

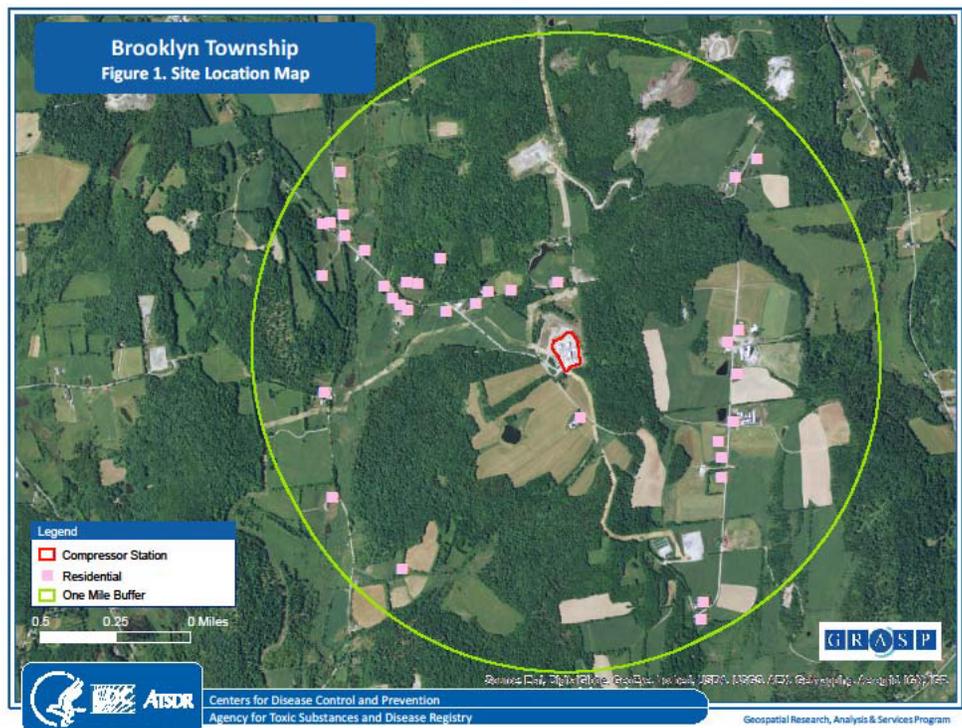
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Southwest Pennsylvania Environmental Health Project Technical Reports

ATSDR Releases Report on Compressor Station Particulate Emissions in Susquehanna County

The federal Agency for Toxic Substances & Disease Registry (ATSDR) conducted an investigation of ambient particulate matter (PM) at a residential property near the Williams Central Compressor Station in Brooklyn Township, Pennsylvania. The monitoring at the Williams compressor station helps characterize the PM exposures and potential health effects in the area surrounding the site; and, while no two gas streams are identical, the findings are useful for thinking about Pennsylvania compressor stations more generally.

*“ATSDR recommends more robust assessment of air quality (including seasonal sampling to include winter) near this natural gas compressor station and other similar air permitted sources.”
(p. 17)*



PM_{2.5} is an important pollutant to monitor when investigating the potential danger to those living near compressor stations. Gas companies are required to report PM_{2.5} emissions to the Pennsylvania Department of Environmental Protection (PADEP). Research has shown that many short and long-term health conditions can result from PM_{2.5} exposure, including decreased lung function and aggravated asthma symptoms; and it appears to be a risk factor for cardiovascular disease. In addition to posing risks on its own, PM_{2.5} can serve as a surrogate for other known air toxics released by a compressor station or other UOGD facility. If PM_{2.5} is being released it is almost certainly accompanied by, for instance, volatile organic compounds (VOCs). A spike in PM_{2.5} signals a spike in other emissions.

The Investigation

Members of the community near the Williams compressor station brought their concerns to the Pennsylvania Department of Health (PAOH), PADEP, ATSDR and the US EPA. They presented air data they had collected themselves using a Speck PM_{2.5} monitor. Residents explained that they had visibly poor air quality, odor events, and a list of adverse health effects that they believe were the result of emissions from the compressor station. The health effects they reported were consistent with what residents near other sites have reported, including sore throats, headaches, and nose bleeds.

