AP42 Section: 11.1

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Title: Results Of The Particulate Emissions Testing On The Baghouse Stacks At Marcoux & Warroad, Minnesota,

Nova Environmental Services, Inc., Chaska, MN,

September 28, 1993.

RESULTS OF THE PARTICULATE EMISSIONS TESTING ON THE BAGHOUSE STACKS AT MARCOUX & WARROAD, MINNESOTA NOVA PROJECT NO.: M93-742

September 28, 1993

Prepared for:

MR. TOM DOWNS
THORSON, INC.
4101 BEMIDJI AVENUE NORTH
BEMIDJI, MN 56601

Prepared by:

NOVA ENVIRONMENTAL SERVICES, INC.
1107 HAZELTINE BOULEVARD, SUITE 400
CHASKA, MINNESOTA 55318
(612) 448-9393

Table of Contents

List of Tables

List of Figures

List of Appendices

1.0 EXECUTIVE SUMMARY

Nova Environmental Services, Inc. (Nova) was contracted by Thorson, Inc. to perform particulate and opacity emission testing on the Baghouse Stacks at their portable asphalt facilities located in Marcoux and Warroad, Minnesota. The series of tests was performed on August 19 and 20, 1993, respectively. The particulate results are summarized in the following table; results of fuel and aggregate analysis are found in Appendix B.

PARAMETER	RUN 1	RUN 2	RUN 3	AVERAGE
Baghouse Stack, Marcoux, Minnesota 935 E				
Test Date Test Time	8/19/93 1040-1214	8/19/93 1315-1421	8/19/93 1500-1638	
Volumetric Flow Rate ACFM DSCFM	 71,180 36,829	 70,425 36,537	 71,949 37,160	 71,185 36,842
Particulate Concentration gr/acf gr/dscf	 0.026 0.049	 0.023 0.043	 0.019 0.038	 0.022 0.043
Particulate Mass Rate lb/hr	 15.541	 13.588	 11.964	 13.698
Opacity Hourly Average (%) High 6-Minute Average (%)				 6.46 10.00

PARAMETER	RUN 1	RUN 2	RUN 3	AVERAGE
Baghouse Stack, Warroad, Minnesota SSE NSPS				
Test Date Test Time	8/20/93 750-859	8/20/93 925-1203	8/20/93 1230-1410	
Volumetric Flow Rate ACFM DSCFM	 71,029 45,247	 75,481 47,220	 69,177 44,489	 71,896 45,652
Particulate Concentration gr/acf gr/dscf	 0.0145 0.0227	 0.0813 0.1300	 0.0575 0.0894	 0.0511 0.0807
Particulate Mass Rate lb/hr	 8.789	 52.548	 34.039	 31.792
Opacity Hourly Average (%) High 6-Minute Average (%)				 32.56 50.63
Opacity Generator (%)				 0.00

2.0 INTRODUCTION

Nova personnel conducted particulate and opacity emission compliance testing on the Baghouse Stacks at the Thorson, Inc. mobile asphalt facilities located in Marcoux and Warroad, Minnesota. On-site testing was conducted by Timothy Nelson and Dwayne Smith. Testing was witnessed by Mr. John Leseman of Thorson, Inc. The testing consisted of three independent one-hour sampling for particulate and opacity at each site with concurrent integrated gas sampling for Orsat analysis. Opacity observations were also recorded on the Generator Stack at the Warroad site.

The objectives of this project were to quantify particulate emissions and compare them to limits set by MPCA permit and Minnesota Rules.

Results are summarized in the next section followed by descriptions of the test methods used and a description of the process being tested. All supporting data are included in the Appendices.

3.0 RESULTS

Results of gas composition and moisture analysis are found in Table 1 and 4. Results of particulate determinations are found in Tables 2 and 5. The particulate emission rate averaged 13.698 lb/hr at an average concentration of 0.043 gr/dscf at Marcoux while the particulate emission rate averaged 31.792 lb/hr at an average concentration of 0.081 gr/dscf at Warroad.

Opacity observations were recorded every 15 seconds for a one-hour time period at each site, including the generator stack at Warroad. These results are shown in Tables 3, 6 and 7.

Initial testing at the Warroad plant was postponed from August 18 to August 20 because of mechanical problems and minor delays during actual testing at each site, but no other problems were encountered during the sampling or analysis of emission samples. After complete review of the test results, we consider the information reported to be an accurate representation of the conditions at the time of testing.

4.0 TEST PROCEDURES

Testing on each Baghouse Stack was performed from five test ports oriented linearly, approximately three (3) equivalent duct diameters downstream of the nearest flow disturbance and approximately 3.5 equivalent duct diameters upstream of the stack outlet. The duct dimensions were verified on-site and found to be 43"x57". A 25 point traverse was used to extract representative samples. Each point was sampled for 2.5 minutes for a run duration of 62.5 minutes. Test port location is illustrated in Figure 1.

PARTICULATE TESTING

Particulate testing was conducted according to EPA Methods 1-5, 40 CFR 60 Appendix A. Using traverse points determined by EPA Method 1, a preliminary velocity profile was obtained with respect to velocity traverse, gas temperature, gas pressure, and the estimated gas moisture content. From this data, sampling nozzles of the appropriate diameter to ensure isokinetic sampling were selected. Additionally, a check was made to determine whether cyclonic flow was present.

The particulate sampling train consisted of a temperature controlled glass-lined sampling probe equipped with an S-type pitot tube and Type K thermocouple. The sampling probe was attached to the sampling module which contained the all-glass in-line filter assembly in a temperature-controlled oven. The back half of the sampling train consisted of a series of glass impingers followed by a tared desiccant-packed drying column. The sampling train was connected to a NuTech control module by means of an umbilical cord. The control module houses a temperature monitored dry-gas meter, a calibrated orifice, dual inclined oil manometers, temperature controllers and necessary flow rate control devices.

Particulate samples were collected by isokinetically extracting a sample gas stream by means of the sampling probe and passing the stream through the glass-fiber filter, the ice-cooled impinger assembly, and the packed drying column which collects all of the moisture remaining in the stream. The gas was then passed through a leakless sampling pump and a dry-test gas meter which integrated the sample volume throughout the testing. A calibrated orifice was connected to the gas meter outlet to facilitate sample flow rate adjustment.

Integrated gas samples were collected concurrently with the particulate samples to determine gas composition and molecular weight of the flue gas. To accomplish this, gas samples were collected in Tedlar bags throughout the duration of testing and later analyzed by chemical absorption using an Orsat gas analyzer.

Representative particulate samples were collected by sampling the centroid of equal area sections of the duct for equal time periods. The sampling rate at each point was adjusted to maintain isokinetic sampling. Pre-programmed hand-held computers were used to facilitate rapid determination of the correct sampling rate.

At the end of each particulate run, the sampling train was disassembled and the samples were recovered. The nozzle was acetone rinsed, brushed and rinsed again while the washings were collected in a labeled container. The probe was similarly cleaned, acetone rinsed and brushed and its washings were transferred to the same container. The sampling filter was transferred from the filter holder to its dedicated petri dish. The filter holder was wiped free of silicone grease, acetone rinsed, brushed and rinsed again and these washings too were added to the probe wash container. The probe wash container was capped and the liquid level was marked for transport. The impinger catch was transferred to a separate container, capped and the liquid level marked. The impinger catch volume was then determined gravimetrically to the nearest gram using a triple beam balance. The desiccant-packed drying column was weighed in the field to the nearest gram and the weight of the absorbed moisture was determined.

Particulate samples were transported to the laboratory and prepared for analysis. Filters were desiccated for 24 hours and weighed to a constant weight and the results were recorded to the nearest 0.1 mg. Probe wash samples were evaporated at ambient temperatures to dryness in tared evaporating dishes. They were then desiccated for 24 hours and weighed to a constant weight. Results were reported to the nearest 0.1 mg.

WET CATCH ANALYSIS - ORGANIC CONDENSIBLES

Organic condensible particulates were collected in the series of ice-cooled glass impingers in the back half of the Method 5 train. The first two impingers were prepared with 100 mls of deionized water each while the third impinger was left dry. After sampling, the volume of condensate in the impingers was recorded and the contents transferred to a sample container.

This wet catch was analyzed for condensible organic particulate via a chloroform/diethyl ether extraction. Three (3) 25 ml portions of diethyl ether were used in the extraction which were then evaporated at room temperature and desiccated to a constant weight. Gravimetric results were then added to the dry catch results (filter and probe wash explained above) to calculate the final particulate concentrations.

VISIBLE EMISSIONS EVALUATION

Visible emissions were evaluated in accordance with EPA Method 9, 40 CFR 60, Appendix A. After the certified observer was positioned relative to the sun and the source, opacity observations were recorded every 15 seconds. The observations were made to the nearest five percent opacity. The average hourly opacity was calculated by dividing the sum of all observations (expressed as percent) by the total number of observations that were made. The high six-minute average opacity was determined by locating the highest 24 consecutive opacity readings and calculating their average opacity.

5.0 PROCESS DESCRIPTION

The two (2) Thorson, Inc. hot mix asphalt facilities tested were manufactured by Boeing Construction and Equipment Company and are Model PSI 425. Each is a rotary drum-type plant and uses petroleum derived used oil for burner fuel.

Pollution control is facilitated by a "dust eater" baghouse Model P-70-1008 manufactured by Custom Welding and Metal Fabrication. Each baghouse has a 12,500 square foot Dupont Nomax Felt Cloth area and a control efficiency of 96 percent by weight as stated by the MPCA Air Permit and Manufacturer Guarantee.

For this series of tests, the Marcoux Plant operated at approximately 320 TPH of virgin aggregate while the Warroad Plant operated at 300 TPH of virgin aggregate.

TABLE 1

Thorson, Inc.
Marcoux, Minnesota
Baghouse Stack

Nova Environmental Services, Inc.
Project No. M93-742

EPA METHOD 3 & 4 -- RESULTS OF GAS COMPOSITION & MOISTURE ANALYSES

TEST NO. 1	RUN 1	RUN 2	RUN 3	AVERAGE
DATE OF TEST	19-Aug-93	19-Aug-93	19-Aug-93	
GAS COMPOSITION, DRY BASIS (ORSAT), %				
CARBON DIOXIDE	5.52	5.60	5.62	5.58
OXYGEN	13.48	13.35	13.43	13.42
CARBON MONOXIDE	NT	NT	NT	NT
NITROGEN	81.00	81.05	80.95	81.00
GAS COMPOSITION, WET BASIS (ORSAT), %				
CARBON DIOXIDE	3.98	4.02	4.01	4.00
OXYGEN	9.71	9.59	9.57	9.62
CARBON MONOXIDE	NT	NT	NT	NT
NITROGEN	58.34	58.23	57.70	58.09
WATER VAPOR	27.97	28.16	28.73	28.29
DRY MOLECULAR WEIGHT	29.42	29.43	29.44	29.43
WET MOLECULAR WEIGHT	26.23	26.21	26.15	26.20

