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Pursuant to 41 Pa.B. 1066, Notice of Intent to Reopen Public Comment Period on Air Quality Permit Exemptions (DEP ID: 275-2101-003) Published at 40 Pa.B. 2822, I hereby register my strenuous objection to Exemption B.38 on oil and gas exploration and production facilities and operations, on the following grounds:

**1. Oil and Gas Wells have a demonstrated Potential to Emit (PTE) Air Pollution in significant amounts.**

Among the pollutants that may be emitted from an oil and gas well are: benzene, toluene, xylenes, ethylbenzene (BTEX); hydrogen sulfide, nitrogen oxides (NOx), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons, sulfur dioxide, and particulates. The DEP itself, "Southwestern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report", November 1 2010, Commonwealth of Pennsylvania, Department of Environmental Protection, [http://files.dep.state.pa.us/RegionalResources/SWRO/SWROPortalFiles/Marcellus\\_SW\\_11-01-10.pdf](http://files.dep.state.pa.us/RegionalResources/SWRO/SWROPortalFiles/Marcellus_SW_11-01-10.pdf), found: "Sampling by the PA DEP using both OP-FTIR and canister methods, did detect concentrations of natural gas constituents including methane, ethane, propane and butane in the air near various Marcellus Shale drilling operations."

Dr. Theo Colborn, the nationally recognized expert on the health impacts from compounds in produced water, states as follows:

"As the list of the products grew, a consistent pattern of health effects kept emerging. Taking into consideration that air and water were the most likely pathways of exposures, we broke out the chemicals into two groups: volatile chemicals and water soluble. ***We also realize now that air is the most immediate pathway.*** [Emphasis added.] From 68% to 86% of the volatile chemicals cause mild to severe irritation of the skin, eye, sinuses, nose, throat, lungs, and the stomach, and cause effects on the brain and nervous system ranging from headaches, blackouts, memory loss, confusion, fatigue or exhaustion, and permanent neuropathies. Many of these chemicals are called sensitizers; they can lead to the development of allergic reactions. 35% to 55% of the chemicals cause disorders that develop slowly such as cardiovascular, kidney, immune system changes, and reproductive organ damage and are toxic to wildlife. Medical practitioners have no way to link health effects such as these with an environmental contaminant." (Written testimony of Theo Colborn, PhD, President of TEDX, Paonia, Colorado before the House Committee on Oversight and Government Reform, hearing on The Applicability of Federal Requirements to Protect Public Health and the Environment from Oil and Gas Development, October 31, 2007,

**2. The huge amounts of pressure required for hydraulic fracturing significantly increase the PTE from dissolved gases in produced water from unconventional Oil and Gas Wells.**

It is a well understood principle of physics that a gas is more soluble in a liquid at high pressure than at low pressure. There is no dispute that Marcellus Shale hydraulic fracturing requires enormous pressures. Some volatile compounds dissolved in produced water are natural constituents of gas liberated from the shale, and some are the result of chemical reactions between “native” constituents of produced gas and introduced fracking fluids; such volatile compounds will dissipate into the air when produced water is brought to the surface. Accordingly, air emissions regulations designed for wells where high pressure hydraulic fracturing is not applied are no longer appropriate to today’s shale gas drilling operations. PTE must be calculated based on a full evaluation of pressure differences between pressurized fluids underground and atmospheric pressure at the surface.

**3. The amount of air pollution emitted by an Oil and Gas Well can vary significantly based on construction methods and operational practices.**

Some drilling companies use so-called “closed loop” methods, in which produced water is contained in enclosed tanks. Other companies contain produced water in open impoundments (“frack pits”). These two methods have completely different air emissions profiles, and thus completely different PTE calculations. By not evaluating this factor in calculating PTE, a blanket exemption for oil and gas wells fails to meet the standard of a rigorous computation of PTE. In a similar fashion, oil and gas wells vary significantly in the extent to which venting and flaring may be used. It is not possible to evaluate whether an exemption from air quality regulations is justified without taking into account all such differences; this can only be done in the context of a permitting process, and hence the exemption for oil and gas wells from all forms of air quality permitting is invalid.

