TOWNSHIP OF BETHLEHEM
Board of Commissioners

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SECRETARY OF THE COMMISSION
2015 NOV 30 A 11: 31
FEDERAL ENERGY REGULATORY COMMISSION

November 13, 2015

ORIGINAL

CP15-558

Dear Sir or Madam:

I am writing to confirm that Bethlehem Township Staff met with Right of Way (ROW) representatives for the proposed PennEast pipeline on Wednesday November 4th, 2015 in the afternoon to discuss proposed Township road crossings in Bethlehem Township, Northampton County, PA of the PennEast Pipeline.
During this meeting, we provided the representatives with information on our roadways and infrastructure in the Township to better assist them in their due diligence of municipal roadway crossings for the pipeline on its proposed route through Bethlehem Township. At the conclusion of the meeting, it was noted that Bethlehem Township is willing to assist in further due diligence, as needed, for this road crossing research.

Additionally, during the meeting staff noted that the Township has undertaken independent research and study for risk analysis to the community as directed by the Board of Commissioners through third party firm Carroll Engineering Corporation. Included in this correspondence, please find the study completed by Carroll Engineering Corporation for your information and consideration. This study is being presented to the Board of Commissioners at the November 16th, 2015 meeting for their review and discussion regarding the PennEast Pipeline's anticipated impact on our community.

Carroll Engineering Corporation has noted that an analysis and review of the various "failure modes", potential gas discharge and ignition scenarios are beyond their scope of services for the study. I would ask that PennEast provide Bethlehem Township with this information in the timeliest manner possible so the Board of Commissioners can address resident and business concerns and make informed decisions while working with PennEast during this project's planning and permitting stages. Bethlehem Township has multiple vocal citizens with expressed concerns about the three points noted above and PennEast's cooperation in providing this information swiftly is greatly appreciated.

Lastly, during the meeting with ROW representatives, it was again noted that the currently proposed pipeline route through Bethlehem Township is set to travel along Hope Road and jog around the PennDOT maintenance facility located adjacent to Route 33. The current trajectory of the pipeline route has the pipeline travelling within what appears to be 300+/- feet of our Hope Ridge condominium community. This community is one of the most densely populated

November 13, 2015

neighborhoods in Bethlehem Township. We would strongly advise and request that PennEast consider a route alternative along Route 33 near the PennDOT facility as opposed to its current one with such close proximity to dense housing for the health and safety of our township residents.

I hope you find the included report to be enlightening and helpful in your planning for the PennEast pipeline project and would ask again that you contact my office at your earliest convenience with the requested information on possible "failure modes", potential gas discharge and ignition scenarios from the pipeline. Please do not hesitate to contact me at 610-814-6402 or mshafer@bethlehemtownship.org if you would like to discuss these matters further.

Sincerely,

Melissa A. Shafer
Township Manager

DRAFT

4.0 – SUMMARY OF RECOMMENDATIONS

4.1 General

- Every proposed crossing (or nearby parallel installation) of existing utility piping should be individually reviewed as part of PennEast's design process. Polyethylene encasement conforming to ANSI/AWWA C105/A21.5 should be provided on all existing water, wastewater and stormwater piping wherever the potential for stray currents exist. A surface potential gradient survey and notifications to all public utility owners in the Township should be provided whenever PennEast modifies the pipeline's ICCP.

- Sinkholes and other risks associated with carbonate geology: Consistent with §230-75 of the Township Code, PennEast should perform geologic studies, and, submit reports from a professional geologist, or a professional engineer with demonstrable education or experience in geotechnical engineering to the Township relating to the hazards. PennEast's contractors should utilize the construction methods, techniques and procedures set forth in those reports and/or as recommended by their professionals to mitigate any ground subsidence hazards.

- The Township should ensure Planning/Zoning/Permits Department personnel are aware of the location of every hazardous liquid or natural gas transmission easement in the Township, in order to ensure that no one obtains a permit for work near a transmission main without clear information regarding the location and setback restrictions. Coordination of future construction activities with the pipeline company should be required as part of any excavation work done within 150 feet of the pipeline.

- The Township should ensure that all new land use planning documents clearly mark and label the location of hazardous liquid or natural gas transmission main easements.

- The Township should require that New Land Development Plans disclose the proximity of transmission pipeline(s) wherever the property is within 1,000 feet of the pipeline company's right-of-way or easement.

- Waterway crossings should be inspected annually (and after every 100 year flood event.)

4.2 Setbacks

The American Petroleum Institute (API) recommends setbacks of 50 feet for new homes, businesses, and places of public assembly with a setback of 25 feet for garden sheds, septic tanks, and water wells. Pipeline operators generally favor substantial setbacks for established pipeline easements. Typically, setbacks lessen the likelihood of third party damage from encroachment activity and lessen the possibility of personal injuries if there is a release from a transmission pipeline. In contrast, when a new natural gas transmission pipeline is being sited, pipeline operators often do not want to pay for a *wide* easement.

The Township should establish setbacks for hazardous liquid and natural gas transmission pipelines to minimize the risk of third party damage to the pipeline. (Because the precise location of a pipeline within an easement or right-of-way is not always known, setbacks should be measured from the edge of the pipeline easement or right-of-way.) In considering the establishment of setbacks associated with hazardous liquid or natural gas pipelines, the Township will need to balance the financial burden that might be imposed on landowners whose property adjoins or is near the pipeline right-of-way or easement because they generally are not compensated for reduced development potential if the easement is not on their property. As the proposed route of the PennEast pipeline crosses a number of differing zoning districts, (*i.e.* agricultural, rural residential, office/business, planned commercial, etc.), the Township may wish to consider each individual zoning district separately in reviewing potential setback requirements.

4.3 Land Use Above the Pipeline

In many communities, linear parks and recreation paths are located on or along pipeline easements and/or right-of-ways. The Township's property at 3001 Hope Road (PARID: M8 9 15B 0205E) would appear to be a candidate for a similar use. The Township may want to consider the installation of paving or athletic fields over the pipeline, as such improvements would be expected to help preclude unauthorized excavation over the pipeline.

Carroll Engineering Corporation

RISK ANALYSIS
PENNEAST PIPELINE
BETHLEHEM TOWNSHIP, PENNSYLVANIA

AUGUST 2015
REVISED OCTOBER 2015

PREPARED FOR:

BETHLEHEM TOWNSHIP
4225 EASTON AVENUE
BETHLEHEM, PA 18020

PREPARED BY:

CARROLL ENGINEERING CORPORATION
949 EASTON ROAD
WARRINGTON, PA 18976

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1.0 - INTRODUCTION

1.1 Overview

This Risk Management Analysis provides basic information about the PennEast Pipeline Project, identifies potential hazards associated with the construction and operation of the pipeline that may be of interest to Bethlehem Township with an emphasis on potential geologic hazards that could be anticipated within the proposed pipeline corridor, identifies those organizations responsible to managing the risks proposed by the pipeline as well as their responsibilities for maintaining appropriate countermeasures and providing future periodic risk assessments. This Risk Analysis is limited to the perspective of those who live and work in Bethlehem Township near the proposed pipeline, and, does not consider any issues related to gas well development or fracking, or any safety concerns of the construction crews that will be tasked with the pipeline construction.

The function of Risk Management Analysis is to present potential issues regardless of the probability of leaks or injury in order to better inform Bethlehem Township of the potential range of issues associated with the construction and operation of the proposed pipeline. It should be noted that the Analysis provided in this report intentionally overestimates anticipated risks as it is the expectation of the pipeline owners as well as governmental regulators that the potential for gas leaks or accidents is extremely low. Nevertheless, the potential for pipeline failure, accidents, and other hazards is real. (A cursory review of literature in the public domain lists over 80 significant gas transmission main failures and/or accidents in the United States within the last 10 years.)

1.2 Background

PennEast is one of a number of new natural gas pipeline projects that are being constructed or expanded to transport the significant quantities of gas now being produced in the Marcellus and Utica Shale regions. As proposed, PennEast will be a 36 inch diameter, 114 mile long, underground pipeline originating in Dallas, Luzerne County, in northeast Pennsylvania, and will terminate at an interconnection with an existing Transco pipeline near Pennington, Mercer County, New Jersey. When complete, the pipeline will include numerous receipt and delivery points, as well as interconnections with other natural gas transmission pipelines. As an interstate natural gas pipeline, PennEast is under the jurisdictional review of the Federal Energy Regulatory Commission (FERC).

Natural gas transmission mains are highly pressurized to provide high flow capacity. Compression of the natural gas is required periodically along the pipeline in order to maintain that high flow capacity. This compression is performed at compressor stations, which are typically placed at 40 to 100 mile intervals along pipelines. The PennEast project proposes a single compressor station, currently proposed in Kidder Township, Carbon County, Pennsylvania. In addition to compressing natural gas to reduce its volume and push it through the piping, metering stations will be placed periodically along the natural gas pipeline. These stations allow pipeline companies to monitor the delivery of the natural gas. With respect to the construction of the transmission main, it will be manufactured from carbon steel, and, will be covered with specialized coating to protect the pipeline from corrosion. In addition, it is expected that the pipeline will be cathodically protected as a further measure to protect the gas pipeline from corrosion.

2.0 – POTENTIAL HAZARDS

2.1 Summary of Potential Hazards

Specific issues and hazards include: corrosion hazards, excavation damage, damage to agricultural lands, geologic hazards, flooding, river scour, river channel migration, piping material or weld defects, equipment failures, and incorrect operations. While other hazard scenarios could be envisioned post-construction, the abovementioned were the primary concerns identified by our evaluation. As explained below, corrosion to municipally-owned underground pipelines, excavation damage, and, the occurrence of sinkholes would seem to be the hazards most likely to affect Township property and facilities.

2.2 Corrosion Hazards

Gas transmission mains are routinely protected by an exterior coating supplemented with an impressed current cathodic protection (ICCP) system. The cathodic protection technique, developed in early nineteenth century, is used to control the corrosion of a metal surface by making it the cathode of an electrochemical cell. While the technique's first applications were associated with the shipping industry, the use of ICCP systems to protect natural gas pipelines became widespread in the 1930's. ICCP systems consist of anodes connected to a DC power source, often a transformer-rectifier connected to AC power.

An ICCP system for a pipeline consists of a DC power source, often an AC powered transformer rectifier and an anode, or array of anodes buried in the ground (an anode groundbed). The DC power source would typically have a DC output of up to 50 amperes and 50 volts, but this depends on several factors, such as the size of the pipeline and coating quality. The positive DC output terminal is connected via cables to the anode array, while another cable would connect the negative terminal of the rectifier to the pipeline, preferably through junction boxes to allow the gas pipeline company to monitor the ICCP system. The output of the DC source will be adjusted to the optimum level based on various tests that will be conducted following the pipeline construction. While much less common than with gas transmission mains, ICCP systems are also used in conjunction with water transmission pipelines whenever owners determine the installation and maintenance of the ICCP system is reasonable for the expected pipeline service life extension attributed to the application of cathodic protection.