TABLE 2

Thorson, Inc.
Marcoux, Minnesota
Baghouse Stack

Nova Environmental Services, Inc.
Project No. M93-742

EPA METHOD 5 - DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

TEST NO. 1	RUN 1	RUN 2	RUN 3	AVERAGE
DATE OF RUN	19-Aug-93	19-Aug-93	19-Aug-93	
RUN START TIME	1040	1315	1500	
RUN END TIME	1214	1421	1638	
STACK STATIC PRESSURE (in. H2O)	-1.15	-1.15	-1.15	-1.15
CROSS SECTIONAL AREA (sq. ft.)	17.021	17.021	17.021	17.021
PITOT TUBE COEFFICIENT	0.840	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES				
IMPINGERS (g)	335	335	335	335
DESSICCANT (g)	28	21	32	27
TOTAL MOISTURE COLLECTED (g)	363	356	367	362
SAMPLE GAS MOISTURE CONTENT (%)	27.97	28.16	28.73	28.29
PARTICULATE DATA				
FILTER PARTICULATE (g)	0.0092	0.0067	0.0047	0.0069
PROBE WASH PARTICULATE (g)	0.0219	0.0181	0.0178	0.0193
CONDENSIBLE PARTICULATE (g)	0.1095	0.0956	0.0820	0.0957
TOTAL PARTICULATE COLLECTED (g)	0.1406	0.1204	0.1045	0.1218
DRY GAS METER COEFFICIENT	0.9982	0.9982	0.9982	0.9982
BAROMETRIC PRESSURE (in. Hg)	29.88	29.88	29.88	29.88
AVG. ORIFICE PRESS. DROP (in. H2O)	1.75	1.69	1.71	1.71
AVG. GAS METER TEMP. (degrees F)	83.8	98.9	102.3	94.99
VOLUME THROUGH GAS METER				
AT METER CONDITIONS (cf)	45.31	45.25	45.64	45.40
STANDARD CONDITIONS (dscf)	44.02	42.78	42.89	43.23
TOTAL SAMPLING TIME (min.)	62.5	62.5	62.5	62.5
NOZZLE DIAMETER (in.)	0.240	0.240	0.240	0.240
AVG. STACK GAS TEMP. (degrees F)	272	268	266	269
VOLUMETRIC FLOWRATE				
AVG. STACK GAS VELOCITY (ft/sec)	69.70	68.96	70.45	69.70
ACTUAL (acfm)	71,180	70,425	71,942	71,185
STANDARD (scfm)	51,132	50,859	52,137	51,376
DRY STANDARD (dscfm)	36,829	36,537	37,160	36,842
ISOKINETIC VARIATION (%)	103.68	101.55	100.10	101.78
PARTICULATE CONCENTRATION				
ACTUAL (gr/acf)	0.026	0.023	0.019	0.022
DRY STANDARD (gr/dscf)	0.049	0.043	0.038	0.043
PARTICLE MASS RATE (lb/hr)	15.541	13.588	11.964	13.698

TABLE 3

Thorson, Inc.
Marcoux, Minnesota
Baghouse Stack

Nova Environmental Services, Inc.
Project No. M93-742
Observer T. Nelson

EPA Method 9 -- Visual Determination of the Opacity of Emissions

Test No. 1 from 1711-1811 on 8/19/93

Seconds	0	15	30	45
Minutes 1	5	5	5	5
2	10	10	10	5
3	5	5	5	5
4	5	10	5	5
5	5	10	5	5
6	5	20	20	5
7	0	5	5	5
8	5	5	5	5
9	5	5	5	5
10	5	5	5	5
11	5	5	5	5
12	5	5	10	5
13	10	5	5	5
14	10	5	10	10
15	10	10	10	5
16	10	10	5	10
17	5	5	5	5
18	5	10	5	5
19	5	5	5	5
20	5	10	5	5
21	5	5	5	5
22	5	5	5	5
23	10	10	5	5
24	5	10	5	10
25	5	10	10	10
26	10	5	5	5
27	5	5	10	5
28	5	5	10	5
29	5	5	10	5
30	5	5	5	5

Seconds	0	15	30	45
Minutes 31	5	5	5	5
32	5	5	5	10
33	5	10	10	10
34	10	10	10	10
35	10	10	5	5
36	10	10	15	15
37	10	10	10	10
38	10	10	10	10
39	10	10	10	10
40	10	10	10	10
41	5	5	5	5
42	5	10	5	5
43	5	5	10	5
44	5	10	10	5
45	5	5	5	5
46	5	5	5	5
47	5	5	5	5
48	5	5	5	5
49	5	5	5	5
50	5	5	5	5
51	5	5	5	5
52	5	5	5	5
53	5	5	5	5
54	5	5	5	5
55	5	5	5	5
56	5	5	5	5
57	5	5	5	5
58	5	5	5	5
59	5	5	5	5
60	5	5	5	5

Average Opacity (%) 6.46

High Six-Minute Opacity (%) 10.00

TABLE 4

Thorson, Inc.
Warroad, Minnesota
Baghouse Stack

Nova Environmental Services, Inc.
Project No. M93-742

EPA METHOD 3 & 4 -- RESULTS OF GAS COMPOSITION & MOISTURE ANALYSES

TEST NO. 1	RUN 1	RUN 2	RUN 3	AVERAGE
DATE OF TEST	20-Aug-93	20-Aug-93	20-Aug-93	
GAS COMPOSITION, DRY BASIS (ORSAT), %				
CARBON DIOXIDE	2.90	2.72	2.71	2.78
OXYGEN	17.30	17.68	17.39	17.46
CARBON MONOXIDE	NT	NT	NT	NT
NITROGEN	79.80	79.60	79.90	79.77
GAS COMPOSITION, WET BASIS (ORSAT), %				
CARBON DIOXIDE	2.52	2.39	2.38	2.43
OXYGEN	15.06	15.50	15.24	15.27
CARBON MONOXIDE	NT	NT	NT	NT
NITROGEN	69.45	69.80	70.03	69.76
WATER VAPOR	12.96	12.31	12.36	12.54
DRY MOLECULAR WEIGHT	29.16	29.14	29.13	29.14
WET MOLECULAR WEIGHT	27.71	27.77	27.75	27.74

TABLE 5 CONT.

Thorson, Inc.
Warroad, Minnesota
Baghouse Stack

Nova Environmental Services, Inc.
Project No. M93-742

EPA METHOD 5 - DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

TEST NO. 1	RUN 1	RUN 2	RUN 3	AVERAGE
DATE OF RUN	20-Aug-93	20-Aug-93	20-Aug-93	
RUN START TIME	750	925	1230	
RUN END TIME	859	1203	1410	
STACK STATIC PRESSURE (in. H2O)	-0.45	-0.45	-0.45	-0.45
CROSS SECTIONAL AREA (sq. ft.)	17.021	17.021	17.021	17.021
PITOT TUBE COEFFICIENT	0.840	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES				
IMPINGERS (g)	132	137	111	127
DESSICCANT (g)	33	25	42	33
TOTAL MOISTURE COLLECTED (g)	165	162	153	160
SAMPLE GAS MOISTURE CONTENT (%)	12.96	12.31	12.36	12.54
PARTICULATE DATA				
FILTER PARTICULATE (g)	0.0053	0.0263	0.0107	0.0141
PROBE WASH PARTICULATE (g)	0.0487	0.0731	0.0523	0.0580
*CONDENSIBLE PARTICULATE (g)	0.0000	0.0000	0.0000	0.0000
TOTAL PARTICULATE COLLECTED (g)	0.0540	0.0994	0.0630	0.0721
DRY GAS METER COEFFICIENT	0.9982	0.9982	0.9982	0.9982
BAROMETRIC PRESSURE (in. Hg)	29.82	29.82	29.82	29.82
AVG. ORIFICE PRESS. DROP (in. H2O)	2.41	2.80	2.45	2.55
AVG. GAS METER TEMP. (degrees F)	78.8	114.5	111.0	101.41
VOLUME THROUGH GAS METER				
AT METER CONDITIONS (cf)	53.22	59.05	55.25	55.84
STANDARD CONDITIONS (dscf)	52.18	54.34	51.12	52.55
TOTAL SAMPLING TIME (min.)	62.5	62.5	62.5	62.5
NOZZLE DIAMETER (in.)	0.240	0.240	0.240	0.240
AVG. STACK GAS TEMP. (degrees F)	258	277	256	264
VOLUMETRIC FLOWRATE				
AVG. STACK GAS VELOCITY (ft/sec)	69.55	73.91	67.74	70.40
ACTUAL (acfm)	71,029	75,481	69,177	71,896
STANDARD (scfm)	51,986	53,850	50,761	52,199
DRY STANDARD (dscfm)	45,247	47,220	44,489	45,652
ISOKINETIC VARIATION (%)	**100.02**	**99.82**	**99.66**	**99.83**
***PARTICULATE CONCENTRATION**				
ACTUAL (gr/acf)	**0.0102**	**0.0177**	**0.0122**	**0.0134**
DRY STANDARD (gr/dscf)	**0.0160**	**0.0282**	**0.0190**	**0.0211**
***MASS RATE (lb/hr)**	**6.188**	**11.412**	**7.245**	**8.281**

* Emisson and mass rates were calculated WITHOUT including condensible back-half organics.

TABLE 5

Thorson, Inc.
Warroad, Minnesota
Baghouse Stack

Nova Environmental Services, Inc.
Project No. M93-742

EPA METHOD 5 - DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

TEST NO. 1	RUN 1	RUN 2	RUN 3	AVERAGE
DATE OF RUN	20-Aug-93	20-Aug-93	20-Aug-93	
RUN START TIME	750	925	1230	
RUN END TIME	859	1203	1410	
STACK STATIC PRESSURE (in. H2O)	-0.45	-0.45	-0.45	-0.45
CROSS SECTIONAL AREA (sq. ft.)	17.021	17.021	17.021	17.021
PITOT TUBE COEFFICIENT	0.840	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES				
IMPINGERS (g)	132	137	111	127
DESSICCANT (g)	33	25	42	33
TOTAL MOISTURE COLLECTED (g)	165	162	153	160
SAMPLE GAS MOISTURE CONTENT (%)	12.96	12.31	12.36	12.54
PARTICULATE DATA				
FILTER PARTICULATE (g)	0.0053	0.0263	0.0107	0.0141
PROBE WASH PARTICULATE (g)	0.0487	0.0731	0.0523	0.0580
CONDENSIBLE PARTICULATE (g)	0.0227	0.3583	0.2330	0.2047
TOTAL PARTICULATE COLLECTED (g)	0.0767	0.4577	0.2960	0.2768
DRY GAS METER COEFFICIENT	0.9982	0.9982	0.9982	0.9982
BAROMETRIC PRESSURE (in. Hg)	29.82	29.82	29.82	29.82
AVG. ORIFICE PRESS. DROP (in. H2O)	2.41	2.80	2.45	2.55
AVG. GAS METER TEMP. (degrees F)	78.8	114.5	111.0	101.41
VOLUME THROUGH GAS METER				
AT METER CONDITIONS (cf)	53.22	59.05	55.25	55.84
STANDARD CONDITIONS (dscf)	52.18	54.34	51.12	52.55
TOTAL SAMPLING TIME (min.)	62.5	62.5	62.5	62.5
NOZZLE DIAMETER (in.)	0.240	0.240	0.240	0.240
AVG. STACK GAS TEMP. (degrees F)	258	277	256	264
VOLUMETRIC FLOWRATE				
AVG. STACK GAS VELOCITY (ft/sec)	69.55	73.91	67.74	70.40
ACTUAL (acfm)	71,029	75,481	69,177	71,896
STANDARD (scfm)	51,986	53,850	50,761	52,199
DRY STANDARD (dscfm)	45,247	47,220	44,489	45,652
ISOKINETIC VARIATION (%)	**100.02**	**99.82**	**99.66**	**99.83**
PARTICULATE CONCENTRATION				
ACTUAL (gr/acf)	0.0145	0.0813	0.0575	0.0511
DRY STANDARD (gr/dscf)	0.0227	0.1300	0.0894	0.0807
PARTICLE MASS RATE (lb/hr)	**8.789**	**52.548**	**34.039**	**31.792**

TABLE 6

Thorson, Inc.
Warroad, Minnesota
Baghouse Stack

Nova Environmental Services, Inc.
Project No. M93-742
Observer T. Nelson

EPA Method 9 -- Visual Determination of the Opacity of Emissions

Test No. 1 from 1505-1605 on 8/20/93

Seconds	0	15	30	45
Minutes 1	50	60	50	60
2	50	50	50	55
3	50	50	50	50
4	50	50	50	50
5	50	50	50	50
6	50	50	45	45
7	45	40	50	45
8	50	45	45	45
9	40	45	40	40
10	40	40	35	40
11	35	40	40	35
12	35	40	40	40
13	40	40	40	35
14	35	35	35	40
15	40	35	35	35
16	40	35	40	35
17	35	40	35	40
18	35	30	30	35
19	35	30	35	40
20	40	40	40	35
21	35	35	35	30
22	35	35	30	30
23	30	30	35	30
24	35	30	35	35
25	30	35	40	40
26	40	40	35	35
27	35	40	30	35
28	35	35	35	35
29	35	35	40	40
30	40	40	40	30

Seconds	0	15	30	45
Minutes 31	40	35	35	35
32	35	35	40	40
33	30	35	30	30
34	30	25	25	25
35	30	30	25	30
36	30	25	25	25
37	25	25	30	25
38	25	25	25	25
39	25	25	30	25
40	30	30	30	25
41	25	25	25	25
42	30	25	25	25
43	30	25	25	25
44	25	25	20	20
45	25	25	25	25
46	25	25	25	25
47	20	25	20	25
48	25	25	25	20
49	20	20	20	25
50	25	25	20	25
51	25	25	20	20
52	20	20	20	25
53	25	25	20	20
54	25	25	20	25
55	25	25	25	20
56	25	20	20	20
57	20	20	20	25
58	20	25	20	25
59	25	25	25	20
60	20	25	25	25

