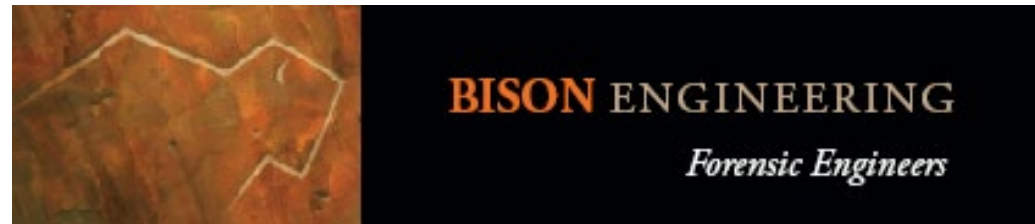


Reducing Consequences of Gas Pipeline Damage



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February 9, 2023 – UCT 2023

PEPCON – Site Investigation & Testing

1988 Soil-Gas Migration Study

- Raised questions about common theories
- Photo shows gas flowed radially from the leak
- Pneumatic pressure causes gas “migration”



PEPCON – Site Investigation & Testing

Testing Showed

- Tracer gas detected 90 feet away
- Positive gas flow 68 feet away
- Gas was pushed through asphalt up to 20 feet



Case Histories/Research

- Sarasota Springs, UT-February 2007- **2 Fatalities**
- Kansas City, KS-Feb 19,2013- **1 Fatality, 15 injuries**
- Canton, IL- November 16, 2016- **1 Fatality, 11 Injuries**
- Millersville, PA-July 2, 2017- **1 Fatality, 3 injuries**
- Durham, NC- April 10, 2019- **2 Fatalities, 25 Injuries**
- Murrieta, CA- July 16, 2019- **1 Fatality, 15 injuries**



