



THE DETROIT INCINERATOR PRIMER: Construction, Design, and Operation

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BREATHE FREE DETROIT

Breathe Free Detroit is a campaign started by the East Michigan Environmental Action Council, the Ecology Center, the Great Lakes Environmental Law Center, and numerous concerned community members, with the goal to shut down the Detroit incinerator. We work to engage the community, research the financial ties and public health effects of the incinerator, and encourage decision-makers to stop the pollution of Detroit's air.

This report was prepared by the Breathe Free Detroit campaign to serve as a resource for individuals, organizations, and government representatives that are interested in the history and current operations of the Detroit Renewable Power incinerator.

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EXECUTIVE SUMMARY

BREATHE FREE DETROIT IS A CAMPAIGN THAT WAS STARTED BY THE EAST Michigan Environmental Action Council, the Ecology Center, the Great Lakes Environmental Law Center, and numerous concerned community members. This report has been prepared by the Breathe Free Detroit Research Committee to serve as a resource for individuals, organizations, and government representatives that are interested in the history and current operations of the Detroit Renewable Power incinerator.

Services Provided by the Incinerator

Since 1986, the incinerator has operated at the intersection of I-94 and I-75 at 5700 Russell Street in Detroit. While initially constructed and owned by the city of Detroit, the facility has been privately owned and operated since 1991. The facility currently provides three primary services: solid waste disposal, electricity, and steam.

Solid Waste Disposal: The incinerator is permitted to process over 1 million tons of solid waste per year. According to a national directory of incinerators prepared by the Energy Recovery Council, the Detroit incinerator is the largest facility of its kind in the country. It is also the fifth largest solid waste disposal facility in the state of Michigan. The majority of solid waste burned at the incinerator comes from outside of the city of Detroit. According to invoices supplied by the Greater Detroit Resource Recovery Authority, the city of Detroit sent 217,052 tons of solid waste to the incinerator in 2016, which was approximately 25% of the total amount received. Additionally, Detroit, by contract pays \$25 per ton to dispose of solid waste collected within the city at the incinerator. Other communities, such as Warren and the Grosse Pointes, pay approximately \$15 per ton. According to a Detroit Renewable Power report, fees associated with the disposal of garbage make up approximately 17% of the facility's revenue.

Electricity Generation: The incinerator uses steam to power a 68 megawatt turbine. This electricity is sold to DTE Energy Co. (DTE) and is distributed to customers on the electric grid. According to a Detroit Renewable Power report, electricity sales make up approximately 25% of the facility's revenue.

Steam: The incinerator's combustion of solid waste produces steam as a byproduct, which is distributed to dozens of privately and publicly owned buildings through what is commonly referred to as the "downtown steam loop" for the purposes of heating and cooling a variety of buildings. The Greater Detroit Resource Recovery Authority has concluded that the steam loop could continue to provide steam to customers without the incinerator. Steam sales represent approximately 43% of the facility's revenue.



Air Emissions from the Incinerator

In addition to providing the services described above, the incinerator also is classified as a major source of air pollution by the Clean Air Act. As described in Table 2, the incinerator emitted hundreds of tons of carbon monoxide, nitrogen oxides, sulfur dioxide, and particulate matter in 2016.

Many of the pollutants emitted by the incinerator are regarded as “criteria pollutants” under the Clean Air Act and create negative health impacts for people living nearby the facility. Common health impacts from criteria air pollutants include both respiratory health impacts, with children and asthmatics being particularly vulnerable, and cardiovascular health impacts, with seniors being particularly vulnerable. The facility has exceeded its air quality standards regarding criteria pollutants hundreds of times over the past few years. In addition to “criteria pollutants,” burning garbage also causes the emission of numerous hazardous air pollutants such as cadmium, chromium, lead, mercury, and dioxins and furans. Many of these hazardous

air pollutants are classified as known or probable carcinogens by the U.S. Environmental Protection Agency. Violations of air emission limits were the subject of a 2017 enforcement action brought by the Michigan Department of Environmental Quality. Lastly, the incinerator creates strong odors. The Michigan Department of Environmental Quality has repeatedly found that these odors present an unreasonable interference with the use and enjoyment of property for residents living nearby the facility. These issues were the subject of a 2014 consent judgment, but despite that consent judgment odor violations have continued.