The Williams Central Compressor Station Study

The investigation was designed to evaluate short-term PM_{2.5} exposure concentrations as well as estimated annual exposures; both based on 24 averages. ATSDR, in conjunction with the EPA, measured and evaluated PM_{2.5} concentrations at a resident's property approximately a half-mile from the 4,000 horsepower compressor station (quite small by 2016 standards). The EPA conducted continuous monitoring using E-BAM monitors, logging every 10 minutes for 18 days. Taking measurements in short intervals enables investigators to better identify short, high spikes in exposures. These short peaks can pose a health threat, as can longer lower exposures. Although they had 10-minute data, in their report, ATSDR investigators relied heavily (although not exclusively) on 24-hour averages because it focused on established and accepted health-related benchmarks – the National Ambient Air Quality Standards (NAAQS), the Air Quality Index (AQI), and the World Health Organization's (WHO) air quality guidelines. These standards put ATSDR's findings in context – up to a point.

“Given the health concerns from residents in the area, the presence of a facility permitted for particulate and gaseous emissions, and review of the citizen-collected PM_{2.5} sensor data, ATSDR requested field monitoring support from EPA”
(p. 7)

The Brooklyn Township Report, along with ATSDR's Brigich Report (see EHP's Technical Report 1), have moved the understanding on exposures and health forward. The two Reports provide empirical evidence that emissions vary in concentrations over time, sometimes reaching levels that are beyond health-based standards. Because peaks in emissions are concealed by averaging, the Environmental Health Project (EHP) urges ATSDR to increase its use of continuous monitoring or short and frequent sampling whenever possible. The 24-hour averages and the averages over the year conceal important information about the exposures individuals experience living in the midst of this UOGD facility and many others.

PM_{2.5} Standards

The PM_{2.5} standard, by which ATSDR assessed the potential for health impact on the immediate community, was defined in the NAAQS. Although *not* designed to protect the health of those living so close to an industrial facility, these standards are commonly used to gauge the potential for region-wide health impacts. The investigators referred to NAAQS's required annual average limits of 12.0 ug/m³ and referred to the NAAQS requirement that the 98th percentile of 24-hour average PM_{2.5} concentrations not exceed 35 ug/m³.

ATSDR notes, however, that the World Health Organization (WHO) has more conservative (that is, more protective) air quality guidelines. WHO uses a 24-hour average level of 25 ug/m³ and an annual level of 10 ug/m³ to judge the safety of air quality. WHO's annual standard was derived from two important studies: An American Cancer Society study and the Harvard Six-Cities study. The Cancer Society's study observed health effects from as little as 9 ug/m³ and the Harvard study observed health effects at as low as 11 ug/m³.

EHP is concerned that the NAAQS, WHO, and AQI convey an underestimate of the potential for harm to residents. Reasons include: 1) spikes in exposures can be well above short term limits, while averages are below; 2) acute health effects are seen at levels below the 24-hour requirements and chronic health effects are seen at levels below the yearly requirements; 3) PM is generally emitted in a mix with other substances. PM_{2.5} can increase toxicity because it can carry other airborne substances into the deep lung; and 4) compressor stations conduct blowdowns intermittently and these produce a much larger output of air contaminants than happens during normal operations. Because of the magnitude of release during blowdowns, they need to be addressed separately and then added to the risk attributed to exposures from normal operations.

Results

Table 1 shows that on the nearby property, the range for the first monitor was 7.8-29.2; the second was 9.8-36.7; the third monitor was 9.3-31.5. The monitoring station in Scranton is the nearest NAAQS monitor and is about 30 miles south of Brooklyn Township.

There are a few things to note about the comparison between the Scranton site and the compressor station site. First, PM_{2.5} levels at the Scranton site are not constant, but fluctuate because, in any given region, air pollution fluctuates depending on nearby sources, large polluters further away, and weather conditions. Second, the Scranton monitor was consistently showing lower levels of PM_{2.5} than the monitors near the compressor station site, yet the two locations fluctuate in a similar pattern.

The Report compares the 24-hour compressor area data with the Scranton NAAQS data and finds that the latter recorded an approximately 36% lower average PM concentration and a narrower and lower range of daily concentrations (4.2 to 25.8 ug/m³) as compared with Brooklyn Township (the 3 averaged to 19 with a range of 7.8 to 36.7 ug/m³). ATSDR also looked at that same time period at three other PA monitors and found Brooklyn's higher than those each day as well.