Average Opacity (%) 32.56

High Six-Minute Opacity (%) 50.63

TABLE 7

Thorson, Inc.
Warroad, Minnesota
Generator Stack

Nova Environmental Services, Inc.
Project No. M93-742
Observer T. Nelson

EPA Method 9 -- Visual Determination of the Opacity of Emissions

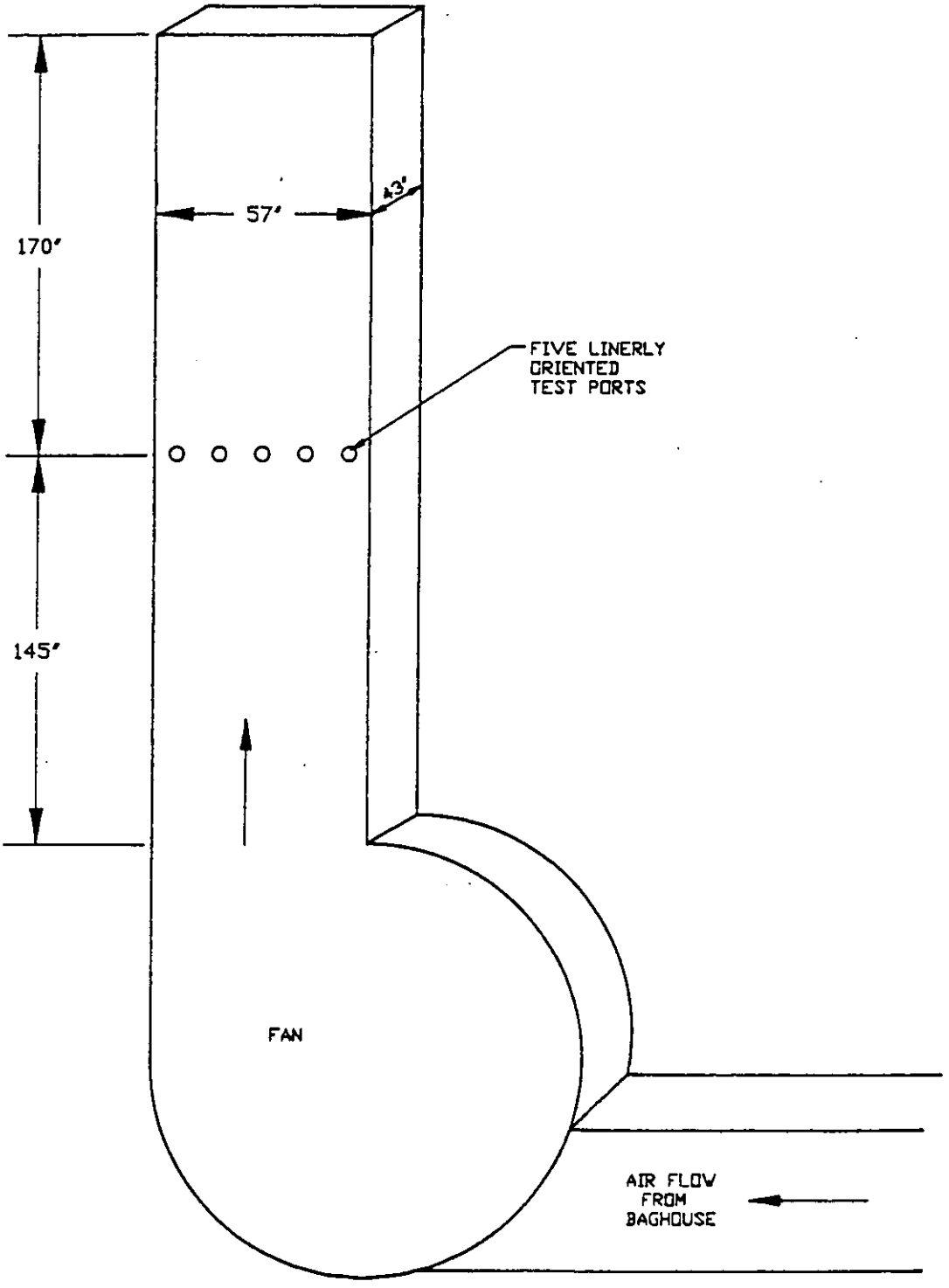
Test No. 1 from 1235-1335 on 8/20/93

Seconds / Minutes	0	15	30	45
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0

Seconds / Minutes	0	15	30	45
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0
60	0	0	0	0

Average Opacity (%) 0.00

High Six-Minute Opacity (%) 0.00



THORSON, INC.
BAGHOUSE STACK
MARCOUX AND WARROAD, MINNESOTA

M1467/M93-742

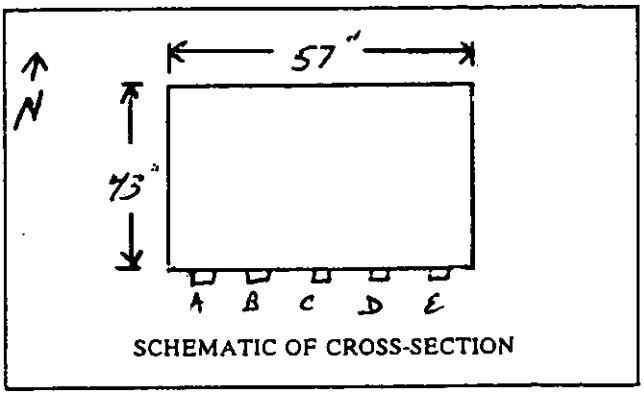
Nova Environmental Services, Inc.

8/19-20/93

1

EPA METHOD 2 FIELD DATA

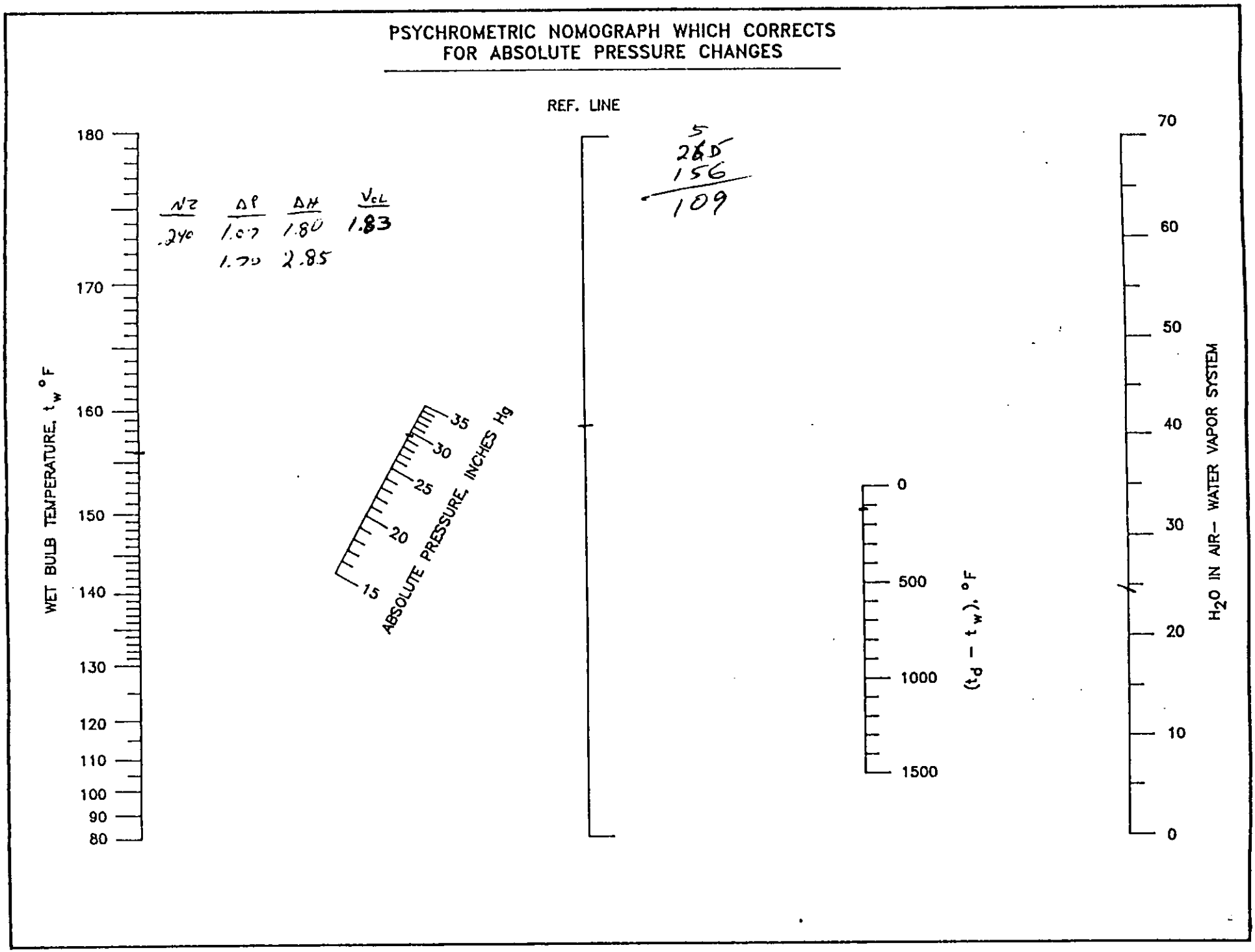
PROJECT NAME THORSON / MARCOUX
SOURCE BAGHOUSE OUTLET
TEST 1 RUN 1 DATE 8-19-93
STACK DIA. 43x57 IN.
DRY BULB 265 °F WET BULB 156 °F
MANOMETER: X REG. ___ EXP. ___ ELEC.
BAROMETRIC PRESSURE 29.88 IN Hg
STATIC PRESSURE -1.15 IN WC
OPERATORS D. SMITH / T. NELSON
PITOT NO. PT-4 Cp .840
FLOW INTO PAPER ___ /FLOW OUT OF PAPER X



SCHEMATIC OF CROSS-SECTION

TRAVERSE POINT NO.	FRACTION OF DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM END OF PORT (IN.)	VELOCITY PRESSURE (IN WC)	TEMPERATURE OF GAS (°F)	CYCLONIC FLOW (Resultant Angle)
		Port Length:	2.0 In.	Time Start:	Hrs.	
A - 1		4.30	6.30	0.77		
2		12.90	14.90	0.85		
3		21.50	23.50	0.95		
4		30.10	32.10	1.10		
5		35.70	40.70	1.60		
B - 1				1.05		
2				0.95		+1
3				0.80		
4				0.75		+1
5				0.95		
C - 1				1.25		
2				1.10		
3				0.85		
4				0.65		
5				0.55		
D - 1				1.55		
2				1.25		
3				0.95		
4				0.80		
5				0.65		
E - 1			$\overline{\Delta P}$ = 1.07	1.70		
2		MC = 25%		1.55		+1
3				1.50		
4				1.40		
5				1.15		+4
Temp. Meas. Tool & S/N:				Time End:	Hrs.	

PSYCHROMETRIC NOMOGRAPH WHICH CORRECTS FOR ABSOLUTE PRESSURE CHANGES



EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME THORSON / MARICOPA METHOD 1-5

SOURCE BAGHOUSE OUTLET DATE 8-19-93 TEST 1 RUN 1

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: (0.00 CFM AT 16 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1 00720

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	535	200	335
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1408	1380	28
TOTAL			363

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-1 BOX NO. BB-2 BAG NO. 1

BAG MATERIAL: TEDLAR SIZE: 442

PRETEST LEAK CHECK: 0 cc/MIN AT 20 IN. Hg

TIME START: 1040 (HRS) TIME END: 1214 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: D.S.

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 1365'39

PITOT NO. PTB-4 Cp .840

BAR. PRESS. 29.88 IN Hg H20 25 %

NOZZLE NO. NS1-8 NOZZLE DIA. .240 IN.

