December 3, 2009

To Whom It May Concern:

The Springfield-Greene County Environmental Advisory Board (EAB) recently reviewed national research on the health and environmental effects of coal-tar based pavement sealants and presented their findings to Springfield City Council on November 23, 2009. Enclosed is a copy of EAB’s letter summarizing the research and their recommendations. The issue has been referred to City Council's Community Involvement Committee for further review. City staff has been requested to gather information regarding the use of coal-tar based sealants in the Springfield area and report back to the Community Involvement Committee. As part of this information gathering, we are soliciting input from the local sealant supply and applicator industry. Specifically, we would like input on the following topics:

- Prior to reading this letter, were you aware of studies that show coal-tar based sealants to be harmful to the environment?
- What type of sealant do you sell/use most often – coal-tar based, asphalt-based, or other?
- Approximately what percentage of your sales/use of sealant is made up of each?
- Are you aware of any reasons such as cost, availability, performance, etc. why asphalt-based sealants are not a viable alternative to coal-tar based sealants?
- Would you be willing to voluntarily discontinue the use of coal-tar based sealants? If so, when do you think it would be feasible for you to phase out its use?

We would appreciate your response to these questions and any other input you would like to provide on this issue. We would like to receive your response by December 11th; however, we will still accept and submit it to the Committee if received after this date. Please submit your response in writing to me by email at clamb@springfieldmo.gov or by mail at 840 Boonville Ave, Springfield, MO 65801.

Sincerely,

Carrie Lamb
Storm Water Technician
Storm Water Services Division

C: Todd Wagner, PE, Storm Water Services Division
Mike Kromrey, EAB Chairman
Coal-Tar Based Pavement Sealants Resource Notebook

Section 7 Addendum

Responses Received as of 12/31/09 to City of Springfield letter to local businesses, dated 12/3/09

1. Springfield Striping & Sealing*
2. Lazer Perfect Striping & Sealing Inc.
3. Mount Vernon Pavers LLC
4. Donelson Construction Co., LLC
5. Pavement Coatings Technology Council
6. SASCO Pavement Coatings, Inc.
8. Tri-Lakes Sealing & Striping

*Since submitting this letter, Springfield Striping & Sealing has committed to voluntarily discontinuing the use of coal-tar sealants.
December 9, 2009

City of Springfield  
Department of Public Works  
Carrie Lamb  
PO Box 8368  
Springfield, MO 65801-8368

RE: Coal-tar based pavement sealers

Dear Ms. Lamb:

My name is Joe Manzardo and I am the owner of Springfield Striping & Sealing and Residential Sealing Services. In response to your letter dated December 3, 2009, I was not aware of any studies that show coal-tar based sealants as harmful to the environment. Ninety five percent of the sealants we use are coal-tar based. Roughly 40% of our sales come from sealcoating. There are a few occasions we use asphalt based sealants, but that is very rare because of cost, availability and performance. We have found asphalt based sealants to be as much as 50% more in cost with a life span of 50% less than coal-tar sealers. We have never considered using asphalt based sealants as our main product and would not be in favor of discontinuing coal-tar.

Sincerely,

Joe Manzardo
December 10, 2009

Carrie Lamb, Storm Water Technician
Department of Public Works
840 Boonville Ave.
Springfield MO 65801-8368

Re: Your request for input on the health and environmental effects of coal-tar based pavement sealants.

Prior to reading this letter, were you aware of studies that show coal-tar based sealants to be harmful to the environment?

I am not aware of any studies (before or including this letter) that show or more importantly, prove with hard, true, scientific facts, that coal-tar based sealants are harmful to the environment.

What type of sealant do you sell / use most often – coal-tar based, asphalt-based, or other? Approximately what percentage of your sales / use of sealant is made up of each?

Our Company currently uses approximately 99% coal-tar based sealants and 1% asphalt based sealer.

Are you aware of any reasons such as cost, availability, performance, etc. why asphalt-based sealants are not a viable alternative to coal-tar based sealants?

Asphalt based sealers are more contingent on the current price of oil. Also, in my experience, they are not known to last as long as coal-tar based sealants.

Would you be willing to voluntarily discontinue the use of coal-tar based sealants? If so, when do you think it would be feasible for you to phase out its use?

At this point, I see no reason to discontinue the use of coal-tar based sealants unless it is proven through independent and scientific studies that it is harmful to the environment. The EAB letter states that "Reducing, or banning coal tar sealants could benefit the City’s ongoing efforts to reduce storm water pollution." The key word in my mind is "could". That may or may not mean that it will. I believe we, in this Community, must only make decisions based on true, independent, non-biased, and solid scientific evidence before we jump to conclusions, on this or any other topic; especially when it may reduce quality and / or increase consumer costs.