While ICCP systems are extremely effective in reducing the potential for external corrosion to the protected pipeline, ICCP systems have the potential to destroy nearby unprotected metallic pipelines. The hazard presented by the operation of an ICCP system is the electrolytic corrosion of unprotected pipelines in the vicinity of pipeline with an operating ICCP system. This potential is well documented. Stray and corrosion currents have been the focus of significant research by the Ductile Iron Pipe Research Association (DIPRA) for many years. (See Appendix A for DIPRA's April 2015 article – Stray Current Effects on Ductile Iron Pipe.) Although a complete discussion of stray current corrosion is beyond the scope of this Risk Analysis, it will be important that the proposed gas pipeline project be designed and constructed with due consideration of existing underground pipelines in the project corridor.

While DIPRA has been at the forefront of stray current research, the potential for corrosion to water, wastewater and stormwater piping is not limited to ductile iron pipelines. Cast iron, steel, steel-reinforced, and other metallic pipelines are also susceptible to damage. For example, it is suspected that the recent, well publicized, sanitary force main break in Valley Forge National Park was associated with stray current effects from a PECO gas transmission main's ICCP on nearby precast concrete cylinder piping used in the construction of the wastewater utility's force main.

Mitigation of Stray Electrical Currents: The potential of stray current damage varies by the pipeline geometry, soil resistivity, water table, pipe sizes, pipeline coating, ICCP system output, etc. As such, every crossing or nearby parallel piping installation within the Township should be reviewed individually. Wherever the potential for stray currents exist, encasement of the existing pipeline in polyethylene may be required. Polyethylene encasements, where required, should conform to ANSI/AWWA C105/A21.5. Locations where a greater potential for stray current damage is expected, more substantial measures to protect existing pipelines may be required.

2.3 Excavation Damage

Excavation damage is generally accepted to be the most probable source of any transmission main accident. Most often, damage to underground facilities occurs when excavators do not contact the Pennsylvania One Call System (POCS) for utility locations before they dig. (Pennsylvania Act 287, as amended, requires excavators as well as private land owners to call the POCS three (3) business days before any kind of digging occurs with powered equipment.) However, it is not unusual for utilities to be damaged even after calls have been made and underground piping locations have been marked, as some excavators do not know the procedures for safely working around utilities. Rather than to solely relying on excavator compliance with POCS requirements, gas pipeline companies typically provide routine surveillance of their facilities in order to anticipate any unauthorized construction in pipeline right-of-ways. In general, gas pipeline companies are proactive relative to the observation and oversight of construction activities in the vicinity of their pipelines. Additional activities commonly undertaken by the gas pipeline companies include: conducting enhanced awareness education, inspection of targeted excavation and backfill activities, inspections for facility support, improvements in the accuracy of line locating, participating in pre-construction meetings with project engineers and contractors in high-risk areas, use of warning tape, installation of additional pipe markers, improvements to system map accuracy and availability, and the recruitment of support from public safety officials.

Given the potential for damage, it's expected that PennEast will actively respond to POCS calls and inquiries, participate in pre-construction meetings relative to land development or other utility projects within the gas pipeline corridor, and provide regular and routine surveillance of PennEast facilities in order to anticipate any construction that might cross the pipeline corridor as well as other measures. As part of any awareness education, PennEast should note that even if the transmission main is merely exposed as part of the excavation process without apparent damage, that the incident should be reported to PennEast as the possibility of secondary damage still exists. Some pipelines are constructed with sensitive coasting that even when scraped or nicked might create holes comprising the pipeline's corrosion protection system, and, thereby lead to future failures.

2.4 Damage to Agricultural Lands

Topsoil should be stripped, segregated and preserved prior to any trenching and/or temporary access road construction. These procedures should be in place in residential areas, actively cultivated or rotated croplands, pastures, hayfields and any other areas where requested by the landowner or the County Conservation District. Topsoil should be removed to its actual depth, and stockpiled separately from the subsoil that will be excavated from the pipeline trench. Topsoil and subsoil mixing and compacting should be avoided as both reduce soil productivity.

Assuming that the construction activities will be in conformance with the PA Department of Environmental Protection's Erosion and Sediment Pollution Control Program Manual, topsoil loss and loss of soil fertility in connection with the gas pipeline project is generally anticipated to be of minor concern.

2.5 Potential Geologic Hazards

2.5.1 Evaluation Approach

The analysis of geologic hazards with respect to the proposed PennEast gas pipeline project considered the primary risks present as a result of the local geology. Readily-available geologic reports and other publically-accessible data were reviewed, along with information published by the local emergency management agency. These were compared to information provided by PennEast Pipeline Company, LLC, as published on the company's web page for the project.

Based on local emergency planning, the geologic hazards identified as being of primary concern are generally categorized as: sinkholes, landslides and earthquakes. To these three, a fourth category: "Other Risks Associated with Carbonate Geology", was added to address additional potential hazards that may be present as a result of the unique characteristics of the underlying dolomite and limestone.

While other geologically-related hazard scenarios could be envisioned for the construction or operation of the pipeline, the abovementioned were the primary concerns identified by our evaluation. As explained below, the occurrence of sinkholes is the geologic hazard identified as most likely to affect the project.

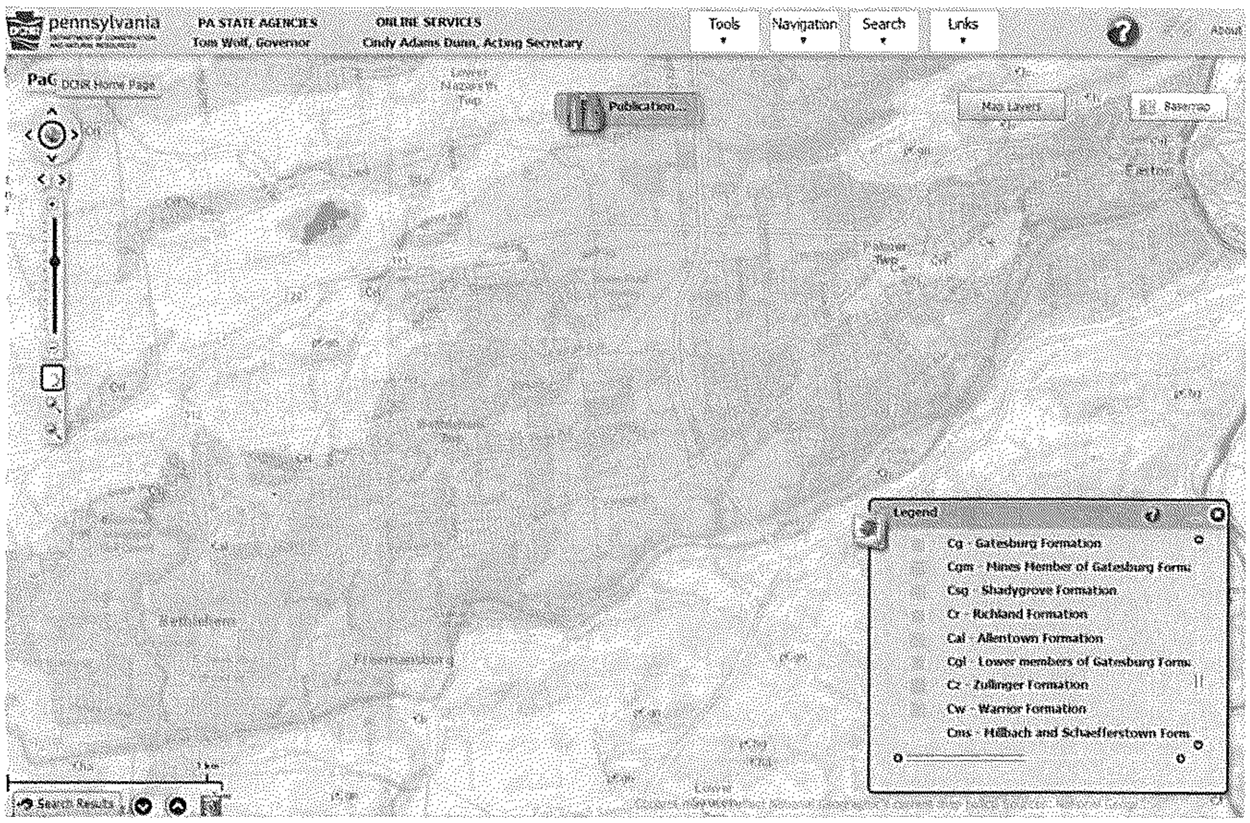
2.5.2 Sinkholes

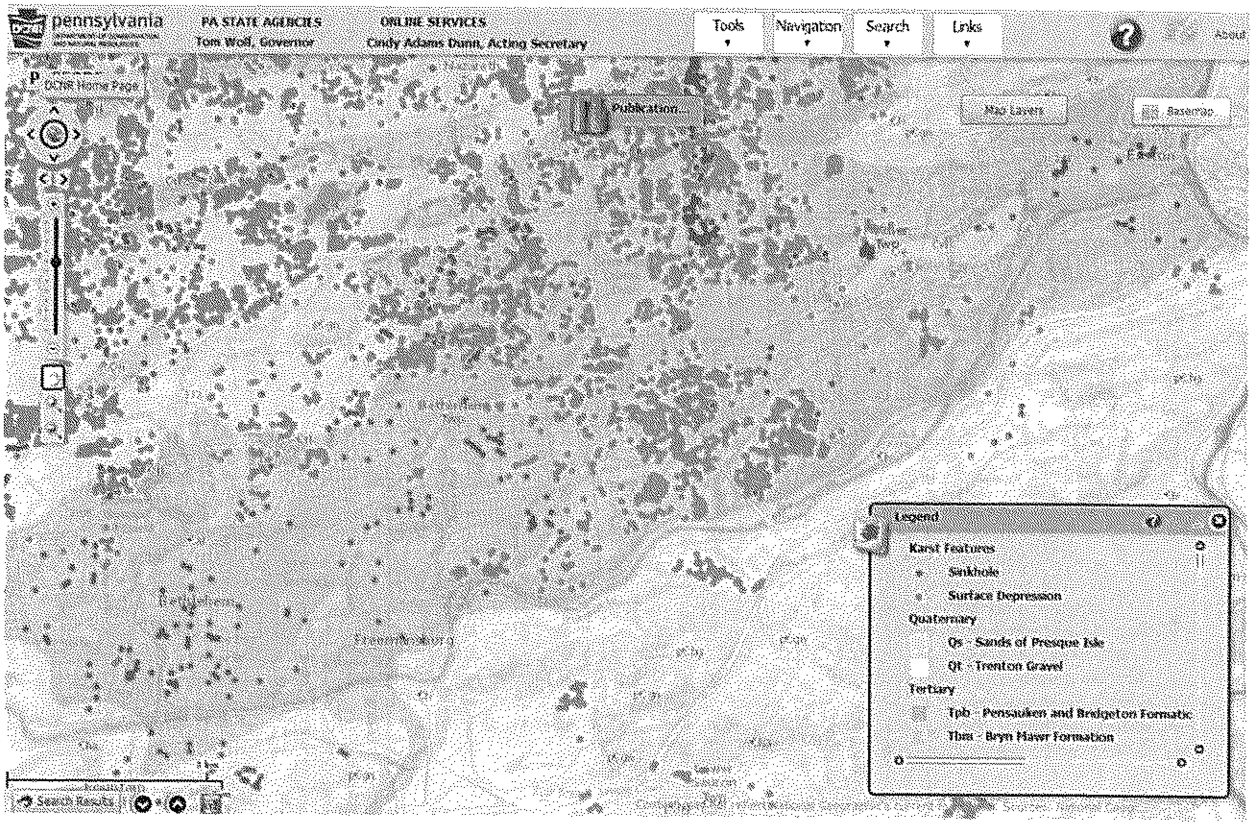
The Pennsylvania Geological Survey web-mapping application for Geologic Data Exploration (PaGEODE) indicates the bedrock underlying most of Bethlehem Township, and nearly the entirety of the proposed PennEast pipeline alignment within the township, is what is commonly known as carbonate (i.e. karst) geology. PaGEODE describes the geology as follows:

