

Coal Tar-Based Pavement Sealers: Usage, Impact and Potential Ban

Background and Usage

Two basic types of pavement sealers are currently on the market; refined coal tar-based and asphalt-based. Sealcoatings based on refined coal tar were introduced in the 1950s and have been used extensively to protect off-street pavements. They are especially common in areas such as Central Texas where coal tar is readily available and summer heat is particularly destructive.

Refined coal tar, a byproduct of the coking process used for steel production, is a very complex mixture of chemicals - quite different in its molecular structure from asphalt. Some of the constituents are in a class of chemicals described as Polycyclic Aromatic Hydrocarbons (PAHs). Being stable in molecular structure, these chemicals repel oil and gas, and provide a barrier coat to protect asphalt surfaces from the destructive elements of weather and chemicals. Most coal tar sealants are mixed in a matrix of clay and water for enhanced flexibility and sand is typically added to provide additional traction.

Pavement sealants containing coal tar are typically applied by commercial applicators on parking lots at apartment complexes, retail centers and office buildings. There are over 40 commercial applicators doing business in the Austin area. Using information from local commercial applicators, staff estimates approximately 660,000 gallons of coal tar sealer are applied by commercial applicators in the Austin area on an annual basis. Typically, the sealant is worn off by abrasive action of traffic, degraded by weathering to particulate form and carried away by rainfall runoff. In areas without water quality control ponds, the particulates travel downgradient to become entrained in sediments of nearby waterways. Sealants are usually reapplied every 1-3 years, depending on traffic and condition of underlying asphalt.

Homeowners may purchase coal tar sealants at local hardware stores to protect and rejuvenate weathered asphalt residential driveways. It is also common for small crews to go door-to-door in some neighborhoods selling quick and inexpensive driveway sealing. Large hardware stores are the main suppliers of home “do-it-yourself” sealcoat products, typically sold in 5-gallon containers, pre-mixed with water and sometimes sand. Less is known about retail sales volume and citizen applications. Variability in both application methods and frequency are likely to be higher compared to commercial users.

Coal tar-based pavement sealers are also typically used at airports for plane parking, tarmacs and runway areas. An April 2000, Federal Aviation Administration Advisory Circular (AC) 150/5370-10A Standards for Specifying Construction of Airports includes a requirement for Item P-629, Coal-Tar Sealer/Rejuvenator, that requires pavement sealers to contain at least 35% coal tar pitch for acceptance on runway asphalt. The reason for this requirement is that coal tar-based pavement sealers offer a greater degree of resistance to jet fuel than asphalt-based sealers. Compliance with these specifications

may be required in some cases to obtain federal airport funding. Staff is awaiting further information from the FAA on this issue.

Coal tar based sealants are not used on City roadways and are not found in City specifications for any purpose. The City does little parking lot maintenance. In the past, some parking lots at City offices which are leased and some City-owned facilities which are maintained by outside contractors have been sealed with coal tar products.

Many sealer manufacturers that previously produced only refined coal tar sealers now also produce asphalt-based sealers or asphalt/refined coal tar blends. The asphalt emulsions deliver most of the same properties as refined coal tar-based coatings -except for the resistance to color fading due to ultraviolet degradation, salts, and petrochemicals like oils, fats, grease and solvents. These deficiencies are inherent in the asphalt binder itself. Being a petroleum derivative, asphalt has a natural affinity for petrochemicals, so it is easily dissolved by them. In recent years, sealcoat manufacturers have been quite successful refining the performance of asphalt based formulations by adding rubber or latex additives which enhance resistance and improve durability. However, because they are not fully resistant to petrochemicals and solvents (like the coal tar products), they are likely to be more expensive to obtain the same level of maintenance. In spite of this deficiency, sealcoaters have recognized some definite advantages of asphalt emulsion over refined coal tar sealers. Manufacturers of the asphalt emulsion sealcoat claim low Volatile Organic Carbons (air and water pollutants), no solvents, no obnoxious odor or fumes, and generally more environmentally friendly properties. City staff are doing additional literature searches and proposing additional investigation to more fully understand how these products may compare to coal tar products from an environmental perspective.

