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Office of the State Fire Marshal
Indiana Department of Homeland Security

Emergency Restriction/Prohibition Order

- From the Department of Transportation
49 U.S.C. 5121(d) May 07, 2014
- This order is issued to all railroad carriers that transport in a single train in commerce within the United States, 1,000,000 gallons or more of UN 1267, Petroleum crude oil, Class 3, sourced from the Bakken shale formation in the Williston Basin (Bakken Crude oil)

DOT Emergency Order

- DOT is requiring that each railroad carrier provide the State Emergency Response Commission (SERC) for each State in which it operates trains transporting 1,000,000 gallons or more of Bakken crude oil, notification regarding the expected movement of such trains through the counties in the State, by identifying each county or jurisdiction the trains will operate.

Transportation of Petroleum Crude Oil By Rail

- Overview of the transportation of petroleum crude oil by rail across the United States.



North American shale plays (as of May 2011)



Current shale plays

Stacked plays

- Shallowest / youngest
- Intermediate depth / age
- Deepest / oldest

* Mixed shale & chalk play
 ** Mixed shale & limestone play
 *** Mixed shale & tight dolostone-siltstone-sandstone play

Prospective shale plays

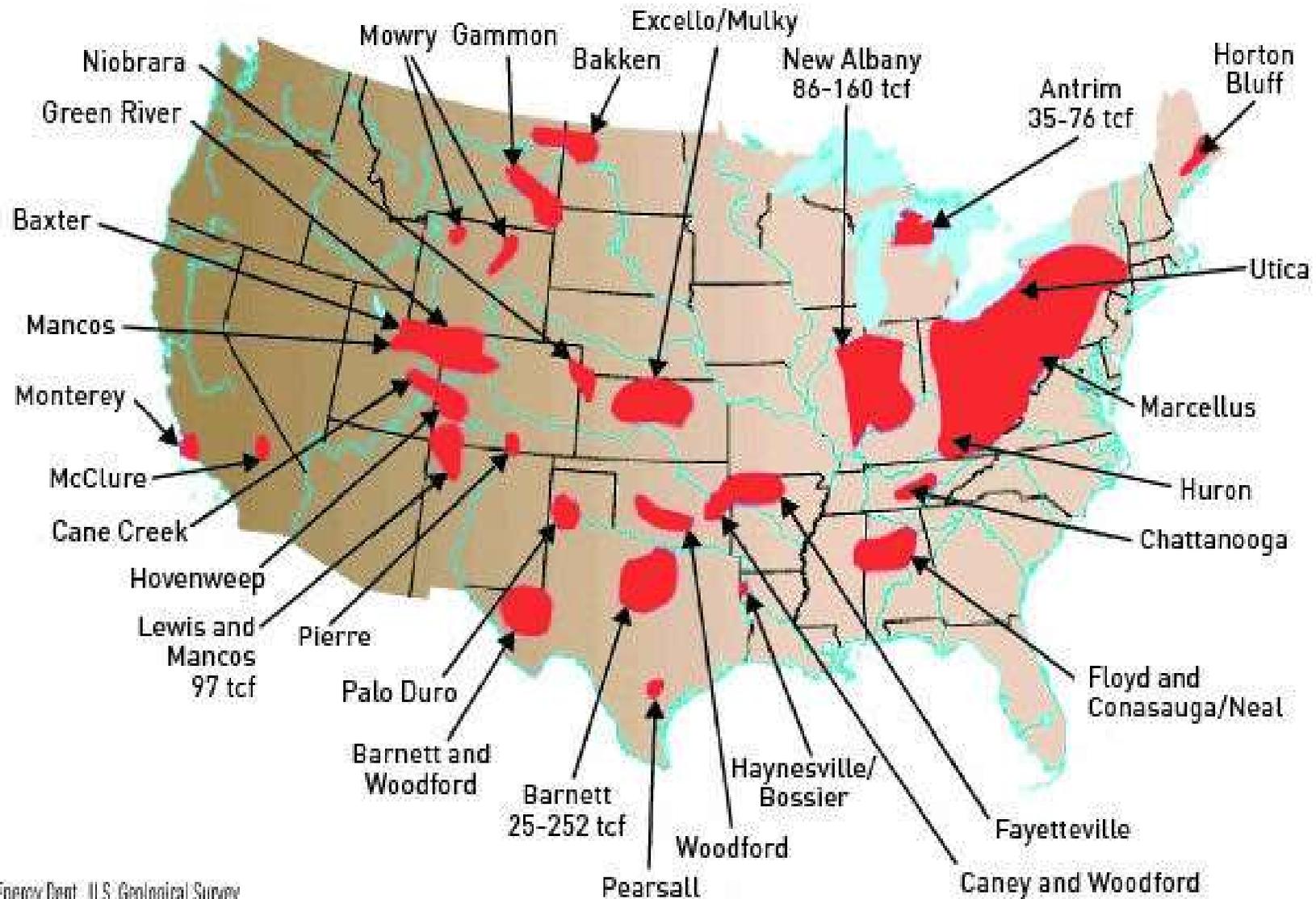
Basins



Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.
 Updated: May 9, 2011

America's Next Energy Frontier

Shale formations in the U.S. hold trillions of barrels of oil and trillions of cubic feet (tcf) of natural gas

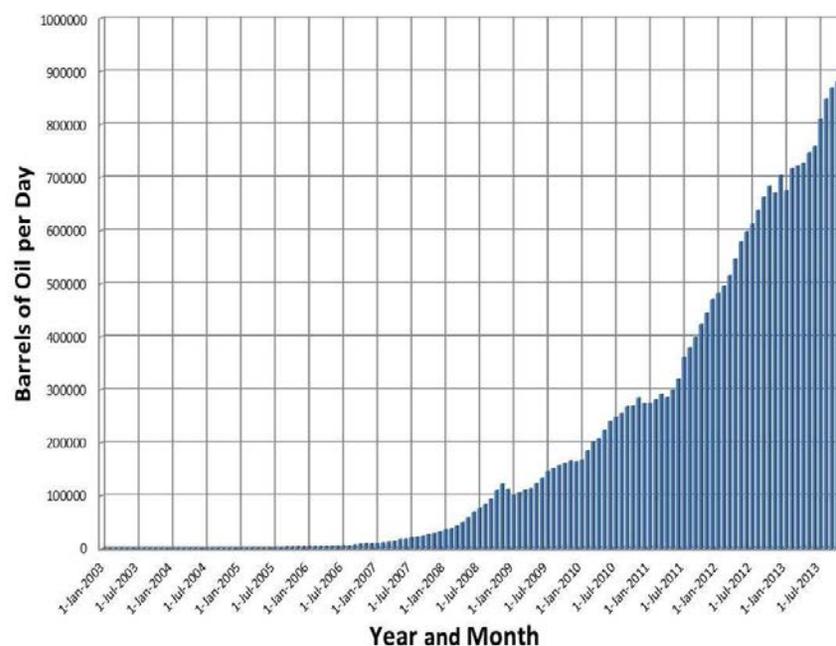


Sources: Energy Dept., U.S. Geological Survey

US Energy Production

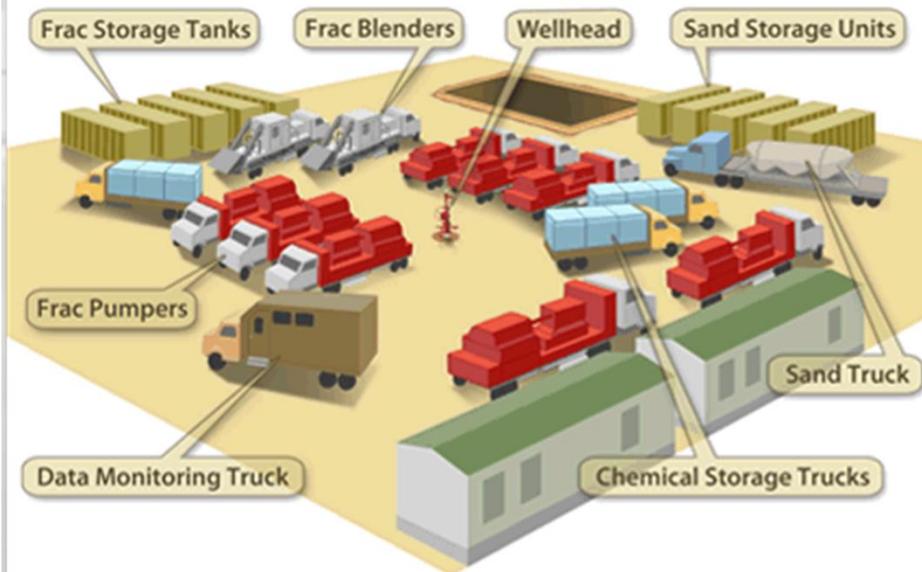
- Growth of domestic natural gas and crude oil production is revolutionizing the US energy economy.
- During December 2013, over 11 million barrels daily were produced.
- In 2013 the Bakken play produced over 10% of all US oil.
- In November 2013, over 10,022 Bakken wells produced 29 million barrels of oil, over 900,000 barrels of oil daily.

