Impacts of Shale Development in Eastern Ohio

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The Jargon…

Leasing

- Landowner receives “bonus money” from lease
- Landowner receives royalty payments on x acres used in drilling unit

- Remainder acreage can be included in future drilling units as separate royalty payments

Selling Mineral Interests

- One time payment
- Landowner has no negotiating rights on future leases conducted on the property

Selling Royalties

- Payment for royalties received on land
- Landowner still owns mineral rights

- Can negotiate future leases on property
- Can collect “bonus money” from leases

Considerations to keep in mind

Minerals vs. royalties rights

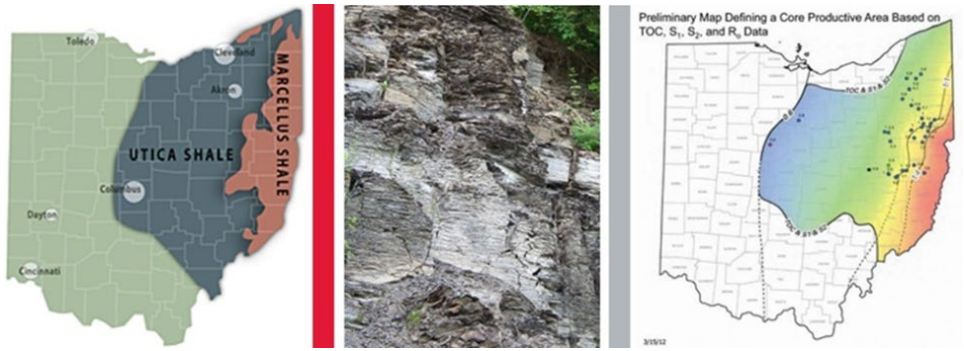
Selling royalties

- Selling 50%
- Indefinite

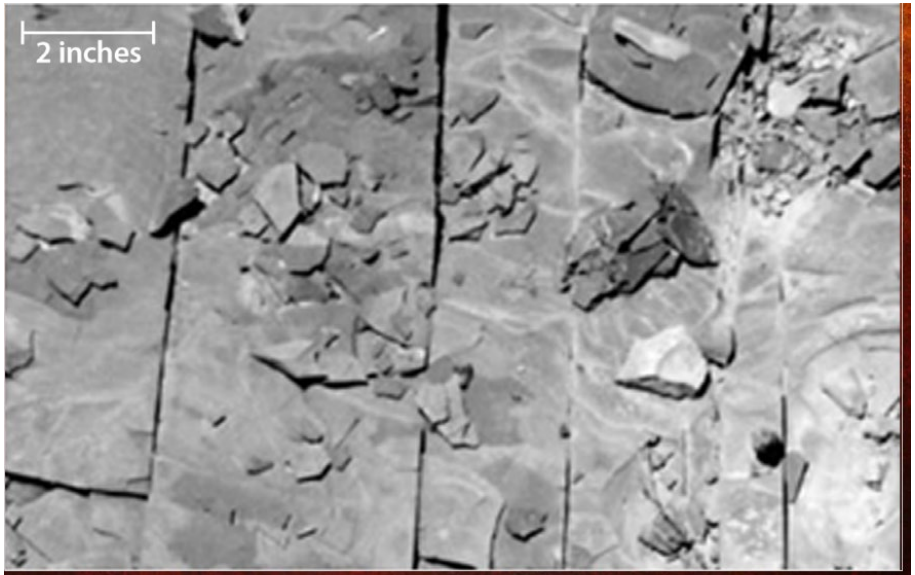
5-10 year leases that are expiring

- Top leasing

Depth of minerals



Some examples of mineral sales



Above: Natural fractures ("joints") in Devonian-age shale, typical of fractures in Marcellus Shale. Image from Geology.com (2010).