Paul Frizzell, President
December 9, 2009
Carrie Lamb
Storm Water Technician

Carrie, in regards to your letter, I am not aware of any studies of coal-tar based sealants to be harmful to the environment. I use coal-tar based sealant, due to its price stability. Approximately 5% of my sales are seal coat. Asphalt based sealants are not a viable alternative to Petroleum sealants due to price fluctuations, making competitive bidding difficult. I would be willing to voluntarily discontinue the use of coal-tar based sealers if deemed necessary. It would be feasible at any time for me phase out the coal-tar based sealers.

Shawn Sexton
Mount Vernon Pavers LLC
December 11, 2009

Dear Ms. Lamb,

I am in receipt of your letter dated December 3, 2009 regarding coal tar use. Thank you for the opportunity to weigh-in on this issue.

I am an owner of Donelson Construction Co., a family operated business located between the towns of Republic and Clever in Christian County. Our families all reside within the City of Springfield, and have since 1972.

Donelson Construction specializes in asphalt pavement maintenance, and is seen as a leader in this industry in the Midwest. We have over 20 years experience in this field, and operate not only in the Springfield metro area, but all over several neighboring states. Our customers include states, counties, and cities, as well as individual property owners. Donelson is a contractor that installs various sealant systems. Some of these systems are designed for parking lots and driveways, which is what coal tar is primarily used for, and many other systems we install are designed for high volume streets, roads, and highways.

I actually greatly hesitate to become involved in this discussion because, as you will read in my responses below, our company never has and never will use coal tar. However, after watching Mr. Kromrey’s presentation to City Council on November 23rd, I feel like the asphalt based sealant side of the industry may be under attack in this debate. My hope is that by responding to the questions below, the record may be set straight regarding some of the rumored negatives about asphalt sealants.

Allow me to answer your questions in the order asked:

1. Yes, we are well aware of the studies regarding coal tar. I am not aware of any evidence from any organization that contradicts their findings.

2. As mentioned, our company installs many different types of sealants for a range of applications. All of these sealant systems are asphalt based. Coal tar is not asphalt. The industry standard, outside of parking lot and driveway contractors, is to treat existing asphalt with material that is compatible with it – asphalt based sealants.

3. 100% of our sales utilize asphalt based sealants.
4. There are many subcategories to address here…

   a. Cost: Coal tar has, in recent years, been in short supply which has driven up the price. Asphalt sealant prices typically ebb and flow with the availability of asphalt and the price of crude. Given all the variations, however, the prices of the two types remain relatively equal. Typically, the materials cost of sealing and re-striping a parking lot or driveway is just 25-35% of the overall price. The majority of the price consists of labor and profit.

   b. Availability: In Missouri, coal tar is manufactured in Springfield, Kansas City, and St. Louis. Each facility that manufactures coal tar makes asphalt based sealant as well. In fact, many of the contractors in the Springfield area have applied asphalt based sealant at one time or another.

   c. Performance: Keep this in mind regarding performance – short term vs. long term.

      Short term…Springfield has many quality contractors that perform installations. However, some sealing contractors just simply want a sealant to look good after the initial installation. This allows a contractor to receive job acceptance by the owner, and most importantly to get paid. Coal tar allows some contractors to be sloppy with its application, whether that entails over-dilution of sealant, poor installation technique, opening to traffic too quickly, a sudden rain event, etc. Whatever the case may be, the components within coal tar that are harmful, also give coal tar a way of staining the surface black, even under early duress. So even if the sealant wears off significantly while it is still tender, it still manages to give just enough black appearance to the surface to allow the contractor to be paid. My experience has been that if some contractors say coal tar is better than asphalt based sealants, this mindset many times is at the heart of the argument.

      Long term…Asphalt sealant has the same characteristics as the asphalt it protects, while coal tar does not. Therefore, asphalt sealants are more likely to expand and contract with freeze/thaw cycles than coal tar. Long term, asphalt sealant is healthier for the pavement.

You may also hear that coal tar is fuel resistant, and asphalt based sealants are not. It is true that fuels and oils are more readily absorbed into the underlying asphalt through asphalt sealant than coal tar. This is likely beneficial in that the oils remain contained within the asphalt and do not readily wash off into the drainage systems. Spots of oil drippings are easily noticed in the middle of numerous parking stalls. The parking surface, nor the sealant somehow “disintegrate” into the environment under these conditions. Further, advancements in technology now have
provided products that can penetrate fuel and oil drippings and chemically alter them to form a hard coating, in effect permanently locking them into the existing pavement. Some in the industry feel that one day this type of treatment may become a mandatory requirement for property owners to insure compliance with storm water runoff regulations.

