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Reuse and the Benefit to Community A Beneficial Effects Economic Case Study for the Reilly Tar & Chemical Corp. (Indianapolis Plant)

Introduction

The Reilly Tar & Chemical Corp. (Indianapolis Plant) Superfund site is in southwest Indianapolis, Indiana. Coal tar refining and wood treating activities took place on the southern part of the site from 1921 to 1972. Chemicals manufacturing started on the northern part of the site in the 1940s and continues today. Former waste handling practices from these operations contaminated soil and groundwater. EPA added the site to the Superfund program's National Priorities List (NPL) in 1984. The cleanup approach enabled chemical manufacturing to continue at the site as well as the installation of a solar facility on the southern part of the site. Innovative thinking and cooperation among EPA, the state and developers led to the return of this formerly contaminated area to beneficial reuse, expanding the renewable energy portfolio of a local utility.

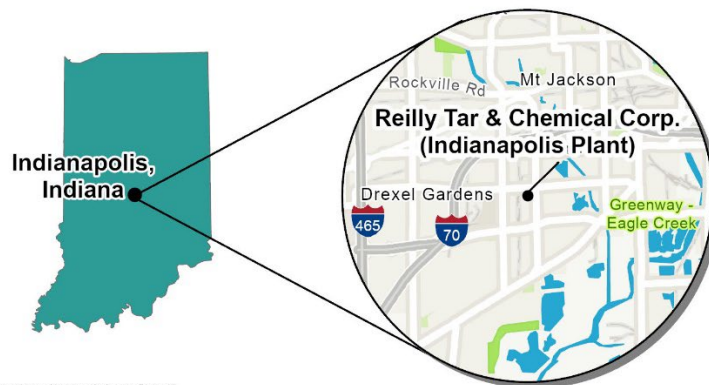
Superfund site restoration and reuse can revitalize local economies with jobs, new businesses, tax revenues and local spending. Cleanup may also take place while active land uses remain on site. This case study explores the cleanup and reuse of the Reilly Tar & Chemical Corp. (Indianapolis Plant) site, illustrating the beneficial effects of Superfund Redevelopment.

Beneficial Effects

One on-site business employs about 50 people. It generates nearly \$33 million in annual sales revenue.

Site properties are currently valued at over \$4 million. They generate about \$290,000 in annual property tax revenue.

Innovative design enabled the installation of a solar array while ensuring the protectiveness of the remedy. Energy production from the solar facility offsets more than an estimated 13,000 metric tons of carbon dioxide every year.



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Figure 1. The site is in Indianapolis, Marion County, Indiana.

Site History

The 120-acre site is in a mixed residential, industrial and commercial area of Indianapolis. Minnesota Street divides the site into the 40-acre Oak Park property to the north and the 80-acre Maywood property to the south. About 1,700 people live within a mile of the site. This community has lower incomes and education levels when compared to statewide averages, and has higher-than-average environmental stressors/pollution.

The Republic Creosoting Company began operating in 1896, ultimately refining coal tar and treating wood on the southern part of the site. The company started its chemical division in the 1920s and changed its name to Reilly Tar & Chemical. Wood treatment operations at the site stopped in 1972. In 1941, several chemical plants started operating on the northern part of the site. Reilly Tar & Chemical Corporation (Reilly) started making specialty chemicals on the Oak Park property in the 1950s. It eventually expanded operations to areas on the Maywood parcel. The Vertellus company was the result of a corporate merger in 2006. It continues to make chemicals on site today under the new name Aurorium.

