April 06, 2017

To: Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, DC 20426

Re: Atlantic Coast Pipeline LLC, Dominion Transmission, Inc. and Piedmont Natural Gas Company, Inc.
Docket Nos. CP15-554-000, CP15-554-001, CP15-555-000, CP15-556-000

Comments of the Virginia Chapter of the Sierra Club concerning the
Draft Environmental Impact Statement

Dear Secretary Bose:

The Virginia Chapter of the Sierra Club (Virginia Sierra Club) submits these comments on the Draft Environmental Impact Statement (DEIS) concerning the proposed Atlantic Coast Pipeline (ACP). We do so on behalf of our 18,000 members, a number of whom live along the route of this and other interstate pipelines currently proposed to pass through Virginia.

As reflected in these comments, the DEIS is deficient in many respects and should be revised or replaced. Likewise, we urge the Commission to discontinue the practice of approving pipeline projects that do not serve the public interest and take seriously its duties to consider all factors affecting public convenience and necessity, including environmental protection, economic impacts and private property rights. Land seized for privately owned pipelines that are motivated by financial incentives of windfall profits does not serve the public interest.

In light of the comments being filed by other organizations, including those submitted by Appalachian Mountain Advocates and the Southern Environmental Law Center on behalf of various organizations, the Virginia Sierra Club has not attempted to cover all the topics that are addressed in those comments.

Table of Contents

I. Greenhouse Gases and Climate Change

The DEIS's purported consideration of the proposed ACP/SHP (collectively, ACP unless otherwise indicated) impacts on climate change is seriously deficient. Among other problems:

- While it mentions calculations of CO2 emissions from pipeline operations and even downstream combustion, it brushes them off without analysis of the implications with a fallacious argument.
- It refuses to estimate impacts from upstream emissions of CO2 and methane (CH4) in production, processing and gathering operations despite their being directly linked to the gas proposed to flow for more than 40 years or more.
- It erroneously applies a factor of 25 for CH4 in computing CO_{2e} (a "GWP") over 100 years, when (a) the more appropriate GWP factor is 87 computed over 20 years given the life and impact of CH4, and (b) even over 100 years, the more recent IPCC GWP factor for 100 years is 37.
- It fails to put the proposal's impact into the larger context of the world's need and commitment to cut GHG emissions drastically as rapidly as possible to prevent worldwide temperature increases "well below" 2.0C—half of which has already been passed.
- It fails to examine the proposed action in the broader context of FERC's current practice of approving all proposed pipeline projects whenever they have contract support and mitigate local environmental impacts.
- It takes credit for the possibility that natural gas could displace "some" coal burning, which is dirtier at the point of combustion, but refuses to consider the probability that gas expansion will displace zero-carbon energy (solar, wind, nuclear, etc.) (which it says is outside the scope) and the inevitability that increased gas transportation will be accompanied by increased CO2 emissions from gas combustion and increased methane emissions upstream.
- It fails to implement practical methods of assessing impacts and their significance, including applying a social cost of carbon and ignoring what science methods can assess.
- It fails to consider possible certificate conditions or policy changes that could mitigate the GHG harms from additional gas combustion, production, and transportation.

a. <u>CO2 Emissions from Pipeline Operations and Downstream Combustion</u>

Following public scoping comments, the DEIS does include estimates for CO2 emissions from operations of the proposed ACP/SHP and from downstream combustion.

Combustion-driven CO2 from ACP/SHP

ACP/SHP	GHG metric tons/year	40 years planned life (2.5%depreciation rate)
Compressor, etc. CO2 (p. 4-453)	1,149,552 CO2	45,982,080
Downstream combustion CO2 (p. 4-512-513)	29,028,450 CO2	1,198,295,000 CO2
Total CO2 from pipeline and downstream combustion	30,178,002 CO2	12,007,120,080

Yet, FERC fails to sum the total emissions over the expected life of the project (40 years at the applicant's chosen depreciation rate). Had it done so, it would have foreseen 12 billion metric tons of CO2 from pipeline operations and deliveries. (Methane losses are not estimated.) That is a far more significant impact than implied by the DEIS. Even though it calculates potential annual emissions from downstream combustion, it brushes aside their significance by claiming that "the downstream combustion of gas is not causally connected because the production and end-use would occur with or without the projects." (p. 4-512). That's a rather startling assertion inasmuch as the entire analysis of the proposed project and alternatives is premised upon there being a "need" for the project which would not be met in its absence.

Beyond that the DEIS merely recites that it cannot tell what specific local or regional harms will occur from the heating impacts of these emissions because of the absence of a method to link specific harms to specific emissions. That approach is erroneous and an abdication of FERC's responsibility, as discussed below.

b. Failure to consider upstream impacts

FERC recognizes that the pipeline is intended to transport and deliver up to 1.5 Bcf per day--actually receiving more in order to supply fuel use, lost and unaccounted for quantities (likely in the 2-3% range). It recognizes, as well, that there will be GHG emissions from combustion (CO2) and leaks and venting in the production, processing and gathering operations upstream of the proposed pipelines. However, FERC ducks all responsibility for estimating these directly connected emissions by claiming (p. 4-512) that "the upstream production … of gas is not causally connected because the production and end-use would occur with or without the projects," by suggesting that pipelines don't induce exploration and production decisions, and that FERC cannot make estimates of impact because it does not know the exact locations of wells.

These are unjustified excuses that fail to fulfill FERC's obligations under the NGA and NEPA. Neither FERC nor anyone else can seriously doubt that expanding transportation capacity will induce new drilling, production, combustion and methane leaks. Pipelines may be built to areas that already show developing supplies, but the arrival of pipelines expands the investments in gas development and production. Producers do not drill without a prospect of selling the gas, and they defer drilling and well-completion when prices are low and outlets are filled**.** A pipeline with a proposed 40 year life would need 21,900 Bcf to stay full, and FERC well knows that producers in the area are not sitting on the of already developed reserves in the project's supply area. Such deliveries will require substantial new exploration and development. The DEIS is plainly deficient by pretending otherwise.

Indeed, FERC and DOE publications document the link between adding pipeline capacity and increasing gas production. *See, e.g.,* EIA's 2013 report, "New infrastructure boosts West Virginia, southern Pennsylvania natural gas production," http://www.eia.gov/todayinenergy/detail.php?id=12311 (July 30, 2013); FERC's "State of the Markets Report 2015" ("SOM 2015")(which links tight transportation capacity to lower wellhead prices in the Marcellus/Utica shale areas and to falling exploration rates).

FERC's disavowal of a connection between expanding pipelines and gas production is particularly remarkable in the DEIS's assertion that the gas would be produced and end-uses served without the proposed pipeline project. That begs much larger public interest questions, including what is the need for the pipeline and what is the justification for taking property and harming the environment along the pipeline's proposed route if the end uses could get the gas anyway? Obviously, if existing pipelines already have sufficient capacity to transport this gas, then the public convenience and necessity would be better served by keeping those pipelines filled with natural gas than by clearing land, laying pipe, crossing streams and wetlands, increasing noise and pollution, and taking people's land. Equally obviously, if the proposed new pipeline does not attract new supplies then the proposed pipeline should be rejected because it will lead to underutilization of existing pipelines and needlessly compound the environmental impacts they produced.

Nor can FERC hide behind uncertainty of the identities of the exact wells that will produce the gas. FERC may not know the identity of the "exact wells" and may not regulate them, but it does know (or can learn) the general characteristics of wells and production methods (i.e., shale fracking) in the region. The capacity of this pipeline means that the gas it transports will come from many different wells over the decades of its operation. Hence a reasonable range of estimates of emissions can be based

on studies of average emission performance from hydraulic fracking and processing methods used in this region. Indeed, elsewhere, the DEIS makes exactly such estimates for water consumption associated with projected production activity. Estimates of GHG emissions caused by the ACP are provided in the attached report prepared by Dr. Richard Ball, PhD, a retired climate scientist, who has reviewed the body of published literature on methane leakage from production operations and, conservatively, uses an emissions estimate from Exxon-Mobil. It shows huge annual impacts from CO2 and methane emissions. These would be extended for at least 40 years given the ACP's planned life.

In sum, there can be no doubt that, without FERC's approval of this and a host of other new pipelines or of expansions of existing pipelines, less gas would be produced, transported, combusted, vented or leaked, presumptively in proportion to the amount of the expanded pipeline capacity. FERC has an obligation under the NGA and NEPA to quantify and evaluate the harms to the public and the environment from those operations and emissions.

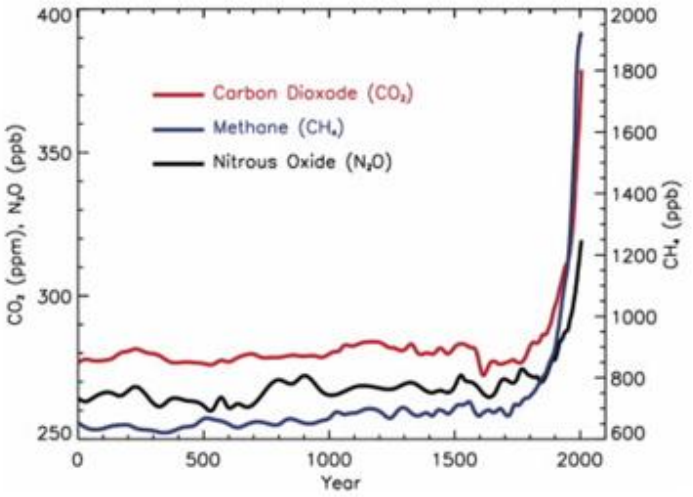
c. Climate Impacts and the Dwindling GHG Budget

The DEIS acknowledges that GHG increases are primarily the product of human activities, particularly fossil fuel production and consumption. It also acknowledges some of the many harms caused by human-caused climate change.

However, the DEIS fails to fully explicate these relationships and how sharply our fossil fuel production and combustion have contributed, and will add, to the problems we face. The rate of human CO2 emissions from fossil fuels and its impact on atmospheric concentrations is illustrated by this graph. CO2, CH4 and N2O have skyrocketed from business-as-usual fossil fuel policies.

Rate of Change Last 2000 Years: CO2, CH4, N2O

(IPCC 4th Assessment Report, Fig. 1, FAQ 2.1, Chapter 2 (2007)



Worldwide temperatures are rising faster than at any time in human history, possibly at any time since the dinosaurs.

These are not vague concerns for the unforeseeable future. According to NOAA:

- 16 of the 17 hottest years since 1880 occurred between 2001 and 2016;
- 1998 (which allegedly started a “pause”) is tied for 7th hottest—some “pause”;
- 2016 surpassed worldwide temperature records set by 2014 and 2015;
- 2016 was the 40th consecutive year above 20th Century average.

The harms from human-caused climate change are already profound; and crossing the 2.0°C level presents intolerable risks that warming and climate impacts will pass a tipping point and spiral out of control. We are already experiencing large changes in weather patterns, forest fires, sea levels, disease and pest vectors, agriculture, and national security threats. Human health will be compromised, as will property values, economic stability and hunger. Like scientists, the U.S. military and intelligence community have no doubt about the threats posed by climate change. These harms from global warming will get worse and *accelerate* to get much worse the longer we wait to reduce greenhouse gas emissions, particularly CO2 and methane which are products of fossil fuel production, transportation and combustion.

Nor is this an abstract issue to Virginians. Parts of Virginia already experience coastal flooding during high tides and common rain events. The U.S. Navy facilities are threatened by sea level rise, as is the regional economy that has arisen to

support the military presence. Hampton Roads is right behind New Orleans for vulnerability to sea level rise and potential storm damage. Virginia has also experienced forest fires during droughts, temperatures have risen, and extreme precipitation events even though neighboring states have fared worse.

Since GHG emissions, particularly CO2 are cumulative, it is essential to start aggressively reducing CO2 and other GHG emissions to prevent a global and national catastrophe. There is a finite amount of CO2 and other GHGs that can be emitted—we cannot exceed the limit without terrible consequences to ourselves, our children and grandchildren.

It may be true that FERC cannot match each ton of CO2 to a specific climate harm, but the DEIS does a disservice by pretending that's the test. By that standard, a smoker should just keep smoking because no one knows whether cancer will be caused by the next cigarette.

While emissions from each individual new pipeline may represent only a fraction of the worldwide problem of GHG emissions, the upstream and downstream emissions they induce are large and the sum of FERC's continuous string of approvals is enormous.

The DEIS makes a number of arguments regarding evaluation of climate impacts that are not consistent with climate science. An example of such statement is in the third paragraph, p. 4-511]:

> "Because we cannot determine the projects' contribution to cumulative impacts on climate change, we cannot determine whether the projects' cumulative impact on climate change would be significant."

That is neither a valid conclusion nor a valid premise. There are relatively well established relationships between the emissions of GHG gases and the resulting incremental increased concentrations in the atmosphere and between the concentrations in the atmosphere and the changes in radiative forcing that drive global warming. Those relationships are examined in detail in the 2013 Assessment of the IPCC on Climate Change, Working Group I report, especially Chapter 8. From that information, one can calculate the total change in heating of the planet in response to a sequence of GHG emissions from the project over a period of time—effectively the cumulative effect of those emissions. This could easily be done with-reduced form (simplified) climate models such as MAGICC available to analysts. However, even simpler methods are available to do that approximately without running models.

An example of such a simplified estimate, performed in a spreadsheet, is shown in Figure 3 below.

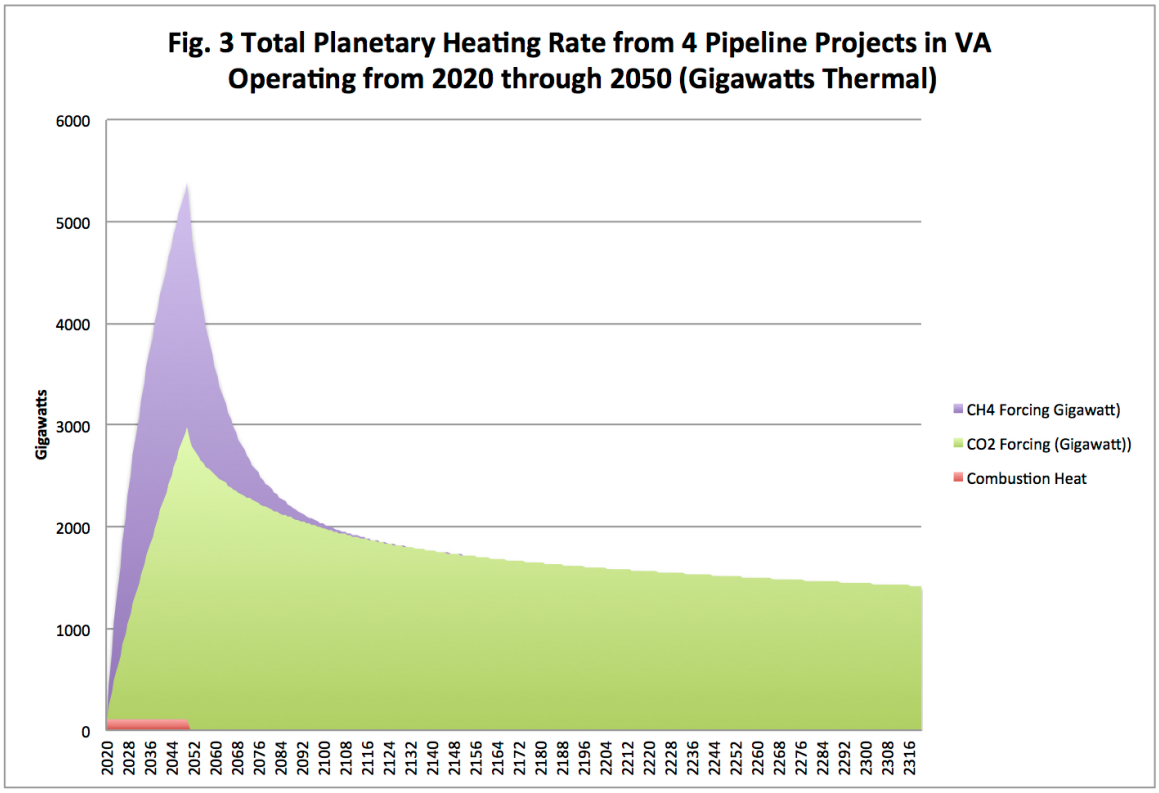


Figure 3 is calculated using an approximate method to estimate radiative forcing based on marginal changes in global GHG concentrations, using equations from IPCC 2013, Chapter 8. A published example of similar approximate methods is described in Alvarez *et al.* (2012). Figure 3 uses GHG emission estimates from the Sierra Club report "GHG Emissions Associated with Two Proposed Natural Gas Transmission Lines in Virginia" (attached as Appendix A) due to four proposed pipeline projects in Virginia, assuming they are operated at full capacity during the 30-year period 2020 through 2050. That amount of heating in turn will tend to raise the temperature of the earth by an estimated amount, with some known degree of uncertainty.

FERC could easily employ similar to methods to compute heating impacts or even changes in global temperature over time due to the ACP or any other combination of natural gas pipelines and compare those estimates to other sources of GHG emissions to assess the significance of those projects.

Another method of evaluating the significance of cumulative GHG emissions from the project is to compare the cumulative emissions of CO2 to the estimated allowable

carbon budget of the Earth that scientists have calculated must not exceed if we are to have a good chance to keep global mean temperature change at less than 2 deg C. An example of this form of evaluation of significance is given below
Even if FERC cannot say exactly what specific climate harm is traceable to each new pipeline, it certainly can recognize that each additional pipeline will make climate change worse, and that by facilitating 35-60 year investments in transportation capacity, its actions contribute to a momentum for growth and continuation of emissions that need to be cut back sooner rather than later. It can also utilize the readily available tool, the existing estimate of the "social cost of carbon", as a proxy for harms from incremental GHG emissions. The existing estimate of the social cost of carbon was laboriously developed and has been vetted and confirmed.

Furthermore, the DEIS understates and then ignores the harm done by methane emissions. The Commission's environmental assessment and "public convenience and necessity" determination must acknowledge and reflect the fact that methane's global warming impact is 87 times CO2 over 20 years. Twenty years is closer to the actual atmospheric life of methane and to the period in which we most need to be cutting GHG emissions. The higher multiple of 87 times over 20 years is more relevant to our immediate global warming predicament than a 100-year figure of 25 CO2e, which is referenced in the DEIS. Most of the methane emitted in a given year will be gone from the atmosphere after 20 years so a 20-year impact period—which extends two decades beyond each year's emissions (to nearly 2080 for the ACP)--is much more relevant than a misleading 100-year figure. The burst of atmospheric and ocean heat from methane is particularly dangerous because it comes when the U.S. and the rest of the world have recognized that dramatic reductions in GHGs are needed over the next 30 years, i.e., by 2050, if the world is to keep worldwide temperatures from increasing by more than 2°C above pre-industrial times. The trapped heat will survive far longer in oceans than in the atmosphere.

Looking at each pipeline application in isolation not at emissions programmatically is arbitrary and contrary to FERC's obligation to protect the public interest. The reality is that FERC's let-them-build policies under its Certificate Policy Statement have given a massive cumulative boost to natural gas production and combustion. The ACP would be "only" 1.5 Bcf/d of new capacity, but that would be in addition to all the other pipelines FERC has certificated and the many pending applications for additional capacity.

Now, more than ever, the Commission needs to analyze how new natural gas combustion and methane emissions fit within a total GHG emissions budget, alongside other sources of GHGs, over the period in which the proposed pipeline will

be operating. Even if each emission source were small when viewed in isolation, the cumulative impacts are huge, and the Commission's power to approve or disapprove proposals to transport natural gas from production areas to markets places it in a central position to exacerbate or mitigate climate change. None of this is reasonably considered by the DEIS.

FERC's analysis also needs to recognize that, in the 2015 Paris Climate Agreement, virtually every country in the world has now joined scientists in recognizing that we must collectively act to reduce GHG emissions rapidly in order to keep global warming temperatures from rising more than 2.0°C above pre-industrial averages. Indeed, the Paris Agreement calls for keeping the temperature increase "well below" 2.0°C. Not only must we reduce GHG emissions rapidly, we must achieve net-zero emissions sometime after 2050. Those limits place profound limits on GHG emissions and on the economic viability of proposed projects that would add to GHG emissions.

Staying within the Paris Agreement's 2.0°C cap on average temperature increases requires limiting future GHG pollution, *i.e*., staying within a "carbon budget" in CO2-equivalent (CO2e) emissions. For a 66% chance of staying below a 2°C increase, total worldwide emissions of CO_2e from 2011-2050 must be under 825 gigatons (1,000 million tons/GT). Less than 650 GT remains in the budget, as 175 GT were emitted 2011-2015. The problem is driven by the fact that much of the CO2 emitted today will stay in the atmosphere for centuries (millennia actually) declining only slowly, condemning many generations beyond ours to the climate harms we cause. (This is illustrated by a graph in the attached report, which shows the slow decline of warming impacts from CO2 over 300 years. That report, which also documents the cumulative harm from CO2 and methane associated with the proposed ACP and MVP pipelines, was primarily authored by Dr. Richard Ball, a climate scientist and physicist who, before retiring, spent 24 years working for DOE and EPA, including several as a lead author of portions of major IPCC reports.

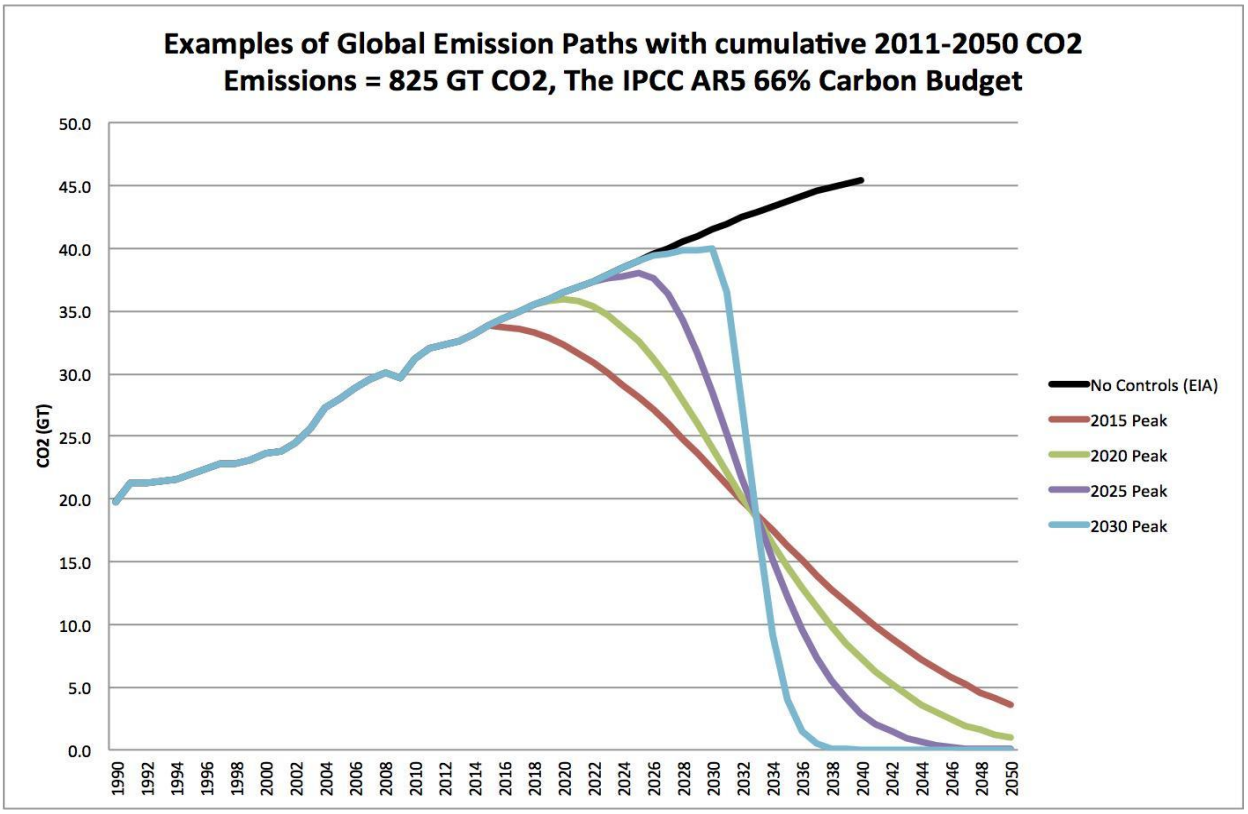
In the Paris Agreement, the United States promised to reduce its CO2 emissions by 26-28% from 2005 levels by 2025, and it reiterated its path to "deep decarbonization" with an 80% reduction of CO2e emissions by 2050. The EU promised even greater reductions. The U.S. recognized that, in order to stay below a 2°C increase, these are the kinds of reductions that are needed from industrialized countries that contributed most to today's high CO2 concentrations.

To put the deep decarbonization goals into perspective, FERC needs to recognize that, even if all coal burning were to end, CO2 emissions from natural gas and

petroleum consumption would need to decline by 68% from 2015 levels by 2050, and that doesn't consider related methane emissions. (See data in Table 12.1, EIA Monthly Energy Review November 2016.) Further, as discussed below, it is not enough to reduce CO2 emissions 80% by 2050 if we start in 10-20 years. CO2 is cumulative, and we are rapidly using our remaining allotment.

Decarbonization needed to stay under a 2.0°C worldwide temperature increase can occur gradually or, by being deferred, occur suddenly. Obviously, the economic harms from delaying the start of GHG reductions and implementing them in a much shorter time frame are potentially profound.

These potential impacts are illustrated by the following graph, which shows alternative pathways to reducing CO2 emissions by amounts needed to stay below a 2.0°C temperature increase. As it illustrates, delaying reductions in CO2 emissions will have profound consequences. In effect, delaying CO2 reductions means that a slope becomes a cliff – a crash landing – and investments made now in long-lived assets, including natural gas pipelines and gas-consuming uses, will face a high probability of being stranded or underutilized.



This graph illustrates that the critical GHG reductions must begin now or in the next few years—well within the lives of pipelines and gas-burning facilities being built or proposed today—or the economy will face the collapse of a pipeline and fossil fuel bubble or a climate wreck. The socio-economic impacts of continuing to invest billions of dollars in long-term assets, like pipelines and fossil-fuel burning generation, while we delay GHG reductions could make the housing collapse and great recession look modest by comparison or, worse, fossil fuel investors will demand to continue to operate and we and our children will suffer the socio-economic and environmental catastrophe of climate change.

The danger that we will cross a tipping point is very real and an existential threat to our children, grandchildren and country. The consequences of GHG emissions will last for centuries; and, our children and grandchildren cannot undo what we do to the climate. It is not surprising that former Treasury Secretary Henry Paulson was quoted last year as saying, "I don't think there's a bigger long-term economic risk than climate change."

The real policy test for the Commission is how it can help to reduce or, at least, not add to GHG emissions and therefore harms from CO2 and other GHGs. There are steps the Commission can take, but climate change (or the economic consequences of sharp reductions later) will get worse as long as FERC's decisions and environmental assessments duck the problem of induced emissions and fail to consider mitigating conditions that would help to hold down emissions.

Planning and action must begin now. Every time the Commission grants a certificate authorizing a new interstate pipeline or expansion of capacity by an existing pipeline, it adds decades of CO2 and methane emissions to the ledger. The problems created are multifaceted, but not fairly avoided. As a result of the profound risks, the Commission should stop acting new interstate pipelines until after it has worked through all the issues in revised environmental assessments that fairly address the issues and possible solutions. It should also reexamine its 1999 Policy Statement, which has evolved as a rubber stamp for new pipeline construction as long as local environmental impacts are addressed.

d. The DEIS's Flawed Analysis of FERC's Actions

The DEIS's impact analysis is badly flawed. This results from several factors including its focus on annual emissions caused by the ACP in isolation, downplaying downstream GHG emissions, ignoring gas displacement of zero-GHG alternatives,

and utterly ignoring both upstream GHG emissions and the economic harms from FERC's helping to inflate the bubble of investments tied to natural gas.

1. Focus on individual pipelines rather than true cumulative impacts.

The DEIS estimates GHG emissions from operation of the ACP and even does a calculation of CO2 emissions from combustion of the 1.5 Bcf/d to be carried by the project. It then suggests that this pipeline alone doesn't have a large impact and cannot be connected to specific harms from climate change.

However, in order to fairly assess the cumulative impacts of FERC's actions, the ACP must be viewed in the context of the planned 40-year life of the project, FERC's overall policy of approving essentially all pipeline proposals that have contract support and agree to mitigate local physical impacts from construction and operation, and the total quantity of gas production and combustion to which the ACP will be added.

First, the annual production and consumption of gas to be transported by the ACP is expected by the applicants to continue for 40 years as reflected in the proposed 2.5% depreciation rate. CO2 emissions are cumulative and will continue to heat the atmosphere and oceans for centuries. Using the EPA calculator referenced in the DEIS, the CO2 emissions from 1.5 Bcf/d of combustion would be 29,957,375 MT per year and 1,198,295,000 MT over the project's expected 40-year lifetime. To that one would need to add CO2 and methane emissions from pipeline and production operations. That would add over 50% to the project's effective CO2e (using the Exxon-Mobil methane emissions estimate) or double the CO2e using a top-down estimate of methane emissions in production areas.

Second, the ACP is not the only project being considered in this region or nationally. The cumulative impacts need to be examined. The problem created by constant gas pipeline expansions is well illustrated by Oil Change International's July 2016 report, "A Bridge Too Far: How Appalachian Basin Pipeline Gas Expansion Will Undermine U.S. Climate Goals," http://priceofoil.org/2016/07/22/a-bridge-too-far-report/ Other aspects of the risks of continuing to build pipelines at the current pace are discussed in IEEFA's study, "Risks Associated With Natural Gas Pipeline Expansion Across Appalachia," http://ieefa.org/wp-content/uploads/2016/05/Risks-Associated-With-Natural-Gas-Pipeline-Expansion-in-Appalachia-_April-2016.2.pdf Yet the Commission and the DEIS are seemingly oblivious to these risks and their likely consequences for ratepayers, the economy and the environment.

Just the Appalachian projects summarized in the DEIS at pp. 4.490-492 would add over 13 Bc/d to the ACP's proposed 1.5 Bcf/d. Collectively, the cumulative operational, downstream and upstream emissions associated with those projects would be far higher than the DEIS' blinkered focus on the ACP in isolation. And, yes, the projects would add production and combustion upstream and downstream, since producers are not sitting on 30-40 years of developed reserves for 14.5 Bcf/d. To put it into a larger perspective, an EIA report cited by FERC in its recent Atlantic Sunrise order, says that natural gas pipeline capacity increased by 127 Bcf/d between 1998 and 2013, with another 38 Bcf/d projected to be added between 2015 and 2030. That is a huge increment of capacity above the already large transmission system in the U.S. amounts to 165 Bcf/d of firm capacity that could be operating well beyond 2050.

To paraphrase former Senator Everett Dirksen, "a billion here and a billion there soon adds up" to real emissions. FERC owes it to the public, including our children, to assess the cumulative impacts of its policies, not merely address individual actions in isolation.

Put in the larger context, the ACP's contribution would be on top of existing emissions from natural gas. Just maintaining current natural gas production and combustion levels would have enormous adverse climate impacts. In 2016, US gas usage was 27,496,889 MMcf (27,497Bcf). Using the EPA CO2 equivalence calculator recommended by the DEIS (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator), just maintaining current natural gas combustion levels would emit:

- 1,504,547,275 tons CO2/ year;
- 45,136,418,262 tons CO2 over 30 years; and
- 60,181,891,017 tons CO2 over 40 years.

With a remaining global budget of under 650 GT to stay under a 2°C increase from pre-industrial levels, 30 years just of current CO2 levels from gas combustion would use up 6.94% of world's remaining budget, while 40 more years would use up over 9% of the remaining budget. Add upstream and operational methane emissions (based on the conservative Exxon-Mobil estimates cited in Dr. Ball's paper and GWP of 87 over 20 years), and the net impact would be 10-12% of the remaining carbon budget just from continuing to produce domestic natural gas at present levels. The impacts would be much higher if methane emissions are at or near the levels found in top-down methane studies cited in Dr. Ball's paper. Those emissions are simply unsustainable and FERC should not continue to implement policies whose cumulative impacts are so harmful.

2. The DEIS's CO2 "displacement" claim is misleading.

The DEIS accurately says that some of the natural gas "could" displace "some coal usage" and that combustion of coal emits more CO2 than combustion of natural gas. However, the "could" and "some" remain unquantified and unanalyzed even though the DEIS could have queried the ACP's planned customers to determine what the actual impacts are going to be.

Further, by focusing only on combustion, the DEIS ignores the facts that the combination of CO2 and methane emissions could make natural gas worse than coal's CO2 emissions from combustion alone. This is illustrated by Dr. Ball's report. The fact that the current Administration is eliminating previously adopted methane emission limits for producers will only make matters worse.

Equally importantly, the DEIS also ignores the fact that some natural gas will displace zero-carbon renewables and enhanced energy efficiency. Nuclear advocates complain that zero-carbon nuclear plants are being shut down by cheap natural gas, and it is clear that utilities' gas-powered investments often displace wind and solar. Investors in natural gas facilities and their affiliates will operate their pipeline and power plant facilities as much as possible in order to justify their investments, and utility affiliates of the ACP will tout gas-burning generation over less profitable renewable energy and improved energy efficiency when they are before regulators. Growing demand for gas-fired generation that will use this expensive project will be the goal.

The cumulative climate consequences are profound. For example, in its 2016 IRP, Dominion Virginia Electric Power, an affiliated ACP market, projected that it would increase its total CO2 emissions by over 80% by 2040, largely through increased gas-fired generation, with limited renewable energy and efficiency. Apart from coal facilities that are already planned for closure, Dominion's IRP identified no additional coal plant shut downs despite large increases in planned gas combustion.

These impacts need to be assessed, quantified and addressed, not ignored. The Commission cannot claim the purported benefits of possibly displacing coal, while refusing to consider the possible harms from displacing clean energy and efficiency.

In short, the DEIS makes no effort to dissect the impacts of constant pipeline expansions or the impacts FERC's decisions are having on cumulative GHG emissions and climate harms. Nor does it consider the closely related problem of

ocean acidification resulting from CO2 emissions. Nor does it consider what creative certificate conditions might help mitigate those impacts, short of simply denying certificates for new pipelines.

Every new pipeline or pipeline expansion authorized by the Commission contributes to this growing climate problems, and FERC's policies need to be reconsidered and revised to address this cumulative problem. There is no reason FERC cannot do this. The NGA's "public convenience and necessity standard" encompasses all factors affecting the public interest, including the environmental consequences of its actions. Moreover, FERC cannot be a passive observer; it has an affirmative duty to investigate and develop facts and analysis needed to serve the public interest. *See, e.g*., *Scenic Hudson Preservation Conference v. FPC*, 354 F2d 608 (2d Cir. 1965) ("In this case, as in many others, the Commission has claimed to be the representative of the public interest. This role does not permit it to act as an umpire blandly calling balls and strikes for adversaries appearing before it; the right of the public must receive active and affirmative protection at the hands of the Commission.")

