Appendix C
Industry-Related Concerns

I. Despite EPA's Multiple Assertions that There Are Alternative Products with Similar Performance and Cost to RTS, No Such Alternatives Are Available.

In its 2020 Proposed MSGP Fact Sheet, EPA contends, without supporting facts, that it has identified alternatives that are similar in product performance and cost to RTS. The agency cites asphalt emulsion sealants and acrylic sealants as examples. It also notes that pervious concrete, permeable asphalt, and paver systems that do not require sealants would reduce discharges, "but may not be appropriate for use with all industrial activities."[160] EPA concludes:

> Given the comparable costs among products, EPA assumes that most facilities who intend to use coal-tar sealcoat will be able to find a product alternative at negligible cost difference yet with similar performance.[161]

EPA offers no support for its contentions in the Fact Sheet, nor does it list any references that would support these assertions and assumptions. In fact, there is substantial information in the public domain that should have led EPA to the opposite conclusion.

While there are certainly alternatives to RTS, none of them come close to RTS in terms of performance and cost. As documented below, the alternatives do not perform as well as RTS and their lifetime costs are higher. These are not our observations alone, but reflect the conclusions of many independent parties who have studied the matter.

A. RTS Performs Better Than the Alternatives.

1. Asphalt Sealants

Where RTS is available, the market prefers it over other alternatives. The reason lies in its performance at protecting asphalt from damage related to petroleum chemicals, road salts, and a variety of other chemicals, as well as UV radiation and oxidation. Protection against damage related to petroleum products is an important reason why coal tar-based sealants are specified at civilian and military airports. Because of its superior performance at resisting chemical and environmental insult, RTS has been the preferred pavement maintenance sealant used on pavements in industrial and commercial areas for decades, including parking lots, gas stations, truck and bus terminals, airport aprons, and taxiways. RTS is also used on driveways for protection and to enhance curb appeal.

While asphalt-based emulsions have many of the same beneficial properties as RTS, they lack coal tar emulsion's superior resistance to petroleum, ultraviolet bleaching, and salts. An asphalt emulsion is a mixture of liquid asphalt and water. Manufacturers have started adding special chemicals and pigments to asphalt emulsions to improve their resistance to petroleum products and to enhance other performance characteristics, but they are still more susceptible to

[160] Fact Sheet at 24
[161] *Id*.

damage caused by petroleum products. Asphalt-based emulsions generally have life spans of two to three years, whereas RTS sealants will generally last four to six years.

a) From manufacture to application of RTS, every step in the process is governed by performance-based standards.

Beginning in the 1970s, the US Army Corps of Engineers (Corps) undertook investigations of fuel-resistant sealers. Shoenberger (1994) gave an overview of performance issues from the perspective of the military that is still applicable:

> Asphalt concrete pavements make up approximately 96% of the surfaced pavements in the United States (Roberts et al. 1991[162]). The majority of parking areas used for low-pressure tire vehicles (automobiles and light trucks) are also paved with asphalt concrete. Since asphalt cement is a petroleum-based product obtained in the distillation of crude oil, it will dissolve or soften when exposed to petroleum-based products. Therefore, asphalt concrete pavements are susceptible to damage from fuel or oil spills or drippage. The damaging materials include gasoline, diesel fuel, hydraulic and brake fluids, aviation fuels, and other petrochemical and synthetic materials. These oils and fluids are required for the operation of vehicles, and the amount of these fluids that falls to the pavement surface from these vehicles depends on the condition of the vehicle and its maintenance operations. … Fuel spills and drippage result in the softening and leaching away of asphalt binder from the aggregate. This causes pavement failures due to rutting or raveling of the surface aggregate in the spillage areas.
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> Normally, fuel or solvent spillage is not a problem on roadways. The speed and movement of the vehicle spreads out the spillage over a large area. The spilled material tends to be worn off or it evaporates from the pavement due to traffic and the effects of weather (rain or sunshine). But, areas of slow speed or highly channelized traffic often have sufficient fuel spillage accumulation to cause damage to the asphalt concrete pavement. Parking areas, especially those with constant vehicle turnover, are very susceptible to damage from such spillage. …..
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> Fuel spillage problems can also be particularly severe for airfield pavements because several types of aircraft engines release the unused portion of fuel remaining in the engine at shutdown, in addition to normal drippage and other losses. These materials will damage the pavement surface almost immediately and even prompt flushing or flooding of the area with water, and ideal evaporation conditions cannot entirely prevent damage. Military installations have all of these problems with fuel spillage plus the possibility of a sabotage scenario. Such a

