November 21, 2016

Received

NOV 29 2016

Virginia Field Office

Mr. Troy Anderson
U.S. Fish & Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

Dear Mr. Anderson: Re: FERC Docket Nos: CP16-10-000 and CP16-13-000

My name is [redacted] and I live in Monroe County, West Virginia. The Mountain Valley pipeline goes from mile marker 173.4 to 195.4 in Monroe County. I have written you before regarding the Mountain Valley Project (MVP) pipeline. This DEIS comment paper is about steep slopes, side slopes and landslides. In December 2014 EQT Corporation and NextEra Energy Resources, LLC, developers of the Mountain Valley Pipeline Project submitted a 238 page report to FERC called filing draft Resource No.1 and the summary of alternatives considered for the Mountain Valley Pipeline Project. The first route was called Route Alternative 1 and the second was called Proposed Route. Quoted from draft Resource No 1 by MVP; "MVP determined that Route Alternative 1 represented insurmountable construction challenges, as well as a high risk of slope failure and pipeline slips, once the pipeline was to be in operation". I wrote scoping comments to FERC about the MVP pipeline on June 2, 1015. Attached is a copy of those comments regarding Destabilization of steep slopes.

In 2006, the Monroe County Commission created the Monroe County Planning Commission. In 2009, the Planning Commission completed the Monroe County Comprehensive Plan. Goal 1.4 of the plan is to manage slopeside development. It was determined that development on slopes from 15%-25% should be monitored closely particularly in karst terrain, and regulated as needed; development on slopes greater than 25% should be prohibited altogether (page 23). In my scoping comments mailed to FERC on June 2, 2015, I included a color coded map of slope percentage taken from the Monroe County Comprehensive Plan. A copy of that map is attached.

The following is taken from the DEIS at *Alternatives 3-22.* "Alternative 1 crosses about 51 more miles of steep slopes and 42 more miles of severe side slope, which would represent significant construction challenges including the need for extra workspaces to achieve a level working area and an increased risk of future slope instability following restoration. Given consideration of these factors, we conclude that Alternative 1 does not offer a significant environmental advantage when compared to the corresponding proposed route".

The DEIS (for CPCP16-10-000 and CP16-13-000) has information comparing slope percentages of Alternative 1 and Proposed Route at *Alternatives 3-24* TABLE 3.4.2-1. The proposed Route has 120 miles of steep slope and 122.8 miles of side slope. Although the proposed route has fewer steep miles, nevertheless, these 120 & 122.8 miles represent "insurmountable construction challenges, as well as a high risk of slope failure and pipeline slips, once the pipeline is to be in operation". Studies conducted by the West Virginia Geological Survey (Lessing and Erwin, 1977) indicate that common situations that could foster rock falls and landslides in West Virginia and the Appalachian Plateau are along areas comprised of moderate to steep slopes within the range of 15 to 45 percent

The DEIS contains two Appendixes K and N-1. Appendix K lists steep slopes along the MVP. Appendix N-1 lists Soils and Soil Limitations crossed by the MVP. Appendix N-1 also lists slope percentages. The slope percentages are different in the two Appendixes for the same mile markers. I have developed a chart comparing the same mile markers comparing the slope percentages for both Appendixes. Attached is a copy. Thank you.

Sincerely, [redacted]

[redacted]

Following is part of Table 3.4.2-1 Comparison of Route Alternative 1 and the Proposed Route. MVP still crosses 120 miles of steep slope and 122.8 miles of side slope. That still means that 120 miles of steep slope and 122.8 miles of severe side slope has a high risk of slope failure and pipeline slips, once the pipeline is in operation

DEIS *Alternatives 3-24* TABLE 3.4.2-1 Comparison of Route Alternative 1 and the Proposed Route

Feature	Route Alternative 1	Proposed Route
Shallow bedrock crossed	217.3	214.9
Steep slope (>20 percent)	171.4	120.0
Side slope crossed (miles)	165.1	122.8
Landslide potential crossed	232.2	224.2
Karst area crossed (miles)	56.2	53.3

2.4.2.16 Rugged Topography *2-49 Description Of The Proposed Action* The MVP would cross 18.5 miles of slopes between 15 and 30 percent grade, and 72.6 miles of slopes greater than 30 percent.

