



BALL STATE UNIVERSITY

Brightfield for Bright Future Project: Brightfield for a Brighter Future Project: Solar Potential Analysis for the City of Muncie

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URBAN PLANNING

Abstract

The Ball State University Regional Analysis and Design studio for Spring 2021 worked in partnership with multiple Ball State University offices and other outside resources to explore the possibility of redeveloping brownfields in Delaware County, Indiana. The studio consisted of 10 sophomore urban planning students under the guidance of Dr. Sanglim Yoo. The studio explored GIS data for the county's brownfields with funding coming from the Ball State Provost Immersive Learning Grant. The studio contacted the Sierra Club Hoosier Chapter to discuss the benefits of a more sustainable Delaware County as well as the current energy production that is available to Indiana. The class used the data collected such as site characteristics, and energy output from the projects and came to the conclusion that the best sites for redevelopment as utility-scale and large-scale were the Motors Liquidation Company and the Muncie Sanitary District Water Treatment Plant, respectively.

Project Description

This project is very important in the area that Ball State University and the CAP program is located in because of the abundance of Brownfields. Ball State University is located in Muncie, Indiana, which is in the northeast part of Indiana, and was once a booming industrial town.

Muncie, Indiana and the Midwest are part of an area nicknamed "The Rust Belt". It is called this because the small towns and even larger cities have lost the infrastructure and industry that was once there, and left behind rusting buildings and empty lots and ghost towns. Starting at the beginning of the 20th century, industry and factories began popping up in Midwest states and their economies grew rapidly. There was an abundance of resources and workers. The biggest being steel production and limestone. Then during the post-war times of the 1950's to the 1970's these industries started to gain competition from international companies, and started leaving the area to go to cheaper places, either national or international. Left behind were acres and acres of contaminated sites and giant factories that the towns and cities were not financially able to redevelop or reuse.

Now, there are opportunities to change that, with the growing sector of solar power. These sites have always been viewed as unusable as they had contaminated grounds and debris left over from their previous owners. For solar farms, it doesn't matter that these sites are polluted because solar panels do not rely on ground conditions. This past fall semester, our sophomore class of Urban Planners researched the basics of solar power and learned what the process of planning for solar energy. This project focused on sites in Delaware County, Indiana, and was based on analyzing sites that would be best for a solar site to be installed. Our class went through a selected list of sites and compared them to each other based on a set of criteria, things like acreage, expected energy output, and current zoning and land use, to find the best candidates for solar power. Then they would be presented to the city government for a chance to actually be considered for redevelopment. The end goal for this project is to teach how to plan for solar as it grows in the coming future, and the process of bringing solar to places that have not had it in the past.

Project Objectives

Promote the use of renewable energy

Analyze possible sites for solar development on brownfields in and around Muncie

Research the environmental and economic benefits of solar power

Provide information and encourage local residents to pursue renewable energy in their community

The Basics of Solar Power

A solar panel works by taking radiation directly from the sun, which generates direct current (DC). The radiation from the sun is captured by a solar cell in a photovoltaic system. The cells are made of semiconductors, or materials that can conduct electricity. Usually cells are put together into solar panels that are arranged in rows. The radiation is passed through the semiconductors to conductive wires usually made of copper. Then the energy is passed to an inverter that changes the energy from Direct Current, DC, to Alternating Current, AC. This power is then immediately used, stored in a battery, or output to the power grid.

