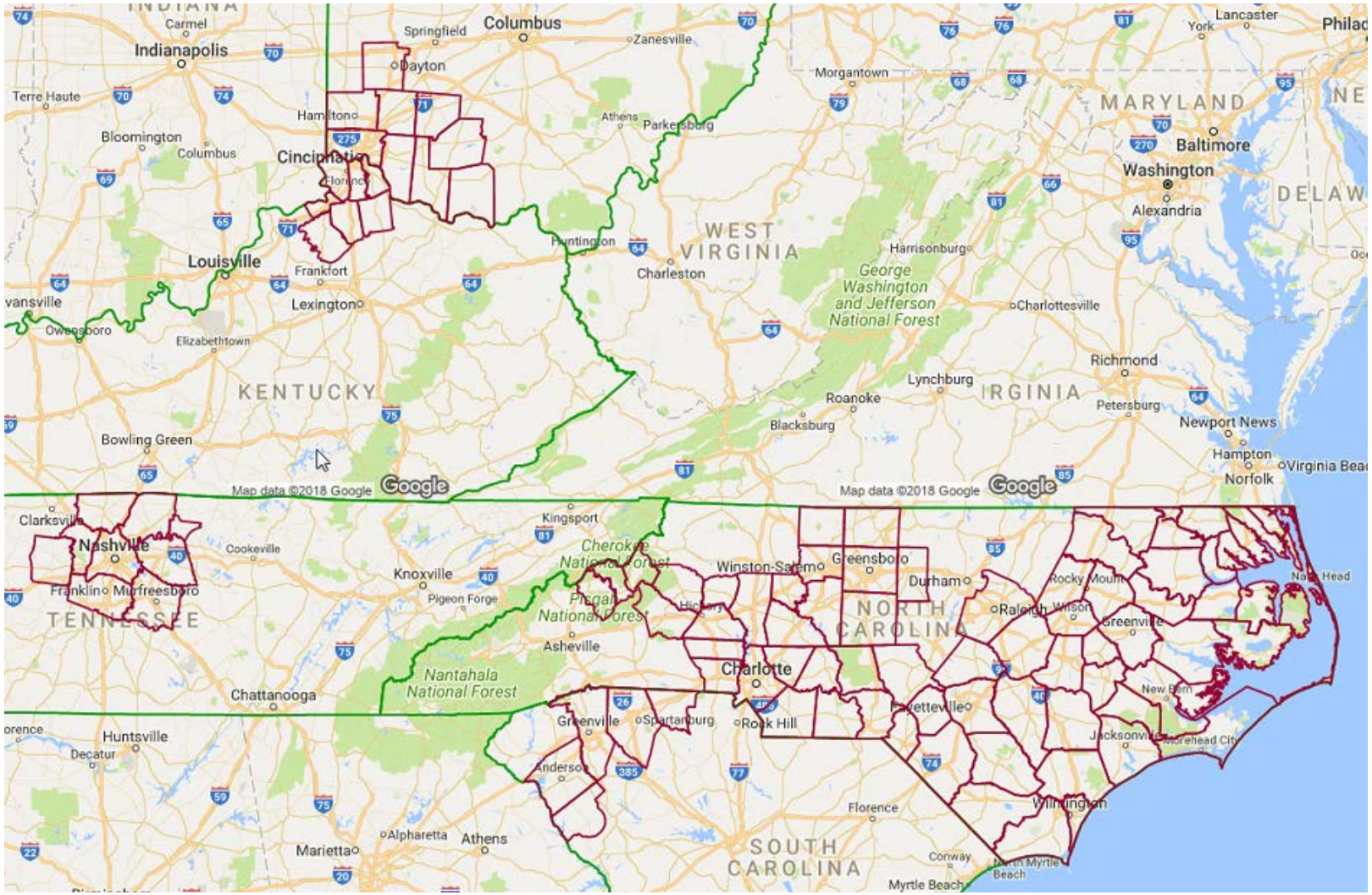
DIMP Annual Program

OGA Technical Seminar – March 22, 2019

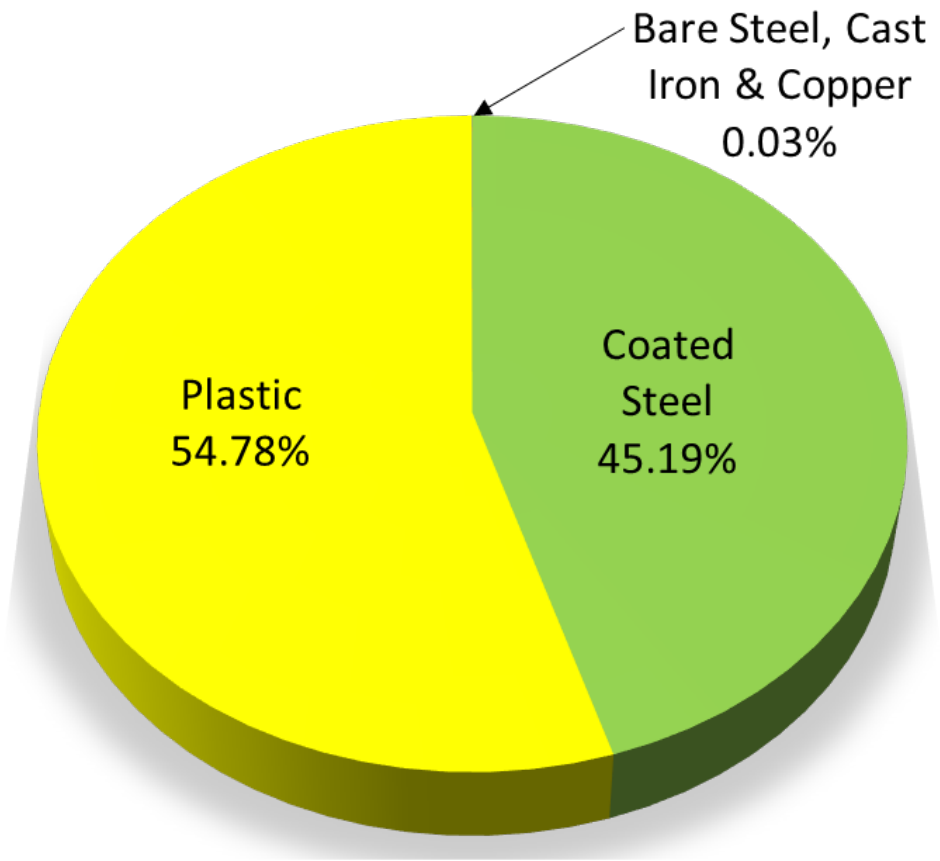
Duke Energy Natural Gas Distribution System

State	Miles of Main	No. of Services
OH	5,714	409,805
KY	1,458	98,736
NC	16,292	813,217
SC	3,787	162,451
TN	3,464	191,700
Total	30,715	1,675,909

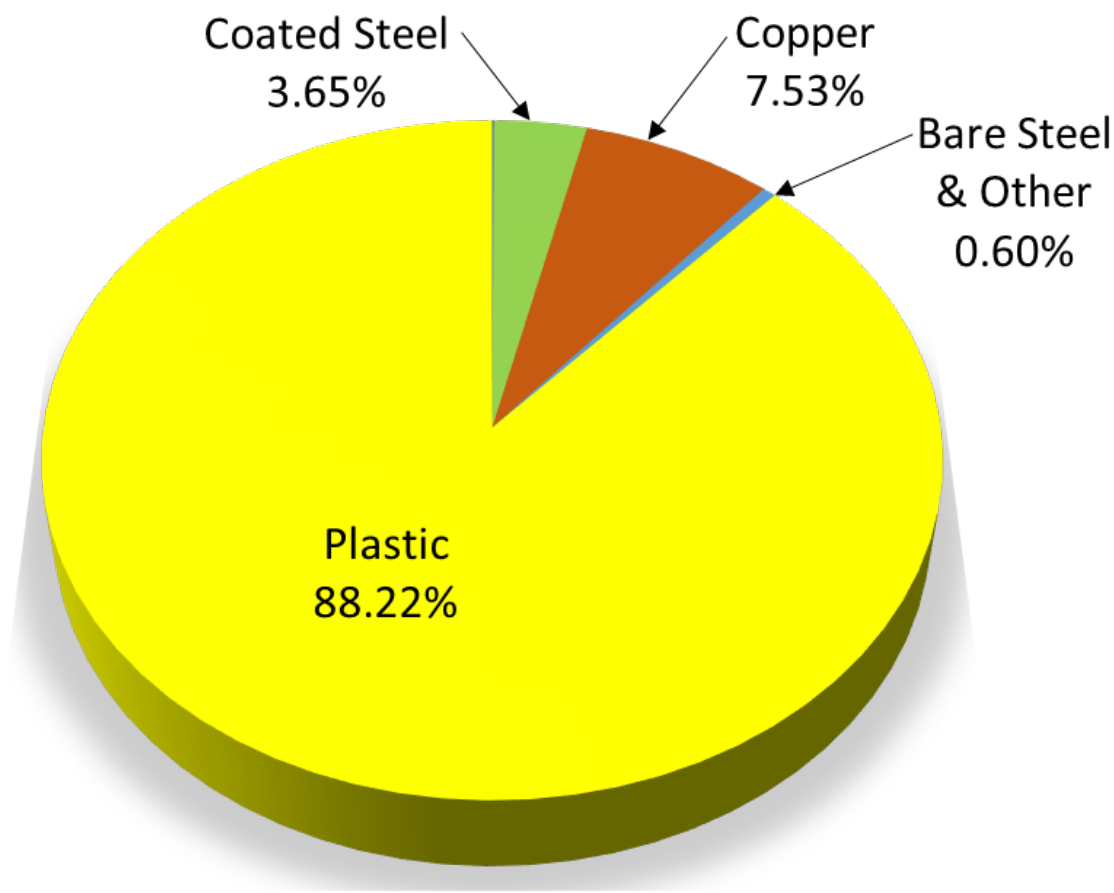
- ~ 60% of mains are plastic
- ~ 80% of services are plastic



