

Garfield County Energy Advisory Board: June 2, 2016



Presentation by



Colorado Public Utilities Commission
PIPELINE SAFETY PROGRAM

Joe Molloy, Program Chief

**“A Current View of Pipeline
Safety Regulation and
Oversight”**

COPUC Pipeline Safety Program:

Program Functions:

Verification of jurisdictional pipeline operator compliance with Colorado pipeline safety rules through inspection and audit (~75%) – *burden of proof on operators*

Investigation of incidents, complaints, and “inadequacies” involving jurisdictional pipelines (~20%) - *burden of proof on inspectors*

Determination of appropriate compliance action(s) necessary to bring jurisdictional pipeline operators into compliance with Colorado pipeline safety rules (~5%)

COPUC Pipeline Safety Program (cont.):

5 Technical Staff = 3 Engineers, 2 Environmental Protection Specialists: Mostly performing verification of pipeline operator design, construction, procedures, records, and training

“Verification” presumes the existence of:

1. **A mature, relatively stable regulatory environment, and**
2. **Appropriate operator compliance resources that influence and oversee all training, operations, maintenance, emergency response and – within last decade +: RISK MANAGEMENT**

COPUC PIPELINE SAFETY REGULATORY ENVIRONMENT: Basis and Scope of Authority founded upon Transportation

- ❖ *Transportation* = ? = Involves movement of some commodity (natural gas, oil, refined products, ammonia, CO₂) usually with “*within or affecting commerce*” ...language (Q: Do you know it when you see it? Where does it start/end?...)...INTER versus INTRA state (Fed/State)
- ❖ Commerce = public livelihood = public safety = *populated areas*
- ❖ “Commerce” function keeps pipelines in U.S. DOT jurisdiction for Feds and in PUC/PSC realm for states...mostly – some exceptions (e.g., CA Fire Marshal for HL pipelines).
- ❖ Definitions have sometimes blurred practical applications of pipeline safety regulations.
- ❖ Colorado regulatory entities have attempted to clarify pipeline regulatory environment (COPUC PSP, COGCC, PHMSA WR, CDPHE)

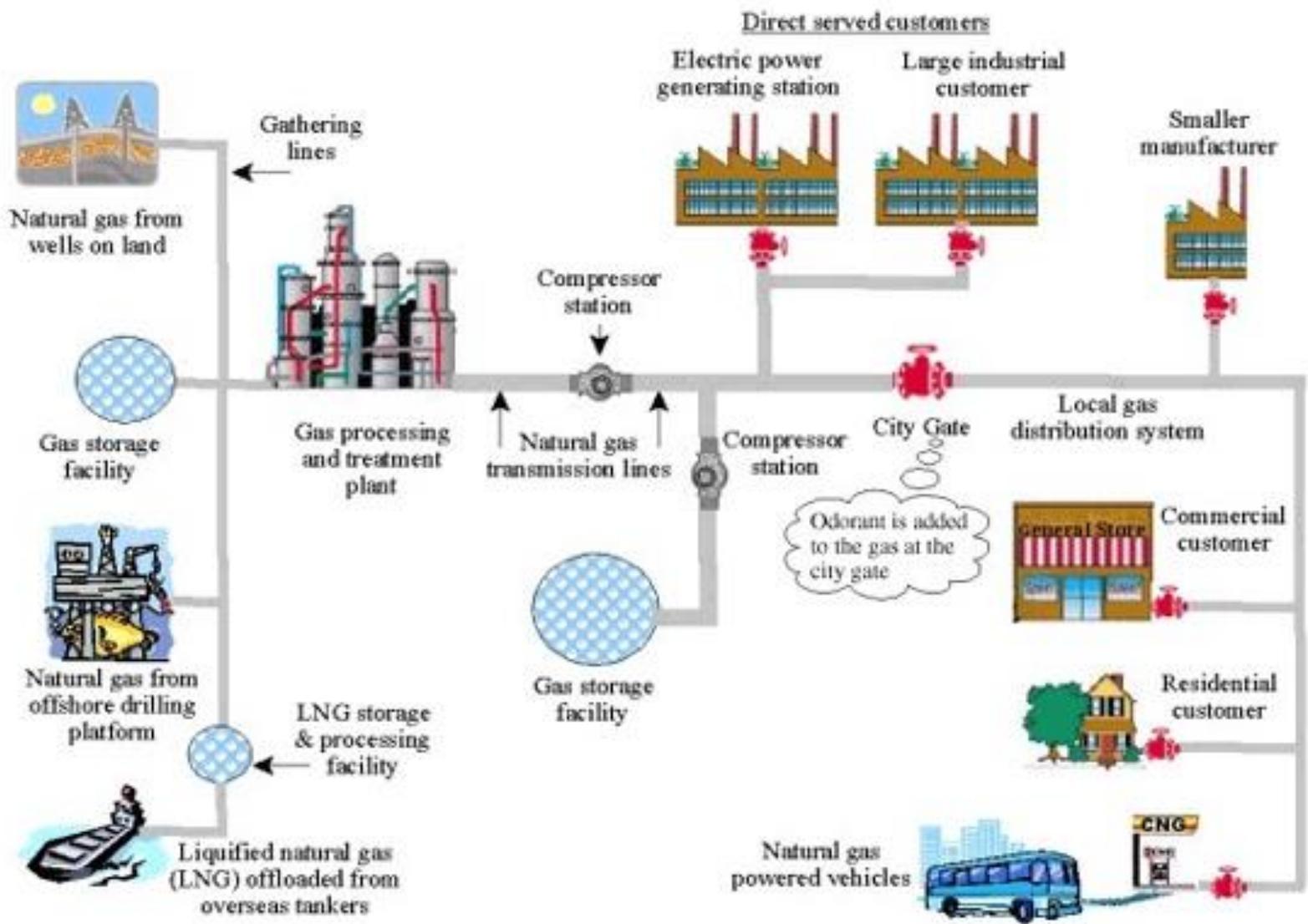
PIPELINE SAFETY REGULATION: Basis and Scope of Authority = Transportation (cont.)

