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Research Triangle Park, NC 27711

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Hot Mix Asphalt Plants
Kiln Dryer Stack
Manual Methods Testing

Asphalt Plant B
Cary, North Carolina
Volume 1 of 2

Office of Air Quality
Clean Air
OAQPS
Planning and Standards

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
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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.

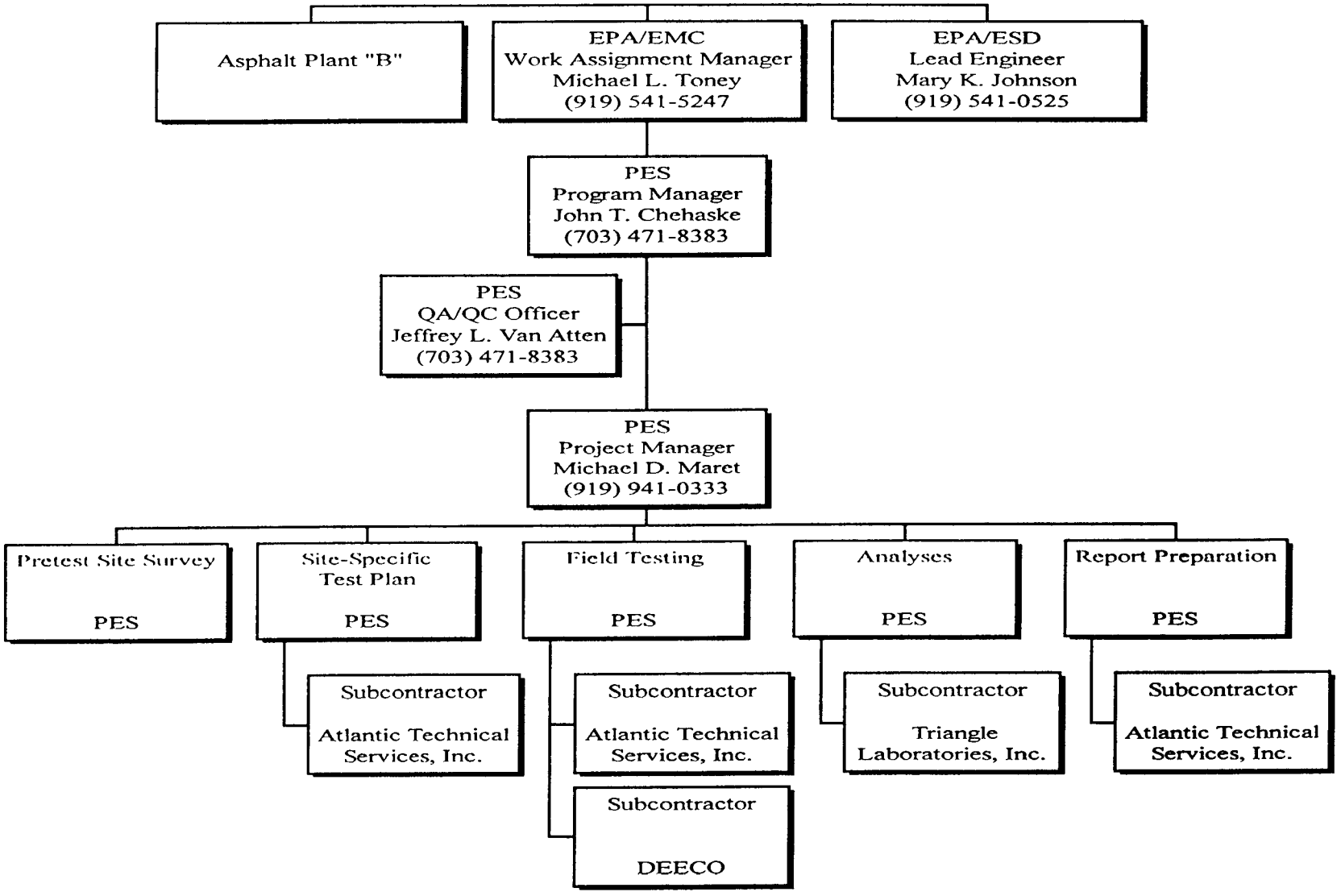


Figure 1.1 Key Personnel and Responsibility for Testing - Asphalt Plant "B", Cary, NC

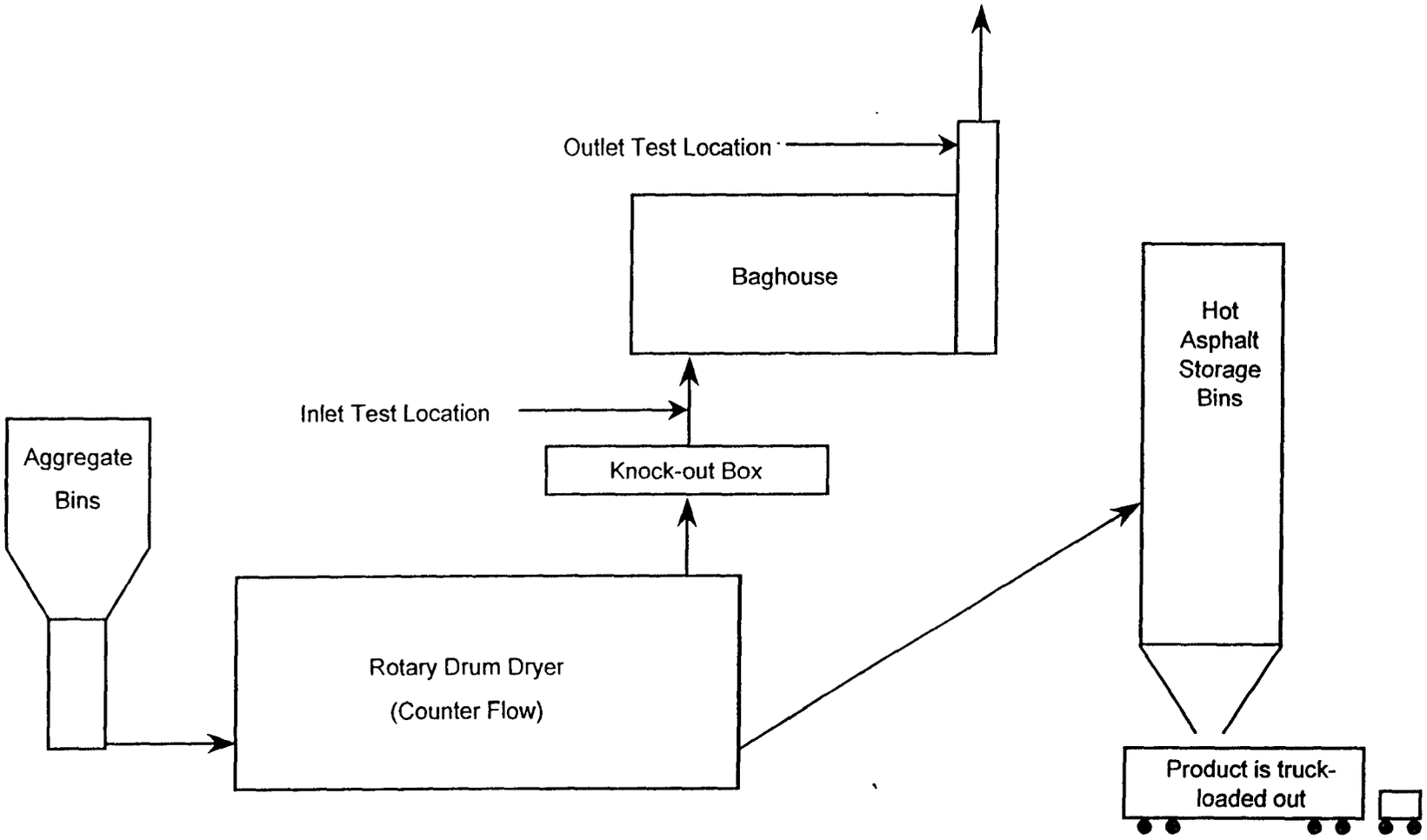


Figure 1.2 Sampling Locations - Asphalt Plant "B", Cary, NC

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 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 Cl^{35} isotopes and the number of Cl^{37} isotopes attached to the PCDDs/PCDFs congeners should agree with the Cl^{35}/Cl^{37} 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[a]	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[a]	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[a]	8/28/97	PCDDs/PCDFs	0908-1428	1108-1328 1355-1405	Filter Change & Port Change Plant Down
R-M29-I-2[a]	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 % CO_2, 13.4% O_2, 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% O_2. The measured stack gas O_2 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% O_2. The (2-run) average adjusted concentration of total PCDFs was {0.868} ng/dscm @ 7% O_2. The (2-run) average adjusted concentration of total PCDDs/PCDFs was {12.1} ng/dscm @ 7% O_2. 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% O_2. Since no PCDF congeners chlorinated at the 2378 positions were detected, the total TEF PCDDs/PCDFs concentration was also 0.011 ng/dscm @ 7% O_2.

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
Dioxins						
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}
Furans						
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
Dioxins							
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
Furans							
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 % CO_2, 14.3% O_2, 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 ft^3 for R-M23-O-1 vs. 213.024 ft^3 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% O_2. The measured stack gas O_2 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% O_2, and the (2-run) average concentration of total PCDFs was {0.245} ng/dscm @ 7% O_2. The (2-run) average adjusted concentration of total PCDDs/PCDFs was {0.777} ng/dscm @ 7% O_2.

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% O_2, 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
Dioxins						
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}
Furans						
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 OXYGEN 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
Dioxins							
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
Furans							
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 % CO_2, 15.2% O_2, 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/dcsm. 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% O_2. The measured stack gas O_2 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% O_2, and the adjusted concentration of total PCDFs was {0.0960} ng/dscm @ 7% O_2. The adjusted concentration of total PCDDs/PCDFs was {17.8} ng/dscm @ 7% O_2.

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% O_2. The concentration of PCDFs adjusted to 2378 toxic equivalents was {0.00320} @ 7% O_2, and TEF concentration for total PCDDs/PCDFs was {0.0220} ng/dscm @ 7% O_2.

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
Dioxins		
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
Furans		
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 % CO_2, 16.3% O_2, 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% O_2. The measured stack gas O_2 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% O_2.

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% O_2.

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% CO_2, 13.6% O_2, 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% O_2. 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
Dioxins		
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
Furans		
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
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	ND		
1234678 HpCDD	ND	0.010	ND
Total HpCDD	ND		
Octa CDD	ND	0.001	ND
Total PCDDs	0.00		0.00
Furans			
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 O_2.
[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 O_2.
[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)			
μg/dscm[a]	ND	ND	0.00
μg/dscm @ 7% O_2[b]	ND	ND	0.00
g/hr[c]	ND	ND	0.00
Arsenic (As)			
μg/dscm[a]	3.56	2.22	2.89
μg/dscm @ 7% O_2[b]	7.39	3.96	5.67
g/hr[c]	0.143	0.0900	0.117
Barium (Ba)			
μg/dscm[a]	765	537	651
μg/dscm @ 7% O_2[b]	1587	957	1,272
g/hr[c]	30.8	21.8	263
Beryllium (Be)			
μg/dscm[a]	ND	ND	0.00
μg/dscm @ 7% O_2[b]	ND	ND	0.00
g/hr[c]	ND	ND	0.00
Cadmium (Cd)			
μg/dscm[a]	14.3	8.51	11.4
μg/dscm @ 7% O_2[b]	29.7	15.2	22.4
g/hr[c]	0.576	0.345	0.460
Chromium (Cr)			
μg/dscm[a]	67.8	51.3	59.6
μg/dscm @ 7% O_2[b]	141	91.4	116.1
g/hr[c]	2.73	2.08	2.41
Cobalt (Co)			
μg/dscm[a]	44.7	32.0	38.4
μg/dscm @ 7% O_2[b]	92.8	57.0	74.9
g/hr[c]	1.8	1.3	1.55
Copper			
μg/dscm[a]	434	384	409
μg/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)			
μg/dscm[a]	60.4	48.3	54.3
μg/dscm @ 7% O_2[b]	125	86.0	106
g/hr[c]	2.43	1.96	2.19
Manganese (Mn)			
μg/dscm[a]	1750	1,357	1,553
μg/dscm @ 7% O_2[b]	3630	2,418	3,024
g/hr[c]	70.4	55.0	62.7
Mercury (Hg)			
μg/dscm[a]	ND	ND	0.00
μg/dscm @ 7% O_2[b]	ND	ND	0.00
g/hr[c]	ND	ND	0.00
Nickel (Ni)			
μg/dscm[a]	41.7	33.9	37.8
μg/dscm @ 7% O_2[b]	86.6	60.5	73.5
g/hr[c]	1.68	1.38	1.53
Phosphorus (P)			
μg/dscm[a]	3,009	2,251	2,629
μg/dscm @ 7% O_2[b]	6,242	4,011	5,126
g/hr[c]	121	91.3	106
Silver (Ag)			
μg/dscm[a]	0.850	0.581	0.715
μg/dscm @ 7% O_2[b]	1.76	1.04	1.40
g/hr[c]	0.0342	0.0236	0.0289
Selenium (Se)			
μg/dscm[a]	ND	0.230	0.115
μg/dscm @ 7% O_2[b]	ND	0.410	0.205
g/hr[c]	ND	0.00933	0.00466
Thallium (Tl)			
μg/dscm[a]	8.64	4.98	6.81
μg/dscm @ 7% O_2[b]	17.9	8.88	13.4
g/hr[c]	0.348	0.202	0.275
Zinc (Zn)			
μg/dscm[a]	539	397	468
μg/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% O_2.
[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% CO_2, 14.3% O_2, 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% O_2. 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% CO_2, 15.2% O_2, 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% O_2. 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 O_2.
[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 O_2.
[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)			
μg/dscm[a]	0.637	0.693	0.665
μg/dscm @ 7% O_2[b]	1.50	1.32	1.41
g/hr[c]	0.0284	0.0292	0.0288
Arsenic (As)			
μg/dscm[a]	ND	ND	0.00
μg/dscm @ 7% O_2[b]	ND	ND	0.00
g/hr[c]	ND	ND	0.00
Barium (Ba)			
μg/dscm[a]	9.10	7.92	8.51
μg/dscm @ 7% O_2[b]	21.4	15.1	18.3
g/hr[c]	0.406	0.334	0.370
Beryllium (Be)			
μg/dscm[a]	ND	ND	0.00
μg/dscm @ 7% O_2[b]	ND	ND	0.00
g/hr[c]	ND	ND	0.00
Cadmium (Cd)			
μg/dscm[a]	0.0794	0.0708	0.751
μg/dscm @ 7% O_2[b]	0.187	0.135	0.161
g/hr[c]	0.00355	0.00299	0.00327
Chromium (Cr)			
μg/dscm[a]	2.19	2.14	2.16
μg/dscm @ 7% O_2[b]	5.16	4.07	4.61
g/hr[c]	0.0978	0.0901	0.0939
Cobalt (Co)			
μg/dscm[a]	ND	ND	0.00
μg/dscm @ 7% O_2[b]	ND	ND	0.00
g/hr[c]	ND	ND	0.00
Copper (Cu)			
μg/dscm[a]	1.54	1.38	1.46
μg/dscm @ 7% O_2[b]	3.63	2.63	3.13
g/hr[c]	0.0688	0.0584	0.0636
Lead (Pb)			
μg/dscm[a]	1.42	1.03	1.22
μg/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)			
μg/dscm[a]	11.6	14.5	13.1
μg/dscm @ 7% O_2[b]	27.4	27.6	27.5
g/hr[c]	0.519	0.612	0.565
Mercury (Hg)			
μg/dscm[a]	ND	ND	0.00
μg/dscm @ 7% O_2[b]	ND	ND	0.00
g/hr[c]	ND	ND	0.00
Nickel (Ni)			
μg/dscm[a]	1.55	1.26	1.41
μg/dscm @ 7% O_2[b]	3.66	2.40	3.03
g/hr[c]	0.0694	0.0531	0.0612
Phosphorus (P)			
μg/dscm[a]	18.2	22.2	20.2
μg/dscm @ 7% O_2[b]	42.9	42.3	42.6
g/hr[c]	0.814	0.937	0.876
Silver (Ag)			
μg/dscm[a]	0.0627	0.0421	0.0524
μg/dscm @ 7% O_2[b]	0.148	0.080	0.114
g/hr[c]	0.00280	0.00177	0.00229
Selenium (Se)			
μg/dscm[a]	0.934	0.888	0.911
μg/dscm @ 7% O_2[b]	2.20	1.69	1.95
g/hr[c]	0.0417	0.0375	0.0396
Thallium (Tl)			
μg/dscm[a]	ND	ND	0.00
μg/dscm @ 7% O_2[b]	ND	ND	0.00
g/hr[c]	ND	ND	0.00
Zinc (Zn)			
μg/dscm[a]	7.34	5.01	6.18
μg/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% O_2.
[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 O_2.
[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 O_2.
[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)	
μg/dscm[a]	ND
μg/dscm @ 7% O_2[b]	ND
g/hr[c]	ND
Arsenic (As)	
μg/dscm[a]	2.13
μg/dscm @ 7% O_2[b]	5.19
g/hr[c]	0.0987
Barium (Ba)	
μg/dscm[a]	318
μg/dscm @ 7% O_2[b]	776
g/hr[c]	14.8
Beryllium (Be)	
μg/dscm[a]	ND
μg/dscm @ 7% O_2[b]	ND
g/hr[c]	ND
Cadmium (Cd)	
μg/dscm[a]	4.25
μg/dscm @ 7% O_2[b]	10.4
g/hr[c]	0.197
Total Chromium (Cr)	
μg/dscm[a]	33.3
μg/dscm @ 7% O_2[b]	81.2
g/hr[c]	1.55
Cobalt (Co)	
μg/dscm[a]	19.7
μg/dscm @ 7% O_2[b]	48.1
g/hr[c]	0.915
Copper (Cu)	
μg/dscm[a]	263
μg/dscm @ 7% O_2[b]	641
g/hr[c]	12.2
Lead (Pb)	
μg/dscm[a]	35.8
μg/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)	
μg/dscm[a]	975
μg/dscm @ 7% O_2[b]	2377
g/hr[c]	45.3
Mercury (Hg)	
μg/dscm[a]	ND
μg/dscm @ 7% O_2[b]	ND
g/hr[c]	ND
Nickel (Ni)	
μg/dscm[a]	21.8
μg/dscm @ 7% O_2[b]	53.1
g/hr[c]	1.01
Phosphorus (P)	
μg/dscm[a]	2170
μg/dscm @ 7% O_2[b]	5292
g/hr[c]	101
Silver (Ag)	
μg/dscm[a]	0.291
μg/dscm @ 7% O_2[b]	0.709
g/hr[c]	0.0135
Selenium (Se)	
μg/dscm[a]	ND
μg/dscm @ 7% O_2[b]	ND
g/hr[c]	ND
Thallium (Tl)	
μg/dscm[a]	0.901
μg/dscm @ 7% O_2[b]	2.20
g/hr[c]	0.0418
Zinc (Zn)	
μg/dscm[a]	239
μg/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% O_2.
[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% CO_2, 16.3% O_2, 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% O_2. 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 cond'tions.
[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 O_2.
[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 O_2.
[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)	
μg/dscm[a]	0.671
μg/dscm @ 7% O_2[b]	2.03
g/hr[c]	0.0324
Arsenic (As)	
μg/dscm[a]	ND
μg/dscm @ 7% O_2[b]	ND
g/hr[c]	ND
Barium (Ba)	
μg/dscm[a]	12.0
μg/dscm @ 7% O_2[b]	36.2
g/hr[c]	0.579
Beryllium (Be)	
μg/dscm[a]	ND
μg/dscm @ 7% O_2[b]	ND
g/hr[c]	ND
Cadmium (Cd)	
μg/dscm[a]	0.0336
μg/dscm @ 7% O_2[b]	0.102
g/hr[c]	0.00162
Total Chromium (Cr)	
μg/dscm[a]	2.16
μg/dscm @ 7% O_2[b]	6.53
g/hr[c]	0.104
Cobalt (Co)	
μg/dscm[a]	ND
μg/dscm @ 7% O_2[b]	ND
g/hr[c]	ND
Copper (Cu)	
μg/dscm[a]	2.57
μg/dscm @ 7% O_2[b]	7.77
g/hr[c]	0.124
Lead (Pb)	
μg/dscm[a]	1.04
μg/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)	
μg/dscm[a]	19.9
μg/dscm @ 7% O_2[b]	60.3
g/hr[c]	0.964
Mercury (Hg)	
μg/dscm[a]	ND
μg/dscm @ 7% O_2[b]	ND
g/hr[c]	ND
Nickel (Ni)	
μg/dscm[a]	1.39
μg/dscm @ 7% O_2[b]	4.21
g/hr[c]	0.0674
Phosphorus (P)	
μg/dscm[a]	24.9
μg/dscm @ 7% O_2[b]	75.2
g/hr[c]	1.20
Silver (Ag)	
μg/dscm[a]	ND
μg/dscm @ 7% O_2[b]	ND
g/hr[c]	ND
Selenium (Se)	
μg/dscm[a]	0.843
μg/dscm @ 7% O_2[b]	2.55
g/hr[c]	0.407
Thallium (Tl)	
μg/dscm[a]	ND
μg/dscm @ 7% O_2[b]	ND
g/hr[c]	ND
Zinc (Zn)	
μg/dscm[a]	5.63
μg/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% O_2.
[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)[a]	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]	201	199	163
Range	149-212	192-206	130-195
Total Produced, tons	1,039	1,241	839
Mix Temperature, °F			
Average[b]	301	299	303
Range	290-330	284-321	286-352
Raw Material (Virgin Aggregate)			
Use Rate, tph			
Average[b]	153	151	154
Range	113-161	145-154	122-183
Total Used, tons	788	943	839
RAP			
Use Rate, tph			
Average[b]	36	36	
Range	18-40	30-43	
Total Used, tons	197	235	none
Asphalt Cement			
Use Rate, tph			
Average[b]	12.3	12.1	9.2
Range	9.1-12.9	11.7-12.6	6.8-12.1
Total Used, tons	54	64	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_2O			
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 sulfur API index	125°F <500 mg/kg (0.05%) 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 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.