**4. The amount of air pollution emitted by an Oil and Gas Well can vary significantly based on the actual composition of gas being extracted.**

“Wet gas” and “dry gas” have completely different air emissions profiles. A calculation of PTE which does not take into account these differences is improperly drawn. As above, a true calculation of PTE can only occur in the context of a permitting process in which these differences are evaluated. A blanket exemption for oil and gas wells does not allow for a proper calculation of PTE.

**5. There are typically no air pollution control devices installed to mitigate air pollution from any unconventional Oil and Gas Well.**

PTE can be significantly mitigated by air pollution control devices. A blanket exemption for oil and gas wells imposes no requirement of any kind that such devices are actually employed, thus significantly increasing PTE. Among the specific sources of air pollution that fail to have any air pollution control devices installed are:

- A. Temporary compression engines for generating the pressure needed for hydraulic fracturing.
- B. Venting and flaring of gas which is being “dumped”.
- C. Condensate tanks

A blanket exemption for oil and gas wells predetermines the outcome of any possible evaluation of the effect air pollution control devices could have in these cases. It is particularly striking to note that whereas fixed compression engines installed in a compressor station are required to have air pollution control devices installed, and evaluation and testing of such devices is part of the air quality permitting process for a compressor station, there is no such requirement for similar technology installed at an oil and gas well.

**6. The exact constituents of air pollution emitted by an Oil and Gas Well depend upon the precise constituents of produced water, which may be difficult to predict.**

As stated above, pressures involved in hydraulic fracturing can result in significant air emissions due to dissolved gasses at high pressure escaping into the air at the atmospheric pressure that applies at the surface. Some of the chemicals that may be emitted are injected into the well as “fracking fluid”, but many are due to chemical reactions between injected compounds and chemicals that occur naturally underground at fracking depth. There is currently a tremendous amount of uncertainty about the nature of such chemicals, and their exact composition can vary significantly from one well to another. Scientific studies of produced water have determined that in some cases, close to half of the chemicals identified in produced water may have no CAS (“Chemical Abstracts Service”) number. It is virtually guaranteed that a chemical with no CAS number has never been scientifically studied for its health effects when emitted as air pollution. A blanket exemption for oil and gas wells from requiring an air quality permit means that there is no framework for evaluating the true PTE from gasses evolving away from produced water containment. The Department of Environmental Protection should require the operator of an oil and gas well to submit samples of produced water for testing, so that nearby wells can be properly evaluated for PTE. Where it is determined that produced water may contain harmful chemicals, those chemicals should be listed in a Material Safety Data Sheet (MSDS) and submitted with a “site permit” for an unconventional gas well. The site permit for an unconventional oil and gas well may currently include an MSDS only for the substances gasoline and diesel fuel. Such a lack of completeness in hazardous substance disclosure is unacceptable.

**7. Air pollution from Oil and Gas Wells is not currently being effectively monitored on a routine basis by any party.**

Devices for adequately measuring air pollution from an oil and gas well are currently extremely expensive; this expense currently makes it prohibitively expensive for concerned citizens to do their own air quality monitoring. Both a PID meter for measuring VOCs to the resolution at which they may be dangerous (e.g. .5 ppm in the case of benzene) and a FLIR camera sensitive to Mid Wavelength Infrared (MWIR), which would allow oil and gas well air pollution emissions to be “seen”, are likely to cost several thousand dollars. Air pollutants from an oil and gas well may be dangerous at extremely small concentrations, and are likely to be invisible in the wavelengths of natural light visible without specialized instruments.

Operators of oil and gas wells are currently doing no air quality monitoring to speak of, and if they are, no data is released to the public. The Department of Environmental Protection has done some air quality monitoring, (e.g. “Southwestern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report” cited above) but only as studies which sampled a small number of specific sites.

Thus, in general, any specific oil and gas well is extremely likely to receive no air quality monitoring of any kind. Note that the logic of excusing an oil and gas well from any form of air quality monitoring on the basis that it is exempt from requiring an air quality permit is inherently circular: there is no data to show proper PTE because the well is exempt; the exemption is deemed reasonable because — absent monitoring — an oil and gas well has been deemed to have insufficient PTE to require an air quality permit. An oil and gas well should not only require an air quality permit, but a permit backed by strong compliance testing.

