Thank you. Good morning. It is a real pleasure to be in Arlington today.

My presentation focuses on an actual story of how a critical water supply problem in the Northwest part of Louisiana was identified, researched, and a solution was proposed and implemented. The solution required the cooperative efforts of the state oil and gas regulators, the local government entities, the interested public, the legislature, and of course, the industry itself. The specific issue that will be discussed is the required use of about 5-million gallons of fresh water per well for the hydraulic fracturing ("fracking") of each Haynesville Shale well, and how such a potential water supply was identified and successfully utilized. I will discuss this issue more in depth in a few minutes.

SLIDE 1: The drilling and development of the Haynesville Shale formation is one of a number of such gas shale formations across the Nation. You will see the subject of my presentation today – the Haynesville Shale Formation - is located within the TX-LA-MS Salt Basin, the Marcellus Shale Formation is within the huge Appalachian Basin, etc, etc. Each of the gas shale formations was deposited within the limits of what is called a geologic basin, or depression, in the earth. Also, the productive portion of the gas shale areas do not necessarily fill the entire basin- only the portion of the basin filled with organically-rich deposits have gas accumulation. SLIDE 2 shows the extent of the prolific Haynesville Shale formation located mainly in Northwest Louisiana, but extends westward into East Texas. Although the surface area of the Haynesville extends into Texas, you

see that the density of drilling and development of the natural gas reserve is much more profound in Louisiana.

Now a little history - Full scale development of this huge natural gas reserve began in earnest in the Spring of 2008 with the worldwide announcement by Chesapeake Energy that the Haynesville Shale represented what could ultimately be the largest natural gas field in the Nation, and perhaps the 4th largest natural gas field in the world! Louisiana's Haynesville Shale, in only three short years, has recently been recognized as the largest natural gas producing shale formation in the Nation, producing over 5.5 Billion cubic feet of natural gas per day.

SLIDE 3 is a geologic column of Northwest Louisiana showing the subsurface geology. Of immediate note is that the Haynesville Shale area of Northwest Louisiana has only a single underground source of drinking water (USDW), called the Carrizo-Wilcox Aquifer, extending from the ground surface to a depth of about 400-feet. You will also note that the depth of the Haynesville Shale is found at a subsurface depth of about 11,000-feet, which is over two miles below the lowermost USDW.

Let's take a look at SLIDE 4, which shows a similar cross section of the Marcellus Shale in the Pennsylvania area – the USDW in the Pennsylvania area extends down to a depth of 1,000-feet, and the top of the Marcellus Shale is found at a depth of 9,000-feet. One quickly ascertains that the geology is quite different in the various shale basins around the Country. Each Basin has its unique geological and engineering characteristics, and specific issues identified in one basin do not necessarily occur in every basin. Each basin and shale

formation needs, therefore, to be regulated by the proven experts for that region, which are usually the state's oil and gas regulatory agencies. The states have gained this unique expertise through many decades of regulatory experience.

SLIDE 5 is a detailed map of the development area of the Haynesville Shale that shows the current extent of the established production units in the area. Each red colored production unit consists of one square mile, or 640-acres. Allocation of production revenues is based on % mineral ownership within that particular unit. In Louisiana, landowners typically lease their mineral interest to companies for an agreed-on per-acre price and an agreed-on % royalty. A quick look at the map shows that the current Louisiana productive area of the Haynesville Shale is about 80-miles in a N-S direction, and about 60-miles in an E-W direction (about 4,800 square miles). Ultimate natural gas reserves in the Haynesville Shale are estimated to be about 251 trillion cubic feet, or enough natural gas to supply the entire United States for about 10 years. Current wells present in the Haynesville, as shown on the map, are 1,984 total wells, of which 122 are currently drilling and 1,055 wells are now producing. The Office of Conservation has established 2,122 production units since Spring of 2008. Ultimate wells needed to fully develop the Haynesville Shale reserves will be in the order of 10,000 wells.

SLIDE 6 shows a quick picture of the productive potential of several of the premiere gas shale accumulations in the Nation. From the estimated recoverable natural gas in each of the gas shales, you see

the Haynesville Shale represents the leading shale natural gas play in the Nation.

SLIDE 7 identifies the main issue that has been a concern since day one of the Haynesville development – WATER SUPPLY. To be exact, the SOURCE of the needed fresh water to be used for fracking the shale formation to allow the natural gas to flow from the shale, up the wellbore and into the pipelines that take the product to market. Fracking takes tremendous volumes of fresh water - about 5 million gallons per well, to be exact.

Haven given you a brief background on the Haynesville Shale of Northwest Louisiana, I would like now to talk on the case study of how development of the Haynesville Shale was cooperatively handled within the State of Louisiana, that required to cooperation of the state and local governing authorities, the impacted community and the regulated industry.

