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"Clear Knowledge in the Over Information Age"

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To: Ms. Mimi Gleason
Township Manager
West Whiteland Township
Exton, PA 19341

Re: Accufacts Observations on Possible Pennsylvania State Pipeline Safety Regulations

1. Introduction

Accufacts Inc. ("Accufacts") was asked to assist West Whiteland Township in addressing questions mainly developed from Township Supervisors public meetings concerning liquid and gas transmission pipelines. As president of Accufacts, I have over forty-five years of experience concerning energy matters, including but not limited to: pipeline siting, design, operation, maintenance, regulatory development, incident command, failure investigation, risk assessment, and litigation, often related to operations in highly sensitive areas. As much of my experience relates to pipeline safety critical issues and investigations, my observations and opinions will reflect information readily available and in the public domain. In addressing the work scope for this effort, Accufacts is not rendering a legal opinion but is providing an outlook based on specialized experience concerning pipeline matters and incidents spanning several decades. Accufacts was asked to focus on liquid and gas transmission pipelines related to possible state regulatory efforts in addressing the eleven questions asked by the Supervisors.

Accufacts' Key Recommendations for Pennsylvania pipeline safety regulation:

The following key recommendations are explained in further detail in this report.

1. With regard to pipeline safety, identify transmission pipelines as to intrastate or interstate, the reasons for such determinations, and make this declaration public.
2. Make available to first responders and local public officials maps of all transmission pipelines within the state. The maps should designate the material moved in the pipeline, pipeline diameter, mainline valve locations, and

MOP/MAOP (Maximum Operating Pressure/Maximum Allowable Operating Pressure) in sufficient detail to assist first responders.[1]

3. Establish a new pipeline siting committee/process that would assure public involvement for such new sensitive infrastructure proposals.
4. For intrastate pipelines, improve and make public assessment methods utilized to assure pipeline integrity for each pipeline in HCAs, and make public general locations of HCAs within the state.
5. Avoid the application of risk assessment (as it relates to probability and consequence) in pipeline safety or pipeline siting.
6. Evaluate whether the one-call law in the state is effective in preventing pipeline damage, especially damage that can fail at a later date.

2. Leveraging background to provide important perspective in answering the Board of Supervisors' questions:

I have observed considerable misunderstanding in discussions related to pipelines in Pennsylvania that may make it difficult to assure an informed decision occurs concerning pipeline matters. Touching on several key issues:

2A) Pipeline ROWs and pipeline safety disconnect

I believe nothing causes greater confusion than the inability to appreciate the disconnect between pipeline siting and pipeline safety regulations. This is especially true for existing pipelines. For example, there are no federal pipeline safety regulations requiring setbacks from pipelines for many reasons. The process of pipeline siting can be confusing and complicated, varying significantly by state, leaving much of the public ill-informed and angry when the laws/regulations are finally understood, often too late in a pipeline siting proposal or change in service. This is especially problematic as there are great differences between existing pipelines, usually governed via right-of-way ("ROW") easement contracts that can be many decades old, and new pipelines. Proposed new pipelines can allow some pipeline operators to become more creative, especially in the application or abuse of eminent domain. The recent flurry of change in service/flow of existing pipelines across the U.S. is further complicating the issues as such changes are usually not required to undergo a formal public review, and existing pipeline ROW agreements may allow for such changes without notification.[2]

[1] The terms MOP and MAOP are defined in minimum federal pipeline safety regulations for liquid and gas pipelines, respectively, and place special pressure obligations on the pipeline operator.

[2] Some FERC jurisdictional existing pipelines may require FERC approval which may trigger a "public review," such as removal from interstate gas service.

PHMSA, the specific agency given federal powers to develop, implement, and enforce minimum pipeline safety regulations, **is specifically prevented** from addressing pipeline siting issues.[3] I concur with the observation in a recent report in Michigan concerning sensitive pipeline matters in that state: "PHMSA does **not:** authorize or permit pipelines, approve pipeline siting or routing, monitor or track commodity shipments, establish spill cleanup criteria, or oversee cleanup operations."[4] Some states and local jurisdictions have powers to affect siting or routing of new pipelines, but I believe they have no power to force the rerouting of existing pipelines, even those undergoing change in service that might go against existing pipeline ROW easement contracts. The ability of state/local powers over new pipeline route selection (gas/liquid intrastate pipelines, and some new interstate liquid pipelines) are codified in state laws if they exist. It is not surprising that the general public is confused on this issue. For an excellent paper to help to clarify some of the pipeline siting and safety confusion, I highly recommend taking the time to read the five-page Pipeline Safety Trust's Briefing Paper #14 and its important referenced Appendix A.[5, 6]

Historically there are over 500,000 miles of transmission pipeline in the U.S. Of this figure, approximately 80 percent is located in less populated areas (i.e., non-HCAs). However, as the population has increased in the country, in combination with increases in oil and gas production and associated need for this energy to reach markets, new and existing transmission pipelines are facing challenges from encroachment in many areas of the country. The siting regulatory processes, from a pipeline safety perspective, have not kept up with associated needs for pipeline safety clarity for this critical infrastructure. Appendix A of the previously cited PST paper provides a summary by state of key pipeline regulatory information, including siting authority/processes if applicable in a particular state, updated as of September 2014.