[162] Roberts, F. L., Kandhal, P. S., Brown, E. R., Lee, D.-Y., and Kennedy, T. W. (1991). "Hot mix asphalt material, mixture, design, and construction." Rep., NAPA, Lanham, MD

scenario could involve fuel being intentionally dumped on an airfield pavement in order to interfere with airplane operations.[163]

Among the early findings of the Corps' research was that coal tar-based sealants had superior fuel resistance, but that the products available at the time were inconsistent in performance. The industry responded in 1994 by establishing PCTC as an engineering research and standard-setting program within the Engineering Department at the University of Nevada – Reno (UNR).[164] The program's goal was to research and establish performance-based standards for the manufacture of what the industry now calls refined coal tar-based sealant (RTS). The results of the UNR phase of PCTC's history are reflected in the ASTM standards that cover everything from the production of the refined coal tar base, RT-12, to its application. These standards are:

- ASTM D490-92(2016), Standard Specification for Road Tar;
- ASTM D4866/D4866M-88(2017)e1, Standard Performance Specification for Coal Tar Pitch Emulsion Pavement Sealer Mix Formulations Containing Mineral Aggregates and Optional Polymeric Admixtures;
- ASTM D5727/D5727M-00(2017)e1, Standard Specification for Emulsified Refined Coal Tar (Mineral Colloid Type);
- ASTM D6945-03(2017), Standard Specification for Emulsified Refined Coal-Tar (Ready to Use, Commercial Grade);
- ASTM D6946-13, Standard Specification for Emulsified Refined Coal-Tar (Driveway Sealer, Ready to Use, Primary Residential Grade), 2013); and
- ASTM D3423 / D3423M-84(2015)e1, Standard Practice for Application of Emulsified Coal-Tar Pitch (Mineral Colloid Type).

The ASTM standards are supplemented by PCTC's guides for preparation of performance-based specifications for RTS:[165]

- PCTC Guide Specification-PCTC01**:** Guide for Preparation of Specifications for the Application of a Refined Coal Tar Emulsion Without Additives Over Asphaltic Pavements
- PCTC Guide Specification-PCTC02: Guide for Preparation of Specifications for the Application of a Refined Coal Tar Emulsion With Additives Over Asphaltic Pavements

RTS manufactured following ASTM's performance-based standards has, for nearly three decades, been consistent and predictable in its resistance to petroleum products and other chemicals and environmental factors that can damage, and shorten the service life of asphalt surfaces. The market still prefers it over the alternatives.

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[163] Shoenberger, J. (1994). Performance of FuelResistant Sealers for Asphalt Concrete Pavements. *Journal of Materials in Civil Engineering, 6*(1), 137-149. doi:doi:10.1061/(ASCE)0899-1561(1994)6:1(137).
[164] PCTC was originally named the Pavement Coatings Technology *Center*. It was renamed as the Pavement Coatings Technology *Council* in 2008 when sponsors of the original Center reorganized PCTC as a 501(c)(6) trade association.
[165] Available at http://www.pavementcouncil.org/1520/.

b) While the performance of some asphalt-based sealants has improved, the variability of such sealants limits consistency.

The performance of some asphalt-based emulsion sealants (ABS) has greatly improved in recent years, although the inherent problem of resistance to petroleum fuels remains less satisfactory. Through research and development into factors such as the composition of asphalts and ingredients to improve asphalt characteristics, companies that make both RTS and ABS have developed ABS that meets the needs of many customers who have less stringent performance requirements. Product consistency, however, is a continuing problem.

To date, performance-based standards have not been developed for ABS because, by both the nature of petroleum and the choices made in petroleum markets and refining processes, the physical properties of asphalt are inconsistent. The asphalt used in the manufacture of ABS is essentially what remains at the end of distillation of heavier crude oils.[166] Crude petroleum extracted from the many different oil fields around the world varies widely from light-to-heavy crude. Over the years, refining processes have evolved to remove increasing amounts of the more-valuable lighter crude components from refining residuals, resulting in asphalts that vary widely in both chemical and physical characteristics. These process changes have exacerbated the inherent variability resulting from the different compositions and characteristics of crude oil extracted from different oil fields around the world.

Changes in the asphalt available to the paving market in recent years have been described, as follows:

> North America has experienced (i) significant shifts in the availability of asphalt, (ii) higher costs for the available asphalt but more importantly, (iii) dramatic changes in asphalt quality; all of which, threaten the paving contractor's and roofing manufacturer's long-term ability to provide a high quality product, significantly increases the costs of paving our highways and ultimately, impacts the life cycle of those roofs and highways.[167]

The key to success of a sealant is its performance in protecting underlying asphalt pavements. The reason RTS is the preferred product is because it meets customer performance criteria and does so consistently. Through understanding of the qualities of asphalts available on the market, as well as inclusion of additives in the manufacturing process, some ABS that meets performance criteria is available. But, for reasons beyond the control of the sealant industry, consistency of performance of ABS has been elusive, limiting the ability of ABS sealant manufacturers to consistently provide a high-quality product that meets customer performance expectations.