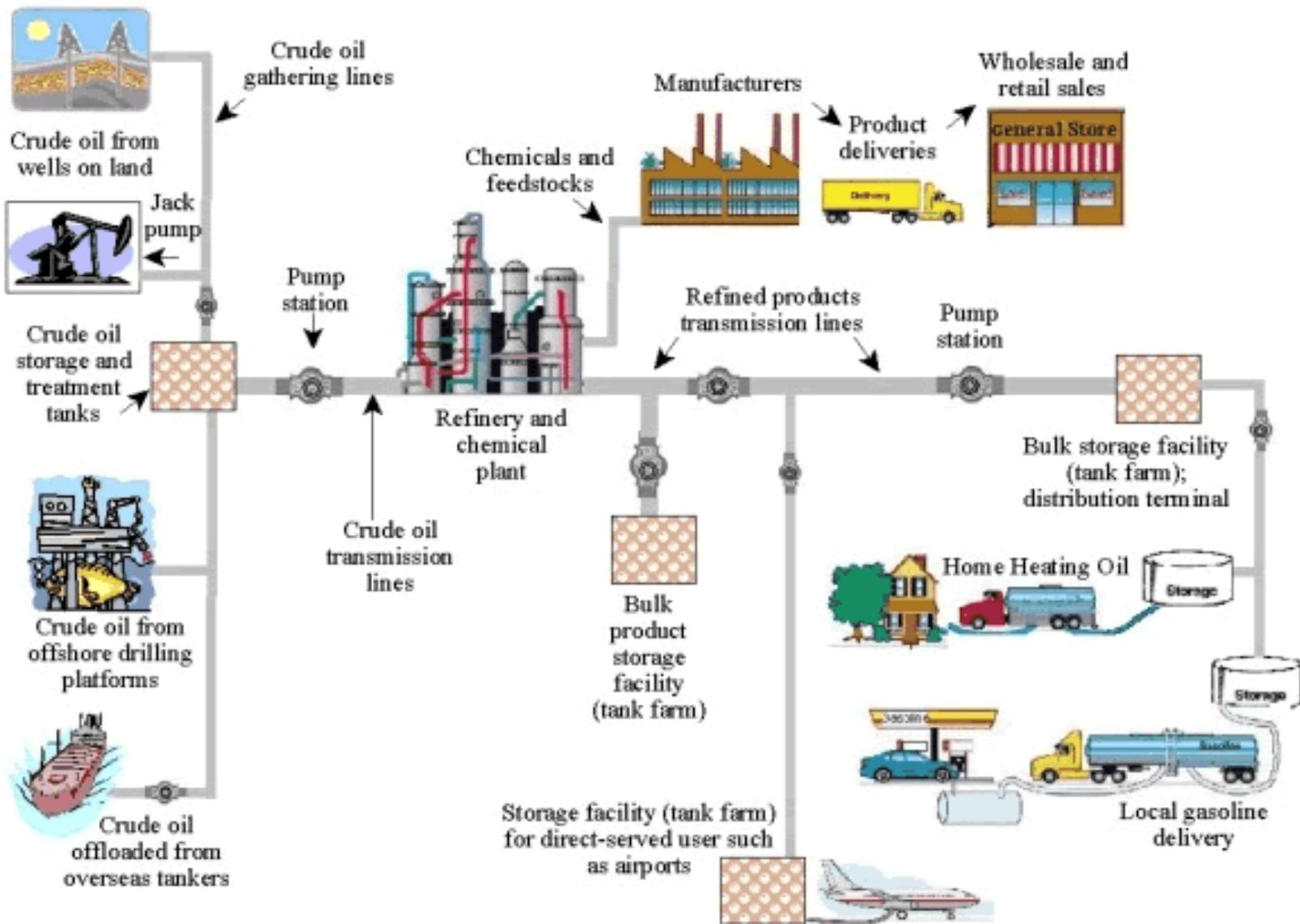
- ❖ Pipeline “transportation” of natural gas occurs in gathering (*midstream*), transmission, distribution, and storage (horizontal pipe up to storage well valve)
- ❖ The *midstream* industry segment is regulated in populated and unusually sensitive areas (liquids-PHMSA, Natural gas-COPUC)
- ❖ Production flowlines: Lines involved in moving untreated/unprocessed produced fluids to wellsite storage, metering or central delivery point (CDP) within the producing field (“production facility” is defined in COPUC rules)
- ❖ Production – the “*upstream*” industry segment – is regulated by the Colorado Oil and Gas Conservation Commission (COGCC) – including pipelines

PIPELINE SAFETY REGULATION: Starts with the Federal Government

- ❖ **U.S. Department of Transportation Pipeline and Hazardous Materials a Safety Administration (PHMSA) is one of Ten Administrative Sections under U.S. Department of Transportation (Secretary Anthony Foxx)**
- ❖ **PHMSA (Office of Pipeline Safety) mission is to protect people and the environment from the risks of hazardous materials transportation**
- ❖ **PHMSA regulates safety of all liquid and natural gas transportation pipelines in the U.S. PHMSA-certified state programs require the adoption of Federal minimum safety standards OR more stringent (but states need to prove this); Colorado has Federal standards with some additional reporting requirements.**
- ❖ **Establishes national policy, sets and enforces standards, educates, and conducts research to prevent pipeline incidents**
- ❖ **Collaborative dialogue/effort with states, public groups, and industry**







PIPELINE SAFETY REGULATION: Implemented by Colorado

- ❖ **Nationally, the majority of pipeline inspections are carried out by state inspectors who work for state agencies**
- ❖ **Colorado PUC (and other states) “certified” by PHMSA to perform pipeline safety inspection & enforcement activities concerning intrastate (can also be interstate agent for PHMSA, Colorado is not currently) pipeline transportation of natural gas. PHMSA Western Region has oversight of interstate gas transportation and all hazardous liquid transportation in Colorado.**



PIPELINE SAFETY REGULATION: Implemented by Colorado (cont.)