> "The Allentown Formation consists of laminated medium-gray dolomite and impure limestone, dark-gray chart stringers and nodules, some calcareous siltstone and some oolites, stromatolites, and sharpstone conglomerate. Beds are well developed and thick. Its maximum thickness is about 2,000 feet (Geyer and Wilshusen, 1982)."

As area residents are aware, this geologic setting is prone to land subsidence where the underlying carbonate bedrock has been dissolved and weakened over by the action of moving water and dissolution. The resulting fractures and solution cavities eventually enlarge to the extent that the rock can no longer support the overlying soils which collapse and form depressions and sinkholes.

Screen shots of the web mapping are provided on the following page showing the location of the Allentown Formation and closed depressions or sinkholes. The location of numerous sinkholes is also indicated in PennEast's map of the proposed route in Bethlehem Township, Sheet 22 of 33 (not shown).





Our review included the April 2013 update of the Lehigh Valley Hazard Mitigation Plan Update prepared for the Lehigh Valley Planning Commission, Lehigh County Emergency Services and Northampton County Emergency Management. Section 4.3.9: "Risk Assessment – Subsidence / Sinkhole", reports that 100% of Bethlehem Township's land area, population and "gross building stock" are located within the "Subsidence / Sinkhole Hazard Area". The plan states that "Sinkhole occurrence is a continuing phenomenon and is fairly common in the carbonate areas of the Lehigh Valley, and the probability of a sinkhole forming in the Lehigh Valley is high." According to the plan, "…the future occurrence of subsidence and sinkholes is considered likely…"

Although land subsidence in karst terrains is a natural occurrence, man-made land disturbances can increase the likelihood of subsidence. Man-made disturbances obviously include activities related to the proposed gas pipeline construction such as: blasting; changes to surface loading; excavation of soil cover or rock; groundwater pumping for excavation dewatering; and changes to soil compaction, grading and vegetative cover that alter stormwater runoff and infiltration or create impoundments.

In the pre-filing draft Resources Report 6 "Geological Resources" that was prepared by the PennEast Pipeline Company for the project, subsidence is identified as a potential geologic hazard in areas of karst terrain (Section 6.3 "Geologic Hazards", Subsection 6.3.4 "Subsidence"). The report states that "A detailed geophysical survey is underway to investigate karst conditions proximate to the Project area".

Given the abovementioned, it's apparent that the proposed gas pipeline project will need to be designed and constructed with due consideration of known sinkholes, closed depressions and related indicators of land subsidence. The pipeline will also need to survive the loss of support in the event of previously unknown land subsidence under the pipe and related facilities. The geological, geotechnical and engineering studies needed to address potential sinkholes and other subsidence hazards would not be substantially dissimilar to those normally required under the Township's Subdivision and Land Development Ordinance. Although subsidence related to the underlying limestone and dolomite geology may be confined to relatively small areas of the pipeline, if they become a factor contributing to failure of the pipe, the impact to the local area may greatly exceed the extent of the geologic feature itself.

2.5.3 Landslides

Section 4.3.6: "Risk Assessment – Landslide" of the Lehigh Valley Hazard Mitigation Plan describes landfills as "the downward and outward movement of slope-forming soil, rock, and vegetation reacting to the force of gravity." According to the plan, "Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, and changes in groundwater levels." With respect to the future occurrence of landslides, the plan states: "Based on available historical data, the future occurrence of landslides can be considered unlikely...", and the entire area of Bethlehem Township is identified as being "Low Susceptibility".

Section 6.3.5 of PennEast's draft Resources Report 6 does not identify areas of susceptibility to landslides within Bethlehem Township. The report describes the topography in the area as "flat to gently undulating". Despite the report assertions, some increased landslide risk seems likely at the steep slopes adjacent to the Lehigh River or wherever blasting is used.

From the above, the occurrence of landslides in connection with the gas pipeline project is generally anticipated to be of minor concern.

2.5.4 Earthquakes

"The Geology of Pennsylvania", Pennsylvania Geologic Survey's Special Publication 1, identifies Southeastern Pennsylvania as the zone of highest seismic activity in the state. Despite the increased risk relative to the remainder of the state, the publication reports a probability of 90 percent "that a maximum acceleration in rock of 10 percent of gravity will not be exceeded in 50 years." This acceleration is associated with damage to ordinary building not designed to resist earthquakes. By comparison, high risk areas of San Andreas Fault in California are characterized as having a maximum acceleration of 60 percent of gravity for the same probability and exposure.

Although the Lehigh Valley Hazard Mitigation Plan indicates the entire population of the Lehigh Valley "is potentially exposed to direct and indirect impacts from earthquakes", it is further stated that "the future occurrence of earthquake events can be considered unlikely..." For Bethlehem Township, the plan estimates "Potential General Building Stock Loss (Structure and Contents) for the 500-Year MRP Earthquake Event" to be only 0.1 percent of the total building value. The impact to critical facilities in the Lehigh Valley is identified in the plan as "...not significant for the 100-year event and is not discussed further."

Section 6.3 of PennEast's draft Report 6 addresses seismic risk, soil liquefaction and faults. With respect to seismic risk, the report section concludes: "In summary, seismic hazard due to wave propagation effects should not pose a significant threat to the PennEast Project. Also, there is no conclusive evidence of Quaternary fault displacement. Therefore, the permanent ground displacement (PGD) hazard due to fault offset is considered insignificant."

From the above, the occurrence of earthquakes, or more specifically their impact upon the gas pipeline project, is anticipated to be of minor concern. This conclusion is based on the reported probable magnitude of an event, and the relative infrequency of the recurrence interval.

As with any land disturbance, it should be noted that the occurrence of an earthquake would obviously increase the likelihood of subsidence and landslides.

2.5.5 <u>Other Risks Associated with Carbonate Geology</u>

The nature of the underlying karst geology with open fractures, solution channels conduits and caves provides interconnected pathways for the rapid movement of groundwater, air and other gasses. The presence of dry caves and other voids above the water table provide places where gas from an underground pipeline leak could accumulate or travel some distance from the source. Furthermore, contaminants released introduced during construction or operation of the pipeline could impact groundwater quality, and may be rapidly transported large distances by the underlying karst hydrogeology, depending on site conditions.

With respect to underground gas releases, local emergency management planning will need to address the possibility of migration and accumulation in naturally-occurring caves, conduits and voids underground, in addition to pathways made by man. PennEast's draft Resource Report 11 ("Reliability and Safety") addresses "...how the project facilities would be designed, constructed, operated, and maintained to minimize potential hazard to the public from the failure of project components because of accidents or natural catastrophes." The topic of emergency response and safety is beyond the scope of this evaluation, except to note the abovementioned potential for underground migration created by the geology of the area.

With respect to potential impacts to groundwater quality and water supplies, Draft Resource Report 2 ("Water Use and Quality") states that "...no public and/or private water supply wells or springs are located within 150 feet of the pipeline construction workspace." Section 6.3 of PennEast's draft Report 6 states: "In the unlikely event that the construction of the Project causes a permanent impact to a groundwater well, rendering the groundwater unsafe for drinking, PennEast will replace or provide an alternate water source."

Draft Resource Report, Section 2 2.2.6 ("Summary of Groundwater Effects and Mitigation") states the following:

> *As engineering design progresses, potential groundwater effects will be evaluated, and mitigating measures will be implemented where appropriate.*

Measures for minimizing and mitigating impact on groundwater will likely include the following:

- *Special blasting techniques as described in the Blasting Plan.*
- *Installation of trench breakers where appropriate.*
- *The use of special dewatering methods as appropriate.*
- *No refueling or storage of hazardous materials will occur within a 200-foot radius of private wells, and 400-foot radius of community and municipal wells.*
- *PennEast will work with well owners to develop and implement plans for monitoring groundwater quality and public/private supply well yields before and after construction to determine whether water supplies have been affected by pipeline construction activities.*
- *In the event of damage resulting from construction PennEast will mitigate the damage through measures which may include, but are not limited to, providing temporary sources of potable water, and conducting the restoration, repair, or replacement or water supplies.*

From the above, the risk of groundwater contamination occurring as a result of the gas pipeline project is generally anticipated to be low. However, in the event that contaminants are released their movement through the karst hydrogeologic system has the potential to be extensive under the right conditions, and the proposed mitigation measures would need to be implemented.

2.6 Piping Material and Weld Defects

The U.S. gas transmission industry is highly regulated both with respect to construction standards as well as operations and maintenance requirements. The Pipeline and Hazardous Materials Safety Administration (PHMSA) and the U.S. Department of Transportation (DOT) guidelines include, but are not limited to, pipeline material standards, operating pressure limits, corrosion and cathodic protection system design, valve spacing, testing and qualification of employees, pipeline operations testing, ongoing monitoring and inspection of the pipeline facilities, internal inspections of the pipeline, welding procedures and testing, including the X-ray testing of all pipeline welds, pipeline depth, public awareness programs, odorization requirements, and ongoing integrity management programs.

