



# Burleigh Manor Middle School

## Safer Sealants Team





Meet Our Team!

# What are COAL TAR Sealants?

Coal tar sealants are substances put on driveways, black tops, and parking lots that are used to extend the life of asphalt. We are asking for 0.1% PAH ban on coal tar pitch-based driveway sealants.

## Why are they used?

- They extend the life of asphalt
- They provide a clean, finished look



However, coal tar sealants contain dangerous chemicals called PAHs that are harmful to people and the environment.

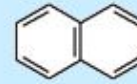
# What are PAHs?

Polycyclic aromatic hydrocarbons (PAHs) are the harmful chemicals found in coal tar sealants.

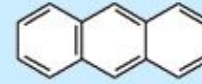
They cause rashes, skin irritations, cancers, mutations, birth defects, and death.

They are also toxic to aquatic animals, including fish and aquatic invertebrates (McIntyre 2017).

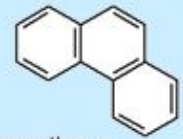
## Polycyclic Aromatic Hydrocarbons (PAH)



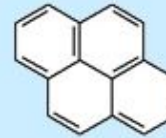
naphthalene



anthracene



phenanthrene



pyrene



benzo [a] pyrene

Metabolic byproducts of benzo [a] pyrene react with DNA to form adducts, leading to carcinogenesis (cancer).

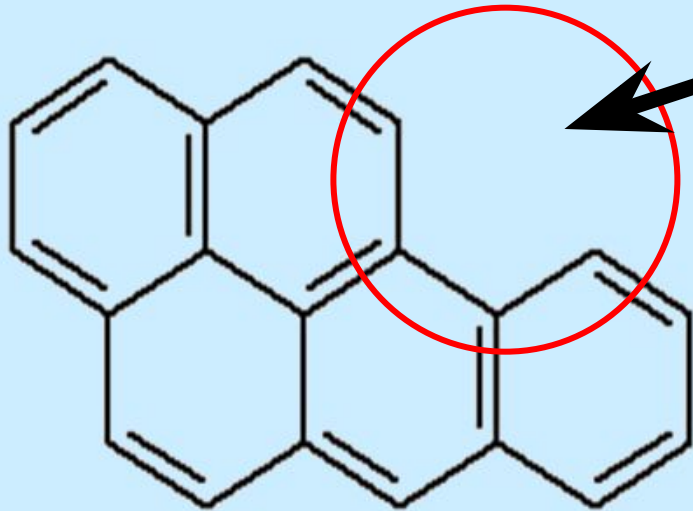


These are five PAH compounds, all are known carcinogens, and all are found in coal tar sealants.

# How do PAHs Cause Cancer?

When PAHs are taken into the body, they go directly to the liver.