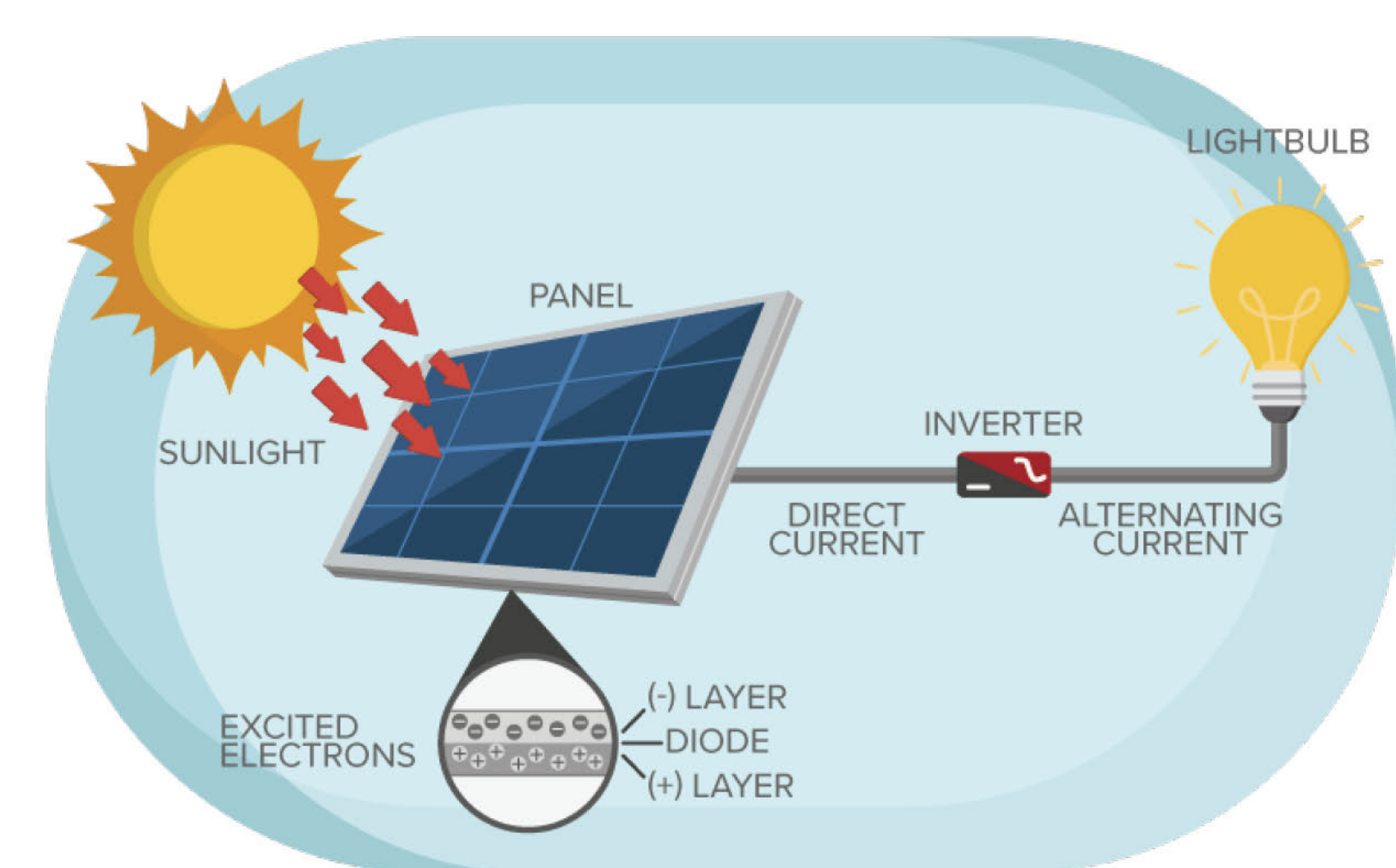
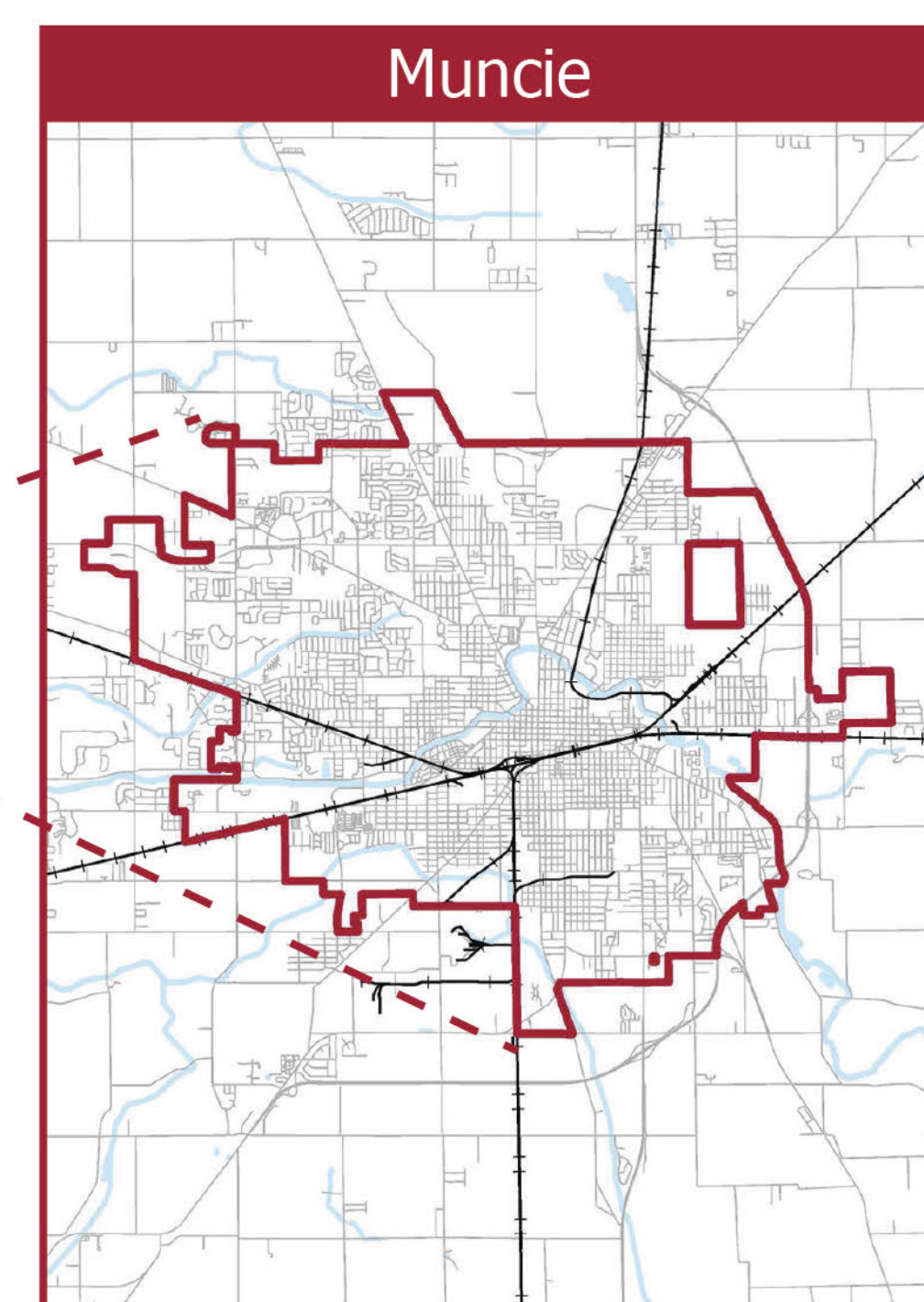
