Kansas Incident Investigations

Investigation Techniques & Lessons Learned

Kansas Corporation Commission

728 Minnesota, Wichita KS

- 12-KGSG-490-GIG
- House fire and explosion
  - 3 victims burned, house destroyed.
- Staff determined break in low pressure cast iron piping led to house explosion.


DO NOT CROSS
CRIME SCENE: DO NOT CROSS

Initial Testing Results

- Leak survey did not indicate presence of a leak.
- Flow test of main indicated leak.
- Barhole testing around perimeter of house and in yard showed limited evidence of a leak.
- Barhole testing under slab foundation found 80% gas.

Small meter/ 9oz cast iron

No vent to surface; pressure/flow test only way to determine leak

Incident site: One small gas detection site 20 feet from house; Leak is 90 feet from house

80% gas under slab

Whose gas is it?

Lessons Learned

- Sampling using CGI is “usual” method.
- Transporting samples requires placard?
  - Not for federal investigators.
  - Simple placard for samples with no pressure and minimal volume (as long as not toxic)
- Low pressure samples difficult to analyze with Gas Chromatograph.

Better Sampling Method

Tedlar Bag sample

Lessons Learned

- Tedlar bags have about a 24 hour life expectancy.
- Can ship by air freight since contents are not pressurized.
- Lab needs to be ready to receive.
- Get all calibration data from lab.

Plume Migration Study with Geoprobe

(Extreme barhole testing)

Core Sample

Completed sample points at 10, 6, and 2 foot depths

Lessons Learned

- Let “wells” stabilize before sampling.
- Calculate displacement volume of tubing.
- After collecting sample, take cgi readings on tubing.
- Granular bentonite as sealing agent provides less than perfect seals.

Additional Input needed

- Protocol for sampling and analyzing low pressure low methane concentration gas
  - Taking sample
  - Transporting sample
  - Preparing lab for sample arrival
  - Calibrating gas chromatograph
  - Analyzing sample (with sufficient gas for repeats)
  - Analyzing results (what to look for)

Not the best way to stabilize an artifact for later failure analysis.

104 Wooten Street

Sublette, Kansas

Kansas
Corporation Commission

104 Wooten, Sublette, KS

- 12-BHCG-519-GIG
- House fire and explosion
  - 4 victims burned, house destroyed.
- Staff determined failure of steel main caused by previous by 3rd party damage led to house explosion.

