BEFORE THE STATE CORPORATION COMMISSION
OF THE STATE OF KANSAS

In the Matter of the Application of Midstates Energy Operating, LLC to authorize injection of saltwater into the Squirrel formation at the Thrasher Wells #I-5, #I-4, and #I-3, and to increase the injection pressure on all wells encompassed by Permit E-31965, located in Section 25, Township 13 South, Range 20 East, Douglas County, Kansas.	)	Docket No. 19-CONS-3173-CUIC CONSERVATION DIVISION License No.: 35503

PRE-FILED DIRECT TESTIMONY OF R L HILBUN

I. BACKGROUND INFORMATION AND QUALIFICATIONS

Q. STATE YOUR NAME AND BUSINESS ADDRESS FOR THE RECORD.

A. My name is R L Hilbun. My business address is Summa Engineering Inc., 101 Park Avenue, Suite 490, Oklahoma City, Oklahoma 73102-7211.

Q. HAVE YOU BEEN RETAINED IN THIS MATTER BY MIDSTATES ENERGY OPERATING, LLC ("MIDSTATES")?

A. Yes.

Q. SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND WORK EXPERIENCE.

A. I received a BS in petroleum engineering from Mississippi State University in 1970. After earning this degree I was hired by Gulf Oil Company as a Petroleum Engineer and worked there for nine months before entering the United States Army. I served in the U.S. Army from 1970-1972 with a secret clearance and advanced to Infantry Sergeant before being honorably discharged. In 1972 I was again hired by Gulf Oil Company as a Staff Engineer and worked for Gulf Oil Company from 1972-1976, as a Production Foreman, Petroleum Engineer and Production Superintendent. From 1977-1981 I was employed by Universal

Resources Corporation as Division Production Engineer and Operations Manager where I was responsible for all of the divisions operational aspects across several states, including drilling, completion and production activities. In 1981 I became the Vice President of Operations for PSEC, Inc., where I was responsible for engineering and operations for oil and gas exploration and production, and maintained such position until 1997. In 1997 I became the president of Summa Engineering Inc., which is a petroleum engineering consulting firm that covers engineering, operational, regulatory and evaluation aspects of the upstream oil and gas industry, and I am still employed in that capacity today. I have been certified as a Licensed Professional Engineer by the state of Oklahoma since 1984 with such license in Petroleum Engineering, Environmental Engineering and Electrical Engineering. However I would like to emphasize that I am not a Licensed Professional Engineer in the State of Kansas, and that despite my education and work history I am neither testifying nor holding myself out as an engineer in this docket. Instead, I wish to be recognized as an expert witness on the basis of my work history and experience in the area of well completions, disposal, water flooding and the environmental impact of injection wells.

Q. SUMMARIZE YOUR EXPERIENCE IN KANSAS OIL FIELDS.

A. I have been actively involved in the Kansas oil and gas industry for nearly six years and have been involved in the drilling and completions of wells in several oil and gas fields in Kansas during that time. I have been involved in the drilling of wells in Kanas as recently as this month. I have also performed reservoir evaluations, assisted in pipeline construction and operation, gas plant construction and operation and iodine recovery operations. In short I have been involved in most all operational aspects related to the well oriented extractive and injection/disposal industry.

Q. SUMMARIZE YOUR EXPERIENCE IN THE AREA OF WELL COMPLETION.

A. I have 47 years of industry experience in drilling, well completion, well work-over and repair. I have experience with conventional vertical wells, precisions directional wells, horizontal wells and deep holes. I have been involved in the completion of many hundreds of wells over the course of my career and have the knowledge and experience to determine the integrity of a well completion.