Asphalt based sealants are an emerging new technology market. Coal tar sealants have been around for about 50 years, whereas asphalt sealants have been used for about half that time. Asphalt sealants came into prominence when the industry self imposed a ban in states like California because of environmental and employee health concerns. Now, coal tar sealants are rarely found used west of the Rocky Mountains. Today many new, and for that matter existing contractors want to get their labor force (who frequently consists of themselves or their family members) away from the skin and lung burns that application of coal tar can cause.

Also, the advancements in new technology have recently given asphalt based systems fuel resistance, similar to coal tar. Further, a locally available asphalt sealant has been tested as “PAH non-detectable”. In the science community that means that it is practically PAH free.

As a wearing surface...A sealant surface also becomes the wearing surface. Under traffic, both types of products will wear off. Water is the number one most frequently used solvent in the world and has a wearing effect upon asphalt, concrete, and most all coatings known to man, including coal tar and asphalt sealants. To say that water is more harmful to asphalt sealant than coal tar is unfounded. Assuming identical application rates of both products, and under the same traffic stress, both products will wear very similarly, depending upon the quality of the manufactured product. This similar wear can be observed on lots here in Springfield.

In summary, properly applied asphalt based sealants have a long, proven track record of sound performance all across the country. Therefore, they are a very viable alternative to coal tar.
5. To reiterate, our company does not apply coal tar and never will. But if we did, the change over would be so easy, it could literally be done overnight. As stated, all contractors have the ability to apply both types of sealant right now - the application equipment is exactly the same. There would not be any out-of-pocket expense for a contractor to switch, except for the time it takes to get familiar with another material, assuming they have never applied asphalt.

Best regards,

Michael J. Donelson
Donelson Construction Co., LLC
Dear Ms. Lamb

I write on behalf of the Pavement Coatings Technology Council (PCTC), the members of which are engaged in providing sealing and coating applications that are used to protect and extend the useful life of pavements. Members of the PCTC are dedicated to providing accurate information about pavement sealers and conducting scientific and engineering research that promotes continuous improvement in the health, safety and environmental performance of pavement coatings. To further this goal, the PCTC supports the use of scientifically valid information and methods to evaluate potential environmental impacts and risks.

The PCTC and its applicator member community are advocates for the environment we work and live in. Contractors engaged in application of pavement sealants are small business, involved in their communities in many ways. As responsible members of the community, contractors take steps to protect the health and safety of employees and the public as well as the local environment through use of proper application standards/Best Management Practices (BMPs). BMPs for storm water pollution prevention are communicated and adhered to by sealant applicators. These BMPs minimize runoff risk as refined coal tar-based and asphalt-based emulsion sealants (asphalt life extenders) are generally thought to have low bioavailability. Some of the BMPs used include:

- Application under proper weather conditions,
- Proper installation equipment in good working order,
- Use of containment tools during application,
- Sewer block for a period following application, and
- Street sweep within one week of application to remove excess topical granules.

Responding to your letter of December 3, 2009 requires two different perspectives. The first is a response to the Springfield/Greene County Environmental Advisory Board memorandum of September 22, 2009. The second addresses questions asked in your letter.
The memorandum contains some generalities about polycyclic aromatic hydrocarbons (PAHs). PAHs are ubiquitous in earth’s environment and, indeed, even in space (see Salama, 2008). The volume of scientific and general interest publications about PAHs over the past three decades is overwhelmingly voluminous. Those interested in learning more might consider starting with *A Guide to Polycyclic Aromatic Hydrocarbons for the Non-Specialist* (Boehm et al., 2002).

Of more specific interest, attached to this letter is a document called *Parking Lot Sealants and Polycyclic Aromatic Hydrocarbons* prepared by the PCTC, containing information about both refined coal tar-based sealants and PAHs.

The EAB memorandum of September 22 contains some purported facts about refined coal-tar based sealants in general and specifically in Springfield/Greene County. The PCTC respectfully submits the following comments and questions to the EAB.

- In the first bullet point, it is stated that PAHs are toxic and also states “some local citizens work with coal tar daily.”
  - Appearances aside, the EAB is surely not implying that it has independently conducted a human health risk assessment that suggests the City investigate and adopt occupational control measures independent of those already in force under the US Occupational Safety and Health Administration (OSHA) and the Missouri Department of Labor and Industrial Relations.