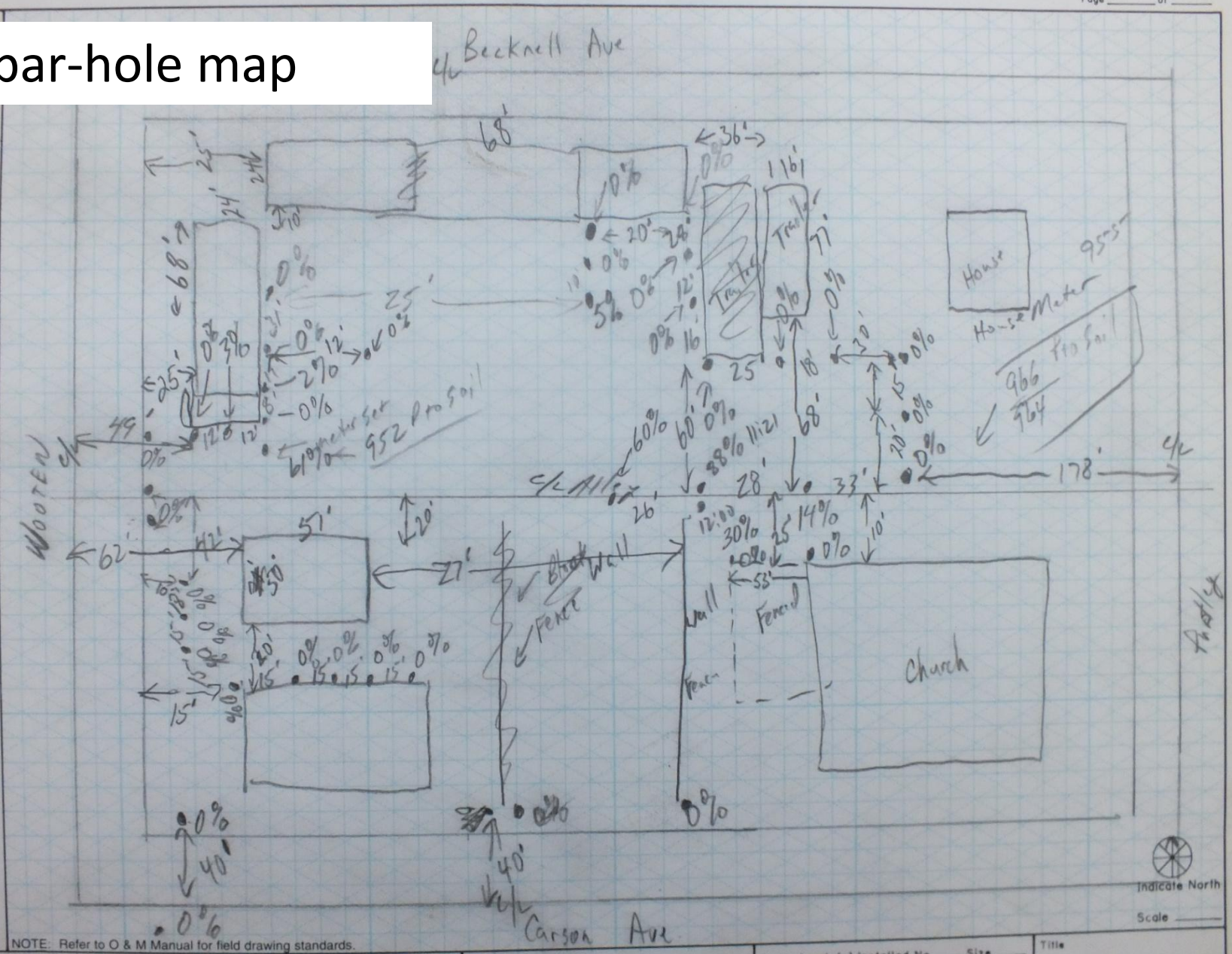

126 Wooten Street, Sublette, Kansas, United States
Address is approximate
104 Wooten, Sublette, KS

