

EXHIBIT A
TESTIMONY REGARDING SEISMIC DATA

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June 16, 1995	Bruce Opening	10	And we will show evidence today that pore geologists and pore geophysicists from three different companies have looked at the data, 3-D seismic data, geological data, and have all agreed on the contouring.
	William Crow	18	The south edge of the producing Strawn mound being unitized is easily identified on proprietary 3-D seismic data.
		28	Around 1994, we developed five wells with 2-D data, felt at that time that was about as far as we could go without risking a dryhole with the present data we had, and came back and shot the 3-D data at that time.
		30	I used a consulting geophysicist, and together we used our interpretation into our structural interpretation.
		30	(Referring to Structure Map) There's more of a saddle existing up here along the section line between 33 and 34 than the map below. ... All locations have been based upon what looked to be the best on 3-D. ... Subsequently had people re-interpret or re-analyze the seismic data after the well was drilled. ... They usually tied pretty well.
		35	(Referring to Nelson's Structure Map) I assume this was probably done based upon his interpretation of the well control and seismic. (Referring to Exhibit 2) I used no seismic at all. This is strictly mapped solely on well-log control.
		40	(Referring to question asked in January 19 th hearing) The zero line depicted there to the north was determined using 3-D seismic data interpretation.

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		40-41	The isopach map not the structure map has included an integration of 3-D seismic.
		41	Used 3-D seismic data to depict where the porosity stops, where the mound ends, so we can pick the edges.
		42	All I used 3-D for was to try to determine where the edge of the reservoir is. I never tried to use it to determine how thick it was.
		42	I have seen enough seismic data in the Strawn that I know the signal that displayed — what a reef looks like. And you can follow it, you can see where it stops. Just strictly off the traces, the signals.
		42	The quality of the 3-D we have, we feel, is — gives us a pretty good indication of where the edge is.
		46	(Referring to Exhibits 2 and 4) This map ... Because it was the basis for the hydrocarbon pore volume map, goes back and interprets the seismic. So it is a combination of well control and seismic interpretation.
		47	The data available from the logs on the Klein 1 gave us an additional tile, which made us be able to go back and look at our seismic more accurately up there.

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		50-51	The geophysicists going back and interpreting and looking at all the data after Phillips had an opportunity — when the first proposal came around, Phillips had not had an opportunity to review the 3-D data. And so after they reviewed the data and came back and we had a long discussion and they proposed some ideas of what they thought was going on in there, that we agreed after some long discussions that they were — they had an accurate representation.
		51	(Referring to chronology - February 1995) We interpreted the reef to be thicker in there than we originally thought. Log data for wells within that tract would be more accurate for pore volume porosity calculations but they don't have a well in every 40, so they have to use some interpretation.
		59	(Referring to Exhibit 4 Structure Map) The structural interpretation has used 3-D to help aid interpretation.
		59	(Referring to Exhibit 4 Isopach Map) Used 3-D in a way to determine where porosity starts and stops.
		60	What you've attempted to do is use that 3-D seismic to tell you where the reservoir pinches out, and you've done that without regard to structure.
		60	When you're looking to see if the reservoir pinches out — at 12,000 feet, whatever it is, you're looking to find some point on that 3-D seismic information where you no longer have a reservoir.

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		61	(Referring to transcript of January hearing) With seismic data, we feel we can depict the reef and see the actual porosity, and we attempt as best we can to follow that porosity signature out until it pinches out, and that was where we determined the zero line was.
		62	You can use the 3-D seismic information to tell you when you're low enough on the structure, [or] you're beyond the porosity that will contribute to production in the reservoir. We can use it for either thing. To determine if you're off structure or ...
		62-63	When you get into seismic, it is interpretive, and three different geophysicists might have two or three different interpretations. In this case, all three had pretty much the same interpretation.
		71	All those subsequent wells were picked using 3-D seismic information. The original Snyder 2 well was picked based upon 3-D seismic work.
		71-72	I did not use any seismic to try to determine how thick anything was. Was picking those locations based upon the signature, the character of the signature, where it appears to be the best.
		74	Used the data from the two new wells and integrated it back into seismic to help revise the map.
		75	This whole reservoir is in communication with — This whole area is in communication, this whole structure? (A) We believe it is. When you take bottomhole pressure tests, they build up to approximately the same pressure. ... There's not any more well control, of deep well control to the south for several miles. So it was picked off of 3-D.

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	Ralph Nelson	105	The contouring of those values as we move throughout the display has been influenced by 3-D seismic interpretations.
	David A. Scolman	109	(Referring to his involvement in interpreting the geology of the West Lovington-Strawn Pool) I started with Ralph Nelson's interpretation, the geological and petrophysical interpretation of the wireline data and of the core data. I used that, then, to calibrate the 3-D seismic and from that calibration determined the structure of the pool and the geometry of the pool.
		109-110	Following the drilling of the additional two wells, of the Snyder 2 and of the Klein well, we expanded our effort in the depth conversion of the seismic data. I went to a more regional picture.
		110	Mr. Nelson and I agreed, based on the consistent seismic signature and the consistent log signature, to use the Tubb formation as the datum horizon. We constructed isopachs in the area between the Tubb and the Strawn. We then created an isochron from the seismic data.
		110	Based on that velocity gradient through the area, we prepared the depth conversion of the seismic time structure map to the current seismic depth structure map that we've entered in this hearing.
		112	The well data forms the basis for the time-to-depth relationship, the velocity relationship. It also gives us an indication of the relationship between seismic signatures and of the reservoir parameters, so that as we drill new information our model updates across the entire field.