- ❖ **Colorado Oil and Gas Conservation Commission (COGCC) regulates production (i.e., pre-transportation) portion of pipelines (and much more...e.g., siting, all on-well equipment, etc.)**
- ❖ **COGCC primary regulatory agency in Colorado; regulations depend on whether the surface location of the oil and gas is owned by the federal government, state government or by private individuals, and whether the location is onshore or offshore.**
- ❖ **COGCC is independent, while COPUC program is audited annually by PHMSA State Programs to determine: Adequate establishment of state policies in accordance with Federal standards; enforcement of standards; and pipeline operator education**



PIPELINE SAFETY REGULATION: Colorado Snapshot

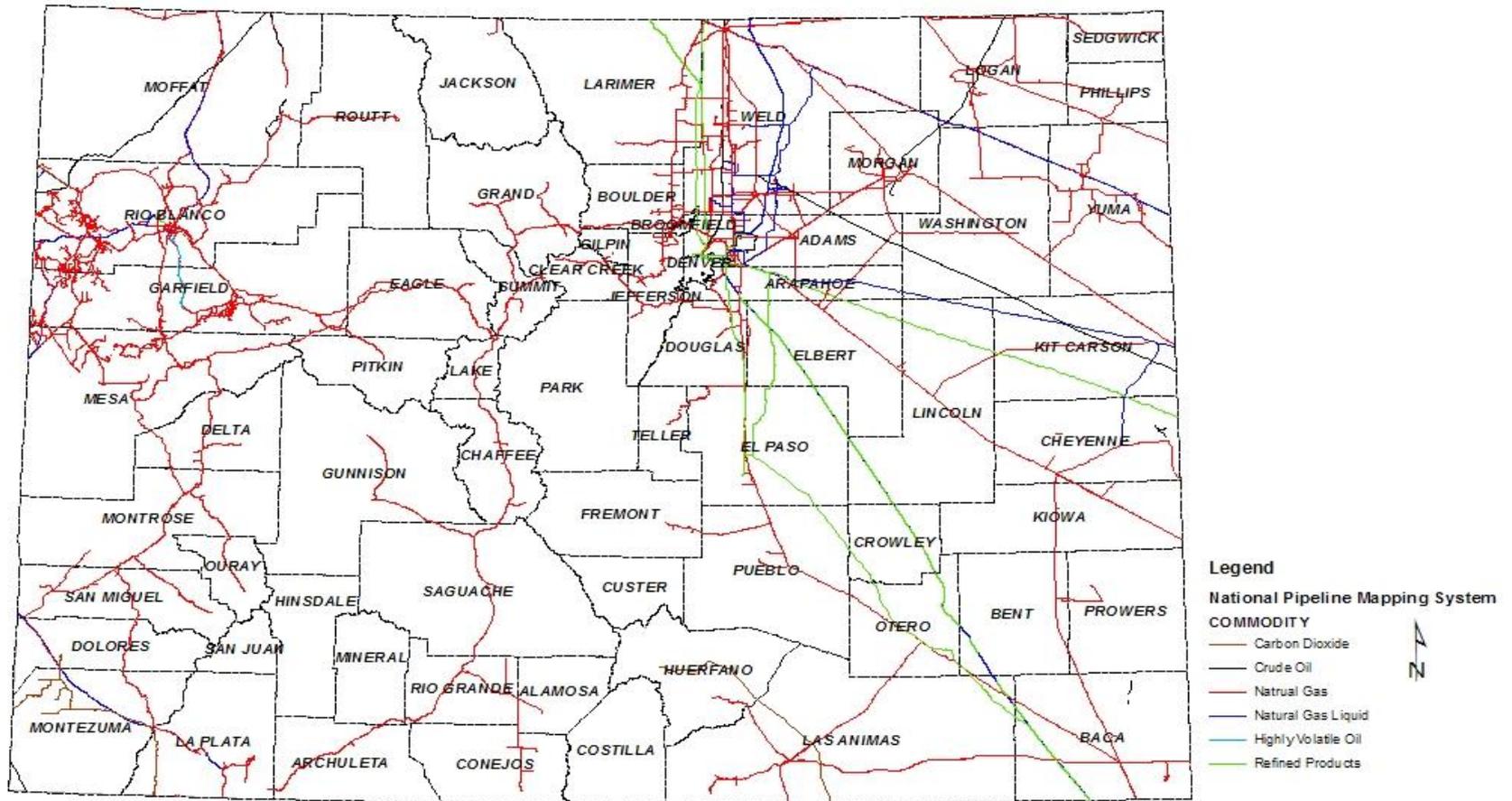
- ❖ COPUC PSP intrastate gas pipeline operators have (2015 data – approximate figures):
 - 1.6 million individual service lines;
 - 54,000 miles of gas distribution mains and services;
 - 3,000 miles of gas transmission lines; and
 - 700 miles of *fully-jurisdictional* gas gathering lines (i.e., non-rural areas: CO rural gathering operators have event/incident reporting requirements)

PIPELINE SAFETY REGULATION: Colorado Snapshot (cont.)

- ❖ COGCC gas and oil producers have (?):
 - **53,000 wells** and most have oil, gas, and water lines, so if you do a little math... it comes out to be thousands of miles of flowlines.
 - **BIG challenge....stay tuned for future talks by COGCC!**

Colorado Pipeline System

Gas Transmission and Hazardous Liquid Pipelines



PIPELINE SAFETY REGULATION: Backstory

- ❖ Technical roots in industry “consensus” standards designed to establish baselines for operational safety and quality and minimize industry confusion (e.g., American Petroleum Institute – API – since 1924). Task and material based (great for both technicians/engineers).
- ❖ Philosophical roots in the Safety, Health, and Environmental regulation creation/reformation in late 1960s to early-to-mid 1970s (e.g., EPA, OSHA, MSHA, etc.)... Office of Pipeline Safety (OPS) created in 1968 under U.S. DOT. Approaches, systems, and “results” based (not-so-great for technicians; can be problematic for engineers).
- ❖ OPINION: Due to an appearance that “reasonable” pipeline industry standards exist(ed), pipeline regulation philosophy faltered/lagged until the development of unique additions to regulations that forced pipeline operators to develop specific risk-based programs addressing pipeline safety (late 1990s/2000s).