4-29 Geology The construction and operation of the MVP could result in unstable slopes including cut slope failures and fill slope failures. *4-29 Geology* Studies conducted by the West Virginia Geological Survey (Lessing and Erwin, 1977) indicate that common situations that could foster rock falls and landslides in West Virginia and the Appalachian Plateau are along areas comprised of moderate to steep slopes within the range of 15 to 45 percent.

4.1.1.5 Geologic Hazards Landslides *4-29 Geology* Slope failure causing a landslide can be initiated by precipitation, seismic activity, slope disturbance due to construction, or a change in groundwater conditions, such as a seasonal high groundwater table, and soil characteristics. Construction factors that may increase the potential for slope failure could include trenching along slopes and the burden of construction equipment on unstable surfaces….. About 151.7 miles (78 percent) of the MVP pipeline route in West Virginia is considered to have a high incidence of and high susceptibility to landslides…. Ground failure and slope movement are typically associated with steep slopes. The MVP would cross 18.5 miles of slopes ranging from 15 percent to 30 percent and 72.6 miles of slopes greater than 30 percent (see appendix K).

4-41 Geology The areas that would be crossed within the Jefferson National Forest by the MVP contain slopes greater than 30 percent and the potential for landslides within the Jefferson National Forest would be moderate to high.

4-47 Geology Our review of Mountain Valley's *Landslide Mitigation Plan,* along with stakeholder comments identified additional areas for landslide analysis and additional BMPs that would be effective in mitigating hazards from potential landslides. Therefore, we recommend that: b. an identification of landslide hazards where the pipeline routes through areas comprised of both steep slopes and red shale bedrock of the Conemaugh, Monongahela, Dunkard, and **Mauch Chunk** Groups;

4.1.1.2 Bedrock Geology Mountain Valley Project *4-5 Geology* The bedrock…. between MPs 149 to 193 consists of shale, sandstone, and limestone bedrock consisting of the **Mauch Chunk**, Greenbrier, and Pocono Groups deposited during the Middle Mississippian Period. my note-**Monroe County is within MPs 149 to 193**

4.2.2.4 Slip-Prone Soils Certain soil types such as shaley or clayey soils are more prone to slipping than other soils. Due to this increased potential for slipping, the probability of landslides is increased when constructing through slip prone soils. The Gilpin-Peabody complex, 35 to 70 percent slopes, Carbo, Faywood, Frederick, Nolichucky, Poplimento, and Sequoia soils are considered to be slip-prone. The MVP would affect about 17.5 acres of the soils and complexes of these soils between MP 172 and 196. my note-**The Mountain Valley pipeline would go from mile marker 173.4 to 195.4 in Monroe County, W.V. All/most of slip-prone soils in 4.2.2.4 having an increased probability of landslides are located in Monroe County, West Virginia.**

The following chart compares Appendix K and Appendix N-1 concerning slope percentage in Monroe County. As you can see, there is a huge difference of slope percentage for the same area between the two charts. A lot of information about Monroe County, West Virginia has been left out of this DEIS. The MVP and all other pipelines should be prohibited altogether in Monroe County due to our steep slopes of 25% up to 70%. There is a high risk of slope failure and pipeline slips, once the pipeline(s) is to be in operation. Monroe County has physical characteristic of steep slopes, karst, sinkholes, caves, slip-prone soils and is totally within the Giles County Seismic Zone (GCSZ).