Neighborhood Around the Incinerator

According to the U.S. Environmental Protection Agency, approximately 21,927 people live within a 1.5-mile radius of the incinerator. Of those people, 76 percent are people of color and 71 percent are low-income. There are 13 schools within that 1.5-mile radius. The playground of the Golightly Elementary school is approximately 1,300 feet from **the incinerator.**



1. CONSTRUCTION AND DESIGN OF THE INCINERATOR

IN 1975, THE CITY OF DETROIT ESTABLISHED A RESOURCE RECOVERY TASK FORCE, WHICH WAS led by the Department of Public Works, to find a suitable site for a solid waste incinerator.¹ At the time, the city of Detroit wanted to find a long-term solution for its solid waste disposal needs. It was hoped that building a publicly-owned incinerator would provide long-term economic stability and predictability regarding solid waste disposal. A publicly-owned incinerator would allow Detroit to avoid paying increased disposal fees, which were predicted to result from a shortfall in landfill capacity by 1990.²

In 1978, the Task Force identified the site at 5700 Russell Street as the preferred location and selected a proposal for the design of the incinerator.³ However, numerous obstacles impeded the construction of the incinerator. First, the city had to negotiate for the construction and operation of the facility. High interest rates in the early 1980s also put the financing of the project in peril. However, in May of 1986, bond financing for construction in the amount of \$438 million was approved and construction commenced soon after.⁴

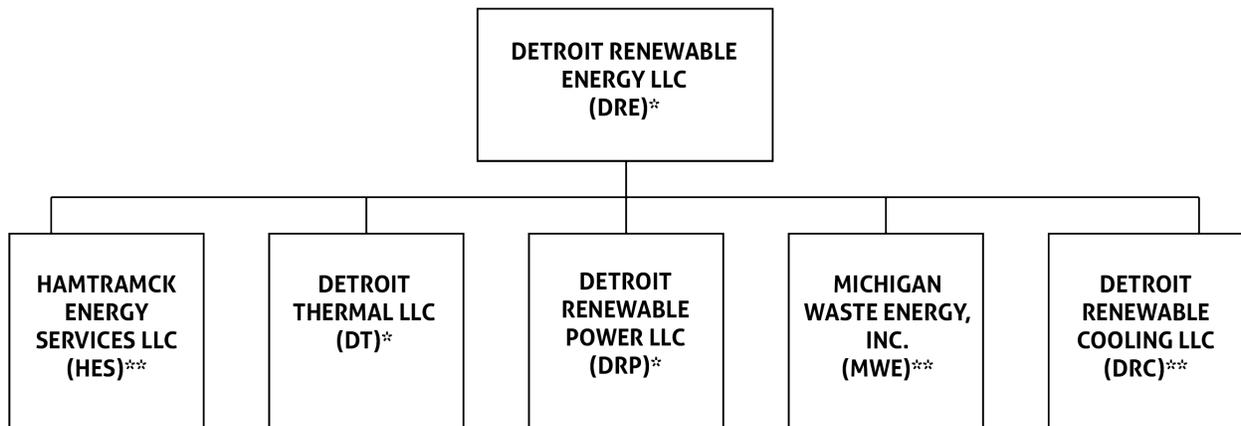
The facility was initially constructed and operated by Combustion-Engineering, Inc. and owned by the city of Detroit. Its design and basic functions have remained largely unchanged since its construction. Waste is received at a 4,000-ton tipping floor. From there, it is fed into one of three identical processing lines where it is shredded into refuse derived fuel (RFD). Once processed, it is conveyed to a 3,600-ton RFD storage area. From there, RFD is conveyed from the secondary storage area to one of three boilers for incineration. Each boiler is a waterwall unit, which means that each boiler is lined with a layer of water that converts to steam during operation. The steam produced during incineration is used to power a 68 megawatt turbine generator and is diverted for distribution to the steam loop for heating and cooling purposes.⁵