PIPELINE SAFETY REGULATION: Structure (Federal)

- ❖ **C.F.R. Title 49: Part 191 (Reporting), Part 192 (Natural Gas), Part 193 (LNG), Part 194 (Oil Pipeline Response Plans), Part 195 (Hazardous Liquids), Part 199 (D&A Testing)**
- ❖ **Part 196 (Damage Prevention/Enforcement) - 2016**
- ❖ **Parts provide structure and metrics for operator pipeline safety procedures – “must haves,” “must dos” (e.g., 192 *Subpart I – Requirements for Corrosion Control* – since 1971)**
- ❖ **“Newer” (2000 onwards) Subparts provide programmatic direction: Operator Qualification (OQ) (Subpart N, 192; Subpart G, 195); Integrity Management (TIM in 192 Subpart O, DIM in 192 Subpart P, Liquid Integrity in 195.492)**

PIPELINE SAFETY REGULATION: Gas Pipelines – Part 192

- ❖ **16 Subparts (A – P) – Significantly-developed regulatory environment**
- ❖ **7 Subparts – A, I, K, L, M, O, P are retroactive, i.e., have the potential to apply to existing/old pipelines as the regulations are updated**
- ❖ **These 7 are the most impactful Subparts on current pipeline activities, and include Definitions (A), Corrosion Control (I), Upgrading (K), Operations (L), Maintenance (M), Transmission Integrity Management (O), and Distribution Integrity Management (P),**

PIPELINE SAFETY REGULATION: Gas Pipelines – Part 192 (cont.)

- ❖ **9 Subparts “frozen in time” for a pipeline (B, C, D, E, F, G, H, J, N) – mostly dealing with materials, design, and construction requirements in place at time of initial pipeline in-service. Even if Subpart changes, a pipeline built under an old requirement is not required to meet the new requirement UNLESS some change triggers requirement**
- ❖ **MD&C regulations essentially derived from industry standards (e.g., ASTM, ANSI, API, etc.)**
- ❖ **These subparts essentially form the basis for a “pipeline pedigree” - *IF they survive in record...***

PIPELINE SAFETY REGULATION: Gas Pipeline Recap

- ❖ **Part 192 is a comprehensive set of regulations initially promulgated in the early 1970s to cover everything from pipeline design, operations and maintenance, and emergency response. These “traditional” regulations tried hard to have firm technical bases with a focus on incremental tasks.**
- ❖ **Newer, non-traditional programmatic regulations since 2000 focus on systems – not only physical systems, but systems of processes within and affecting pipeline operations: Operator Qualification and Integrity Management.**
- ❖ **Future changes to pipeline safety regulations will likely reinforce this systems-approach to pipeline safety.**

“Systems Approach” to Pipeline Safety: The example of “Integrity Management”

- ❖ **Operators becoming IM centric**
- ❖ **Integrity Management = base word**
“Integral” = Know the pipeline system, understand its risks, and react to that risk
- ❖ **Gas Transmission IM (TIM) = 2003,**
“Prescriptive” implementation (“You need to...”)
- ❖ **Gas Distribution IM (DIM) = 2010, “Descriptive”**
implementation (“You should consider...”)

“Systems Approach” to Pipeline Safety: The example of “Integrity Management” (cont.)

- ❖ **All IM concepts distill to “KNOW THE SYSTEM; KNOW THE LOCATION; KNOW THE THREATS”**
- ❖ **Easier said than done = resource and data intensive; operators seeking “continual improvement” – takes *time and experience*...and does the “pipeline pedigree” exist? (Many operators have experienced disappointing record retention/detail)**
- ❖ **What is the “proper” way to react to threats? Currently this is largely retrospective in nature = NO RELEASES; downward trend in releases**



INTEGRITY MANAGEMENT: What are threats to pipeline?

❖ **Eight (8) threat categories (DIM) – currently leak data driven:**

- Corrosion,
- Natural forces
- Excavation damage
- Other outside force damage
- Material or welds
- Equipment failure
- Incorrect operations
- Other concerns

❖ **Threat/Risk Analysis (TIM) – “assessment” driven (ILI, Direct Assessment)**

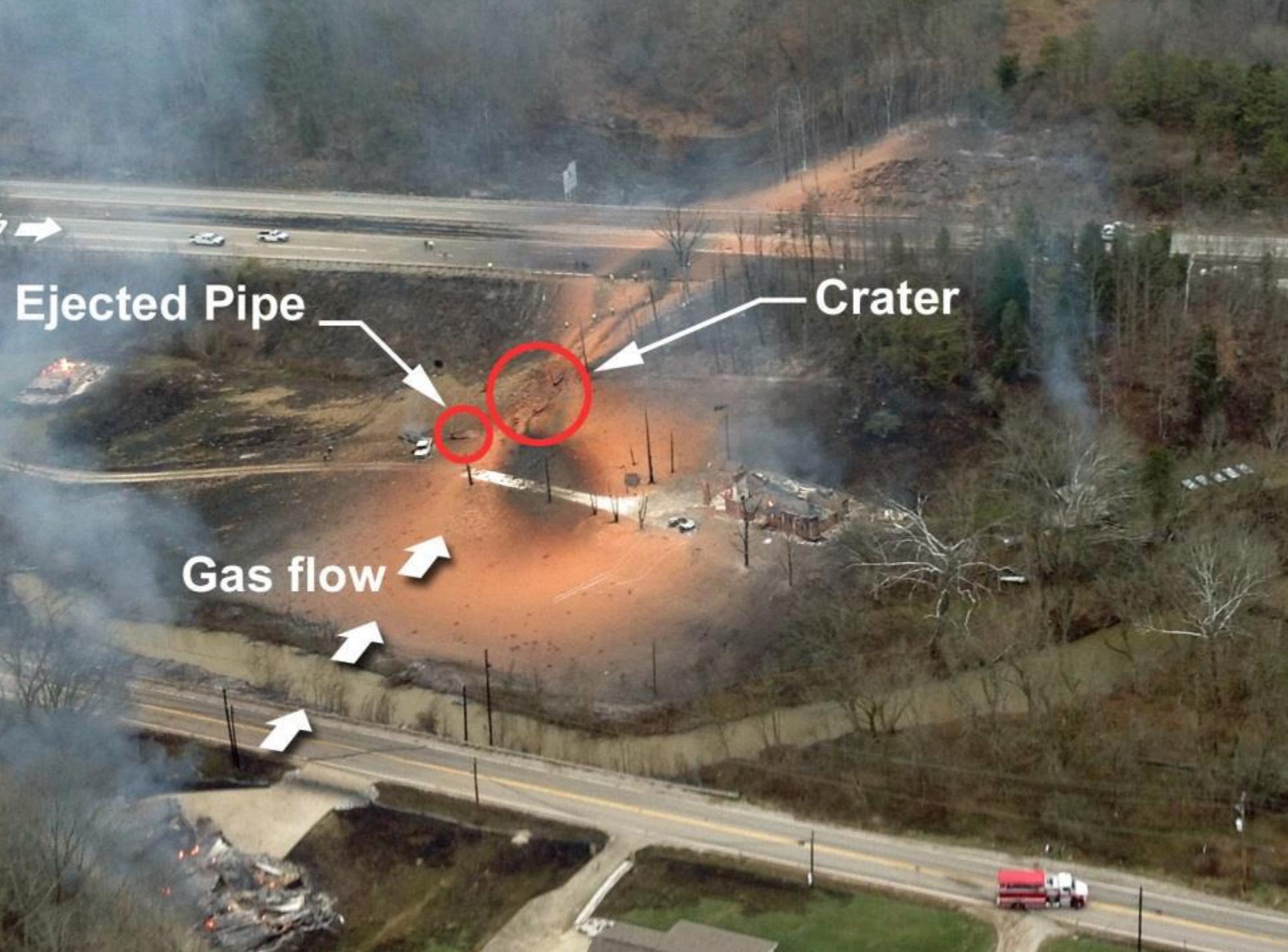
INTEGRITY MANAGEMENT: Managing threats to pipeline