**8. The health impacts of Oil and Gas Well air pollution are likely to vary significantly based on local conditions, such as topography, susceptibility to temperature inversions, and the number of other wells in the immediate area.**

Many pollutants that can be emitted by an oil and gas well are heavier than air. Others (e.g. NO<sub>x</sub>) are known precursors of ozone. In both cases, the harmful effects of air pollution are magnified by any conditions that can promote the formation of temperature inversions or inhibit dispersion by wind patterns. These effects can magnify the exposure level of any nearby resident considerably, and cause adverse health effects at

concentrations that might be otherwise less adverse. Under adverse circumstances of weather and topography, rural oil and gas wells have been associated with ozone pollution comparable to the effect of motor vehicles in urban areas. A blanket exemption for oil and gas wells from the requirement for an air quality permit forecloses on the possibility of properly evaluating such air pollution aggravating circumstances.

#### **9. The health impacts of Oil and Gas Well air pollution are not being properly assessed.**

Many of the pollutants emitted by oil and gas wells are known carcinogens, which can be harmful at extremely low concentrations. Oncologists warn that for many carcinogens, there is simply no medical basis for proclaiming an exposure level as a “safe dose”. However, since cancer is a “probabilistic disease”, proving the exact cause of any given cancer can be extremely problematic. Other symptoms of exposure to air pollutants emitted by oil and gas wells resemble those diagnosed with more common conditions, such as asthma and the notorious catch-all, “flu-like symptoms”. Such symptoms are often specifically exempted from reporting requirements, because they may be associated with varying common medical problems. Accordingly, a study of the health effects of air pollution from oil and gas wells can only be done by medical professionals using scientifically valid epidemiological methods. This is not being done in Pennsylvania, despite widespread complaints of health problems in the vicinity of concentrated oil and gas well drilling.

The Department of Environmental Protection is so poorly prepared to assess the health impacts of oil and gas production pollution that when a recent Plan Approval for a compressor station (Shamrock Compressor Station, air quality permit PA-26-00588) was challenged on the basis that projected emissions levels were not commensurable with toxicity safety standards, the DEP could produce no data of its own translating a compressor station PTE into the number of exposures to toxic substance disease, and instead relied upon a non-peer-reviewed study produced by an applicant in a different industry (a landfill) to arrive at a dubious calculation of carcinogenicity (see Memo from Alan A. Binder to Air Quality Permit File PA-26-00588, Response #5, page 6). It is quite easy not to find adverse health effects from air pollution if no one is looking for them. If the Department of Environmental Protection is so poorly prepared with peer reviewed scientific data that it cannot convert a PTE of hazardous air pollutants measured in tons per year into a probability of exposure to toxic substance disease for a nearby resident, the department has no business whatsoever exempting such a source of air pollution from the air quality permitting process. The polluting technology in the case of a compressor station compression engine is similar to the technology of a compression engine used for generating the pressure required for hydraulic fracturing, so the issues are similar.

#### **10. Oil and Gas Wells are typically connected to a common compressor station serving multiple wells, and therefore their PTE must be subject to aggregation analysis under federal and state law.**

The Pennsylvania Air Pollution Control Act incorporates by reference significant portions of the United States Clean Air Act. The EPA has directed that the following criteria be used to determine whether multiple smaller sources of air pollution should be aggregated into a single PTE analysis as a larger source:

- A. The smaller sources are all under common business control.
- B. The smaller sources are contiguous or adjoined.
- C. The smaller sources are all part of the same industrial grouping.

It is typical for multiple oil and gas wells operated by the same company to be connected to a common compressor station. It is manifestly obvious that in this case, these wells taken together meet all three criteria above. Consequently, under current air pollution law there should be an evaluation of PTE for all these wells taken together. To assume before the fact that such a joint PTE is so minimal as to justify a blanket exemption from requiring an air quality permit is simply ludicrous.