For existing pipelines, the controlling documents usually relate to the specific pipeline easement contracts crossing the property that give the pipeline operator certain rights depending on the state, or possibly restrict property owner's ability to utilize their property. It is my experience concerning existing pipelines, that the specific wording in easement contracts, and **contract law within a state**, play an important role as to the property rights of

[3] USC §60104(e) Location and routing of Facilities.
[4] Michigan Department of Attorney General and Department of Environmental Quality, "*Michigan Petroleum Pipeline Task Force Report*," July 2015, p. 19, https://www.michigan.gov/documents/deq/M_Petroleum_Pipeline_Report_2015-10_reducedsize_494297_7.pdf.
[5] Pipeline Safety Trust, "Pipeline Briefing Paper #14, *Jurisdictional Issues Related to Pipelines*," last updated: September 2015, http://pstrust.org/wp-content/uploads/2015/09/2015-PST-Briefing-Paper-14-Jurisdictional-Issues.pdf.
[6] Pipeline Safety Trust, "Local Government Guide to Pipelines," First Edition 2014, Appendix A State by State Regulatory Information, http://pstrust.org/wp-content/uploads/2013/10/PST-Govt-Guide-Pipelines-2014-web.pdf.

landowners. This isn't always the case, however, as even the most clearly written contracts can be manipulated by attorneys, and courts in some states that may not be focused on assuring the protection of existing property rights.[7] Given my experience in many pipeline easement cases, it is not likely that a change in pipeline service or flow reversal would trigger a siting review, especially if existing pipeline ROW easements are worded so as to not restrict nor prevent such changes.

For any property owner faced with possible pipeline easement issues, either related to existing or new pipelines, I highly recommend that advice be sought from attorneys who are experienced in a specific state's property and contract law concerning such matters, especially as it may relate to "eminent domain." Resolution of such issues is usually driven by a specific state's approach as to whether protection of real property is of importance, and there is a wide spectrum of conclusions on this topic across the country. One comment about existing pipeline ROWs is worth mentioning. The presence of an existing pipeline ROW can serve as a key temptation by pipeline operators to place new additional pipeline(s) within or near such existing pipeline ROWs to save effort and money by a pipeline company.

2B) Intrastate vs interstate designation/jurisdiction

For pipelines, my experience would indicate there are no simple rules for interstate vs intrastate determination/designation, leaving pipeline operators with an opportunity to be highly creative, at the public's expense. Congress has enacted statutes or laws in the United States Code ("USC") to assure certain "minimum" safety protections to the public from hazardous transmission pipelines, both gas and liquid, either intrastate or interstate.[8] These safety laws are then promulgated by the federal agency responsible for pipeline safety, the Pipeline and Hazardous Materials Safety Administration, or PHMSA, into regulations establishing minimum pipeline safety standards intended to be practically implemented by PHMSA.[9] As previously mentioned, PHMSA is specifically excluded from pipeline siting jurisdiction. A good general information source with many appropriate references to pipeline safety regulatory responsibility and challenges similar to that facing Pennsylvania, including HVL transmission pipelines, can be found in a section of a recent state of Michigan pipeline safety report.[10] Michigan is a state developing or wrestling with new state pipeline safety

[7] I have seen recent efforts in some states for pipeline operators to try and reinterpret pre-existing, by many decades, pipeline easement contracts by asserting false claims of pipeline safety or national security to attempt to sterilize existing pipeline ROW easements. Such efforts have met with mixed success depending on the state.

[8] USC: Title 49. Transportation Subtitle VIII-Pipelines (§§ 60101 – 60503).

[9] Code of Federal Regulations, Title 49 Transportation Parts 190 – 199.

[10] "*Michigan Pipeline Safety Advisory Board Final Report,*" Submitted December 20, 2018, Appendix 2 "*MAE whitepaper on Hazardous Liquid Pipeline Safety*" at

regulations for liquid pipelines, but has a long history of an organization with a gas pipeline safety office, a similar arrangement that has historically occurred in Pennsylvania.

Under the USC, PHMSA may grant states who meet certain requirements the ability to advance additional safety regulations for intrastate pipelines if a state agency annually meets certain conditions (aka "60105(a) certification").[11] In 2018, there were fifty-one state agencies that have 60105(a) certification authority for intrastate gas pipelines. All but two states have 60105(a) certification for natural gas systems. Fifteen states have 60105(a) certification for their intrastate hazardous liquid transmission pipelines.[12] Under the 60105(a) certification process (for gas or liquid pipeline safety), states on their intrastate pipelines can impose pipeline safety standards in excess of minimum federal pipeline safety regulations, as long as such intrastate regulations are not in conflict with PHMSA regulations. States with 60105(a) certifications also have pipeline safety enforcement powers, but only on their intrastate pipelines, so, from a pipeline safety/enforcement perspective, the intrastate or interstate designation is important. Though rare, the intrastate/interstate designation can change with time, but such changes should clearly be made public given the importance of understanding which pipeline safety regulations will apply.

States can have special Interstate Agent agreements with PHMSA that allow state pipeline safety organizations to participate in the oversight, or essentially act as an agent for PHMSA, in activities such as inspections of interstate pipelines within their state.[13] The granting by PHMSA of Interstate Agent status is not made lightly and recent attempts by states asking to be given such Interstate Agent authority have met with failure.[14] To date, fifteen states for gas and five states for liquids, have Interstate Agent agreements with the Secretary of Transportation. **It is worth clearly stating, however, that by federal law, PHMSA has the sole legal authority to promulgate safety regulations for interstate pipelines and sole jurisdiction for interstate pipeline safety enforcement, even for those states granted Interstate Agent agreements.** States cannot enforce pipeline safety regulations on pipelines designated interstate so the distinction of interstate versus intrastate concerning pipeline safety is again important.

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https://mipetroleumpipelines.com/sites/mipetroleumpipelines.com/files/document/pdf/PSAB-finalreport_12-20-2018.pdf, pp. 2 through 5.

[11] 49 USC §60105. State pipeline safety program certifications.

[12] Some states have more than one agency having pipeline safety jurisdiction, while Hawaii and Alaska have no agencies responsible for pipeline safety, either gas or liquid.

[13] 49 USC §60106(b) State pipeline safety agreements.