Duke Energy Ohio Distribution System

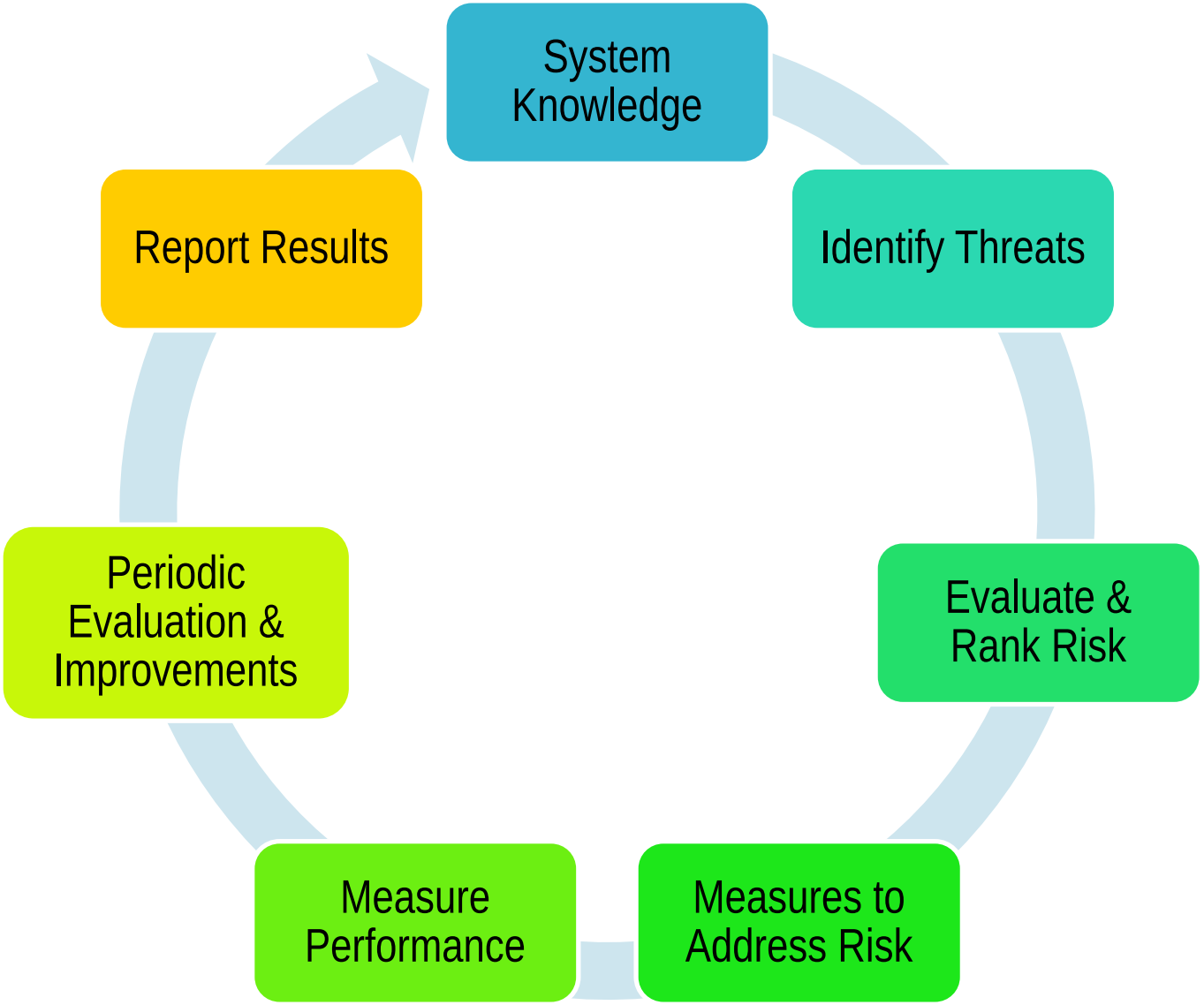


Miles of Main



Number of Services

Elements of DIMP



Quality Management Approach

Plan: *DIMP Plan*

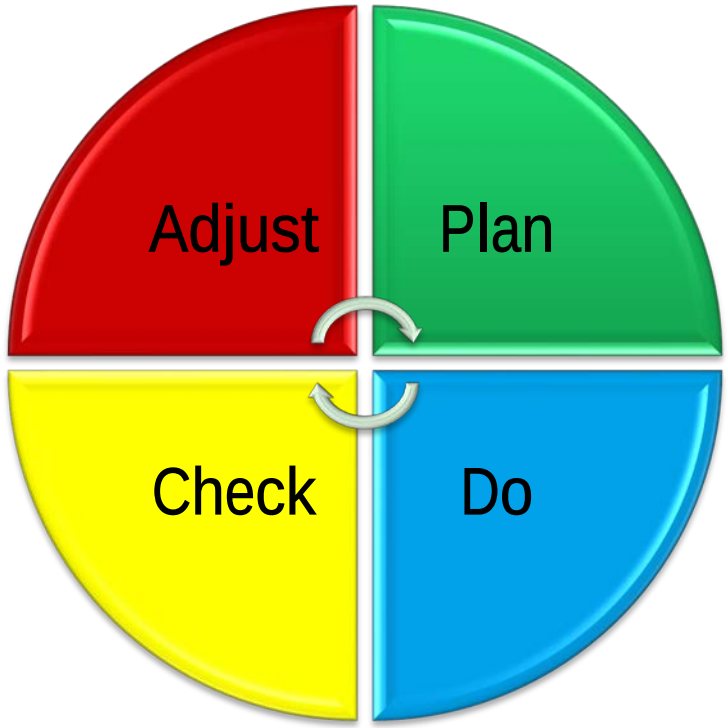
- Vendor hosted Process Workflow Management Platform

Do: *System Knowledge, Threat ID, Rank Risk, Measures to Address Risk*

- Execute the processes
- Develop Programs and Activities to Address Risk (PAAR)

Check: *Measure Performance, Monitor Results & Measure Effectiveness*

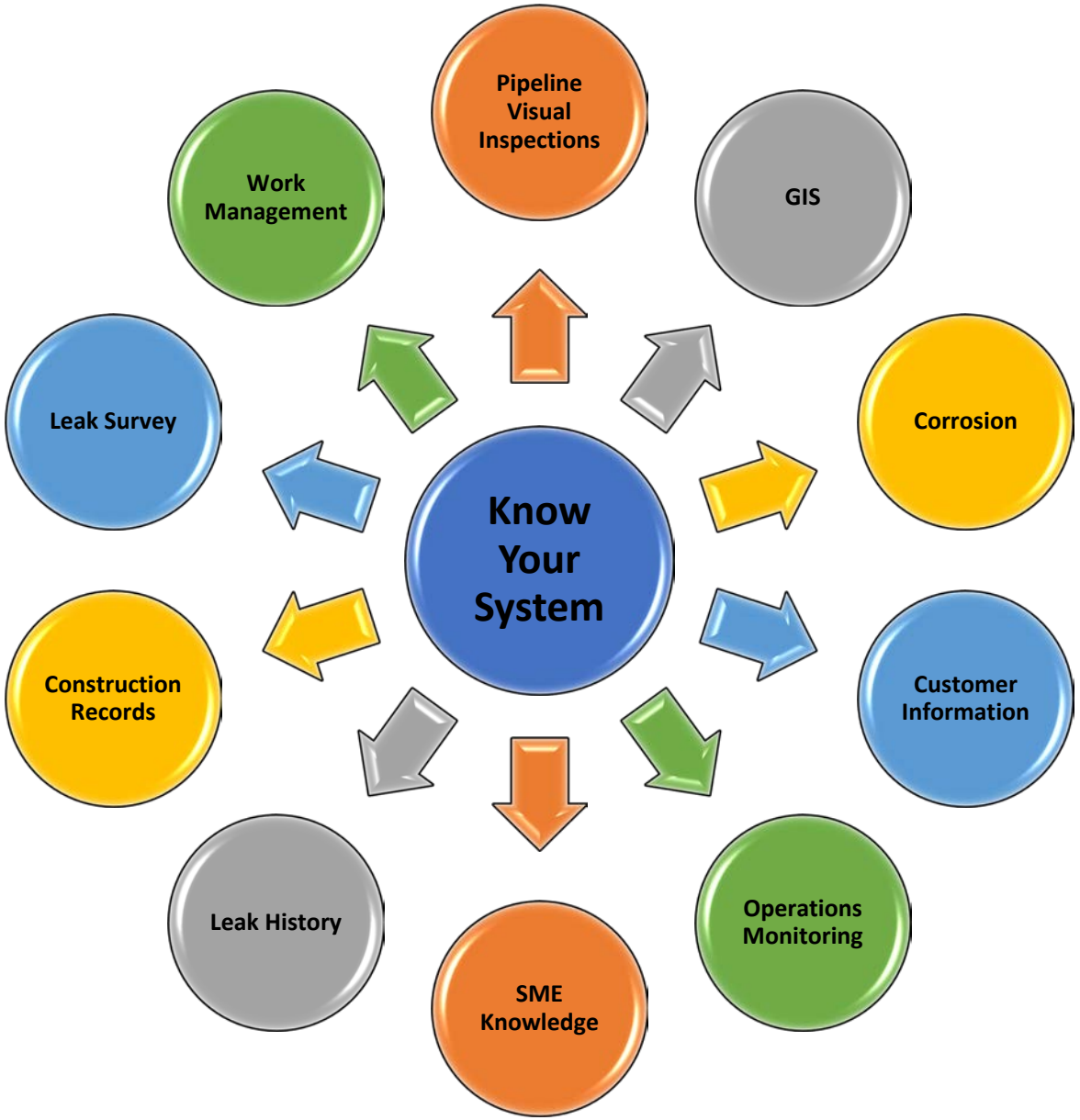
- Review results compared with plan objectives
- Collect organizational feedback