- ❖ **TIM and DIM – great concepts (“see the forest”);**
challenging to implement correctly; requires
resources, vigilance, continual improvement...
meant to minimize gaps/cracks in traditional
safety/compliance monitoring of pipeline threats

- ❖ **Can be difficult to seal the gaps – Retrospective on**
Transmission: Sissonville, WV case study;
Prospective on Distribution: Colorado leak statistics



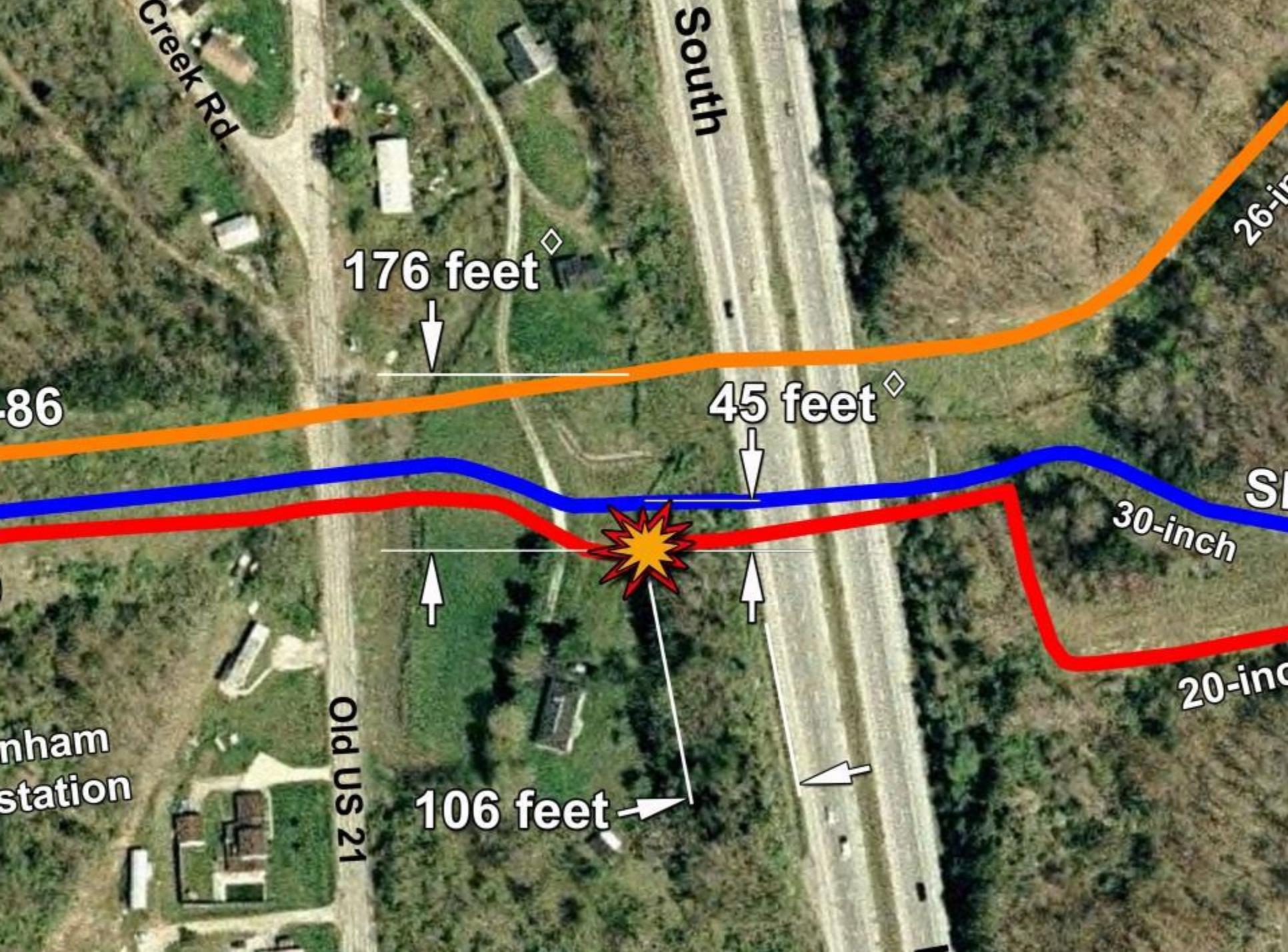
Sissonville, W. Virginia December 2012: 20" 1967 coal-tar/epoxy coated 0.281 X60 steel @ 929 psi OP with impressed current CP....generalized external corrosion leak @ 6:00 position



