

1.0 INTRODUCTION

An independent lab, Clayton Environmental Consultants, Inc. performed an industrial hygiene assessment at the Sikeston Municipal Airport in Sikeston, Missouri, during spray application of a rejuvenator sealer on the runway and taxiway.

Mr. Ronald C. Poore, Industrial Hygienist at Clayton, performed the assessment on June 15, 1994. This assessment included collection of personal and area samples for coal tar pitch volatiles and 1,2,4-trimethylbenzene.

The scope of Clayton's services was outlined in Clayton's Proposal No. 94-1-082 dated June 10, 1994. The proposal incorporated Clayton's standard terms and conditions, under which the work was performed.

Appendix A provides tabulated sampling and analytical data for the samples collected to quantify personal exposures to and area concentrations of, the selected chemical contaminants. Appendix B provides a diagram of the Sikeston Airport with the sampling locations.

2.0 SUMMARY AND RECOMMENDATIONS

Clayton's findings are based on visual observations and analytical results of area and personal air samples collected at the airport.

2.1 SUMMARY OF ASSESSMENT

2.1.1 Coal Tar Pitch Volatiles

Coal tar pitch, the residue from heated and distilled tars, is generally a solid, cement-like material that liquefies when heated. Coal tar pitch volatiles (CTPVs) are the vapors emitted into the air when coal tar is heated.

Area air samples for CTPVs were collected near the permanently mounted landing lights within 10 feet of the runway during and after spray application of the rejuvenator sealer. Laboratory analytical results for the samples indicated that, at the time of Clayton's assessment, the area concentrations of CTPVs downwind of the application area were less than the Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL)

Personal air samples were collected on the Application Operator and the Assistant Operator during spray application of the rejuvenator sealer. Analytical results of the samples indicated that the personal exposure of the Assistant Operator was less than the OSHA PEL time-weighted average, threshold limit value (TLV-TWA). However, the personal exposure of the Application Operator during spray application of the rejuvenator sealer was greater than the OSHA PEL-TWA and the American Conference of Governmental Industrial Hygienists (ACGIH) TLV-TWA.*

*Note: This exposure was subsequently determined to have been caused by the rejuvenator sealer splashing on to the Application Operator's actual monitor during vehicle fill up.

2.1.2 1.2.4-Trimethylbenzene

Analysis of area air samples collected downwind of the application area for 1,2,4-trimethylbenzene during and after application of the rejuvenator sealer were less than the TLV-TWA recommended by the ACGIH. 1,2,4-trimethylbenzene is not regulated by OSHA.

2.1.3 Polynuclear Aromatic Hydrocarbons

Polynuclear aromatic hydrocarbons (PNAs), also known as polycyclic aromatic hydrocarbons (PAHs) have been identified in coal tar pitch and have been extensively researched for their carcinogenicity. Benzo(a)pyrene (BaP) has frequently been used to indicate the presence of PNAs. OSHA has established a PEL for BaP.

The sample collected on the Application Operator indicated that personal exposure to CTPVs was greater than the OSHA PEL-TWA and the ACGIH TLV-TWA established for CTPVs. This sample was further analyzed to indicate the presence of PNAs. Laboratory analytical results indicated the presence of five PNAs; anthracene, BaP, chrysene, phenanthrene, and pyrene. The results for BaP were less than the respective OSHA PEL.*

2.2 RECOMMENDATIONS

The manufacturer of the rejuvenator sealer provided Clayton with a copy of the material safety data sheet (MSDS) for the rejuvenator sealer.

Based on the results of personal and area measurements and on observations made during the June 15, 1994, field assessment at the airport, Clayton recommends that Section VIE - Personal Protection Information of the the rejuvenator sealer MSDS include provisions for wearing respiratory protection that provides adequate protection against personal exposures of the Application Operator to CTPVs.*

3.0 DESCRIPTION OF OPERATIONS

The rejuvenator sealer is manufactured for application on asphalt and concrete surfaces to recondition and prolong the useful life of those surfaces.

At the Sikeston Municipal Airport, the rejuvenator sealer was applied using a spray application vehicle developed by Bowser & Tarr, the application contractor. The Application Operator drove the application vehicle, which was continually receiving the rejuvenator sealer from a tanker truck positioned in front of (and moving with) the application vehicle. The Assistant Operator, stationed on the rear of the tanker truck, controlled the flow of the rejuvenator sealer through a hose from the tanker to the application vehicle.