It is important to note that even at its construction, the facility was designed to process about 850,000 tons per year, which was in excess of the 650,000 tons of waste produced by Detroit at the time.⁶ The belief was that the additional capacity would be an asset for the city of Detroit, which initially owned the facility, since that excess capacity could represent additional revenue for the City and cost savings if



solid waste disposal costs rose in the future.⁷ In October of 1991, the city of Detroit sold the incinerator to private owners.⁸ However, the city still owns the land on which the incinerator sits. It leases the land to the Greater Detroit Resource Recovery Authority, who subleases it to the owners of the incinerator. The corporate structure associated with the incinerator consists of an umbrella limited liability company, which is Detroit Renewable Energy LLC, with several subsidiary limited liability companies operating under its complete control, including Detroit Renewable Power LLC, which owns the incinerator, and Detroit Thermal

LLC, which owns the steam distribution system. Detroit Renewable Energy LLC, the umbrella company, has been owned by a variety of private owners since the city of Detroit sold the facility in 1991. In 2010, Atlas Holdings and Thermal Ventures purchased the facility. Now, in 2018, a sale has been finalized to transfer ownership of the Detroit Renewable Energy LLC and all of its subsidiary companies to Basalt Infrastructure Partners and DM Energy Partners LLC.



2. SERVICES OF THE INCINERATOR

BASED ON ITS OPERATIONS AS DESCRIBED ABOVE, THE INCINERATOR PROVIDES THREE primary, revenue-generating services: the disposal of solid waste; the distribution of steam for heating and cooling via the downtown steam loop; and the distribution of electricity.

a. Solid Waste Disposal

According to a directory of waste-to-energy incinerators prepared by the Energy Recovery Council, which is a national association of owners and operators of waste-to-energy facilities in the United States, the Detroit incinerator can burn the most garbage per day of any incinerator in the country.⁹ The incinerator is permitted to process 20,000 tons of garbage per week and 1,043,000 tons per year.¹⁰ The amount of waste received by the incinerator varies, but is generally around 800,000 tons per year.¹¹ According to reports submitted by the owners of the incinerator to Wayne county, in 2017 the incinerator received 822,579 tons of waste and incinerated 789,933 tons of the waste that it received.¹² Based on these figures, the Detroit incinerator is the fifth largest solid waste disposal facility in the state regarding the amount of waste it receives.¹³

Detroit sends about 217,000 tons of solid waste to the incinerator, which is approximately 25% of the total amount of solid waste received by the incinerator in a given year.

From 2015 through 2017, the incinerator received trash from thirteen Michigan counties, as well as Canada, Ohio and Illinois.¹⁴ According to invoices sent by the owners of the incinerator to the Greater Detroit Resource Recovery Authority, Detroit sends about 217,000 tons of solid waste to the incinerator, which is approximately 25% of the total amount of solid waste received by the incinerator in a given year.¹⁵

The owners of the incinerator have contracts with many municipalities for the disposal of solid waste. Per their contract with the Greater Detroit Resource Recovery Authority, Detroit is obligated to pay \$25.00 per ton of solid waste disposed of at the facility.¹⁶ This contract expires in October 2021. The Grosse Pointes collectively pay \$15.50 per ton per a contract that expired at the end of 2017.¹⁷ Warren pays \$15.00 per ton per a contract that is set to expire in January 2019.¹⁸ According to a report from 2013, fees associated with the disposal of garbage make up about 17% of the Detroit Renewable Energy's revenue.¹⁹

b. Electricity Generation

Steam produced by the incinerator's boilers is used to power a turbine that has a nameplate capacity of 68 megawatts. This electricity is sold to DTE. Additionally, the Michigan Clean and Renewable Energy and Waste Reduction Act regards municipal solid waste incineration as a renewable energy resource that is eligible for renewable energy credits.²⁰ As such, the incinerator receives one renewable energy credit for each megawatt of electricity that it produces. The incinerator sells all of its renewable energy credits to DTE for \$7.00 per renewable energy credit pursuant to a renewable energy credit purchase agreement.²¹ According to reports submitted by the incinerator, electricity sales make up approximately 25% of the facility's revenue.²²