PHMSA inspection protocols are largely based on pipeline "class locations" which consider building densities along the pipeline route with consideration potential impact radius. Based on the proposed pipeline diameter, it is generally expected that the resulting potential impact radius would place much of the route through Bethlehem Township in the highest classifications thereby requiring the most stringent specifications relative to the pipeline standards and inspection frequencies.

Pipeline construction is expected to conform to industry standards. All sections of the pipeline will be rigorously tested prior to the pipeline being put into operation. Construction defects resulting in an accident or release is generally anticipated to be of minor concern.

Pipeline maintenance rules are covered in Code of Federal Regulations (CFR) sections, 49 CFR 192 for natural gas pipelines. It is expected that PennEast will inspect the pipeline regularly in order to identify and mitigate issues long before they become problematic. It is anticipated that much of the inspection work will be conducted via in-line inspection devices which incorporate electromagnetic acoustic, magnetic flux, and other advanced technologies. These diagnostic inspection devices (smart pigs) will travel through the pipeline gathering information without stopping flow of product. Smart pigs are capable of producing terabytes of data about the pipeline, intending to measure wall thickness and geometric shape, identify dents and microscopic cracks, in addition to other elements associated with the pipeline integrity. Other maintenance activities include checking of cathodic protection levels for the proper range, surveillance for construction, erosion, or leaks by foot, land vehicle, or air, and running of cleaning pigs, if warranted.

2.7 Flooding, River Scour, River Channel Migration

As discussed in other sections of this Analysis, the construction, maintenance and operation of natural gas transmission pipelines is highly regulated. In 2015, the PHMSA issued an updated advisory bulletin to all pipeline owners or operators relative to the actions that operators are to consider relative to insuring the integrity of pipelines in the event of flooding, river scour, and river channel migration. A copy of the advisory bulletin is provided in Appendix B.

Design of the Lehigh River crossing should conform to engineering best practices in order to provide for a crossing sufficient to withstand the risks posed by anticipated flood conditions, river scour and river channel migration. Soil borings and other expert analysis will be required to determine appropriateness of the means and methods of the crossing installation. With regular surveillance of the crossing and the pipeline integrity, potential for rupture in the vicinity of the crossing is generally anticipated to be of minor concern.

3.0 - FREQUENCY OF FUTURE RISK ASSESSMENTS/INSPECTIONS

3.1 General

Once the pipeline is in-service, it is expected that PennEast inspectors will regularly inspect pipeline, conduct leak surveys and send sensor equipment through the line to ensure that pipeline integrity has not been compromised. Further, it is expected that PennEast's operator will continuously monitor (24/7/365) gas pressure and flow in the pipeline. Federal requirements dictate that PennEast will perform leak surveys at least annually and with internal inspections at no less than seven year intervals. Additionally, the pipeline will be clearly marked at all road crossings, creeks, property lines, and fence lines to minimize the potential for third-party damage.

Typical of the pipeline industry, it is expected that aerial patrols of the pipeline rights-of-way will be completed at least once a week (in high hazard areas, as often as three times a week). Mowing and clearing of the right-of-way allows for patrols by both air and ground to discover activity that could lead to pipeline damage. It also allows the company to easily discover leaks and natural earth movement that could lead to damage of the pipeline facilities. Aerial patrols provide a bird's-eye view of the pipeline and surrounding community. Pilots will be tasked with looking for ground changes, construction activities, or other conditions that could affect the pipeline. Right-of-way maintenance is important because it will make the location of pipeline more clearly apparent to the individuals that might consider excavation in the vicinity of the pipeline.

3.2 Routine Current Monitoring for Cathodic Protection

Proper electric current flow along the surface of a pipeline impedes corrosive activity, and, is expected to prolong the useful life of the pipeline for many decades. While the amount of current applied to the pipeline will be harmless to humans, animals, and other forms of life, as indicated earlier in the Risk Analysis, the ICCP has the potential to cause corrosion to unprotected underground water, stormwater and wastewater piping systems. PennEast should be required to conduct a surface potential gradient survey and provide notifications to public utility owners in Bethlehem Township, whenever there are modifications to the PennEast ICCP.

3.3 Sign/Marker Maintenance

PennEast is expected to place markers and signs along the pipeline right-of-way to inform the public of the presence of the pipeline. The markers should be placed at road crossings, railroad crossings and other significantly visible points along the right-of-way to reduce the possibility of damage to or interference with the transmission main. In densely populated areas, it is normal for markers to be placed within "line of sight" proximity (meaning that the markers should be placed close together so that they can be seen from one marker to the next.) Signs should be placed where the pipelines cross major waterways. The markers and signs include the name of the PennEast pipeline business unit along with emergency phone numbers to call if any abnormal condition or suspicious activity is detected.

3.4 Waterway Inspections

Locations where the pipeline crosses waterways should be inspected every year (and after every 100 year flood event) to check for bank erosion, visible pipeline exposure, and natural gas leaks indicated by bubbles. Depending on the construction methods utilized during the crossing construction, underwater inspections to determine if the pipeline is adequately covered may be warranted. If the pipeline does not have adequate cover, any coating damage should be repaired and the pipeline should be re-covered.

4.0 – SUMMARY OF RECOMMENDATIONS

4.1 General

- Every proposed crossing (or nearby parallel installation) of existing utility piping should be individually reviewed as part of PennEast's design process. Polyethylene encasement conforming to ANSI/AWWA C105/A21.5 should be provided on all existing water, wastewater and stormwater piping wherever the potential for stray currents exist. A surface potential gradient survey and notifications to all public utility owners in the Township should be provided whenever PennEast modifies the pipeline's ICCP.

- Sinkholes and other risks associated with carbonate geology: Consistent with §230-75 of the Township Code, PennEast should perform geologic studies, and, submit reports from a professional geologist, or a professional engineer with demonstrable education or experience in geotechnical engineering to the Township relating to the hazards. PennEast's contractors should utilize the construction methods, techniques and procedures set forth in those reports and/or as recommended by their professionals to mitigate any ground subsidence hazards.

- The Township should ensure Planning/Zoning/Permits Department personnel are aware of the location of every hazardous liquid or natural gas transmission easement in the Township, in order to ensure that no one obtains a permit for work near a transmission main without clear information regarding the location and setback restrictions. Coordination of future construction activities with the pipeline company should be required as part of any excavation work done within 150 feet of the pipeline.

- The Township should ensure that all new land use planning documents clearly mark and label the location of hazardous liquid or natural gas transmission main easements.

- The Township should require that New Land Development Plans disclose the proximity of transmission pipeline(s) wherever the property is within 1,000 feet of the pipeline company's right-of-way or easement.

- Waterway crossings should be inspected annually (and after every 100 year flood event.)

4.2 Setbacks

The American Petroleum Institute (API) recommends setbacks of 50 feet for new homes, businesses, and places of public assembly with a setback of 25 feet for garden sheds, septic tanks, and water wells. Pipeline operators generally favor substantial setbacks for established pipeline easements. Typically, setbacks lessen the likelihood of third party damage from encroachment activity and lessen the possibility of personal injuries if there is a release from a transmission pipeline. In contrast, when a new natural gas transmission pipeline is being sited, pipeline operators often do not want to pay for a *wide* easement.

The Township should establish setbacks for hazardous liquid and natural gas transmission pipelines to minimize the risk of third party damage to the pipeline. (Because the precise location of a pipeline within an easement or right-of-way is not always known, setbacks should be measured from the edge of the pipeline easement or right-of-way.) In considering the establishment of setbacks associated with hazardous liquid or natural gas pipelines, the Township will need to balance the financial burden that might be imposed on landowners whose property adjoins or is near the pipeline right-of-way or easement because they generally are not compensated for reduced development potential if the easement is not on their property. As the proposed route of the PennEast pipeline crosses a number of differing zoning districts, (*i.e.* Agricultural, Rural Residential, Office/Business, Planned Commercial, etc.), the Township may wish to consider each individual zoning district separately in reviewing potential setback requirements.

4.3 Land Use Above the Pipeline

In many communities, linear parks and recreation paths are located on or along pipeline easements and/or right-of-ways. The Township's property at 3001 Hope Road (PARID: M8 9 15B 0205E) would appear to be a candidate for a similar use. The Township may want to consider the installation of paving or athletic fields over the pipeline, as such improvements would be expected to help preclude unauthorized excavation over the pipeline.

APPENDIX A

APPENDIX A

Ductile Iron Pipe Research Association

Stray Current Effects on Ductile Iron Pipe

April 2015

dipra
Ductile Iron Pipe
Research Association

Strength and Durability for Life

CORROSION CONTROL

Stray Current Effects on Ductile Iron Pipe

By Richard W. Bonds, P.E.

Last Revised:
April, 2015

Stray currents pertaining to underground pipelines are direct currents flowing through the earth from a source not related to the pipeline being affected. When these stray direct currents accumulate on a metallic pipeline or structure, they can induce electrolytic corrosion of the metal or alloy. Sources of stray current include cathodic protection systems, direct current power trains or street cars, arc-welding equipment, direct current transmission systems, and electrical grounding systems.

To cause corrosion, stray currents must flow onto the pipeline in one area, travel along the pipeline to some other area or areas where they then leave the pipe (with resulting corrosion) to re-enter the earth and complete the circuit to their ultimate destination. The amount of metal lost from corrosion is directly proportional to the amount of current discharged from the affected pipeline.[1]

Fortunately, in most cases, corrosion currents on pipelines are only thousandths of an ampere (milliamps). With galvanic corrosion, current discharge is distributed over wide areas, dramatically decreasing the localized rate of corrosion. Stray current corrosion, on the other hand, is restricted to a few small points of discharge, and, in some cases, penetration can occur in a relatively short time.

Considering the amount of buried iron pipe in service in the United States, stray current corrosion problems for electrically discontinuous gray iron and Ductile Iron Pipe are very infrequent. When encountered, however, there are two main techniques for controlling stray current electrolysis on underground pipelines. One technique involves insulating or shielding the pipeline from the stray current source; the other involves draining the collected current by either electrically bonding the pipeline to the negative side of the stray current source or installing grounding cell(s).[2]

Inquiries to the Ductile Iron Pipe Research Association (DIPRA) show that, of the different sources of stray current previously mentioned, impressed current cathodic protection systems on nearby structures have been the major concern of water utilities. As a result, DIPRA has conducted research for many years on the effects of stray currents from cathodic protection systems on both bare and polyethylene encased iron pipe. The cause, investigation, and mitigation of this source of stray current on iron pipe is the focus of this article.

Ductile Iron Pipe is Electrically Discontinuous

Ductile Iron Pipe is manufactured in nominal 18- and 20- foot lengths and employs a rubber-gasketed jointing system. Although several types of joints are available for Ductile Iron Pipe, the push-on joint and, to a lesser degree, the mechanical joint are the most prevalent.