Carbon atoms of benzo[a]pyrene



This creates an  
**ETHER.**

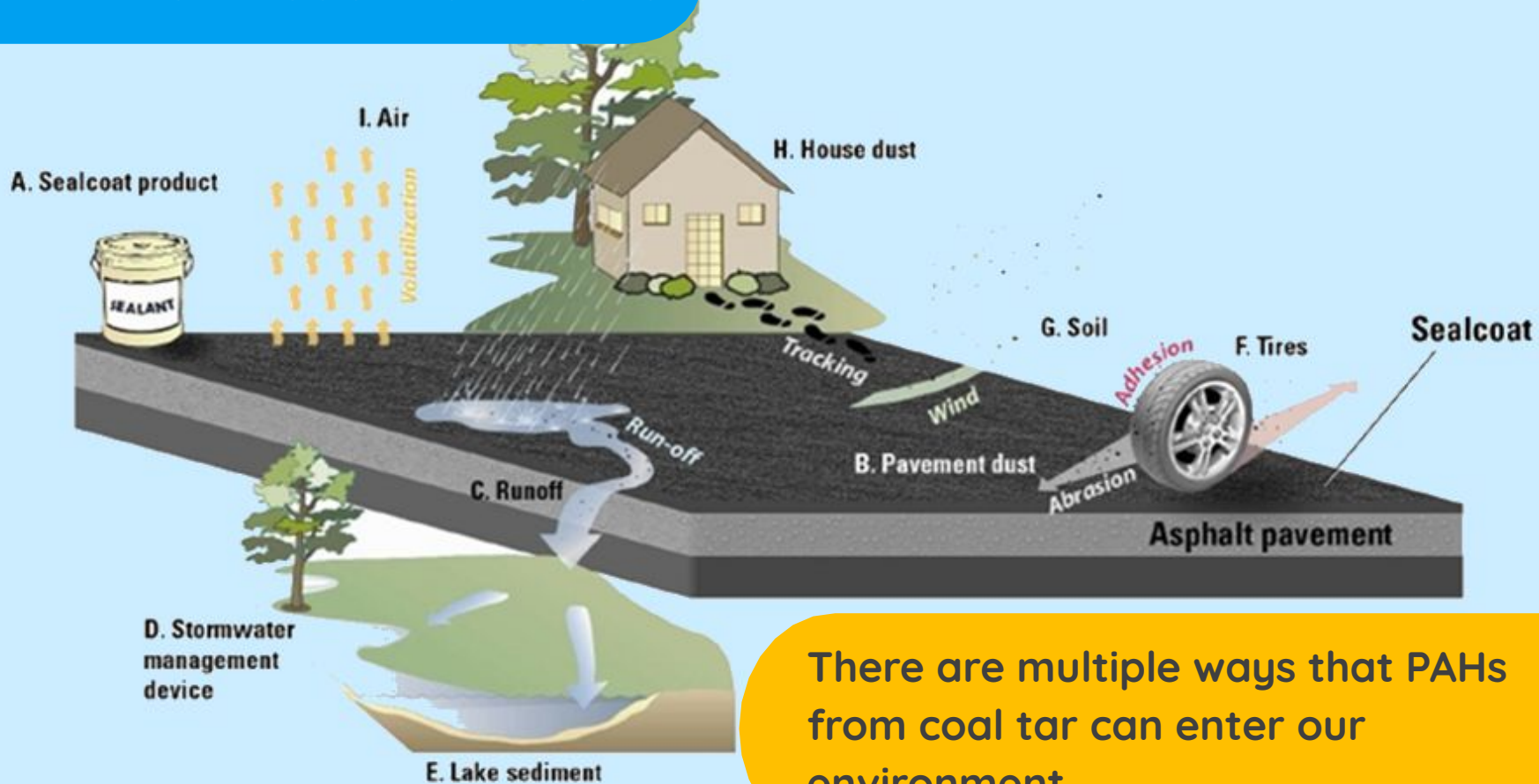
Ethers bind naturally with DNA  
and damage it, causing cancer.  
(Maryland Dept. of Health 2019)

# UV and PAH Dangers

PAHs and UV light are a **toxic** combination. When UV rays come in contact with PAHs, it makes the PAHs even more harmful (Arfsten *et al.*).



# How PAHs in Coal Tar Travel



There are multiple ways that PAHs from coal tar can enter our environment.

# House Dust

House dust adjacent to coal tar sealed parking lots contain concentrations of PAHs 25 times higher than house dust collected in houses near unsealed or asphalt sealed parking lots (Williams and Wilbur 2017).

Children crawl and play on floors and put their fingers in their mouths a lot, so they have a higher chance of being affected by **PAHs** (Williams and Wilbur 2017).

Household dust with **PAHs** leads to an **elevated cancer risk** for children (Mahler *et al* 2016).





# How Carcinogenic are PAHs?

Benzo[a]pyrene, benzene, coal tar, and coal tar pitch are all classified as known carcinogens by numerous health agencies.

- Group 1 carcinogen (carcinogenic to humans)  
International Agency for Research on Cancer  
World Health Organization
- Known to cause cancer  
National Toxicology Program
- Group A Carcinogen (carcinogenic to humans)  
Environmental Protection Agency
- Occupational Carcinogen  
Centers for Disease Control and Prevention

*A Rough Guide to*  
**IARC CARCINOGEN CLASSIFICATIONS**

The International Agency for Research on Cancer (IARC) classifies substances to show whether they are suspected to cause cancer or not. It places substances into one of five categories depending on the strength of evidence for their carcinogenicity.