Purchase Price	Price/Acre	% of Interest
$280,000.00	$3,500.00	100.0000%
$102,700.00	$5,000.00	
$444,269.50	$8,500.00	100.0000%
$468,586.44	$8,965.24	100.0000%
		50.0000%
		50.0000%
$1,254.53	$5.78	0.0031%
$5,018.13	$23.11	0.0125%
$1,254.53	$5.78	0.0031%
$1,254.53	$5.78	0.0031%

Hydraulic Fracturing

Some of the frack fluid flows with the gas to the surface, where it is pumped away for disposal or recycled. The rest remains underground

Ohio EPA Brine water info

"Brine" includes all saline geological formation water resulting from, obtained from, or produced in connection with the exploration, drilling, or production of oil or gas, including saline water resulting from, obtained from, or produced in connection with well stimulation or plugging of a well. (R.C. 1509.01(U)) The definition of brine includes flowback water from hydraulic fracturing.

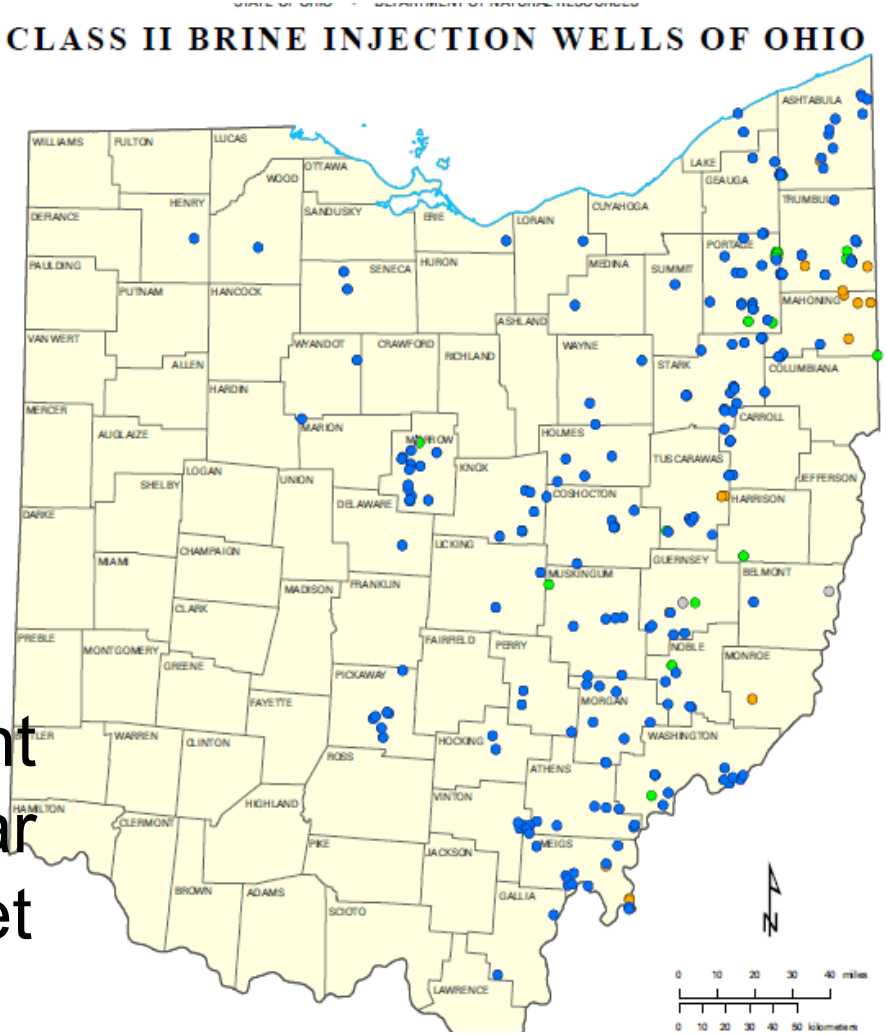
- TDS in the form of soluble salts in brine can reach concentrations as high as 200,000 mg/l. In comparison, the salinity of seawater from concentrated salts is about 35,000 mg/l.

Brine Disposal

- Ideally is recycled
- Injection wells
- Drill cuttings are “solid waste”
  - Oil and gas exploration and production wastes, including drill cuttings and drilling muds, are not classified as hazardous waste under state or federal law.
  - Ohio EPA regulates these cuttings as solid waste. Solid waste must be sent to a licensed solid waste landfill for disposal.