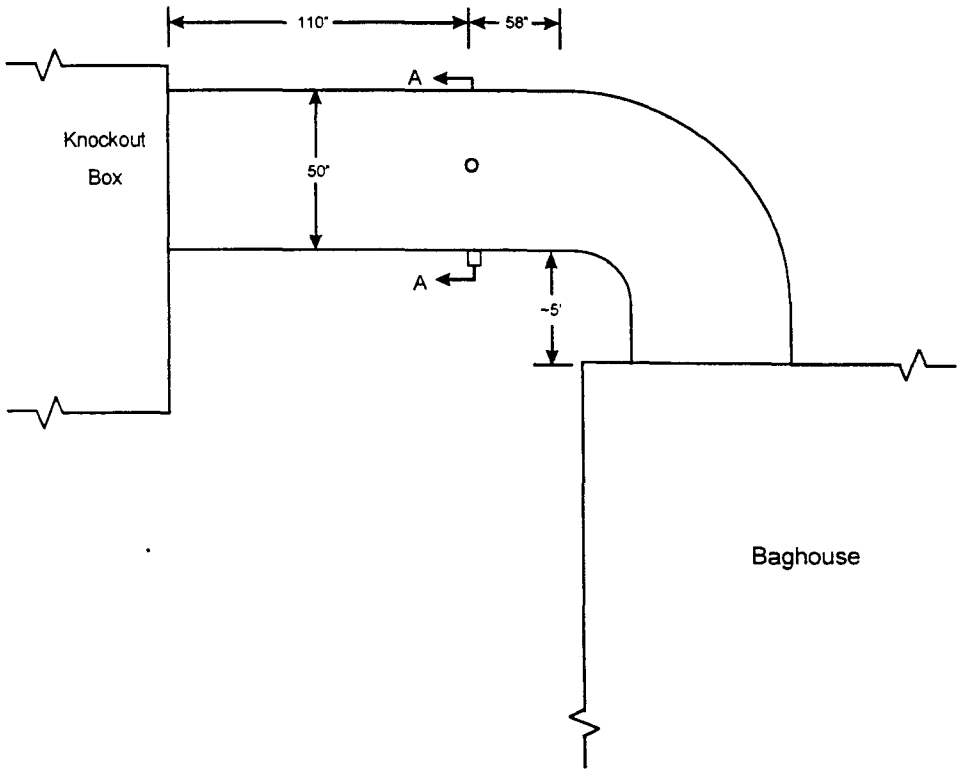
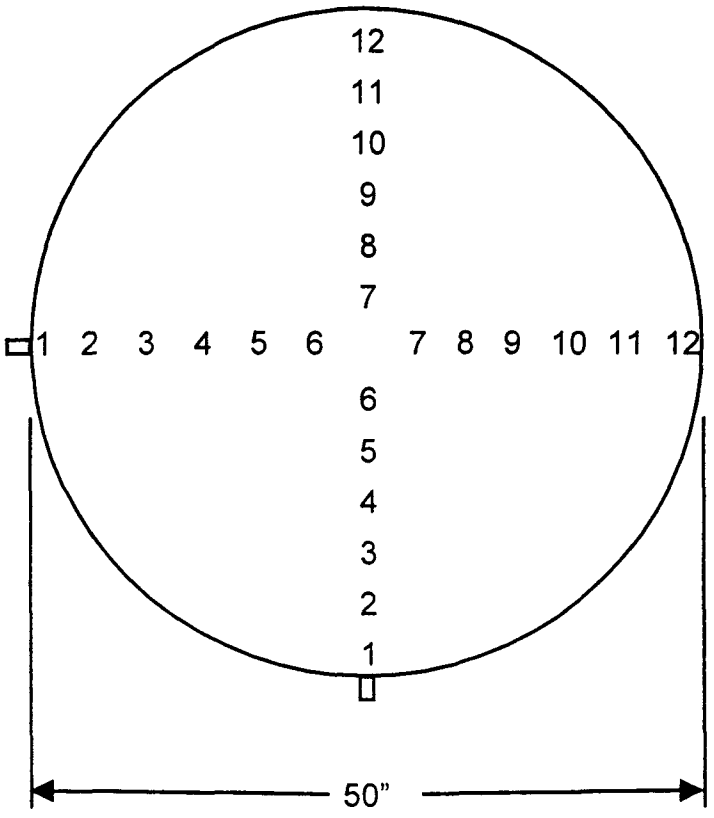


Figure 4.1 Baghouse Inlet Sampling Location - Asphalt Plant "B", Cary, NC



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

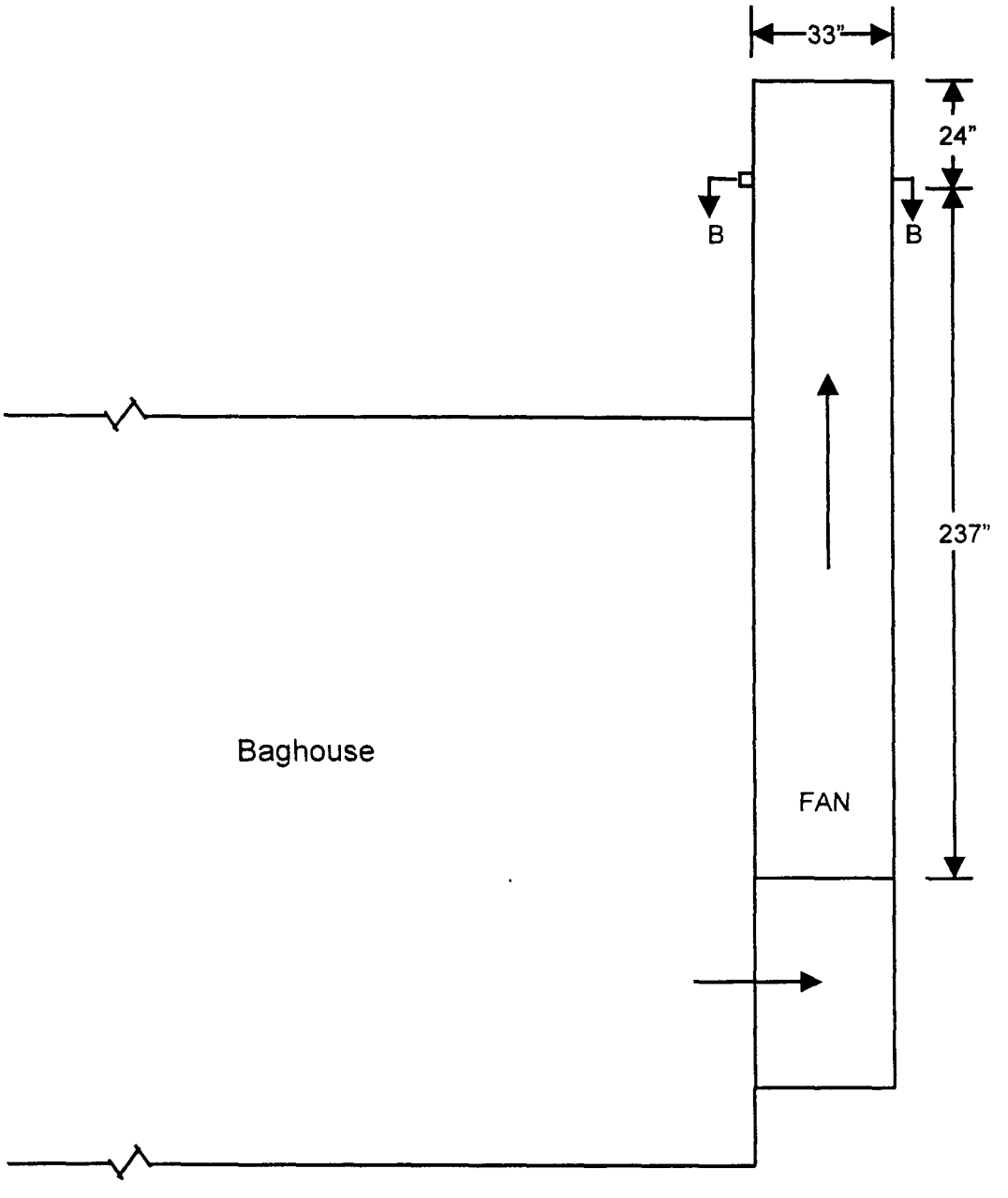
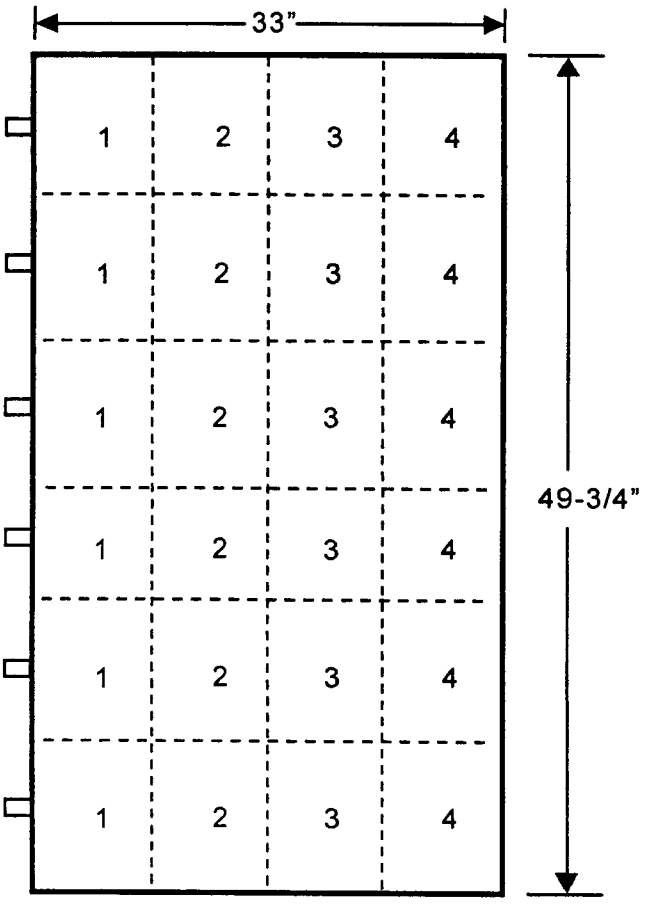


Figure 4.3 Baghouse Outlet Sampling Location - Asphalt Plant "B", Cary, NC



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]
Baghouse Inlet	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
Baghouse Outlet	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/ft^3) 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