Case Histories

Sarasota Springs, UT – 2007 – 2 Construction Fatalities



Case Histories

Kansas City, KS - 2013 – 1 Fatality/15 Injuries



Case Histories

Canton, IL – 2016 – 1 Fatality/11 Injuries



Case Histories

Millersville, PA – 2017 – 1 Fatality/3 Injuries



Case Histories

Durham, NC – 2019 – 2 Excavation/25 Injuries

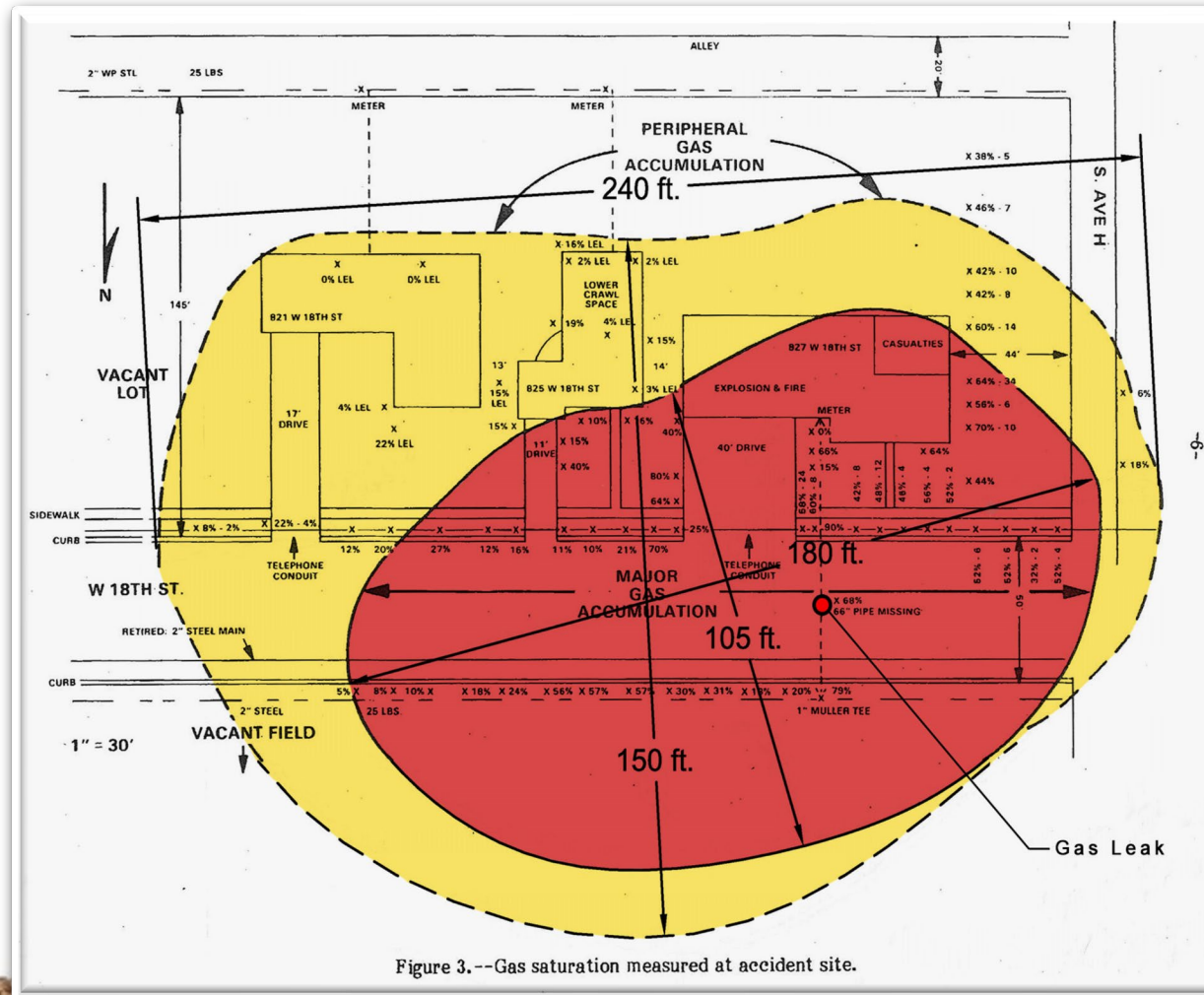


Case Histories

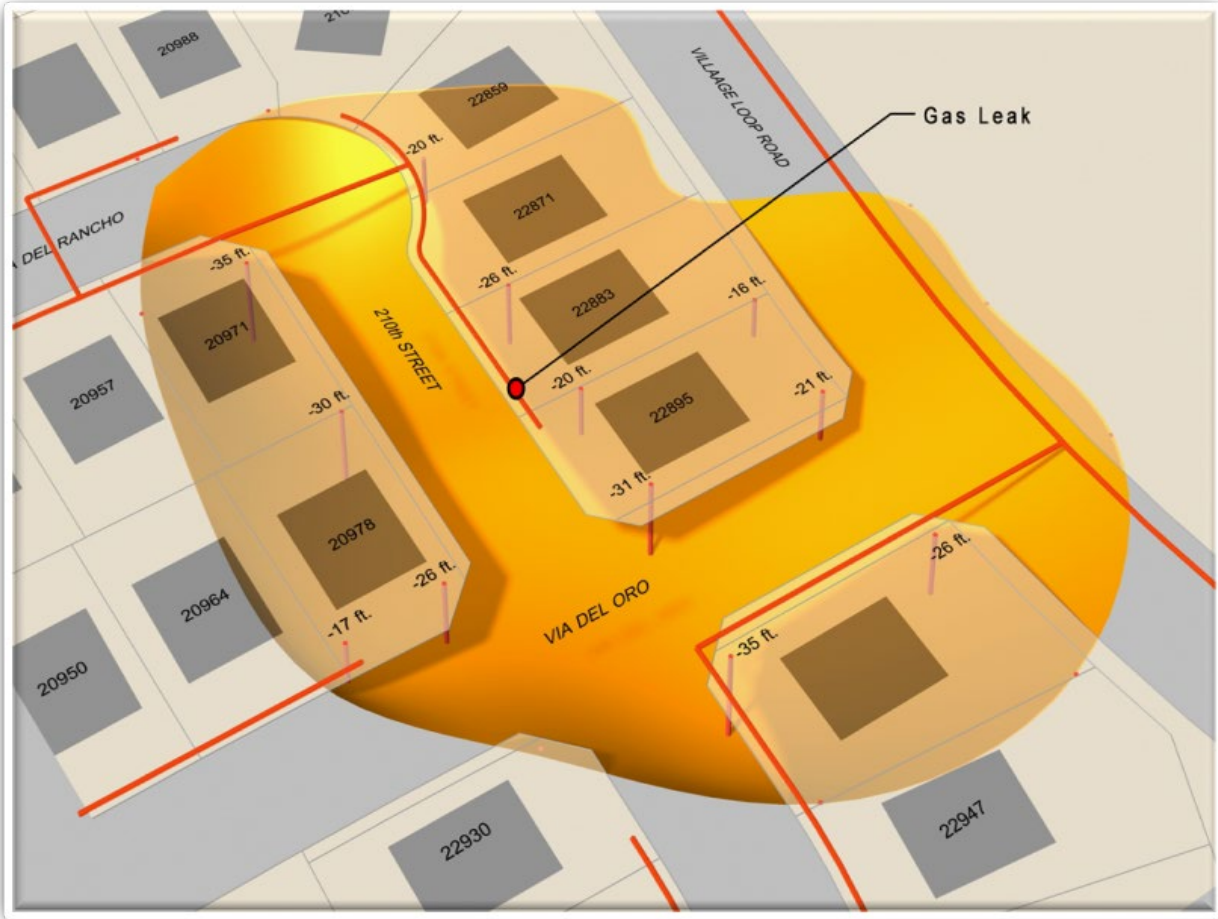
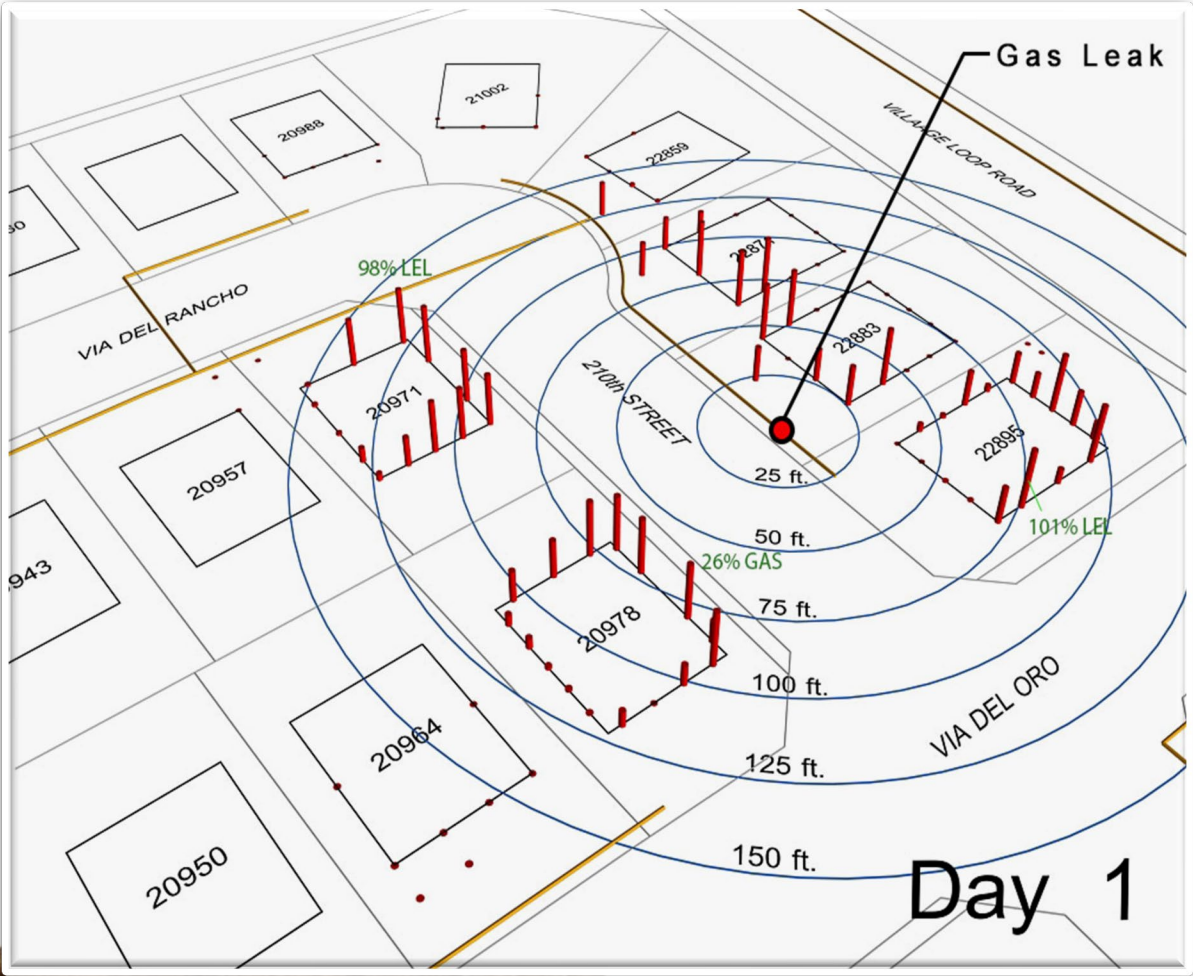
Murrieta, CA – 2019 – 1 Fatality/15 Injuries