- Some PAHs have been identified as potential human carcinogens.
  - Seven of the 16 PAHs on EPA’s Priority Pollutant list have, indeed, based on studies in experimental rodents conducted at high exposure concentrations, been identified as possible human carcinogens.

- The third bullet of the EAB memorandum purports to address the PAH content of refined coal tar-based sealants.
  - The PCTC requests more information on the source of the EAB’s statements that refined coal tar-based sealants “contain approximately 50 percent PAHs by weight. We [EAB] estimate between 1.1 and 1.9 million pounds of PAHs are applied to the greater Springfield metro areas road surfaces annually.” Refined coal tar-based sealants are an emulsion, made by mixing refined coal tar with an approximately equal volume of clay and addition of an emulsifier. During application, the amount of coal tar in the emulsion is diluted even further by the addition of an aggregate (usually quartz sand) and water.

- The EAB memorandum states “Parking lots where coal tar sealants are used have been identified as point sources for PAHs in waterways.”
  - Indeed, one study (Mahler et al., 2005 or the corrected version, Mahler et al., 2007) in Austin, Texas reported the unsurprising result that chips of sealant from seal coated parking lots contain PAHs. The authors reached conclusions far beyond what was warranted by the study, however, by asserting that sealant was a
significant source of PAHs in sediments in Austin waterways. The study only looked at one of the thousands of possible sources of PAHs in Austin. Gauthier and DeMott (2008) and DeMott et al. (submitted) conducted a study of PAHs in Austin sediments, collecting samples before and after the city banned sealants. Unlike the Mahler et al. study, the DeMott study analyzed the suite of PAHs commonly used to apportion PAHs among possible sources. Results of this follow-up study not only showed that concentrations of PAHs in sediments were not discernably different before and 2.5 years after the ban, but also showed that refined coal tar-based sealants could not be identified in Austin sediment PAH profiles.

- The EAB memorandum suggests that “Reducing or banning coal tar sealants could benefit the City’s ongoing efforts to reduce storm water pollution as required by its MS4 permit.”
  - A brief review of the City’s National Pollutant Discharge Elimination System (NPDES) permit does not indicate that PAHs are monitored as pollutants of concern. Nor does the Annual Report indicate any data that has been collected that suggests that refined coal tar-based sealant is a, much less THE, source of any PAHs in City stormwater. The PCTC is baffled that the City would consider acting on a recommendation based on a complete absence of either prior concern or any data in support of the recommendation.
- The EAB memorandum states “Alternative products to coal tar sealants exist, at similar prices, and can be applied by local businesses using the same equipment as for applying coal tar sealants.”
  - The PCTC requests the EAB’s sources for these assertions. We urge the City to consider that different sealant products are applied according to the advantages and disadvantages of each product for the specific application. Different sealants have different characteristics that are not equivalent.

Letter from Carrie Lamb, Storm Water Services Division, City of Springfield dated December 3, 2009

Most of the questions posed in your letter are related to individual businesses and, as such, it would not be appropriate for PCTC to comment. However, taken in context, the first question “Prior to reading this letter, were you aware of studies that show coal-tar based sealants to be harmful to the environment?” seems to side-step the issue that appears to be concern that PAHs could be present in local sediments. One might as well ask whether, being aware that all the products or activities listed below contain or create PAHs that enter the environment, the City of Springfield would take recommendations to restrict the product or activity under advisement:
  - Operating an internal combustion engine that uses petroleum products, natural gas biodiesel, or other alternative biofuels such as ethanol;
  - Using any form of lubricant other than molybdenum- or graphite-based products;
- Driving on rubber or synthetic rubber tires;
- Paving roads with asphalt;
- Using asphalt roofing materials;
- Burning wood;
- Operating a jet engine;
- Barbeque-ing;
- Composting;
- Smoking legal or illegal plant materials;
- Burning toast or, for that matter, any food;
- Operating an acetylene torch; or
- Lighting a candle.

Refined coal-tar based sealants extend the life of asphalt pavement and, by some estimates, last twice as long as asphalt-based sealants in similar applications. The coal tar-based product thus has a life cycle advantage in that less (PAH-containing) asphalt needs to be used over the lifetime of a paved area. Refined coal-tar based sealants are not subject to corrosion and deterioration caused by leaks or spills of petroleum-based products, and are thus used in areas where petroleum-based products may be released such as parking lots and vehicle/aircraft maintenance facilities.