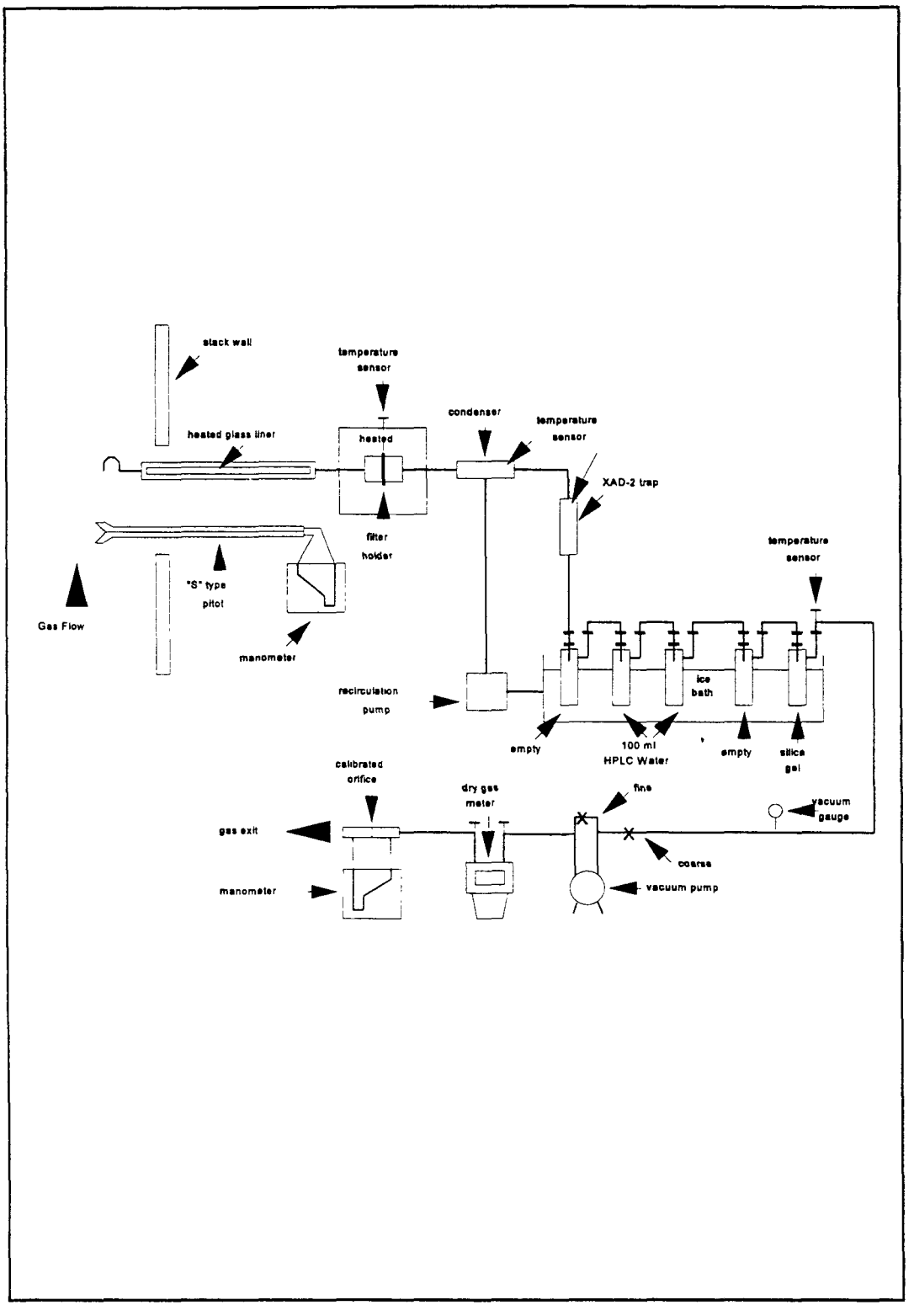


Figure 5.1 Method 23 Sample Train Schematic - Asphalt Plant "B", Cary, NC

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 the 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

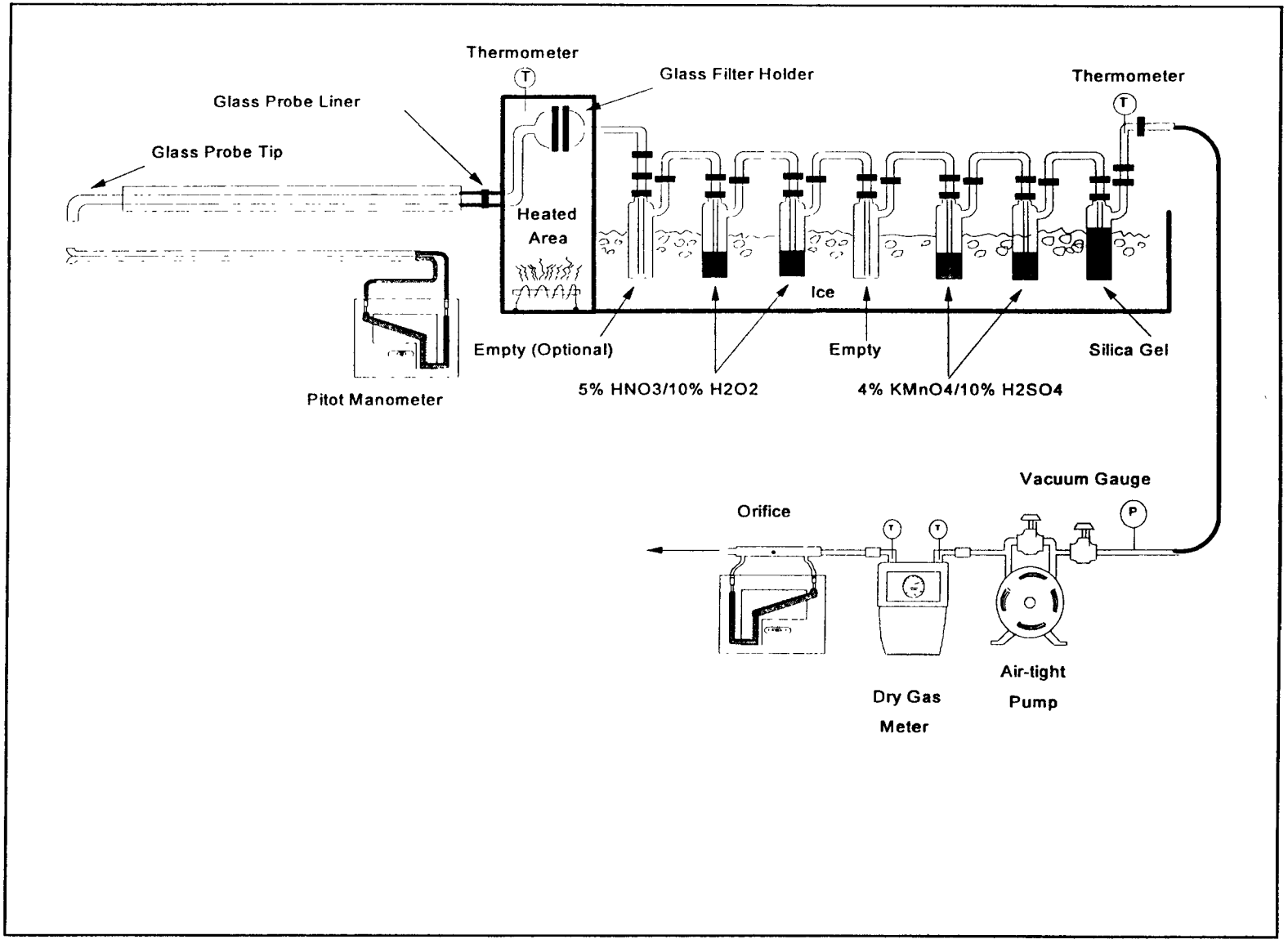


Figure 5.2 Method 29 Sample Train Schematic - Asphalt Plant "B", Cary, NC

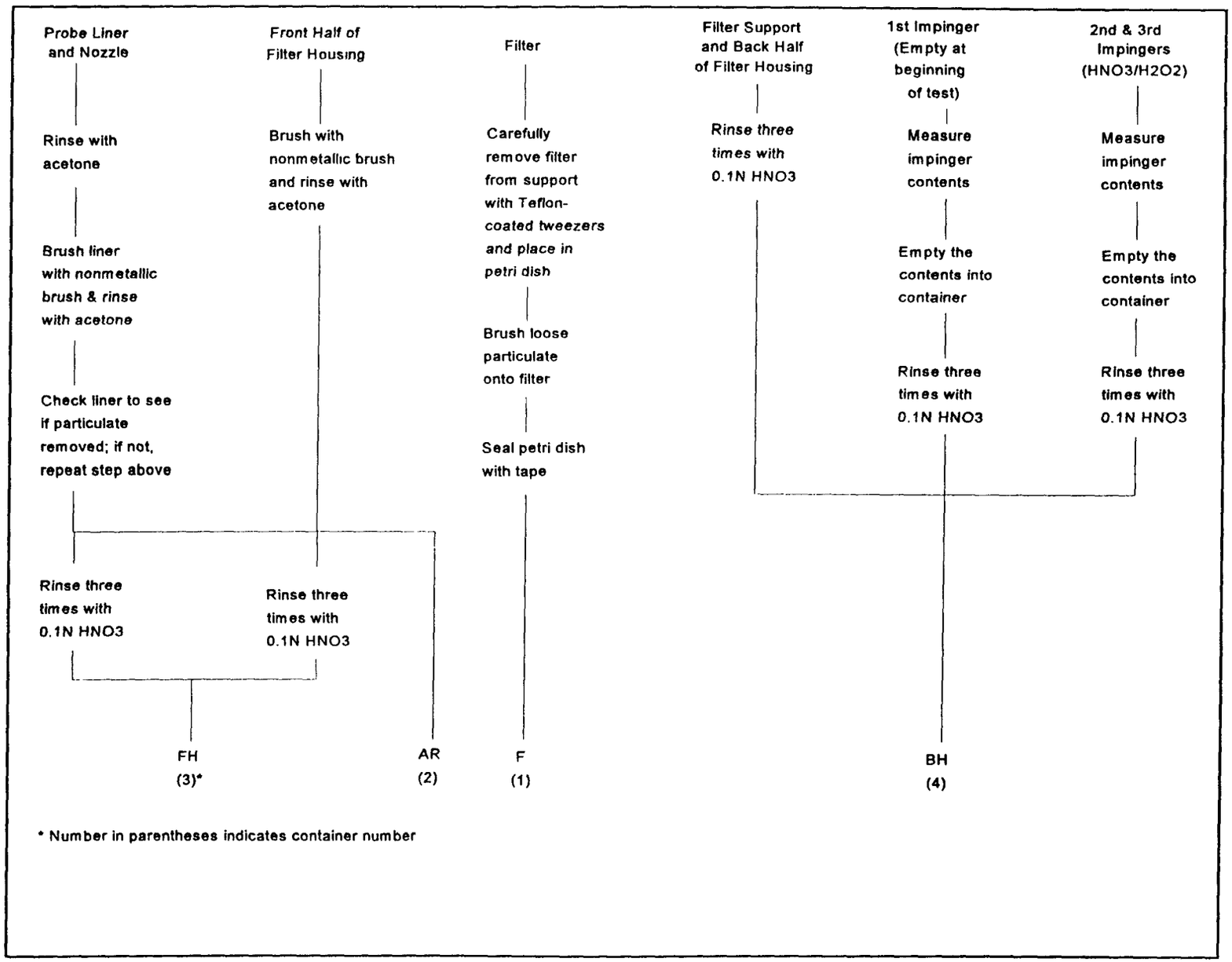


Figure 5.3 Method 29 Sample Recovery Scheme (Sample Fractions 1-4) Asphalt Plant "B", Cary, NC

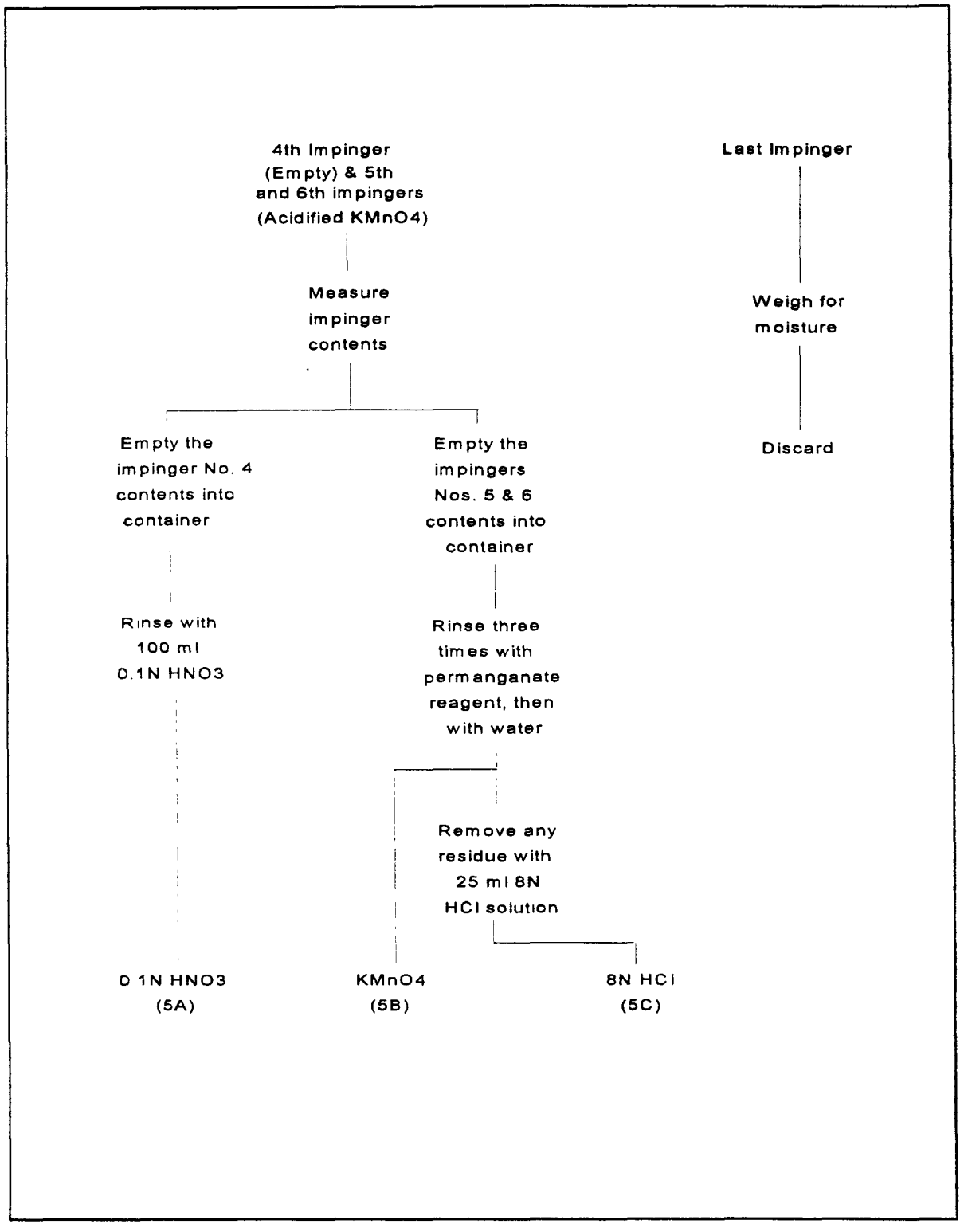


Figure 5.4 Method 29 Sample Recovery Scheme (Sample Fraction 5)
Asphalt Plant "B", Cary, NC

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 that 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	$-10° \leq \alpha_1 \leq 10°$	2.5	2	2
α_2	$-10° \leq \alpha_1 \leq 10°$	-2.5	-1	1
β_1	$-5° \leq \beta_1 \leq 5°°$	1	2	0
β_2	$-5° \leq \beta_1 \leq 5°$	-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 ($\Delta H_@$)		
	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										
Internal Standards										
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%
Surrogate Standards										
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%
Alternate Standards										
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										
Internal Standards										
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 ±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 (μg/L)	Recovery (%)	Recovered Amount (μg/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 (μg/L)	Recovered Amount (μg/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 Inlet Temp. (oF)	Fabric Filter Outlet Temp. (oF)	Fabric Filter Pressure Drop (in. H2O)	Fuel Use (gal)	Visible Emissions
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.

ASPHALT PLANT "B"

Test Run 2

Test Date: August 28, 1997

Total Test Time: 6.7 hrs

Time	Event	Product Type	Fabric Filter Inlet Temp. (oF)	Fabric Filter Outlet Temp. (oF)	Fabric Filter Pressure Drop (in. H2O)	Fuel Use (gal)	Visible Emissions
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.

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 "8"

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.

ASPHALT PLANT "B"
Test Run 3
Test Date: August 29, 1997
Total Test Time: 6.1 hrs

Time	Event	Product Type	Fabric Filter Inlet Temp. (oF)	Fabric Filter Outlet Temp. (oF)	Fabric Filter Pressure Drop (in. H2O)	Fuel Use (gal)	Visible Emissions
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

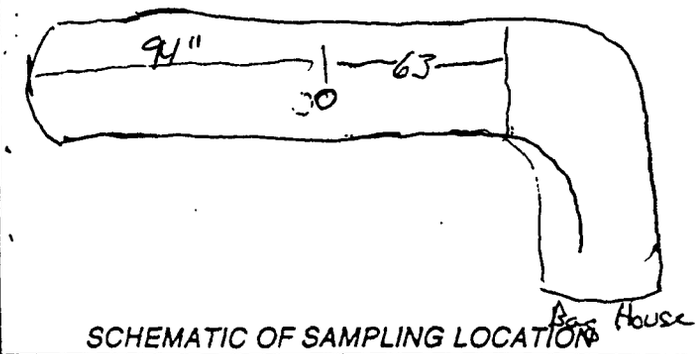
Raw Field Data

Baghouse Inlet

DEECO

EPA METHOD 1
TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT: ASPHALT PLANT "B"
CITY: Cary 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: beginning of nipple
NEAREST DOWNSTREAM DISTURBANCE: 63"
DISTURBANCE: 90° Bend
SAMPLER: ADD/MH DATE: 8-25-97



SCHEMATIC OF SAMPLING LOCATION

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" 3.25	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 3/8
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

epa1circ.wk1

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. H_2O: -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_2O	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~~ 0.57	279
8	~~0.72~~ 0.47	283
9	0.77 ✓	287
10	~~0.81~~ 0.74	289
11	~~0.84~~ 0.70	291
12	~~0.80~~ 0.64	293
B 1	0.11	250
2	0.16	256
3	0.27	264
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	
	$\overline{\sqrt{\Delta P}}$ = 0.686	$\overline{Ts}$ = 271.8

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

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

$Md =$

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

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

$Ms =$

$\overline{Ts} =$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ in. Hg

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

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

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

$Vs =$ ft/s

$As =$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ dscfm

0.286 Ideal Nozzle

GAS ANALYSIS DATA FORM

PLANT: ASPHALT PLANT "B"
DATE: 8-28-97 TEST NO: BI-M3-2
SAMPLING TIME (24-hr CLOCK):
SAMPLING LOCATION: BAGHOUSE INLET
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS): INT.
ANALYTICAL METHOD: ORSAT
AMBIENT TEMPERATURE: 70
OPERATOR: T. THOMPSON

COMMENTS:

GAS \ RUN	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	13.1	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	

GAS ANALYSIS DATA FORM

PLANT Asphalt Plant "8"

DATE _____ TEST NO _____

SAMPLING TIME (24-hr CLOCK) _____

SAMPLING LOCATION Baghouse Inlet.