2. Acrylic Sealants

Acrylic sealants are a specialty product principally used for tennis courts, where they have the advantage of allowing control of the speed of play. As experience has shown on tennis courts,

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[166] Little-to-no asphalt is produced from light crude oils, such as from some southern US oil fields, or from shale oil.

[167] *The Asphalt Challenge*. Engineered Additives LLC. http://engineeredadditives.com/asphaltchallenge.html

however, acrylic coatings are brittle, resulting in the need to resurface courts every few years even though they are not subject to vehicle traffic. Brittleness even more severely limits the useful life of acrylic sealants used on pavements exposed to the heavy load of cars and trucks. Reduced service life only adds to the additional limitation that acrylic sealers are prohibitively expensive for use on large asphalt-paved surfaces. For these reasons, acrylic sealants are not competitive in the pavement maintenance world and are not generally regarded as a viable alternative to RTS.

3. Permeable Pavements

Permeable pavements are considered a means of ameliorating storm water runoff issues because they are engineered with pore space that allows dissolved and particulate materials washed off by rainfall to permeate the pavement for capture or immobilization by an underlying drainage system or by soils. A standard method of making large concrete or asphalt roadway or parking lot surfaces more porous is to reduce fine particles in the concrete/asphalt mix. Unfortunately, this reduces the load bearing capacity of the pavement. Installation of permeable pavements is also more expensive than traditional pavement, and the pore space available for permeability decreases over time, as the material is compressed or collapsed under the weight of vehicles.

Once such pavements are installed, particulates infiltrate the pore space, leading to declining effectiveness over time and, eventually, complete clogging. In more northerly climates, application of sand and de-icing chemicals can lead to very rapid clogging. To maintain permeability of acrylic pavements, it is necessary to institute a maintenance program involving routine removal of particles from pore space, typically with an industrial vacuum. Without such elaborate and expensive maintenance, infiltration of storm water becomes increasingly inefficient, leading to runoff that is no different than from impervious pavements.

For these reasons alone, permeable products are usually inappropriate for application on surfaces with vehicle traffic. Additionally, the costs of alternative permeable products at the point of application are often greater than those for RTS products, and the cost of maintenance can be much greater than for maintenance of traditional pavements.

B. Life-Cycle Cost-Competitiveness of RTS Is Superior

Pavement maintenance programs consist of three different types of operation: preventive maintenance, corrective maintenance, and emergency maintenance. As concluded by the University of Minnesota's Airport Technical Assistance Program (AirTAP) from an assessment of the benefits of a pavement maintenance program:

> Preventive maintenance is generally the least expensive type of maintenance, and emergency the most. Emphasizing preventive maintenance will keep pavement in good condition and prolong the time until corrective maintenance is required. A pavement preservation program is designed to preserve a pavement structure, enhance its performance, extend pavement life, and meet user needs. An effective program integrates many preventive maintenance strategies and rehabilitation treatments with the goal of cost-effectively and efficiently enhancing pavement performance. . . .

> Pavement preservation has many benefits, the most important of which is preserving a pavement's structural integrity and realizing a substantial maintenance cost savings over the life of the pavement. . . .
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> To be cost-effective, pavement preventive maintenance treatments should be applied early in the life of a pavement. It is much less expensive to repair a pavement when distresses are just beginning to appear.[168]

Figure 1 below illustrates AirTAP's assessment of the value of a pavement maintenance program.