EPA METHOD 5 FIELD DATA

PROJECT NAME THORSON / MARCOUX OPERATORS D. SMITH / T. NELSON METER BOX NO. 1 ΔH@ 1.89 IN WC

SOURCE BAGHOUSE OUTLET DATE 5-19-93 TEST 1 RUN 1 GASMETER COEFF. 0.9982

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (°F) STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	OXYGEN (% v/v)
	(1040)	(501.25)											
A - 5	2.5	503.05	1.00	1.67	3.02	7	268	251	253	55	70	64	13.2
4	5	504.69	0.88	1.46	4.67	7	274	250	247	54	70	69	13.2
3	7.5	506.40	0.95	1.58	6.38	7	272	250	251	54	72	70	13.0
2	10	508.16	0.80	1.33	7.96	7	276	250	249	54	74	70	13.2
1	12.5	509.51	0.77	1.28	9.51	6	277	250	252	53	76	71	13.1
B - 5	15	511.42	1.15	1.91	1.41	9	277	250	252	53	80	73	12.9
4	17.5	513.05	0.85	1.42	3.04	7	281	250	250	54	82	73	12.9
3	20	514.70	0.88	1.47	4.71	7	282	249	250	54	84	75	12.9
2	22.5	516.48	0.98	1.64	6.47	8	283	249	248	55	86	75	13.0
1	25	518.31	1.05	1.76	8.30	9	282	251	253	55	90	77	13.1
C - 5	27.5	519.75	0.64	1.08	9.74	5	281	250	251	55	90	79	13.0
4	30	521.24	0.69	1.17	1.24	5	281	249	248	56	91	77	13.0
3	32.5	522.93	0.89	1.50	2.93	8	283	250	248	56	91	80	13.1
2	35	524.89	1.20	2.02	4.70	10	285	250	247	56	93	81	13.1
1	37.5	526.95	1.30	2.19	6.96	11	285	250	251	57	95	82	13.1
D - 5	40	528.40	0.65	1.10	8.42	5	284	250	251	57	95	83	13.0
1131 Dwn 4	42.5	530.01	0.78	1.33	0.02	6	281	251	254	57	96	84	13.1
1152 up 3	45	531.82	0.92	1.68	1.82	7	283	251	252	58	90	86	13.5
2	47.5	533.88	1.20	2.12	3.85	10	251	251	251	60	91	87	13.4
1	50	536.10	1.50	2.64	6.10	14	256	251	250	60	93	87	13.2
E - 5	52.5	538.12	1.20	2.09	8.11	10	264	250	248	59	94	88	13.7
4	55	540.30	1.40	2.46	0.30	13	260	250	246	60	96	88	13.8
3	57.5	542.51	1.40	2.47	2.48	13	259	251	249	61	98	89	13.7
2	60	544.30	0.95	1.67	4.29	8	263	250	247	61	100	89	13.6
(1214) 1	62.5	546.56	1.50	2.64	6.56	14	262	249	249	60	100	90	13.5
	Θ=62.5	Vm=		ΔH=1.75							AVG.= 83.8		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME THORSON / MARCOUX METHOD 1-5

SOURCE BAGHOUSE OUTLET DATE 5-19-93 TEST 1 RUN 2

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: (0.00 CFM AT 17 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1 00721

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	535	200	335
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1305	1284	21
TOTAL			356

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-1 BOX NO. BB-2 BAG NO. 2

BAG MATERIAL: TEDLAR SIZE: 44L

PRETEST LEAK CHECK: 0 cc/MIN AT 20 IN. Hg

TIME START: 1315 (HRS) TIME END: 1421 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: D. SMITH

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 136539

PITOT NO. PTB-4 Cp .840

BAR. PRESS. 29.85 IN Hg H20 27 %

NOZZLE NO. NS1-8 NOZZLE DIA. .240 IN.

EPA METHOD 5 FIELD DATA

PROJECT NAME THORSEN / MARCONI OPERATORS D. SMITH / T. NELSON METER BOX NO. 1 ΔH@ 1.89 IN WC

SOURCE BAGHOUSE OUTLET DATE 5-19-93 TEST 1 RUN 2 GASMETER COEFF. 0.9952

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (° F)						OXYGEN
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	(% v/v)
	(1315)	(546.90)											
A - 5	2.5	548.68	0.94	1.61	8.65	7	239	250	254	58	92	91	13.0
4	5	550.44	0.95	1.61	0.42	7	256	249	247	58	92	91	12.8
3	7.5	552.20	0.97	1.63	2.20	7	261	251	250	57	93	91	12.6
2	10	553.86	0.83	1.39	3.84	6	267	250	252	57	94	91	12.9
1	12.5	555.45	0.79	1.31	5.44	6	271	250	254	57	96	92	12.7
B - 5	15	557.05	0.82	1.37	7.07	6	271	249	256	58	98	92	13.2
4	17.5	558.78	0.89	1.49	8.78	7	268	250	247	58	98	92	13.5
3	20	560.50	0.90	1.50	0.49	7	272	250	254	58	100	93	13.4
2	22.5	562.30	0.99	1.65	2.29	8	274	250	251	59	101	93	13.4
1	25	564.13	1.03	1.72	4.13	8	273	250	249	59	102	94	13.4
C - 5	27.5	565.66	0.72	1.21	5.67	5	273	250	248	59	102	95	13.4
4	30	567.24	0.75	1.26	7.24	6	273	250	250	60	103	95	13.5
3	32.5	568.96	0.88	1.47	8.94	7	276	249	247	60	104	95	13.0
2	35	570.71	0.94	1.57	0.70	7	275	250	245	60	104	96	13.0
1	37.5	572.61	1.10	1.84	2.61	9	275	250	247	60	105	96	13.2
D - 5	40	574.13	0.70	1.18	4.13	5	273	250	248	61	104	96	13.2
4	42.5	575.79	0.82	1.39	5.79	7	269	250	252	61	104	97	13.4
3	45	577.62	1.00	1.68	7.61	8	271	251	250	60	106	97	13.2
2	47.5	579.65	1.25	2.11	9.65	10	271	250	248	60	107	98	13.5
1	50	581.87	1.50	2.53	1.88	14	272	251	249	59	108	98	13.4
E - 5	52.5	583.51	0.78	1.32	3.50	6	272	249	250	59	108	99	13.4
4	55	585.58	1.30	2.26	5.62	12	251	250	256	59	108	99	13.4
3	57.5	587.79	1.40	2.39	7.79	13	263	251	253	60	110	100	13.4
2	60	590.05	1.50	2.55	0.05	14	268	251	250	60	111	100	13.0
(1421) 1	62.5	592.15	1.30	2.22	2.14		268	250	248	61	112	101	13.4
	Θ = 62.5	Vm =		ΔH = 7.69							AVG. =	98.9	

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME THORSON/MARCOUX METHOD 1-5

SOURCE BAG HOUSE OUTLET DATE 8-19-93 TEST 1 RUN 3

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: (0.00 CFM AT 16 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1 00722

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	535	200	335
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1368	1336	32
TOTAL			367

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-1 BOX NO. BB-2 BAG NO. 3

BAG MATERIAL: TEDLAR SIZE: 4'x6'

PRETEST LEAK CHECK: 0 cc/MIN AT 20 IN. Hg

TIME START: 1500 (HRS) TIME END: 1638 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: D. SMITH

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 136539

PITOT NO. PTB-4 Cp .840

BAR. PRESS. 29.88 IN Hg H2O 28 %

NOZZLE NO. N91-8 NOZZLE DIA. .240 IN.

EPA METHOD 5 FIELD DATA

PROJECT NAME THORSON/MARCOUX OPERATORS D. SMITH/T. NELSON METER BOX NO. 1 ΔH@ 1.89 IN WC

SOURCE BAGHOUSE OUTLET DATE 8-19-93 TEST 1 RUN 3 GASMETER COEFF. 0.9952

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (°F) STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	OXYGEN (% v/v)
	(1500	(592.50)											
A - 5	2.5	594.38	1.10	1.79	4.38	7	276	249	252	60	99	100	13.2
4	5	596.13	0.95	1.57	6.13	7	269	251	256	58	99	100	13.2
3	7.5	597.84	0.90	1.48	7.84	6	271	250	250	58	101	100	13.2
2	10	599.53	0.86	1.41	9.51	6	273	249	246	58	102	100	13.2
1	12.5	601.16	0.82	1.35	1.15	6	271	251	245	59	104	100	13.2
B - 5	15	602.99	1.03	1.70	2.98	8	271	251	252	59	104	100	13.4
4	17.5	604.73	0.92	1.51	4.71	7	273	249	248	59	106	100	13.4
3	20	606.56	1.05	1.72	6.56	8	276	250	252	60	107	100	13.2
2	22.5	608.50	1.15	1.89	8.50	9	275	251	251	60	107	101	13.0
1	25	610.35	1.05	1.73	0.35	9	276	249	246	61	108	101	13.4
C - 5	27.5	611.96	0.79	1.30	1.96	6	276	249	250	61	106	101	13.4
4	30	613.53	0.75	1.24	3.53	6	273	250	255	61	106	101	13.4
3	32.5	615.25	0.90	1.49	5.25	7	272	250	252	61	107	101	13.4
2	35	617.24	1.20	1.99	7.23	10	271	250	251	60	107	101	13.5
1	37.5	619.30	1.30	2.16	9.30	11	267	249	247	59	107	101	13.2
D - 5	40	620.76	0.65	1.08	0.77	5	268	250	253	59	105	100	13.3
4	42.5	622.40	0.81	1.34	2.40	6	269	252	252	58	105	100	13.4
3	45	624.16	0.95	1.57	4.16	7	273	251	254	58	105	100	13.3
2	47.5	626.20	1.25	2.06	6.18	10	273	250	255	58	105	100	13.0
1	50	628.17	1.20	1.98	8.16	10	273	249	250	59	107	100	13.4
E - 5	52.5	629.76	0.70	1.27	9.74	6	209	251	252	59	100	99	13.3
4	55	631.44	1.40	2.41	1.92	12	237	250	250	61	100	99	13.2
3	57.5	634.16	1.50	2.56	4.16	13	241	250	250	61	102	100	13.4
2	60	635.98	0.99	1.67	5.98	8	252	250	251	60	104	100	13.2
1	62.5	638.14	1.40	2.36	8.14	12	255	249	253	60	105	100	13.0
	Θ = 62.5	Vm=		ΔH=1.71							AVG.=	102.3	

DWN 1555 UP 1625

(1638)

TANDY PC- 6 STACK TEST PROGRAM
FIELD DATA

PROJECT NAME THORSON/MARCUS TEST NO. 1 DATE 8-19-93

SOURCE BAGHOUSE OUTLET OPERATOR D. SMITH

INITIALIZATION PARAMETERS		BEGINNING AND END RUN INPUT PARAMETERS			
			RUN 1	RUN 2	RUN 3
Y =	0.9952	V/O	501.25	546.90	592.50
$\Delta H@$ =	1.89	NO. OF POINTS	25	25	25
Cp =	.840	MC	25	27	28
D_n =	.240	V/F	546.56	592.15	638.14
P_b =	29.58	G-H_2O	363	356	367
Δt =	2.5	RUN TIME	62.5	62.5	62.5
MC =	.25	1-RND/2-RECT	2	2	2
B'O_2 =	17.5	DIA (INS)	—	—	—
t_M =	70	L (INS)	43	43	43
P_g =	-1.15	W (INS)	57	57	57

END OF RUN - RUN 135

START OF RUN - RUN 22

ΔP - RUN 45

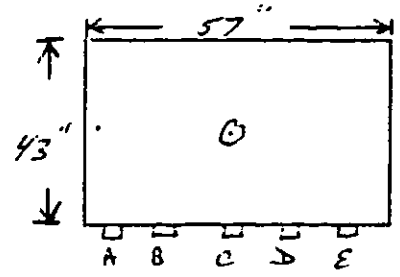
t_M IN/OUT - RUN 100

RESULTS

	RUN 1	RUN 2	RUN 3
$(\overline{\sqrt{\Delta P}})$	1.0029	0.9946	1.0063
$\overline{\Delta H}$	1.7776	1.6878	1.7255
$\overline{TS}$	272.0	268.1	265.6
$\overline{TM}$	83.3	95.7	102.3
V/STD	44.02	42.78	42.89
MC	27.96	28.15	28.71
$\overline{VEL}$	69.42	68.96	69.80
ISO%	104.09	101.54	101.02
ACFM	70,894	70,419	71,281
DSCFM	36,671	36,526	36,807