GROUP	WHAT DOES IT MEAN?	WHAT DOES IT INCLUDE?
<b>GROUP 1</b>	<b>CARCINOGENIC TO HUMANS</b> Sufficient evidence in humans. Causal relationship established.	 Smoking, exposure to solar radiation, alcoholic beverages and processed meats.
<b>GROUP 2A</b>	<b>PROBABLY CARCINOGENIC TO HUMANS</b> Limited evidence in humans. Sufficient evidence in animals.	 Emissions from high temp. frying, steroids, exposures working in hairdressing, red meat.
<b>GROUP 2B</b>	<b>POSSIBLY CARCINOGENIC TO HUMANS</b> Limited evidence in humans. Insufficient evidence in animals.	 Coffee, gasoline & gasoline engine exhaust, welding fumes, pickled vegetables.
<b>GROUP 3</b>	<b>CARCINOGENICITY NOT CLASSIFIABLE</b> Inadequate evidence in humans. Inadequate evidence in animals.	 Tea, static magnetic fields, fluorescent lighting, polyethylene.
<b>GROUP 4</b>	<b>PROBABLY NOT CARCINOGENIC</b> Evidence suggests no carcinogenicity in humans/animals.	<b>1</b> ONLY 1 CHEMICAL EVER PLACED IN THIS GROUP, OF ALL SUBSTANCES ASSESSED Caprolactam, which is used in the manufacture of synthetic fibres.

THE IARC'S INDEX ONLY TELLS US HOW STRONG THE EVIDENCE IS THAT SOMETHING CAUSES CANCER. SUBSTANCES IN THE SAME CATEGORY CAN DIFFER VASTLY IN HOW MUCH THEY INCREASE CANCER RISK.

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# Types of Cancers Associated with Coal Tar Exposure

Agencies below have found that exposure to PAHs over the long term increase the risk of...

- skin
- lung
- kidney
- bladder
- stomach

...cancers in humans and animals (Williams and Wilbur *et al.* 2017).



# Columbia University Center for Children's Environmental Health Study

A 2012 study was conducted on 164 randomly selected, healthy pregnant women:

- They concluded that PAH exposure is associated with methylation (*changing DNA segments, genes, and white blood cells*) in the umbilical cord of the participants
- The study also showed that PAHs can cross the placenta and fetal blood-brain barrier, triggering inflammation that is toxic to the developing brain
- They also concluded that coal tar exposure causes lower IQs  
(Perera, F., Weiland, K., Neidell, M. *et al.* 2014)



# Taylorville, Illinois, Neuroblastoma Cases Linked to Coal Tar

On Feb. 22, 2002, the Illinois Supreme Court upheld the jury award in the case of ZACHARY DONALDSON *et al.*, Appellees, v. CENTRAL ILLINOIS PUBLIC SERVICE COMPANY *et al.*

- 50,000 gallons of coal tar was buried
- Construction disturbed it
- A jury awarded \$3.2 million to four children
- The children were stricken with neuroblastoma as a result of their exposure to the PAHs in Coal Tar

# PAHs in Urban Sources

All concentrations in mg/kg (averages of up to 6 studies)

- Fresh asphalt 1.5
- Weathered asphalt 3
- Fresh motor oil 4
- Brake particles 16
- Road dust 24
- Tire particles 86
- Diesel engine 102
- Gasoline engine 370
- Used motor oil 440

## Pavement Sealcoat

● Asphalt Based  
~ 50

● Coaltar based

~70,000

# PAHs and the Environment

## *Bottom-dwellers*



Freshwater  
mussels



Caddisfly larvae



Mayfly larvae



Snails



Stonefly larvae



Dragonfly larvae

Coal tar contains **16 PAHs** that are classified as U.S. Environmental Protection Agency Priority Pollutants, including naphthalene and pyrene (Mahler and Van Metre 2017).