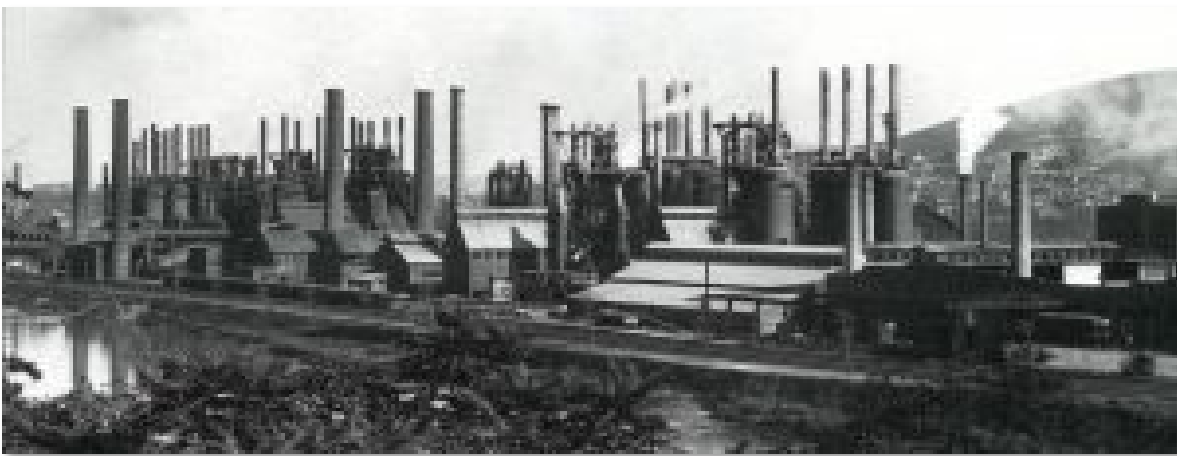


Figure 2. The Republic Creosoting Company Plant, Indianapolis, 1905.

Source: Vertellus website: <http://vertellus.com/about>.

Contamination History

Contamination at the site is a result of wastes from the creosoting process and substances used to make specialty chemicals. Analyses found that at least five former waste-disposal areas could be the sources of contamination. These areas include a lime pond, an abandoned railway trench, a former sludge treatment pit, a drainage ditch and a landfill.

From 1953 to 1965, operators disposed of waste from chemical process areas in the lime pond at the Oak Park property, including solid materials and sludge. Investigators found volatile organic compounds (VOCs) in the soil east of the pond. An abandoned railway trench on the northern part of the Maywood property once enabled the loading and unloading of rail shipments. Later, operators backfilled the trench with drums of coal tar enamel and foundry sand. Investigators found VOCs and semi-volatile organic compounds (SVOCs) in the fill material. Between the early 1950s and 1979, operators dumped sludge from coal tar refining and synthetic chemical operations into the former sludge treatment pit on the Maywood property, leading to VOC and SVOC contamination. The sludge was left in the pit to evaporate. It was later disposed of in landfills.

From the start of industrial activities in 1921 until the mid-1970s, operators also dumped construction debris and soil at the South Landfill in the southern area of the Maywood property. Operators also disposed of other solid and semi-solid wastes. These wastes included creosoted timbers, pitch, coal, sludge and distillation residues from chemical processes. Contaminants in this area included VOCs, SVOCs, nonaqueous phase liquid (NAPL) and dense nonaqueous phase liquid (DNAPL). The former drainage ditch carried wastewater from a petroleum production separator into the storm sewer and eventually into a nearby creek, leaving behind VOCs and SVOCs.

The first site-related complaint came up in 1955. It cited odors and disposal practices as well as the presence of alpha picoline, a chemical made at the site, in nearby residential wells. In the years that followed, the community frequently expressed concerns about the site. In 1964, investigations found contamination in off-site groundwater and on-site surface water. Subsequent investigations by the state and EPA identified on-site groundwater contamination and elevated levels of contaminants in soil. In 1987, a spill of 60,000 gallons of waste fuel occurred on the Oak Park property.

Investigations found benzene, pyridine and ammonia in the groundwater. EPA found that the groundwater contamination as well as potential contact with soil contaminated with VOCs, SVOCs and polynuclear aromatic hydrocarbons (PAHs) posed an unacceptable risk to human health and the environment. EPA added the site to the NPL in 1984.



Figure 3. Lumber treated with creosote.