EPA METHOD 2 FIELD DATA

PROJECT NAME THORSON / WARROAD
SOURCE BAGHOUSE OUTLET
TEST 1 RUN 1 DATE 8-18-93
STACK DIA. 43 x 57 IN.
DRY BULB 290 °F WET BULB 134 °F
MANOMETER: X REG. ___ EXP. ___ ELEC.
BAROMETRIC PRESSURE 29.80 IN Hg
STATIC PRESSURE -0.45 IN WC
OPERATORS D. SMITH / T. NELSON
PITOT NO. PT-4 Cp .840
FLOW INTO PAPER ___ /FLOW OUT OF PAPER X

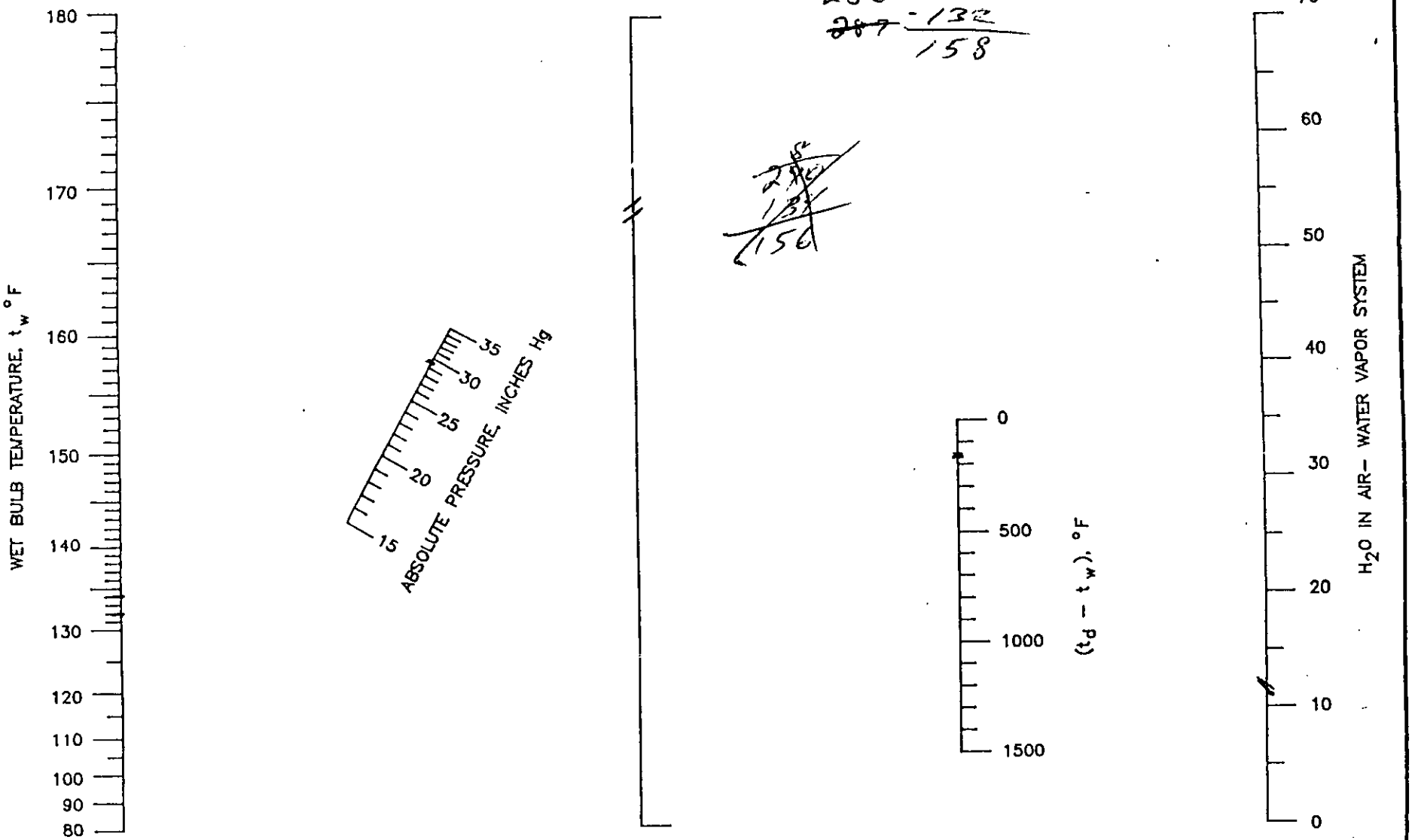


SCHEMATIC OF CROSS-SECTION

TRAVERSE POINT NO.	FRACTION OF DIAMETER	DISTANCE FROM STACK WALL (IN.)	DISTANCE FROM END OF PORT (IN.)	VELOCITY PRESSURE (IN WC)	TEMPERATURE OF GAS (°F)	CYCLONIC FLOW (Resultant Angle)
		Port Length: 3.5 In.		Time Start: 0815 Hrs.		
A - 1		4.30	7.80	1.50	290	+5
2		12.90	16.40	1.65	290	+5
3		21.50	25.00	1.75	290	+6
4		30.10	33.60	1.85	290	+8
5		38.70	42.20	1.80	290	+8
B - 1				1.15	289	+2
2				1.20	289	+3
3				1.40	289	+5
4				1.35	290	+6
5				1.35	290	+5
C - 1				0.68	291	+2
2				0.76	291	+3
3				0.78	291	+3
4				0.80	292	+5
5				0.82	292	+5
D - 1				0.57	291	+1
2	FT/SEC. =			0.60	291	+2
3	ACFM =			0.55	289	+3
4	DSCFM =			0.55	289	+3
5	MC. =	12 %		0.55	289	+2
E - 1	O_2 =	15 %	$\overline{\Delta P}$ = 0.98	0.53	289	+1
2	TS =	290 °F		0.59	289	+2
3				0.59	289	+2
~~4~~				~~0.57~~	~~290~~	~~+1~~
~~5~~				0.53	290	+1
Temp. Meas. Tool & S/N:				Time End: 0915 Hrs.		

METHOD2.FRM\ADITRN

PSYCHROMETRIC NOMOGRAPH WHICH CORRECTS FOR ABSOLUTE PRESSURE CHANGES



EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME THORSON / LARK ROAD METHOD 1-5

SOURCE BAGHOUSE OUTLET DATE 5-20-93 TEST 1 RUN 1

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: (0.00 CFM AT 17 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1 00723

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	332	200	132
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1377	1344	33
TOTAL			165

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-1 BOX NO. BB-1 BAG NO. 1

BAG MATERIAL: TEDLAR SIZE: 44L

PRETEST LEAK CHECK: 0 cc/MIN AT 20 IN. Hg

TIME START: 0750 (HRS) TIME END: 0859 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: D. SMITH

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 136539

PITOT NO. PTB-4 Cp .840

BAR. PRESS. 29.82 IN Hg H20 12 %

NOZZLE NO. NS1-8 NOZZLE DIA .240 IN.

EPA METHOD 5 FIELD DATA

PROJECT NAME THORSON/WARROAD OPERATORS D. SMITH/T. NELSON METER BOX NO. 1 ΔH@ 1.89 IN WC

SOURCE BAGHOUSE OUTLET DATE 8-20-93 TEST 1 RUN 1 GASMETER COEFF. 0.9982

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (°F) STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	OXYGEN (% v/v)
	(0750)	(635.55)											
A - 5	2.5	640.64	1.10	2.40	0.66	9	255	250	249	55	67	63	12.5
4	5	643.02	1.45	3.13	3.06	14	261	251	249	55	70	64	12.4
3	7.5	645.45	1.45	3.13	5.47	14	265	249	250	55	70	65	12.3
2	10	647.80	1.35	2.92	7.80	14	263	250	251	56	73	65	12.5
1	12.5	650.05	1.25	2.73	0.05	13	260	250	250	56	77	66	12.2
B - 5	15	652.45	1.40	3.07	2.44	15	259	250	249	56	77	67	12.4
4	17.5	654.70	1.25	2.74	4.71	12	260	250	250	56	79	68	12.5
3	20	657.01	1.30	2.86	7.03	13	259	250	251	57	81	69	12.6
2	22.5	659.40	1.35	2.99	9.40	14	257	250	250	57	83	69	12.6
1	25	661.70	1.25	2.77	1.69	13	257	251	250	57	85	70	12.5
C - 5	27.5	663.74	1.00	2.23	3.74	9	257	250	249	58	84	72	12.5
4	30	665.75	1.00	2.23	5.80	9	256	250	250	58	86	72	12.5
3	32.5	667.94	1.10	2.45	7.96	10	258	251	252	58	87	74	12.5
2	35	670.11	1.10	2.46	0.12	10	258	250	251	58	88	74	12.6
1	37.5	672.22	1.03	2.31	2.22	10	258	250	249	59	89	75	12.6
D - 5	40	674.10	0.84	1.89	4.11	8	258	250	249	59	88	76	12.6
4	42.5	676.01	0.85	1.91	6.02	8	258	250	250	59	90	76	12.6
3	45	677.98	0.89	2.00	7.98	8	258	251	252	59	90	77	12.7
2	47.5	680.02	0.96	2.16	0.02	9	258	250	250	60	91	77	12.7
1	50	682.12	1.03	2.32	2.12	10	259	250	250	60	92	79	12.7
E 5	52.5	684.05	0.83	1.91	4.04	8	246	249	251	59	92	80	12.6
4	55	685.98	0.85	1.93	5.97	8	254	250	250	59	93	80	12.5
3	57.5	687.89	0.85	1.92	7.89	8	258	250	250	58	94	81	12.4
2	60	689.83	0.86	1.94	9.83	8	261	251	249	58	95	81	12.4
(0859) 1	62.5	691.77	0.86	1.94	1.77	8	262	250	250	58	96	82	12.4
	θ = 62.5	Vm =		ΔH = 24							AVG. =	78.8	

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME THORSON/WARREAD METHOD 1-5

SOURCE BAGHOUSE OUTLET DATE 8-20-93 TEST 1 RUN 2

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: (0.00 CFM AT 18 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1 00724

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	337	200	137
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1304	1279	25
TOTAL			162

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-1 BOX NO. BB-1 BAG NO. 2

BAG MATERIAL: TEDLAR SIZE: 44L

PRETEST LEAK CHECK: 0 cc/MIN AT 20 IN. Hg

TIME START: 0925 (HRS) TIME END: 1203 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: D. SMITH

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 136534

PITOT NO. STB-4 Cp .840

BAR. PRESS. 29.82 IN Hg H20 13 %

NOZZLE NO. N31-8 NOZZLE DIA. .240 IN.

EPA METHOD 5 FIELD DATA

PROJECT NAME THORSON/WARLOAD OPERATORS D. SMITH/T. NELSON METER BOX NO. 1 ΔH@ 1.89 IN WC

SOURCE BAGHOUSE OUTLET DATE 8-20-93 TEST 1 RUN 2 GASMETER COEFF. 0.9952

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (° F)						OXYGEN
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	(% v/v)
	(0925)	(692.10)											
0928 A - 5	2.5	694.38	1.25	2.75	4.38	10	254	251	253	60	89	85	17.5
0956 4	5	697.01	1.65	3.71	7.05	16	247	251	250	62	111	110	17.5
3	7.5	699.75	1.60	3.74	9.79	16	250	251	248	62	113	111	17.6
2	10	702.44	1.50	3.52	4.45	15	249	250	248	61	113	111	17.5
1	12.5	705.00	1.40	3.27	5.01	15	253	250	250	61	113	111	17.5
B - 5	15	707.65	1.45	3.39	7.62	15	251	250	250	61	115	112	17.5
4	17.5	710.16	1.35	3.17	0.15	14	250	250	247	60	115	113	17.5
3	20	712.75	1.45	3.39	2.77	15	254	250	251	60	116	113	17.4
2	22.5	715.46	1.55	3.63	5.47	16	254	250	253	60	118	114	17.4
1	25	718.01	1.35	3.15	8.00	14	258	249	254	61	120	114	17.4
C - 5	27.5	720.35	1.15	2.70	0.34	11	257	250	251	61	120	115	17.4
4	30	722.54	1.03	2.39	2.54	10	266	251	250	62	121	115	17.3
3	32.5	724.88	1.20	2.77	4.91	11	270	250	251	62	122	116	17.5
2	35	727.31	1.25	2.90	7.34	12	267	249	251	61	121	115	17.6
1	37.5	729.72	1.20	2.78	9.72	11	264	250	250	61	121	115	17.6
D - 5	40	731.81	0.94	2.19	1.83	8	263	251	249	61	118	115	17.6
4	42.5	733.99	0.97	2.28	3.99	9	255	250	251	60	118	115	17.7
3	45	736.18	1.03	2.42	6.20	10	255	250	252	60	118	115	17.8
2	47.5	738.55	1.15	2.71	8.55	12	254	250	251	60	119	115	17.8
1	50	740.89	1.15	2.71	0.89	12	253	250	249	61	119	115	17.6
E - 5	52.5	742.91	0.86	2.01	2.91	8	261	250	249	61	117	114	17.6
4	55	744.98	0.90	2.11	4.98	8	258	251	250	61	117	115	17.6
3	57.5	747.03	0.89	2.08	7.04	8	258	251	251	62	117	115	17.2
2	60	749.11	0.90	2.11	9.11	8	257	251	251	62	117	115	17.5
(1203) 1	62.5	751.15	0.87	2.05	1.15	8	254	250	252	62	117	115	17.3
	Θ=62.5	Vm=		ΔH=2.79							AVG.= 114.5		

