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Hot Mix Asphalt Plants Kiln Dryer Stack Manual Methods Testing

Asphalt Plant B Cary, North Carolina Volume 1 of 2



FINAL REPORT

**EMISSIONS TEST AT AN ASPHALT CONCRETE PRODUCTION PLANT:
ASPHALT PLANT "B" - CARY, NORTH CAROLINA**

VOLUME I OF II
REPORT TEXT
APPENDIX A
APPENDIX B

EPA Contract No. 68D70069
Work Assignment No. 2-09

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1.0 INTRODUCTION

The United States Environmental Protection Agency (USEPA) is investigating the asphalt concrete production source category to identify and quantify emissions of hazardous air pollutants (HAPs) from rotary aggregate dryers used at these facilities. There are two types of rotary drum dryers in use at asphalt concrete production plants: parallel flow, wherein the direction of travel of the drying aggregate is the same as the direction of travel of the burner exhaust gases, and counter flow, wherein the aggregate and exhaust gas flows are opposite to each other. On May 7, 1997, a work assignment was issued by EPA's Office of Air Quality Planning and Standards, Emissions Measurement Center, (OAQPS, EMC) to Pacific Environmental Services, Inc. (PES), of Research Triangle Park, North Carolina. The work assignment specified that emissions testing for HAPs be conducted on one of each type of aggregate dryer. Two candidate facilities were therefore identified and selected by EPA as host facilities for the testing program.

This document describes the test procedures, results, and quality assurance procedures that were employed during the testing of a parallel flow rotary drum aggregate dryer, which was Asphalt Plant "B", Cary, North Carolina facility. The facility was identified as a candidate by EPA due to its location close to EPA facilities in Research Triangle Park, North Carolina, and because it is typical of parallel flow rotary dryers in the asphalt production source category. The results of the emissions testing program conducted at a facility employing a counter flow rotary aggregate dryer are presented in a separate report.

The scope of the work assignment was to plan and conduct an air emissions testing program to quantify emission rates of HAPs from the rotary aggregate drier located at Asphalt Plant "B". The planning and testing phase of the program was conducted under EPA Contract No. 68D20162, Work Assignment No. 4-13. Because the period of performance of the contract expired on September 30, 1997, PES was issued a second work assignment to complete the data reduction, a portion of the analysis, and the preparation of the draft report, which was completed under EPA Contract No. 68D70002, Work Assignment No. 0-005. This final report incorporates comments from EPA and the National Asphalt Pavement Association, and includes a process description and process data collected by EPA's Emission Standards Division (ESD) contractor. The final report was prepared under EPA Contract No. 68D70069, Work Assignment No. 2-09.

The primary objective of the test program was to obtain data on the controlled and uncontrolled emissions of polychlorinated dibenzo-*p*-dioxins (PCDDs or "dioxins") and polychlorinated dibenzofurans (PCDFs or "furans"), particulate matter (PM), and metallic HAP and non-HAP compounds from rotary drum dryers. A secondary objective of the test program was to observe and record plume opacity. The data will be used by ESD to determine whether HAPs are emitted at levels that would justify regulation under the Maximum Achievable Control Technology (MACT) program.

The test program at Asphalt Plant "B" was completed during the week of August 25, 1997. The basic test methods that were employed were EPA Test Methods 1 (sample point location), 2 (gas velocity and flow), 3B (gas molecular weight and emission correction factors), 4 (gas moisture content), 5 (particulate matter concentration), 9 (plume opacity), 23 (PCDDs/PCDFs concentrations) and 29 (metals concentrations). Particulate matter concentrations were determined by using tared filters in the Method 29 sampling train. PES conducted three sampling runs; the results of the test runs are presented in Section 2.0 of this document. Although the work assignment called for three sampling runs to be conducted during the production of asphalt concrete with reclaimed asphalt pavement or RAP, only two sampling runs with RAP were conducted, at the direction of the EPA Work Assignment Manager. Three test runs with RAP addition were desired, but not possible since the facility did not operate on either the 25th or 26th of August due to lack of product demand. The third test run was conducted while the facility was making asphalt without the addition of RAP to the mix.

PES used three subcontractors to assist in the completion of this testing effort. Deeco, Inc. (DEECO) of Raleigh, North Carolina; Triangle Laboratories, Inc. (TLI) of Durham, North Carolina, and Atlantic Technical Services, Inc. (ATS), of Chapel Hill, North Carolina. DEECO provided source testing support at the inlet sampling location, visual emissions observations of controlled emissions, and sample recovery support. TLI provided analytical services for the quantification of PCDDs/PCDFs, and metals in the collected samples, and ATS provided on-site sampling support as well as support during preparation of the site test plan, draft report and calculation of the emissions testing results.

The test program organization and major lines of communication are presented in Figure 1.1. The PES Project Manager communicated directly with the EPA Work Assignment Manager and coordinated all of the on-site testing activities. The sampling locations at Asphalt Plant "B" are shown in Figure 1.2.

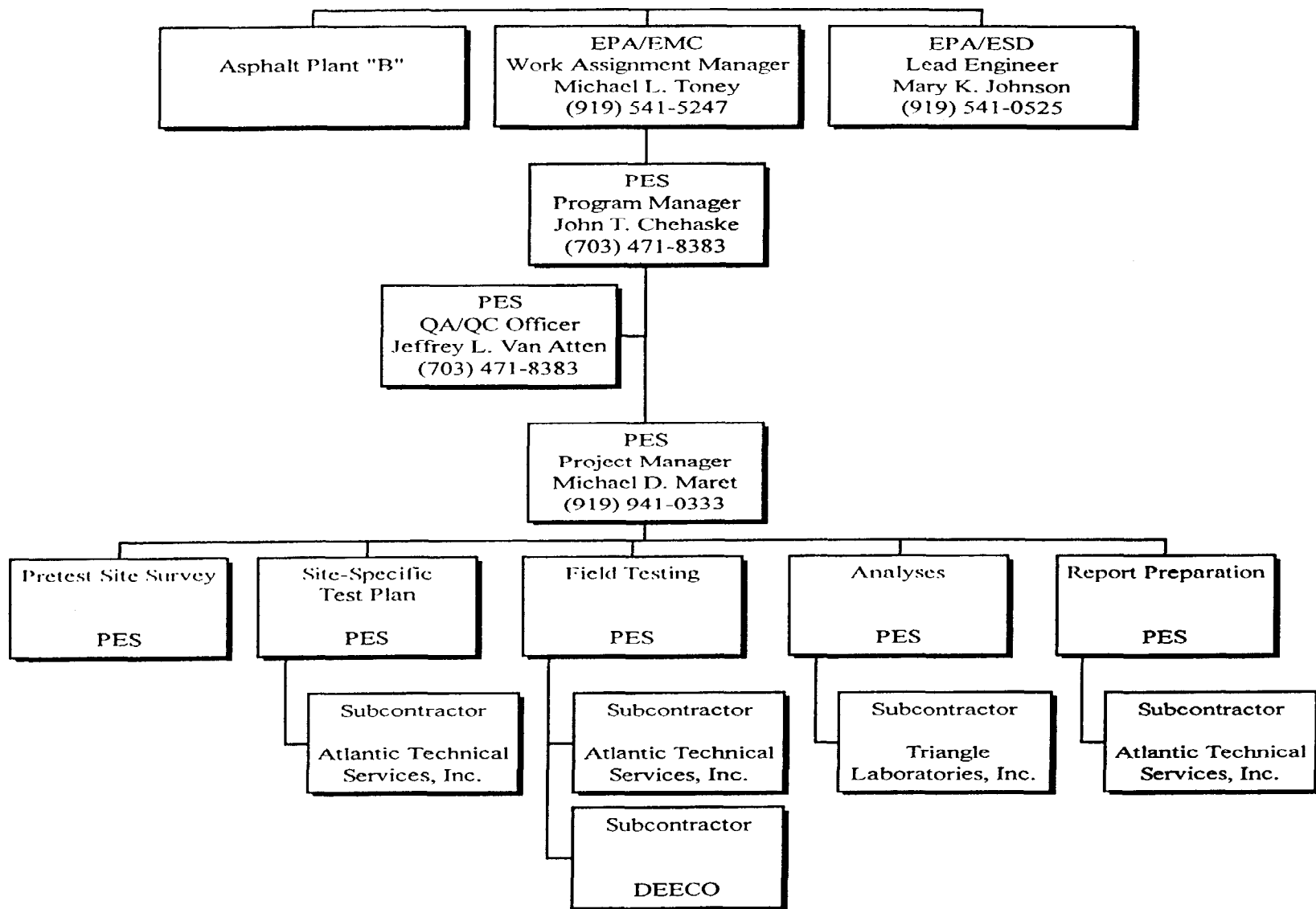


Figure 1.1 Key Personnel and Responsibility for Testing - Asphalt Plant "B", Cary, NC

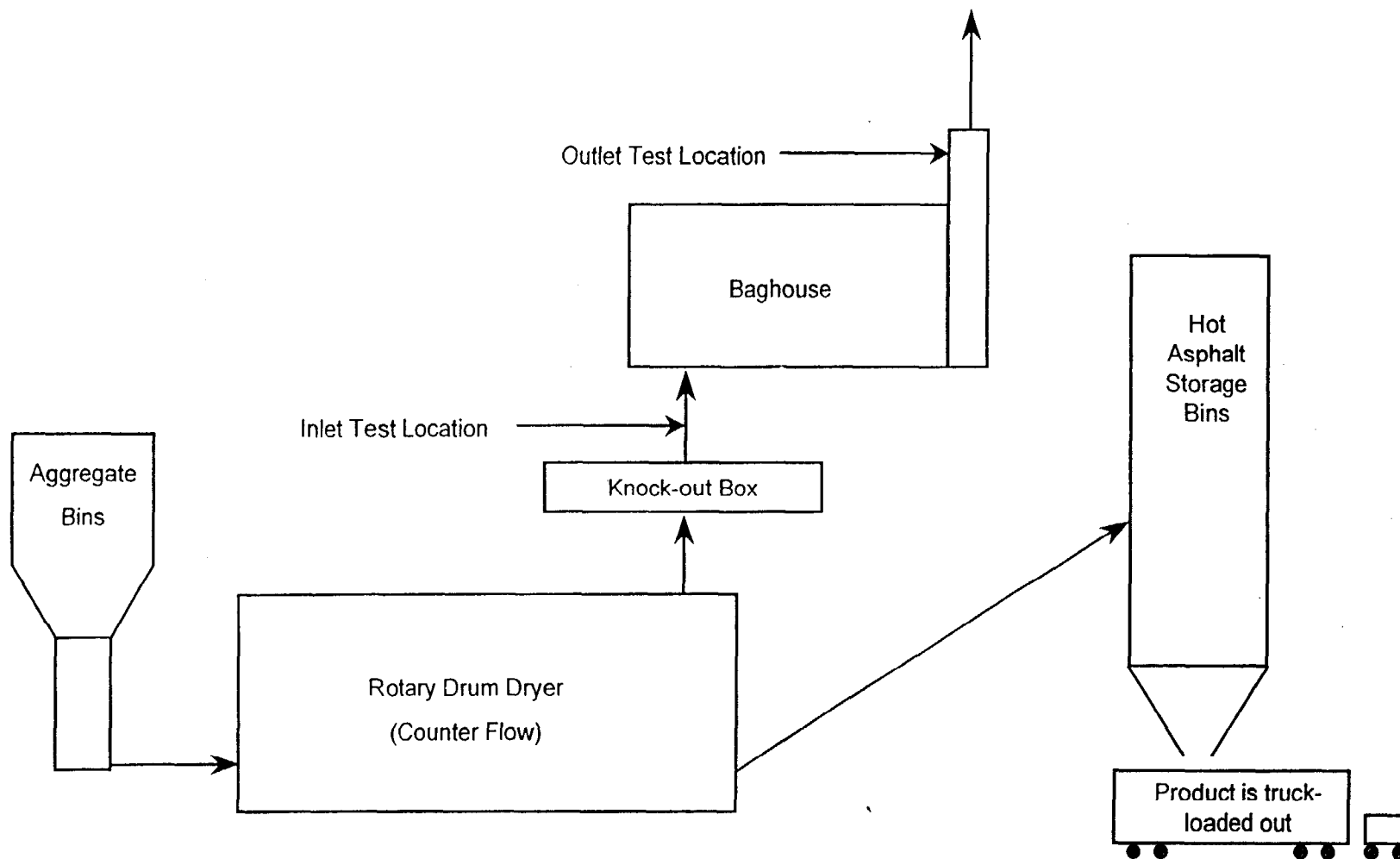


Figure 1.2 Sampling Locations - Asphalt Plant "B", Cary, NC

2.0 SUMMARY OF RESULTS

This section summarizes the results of testing program at Asphalt Plant "B". The following pages present the times and durations of each of the sampling runs that were conducted, the sampling parameters during each run, the effluent gas parameters, and the concentrations and mass emission rates of the target HAPs. Sampling of emissions was conducted on three consecutive days from August 27, 1997 through August 29, 1997, during which time three sampling runs for both PCDDs/PCDFs metals were conducted at each test location. Table 2.1 presents the "Emissions Test Log" which summarizes clock times, target pollutants and down times due to filter and port changes for each of the Method 23 and Method 29 sampling runs attempted. The results of the PCDDs/PCDFs sampling during asphalt production with RAP are presented in Tables 2.2 through 2.7, and the results of the PCDDs/PCDFs sampling conducted during production with virgin aggregate (i.e., without RAP) are presented in Tables 2.8 through 2.13. The results of the particulate matter and metals sampling runs conducted during RAP addition are presented in Tables 2.14 through 2.19, and the results of the PM and metals runs conducted during asphalt production with virgin aggregate are presented in Tables 2.20 through 2.25.

2.1 OXYGEN AND CARBON DIOXIDE MEASUREMENTS

Concurrent with the Method 23 and Method 29 sampling at the baghouse outlet, integrated bag samples of the effluent gas were collected and analyzed using an Orsat® apparatus to determine oxygen and carbon dioxide concentrations for the purpose of calculating stack gas molecular weight. The oxygen and carbon dioxide concentrations presented for the first sampling run are the average of the oxygen and carbon dioxide concentrations measured during runs two and three. The diluent concentrations are presented in this manner since the results of the analyses from the first run were misplaced during the field testing portion of the test program, and were not recovered. The diluent concentrations measured during the second and third runs should be representative of the concentrations during the first run, since the operating conditions were essentially unchanged.

2.2 PCDDs/PCDFs MEASUREMENTS

PCDDs/PCDFs results are presented as 1) actual concentrations and mass emission rates, 2) concentrations adjusted to 7 percent (%) oxygen (O_2), and 3) concentrations adjusted to 7% O_2 and 2378 TCDD toxic equivalent basis. Adjustment of the congeners to a 2378 TCDD toxic equivalent basis was accomplished using the Toxic Equivalency Factor (TEF) values developed

by the North Atlantic Treaty Organization, Committee on the Challenges of Modern Society, August 1988.

The Method 23 sample fractions consisted of a sample train front-half solvent rinse, a particulate filter, a back-half solvent rinse, and an XAD®-2 sorbent resin module. During analysis, each of the sample fractions was extracted, concentrated, combined, and analyzed using a Gas Chromatograph with a Mass Spectrometer detector (GC/MS), according to the procedures outlined in Method 23. During analysis, the combined sample extract was separated with a DB-5 capillary column. Where the results of that analysis indicated the presence of 2378 TCDF congeners, the analysis was repeated using a DB-225 capillary column so that the TCDF congeners could be more readily separated and quantified.

The results of the analyses indicated the presence of congeners that were qualified as Estimated Maximum Possible Concentrations, or EMPCs. From time to time during the Method 23 analyses, a peak elutes at the position expected for a particular congener, but the peak fails validation based on the theoretical split of chlorine isotopes. That is to say that the number of Cl³⁵ isotopes and the number of Cl³⁷ isotopes attached to the PCDDs/PCDFs congeners should agree with the Cl³⁵/Cl³⁷ ratio found in nature. For each congener, this ratio must agree within 15%. If the mass ratio of chlorine isotopes does not agree with the natural chlorine isotope ratio, then the peak is flagged as an EMPC.

In the calculation of average and total PCDDs/PCDFs congeners, analytical results below the method detection limit have been assigned a value of zero, and are included in the calculation of sums and averages. Congeners with that have been calculated as EMPC values are designated using braces, {}, and the EMPC values are used to calculate sums and averages. If a sum or average value is reported inside braces, then one (or more) EMPC values were used to calculate this value.

The values presented as "Total PCDDs" are the sum of the "12346789 OCDD" polychlorinated dibenzo-p-dioxin and all of the dioxins labeled "Total"; "Total PCDFs" values are the sum of the "12346789 OCDF" polychlorinated dibenzofuran and all of the furans labeled "Total". "Total PCDDs + Total PCDFs" values are the sum of the "Total PCDDs" and "Total PCDFs" values. Values that have been qualified as being EMPC have been included in the sums. Concentrations and emission rates based on or including EMPC values are denoted by braces ({}).

TABLE 2.1

**EMISSIONS SAMPLING TEST LOG
ASPHALT PLANT "B" - CARY, NC**

Run ID	Date	Target Pollutant	Run Time (24-hr clock)	Down Period(s)	Comment
Baghouse Inlet					
R-M23-I-1*	8/27/97	PCDDs/PCDFs	0940-1227	0948-1014 1025-1030 1040-1049 1100-1107 1120-1131 1140-1146 1200-1206	Filter Change Filter Change Filter Change Filter Change Filter Change Plant Down Filter Change
R-M29-I-1*	8/27/97	PM & Metals	1000-1200	1014-1015 1031-1041 1101-1107 1150-1156	Plant Down Filter Change Filter Change Filter Change
R-M23-I-2*	8/28/97	PCDDs/PCDFs	0908-1428	1108-1328 1355-1405	Filter Change & Port Change Plant Down
R-M29-I-2*	8/28/97	PM & Metals	1019-1427	1129 1355-1407	Filter Change Plant Down Plant Down
R-M23-I-3	8/29/97	PCDDs/PCDFs	0818-1413	1018-1105 1138-1139 1153-1205	Filter Change & Port Change Power loss Plant Down & Filter Change
R-M29-I-3	8/29/97	PM & Metals	0819-1403	1105 1232	Filter & Port Change Stop for M23
Baghouse Outlet					
R-M23-O-1	8/27/97	PCDDs/PCDFs	0940-1516	0950-1019 1029-1032 1052-1112 1140-1146 1158-1202 1242-1246 1326-1335 1402-1412 1427-1436	Stop for inlet ^b Stop for inlet ^b Port Change Plant Down Port Change Port Change Port Change Plant Down Port Change

TABLE 2.1 (CONCLUDED)

**EMISSIONS SAMPLING TEST LOG
ASPHALT PLANT "B"- CARY, NC**

Run ID	Date	Target Pollutant	Run Time (24-hr clock)	Down Period(s)	Comment
R-M29-O-1	8/27/97	PM & Metals	0940-1516	0950-1019 1029-1032 1052-1112 1140-1146 1158-1202 1242-1246 1326-1335 1402-1412 1427-1436	Stop for inlet ^b Stop for inlet ^b Port Change Plant Down Port Change Port Change Port Change Plant Down Port Change
R-M23-O-2	8/28/97	PCDDs/PCDFs	0746-1229	0826-0830 0901-0909 0919-0921 1001-1004 1044-1049 1110-1128 1147-1149	Port Change Plant Down Port Change Port Change Port Change Plant Down Port Change
R-M29-O-2	8/28/97	PM & Metals	0746-1229	0826-0830 0901-0909 0919-0921 1001-1004 1044-1049 1110-1128 1147-1149	Port Change Plant Down Port Change Port Change Port Change Plant Down Port Change
R-M23-O-3	8/29/97	PCDDs/PCDFs	0809-1236	0849-0852 0932-0935 1015-1018 1058-1102 1142-1145 1211-1222	Port Change Port Change Port Change Port Change Port Change Plant Down

^a Test runs were shortened due to high grain loading at the baghouse inlet.

^b Sampling was delayed at the outlet so that sampling could be conducted nearly simultaneously with the inlet sampling.

2.2.1 Baghouse Inlet-Asphalt Production with RAP

In order to collect samples at the inlet location the filter holder in the Method 23 sampling train was modified during the test program. These modifications were necessary due to the extremely high grain loading at the baghouse inlet location, which caused the filters in the Method 23 sampling train to plug. The high grain loading resulted in sampling at non-isokinetic conditions during Run R-M23-I-1 since the sampling rate could not be maintained. After the first sampling run, the filter holder was modified by replacing the 3-inch diameter filter with a 4-inch diameter filter. In addition, precleaned Teflon® wool was placed into the front-half section of the filter holder to serve as a pre-filter. Even with the filter modifications, stack particulate loading conditions mandated frequent filter changes during the sample runs.

PES conducted two Method 23 sampling runs at the baghouse inlet during asphalt production using RAP. Table 2.2 summarizes the PCDDs/PCDFs emissions sampling and stack gas parameters at the baghouse inlet. The total sampling times for each run were 96 and 170 minutes for run R-M23-I-1 and R-M23-I-2, respectively, instead of the desired 240 minute run time. The test runs were curtailed prematurely due to particulate loading in the gas stream which exceeded the capacity of the Method 23 sampling train. The (2-run) average sample volume was 53.642 dry standard cubic feet (dscf) which is equivalent to 1.519 dry standard cubic meters (dscm). The (2-run) average inlet gas temperature was 307°F and contained 5.2 % CO₂, 13.4% O₂, and 28.8% moisture. The inlet gas volumetric flow rate was 47,515 actual cubic feet per minute (acfm) which is equivalent to 23,004 dry standard cubic feet per minute (dscfm) or 651.4 dry standard cubic meters per minute (dscmm).

Table 2.3 presents the PCDDs/PCDFs stack gas concentrations and emission rates at the baghouse inlet. The (2-run) average concentration of total PCDDs was {5.99} nanograms per dry standard cubic meter (ng/dscm), and the (2-run) average concentration of total PCDFs was {0.467} ng/dscm. The total PCDDs/PCDFs concentration was {6.46} ng/dscm. The (2-run) average emission rate of total PCDDs was {234} micrograms per hour (μg/hr), and the (2-run) average emission rate of total PCDFs was {18.3} μg/hr. The (2-run) average emission rate of total PCDFs/PCDDs congeners was {252} μg/hr.

Table 2.4 presents the PCDDs/PCDFs concentrations adjusted to 7% O₂. The measured stack gas O₂ concentration was 13.4%. Therefore, the adjusted PCDDs/PCDFs concentrations were greater than the actual concentrations. The (2-run) average adjusted concentration of total PCDDs was 11.2 ng/dscm @ 7% O₂. The (2-run) average adjusted concentration of total PCDFs was {0.868} ng/dscm @ 7% O₂. The (2-run) average adjusted concentration of total PCDDs/PCDFs was {12.1} ng/dscm @ 7% O₂. Table 2.4 also presents the adjusted concentrations in 2378 TCDD toxic equivalents. The TEF concentration for total PCDDs was 0.011 ng/dscm @ 7% O₂. Since no PCDF congeners chlorinated at the 2378 positions were detected, the total TEF PCDDs/PCDFs concentration was also 0.011 ng/dscm @ 7% O₂.

TABLE 2.2

**PCDDs/PCDFs EMISSIONS SAMPLING AND EXHAUST GAS PARAMETERS
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B"- CARY, NC**

Run Number	R-M23-I-1	R-M23-I-2	Average
Date	8/27/97	8/28/97	
Sampling Duration, minutes	96	170	133
Average Sampling Rate, dscfm ^a	0.59	0.30	0.45
Sample Volume:			
dscf ^b	56.399	50.885	53.642
dscm ^c	1.597	1.441	1.519
Average Exhaust Gas Temperature, °F	308	306	307
O ₂ Concentration, % by volume	13.8	13.1	13.4
CO ₂ Concentration, % by volume	5.2	5.2	5.2
Moisture, % by volume	29.9	27.7	28.8
Exhaust Gas Volumetric Flow Rate:			
acfm ^d	48,074	46,957	47,515
dscfm ^a	22,981	23,027	23,004
dscmm ^e	650.7	652.1	651.4
Isokinetic Sampling Ratio, %	115	102.6	108.8

^a Dry standard cubic feet at 68°F and 1 atm.

^b Dry standard cubic feet at 68°F and 1 atm.

^c Dry standard cubic meters at 20°C and 1 atm.

^d Actual cubic feet per minute at inlet gas conditions.

^e Dry standard cubic meters per minute at 20°C and 1 atm.

TABLE 2.3

**PCDDs/PCDFs CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Congener	Concentration ^a ng/dscm, as measured			Emission Rate ^b µg/hr		
	R-M23-I-1	R-M23-I-2	Average	R-M23-I-1	R-M23-I-2	Average
<u>Dioxins</u>						
2378 TCDD	ND	ND	0.00	ND	ND	0.00
Total TCDD	ND	ND	0.00	ND	ND	0.00
12378 PeCDD	ND	ND	0.00	ND	ND	0.00
Total PeCDD	ND	ND	0.00	ND	ND	0.00
123478 HxCDD	ND	ND	0.00	ND	ND	0.00
123678 HxCDD	ND	ND	0.00	ND	ND	0.00
123789 HxCDD	ND	ND	0.00	ND	ND	0.00
Total HxCDD	ND	ND	0.00	ND	ND	0.00
1234678 HpCDD	ND	ND	0.00	ND	ND	0.00
Total HpCDD	{0.219}	ND	{0.110}	{8.56}	ND	{4.28}
Octa CDD	6.07	5.69	5.88	237	223	230
Total PCDDs	{6.29}	5.69	{5.99}	{246}	223	{234}
<u>Furans</u>						
2378 TCDF	ND	ND	0.00	ND	ND	0.00
Total TCDF	{0.113}	0.118	{0.115}	{4.40}	4.62	{4.51}
12378 PeCDF	ND	ND	0.00	ND	ND	0.00
23478 PeCDF	ND	ND	0.00	ND	ND	0.00
Total PeCDF	0.294	0.229	0.262	11.5	8.96	10.2
123478 HxCDF	ND	ND	0.00	ND	ND	0.00
123678 HxCDF	ND	ND	0.00	ND	ND	0.00
234678 HxCDF	ND	ND	0.00	ND	ND	0.00
123789 HxCDF	ND	ND	0.00	ND	ND	0.00
Total HxCDF	ND	ND	0.00	ND	ND	0.00
1234678 HpCDF	ND	ND	0.00	ND	ND	0.00
1234789 HpCDF	ND	ND	0.00	ND	ND	0.00
Total HpCDF	ND	{0.180}	{0.0902}	ND	{7.06}	{3.53}
Octa CDF	ND	ND	0.00	ND	ND	0.00
Total PCDFs	{0.407}	{0.527}	{0.467}	{15.9}	{20.6}	{18.3}
Total PCDDs + PCDFs	{6.70}	{6.22}	{6.46}	{262}	{243}	{252}

^a Nanogram per dry standard cubic meter at 20°C and 1 atm.

^b Micrograms per hour.

ND Non Detectable - Results are below target analyte detection limits. ND values are counted as zero in totals and averages.

{ } Estimated Maximum Possible Concentration. EMPC values are counted in totals and averages.

TABLE 2.4

**PCDDs/PCDFs CONCENTRATIONS AND 2378 TOXIC EQUIVALENT
CONCENTRATIONS ADJUSTED TO 7 PERCENT OXYGEN
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Congener	Concentration ^a ng/dscm, adjusted to 7% O ₂			2378- TCDD ^b Toxic Equiv. Factor	2378 Toxic Equivalents ng/dscm, adjusted to 7% O ₂		
	R-M23-I-1	R-M23-I-2	Average		R-M23-I-1	R-M23-I-2	Average
<u>Dioxins</u>							
2378 TCDD	ND	ND	0.00	1.000	ND	ND	0.00
Total TCDD	ND	ND	0.00				
12378 PeCDD	ND	ND	0.00	0.500	ND	ND	0.00
Total PeCDD	ND	ND	0.00				
123478 HxCDD	ND	ND	0.00	0.100	ND	ND	0.00
123678 HxCDD	ND	ND	0.00	0.100	ND	ND	0.00
123789 HxCDD	ND	ND	0.00	0.100	ND	ND	0.00
Total HxCDD	ND	ND	0.00				
1234678 HpCDD	ND	ND	0.00	0.010	ND	ND	0.00
Total HpCDD	{0.429}	ND	{0.215}				
Octa PCDDs	11.9	10.1	11.0	0.001	0.0119	0.0101	0.011
Total PCDDs	{12.3}	10.1	{11.2}		0.0119	0.0101	0.011
<u>Furans</u>							
2378 TCDF	ND	ND	0.00	0.100	ND	ND	0.00
Total TCDF	{0.221}	0.210	{0.215}				
12378 PeCDF	ND	ND	0.00	0.050	ND	ND	0.00
23478 PeCDF	ND	ND	0.00	0.500	ND	ND	0.00
Total PeCDF	0.576	0.408	0.492				
123478 HxCDF	ND	ND	0.00	0.100	ND	ND	0.00
123678 HxCDF	ND	ND	0.00	0.100	ND	ND	0.00
234678 HxCDF	ND	ND	0.00	0.100	ND	ND	0.00
123789 HxCDF	ND	ND	0.00	0.100	ND	ND	0.00
Total HxCDF	ND	ND	0.00				
1234678 HpCDF	ND	ND	0.00	0.010	ND	ND	0.00
1234789 HpCDF	ND	ND	0.00	0.010	ND	ND	0.00
Total HpCDF	ND	{0.322}	{0.161}				
Octa CDF	ND	ND	0.00	0.001	ND	ND	0.00
Total PCDFs	{0.797}	{0.940}	{0.868}		0.00	0.00	0.00
Total PCDDs + PCDFs	{13.1}	{11.1}	{12.1}		0.0119	0.0101	0.011

^a Nanogram per dry standard cubic meter adjusted to 7 percent oxygen at 20°C and 1 atm.

^b North Atlantic Treaty Organization, Committee on the Challenges of Modern Society. Pilot study on International Information Exchange on Dioxins and Related Compounds: International Toxicity Equivalency Factor (I-TEF) Methods of Risk Assessment for Complex Mixtures of Dioxins and Related Compounds. Report No. 176, August 1988.

ND Non Detectable - Results are below target analyte detection limits. ND values are counted as zero in totals and averages.

{ } Estimated Maximum Possible Concentration. EMPC values are counted in totals and averages.

2.2.2 Baghouse Outlet-Asphalt Production with RAP

PES conducted two Method 23 sampling runs at the baghouse outlet during asphalt production using RAP. Table 2.5 summarizes the PCDDs/PCDFs emissions sampling and stack gas parameters. The total sampling time for each run was 240 minutes. The (2-run) average sample volume was 199.815 dscf or 5.658 dscm. The (2-run) average stack gas temperature was 285 °F and contained 4.45 % CO₂, 14.3% O₂, and 30.3% moisture. The average stack gas volumetric flow rate was 49,689 acfm or 24,286 dscfm or 687.7 dscmm.

The isokinetic sampling ratio calculated for sampling run R-M23-O-1 was 115.5%. It is the position of PES that this is an anomalous calculation of the isokinetic sampling ratio, and is most likely due to an in-leakage of the impinger water bath into the water knock-out impinger during the final leak check. Comparison of the Method 23 sampling data with the Method 29 sampling data on the outlet shows that the sampling times were identical and the sample volumes were within 3% of each other (206.781 ft³ for R-M23-O-1 vs. 213.024 ft³ for R-M29-O-1). The condensate collected in the Method 23 train was 451 grams more than that collected in the Method 29 train, however. When the quantity of condensate collected in the Method 29 train is substituted into the Method 23 isokinetic calculation, the isokinetic sampling ratio is 108.6%. No adjustments were made to the calculations for R-M23-O-1.

Table 2.6 presents the PCDDs/PCDFs stack gas concentrations and emission rates. The (2-run) average concentration of total PCDDs was {0.269} ng/dscm. The (2-run) average concentration of total PCDFs was {0.125} ng/dscm. The (2-run) average concentration of total PCDDs/PCDFs was {0.394} ng/dscm. These values corresponded to (2-run) average emission rates of {11.3} µg/hr for PCDDs, {5.32} µg/hr for PCDFs and {16.7} µg/hr, total PCDDs/PCDFs for the two sampling runs. Table 2.7 presents the PCDDs/PCDFs concentrations adjusted to 7% O₂. The measured stack gas O₂ concentration was 14.3%. Therefore, the adjusted PCDDs/PCDFs concentrations were greater than the actual concentrations. The (2-run) average adjusted concentration of total PCDDs was {0.532} ng/dscm @ 7% O₂, and the (2-run) average concentration of total PCDFs was {0.245} ng/dscm @ 7% O₂. The (2-run) average adjusted concentration of total PCDDs/PCDFs was {0.777} ng/dscm @ 7% O₂.

Table 2.7 also presents the adjusted concentrations in 2378 TCDD toxic equivalents. No 2378 PCDD congeners were detected, therefore the concentration of PCDDs adjusted to 2378 toxic equivalents was zero. The (2-run) average concentration of PCDFs adjusted to 2378 toxic equivalents was {0.00628} @ 7% O₂, as was the (2-run) average TEF concentration for total PCDDs/PCDFs.

TABLE 2.5

**PCDDs/PCDFs EMISSIONS SAMPLING AND STACK GAS PARAMETERS
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M23-O-1	R-M23-O-2	Average
Date	8/27/97	8/28/97	
Sampling Duration, minutes	240	240	240
Average Sampling Rate, dscfm ^a	0.86	0.80	0.83
Sample Volume:			
dscf ^b	206.781	192.849	199.815
dscm ^c	5.855	5.461	5.658
Stack Gas Temperature, °F	283	287	285
O ₂ Concentration, % by volume	15.0	13.6	14.3
CO ₂ Concentration, % by volume	4.0	4.9	4.45
Moisture, % by volume	32.2	28.3	30.3
Exhaust Gas Volumetric Flow Rate:			
acfm ^d	49,075	50,303	49,689
dscfm ^a	23,450	25,122	24,286
dscmm ^e	664.0	711.4	687.7
Isokinetic Sampling Ratio, %	115.5	100.5	108.0

^a Dry standard cubic feet per minute at 68°F and 1 atm

^b Dry standard cubic feet at 68°F and 1 atm

^c Dry standard cubic meters at 20°C and 1 atm

^d Actual cubic feet per minute at stack conditions

^e Dry standard cubic meters per minute at 20°C and 1 atm

TABLE 2.6

**PCDDs/PCDFs CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Congener	Concentration ^a ng/dscm, as measured			Emission Rate ^b μg/hr		
	S-M23-O-1	S-M23-O-2	Average	S-M23-O-1	S-M23-O-2	Average
<u>Dioxins</u>						
2378 TCDD	ND	ND	0.00	ND	ND	0.00
Total TCDD	ND	ND	0.00	ND	ND	0.00
12378 PeCDD	ND	ND	0.00	ND	ND	0.00
Total PeCDD	{0.0905}	{0.183}	{0.137}	{3.61}	{7.82}	{5.71}
123478 HxCDD	ND	ND	0.00	ND	ND	0.00
123678 HxCDD	ND	ND	0.00	ND	ND	0.00
123789 HxCDD	ND	ND	0.00	ND	ND	0.00
Total HxCDD	ND	0.081	0.040	ND	3.44	1.720
1234678 HpCDD	ND	ND	0.00	ND	ND	0.00
Total HpCDD	ND	{0.183}	{0.0916}	ND	{7.82}	{3.91}
Octa CDD	ND	ND	0.00	ND	ND	0.00
Total PCDDs	{0.091}	{0.447}	{0.269}	{3.61}	{19.1}	{11.3}
<u>Furans</u>						
2378 TCDF	ND	ND	0.00	ND	ND	0.00
Total TCDF	0.026	ND	0.013	1.02	ND	0.510
12378 PeCDF	ND	{0.0439}	{0.022}	ND	{1.88}	{0.938}
23478 PeCDF	ND	ND	0.00	ND	ND	0.00
Total PeCDF	ND	{0.0751}	{0.0375}	ND	{3.20}	{1.60}
123478 HxCDF	ND	ND	0.00	ND	ND	0.00
123678 HxCDF	ND	ND	0.00	ND	ND	0.00
234678 HxCDF	ND	ND	0.00	ND	ND	0.00
123789 HxCDF	ND	{0.0439}	{0.0220}	ND	{1.88}	{0.938}
Total HxCDF	ND	{0.0842}	{0.0421}	ND	{3.60}	{1.80}
1234678 HpCDF	ND	ND	0.00	ND	ND	0.00
1234789 HpCDF	ND	ND	0.00	ND	ND	0.00
Total HpCDF	ND	{0.0659}	{0.0330}	ND	{2.81}	{1.41}
Octa CDF	ND	ND	0.00	ND	ND	0.00
Total PCDFs	0.026	{0.225}	{0.125}	1.02	{9.61}	{5.32}
Total PCDDs + PCDFs	{0.116}	{0.672}	{0.394}	{4.63}	{28.7}	{16.7}

^a Nanogram per dry standard cubic meter at 20°C and 1 atm.

