

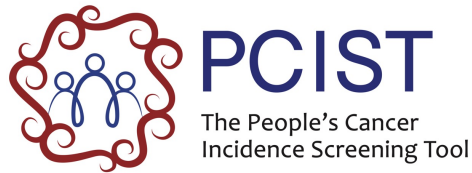
An Environmental Health Impact Analysis:

Comparing the Air Emissions Produced by the Reworld Delaware Valley Resource Recovery Facility/Trash Incinerator (Chester City, Delaware County, PA) and the Fairless Hills Landfill and Renewable Natural Gas Facility (Falls Township, Bucks County, PA) from 1999-2024

Prepared for Councilwoman Jamie Gauthier's Office
To inform deliberations on the "Stop Trashing Our Air Act" under
consideration by Philadelphia City Council

4/27/2026

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Sources and Methods

- This analysis uses site air emissions data that is regularly reported by waste disposal facilities to the Pennsylvania Department of Environmental Protection (DEP) and is publicly available
- This analysis is based on air emissions data for each pollutant for every year for which it was reported to the DEP by the facility during the 25-year period from 1999-2024. The range of years reported for each pollutant varies
- Data from all reported years for a given pollutant were averaged to arrive at the average annual value emitted by the facility. The amounts emitted are reported here in pounds (lbs)
- The volume of waste that is landfilled at Fairless Hills (1.3 million tons/yr) vs at the Chester Incinerator (1.2 million tons/yr) is reported to be roughly equivalent and does not markedly affect the comparative analysis
- Note:
 - This analysis does not assess additional air emissions associated with the transport and disposal of toxic fly ash from the Reworld incinerator. It also cannot assess incomplete products of combustion (including VOCs, dioxins and furans, and heavy metals) that are known to be released from trash incinerators via (emergency) rooftop vents
 - The Fairless Hills Landfill Complex consists of three independently-reporting parts: an inactive landfill; an active landfill; and a recently opened Renewable Natural Gas plant that captures and processes methane emissions from both landfill sites for commercial distribution and use. This analysis provides data for all three sites, separately and combined. It should be noted, however, that the closed landfill will produce its emissions regardless of whether Philadelphia's future waste is incinerated or landfilled and, hence, should arguably be excluded from this analysis. It has been included to make the most conservative possible comparison.

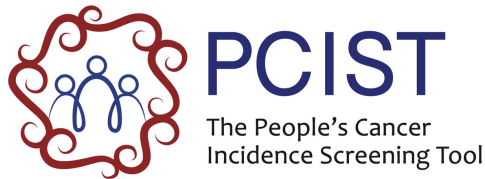


PCIST

The People's Cancer
Incidence Screening Tool

Greenhouse Gases

Reported Gas	Fairless Hills Renewable Natural Gas (RNG) Plant Avg Annual Emissions in lbs (newly opened and brought online in 2024)	Fairless Hills GROW Landfill (closed) Avg Annual Emissions in lbs	Fairless Hills Landfill (active) Avg Annual Emissions in lbs	Fairless Hills Landfill+RNG (combined) Avg Annual Emissions in lbs	Chester Reworld Incinerator Avg Annual Emissions in lbs	Difference in the Amount Emitted between Fairless Combined & Chester Reworld Incinerator
Carbon Dioxide	5,581,300	76,125,698	354,475,303	436,182,301	1,859,394,712	1,423,212,411 (1.4 billion) lbs more per year by the incinerator
Carbon Monoxide	3,780	12,616	29,300	45,696	712,560	666,864 lbs more per year by the incinerator
Methane	180	6,850,602	6,204,903	13,055,684	656,034	12,399,650 (12.4 million) lbs more per year by the landfill complex; and 5,548,869 (5.5 million) lbs more by the active landfill site only