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) _____

ANALYTICAL METHOD _____

AMBIENT TEMPERATURE _____

OPERATOR _____

COMMENTS:

GAS \ RUN	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	

50 2.767
60 2.789
70 2.691
80 2.655
90 2.670
00 2.585
10 2.552
10 2.519

FIELD DATA SHEET

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: Dioxin Operator: AD/MH
Pbar: 29.8 Ps: -1.8
CO2: 6 O2: 15
Probe Length/Type: 5'/glass Pitot #: 5B
Stack Diameter: 54 1/2 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: ____

	Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	AUX
	A 12	0	940	722.621											
			9:48 / 10:14	727.444 / 727.632	0.60	1.53	1.5	310	230	261	49	91	82	15	50
Change of filter	11	16	10:16	728.86	0.43	1.08	1.1	321	229	260	52	88	85	9	46
			10:25 / 10:30	733.810 / 733.930											
Change of filter	10	20	10:32	734.700	0.56	1.28	1.3	306	234	252	51	95	87	9	46
			10:40 / 10:49	734.730								99	91		
Change filter	9	30	[illegible]	741.77	0.37	0.94	0.94	310	233	250	49	99	91	9	49
			11:00 / 11:07	746.524											
Change filter	8	40	11:04	747.38	0.32	0.82	0.82	308	235	250	53	101	95	7	53
	7	50	11:18	752.57	0.37	0.94	0.94	308	235	245	50	106	100	20	49
			11:20 / 11:31	753.584											
Change filter	6	60	[illegible]	758.06	0.54	1.39	1.4	299	236	241	51	102	96	16	52
Plant shut down			11:40 / 11:46	759.021											
	5	70	1155	764.60	0.36	0.80	0.80	309	232	245	50	101	96	19	53
Change filter			1200 / 1206	767.059											
	4	80	1211	769.87	0.68	1.74	1.7	307	238	253	56	105	97	9	57
	3	90	[illegible]	77[illegible].02	0.61	1.58	1.6	299	236	258	49	108	97	12	50
		96.0	[illegible]	781.179	END	OF	RUN								
	2	100													
	1	110													
	B	120													

ΔVm= ____ $\sqrt{\Delta p}$= ____ ΔH= ____ Ts= ____ Tm= ____

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	~~422.3~~	704.7	700.6	599.6	870.5	g
Net wt.	42.3	~~507.3~~ 480.3	27.0	(54.9)	4.7	11.1	g

Description 510.5

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 1 of 2

Plant: ASPHALT PLANT "B"
Sampling Location: Inlet to bag house
Run Number: 2 Date: 8-28-97
Pretest Leak Rate: 0.008 cfm @ 20 in. Hg.
Pretest Leak Check: Pitot: 0.000 Orsat:

Sample Type: Dioxin Operator: ADD/MH
Pbar: 29.60 Ps: -1.8
CO2: 6 O2: 15
Probe Length/Type: 5'/Glass Pitot #: 5B
Stack Diameter: 54 1/2 As:

Nozzle ID: 0.194 Thermocouple #: 5B
Assumed Bws: 32% Filter #:
Meter Box #: M5-4 Y: 1.021 ΔH@: 1.8168
Post-Test Leak Rate: 0.002 cfm @ 12" in. Hg.
Post-Test Leak Check: Pitot: Orsat:

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	AUX
A 12	0	9:08	781.744											
				0.71	0.42	0.42	309	230	257	63	85	83	1.0	52
11	10	9:18	785.49	0.64	0.38	0.38	311	229	255	52	90	84	3.0	52
			~~789.03~~	~~0.55~~	~~0.33~~	~~0.33~~	~~299~~	~~231~~	~~254~~	~~50~~	~~93~~	~~85~~	~~3.5~~	~~52~~
10	20	9:28	789.03	0.55	0.33	0.33	299	231	254	50	93	85	3.5	52
	30													
9	30	9:38	792.33	0.56	0.34	0.34	306	230	253	52	94	88	5.0	53
	40													
8	40	9:48	795.73	0.47	0.28	0.28	311	232	252	53	96	89	5.5	52
	50													
7	50	9:58	798.82	0.38	0.23	0.23	309	233	254	51	96	89	5.5	50
	60													
6	60	10:08	801.66	0.49	0.29	0.29	311	240	252	51	98	90	6.0	50
	70													
5	70	10:18	804.75	0.67	0.40	0.40	312	241	258	51	99	92	8.5	50
	80													
4	80	10:28	808.35	0.65	0.39	0.39	307	242	251	52	99	93	11.0	51
	90													
3	90	10:38	811.94	0.64	0.39	0.39	293	240	251	52	100	94	12.0	51
	100													
2	100	10:48	815.69	0.58	0.35	0.35	304	235	249	55	99	94	12.0	51
	110													
1	110	10:58	819.08	0.56	0.33	0.33	313	232	250	56	100	98	12.0	51
	120						312							
B 1	120	~~11:08~~ 13:28	~~822.455~~ 825.646	0.24	0.14	0.14	312	231	240	67	101	97	1.0	54
2	130	13:38	828.30	0.27	0.17	0.17	315	229	245	65	105	99	1.0	54

ΔVm= $\overline{\sqrt{\Delta p}}$= $\overline{\Delta H}$= $\overline{Ts}$= $\overline{Tm}$=

.739
.729
.719
.710
.701
.692
Bws 31%
K
.637
.628
.620
.611
.603
.596
.588
Bws 28%
.666
.657
.648
.640
.632
Filter Change
Leak ✓
.008
.009

Plant Name: ASPHALT PLANT "B"

Test Date: 8-28-87

Run Number: 2

Operator: [illegible]/MA

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg	AUX
2													
3	140	1348	830.72	0.24	0.15	0.15	305	232 / 247	65	108	102	2.0	55
		~~1345~~ 1405											
4	150	1408	833.14	0.24	0.16	0.16	294	233 / 251	67	106	104	2.0	56
5	160	1418	835.53	0.18	0.12	0.12	290	233 / 250	67	105	106	2.0	54
6	170	1428	837.950	~END	OF	RUN							
7	180												
8	190												
9	200												
10	210												
11	220												
12	230												
	240												

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"		Run No.:
Sample Date: 8/28/97	Filter No.(s):	Job No.:
Sample Location: ~~FIELD BLK~~ INLET RUN 2		
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.	852.8	528.9	705.7	705.3	604.6	868.5	g
Initial wt.	467.8	~~427.8~~	705.1	704.3	602.8	855.2	g
Net wt.	385.0	13.2	0.6	1.0	1.8	13.3	g

515.7 TOTAL = 414.9 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:

% moisture

K

.666
.657
.648
.640
.632
.612

1 . M23-3

FIELD DATA SHEET

Plant: Asphalt Plant "B"
Sampling Location: Inlet to bag house
Run Number: 3 Date: 8-29-97
Pretest Leak Rate: 0.006 cfm @ 15" in. Hg.
Pretest Leak Check: Pitot: 0.000 Orsat: NA

Sample Type: Dioxin Operator: ADD/MH
Pbar: 29.60 Ps: −1.8
CO2: 15 O2: 6
Probe Length/Type: 6'/Glass Pitot #: 5B
Stack Diameter: 54 1/2 As:

Nozzle ID: 0.194 Thermocouple #: 5B
Assumed Bws: 28 Filter #:
Meter Box #: M5-4 Y: 1.021 ΔH@: 1.818
Post-Test Leak Rate: 0.009 cfm @ 28 in. Hg.
Post-Test Leak Check: Pitot: 0.001 Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)	Avg
B 1	0	8:18	838.235											51
2	10	8:28	840.57	0.39	0.24	0.24	348	249	253	58	83	77	1.5	57
3	20	8:38	843.33	0.30	0.19	0.19	305	238	251	59	85	79	1.5	59
4	30	848	845.81	0.25	0.16	0.16	294	266	255	64	88	81	1.5	59
5	40	858	848.69	0.24	0.16	0.16	291	243	255	57	89	83	2.0	60
6	50	908	850.54	0.29	0.19	0.19	290	241	253	54	91	85	2.0	61
7	60	918	853.14	0.49	0.32	0.32	289	241	255	58	91	85	3.0	61
8	70	928	856.25	0.63	0.41	0.41	292	235	254	53	94	87	4.0	55
9	80	938	859.92	0.69	0.45	0.45	290	232	258	55	97	90	5.5	56
10	90	948	863.79	0.67	0.44	0.44	292	229	255	59	98	89	6.0	55
11	100	958	867.62	0.63	0.42	0.42	278	230	256	61	98	91	8.0	57
12	110	1008	871.37	0.64	0.42	0.42	280	232	255	62	99	92	9.0	58
A 12	120	1018 1105	875.235 875.538	0.68	0.57	0.57	280	228	254	67	101	95	14.0	57
11	130	1115	879.79	0.55	0.46	0.46	289	231	254	52	100	94	20.0	54
10	140	1125	883.58	0.58	0.50	0.50	273	229	253	51	99	95	24.0	51
9	150	1135	887.47	0.034	0.29	0.29	0.29	230	249	54	99	98	19.0	52
8	160	11:38 11:31	890.58	0.61	0.52	0.52	272	232	250	63	100	98	25.0	56
7	170	1155 1205	891.623 892.028	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	56
5	190	12:41	902.03	0.69	0.57	0.57	295	233	251	59	97	96	7.0	57
4	200	13:33	906.08	0.62	0.52	0.52	280	233	250	67	100	95	9.0	62
3	210	13:43	910.24	0.62	0.52	0.52	284	229	250	62	104	96	11.0	62
2	220	13:53	914.25	0.65	0.55	0.55	283	230	250	63	106	99	14.5	58
1	230	14:03	918.48	0.71	0.58	0.58	304	231	252	66	107	99	23.0	57
	240	14:13	922.663	END OF RUN										

% moisture
.856
.844
.833
.822
.811
.801
.791

Meter Vol 898 G

Plant start 12:42
Meter start 13:23

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"		Run No.:
Sample Date: 8/29/97	Filter No.(s):	Job No.:
Sample Location: INLET RUN 3		
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.	488.4	900.2	657.4	642.3	601.7	928.8	g
Initial wt.	455.9	428.8	718.4	715.4	600.0	907.3	g
Net wt.	32.5	471.4	(61.0)	(73.1)	1.7	21.5	g

Description 393.0 g

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:

PORT B IS EAST

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

FIELD DATA SHEET

Plant: ASPHALT PLANT "B"
Sampling Location: INLET
Run Number: 1 Date: 08/27/97
Pretest Leak Rate: 0.011 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: N/A

Sample Type: METALS Operator: J.E.B.
Pbar: 29.8 Ps: -1.8 " H_2O
CO2: O2:
Probe Length/Type: 5' GLASS Pitot #: PSC
Stack Diameter: As:

Nozzle ID: 0.256 Thermocouple #: TSC
Assumed Bws: Filter #: SEE RECOVERY
Meter Box #: M5-9 Y: ~~1.776~~ 1.016 ΔH@: 1.776
Post-Test Leak Rate: 0.001 cfm @ 28 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: N/A

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
B1	0		118.338										
2	10		124.31	0.42*	1.1	1.1	307	233	262	57	95	95	4
3	20		130.27	0.43**	1.1	1.1	320	246	231	55	97	97	7
4	30		136.15	0.45	1.1	1.1	298	262	246	55	99	97	13
5	40		142.18	0.48†	1.2	1.2	303	231	229	61	100	99	19/5
6	50		148.07	0.44	1.1	1.1	299	259	257	59	106	101	11
7	60		154.08	0.46††	1.2	1.2	300	261	264	63	107	104	20/4
8	70		159.66	0.47	1.2	1.2	301	264	247	54	109	105	8
9	80		166.20	0.58*	1.5	1.5	299	262	270	58	101	102	19/
10	90			0.67 AB	1.7	1.7	306	247	245	62	101	102	4
11	100												
12	110												
	120												
	VF		171.036										

ck
96
~~7.16~~
9.562
= *
ACK

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 Ø	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	Ø	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	Ø	603.0	718.5	115.5
5	KMnO4	100	① ~~682.8~~ 727.2	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

@ 28% W_{20} 0.63

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: M29 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 (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
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	1039	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~~ 0.40	~~0.24~~ 0.23	~~0.24~~ 0.23	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.~~76~~ 93	0.44 ~~0.38~~	0.40 ~~0.30~~	314	258	233	64	103	103	2
10	90		200.62	0.~~72~~ 98	0.42 ~~0.34~~	~~0.42~~	312	262	242	62	108	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	303	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	103	9
	170	1350	228.17	~~0.35~~ 0.30	~~0.22~~ 0.19	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	~~0.29~~	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												

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	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	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:

K = 0.67

1 - M29-3

FIELD DATA SHEET

15% H_2O K = 0.88

JMBERED NOTES ON BACK

PORT A 5 WEST

Plant: ASPHALT PLANT "8"
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: M 29 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 #: SBB & GLOVERY
Meter Box #: M5-9 Y: 1.016 ΔH@: 1.776
Post-Test Leak Rate: 0.012 cfm @ 25 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: N/A

1 → IN

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
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	49	95	91	5
7	1:00		260.99	0.48	0.32 ~~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 ~~0.70~~	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
8 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	0.23 ~~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

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

TRAVERSE POINT LOCATION FOR ~~CIRCULAR~~ DUCTS

Plant: ASPHALT PLANT "B"

Date: 8-26-97

Sampling Location: BAGHOUSE OUT

Inside of Far Wall to Outside of Nipple: 33"

Inside of Near Wall to Outside of Nipple (Nipple Length): 2"

Stack I.D.: 33 x 49

Distance Downstream from Flow Disturbance (Distance B):

24" inches / Stack I.D. = .72 dd

Distance Upstream from Flow Disturbance (Distance A):

136 inches / Stack I.D. = 4.1 dd 3.45 equiv dd

Calculated By: MM

Schematic of Sampling Location

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3 (To nearest 1/8")	Nipple Length (inches)	Traverse Point Location (Sum of Col. 4 & 5)
1	4 1/8	4 1/8		2"	6 1/8
2	8 1/4	12 3/8			14 3/8
3	8 1/4	20 5/8			22 5/8
4	8 1/4	28 7/8			30 7/8

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: Asphalt Plant "B" Date: 8-26-97

Sampling Location: STACK Clock Time: 0830

Run #: Velocity Operators: MAD

Barometric Pressure, in. Hg: _____ Static Pressure, in. H_2O: -.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 ck c/w

Traverse Point Number	Velocity Head in. H_2O	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
~~E~~ 4	.34	279
F 1	.35	273
2	.39	272
3	.36	272
4	.32	272
	$\overline{\sqrt{\Delta P}}$ = .949	$\overline{Ts}$ = 278

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

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

$Md =$

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

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

$Ms =$

$\overline{Ts} =$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ in. Hg

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

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

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

$Vs =$ ft/s

$As =$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ dscfm

GAS ANALYSIS DATA FORM

PLANT: ASPHALT PLANT "B"

DATE: 8-28-97 TEST NO: ~~8-28-97~~ BS-M3-2

SAMPLING TIME (24-hr CLOCK):

SAMPLING LOCATION: BAGHOUSE STACK

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS): INTEGRATED

ANALYTICAL METHOD: ORSAT

AMBIENT TEMPERATURE: 70

OPERATOR: T. THOMPSON

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	

GAS ANALYSIS DATA FORM

PLANT Asphalt Plant "B"

DATE 8/29/97 TEST NO

SAMPLING TIME (24-hr CLOCK)

SAMPLING LOCATION Baghouse Outlet

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS)

ANALYTICAL METHOD

AMBIENT TEMPERATURE

OPERATOR

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						[illegible]	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)							80.7	28/100	
								TOTAL	

