A PIPELINE OF PROBLEMS

AN OVERVIEW OF GAS PIPELINE SAFETY ISSUES

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INTRODUCTION

Oil and gas pipelines are everywhere, and nowhere. They hide in plain sight, buried, and marked above ground only by a mown right-of-way and the periodic yellow post or mile marker. Because they are not highly visible like transmission lines or power plants, they typically aren't given much thought - unless a pipeline easement touches *your own* property.

Yellow warning post indicating a nearby pipeline in the Upstate of South Carolina. (photo/Shelley Robbins)

Pipeline accidents - leaks, spills, and explosions - hold attention for a few news cycles and then fade away. The claims by pipeline operators are usually along the lines of "this was a rare event and we have safeguards to keep it from happening again." But according to a FracTracker analysis of oil and gas pipeline incidents reported between 2010 and 2023, a fire erupts every 4.2 days, an explosion occurs every 12.2 days, a person is killed in one of these incidents every 29 days, and an injury is reported every 6.5 days. During this time period, there were 2,955 incidents reported *just along methane gas* gathering, transmission, and distributions lines, resulting in 149 fatalities and 697 injuries.

So these events truly are not so rare after all. But we continue to add more and more miles of dangerous new pipelines every year.

This white paper discusses pipeline risk classifications, proximity to homes and daycares, pipeline construction failures, pipeline exposure above ground, geologic risk such as earthquakes and landslides, and the impact climate change is having on East Coast rain events and pipeline safety.

All of these issues lead us to the question: *why are we still building them?*

PIPELINE RISK CLASSIFICATIONS, POTENTIAL IMPACT RADIUS, AND OPERATING PRESSURE

Class location units
During the pipeline design process, sections of the pipeline are given classifications based on the density of the adjacent population. A "class location unit" is one mile long and 220 yards on each side of the pipeline.

- Class 1: 10 or less buildings intended for human occupancy
- Class 2: 11 to 45 buildings intended for human occupancy
- Class 3: 46 or more buildings intended for human occupancy OR where the pipeline is within 100 yards of a building or outdoor area occupied by 20 or more persons for 5 days per week for at least 10 weeks per year
- Class 4: buildings with four or more stories are prevalent[1]

The classification of a segment of a pipeline determines how deep the pipe is buried, how often the right of way is visually inspected, and other safety precautions.

One problem with this system is that classifications can change over time as population gets denser along a pipeline. This matters because, for instance, a pipeline that crossed agricultural land 10 years ago may now be adjacent to a dense subdivision, exposing residents to risk that has not been mitigated.

High Consequence Area
Another term used in pipeline design is High Consequence Area (HCA).[2] All Class 3 and Class 4 locations are considered high consequence areas, as are Class 1 and Class 2 locations with a *potential impact radius* greater than 660 feet and that contains 20 or more buildings intended for human occupancy OR identified sites where people routinely gather (beaches, playgrounds, stadiums, churches, community centers, etc.) or that are difficult to evacuate (hospitals, prisons, nursing homes).[3] When a pipeline is built in a HCA, best practice is to bury it deeper - 48 to 60 inches deep as opposed to 30 to 36 inches for a non-HCA location.

Potential impact radius (PIR)
The *potential impact radius* (PIR) is another safety element of pipeline design and defined as "the radius of a circle within which the potential failure of a pipeline could have significant impact on people or property." The PIR is determined by the formula r = 0.69* (square root of ($p*d^2$)), where 'r' is the radius of a circular area in feet surrounding the point of failure, 'p' is the maximum allowable

[1] 49 CFR Part 192.5
[2] A resource explaining High and Medium Consequence Areas can be found here: https://www.atmosi.com/en/news-events/blogs/high-consequence-areas-vs-moderate-consequence-areas-what-s-the-difference/
[3] 49 CFR 192.903

operating pressure (MAOP) in the pipeline segment in pounds per square inch, and 'd' is the nominal diameter of the pipeline in inches.[4]

For a 30 inch pipeline with a MAOP of 1,440 psi such as Enbridge's Ridgeline Expansion in Tennessee:

PIR=.69*(square root of ($1440*30^2$)) = .69*square root of 1,296,000 = .69*1,138.43 = 785.5 feet

So the formula-derived Potential Impact Radius of the Ridgeline Expansion Pipeline is about 786 feet from the centerline of the proposed pipeline. Another name for this is **the blast zone**.

The PIR, or blast zone calculation is just that - a mathematical formula that may not always yield appropriate protections. The Pipeline Safety Trust has called the PIR formula into question in their scoping comments for the Transco Southeast Supply Enhancement Project:

In 2022, the National Transportation Safety Board (NTSB) released a Pipeline Investigation Report of the 2019 Enbridge natural gas transmission pipeline rupture and fire in Danville, KY that killed one, injured six, and caused extensive property damage. In its findings, the NTSB documents the fact that in this incident, the PIR at the rupture site was calculated at 633 feet, but physical evidence at the accident site found damage to homes up to 1,100 feet from the rupture crater. The woman who was killed by the rupture was also found at 640 feet, which was beyond the calculated PIR. NTSB's report also documents the history of problems with the current PIR formula going back to 2000: the 2000 Carlsbad, NM incident that killed 12 people, the 2010 San Bruno, CA incident that killed 8 and injured 58, and the 2012 Sissionville, WV explosion that destroyed three homes and caused extensive environmental damage. This report called into question the PIR calculation method and recommended that PHMSA revise the calculation methodology for PIRs, which it still has not done. NTSB renewed this recommendation in 2023 after the 2021 Kinder Morgan Natural Gas-Fueled Explosion in Coolidge, AZ that killed two people, damaged 33 acres of vegetation, and caused over $5 million dollars of costs. FERC should ensure that Williams' PIR calculation takes this recommendation into account and considers the unique nature of co-located pipeline infrastructure.[5]

PST's comments in the Transco SSEP docket bring up another safety issue - the co-location of two large diameter high pressure pipelines *exacerbates* the danger and increases the size of the "potential impact radius," or blast zone. If one pipeline in the right of way experiences a catastrophic failure - it is highly likely that they all do, making the disaster that much worse.

