



Jefferson County Health Department will promote positive health outcomes through the delivery of foundational public health services.

Guidance Concerning Environmental Public Health Impacts of Data Centers (2.25.2026)

Overview

Data centers offer a combination of economic opportunities and significant environmental, health, and infrastructure challenges. While they can generate tax revenue, create jobs, and attract technology investment, they may also pose risks related to air quality, water consumption, noise pollution, and power grid stability. This report summarizes the primary impacts and key considerations for communities evaluating new or proposed data center projects. Its purpose is to provide guidance to decision-makers and residents as they discuss the potential construction of a data center in their area.

Many public health impacts can be reduced through proper project design, high-quality construction practices, and consistent oversight by appropriate regulatory agencies, such as the Missouri Department of Natural Resources. Communities are encouraged to carefully weigh both the potential benefits and the associated risks before reaching a decision.

In preparing this document, the Jefferson County Health Department contacted another county health department to determine whether they had received citizen complaints related to data centers in their jurisdiction. No complaints were reported. This document should not be interpreted as Jefferson County Health Department endorsing or opposing the development of data centers; it is intended solely to provide awareness and educational information.

Air Quality and Respiratory Health

Data centers may contribute to local air pollution through direct and indirect emissions.

Key Issues

- **Diesel Generator Emissions:**

Backup generators—commonly Tier 2 diesel units—emit nitrogen oxides (NOx) and fine particulate matter (PM2.5). During testing or outages, emissions can be significant relative to cleaner Tier 4 units and can create localized exposure concerns for nearby residents.^{1 2 3}

- **Health Risks:**

Exposure to PM2.5 and NOx is linked to asthma, lung cancer, and cardiovascular disease. Strengthening the annual PM2.5 standard to 9.0 µg/m³ in 2024 reflects the latest health evidence on these risks.^{4 5 6}

- PM 2.5 is defined as fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller. These particles come in many sizes and shapes and can be made up of hundreds of different chemicals. Some are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks, or fires. Most particles form in the atmosphere through complex reactions involving pollutants such as sulfur dioxide and nitrogen oxides, which are emitted by power plants, industries, and automobiles.
 - Key Harmful PM2.5 Components of Fossil Fuels: ¹³
 - Black Carbon (Elemental Carbon): Produced by the incomplete combustion of diesel and coal, this soot is highly toxic to the cardiovascular system.
 - Sulfates (SO₄) & Nitrates (NO₃): Formed from sulfur dioxide (SO₂) and nitrogen oxides (NOx) emitted by power plants and vehicles, these secondary particles are major contributors to respiratory issues.
 - Polycyclic Aromatic Hydrocarbons (PAHs): Organic compounds that adsorb onto particle surfaces, often linked to carcinogenicity and chronic obstructive pulmonary disease (COPD).
 - Heavy Metals: Vanadium (V), Nickel (Ni), Manganese (Mn), and Iron (Fe), often released from heavy oil combustion in shipping and industry.
 - Volatile Organic Compounds (VOCs): Including benzene and formaldehyde, these contribute to secondary organic aerosol formation.
 - Nitrogen dioxide NO₂ is defined as a highly reactive, reddish brown toxic gas with a pungent odor, primarily produced by burning fossil fuels in vehicles, power plants, and industrial equipment. As a key component of nitrogen oxides (NOx), it contributes to smog, acid rain, and secondary particulate matter. It is a major respiratory irritant, causing increased asthma symptoms and reduced lung function, particularly in children and sensitive individuals.



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- **Indirect Pollution:**

High energy consumption forces utilities to keep fossil-fuel plants online longer, increasing regional emissions.³

- **Key EPA National Ambient Air Quality Standards (NAAQS)**

- **Fine Particulate Matter (PM_{2.5}):** The annual primary standard was tightened to 9.0 micrograms per cubic meter in February 2024 to better protect public health. This is the average daily exposure limit over the course of a year. It is designed to protect against chronic, long-term health effects (e.g., cardiovascular disease, lung cancer). The 24-hour standard remains at 35 micrograms per cubic meter. This is designed to protect against acute, short-term exposure effects (e.g., asthma attacks, increased risk of heart attacks).^{3 4 5 6}

- **Nitrogen Dioxide:** 100 parts per billion (ppb) (1-hour) and 53 parts per million (ppm) (annual).^{4 6}

- **Preventative Measures:**

- Limit the permissible hours of operation for backup diesel generators. Typically, these are permitted to operate up to 50 -100 hours per year for routine maintenance, testing, and unplanned emergency grid outages.
- Hydrogen fuel cells and Natural gas generators are emerging in large-scale, long-duration applications and represent much cleaner options than diesel generators.
- Natural gas power generation for data centers provides a lower emissions profile, is highly available, and allows for longer runtimes.
- Integration of renewable energy sources such as solar or wind.
- Battery energy source systems can provide shorter-term backup power with high efficiency, lower cost, and reduced emissions.^{1 2 3}

Water Security and Quality

The cooling demands of large data centers can put significant pressure on local water systems.

Key Issues

- **Consumption:**

Large data centers may use millions of gallons per day; several sources document individual sites using ~3–5 MGD and larger facilities up to 5 MGD, comparable to a town of 10,000–50,000 people.^{7 8}

- **Community Effects:**

Documented cases show stressed municipal supplies and concern over well levels in high impact regions when multiple facilities cluster.^{7 9}

- **Contamination Risks:**

Cooling systems and e-waste can create potential pathways for wastewater, stormwater, or soil/groundwater impacts if not properly managed.⁷

- **Preventative Measures:**

- Use of Public water vs Private water to ensure water usage can be monitored
- Closed-loop water cooling systems
- Using air-cooled systems with water-cooled systems during cooler weather.^{7 10}

Noise and Physical Disturbance

Constant operations introduce persistent environmental noise.

Key Issues

- **Noise Pollution:**

HVAC systems, cooling towers, and server infrastructure can produce sustained 75–100 dBA source levels, with low frequency components traveling far and causing a continuous hum that disturbs sleep and elevates stress in nearby neighborhoods.^{11 12}

- **Grid Instability Risks:**

Sudden load changes from data centers can cause voltage spikes ("harmonics"), damaging appliances or increasing fire hazards.³

- **Established decibel limits**

- The 70 dB(A) $L_{eq(24)}$ environmental exposure limit recommended by the Environmental Protection Agency (EPA)
- The 80 dB(A) maximum of 40 hours per week recommended by the WHO.
- The 85 dB(A) Recommended Exposure Limit (REL) published by the National Institute for Occupational Safety and Health (NIOSH)



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- **Preventative Measures:**

- Increase the distance from the source to the property line.
- Addition of natural barriers such as trees or berms between the source and the property line.
- Enclosing generators or placing walls to reduce or direct noise away from residential areas.
- Schedule generator testing during the daytime and coordinate with the community.^{11 12}

Environmental Public Health Summary

Data centers can affect environmental health through air emissions, water use, noise, and light. Their overall impact depends on facility location, environmental regulations, and the effectiveness of mitigation measures.

Key Environmental Health Considerations

- **Air Quality:** Diesel backup generators and maintenance testing can release particulate matter and other pollutants.
- **Water Resources:** High cooling-related water demand may strain local supplies, and improper handling of process water can introduce contamination risks.
- **Noise:** Continuous equipment noise can affect nearby residents' comfort and well-being.
- **Wastewater and Stormwater:** Runoff or discharge that is not properly managed can carry pollutants into soil and water systems.

When supported by strong environmental controls and transparent monitoring, data centers can reduce these risks and limit impacts on surrounding communities.

Footnotes

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