Q. SUMMARIZE YOUR EXPERIENCE IN THE AREA OF DISPOSAL, WATER FLOODING AND THE ENVIRONMENTAL IMPACT OF INJECTION WELLS.

A. I have over four decades of experience in disposal and injection well permitting, construction and operation. In my current employment I am often retained to perform radius of endangerment calculations for injection and disposal wells and am responsible for designing and overseeing water-flood operations. I routinely provide Spill Protection, Control and Countermeasure Plans for clients and perform Phase 1 environmental studies for oil and gas operators. In addition I often consult upon and oversee environmental cleanup and remediation work for clients. I personally consider myself a “tree hugger” and take my environmental work extremely seriously.

Q. WHAT IS THE PURPOSE THIS TESTIMONY?

A. The purpose of this testimony is to support Midstates’ Application to inject water into the Squirrel Formation at the Thrasher #I-5, #I-4, #I-3 enhanced recovery wells, located in Section 25, Township 13 South, Range 20 East, Douglas County, Kansas and to increase injection pressure on all wells encompassed by Permit E-31965. I have reviewed such applications, am familiar with the same and the authority they request and feel that the granting of such applications will prevent waste without posing any real risk to fresh and

usable water or induced seismicity.

II. PURPOSE OF THE SUBJECT APPLICATION

Q. PLEASE DESCRIBE THE THRASHER #I-5, #I-4, #I-3 WELLS AND THEIR INTENDED PURPOSE IF MIDSTATES' APPLICATION IS GRANTED.

A. The Thrasher #I-5 well was drilled and completed in 2014 as an enhanced oil recovery well pursuant to KCC rules and regulations, and the operator obtained injection authority for such well in August of 2014 and placed said well into service as an enhanced recovery injection well. This well has been operational since such date. However, Midstates became aware by and through Docket No. 18-CONS-3196-CUIC that the injection authority for such well had been revoked by reason of the prior operator failing to keep its operator's license current. Promptly upon learning that such permit had been revoked, Midstates filed its application to reinstate injection authority for the Thrasher #I-5 Well in order to voluntarily maintain compliance with KCC rules and regulations. The Thrasher #I-5 well was drilled to a total depth of 822 feet and completed into the Squirrel Formation which is the same formation that the production wells located on the Thrasher Lease are completed into. Injection into the Thrasher #I-5 has enhanced the production from the Thrasher Lease and prevented waste. Therefore, Midstates seek authority to leave such well in service as an injection well and to reinstate injection authority for such well. Midstates' Application seeks authority to inject water through the Thrasher #I-5 well into the Squirrel Formation through the present completion at a maximum volume of 100 barrels of water per day and at maximum injection pressure of 500 PSI for each of said wells.

The Thrasher #I-3 and #I-4 wells are design approvals, meaning that such wells have not yet been drilled. However, such wells are expected to be drilled to a total depth of

approximately 822 feet and completed into the Squirrel Formation which is the same formation that the production wells located on the Thrasher Lease are completed into. Midstates believes that injection into the Thrasher #I-3 and #I-4 will enhance the production from the Thrasher Lease and prevented waste. Therefore Midstates Application seeks authority to inject water through the Thrasher #I-3 and #I-4 well into the Squirrel Formation once such wells complete successful mechanical integrity tests at a maximum volume of 100 barrels of water per day and at maximum injection pressure of 500 PSI for each of said wells.

Q. WHAT WOULD BE THE PURPOSE OF INJECTING WATER INTO THE WELLS THAT ARE THE SUBJECT OF THIS DOCKET?

A. The purpose of injection into these wells would be to enhance the recovery of oil from the production wells located upon the lease through water-flooding. These shallow sandstone reservoirs are very heterogeneous, typically low permeability, compartmentalized reservoirs, exhibiting very low initial pressure. In addition, the crude present in the reservoirs is quite viscous. Due to the relatively low solution gas present in the crude the pressure depletes rapidly with production, consequently the majority of the recoverable reserves must be recovered by application of enhanced recovery processes primarily water flooding. Water flooding is essentially the injection of water into the producing formation in order to increase the oil production rate and the ultimate oil recovery from the reservoir. The science of water flooding dates back to the early 1900's. As fluids are removed from a reservoir the reservoir pressure is reduced, therefore water is injected into the producing formation in an attempt to maintain the reservoir pressure. As water is injected it forms an oil bank which then moves toward the area of lowest pressure, i.e. the production wells thereby increasing the production of oil. In order for water flooding to be efficient the water injection