Enbridge notes on p. 9 of its application for the Ridgeline Expansion that FERC actually encourages co-location of pipelines. They cite a 2014 approval for Transco: "In order to reduce

[4] 49 CFR 192.903
[5] Pipeline Safety Trust comments in FERC Docket PF24-2 at p. 2: https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20240702-5027&optimized=false

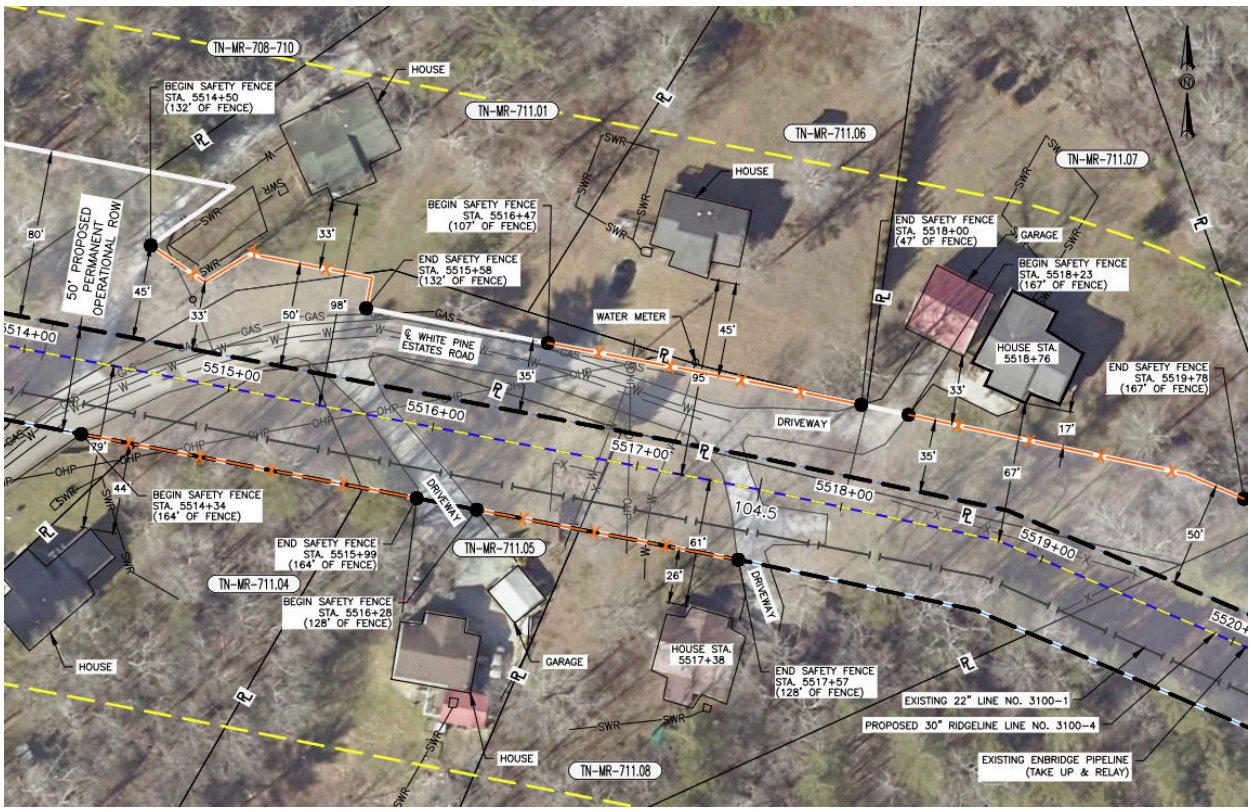
environmental impacts, the Commission's policy is to encourage collation where possible, recognizing that each case may have unique circumstances."[6]

But should they continue this policy? Of the recent Southeastern pipeline proposals, *part of the MVP Southgate, most of the T15, almost all of the Ridgeline Expansion, and all of the new segments of the Transco Southeast Supply Enhancement Project are co-located with existing, older gas pipelines.*

WOULD THEY REALLY PUT A GIANT PIPELINE BESIDE MY HOUSE? OR BESIDE MY KID'S DAYCARE OR SCHOOL?

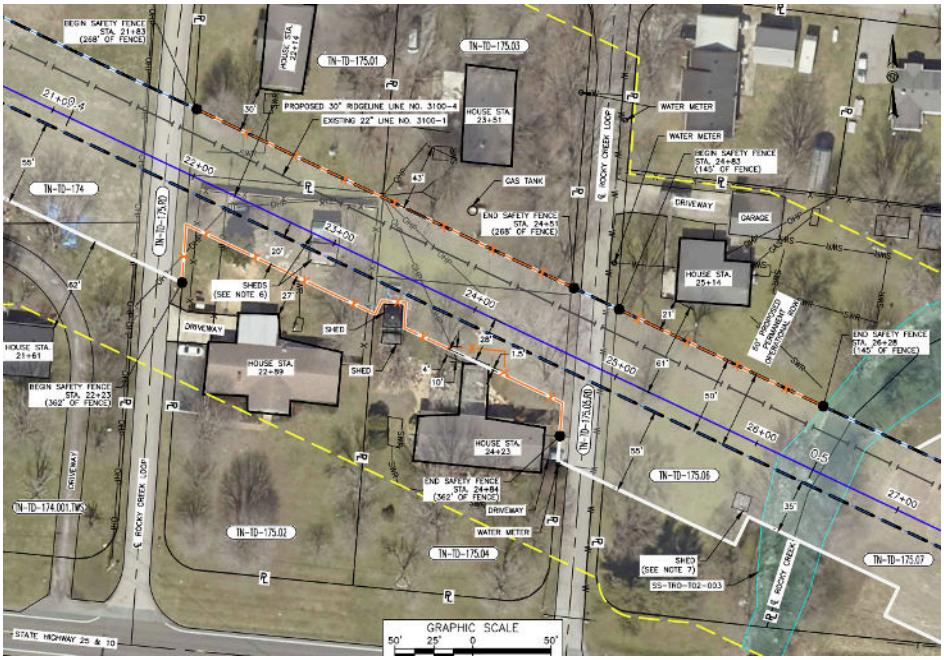
Short answer: yes. This is especially common for pipelines that are *co-located* for reasons mentioned above - populations often move closer to older pipelines over time, often without giving the site much consideration. These pipelines have become out of site and out of mind.