Site Cleanup

Reilly, the site's potentially responsible party (PRP), started remedial investigations in 1987 and led cleanup activities with oversight from EPA and the Indiana Department of Environmental Management (IDEM). To manage the complex cleanup, EPA divided the site into five different areas, called operable units (OUs). EPA selected the cleanup plan for OU1 in 1992 and updated it in 2021. It laid out interim actions to contain and treat groundwater, established restrictions on the development of the landfill, prohibited drinking water well installation and use, and created a buffer zone around the landfill property. EPA signed the cleanup plan for OU2 in 1993 and updated it in 1997, addressing soil contamination in the source areas. This plan included the solidification and covering of

sludge in part of the South Landfill area, and excavation and off-site thermal treatment of soil from the four other source areas. The plan also restricted the use of these areas to industrial uses and limited access to prevent exposure to contamination.

EPA selected the cleanup plans for OU3 and OU4 in 1996. These plans included placing a permeable soil cover on part of the southern area of the site, as well as a concrete cover and soil vapor extraction (SVE) system in a northern part of the site. Land use restrictions known as institutional controls also limit the use of these areas to industrial uses and protect the covers. EPA finalized the cleanup plan for OU5 in 1997. It selected the site's existing groundwater extraction system to prevent groundwater contamination from migrating off site. It also established monitoring for areas of off-site groundwater to determine if levels of contamination were decreasing naturally.

All parts of the site's remedy are in place. EPA and IDEM have regularly shared information with community members and other site stakeholders, and sought their feedback. The extraction system built in 1994 addressed groundwater contamination, which was treated at a publicly owned treatment works. In 2021, EPA updated this part of the remedy from a pump-and-treat system to biosparging, an in-place method that stimulates the natural degradation of contamination with bacteria. Ongoing monitoring of groundwater on site and off site helps determine the ongoing protectiveness of the remedy. Land use restrictions at the site limit the types of uses and activities that can take place. Vertellus, now Aurorium, continues to operate the site's remedy and conduct maintenance activities on behalf of Reilly.

Beneficial Effects

Today, the site remains in productive continued use and supports new reuse. Site business Vertellus continued to produce specialty chemicals during the cleanup, providing local jobs and generating tax revenues. Coordination among Vertellus, developers, EPA and the state of Indiana enabled the redevelopment of a vacant area on the southern part of the site as Maywood Solar Farm, a solar energy project. Open, unused land with appropriate use restrictions can be an ideal location for the installation of solar energy projects. These types of projects can benefit communities and help achieve EPA's goal of supporting projects that provide clean, renewable energy in disadvantaged communities and offset carbon emissions. Innovative ideas and close collaboration enabled the development of the solar energy project at the site while ensuring the continued protectiveness of the site's remedy.



Figure 4. View of Maywood Solar Farm at the site.

Vertellus (now Aurorium)

While Aurorium has locations all over the world, Indianapolis hosts its headquarters as well as its largest manufacturing plant, the facility at the site. According to the company, its on-site operation at 1500 South Tibbs Avenue is the largest facility producing the compounds pyridine and picoline in the world. Its products have uses in the pharmaceutical and agrochemical industries, including in the making of pesticides and herbicides. Vertellus is the successor to Reilly Tar & Chemical Corporation, whose founder started creosote manufacturing activities at the end of the 19th century at the South Tibbs Avenue facility. The company declared bankruptcy in 2016, announcing up to 50 layoffs at the Indianapolis plant at that time. It has since undergone changes in ownership, financial restructuring and other acquisitions to emerge from bankruptcy. In 2023, Vertellus acquired CENTAURI Technologies, the company's sixth acquisition since 2019, and rebranded itself as Aurorium. The new company name "better represents the Company's growth and evolution as a global materials innovation partner with a diversified portfolio of specialty ingredients and performance-enhancing materials." Aurorium continues to make specialty chemicals on site. Today, the company employs around 50 people. It generates nearly \$33 million in annual sales at its chemical production facility on site.



Figure 5. Chemicals made at Aurorium's facility on site are used in the pharmaceutical industry.