Historically, the Commission worried about the adequacy of natural gas reserves to support new pipelines. It required pipelines to prove that they were backed by at least 20 years of proven reserves. It had a public-interest policy against service to wasteful boiler fuel uses (including turbines), as well as policies against duplicative construction and in favor of using existing rights of way. It had policies for allocating supplies to high-priority uses in times of short supplies or capacity.

Now, the greatest problems are the capacity of the atmosphere to absorb emissions of GHGs, particularly CO2 and methane, without heating the planet to ever more dangerous levels and the destructive and wasteful race to build new pipelines that cannot remain full for their useful lives without contributing to the climate catastrophe. The planet is the limiting factor, not a supply shortage.

Like funds in a bank account, every future unit of CO2 and methane pollution must be subtracted from the limited pool of future emissions that the atmosphere can absorb without catastrophic harm to our society, children and grandchildren. If we use up all or most of the potentially tolerable GHG emissions in the next 20 years, there will be an economic and energy-combustion collapse thereafter.

Issues that must be addressed include, but are not limited to, the following.

- The CO2 and methane emitted as a result of expanding pipeline take-away and delivery capacity will be on top of other emissions from natural gas and non-natural gas sources.
- Combustion, venting and leaks of natural gas will run beyond our climate-budget limits if the pipeline network continues to expand and stays full for the economic and physical lives of the pipelines. Pipelines approved today are designed to operate beyond 2050 and therefore long after sharp reductions in GHG emissions are needed. Impacts from their induced emissions will last far longer.
- As the CO2 budget cap is approached and future GHG limits tighten – and they will because physical realities cannot (and dare not) be overridden forever by short-term politics – either all pipelines will be underutilized and face financial harm or some (perhaps many) will fail outright. The Commission has previously seen stranded costs and bankruptcies in both natural gas and electricity markets, and they are not pretty. Continuing to authorize new pipeline capacity in the face of climate limits will cause worse gas and electric stranded assets than FERC has seen before. FERC is responsible for the consequences of every pipeline it approves.
- The health of the natural gas industry and the economy are placed at risk by continuing to build new facilities to produce, transport and utilize natural gas. Individual pipelines and power plants are multi-billion dollar investments, all of which are endangered by the foreseeable need to cut emissions fast.
- Not every proposed pipeline can rationally be approved given the building dangers from climate change and the GHG cuts needed to mitigate it. FERC must prioritize natural gas pipelines, potential uses and users, and possibly producers and production areas well before the aggregate CO2e limits are reached. The mere fact that it has not done so in recent years does not mean its public interest duties are satisfied by continuing to ignore the problems created by expansions. (Even if climate were not adversely affected, FERC needs to implement policies that encourage expansions and use of existing rights-of-way, as well as combined projects (as it has in the past).
- FERC's curtailment priorities recognize that residential, small commercial and industrial process uses need to be protected in the event of a supply shortage. Looking ahead, as FERC and EISs are expected to do, the Commission needs to consider what will happen to those priority-users and others if aggregate natural gas demand and capacity are raised based on the implicit, false assumption that the atmosphere can absorb GHG emissions at current or growing levels without limit. What will happen to the gas-fired generators and manufacturing facilities and large commercial facilities that were led to believe that there would be ample supplies of natural gas for the lives of the

pipelines being built? How will the consequences of overbuilding be allocated among the new and pre-existing pipelines? What will happen to the economy when the blind surge for new production and demand runs into the climate limits that are amply known today?

- The DEIS does not seriously evaluate "need", including how the gas will be utilized, when new uses will come on line, what cleaner energy sources (including efficiency) would be displaced, and what less harmful transportation paths might be used.
- It does not address how zero-carbon options, like wind, solar and efficiency, can meet energy needs at lower environmental costs in the absence of a constantly expanding pipeline grid. *See City of Pittsburgh v. FPC*, 236 F.2d 741 (D.C. Cir. 1956) ("The existence of a more desirable alternative is one of the factors which enters into a determination of whether a particular proposal would serve the public convenience and necessity. That the Commission has no authority to command the alternative does not mean that it cannot reject the proposal.")
- Similarly, FERC needs to consider (a) what mitigating conditions it can place on new certificates in order to reduce the risks and (b) whether, absent adequate conditions; it should reject a certificate application. Certificate conditions could, for example, encourage or require natural gas customers to co-construct zero-carbon renewables, make efficiency investments or commit to replace dirtier combustion (e.g., coal plants) to reduce aggregate emissions. Perhaps transportation should be limited to producers who certify measures to eliminate methane emissions from their operations. Absent such measures, FERC cannot reasonably approve new projects that may make multi-decade commitments to natural gas production and consumption, while jeopardizing the overall public interest in avoiding catastrophic climate change.
- The Commission also needs to evaluate the extent to which existing pipeline capacity is sufficient to meet long-term needs without encouraging reliance on expanded natural gas usage that cannot be sustained. Inasmuch as the current natural gas transportation network can deliver nearly 30Tcf per year – up substantially in the last decade – for decades to come, how much more can be tolerated. It may be that new production should be reduced or at least delayed and stretched out over time rather than building an eminently-burstable bubble of production and transmission capacity.
- FERC needs to re-examine its SFV rate design, which shelters pipelines from financial risks and subsidizes greater gas usage by excluding virtually all pipeline costs from the volumetric charges for firm transportation. That policy no longer makes sense when combustion and related emissions are harmful.

The central purpose of a NEPA-required EIS is to examine, describe and quantify these and other environmental impacts and risks so that the Commission's decisions can rationally and responsibly address these problems and their implications when considering individual applications and potential new policies. Instead, the DEIS in this ducks all of these climate issues, even though it acknowledges that GHGs are causing serious harms that will get worse the more CO2 and methane are emitted. In effect, it says that it doesn't need to consider these critical issues because each pipeline is only part of the larger picture, which remains unexamined. The Commission needs to do better. The longer it waits to confront these issues, the greater the harms will be to the gas industry, the public and the planet.

II. Need, Risks and the Public Interest

As a practical matter, FERC assumes a "need" for the proposed ACP/SHP projects (collectively "ACP" unless otherwise indicated) because the owners applied for a certificate and their affiliates entered into 20-year contracts for capacity. In support, the application recites that the customers will serve existing or future loads, 80% of which will be in power plants. There are several problem with the Commission's assumption of "need".

a. The contracts on which the Commission is relying are not arms-length agreements between parties who will bear the full economic risks. Rather, all the contracting parties are affiliates and all are affiliated with monopoly utilities which expect to shift the high costs and risks to captive markets. It is entirely foreseeable that once their affiliates have built this incredibly expensive pipeline, their utility cousins will endeavor to shift costs and risks to their customers, source supplies through these pipelines and, in the case of electric utilities, design power plants that will depend on their affiliated pipes. They will try to limit state regulators' resistance to the high costs by invoking preemption, by referring to FERC's certificate finding that the pipelines and contracts serve the "public convenience and necessity", and by steering their future construction proposals to ones that depend on the affiliated pipelines. (In Virginia, at least, the utility commission can only approve or disapprove construction applications by electric utilities; it cannot order construction of a different facility or open markets to competing providers.) In short, this is not a case in which FERC can rely on market participants' supposed assumption of risks as a basis for presuming a need. In any event, the collapse of the mortgage bond market a decade ago demonstrates that unsupervised bubble-chasers can endanger us all.

b. The DEIS indefensibly assumes without more that new capacity would not be available from existing or potential projects within a reasonable period. However, as

noted elsewhere, some of the applicant's claimed loads are "existing" loads and thus are presumably being served from existing pipeline capacity, and no time frame is spelled out by the application for future needs. Thus, the claimed need has not been shown.

This is well illustrated by the ACP's listing as delivery points two Dominion-owned electric power plants which already have 20-year contracts for much less expensive firm transportation service from Transco pursuant to earlier certificates issued by FERC. As to future needs, the application speaks only vaguely about future needs without specifying the magnitude or timing of those needs. With prices as high as are being proposed by the ACP, few unaffiliated customers will rush to sign up absent heavy discounts or a denial of access to alternatives. Access to temporarily low-cost natural gas is undercut by the ACP's unusually high costs and rates, and may be offset by increases in the future. It was not long ago, that natural gas prices exceeded $10/dth, so "low-prices" are not a given.

c. In any event, in its recent order approving Transco's Atlantic Sunrise project, FERC undercut any claim of an urgent "need" for proposed pipeline capacity stated that:

> "If the proposed project were not constructed, it is reasonable to assume that any new production spurred by such factors would reach intended markets through alternate pipelines or other modes of transportation."

d. Beyond the near term claim of need, the longer-term need is much more problematic. As discussed above, climate change from fossil fuel emissions of GHGs (CO2 and methane in the case of natural gas) poses a massive danger to the health of people, the environment, property, national security and the economy. The dangers are so severe, that, in 2016, virtually every nation voted to adopt the Paris Agreement, which calls for dramatic reductions of GHG emissions from now through 2050 and beyond—all within the lifetimes of pipelines being proposed today. Net-zero emissions are needed some time after 2050, with dramatic reductions before then.

Politicians may brashly assert that climate change is a "hoax," but the DEIS recognizes the contrary, the visible facts around us already contradict those claims, and the best, accepted science says that, without sharp GHG reductions, the world is heading to an unprecedented, dangerous and unstable world. Natural gas *combustion* may be cleaner than coal, but total GHG emissions from natural gas production, transportation and combustion is a very real problem which directly

conflicts with the world's goal of keeping the worldwide temperature increase to well below 2.0°C.

In that context, continuing to build pipelines exposes the nation to a rapidly building pipeline capacity bubble. Billions of dollars are being invested in pipelines, which induces billions more of investments in upstream and downstream facilities to produce, process, deliver and burn natural gas. Given the imperatives of climate mitigation (or the harm that results from delayed mitigation), has combustion will have to be cut back and, utilization of gas facilities at every point in the system will decline.

The inevitable results will include huge stranded assets, write-offs and bankruptcies. The results will also include fights over what users should get access to burning the remaining available supplies. FERC has seen those crises and fights before and should be doing everything it can to avoid them going forward.

Expanding investments in pipeline and generation capacity adds to the growing bubble. FERC cannot brush this risk off with a view that it can rely on sophisticated investors. Who was more sophisticated than the investment bankers who inflated the mortgage-security bubble a decade ago, leading to a massive financial collapse and the worst recession since the Great Depression? So-called sophisticated investors previously chased bubbles for technology, metals, railroads and fossil fuels in other eras. Some invested and lost badly, while others shifted risks to others; and, always, innocent bystanders and the general public suffered when the bubbles burst. These risks are particularly great when monopoly utilities and their affiliates take risks they can pass on to captive customers.

FERC is obligated to look deeply into these issues and protect the public interest, rather than assume need just because someone will sign a contract based on near-term thinking. At this time, the real "need" is to temper investments in new projects and figure out how to limit new construction to sustainable levels and to serve only existing and very high priority uses whose emissions have been mitigated and offset. FERC has broad authority to address these issues in evaluating projects and rates under the NGA. Some decades ago, it looked at need and demand selectively in light of supply shortages and curtailments. Now, it should look ahead to the probable demand curtailments that will be driven by climate mitigation—whether we like it or not—and limit new capacity to sustainable levels. It should take a skeptical look at bubble-building projects and should use its conditioning authority to incentivize clean energy, displace coal, and mitigate gas dependence that will make the transition to cleaner fuels harder.

III. Failure to Adequately Consider Alternatives

Even assuming that there were a "need" for greater gas deliveries, the DEIS fails to adequately consider alternatives, including a no-action alternative and alternatives that would combine proposals or build upon an existing pipeline system. Its analysis imposes unreasonable pre-conditions for serious consideration, and FERC fails to affirmatively explore alternatives that would meet the presumed transportation need while greatly mitigating harms to the public, the environment, private land owners, and total costs, in both the near and long term. The DEIS's approach to alternatives fails to fulfill FERC's duties under the NEPA to consider impacts and alternatives and under the NGA to protect the overall public interest.

a. As a practical matter, the DEIS requires that, to be considered, an alternative must have capacity that is currently available, must connect the same points, and must satisfy the economic interests of the contracting parties (conflated into the phrase serve the same "purpose"). That set of pre-conditions effectively eliminates serious FERC consideration of any alternative pipeline option—even though existing and proposed pipelines pass through or near the proposed area of production and connect to Transco and/or Columbia, and the prospective customers are already served by one or both of them.

b. When it does consider the option of combining the ACP and MVP, it acknowledges that there would be considerable environmental benefits, but it dismisses the option with the cursory statement:

> "We also evaluated the feasibility of merging ACP and MVP into one pipeline system. Although the merged system holds several environmental advantages over constructing both projects separately, including increased collocation, avoidance of MNF and GWNF, reduced crossings of the ANST and BRP, reduced number of access roads and contractor/pipe yards, and less construction across karst terrain; construction of the merged systems would require an additional 30 feet or more of extra construction right-of-way width, would increase air and noise emissions due to the additional compression required, and would result in a significant delay of delivery of natural gas to the proposed customers of both MVP and ACP."
>
> <u>And</u>
>
> "Our analysis of system alternatives concluded that other existing natural gas transmission systems in the ACP and SHP area lack the available capacity to

> meet the purpose of the projects. Modifying these systems could result in impacts similar to those of the proposed projects or would be economically impractical. Additional compression/looping would not offer a significant environmental advantage over the proposed actions. The use of an alternative transportation system, liquefied natural gas sourced gas, and/or truck or rail would be economically impractical. We conclude that the use of a system alternative is not preferable to the proposed action."

Those statements do not support the conclusions. They do not explain, for example,

> (a) why a delay would be critical when the customers have not shown any immediate need (*e.g.*, Dominion already has 20-years of firm service from Transco to meet all known needs at two identified delivery points and the application only vaguely describes the customers' need to serve "existing and future" loads, the former already being met and the later having unspecified timing) and any such delay is a product of the applicants' choosing to build self-owned pipelines at greater total costs and impacts rather than seeking a less-costly, environmentally preferred project in the first place;
>
> (b) why the "purposes" of self-dealing affiliates who have monopoly power in utility service territories deserve unexamined protection;
>
> (c) why the DEIS fails to consider the myriad other environmental benefits, including protection of wildlife, natural areas, and property rights of the many citizens who will lose property under the threat of eminent domain and/or be harmed by construction and operation of a pipeline near their property;
>
> (d) whether expanding existing pipelines or combining pending proposals actually "would" have "similar" adverse impacts, not merely that they "could" if not examined.

c. Consideration of the "co-location" option considered is also flawed. Although building two adjacent pipelines would be much less desirable economically and environmentally than a single pipeline, it would still be better to use one right-of-way than two Greenfield projects. The latter would cost more and do more harm to the environment and the rights of landowners.

d. The DEIS does not adequately consider the possibility of simply expanding and extending existing pipeline systems, such as those of Columbia and Transco, which already serve the ACP customers and regions. Transco, for example, already

serves, under much less expensive 20-year contracts all the needs of the two Dominion-owned power plants (Brunswick and Greensville) which the ACP is proposed also to serve. Transco also serves other ACP customers, and it would undoubtedly be glad to expand service. Columbia is also proposing to expand its system for delivery to Transco and could receive gas from DTI.

Transco has the added advantage of bi-directional flow from the Marcellus and from the Gulf, which would reduce the cost of expansion and enhances the likely reliability. And, Transco appears to be glad to expand its system, as evidenced by other recent projects, such as the Atlantic Sunrise and Southside Expansion (I and II) projects.

The DEIS does not meet its obligations by merely reciting that existing pipelines do not have "existing capacity" to meet all the alleged needs. The ACP does not have "existing" capacity to serve those needs. Nor is it sufficient to recite that there might be delay in commencing service. The application only says that the affiliated customers want the ACP in order to serve "existing and new" needs. Existing needs are already being met and new ones have no specified start-up dates. Vague pronouncements do not constitute analysis or evidence.

e. Just because the affiliate-dealing owners want to build the ACP does not justify the "purpose" or warrant overriding the myriad other public interests that are harmed by construction and operation of a major Greenfield pipeline whose markets could be served at lower cost and impacts in other ways—even assuming such service is desirable. FERC has a duty to consider whether its light-handed federal regulation, which approves all requested projects, subject to local-environmental conditions and contract requirements, serves the public interest in a case like this.

f. The DEIS also errs by failing to consider how clean energy and efficiency alternatives can better meet the nation's electricity needs in light of climate constraints. Since 79% of the proposed ACP capacity would serve electric generation, other electric options should be considered, particularly since they may be displaced by new investments in gas-fired generation. As explained in *City of Pittsburgh*, denial of a proposal may be appropriate if better alternatives may emerge, even ones beyond the Commission's jurisdiction.

g. FERC needs to consider alternatives, like limiting approvals to projects that commit to GHG-mitigation measures or by imposing certificate conditions that would reduce GHG emissions in ways that would mitigate combustion and leakage of natural gas. For example, in evaluating applications, large new power plants that offset emissions with equal amounts of zero-emitting electricity or that implement carbon capture and

storage would be more appropriately served than ones that merely promise to emit all the CO2 they can. Certificate and tariff conditions could enforce such measures. Without creative measures to reduce the harm from growing combustion and leakage, we have reached the point at which FERC needs to reject projects that will only add to GHG emissions.

h. The DEIS cannot justify dismissing alternatives, such as combining systems or expanding existing systems, by asserting that alternatives "could" cost more or be uneconomical, without serious analysis. The ACP is an incredibly expensive transportation option even if it were needed. It is hard to see how other alternatives could be more expensive. As shown below, the projected transportation rate (at 100% load factor) for the ACP (including SHP) is (a) nearly 7 times the rate for the WB Xpress, (b) nearly twice the rate for the MVP/EE, (c) more than 3 times the rate for Transco's recent expansion to serve the same two major power plants that Dominion seeks to serve (redundantly) with the ACP, and (d) more than twice the rate of Transco's Atlantic Sunrise project. Are proliferating greenfield pipelines really better than one, particularly when some are far less expensive than the ACP and MVP and when the owners/shippers on the most expensive proposal (the ACP) would off-load all their "business risk" onto affiliated utilities and their customers. Does this serve the public interest?

Here is a brief comparison of costs and rates (not counting fuel and variable costs) based upon relevant applications.

Project	Length	Capacity/day	Yr1 Rate Base/ Rate 100%LF	Other
ACP/DTI	641 miles ACP +DTI Supply Header	1.5 MMDth	ACP $5.05B + ROR (incl'g 15%ROE) + DTI $478MM / Vol Rate $1.75 +DTI ($0.154) = $1.90/Dth	Crosses WB Xpress and connects to Transco near where Transco already serves two generators to be served by ACP; Owned by affiliated utilities some or all with captive markets
MVP/EE	301 miles MVP + EE	2.0 MMDth	$3.6B rate base + ROR (incl'g	Connects to WB Xpress & Transco

			15.77% ROE) / Vol Rate $0.977	
Columbia WB Xpress	29 miles, mostly within existing ROW	1.3 MMDth	$758M rate base + ROR (incl'g 12.98% ROE) Vol Rate $0.266	Connects to Transco
Transco Southside Expansions I and II	104 miles	520,000 Dth/d	$251mm Blended vol. rate $0.55	Transco
Transco Atlantic Sunrise	200 miles	1.7 MMdth	$2.6 billion Vol. rate $0.7735	Transco

Despite its length, the DEIS is seriously inadequate when it comes to dealing with these critical issues. Seriously examining alternatives with intent to approve better options is what the environmental impact assessment is supposed to help FERC do. And, under the NGA, FERC is obligated to examine such issues, whether or not they have been vetted in a DEIS. *See Scenic Hudson Preservation Council; City of Pittsburgh.*

If FERC called upon the applicants to make proposals that would avoid the duplicative construction impacts, they could be expected to do so, particularly when FERC is handing out 15+% rates of return. By implementing a policy that virtually promises to approve all proposals that are supported by contracts (whether or not they are arms-length contracts with parties who bear the full risks), the Commission invites a proliferation of pipelines and environmental impacts. It arbitrarily reinforces that proliferation by refusing to conduct comparative hearings and by rejecting consideration of alternatives because they lack currently available capacity and could not be built in the same time frame. Denying or even threatening to deny duplicative certificate applications would do wonders for reducing the environmental and economic impacts.

i. The no-action alternative is not fairly considered. Instead it is rejected by reciting: "disapproval of the proposal would not achieve the applicant's' contractual "purpose" of transporting gas between specific points in the same time frame."

> While the no-action alternative would eliminate the short- and long-term environmental impacts identified in this EIS, the end-use markets would not receive the natural gas to the delivery points specified by the precedent agreements signed by Atlantic and DTI within a timeframe reasonably similar to the proposed projects. Because this alternative would not be able to meet the purpose of ACP and SHP, we conclude it is not preferable to the proposed action. We also conclude alternative energy sources, energy conservation, and efficiency are not within the scope of this analysis because the purpose of ACP and SHP is to transport natural gas. (ES-13)

The DEIS does not consider any of the reasons outlined above showing why construction and operation of this pipeline is neither needed nor consistent with the public interest. Even if a pipeline were needed, a better and likely cheaper alternative could be found with existing pipelines operating in the region. No urgency or emergency has been proven which precludes a closer look.

Thus, despite its lengthy consideration of localized impacts and some possible routing tweaks, the DEIS fails to adequately review alternatives. Even apart from NEPA, NGA Section 7(c) of the Natural Gas Act requires the Commission to explore the full array of potential harms, benefits of alternatives, in addition to current and long-term need, in order to protect the "public convenience and necessity" and to protect private landowners from unnecessary use of Section 7(h)'s extraordinary grant of eminent domain to privately owned pipelines.

The Commission's current implementation of its 1999 Certificate Policy Statement is no longer defensible. It has resulted in a proliferation of duplicative pipelines; it interferes with the case-specific consideration of alternatives and need, and it is outmoded by the dangers posed by climate change. The policy tilt toward applicants is no longer defensible and must be revisited based on new circumstances and evidence available to the Commission. Even if need were shown (by more than that contracting parties want something), incentivizing or requiring development of one pipeline to meet the alleged regional needs would far better serve the public interest and better protect private landowners and their neighbors from the intrusive use of eminent domain and the threat of it. Even if there was once merit to the Policy Statement's assumption that markets will protect the public interest, those assumptions are no longer valid.

IV. Takings of Private Property Land

The Commission seems to treat the taking of private land and the threat of eminent domain as a mere by-product of NGA Section 7(h), somehow Congress's fault, not FERC's. But, takings of private property by legal force or threat are the direct result of the *Commission's* Section 7(c) decisions to approve a proliferation of pipelines across new *areas whenever private corporations contract to build those pipelines*. Inasmuch as these are private owners to serve private affiliated shippers, FERC's blinders-on approach improperly elevates private business interests over the rights of private landowners. FERC's policy of approving proposed pipelines whenever there is contract support from private parties (subject to local environmental mitigation) raises serious constitutional questions about property takings for private benefits; and, in any event, it violates FERC's duty to balance the overall public interest and fairly consider all interests in the specific case before it, as opposed to some grand policy.

Protests and adverse comments by hundreds of private citizens is *prima facie* evidence that the public does not want or need the sprawl of proposed pipelines and that FERC should consolidate or reject projects in order to avoid duplicative facilities and to protect the public interest.

Sadly, FERC has lost any reputation it may have had as a fair arbiter of public and private interests. And, no, the Commission is not "misunderstood" by angry citizens. FERC's open-construction policies are understood all too well. The Commission needs to revisit its implementation of the 1999 Policy Statement in order to better protect people and the public interests generally. The Policy Statement was never a regulation that limits FERC's ability to consider all factors relevant to the public interest, and it cannot lawfully be treated as one.

V. Environmental review comments on the Draft EIS

Note: Italicized words are direct statements taken from the Draft EIS.

1. Waterbodies - Statements from the Draft EIS:

Page ES-8

ACP and SHP pipeline facilities would cross 1,989 waterbodies, including 851 perennial, 779 intermittent, 248 ephemeral, 64 canals/ditches, and 47 open water ponds/reservoirs (some waterbodies are crossed more than once). This also includes 21 major water body crossings and 12 section 10 (navigable) waterbodies. Of these,

ACP would cross 1 perennial, 7 intermittent, and 5 ephemeral waterbodies in the MNF, and 29 perennial, 12 intermittent and 4 ephemeral waterbodies on the GWNF. Waterbodies would be crossed in accordance with Atlantic's and DTI's construction and restoration plans, which outline common industry construction methods and are generally consistent with the Procedures. Twenty-six waterbodies, many of which are sensitive or contain threatened and endangered species, would be crossed via HDD or bore, including major waterbodies such as the James, Roanoke, Cape Fear, Nottoway, and Nansemond Rivers.

Page ES-9

We recommend that Atlantic file updated site specific crossing plans for major water body crossings that have changed in location or design since the previous site-specific crossing plans were filed.

Atlantic would cross the Neuse River (AP-2 MP 98.5) using the wet open-cut method, which would result in increased turbidity and sedimentation of the water body. As such, we recommend that Atlantic file the results of quantitative modeling for turbidity and sedimentation associated with the wet open-cut crossings of this water body and any other major water body crossed via an open-cut method.

Waterbody crossing comments:

There will be significant increases in sediment loading to major waterbodies and perennial streams due to use of wet open-cut water body crossings. *ACP and SHP pipeline facilities would cross 1,989 waterbodies, including 851 perennial, 779 intermittent, 248 ephemeral, 64 canals/ditches, and 47 open water ponds/reservoir.* The majority of these crossings are by open cut methods in streams and rivers. The large number of crossings makes this a very significant issue.

The effectiveness of wet open cut crossings is dependent on proper design and application. The probability of construction related difficulties is high. Reported difficulties include: (1) pump failure or insufficient capacity, (2) dam or flume failure, (3) poor dam seal, (4) poor containment of pumped ditch water, and (5) poor maintenance of erosion control measures. Larger water crossings require longer periods of in stream activity and the control of larger volumes of stream flow and trench water. Both characteristics increase the risk of sediment being released into a watercourse. Construction problems result in large increases in downstream Total Suspended Solids (TSS) impacting aquatic habitat and fish populations. These problems are not uncommon.

The quantitative modeling assessments were not performed for turbidity and sedimentation associated with wet open-cut crossings. The Draft EIS did “not quantify the duration, extent, or magnitude of estimated turbidity levels” from wet or dry open cut trenching.

Final conclusions cannot be drawn regarding the effects of sedimentation and turbidity on fisheries and aquatic resources due to the wet open-cut crossings. Modeling is not complete and an accurate assessment of sedimentation impacts on these rivers cannot be determined. Additional assessment is required for the river and stream crossings. The lack of conclusions shows a flagrant admission of negligence on the part of ACP by not performing the modeling assessment. This is another example where the basis for the choice of crossing methods were not explained or justified by technical assessments or impact analyses. Additional information is required for review of the Draft EIS.

Past problems with Dominion Transmission pipeline construction problems on other pipeline projects show a trend of negligent construction practices during construction. Dominion Transmission Inc. was cited by the West Virginia Department of Environmental Protection (DEP) for 13 water pollution violations. The DEP issued Notices of Violations to Dominion Transmission for violations that occurred between October 1, 2012, and February 28, 2014. The violations occurred along three pipelines in Ohio, Marshall and Doddridge counties in northwestern West Virginia. Six of the violations, impacting 12 waterways, involved the G-150 pipeline.

During a 16-month period, DEP inspectors reported 16 incidents of sediment pollution; one incident of pollution by distinctly visible settleable solids (DVSS); one incident of pollution by DVSS, crude oil and produced water; and one incident of pollution by produced water. The violations impacted a total of 17 streams. A DEP finding of fact, included with the consent order, reveals that Dominion was not forthcoming with pipeline project and incident information.

As a result of the violations, the DEP issued an “Order for Compliance,” known as a consent order, to Dominion. The consent order requires Dominion to “immediately take all measures to initiate compliance with pertinent rules and laws” and “immediately commence exclusive use of best management practices and sediment and erosion controls.” Dominion was required to submit a plan for corrective actions and a schedule for plan completion. In addition, the company was required to conduct a geotechnical analysis to determine causes of right-of-way failures and

submit an inventory of all soil slips that have occurred at its pipeline projects. The DEP assessed a civil fine of $55,470.

The impacts on water are of enormous concern. This consent order indicates that Dominion has not followed careful construction practices on other projects. One of the problems is that a lot of the work is done by sub-contractors, and there is a culture of contractors who do as they please without following the rules set for construction practices. Considerable effort for construction monitoring and testing would be required during construction to insure that the contractors meet minimum standards of care for construction practices. Daily on-site inspections would be required in areas with steep terrain, waterbody crossings and wetlands crossing to insure compliance with environmental regulations. The Draft EIS does not clearly state the conditions for on-site inspections on a daily basis.

Page 2-37 - 2.3.3.1 Waterbody Crossings

ATWS necessary for waterbody crossings would be located a minimum of 50 feet from the waterbody edge, except where adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. The 50-foot setback would be maintained unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies. Additional ATWS setbacks may be required on FS administered lands to comply with riparian setback standards, and would become conditioned as part of the SUP process. As stated in section 2.3.1.1, we have determined that Atlantic's and DTI's request to locate certain ATWS within 50 feet of waterbodies is acceptable.

Comment:

The total combined buffer width for any ATWS's should be no less than 50 feet.
Where excess nutrients, sediments, etc. are a concern, buffers more 100 feet wide or more are required to provide the most fish and wildlife habitat value. All buffers should be designed to meet or exceed the minimum requirements of local species of concern.

Existing wooded buffers should be protected when allowing minimal modifications to the extent that they do not diminish the ability of the buffer to perform its water quality functions. Effective vegetation must be established and woody buffer plantings are required, where no vegetation exists in a buffer, or the existing vegetation is insufficient to accomplish the three functions of retarding runoff, preventing erosion and filtering nonpoint pollution.

Scientific studies have noted that, on first, second and third-order streams (headwater streams and those less than approximately sixty feet wide), the twenty-five feet closest to the stream provide functions critical to the stream health. The ability of this portion of the buffer to moderate water temperature, provide bank stabilization and supply organic debris for aquatic organisms makes it especially sensitive to potentially harmful activity such as excessive removal of vegetation and construction operations.

2. Water withdrawals - Statements from the Draft EIS:

Atlantic is proposing to use about 138.9 million gallons surface waters and municipal water for hydrostatic testing, dust control and to construct HDDs; and DTI is proposing to use 4.3 million gallons for hydrostatic testing and dust control. Impacts associated with the withdrawal and discharge of water would be minimized by Atlantic's and DTI's adherence to their construction and restoration plans, and state water withdrawal and National Pollutant Discharge Elimination System discharge permits. Atlantic and DTI are still evaluating potential water sources for dust control. ***Due to the large quantity of water needed, we recommend that Atlantic and DTI identify proposed or potential sources of water used for dust control, anticipated quantities of water to be appropriated from each source, and the measures that would be implemented to ensure water sources and its aquatic biota are not adversely affected by the appropriation activity.***

Water withdrawal comments:

Atlantic and DTI propose to withdraw more than 143 million gallons of water from local streams and rivers for testing and dust control during construction. This is a very large volume of water to be used for construction and raises substantial issues. Many questions remain unanswered, such as:

- From what locations will the water be withdrawn? And, what is the quantity of withdrawal for each location?
- What measures will be taken to mitigate the release of water back into streams and rivers after use for testing?

The hydrology for each water withdrawal location should be modeled to insure that there is adequate water flow to the withdrawal point. Riparian rights should be considered so that property owners downstream of withdrawal points have adequate

flow during withdrawal of water for pipeline testing. A schedule for withdrawal of water is required at each withdrawal location.

The Draft EIS is not complete and is not adequate due to lack of information on a water withdrawal plan.

3. Wetlands Crossings - Statements from the Draft EIS:

Page ES-8

Construction of ACP and SHP would temporarily affect 786.2 acres of wetland and operation would affect 248.3 acres of wetland. The majority of impacts would be on palustrine forested wetlands, affecting 604.8 acres and 231.9 acres during construction and operation, respectively. Total length of wetlands crossings is ***427,805 feet*****.**

While temporary impacts on herbaceous and scrub-shrub wetlands would be expected to recover fairly quickly, ***we recognize that impacts on forested wetlands would be long-term in the temporary work areas and permanent in the maintained pipeline easement, at aboveground facilities, and new or permanently maintained access roads****. Atlantic and DTI are working with the USACE to determine wetland mitigation requirements and we recommend that they file copies of their final wetland mitigation plans and documentation of USACE approval of the plans.*

Page 2-41 2.3.3.3 Wetland Crossings

ATWS for wetland crossings would be located in upland areas a minimum of 50 feet from the wetland edge unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies. As stated in section 2.3.1.1, we have determined that Atlantic's and DTI's request to locate certain ATWS within 50 feet of wetlands and the request for expanded workspace within certain wetlands is acceptable.

Wetlands comments:

The U.S. Army Corps of Engineers (Corps) reviews applications for Department of the Army (DA) permits under Section 404 of the Clean Water Act. Most activities authorized by Section 404 permits result in adverse impacts to waters of the United States. Compensatory mitigation is necessary to offset these unavoidable impacts to

aquatic resource functions and services and to meet the programmatic goal of “no overall net loss” of aquatic resource functions and services.

On April 10, 2008, the Corps and U.S. Environmental Protection Agency published regulations entitled, “Compensatory Mitigation for Losses of Aquatic Resources” (Mitigation Rule). One of the primary goals of these regulations was to improve the quality and success of compensatory mitigation plans that are designed to offset impacts to aquatic resources authorized by Department of the Army (DA) permits. The Mitigation Rule emphasizes the strategic selection of mitigation sites on a watershed basis and established equivalent standards for all types of compensatory mitigation (mitigation banks, in-lieu fee programs, and permittee-responsible mitigation plans).

Federal and state agencies require that a three-step “sequencing” process be followed when proposing a project that may impact wetlands. The first step of sequencing is that wetlands must be avoided to the extent practicable. Then, if avoidance is not an option, impacts must be minimized to the greatest extent practicable. Finally, if permanent impacts on wetlands are unavoidable, wetland replacement or compensatory mitigation is required to replace lost wetland function.

Construction activities would temporarily and permanently affect wetland vegetation and habitats, and could temporarily affect soil and hydrology characteristics. Emergent wetlands would typically recover to pre construction conditions within 1 to 2 years, and scrub-shrub wetlands could take 2 to 4 years, depending on the age and complexity of the system. Impacts on forested wetlands would be much longer, and may include changes in the density, type, and biodiversity of vegetation. Given the species that dominate the forested wetlands crossed by ACP and SHP, **recovery to pre construction state may take up to 30 years or more.** Impacts on habitat will occur due to fragmentation, loss of riparian vegetation, and microclimate changes associated with gaps in forest canopy.

The length and large areas for wetlands crossings indicate that the applicant made very little attempt to avoid crossing wetlands. Avoidance is the first and primary step in the design of a linear project. This requirement was not met.

Pipeline operation “would affect 248.3 acres of wetlands permanently.” This is a significant area for mitigation of impacts. A rigorous analysis is required to determine whether a proposed mitigation plan will fully offset potential adverse impacts associated with the proposed project. A mitigation plan was not included in the Draft

EIS for review. Conclusions cannot be determined due to lack of information available.