Below are images taken from the alignment maps in two separate locations along the proposed Enbridge/ETNG Ridgeline Expansion pipeline project in Tennessee. The original pipeline in these images, called Line 3100, was built in 1949. The new pipeline will parallel the old pipeline and squeeze between these houses, in one instance as close as 28 feet from the home.



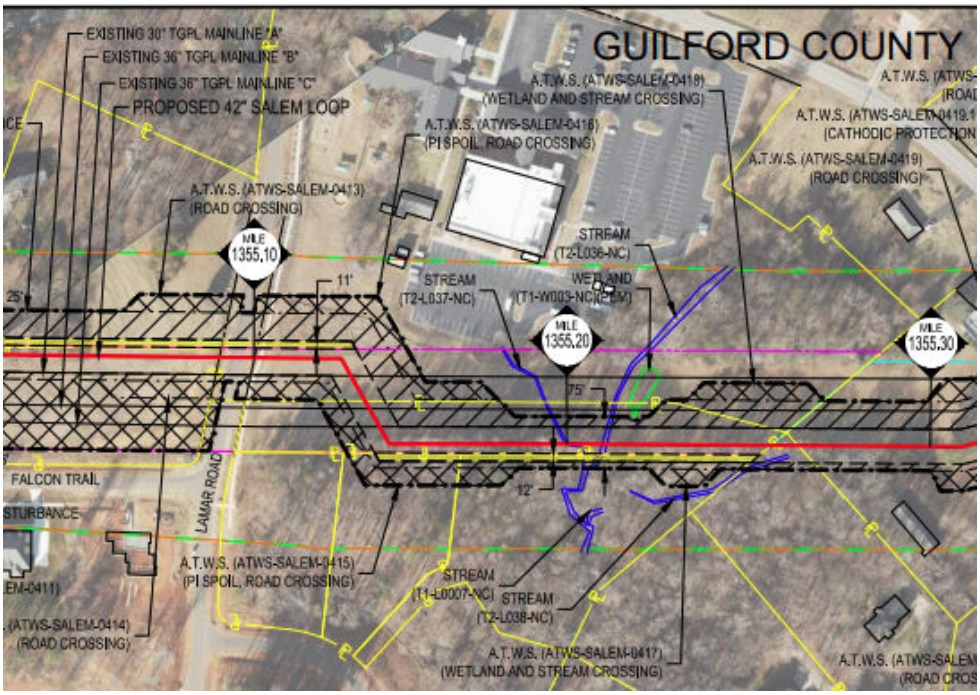
Example 1 from Enbridge/ETNG Ridgeline Expansion

[6] Transcontinental Gas Pipe Line Company, LLC, 149 FERC 61,258 at p. 116 (2014)



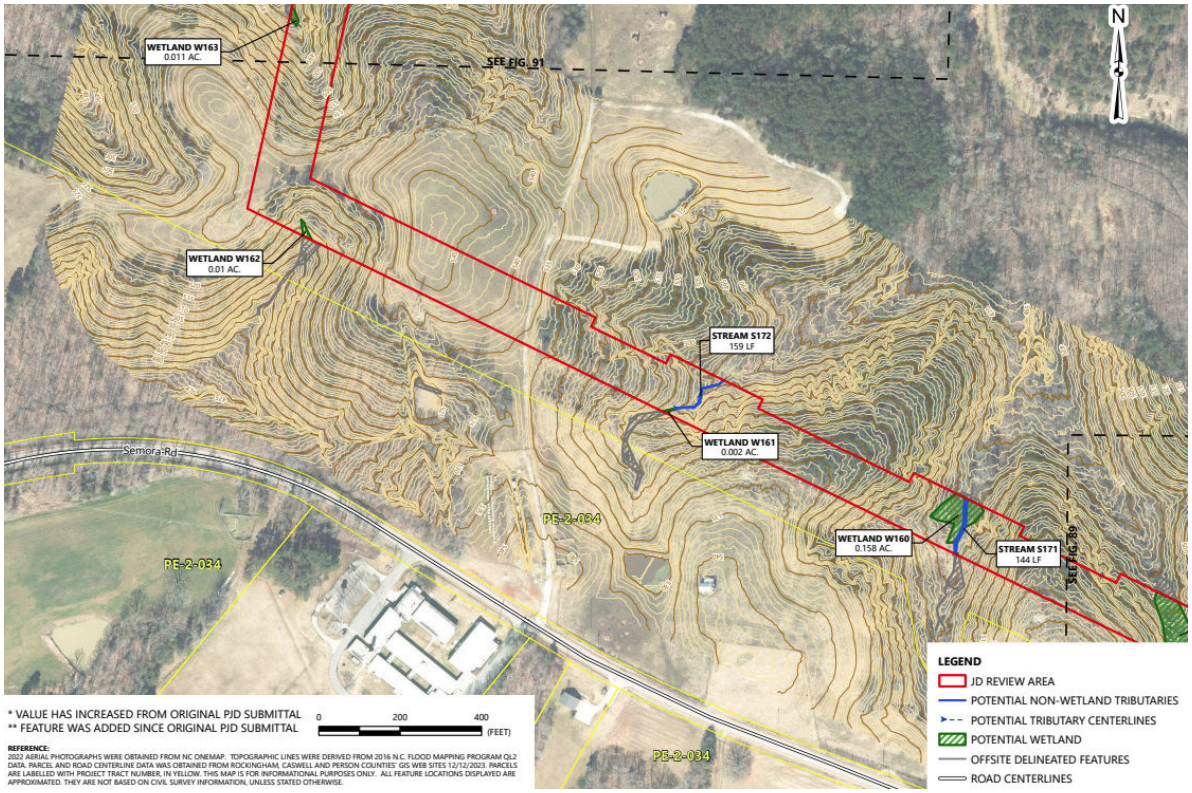
Example 2 from Enbridge/ETNG Ridgeline Expansion

The alignment map below is from the Transco Southeast Supply Enhancement Project and specifically from the Salem Loop section of the proposed project. The building shown is a church that has a weekday school. In this location, Williams Transco is proposing not only to add another pipeline (42 inch diameter) in this location but also to *cross* the three existing large diameter pipelines, adding to the risk in a High Consequence Area.



