Vulnerability Amplification: How Grid-Embedded Burdens Compound Disadvantage in Ann Arbor's Most Vulnerable Census Tracts

The Saline data center is 14 km from Ann Arbor's highest-SVI communities. Distance decay reduces proximity burden, but service-territory allocation does not.

Tract 26161410600 is 13.8 km from the data center. Distance decay reduces its proximity burden to 9% of the site score. But grid-embedded burdens (indirect water withdrawal, grid NOx, and carbon emissions) arrive at full population-weighted intensity through DTE's service territory. Vulnerability amplification then lifts this tract's EJMI 29% above what distance alone would predict.

SVI 1.000 | 78% minority | 39% poverty | Median income $29,391 | EJScreen 100th percentile

How the Same Facility Scores Differently by Tract

	Saline Twp (closest)	Saline Twp (4.6 km)	Ann Arbor 26161410600	Ann Arbor 26161400500
Distance from site	1.64 km	4.56 km	13.75 km	14.0 km
Population	3,544	6,292	3,055	7,871
Median income	$154,886	$87,305	$29,391	$30,085
Poverty rate	2.1%	4.6%	39.3%	69.8%
Minority population	18.3%	12.1%	78.4%	23.7%
SVI score	0.389	0.148	1.000	0.926
Proximity burden share	79%	71%	74%	63%
Grid burden share	21%	29%	26%	37%
Env burden (0–100)	44.2	21.6	5.7	5.6
Health burden (0–100)	48.4	23.7	6.3	6.1
Air burden (0–100)	41.3	20.2	5.4	5.2
Water burden (0–100)	43.1	43.6	4.7	5.5
Climate burden (0–100)	1.4	2.5	1.2	3.1
Procedural deficit	62.3	30.4	8.1	7.9
Vulnerability amplifier	1.117×	1.044×	1.3×	1.278×
EJMI without amplification	42.9	26.0	5.0	5.3
EJMI with amplification	47.9	27.2	6.4	6.8
Vulnerability uplift	+12%	+4%	+29%	+27%

What This Table Shows

The leftmost two columns are Saline Township tracts closest to the facility. They have the highest EJMI scores (47.9 and 27.2) because distance decay gives them 79–89% of the site-level burden. But their low vulnerability (SVI 0.04–0.39) means amplification adds only 4–12% to their scores.

The rightmost two columns are Ann Arbor's most disadvantaged tracts. Distance decay drops their proximity burden to 9–10% of the site score. Yet grid-embedded burdens (indirect water withdrawal, grid NOx, carbon emissions via DTE's service territory) still reach them at 26–37% of their total allocated burden. And because SVI scores of 0.926–1.000 trigger the maximum vulnerability amplifier (1.278–1.300×), their final EJMI is lifted 27–29% above what distance alone would predict.

This is the structural inequity that EGLE's single-site permitting cannot detect: the same facility burdens affluent nearby tracts through proximity and disadvantaged distant tracts through the grid, and pre-existing vulnerability compounds the latter. HB 5594–5596 should require tract-level cumulative burden analysis using a framework like EJMI before any data center above 100 MW is permitted.

Sources and Methodology

1. Tract demographics: ACS 2022 5-Year (B01003, B17001, B19013, C16002, B03002, B25070). Centroids: Census TIGERweb 2020.
2. SVI: Constructed from ACS per CDC/ATSDR SVI methodology (percentile ranking of socioeconomic, household, minority/language, housing/transport indicators).
3. EJMI framework: distance decay 1/(1+(d/3km)^1.5); watershed allocation by HUC-12; service territory allocation by DTE Electric population share.
4. Vulnerability amplifier: 1 + 0.3 × SVI. Procedural deficit amplifier: 1 + 0.2 × (deficit_score/100). Per EPA OEJ cumulative impact guidance.
5. Site-level scores from dc_impact_model_v3.R, calibrated against Google, Microsoft, and Meta sustainability disclosures (2024).