The Draft EIS is not complete and is not adequate due to lack of information on a wetlands mitigation plan.

4. Land Disturbance and Forest Fragmentation

Statements from the Draft EIS:

Page 2-15

*Collectively, construction of ACP and SHP would disturb **12,030.7 acres** of land. Following construction, **5,976.0.0 acres of new land would be permanently maintained** for operation and maintenance of the project facilities. The remaining 6,054.7 acres of land disturbed by ACP and SHP would be restored and allowed to revert to former use. The portion of ACP on NFS lands would disturb 401.9 acres of land. Following construction, 209.6 acres of new land would be permanently maintained for operation and maintenance of the project facilities on NFS lands. The remaining 192.3 acres of land disturbed by ACP on NFS lands would be restored and allowed to revert to former use.*

Page ES-9

Impacts on vegetation from ACP and SHP would range from short-term to permanent due to the varied amount of time required to reestablish certain community types, as well as the maintenance of herbaceous and shrub vegetation within the permanent right-of-way and the conversion of aboveground facility locations and new permanent access roads to non-vegetated areas. The greatest impact on vegetation would be on forested areas because of the time required for trees to return to preconstruction condition.

*Construction in forest lands would remove the tree canopy over the width of the construction right-of-way, which would change the structure and local setting of the forest area. The regrowth of trees in the temporary workspaces would take years and possibly decades, and ACP and SHP would contribute to forest fragmentation. Moreover, the forest land on the permanent right-of-way would be affected by ongoing vegetation maintenance during operations, which would preclude the re-establishment of trees on the rights-of-way**. Operation of ACP and SHP would have long-term to permanent effects on about 4,208 acres of vegetation,***

including about 3,424 acres of upland forest vegetation (deciduous, coniferous, and mixed)*. Operation of ACP on federal land would have long-term to permanent impacts on about 179 acres of vegetation, including about 33 acres in MNF, 146 acres in GWNF, and 0.5 acre in BRP.*

Page ES-10

To further minimize impacts on forest lands, we recommend that Atlantic limit maintenance and vegetation clearing activities along the AP-1 mainline to a 50-foot right-of-way.

Based on pending survey results and mitigation measures (e.g., reseeding), we have several recommendations to provide a revised BE, Restoration and Rehabilitation Plan, and Invasive Plant Species Management Plan. Also, based on comments from the VDCR, we recommend that Atlantic demonstrate VDCR's concurrence with Atlantic's proposed avoidance and minimization measures at the Handsom-Gum, Branchville, and Emporia Powerline Bog Conservation Sites.

Impacts from construction on wildlife species include the displacement of wildlife from the right-of-way or work sites into adjacent areas and the potential mortality of some individuals. The cutting, clearing, and/or removal of existing vegetation within the construction work area could also impact wildlife by reducing the amount of available habitat for nesting, cover, and foraging. Construction could also lower reproductive success by disrupting courting, nesting, or breeding of some species, which could also result in a decrease in prey available for predators of these species. These impacts would be temporary, lasting only while construction is occurring, or short-term, lasting no more than a few years until the pre construction habitat and vegetation type is reestablished. Other impacts would be longer term such as the re-establishment of forested habitats, ***which could take decades****.*

ACP could impact cave invertebrates and other subterranean obligate species (amphipods, isopods, copepods, flatworms, millipedes, beetles, etc.) that are endemic to only a few known locations. Therefore, we recommend that Atlantic file a revised Karst Terrain Assessment, Construction Monitoring, and Mitigation Plan that considers unknown underground features, porosity, and connectivity of these subterranean systems, and identifies conservation measures to address potential project impacts.

Page ES-11

Several agencies, including the FS and WVDNR, have expressed concerns regarding forest fragmentation and the impacts on interior forest and their associated wildlife species. While impacts on species inhabiting interior forest blocks were analyzed, other species have minimum interior forest patch areas that differ from that identified and mitigated for by Atlantic. We recommend that Atlantic and DTI file an updated fragmentation analysis; consider a 300-foot forested buffer as the impact area; discuss how the creation of forest edge or fragmentation would affect habitat and wildlife; and identify the measures that would be implemented to avoid, minimize, or mitigate impacts on interior/core forest habitat.

*We conclude that ACP and SHP would not have a significant adverse impact on vegetation and wildlife**, with the exception of forested areas, which would experience significant impacts as a result of the effects of fragmentation and where forest land would convert to herbaceous vegetation in the permanent right-of-way.***

Pages ES-12 and ES-13 Cumulative Impacts

Long-term cumulative impacts would occur on forested wetland and upland forested vegetation and associated wildlife habitats.

Comments:

Forest fragmentation is a critical aspect of the extent and distribution of ecological systems. Many forest species are adapted to either edge or interior habitats. Changes in the degree or patterns of fragmentation can affect habitat quality for the majority of mammal, reptile, bird, and amphibian species found in forest habitats (Fahrig, 2003). As forest fragmentation increases beyond the fragmentation caused by natural disturbances, edge effects become more dominant, interior-adapted species are more likely to disappear, and edge- and open-field species are likely to increase.

Operation of the ACP and SHP would have long-term to permanent effects on about 4,208 acres of vegetation out of a total of 5,976.0.0 acres, including about 3,424 acres of upland forest vegetation (deciduous, coniferous, and mixed). Over 57% of the project includes crossing and fragmenting wooded forests.

Forest fragmentation is a cause of considerable concern in present times as industrial activities have forced their way through forests, leaving behind small dispersed patches. The threat of degradation looms large as these small reservoirs of

biodiversity are easy prey to environmental threats. Fragmentation also results in the breaking up of many lifecycle processes for thousands of species. This can eventually lead to progressive decline in species diversity and result in irreversible damage to the ecosystem.

Habitat fragmentation has been described as one of the major drivers of biodiversity loss worldwide, particularly in the case of forest ecosystems, which are decreasing globally at an alarming rate. Forest fragmentation may affect forest-dwelling organisms through several (though not necessarily independent) pathways, including the effects of decreasing patch size, increased patch isolation, altered habitat conditions and the alteration of plant-animal interactions. Though most research has focused to date on animal populations, several studies have shown that plant populations tend to be smaller and show decreased reproductive outputs (seed production and germinability) in fragmented than in continuous habitats. These population changes result in a higher extinction risk due to the combined effects of higher demographic stochasticity and increased isolation between local populations.

It is recommended that the applicant prepare a detailed forest fragmentation analysis for a 300 foot wide corridor through forest lands. The pipeline route should be re-located to avoid fragmenting forest lands as much as possible. The proposed route is not acceptable because forests would experience significant impacts as a result of the effects of fragmentation where forest land would convert to herbaceous vegetation in the permanent right-of-way. The re-establishment of forested habitats could take decades. The ACP and SHP would contribute significantly to forest fragmentation in the current proposal.

<u>The Draft EIS is not complete and is not adequate due to lack of information on forest fragmentation mitigation plans.</u>

<u>5. Steep slopes:</u>

Statements from the Draft EIS:

<u>Page 2-19</u>

In West Virginia and northwestern Virginia, the proposed AP-1 mainline would be constructed in steep terrain. Generally, the pipeline alignment runs along ridgelines and up and down slopes (as opposed to crossing laterally on side slopes). Installation along the ridgelines would generally require wider construction rights-of-way to create a level work area and store trench material. When constructing along

steep slopes, construction personnel would be required to work in the trench to weld the pipeline. In these areas, the trench would typically be 30 feet wide to provide sufficient space for construction personnel to work in the trench safely. The additional spoil generated from a wider trench would require an additional 25 feet of temporary construction workspace to provide sufficient space to store trench spoil. For these reasons, Atlantic would require a wider construction right-of-way for the AP-1 mainline.

Page 4-26 Steep Slopes

ACP crosses 30.4 miles of slopes ranging from 20 percent to 35 percent and 11.6 miles of slopes greater than 35 percent in West Virginia; 28.8 miles of slopes ranging from 20 percent to 35 percent and 12.5 miles of slopes greater than 35 percent in Virginia; and approximately 0.3 mile of slopes ranging from 20 percent to 35 percent and less than 0.1 mile of slopes greater than 35 percent in North Carolina.

Geosyntec identified over 100 possible slope instability hazard locations along the AP-1 mainline where evidence suggests previous slope instability, or where the potential exists for slope instability, and 46 steep slopes that met the criteria for further evaluation used in the Geohazard Analysis Program. Geosyntec also identified 76 possible slope instability hazard locations along SHP (TL-635 loopline) where evidence suggests previous slope instability, or where the potential exists for slope instability, and 20 steep slopes that met the same evaluation criteria.

During construction of the pipeline facilities, activities on steep slopes could initiate localized slope movement. In addition, during operation, a naturally occurring landslide could damage the proposed facilities and create a potential safety hazard to nearby residents.

Atlantic and DTI have not yet completed the Phase 2 analysis and field surveys at all evaluation sites, and final measures related to slope hazards have not yet been completed for ACP and SHP.

Comments:

The Atlantic Coast Pipeline proposes to construct a large diameter pipeline across terrain that is not suitable by nature for a pipeline. The ACP is attempting to modify steep slopes to conform to its proposed interests in building a pipeline through rugged terrain.

Steep slopes are generally defined as land with a slope angle of 20% or greater. Steep slopes are prone to natural disasters. Rain falling on steep slopes runs off much faster than rain that falls on flat land surfaces. The steeper the slope, the greater the potential for erosion, leading to increased risk of landslides, both during and after construction.

Extreme erosion causes grave problems such as water pollution, increased flood hazard, loss of fish populations, degradation of habitat, and the general impairment of stream ecosystems. Eroded material accumulates in streams where it buries spawning areas, makes water unsuitable for human use, and reduces channel capacity. Grading practices, vegetation removal and other construction and development activities can increase sediment yields as much as 40,000 times. Over the course of a year, a ten-acre construction site can generate and send as much as 2,000 tons of sediment downstream, the equivalent of 200 dump truck loads of earth.

Despite efforts to revegetate steep, mountainous slopes after construction, slopes between 33% and 50% have a poor chance of revegetating, and slopes over 50% have an improbable chance of revegetating. Steep slopes will make it difficult to properly install erosion control devices during construction.

In areas of steep slopes, the ability of construction equipment to maneuver safely and with dexterity is hampered. Tasks that would normally be routine on gentle slopes become extreme challenges to the capabilities of equipment and operators. The ability to operate equipment safely becomes a major focus of the construction operation.

It is highly doubtful that the erosion control devices on steep slopes will be maintained on a daily basis as required by the erosion control plan narrative, unless there is constant monitoring of the job site by erosion control inspectors. Contractors often try to save time and money by cutting corners or taking shortcuts when no one is monitoring the construction. It is more difficult to maintain water bars or trench breakers on steep slopes. The waterbars and trench breakers are an impediment to construction and get in the way of the construction operation. There are numerous reported cases of contractors not installing or maintaining erosion control devices.

A case study for a 12-inch pipeline constructed in Giles County, Virginia, demonstrates one case of a pipeline construction with severe erosion control problems. The pipeline was constructed in 2014 and the pipeline corridor is still not vegetated. The contractor did not install an adequate number of erosion control devices or maintain the erosion control devices that were in place. An intense rainfall

event occurred when the pipeline corridor was bare and the in-place erosion control measures were not adequate to prevent soil from eroding down slope. Mud flowed down the mountain side into streams at the bottom of the slope. Additional work was required to restore the impacted streams. Contractor negligence and inadequate erosion control devices on steep slopes was a cause for the failure.

The magnitude of the large areas involved with steep slopes creates a situation which will result in increased erosion over many years. The applicant has not provided a quantitative analysis of the cumulative impacts of sediment loading produced by clearing and grading the pipeline corridor on steep slopes. Over 100 possible slope instability hazard locations were identified, but no mitigation measures were shown for these areas. The Phase 2 surveys and field analysis are not complete.

The Draft EIS is not adequate due to incomplete information on slope erosion potential, sediment loading calculations and erosion control measures. No construction plans were available for review to determine adequacy of proposed erosion control measures.

6. Landslides and slope stability

Statements from the Draft EIS:

4.1.4.2 Slope Stability

For all 55 sites visited during Phase 2 ground reconnaissance, new hazard rankings were assigned based upon assessment of field conditions and anticipated construction impacts. Ten sites, five on ACP and five on SHP, have been assigned a high potential slope instability hazard.

While colluviums accumulation was observed on most of the steep slopes, the colluvium was thin and overlying bedrock. Signs of creep were often observed in the colluvium. Slope creep in colluvium is not found in conjunction with naturally occurring landslides, but it can be an indication that slope instability could be induced during pipeline construction activities.

Natural landslides may occur during the construction, operation, and maintenance of ACP and SHP. Potential natural landslides in the project area include a variety of mass movements such as debris slides, debris flows, rockslides, rock falls, and

slumps. Debris flows (also referred to as mudslides, mudflows, or debris avalanches) are the dominant type of rapid, catastrophic landslide.

Project-induced landslides, such as failures of cut slopes or fill slopes, may result from the construction, operation, and maintenance of the pipelines and access roads. Another type of project-induced landslide may result from the projects' alteration of the surface and subsurface drainage in the areas of construction and in adjacent natural slopes along the pipeline and access roads. Changes in surface and subsurface drainage may increase pre-existing landslide hazard potential on natural slopes adjacent to the pipeline and access roads, and may create or contribute to failure of the natural slopes adjacent to the pipeline and access roads.

*In West Virginia, **73 percent of the AP-1 mainline route would cross areas with a high incidence of and high susceptibility to landslides**. In Virginia, approximately 28 percent of the AP-1 mainline route would cross areas with a high incidence of and high susceptibility to landslides (Highland, Bath, Augusta, and Nelson Counties); 21 percent would cross areas with a moderate incidence of and high susceptibility to landslides (Augusta, Nelson, and Buckingham Counties); and 7 percent would cross areas with a moderate incidence of and moderate susceptibility to landslides (Augusta County).*

The locations along the pipeline route identified as high and medium threat level hazards are undergoing further analysis as part of a Phase 2 program that includes detailed mapping and potentially subsurface exploration by soil borings or deep test pits and engineering analysis. Atlantic has not yet completed the Phase 2 analysis at all evaluation sites.

4.1.7 Conclusion

While Atlantic and DTI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, the development of other slope instability/landslide risk reduction measures have not been completed or have not been adopted. Additionally, although the proposed pipelines have been cited to maximize ridgeline construction, numerous segment of pipeline would be constructed on steep slopes and in areas of high landslide potential. Considering the historic and recent landslide incidences in the immediate project area, along with the factors above, we conclude that constructing the pipelines in steep terrain or high landslide incidence areas could increase the potential for landslides to occur.

Comments:

Numerous segments of pipeline would be constructed on steep slopes and in areas of high landslide potential along the pipeline corridor. The impact of a landslide in steep terrain would be a catastrophic event leading to a break or rupture in the pipeline. The resultant explosion would devastate more than a half mile swath of adjacent countryside leading to forest fires, property damage and potentially serious human injury.

Factors such as: failure to properly handle surface and ground water; over-steepening of slopes by placing of fills and/or removing lateral support; failure to recognize geologic formations with low shear strengths; failure to recognize inherent weakness, such as linears, fractures, and joints, in otherwise competent bedrock; and improper blasting techniques can, and often do, lead to costly slope failures. These and other potential problems should be identified up front, during site design, to avoid huge remediation expenditures as well as environmental damage and threats to public safety.

Areas of high groundwater table and surface drainage paths contribute to the instability of slopes. Drainage paths or streams can over-steepen slopes from erosion. Human activities are a common contributor to landslide events. Large excavations located in mountainous areas related to rural development increase the number of and potential for landslides. Development of this type tends to create over-steepened slopes and drainage alteration that leads to the potential for many landslides. The removal of surface vegetation during land development can affect slope stability through increased infiltration of rainfall.

It is incumbent upon any pipeline developer to employ due diligence in regard to the potential for slope failure resulting from the construction of a proposed project and take whatever steps are necessary to minimize or prevent slope failures, especially where this would endanger public safety or result in environmental or property damage.

For projects where significant potential for dangerous slope failures exists, appropriate steps should be taken to ascertain the probable nature of the failure, such as a geotechnical study, and all appropriate measures should be taken to alleviate the potential dangers. For sites with greater potential risk, the actual construction should be done under the supervision of an independent geotechnical engineer or geologist. While these measures can significantly increase initial costs for a project, they are small in comparison to remediation costs, not to mention collateral

costs incurred by others who may be affected by large-scale slope failures. Sites with great potential for public risk or property damage should be avoided, if at all possible.

Slope stability modeling analyses are required by engineering practices for slopes exceeding 2:1, or 50% gradient. It is recommended that slope stability analysis be applied to slopes over 30% along the pipeline corridor. There are numerous areas of slopes over 30% along the pipeline corridor. A complete analysis cannot be done without the slope stability modeling results for steep slopes and areas with sensitive soils.

Slope stability analysis was not submitted for the areas identified by Geosyntech. Submittal of slope stability analysis is required for areas over 30% in slope. The Draft EIS is not complete for public review due to this omission.

There is not adequate engineering verification of a plan to prevent landslides from occurring in areas with high landslide potential. The Draft EIS concludes that constructing the pipelines in steep terrain or high landslide incidence areas could increase the potential for landslides to occur. The risk of landslides in steep mountain terrain is high. Additional engineering plans are required to show the plans for buttressing of high landslide potential areas.

7. Earthquake Hazards

Statements from the Draft EIS:

4.1.4.1 Seismic Related Hazards

The CVSZ is a Class A feature and is located within the Appalachian Piedmont Province, and at its closest point as defined by the USGS, is located approximately 25 miles to the northeast of ACP at AP-1 MP 210. The CVSZ is associated with the Spotsylvania high-strain zone, which is a boundary of weakness between two bedrock terrains. The CVSZ has the potential for future earthquakes that relieve stresses that buildup within the bedrock of central Virginia as the North American Tectonic Plate moves westward. The proximity of ACP to the CVSZ increases the potential for a significant seismic event in the project area, which is reflected in the USGS PGAs discussed above (Crone and Wheeler, 2000).

The Mineral, Virginia earthquake occurred within the CVSZ and the epicenter is located approximately 50 miles northeast of ACP from AP-1 MP 210 at a depth of approximately 4.3 miles. This earthquake caused substantial damage to buildings

and monuments located within 100 miles of the epicenter, concentrated from central Virginia to Washington D.C. (Horton et al., 2015a). A new buried fault with no surface expression, named the Quail Fault, has been proposed as the source of the August 23, 2011 earthquake

In conclusion, ACP and SHP are sited in areas with low probability of localized earth movement. However, the AP-1 mainline would traverse an area of the CVSZ, between MPs 170 and 260 with peak ground accelerations approach 0.15 g, and given the recent (2011) seismic event at Mineral Virginia has the potential for an earthquake with an M 5.8 (MMI VII).

Comments:

The conclusion reached in the section above is not correct, nor does it provide adequate reassurance that an earthquake in the region would not result in a catastrophic event. In fact, a 2.4 magnitude earthquake — with the epicenter 11 km northeast of Buckingham — occurred at 7:03 a.m. Wednesday, March 22, 2017. According to the United States Geological Survey (USGS), the earthquake had a depth of 8.1 km. Since 2011, there have been recurrent and frequent tremors and earthquakes in the Central Virginia Seismic Zone.

Earthquakes are low probability, high-consequence events. An earthquake can have a devastating impact, even if only one occurs in the lifetime of the asset. A moderate earthquake can cause serious damage to unreinforced buildings, building contents, and non-structural systems, and can cause serious disruption in building operations. Moderate and even very large earthquakes are inevitable, although very infrequent, in areas of normally low seismic activity. Consequently, in these regions buildings are seldom designed to deal with an earthquake threat; therefore, they are extremely vulnerable.

Earth movement associated with earthquakes can cause pipelines to shift and possibly rupture resulting in dangerous leaks. Older, more brittle pipelines would be more susceptible to damage as the result of abrupt earth movements. For example, Columbia Gas confirmed that a gas leak in downtown Fredericksburg, Virginia was related to the 2011 Mineral earthquake. After the earthquake, Columbia Gas discovered the leak as part of a company emergency response pipeline safety survey that was conducted as a result of the earthquake. The survey showed that the natural gas was leaking into the storm and sanitary sewer system. This leak resulted in road closings and residence and other building evacuations until repairs were made.

An earthquake could have a catastrophic impact on the ACP. There is no assurance that there will not be an earthquake in the vicinity of the pipeline. Recent history shows that the probability of recurrent earthquakes is high within the Central Virginia Seismic Zone. The 2011 Louisa County earthquake damaged the Washington Monument in Washington, D.C., which is over 80 miles away. The March 22 earthquake was 10 miles away from Buckingham.

A rupture for a 42-inch high pressure pipeline would create a half mile wide swath of destruction in a populated area causing property damage and possible loss of life. This issue requires careful consideration. We would assert that the risks are too high to justify construction of a large diameter pipeline in the Central Virginia Seismic Zone.

8. Soils:

Statements from the Draft EIS:

4.2.2 Soil Characteristics and Limitations

Several soil characteristics have the potential to affect, or be affected by, construction and operation of a pipeline. These include erosion potential, depth to shallow bedrock, stony and rocky soils, compaction potential, revegetation concerns, drainage patterns, hydric soils, and prime farmlands or farmlands of statewide importance.

4.2.2.1 Erosion by Water and Wind

Soils most susceptible to water erosion are typified by bare or sparse vegetative cover, non-cohesive soil particles, low infiltration rates, and/or moderate to steep slopes. Soils more typically resistant to water erosion include those that occupy low relief areas, are well vegetated, and have high infiltration capacity and internal permeability. The potential for soils to be eroded by water was evaluated based on the K factor, where available, and slope. The K factor represents a relative quantitative index of the susceptibility of bare soil to particle detachment and transport by water, and is one of the factors used in the Revised Universal Soil Loss Equation to calculate soil loss. K factor values range from 0.02 to 0.69. Soils with a slope >15% or soils with a K value of >0.35 and slopes greater >5% are considered highly erodible by water.

Based on the K factor and slope designations discussed above, 4,336.7 acres of soils susceptible to water erosion would be affected by constructing the projects, including 3,652.5 acres for ACP and 684.1 acres for SHP.

4.2.2.5 Poor Revegetation Potential

The vegetation potential of soils is based on several characteristics including topsoil thickness, soil texture, and available water capacity, susceptibility to flooding, soil chemistry, soil microbial populations, organic matter content, and slope. Other considerations included whether or not the soils are natural, human transported, or disturbed. Some soils have characteristics that cause a high seed mortality. These areas may need additional management and may be difficult to revegetate. The clearing and grading of soils with poor revegetation potential could result in a lack of adequate vegetation following construction and restoration of the right-of-way, which could lead to increased erosion, a reduction in wildlife habitat, and adverse visual impacts.

Based on the factors discussed above, 7,685.6 acres of soils with poor revegetation potential would be affected by constructing the projects, including 6,982.4 acres for ACP and 703.2 acres for SHP.

4.2.3 General Impacts and Mitigation

Construction activities, such as clearing, grading, trench excavation, backfilling, and the movement of construction equipment along the right-of-way would affect soil resources. Clearing removes protective vegetative cover and exposes the soil to the effects of wind and rain, which increases the potential for soil erosion and sedimentation of sensitive areas. Grading, spoil storage, and equipment traffic can compact soil, reducing porosity and increasing runoff potential. Excess rock or fill material brought to the surface during trenching operations could hinder the restoration of the right-of-way. In areas of forest where the vegetation would change on the permanent right-of-way after construction, the continued formation and weathering of soil would change over the life of the project.

Page F-10. 5.3 Soil Compaction

Compaction impacts will be mitigated through the use of tillage equipment during restoration activities such as a paraplow or similar implement. In areas where topsoil segregation occurs, plowing with a paraplow or other deep tillage implement to alleviate subsoil compaction will be conducted before replacement of the topsoil. In

rocky or heavily rooted soils, compaction may be impossible to measure and rectify without additional damage. If compaction testing is impeded by rock or roots, Atlantic and DTI may conclude that there is a suitable amount of large material in the soil to rectify potential compaction. Soil compaction will be remediated prior to re-spreading of salvaged topsoil.

Comments:

The combination of 4,336.7 acres of soils susceptible to water erosion, 7,685.6 acres of soils with poor revegetation potential and 3,248.2 acres of shallow to bedrock soils will make re-establishment of vegetation very difficult in many areas traversed by the pipeline. Many areas will remain denuded and bare for years, thus increasing the rate of sediment runoff significantly above pre-construction levels.

Despite efforts to revegetate steep, mountainous slopes after construction, slopes between 33% and 50% have a poor chance of revegetating, and slopes over 50% have an improbable chance of revegetating. This will leave many areas along the corridor with bare soils and rocky outcrops in places where the depth to rock is less than 12 inches. The denuded areas will cause increased stormwater runoff and erosion down slope of the problem areas.

Soil compaction in the surface layer increases stormwater runoff, thus increasing soil losses. Soil compaction occurs when soil particles are pressed together, reducing pore space between them. Heavily compacted soils contain few large pores and have a reduced rate of both water infiltration and drainage from the compacted layer. Soil compaction changes pore size, distribution, and soil strength. As the pore space is decreased within a soil, the bulk density is increased. Excessive soil compaction impedes root growth and therefore limits the amount of soil explored by roots. This, in turn, can decrease the plant's ability to take up nutrients and water. From the standpoint of erosion and soil loss on steep slopes, the adverse effect of soil compaction on water flow and storage is very serious.

The DEIS states that “revegetation will be considered successful when the density and cover of non-nuisance vegetation is similar to adjacent areas that were not disturbed by construction activities. Atlantic and DTI will continue revegetation efforts until they are successful. Restoration will be considered successful when construction debris is removed, similar vegetative cover or bedrock has been restored, the original surface elevations are restored as closely as practicable to preconstruction contours, the surface condition is similar to adjacent non-disturbed areas, and proper drainage is restored.” The criterion for successful revegetation

does not specify an objective standard for measuring the percentage of coverage for re-vegetation. Engineering standards and specifications typically include a specific percentage of vegetation coverage within a specific time frame as a measurement of revegetation success. This is not included in the Draft EIS, and should be confirmed and provided in the Final EIS.

The Restoration and Rehabilitation Plan does not provide reassurance that areas with low revegetation potential, shallow to bedrock soils and soils susceptible to water erosion will ever revegetate to original pre-construction conditions. These areas will remain bare and continue to erode over many years. The Draft EIS provides specifications for revegetation, but under the site conditions, the probability of revegetation is very low.

9. Bedrock and blasting

Statements from the Draft EIS:

Page 4-3 4.1.2.1 Surficial/Bedrock Geology

Surficial geology has not been mapped in detail in the areas crossed by ACP and SHP. Approximately 48 percent (73.9 miles) of the shallow bedrock crossed ACP facilities is considered lithic (competent or hard).

4.1.2.2 Shallow Bedrock and Blasting

Bedrock present within 5 feet of the surface are considered to be shallow, and within the anticipated trench depth. Areas with shallow bedrock classifications were identified using the Natural Resources Conservation Service's (NRCS) Soil Survey Geographic Database (SSURGO) (Soil Survey Staff, 2016).

Based on SSURGO data and the mapped locations of shallow bedrock, blasting may be required along 152.7 miles (25 percent) of ACP and 34.0 miles (91 percent) of SHP. In addition, SSURGO data identifies that lithic (hard) bedrock is present on 73.9 miles (12 percent) of ACP and 22.1 miles (59 percent) of SHP, which may also require blasting or other special construction techniques.

Comments:

The Draft EIS states that more than 150 miles of the pipeline corridor may require blasting. Half of that distance crosses hard bedrock. Blasting will mainly be required

in the steep mountainous areas of WV and Northwest VA. These are areas with a high potential for landslides, not only within the pipeline corridor, but also in the areas adjacent to the corridor.

Blasting will induce landslides in mountain areas with steep slopes and will de-stabilize the overburden and colluviums surrounding the blast areas. This situation would be a hazard to construction crews working in the corridor below the blasting areas. Slopes will require time to reach equilibrium after destabilization from blasting. During the time required for re-stabilization, additional landslides may occur.

In populated areas, blasting must be carefully monitored to protect adjacent properties from damage. It is incumbent on the applicant to provide all necessary means for protection of properties from damage. The Draft EIS does not take into account that contractors don't always follow proper safety procedures during construction. Mistakes are often made.

The Draft EIS does not provide reassurance that strict monitoring requirements will be followed. It is proposed that Inspection services are funded by ACP and DTI. However, it is not stated in the DEIS who administers the contract and procurement for inspection services. If ACP or DTI procures and funds inspection services, then there is a conflict of interest. It would not be appropriate for the applicants to fund construction inspection services. FERC should be the funding and procurement source for contracting inspection services.

10. Karst topography

Statements from the Draft EIS:

4.1.2.3 Karst Geology

The National Karst Map (Weary and Doctor, 2014) indicates that the proposed ACP route would cross approximately 56.4 miles of areas mapped as potential karst terrain in Virginia and West Virginia. Analysis of landscape features outside the mapped coverage identified additional karst features, bringing the total crossing length over potential karst terrain to approximately 71.3 miles. By conducting further regional, yet more detailed, geological mapping, Atlantic refined the crossing distance through actual karst terrain to be 32.5 miles in Randolph and Pocahontas Counties, West Virginia, and Highland and August Counties, Virginia.

Pocahontas County, West Virginia. *Field surveys were completed on approximately 70 percent of the proposed alignment in Pocahontas County because landowner permission was not granted for the remainder of the segment. The field survey identified 35 point features and 14 area features that are located within, adjoin, or receive drainage from the 300-foot-wide corridor, all of which are sinkholes with the exception of 2 springs. Thirty of the features were ranked as high risk, and 15 were ranked as low risk karst features.*

Highland County, Virginia. *The field survey identified 9 point features and 19 area features, which were all identified as sinkholes except for two cave entrances. Of the 28 features that were identified in the survey, 23 were ranked as having high risk.*

Bath County, Virginia. *The field survey identified 40 point features (all sinkholes except for 3 springs and 1 cave) but no area features, the majority of which were found along the western pediment of Walker Mountain in the Mill Creek Valley. Of these, 22 were ranked as high risk and 15 were ranked as moderate risk.*

Augusta County, Virginia. *33.8 miles was determined to have potential for karst features, and field surveys were conducted over 70 percent of this area. The field surveys identified 65 point features and 13 area features as sinkholes with the exception of 2 springs and 2 caves. Of the 78 karst features identified in the surveys, 24 were ranked as high risk, 30 were ranked as moderate risk, and 24 were ranked as low risk. Additionally, the surveys identified two notable areas of concentrations of karst development: the Cochran Cave area southwest of Staunton, and an area southeast of Stuart's Draft that extends southward towards Sherando Camp. Areas of concern include the crossing of karst near Deerfield (approximate AP-1 MP 109), and two areas with a heavy concentration of sinkholes near Churchville (approximate AP-1 MPs 127 to 141) and Stuarts Draft (approximate AP-1 MPs 145 to 153).*

However, because Atlantic has not received permission from landowners for field surveys, final locations of the surface karst features in the area would be determined when access permissions have been obtained. Dye trace tests conducted in 4-15 Geologythe area determined that water from sinking streams flowing into subsurface conduits can travel miles over a couple days, further indicating the degree of subterranean karst development.

Page 4-17 Construction Impacts and Mitigation

The primary geologic impact that could affect the proposed pipeline and aboveground facilities in karst sensitive areas is the sudden development of a

sinkhole that damages the facilities and poses a safety risk. Other subsidence features could develop gradually over time, but would not pose an immediate risk to the proposed facilities. The development of karst features could be initiated by the physical disturbance associated with trenching, blasting, or grading, or by diverting or discharging project related water into otherwise stable karst features.

Comments:

Karst is one of the most environmentally sensitive geologic landscapes on Earth. It is a major underlying component in this region. Atlantic Coast Pipeline and its consultants have barely scratched the surface in adequately assessing the three-dimensional attributes of karst and identifying the hazards that it imposes on construction and safe maintenance of the pipeline. Merely mapping sinkholes that appear on topographic maps and aerial imagery not only misses subtle karst features on the surface, but totally ignores the complex, well-integrated, efficient networks of groundwater flow through extensive karst aquifers. Detailed inventories of all sinkholes, caves, recharge areas, and springs, along with systematic dye-tracing, are necessary in order to identify a route through a veritable gauntlet of such features.

It is standard engineering practice to conduct soil borings under the supervision of a licensed geologist at frequent intervals along construction corridors to determine if there are impacts on underground caverns and water flow network. None of this was done for analysis of construction impacts to underground terrain.

VI. Comments from Sherman Bamford – State Forests Chair

Dear Ms. Bose,

Thank you for the opportunity to comment on this project.

The proposed Atlantic Coast Pipeline would facilitate increased development of hydraulically fracked natural gas throughout the eastern United States. The proposed pipeline is proposed through important habitat on Allegheny Mountain, the Deerfield Valley, the Blue Ridge and surrounding areas of Virginia and adjacent states.

Hydraulic fracking is a controversial issue. Here as elsewhere, natural gas development accelerates the impacts of climate change, and discourages the development and use of renewable energy. It encourages hydraulic fracturing and increases methane emissions that are 80 times more harmful than CO2 emissions.

The Atlantic Coast Pipeline (ACP) would cut a path through the George Washington National Forest - passing through highly sensitive karst geology, dense forests, across trout streams, and steep mountainous terrain. The purpose of the pipeline is to deliver fracked natural gas from Midwest over the mountains. Ultimately, if hydrofracking begins in Virginia, the pipeline could also be used to transport fracked gas from Virginia as well.

Project construction will result in the clear-cutting of hundreds of thousands of trees in the forest land that will be disturbed by the Project. The permanent conversion of forest to open land will fragment important habitat, will result in increased stormwater runoff, and will compromise the area's resilience to flooding in the face of increased precipitation and more frequent and intense storm events. The Pipeline Project will cross multiple public drinking water supply watersheds, wetlands, and water bodies, including designated high quality streams, trout streams, and protected streams.

The Sierra Club values the importance of protecting the Commonwealth's aquatic resources. Over 25,000 miles of Virginia's freshwater streams and rivers contribute considerable biological, recreational and economic benefits. Virginia's abundant waters support a great diversity of aquatic organisms, including 224 species of self-sustaining freshwater fishes and 82 freshwater mussel species. In 2006, recreational angling and its ripple effects (i.e., through purchase of gas, lodging, gear, etc.), provided an estimated $1.3 billion to Virginia's economy. In addition to Virginia, these waters serve as a regional resource for communities and industries in Maryland, West Virginia, North Carolina, Tennessee, Kentucky, and the District of Columbia.

Numerous areas are potential landslide areas in the mountainous region of the State of Virginia. The likelihood for these soils to become unstable during or after construction is high. Multiple features also contain seepage or drainage features which can provide for greater accelerated erosion potential or exacerbate the likelihood of a landslide. Pipeline activity such as trenching along slopes and equipment on unstable surfaces increases the risk of landslides. Slope failure in combination with poorly managed stormwater runoff can increase the likelihood of sedimentation of nearby streams and wetlands.