Maywood Solar Farm

In the early 2010s, Vertellus was considering ways to use the southern part of the Maywood property, an area that includes the former South Landfill. About 40 acres of the Maywood property had long been mostly vacant or used for storing shipping trailers. With cleanup complete, any development projects would need to be designed in a way that did not impact the protectiveness of the site's remedy. Avoiding disturbance of the site's capped areas was of particular importance.

Around that time, a firm interested in solar projects in the area approached Vertellus. This outreach kicked off discussions about the potential to convert the land into a large-scale solar project. At the same time, the Indianapolis Power & Light Company (IPL), a local utility now known as AES, was offering a voluntary "feed-in tariff" incentive called the Rate Renewable Energy Production (REP) pilot program. Under this incentive, utility customers with a qualifying renewable energy project could lock in a set price for electricity. The utility would pay above-market rates for the electricity produced, with a longer-term power purchase contract that could be set for a maximum of 15 years. With Vertellus looking to develop its underused land at the site, and the concurrent renewable energy incentive from IPL, the timing was right to set in motion a process to turn the once-contaminated land into a resource for solar power generation.

The project also aligned well with the goals of EPA's Superfund Redevelopment Program, which supports solar and other renewable energy projects at Superfund sites as part of green remediation efforts that benefit communities and bolster long-term sustainability goals for energy production and climate resilience. From the

outset, EPA managers, state officials, property owners and developers coordinated closely to ensure the project's viability and secure the long-term protection of human health and the environment.



Figure 6. A mostly vacant area on the southern part of the site.

Vertellus first partnered with Inovateus Solar to apply to the Rate REP program in August 2012. IPL approved the application shortly thereafter, and Vertellus and Inovateus Solar submitted interconnection and power purchase agreements to the Indiana Utility Regulatory Commission (IURC), which gave final approval for the agreements in 2013. Unfortunately, while the incentive program demonstrated great promise in increasing carbon-cutting renewable energy projects, it stopped accepting applications after just a couple of years, during the same month when Vertellus received approval to participate in 2013. This narrow window for participation in the incentive program underlined the importance of efficient and swift action on the part of all parties to acquire approvals and move the project forward.

After the initial application approval, Vertellus set out to find a different solar developer that could tackle the project's complex design needs. Hanwha Q Cells, a division of a South Korean company, had experience building large solar facilities. The company also brought its experience working at contaminated sites to the table. While vacant areas at Superfund sites can be well suited for land-intensive solar projects, ensuring remedy protectiveness can present unique design and installation challenges. Potential costs and legal liabilities can prove prohibitive. At the site, Hanwha Q Cells focused on minimizing the potential of soil disturbance at capped areas and addressing risks of exposure to buried waste during project construction activities.

Typically, large-scale solar projects rely on extensive excavation and trenching to install the needed infrastructure to mount and power the solar arrays. At the site, such activities could threaten the protectiveness of capped areas and create potential exposure risks for workers. To address these issues, Hanwha Q Cells devised an innovative soil management plan to minimize ground disturbance. Its design employed a driven, pile-based mounting system, which reduced the need to move or excavate soil. It also avoided trenching by keeping equipment such as panel wiring and inverter pads aboveground using cable trays. The project also worked with the site's topography rather

than extensively grading land to achieve a level surface. The company was able to reduce soil movement by an estimated 93%, compared to conventional solar construction approaches.



Figure 7. Crews preparing the site for solar project installation.



Figure 8. A driven-pile method was used in place of concrete ballasts.

Sustainability Benefits

Full-scale electricity generation at the Maywood Solar Farm started in early 2014. The project covers 45 acres on the southern part of the site and includes more than 36,000 ground-mounted, fixed-tilt solar panels, 4,549 piles, 1,400 solar panel racking tables and eight inverters. The project used conventional financing and received no other subsidies outside of IPL’s Rate REP program. Construction of the solar project employed about 75 to 100 people. Vertellus, now Aurorium, derives value through a lease agreement with 174 Power Global, previously Hanwha Q Cells. According to the National Renewable Energy Laboratory’s PVWatts Calculator, the Maywood Solar Farm’s estimated annual power production is 14,538 megawatt hours.¹ Using solar energy instead of traditional sources eliminates greenhouse gas emissions and carbon dioxide emissions. Power generated at the Maywood Solar Farm is effectively equivalent to avoiding the release of:²



10,303 metric tons of carbon dioxide.