These rubber-gasketed joints offer electrical resistance that can vary from a fraction of an ohm to several ohms, which is sufficient for Ductile Iron Pipelines to be considered electrically discontinuous. A Ductile Iron Pipeline thus comprises 18- to 20- foot-long conductors that are electrically independent of each other. Because the joints are electrically discontinuous, the pipeline exhibits increased longitudinal resistance and does not readily attract stray direct current. Any accumulation, which is typically insignificant, is limited to short electrical units.

Joint resistance has been measured at numerous test sites as well as in operating water systems. Table 1 lists 45 joints tested at a DIPRA stray current test site in an operating system in New Braunfels, Texas. In 830 feet of 12-inch-diameter push-on-joint Ductile Iron Pipe, nine joints were found to be shorted. Such shorts sometimes result from metal-to-metal contact between the spigot end and bell socket due to the joint being deflected to its maximum. Due to oxidation of the contact surfaces, however, shorted joints can develop sufficient resistance over time to be considered electrically discontinuous with regard to stray currents.

FIGURE 1

Stray Current Test Site, Kansas City, Missouri

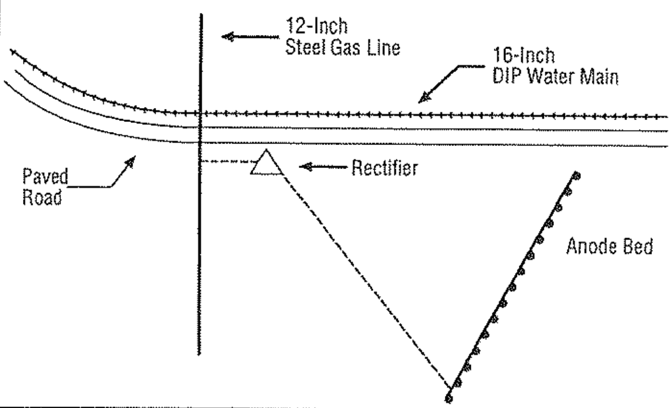


TABLE 1

Joint Resistance Measurements
Existing 12-Inch Ductile Iron pipeline
New Braunfels, Texas

Joint No.	Reading	Joint No.	Reading
1	14.0 ohms	24	10.0 ohms
2	Shorted	25	5.4 ohms
3	Shorted	26	3.4 ohms
4	Shorted	27	3.7 ohms
5	Shorted	28	5.0 ohms
6	2.5 ohms	29	6.1 ohms
7	5.9 ohms	30	2.3 ohms
8	Shorted	31	3.3 ohms
9	2.7 ohms	32	5.1 ohms
10	15.0 ohms	33	3.5 ohms
11	6.0 ohms	34	3.2 ohms
12	20.0 ohms	35	4.0 ohms
13	7.2 ohms	36	3.0 ohms
14	Shorted	37	2.8 ohms
15	Shorted	38	3.9 ohms
16	5.6 ohms	39	3.8 ohms
17	4.6 ohms	40	23.0 ohms
18	9.3 ohms	41	4.2 ohms
19	5.3 ohms	42	14.0 ohms
20	5.5 ohms	43	3.2 ohms
21	5.7 ohms	44	Shorted
22	7.1 ohms	45	Shorted
23	17.0 ohms		

The ability of electrically discontinuous Ductile Iron Pipe to deter stray current was demonstrated in an operating system in Kansas City, Missouri, where a 16-inch Ductile Iron Pipeline was installed approximately 100 feet from an impressed current anode bed (Figure 1). A 481-foot section of the pipeline was installed so that researchers could bond all the joints or only every other joint. When current measurements were made on this section of pipeline, it collected more than 5-1/2 times the current when all joints were bonded than when every other joint was bonded (Figure 2, next page).

The effect of joint bonding on stray current accumulation has also been demonstrated in the laboratory. Figure 3, next page, illustrates a stray current environment installed outside the DIPRA laboratory consisting of three sections of 6-inch diameter push-on-joint Ductile Iron Pipe.

FIGURE 2

Effect of Joint Bonding Field Installation Kansas City, Missouri

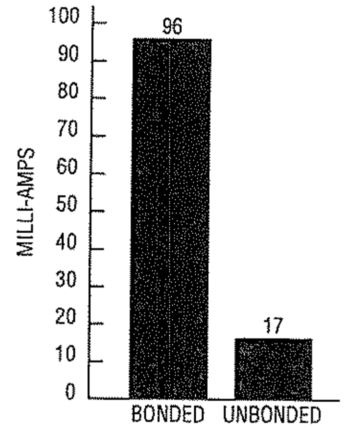


FIGURE 3

DIPRA Stray Current Study

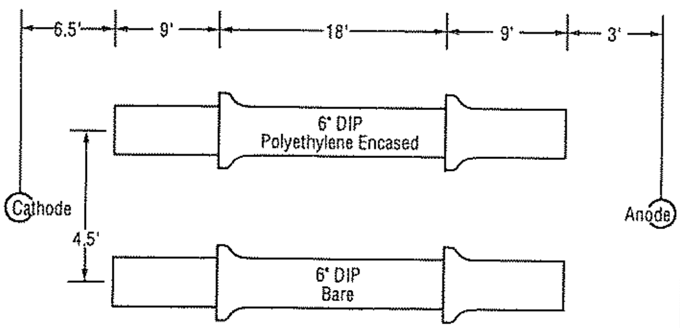
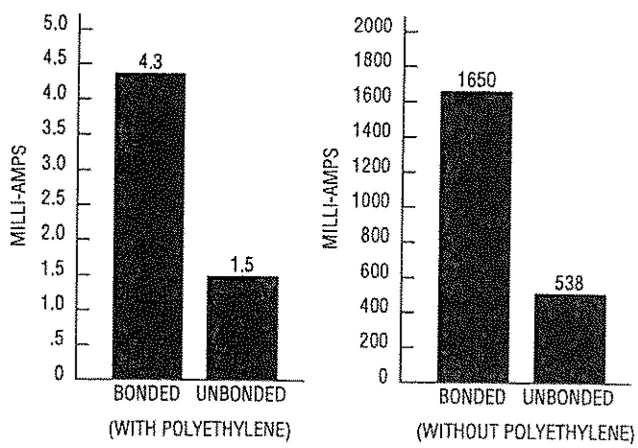


FIGURE 4

Effects of Joint Bonding - Laboratory Installation Rectifier Output: 8 AMPS



The pipe was installed so that researchers could test combinations of bonded joints, unbonded joints, polyethylene-encased pipe, and bare pipe. It was found that pipe with bonded joints collected three times more current than pipe with unbonded joints (Figure 4). Also, when exposed to the same environment, the bare pipe collected more than 1,100 times the current collected by the pipe encased in 8-mil polyethylene.[3]

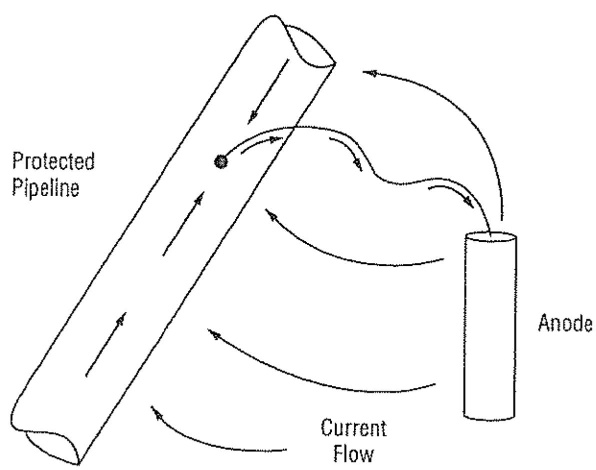
Cathodic Protection Systems

Cathodic protection, which is a system of corrosion prevention that turns the entire pipeline into the cathode of a corrosion cell, is used extensively on steel pipelines in the oil and gas industries. The two types of cathodic protection systems are galvanic and impressed current.

Galvanic cathodic protection systems utilize galvanic anodes, also called sacrificial anodes, that are electrochemically more active than the structure to be protected. These anodes are installed relatively close to the structure, and current is generated by metallically connecting the structure to the anodes. Current is discharged from the anodes through the electrolyte (soil in most cases) and onto the structure to be protected. This system establishes a dissimilar metallic corrosion cell strong enough to counteract normally existing corrosion currents (Figure 5). Galvanic cathodic protection systems normally consist of highly localized currents, which are low in magnitude. Therefore, they are generally not a concern of stray current for other underground structures.[4]

FIGURE 5

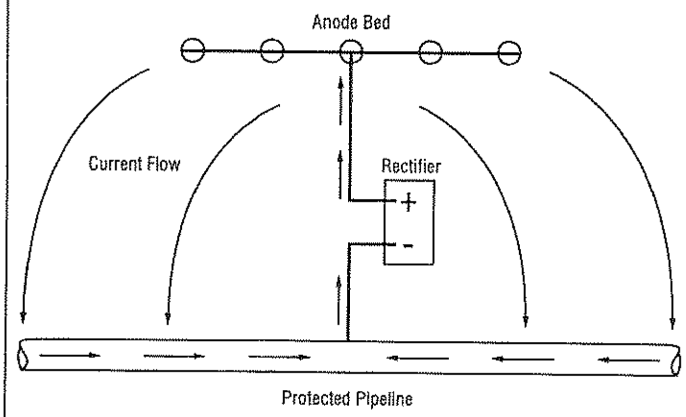
Galvanic Cathodic Protection System



Stray current corrosion damage is most commonly associated with impressed current cathodic protection systems utilizing a rectifier and anode bed. The rectifier converts alternating current to direct current, which is then impressed in the cathodic protection circuit through the anode bed. The rectifier's output can be less than 10 volts or more than 100 volts, and less than 10 amperes to several hundred amperes. The impressed current discharge from the ground bed travels through the earth to the pipeline it is designed to protect and returns to the rectifier by a metallic connection (Figure 6). Unlike galvanic cathodic protection systems, one impressed current ground bed normally protects miles of pipeline.

FIGURE 6

Impressed Current Cathodic Protection System



Ductile Iron Pipelines in Close Proximity to Impressed Current Anode Beds

Whether an impressed current cathodic protection system might create a problem on a Ductile Iron Pipeline system depends largely on the impressed voltage on the anode bed and its proximity to the Ductile Iron Pipeline. In general, the greater the distance between the anode bed and the Ductile Iron Pipeline, the less the possibility of stray current interference.

If a Ductile Iron pipeline is in close proximity to an impressed current cathodic protection anode bed, a potential stray current problem might exist. Around the anode bed (the area of influence), the current density in the soil is high, and the positive earth potentials might force the Ductile Iron Pipeline to pick up current at points within the area of influence. For this current to complete its electrical circuit and return to the negative terminal of the rectifier, it must leave the Ductile Iron Pipeline at one or more locations, resulting in stray current corrosion.