DEECO

Visible Emission Observation Form

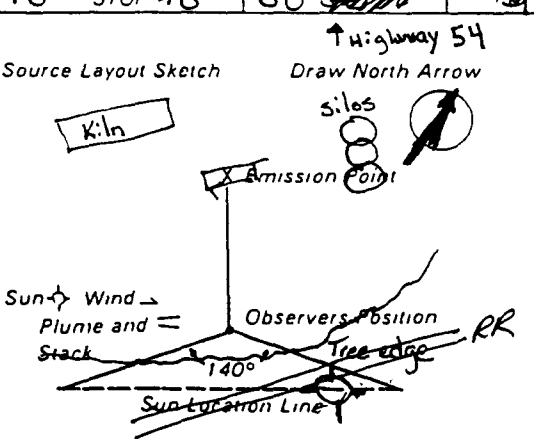
A

SOURCE NAME	Baghouse Exit
ADDRESS	ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd
CITY	Raleigh
STATE	NC
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	aggregate dryer
OPERATING MODE	
CONTROL EQUIPMENT	baghouse
OPERATING MODE	
DESCRIBE EMISSION POINT	START rectangular white stack STOP SAME
HEIGHT ABOVE GROUND LEVEL	START 35 ft STOP SAME
HEIGHT RELATIVE TO OBSERVER	START 15 ft STOP SAME
DISTANCE FROM OBSERVER	START 400 ft STOP SAME
DIRECTION FROM OBSERVER	START NW STOP SAME
DESCRIBE EMISSIONS	START coming upward STOP SAME
EMISSION COLOR	START grey STOP SAME
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☐ YES ☑
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☑
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	START 3-4 ft above exit STOP SAME
DESCRIBE BACKGROUND	START trees (softwoods) / sky STOP SAME
BACKGROUND COLOR	START green/blue STOP SAME
SKY CONDITIONS	START clear STOP SAME
WIND SPEED	START 1-3 mph STOP 0-2 mph
WIND DIRECTION	START NE STOP NE
AMBIENT TEMP	START 76 STOP 78
WET BULB TEMP	68
RH, percent	70

OBSERVATION DATE	START TIME	STOP TIME
8-27-97	10:22	11:22

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1	0	0	0	0	31	0	0	5	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	/	0	0
8	0	/	0	0	38	0	0	5	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	/	0	0	0
11	0	5	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	/	0	0	0
14	0	0	0	0	44	0	/	0	0
15	0	0	0	/	45	5	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	/	/	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	5
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	/
25	5	0	0	0	55	/	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	/	/	/
28	0	0	0	0	58	0	0	0	0
29	0	/	/	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

Source Layout Sketch — Draw North Arrow



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
CERTIFIED BY	ETA
DATE	3-14-97
VERIFIED BY	
DATE	

COMMENTS: /- obstruction of opacity reading

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TITLE
DATE

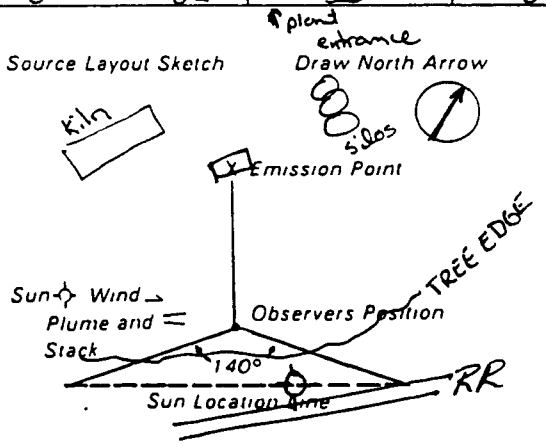
DEECO

Visible Emission Observation Form

1 B

SOURCE NAME	Baghouse Exit
ADDRESS	ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd
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	START 35 ft STOP SAME
HEIGHT RELATIVE TO OBSERVER	START 15 ft STOP SAME
DISTANCE FROM OBSERVER	START 100 ft STOP SAME
DIRECTION FROM OBSERVER	START NNW STOP SAME
DESCRIBE EMISSIONS	START coming STOP SAME
EMISSION COLOR	START grey STOP SAME
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☑ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	START 3-6 ft above exit STOP SAME
DESCRIBE BACKGROUND	START trees/sky STOP SAME
BACKGROUND COLOR	START green/blue STOP SAME
SKY CONDITIONS	START clear STOP SAME
WIND SPEED	START 0-2 mph STOP 0-3 mph
WIND DIRECTION	START NE STOP SAME
AMBIENT TEMP	START 78 STOP 82
WET BULB TEMP.	70
RH.percent	68

Source Layout Sketch



OBSERVATION DATE	START TIME	STOP TIME
8-27-97	11:25	12:25

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	0	/
2	0	0	0	0	32	/	/	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	/	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	/	5
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	/	/	0	0
13	5	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	/	46	0	0	0	0
17	0	0	0	0	47	0	0	0	/
18	0	0	0	0	48	0	5	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	5	0	0
21	0	0	0	0	51	0	0	0	/
22	0	0	/	/	52	0	0	0	0
23	0	0	0	0	53	0	0	0	/
24	0	0	0	0	54	0	/	0	0
25	0	5	0	0	55	0	/	0	0
26	0	0	5	0	56	0	0	0	0
27	0	0	0	0	57	5	0	0	0
28	0	0	0	0	58	0	/	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD	0.42
NUMBER OF READINGS AB	0 % WERE 7
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
CERTIFIED BY	ETA
DATE	3-14-97
VERIFIED BY	
DATE	

COMMENTS

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DATE

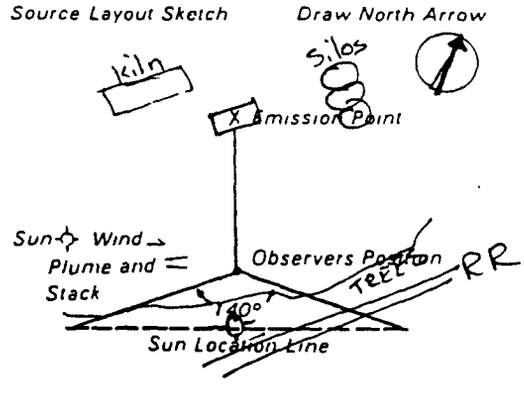
DEECO

Visible Emission Observation Form

c

SOURCE NAME	Baghouse Exit
ADDRESS	Asphalt Plant "B" (West Raleigh Plant)
	New Chapel Hill Rd
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	START 35 ft STOP SAME
HEIGHT RELATIVE TO OBSERVER	START 15 ft STOP SAME
DISTANCE FROM OBSERVER	START 400 ft STOP SAME
DIRECTION FROM OBSERVER	START NNW STOP SAME
DESCRIBE EMISSIONS	START roiling STOP SAME
EMISSION COLOR	START grey STOP SAME
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT.	NO ☑ YES ☐
IF WATER DROPLET PLUME:	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	START green/blue STOP SAME
SKY CONDITIONS	START clear STOP SAME
WIND SPEED	START 1-3 mph STOP 0-3 mph
WIND DIRECTION	START N STOP NW
AMBIENT TEMP	START 82 STOP 86
WET BULB TEMP.	75
RH,percent	72

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	START TIME *	STOP TIME
8-27-97	12:29	13:29

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	/	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	/	/	0	35	0	0	0	0
6	0	/	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	5	0
8	0	0	0	0	38	0	5	0	/
9	/	0	0	0	39	0	0	0	0
10	0	/	0	0	40	0	/	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	5	0	0	0	44	0	0	0	0
15	0	0	/	0	45	0	0	0	0
16	/	/	/	/	46	0	0	0	0
17	0	0	5	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	/
19	/	0	0	0	49	/	0	/	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	/
22	0	0	0	/	52	0	/	0	0
23	0	0	0	0	53	0	5	0	0
24	/	0	0	0	54	0	/	/	/
25	0	0	0	0	55	/	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	/	5	/
28	0	0	0	0	58	0	0	/	/
29	0	0	5	0	59	0	0	0	0
30	0	0	10	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD	0.625
NUMBER OF READINGS ABOVE	0 % WERE 8
RANGE OF OPACITY READINGS MINIMUM	0
MAXIMUM	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: / - indicates obstruction/interference during reading

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* SUN SLIGHTLY OVERHEAD. FELT READING TO STILL BE ACURATE.

DEECO

Visible Emission Observation Form

10

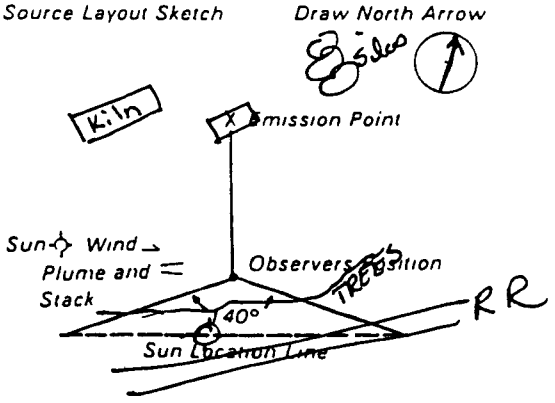
SOURCE NAME	Baghouse Exit
ADDRESS	ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd
CITY	Raleigh
STATE	NC
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	aggregate dryer
OPERATING MODE	
CONTROL EQUIPMENT	baghouse
OPERATING MODE	
DESCRIBE EMISSION POINT START	white rectangular stack
STOP	SAME
HEIGHT ABOVE GROUND LEVEL START	35 ft
STOP	SAME
HEIGHT RELATIVE TO OBSERVER START	15 ft
STOP	SAME
DISTANCE FROM OBSERVER START	400 ft
STOP	SAME
DIRECTION FROM OBSERVER START	NNW
STOP	SAME
DESCRIBE EMISSIONS START	coning
STOP	SAME
EMISSION COLOR START	grey
STOP	SAME
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT.	NO ☑ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	3-6 ft above exit
STOP	SAME
DESCRIBE BACKGROUND START	trees
STOP	SAME
BACKGROUND COLOR START	green
STOP	SAME
SKY CONDITIONS START	scattered
STOP	broken
WIND SPEED START	0-3 mph
STOP	1-3 mph
WIND DIRECTION START	NW
STOP	SAME
AMBIENT TEMP START	86
STOP	89
WET BULB TEMP	79
RH, percent	73

OBSERVATION DATE	START TIME	STOP TIME
8-27-97	13:37	14:31

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1	0	0	0	0	31	0	/	0	/
2	0	0	0	0	32	/	/	/	0
3	0	0	0	5	33	0	0	0	0
4	/	0	0	0	34	0	0	0	/
5	0	0	0	0	35	/	0	5	5
6	0	0	0	0	36	/	5	5	0
7	0	0	0	0	37	0	/	/	0
8	0	0	/	/	38	0	0	0	0
9	0	0	0	0	39	/	/	/	/
10	0	0	0	0	40	/	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	5	/	/	0
13	/	0	0	0	43	0	0	0	0
14	0	0	0	0	44	/	0	0	0
15	0	0	0	0	45	5	0	0	/
16	0	0	0	0	46	0	0	0	/
17	0	0	0	0	47	0	0	0	0
18	/	0	0	0	48	0	0	0	0
19	0	0	0	0	49	/	/	/	/
20	0	0	0	5	50	/	/	/	/
21	0	0	0	0	51	/	/	/	/
22	0	0	0	0	52	/	/	/	/
23	0	0	0	0	53	/	/	/	/
24	0	0	0	0	54	/	/	/	/
25	0	5	0	0	55	/	/	/	/
26	0	0	/	0	56	/	/	/	/
27	0	0	0	0	57	/	/	/	/
28	0	0	/	0	58	/	/	/	/
29	/	0	* /	/	59	/	/	/	/
30	0	0	0	0	60	/	/	/	/

Source Layout Sketch

Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD	1.04
NUMBER OF READINGS ABO	0 % WERE 9
RANGE OF OPACITY READINGS MINIMUM	0
MAXIMUM	5
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 / - indicates interference of opacity reading

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*Break in process operation.

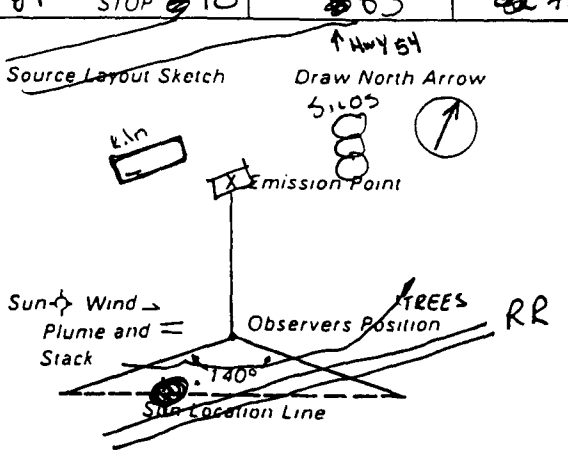
DEECO

Visible Emission Observation Form

1E

SOURCE NAME	Baghouse Exit
ADDRESS	ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd
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 START	35 ft
STOP	same
HEIGHT RELATIVE TO OBSERVER START	15 ft
STOP	same
DISTANCE FROM OBSERVER START	400 ft
STOP	same
DIRECTION FROM OBSERVER START	NNW
STOP	same
DESCRIBE EMISSIONS START	coming
STOP	same
EMISSION COLOR START	gray
STOP	same
PLUME TYPE. CONTINUOUS	☑
FUGITIVE	☐
INTERMITTENT	☐
WATER DROPLETS PRESENT NO	☑
YES	☐
IF WATER DROPLET PLUME: ATTACHED	☐
DETACHED	☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	3-6 ft above exit
STOP	same
DESCRIBE BACKGROUND START	trees
STOP	same
BACKGROUND COLOR START	green
STOP	same
SKY CONDITIONS START	broken
STOP	same
WIND SPEED START	0-3 mph
STOP	0-2 mph
WIND DIRECTION START	SW
STOP	same
AMBIENT TEMP START	89
STOP	90
WET BULB TEMP.	83
RH percent	77

Source Layout Sketch



OBSERVATION DATE	START TIME	STOP TIME
8-27-97	14:41	15:26

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	/	/	0	0
2	0	0	0	0	32	/	/	0	0
3	0	0	0	0	33	/	0	0	0
4	0	0	0	0	34	0	/	/	/
5	/	/	/	0	35	0	/	0	0
6	0	0	0	0	36	0	5	0	0
7	0	0	0	/	37	0	/	/	/
8	/	0	0	5	38	/	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	/	0	0	0	41	0	0	0	0
12	0	/	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	/
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46				
17	0	0	0	0	47				
18	0	0	0	0	48				
19	0	0	0	0	49				
20	0	0	0	0	50				
21	0	0	0	/	51				
22	/	/	0	0	52				
23	0	0	0	0	53				
24	0	0	0	5	54				
25	0	0	5	/	55				
26	0	0	0	0	56				
27	0	0	0	0	57				
28	0	0	0	0	58				
29	0	0	0	0	59				
30	0	0	0	0	60				

END OF MANUAL METHOD 9 RUN

AVERAGE OPACITY FOR HIGHEST PERIOD	0.42 %
NUMBER OF READINGS ABOVE	0 % WERE 4
RANGE OF OPACITY READINGS MINIMUM	0
MAXIMUM	5
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
/ indicates interference of reading

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TITLE
DATE

DEECO

Visible Emission Observation Form

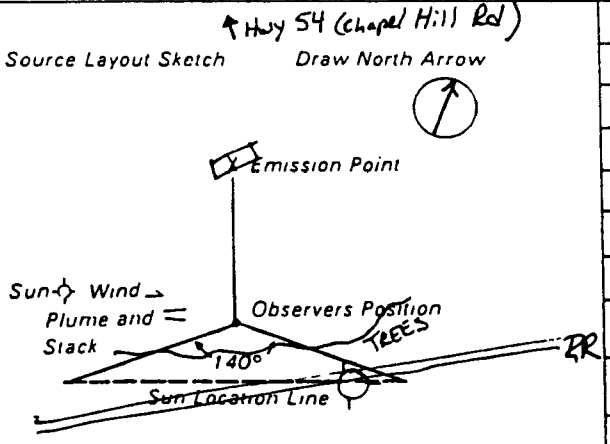
2c

SOURCE NAME	Baghouse Exit
ADDRESS	ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd
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	START 35 ft STOP same
HEIGHT RELATIVE TO OBSERVER	START 15 ft STOP same
DISTANCE FROM OBSERVER	START 400 ft STOP same
DIRECTION FROM OBSERVER	START NNW STOP same
DESCRIBE EMISSIONS	START coming upward STOP same
EMISSION COLOR	START grey STOP same
PLUME TYPE. CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☑ YES ☐	
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	START 3-6' above exit STOP same
DESCRIBE BACKGROUND	START trees STOP same
BACKGROUND COLOR	START green STOP same
SKY CONDITIONS	START scattered STOP clear
WIND SPEED	START 2-5 mph STOP same
WIND DIRECTION	START East STOP same
AMBIENT TEMP	START 82 STOP 85
WET BULB TEMP.	76
RH.percent	76

OBSERVATION DATE	START TIME	STOP TIME
8-28-97	10:10	10:13

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	/	/	0
2	0	0	0	0	32	0	0	0	/
3	0	0	0	0	33	/	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	5	36	0	0	0	0
7	/	/	0	0	37	0	0	0	0
8	0	0	0	0	38	0	/	/	/
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	/	/	0	0	41	0	0	0	0
12	/	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	/
15	0	0	0	0	45	/	0	0	0
16	0	0	5	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	/	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	5	0	0	0	52	/	/	/	0
23	0	0	0	0	53	/	0	0	0
24	0	0	0	0	54	0	0	/	/
25	0	0	0	0	55	0	0	0	0
26	/	/	/	/	56	0	0	0	/
27	/	/	/	0	57	0	0	0	0
28	0	0	0	/	58	0	0	0	0
29	0	/	0	0	59	0	0	0	0
30	0	0	0*	0	60	0	0	0	0