The Shenandoah Valley and other areas the proposed pipeline would cross in Virginia are underlain with karst geology. A significant portion of the current routes proposed for the pipeline run through karst areas. Karst topography is a landscape formed from the dissolution of soluble rocks such as limestone, dolomite, and gypsum. It is characterized by underground drainage systems with sinkholes, dolines,

and caves. Dissolution of the carbonate bedrock leads to the development of karst features and subsurface karst aquifers. Karst aquifers are characterized as having complex flow pathways that can transmit groundwater at significantly higher flow rates than that of typical clastic or crystalline aquifers. As a result of their typically high hydraulic conductivities, karst aquifers have the ability to rapidly transmit contamination through the aquifer. According to the Virginia Department of Conservation and Recreation (VDCR), the most important current and future environmental issue with respect to karst is the sensitivity of karst aquifers to groundwater contamination, since water can travel rapidly through solution conduits with relatively little time for natural filtering (VDCR 2015). As the DEIS admits, (p.200), the "development of karst features could be initiated by the physical disturbance associated with trenching, blasting, or grading, or by diverting or discharging project- related water into otherwise stable karst features."

One of the more interesting features of karst topography is undoubtedly the limestone cave formations associated with large groundwater flows in Karst terrains. Caves are elongate cavities in limestone produced by solution and aided by mechanical erosion. They form along paths of greatest groundwater solution, usually along joint planes as water circulates through the fractures. Cave entrances and terminations can be found in the bottom of dolines, on hillsides, in quarries, at various other exposed locations. Cave passages can be determined in one of three ways, Linear, Angulate, and Sinuous. Linear is a straight linear passage with no change in ground level. Angulate is a passage consisting of sharp almost 90 degree changes in cave path, both up and down. Sinuous is a curved path of very smooth changes in height. The cave pattern depends directly on the mode of groundwater recharge in the area.

Because the land beneath karst topography is very unstable, it has a tendency to become too fragile to support the surface, and will collapse, creating a sink hole. Sink holes make building or living on karst topography very dangerous. The ground beneath a building, home, or school could give way at any time, creating a dangerous hazard for people to live with, creating a risk that hazardous liquids could be released and then move swiftly through subterranean rivers and streams, polluting water sources a mile or more away. Deadly vapors also could settle into underground caves.

The DEIS does not include an adequate analysis of an alternative route for the ACP that would not cross National Forest lands, as federal regulations require and as specified at FSM 2703.2(2)b. The minimum threshold for deciding whether *any* crossing of the National Forest lands may be allowed, is a finding that the "proposed use cannot reasonably be accommodated on non-National Forest System land."

Note: Page numbers in these comments are based on page numbers from the PDF document provided by FERC.

National Environmental Policy Act

The National Environmental Policy Act ("NEPA") is the nation's basic charter for the protection of the environment. NEPA makes it national policy to "use all practicable means and measures * * * to foster and promote the general welfare [and] to create and maintain conditions under which [humans] and nature can exist in productive harmony."[1] NEPA's purposes are to "help public officials make decisions that are based on [an] understanding of environmental consequences, and to take actions that protect, restore, and enhance the environment."[2]

1. "Hard Look"

To accomplish these purposes, NEPA requires all agencies of the federal government to prepare a "detailed statement" regarding all "major federal actions significantly affecting the quality of the human environment."[3] This statement is commonly referred to as an Environmental Impact Statement ("EIS"). NEPA further provides that agencies "shall * study, develop, & describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources."[4]

An EIS must describe (1) the "environmental impact of the proposed action," (2) any "adverse environmental effects which cannot be avoided should the proposal be implemented," (3) alternatives to the proposed action, (4) "the relationship between local short- term uses of [the] environment and the maintenance and enhancement of long-term productivity," and (5) any "irreversible or irretrievable commitment of resources which would be involved in the proposed action should it be implemented."[5]

NEPA's disclosure goals are two-fold: (1) to ensure that the agency has carefully and fully contemplated the environmental effects of its action, and (2) to ensure that the public has sufficient information to challenge the agency's action. The Council on Environmental Quality ("CEQ") – an agency within the Executive Office of the

[1] 42 U.S.C. § 4331(a).
[2] 40 C.F.R. § 1500.1(b)-(c).
[3] 42 U.S.C. § 4332(C).
[4] Id. § 4332(2)(E).
[5] 42 U.S.C. § 4332.

President – has promulgated regulations implementing NEPA that are binding on all agencies.[6]

The CEQ regulations provided that the direct, indirect, and cumulative effects of the proposed action must be analyzed under NEPA.[7] When the agency prepares an EIS, it must take a hard look at the impacts of the action and ensure "that environmental information is available to public officials and citizens before decisions are made and before actions are taken," and the "information must be of high quality."[8] In preparing NEPA documents, federal agencies "shall insure the professional integrity, Including scientific integrity, of the discussions and analyses" and "identify any methodologies used and * * * make explicit reference by footnote to the scientific and other sources relied upon for conclusions * * *."[9]

NEPA requires that the Environmental Impact Statement contain high-quality information and accurate scientific analysis.[10] If there is incomplete or unavailable relevant data, the Environmental Impact Statement must disclose this fact.[11] If the incomplete information is relevant and essential to a reasoned choice, and costs are not "exorbitant," the information must be compiled and included.[12]

p.28 The proposed action statement contains no mention of access roads (miles), no mention of associated construction sites, ground disturbing activities, and other activities associated with pipeline infrastructure (acres) would be part of the proposed action. The proposed action statement is misleading and it underestimates the real impacts of the project.

p. 31 FERC dismisses concerns about sensitive groundwater and cave systems by saying that these are found at "greater depths." This simplistic statement ignores the fact that groundwater contamination, water quality impacts, and other impacts are much more likely to impact underground resources in karst terrain than non-karst terrain. The proposed pipeline will cross 32.5 mi of karst terrain. (p. 30).

p. 31: The DEIS states: "Prior to construction, Atlantic would perform electrical resistivity investigation surveys to detect subsurface solution features along all portions of the route with the potential for karst development". Why wasn't this work

[6] See 40 C.F.R. §§ 1500-1508.
[7] 40 C.F.R. §§ 1508.8, 1508.27(b)(7).
[8] 40 C.F.R. § 1500.1(b).
[9] 40 C.F.R. § 1502.24.
[10] 40 C.F.R. § 1500.1(b).
[11] 40 C.F.R. § 1502.22.
[12] Id. § 15021.22(a).

performed beforehand? What if caves or other sensitive resources are discovered under or near pipeline or other infrastructure site(s)? The public is precluded from making informed comments on this DEIS. The DEIS contains inadequate information

p. 31: According to the DEIS, “a number of surface sinkholes are present in the area of Little Valley” and “ACP would cross the Cochran’s Cave Conservation Site, which is designated as a first order globally significant conservation site that is known to harbor sensitive species” Why aren’t areas such as these avoided altogether?

p. 31: The public is precluded from making informed comments on this DEIS. The DEIS contains inadequate information on potential impacts to Cochrans Cave Conservation Site and Cochrans Cave #2. Atlantic had not yet consulted with VA DCR as of the date of the DEIS. Therefore, impacts to these resources are speculative or largely unknown.

<u>Caves and karst:</u>

According to Holsinger, (1975) “Bath County is speleologically one of the most important counties in the state. Of the 86 recorded caves, 12 are large and several are quite extensive. Butler-Sinking Creek Cave, the largest cave in Virginia [identified at the time] is located in the northern part of the county.”

Indeed, there are at least thirteen caves identified by Douglas in the narrow band within approximately 1 mi of where the the ACP is proposed in the northern part of the county near Burnsville and Little Valley Run.

These include (based on the numbering system in Douglas):

In Little Valley Run watershed (Williamsville Quad., p.694):
(24) Wildcat – “entrance… is a sink in the nose of a ridge” (Douglas, p.129)
(25)
(26)
(27) Smoking – “in a small sink near a large oak tree” (Douglas, p. 147).

In the Burnsville/Dry Run area (Williamsville Quad, p.694):

(51) Butler Cave/Sinking Creek system – “All geological and topographical signs pointed to the existence of a large cavern in the general area; the drainage from both Chestnut Ridge and Jack Mountain disappears underground and there are hundreds of sinks, many exceeding 100 ft in depth. In addition, William E. Davies, of the US

Geological Survey predicted many years ago the existence of a large complex caves system in the valley. There are three large water resurgences in the Bullpasture River three miles NE….The Butler Cave-Sinking Creek System is the largest cave known in the State of Virginia, and ranks high among the major caverns of the world. At present, over 50,000 acres of gallery have been explored and mapped. Additional exploration, now being carried out, indicates that Butler, Breathing (Butler Saltpeter), Lockridge Aqua, and numerous cave systems in the area are all part of the same large subterranean drainage system. It is probable that the parts of the system known at present constitute less than a third of the complete system."(Douglas, pp. 135-146) "The length …has been extended to 75,504 ft. and the depth (below the entrance) to 570 ft….This cave is the largest continuously explorable segment of the large subterranean drainage system that drains Burnsville Cove." (Holsinger p.62-63)

(59) Haroufs Hole – "it is probably the upper levels of Sinking Creek system" (per Nicholson, 1960, in Douglas, p. 146).

(45) Burnsville Sink #1- "a stream flows in during wet weather" (per Nicholson, 1958, in Douglas, p. 134).

(46) Burnsville Sink #2 (Boundless) -"A fair size stream sinks in its bed before reaching the entrance….It may connect with the Sinking Creek System. 1100 ft of passage has been mapped (Douglas, pp.134-35). "Is closely related to, but does not physically connect with, Butler-Sinking Creek Cave which lies just to the NE. … Cave contains about 1.800 ft of …passage trending NE and east….This stream has been dye traced to its resurgence at Aqua Cave spring about 4 miles to the NE." (Holsinger, p. 60-61).

(1) Carpenters (Douglas, p.146). "500 feet of passage, two pits, and a small lower level…The cave has many vertical features, including pits and tight canyons." (Holsinger, p. 64).

(3) Armstrong – "a low 75 ft passage leading out of bottom of large sink. It absorbs vast amounts of water in wet weather. The massive Heidelberg limestone is nearly flat-lying at this point." (Douglas, 149). "Recent exploration has extended the length of this cave to over 400 ft….The stream in Armstrong Cave has been dye traced to Cathedral Spring, 5.5 mi. to the NE" (Holsinger, p.58).

(57) Lockridges Water Sinks – "a stream …disappears into a small sink…beyond where the water sinks, there is a small cave just below the surface." (Douglas, p. 147)

(55) Rat Hole 1180 – "200 ft of walking passage. The rest is a low crawl."(per Nicholson, 1960, in Douglas, p. 147).

(58) Burns Chestnut Ridge – "a maze cave on several levels….several long narrow rooms with 30 ft ceilings …" (per Nicholson, 1960, in Douglas, p. 134).

"length…approximately 2,000 ft…..The stream in this cave has been dye traced to

Cathedral Spring which is located 3 mi to the NE on the Bullpasture River." (Holsinger, 61-62).

Butler Cave-Breathing Cave is a National Natural Landmark under the National Park Service. National Natural Landmarks are the best examples of biological features in both private and public ownership. National natural landmark status constitutes an agreement to preserve, in so far as possible, the natural values of the site. Access to the entrance is owned by Butler Cave Conservation Society, the first cave society formed in the United States. Today Butler Cave is estimated at over 18 miles in length and Chestnut Ridge Cave System is estimated at over 21 miles in length. These are some of the longest caves in Virginia and are among the 125 longest caves in the world.

There are several long, complex, interconnected cave systems in the area. Based on early descriptions and dye tracing cited in early descriptions, it appears that many of these systems have interconnecting stream systems. Some appear to be different caves at different levels, but may be, in some way interconnected.

FERC should have recognized that such cave systems exist in the area and should have fully analyzed any potential impacts from the project on these cave systems and other karst or cave features in the area. FERC must do so to avoid the possibility of degrading these cave system and other karst features, degrading water quality over large areas, risking that values that led to national natural landmark status, and harming wildlife that depend on them. FERC should determine whether any other caves or cave systems not mentioned above underlie the proposed FERC corridor and surrounding areas where activities may take place. FERC should determine whether and how any karst or caves in the area are physically connected and hydrological connection to one another, and whether any are possibly physically or hydrological connected to any of the large cave systems mentioned above. If parts of the ACP route are not located above the caves or within karst features themselves, but are either upstream from them or downstream from them in non-karst terrain, effects on water quality flowing upstream from or downstream to the cave systems should be examined as well. Impacts on wildlife species associated with any sinkholes, caves or karst terrain in the area should be disclosed and analyzed.

Additional caves near the route may include:

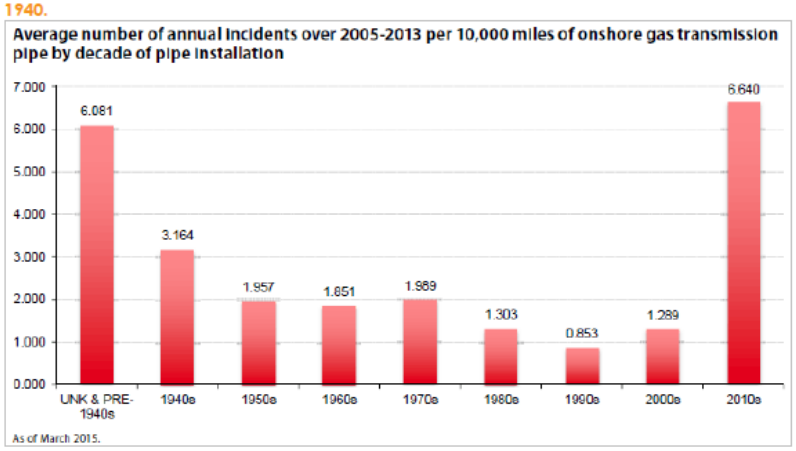
Staunton Quad (p.687)
(4) Blue Hole (Gibsons Hole)

Waynesboro Quad (p. 692)
(3) Coiner Springs

Henry H Douglas, Caves of Virginia,Virginia Region of the National Speleological Society, Falls Church (1964)
John R Holsinger, Description of Virginia Caves, Virginia Division of Minerals (1975).

Page 31: while "many miles of similar pipeline facilities that were installed using similar methods and have safely operated in karst-sensitive areas for decades," how many have not? How many miles of pipeline facilities opened and operated safely on karst and steep slopes and how many have not? Have monitoring levels been adequate to demonstrate this fact? Although pipeline officials assure everyone that the project poses almost no risk, the fact is that pipelines built since 2010 have almost six times the failure rate of those built in the 1990s and a higher failure rate than any pipeline construction since the 1990s. Given that the proposed pipeline would be built on much more challenging and dangerous terrain than any others of this size and length, the chances of failure would likely be increased.

Figure 5. Pipeline incidents on newly installed pipelines are comparable to those installed pre-1940.



Source: U.S. Pipeline and Hazardous Materials Safety Administration, Pipeline Safety Trust

p. 31: The Best in Class program cited on this page is questionable because it does not seek to avoid or minimize construction on steep slopes. The assumption is that construction will take place on steep slopes. Issues inherent with construction and operation in such terrain are not addressed. Also, since this program is something that is only now being developed (not proven), it is unclear how Atlantic intends to demonstrate that methods uses are indeed effective, quantitatively measurable, and can be/will be regularly monitored or whether this is simply a public relations program. Given the speed with which Atlantic intends to build this pipeline, any wrong assumptions captured in feedback monitoring will simply be too late.

p.32: FERC says: “Based on our review ….we conclude that the potential for ACP and SHP to initiate or be affected by damaging karst conditions would be adequately minimized.” But this DEIS lacks the information needed to assess the impacts of the project. “On the MNF and GWNF, Atlantic has not provided the information requested by the FS to assess potential project-induced landslide hazards and risk to public safety, resources, and infrastructure and also the effectiveness of proposed mitigation measures for restoration of steep slopes. Therefore, we recommend that Atlantic file the plans, typical drawings, and site-specific designs of representative construction segments to display the magnitude of the proposed slope modifications (cuts and fills) for National Forest System (NFS) lands as requested by the FS.”

p. 32: FERC says that direct impacts on recreationalists’ use of the [Appalachian] trail and [Blue Ridge] parkway.”

How else is it impacting the trail, parkway, and recreationists? What noise impacts and impacts to the viewsheds would occur?

p.32: The project would have a “long-term impact at temporary workspace areas and a permanent impact within the operational right-of-way.” This is a significant impact to forests in the region. FERC must analyze the permanent and long-term deforestation this corridor will cause, as well as impacts to wildlife and native plants.

p.33 Although FERC asserts that “in general, impacts on recreational and special interest areas would be temporary and limited to the period of active construction, which typically would last only several days to several weeks,” the agency fails to catalog, let alone analyze the numerous trails, river systems, camping areas, picnicking areas, caving areas, fishing areas, hunting areas, skiing areas and other recreational sites across the two national forests, national parklands, state lands, and conservancy lands this project could impact. All national forest lands are recreational areas and special interest areas. The agency has not analyzed impacts to these areas, so has no basis on which to make such a blanket statement.

There are, in addition, a number of special areas identified by the Forest Service (See special-areas2.pdf). These include:

(1) Two Indiana bat protection area a few miles to the south of the northern Bath County segment of the proposed route. These special areas are located around the periphery of an Indiana bat hibernacula. There are three Indiana bat protection areas and three hibernacula in Bath County and may be other hibernacula across the state

line in West Virginia. Comprehensive surveys for the bat should take place. The surveys, to date, have yielded few bats in Bath County. Due to white nose syndrome, endangered and listed bat populations (Indiana, northern long-eared, and gray bats) may be greatly weakened or may be suffering serious population declines, so the impacts of additional stresses on the bats should be considered.
(2) Scenic corridor and viewshed along Jennings Branch.
(3) Scenic corridor and viewshed below the location where the ACP is proposed to cross the AT and Blue Ridge Parkway.
(4) Mt Torry Furnace.
(5) Browns Pond special area "consists of two units, each designed around the protection of a sinkhole pond…Browns Pond is not large but it is quite undisturbed. Winterberry Pond is half the size of Browns Pond."

Virginia Division of Natural Heritage program recommends: "Timber cutting and road expansion projects should be excluded from within the protection boundaries of this special area. The existing forest road that crosses the outlet or overflow of Browns Pond should not be improved in any way that would affect the drainage or the hydrology of the pond. Water levels of the ponds should not be stabilized. No timber cutting should occur in or around the sinkholes that are scattered outside of the special interest area." Biological Diversity in the George Washington National Forest p.36-37.

Other special areas include overlooks and trails along the Blue Ridge Parkway. These include –

1. Three Ridges Overlook
2. Catoctin Trail
3. Side trails from Humpback Rocks to the AT
4. Humpback Rocks
5. Greenstone Trail
6. Priest Overlook & Priest Overlook Trail
7. White Rock Falls Trail

Proposed pipeline construction is a permanent change to the visual quality and the recreation values of the Appalachian National Scenic Trail. The cumulative impacts to the ANST are of a programmatic nature as there are currently numerous crossings of the ANST proposed including one other in Virginia (Mountain Valley Pipeline). The continual degradation of the ANST is unacceptable and these impacts cannot be mitigated.

There are other trails at risk that FERC did not even acknowledge. These include the Great Eastern Trail.
(1) The Great Eastern Trail is an 1800 mi trail from Alabama to the Finger Lakes of New York. This long distance trail runs through the Jerkemtight Roadless Area and further north along the crest of Shenandoah Mountain. The proposed route runs just to the south in the Walker Mountain area. What are the impacts to the viewshed?

Other trail viewsheds, trail corridors and trail features that could be adversely impacted include:

(2) Bear Rock Trail on Warm Springs Mountain (shown on DEIS project maps)
(3) Tower Hill Mountain Trail (shown on DEIS project maps)
(4) Fort Lewis Trail on Tower Hill Mountain (shown on DEIS project maps)
(5) Shenandoah Mountain Trail (Great Eastern Trail)
(6) Trails to Browns Pond and vicinity
(7) Trail 451 on Warm Springs Mountain
(8) Trail 717 on Jerkemtight
(9) Trail 443 on North Mountain
(10) Trail 636 Paddy Lick Trail
(11) Rt. 121 on Back Creek Mtn
(12) Trail 622 Wilson Mtn
(13) Trail 488 Walker Mtn
(14) Trail 507 Torry Ridge
(15) Trail 518 Torry Ridge
(16) Trail 479 Kennedy Ridge
(17) Tr 650 Dowells Draft
(18) Trail 485 Crawford Mtn
(19) Trail 489 Crawford Mtn
(20)Trail 449 Braley Pond

p.33: How does a 50-ft permanent right of way compare with other pipelines and other utility corridors? What are the cumulative impacts of this permanent forest fragmentation along with other corridors in the area?

p.33: “Additional visual analyses… photo simulations to determine and report on the potential visual effects” and consultations with national forests and the Appalachian Trail Conservancy have not been conducted as of the release of this DEIS. It is impossible for the public to evaluate visual impacts of the project.

p.33: FERC admits that the project would is "*likely to adversely affect"* at least "five federally listed species (Indiana bat, Northern long-eared bat, Roanoke logperch, running buffalo clover, and Madison Cave isopod)." What surveys of the populations and habitat of these species have been conducted and what will the effects be on specific populations and locations along the route?

p.34: FERC says that the pipeline "would not likely adversely affect or have no effect on the remaining species identified by the FWS and NOAA Fisheries." What remaining species are these? Did these include all TES, Proposed and Candidate species? How thorough were the surveys for these species? Were these surveys conducted at the optimal time of year for detecting species? Were appropriate habitats surveyed at appropriate times of the year and the day? What special surveying techniques were used for cryptic species, rarely encountered species and other hard-to-detect species?

p.34: Apparently, the requisite surveys have not been conducted. We learn from the DEIS that "survey access was not available in all cases" and some survey results are "pending." It is not even clear from the DEIS that the appropriate methods have been used. FERC does not even have in-hand a list of waterbodies that may provide habitat for TES, Proposed, Candidate or other federal or state species of concern.

P.34. Information on species that may be found on or downstream from Forest Service lands is "inadequate or inconsistent." Yet again, we wish to reiterate that a new DEIS be released after the revised BA/BE, a GWNF Locally Rare Species report, and revised Migratory Bird plan is released, so that the public and agencies can intelligently comment on rare and listed species information and the impacts of the proposed pipeline.

p.34: Direct and indirect impacts to bottlenose dolphin and harbor seal caused by noise, ground and wetland disturbance and sediment from runoff should be assessed.

p.35: FERC assumes only one kind of scenario – "if a pipeline incident resulting in a release of natural gas were to occur, the released gas would migrate up and rapidly dissipate into the atmosphere, and there would be no contamination risk to surrounding soil and groundwater media." FERC does not consider the possibility that a fire or explosion could occur along the pipeline and infrastructure, and how water resources could be affected.

p.35: According to the DEIS, “Atlantic and DTI would conduct preconstruction and post-construction water quality testing to determine whether construction activities have adversely affected water sources.” However, it is often very difficult to detect the path of water flows in conventional terrain, let alone karst terrain. For example, Crystal Springs is a source of drinking water in the City of Roanoke and produces a large volume of water for municipal use. After over a hundred years of use, no one has been able to locate the location of the groundwater that is the source of the springs.

Elsewhere, karst water flows are even more notoriously difficult to detect. Such testing may not determine the location of the water flows or identify all of the landowners and resources affected downstream. This not only applies the springs and wells used by landowners, but also aquatic or wetland habitats utilized by plants, animals, and biological communities both above-ground and belowground. Moreover, FERC does not explain why the limits of 150 from construction space (for conventional terrain) or 500 ft from construction space (for karst terrain) were selected. It is quite possible that activities could affect resources many more 100s of feet – or miles - away than these limits. “The hollow nature of karst terrain results in a very high pollution potential. Streams and surface runoff entering sinkholes or caves bypass natural filtration through the soil and provide direct conduits for contaminants in karst terrain. Groundwater can travel quite rapidly through these underground networks – up to several miles a day – and contaminants can be transmitted quickly to wells and springs in the vicinity.”[13]

Do any sinkholes or karst areas exist in the location near Orebank Br and Mills Cr near Big Levels in Augusta County? Grassy Pond Natural Heritage site, also below Big Levels, contains two nearby sinkhole ponds and Big Levels Extension Natural Heritage site, below Big Levels, contains boggy areas inhabited by rare swamp-pinks. See Biological Diversity in the George Washington National Forest and Biological Diversity in the George Washington National Forest: First Update (Nat. Her. Tech. Rpt 00-10). There are a number of ponds in the area and wonder if the project area contains any similar habitat.

p.35 The proposed pipeline would cross 1,989 waterbodies including 26 T&E or sensitive waterbodies. This is a very large number of waterbodies (nearly 2000), and the possibility that something could go wrong in one or more waterbodies is high, even with mitigation measures employed. Weather, the difficulty of inspecting and overseeing the work on 1989 waterbodies, and other factors could play a role.

[13] Zokaites, Carol, Living on Karst: A Reference Guide for Landowners in Limestone Regions, Cave Conservancy of the Virginias, 1997.

p. 36: Blasting would be "required." The DEIS should disclose where proposed blasting would occur and what nearby resources could be impacted.

p. 36: 138 million gallons would be used for hydrostatic testing, HDD construction and other purposes. The agency has not identified where these millions of gallons of water would be sourced from, or how depletion of water from specific sources could adversely affect other users, local habitats, or wetlands. The DEIS only discloses where 17.8 million gallons would come from (p.295). Presumably 6 million gallons alone would come from the James River, much of it for the HDD in Augusta, Nelson and Buckingham Counties. What resources would be impacted by this 6 million gallon withdrawal?

p.36: There would be long-term impacts to forested wetlands. There is no information on what mitigation measures would be employed, or their effectiveness. Again, as stated elsewhere, when the agency prepares an EIS, it must take a hard look at the impacts of the action and ensure "that environmental information is available to public officials and citizens before decisions are made and before actions are taken," and the "information must be of high quality."[14]

p.37: The BE will be revised based on "pending" survey results. Why was this revision not done before the release of the DEIS?

p.37: When will the public be allowed to comment on the revised Karst Terrain Assessment or Migratory Bird Plan?

p.38: In addressing socioeconomic concerns, benefits are discussed "on a regional scale." Environmental impacts, on the other hand are not analyzed on a regional scale (or even on a lesser scale – e.g. watershed scale or ecoregional scale). If FERC had prepared this EIS in an even-handed fashion, it would have considered the impacts of the multiple pipeline proposals that are proposed in this region, in the major watersheds of this region, or the ecoregions affected. And life-cycle impacts, including the impacts of hydrofracking, natural gas transportation, natural gas use (along with climate impacts of burning fracked natural gas).

p.40: At this early stage in the process, FERC has already "concluded" that the majority of impacts of this project would not result in a cumulative impact. We doubt that FERC is capable of being an unbiased decision maker. **More importantly, we doubt that having already concluded that there will be no impacts if the face of**

[14] 40 C.F.R. § 1500.1(b).

incomplete and inconsistent information, that FERC is capable of taking the "hard look" at the issues that NEPA requires.

p.79: What are the noise impacts of the compressor station at MP 191.5 in Buckingham Co., Va. Were simulations conducted? Did simulations take into consideration any reverberations facilitated by proximity to the river?

p.87: The project would disturb 12,030 acres of land. In Virginia, forests offset nearly 20% of our state's CO2 emissions according to the Department of Forestry (www.dof.virginia.gov/resinfo/climate-change.shtml). How does this project, in addition to the thousands of acres of forestland that is being converted to non-forest land elsewhere in Va and W.Va., contribute to climate change? The DEIS should recognize the forest's value for carbon sequestration in addition to helping ecosystems adapt to climate change.

How does this project, in addition to the thousands of acres of forestland that is being converted to non-forest land elsewhere in VA and W.Va., contribute to forest fragmentation and loss of critical habitat needed for climate change adaptation?

p.91: We agree that it is not appropriate for Atlantic to pursue negotiations for a 75 ft ROW for the project, when based on experience with other projects, FERC finds the right-of-way too large. FERC should analyze whether a right of way that it even smaller than the one it proposes is more suitable for this project, especially given the fact that this project traverses sensitive habitats and traverses narrow ridges that would have to be widened and flattened for this project to proceed. Alternatives that do so should be explicitly examined.

p.92: 9% of the mainline is proposed to be collocated with other facilities and 13% of the combined routes would be collocated with other facilities. Since FERC admits this is possible in many locations, FERC should analyze whether additional collocation could be achieved, especially given the fact that this project traverses sensitive habitats, contributes to tens of thousands of acres of forest fragmentation, and traverses narrow ridges that would have to be widened and flattened for this project to proceed. We note the length of the pipeline was increased in changing from one national forest alternative to another; the increases in mileage involved in switching to one of the other collocation alternatives discussed but dismissed is relatively small and should be studied.

There is not an adequate discussion of single-pipe or co-location alternatives. Missing from the discussion is the question of whether there is enough supply or

demand for utilization of all of the multiple pipelines proposed to criss-cross the eastern US. The degree to which these pipeline ventures are speculative in nature or redundant is not explored. This flaw in the DEIS makes it imperative for FERC or the land agencies affected to conduct a programmatic EIS as suggested on p. 70-71. FERC uses circular logic to avoid such an exploration, which is required if FERC is to take the hard look at the issue that NEPA requires.

If the MVP is also is also built, there would be even more construction in landslide prone areas (considering both pipeline systems). This is all the more reason to avoid construction in both locations. Please consider the combined impacts of the two pipeline system in landslide prone areas as portions of both are in the Chesapeake Bay watershed system and the New River/Ohio River watershed system.

p.93: It would be helpful if FERC could provide mapping of the additional temporary workspace proposed, in addition to the verbal descriptions in the Appendices. It is difficult to tell how specific resources would be impacted that appear to be in proximity to the ATWS.

p.97: FERC states that "Atlantic has identified 387 existing roads that would need to be temporarily improved for ACP. Atlantic would also construct 66 new access roads during construction of ACP, and 19 proposed access roads consist of an existing road that would also include a new portion that would need to be constructed."

What is meant by "temporarily improved?" What activities would take place to "improve" the roads? Could any of these changes have adverse impacts on the environment or local residents by creating more extensive cut and fill? Creating more sediment (short-term or long-term)? Facilitating illegal motorized vehicle use, including off-road use in any areas? Facilitate increased traffic on roads poses a threat to wildlife, residents, and their children? How long a time period is meant by "temporary?" By what means will the road be "restored" if temporary? Would any of the activities change any of the classifications of Forest Service roads and affect national forest management prescriptions for given areas, affect semi-primitive areas and (indirectly) affect potential wilderness areas (PWAs) or inventoried roadless areas? Would any of the activities affect trails or trail-users? Hunters, anglers, canoers and other recreationists?

Paddy Knob potential wilderness area is next to the proposed ACP route's crossing of Allegheny Mountain. (GWNF Plan Revision DEIS Appx C). According to the Forest Service's potential wilderness area evaluation for the area, Paddy Knob "is a steep and rugged mountainside capable of offering a primitive experience…. The

location of Paddy Knob is remote and the area is thinly populated….the habitat is unusual for Virginia and deserves protection". According to Virginia's Mountain Treasures, The Unprotected Wildlands of the George Washington National Forest, (Wilderness Society, et al), the area "lays claim to some of the highest elevations on the George Washington National Forest….Paddy Knob has an elevation of over 4477 ft… Significant stands of old growth have been identified. Paddy Lick may contain 2649 acres of possible old growth" (p. 65)

The area has a "small core of 3284 acres of semi primitive land." (GWNF Plan FEIS, C-24) FERC should evaluate whether the project could diminish this semi primitive core, could alter the recreational opportunity spectrum of this area, and alter the remoteness of the area and the primitive experience it offers, thus increasing the possibility the area would no longer meet criteria for wilderness designation. If the unusual high elevation habitat or old growth forest in the area is contiguous to or spills over into similar habitat in the ACP corridor, then FERC should analyze the degree to which this project would degrade this large block of habitat.

p.99: Under what circumstances would fish be relocated and how would this affect the viability of fish and fish population?

p.100: The DEIS says the Forest Service "would strive through mitigation to obtain a net benefit to natural resources and their functions." What does this mean? The term strive provides no assurance that Atlantic would demonstrate that mitigation measures are effective. We are uncertain as to how any of this can be measured or quantified.

p.101: The DEIS lists over a dozen encroachments on wetlands and expansions of the corridor, most to support the boring of roads or HDD. Atlantic should explore alternatives that avoid these types of wetland encroachments.

p.108: On FS lands, what is the effectiveness of the decompaction method – spreading cut and scraped vegetation on site? How will this differ from the soil and topsoil originally in place? Will the same types of vegetation grow in its place as before? Or will the soil be more acidic, lack organic matter, etc, or be more impoverished in other ways, such that fewer plants grow back or only weedy plants grow back in its place? What studies show that this is an effective method of restoring soil to its original level of vitality? What monitoring will occur?

Would spreading slash be an effective method of deterring illegal motorized vehicle use? It stands to reason, that if there is a long, linear open corridor, there would be

multiple points of potential access. How could Atlantic prevent illegal access along the entire corridor using slash piles?

p.108: “Special markers providing information and guidance for aerial patrol pilots” would be installed along the pipeline route. If these markers are to be visible from airplanes, would they be noticeably visible from national parks, national forests, wilderness areas, and other location where visual quality is important? How would this impact visual quality? Would scenic quality objectives be met for all areas?

p. 109: The DEIS states “we have determined that Atlantic’s and DTI’s request to locate certain ATWS within 50 feet of waterbodies is acceptable.” Has FERC identified the rare or listed species found in these waterbodies and in riparian areas/wetlands adjacent to them? Are there any impacts to rare or listed species or rare biological communities?

p.114-5: Winching construction equipment and using the two-tone method may protect workers and equipment on steep slopes, but how does this protect soils or prevent slope failures or landslides? Clearing vegetation, disturbing the ground, and digging in the ground on steep slopes will ultimately weaken the soil. And that could lead to harm to persons living down slope or persons depending on water sources down slope.

p.120-21: EIs are to monitor the work to ensure that Atlantic “complies with the construction procedures and mitigation measures.” What level of expertise on all matters are the EIs required to have? Are they trained biologists and experts who are able to identify all TES species, locally rare species and state-protected species that may be encountered during the project? Geologists and archaeologists trained to identify important sites? How will the public be assured that sensitive resources are protected?

p. 123-4: Post-construction monitoring – It appears that Atlantic would have the primary responsibility for conducting post-construction monitoring. Atlantic would monitor the sites for 2-3 growing seasons post-construction until certain thresholds are deemed met and “restoration is deemed successful.” It is not clear how thoroughly “FERC, cooperating agencies, and/or other agencies would continue to conduct oversight inspection and monitoring to assess the success of restoration,” because the DEIS provides no information on how frequently the agencies would monitor and no information on what techniques they would use. The DEIS says that “other land and resource management agencies [such as the Forest Service] may conduct their own restoration inspections in areas where they have jurisdiction,” but it

is not clear how thorough or frequent these would be. Forest Service budgets have been cut significantly in recent years. Monitoring activities that were conducted routinely have, in many cases, not been done so with the same frequency as in the past. For example, in the project area for the CMB and Nettle Patch timber sale in the Clinch Ranger District (GWJNFs), macro invertebrate sampling has not been conducted on the major streams in the project since 2000 – in 17 years. This is in spite of the fact that a major timber sale (CMB) hundreds of acres in size took place in these watersheds in 1998-2005 and in spite of the fact that a major timber sale hundreds of acres in size is planned in the same area (Nettle Patch) at present.