The greenhouse gas emissions of **2,293** gasoline-powered passenger vehicles driven for one year.



The carbon dioxide emissions from **1,299** homes’ energy use for one year.

¹ National Renewable Energy Laboratory PVWatts® Calculator: <http://pvwatts.nrel.gov>.

² EPA Greenhouse Gas Equivalencies Calculator: <http://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>.

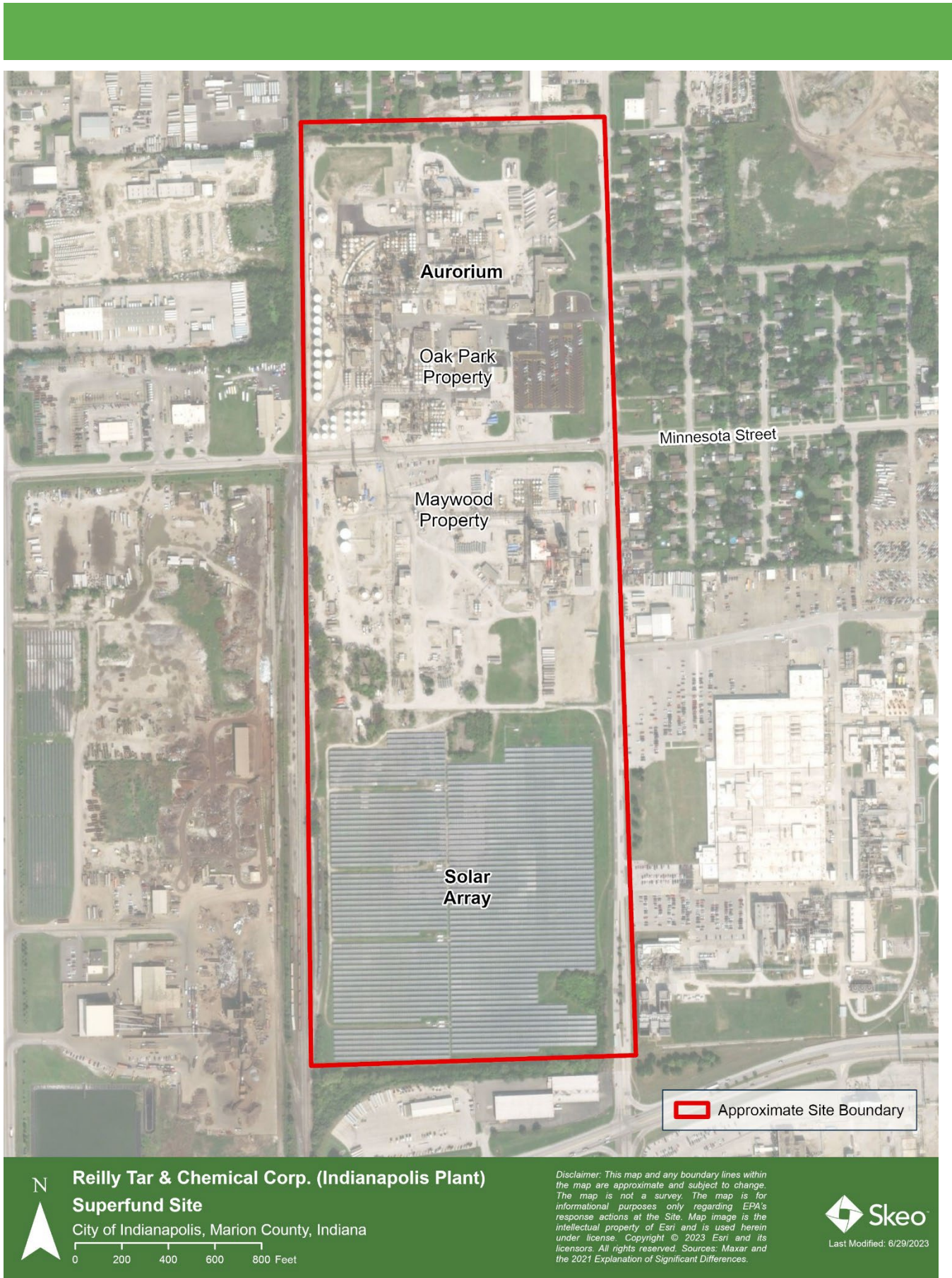


Figure 9. This site map shows Maywood Solar Farm as well as active chemical manufacturing facilities on the Oak Park and Maywood properties.

Solar Redevelopment Lessons Learned

Maywood Solar Farm has continued operating through mergers, acquisitions and business name changes. Key lessons learned from the solar facility's development are shared below.

Solar facilities at Superfund sites are a win-win.

Providing electricity through renewable resources. Returning a blighted property to beneficial use. Establishing partnerships to ensure the long-term protectiveness of the site remedy in place that will also support long-term beneficial use. Solar projects at Superfund sites can serve multiple purposes while achieving industry, agency and community objectives. At appropriately scoped sites, solar power generation can be a well-chosen redevelopment priority.

Solar development at a Superfund site can cost about the same as it would on a greenfield.

Through close coordination with EPA, Hanwha Q Cells was able to complete Maywood Solar Farm without any restrictive additional costs. In fact, final project costs were comparable to estimated project costs for a similarly sized project on a greenfield.

EPA support helps make redevelopment projects possible at many Superfund sites.