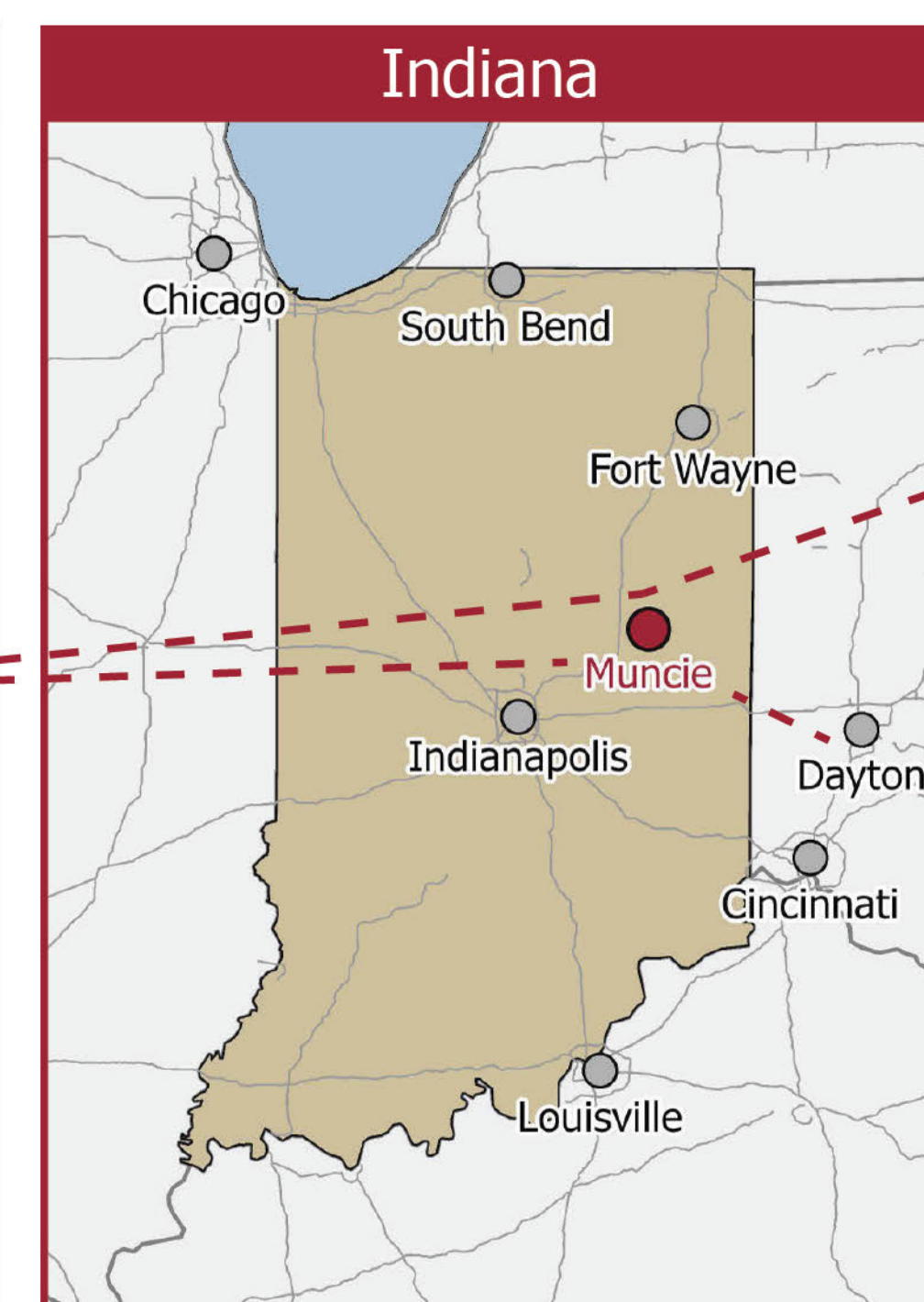