Application employees are potentially exposed to airborne contaminants during the onsite preparation, transfer, and application of the rejuvenator sealer. On the day of the assessment, the contractor's employees did not wear personal protective equipment. Two of the employees were observed applying sun-block cream to reduce skin contact with the rejuvenator sealer.

4.0 METHODS AND MATERIALS

Clayton's American Industrial Hygiene Association (AIHA)-accredited laboratory in Novi, Michigan, analyzed the samples collected during this assessment.

Battery-powered air sampling pumps (Mine Safety Appliances Company [MSA], Model C-210 and Flow-Lite® Portable Pumps, respectively) drew air at calibrated flow rates through a glass tube containing activated charcoal for 1,2,4-trimethylbenzene and a 37-millimeter glass fiber filter for CTPVs. Each pump was calibrated before and after sample collection using a primary standard. The air samples were analyzed using procedures outlined in the following OSHA methods:

- "Coal Tar Pitch Volatiles"; Method 58; dated July, 1986; analysis for coal tar pitch volatiles by gravimetrically determining the benzene-soluble fraction (BSF). If the BSF exceeds the PEL, the sample is further analyzed by high-performance liquid chromatography (HPLC) with a fluorescence detector to determine the presence of selected PAHs.
- "Organic Vapors"; Method 7 (modified); dated November, 1989; analysis for 1,2,4-trimethylbenzene by gas chromatography using a flame ionization detector.

5.0 STANDARDS AND GUIDELINES

The standards and guidelines used to evaluate the analytical results of this industrial hygiene assessment are taken from the sources listed below.

OSHA - Title 29 of the *Code of Federal Regulations* (CFR) Part 1910.1000

- 1993-1994, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," published by ACGIH.

OSHA and ACGIH Standards and Guidelines

Contaminant	OSHA PEL-TWA ^a	ACGIH TLV-TWA ^b
Benzo(a)pyrene	0.2 mg/m ³ ^c	--
Coal Tar Pitch Volatiles ^d	0.2 mg/m ³	0.2 mg/m ³
1,2,4-Trimethylbenzene	NRe	25 ppm ^f

^a OSHA PEL-TWA means the 8-hour, time-weighted average (TWA), permissible exposure limit (PEL) established by the Occupational Safety and Health Administration (OSHA).

^b ACGIH TLV-TWA means the 8-hour TWA, threshold limit value (TLV) recommended by the American Conference of Governmental Industrial Hygienists (ACGIH).

^c mg/m³ means milligrams of contaminant per cubic meter of contaminated air, on a weight-to-volume basis.

^d ACGIH has designated coal tar pitch volatiles (CTPVs) as confirmed human carcinogens based on the weight of evidence from epidemiologic studies of, or convincing clinical evidence in, exposed humans.

^e NR means "not regulated."

^f ppm means parts of contaminant per million parts of contaminated air, on a volume-to-volume basis.

6.0 RESULTS AND DISCUSSION

Area samples were collected along the length of the runway on the downwind side of the the rejuvenator sealer application vehicle. The day was relatively calm with winds ranging from 3 to 7 miles per hour from the south. The temperature on the day of the assessment reached 102°F. Personal samples were collected on Bowser & Tarr employees while applying the rejuvenator sealer to the runway.

According to Mr. Godden, federal, state or local employees are typically on site during the rejuvenator sealer application activities to inspect and ensure that the rejuvenator sealer is properly applied on a designated surface. These employees are also potentially exposed to these airborne contaminants during the period in which they are onsite. Inspectors are on site for a limited time and are not directly involved with the preparation, transfer, or application of the rejuvenator sealer. **Therefore, it is reasonable to assume that their potential 8-hour TWA exposure to the airborne contaminants assessed would be less than the potential exposure of the contractor employees directly involved in the application of the rejuvenator sealer.**

6.1 COAL TAR PITCH VOLATILES

Results of analysis of the area air samples collected along the runway on the downwind side of the the rejuvenator sealer application area ranged from less than 0.05 to less than 0.06 milligrams contaminant per cubic meter of contaminated air, on a weight-to-volume basis (mg/m³). These results are less than the 8-hour OSHA PEL-TWA and the ACGIH TLV-TWA of 0.2 mg/m³ established for CTPVs. **The result of analysis for the sample collected on the upwind side of the runway was less than 0.05 mg/m³, which is less than the OSHA PEL-TWA and the ACGIH TLV-TWA for CTPV.**

Results of analysis of the personal samples collected on the Assistant Operator were less than 0.08 mg/m³ which is less than the 8-hour OSHA PEL-TWA and the ACGIH TLV-TWA. Results of analysis for the sample collected on the Application Operator for Bowser & Tarr was 0.29 mg/m³. This result is greater than the OSHA 8-hour PEL-TWA and the ACGIH TLV-TWA of 0.2 mg/m³ established for CTPVs.