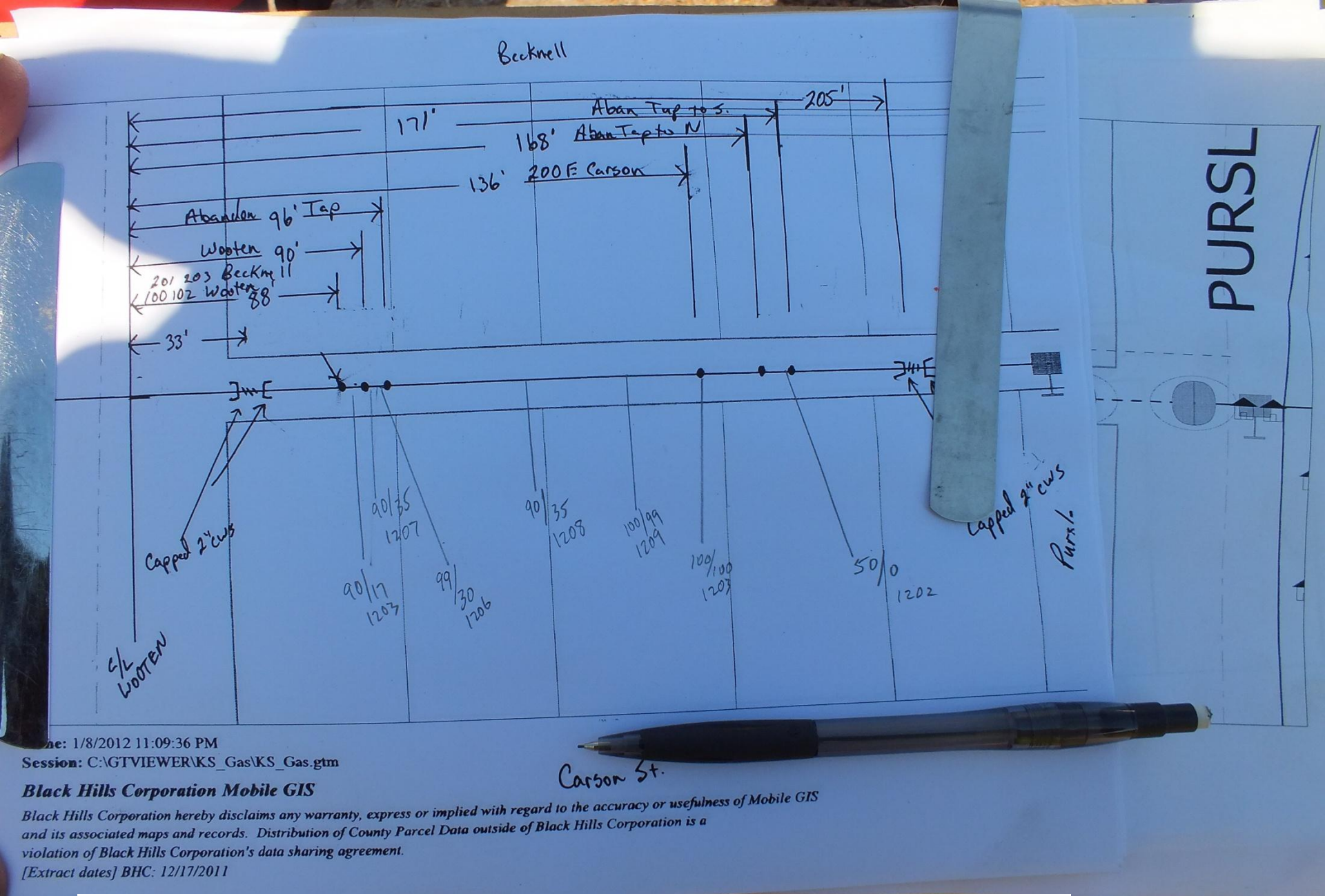
104 Wooten, Sublette, KS

Front door site
Looking east

ALLEY LOOKING SOUTH (EAST END)

