

Health Risks from Shale Gas Waste

POSSIBLE PATHWAYS OF EXPOSURE

Even with some federal and state regulations controlling waste disposal, there are still health risks associated with the transport and disposal of SGD waste. The pathways of exposure that can impact health include:

- Water and soil contamination from spills, leaks, dumping, accidents, and inadequately treated waste.
- Water contamination from liquid waste from an accidental loss of drilling fluids during a drilling operation from the borehole to the ground surface (known as a frac-out).
- Air emissions, such as methane and volatile organic compounds (VOCs), from storage tanks, flaring, and venting.
- Air emissions evaporated from open wastewater ponds.
- Diesel emissions from trucking and pumps.
- Soil contamination from airborne pollutants.
- In utero transmission of pollutants from mother to fetus during pregnancy.



Photo courtesy of Ted Auch, FracTracker Alliance, 2019. Aerial support provided by LightHawk.

WHY IS SGD WASTE A CONCERN?

Shale gas development (SGD)—also known as fracking—produces waste in liquid, sludge, and solid forms during processing and transportation. This waste contains toxic substances, including radioactive materials, that can enter the environment through spills, accidents, illegal dumping, and leaks.

Shale gas waste has little government oversight, making it a public health concern. Because of loopholes in the Resource Conservation and Recovery Act (RCRA), waste from shale gas exploration and production is exempt from being classified as hazardous in federal government regulations, and most states do not adjust for this exemption.

Inadequate government oversight, a lack of standardized radioactivity testing, industry self-reporting that underestimates dangers, and deficient maintenance and handling procedures have allowed industry operators to transport toxic and radioactive substances without hazardous waste designations. This can have major implications for how spills are addressed and the accompanying risks to first responders who deal with accidents. Drivers of transport vehicles often have little knowledge of the toxicity of what they are handling. Also, toxic waste often avoids comprehensive tracking and may be disposed of in nonhazardous waste landfills, which has the potential to threaten public health.

WHERE DOES WASTE GO?²



Class II Injection Wells

CLASS II INJECTION WELLS

Liquid waste brought to the surface during the hydraulic fracturing process can be disposed of by injecting it into deep underground wells, called Class II injection wells.

RECYCLED LIQUID WASTE

Some SGD liquid waste is recycled and used in other wells. To be usable, the waste must first be treated. The treatment process can complicate the tracking of liquid waste from cradle to grave. The recycled fluids are stored in tanks, impoundments, or containment pools and are trucked or piped to locations to be reused. Each time liquid waste is recycled, the toxics in the leftover by-products will be more concentrated. Any solid or liquid by-products of the recycling treatment process are sent to landfills or injected into Class II injection wells.



Recycled Liquid Waste

WASTEWATER TREATMENT PLANTS

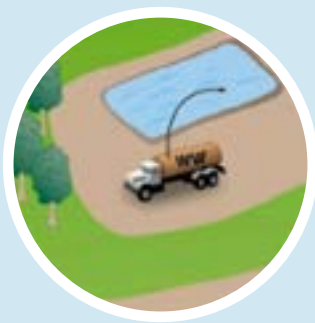
Some wastewater treatment plants treat SGD liquid waste and release the treated water into surface water. When liquid waste is cleaned, the toxics in the leftover by-products will be more concentrated. Any solid or liquid by-products of the wastewater treatment process are sent to landfills or injected into Class II injection wells.



Wastewater
Treatment Plants

EVAPORATION PONDS

Evaporation ponds or pits can also be used for SGD wastewater disposal. Wastewater is put into ponds where it can naturally evaporate. In Pennsylvania, most wastewater ponds were banned in 2016, although some centralized waste pits may be used if they are permitted. In some instances, evaporation ponds have leaked, fouling nearby water wells and posing a serious health risk to residents, pets, and livestock.



Evaporation Ponds

SOLID WASTE³

Solid waste includes drill cuttings comprised of pulverized rocks extracted during drilling, contaminated equipment used in the extraction process, and treated leachate, such as sludge filter cakes. Shale from the Marcellus and Utica formations typically contain radioactive materials (primarily radon, uranium, radium, and thorium), which are brought to the surface with drill cuttings. Levels of radioactivity vary in the shale and drill cuttings.

LANDFILL LEACHATE

Solid waste material from SGD deposited in landfills leaches toxic substances when rainwater flows through the landfill. This contaminated leachate is often processed through public sewage treatment plants, which are not designed to remove toxics. Sewage treatment plants may discharge toxics into surface waters.

WHAT IS THE RCRA?

Subtitle C of the Resource Conservation and Recovery Act (RCRA) of 1976 is meant to give the Environmental Protection Agency (EPA) the authority to regulate hazardous waste from “cradle to grave,” which includes its generation, transportation, storage, and disposal.¹ But, despite several amendments to the RCRA, waste from the production and exploration of oil, gas, and geothermal energy is exempt from this regulation.