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		113	We had talked about what the seismic indicates, as far as the geometry of the reef. We see the reef itself as an indication of thickening on the seismic data, and we have noticed an empirical relationship between various seismic parameters, such as amplitude, to indicate the relative reservoir quality.
		114	As far as the southeast corner is concerned, there is a relationship that we derived looking at the various seismic parameters to those calibration points. And based on that, we show that the reservoir quality of the rock deteriorates into the southeast quarter, and the well control is — seems to back that up.
		115	There was some earlier 2-D seismic data. Used the information. It ranges in vintage. It's mostly acquired during the 1980's. It's all modern-quality high resolution CDP seismic data.
		116	Doesn't have a base map to show where those shot points are.
		116	Since the 3-D coverage contains everything ... There would be duplication of the 2-D CDP data and of the 3-D data. 3-D is more accurate than the 2-D data.
		117	They had the base set of information on the 3-D seismic work for more than a year. Almost eighteen months to two years.
		117	We have seismic traces roughly every 110 feet. It in the form of squares.

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		117-118	There's not a true shot point to generate the 3-D seismic work ... because they are laying out a two-dimensional array of geophones. Any one particular shot point will generate CDP traces over a wide variety of area.
		118	(Referring to the area of geophysics) You'll use the well data, you'll look at how the well information ties your seismic signatures - - that includes both structuring, amplitudes to reservoir parameters - - and use that information, then, to extrapolate into areas where you don't currently have well control.
		119	To do it properly, you would look at the statistical variance between various seismic parameters and various geological or petrophysical parameters.
		119	The process begins with the creation of a synthetic seismogram, which is using the sonic log, which measures the travel time of a formation in the wellbore, and relates that to the speed of sound in rocks. From that, you can make a model of what you believe a seismic trace would look like running through rock at that velocity.
		120	So in 3-D work I'm going to see a similar seismic trace that I would see from a geophysicist with the 2-D presentation. The seismic traces would look similar.
		121	Once that calibration is done, you compare your model seismic, and you try to get - - the first thing to establish is which reflectors in the seismic represent which geologic layer boundaries.

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		121	Because of the inherent differences in a sonic log measuring of the speed of sound in the rock and the seismic measuring the speed of sound in the rock, it is better to use an interpretation, to go ahead and use, say, your breadth of knowledge in making that calibration through an entire trend, to go ahead and fit those reflectors, to take a look at which reflectors on the synthetic trace you believe match which reflectors on the actual seismic data.
		122	It depends on the nature of the reflectors that you're mapping on. In this part of the world, the Strawn is a good-quality seismic reflector. It's a fairly simple acoustic interface between the overlying shales and the carbonate.
		123	The most important thing that we look for is the relationship between the depth surface, from the log information, and the time surface from the seismic information.
		123	Mr. Crow and I were in agreement, as was Phillips, into the shape of the depth surface in this pool when I made my depth seismic map.
		125	When we first did our work that led up to the maps of late 1994, we were using rough relationships for the area between the time and the depth picks, between seismic and well information. We used that, to qualitatively shape our contours to extrapolate a well away from the well information.
		125	In this particular reservoir, you're not going to be able to generate an oil-water contact by looking at seismic information.

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		126	I did not want to bias an interpretation. I wanted to let both the seismic data and the well data give Mr. Nelson and I the best interpretation we could of the geologic information to explain the reservoir, and then once we had that, look for - - compare that back to the material balance and see if we believed we had roughly the same pool described.
		127	I use all of that information at the local area, my experience in the trend through this entire area from studying other fields and 2-D and 3-D seismic responses in those other fields, to come up with my final interpretation of the data.
	Michael G. Clemenson	149	Was not provided an opportunity to take a copy of the database or the data tape that went into the 3-D seismic work.
		164	As I recall his testimony (applicant), he said from seismic, he picked the edge of the reservoir, the place where it tailed down , and they lost that seismic amplitude anomaly.
		165	In order to achieve that interpretation. He would have to look at the 3-D seismic data and find the edge boundary of the reservoir, and from there he would have to draw a zero lie all around the boundary that he saw.
		165	To make that kind of analysis, you have to look at your seismic data, you have to tie it to your well data. From there, you should generate velocity maps, velocity should be converted to depth, and then you have to be careful of some things.

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		166	(Q) If the northern edge of the seismic data corresponds to the northern edge of the unit, what happens to the reliability of the seismic data? (A) Well it's decreased within the unit. And again, I asked for a seismic geophone array to see where the basic data was present and couldn't get to it.
		166	When I was employed with Tenneco, we were broken up into teams and there was cross training where I was required to go to the geophysical department for months, I've had courses in geophysical interpretation. I have worked on 3-D seismic stations.
		167	I think that it was the best characterized by an earlier witness that with 3-D seismic you can find subtle seismic anomalies that can lead you to finding these phylloid algal mound buildups, and that this 3-D seismic is a good semi-quantitative tool to find those phylloid algal mound buildups.
		172	(Q) Is a map based solely on well control superior to a map based on well control and 3-D seismic? (A) That depends on the purpose of the map. If you are mapping a wide trend, long trend, where you would like to know - - Well, I will say that if you have a long trend, you would want to use some seismic data there.
		172	The seismic would be a good semi-quantitative tool to help define the boundaries or the edges of the reservoir. When you get into very tight interpretation, I don't know that it's useful.

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		173	Didn't drill the wells and doesn't know that seismic was used for every single well, solely, only, and that no other geologic information was used to generate a map to drill wells from.
		181	Seismic is a good semi-quantitative tool to locate velocity anomalies that will help you to pick out a these phylloid algal mound reefs.
		181	When you pick a seismic reflector two miles in the ground, you have to know the quality of your seismic data to know whether or not you're accurate to within 30 feet or 50 feet, and that's what we're talking about on this map.
		182	In the absence of well control, seismic may be a useful semi quantitative tool to get you in the ballpark of drawing a structure map.
		187	(Q) Do you feel like you could have done a better job mapping this structurally if you would have had the 3-D seismic data. (A) Personally, I looked at the 3-D seismic data. I thought it was pretty shadowy, and I would not use it.
	Brad Birkelo	250	(Q) At the time you went to examine the seismic material in Dalen's offices, did Phillips already have a stated position either in opposition to or in support of the proposed unit? (A) No ... we went there to develop an opinion based on all the data that was available.

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		251	The discussions that we had with Gillespie and Dalen, after my visit to view the seismic data and after I had a chance to come back and integrate it with the geologic data that we had, at that point in time we had some — what I felt were some areas where the — their mapping was maybe not taking into account certain things which I had seen on the seismic data.
		255	I think, what's happened with the zero line of the pore volume map on the final map that Gillespie has done. From when I looked at the data, there were indications to me that the Strawn at that particular area, based on the seismic data, dipped below the oil-water contact. And so even though you can have porous reef in that section, in that northwest quarter of Section 34, almost all of that porosity was actually below the oil-water contact.
		255	If I had well-log data alone, it would have been difficult to justify that re-entrant. But the seismic data, in my mind, very clearly showed that there, and it was very justified in being in the final map.
		259	(Referring to Dallas) The quality of the seismic data looked excellent to me.
		260	The oil-water contact is not something he as a geophysicist can see on 3-D seismic data.
		260-261	At the working interest owners' meeting, I had not looked at the 3-D

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		261	Reached a consensus regarding the Gillespie-Dalen map following the drilling of the final two wells, the Klein Number 1 and the Snyder Number 2 wells.
		261	We agreed at the point in time at which we conversed, following my look at their seismic data, that we would postpone any remapping of the data until after we had collected the data from those two wells and recalibrated our maps based on those two wells.
		261	Went to Dallas to look at the seismic data at the end of December.
		262	Saw the seismic data after he saw the original hydrocarbon pore volume map.
		262	Saw some areas where he felt they had not taken into account as much information as was actually in the seismic data, and that was pointed out to them at that time.
		263	Took with him when he left Scolman's office, cross-sections, four profiles across the 3-D volume. Took maps essentially of a couple of seismic attributes that corresponded to the topper, basically the top of the Strawn interval, so I could do my own depth conversation back in the office.
		265	We were looking at the seismic attributes and giving each other what we felt were our interpretations of what those attributes actually meant.

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		266	The character of the seismic wavelength will change, depending upon the amount of porosity and the distribution of the porosity, and those are the types of things that we were discussing.
		267	The seismic attributes we measure reflect porosity and are related to porosity. By measuring specific values, you do not actually get a porosity value. It's nothing like log analysis.
		268	The distribution of porosity within the reservoir will cause different signatures within the interval that is represented on the seismic data of the reservoir. Those wave-form characters ... change depending upon how the porosity is distributed throughout the reef section and how thick that reef section is in general.
		269	What we use the seismic to do is to fill in the gaps, and at 110-foot spacings that seismic data does a very good job of filling in the gaps between the wellbores. It doesn't make us just make things up in our heads. We can't actually go in and use what the seismic data is telling us is there, or at least indicating that, to guide our mapping.
		270	If you want to get that plus or minus ... It's a fairly detailed analysis of velocities, frequency of the seismic data and a lot of other things.
		270	(Q) As we move out from the wellbore in any dimension, how much do we reduce the accuracy of the method? (A) That's not something you can answer straightforward. It really depends upon your degree of well control, the quality of the seismic data and the degree of variability that takes place not only within the reservoir but within the overburden.

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