Image: <https://medium.com/the-pingo-blog/how-solar-panels-work-c693eeabab>

Regional Context



Central Eastern Indiana is composed of 8 counties that were all established in the 1800s gas boom. The 8 counties are Blackfield, Hancock, Henry, Jay, Madison, Wayne, Randolph, and Delaware. The gas boom created many glass factories, manufacturing, and automotive jobs, especially in Muncie and Anderson, the two largest cities in the region.

In the 1980s, automobile among other factory jobs were declining, and the Central Eastern Indiana region became a part of the Rust Belt. This decline resulted in many vacant properties which experienced decades of polluting industry, thus becoming the brownfields seen around the city of Muncie today.

Real-Life Example: Kokomo, IN

Our urban planning class took a field trip to Kokomo, IN to see and learn about how solar power was implemented into the city. The existing industrial buildings were demolished and two feet of soil was added to keep industrial contaminants contained.

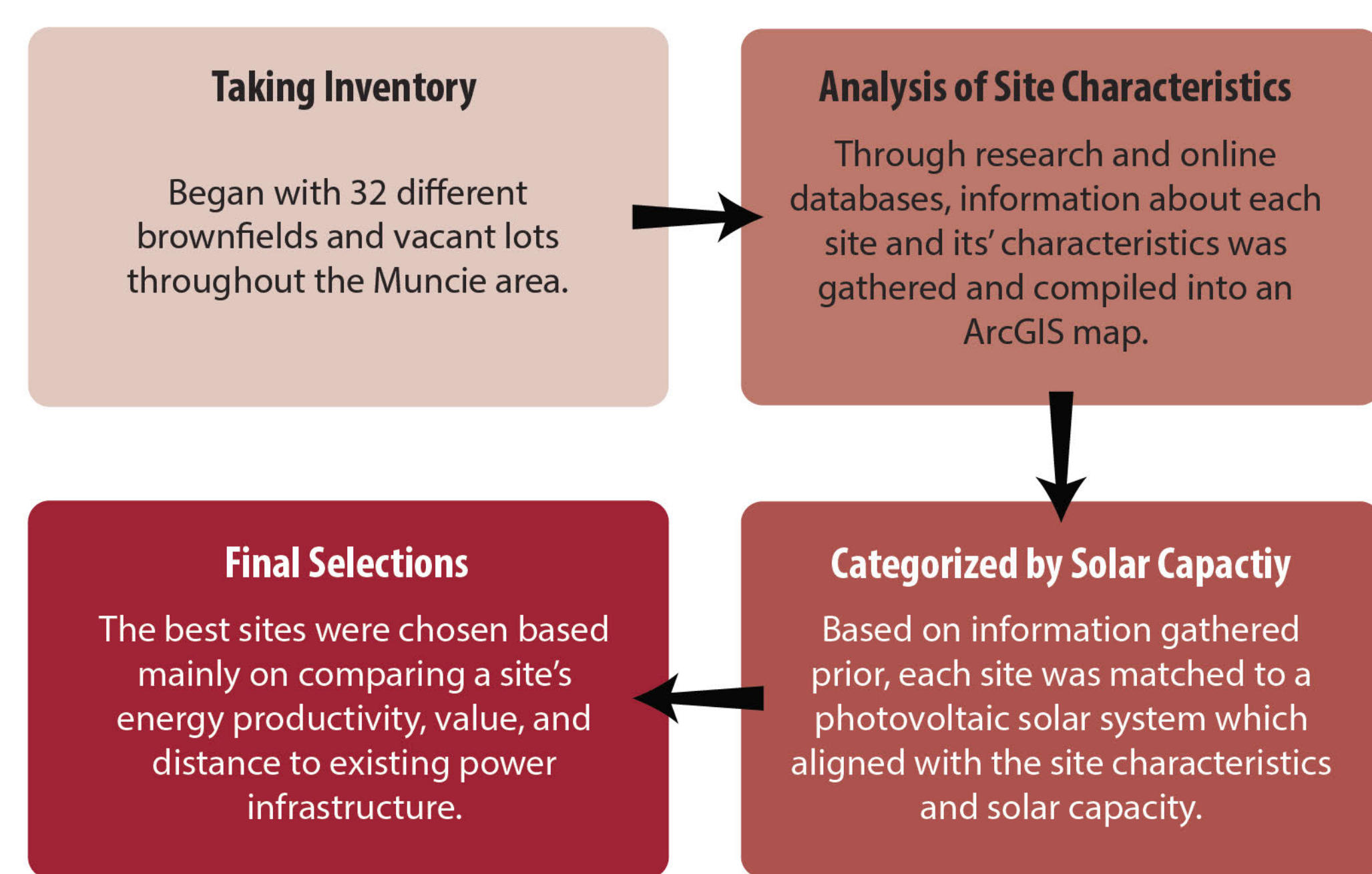


Above: Weather monitoring system



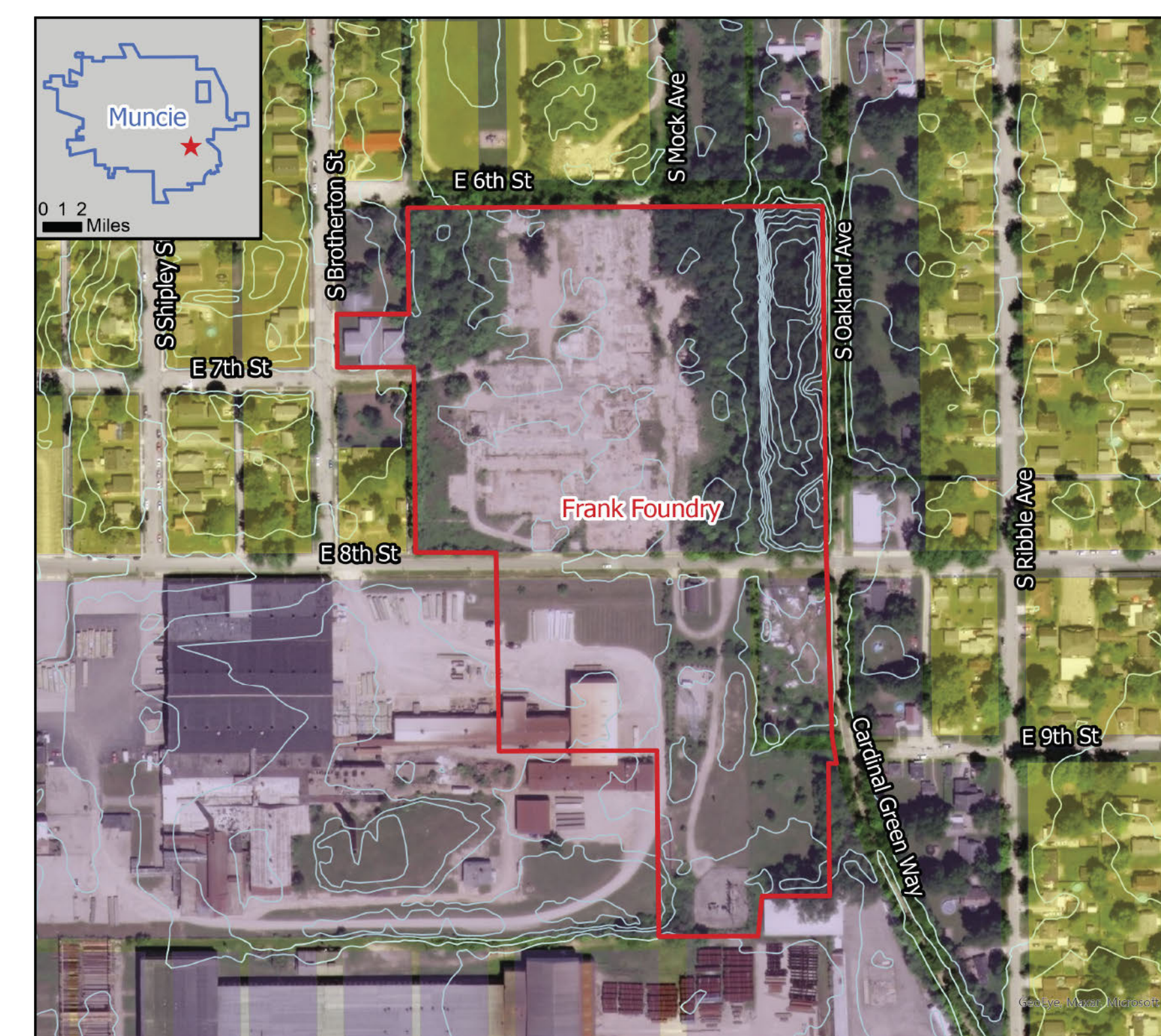
Below: Solar array of 24 panels.

Site Selection Process



Solar Power can be used anywhere on Earth that gets sunlight. In the Midwest, Indiana specifically, there are plenty of hours of available sunlight from which electricity can be generated throughout the year. Solar farms are easily constructed on flat, open land, which is abundant in Indiana. Hence, solar farms are a great investment for communities to pursue a greener energy future and redevelop abandoned/vacant lots.

