

CASE STUDY: FRACKING METHANE GAS FUGITIVE EMISSIONS

Project Description: Investigation of Well Malfunction, Health Effects to Nearby Residents.

Scope of Services: AET was contracted to evaluate the impact of a fracking well malfunction on a residence located approximately 300 yards from the well. The well had been capped and the occupants of the residence moved out; Since the malfunction the occupants complained of a natural gas-like odors and reportedly experienced headaches.

Fracking is a drilling method which injects a mixture of water, sand and unspecified (**proprietary**) chemicals under high pressure to release trapped methane gas found in underground rock formations. Studies indicate that as many as 9% of fracking wells leak (release fugitive emissions). Methane is a potent greenhouse gas (20-34 times reactive than carbon dioxide) which disperses into the atmosphere during well leakage and is viable in the atmosphere for up to 10-20 years.

Methane gas is a *colorless, odorless, tasteless* gas. Methane is relatively non-toxic and does not have an OSHA PEL Standard; its health effects are as a simple asphyxiant displacing oxygen in the lungs. Methane is extremely flammable and can explode at concentrations between 5% (LEL) and 15% (UEL).

AET's Investigative Approach/Tools:

1. **Odor Detection...** However subjective, the first step in IAQ investigations is for the investigator to utilize their olfactory sense (their nose) to confirm/deny the odor presence. Although methane is an odorless gas, numerous other odor sources can be found in the residential environment which may contribute to IAQ complaints.
2. **Visual Inspection...** The IAQ investigator must also rule out other odor sources such as mold growth, chemical/cleaning products used, new furnishings, renovations, painting, poor housekeeping practices, etc. A visual review of building components, controls and surround area can identify confounding sources.
3. **Air Quality Sampling...**
 - a. **Grab sampling (Tedlar bag):** Samples were collected inside and outside the residence for methane gas and analyzed by Infrared Spectrophotometry. Methane levels were consistent (2.2 - 2.3 ppm) inside and outside the residence, representative of general background levels in the atmosphere.
 - b. **Direct Reading Instrumentation:** Real time measurements using both flame ionization detection (FID) and photoionization detection (PID) instrumentation were used both inside and outside the residence. FID records TVOCs (including methane) in parts per million range and PID records TVOCs (excluding methane) in the parts per billion range.
 - c. **Integrated Absorption Tube Sampling:** Background air samples were collected on the 1st floor and basement levels of the residence and analyzed by GCMS analysis. TVOC results were compared to the US Green Building Council Guideline of 500 ug/M³. TVOC results were 5000 ug/M³ on the 1st floor and 3500 ug/M³ in the basement. These results are considered elevated for residential environments. GCMS analysis found no EPA hazardous air pollutants (HAPs) in the TVOC concentrations exceeding 1.0 ppb. HAPs represent more toxic VOCs that are known or suspected to cause cancer or other serious health effects.
4. **Water Quality Sampling...** Grab samples were collected at the water discharge points and compared to the EPA Safe Drinking Water Standard (metals, VOCs, Semi-VOCs, pesticides, herbicides and general chemistry parameters). In addition, methane gas concentrations within the water samples were analyzed by Dissolved Gas Analysis. The residence uses a private well/cistern for its water.

CONCLUSION: No impact to the residence from the fracking well malfunction was identified based on visual inspection, testing and analysis. Specific IAQ sources related to chemical use and storage along with poor housekeeping were noted. Elevated VOC levels resulted in project specific recommendations unrelated to methane gas fugitive emissions.

NOTE: The States of CO, TX, AR, MT and WY have passed laws requiring drillers to disclose the **proprietary** chemicals used in their fracking operations. The extent to which these chemicals can cause odor or health related problems is still in the discovery stage.

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