c. Steam Sales

Most of the incinerator's revenue comes from its steam sales, which is formally done by Detroit Thermal. Both Detroit Renewable Power, the company which owns the incinerator, and Detroit Thermal, the company which owns the steam loop, are under common ownership. According to Detroit Thermal, its steam system serves 85 customers in the downtown area.²³ Detroit Thermal, as a public utility, is regulated by the Michigan Public Service Commission. As a public utility, Detroit Thermal provides steam to customers either in accordance with the terms of a special contract negotiated with the customer or in accordance with the terms specified in Detroit Thermal's steam tariff. According to Detroit Thermal, approximately 13 customers have special contracts and 72 customers are served according to the general terms of its steam tariff.²⁴

Steam sales make up approximately 43% of the incinerator's revenue.

According to a 2013 report, Detroit Thermal's tariff customers have included large entities such as Henry Ford Hospital. Detroit Thermal charges its tariff customers varying rates based on the volume of steam they consume. According to its tariff, small volume customers generally pay a higher rate than high volume customers. The prices for special contracts vary. Currently, the following organizations receive steam from the incinerator via a special contract. The special contracts referenced in Table 1 have varying terms, including the price for steam provided and the length of the special contract. According to reports submitted by Detroit Thermal, steam sales make up approximately 43% of the incinerator's revenue.



Steam is released along the steam loop displaying the inefficiency of the system.

TABLE 1 Companies and Buildings Served In Accordance With Special Contracts for the Purchase of Steam from Detroit Thermal

Company	Buildings
Bedrock Management Services	<ul style="list-style-type: none"> • One Woodward • First National Building • Chase Building • One Detroit Center • Federal Reserve
Detroit Wayne Joint Building Authority	<ul style="list-style-type: none"> • Coleman A. Young Municipal Center • Old Wayne County Jail Annex • Frank Murphy Hall of Justice • Baird Detention Facility • Old Juvenile Court
Detroit Regional Convention Facility Authority	<ul style="list-style-type: none"> • Cobo Hall
Becton, Dickinson, and Company	<ul style="list-style-type: none"> • 920 Henry St.
Detroit Medical Center	<ul style="list-style-type: none"> • Children’s Hospital of Michigan • Detroit Receiving Hospital & University Health Center • Harper Hospital • Harper Hospital Cancer Center • Harper Hospital Apartments • Harper Hospital – Professional Office Building • Hutzel Hospital • Rehabilitation Institute of Michigan • Detroit Medical Center Cardiovascular Institute
Riverfront Holdings	<ul style="list-style-type: none"> • Renaissance Center, Towers 500 and 600
Wayne State University	<ul style="list-style-type: none"> • Eugene Applebaum College of Pharmacy and Health Science Building
Wayne State University	<ul style="list-style-type: none"> • Gordon H. Scott Hall • Helen Vera Prentis Lande
Woodward SA-ZK LLC	<ul style="list-style-type: none"> • 3901 Woodward
Federal Government, General Services Administration	<ul style="list-style-type: none"> • Theodore Levin U.S. Courthouse
Federal Government, General Services Administration	<ul style="list-style-type: none"> • Patrick V. McNamara Federal Building
Blue Cross Blue Shield	<ul style="list-style-type: none"> • 600 and 500 Lafayette

3. AIR QUALITY AND THE INCINERATOR

THE POLLUTANTS THAT ARE EMITTED FROM THE INCINERATOR CAN BE BROKEN DOWN INTO two broad categories: “criteria pollutants” and “hazardous air pollutants.” Criteria air pollutants are air pollutants that are commonly present in all environments. They can irritate airways, harm the respiratory system, aggravate respiratory diseases such as asthma, contribute to wheezing, and cause breathing difficulties that result in hospitalization. Long-term exposure to criteria air pollutants may contribute to the development of asthma and increased susceptibility to respiratory infections. Children and the elderly are the most susceptible to these health effects. The specific criteria air pollutants that the incinerator emits are particulate matter, sulfur dioxide, nitrogen oxides, and carbon monoxide. Hazardous air pollutants are toxic air pollutants that are commonly classified as probable or known carcinogens. The specific hazardous air pollutants emitted by the incinerator are cadmium, chromium, lead, mercury, and dioxins and furans. Many volatile organic compounds are considered hazardous air pollutants.