^b Micrograms per hour.

ND Non Detectable - Results are below target analyte detection limits. ND values are counted as zero in totals and averages.

{ } Estimated Maximum Possible Concentration. EMPC values are counted in totals and averages.

TABLE 2.7

**PCDDs/PCDFs CONCENTRATIONS AND 2378 TOXIC EQUIVALENT STACK
GAS CONCENTRATIONS ADJUSTED TO 7 PERCENT O₂
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Congener	Concentration ^a ng/dscm, adjusted to 7 percent O ₂			2378- TCDD ^b Toxic Equiv. Factor	2378 Toxic Equivalencies ng/dscm, adjusted to 7 percent O ₂		
	R-M23-O-1	R-M23-O-2	Average		R-M23-O-1	R-M23-O-2	Average
<u>Dioxins</u>							
2378 TCDD	ND	ND	0.00	1.000	ND	ND	0.00
Total TCDD	ND	ND	0.00				
12378 PeCDD	ND	ND	0.00	0.500	ND	ND	0.00
Total PeCDD	{0.213}	{0.349}	{0.281}				
123478 HxCDD	ND	ND	0.00	0.100	ND	ND	0.00
123678 HxCDD	ND	ND	0.00	0.100	ND	ND	0.00
123789 HxCDD	ND	ND	0.00	0.100	ND	ND	0.00
Total HxCDD	ND	0.153	0.0767				
1234678 HpCDD	ND	ND	0.00	0.010	ND	ND	0.00
Total HpCDD	ND	{0.349}	{0.174}				
Octa CDD	ND	ND	0.00	0.001	ND	ND	0.00
Total PCDDs	{0.213}	{0.851}	{0.532}		0.00	0.00	0.00
<u>Furans</u>							
2378 TCDF	ND	ND	0.00	0.100	ND	ND	0.00
Total TCDF	0.0604	ND	0.0302				
12378 PeCDF	ND	{0.0837}	{0.0418}	0.050	ND	{0.00418}	{0.00209}
23478 PeCDF	ND	ND	0.00	0.500	ND	ND	0.00
Total PeCDF	ND	{0.143}	{0.0715}				
123478 HxCDF	ND	ND	0.00	0.100	ND	ND	0.00
123678 HxCDF	ND	ND	0.00	0.100	ND	ND	0.00
234678 HxCDF	ND	ND	0.00	0.100	ND	ND	0.00
123789 HxCDF	ND	{0.0837}	{0.0418}	0.100	ND	{0.00837}	{0.00418}
Total HxCDF	ND	{0.160}	{0.0802}				
1234678 HpCDF	ND	ND	0.00	0.010	ND	ND	0.00
1234789 HpCDF	ND	ND	0.00	0.010	ND	ND	0.00
Total HpCDF	ND	{0.126}	{0.0628}				
Octa CDF	ND	ND	0.00	0.001	ND	ND	0.00
Total PCDFs	0.0604	{0.429}	{0.245}		0.00	{0.0126}	{0.00628}
Total PCDDs +	{0.274}	{1.28}	{0.777}		0.00	{0.0126}	{0.00628}

^a Nanogram per dry standard cubic meter adjusted to 7 percent oxygen at 20°C and 1 atm.

^b North Atlantic Treaty Organization, Committee on the Challenges of Modern Society. Pilot study on International Information Exchange on Dioxins and Related Compounds: International Toxicity Equivalency Factor (I-TEF) Methods of Risk Assessment for Complex Mixtures of Dioxins and Related Compounds. Report No. 176, August 1988.

ND Non Detectable - Results are below target analyte detection limits. ND values are counted as zero in totals and averages.

{ } Estimated Maximum Possible Concentration. EMPC values are counted in totals or averages.

2.2.3 Baghouse Inlet - Asphalt Production without RAP

At the request of the EMC Work Assignment Manager, PES conducted one Method 23 sampling run at the baghouse inlet during asphalt production without the addition of RAP. Table 2.8 summarizes the PCDDs/PCDFs emissions sampling. The total sampling time for the test run was 240 minutes. The sample volume was 80.735 dscf or 2.286 dscm. The stack gas temperature was 290°F and contained 4.0 % CO₂, 15.2% O₂, and 18.6% moisture. The stack gas volumetric flow rate was 48,211 acfm or 27,178 dscfm or 769.6 dscmm.

Table 2.9 presents the PCDDs/PCDFs stack gas concentrations and emission rates. The concentration of total PCDDs was 7.24 ng/dscm, and the concentration of total PCDFs was {0.0394} ng/dscm. The concentration of total PCDDs/PCDFs was {7.28} ng/dscm. These values corresponded to emission rates of 334 µg/hr for total PCDDs, {1.82} µg/hr for total PCDFs, and {336} µg/hr for total PCDDs/PCDFs. Table 2.10 presents the PCDDs/PCDFs concentrations adjusted to 7% O₂. The measured stack gas O₂ concentration was 15.2%. Therefore, the adjusted PCDDs/PCDFs concentrations were greater than the actual concentrations. The adjusted concentration of total PCDDs was 17.7 ng/dscm @ 7% O₂, and the adjusted concentration of total PCDFs was {0.0960} ng/dscm @ 7% O₂. The adjusted concentration of total PCDDs/PCDFs was {17.8} ng/dscm @ 7% O₂.

Table 2.10 also presents the adjusted concentrations in 2378 TCDD toxic equivalents. The concentration of total PCDDs adjusted to 2378 toxic equivalents was 0.0188 ng/dscm @ 7% O₂. The concentration of PCDFs adjusted to 2378 toxic equivalents was {0.00320} @ 7% O₂, and TEF concentration for total PCDDs/PCDFs was {0.0220} ng/dscm @ 7% O₂.

TABLE 2.8

**PCDDs/PCDFs EMISSIONS SAMPLING AND STACK PARAMETERS
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M23-I-3
Date	8/29/97
Sampling Duration, minutes	240
Average Sampling Rate, dscfm ^a	0.34
Sample Volume:	
dscf ^b	80.735
dscm ^c	2.286
Exhaust Gas Temperature, °F	290
O ₂ Concentration, % by volume	15.2
CO ₂ Concentration, % by volume	4.0
Moisture, % by volume	18.6
Exhaust Gas Volumetric Flow Rate:	
acfm ^d	48,211
dscfm ^a	27,178
dscmm ^e	769.6
Isokinetic Sampling Ratio, %	97.7

^a Dry standard cubic feet per minute at 68°F and 1 atm

^b Dry standard cubic feet at 68°F and 1 atm

^c Dry standard cubic meters at 20°C and 1 atm

^d Actual cubic feet per minute at stack conditions

^e Dry standard cubic meters per minute at 20°C and 1 atm

TABLE 2.9

**PCDDs/PCDFs CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Congener	Concentration ^a ng/dscm, as measured	Emission Rate ^b μg/hr
	R-M23-I-3	R-M23-I-3
<u>Dioxins</u>		
2378 TCDD	ND	ND
Total TCDD	ND	ND
12378 PeCDD	ND	ND
Total PeCDD	ND	ND
123478 HxCDD	ND	ND
123678 HxCDD	ND	ND
123789 HxCDD	ND	ND
Total HxCDD	0.00875	0.404
1234678 HpCDD	0.0612	2.83
Total HpCDD	0.149	6.87
Octa PCDDs	7.09	327
Total PCDDs	7.24	334
<u>Furans</u>		
2378 TCDF	ND	ND
Total TCDF	0.00437	0.202
12378 PeCDF	ND	ND
23478 PeCDF	ND	ND
Total PeCDF	{0.00437}	{0.202}
123478 HxCDF	0.00875	0.404
123678 HxCDF	ND	ND
234678 HxCDF	{0.00262}	{0.121}
123789 HxCDF	ND	ND
Total HxCDF	0.0131	0.606
1234678 HpCDF	0.0175	0.808
1234789 HpCDF	ND	ND
Total HpCDF	0.0175	0.808
Octa CDF	ND	ND
Total PCDFs	{0.0394}	{1.82}
Total PCDDs + PCDFs	{7.28}	{336}

^a Nanogram per dry standard cubic meter at 20°C and 1 atm.

^b Micrograms per hour.

ND Non Detectable - Results are below target analyte detection limits. ND values are not counted in totals or averages.

{ } Estimated Maximum Possible Concentration. EMPC values are counted in totals and averages.

TABLE 2.10

**PCDDs/PCDFs CONCENTRATIONS AND 2378 TOXIC EQUIVALENT STACK
GAS CONCENTRATIONS ADJUSTED TO 7 PERCENT OXYGEN
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Congener	Concentration ^a ng/dscm, adjusted to 7% O ₂	2378-TCDD ^b Toxic Equiv. Factor	2378 Toxic Equivalents ng/dscm, adjusted to 7% O ₂
	R-M23-I-3		R-M23-I-3
Dioxins			
2378 TCDD	ND	1.000	ND
Total TCDD	ND		
12378 PeCDD	ND	0.500	ND
Total PeCDD	ND		
123478 HxCDD	ND	0.100	ND
123678 HxCDD	ND	0.100	ND
123789 HxCDD	ND	0.100	ND
Total HxCDD	0.0213		
1234678 HpCDD	0.149	0.010	0.001
Total HpCDD	0.363		
Octa CDD	17.3	0.001	0.0173
Total PCDDs	17.7		0.0188
Furans			
2378 TCDF	ND	0.100	ND
Total TCDF	0.0107		
12378 PeCDF	ND	0.050	ND
23478 PeCDF	ND	0.500	ND
Total PeCDF	{0.0107}		
123478 HxCDF	0.021	0.100	0.00213
123678 HxCDF	ND	0.100	ND
234678 HxCDF	{0.00640}	0.100	{0.000640}
123789 HxCDF	ND	0.100	ND
Total HxCDF	0.0320		
1234678 HpCDF	0.0427	0.010	0.000427
1234789 HpCDF	ND	0.010	ND
Total HpCDF	0.0427		
Octa CDF	ND	0.001	ND
Total PCDFs	{0.0960}		{0.00320}
Total PCDDs + PCDFs	{17.8}		{0.0220}

^a Nanogram per dry standard cubic meter adjusted to 7 percent oxygen at 20°C and 1 atm.

^b North Atlantic Treaty Organization, Committee on the Challenges of Modern Society. Pilot study on International Information Exchange on Dioxins and Related Compounds: International Toxicity Equivalency Factor (I-TEF) Methods of Risk Assessment for Complex Mixtures of Dioxins and Related Compounds. Report No. 176, August 1988.

ND Non Detectable - Results are below target analyte detection limits. ND values are counted as zero in totals and averages.

{ } Estimated Maximum Possible Concentration. EMPC values are counted in totals or averages.

2.2.4 Baghouse Outlet - Asphalt Production without RAP

PES conducted one Method 23 sampling run at the baghouse outlet during asphalt production without the addition of RAP. Table 2.11 summarizes the PCDDs/PCDFs emissions sampling. The total sampling time for the test run was 240 minutes. The sample volume was 209.298 dscf or 5.927 dscm. The stack gas temperature was 268°F and contained 3.0 % CO₂, 16.3% O₂, and 19.6% moisture. The stack gas volumetric flow rate was 49,832 acfm or 28,612 dscfm or 810.2 dscmm.

Table 2.12 and 2.13 presents the PCDDs/PCDFs stack gas concentrations and emission rates. No PCDDs congeners were detected. The concentration of total PCDFs was {0.00337} ng/dscm. The emission rate of total PCDFs was {0.164} µg/hr. Table 2.13 presents the PCDDs/PCDFs concentrations adjusted to 7% O₂. The measured stack gas O₂ concentration was 16.3%. Therefore, the adjusted PCDFs concentrations were greater than the actual concentrations. The adjusted concentration of total PCDFs was {0.0102} ng/dscm @ 7% O₂.

Table 2.13 also presents the adjusted concentrations in 2378 toxic equivalents. The TEF concentration for total PCDDs/PCDFs was 0.00 ng/dscm @ 7% O₂.

2.3 PARTICULATE MATTER AND METALS MEASUREMENTS

2.3.1 Baghouse Inlet-Asphalt Production with RAP

PES conducted two Method 29 sampling runs at the baghouse inlet during asphalt production using RAP. Table 2.14 summarizes the particulate matter/metals emissions sampling and exhaust gas parameters. The total sampling time was 87 minutes for sampling run R-M29-I-1, and 200 minutes for sampling run R-M29-I-2; sampling durations were shortened due to the high inlet grain loading conditions explained previously. The (2-run) average sample volume was 55.333 dscf or 1.567 dscm. The (2-run) average exhaust gas temperature was 306 °F, and contained 4.9% CO₂, 13.6% O₂, and 27.9% moisture. The (2-run) average exhaust gas volumetric flow rate was 48,440 acfm or 23,776 dscfm or 673 dscm.

Table 2.15 summarizes the exhaust gas particulate matter concentrations and emission rates at the baghouse inlet. The (2-run) average concentration was 55.3 grains per dry standard cubic foot (gr/dscf) or 126.4 grams per dry standard cubic meter (g/dscm). The concentrations are also shown adjusted to 7% O₂. The (2-run) average mass emission rate was 11,271 pounds per hour (lb/hr) or 5,113 kilograms per hour (kg/hr).

Table 2.16 summarizes the exhaust gas metals concentrations and emission rates. Most of the target metals were found to be present in both samples. The (2-run) average concentrations ranged from 2,629 micrograms per dry standard cubic meter (µg/dscm) for phosphorus to 0.115 µg/dscm for selenium.

TABLE 2.11

**PCDDs/PCDFs EMISSIONS SAMPLING AND STACK PARAMETERS
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M23-O-3
Date	8/29/97
Sampling Duration, minutes	240
Average Sampling Rate, dscfm ^a	0.87
Sample Volume:	
dscf ^b	209.298
dscm ^c	5.927
Exhaust Gas Temperature, °F	268
O ₂ Concentration, % by volume	16.3
CO ₂ Concentration, % by volume	3.0
Moisture, % by volume	19.6
Exhaust Gas Volumetric Flow Rate:	
acfm ^d	49,832
dscfm ^a	28,612
dscmm ^e	810.2
Isokinetic Sampling Ratio, %	99.6

^a Dry standard cubic feet per minute at 68°F and 1 atm

^b Dry standard cubic feet at 68°F and 1 atm

^c Dry standard cubic meters at 20°C and 1 atm

^d Actual cubic feet per minute at stack conditions

^e Dry standard cubic meters per minute at 20°C and 1 atm

TABLE 2.12

**PCDDs/PCDFs CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Congener	Concentration ^a ng/dscm, as measured	Emission Rate ^b µg/hr
	R-M23-O-3	R-M23-O-3
<u>Dioxins</u>		
2378 TCDD	ND	ND
Total TCDD	ND	ND
12378 PeCDD	ND	ND
Total PeCDD	ND	ND
123478 HxCDD	ND	ND
123678 HxCDD	ND	ND
123789 HxCDD	ND	ND
Total HxCDD	ND	ND
1234678 HpCDD	ND	ND
Total HpCDD	ND	ND
Octa CDD	ND	ND
Total PCDDs	0.00	0.00
<u>Furans</u>		
2378 TCDF	ND	ND
Total TCDF	ND	ND
12378 PeCDF	ND	ND
23478 PeCDF	ND	ND
Total PeCDF	{0.00337}	{0.164}
123478 HxCDF	ND	ND
123678 HxCDF	ND	ND
234678 HxCDF	ND	ND
123789 HxCDF	ND	ND
Total HxCDF	ND	ND
1234678 HpCDF	ND	ND
1234789 HpCDF	ND	ND
Total HpCDF	ND	ND
Octa CDF	ND	ND
Total PCDFs	{0.00337}	{0.164}
Total PCDDs + PCDFs	{0.00337}	{0.164}

^a Nanogram per dry standard cubic meter at 20°C and 1 atm.

^b Micrograms per hour.

ND Non Detectable - Results are below target analyte detection limits. ND values are counted as zero in totals and averages.

{ } Estimated Maximum Possible Concentration. EMPC values are counted in totals or averages.

TABLE 2.13

**PCDDs/PCDFs CONCENTRATIONS AND 2378 TOXIC EQUIVALENT
CONCENTRATIONS ADJUSTED TO 7 PERCENT OXYGEN
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Congener	Concentration ^a ng/dscm, adjusted to 7% O ₂	2378-TCDD ^b Toxic Equiv. Factor	2378 Toxic Equivalents ng/dscm, adjusted to 7% O ₂
	R-M23-O-3		R-M23-O-3
<u>Dioxins</u>			
2378 TCDD	ND	1.000	ND
Total TCDD	ND		
12378 PeCDD	ND	0.500	ND
Total PeCDD	ND		
123478 HxCDD	ND	0.100	ND
123678 HxCDD	ND	0.100	ND
123789 HxCDD	ND	0.100	ND
Total HxCDD	ND		
1234678 HpCDD	ND	0.010	ND
Total HpCDD	ND		
Octa CDD	ND	0.001	ND
Total PCDDs	0.00		0.00
<u>Furans</u>			
2378 TCDF	ND	0.100	ND
Total TCDF	ND		
12378 PeCDF	ND	0.050	ND
23478 PeCDF	ND	0.500	ND
Total PeCDF	{0.0102}		
123478 HxCDF	ND	0.100	ND
123678 HxCDF	ND	0.100	ND
234678 HxCDF	ND	0.100	ND
123789 HxCDF	ND	0.100	ND
Total HxCDF	ND		
1234678 HpCDF	ND	0.010	ND
1234789 HpCDF	ND	0.010	ND
Total HpCDF	ND		
Octa CDF	ND	0.001	ND
Total PCDFs	{0.0102}		0.00
Total PCDDs + PCDFs	{0.0102}		0.00

^a Nanogram per dry standard cubic meter adjusted to 7 percent oxygen at 20°C and 1 atm.

^b North Atlantic Treaty Organization, Committee on the Challenges of Modern Society. Pilot study on International Information Exchange on Dioxins and Related Compounds: International Toxicity Equivalency Factor (I-TEF) Methods of Risk Assessment for Complex Mixtures of Dioxins and Related Compounds. Report No. 176, August 1988.

ND Non Detectable - Results are below target analyte detection limits. ND values are counted as zero in totals and averages.

{ } Estimated Maximum Possible Concentration. EMPC values are counted in totals or averages.

TABLE 2.14

**PARTICULATE MATTER/METALS EMISSIONS SAMPLING
AND INLET GAS PARAMETERS
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-I-1	R-M29-I-2	Average
Date	8/27/97	8/28/97	
Time	1000-1200	1019-1427	
Sampling Duration, minutes	87	200	143.5
Average Sampling Rate, dscfm ^a	0.573	0.304	0.439
Sample Volume:			
dscf ^b	49.883	60.783	55.333
dscm ^c	1.413	1.721	1.567
Exhaust Gas Temperature, °F	304	309	306
O ₂ Concentration, % by volume	14.2	13.1	13.6
CO ₂ Concentration, % by volume	4.6	5.2	4.9
Moisture, % by volume	28.5	27.3	27.9
Exhaust Gas Volumetric Flow Rate:			
acfm ^d	48,345	48,535	48,440
dscfm ^a	23,687	23,865	23,776
dscmm ^e	671	676	673
Isokinetic Sampling Ratio, %	109.7	100.5	105.1

^a Dry standard cubic feet per minute at 68°F and 1 atm.

^b Dry standard cubic feet at 68°F and 1 atm.

^c Dry standard cubic meters at 20°C and 1 atm.

^d Actual cubic feet per minute at inlet gas conditions.

^e Dry standard cubic meters per minute at 20°C and 1 atm.

TABLE 2.15

**PARTICULATE MATTER CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-I-1	R-M29-I-2	Average
Date	8/27/97	8/28/97	
Time	1000-1200	1019-1427	
Concentration:			
gr/dscf ^a	42.2	68.3	55.3
gr/dscf @ 7% O ₂ ^b	87.5	121.8	104.6
g/dscm ^c	96.5	156.4	126.4
g/dscm @ 7% O ₂ ^d	200	279	239
Emission Rate:			
lb/hr ^e	8,561	13,981	11,271
kg/hr ^f	3,883	6,342	5,113

^a Grains per dry standard cubic foot at 68°F and 1 atm.

^b Grains per dry standard cubic foot at 68°F and 1 atm adjusted to 7 percent O₂.

^c Grams per dry standard cubic meter at 20°C and 1 atm.

^d Grams per dry standard cubic meter at 20°C and 1 atm adjusted to 7 percent O₂.

^e Pounds per hour.

^f Kilograms per hour.

TABLE 2.16

**METALS CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-I-1	R-M29-I-2	Average
Date	8/27/97	8/28/97	
Time	1000-1200	1019-1427	
Antimony (Sb)			
$\mu\text{g/dscm}^a$	ND	ND	0.00
$\mu\text{g/dscm @ 7\% O}_2^b$	ND	ND	0.00
g/hr ^c	ND	ND	0.00
Arsenic (As)			
$\mu\text{g/dscm}^a$	3.56	2.22	2.89
$\mu\text{g/dscm @ 7\% O}_2^b$	7.39	3.96	5.67
g/hr ^c	0.143	0.0900	0.117
Barium (Ba)			
$\mu\text{g/dscm}^a$	765	537	651
$\mu\text{g/dscm @ 7\% O}_2^b$	1587	957	1,272
g/hr ^c	30.8	21.8	263
Beryllium (Be)			
$\mu\text{g/dscm}^a$	ND	ND	0.00
$\mu\text{g/dscm @ 7\% O}_2^b$	ND	ND	0.00
g/hr ^c	ND	ND	0.00
Cadmium (Cd)			
$\mu\text{g/dscm}^a$	14.3	8.51	11.4
$\mu\text{g/dscm @ 7\% O}_2^b$	29.7	15.2	22.4
g/hr ^c	0.576	0.345	0.460
Chromium (Cr)			
$\mu\text{g/dscm}^a$	67.8	51.3	59.6
$\mu\text{g/dscm @ 7\% O}_2^b$	141	91.4	116.1
g/hr ^c	2.73	2.08	2.41
Cobalt (Co)			
$\mu\text{g/dscm}^a$	44.7	32.0	38.4
$\mu\text{g/dscm @ 7\% O}_2^b$	92.8	57.0	74.9
g/hr ^c	1.8	1.3	1.55
Copper			
$\mu\text{g/dscm}^a$	434	384	409
$\mu\text{g/dscm @ 7\% O}_2^b$	900	684	792
g/hr ^c	17.5	15.6	16.5

TABLE 2.16 (Concluded)

**METALS CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-I-1	R-M29-I-2	Average
Lead (Pb)			
$\mu\text{g/dscm}^a$	60.4	48.3	54.3
$\mu\text{g/dscm @ 7\% O}_2^b$	125	86.0	106
g/hr ^c	2.43	1.96	2.19
Manganese (Mn)			
$\mu\text{g/dscm}^a$	1750	1,357	1,553
$\mu\text{g/dscm @ 7\% O}_2^b$	3630	2,418	3,024
g/hr ^c	70.4	55.0	62.7
Mercury (Hg)			
$\mu\text{g/dscm}^a$	ND	ND	0.00
$\mu\text{g/dscm @ 7\% O}_2^b$	ND	ND	0.00
g/hr ^c	ND	ND	0.00
Nickel (Ni)			
$\mu\text{g/dscm}^a$	41.7	33.9	37.8
$\mu\text{g/dscm @ 7\% O}_2^b$	86.6	60.5	73.5
g/hr ^c	1.68	1.38	1.53
Phosphorus (P)			
$\mu\text{g/dscm}^a$	3,009	2,251	2,629
$\mu\text{g/dscm @ 7\% O}_2^b$	6,242	4,011	5,126
g/hr ^c	121	91.3	106
Silver (Ag)			
$\mu\text{g/dscm}^a$	0.850	0.581	0.715
$\mu\text{g/dscm @ 7\% O}_2^b$	1.76	1.04	1.40
g/hr ^c	0.0342	0.0236	0.0289
Selenium (Se)			
$\mu\text{g/dscm}^a$	ND	0.230	0.115
$\mu\text{g/dscm @ 7\% O}_2^b$	ND	0.410	0.205
g/hr ^c	ND	0.00933	0.00466
Thallium (Tl)			
$\mu\text{g/dscm}^a$	8.64	4.98	6.81
$\mu\text{g/dscm @ 7\% O}_2^b$	17.9	8.88	13.4
g/hr ^c	0.348	0.202	0.275
Zinc (Zn)			
$\mu\text{g/dscm}^a$	539	397	468
$\mu\text{g/dscm @ 7\% O}_2^b$	1118	707	913
g/hr ^c	21.7	16.1	18.9

^a Micrograms per dry standard cubic meter @ 20° C and 1 atm.

^b Micrograms per dry standard cubic meter @ 20° C and 1 atm, adjusted to 7% O₂.

^c Grams per hour.

2.3.2 Baghouse Outlet-Asphalt Production with RAP

PES conducted two Method 29 sampling runs at the baghouse outlet during production with RAP. Table 2.17 summarizes the particulate matter/metals emissions sampling and stack gas parameters. The total sampling time for each test run was 240 minutes. The (2-run) average sample volume was 197.630 dscf or 5.596 dscm. The (2-run) average stack gas temperature was 291 °F and contained 4.5% CO₂, 14.3% O₂, and 27.1% moisture. The average (2-run) stack gas volumetric flow rate was 50,276 acfm or 25,559 dscfm or 724 dscmm. The (2-run) average stack gas opacity was less than 5%.

Table 2.18 summarizes the stack gas particulate matter concentrations and emission rates. The (2-run) average concentration was 0.00832 gr/dscf or 0.0190 g/dscm. The concentrations are also shown adjusted to 7% O₂. The (2-run) average emission rate was 1.82 lb/hr or 0.826 kg/hr.

Table 2.19 summarizes the stack gas metals concentrations and emission rates. Most of the target metals were found to be present in both samples. The (2-run) average concentrations ranged from 0.0524 µg/dscm for silver to 20.2 µg/dscm for phosphorus.

2.3.3 Baghouse Inlet - Asphalt Production without RAP

PES conducted one test run at the baghouse inlet during asphalt production without the addition of RAP. Table 2.20 summarizes the particulate matter/metals emissions sampling and stack gas parameters. The total sampling time for the test run was 240 minutes. The sample volume was 81.522 dscf or 2.308 dscm. The stack gas temperature was 289 °F and contained 4.0% CO₂, 15.2% O₂, and 18.9% moisture. The stack gas volumetric flow rate was 48,550 acfm or 27,325 dscfm or 774 dscmm.

Table 2.21 summarizes the stack gas particulate matter concentrations and emission rates. The concentration was 76.8 gr/dscf or 175.7 g/dscm. The concentrations are also shown adjusted to 7% O₂. The average emission rate was 17,789 lb/hr or 8,155 kg/hr.

Table 2.22 summarizes the stack gas metals concentrations and emission rates. Most of the target metals were present in the sample. Concentrations ranged from 0.291 µg/dscm for silver to 2,170 µg/dscm for phosphorus.

TABLE 2.17

**PARTICULATE/METALS EMISSIONS SAMPLING AND STACK GAS PARAMETERS
 ROTARY DRUM DRYER - BAGHOUSE OUTLET
 ASPHALT PRODUCTION WITH RAP
 ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-O-1	R-M29-O-2	Average
Date	8/27/97	8/28/97	
Sampling Duration, minutes	240	240	240
Average Sampling Rate, dscfm ^a	0.888	0.759	0.823
Sample Volume:			
dscf ^b	213.024	182.236	197.630
dscm ^c	6.032	5.160	5.596
Stack Gas Temperature, °F	289	292	291
O ₂ Concentration, % by volume	15	13.6	14.3
CO ₂ Concentration, % by volume	4.0	4.9	4.5
Moisture, % by volume	26.5	27.7	27.1
Exhaust Gas Volumetric Flow Rate:			
acfm ^d	51,035	49,516	50,276
dscfm ^a	26,285	24,833	25,559
dscmm ^e	744	703	724
Isokinetic Sampling Ratio, %	109.5	99.2	104.3
Stack Gas Opacity:			
Average Opacity, %	<5	<5	<5
Calculated Average, %	0.67	0.21	0.44
Max. Single Reading, %	10	10	10
Max. 6-min. Block Avg., %	0.63	0.68	0.65
Max. 6-min Rolling Avg., %	0.71	0.95	0.83

^a Dry standard cubic feet per minute at 68°F and 1 atm.

^b Dry standard cubic feet at 68°F and 1 atm.

^c Dry standard cubic meters at 20°C and 1 atm.

^d Actual cubic feet per minute at stack conditions.

^e Dry standard cubic meters per minute at 20°C and 1 atm.

TABLE 2.18

**PARTICULATE MATTER CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-O-1	R-M29-O-2	Average
Date	8/27/97	8/28/97	
Time	0940-1516	0746-1229	
Concentration:			
gr/dscf ^a	0.00832	0.00832	0.00832
gr/dscf @ 7% O ₂ ^b	0.0196	0.0158	0.0177
g/dscm ^c	0.0190	0.0190	0.0190
g/dscm @ 7% O ₂ ^d	0.0448	0.0362	0.0405
Emission Rate:			
lb/hr ^e	1.87	1.77	1.82
kg/hr ^f	0.850	0.803	0.826

^a Grains per dry standard cubic foot at 68°F and 1 atm.

^b Grains per dry standard cubic foot at 68°F and 1 atm adjusted to 7 percent O₂.

^c Grams per dry standard cubic meter at 20°C and 1 atm.

^d Grams per dry standard cubic meter at 20°C and 1 atm adjusted to 7 percent O₂.

^e Pounds per hour.

^f Kilograms per hour.

TABLE 2.19

**METALS CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-O-1	R-M29-O-2	Average
Date	8/27/97	8/28/97	
Clock Time, 24-hr Clock	0940-1516	0746-1229	
Antimony (Sb)			
$\mu\text{g/dscm}^a$	0.637	0.693	0.665
$\mu\text{g/dscm @ 7\% O}_2^b$	1.50	1.32	1.41
g/hr ^c	0.0284	0.0292	0.0288
Arsenic (As)			
$\mu\text{g/dscm}^a$	ND	ND	0.00
$\mu\text{g/dscm @ 7\% O}_2^b$	ND	ND	0.00
g/hr ^c	ND	ND	0.00
Barium (Ba)			
$\mu\text{g/dscm}^a$	9.10	7.92	8.51
$\mu\text{g/dscm @ 7\% O}_2^b$	21.4	15.1	18.3
g/hr ^c	0.406	0.334	0.370
Beryllium (Be)			
$\mu\text{g/dscm}^a$	ND	ND	0.00
$\mu\text{g/dscm @ 7\% O}_2^b$	ND	ND	0.00
g/hr ^c	ND	ND	0.00
Cadmium (Cd)			
$\mu\text{g/dscm}^a$	0.0794	0.0708	0.751
$\mu\text{g/dscm @ 7\% O}_2^b$	0.187	0.135	0.161
g/hr ^c	0.00355	0.00299	0.00327
Chromium (Cr)			
$\mu\text{g/dscm}^a$	2.19	2.14	2.16
$\mu\text{g/dscm @ 7\% O}_2^b$	5.16	4.07	4.61
g/hr ^c	0.0978	0.0901	0.0939
Cobalt (Co)			
$\mu\text{g/dscm}^a$	ND	ND	0.00
$\mu\text{g/dscm @ 7\% O}_2^b$	ND	ND	0.00
g/hr ^c	ND	ND	0.00
Copper (Cu)			
$\mu\text{g/dscm}^a$	1.54	1.38	1.46
$\mu\text{g/dscm @ 7\% O}_2^b$	3.63	2.63	3.13
g/hr ^c	0.0688	0.0584	0.0636
Lead (Pb)			
$\mu\text{g/dscm}^a$	1.42	1.03	1.22
$\mu\text{g/dscm @ 7\% O}_2^b$	3.34	1.95	2.64
g/hr ^c	0.0632	0.0433	0.0533

TABLE 2.19 (Concluded)

**METALS CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITH RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-O-1	R-M29-O-2	Average
Manganese (Mn)			
$\mu\text{g/dscm}^a$	11.6	14.5	13.1
$\mu\text{g/dscm @ 7\% O}_2^b$	27.4	27.6	27.5
g/hr^c	0.519	0.612	0.565
Mercury (Hg)			
$\mu\text{g/dscm}^a$	ND	ND	0.00
$\mu\text{g/dscm @ 7\% O}_2^b$	ND	ND	0.00
g/hr^c	ND	ND	0.00
Nickel (Ni)			
$\mu\text{g/dscm}^a$	1.55	1.26	1.41
$\mu\text{g/dscm @ 7\% O}_2^b$	3.66	2.40	3.03
g/hr^c	0.0694	0.0531	0.0612
Phosphorus (P)			
$\mu\text{g/dscm}^a$	18.2	22.2	20.2
$\mu\text{g/dscm @ 7\% O}_2^b$	42.9	42.3	42.6
g/hr^c	0.814	0.937	0.876
Silver (Ag)			
$\mu\text{g/dscm}^a$	0.0627	0.0421	0.0524
$\mu\text{g/dscm @ 7\% O}_2^b$	0.148	0.080	0.114
g/hr^c	0.00280	0.00177	0.00229
Selenium (Se)			
$\mu\text{g/dscm}^a$	0.934	0.888	0.911
$\mu\text{g/dscm @ 7\% O}_2^b$	2.20	1.69	1.95
g/hr^c	0.0417	0.0375	0.0396
Thallium (Tl)			
$\mu\text{g/dscm}^a$	ND	ND	0.00
$\mu\text{g/dscm @ 7\% O}_2^b$	ND	ND	0.00
g/hr^c	ND	ND	0.00
Zinc (Zn)			
$\mu\text{g/dscm}^a$	7.34	5.01	6.18
$\mu\text{g/dscm @ 7\% O}_2^b$	17.3	9.54	13.4
g/hr^c	0.328	0.211	0.270

^a Micrograms per dry standard cubic meter @ 20° C and 1 atm.

^b Micrograms per dry standard cubic meter @ 20°C and 1 atm, adjusted to 7% O₂.

^c Grams per hour.

TABLE 2.20

**PARTICULATE MATTER/METALS EMISSIONS SAMPLING
AND STACK GAS PARAMETERS
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-I-3
Date	8/29/97
Sampling Duration, minutes	240
Average Sampling Rate, dscfm ^a	0.340
Sample Volume:	
dscf ^b	81.522
dscm ^c	2.308
Exhaust Gas Temperature, °F	289
O ₂ Concentration, % by volume	15.2
CO ₂ Concentration, % by volume	4.0
Moisture, % by volume	18.9
Exhaust Gas Volumetric Flow Rate:	
acfm ^d	48,550
dscfm ^a	27,325
dscmm ^e	774
Isokinetic Sampling Ratio, %	96.1

^a Dry standard cubic feet per minute at 68°F and 1 atm.

^b Dry standard cubic feet at 68°F and 1 atm.

^c Dry standard cubic meters at 20°C and 1 atm.

^d Actual cubic feet per minute at stack conditions.

^e Dry standard cubic meters per minute at 20°C and 1 atm.

TABLE 2.21

**PARTICULATE MATTER CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC.**

Run Number	R-M29-I-3
Date	8/29/97
Time	0819-1403
Concentration:	
gr/dscf ^a	76.8
gr/dscf @ 7% O ₂ ^b	187.2
g/dscm ^c	175.7
g/dscm @ 7% O ₂ ^d	428
Emission Rate:	
lb/hr ^e	17,879
kg/hr ^f	8,155

^a Grains per dry standard cubic foot at 68°F and 1 atm.

^b Grains per dry standard cubic foot at 68°F and 1 atm adjusted to 7 percent O₂.

^c Grams per dry standard cubic meter at 20°C and 1 atm.

^d Grams per dry standard cubic meter at 20°C and 1 atm adjusted to 7 percent O₂.