Table 1: Bakken Oil Production in North Dakota 2003-2013



Hydraulic Fracturing Sites

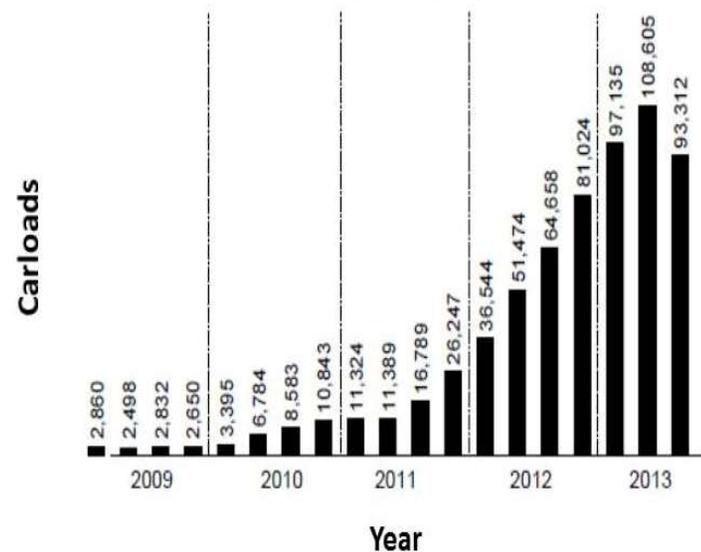
Well Site: Roads, trucks, a rig, pumping units and drilling equipment are all shuttled or stored at the drilling location.



Crude Oil Transport

- Increased energy production equals increased transport by all modes.
- The volume of crude oil moving by rail has quadrupled in less than a decade – now 725K bbl daily.
- Rail volume has increased, but accidents have declined by 43 %.
- Hazmat related incidents are down 16 %.
- Sharp increase in use of unit trains - 100 cars or more of a single commodity.

Table 2: Originated Carloads of Crude Oil on Class 1 Railroads



The Players

- **Offeror:** a.k.a “**shipper**” has the following responsibilities under Title 49 CFR...
 - Determine whether a material meets the definition of a “hazardous material.”
 - Proper shipping name
 - Class/division
 - Identification number
 - Hazard warning label
 - Packaging
 - Marking
 - Employee training
 - Shipping papers
 - Emergency response information
 - Emergency response telephone number
 - Certification
 - Compatibility
 - Blocking and bracing
 - Placarding
 - Security plan
 - Incident reporting

**THE SHIPPER EITHER
“OWNS” OR “LEASES”
THE RAIL TANK CAR
USED IN RAIL
TRANSPORTATION**

**THE SHIPPER IS ALSO
RESPONSIBLE FOR
THE “PRODUCT” IN
THE TANK CAR...**

The Players

- **Carrier:**
 - **Class 1 Railroads**
 - Norfolk Southern
 - CSX Transportation
 - Canadian North
 - Railroads share their lines and equipment
 - Right now, none of the major Class 1 railroads have enough power or lines to meet current demands.
 - Do not assume responsibilities during the initial assessment...ask questions!!
- **Consignee/Receiver:**
 - Refinery
 - Exporter
 - Shipper

Use Proper Shipping Name

- Shipper must prepare the package properly...
- UN1267 Petroleum Crude Oil
- Single CAS # 8002-05-2
- PG I or II (in US)
- PG depends upon boiling point and/or flashpoint of the specific material transported (CFR 49 part 173-121)

Packing Group	Flash-Point (closed cup)	Initial Boiling Point
I		$\leq 35^{\circ}\text{C}$ (95°F)
II	$< 23^{\circ}\text{C}$ (73°F)	$> 35^{\circ}\text{C}$ (95°F)
III	$\geq 23^{\circ}\text{C}$, $\leq 60^{\circ}\text{C}$ $\geq 73^{\circ}\text{F}$, $\leq 140^{\circ}\text{F}$	$> 35^{\circ}\text{C}$ (95°F)

Petroleum Crude Oil

- No reference is ever made on where the crude oil came from...
- Two types of crude:
 - Light
 - Heavy
- Light grade:
 - Sweet
 - Sour
- Not a uniform substance and its physical and chemical properties vary from oilfield to oilfield
 - Even within wells located in the same oilfield,



Crude Oil Additives

- Possible Condensates (Diluents)
 - Alcohols
 - Ethers
 - Metals
 - Methane
 - Pentane
 - Blends or butane
 - Pentane and other hydrocarbons gases
- There are many different additives that can be found in crude oil.
- Many of these are used as diluents to allow the heavier crudes to be shipped.
- Some can also be produced as the product agitates during shipping.