[14] U.S. Government Accountability Office Report to Congressional Committees, "Interstate Pipeline Inspections Additional Planning Could Help DOT Determine Appropriate Level of State Participation _ GAO-18-461," May 2018, p. 18, Appendix I, "*States That Have Applied and Have Not Been Accepted for Interstate Agent Status*,"

The above discussion of inspection/enforcement authority for transmission pipeline safety can be summarized in Table 1. Pennsylvania historically has gas pipeline safety jurisdiction under an annual 60105(a) certification, but only recently (January 1, 2018), applied for and received certification for liquid transmission pipelines that would cover intrastate liquid transmission pipelines.

Table 1: Intrastate vs Interstate Inspection/Enforcement Responsibility:

	Inspection (Intrastate)	Enforcement (Intrastate)	Inspection (Interstate)	Enforcement (Interstate)
No State Safety Program	PHMSA	PHMSA	PHMSA	PHMSA
Intrastate Agreement	State	PHMSA	PHMSA	PHMSA
Certification	State	State	PHMSA	PHMSA
Interstate Agreement	State	State	State/PHMSA	PHMSA

Transmission mileage reported to PHMSA for the entire U.S. for the most recent reporting cycle, year-end of 2017, consisted of 297,519 miles of gas transmission and 215,733 miles of liquid transmission pipelines. Of these totals, 105,453 and 67,725 miles respectively, were classified as gas and liquid intrastate pipelines.

At the end of 2017, reports to PHMSA indicated the following breakdown for transmission pipelines within Pennsylvania:

Table 2: Pennsylvania transmission pipeline mileage reported to PHMSA (end of 2017)

	Intrastate miles	Interstate Miles
For hazardous liquid transmission pipelines	164	2948
For natural gas transmission pipelines	1224	8946

Pennsylvania is not unique in its relatively low proportion of intrastate pipelines.

I believe PHMSA does a decent job of trying to explain how liquid transmission intrastate/interstate jurisdiction is generally determined, though my experience over the years is that there is no hard and fast rule for this important designation that covers all cases, and

the courts from time to time have had to get involved in this matter.[15] **Given the limitations placed on states concerning interstate pipeline safety, it is important that transmission pipelines be clearly identified as to intrastate or interstate, the reasons for such determinations, and that such information be made public.**

2C) Risk assessment misuse

From where I stand, probably no other issue has caused more misinformation, concern, and understandable public anxiety than the misuse of the term "risk assessment" regarding transmission pipelines. U.S. federal pipeline safety regulation does not define this term in reference to probability/consequence approaches for failure estimation or prediction. It is my experience that the misuse of risk assessment "probabilities" for pipelines is too often by parties driving other agendas, especially given the technical incompleteness of many of the approaches I have observed, both in countries that permit this approach and in Pennsylvania. Risk assessment in U.S. pipeline safety regulation relates to prioritization of pipeline threats in the application of integrity management ("IM") in an attempt to avoid pipeline failure, especially rupture. Some countries specifically identify probability/consequence risk management approaches in their pipeline safety regulations, but the U.S. is not one of them for many reasons. For example, the U.S. has a long history of oil and gas development and more pipeline transmission mileage than any of the next 10 countries combined containing significant pipeline mileage.[16] To retrofit the existing over 500,000 miles of U.S. hazardous transmission pipelines in this country utilizing probability/consequence approaches can be an insurmountable political challenge, even if attempts are made to deal solely with new pipeline siting.

After the incorporation of the term risk assessment in IM regulations in the early 2000's, PHMSA and the NTSB found serious problems in risk modeling approaches utilized by pipeline operators in their IM approaches. PHMSA issued a draft report on various risk modeling techniques and asked for public comment as they relate to "the effectiveness of each type of modeling technique in supporting risk assessments."[17] Accufacts commented on the draft report, and these comments are a matter of public record.[18] Clearly, the application

[15] PHMSA 49CFR§195, "Appendix A to Part 195 - Delineation Between Federal and State Jurisdiction – Statement of Agency Policy and Interpretation," Amdt. Apr. 23, 1985.
[16] Richard B. Kuprewicz, "*General Observations on the Myth of a Best International Pipeline Standard*," March 31, 2007, p. 2, Figure 1 - Countries with the Greatest Pipeline Mileage, http://pstrust.org/docs/best_standard_report.pdf.
[17] Department of Transportation, PHMSA Notice, "Pipeline Safety: Gas and Hazardous Liquid Pipeline Risk Models," at https://www.regulations.gov/, Docket No. PHMSA-2018-0050, August 16, 2018.
[18] Accufacts Inc., "Accufacts Comments on Risk Modeling Technical Report Draft 1, dated May 9, 2018," at http:/www.regulations.gov, Docket No. PHMSA-2018-0050, October 16, 2018.

of risk assessment was never meant to assign risk values for frequency/consequence estimates or pipeline failure prediction.

My experience would indicate that part of the problem in assigning probability/consequence approaches in an attempt to predict pipeline future operation is that the low probability/high consequence events associated with pipeline failure aren't captured well enough in various databases to allow their use as a tool for such forecasting. For example, while PHMSA has made great strides in making certain pipeline incident databases public and available, great care should be undertaken to recognize the limitations of these self-reported and often un-auditable records that can be inaccurate. Care should be taken to recognize the limits of the database's accuracy as well as the many assumptions that must be made in using such tools for predictions. I have observed that it is all too easy to drive risk assessment to whatever outcome one wants to hear. I have also observed in investigating too many pipeline failures that the past is a poor predictor of pipeline safety management, where pipeline operators can easily lose control of their operation, driving their system to failure.

I am particularly struck by a risk assessment reference I observed many decades ago from a renowned expert on large organizations and their impact on society as technology gets more complex. When speaking about the use of risk assessment, he indicated "Ultimately, the issue is not risk, but power, the power to impose risks on the many for the benefit of the few."[19] From my perspective there are many reasons why risk assessment has not been codified in minimum pipeline safety regulations in the U.S. and the challenges in trying to impose acceptable quantifiable pipeline risk standards, (i.e., frequency/consequence) efforts in pipeline safety regulation, I believe are significant. **Given the wide range of possible outcomes and the technical incompleteness I have observed to date in the state concerning pipeline risk assessments, I recommend avoiding the application of risk assessment (as it relates to probability and consequence) in pipeline safety or pipeline siting.** Rather than focus on risk assessment, the issue may be related to understanding the consequences, especially pipeline rupture, along a particular pipeline route. Such rupture potential impacts along a pipeline can be very location and terrain specific.