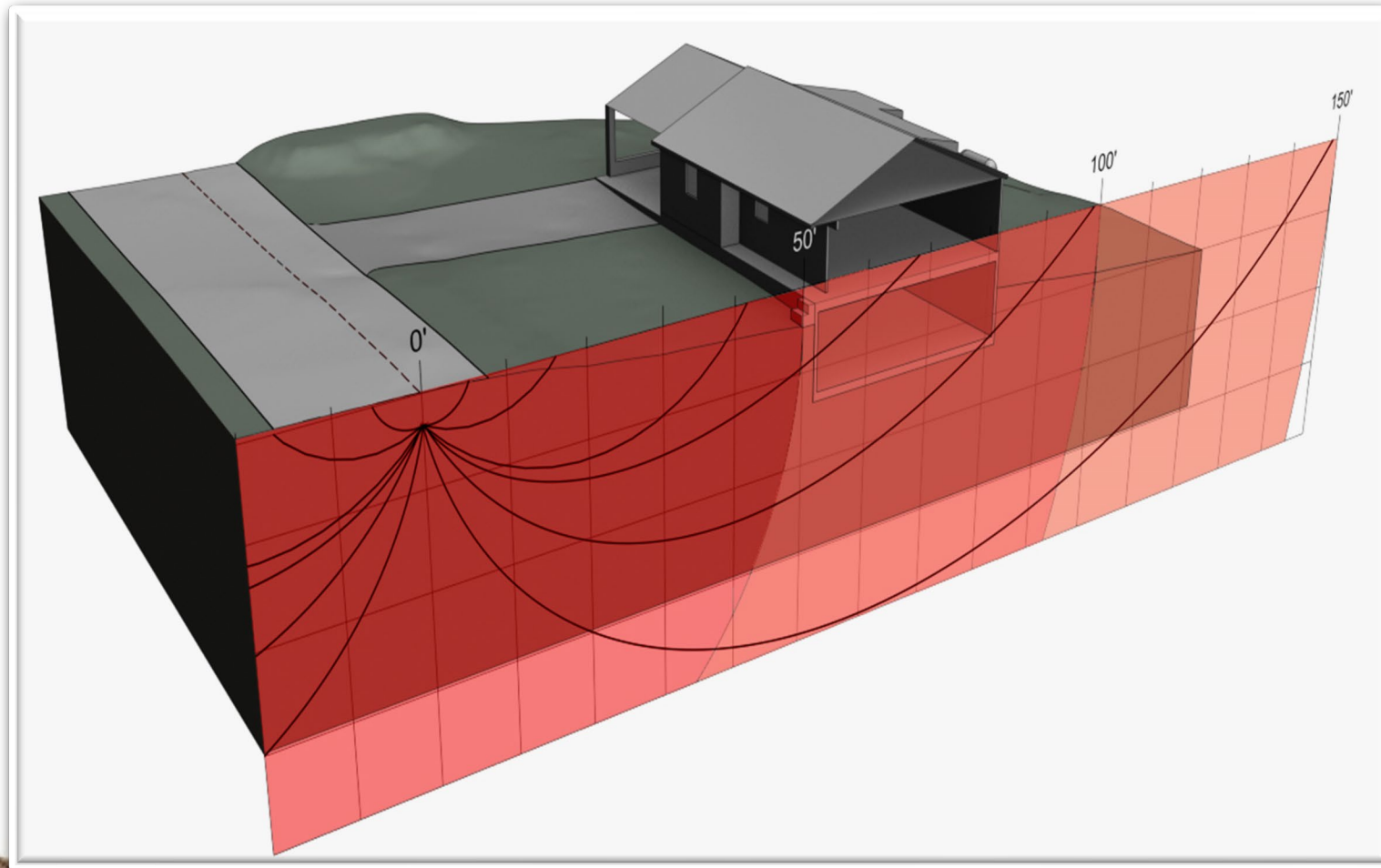
Notable Incident - Portales, NM



Notable Incident – Queen Creek, AZ



Notable Incident – Holly Springs, MS



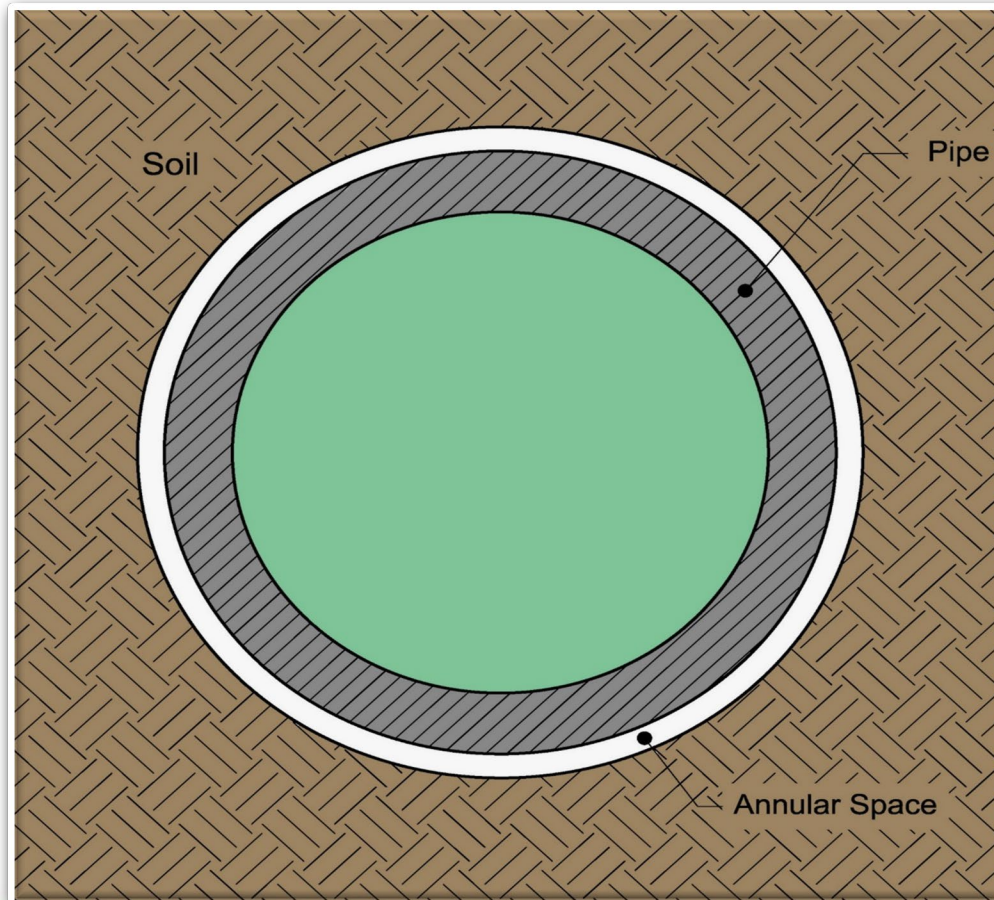
Concepts Review

- Most gas explosions occur in structures within 50 feet of the leak,
- Pressure can force gas down at least 35 feet,
- Lateral distance gas flows is not related to soil type, not proportional to pipeline pressure,
- Broad range of known or unknown conditions.