Class II Injection Wells

- Brine water pumped ~4500 ft below impermeable rock layers into porous rock
- No wells drilled in geologic faults or Precambrian rock
- Three layers of steel pipe casing with cement
- Inspected 4-5X per year
- ODNR regulations meet or exceed EPA standards



What should the water well sample be analyzed for?

"**Chloride and sodium** are principal chemical components in oil and gas field brine waters and are typically elevated compared to shallow ground waters in Ohio. Another indicator of oil and gas activities is the presence of dissolved **methane gas** in water. The additional recommended parameters (e.g. **barium, potassium, sulfate, bromide, BTEX**) aid in the interpretation of water quality results and help distinguish various types of water quality contamination."

- BTEX: (benzene, toluene, ethylbenzene, and xylenes)

Recommendations for Water Well Sampling Before Oil and Gas Drilling

Recommended Water Quality Sampling Parameters		
Tier 1 Parameters	**Tier 2 Parameters**	**Tier 3 Parameters**
Barium Chloride Magnesium Potassium Sodium Strontium Sulfate Total dissolved solids Specific Conductivity	**Tier 1 sample parameters +** Calcium Hardness Total Alkalinity pH Iron Manganese Total suspended solids Bromide	**Tier 1 and 2 sample parameters +** BTEX (benzene, toluene, xylene, ethylbenzene) Methane (dissolved)*

*Include with Tier 1 if laboratory can analyze for methane.

Other Contaminants Associated with Ground Water

Nitrate

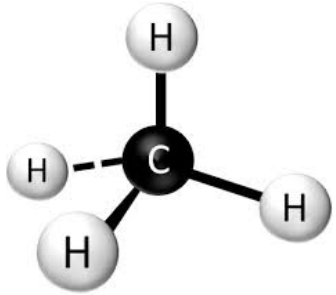
Arsenic

Escherichia coli (*E. coli*)

Blue-green Algae (Cyanobacteria)

Methane in Groundwater

Methane is a colorless, odorless and tasteless gas, which is produced by biological decay of organic materials or by high temperatures and pressures acting on organic materials.



- Coal beds,
- Organic rich shales,
- Landfill materials,
- Compost piles, and other accumulations of organic materials both above and underground.

Methane values

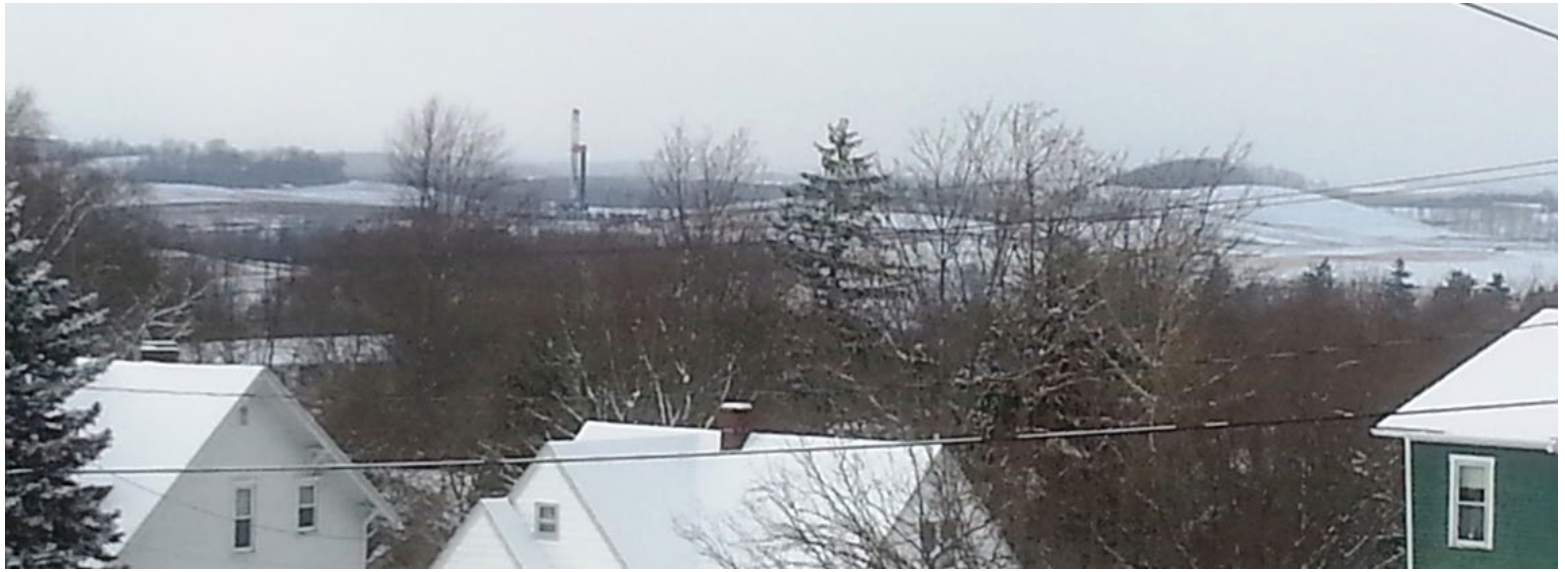
- Methane concentrations below **1 mg/L are considered harmless.**
- Methane levels in the range of **7 to 10 mg/L** usually are not a concern, but should be **monitored** for changes
- **Above 10 mg/L**
- Vented wellhead caps, or some form of aeration and ventilation to allow the methane to safely dissipate outdoors