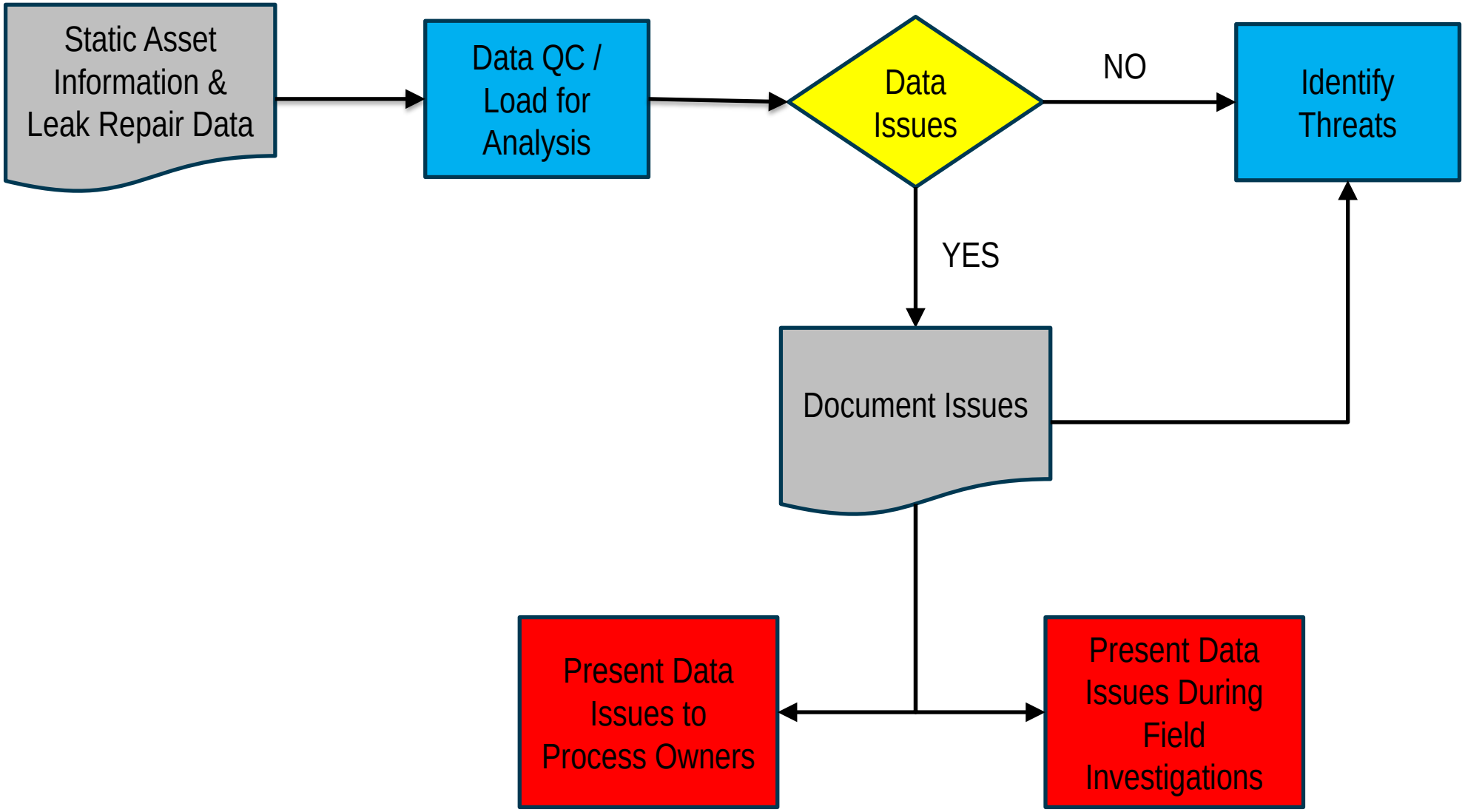
Adjust: *Periodic Evaluation & Improvement*

- Determine where to apply changes for improvements
- What, when, why and where to take corrective actions between actual and planned results

System Knowledge



System Knowledge



Plan to obtain additional information

- Utilize existing activities
- Revising all appropriate survey / inspection forms and procedures
- Training personnel to properly collect the data
- Updating recordkeeping procedures and / or data management systems
- Integrating newly collected information into existing records

Identify Threats

Threat Categories (PHMSA Form F7100.1-1)

- Excavation Damage
- Equipment Failure
- Corrosion Failure
- Pipe, Weld, or Joint Failure *(Material & Weld)*
- Natural Force Damage
- Other Outside Force Damage
- Incorrect Operation
- Other Cause

Sources:

- Leak History
- Corrosion Records
- Continuing Surveillance Records
- Patrolling Records
- Maintenance History
- *One Call* & Excavation Damage Experience
- *SME Knowledge*
- *Design & Construction Specifications*
- *Known manufacturer defects & historical material issues*
- Other reasonably available information

Identify Threats

Gas Piping Technology Committee (GPTC)

Appendix G-192-8 DIMP

Table 4.1

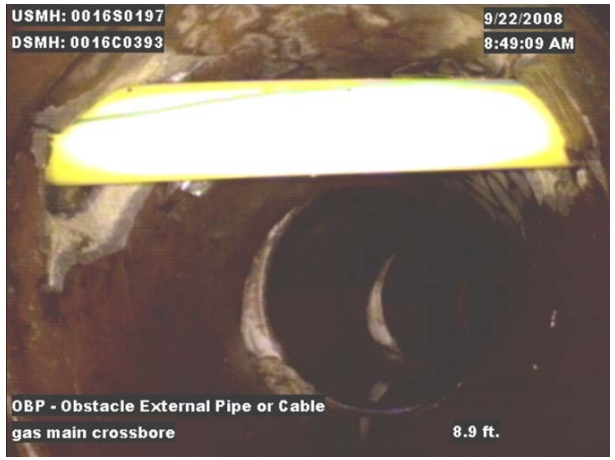
Primary Threat	Threat Subcategories	Questions to Check Subcategory Applicability to System	Extent of Threat		
			General	Local	NA
CORROSION (Continued)	Atmospheric corrosion	• Have corrosion leaks occurred? • Do visual inspections indicate external corrosion pitting? • Do visual inspections indicate coating deterioration?			
NATURAL FORCES (e.g., earth movement, lightning, heavy rains/floods, temperature extremes, high winds)	Outside force/weather: steel pipe	• Do portions of the system lie in areas of known land subsidence, landslides, earthquake fault zones, or washouts?			
	Outside force/weather: plastic pipe	• Has outside force caused plastic pipe to fail? • Do portions of the system lie in areas of known land subsidence, landslides, earthquake fault zones, or washouts?			
	Outside force/weather: cast iron pipe	• Are there leaks due to ground movement, frost heave, or earth subsidence?			
EXCAVATION DAMAGE	Operator (or its contractor)	• Are damages being caused by crews not following one-call laws? • Are damages increasing? • Have damages from mislocated lines or poorly performing locators been experienced? • Are facilities marked out, and marked out accurately? • Are damages being caused by failure to protect pipe during backfill operations?			