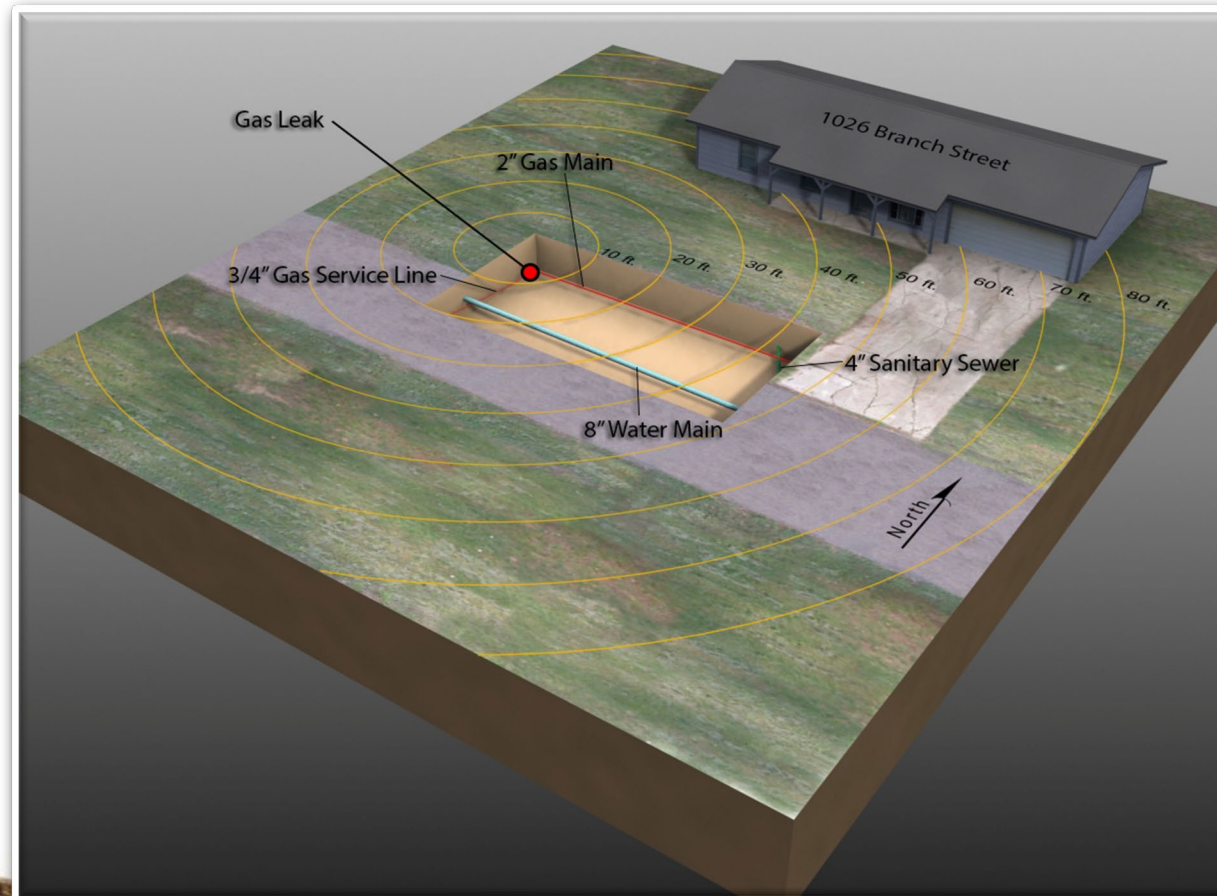
Existing Theories/Myths

➤ Does gas from a leak “follow the pipeline”?