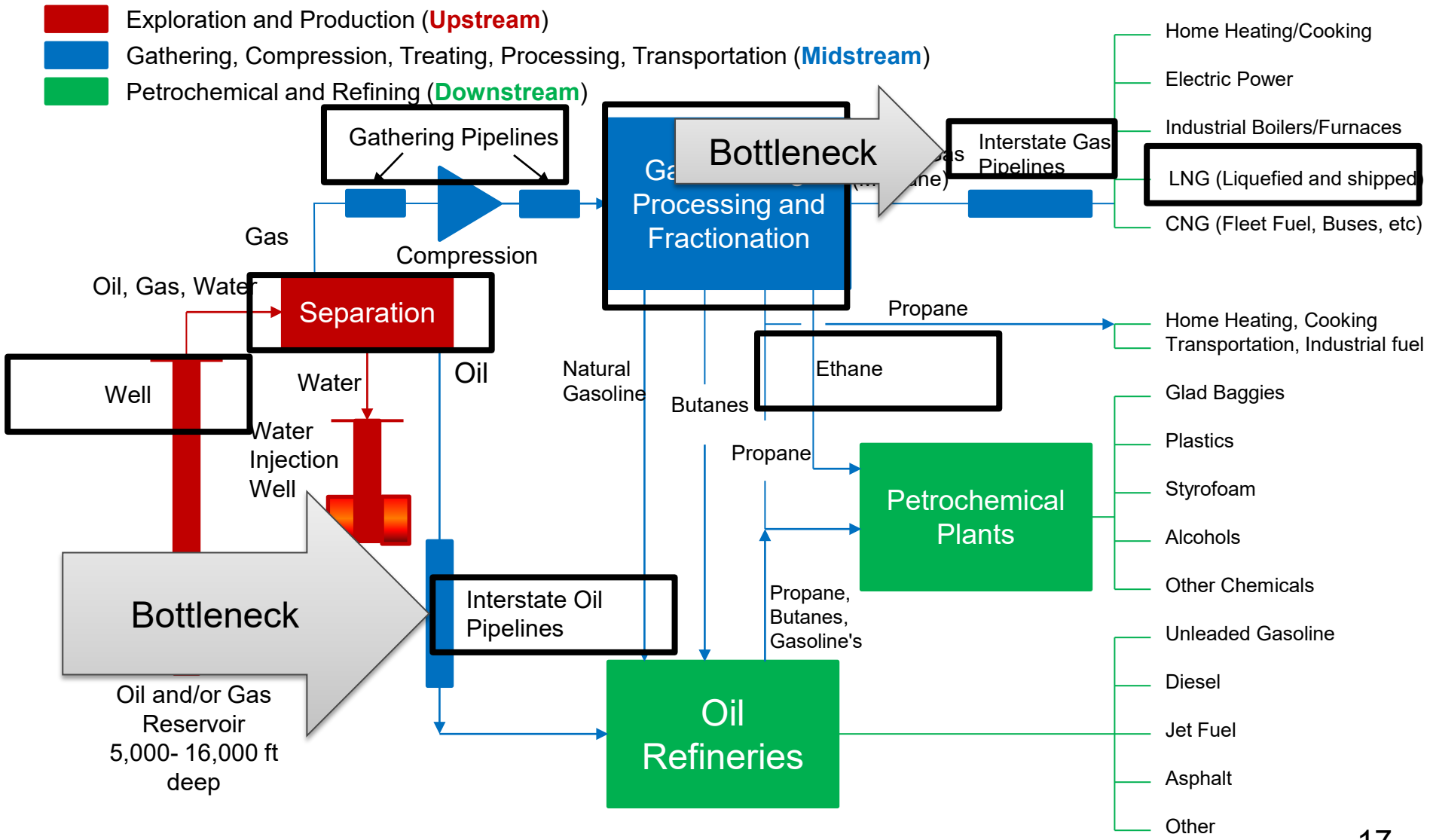
Methane Values

Methane levels **above 28 mg/L** have an **explosive or flammable potential**. Contact your local health department