TABLE 4.1 - SAMPLE THREAT IDENTIFICATION METHOD

Potential Threats

Sources:

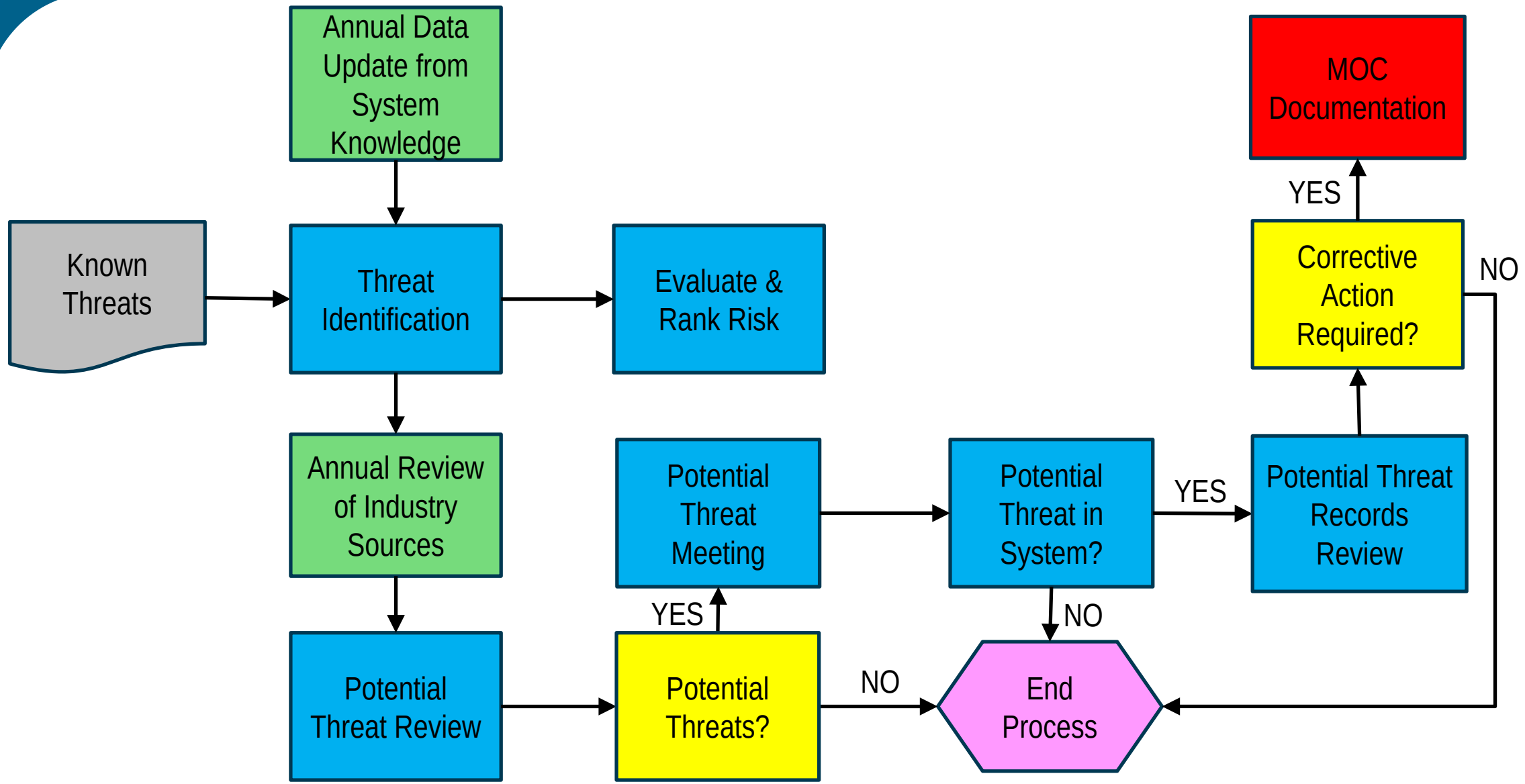
- PMSA Advisory Bulletins
- State Advisories
- Industry Experiences
- NTSB Reports
- Other Notices
- PHMSA Interpretations
- Field Notifications



Sample Potential Threats to Investigate:

- Cross Bores
- Remaining Quantities of Bare Steel/Cast Iron
- Over pressurization Possibilities of Low/Standard Pressure Distribution Systems
- Honeywell Permalock Tapping Tees
- Aldyl-A Plastic Remaining in Distribution Systems
- Static pinhole leaks in PE services
- Data inaccuracies