FIGURE 7

Stray Current From A Cathodic Protection Installation

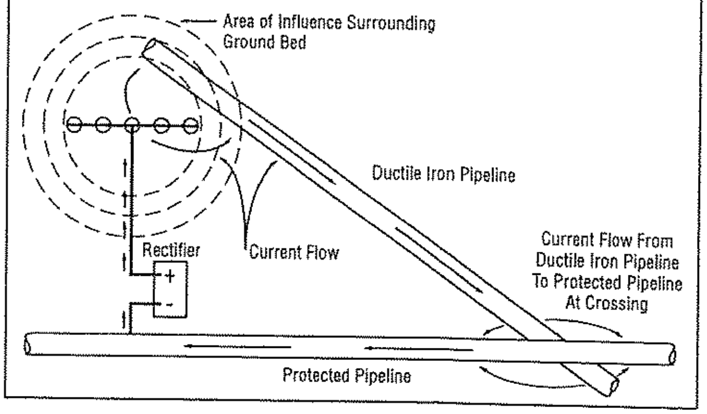


Figure 7 shows a Ductile Iron Pipeline passing close to the impressed current ground bed and then crossing the protected pipeline at a more remote location. Here, if the current density is high enough, current is picked up by the Ductile Iron Pipeline in the vicinity of the anode bed. The current then travels down the Ductile Iron Pipeline, jumping the joints, toward the crossing. It then leaves the Ductile Iron Pipeline and is picked up by the protected pipeline to complete its electrical circuit and return to the negative terminal of the rectifier. At the locations where the current leaves the Ductile Iron Pipeline, usually in the vicinity of the crossing and/or in areas of low soil resistivity, stray current corrosion results.

Figure 8, next page, shows a Ductile Iron Pipeline paralleling a cathodically protected pipeline and passing close to its impressed current anode bed. Again, if the current density is high enough, the Ductile Iron pipeline may pick up current in the vicinity of the anode bed, after which the current flows along the Ductile Iron Pipeline in both directions and leaves to return to the protected pipeline in more remote areas. This may result in current discharging from the Ductile Iron Pipeline in many areas, usually in low soil resistivity areas, rather than concentrated at the crossing as in the previous example.

FIGURE 8

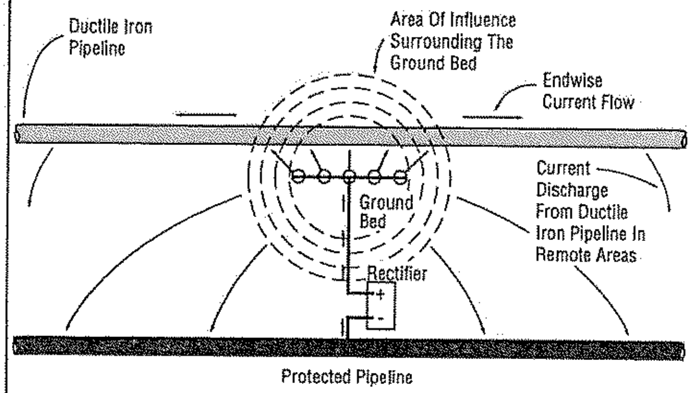
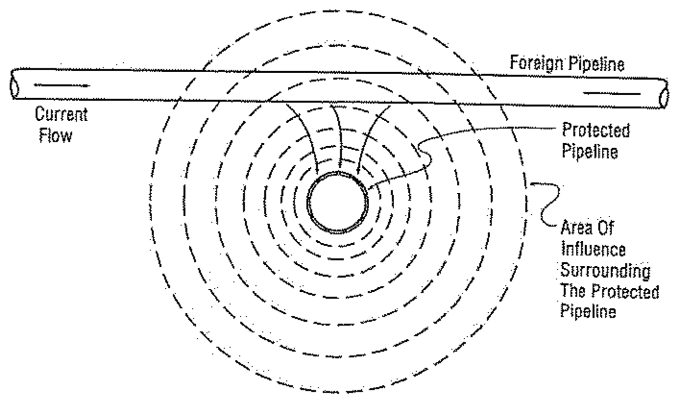


FIGURE 9

Foreign pipeline Passing Through Potential Gradients Around Cathodically Protected Bare pipeline



Normally, electrically discontinuous Ductile Iron Pipe will not pick up stray current unless it comes close to an anode bed where the current density is high.

Pipeline Crossings Remote to Impressed Current Anode Beds

Usually, a stray current problem will not exist where a Ductile Iron Pipeline crosses a cathodically protected pipeline whose anode bed is not in the general vicinity. A potential gradient area surrounds a cathodically protected pipeline due to current flowing to the pipeline from remote earth. This current causes the soil adjacent to the pipeline to become more negative with respect to remote earth. The intensity of the area of influence around a protected pipeline is a function of the amount of current flowing to the pipeline per unit area. If a foreign pipeline crosses a cathodically protected pipeline and passes through this potential gradient, it tends to become positive with respect to adjacent earth. Theoretically, the voltage difference between pipe and earth can force the foreign pipeline to pick up cathodic protection current in remote sections and discharge it to the protected pipeline at the crossing, causing stray current corrosion on the foreign pipeline (Figure 9). Because the intensity of the potential gradient around the protected pipeline is small – negligible for well-coated pipelines – and because Ductile Iron pipelines are electrically discontinuous, stray current corrosion is rarely a problem for Ductile Iron Pipe systems crossing cathodically protected pipelines if the impressed current anode bed is remote. At these locations, the Ductile Iron Pipeline can be encased with polyethylene per ANSI/AWWA C105/A21.5 for a 20-foot perpendicular distance on each side of the crossing for precautionary purposes.

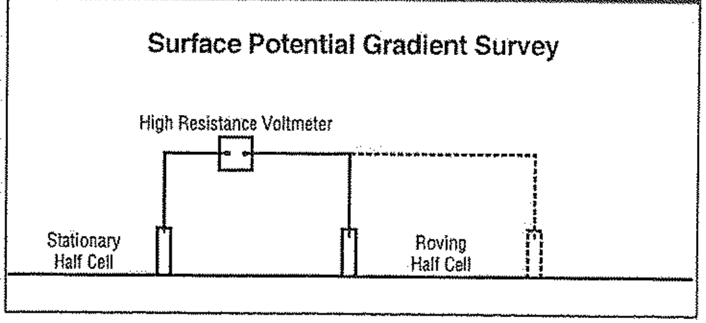
Investigation of the Pipeline Route Prior to Installation

It is important to inspect the pipeline route during the design phase for possible stray current sources. If stray current problems are suspected, mitigation measures can be designed into the system, the pipeline can be rerouted, or the anode bed can be relocated.

If, during the visual inspection, an impressed current cathodic protection rectified anode bed is encountered in the general vicinity of the proposed pipeline, one method of investigating the possibility of potential stray current problems is to measure the potential difference in the soil along the proposed pipeline route in the area of the anode bed. This can be done by conducting a surface potential gradient survey using two matched half cell electrodes (usually copper-copper sulfate half cells) in conjunction with a high resistance voltmeter. When the half cells are spaced several feet apart in contact with the earth and in series with the high resistance voltmeter, earth current can be detected by recording any potential difference. The potential gradient in the soil, which is linearly proportional to the current density, can then be evaluated by dividing the recorded potential difference by the distance separating the two matched half cells.

When conducting a surface potential gradient survey, one half cell can be designated as "stationary" and placed directly above the proposed pipe alignment while the other half cell is designated as "roving" (Figure 10, next page). Potential difference readings are then recorded

FIGURE 10



as the roving half cell is moved in intervals along the proposed route. A graph of potential vs. distance along the proposed pipeline can then be constructed. Normally, depending on the geometry of the ground bed, cathodically protected pipeline, and foreign pipeline locations, the highest current density will be found closest to the anode bed. Usually, the higher the current density, the greater the possibility of encountering a stray current corrosion problem on the proposed pipeline.

The installation of a Ductile Iron Pipeline typically will not appreciably change the potential profile. This allows the engineer to make recommendations based on the surface potential gradient survey conducted prior to pipeline installation. Figure 11 and Figure 12 are surface potential gradient survey graphs of stray current test sites located in New Braunfels, Texas, and in San Antonio, Texas, respectively, which compare the current density profile before and after installation of the Ductile Iron pipeline. As can be seen, there is very little difference in the current densities of the two profiles regarding their slope and their boundaries – a fact evidenced in numerous other installations and test sites.

FIGURE 11

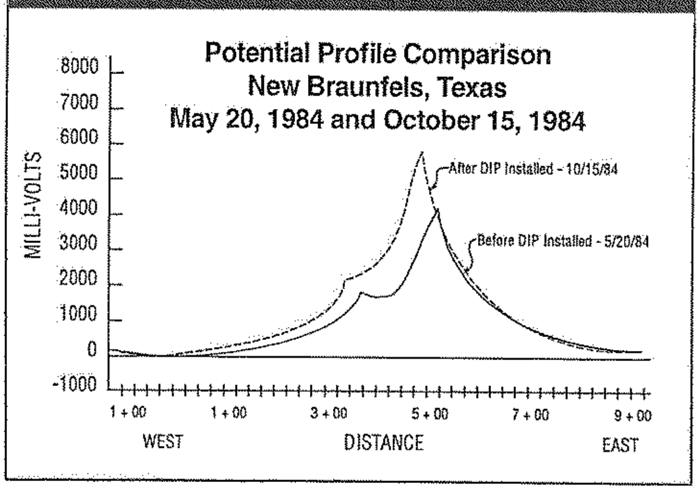
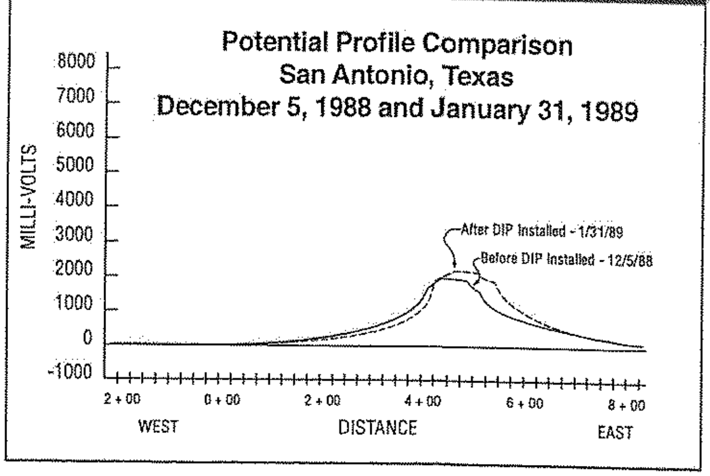


FIGURE 12



pipeline installations can vary by geometry, soil resistivity, water table, pipe sizes, pipeline coating, rectifier output, etc. Yet by knowing the potential gradient prior to installation, the engineer can predict – using conservative values – whether the proposed pipeline will be subjected to stray current corrosion.