Ejected Pipe

Crater

Gas flow



Creek Rd

South

176 feet

45 feet

.86

26-in

30-inch

SI

20-inc

nham
station

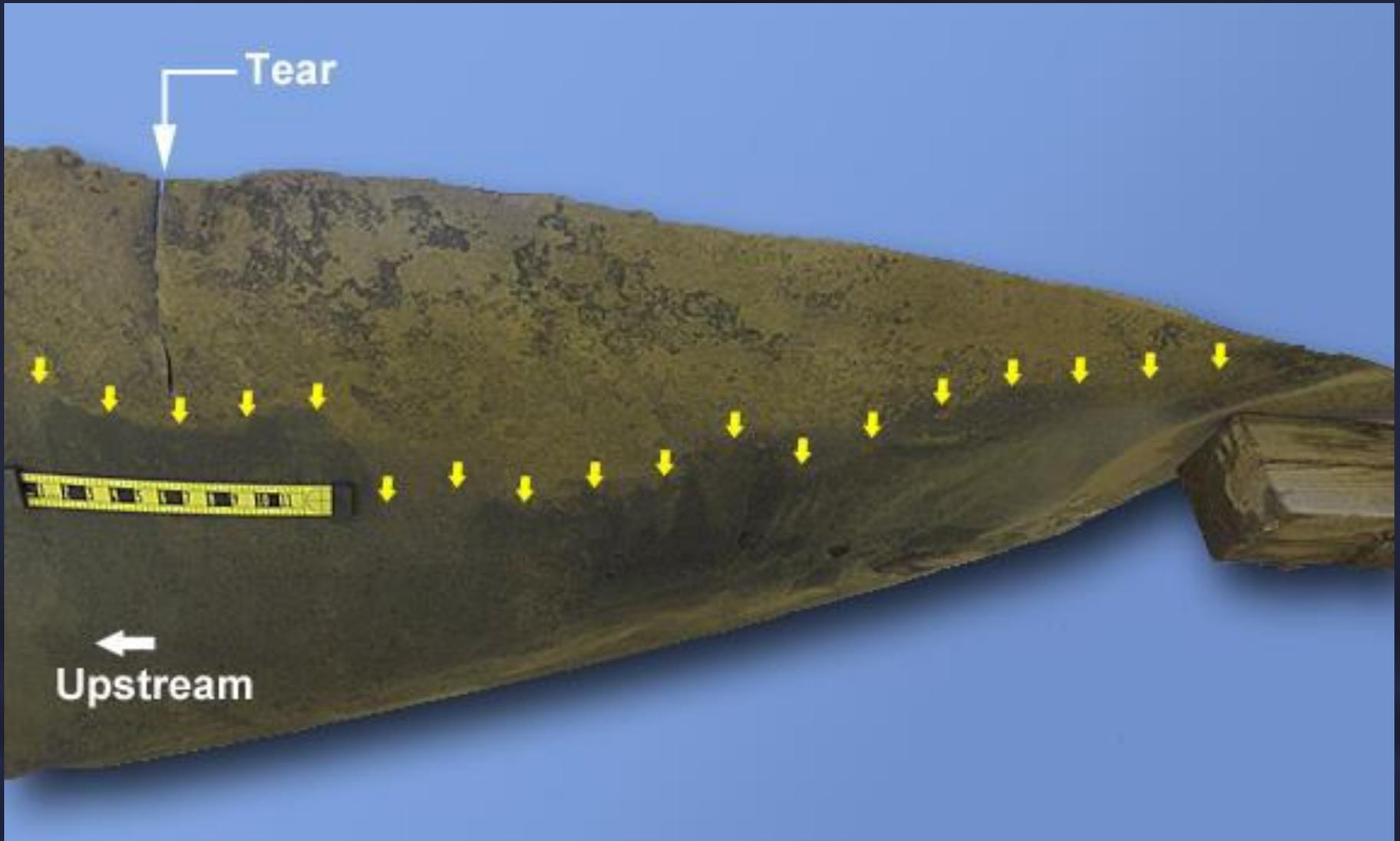
Old US 21

106 feet

INTEGRITY MANAGEMENT: Sissonville Summary – Where are the IM gaps?

- ❖ **20" transmission line NOT subject to TIM (non-HCA based on PIR); two adjacent lines were HCA and TIM (26-inch-diameter pipeline and a 30-inch-diameter pipeline) – all 1000 psig MAOP, all interconnected, all similar vintage (1950s and 1960s)**
- ❖ **No pipeline evaluation on 20" – ILI in 2009 on two adjacent lines with indications as follows within 500' of the 20" line rupture: 161 external metal loss (EML) features on 30" >10% wall loss (15 of 20-30% with no repairs); 63 EML on 26" > 10% (15 > 30%, one repair on 41% wall loss)**





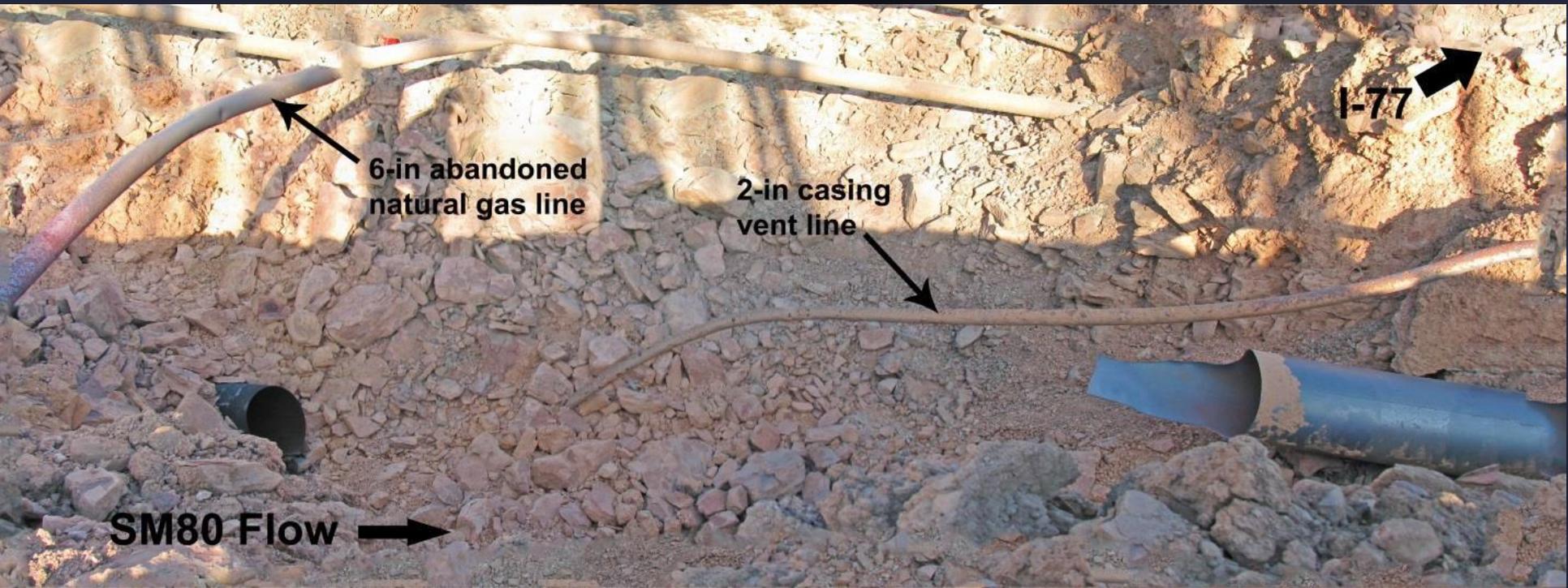
70% wall loss at initiation (tear); arrows at extent of generalized corrosion