Example 3 from Transco's Southeast Supply Enhancement Salem Loop behind a church with a weekday school

The next map is from the Enbridge/PSNC T-15 Reliability Project, and specifically a greenfield lateral that will serve Duke Energy's two proposed combined cycle plants in Person County. The building shown at the bottom of the image is an elementary school serving more than 200 children in kindergarten through 5th grade. The pipeline would be less than 600 feet from the elementary school, and given the 30" diameter and the fact that it will serve two 1,360 MW gas plants, if the MAOP winds up being the normal 1,440 psi, then the PIR in this High Consequence Area would be 786 feet.



Example 4 from Enbridge/PSNC's proposed T15 Reliability Project in Person County, NC

It is often surprising to find out just how many miles of buried fossil fuel pipelines exist within a community. Journalist Lisa Sorg tallied those numbers for North Carolina counties in this Newsline article. Mecklenburg County, NC - the most densely populated county in the state - tops her list with 188 miles of gas transmission lines. Rockingham County, where the Transco pipeline enters the state from Virginia, has 112 miles, but that number may increase significantly if three projects - the Transco Southeast Supply Enhancement, MVP Southgate, and Enbridge T15 - are all built.

PIPELINE CONSTRUCTION ISSUES

The Federal Energy Regulatory Commission (FERC) has oversight of pipeline construction; and once a pipeline is placed into service, safety oversight shifts to Pipelines and Hazardous Materials Safety Administration (PHMSA).[7] Pipeline construction consists of several phase:

- Clearing, grading, and trenching
- Stringing, welding, and coating
- Lowering and backfilling
- Hydrostatic testing
- Restoration[8]

Steel pipeline segments are fabricated in 40-80 foot segments in rolling mills and then welded together in the field. Both the fabrication and the welding portions of the process can result in defects that increase the risk of catastrophic failure. On May 1, 2024, the Mountain Valley Pipeline (MVP) experienced a significant failure during hydrostatic testing (when water is run through a new pipeline at maximum pressure to test the integrity of the pipeline before it is put into service). The cause of the blow-out was a "buttwelding fitting," which is a manufactured elbow joint that changes the direction of the pipeline.

On August 28, Mountain Valley Pipeline submitted an analysis of the failure to PHMSA. In his cover letter to PHMSA, the Vice President of the Mountain Valley Pipeline stated: "For MVP, there are more than 2500 such fittings installed and hydrotested with a single failure resulting in a *negligible fitting failure rate*." (emphasis added) But it does not seem so negligible when considering the possibility that flammable, high pressure gas could have exploded from the pipeline rather than water. It is unusual for a pipeline to fail its hydrostatic testing, so this is not an encouraging sign for its future decades of use moving 2 billion cubic feet or more of explosive gas per day.

The elbow fitting was replaced, and the 300 mile pipeline, climbing up and down and curving along steep slopes, began service on June 10, 2024. On August 11, 2023, less than a year before the hydrostatic testing failure, PHMSA issued the Mountain Valley Pipeline a Notice of Proposed Safety Order after inspections revealed installation problems. PHMSA had been conducting oversight of MVP pipeline construction since 2018. The problems associated with the construction of this 303 mile long pipeline are extensive, but this particular notice focused on concerns with the cathodic protection system, with pipeline corrosion due to exposure to the elements, improper installation at two locations that could cause damage to the pipeline during hydrostatic testing, and a general concern about karst topography and steep slopes.

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[7] Source: https://www.ferc.gov/sites/default/files/2020-04/gas_1.pdf p. 25 (Accessed December 3, 2024)
[8] This slide deck from Upstate Forever's four-part webinar series Pipelines 101 offers an overview of pipeline construction with photos of the different phases: https://www.upstateforever.org/files/files/Webinar3FINAL%281%29.pdf

The Mountain Valley Pipeline is the latest large diameter, high-pressure pipeline that has come online in the Southeast, and the construction violations and failure of the hydrostatic test confirm concerns about pipeline construction, especially in an environment where private equity firms squeeze profits by speeding up the construction process and cutting corners[9] and oversight agencies lack the personnel to routinely inspect projects.[10][11] Pipeline inspectors themselves have expressed concerns about the perverse incentives they often operate under. Pipeline inspectors work for contracting companies that are paid by the pipeline companies, and they are often either reluctant to report concerns or, when they do, those concerns are ignored. The pipelines companies "have a history of putting profit over safety," noted one pipeline inspector whistleblower who saw pipes go in the ground that were dented with rocks and had lost their protective coating in places.[12] Bill Caram, the executive director of the Pipeline Safety Trust, noted that "The reality is that operators are inspecting their own systems."[13] A year-long investigation by Politico's E&E News confirmed this dangerous situation.[14] There is a feeling among inspectors that they are "caught between doing their job and keeping their job."[15] As we continue to add miles and miles of pipelines under these conditions, the risk of significant public harm increases.