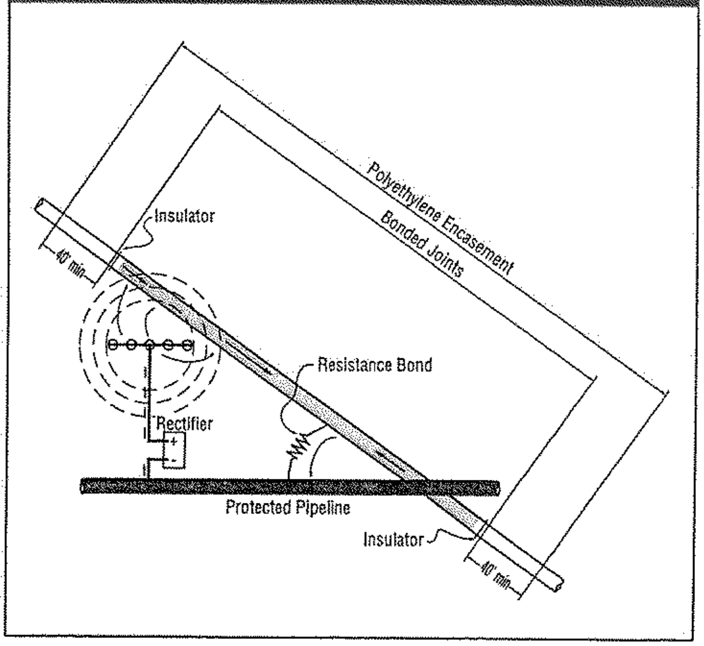
Mitigation of Stray Current

Electrical currents in the earth follow paths of least resistance. Therefore, the greater the electrical resistance a foreign pipeline has, the less it is susceptible to stray currents. Ductile Iron Pipelines offer electrical resistance at a minimum of every 18 to 20 feet due to their rubber-gasketed joint systems. This in itself is a big deterrent to stray current accumulation. The effect of joint electrical discontinuity can be greatly enhanced by encasing the pipe in loose dielectric polyethylene encasement in accordance with ANSI/AWWA C105/A21.5.

The electrical discontinuity of Ductile Iron Pipelines and the shielding effect of polyethylene are effective deterrents to stray current accumulation and are all that is required in the vast majority of stray current environments. This would include any crossing of cathodically protected pipelines and/or where the Ductile Iron Pipeline parallels a cathodically protected pipeline. At these locations the potential gradient is created by the protective current flowing to the protected pipeline and is normally small.

There are isolated incidents where electrical discontinuous joints and polyethylene encasement would not be adequate to protect the pipe, e.g., the Ductile Iron Pipeline passing through, or very close to, an impressed current cathodic protection anode bed. When this is encountered, consideration should be given to rerouting the pipeline or relocating the anode bed. If neither of these options is feasible, the potential area of high density stray current should be defined (this can be accomplished by conducting a surface potential gradient survey), the Ductile Iron Pipe in this area should be electrically bonded together and electrically isolated from adjacent pipe, polyethylene encasement should be installed in accordance with ANSI/AWWA C105/A21.5 through the defined area and extended for a minimum of 40 feet on either side of said area, and appropriate test leads and "current drain" should be installed. A typical installation is shown in Figure 13.

FIGURE 13



In the defined area, the Ductile Iron Pipe will probably collect stray current. This area needs to be electrically isolated from adjacent piping that will not be collecting stray current. One method of achieving this is installing insulating couplings. Bonding of joints in this area ensures that corrosion will not occur at the joints.

Polyethylene encasement of the pipe in the defined area dramatically reduces the amount of collected stray current. This helps to contain the area of influence and reduces the power consumption of the cathodic protection system. The polyethylene encasement extending on either side of the said area shields the pipe from collecting stray current. Test leads for monitoring are normally installed on each side of the insulators and in the location of the crossing, if one exists. By having test leads on each side of the insulators, their effective electrical isolation can be ascertained. The test leads on the insides of the insulators can also be used to check whether the bonded section is, in effect, electrically continuous.

The collected current then will need to be effectively drained back to the cathodic protection system. This can be accomplished by installing a resistance bond from the affected area of the Ductile Iron Pipeline to the protected pipeline or to the negative terminal of the rectifier. Resistance can then be regulated to achieve a desired potential on the Ductile Iron Pipeline and reduce the current consumption from the cathodic protection system. Another method of draining the collected current is the design and installation of grounding cells. These grounding cells normally consist of anodes located in areas of current discharge.

Conclusions

DIPRA has conducted numerous investigations in major operating water systems where Ductile Iron Pipelines crossed cathodically protected gas and petroleum pipelines. These investigations involved rectifiers and anodes located in the immediate vicinity (within several hundred feet of the crossing), as well as those located at remote distances.

When the anode beds were remote to the crossings, all investigations indicated that the amount of influence on the Ductile Iron Pipe was negligible and would not be considered detrimental to the expected life of the system. In installations where the anode bed was located in the immediate vicinity, the findings were influenced by factors such as rectifier output, soil resistivity, diameter of the respective pipelines, condition of the coating on the protected line, etc. Despite these variables, several observations confirmed the findings of laboratory tests. The most significant was the efficacy of rubber-gasketed joints and polyethylene encasement in deterring stray current from Ductile Iron Pipelines.

Throughout the United States, thousands of Ductile Iron and gray iron pipelines cross cathodically protected pipelines. Yet very few actual failures from stray current interference have been reported.

This is additional strong evidence that stray current corrosion will seldom be a significant problem for electrically discontinuous Ductile Iron Pipelines. The bonding of joints and the use of galvanic anodes or drainage bonds may well be a solution to stray current interference in high current density areas, but these systems must be carefully maintained and monitored. If the anode grounding cell becomes depleted or the drainage connection broken, the bonded Ductile Iron Pipeline will be more vulnerable to stray current damage than if the pipe had been installed without joint bonds. Therefore, such measures should be taken only where stray current interference is inevitable. In most cases, passive protective measures such as polyethylene encasement are more desirable.

References

1. A. W. Peabody, *Control of Pipeline Corrosion*, National Association of Corrosion Engineers, Houston, Texas.

2. E. F. Wagner, "Loose Plastic Film Wrap as Cast-Iron Pipe Protection," Presented September 17, 1963, at AWWA North-Central Section Meeting, Reprinted in *Journal* AWWA, Vol. 56, No. 3, pp. 361-368, (March 1964).

3. T. F. Stroud, "Corrosion Control Measures for Ductile Iron Pipe," National Association of Corrosion Engineers, 1989 Conference.

4. W. Harry Smith, "Corrosion Management in Water Supply Systems," Van Nostrand Reinhold, 1989.

Ductile Iron Pipe Research Association

An association of quality producers dedicated to the highest pipe standards through a program of continuing research and service to water and wastewater professionals.

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Ductile Iron Pipe Research Association

APPENDIX B

APPENDIX B

PHMSA Issuance of Advisory Bulletin

Potential for Damage to Pipeline Facilities Caused by Flooding, River Scout, and River channel Migration

April 2015

workshop will be webcast. Attendees, both in person and by webcast, are strongly encouraged to register to help ensure accommodations are adequate.

Presentations will be available online at the meeting page and also be posted in the E-Gov Web site: *http://www.regulations.gov,* at docket number PHMSA–2014–0014 within 30 days following the meeting.

Authority: 49 U.S.C. Chapter 601 and 49 CFR 1.97.

Issued in Washington, DC, on April 3, 2015.

Jeffrey D. Wiese,

Associate Administrator for Pipeline Safety.

[FR Doc. 2015–08115 Filed 4–8–15; 8:45 am]

BILLING CODE 4910–60–P

DEPARTMENT OF TRANSPORTATION

Pipeline and Hazardous Materials Safety Administration

[Docket No. PHMSA–2015–0105]

Pipeline Safety: Potential for Damage to Pipeline Facilities Caused by Flooding, River Scour, and River Channel Migration

AGENCY: Pipeline and Hazardous Materials Safety Administration (PHMSA); DOT.

ACTION: Notice; Issuance of Advisory Bulletin.

SUMMARY: PHMSA is issuing this updated advisory bulletin to all owners and operators of gas and hazardous liquid pipelines to communicate the potential for damage to pipeline facilities caused by severe flooding. This advisory includes actions that operators should consider taking to ensure the integrity of pipelines in the event of flooding, river scour, and river channel migration.

FOR FURTHER INFORMATION CONTACT: Operators of pipelines subject to regulation by PHMSA should contact the appropriate PHMSA Region Office. The PHMSA Region Offices and their contact information are as follows:

- Central Region: 816–329–3800, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin
- Eastern Region: 609–989–2171, Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia
- Southern Region: 404–832–1147, Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, and Tennessee
- Southwest Region: 713–272–2859, Arkansas, Louisiana, New Mexico, Oklahoma, and Texas
- Western Region: 720–963–3160, Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming

Intrastate pipeline operators should contact the appropriate state pipeline safety authority. A list of state pipeline safety authorities is provided at: *www.napsr.org*

SUPPLEMENTARY INFORMATION:

I. Background

Section 192.613(a) of the Pipeline Safety Regulations (49 CFR parts 190–199) states that "[e]ach operator shall have a procedure for continuing surveillance of its facilities to determine and take appropriate action concerning changes in class location, failures, leakage history, corrosion, substantial changes in cathodic protection requirements, and other unusual operating and maintenance conditions." Section 192.613(b) further states that "[i]f a segment of pipeline is determined to be in unsatisfactory condition but no immediate hazard exists, the operator shall initiate a program to recondition or phase out the segment involved, or, if the segment cannot be reconditioned or phased out, reduce the maximum allowable operating pressure in accordance with § 192.619(a) and (b)."

Likewise, § 195.401(b)(1) of the Pipeline Safety Regulations states that "[w]henever an operator discovers any condition that could adversely affect the safe operation of its pipeline system, it must correct the condition within a reasonable time. However, if the condition is of such a nature that it presents an immediate hazard to persons or property, the operator may not operate the affected part of the system until it has corrected the unsafe condition." Section 195.401(b)(2) further states that "[w]hen an operator discovers a condition on a pipeline covered under [the integrity management requirements in] § 195.452, the operator must correct the condition as prescribed in § 195.452(h)." Severe flooding, river scour, and river channel migration are the types of unusual operating conditions that can adversely affect the safe operation of a pipeline and require corrective action under §§ 192.613(a) and 195.401(b).