immediately for additional assistance.

Federal and State Taxes:

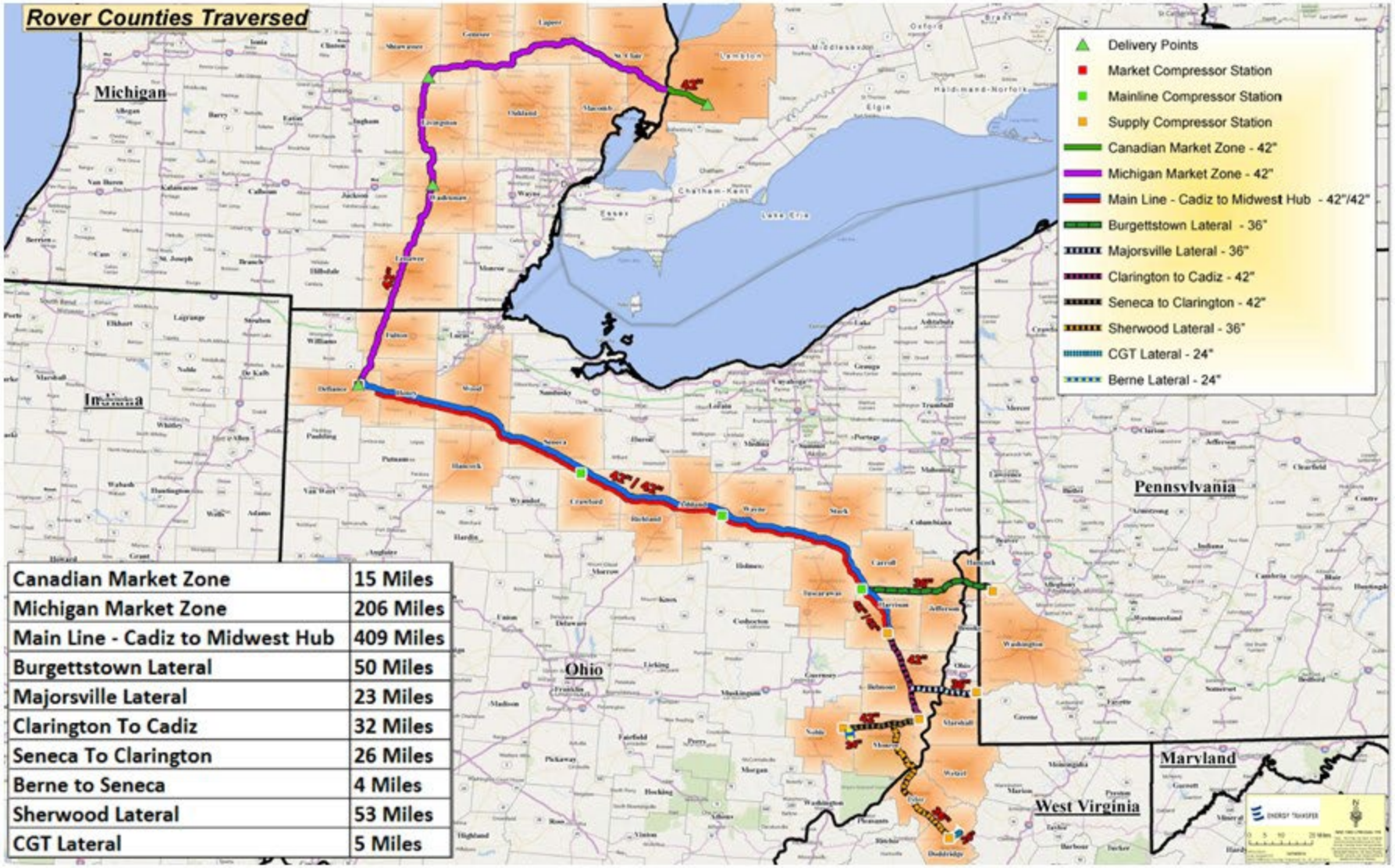
1. Royalty Payments
2. Easement Payments
3. Lease Payments (Bonus Money)