In the Gilmore Hollow timber sale project area (Glenwood Ranger District, GWNFs), macro invertebrate sampling has not been conducted in the North Creek (lower) or Sprouts Run watersheds since 1996. North Creek watershed, a Tier III Exceptional Waterway, was the site of a major flooding event that encroached on Forest Service roads and destroyed trail bridges after 1996. Sprouts Run is the site of a National Recreation Trail; logging took place in the watershed during the mid-1990s. So there is a question as to whether the Forest Service will have the capability to monitor and enforce the reclamation/restoration provisions incorporated into the ROD on the many miles that the pipeline project would impact. Secondly, there is a question as to who would fund the monitoring and enforcement activities of FERC, the Forest Service and other cooperating agencies. Since this is a for-profit project on public land, would Atlantic compensate the Forest Service, National Park Service, Virginia DCR, Virginia Department of Inland Fisheries, conservation easement holders and others affected by the project for the full amount of their monitoring and enforcement activities? What amount of money has Atlantic set aside for funding these activities? And is this funding assured if Atlantic were to go bankrupt, if Atlantic were not to make as much money on the project as expected, or if the project or pipeline were to change hands?

p.124: The patrol program would include “periodic aerial and ground patrols.” How much if this would involve actual on-the-ground monitoring? Aerial monitoring? How frequently for each? Would aerial monitoring be adequate to detect “erosion and wash-out areas, areas of sparse vegetation, damage to permanent erosion control devices” and other conditions?

p.124: The DEIS is unclear and perhaps inconsistent on revegetation and restoration. How long would woody vegetation be cut back in the corridor? For the life of the pipeline? How can an area be deemed restored until trees attain their full maturity? How will we know that the site is suitable for growing trees until many years after completion? Nearly 7,000 acres of soils with poor revegetation potential would be

affected on the ACP corridor (p.230). Is 2 or 3 years an adequate timeframe to determine this? How can restoration be deemed to have occurred until a full complement of wildlife and native plants returns?

p.125: If optional expansion occurs, where would additional facilities and infrastructure be installed/constructed? What will be the impacts?

p.127: Is the analysis, information and aerial imagery from the evaluation of the three criteria (e.g. publicly available data, GIS data, aerial imagery, and field surveys) used in the evaluation of alternatives available? Where can we obtain this?

p.128: Not only the purpose of the project (produce 1.44 bcf/d), but also the need for it must be established. Production of a given amount of fuel is not an end in itself. The fuel is used to provide a source of power so that activities can take place. That is the need for the project. FERC must evaluate whether alternative sources of power can also be used to achieve the same need.

p.129: FERC does not explain why an "alternative" that would "result in end users seeking alternate energy from other sources such as …. Renewable energy" is "not preferable" or recommended.

p.135: Construction and operation of a merged system "may hold an environmental advantage" but would result in "significant delay." So construction speed is placed at a higher premium than environmental impacts. We would note that selecting and unpopular alternative could also result in significant delay as well, as there could be significant opposition from affected landowners and others. FERC should study and identify all alternatives that are environmentally preferable. Determining which alternative is most expedient should never play a role in which alternatives are examined.

p.135-6: FERC admits that there is a theoretical possibility that ACP gas could be shipped from Cove Point or Elba Island LNG ports. FERC dismisses this issue based on the fact that additional infrastructure and adjustments would be needed before shipping from the LNG ports could be achieved. But FERC does not disclose the cost of these changes. Or the revenue that Atlantic and its partners could expect to generate. It is entirely possible that compared to the costs of building the ACP and the costs of building the two LNG terminals, the costs of the additional changes will be relatively minor, or that the rate of return on these additional investments would warrant the construction of link-ups to one or more LNG ports based on the profits Atlantic would make on LNG shipped gas. Or that the private investors who

proposed building ARC may receive subsidies or tax breaks. Or any number of other considerations. FERC has not looked at the factors may be examined by Atlantic in the decision as to whether to connect to LNG ports or not, or how this will affect its decision.

p.136: In discussing the MVP co-location alternative, FERC says: would present significant constructability issues as a portion of MVP route in northern West Virginia follows narrow ridgelines. Based on our review of data, aerial photography, and topography, we conclude that there is insufficient space along the majority of ridgelines in West Virginia to accommodate two parallel 42-inch-diameter pipelines. FERC needs to further disclose what these constraints are in terms of size and in terms of resources impacted, as it applies to the ACP itself and its infrastructure and clearings. There is no discussion or analysis of this in the DEIS. FERC also needs to disclose what these constraints are in terms of size and in terms of resources impacted, as it applies to the MVP itself and its infrastructure and clearings. Please incorporate this comment into our formal comments on the Mountain Valley Pipeline as well.

p.139: This statement by FERC is illustrative of the agency's approach –"although in many cases, steep slopes are not in themselves construction or routing constraints." The long-term impacts of constructing a pipeline across steep slopes have not been fully evaluated. Such a conclusory statement cannot be justified.

p.145: FERC dismissed a national forest avoidance alternative on speculative ground. The agency says that "the amounts of environmental impacts on various resources are concurrently increased" under such an alternative but admits that "ground resource surveys have not been conducted."

p.152: This map does not show the SHP proposed route mentioned in the description.

p.153: What is "backhoe stripping" to identify unmarked graves. Using heavy equipment on gravesites could desecrate graves and cause damage the remains that exist in these sites. How will this harm archaeological sites protected by law? Atlantic should survey the area, preferably using hand tools approved by archaeologists and researchers, to identify unmarked gravesites before construction.

p.154 & 146: Yogaville Ashram Historic District is not identified on the map (p. 152). How does the proposed route avoid the historic district?

Atlantic should develop alternatives that totally avoid historic districts, wetlands, wildlife management areas, and conservation easements in this area altogether.

p.164: Atlantic should develop an alternative that avoids Ft. Pickett, Ward Burton Wildlife Foundation lands, and Ward Burton Wildlife Foundation potential lands altogether. An alternative other than Alt.1, 2 & 3 should be examined.

p. 184: Conclusions in the EIS are based on the assumption that "Atlantic and DTI would implement the mitigation measures included in their applications and supplemental submittals to the FERC and cooperating agencies." But changes in these mitigation measures are now being advocated by FERC. And surveys, other data and reports, and the results of interagency consultations have not been presented to FERC, so how can FERC may any conclusions based on such incomplete information? FERC also assumes that "Atlantic and DTI would comply with all applicable laws and regulations." But as stated above, pipelines built since 2010 have almost six times the failure rate of those built in the 1990s and a higher failure rate than any pipeline construction since the 1990s. Given that the proposed pipeline would be built on <u>much more challenging and dangerous terrain</u> than any others of this size and length, the chances of failure would be increased.

p.197-8: "GeoConcepts (2016) completed survey …in four discontinuous segments …39 percent of the total alignment in Bath County." Since only 39% of Bath County is surveyed, information is far from complete. Surveys in Augusta County are also incomplete (over 70% - up to 30% unsurveyed). It is notable that the Bath County "field survey identified 40 point features ….Of these, 22 were ranked as high risk and 15 were ranked as moderate risk [92.5% at moderate to high risk]." Given the lack of survey data, this DEIS is incomplete. The appropriate surveys, information-gathering and analysis needs to be completed and the public needs to be offered an additional opportunity to comment.

p.200: Atlantic has not conducted electrical resistivity investigation surveys along the route.

p.201: What constitutes a "minor reroute of the pipeline?" How far from the original route? How would the public, affected landowners, scientific experts, recreationists and others be consulted in the event of a reroute? What opportunities would the public have to comment on, object to, or appeal a reroute if there are found to be impacts along the new proposed route?

p.202: FERC asserts that beheading of a stream is unlikely to occur due to trench depth of 10-12 ft., but many sinkholes, cave openings, and other karst features occur close to the surface. Due to its porosity, karst is much more sensitive to ground disturbance that other terrains. And as the DEIS admits, (p.200), the "development of karst features could be initiated by the physical disturbance associated with trenching, blasting, or grading, or by diverting or discharging project- related water into otherwise stable karst features."

p.205: The pipeline proposed route is "within 100 miles of nine faults identified in the USGS Quaternary Fault and Fold Database." It is important to note that since the impacts of eastern earthquakes tend to be felt over a large distance, earthquakes along any of these faults (or others beyond this zone) could impact the pipeline or could impact the very steep slopes that portions of the route are proposed on. What potential landslides, debris flows or pipeline ruptures could occur? What would be the impacts on landowners and natural resources?

p.207: There are several slopes with high potential slope instability. "Ten sites, five on ACP and five on SHP, have been assigned a high potential slope instability hazard." What resources are found on or around these areas, and what resources downstream could be impacted? It is important to note that there could be more slopes with high potential slope instability. Thirty preliminary sites identified were not visited, some due to access restrictions. And twelve sites on ACP were dismissed as having no potential slope instability; some of these were dismissed based on aerial reconnaissance alone. These areas should be surveyed on the ground as well, and analyzed.

p.208: "In West Virginia, 73 percent of the AP-1 mainline route would cross areas with a high incidence of and high susceptibility to landslides. In Virginia, approximately 28 percent of the AP-1 mainline route would cross areas with a high incidence of and high susceptibility to landslides (Highland, Bath, Augusta, and Nelson Counties)." What resources are found on or around these areas, and what resources downstream could be impacted?

p.209: Why is there further evaluation only for slopes "longer than 200 feet with slope greater than 58 percent"? Without explanation, this seems to be arbitrary. Aren't many slopes over 45% susceptible to slope failure or erosion problems that, in the medium- or long-term could lead to slope failures? Aren't some soil types more susceptible to slope failure than others? Couldn't the presence of past logging operations, other utility lines, roads or other activities contribute to slope failure and landslides? FERC does not explain its rationale for this 200 ft/58% limit.

p.209: Ninety-nine percent of the proposed ACP route through the GWNF has a moderate (41%) or high (58%) incidence of and high susceptibility to landslides. What resources are found on or around these areas, and what resources downstream could be impacted? This general area has experienced severe debris flows, such as the debris flows that occurred in Nelson County after Hurricane Camille in 1969. FERC should also analyze the potential impacts of high water events on erosion, slumps, landslides, debris flows, and downstream water resources, given the history and terrain.

p. 222: “On the GWNF, more than 80 ATWS would be required” and “the area of disturbance” would be increased “to between 175 feet and 200 feet wide in certain areas.” What are the impacts of such giant linear clear cuts on wildlife and wildlife corridors?

p.223: Narrow ridge tops would be widened and flattened under this proposal. As mentioned in the DEIS, these areas could be more susceptible to landslides. The potential for landslides should be carefully evaluated location by location. Due to the relative inaccessibility of these areas, narrow ridge tops are also frequently the sites of remnant tracts of old growth. Potential impacts to old growth in these areas need to be explored and analyzed. Many narrow ridge tops are rocky. Unique native plants, wildlife and biological communities associated with these area (e.g. rattlesnakes, Allegheny wood rats, rock skullcap, or other species) need to be analyzed. Also, because alteration of the terrain may be highly visible, impacts to visual quality need to be analyzed.

p.223: The DEIS says “Based on Atlantic’s *Karst Survey Report,* we are unable to determine which karst features are located on NFS lands.” Impacts of this project on karstlands on the GWNF are undisclosed. This information should be provided and the public should be allowed to comment on it in full.

p.223: FERC and Atlantic do not disclose the magnitude of cuts and fills for pipeline corridor and roads on the GWNF. The maps in Appendix B show several of the sections where the proposed pipeline and roads cross the GWNF. For example, Appendix Pages 26, 27, 28, 30, 31*, 32*, 35, 38, 39*, 40*, 49 & 50 [these are the original printed page numbers on the maps; note that those with * have extensive road or pipeline sections, and/or extensive steep slopes.] It is important for the public to know if how extensive the cut and fill is along these pipeline/road sections in order to know how specific resources might be impacted.

For example, it is important to know how the road from the Cowpasture River to the Browns Pond watershed might affect the Cowpasture River or Browns Pond. Or how the cut and fill on pipeline/road sections on Big Crooked Ridge or Steep Pinch Ridge might affect the viewshed from the Potential Wilderness Area across Townsend Draft might be affected. How cut and fill on Camp Ridge might impact the scenic byway along Jennings Branch in the valley below.

p.224: We do not understand how FERC can conclude that "the impacts would be minimized and mitigated" when "the development of other slope instability/landslide risk reduction measures" have not been completed.

p.238: Sixteen access roads are used for construction on NF lands and 15 would be retained for permanent access roads for the project. Which segments would be permanent? What are the impacts of each of these road segments on TES and Locally Rare Species, wildlife, old growth, water quality, recreation and trails, illegal motorized use, invasive plants, forest fragmentation, soils, cave and karst areas, semiprimitive areas, and aquatic species? How many miles of roads are planned in each area? To what degree would areas be fragmented compared to the status quo? How are the roads managed now under the Forest Service's classification system? How would this change?

We note that there is one fairly long segment proposed between milepost 93 & 94 of the pipeline – over Duncan Knob and a second one to Laurel Run. Another is planned from the Cowpasture River to Tower Hill Mtn (MP 96-98). Another is planned on the East Branch of Dowells Draft (MP 116-119). FERC should examine ways to decrease road distance, especially when important resources (such as the Cowpasture River or the Duncan Knob landscape, or scenic views from Jennings Br area are at stake.) FERC should disclose how much it costs to maintain this extensive road system and who would pay for it. FERC should disclose how much it costs to patrol for illegal motorized vehicle use on this extensive road system and surrounding areas and who would pay for it.

p.243: How will this project comply with Va. Best Management Practices? Who will monitor the project to ensure compliance, and what training will they have?

p.244-45: How will this project comply with the Forest-Wide Standards and Guidelines on pp.244-45, how will it comply with other Forest-Wide Standards and Guidelines in the GWNF Revised Plan Revision, and how will it comply with the GWNF Plan Revisions for the specific management areas that the project crosses? The DEIS says that "In addition to potentially issuing a SUP, there is a need for the

FS to consider amending affected *LRMPs* to make provision for the ACP right-of-way." (p.245-46). It is clear that the pipeline proposal is inconsistent with many of the Forest-Wide and Management Prescription Area Standards and Guidelines and would cause the national forest to expend scarce dollars to monitoring, mitigation, and repair of damage ecosystems resulting from the pipeline construction; as it stands, the Forest Service has too few funds to manage the problems it deals with before the construction of the pipeline. We do not favor amending any of the provisions of the GWNF Plan as we are stakeholders in its development, and as it took many years to develop. Atlantic should consider locating the pipeline off of the national forest or on existing utility corridors that would allow the types of activities proposed.

p. 251-58: The DEIS discloses water wells in the vicinity of ACP. How will Atlantic compensate landowners whose wells or springs are damaged?

p. 277: In its statement on surface water classification, the DEIS fails to mention that the Virginia Department of Environmental Quality (DEQ) made a determination that the Cowpasture River was eligible to be listed as an exceptional (Tier III) state water. As such, it is probably the highest quality river <u>of its size</u> in Virginia. Atlantic should disclose mitigation measures that would assure that the Cowpasture River maintains the special values and exceptional water quality of the river. We are especially concerned about activities around the river, on the slopes above the river, within the tributaries of the river (including pipeline construction and the proposed access road).

p.281: We note that the Cities of Staunton, Norfolk, and Emporia obtain drinking water from waterways affected by the proposed ACP project. What additional protective measures will be applied to protect drinking water for these cities and for persons dependent on wells and springs affected by the project?

p.282: The DEIS makes a cursory statement on designated Wild and Scenic Rivers but fails to mention that there are a number of Virginia waterways in the pipeline corridor that are eligible Wild and Scenic Rivers. FERC and the cooperating agencies must protect the outstandingly remarkable values for which these waterways were found eligible Wild and Scenic Rivers. See GWNF Plan Revision DEIS Appendix D "Wild and Scenic Rivers Eligibility Determination."

These include:

1. The Cowpasture River. Segment B from Rt 42 Bridge to the Confluence with Bullpasture River. Fish and Wildlife Values Class A. Historic and Cultural Values Class A

2. The Bullpasture River. Segment A. Scenic, Recreational and Geological Values, Class A.

p.315: The project would impact 95 acres of the Windy Cove conservation site and nearly 50 acres of the Great Dismal Swamp – Northwest Section conservation site.

Other sites appear to have a much smaller footprint, but may impact more of the natural community than figures indicate. For example, shale barrens are rare on the landscape and tend to be rather small in scale, so the portion of the Big Cedar Shale Barren conservation site impacted may be significant relative to the "acreage number" in the chart. In any event, given that the acreages are relatively small for these sites individually, why is it not possible for Atlantic to avoid them altogether?

p.333: FERC's "review of the potential impacts on vegetation" does not include any discussion or analysis on the impacts to old growth forest. According to the Forest Service's Southern Region guidance on old growth (FR-62), old growth in the eastern U.S. comprises approximately 0.5% of the old growth that historically existed in the southeastern US. Much of it was cut down in the early part of the 20th century.

As part of this analysis, the Decision makers should identify all old growth of any size (including within-stand old growth and old growth partially within multiple stands). Old growth components and old growth habitat value of all old growth of any size should be adequately protected. The FS should protect mature forest adjacent to or near existing old growth may be important ecological components that should be protected, as well. FERC should have provided figures on the size, distribution, and age of trees to be cut. FERC should have provided figures on the size, distribution, and age of trees to be cut. FERC should have disclosed the impacts on old growth and disclose whether the treatments could preclude or delay the attainment of old growth status.

The agency should examine whether there is any within-stand patches of OG or relic trees that should be protected or buffered from disturbance. It is possible that some old growth may exist within whole stands, partial stands, or portions of stands adjoining other stands. If any inclusions of an older age are found in the course of surveys, it would be proper to change the stand layouts and dimensions and numbers to incorporate this new data.

The agency should examine the spatial arrangement of OG and surrounding mid- late-successional habitat, to determine whether any such areas should be protected or buffered from disturbance. Even if these areas did not meet operational

criteria for old growth, given the obvious shortage of old growth in this area (and throughout the Appalachians) FERC should also consider designating some of the best areas as small, medium or large old growth tracts.

In FR-62, the Southern Region of the FS includes the following “considerations for old-growth forests during project-level planning:””When developing overall management strategies for an area, care should be taken not to isolate the medium- and small-sized old growth patches from the mid- and late-successional forests.” (pp. 26-7). National Forests need to “provide for ... representation of all old growth forest community types” (FR-62 p14) and “consider underrepresented old growth forest community types” (FR-62 p17) in planning.

Thorough old growth surveys should be conducted which include a record of where each of the plots were taken, a record of how each of the criteria for old growth were determined, and whether the FERC ensured that the criteria used were appropriate for this geographical area and the old growth types found here.

In 2010, I used Forest Service GIS layers to map stands on the GWNF that are 140 years or older (Based on Forest Service Southern Region’s guidance, old growth can vary from 120-130-140 years or older, dependent on the old growth forest type and other conditions measured on the ground.) I found a large tract of 140 yrs old (now approx. 147 year old) forest land near the location where the proposed ACP would cross into Va. from WV, and along the slope below it in the GWNF. See Old Growth Map North GWNF.pdf. See also og-r8-north.pdf and og-r8-south.pdf, from the GWNF Forest Plan Revision process, which show more extensive areas of potential old growth in the Highland County, Bath County and Augusta County portions of the proposal. See also photographs taken by Sherman Bamford, August 2015, in the Highland County portion of the ACP proposed route.

Old growth should be surveyed and avoided. FERC must carefully examine the configuration and old growth forest types of old growth to avoid fragmenting large and medium sized old growth tracts and significant and large/medium sized mature forest/old growth tracts. FERC must avoid logging rare or underrepresented old growth forest types and higher elevation old growth forest.

p.335-337: There is little analysis of bats, salamanders, Neotropical migratory birds, TES and locally rare species, or other key forest interior species, species that are vulnerable to forest fragmentation at various scales, and species vulnerable to climate change. In this DEIS, the amount of detail on individual species and wildlife, as a whole, is so lacking that it ranks below an environmental assessment. We

would expect there to be much more local information on wildlife species and native plants than provided, and much more information on how local populations could be affected by the project.

p.347: The DEIS says, “Approximately 89 percent of current access roads identified are located on existing roads (private and/or public). Approximately 15 percent are new roads, and roughly 4 percent are extensions of existing roads.” The DEIS should have identified what road access proposals are on existing roads, what road access proposals are new roads, and which are extensions, and where they are located. Maps should have illustrated this. The degree to which road projects (and the pipeline corridor itself) would upgrade access in existing areas or create new access into areas should have been disclosed. The degree to which the project could facilitate increased motorized use, increased disturbance to wildlife, and new vectors for invasive species should have been disclosed and analyzed. The degree to which the project could affect visitor/recreationalist use of certain areas (and affect semi primitive areas and other recreational opportunity spectrum designations) should have been disclosed and analyzed.

p.348: In the DEIS, “edge habitat is considered to be 300-foot forested buffer from a corridor/ disturbance with interior forest starting at the point beyond the 300-foot edge buffer”. It is unclear how the 300 ft figure was derived. A study using GIS data sets has shown that "forest interior species and specialists are selecting landscapes with no edges or low-contrast edges, lower number of patch types per unit area, and a greater number of core areas." Villard, M. and B. Maurer, 1996, "Geostatistics as A Tool for Examining Hypothesized Declines In Migratory Songbirds", Ecology 77(1) at 63. Current scientific knowledge recognizes a potential 600 meter edge effect for bird populations (see Leimgruber et al. and Wilcove, D.S. et al, 1986, "Habitat fragmentation in the temperate zone", pp. 237-256 in Soule (ed.) Conservation Biology, Sinauer Press, Sunderland MA. Fanzreb and Phillips (USDA FS SRS Gen Tech Rpt SE-96) report that for migratory birds, susceptibility to predation is "particularly acute" in the zone less than 100 yd. from the forest edge.

p.349: We are happy that FERC advocates “collocating the pipeline adjacent or parallel to existing rights-of-way,” but many sensitive resources are still impacted to a great degree by this project. Alternatives should be considered that co-locate much more of the route.

p.350: The DEIS should provide more information as to how chronic noise would be mitigated during the long periods of construction. According to the DEIS, at “a distance of 50 feet from ACP and SHP work areas, general construction would

generate noise levels of about 85 decibels on the A weighted decibel scale (dBA), and about 92 dBA at 50 feet as a result of HDD operations for ACP," which is noisier than the compressor stations. This kind of chronic noise could very well affect wildlife species, wildlife corridors, wildlife migration, utilization of nesting/denning or feeding areas, or other wildlife utilization of their habitat.

p.352: The DEIS admits that there would be "the removal of approximately 6,800 acres of forested vegetation (includes 3,800 acres of permanent impacts)" and "fragmentation of interior forest blocks," but we could find no maps of large blocks of interior forest that would be impacted similar to that found in the Mountain Valley Pipeline DEIS pp.370-372. Aside from the problems with that analysis, we know such maps should be available. The MVP DEIS utilized maps for both West Virginia and Virginia, and the majority of this project covers parts of those states. So the agencies that produced the MVP DEIS maps should also be able to produce maps for the ACP.

p.352: It is curious that the DEIS states that "ACP and SHP would not significantly affect common wildlife species at population levels," but contains no similar statement regarding forest interior species, rare and imperiled species, species at the edge of their ranges, disjunctive species or other at-risk species. Why should the priority be placed on protecting already common species, rather than at risk species?

p.357: Blasting could occur in "24 wild brook streams and/or stockable trout streams." FERC should pay particular attention to how ground disturbing activities and loss of shading and canopy near streams could affect trout habitat and trout populations in streams in the area - since this is an important area for trout. We are particularly concerned about the potential for forest clearing in this project to negatively affect water quality, sediment levels, and water temperature. FERC should analyze these issues and should fully mitigate all impacts. What are large woody debris levels along these streams and do they need to be augmented?

FERC should have also considered how it would protect the stream management zones, as laid out in the Virginia BMPs. These are different from the riparian zones established in the JNF Plan in some respects. For example, they require that the forest floor "remain essentially undisturbed" in the SMZ, which is 60-120 ft. along trout streams, dependent on slope of adjacent lands.

Wider stream buffers should have been considered. Many species and biological communities rely on the health of riparian areas. See Jan 13, '04 USF&WS BO for the JNF p. 2 bottom paragraph and p. 3 top paragraph; and Seth

Wenger, 1999, “A Review of the Scientific Literature on Riparian Buffer Width, Extent and Vegetation”, Institute of Ecology, University of Georgia, 59 pp. (both incorporated by reference). And The Virginia Department of Game and Inland Fisheries (VDGIF) stated its position that the proposed riparian corridors in the draft revised Jefferson LRMP were not sufficient to protect threatened and endangered aquatic species. *See* Comment letter 2575 on the draft revised Jefferson LRMP, William Woodfin, Jr., Virginia Department of Game and Inland Fisheries, already in the FS's possession, incorporated by reference. Instead of the proposed riparian standards, the *VDGIF recommended increasing the standard buffers with an allowance to reduce the buffers on a site-specific basis after consultation with all cooperating agencies*. Wider streamside buffers than those proposed here should have been considered and implemented.

Headwaters and small streams are particularly sensitive: "The effects of sediment delivered to a stream channel diminish as watershed size increases. Most vulnerable are small sensitive headwaters catchments where concentrated timber harvest activity can have profound results. . . . After four years, sediment rates are normally back to predisturbance levels. However, once sediment is deposited in a stream channel, its effects can persist for decades or even centuries (Frissel, 1996)." (JNF Enterprise TS EA-42; incorporated by reference). "Generally the headwater fish populations are the most threatened." (GWNF FEIS J-8). For information regarding salamander use of headwater stream habitat see Headwater Stream habitats (incorporated by reference). This information needs to be fully considered and incorporated into the analysis. Expanded no cutting or no disturbance zones around stream courses needs to be implemented here.

The GWNF Plan requires the FS to delineate riparian areas and this should be done as part of the ACP proposed project through maps and other documentation.

Springs and seeps are a component of landscape diversity and are very important for maintaining the population viability and distribution of salamanders, frogs, crayfish, box turtles, ruffed grouse, turkeys, and other species (see JNF Hagan Hall Timber Sale EA -43, 44, 46; incorporated by reference). Removal of their canopy cover impedes and disrupts the natural ecological succession of these areas. Implementation of the proposed alternative/mitigation is not compliant with the DFC for these microhabitats. These areas should be absolutely off-limits to cutting and removal and vehicles; and the no-disturbance zone should be more than just the "immediate" wet area due to hydrological, shade, and drying concerns.

"Elimination of terrestrial vegetation around aquatic breeding sites causes amphibian populations to decline [citations omitted]. Thus, maintenance of amphibian biodiversity depends on the protection and management of both aquatic breeding sites and the surrounding terrestrial habitat." "Factors influencing amphibian and small mammal assemblages in central Appalachian forests", Mitchell et al, Forest Ecology and Management 96: 65-76 (1997). (research conducted on the GWNF, incorporated by reference).

"Downed material in these spots is providing cover which was formerly provided by a forest canopy. This downed material is retaining the cooler temperatures and higher humidity associated with springs and seeps." (Hagan Hall Wildlife Existing Condition report, Aug. 1998). "Removal of material from these sites [seeps, springs, bogs, and forested wetlands], particularly where most of the tree canopy is now gone, would increase the solar radiation causing warming temperatures and less humidity. . . . increased temperatures and drier air can affect the presence of certain amphibians and small mammals." (Hagan Hall EA-47). Ecosystem management should recognize that there is more to seeps, springs, bogs, and forested wetlands than just their physical characteristics. If these locations become unusable or unattractive to some amphibians, mammals, or other taxa that would be expected here, then they are not fully functional. There should be analysis or citation to studies to corroborate the assertion that retention of 5-15% (or whatever basal area the cutting method retains) of the overstory cover shading these sites is enough to maintain their full functioning and attain their DFC.

Surveys to identify these areas should have been carried out during wet periods when they can be properly detected (see state BMP manual). "Seeps and other wetlands ... are best located during rainy season as many wetlands are difficult to identify during dry periods." - Forestry Best Management Practices for Water Quality in Virginia Technical Guide at pg. 42 (incorporated by reference). If the habitats are not properly identified and inventoried, they cannot be properly protected, mitigated, and monitored.

Seep areas provide critical riparian habitat. A VDGIF biologist states they should be protected "by a minimum of 100 feet on each side (preferably 200-300 feet)" (see GWNF Johnson Mtn. timber sale project file at tab 20; incorporated by reference). This 200-300' zone should be applied here. See also Jan 13, '04 USF&WS BO for the JNF p. 2 bottom paragraph; and Seth Wenger, 1999, “A Review of the Scientific Literature on Riparian Buffer Width, Extent and Vegetation”, Institute of Ecology, University of Georgia, 59 pp. (both in your possession and incorporated by reference).

FERC should pay particular attention to how ground disturbing activities and loss of shading and canopy near streams could affect trout habitat and trout populations in streams in the area - since this is an important area for trout. FERC should assess the degree to which proposed activities could affect water quality, sediment levels, levels of large woody debris and water temperature in the specific streams and stream reaches in the project area. Cumulative effects should also be assessed.

The Virginia Department of Game and Inland Fisheries classify wild trout streams as follows:

"Wild natural trout streams.

"Class ii. Stream contains a good wild trout population or the potential for one but is lacking in aesthetic quality, productivity, and/or in some structural characteristic. Stream maintains good water quality and temperature, maintains at least a fair summer flow, and adjacent land is not extensively developed. Stream would be considered a good wild trout stream and would represent a major portion of Virginia's wild trout waters.

"Class iii. Stream which contains a fair population of wild trout with carrying capacity depressed by natural factors or more commonly man-related landuse practices. Land use activities may result in heavy siltation of the stream, destruction of banks and fish cover, water quality degradation, increased water temperature, etc. Most streams would be considered to be in the active state of degradation or recovery from degradation. Alteration in land use practices would generally improve carrying capacity of the stream." (9 VAC 25.60 Virginia Water Quality Stds)

There are several class ii-v trout streams in the project area. For example, the Bullpasture River (and tributaries) is a class v trout stream, Jennings Branch and Orebank Cr are class iv trout streams, Mills Cr. (South R watershed), North Fork Back Creek (South River watershed), Spruce Cr. (Rockfish R. watershed), and South Fork Rockfish River (Rockfish R watershed) are class ii trout streams.

There are a high number of high quality trout streams in the project area. Adequate protection of these and other trout streams in the project area should be a high priority. Perennial, intermittent, and ephemeral tributaries of trout streams should also be considered because these play an important role in downstream water

quality. Other fishery related resources should be protected as well, such as the Coursey Springs Fish Cultural Station on the Cowpasture River.

p.363: Orangefin madtom, a Forest Service sensitive species and Virginia threatened species, is found in the Cowpasture River and perhaps other waterways in the area. Thorough surveys of this species must be conducted and adequate protective measures should be put in place. The habitat of the orangefin madtom "includes swift riffles with small cobble substratum; this madtom occupies interstitial spaces among cobbles; generally it is not in areas with large amounts of sand and silt (Simonson and Neves 1992). Riffles and runs of medium to large, cool to warm usually clear streams; lives under large gravel, rubble and probably boulders and other cover."[15]

p.364: "Atlantic has assumed presence of freshwater mussel species at the Cowpasture River, James River, Appomattox River, Nottoway River, Sturgeon Creek, Meherrin River, and any perennial tributaries to these rivers." " On ACP, the James spinymussel may occur in perennial streams within the James River watershed in Highland, Nelson, Buckingham, Bath, and Cumberland Counties, Virginia. " (p.417)

- The requisite full, intensive, and competent surveys, inventories, and data gathering for listed and agency-recognized species must be performed. Cumulative impacts must be analyzed and accounted for.

- According to a study commissioned by the American Fisheries Society Endangered Species Committee, there are "297 native freshwater mussels [in the U.S. and Canada], of which 213 taxa (71.7%) are considered endangered, threatened, or of special concern... and only 70 (23.6%) as currently stable... Freshwater mussels (also called naiads, unionids or clams) of the families Margaritiferidae and Unionidae are worldwide in distribution but reach their greatest diversity in North America with about 297 recognized taxa... During the past 30 years, numbers both of individual and species diversity of native mussels have declined throughout the United States and Canada. Freshwater mussels (as well as other aquatic species) are imperiled disproportionately relative to terrestrial species... This alarming decline, the severity of which was not recognized until recently, is primarily the result of habitat destruction and degradation associated with adverse anthropogenic activities."[16]

---

[15] http://explorer.natureserve.org/servlet/NatureServe?sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=103813&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=103813&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=103813)

[16] Williams, Warren, Cummings, Harris and Neves, 1993.

- At its peak, the James spinymussel (Pleurobema collina) was distributed from a location a few miles upstream of Richmond, Va. and throughout the James River basin upstream. Since that time, its range has been reduced by approximately 90% (Clarke and Neves, 1984) The James spinymussel now survives in a few tributaries of the James. (Terwilliger, 1990)

- Water quality can greatly affect the suitability of mussel habitat. Road construction is one of the most detrimental activities impacting mussels.[17] A section of Virginia's Endangered Species edited by Dr. Neves acknowledged poor logging and road building practices within the national forest are a threat to the spinymussel in one watershed. He stated that "activities in Jefferson National Forest likely to affect the streams in which Pleurobema collina lives should be monitored by the United States Forest Service." (Terwilliger, 1990).

- The James spinymussel depends on fish species such as the bluehead chub (Nocomus leptocephalus), rosyside dace (Clinostomus funduloides), satinfin shiner (Cyprinella analostana), rosefin shiner (Lythurus ardens), central stoneroller (Camptostoma anomalum), blacknose dace (Rhinichthys atralulus) and mountain redbelly dace (Phoxinus oreas) in order to reproduce, so potential impacts to these fish species should have been considered as well. These fish serve as the prime fish hosts for young developing mussel larvae, called glochidia (Terwilliger, 1990, p. 254; Hove and Neves, 1994) See also George Washington and Jefferson National Forest T & E Mussel and Fish Conservation Plan (Mussel and Fish Conservation Plan), 6 & 31: " The decline of fish host species may present a problem in mussel reproduction." There is no monitoring or analysis of impacts to host fish.

- James spinymussel females usually produce significantly fewer glochidia than other mussels. Female mussels release glochidia during a short period from early June to through late July. Water temperature and springtime water flows are believed to be important factors as far as James spinymussel reproduction is concerned.[18] The timing of activities and longevity of impacts should be of concern. There is no attempt to mitigate such effects or monitor such effects over the long term.