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We are all guilty of looking for a magic bullet, in this case the one that will solve the problem of PAHs in sediments in urban waterways. Unfortunately, a focus on any type of pavement sealer, whether coal tar- or asphalt-based, can only lead to disappointment as changing sealant use patterns is likely to have little or no discernable impacts on the nature of the problem – to the extent there is a problem - in Springfield or Greene County or anywhere in the modern world. The modern world can be fairly characterized as the world where PAH-containing materials are used. Many studies have shown that PAH concentrations increase as population increases (for example, see Hafner et al., 2005), without any indication that areas where refined coal tar-based sealants are used are any more likely to have high PAH concentrations.

Thank you for your attention. Please feel free to contact me should there be any questions.

Very truly yours,

Anne P. LeHuray, Ph.D.
Executive Director

Attachment
References


PARKING LOT SEALANTS
AND
POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

**Refined coal tar-based sealants and PAHs**

- Coal tar is a by-product of the production of coke used in making iron and steel. Coal tar consists of a mixture of naturally occurring compounds containing hydrogen and carbon that are common to all organic fuels (coal-, petroleum-, wood-based fuels). Some of these hydrocarbons belong to a class of materials called polycyclic aromatic hydrocarbons (PAHs). More about PAHs later.

- Refined coal tar-based sealant emulsions are made from refined coal tar. The concentration of PAHs in the refined coal tar used to make sealants is less than that in unrefined coal tar. Historically, refined coal tar-based sealants have been more commonly used in regions of the country where coke plants are present.

- In addition to refined coal tar, refined coal tar-based sealant emulsions contain clay and emulsifiers (emulsifiers are ingredients used to bind together substances that don’t normally mix, such as oil and water). Prior to application, the refined coal tar sealant emulsion is further diluted by addition of sand and water.

- The sources of PAHs in soils and sediments have been the subject of an enormous volume of research over the past three decades. Identification of sources and apportioning specific sources to specific occurrences of PAHs has developed into its own scientific discipline called “Environmental Forensics.”

- One recent publication has suggested that refined coal tar-based sealants applied to parking lots may be a significant source of PAHs in Austin, Texas. This suggestion only can be evaluated in highly localized instances, and only when all local sources PAHs have been evaluated. Unfortunately, the authors of the Austin study did not evaluate any possible source other than parking lots, even though data exist that old industrial facilities that formerly operated next to Austin’s streams and ponds are a source of the PAHs in sediments.

- A follow up study in Austin, Texas that looked at PAHs in sediments before and three years after a municipal ban on the use of refined coal tar-based sealants showed no discernable differences either in the sources or amounts of PAHs in local streams (Gauthier and DeMott, 2008; DeMott and others, submitted for publication to the Journal of Environmental Forensics).

- A study is in progress at the University of New Hampshire, where refined coal tar-based sealant was applied to test parking lot. The study to date demonstrates the importance of adhering to manufacturer’s directions during sealant application. Refined coal tar-based sealants are an emulsion, which means that,
Coal Tar-Based Sealants and PAHs

like Jello®, the material must gel or cure. Manufacturers direct that sealants be applied when the weather is warm and no rain is in the forecast. Unfortunately, the sealant was applied to the University of New Hampshire test parking lot on a day when temperatures were not optimal and it rained within hours of application. Photographs taken by the researchers clearly show that the sealant did not cure properly. Nevertheless, data reported so far show that the washed off sealant was trapped near the point of application with surprising efficiency by vegetation in the runoff stream.

- Other than the controversial single study in Austin, no data exist to corroborate that refined coal tar-based sealants are a significant source of PAHs in any sediment.
- This is not to say that no PAHs in the environment come from refined coal tar-based sealants. PAH sources are everywhere that organic fuels are used, and the number of potential sources is very large.

What are PAHs

- Polycyclic Aromatic Hydrocarbons (PAHs) are a class of natural organic chemical compounds consisting of carbon and hydrogen atoms combined in thousands of different ways. A few hundred of the more common combinations have been named, and are sometimes considered separate chemicals.
- PAHs occur as complex mixtures and not as single compounds. PAHs are primarily introduced into the environment as by-products of incomplete combustion. These combustion sources are numerous, including natural sources such as wildfires as well as industrial processes, transportation, energy production and use, food preparation, smoking tobacco, and disposal activities such as open trash burning. Combustion sources are said to produce pyrogenic PAHs (that is, PAHs from burning). Petrogenic PAHs (literally, PAHs from rocks) are found in coal and crude oil.
- If you want to make your own PAHs, try any of the following: smoke a cigarette, barbeque a steak, burn toast, start composting, make a campfire, burn oil for heat, run an internal combustion engine, run a jet engine, light a candle, light an acetylene torch without adding oxygen.
- PAHs are lipophilic, meaning that they like oil more than water. In the environment, PAHs are thus not found in clean water but instead occur in soil and sediments.
- PAHs are present in soils and sediments in urban environments; PAH concentrations have been shown to increase as the population of the urban area increases (for example, see Hafner and others, 2005).
- Unlike metals, PAHs are organic compounds (contain carbon) and therefore can degrade in the environment. In aquatic environments, PAHs biodegrade (that is, are broken down by micro-organisms) to a greater or lesser degree depending on a wide variety of factors. PAHs can also be degraded by sunlight and atmospheric oxidation. Degradation is more rapid for some PAHs than for others so that, in the context of a human life time, some PAHs have been described as persistent.
• PAHs can enter the environment from “point sources,” such as municipal or industrial outfalls, or “non-point sources,” such as rainfall, runoff, or atmospheric deposition.