Possibility of Regulation - Product Ban

In response to the City Manager's direction, staff investigated the potential for product regulation through both City ordinance and through federal action.

Legal Department Consultation

City Legal staff have stated that it may be possible to regulate coal-tar based products or their use within the city limits or the ETJ depending on what impacts and harm are identified. Any regulations would be tailored to avoid or control the specific harm identified. These contingencies and their enforcement practicality need to be evaluated in detail from a legal standpoint and the City Attorney is available to discuss legal issues and liability with Council related to regulatory actions taken by the city. In general, no issues or liability were foreseen with respect to voluntary efforts, education or incentive programs.

Product Regulation under EPA

City staff consulted EPA headquarters as to the appropriate regulatory mechanism for addressing product concerns like coal tar based pavement sealers and the history of regulation of these products. This communication was facilitated by Senator Lloyd Doggett's office. It appears that as a recyclable by-product, coal tar pavement sealer has not been comprehensively evaluated on the basis of its toxic properties, in particular on the basis of its potential for impacts on the aquatic environment. PAHs as found in coal tar based pavement sealers serve as the basis for listing certain hazardous wastes under the Resource Conservation and Recovery Act (RCRA). They are listed as constituents for groundwater monitoring and are monitored in hazardous wastes as part of the RCRA land disposal restrictions. The USEPA has recognized 17 PAH compounds as priority pollutants under the Clean Water Act. Seven of these compounds are classified by USEPA as probable human carcinogens.

In 1992, the USEPA ruled that coke by-product residues, including coal tar, were excluded from being classified as a hazardous waste if they are recycled in the following specific manners: 1) being returned to coke ovens as feedstock to produce coke; 2) being returned to the tar recovery process as a feedstock to produce coal tar; or 3) when it is mixed with coal tar prior to coal tar refining or sale. These exclusions are conditioned on there being no land disposal of the recycled material.

EPA staff consulted including representatives from the RCRA, TSCA, NPDES, and CERCLA programs involved in regulation of hazardous chemicals acknowledged the potential for environmental impacts of the sealant, but none of those consulted suggested that their programs were the appropriate avenue for product regulation. They did recommend that additional targeted studies be performed and published in peer reviewed technical literature in order for their agency to fully evaluate the issue and potential need for additional regulation. Such studies were seen as antecedent to any federal participation in broader scale investigations of the products and their impacts. The development of additional data and analysis was suggested as the first course of action for the City. We are awaiting additional information from EPA regarding the regulatory framework related to pavement sealers.

Proposed Investigations

In order to provide information on impacts and harm and to more thoroughly examine the connection between coal tar based sealants applied to parking lots and resulting ambient sediment contamination in Austin creeks, several investigations are proposed. On the basis of these investigations and success of voluntary measures, an effective product usage policy can be developed. This may involve banning specific sealant types, Best Management Practices or other mitigative controls.

Study of PAHs in Stormwater Generated from Sealant Surfaces.

We are conducting additional testing and analysis in conjunction with the United States Geological Survey (USGS) to further document the connection between the coal tar pavement sealers and sediment contamination, and to compare the contaminants which are associated with the coal tar products with the contaminants which may be associated with the alternative, asphalt-based pavement sealers. A number of similar parking lots are being tested that use different sealants including sites with unsealed concrete surfaces and sites without sealants. Simulated rain events are being used to create parking lot runoff. Both the solids and liquids in the runoff are being tested for PAHs and metals. Additionally, parking lot surface material will be scraped from the surface of the areas sampled and analyzed for PAHs and metals. This analysis will allow for a direct comparison of the assumed source material with the material washed from the parking lot. During this study, asphalt and coal tar sealants are also being applied to a test site to determine the amounts of PAHs released from freshly sealed surfaces and investigate whether the amount changes over time. The testing is being conducted in August and September of 2003. Laboratory results will not be available until 2004.