^e Pounds per hour.

^f Kilograms per hour.

TABLE 2.22

**METALS CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-I-3
Date	8/29/97
Time	0819-1403
Antimony (Sb)	
$\mu\text{g/dscm}^a$	ND
$\mu\text{g/dscm @ 7\% O}_2^b$	ND
g/hr ^c	ND
Arsenic (As)	
$\mu\text{g/dscm}^a$	2.13
$\mu\text{g/dscm @ 7\% O}_2^b$	5.19
g/hr ^c	0.0987
Barium (Ba)	
$\mu\text{g/dscm}^a$	318
$\mu\text{g/dscm @ 7\% O}_2^b$	776
g/hr ^c	14.8
Beryllium (Be)	
$\mu\text{g/dscm}^a$	ND
$\mu\text{g/dscm @ 7\% O}_2^b$	ND
g/hr ^c	ND
Cadmium (Cd)	
$\mu\text{g/dscm}^a$	4.25
$\mu\text{g/dscm @ 7\% O}_2^b$	10.4
g/hr ^c	0.197
Total Chromium (Cr)	
$\mu\text{g/dscm}^a$	33.3
$\mu\text{g/dscm @ 7\% O}_2^b$	81.2
g/hr ^c	1.55
Cobalt (Co)	
$\mu\text{g/dscm}^a$	19.7
$\mu\text{g/dscm @ 7\% O}_2^b$	48.1
g/hr ^c	0.915
Copper (Cu)	
$\mu\text{g/dscm}^a$	263
$\mu\text{g/dscm @ 7\% O}_2^b$	641
g/hr ^c	12.2
Lead (Pb)	
$\mu\text{g/dscm}^a$	35.8
$\mu\text{g/dscm @ 7\% O}_2^b$	87.4
g/hr ^c	1.66

TABLE 2.22 (Concluded)

**METALS CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE INLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-I-3
Manganese (Mn)	
$\mu\text{g/dscm}^a$	975
$\mu\text{g/dscm @ 7\% O}_2^b$	2377
g/hr ^c	45.3
Mercury (Hg)	
$\mu\text{g/dscm}^a$	ND
$\mu\text{g/dscm @ 7\% O}_2^b$	ND
g/hr ^c	ND
Nickel (Ni)	
$\mu\text{g/dscm}^a$	21.8
$\mu\text{g/dscm @ 7\% O}_2^b$	53.1
g/hr ^c	1.01
Phosphorus (P)	
$\mu\text{g/dscm}^a$	2170
$\mu\text{g/dscm @ 7\% O}_2^b$	5292
g/hr ^c	101
Silver (Ag)	
$\mu\text{g/dscm}^a$	0.291
$\mu\text{g/dscm @ 7\% O}_2^b$	0.709
g/hr ^c	0.0135
Selenium (Se)	
$\mu\text{g/dscm}^a$	ND
$\mu\text{g/dscm @ 7\% O}_2^b$	ND
g/hr ^c	ND
Thallium (Tl)	
$\mu\text{g/dscm}^a$	0.901
$\mu\text{g/dscm @ 7\% O}_2^b$	2.20
g/hr ^c	0.0418
Zinc (Zn)	
$\mu\text{g/dscm}^a$	239
$\mu\text{g/dscm @ 7\% O}_2^b$	584
g/hr ^c	11.1

^a Micrograms per dry standard cubic meter @ 20° C and 1 atm.

^b Micrograms per dry standard cubic meter @ 20°C and 1 atm, adjusted to 7% O₂.

^c Grams per hour.

2.3.4 Baghouse Outlet - Asphalt Production without RAP

PES conducted one test run at the baghouse outlet during asphalt production without the addition of RAP. Table 2.23 summarizes the particulate matter/metals emissions sampling and stack gas parameters. The total sampling time for the test run was 240 minutes. The sample volume was 205.914 dscf or 5.831 dscm. The stack gas temperature was 274°F and contained 3.0% CO₂, 16.3% O₂, and 20.8% moisture. The stack gas volumetric flow rate was 50,521 acfm or 28,440 dscfm or 805 dscmm.

Table 2.24 summarizes the stack gas particulate matter concentrations and emission rates. The concentration was 0.0132 gr/dscf or 0.0303 g/dscm. The concentrations are also shown adjusted to 7% O₂. The emission rate was 3.23 lb/hr or 1.46 kg/hr.

Table 2.25 summarizes the stack gas metals concentrations and emission rates. Not all of the target metals were detected in the samples. Detected concentrations ranged from 0.0336 µg/dscm for cadmium to 24.9 µg/dscm for phosphorus.

2.4 VISIBLE EMISSIONS OBSERVATIONS

Visible Emissions Observations (VEOs) of the stack exhaust were made during the testing by a certified observer. Observations were made simultaneously with the testing, except during the first run when VEOs were suspended during the period from 1207 to 1304 when the location of the sun was directly over the observer. The average opacity during asphalt production with RAP is presented along with the outlet stack gas parameters in Table 2.14. For each run the calculated average opacities were 2.15, 1.21, and 0.702%. Since VEO observations are recorded in 5% increments, the average opacity during these runs is more properly reported as less than 5% opacity. Also presented are the maximum single opacity observed, the maximum 6-minute block average, and the maximum 6-minute rolling average during each test run. During the production of asphalt without RAP, the calculated average opacity of the outlet gas stream was 0.104%; however, this result is more properly reported as an average opacity of < 5 %. The opacity data during production with RAP are presented along with the stack gas parameters in Table 2.17.

TABLE 2.23

**PARTICULATE MATTER/METALS EMISSIONS SAMPLING
AND STACK GAS PARAMETERS
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-O-3
Date	8/29/97
Sampling Duration, minutes	240
Average Sampling Rate, dscfm ^a	0.858
Sample Volume:	
dscf ^b	205.914
dscm ^c	5.831
Exhaust Gas Temperature, °F	274
O ₂ Concentration, % by volume	16.3
CO ₂ Concentration, % by volume	3.0
Moisture, % by volume	20.8
Exhaust Gas Volumetric Flow Rate:	
acfm ^d	50,521
dscfm ^a	28,440
dscmm ^e	805
Isokinetic Sampling Ratio, %	97.8
Stack Gas Opacity:	
Average Opacity, %	<5
Calculated Average, %	0.965
Max. Single Reading, %	10
Max. 6-min. Block Avg., %	2.29
Max. 6-min Rolling Avg., %	3.07

^a Dry standard cubic feet per minute at 68°F and 1 atm.

^b Dry standard cubic feet at 68°F and 1 atm.

^c Dry standard cubic meters at 20°C and 1 atm.

^d Actual cubic feet per minute at stack conditions.

^e Dry standard cubic meters per minute at 20°C and 1 atm.

TABLE 2.24

**PARTICULATE MATTER CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-O-3
Date	8/29/97
Time	0809-1236
Concentration:	
gr/dscf ^a	0.0132
gr/dscf @ 7% O ₂ ^b	0.0400
g/dscm ^c	0.0303
g/dscm @ 7% O ₂ ^d	0.0915
Emission Rate:	
lb/hr ^e	3.23
kg/hr ^f	1.46

^a Grains per dry standard cubic foot at 68°F and 1 atm.

^b Grains per dry standard cubic foot at 68°F and 1 atm adjusted to 7 percent O₂.

^c Grams per dry standard cubic meter at 20°C and 1 atm.

^d Grams per dry standard cubic meter at 20°C and 1 atm adjusted to 7 percent O₂.

^e Pounds per hour.

^f Kilograms per hour.

TABLE 2.25

**METALS CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-O-3
Date	8/29/97
Clock Time, 24-hr Clock	0809-1236
Antimony (Sb)	
$\mu\text{g/dscm}^a$	0.671
$\mu\text{g/dscm @ 7\% O}_2^b$	2.03
g/hr ^c	0.0324
Arsenic (As)	
$\mu\text{g/dscm}^a$	ND
$\mu\text{g/dscm @ 7\% O}_2^b$	ND
g/hr ^c	ND
Barium (Ba)	
$\mu\text{g/dscm}^a$	12.0
$\mu\text{g/dscm @ 7\% O}_2^b$	36.2
g/hr ^c	0.579
Beryllium (Be)	
$\mu\text{g/dscm}^a$	ND
$\mu\text{g/dscm @ 7\% O}_2^b$	ND
g/hr ^c	ND
Cadmium (Cd)	
$\mu\text{g/dscm}^a$	0.0336
$\mu\text{g/dscm @ 7\% O}_2^b$	0.102
g/hr ^c	0.00162
Total Chromium (Cr)	
$\mu\text{g/dscm}^a$	2.16
$\mu\text{g/dscm @ 7\% O}_2^b$	6.53
g/hr ^c	0.104
Cobalt (Co)	
$\mu\text{g/dscm}^a$	ND
$\mu\text{g/dscm @ 7\% O}_2^b$	ND
g/hr ^c	ND
Copper (Cu)	
$\mu\text{g/dscm}^a$	2.57
$\mu\text{g/dscm @ 7\% O}_2^b$	7.77
g/hr ^c	0.124
Lead (Pb)	
$\mu\text{g/dscm}^a$	1.04
$\mu\text{g/dscm @ 7\% O}_2^b$	3.16
g/hr ^c	0.0505

TABLE 2.25 (Concluded)

**METALS CONCENTRATIONS AND EMISSION RATES
ROTARY DRUM DRYER - BAGHOUSE OUTLET
ASPHALT PRODUCTION WITHOUT RAP
ASPHALT PLANT "B" - CARY, NC**

Run Number	R-M29-O-3
Manganese (Mn)	
$\mu\text{g/dscm}^a$	19.9
$\mu\text{g/dscm @ 7\% O}_2^b$	60.3
g/hr^c	0.964
Mercury (Hg)	
$\mu\text{g/dscm}^a$	ND
$\mu\text{g/dscm @ 7\% O}_2^b$	ND
g/hr^c	ND
Nickel (Ni)	
$\mu\text{g/dscm}^a$	1.39
$\mu\text{g/dscm @ 7\% O}_2^b$	4.21
g/hr^c	0.0674
Phosphorus (P)	
$\mu\text{g/dscm}^a$	24.9
$\mu\text{g/dscm @ 7\% O}_2^b$	75.2
g/hr^c	1.20
Silver (Ag)	
$\mu\text{g/dscm}^a$	ND
$\mu\text{g/dscm @ 7\% O}_2^b$	ND
g/hr^c	ND
Selenium (Se)	
$\mu\text{g/dscm}^a$	0.843
$\mu\text{g/dscm @ 7\% O}_2^b$	2.55
g/hr^c	0.407
Thallium (Tl)	
$\mu\text{g/dscm}^a$	ND
$\mu\text{g/dscm @ 7\% O}_2^b$	ND
g/hr^c	ND
Zinc (Zn)	
$\mu\text{g/dscm}^a$	5.63
$\mu\text{g/dscm @ 7\% O}_2^b$	17.0
g/hr^c	0.272

^a Micrograms per dry standard cubic meter @ 20° C and 1 atm.

^b Micrograms per dry standard cubic meter @ 20°C and 1 atm, adjusted to 7% O₂.

^c Grams per hour.

3.0 PROCESS DESCRIPTION

The Asphalt Plant "B" production facility in Cary, North Carolina, has been in operation since 1987. It is a parallel flow, continuous drum mix process. The dryer/mixer is an ASTEC drum (8 ft. by 45 ft.), with a rated capacity of 325 tons per hour. The plant has the capability of producing up to 14 asphalt mix types, with or without the use of RAP.

Asphalt concrete, called "hot mix asphalt" (HMA) by the industry, is a mixture of well-graded, high quality virgin aggregate that is heated and mixed with liquid asphalt cement to produce paving material. The characteristics of the asphalt concrete are determined by the relative amounts and types of aggregate (and RAP) used. In the asphalt reclamation process, old asphalt pavement is removed from the road surface, transported to the plant, then crushed and screened to the appropriate size for further processing.

In the parallel flow continuous drum mix process, virgin aggregate of various sizes is fed to the drum by cold feed controls in proportions dictated by the final mix specifications. Aggregate is delivered by conveyor belt to the dryer section of the drum, entering at the same end as the burner (hence, the descriptor "parallel" flow). The aggregate is heated and dried by the high temperatures in the dryer and then moves into the mixer section where it is coated with liquid asphalt cement, and conditioner (if used). Liquid asphalt cement and conditioner are delivered to the mixer by a variable flow pump that is electronically linked to the aggregate feed weigh scales. The hot aggregate mixture is also combined with RAP (if any) and recycled dust from the control system. The resulting asphalt concrete mixture is discharged from the end of the drum mixer and conveyed to storage silos for delivery to trucks. Refer to Figure 1.2 for a simplified process schematic.

There are six cold storage bins and three hot mix storage silos at the facility. The hot mix storage silo capacities are 200 tons each, for a total of 600 tons. There are two screens for aggregate sizing and two 25,000 gallon heated asphalt cement storage vessels, for a total asphalt cement capacity of 50,000 gallons (125 tons). The plant usually uses natural gas for all its process fuel needs; however, during the source tests No. 2 oil, the back-up fuel, was used in the drum mixer. The amount of energy needed from the fuel for the asphalt production process is 300,000 BTU per ton of asphalt produced. The hot gas contact time, i.e., the time from when the aggregate enters the dryer to when it exits the coater, is approximately 3 to 4 minutes. Surface mixes are closer to 3 minutes and base mixes are closer to 4 minutes.

The facility used an asphalt cement (AC) called AC-20, obtained from Citgo of Wilmington, North Carolina. An anti-strip conditioner, called Ad-Here® (from Arr-Maz®), is sometimes used; anti-strip is required for all North Carolina Department of Transportation jobs.

For particulate matter (PM) control, the facility uses a knockout box as a primary control and a fabric filter as a secondary control. The fabric filter is an ASTEC Pulse-Jet, equipped with 780 14-ounce Nomex bags; it is operated with an air-to-cloth ratio of approximately 5 feet per minute. The process gas exits the drum and proceeds through the knockout box into a fabric filter, where it is exhausted through a stack. As mentioned above, the dust collected by the PM control devices is recycled to process.

EPA source tests were performed at the facility on August 27, 28, and 29, 1997. The source testing took place at the inlet and outlet of the fabric filter. Data were taken at 15-minute intervals during the entire "test period," i.e., the time period when at least one manual and both instrumental tests were running. According to plant personnel, the plant was operating under normal conditions during the tests.

For the three test dates (August 27, 28, and 29, 1997), the average asphalt concrete production rates per test run were 201, 199, and 163 tons per hour (tph), respectively, corresponding to total production of 1,039, 1,241, and 839 tons. During the first two test runs (August 27 and 28), a surface asphalt coating that included RAP was produced; during the third test run (August 29), a surface coating (accounting for 73% of the total asphalt concrete produced) and a binder coating (accounting for 27% of total production) were produced, both without RAP. A high sulfur No. 2 fuel oil was used for fuel in the production process during the tests. No conditioner was used during the tests.

Table 3.1 summarizes the operating conditions observed during the EPA source test periods at Asphalt Plant "B". Tables 3.2 and 3.3 describe the asphalt mixes produced and the fuel used, respectively, during the tests. Table 3.4 describes the specifics of plant operation during the tests. Appendix A shows all the data recorded during the tests, along with the results of statistical analyses.

TABLE 3.1

**PLANT OPERATING CONDITIONS
ASPHALT PLANT "B" - CARY, NC**

Process Data	Test Run		
	R-M23-1 R-M29-1 08/27/97	R-M23-2 R-M29-2 8/28/97	R-M23-3 R-M29-3 08/29/97
Product Type(s)*	surface mix, with RAP (BCSC, RI-2)	surface mix, with RAP (BCSC, RI-2)	surface mix, no RAP (BCSC, I-2); and binder (BCBC, Type H)
Asphalt Concrete Production Rate, tph Average ^b Range Total Produced, tons	201 149-212 1,039	199 192-206 1,241	163 130-195 839
Mix Temperature, °F Average ^b Range	301 290-330	299 284-321	303 286-352
Raw Material (Virgin Aggregate) Use Rate, tph Average ^b Range Total Used, tons	153 113-161 788	151 145-154 943	154 122-183 839
RAP Use Rate, tph Average ^b Range Total Used, tons	36 18-40 197	36 30-43 235	none
Asphalt Cement Use Rate, tph Average ^b Range Total Used, tons	12.3 9.1-12.9 54	12.1 11.7-12.6 64	9.2 6.8-12.1 51
Conditioner (lb)	none	none	none

TABLE 3.1 (CONCLUDED)

**PLANT OPERATING CONDITIONS
ASPHALT PLANT "B" - CARY, NC**

Process Data	Test Run		
	R-M23-1 R-M29-1 08/27/97	R-M23-2 R-M29-2 8/28/97	R-M23-3 R-M29-3 08/29/97
Fabric Filter Operation^b			
Temperature, °F			
Inlet	344	343	325
Outlet	271	283	269
Pressure Drop, in. H ₂ O			
Average	0.9	0.9	1.2
Range	0.8 - 1.2	0.1 - 1.1	0.5 - 2.0
Fuel			
Use Rate, ^c gph	340	344	266
Total Used, gal	1,906	2,305	1,620

- ^a BCSC, Type I-2 = bituminous concrete, surface coarse
 BCSC, Type RI-2 = bituminous concrete, surface coarse, with RAP
 BCBC, Type H = bituminous concrete, binder coarse (type H)
 See Table 3.2 for more detail on product specifications.
- ^b As a straight average of the 15-minute interval data shown in Appendix A.
- ^c Fuel use rate was calculated from the total fuel used during the time interval.

TABLE 3.2

**ASPHALT MIX SPECIFICATIONS
ASPHALT PLANT "B" - CARY, NC**

Product	Material	Amount
Surface Coating (BCSC, Type I-2)	78-M regular screenings classified screenings Total asphalt cement	22% aggregate 34% aggregate 44% aggregate 100% aggregate 6.4% mix
Surface Coating, with RAP (BCSC, Type RI-2)	78-M screenings classified screenings RAP Total Asphalt cement total additional from RAP	17% aggregate 23% aggregate 42% aggregate 18% aggregate 100% aggregate 6.4% mix 5.2% mix 0.9% mix
Binder (BCBC, Type H)	78-M #67 regular screenings wet screenings Total asphalt cement	19% aggregate 48% aggregate 23% aggregate 10% aggregate 100% aggregate 4.6% mix

TABLE 3.3

**FUEL SPECIFICATIONS
ASPHALT PLANT "B" - CARY, NC**

Fuel Type	Characteristics	Descriptor(s)
High Sulfur, No. 2 Fuel Oil	flash point 125°F sulfur <500 mg/kg (0.05%) API index 33.2	dyed diesel fuel not for on-road use

TABLE 3.4

**SPECIFICS OF PLANT OPERATION
ASPHALT PLANT "B" - CARY, NC**

Parameter	Test Run / Test Date		
	R-M23-1 R-M29-1 08/27/97	R-M23-2 R-M29-2 8/28/97	R-M23-3 R-M29-3 08/29/97
Test Period	0940-1516	0746-1428	0809-1413
Plant Shut Downs ^a (with approximate duration)	1002 (5 min) 1140 (6 min) 1402 (10 min)	0901 (8 min) 1110 (18 min) 1355 (12 min)	1212 (9 min) 1242 (42 min)
Plant Production Rate Change(s)	1115-1145: mix rate slowed from nominally 200 to 150 tph	none	1007-1222: mix rate increased from nominally 150 to 200 tph 1237-1422: mix rate decreased from nominally 200 to 130 tpy
Product Changes	none	none	0807-0822 and 1022-1422: I-2 produced (642 tons) 0837-1007: binder produced (237) tons)

^a The shutdown at 1242 during Run 3 was put into effect to avoid overfilling of the silos with asphalt concrete mix; all other shutdowns were due to aggregate clogging in the conveyor system.

4.0 SAMPLING LOCATIONS

As stated previously, isokinetic sampling was conducted to determine the controlled and the uncontrolled emissions of the target compounds. Sampling was conducted at the baghouse inlet just after the knockout box, and at the baghouse outlet, downstream of the ID fan. Detailed descriptions of the sampling locations, as well as schematic diagrams, follow.

4.1 BAGHOUSE INLET SAMPLING LOCATION

The baghouse inlet consisted of a round horizontal duct which exits the knockout box and makes a 90° downward bend before it enters the baghouse through the top. The inlet duct diameter was 50 inches. Since there were no sample ports at the inlet location, sample ports were installed according to the EPA Method 1 specifications. A schematic diagram of the inlet sampling location is presented in Figure 4.1. Two 4-inch diameter sample ports were installed on the knockout box exit/baghouse inlet duct, 110 inches (2.20 duct diameters) downstream of the knockout box exit. The nearest downstream disturbance was the elbow prior to the baghouse inlet. For this sampling location and geometry, Method 1 specifies a minimum of 24 sample points in the duct cross-section. Accordingly, PES conducted isokinetic traverses using a 24 point sample matrix, consisting of two 12 point sample traverses. The sample ports were offset 90° to each other and were situated 45° to a vertical line bisecting the horizontal portion of the duct. Figure 4.2 presents a schematic diagram of the sample traverse points, as well as their locations inside the duct cross section.

4.2 BAGHOUSE OUTLET SAMPLING LOCATION

The baghouse outlet consisted of a 33-inch x 49 ½-inch square duct on the outlet of the baghouse. The equivalent diameter of the exhaust was 39.6 inches. The sample ports were located 24 inches (0.606 equivalent diameters) upstream of the nearest disturbance, which is the stack outlet, and 237 inches (5.99 equivalent diameters) downstream of the nearest disturbance, which is the outlet of the ID fan. For this sampling location and geometry, Method 1 specifies a minimum of 24 sample points for isokinetic traverses. There are six sample ports installed on the 49 ¾-inch side of the stack, so PES used a 24 point sampling matrix consisting of six four-point traverses. A schematic diagram of the stack outlet is presented in Figure 4.3, and a schematic of the sample traverse points are presented in Figure 4.4.

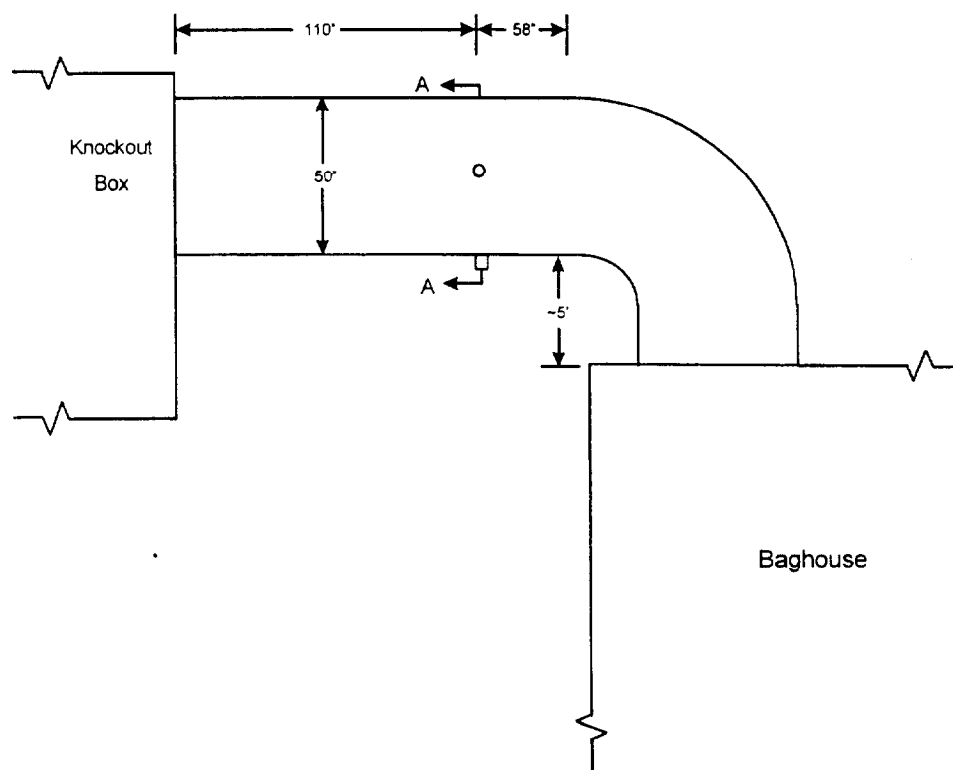
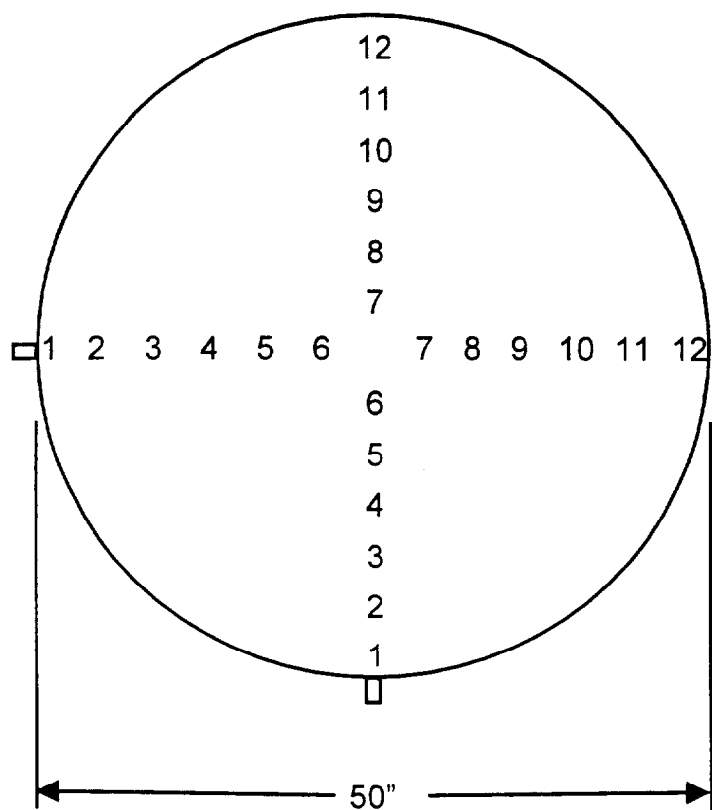


Figure 4.1 Baghouse Inlet Sampling Location - Asphalt Plant “B”, Cary, NC



Section A

Traverse Point Number	Distance from inside wall inches
1	1.05
2	3.35
3	5.90
4	8.85
5	12.5
6	17.8
7	32.2
8	37.5
9	41.2
10	44.1
11	46.7
12	49.0

Figure 4.2 Baghouse Inlet Point Locations - Asphalt Plant "B", Cary, NC

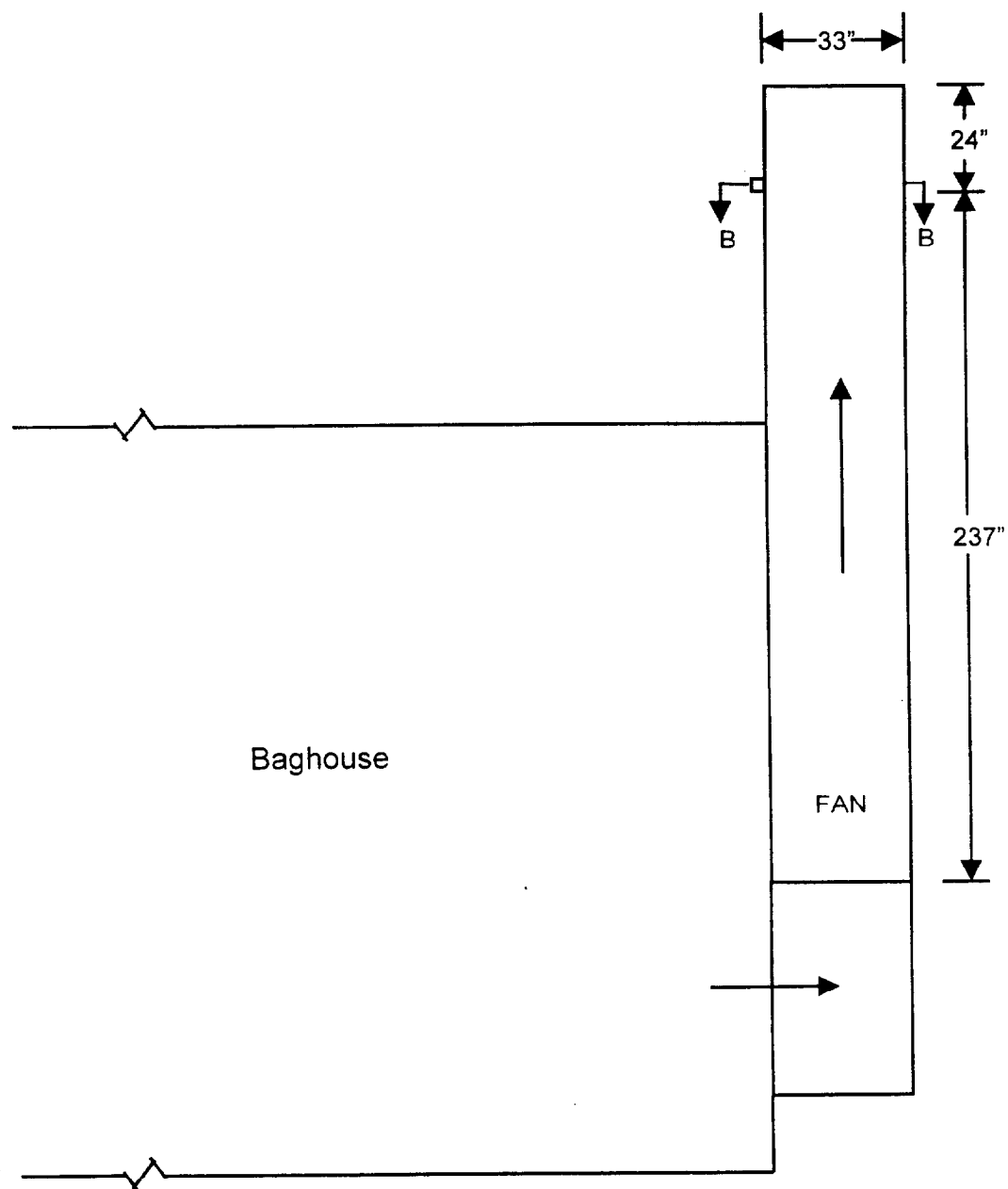
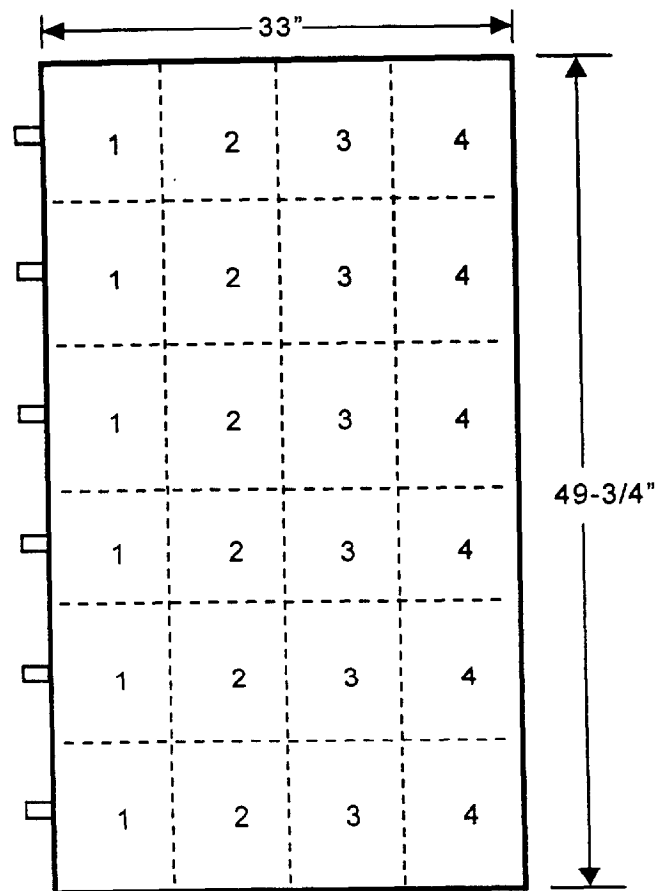


Figure 4.3 Baghouse Outlet Sampling Location - Asphalt Plant "B", Cary, NC



Section B

Traverse Point Number	Distance from Inside wall (inches)
1	4.1
2	12.4
3	20.6
4	28.9

Figure 4.4 Baghouse Outlet Point Locations - Asphalt Plant "B", Cary, NC

5.0 SAMPLING AND ANALYSIS PROCEDURES

Table 5.1 summarizes the sources, test parameters, test methods, number of tests, and planned duration of each event. Sampling of the baghouse inlet and outlet was conducted simultaneously for PCDDs/PCDFs, and PM/Metals. Brief descriptions of each method follow:

5.1 LOCATION OF MEASUREMENT SITES AND SAMPLE/VELOCITY TRAVERSE POINTS

EPA Method 1, "Sample and Velocity Traverses for Stationary Sources," was used to select the measurement sites and to establish velocity and sample traverse point locations. The measurement sites are discussed in Section 4.0.

5.2 DETERMINATION OF STACK GAS VOLUMETRIC FLOW RATE

EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)," was used to determine gas volumetric flow rate at the baghouse inlet and outlet. A Type S pitot tube, constructed according to Method 2 criteria and having an assigned coefficient of 0.84, was connected to an inclined-vertical manometer and used to measure velocity pressure. A Type K thermocouple attached directly to the pitot tube was used to measure gas temperature. For each sampling run, the gas velocity was calculated from the average of the square roots of the velocity pressure readings, the average gas temperature, the molecular weight, and the stack static pressure. The volumetric flow rate was calculated as the product of the average gas velocity and the duct cross-sectional area.

5.3 DETERMINATION OF DRY MOLECULAR WEIGHT AND EMISSION CORRECTION FACTORS

EPA Method 3B, "Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air," was used to measure carbon dioxide and oxygen content of the stack gases. Gas samples were extracted from each stack using the integrated, multi-point bag sampling technique. The bag contents were analyzed onsite within four hours after sample collection using an Orsat® analyzer to determine % concentrations of carbon dioxide and oxygen. The Orsat® analyzer had 0.2 % subdivisions.

TABLE 5.1

**SAMPLING LOCATIONS, TEST PARAMETERS
AND TEST METHODS SUMMARY
ASPHALT PLANT "B" - CARY, NC**

Sampling Location	Parameter	Test Methods	No. of Tests	Net Run Time, Minutes ^a
<u>Baghouse Inlet</u>	Flow Rate	EPA 1 & 2	3	96, 200, 240
	O ₂ /CO ₂	EPA 3B	3	87, 200, 240
	Moisture	EPA 4	3	96, 200, 240
	PCDDs/PCDFs	EPA 23	3	96, 170, 240
	PM/Metals	EPA 29	3	87, 200, 240
<u>Baghouse Outlet</u>	Flow Rate	EPA 1 & 2	3	240, 240, 240
	O ₂ /CO ₂	EPA 3B	3	240, 240, 240
	Moisture	EPA 4	3	240, 240, 240
	PCDDs/PCDFs	EPA 23	3	240, 240, 240
	PM/Metals	EPA 29	3	240, 240, 240

^a Net run times presented are for the first, second, and third sampling runs, respectively

5.4 DETERMINATION OF STACK GAS MOISTURE CONTENT

EPA Method 4, "Determination of Moisture Content in Stack Gases," was used to determine gas moisture content. The quantity of condensate collected during each sampling run was determined gravimetrically as the difference of the pre- and post-test impinger weights. The gas moisture volume was then calculated as the ratio of the moisture volume (assuming a conversion factor of 0.0415 g/ft³) to the sum of the moisture volume and the dry gas volume as indicated by the dry gas meter. The Method 4 procedure was conducted simultaneously with each Method 23 and Method 29 sampling run. The moisture gained in the XAD[®] module in the Method 23 sample train was also determined.