Exploration and Production (Upstream)
Gathering, Compression, Treating, Processing, Transportation (Midstream)
Petrochemical and Refining (Downstream)
Gathering Pipelines
Bottleneck
Processing and Fractionation
Interstate Gas Pipelines
Home Heating/Cooking
Electric Power
Industrial Boilers/Furnaces
LNG (Liquefied and shipped)
CNG (Fleet Fuel, Buses, etc)
Gas
Compression
Oil, Gas, Water
Separation
Well
Water
Oil
Water Injection Well
Natural Gasoline
Butanes
Propane
Ethane
Propane
Home Heating, Cooking
Transportation, Industrial fuel
Petrochemical Plants
Glad Baggies
Plastics
Styrofoam
Alcohols
Other Chemicals
Bottleneck
Interstate Oil Pipelines
Propane, Butanes, Gasoline's
Oil and/or Gas Reservoir 5,000- 16,000 ft deep
Oil Refineries
Unleaded Gasoline
Diesel
Jet Fuel
Asphalt
Other

Cadiz, Ohio (Harrison County)

Rover Pipeline, LLC



Canadian Market Zone	15 Miles
Michigan Market Zone	206 Miles
Main Line - Cadiz to Midwest Hub	409 Miles
Burgettstown Lateral	50 Miles
Majorsville Lateral	23 Miles
Clarington To Cadiz	32 Miles
Seneca To Clarington	26 Miles
Berne to Seneca	4 Miles
Sherwood Lateral	53 Miles
CGT Lateral	5 Miles

ROVER PIPELINE

Easement Width

Typical width:

- 100 to150 feet- often includes construction area (temporary)
- May shrink down to about 50-75 feet after construction (perpetual)?

Pipeline Depth

Clarify the required depth of the pipeline when laid beneath the land surface.

Minimum: 36 inches

For agriculture, consider 48-60 inches to avoid conflicts with surface use. (reference ODNR Pipeline Construction Standards again)

Other Structures or Facilities

- Restrict surface facilities or structures on the easement.
  - Compressor/pump stations?
  - Pig launchers, drips, valves, metering equipment?
- Negotiate as Separate agreement
- Alternatively, could limit surface facilities to certain locations.
- Consider this in payment determination.

Substances in the Pipeline

Limit to natural gas and constituents.

Generally prohibit other substances.

- List specifically excluded substances like sewage, wastewater, etc.

Limitations on Easement Use

- Prohibit company's right to grant permission:
  - To other companies.
  - For other types of easement uses.
- Determine ingress or egress points onto the easement

Construction Timetable

- Establish a specific time period for the construction and installation of the pipeline.
  - Include timetable for temporary construction easement.
- Include remedies for failing to meet timeline.
- Include restrictions on workers during construction period.

Restoration of Land

Incorporate ODNR standards.

And/or establish how company will restore easement area.