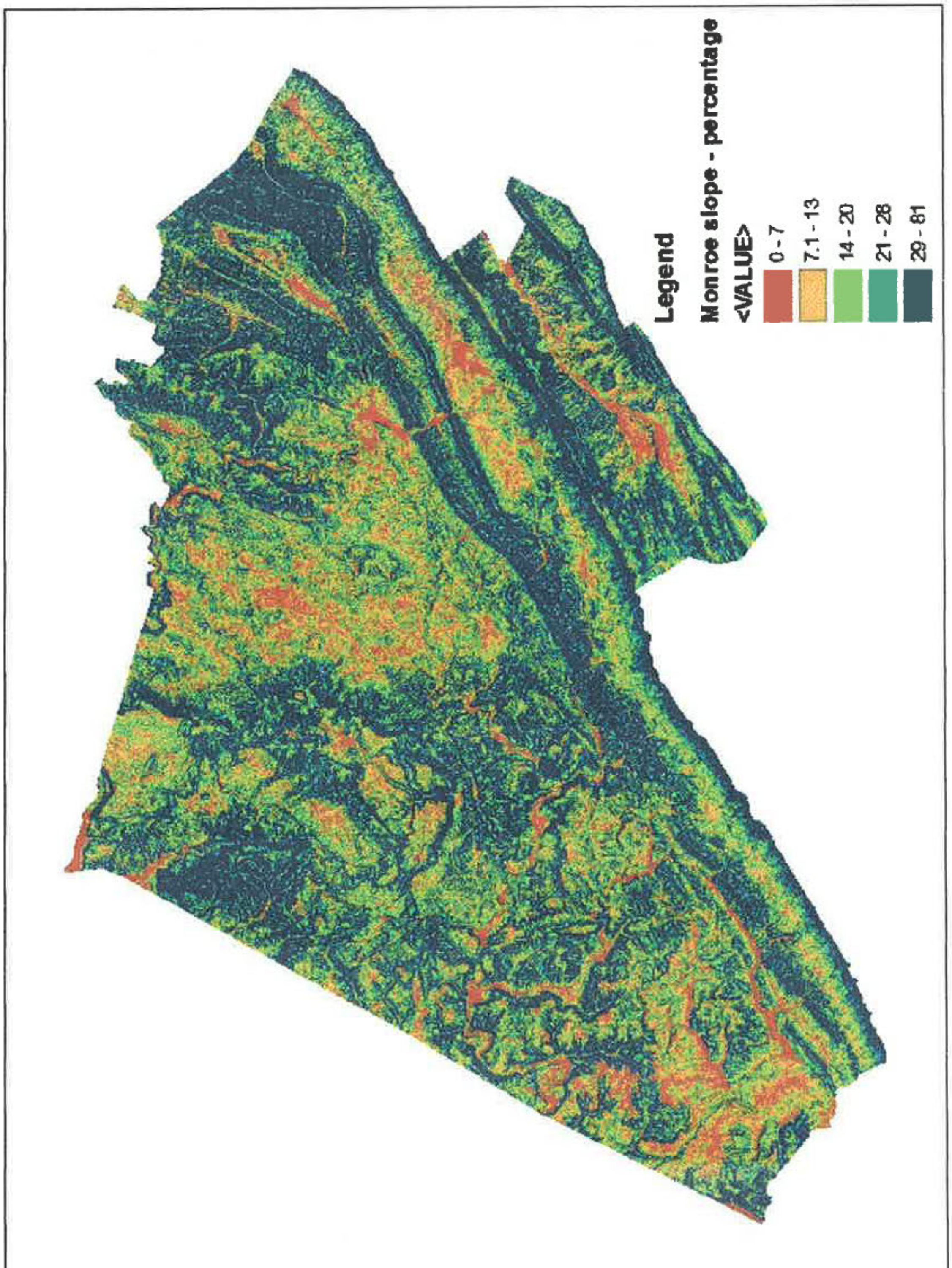
COMPARISON OF SLOPE PERCENTAGE BETWEEN APPENDIX K AND APPENDIS N-1

APPENDIX K **Steep Slopes along the MVP**					APPENDIX N-1 **Soils and Soil Limitations Crossed by the MVP**			
MP Start	**MP End**	**Grade (%)**	**Max Slope (%)**	**Min Slope(%)**	**MP**	**County**	**Map Unit ID**	**Soil Name**
174.6	174.6	5-30	18.9	16.2	174.6	Monroe	CIF	Cateache-Litz complex, 35 to 55 percent slopes
174.7	174.7	15-30	22.8	17.8	174.7	Monroe	CIF	Cateache-Litz complex, 35 to 55 percent slopes
176.6	176.6	15-30	23.6	17.2	176.6	Monroe	CIE	Cateache-Litz complex, 25 to 35 percent slopes
179.1	179.1	15-30	20.8	15.1	179.1	Monroe	RgE	Rough very channery silt loam 25 to 35 percent slopes
179.9	179.9	15-30	18.9	16.0	179.9	Monroe	CIE	Cateache-Litz complex 25 to 35 percent slopes
182.5	182.6	>30	49.8	15.8	182.5	Monroe	LtF	Litz silt loam, 35 to 60 percent slopes
192.3	192.4	15-30	19.2	15.1	192.3	Monroe	WeF	Weikert channery silt loam 25 to 55 percent slopes
192.6	192.6	>30	34.7	21.3	192.6	Monroe	DeF	Dekalb channery loam very stony 35 to 55 percent slopes
193.3	193.3	15-30	27.7	16.6	193.3	Monroe	DeF	Dekalb channery loam very stony 35 to 55 percent slopes
193.4	193.6	>30	34.8	19.7	193.4	Monroe	WeF	Weikert channery silt loam 25 to 55 percent slopes
195.1	195.4	>30	58.8	17.4	195.1	Monroe	DeG	Dekalb channery Loam very stony 55 to 70 percent slopes
195.1	195.4			↔	195.2	Monroe	DeG	Dekalb channery Loam very stony 55 to 70 percent slopes
195.1	195.44			↔	195.3	Monroe	DeG	Dekalb channery Loam very stony 55 to 70 percent slopes
195.1	195.44			↔	195.4	Monroe	23F	Lehew & Wallen soils, very stony 35 to 65 percent slopes
195.1	195.44			↔	195.4	Monroe	DeG	Dekalb channery very stony 55 to 70 percent slopes

DEIS 4.2.2.4 Slip-Prone Soils The probability of landslides is increased when constructing through slip prone soils. The Gilpin-Peabody complex, 35 to 70 percent slopes, Carbo, Faywood, Frederick, Nolichucky, Poplimento, and Sequoia soils are considered to be slip-prone. The MVP would affect about 17.5 acres of the soils and complexes of these soils between MP 172 and 196

my note-**The Mountain Valley pipeline would go from mile marker 173.4 to 195.4 in Monroe County, W.V. Most of slip-prone soils in 4.2.2.4 having an increased probability of landslides are in Monroe County, W.V**

Attachment 6b
Monroe County Comprehensive Plan - Slope percentage



This page and following pages were mailed to FERC as part of the scoping process on June 2, 2015 by (b) (6) [redacted]

I. Geology and Soils

A. Destabilization of steep slopes