ACGIH has designated CTPVs as confirmed human carcinogens for which "worker exposure by all routes should be carefully controlled to levels as low as possible below the TLV."

6.2 1,2,4-TRIMETHYLBENZENE

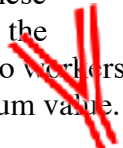
Results of analysis of the samples collected along the runway on the downwind side of the the rejuvenator sealer area of application ranged from less than 0.01 to 2.9 ppm 1,2,4-trimethylbenzene. These results are less than the ACGIH 8-hour TLV-TWA of 25 ppm established for 1,2,4-trimethylbenzene. 1,2,4-Trimethylbenzene is not regulated by OSHA. **The results of analysis for the sample collected on the upwind side of the runway was less than 0.01 ppm, which is less than the ACGIH TLV-TWA for 1,2,4-trimethylbenzene.**

The results of analysis for the samples collected for 1,2,4-trimethylbenzene on the Assistant Operator and the Application Operator ranged from 2.1 to 3.5 ppm. **These results are less than the ACGIH 8-hour TLV-TWA of 25 ppm established for 1,2,4-trimethylbenzene.**

6.3 POLYNUCLEAR AROMATIC HYDROCARBONS

Results of analysis of Sample A7548, collected on the Application Operator and analyzed for five selected PNAs, were 0.006 mg/m³ for anthracene, 0.0022 mg/m³ for BaP, 0.0031 mg/m³ for chrysene, 0.0022 mg/m³ for phenanthrene, and 0.0047 mg/m³ for pyrene. The results for BaP are less than the OSHA 8-hour PEL of 0.2 mg/m³ established for BaP. ACGIH has designated BaP and chrysene as "suspected human carcinogens" for which "worker exposure by all routes should be carefully controlled to levels as low as possible below the TLV."

The patent for the rejuvenator sealer indicates that the material contains other PAHs. These hydrocarbons comprise between 1 and 20% the rejuvenator sealer by weight. Assessing the comparative carcinogenicity of these compounds and evaluating their potential hazard to workers requires additional research. In the interim, worker exposure should be kept to a minimum value.



APPENDIX A
SAMPLING AND ANALYTICAL RESULTS

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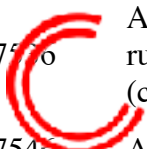
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Table 1
Results of Personal and Area Air Sampling and
Analysis for Coal Tar Pitch Volatiles during
Spray Application of Rejuvenator Sealer
at the
Sikeston Municipal Airport
Sikeston, Missouri

Clayton Project No. 56291.00
Sampling Date: June 15, 1994

Sample Number	Sample Location	Sampling Period		Sample Volume (Liters)	Coal Tar Pitch Volatiles (mg/m ³)
		Start	Stop		
A7548	William J. Tarr Operator	1202	1758	489.5	0.29
A7540	Patrick Toner Assistant Operator	1203	1759	502.0	<0.08
A7512	Area, near runway lights (south end)	1206	1910	848.0	<0.05
A7576	Area, near runway lights (center crossover)	1208	1208	823.2	<0.05
A7546	Area, near runway lights (third crossover)	1209	1905	636.5	<0.06



**Table 1 (continued) Results of Personal and Area Air Sampling and
Analysis for Coal Tar Pitch Volatiles during
Spray Application of Rejuvenator Sealer
at the
Sikeston Municipal Airport
Sikeston, Missouri**

Clayton Project No. 56291.00

Sampling Date: June 15, 1994

Sample Number	Sample location	Sample Period Start	Sample Period Stop	Sample Volume (Liters)	Coal Tar Pitch Volatiles (mg/m ³)
A7527	Area, near Runway lights (north end)	1210	1902	819.9	<0.05
A7547	Area, near Runway lights (south end)	1205	1913	851.7	<0.05
A7555	Area, near Runway lights (south end-upwind of application area)	1213	1916	816.4	<0.05
	OSHA 8-hour PEL-TWA				0.02
	ACGIH 8-hour TLV-TWA				0.02

Mg/m³: milligrams of coal tar pitch volatiles per cubic meter of contaminated air on a weight-to-volume basis