- After construction and after any future surface disturbance.
- Specify top soil removal and replacement methods (double ditching; original topsoil).
- Require soil enrichment—manure, compost.
- Require reseeding—may need future years, until established.

Could there be some yield loss and if so how long?

- Agricultural Crossing Standards. The agricultural crossing standards outlined in the AIMP apply to construction activities proposed to occur on agriculture land in active crop production and pasture land. Construction standards and policies covered by the AIMP include requirements for:

  - Pipeline depth
  - Topsoil replacement
  - Tile lines
  - Installation of additional tile lines
  - Rock removal
  - Removal of construction debris
  - Compaction, rutting, fertilization, and liming
  - Land leveling
  - Backfill profile and trench crowning
  - Prevention of soil erosion
  - Repair of damaged soil conservation practices
  - Construction during wet weather
  - Damages to private property
  - Clearing of trees and brush from the easement
  - Interference with irrigation systems
  - Ingress and egress routes
  - Temporary roads
  - Weed control
  - Pumping of water from open trenches
  - Aboveground facilities
  - Advanced notice of access to private property
  - Reporting of inferior agricultural impact mitigation work (Toll-free number provided)
  - General monitoring and remediation

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Pipeline Company Concerns:

- Prevent Erosion
  - ODNR EPA
- Timeline

Your Concerns:

- Timeline
- Erosion
- Crop
- Weeds
- Compaction
- Soil Health
- Land usage!!!

Sweet Clover and Red Clover

The pipeline company will most likely seed once

Mind set should be:

"What is the best way to mitigate the possible re-seeding issues"

Your Possible Concerns:

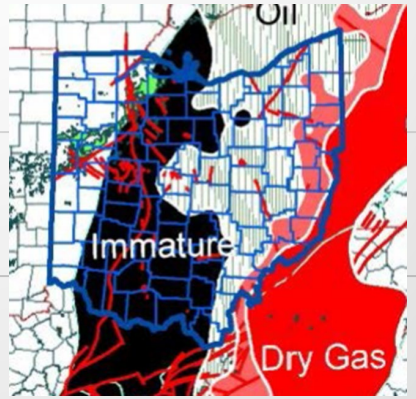
1. Compaction?
   - Wet Month
2. Time of Year?
   - What will grow best
3. Weeds?
4. Soil Test?
   - pH
   - Nutrition vs. Fertility
5. Pasture, Hay, Wildlife…

Will I See Royalties?

Ask the oil and gas companies and the answer is; yes! The question is: When?

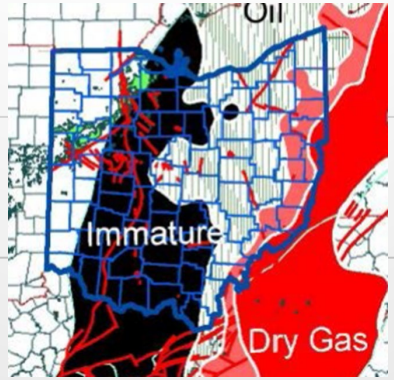
Ask the companies buying the mineral rights or royalties and the answer is; No.

Barrels of Oil per Well Yearly



	State	Belmont	Guernsey	Harrison	Jefferson	Monroe	Noble
2015	17,686	1,919	56,531	27,719	20	1,681	25,795
2016	11,947	951	37,899	23,288	18	1,495	11,860
2017	8,685	185	31,797	19,024	3	450	8,410
2018	9,085	88	50,254	12,169	0	955	9,845

MCF of Gas per Well Yearly



MCF GAS

	State	Belmont	Guernsey	Harrison	Jefferson	Monroe	Noble
2015	768,097	2,016,805	417,266	583,377	374,925	1,118,749	890,998
2016	920,860	2,090,497	403,128	654,622	1,394,307	1,624,687	850,105
2017	906,248	2,159,024	332,652	485,823	1,503,837	1,296,528	741,006
2018	1,077,217	2,138,085	370,686	459,060	2,482,143	1,790,284	691,755

http://oilandgas.ohiodnr.gov/

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http://go.osu.edu/EEETdlGS_ShaleDevEastOH

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