Local governments, private parties and communities lead solar development projects at Superfund sites. To help make these projects possible, EPA brings its depth of knowledge, guidance and counsel to the table, helping to streamline the redevelopment process and minimize any "extra" cost of siting a project on a Superfund site. In Indianapolis, EPA worked with developers to identify risks and construction requirements for working at the site, clarify relevant costs and liabilities outside of a typical market study, outline purchaser protections and develop a bona fide prospective purchaser agreement, and minimize and mitigate liability wherever possible.



Figure 10. An incentive through a local utility improved the commercial viability of Maywood Solar Farm.

Transparent and open collaboration facilitate long-term project sustainability.

With clear guidance for construction activities and operation and maintenance responsibilities as well as liability mitigation and protections through compliance with a bona fide prospective purchaser agreement, a transparent operational framework

was in place at the site. As a result, despite mergers, acquisitions and name changes, transitions of site responsibilities and protections were smooth and straightforward. EPA resources help parties collaboratively build strong foundations for redevelopment projects, ensuring the long-term sustainability of the projects and site remedies.

EPA Region 5 RENEW Award

EPA Region 5 developed the RENEW Award to recognize outstanding efforts in the reuse of Superfund sites that strengthen communities and advance environmental protection. In April 2014, EPA Region 5 honored developer Hanwha Q Cells with the first-ever Region 5 RENEW Award in recognition of its commitment to the safe and beneficial reuse of the Reilly Tar & Chemical Corp. (Indianapolis Plant) Superfund site. The photo below shows the 2014 ribbon-cutting ceremony at the 10.86-megawatt facility.



Figure 11: Representatives from Vertellus Specialties, Inc., EPA Region 5, Hanwha Q CELLS USA, IDEM and Indiana’s 97th District at the ribbon-cutting ceremony for Maywood Solar Farm.

“EPA supports safe and appropriate site reuse. In particular, the Agency views renewable energy as a great reuse for Superfund sites and other impaired properties.”