Unit Train



**UNIT TRAIN = A TRAIN HAULING 100 OR MORE RAILCARS
OF THE SAME PRODUCT**

Shipping Container



Been moving crude oil since 1865...

Shipping Container

- DOT 111 series is the workhorse of the tank car fleet.
- 335,000 tank cars in fleet
- 228,000 general service
- 92,000 flammable liquids (1/3)
- **18,000 CPC-1232 (built after 2011)**
- 74,000 Legacy cars = service life 40 years + 10 year extension





Recent Crude Oil Derailments

- *Lynchburg, VA*

April 30, 2014 – 17 of 105 cars of Bakken Oil unit train derailed



- *Plaster Rock, NB*

January 7, 2014- 16 cars derailed, 8 were hazmat



- *Casselton, ND*

December 20, 2013 - 20 of 106 crude oil tank cars derailed



- *Aliceville, AL*

November 8, 2013 - 25 of 90 crude oil tank cars derailed



- *Lac-Megantic, QE*

July 6, 2013- 74 cars derailed of runaway train resulting in 47 fatalities



Environment

- Flammable liquids and toxic solvents can create significant problems.
- The underground movement of hazmat's follows the least resistant path.
- The downward movement of the hazmat will be interrupted by one of three events:
 - It will be absorbed by the soil.
 - It will encounter an impermeable bed.
 - It will reach the water table.

Estimate Potential Course & Harm

- Incident Potential
- Magnitude of the incident
- Spread of hazardous materials
- Life hazard
- Mode of operation
 - Non-intervention
 - Offensive
 - Defensive
- Impact on the environment and exposures
- Safety factors and consideration
- Situational awareness and assessment of the incident potential go hand-in-hand
- Other predictions



Determine Strategic Goals

- Broad and general statements of “what” is to be accomplished...
 - Isolation
 - Notification
 - Identification
 - Protection
 - Spill control
 - Leak control
 - Fire control
 - Evidence collection
 - Recovery and termination
- Incident Commander responsibilities!



Assess Tactical Options & Resources

- Strategic Goal #7: **Fire Control**
 - Extinguishment
 - Controlled burn
 - Exposure protection
 - Withdrawal
 - Foam operations using AR-AFFF
- Strategic Goal #8: **Evidence Collection**
- Strategic Goal #9: **Recovery and Termination**
 - Recovery: returning conditions to pre-incident status
 - Termination: documenting activities.
 - Required by OSHA 29 CFR 1910:120(q)





Determining Cooling Water Requirements for Exposures

- Exposure protection usually starts before foam application starts.
- Exposure lines should be applied when there is direct flame impingement on exposed tanks and/or when radiated heat is sufficient to cause steam at the tank shell when water is applied.

Determining Cooling Water Requirements for Exposures

- Basic cooling water guidelines
 - Recommended flow is a widely quoted number that has proven to be a reliable guideline over time.
 - Taking action with less water using offensive and defensive tactics increases risk to personnel significantly.
 - Lower flow rates may be effective if applied from fixed systems and can be activated without risk to responders.

Foam Requirements

- Determine the type of fuel involved.
- Determine the surface area involved.
- Determine the recommended NFPA 11 foam application rate.
- Determine the duration of foam application of foam application per NFPA 11:
 - Liquid spill = 15 minutes
 - Storage tank = greater than 50 minutes
- Determine the quantity of foam concentrate required. This will be determined by the percentage of foam concentrate used.







