AP42 Section: 11.1

Reference Number: 75

Title: Results Of A Source Emission Compliance Test On An Asphalt Plant Operated By Lakes Area Asphalt, Inc., Brainerd, Minnesota,

MMT Environmental Services, Inc., St. Paul, MN,

November 7, 1994.

MMT Environmental Services, Inc.
4610 North Churchill Street
St. Paul, MN 55126-5892
Phone (612) 483-9595 Fax (612) 483-2699

RESULTS OF A SOURCE EMISSION COMPLIANCE TEST ON AN ASPHALT PLANT OPERATED BY LAKES AREA ASPHALT, INC. BRAINERD, MINNESOTA October 19, 1994

Submitted to:

Lakes Area Asphalt, Inc.
4357 Highway 210 Northeast
Brainerd, MN 56401
Attn: Mr. Mike Westemeier

Prepared by:

Ted Gibbons
Sampling Team Leader

Approved by:

Alan L. Trowbridge
Director of Technical Services

MMT Report Number: 10090
MMT Project Number: 9641
Report Issued: November 7, 1994

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REPORT CERTIFICATIONS

1. **Certification of sampling procedures by the sampling team leader:**
I certify under penalty of law that the sampling procedures were performed in accordance with the approved test plan and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained in the report.

Name: Ted M. Gibbons Signature: Ted M Gibbons

Title: Technical Services Technician Date: 11-4-94

2. **Certification of analytical procedures by the responsible sample analyst:**
I certify under penalty of law that the analytical procedures were performed in accordance with the requirements of the test methods and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained in the report.

Name: Bill Anderson Signature: Bill Anderson

Title: Technical Services Technician Date: 11-4-94

3. **Certification of test report by testing department senior staff:**
I certify under penalty of law that this report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analyses relating to the performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained in the report.

Name: Alan L. Trowbridge Signature: Alan L Trowbridge

Title: Director of Technical Services Date: 11/7/94

4. **Certification of test report by the emission facility Owner or Operator:**
I certify under penalty of law that the information submitted in this report accurately reflects the operating conditions at the emission facility during this performance test and describes the date and nature of all operational and maintenance activities that were performed on the process and control equipment during the month prior to the performance test. Based on my inquiry of the person or persons who performed the operational and maintenance activities, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained in the cover letter or attachments submitted with this report.

Name: M. W. Westemeier Signature: M. W. Westemeier

Title: President Date: 11-30-94

RESULTS OF A SOURCE EMISSION COMPLIANCE TEST ON AN ASPHALT PLANT OPERATED BY LAKES AREA ASPHALT, INC., BRAINERD, MINNESOTA
October 19, 1994

MMT Report Number: *10090*
MMT Project Number: 9641
Report Issued: November 7, 1994

1 INTRODUCTION

MMT Environmental Services, Inc. (MMT) was contracted by Lakes Area Asphalt, Inc. to perform a source emission compliance test on a single source at their hot-mix asphalt plant operating near Brainerd, Minnesota. The asphalt plant is a Northern Improvement unit rated at 120 tons per hour. Emissions generated by the plant's aggregate drum mixer are controlled by a Argo model 40-055 wet scrubber. The scrubber exhaust was tested for particulate and visible emissions on October 19, 1994. The test was performed as a condition of Minnesota Pollution Control Agency air emission permit number 1949A-93-G-1 which identifies the source as Emission Point #1. This report presents the results of the test program along with all substantiating documentation.

The MMT sampling team consisted of Messrs. Ted Gibbons, Bill Anderson and Alan Trowbridge. Messrs. Mike Westemeier and David Mount represented Lakes Area Asphalt, Inc. throughout the test period. Representatives of the Minnesota Pollution Control Agency were invited to witness the test proceedings but declined to do so.

2 TEST RESULTS

The results of the particulate emission test are presented in Table 2.1. The data indicates an average effluent particulate concentration of 0.078 grains per dry standard cubic foot (based on the EPA Method 5 front catch only).

The visible emission test was performed concurrent with the first particulate test run. The maximum observed plume opacity after dissipation of the attached water vapor plume was fifteen (15) percent.

MPCA air emission permit number 1949A-93-G-1 states that the asphalt concrete plant must not exhaust any gases (1) which contain particulate matter in excess of 0.04 grains per dry standard cubic foot or (2) which exhibit 20 percent or greater opacity. The test results indicate that the source, under the conditions tested, was not in compliance with particulate concentration standard.

The average process weight rate (aggregate + asphalt) during the test period was 87 tons per hour.

The EPA Method 2 preliminary traverse was cut-short due to mechanical problems with the process equipment. It was not repeated because of time constraints due to limited production time (run #3 was completed just as the plant ran out of work to do). Based on the incomplete data, the nozzle size selected for first test run was a little too small. This resulted in a run #1 sample volume which was a little low (25.4 dscf). The isokinetic variation for test run #2 was a little high (111.6%) and was probably due in part to the variations in gas moisture content (34 - 41%). Neither of these problems should have had any significant impact on the test results.

No other problems were encountered during sample acquisition or analysis. Based on a review of the entire test proceedings, it is MMT's opinion that the results presented herein are accurate and can be used for compliance status determination.

Table 2.1 Particulate Emission Test Results
Lakes Area Asphalt, Inc., Brainerd, Minnesota
Asphalt Plant Scrubber Exhaust Test, October 19, 1994

Parameter	Run #1	Run #2	Run #3	Average
Time of Test;				
Start Time, hr	1144	1408	1609	---
Finish Time, hr	1253	1516	1726	---
Effluent Temperature, °F	160	168	164	164
Effluent Moisture Content, % v/v	34.1	41.2	37.5	37.6
Effluent Composition Parameters;				
Carbon Dioxide, % v/v dry	6.2	6.3	5.9	6.1
Oxygen Content, % v/v dry	11.2	11.4	11.8	11.5
Effluent Volumetric Flow Rate;				
Actual Conditions, acfm	10,566	11,846	10,967	11,126
Standard Conditions, scfm	8,515	9,419	8,779	8,908
Dry Standard Conditions, dscfm	5,610	5,540	5,489	5,546
Effluent Particulate Concentration;				
Front Catch Only, gr/dscf	0.1178	0.0418	0.0732	**0.0776**
Back Catch Only, gr/dscf	0.0076	0.0109	0.0165	0.0117
Total Catch, gr/dscf	0.1254	0.0527	0.0897	0.0893
Source Particulate Emission Rate;				
Classical Method, lb/hr	6.04	2.51	4.22	4.26
Ratio of Areas Method, lb/hr	6.05	2.79	4.31	4.38
Average of Two Methods, lb/hr	6.05	2.65	4.27	4.32
Test Quality Control Parameters;				
Total Sampling Time, min.	62.5	62.5	62.5	62.5
Total Volume Sampled, dscf	25.410	40.502	36.785	34.232
Total Particulate Mass Collected, g	0.2067	0.1385	0.2139	0.1864
Average Isokinetic Variation, %	100.3	111.6	102.3	104.7

Standard Conditions: 68°F, 29.92 in. Hg

3 PROCESS DATA

The asphalt plant is shown schematically in Figure 4.1. Production data is presented in Appendix E and summarized in Table 3.1. During the test period the burner on the plant's aggregate drum dryer was fired with propane.

Table 3.1 Summary of Process Data
Lakes Area Asphalt, Inc., Brainerd, Minnesota
Asphalt Plant Scrubber Exhaust Test, October 19, 1994

Parameter	Run #1	Run #2	Run #3	Average
Time of Test, hr				
Start	1144	1408	1609	---
Finish	1253	1516	1726	---
Process Weight Rate, ton/hr	87	84	90	87
Material Moisture Content, %	6.3	6.1	6.2	6.2
Dryer Gas Temperature, °F	307	285	280	291
Scrubber Pressure Drop, in WC	9.2	9.2	9.4	9.3

Scrubber water: 350 gpm at 35 psi.

4 TEST PROCEDURES

In order to determine the pollutant emission rate from stationary sources, the Environmental Protection Agency (EPA) has established a series of reference methods which specify the manner in which tests must be performed. These reference methods are found in the Code of Federal Regulations (40 CFR 60) under Title 40 "Protection of the Environment"; Chapter 1 "Environmental Protection Agency"; Subchapter C "Air Programs"; Part 60 "Standards of Performance for New Stationary Sources"; Appendix A "Reference Methods". Unless otherwise noted, the tests presented in this report were performed according to the EPA Reference Methods as revised on July 1, 1993. A brief description of the test procedures used follows.

4.1 SAMPLING POINTS

The number of sampling points and their location with in the source stack/duct was determined per EPA Method 1 which is entitled "Sample and velocity traverses for stationary sources". In this method the number of sampling points is based on the length of straight, undisturbed flow both before and after the sampling port location. Site specific data is presented in Figure 4.1.

4.2 EFFLUENT VOLUMETRIC FLOW RATE

The effluent volumetric flow rate was determined per EPA Method 2 which is entitled "Determination of stack gas velocity and volumetric flow rate (Type S pitot tube)". Gas velocity pressure (head) and temperature data were obtained during each EPA Method 5 particulate test run by traversing each of the sampling points defined by EPA Method 1. This data, along with gas density (EPA Method 3) and moisture content (EPA Method 4), was used to calculate the gas velocity at each sampling point. The source volumetric flow rate was calculated by multiplying the average gas velocity by the stack/duct cross-sectional area at the point of measurement.

4.3 EFFLUENT COMPOSITION AND MOLECULAR WEIGHT

The density of the effluent was determined per EPA Method 3 which is entitled "Gas analysis for the determination of dry molecular weight". One gas sample was collected during each EPA Method 5 particulate test run. The gas samples were analyzed for carbon dioxide and oxygen concentrations with a standard Orsat analyzer using commercially prepared solutions. For calculations of gas density the balance of the gas was assumed to be nitrogen and carbon monoxide.

4.4 EFFLUENT MOISTURE CONTENT

The effluent moisture content was determined per EPA Method 4 which is entitled "Determination of moisture content in stack gases". Data for making the gas moisture content determinations was collected simultaneously with each EPA Method 5 particulate test run. The gas moisture content was calculated from the mass and/or volume of liquid collected in the Method 5 sampling train cold box impingers and the volume of gas sampled.

Figure 4.1 Site Description Form
Lakes Area Asphalt, Inc., Brainerd, Minnesota
Asphalt Plant Scrubber Exhaust Test, October 19, 1994

SAMPLING LOCATION DATA

Stack Cross-Sectional Dimension;
- Depth, inches 24.5
- Width, inches 27.5
- Equivalent diameter, inches 25.9

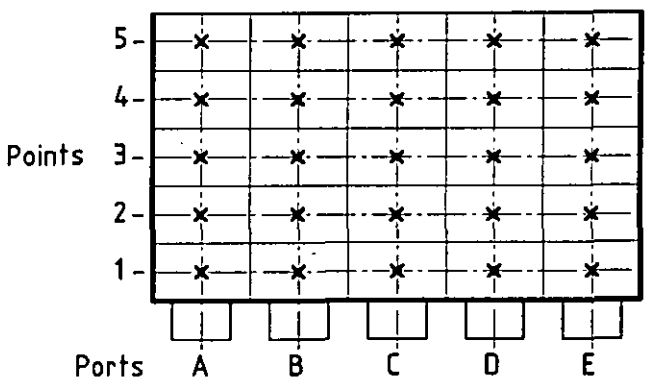
Length of straight, undisturbed flow;
- Before ports, inches 120
- After ports, inches 36
- Before ports, stack diameters 4.6
- After ports, stack diameters 1.4

Number of sampling points;
- Required by EPA Method 1 25
- Actually used 25
  - Number of ports 5
  - Number of points per port 5

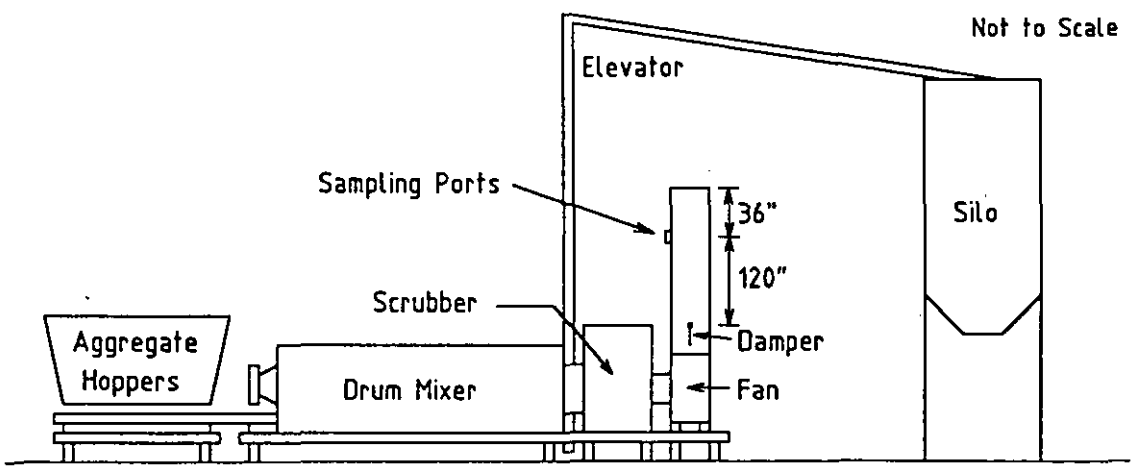
Particulate test sampling time;
- Minutes per point: 2.5
- Minutes per test run: 62.5

SAMPLING POINT LOCATION WITHIN STACK CROSS-SECTION

Point Number	Percent of Traverse	Inches from Wall
1	10.0	2.5
2	30.0	7.4
3	50.0	12.3
4	70.0	17.2
5	90.0	22.1



SAMPLING SITE SCHEMATIC



4.5 EFFLUENT PARTICULATE CONCENTRATION

The effluent particulate concentration was determined per EPA Method 5 which is entitled "Determination of particulate emissions from stationary sources". For each test run, particulate matter was isokinetically withdrawn from the gas stream at each of the EPA Method 1 defined sampling points and collected on a glass fiber filter which was maintained at constant temperature (248±25°F). Water vapor, organic vapors and inorganic vapors which passed through the filter were collected in an impinger trap which was ice-cooled to maintain an exit temperature of not more than 68°F.

The EPA Method 5 sampling train (Figure 4.2) includes a heated sampling probe with attached nozzle, thermocouple and S-type pitot tube. The probe attaches to the front sample case (hot box) which houses a glass cyclone (optional) and an all-glass in-line filter holder in a temperature controlled environment. The front sample case is connected to the back sample case (cold box) which houses a series of glass impingers and a desiccant column in an ice bath. The back sample case is connected to the control unit which contains the sample vacuum pump, gas meter, pressure and temperature indicators and all operating controls.