What’s the problem with PAHs?
• The U.S. Environmental Protection Agency (EPA) lists 16 PAHs as Priority Pollutants. Seven of the 16 are listed in the U.S. Report on Carcinogens (http://ntp.niehs.nih.gov/ntp/roc/toc11.html):
  o one is classified as a known human carcinogen,
  o seven are classified as likely to be human carcinogens, which generally means that tumors have been found in experimental animals exposed to high concentrations of the substance.
Nine of the 16 are not classified as carcinogens. The U.S. Report on Carcinogens list is consistent with the list developed by the World Health Organization’s International Agency for Research on Cancer.
• Because PAHs are practically insoluble in water, they tend to be concentrated in soils and sediment. In aquatic environments, bottom-living and bottom-feeding organisms can come in contact with PAH-contaminated sediment. Impacts of PAHs on the health of aquatic organisms are widely studied and many books and scholarly papers are available on the topic. In general, PAHs with lower molecular weights can be acutely toxic when present at elevated concentrations but are generally noncarcinogenic to aquatic organisms. PAHs with higher molecular weights are generally not acutely toxic to aquatic organisms, but a number of them are classified as possible carcinogens.
• Interactions between aquatic organisms and PAHs in sediments are exceedingly complex. Scientists who have worked extensively on the problem agree that the occurrence of adverse biological effects are difficult to predict using only concentration data. The likelihood of adverse biological effects at any particular location depends on a host of factors, including the sensitivity of species present and the bioavailability of the PAHs at the location. Bioavailability in turn depends on factors such as physicochemical properties, geochemical and biological factors, and even the source of the PAHs. For example, there is some evidence that PAHs from coal-related sources are less bioavailable than petroleum-related sources, which are thought to be more readily desorbed from sediment particles (Paine and others, 1996).

How do PAHs get into streams?
• PAHs get into streams primarily through atmospheric deposition and rainfall runoff. Atmospheric deposition of particulate matter introduces PAHs from both distant and nearby sources into streams. Atmospheric PAHs are from vehicle exhaust, forest fires and other combustion sources. Rainfall runoff introduces more locally derived materials from surfaces such as roads, parking lots and roofs, picking up PAHs from tire particles, leaking gasoline and motor oil and roofing materials as well as an additional component of atmospheric particles. In formerly industrialized urban areas, PAHs were introduced into local streams via
old industrial facilities such as manufactured gas plants (MGPs), wood treating facilities and a limitless array of possible sources that processed or used organic fuels (coal, petroleum, wood).

- The sources of PAHs in soils and sediments have been the subject of an enormous volume of scientific research over the past three decades. Identification of sources and apportioning specific sources to specific occurrences of PAHs has developed into its own scientific discipline called “Environmental Forensics.” In a recent book about Environmental Forensics, ways of identifying PAH sources were reviewed (Boehm, 2006).

- One recent publication has suggested that refined coal tar-based sealants applied to parking lots may be a significant source of PAHs in Austin, Texas. This study in Austin (Mahler and others, 2005, 2007) unfortunately was limited, failing to include other local sources of PAHs and even disregarding the four former manufactured gas plant (MGP) facilities located at and near the sites of PAH contamination. According to a 2003 article in a local newspaper, the Austin Statesman, “The chemical fingerprint of the contamination at the hillside above Barton Springs pool and in the creek is identical to that of coal gasification wastes...” Coal gasification wastes are found at MGP facilities.

- A follow-up study in Austin that looked at PAHs in sediments before and three years after a municipal ban on the use of refined coal tar-based sealants showed no discernable differences either in the sources or amounts of PAHs in local streams (Gauthier and DeMott, 2008; DeMott and others, submitted for publication to the journal Environmental Forensics).