[9] There is a popular saying in the pipeline world: "Get the b***h in the ditch."
[10] For example, the North Carolina Utilities Commission, which oversees pipeline safety for pipelines that fall within state jurisdiction, has only five inspectors to cover the entire state, including both transmission and distribution gas pipelines.
[11] The GAO noted in 2018 that PHMSA had "not developed a plan that systematically identifies the anticipated interstate pipeline inspection workload or the number of inspection staff needed to meet that workload." Source: https://www.gao.gov/assets/gao-18-461.pdf (accessed December 3, 2024)
[12] Source: Inspector: Weak pipeline rules put "profit over safety" December 3, 2024 (accessed January 23, 2025)
[13] ibid
[14] Source: 'Everything's on fire': Inside the US failure to safeguard pipelines May 2, 2024 (accessed January 23, 2025)
[15] ibid

PIPELINE EXPOSURES

Gas pipelines are always meant to be buried several feet underground,[16] and sometimes they are even embedded in bedrock. But they don't always stay buried. Pipelines can become exposed for several reasons, with the most common reason being erosion at either a stream crossing or from the formation of a gully beside the pipeline right of way that encroaches toward the pipe.

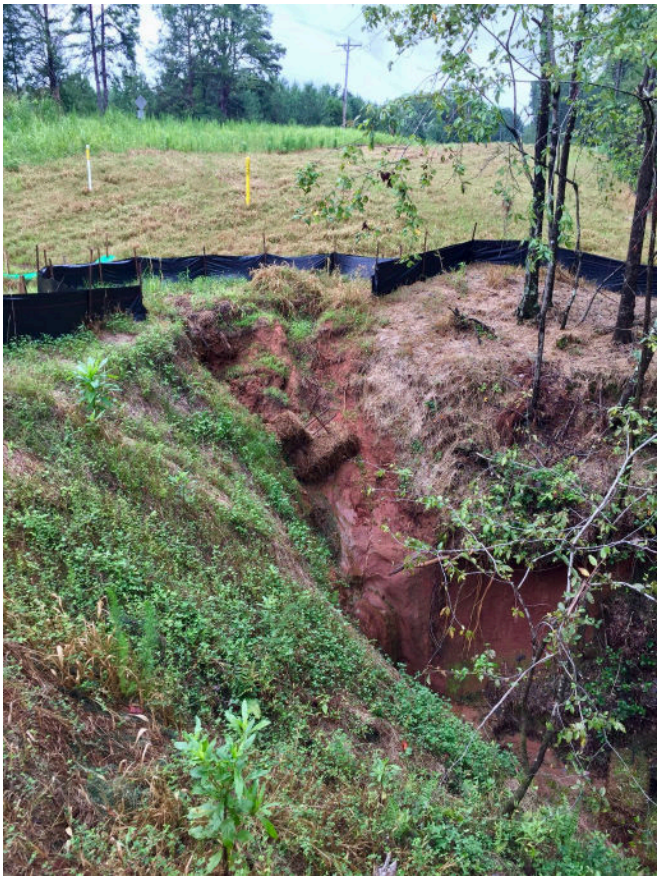
Exposed pipeline in the Upstate of South Carolina (photo/Shelley Robbins)

In 1969, an 8-inch pipeline was constructed between the main Transco pipeline in the Upstate of South Carolina and the midlands. In one instance, at a stream crossing that had required blasting through rock in order to lay the pipe below the stream, the pipeline jumped up out of its rock trench during the hydrostatic testing phase, according to a local landowner. The pipe was still in this condition in 2017 (see photo at right). The landowner had reported the situation repeatedly to Dominion, only to be told that the gas utility could only repair a certain number of pipeline issues each year.

In 2018, the environmental non-profit Upstate Forever documented[17] an example of gully encroachment related to a newly-constructed 55 mile 12 inch Transco to Charleston pipeline that was also built to deliver gas from Transco to the rest of the state.

[16] Pipelines are usually placed 30 to 36 inches underground, or 48 to 60 feet underground in a High Consequence Area.

[17] Source: https://www.greenvillebusinessmag.com/2018/08/07/178275/upstate-forever-says-gully-potential-danger-to-spartanburg-pipeline (accessed December 2, 2024)



Gully encroachment along the Dominion (now Carolina Gas Transmission/Berkshire Hathaway) Transco to Charleston pipeline project in Spartanburg County, SC (photo/Shelley Robbins)

Two pipeline exposure locations in Rockingham County were self-reported by Dominion Energy (now Enbridge) along the *existing* T15 pipeline in North Carolina. In an application for water quality permits filed on August 1, 2024, Dominion stated that it had been monitoring one of the exposures over the past year. "Wolf Island Creek is a sand bed stream and over the past two months of monitoring (June/July 2024), the exposure has become much more severe, and the exposed pipeline is effectively acting as a dam in the stream."[18] Dominion did not state in the application when they became aware of the second exposure. They noted that "The longer the pipeline remains exposed, the greater the risk of corrosion or damage…."[19] Dominion planned to install replacement segments at a greater depth (five feet below the bottom of the streambed).

This risk may decrease over time thanks to new monitoring technologies such as drones that make it possible to monitor pipeline right-of-ways without deploying personnel along the entire alignment.

[18] DENC T15 Exposures NC DEQ water permit application: https://edocs.deq.nc.gov/WaterResources/DocView.aspx?id=3420857&dbid=0&repo=WaterResources p. 2 (accessed December 2, 2024)
[19] ibid

GEOLOGIC RISKS - EARTHQUAKES AND LANDSLIDES

In addition to risks associated with construction, pipelines are subject to geologic risks such as seismic activity and landslides. Landslides can happen as a result of seismic activity, intense rainfall, or disturbance (such as pipeline construction) in a geographically unstable area. Advocates in the Appalachian Mountains have been warning about the danger of landslides to pipelines for several years, but pipelines continue to be built and accidents continue to happen.