5.5 DETERMINATION OF POLYCHLORINATED DIBENZO-P-DIOXINS AND POLYCHLORINATED DIBENZOFURANS

EPA Method 23, "Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans From Stationary Sources" was used to determine PCDDs and PCDFs at the baghouse inlet and outlet. A schematic of the Method 23 sampling train is shown in Figure 5.1. Gas samples were extracted from the gas streams isokinetically, and passed through a glass nozzle, heated glass-lined sample probe, a heated glass fiber filter, a coil condenser and a sorbent resin trap containing approximately 40 grams of spiked XAD[®]-2 sorbent resin. Ice water from the impinger bath was continuously recirculated through water jackets on the coil condenser and the XAD[®]-2 sorbent resin trap to cool the sample gas and facilitate

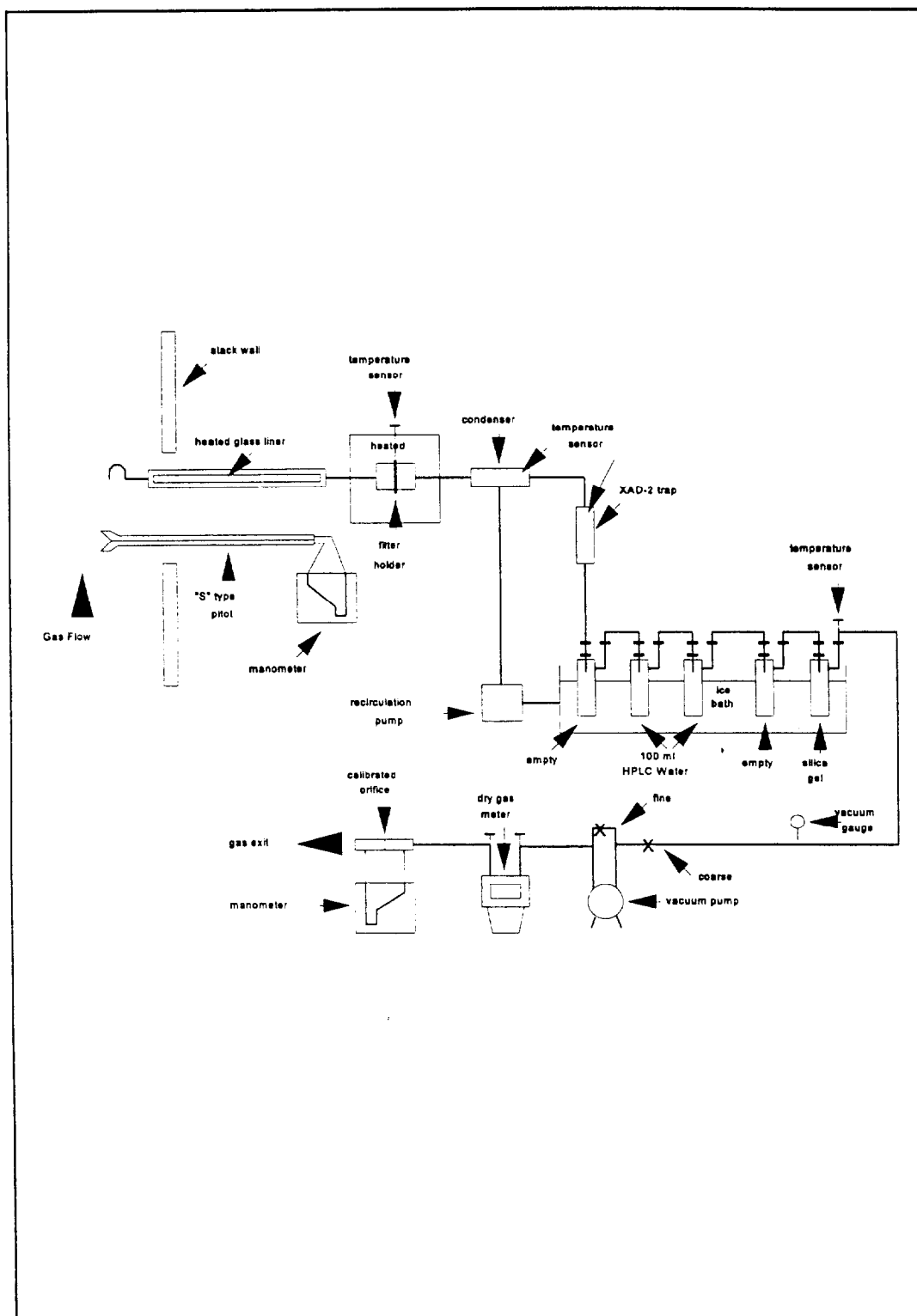


Figure 5.1 Method 23 Sample Train Schematic - Asphalt Plant "B", Cary, NC

absorption of PCDDs and PCDFs onto the XAD®-2 resin. At the conclusion of each sample run, the sample train components (except the sorbent trap) were rinsed with pesticide-grade acetone and toluene.

Upon receipt by the subcontract laboratory, which was TLI, the samples were concentrated, combined, and analyzed using a gas chromatograph with a mass spectrometer detector (GC/MS). Sample aliquots were initially separated using a DB-5 capillary column; where the results of the analyses using the DB-5 column indicated the presence of 2378 PCDFs, the sample was re-analyzed using a DB-225 capillary column, and the results of the DB-225 analysis used for the subsequent calculations of emission rate and toxic equivalency for the 2378 PCDFs congener.

5.6 DETERMINATION OF PARTICULATE MATTER AND METALS

EPA Method 29, "Determination of Metals Emissions From Stationary Sources," was used to determine filterable particulate matter and metals at the baghouse inlet and baghouse outlet locations. The target metals included: antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), phosphorus (P), silver (Ag), selenium (Se), thallium (Tl), and zinc (Zn). A Method 29 sampling train schematic is presented in Figure 5.2. Gas samples were withdrawn from the gas streams isokinetically and through a glass nozzle, heated glass-lined sample probe, a heated quartz fiber filter, and an impinger train containing reagents for the absorption of metals. The first impinger in the train was empty, the second and third impingers each contained 100 ml of a 5% nitric acid (HNO_3)/10% hydrogen peroxide (H_2O_2) solution, the fourth impinger was empty, the fifth and sixth impingers each contained 100 ml of a 4% potassium permanganate (KMnO_4)/10% sulfuric acid (H_2SO_4) solution, and the last impinger contained a known quantity of silica gel.

The sample analysis scheme for metals is shown in Figures 5.3 and 5.4. At the conclusion of each sampling run, the front half of the sampling train (i.e., in front of the tared quartz fiber filter) was rinsed with acetone followed by a solution of 0.1 N HNO_3 . The first three impingers were quantitatively recovered and rinsed with 100 ml of HNO_3 solution; the impinger contents and the rinses were collected in a pre-cleaned glass sample bottle. The contents of the fourth and fifth impingers were recovered and impingers rinsed with 100 ml of fresh acidified potassium permanganate solution, followed by a rinse with 100 ml of deionized water into a pre-cleaned glass sample bottle. The fourth and fifth impingers were then rinsed with 25 ml of 8 N HCl solution, which was collected in pre-cleaned glass sample jar containing 200 ml of deionized water.

Analyses for the determination of particulate matter concentrations and emission rates were conducted at PES facilities in Research Triangle Park, NC. The acetone probe rinses and the filters were transferred to pre-cleaned, tared beakers, evaporated to dryness, desiccated, and weighed to constant weight. At the conclusion of the particulate matter analysis, the beakers were sealed with Parafilm® and transported to the subcontract laboratory, Triangle Laboratories, Inc., for determination of the target metals content. Each sample run generated two fractions for

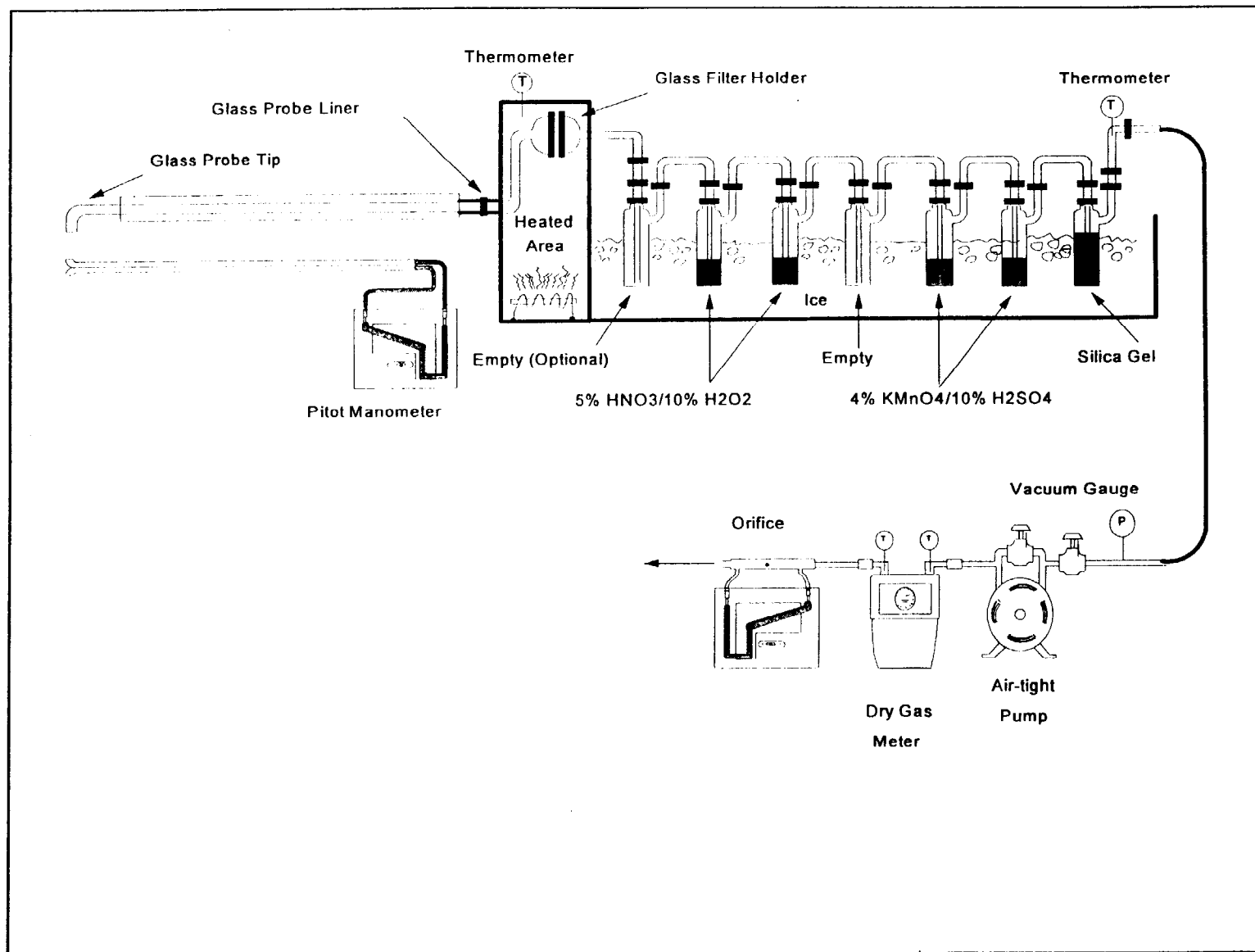


Figure 5.2 Method 29 Sample Train Schematic - Asphalt Plant "B", Cary, NC

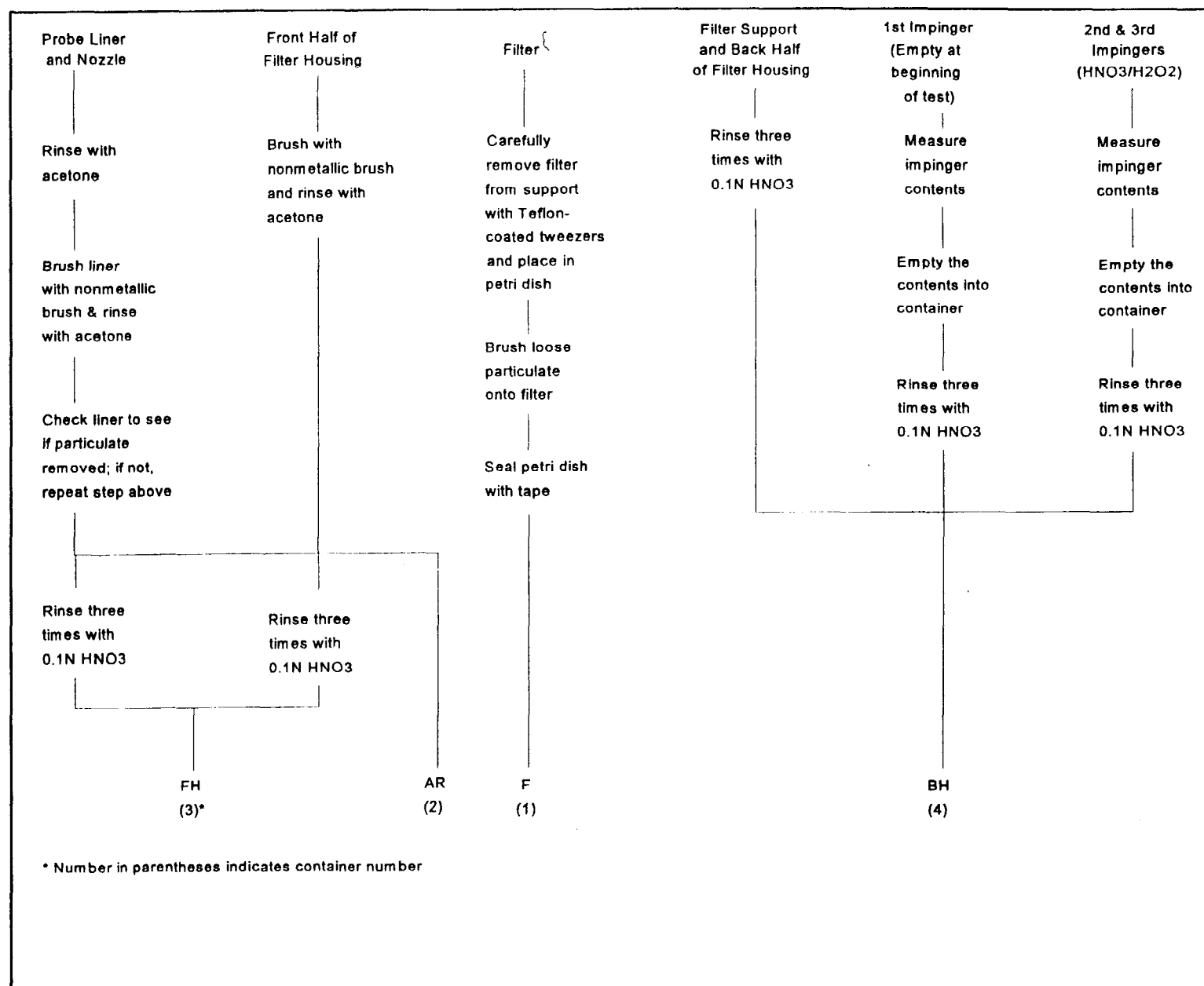
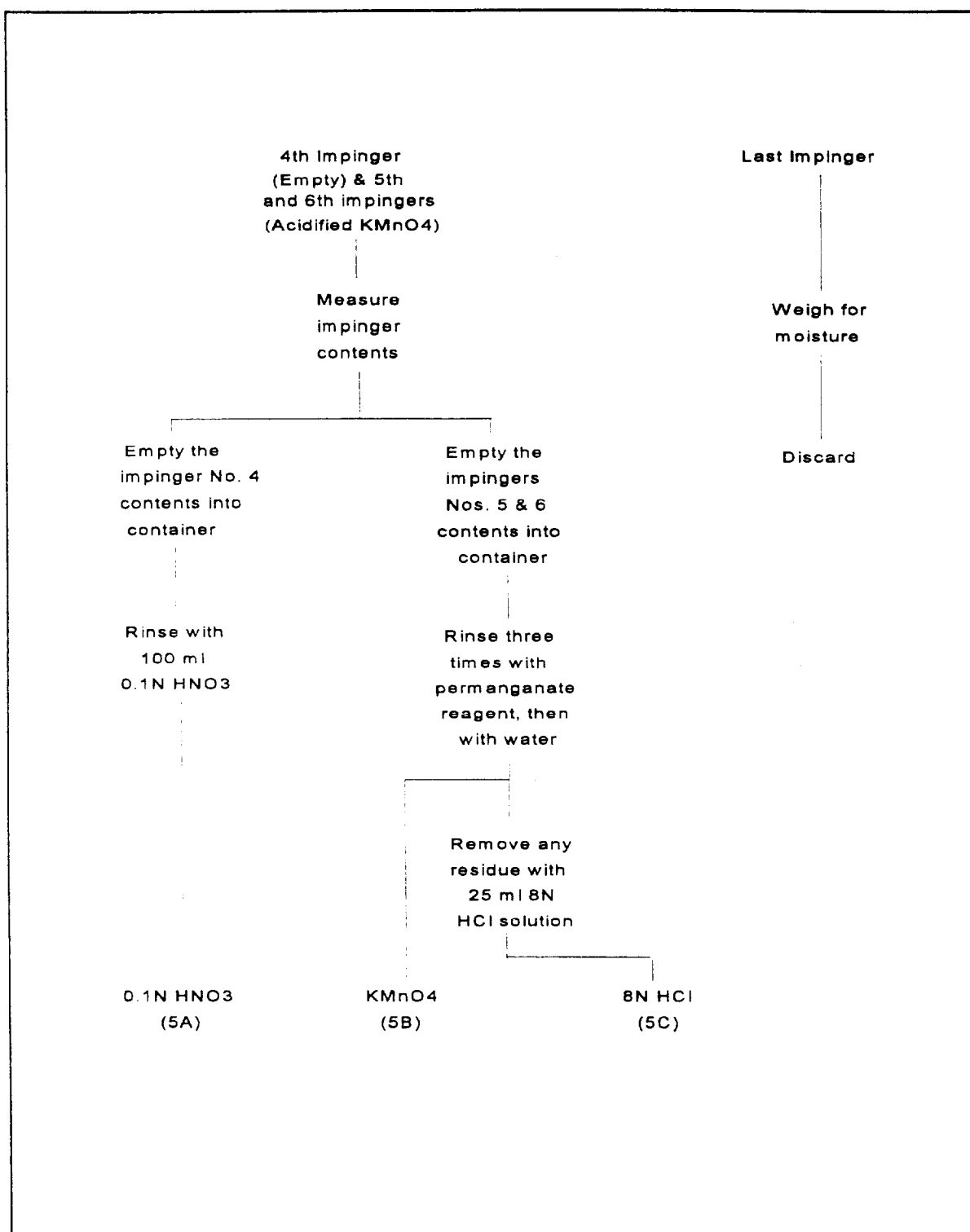


Figure 5.3 Method 29 Sample Recovery Scheme (Sample Fractions 1-4)
Asphalt Plant "B", Cary, NC



**Figure 5.4 Method 29 Sample Recovery Scheme (Sample Fraction 5)
Asphalt Plant "B", Cary, NC**

the analysis of all target metals except mercury, and five fractions for analysis of mercury. Except for mercury, analyses of the target metals were conducted using the analytical method which resulted in the lowest detection for each metal; either graphite furnace atomic absorption spectroscopy (GFAAS), or inductively coupled argon plasma (ICP) emission spectroscopy. Analysis for mercury content was determined using cold vapor atomic absorption spectroscopy (CVAAS).

5.7 DETERMINATION OF PLUME OPACITY

EPA Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources" was used to quantify visible emissions from the baghouse outlet stack. The observer was certified to read plume opacities at a field training session held in Raleigh, North Carolina by Eastern Technical Associates of Raleigh, North Carolina on March 12, 1997 (Certificate No. 257158).

6.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND RESULTS

This section describes the specific QA/QC procedures employed by PES during the performance of this source testing program. PES' quality assurance program was based upon the procedures and guidelines contained in the "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods," EPA/600/R-94/038c, as well as in the test methods to ensure the collection, analysis, and reporting of reliable source test data.

6.1 CALIBRATION OF APPARATUS

Since no mechanism exists for an independent measurement of emissions from the source, careful preparation, checkout, and calibration of the source testing sampling and analysis equipment is essential to ensure the collection of data of high quality. PES maintains a comprehensive schedule for preventative maintenance, calibration, and preparation of the source testing equipment.

6.1.1 Barometers

PES used aneroid barometers which were calibrated against a station pressure value reported by a nearby National Weather Service Station, and corrected for elevation.

6.1.2 Temperature Sensors

The responses of the Type K thermocouples used in the field testing program were checked using Calibration Procedure 2e as described in the Quality Assurance Handbook. The response of each temperature sensor was recorded when immersed in an ice water bath, at ambient temperature, and in a boiling water bath; each response was checked against an ASTM 3F reference thermometer. Table 6.1 summarizes the results of the thermocouple calibrations and the acceptable levels of variance. Digital temperature readouts were calibrated using a thermocouple simulator having a range of 0-2400°F.

6.1.3 Pitot Tubes

For the measurement of velocity pressure in the gas streams, PES used Type S pitot tubes constructed according to EPA Method 2 specifications. Pitot tubes meeting these geometric specifications are assigned a baseline pitot coefficient (C_p) of 0.84 and need not be subjected to a wind tunnel calibration. PES performs, at a minimum, annual calibration checks of pitots using Calibration Procedure 2 as found in the Quality Assurance Handbook.

TABLE 6.1

**SUMMARY OF TEMPERATURE SENSOR CALIBRATION DATA
ASPHALT PLANT "B" - CARY, NC**

Temp. Sensor I.D.	Usage	Temperature, °R		Absolute Difference %	EPA Criteria %
		Reference	Sensor		
5C	Stack Gas	498	498	0	<±1.5
		562	561	0.17	<±1.5
		628	629	0.16	<±1.5
5B	Stack Gas	496	499	0.60	<±1.5
		553	559	1.0	<±1.5
		596	596	0	<±1.5
RT3	Stack Gas	501	501	0	<±1.5
		532	532	0	<±1.5
		670	672	0.30	<±1.5
RT20	Stack Gas	492	493	0.20	<±1.5
		534	532	0.37	<±1.5
		672	671	0.15	<±1.5
RT11	Impinger Exit	496	495	0.20	<±1.5
		532	534	0.37	<±1.5
		670	670	0	<±1.5
SH4	Impinger Exit	497	496	0.20	<±1.5
		532	535	0.56	<±1.5
		670	669	0.15	<±1.5

The results of the dimensional checks for each pitot tube used in this test program are summarized in Table 6.2.

6.1.4 Differential Pressure Gauges

PES uses Dwyer inclined/vertical manometers to measure differential pressures. These include velocity pressure, static pressure, and meter orifice pressure. Manometers are selected with sufficient sensitivity to accurately measure pressures over the entire range of expected values. Manometers are primary standards and require no calibration.

6.1.5 Dry Gas Meter and Orifice

The Method 23 and 29 dry gas meters and orifices were calibrated in accordance with Calibration Procedure 5 in the Quality Assurance Handbook. This procedure involves direct comparison of the dry gas meter to a reference dry test meter. The reference dry test meter is calibrated annually against a wet test meter. Before its initial use in the field, the metering system was calibrated at several flow rates over the normal operating range of the metering system. For the initial calibration to be considered valid, the results of individual meter calibration factors (γ), cannot differ from the average by more than 0.02, and the results of individual meter orifice factors ($\Delta H_{@}$), cannot differ from the average by more than 0.20. After field use, the metering system calibration was checked at the average flow rate and highest vacuum observed during the test period. The results of the post-test meter correction factor check cannot differ by more than 5 % from the average meter correction factor obtained during the initial, or thereafter, the annual calibration. Table 6.3 presents the results of the dry gas meter and orifice calibrations.

6.2 ON-SITE MEASUREMENTS

The on-site QA/QC activities include:

6.2.1 Measurement Sites

Prior to sampling, the stacks were checked dimensionally to determine the suitability of the measurement site locations with respect to the Method 1 criteria. Distances to upstream and downstream disturbances, test port locations and inside stack dimensions were checked to evaluate the uniformity of the stack cross sectional area. The inside stack dimensions, stack wall thickness, and sample port lengths were measured to the nearest 1/16 inch.

TABLE 6.2

**SUMMARY OF PITOT TUBE DIMENSIONAL DATA
ASPHALT PLANT "B" - CARY, NC**

Measurement	Criteria	Results		
		Pitot Tube Identification		
		5C	5B	RP-20
α_1	$-10^\circ \leq \alpha_1 \leq 10^\circ$	2.5	2	2
α_2	$-10^\circ \leq \alpha_1 \leq 10^\circ$	-2.5	-1	1
β_1	$-5^\circ \leq \beta_1 \leq 5^\circ$	1	2	0
β_2	$-5^\circ \leq \beta_1 \leq 5^\circ$	-1	0	1
γ	-	2.5	1	0.5
θ	-	0	0.5	0
A	-	1.013	0.990	1.0065
$Z = A \tan \gamma$	≤ 0.125 in.	0.044	0.017	0.009
$W = A \tan \theta$	≤ 0.03125 in.	0	0.009	0
D_t	$0.1875" \leq D_t \leq 0.375"$	0.370	0.383	0.375
$A/2D_t$	$1.05 D_t \leq P \leq 1.50 D_t$	Yes	Yes	Yes
Acceptable		Yes	Yes	Yes
Assigned Coefficient		0.84	0.84	0.84

TABLE 6.3**SUMMARY OF DRY GAS METER AND ORIFICE CALIBRATION DATA
ASPHALT PLANT "B" - CARY, NC**

Meter Box No.	Dry Gas Meter Correction Factor (γ)				Meter Orifice Coefficient (ΔH_{or})		
	Pre-test	Post-test	% Diff.	EPA Criteria	Average	Range	EPA Criteria
M5-4	1.021	1.046	2.5	<5%	1.82	1.74-1.87	1.62-2.02
M5-9	1.016	1.016	0.0	<5%	1.78	1.71-1.82	1.59-1.98
MB-11	0.987	1.008	2.1	<5%	1.93	1.73-2.13	1.87-1.97
MB-10	0.965	0.979	1.5	<5%	1.75	1.68-1.82	1.55-1.95

6.2.2 Velocity Measurements

All velocity measurement apparatus were assembled, leveled, zeroed, and leak-checked prior to and at the end of each sampling run. The stack static pressure was determined at a single point within the stack corresponding to the average velocity pressure as obtained during the pre-test velocity traverse.

6.2.3 Flue Gas Sampling

Integrated flue gas samples were collected in Tedlar[®] gas bags from the baghouse exhaust. Prior to their initial use, the bags were leak checked and purged with nitrogen to ensure cleanliness. Prior to and after completion of each sampling run, the stack gas molecular weight sampling system was leak checked. The bag samples were analyzed on-site using an Orsat[®] analyzer. Prior to use the Orsat[®] analyzer was assembled and replenished with fresh reagents and leak checked as per the manufacturer's procedures.

6.2.4 Moisture

During sampling, the exit gas temperature of the last impinger in each sampling train was maintained below 68°F to ensure condensation of stack gas water vapor. The moisture gain in the impinger train due to flue gas moisture was determined gravimetrically using a digital top-loading electronic balance with a resolution of 0.1 g. For subsequent calculations of the flue gas moisture volume, the calculated moisture volume due to the impinger weight gain is compared to the stack gas saturation volume at the average stack gas temperatures. If the calculated moisture volume due to impinger weight gain exceeds the saturation volume, the assumption is made that moisture droplets entered the sampling system, and the saturation volume is used to calculate stack gas molecular weight. The lower moisture value obtained using the reference method and saturation method was subsequently used in all Method 23 and Method 29 calculations.

6.2.5 Method 23/Method 29

The QA/QC activities for the for Method 23 and Method 29 sampling trains were similar. Prior to field testing, all glassware used was pre-cleaned according to the guidelines presented in Method 23 and 29. The Method 23 glassware was cleaned based upon procedures presented in Section 3A of "The Manual of Analytical Methods for the Analysis of Pesticides in Human and Environmental Samples." The Method 29 sampling train glassware was prepared by first rinsing with hot tap and then water and then washed in hot soapy water. Next, all glassware was rinsed three times with tap water, followed by three additional rinses with water. Then all glassware was soaked in a 10% (V/V) nitric acid solution for a minimum of four hours, rinsed three times with water, then rinsed a final time with acetone, and allowed to air dry. On all of the Method 23 and Method 29 glassware, openings where contamination could occur was covered with Parafilm® or Teflon® tape until the trains were assembled for sampling.

Table 6.4 summarizes the results of the post-test sample train leak checks for the Method 23 and Method 29 sampling trains, as well as the isokinetic sampling ratios for each of the sampling runs attempts. It should be noted that the Method 23 and Method 29 sampling runs at the baghouse inlet were aborted after approximately 20 minutes of sampling. Although the Method 29 isokinetic sampling ratio was within the required tolerance, the Method 23 ratio was not. This was due to the significant pressure drop across the train from the collected particulate matter and the XAD®-2 sorbent resin trap, which made it impossible to collect a gas sample at the flow rate required by the isokinetic rate equation. All pre- and post-test sample train leaks met the acceptance criteria.

In order to evaluate the effectiveness of the on-site cleanup procedures, field blank samples of the Method 23 and Method 29 sample trains were collected during the field test program. The sample trains were assembled in same manner as the trains prepared for actual sampling runs, and were transported to the baghouse outlet sampling location. The sample trains were each leak-checked and allowed to heat to the normal operating temperature. They were then leak-checked again, and transported to the on-site field laboratory for recovery. The samples generated from the field blank trains were handled and analyzed in the same manner as the other samples generated during actual test runs.

In order to evaluate contamination levels in the sampling reagents, blank samples of all reagents used for both the Method 23 and Method 29 sampling were collected. These sample blanks were submitted for analysis along with the run samples and field blank samples for analysis.

6.3 ANALYSES

6.3.1 Method 23 Analyses

Table 6.5 presents the results of the recovery efficiencies for the internal, surrogate, and alternate standards used in conjunction with Method 23. Internal standards are used during analysis to quantify the ability of the analytical technique to quantify the target PCDDs/PCDFs

TABLE 6.4

**SUMMARY OF METHOD 23/ METHOD 29 FIELD SAMPLING QA/QC DATA
ASPHALT PLANT "B" - CARY, NC**

Date	Site	Run No.	Pre-Test Leak Rate acfm	Post-Test Leak Rate acfm	EPA Criteria	Percent Isokinetic	EPA Criteria
8/27/97	Inlet	R-I-M23-1	0.008	0.007	< 0.02	115.0%	90%-110%
		R-I-M29-1	0.011	0.001	< 0.02	109.7%	90%-110%
	Outlet	R-O-M23-1	0.003	0.002	< 0.02	115.5%	90%-110%
		R-O-M29-1	0.007	0.004	< 0.02	109.5%	90%-110%
8/28/97	Inlet	R-I-M23-2	0.008	0.002	< 0.02	102.6%	90%-110%
		R-I-M29-2	0.003	0.012	< 0.02	100.5%	90%-110%
	Outlet	R-O-M23-2	0.001	0.008	< 0.02	100.5%	90%-110%
		R-O-M29-2	0.011	0.005	< 0.02	99.2%	90%-110%
8/29/97	Inlet	R-I-M23-3	0.006	0.009	< 0.02	97.7%	90%-110%
		R-I-M29-3	0.004	0.012	< 0.02	96.1%	90%-110%
	Outlet	R-O-M23-3	0.004	0.003	< 0.02	99.6%	90%-110%
		R-O-M29-3	0.012	0.009	< 0.02	97.8%	90%-110%

TABLE 6.5

**SUMMARY OF METHOD 23 STANDARDS RECOVERY EFFICIENCIES
ASPHALT PLANT "B" - CARY, NC**

	Percent Recovery									QC Limits
	TLI XAD-2 Blank	M23- RB	R-M23 -O-1	R-M23 -O-2	R-M23 -O-3	R-M23 -O-FB	R-M23 -I-1	R-M23- I-2	R-M23 -I-3	
FULL SCREEN ANALYSIS										
<u>Internal Standards</u>										
2,3,7,8-TCDF	105	68.5	137	88.1	114	75.7	72.8	45.4	63.3	40-130%
2,3,7,8-TCDD	74.6	61.5	145	90.2	95.4	71.5	73.3	50.6	58.5	40-130%
1,2,3,7,8-PeCDF	94.4	67.5	160	82.1	91.9	75.4	50.6	36.1	56.9	40-130%
1,2,3,7,8-PeCDD	101	69.2	177	102	100	86.9	45.4	35.5	57.2	40-130%
1,2,3,6,7,8-HxCDF	73.5	75.6	124	81.0	103	81.3	65.4	56.9	64.5	40-130%
1,2,3,6,7,8-HxCDD	83.2	69.2	122	77.6	92.2	76.5	70.9	49.5	58.0	40-130%
1,2,3,4,6,7,8-HpCDF	64.0	60.9	91.2	47.2	64.7	75.9	56.0	32.2	35.3	25-130%
1,2,3,4,6,7,8-HpCDD	71.5	66.8	88.5	53.2	63.8	87.9	59.6	30.0	29.8	25-130%
1,2,3,4,6,7,8,9-OCDD	73.1	60.2	60.5	29.8	31.6	87.6	55.8	17.5	16.0	25-130%
<u>Surrogate Standards</u>										
2,3,7,8-TCDD	94.6	105	79.3	100	101	95.6	102	102	103	70-140%
2,3,4,7,8-PeCDF	101	95.0	71.8	93.1	93.4	89.4	92.1	87.4	93.4	70-140%
1,2,3,4,7,8-HxCDF	87.3	89.0	73.8	94.3	85.0	83.1	117	100	112	70-140%
1,2,3,4,7,8-HxCDD	81.6	87.7	64.4	85.6	83.2	72.6	89.9	90.2	99.8	70-140%
1,2,3,4,7,8,9-HpCDF	78.6	97.8	78.7	116	86.7	67.8	110	84.3	75.7	70-140%
<u>Alternate Standards</u>										
1,2,3,7,8,9-HxCDF	69.4	75.8	74.3	58.2	84.8	69.7	80.6	49.8	54.2	40-130%
2,3,4,6,7,8-HxCDF	73.3	79.3	92.3	73.7	94.6	81.5	76.4	53.8	73.5	40-130%
CONFIRMATION ANALYSIS										
<u>Internal Standards</u>										
2,3,7,8-TCDF	67.4	NA	NA	NA	NA	70.9	NA	NA	53.9	40-130%

NA Confirmation analysis was not necessary on samples where no TCDF were detected in the full screen analysis.

congeners. An internal standard mixture consisting of known amounts of nine congeners was added to each of the analyzed samples during quantification. Recovery efficiencies for OCDD were less than the minimum recovery efficiency of 25% for the samples collected during runs R-M23-I-2 and R-M23-I-3. OCDD internal standard recoveries for these two samples were 17.5 and 16.0 percent, respectively.

Surrogate standards are a mixture of congeners that are spiked onto the sorbent resin during packing of the traps, and provide an indication of the collection efficiency of the resin during the sampling runs. Recoveries of all surrogate standards were within the prescribed limitations for all runs except for the field blank sample for 1,2,3,4,7,8,9 Hepta-chlorinated dibenzo-furan. The recovery efficiency was 67.8 percent, and the minimum required for QA validation was 70 percent. Recoveries of alternate standards and internal standards during confirmation analysis (when required) were all within the QA ranges.

6.3.2 Method 29 Analyses

The results of QA analyses for the Method 29 samples are presented in Tables 6.6 through Tables 6.13. Lab control spikes (Table 6.6) were within the recovery limits for all metals except nickel, with a recovery of 131%, and thallium, with a recovery of 73%. The control limits for lab control spikes are 80 to 120%. The sample results should be considered biased high for Ni and biased low for Tl. A matrix spike (Table 6.7) was conducted on the sample from Run R-M29-O-1. Matrix spikes are conducted to evaluate if the sample matrix contains an unknown compound which interferes with the quantification of one or more of the target metals. Matrix spike recoveries for the front half of the sample were low for cobalt, which may indicate that the results of the front half analyses for cobalt may be biased low. Matrix spike recoveries for the back-half fractions were within the qualification criteria for all metals. Table 6.8 summarizes the Method 29 serial dilution analysis QC data for Run R-M29-O-1. Except for the front half chromium analysis, the relative percent deviation (RPD) was <10% for all the metals. The serial dilution results for Cr demonstrated a RPD outside the QC control criteria of 10.0%, which indicates the presence of an amount of interferents specific to this analyte in the native sample matrix. This sample should be considered biased low for Cr due to matrix interference. Table 6.9 summarizes the Method 29 duplicate analysis QC data for Run R-M29-O-2. With the exception of lead in the front half fraction, the duplicate analysis QC results were within the RPD limit of $\pm 20\%$. Table 6.10 presents the results of the method blank. All analytes found in the method blank were detected at a level equal to or less than the Reporting Detection Limits (RDLs) except for Ni. The Ni results should be considered biased high. Table 6.11 summarizes the Method 29 field and reagent blank analysis QC data. The field blank was collected during the field sampling portion of the test program and is used as an indicator of background contamination in the ambient air at the sampling site. The reagent blanks were analyzed for the target metals and the results were used to correct the sample results.