At what concentration do PAHs affect stream aquatic organisms?
- The effects of PAHs in sediments on aquatic organisms have been the subject of an enormous volume of scientific research over the past three decades.
- Some research has found that PAHs adversely impact the health of aquatic organisms and/or ecosystems. Other research has found no impact or even beneficial impacts.
- One study (Paine and others, 1996) concluded that PAHs derived from coal tar-based sources have less adverse effects than PAHs from other sources.
- One study in sediments in Austin, Texas waterways attributed most if not all adverse impacts to an ecosystem to a single source: refined coal tar-based sealants. It remains unclear why the authors of this study did not consider other PAH sources known to contribute to PAHs in sediments in Austin.
- Many governments have published guidelines and reference concentrations for the amount of PAHs in sediments that are expected to limit possible adverse effects to organisms or ecosystems. One such guideline is the Probable Effect Concentration (PEC) [reference uncertain] for PAHs, which sets 22.8 mg/kg as the concentration below which adverse impacts to bottom-dwelling organisms are expected to be minimal.
Coal Tar-Based Sealants and PAHs

**What are options for reducing or preventing impacts from PAHs in paving materials?**

- While there is no evidence that refined coal tar-based sealants are important sources of PAHs in sediments, and reduction in use of refined coal tar-based sealants is unlikely to result in any noticeable decrease in PAHs either already in sediments or that is deposited in sediments in the future, PCTC members recommend that manufacturer’s specifications be followed to limit the possibility of environmental releases. Specific Best Management Practices (BMPs) include:
  - Make sure no significant rainfall is forecast for at least 48 hours after application of the sealcoat;
  - Only apply sealcoat when temperatures are above 60° Fahrenheit and rising throughout the application period;
  - Take appropriate measures (such as use of containment tools and sewer blocks) to ensure that newly applied sealcoat does not impinge on adjacent surfaces or enter storm or sewer drains;
  - Make sure that no traffic can access the newly sealcoated surface for at least 12 hours; and
  - Street sweep within one week of application to remove excess topical granules.

- Asphalt-based sealants also contain PAHs. As documented in the same University of New Hampshire study described above, asphalt-based sealants are another source of PAHs in the environment. Manufacturer’s specifications must also be followed during application of asphalt-based sealcoat.

- Asphalt on high speed roadways, on roofs and other surfaces are sources of PAHs, as are gasoline spills, oil and lubricant leaks and materials abraded from tires. To minimize PAHs in the environment, avoid spills and leaks and make sure equipment is in optimal working order.

- Concrete parking lots are not usually sealed, but do collect PAHs from spills, leaks, abrasion and atmospheric deposition which may be washed into streams during rain events. To minimize PAHs in the environment, avoid spills and leaks and make sure equipment is in optimal working order.

- A North Carolina State University study found a reduction in the concentration of PAHs from parking lot runoff after treatment by a vegetated bioretention cell. This is similar to the attenuation noted in the University of New Hampshire study. Installing bioretention cells (also called rain gardens, or, in plain language, plant beds) to treat parking lot runoff may reduce PAHs, as well as other pollutants, in stormwater runoff.

- Some proprietary stormwater management devices are marketed to reduce organic matter such as PAHs in runoff.

**Have any local governments responded to the research on PAHs and coal-tar based sealants?**

- The City of Austin, Texas passed an ordinance in November 2005 prohibiting the use and sale of refined coal tar-based sealants. Sediment samples collected before and about three years after the ban found no reduction in the amounts or types of PAHs in Austin sediments.
• Some other local governments (Dane County [Madison], Wisconsin and Washington, DC) have passed similar bans. In both Wisconsin and Washington, the ban was based on the study in Austin, Texas. There is no evidence that refined coal tar-based sealants have discernably contributed PAHs to sediments in either Madison or Washington, DC.

• Beginning in 2010, the State of Minnesota plans to restrict state agencies from purchasing undiluted coal tar-based sealant.

Selected References

A. I am aware of a study conducted in Austin, Texas purported to show PAH levels in one area of a city stream that (in their study and in their words) 1) was not a threat to human health and 2) has not changed in the 5 years since the banning of coal tar sealer in Austin.

B. Coal tar sealer is by far the preferred sealer.

C. 85% coal tar – 15% asphalt

D. Coal tar sealer is 2 to 3 times more effective than asphalt based sealer in terms of longevity and effectiveness of sealing the surface on off-street parking areas. Therefore, to keep an asphalt surface properly sealed with asphalt based sealant, one would need to seal it 2 to 3 times more often and at 2 to 3 times the cost. Since asphalt also contains PAH’s it doesn’t seem wise to replace one product for the other. The net result of this would be to levy a tax on the people of Springfield and Greene County with no corresponding result in revenue flowing to the county itself and no discernible change in the questionable, (already disproven in Austin) effect on the environment.