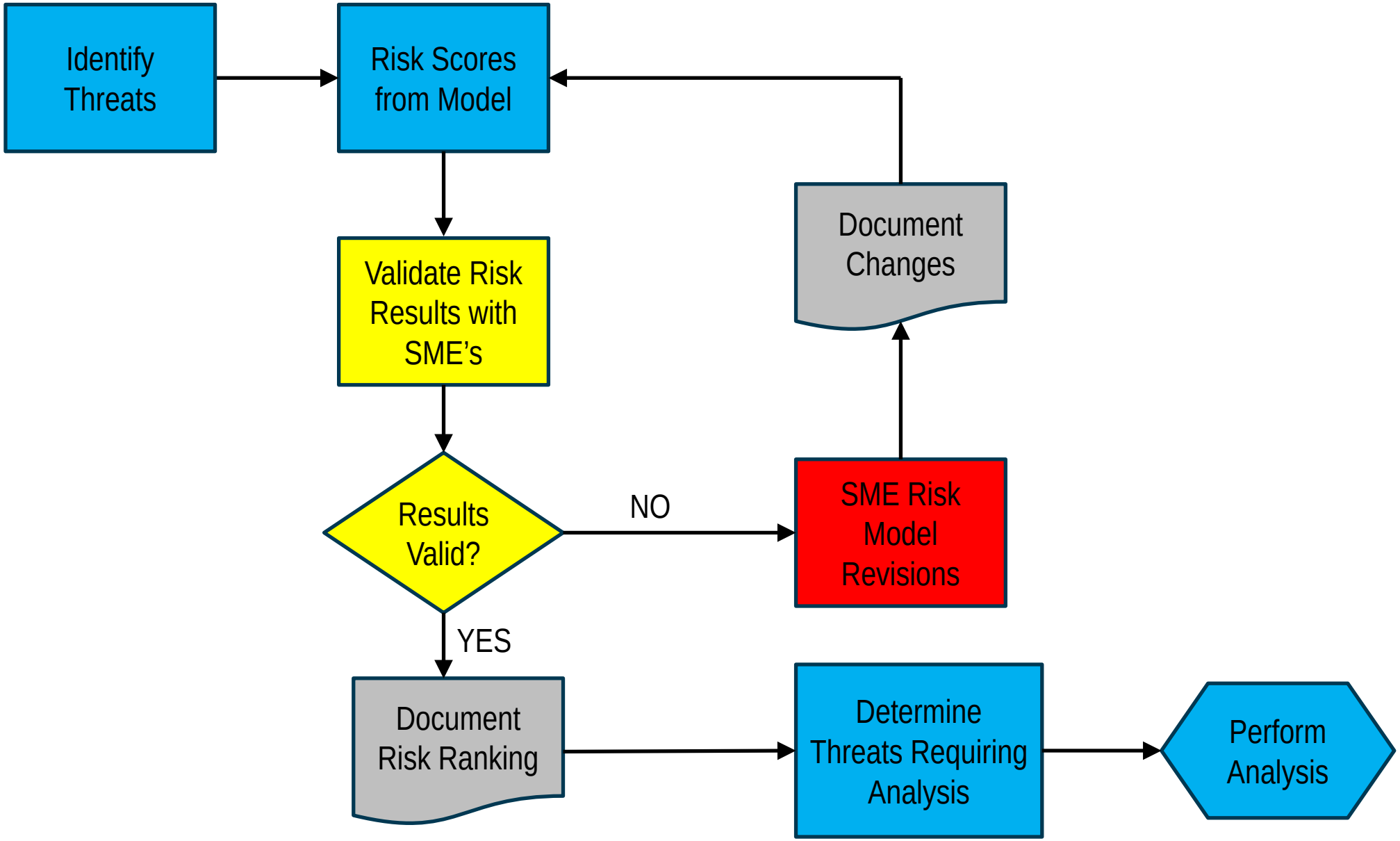
Identify Threats



Evaluate and Rank Risk

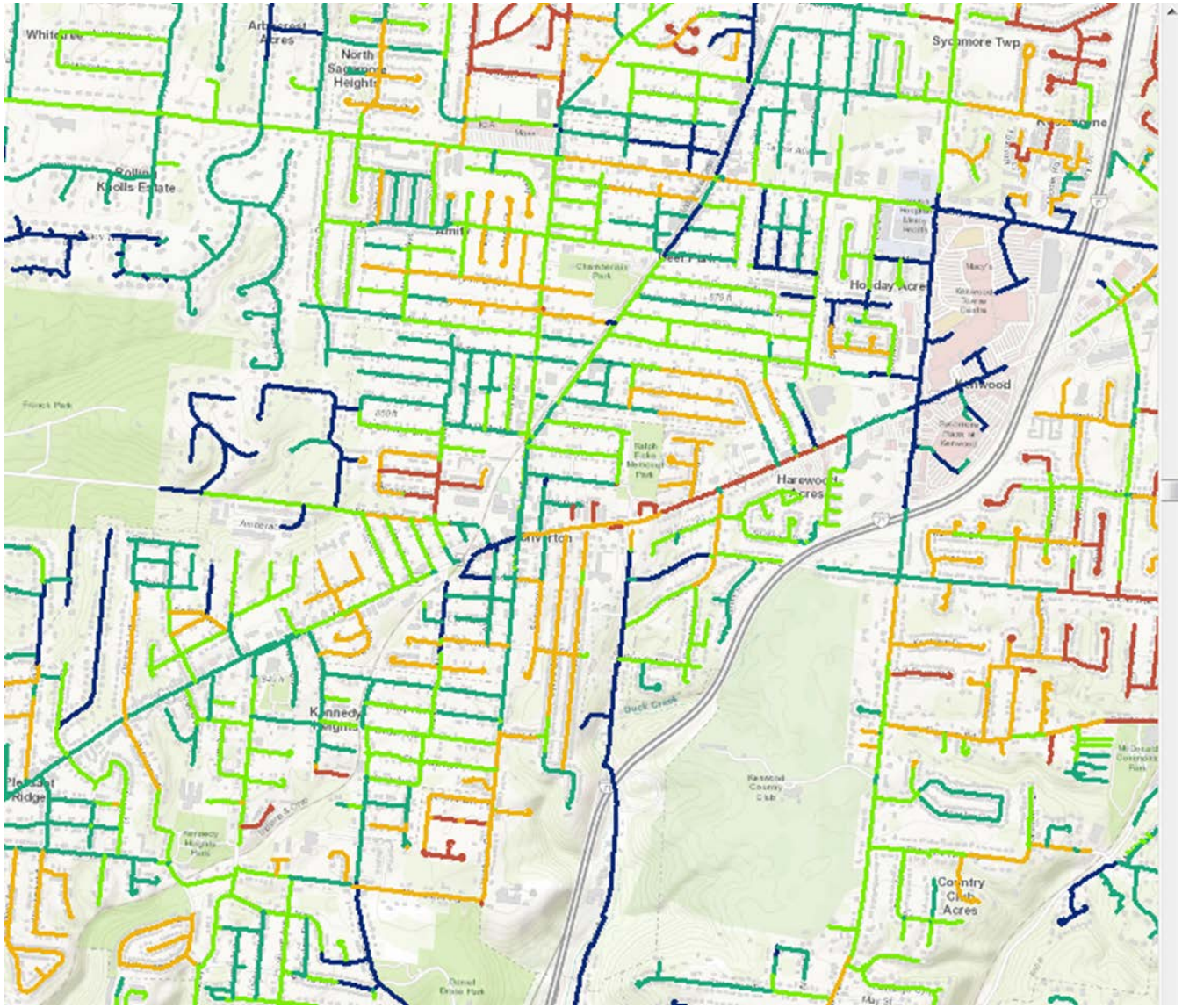
- Risk should drive replacement projects and programs
- Local impact of threats are addressed during district threat analysis
- Data driven approach
  - Relative risk can be grouped by material, grade, main, service, facilities, etc. to focus corrective actions as required
- Potential threats are not included in current risk modeling (leak based)
  - If they are found in our system, then they are no longer potential threats but rather actual threats
  - Once decided that further action is warranted, corrective actions are implemented.
  - We are developing a new segmented based risk model that will have capability to include potential threats

Evaluate & Rank Risk



Segment Based Risk Model

- Common ESRI Model for all 5 states
- Risk score for each main segment based on the number of leaks, material, pressure, population density, diameter & age
- Ranks segments with more leaks as higher threat pipes.
- Capability to add other factors such as potential threats
- Mid 2019 – scheduled completion
- 3Q 2019 – schedule meetings with SME’s to validate results



Measures to Address Risk

- Determine & implement measures designed to reduce risk from failure
- Must include effective leak management program (unless all leaks are repaired when found)
- GPTC Appendix G, 6.2 Leak Management Program

Locate the leaks in the distribution system;

Evaluate the actual or potential hazards associated with these leaks;

Act appropriately to mitigate these hazards;

Keep records; and

Self-assess to determine if additional actions are necessary to keep people and property safe.

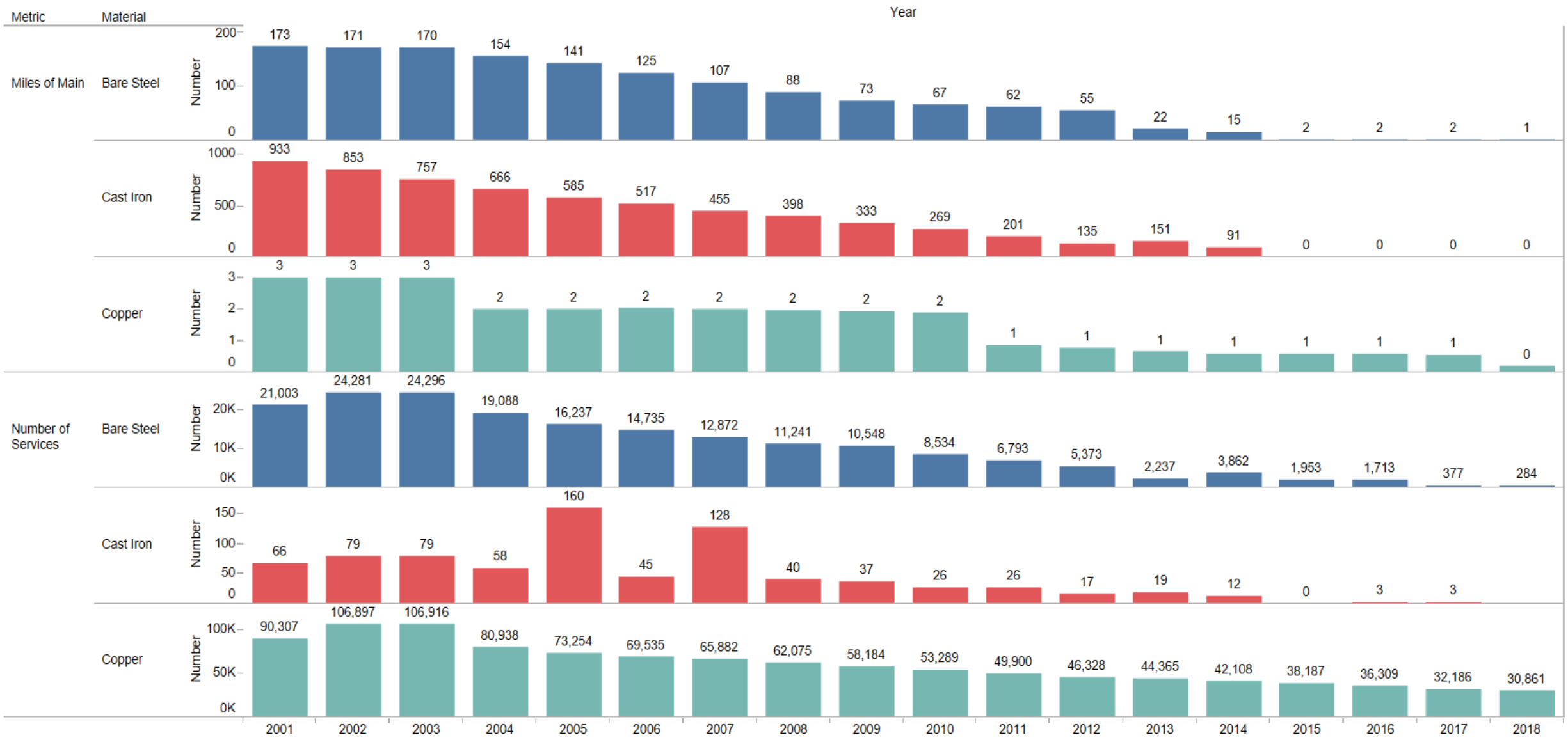
Measures to Address Risk

- GPTC Appendix G-192-8, Table 6.1 Additional or Accelerated Actions
  - Examples of possible A/A actions to manage risk posed by threats

Threats		Examples of Possible A/A Actions
Primary	**Subcategory**	
NATURAL FORCES (e.g., earth movement, lightning, heavy rains/floods, temperature extremes, high winds)	Outside force/weather:	• Relocate pipe from high risk locations. • Replace pipe in high risk locations. • Install slip or expansion joints for earth movement. • Install strain gages on pipe. • Install automatic shut-offs. • Expand the use of excess flow valves. • Conduct leak survey after significant earthquake or other event.
	Outside force/weather: Plastic pipe	• Relocate pipe from high risk locations. • Replace pipe in high risk locations. • Expand the use of excess flow valves. • Conduct leak survey after significant earthquake or other event.
	Outside force/weather: Cast iron pipe	• Replace. • Leak survey after an event. • Install additional facilities to increase flexibility (e.g., expansion bends, expansion joints).
EXCAVATION DAMAGE	Operator (or its contractor)	• Conduct enhanced awareness education. • Inspect targeted excavation and backfill activities. > Ensure separation, as needed, from existing facilities and those being installed. • Inspect for facility support. > Ensure inserted facilities are adequately supported. • Improve accuracy of line locating. > Install tracer wire. > Enhance the locating signal by connecting a small anode to the tracer wire. > Install electronic marking devices. • Expand the use of excess flow valves. • Improve system map accuracy (e.g., updates from field observation or GPS data). • Improve system map availability. • Install additional line markers.