Table 1. Concentrations of PM_{2.5} in Brooklyn Township and Scranton, reported in 24 hour averages of mg/m³

Date	Brooklyn Monitor 1	Brooklyn Monitor 2	Brooklyn Monitor 3	Daily average of 3 monitors	Scranton air monitoring station
8.17.2015	22.7	23.8	27.6	24.7	16.89
8.18.2015	25.7	25.0	24.6	25.1	19.0
8.19.2015	21.1	21.8	21.5	21.5	12.83
8.20.2015	13.0	12.4	12.1	12.5	4.2
8.21.2015	9.5	13.9	9.3	10.9	4.29
8.22.2015	10.3	11.7	10.3	10.8	5.32
8.23.2015	11.7	13.2	13.5	12.8	8.47
8.24.2015	24.9	21.3	21.0	22.4	10.22
8.25.2015	14.0	16.6	15.8	15.5	10.07
8.26.2015	12.8	16.0	15.7	14.8	6.72
8.27.2015	7.8	11.3	11.0	10.0	4.49
8.28.2015	7.9	9.8	12.1	9.9	4.3
8.29.2015	17.7	15.5	17.1	16.8	10.79
8.30.2015	18.3	22.0	24.2	21.5	16.62
8.31.2015	18.4	21.0	20.0	19.8	16.36
9.1.2015	20.1	24.9	27.7	24.2	20.14
9.2.2015	28.3	29.4	31.5	29.7	25.82
9.3.2015	29.2	36.7	31.2	32.4	24.34
Average for 18 days	17	19	19	19	10.8

EPA values – *light green* above annual standard, *deep green* above 24-hour standard

WHO values – *light blue* above annual standard, *deep blue* above 24-hour standard

Because the numbers in Table 1 are averages over 24-hours for samples taken every 10 minutes, the highs (and lows) of PM_{2.5} are washed out in the averaging process. While the highs, when averaged over 24-hours, are 29.2, 36.7, and 31.2, the report notes that concentrations, in fact, registered high concentrations between 40 and 84 ug/m³. These are likely for short periods but, nonetheless, are high enough to cause acute health effects. At the highest daily average, 36.7, the AQI determines the air would be “Unhealthy for Sensitive Groups.” And the term “sensitive groups” is not a small part of the population as it covers the elderly and children. Acute high exposures are associated with cough, shortness of breath, and irritation of eyes, to name a few effects.

To consider chronic exposures, ATSDR calculated Brooklyn’s expected annual average to be 13% lower than the 18-day average they saw in the investigation. They estimated the annual average at 15-16 ug/m³, which is above the NAAQS and WHO standards. The report states that there is evidence that long-term exposure to PM_{2.5} of 9.7-27 ug/m³ can cause an increase in respiratory symptoms and asthma incidence, as well as respiratory hospitalizations. The health effects of toxic irritants can be increased when fine particles are present. The Report notes that developmental outcomes, specifically reductions in birth weight, can

increase at average PM_{2.5} concentrations of 11-19.8 ug/m³; and pre-term births can increase at concentrations as low as 5.3 ug/m³. (p.14)

The report suggests, “If the average concentration of 19 was present in the ambient air for a duration longer than monitoring had occurred (i.e., a year or more), the risk for adverse health effects from chronic exposures for some exposed individuals would be increased.”

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Our mission is to respond to individuals’ and communities’ need for access to accurate, timely and trusted public health information and health services associated with natural gas extraction.

Conclusions

The ATSDR Report makes an important contribution to the understanding of compressor station PM_{2.5} emissions and nearby exposures. EHP hopes additional reports on community exposure to UOGD will be produced by ATSDR, as they are extremely valuable. New compressor stations are being constructed which are 10 times greater than the Williams Central Compressor Station, so an evaluation of larger compressor stations would be a great benefit to those with concerns about these facilities. This Report, along with ATSDR’s report on the Brighc Compressor Station, show that emissions and exposures vary and reach levels that could impact residents’ health.

This report was drawn from:

Health Consultation

Brooklyn Township PM_{2.5} Health Consultations

Brooklyn Township, Susquehanna County, Pennsylvania

Cost Recovery Number 3A4K00

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