Long-term exposure to criteria air pollutants may contribute to the development of asthma.

The major sources of air pollution from the incinerator are the pollutants that result from the burning of garbage at its three boilers. According to the Michigan Air Emissions Reporting System, the incinerator’s boilers emitted the following tons of criteria pollutants in 2016.

The incinerator is regarded as a major emitting facility pursuant to the federal Clean Air Act. As such, it is required to obtain and operate in compliance with the standards contained in its Renewable Operating Permit. This permit must be renewed every five years by the Michigan Department of Environmental Quality. In general, the



Renewable Operating Permit serves as a clearinghouse **for** all of the air quality regulations that apply to the incinerator. These regulations set air emissions limits and air quality monitoring requirements for the incinerator.

The incinerator’s renewable operating permit contains emission limits for particulate matter, cadmium, hexavalent chromium, total chromium, lead, mercury, dioxins and furans, hydrogen chloride, sulfur dioxide, total fluoride, carbon monoxide, volatile organic compounds, and nitrogen oxides. Emissions from each boiler are controlled by a dry scrubber and a baghouse, which captures pollutants. Emission monitoring requirements vary based on the pollutant. The incinerator is required to continuously monitor its emissions for some pollutants with continuous emission monitoring systems. These systems provide the incinerator and the MDEQ with continuous air emission data to ensure that the facility is complying with emission limits. Alternatively, the incinerator is required to conduct an annual stack test to verify emission levels for other pollutants.

TABLE 2 **Total Air Emissions in Tons from All Three Incinerator Boilers in 2016**

	Carbon Monoxide	Nitrogen Oxides	Particulate Matter	Sulfur Dioxide	Volatile Organic Compounds
Total Emissions in tons per year	367 tons	1,245 tons	50 tons	146 tons	34 tons

TABLE 3 **Number of Exceedances of Air Emission Limits & Number of Odor Violation Notices Issued by MDEQ– 2013 through 3rd Quarter of 2017**

Year	1-Hr. Carbon Monoxide Limit	24-Hr. Carbon Monoxide Limit	24-Hr. Nitrogen Oxide Limit	24-Hr. Sulfur Dioxide Limit	MDEQ Odor Violations
2013	55	0	6	0	0
2014	69	0	0	0	17
2015	266	3	0	4	5
2016	169	6	5	2	17
2017	109	3	5	0	9
Total	668	12	16	6	48

The incinerator must monitor sulfur dioxide, nitrogen oxides, and carbon monoxide with continuous emission monitoring systems. For all other pollutants, including particulate matter, the incinerator generally must conduct an annual stack test to determine emission amounts and compliance.

The incinerator has regularly exceeded numerous different emission limits that it is required to follow in accordance with the terms of its renewable operating permit and federal regulations. Since the start of 2013, the incinerator has exceeded emission limits over 700 times. In 2017, the MDEQ penalized Detroit Renewable Power for 6 alleged violations of emission limits and assessed a \$150,000 penalty.

Since the start of 2013, the incinerator has exceeded emission limits over 700 times.

As illustrated in Table 3, the incinerator most frequently violates its 1-hour carbon monoxide emission limit, which is 267 parts per million based on a 1-hour average. The incinerator monitors its carbon monoxide emissions with a continuous emissions monitor. According to the EPA, carbon monoxide emissions are a good indicator as to whether the incinerator is adequately combusting garbage, which is important because the inadequate combustion of garbage can cause elevated emissions of hazardous air pollutants.²⁵

Specifically, inadequate combustion may cause increased emissions of metal oxides or vapors and metal vapors.²⁶ Additionally, the incomplete combustion of plastics can cause the emission of hazardous substances such as dioxins.²⁷ The incinerator is only required to conduct annual stack tests for these hazardous air pollutants. Therefore, the 1-hour carbon monoxide standard is important to ensure that the incinerator is adequately combusting its garbage and is not causing increased emissions of hazardous air pollutants such as dioxins. Additionally, due to a malfunction in its pollution control technology, the incinerator experienced a prolonged violation of its particulate matter standard.



Residents provide the phone number to call MDEQ with odor complaints.

While a stack test conducted on December 2, 2015 revealed that particulate matter emissions were in violation of the applicable air pollution standard, the incinerator did not fix its pollution control technology to stop the violation until February 20, 2016. During this time, it regularly operated its facility, which resulted in excessive amounts of particulate matter being emitted into the nearby community.

The incinerator also regularly causes strong odors, which are generally caused by trash stored by the facility prior to incineration. The Michigan Department of Environmental Quality has determined that odors released from the facility have violated Michigan Rule 336.1901 prohibiting the "...unreasonable interference with the comfortable enjoyment of life and property" for nearby residents.²⁸ As a result, MDEQ has issued 48 odor violation notices to the incinerator's owners since the start of 2014, as detailed in Table 3.

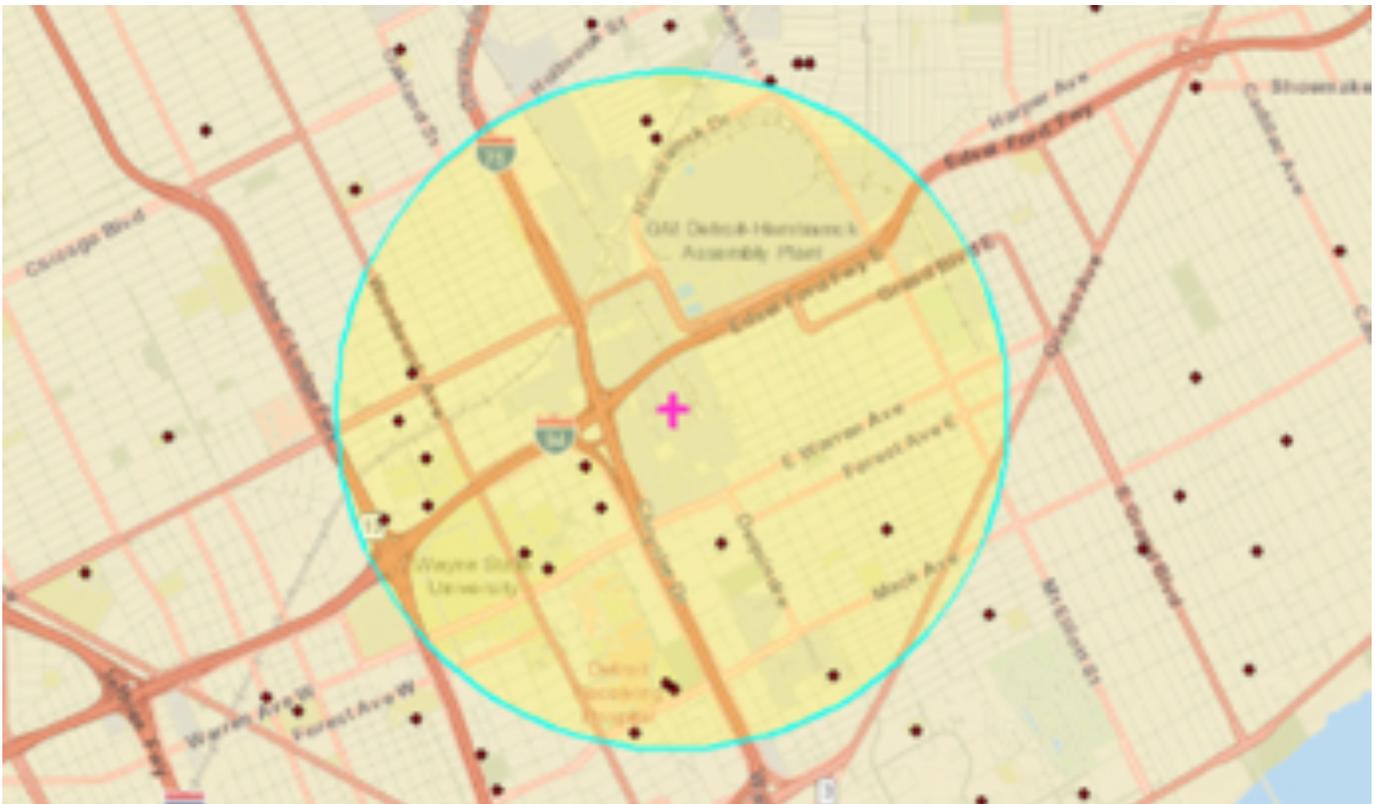
Odors from the incinerator continue to violate the terms of its renewable operating permit.

In 2014, Michigan negotiated a consent judgment with the owners of the incinerator to penalize the owners of the incinerator for its odor violations and to require it to take additional measures to control its odor. However, despite the consent judgment, odors from the incinerator continue to violate the terms of its renewable operating permit and enforcement of those odor violations by the Michigan Department of Environmental Quality is ongoing.



4. NEIGHBORHOOD SURROUNDING THE INCINERATOR

THE NEIGHBORHOOD SURROUNDING THE INCINERATOR IS DENSELY POPULATED WITH several schools. According to the U.S. Environmental Protection Agency's EJSCREEN tool, approximately 21,927 people live within a 1.5-mile radius of the incinerator. Of those people, 76 percent are people of color and 71 percent are low-income people. Additionally, there are approximately 13 schools within a 1.5-mile radius of the incinerator. The closest school is Golightly Elementary, which is approximately 1,300 feet from the incinerator.



5. COMMON HEALTH EFFECTS CAUSED BY INCINERATORS

INCINERATORS COMMONLY EMIT A NUMBER OF POLLUTANTS, PARTICULARLY WHEN THEY inadequately combust garbage. The particular pollutants of concern are carbon monoxide, nitrogen oxides, sulfur dioxide, hydrochloric acid, lead, mercury, chromium, arsenic, beryllium, dioxins and furans, PCBs, and polycyclic aromatic hydrocarbons, as these pollutants can have a significant health impact on the people living near the incinerator.²⁹

These pollutants can have a significant health impact on the people living near the incinerator.

A study recently found that carpet dust samples collected from homes near municipal solid waste incinerators commonly have higher concentrations of dioxins and furans than the average home, suggesting that residents living nearby the incinerator may be subject to increased levels of dioxin exposure.³⁰ Dioxins and furans are a family of toxic substances, with 2,3,7,8-TCDD being considered the most toxic.³¹ Long-term, chronic exposure to dioxins and furans has been linked to the impairment of the immune system, the developing nervous system, and reproductive functions.³²

These results correspond with the results of another study, which found an association between exposure to incinerator air pollution and pre-term births.³³ Complications related to preterm birth are among the main indirect causes of neonatal mortality, mortality in children under 5 years old, and long-term disability.³⁴



6. CONCLUSION

LOCATED AT THE INTERSECTION OF I-94 AND I-75, THE INCINERATOR IS ONE OF THE largest solid waste disposal facilities in the state. It has served the disposal needs of over a dozen Michigan counties as well as Canada, Illinois, and Ohio. Due to a long-term contract, Detroit pays an elevated disposal fee of \$25 per ton while other communities such as Grosse Pointe and Warren generally pay \$15 per ton. The incinerator also creates a number of negative externalities primarily in the form of odors and air pollution. Since 2014, the incinerator has consistently struggled to control its odors. Additionally, starting in 2015 the incinerator has consistently struggled to keep its air pollutant emissions below its emission limits. The odors from the incinerator have regularly been a nuisance for local residents living nearby the incinerator, particularly in the summer months. Numerous studies have also found that air pollution from municipal waste incinerators may cause elevated levels of toxic substances, such as dioxins and furans, which have been associated with serious negative health effects.



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