must be at a rate sufficient to recover the oil within a specified time. The injection rates in these reservoirs are usually small (i.e. similar to the rate requested in the Midstates Application) due to low permeability, viscous oil, and low injection pressures. Thus the ultimate purpose of the proposed injection is to increase the production of oil and the ultimate recovery of oil from the reservoir, thereby preventing underground waste.

Q. IN YOUR OPINION WILL GRANTING MIDSTATES' APPLICATION PREVENT UNDERGROUND WASTE?

A. Yes.

Q. WILL THE INJECTION WELLS WHICH ARE THE SUBJECT OF THE PENDING APPLICATION COMPLY WITH ALL APPLICABLE RULES AND REGULATIONS PROMULGATED BY THE KANSAS CORPORATION COMMISSION?

A. Yes.

Q. IN YOUR OPINION WILL INJECTION INTO THE SQUIRREL FORMATION THROUGH THE SUBJECT INJECTION WELLS BE CONTAINED WITHIN THE SQUIRREL FORMATION?

A. Yes. The Well Completion Report for the Thrasher #I-5 indicates that when the well was drilled the operator drilled down 40 feet, and set that length of seven inch surface casing, cemented it to the surface. Then they drilled down to the total depth of 822 feet using 2.875" casing and cemented it to the surface. The casing was then perforated from 719' to 729' in the Squirrel formation which is the producing formation. After the well was completed a Mechanical Integrity Test ("MIT") was performed upon the well to ensure the integrity of the well construction. The subject well passed the MIT test with no issues. All freshwater strata above the Squirrel formation is protected by the surface and producing casing strings which

are both cemented to the surface and also by the presence of a number of shale layers above the perforations. Thus, in my opinion the integrity of the completion for the subject well is sound and the integrity of the well construction is sufficient to confine the injected water to the Squirrel formation. The Thrasher #I-3 and I-4 wells will be completed and tested in the same manner as the Thrasher #I-5.

Thus, in my opinion all water injected into the subject wells will be confined within the Squirrel formation by the well construction and also by the natural geological features present in these wells.

Q. IN YOUR OPINION DO THE SUBJECT INJECTION WELLS POSE A SIGNIFICANT RISK TO FRESH AND USABLE GROUND WATER FORMATIONS IN THE AREA?

A. No.

Q. ARE ANY INJECTION WELLS CURRENTLY OPERATING IN THE VACINITY OF THE SUBJECT WELL?

A. Yes. The Thrasher I-5 and the Thrasher #10 are injection wells that are operating on the same lease as the proposed Thrasher #I-3 and I-4 wells and are located one injection well spacing pattern away from the proposed Thrasher #I-3 and I-4 wells. The Thrasher I-5 was permitted in 2014 and has been in operation since 2014. In addition, the Thrasher #10 was permitted in 2018 however such well will not accept injection water at the rate currently permitted. The Thrasher I-5 has been operating for approximately five years and there have been no adverse effects attributable to such injection during that time. Thus, there is no reason that we cannot also conclude that the Thrasher #I-3 and I-4 well will operate equally as safely and efficiently as the Thrasher I-5 has operated for the last five years.

In addition, injection into the Thrasher #I-5, I-3 and I-4 will complement the injection

into the Thrasher #10. Injection of water into the Thrasher #I-5, I-3 and I-4 will simply further develop and expand the water flood already being conducted upon the Thrasher Lease.

Q. WHY IS MIDSTATES' REQUESTING AUTHORITY TO INCREASE THE INJECTION PRESSURE ON ALL WELLS ENCOMPASSED BY PERMIT E-31965 FROM 400 PSIG TO 500 PSIG?