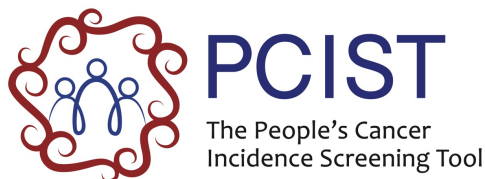


Greenhouse Gases Conclusions

- Using a conventional conversion formula, over the next two decades the **13 million lbs more methane** that is historically released each year by the landfill is estimated to cause ~ 78% as much global warming as the **1.4 billion pounds more carbon dioxide** that is released by the incinerator. **The global warming impact of the Reworld incinerator in comparison with the Fairless landfill is ~ 22% worse based upon the compared carbon dioxide and methane emissions**
- The **Renewable Natural Gas Plant at the Fairless Hills Landfill opened in 2024** to capture biogas from both the closed and active landfills. It will produce 3 million MMBtu of natural gas for commercial and residential use. It is unknown whether it is self-powered or how much electricity it draws from the grid
- The **Reworld incinerator produces 87 megawatts of electricity 24/7** for commercial and residential purposes. It uses a portion of this power to run its internal systems, but the facility is a net-generator, not completely self-powered. It is unknown how much electricity it draws from the grid
- The **Reworld incinerator releases 600,000 lbs more toxic carbon monoxide** into the air
- The **Reworld incinerator releases 83,076 lbs more nitrous oxide**, an acid gas that is also a greenhouse gas, while the **Fairless landfill complex releases 79,931 lbs more of ammonia**, a base gas that converts into nitrous oxide and, therefore, also affects global warming (see Acid and Other Gases)
- Both the Fairless Hills landfill and the Reworld incinerator in Chester **contribute significantly to global warming**, highlighting the urgent need for Philadelphians to move towards a responsible zero waste plan
- Chronic exposure to these greenhouse gases is known to produce **headaches, reduced cognitive performance, lethargy, confusion, dizziness, difficulty breathing, organ damage and, in high enough concentrations, death**
- The American Lung Association gives Philadelphia a grade “F” for its ground level ozone. **On balance, landfilling is the more responsible choice for protecting human health and our climate’s health**

Acid and Other Gases

Reported Gas	Fairless Hills Renewable Natural Gas (RNG) Plant Avg Annual Emissions in lbs; newly opened and brought online in 2024	Fairless Hills GROW Landfill (closed) Avg Annual Emissions in lbs	Fairless Hills Landfill (active) Avg Annual Emissions in lbs	Fairless Hills Landfill+RNG (combined) Avg Annual Emissions in lbs	Chester Reworld Incinerator Avg Annual Emissions in lbs	Difference in the Amount Emitted between Fairless Combined and Chester Reworld Incinerator in lbs
Nitrogen Oxides	2,700	7,229	36,930	46,859	2,474,462	2,427,603 (2.4 million) lbs more per year by the incinerator
Nitrous Oxide	40	0	2,070	2,110	86,086	83,976 lbs more per year by the incinerator
Sulfur Oxides	180	10,003	204,465	214,648	557,682	343,033 lbs more per year by the incinerator
Hydrochloric Acid	160	76	360	596	62,792	62,196 lbs more per year by the incinerator
Ammonia	0	70,549	9,382	79,931	0	79,931 lbs more per year by the landfill combined; 9,382 pounds more per year by the active landfill



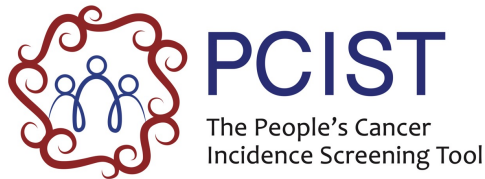
Acid and Other Gases

Conclusions

- The **Reworld incinerator releases 2.4 million pounds more nitrogen oxides** – acid gases that contribute to acid rain – than does the combined Fairless Hills landfill complex
- The **Reworld incinerator releases 83,976 pounds more nitrous oxide** – an acid gas that is also a greenhouse gas – than does the combined Fairless Hills landfill complex
- The **Reworld incinerator releases 343,033 pounds more sulfur oxides** – acid gases that contribute to acid rain – than does the combined Fairless Hills landfill complex combined
- The **Reworld incinerator releases 62,196 pounds more hydrochloric acid** – an acid gas that contribute to acid rain – than does the Fairless Hills landfill complex combined
- The **combined Fairless Hills landfill complex releases 79,931 pounds more ammonia**, while the **active part of the landfill alone releases 9,382 pounds more ammonia** – a base gas that converts into nitrous oxide (a greenhouse gas) in the atmosphere – than does the Reworld Incinerator in Chester
- All of these acid and other gases are **known respiratory irritants that contribute to respiratory inflammation and worsened respiratory infections, chronic asthma, bronchitis, COPD, respiratory cancers (lung, laryngeal, oral and pharyngeal, with some evidence for additional ones) and cardiovascular problems**. There is also evidence of these gases causing **developmental and behavioral problems in infants and children** due to chronic inflammation and reduced oxygenation
- *On balance, landfilling is the more responsible choice for protecting human health and our climate's health*

Particulate Matter (PM)