Foam Calculations

- Calculation – Ignited flammable liquid spill:
 - Length x Width = Area in ft. squared
 - Area x 0.10 gpm/ square foot = Application Rate
 - Application Rate x 15 minutes = Total Flow Rate (TFR)
 - Total Flow Rate x 0.01 or 0.03 = Amount of Concentrate



Foam Calculations

- Derailment with 3 tank cars that have ruptured and the product has pooled. The size of the pooled area is 100' x 75'. The foam available is AFFF 1%.
 - Determine area: $100' \times 75' = 7,500$ sq. ft.
 - Application rate: .10
 - $7,500 \times .10 = 750$ gpm solution
 - $750 \text{ gpm} \times 15 \text{ min} = 11,250$ gallons (total solution)
 - $11,250 \text{ gallons} \times .01 = 112.5$ gallons of concentrate
 - 22.5 – 5 gallon buckets (containers)

Plan and Implement Actions

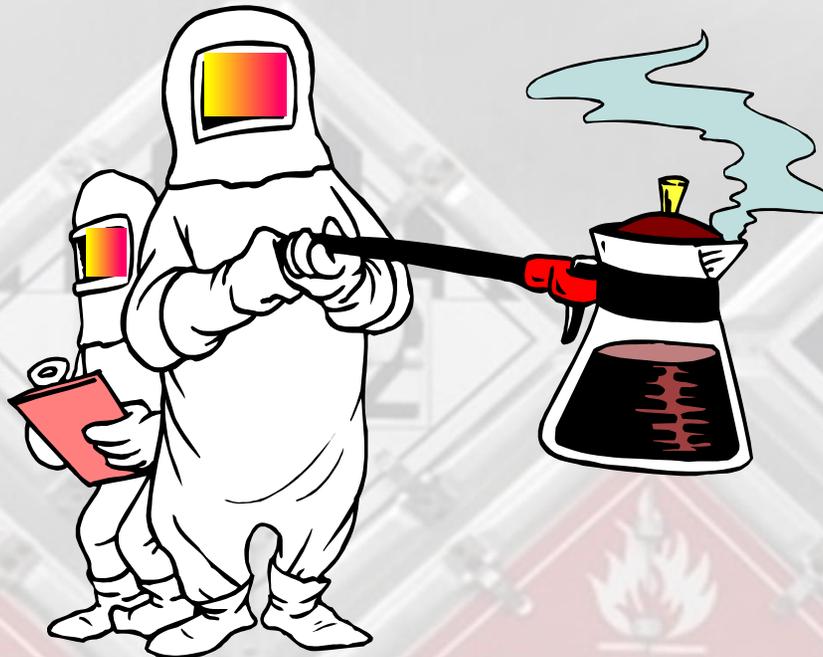
- Written Incident Action Plan and Site Safety Plan...
- **Incident Action Plan:**
 - Hazard and risk assessment
 - Strategic goals
 - Tactical objectives
 - Control objectives
 - Assignments
 - General safety messages
 - Weather conditions
 - Communications plan
 - Medical plan
 - Site layout/diagram
 - Traffic plan

INCIDENT BRIEFING	1. Incident Name	2. Date	3. Time												
4. Map Sketch															
5. Current Organization															
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 20%;">Incident Commander</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">Safety Officer:</div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 5px;"> <div style="border: 1px solid black; padding: 5px; width: 20%;">Liaison Officer or Agency Rep:</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">Information Officer:</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 20%;">Planning</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">Operations</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">Logistics</div> <div style="border: 1px solid black; padding: 5px; width: 20%;">Finance</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 15%;">Div. _____</div> <div style="border: 1px solid black; padding: 5px; width: 15%;">Div. _____</div> <div style="border: 1px solid black; padding: 5px; width: 15%;">Div. _____</div> <div style="border: 1px solid black; padding: 5px; width: 15%;">Div. _____</div> <div style="border: 1px solid black; padding: 5px; width: 20%;"> <table style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2" style="text-align: center;">Air</td></tr> <tr><td>Air Operations</td><td>_____</td></tr> <tr><td>Air Support</td><td>_____</td></tr> <tr><td>Air Attack</td><td>_____</td></tr> <tr><td>Air Tanker Coord</td><td>_____</td></tr> <tr><td>Helicopter Coord</td><td>_____</td></tr> </table> </div> </div>				Air		Air Operations	_____	Air Support	_____	Air Attack	_____	Air Tanker Coord	_____	Helicopter Coord	_____
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Page 1 of	6. Prepared by (Name and Position)														

Evaluate Incident Action Plan

- Verify that strategic goals are appropriate
- Verify that tactical objectives are correct
- Review site safety plan:
 - Name the Safety Officer
 - Confirm training level of all responders
 - Determine correct personal protective equipment
 - Air & environmental monitoring
 - Conduct hazard analysis
 - Verify site control measures
 - Check decontamination and emergency decontamination
 - Make a site specific SOP
 - Communications

1-317-439-8117 (cell)



**24-hour Emergency Notification
1-800-669-7362 (option 1)**

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