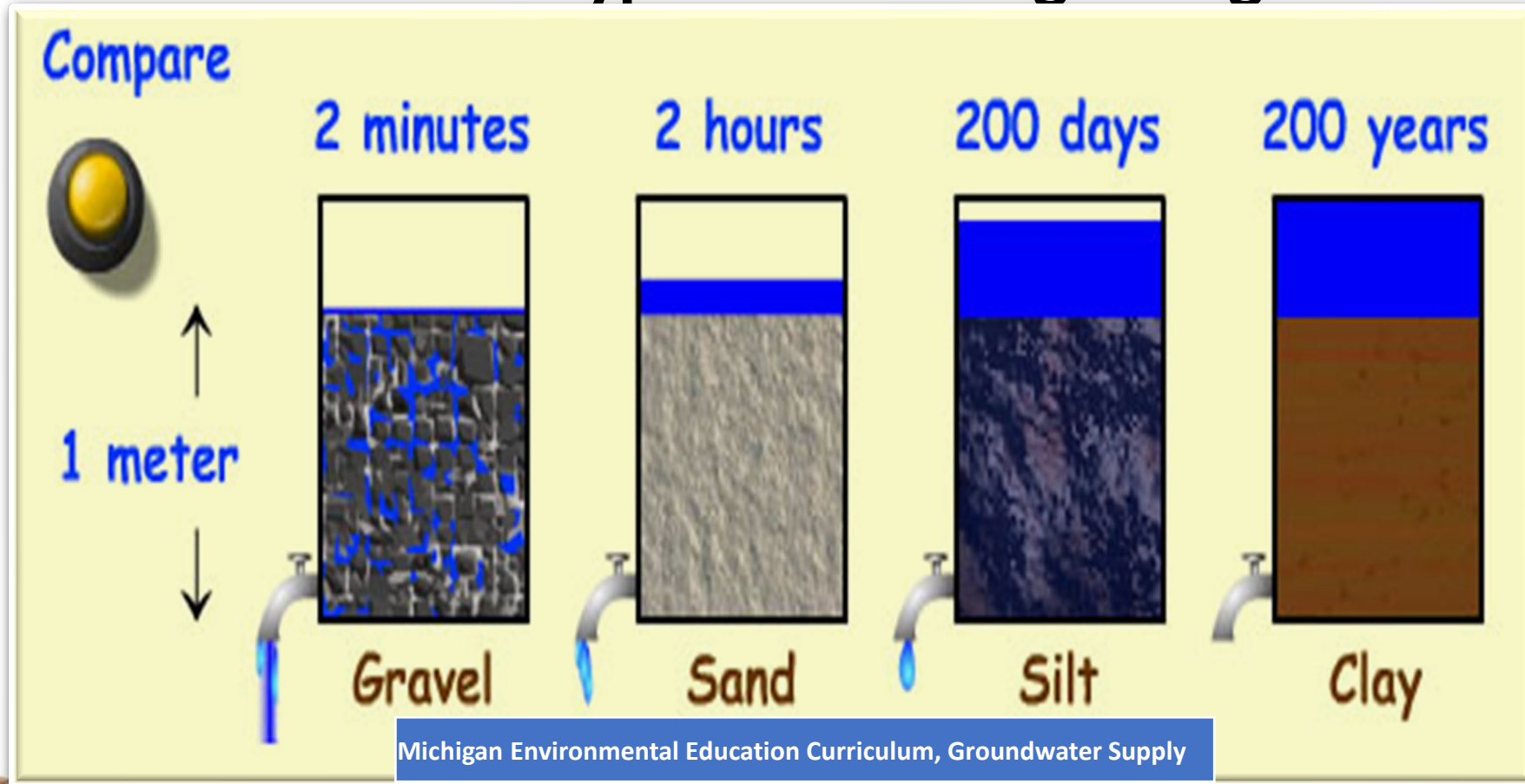
Existing Theories/Myths

➤ Does natural gas from a leak only migrate up?



Existing Theories/Myths

➤ How does soil type affect soil-gas migration?



Existing Theories/Myths

- **A positive gas flow rate into a structure is necessary to cause an explosion?**



Existing Theories/Myths

➤ How does pipeline pressure affect soil-gas migration?

• Philadelphia, PA	5/11/1979	0.25 psi and 20-30 feet
• Williamsport, PA	1/25/1977	10 psi and 70 feet
• Pittsburgh, PA	1/17/2003	18 psi and 100 feet
• Bowie, MD	6/23/1973	20 psi and 120 feet
• Annandale, VA	3/24/1972	22 psi and 240 feet
• Portales, NM	5/23/1982	25 psi and 60 feet
• Odessa, WA	12/26/2008	40 psi and 60 feet
• Jackson, MS	12/24/2008	45 psi and 70 feet
• Rancho Cordova, CA	12/24/2008	55 psi and 45 feet

Existing Theories/Myths

- **How long does it take for gas to migrate through soil and cause an explosion?**

Annandale, VA	240' in 30 mins at 22 psi
Philadelphia, PA	30' in 15 mins at 0.25 psi
Chicago Heights, IL	40' in 30 mins at 28 psi