EPA METHOD 3/4/5 FIELD DATA

PROJECT NAME THORSON/WARROAD METHOD 1-5

SOURCE BAGHOUSE OUTLET DATE 8-20-93 TEST 1 RUN 3

SAMPLE TRAIN LEAK CHECK:

PRETEST: (≤0.02 CFM AT 15 IN. Hg (vac) ☒ POSTTEST: (0.00 CFM AT 18 IN. Hg (vac) ☒

PARTICULATE CATCH DATA:

NO.S OF FILTERS USED: 1 00725

CONDENSATE DATA:

ITEM	WEIGHT (g)		
	FINAL	TARE	DIFFERENCE
IMPINGER NO. 1	311	200	111
IMPINGER NO. 2			
IMPINGER NO. 3			
CONDENSER			
DESICCANT	1387	1345	42
TOTAL			153

☐ AMBIENT AIR 20.9% O_2 (V/V)

INTEGRATED GAS SAMPLING DATA:

BAG PUMP NO. BP-1 BOX NO. BB-1 BAG NO. 3

BAG MATERIAL: TEDLAR SIZE: 4'x6'

PRETEST LEAK CHECK: 0 cc/MIN AT 20 IN. Hg

TIME START: 1230 (HRS) TIME END: 1410 (HRS)

SAMPLING RATE: 400 cc/MIN OPERATOR: D. SMITH

S/N OF O_2 ANALYZER USED TO MONITOR TRAIN OUTLET: 136539

PITOT NO. PTB-4 Cp .840

BAR. PRESS. 29.82 IN Hg H2O 12 %

NOZZLE NO. NS1-8 NOZZLE DIA .240 IN.

EPA METHOD 5 FIELD DATA

PROJECT NAME THORSON/WARROAD OPERATORS D. SMITH/T. NELSON METER BOX NO. 1 ΔH@ 1.82 IN WC

SOURCE BAGHOUSE OUTLET DATE 8-20-93 TEST 1 RUN 3 GASMETER COEFF. 0.9982

TRAVERSE POINT NO.	SAMPLING TIME (MIN.)	SAMPLE VOL. (cf)	VELOCITY HEAD (IN WC)	ORIFICE METER (IN WC)	DES. VOL. (cf)	VAC IN Hg	TEMPERATURE (°F)						OXYGEN
							STACK	PROBE	OVEN	IMPG.	GAS/IN	GAS/OUT	(% v/v)
	1230	751.55											
A - 5	2.5	753.88	1.15	2.74	3.90	10	256	250	254	58	111	113	17.9
1235 → 4	5	756.57	1.55	3.63	6.60	15	263	250	253	58	111	113	18.0
1310 → 3	7.5	759.21	1.40	3.35	9.20	14	248	251	252	60	103	108	17.8
2	10	761.70	1.30	3.06	1.67	13	252	250	248	59	103	108	18.2
1	12.5	764.03	1.20	2.81	4.03	11	256	250	251	59	105	107	18.2
B - 5	15	766.40	1.20	2.81	6.40	11	257	250	251	60	107	107	18.0
4	17.5	768.71	1.15	2.69	8.72	11	259	250	251	60	109	107	18.0
3	20	771.09	1.20	2.82	1.09	11	257	251	253	61	112	108	18.2
2	22.5	773.52	1.25	2.94	3.52	12	260	251	250	61	113	108	18.4
1	25	775.85	1.15	2.70	5.85	11	262	249	251	62	115	108	18.4
C - 5	27.5	777.91	0.90	2.12	7.91	8	260	250	250	62	116	109	18.5
4	30	780.03	0.96	2.27	0.05	8	259	250	250	63	116	108	18.5
3	32.5	782.26	1.04	2.46	2.28	10	260	249	251	63	116	109	18.5
2	35	784.50	1.08	2.55	4.54	11	261	251	251	63	116	109	18.5
1	37.5	786.68	0.97	2.30	6.70	10	257	250	249	62	116	109	18.5
D - 5	40	788.66	0.82	1.95	8.68	8	257	249	250	62	114	109	18.5
4	42.5	790.65	0.82	1.95	0.66	8	254	250	250	62	114	109	18.5
3	45	792.68	0.85	2.02	2.68	8	254	251	251	62	115	109	18.5
2	47.5	794.78	0.92	2.19	4.79	9	253	249	250	63	115	110	18.5
1	50	796.96	0.98	2.34	6.96	10	252	251	248	63	116	110	18.6
E - 5	52.5	798.93	0.80	1.92	8.93	7	252	250	251	63	115	109	18.5
4	55	800.86	0.78	1.85	0.86	7	257	249	250	63	115	110	18.5
3	57.5	802.84	0.82	1.94	2.84	7	260	250	251	64	116	110	18.4
2	60	804.80	0.80	1.90	4.80	7	257	250	251	64	116	110	18.4
(1410) 1	62.5	806.80	0.83	1.98	6.80	8	256	251	249	64	116	110	18.2
	Θ = 62.5	Vm=		ΔH=2.45							AVG.=	111.0	

TANDY PC– 6 STACK TEST PROGRAM
FIELD DATA

PROJECT NAME THORSON / WARROAD TEST NO. 1 DATE 8-20-93

SOURCE BAGHOUSE OUTLET OPERATOR D. SMITH

INITIALIZATION PARAMETERS		BEGINNING AND END RUN INPUT PARAMETERS	RUN 1	RUN 2	RUN 3
Y =	0.9982	V/O	638.55	692.10	751.55
$\Delta H_@$ =	1.89	NO. OF POINTS	25	25	25
Cp =	.840	MC	12	13	12
D_n =	.240	V/F	691.77	751.15	806.80
P_b =	29.82	G–H_2O	165	162	153
Δt =	2.5	RUN TIME	62.5	62.5	62.5
MC =	12	1–RND/2–RECT	2	2	2
$B'O_2$ =	15	DIA (INS)	—	—	—
t_M =	65	L (INS)	43	43	43
P_g =	-0.45	W (INS)	57	57	57

END OF RUN – RUN 135

START OF RUN – RUN 22

ΔP – RUN 45

t_M IN/OUT – RUN 100

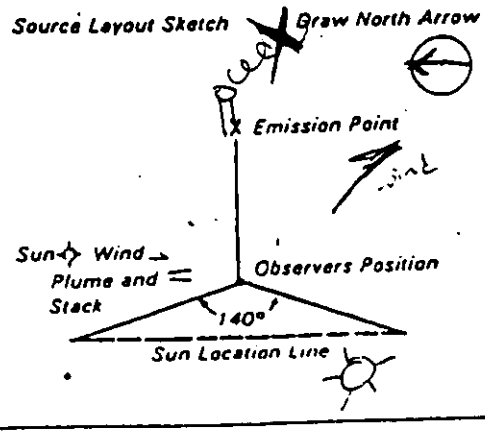
RESULTS

	RUN 1	RUN 2	RUN 3
$(\overline{\sqrt{\Delta P}})$	1.0383	1.0905	1.0133
$\overline{\Delta H}$	2.1144	2.7974	2.4526
$\overline{TS}$	258.2	256.6	256.8
$\overline{TM}$	73.8	114.5	111.0
V/STD	52.18	54.34	51.12
MC	12.96	12.30	12.35
$\overline{VEL}$	68.99	72.53	67.26
ISO%	100.83	98.93	100.42
ACFM	20,450	24,065	68,687
DSCFM	44,863	47,625	44,135

Visible Emission Observation Form

SOURCE NAME	Thorson Inc
ADDRESS	Malcolm Corner
CITY	Crookston
STATE	MN
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Asphalt Dryer Drum
OPERATING MODE	100% 330 TPH
CONTROL EQUIPMENT	Bag House Dust Eater
OPERATING MODE	Normal
DESCRIBE EMISSION POINT START	rectangular Stack
DESCRIBE EMISSION POINT STOP	rectangular Stack
HEIGHT ABOVE GROUND LEVEL START	50'
HEIGHT ABOVE GROUND LEVEL STOP	50'
HEIGHT RELATIVE TO OBSERVER START	50'
HEIGHT RELATIVE TO OBSERVER STOP	50'
DISTANCE FROM OBSERVER START	450'
DISTANCE FROM OBSERVER STOP	450'
DIRECTION FROM OBSERVER START	E
DIRECTION FROM OBSERVER STOP	E
DESCRIBE EMISSIONS START	rolling VOC
DESCRIBE EMISSIONS STOP	rolling VOC
EMISSION COLOR START	gray
EMISSION COLOR STOP	gray
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	20' from outlet
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	20' from outlet
DESCRIBE BACKGROUND START	Blue Sky
DESCRIBE BACKGROUND STOP	Blue Sky
BACKGROUND COLOR START	Blue
BACKGROUND COLOR STOP	Blue
SKY CONDITIONS START	Clear
SKY CONDITIONS STOP	P Cloudy
WIND SPEED START	0-5
WIND SPEED STOP	0-10
WIND DIRECTION START	From W
WIND DIRECTION STOP	W
AMBIENT TEMP START	68
AMBIENT TEMP STOP	80
WET BULB TEMP.	
RH.percent	

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	START TIME	STOP TIME
8/19/13	1711	1811

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

AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM	MAXIMUM
OBSERVER'S NAME (PRINT)	Timothy Nelson
OBSERVER'S SIGNATURE	Timothy Nelson
DATE	8/19/13
ORGANIZATION	Nova
CERTIFIED BY	ETA
DATE	4/1/13
VERIFIED BY	
DATE	

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE

DATE

Visible Emission Observation Form

This form is designed to be used in conjunction with EPA Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources." Any deviations, unusual conditions, circumstances, difficulties, etc., not dealt with elsewhere on the form should be fully noted in the section provided for comments. Following are brief descriptions of the type of information that needs to be entered on the form; for a more detailed discussion of each part of the form, refer to the "User's Guide to the Visible Emission Observation Form."

**Source Name - full company name, parent company or division information, if necessary.*

**Address - street (not mailing) address or physical location of facility where VE observation is being made.*

Phone - self-explanatory.

Source ID Number - number from NEDS, CDS, agency file, etc.

**Process Equipment, Operating Mode - brief description of process equipment (include ID no.) and operating rate, % capacity utilization, and/or mode (e.g., charging, tapping).*

**Control Equipment, Operating Mode - specify control device type(s) and % utilization, control efficiency.*

**Describe Emission Point - stack or emission point location, geometry, diameter, color; for identification purposes.*

**Height Above Ground Level - stack or emission point height, from files or engineering drawings.*

**Height Relative to Observer - indicate vertical position of observation point relative to stack top.*

**Distance From Observer - distance to stack ±10%; to determine, use rangefinder or map.*

**Direction From Observer - direction to stack; use compass or map; be accurate to eight points of compass.*

**Describe Emissions - include plume behavior and other physical characteristics (e.g., looping, lacy, condensing, fumigating, secondary particle formation, distance plume visible, etc.).*

**Emission Color - gray, brown, white, red, black, etc.*

Plume Type:
Continuous - opacity cycle >6 minutes
Fugitive - no specifically designed outlet
Intermittent - opacity cycle <6 minutes

***Water Droplets Present - determine by observation or use wet sling psychrometer; water droplet plumes are very white, opaque, and billowy in appearance, and usually dissipate rapidly.*

***If Water Droplet Plume:*
Attached - forms prior to exiting stack
Detached - forms after exiting stack

***Point in the Plume at Which Opacity was Determined - describe physical location in plume where readings were made (e.g., 4 in. above stack exit or 10 ft after dissipation of water plume).*

**Describe Background - object plume is read against, include atmospheric conditions (e.g., hazy).*

**Background Color - blue, white, new leaf green, etc.*

**Sky Conditions - indicate cloud cover by percentage or by description (clear, scattered, broken, overcast, and color of clouds).*

**Windspeed - use Beaufort wind scale or hand-held anomometer; be accurate to ±5 mph.*

**Wind Direction - direction wind is from; use compass; be accurate to eight points.*

**Ambient Temperature - in °F or °C.*

***Wet Bulb Temperature - the wet bulb temperature from the sling psychrometer.*

***Relative Humidity - use sling psychrometer; use local U.S. Weather Bureau only if nearby.*

**Source Layout Sketch - include wind direction, associated stacks, roads, and other landmarks to fully identify location of emission point and observer position.*

Draw North Arrow - point line of sight in direction of emission point, place compass beside circle, and draw in arrow parallel to compass needle.