A representative particulate sample was acquired by sampling for equal periods of time at the center of a number of equal area regions within the stack/duct. At each sampling point the gas velocity head and temperature were measured and the sampling rate rapidly adjusted to isokinetic conditions with the aid of a nomograph or programmable computing device. Sample gas drawn into the nozzle flowed through the probe to the glass fiber filter where the solid particulate matter was collected. The gases then passed through the ice-cooled condenser (impingers and desiccant column) which quantitatively removed all moisture and condensable particulate matter from the gas stream. The gas then passed through the vacuum pump, the dry test gas meter and the calibrated orifice.

Leak checks to detect any dilution air being pulled into the sampling line were performed at the beginning and end of each test run and also when and if any sample line connections were broken.

After completion of each test run, the sampling train was removed to the clean-up area for sample recovery. The filter was removed from the filter holder and placed in Container #1. Particulate matter collected in the nozzle, probe and all connecting glassware in front of the filter was quantitatively transferred to Container #2 by means of a distilled water wash followed by an acetone wash. A stiff brush was used in the probe cleaning step to help dislodge deposits.

The liquid collected in impingers #1, #2 and #3 was measured and transferred to Container #3. These impingers and all connecting pieces between the filter paper and the desiccant column were then rinsed with distilled water and these rinsings were added to Container #3. These same pieces were then rinsed with acetone and these rinsings were placed in Container #4.

The desiccant column was then weighed and its contents transferred to a waste desiccant container. Samples of the rinse solutions (water and acetone) were retained as analytical blanks.

Sample particulate analysis was performed at MMT's laboratory. The filter was dried in a 105°C oven for three hours and then desiccated to a constant weight. The contents of Container #2 were quantitatively transferred to a tared beaker, evaporated at ambient temperature and pressure to near dryness and then desiccated to a constant weight.

Figure 4.2 Particulate Sampling Train Description
Lakes Area Asphalt, Inc., Brainerd, Minnesota
Asphalt Plant Scrubber Exhaust Test
October 19, 1994

PARTICULATE SAMPLING TRAIN IDENTIFICATION

Sampling Train Manufacturer: ..... MMT Environmental Services, Inc.
Sampling Train Model: ..... Universal Stack Sampler, unit #4

Hot Box Set-up and Operating Temperature;
- Cyclone used: ..... No
- Filter Media: ..... Glass Fiber Filter, Whatman GF/C, 11.0 cm diameter
- Filtration Temperature: ..... 248 ± 25 degrees Fahrenheit

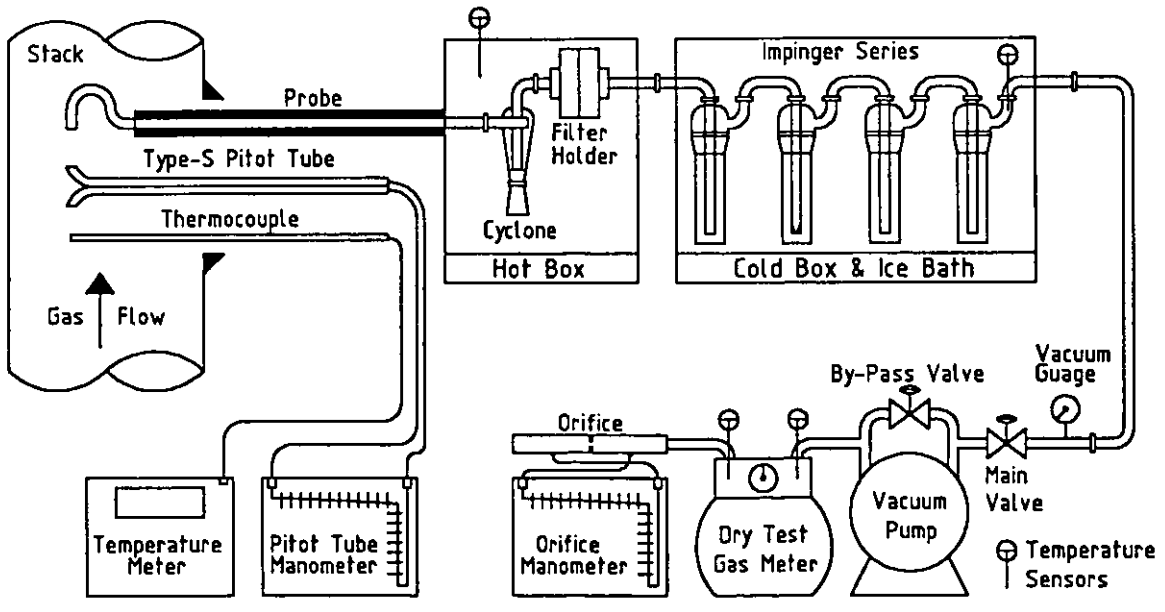
Cold Box Set-up; Impinger Type and Initial Contents
- Impinger #1: ..... Modified Greenburg-Smith design, 100 ml deionized, distilled water
- Impinger #2: ..... Standard Greenburg-Smith design, 100 ml deionized, distilled water
- Impinger #3: ..... Modified Greenburg-Smith design, empty
- Impinger #4: ..... Modified Greenburg-Smith design, ≈ 250 grams silica gel, indicating type

Nozzles Used: ..... MMT #L2, 0.249" diameter, stainless steel, for Run #1
MMT #L6, 0.300" diameter, stainless steel, for Runs #2 & #3

Sampling Probe Used: .... MMT #44, stainless steel liner

Pitot Tube Used: ..... MMT #41, S-type, 0.842 coefficient

PARTICULATE SAMPLING TRAIN SCHEMATIC



The contents of Container #3 were analyzed for condensable organic compounds using the chloroform/ethyl ether extraction procedure described in Minnesota Rule 7011.0725. The collected extract was transferred to a tared beaker, evaporated at ambient temperature and pressure to near dryness and then desiccated to a constant weight. The contents of Container #4 were quantitatively transferred to a tared beaker, evaporated at ambient temperature and pressure to near dryness and then desiccated to a constant weight.

The mass of particulate matter collected and the volume of gas sampled were used to calculate the effluent particulate concentration. The source particulate mass emission rate was calculated by multiplying the effluent particulate concentration by the source volumetric flow rate. Separate calculations were performed for total catch, front catch only (Containers 1 & 2) and back catch only (Containers 3 & 4).

4.6 SOURCE PLUME OPACITY

The source visible emissions were determined by the visual observations of a certified visible emissions evaluator per EPA Method 9 which is entitled "Visual determination of the opacity of emissions from stationary sources".

In this procedure, the observer positions himself at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140 degree sector to his back. Consistent with this requirement, the observer's line of site was, as much as possible, perpendicular to the plume's direction.

Opacity observations were made at the point of greatest opacity in that portion of the plume where condensed water vapor was not present. Observations were made at 15-second intervals and recorded to the nearest 5 percent opacity.

5 QUALITY ASSURANCE

The project manager is responsible for implementation of the quality assurance program as applied to any specific project.

5.1 SAMPLING QUALITY ASSURANCE

Source sampling quality assurance procedures are implemented to ensure work is performed:

- by competent, trained individuals experienced on the specific methodologies being used
- using properly calibrated equipment
- using approved procedures for sample handling and documentation

All measuring devices (pitot tubes, dry gas meters, thermocouples, portable gas analyzers, etc.) are uniquely identified and calibrated with documented procedures and acceptance criteria before and after each field effort. Records of all calibration data are maintained in the files. Prior to the test program, MMT provides the following:

- filter numbers and tare weights of all filters available for the test
- results of an acetone residue analysis on the acetone to be used during the test
- calibrations of all pitot tubes, dry gas meters, orifice meters, thermocouples and probes

Specific details of MMT's QA program for stationary air pollution sources may be found in "Quality Assurance Handbook for Air Pollution Measurement Systems", Volume III (EPA-600/4-7-027b).

5.2 ANALYTICAL QUALITY CONTROL

MMT maintains a vigorous quality control program for all sample analyses. This program is based on the general guidelines given in "Handbook for Analytical Quality Control in Water and Waste water Laboratories" (EPA-600/4-79-019); March 1979 . This program suggests guidelines in the areas of:

- Laboratory services
- Glassware
- Solvents
- Analytical performance
- Instrument selection
- Reagents
- Gases
- Laboratory safety

Standards and curves are determined for each analysis using the appropriate standard. Least square linear regression calculations are used in determining "best fit" to the data. Correlation coefficients are also calculated.

5.3 CALIBRATION GASES

MMT uses either EPA Protocol 1 or Acublend Certified Master gases (Scott Specialty Gases) when performing all calibrations in order to ensure tolerances on gas concentrations have been verified and are negligible. Certifications of all calibration gas bottles used during testing are presented in each report.

APPENDIX A: CALCULATIONS

DEFINITION OF UNIT ABBREVIATIONS

ACFM ..... ACTUAL CUBIC FEET PER MINUTE

DEG F ..... DEGREES FAHRENHEIT

DCF ..... DRY CUBIC FEET

DSCF ..... DRY STANDARD CUBIC FEET

DSCFM ..... DRY STANDARD CUBIC FEET PER MINUTE

FPS ..... FEET PER SECOND

G ..... GRAMS

GR/ACF ..... GRAINS PER ACTUAL CUBIC FOOT

GR/DSCF ..... GRAINS PER DRY STANDARD CUBIC FOOT

GR/SCF ..... GRAINS PER STANDARD CUBIC FOOT

IN ..... INCHES

IN HG ..... INCHES OF MERCURY

IN WC ..... INCHES OF WATER

LB/HR ..... POUNDS PER HOUR

LB/LB-MOLE .. POUND PER POUND-MOLE

MIN ..... MINUTES

ML ..... MILLILITERS

SCF ..... STANDARD CUBIC FEET

SCFM ..... STANDARD CUBIC FEET PER MINUTE

SF ..... SQUARE FEET

% V/V DRY ... PERCENT BY VOLUME, DRY BASIS

DEFINITION OF STANDARD CONDITIONS

STANDARD TEMPERATURE ..... 68 DEGREES FAHRENHEIT

STANDARD PRESSURE ..... 29.92 INCHES OF MERCURY

DEFINITION OF VARIABLES

An .... CROSS-SECTIONAL AREA OF NOZZLE, SF
As .... CROSS-SECTIONAL AREA OF STACK, SF
Bwp ... EFFLUENT MOISTURE CONTENT, PERCENT BY VOLUME
Bws ... EFFLUENT MOISTURE CONTENT, PROPORTION BY VOLUME
Ca* ... EFFLUENT PARTICULATE CONCENTRATION AT ACTUAL CONDITIONS, GR/ACF; *=f,b,t; Caf: FRONT CATCH ONLY; Cab: BACK CATCH ONLY; Cat: TOTAL CATCH
CD .... EFFLUENT CARBON DIOXIDE CONCENTRATION, % V/V DRY
CM .... EFFLUENT CARBON MONOXIDE CONCENTRATION, % V/V DRY
Cp .... PITOT TUBE COEFFICIENT, DIMENSIONLESS
Cs* ... EFFLUENT PARTICULATE CONCENTRATION AT DRY STANDARD CONDITIONS, GR/DSCF; *=f,b,t; Csf: FRONT CATCH ONLY; Csb: BACK CATCH ONLY; Cst: TOTAL CATCH
Cw* ... EFFLUENT PARTICULATE CONCENTRATION AT STANDARD CONDITIONS, GR/SCF; *=f,b,t; Cwf: FRONT CATCH ONLY; Cwb: BACK CATCH ONLY; Cwt: TOTAL CATCH
Dn .... NOZZLE DIAMETER, IN
I ..... ISOKINETIC VARIATION, %
Md .... EFFLUENT MOLECULAR WEIGHT, LB/LB-MOLE, DRY BASIS
Ms .... EFFLUENT MOLECULAR WEIGHT, LB/LB-MOLE, WET BASIS
NI .... EFFLUENT NITROGEN CONCENTRATION, % V/V DRY
OX .... EFFLUENT OXYGEN CONCENTRATION, % V/V DRY
Pb .... BAROMETRIC PRESSURE, IN HG
Pg .... STACK STATIC PRESSURE, IN WC
Po .... AVERAGE PRESSURE DROP ACROSS THE METERING ORIFICE, IN WC
Ps .... STACK ABSOLUTE PRESSURE, IN HG
Pv .... AVERAGE SQUARE-ROOT VELOCITY PRESSURE, IN WC
Qa .... EFFLUENT FLOW RATE AT ACTUAL CONDITIONS, ACFM
Qs .... EFFLUENT FLOW RATE AT STANDARD CONDITIONS, SCFM
Qsd ... EFFLUENT FLOW RATE AT STANDARD CONDITIONS, DRY BASIS, DSCFM
Rc* ... SOURCE PARTICULATE EMISSION RATE, CLASSICAL METHOD, LB/HR; *=f,b,t; Rcf: FRONT CATCH ONLY; Rcb: BACK CATCH ONLY; Rct: TOTAL CATCH
Rr* ... SOURCE PARTICULATE EMISSION RATE, RATIO OF AREAS METHOD, LB/HR; *=f,b,t; Rrf: FRONT CATCH ONLY; Rrb: BACK CATCH ONLY; Rrt: TOTAL CATCH
Sl .... STACK DIAMETER OR LENGTH, IN
Sw .... STACK WIDTH, IN
Ti .... TOTAL SAMPLING TIME, MIN
Tm .... AVERAGE DRY GAS METER TEMPERATURE, DEG F
Ts .... AVERAGE EFFLUENT TEMPERATURE, DEG F
Vl .... VOLUME OF LIQUID COLLECTED, ML
Vm .... VOLUME OF GAS SAMPLED AT METER CONDITIONS, DCF
Vms ... VOLUME OF GAS SAMPLED AT STANDARD CONDITIONS, DSCF
Vs .... AVERAGE EFFLUENT VELOCITY, FPS
Vw .... VOLUME OF WATER VAPOR COLLECTED AT STANDARD CONDITIONS, SCF
Wb .... MASS OF PARTICULATE MATTER COLLECTED IN THE BACK (WET) CATCH, G
Wf .... MASS OF PARTICULATE MATTER COLLECTED IN THE FRONT (DRY) CATCH, G
Wt .... TOTAL MASS OF PARTICULATE MATTER COLLECTED, G
Y ..... DRY GAS METER COEFFICIENT, DIMENSIONLESS

EQUATIONS USED TO CALCULATE PARTICULATE EMISSIONS

```
An = 0.005454154 * Dn * Dn

As = 0.005454154 * Sl * Sl      (FOR ROUND STACKS)

As = Sl * Sw / 144.0      (FOR RECTANGULAR STACKS)

Ps = Pb + Pg/13.6

NI = 100.0 - CD - OX - CM

Wt = Wf + Wb

Vms = (528/29.92) * Vm * Y * (Pb + Po/13.6) / (Tm + 460.0)

Vw = 0.04707 * Vl

Bws = Vw / (Vw + Vms)

Bwp = 100.0 * Bws

Md = 0.440 * CD  +  0.320 * OX  + 0.280 * (NI + CM)

Ms = Md * (1.0 - Bws)  +  18.0 * Bws

Vs = 85.49 * Cp * Pv * SQRT( (Ts+460.0)/(Ms*Ps) )

Qa = 60.0 * Vs * As

Qs = Qa * (528/29.92) * Ps / (Ts + 460.0)

Qsd = Qs * (1.0 - Bws)

I = 0.09450 * (Ts+460.0) * Vms / (Ps * Vs * An * Ti * (1.0-Bws) )

Csf = 15.42 * Wf / Vws
Csb = 15.42 * Wb / Vws
Cst = 15.42 * Wt / Vws

Cwf = Csf / (1.0 - Bws)
Cwb = Csb / (1.0 - Bws)
Cwt = Cst / (1.0 - Bws)

Caf = Cwf * (29.92/528.0) * (Ts+460.0) / Ps
Cab = Cwb * (29.92/528.0) * (Ts+460.0) / Ps
Cat = Cwt * (29.92/528.0) * (Ts+460.0) / Ps

Rcf = 0.008578 * Csf * Qsd
Rcb = 0.008578 * Csb * Qsd
Rct = 0.008578 * Cst * Qsd

Rrf = 0.008578 * Csf * (Vms/Ti) * (As/An)
Rrb = 0.008578 * Csb * (Vms/Ti) * (As/An)
Rrt = 0.008578 * Cst * (Vms/Ti) * (As/An)
```

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9641 COMPANY: LAKES AREA ASPHALT
TEST NUMBER: 1 SOURCE: SCRUBBER EXHAUST
RUN NUMBER: 1 TIME: 10/19/94 1144-1253

SAMPLING LOCATION PORT	POINT	TRAVERSE POINT DATA: VELOCITY PRESSURE IN WC	ORIFICE PRESSURE IN WC	TEMPERATURE, DEG.F: STACK GAS	METER INLET	METER OUTLET	VELOCITY PROFILE: SQRT VELOCITY PRESSURE	GAS VELOCITY FT/SEC
A	1	0.5100	0.840	160	50	50	0.714	47.60
A	2	0.6300	1.000	154	51	50	0.794	52.64
A	3	1.0000	1.600	151	52	49	1.000	66.16
A	4	0.5500	0.910	154	53	50	0.742	49.19
A	5	0.4700	0.770	156	54	50	0.686	45.55
B	1	0.4200	0.690	152	52	50	0.648	42.91
B	2	0.3600	0.590	152	53	50	0.600	39.73
B	3	0.4100	0.680	153	53	50	0.640	42.43
B	4	0.3500	0.580	153	54	50	0.592	39.21
B	5	0.5500	0.910	161	55	50	0.742	49.47
C	1	0.3200	0.530	168	54	50	0.566	37.95
C	2	0.3400	0.560	164	55	50	0.583	38.99
C	3	0.3000	0.490	161	55	50	0.548	36.53
C	4	0.3000	0.490	158	55	50	0.548	36.45
C	5	0.3000	0.490	158	55	50	0.548	36.45
D	1	0.2300	0.380	160	53	50	0.480	31.96
D	2	0.2000	0.330	169	54	50	0.447	30.02
D	3	0.1500	0.250	161	54	50	0.387	25.83
D	4	0.2100	0.350	161	54	50	0.458	30.57
D	5	0.1700	0.280	166	54	50	0.412	27.61
E	1	0.1900	0.210	163	52	51	0.436	29.12
E	2	0.1700	0.280	169	53	51	0.412	27.68
E	3	0.1400	0.230	169	53	50	0.374	25.12
E	4	0.1400	0.230	165	53	50	0.374	25.04
E	5	0.1500	0.250	164	53	50	0.387	25.90
AVERAGE		0.3424	0.557	160	53	50	0.565	37.64

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9641
TEST NUMBER: 1
RUN NUMBER: 1

COMPANY: LAKES AREA ASPHALT
SOURCE: SCRUBBER EXHAUST
TIME: 10/19/94 1144-1253

Original Corrected from 354.7ml Due to excess water droplets

TEST DATA

GAS METER COEFFICIENT	1.0089 Y	VOLUME OF LIQUID COLLECTED, ML	279.5 Vl
PITOT TUBE COEFFICIENT	0.842 Cp		
NOZZLE DIMENSIONS:		GAS COMPOSITION, % V/V DRY:	
DIAMETER, IN	0.249 Dn	CARBON DIOXIDE	6.23 CD
AREA, SF	0.000338 An	OXYGEN	11.20 OX
		CARBON MONOXIDE	0.00 CM
		NITROGEN (BY DIFFERENCE)	82.57 NI
STACK DIMENSIONS:			
DIAMETER/LENGTH, IN	24.50 Sl	AVE. TRAVERSE POINT DATA:	
WIDTH, IN	27.50 Sw	STACK TEMP., DEG F	160 Ts
AREA, SF	4.679 As	METER TEMP., DEG F	52 Tm
		ORIFICE PRESSURE, IN WC	0.557 Po
BAROMETRIC PRESSURE, IN HG	28.26 Pb	SQRT VELOCITY P., IN WC	0.565 Pv
STACK PRESSURES:		MASS OF PARTICULATE MATTER	
STATIC, IN WC	0.75 Pg	COLLECTED, G:	
ABSOLUTE, IN HG	28.32 Ps	FRONT CATCH (94.0%)	0.1942 Wf
		BACK CATCH (6.0%)	0.0125 Wb
SAMPLING TIME, MIN	62.50 Ti	TOTAL CATCH	0.2067 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	25.805 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	25.410 Vms	GAS MOLECULAR WEIGHT:	
		DRY BASIS, LB/LB-MOLE	29.44 Md
		WET BASIS, LB/LB-MOLE	25.54 Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	13.156 Vw	AVERAGE GAS VELOCITY, FPS	37.64 Vs
GAS MOISTURE CONTENT:		GAS VOLUMETRIC FLOW RATE:	
VOLUME FRACTION	0.3411 Bws	ACTUAL, ACFM	10566 Qa
PERCENT BY VOLUME	34.11 Bwp	STANDARD, SCFM	8515 Qs
		DRY STANDARD, DSCFM	5610 Qsd
		ISOKINETIC VARIATION, %	100.33 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0626 Caf	0.0040 Cab	0.0666 Cat
STANDARD, GR/SCF	0.0776 Cwf	0.0050 Cwb	0.0826 Cwt
DRY STANDARD, GR/DSCF	0.1178 Csf	0.0076 Csb	0.1254 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	5.67 Rcf	0.37 Rcb	6.04 Rct
RATIO OF AREAS METHOD	5.69 Rrf	0.37 Rrb	6.05 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG

* NON-APPLICABLE DATA

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9641 COMPANY: LAKES AREA ASPHALT
TEST NUMBER: 1 SOURCE: SCRUBBER EXHAUST
RUN NUMBER: 2 TIME: 10/19/94 1408-1516

		TRAVERSE POINT DATA					VELOCITY PROFILE	
SAMPLING LOCATION PORT	POINT	VELOCITY PRESSURE IN WC	ORIFICE PRESSURE IN WC	TEMPERATURE, DEG.F STACK GAS	METER INLET	METER OUTLET	SQRT VELOCITY PRESSURE	GAS VELOCITY FT/SEC
A	1	0.4600	1.600	168	50	50	0.678	46.22
A	2	0.4200	1.400	169	50	50	0.648	44.20
A	3	0.3300	1.100	170	50	50	0.574	39.21
A	4	0.5800	2.000	169	51	50	0.762	51.94
A	5	0.4500	1.500	169	51	50	0.671	45.75
B	1	0.5000	1.700	168	51	50	0.707	48.19
B	2	0.4200	1.400	168	51	51	0.648	44.17
B	3	0.4300	1.500	171	52	51	0.656	44.79
B	4	0.5200	1.800	169	52	51	0.721	49.18
B	5	0.4600	1.600	120	52	51	0.678	44.42
C	1	0.3500	1.200	169	52	51	0.592	40.35
C	2	0.3400	1.200	169	52	51	0.583	39.77
C	3	0.3200	1.100	170	52	51	0.566	38.61
C	4	0.3600	1.200	170	52	51	0.600	40.95
C	5	0.3000	1.000	171	52	51	0.548	37.42
D	1	0.3800	1.300	171	52	51	0.616	42.11
D	2	0.3200	1.100	170	52	51	0.566	38.61
D	3	0.3000	1.000	170	52	51	0.548	37.39
D	4	0.2800	1.000	171	52	51	0.529	36.15
D	5	0.3800	1.300	173	52	51	0.616	42.18
E	1	0.3900	1.300	174	52	51	0.624	42.76
E	2	0.4400	1.500	172	52	51	0.663	45.35
E	3	0.4000	1.400	173	52	51	0.632	43.27
E	4	0.3600	1.200	174	52	51	0.600	41.08
E	5	0.2000	0.680	172	52	51	0.447	30.57
AVERAGE		0.3876	1.323	168	52	51	0.619	42.20

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9641 COMPANY: LAKES AREA ASPHALT
TEST NUMBER: 1 SOURCE: SCRUBBER EXHAUST
RUN NUMBER: 2 TIME: 10/19/94 1408-1516

TEST DATA

GAS METER COEFFICIENT	1.0089 Y	VOLUME OF LIQUID COLLECTED, ML	602.4 Vl
PITOT TUBE COEFFICIENT	0.842 Cp	GAS COMPOSITION, % V/V DRY;	
NOZZLE DIMENSIONS;		CARBON DIOXIDE	6.33 CD
DIAMETER, IN	0.300 Dn	OXYGEN	11.40 OX
AREA, SF	0.000491 An	CARBON MONOXIDE	0.00 CM
		NITROGEN (BY DIFFERENCE)	82.27 NI
STACK DIMENSIONS;			
DIAMETER/LENGTH, IN	24.50 Sl	AVE. TRAVERSE POINT DATA;	
WIDTH, IN	27.50 Sw	STACK TEMP., DEG F	168 Ts
AREA, SF	4.679 As	METER TEMP., DEG F	51 Tm
		ORIFICE PRESSURE, IN WC	1.323 Po
BAROMETRIC PRESSURE, IN HG	28.30 Pb	SQRT VELOCITY P., IN WC	0.619 Pv
STACK PRESSURES;		MASS OF PARTICULATE MATTER	
STATIC, IN WC	0.18 Pg	COLLECTED, G;	
ABSOLUTE, IN HG	28.31 Ps	FRONT CATCH (79.3%)	0.1098 Wf
		BACK CATCH (20.7%)	0.0287 Wb
SAMPLING TIME, MIN	62.50 Ti	TOTAL CATCH	0.1385 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	40.950 Vm		

Corrected from 758.7 ml Due to excess water droplets

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	40.502 Vms	GAS MOLECULAR WEIGHT;	
		DRY BASIS, LB/LB-MOLE	29.47 Md
		WET BASIS, LB/LB-MOLE	24.75 Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	28.355 Vw	AVERAGE GAS VELOCITY, FPS	42.20 Vs
GAS MOISTURE CONTENT;		GAS VOLUMETRIC FLOW RATE;	
VOLUME FRACTION	0.4118 Bws	ACTUAL, ACFM	11846 Qa
PERCENT BY VOLUME	41.18 Bwp	STANDARD, SCFM	9419 Qs
		DRY STANDARD, DSCFM	5540 Qsd
		ISOKINETIC VARIATION, %	111.56 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0196 Caf	0.0051 Cab	0.0247 Cat
STANDARD, GR/SCF	0.0246 Cwf	0.0064 Cwb	0.0310 Cwt
DRY STANDARD, GR/DSCF	0.0418 Csf	0.0109 Csb	0.0527 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	1.99 Rcf	0.52 Rcb	2.51 Rct
RATIO OF AREAS METHOD	2.21 Rrf	0.58 Rrb	2.79 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG * NON-APPLICABLE DATA

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9641 COMPANY: LAKES AREA ASPHALT
TEST NUMBER: 1 SOURCE: SCRUBBER EXHAUST
RUN NUMBER: 3 TIME: 10/19/94 1609-1726

		TRAVERSE POINT DATA					VELOCITY PROFILE	
SAMPLING LOCATION PORT	POINT	VELOCITY PRESSURE IN WC	ORIFICE PRESSURE IN WC	TEMPERATURE, DEG.F STACK GAS	METER INLET	METER OUTLET	SQRT VELOCITY PRESSURE	GAS VELOCITY FT/SEC
A	1	0.5700	1.900	168	50	50	0.755	51.04
A	2	0.6200	2.100	157	50	50	0.787	52.76
A	3	0.5500	1.900	161	50	50	0.742	49.86
A	4	0.5400	1.800	162	50	50	0.735	49.44
A	5	0.5200	1.800	159	50	50	0.721	48.40
B	1	0.5000	1.700	140	50	50	0.707	46.72
B	2	0.4700	1.600	165	50	50	0.686	46.24
B	3	0.5100	1.700	163	50	50	0.714	48.09
B	4	0.4700	1.600	167	50	50	0.686	46.31
B	5	0.4400	1.500	169	50	50	0.663	44.88
C	1	0.4500	1.500	162	50	50	0.671	45.13
C	2	0.4000	1.400	169	50	50	0.632	42.79
C	3	0.3000	1.000	163	50	50	0.548	36.88
C	4	0.1900	0.650	165	50	50	0.436	29.40
C	5	0.3300	1.100	169	50	50	0.574	38.87
D	1	0.1800	0.610	172	50	50	0.424	28.77
D	2	0.2400	0.820	160	51	50	0.490	32.91
D	3	0.3300	1.100	167	51	50	0.574	38.80
D	4	0.2800	0.960	164	51	50	0.529	35.66
D	5	0.1900	0.650	170	51	50	0.436	29.51
E	1	0.2000	0.680	167	50	50	0.447	30.21
E	2	0.1400	0.480	162	51	50	0.374	25.17
E	3	0.2200	0.750	167	51	50	0.469	31.68
E	4	0.0900	0.310	171	51	50	0.300	20.33
E	5	0.1500	0.510	172	51	50	0.387	26.27
AVERAGE		0.3552	1.205	164	50	50	0.580	39.07

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9641 COMPANY: LAKES AREA ASPHALT
TEST NUMRER: 1 SOURCE: SCRUBBER EXHAUST
RUN NUMBER: 3 TIME: 10/19/94 1609-1726

corrected from 7411.0 ml due to excess water droplets

TEST DATA

GAS METER COEFFICIENT	1.0089	Y	VOLUME OF LIQUID COLLECTED, ML	468.3	Vl
PITOT TUBE COEFFICIENT	0.842	Cp			
			GAS COMPOSITION, % V/V DRY;		
NOZZLE DIMENSIONS;			CARBON DIOXIDE	5.90	CD
DIAMETER, IN	0.300	Dn	OXYGEN	11.80	OX
AREA, SF	0.000491	An	CARBON MONOXIDE	0.00	CM
			NITROGEN (BY DIFFERENCE)	82.30	NI
STACK DIMENSIONS;					
DIAMETER/LENGTH, IN	24.50	Sl	AVE. TRAVERSE POINT DATA;		
WIDTH, IN	27.50	Sw	STACK TEMP., DEG F	164	Ts
AREA, SF	4.679	As	METER TEMP., DEG F	50	Tm
			ORIFICE PRESSURE, IN WC	1.205	Po
BAROMETRIC PRESSURE, IN HG	28.31	Pb	SQRT VELOCITY P., IN WC	0.580	Pv
STACK PRESSURES;			MASS OF PARTICULATE MATTER		
STATIC, IN WC	0.18	Pg	COLLECTED, G;		
ABSOLUTE, IN HG	28.32	Ps	FRONT CATCH (81.6%)	0.1746	Wf
			BACK CATCH (18.4%)	0.0393	Wb
SAMPLING TIME, MIN	62.50	Ti	TOTAL CATCH	0.2139	Wt
VOLUME OF GAS SAMPLED AT METER, DCF	37.116	Vm			

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	36.785	Vms	GAS MOLECULAR WEIGHT;		
			DRY BASIS, LB/LB-MOLE	29.42	Md
			WET BASIS, LB/LB-MOLE	25.14	Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	22.043	Vw	AVERAGE GAS VELOCITY, FPS	39.07	Vs
GAS MOISTURE CONTENT;			GAS VOLUMETRIC FLOW RATE;		
VOLUME FRACTION	0.3747	Bws	ACTUAL, ACFM	10967	Qa
PERCENT BY VOLUME	37.47	Bwp	STANDARD, SCFM	8779	Qs
			DRY STANDARD, DSCFM	5489	Qsd
			ISOKINETIC VARIATION, %	102.26	I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0366 Caf	0.0082 Cab	0.0449 Cat
STANDARD, GR/SCF	0.0458 Cwf	0.0103 Cwb	0.0561 Cwt
DRY STANDARD, GR/DSCF	0.0732 Csf	0.0165 Csb	0.0897 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	3.45 Rcf	0.78 Rcb	4.22 Rct
RATIO OF AREAS METHOD	3.52 Rrf	0.79 Rrb	4.31 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG * NON-APPLICABLE DATA

TABLE SUMMARY OF PARTICULATE EMISSION TEST RESULTS

PROJECT NUMBER: 9641 COMPANY: LAKES AREA ASPHALT
TEST NUMBER: 1 SOURCE: SCRUBBER EXHAUST

TEST PARAMETER	RUN 1	RUN 2	RUN 3
TEST DATE	10/19/94	10/19/94	10/19/94
TIME OF TEST, HR;			
START	1144	1408	1609
FINISH	1253	1516	1726
EFFLUENT TEMPERATURE, DEGREES F	160	168	164
BAROMETRIC PRESSURE, IN HG	28.26	28.30	28.31
EFFLUENT MOISTURE CONTENT, % V/V	34.1	41.2	37.5
EFFLUENT COMPOSITION, % V/V DRY;			
CARBON DIOXIDE	6.2	6.3	5.9
OXYGEN	11.2	11.4	11.8
CARBON MONOXIDE	0.0	0.0	0.0
EFFLUENT VOLUMETRIC FLOW RATE;			
ACTUAL CONDITIONS, ACFM	10566	11846	10967
STANDARD CONDITIONS, SCFM	8515	9419	8779
DRY STANDARD CONDITIONS, DSCFM	5610	5540	5489
ISOKINETIC VARIATION, %	100.3	111.6	102.3
EFFLUENT PARTICULATE CONCENTRATION;			
EFFLUENT FRONT HALF PARTICULATE CONCENTRATION;			
ACTUAL CONDITIONS, GR/ACF	0.0626	0.0196	0.0366
STANDARD CONDITIONS, GR/SCF	0.0776	0.0246	0.0458
DRY STANDARD CONDITIONS, GR/DSCF	0.1178	0.0418	0.0732
EFFLUENT BACK HALF PARTICULATE CONCENTRATION;			
ACTUAL CONDITIONS, GR/ACF	0.0040	0.0051	0.0082
STANDARD CONDITIONS, GR/SCF	0.0050	0.0064	0.0103
DRY STANDARD CONDITIONS, GR/DSCF	0.0076	0.0109	0.0165
EFFLUENT TOTAL PARTICULATE CONCENTRATION;			
ACTUAL CONDITIONS, GR/ACF	0.0666	0.0247	0.0449
STANDARD CONDITIONS, GR/SCF	0.0826	0.0310	0.0561
DRY STANDARD CONDITIONS, GR/DSCF	0.1254	0.0527	0.0897
SOURCE PARTICULATE EMISSION RATE;			
CLASSICAL METHOD, LB/HR	6.04	2.51	4.22
RATIO OF AREAS METHOD, LB/HR	6.05	2.79	4.31

PARTICULATE CONCENTRATION AND EMISSION RATES BASED ON ANALYSIS OF THE SAMPLING TRAIN FRONT AND BACK CATCHES.

STANDARD CONDITIONS: 68 DEGREES FAHRENHEIT, 29.92 INCHES OF MERCURY.

TABLE ANALYSIS OF VISIBLE EMISSION TEST DATA

PROJECT NUMBER: 9641
DATE TESTED: 10-19-94
TIME OF TEST: 1150

COMPANY: LAKES AREA ASPHALT
SOURCE: SCRUBBER OUTLET
OBSERVER: ALAN TROWBRIDGE
RE-CERTIFICATION DATE: 4-5-95

PLUME OPACITY OBSERVATIONS

MINUTE	**	SECONDS 00	15	30	45	MINUTE	**	SECONDS 00	15	30	45	MINUTE	**	SECONDS 00	15	30	45
0		5	10	5	5	20		5	5	0	0	40		0	0	0	0
1		5	5	0	5	21		0	0	0	0	41		0	0	0	0
2		0	0	0	0	22		0	0	0	0	42		0	0	0	0
3		0	5	0	0	23		0	0	0	0	43		0	0	0	0
4		0	0	5	0	24		0	0	5	10	44		0	5	0	0
5		0	0	0	0	25		5	10	15	5	45		0	0	0	0
6		5	0	0	0	26		5	5	0	0	46		0	0	0	0
7		0	0	0	0	27		0	0	0	0	47		0	0	0	5
8		0	0	5	5	28		0	0	0	0	48		5	10	0	5
9		0	5	0	0	29		0	0	0	0	49		0	0	0	0
10		0	0	0	0	30		0	0	0	0	50		0	0	0	0
11		0	0	0	0	31		0	0	5	0	51		0	0	0	0
12		0	0	5	0	32		5	10	15	15	52		0	0	0	0
13		0	5	0	0	33		10	5	0	0	53		0	0	0	0
14		0	0	0	0	34		0	0	0	0	54		0	0	0	0
15		0	0	0	0	35		0	0	5	10	55		0	5	5	0
16		0	0	0	0	36		5	0	0	0	56		0	0	0	0
17		0	0	0	0	37		0	0	0	0	57		0	0	0	0
18		0	5	0	0	38		0	0	0	0	58		0	0	5	0
19		5	10	15	10	39		0	0	0	0	59		0	0	0	5

SUMMARY OF TEST DATA

PLUME OPACITY %	PERCENT OF TIME AT OPACITY	PERCENT OF TIME OPACITY EXCEEDED
0	79.58	20.42
5	15.00	5.42
10	3.75	1.67
15	1.67	0.00
20	0.00	0.00
25	0.00	0.00
30	0.00	0.00
35	0.00	0.00
40	0.00	0.00
45	0.00	0.00
50	0.00	0.00
55	0.00	0.00
60	0.00	0.00
65	0.00	0.00
70	0.00	0.00
75	0.00	0.00
80	0.00	0.00
85	0.00	0.00
90	0.00	0.00
95	0.00	0.00
100	0.00	0.00

OPACITY RANGE,%	TIME OPACITY IN RANGE % OF TIME	MIN/HR
0 - 20	100.00	60.00
25 - 40	0.00	0.00
45 - 60	0.00	0.00
> 60	0.00	0.00

MAXIMUM OBSERVED OPACITY, %: 15
MINIMUM OBSERVED OPACITY, %: 0
ARITHMETIC MEAN OPACITY, %: 1.4

SIX-MINUTE AVERAGE OPACITY, %

MAXIMUM:	3.5 (31:30-37:15)
2nd LARGEST:	2.7 (19:45-25:30)
3rd LARGEST:	2.1 (00:15-06:00)
4th LARGEST:	1.5 (13:45-19:30)
5th LARGEST:	1.3 (44:15-50:00)

APPENDIX B: FIELD DATA FORMS

SOURCE EMISSION TEST
SITE DESCRIPTION DATA SHEET

TRAVERSE POINT LOCATION		
Traverse Point Number	Port Length: 3.5 Inches From Wall	Inches From Port
1	2.45	6.0
2	7.35	10.9
3	12.25	15.8
4	17.15	20.7
5	22.05	25.6
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

PRELIMINARY TRAVERSE DATA	
Effluent Temperature, °F:	
Ave. Velocity Pressure, IN WC:	

MMT Job Number: 9641 Date: Oct. 94

Company: Lakes Area Asphalt

Address:

Source: Scrubber Exhaust

Source Cross-sectional Dimensions

Round Duct; diameter: NA

Rectangular Duct;

Depth ~~Length~~: ~~24.5~~ 24.5"

Width: 27.5

Equivalent diameter: 25.9

$D_e = 2LW/(L+W)$

Distance to Nearest Flow Disturbance;

Before Ports: 120" = 4.6 diameters

After Ports: 36" = 1.4 diameters

Number of Sampling Points;

Required by EPA Method 1: 25

Actually Used: ~~25~~ 25

Number of ports: 5 (Five)

Points per port: 5

Sampling Time;

Minutes per Point: 2.5

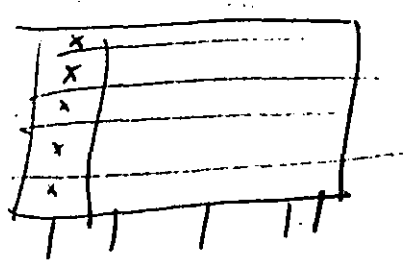
Minutes per Test Run: 62.5

SITE SKETCH AND COMMENTS

Port Type: 3" female NPT

Port Depth: 3.5"

4.9 - 2 + 4.9



FORM: S-FD-1c

EPA METHOD 2: VOLUMETRIC FLOW RATE DETERMINATION

Field Data Sheet

MMT Job Number: 9641 | Ambient Temperature, °F: 50

Date: Filled 10-19-94 | Barometric Pressure, in. Hg.: 28.26

Company: Lakes Area Asphalt | Static Pressure, in. WC: -.3

Source: Scrubber | Dry Bulb Temp., °F: ~~105~~ 149

Dimensions, inches: 24.5 x 27.5 | Wet Bulb Temp., °F: 149

Test Team Members: BA-TG | Relative Humidity, %:

Test No.: 0 | Run No.: Prelim | Moisture Content, %: ~~27~~ 35

VELOCITY TRAVERSE: Time: 1026 | Pitot Tube No: 41 | Coefficient: A = .842

Traverse Point Number	Inches From Wall	Inches From Port	PORT A ΔP in. H2O	PORT A Temp. °F	PORT B ΔP in. H2O	PORT B Temp. °F	PORT C ΔP in. H2O	PORT C Temp. °F	PORT D ΔP in. H2O	PORT D Temp °F
1				.20						
2						.35		.34		
3										
4										
5				.20		.40				
6										
7										
				Port	Port	Port	Port	Port		
				.66		.54				
					.62	.52				
						.65				
25 points - 2.5 min/point										
	62.5 min/test									
				average	V_p =					
Nozzle ID	Nozzle dia.	$\bar{x}$ all/port	vol/test	Min	V_p =					
		.99/1.2	35.5	Max	V_p =					
L2	.249									
L6	.300	2.1/2.4	51	Ideal	N_p = .275	" Q	.259	Q		
				Actual	N_p = L2					
				Nozzle ID:	.249					

Sat. 165°F 38% MC

150 Wet 26% MC

35% MC

FORM: S-FD-2b

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1	RUN: 1
Page 1 of 2	

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETERS
MMT Job Number: 9641	Control Unit No.: 4	ΔH@ 1.82
Date: Wed 10.19.94	Gas Meter Coefficient: 1.004	TM 656
Company: Lakes Area Asphalt	Sample Box No.: 4	MC 27
Source: Scrubber Exhaust	Probe No.: 44 Length: 44"	PS/PM 1.0
Source Dimensions: 24.5 x 27.5" Width	Pitot No.: 41 Coefficient: A=.842	C 1.00
Test Team: BA-TP	Nozzle No.: C2 Diameter: .249" ø	TS 150
Test Procedure: 1-5	Filter No.: 8907	R
Ambient Temp., °F: 50	Barometric Pressure, in.Hg: 28.26	Static Pressure, in.WC: .75

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
1144	1	0	210.606	.51	.84	.84	5	160	50	50	236	247	50
	2		212.0	.63	1.03	1.0	9	154	51	50	249	246	50
1149	3	5	213.4	1.0	1.64	1.6	13	151	52	49	246	253	50
	4		215.2	.55	.91	.91	8	154	53	50	247	251	50
1154	5	10	216.3	.47	.77	.77	8	156	54	50	248	250	50
1156.5	End	12.5	217.7										
1158	1	12.5	X	.42	.69	.69	6	152	52	50	249	246	48
	2	15	219.1	.36	.59	.59	5	152	53	50	247	251	46
1203	3		220	.41	.68	.68	6	153	53	50	251	244	44
	4	20	221.3	.35	.58	.58	6	153	54	50	253	246	45
1208	5		222.0	.55	.91	.91	8	161	55	50	250	245	45
1210.5	End	25	223.5										
1212	1	25	X	.32	.53	.53	6	168	54	50	249	244	47
	2		224.6	.34	.56	.56	6	164	55	50	251	250	47
1217	3	30	225.6	.30	.49	.49	6	161	55	50	250	246	47
	4		226.5	.30	.49	.49	7	158	55	50	249	247	47
1222	5	35	227.5	.30	.49	.49	7	153	55	50	251	241	47
1224.5	End	37.5	228.5										
1226	1	37.5	X	.23	.38	.35	5	160	53	51	250	249	47
	2	40	229.6	.20	.33	.33	6	163	54	50	253	251	47
1231	3		230.5	.15	.25	.25	5	161	54	50	251	250	47
	4	45	231.3	.21	.35	.35	5	161	54	50	250	246	47
1236	5		232	.17	.25	.28	5	166	54	50	248	249	47
1238.5	End	50	232.9										

Parallel flow mixer

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial	100	100	0	750.0	
Difference					
Total Moisture Collected:					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1119	.0004	18

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id: 1	Replicate 1		Replicate 2		Replicate 3		Average	
	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide							CO_2	
Oxygen							O_2	
Carbon Monoxide							CO	

FORM: S-FD — Natural Gas

Total Sampling Time, min.:

Volume of Gas Sampled, DCF:

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1	RUN: 1
Page 2 of 2	

TEST IDENTIFICATION		EQUIPMENT IDENTIFICATION		NOMOGRAPH PARAMETERS
MMT Job Number: 9641		Control Unit No.:		ΔH@
Date: 10.19.94		Gas Meter Coefficient:		TM
Company: Cakes Area		Sample Box No.:		MC
Source: Scrubber Exhaust		Probe No.:	Length:	PS/PM
Source Dimensions: 1'		Pitot No.:	Coefficient:	C
Test Team:		Nozzle No.:	Diameter:	TS
Test Procedure:		Filter No.:		R
Ambient Temp., °F:	Barometric Pressure, in.Hg:		Static Pressure, in.WC:	

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
1240	1	0	X	.19	.21	.31	5.5	163	52	51	251	243	48
	2		233.6	.17	.25	.28	5	169	53	51	250	249	47
1245	3	5	234.15	.14	.23	.23	5	167	53	50	252	241	47
	4		235.2	.14	.23	.23	5	165	53	50	251	245	47
1250	5	10	235.9	.15	.25	.25	5	Kept	53	50	252	241	47
1255	End	15	236.411										

210.666 start

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial					
Difference					
Total Moisture Collected:					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1254	.002	15

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id: 1-1	Replicate 1		Replicate 2		Replicate 3		Average	
	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide							CO2	
Oxygen							O2	
Carbon Monoxide							CO	

Total Sampling Time, min.: _____

FORM: S-FD-5

Volume of Gas Sampled, DCF: _____

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1	RUN 2 (Two)
Page 1	of 3

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETERS
MMT Job Number: 9641	Control Unit No.: 4	ΔH@1.82
Date: Wed. 10-19-94	Gas Meter Coefficient: 1.004	TM 51
Company: Eagles Area Asphalt	Sample Box No.: 4	MC 35
Source: Scrubber outlet	Probe No.: 44 Length: 14"	PS/PM = 1.5
Source Dimensions: 24.5 * 27.5	Pitot No.: 41 Coefficient: A=.842	C 1.007
Test Team: BA TR	Nozzle No.: 66 Diameter: .300	TS 168
Test Procedure: EPA 1-5	Filter No.: 8903	R
Ambient Temp., °F: 49	Barometric Pressure, in.Hg: 28.3	Static Pressure, in.WC: .18

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
1408	1	0	236.897	.46	1.57	1.6	13	168	50	50	251	255	49
	2		237.0	.42	1.43	1.4	12	169	50	50	248	258	49
1413	3	5	240.5	.33	1.13	1.1	10	170	50	50	249	260	50
	4		242.0	.58	1.97	2.0	16	169	51	50	247	247	50
1418	5	10	244.1	.45	1.51	1.5	12	169	51	50	241	244	50
1420.5	End	12.5	245.9										
1422.5	1	12.5	X	.50	1.71	1.7	14	168	51	50	246	236	50
1425	2	15	247.7	.42	1.43	1.4	12	168	51	51	244	237	50
	3		249.4	.43	1.47	1.5	13	171	52	51	250	244	51
1430	4	20	251.2	.52	1.78	1.8	17	169	52	51	252	248	51
	5		253.1	.46	1.57	1.6	14	170	52	51	255	249	52
1435	End	25	254.8										
1436	1	25	X	.35	1.19	1.2	11	169	52	51	261	248	52
	2		256.3	.34	1.16	1.2	11	167	52	51	259	249	52
1441	3	30	257.7	.32	1.1	1.1	11	170	52	51	257	251	52
	4		259.4	.36	1.23	1.2	11	170	52	51	258	252	52
1446	5	X	261.0	.30	1.03	1.0	10	171	52	51	251	253	53
1448	End	37.5	262.3										
1449.5	1	37.5	X	.38	1.3	1.3	14	171	52	51	250	251	53
1452	2	40	264.1	.32	1.1	1.1	12	170	52	51	251	250	53
	3		265.4	.30	1.03	1.0	11	170	52	51	252	251	54
1457	4	45	267.0	.28	.96	1.0	11	171	52	51	254	252	54
	5		268.4	.38	1.3	1.3	14	173	52	51	249	252	54
1502	End	50	270.0										

≈ 100 gpm Scrubber flow rate ± 30 gpm

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial	100	100	0	731.2	X
Difference					
Total Moisture Collected:					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1400	.005	16

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id:	Replicate 1		Replicate 2		Replicate 3		Average	
1-2	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide							CO_2	
Oxygen							O_2	
Carbon Monoxide							CO	

H2O droplets Present - R2

Total Sampling Time, min.: _____

FORM: S-FD-5

Volume of Gas Sampled, DCF: _____

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1	RUN: 2
Page 2 of 2	

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETERS
MMT Job Number: 9641	Control Unit No.:	ΔH@
Date: 10-Feb-94	Gas Meter Coefficient:	TM
Company: Lake Area	Sample Box No.:	MC
Source: Scrubber Exhaust	Probe No.: Length:	Pg/PM
Source Dimensions:	Pitot No.: Coefficient:	C
Test Team:	Nozzle No.: Diameter:	TS
Test Procedure:	Filter No.:	R
Ambient Temp., °F:	Barometric Pressure, in.Hg:	Static Pressure, in.WC:

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
X	1503	1 South	0	X	1.34	1.3	14	174	52	51	245	239	55
271.2		2		271.5		1.5	15	172	52	51	252	246	55
272.9	1508	3 Port	5	273.4	1.36	1.4	15	173	52	51	251	271	55
274.6		4		275.0	1.23	1.2	13.5	174	52	51	250	276	55
276.1	1513	5	10	276.8	.68	.68	8	172	52	51	254	271	55
277.3	1515.5	End	12.5	278.9									

277.8 47
278.8 97
236.8 90
40.1 50

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial					
Difference					
Total Moisture Collected:					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1519	.008	22"

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id: 1-2	Replicate 1		Replicate 2		Replicate 3		Average	
	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide							CO_2	
Oxygen							O_2	
Carbon Monoxide							CO	

Total Sampling Time, min.:

FORM: S-FD-5

Volume of Gas Sampled, DCF:

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1	RUN: 3
Page 1 of 2	

TEST IDENTIFICATION		EQUIPMENT IDENTIFICATION		NOMOGRAPH PARAMETERS
MMT Job Number:	9641	Control Unit No.:	4	ΔH@ 1.82
Date:	Wed 10.19.94	Gas Meter Coefficient:	1.004	TM 51
Company:	Coles Area Asphalt	Sample Box No.:	4	MC 35
Source:	Scrubber Exhaust	Probe No.: 44	Length: 41	PS/PM ≈ 1.0
Source Dimensions:	24.5 x 27.5	Pitot No.: 4	Coefficient: 4 - .842	C 1.004
Test Team:	BA TC	Nozzle No.: 66	Diameter: .300" @	TS 170
Test Procedure:	EPA 1-5	Filter No.:	8904	R
Ambient Temp., °F:	49	Barometric Pressure, in.Hg:	28.31	Static Pressure, in.WC: 1.8

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F: STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
1609	1	0	278.606	.57	1.94	1.9	15	168	50	50	245	247	52
1611.5	2		279.8	.62	2.12	2.1	17	157	50	50	251	271	51
1614	3	5	281.8	.55	1.9	1.9	15	161	50	50	248	277	50
1616.5	4		283.7	.54	1.84	1.8	14	162	50	50	238	265	50
1619	5	10	285.7	.52	1.77	1.8	14	159	50	50	250	255	50
1621.5	End	12.5	287.6										
1622	1	12.5	X	.50	1.71	1.7	14	140	50	50	254	251	50
1624.5	2	15	289.4	.47	1.60	1.6	13	165	50	50	251	253	51
[illegible]	3		291.2	.51	1.7	1.7	14	163	50	50	250	247	51
[illegible]	4 1641.5	20	293.0	.47	1.6	1.6	13	167	50	50	249	247	51
[illegible]	5 44		294.7	.44	1.5	1.5	12	169	50	50	251	248	52
[illegible]	End 1646.5	25	296.5										
1647	1 1646.5	25	X	.45	1.53	1.5	12	162	50	50	250	251	52
1649.5	2		298.2	.40	1.36	1.4	12	169	50	50	261	250	52
1652	3	30	300.0	.30	1.02	1.0	11	163	50	50	265	250	52
1654.5	4		301.4	.19	.65	.65	7	165	50	50	257	252	53
1657	5	35	302.5	.33	1.12	1.1	11	169	50	50	254	251	53
1659.5	End	37.5	304.0										
1700	1	37.5	X	.18	.61	.61	7	172	50	50	255	259	53
1702.5	2	40	305.1	.24	.82	.82	8	160	51	50	251	262	53
1705	3		306.5	.33	1.13	1.1	11	167	51	50	251	252	53
1707.5	4	45	308.0	.28	.96	.96	10	164	51	50	250	257	54
1710	5		309.2	.19	.65	.65	7	170	51	50	250	252	54
1712.5	End	50	310.5										
						Restart @	1639						

Dam @ 1624.5 Down @ 1702.5 Restart @ 1630 X Vp = .40 - .38 = .2 Fuel = Propane

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial	100	100	0	715.8	
Difference					
Total Moisture Collected:					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1542	.005	22

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id: 1-3	Replicate 1		Replicate 2		Replicate 3		Average	
	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide							CO_2	
Oxygen							O_2	
Carbon Monoxide							CO	

Total Sampling Time, min.:

FORM: S-FD-5

Volume of Gas Sampled, DCF:

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1	RUN: 3
Page 2 of 2	

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETERS
MMT Job Number: 9641	Control Unit No.:	ΔH@
Date: 10-19-84	Gas Meter Coefficient:	TM
Company: Lake Area Asphalt	Sample Box No.:	MC
Source: Scrubber Exhaust	Probe No.: Length:	PS/PM
Source Dimensions:	Pitot No.: Coefficient:	C
Test Team:	Nozzle No.: Diameter:	TS
Test Procedure:	Filter No.:	R
Ambient Temp., °F:	Barometric Pressure, in.Hg:	Static Pressure, in.WC:

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
1713	1	0	X	.20	.168	.165	7	167	50	50	245	250	55
311.8	2		311.6	.14	.118	.115	5	162	51	50	247	247	55
1718	3	5	312.8	.22	.175	.175	8	167	51	50	249	246	55
314	4		313.9	.09	.131	.131	4/5	171	51	50	260	245	56
344.7	1723	10	314.8	.15	.151	.151	5	172	51	50	256	244	55
315.8	17255	12.5	315.722										
	End 1												
	2												
	3												
	4												
	End 1												
	2												
	3												
	4												
	End 1												
	2												
	3												
	4												
	5												
	End												

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial					
Difference					
Total Moisture Collected:					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
1729	.006	19

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id:	Replicate 1		Replicate 2		Replicate 3		Average	
1-3	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide							CO2	
Oxygen							O2	
Carbon Monoxide							CO	

Total Sampling Time, min.:

FORM: S-FD-5

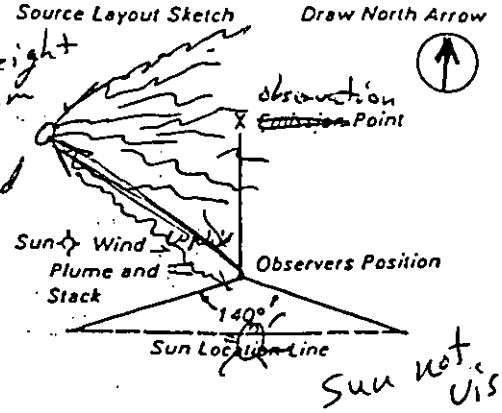
Volume of Gas Sampled, DCF:

Pr. # 9641 Test-Run # 1-1

Visible Emission Observation Form

SOURCE NAME: Lakes Area Asphalt	OBSERVATION DATE: 10/19/94
ADDRESS: 4357 Highway 210 NE	START TIME: 1150
CITY: Brainerd / STATE: MN / ZIP:	STOP TIME: 1250
PHONE: / SOURCE ID NUMBER:	
PROCESS EQUIPMENT: Asphalt Plant / OPERATING MODE: Normal	
CONTROL EQUIPMENT: Scrubber / OPERATING MODE: Normal	
DESCRIBE EMISSION POINT: ~24"x24" Steelstack	
~~START~~ ~~STOP~~	
HEIGHT ABOVE GROUND LEVEL START: STOP: / HEIGHT RELATIVE TO OBSERVER START: STOP:	
DISTANCE FROM OBSERVER START: ~250' STOP: same / DIRECTION FROM OBSERVER START: WNW STOP: WNW	
DESCRIBE EMISSIONS START: Blue haze STOP: Steam plume, occasional	
EMISSION COLOR START: STOP: / 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: After water vapor dissipate STOP: same	
DESCRIBE BACKGROUND START: Sky, trees STOP: Sky, trees	
BACKGROUND COLOR START: gray, green STOP: same / SKY CONDITIONS START: Overcast STOP: overcast	
WIND SPEED START: ~4-7 mph STOP: 3-5 mph / WIND DIRECTION START: W STOP: W	
AMBIENT TEMP. START: STOP: / WET BULB TEMP. / RH, percent	

Source Layout Sketch — Draw North Arrow



plume height varied from ~10-100 ft above ground

at times steam plume went over observer

Sun not visible

SEC / MIN	0	15	30	45	MIN	SEC 0	15	30	45
1	5	10	5	5	31	0	0	0	0
2	5	5	0	5	32	0	0	5	0
3	0	0	0	0	33	5	10	15	15
4	0	5	0	0	34	10	5	0	0
5	0	0	5	0	35	0	0	0	0
6	0	0	0	0	36	0	0	5	10
7	5	0	0	0	37	5	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	5	5	39	0	0	0	0
10	0	5	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	0	0
13	0	0	5	0	43	0	0	0	0
14	0	5	0	0	44	0	0	0	0
15	0	0	0	0	45	0	5	0	0
16	0	0	0	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	5
19	0	5	0	0	49	5	10	0	5
20	5	10	15	10	50	0	0	0	0
21	5	5	0	0	51	0	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	0	0
25	0	0	5	10	55	0	0	0	0
26	5	10	15	5	56	0	5	5	0
27	5	5	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	5	0
30	0	0	0	0	60	0	0	0	5

AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE 15 % WERE 0
RANGE OF OPACITY READINGS MINIMUM: 0	MAXIMUM: 15
OBSERVER'S NAME (PRINT): Alan L. Trowbridge	
OBSERVER'S SIGNATURE: Alan L. Trowbridge	DATE: 10/19/94
ORGANIZATION: MPT Environmental Services Inc	
CERTIFIED BY: ETA	DATE: 10/5/94
VERIFIED BY:	DATE:

COMMENTS: Higher opacities occurred when fugitive from product outlet chute mixed with scrubber plume

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE / TITLE / DATE

APPENDIX C: LABORATORY REPORTS

SUMMARY OF PARTICULATE EMISSION TEST LABORATORY DATA

PROJECT NUMBER: 9641 COMPANY: LAKES AREA ASPHALT
TEST NUMBER: 1 SOURCE: SCRUBBER EXHAUST

	MASS OF PARTICULATE MATTER COLLECTED, GRAMS							
	FRONT CATCH				BACK CATCH			TOTAL PARTICULATE MASS COLLECTED
RUN NUMBER	FRONT WASH	CYCLONE CATCH	FILTER CATCH	FRONT TOTAL	IMPINGER CATCH **	IMPINGER WASH	BACK TOTAL	
1	0.0435	0.0000	0.1507	0.1942	0.0016	0.0109	0.0125	0.2067
2	0.0467	0.0000	0.0631	0.1098	0.0104	0.0183	0.0287	0.1385
3	0.0359	0.0000	0.1387	0.1746	0.0117	0.0276	0.0393	0.2139

* NOT APPLICABLE

** CHLOROFORM/ETHYL ETHER EXTRACTION

LABORATORY REPORT: EPA Method 5

Project Number: # 9641 Company: LAKE AREA ASPHALT

Frontwashes

Test-Run	1-1	1-2	1-3	Date
Dish #	1268	1271	1274	- - - - -
1	2.3497	2.3115	2.3199	10-24-94
2	2.3496	2.3115	2.3198	10-27-94
3	2.3495	2.3114	2.3198	10-28-94
Tare	2.3058	2.2645	2.2837	4-26-94
Blank	0.0002	0.0002	0.0002	- - - - -
Net	0.0435	0.0467	0.0359	- - - - -

Solvent Blanks

Solvents	Acetone	Chloroform	Ether	Date
Dish #	1265	1266	1267	- - - - -
1	2.3025	2.2812	2.3192	10-24-94
2	2.3025	2.2812	2.3192	10-27-94
3	2.3025	2.2812	2.3191	10-28-94
Tare	2.3023	2.2810	2.3189	4-26-94
Net	0.0002	0.0002	0.0002	- - - - -

Backwashes

Test-Run	1-1	1-2	1-3	Date
Dish #	1269	1272	1275	- - - - -
1	2.3325	2.3397	2.3241	10-24-94
2	2.3324	2.3397	2.3240	10-27-94
3	2.3325	2.3399	2.3240	10-28-94
Tare	2.3113	2.3012	2.2962	4-26-94
Blank	0.0002	0.0002	0.0002	- - - - -
Net	0.0109	0.0183	0.0276	- - - - -

Glass Filters

Test-Run	1-1	1-2	1-3	Date
Filter #	8902	8903	8904	- - - - -
1	0.6599	0.5745	0.6467	10-24-94
2	0.6599	0.5746	0.6465	10-27-94
3	0.6598	0.5747	0.6465	10-28-94
Tare	0.5091	0.5114	0.5078	6-2-94
Net	0.1507	0.0631	0.1387	- - - - -

Extractions

Test-Run	1-1	1-2	1-3	Date
Dish #	1270	1273	1276	- - - - -
1	2.3331	2.3377	2.2961	10-24-94
2	2.3330	2.3377	2.2963	10-27-94
3	2.3330	2.3375	2.2960	10-28-94
Tare	2.3306	2.3267	2.2839	4-26-94
Blank	0.0004	0.0004	0.0004	- - - - -
Net	0.0016	0.0104	0.0117	- - - - -

COMMENTS

Lowest Final Weight
- Tare
- Blank(if applicable)

= Sample Net Gain (grams)

Signature Bill Anderson Date 10-28-94

Laboratory Report: Moisture Content of Aggregate Samples

Project Number 9641 Company Lakes Area Asphalt

Test 1-1

Trial #	1	2	3	Date
Dish #	1289	1290	1291	
Tare	2.3185	2.3218	2.2750	4.26.94
Tare + Wet	45.6435	45.4163	45.3073	11.3.94
Wet	43.3250	43.0945	43.0323	
Dry	40.4742	40.4718	40.3138	
Dry + Tare	42.7927	42.7936	42.6688	11.4.94
% Moisture	6.58	6.09	6.13	

Test 1-2

Trial #	1	2	3	Date
Dish #	1292	1293	1294	
Tare	2.2984	2.2854	2.3171	4.26.94
Tare + Wet	45.5882	45.2484	45.5555	11.3.94
Wet	43.2898	42.9630	43.2384	
Dry	40.5768	40.3853	40.5910	
Dry + Tare	42.8750	42.6707	42.9081	11.4.94
% Moisture	6.27	6.00	6.12	

Test 1-3

Trial #	1	2	3	Date
Dish #	1295	1296	1297	
Tare	2.2742	2.3015	2.2969	4.26.94
Tare + Wet	45.1859	45.2932	45.3363	11.3.94
Wet	42.9117	42.9917	43.0894	
Dry	40.1788	40.2921	40.5166	
Dry + Tare	42.4530	42.5936	42.8135	11.4.94
% Moisture	6.37	6.28	5.97	

Summary

	Mean	Deviation	% Error
Test 1-1	6.27	.27	4.3
1-2	6.13	.14	2.2
1-3	6.21	.21	3.4

Comments

$\frac{\text{Dry}}{\text{Wet}} * 100 =$ % Solids

Virgin Aggregate

100- % Solids = % Moisture

Run

Signature Ted Gibbons Date 11.4.94

mmt environmental services inc.

EPA METHOD 4 MOISTURE ANALYSIS

Sampling Train* Cold Box Setup		
Impinger	Type**	Initial Contents
1	M	100 ml H_2O
2	S	100 ml H_2O
3	M	empty
4	M	silica gel
5	---	not used
6	---	not used
7	---	not used

MMT Project Number: 9641
Company: Lakes Area Asphalt
Source: Scrubber Exhaust
Sample Acquisition:
Dates: 10-19-94
Technicians: BA-TG
Sample Recovery:
Date: 10-21-94
Technician: BA

* EPA Method 5 sampling train ** S: Standard (with orifice) M: Modified (straight tube)

Test-Run 1-1 Box No: Filter No: 8902

Impinger Number	Mass (g) or Volume (ml) Initial	Final	Net Gain
1	100	430	330
2	100	105	05
3	0	0	0
4	750.0	759.7	9.7
5	---	---	0
6	---	---	0
7	---	---	0
Total mass of liquid collected, g			354.7
Description of liquid collected:	Clear		

Test-Run 1-2 Box No: Filter No: 8903

Impinger Number	Mass (g) or Volume (ml) Initial	Final	Net Gain
1	100	461	361
2	100	400	300
3	0	60	60
4	791.2	828.9	37.7
5	---	---	0
6	---	---	0
7	---	---	0
Total mass of liquid collected, g			758.7
Description of liquid collected:	Clear		

Test-Run 1-3 Box No: Filter No: 8904

Impinger Number	Mass (g) or Volume (ml) Initial	Final	Net Gain
1	100	330	230
2	100	418	318
3	0	160	160
4	754.8	784.8	33.0
5	---	---	0
6	---	---	0
7	---	---	0
Total mass of liquid collected, g			741.0
Description of liquid collected:	Clear		

Test-Run Box No: Filter No:

Impinger Number	Mass (g) or Volume (ml) Initial	Final	Net Gain
1	100		
2	100		
3	0		
4			
5	---	---	0
6	---	---	0
7	---	---	0
Total mass of liquid collected, g			
Description of liquid collected:			

MMT form: S-LB-4b 5/9/84

mmt environmental services, inc.

EPA METHOD 3 LABORATORY REPORT
ORSAT ANALYSIS

Project Number: 9611
Company: Lakes Area Asphalt

Sample Identification		Gas Parameter Measured	Replicate #1 Buret ml Reading	Replicate #1 Percent Volume	Replicate #2 Buret ml Reading	Replicate #2 Percent Volume	Replicate #3 Buret ml Reading	Replicate #3 Percent Volume	Average Percent Volume	Fuel Factor Fo
Bag Id:	Submitted by: BA	Initial Reading	0.0		0.0		0.0			
1-1	Submittal Date: 10.19.94 Time: 1201	Carbon Dioxide	6.2	6.2	6.3	6.3	6.2	6.2	6.23	1.551
	Analyzed by: TG	Oxygen	17.5	11.2	17.5	11.2	17.4	11.2	11.20	
	Analysis Date: 10.20.94 Time: 0650	Carbon Monoxide	X							
Bag Id:	Submitted by: BA	Initial Reading	0.0		0.0		0.0			
1-2	Submittal Date: 10.19.94 Time: 1430	Carbon Dioxide	6.4	6.4	6.3	6.3	6.3	6.3	6.33	1.501
	Analyzed by: TG	Oxygen	17.8	11.4	17.7	11.4	17.7	11.4	11.40	
	Analysis Date: 10.20.94 Time: 0655	Carbon Monoxide	X							
Bag Id:	Submitted by: BA	Initial Reading	0.0		0.0		0.0			
1-3	Submittal Date: 10.19.94 Time: 1700	Carbon Dioxide	5.9	5.9	5.9	5.9	5.9	5.9	5.90	1.542
	Analyzed by: TG	Oxygen	17.7	11.8	17.7	11.8	17.7	11.8	11.80	
	Analysis Date: 10.20.94 Time: 0705	Carbon Monoxide	X							
Bag Id:	Submitted by:	Initial Reading								
	Submittal Date: Time:	Carbon Dioxide								
	Analyzed by:	Oxygen								
	Analysis Date: Time:	Carbon Monoxide								

Percent Volume Calculations:
$\%CO_2 = 100 * (CO_2 - IR) / (100 - IR)$
$\%O_2 = 100 * (O_2 - CO_2) / (100 - IR)$
$\%CO = 100 * (CO - O_2) / (100 - IR)$
where IR, CO_2, O_2 & CO are buret ml values

$Fo = (20.9 - \%O_2 + 0.5*\%CO) / (\%CO_2 + \%CO)$
Fuel factor Fo is a quality control check which is only valid for pure combustion sources. The EPA Method 3B list of acceptable Fo ranges for various fuels is presented to the right.

Anthracite coal:	1.016 - 1.130	Distillate oil:	1.260 - 1.413
Bituminous coal:	1.083 - 1.230	Residual oil:	1.210 - 1.370
Lignite coal:	1.016 - 1.130	Natural gas:	1.600 - 1.836
Wood:	1.000 - 1.120	Propane gas:	1.434 - 1.586
Wood bark:	1.003 - 1.130	Butane gas:	1.405 - 1.553

MMT form: S-LB-3a 5/9/94

Record buret readings to the nearest 0.1 ml.

Record percent volume values to the nearest 0.01 percent.

APPENDIX D: CALIBRATION DATA

CALIBRATION
DRY TEST METER/ORIFICE METER

Page: SSQA-1- 73

Date: Friday 10.21.94 Barometric Pressure, in. Hg. (Pb): 28.53

EQUIPMENT IDENTIFICATION			
Control Unit 4	Dry Test Meter	Wet Test Meter	Calibration Type
Mfg: Andersn	Mfg: Rockwell	Mfg: GCA Corp.	General: X
Model: Univrsl	Model: 5-175	Model: Precision	Post-test: X
SN: 591-544	SN: 83	SN: 11 AH 12	

EQUIPMENT CALIBRATION

Orifice Pressure Drop in. WC H	Pump Vac. in.Hg	Wet Test Meter Volume, CF Initial V_{wi}	Wet Test Meter Volume, CF Final V_{wf}	Temp. °F T_w	Dry Test Meter Volume, CF Initial V_{di}	Dry Test Meter Volume, CF Final V_{df}	Temperature, °F Inlet Initial T_{ii}	Temperature, °F Inlet Final T_{if}	Temperature, °F Outlet Initial T_{oi}	Temperature, °F Outlet Final T_{of}	Elapsed Time, min. Q
1.0	17	2820	9,406	71	319,726	328,892	65	63	75	67	16
1.0	17	9.406	16.444	71	328,892	335,851	67	73	78	69	12
1.0	17	16.444	22.268	71	335.851	341,605	69	76	79	70	10

COMPUTER PRINTOUT

Pt. #9641 X = H = 1.03 in. WC. Max Vaccum = 17 in. Hg

H	Vw	Tw	Vd	Td	Q	C	Hø
1.0	9.406	71	9.166	67.5	16.0	1.0168	1.7185
1.0	7.038	71	6.959	71.8	12.0	1.0102	1.7128
1.0	5.824	71	5.754	73.5	10.0	1.0143	1.7313

AVERAGE CORRECTION FACTOR: C = 1.0138
AVERAGE ORIFICE CONSTANT: Hø = 1.7209

EQUATIONS:
Vw = Vwf - Vwi
Vd = Vdf - Vdi
Td = (Tii + Tif + Toi + Tof) / 4
C = Vw * Pb * (Td+460) / (Vd * (Pb+H/13.6) * (Tw+460))
Hø = 0.0317 * H * ((Tw+460)*Q/Vw)^2 / (Pb * (Td+460))

Post test
1.0138
Orc 1.0039
Average 1.0089 C

Calibration Performed by:

(Print) Ted Gibbons

(Signature) Ted Gibbons

FORM: SSQA-1

CALIBRATION
DRY TEST METER/ORIFICE METER

Page: SSQA-1-72

Date: Monday 10-17-94 Barometric Pressure, in. Hg. (Pb): 28.57

EQUIPMENT IDENTIFICATION			
Control Unit 4	Dry Test Meter	Wet Test Meter	Calibration Type
Mfg: Andersen	Mfg: Rockwell	Mfg: GCA Corp	General: X
Model: Universal	Model: 5-175	Model: Precision	Post-test: X
SN: 591-544	SN: 83	SN: 11 AH 12	

EQUIPMENT CALIBRATION

Orifice Pressure Drop in. WC H	Pump Vac. in.Hg	Wet Test Meter Volume, CF Initial V_{wi}	Wet Test Meter Volume, CF Final V_{wf}	Wet Test Meter Temp. °F T_w	Dry Test Meter Volume, CF Initial V_{di}	Dry Test Meter Volume, CF Final V_{df}	Dry Test Meter Temperature, °F Inlet Initial T_{ii}	Dry Test Meter Temperature, °F Inlet Final T_{if}	Dry Test Meter Temperature, °F Outlet Initial T_{oi}	Dry Test Meter Temperature, °F Outlet Final T_{of}	Elapsed Time, min. Q
1.1	9	2680	7.848	71	184.533	192.372	67	66	68	77	13
1.1	9	7.848	14.982	71	192.372	199.458	76	68	69	81	12
1.1	9	14.982	25.055	71	199.458	209.480	73	69	83	70	17

COMPUTER PRINTOUT

Pr.# 9656 Average orifice P_a = 1.08, max vacuum = 9 in. Hg

H	Vw	Tw	Vd	Td	Q	C	Ha
1.1	7.848	71	7.839	69.5	13.0	0.9955	1.7833
1.1	7.134	71	7.096	73.5	12.0	1.0087	1.8251
1.1	10.073	71	10.022	73.8	17.0	1.0074	1.8364

AVERAGE CORRECTION FACTOR: C = 1.0039
AVERAGE ORIFICE CONSTANT: Ha = 1.8150

EQUATIONS:

$V_w = V_{wf} - V_{wi}$
$V_d = V_{df} - V_{di}$
$T_d = (T_{ii} + T_{if} + T_{oi} + T_{of}) / 4$
$C = V_w * P_b * (T_d+460) / (V_d * (P_b+H/13.6) * (T_w+460))$
$Ha = 0.0317 * H * ((T_w+460)*Q/V_w)^2 / (P_b * (T_d+460))$

Pre-test

Calibration Performed by:

(Print) Ted Gibbons

(Signature) Ted Gibbons

FORM: SSQA-1

CALIBRATION

S-TYPE PITOT TUBE

Probe ID: 44" S.S.

Date: 3.28.94

S-Type Pitot Tube ID No.: 41"

Ambient Temperature, °F: 70

Standard Pitot Tube ID No.: 1.5 A

Barometric Pressure, in. Hg.: 28.6

Standard Pitot Tube Coefficient: 0.990

40" Inflexible thermocouple

PITOT TUBE EXAMINATION

Alignment Check	Pitot Tube Dimensions	Pitot Assembly Intercomponent Spacings
✓ $\alpha 1 < 10°$ ✓ $\alpha 2 < 10°$ ✓ $\beta 1 < 5°$ ✓ $\beta 2 < 5°$ ✓ Q<1/8 in. ✓ R<1/32 in.	External tubing diameter (D_t): 3/8 Base to Side A opening plane (P_A): .50 Base to Side B opening plane (P_B): .51	Pitot to _____ nozzle (X): NA Pitot to probe sheath (Y): NA Pitot to thermocouple, along probe (W): NA Pitot to thermocouple, perpendicular to probe (Z): NA

DESIRED CALIBRATION POINT		SIDE A CALIBRATION		SIDE B CALIBRATION	
Velocity ft/sec	P_{std} in. WC	P_{std} in. WC	P_s in. WC	P_{std} in. WC	P_s in. WC
20	0.09	0.08	0.11	.12	.17
40	0.37	0.34	0.47	.39	.55
60	0.82	0.79	1.10	.84	1.17
80	1.45	1.48	2.05	1.5	2.05
100	2.30	X	X	X	X

COMPUTER PRINTOUT

SIDE A CALIBRATION				SIDE B CALIBRATION			
Pstd	Ps	Cp	Cp-Cp(A)	Pstd	Ps	Cp	Cp-Cp(B)
0.080	0.110	0.844	0.003	0.120	0.170	0.832	-0.006
0.340	0.470	0.842	0.000	0.390	0.550	0.834	-0.004
0.790	1.100	0.839	-0.003	0.840	1.170	0.839	0.001
1.480	2.050	0.841	-0.000	1.500	2.050	0.847	0.009
Cp(A) = 0.842				Cp(B) = 0.838			

Side A σ_n = .002

Side B σ_n = .006

Calibration Performed by:

(Print) Bill & Ted

(Signature) Bill & Ted

FORM: SSQA-2

CALIBRATION

NOZZLE DIAMETER

Nozzle Number	Nominal Diameter, in.	Measured Diameter, in. D1	D2	D3	Nozzle* Diameter, in.
L-1		.174	.175	.175	.175
L-2		.249	.248	.249	.249
L-3		.355	.355	.355	.355
L-4		.489	.488	.489	.489
L-5		.125	.125	.125	.125
L-6		.300	.300	.300	.300
L-7		.175	.175	.176	.175
L-8		.489	.490	.491	.490
L-10		.245	.246	.245	.245
L-11		.250	.250	.250	.250
L-12		.247	.248	.248	.248
L-13		.240	.240	.239	.240
L-14		.199	.199	.199	.199

* Nozzle diameter = (D1 + D2 + D3)/3

Calibration Performed by:

(Print) Bill Anderson

(Signature) Bill Anderson

Date: 3-18-94

FORM: SSQA-3

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Alan Stowbridge

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

Thomas Lore
President

245698
Certificate Number

Vice President

Minneapolis
Location

David B. Savage, Jr.
Program Manager

October 5, 1994
Date of Issue

APPENDIX E: PROCESS DATA

ASPHALT PLANT OPERATING CONDITIONS DURING PERFORMANCE TEST

Mid-Continental Testing Services, Inc.

Project No: Date: 10-12-94

Company: Lake Area Asphalt Co.

Location: Red Lake Falls, MN

The Minnesota Pollution Control Agency requires that the following information be included in the performance test report. The agency may reject any report without this completed form duly certified by a company representative.

Asphalt Plant Description

Mfg: Shop-Built

Model: D-M-80

Type: ☑ Drum Mix ☐ Conventional ☐ Other (specify):

Class: ☐ Stationary ☑ Portable

Fuel Description

Itemize all fuels and materials added to the combustion process during the test period (if oil specify type):

Propane - 120/150 AC 2331

Is the above listed fuel the "dirtiest" that the plant is allowed to burn? ☐ Yes ☑ No

Is the above fuel substantially the highest sulfur containing fuel normally burned? ☐ Yes ☑ No

Production specific fuel usage determination method:

☐ Measured _____ cu.ft./ton hot mix

☑ Calculated 6 gal/ton hot mix

Number of burners in system dryer: 1

Burner rating: 5/ mil 10⁶Btu = 100% control setting

Heat Input Data (specify units)

Test Run Number	Fuel Usage Rate /Hr	Fuel Heat Content Btu/	Total Heat Input Rate 10⁶Btu/Hr
1	558	91,500	
2			
3			

Pollution Control Equipment

Mfg: ARO

Model: VWS 200P-028

Type: ☐ Baghouse ☐ Cyclone ☐ Multiclone ☐ Venturi Scrubber ☑ Wet Scrubber ☐ Other:

Control Equipment Operating Parameters

Was control equipment operating normal during the test period? ☑ Yes ☐ No

Normal system pressure drop, in WC: 0-9

Normal system air flow rate, acfm: 20,000

For Baghouse systems:	Design	At Test
Cleaning cycles		
Air-to-Cloth Ratio		
For Wet Scrubbing Systems		
% scrubbing water recycled	100	100
Number of spray bars	1	1
Water delivery pressure, psi	35	35
Water flow rate, gpm	300	300

Control Equipment Cleaning/Maintenance

Date and procedure of last maintenance or cleaning of the pollution control equipment:

10-13-94

Cleaned out Holding Tanks

Cleaned Nozzles

Aggregate and Recycle Material Usage

Test Number	Virgin Aggregate ton/hr	Recycle Material ton/hr	Liquid Asphalt ton/hr	Process Weight Rate* ton/hr	Recycle Percentage %**
1	93	0	5.8	98.8	0
2					
3					

Aggregate & Recycle Moisture Content

Test Number	Virgin Aggregate % moisture	Recycle Material % moisture	Combined Material % moisture
1			
2			
3			

* Process Weight Rate = Total of all materials introduced into the process equipment = Aggregate + Recycle + Asphalt

** % Recycle = 100 x Recycle / (Aggregate + Recycle) — Asphalt excluded as per Minn. Dept. of Transportation mix basis calculation

Describe location of the thermocouples reading the dryer gas exit temperature:

End of Drum

Affidavit: I certify that the information recorded above is accurate and correctly describes the [illegible] the indicated performance test period.

mmt environmental services, inc.

ASPHALT PLANT OPERATING DATA LOG

(Record Data at 15 Minute Intervals)

Project No: 9641 Date: 10-19-94

Company: Lakes Area Asphalt

Location: 6 mile NE Brainerd on 210

Time of Day Hr : Min	Burner Setting %	Material Processing Rate, Tons Per Hour: Aggregate Material	Recycle Material	Total Solid Materials	Liquid Asphalt	Total All Materials	Dryer Exhaust Gas Temp. °F	Dust Collector Pressure Drop inches water	Wet Scrubber Water: Flow Rate gpm	Pressure psi		
1145	9					86	289	9	NA			
1200	9					87	305	9.5				
1215	9					88	199	9.2				
1230	9					86	320	9.3				
1245	9					87	400	9.2				
1255	Down					86	330	9.0				
1400	Up & Running					?						
1415	9					84	300	9.5				
1430	9					82	298	9.4				
1445	9					85	279	9.2				
1500	9					83	260	9.1				
1515	9					84	290	8.8				
15-16	Down											
	UP-Running											

#1

#2 58

Affidavit: I certify that the information recorded above is accurate and correctly describes plant operating conditions during the indicated period. I also certify that the above data was recorded by myself or by personnel under my direct supervision.

By (print): David W Mount Position: Plant oper

Signature: David W Mount Phone: 218-829-4737

mmt environmental services, inc.

ASPHALT PLANT OPERATING DATA LOG

(Record Data at 15 Minute Intervals)

Project No: 9641 Date: 10/19/11

Company: Lakes Area

Location: Lowes NE Brainerd

Time of Day Hr : Min	Burner Setting %	Material Processing Rate, Tons Per Hour: Aggregate Material	Recycle Material	Total Solid Materials	Liquid Asphalt	Total All Materials	Dryer Exhaust Gas Temp. °F	Dust Collector Pressure Drop inches water	Wet Scrubber Water: Flow Rate gpm	Wet Scrubber Water: Pressure psi		
1600	UP	RUNNING										
1615	9					90	271	9.3				
1630	9					89	272	9.6				
1645	9					95	296	9.4				
1700	9					88	265	9.5				
1715	9					89	293	9.5				
1730	9					88	291	9.3				
							Mike will Fax other data Form					

#3

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Affidavit: I certify that the information recorded above is accurate and correctly describes plant operating conditions during the indicated period. I also certify that the above data was recorded by myself or by personnel under my direct supervision.

By (print): David W Mount Position: PLANT OPER

Signature: David W Mount Phone: 218 829-4737

MMT form: S-PD-1a Rev.3/2004

APPENDIX F: TEST PLAN

Minnesota Pollution Control Agency

October 25, 1994

Mr. Mike Westemeier
Lakes Area Asphalt, Inc.
4357 Highway 210 Northeast
Brainerd, Minnesota 56401

RE: September 23, 1994, Test Plan Submittal for the October 18, 1994, Performance Test on the Hot Mix Asphalt Plant

Dear Mr. Westemeier:

This letter, which grants a shorter notification period, and its enclosures conclude the pretest requirements for the Lakes Area Asphalt, Inc. (Company) facility located in Brainerd, Minnesota, as discussed during our telephone conversation of October 12, 1994.

The Air Quality Division (AQD) staff of the Minnesota Pollution Control Agency (MPCA) has reviewed the submittal, and has approved the test plan with the following provisions:

1. Company confirmed that the pressure gauge for the scrubber water line has been corrected, per request made by Julie Hendricks, of the MPCA, Brainerd Regional Office.

2. Company has been made fully aware they will be limited to tested production rate as stated in Minn. Rules pt. 7017.2025.

These provisions are modifications to the test plan, and are to be incorporated into the proposed test.

Copies of the Asphalt Plant Operating Conditions During Stack Testing, Certifications Required For Performance Test Reports, and Microfiche Submittal forms were explained in a telephone conversation. Testing Consultant has agreed to present the forms at time of test. These forms will help you to comply with the submittal requirements of Minn. Rules pts. 7017.2035 and 7017.2040. **A copy of the test plan, including this letter, must be included as part of the performance test report.**

520 Lafayette Rd. N.; St. Paul, MN 55155-4194; (612) 296-6300 (voice); (612) 282-5332 (TTY)

Please remember that it is not the Testing Consultant's responsibility to submit the test report or microfiche copy of the test report or to certify that the microfiche submitted is an exact copy of the original test report by the deadlines specified in the applicable compliance document (i.e. permit, stipulation agreement, administrative penalty order, etc). The responsibility for these submittals lies solely with the Company.

If you have any questions regarding this letter or the enclosures, please contact me at (612)297-8301.

Sincerely,

Craig D. Averman
Performance Test Coordinator
Compliance Determination Unit
Compliance and Enforcement Section
Air Quality Division

CDA:jeh

Enclosures

cc: Julie Hendricks, MPCA, Brainerd Regional Office
Onsoon Berglund, AQD
AQD File No: 1949A

mmt environmental services, inc.

September 21, 1994

Pre-test Meeting
10/12/94 1:00PM
Craig Averman > at MPCA
Al Trowbridge
Mike Westemeier
by phone

Mr. Craig D. Averman
Compliance and Enforcement Section
Air Quality Division
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Re: Compliance Test Schedule - Lakes Area Asphalt, Inc.

Dear Craig:

MMT Environmental, Inc. (MMT) has been contracted by Lakes Area Asphalt, Inc. to perform a source emission compliance test on their asphalt plant operating near Brainerd, Minnesota. The source is identified as Emission Point #1 in Minnesota Air Emission Permit #1949A-93-G-1.

The asphalt plant's scrubber exhaust will be tested for particulate and visible emissions using standard EPA and MPCA test methods. A copy of the proposed test plan is enclosed.

Subject to your approval and the plant obtaining enough work, the test has been scheduled for **Tuesday, October 18, 1994**. This is less than the required 30 day notification and we will certainly re-schedule if the MPCA should so request.

We would like to set up a pre-test meeting as soon as possible. Please contact either Mike Westemeier at Lakes Area Asphalt, Inc. (218-829-4737) or myself (483-9595) at your earliest convenience.

Sincerely,

Alan L. Trowbridge

Alan L. Trowbridge
Director of Technical Services

cc: Mike Westemeier
Lakes Area Asphalt, Inc.
4357 Highway 210 Northeast
Brainerd, MN 56401

4610 N. Churchill St. • St. Paul, MN 55126-5892 • 612 / 483-9595 • FAX 612 / 483-2699

mmt environmental services, inc.

SOURCE EMISSION COMPLIANCE TEST PLAN
ASPHALT PLANT TEST PLAN #9641

Date Test Plan Written/Revised	MPCA Pre-Test Meeting Date	Scheduled Test Date(s)
September 20, 1994	to be determined	October 18, 1994

PART I. GENERAL INFORMATION

1: Emission Facility: ..... Lakes Area Asphalt, Inc.
4357 Highway 210 Northeast
Brainerd, MN 56401

2: Facility Contact Person: ..... Mike Westemeier
Phone: (218) 829-4737 Fax: (218) 825-7323

3: MPCA file/permit number: ..... Permit #1949A-93-G-1

4: Reason For Test: ..... Permit Requirement

5: Source to be Tested:..... Emission Point #1
Asphalt Plant Scrubber Exhaust
See Figure 1 for sampling location data

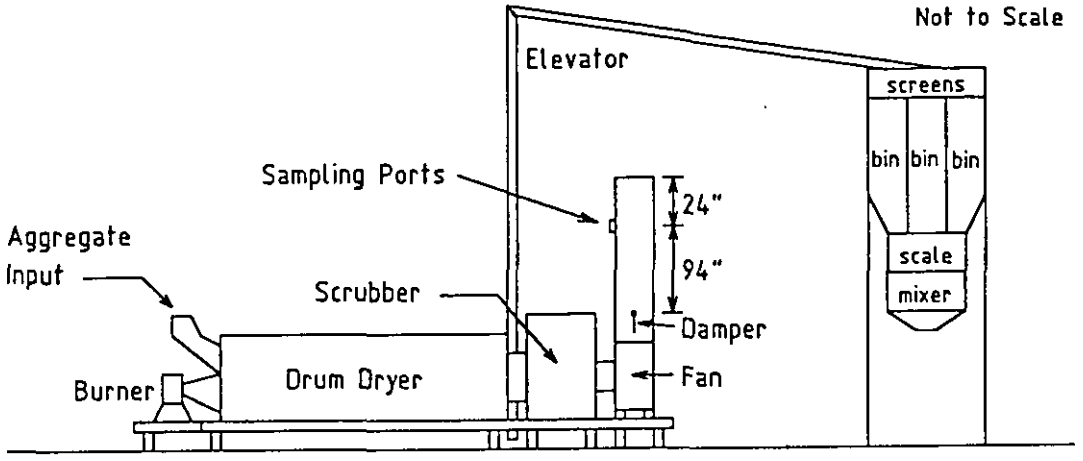
6: Physical Location of Source: ..... Stationary unit located at:
4357 Highway 210 Northeast
Brainerd, MN 56401

7: Testing Company: ..... MMT Environmental Services, Inc.
4610 N. Churchill Street, St. Paul, MN 55126-5892
Phone: (612) 483-9595 Fax: (612) 483-2699
Contact: Alan Trowbridge

8: Test Plan Discussions: ..... Pre-test meeting

9: Out-of-State Compliance Test: ..... Not Applicable

Figure 1: Process and sampling site schematic



EPA Method 1 Sampling Location Data:

24.5" cross-sectional depth
27.5" cross-sectional width
25.9" equivalent diameter
94" (3.63 diameters) of straight, undisturbed flow before sampling ports
24" (0.93 diameters) of straight, undisturbed flow after sampling ports
25 points required by EPA method 1 for particulate test
28 points to be used (4 sampling ports x 7 sampling points per port)
70 sampling minutes per test run (2.5 min/point x 28 points/test run)

PART II. TESTING REQUIREMENTS

1. Pollutants to be tested, applicable emission limits, and governing regulations:

Emission Point	Pollutant	Emission Limit	Applicable Rule or Regulation
1	Particulate Matter	Exhaust gas particulate concentration must not exceed 0.04 gr/dscf	Minnesota Rule 7011.0910 Federal Regulations 40 CFR 60.90 - 60.93
1	Opacity	Exhaust gases must not exhibit 20% or greater opacity	Minnesota Rule 7011.0910 Federal Regulations 40 CFR 60.90 - 60.93

The emission test must be conducted with the asphalt plant's burner operating on the lowest quality (highest emitting) fuel listed in or allowed by the facility's permit.

The fuel to be used during the test on Emission Point #1 is **PROPANE.**

2. Fuel sampling and analysis (Applicable to solid and liquid fuels only): **NOT APPLICABLE**

Required as part of the compliance demonstration. The MPCA will not accept test reports without an analysis of fuel samples collected during the test period.

Sampling and analytical procedures are describe in MPCA Exhibit D which is also known as Part 11 of the MPCA Air Emission Permit.

A) Sampling - One tap sample is collected during each particulate test run. In order to be representative of the fuel burned during the test period, the fuel sampling location must be as close as possible to the burner. The minimum sample size is one pint.

B) Analysis - The individual fuel samples are to be combined together into a single composite sample which is to be analyzed for:
   a) Sulfur content, % by weight
   b) Ash content, % by weight
   c) Moisture content (solid fuels only), % by weight
   d) Gross heating value, BTU/gal or BTU/lb
   e) The following analyses are required additions when the fuel is USED OIL:
      Flash point, °F
      Lead content, percent by weight
      Polychlorinated biphenyls (PCBs), ppm by weight
      Organic halogens, percent by weight
      Acidity, pH

0.04 gr/dscf limit based on front catch only — but must report front + back

3. Moisture Content of the Aggregate

   Required as part of the compliance demonstration. The MPCA will not accept test reports without moisture content analyses of aggregate samples collected during the test period.

   A) Sampling - Collect two or more samples of raw material during each particulate test run. In order to be representative of the material processed during the test period, the samples must be collected as close to the drum mixer/dryer as possible. If recycled material is included in the aggregate then , if possible, collect the samples after the virgin and recycled materials have been mixed. Otherwise collect separate samples of the virgin and recycled materials.

   For each particulate test run, mix the individual samples into a single composite. If separate virgin and recycled material samples were collected, then combine the individual samples to obtain one virgin-composite and one recycled-composite for each particulate test run.

   B) Analysis - Each composite sample is to be analyzed for moisture content per ASTM or other recognized methodologies. If separate virgin and recycled samples were collected, then a mass-weighted average aggregate moisture content must be calculated based on the virgin/recycled proportions processed during the test period.

   Note: The facility owner/operator must provide (for inclusion in the test report) a copy of the manufacturer's specifications which define the design capacity of the plant as a function of the aggregate moisture content.

PART III. OPERATING CONDITIONS

1. General operating parameters for each emission point to be tested:

   Note that the asphalt plant, pollution control equipment and all related equipment must be operated by the facilities regular operators using their normal operating procedures.

Emission Point #1	
	Process Equipment Description: Equipment ..... Asphalt Plant Manufacturer/Model ..... Northern Improvement Rated Capacity ..... 120 ton/hr @ 5% Moisture
	Process Rates and Operating Conditions during Test: Process weight rate: Aggregate, virgin ..... 80 ton/hr Aggregate, recycle ..... 0 ton/hr Asphalt ..... 5 ton/hr Total process weight rate ..... 85 ton/hr Fuel Type ..... Propane
	Control Equipment Description: Equipment ..... Wet Scrubber Manufacturer/Model Argo-40-055
	Control Equipment Operating Parameters: Normal Pressure Drop ..... 1 to 3 in. WC Water flow rate ..... 40 gpm Water delivery pressure ..... 50 psi Percentage of Water Recycled ..... 100 %

2. Explanation of why the proposed test conditions are considered to be the worst case in accordance with Minnesota Rules part 7017.2025, subpart 2:

Emission Point	Rationale For Worst Case
1	Worst case is generally considered to be: 1) operation at maximum capacity 2) burning of worst quality fuel 3) maximum ratio of recycled to virgin aggregate 4) maximum recycling of scrubber water

3. Definition of the normal range of process or operating rates for each emission unit:

Emission Point	Normal Range of Process or Operating Rates
1	Normal production rates vary between 60 and 100 tons per hour. Aggregate moisture content varies between 3 and 5 percent.

4. For each piece of process and control equipment listed in section III.1. above, the following are the descriptions of how air pollution control and process equipment will be monitored:

Emission Point	Process Equipment Description	Description Of Process Monitoring During Test Period
1	Asphalt plant	Process data will be recorded by plant personnel. Aggregate feed rate monitored by belt scales. Asphalt feed rate determined by gallon meter. Fuel usage determined by gas meter. Dryer gas temperature monitored by thermocouple and indicating meter.

Emission Point	Control Equipment Description	Description Of Control Equipment Monitoring During Test Period
1	Wet Scrubber	Process data will be recorded by plant personnel. Scrubber pressure drop determined by U-tube manometer. Water flow rate determined by flow rate gauge. Water delivery pressure determined by pressure gauge.

PART IV. TEST METHODS

1. Specific Test Plan

   A) Three (3) replicate particulate emission test runs per EPA Methods 1, 2, 3, 4 and 5.
   B) One (1) hour of plume opacity observations per EPA Method 9. The opacity observations shall be performed concurrent with one (1) of the particulate emission tests.

2. General Test Methodology

   The following is a general listing of test requirements:

   A) EPA Method 1 for the location of sampling ports and sampling points.

      A check for cyclonic flow must be done whenever there is a cyclonic type of device directly upstream of the sampling location. The check must be performed even if flow straightening vanes have been installed.

      If the sampling location does not meet the minimum requirements of EPA Method 1, then the testing firm must conduct flow pattern evaluation and testing according to the alternative procedures in part 2.5 of EPA Method 1. Flow pattern documentation is required.

      Previously documented flow pattern tests are acceptable providing that no changes have occurred that would affect the flow pattern.

   B) EPA Method 2 for velocity and volumetric flow rate determination. Three (3) test runs are required; one concurrent with each pollutant emission test run.

   C) EPA Method 3 for gas analysis (CO_2 & O_2). Three (3) determinations are required; one integrated sample concurrent with each pollutant emission test run.

   D) EPA Method 4 for determination of moisture in the flue gases. Three (3) test runs are required; one concurrent with each pollutant emission test run.

   E) EPA Method 5 as amended by Minnesota Rules 7017.2060 and 7011.0725 for the determination of particulate matter emissions. Particulate analysis will include back catch condensable organic matter. Three (3) test runs are required and each run must represent a minimum sampling time of 60 minutes and a minimum sample volume of 32 dry standard cubic feet.

   F) EPA Method 9 as amended in Minnesota Rule 7017.2060 for the determination of visible emissions. Normally one (1) sixty-minute test is required. However, if this is an initial compliance test subject to NSPS regulations, then three (3) sixty-minute tests are required.

      If particulate emission testing is being performed, then the opacity test(s) must be performed concurrent with one or more of the EPA Method 5 test runs. Note: weather conditions may make it impossible to obtain valid opacity observations concurrent with the particulate test. If such circumstances exist, the visible emission test will be rescheduled for a later time/date and will be performed at similar load conditions.

3. Reference to any compliance document, federal regulation, or Minnesota rule or statute requiring use of specific methods or procedures, shall be stated in this section. **NONE**

4. Proposed alternative/equivalent test methods: **NONE**

5. Non-reference test method: For each proposed non-reference test method, include a statement of the detection limit and the degree of accuracy of that method at the expected emission rate and under the conditions of the performance test. **NOT APPLICABLE**

NOTE: Sampling times and rates must be increased if necessary to ensure that the detection limit for each pollutant is below the applicable emission limit, using the equation in Minn. Rules pt. 7017.2045, Subp. 6.

PART V. CEMS RELATIVE ACCURACY TEST

Testing of continuous emission monitoring systems is **not** included in this test program.

PART VI. OTHER

For each process unit to be tested the following are specified:

1. Pollutant(s) emissions must be reported in same terms as the emission limit(s).

2. Special averaging times for emission limits: NOT APPLICABLE

3. Plant personnel must complete the following two forms and give them to the testing firm representative for inclusion in the test report. A copy of each form is included at the end of this test plan.
   A) Asphalt Plant Operating Conditions During Stack Testing
   B) Asphalt Plant Operating Data Log

4. One complete test report (one hard copy) shall be submitted to the MPCA within 45 days after the date on which the on-site testing was completed. The test report **must** be submitted to the agency regardless of the test results. Note that submittal of the report to the MPCA is the responsibility of the owner/operator and not of the testing firm.

5. A microfiche copy of the report shall be submitted to the MPCA within 105 days after the date on which the on-site testing was completed. The microfiche copy **must** be submitted to the agency regardless of the test results. Note that submittal of the microfiche copy to the MPCA is the responsibility of the owner/operator and not of the testing firm.

6. All submittals shall be addressed to:

Supervisor, Compliance Determination Unit
Compliance and Enforcement Section
Air Quality Division
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155-4194

PART VII. MPCA WARNING TO OWNER/OPERATOR

Given the seriousness of exceeding an emission limit, the Company is hereby provided notice that enforcement action will be taken for a first performance test failure . This enforcement action will not be initiated until the results of the retest have been reviewed by MPCA staff and will require the Company to pay a civil penalty.

Please be advised that upon receiving written notice of a second performance test failure, the Company will be required to either shut down the tested process unit(s) or to submit a compliance plan, subject to MPCA approval, which indicates specific measures-to-be-taken which are expected to make all the unit(s) operate in compliance with the applicable emission limitations . The plan must also include specific measures the facility will take to minimize emissions until compliance is demonstrated. However, if the unit(s) continue to operate, they will be considered to be operating in violation of the applicable limits from the date of the performance test until a retest has been conducted that demonstrates compliance .

Please note that results of a performance test are not final until MPCA staff provides a written compliance determination.

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