When benthic organisms (bottom-dwellers) are exposed to PAHs, they experience problems such as **loss of consciousness, inability to reproduce, and death**, which can disrupt entire food chains (McIntyre 2017).

# PAHs and Environmental Health



Tumors in brown bullhead catfish from the Anacostia River, Washington, D.C., are believed to be related to elevated PAH concentrations (Pinkney and others, 2009). Photograph by A.E. Pinkney.

Varying levels of exposure to PAHs from sealants are toxic to human and aquatic health.

- “**Acutely toxic**” to fathead minnows and water fleas (Mahler *et al.* 2016)
- May be linked to **tumors** in brown bullhead catfish in the Anacostia and Potomac Rivers (Pinkney 2013)

Fish embryos that are exposed to low amounts of **PAHs** can develop **eyes with shorter retinas and smaller lenses, misshaped hearts, and abnormal heartbeats.**

# PAHs in Soil

Wind, runoff, and especially snow plows, can move PAH-contaminated pavement dust into nearby **soil**.

- PAH concentrations in **soil** can range from **2.3** to **14 times** higher in soils adjacent to sealcoated pavement than unsealed pavement (VanMetre *et al.* 2009).
- Elevated levels of PAHs can be found for up to **three years** after the sealcoat is applied (UNH Sea Grant).



Soil contaminated with PAHs excavated at a former manufactured- gas plant site (Photo by Michael Aitken)



# PAHs in Stormwater

- Opponents have said that water testing has come up without dangerous levels of PAHs. However, according to the US National Library of Medicine and National Institutes of Health, “Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous contaminants in the environment exhibiting moderate to low water solubility that promotes sorption to particulates and subsequent accumulation in sediments.”  
**This means that the PAHs settle in the sediment, not the water, meaning that by testing the water you cannot make an accurate claim about PAHs.**
- High concentrations of PAHs have accumulated in some stormwater pond sediments around the state.
- Research conducted by the Minnesota Pollution Control Agency, the U.S. Geological Survey, and the University of New Hampshire Stormwater Center shows that **coal tar-based sealants are a significant source of PAHs to urban waterways.**

# Clean Up Costs

Cities must maintain stormwater ponds by dredging them, and if the PAH concentrations in the dredged material are high enough, **disposal can be very costly, in the hundreds of millions of dollars statewide.**

- Studies by the MPCA show that the decrease in use of coal tar products will **reduce the clean up costs by a half or almost two thirds.**



Minnesota Pollution  
Control Agency

## Safety Data Sheets

We looked through many safety data sheets that sealcoating companies provide on their websites. Many of these safety data sheets say their sealants contain hazardous PAHs like benzo[a]pyrene and naphthalene (both are known carcinogens).



# Safety Data Sheets

GemSeal is a company that manufactures coal tar sealants with PAH levels higher than 0.1%, and their safety data sheet states that their product is classified as a Category 1A carcinogen.

The safety data sheet also states that the refined tar may cause:

- allergic reactions
- genetic defects
- fertility damage
- organ damage
- reproductive effects



# Safer Sealants



Home Depot Latex-ite Sealant Display

Latex-based sealers and asphalt-based sealers are two alternatives easy to get and priced about the same as high PAH coal tar based sealers.

Asphalt and latex-based sealers cost about **\$16.84-\$35.99 per 4.75 gallon bucket** at Home Depot, Lowe's, and ACE stores, which is comparable to coal tar sealants.

# A Comparison of Driveways...



Can you identify the different sealants?

# Industry Claims

**Claim:** Coal tar sealants have zero correlation to cancers in humans and aquatic species.

**In reality:** The EPA states that coal tar emulsion sealants can contain up to 35% refined coal tar, which is made up of 50% PAHs by mass. According to key health agencies, PAHs are carcinogens known to be toxic to human and aquatic life.