Evaluation Method	Estimated Burst Pressure, psig
B31G	680
Modified B31G	932
Effective Area Method	1002

***Using 0.078" rwt (on 0.281" nwt) = 72%
wall loss; actual rupture occurred at ~929
psig**

INTEGRITY MANAGEMENT: Sissonville Summary – Where are the IM gaps?

- ❖ Operator performed close-interval survey (CIS) on entire system in 1995; 28 indications requiring remediation, but **no indications** in rupture area
- ❖ CIS on portion of 26" in 2004/2005; 17 indications requiring remediation
- ❖ CP test station within 100' of rupture – 10 years of good reads (2003 – 2012)



6-in abandoned
natural gas line

2-in casing
vent line

SM80 Flow →

I-77 →

INTEGRITY MANAGEMENT: Sissonville Summary – IM gap observations/questions

- ❖ Operator's IM was to letter of rule, but not intent/philosophy = lacked opportunity for *integration* of information
- ❖ ILI and CIS assessment information not tied together, where was the CP group...lost in the IM process?
- ❖ Adequacy/appropriateness of CIS (shielding)?
- ❖ Adequate/appropriate CP test station (soil condition Abnormal Operating Condition)?
- ❖ Lack of CP data tools?
- ❖ Data under/overload?

Distribution Integrity Management Example



Denver Area Distribution: 20" 150 psig distribution line shorted to water line – Picked up by CIS

Transmission Integrity Management Example



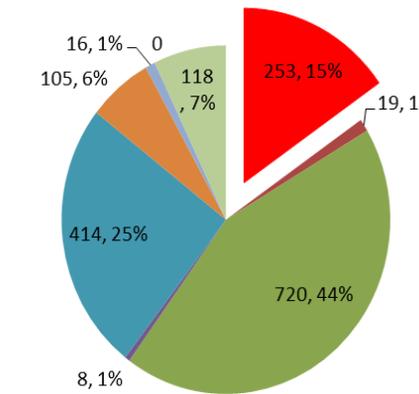
Denver Area Transmission: 20" ~600 psig late-1990s FBE line with pitting corrosion... AC? Many years good CP reads...Picked up by ILI

INTEGRITY MANAGEMENT (DIM) EXERCISE: How to quantify overall corrosion threat (mains)?

- ❖ **Extent of steel mains in Colorado:** +14% **Since 1990**
(11,300 miles 1990; 12,900 miles 2013) ...Plastic up 190%
- ❖ **Bare steel:** -62% **Since 1990** (601 miles 1990; 230 miles 2013)
...76 miles “protected”
- ❖ **“Unprotected” steel pipe:** 6.3% of total in 1990; 7.9%
of total in 2013 = **up 1.6%...why?**
 - **Physical reasons – depleted anodes, deteriorating coating... (?)**
 - **Better data and data assimilation to create a more accurate picture of systemic materials and CP**

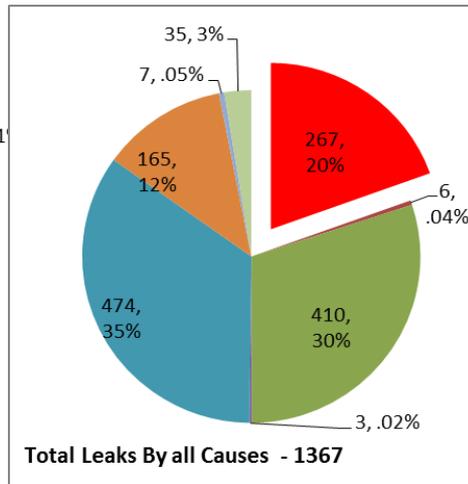
INTEGRITY MANAGEMENT (DIM) EXERCISE: Colorado Leak Data (Mains)

2010



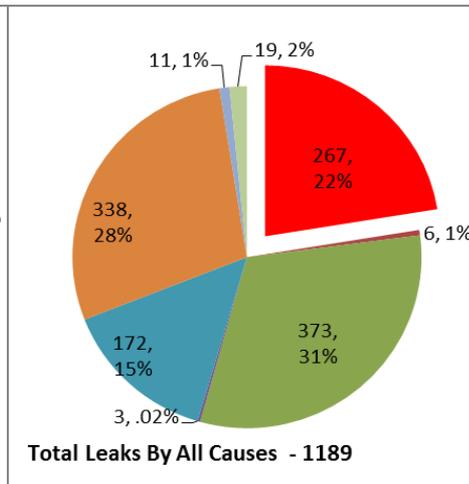
Total Leaks By All Causes - 1653

2011



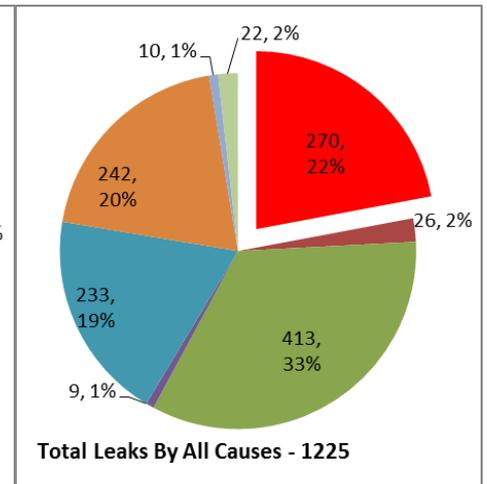
Total Leaks By all Causes - 1367

2012



Total Leaks By All Causes - 1189

2013



Total Leaks By All Causes - 1225

- Corrosion
- Natural Forces
- Excavation
- Outside Forces
- Material or Welds
- Equipment
- Operations
- Construction
- Other

INTEGRITY MANAGEMENT (DIM)

EXERCISE: How to quantify corrosion threat (mains), cont.?