Leach Xpress - land subsidence leads to explosion

Just before 5am on June 7, 2018, an 83-foot section of TransCanada/Columbia Gas Transmission's Leach Xpress pipeline near Moundsville, West Virginia exploded, creating a fire that burned for several hours. PHMSA stated that the failure "was the result of land subsidence causing stress on a girth weld." The blast was in a remote area and no one was injured, but the fireball burned for hours. The Leach Xpress is 36 inches in diameter and its MAOP is 1,440 psig. The pipeline was constructed in 2017, and put into service on January 1, of 2018. It was considered "best in class," and its hydrostatic testing was considered successful, according to the Notice of Proposed Safety Order issued by PHMSA. In the order, the agency also identified *six additional* locations along the pipeline where similar geography could cause the pipeline to fail. On its Incident Report form to PHMSA, TransCanada described the cause of the explosion and fireball as an "Unintentional release of gas." PHMSA stated in its Notice of Proposed Safety Order that "it appears conditions exist on your pipeline system that pose an integrity risk to public safety, property, or the environment."

This finding by PHMSA illustrates an important problem in the pipeline construction and operations process first mentioned in the preceding section: FERC is responsible for oversight of the pipeline while it is under construction, including construction standards, while PHMSA is responsible for safety issues and inspections after the pipeline becomes operational.[20] It appears that PHMSA is telling FERC that it did not do its job. PHMSA, as part of the DOT, has the authority under 49 USC Ch. 601 (Safety) to "prescribe minimum safety standards for pipeline transportation and for pipeline facilities" and those standards may apply to design, installation, inspection, testing, and construction of interstate pipelines.[21] PHMSA prescribes the safety standards and FERC ideally incorporates them into the certificate conditions.

Mountain Valley Pipeline - steep slopes and karst topography risks

[20] Source: https://www.ferc.gov/sites/default/files/2020-04/gas_1.pdf p. 25 (Accessed December 3, 2024)
[21] Source: https://uscode.house.gov/view.xhtml?path=/prelim@title49/subtitle8/chapter601&edition=prelim (Accessed December 3, 2024)

The Mountain Valley Pipeline entered service on June 10, 2024. After an initial four year period of monitoring steep slopes one to two times per year, the MVP operator will only monitor the slopes every five years, according to the approved Landslide Mitigation Plan.

In PHMSA's Notice of Proposed Safety Order to MVP on August 11, 2023, one of the concerns listed was the potential for land movement and strain. "The Affected Facility traverses areas of karst topography and steep slopes, making the pipeline environment susceptible to land movement. Land movement has been a causal factor in recent pipeline failures in the general vicinity of the route of the Affected Facility. Further, the Affected Facility axially traverses many steep hillside and valley combinations that require sag bends and tie-in welds. Axial stresses on girth welds in sagbend and over-bend locations, and areas where tie-in welds may be susceptible to excessive external stress during and/or soon after construction, have also been a causal factor in recent pipeline failures in the general vicinity of the pipeline route." (The two failures referenced in this paragraph are 1) the Leach Xpress, and 2) Enterprise Products ethane liquids pipeline failure near Follansbee, West Virginia[22] in 2015 in which a girth weld failed tensile overload from the weight of the surrounding soil caused a fire that burned five acres and melted the siding on a home that was 2,000 feet from the rupture.)

Proposed Ridgeline Expansion - seismic activity and landslide risk

The 122-mile proposed Ridgeline Expansion pipeline in Tennessee is almost guaranteed to have landslide issues. SACE analyzed the Draft Environmental Statement and found numerous concerns.[23] The terrain for the Ridgeline Expansion is much like that of the Mountain Valley Pipeline - hilly and steep with areas of seismic activity. Only 38 of the proposed pipeline's 122 miles are classified as "low" susceptibility to landslides. 29 miles are categorized as "moderate" and and eye-popping 55 miles are categorized as "high susceptibility." The risk can be visualized in the map labeled as Figure 5.2.1: Landslide Hazard Map, shown below. The discussion of landslide risk is buried in Appendix 6D of the DEIS documents.

[22] Source: https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/inspections-and-investigations/17866/149469enterpriseproductsoperatingllcfir2015126reportandappendices.pdf (Accessed December 3, 2024)
[23] SACE Ridgeline Expansion DEIS Comments: https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20240715-5128&optimized=false (Accessed December 17, 2024)