- Pesticides and contaminants have long been recognized as a threat to mussels (Williams et al 1993; see also EPA, "Protecting Endangered Species," EPA Rpt. #21T-3055, June 1992)There is no information in the DEIS on what contaminants

[17] Hove and Neves, 1994.
[18] Hove and Neves, 1994, p. 34 & 37)

from the sites might flow into waterways inhabited by mussels or the impacts of herbicide release necessitated by this project, or cumulative impacts.

- It is not clear that all provisions of the Mussel and Fish Conservation Plan, adopted into the Plan revision, are being fully implemented. For example, the Mussel and Fish Conservation Plan requires that minimum conservation zone widths be measured based on stream type and slope (MFC Plan 12). Conservation Zones used in the project may not adequately take into account the steep slopes found in the cutting units (EA Aquatics). FERC never discloses how steep the slopes are in and around waterways inhabited by the James spinymussel, and their upper reaches.

- The Mussel and Fish Conservation Plan objectives require the FS to manage streams "in a manner that results in a minimum of 200 pieces of large woody debris (LWD) per stream mile (125 LWD/km)." Minimum diameters of LWD pieces are specified (MFC Plan 12). The FS does not disclose whether LWD levels are adequate and whether they would be maintained or improved as a result of this project.

- The MFC Plan objectives require the FS to manage streams in a manner that meets or exceeds State Water Quality Standards (MFC Plan 12). Theoretically, this would be accomplished by implementing BMPs, but FERC does not demonstrate the effectiveness of BMPs at meeting state water quality standards in this ranger district and NF, or that timber sale administrators could assure that BMPs are fully adhered to.

- And FERC has not demonstrated that current monitoring requirements are being followed, including, e.g., direct monitoring of T&E mussel populations and habitat, or development of a proper protocol.

- The past and current state of biotic populations and water quality of perennial streams, and intermittent and ephemeral tributaries, even if a "fishery" may be absent, are undisclosed. Some populations may be close to threshold levels of tolerance for sediment; but who knows, the agency discloses no information on this relevant factor. Total amounts of sediment estimated to enter these streams along with the proposed cutting are tabulated but not meaningfully analyzed. How many tons would enter precisely what stream segments? On this the table and discussion in the DEIS are silent. Monitoring information as to effects to intermittent stream populations and water quality from previous cutting are absent. Exceeding the threshold levels for certain intermittent tributary "resources" may be at risk.

- "The effects of sediment delivered to a stream channel diminish as watershed size increases. Most vulnerable are small sensitive headwaters catchments where concentrated timber harvest activity can have profound results. . . . After four years, sediment rates are normally back to predisturbance levels. However, once sediment is deposited in a stream channel, its effects can persist for decades or even centuries (Frissel, 1996)." (JNF Enterprise TS EA-42; incorporated by reference) So this project may result in significant impacts to channel condition and population viability or distribution.

- The preferred habitat of the Atlantic pigtoe is coarse sand and gravel at the downstream edge of riffles. It is less common in sand, cobble and mixtures of sand, silt and detritus (Bogan and Alderman, 2004). The Atlantic pigtoe requires fast flowing, well oxygenated streams and is restricted to fairly pristine habitats. Adams et al. (1990) state that *Fusconaia masoni* prefers yielding substrates of sands or gravel below riffles.[19]

-Green floater - This is considered to be a species of quiet waters, Ortmann (1919) stated, "it avoids the larger rivers and prefers smaller streams... it is averse to very strong current, and prefers the quiet parts, pools and eddies with gravelly and sandy bottoms". Clarke (1985) concurred with this description of its habitat preference. often found in small creeks and large rivers and sometimes canals. This species is intolerant of strong currents and occurs in pools and other calm water areas (Strayer and Jirka, 1997). Preferred substrate is gravel and sand in water depths of one to four feet. This species is more likely to be found in hydrologically stable streams, not those prone to flooding and drying. Good water quality is also important.[20]

Yellow lance-This species is found in sandy substrates, rocks and in mud, in slack water areas (Johnson, 1970), but apparently is absent from lakes (Britton and Fuller, 1979). It is also found buried deep in sand and may migrate with shifting sands (J. Alderman, pers. comm.). Although it prefers clean, coarse to medium sized sands as substrate, on occasion, specimens are also found in gravel substrates. This species

[19] http://explorer.natureserve.org/servlet/NatureServe?sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=112228&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=112228&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=112228

[20] http://explorer.natureserve.org/servlet/NatureServe?sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=107377&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=107377&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=107377

is found in the main channels of drainages down to streams as small as a meter across.[21]

These mussels have varying types of habitat preferences. FERC should ensure that activities in river and stream bottoms protect habitats of mussels and other aquatic species.

p.379-80:The numerous inconsistencies presented by Atlantic need to be cleared up.

p.380: Although the ACP would cross many streams and rivers, FERC only requested that baseline macroinvertebrate surveys be conducted on seven streams. And only 72% of those 7 streams have been surveyed. The surveying program needs to be greatly expanded to include all waterways (and ponds) impacted by the project

p.381: Complete surveys (include downstream surveys need to be conducted for roughhead shiner, orangefin madtom, yellow lance and Potomac sculpin. The roughhead shiner, is a G2G3 and S2S3 species. The roughhead shiner is confined to the Ridge and Valley province of the upper James drainage, Virginia…The contiguity within subpopulations and the sharp limits of the range of the species indicate that high gradient and small size of stream, turbidity, and siltation variously combine to effect the tight distribution of the roughhead shiner (Jenkins and Burkhead, 1975a)" Terwilliger (1991). The roughhead shiner is a sensitive species (R-8 sensitive species list).

FERC should have analyzed how the project (including forest clearing, roads, and other infrastructure) affect sediment-sensitive species such as troutand other aquatic species. Efficacy of proposed mitigation measures for protected aquatic species must be explained, and they must completely compensate for potential adverse effects.

Cumulative effects of the ACP pipeline, other land disturbing activities in combination with other past, present, and reasonably activities and events in this watershed should be analyzed in accordance with NEPA. There is a possibility that these activities in combination with non-FS activities or events may already be contributing significant levels of sediment, affecting the viability of rare aquatic species.

[21] http://explorer.natureserve.org/servlet/NatureServe?sourceTemplate=tabular_report.wmt&loadTemplate=species_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=110016&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=110016&offPageSelectedElType=species&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=110016&selectedIndexes=150434

p.381: Atlantic would only be required to “attempt” to mitigate long-term impacts related to slope instability adjacent to streams. This is not mitigation. There is no assurance that Atlantic would be required to do anything that remotely protects these habitats, only to “attempt” to.

p.382-85: Surveys for virtually all T, E and under-review species are still uncompleted or pending.

p.387: “Fragmentation of forest habitat used for foraging or migration may contribute to population declines of the Virginia big-eared bat.” The gray bat is documented in Bath County, and, according to the DEIS, in Buckingham County. (p.388). FERC and Atlantic must complete thorough and competent surveys for all federally species potentially impacted by the project.

p.390: Indiana bats were detected in Highland and Augusta County. Indiana bat hibernacula exist in Bath County.

<u>Indiana bats and Northern Long-eared bats</u>

These two federally listed bats are vulnerable because of white nosed syndrome and their reliance on summer roosting habitat found on national forests.

The DEIS does not seem to recognize the precariousness of the species' population in Virginia. Here on the periphery of their range, the Bats' numbers have plummeted. **Net losses of 1300 Bats since counts were initiated in VA winter hibernacula** (IBat EA-11)**, a decline of approximately 75% in this state**. Bat populations in Starr Chapel Cave plummeted from 600 bats in the early 60s to 54 bats by 1996-97. Bat populations in Mtn. Grove Cave have declined from 23 bats in 1992 to 2 bats by 1997- 98 (IBAt EA-11).

The Brack and Brown (2002) study discloses that less than half of identified roost trees are shagbark hickory, but the FS mainly only protects shagbark hickories in its inadequate mitigation measures with no assurance that adequate other potential roost trees are protected. Research in Indiana and Kentucky indicates that bats range up to 5 mi. from hibernacula during fall and spring swarming periods (ibid p. 25).

Clawson (2002) reported an 80% decrease in bat populations over the last 40 years in the southern portion of the bats' range (Alabama, Arkansas, Kentucky, Missouri, Tennessee, and Virginia) (ibid, 13).

FERC and the FS should perform the needed surveys and inventories of the area and its habitat (the proper site-specific good faith "hard look" by qualified personnel using valid methods) necessary for clearly establishing the status of the Bat here, it is clear the agency would not be placing the requisite highest priority on the Indiana Bat and other T&E bats and their habitat Forest clearing proposed in the Alternatives could adversely affect roosting (sheltering), maternity (breeding), foraging (feeding), and swarming habitat of the Indiana Bat and other T&E bats. Logging could remove the very trees (large mature with broken tops and cavities and snags and exfoliating bark) with the characteristics known to be used or favored by the Bats. Top priority should be given to the Bats.

This felling/removal also ignore the Bats' known loyalty to habitat. The agency must address the impact of removing a roost tree when the bats are not there. There is the need to consider, loyalty to the roost trees, stress of finding new roosts, and the impacts of removing trees next to roosts or potential roosts (i.e., making the tree more susceptible to wind throw and changing the thermal dynamics).

Ignored also is the fact that the Bats are known to especially use riparian and stream corridors for dispersal and feeding. All forested habitat is not "equal', the agency is proposing to disturb and degrade areas of Forest that are particularly important to the Bats. Most, if not all, of the tracts proposed for clearing are adjacent to streambeds. Efficacy of proposed mitigation measures for the Bat must be explained, and they must completely compensate for potential adverse effects. For example, the increased susceptibility of remnant leave trees to windthrow should be assessed. Efficacy of retaining only shagbark hickory trees is unsubstantiated; the Bats are known to use other tree species that are present here that the cuts will remove. See Table 4 at pg. 21 of GWJNF IBRS. White, chestnut, and northern red oaks, species which are prevalent here, are "Class 1 Tree Species" and are likely to be used for roosting and maternity sites. The effectiveness of retaining a certain number of snags per acre should be substantiated. If the Bats were receiving the required “top priority” all snags and large potential den trees would be retained.[22] The mitigation may not necessarily retain the large old or dead/damaged trees of greatest benefit to the Species. Concern over low snag amounts (and quality) is not merely conjectural.[23]

[22] See Bensman v. USFS (1997).

[23] See the information found in USDA FS General Technical Report SE-94 "Biodiversity and Coarse Woody Debris in Southern Forests" (incorporated by reference).

Another mitigation often offered for Bat roost trees is in effect no mitigation. "If during implementation active roost trees are identified. . ." Loggers or overseers cannot be expected to be qualified at identifying or locating TESLR species or roost trees. And there is no assurance that they would notify proper authorities if they did find anything." Reliance upon such mitigation for a FONSI is unreasonable and/or arbitrary and capricious.

There is no mitigation requirement for examining cut trees to ascertain if "incidental take" or significant harm to Bats should occur. In a meeting attended by members of the appellants on July 26, 2002 at the GWNF Deerfield RD office, the agency timber sale administrators and contract inspectors present made it quite clear that they "do not monitor or track wildlife killed" at logging sites. How would ACP do so?

Of particular concern are cumulative impacts to the IB. The proposed action, in concert with other past, present and future actions, could result in CIs to the Bat. Past actions have already harmed Bat habitat in this analysis area. There is clear evidence that further habitat modification (e.g., cutting of trees for sale) is foreseeable here and elsewhere in the Bats' habitat in this Forest and ranger district. The agency's assertion that CIs will not impact the Bat's populations in Virginia must be explained & substantiated. The Bats' viability is particularly at risk here due to it being on the edge of its range and its small population in Virginia.

The agency is at present modifying and/or damaging and/or degrading and/or destroying IB habitat (or contemplating such) throughout its range. The planners often do not seem to recognize the precariousness of the species' population on this Forest. Here on the periphery of their range, the Bats' numbers have plummeted. Net losses of 1300 Bats since counts were initiated in Virginia winter hibernacula[24], a decline of approximately 75% in this state.

Northern Long-eared Bat

The DEIS states that the northern long-eared bat, a proposed endangered species could be adversely impacted. The northern long-eared bat has declined 99% in the Northeast, 96% in Virginia, roughly 68% in West Virginia. Unlike the little brown bat, which is showing signs of stabilization in areas longest affected by white nosed syndrome, the northern long-eared bat population does not appear to be stabilizing anywhere. Northern long-eared bat populations are starting to show increasing mortality in the Southeast and Midwest. Twenty- five states in its 38 state range are

[24] GWJNF IBat EA-11.

now affected by white nosed syndrome, and 5 Canadian provinces in its range are also now affected by white nosed syndrome.

- FERC should have analyzed the particular habitat needs of the long-eared bat and should have analyzed how the project would impact the bat and its habitat. Surveys should be conducted for the bat (and other PTESLR bats). Compared to random trees, roosts of northern long-eared bats were within intact forests. Amount of obstruction and decay differed; roosts of M. sodalis typically were less cluttered and more decayed than those of M. septentrionalis. Indiana bats roosted almost exclusively under exfoliating bark of bottomland snags, whereas northern long-eared bats also made extensive use of cavities and crevices. Northern long-eared bats used five identified species of trees for roosting; nine roosts were in pin oak, five in elm, two in unidentified snags, and one each in sweetgum, oak, and hawthorn (Cratagus spp.). Comparing roosts of Indiana bats and northern long-eared bats, two variables were significant. Degree of roost obstruction was greater around northern long-eared bat roosts than around Indiana bat roosts.[25]

-FERC and the FS should consider the differences between northern long-eared bats and Indiana bats and their use of habitats. Northern long-eared bats appear to select roosts with **generally more canopy cover** than Indiana bats do.

Some variation undoubtedly is related to differences in methodology, because virtually every study measures canopy cover in a different way. Second, roosts found in closed-canopy forests, particularly primary roosts, are often associated with natural or man-made gaps (e.g., openings created when nearby trees fall, riparian edges, trail or forest road edges). Although the forest may be accurately described as closed canopy, the canopy in the immediate vicinity of the roost tree may have an opening that allows for solar radiation to reach the roost.

Northern long-eared bat: Similar to Indiana bat. Beetles, mayflies, moths (Brack and Whitaker 2001, Lee and McCracken 2004, Feldhamer *et al*. 2009) Potential differences Indiana bat, as gleaners, **NLEB eat more arachnids (spiders)** (Feldhamer *et al*. 2009) and **more orthopterans** than Indiana bat (Lee and McCracken 2004).

Indiana bats: Flying insects. Consistent use of moths, flies, beetles, and caddisflies throughout the year at various colonies suggests that Indiana bats are selective predators to a certain degree, but incorporation of ants into the diet also indicates

[25] Timothy C. Carter , George A. Feldhamer, ÒRoost tree use by maternity colonies of Indiana bats and northern long-eared bats in southern Illinois,Ó Forest Ecology and Management 219 (2005).

that these bats can be opportunistic (Murray and Kurta 2002). Hence, Brack and LaVal (1985) and Murray and Kurta (2002) suggested that the Indiana bat may best be described as a selective opportunist, as are a number of other *Myotis* species (Fenton and Morris 1976).

Foraging behavior:

Northern long-eared bats: Nocturnal. Both hawking and **gleaning** (Brack and Whitaker 2001, Feldhammer et al. 2009, Fenton and Bogdanowicz 2002; Ratcliffe and Dawson 2003). **Within canopy** more than Indiana bat (Nagorsen and Brigham 1993).

p.425: The first documented occurrence of small whorled pogonia in Highland County was found adjacent to the corridor. Local populations of this plant species need to be protected by avoidance.

.

Turtles:

Turtles may be impacted by the project. Field studies and statistical analyses clearly show that even modest mortality rates (intentional or incidental) of adult turtles can lead to strong declines in populations.[26] Researchers found that the accidental loss of even one adult box turtle every year could not be sustained by the population.[27] Also, "studies demonstrate how relatively subtle shifts in plant community structure, resulting in shifts in microclimate and altering life history, can lead to steep population declines."[28]

"Effective management and conservation programs will recognize the integrated nature of life histories and the extreme limitation that the evolution of longevity has placed on the ability of populations of long-lived organisms to withstand and respond to increased mortality or reduced fecundity of any life-history stage. In addition,

[26] See J.D. Congdon et al, 1993, "Delayed sexual maturity and demographics of Blanding's turtles (Emydoidea blandingii): Implications for conservation and management of long-lived organisms", Conservation Biology 7: 826-833; and J.D. Congdon et al, 1994, "Demographics of common snapping turtles (Chelydra serpentina): Implications for conservation and management of long-lived organisms", American Zoologist 34: 397-408; and J.P. Gibbs and G.D. Amato, 2000, "Genetics and Demography in Turtle Conservation", pp. 207-217 in M.W. Klemens (ed.), Turtle Conservation, Smithsonian Institution Press Washington D.C.

[27] see Doroff, A.M. and L.B. Keith, 1990, "Demography and ecology of an ornate box turtle (Terrapene ornata) population in south-central Wisconsin", Copeia 1990: 387-399.

[28] Curtin, C.G., 1997, "Biophysical Analysis of the Impact of Shifting Land Use on Ornate Box Turtles, Wisconsin, USA", pp. 31-36 i
Gn J. Van Abbema (ed.), Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles - An International Conference, New York Turtle and Tortoise Society, New York.

programs developed to aid in the recovery of depleted populations of long-lived organisms must recognize that there will be long delays before population responses can be detected." [29]

p. 547: Black bears are found in the project area. Sherman Bamford observed a black bear in the Townsend Draft area in August 2015. **Black bear** is an MIS here and throughout the GWNF (GWNF Plan MIS List) and an important featured species in this bear management area and adjacent areas. Issues of negative impacts to the MIS black bear due to increased disturbance, stress, vulnerability, and deaths which the project could foreseeably facilitate should receive a hard look. See also 36 CFR 219.19(a)(4). "It is evident that hunting is a stronger influence on the dynamics of the local population than is habitat capability... Potential biotic increases in habitat quality resulting from timber harvest may easily be outweighed by the potential effects on population dynamics...We believe that habitat capability models, no matter how complex, cannot predict the status of bear populations by themselves. Population dynamics must be explicitly considered in evaluating the long-term effects of habitat manipulation on bears."[30]

Black bears occupy only 5-10% of their former range in the southeast and "would now likely be totally extirpated in this region were it not for federal lands containing designated wilderness or de facto wilderness".[31] FERC should analyze the negative impacts to populations that the proposal would foreseeably result in (e.g., increased legal and illegal disturbance, facilitated poaching and hunting).[32]

Foreseeable negative impacts from the proposed action to most MIS must be thoroughly analyzed in the EIS. For example, agency planners must use the latest scientific information when assessing impacts to MIS black bears and their habitat. A report published in 1991 by Steven Reagan, “Habitat use by female black bears in a southern Appalachian bear sanctuary”, analyzes how removal of forest cover adversely affects black bears. The Forest Service is already in receipt of this information; it was delivered to the JNF Supervisor’s office (currently the GW&JNFs SO) several years ago by the Southern Appalachian Biodiversity Project. We incorporate it by reference into the administrative record. One significant finding of this research was that black bears were not taking advantage of food and habitat in

[29] Congdon et al 1993, op cit.
[30] - Brody and Stone "Timber Harvest And Black Bear Population Dynamics" (previously submitted with appeal of the West Dry Branch TS on this GW National Forest - the agency is already in receipt of this information - we incorporate it by reference into the AR - including the Powell declaration - "To date I have not been able to document that logging...ha[s] any positive effects on black bears or black bear habitat...").
[31] Pelton, "Habitat needs of black bears in the east," in Wilderness and Natural Areas in the Eastern United States, Kulhavy and Conner, eds., 1984.
[32] See also 40 CFR 1507.2(d) and 1508.27 and FSH 1909.15, ch.05.

even-age logging sites as was anticipated. He also found that such logging results in a dramatic increase in female black bears' home range. The same potential result can reasonably be expected to occur here from this proposed even-age logging. The outcome would be increased competition for a limited food and habitat supply. Having to roam over a greater area would also make them potentially more vulnerable to legal, illegal, and accidental killing, injury, or stress by humans. These foreseeable direct, indirect, and cumulative impacts must be adequately considered and analyzed by the planners. The best and most accurate scientific information must be used - per NEPA. The potential clearly exists for significant impacts to black bear viability here. There must be hard inventory and population data for this MIS to provide an accurate picture.

-Bears need security. Black bears are classified as "wide ranging area sensitive species"[33]. Areas of grapevines and large denning trees are key habitat components. Large hollow den trees are the preferred den sites of black bears.[34] Grapes are a soft-mast food source of black bears.[35] Hollow trees, existing stumps, snags, shallow holes, and rock outcrops are potential bear den sites. These must be protected. There must be analysis of the loss of interior and remote habitat that will occur and has already occurred here. The road density, when both legally and illegally used motor routes are considered, may be in excess of that found to be desirable for bears. (there is little info in the DEIS) And the effects of miles of nearby access roads must be properly analyzed. Use of these routes, and associated noise, disturbance, and partying, create constant disturbance which may impact black bears. And "closed" roads are known to be violated by vehicle use here and elsewhere. Temporary and closed roads facilitate more access and disturbance and mortality. Road densities must meet Plan objectives for these important habitat components in the PA. And the agency's own "Wildlife Population Data Working Paper" shows that the impact to bears becomes negative when the proportion of suitable acreage in regeneration areas exceeds 10%. If recent clearings, even-aged cuts, grassy areas around roads existing and proposed roads, existing and proposed landings, and natural within stand openings are included in these figures, the criteria data and amount of suitable land here should be disclosed to the public.

- Above ground den trees are important to black bears in the Appalachians. Data from a study in the Allegheny Mountains of Virginia, for example, "show 93 percent of denned bears denned above ground in standing hollow trees." (GWNF Hoover Creek timber sale EA-57; incorporated by reference) Trees of sufficient size for bears to den are old large trees. Yet the agency's action would remove these key elements

[33] SAA Terr Rpt 154&158.
[34] see eg JNF Plan Rev DEIS 3-177)
[35] See JNF Plan Rev DEIS 3-177.

over the long-term, habitat significant to viability. Even if a few den trees are protected these trees are vulnerable to accidental or intentional damage by logging operators and may topple over in windstorms if left standing in a much more exposed location in the middle of a timber cut. The analysis must fully and fairly consider this factor. This omission is particularly glaring since there is no information in the project record as to amounts of trees in the area suitable for bears to den in, and given that the agency claims old growth is not present which would mean that such trees can be expected to be scarce.

- A clear goal for black bear conservation is "promoting remote forest conditions when managing forests (e.g., minimizing forest fragmentation, limiting road development)." [36]

- Clearing, roads, and other operations can be seen to make an area more desirable for Bear hunters (e.g., providing easier access for humans, attracting Bears to so-called "escape" habitat that does not actually provide an escape), but this does not equate to being better for Bears. Roadways and clearings can foreseeably be used for legal and illegal access.[37] Poaching and other wildlife disturbing activities must be fully and fairly considered.

- These foreseeable direct, indirect, and cumulative impacts must be adequately considered and analyzed by the planners.

- FERC should provide hard inventory and population data for this MIS.

Off-road vehicles:

FERC and Atlantic need to provide measures that are demonstrated to be effective. Evidence-based effectiveness of measures has not been disclosed.

There is nothing in the statement as to what monitoring would occur, how often it would occur, how thorough it would be, or how long it would last (i.e., for the life of the pipeline and/or the open-space corridor). There is nothing in the statement as to whether FERC and Atlantic would provide any additional funding for law enforcement officers who would patrol the area. FS budgets have been cut drastically over the past two decades and the GWJNFs are understaffed. How would

[36] Rudis, V.A., and J.B. Tansey. 1995. Regional Assessment of Remote Forests and Black Bear Habitat from Forest Resource Surveys. J. Wildl. Management 59(1): 170-180 (written by FS researcher; incorporated by reference).
[37] See also Jefferson NF Wilson Mtn. TS EA-69 - "roads and forwarder trail could increase hunting/poaching pressure".

existing LEOs be able to patrol the additional linear corridor provided by the pipeline footprint?

Also, does Atlantic have the financial ability to pay for LEO staffing and patrols over the foreseeable future? What financial guarantee or bond will be required to ensure that if the partnership dissolves, if Atlantic goes bankrupt, or if Atlantic is sold, transferred, or otherwise ceases to exist, the forest around the pipeline will be protected from illegal motorized use facilitated by the infrastructure in place?

In April 2003, Forest Service Chief Dale Bosworth identified unmanaged off-road vehicle use as one of the four greatest threats to America's National Forests, along with fire, the spread of invasive species and habitat fragmentation. The Chief catalogued the damage and the other negative impacts caused by uncontrolled off-road vehicle use: "We're seeing more and more erosion, water degradation and habitat destruction. We're seeing more and more conflicts between users. We're seeing more damage to cultural sites and more violation of sites sacred to American Indians. And those are just some of the impacts."

On July 26, 2002 the GWNF's head LEO, Mr. Woody Lipps stated that "the number 1 threat on the Forest is illegal ATV use." In a letter dated July 1, 2004, Lipps stated, "so far this year, cross-country motor vehicle operation is the most reported violation occurring on the GW/Jeff."

Illegal motorized use is a very serious threat within the Jefferson National Forest. In a letter dated July 1, 2004, Woody Lipps, the George Washington and Jefferson National Forests' chief law enforcement officer stated, "so far this year, cross-country motor vehicle operation is the most reported violation occurring on the GW/Jeff[erson National Forests]." Illegal motorized use has been a highly serious problem since this time.

According to Brian Webb, the forest's current chief law enforcement officer, recently, illegal motorized users have gone so far as tearing out Forest Service gates in some cases, literally pulling them out of the ground to get around them or simply to damage them. In the Roaring Branch mountain treasure, a network of user created motorized trails has been built and a makeshift cabin was built on public land near ATV trails.

Unfortunately, as Forest Service budgets have been cut, the number of law enforcement personnel has also dwindled and it has become harder to apprehend illegal motorized users and vandals. In the 1990s, there were 23-25 law enforcement

officers distributed throughout the ranger districts of Virginia's two national forests. In recent years there have only been 10-12 officers.[38]

ENVIRONMENTAL IMPACTS OF OFF-HIGHWAY VEHICLES

Over the past several decades as wages and leisure time have increased, more and more Americans are participating in outdoor recreation. From hiking to mountain biking, from snowmobiling to off-road motorcycle use, and from hunting to birdwatching millions of Americans spend their time and money participating in one or more of these and other activities. While some forms of outdoor recreation are experiencing an overall decline in the number of participants (e.g., hunting) most other outdoor recreational pursuits are increasing in popularity. This increase, however, is not without an environmental cost.

The concept of a "non-consumptive" user is a myth. Each and every form of outdoor recreation exacts an impact on the environment. The severity, significance, and degree of impact are variable depending on the recreational activity. In general, the most damaging of the outdoor recreational activities on the environment is the use of ORVs. Perhaps as a consequence of America's love affair with the automobile, the popularity of ORV use has increased substantially over the past several decades. Today, motorcycles, all-terrain vehicles, snowmobiles, and wheel drive vehicles invade our public lands, including National Forests. In their wake, these vehicles leave a trail of destruction involving the soils, vegetation, wildlife, and air and water quality.

The impacts are not the same across the board. Different ecosystems with different soil types, different floral assemblies, and which are subject to different climatic patterns experience variable levels of ORV impacts. Nevertheless there are no ecosystems which are immune to the adverse impacts of ORVs. As stated by Sheridan (1979), "ORVs have damaged every kind of ecosystem found in the United States: sand dunes covered with American beach grass on Cape Cod; pine and cyprus woodlands in Florida; hardwood forests in Indiana; prairie grasslands in Montana; chaparral and sagebrush hills in Arizona; alpine meadows in Colorado; conifer forests in Washington; arctic tundra in Alaska." Many ecological communities have a relatively low threshold to impacts of recreational use (Frissell and Duncan 1965). Moreover, as ORV technologies have advanced, ORVs are more comfortable and reliable, able to travel greater distances, and able to access areas that were previously inaccessible, thereby exacerbating their impacts on the environment.

[38] Meeting with Brian Webb, Patrol Captain, Supervisors Office, February 11, 2011.

Indeed, the impacts of ORVs are complex and interrelated and they frequently interact synergistically, producing a "whole" more damaging than the sum of the individual impacts which can result in substantial degradation to the ecology of disturbed habitats to the detriment of the biotic community occupying those habitats. Thus, ORV impacts to soil are not limited to the appearance of a tire tread, but include an increase in soil bulk density (compaction), a decrease in soil permeability to water, increased water runoff, increased erosion, and a decrease in vegetation density and productivity. Similarly, ORV impacts on wildlife are not limited to a simple disturbance, but may include increased stress, increased energy use, displacement from important habitat, and interruption of feeding activities. The cumulative effect of these impacts may adversely impact animal production and survival. Indeed, while the pass of one ORV can result in adverse impacts, the collective impacts of thousands of ORVs can be environmentally devastating. In many ecosystems these impacts, particularly to the soils, cannot simply be erased by prohibiting ORV use, but may actually require decades, if not centuries, for nature to repair.

The adverse impacts of ORVs are not limited to soils, vegetation, and wildlife. As Berry (1980) reported, ORV management problems include illegal trespass into areas in which ORV use is not authorized, widening of trails, fragmentation of wildlife habitats through unauthorized proliferation of trails, increased access to sensitive habitat and resources, and increased vandalism associated with increased visitor use. Moreover, though not widely reported, ORVs have also been implicated in damaging archaeological and geologic sites (Stebbins 1974a, Stebbins and Cohen 1976, Wilshire and Nakata 1976) while others have noted that ORV trails frequently serve as dumps for human trash (Kalisz 1996).

As reported by Wilshire et al. (1977):

"ORVs have now invaded an enormous variety of natural settings, from deserts and coastal dunes to forested mountains, and from fertile habitats for wildlife to unique refuges for relict flora and fauna. The capability of the land and its biota to sustain this impact is as varied as the invaded habitats, but damage by ORVs in even the least vulnerable areas will require periods for recovery measured in centuries or millennia. Losses of soil and changes in the land surface will be long lasting, and certain natural life systems will never recover from the intensive ORV impacts already sustained. Archaeological and historical features, relict landforms, primitive soils, and other legacies of irreplaceable cultural, aesthetic, and scientific value have also been permanently lost."

The scientific literature indisputably demonstrates that ORVs cause significant and severe direct, indirect, and cumulative adverse impacts on the environment. These impacts include soil compaction, accelerated soil erosion, denudation and loss of floral species diversity and production, reductions in animal populations, degradation of aesthetic and visual qualities, and adverse impacts on non-motorized forest users. Evaluating and interpreting ORV impacts involves a variety of factors including terrain topography, soil moisture content, soil substrate, plant habitat type, types of vehicle, weight of vehicles, wheel configuration, types of tires\treads (i.e., low pressure, lugs, cleats, ribbed), time of year, and the amount and timing of ORV use (Ahlstrand and Racine 1993, Wooding and Sparrow 1979). Each of these factors may attenuate or amplify the environmental impacts of ORVs.

These impacts and others are not limited to the pages of scientific publications, but have been documented on a large number of National Forests. Though many National Forests fail to properly monitor the effects of ORVs on their lands as required by law, records obtained by Wildlands Center for Preventing Roads through the Freedom of Information Act provide numerous examples of the adverse impacts of ORVs on USFS lands. This evidence, which is summarized in the ORV Impacts on National Forests section of this document, represents the minimum impacts of ORVs on USFS lands based on current, and frequently insufficient, monitoring data. If the USFS properly monitored ORV effects, the evidence of adverse ORV impacts would be even more staggering than that gleaned from the records obtained through FOIA.

See also the following Reviews of the Environmental, Social and other impacts of ORVs:

Havlick, D.G. 2002. No Place Distant: Roads and Motorized Recreation on America's Public Lands. Foreword by Mike Dombeck. Island Press, Washington, DC.

Stokowski, P.A. and C.B. LaPointe. 2000. Environmental and social effects of ATVs and ORVs: an annotated bibliography and research assessment. School of Natural Resources, University of Vermont. 31p.
http://www.anr.state.vt.us/anr/atv_nov20_final.pdf

Wildlands CPR, The Wilderness Society, et al. 1999. Petition to enhance and expand regulations governing the administration of recreational off-road vehicle use on National Forests. Published by Wildlands CPR, Missoula, MT 188p.
http://www.wildlandscpr.org/orvs/ORVpetition.doc

Wilkinson, T. 2000. Loud, Dirty, and Destructive. Wilderness, Pp. 26-31, 2000.

Abstract: Off-road vehicles (ORVs) could be the largest growing threat to America's wilderness. The Forest Service estimates that from 1979 to 1987 the number of ORVs using national forests has grown from 5.3 million visitors-days to 80 million visitor-days. The threat to wilderness will continue to grow given that between 1991 and 1997 the annual ORV sales have doubled. Wilderness supporters are outraged over the escalating problems of ORV use on public lands. The four federal agencies involved have ignored these threats to wilderness on large areas of undeveloped public land. Snowmobiles, four-wheelers, dirt bikes, and other ORVs leave their mark on back-country wilderness areas. Trails, both legal and illegal, disturb the natural wilderness and character of the land. The noise can drive away birds and harm the sensitive hearing of small mammals. Amphibians, reptiles, and plants become crushed when up against ORVs. Big game hunters worry that the proliferation of machines will scare off wildlife. Two-stroke engines cause water and air pollution, sometimes spilling fuel directly into soil and water. ORVs scar the land and harm wildlife with noisy, polluting, trail-mangling machines. ORVs are transforming recreation in national forests, especially in western lands. A coalition of over 100 groups filed a petition with the Forest Service urging the management of ORV use and the definition of the recreational standards. The ORV lobby, well-organized with financial support, maintains a good relationship with land managers who traditionally have supported ORV recreational uses. Grassroots and environmental efforts are bringing national attention to the ORV issue. The National Park Service has proposed a ban on snowmobiles in parks such as Yellowstone, and has other plans to limit ORV use. Environmentalists call for more actions limiting ORV use and want untouched areas undisturbed, unpolluted, and populated with wildlife.

Wilkinson, T 2001. On the beaten path. National Parks 75(3-4): 34-8.

Abstract: The National Park Service (NPS) has developed a new strategy to combat the damage caused by off-road vehicles (ORVs) in Big Cypress National Preserve in Florida. Across the National Park System, there is a noisy and increasing multitude of people using motorized recreation, causing a wide range of detrimental effects on wildlife and habitat. In Big Cypress National Preserve, which features some 22,000 miles of unregulated ORV trails, ORVs have caused massive destruction to the preserve's impressive biological diversity. The NPS' new bold, multiyear strategy will close trails to secure habitat, deploy scientists to assess damage, establish 400 miles of ORV trails, and limit the number of permits to 2,000. The NPS will also increase regular patrols of rangers to prevent illegal incursions. However, ORV groups, which

have until now enjoyed de facto primacy over the backcountry and have hunting privileges there, intend to fight the new regulations.