<: Less than

OSHA: Occupational Safety and Health Administration

PEL: Permissible exposure limit

TWA: Time-weighted average

ACGIH: American Conference of Governmental Industrial Hygienists

TLV: Threshold Limit Value

Table 2
Results of Personal and Area Air Sampling and Analysis
for
1,2,4-Trimethylbenzene
during Spray Application of Rejuvenator sealer
at the
Sikeston Municipal Airport
Sikeston, Missouri

Clayton Project No. 56291.00

Sampling Dates: June 15, 1994

Sample Number	Sample Location	Sampling Period		Sample Volume (Liters)	1,2,4-Trimethylbenzene (ppm)
		Start	Stop		
ET-1	Patrick Toner Assistant Operator	1202	1614	27.6	2.1
ET-2	William J. Tarr Operator	1202	1613	27.6	3.5
ET-4	Area, near runway lights (south end)	1206	1627	28.7	2.9
ET-5	Area, near runway lights (center crossover)	1208	1625	33.4	2.2
ET-6	Area, near runway lights (third crossover)	1209	1622	30.4	1.9
ET-7	Area, near runway lights (north end)	1210	1615	29.4	1.2



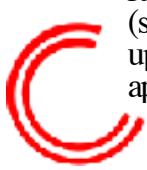
Table 2 (continued)
Results of Personal and Area Air Sampling and Analysis
for
1,2,4-Trimethylbenzene
during Spray Application of Rejuvenator sealer
at the
Sikeston Municipal Airport
Sikeston, Missouri

Clayton Project No. 56291.00

Sampling Date: June 15, 1994



Sample Number	Sample Location	Sampling Period		Sampling Volume (Liters)	1,2,4-Trimethylbenzene (ppm)
		Start	Stop		
ET-8	Area, near runway lights (south end)	1205	1631	34.6	0.29
ET-9	Area, near runway lights (south end-upwind of application area)	1613	1632	31.1	<0.01
ET-10	William J. Tarr, Operator	1613	1758	11.6	<0.2
ET-11	Patrick Toner, Assistant Operator	1614	1759	11.6	0.1
ET-12	Area, near runway lights (south end)	1627	1910	17.9	0.1
ET-13	Area, near runway lights (center crossover)	1625	1908	20.2	0.09



**Table 2 (continued) Results of Personal and Area Air Sampling and Analysis
for
1,2,4-Trimethylbenzene
during Spray Application of Rejuvenator sealer
at the
Sikeston Municipal Airport
Sikeston, Missouri**

Clayton Project No. 56291.00

Sampling Date: June 15, 1994

Sample Number	Sample Location	Sample Period		Sample Volume (liters)	1,2,4-Trimethylbenzene (ppm)
		Start	Stop		
Et-14	Area, near runway lights (third crossover)	1622	1905	19.6	1.5
ET-15	Area, near runway lights (north end)	1615	1902	20.0	<0.03
ET-16	Area, near runway lights (south end)	1631	1913	21.1	0.11
ET-17	Area, near runway lights (south end-upwind of application area)	1632	1916	19.7	<0.02
	OSHA 8-hour NE PEL-TWA				NE
	ACGIH 8-hour TLV-TWA				25

Mg/m3: milligrams of coal tar pitch volatiles per cubic meter of contaminated air on a weight-to-volume basis

<: Less than

OSHA: Occupational Safety and Health Administration

PEL: Permissible exposure limit

TWA: Time-weighted average

ACGIH: American Conference of Governmental Industrial Hygienists

TLV: Threshold Limit Value

Table 3

**Results of personal Air Sampling and Analysis for
Polynuclear Aromatic Hydrocarbons
During Spray Application of Rejuvenator sealer
At the
Sikeston municipal Airport
Sikeston, Missouri**

**Clayton Project No. 56291.00
Sampling Date: June 15, 1994**

Sample Number	Sample Location	Sampling Period Start Stop	Sample Volume (Liters)	Anthracene ((mg/m ³))	Benzi(a) Pyrene* (mg/m ³)	Chrysene* (mg/m ³)	Phenanthrene (mg/m ³)	Pyrene (mg/m ³)
A7548	William Tarr Operator	1202 1758	489.5	0.006	0.0022	0.0031	0.0022	0.0047
	OSHA 8-hour PEL-TWA			NE	0.2	NE	NE	NE
	ACGIH 8-hour TLV-TWA			NE	NE	NE	NE	NE