•MVP declares the first route they chose has "a high risk of slope failure and pipeline slips, once the pipeline was to be in operation."

EQT Corporation and NextEra Energy Resources, LLC, developers of Mountain Valley Pipeline Project submitted a 238 page report to FERC called filing draft Resource Report No. 1 and the Summary of Alternatives considered for the Mountain Valley Pipeline Project that is in the pre-filing process. So far, they have considered two routes for this pipeline and are now working on a third route. The first was called Route Alternative 1 and the second was called Proposed Route. Attached is a copy of their map comparing the two proposed routes. The Route Alternative 1 was determined unsuitable.

"MVP determined that Route Alternative 1 represented insurmountable construction challenges, as well as a high risk of slope failure and pipeline slips, once the pipeline was to be in operation". (see attachment #6a) It does not matter if this followed an existing power pole right of way. The fact that this route represented insurmountable construction challenges, as well as a high risk of slope failure and pipeline slips, once the pipeline was to be in operation **is the key.** What does matter is that this finding of this route is very important information that has been overlooked and ignored by FERC. FERC must look at the slope percentage of Route Alternative 1 (blue-high risk of slope failure and pipeline slips) comparable to the Proposed Route (red) and any and all other alternative routes considered. West Virginia is called the Mountain State for a reason.

In 2006, the Monroe County Commission created the Monroe County Planning Commission. In 2009, the Planning Commission developed the Monroe County Comprehensive Plan. Goal 1.4 of the plan is to manage slopeside development. It was determined that **development on slopes from 15%-25% should be monitored closely particularly in karst terrain, and regulated as needed; development on slopes greater than 25% should be prohibited altogether**. A color coded map **(see attachment #6b)** shows percentage of slope for Monroe County. **Much of Monroe County is color coded from 29% to 81% slope indicating development should be prohibited altogether.** It is obvious from the MVP report that they have not given our "karst" habitat any consideration, thought or attention at all. There is no mention by MVP of "Karst" habitat within this 238 page report. The word "Karst" occurs only one time in the report (page 67) and that is in a letter to NextEra Energy from The Nature Conservancy in Richmond, Virginia.