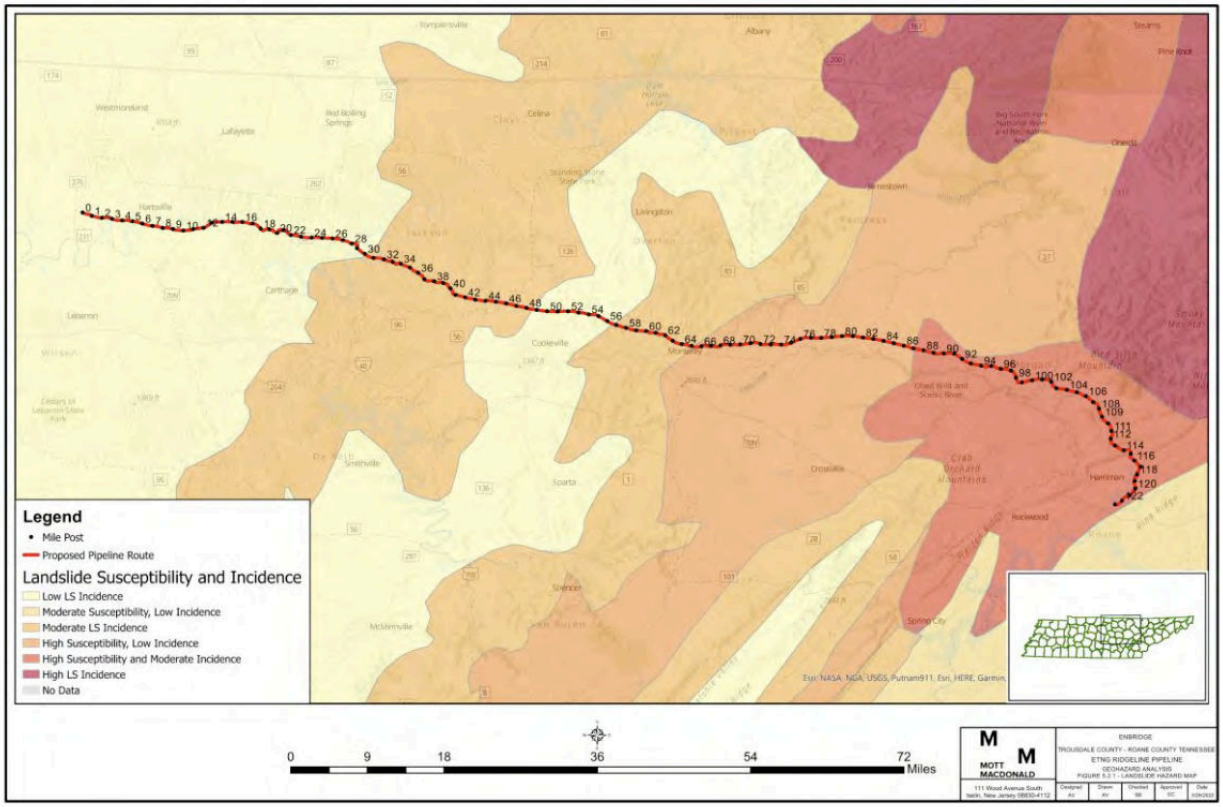


Figure 5.2.1: Landslide Hazard Map

Figure showing landslide susceptibility from the Ridgeline Expansion Draft Environmental Impact Statement

The landslide risk analysis was separated from the discussion of High Consequence Areas, where an accident could cause significant loss of life. The HCA discussion was also buried deep within the DEIS (on page 506 of a 711 page document). More than one quarter of the proposed route (31.4 miles) is classified as High Consequence and an additional 51.9 miles is categorized as Medium Consequence. In SACE's comments to FERC, we called the efforts to bury this information "risk camouflage." The pipeline is proposed to operate at 1,440 psi, the same pressure as the Mountain Valley Pipeline.

FERC did ask East Tennessee Natural Gas to clarify what would trigger action from their seismic monitoring efforts, and ETNG responded that first they would be notified of an earthquake occurrence by the CambioTM cloud-based software analysis of near real-time earthquake event feeds from the USGS ShakeCast Earthquake Notification Service and Natural Resources Canada (NRCan). "Virtual gauges are set along the pipeline at approximate 5-mile intervals such that if an

earthquake of concern occurs within the applicable distance, **an email is generated** and sent to East Tennessee's Geohazard team."[24] (emphasis added)

An email is generated.

Email is not a comforting method of communication given the risk associated with this project.

Landslide risk is unnerving even to the pipeline industry

As recently as October of 2024, the Pipeline Technology Podcast aired an episode titled "API 1187, The Need for a Landslide Hazard Standard with Mark Piazza (Senior Policy Advisor at the American Petroleum Institute (API)) & Andy Duncan."[25] (Manager for Pipeline Integrity Engineering at Enbridge, the parent company of ETNG.) Their discussion centered around the threat that landslides pose to large diameter, high pressure pipelines due to steep slopes, variation in soil types, and significant rain events. The consensus among the three appeared to be that 1) landslides can happen anywhere, but the Marcellus and Utica region neighboring Tennessee is an example of special and increasing concern; 2) landslides are not predictable and manageable in the way pipe corrosion is; 3) there isn't the same level of understanding and available advanced technology for landslides as there is for the pipeline metal itself; and 4) there is no guidance yet from PHMSA.

This frank conversation among industry participants should give FERC and other regulators pause. Enbridge's Andy Duncan noted that higher strength steel is allowing pipelines to be built in "aggressive terrains" and they are "seeing more interacting threats to pipelines due to landslides." A few excerpts from their conversation include:

Andy Duncan: "They go to these enormous slopes, enormous mountains and think that's the real threat. They are, but *any slope*, especially, you mentioned steep, wet, and then disturbed and that's when you put a pipeline in. That terrain, a lot of slopes that go through the area and it creates *so many opportunities for a single failure to happen. It only takes one slope to move*." (emphasis added)

Andy Duncan: "We see PHMSA data… that shows *we continue to have pipeline safety incidents that are driven by landslides*." (emphasis added)

Russel Treat (host): "We're struggling, as an industry, with all the data that it's providing, but we're not having a lot of issues in the industry with that threat. That threat's pretty well-managed,

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[24] East Tennessee Natural Gas, LLC Ridgeline Expansion Project Docket Nos. CP23-516-000 and CP23-516-001https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20240829-5159&optimized=false (Accessed December 17, 2024)

[25] Podcast: https://pipelinepodcastnetwork.com/api-1187-the-need-for-a-landslide-hazard-standard/ (accessed December 17, 2024)

versus the whole area of landslide. Mark's comment about ground movement is right on point. *We don't have nearly the same level of understanding.*

We don't have really a lot in the way of advanced technology that allows us to monitor that and mitigate and manage that risk well…" (emphasis added)

Andy Duncan: "(I)t's really not a time-dependent threat, it's an event. You mentioned rainfall and water in the soils early on. We have a threat that may exist in a thousand slopes in the Utica, but only one of them is going to move. *We don't know which one and we don't know when.*" (emphasis added)

Russel Treat: "Would it be correct to say that *the current state is there's no direct guidance*, but it is a threat that the regulators are aware of and are asking questions about?

Mark Piazza: Yeah." (emphasis added)

So we keep building pipelines in risky areas, but there is no direct guidance.

JUST ADD WATER

Consider for a moment the impact Hurricane Helene had on the drinking water transmission system in Asheville, North Carolina. After a flooding event in 2004 that damaged the City's transmission pipeline from the North Fork Reservoir, the line was repaired and a backup line was added and buried **25 feet below ground**. Helene's flooding decimated the primary water line *and* the redundant line 25 feet down.[26] Now imagine if that was a high pressure methane gas pipeline. Water doesn't explode.