3. Following the above important perspectives, I will now focus on the eleven specific questions asked of Accufacts in the work scope:

1. *What regulations in other states have been effective in improving pipeline safety and reducing accidents, and should be considered for adoption in Pennsylvania? Are these regulations the same for new and existing (or grandfathered) pipelines?*

[19] Charles Perrow, "Normal Accidents – Living with High-Risk Technologies," first published in 1984 and revised edition in 1999, p. 306, Princeton, NJ: Princeton University Press.

1A1. A 2013 study completed by the National Association of Pipeline Safety Representatives ("NAPSR") and the National Association of Regulatory Utility Commissioners ("NARUC"), distilled to a five-page Executive Summary, identifies major areas or initiatives where states are exceeding federal minimum pipeline safety regulations.[20] The area where states are exceeding federal pipeline safety regulations mainly concern natural gas pipelines, and more specifically, natural gas distribution systems that are under state public utility commissions, as gas distribution systems are usually intrastate. A review of Figure 2 in the NAPSR Executive Summary will indicate that the vast preponderance of state pipeline safety regulations exceeding federal pipeline safety regulations mainly lie in natural gas distribution systems. This should not come as a surprise as basically, with a few exceptions, many states simply incorporate the minimum federal pipeline safety regulations.

The full 2013 NAPSR/NARUC study, providing more detail by state is also at the same referenced website.[21] A further analysis of the details by state in Part 192 (covering natural gas) vs Part 195 (covering hazardous liquid pipelines) will also demonstrate that only a few states impose additional pipeline safety regulations for intrastate transmission pipelines related to construction and design, and none addresses change in service nor reverse flow. Washington, California, Texas, New Mexico, and New Jersey are some of the few states that impose additional safety conditions on pipelines beyond federal minimums, for their intrastate transmission pipelines, driven by past failure experiences, I believe.

1A2. For intrastate pipelines, however, based on my experience, I advise that states should focus their regulatory efforts for existing or new intrastate transmission pipelines on clarifying periodic integrity management approaches and assessments in High Consequence Areas, or HCAs. It is important that regulators assure that pipeline operators have properly identified threats that can cause pipeline failure, either gas or liquid transmission pipelines, and are utilizing the appropriate assessment methods properly to deal with such threats in a timely manner, well before they go to pipeline failure, especially rupture. Federal regulations do not identify the various strengths and weaknesses of the four assessment methods identified in federal IM regulation (46CFR§195.452(j)(5) & 49CFR§192.937(c)). It is also important to appreciate the weaknesses as well as the strengths of each assessment approach, and that each is being utilized prudently on a particular pipeline segment. Clarification of the various

[20] NAPSR & NARUC, "Providing Increased Public Safety Levels – Executive Summary, Compendium of State Pipeline Safety Requirements & Initiatives Compared to Code of Federal Regulations," 2nd Edition 2013, Figures 1 & 2, State Initiative Executive Final Summary – September, 2013 at http://www.napsr.org/compendium.html.
[21] *Ibid.,* Compendium NAPSR 2nd Edition – October, 2013.

assessment methods strengths and weaknesses for threat evaluation is an area that would best be addressed in enhanced rulemaking (either at the state or federal level), as there is much misunderstanding/misinformation, even across the industry, given the number of ruptures that are still occurring in transmission pipelines.

1A3. Regulations should require clearly making public HCAs identified by a pipeline operator. I have investigated many pipeline failures recently where the pipeline operator failed to properly identify HCAs, a very critical first step required in IM regulations. If this important first step is not done properly many questions may be raised about a pipeline operator's IM approach and its adequacy. **I thus recommend that for intrastate pipelines, improve and make public, assessment methods utilized to assure pipeline integrity for each pipeline in HCAs, and make public general locations of HCAs within the state.**

1A4. To complement IM effectiveness, regulations should address certain parameters and processes associated with one-call notification for excavation activities near pipelines to assure that state one-call laws are effective, not just adequate. An IM program for a transmission pipeline can easily be undermined by reckless "excavation" activities. Not all excavation damage to a pipeline fails at the time of such activity, and some assessment methods are still incapable of identifying certain damage. Also, such inappropriate excavation activity near a pipeline does not have to hit it to cause its failure at a later date. **Additional efforts are warranted to evaluate if the current one-call law in the state is effective in preventing pipeline damage, especially damage that can fail at a later date.**

The above efforts should apply to new as well as existing pipelines with one caveat. For new pipelines, I would advise regulators to require that all girth welds be radiologically inspected, and that these girth weld assessment/inspection records be kept for the life of the pipeline (most prudent pipeline operators are already 100% radiographically inspecting such welds). The welding inspection requirement is especially important in areas that could expose a pipeline to abnormal loading risks, such as areas that could experience sinkholes that could cause a pipeline to full bore rupture from girth weld "snapping" failures.

2. *Are there regulations in other states **beyond federal minimum requirements** that would require notifications about pipeline construction or significant changes in pipeline operations (such as a change from petroleum to natural gas liquids) to nearby property owners and local governments or public education about pipelines?*

2A1. The simple answer is no. Federal minimum pipeline safety regulations are

preemptive and do not address pipeline siting (reference federal code 49 U.S. Code § 60104 (e))

2A2. A few states (such as Washington and Minnesota), however, have special siting jurisdiction for new liquid pipelines, either intrastate or interstate. In these specific states the state legislatures have chosen to exercise their rights on pipeline siting processes, given the potential of an oil spill to contaminate critical waters.

a. I recommend establishing a new pipeline siting committee/process that would assure public involvement for such new sensitive infrastructure proposals.

