,861	6,172,792	808,835	1.42	1	0.23	0.9	1095	33	43	209	3	3	3									
1,752,059	17817	114,188,821	31,137,825	14,128,031	10,703,977	3,67	54	0.73	6.8	20	14	13	13	942	13	8	2									
1,709,093	158383	AMERICAN OIL AND GAS, LLC	9,456,296	3,285,142	2,385,142	1,23	2	0.61	2.4	548	39	45	236	1	0	1	0									
1,732,169	372224	MURPHY OPERATING, LLC	4,455,296	1,807,067	1,267,067	1,23	2	0.61	2.4	548	39	45	236	1	0	1	0									
1,676,119	14516	FAHSEN OIL & RANCH LTD	5,943,772	1,676,119	3,781,807	1,23	1	0.36	1.4	700	38	47	217	0	0	0	0									
1,676,119	14516	FAHSEN OIL & RANCH LTD	5,943,772	1,676,119	3,781,807	1,23	1	0.36	1.4	700	38	47	217	0	0	0	0									
1,024,068	18917	KEAD & STEVENS INC	3,602,711	1,624,520	3,521,818	841,221	6.17	9	3.00	11.7	122	47	48	1024	4	2	1	0								
1,024,068	18917	KEAD & STEVENS INC	3,602,711	1,624,520	3,521,818	841,221	6.17	9	3.00	11.7	122	47	48	1024	4	2	1	0								
4,338,243	102	AMNSTRONG ENERGY CORP	4,338,243	1,952,133	2,093,975	2,584,656	1.34	2	1.28	5.0	548	50	50	250	1	1	0									
701,080,642	Total	955,207,082	2,852,073,340	2,04	1,841																					

Exhibit 3