Companies initially (in 2008) opted to use underground fresh water from the area's local aquifer called the Carrizo-Wilcox aquifer, which is shown on this SLIDE colored in "green". Well, this turned out to not be the best choice. Almost immediately our office, as well as other governmental agencies, began to receive literally hundreds of complaints from local landowners that their domestic ground water wells were "going dry". Suddenly the pumps in their domestic wells were reported to be "sucking air". After researching the files of numerous state and federal government agencies it was quickly determined that the Carrizo-Wilcox aquifer was not capable of quickly providing such large volumes of water needed for fracking. Therefore, we determined that companies had to immediately revise

their frack water source plans and move to an alternate source of frack water. As regulators, we had identified a serious problem to resolve.

Fortunately, the USGS has over many years accumulated a tremendous amount of technical data on the various ground water aquifers around the State, the Carrizo-Wilcox aquifer included. Our Staff reviewed this data, and determined in October, 2008 that the low yield Carrizo-Wilcox aquifer was simply not suitable for producing the required volumes of fresh water needed for fracking, and that alternate sources must be identified and utilized. Our research also concluded that another local aquifer, called the Red River Alluvial Aquifer (shown in "yellow") that was located adjacent to the Red River, was indeed, a suitable high yield aquifer for withdrawing water for fracking. Although our research showed that the Red River Alluvial Aquifer water was highly mineralized (not potable), it was determined to be ideal for hydraulic fracturing. And since the aquifer was identified as a high yield aquifer that was being continuously recharged by the Red River, it was an inexhaustible source of good water for fracking. Additionally, our Agency identified two extremely large surface water bodies located in Northwest Louisiana, the Toledo Bend Reservoir to the west, and the Red River located right in the middle of the Haynesville Shale development, were also ideal for meeting the tremendous water volume requirements for Haynesville Shale development.

So, the obvious solution was for companies to utilize these alternative surface water and ground water sources for drilling and fracking – and to simply leave the Carrizo-Wilcox for its historical domestic use.

SLIDE 8 shows an October 16, 2008 MEMO issued to all Louisiana oil and gas operators advising operators to make the change to the newly identified alternate sources as soon as possible. Actual implementation of this new directive had to pass public muster, and a fail-safe reporting system to document industry compliance needed to be adopted in our regulations. And this happened, I am happy to report.

SLIDE 9 shows the September 15, 2009 MEMO to industry directing each company to report both the volume and the source of water used in conjunction with each Haynesville Shale well. The information must be certified accurate under penalty of law, and submitted on a form that becomes a part of the official records of the well. Companies are complying with this new directive, as required.

As shown in **SLIDE 10**, I have a pie chart that shows the actual results of the industry's transition from use of ground water to surface water over the past two years. The State's reporting and tracking procedure provides my Office with a very effective way to manage both the surface and ground water usage in the Haynesville Shale, and to detect any sustainability problems early on.

In an effort to be as cost effective as possible, oil and gas companies are typically interested in new ways to streamline their processes. It's our job as regulators to ascertain that new operational procedures remain in full compliance with both our laws and rules. In response to a recent industry proposal to be able to re-use "flow-back" water for additional fracking operations, we have developed new regulations to allow this to happen. The reuse of flow back water is simply a good conservation measure. This process will, of course, reduce the use of

ground and surface water, which affords their use for other beneficial activities. However, when reusing flow-back water, we do require that companies retain the legal custody of their used frack water in case a liability issue arises in the future. The new Rule allowing such reuse recently went into effect and seems to be working very well.

A final issue we have hopefully addressed satisfactorily at the State level in the development of the Haynesville shale is the matter of our establishing a drilling and production Ordinance for Haynesville Shale wells located within corporate and city limits of populated areas. Distance restrictions from roads, dwellings, schools and churches, and certain domestic water wells constitute main portions of the Ordinance. Noise and dust restrictions are also included in our Ordinance. Our Ordinance has been in effect for over two years now.

As to the future development of the Haynesville Shale in Northwest Louisiana, and especially the providing of adequate sources of water to allow full use by all of the stakeholders, we anticipate no significant supply problems.

SLIDE 12 shows the tremendous capacity of the two main surface water sources present in the Haynesville Shale area. Again, these are Toledo Bend Reservoir and the Red River. The graph shows that Louisiana has enough available fresh surface water (about 300-billion gallons of water annually) to frack over 88,500 Haynesville Shale wells per year! And as I have mentioned previously, the projected total number of Haynesville Shale wells needed to develop the Haynesville Shale gas reserves over the next two or three decades, will be about 10,000. Note this tremendous quantity of available surface water does not even consider the prolific underground water source of the

Red River Alluvial Aquifer. Based on this information shown in the last SLIDE, Louisiana is shown to be in great shape to adequately handle our hydraulic fracturing needs for a long, long time.

In closing and as summarized in SLIDE 13, I hope the message that I have presented today clearly shows that the oil and gas regulatory authorities in the various gas producing states clearly have the capability, expertise and regulatory knowledge to effectively manage their programs to the benefit of providing full environmental and public safety protection to the population without the federal government becoming unduly involved. I sincerely thank the EPA for sponsoring this Workshop and allowing me to provide these comments.