Table 6.12 presents the results of the Method 29 matrix spikes for mercury. The pre-digestion spike and the pre-digestion spike duplicate for Hg for several of the samples demonstrated percent recoveries outside the QC criteria, which may indicate significant matrix effects specific to this analyte in the native sample matrix. Table 6.13 presents the results of the

mercury analysis of the field blank sample. The results of the analysis for mercury were below the detection limit for all fractions.

TABLE 6.6

**SUMMARY OF METHOD 29 ANALYSIS QC DATA
LAB CONTROL SPIKES
ASPHALT PLANT "B" - CARY, NC**

Analyte	Spike Amount (μg)	Recovered Amount (μg)	Recovery (%)
Ag	50	42.95	86
As	50	44.95	90
Ba	50	46.80	94
Be	50	45.78	92
Cd	50	46.59	93
Co	50	46.65	93
Cr	50	47.19	94
Cu	50	47.89	96
Mn	50	47.50	95
Ni	50	65.43	131
P	1000	908.82	91
Pb	50	45.94	92
Sb	50	46.51	93
Se	50	46.39	93
Tl	50	36.40	73
Zn	200	194.41	97

TABLE 6.7

**SUMMARY OF METHOD 29 ANALYSIS QC DATA
POST DIGESTION MATRIX SPIKES RUN NO. R-M29-O-1
ASPHALT PLANT "B" - CARY, NC**

Analyte	Front Half		Back Half	
	Recovered Amount ($\mu\text{g/L}$)	Recovery (%)	Recovered Amount ($\mu\text{g/L}$)	Recovery (%)
Ag	42.33	80	42.65	83
As	47.28	95	42.89	86
Ba	575.52	LS	58.97	101
Be	44.63	89	46.31	93
Cd	43.53	87	51.82	95
Co	17.32	35	47.41	95
Cr	172.26	93	52.63	94
Cu	118.97	95	68.63	96
Mn	709.59	LS	63.17	82
Ni	105.88	94	79.71	94
P	1391.02	89	1419.02	86
Pb	75.53	90	96.36	89
Sb	95.35	114	45.56	91
Se	85.76	78	50.52	83
Tl	20.40	82	21.90	88
Zn	397.21	92	389.40	86
LS Low spike; % Recovery is not considered valid when spike amount is less than 20% of recovered amount				

TABLE 6.8

**METHOD 29 SERIAL DILUTION ANALYSIS QC DATA RUN NO. R-M29-O-1
ASPHALT PLANT "B" - CARY, NC**

Analyte	Front Half			Back Half			RPD Limit (%)
	Sample (μg)	Serial Dilution (μg)	RPD (%)	Sample (μg)	Serial Dilution (μg)	RPD (%)	
Ag	0.241	<0.500	<RDL	0.137	<0.527	<RDL	10
As	<0.500	<2.50	<RDL	<0.527	<2.64	<RDL	10
Ba	54.0	55.9	3.46	0.901	<1.05	<RDL	10
Be	<0.100	<0.500	<RDL	<0.105	<0.527	<RDL	10
Cd	<0.100	<0.500	<RDL	0.479	<0.527	<RDL	10
Co	<0.100	<0.500	<RDL	<0.105	<0.527	<RDL	10
Cr	12.6	16.3	25.6	0.609	<1.05	<RDL	10
Cu	7.13	7.10	<RDL	2.16	1.66	<RDL	10
Mn	67.7	72.1	6.29	2.34	1.95	<RDL	10
Ni	5.91	6.66	<RDL	3.46	2.85	<RDL	10
P	50.6	55.1	<RDL	59.3	57.2	<RDL	10
Pb	3.07	3.80	<RDL	5.47	5.96	<RDL	10
Sb	3.84	5.76	<RDL	<0.422	<2.11	<RDL	10
Se	4.67	5.44	<RDL	0.962	<1.58	<RDL	10
Tl	<0.200	<1.00	<RDL	<0.211	<1.05	<RDL	10
Zn	21.4	23.4	<RDL	22.9	23.4	<RDL	10

* Note: Serial dilution analyte results are not considered valid when the concentration in the analyte is less than 10 times the Reported Detection Limit (RDL) for ICP analysis and 5 times the RDL for GFAA analysis. RPD = Relative percent deviation.

TABLE 6.9

**METHOD 29 DUPLICATE ANALYSIS QC ANALYSIS DATA RUN NO. R-M29-O-2
ASPHALT PLANT "B" - CARY, NC**

Analyte	Front Half			Back Half		
	Sample (μg)	Duplicate (μg)	RPD (%)	Sample (μg)	Duplicate (μg)	RPD (%)
Ag	0.215	0.219	<RDL	<0.106	<0.106	<RDL
As	<0.500	<0.500	<RDL	<0.528	<0.528	<RDL
Ba	40.2	40.1	0.249	0.748	0.722	<RDL
Be	<0.100	<0.100	<RDL	<0.106	<0.106	<RDL
Cd	0.174	<0.100	<RDL	0.203	0.18	<RDL
Co	<0.100	<0.100	<RDL	<0.106	<0.106	<RDL
Cr	10.5	10.5	0.00	0.594	0.443	<RDL
Cu	5.73	5.81	1.39	1.45	1.29	<RDL
Mn	63.3	63.0	0.475	11.7	11.6	0.858
Ni	5.02	5.01	0.199	1.52	1.44	<RDL
P	46.4	44.5	4.18	69.7	68.7	1.45
Pb	2.41	2.14	11.9	3.02	3.02	0.00
Sb	3.85	3.30	RDL	<0.422	<0.422	<RDL
Se	3.75	3.99	6.20	0.683	0.743	<RDL
Tl	<0.20	N/A	N/A	<0.211	N/A	N/A
Zn	18.3	18.1	1.10	7.75	7.57	<RDL
Note: Duplicate analysis not reported for Tl, since Tl was analyzed by GFAA						

TABLE 6.10**METHOD 29 METHOD BLANK ANALYSIS QC DATA
ASPHALT PLANT "B" - CARY, NC**

Analyte	Reporting Detection Limit ($\mu\text{g/L}$)	Recovered Amount ($\mu\text{g/L}$)	Pass or Fail*
Ag	1	-0.31	Pass
As	5	-0.83	Pass
Ba	2	0.08	Pass
Be	1	-0.01	Pass
Cd	1	0.03	Pass
Co	1	-0.32	Pass
Cr	2	0.26	Pass
Cu	2	0.73	Pass
Mn	2	0.39	Pass
Ni	3	10.14	Fail
P	30	-5.19	Pass
Pb	2	0.71	Pass
Sb	4	-0.06	Pass
Se	3	0.50	Pass
Tl	2	-1.30	Pass
Zn	12	2.79	Pass

* Method Blank considered "Pass" when recovered amount is less than the detection limit

TABLE 6.11

**METHOD 29 FIELD AND REAGENT BLANK ANALYSIS QC DATA
ASPHALT PLANT "B" - CARY, NC**

Analyte	Field Blank		Reagent Blank	
	Front Half (μg)	Back Half (μg)	Front Half (μg)	Back Half (μg)
Ag	0.155	0.205	0.270	<0.100
As	<0.500	<0.500	<0.500	<0.500
Ba	12.4	<0.200	4.33	0.326
Be	<0.100	<0.100	<0.100	<0.100
Cd	<0.100	<0.100	<0.100	<0.100
Co	<0.100	<0.100	<0.100	<0.100
Cr	10.7	<0.200	9.33	0.222
Cu	4.65	0.256	1.06	1.44
Mn	37.7	0.456	0.911	34.7
Ni	4.88	0.582	4.68	0.606
P	28.9	<3.00	<3.00	55.3
Pb	<0.200	0.393	<0.200	0.265
Sb	4.77	<0.400	4.18	<0.400
Se	4.18	<0.300	4.35	<0.300
Tl	<0.200	<0.200	<0.200	<0.200
Zn	10.1	1.26	2.60	2.03

Note: Method 29 reagents were prepared from the same lots for the testing conducted on the parallel flow drier and the counter flow drier, therefore, only one set of reagent blanks were submitted for analysis. Reprints of the reagent blank analysis results are presented in Appendix C.2. These reagent blanks were submitted along with the samples collected during testing on the counter flow drier.

TABLE 6.12

**METHOD 29 MERCURY SPIKE ANALYSIS QC DATA
ASPHALT PLANT "B" - CARY, NC**

Sample ID	Spike Amount (μg)	Recovery (%)	Recovery Limits (%)
Lab Control Spikes			
LCS1	5	100	80-120
LCS1 Dup	5	98	80-120
LCS 2	5	107	80-120
LCS 2 Dup	5	109	80-120
LCS 3	5	100	80-120
LCS 3 Dup	5	97	80-120
Matrix Spikes			
R-M29-O-1	5	50	80-120
R-M29-O-1 Dup	5	51	80-120
R-M29-O-2	5	58	80-120
R-M29-O-2 Dup	5	54	80-120
R-M29-O-FB	5	99	80-120
R-M29-O-FB Dup	5	102	80-120
R-M29-I-1	5	52	80-120
R-M29-I-1 Dup	5	53	80-120
R-M29-I-2	5	163	80-120
R-M29-I-2 Dup	5	159	80-120
R-M29-I-3	5	169	80-120
R-M29-I-3 Dup	5	172	80-120

TABLE 6.13**METHOD 29 MERCURY FIELD BLANK ANALYSIS QC DATA
ASPHALT PLANT "B" - CARY, NC**

Sample ID	Recovered Amount (μg)
FH	< 0.400
FH - Dup	< 0.400
BH	< 0.300
BH- Dup	< 0.300
HNO3	< 0.300
HNO3 - Dup	< 0.300
KMnO4	< 1.60
KmnO4 - Dup	< 1.60
HCl	< 0.200
HCl - Dup	< 0.200

APPENDIX A
PROCESS DATA

Appendix A: Process Data

ASPHALT PLANT "B"

Test Run 1

Test Date: August 27, 1997

Total Test Time: 5.6 hrs

Time	Event	Product Type	Asphalt Concrete Production		Asphalt Temp. (oF)	Aggregate Use		RAP Use		Asphalt Cement Use		Calculated Conditioner Use	
			Rate (TPH)	Total (tons)		Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)
0940		RI-2	210	547	297	159	418	39	102	12.9	28	0	0
1000	*	RI-2	209	600	297	159	457	37	112	12.7	31	0	0
1015		RI-2	208	631	309	159	481	37	118	12.6	32	0	0
1030		RI-2	209	684	303	158	521	38	128	12.8	35	0	0
1045		RI-2	210	736	296	159	560	38	138	12.7	38	0	0
1100		RI-2	209	788	310	158	600	39	147	12.6	40	0	0
1115		RI-2	208	840	301	158	640	38	157	12.7	43	0	0
1130	*	RI-2	209	892	301	158	679	39	167	12.7	46	0	0
1145		RI-2	208	928	320	158	707	37	174	12.7	48	0	0
1200		RI-2	211	976	304	159	743	40	183	12.9	50	0	0
1215		RI-2	209	1,028	301	159	782	37	193	12.8	53	0	0
1230		RI-2	210	1,080	296	159	822	38	203	12.8	55	0	0
1245		RI-2	211	1,133	292	159	862	39	213	12.9	58	0	0
1300		RI-2	212	1,185	330	160	902	39	223	12.9	61	0	0
1315		RI-2	209	1,238	292	160	942	37	233	12.7	64	0	0
1330		RI-2	207	1,290	305	159	981	36	243	12.5	66	0	0
1345	*	RI-2	211	1,343	293	161	1,022	37	253	12.9	69	0	0
1415		RI-2	206	1,422	290	158	1,081	35	268	12.8	73	0	0
1430		RI-2	211	1,474	297	161	1,120	37	278	12.9	76	0	0
1445	*	RI-2	149	1,511	296	113	1,149	18	285	9.2	78	0	0
1500		RI-2	151	1,549	292	114	1,177	28	292	9.2	80	0	0
1516		RI-2	149	1,586	308	113	1,206	26	299	9.1	82	0	0

Appendix A: Process Data

ASPHALT PLANT "B"

Test Run 1

Test Date: August 27, 1997

Total Test Time: 5.6 hrs

Time	Event	Product Type	Asphalt Concrete Production		Asphalt Temp. (oF)	Aggregate Use		RAP Use		Asphalt Cement Use		Calculated Conditioner Use	
			Rate (TPH)	Total (tons)		Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)
Total				1,039			788		197		54		0
Mean			201		301	153		36		12.3		0	
St. Dev			21		9	16		5		1.2		0	
Min			149		290	113		18		9.1		0	
Max			212		330	161		40		12.9		0	

*See Table 4 for a description of these events.

Appendix A: Process Data

ASPHALT PLANT "8"

Test Run 1

Test Date: August 27, 1997

Total Test Time: 5.6 hrs

Time	Event	Product Type	Fabric Filter			Fuel Use (gal)	Visible Emissions
			Inlet Temp. (oF)	Outlet Temp. (oF)	Pressure Drop (in. H ₂ O)		
0940		RI-2	345	270	0.8	77564	none
1000	*	RI-2	340	270	0.8	77656	none
1015		RI-2	365	270	0.8	77719	none
1030		RI-2	350	285	0.9	77815	none
1045		RI-2	340	270	0.9	77911	none
1100		RI-2	350	270	0.9	78003	none
1115		RI-2	350	270	0.9	78113	none
1130	*	RI-2	350	280	0.9	78201	none
1145		RI-2	330	235	1.2	78260	none
1200		RI-2	350	275	1.1	78375	none
1215		RI-2	340	280	1.0	78448	none
1230		RI-2	340	270	1.0	78577	none
1245		RI-2	340	270	1.0	78648	none
1300		RI-2	335	270	1.0	78749	none
1315		RI-2	335	270	1.0	78837	none
1330		RI-2	350	270	0.8	78923	none
1345		RI-2	340	270	0.8	79020	none
1415		RI-2	350	260	0.9	79154	none
1430		RI-2	330	280	1.0	79258	none
1445	*	RI-2	350	270	1.0	79325	none
1500		RI-2	345	275	1.0	79404	none
1516		RI-2	350	285	1.0	79470	none

Appendix A: Process Data

ASPHALT PLANT "B"

Test Run 1

Test Date: August 27, 1997

Total Test Time: 5.6 hrs

Time	Event	Product Type	Fabric Filter			Fuel Use (gal)	Visible Emissions
			Inlet Temp. (oF)	Outlet Temp. (oF)	Pressure Drop (in. H2O)		
Total						1,906	
Mean			344	271	0.9		
St. Dev			8	10	0.1		
Min			330	235	0.8		
Max			365	285	1.2		

*See Table 4 for a description of these events.

Appendix A: Process Data

ASPHALT PLANT "B"

Test Run 2

Test Date: August 28, 1997

Total Test Time: 6.7 hrs

Time	Event	Product Type	Asphalt Concrete Production		Asphalt Temp. (oF)	Aggregate Use		RAP Use		Asphalt Cement Use		Calculated Conditioner Use	
			Rate (TPH)	Total (tons)		Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)
0746		RI-2	194	86	295	146	66	37	15	11.7	4	0	0
0800		RI-2	193	116	298	145	90	36	21	11.8	6	0	0
0815		RI-2	192	164	294	147	126	34	30	11.7	8	0	0
0830		RI-2	195	212	288	148	163	36	39	11.7	11	0	0
0845		RI-2	197	261	299	149	200	36	48	12.0	13	0	0
0900	*	RI-2	195	310	306	149	237	34	57	12.0	16	0	0
0915		RI-2	198	341	300	150	260	36	63	12.1	17	0	0
0930		RI-2	206	390	285	150	298	43	73	12.6	20	0	0
0945		RI-2	200	440	299	151	336	37	82	12.2	22	0	0
1000		RI-2	199	490	299	151	372	36	92	12.1	25	0	0
1015		RI-2	198	540	299	151	411	35	101	12.2	27	0	0
1030		RI-2	199	589	302	151	449	36	110	12.1	30	0	0
1045		RI-2	198	639	301	151	487	35	120	12.2	33	0	0
1100	*	RI-2	204	689	297	153	525	39	129	12.3	35	0	0
1130		RI-2	199	755	296	152	575	35	142	12.2	38	0	0
1145		RI-2	203	805	321	153	613	38	152	12.2	41	0	0
1200		RI-2	201	856	307	154	651	35	161	12.2	44	0	0
1215		RI-2	201	906	309	152	689	37	171	12.2	46	0	0
1230		RI-2	203	957	304	154	728	37	180	12.3	49	0	0
1245		RI-2	198	1007	303	153	766	32	190	12.1	51	0	0
1300		RI-2	204	1058	284	154	805	38	200	12.3	54	0	0
1315		RI-2	203	1109	296	154	843	37	209	12.3	56	0	0
1330		RI-2	202	1159	305	153	881	36	219	12.2	59	0	0
1345	*	RI-2	195	1209	302	152	920	30	228	12.0	62	0	0
1415		RI-2	197	1278	293	150	972	35	241	12.0	65	0	0
1428		RI-2	198	1327	302	150	1009	36	250	12.0	68	0	0

Appendix A: Process Data

ASPHALT PLANT "B"

Test Run 2

Test Date: August 28, 1997

Total Test Time: 6.7 hrs

Time	Event	Product Type	Asphalt Concrete Production		Asphalt Temp. (oF)	Aggregate Use		RAP Use		Asphalt Cement Use		Calculated Conditioner Use	
			Rate (TPH)	Total (tons)		Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)
Total				1,241			943		235		64		0
Mean			199		299	151		36		12.1		0	
St. Dev			4		7	2		2		0.2		0	
Min			192		284	145		30		11.7		0	
Max			206		321	154		43		12.6		0	

*See Table 4 for a description of these events.

Appendix A: Process Data

ASPHALT PLANT "B"

Test Run 2

Test Date: August 28, 1997

Total Test Time: 6.7 hrs

Time	Event	Product Type	Fabric Filter			Fuel Use (gal)	Visible Emissions
			Inlet Temp. (oF)	Outlet Temp. (oF)	Pressure Drop (in. H2O)		
0746		RI-2	345	340	0.9	79777	none
0800		RI-2	340	260	0.8	79861	none
0815		RI-2	340	270	0.9	79947	none
0830		RI-2	330	255	0.9	80048	none
0845		RI-2	340	260	0.8	80118	none
0900	*	RI-2	350	270	0.9	80224	none
0915		RI-2	350	280	1.0	80284	none
0930		RI-2	330	285	1.0	80374	none
0945		RI-2	340	285	1.0	80485	none
1000		RI-2	350	280	1.0	80570	none
1015		RI-2	350	290	1.0	80655	none
1030		RI-2	350	285	1.0	80763	none
1045		RI-2	345	280	1.0	80854	none
1100	*	RI-2	350	290	1.0	80943	none
1130		RI-2	350	280	1.1	81068	none
1145		RI-2	360	300	1.0	81170	none
1200		RI-2	350	295	1.0	81261	none
1215		RI-2	350	290	1.0	81364	none
1230		RI-2	350	295	1.0	81461	none
1245		RI-2	340	285	1.0	81529	none
1300		RI-2	325	275	1.0	81611	none
1315		RI-2	335	275	0.5	81692	none
1330		RI-2	335	285	0.5	81776	none
1345	*	RI-2	340	290	0.5	81864	none
1415		RI-2	330	280	0.1	81978	none
1428		RI-2	340	275	0.9	82082	none

Appendix A: Process Data

ASPHALT PLANT "B"

Test Run 2

Test Date: August 28, 1997

Total Test Time: 6.7 hrs

Time	Event	Product Type	Fabric Filter			Fuel Use (gal)	Visible Emissions
			Inlet Temp. (oF)	Outlet Temp. (oF)	Pressure Drop (in. H2O)		
Total						2,305	
Mean			343	283	0.9		
St. Dev			8	16	0.2		
Min			325	255	0.1		
Max			360	340	1.1		

*See Table 4 for a description of these events.

Appendix A: Process Data

ASPHALT PLANT "B"

Test Run 3

Test Date: August 29, 1997

Total Test Time: 6.1 hrs

Time	Event	Product Type	Asphalt Concrete Production		Asphalt Temp. (oF)	Aggregate Use		RAP Use		Asphalt Cement Use		Calculated Conditioner Use	
			Rate (TPH)	Total (tons)		Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)
0809		I-2	130	28	344	122	28	0	0	8.1	1	0	0
0822		I-2	160	66	293	150	66	0	0	9.9	4	0	0
0837		Binder	150	102	310	143	102	0	0	6.8	6	0	0
0852		Binder	153	139	296	146	138	0	0	7.1	8	0	0
0907		Binder	154	175	296	147	175	0	0	7.0	9	0	0
0922		Binder	154	212	295	147	212	0	0	7.0	11	0	0
0937		Binder	155	249	296	148	249	0	0	7.2	13	0	0
0952		Binder	155	285	300	148	285	0	0	7.2	15	0	0
1007	*	Binder	188	329	297	179	329	0	0	8.7	17	0	0
1022		I-2	185	373	300	177	373	0	0	8.4	19	0	0
1037		I-2	194	419	291	182	419	0	0	12.0	22	0	0
1052		I-2	193	464	300	181	464	0	0	12.0	25	0	0
1107		I-2	195	509	302	183	509	0	0	12.1	28	0	0
1122		I-2	194	555	286	182	555	0	0	12.0	31	0	0
1137		I-2	194	600	288	182	600	0	0	12.0	34	0	0
1152		I-2	193	645	289	181	645	0	0	12.0	37	0	0
1207	*	I-2	194	691	297	182	691	0	0	12.0	40	0	0
1222		I-2	193	709	302	182	709	0	0	11.8	41	0	0
1237	*	I-2	132	749	334	124	749	0	0	8.2	44	0	0
1325		I-2	130	772	352	122	772	0	0	8.0	45	0	0
1337		I-2	130	788	293	122	788	0	0	8.0	46	0	0
1352		I-2	130	818	292	122	818	0	0	8.1	48	0	0
1407		I-2	131	819	307	123	849	0	0	8.1	50	0	0
1413		I-2	130	867	311	123	867	0	0	8.1	52	0	0

Appendix A: Process Data

ASPHALT PLANT "B"

Test Run 3

Test Date: August 29, 1997

Total Test Time: 6.1 hrs

Time	Event	Product Type	Asphalt Concrete Production		Asphalt Temp. (oF)	Aggregate Use		RAP Use		Asphalt Cement Use		Calculated Conditioner Use	
			Rate (TPH)	Total (tons)		Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)	Rate (TPH)	Total (tons)
Total				839			839		0		51		0
Mean			163		303	154		0		9.2		0	
St. Dev			26		17	25		0		2.0		0	
Min			130		286	122		0		6.8		0	
Max			195		352	183		0		12.1		0	

*See Table 4 for a description of these events.

Appendix A: Process Data

ASPHALT PLANT "B"

Test Run 3

Test Date: August 29, 1997

Total Test Time: 6.1 hrs

Time	Event	Product Type	Fabric Filter			Fuel Use (gal)	Visible Emissions
			Inlet Temp. (oF)	Outlet Temp. (oF)	Pressure Drop (in. H2O)		
0809		I-2	365	285	1.0	83174	none
0822		I-2	320	265	2.0	83250	none
0837		Binder	335	285	1.0	83317	none
0852		Binder	320	270	1.2	83394	none
0907		Binder	320	270	1.2	83444	none
0922		Binder	320	270	1.1	83508	none
0937		Binder	325	270	1.1	83572	none
0952		Binder	330	270	1.1	83638	none
1007	*	Binder	320	270	1.0	83711	none
1022		I-2	290	270	1.0	83784	none
1037		I-2	310	260	1.2	83872	none
1052		I-2	320	260	1.5	83927	none
1107		I-2	320	270	1.3	84055	none
1122		I-2	310	260	1.2	84171	none
1137		I-2	310	260	1.2	84209	none
1152		I-2	310	260	1.2	84305	none
1207	*	I-2	320	265	1.5	84404	none
1222		I-2	310	250	1.9	84434	none
1237	*	I-2	360	290	1.9	84512	none
1325		I-2	370	270	0.5	84556	none
1337		I-2	320	260	0.5	84600	none
1352		I-2	320	260	0.5	84657	none
1407		I-2	335	280	1.0	84728	none
1413		I-2	335	280	1.0	84794	

APPENDIX B
RAW FIELD DATA

Appendix B.1

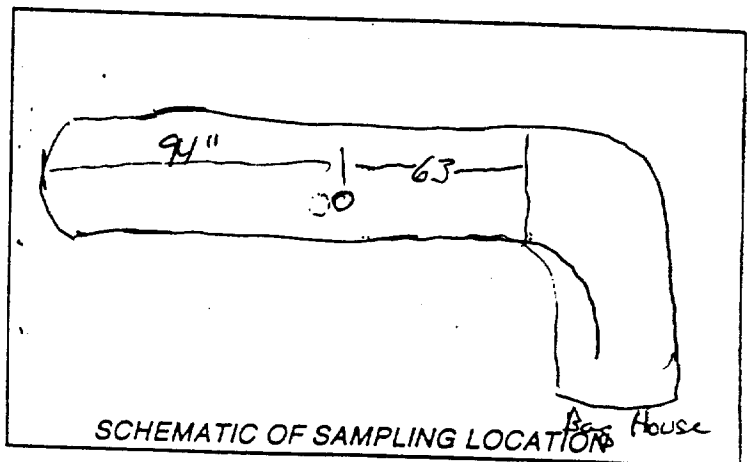
Raw Field Data

Baghouse Inlet



EPA METHOD 1 TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT ASPHALT PLANT "B"
CITY Carr STATE NC
SAMPLING LOCATION Inlet to bag house
INSIDE OF FAR WALL TO OUTSIDE
OF NIPPLE, (DISTANCE A) 57 3/4
INSIDE OF NEAR WALL TO OUTSIDE
OF NIPPLE, (DISTANCE B) 3 1/4
NEAREST UPSTREAM DISTURBANCE 94"
DISTURBANCE begin of pipe
NEAREST DOWNSTREAM DISTURBANCE 63"
DISTURBANCE 90° Bend
SAMPLER ADD/MH DATE 8-25-97



TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	2.1	54 1/4	1.14	3 1/4" _{8.25}	4.39 ~ 4 3/8
2	6.7		3.63		6.88 6 7/8
3	11.8		6.40		9.65 9 5/8
4	17.7		9.60		12.85 12 7/8
5	25.0		13.56		16.81 16 3/4
6	35.6		19.31		22.56 22 1/2
7	64.4		34.94		38.19 38 1/4
8	75.0		40.69		43.94 43 7/8
9	82.3		44.65		47.90 47 7/8
10	88.2		47.85		51.10 51 1/8
11	93.3		50.62		53.87 53 7/8
12	97.9		53.11		56.36 56 3/8

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: ASPHALT PLANT "B" Date: 8/26
 Sampling Location: Baghouse Inlet Clock Time: 8:00
 Run #: Preliminary Operators: MH/AD
 Barometric Pressure, in. Hg: 29.85 Static Pressure, in. H₂O: -1.8
 Moisture, %: 25% Molecular wt., Dry: Pitot Tube, Cp: 0.84
 Stack Dimension, in. Diameter or Side 1: Side 2:
 Wet Bulb, °F: Dry Bulb, °F:

Traverse Point Number	Velocity Head In. H ₂ O	Stack Temp. °F
A 1	0.44	
2	0.49	122
3	0.55	140
4	0.57	186
5	0.58	219 277
6	0.60	270 ✓
7	0.70 0.5	279
8	0.72 0.4	283
9	0.77 ✓	287
10	0.81 0.71	289
11	0.84 0.70	291
12	0.88 0.64	293
B 1	0.11	250
2	0.16	256
3	0.23	265
4	0.26	274
5	0.43	273
6	0.48	272
7	0.50	266
8	0.50	263
9	0.54	261
10	0.53	260
11	0.45	
12	0.41	
$\overline{\Delta P} = 0.686$		$\overline{T_s} = 271.8$

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$M_d = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$$

$$M_d =$$

$$M_s = M_d \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$$

$$M_s = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$$

$$M_s =$$

$$T_s = \quad ^\circ F = \quad ^\circ R (^\circ F + 480)$$

$$P_s = P_b + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$$

$$P_s = \quad \text{in. Hg}$$

$$\overline{\Delta P} =$$

$$V_s = 85.49 \times C_p \times \sqrt{\overline{\Delta P}} \times \sqrt{\frac{T_s (^\circ R)}{P_s \times M_s}}$$

$$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$$

$$V_s = \quad \text{ft/s}$$

$$A_s = \quad \text{ft}^2$$

$$Q_s = V_s \times A_s \times 60 \text{ s/m}$$

$$Q_s = \quad \times \quad \times 60$$

$$Q_s = \quad \text{acfm}$$

$$Q_{s, \text{std}} = Q_s \times 17.647 \times \frac{P_s}{T_s} \times (1 - \frac{\%H_2O}{100})$$

$$Q_{s, \text{std}} = \quad \times 17.647 \times \quad \times (1 - \frac{\quad}{100})$$

$$Q_{s, \text{std}} = \quad \text{dscfm}$$

0.286
 Adair
 Nozzle

COMMENTS:

GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M _d
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO ₂	5.2		5.2		5.2	5.2	5.2	44/100	
O ₂ (NET IS ACTUAL O ₂ READING MINUS ACTUAL CO ₂ READING)	18.3	12.1	18.3	13.1	18.3	13.1	13.1	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O ₂ READING)						-		28/100	
N ₂ (NET IS 100 MINUS ACTUAL CO READING)		81.7		81.7		81.7	81.7	28/100	
								TOTAL	

COMMENTS:

GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO ₂	4.0						4.0	44/100	
O ₂ (NET IS ACTUAL O ₂ READING MINUS ACTUAL CO ₂ READING)	19.2	15.2					15.2	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O ₂ READING)							80.8	28/100	
N ₂ (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

FIELD DATA SHEET

20 2.800
40 2.807
50 2.767
60 2.789
70 2.691
80 2.655
90 2.670
00 2.585
10 2.552
20 2.519

Plant: ASPHALT PLANT "E"
Sampling Location Inlet to bag house
Run Number: 1 Date: 8-27-97
Pretest Leak Rate: 0.008 cfm @ 18 in. Hg.
Pretest Leak Check: Pitot: 0.00 Orsat: _____

Sample Type: Pioxm Operator: AD/MH
Pbar: 29.8 Ps: -1.8
CO2: 6 O2: 15
Probe Length/Type: 5' / 1/2" L Pitot #: 5B
Stack Diameter: 54 1/2" L As: _____

Nozzle ID: 0.257 Thermocouple #: 5B
Assumed Bws: 15% Filter #: _____
Meter Box #: M5-4 Y: 1.021 ΔH @: 1.818
Post-Test Leak Rate: 0.007 cfm @ 25 in. Hg.
Post-Test Leak Check: Pitot: _____ Orsat: _____

[illegible]

Change of filter
Change of filter
Change of filter
Change of filter
Change of filter
Plant & CE down
Change of filter

Aux

50
46
46
49
53
49
52
53
57
50

$$\Delta V_m = \underline{\hspace{2cm}} \quad \sqrt{\Delta p} = \underline{\hspace{2cm}} \quad \Delta H = \underline{\hspace{2cm}} \quad T_s = \underline{\hspace{2cm}} \quad T_m = \underline{\hspace{2cm}}$$

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"						Run No.:	
Sample Date:			Filter No.(s):			Job No.:	
Sample Location: INLET #1							
Recovery Date:			XAD-2 Trap No.(s):				
Sample Recovery Person:							
Moisture Data							
Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	467.3	987.6	731.7	645.7	604.3	881.6	g
Initial wt.	425.0	422.5	704.7	700.6	599.6	870.5	g
Net wt.	42.3	565.3	27.0	(54.9)	4.7	11.1	g
Description: 5105							
Train System:							
Probe:							
Filter: Color -				Loading -			
Impinger Contents:							
Silica Gel: @Grams Used -				Color -		% Spent -	
Condensate Observed In Front Half:							
Recovered Sample Fractions							
Filter Container No.						marked/sealed:	
XAD Module Container No.:						marked/sealed:	
Probe (FH) & Back Half Rinse (Acetone) Container No.:						Liquid level marked/sealed:	
Probe (FH) & Back Half Rinse (Toluene) Container No.:						Liquid level marked/sealed:	
Impinger Contents Container No.:						Liquid level marked/sealed:	
Impinger Rinse (Acetone/MeCl2) Container No.:						Liquid level marked/sealed:	

FIELD DATA SHEET

Assumed Bws 32%

Pg 1022

Plant: ASPHALT PLANT 'B'

Sample Type: Dioxin Operator: ADD/MH

Nozzle ID: 0.194 Thermocouple #: 5B

Sampling Location: Inlet to bag house

Pbar: 29.60 Ps: -1.8

Assumed Bws: 32% Filter #:

Run Number: 2 Date: 8-28-97

CO2: 6 O2: 15

Meter Box #: M5-Y Y: 1.01 ΔH@: 1.818

Pretest Leak Rate: 0.008 cfm @ 20 in. Hg.

Probe Length/Type: 5' glass Pitot #: 5B

Post-Test Leak Rate: 0.002 cfm @ 12 in. Hg.