First bar-hole map

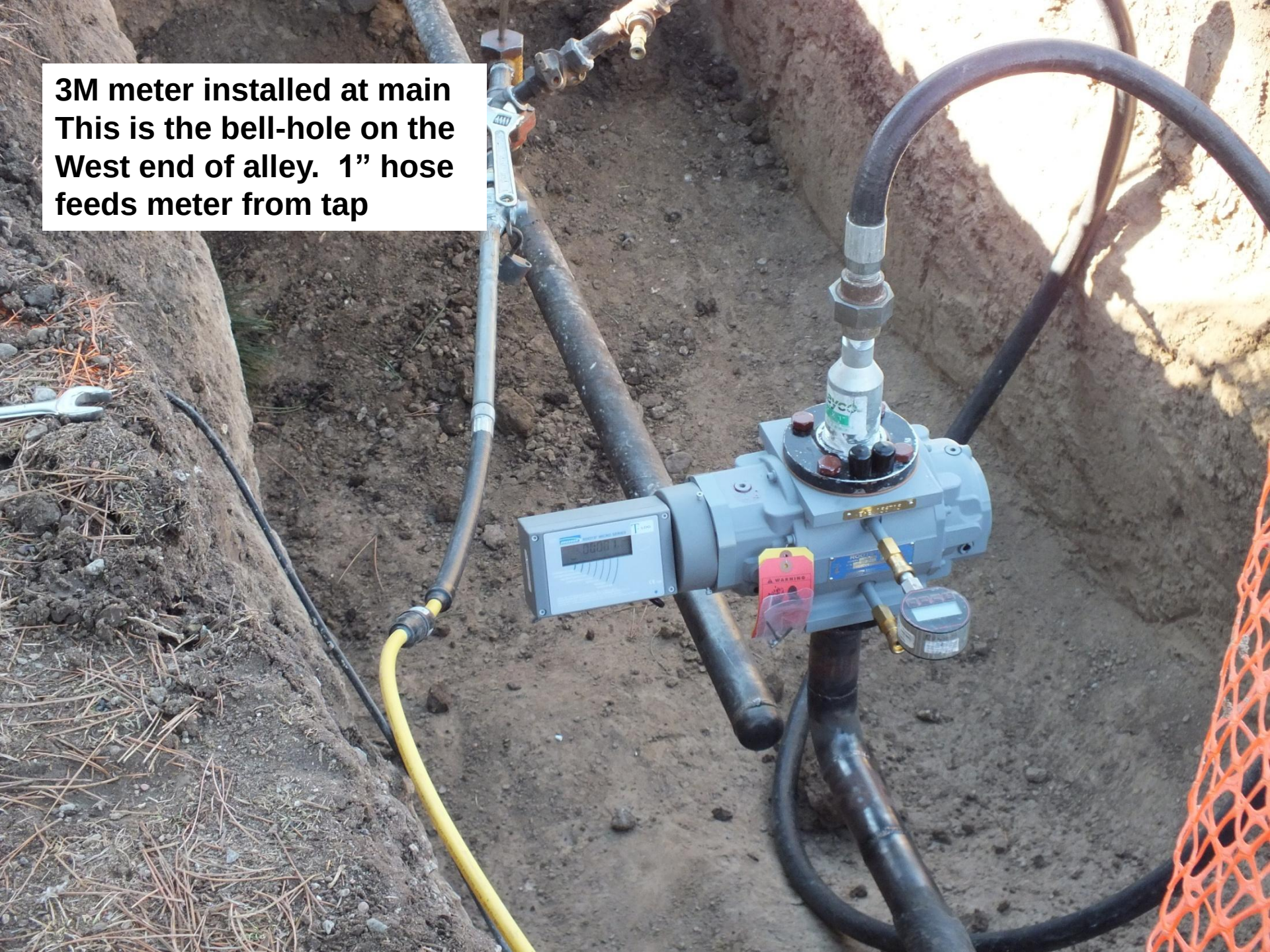




Example of migration documentation in alley

Lessons Learned

- Prioritize testing to determine safety of remaining structures.
- Have a helper draw map and record data.
- Make a master copy of map for later updates.
- Draw additional maps to show area of leak.
- Use flags with numbers to show barhole locations.


3M meter installed at main
This is the bell-hole on the
West end of alley. 1” hose
feeds meter from tap


6 CGI’s used to pinpoint leak

Lessons learned

- Use the most accurate and largest meter available for flow test.
- Watch for restrictions from pressure regulator.
- CGI’s placed along section of main may help pinpoint where to dig.
- Test for long enough period to get stable results.


Crack in main
View while in place,
Not yet removed.


This and the following pictures
Are of the device crafted to maintain
support of the damaged main.

Black Hills Energy

Welding angle frame members


About 18 inches between cracks


Sewer service 90 elbow going
down to main below


Gas
Top
Sewer

Failed artifact put back in place after uncovering sewer line installed 20 years ago.

Lessons Learned

- Build substantial structure;
- adjust with bolts and clamps;
- weld structure in place.