– Dion Novak, EPA Region 5 Project Manager

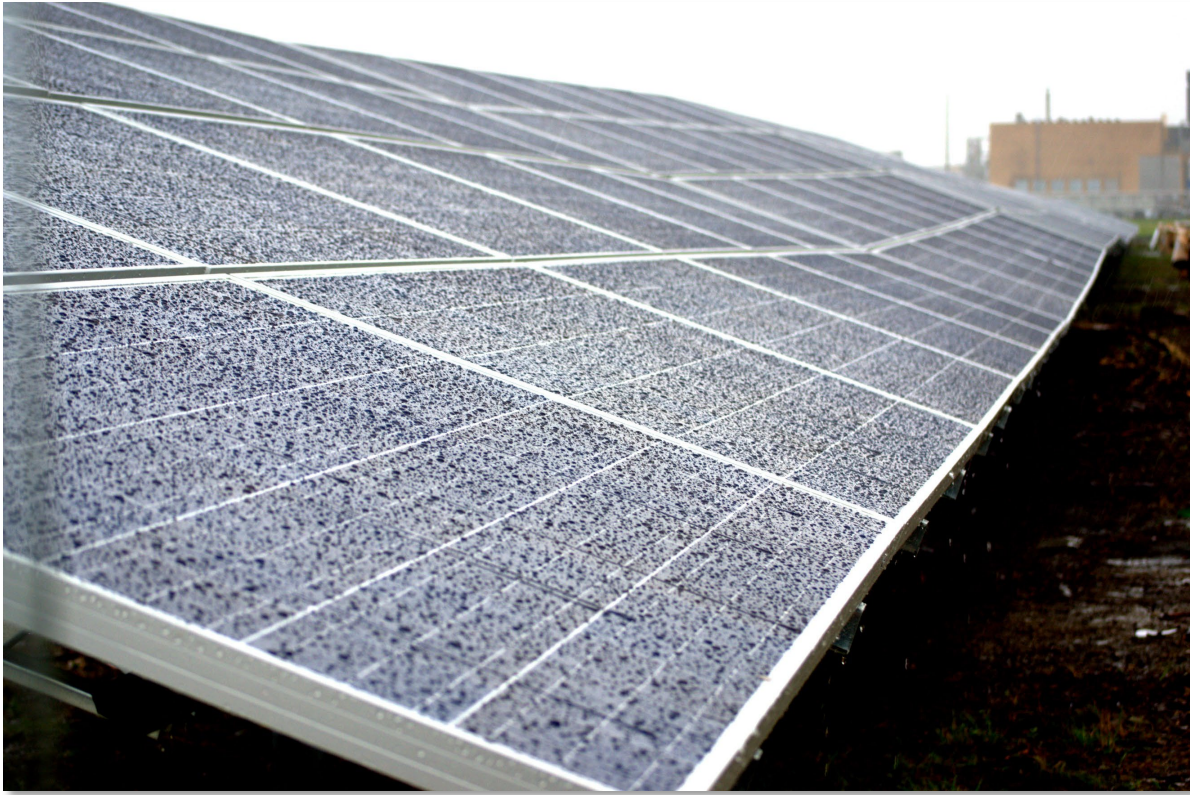


Figure 12. More than 36,000 solar panels power the 10.86-megawatt capacity solar facility.

Property Values and Tax Revenues

On-site properties help generate property tax revenues that support local government and public services. Today, site properties have a combined value of over \$4 million. In 2022, site properties generated about \$290,000 in total property tax revenues.

Conclusion

Collaboration and cooperation among EPA, IDEM, Vertellus and developers was vital to the successful cleanup and beneficial reuse and continued use of the Reilly Tar & Chemical Corp. (Indianapolis Plant) Superfund site. EPA's and IDEM's carefully designed cleanup protects human health and the environment and is compatible with future use priorities at the site. Hanwha Q Cells' innovative design approach allowed for the safe installation of the solar project while protecting the integrity of the site's remedy. A local utility program incentivized renewable energy projects and contributed to the commercial feasibility of solar redevelopment at the site. The cleanup approach also enabled Vertellus, and later Aurorium, to continue its chemical manufacturing operations on site, ensuring continued employment and income for area workers during cleanup.