Pretest Leak Check: Pitot: 0.002 Orsat:

Stack Diameter: 54 1/2 As:

Post-Test Leak Check: Pitot: Orsat:

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vn) ft ³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)	AUX
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)		
A 12	0	9:08	781.744											
11	10	9:18	785.49	0.71	0.42	0.42	309	230	257	63	85	83	1.0	52
10	20	9:28	789.03	0.64	0.38	0.38	311	229	255	52	90	84	3.0	52
10	30	9:28	789.03	0.55	0.33	0.33	299	231	254	50	93	85	3.5	52
9	40	9:38	792.33	0.56	0.34	0.34	306	230	253	52	94	88	5.0	53
8	50	9:48	795.73	0.47	0.28	0.28	312	232	252	53	96	89	5.5	52
7	100	9:58	798.82	0.38	0.23	0.23	309	233	254	51	96	89	6.5	50
6	110	10:08	801.66	0.49	0.29	0.29	311	240	252	51	98	90	6.0	50
5	120	10:18	804.75	0.67	0.40	0.40	312	241	258	51	99	92	8.5	50
4	130	10:28	808.35	0.65	0.39	0.39	307	242	251	52	99	93	11.0	51
3	140	10:38	811.94	0.64	0.39	0.39	293	240	251	52	100	94	12.0	51
2	150	10:48	815.69	0.58	0.35	0.35	304	235	249	55	99	94	12.0	51
1	160	10:58	819.08	0.56	0.33	0.33	313	232	250	56	100	98	12.0	51
B 1	170	11:08	822.455	0.24	0.14	0.14	312	231	240	67	101	97	1.0	54
2	180	11:38	828.30	0.27	0.17	0.17	315	229	245	65	105	99	1.0	54

ΔVm=

√Δp=

ΔH=

Ts=

Tm=

Filter Change
leak
2.008
2.009

Plant Name: ASPHALT PLANT "B"Test Date: 8-28-87Run Number: 2Operator: D/MH

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_1) ft ³	Velocity Head (P_v) in. H ₂ O	Orifice Pres. Differential (ΔP) in. H ₂ O		Stack Temp. °F (T)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum in. Hg	
					Desired	Actual				Inlet (T _{in}) °F	Outlet (T _{out}) °F		
0	1							1					AUX
3	140	1348	830.72	0.24	0.15	0.15	305	232 / 247	65	108	102	2.0	55
		1345						1					
4	150	1408	833.14	0.24	0.16	0.16	294	233 / 251	67	106	104	2.0	56
								1					
5	160	1418	838.53	0.18	0.12	0.12	290	233 / 250	67	105	106	2.0	54
								1					
6	170	1428	837.950	~END OF RUN				1					
								1					
7	180							1					
								1					
8	190							1					
								1					
9	200							1					
								1					
10	210							1					
								1					
11	220							1					
								1					
22	230							1					
								1					
	240							1					
								1					
								1					

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: <u>ASPHALT PLANT "B"</u>						Run No.:	
Sample Date: <u>8/28/97</u>			Filter No.(s):			Job No.:	
Sample Location: <u>FIELD BLK INLET RUN 2</u>							
Recovery Date:			XAD-2 Trap No.(s):				
Sample Recovery Person:							
Moisture Data							
Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	<u>852.8</u>	<u>528.9</u>	<u>705.7</u>	<u>705.3</u>	<u>604.6</u>	<u>868.5</u>	g
Initial wt.	<u>487.8</u>	<u>427.8</u>	<u>705.1</u>	<u>704.3</u>	<u>602.8</u>	<u>855.2</u>	g
Net wt.	<u>365.0</u>	<u>13.2</u>	<u>0.6</u>	<u>1.0</u>	<u>1.8</u>	<u>13.3</u>	g
		<u>515.7</u>	Description		<u>TOTAL = 414.9 g</u>		
Train System:							
Probe:							
Filter: Color -				Loading -			
Impinger Contents:							
Silica Gel: @Grams Used -				Color -		% Spent -	
Condensate Observed In Front Half:							
Recovered Sample Fractions							
Filter Container No.						marked/sealed:	
XAD Module Container No.:						marked/sealed:	
Probe (FH) & Back Half Rinse (Acetone) Container No.:						Liquid level marked/sealed:	
Probe (FH) & Back Half Rinse (Toluene) Container No.:						Liquid level marked/sealed:	
Impinger Contents Container No.:						Liquid level marked/sealed:	
Impinger Rinse (Acetone/MeCl2) Container No.:						Liquid level marked/sealed:	

0% moisture

K

FIELD DATA SHEET

1. m23-3

0.666

0.657

0.648

0.640

0.632

0.612

0.600

0.588

0.576

0.564

0.552

0.540

0.528

0.516

0.504

0.492

0.480

0.468

0.456

0.444

0.432

0.420

0.408

0.396

0.384

0.372

0.360

0.348

0.336

0.324

0.312

0.300

0.288

0.276

0.264

0.252

0.240

0.228

0.216

0.204

0.192

0.180

0.168

0.156

0.144

0.132

0.120

0.108

0.096

0.084

0.072

0.060

0.048

0.036

0.024

0.012

0.000

Plant: ASPHALT PLANT "B"

Sample Type: Dioxin Operator: ADD/MHNozzle ID: 0.194 Thermocouple #: 58Sampling Location: Inlet to bag housePbar: 29.60 Ps: -1.8Assumed Bws: 28 Filter #: Run Number: 3 Date: 8-29-97CO2: 15 O2: 6Meter Box #: M5-4Y: 1.021 ΔH@: 1.818Pretest Leak Rate: 0.006 cfm @ 15" in. Hg.Probe Length/Type: 6' Glass Pitot #: 5BPost-Test Leak Rate: 0.009 cfm @ 28 in. Hg.Pretest Leak Check: Pitot: 0.000 Orsat: NAStack Diameter: 5 1/2 As: Post-Test Leak Check: Pitot: 0.001 Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vn) ft ³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
B 1	0	8:18	838.235	0.35	0.16	0.16	288	249	251	58	83	77	1.5
2	10	8:20	846.57	0.39	0.24	0.24	348	249	253	58	83	77	1.5
3	20	8:38	843.33	0.30	0.19	0.19	305	238	251	59	85	79	1.5
4	30	8:48	845.81	0.25	0.16	0.16	294	266	255	64	88	81	1.5
5	40	8:58	848.69	0.24	0.16	0.16	291	243	255	57	89	83	2.0
6	50	9:08	850.54	0.29	0.19	0.19	290	241	253	54	91	85	2.0
7	60	9:18	853.14	0.49	0.32	0.32	289	241	255	58	91	85	3.0
8	70	9:28	856.25	0.63	0.41	0.41	292	235	254	53	94	87	4.0
9	80	9:38	859.92	0.69	0.45	0.45	290	232	258	55	97	90	5.5
10	90	9:48	863.79	0.67	0.44	0.44	292	229	255	59	98	89	6.0
11	100	9:58	867.62	0.63	0.42	0.42	278	230	256	61	98	91	8.0
12	110	10:08	871.37	0.64	0.42	0.42	280	232	255	62	99	92	9.0
A 12	120	10:18	875.235	0.68	0.57	0.57	280	228	254	67	101	95	14.0
11	130	11:15	879.79	0.55	0.46	0.46	289	231	254	52	100	94	20.0
10	140	11:25	883.58	0.58	0.50	0.50	273	229	253	51	99	95	24.0
9	150	11:35	887.47	0.53	0.49	0.49	273	230	249	54	99	98	19.0
8	160	11:45	890.58	0.61	0.52	0.52	272	232	250	63	100	98	25.0
7	170	11:55	891.62	0.51	0.43	0.43	282	234	252	68	99	97	3.0
6	180	12:31	898.32	0.52	0.43	0.43	302	235	251	58	103	96	4.0
5	190	12:41	902.03	0.69	0.57	0.57	295	233	251	59	97	96	7.0
4	200	13:33	906.08	0.62	0.52	0.52	280	233	250	67	100	95	9.0
3	210	13:43	910.24	0.62	0.52	0.52	284	229	250	62	104	96	11.0
2	220	13:53	914.25	0.65	0.55	0.55	283	230	250	63	106	99	14.5
1	230	14:03	918.48	0.71	0.58	0.58	304	231	252	66	107	99	23.0
	240	14:13	922.663		END OF RUN								

ΔVm=

√Δp=

ΔH=

Ts=

Tm=

Aug

51

57

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METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: <u>ASPHALT PLANT "B"</u>						Run No.:	
Sample Date: <u>8/29/97</u>			Filter No.(s):			Job No.:	
Sample Location: <u>INLET RUN 3</u>							
Recovery Date:			XAD-2 Trap No.(s):				
Sample Recovery Person:							
Moisture Data							
Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	<u>488.4</u>	<u>900.2</u>	<u>657.4</u>	<u>642.3</u>	<u>601.7</u>	<u>928.8</u>	g
Initial wt.	<u>455.9</u>	<u>428.8</u>	<u>718.4</u>	<u>715.4</u>	<u>600.0</u>	<u>907.3</u>	g
Net wt.	<u>32.5</u>	<u>471.4</u>	<u>(61.0)</u>	<u>(73.1)</u>	<u>1.7</u>	<u>21.5</u>	g
Description						<u>393.0g</u>	
Train System:							
Probe:							
Filter: Color -				Loading -			
Impinger Contents:							
Silica Gel: @Grams Used -				Color -		% Spent -	
Condensate Observed In Front Half:							
Recovered Sample Fractions							
Filter Container No.						marked/sealed:	
XAD Module Container No.:						marked/sealed:	
Probe (FH) & Back Half Rinse (Acetone) Container No.:						Liquid level marked/sealed:	
Probe (FH) & Back Half Rinse (Toluene) Container No.:						Liquid level marked/sealed:	
Impinger Contents Container No.:						Liquid level marked/sealed:	
Impinger Rinse (Acetone/MeCl2) Container No.:						Liquid level marked/sealed:	

250	2.8
240	2.8
250	2.7
260	2.7
270	2.7
310	2.5

Nº 1

Nozzle ID: 0,256 Thermocouple #: T5C
Assumed Bws: _____ Filter #: SEE RECOVERY
Meter Box #: MS-9 Y: 1.016 ΔH @: 1.776
Post-Test Leak Rate: 0.001 cfm @ 28 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: N/A

[illegible]

ack
neck 7
1096
~~9216~~
119,562
EE *
3ACIK

97. $\Delta V_m =$ $\sqrt{\Delta p_m} =$ $\Delta H =$ $T_0 =$ $T_m =$

MULTI-METALS SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"			Run No.: 1		
Date: 8/27/97		Sample Box No.:		Job No.:	
Sample Location: INLET					
Sample Type: M29					
Sample Recovery Person: J. MORGAN					
Container	Description	Volume, ml	Sealed/Level Marked		
Front Half					
1	Filter No.(s) M97-10,11,12,14,15	N/A	yes		
2	Acetone Rinse	456.6	yes / yes		
3	Nitric Rinse	264.0	yes / yes		
Back Half					
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter	750.3+359.6	yes / yes		
5A	Nitric Rinse - Impinger No. 4	② ∅	yes / yes		
5B	KMNO4/H2O Rinse - Impingers 5 & 6				
5C	HCl Rinse - Impingers 5 & 6				
Moisture Data					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	Knockout	∅	693.6	1053.3	359.7
2	5%/10%	100	762.2	807.5	45.3
3	5%/10%	100	710.0	717.5	7.5
4	Knockout	∅	603.0	718.5	115.5
5	KMnO4	100	① 727.3 682.8 gm	683.4	-43.8
6	KMnO4	100	731.0	661.6	-69.4
7	SG	N/A	311.3	819.0	7.7
Total					422.5 ✓
Comments: ① Changed due to leaking impinger					
② Number 5 impinger contents					

Q 28% 0.63
W₂₀

FIELD DATA SHEET

Plant: ASPHALT PLANT "B"
 Sampling Location: INLET
 Run Number: 2 Date: 8/28/97
 Pretest Leak Rate: 0.003 cfm @ 26 in. Hg.
 Pretest Leak Check: Pitot: ☒ Orsat: N/A

Sample Type: MZ9 Operator: JEB
 Pbar: 29.6 Ps: -1.8
 CO2: _____ O2: _____
 Probe Length/Type: 5' GLASS Pitot #: PSC
 Stack Diameter: _____ As: _____

Nozzle ID: 0.194 Thermocouple #: TSC
 Assumed Bws: 32 Filter #: SEE RECOVERY
 Meter Box #: M5-9 Y: 1.016 ΔH@: 1.776
 Post-Test Leak Rate: 0.012 cfm @ 16 in. Hg.
 Post-Test Leak Check: Pitot: ☒ Orsat: N/A

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vn) ft ³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
B 1	0	1019	171.670										
2	10	1029	174.26	0.32	0.18	0.18	306	261	257	67	95	95	1
3	20	1036	177.02	0.38	0.22	0.22	309	260	254	61	97	95	3
4	30	1049	179.98	0.42	0.24	0.24	304	260	259	61	100	97	4
5	40	1059	182.85	0.47	0.24	0.24	309	262	260	62	102	99	4
6	50	1101	185.72	0.41	0.24	0.24	308	257	257	64	103	100	6
7	60	1109	188.60	0.41	0.24	0.24	312	260	260	53	104	101	7
8	70	1119	192.19	0.63	0.37	0.37	316	261	259	51	105	103	11
9	80	1129	195.698 / 196.564	0.7693	0.44	0.44	314	258	233	64	103	103	2
10	90		200.62	0.7293	0.44	0.42	312	262	242	62	103	103	3
11	100		204.37	0.70	0.41	0.41	314	246	247	66	104	103	4
12	110		208.13	0.66	0.40	0.40	334	246	244	62	105	103	5
A	120	1300	211.810	0.64	0.40	0.40	293	230	242	60	102	103	5
	130	1310	216.21	0.52	0.33	0.33	203	233	242	52	105	103	7
	140	1320	219.67	0.42	0.25	0.25	312	234	243	52	105	103	8
	150	1330	222.58	0.40	0.25	0.25	312	233	243	53	103	102	8
	160	1340	225.46	0.41	0.26	0.26	310	234	245	53	104	102	9
	170	1350	228.17	0.35	0.22	0.19	306	235	245	53	103	102	8
	180	1400	231.08	0.37	0.23	0.23	303	234	243	55	105	103	9
	190		234.32	0.52	0.32	0.32	234	234	242	57	106	105	9
	200		237.676	0.53	0.33	0.33	299	230	243	53	104	104	13
	210												
	220												
	230												
	240												

ΔVm= _____ √Δp= _____ ΔH= _____ Ts= _____ Tm= _____

MULTI-METALS SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"		Run No.: 2			
Date: 8/28/97	Sample Box No.:		Job No.:		
Sample Location: INLET					
Sample Type: M29					
Sample Recovery Person: J. MORGAN					
Container	Description	Volume, ml	Sealed/Level Marked		
Front Half					
1	Filter No.(s)				
2	Acetone Rinse				
3	Nitric Rinse				
Back Half					
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter				
5A	Nitric Rinse - Impinger No. 4				
5B	KMNO ₄ /H ₂ O Rinse - Impingers 5 & 6				
5C	HCl Rinse - Impingers 5 & 6				
Moisture Data					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	EMPTY	φ	697.0	1140.5	443.5
2	5% / 10%	100	731.8	752.6	20.8
3	5% / 10%	100	674.5	676.1	1.6
4	EMPTY	φ	623.7	624.4	0.7
5	KMnO ₄	100	715.0	716.7	1.7
6	KMnO ₄	100	732.9	734.8	1.9
7	SG	N/A	863.9	878.7	14.8
Total					485.0 ✓
Comments:					

NUMBERED
NOTES ON
BACK

PORT A
IS WEST

N →
OUT

OUT
IN

FIELD DATA SHEET

K = 0.67

1520 420 K = 0.88

1-M29-3

Plant: ASPHALT PLANT "B"

Sampling Location: INLET

Run Number: 3 Date: 08/29/97

Pretest Leak Rate: 0.004 cfm @ 26 in. Hg.

Pretest Leak Check: Pitot: ✓ Orsat: N/A

Sample Type: M29 Operator: JEB

Pbar: 29.6 Ps: -1.8

CO2: O2:

Probe Length/Type: 5' GLASS Pitot #: P56

Stack Diameter: As:

Nozzle ID: 0.196 Thermocouple #: T5C

Assumed Bws: 28 Filter #: SBE 2 GLOVER

Meter Box #: M5-9 Y: 1016 ΔH@: 1.776

Post-Test Leak Rate: 0.012 cfm @ 25 in. Hg.

Post-Test Leak Check: Pitot: ✓ Orsat: N/A

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vn) ft ³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
A 1	0	0819	238.194										
2	10		242.62	0.90	0.60	0.60	283	235	239	48	79	78	2
3	20		246.65	0.73	0.49	0.49	337	257	240	43	86	81	3
4	30		250.49	0.73	0.49	0.49	302	258	240	45	91	85	4
5	40		254.19	0.56	0.38	0.38	293	242	241	47	94	89	4
6	50		257.56	0.54	0.36	0.36	292	248	243	44	95	91	5
7	1:00		260.99	0.48	0.24	0.32	292	246	240	51	96	93	5
8	1:10		264.45	0.55	0.37	0.37	291	244	239	51	99	95	6
9	1:20		268.38	0.70	0.47	0.47	293	239	240	51	99	96	7
10	1:30		272.31	0.67	0.45	0.45	292	233	241	51	99	96	9
11	1:40		276.17	0.67	0.45	0.45	296	240	242	50	100	97	10
12	1:50		279.55	0.45	0.30	0.30	278	266	242	52	99	97	10
B 1	2:00	11:05	282.759 / 283.773	0.47	0.31	0.31	260	253	240	53	98	97	11
2	2:10		286.61	0.25	0.22	0.22	281	257	240	61	97	97	1
3	2:20		289.39	0.26	0.26	0.23	275	257	240	53	100	97	2
4	2:30		292.12	0.24	0.21	0.21	282	257	242	55	101	98	2
5	2:40		294.61	0.23	0.20	0.20	274	255	240	56	101	99	3
6	2:50		297.44	0.25	0.22	0.22	276	253	239	55	101	100	4
7	3:00	1232	300.317	0.26	0.23	0.23	278	232	242	55	103	100	5
8	3:10		304.14	0.48	0.42	0.42	306	232	243	55	101	101	5
9	3:20		308.15	0.63	0.55	0.55	300	230	245	58	98	99	6
10	3:30		312.86	0.89	0.70	0.70	284	246	244	51	100	98	11
11	3:40		317.34	0.72	0.63	0.63	283	256	243	52	101	99	15
12	3:50		321.15	0.70	0.61	0.61	283	234	238	55	100	100	21
	4:00		324.606	0.54	0.48	0.40	303	229	238	60	100	100	24

ΔVn=

√Δp=

ΔH=

Ts=

Tm=

MULTI-METALS SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"			Run No.: 3		
Date: 8/29/97		Sample Box No.:		Job No.:	
Sample Location: INLET					
Sample Type: M29					
Sample Recovery Person: T. THOMPSON					
Container	Description	Volume, ml	Sealed/Level Marked		
Front Half					
1	Filter No.(s)				
2	Acetone Rinse				
3	Nitric Rinse				
Back Half					
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter				
5A	Nitric Rinse - Impinger No. 4				
5B	KMNO4/H2O Rinse - Impingers 5 & 6				
5C	HCl Rinse - Impingers 5 & 6				
Moisture Data					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	EMPTY	0	699.7	1059.0	359.3
2	5%/10%	100	738.1	757.4	19.3
3	5%/10%	100	679.9	682.0	2.1
4	EMPTY	0	627.0	630.6	3.6
5	KMnO4	100	716.5	716.3	(0.2)
6	KMnO4	100	734.1	734.6	0.5
7	SIL. GEL	✓	878.7	898.0	19.3
Total					403.9
Comments:					

Appendix B.2

Raw Field Data

Baghouse Outlet

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: ASPHALT PLANT "B" Date: B-26-97
 Sampling Location: STACK Clock Time: 0830
 Run #: Velocity Operators: MAH
 Barometric Pressure, in. Hg: _____ Static Pressure, in. H₂O: -32
 Moisture, %: 26% Molecular wt., Dry: _____ Pitot Tube, Cp: 84
 Stack Dimension, in. Diameter or Side 1: 33 Side 2: 49
 Wet Bulb, °F: _____ Dry Bulb, °F: _____

Cyclonic etc c/w

Traverse Point Number	Velocity Head in. H ₂ O	Stack Temp. °F
A 1		
2		
3		
4		
B 1	2.3	275
2	2.3	275
3	2.1	279
4	1.7	281
C 1	1.2	279
2	1.4	283
3	1.5	283
4	1.5	285
D 1	.66	280
2	.76	281
3	.81	280
4	.9	281
E 1	.51	279
2	.41	279
3	.40	279
4	.34	277
F 1	.35	273
2	.39	272
3	.36	272
4	.32	272
$\overline{\Delta P} = .949$		$\overline{T_s} = 278$

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$M_d = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$$

$$M_d =$$

$$M_s = M_d \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$$

$$M_s = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$$

$$M_s =$$

$$T_s = \quad ^\circ F = \quad ^\circ R (^\circ F + 460)$$

$$P_s = P_b + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$$

$$P_s = \quad \text{in. Hg}$$

$$\overline{\Delta P} =$$

$$V_s = 85.49 \times C_p \times \sqrt{\overline{\Delta P}} \times \sqrt{\frac{T_s (P_b)}{P_s \times M_s}}$$

$$V_s = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$$

$$V_s = \quad \text{ft/s}$$

$$A_s = \quad \text{ft}^2$$

$$Q_s = V_s \times A_s \times 60 \text{ s/m}$$

$$Q_s = \quad \times \quad \times 60$$

$$Q_s = \quad \text{acfm}$$

$$Q_{s, \text{std}} = Q_s \times 17.847 \times \frac{P_s}{T_s} \times (1 - \frac{\%H_2O}{100})$$

$$Q_{s, \text{std}} = \quad \times 17.847 \times \quad \times (1 - \frac{\quad}{100})$$

$$Q_{s, \text{std}} = \quad \text{dscfm}$$

11

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO ₂	4.9	4.9	4.9	4.9	4.9	4.9	4.9	44/100	
O ₂ (NET IS ACTUAL O ₂ READING MINUS ACTUAL CO ₂ READING)	18.5	13.6	18.5	13.6	18.5	13.6	13.6	32/100	
CO(NET IS ACTUAL CO READING MINUS ACTUAL O ₂ READING)		—						28/100	
N ₂ (NET IS 100 MINUS ACTUAL CO READING)		81.5		81.5		81.5	81.5	28/100	
								TOTAL	

COMMENTS:

RUN GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO ₂	3.0						3.0	44/100	
O ₂ (NET IS ACTUAL O ₂ READING MINUS ACTUAL CO ₂ READING)	19.3	16.3						32/100	
CO(NET IS ACTUAL CO READING MINUS ACTUAL O ₂ READING)								28/100	
N ₂ (NET IS 100 MINUS ACTUAL CO READING)							89.7	28/100	
								TOTAL	



Visible Emission Observation Form

1 A

SOURCE NAME Baghouse Exit			OBSERVATION DATE 8-27-97				START TIME 10:22				STOP TIME 11:22			
ADDRESS Asphalt Plant "B" (West Raleigh Plant)			SEC MIN				SEC MIN							
New Chapel Hill Rd			0 15 30 45				0 15 30 45							
CITY Raleigh STATE NC ZIP			1 0 0 0 0				31 0 0 5 0							
PHONE SOURCE ID NUMBER			2 0 0 0 0				32 0 0 0 0							
PROCESS EQUIPMENT aggregate dryer OPERATING MODE			3 0 0 0 0				33 0 0 0 0							
CONTROL EQUIPMENT baghouse OPERATING MODE			4 0 0 0 0				34 0 0 0 0							
DESCRIBE EMISSION POINT START rectangular white stack STOP SAME			5 0 0 0 0				35 0 0 0 0							
HEIGHT ABOVE GROUND LEVEL START 35 ft STOP SAME			6 0 0 0 0				36 0 0 0 0							
HEIGHT RELATIVE TO OBSERVER START 15 ft STOP SAME			7 0 0 0 0				37 0 0 0 0							
DISTANCE FROM OBSERVER START 400 ft STOP SAME			8 0 0 0 0				38 0 0 5 0							
DIRECTION FROM OBSERVER START NNW STOP SAME			9 0 0 0 0				39 0 0 0 0							
DESCRIBE EMISSIONS START coming upward STOP SAME			10 0 0 0 0				40 0 0 0 0							
EMISSION COLOR START grey STOP SAME			11 0 5 0 0				41 0 0 0 0							
PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐			12 0 0 0 0				42 0 0 0 0							
WATER DROPLETS PRESENT: NO ☐ YES ☒			13 0 0 0 0				43 0 0 0 0							
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☒			14 0 0 0 0				44 0 0 0 0							
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 3-4 ft above exit STOP SAME			15 0 0 0 0				45 5 0 0 0							
DESCRIBE BACKGROUND START trees (softwoods) / sky STOP SAME			16 0 0 0 0				46 0 0 0 0							
BACKGROUND COLOR START green/blue STOP SAME			17 0 0 0 0				47 0 0 0 0							
SKY CONDITIONS START clear STOP SAME			18 0 0 0 0				48 0 0 0 0							
WIND SPEED START 1-3 mph STOP 0-2 mph			19 0 0 0 0				49 0 0 0 0							
WIND DIRECTION START NE STOP NE			20 0 0 0 0				50 0 0 0 0							
AMBIENT TEMP START 76 STOP 78			21 0 0 0 0				51 0 0 0 0							
WET BULB TEMP. 68 RH. percent 70			22 0 0 0 0				52 0 0 0 5							
Source Layout Sketch ↑ Highway 54 Draw North Arrow Kiln Silos Emission Point Observers Position Tree edge Sun location Line 140°			23 0 0 0 0				53 0 0 0 0							
			24 0 0 0 0				54 0 0 0 0							
			25 5 0 0 0				55 0 0 0 0							
			26 0 0 0 0				56 0 0 0 0							
			27 0 0 0 0				57 0 0 0 0							
			28 0 0 0 0				58 0 0 0 0							
			29 0 0 0 0				59 0 0 0 0							
			30 0 0 0 0				60 0 0 0 0							
COMMENTS 1 - obstruction of opacity readings			AVERAGE OPACITY FOR HIGHEST PERIOD 0.42				NUMBER OF READINGS ABOVE 0 % WERE 6							
			RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 5											
			OBSERVER'S NAME (PRINT) David G Goshaw											
			OBSERVER'S SIGNATURE				DATE 8-27-97							
			ORGANIZATION DEECO Inc											
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS			CERTIFIED BY ETA				DATE 3-14-97							
SIGNATURE			VERIFIED BY				DATE							
TITLE														
DATE														



Visible Emission Observation Form

1 B

SOURCE NAME			OBSERVATION DATE				START TIME				STOP TIME			
Baghouse Exit			8-27-97				11:25				12:25			
ADDRESS			SEC	0	15	30	45	SEC	0	15	30	45		
ASPHALT PLANT "B" (West Raleigh Plant)			MIN					MIN						
New Chapel Hill Rd			1	0	0	0	0	31	0	0	0	0		
CITY	STATE	ZIP	2	0	0	0	0	32	0	0	0	0		
Raleigh	NC	27608	3	0	0	0	0	33	0	0	0	0		
PHONE	SOURCE ID NUMBER		4	0	0	0	0	34	0	0	0	0		
PROCESS EQUIPMENT		OPERATING MODE	5	0	0	0	0	35	0	0	0	0		
aggregate dryer			6	0	0	0	0	36	0	0	0	0		
CONTROL EQUIPMENT		OPERATING MODE	7	0	0	0	0	37	0	0	0	0		
baghouse			8	0	0	0	0	38	0	0	0	5		
DESCRIBE EMISSION POINT			9	0	0	0	0	39	0	0	0	0		
START white rectangular stack STOP SAME			10	0	0	0	0	40	0	0	0	0		
HEIGHT ABOVE GROUND LEVEL	HEIGHT RELATIVE TO OBSERVER		11	0	0	0	0	41	0	0	0	0		
START 35 ft STOP SAME	START 15 ft STOP SAME		12	0	0	0	0	42	0	0	0	0		
DISTANCE FROM OBSERVER	DIRECTION FROM OBSERVER		13	5	0	0	0	43	0	0	0	0		
START 400 ft STOP SAME	START N/NW STOP SAME		14	0	0	0	0	44	0	0	0	0		
DESCRIBE EMISSIONS			15	0	0	0	0	45	0	0	0	0		
START coming STOP SAME			16	0	0	0	0	46	0	0	0	0		
EMISSION COLOR	PLUME TYPE: CONTINUOUS ☒		17	0	0	0	0	47	0	0	0	0		
START grey STOP SAME	FUGITIVE ☐ INTERMITTENT ☐		18	0	0	0	0	48	0	5	0	0		
WATER DROPLETS PRESENT:	IF WATER DROPLET PLUME:		19	0	0	0	0	49	0	0	0	0		
NO ☒ YES ☐	ATTACHED ☐ DETACHED ☐		20	0	0	0	0	50	0	5	0	0		
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED			21	0	0	0	0	51	0	0	0	0		
START 3-6 ft above exit STOP SAME			22	0	0	0	0	52	0	0	0	0		
DESCRIBE BACKGROUND			23	0	0	0	0	53	0	0	0	0		
START trees/sky STOP SAME			24	0	0	0	0	54	0	0	0	0		
BACKGROUND COLOR	SKY CONDITIONS		25	0	5	0	0	55	0	0	0	0		
START green/blue STOP SAME	START clear STOP SAME		26	0	0	5	0	56	0	0	0	0		
WIND SPEED	WIND DIRECTION		27	0	0	0	0	57	5	0	0	0		
START 0-2 mph STOP SAME	START NE STOP SAME		28	0	0	0	0	58	0	0	0	0		
AMBIENT TEMP	WET BULB TEMP.	RH. percent	29	0	0	0	0	59	0	0	0	0		
START 70 STOP 82	70	68	30	0	0	0	0	60	0	0	0	0		
Source Layout Sketch			AVERAGE OPACITY FOR HIGHEST PERIOD 0.42											
			NUMBER OF READINGS ABOVE 0.42 7											
Source Layout Sketch Kiln Emission Point Observers Position Sun Location Tree Edge RR 140°			RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 5											
COMMENTS			OBSERVER'S NAME (PRINT) David G Goshaw											
			OBSERVER'S SIGNATURE DATE 8-27-97											
			ORGANIZATION DEECO Inc											
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS			CERTIFIED BY ETA DATE 3-14-97											
SIGNATURE			VERIFIED BY DATE											
TITLE			DATE											



Visible Emission Observation Form

SOURCE NAME		OBSERVATION DATE		START TIME		STOP TIME	
Baghouse Exit		8-27-97		12:29		13:29	
ADDRESS		SEC		SEC			
ASPHALT PLANT "B" (West Raleigh Plant)		MIN		MIN			
New Chapel Hill Rd		0 15 30 45		0 15 30 45			
CITY Raleigh		STATE NC		ZIP			
PHONE		SOURCE ID NUMBER					
PROCESS EQUIPMENT		OPERATING MODE					
aggregate dryer							
CONTROL EQUIPMENT		OPERATING MODE					
baghouse							
DESCRIBE EMISSION POINT							
START white rectangular stack STOP SAME							
HEIGHT ABOVE GROUND LEVEL		HEIGHT RELATIVE TO OBSERVER					
START 35 ft STOP SAME		START 15 ft STOP SAME					
DISTANCE FROM OBSERVER		DIRECTION FROM OBSERVER					
START 400 ft STOP SAME		START N/NW STOP SAME					
DESCRIBE EMISSIONS							
START running STOP SAME							
EMISSION COLOR		PLUME TYPE: CONTINUOUS ☒					
START grey STOP SAME		FUGITIVE ☐ INTERMITTENT ☐					
WATER DROPLETS PRESENT:		IF WATER DROPLET PLUME:					
NO ☒ YES ☐		ATTACHED ☐ DETACHED ☐					
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED							
START 3.5 ft above exit STOP SAME							
DESCRIBE BACKGROUND							
START trees/sky STOP SAME							
BACKGROUND COLOR		SKY CONDITIONS					
START green/blue STOP SAME		START clear STOP SAME					
WIND SPEED		WIND DIRECTION					
START 1-3 mph STOP 0.3 mph		START N STOP NW					
AMBIENT TEMP		WET BULB TEMP.		RH. percent			
START 82 STOP 82.8		82.8		72			
Source Layout Sketch		Draw North Arrow					
AVERAGE OPACITY FOR HIGHEST PERIOD		NUMBER OF READINGS ABOVE					
0.625		0 % WERE 8					
RANGE OF OPACITY READINGS		MINIMUM		MAXIMUM			
		0		10			
OBSERVER'S NAME (PRINT)		David. Goshaw					
OBSERVER'S SIGNATURE		DATE					
		8-27-97					
ORGANIZATION		DEECO Inc					
CERTIFIED BY		ETA		DATE			
				3-14-97			
VERIFIED BY		DATE					

COMMENTS: 1 - indicates obstruction/interference during reading

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TITLE DATE

SLIGHTLY * SUN NOT DIRECTLY OVERHEAD. FEEL READING TO STILL BE ACCURATE.



Visible Emission Observation Form

10

SOURCE NAME				OBSERVATION DATE				START TIME				STOP TIME			
ADDRESS				SEC				SEC				SEC			
MIN				MIN				MIN				MIN			
Baghouse Exit				8-27-97				13:37				14:31			
ASPHALT PLANT "B" (West Raleigh Plant)				0				0				0			
New Chapel Hill Rd				15				15				15			
CITY Raleigh				STATE NC				ZIP				31			
PHONE				SOURCE ID NUMBER				32				32			
PROCESS EQUIPMENT				OPERATING MODE				33				33			
aggregate dryer								34				34			
CONTROL EQUIPMENT				OPERATING MODE				35				35			
bag house								36				36			
DESCRIBE EMISSION POINT				START				37				37			
white rectangular stack STOP SAME								38				38			
HEIGHT ABOVE GROUND LEVEL				HEIGHT RELATIVE TO OBSERVER				39				39			
START 35 ft STOP SAME				START 15 ft STOP SAME				40				40			
DISTANCE FROM OBSERVER				DIRECTION FROM OBSERVER				41				41			
START 400 ft STOP SAME				START NNW STOP SAME				42				42			
DESCRIBE EMISSIONS				START				43				43			
coning STOP SAME								44				44			
EMISSION COLOR				PLUME TYPE: CONTINUOUS ☒				45				45			
START grey STOP SAME				FUGITIVE ☐ INTERMITTENT ☐				46				46			
WATER DROPLETS PRESENT:				IF WATER DROPLET PLUME:				47				47			
NO ☒ YES ☐				ATTACHED ☐ DETACHED ☐				48				48			
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED				START				49				49			
3-6 ft above exit STOP SAME								50				50			
DESCRIBE BACKGROUND				START				51				51			
trees STOP SAME								52				52			
BACKGROUND COLOR				SKY CONDITIONS				53				53			
START green STOP SAME				START scattered STOP broken				54				54			
WIND SPEED				WIND DIRECTION				55				55			
START 0-3 mph STOP 1-3 mph				START NW STOP SAME				56				56			
AMBIENT TEMP.				WET BULB TEMP.				57				57			
START 86 STOP 89				79 73				58				58			
RH. percent								59				59			
Source Layout Sketch				Draw North Arrow				60				60			
								AVERAGE OPACITY FOR HIGHEST PERIOD				NUMBER OF READINGS ABOVE			
								1.04				0 % WERE 9			
								RANGE OF OPACITY READINGS							
								MINIMUM				MAXIMUM			
								0				5			
								OBSERVER'S NAME (PRINT)				David. Goshaw			
								OBSERVER'S SIGNATURE				DATE			
												8-27-97			
								ORGANIZATION				DEECO Inc			
								CERTIFIED BY				DATE			
								ETA				3-14-97			
								VERIFIED BY				DATE			

COMMENTS / - indicates interference of opacity reading

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*Break in process operation.
Re-test 11.12



Visible Emission Observation Form

1E

SOURCE NAME			OBSERVATION DATE				START TIME				STOP TIME					
Baghouse Exit			8-27-97				14:41				15:26					
ADDRESS			SEC				SEC									
ASPHALT PLANT "B" (West Raleigh Plant)			MIN				MIN									
New Chapel Hill Rd			0 15 30 45				0 15 30 45									
CITY		STATE	ZIP		1		2		3		4		5			
Raleigh		NC			0 0 0 0		31		/ /		0 0					
PHONE		SOURCE ID NUMBER		3		0 0 0 0		33		/ 0		0 0				
PROCESS EQUIPMENT		OPERATING MODE		4		0 0 0 0		34		0 / /		/ /				
aggregate dryer				5		/ / / 0		35		0 / 0		0 0				
CONTROL EQUIPMENT		OPERATING MODE		6		0 0 0 0		36		0 5 0		0 0				
baghouse				7		0 0 0 /		37		0 / /		/ /				
DESCRIBE EMISSION POINT			8		/ 0 0 5		38		/ 0 0		0 0					
START white rectangular stack STOP same			9		0 0 0 0		39		0 0 0		0 0					
HEIGHT ABOVE GROUND LEVEL		HEIGHT RELATIVE TO OBSERVER		10		0 0 0 0		40		0 0 0		0 0				
START 35 ft STOP same		START 15 ft STOP same		11		/ 0 0 0		41		0 0 0		0 0				
DISTANCE FROM OBSERVER		DIRECTION FROM OBSERVER		12		0 / 0 0		42		0 0 0		0 0				
START 400 ft STOP same		START NNW STOP same		13		0 0 0 0		43		0 0 0		/				
DESCRIBE EMISSIONS			14		0 0 0 0		44		0 0 0		0 0					
START coning STOP same			15		0 0 0 0		45		0 0 0		0 0					
EMISSION COLOR		PLUME TYPE: CONTINUOUS ☒		16		0 0 0 0		46								
START gray STOP same		FUGITIVE ☐ INTERMITTENT ☐		17		0 0 0 0		47								
WATER DROPLETS PRESENT:		IF WATER DROPLET PLUME:		18		0 0 0 0		48								
NO ☒ YES ☐		ATTACHED ☐ DETACHED ☐		19		0 0 0 0		49								
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED			20		0 0 0 0		50									
START 3-6 ft above exit STOP same			21		0 0 0 /		51									
DESCRIBE BACKGROUND			22		/ / 0 0		52									
START trees STOP same			23		0 0 0 0		53									
BACKGROUND COLOR		SKY CONDITIONS		24		0 0 0 5		54								
START green STOP same		START broken STOP same		25		0 0 5 /		55								
WIND SPEED		WIND DIRECTION		26		0 0 0 0		56								
START 0-3 mph STOP 0-2 mph		START SW STOP same		27		0 0 0 0		57								
AMBIENT TEMP		WET BULB TEMP.		28		0 0 0 0		58								
START 89 STOP 89.0		RH percent		29		0 0 0 0		59								
		77		30		0 0 0 0		60								
Source Layout Sketch			AVERAGE OPACITY FOR HIGHEST PERIOD		NUMBER OF READINGS ABOVE 0 % WERE											
Draw North Arrow			0.42%		4											
Emission Point			RANGE OF OPACITY READINGS		MINIMUM		MAXIMUM									
Sun Wind Plume and Stack			0		5											
Observers Position			OBSERVER'S NAME (PRINT)		David Goshaw											
TRES RR			OBSERVER'S SIGNATURE				DATE		8-27-97							
Sta Location Line			ORGANIZATION		DEECO Inc											
140°			CERTIFIED BY		ETA		DATE		3-14-97							
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SIGNATURE																
TITLE																
DATE																