Foltz, R.B., D. Meadows, C. Napper, R. Gonzales, C. Aldrich. Study proposal. Impacts of All Terrain Vehicles (ATV) on National Forest Lands and Grasslands. May 2004

Abstract: The US Forest Service will conduct a study to determine the potential impacts of All Terrain Vehicles (ATVs) on National Forest Lands and Grasslands. The objective is to determine which ATV mechanical components and equipment may cause potential impacts to the natural environment. The tests will be conducted on existing trails and areas open to cross country travel. Locations for the study are in Louisiana, Missouri, Kentucky, Minnesota, Montana, and Washington. Parallel trails dedicated to a single combination of ATV type and tire combination will be located at each site. ATV traffic will occur until three levels of soil disturbance, Low, Medium, and High, have been achieved. Key indicators for the soil disturbance classes will be presence or absence of vegetation cover, trail condition, and potential erosion condition. Following the ATV traffic, measurements of the erosion potential will be taken on each disturbance class. At the conclusion of the study we will be able to demonstrate the ATV vehicle and tire combinations that produce each level of soil disturbance, the erosion implications of those classes, and a method to predict soil erosion from ATV traffic in climates different from the test areas.

CLOSING REQUIREMENTS

Due to the extensive damage that the Forest Service has documented, it is simply not legal for the Forest Service to allow any ORV use on the Forest. The Forest Service is required to:

> *[t]he respective agency head shall, whenever he determines that the use of off-road vehicles will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat or cultural or historic resources of particular areas or trails of the public lands, immediately close such areas or trails to the type of off-road vehicle causing such effects, until such time as he determines that such adverse effects have been eliminated and that measures have been implemented to prevent future recurrence.*

Section 9 of E.O. 11644 as amended by E.O. 11989.

The effects of use by specific types of vehicles off roads on National Forest System lands will be monitored. If the results of monitoring, including public input, indicate that the use of one or more vehicle types off roads is causing or will cause considerable adverse effects on the factors and resource values referred to in Sec. 295.2, the area or trail suffering adverse effects will be immediately closed to the responsible vehicle type or types until the adverse effects have been eliminated and measures have been implemented to prevent future recurrence as provided in 36 CFR part 261.

The disclosure of information on key forest types is a mere listing of the acreage. This is supposed to be a site-specific EIS. One would expect more detailed analysis, including location (maps, discussion) of forest types, significance of forest types, presence of important biological communities. The discussion is too simplistic. It breaks forest types into the broadest of categories. In reality there a many more forest types than listed based on soils and numerous other factors. Some of these are quite rare or unusual. The Virginia Division of Natural Heritage can provide more information on this.

The discussion should have also analyzed the degree to which wildlife species utilize different types of biological communities during different stages of their lives. Likewise, the list of wildlife species on this page is merely a rote list of some wildlife species. We would expect a more detailed discussion of the impact of the pipeline on wildlife species found in the area, particularly wildlife species that are indicators of certain types of habitat, keystone species, rare and listed species, and species that are disturbance species (e.g. salamanders, trout, etc)

Salamanders:

FERC should sufficiently examine and consider the potential impacts upon salamanders. This concern is significant here given the project's potential to destroy, degrade, or fragment suitable salamander habitat in some locations. Populations in the project area could be centered in, perhaps even be only found at, the particular places targeted for intense manipulation. They have very small home ranges with limited abilities of mobility (see attachments). They are susceptible and vulnerable to severe site-specific harm to their habitat and numbers; harm that would occur should the decision be implemented.

Their life history requirements and characteristics greatly restrict their abilities to "recolonize" areas. Since this project area does not contain Peaks of Otter salamander (POS) habitat, then the MIS (viz., black bears, pileated woodpeckers)

and other species listed in the JNF Plan are of limited, even misleading, use for gauging impacts to site-sensitive salamander populations. Additional salamander/amphibian/reptile MIS need to be considered in this analysis.

The use of these species does not accurately gauge the impacts to small site-sensitive species of low mobility such as salamanders and turtles. Management plans must insure research on and (based on continuous monitoring and assessment in the field) evaluation of the effects of each management system to the end that it will not produce substantial and permanent impairment of the productivity of the land.

Present MIS do not allow for the accurate monitoring and assessment of management impacts to salamander populations in the Eastern Divide Ranger District where POS do not occur. Then some other indicator of effects needs to be used; the project's and Plan's MIS are deficient. 16 U.S.C. 1604(g)(3)(C).

Impacts to site-sensitive creatures such as salamanders should be properly monitored and assessed. These creatures are very important components of forest ecosystems. The biomass of salamanders in a northern hardwood forest was twice that of the bird community during the breeding season and nearly equal to that of small mammals (see Burton and Likens, 1975, Copeia: 541-546). While in southern Appalachian forests, salamander biomass may exceed that of all other vertebrates combined (see Hairston, 1987, Community Ecology and Salamander Guilds). It is clear that they play key roles in ecosystem dynamics.

Impacts to site-sensitive creatures such as salamanders are not being properly monitored and assessed. These creatures are vitally significant components of forest ecosystems. The biomass of salamanders in a northern hardwood forest was twice that of the bird community during the breeding season and nearly equal to that of small mammals (see Burton, T.M. and G.E. Likens, 1975, "Salamander populations and biomass in the Hubbard Brook Experimental Forest, New Hampshire", Copeia (1975): 541-546). While in southern Appalachian forests, salamander biomass may exceed that of all other vertebrates combined.[39] It is clear that they play key roles in ecosystem dynamics.

Abundant studies reveal the severe impacts of logging upon salamander populations and their preference for older forest sites. See "The Relationship between Forest Management and Amphibian Ecology", 1995, deMaynadier and Hunter, Environmental Reviews 3:230-261 (incorporated by reference).

[39] Hairston, N.G., 1987, Community Ecology and Salamander Guilds, Cambridge University Press, Cambridge, UK.

See also "Effects of Timber Harvesting on Southern Appalachian Salamanders", Petranka et al, 1993, Conserv. Biol. 7:363-370;
"Effects of Timber Harvesting on Low Elevation Populations of Southern Appalachian Salamanders", Petranka et al., 1994, Forest Ecology and Management 67:135-147; and "Plethodontid Salamander Response to Silvicultural Practices in Missouri Ozark Forests", 1999, Herbeck and Larsen, Conservation Biology 13:3, 623-632) (these are standard journals readily available to the agency; the agency is already in possession of most if not all of this info as the studies took place on and were funded by NFs).

Also, James Organ, "Studies on the Life History of the Salamander, Plethodon welleri," Copeia 1960 No. 4. Also R.G. Jaeger, "Moisture as a Factor Influencing the Distributions of Two Species of Terrestrial Salamanders," Oecologia (Berl.)6, 191-207 (1971);
"Competitive Exclusion and Environmental Tolerances in the Distribution of Two Species of Salamander (Genus Plethodon) in Virginia, U.Md. Doc. Dissertation, 1969; and
Jaegar, Bioscience Vol. 24, No.1 (33-39) regarding the effects of competition on salamanders, including effectives of moisture and environmental tolerances on competing salamanders.

Terrestrial salamander abundances are affected by forest thinning (Grialou, J.A., West, S.D., and R.N. Wilkins. 2000. The effects of forest clearcut harvesting and thinning on terrestrial salamanders. Journal of Wildlife Management 64(1): 105-113).

Harpole and Haas, "Effects of Seven Silvicultural Treatments on Terrestrial Salamanders, For. Ecol. & Mgmt. 114:349-356 (1999) found that relative abundance of salamanders based on area-constrained searches decreased on group selection cuts, 12-14 sq. m shelterwood cuts, 4-7 sq. m shelterwood cuts, leave tree cuts, and clear cuts.[40]

Large plethodontid populations declined in group selection cuts after the Daves Ridge TS (Mt Rogers NRA). See the 1994 SO monitoring and evaluation report, section on Daves Ridge TS and James Organ's report on salamanders and related issues in the Daves Ridge area ("Salamander Survey in Connection with Daves Ridge Timber Sale").

[40] Harpole and Haas, "Effects of Seven Silvicultural Treatments on Terrestrial Salamanders, For. Ecol. & Mgmt. 114:349-356 (1999).

The above documents, already in possession of the GWJNF, are incorporated by reference.

FERC has not sufficiently examined and considered the potential impacts upon salamanders. Another pertinent study that the agency needs to incorporate in its analysis and decision is "Determinants of salamander distributions along moisture gradients" by M. Grover in Copeia 2000 (1): 156-168.

The present MIS, except for some TES species, are all large mobile vertebrates. The use of these species does not accurately gauge the impacts to small site-sensitive species of low mobility such as salamanders. Management plans must insure research on and (based on continuous monitoring and assessment in the field) evaluation of the effects of each management system to the end that it will not produce substantial and permanent impairment of the productivity of the land. Present MIS (outside of the limited ranges of the Peaks of Otter Salamanders) do not allow for the accurate monitoring and assessment of management impacts to salamander populations. Other indicators of effects need to be implemented.

Cerulean Warblers:

The cerulean is recognized by the FS and others as an area-sensitive species.[41] Other species are listed as area sensitive species in the SAA. The FS should consider the impacts to these area-sensitive species.

The FS found that cerulean warblers “tended to be older, large diameter stands with tall trees, a deciduous understory, multiple layers and ages...” ((Cerulean Warbler Interim Mgmt Strategy, Clinch RD, GWJNFs, p. -7) “Trees 18.2 in. in diameter composed greater than one-fourth of the overstory trees in the stands.” (CW IMS-7) The IMS documents that research characterized “suitable cerulean warbler habitat as mature forest with a high, closed canopy and a large number of stems greater than 12 in. diameter...” (CWS IMS-8) The cerulean warbler is found in the PA and vicinity. The cerulean warbler, is an area-sensitive bird (Southern Appalachian Assessment, Terrestrial Report); the cerulean warbler is experiencing the greatest annual decline of any of the warbler species and this significant decline is continuing. (Robbins, Fitzpatrick and Hamel, 1989, " A warbler in trouble: Dendroica cerulea") Studies have found cerulean warblers chiefly in “large tracts of mature, semi-open deciduous forest.” Robbins, Fitzpatrick and Hamel, 1992. The authors of one study, affirm that there is a “need to protect extensive tracts of mature deciduous forest,”

[41] Southern Appalachian Assessment, Terrestrial Report, Robbins et al., Cove Creek BE, 1995, Clinch RD, J&GWNFs, Maple Springs Branch BE, Clinch RD, J&GWNFs

especially on publicly owned land. See also excerpts from the Maple Springs Branch BE on the cerulean warbler (Clinch RD, GWJNFs, already in the agency's possession, incorporated by reference).

- The cerulean is recognized by the FS and others as an area-sensitive species (SAA, Terrestrial Rept, Robbins et al., Cove Creek BE, 1995, Clinch RD, J&GWNFs, Maple Springs Branch BE, Clinch RD, J&GWNFs). The Southern Appalachian Assessment Terrestrial Report lists the cerulean warbler among “area sensitive, mid- to late-successional deciduous forest species” (SAA/TR-70, in the agency's possession, incorporated by reference). It predicts that “based on past trends in land use, it is expected that, over the next 15 years, suitable acreage [for these area sensitive species] and associated forest interior habitats will continue to decrease due to loss of forestland to other uses such as agricultural pasture and development.”(SAA/TR-72) The cerulean warbler is found in a variety of deciduous forest types, usually in extensive woods. (Brandt, 1947; Peterjohn and Rice, 1991; Andrle and Carroll, 1988; Brooks, 1908; Mengel, 1965; Cadman et al., 1987; Torrey, 1896; Kirkwood, 1901; Maxon, 1903; Hann, 1937) Most often, its occurrence is recorded in forests with large, tall trees. (Lynch,1991; Robbins et al, 1989; Wilson, 1811; Oliarnyk, 1996; Mengel, 1965; Andrle and Carroll, 1988; Robinson, 1996; Torrey, 1896; Schorger, 1927) “A change to shorter rotation periods and even-aged management,” one of the 6 “chief constraints on the breeding ground” listed in Robbins et al., 1989.

According to USF&WS, "Ceruleans are routinely identified with large tracts, tall trees, and mature forest.” (Cerulean Warbler Status Assessment April 2000) For example, Lynch (1981) indicates minimum habitat requirements of the birds along the Roanoke River of North Carolina "to include: (1.) a closed canopy, (2.) presence of scattered, very tall old-growth canopy trees, and (3) good development of vegetation strata, i.e. distinct zonation of canopy, subcanopy, shrub, and ground-cover layers." (Cerulean Warbler Status Assessment April 2000).

This project has the potential to alter or degrade these habitat characteristics in the project area removal of contiguous forest cover and removal of large, old trees that are potential cerulean warbler nest trees.

The Cerulean Warbler is in need of robust conservation planning, especially by the Forest Service. Cerulean Warbler populations have declined dramatically since the 1960s. Data from the Breeding Bird Survey show that the Cerulean population has decreased approximately 80% since 1966, with an average rate of decline of -4.1% per year from 1966 to 2007. (J. R. Sauer et al., *The North American Breeding Bird*

Survey, Results and Analysis 1966-2007 (updated 15 May 2008), Version 5.15.2008 (USGS Patuxent Wildlife Research Center, Laurel, MD, 2009) The U.S. Fish and Wildlife Service's Cerulean Warbler Status Assessment concluded that this precipitous population loss represented the largest decline among any warbler species and one of the most significant declines among neotropical migratory birds. (J. R. Sauer et al) Much of this decline has occurred in the species'core breeding range. Dramatic habitat loss to mining, development, and logging throughout the Cerulean's breeding range, as well as loss of habitat in its winter range, are the primary causes of this decline.[42]

National forests like the JNF and other portions of the proposed MVP corridor are critical to the Cerulean Warbler's long-term survival, because of the Cerulean's habitat requirements. The Cerulean Warbler is an area sensitive forest-interior species, dependent on large tracts of mature forest to breed successfully.

Documents referenced for inclusion:

(C. Robbins., *A Warbler In Trouble: Dendroica Cerulea*, in Hagen, et al., *Ecology and Conservation of Neotropical Migrant Landbirds* at 555-56, 560. Smithsonian Inst. Pr. (1992);
Nicholson, C.P. 2004. *Ecology of the Cerulean Warbler in the Cumberland Mountains of East Tennessee*, at 1. Dissertation, University of Tennessee, Knoxville, USA [hereinafter —Nicholson 2004‖].
See also C. Oliarnyk & R. Robertson, Breeding Behavior and Reproductive Success of Cerulean Warblers in Southeastern Ontario,‖ *Wilson Bull* 108(4): 673 (1996);
R. Askins, "Relationship Between the Regional Abundance of Forest and the Composition of Forest Bird Communities," *Biological Conservation* 39: 144 Table 5 (1987);
R. Connor and J. Dickson, "Relationships Between Bird Communities and Forest Age, Structure, Species Composition and Fragmentation in the West Gulf Coastal Plain," *Texas J. Sci. suppl.* 49(3): 131 (1997) ("Cerulean Warblers, …are perhaps the most area-sensitive bird in this region and are likely the most vulnerable species to the forest fragmentation in this region");
Cathy A. Weakland & Petra Bohall Wood, —Cerulean Warbler (Dendroica Cerulea) Microhabitat and Landscape-Level Habitat Characteristics in\ Southern West Virginia,‖ *Auk* 122(2): 497, 498, 506 (2005).

[42] (Hamel (2000); Paul B. Hamel, How We Can Learn More About the Cerulean Warbler (Dendroica Cerulea), *Auk* 121(1): 7, 9 (2004).)

Cerulean Warblers require a minimum forested area of 700 hectares to sustain a viable population. (MTM EIS at III.F-15.) In a Tennessee study, Ceruleans were found only in forest tracts greater than 800 hectares (2,000 acres).[43] Another study found that the probability of encountering a Cerulean reached its maximum when the area consisted of 3,000 or more unfragmented hectares (7,500 acres) of forest. (Robbins et al. 1992) Within the context of a fragmented landscape of private land, the unfragmented forest habitat provided in the path of the proposed MVP is of critical importance to area-sensitive species like the Cerulean Warbler. The landscape surrounding the George Washington-Jefferson National Forests is projected to continue to fragment for new housing density at the fastest rate of any national forests. (U.S. Forest Service, Forests on the Edge at 9.)

"For nest trees, cerulean warblers preferred white oaks, sugar maples, and cucumber magnolias and avoided red maples and oaks in the red oak group (scarlet, black, northern and southern red oak." (CEWA study p. 15). It is not clear that these preferences are used in determining tree species retention.

Prime Cerulean habitat should generally be protected from fragmentation, especially large unfragmented forest blocks of 7,500 acres or more that contain existing old growth forest.

There are viability concerns for cerulean warblers, other species of interior forest-dwelling warblers, species of cuckoos, and other interior-forest dwelling songbirds listed as declining in BBS (or other ornithological data) that must be taken into consideration.

Other species are listed as area sensitive species in the SAA. The FS should consider the impacts to these area-sensitive species.

The proposed activities could impact birds that have different stratigraphic preferences, niches, and life cycle needs. What are the stratigraphic preferences and vegetative preferences of cerulean warbler and other birds? How would the project affect birds with different stratigraphic preferences and vegetative preferences of birds other than and including cerulean warblers?

The proposed activities could impact birds during the time that birds are seeking mates, breeding, nesting, rearing their young, or migrating. During what period due forest interior birds seek mates? Breed? Migrate? How would the project affect these

[43] (Chandler S. Robbins et al., *A Warbler in Trouble: Dendroica cerulean*, at 555, Manomet Symposium (1989))

factors? The project may involve a taking under the MBTA if birds are killed in nest trees or nearby trees.

What activities are affecting the forest interior birds throughout their breeding range? Wintering range? How do these activities cumulatively affect birds?

The 2001 Executive Order on Migratory Birds states: "Sec. 3. Federal Agency Responsibilities. (e) Pursuant to its MOU, each agency shall, to the extent permitted by law and subject to the availability of appropriations and within Administration budgetary limits, and in harmony with agency missions:
(1) support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions;…
(4) design migratory bird habitat and population conservation principles, measures, and practices, into agency plans and planning processes (natural resource, land management, and environmental quality planning, including, but not limited to, forest and rangeland planning, coastal management planning, watershed planning, etc.) as practicable, and coordinate with other agencies and nonfederal partners in planning efforts;…
(6) ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern;…
(9) identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. With respect to those actions so identified, the agency shall develop and use principles, standards, and practices that will lessen the amount of unintentional take, developing any such conservation efforts in cooperation with the Service. These principles, standards, and practices shall be regularly evaluated and revised to ensure that they are effective in lessening the detrimental effect of agency actions on migratory bird populations. The agency also shall inventory and monitor bird habitat and populations within the agency's capabilities and authorities to the extent feasible to facilitate decisions about the need for, and effectiveness of, conservation efforts;"…
Sec. 2 i) "Species of concern" refers to those species listed in the periodic report "Migratory Nongame Birds of Management Concern in the United States," priority migratory bird species as documented by established plans (such as Bird Conservation Regions in the North American Bird Conservation Initiative or Partners in Flight physiographic areas), and those species listed in 50 C.F.R. 17.11." Several

birds listed in Bird Species of Conservation Concern 2002 are found in this area (see breeding bird survey records). Impacts to these NTMBs should be analyzed.

The Allegheny woodrat is found on the GWNF. New strategies such as "maintaining sufficient old growth mast producing canopies (Beck 1977; McShea 2000), maintenance of continuously forested corridors" " public education, maintenance of course woody debris such as large snags and fallen logs, and more may be required to insure the long-term survival of the Allegheny woodrat".[44]

What visual impacts would the project have on potential wilderness areas, or the approach roads to these areas? How would this impact the recreational experience?

Throughout the entire proposed pipeline route there are a number of portions of the pipeline route may contain boulder fields or very rocky areas. These are important elements of biodiversity and are important habitat for various species (e.g. Allegheny Woodrats, amphibians, reptiles). Forest clearing and ground disturbing activities must be avoided in these areas. But merely not performing actions within the outcrops and slopes themselves does not avoid impacts to these unique areas. Without proper buffer zones (such as extending out at least a tree height or approximately 150') the habitat conditions and populations within the outcrops would not be protected. See the above discussion regarding habitat conditions, functionality, and no-disturbance zones around springs and seeps. The present mitigation is not sufficient for avoiding significant impacts to these areas and the decision does not protect the Forest's diversity.

Rocky outcroppings, rocky ridge spines, cliffs, and rocky slopes are known to be extremely important habitat for various species such as Timber Rattlesnakes (see also p. 444), Coal Skinks, Allegheny Woodrats, peregrine falcons, and salamanders, as well as mosses and lichens and others. Implementation of the proposed cutting would significantly alter the ecological conditions at these rocky sites (e.g., temperature and moisture regimes). In addition, the operation of logging equipment would alter the soil conditions and the rocks. Small site-sensitive species of limited mobility would also be killed or maimed directly.

This relevant environmental factor must be given a hard look. FERC must fully and fairly consider the impacts of the proposed activities upon these areas. The proposed operations could significantly affect their distribution and mortality

[44] See '01-'03 GWJNFs Monitoring &Evaluation (M& E) Rpt Mengak 2002 pp. 30-34, See also the entire'01-'03 GWJNFs M&E Rpt Mengak 2002 pp. 1-38.

(degrades or destroys den conditions, road kills and crushing, increased motorized use, draws more people to area, habitat displacement, etc.). Their security and viability may be significantly worsened.

Den sites are ecologically critical areas, like bird rookeries or Indiana Bat hibernacula. The snakes are even more vulnerable because unlike birds and bats they cannot fly away. There is a clear need to establish what their status is here. Harm to a relatively small area could actually affect an area or population for miles around.

They should be searched for during the time of spring egress (from the den) or fall ingress (into den). During these times they stay in close proximity to their den sites. Then their status and the possibility of the presence of dens here can be ascertained. We are particularly concerned about the harm implementing this project could have on "Timber Rattlesnakes (*Crotalus horridus*). This is a species of viability concern on this Forest and elsewhere throughout its range[45] (see, e.g., 2003 JNF DEIS at Appendix E). Individuals of this species congregate in concentrated areas (i.e., den sites) during the winter and immediately pre- and post-hibernation. Many snakes may travel from a wide area (from 2.5 miles away and more) when migrating to one of these overwintering sites. Populations and individuals are especially vulnerable to direct and indirect disturbance during these denning times.

“Actual construction techniques may differ depending upon field conditions and or regulatory requirements.” What leeway to pipeline investors/developers have to weaken construction techniques based on field conditions? If this project is approved assuming current regulatory requirements are adequate mitigation measures and subsequent weaker regulations replace existing regulations, what would happen? Would a new NEPA analysis have to be prepared to determine whether there are significant impacts on the environment?

Sincerely yours,
Sherman Bamford

VII. Conclusions:

[45] See Reptiles of Virginia by Joseph Mitchell and "The Timber Rattlesnake: Its Distribution and Natural History" by W.H. Martin in *Conservation of the Timber Rattlesnake in the Northeast* published by the Massachusetts Audubon Society, incorporated by reference.

Construction of a large, 42-inch-diameter gas pipeline across the central Appalachian fold belt is without precedent.[46] The magnitude of this undertaking is daunting. The size of the high-pressure pipe and a terrain that is high in relief and complex in its geology poses considerable risks in engineering design, and construction challenges. The Atlantic Coast Pipeline creates concern for significant risk of adverse impacts due to the nature of the terrain that the line would cross.

The identified problems associated with the pipeline impact the entire natural environment along its route. Deliberation related to the ACP application must approach the natural system as a whole. Human quality of life is intimately tied to the natural ecosystem. Degradation of the natural environment has direct consequences on individuals and communities living on or near path of the pipeline, including local economies dependent on nature-based tourism.

Contrary to FERC policy to "avoid and minimize" adverse effects, Atlantic Coast Pipeline LLC, Dominion Transmission, Inc. and Piedmont Natural Gas Company, Inc. have not adequately addressed many of the environmental concerns germane to this region. Moreover, ACP has totally ignored compound effects of hazards. Numerous findings that have been generated and submitted by registered interveners, professionally done with due diligence, have brought to light considerable details, many of which bring aspects of the ACP application into question.

The geologic environment, including active processes in karst, slopes, soils, and earthquakes, are a physical part of an overall natural system. Lifeforms, whether in the forests, grasslands, soil, streams, or in caves and groundwater are integral parts of the system. Erosion and sedimentation, contamination of surface streams, wells, and aquifers, and fragmentation are destructive to the entire ecosystem.

Atlantic Coast Pipeline has routed its proposed pipeline through one of the most environmentally sensitive areas of our nation. As a direct result of the routing, if constructed, the pipeline would be subjected to serious geologic impact due to poor soils, shallow bedrock and blasting, steep slopes, landslide potential and seismic hazards. Many of the potential hazards discussed in this report have not been adequately identified in the ACP application, nor have suitable mitigation measures been advanced.

Based on extensive experience and study of this region, we are confident that a safe and environmentally sound route for a pipeline of this magnitude cannot be identified,

[46] An Expert Report on Geologic Hazards in the Karst Regions of Virginia and West Virginia, Ernst H. Kastning, Ph.D., P.G. July 3, 2016.

engineered, constructed, nor maintained through the karst of the rugged Valley and Ridge Province. **Our recommendation, based on the multiple environmental issues and potential hazards, is for FERC to reject the application. The stakes are very high and the risks are far too great.**

Respectfully,

Kate Addleson, Director, Virginia Chapter Sierra Club
William Penniman, Conservation Chair
Kirk A. Bowers, PE, Pipelines Campaign Coordinator
Sherman Bamford, Forestry Chair

Appendix A

GHG Emissions Associated with Two Proposed Natural Gas Transmission Lines in Virginia

GHG Emissions Associated with Two Proposed Natural Gas Transmission Lines in Virginia[i]

Summary of GHG Emission Estimates

The primary purpose of this white paper is to estimate possible greenhouse gas (GHG) emissions associated with several proposed new interstate natural gas transmission lines that would run through parts of Virginia. By "associated" emissions we mean the major GHG emissions that are estimated to occur (a) from operation of the transmission pipelines, (b) from the upstream stages of production and processing of the natural gas that is intended to go into to those transmission pipelines, and (c) from combustion of the transported natural gas. (The analysis excludes leaks from local distribution lines, which we assume would be avoided if the gas will be combusted in large plants connected closely to the transmission lines; however, local distribution lines are a major source of methane emissions and would need to be accounted for—in addition to combustion emissions—if deliveries are first made to local gas distributors.)

The four major interstate natural gas transmission lines and their daily throughputs of gas proposed in Virginia are the Atlantic Coast (ACP, 1.5 bcf/day), the Mountain Valley (MVP, 2.0 bcf/day), the WB Xpress Project to expand the capacity of the Columbia Gas Transmission pipeline by 1.3 bcf/day), and the Appalachian Connector (up to 2 bcf/day), for a total of 6.8 bcf/day.

Our emission estimates for the Atlantic Coast (ACP) and Mountain Valley (MVP) pipelines are summarized in Figures 1 and 2, respectively. The base case (in the first column of the Figures) is from a published analysis: that of Laurenzi and Jersey (2013), referred to here as the "ExxonMobil" analysis since the authors are employees of that Corporation and used data from drilling sites owned by it. In addition we developed three alternative cases based on different assumptions than used in the ExxonMobil results, although one of those cases is derived directly from the ExxonMobil results. In general, the four cases fall into two pairs (labeled ExxonMobil and"EX") that amount to a low and a higher estimate of upstream emissions of methane (CH_4), while estimated carbon dioxide (CO_2) remain the same for all cases. Within each pair the difference in carbon dioxide-equivalent (CO_{2eq}) total emissions is due to two different assumptions about how methane is weighted—known as the Global Warming Potential (GWP) of methane. (More detail on the quantitative contributions of CO_2 and CH_4 in the four cases is given in Tables 1 and 2 in the next section.) For comparison to those pipeline-associated GHG emissions, a seventh column in the Figures shows the total reported emissions of GHGs in Virginia in 2014 from EPA's Greenhouse Gas Reporting Program.

A more detailed explanation of the results is given in the next section. A subsequent section, Discussion of Assumptions and Results, describes the underlying basis and compares our results to other studies from the recent literature. Following that section we present some recommendations based on the results and lessons learned in analyzing the literature on emissions from the natural gas fuel cycle.

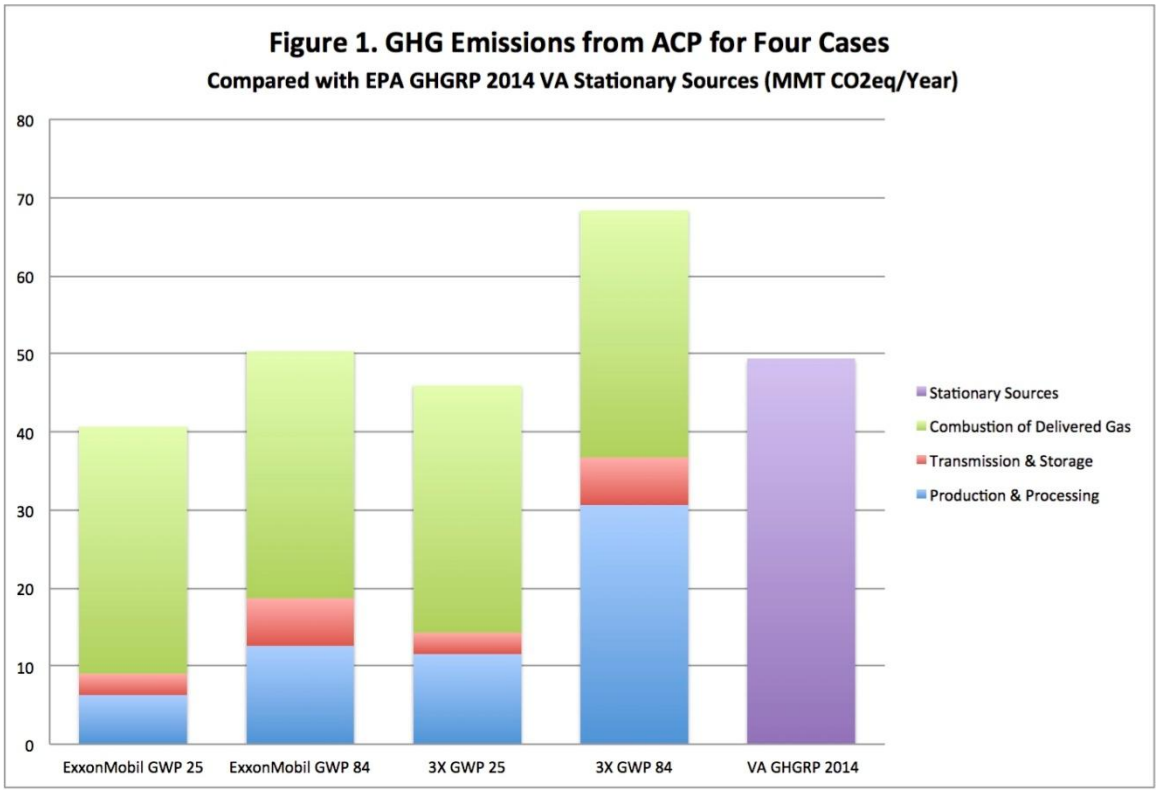
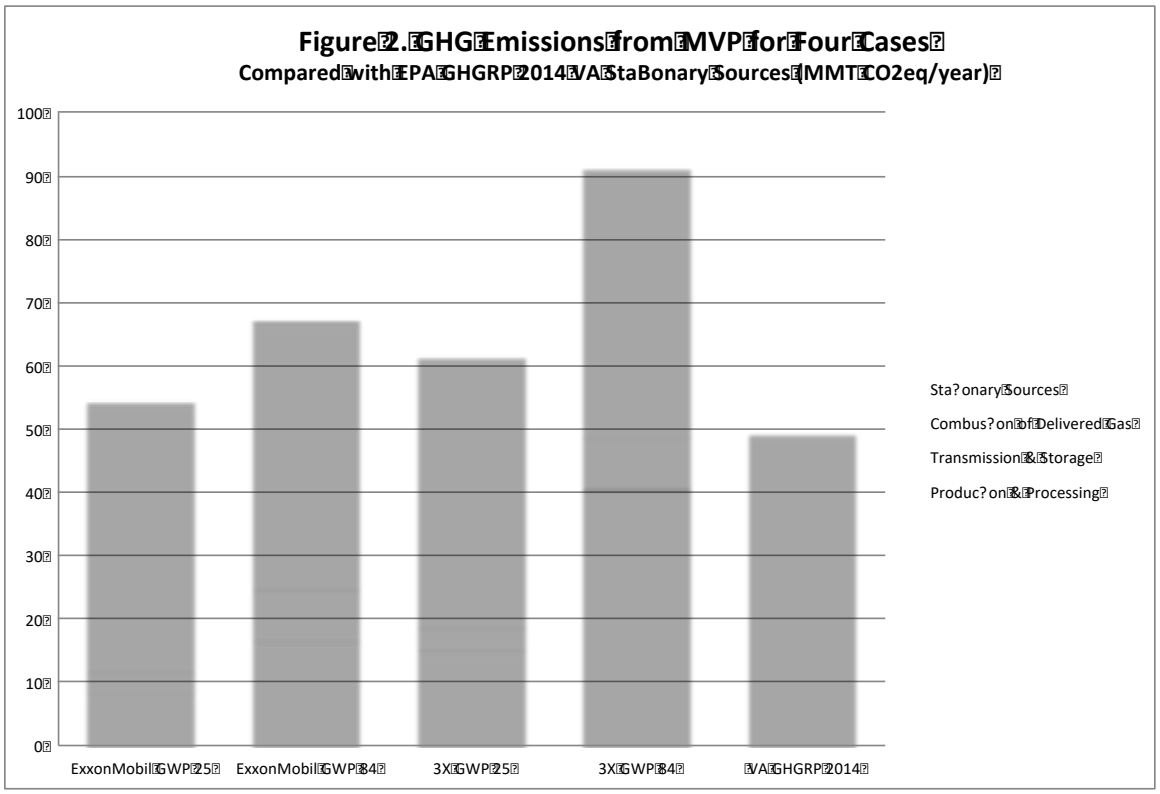
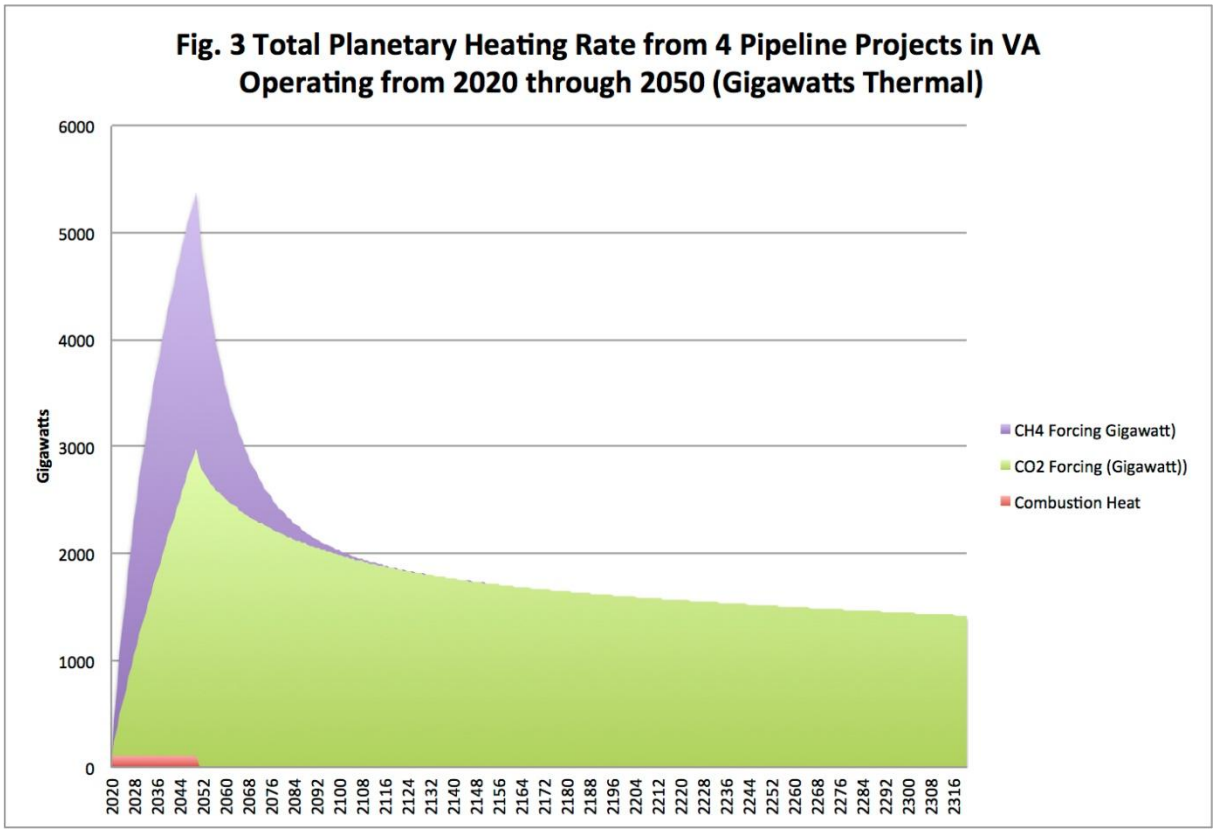


Figure 1. GHG Emissions from ACP for Four Cases
Compared with EPA GHGRP 2014 VA Stationary Sources (MMT CO2eq/Year)
80
70
60
50
40
30
20
10
0
ExxonMobil GWP 25
ExxonMobil GWP 84
3X GWP 25
3X GWP 84
VA GHGRP 2014
Stationary Sources
Combustion of Delivered Gas
Transmission & Storage
Production & Processing



The issue of which GWP to choose can be bypassed by computing the time-dependent radiative forcing due separately to CO_2 and CH_4. Figure 3 shows the results of calculations of radiative forcing computed by a simple model. However, instead of showing radiative forcing in conventional units of watts/meter^2 we show the total thermal heating effect on the planet of GHG emissions from all four pipeline projects, consisting of the radiative forcing multiplied by the total surface area of the Earth plus, for comparison, the much smaller generation of heat generated by combustion of the natural gas delivered by the pipelines. Note that the thermal effect of CO2 persists long after operations cease (we show it for 300 years), and will last for centuries after that. The basis for this graph is explained in more detail in the Discussion section below.