Table 6.1 Continued

Material Analysis - Reduction in Sub-Standard Materials

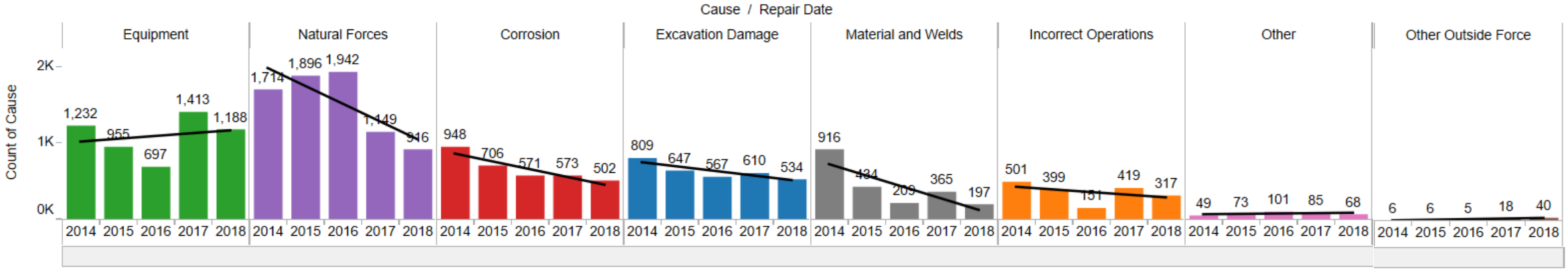


Measure Performance, Monitor Results and Evaluate Effectiveness

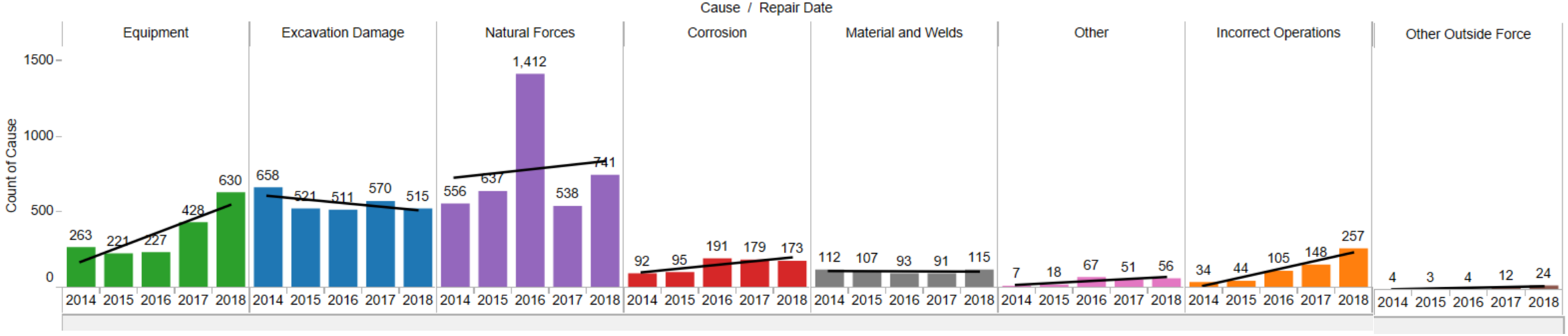
- Develop and monitor performance measures from an established baseline to evaluate the effectiveness of its IM program.
- Must consider the results of its performance monitoring in periodically re-evaluating the threats and risks. These performance measures must include the following:
    i. Number of hazardous leaks either eliminated or repaired, categorized by cause;
    ii. Number of excavation damages;
    iii. Number of excavation tickets;
    iv. Total number of leaks either eliminated or repaired, categorized by cause;
    v. Number of hazardous leaks either eliminated or repaired, categorized by material;
    vi. Any additional measures the operator determines are needed to evaluate the effectiveness of the operator's IM program in controlling each identified threat.

Required Performance Measures - Leaks

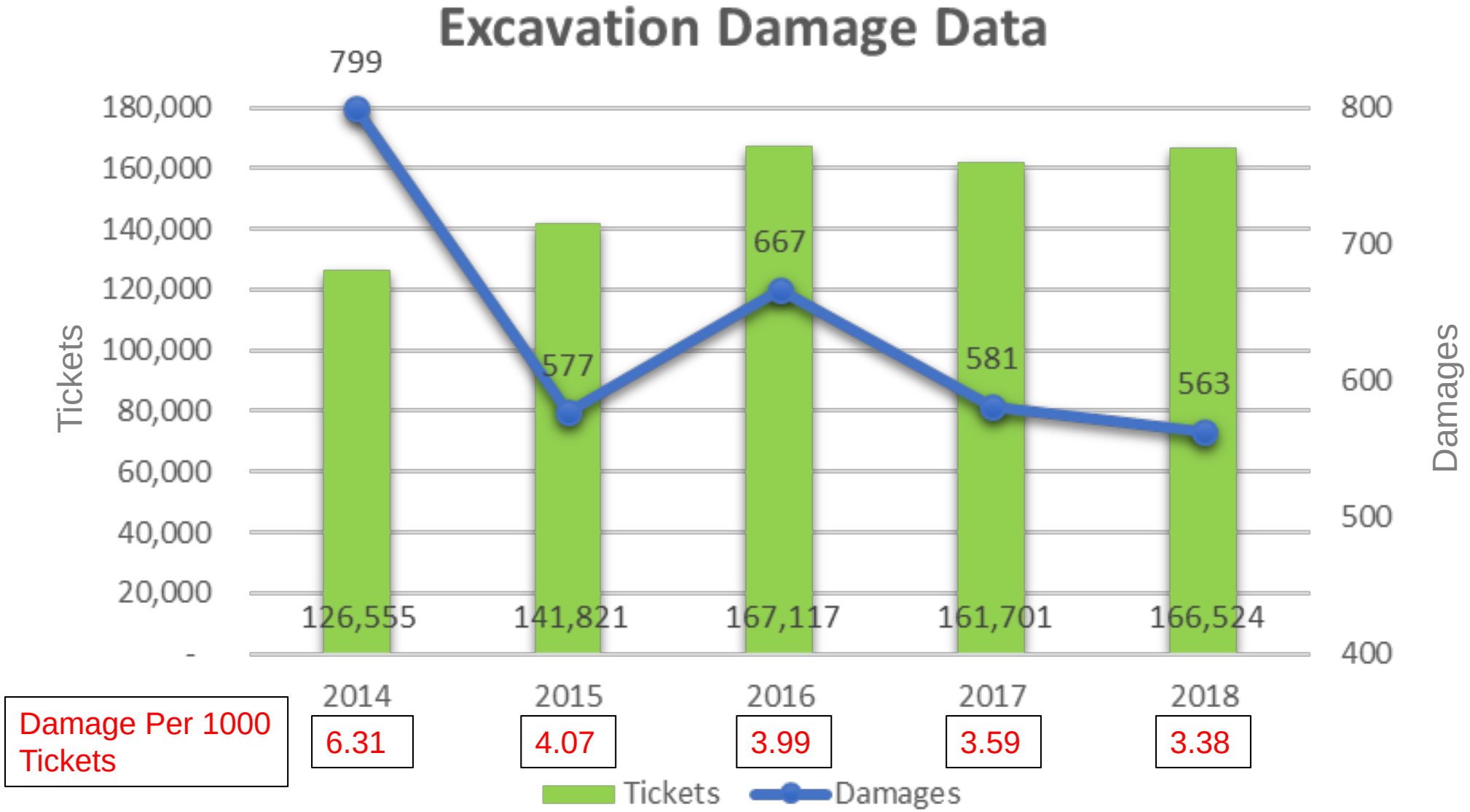
All Leaks By Cause



Hazardous Leaks By Cause



Required Performance Measures - Excavation



Damage Per 1000 Tickets	2014	2015	2016	2017	2018
	6.31	4.07	3.99	3.59	3.38

GPTC Appendix G-192-8 7.2 Examples of Performance Measures

Corrosion

- Leaks due to external or internal corrosion.
- Exposed pipe condition reports that found corrosion or coating damage.
- Repairs required due to non-leaking pitting or coating damage (above and below ground).
- Cathodic protection zones found with low protection levels.
- Areas of active corrosion found (unprotected pipe)

Natural forces

- Leaks due to weather or other natural forces.
- Repair, replacement or relocation actions due to natural forces.

Other outside force damage

- Leaks or failures caused, or repairs necessitated, by vandalism.
- Leaks or failures caused, or repairs necessitated, by vehicular damage.
- Instances of damage that is secondary to non-pipeline fire or explosion.
- Leaks or failures on previously damaged pipe.
- Leaks, failures, damage, or movement caused by blasting.
- Leaks, failures, damage, or movement caused by heavy vehicle traffic over or near pipelines.

Pipe, Weld or Joint

- Pipe failures during pressure tests.
- Joint failures during pressure tests.
- In-service pipe or joint failures (not caused by outside force or excavation damage).
- Production joints rejected by an inspector other than the joiner.
- Joiners failing re-qualification.

Equipment failure

- Regulator failures.
- Relief valve failures.
- Seal, gasket or O-ring failures.
- Regulators or relief valves found with set points outside of acceptable range
- Emergency valves found inoperable.
- SCADA failures, system upsets, or false readings.

Incorrect operations

- Service outages due to operator error.
- Odor tests finding insufficient odorant.
- Response times to leak or odor calls.
- Hazardous leaks make safe or repair times.

GPTC Appendix G 7.2 Examples of Performance Measures

Excavation damage

- Excavation damages as defined in §192.1001 (first / second / third party).
- Normalized damages (damage ratio) defined as damages per 1,000 tickets. A ticket is defined as the receipt of information by the underground facility operator from the notification center regarding onsite meetings, project design, or a planned excavation.
- Ratio of no-show tickets to total tickets received by the operator. A no-show ticket is one that was not responded to by the locators within the allowed time.
- Failure by notification center to accurately transmit tickets to the operator.
- Damages by cause, facility type (mains, services), and responsible party. Cause categories may include the following.
    i. Excavator's failure to call.
    ii. Excavator's failure to provide accurate ticket information (e.g., wrong address).
    iii. Operator's failure to mark.
    iv. Operator's failure to mark accurately.
    v. Excavator's failure to wait required time for marking.
    vi. Excavator's failure to protect marks.
    vii. Excavator's failure to utilize precaution when excavating within the tolerance zone.
    viii. Excavator's failure to properly support and protect facility.