Mg/m³: milligrams of coal tar pitch volatiles per cubic meter of contaminated air on a weight-to-volume basis

<: Less than

OSHA: Occupational Safety and Health Administration

PEL: Permissible exposure limit

TWA: Time-weighted average

ACGIH: American Conference of Governmental Industrial Hygienists

TLV: Threshold Limit Value

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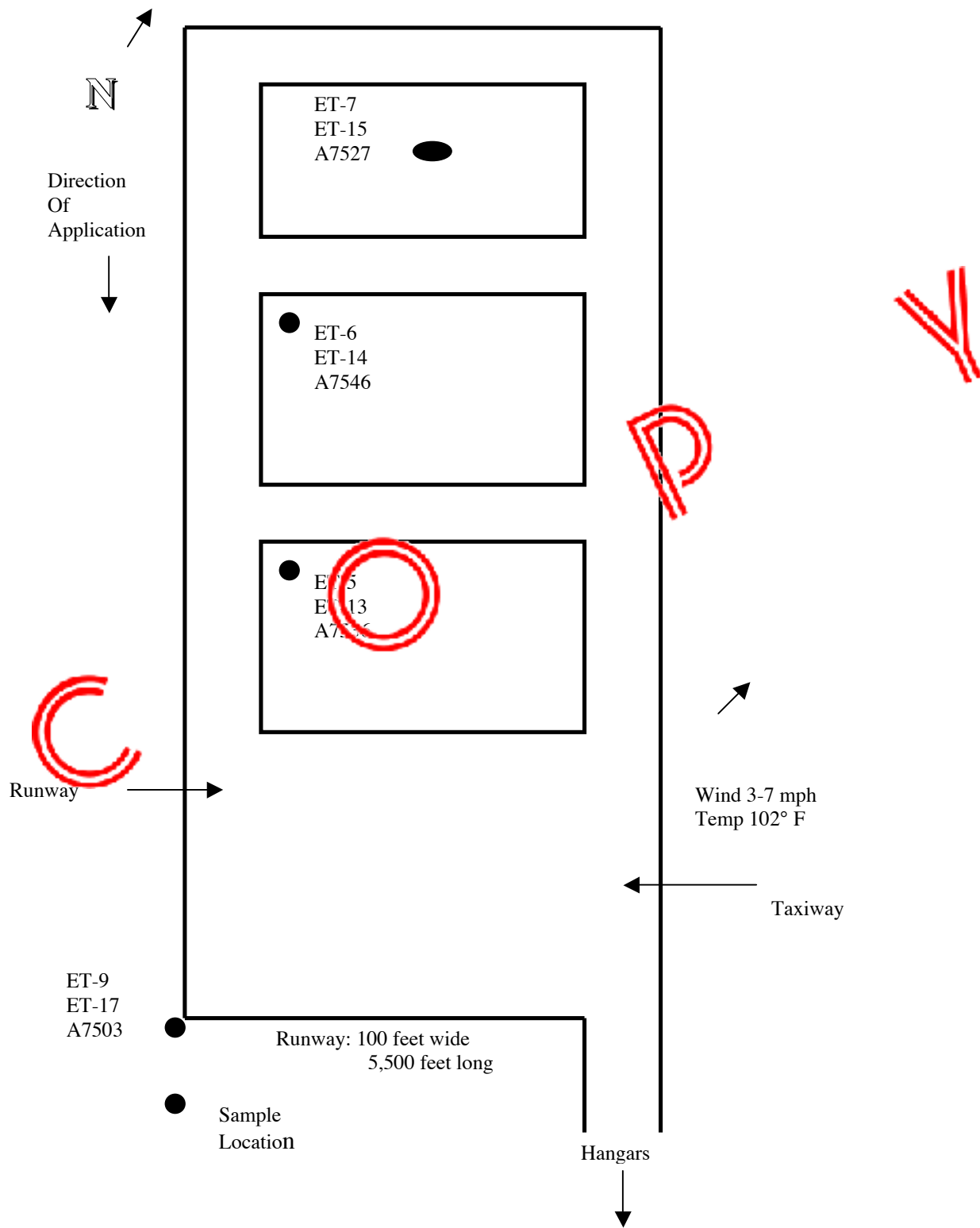
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APPENDIX B

SAMPLING LOCATIONS

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Sampling locations at Sikeston Municipal Airport in Sikeston, Missouri. Clayton
 Project No. 56291.00 June 15, 1994