1905 Navajo

Topeka, Kansas

Kansas
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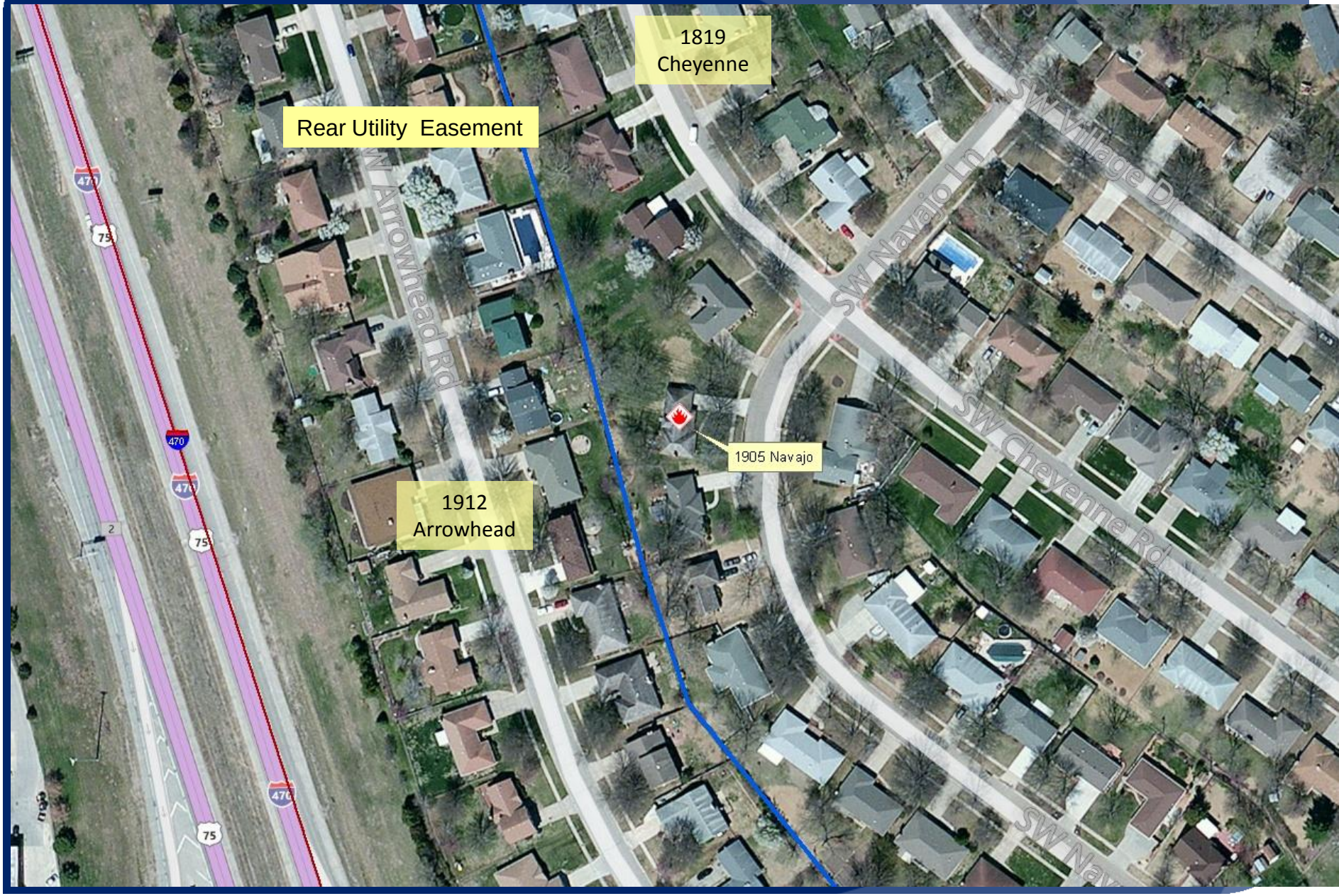
1905 Navajo, Topeka, Kansas

- 12-GIMG-584-GIP
- House destroyed; One fatality.
- Staff determined excavator damage caused explosion by pulling pipe out of compression fitting.
- Recommended excavator be cited for failure to call 9-1-1.
- Recommended operator be cited for ineffective emergency plan.

Aerial Photo of Rear Utility Easement



Aerial Photo of Scene Immediately after Explosion


“Pot-Holes” where sprinkler line
To cross gas service line
Locate marks for gas service line