Excavation damage (cont'd)

- Leaks or failures on previously damaged pipe.
- Repairs implemented as a result of first / second / third-party damage prior to leak or failure.
- Excavation notices versus number of locates (not all notices will require an actual locate).
- Locates timely or untimely made.
- Negative callbacks timely or untimely made if state law, the one-call center, or another entity requires such calls.
- Mis-locates later identified.

Guidance for Strengthening Pipeline Safety Through Rigorous Program Evaluation and Meaningful Metrics

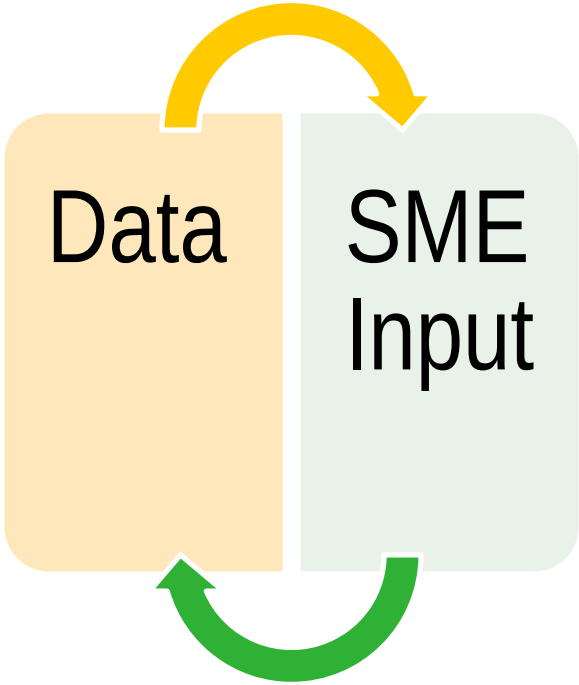
- Major topic areas addressed in the guidance document include:
  - Establishing Safety Performance Goals.
  - Identifying Required Metrics.
  - Selecting Additional Meaningful Metrics.
  - Metric Monitoring and Data Collection.
  - Program Evaluation Using Metrics.
- Tables for regulation-required metrics & other programmatic and threat-specific metrics
  - Table 1 - IM-related metrics documented in pipeline operators' annual reports.
  - Table 2 - lists the threat-specific metrics required by § 192
  - Table 3 - guidance to identify meaningful metrics to help understand and measure the effectiveness of the individual program elements and processes used in an IM program
  - Table 4 - guidance to identify meaningful threat-specific metrics that may be required to effectively measure the performance of IM programs.

Investigation & Program Evaluation

- Annual Meetings
  - Meet with Executive Management twice a year
    - Spring – Annual Report and Performance Measures
    - Fall – Program Updates
  - DIMP Roadshows
    - Meet with all Districts/Resource Centers at least once per year
    - Additional meetings held depending on specific identified threats
  - DIMP Computer Based Training (CBT)
    - To be completed by all field personnel
    - Explains how their daily work is used in DIMP

Field Investigations

- Field investigations are the connection between understanding threat performance, potential threats, and organizational feedback on programs and the determination of corrective actions. During the field investigations one or more of the following may be presented:
  - Data Collection Issues
  - Equipment issues
  - Procedural Issues
  - Main Replacements
  - Threat Review
  - State Level Threats of Concern
  - District Specific Threats of Concern



- Identification & Validation is a bi-directional process

Periodic Evaluation & Improvement

- Re-evaluate threats and risks on its entire pipeline
- Consider the relevance of threats in one location to other areas.
- Determine the appropriate period for conducting complete program evaluations
- Complete program re-evaluation at least every five years.
- Consider the results of the performance monitoring in these evaluations.

Periodic Evaluation & Improvement

- Review the DIMP plan – are we doing what we say we are going to do & have we made any changes on how we execute the program
- Review the success of the programs and activities
- Determination if additional information is needed
- Trending of data the reportable performance measures
- Program effectiveness (results) have been identified as the performance of the following areas:
  - Leak Management
  - Risk Management
  - Threat Management
  - Excavation Damage Management
  - Incorrect Operations Management
  - Asset Management

Report Results

Annual Report - Gas Distribution System, PHMSA Form 7200.1-1 submit by March 15

- Material, diameter and year installed for miles of main and number of services
- The four performance measures specified in 49 CFR §192.1007(e) must be reported:
  1) Total number of leaks either eliminated or repaired, categorized by threat.
  2) Number of hazardous leaks either eliminated or repaired, categorized by threat.
  3) Number of excavation damages.
  4) Number of excavation tickets

PART B - SYSTEM DESCRIPTION	Report miles of main and number of services in system at end of year.										
1. GENERAL											
	STEEL				PLASTIC	CAST/ WROUGHT IRON	DUCTILE IRON	COPPER	OTHER	Reconditioned Cast Iron	SYSTEM TOTAL
	UNPROTECTED		CATHODICALLY PROTECTED								
	BARE	COATED	BARE	COATED							
MILES OF MAIN					Calc	Calc	Calc	Calc	Calc	Calc	Calc
NO. OF SERVICES					Calc	Calc	Calc	Calc	Calc	Calc	Calc

2. MILES OF MAINS IN SYSTEM AT END OF YEAR							
MATERIAL	UNKNOWN	2" OR LESS	OVER 2" THRU 4"	OVER 4" THRU 8"	OVER 8" THRU 12"	OVER 12"	SYSTEM TOTALS
STEEL							Calc
DUCTILE IRON							Calc
COPPER							Calc
CAST/WROUGHT IRON							Calc
PLASTIC 1. PVC							Calc
2. PE							Calc
3. ABS							Calc
4. OTHER PLASTIC							Calc
OTHER							Calc
Reconditioned Cast Iron							Calc
SYSTEM TOTALS	Calc	Calc	Calc	Calc	Calc	Calc	Calc