END OF MANUAL METHOD RUN



Visible Emission Observation Form

2c

SOURCE NAME Baghouse Exit				OBSERVATION DATE 8-28-97				START TIME 10:10				STOP TIME 10:13					
ADDRESS Asphalt Plant "B" (West Raleigh Plant)				SEC MIN 0 15 30 45				SEC MIN 0 15 30 45									
New Chapel Hill Rd				1 0 0 0 0				31 0 1 1 0									
CITY Raleigh		STATE NC		ZIP		2 0 0 0 0		32 0 0 0 1									
PHONE		SOURCE ID NUMBER		3 0 0 0 0		33 1 0 0 0											
PROCESS EQUIPMENT aggregate dryer		OPERATING MODE		4 0 0 0 0		34 0 0 0 0											
CONTROL EQUIPMENT baghouse		OPERATING MODE		5 0 0 0 0		35 0 0 0 0											
DESCRIBE EMISSION POINT				6 0 0 0 5				36 0 0 0 0									
START white rectangular stack STOP same				7 1 1 0 0				37 0 0 0 0									
HEIGHT ABOVE GROUND LEVEL		HEIGHT RELATIVE TO OBSERVER		8 0 0 0 0				38 0 1 1 1									
START 35 ft STOP same		START 15 ft STOP same		9 0 0 0 0				39 0 0 0 0									
DISTANCE FROM OBSERVER		DIRECTION FROM OBSERVER		10 0 0 0 0				40 0 0 0 0									
START 400 ft STOP same		START WNW STOP same		11 1 1 0 0				41 0 0 0 0									
DESCRIBE EMISSIONS				12 1 0 0 0				42 0 0 0 0									
START coming upward STOP same				13 0 0 0 0				43 0 0 0 0									
EMISSION COLOR		PLUME TYPE: CONTINUOUS ☒		14 0 0 0 0				44 0 0 0 1									
START grey STOP same		FUGITIVE ☐ INTERMITTENT ☐		15 0 0 0 0				45 1 0 0 0									
WATER DROPLETS PRESENT: NO ☒ YES ☐		IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐		16 0 0 5 0				46 0 0 0 0									
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED				17 0 0 0 0				47 0 0 0 0									
START 3-6' above exit STOP same				18 0 10 0 0				48 0 0 0 0									
DESCRIBE BACKGROUND				19 0 0 0 0				49 0 0 0 0									
BACKGROUND COLOR		SKY CONDITIONS		20 0 1 0 0				50 0 0 0 0									
START green STOP same		START feathered STOP clear		21 0 0 0 0				51 0 0 0 0									
WIND SPEED		WIND DIRECTION		22 5 0 0 0				52 1 1 1 0									
START 2-5 mph STOP same		START East STOP same		23 0 0 0 0				53 1 0 0 0									
AMBIENT TEMP		WET BULB TEMP.		RH. percent		24 0 0 0 0				54 0 0 1 1							
START 82 STOP 85		76.8		88		25 0 0 0 0				55 0 0 0 0							
Source Layout Sketch Draw North Arrow				26 1 1 1 1				56 0 0 0 1									
				27 1 1 1 0				57 0 0 0 0									
				28 0 0 0 1				58 0 0 0 0									
				29 0 1 0 0				59 0 0 0 0									
				30 0 0 0 0*				60 0 0 0 0									
				AVERAGE OPACITY FOR HIGHEST PERIOD 0.83%				NUMBER OF READINGS ABOVE 0% WERE									
				RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 10													
				OBSERVER'S NAME (PRINT) David Goshaw													
				OBSERVER'S SIGNATURE				DATE 8-28-97									
				ORGANIZATION DEECO Inc													
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TITLE		DATE		VERIFIED BY		DATE											

* 3 min break



Visible Emission Observation Form

28

SOURCE NAME Baghouse Exit		OBSERVATION DATE 8-28-97				START TIME 9:00		STOP TIME 10:03			
ADDRESS ASPHALT PLANT "B" (West Raleigh Plant)		SEC MIN	0	15	30	45	SEC MIN	0	15	30	45
New Chapel Hill Rd		1	0	/	/	/	31	0	0	0	0
CITY Raleigh	STATE NC	2	0	0	0	0	32	0	0	5	0
PHONE	SOURCE ID NUMBER	3	0	0	0	0	33	0	0	0	0
PROCESS EQUIPMENT aggregate dryer		4	0*	0	5	0	34	0	/	/	0
OPERATING MODE		5	0	0	0	0	35	0	/	/	/
CONTROL EQUIPMENT baghouse		6	0	/	/	/	36	0	0	0	0
OPERATING MODE		7	/	/	/	0	37	0	0	0	0
DESCRIBE EMISSION POINT START white rectangular stack STOP SAME		8	0	0	0	0	38	0	0	0	0
HEIGHT ABOVE GROUND LEVEL START 35 ft STOP same	HEIGHT RELATIVE TO OBSERVER START 15 ft STOP same	9	0	0	0	0	39	0	0	0	0
DISTANCE FROM OBSERVER START 400 ft STOP SAME	DIRECTION FROM OBSERVER START NNW STOP same	10	0	0	10	0	40	0	0	0	0
DESCRIBE EMISSIONS START coning upward STOP same		11	0	0	0	0	41	0	0	0	0
EMISSION COLOR START grey STOP same	PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐	12	0	0	0	0	42	0	0	0	0
WATER DROPLETS PRESENT: NO ☒ YES ☐	IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	13	0	0	0	0	43	0	0	0	0
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 3-5 ft above exit STOP same		14	0	/	0	0	44	0	0	0	0
DESCRIBE BACKGROUND START trees STOP same		15	0	5	5	0	45	0	0	0	0
BACKGROUND COLOR START green STOP same	SKY CONDITIONS START clear STOP scattered	16	0	0	0	0	46	0	0	0	0
WIND SPEED START 0-2 mph STOP 2-5 mph	WIND DIRECTION START NE STOP E	17	0	0	0	0	47	0	0	0	0
AMBIENT TEMP START 77 STOP 82	WET BULB TEMP. 71	18	0	0	0	0	48	0	0	0	0
RH. percent 74		19	/	/	0	0	49	0	0	0	5
Source Layout Sketch ↑ plant entrance Draw North Arrow		20	0	0	0	0	50	0	0	0	/
		21	/	0	5	0	51	/	0	0	0
AVERAGE OPACITY FOR HIGHEST PERIOD 0.83%		22	0	0	0	0	52	0	0	0	0
NUMBER OF READINGS ABOVE 0% WERE 10		23	0	0	0	/	53	0	/	/	0
RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 10		24	0	0	0	0	54	0	0	0	0
OBSERVER'S NAME (PRINT) David Goshaw		25	0	0	0	0	55	0	0	0	5
OBSERVER'S SIGNATURE		26	0	0	0	0	56	/	0	0	0
DATE 8-28-97		27	0	0	0	5	57	0	0	0	0
ORGANIZATION DEECO Inc		28	/	0	0	0	58	0	5	0	0
CERTIFIED BY ETA		29	0	0	0	0	59	0	0	0	0
DATE 3-14-97		30	0	0	/	0	60	0	0	0	0
VERIFIED BY		COMMENTS slash indicates opacity readings interference I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE TITLE DATE									

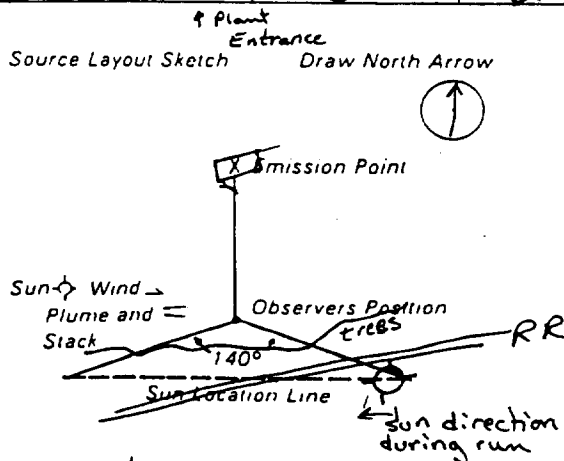
* kiln stopped
restart 9:08



Visible Emission Observation Form

2a

SOURCE NAME Baghouse Exit				OBSERVATION DATE 8-28-97				START TIME 7:52				STOP TIME 8:52			
ADDRESS ASPHALT PLANT "B" (West Raleigh Plant)				SEC MIN				SEC MIN							
New Chapel Hill Rd				0 15 30 45				0 15 30 45							
CITY Raleigh STATE NC ZIP				1 0 0 0 0				31 0 0 0 0							
PHONE				2 0 0 5 0				32 0 0 0 0							
SOURCE ID NUMBER				3 0 0 0 0				33 / / 0 0							
PROCESS EQUIPMENT aggregate dryer				4 0 0 0 0				34 0 0 0 0							
OPERATING MODE				5 0 0 0 0				35 5 0 0 0							
CONTROL EQUIPMENT baghouse				6 0 0 0 0				36 0 0 0 0							
OPERATING MODE				7 0 0 0 0				37 0 0 0 0							
DESCRIBE EMISSION POINT				8 0 0 0 5				38 0 0 0 0							
START white rectangular stack STOP SAME				9 0 0 0 0				39 0 0 0 0							
HEIGHT ABOVE GROUND LEVEL				10 0 0 0 0				40 0 / 0 0							
START 35 ft STOP same				11 0 0 0 0				41 0 0 0 5							
HEIGHT RELATIVE TO OBSERVER				12 / 0 0 0				42 0 0 0 0							
START 18 ft STOP SAME				13 0 0 0 0				43 0 0 0 0							
DISTANCE FROM OBSERVER				14 0 0 0 0				44 0 0 0 0							
START 400 ft STOP same				15 0 0 0 0				45 0 0 0 0							
DIRECTION FROM OBSERVER				16 0 0 0 0				46 0 0 0 0							
START N STOP SAME				17 0 0 / /				47 0 0 0 0							
DESCRIBE EMISSIONS				18 0 / 0 0				48 0 0 0 0							
START coming upward STOP SAME				19 0 0 0 0				49 / 0 0 /							
EMISSION COLOR				20 0 0 0 0				50 / 0 0 0							
START grey STOP same				21 0 0 0 0				51 0 0 0 0							
PLUME TYPE: CONTINUOUS ☒				22 / 0 0 0				52 0 0 / /							
FUGITIVE ☐ INTERMITTENT ☐				23 0 0 0 0				53 / 0 5 0							
WATER DROPLETS PRESENT: NO ☐ YES ☒				24 0 0 0 0				54 0 0 0 0							
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☒				25 0 0 0 0				55 0 0 0 /							
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED				26 0 0 0 0				56 0 0 0 0							
START 2-4 ft above exit STOP 2-5 ft above exit				27 0 0 0 0				57 0 0 0 0							
DESCRIBE BACKGROUND				28 0 0 0 0				58 0 0 0 0							
START trees STOP SAME				29 0 0 0 /				59 0 0 0 0							
BACKGROUND COLOR				30 / 0 / 0				60 0 0 0 0							
START green STOP SAME				AVERAGE OPACITY FOR HIGHEST PERIOD 0.208%				NUMBER OF READINGS ABOVE 0 % WERE 5							
SKY CONDITIONS				RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 5				OBSERVER'S NAME (PRINT) David Goshaw							
START clear STOP SAME				OBSERVER'S SIGNATURE <i>[Signature]</i>				DATE 8-28-97							
WIND SPEED				ORGANIZATION DEECO Inc				CERTIFIED BY ETA				DATE 3-14-97			
START 0-2 mph STOP 1-3 mph				I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE				VERIFIED BY				DATE			
WIND DIRECTION				TITLE				DATE							
START E STOP SAME															
AMBIENT TEMP. START 73 STOP 77															
WET BULB TEMP. 67 RH, percent 71															





Visible Emission Observation Form

20

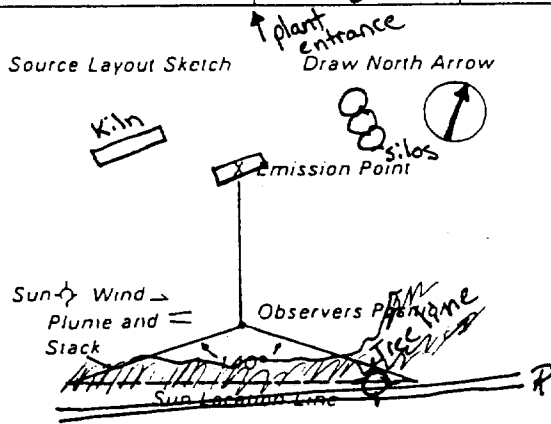
SOURCE NAME Baghouse Exit			OBSERVATION DATE 8-28-97				START TIME 11:18				STOP TIME 12:20			
ADDRESS ASPHALT PLANT "B" (W. Raleigh Plant)			SEC MIN				SEC MIN				SEC MIN			
New Chapel Hill Rd			0 15 30 45				0 15 30 45				0 15 30 45			
CITY Raleigh			STATE NC				ZIP							
PHONE			SOURCE ID NUMBER											
PROCESS EQUIPMENT aggregate dryer			OPERATING MODE											
CONTROL EQUIPMENT baghouse			OPERATING MODE											
DESCRIBE EMISSION POINT														
START white rectangular stack			STOP same											
HEIGHT ABOVE GROUND LEVEL			HEIGHT RELATIVE TO OBSERVER											
START 35 ft			STOP same											
DISTANCE FROM OBSERVER			DIRECTION FROM OBSERVER											
START 400 ft			STOP same											
DESCRIBE EMISSIONS														
START coming upward			STOP same											
EMISSION COLOR			PLUME TYPE: CONTINUOUS ☒											
START grey			STOP same											
WATER DROPLETS PRESENT: NO ☒ YES ☐			IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐											
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED														
START 3-6' above stack			STOP same											
DESCRIBE BACKGROUND														
START trees			STOP same											
BACKGROUND COLOR			SKY CONDITIONS											
START green			STOP same											
WIND SPEED			WIND DIRECTION											
START 2-6 mph			STOP 16 mph											
AMBIENT TEMP			WET BULB TEMP.				RH. percent							
START 85			STOP 80											
Source Layout Sketch			Draw North Arrow											
Sun → Wind → Plume and Stack Observer's Position Sun Location Line 140° RR														
COMMENTS														
slash indicates interference of reading														
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS														
SIGNATURE														
TITLE														
DATE														
OBSERVER'S NAME (PRINT)														
OBSERVER'S SIGNATURE														
ORGANIZATION														
CERTIFIED BY														
VERIFIED BY														
DATE														
DATE														

*klm stopped 5 min break



Visible Emission Observation Form

3a

SOURCE NAME		OBSERVATION DATE		START TIME		STOP TIME	
Baghouse Exit		8-29-97		8:13		9:13	
ADDRESS		SEC		SEC			
ASPHALT PLANT "B" (West Raleigh Plant)		MIN		MIN			
New Chapel Hill Rd		0 15 30 45		0 15 30 45			
CITY Raleigh		STATE NC		ZIP			
PHONE		SOURCE ID NUMBER					
PROCESS EQUIPMENT		OPERATING MODE					
aggregate dryer							
CONTROL EQUIPMENT		OPERATING MODE					
baghouse							
DESCRIBE EMISSION POINT							
START white rectangular stack STOP SAME							
HEIGHT ABOVE GROUND LEVEL		HEIGHT RELATIVE TO OBSERVER					
START 35 ft STOP SAME		START 15 ft STOP SAME					
DISTANCE FROM OBSERVER		DIRECTION FROM OBSERVER					
START 400 ft STOP SAME		START NNW STOP SAME					
DESCRIBE EMISSIONS							
START coming STOP SAME							
EMISSION COLOR		PLUME TYPE: CONTINUOUS ☒					
START grey STOP SAME		FUGITIVE ☐ INTERMITTENT ☒					
WATER DROPLETS PRESENT:		IF WATER DROPLET PLUME:					
NO ☒ YES ☐		ATTACHED ☐ DETACHED ☐					
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED							
START 2-3 ft above exit STOP SAME							
DESCRIBE BACKGROUND							
START trees STOP SAME							
BACKGROUND COLOR		SKY CONDITIONS					
START green STOP SAME		START clear STOP SAME					
WIND SPEED		WIND DIRECTION					
START 0-1 mph STOP SAME		START East STOP SAME					
AMBIENT TEMP		WET BULB TEMP.		RH percent			
START 70 STOP 76		66		80			
Source Layout Sketch		↑ plant entrance Draw North Arrow					
							
COMMENTS							
sketch indicates line of sight interference							
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS		CERTIFIED BY		DATE			
SIGNATURE		ETA		8-29-97			
TITLE		VERIFIED BY		DATE			

AVERAGE OPACITY FOR HIGHEST PERIOD		NUMBER OF READINGS ABOVE 5% WERE			
25%		14			
RANGE OF OPACITY READINGS		MINIMUM		MAXIMUM	
		0		10	
OBSERVER'S NAME (PRINT)		David Goshaw			
OBSERVER'S SIGNATURE					
ORGANIZATION		DEECO Inc			



Visible Emission Observation Form

38

SOURCE NAME Baghouse Exit				OBSERVATION DATE 8-29-97				START TIME 7:23				STOP TIME 10:23			
ADDRESS ASPHALT PLANT "B" (West Raleigh Plant)				SEC MIN 0 15 30 45				SEC MIN 0 15 30 45							
New Chapel Hill Rd				1 0 0 0 5				31 0 0 0 0							
CITY Raleigh		STATE NC		ZIP		2 5 0 0 0		32 0 0 0 0							
PHONE		SOURCE ID NUMBER		3 5 0 0 0		33 5 0 0 0									
PROCESS EQUIPMENT aggregate dryer		OPERATING MODE		4 0 0 5 0		34 0 0 0 0									
CONTROL EQUIPMENT baghouse		OPERATING MODE		5 5 0 0 0		35 10 0 0 0									
DESCRIBE EMISSION POINT				6 0 0 0 5		36 5 0 0 5									
START white rectangular stack STOP SAME				7 5 0 0 0		37 0 0 0 0									
HEIGHT ABOVE GROUND LEVEL		HEIGHT RELATIVE TO OBSERVER		8 0 5 0 0		38 5 0 0 5									
START 35 ft STOP SAME		START 15 ft STOP SAME		9 5 0 0 0		39 0 0 0 0									
DISTANCE FROM OBSERVER		DIRECTION FROM OBSERVER		10 0 0 5 0		40 0 0 0 0									
START 400 ft STOP SAME		START NNN STOP SAME		11 0 5 0 0		41 0 0 5 5									
DESCRIBE EMISSIONS				12 10 0 0 0		42 0 0 0 0									
START coning STOP same				13 5 0 0 5		43 0 0 5 0									
EMISSION COLOR		PLUME TYPE: CONTINUOUS ☐		14 0 0 0 5		44 0 0 0 0									
START grey STOP same		FUGITIVE ☐ INTERMITTENT ☒		15 0 0 0 0		45 0 0 0 0									
WATER DROPLETS PRESENT: NO ☒ YES ☐		IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐		16 5 0 10 5		46 0 0 5 0									
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED				17 0 0 0 0		47 0 0 0 0									
START 2-6 ft above exit STOP 2-5 ft above exit				18 0 0 0 0		48 0 0 0 0									
DESCRIBE BACKGROUND				19 0 0 0 0		49 0 0 0 0									
START trees STOP same				20 0 0 0 10		50 0 0 0 0									
BACKGROUND COLOR		SKY CONDITIONS		21 0 5 5 0		51 0 0 0 0									
START green STOP same		START clear STOP clear		22 0 10 0 0		52 0 5 0 0									
WIND SPEED		WIND DIRECTION		23 0 0 0 0		53 5 0 0 0									
START 1-3 mph STOP 1-4 mph		START East STOP SE		24 0 0 0 0		54 0 5 5 0									
AMBIENT TEMP		WET BULB TEMP.		25 0 0 5 0		55 10 0 0 0									
START 76 STOP 81		69		26 0 0 10 0		56 0 0 0 0									
		RH. percent		27 0 0 0 0		57 0 0 0 0									
		70		28 0 0 0 0		58 0 0 0 0									
Source Layout Sketch				29 0 0 0 0		59 0 0 0 0									
				30 0 0 0 0		60 0 0 0 0									
Comments: slash indicates interference of reading				AVERAGE OPACITY FOR HIGHEST PERIOD 1.875%				NUMBER OF READINGS ABOVE 5% WERE 6							
				RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 10											
				OBSERVER'S NAME (PRINT) David Goshaw											
				OBSERVER'S SIGNATURE				DATE 8-29-97							
				ORGANIZATION DEECO Inc.											
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE				CERTIFIED BY ETA				DATE 3-14-97							
TITLE				VERIFIED BY				DATE							



Visible Emission Observation Form

3c

SOURCE NAME				OBSERVATION DATE				START TIME				STOP TIME			
ADDRESS				SEC				SEC							
CITY				STATE		ZIP		MIN				MIN			
Baghouse Exit				8-29-97				10:33				11:33			
ASPHALT PLANT "B" (West Raleigh Plant)				MIN				MIN							
New Chapel Hill Rd				0				0				0			
Raleigh				NC				31				0			
PHONE				SOURCE ID NUMBER				32				0			
PROCESS EQUIPMENT				OPERATING MODE				33				0			
aggregate dryer								34				0			
CONTROL EQUIPMENT				OPERATING MODE				35				0			
baghouse								36				0			
DESCRIBE EMISSION POINT								37				0			
START white rectangular stack								38				0			
STOP same								39				0			
HEIGHT ABOVE GROUND LEVEL				HEIGHT RELATIVE TO OBSERVER				40				0			
START 35 ft STOP same				START 15 ft STOP same				41				0			
DISTANCE FROM OBSERVER				DIRECTION FROM OBSERVER				42				0			
START 400 ft STOP same				START NW STOP same				43				0			
DESCRIBE EMISSIONS								44				0			
START coming				STOP same				45				0			
EMISSION COLOR				PLUME TYPE: CONTINUOUS ☐				46				0			
START grey STOP same				FUGITIVE ☐ INTERMITTENT ☒				47				0			
WATER DROPLETS PRESENT:				IF WATER DROPLET PLUME:				48				0			
NO ☒ YES ☐				ATTACHED ☐ DETACHED ☐				49				0			
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED								50				0			
START 25 ft above exit STOP same								51				0			
DESCRIBE BACKGROUND								52				0			
START trees				STOP same				53				0			
BACKGROUND COLOR				SKY CONDITIONS				54				0			
START green STOP same				START clear STOP clear				55				0			
WIND SPEED				WIND DIRECTION				56				0			
START 1-5 mph STOP same				START East STOP same				57				0			
AMBIENT TEMP.				WET BULB TEMP.				58				0			
START 81 STOP 85				72				59				0			
RH. percent				65				60				0			
Source Layout Sketch ↑ plant entrance kiln silos ↑ Emission Point Sun → Wind → Plume and = Stack Observers Position trees Sun Location Line				24				0							
				25				0							
				26				0							
				27				0							
				28				0							
				29				0							
				30				0							
				AVERAGE OPACITY FOR HIGHEST PERIOD				1.875%				NUMBER OF READINGS ABOVE 4% WERE 4			
				RANGE OF OPACITY READINGS				MINIMUM 0 MAXIMUM 10							
				OBSERVER'S NAME (PRINT)				David Goshaw							
COMMENTS				OBSERVER'S SIGNATURE				DATE							
/ indicates line of sight interference								8-29-97							
				ORGANIZATION				DEECO Inc.							
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE				CERTIFIED BY				DATE							
TITLE				ETA				3-14-97							
DATE				VERIFIED BY				DATE							



Visible Emission Observation Form

30

SOURCE NAME Baghouse Exit		OBSERVATION DATE 8-29-97		START TIME 11:43		STOP TIME 12:43		
ADDRESS Asphalt 215 "B" (West Raleigh Plant)		SEC MIN		SEC MIN		SEC MIN		
New Chapel Hill Rd		0 15 30 45		0 15 30 45		0 15 30 45		
CITY Raleigh	STATE NC	ZIP		1 2 3 4		5 6 7 8		
PHONE	SOURCE ID NUMBER		9 10 11 12		13 14 15 16		17 18 19 20	
PROCESS EQUIPMENT aggregate dryer		OPERATING MODE		21 22 23 24		25 26 27 28		
CONTROL EQUIPMENT baghouse		OPERATING MODE		29 30 31 32		33 34 35 36		
DESCRIBE EMISSION POINT START wh. to rectangular stack STOP same		37 38 39 40		41 42 43 44		45 46 47 48		
HEIGHT ABOVE GROUND LEVEL START 35 ft STOP same		49 50 51 52		53 54 55 56		57 58 59 60		
HEIGHT RELATIVE TO OBSERVER START 15 ft STOP same		61 62 63 64		65 66 67 68		69 70 71 72		
DISTANCE FROM OBSERVER START 400 ft STOP same		73 74 75 76		77 78 79 80		81 82 83 84		
DIRECTION FROM OBSERVER START WNW STOP same		85 86 87 88		89 90 91 92		93 94 95 96		
DESCRIBE EMISSIONS START coning STOP same		97 98 99 100		101 102 103 104		105 106 107 108		
EMISSION COLOR START grey STOP same		109 110 111 112		113 114 115 116		117 118 119 120		
PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐		121 122 123 124		125 126 127 128		129 130 131 132		
WATER DROPLETS PRESENT: NO ☒ YES ☐		133 134 135 136		137 138 139 140		141 142 143 144		
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐		145 146 147 148		149 150 151 152		153 154 155 156		
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 3-6 ft above exit STOP same		157 158 159 160		161 162 163 164		165 166 167 168		
DESCRIBE BACKGROUND START trees STOP same		169 170 171 172		173 174 175 176		177 178 179 180		
BACKGROUND COLOR START green STOP same		181 182 183 184		185 186 187 188		189 190 191 192		
SKY CONDITIONS clear		193 194 195 196		197 198 199 200		201 202 203 204		
WIND SPEED START 0-5 mph STOP same		205 206 207 208		209 210 211 212		213 214 215 216		
WIND DIRECTION START East STOP same		217 218 219 220		221 222 223 224		225 226 227 228		
AMBIENT TEMP START 88.5 STOP 87		229 230 231 232		233 234 235 236		237 238 239 240		
WET BULB TEMP. 73		241 242 243 244		245 246 247 248		249 250 251 252		
RH. percent 56		253 254 255 256		257 258 259 260		261 262 263 264		
Source Layout Sketch 		265 266 267 268		269 270 271 272		273 274 275 276		
Draw North Arrow		277 278 279 280		281 282 283 284		285 286 287 288		
AVERAGE OPACITY FOR HIGHEST PERIOD 2.9%		289 290 291 292		293 294 295 296		297 298 299 300		
NUMBER OF READINGS ABOVE 5% WERE 7		301 302 303 304		305 306 307 308		309 310 311 312		
RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 10		313 314 315 316		317 318 319 320		321 322 323 324		
OBSERVER'S NAME (PRINT) David Goshaw		325 326 327 328		329 330 331 332		333 334 335 336		
OBSERVER'S SIGNATURE		337 338 339 340		341 342 343 344		345 346 347 348		
DATE 8-29-97		349 350 351 352		353 354 355 356		357 358 359 360		
ORGANIZATION DEECO Inc.		361 362 363 364		365 366 367 368		369 370 371 372		
CERTIFIED BY ETA		373 374 375 376		377 378 379 380		381 382 383 384		
DATE 3-14-97		385 386 387 388		389 390 391 392		393 394 395 396		
VERIFIED BY		397 398 399 400		401 402 403 404		405 406 407 408		
DATE		409 410 411 412		413 414 415 416		417 418 419 420		

* Kiln stopped.

restart @ 12:23

** Kiln stopped

end of manual run

Page 1 of 3 K=2.7

FIELD DATA SHEET

Plant: ASPHALT PLANT "8"
 Sampling Location: highhouse stock
 Run Number: M23-0-1 Date: 8-27-97
 Pretest Leak Rate: 0.003 cfm @ 15 in. Hg.
 Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: M23 Operator: DMG
 Pbar: 29.5 Ps: -1.5
 CO2: O2:
 Probe Length/Type: 4' glass Pitot #: PR-20
 Stack Diameter: 49" x 33" As:

Nozzle ID: 0.256 Thermocouple #:
 Assumed Bws: 15 Filter #: 1123-C-1
 Meter Box # 1112 Y: C982 ΔH@: 1.95
 Post-Test Leak Rate: 0.002 cfm @ 16 in. Hg.
 Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Nm ³ @ 000)	Velocity Head (Δp) in H ₂ O	Orifice Pressure Differential of XAD (ΔH) in H ₂ O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
A	0/0	0940	925.60										
A1	5	0945	933.00	2.2	65	5.9	283	249	252	65	92	92	12
	10	0950	938.20	2.2	63	5.9	285	245	253	643	93	93	12
2	15	1024	945.50	2.0	65	5.4	289	246	255	47	98	98	12
	20	1029/1032	951.87	2.0	65	5.4	290	247	249	44	99	99	12
3	25	1037	957.60	1.7	64	4.6	287	246	249	48	102	100	10
	30	1042	963.52	1.7	65	4.6	282	247	241	46	105	104	10
4	35	1047	968.80	1.3	63	3.5	281	247	254	48	107	102	8
	40	1052	973.48	1.3	60	3.5	282	247	255	52	109	105	8
	40/0	1112	973.98										
B1	5	1117	979.60	1.8	63	4.9	284	246	250	55	104	107	10
	10	1122	985.64	1.8	63	4.9	287	247	254	42	107	107	12
2	15	1127	992.26	2.1	65	5.7	289	246	249	48	109	109	15
	20	1132	998.77	2.1	65	5.7	291	246	242	51	110	110	15
3	25	1137	1005.2	2.0	63	5.4	290	245	248	52	111	110	15
	30	1148	11.8	2.0	60	5.4	290	247	245	53	113	111	15
4	35	1153	17.62	1.8	64	4.9	275	246	254	59	110	111	15
	40	1158	23.59	1.7	63	4.6	284	245	243	58	113	112	15

1 1029

AV

AV

Ts

Tm

Plant Name: ASPHALT PLANT "B"Test Date: 8-27-97Run Number: 1123-0-1Operator: VMC

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V) ft ³	Velocity Head (P _v) in. H ₂ O	Orifice Pres. Differential (ΔH) in. H ₂ O		Stack Temp. °F (T _s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum In. Hg
					Barred	Actual				Inlet (T _{in}) °F	Outlet (T _{out}) °F	
	80/0	1/202	1023.58					1				
C 1	5	1/207	28.3	1.0	65	2.7	286	246/251	58	111	111	8
	10	1/212	32.9	1.0	63	2.7	287	246/247	53	111	113	8
2	15	1/217	37.54	1.2	63	3.2	290	246/242	52	111	111	9
	20	1/222	42.83	1.2	61	3.2	286	246/240	56	111	111	9
3	25	1/227	47.87	1.2	60	3.2	288	247/247	59	111	111	9
	30	1/232	53.66	1.2	60	3.2	285	247/252	58	111	111	9
4	35	1/237	57.90	1.3	64	3.5	284	247/251	58	112	110	10
	1/40	1/242	1063.61	1.3	65	3.5	283	247/245	58	113	112	10
	1							1				
	1							1				
	1							1				
	1/40	1/246	1063.61	0.67		1.8		1				
D 1	5	1/251	66.89	0.67	57	1.8	281	247/253	56	111	111	7
	10	1	71.91	0.67	54	1.8	282	248/245	51	111	111	7
2	15	1	75.36	.80	54	2.16	279	248/251	51	114	113	7
	20	1	79.78	.80	55	2.16	279	249/250	52	114	113	7
3	25	1	83.00	.85	55	2.30	280	251/252	52	115	112	8
	30	1	86.98	.94	56	2.54	280	252/253	51	115	113	9
4	35	1	91.33	.94	56	2.54	278	251/250	54	116	113	9
	1/40	1	95.95					1				
	1							1				
	1							1				
	1							1				

Plant Name: ASPHALT PLANT "B"

Test Date: 8-27-97

Run Number: M23-0-1

Operator: Yma

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V _L) ft ³	Velocity Head (P _V) in. H ₂ O	Orifice Pres. Differential		Stack Temp. °F (T _s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum In. Hg	
					Desired	Actual				Inlet (T _{in}) °F	Outlet (T _{out}) °F		
	160/0	1	1335	95.95	0.48	53	1.30	286	252/250	60	114	116	6
E1	5	1		99.30	.48	40	1.30	281	251/253	57	114	115	6
	10	1		102.34	.54	38	1.46	279	249/255	50	113	113	7
2	15	1		105.59	.60	38	1.62	281	251/251	45	116	115	7
	20	1		109.24	.60	38	1.62	280	248/253	44	117	115	7
3	25	1	402.50 1412.40	112.93	.63	37	1.70	280	250/252	44	118	117	7
	30	1		116.65	.63	51	1.70	279	251/254	50	118	117	7
4	35	1		120.32	.78	50	2.11	283	248/251	50	115	116	8
	200	1		124.33	.78	53	2.11	285	250/250	55	115	115	8
		1							1				
		1							1				
		1							1				
	200/0	1	1436	124.33					1				
F 1	5	1		129.86	.45	122.5	1.22	275	252/251	57	112	113	6
	10	1		133.18	.45	53	1.22	279	248/250	57	113	113	6
2	15	1		136.25	.50	53	1.35	284	250/252	57	114	113	6
	20	1		139.55	.50	53	1.35	284	252/250	57	114	112	6
3	25	1		142.87	.55	53	1.49	284	250/253	57	113	112	6
	30	1		146.22	.55	54	1.49	284	251/249	57	113	112	6
4	35	1		149.83	.42	54	1.13	283	250/250	59	113	112	6
	240/0	1		152.829	.42	54	1.13	283	248/249	57	113	112	6
		1							1				
		1							1				
		1							1				

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"						Run No.:	
Sample Date:			Filter No.(s):			Job No.:	
Sample Location: OUTLET #1							
Recovery Date:			XAD-2 Trap No.(s):				
Sample Recovery Person:							
Moisture Data							
Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	525.0	774.3	987.9	809.6	802.7	832.0	g
Initial wt.	479.8	513.0	696.1	696.8	598.7	777.8	g
Net wt.	45.2	1625.3	24.8	112.8	4.0	54.2	g
Description bml - 2083.3 ✓							
Train System:							
Probe:							
Filter: Color -				Loading -			
Impinger Contents:							
Silica Gel: @Grams Used -				Color -		% Spent -	
Condensate Observed In Front Half:							
Recovered Sample Fractions							
Filter Container No.						marked/sealed:	
XAD McJule Container No.:						marked/sealed:	
Probe (FH) & Back Half Rinse (Acetone) Container No.:						Liquid level marked/sealed:	
Probe (FH) & Back Half Rinse (Toluene) Container No.:						Liquid level marked/sealed:	
Impinger Contents Container No.:						Liquid level marked/sealed:	
Impinger Rinse (Acetone/MeCl2) Container No.:						Liquid level marked/sealed:	

999.6
 279.2
 348.5
 1625.3

FIELD DATA SHEET

Plant: ASPHALT PLANT "B"
 Sampling Location: BAGHOUSE STACK
 Run Number: _____ Date: 8-28-97
 Pretest Leak Rate: 0.001 cfm @ 15.0 in. Hg.
 Pretest Leak Check: Pitot: ☒ Orsat: ☒

Sample Type: M23 Operator: T. Thompson
 Pbar: 29.60 Ps: -0.8
 CO2: _____ O2: _____
 Probe Length/Type: 4' galv Pitot #: PR20
 Stack Diameter: 45" x 33" As: 10.31 sq ft.