Service Line Damage Caused by Vibratory Plow

Service Line After Removal from Ground

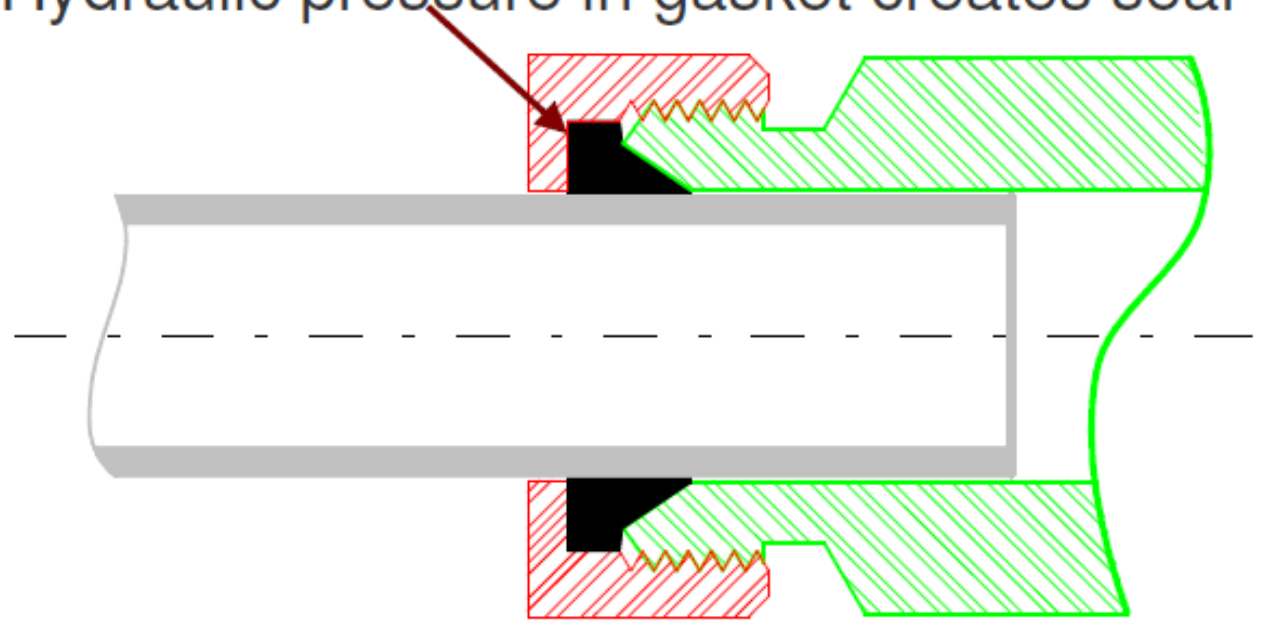
Service Line Pulled out of Compression Fitting

Service Line Pulled from Compression Fitting

Schematic of Compression Fitting

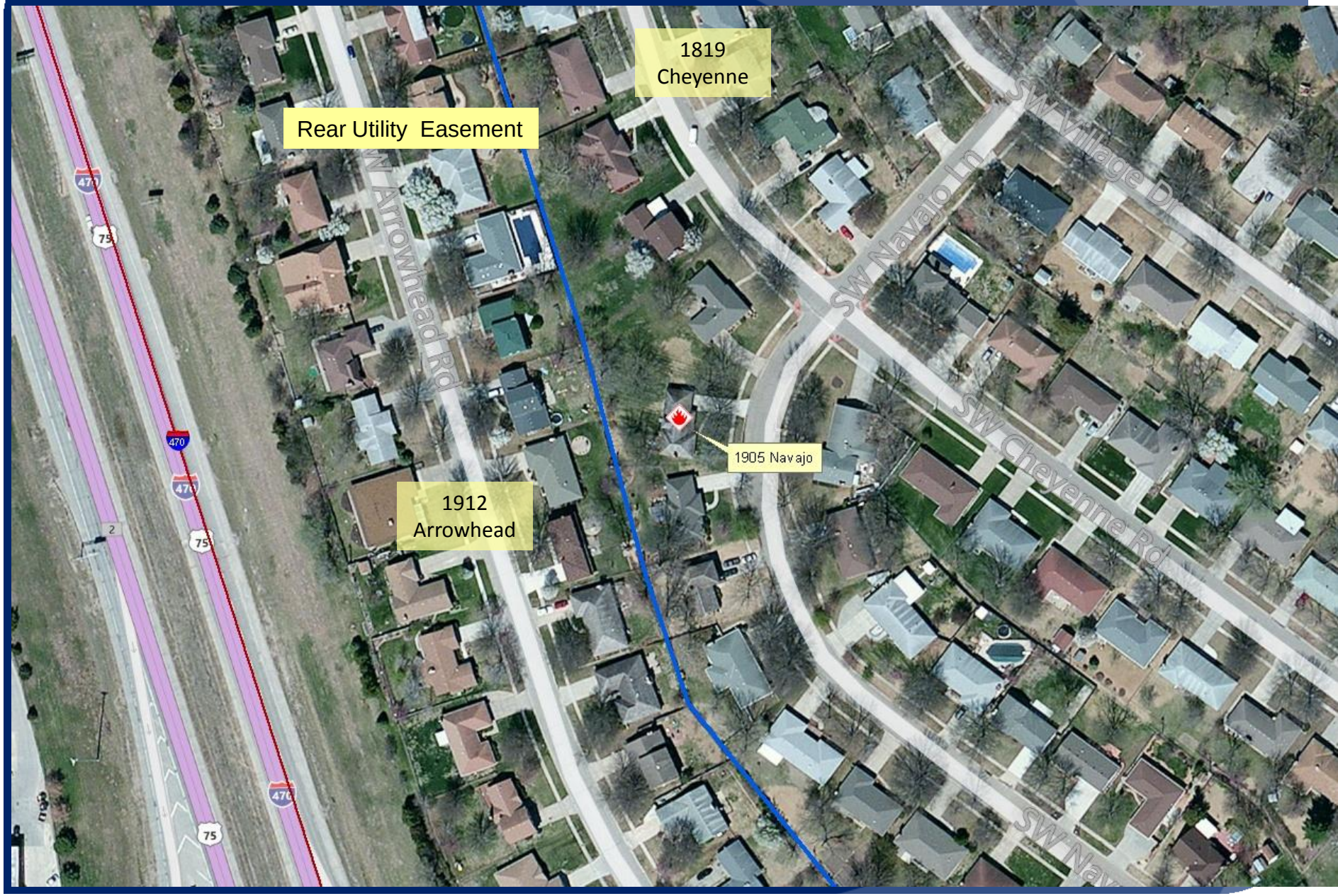
Tighten Nut or Follower
– Crush Gasket Against Pipe