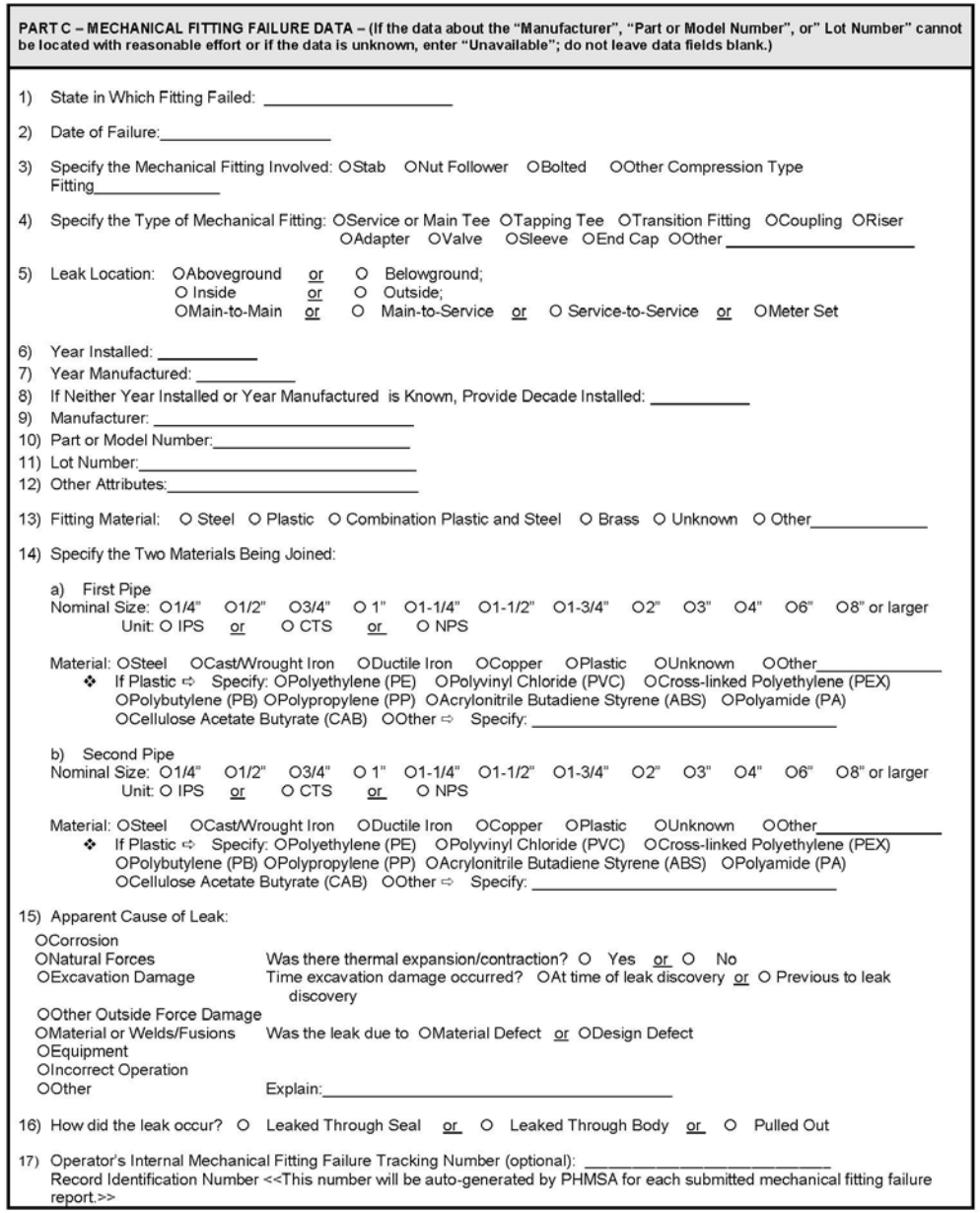
Describe Other Material: _____

3. NUMBER OF SERVICES IN SYSTEM AT END OF YEAR					AVERAGE SERVICE LENGTH _____ FEET		
MATERIAL	UNKNOWN	1" OR LESS	OVER 1" THRU 2"	OVER 2" THRU 4"	OVER 4" THRU 8"	OVER 8"	TOTAL
STEEL							Calc
DUCTILE IRON							Calc
COPPER							Calc
CAST/WROUGHT IRON							Calc
PLASTIC 1. PVC							Calc
2. PE							Calc
3. ABS							Calc
4. OTHER PLASTIC							Calc
OTHER							Calc
Reconditioned Cast Iron							Calc
SYSTEM TOTALS	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Describe Other Material: _____

Mechanical Fitting Failure Report, PHMSA Form F 7100.1-2 submit by March 15

- Location of the failure in the system
- Nominal pipe size
- Material type
- Nature of failure including any contribution of local pipeline environment
- Coupling manufacturer
- Lot number and date of manufacture
- Other information that can be found in markings on the failed coupling



PART C – MECHANICAL FITTING FAILURE DATA – (If the data about the "Manufacturer", "Part or Model Number", or" Lot Number" cannot be located with reasonable effort or if the data is unknown, enter "Unavailable"; do not leave data fields blank.)

1) State in Which Fitting Failed: _____

2) Date of Failure:_____

3) Specify the Mechanical Fitting Involved: OStab ONut Follower OBolted OOther Compression Type Fitting_____

4) Specify the Type of Mechanical Fitting: OService or Main Tee OTapping Tee OTransition Fitting OCoupling ORiser OAdapter OValve OSleeve OEnd Cap OOther _____

5) Leak Location: OAboveground or O Belowground;
O Inside or O Outside;
OMain-to-Main or O Main-to-Service or O Service-to-Service or OMeter Set

6) Year Installed: _____
7) Year Manufactured: _____
8) If Neither Year Installed or Year Manufactured is Known, Provide Decade Installed: _____
9) Manufacturer: _____
10) Part or Model Number:_____
11) Lot Number:_____
12) Other Attributes:_____

13) Fitting Material: O Steel O Plastic O Combination Plastic and Steel O Brass O Unknown O Other_____

14) Specify the Two Materials Being Joined:

a) First Pipe
Nominal Size: O1/4" O1/2" O3/4" O 1" O1-1/4" O1-1/2" O1-3/4" O2" O3" O4" O6" O8" or larger
Unit: O IPS or O CTS or O NPS

Material: OSteel OCast/Wrought Iron ODuctile Iron OCopper OPlastic OUnknown OOther_____
❖ If Plastic ⇨ Specify: OPolyethylene (PE) OPolyvinyl Chloride (PVC) OCross-linked Polyethylene (PEX)
OPolybutylene (PB) OPolypropylene (PP) OAcrylonitrile Butadiene Styrene (ABS) OPolyamide (PA)
OCellulose Acetate Butyrate (CAB) OOther ⇨ Specify: _____

b) Second Pipe
Nominal Size: O1/4" O1/2" O3/4" O 1" O1-1/4" O1-1/2" O1-3/4" O2" O3" O4" O6" O8" or larger
Unit: O IPS or O CTS or O NPS

Material: OSteel OCast/Wrought Iron ODuctile Iron OCopper OPlastic OUnknown OOther_____
❖ If Plastic ⇨ Specify: OPolyethylene (PE) OPolyvinyl Chloride (PVC) OCross-linked Polyethylene (PEX)
OPolybutylene (PB) OPolypropylene (PP) OAcrylonitrile Butadiene Styrene (ABS) OPolyamide (PA)
OCellulose Acetate Butyrate (CAB) OOther ⇨ Specify: _____

15) Apparent Cause of Leak:
OCorrosion
ONatural Forces — Was there thermal expansion/contraction? O Yes or O No
OExcavation Damage — Time excavation damage occurred? OAt time of leak discovery or O Previous to leak discovery
OOther Outside Force Damage
OMaterial or Welds/Fusions — Was the leak due to OMaterial Defect or ODesign Defect
OEquipment
OIncorrect Operation
OOther — Explain:_____

16) How did the leak occur? O Leaked Through Seal or O Leaked Through Body or O Pulled Out

17) Operator's Internal Mechanical Fitting Failure Tracking Number (optional): _____
Record Identification Number <<This number will be auto-generated by PHMSA for each submitted mechanical fitting failure report.>>

Next meeting:

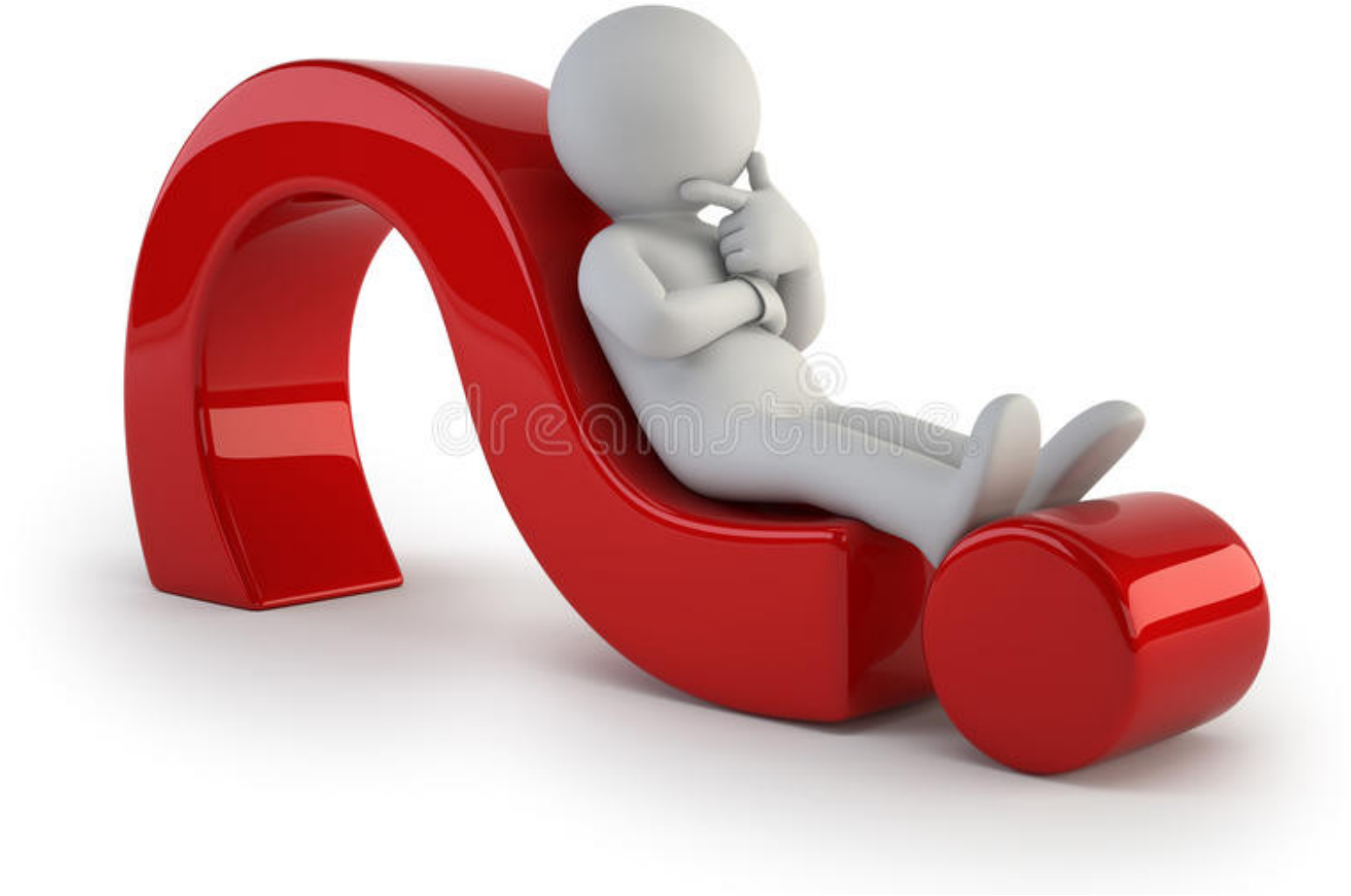
- Tuesday May 7 from 10 AM – Noon
- IGS Energy, 6100 Emerald Parkway, Dublin, OH 43016 (Free Market Conference Room)

Questions:

jim.collins@duke-energy.com

(513) 287-1426

Q & A

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