Human Health Impact Investigation

No human health impacts have been identified by State or Federal authorities to date specifically from use and subsequent dispersal of particulate coal tar sealer to the environment. We believe additional work is warranted relative to the bioavailability of the material, both on the pavement itself (particularly in the residential or multifamily driveway scenario) and in unconsolidated particulate form as it may accumulate adjacent to sealed areas in places where children regularly play. We have conveyed that concern to EPA headquarters staff.

The recent Health Consultation endorsed by TCEQ, EPA, Texas Department of Health and the Agency of Toxic Substances and Disease Registry indicated that no apparent health threats were posed by any contaminant in Barton Springs Pool at current levels. City staff subsequently requested that TCEQ develop criteria to assist the City in knowing what levels of PAHs in the sediment would in fact pose a human health threat. After considerable analysis, the TCEQ declined to provide any specific Protective Concentration Level for sediment PAHs in Barton Springs Pool because, under current maintenance practices, the exposure is so low that the resulting acceptable level is so high as to be meaningless (see attached letter). That is, the concentration of PAH in sediments in Barton Springs Pool could not realistically reach concentrations that could cause a human health threat. Water column PCLs acceptable for human health specific to Barton Springs Pool exposure are also higher than any observed levels even in water quality ponds collecting contaminated sediment.

Aquatic Life Impact Investigation

Aquatic life impacts have long been a concern for City staff studying this issue, as it appears that the PAH containing materials that are eroding off parking lots are

accumulating in some areas in stream sediments where aquatic life may be affected. We have looked at aquatic life impacts from three angles: 1) comparing observed contaminant concentrations to known concern levels ; 2) examining the aquatic life community in areas of high contaminant concentrations to look for signs of deleterious impact, and 3) conducting laboratory tests which determine if sediment collected on site is toxic to test organisms.

- 1) Although aquatic life impacts of coal tar-based sealant application have not been studied as such by any regulatory agency, the toxicological properties of many of the individual chemical constituents in coal tar, specifically PAHs, have been determined in the laboratory. These properties have been used to develop guidelines for acceptable levels of these constituents in ambient sediment, but no regulatory criteria for sediment concentrations have been promulgated. In E. Bouldin Creek, in Waller Creek and in Barton Creek in areas downstream of large parking lots, sediment concentrations of the PAH, benzo(a)pyrene (BaP) have far exceeded the concentrations at which effects on aquatic life are predicted to occur. By nature, sediment accumulations are transitory and contaminants which adhere to them will be diluted with cleaner sediments as they move downstream. However, we are concerned that concentrations throughout our watersheds will increase over time with continued coal tar sealant use. PAH's have increased over time in the sediments in Town Lake according to the core samples which have been analyzed, and that could potentially represent the future for other Austin waterways. PAH testing is continuing at the mouths of all Austin creeks periodically through the Drainage Masterplan water quality assessments, and targeted testing is underway associated with the investigation of coal tar sealants.
- 2) The aquatic invertebrate community and the attached algae community (diatoms) in creek areas with PAH contamination may provide information regarding the impact of the sealers. The preliminary evaluation of available data from two sites on Barton creek indicates that some relationship may be present between increasing PAH concentration and decreasing measures of aquatic invertebrates and diatom community health. However, this evaluation is based on limited data. Many other complicating factors (including hydrology) make a direct comparison of community metrics to sediment concentrations problematic. Nevertheless, staff are investigating a more controlled selection of evaluation sites upstream and downstream of high PAH sediment deposition where more information about this potential relationship can be obtained. This method of isolating PAH impacts is complicated by the variability seen in aquatic biological communities city-wide attributable to modified habitat, flow regime, other non-point source pollutants, or natural factors.
- 3) Another standard strategy to document aquatic life impacts is to conduct toxicity testing in which test organisms are exposed to sediments collected on site and observed for mortality or other chronic effects. We contracted with the USGS Columbia Environmental Research Center Laboratory in Missouri to conduct this type of testing for the City in September 2000 as we were trying to understand the

significance of the PAH levels to Barton Creek and the prey species for the Barton Springs Salamander. This testing was also suggested as necessary for TCEQ to consider a creek to be listed as “impaired” due to sediment contamination (as not numerical standards are available) and thus be eligible to receive more scrutiny and more funding from the State.