HEALTH CONCERNS

An EPA study found 29 different chemicals, such as pyridine and acetone, present in produced water from SGD.² Many of these chemicals could lead to adverse health effects. Health concerns from shale gas waste include:

- Cancer
- Immune system effects
- Heart and brain damage
- Changes in body weight
- Changes in blood chemistry
- Liver and kidney problems
- Central nervous system issues
- Reproductive toxicity
- Poor birth outcomes and birth defects

RADIUM AND RADON EXPOSURE

The presence of radium-226 and radium-228 are of great concern for individuals’ health. The radioactive decay process releases energy in the form of radiation as unstable elements attempt to become stable. When these unstable elements are ingested or inhaled, the resulting internal exposure to radiation can contribute to various types of cancers. Radium-226 persists in the human body and environment with a long half-life (half the time it takes radium to decay) of 1,600 years.⁴

As radium-226 decays, it produces **radon**, which emits radiation that can enter the body. While radon has a much shorter half-life than radium, it can travel through air, settle on surface water, seep into groundwater, and collect in basements. Evaporation of leachate from shale gas sites or landfills can enable the release of radon into the atmosphere. The EPA considers radon to be a human carcinogen, indicating that the more exposure someone has to radon, the higher the chance they will develop cancer. Radon is the second leading cause of lung cancer in the U.S., estimated to be responsible for 20,000 lung cancer deaths every year.⁵



Water impoundment. Photo courtesy of Bob Donnan.



Drill cuttings on West Virginia site. Photo courtesy of FracTracker Alliance, 2013.

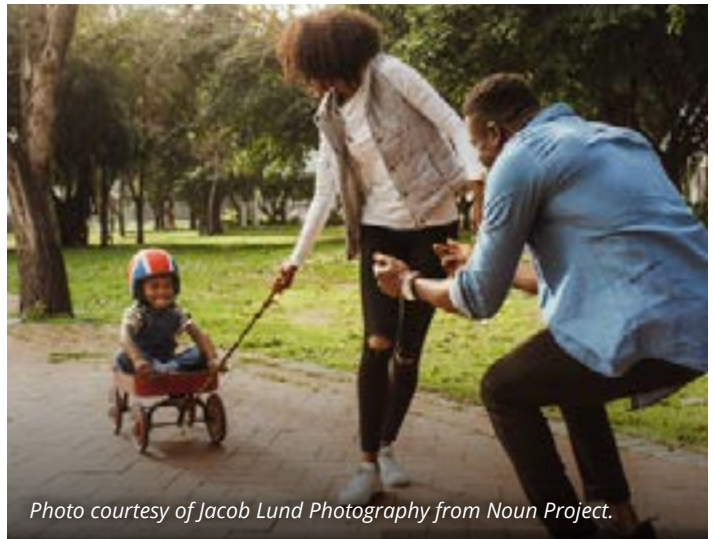


Photo courtesy of Jacob Lund Photography from Noun Project.

WHAT YOU CAN DO TO PROTECT YOURSELF

- Check the outdoor air quality in your area by visiting [airnow.gov](https://www.airnow.gov) and entering your zip code. AirNow analyzes air quality data to determine whether levels of important regional pollutants are healthy or unhealthy. In the event of an unhealthy air quality day, children and other vulnerable populations (the elderly, those with health conditions, pregnant individuals) should stay inside or limit going outdoors to short intervals.
- Be aware of SGD near your home, work, or schools. You can check nearby facilities at oilandgasthreatmap.com/threat-map.
- If you use well water, have your well tested yearly. If you notice any changes in taste, color, or smell, stop using the water immediately and have it tested as soon as possible. Be sure to vent your bathroom with an exhaust fan when showering.

- If you swim, fish, or recreate in streams or rivers, be aware of sewage treatment plant discharge point locations. If the sewage treatment plant accepts landfill leachate, the discharge may expose you to radioactive waste.
- Wear gloves when handling soil, especially when you think it may be contaminated. Wash your hands after coming in contact with potentially contaminated soil or water. Remove shoes upon entering your residence to reduce the spread of contamination.
- **Contact your local** representative and advocate for closing the **hazardous waste loophole**.
- For more recommendations about how to protect your health and monitor your air, water, and soil quality, visit [EHP's website](#).

¹ U.S. Environmental Protection Agency. (2022, September 12). *Summary of the Resource Conservation and Recovery Act*. <https://www.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act>

² U.S. Environmental Protection Agency. (2016). *Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States*. Office of Research and Development, Washington, DC. [EPA/600/R-16/236F](https://www.epa.gov/600/r-16/236f), 2016

³ U.S. Environmental Protection Agency. (2023, May 5). *Radioactive Waste Material From Oil and Gas Drilling*. <https://www.epa.gov/radtown/radioactive-waste-material-oil-and-gas-drilling>

⁴ U.S. Environmental Protection Agency. (2023, February 16). *Radionuclide Basics: Radium*. <https://www.epa.gov/radiation/radionuclide-basics-radium>

⁵ Centers for Disease Control and Prevention. (2023, January 4). *Radon in the Home*. <https://www.cdc.gov/nceh/features/protect-home-radon/index.html>

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