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD	0.83 %
NUMBER OF READINGS ABO	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
CERTIFIED BY	ETA
DATE	3-14-97
VERIFIED BY	
DATE	

COMMENTS: slash indicates interference of reading

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SIGNATURE

TITLE — DATE

* 3 min break

DEECO

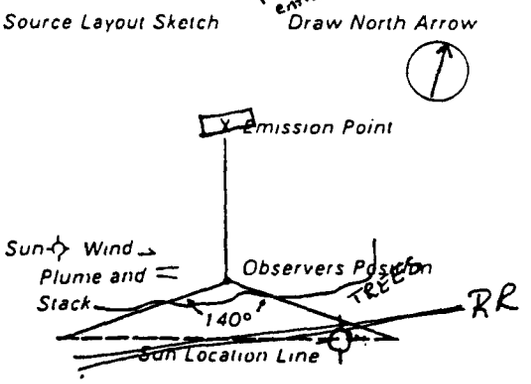
Visible Emission Observation Form

2B

SOURCE NAME	Baghouse Exit
ADDRESS	ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd
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 START	35 ft
STOP	same
HEIGHT RELATIVE TO OBSERVER START	15 ft
STOP	same
DISTANCE FROM OBSERVER START	400 ft
STOP	SAME
DIRECTION FROM OBSERVER START	NNW
STOP	same
DESCRIBE EMISSIONS START	coming upward
STOP	same
EMISSION COLOR START	grey
STOP	same
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☑ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	3-5 ft above exit
STOP	same
DESCRIBE BACKGROUND START	trees
STOP	same
BACKGROUND COLOR START	green
STOP	same
SKY CONDITIONS START	clear
STOP	scattered
WIND SPEED START	0-2 mph
STOP	2-5 mph
WIND DIRECTION START	NE
STOP	E
AMBIENT TEMP START	77
STOP	82
WET BULB TEMP	71
RH, percent	74

Source Layout Sketch

Draw North Arrow



OBSERVATION DATE	START TIME	STOP TIME
8-28-97	9:00	10:03

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	/	/	/	31	0	0	0	0
2	0	0	0	0	32	0	0	5	0
3	0	0	0	0	33	0	0	0	0
4	0*	0	5	0	34	0	/	/	0
5	0	0	0	0	35	0	/	/	/
6	0	/	/	/	36	0	0	0	0
7	/	/	/	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
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11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
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19	/	/	0	0	49	0	0	0	5
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21	/	0	5	0	51	/	0	0	0
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23	0	0	0	/	53	0	/	/	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	5
26	0	0	0	0	56	/	0	0	0
27	0	0	0	5	57	0	0	0	0
28	/	0	0	0	58	0	5	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	/	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD 0.83 %

NUMBER OF READINGS ABOVE 0 % WERE 10

RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 10

OBSERVER'S NAME (PRINT) David Goshaw

OBSERVER'S SIGNATURE [signature] DATE 8-28-97

ORGANIZATION DEECO Inc

CERTIFIED BY ETA DATE 3-14-97

VERIFIED BY DATE

COMMENTS slash indicates opacity reading interference

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TITLE DATE

* kiln stopped restart 9:08

DEECO

Visible Emission Observation Form

2A

SOURCE NAME	Baghouse Exit
ADDRESS	ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd
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 retangular stack
DESCRIBE EMISSION POINT STOP	SAME
HEIGHT ABOVE GROUND LEVEL START	35 ft
HEIGHT ABOVE GROUND LEVEL STOP	same
HEIGHT RELATIVE TO OBSERVER START	18 ft
HEIGHT RELATIVE TO OBSERVER STOP	SAME
DISTANCE FROM OBSERVER START	400 ft
DISTANCE FROM OBSERVER STOP	same
DIRECTION FROM OBSERVER START	N
DIRECTION FROM OBSERVER STOP	SAME
DESCRIBE EMISSIONS START	coming upward
DESCRIBE EMISSIONS STOP	SAME
EMISSION COLOR START	grey
EMISSION COLOR STOP	same
PLUME TYPE: CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☐ YES ☑	
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☑	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	2-4 ft above exit
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	2-5 ft above exit
DESCRIBE BACKGROUND START	trees
DESCRIBE BACKGROUND STOP	SAME
BACKGROUND COLOR START	green
BACKGROUND COLOR STOP	SAME
SKY CONDITIONS START	clear
SKY CONDITIONS STOP	SAME
WIND SPEED START	0-2 mph
WIND SPEED STOP	1-3 mph
WIND DIRECTION START	E
WIND DIRECTION STOP	SAME
AMBIENT TEMP START	73
AMBIENT TEMP STOP	77
WET BULB TEMP.	67
RH, percent	71

OBSERVATION DATE	START TIME	STOP TIME
8-28-97	7:52	8:52

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
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4	0	0	0	0	34	0	0	0	0
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8	0	0	0	5	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
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11	0	0	0	0	41	0	0	0	5
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13	0	0	0	0	43	0	0	0	0
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15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	/	/	47	0	0	0	0
18	0	/	0	0	48	0	0	0	0
19	0	0	0	0	49	/	0	0	/
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21	0	0	0	0	51	0	0	0	0
22	/	0	0	0	52	0	0	/	/
23	0	0	0	0	53	/	0	5	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	/
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27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	/	59	0	0	0	0
30	/	0	/	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD 0.208 %

NUMBER OF READINGS ABO 0 % WERE 5

RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 5

OBSERVER'S NAME (PRINT) David Goshaw

OBSERVER'S SIGNATURE

DATE 8-28-97

ORGANIZATION DEECO Inc

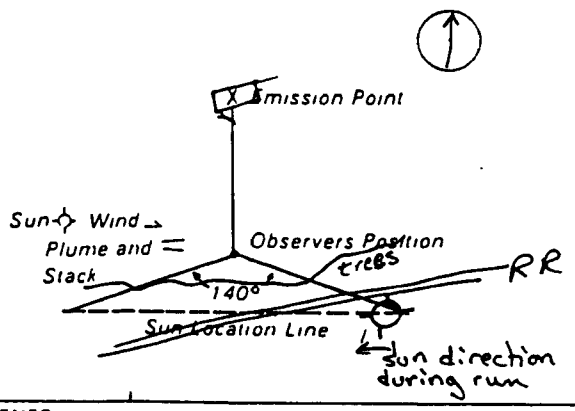
CERTIFIED BY ETA

DATE 3-14-97

VERIFIED BY

DATE

Source Layout Sketch — Draw North Arrow



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TITLE

DATE

DEECO

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) New Chapel Hill Rd		
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 START 35 ft STOP same / HEIGHT RELATIVE TO OBSERVER START 15 ft STOP same		
DISTANCE FROM OBSERVER START 400 ft STOP same / DIRECTION FROM OBSERVER START NNW STOP same		
DESCRIBE EMISSIONS START coming upward STOP same		
EMISSION COLOR START grey STOP same / PLUME TYPE: CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐		
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 START green STOP same / SKY CONDITIONS START clear STOP scattered		
WIND SPEED START 2-6 mph STOP 16 mph / WIND DIRECTION START East STOP East		
AMBIENT TEMP START 85 STOP 88 / WET BULB TEMP 80 / RH, percent 80		

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0*	0	0	0	32	5	0	0	0
3	0	/	/	/	33	0	0	0	0
4	0	0	0	0	34	0	0	5	0
5	0	0	0	/	35	/	0	0	0
6	0	0	0	0	36	5	0	0	0
7	0	5	0	0	37	0	0	0	0
8	0	5	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	/	0	41	0	0	0	0
12	0	5	0	0	42	0	10	0	0
13	5	0	0	0	43	0	0	0	0
14	0	0	5	0	44	0	/	0	0
15	0	0	0	0	45	5	0	0	0
16	0	0	5	0	46	0	0	0	0
17	0	0	0	/	47	0	/	0	5
18	/	0	0	0	48	/	0	0	0
19	0	0	0	/	49	0	0	0	0
20	0	0	0	0	50	/	0	0	0
21	0	0	0	0	51	5	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	5	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	5	56	0	0	0	/
27	0	0	/	/	57	0	0	/	/
28	0	0	0	0	58	0	/	0	/
29	0	0	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 14

RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 10

OBSERVER'S NAME (PRINT) David Goshaw

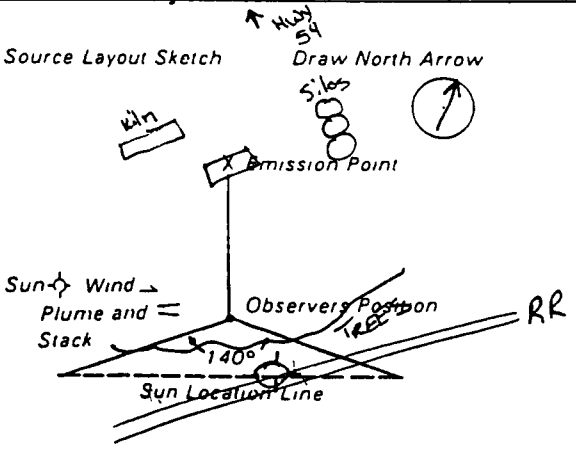
OBSERVER'S SIGNATURE [signature] DATE 8-28-97

ORGANIZATION DEECO Inc

CERTIFIED BY ETA DATE 3-14-97

VERIFIED BY DATE

Source Layout Sketch — Draw North Arrow



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SIGNATURE
TITLE DATE

*Kiln stopped 5 min break

DEECO

Visible Emission Observation Form

3a

SOURCE NAME	Baghouse Exit
ADDRESS	ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd
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	START 35 ft STOP SAME
HEIGHT RELATIVE TO OBSERVER	START 15 ft STOP SAME
DISTANCE FROM OBSERVER	START 400 ft STOP SAME
DIRECTION FROM OBSERVER	START NNW STOP SAME
DESCRIBE EMISSIONS	START coming STOP SAME
EMISSION COLOR	START grey STOP SAME
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☑
WATER DROPLETS PRESENT:	NO ☑ YES ☐
IF WATER DROPLET PLUME:	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	START green STOP SAME
SKY CONDITIONS	START clear STOP same
WIND SPEED	START 0-1 mph STOP same
WIND DIRECTION	START East STOP same
AMBIENT TEMP	START 70 STOP 76
WET BULB TEMP.	66
RH percent	80

OBSERVATION DATE 8-29-97 | START TIME 8:13 | STOP TIME 9:13

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	5	31	0	0	5	/
2	0	0	0	0	32	0	0	0	[illegible]
3	10	0	0	0	33	0	5	5	0
4	0	5	0	0	34	5	0	5	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	10	0
8	0	0	0	0	38	0	0	5	0
9	0	/	/	0	39	0	0	10	0
10	0	0	5	0	40	0	0	0	/
11	10	0	0	0	41	/	0	0	0
12	0	0	0	0	42	0	0	5	/
13	0	5	0	10	43	0	0	0	0
14	0	5	0	5	44	0	0	5	[illegible]
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16	0	0	5	0	46	0	0	0	0
17	0	/	0	0	47	0	0	0	0
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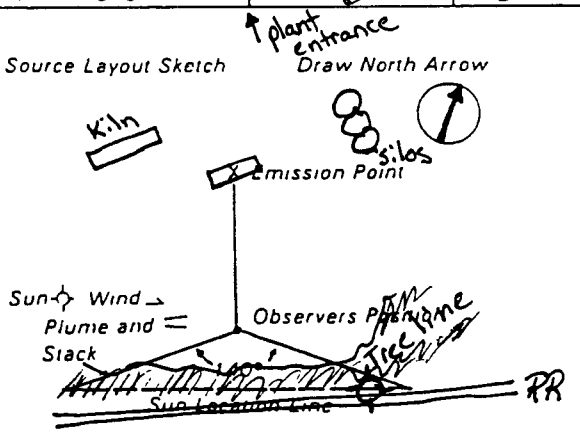
24	0	0	0	0	54	0	0	5	
25	5	0	0	0	55	5	5	10	
26	0	0	0	0	56	0	0	0	
27	5	5	0	0	57	10	5	0	
28	0	0	0	0	58	0	0	0	
29	5	0	10	5	59	0	0	0	
30	10	5	5	0	60	0	0	0	

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD 25 %

NUMBER OF READINGS AT 5 % WERE 14

RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 10

OBSERVER'S NAME (PRINT) David Gosnaw

OBSERVER'S SIGNATURE [signature] DATE 8-29-9

ORGANIZATION DEECO Inc

COMMENTS slash indicates line of sight interference

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TITLE DATE

CERTIFIED BY ETA DATE 3-14-9

VERIFIED BY DATE

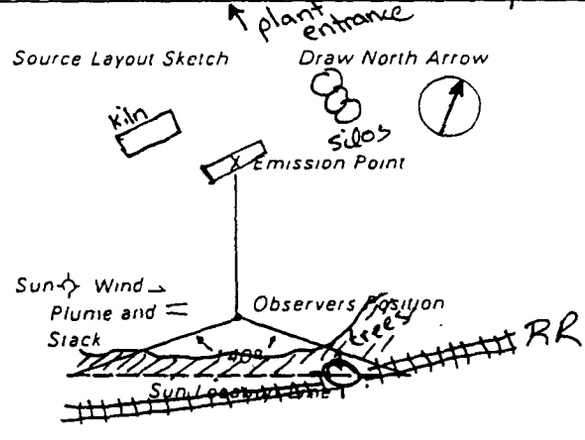
DEECO

Visible Emission Observation Form

3B

SOURCE NAME	Baghouse Exit
ADDRESS	ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd
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	START 35 ft STOP SAME
HEIGHT RELATIVE TO OBSERVER	START 15 ft STOP SAME
DISTANCE FROM OBSERVER	START 400 ft STOP same
DIRECTION FROM OBSERVER	START NNW STOP SAME
DESCRIBE EMISSIONS	START coming STOP same
EMISSION COLOR	START grey STOP same
PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☑	
WATER DROPLETS PRESENT	NO ☑ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	START 2-6 ft above exit STOP 2-5 ft above exit
DESCRIBE BACKGROUND	START trees STOP same
BACKGROUND COLOR	START green STOP same
SKY CONDITIONS	START clear STOP clear
WIND SPEED	START 1-3 mph STOP 1-4 mph
WIND DIRECTION	START East STOP SE
AMBIENT TEMP	START 76 STOP 81
WET BULB TEMP.	69
RH, percent	70

Source Layout Sketch



OBSERVATION DATE	START TIME	STOP TIME
8-29-97	9:23	10:23

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
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2	5	0	0	0	32	0	0	0	0
3	5	0	0	0	33	5	0	0	0
4	0	0	5	0	34	0	0	0	0
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25	0	0	5	0	55	10	0	0	0
26	0	0	10	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	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

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

COMMENTS slash indicates interference of reading

OBSERVER'S SIGNATURE

DATE 8-29-97

ORGANIZATION DEECO Inc.

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE

DATE

CERTIFIED BY ETA

DATE 3-14-97

VERIFIED BY

DATE

DEECO

Visible Emission Observation Form

[redacted] 3

SOURCE NAME Baghouse Exit	OBSERVATION DATE 8-29-97	START TIME 10:33	STOP TIME 11:33
ADDRESS ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd			
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 START 35 ft STOP same	HEIGHT RELATIVE TO OBSERVER START 15 ft STOP same		
DISTANCE FROM OBSERVER START 400 ft STOP same	DIRECTION FROM OBSERVER START NNW STOP same		
DESCRIBE EMISSIONS START coming STOP same			
EMISSION COLOR START grey STOP same	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☑		
WATER DROPLETS PRESENT: NO ☑ YES ☐	IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐		
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START 25 ft above exit STOP same			
DESCRIBE BACKGROUND START trees STOP same			
BACKGROUND COLOR START green STOP same	SKY CONDITIONS START clear STOP clear		
WIND SPEED START 1-5 mph STOP same	WIND DIRECTION START East STOP same		
AMBIENT TEMP START 81 STOP 85	WET BULB TEMP. 72	RH,percent 65	

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30
1	5	0	0	0	31	0	0	0
2	0	0	0	0	32	0	0	0
3	0	5	0	0	33	0	0	0
4	0	0	0	0	34	0	5	0
5	0	0	0	0	35	0	0	0
6	0	0	5	0	36	0	0	0
7	0	0	5	0	37	0	0	0
8	0	0	5	5	38	0	0	0
9	5	0	5	0	39	0	0	0
10	5	0	0	0	40	0	5	0
11	0	5	0	0	41	0	10	0
12	0	5	/	/	42	0	0	0
13	0	0	0	0	43	0	5	0
14	0	0	0	0	44	0	0	0
15	0	0	0	0	45	0	0	0
16	5	0	10	0	46	0	0	0
17	0	0	0	1	47	5	0	0
18	/	0	5	0	48	/	0	0
19	0	0	0	0	49	0	0	0
20	0	10	0	0	50	0	5	0
21	0	5	0	0	51	/	0	0
22	0	0	0	0	52	0	0	0
23	0	0	0	0	53	0	0	0
24	0	/	0	0	54	0	0	5
25	0	0	0	0	55	0	0	0
26	0	0	0	0	56	0	0	0
27	5	0	0	0	57	0	0	0
28	0	5	0	5	58	0	0	0
29	0	0	0	0	59	5	0	0
30	5	0	0	0	60	5	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD 1.875 % — NUMBER OF READINGS 4 % WERE 4

RANGE OF OPACITY READINGS MINIMUM 0 MAXIMUM 10

OBSERVER'S NAME (PRINT) David Goshaw

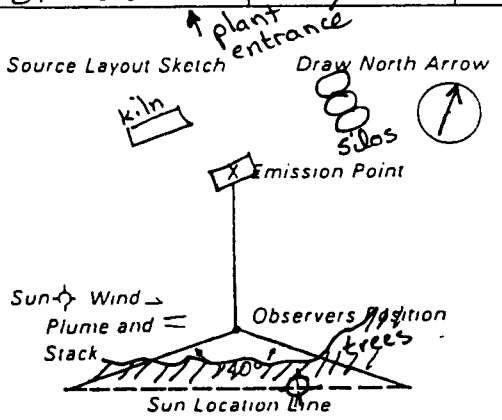
OBSERVER'S SIGNATURE [signature] DATE 8-29-97

ORGANIZATION DEECO Inc.