2A3. Several states have regulations that exceed federal minimums related to intrastate pipeline new construction (mainly gas) but relate in general to issues of timely advanced notice to state regulators before new construction is to begin to avoid surprises to the regulators.

2A4. Accufacts is not aware of any notification requirements for service changes to existing pipelines, even for flow reversals, though there are some FERC applications that require a FERC approval process for gas pipelines.

a. There are usually no notification requirements, once a pipeline has been built. Service changes may be influenced by existing ROW easement agreements and the state's contract law.

i. There are minimum requirements, however, under federal pipeline safety regulations for liquid pipeline operators mandating: "Notifying fire, police, and other appropriate public officials of hazardous liquid …emergencies" to assure that they can be prepared for pipeline emergencies, "including additional precautions necessary for an emergency involving a pipeline system transporting a highly volatile liquid."[22]

The above minimum requirements do not obligate the operator to supply first responders or local officials with integrity management related information. I believe certain IM information is highly relevant

[22] For liquid pipelines see 49CFR195.402(e)(7). For gas pipelines, similar minimum requirements are codified in 49CFR192.615.

and should be pursued for intrastate pipelines, including:

1. the location of HCAs,
2. the location of an anomaly that merits a pressure reduction of the pipeline, and
3. the presence of "immediate" or "60-day" or "180-day" repair conditions as defined in liquid transmission pipeline safety regulations, or the presence of "immediate" or "one-year" repair conditions for gas transmission pipelines.[23, 24]

ii. In addition, intrastate pipeline regulations can go beyond federal regulations, and this has occurred in several states such as within the Office of the California State Fire Marshal who oversees the safety of many thousands of miles of intrastate liquid pipelines in that state. This includes giving certain powers to the State Fire Marshal governing pipeline operation and emergency response plans, such as the development of a comprehensive database of pipeline information.[25]

b. For liquid pipelines, a few states have additional possible influence through change in service (i.e., gas to liquid) through their rights to review/influence oil spill response programs and related permitting, such as in Washington State's EFSEC process for "major energy siting and permitting."[26]

c. I would suggest that regulatory efforts focus on making available to first responders and local public officials maps of all transmission pipelines within the state. The maps should designate the material moved in the pipeline, pipeline diameter, mainline valve locations, and MOP/MAOP in sufficient detail to assist these officials. Pennsylvania would not be the first state to require such important information.

d. Lastly, much has been made by some trying to stop pipelines about the uniqueness of HVL. Such attempts, while understandable, can cause widespread fear that may result in inappropriate actions in a real pipeline emergency. The truth of the matter is that all transmission pipelines are capable of releasing hundreds if not thousands of tons of hazardous hydrocarbon in a massive pipeline failure. First responders need to know what is most likely moving in a transmission pipeline but will understand through their training, that their

[23] 49CFR195.452(h)(4).
[24] 49CFR192.933(d).
[25] *CA Chapter 5.5. The Elder California Pipeline Safety Act of 1981.*
[26] See https://www.efsec.wa.gov/.

response will be highly limited and situational, dependent on many factors, including terrain.

3. *Do other states have regulations for public dissemination of risk assessments completed by pipeline operators?*

3A1. The basic answer is no, as risk assessment related to probability/consequence of pipeline failure is not incorporated into federal pipeline safety regulations.
   a. Use of risk assessment in terms of probability/consequence in the U.S. as it relates to pipeline safety does not apply (see 49 U.S. Code § 60102 (a)(3)).

3A2. See Accufacts public comment on draft Risk Modeling Technical Report Draft 1, dated May 9, 2018 at http://www.regulations.gov (Docket No. PHMSA-2018-0059).
   a. The term "Risk Assessment" has a different meaning in integrity management pipeline safety regulations.

3A3. Risk Assessments are often utilized in environmental DEISs/EAs when applied to new pipelines that aren't meant to, nor don't really, adequately address pipeline safety.
   a. There are specific requirements for new school siting risk analysis near pipelines in California, but this is significantly different from risk assessment for pipeline siting, and I believe California's approach has some challenges needing serious improvement.[27]

4. *Are there industry best practices that could be formalized as state regulations to raise the floor for standard operations?*

4A1. Too much focus has been placed on the general industry term "best practices" as this term can have a wide range of meanings, applications, and effectiveness, and can be difficult for regulators to apply and/or enforce.
   a. For intrastate regulatory development, I advise more prescriptive clarity and specificity on certain parts of some industry practices that should be followed.
      i. For example, API 1163 defines specific use of ILI and field verification digs to develop an ILI's unity plots. This standard does not specify the incorporation of ILI tool tolerances nor the minimum number of field verification digs to validate ILI vendor claims, but should.

5. *Are there regulatory or industry best practice from other countries that could be applied in Pennsylvania?*

[27] See "Guidance Protocol School Site Pipeline Risk," at https://www.cde.ca.gov/ls/fa/sf/protocol07.asp.

5A1. I don't advise trying to imitate other countries' regulatory practices. See Accufacts previously cited paper "General Observations on the Myth of a Best International Pipeline Standard," March 31, 2007.

a. The U.S. has many more miles of transmission pipeline than any other country by a wide margin.

5A2. In the area of pipeline risk assessment utilizing probability/consequence, British/Canadian/Commonwealth pipeline safety regulations establish mortality thresholds which may not be appropriate, nor acceptable in the U.S.

6. *Are there Pennsylvania regulations for other industries or utilities that could apply to gas and hazardous liquid pipelines and would enhance safety?*

6A1. I strongly advise that, while transportation transmission pipelines are specifically exempted from OSHA Process Safety Management ("PSM") regulations, state pipeline regulations embrace many of the concepts of PSM intended to assure that a pipeline company's management maintains system integrity via prudent control and safety incorporating many of the hazard management processes utilized in other industries (refining/chemical) that have proven to be highly effective.

6A2. Many of the problems I have uncovered during pipeline incident investigations could be addressed by shifting some of the sections in Federal pipeline safety regulations to prescriptive requirements utilizing "shall" for intrastate pipelines. Many performance-based approaches are not working given their wide variation in intent interpretation. I don't advise throwing out all performance-based approaches related to pipeline safety, but more prescriptive clarity is warranted in certain critical pipeline safety regulations such as management of change regulations, and the use of the four allowed assessment methods identified in federal regulations for pipeline threat evaluation.

a. These four assessment methods are:
   i. Internal inspection tool or tools (usually ILI),
   ii. Pressure test (i.e., hydrotesting),
   iii. External corrosion direct assessment for liquid, or direct assessment for external, internal or stress corrosion cracking for gas transmission pipeline, or
   iv. Other technology that can provide an equivalent understanding of the condition.

7 *Are there regulations that the PUC should adopt specifically <u>for hazardous liquid pipelines</u> that are not necessary for gas pipelines?*

7A1. For intrastate liquid pipelines, provide additional details/requirements for mainline valve placement and their possible remote (via SCADA) operation, driven by elevation and hydraulic profiles, and sensitive area (HCAs) locations that a liquid pipeline rupture could affect. Such determinations will be driven by:

a. Liquid type,
b. Gravity,

c. Area sensitivity, and
d. Terrain.

7A2. For liquid pipelines, require the use of pipeline "rupture" detection defining rupture as high rate releases, mandating immediate pipeline shutdown and mainline valve closure (no false alarms for any reason – get the alarm - immediately shut down and close mainline valves), and proceed with possible release emergency procedures.

8 Is it possible for the PUC to enforce federal or state safety regulations on interstate gas and hazardous liquid pipelines? If yes, what steps would they need to take?

8A1. No. Enforcement of pipeline safety regulations on *interstate* pipelines, gas or liquid, is specifically a federal jurisdiction under PHMSA and is clearly spelled out under current federal law. Even when a state pipeline safety agency is granted the highest level of safety review, to act as an Interstate Agent for PHMSA, which gives a state pipeline safety agency authority similar to PHMSA for inspections/audits etc., enforcement powers clearly remain with PHMSA, as specified in existing federal law.

9. Address any known loopholes to the integrity management requirements, particularly for grandfathered or repurposed pipelines

9A1. Major failures observed in numerous pipeline rupture investigations, either for older as well as newer pipelines, have tended to fall into the following major categories:
a. Not properly identifying HCAs.
b. Not identifying all threats that could lead to pipeline rupture on a particular segment.
c. Failure to match pipeline integrity assessment method capability/limitations to threats.
i. Misuse or overreliance on ILI.
1. See Accufacts 2005 paper: "Observations on the Application of Smart Pigging on Transmission Pipelines."[28]
i. Paper still relevant given many recent pipeline ruptures observed following ILI.
2. Failure to timely determine ILI anomalies.
i. For most types of "general" corrosion threats, proper choice and use of high resolution ILI can be the best tool to assess most corrosion threats. Such information must, however, **be integrated with additional information**, such as type of pipeline coating if any, the effectiveness of pipeline cathodic protection ("CP"), the

[28] At: http://pstrust.org/docs/final_pigging_white_paper.pdf#search=%22Observations%20on%20the%20Application%20of%20Smart%20%22.

location on the pipe of the identified anomaly, and the ability of the ILI to properly characterize the corrosion anomaly.
ii. Field verification digs are a must to confirm a pig vendor's claims.
iii. ILI is still limited on accurately identifying certain pitting or corrosion cracking threats.

ii. Misuse of hydrotesting (such as dropping test pressure to avoid test failures or leaks) is very dangerous for cracking threats.
iii. Attempt to utilize direct assessment for non-corrosion threats.
iv. Failure to acknowledge the severe limitations of direct assessment, especially confirmatory direct assessment, in corrosion threats.

d. Incomplete records amounting to false engineering assumptions, or guessing, on predicting time to failure estimates that are anything but "conservative."
e. Failure to incorporate that some threats are "interactive" making time to failure prediction unreliable.
i. E.g., dents with stress concentrators.
ii. Microbiologically influenced corrosion, or MIC.

10. Are there regulations that the PUC should adopt for construction or integrity management of pipelines in high consequence areas? If any of the previous answers include regulations that address the increased risk of life or property in high consequence areas, please note that.

10A1. Capture the importance of proper pipeline siting to avoid areas that could be prone to massive landslide, as no pipeline can be designed for such severe "abnormal loading," that usually when they fail, fail as pipeline rupture.

10A2. For new pipelines, require that all girth welds be radiologically inspected/assessed, and such records be maintained for the life of the pipeline.

10A3. Make integrity assessment results available to state regulators, including field verification dig observations and unity plots for ILI assessments.

10A4. For certain cracking threats, require periodic hydrotesting well above current federal strength test requirement utilized to establish MOP/MAOP (= 1.25X hydrotest), and incorporate spike hydrotest protocols.

a. Prudent high-pressure hydrotesting protocol (utilizing proper pressure/volume, or P-V plot), well known within the industry for many decades, eliminates the risk of such special hydrotesting assessments overstressing the pipe during such testing. Ironically, such important hydrotesting protocols are not incorporated into federal pipeline regulations.
b. It should be noted that hydrotesting does not adequately test certain crack threat anomalies, such as cracks in girth welds or their related heat affected zone, or HAZ.
i. The location of girth weld or associated HAZ crack threats needs location specific analysis as to potential abnormal loading threats (such as landslide, sinkhole potential) that can result in pipeline rupture.

10A5. Require timely reporting of all overpressure events (pressures exceeding MOP/MAOP plus permitted safety accumulation) to regulators.

10A6. While PA has received a recent determination from PHMSA of "adequacy" of their One-Call Law Enforcement Program, I recommend a review to verify if PA one-call law is effective as it relates to pipelines:[29]
   a. Require reporting and monitoring of excavation damage to all pipelines within state by:
      i. first party (pipeline operator)
      ii. second party (pipeline contractor)
      iii. third party (all others)
   b. Does the program provide a feedback mechanism to identify and correct errant behavior for serious or repeat offenders?

10A7. I was asked the question whether adding odorant to an HVL liquid line would help in detection of a release. Given the unique nature of a HVL leak release to auto-refrigerate, or cool, releasing a combination of a liquid and gas, odorant addition in an HVL liquid transmission pipeline I believe would not be technically feasible or reliable at release detection. Odorant injection, given many technical challenges for HVL, would most likely be the most dangerous of safety approaches, an illusion of a safety, and I thus recommend this approach be avoided.

11. Are there any other recommendations for regulations, certifications, permitting or enforcement by the PUC to improve the actual and perceived safety of gas and hazardous liquid pipelines

11A1. While written in 2002 and 2003, the Accufacts papers identifying specific recommendations for improvements in pipeline design, operation, and maintenance that, after investigating recent pipeline failures, are still very relevant.[30, 31] I have attached the specific recommendation pages as Attachment 1 (Accufacts 2002 Recommendations to Washington State JLARC)/WUTC) and Attachment 2 (Accufacts 2003 Recommendations to Washington City and County Pipeline Safety Consortium).
   a. Critical safety approaches should never rely on one single approach but on at least two independent safety methodologies.
      i. Examples of critical safety approaches are devices associated with over pressure protection, or remote operated emergency pipeline shutdown and isolation systems.

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[29] PHMSA, "Determination of Adequacy," website https://www.phmsa.dot.gov/pipeline/excavator-final-rule/determinations-adequacy.

[30] Richard B. Kuprewicz, "Preventing Pipeline Failures," produced for Washington State Joint Legislative Audit and Review Committee (JLARC), December 30, 2002. Appendix 6, pp. 57 & 58 at http://leg.wa.gov/jlarc/AuditAndStudyReports/Documents/03-5.pdf.

[31] Richard B. Kuprewicz, "Preventing Pipeline Releases," prepared for the Washington City and County Pipeline Safety Consortium, July 22, 2003, pp. 29 & 30.

11A2. It bears repeating that there is a difference between pipeline safety regulations and pipeline siting processes.
   a. The fix for pipeline siting processes most likely would be a legislative solution concerning new pipeline siting and/or product change/flow reversal of existing pipelines and it would only apply to intrastate pipelines (not interstate pipelines).

11A3. There are many similarities between liquid and gas transmission pipeline safety regulations, but also important differences:
   a. Rupture fracture dynamics and actual impact areas are very different for gas and liquid transmission pipelines.
   b. To prevent pipeline overpressure, each mainline valve installation for liquid transmission pipeline should undergo proper surge analysis subject to regulatory review.
   c. Placement of mainline valves on a liquid pipeline is highly dependent on the pipeline's elevation profile.
   d. It needs to be clearly conveyed that mainline valve installations are safety devices in the event of pipeline rupture, and are not a safety risk.

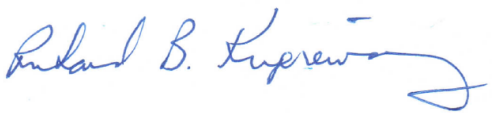
11A4. Rupture release remote determination (i.e., via SCADA) utilizes different technical approaches.
   a. Pressure loss can be a very poor and untimely monitor of pipeline rupture for either gas or liquid pipelines.
   b. For the best and most timely release detection, I advise that release detection focus on rupture releases that are remotely identified by major rate changes within a pipeline, and can be very pipeline specific.
      i. Such indications of rupture flow changes move at the speed of sound within the fluid and are much more timely indications than pressure loss.
      ii. The compressibility of the hydrocarbon mixture and pipeline inventory complicates, confuses, and can delay release detection by pressure loss, given the thousands of tons of possible hydrocarbon inventory within a pipeline segment.

4. Conclusions

It is important to understand whether a transmission pipeline is an interstate or intrastate pipeline, and from a pipeline safety perspective, a pipeline segment cannot be both. Both federal minimum pipeline safety regulations and additional state pipeline safety requirements in several states give additional important information to first responders and local officials to assist in a pipeline emergency, and federal regulations place this responsibility on the pipeline operator. Risk assessments related to probability and consequence provide little value in pipeline operation or siting given the wide range of possible outcomes and the technical incompleteness I have observed to date within the state concerning pipelines. Consequence analysis is more appropriate, but care must also be exercised in such

consequence analysis used to reflect true pipeline rupture dynamics, either for liquid or gas pipelines, which have different release dynamics. Terrain can also play an important role in consequence analysis.

A process to provide public involvement in new pipeline siting is warranted, but my experience would suggest preventing change in service or reverse flow on existing pipelines might be in conflict with minimum federal pipeline safety regulations. Federal minimum pipeline safety regulations place an obligation on the pipeline operator to provide local emergency responders and public officials with limited information concerning interstate pipelines. There is an understandable need to provide such responders and local officials with additional information related to transmission pipelines that I have identified in this report. Such information can be mandated for intrastate pipelines and are already required in a few states within the U.S., such as Washington State with its strong public right-to-know laws.



Richard B. Kuprewicz,
President,
Accufacts Inc.

Specific Recommendations for WUTC

Based on the observations provided in this report, the following recommendations should be instituted within the WUTC to insure that pipelines are designed, maintained, and operated safely within Washington State. These recommendations are presented in priority to be effective and efficient, with the most critical listed first,

1) **Pipeline Inspections**
   The WUTC **should immediately redirect** its pipeline inspection efforts toward verifying that a pipeline's Baseline Data system design is understood and documented on a "simplified flow" drawing. Regulatory inspection efforts should then focus on insuring that equipment is properly purchased, installed, operated, and maintained to keep the pipeline operating within this specific design intent. **Priority should be given to gas and liquid transmission pipeline segments spanning HCAs, operating at the upper end of their velocity ranges that are at the greatest risk of exceeding MOP/MAOP.**

2) **Over-reliance on Pipeline Integrity Management**
   In any regulatory pipeline safety program there is great temptation to believe IM can play the major role in preventing pipeline failures. IM should not supplant other regulatory efforts that insure pipelines are prudently designed, operated, and maintained. Washington State efforts should be focused on insuring that WUTC inspection resources are not overly diverted to IM activities at the expense of specific recommended items included in this list.

3) **Management of Change**
   The WUTC should formulate regulations requiring appropriate Management of Change approval procedures within a pipeline company for any pipeline change of Baseline design that is not a replacement in kind.

4) **Overpressure Reporting**
   The WUTC should adopt new regulations that require **all** pressures in excess of 110% MOP/MAOP **anywhere within a pipeline** be reported to the WUTC in a timely manner so that proper mitigation can be assured to prevent reoccurrence.

5) **Safety Critical Equipment**
   The WUTC should foster pipeline regulations defining **safety critical equipment** and incorporating the concept of independency for such equipment in pipeline operations. This effort should capture the point that redundancy is not independency. In addition, the frequency of operation of safety critical overpressure equipment should be reported at least annually.

6) **SCADA Computer Monitoring**
   The WUTC should adopt regulations requiring SCADA computer "leak detection" monitoring on transmission pipelines operating across HCAs.

7) **Grandfathered Anomalies**
The WUTC should compile a list by pipeline, of all anomalies of concern that are grandfathered, but that would no longer be permitted in new pipeline operation.

8) **Inline Inspection**
The WUTC should foster further development of and proper use of inline inspection tools including development of industry practices capturing the concepts outlined in this report. Such development must also acknowledge the limited capabilities of these devices even as technology continues to improve.

9) **Third Party Damage Prevention**
The WUTC should adopt additional third party damage prevention regulations exceeding the basic current one-call and public education efforts. Such regulations should focus on addition requirements within pipeline companies capturing the concepts defined in this report.

10) **Specialized Expertise**
Given the rapid development and changes in unique pipeline technologies such as smart pigging, hydraulic analysis, and leak detection, the WUTC should budget sufficient resources to permit the use of independent specialized expertise when needed.

Attachment 2 - Accufacts 2003 Recommendations to Washington City and County Pipeline Safety Consortium

Specific Recommendations for Improvements in Pipeline Design, Operation and Maintenance

Based on the observations provided in this report, the following recommendations should be instituted to insure that pipelines are designed, maintained, and operated safely. These recommendations are presented in priority to be effective and efficient, with the most critical listed first:

1) **Pipeline Inspections**
   Inspection should immediately redirect efforts toward verifying that a pipeline's Baseline Data system design is understood and documented on a "simplified flow" drawing, including all tie-in points. Regulatory inspection efforts should then focus on insuring that equipment is properly purchased, installed, operated, and maintained to keep the pipeline operating within this specific design intent. Priority should be given to gas and liquid transmission pipeline segments spanning HCAs, operating at the upper end of their velocity ranges that are at the greatest risk of exceeding MOP/MAOP.

2) **Internal Corrosion Federal Regulations and Industry Standards**
   Regulations and industry standards for internal corrosion programs need to be quickly improved. Given the major "factor" trends identified in this report, explicit internal corrosion efforts pertaining to gas transmission pipeline systems should receive priority.

3) **Over-reliance on Pipeline Integrity Management**
   In any pipeline safety program there is great temptation to believe IM can play the major role in preventing pipeline failures. IM should not supplant other regulatory efforts that insure pipelines are prudently designed, operated, and maintained. Efforts should be focused on insuring that inspection resources are not overly diverted to IM activities at the expense of specifically recommended items included in this list.

4) **Management of Change**
   Regulations should be formulated requiring appropriate Management of Change approval procedures within a pipeline company for any pipeline change of Baseline design that is not a replacement in kind, including product quality specifications entering the pipeline.

5) **Overpressure Reporting**
   Regulations should adopt changes that require all pressures in excess of 110% MOP/MAOP anywhere within a pipeline to be reported in a timely manner so that proper mitigation can be assured to prevent reoccurrence.

6) **Safety Critical Equipment**
   Pipeline regulations need to provide clearer guidance on safety critical equipment and incorporate the concept of independency for such equipment. This effort

should capture the point that redundancy is not independency. In addition, the frequency of operation of safety critical overpressure equipment should be reported at least annually.

7) **SCADA Computer Monitoring**
Regulations should be adopted requiring SCADA computer "leak detection" monitoring on transmission pipelines operating across HCAs.

8) **Grandfathered Anomalies**
Pipeline companies should compile a list, by pipeline, of all anomalies of concern that are grandfathered, but that would no longer be permitted in new pipeline operation. This grandfathered anomaly list should be disclosed under community right-to-know.

9) **Pipeline Inspection Technologies**
Regulatory efforts should foster further development and proper use of inline inspection tools ("smart pigs") including improvement of industry practices capturing the inspection concepts outlined in this report. Such development must also acknowledge the limited capabilities of these devices even as they continue to improve. Other technologies that may selectively identify certain "at risk" anomalies should also be cultivated.

10) **Third Party Damage Prevention**
Efforts should incorporate additional third party damage prevention processes exceeding the basic current one-call and public education efforts. Emphasis should focus on additional requirements within pipeline companies capturing the concepts defined in this report.

11) **Specialized Expertise**
Given the rapid development and changes in unique pipeline technologies such as smart pigging, hydraulic analysis, corrosion, and leak detection, regulatory agencies should budget sufficient resources to permit the use of independent specialized expertise when needed.