Currently asphalt based sealer costs from 10% to 20% more than coal tar sealer. Since the price is directly tied to the price of oil, it could easily double at any time. Coal tar sealer has historically been much more stable in price fluctuations than asphalt.

The two coatings are not interchangeable. They have specific jobs that they are suited for much like house paint and automotive paint. The common misconception is that you can simply replace one with the other for any application. Coal tar sealer is highly resistant to gas and oil, making it exceptionally able to protect asphalt from automotive fluids that dissolve and soften asphalt. Because it does not readily oxidize, it will not combine with water and dissolve, making it last longer and be much less of a threat to wash away. If it is worn off of the surface, it will not dissolve and become liquid, therefore, it cannot flow as a liquid. Some asphalt coatings will combine much more easily with water and wash off the lot.

Asphalt coatings, in general, work well in higher speed applications such as streets and airports. They hold up better to rolling traffic than coal tar coatings do. They typically do, however, scuff significantly more in parking lots where turning radii are tight and they require a 3 to 5 week
‘wearing in’ period before the scuffing and tearing goes away. In hot weather this can also lead to tracking.

The bigger problem being left unsaid, however, is the law of unintended consequences brought on by dropping the use of coal tar sealer. Never mind the fact that no study has been done to determine if there is even a presence of sealer generated PAH’s in our streams and therefore if a ban would have any basis in need, but the environmental impact to the area as a whole has not even been considered.

The primary purpose of surface coatings is to seal in the asphalt binder that glues the stones together in the asphalt pavement. A properly maintained and coal tar sealed asphalt lot will last 30 years or more because the surface stays ‘live’ with oil and stays flexible. Asphalt based coatings have the same oxidation rate as the underlying asphalt and are not nearly as effective at sealing in the pavement ‘glue’, allowing earlier failure of the paved surface. If pavement is not properly protected it oxidizes (turns gray) and stiffens, losing the ability to move with traffic. It then breaks into cracks which allow water into the base causing base failure and potholes. Eventually this results in the need for patching, crack sealing, and finally an overlay to correct the defects and the uneven driving surface. What does this mean to the environment?

Asphalt is composed of gravel, stones, sand, and asphalt tar. The stones are mined from quarries as large rock slabs (using diesel powered drills and loaders) and then crushed (using giant crushing machines and immense energy). These aggregates are dumped into a hopper using electrically powered conveyors (coal powered electricity), combined with asphalt oil (brought to the US as crude from the Middle East and refined at high heat, and trucked in diesel trucks to the paving plant) and turned in a rotary drum or pug mill (diesel or coal/electric powered), heated to 350 deg (diesel or fuel oil), mixed some more and dumped into diesel powered dump trucks. The hot asphalt is then trucked to the parking lot (heavy diesel trucks over public highways), installed with a diesel/gas powered paver, and rolled in place with either gas powered or diesel powered rollers. The National Asphalt Pavers Association says that the average service life of unsealed asphalt is 7 to 10 years. This means unsealed pavement will need to be overlayed with fresh asphalt at least 2 to 3 times in a 30 year span, thereby initiating this entire process unnecessarily. Doing without coal tar sealer is hardly cost NEUTRAL, and more importantly it is demonstrably environmentally damaging!

E. I would not be willing to discontinue a product that I believe in.
Carrie,

In regards to your request for information regarding the sales or use of coal tar based sealing products, I can provide little information to assist the Springfield-Greene County Environmental Advisory Board in their decision to possibly ban such coal based products due to the presence of HAPs. Journagan Construction Company does not use or supply any coal tar based products. We produce hot mixed asphalt products from refined distilled petroleum based asphalt cement binders. All of our binders, emulsions, tack oils and prime are petroleum based.

We are aware that some limited studies have been performed with coal tar based products regarding storm water quality issues. HAPs are present in many common materials found in our environment including waste oils, fuels and exhaust emissions. We understand that the presence of these additional sources in the environment may contribute to any elevated HAP concentrations detected from storm water runoff from parking lots.

Please feel free to contact me if I can help provide any additional information.

Perry J. Schneider, R.G.
Director of Safety & Environment
Journagan Construction Company, Inc.
417-869-7222
I know coal-tar sealer is harmful to the environment. That is why I no longer use coal-tar sealer. I started using an asphalt base sealer in April 2009.

Tri-Lakes Sealing & Striping
Phyllis