•Blasting-Blasting to remove rocks anywhere will dislodge rock and soil in other areas. The St. Clair fault is a real concern that cannot be overlooked. There may also be blasting in residential areas. Page 156 of the MVP draft report 1 describes the use of blasting for trenching.

"To bury the pipeline underground, it will be necessary to excavate a trench. The trench will be excavated with a track-mounted backhoe, or similar equipment. **Explosives** will only be used when necessary in areas where rock substrates are found at depths that interfere with conventional excavation or rock trenching methods." **Page 168 states that "At this time the extent of blasting for the Project is unknown."** Much of Peters Mountain/Appalachian Mountains are comprised of rock containing many synclines and anticlines.

•**Earthwork, construction - deforestation, slope alteration, erosion, sedimentation control** - Earthwork (construction) that is done on the top 4 feet of earth in our area is subject to causing changes that can result in landslides, flash flooding, water contamination and changes in direction of water flow. The greatest fluctuation of water content always occurs in the top 2 feet .

•**Landslides** An article by Peter F. Ffolliott, Kenneth N. Brooks, Roberto Pizarro Tapia, Pablo García Chevesich, Daniel G. Neary entitled **Soil Erosion and Sediment Production on Watershed Landscapes: Processes and Control describes causes of landslides.** Soil mass movement is the instantaneous downslope gravity-driven movement of finite masses of soil, rock, and debris. Landslides, debris avalanches, slumps and earthflows, creep, and debris torrents are examples of this movement. Landslides are often used as a generic term to include all forms of soil mass movement that exhibit perceptible motion (Satterlund and Adams 1992). However, large amounts of imperceptible soil mass movement also occur. Soil mass movement occurs on slopes where forces promoting failure become large compared with the resistance of soil to failure (Swanston and Swanson 1980, Satterlund and Adams, 1992, Brooks et al. 2013). **These conditions are pronounced in steep, mountainous areas that experience high-intensity and often prolong rainfall events or rapid snowmelt.** Forces promoting failure (shear stress) increase as the inclination of a slope increases or as the weight of the soil mass increases. The presence of bedding planes and fractures in underlying bedrock can cause sites of weakness on a hill slope. **Earthquakes or activities such as blasting for construction can augment the sheer stress.**

•**Deforestation-removal of vegetation from right of way** - An article by James H. Patric is entitled **DEFORESTATION EFFECTS on Soil Moisture, Streamflow, and Water Balance in the Central Appalachians.** The objective of his study was to determine deforestation effects on soil moisture, streamflow, and water balance.

The study watersheds are located on the Fernow Experimental Forest near Parsons, West Virginia, on mountain land ranging from 2 to 3 thousand feet in elevation above sea level. After the first year of soil-moisture measurement, they concluded that water content below 2 feet remained virtually constant on the barren watersheds (after deforestation). The greatest fluctuation of water content always occurred in the top 2 feet. During the 3 years that watersheds 6 and 7 were kept barren (deforestation), average annual streamflow was 10 inches greater than it would have been had the watersheds remained fully forested. Most of the increase was in the growing season.

Rain absorbed into already moist soils of the barren (deforestation) watersheds maintained the streams from these watersheds at consistently higher levels than had prevailed under the original forest vegetation.

The growing season is roughly May through September, with an average frost-free season of 145 days. Tree leaves emerge late in April, are fully grown by June 1, and begin to fall in early October. About 95 percent of the tree roots are found in the upper 3 feet of soil. Soil-moisture changes to 4 feet were computed. The 4-foot soil depth used for moisture measurement is both physically and biologically appropriate; it is about the maximum depth of Calvin soil and contains most of the forest tree roots. Gain or loss of soil moisture is considered a suitably complete statement of rainfall disposition on the forested watershed. This equation neglects the small and relatively constant losses of soil moisture by direct evaporation, photosynthesis, and plant respiration.

A case of extreme variation in runoff with small differences in climate occurred in Virginia (Burford and Lillard 1966). There, 52 percent of rainfall drained off one watershed and only 21 percent from another nearby. The authors attribute these differences in runoff to the soil, parent material, and basic geological characteristics of each basin.