Soil and sediment were collected for the test from Barton Springs Pool, Barton Creek and from tributary areas that do not usually flow. Although the non-flowing areas are not aquatic habitats, we tested them understanding that the higher contaminant concentrations found there would eventually be making their way into the creek. The test species was a tiny invertebrate, the amphipod *Hyalella azteca*, which is a prey species for the salamander. No toxicity was found for samples using standard test methods. However, when ultraviolet light simulating sunlight exposure at one foot or less of depth was added to the method, the sediments collected from the tributary areas were toxic to the test species. This testing was not used by TCEQ in evaluating the impairment in the Clean Rivers Program because the UV light is not part of the standard protocol. However, after the human health issues at the pool had been resolved this spring, the agency determined to do additional toxicity testing themselves, both in the pool and in the creek. Results from the TCEQ sampling in Barton Springs Pool showed no toxicity under a shorter duration protocol than previously used by the City; however, some reproductive effects were identified that warranted continued testing. TCEQ plans to periodically repeat this testing and has also recently obtained additional samples for testing from several areas of Barton creek. City staff are both coordinating with TCEQ plans and investigating further testing that may be appropriate to directly assess toxicity to aquatic life.

As shown above, documentation of impacts to the aquatic community is still limited due to its technical difficulty and expense. Additional work needs to be done in this arena and we are communicating broadly with professionals in other areas hoping to get more scientists looking at the issue.

Proposed Public Outreach and Voluntary Compliance Campaign

While we collect more information from EPA, from other water quality professionals and from our own investigations, we propose an aggressive public outreach campaign targeting local commercial producers, applicators and retailers of pavement sealers. The goal of the proposed initiative would be to affect a voluntary switch to products which do not contain coal tar while we learn more about the problem and collect information which may potentially support a ban. We have already done some significant work in this direction with excellent results.

Pavement Sealer Producers: We have had ongoing discussions with the major producer of coal tar based pavement sealer in the Austin area, Star-Seal, which provides approximately 60% of the product that is used in Central Texas. The owner has been extremely forthcoming and helpful over the past few months in providing information

about the business, usage numbers and contacts for our ongoing investigations. He has also agreed to assist in our proposed research in which we will sample runoff constituents from freshly applied sealant.

Most importantly, Star-Seal expressed a willingness to switch to producing a non-coal tar based product if the coal tar is indeed causing a problem. At our last meeting, we were surprised to hear from the owner that he had in fact sold his plant to a competitor who produces an asphalt-based sealant, which does not contain coal tar. Although, Star-Seal was considering producing an asphalt sealant under the Star-Seal name, the competitor was already further along in the marketplace with their product, and thus an outright sale was the business decision that was made. If former Star-Seal customers make the switch, the conversion of the Star-Seal plant represents over 400,000 gallons annually of coal tar based sealant that has been eliminated as a contaminant source in central Texas watersheds.

We propose to communicate with other producers in Texas who also sell product for use in our area to inform them of our concerns and to ask for their voluntary cooperation in not selling coal-tar based products for use in our area.

Pavement Sealer Applicators: We have also had ongoing discussions with the major commercial applicator in the Austin area, Wheeler Coating. The owner of that company has likewise been extremely cooperative in providing information we need to plan and interpret our research and has also agreed to assist in our future proposed research. Most importantly, he is voluntarily switching to the product that the former Star-Seal plant will be producing, an asphalt-based sealant known as Paveshield. He has indicated he will provide the coal tar sealant on request only, as opposed to routinely offering coal tar based products. We propose to contact other applicators (over 40 locally) to share our work, inform them that the City is considering a ban and solicit their help in eliminating contamination associated with use of coal-tar based products.