# Industry Claims

**Claim: Banning coal tar would be devastating to local businesses.**

**In reality: Instead of banning the manufacturing of coal-tar sealants outright, we will use a tiered recognition-award system to incentivise manufacturers to reduce the percentage of PAHs in these products. Besides, many seal coat application companies have already stopped using coal tar sealants. The major coal tar sealant manufacturers all make asphalt and latex sealers.**



# Industry Claims

**Claim:** Coal tar can help the Chesapeake Bay. PAHs are the building blocks of life, as they are hydrocarbons and are made of water and carbons.

**In reality:** Hydrocarbons are not made of water and carbons, but hydrogen and carbon. PAHs actually harm the environment, especially bottom-dwellers, which are the building blocks of the freshwater food chain.

# Industry Claims

**Claim:** Coal tar coats the stormwater and sewage treatment, which would help stop sewer water from infiltrating the drinking water supply.

**In reality:** Our bill only covers sealcoat that is made of coal tar pitch, or refined coal tar, products that coat driveways and parking lots. We are not calling for a ban on any other products that may contain coal tar.

# Industry Claims

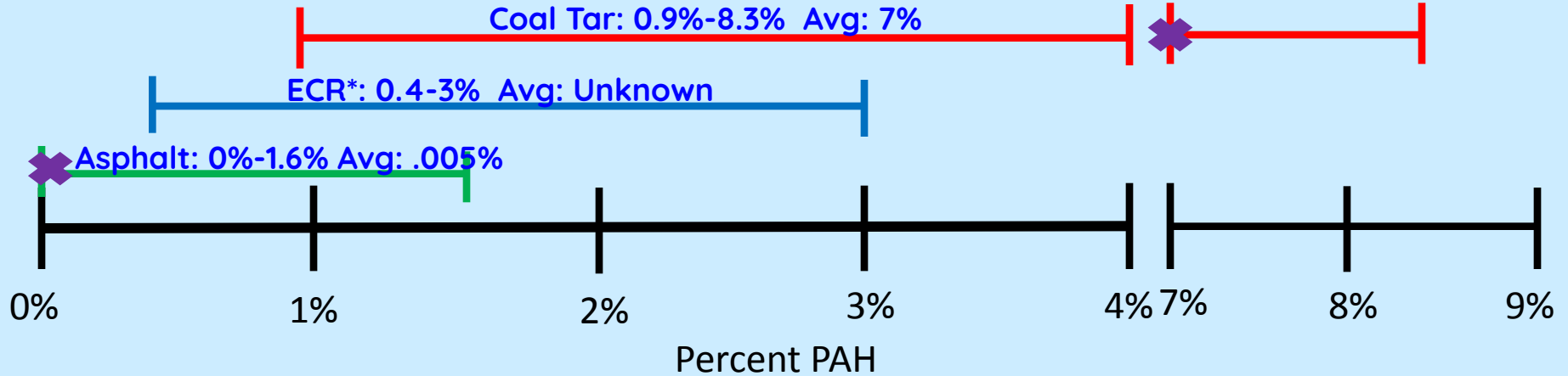
**Claim:** High PAH sealants are deemed safe for workers, has minimal to no health effects, and is classified as safe and effective by the Food and Drug Administration.

**In reality:** Throughout our research, we found that high PAH sealants are dangerous to humans and can cause skin, lung, kidney, bladder, and stomach cancers.

# The Bill

We worked with Sean Campbell from Seaboard Asphalt to address his concerns regarding the bill, including the sale outside of MD, enforcement, and the 0.1% limit in the bill

# PAH Concentrations by Sealant Type



\*concentration range is an estimate from Minnesota Pollution Control Agency

The difference between the coal tar and asphalt averages is 6.995%

✖ Average PAH concentration

# Why We Need A 0.1% PAH Limit

A 0.1% PAH limit will prevent companies from creating new sealants such as ECR, which contain dangerous levels of PAHs.

