

What Birmingham Should Require Before Approving Future AI Factories – Temperature Impacts

A simple, forward-looking request about one thing only: heat.

This is not about any one project. It is about the rules a city writes for the projects that come next.

Two scientific studies released in 2026 found measurable warming around large data centers. One drove sensors through neighborhoods and measured the air. One used twenty years of satellite data to measure the ground. Neither was done in Birmingham. Neither can predict an exact temperature at any one address. But together they raise a fair question a city should answer before it approves a project, not after.

The question, in one sentence

Before a facility that turns hundreds of megawatts of electricity into heat is approved, has anyone studied where that heat goes after it leaves the property?

What the studies found

The first study, from Arizona State University, is the first of its kind. Researchers drove temperature sensors through neighborhoods next to operating data centers and measured the actual air, a few feet off the ground, where people and animals live. They found measurable warming beyond the property line, on the order of one to nearly four degrees Fahrenheit, reaching hundreds of feet into nearby neighborhoods. The work was funded by the U.S. Department of Energy, declares no conflict of interest, and has been peer reviewed and published, meaning independent experts checked it before it appeared.

The second study, led by the University of Cambridge with international partners, took the opposite approach and a far wider view. Using twenty years of satellite temperature readings, the team compared the ground temperature around thousands of AI data centers worldwide, before and after each began operating, focusing on facilities outside dense cities so other activity would not muddy the signal. They found a consistent jump in surface temperature once a facility switched on, across many different climates, and named the pattern the data heat island effect. That study is newer and has not yet been peer reviewed.

The two used completely different methods, ground sensors in one case and satellites in the other and reached the same broad conclusion. Large data centers can create measurable warming around them. Here is how they compare.

	Arizona State study	Cambridge study
What it measured	The air people breathe, near the ground	The ground and rooftop temperature, by satellite
How	Sensors driven through real neighborhoods	Twenty years of satellite data, thousands of sites, before vs after each opened
Where	Operating data centers, Phoenix area	Thousands of AI facilities worldwide, mostly outside cities
What they found	About 1 to nearly 4 degrees F warmer nearby	A consistent surface temperature jump after opening, across many climates
How far	Hundreds of feet from the fence	Reaching well beyond the property, miles in places
Reviewed by experts	Yes, peer reviewed and published	Not yet, still a preprint

One honest note a reader should keep in mind. Air temperature and ground surface temperature are not the same measurement. On a hot day, pavement can scald a hand while the air only feels warm. The two studies measured different things, which is why their numbers differ. What matters is that two very different methods pointed the same direction.

Why even a small increase is worth studying

A change of a degree or two can sound trivial. It is not, and the reason is simple.

A human body runs at about 98.6 degrees. Let it rise just three or four degrees and you do not feel a little warm. You have a fever and you are in bed. Small numbers matter enormously when they are added to a baseline already near a limit. Summer afternoons in this region already sit close to the edge of safe outdoor conditions, so extra heat is not added to a mild day. It is added to the most dangerous days, the ones already at the limit, and it returns every summer.

Why a temperature increase matters to the people nearby.

These are not hypothetical worries. They are the documented consequences that federal agencies associate with locally higher temperatures. Whether and how much they occur at a given site is exactly what a thermal study would determine.

Higher power bills. Air conditioners work against the outside air, so when the air around a building is warmer, the unit runs longer and costs more. The EPA reports that air conditioning electricity demand rises roughly 1 to 9 percent for every 2 degrees Fahrenheit of temperature increase, with the United States, where most buildings have air conditioning, at the high end. In a region where cooling is already the largest part of a summer electric bill, that lands directly on homeowners and businesses.

Strain on the power grid. The EPA notes that higher local temperatures raise not just overall electricity use but peak demand, which spikes on hot summer afternoons. In extreme heat, that added demand can overload the system and force a utility into rolling brownouts or blackouts, affecting everyone on the grid, not only the nearest neighbors.

Health and safety on the hottest days. The CDC and the National Weather Service report that extreme heat is one of the leading weather-related causes of death in the United States. The people who feel added heat first are older adults, young children, people with heart or lung conditions, and anyone who works or exercises outdoors. A few degrees on an already dangerous afternoon is not a comfort question. It is a safety one.

Warmer nights, and less recovery. Heat that builds during the day lingers after dark. The EPA finds nighttime temperatures in heat affected areas run measurably higher, and warm nights are when heat illness compounds, because the body never gets its overnight cool down.

Lakes, creeks, and wildlife. The EPA links elevated local temperatures to warmer stormwater runoff, which raises the temperature of nearby lakes and creeks. Warmer water holds less oxygen, which stresses fish and the life that depends on them, and can worsen algae. Birds, pollinators, and other wildlife in nearby green space feel heat stress too.

Dirtier air. The EPA notes that hotter conditions speed the formation of ground level ozone, or smog, and that the extra power generation to meet cooling demand adds air pollutants. Both can aggravate asthma and other respiratory conditions in the surrounding community.

None of these is a claim that a specific outcome will happen at a specific site. They are the reasons the question is worth asking before a decision, not after.

What a city should require

For future AI factories and hyperscale data centers, the ordinance should require:

1. Site specific thermal impact studies. Independent modeling of potential off site warming, before approval.
2. Prevailing wind analysis. An evaluation of where released heat is most likely to travel during summer operating conditions.
3. Summer peak condition modeling. Analysis of the hottest periods, when cooling equipment runs at maximum.
4. Public disclosure. The results made available to the public before any hearing or approval.
5. Post construction verification. Confirmation that real world conditions match the modeling once the facility is operating.

A reasonable request

The purpose is not to oppose technology, jobs, or growth. The purpose is to make sure decisions are informed by science. Two independent studies now suggest that large data centers can create measurable warming, and federal agencies have long documented how local warming affects energy costs, public health, and the environment. Before future projects are approved, a city should require thermal studies, so residents, businesses, and community institutions understand the potential impact first.

Suggested comment for a public hearing

I respectfully ask that the city require thermal impact studies for future AI factories and hyperscale data centers. Two recent scientific studies have documented measurable warming around large data centers, and federal agencies have long linked local warming to higher energy bills, grid strain, and heat related health risks. Before approving future projects, the ordinance should require site specific thermal modeling, prevailing wind analysis, public disclosure of the results, and post construction verification, so that nearby neighborhoods and community facilities understand the potential impact before construction begins.

Sources

Sailor, David J., et al. Data Center Waste Heat as an Emerging Urban Thermal Hazard: First Field Measurements of Neighborhood Scale Air Temperature Impacts. ASME Journal of Engineering for Sustainable Buildings and Cities, vol. 7, 2026. Peer reviewed.

Marinoni, Andrea, et al. The Data Heat Island Effect: Quantifying the Impact of AI Data Centers in a Warming World. Preprint, arXiv, 2026. Not yet peer reviewed.

U.S. Environmental Protection Agency. Heat Island Impacts, and Climate Change and Heat Islands. epa.gov/heatislands. Energy demand, peak load and grid strain, water quality, air quality, and nighttime temperature effects.

U.S. Centers for Disease Control and Prevention, and National Weather Service. Extreme heat as a leading weather related cause of death in the United States; vulnerable populations. cdc.gov and weather.gov.

National Weather Service ASOS wind records, Birmingham-Shuttlesworth (BHM) and Bessemer (EKY), via the Iowa Environmental Mesonet, Iowa State University. Summer afternoons, May to September, noon to 6 p.m.