Research Conclusions

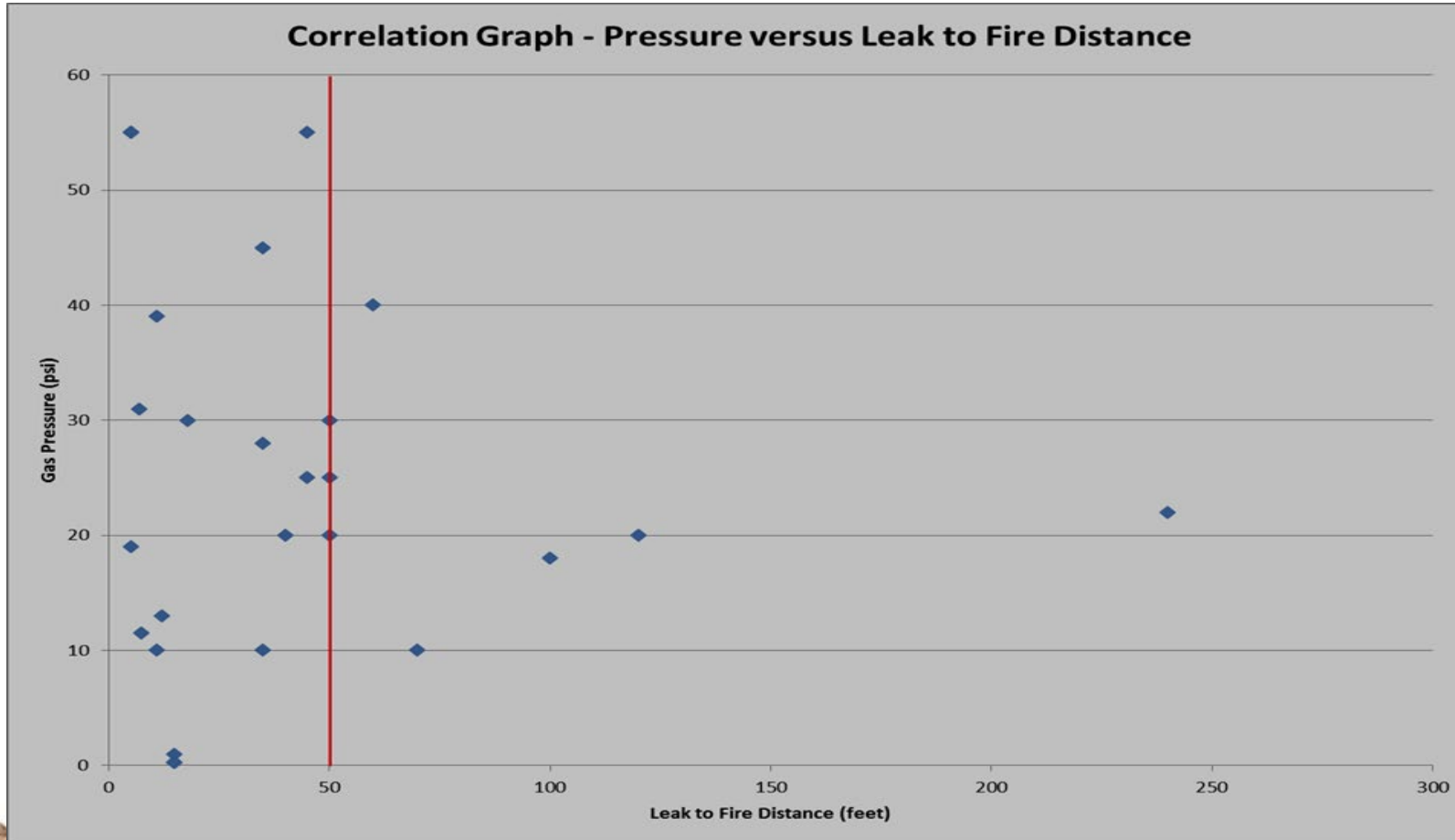
Revise fundamental concepts

- Gas migration is radial vs “path of least resistance”
- Pressure forces gas in all directions
- “Pneumatic intrusion” causes explosion
- Time can be remarkably short
- Time variable is ignition source



Research Conclusions

50 feet concept



Research Conclusions

First responders' knowledge can save lives

- Safer ways for initial risk assessment
- Identify large leaks quickly
- Evacuate structures within 50' of large leak
- Park emergency vehicles at least 100' from reported leak location



THANK YOU

CONTACT US ANY TIME IF YOU HAVE MORE QUESTIONS

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