This is only one example of the power of climate-change fueled rain events. Helene triggered so many landslides in the mountains between North Carolina and Tennessee that the U.S. Geologic Survey set up a unique landing page[27] to track how many had been observed and how many of those impacted infrastructure such as roads, rivers, and structures. As of this writing, USGS has identified a stunning 2,004 total landslides, of which 1,064 have impacted infrastructure (see USGS Hurricane Helene Landslides Observation Dashboard map below). The number has changed daily and may continue to climb. Landslides were recorded in Tennessee, North Carolina, South Carolina, Kentucky, Virginia, and Georgia. This was one climate change-fueled storm. It will not be the last.

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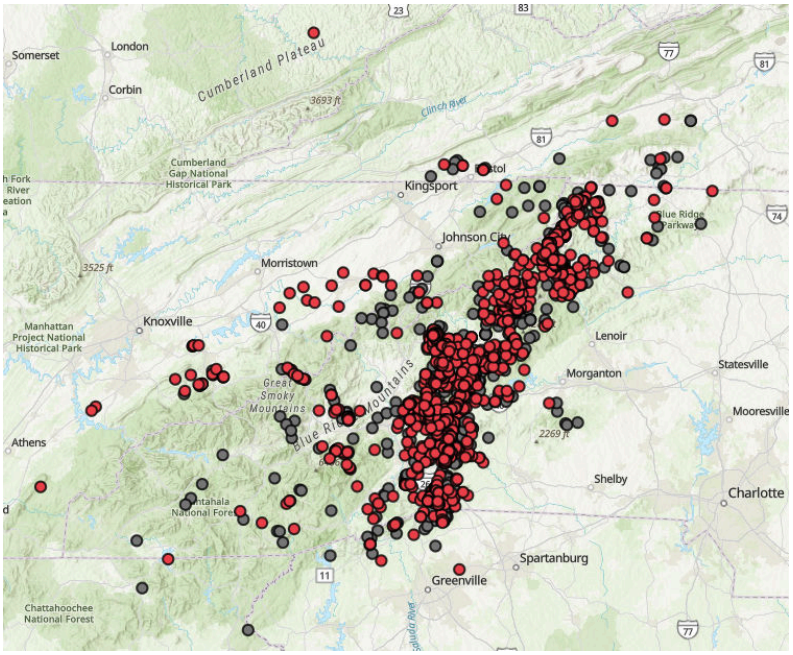
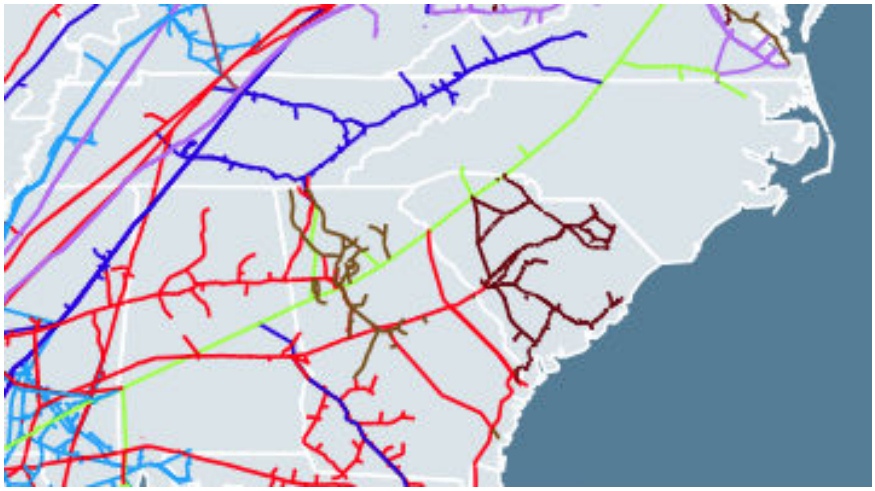
[26] Source: https://www.citizen-times.com/story/news/local/2024/10/04/asheville-water-drone-images-show-full-extent-of-helene-damage/75517251007/ (Accessed December 17, 2024)

[27] USGS Hurricane Helene Landslides Observation Dashboard: https://www.arcgis.com/apps/dashboards/01b4f51fc0b64002bf7722a9acfc181d (Accessed December 17, 2024)



Source: USGS Hurricane Helene Landslides Observation Dashboard[28]

The Interstate Natural Gas Association of America (INGAA) maintains an interactive map of the operating interstate pipelines in the US (see below), and there is a conspicuous hole in the map where the Blue Ridge Mountains rise. With the exception of the Mountain Valley Pipeline, most large transmission projects do not attempt to cross the Appalachian Mountains. When the MVP (not depicted yet on the map) began service in June of this year, that door of hubris was opened.



Map showing how the major interstate pipeline systems go around the steepest part of the Appalachian Mountains. Source: INGAA[29]

[28] USGS Hurricane Helene Landslides Observation Dashboard: https://www.arcgis.com/apps/dashboards/01b4f51fc0b64002bf7722a9acfc181d

[29] INGAA map: https://custom.envisionmaps.net/ingaa/default.html (Accessed December 17, 2024)

As the permitting processes for pipelines are weakened at the federal and state levels, and as pipeline construction speeds up, pipelines will become more and more dangerous.

And in a changing East Coast climate, where intense rain events fueled by climate change are no longer "100 year events" - is it still safe to build this kind of infrastructure on steep slopes or even in valleys that could channel raging flood waters? Is it?

The answer is clearly no.

LOOKING AHEAD

The need for new power generation - for the grid, for industries, for homes - can be met with cleaner alternatives such as solar, wind, geothermal, and energy storage. These clean alternatives do not expose neighboring communities to the safety risks outlined in this paper. Meanwhile, pipeline construction failures and geologic and climate-fueled meteorological risks will increase in likelihood as pipeline companies continue the push to add more miles to the system and as pipelines are increasingly located in close proximity to homes and groups of people who cannot evacuate quickly

The question that we must face is whether these pipeline expansions are genuinely needed. Clean alternatives are viable and affordable, and it is time for fossil fuel pipeline projects to come out of the shadows to face scrutiny that takes diligent account of the increasing dangers they pose to the communities that surround them.