In 2018 the Commission authorized Midstates to inject into the Thrasher #10 at a maximum injection rate of 100 barrels per-day and a maximum injection pressure of 400 psig. Upon receiving such authority Midstates attempted to place such well into service, however such well will not accept sufficient water at 400 psig pressure to achieve an effective water flood on the Thrasher lease. Therefore, Midstates requests authority to increase such injection pressure to 500 psig, in order to cause such well to accept sufficient water to achieve an effective water flood.

Q. DOES MIDSTATES' REQUEST TO INCREASE THE INJECTION PRESSURE ON ALL WELLS ENCOMPASSED BY PERMIT E-31965 FROM 400 PSIG TO 500 PSIG EFFECT ANY OF THE CONSLUSIONS OR RECOMMENDATIONS CONTAINED IN THIS TESTIMONY?

A. No. All conclusions and recommendations set forth in this testimony have been made with the assumption that the subject wells are permitted to inject at a maximum volume of 100 barrels of water per day and at maximum injection pressure of 500 psig for each of said wells. Moreover, the injection wells located upon the Hadl lease which is adjacent to the Thrasher lease to the South are permitted to inject at a maximum pressure of 600 psig and such wells have been operating at pressures at or above 500 psig since such wells were authorized with no ill effects. The requested pressure of 500 psig is still incredibly low in the context of

disposal and injection wells and is well within safe operating limits for injection pressure in the area of the subject wells.

Q. IN YOUR OPINION WILL THE INJECTION PROPOSED IN MIDSTATES' APPLICATIONS POSE A SIGNIFICANT RISK FOR INDUCING SEISMICITY?

A. No. First, the proposed injection rate and pressure is extremely low in the context of oil and gas production operations even if such pressure is increased to 500 psig, and the producing formation is very shallow. Generally speaking the potential for inducing seismicity only exists if a well is high volume and is in communication with the crystalline granite basement which is where seismicity originates. In the instance of the wells which are the subject of this docket the natural geology precludes the subject wells from communicating with the crystalline granite basement. The presence of the 400 foot thick Morrow shale above the Mississippi Lime formation at a depth of approximately 1,230 feet and the 250 foot thick Maquoketa Shale below the Mississippi Lime formation at a depth of approximately 1,844 feet effectively seal any injected water from the crystalline granite basement.

Q. WHAT IS YOUR PROFESSIONAL OPINOIN REGARDING MIDSTATES' APPLICATION?

A. The Thrasher #I-5, I-3 and I-4 wells will be environmentally safe injection wells at the amended 500 psig operating pressure. By re-pressuring the producing reservoir they will prevent waste of natural resources. Therefore, I highly recommend the Midstates' Application be granted.

Q. DOES THIS COMPLETE YOUR TESTIMONY TO THE COMMISSION?

A. Yes.

VERIFICATION OF R. L. HILBUN

STATE OF OKLAHOMA)
) ss:
COUNTY OF Oklahoma)

R. L. Hilbun, being duly sworn, upon his oath states that he has read the document title "Pre-filed Testimony of R. L. Hilbun" to which this Verification is attached, that he is aware of its contents, and declares that the statements contained in said document are true and correct to the best of his information, knowledge and belief.

R. L. Hilbun

SUBSCRIBED AND SWORN to before me on this 22nd day of February, 2019.

Notary Public

Appointment/Commission Expires: 12-14-19

JENNIFER LOZANO NOTARY # 15011244 EXP. 12/14/19 PUBLIC STATE OF OKLAHOMA

CERTIFICATE OF SERVICE

I hereby certify that a copy of the above and foregoing was sent via U. S. Mail, postage prepaid, hand-delivery, or electronically, this 25th day of February, 2019, addressed to:

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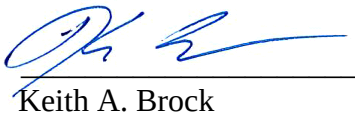

Keith A. Brock