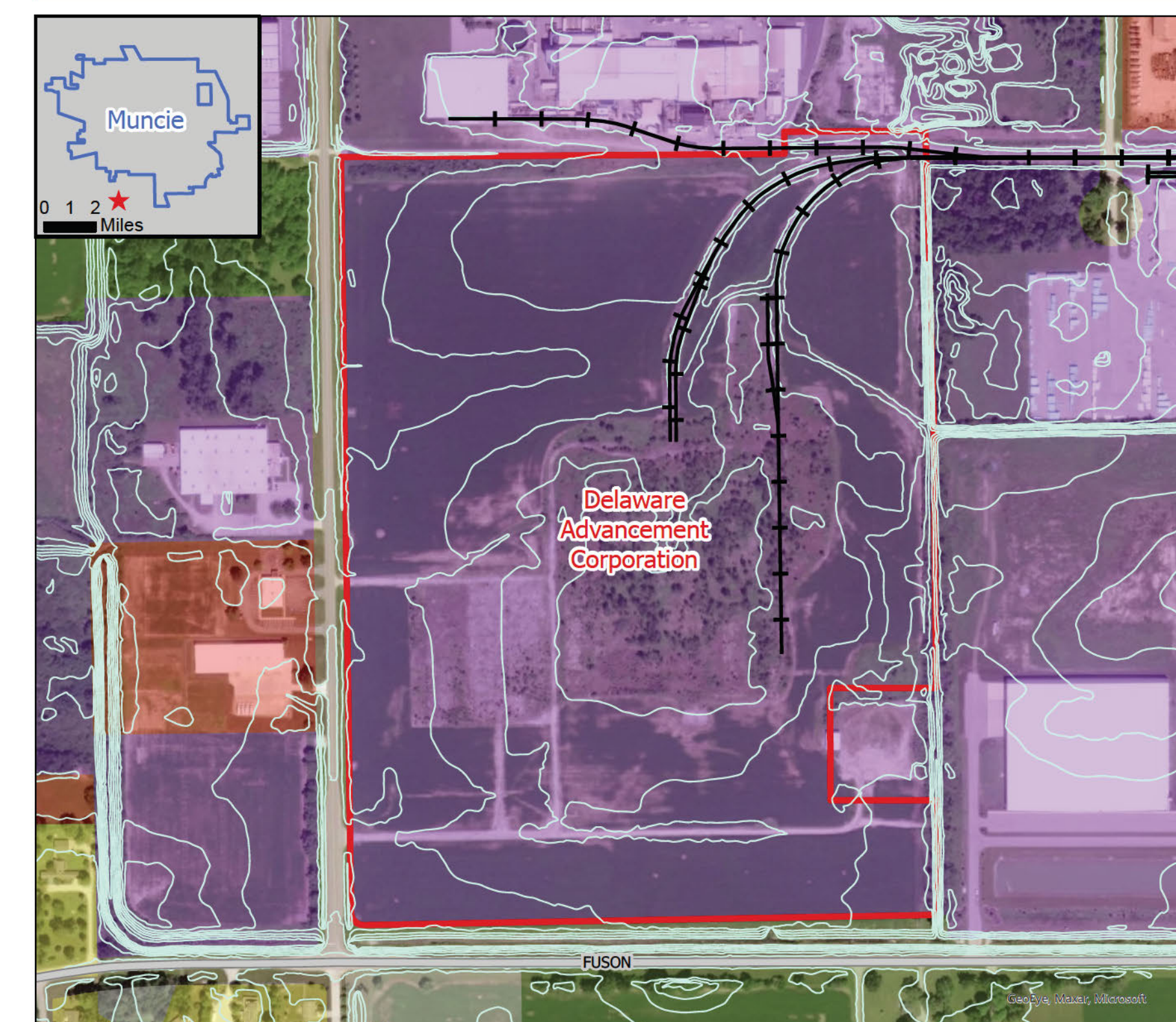
Large Scale Solar PV Installation



Legend: Boundary, Residential, Agriculture, Railroad, Commercial, Institutional, Contours, Industrial

- Frank Foundry**
- + Address: 2100 E 8th St., Muncie, IN
- + Brownfield Program: EPA Brownfields
- + Area: 19.25 acres
- + Zoning: Intense Industrial
- + Municipality: Southeast Neighborhood, City of Muncie, Delaware County, IN
- + Distance to Substation: 0.7 mi
- + Distance to Transmission Line: 1.3 mi
- + Distance to Major Road: 0 mi
- + Estimated Solar Energy Production: 21,161,298 kWh/year
- + Estimated Annual Energy Value: \$1,798,710

Utility Scale Solar PV Installation



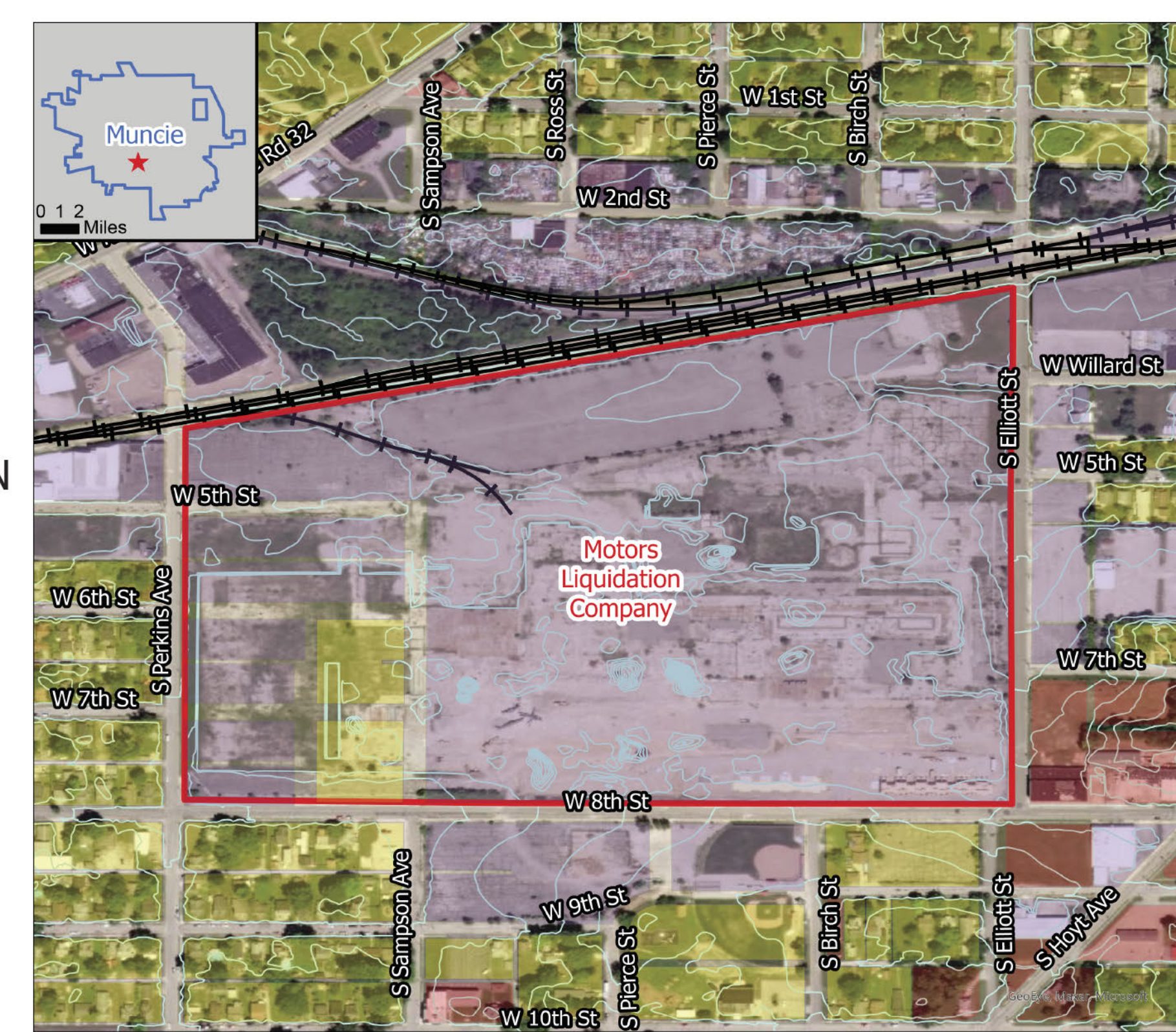
Legend: Site Boundary, Residential, Agriculture, Contours, Commercial, Institutional, Railroads, Industrial