Sun Location Line - point line of sight in direction of emission point, place pen upright on sun location line, and mark location of sun when pen's shadow crosses the observers position.

***Comments - factual implications, deviations, altercations, and/or problems not addressed elsewhere:*

Acknowledgment - signature, title, and date of company official acknowledging receipt of a copy of VE observation form.

**Observation Date - date observations conducted*

**Start Time, Stop Time - beginning and end times of observation period (e.g., 1635 or 4:35 p.m.).*

**Data Set - percent opacity to nearest 5%; enter from left to right starting in left column.*

**Average Opacity for Highest Period - average of highest 24 consecutive opacity readings.*

Number of Readings Above (Frequency Count) - count of total number of readings above a designated opacity.

**Range of Opacity Readings:*
Minimum - lowest reading
Maximum - highest reading

**Observer's Name - print in full.*

Observer's Signature, Date - sign and date after performing final calculations.

**Organization - observer's employer.*

**Certifier, Date - name of "smoke school" certifying observer and date of most recent certification.*

Verifier, Date - signature of person responsible for verifying observer's calculations and date of verification.

---

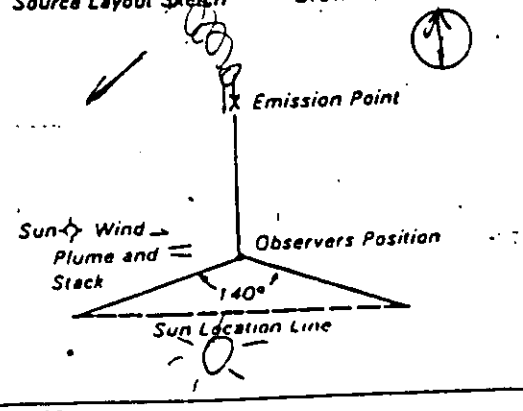
*Required by Reference Method 9; other items suggested

**Required by Method 9 only when particular factor could affect the reading

Visible Emission Observation Form

SOURCE NAME	Thoson Inc
ADDRESS	Warroad Airport
CITY	Warroad
STATE	MN
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Asphalt Drum
OPERATING MODE	100 / 300 TPH
CONTROL EQUIPMENT	Baghouse
OPERATING MODE	Normal
DESCRIBE EMISSION POINT START	rectangular Stack
DESCRIBE EMISSION POINT STOP	rectangular Stack
HEIGHT ABOVE GROUND LEVEL START	50'
HEIGHT ABOVE GROUND LEVEL STOP	50'
HEIGHT RELATIVE TO OBSERVER START	50'
HEIGHT RELATIVE TO OBSERVER STOP	50'
DISTANCE FROM OBSERVER START	150'
DISTANCE FROM OBSERVER STOP	150'
DIRECTION FROM OBSERVER START	
DIRECTION FROM OBSERVER STOP	
DESCRIBE EMISSIONS START	Rolling white
DESCRIBE EMISSIONS STOP	Rolling white
EMISSION COLOR START	White
EMISSION COLOR STOP	white
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	20' from outlet
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	20' from outlet
DESCRIBE BACKGROUND START	Blue Sky
DESCRIBE BACKGROUND STOP	Blue Sky
BACKGROUND COLOR START	Blue
BACKGROUND COLOR STOP	Blue
SKY CONDITIONS START	Clear
SKY CONDITIONS STOP	clear
WIND SPEED START	5-10
WIND SPEED STOP	5-10
WIND DIRECTION START	SW
WIND DIRECTION STOP	
AMBIENT TEMP START	80
AMBIENT TEMP STOP	80
WET BULB TEMP.	
RH,percent	

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	START TIME	STOP TIME
4/20/93	1505	1605

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

AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM	MAXIMUM
OBSERVER'S NAME (PRINT)	Timothy Nelson
OBSERVER'S SIGNATURE	Timothy Nelson
DATE	5/20/93
ORGANIZATION	Nova
CERTIFIED BY	ETA
DATE	4/1/93
VERIFIED BY	
DATE	
COMMENTS	
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	
TITLE	DATE

Visible Emission Observation Form

This form is designed to be used in conjunction with EPA Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources." Any deviations, unusual conditions, circumstances, difficulties, etc., not dealt with elsewhere on the form should be fully noted in the section provided for comments. Following are brief descriptions of the type of information that needs to be entered on the form; for a more detailed discussion of each part of the form, refer to the "User's Guide to the Visible Emission Observation Form."

**Source Name - full company name, parent company or division information, if necessary.*

**Address - street (not mailing) address or physical location of facility where VE observation is being made.*

Phone - self-explanatory.

Source ID Number - number from NEDS, CDS, agency file, etc.

**Process Equipment, Operating Mode - brief description of process equipment (include ID no.) and operating rate, % capacity utilization, and/or mode (e.g., charging, tapping).*

**Control Equipment, Operating Mode - specify control device type(s) and % utilization, control efficiency.*

**Describe Emission Point - stack or emission point location, geometry, diameter, color; for identification purposes.*

**Height Above Ground Level - stack or emission point height, from files or engineering drawings.*

**Height Relative to Observer - indicate vertical position of observation point relative to stack top.*

**Distance From Observer - distance to stack ±10%; to determine, use rangefinder or map.*

**Direction From Observer - direction to stack; use compass or map; be accurate to eight points of compass.*

**Describe Emissions - include plume behavior and other physical characteristics (e.g., looping, lacy, condensing, fumigating, secondary particle formation, distance plume visible, etc.).*

**Emission Color - gray, brown, white, red, black, etc.*

Plume Type:
Continuous - opacity cycle >6 minutes
Fugitive - no specifically designed outlet
Intermittent - opacity cycle <6 minutes

***Water Droplets Present - determine by observation or use wet sling psychrometer; water droplet plumes are very white, opaque, and billowy in appearance, and usually dissipate rapidly.*

***If Water Droplet Plume:*
Attached - forms prior to exiting stack
Detached - forms after exiting stack

***Point in the Plume at Which Opacity was Determined - describe physical location in plume where readings were made (e.g., 4 in. above stack exit or 10 ft after dissipation of water plume).*

**Describe Background - object plume is read against, include atmospheric conditions (e.g., hazy).*

**Background Color - blue, white, new leaf green, etc.*

**Sky Conditions - indicate cloud cover by percentage or by description (clear, scattered, broken, overcast, and color of clouds).*

**Windspeed - use Beaufort wind scale or hand-held anomometer; be accurate to ±5 mph.*

**Wind Direction - direction wind is from; use compass; be accurate to eight points.*

**Ambient Temperature - in °F or °C.*

***Wet Bulb Temperature - the wet bulb temperature from the sling psychrometer.*

***Relative Humidity - use sling psychrometer; use local U.S. Weather Bureau only if nearby.*

**Source Layout Sketch - include wind direction, associated stacks, roads, and other landmarks to fully identify location of emission point and observer position.*

Draw North Arrow - point line of sight in direction of emission point, place compass beside circle, and draw in arrow parallel to compass needle.

Sun Location Line - point line of sight in direction of emission point, place pen upright on sun location line, and mark location of sun when pen's shadow crosses the observers position.

***Comments - factual implications, deviations, altercations, and/or problems not addressed elsewhere.*

Acknowledgment - signature, title, and date of company official acknowledging receipt of a copy of VE observation form.

**Observation Date - date observations conducted*

**Start Time, Stop Time - beginning and end times of observation period (e.g., 1635 or 4:35 p.m.).*

**Data Set - percent opacity to nearest 5%; enter from left to right starting in left column.*

**Average Opacity for Highest Period - average of highest 24 consecutive opacity readings.*

Number of Readings Above (Frequency Count) count of total number of readings above a designated opacity.

**Range of Opacity Readings:*
Minimum - lowest reading
Maximum - highest reading

**Observer's Name - print in full.*

Observer's Signature, Date - sign and date after performing final calculations.

**Organization - observer's employer.*

**Certifier, Date - name of "smoke school" certifying observer and date of most recent certification.*

Verifier, Date - signature of person responsible for verifying observer's calculations and date of verification.

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*Required by Reference Method 9; other items suggested

**Required by Method 9 only when particular factor could affect the reading

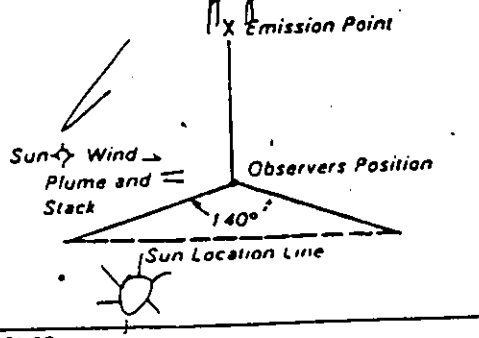
Visible Emission Observation Form

SOURCE NAME: Thorson Inc,	OBSERVATION DATE: 8/20/93	START TIME: 1255
ADDRESS: Warroad Airport.		STOP TIME: 1335

CITY: Warroad	STATE: MN	ZIP:
PHONE:	SOURCE ID NUMBER:	
PROCESS EQUIPMENT: Generator	OPERATING MODE: Norm	
CONTROL EQUIPMENT: Muffler	OPERATING MODE: Norm	
DESCRIBE EMISSION POINT: START Muffler pipe STOP Muffler pipe		
HEIGHT ABOVE GROUND LEVEL: START 15' STOP 15'	HEIGHT RELATIVE TO OBSERVER: START 15' STOP 15'	
DISTANCE FROM OBSERVER: START STOP	DIRECTION FROM OBSERVER: START STOP	
DESCRIBE EMISSIONS: START limited STOP limited		
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 4" from outlet STOP 4" from outlet		
DESCRIBE BACKGROUND: START Blue Sky STOP Blue Sky		
BACKGROUND COLOR: START Blue STOP Blue	SKY CONDITIONS: START Clear STOP Clear	
WIND SPEED: START 5-10 STOP 5-10	WIND DIRECTION: START SW STOP SW	
AMBIENT TEMP: START 80 STOP 80	WET BULB TEMP.	RH.percent

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

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS: MINIMUM	MAXIMUM
OBSERVER'S NAME (PRINT): Timothy Nelson	
OBSERVER'S SIGNATURE: Timothy Nelson	DATE: 8/20/93
ORGANIZATION: Nova	
CERTIFIED BY: ETA	DATE: 9/1/93
VERIFIED BY	DATE

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE — DATE

Visible Emission Observation Form

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*Source Name - full company name, parent company or division information, if necessary.

*Address - street (not mailing) address or physical location of facility where VE observation is being made.

Phone - self-explanatory.

Source ID Number - number from NEDS, CDS, agency file, etc.

*Process Equipment, Operating Mode - brief description of process equipment (include ID no.) and operating rate, % capacity utilization, and/or mode (e.g., charging, tapping).

*Control Equipment, Operating Mode - specify control device type(s) and % utilization, control efficiency.

*Describe Emission Point - stack or emission point location, geometry, diameter, color; for identification purposes.

*Height Above Ground Level - stack or emission point height, from files or engineering drawings.

*Height Relative to Observer - indicate vertical position of observation point relative to stack top.

*Distance From Observer - distance to stack ±10%; to determine, use rangefinder or map.

*Direction From Observer - direction to stack; use compass or map; be accurate to eight points of compass.

*Describe Emissions - include plume behavior and other physical characteristics (e.g., looping, lacy, condensing, fumigating, secondary particle formation, distance plume visible, etc.).