•**Flash flooding** An article by James H. Patric Forest Service Research Paper titles **Soil-Water Relations of Shallow Forested Soils During Flash Floods in West Virginia** explains how complete infiltration can lead to flooding. Under prolonged rainfall, zones of exfiltration expand upslope, in effect lengthening and widening stream channels. When rain stops, exfiltration diminishes and channels shrink to prestorm dimensions. Mr. Patric was formerly project leader in forest hydrology research, Northeastern Forest Experiment Station, USDA Forest Service, at Parsons, West Virginia, and Adjunct Professor of Forestry, West Virginia University at Morgantown.

Stormflow-rain that fails to infiltrate-reaches streams by flowing overland to them. But what if all the rain infiltrates? Does that ever happen? Forest hydrologists think that it does and, furthermore, that overland flow is a rarity in the humid climate forest. They believe that rate of infiltration (the maximum rate at which rain can enter the soil) almost always exceeds rainfall intensities on well-managed forest land throughout the eastern United States

Our best clues are from the Fernow Experimental Forest, near Parsons, where abundant data are available concerning the soil-water relations of Calvin silt loam. It is wettest in springtime, containing as much as 15 inches of water in the upper 4 feet of soil. Transpiration by trees is most rapid in June and July, lowering midsummer moisture content to about 10 inches of water (Patric 1973). Thus, Calvin soil has retention capacity for about 5 more inches of rain in midsummer than in early spring. Presumably, the Weikert-Berks series, too, had greater rain-retention capability in August. The drier the soil at the onset of a storm, the more rain is needed to start the sequence of saturation, exfiltration, overland flow, and soil erosion.

These results are important because the soils, vegetation, topography, and land use on the flash flooded sites typify much forested land not only in West Virginia but in most of the central Appalachian region.

The U.S. Soil Conservation Service (1979) estimates a national soil-loss rate averaging 4.8 tons per acre per year from cropland, and 10.6 tons for the Appalachian states. The key is complete infiltration. Under prolonged rainfall, zones of exfiltration expand upslope, in effect lengthening and widening stream channels. When rain stops, exfiltration diminishes and channels shrink to prestorm dimensions. Overland flow and piping contribute to the drainage process, but only as the soil saturation that is prerequisite to their functioning develops. Differences in stormflow and erosion occurred not because the behavior of water in the soils differed, but because infiltrated water performed the same way in forest-soil-bedrock complexes of differing configuration and antecedent wetness.

•Seasonal temperature changes affecting expansion and contraction of pipeline

An article by Jim Smith, FMC Technologies entitled **EFFECTS OF FLUID PROPERTIES ON PIPELINE MEASUREMENT** explains how temperature influences the increase and decrease of volume. Volume measurements are corrected to standard conditions which mean a fixed temperature and pressure. Most common for custody transfer is 60 deg F and 0 psig (atmospheric 14.696 psia). If we filled a 1 gallon container with 1/2 gallon of diesel fuel at 60 deg and 0 psig, we know that if we heated the liquid to 85 deg F, keeping pressure at 0 psig, the volume would increase its physical space inside the container. The opposite would be true if we cooled the diesel down to 30 deg F, we would have a decrease in volume. This is due to the expansion and contraction associated with all liquids which determines how much the volume will change per degree change in temperature.

The temperature is very important when collecting data on the viscosity of a liquid. The viscosity at min and max operating temperatures should be the minimum data collected. Product temperatures should be considered year round in regions with changing seasonal temperatures which can have an effect on viscosity values. The range gives an idea of how much or how little this property will change with changes in temperature.

High viscosity liquid products are described as thick and heavy, commonly attributed to crude oils, bunker fuels and asphalt. These would prove difficult to flow and pump at low temperatures but easier at higher temperatures which, is why it is common to heat these products, lowering their viscosity. Low viscosity products are described as thin and light such as gasoline, kerosene and ethane. These products flow easily in comparison and have smaller values of viscosity. The viscosity will affect different metering technologies in different ways through its ability to flow.

Vapor Pressure is simply defined as the amount of pressure required to keep a fluid in a liquid state. If the fluid pressure goes below the vapor pressure, the liquid can change into a gas which is sometimes referred to as **flashing.**