CERTIFIED BY ETA DATE 3-14-97

VERIFIED BY DATE

Source Layout Sketch — Draw North Arrow



COMMENTS / indicates line of sight interference

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SIGNATURE

TITLE DATE

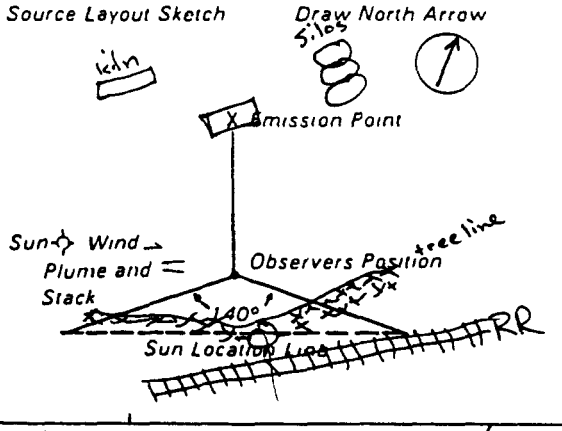
DEECO

Visible Emission Observation Form

3D

SOURCE NAME	Baghouse Exit
ADDRESS	ASPHALT PLANT "B" (West Raleigh Plant) New Chapel Hill Rd
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 START	35 ft
STOP	same
HEIGHT RELATIVE TO OBSERVER START	15 ft
STOP	same
DISTANCE FROM OBSERVER START	400 ft
STOP	same
DIRECTION FROM OBSERVER START	NW
STOP	same
DESCRIBE EMISSIONS START	coming
STOP	same
EMISSION COLOR START	grey
STOP	same
PLUME TYPE. CONTINUOUS	☑
FUGITIVE	☐
INTERMITTENT	☑
WATER DROPLETS PRESENT: NO	☑
YES	☐
IF WATER DROPLET PLUME ATTACHED	☐
DETACHED	☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	3-6 ft above exit
STOP	same
DESCRIBE BACKGROUND START	trees
STOP	same
BACKGROUND COLOR START	green
STOP	same
SKY CONDITIONS START	clear
STOP	scattered
WIND SPEED START	0-5 mph
STOP	same
WIND DIRECTION START	East
STOP	same
AMBIENT TEMP START	85
STOP	87
WET BULB TEMP.	73
RH, percent	56

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	START TIME	STOP TIME
8-29-97	11:43	12:43

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1	0	0	/	0	31	0	0	0	*/
2	5	0	/	0	32	10	5	0	0
3	/	/	0	0	33	0	0	0	0
4	0	0	0	0	34	10	0	0	0
5	0	0	5	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	5	/
8	0	0	0	0	38	/	/	0	/
9	5	0	/	/	39	/	0	0	0
10	0	0	0	0	40	/	0	5	0
11	0	0	0	0	41	0	0	10	0
12	0	0	0	0	42	0	5	0	5
13	0	0	0	0	43	0	5	10	0
14	0	0	0	0	44	0	0	5	0
15	0	0	0	0	45	5	0	0	10
16	0	0	0	0	46	0	10	0	0
17	5	0	5	0	47	10	5	0	0
18	0	0	0	0	48	0	0	0	0
19	5	0	0	0	49	5	0	5	0
20	0	/	0	0	50	0	0	0	0
21	5	/	0	0	51	0	10	0	0
22	0	0	/	10	52	0	0	0**	0
23	5	0	0	0	53				
24	0	0	0	0	54				
25	5	0	0	0	55				
26	0	0	0	0	56				
27	0	0	0	0	57				
28	0	0	0	0	58				
29	0	0	0	0	59				
30	0	/	0	0	60				

AVERAGE OPACITY FOR HIGHEST PERIOD	2.9%
NUMBER OF READINGS ABOVE 5% WERE	7
RANGE OF OPACITY READINGS MINIMUM	0
MAXIMUM	10
OBSERVER'S NAME (PRINT)	David Goshaw
OBSERVER'S SIGNATURE	[signature]
DATE	8-29-97
ORGANIZATION	DEECO Inc.
CERTIFIED BY	ETA
DATE	3-14-97
VERIFIED BY	
DATE	

COMMENTS: / - indicates opacity reading interference

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SIGNATURE
TITLE
DATE

* Kiln stopped.

** Kiln stopped

Page 1 of 3 K=2.7

FIELD DATA SHEET

Plant: ASPHALT PLANT "B"
Sampling Location baghouse stack
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: TMS
Pbar: 29.5 Ps: -1.5
CO2: O2:
Probe Length/Type: 4' glass Pitot #: PR-20
Stack Diameter: 49"x33" As:

Nozzle ID: 0.256 Thermocouple #:
Assumed Bws: 15 Filter #: M23-0-1
Meter Box #: MB12 Y: 0.982 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 (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O: ~~Desired~~	Orifice Pressure Differential (ΔH) in H2O: Actual	Stack Temp. (Ts)	Temperature °F: Probe	Temperature °F: Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
0	0/0	0940	~~925.600~~										
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	43	93	93	12
2	15	1024	945.50	2.0	65	5.4	289	246	255	47	98	95	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	969.80	1.3	63	3.5	281	247	254	48	107	102	8
	40	1052	973.98	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	109	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	1.5	64	4.9	275	246	254	59	112	111	15
	80	1158	23.59	1.7	63	4.6	284	245	243	58	113	112	15

156.51

M-29

Plant Name: Asphalt Plant "B" **Test Date:** 8-27-97

Run Number: 01 **Operator:** MAD

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
—	120	1246	150.241									
F 1	125	1251	153.73	.53	NA	1.29	287	247 / 253	64	112	109	2
	130	1256	156.46	.53		1.29	287	248 / 253	64	112	109	2
2	135	1301	160.16	.55		1.34	285	247 / 254	60	113	109	2
	140	1306	163.9	.5		1.21	285	246 / 255	59	113	109	2
3	145	1311	167.37	.6		1.4	285	243 / 247	57	112	109	2
	150	1316	171.0	.61		1.4	285	244 / 248	57	111	109	2
4	155	1321	174.37	.52		1.26	284	243 / 247	58	112	110	2
	160	1326	177.772	.53		1.29	285	244 / 246	59	112	110	2
A 1	165	1335/1340	184.32	2.1		5.1	290	245 / 243	59	113	111	3
	170	1345	191.16	2.1		5.1	295	246 / 242	61	114	112	3
2	175	1350	198.23	2.3		5.6	287	246 / 244	60	115	113	4
	180	1355	205.75	2.4		5.8	287	246 / 247	61	117	113	4
3	185	* 1400	211.17	1.5		3.65	289	245 / 248	62	119	114	3.5
	190	1405	217.08	1.6		3.9	290	245 / 250	62	121	115	3.5
4	195	1420	222.59	1.3		3.17	281	246 / 251	63	116	114	3.5
	200	1425	227.507	1.2		2.92	289	247 / 250	63	116	114	3.5
B 1	205 *	1435/1439	234.04	2.0		4.87	282	246 / 251	63	112	112	3.5
	210	1446	240.52	2.0		4.87	282	245 / 250	60	112	112	3.5
2	215	1451	247.26	2.2		5.36	290	246 / 251	59	114	112	4
	220	1456	254.04	2.1		5.1	290	247 / 252	60	116	112	4
3	225	1501	260.75	2.1		5.1	292	246 / 253	60	116	112	4
	230	1506	267.44	2.1		5.1	292	245 / 254	60	114	112	4
4	235	1511	273.94	1.7		4.1	293	245 / 253	60	114	111	4
	240	1516	278.983	1.6		3.9	293	245 251	61	114	111	4

737.264 Vm + 76.816

Plant: ASPHALT PLANT "B" Sample Type: M-29 Operator: MAD Nozzle ID: .25 Thermocouple #: _____

Sampling Location: BAGHOUSE EXIT (STACK) Pbar: 29.8 Ps: -.42 Assumed Bws: 15% Filter #: _____

Run Number: 01 Date: 8-27-97 CO2: _____ O2: _____ Meter Box #: AR-10 Y: 9.65 ΔH@: 1.747

Pretest Leak Rate: .007 cfm @ 11 in. Hg. Probe Length/Type: 4' GLASS Pitot #: _____ Post-Test Leak Rate: .004 cfm @ 6 in. Hg.

Pretest Leak Check: Pitot: ✓ Orsat: _____ Stack Diameter: 33x49 As: _____ Post-Test Leak Check: Pitot: ✓ Orsat: _____

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
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*	55.74	1.4		3.3	291	244	249	66	93	90	1
	20	0959*	61.113	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	254	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	296	244	252	60	113	107	2
	70	1142	108.2	1.1		2.66	295	245	253	61	113	108	2
4	75	1153	112.94	1.1		2.6	282	245	255	62	112	107	2
	80	1158	118.045	1.2		2.5	284	247	254	62	113	108	2
E 1	85	1202/1207	121.73	.63		1.52	292	246	254	60	113	110	2
	90	1202	125.57	.64		1.56	292	247	257	60	113	111	2
2	95	1217	129.4	.68		1.65	295	246	251	61	113	111	2
	100	1222	133.2	.72		1.75	295	247	257	61	113	111	2
3	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 START RESTART @ 10A

*0959 STOP RESTART @ 1032

*1140 STOP PLANT DOWN. RESTART @ 1146

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

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"		Run No.:
Sample Date: 8/29/97	Filter No.(s):	Job No.:
Sample Location: OUTLET RUN 3		
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.	316.3	1211.1	958.6	753.5	603.2	912.2	g
Initial wt.	303.7	~~429.0~~	711.5	~~599.0~~	599.0	864.6	g
Net wt.	~~12.9~~ 12.6	735.8 475.3	247.1	40.1 713.4	4.2	47.6 1255	g

Description

Train System: 1,087.4 grams

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:

Plant Name: ASPHALT PLANT "B" **Test Date:** 8-29-97

Run Number: M23-0-3 **Operator:** DMS

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
	160/0	1102	522.03		XAD							
27 E 1	5	1107	525.55	0.50	57	1.40	265	248 / 256	57	105	104	7
	10	1112	529.10	0.60	45	1.60	269	246 / 249	53	105	104	7
2	15	1117	533.21	0.65	45	1.80	270	247 / 241	55	105	104	8
	20	1122	537.40	0.65	46	1.80	269	246 / 242	54	106	104	8
3	25	1127	542.23	0.73	46	2.00	264	246 / 252	55	107	105	9
	30	1132	546.82	0.78	50	2.15	260	247 / 253	55	108	105	9
4	35	1137	551.75	0.90	49	2.40	258	247 / 248	55	109	106	10
	200	1142	556.46	0.90	57	2.40	258	248 / 242	56	110	106	10
	200/0	1145	556.46									
F 1	5	1150	560.14	0.40	50	1.10	261	247 / 252	57	109	107	7
	10	1155	563.95	0.40	47	1.10	258	248 / 252	56	109	107	8
2	15	1200	567.82	0.46	46	1.25	259	245 / 242	58	110	108	8
	20	1205	571.72	0.46	46	1.25	258	247 / 249	58	109	108	8
3	25	1210	575.68	0.50	47	1.35	260	246 / 254	59	109	108	8
	30	1226	579.58	0.50	47	1.35	263	246 / 257	60	109	108	9
4	35	1231	583.52	0.52	45	1.40	261	248 / 243	58	107	108	9
	240/off	1236	587.600	0.52	48	1.40	271	247 / 243	58	108	108	9

Stop @ 1211 - feed problem, restart @ 1222

Plant Name: ASPHALT PLANT "B"

Test Date: 8-29-97

Run Number: M23-0-3

Operator: TRS

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O ~~Desired~~	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp.° F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
	80/0	0935	454.00									
C 1	5	0940	458.63	1.1	48	2.4	271	247/252	55	97	95	10
	10	0945	463.10	1.1	46	2.4	271	247/242	53	99	96	10
2	15	0950	467.72	1.3	45	2.9	272	246/255	53	100	96	10
	20	0955	472.50	1.3	45	2.9	274	247/252	52	102	98	10
3	25	1000	477.35	1.4	44	3.1	275	247/249	52	103	98	10
	30	1005	482.11	1.3	47	2.9	269	247/254	53	105	99	10
4	35	1010	487.10	1.4	48	3.1	269	245/242	54	105	100	11
	120	1015	491.910	1.5	48	3.3	272	245/241	54	105	101	11
	120/0	1018	491.910									
D 1	5	1023	495.27	0.67	57	1.47	278	249/247	59	103	101	7
	10	1028	498.54	0.63	55	1.40	270	248/244	56.	104	101	7
2	15	1033	502.20	0.78	46	1.72	256	247/242	52	104	102	8
	20	1038	505.78	0.82	47	1.80	260	247/244	52	105	102	9
3	25	1043	509.71	0.87	47	1.90	259	247/254	51	105	102	9
	30	1048	513.38	0.82	48	1.80	263	246/252	52	106	103	9
4	35	1053	517.55	1.05	48	2.30	265	247/242	52	106	103	9
	160	1058	522.03	1.05	47	2.30	266	247/244	55	106	104	9

FIELD DATA SHEET

Plant: ASPHALT PLANT "B"
Sampling Location: Baghouse Stack
Run Number: M23-0-3 Date: 8-29-57
Pretest Leak Rate: 0.004 cfm @ 18 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: M23 Operator: TATT
Pbar: 29.6 Ps: -1.3
CO2: O2:
Probe Length/Type: 4' glass Pitot #: PR-20
Stack Diameter: 49"x33" As:

Nozzle ID: 0.251 Thermocouple #: PR 20
Assumed Bws: 25 Filter #: M23-0-3
Meter Box #: MB12 Y: 0.982 ΔH@: 2.95
Post-Test Leak Rate: 0.003 cfm @ 20 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential XAD (ΔH) in H2O ~~Desired~~	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
2.2	0/0	0809	361.502										
A1	5	0814	367.70	2.3	59	5.1	278	247	248	44	69	69	15
	10	0819	373.62	2.5	54	5.5	269	243	240	41	73	72	17
2	15	0824	380.19	2.5	56	5.5	269	248	256	45	75	73	17
	20	0829	386.00	2.3	52	5.1	265	245	255	49	78	75	15
3	25	0834	391.85	2.0	50	4.4	294	248	243	50	80	76	14
	30	0839	397.33	1.9	49	4.2	286	247	248	50	84	78	14
4	35	0844	402.14	1.4	49	3.1	280	249	246	51	86	79	11
	40	0849	406.975	1.4	48	3.1	275	248	243	50	88	82	11
	40/0	0852	406.975										
B1	5	0857	412.37	1.9	48	4.2	271	248	253	53	85	85	14
	10	0902	417.86	1.9	49	4.2	270	248	243	49	91	86	14
2	15	0907	423.88	2.4	51	5.3	271	247	241	52	93	88	16
	20	0912	430.85	2.3	49	5.1	271	246	255	52	95	89	15
3	25	0917	436.15	2.3	52	5.1	271	246	249	51	97	91	15
	30	0922	442.40	2.1	53	4.6	271	248	253	52	98	92	15
4	35	0927	448.05	2.1	54	4.6	272	246	241	53	98	93	15
	80	0932	454.00	2.1	53	4.6	273	247	244	53	99	94	15

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: ASPHALT PLANT "B"		Run No.:
Sample Date: 8/28/97	Filter No.(s):	Job No.:
Sample Location: OUTLET RUN 2		
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.	463.1	844.2	986.4	916.0	648.8	848.9	g
Initial wt.	428.4	429.2	691.7	682.5	600.8	803.5	g
Net wt.	34.7	415.0 482.6	294.7	~~233.5~~	48.0	45.54	g
		904.6	Description 293.5 cmb		TOTAL	~~1561.0~~	

Train System: → 1620.9 grams

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

Plant Name: ASPHALT PLANT "B"