Reported Particulate Matter Type	Fairless Hills Renewable Natural Gas (RNG) Plant Avg Annual Emissions in lbs; newly opened and brought online in 2024	Fairless Hills GROW Landfill (closed) Avg Annual Emissions in lbs	Fairless Hills Landfill (active) Avg Annual Emissions in lbs	Fairless Hills Landfill+RNG (combined) Avg Annual Emissions in lbs	Chester Reworld Incinerator Avg Annual Emissions in lbs	Difference in the Amount Emitted between Fairless Combined and Chester Reworld Incinerator in lbs
PM 10	320	29,582	72,711	102,613	120,497	17,884 lbs more per year by the incinerator
PM 2.5	320	13,502	56,509	70,331	73,587	3,256 lbs more per year by the incinerator
Condensable Particulate Matter (1-2 micrometers)	0	60	0	60	1,206,040	1,205,980 (1.2 million) lbs more per year by the incinerator
All Particulate Matter Combined	640	43,144	129,220	173,004	1,400,124	1,227,120 (1.2 million) lbs more per year by the incinerator

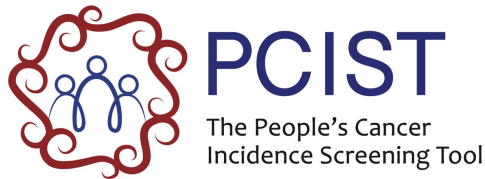


Particulate Matter (PM) Conclusions

- The **Reworld incinerator releases 17,884 lbs more PM 10 per year** than does the Fairless Hills landfill complex combined. PM 10 enters the bronchi and lungs, causing immediate issues like **coughing, bronchitis and asthma**. With chronic exposure, it also increases the risk of **cardiovascular diseases including heart attacks and stroke** and **premature and low-weight births**
- The **Reworld incinerator releases 3,256 lbs more PM 2.5** than does the Fairless Hills landfill complex combined. PM 2.5 penetrates deep into the lungs and enters the bloodstream. As such, it serves as a carrier for neurotoxic, endocrine-disrupting and carcinogenic emissions, including heavy metals, to enter the bloodstream. Most prominently, PM2.5 is a known cause of significant respiratory diseases such as **asthma and COPD**, as well as **cardiovascular diseases, including heart attacks and stroke; neurological and neurodevelopmental conditions like autism and ADHD; premature and low-weight births; and cancer, especially lung, laryngeal, oral and pharyngeal in the respiratory tract, as well as breast, liver and pancreatic, among others**
- The **Reworld incinerator releases 1.2 million pounds more condensable PM** than does the Fairless Hills landfill complex combined. Condensable PM is emitted in the form of gases and subsequently forms 1-2 micrometer particles as it cools. It presents all of the same health hazards as PM 2.5, including delivering toxins into the bloodstream
- The **Reworld incinerator releases 1.2 million pounds more combined particulate matter (PM10, PM2.5 and condensable together)** than does the Fairless Hills landfill complex combined. Particulate matter, including those formed by condensation, is **classified as a Group 1 carcinogen**
- The American Lung Association gives Philadelphia a grade “F” for particulate matter pollution. ***On balance, landfilling is the more responsible choice for protecting human health and our climate's health***

Heavy Metals

Reported Metal	Fairless Hills Renewable Natural Gas (RNG) Plant Avg Annual Emissions in lbs; newly opened and brought online in 2024	Fairless Hills GROW Landfill (closed) Avg Annual Emissions in lbs	Fairless Hills Landfill (active) Avg Annual Emissions in lbs	Fairless Hills Landfill+RNG (combined) Avg Annual Emissions in lbs	Chester Reworld Incinerator Avg Annual Emissions in lbs	Difference in the Amount Emitted between Fairless Combined and Chester Reworld Incinerator in lbs
Lead	0	0	0	0	37	37 lbs more per year by the incinerator
Mercury	0	0	0	0	51	51 lbs more per year by the incinerator
Nickel	0	0	0	0	43	43lbs more per year by the incinerator
Cadmium (reported in 2014 only)	0	0	0	0	20	20lbs more per year by the incinerator



Heavy Metals Conclusions

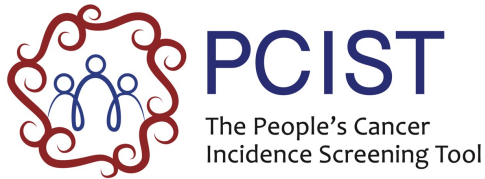
- The **Reworld incinerator releases 37 lbs more lead** than does the combined Fairless Hills landfill complex. Lead, which can reach the bloodstream via PM2.5, damages the nervous system and causes **lowered IQ, behavioral problems, developmental delays and learning disabilities in children. In adults, it causes neurological and cardiovascular diseases; reduced fertility; and kidney damage**
- The **Reworld incinerator releases 51 pounds more mercury** than does the combined Fairless Hills landfill complex. Mercury, carried into the bloodstream via PM2.5, is a **potent neurotoxin that affects brain and neuromuscular functioning**. It also **damages the kidneys and immune system**
- The **Reworld incinerator releases 43 pounds more nickel** than does the combined Fairless Hills landfill complex. Nickel, reaching the bloodstream via PM2.5, causes respiratory and cardiovascular diseases, damaged kidney function, and and lung and nasal cancers
- *On balance, landfilling is the more responsible choice for protecting human health and our climate's health*

Volatile Organic Compounds (VOCs)

Reported VOC	Fairless Hills Renewable Natural Gas (RNG) Plant Avg Annual Emissions in lbs; newly opened and brought online in 2024	Fairless Hills GROW Landfill (closed) Avg Annual Emissions in lbs	Fairless Hills Landfill (active) Avg Annual Emissions in lbs	Fairless Hills Landfill+RNG (combined) Avg Annual Emissions in lbs	Chester Reworld Incinerator Avg Annual Emissions in lbs	Difference in the Amount Emitted between Fairless Combined and Chester Reworld Incinerator in lbs
VOCs	220	44,892	21,513	66,625	24,047	42,578 lbs more per year by the combined landfill; BUT the incinerator releases 2,534 lbs more per year than the active landfill site alone

Note: the VOCs reported by the incinerator are not broken down by specific chemical. However, they are reported separately by the Fairless Hills landfill complex and include the following emitted in excess of 1,000 lbs per year: carbon disulfide and other **non-methane hydrocarbons (112,690 lbs)**; methanol (11,403 lbs); 2-Butanone (4,882 lbs); toluene (3,848 lbs); benzene (3,603 lbs); xyelene (2,822 lbs); dichloromethane (1,655 lbs); ethylbenzene (1,196 lbs); plus others for a combined total of **methane VOCs (34,024 lbs)**

1,1,2,2- Tetrachloroethane	Ethylene Dichloride	Acetaldehyde
1-4 Dichlorobenzene	Ethylene Dichloride	Acetonitrile
Benzene	Methanol	Carbon Oxysulfide (Carbonyl Sulfide)
Chlorobenzene	Methyl Chloroform (1,1,1-Trichloroethane)	Cumene
Chloroethene (vinyl chloride)	Methyl Ethyl Ketone (2-Butanone)	Styrene
Chloroethane (ethyl chloride)	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	Vinyl Acetate
Ethyl Benzene	Methylene Chloride (Dichloromethane)	Non-Methane VOCs:
Chloroform	Propylene Dichloride (1,2-Dichloropropane)	Carbon Disulfide
Toluene	Tetrachloroethylene (Perchloroethylene)	Carbon Sulfide
Xylenes	Trichloroethylene	Carbon Tetrachloride
Hexane	Vinylidene Chloride (1,1-Dichloroethylene)	Non-Methane Hydrocarbons
	2,2,4-Trimethylpentane	



Volatile Organic Compounds (VOCs) Conclusions

- The **combined Fairless Hills Landfill complex releases 42,578 lbs more VOCs** than does the Reworld incinerator. However, **the incinerator releases 2,534 pounds more VOCs than the active landfill site alone**
- Many VOCs are **potent carcinogens** and classified as such by the International Agency for Research on Cancer. Benzene is strongly linked to **leukemia, non-Hodgkin's lymphoma** and **multiple myeloma**
- Carbon disulfide causes **CNS, respiratory, ocular, cardiac, dermal, GI, renal, and reproductive diseases**
- Non-methane hydrocarbons cause **cancer**, as well as **respiratory, cardiovascular, neurological and prenatal/developmental diseases**.
- Methanol causes **birth defects in the central nervous system**, as well as **neurological, GI, respiratory and ocular conditions**
- Exposure to vinyl chloride causes **neurological conditions** as well as **liver and other cancers**
- Many express concern that the Reworld incinerator does not document and report the release of hydrocarbons (as recorded by FLIR OGI cameras) including VOCs, as well as heavy metals and persistent organic pollutants such as highly carcinogenic dioxins and furans, from its frequently active emergency rooftop vent system
- On balance, ***neither landfilling nor incineration is a responsible choice for protecting human health, especially in terms of known risks for respiratory, neurological, renal, liver and GI diseases, reproductive and developmental abnormalities (including autism and ADHD), and many cancers that are on the rise in children and adults***