

# Chip Waste is Forever

## PFAS Fact Sheet



### What are PFAS?

Perfluoroalkyl and Polyfluoroalkyl substances (PFAS) are a family of thousands of highly toxic human-made compounds. They are known as “forever chemicals” because they are persistent and last nearly forever. The electronics industry considers their use essential to the production of semiconductors. PFAS must be better managed and eventually replaced with safer alternatives.

PFAS molecules have one or more fluorine atoms linked to a chain of carbon atoms. The carbon-fluorine bond is the one of the strongest bonds found in nature. Because of their durability, these chemicals are used in consumer products, industrial applications, and fire-fighting foam.

### What’s wrong with PFAS?

PFAS are very toxic and persistent. They tend to accumulate in our bodies and in the bodies of fish and wildlife.

Exposure to PFAS may lead to:

- Decreased fertility and other reproductive effects
- Developmental effects or delays in children
- Increased risk of prostate, kidney, testicular, and other cancers
- Damage to the immune system
- Interference with hormones
- Increased cholesterol levels and risk of obesity

PFAS compounds with six or more carbon atoms, known generally as long chain, tend to be extremely toxic, while shorter chain molecules are less toxic but still not safe.

*No PFAS chemical has ever been shown to be safe to human health at any level, even in minute quantities.*

### PFAS in Chip-Making

The semiconductor industry has identified over one thousand uses of PFAS in manufacturing and its supply chain. There are no proven alternatives for most of those uses, and where an adequate substitute is found, it typically takes three to four years to put the change into practice.



**Process Chemicals.** PFAS are used in the fabrication of silicon wafers, from which chips are made. Many PFAS are found in the wastewater of semiconductor companies. There are currently no regulatory limits on PFAS discharges, so chip makers can legally release the toxic chemicals into surface waters or send them to wastewater plants that are not equipped to remove PFAS. Many of those plants deliver them off-site in the form of biosolids (sludge), some of which is used as fertilizer on farms.



**Fluorinated Gases.** Fluorinated gases used in chip-making are potent, persistent greenhouse gases that contribute to climate change and can produce PFAS byproducts. In 2023, electronics manufacturers in the U.S. released fluorinated gases whose climate impact (4.4 million metric tons of CO<sub>2</sub>) was equivalent to the electricity use of more than 900,000 homes.



**Fluoropolymers.** Fluoropolymers are another subset of PFAS, formed by combining identical PFAS molecules. They may be less hazardous than non-polymer PFAS, but across their lifecycle (between production, use, and disposal), they are highly hazardous to human health.

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*The widespread and growing use of these compounds constitutes a large uncontrolled experiment on people and other inhabitants of planet Earth.*

*They must be phased out as quickly as possible, and until that happens, they must be removed from industrial waste streams and fully destroyed.*

## Recommendations

1. The semiconductor industry should be required to measure and publicly report its use and release of all PFAS into the environment, as well as potential workplace exposures.
2. Industry and government should develop environmentally superior substitutes for all forms of PFAS in semiconductor production.
3. Companies should be required to remove and destroy all PFAS from their waste streams.
4. Programs should be put in place to prevent the environmental release of fluoropolymers and other PFAS at the “end of life” of electronic equipment.

## Take Action

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