- Delaware Advancement Corporation**
- + Address: 4500 S Delaware Dr., Muncie, IN
- + Brownfield Program: EPA Brownfields
- + Acreage: 100.1 acres
- + Zoning: Intense Industrial
- + Municipality: Muncie, Delaware County, IN
- + Distance to Substation: 1.3 mi
- + Distance to Transmission line: 0.55 mi
- + Distance to Major road: 0 mi
- + Estimated Solar Energy Production: 83,021,112 kWh/year
- + Estimated Annual Energy Value: \$7,056,797



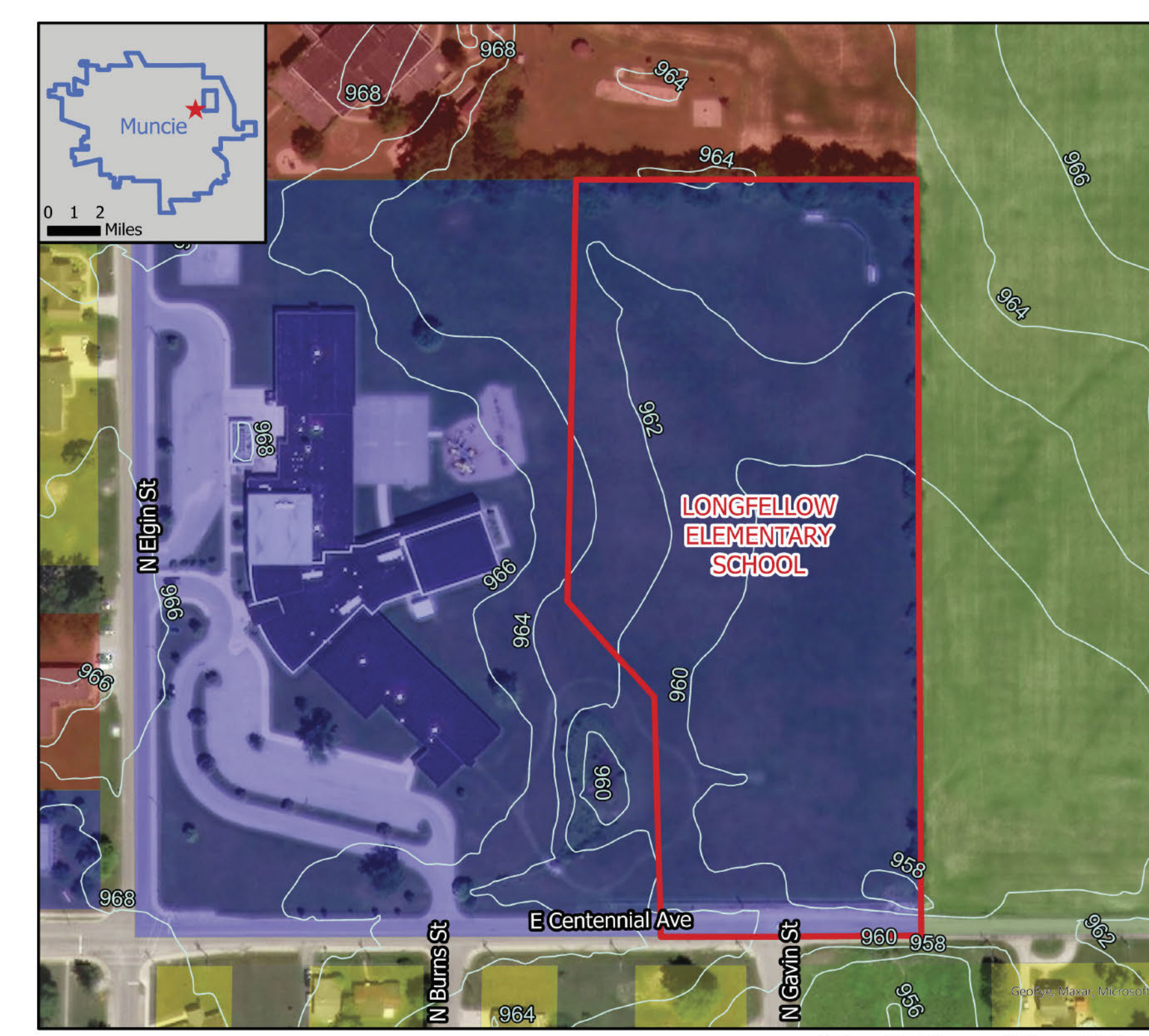
Legend: CR3 of IN, Industrial, Railroad, Contour

- CR3 of IN**
- + Address: 2501 W Mt. Pleasant Blvd, Muncie, IN
- + Brownfield Program: EPA Brownfields
- + Area: 10 acres
- + Zoning: Industrial
- + Municipality: Center Township, Delaware County, IN
- + Distance to Substation: 1.1 mi
- + Distance to Transmission Line: 1.0 mi
- + Distance to Major Road: 0.98 mi
- + Estimated Solar Energy Production: 9,237,052 kWh/year
- + Estimated Annual Energy Value: \$665,992



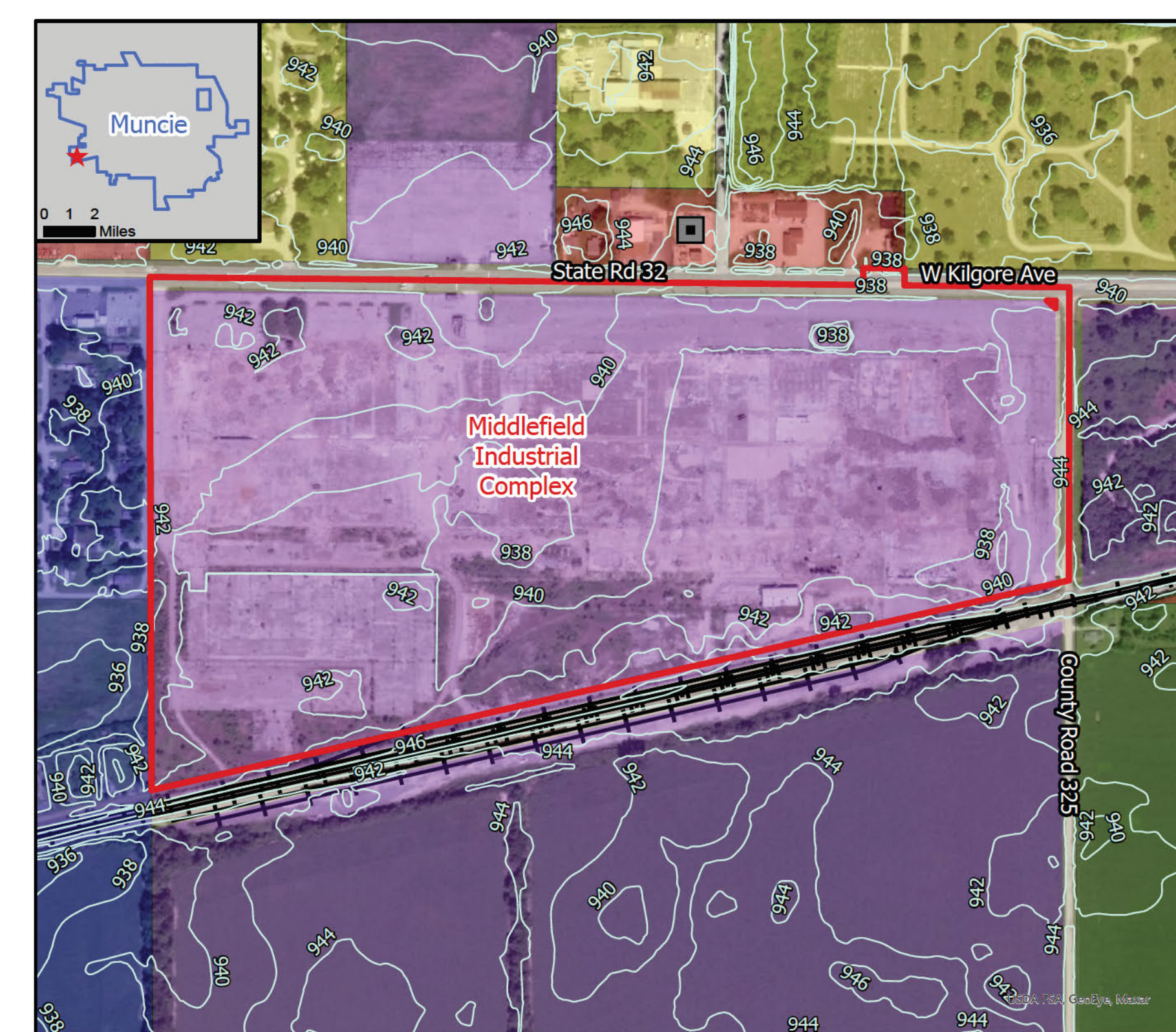
Legend: Boundary, Residential, Agriculture, Railroad, Commercial, Institutional, Contours, Industrial

- Motors Liquidation Company**
- + Address: 1200 W 8th Street, Muncie, IN
- + Brownfield Program: EPA Brownfields
- + Area: 58.39 acres
- + Zoning: Intense Industrial
- + Municipality: Southwest Neighborhood, City of Muncie, Delaware County, IN
- + Distance to Substation: 0.6 mi
- + Distance to Transmission Line: 0 mi
- + Distance to Major Road: 0 mi
- + Estimated Solar Energy Production: 48,688,712 kWh/year
- + Estimated Annual Energy Value: \$4,138,540



Legend: Boundary, Commercial, Vacant, Contours, Institutional, Residential, Agricultural

- Longfellow Elementary School**
- + Address: 1700 N Elgin Street, Muncie, IN
- + Brownfield Program: None
- + Area: 5.42 acres
- + Zoning: Residence Zone 4
- + Municipality: City of Muncie, Delaware County, IN
- + Distance to Substation: 1.0 mi
- + Distance to Transmission Line: 2.1 mi
- + Distance to Major Road: 0 mi
- + Estimated Solar Energy Production: 4,383,080 kWh/year
- + Estimated Annual Energy Value: \$372,563



Legend: Site Boundary, Railroads, Industrial, Substation, Residential, Yorktown, Contours, Commercial, Agriculture

- Middlefield Industrial Complex**
- + Address: 5401 W Kilgore Avenue, Muncie, IN
- + Brownfield Program: IDEM Brownfield
- + Acreage: 73.3
- + Zoning: Industrial
- + Municipality: Muncie, Delaware County IN
- + Distance to substation: 0.03 mi
- + Distance to transmission line: 0.58 mi
- + Distance to major road: 0 mi
- + Estimated Solar energy production: 59,636,044 kWh/year
- + Estimated energy value: \$5,069,064