Test Date: 8-28-97

Run Number: ~~A~~ M23-0 -2

Operator: T. THOMPSON

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg	XAD OUTLET TEMP °F
													44
2	15	/	291.87	0.79	1.82	1.82	291	252 / 255	48	105	101	7	* 45
3	20	/	294.97	.87	1.83	1.83	290	253 / 251	49	105	102	7	46
3	25	/	298.80	.87	1.83	1.83	288	250 / 251	49	106	103	7	46
4	30	/	302.48	1.20	2.52	2.52	291	249 / 252	50	107	103	9	47
	35	/	306.86	1.20	2.52	2.52	293	250 / 251	50	108	104	9	49
E1	160/0	/ 1049	311.28	.55	1.16	1.16	287	252 / 250	52	106	105	6	50
	5	/	314.35	.55	1.16	1.16	288	250 / 253	52	107	105	6	51
2	10	/	317.33	.65	1.37	1.37	290	248 / 250	52	107	105	7	52
	15	/	320.62	.65	1.37	1.37	289	249 / 252	52	108	106	7	52
3	20	/ 1110/1128	323.95	.69	1.45	1.45	286	251 / 250	55	107	105	7	55
	25	/ ~~1133~~	327.33	.69	1.45	1.45	286	245 / 247	49	106	105	7	54
4	30	/	330.75	.75	1.58	1.58	295	247 / 244	49	106	106	7	55
	35	/	334.28	.81	1.70	1.70	298	245 / 242	51	107	105	7	55
E2	280/0	1147/1149	337.81	.45	0.95	0.95	293	245 / 245	53	106	105	6	57
	5	/ 1154	340.55	.49	1.03	1.03	293	247 / 242	52	106	105	6	57
2	10	/ 1159	343.41	~~.50~~ 0.53	~~2.10~~	1.11	292	247 / 241	53	107	106	6	59
	15	/ 1204	346.49	0.53	1.11	1.11	290	248 / 256	52	108	106	6	57
3	20	/ 1209	349.47	0.48	1.00	1.00	291	245 / 255	54	108	106	6	57
	25	/ 1214	352.33	0.53	1.11	1.11	292	246 / 243	56	108	106	7	57
4	30	/ 1219	355.33	0.53	1.11	1.11	292	247 / 249	56	109	107	7	57
	35	/ 1224	358.27	0.50	1.05	1.05	290	248 / 245	57	109	107	6	59
	240	/ 1229	361.187					/					
		/						/					
		/						/					

* CHANGE K factor to 2.10

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: M 23 Operator: T. THOMPSON
Pbar: 29.60 Ps: -0.5
CO2: _____ O2: _____
Probe Length/Type: 4' glass Pitot #: PR20
Stack Diameter: 45" x 33" As: 10.31 sq ft.

Nozzle ID: 0.256 Thermocouple #: PR20
Assumed Bws: 32% Filter #: M23-0-2
Meter Box #: MB12 Y: 0.98 ΔH@: 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 (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	XAD EXIT TEMP °F
A1	0/0	0746	153.016	2.10	4.83	4.83	276	250	252	56	70	70	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	245	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	88	81	9	58
B1	40/0	0824 / 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	49	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	251	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	0901 / 0909	232.87	1.75	4.03	4.03	289	250	251	40	[illegible]	91	11	58
	35		238.42	1.75	4.03	4.03	281	251	251	42	93	93	11	56
C1	80/0	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

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

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~~	937.9	809.6	602.7	832.0	g
Initial wt.	479.8	513.0	696.1	696.8	598.7	777.8	g
Net wt.	45.2	1625.3	241.8	112.8	4.0	54.2	g

Description Total: 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 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:

999.6
279.2
346.5
1625.3

Plant Name: ASPHALT PLANT "B"

Test Date: 8-27-97

Run Number: M23-0-1

Operator: [illegible]

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential XAD °F (ΔH) in. H_2O Desired	Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
	160/0	1335	95.95	0.48	.53	1.30	286	252 / 250	60	114	116	6
E1	5		99.30	.48	~~.40~~	1.30	281	251 / 253	57	114	115	6
	10		102.34	.54	.38	1.46	279	249 / 255	50	115	115	7
2	15		105.54	.60	.38	1.62	281	251 / 251	45	116	115	7
	20		109.24	.60	.38	1.62	280	248 / 253	44	117	115	7
3	25	1402 59° 1412 60°	112.93	.63	.37	1.70	280	250 / 252	44	118	117	7
	30		116.65	.63	.51	1.70	274	251 / 254	50	118	117	7
4	35		120.32	.78	.50	2.11	289	248 / 251	50	115	116	8
	200		124.33	.78	.53	2.11	285	250 / 250	55	115	115	8
								/				
								/				
								/				
								/				
	200/0	1436	124.33									
F 1	5		129.86	.45	~~1.22~~ .54	1.22	275	250 / 251	57	112	113	6
	10		133.68	.45	.53	1.22	279	248 / 250	57	113	113	6
2	15		136.25	.50	.53	1.35	284	250 / 252	57	114	113	6
	20		139.55	.50	.53	1.35	284	252 / 250	57	114	112	6
3	25		142.87	.55	.53	1.49	284	250 / 253	57	113	112	6
	30		146.22	.55	.54	1.49	284	251 / 249	57	113	112	6
4	35		149.83	.42	.54	1.13	283	250 / 250	59	113	112	6
	240/0		152.829	.42	.54	1.13	283	248 / 249	59	113	112	6
								/				
								/				
								/				

Plant Name: ASPHALT PLANT "B"

Test Date: 8-27-97

Run Number: M23-0-1

Operator: VMC

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O ~~Desired~~	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
	80/0	1202	1023.58					/				8
C 1	5	1207	28.3	1.0	65	2.7	286	246 / 251	58	111	111	8
	10	1212	32.9	1.0	63	2.7	287	246 / 247	53	111	113	9
2	15	1217	37.54	1.2	63	3.2	299	246 / 242	52	111	111	9
	20	1222	42.53	1.2	61	3.2	286	246 / 240	56	111	111	9
3	25	1227	47.87	1.2	60	3.2	288	247 / 247	59	111	111	9
	30	1232	53.00	1.2	60	3.2	285	247 / 252	58	111	111	10
4	35	1237	57.90	1.3	64	3.5	284	247 / 251	55	112	110	10
	120	1242	1063.61	1.3	65	3.5	283	247 / 245	55	113	112	
		/						/				
		/						/				
		/						/				
		/						/				
	120/0	1246	1063.61	~~0.67~~		~~1.8~~						
D 1	5	1251	66.89	0.67	57	1.8	281	247 / 253	56	111	111	7
	10	/	70.91	0.67	54	1.8	282	248 / 245	51	111	111	7
2	15	/	74.36	.80	54	2.16	279	248 / 251	51	114	113	7
	20	/	79.78	.80	55	2.16	279	249 / 250	52	114	113	7
3	25	/	83.00	.85	55	2.30	280	251 / 252	52	115	112	8
	30	/	88.88	.94	56	2.54	280	252 / 253	54	115	113	9
4	35	/	91.53	.94	56	2.54	278	251 / 252	54	116	113	9
	160	/	95.95					/				
		/						/				
		/						/				
		/						/				

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	$KMnO_4$	100	637.1	634.9	-2.2
6	$KMnO_4$	100	731.3	729.5	-1.8
7	SG	N/A	① 886.0 ~~834.1~~	927.0	41.0
Total					1632.0 g

Comments: ① Added more SG before run

FIELD DATA SHEET

Plant: Asphalt Plant "B" Sample Type: M-29 Operator: MAD Nozzle ID: .252 Thermocouple #: ____

Sampling Location Baghouse Exit (Stack) Pbar: 29.6 Ps: -.4 Assumed Bws: .25 Filter #: ____

Run Number: 02 Date: 8-28-97 CO2: ____ O2: ____ Meter Box #: MB10 Y: .965 ΔH@: 1.74

Pretest Leak Rate: .011 cfm @ 10 in. Hg. Probe Length/Type: 4' Glass Pitot #: ____ Post-Test Leak Rate: .005 cfm @ 7 in. Hg.

Pretest Leak Check: Pitot: ✓ Orsat: ✓ Stack Diameter: 33 x 49 As: ____ Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
C	0	0746	79.83										
1	5	0751	84.0	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	93.0	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	0830/0835	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		1.90	295	244	251	43	94	87	1
4	80	0908	145.026	1.0		1.96	295	243	251	44	94	87	1
E 1	85	0921/0926	148.24	.59		1.16	288	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

Plant Name: ASPHALT PLANT "B" **Test Date:** 8-28-97

Run Number: 02 **Operator:** [illegible]

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
	120	1 1004	172.23									
F 1	125	1 1009	174.94	.4	NA	.78	293	246 / 243	59	100	95	1
	130	1 1014	177.72	.42		.83	293	245 / 242	62	101	96	1
2	135	1 1019	180.8	.54		1.06	294	243 / 240	49	103	93	1
	140	1 1024	183.4	.51		.89	295	242 / 239	51	104	93	1
3	145	1 1029	186.1	.47		.82	295	244 / 244	50	105	96	1
	150	1 1034	188.95	.47		.82	295	246 / 248	50	106	100	1
4	155	1 1039	191.87	.5		.94	295	247 / 247	50	106	101	1
	160	1 1044	194.75	.48		9	295	251 / 247	51	102	101	1
A 1	165	1049/1054	200.74	2.1		3.9	294	254 / 243	56	107	103	3
	170	1 1059	206.46	2.2		4.1	294	252 / 244	59	109	105	3
2	175	1 1104	212.4	2.1		3.9	295	251 / 249	59	113	106	3
	180	1 1109	218.37	2.1		3.9	295	251 / 249	59	114	106	3
3	185	1 1134	223.67	1.4		2.6	282	252 / 247	61	115	107	3
	190	1 1139	228.64	1.5		2.6	281	253 / 246	59	115	107	3
4	195	1 1142	232.83	1.2		2.2	298	251 / 249	58	109	106	3
	200	1 1147	237.178	1.2		2.2	298	251 / 247	55	111	106	3
B 1	205	1149/1154	242.38	1.7		3.2	298	251 / 246	54	110	107	3
	210	1 1159	247.12	1.4		2.6	299	252 / 247	58	111	107	3
2	215	1 1204	252.44	1.9		3.6	300	251 / 246	54	113	107	3
	220	1 1209	258.34	2.0		3.9	300	252 / 247	53	114	108	3
3	225	1 1214	264.18	2.1		3.9	299	251 / 248	60	116	109	3
	230	1 1219	270.1	2.1		3.9	299	252 / 246	61	116	109	3
4	235	1 1224	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 RESTART

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 - 460 (907.4) + 375 = 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	$KMnO_4$	100	638.9	640.9	2.0
6	$KMnO_4$	100	730.3	731.5	1.2
7	SG	N/A	992.0	1024.2	32.2
Total					1484.6 g

Comments:

FIELD DATA SHEET

Plant: ASPHALT PLANT "B"
Sampling Location: BAGHOUSE EXIT (STACK)
Run Number: 03 Date: 8-29-97
Pretest Leak Rate: .012 cfm @ 9 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: M-29 Operator: MAD
Pbar: 29.4 Ps: -.42
CO2: O2:
Probe Length/Type: 4' GLASS Pitot #:
Stack Diameter: 33 x 49 As:

Nozzle ID: .252 Thermocouple #:
Assumed Bws: .25 Filter #:
Meter Box #: MB10 Y: .965 ΔH@:
Post-Test Leak Rate: .009 cfm @ 6 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	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	1.3		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	0855/0857	125.85	.78		1.55	280	251	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	57	93	86	1
	60	0912	137.55	.97		1.93	275	254	247	52	94	87	1
3	65	0917	141.64	1.0		1.99	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	255	247	53	97	91	1
	80	0932	154.164	1.0		1.99	277	254	245	54	99	92	1
E 1	85	0935/0940	157.29	.6		1.19	278	253	247	58	99	93	1
	90	0945	160.39	.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	174.57	.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

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

Plant Name: Asphalt Plant "B" **Test Date:** 8-29-97

Run Number: 03 **Operator:** MAD

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp.° F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
	120	1018	182.032									
F 1	125	1023	184.91	.45	NA	.89	283	247 / 246	62	104	101	1
	130	1028	187.91	.5		.99	283	257 / 245	62	105	102	1
2	135	1033	190.94	.47		.93	275	250 / 246	59	106	103	1
	140	1038	193.82	.49		.97	261	249 / 247	58	107	104	1
3	145	1043	196.85	.49		.97	261	248 / 247	57	108	104	1
	150	1048	199.8	.49		.97	263	251 / 247	57	108	104	1
4	155	1053	203.01	.54		1.07	265	253 / 246	54	108	105	1
	160	1058	206.398	.54		1.07	268	253 / 245	54	108	105	1
A 1	165	1102/1107	213.33	2.7		5.45	268	254 / 246	57	107	105	3.5
	170	1112	220.35	2.3		5.65	268	257 / 246	55	109	105	3.5
2	175	1117	227.35	2.3		5.65	275	257 / 249	54	112	106	3.5
	180	1122	234.65	2.3		5.65	274	257 / 251	55	114	106	3.5
3	185	1127	240.81	1.9		4.67	273	258 / 254	59	117	107	3.5
	190	1132	247.24	1.9		4.67	270	255 / 254	61	118	109	3.5
4	195	1137	252.92	1.1		2.7	265	253 / 254	58	119	110	3.0
	200	1142	257.473	1.2		2.95	262	252 / 254	58	119	110	3.0
B 1	205	1145/1150	264.03	2.0		4.9	263	257 / 256	60	116	112	3.0
	210	1155	270.43	1.9		4.67	263	252 / 254	60	118	112	3.0
2	215	1200	277.36	2.2		5.4	263	252 / 254	58	119	113	3.0
	220	1205	284.19	2.2		5.4	264	252 / 253	58	119	113	3.5
3	225	1210	290.78	2.0		4.9	265	252 / 254	59	119	113	3.5
	230	1215	294.45	2.0		4.9	267	252 / 255	61	119	113	3.5
4	235	1220	303.24	1.6		3.9	269	251 / 256	64	119	113	3.5
	240	1225	309.029	1.6		3.9	269	252 / 256	64	119	113	3.5

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	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	731.6	1617.3	885.7
2	5%/10%	100	720.0	902.6	182.6
3	5%/10%	100	756.8	791.5	~~111.6~~ 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 =	1147.1 g
Total					~~1224.0~~

Comments:

FIELD DATA SHEET

Plant: Asphalt Plant "B"
Sampling Location: Baghouse Exit (Stack
Run Number: F/B 1 Date: 8-28-97
Pretest Leak Rate: .014 cfm @ 10 in. Hg.
Pretest Leak Check: Pitot: NA Orsat: N/A

Sample Type: Field Blank M-23 Operator: [illegible]
Pbar: 29.6 Ps: N/A
CO2: O2:
Probe Length/Type: 4' Glass Pitot #: N/A
Stack Diameter: N/A As: N/A

Nozzle ID: .252 Thermocouple #: N/A
Assumed Bws: N/A Filter #:
Meter Box #: Y: ΔH@:
Post-Test Leak Rate: .004 cfm @ 10 in. Hg.
Post-Test Leak Check: Pitot: N/A Orsat: N/A

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	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)	
			61.544										
			61.639										
			61.639										
			61.704	.011	@ 10" Hg								
			61.704										
			61.796	.004	@ 10" Hg								

METHOD 23 CDD/CDF SAMPLE RECOVERY DATA

Plant: ASPHALT, PLANT "B"		Run No.:
Sample Date: 8/28/97	Filter No.(s):	Job No.:
Sample Location: FIELD BLK (METHOD 23)		
Recovery Date:	XAD-2 Trap No.(s):	
Sample Recovery Person: BHR		

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.	460.0	509.6	706.6	710.5	600.0	908.6	g
Initial wt.	459.3	509.7	706.6	710.7	599.9	908.0	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:

MDG - 1 C3?

C = 1.021

Page _____ of _____

Plant Name: ASPHALT PLANT "B" **Test Date:** _____

Run Number: _____ **Operator:** _____

Traverse Point Number	Sampling Time, (min.) / Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
1	/	708.184	0.4				/		85	83	3
	20 /	711.80	0.42			252	231 / 254	58	88	83	11
	/	715.44	0.52			255	241 / 252	56	90	86	17
	/	718.62				231	243 / 254	60	90	85	23
	21 minutes /	721.837				230	/		90	86	
	/						/				
	/						/				
	/	13.6530					/			86.6	
	/						/				
	/			Avg ΔH			/				
	/			1.4			/				
	/						/				
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MULTI-METALS SAMPLE RECOVERY DATA

Plant: K-F 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: J. 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	Ø	724.6	724.6	Ø
2	5%/10%	100	727.2	727.2	Ø
3	5%/10%	100	753.1	753.2	0.1
4	EMPTY	Ø	622.1	622.1	Ø
5	$KMnO_4$	100	~~684.4~~ 688.0	688.2	0.2
6	$KMnO_4$	100	~~735.8~~ 736.6	737.1	0.5
7	SG	N/A	867.7	868.2	0.5
Total					1.3

Comments: