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1) WHAT IS SEISMIC DATA?

- Seismic data is an image of the earth below the surface of the ground.
- Seismic data shows different rock formations as layers of reflectors.
- Different rock types, and the fluids in the rocks, cause seismic reflection events.
- Seismic data is collected in the field, processed in a computer center, and interpreted by a geophysicist.
1) WHAT IS SEISMIC DATA?

- There is 2, 3, and 4 dimensional seismic data (2d, 3d, 4d) being collected around the world at this time.
- 2d seismic shows a single slice of the earth.
- 3d seismic shows a volume of earth.
- 4d seismic shows a 3d volume at different times in the life of an oil and/or gas field.
- 3d seismic is the primary choice of data collection today for oil and gas exploration.
2) HOW IS SEISMIC DATA COLLECTED?

Land Seismic Exploration Technique
"The Reflection Seismic Method"

The “Reflection Seismic Method” is a geophysical technique used to map in 2D or 3D, an image of the earth’s subsurface. Reflection Seismic is used by Oil & Gas, Coal Seam Gas, Minerals and Coal Exploration and Production companies to develop a clear understanding of subsurface rock structure and other geologic properties.
2) HOW IS SEISMIC DATA COLLECTED?

- Sound waves are sent into the ground using an energy source such as vibrators, air guns or dynamite.
- The sound waves pass through the earth and are reflected off of, and transmitted through, the rock layers. (think of sonar, an MRI, or a cat scan)
- A seismic crew goes into the field and collects the data.
Vibrators moving along a road

Crew personnel moving through a marshy area

Personnel working in a heavily wooded area
Sound waves generated at the energy source go down into the subsurface and reflect off of rock layers. Sound waves then reach the ground surface and are detected by listening devices called geophones. Snell’s law of refraction at work helps in understanding the behavior of these waves as they travel through different rock layers.
A geophone and receiver box like this is used in the field to listen to the sound waves generated by the energy source.
3) When is seismic data collected?

- Seismic data is collected when the environmental requirements and weather conditions permit.
  - This can be during the day or night.
- Usually, it is done when there is the least cultural (people) activity.
- In the countryside acquisition is usually during the day.
- In the city it may be while most people are sleeping.
4) How much does it cost to collect seismic data?

- The cost of acquisition depends on permit costs, crew costs, and other equipment costs.
- Currently, it costs around $85,000 per square mile to acquire 3d seismic data.
- The Oil and Gas company that requests the acquisition spends at least $1MM, and possibly over $40MM, before they see any of the results.
- The mineral owner pays nothing.
5) How do I give permission to a company that wants to collect seismic information on my property?

- You will be contacted by a permit agent prior to any activity on the surface of your land.
- Read the permit carefully.
- Make it clear what your expectations are for the use of the surface of your land.
- Put any special requirements in the permit, *i.e.*: gate entry, locks, call 1st, etc.
Questions attached to the Seismic Permit form

1. Are there any structures on your property like houses, barns, pipelines, oil or water wells or power lines?
2. Where can we enter your property? Is your property Locked? If so, we will interlock a company lock.
3. Whom do we talk to for entry and what is the telephone number?
4. Are there any weight limits on bridges or culverts located on your property?
5. Do you have crops on your property? Where are they planted? When will they be harvested or replanted?
6. Do you have livestock on your property? Do the gates between pastures need to be open or closed?
7. Do you have any hazards on your property like creek beds, bad dogs, or snake prone areas?
8. Does anyone live on this property?
9. Is there a surface tenant on the property? What is their name and how do we contact them?
10. Do you own minerals on this tract? If so, what percentage and (if the interest is less than 100%) do you know who the other fractional owners are? Please give us their contact information.
11. Is there an Oil and Gas lease on this property? If yes, to whom and when was it taken?
12. Are there any concerns you may have regarding our operation?
6) What kind of environmental damage might I expect?

- Crews are very sensitive to their ecological surroundings and try to cause minimal damage.
- Crews want to have a minimal footprint in the field.
- Crews have requirements to keep the energy sources a minimum distance from certain surface features such as houses, barns, pipelines, water wells, oil/gas wells, septic tanks, sewage lines, etc. 
  
  
  (Don’t forget to tell the permit agent about any of these on your property.)

- Most work involves light to moderate weight trucks and equipment, 3 and/or 4 wheelers, and of manpower.
6) What kind of environmental damage might I expect?

- In heavily forested areas, minor clearing may be needed to get through the underbrush.
- All trash, flagging and markings are removed immediately after the acquisition is completed.
- All surface evidence of seismic crew work is usually gone within six months to a year of the work.
- You don’t have to worry about your favorite cow not giving milk, the flight path of your favorite birds, or any other issues about livestock or wildlife.
7) What payments should I expect?

- Permits usually include a payment to the surface owner of $10-$25 per acre for the right to cross the land.
- This payment covers minimal surface use damage.
- Excess damages for trees or crops are paid to the owner at the fair market price.
8) Do I get a copy of the results of the seismic data?

- Mineral owners with less than 640 acres (1 square mile) would not benefit from having copies of the processed 3d seismic data.
- Owners of large mineral acreage (>640 acres) may want to request a copy of the processed 3d seismic data over their acreage.
- Be aware that there are certain things to ask for when requesting data. Seek a seismic expert for advice.
  - Seismic data must be viewed on a seismic workstation.
  - This means there will be a cost to you for loading of the data, viewing and interpretation.
9) Why should I allow seismic data to be collected on my property?

- Seismic data allows oil and gas companies to develop a clear understanding of the subsurface rock structure and other geologic rock properties.
- Wells can then be drilled in the best place to achieve the maximum production.
- The net result should be more revenue for everyone involved.
Seismic data gives the explorationist a picture of the geology of the subsurface.
10) Why does a company need to collect seismic data on my land for the Haynesville Shale?

- The Haynesville Shale play involves complex rock structural properties.
- 3d seismic data will help the companies drill wells in optimum locations so that they can extract the maximum amount of oil and gas for the smallest cost.
- Better economics benefit the mineral owners as well as the oil and gas companies.
3D data plus new processing algorithms
generate clear images of the subsurface
What does the Haynesville Shale oil and gas formation look like on seismic data?

It is a complex set of reflectors from 7,000’ deep in Caddo Parish to over 12,000’ deep in Desoto and Sabine Parishes.
The geologist’s and geophysicist’s job is to fill in the gap between wells (interpolate). This log cross-section shows how 3d seismic is filling in the gap.
Now you know all about SEISMIC DATA and oil and gas exploration and production.

Let’s hear from some experts regarding Leasing, Drilling, and Production.
A SEISMIC OIL AND GAS PRIMER

by

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