- ❖ Review of Colorado main corrosion leak trend = Consistent/No change (matches overall leak trend)
- ❖ What does it mean (good/bad/indifferent)?
Indifferent, because:
 - ❖ “Young” data – only 5 years worth
 - ❖ “Lumpy” data – recalling 1,3,5 year leak-survey cycles; not all areas may be represented
 - ❖ “Fuzzy” data – whole of Colorado represented, the granularity of unique operating areas is lost

INTEGRITY MANAGEMENT (DIM)

EXERCISE: Conclusions

- ❖ Leak data as DIM tool is young, lumpy, and fuzzy (for both COPUC and for operators with multiple operating areas) = needs to “cook longer” before using as a confident basis for DIM progress review
- ❖ COPUC and operators both ultimately looking for entire leak “pie” to shrink (less leaks).

INTEGRITY MANAGEMENT (DIM) EXERCISE: Conclusions (cont.)

- ❖ In the meantime, COPUC is still looking for operators to address and reduce system risks ...
- ❖ Operators must use other data metrics, targeting “problematic” (i.e., not just leaking) materials (e.g., bare steel/poorly performing coating types) and systems (e.g., shorted CP) to proceed with risk reduction

IM TAKE-AWAYS:

- ❖ **OPINION**: Integrity Management (IM) is the essential philosophy of pipeline safety regulation that was lacking since Part 192's inception.
- ❖ IM is becoming the foundation of traditional compliance
- ❖ Data drives IM systems analyses, and can crash them through:
 - No (uncollected) or minimal data;
 - Data overload
 - Poor/imprecise data; and
 - Unconnected data

IM TAKE-AWAYS (cont.):

- ❖ IM is a reflection of the essential reality that engineering is not simply the widespread application of science, it is the socially-acceptable application of science, i.e., as social expectations change, so does engineering.
- ❖ The result is that, although there may never be enough or timely data, regulators and the public still expect system risk minimization from IM efforts
- ❖ TIM – are we seeing this?...U.S. Congress = No.

2016 PHMSA Notice of Proposed Rulemaking (NPRM):

- ❖ **Safety of Gas Transmission and Gathering Pipelines (Docket No. PHMSA-2011-0023) – Note “2011” nomenclature; this is technically not a new rulemaking**
- ❖ **Comments due by July 7, 2016**
- ❖ **<https://www.regulations.gov> – search on docket above.**

2016 PHMSA Notice of Proposed Rulemaking (NPRM): Gathering*

- ❖ **Original 2006 gathering line rule designed for small diameter, low energy pipelines**
- ❖ **Relied on API RP 80**
- ❖ **Operator misuse of ambiguous language**
- ❖ **Created Types A and B pipelines, depending on operating pressures**

* Thanks to Mary Friend, PSP Manager, West Virginia

2016 PHMSA Notice of Proposed Rulemaking (NPRM) (cont.): Gathering*

- ❖ **Modify regulations for onshore gas gathering pipelines**
- ❖ **Repeal use of API RP80**
- ❖ **Redefine gathering pipelines**
- ❖ **Extend regulations of Type A for pipelines ≥ 8 inches in Class 1 locations**
- ❖ **Extend reporting requirements for regulated gathering pipelines**

* Thanks to Mary Friend, PSP Manager, West Virginia

2016 PHMSA Notice of Proposed Rulemaking (NPRM): Transmission*

❖ Address a variety of topics and issues

❖ NTSB concerns

- San Bruno

- Sissonville

❖ Other incidents

- Mayflower, Arkansas

- Yellowstone River

- Kalamazoo, MI

* Thanks to Mary Friend, PSP Manager, West Virginia

2016 PHMSA Notice of Proposed Rulemaking (NPRM) (cont.): Transmission

- ❖ **Introduces concept of MODERATE Consequence Area (MCA), not just High Consequence Area (HCA)**

- ❖ **Moderate consequence area means:**

...an onshore area that is within a potential impact circle, as defined in §192.903, containing five (5) or more buildings intended for human occupancy, an occupied site, *or a right-of-way for a designated interstate, freeway, expressway, and other principal 4-lane arterial roadway as defined in the Federal Highway Administration's Highway Functional Classification Concepts, Criteria and Procedures*, and does not meet the definition of high consequence area, as defined in § 192.903.

2016 PHMSA Notice of Proposed Rulemaking (NPRM) (cont.): Transmission

❖ **Modifies Part 192 “General Requirements” §192.13 to explicitly include “Management of Change (MOC)” processes – *influencing and structuring corporate culture through regulation; based on ASME/ANSI standard B31.8S.***

❖ **§192.13(d):**

Each operator of an onshore gas transmission pipeline must evaluate and mitigate, as necessary, risks to the public and environment as an integral part of managing pipeline design, construction, operation, maintenance, and integrity, including management of change. Each operator of an onshore gas transmission pipeline must develop and follow a management of change process, as outlined in ASME/ANSI B31.8S, section 11, that addresses technical, design, physical, environmental, procedural, operational, maintenance, and organizational changes to the pipeline or processes, whether permanent or temporary.

Webinar on NPRM

- ❖ **Internet Search on:** *Safety of the Nation's Gas Transmission Pipelines*
NPRM webinar
- ❖ **Wednesday, June 8, 2016**
- ❖ **11 – 1 p.m. MDT**
- ❖ **RSVP by 4 p.m. Tuesday, June 7**

THANK YOU - FROM THE COPUC PSP



Q & A

ADDITIONAL RESOURCES:

❖ PHMSA website:

www.phmsa.dot.gov/pipeline

❖ COPUC website:

www.dora.colorado.gov/puc

❖ COGCC website:

cogcc.state.co.us

❖ National Transportation Safety Board (NTSB) website:

www.nts.gov/investigations/Pipeline