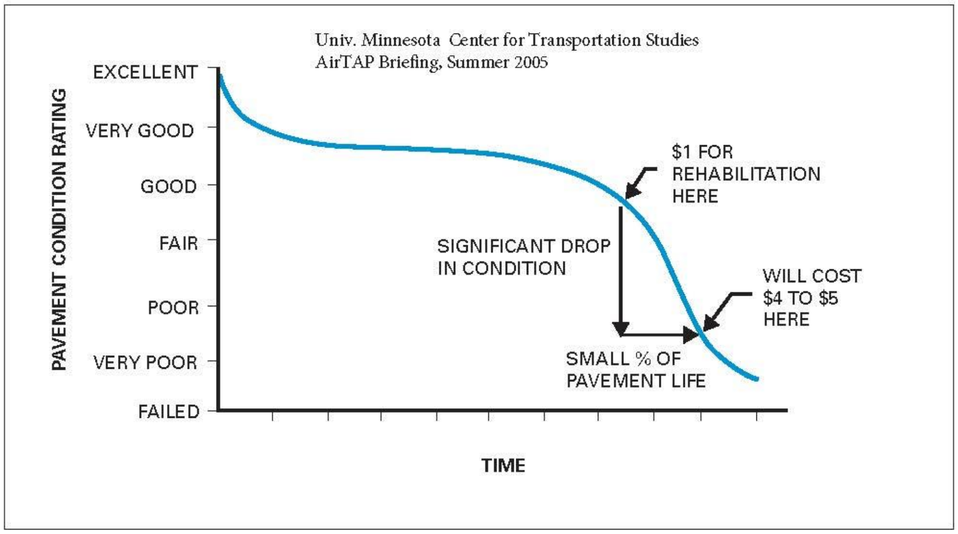

Figure 1. Preventive maintenance preserves the condition of the pavement and costs significantly less than rehabilitation.

Sealcoating is an integral part of a preventive maintenance program. It extends the useful service life of a pavement asset and costs considerably less than repaving or other measures that may be needed later to correct chronic or acute pavement problems.

A comprehensive assessment of the costs associated with any sealcoating must include the costs incurred over the life cycle of a paved surface. The initial cost is the cost of the sealant being applied to a surface—either RTS or ABS—and the cost of applying it. The cost of application is virtually the same. And, the initial cost of the sealant can be compared in the moment using the price of RTS versus the price of ABS. But, the initial cost does not tell the whole story—the cost over the life cycle of a paved surface must be considered, and this factor favors RTS.

PCTC/COETF estimate that the cost savings of a pavement maintenance program that includes sealcoating results in a 12-year total cost for a commercial installation of about $0.39/sq. ft. versus an unsealed total cost of $1.76/sq. ft. This assumes that, after 12 years of use, an unsealed lot would require an overlay with 2" of asphalt.[169] This figure assumes equal longevity for RTS

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[168] *Pavement preservation: protecting your airport's biggest investment*. AirTAP Briefing Summer 2005.

[169] Details of the assumptions used in both commercial and residential examples are illustrated in infographics available at http://www.pavementcouncil.org/education/.

and ABS. When the longer period between needed sealcoat applications of RTS is considered, the 12-year cost of a sealcoat program would be even less than the example calculation.

EPA needs to consider that, in the real world, cost is more than an initial, one-time consideration. The life-cycle cost must be considered. And, when it is, RTS is the clear winner. For this reason, EPA's assumption that,

> [g]iven the comparable costs among products, EPA assumes that most facilities who intend to use coal-tar sealcoat will be able to find a product alternative at negligible cost difference yet with similar performance,[170]

is not based in fact.

C. Independent Sources Recognize the Superior Value and Performance of RTS

Missouri State University (MSU) studied the relative merits of RTS vs. alternative products in 2015. The MSU Board of Governors, after "much research completed," found asphalt sealant was not recommended due to "cost and longevity." More specifically, MSU found that the asphalt life-cycle was two to three years, while that for RTS was four to six years. And, yet, the cost of installation was almost the same, $0.09/ft^2$ for asphalt emulsion and $0.11/ft^2$ for RTS.[171] And, according to an article in the Springfield (MO) News-Leader, the University found that asphalt emulsion was "less effective at blocking water and lasts half as long."[172]

Another exhaustive study of sealcoat alternatives was conducted in 2010 by Geoffrey H. Butler, an architect based in Springfield, Missouri. In his white paper, which he provided to the City of Springfield, Mr. Butler explained what he had learned about pavement sealers from designing projects that involved parking lots:

> As a developer and property owner, I have experience with both the coal tar sealers and the asphalt based sealers. . . . The [asphalt based sealer] wore off rather quickly lasting only two years. . . I have used coal-tar sealants. . . very successfully. It lasts 4-6 years per application, does not track. . . and has never re-emulsified. . . . Coal tar sealant is highly resistant to gas and oil. . . . The cost to properly repair or replace an asphalt parking lot exceeds the cost to build it in the first place.[173]

These two independent sources confirm the cost and performance qualities discussed above. Many other could be cited. In contrast, EPA provides no explanation or references to support its assertions that cost-effective alternatives are available. In fact, alternatives of similar performance and cost to RTS are not available. EPA's claims to the contrary are simply untrue, and the Agency needs to correct the record.

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170 Fact Sheet, p. 24. EPA provides no supporting information for this "assumption."
171 Parking Lot Sealant Summary, Board of Governors Meeting, Missouri State University, February 26, 2015
172 Riley, C. "After trying alternative, MSU resumes use of coal tar sealant," April 3, 2015 Springfield News-Leader, Springfield, Missouri.
173 Geoffrey Butler, AIA, "What I have learned about Coal Tar Sealers," January 14, 2010