Detailed Description of Results

The ExxonMobil analysis produced results based on emission values per unit output of a hypothetical natural gas electric power plant (Kg CO_{2eq}/MWh), and we scaled their GHG emissions values to correspond to the potential maximum natural gas throughput of the respective pipelines (1.5 Bcf/day for ACP and 2.0 Bcf/day for the MVP). We chose this study because it was a partial LCA analysis (of the production at the well head stage), provided detailed results for process steps separately for carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) emissions, and pertained to conditions specific to natural gas from hydraulic fracturing production in the Marcellus shale region, which is identified as the source for the two pipelines in question, including some measurements made on the Corporation's own well operations.

However, while these ExxonMobil estimates are useful as a starting point, they may not be representative of all fracking operations in the Marcellus or other shale regions. In fact, other estimates of overall emissions from that region suggest much higher fugitive emissions of methane, and it is clear that some operators are responsible for much more emissions per unit of production than others. For that reason we also present an alternative set of estimates for methane emissions from the overall production and processing stage, as discussed below. Note that neither of these estimates appears to consider the problem of post-production leaks, which, as documented by Schlumberger, may emerge many years after a well has been capped and taken out of operations.

Figure 1 and Table 1 show results applicable to the ACP pipeline, while Figure 2 and Table 2 show similar results for the MVP pipeline. For simplicity, we aggregated the original authors' more detailed process level results into three major fuel cycle stages:[47] Production and Processing (i.e., operations upstream of the transmission line), Transmission and Storage, and Combustion of the delivered pipeline gas (assuming no local distribution). (CO_{2eq} emissions of N_2O are neglected in Tables 1 & 2 as relatively small compared to the GHG impacts of methane and CO_2 emissions.) We believe that assessing GHG emissions from all three major fuel cycle stages, not just the transmission pipeline stage, is important because these new pipelines are intended to collect the produced gases and transport them to new or expanded markets in Virginia and North Carolina, and possibly even to foreign export terminals. Hence, the pipelines will tend to generate or at least support additional uses of natural gas that arguably will result in greater gas production and combustion and their associated emissions. Some of the uses may include new industrial plants owned by foreign companies that are attracted to the region by the availability of cheaper natural gas supplies than available abroad. Pipeline proponents have been touting such economic development as a benefit of their pipelines.

The two principle issues in making methane leakage estimates are: 1) what is the actual leakage rate of methane from various stages of the natural gas fuel cycle? and 2) what is the appropriate choice of *global warming potential* (GWP) (or other method) to apply when comparing emissions of CO_2 to other GHGs, especially to methane? The reason there are four columns in the two tables and first two figures is because we made alternative choices for both of those issues. In Tables 1 and 2 the first column is from the generic estimates given by Laurenzi and Jersey (except for the scaling up to each pipeline). Note that the scale-up assumes the pipelines operate at full capacity 24/7/365 because we have no estimates from the proponents about their planned operating schedule. The second column adjusts the methane CO_{2eq} emission values (the first column was based on EPA's 100-year GWP assumption of 25) to the 20-year GWP of 84 from IPCC AR5 when summing to obtain total CO_{2eq} emissions from each stage. The third and fourth columns (3X) increase the methane emissions from Production and Processing (but not the transmission or combustion stage emissions) by multiplying Columns 1 and 2, respectively, by a factor of three to reflect results typical of *top-down* higher methane emission measurements in the Marcellus and other shale basins. The reason for this choice is explained below in the Discussion section. Those two adjustments increase the upstream production and processing emissions in Column 4 by a factor of 4.9 and the total system emission by a factor of 1.7 relative to column 1. (Note that the CH_4 emission values shown in the Tables are in million metric tonnes (MMT) of methane, not CO_{2eq}.) The CO_{2eq} values from the four columns in the tales are also shown graphically in the bar charts of Figures 1 and 2.

[47] The f*uel cycle* approach means analysis of operational impacts of all relevant stages from extraction through use and disposition of wastes; a *life cycle analysis* (LCA) approach extends the analysis to consideration of the indirect impacts of manufacturing and transporting the equipment and the raw materials that go into the stages and is evaluated over the estimated lifetime of the capital facilities.

For comparison, Virginia's two largest sources of CO_{2eq} GHG emissions in 2014 were the Chesterfield (7.22 MMT) and Clover (5.67 MMT) coal-fired power plants. The Column 1 total in Table 1 from the ACP pipeline (40.7) is comparable to the total contribution from the 177 GHG sources in Virginia (49.4 MMT CO_{2eq}) from EPA's Greenhouse Gas Reporting Program (GHGRP) in 2014, while the total in Table 2 from the MVP pipeline considerably exceeds it.[48] (However, only part of the emissions in Tables 1 and 2 would occur in Virginia.) These Virginia GHGRP values also are compared against the pipeline values in Figures 1 and 2. Obviously the comparable totals for the higher methane emissions assumed in Columns 3 and 4 of the two tables would be even higher, but only Columns 1 and 3 should be compared with EPA's GHG values since the latter also assume a GWP of 25.

[48] This is based on EPA's "Flight database" from their Greenhouse Gas Reporting system, but that database excludes GHG emissions from onshore oil and gas production at the state level, hence it does not include the emissions from coal bed methane extraction operations in Virginia, for example. Also, the list of 177 large sources includes some that reported zero emissions in 2014 compared with substantial emissions in prior years and EPA generally assumes the GHGRP reported emissions underestimate actual totals somewhat. Only large sources are required to report, and the database does not include transportation and many small sources

TABLE 1. Generic GHG Emission Estimates for the ACP Pipeline

GHG Emissions by gas and fuel cycle stage	ExxonMobil* (w/CH_4 GWP=25 over 100 years)	Adjusted ExxonMobil* (w/CH_4 GWP=84 over 20 years)	Top-Down Higher CH4 Leakage Estimate** (w/CH_4 GWP=25)	Top-Down Higher CH4 Leakage Estimate** (w/CH_4 GWP=84)
Production & Processing				
CO_2 (MMT CO_2/year)	3.60	3.60	3.60	3.60
CH_4 Losses (MMT CH_4/year)	0.107	0.107	0.321	0.321
Total CO_{2eq} Emissions (MMT/year)	6.3	12.6	11.6	30.6
Transmission & Storage				
CO_2 (MMT CO_2/year)	1.27	1.27	1.27	1.27
CH_4 Losses (MMT CH_4/year)	0.058	0.058	0.058	0.058
Total CO_{2eq} Emissions (MMT/year)	2.7	6.1	2.7	6.1
Combustion of Delivered Gas				
CO_2 (MMT/year)	31.7	31.7	31.7	31.7
Grand Total GHG Emissions (MMT CO_{2eq} /year)	40.7	50.4	46.0	68.4

* ExxonMobil means the ANALYSIS analysis of Laurenzi & Jersey (2013); note that this was a generic analysis, not specific to the ACP pipeline. The values here represent a conversion from their numbers in terms of emissions/MWh into emissions/SCF, which are multiplied times the ACP capacity of 1.5 Bcf/day to get the MMT/year values shown here. These values assume full-time operation 24/7/365.

** Assumes 3 X ExxonMobil CH_4 Production & Processing emissions (see discussion)

TABLE 2. Generic GHG Emission Estimates for the MVP Pipeline

GHG Emissions by gas and fuel cycle stage	Exxon-Mobil* (w/CH_4 GWP=25 over 100 years)	Adjusted Exxon-Mobil* (w/CH_4 GWP=84 over years)	Top-Down Higher CH4 Leakage Estimate** (w/CH_4 GWP=25)	Top-Down Higher CH4 Leakage Estimate** (w/CH_4 GWP=84)
Production & Processing				
CO_2 (MMT CO_2/year)	4.8	4.8	4.8	4.8
CH_4 Losses (MMT CH_4/year)	0.143	0.143	0.428	0.428
Total CO_{2eq} Emissions (MMT/year)	8.4	16.8	15.5	40.8
Transmission & Storage				
CO_2 (MMT CO_2/year)	1.7	1.7	1.7	1.7
CH_4 Losses (MMT CH_4/year)	0.077	0.077	0.077	0.077
Total CO_{2eq} Emissions (MMT/year)	3.6	8.1	3.6	8.1
Combustion of Delivered Gas CO_2 (MMT/year)	42.3	42.3	42.3	42.3
Grand Total GHG Emissions (MMT CO_{2eq} /year)	54.3	67.2	61.3	91.2

* ExxonMobil means the ANALYSIS analysis of Laurenzi & Jersey (2013); note that this was a generic analysis, not specific to the MVP pipeline. The values here represent a conversion from their numbers in terms of emissions/MWh into emissions/SCF, which are multiplied times the MVP capacity of 2.0 Bcf/day to get the MMT/year values shown here. These values assume full-time operation 24/7/365.

** Assumes 3 X ExxonMobil CH_4 Production & Processing emissions (see discussion)

Discussion of Assumptions and Results

The two principle issues in making these estimates are: 1) what is the actual leakage rate of methane from various stages of the natural gas fuel cycle, and 2) what is the appropriate choice of *global warming potential* (GWP) (or other method) to apply when comparing emissions of CO_2 to other GHGs, especially to methane? Both of those questions have been issues for several decades. Neither is completely settled today. We have approached it in our estimates by choosing a lower and higher value for each factor, and also produced a separate analysis that obviates the GWP issue.

The issue of leakage rates remains unresolved and a very controversial topic. The way chosen here to represent a range of opinion on leakage rates from the upstream production and processing stages is to show a lower estimate (the so-called ExxonMobil values, which are similar to EPA's emission factors) vs. a higher estimate (the "3 X" or "Top-Down Higher" values in Columns 3 &4) as explained further below.

Choice of GWP. The GWP issue is now quite well understood scientifically but remains controversial in the policy and political arenas. The issue with a GWP selection is that the UN adopted a 100-year GWP as part of the Kyoto Protocol. EPA also adopted it because of the need to have a specific way to weight various GHGs and value emission tradeoffs and to be consistent with International reporting requirements. However, for other purposes such as evaluating mitigation strategies and longer-term tradeoffs, many climate scientists and policy analysts, including the latest IPCC reports, now understand its limitations. For strategic purposes there are alternative solutions for characterizing the relative impacts available in the literature (e.g., Alvarez et al. 2012) that render that choice irrelevant. However, for simplicity here we simply compute methane effects for two widely different values of the GWP to illustrate the range: EPA's value of 25 (that was based on the IPCC AR4 2007 report for a 100-year time frame) and was used by Laurenzi and Jersey, and the IPPC AR5 2013 value of 84 for a 20-year time frame. We believe that the latest scientific estimates should be applied and that there is no scientific justification for preferring a 100-year over a 20-year values, especially since many of the GHG mitigation goals of the U.S. (for example, the U.S. pledge to the UNFCCC process for 2025) will occur over much shorter periods of time, closer to a 20-year period.

We also show in Figure 3 the results of a simple model that shows the temporal evolution of planetary heating due to the emissions of CO_2 and CH_4 (separately) plus heating from combustion of the delivered gases from all four pipeline projects. For this chart we used the higher methane emission rates (columns 3 and 4 in the tables). Planetary heating from the GHG emissions means the incremental radiative forcing at the top of the atmosphere due to the emitted gases. Our simple model is similar to that described by Alvarez et al. 2012, although we use updated parameters based on the latest estimates of total greenhouse gas concentrations in the atmosphere and display our results in absolute terms as planetary heating. Our model will be described in more detail in a subsequent paper. This approach eliminates the need for using GWPs and provides more information.

Production and Processing Stages. Estimates of GHG emissions from natural gas production, processing and gathering pipeline transport operations differ widely and currently are very controversial. Briefly, there is an unresolved disconnect between two general approaches to estimating emissions: so-called *bottom-up* methods that sum up measurements and/or generic emission factor-based estimates for individual operations and equipment in the overall process, versus *top-down* methods based on measuring concentrations of methane in the atmosphere for some region in which there are natural gas and/or oil producing operations, then translating those measurements into estimates of emissions associated with natural gas and oil production, processing and other stages (depending on what operations are occurring in the study region). Those two approaches lead to estimated emissions that can differ by as much as an order of magnitude. Figure 4 below shows some examples of top-down compared with EPA bottom-up estimates. Note that several top-down estimates shown in Figure 4 have a median value of about 10% leakage, compared with the EPA estimate between 1 and 2%.

Tables 1 and 2 begin with one estimate (Columns 1 & 2) of a bottom-up approach, the Exxon-Mobil study, which is near the lower end of the range of such estimates, (although there are even lower ones). It amounts to about 1.12 % leakage of methane from the upstream production and processing stages of Marcellus shale fracking, in particular in the Southwestern Pennsylvania part of that region. We also give hypothetical (3X) estimates (Columns 3 & 4) (based on multiplying the Exxon Mobil results by a factor of 3) that we believe are representative of the middle of the top-down estimates and also are comparable to the higher end of bottom up estimates), which is equivalent to upstream methane emissions of about 3.4%. The ExxonMobil results for methane emission appear to be roughly in the same range as some other bottom-up estimates near the low end, including values based on EPA's Greenhouse Gas Emission Inventory. There are a number of general issues with most bottom-up studies, including the difficulty of assuring that individual measurements made to determine emission factors are representative of the broader industry operations, and that most measurements have been made by or in close association with the producing industry that has a vested industry in showing low emissions. (It is difficult to make detailed measurements at a site without the operator's cooperation, and there always is a question about whether the operator may do things differently when he knows researchers or government inspectors are present.)

The particular high-end estimate for methane leakage we use here (3.4%) is comparable to the top-down results reported in the study by Petron *et al.* (2014), *viz.* 4.1±1.5%. However, that pertained to natural gas production from a combination of oil and gas wells and supporting infrastructure. That study involved atmospheric studies using various combinations of ground-based air monitors, aircraft measurements, and other measurements of methane and VOC concentrations. There have been relatively large uncertainty bounds on top-down methods. (See bounds shown in Figure 4 below, but also the newer Zavala-Araiza *et al.,* 2015 study discussed below.) The advantage of top-down estimates is that they tend to capture all the methane emissions in a region, including natural gas industry sources that may have much higher emissions than represented by emission factors (and there is much evidence that a few large leakage sources account for a disproportionate contribution

to totals). Their result was nowhere near the worst-case leakage example among top down studies, some of which found values of methane leakage on the order of 10% or more, as shown in Figure 4. A leakage rate of 3.4% is also consistent with higher estimates using bottom-up methods from the literature [for example, see Brandt et al. (2014)]. Atmospheric measurements do not measure CO_2 emissions, so we use the same CO_2 estimates from Laurenzi and Jersey in this column in Table 1. Also note that atmospheric measurements do not necessarily capture all the indirect LCA values since some of those may apply to operations outside the producing areas, but those tend to be the smaller part of the total emissions.

A very recent report by Zavala-Araiza *et al.* (2015) reconciles bottom-up and top-down estimates in the Barnett shale oil and gas-production region of Texas. It augments conventional bottom-up inventories, accounts for high emitters, and compares them to top-down aircraft studies in which ethane measurements are used to correct for biogenic sources. Their bottom-up inventory is 1.9 times estimated emissions based on the EPA GHGI program, and represents a methane leakage rate of 1.5% (1.2—1.9%). The Aircraft top-down measurements of fossil methane averaged about 10% higher than the bottom-up estimates, but still within the top-down uncertainty bounds. Those results for the Barnett region indicate a significantly smaller leakage rate than the Petron et al. (2014) results obtained in the Denver-Julesburg gas and oil production region.

The Zavala-Araiza results (a methane leakage rate of 1.5% for upstream production and processing stages) suggest a medium leakage case in between our base Exxon Mobil value and the "Higher 3X" leakage estimate of 3.4% in columns three and four. Of course, neither of those estimates from other basins necessarily pertains to the Marcellus shale gas production region, so we cannot say whether our assumed medium and high values in the Tables and Figures are consistent. We do not claim that the value of 3.4% used here is a valid upper estimate for the Marcellus region, but only that it illustrates the potential impact of a higher estimate that is slightly smaller than a top-down result from another region that involved particularly comprehensive measurements.

A report by Marchese *et al.* (2015) gives estimates of emissions from the gas processing and gathering pipeline stages (which stages are included in our estimates of Production and Processing). Generally they found that their measurements of 16 gas processing plants were even lower than EPA's emission factors, but measurements of 114 gathering pipeline facilities were often much higher than EPA emission factors. A few of the smaller gathering facilities appear to have leakage rates exceeding 10% of gas throughput, but most were much less than that. Marchese et al. did conclude that:

> "While there is uncertainty in determining gathering facility emissions from the EPA GHGI, the results of this study suggest that the GHGI substantially underestimates emissions from gathering facilities.

The Marchese study indicates that emissions from gathering lines may be considerably larger than estimated in the ExxonMobil analysis. However, such increased methane emissions presumably would already be accounted for in broad region top-down studies that are the basis for our medium

and higher methane estimates, so there does not appear to be a need to factor that into our results in columns three through six.

A recent report, Concerned Health Professionals of New York Report (2015), found that (p. 52-57):

> "Leakage from faulty wells is an issue that the industry has identified and for which it has no solution. According to Schlumberger, one of the world's largest companies specializing in fracking, about five percent of wells leak immediately, 50 percent leak after 15 years, and 60 percent leak after 30 years. Data from Pennsylvania's Department of Environmental Protection (DEP) for 2000-2012 show over nine percent of shale gas wells drilled in the state's northeastern counties leaking within the first five years. Leaks pose serious risks including potential loss of life or property from explosions and the migration of gas or other chemicals into drinking water supplies.
>
> "Leaks also allow methane to escape into the atmosphere, where it acts as a more powerful greenhouse gas than carbon dioxide. Indeed, over a 20-year time frame, methane is 86 times more potent a heat accumulator than carbon dioxide. There is no evidence to suggest that the problem of cement and well casing impairment is abating. Indeed, a 2014 analysis of more than 75,000 compliance reports for more than 41,000 wells in Pennsylvania found that newer wells have higher leakage rates and that unconventional shale gas wells leak more than conventional wells drilled within the same time period. Industry has no solution for rectifying the chronic problem of well casing/cement leakage."

Combustion Stage. CO_2 emissions from the natural gas-fired combustion (e.g., power plant) stage depend mainly on the amount of gas consumed, which in this case is simply the throughput of the pipeline, and slightly on the composition of natural gas (which changes the CO_2 per cubic foot). Effectively we used the latter factor from Laurenzi and Jersey since they based it on typical pipeline natural gas produced in the Marcellus shale region (rather than EPA's nominal emission factor). Any combustion use of the transmission line natural gas throughput would give the same result. However, natural gas delivered further for use through local distribution lines would have higher overall CO_{2eq} emissions because of the substantial extra leakage of methane in many distribution systems. GHG emissions published by Laurenzi and Jersey from this stage are just from combustion, are not based on a life cycle analysis, and do not account for any leakage of methane or unburned methane in the power plant exhaust or pre-combustion handling. While we could not find a definitive emission factor from EPA for methane specific to NGCC power plants, NETL (2010) gives the factor 8.56 E-06 kg/MWh for NGCC plants[49]. That would be negligible compared with the CO_2 emissions.

[49] Methane emission factors vary with the type of combustion process; methane and N_2O emissions from simple gas turbines and other engines used to power pipeline compressors are not as small; e.g., EPA's AP-42 GHG emission factors for natural gas-fired turbines are 0.003 lb/MMBtu for N_2O and 0.0086 for CH_4, which together amount to about 1.4% of the CO_2 emissions when the AR5 20-year GWPs for those gases are applied (268 for N_2O).

Transmission and Storage (T&S) Stage. Our base estimate for this stage is based on a different treatment. The ExxonMobil analysis did not base their estimate on a life-cycle analysis or a detailed calculation of emissions from pipeline facilities. Rather, it takes 2009 EPA estimates of total T&S fugitive methane emissions and total CO2 from compressors to calculate the ratio to total natural gas withdrawals that year. That results in an average leakage rate of 0.45% of methane and an average amount of CO2 emissions of 82 Kg/MMScf of transported gas. We only have limited information about the two proposed pipelines, such as lengths, sizes, compressor horsepower, and maximum gas throughput per day. There do not appear to be any emission factors available to estimate pipeline emissions based only on those parameters. Given those limitations and the generic nature of information from the Laurenzi and Jersey (2013) paper about the assumptions and data for their emission estimates of the Transmission and Storage stage, it did not appear feasible to estimate how their generic estimates of methane should scale with various pipeline parameters, other than a direct scaling with pipeline throughput capacity. We also note that GHG emission estimates from the pipeline proponents do not yet appear to be available. That may especially be important for the direct emission values for pipeline operations. The analysis of Laurenzi and Jersey (2013) assumes a 0.45% CH_4 leak rate in transmission but they do not state specific assumptions about transmission miles, compressor HP and other factors. Rather, they assume a fraction of total EPA estimates for pipeline CH_4 leakage and compressor CO_2 emissions in 2009 based on the fraction of gross gas withdrawals. The ACP and MVP transmission pipelines, totaling 554.6 miles and 294 miles, respectively, may not be typical of the length and leakage rates implicit in the Laurenzi and Jersey analysis. It would be desirable to update those estimates when more specific information becomes available.

Subramanian *et al.* (2015) recently published an onsite study of compressor station emissions. It includes measurements of methane emissions from 47 transmission line compressor and storage sites. This is claimed to be the most comprehensive set of measurements since the 1996 joint EPA/Gas Research Institute study. However, the measured fugitive methane emission estimates vary by several orders of magnitude among stations and the study found no correlation between emissions and compressor horsepower. Those results, together with results of other studies, indicate that there are large variations in emissions among different technologies used in equipment, probably in the amount of effort companies spend on maintenance of things like seals on compressors, valves, and leaks, and perhaps also in the efforts spent on monitoring to detect leaks.[50] Because of the wide variance in these results and the lack of clear correlation to pipeline parameters such as total horsepower and size of pipeline, we were unable to use the results to replace or compare directly with those of the ExxonMobil study.

[50] An EPA background study, EPA (2014), prepared for analysis of a proposed NSPS standard, estimated the following methane emissions achievable per compressor for each of the three types of transmission compressor: 27.1 metric tonne/year for reciprocating, 126 for centrifugal with wet seals, and 15.9 for centrifugal with dry seals, but those estimates apparently do not include all the other components at a compressor station, which in practice can contribute substantial emissions due to leakage, venting and exhaust emissions.

Zimmerle *et al.* (2015) published a recent study of the U.S. natural gas transmission line and storage system (T&S) methane emissions. This study's estimated overall US transmission and storage sector emissions for 2012 as 1503 Gg/yr, which were within their statistical uncertainty of EPA's GHGI estimated value of 2071 Gg/yr. They also found super emitter stations that appear to be due to equipment or control malfunctions. One can compare those leakage estimates with the U.S. total value that the ExxonMobil study used as the basis for their generic estimate of pipeline emissions, which was 2,115 Gg/yr for 2009, or 0.45% of total gas production. Since total gross withdrawals in 2012 were about 16.5% larger than in 2009, the Zimmerle study value of 1503 Gg/yr corresponds to a methane leakage rate of about 40% less than the ExxonMobil study, or about 0.27% of gross withdrawals (apparent range of 0.23 to 0.39%). However, both of those estimates refer to averages over a national mix of different pipelines of different sizes, ages and capacities, so it is questionable whether they can be applied directly to specific new transmission pipeline projects. The Zimmerle *et al*. study includes the results from Subramanian et al. (2015) at individual compressor station and storage sites, but apparently extends the analysis. They fit all their results to several different models in order to draw conclusions about the overall population of sites, including the U.S. total T&S emissions cited above. However, it again it is difficult for us to interpret those results in terms of

specific estimates for the ACP and MVP pipelines.

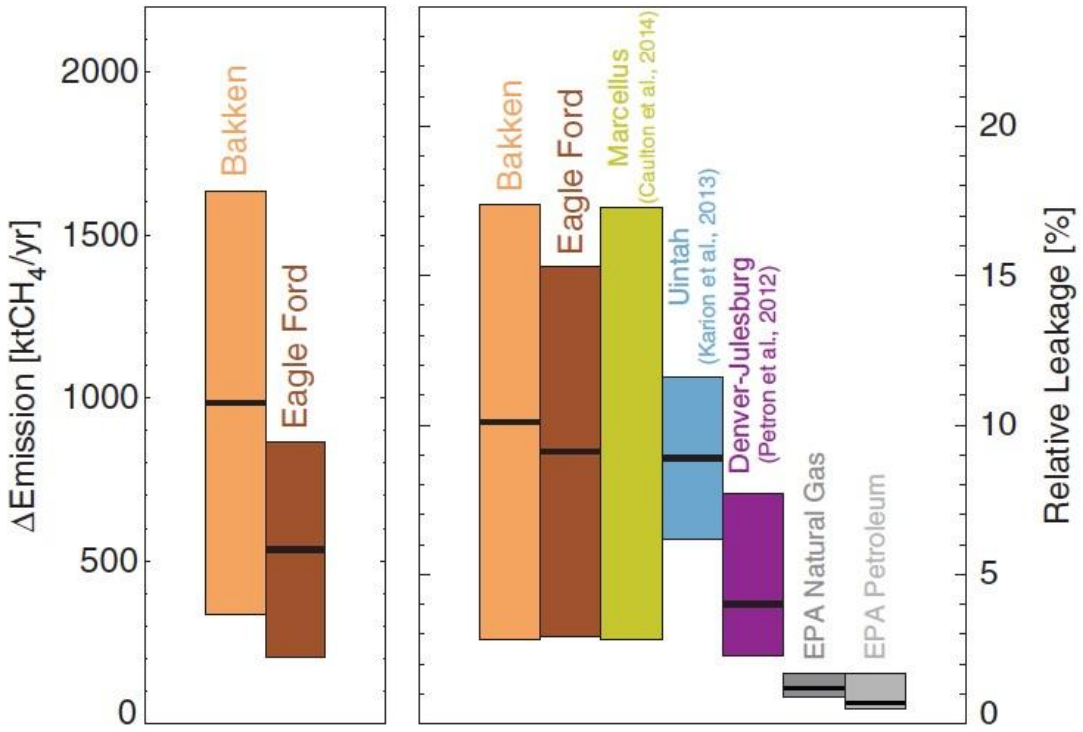


Figure 7. Estimated methane emissions are shown for the targeted regions Bakken in light brown, and Eagle Ford in dark brown. Shown are absolute emission increase (2009–2011 relative to 2006–2008) in the left panel, and the leakage rate relative to production in the right panel, in each case together with the 1σ-uncertainty ranges. For comparison, leakage estimates from previous studies in Marcellus (2012) [*Caulton et al.*, 2014], Uintah (2012) [*Karion et al.*, 2013], and Denver-Julesburg (2008) [*Pétron et al.*, 2012] (yellow, blue, and magenta) are shown together with the EPA bottom-up inventory estimates for natural gas and petroleum systems (2011) [*U.S. Environmental Protection Agency*, 2014] (grey) in the right panel.

Fig. 4. Chart from Schneising *et al*. (2014). (Figure and caption copied directly from Figure 7 of their report)

Conclusions and Recommendations

The potential total GHG emissions associated with these two proposed new pipelines could greatly increase emissions from this region for decades into the future. Hence, in an era where climate change mitigation will require reducing GHG emissions sharply, decision makers need to consider whether approval of these projects is consistent with national and international goals for climate mitigation.

Given the observed wide variation in methane emissions and the very high total potential GHG emissions, it is important that the transmission pipeline companies and FERC provide complete life-cycle estimates of methane and CO_2 emissions from their projects for the EIS for their proposed pipeline projects, together with detailed documentation of their assumptions so that the potential GHG emissions and other environmental impacts of the pipeline stage can properly be judged. It is clear that expanding gas usage and supporting it with new pipelines and production implies substantially greater total GHG emissions than appear when agencies or advocates focus on only one stage at a time and ignore the indirect impacts of the immediate project.

FERC must recognize that the emerging world commitment to cut GHG emissions, as evidenced by the recent UNFCCC COP21 agreement in Paris, will mean that the operating lives of new natural gas investments are likely to be substantially shorter than the traditional assumption that a pipeline will operate for thirty or more years. Expanding investments based on such rosy assumptions will lead to substantial stranded investments, in addition to increased global warming from excessive GHG emissions. These are ample grounds for rejecting certificate applications for expanded natural gas pipeline capacity. At a minimum, pipeline investors should be placed at risk for under-recovery of investments as a result of overcapacity for transportation of natural gas that cannot continue to be burned at historic, let alone expanded, levels for several decades into the future.

Furthermore, if FERC decides to allow either of the proposed pipelines to proceed, it should require detailed maintenance and emission monitoring plans for new and associated existing pipelines and compressor stations adequate to prevent leaks and detect all releases of methane to the atmosphere in a timely fashion so that substantial leaks can quickly be remedied, both for public safety and to minimize the climate impacts of GHG emissions.

References

Alvarez *et al.* (2012): Alvarez, R. A., *et al*., "Greater focus needed on methane leakage

from natural gas infrastructure", PNAS, 109, 6435–6440, April 24, 2012.

Brandt *et al.* (2014): Brandt, A. *et al.* "Methane Leaks from North American Natural Gas Systems", *Science* 343, 733 (2014) DOI: 10.1126/science.1247045

Concerned Health Professionals of New York, "Compendium Of Scientific, Medical, And Media Findings Demonstrating Risks And Harms Of Fracking (Unconventional Gas And Oil Extraction)" Third Edition (October 14, 2015), p. 52-57.

"Exxon Mobil Report" Laurenzi and Jersey (2013): Laurenzi, J., and G. Jersey, "Life Cycle Greenhouse Gas Emissions and Freshwater Consumption of Marcellus Shale Gas", Env. Sci. & Technol, dx.doi.org/10.1021/es305162w.

Marchese et al. (2015): Marchese, A.J., *et al*., "Methane Emissions from United States Natural Gas Gathering and Processing", DOI: 10.1021/acs.est.5b02275

Environ. Sci. Technol.

NETL (2010): "Life Cycle Analysis: Natural Gas Combined Cycle (NGCC) Power Plant", DOE/NETL-403/110509.

Petron *et al.* (2014): Pétron, G., et al. (2014), "A new look at methane and nonmethane hydrocarbon emissions from oil and natural gas operations in the Colorado Denver-Julesburg Basin", J. Geophys. Res. Atmos., 119, 6836–6852, doi:10.1002/2013JD021272.

Schneising *et al.* (2014): Schneising, O., J. P. Burrows, R. R. Dickerson, M. Buchwitz, M. Reuter, and H. Bovensmann (2014), Remote sensing of fugitive methane emissions from oil and gas production in North American tight geologic formations, Earth's Future, 2, doi:10.1002/2014EF000265

Subramanian et al. (2015): "Methane Emissions from Natural Gas Compressor Stations in the Transmission and Storage Sector: Measurements and Comparisons with the EPA Greenhouse Gas Reporting Program Protocol", DOI:10.1021/es5060258, Environ. Sci. Technol. 2015, 49, 3252−3261

EPA (2014): EPA OAQPS, " Oil and Natural Gas Sector Compressors Report for Oil and Natural Gas Sector Compressors Review Panel", April 2014.

G. Vaidyanathan, "Which oil and gas companies are leaking the most methane?" http://www.eenews.net/climatewire/2015/06/26/stories/1060020954 (June 26, 2015).

Zavala-Araiza et al. (2015): Zavala-Araiza D. et al., "Reconciling divergent estimates of oil and gas methane emissions", www.pnas.org/cgi/doi/10.1073/pnas.1522126112

Zimmerle et al. (2015): "Methane Emissions from the Natural Gas Transmission and Storage System in the United States", Environ. Sci. Technol. 2015, 49, 9374−9383.

[i] Prepared for the Virginia Chapter Sierra Club with contributions by Richard H. Ball, Ph.D., volunteer Sustainable Energy Chair, William Penniman, Esq., volunteer Conservation Chair, and Kirk Bowers, PE, Pipelines Program Manager, Virginia Chapter.