Nozzle ID: 0.256 Thermocouple #: P220
 Assumed Bws: 322 Filter #: M23-0-2
 Meter Box #: MD12 Y: 0.90 $\Delta H@$: 1.95
 Post-Test Leak Rate: 0.004 cfm @ 19 in. Hg.
 Post-Test Leak Check: Pitot: ☒ Orsat: ☒
 K = 2.30

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Nm) ft ³	Velocity Head (Δp) in H ₂ O	Orifice Pressure Differential (ΔH) in H ₂ O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)	XAD EXIT TEMP °F
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)		
A1	0/0	0746	153.016	2.10	4.83	4.83	276	249	246	58	73	71	12.5	41
	5		157.90	2.10	4.83	4.83	276	249	246	58	73	71	12.5	37
2	10		163.70	2.45	5.64	5.64	281	250	252	59	75	72	15	38
	15		169.94	2.45	5.64	5.64	283	250	248	46	79	74	15	45
3	20		176.39	1.95	4.49	4.49	285	250	249	46	83	76	12	60
	25		182.23	1.95	4.49	4.49	283	250	255	47	84	77	12	60
4	30		188.01	1.35	3.11	3.11	280	249	248	48	86	78	9	59
	35		192.86	1.35	3.11	3.11	277	251	250	48	86	78	9	58
B1	40/0	0830	197.68	1.80	4.14	4.14	276	250	254	46	87	83	11	58
	5		203.20	1.80	4.14	4.14	277	250	253	59	91	85	11	58
2	10		208.61	2.20	5.06	5.06	282	249	250	40	92	85	14	57
	15		214.71	2.20	5.06	5.06	284	249	254	40	95	87	14	58
3	20		220.80	2.10	4.83	4.83	287	250	249	40	96	89	13	59
	25		226.84	2.10	4.83	4.83	289	251	250	40	97	91	13	59
4	30	0909	232.87	1.75	4.03	4.03	289	250	251	40	97	91	11	58
	35		238.42	1.75	4.03	4.03	281	251	251	42	93	93	11	56
C1	40/0	0921	243.78	1.00	2.30	2.30	283	254	252	48	99	95	7.5	58
	5		248.00	1.00	2.30	2.30	284	250	253	44	99	95	7.5	59
2	10		252.25	1.10	2.53	2.53	282	249	255	44	100	96	8.0	59
	15		252.79	1.10	2.53	2.53	283	251	254	46	101	96	8.0	59
3	20		261.14	1.25	2.88	2.88	284	249	253	46	101	97	9.0	59
	25		265.94	1.25	2.88	2.88	287	251	255	47	103	98	9	60
4	30		270.61	1.50	3.45	3.45	285	252	254	47	102	99	10	60
	35		275.68	1.50	3.45	3.45	286	253	254	47	103	99	10	60
D1	120/0	1004	280.86	.57	1.31	1.31	288	250	251	48	102	100	6	40
	5		284.10	.60	1.38	1.38	288	248	250	48	103	100	6	42
2	10		287.45	.79	1.82	1.82	290	252	251	48	104	101	7	44

Tm = _____

Plant Name: ASPHALT PLANT "B"Test Date: 8-28-97Run Number: AA M23-0 - 2Operator: T. THOMPSON

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V _L) ft ³	Velocity Head (P _v) in. H ₂ O	Orifice Pres. Differential (Δh) in. H ₂ O		Stack Temp. °F (T _s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum In. Hg	KAD BUTLET TEMP °F
					Desired	Actual				Inlet (T _{in}) °F	Outlet (T _{out}) °F		
2	15	1	298.7	0.79	1.82	1.82	291	252 / 255	48	105	101	7	44
3	20	1	294.97	.87	1.83	1.83	290	253 / 251	49	105	102	7	* 45
3	25	1	298.80	.87	1.83	1.83	288	250 / 251	49	106	103	7	46
4	30	1	302.48	1.20	2.52	2.52	291	249 / 252	50	107	103	9	46
	35	1	306.86	1.20	2.52	2.52	293	250 / 251	50	108	104	9	47
E1	160/0	1 1049	311.28	.55	1.16	1.16	289	252 / 250	52	106	105	6	49
	5	1	314.35	.55	1.16	1.16	288	250 / 253	52	107	105	6	50
2	10	1	317.33	.65	1.37	1.37	290	248 / 250	52	107	105	7	51
	15	1	320.62	.65	1.37	1.37	289	249 / 252	52	108	106	7	52
3	20	1 1110 / 1128	323.95	.69	1.45	1.45	286	251 / 250	55	107	105	7	55
	25	1 1123	327.33	.69	1.45	1.45	286	245 / 247	49	106	105	7	54
4	30	1	330.75	.75	1.58	1.58	295	247 / 244	49	106	106	7	58
	35	1	334.28	.81	1.70	1.70	298	245 / 242	51	107	105	7	55
F-4	280/0	1 1147 / 1149	337.81	.45	0.95	0.95	293	245 / 245	53	106	105	6	57
	5	1 1154	340.55	.49	1.03	1.03	293	247 / 242	52	106	105	6	57
	10	1 1159	343.41	.53	1.11	1.11	292	247 / 241	53	107	106	6	59
	15	1 1204	346.49	0.53	1.11	1.11	290	248 / 256	52	108	106	6	57
3	20	1 1209	349.47	0.48	1.00	1.00	291	245 / 255	54	108	106	6	57
	25	1 1214	352.33	0.53	1.11	1.11	292	246 / 243	56	108	106	7	57
4	30	1 1219	355.33	0.53	1.11	1.11	292	247 / 249	56	109	107	7	57
	35	1 1224	358.27	0.50	1.05	1.05	290	248 / 245	57	109	107	6	59
	290	1 1229	361.187					1					
		1						1					
		1						1					

* CHANGE K factor to 2.10

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: <u>ASPHALT PLANT "B"</u>						Run No.:	
Sample Date: <u>8/28/97</u>			Filter No.(s):			Job No.:	
Sample Location: <u>OUTLET RUN 2</u>							
Recovery Date:				XAD-2 Trap No.(s):			
Sample Recovery Person:							
Moisture Data							
Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	<u>463.1</u>	<u>844.2</u>	<u>986.4</u>	<u>916.0</u>	<u>648.8</u>	<u>848.9</u>	g
Initial wt.	<u>428.4</u>	<u>429.2</u>	<u>691.7</u>	<u>682.5</u>	<u>600.8</u>	<u>803.5</u>	g
Net wt.	<u>34.7</u>	<u>415.0</u>	<u>294.7</u>	<u>233.5</u>	<u>48.0</u>	<u>45.44</u>	g
		<u>904.6</u>	Description <u>293.5</u>			TOTAL	<u>1561.0</u>
Train System:							
Probe:							
Filter: Color -				Loading -			
Impinger Contents:							
Silica Gel: @Grams Used -				Color -		% Spent -	
Condensate Observed In Front Half:							
Recovered Sample Fractions							
Filter Container No.						marked/sealed:	
XAD Module Container No.:						marked/sealed:	
Probe (FH) & Back Half Rinse (Acetone) Container No.:						Liquid level marked/sealed:	
Probe (FH) & Back Half Rinse (Toluene) Container No.:						Liquid level marked/sealed:	
Impinger Contents Container No.:						Liquid level marked/sealed:	
Impinger Rinse (Acetone/MeCl2) Container No.:						Liquid level marked/sealed:	

486.9 ADD TO KO

0 11 2

Nozzle ID: 0.251 Thermocouple #: PR 20

Assumed Bws: 25 Filter #: M23 v-3

Meter Box #: MB/2 Y: 0.982 $\Delta H@$: 6.95

Post-Test Leak Rate: 0.003 cfm @ 20 in. Hg.

Post-Test Leak Check: Pitot: ☒ Orsat: ☒

$$\underline{(-2.2)}$$
$$\Delta V_m = \quad \sqrt{\Delta p} = \quad \Delta H = \quad T_0 = \quad T_m =$$

Plant Name: ASPHALT PLANT "B"Test Date: 8-29-97Run Number: m23-0-3Operator: TH

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_L) ft ³	Velocity Head (P_v) in. H ₂ O	Orifice Pres. Differential (ΔH) in. H ₂ O		Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum In. Hg
					Desired	Actual				Inlet (T_{in}) °F	Outlet (T_{out}) °F	
	80/0	10935	454.00	X	X	X	X	X	X	X	X	X
C 1	5	10940	458.63	1.1	48	2.4	271	247/252	55	97	95	10
	10	10945	463.10	1.1	46	2.4	271	247/242	53	99	96	10
2	15	10950	467.72	1.3	45	2.9	272	246/255	53	100	96	10
	20	10955	472.50	1.3	45	2.9	274	247/252	52	102	98	10
3	25	11000	477.35	1.4	44	3.1	275	247/249	52	103	98	10
	30	11005	482.11	1.3	47	2.9	269	247/254	53	105	99	10
4	35	11010	487.10	1.4	48	3.1	269	245/242	54	105	100	11
	120	11015	491.910	1.5	48	3.3	272	245/241	54	105	101	11
	1							1				
	1							1				
	120/0	11018	491.910	X	X	X	X	X	X	X	X	X
D 1	5	11023	495.27	0.67	57	1.47	278	249/247	59	103	101	7
	10	11028	498.54	0.63	55	1.40	270	248/244	56	104	101	7
2	15	11033	502.20	0.78	46	1.72	256	247/242	52	104	102	8
	20	11038	505.78	0.82	47	1.80	260	247/244	52	105	102	9
3	25	11043	509.71	0.87	47	1.90	259	247/254	51	105	102	9
	30	11048	513.38	0.82	48	1.80	283	246/252	52	106	103	9
4	35	11053	517.55	1.05	48	2.30	265	247/242	52	106	103	9
	160	11058	522.03	1.05	47	2.30	266	247/244	55	106	104	9
	1							1				
	1							1				
	1							1				
	1							1				

Plant Name: ASPHALT PLANT "B"Test Date: 8-29-97Run Number: m23-0-3Operator: TDG

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V) ft ³	Velocity Head (P _v) in. H ₂ O	Orifice Pres. Differential (ΔH) in. H ₂ O		Stack Temp. °F (T)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum In. Hg
					Desired	Actual				Inlet (T _{in}) °F	Outlet (T _{out}) °F	
	160/0	11102	522.03	X	XAD	X	X	X	X	X	X	X
E 1	5	11107	525.55	0.50	57	1.40	265	248' 256	57	105	104	7
	10	11112	529.10	0.60	45	1.60	269	246' 249	53	105	104	7
2	15	11117	533.21	0.68	45	1.80	270	247' 241	55	105	104	8
	20	11122	537.40	0.65	46	1.80	269	246' 242	54	106	104	8
3	25	11127	542.23	0.73	46	2.00	264	246' 282	55	107	105	9
	30	11132	546.82	0.78	50	2.15	260	247' 253	55	108	105	9
4	35	11137	551.75	0.90	49	2.40	258	247' 248	55	109	106	10
	200	11142	556.46	0.90	57	2.40	258	248' 242	56	110	106	10
	1							1				
	1							1				
	1							1				
	1							1				
	200/0	11145	556.46	X	X	X	X	X	X	X	X	X
F 1	5	11150	560.14	0.40	50	1.10	261	247' 252	57	109	107	7
	10	11155	563.95	0.40	47	1.10	258	248' 252	56	109	107	8
2	15	11200	567.82	0.46	46	1.25	259	245' 242	58	110	108	8
	20	11205	571.72	0.46	46	1.25	258	247' 249	58	109	108	8
3	25	11210	575.68	0.50	47	1.35	260	246' 284	59	109	108	8
	30	11226	579.58	0.50	47	1.35	263	246' 257	60	109	108	9
4	35	11231	583.52	0.52	45	1.40	261	248' 243	58	107	108	9
	240/11	11236	587.600	0.52	48	1.40	271	247' 243	58	108	108	9
	1							1				
	1							1				

* Stop @ 1211 - feed problem, restart @ 1222

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: <u>ASPHALT PLANT "B"</u>						Run No.:	
Sample Date: <u>8/29/97</u>			Filter No.(s):			Job No.:	
Sample Location: <u>OUTLET RUN 3</u>							
Recovery Date:				XAD-2 Trap No.(s):			
Sample Recovery Person:							
Moisture Data							
Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H ₂ O) (untipped)	3 (100 ml H ₂ O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	<u>316.3</u>	<u>1211.1</u>	<u>958.6</u>	<u>753.5</u>	<u>603.2</u>	<u>912.2</u>	g
Initial wt.	<u>303.7</u>	429.0	<u>711.5</u>	599.0	<u>599.0</u>	<u>864.6</u>	g
Net wt.	<u>12.6</u>	<u>735.8</u>	<u>247.1</u>	<u>40.1</u>	<u>4.2</u>	<u>47.6</u>	g
Description <u>713.4</u> <u>H₂S</u>							
Train System: <u>1,087.4 grams</u>							
Probe:							
Filter: Color - Loading -							
Impinger Contents:							
Silica Gel: @Grams Used - Color - % Spent -							
Condensate Observed In Front Half:							
Recovered Sample Fractions							
Filter Container No.						marked/sealed:	
XAD Module Container No.:						marked/sealed:	
Probe (FH) & Back Half Rinse (Acetone) Container No.:						Liquid level marked/sealed:	
Probe (FH) & Back Half Rinse (Toluene) Container No.:						Liquid level marked/sealed:	
Impinger Contents Container No.:						Liquid level marked/sealed:	
Impinger Rinse (Acetone/MeCl ₂) Container No.:						Liquid level marked/sealed:	

M-29 FIELD DATA SHEET

Plant: ASPHALT PLANT "B" Sample Type: M-29 Operator: MAJ
 Sampling Location: BAGHOUSE EXIT (STACK) Pbar: 29.8 Ps: -.42
 Run Number: 01 Date: 8-27-97 CO2: O2:
 Pretest Leak Rate: 007 cfm @ 11 in. Hg. Probe Length/Type: 4' GLASS Pitot #:
 Pretest Leak Check: Pitot: ✓ Orsat: Stack Diameter: 33x49 As:

Nozzle ID: 252 Thermocouple #:
 Assumed Bws: 15% Filter #:
 Meter Box #: 4210 Y: 9605 ΔH@: 1.747
 Post-Test Leak Rate: 004 cfm @ 6 in. Hg.
 Post-Test Leak Check: Pitot: ✓ Orsat:

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vn) ft ³	Velocity Head (Δp) in H ₂ O	Orifice Pressure Differential (ΔH) in H ₂ O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
C 1	0	0940	41.719										
1	5	0945	46.85	.94	NA	2.27	282	243	248	68	89	90	1
	10	0950	50.31	.99		2.39	281	244	249	64	93	90	1
2	15	0954	55.76	1.4		3.3	291	244	249	60	93	90	1
	20	0959	60.113	1.4		3.3	294	247	251	60	99	94	1
3	25	1037	66.31	1.5		3.6	294	248	252	56	102	97	2
	30	1042	71.83	1.5		3.6	295	247	254	54	103	98	2
4	35	1047	77.52	1.6		3.8	289	246	255	54	106	100	2
	40	1052	83.003	1.5		3.6	289	247	252	54	107	104	2
D 1	45	1112/1117	86.56	.63		1.52	291	253	251	56	108	104	2
	50	1122	90.16	.63		1.45	292	249	252	58	109	104	2
2	55	1127	94.44	.86		2.08	294	247	253	59	111	106	2
	60	1132	98.59	.84		2.03	294	246	251	59	112	106	2
3	65	1137	103.44	1.05		2.53	294	244	252	60	113	107	2
	70	1148	108.2	1.1		2.66	295	245	253	61	113	108	2
4	75	1153	112.94	1.1		2.6	286	245	255	62	112	107	2
	80	1158	118.045	1.2		2.9	284	247	254	62	113	108	2
E 1	85	1202/1207	121.73	.63		1.52	292	246	254	60	113	110	2
2	90	1202	125.57	.64		1.56	292	247	257	60	113	111	2
	95	1217	129.4	.60		1.65	295	244	251	61	113	111	2
3	100	1222	133.2	.72		1.75	295	247	257	61	113	111	2
	105	1227	137.18	.83		2.02	292	248	256	60	111	108	2
	110	1232	141.53	.83		2.02	292	248	254	60	110	108	2
4	115	1237	145.66	.88		2.14	290	247	251	62	110	108	2
	120	1242	150.24	.88		2.14	289	246	252	62	110	108	2

* 0950 STOP RESTART @ 1019
 * 0950 STOP RESTART @ 1032

* 1140 STOP PLANT DOWN. RESTART @ 1146
 Δp = ΔH = Ts =

Tm =

156.57

M-29

Page 2 of 2Plant Name: ASPHALT PLANT "B"Test Date: 8-27-97Run Number: 01Operator: NAD

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V _g) ft ³	Velocity Head (P _v) in. H ₂ O	Orifice Pres. Differential (ΔI) in. H ₂ O		Stack Temp. °F (T _s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum In. Hg
					Desired	Actual				Inlet (T _{in}) °F	Outlet (T _{out}) °F	
—	120	1 1246	150.241									
F 1	125	1 1251	153.73	.53	NA	1.29	287	247 1253	64	112	109	2
	130	1 1258	152.46	.53		1.29	287	248 1253	64	112	109	2
2	135	1 1304	160.16	.55		1.34	285	247 1254	60	113	109	2
	140	1 1306	163.9	.5		1.21	285	246 1255	59	113	109	2
3	145	1 1311	167.37	.6		1.4	285	243 1247	57	112	109	2
	150	1 1316	171.0	.61		1.4	285	244 1248	57	111	109	2
4	155	1 1321	174.37	.52		1.26	284	243 1247	58	112	110	2
	160	1 1324	177.772	.53		1.29	285	244 1246	59	112	110	2
A 1	165	1 1335	184.32	2.1		5.1	290	245 1243	59	113	111	3
	170	1 1345	191.16	2.1		5.1	295	246 1242	61	114	112	3
2	175	1 1350	198.23	2.3		5.6	287	246 1244	60	115	113	4
	180	1 1355	205.75	2.4		5.8	287	246 1247	61	117	113	4
3	185	1 1400	211.17	1.5		3.65	289	245 1248	62	119	114	3.5
	190	1 1405	217.08	1.6		3.9	290	245 1250	62	121	115	3.5
4	195	1 1420	222.59	1.3		3.17	281	246 1251	63	116	114	3.5
	200	1 1425	227.507	1.2		2.92	289	247 1250	63	116	114	3.5
B 1	205	1 1435	224.04	2.0		4.87	282	246 1257	63	112	112	3.5
	210	1 1446	240.52	2.0		4.87	282	245 1250	60	112	112	3.5
2	215	1 1451	242.26	2.2		5.36	290	246 1257	59	114	112	4
	220	1 1456	254.04	2.1		5.1	290	247 1252	60	116	112	4
3	225	1 1501	260.75	2.1		5.1	292	246 1253	60	116	112	4
	230	1 1506	267.44	2.1		5.1	292	245 1254	60	114	112	4
4	235	1 1511	273.94	1.7		4.1	293	245 1253	60	114	111	4
	240	1 1516	278.983	1.6		3.9	293	245 1251	61	114	111	4

156.57

737-264 V_g + 76.816

MULTI-METALS SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"		Run No.: 1			
Date: 8/27/97	Sample Box No.:		Job No.:		
Sample Location: OUTLET					
Sample Type: M29					
Sample Recovery Person: J. MORGAN					
Container	Description	Volume, ml	Sealed/Level Marked		
Front Half					
1	Filter No.(s) . M97.013	N/A	YES / N/A		
2	Acetone Rinse				
3	Nitric Rinse				
Back Half					
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter	950 x2			
5A	Nitric Rinse - Impinger No. 4				
5B	KMNO4/H2O Rinse - Impingers 5 & 6				
5C	HCl Rinse - Impingers 5 & 6				
Moisture Data					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	KNOCKOUT	Ø	728.3	1161.9	(685.1) + 433.6
2	5% / 10%	100	732.3	932.7	200.4
3	5% / 10%	100	735.8	946.9	211.1
4	KNOCKOUT	Ø	568.7	633.5	64.8
5	KMnO4	100	637.1	634.9	-2.2
6	KMnO4	100	731.3	729.5	-1.8
7	SG	N/A	Ø 886.0 834.1 gm	927.0	41.0
Total					1632.0 g ✓
Comments: ① Added more SG before run					

FIELD DATA SHEET

Plant: ASPHALT PLANT "B"
 Sampling Location: BARREX EXIT (STACK)
 Run Number: 02 Date: 8-28-97
 Pretest Leak Rate: .011 cfm @ 10 in. Hg.
 Pretest Leak Check: Pitot: ☒ Orsat: ☒

Sample Type: M-29 Operator: MAAD
 Pbar: 29.6 Ps: -.4
 CO2: O2:
 Probe Length/Type: 4' Glass Pitot #:
 Stack Diameter: 33 x 49 As:

Nozzle ID: 252 Thermocouple #:
 Assumed Bws: 25 Filter #:
 Meter Box #: M010 Y: 965 ΔH@: 1.74
 Post-Test Leak Rate: .005 cfm @ 7 in. Hg.
 Post-Test Leak Check: Pitot: ☒ Orsat: ☒

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vn) ft ³	Velocity Head (Δp) in H ₂ O	Orifice Pressure Differential (ΔH) in H ₂ O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
C	0	0746	79.83										
	5	0751	84.8	1.1	NA	2.1	278	241	239	51	72	70	.5
	10	0756	87.94	1.0		1.9	281	245	243	51	74	71	.5
2	15	0801	93.8	1.5		2.9	288	246	247	47	78	76	.5
	20	0806	97.65	1.4		2.7	286	249	246	46	79	77	.5
3	25	0811	102.36	1.4		2.7	291	247	245	54	84	76	.5
	30	0816	107.03	1.4		2.7	291	247	243	54	85	77	.5
4	35	0821	111.96	1.5		2.9	290	246	245	56	86	78	1
	40	0826	116.679	1.5		2.9	288	245	246	57	86	78	1
D 1	45	0831	119.84	.57		1.12	283	243	249	58	86	82	1
	50	0840	122.82	.54		1.06	279	244	252	61	87	82	1
2	55	0845	126.31	.78		1.53	289	247	251	49	89	82	1
	60	0850	130.11	.82		1.61	287	246	252	48	89	83	1
3	65	0855	133.7	.80		1.57	290	247	252	49	93	84	1
	70	0900	137.25	.80		1.57	291	246	253	53	95	86	1
4	75	0903	140.94	.97		1.98	295	244	251	43	94	87	1
	80	0910	145.026	1.0		1.96	295	243	257	44	94	87	1
E 1	85	0915	148.24	.59		1.16	298	241	250	52	94	90	1
	90	0931	151.52	.64		1.25	288	239	247	53	94	89	1
2	95	0936	154.78	.59		1.16	289	239	245	47	97	91	1
	100	0941	158.16	.62		1.21	289	238	243	52	99	92	1
3	105	0946	161.62	.68		1.33	291	237	244	53	100	93	1
	110	0951	165.06	.71		1.39	293	239	246	55	100	94	1
4	115	0956	168.62	.79		1.5	291	238	243	56	101	94	1
	120	1001	172.23	.8		1.57	290	237	244	58	101	95	1

300 @ 0901 0951 1001 1011 1021 1031 1041 1051 1061 1071 1081 1091 1101 1111 1121 1131 1141 1151 1161 1171 1181 1191 1201

Δp=

ΔH=

Ts=

Tm=

Plant Name: ASPHALT PLANT "B"

Test Date: 8-28-97

Run Number: 02

Operator: MFD

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V _L) ft ³	Velocity Head (P _v) in. H ₂ O	Orifice Pres. Differential (ΔP) in. H ₂ O		Stack Temp. °F (T _s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum In. Hg
					Desired	Actual				Inlet (T _{in}) °F	Outlet (T _{out}) °F	
	120	11064	172.23	1.111	NA	NA	NA	NA	NA	NA	NA	NA
F 1	125	11009	174.97	.4	NA	.78	293	246 / 243	59	100	95	1
	130	11014	177.72	.42		.83	293	245 / 242	62	101	96	1
2	135	11019	180.8	.54 *		1.06	294	243 / 240	49	103	93	1
	140	11024	183.7	.51		.89	295	242 / 239	51	104	93	1
3	145	11029	186.1	.47		.82	295	244 / 244	50	105	96	1
	150	11034	188.95	.47		.82	295	246 / 248	50	106	100	1
4	155	11039	191.87	.5		.94	295	247 / 247	50	106	101	1
	160	11044	194.75	.48		.9	295	251 / 247	51	106	101	1
A 1	165	11049/1054	200.74	2.1		3.9	297	254 / 243	56	107	103	3
	170	11054	206.46	2.2		4.1	297	252 / 244	59	109	105	3
2	175	11104	212.4	2.1		3.9	295	257 / 249	59	113	106	3
	180	11109	218.37	2.1		3.9	295	251 / 249	59	114	106	3
3	185	11134	223.67	1.4		2.6	282	252 / 247	61	115	107	3
	190	11139	228.64	2.5		2.6	281	253 / 246	59	115	107	3
4	195	11142	232.83	1.2		2.2	298	251 / 249	58	109	106	3
	200	11147	237.178	1.2		2.2	298	251 / 247	55	111	106	3
B 1	205	11149/1154	242.38	1.7		3.2	298	251 / 246	56	110	107	3
	210	11155	247.12	1.4		2.6	299	252 / 247	58	111	107	3
2	215	11204	252.44	1.9		3.6	300	251 / 246	54	113	107	3
	220	11209	258.34	2.0		3.7	300	252 / 247	53	114	108	3
3	225	11214	264.18	2.1		3.9	299	251 / 248	60	116	109	3
	230	11219	270.1	2.1		3.9	299	252 / 246	61	116	109	3
4	235	11224	274.051	1.5	✓	2.8	299	251 / 247	61	117	110	3
	240	1229	280.159	1.6		3.0	299	252 / 248	64	117	110	3

1110 STOP Plant down 1129 RESUME

MULTI-METALS SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"			Run No.: 2		
Date: 8/28/97		Sample Box No.:		Job No.:	
Sample Location: OUTLET					
Sample Type: M29					
Sample Recovery Person: J. MORGAN					
Container	Description	Volume, ml	Sealed/Level Marked		
Front Half					
1	Filter No.(s) M97-019				
2	Acetone Rinse				
3	Nitric Rinse				
Back Half					
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter				
5A	Nitric Rinse - Impinger No. 4				
5B	KMNO4/H2O Rinse - Impingers 5 & 6				
5C	HCl Rinse - Impingers 5 & 6				
Moisture Data					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	EMPTY	Ø	731.3	1104.8	^{1113.4} - 46.0 ^(907.4) + 375.5 = 1080.9
2	5% / 10%	100	766.6	981.6	215.0
3	5% / 10%	100	765.1	912.6	147.5
4	EMPTY	Ø	571.1	576.9	5.8
5	KMnO4	100	638.9	640.9	2.0
6	KMnO4	100	730.3	731.5	1.2
7	SG	N/A	992.0	1024.2	32.2
Total					1484.6 g
Comments:					

0-224-3

FIELD DATA SHEET

Plant: ASPHALT PLANT "B"

Sampling Location: BAGHOUSE Exit (Stack)

Run Number: 03 Date: 8-29-97

Pretest Leak Rate: 0.12 cfm @ 9 in. Hg.

Pretest Leak Check: Pitot: ☒ Orsat: ☒

Sample Type: N-29 Operator: MAD

Pbar: 29.4 Ps: -42

CO2: O2:

Probe Length/Type: 4' Glass Pilot #:

Stack Diameter: 33 x 49 As:

Nozzle ID: .252 Thermocouple #:

Assumed Bws: 25 Filter #:

Meter Box #: MB10Y: 965 ΔH@:

Post-Test Leak Rate: 0.09 cfm @ 6 in. Hg.

Post-Test Leak Check: Pitot: ☒ Orsat: ☒

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vn) ft ³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	0809	81.713										
C 1	5	0814	86.44	1.3	VA	2.7	285	257	248	48	75	72	1
	10	0819	90.96	1.2		2.4	282	258	249	47	78	74	1
2	15	0824	95.86	1.5		2.9	272	259	249	47	77	73	1
	20	0829	101.18	1.6		3.2	271	258	250	47	79	74	1
3	25	0834	106.25	1.6		3.2	300	259	251	53	80	75	1
	30	0839	111.47	1.6		3.2	300	258	249	52	84	76	1
4	35	0844	116.82	1.7		3.4	291	247	249	59	87	78	1
	40	0849	122.218	1.7		3.4	286	249	250	60	89	81	1
D 1	45	0854	125.85	.78		1.55	280	257	251	61	90	84	1
	50	0902	129.52	.80		1.6	277	252	251	61	91	86	1
2	55	0907	133.44	.94		1.8	276	251	250	67	93	86	1
	60	0912	137.55	.97		1.93	275	254	247	62	94	87	1
3	65	0917	141.64	1.0		1.79	275	251	247	52	95	88	1
	70	0922	145.75	1.0		1.99	275	254	246	51	96	90	1
4	75	0927	150.33	1.1		2.19	276	258	247	53	97	91	1
	80	0932	154.164	1.0		1.99	277	254	245	54	99	92	1
E 1	85	0937	157.29	.6		1.19	278	253	247	58	99	93	1
	90	0945	160.37	.58		1.15	278	251	249	61	100	94	1
2	95	0950	163.92	.7		1.39	278	251	248	60	101	95	1
	100	0955	167.37	.7		1.39	278	248	248	60	102	96	1
3	105	1000	170.94	.73		1.45	279	247	249	60	103	97	1
	110	1005	174.53	.74		1.47	280	246	251	59	104	98	1
4	115	1010	178.28	.84		1.67	276	247	254	60	105	100	1
	120	1015	182.036	.85		1.69	274	248	255	62	106	101	1

ΔVn=

√Δp=

ΔH=

Ts=

Tm=

Plant Name: ASPHALT PLANT "B"Test Date: 8-29-97Run Number: 03Operator: MAD

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V) ft ³	Velocity Head (P _v) in. H ₂ O	Orifice Pres. Differential (ΔH) in. H ₂ O		Stack Temp. °F (T _s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum In. Hg
					Desired	Actual				Inlet (T _{in}) °F	Outlet (T _{out}) °F	
	120	1 1018	182.036									
F 1	125	1 1023	184.91	.15	NA	.89	283	247 / 246	62	104	101	1
	130	1 1028	187.91	.5		.99	283	257 / 245	62	105	102	1
2	135	1 1033	190.74	.17		.93	275	250 / 246	59	106	103	1
	140	1 1038	193.82	.49		.97	261	249 / 247	58	107	104	1
3	145	1 1043	196.85	.49		.97	261	248 / 247	57	108	104	1
	150	1 1048	199.8	.49		.97	263	251 / 247	57	108	104	1
4	155	1 1053	203.01	.54		1.01	265	253 / 246	54	108	105	1
	160	1 1058	206.996	.54		1.02	268	253 / 245	54	108	105	1
A 1	165	1 1102/1107	213.33	2.2		5.40	268	254 / 246	57	107	105	3.5
	170	1 1112	220.35	2.3		5.65	268	257 / 246	59	109	105	3.5
2	175	1 1117	227.35	2.3		5.65	275	257 / 249	54	112	106	3.5
	180	1 1122	234.65	2.3		5.65	274	257 / 257	55	114	106	3.5
3	185	1 1127	240.81	1.9		4.67	273	258 / 257	59	117	107	3.5
	190	1 1132	247.24	1.9		4.67	270	255 / 254	61	118	109	3.5
4	195	1 1137	252.32	1.1		2.7	265	253 / 254	58	119	110	3.0
	200	1 1142	257.473	1.2		2.95	262	252 / 254	58	119	110	3.0
B 1	205	1 1145/1150	264.03	2.0		4.9	263	257 / 256	60	116	112	3.0
	210	1 1255	270.43	1.9		4.67	263	252 / 254	60	118	112	3.0
2	215	1 1200	277.36	2.2		5.4	267	252 / 254	58	119	113	3.0
	220	1 1205	284.19	2.2		5.4	264	252 / 253	58	119	113	3.0
3	225	1 1210	290.78	2.0		4.9	265	252 / 254	59	119	113	3.5
	230	1 1215	297.45	2.0		4.9	267	252 / 255	61	119	113	3.5
4	235	1 1220	303.24	1.6		3.9	269	251 / 256	64	119	113	3.5
	240	1 1225	309.029	1.6		3.9	269	252 / 256	64	119	113	3.5

* CUPD K-FACTOR 1.2 to 2.4

STOP @ 1041 Plant Down Restart 1222

MULTI-METALS SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"			Run No.: 3		
Date: 8/29/97		Sample Box No.:		Job No.:	
Sample Location: OUTLET					
Sample Type: M29					
Sample Recovery Person: J. MORGAN					
Container	Description	Volume, ml	Sealed/Level Marked		
Front Half					
1	Filter No.(s)				
2	Acetone Rinse				
3	Nitric Rinse				
Back Half					
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter				
5A	Nitric Rinse - Impinger No. 4				
5B	KMNO ₄ /H ₂ O Rinse - Impingers 5 & 6				
5C	HCl Rinse - Impingers 5 & 6				
Moisture Data					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	EMPTY	Ø	731.6	1617.3	885.7
2	5% / 10%	100	720.0	902.6	182.6
3	5% / 10%	100	756.8	791.5	-11.6 ^{34.7}
4	EMPTY	Ø	573.0	581.2	8.2
5	KMnO ₄	100	640.3	639.6	-0.7
6	KMnO ₄	100	734.0	732.8	-1.2
7	SG	N/A	954.2	992.0	37.8
				TOTAL =	1147.1g
Total					+224.0
Comments:					

FIELD Blank

Nozzle ID: 252 Thermocouple #: 7A
Assumed Bws: 145 Filter #: _____
Meter Box #: _____ Y: _____ ΔH@: _____
Post-Test Leak Rate: 0.04 cfm @ 10 in. Hg.
Post-Test Leak Check: Pitot: N/A Orsat: N/A

[illegible] $\overline{Tm} =$

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: <u>ASPHALT, PLANT "B"</u>						Run No.:	
Sample Date: <u>8/28/97</u>			Filter No.(s):			Job No.:	
Sample Location: <u>FIELD BLK (Methion 23)</u>							
Recovery Date:				XAD-2 Trap No.(s):			
Sample Recovery Person: <u>BHR</u>							
Moisture Data							
Impingers	XAD - 2 Trap	1 (knockout)	2 (100 ml H2O) (untipped)	3 (100 ml H2O) (tipped)	4 (knockout) (untipped)	Silica gel (untipped)	
Final wt.	<u>460.0</u>	<u>509.6</u>	<u>706.6</u>	<u>710.5</u>	<u>600.0</u>	<u>908.6</u>	g
Initial wt.	<u>459.3</u>	<u>509.7</u>	<u>706.6</u>	<u>710.7</u>	<u>599.9</u>	<u>908.0</u>	g
Net wt.							g
Description							
Train System:							
Probe:							
Filter: Color -				Loading -			
Impinger Contents:							
Silica Gel: @Grams Used -				Color -		% Spent -	
Condensate Observed In Front Half:							
Recovered Sample Fractions							
Filter Container No.						marked/sealed:	
XAD Module Container No.:						marked/sealed:	
Probe (FH) & Back Half Rinse (Acetone) Container No.:						Liquid level marked/sealed:	
Probe (FH) & Back Half Rinse (Toluene) Container No.:						Liquid level marked/sealed:	
Impinger Contents Container No.:						Liquid level marked/sealed:	
Impinger Rinse (Acetone/MeCl2) Container No.:						Liquid level marked/sealed:	

$\angle = 1.021$

Plant Name: ASPHALT PLANT "B"

Run Number: _____

Operator: _____

[illegible]

MULTI-METALS SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"			Run No.: FB		
Date: 8/27/97		Sample Box No.:		Job No.:	
Sample Location: N/A					
Sample Type: M29					
Sample Recovery Person: S. MORGAN					
Container	Description	Volume, ml	Sealed/Level Marked		
Front Half					
1	Filter No.(s) M97.017				
2	Acetone Rinse				
3	Nitric Rinse				
Back Half					
4	Nitric Rinse - Imp. 1,2,3, + Back 1/2 Filter				
5A	Nitric Rinse - Impinger No. 4				
5B	KMNO4/H2O Rinse - Impingers 5 & 6				
5C	HCl Rinse - Impingers 5 & 6				
Moisture Data					
Impinger No.	Contents	Initial Volume, ml	Weight, grams		
			Initial	Final	Net
1	EMPTY	0	724.6	724.6	0
2	5% / 10%	100	727.2	727.2	0
3	5% / 10%	100	753.1	753.2	0.1
4	EMPTY	0	622.1	622.1	0
5	KMnO4	100	688.0 684.4	688.2	0.2
6	KMnO4	100	735.6 735.6	737.1	0.5
7	SG	N/A	867.7	868.2	0.5
Total					1.3
Comments:					