Pavement Sealer Retailers: We have contacted Lowe's and Home Depot about the products they sell and have asked whether they might voluntarily delete the coal-tar based products from their inventory. Although we have not gotten a commitment from them at this time, both stores have seemed willing to listen to our issues and we are now having discussions with distributors and discussing alternative products they could provide their customers.

Commercial Users of Coal-Tar Pavement Sealers: The owner of the apartments in the drainage area to the contaminated tributary upstream of BSP, has agreed not to use coal tar pavement sealers until such time as the City indicates otherwise. We are currently engaged in a project to identify the businesses with large parking lots between Loop 360 and Barton Springs. We propose to communicate with those businesses to ask for voluntary compliance to cease use of coal tar based products. We also propose to do outreach through apartment associations and through other trade and real estate groups, asking them to cease the use of coal-tar sealers pending further consideration.

Governmental Users of Coal-Tar Pavement Sealer: Although City of Austin specifications do not call for coal-tar based products, there are some instances in which contractors who were hired for maintenance of City properties used coal-tar products. In addition, Coal tar products have been used at the Austin Bergstrom International Airport, where there are Federal Aviation Administration requirements to use specific properties in order to obtain federal funding. We are inquiring of FAA whether non-coal tar alternative could be substituted without affecting funding considerations.

State properties with parking lots are potentially a source of coal tar pavement sealers; however, they typically use commercial applicators which are also targeted for reduction in its use through education. The University of Texas has already suspended use of coal tar-based pavement sealers and is cooperating with City staff on our additional research this summer. Contacts with other state agencies with potential for using coal tar sealants will also be made.

Citizen Outreach: Proposed press releases are in the planning stages to educate the public relative to the pavement sealers. Neighborhood groups and non-profit groups concerned about water quality have requested information about the PAH in Barton Springs issue associated with previous media coverage, and they would also be information conduits for public education about sealant issues.

Environmental Agency Outreach: City staff organized a July 18, 2003 meeting of the major state and regional agencies concerned with aquatic life impacts and endangered species impacts from contaminated sediment. The goal of the meeting was to inform the technical staff of these agencies on the testing performed to date, update them with the proposed additional studies discussed above, and solicit a peer review of the proposed course of action. Technical staff from US Fish and Wildlife Service, Texas Commission on Environmental Quality, the Barton Springs Edwards Aquifer Conservation District, the United States Geological Survey and the Edwards Aquifer Research Center at Texas State University in San Marcos attended the meeting.

Interaction with Ongoing City Programs: Two ongoing programs conducted by the City of Austin were identified as contacts for some of the information generated on parking lot pavement sealers. First, the City's Green Builder Program was considered as a distributor of construction material information and a concerned party with respect to pavement sealers and other coal tar based products. In addition, both Green Builder and Austin Energy were identified as having interests in modification of asphalt surfaces on the basis of their impact on the Urban Heat Island. As mentioned previously, coal tar pavement sealers are often used for their aesthetic appeal as they leave a glossy black surface resembling new asphalt. This surface increases heat absorption and may contribute to the heat island effect. Alternatives which reduce this effect may be of interest to these City programs. Further interaction with these programs is proposed.

Conclusion

At the present time, staff proposes to conduct additional research and investigation on PAH containing pavement sealers and on the alternative products which would be increasingly used if the City bans coal tar sealants. The additional information may support a ban, and may also be used to provoke additional attention nationwide to this issue. Meanwhile we propose to continue and enhance outreach activities to the pavement sealing industry-producers, retailers, applicators and users- and to the general public, with the goal of reducing production, sale and use while we complete our work. A targeted outreach program will be conducted to reach commercial parking lot owners in areas closest to Barton Springs Pool. We will continue discussions with EPA on the regulatory issues surrounding these products and with other water and sediment quality professionals nationwide. We anticipate a report back to Council on these activities in Spring of 2004.