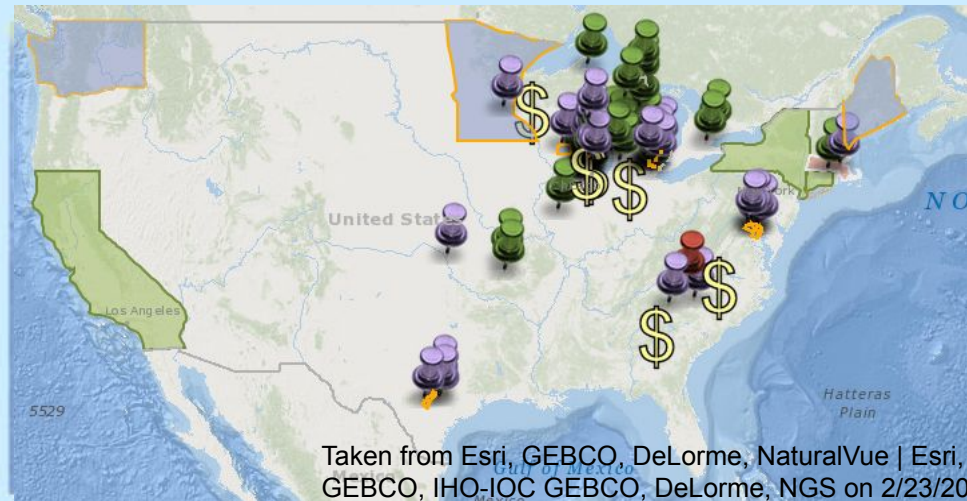
## Legislative Precedent:

- The District of Columbia, Wisconsin (1/2024), and Maine (10/2020)
- The European Union classifies road waste with 0.1% PAHs or higher as **hazardous waste** (Vansteenkiste & Verhasselt 2004)

# List of US State and County Bans

Albertville, MN  
 Almont, MI  
**Annapolis, MD**  
 Ann Arbor, MI  
 Ann Arbor Township, MI  
**Anne Arundel County, MD**  
 Austin, TX  
 Bee Cave, TX  
 Buffalo, MN  
 Cannon Falls, MN  
 Centerville, MN  
 Circle Pines, MN  
 Dane County, WI  
 Dexter, MI  
 Eden Prairie, MN  
 Edwards Aquifer  
 Authority, TX  
 Edina, MN  
 Elk River, MN  
 Evanston, IL

Falcon Heights, MN  
 Glendale, WI  
 Golden Valley, MN  
 Greenville, SC  
 Hamburg Township, MI  
 Hutchinson, MNV  
**Howard County, MD!!**  
**State of Indiana - pending**  
 Inver Grove Heights, MN  
**Home Depot Stores Throughout  
 U.S.**  
 Little Canada, MN  
**Lowes Stores**  
 Maplewood, MN  
**State of Maryland??**  
 Medina, MN  
 Milwaukee, WI  
 Minneapolis, MN  
**State of Minnesota**  
**Montgomery County, MD**  
 New Hope, MN  
 Newport, MN  
 North Barrington, IL



Taken from Esri, GEBCO, DeLorme, NaturalVue | Esri, GEBCO, IHO-IOC GEBCO, DeLorme, NGS on 2/23/20

Oakdale, MN  
 Pittsfield Township, MI  
 Prior Lake, MN  
**Prince George's County,  
 MD**  
 Rosemount, MN  
 Roseville, MN  
 San Antonio, TX  
 San Marcos, TX  
 Scio Township, MI  
 Shoreview, MN  
 Shorewood, MN  
 South Barrington, IL  
 Spring Lake Township, MI  
**State of Maine**

Suffolk County, NY  
 Vadnais Heights, MN  
 Van Buren Township, MI  
 Waconia, MN  
**Washington, DC**  
**State of Washington**  
 West Bloomfield Township, MI  
 White Bear Lake, MN  
 West St. Paul, MN  
 Westwood, MA  
 Wilmette, IL  
 Winnetka, IL  
 Winfield, KS  
 Woodland, MN

# Protect Maryland!

Currently, there are coal tar sealant bans in 4 Maryland counties: Montgomery County (2012), Prince George's County (2015), Anne Arundel County (2015), and Howard County (2018).

Currently, about 45% of all Maryland residents are now under a coal tar ban, so why not ban it in the whole state?

Let's join the 22.6 million Americans who are currently protected under a coal tar ban!