In addition, Part 194 requires operators of onshore oil pipelines to "include procedures and a list of resources for responding, to the maximum extent practicable, to a worst case discharge and to a substantial threat of such a discharge" under § 194.107(a). Per § 194.115, the operator must "identify, and ensure, by contract or other approved means, the resources necessary to remove, to the maximum extent practicable, a worst case discharge and to mitigate or prevent a substantial threat of a worst case discharge".

Furthermore, an operator must take additional preventative and mitigative measures beyond those already required in Parts 192, 194, and 195 to prevent a pipeline failure and to mitigate the consequences of a pipeline failure per §§ 192.935, 194.107(a) and 195.452(i). An operator must base the additional measures on the threats the operator has identified for each pipeline segment. If an operator determines outside force damage (*e.g.*, earth movement, floods) is a threat to the pipeline, the operator must take steps to minimize the probability of damage and the consequences of a release.

PHMSA has released five Advisory Bulletins on this subject, with the earliest issued July 29, 1993, (ADB–93–03), and the most recent on July 27, 2011, (ADB–11–04; 76 FR 44985). Each of these bulletins followed an event that involved severe flooding that affected pipelines in the areas of rising waters. Four of the more notable events are briefly described below:

On August 13, 2011, Enterprise Products Operating, LLC discovered a release of 28,350 gallons (675 barrels) of natural gasoline in the Missouri River in Iowa. The rupture, according to the metallurgical report, was the result of fatigue crack growth driven by vibrations in the pipe from vortex shedding.

On July 1, 2011, ExxonMobil Pipeline Company experienced a pipeline failure near Laurel, Montana, resulting in the release of 63,000 gallons (1,500 barrels) of crude oil into the Yellowstone River. According to the results of PHMSA's accident investigation, the rupture was caused by channel migration and river bottom scour, leaving a large span of the pipeline exposed to prolonged current forces and debris washing downstream in the river. Those external forces damaged the exposed pipeline.

On July 15, 2011, NuStar Pipeline Operating Partnership, L.P. reported a 4,200 gallon (100 barrels) anhydrous ammonia spill in the Missouri River in Nebraska requiring extensive environmental response and causing supply disruption. The 6-inch-diameter pipeline was exposed by scouring during extreme flooding.

On January 17, 2015, a breach in the Bridger Pipeline Company's Poplar system resulted in another spill into the Yellowstone River near the town of Glendive, Montana, releasing an estimated 28,434 gallons (677 barrels) of crude oil into the river and impacting local water supplies. Preliminary information indicates over 100 feet of pipeline was exposed on the river bottom, and a release point was near a girth weld.

As shown in these events, river bottom scour and channel migration may occur due to seasonal flooding, increased stream velocities, and man-made and natural river bank restrictions. River scour and channel migration may damage a pipeline as a result of additional stresses imposed on the pipe by undermining underlying support soils, exposing the pipeline to lateral water forces and impact from waterborne debris. Lateral water forces may cause excessive bending loads that lead to pipeline failures, and possible impact forces from debris in the river or harmonic vibrations from water rapidly passing over pipelines can also increase the potential for pipeline failures.

Additionally, the safety of valves, regulators, relief sets, pressure sensors, and other facilities normally above ground or above water can be jeopardized when covered by water. Not only can these facilities become inoperable when submerged, but they are also at a greater risk of damage by outside forces, floating debris, river currents, and craft operating on the water. Boaters involved in rescue operations, emergency support functions, sightseeing, and other activities are generally not aware of the seriousness of an incident that could result from their craft damaging a pipeline facility that is unseen beneath the surface of the water. Depending on the size of the craft and the pipeline facility struck, significant pipeline damage may result.

Although accidents at river crossings account for less than one percent of the total number of pipeline accidents, the consequences of a release in water can be much more severe because of the threats to drinking water supplies and the environment. Unlike hazardous liquid releases on land where it can be easier to respond to and contain spills, swift-moving river currents will carry hazardous liquids further downstream, potentially impacting much larger geographical areas and more communities. Product releases in rivers can create difficult, costly, and lengthy spill response and remediation scenarios and activities for operators, communities, and local, state, and Federal responders.

II. Advisory Bulletin (ADB–2015–01)

To: Owners and Operators of Gas and Hazardous Liquid Pipeline Systems.

Subject: Potential for Damage to Pipeline Facilities Caused by Severe Flooding.

Advisory: Severe flooding can adversely affect the safe operation of a pipeline. Operators need to direct their resources in a manner that will enable them to determine and mitigate the potential effects of flooding on their pipeline systems in accordance with applicable regulations. Operators are urged to take the following actions to prevent and mitigate damage to pipeline facilities and ensure public and environmental safety in areas affected by flooding:

1. Utilize experts in river flow, such as hydrologists or fluvial geomorphologists, to evaluate a river's potential for scour or channel migration at each pipeline river crossing.
2. Evaluate each pipeline crossing a river to determine the pipeline's installation method and determine if that method (and the pipeline's current condition) is sufficient to withstand the risks posed by anticipated flood conditions, river scour, or river channel migration. In areas prone to these conditions and risks, consider installing pipelines using horizontal directional drilling to help place pipelines below elevations of maximum scour and outside the limits of lateral channel migration.
3. Determine the maximum flow or flooding conditions at rivers where pipeline integrity is at risk in the event of flooding (*e.g.*, where scour can occur) and have contingency plans to shut down and isolate those pipelines when those conditions occur.
4. Evaluate the accessibility of pipeline facilities and components that may be in jeopardy, such as valve settings, which are needed to isolate water crossings or other sections of pipelines.
5. Extend regulator vents and relief stacks above the level of anticipated flooding as appropriate.
6. Coordinate with emergency and spill responders on pipeline locations, crossing conditions, and the commodities transported. Provide maps and other relevant information to such responders so they can develop appropriate response strategies.
7. Coordinate with other pipeline operators in flood areas and establish emergency response centers to act as a liaison for pipeline problems and solutions.
8. Deploy personnel so that they will be in position to shut down, isolate, contain, or perform any other emergency action on an affected pipeline.
9. Determine if facilities that are normally above ground (*e.g.*, valves, regulators, relief sets, etc.) have become submerged and are in danger of being struck by vessels or debris and, if possible, mark such facilities with U.S. Coast Guard approval and an appropriate buoy.
10. Perform frequent patrols, including appropriate overflights, to evaluate right-of-way conditions at water crossings during flooding and after waters subside. Report any flooding, either localized or systemic, to integrity staff to determine if pipeline crossings may have been damaged or would be in imminent jeopardy from future flooding.
11. Have open communications with local and state officials to address their concerns regarding observed pipeline exposures, localized flooding, ice dams, debris dams, and extensive bank erosion that may affect the integrity of pipeline crossings.
12. Following floods, and when safe river access is first available, determine if flooding has exposed or undermined pipelines because of new river channel profiles. This is best done by a depth of cover survey.
13. Where appropriate, surveys of underwater pipe should include the use of visual inspection by divers or instrumented detection. Pipelines in recently flooded lands adjacent to rivers should also be evaluated to determine the remaining depth of cover. You should share information gathered by these surveys with affected landowners. Agricultural agencies may help to inform farmers of potential hazards from reduced cover over pipelines.
14. Ensure that line markers are still in place or are replaced in a timely manner. Notify contractors, highway departments, and others involved in post-flood restoration activities of the presence of pipelines and the risks posed by reduced cover.

If a pipeline has suffered damage or is shut-in as a precautionary measure due to flooding, the operator should advise the appropriate PHMSA regional office or state pipeline safety authority before returning the line to service, increasing its operating pressure, or otherwise changing its operating status. Furthermore, reporting a Safety-Related Condition as prescribed in §§ 191.23 and 195.55 may also be required.

Authority: 49 U.S.C. Chapter 601 and 49 CFR 1.97

Issued in Washington, DC, on April 6, 2015.

Timothy P. Butters,

Acting Administrator.

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DEPARTMENT OF TRANSPORTATION

Office of the Secretary

Notice of Applications for Certificates of Public Convenience and Necessity and Foreign Air Carrier Permits Filed Under Subpart B (formerly Subpart Q) During the Week Ending March 28, 2015.

The following Applications for Certificates of Public Convenience and Necessity and Foreign Air Carrier. Permits were filed under Subpart B (formerly Subpart Q) of the Department of Transportation's Procedural Regulations (See 14 CFR 302. 201 et. seq.). The due date for Answers, Conforming Applications, or Motions to Modify Scope are set forth below for each application. Following the Answer period DOT may process the application by expedited procedures. Such procedures may consist of the adoption of a show-cause order, a tentative order, or in appropriate cases a final order without further proceedings.

Docket Number: DOT–OST–2015–0064.

Date Filed: March 25, 2015.

Due Date for Answers, Conforming Applications, or Motion to Modify Scope: April 15, 2015.

Description: Application of Altius Aviation, LLC requesting authority to operate scheduled passenger service as a commuter air carrier.

Docket Number: DOT–OST–2015–0065.

Date Filed: March 26, 2015.

Due Date for Answers, Conforming Applications, or Motion to Modify Scope: April 16, 2015.

Description: Application of Air Baltic Corporation A/S ("AirBaltic") requesting a foreign air carrier permit to authorize foreign air transportation to engage in: (i) Foreign scheduled and charter air transportation of persons, property and mail from any point or points behind any Member State of the European Union, via any point or points in any Member State and via intermediate points, to any point or points in the United States and beyond; (ii) foreign scheduled and charter air transportation of persons, property and mail between any point or points in the United States and any point or points in any member of the European Common Aviation Area; (iii) foreign scheduled and charter air transportation of cargo between any point or points in the United States and any other point or points; (iv) other charters pursuant to the prior approval requirements; and (v) transportation authorized by any additional route rights made available to European Union carriers under the U.S.-EU Air Transport Agreement in the future. AirBaltic also requests an exemption to the extent necessary to allow it to provide the services described above for a two-year period or until the requested permit authority becomes effective, whichever occurs first.

Docket Number: DOT–OST–1999–6663 and DOT–OST–2011–0076.

Date Filed: March 24, 2015.

Due Date for Answers, Conforming Applications, or Motion to Modify Scope: April 14, 2015.

Description: Application of United Parcel Service Co. requesting an amendment of its U.S.-Mexico certificate of public convenience and necessity and a related exemption, as well as a designation under the U.S.-Mexico Air Transport Agreement authorizing it to provide scheduled foreign air transportation of property and mail between Dallas, Texas (DFW) and Mexico City, Mexico (MEX).

Barbara J. Hairston,

Supervisory Dockets Officer, Docket Operations, Federal Register Liaison.

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