Hydraulic pressure in gasket creates seal



Big Meter/ Small Regulator

Congested Rear Easement shared by gas and sanitary sewer



Lessons Learned

- Flow tests become irrelevant with coupling pull out.
  - Can calculate flow based on orifice calculation.
- Smoke canister in isolated main section chased with air.
- Sewer camera in sewer main showed smoke in sewer within 5 minutes.
- Access to rear easements may be limited for operator equipment and first responders.

Lessons Learned

- Liaison with emergency responders so they understand operator's role.
  - Protect evidence while making system safe as soon as possible.
  - Rear Easements with limited access can delay your response.

Brewster, Kansas

- 128 Nebraska Ave
- House fire at vacant house with gas meter locked off.
- No electric service to the house.

Meter Location and yard line

Leaking Meter

- Meter reading zero usage since locked off.
- Meter registered usage after fire.
- 192.727(d)(1): Valve that is closed to prevent flow of gas to a customer must be locked.

Locked Valve

Investigation Results

- Yard line pressure test okay.
- Service regulator lockup test okay.
- Was gas leaking through appliance fittings?
- Flow calculation on meter showed volume that registered to be equivalent to the time from the beginning of the fire until the meter was read.

Leaking Valve

Lessons Learned

- If gas suspected, routine investigations should include:
  - Meter readings with witnesses at time of arrival.
  - Pressure test of piping to the building wall.
  - Lockup check of service regulator.
  - Leakage and flow test of meter if leaking past valve.
  - Witnessed odor check with calibrated odorometer.
- Use blinds or plugs to shut off gas to customers.

Consider Requesting Special Assistance

Wichita Kansas water damage

- Driller installing telecom lines struck water main and parallel low pressure gas main.
- Didn’t realize gas main was cut until bubbles showed up as water was removed from hole – 4 hours later.
- Over 600 customers without gas service; dewatering main took days.
- Estimated costs: More than $500,000.

Proximity of Gas and Water Mains

Investigation Direction

- Accurate Locates?
- Reasonable Care when excavating?
- Public Awareness Liaison with water department ?
- If water line hit adjacent to gas line, train excavators to notify gas company as well?
- How to monitor gas system during winter weather?