This once-contaminated area now hosts a business that provides jobs and services to the community while supporting the on-site generation of renewable energy. Today, on-site operations support local economic growth, providing about 50 jobs. In 2022, the on-site business generated nearly \$33 million in sales revenue.



Figure 13. An aerial view of Maywood Solar Farm.

For more information about EPA's Superfund Redevelopment Program, visit:
<https://www.epa.gov/superfund-redevelopment>.

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Technical Appendix

Employment Information for On-Site Jobs

EPA obtained the data included in this appendix directly from reputable sources and reported the data as presented by those sources. Information on the number of employees and sales volume for on-site businesses came from the Hoovers/Dun & Bradstreet (D&B) database.¹ D&B maintains a database of over 300 million businesses worldwide. When Hoovers/D&B database research was unable to identify employment and sales volume for on-site businesses, EPA used the Reference Solutions database.² These databases include data reported by businesses. Accordingly, some reported values might be underestimates or overestimates.

Wage and Income Information for On-Site Jobs

EPA obtained wage and income information from the U.S. Bureau of Labor Statistics (BLS). Part of the U.S. Department of Labor, the BLS is the principal federal agency responsible for measuring labor market activity, working conditions and price changes in the economy. All BLS data meet high standards of accuracy, statistical quality and impartiality.

EPA used the BLS Quarterly Census of Employment and Wages database to obtain average weekly wage data for businesses at the Reilly Tar & Chemical Corp. (Indianapolis Plant) Superfund site. Average weekly wage data were identified by matching the North American Industry Classification System (NAICS) codes for each type of business with weekly wage data for corresponding businesses in Marion County. If weekly wage data were not available at the county level, EPA sought wage data by state or national level, respectively. In cases where wage data were not available for the six-digit NAICS code, EPA used higher-level (less-detailed) NAICS codes to obtain the wage data.

To determine the annual wages (mean annual) earned from jobs generated by each of the selected businesses at the Reilly Tar & Chemical Corp. (Indianapolis Plant) Superfund site, EPA multiplied the average weekly wage figure by the number of weeks in a year (52) and by the number of jobs (employees) for each business.

¹ <http://www.dnb.com>.

² <https://www.thereferencegroup.com>.

Table A-1. Reilly Tar & Chemical Corp. (Indianapolis Plant) Superfund Site: Information for On-Site Organizations and Businesses

On-Site Business	NAICS Code ^a	NAICS Title	Number of Employees ^b	Average Weekly Wage (2021) ^c	Annual Wage (Mean Annual) per Employee	Total Annual Income ^d	Annual Sales (2022) ^b
Aurorium (formerly Vertellus Specialties, Inc.)	325199	All Other Basic Organic Chemical Manufacturing	50	\$1,323	\$68,796	\$3,439,800	\$32,759,000
Totals			50			\$3,439,800	\$32,759,000

^a NAICS code provided in the D&B database, unless otherwise noted.

^b Data are from the Reference Solutions database.

^c Average weekly wage per employee based on BLS 2021 Average Weekly Wage data.

^d Total annual income figures derived by multiplying “Number of Employees” by “Annual Wage (Mean Annual) per Employee.”

Property Values and Local Tax Revenue Generated from Property Taxes

EPA obtained data on the most recently assessed values for property parcels at the Reilly Tar & Chemical Corp. (Indianapolis Plant) Superfund site in May 2022 through property records accessible through Marion County’s online property appraisal database.³ EPA also obtained 2022 property tax information for the site parcels.

Table A-2. Property Value and Tax Summary for Taxes Payable

Parcel ID No.	Total Assessed Value of Land and Improvements (2022)	Total Property Tax (2022)
49-11-17-108-001.000-970	\$396,900	\$17,129
49-11-17-108-002.000-970	\$1,298,600	\$76,667
49-11-17-100-003.000-900	\$2,511,600	\$195,449
49-11-17-107-046.000-900	\$21,900	NA
Totals	\$4,229,000	\$289,245

NA = not available. Parcel is exempt from property tax.

³ Marion County Assessor’s Office: <https://www.indy.gov/agency/marion-county-assessors-office>.