*Emission Color - gray, brown, white, red, black, etc.

Plume Type:
- Continuous - opacity cycle >6 minutes
- Fugitive - no specifically designed outlet
- Intermittent - opacity cycle <6 minutes

**Water Droplets Present - determine by observation or use wet sling psychrometer; water droplet plumes are very white, opaque, and billowy in appearance, and usually dissipate rapidly.

**If Water Droplet Plume:
- Attached - forms prior to exiting stack
- Detached - forms after exiting stack

**Point in the Plume at Which Opacity was Determined - describe physical location in plume where readings were made (e.g., 4 in. above stack exit or 10 ft after dissipation of water plume).

*Describe Background - object plume is read against, include atmospheric conditions (e.g., hazy).

*Background Color - blue, white, new leaf green, etc.

*Sky Conditions - indicate cloud cover by percentage or by description (clear, scattered, broken, overcast, and color of clouds).

*Windspeed - use Beaufort wind scale or hand-held anemometer; be accurate to ±5 mph.

*Wind Direction - direction wind is from; use compass; be accurate to eight points.

*Ambient Temperature - in °F or °C.

**Wet Bulb Temperature - the wet bulb temperature from the sling psychrometer.

**Relative Humidity - use sling psychrometer; use local U.S. Weather Bureau only if nearby.

*Source Layout Sketch - include wind direction, associated stacks, roads, and other landmarks to fully identify location of emission point and observer position.

Draw North Arrow - point line of sight in direction of emission point, place compass beside circle, and draw in arrow parallel to compass needle.

Sun Location Line - point line of sight in direction of emission point, place pen upright on sun location line, and mark location of sun when pen's shadow crosses the observers position.

**Comments - factual implications, deviations, altercations, and/or problems not addressed elsewhere.

Acknowledgment - signature, title, and date of company official acknowledging receipt of a copy of VE observation form.

*Observation Date - date observations conducted

*Start Time, Stop Time - beginning and end times of observation period (e.g., 1635 or 4:35 p.m.).

*Data Set - percent opacity to nearest 5%; enter from left to right starting in left column.

*Average Opacity for Highest Period - average of highest 24 consecutive opacity readings.

Number of Readings Above (Frequency Count) - count of total number of readings above a designated opacity.

*Range of Opacity Readings:
- Minimum - lowest reading
- Maximum - highest reading

*Observer's Name - print in full.

Observer's Signature, Date - sign and date after performing final calculations.

*Organization - observer's employer.

*Certifier, Date - name of "smoke school" certifying observer and date of most recent certification.

Verifier, Date - signature of person responsible for verifying observer's calculations and date of verification.

---

*Required by Reference Method 9; other items suggested

**Required by Method 9 only when particular factor could affect the reading

Nova
Environmental Services, Inc.

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: THORSON/WARROAD | Test No.: 1 | Run No.: 1
Source: BAGHOUSE OUTLET | Analyzed by: DWAYNE A. SMITH
Job No.: M93-742 | Date: 8-27-93 | Solvent: _____
Date Submitted: 8-24-93 | Transport Leakage: ___ No ___ Yes _____ ml

Filter Blank:

Filter No.: 00726
Final Wt. = 0.4893 g
Tare Wt. = 0.4893 g
Wt. Gain = 0.0000 g

Acetone Blank:

100 ml (Sample)
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Water Blank:

100 ml (Sample)
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Blank Correction Calculations:

Filter = (Wt. Gain) = 0.0000 g
Acetone = _____ ml x _____ g/100 ml = _____ g
Water = _____ ml x _____ g/100 ml = _____ g

Filter:

Filter No. 00723
Final Wt. = 0.4910 g
Tare Wt. = 0.4857 g
Wt. Gain = 0.0053 g
Less Blank = 0.0000 g
Corrected Gain = 0.0053 g

Probe and Front Half Wash:

Volume Of Solvent: _____ ml
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Impinger Water and Backhalf Wash:

Organic Extraction:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Inorganic Water Solubles:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Total Particulate:

Filter..... 0.0053 g
Front-Half Wash..... _____ g
Extraction..... _____ g
Water Solubles..... _____ g

Total Particulate..... _____ g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

**Tare weight here is of evaporating dish or beaker.

Nova
Environmental Services, Inc.

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: THORSON/WARROAD
Source: BAGHOUSE OUTLET
Job No.: M93-742
Date Submitted: 8-24-93

Test No.: 1 Run No.: 2
Analyzed by: DWAYNE A. SMITH
Date: 8-27-93 Solvent: _____
Transport Leakage: ___ No ___ Yes _____ ml

Filter Blank:

Filter No.: 00726
Final Wt. = 0.4893 g
Tare Wt. = 0.4893 g
Wt. Gain = 0.0000 g

Acetone Blank:

100 ml (Sample)
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Water Blank:

100 ml (Sample)
Final Wt. = _____
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Blank Correction Calculations:

Filter = (Wt. Gain) = 0.0000 g
Acetone = _____ ml x _____ g/100 ml = _____ g
Water = _____ ml x _____ g/100 ml = _____ g

Filter:

Filter No. 00724
Final Wt. = 0.5189 g
Tare Wt. = 0.4926 g
Wt. Gain = 0.0263 g
Less Blank = 0.0000 g
Corrected Gain = 0.0263 g

Probe and Front Half Wash:

Volume Of Solvent: _____ ml
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Impinger Water and Backhalf Wash:

Organic Extraction:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Inorganic Water Solubles:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Total Particulate:

Filter..... 0.0263 g
Front-Half Wash..... _____ g
Extraction..... _____ g
Water Solubles..... _____ g

Total Particulate..... _____ g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

**Tare weight here is of evaporating dish or beaker.

Nova
Environmental Services, Inc.

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: THORSON/WARROAD | Test No.: 1 | Run No.: 3
Source: BAGHOUSE OUTLET | Analyzed by: DWAYNE A. SMITH
Job No.: M93-242 | Date: 8-27-93 | Solvent: _____
Date Submitted: 8-24-93 | Transport Leakage: ___ No ___ Yes _____ ml

Filter Blank:

Filter No.: 00726
Final Wt. = 0.4893 g
Tare Wt. = 0.4893 g
Wt. Gain = 0.0000 g

Acetone Blank:

100 ml (Sample)
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Water Blank:

100 ml (Sample)
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Blank Correction Calculations:

Filter = (Wt. Gain) = 0.0000 g
Acetone = _____ ml x _____ g/100 ml = _____ g
Water = _____ ml x _____ g/100 ml = _____ g

Filter:

Filter No. 00725
Final Wt. = 0.5042 g
Tare Wt. = 0.4935 g
Wt. Gain = 0.0107 g
Less Blank = 0.0000 g
Corrected Gain = 0.0107 g

Probe and Front Half Wash:

Volume Of Solvent: _____ ml
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Impinger Water and Backhalf Wash:

Organic Extraction:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Inorganic Water Solubles:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Total Particulate:

Filter..... 0.0107 g
Front-Half Wash..... _____ g
Extraction..... _____ g
Water Solubles..... _____ g

Total Particulate..... _____ g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

**Tare weight here is of evaporating dish or beaker.

Nova
Environmental Services, Inc.

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: THORSON / MARCOUX
Source: BAGHOUSE OUTLET
Job No.: M93-742
Date Submitted: 8-24-93

Test No.: 1 Run No.: 1
Analyzed by: DWAYNE A. SMITH
Date: 8-27-93 Solvent: _____
Transport Leakage: ___ No ___ Yes _____ ml

Filter Blank:

Filter No.: 00726
Final Wt. = 0.4893 g
Tare Wt. = 0.4893 g
Wt. Gain = 0.0000 g

Acetone Blank:

100 ml (Sample)
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Water Blank:

100 ml (Sample)
Final Wt. = _____
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Blank Correction Calculations:

Filter = (Wt. Gain) = 0.0000 g
Acetone = _____ ml x _____ g/100 ml = _____ g
Water = _____ ml x _____ g/100 ml = _____ g

Filter:

Filter No. 00720
Final Wt. = 0.4998 g
Tare Wt. = 0.4906 g
Wt. Gain = 0.0092 g
Less Blank = 0.0000 g
Corrected Gain = 0.0092 g

Probe and Front Half Wash:

Volume Of Solvent: _____ ml
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Impinger Water and Backhalf Wash:

Organic Extraction:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Inorganic Water Solubles:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Total Particulate:

Filter..... 0.0092 g
Front-Half Wash..... _____ g
Extraction..... _____ g
Water Solubles..... _____ g

Total Particulate..... _____ g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

**Tare weight here is of evaporating dish or beaker.

Nova
Environmental Services, Inc.

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: THORSON/MARCOUX | Test No.: 1 | Run No.: 2
Source: BAGHOUSE OUTLET | Analyzed by: DWAYNE A. SMITH
Job No.: M93-742 | Date: 8-27-93 | Solvent: _____
Date Submitted: 8-24-93 | Transport Leakage: ___ No ___ Yes _____ ml

Filter Blank:

Filter No.: 00726
Final Wt. = 0.4893 g
Tare Wt. = 0.4893 g
Wt. Gain = 0.0000 g

Acetone Blank:

100 ml (Sample)
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Water Blank:

100 ml (Sample)
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Blank Correction Calculations:

Filter = (Wt. Gain) = 0.0000 g
Acetone = _____ ml x _____ g/100 ml = _____ g
Water = _____ ml x _____ g/100 ml = _____ g

Filter:

Filter No. 00721
Final Wt. = 0.4972 g
Tare Wt. = 0.4905 g
Wt. Gain = 0.0067 g
Less Blank = 0.0000 g
Corrected Gain = 0.0067 g

Probe and Front Half Wash:

Volume Of Solvent: _____ ml
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Impinger Water and Backhalf Wash:

Organic Extraction:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Inorganic Water Solubles:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Total Particulate:

Filter..... 0.0067 g
Front-Half Wash..... _____ g
Extraction..... _____ g
Water Solubles..... _____ g

Total Particulate..... _____ g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

**Tare weight here is of evaporating dish or beaker.

Nova
Environmental Services, Inc.

EPA METHOD 5
GRAVIMETRIC ANALYSIS LABORATORY DATA

Plant: THORSON/MARCOUX
Source: BAGHOUSE OUTLET
Job No.: M93-742
Date Submitted: 8-24-93
Test No.: 1
Analyzed by: DWAYNE A. SMITH
Date: 8-27-93
Run No.: 3
Solvent:
Transport Leakage: ___ No ___ Yes _____ ml

Filter Blank:

Filter No.: 00726
Final Wt. = 0.4893 g
Tare Wt. = 0.4893 g
Wt. Gain = 0.0000 g

Acetone Blank:

100 ml (Sample)
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Water Blank:

100 ml (Sample)
Final Wt. = _____ ;
Tare Wt. = _____ g
Wt. Gain = _____ g/100 ml

Blank Correction Calculations:

Filter = (Wt. Gain) = 0.0000 g
Acetone = _____ ml x _____ g/100 ml = _____ g
Water = _____ ml x _____ g/100 ml = _____ g

Filter:

Filter No. 00722
Final Wt. = 0.4988 g
Tare Wt. = 0.4941 g
Wt. Gain = 0.0047 g
Less Blank = 0.0000 g
Corrected Gain = 0.0047 g

Probe and Front Half Wash:

Volume Of Solvent: _____ ml
Final Wt. = _____ g
Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Impinger Water and Backhalf Wash:

Organic Extraction:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Inorganic Water Solubles:

Final Wt. = _____ g
**Tare Wt. = _____ g
Wt. Gain = _____ g
Less Blank = _____ g
Corrected Gain = _____ g

Total Particulate:

Filter..... 0.0047 g
Front-Half Wash..... _____ g
Extraction..... _____ g
Water Solubles..... _____ g

Total Particulate..... _____ g

Front-Half includes sampling train components up to and including the filter.
Back-Half is from the filter, up to and including the third impinger.

**Tare weight here is of evaporating dish or beaker.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

September 20, 1993

Nova Environmental Services, Inc.
1107 Hazeltine Blvd., Suite 420
Chaska, Minnesota 55318

Attention: Dwayne Smith

LABORATORY REPORT: #9871
NOVA PROJECT: #M93-742

SAMPLES COLLECTED: August 24, 1993
SAMPLES RECEIVED: August 24, 1993

Laboratory Log No.	Sample Identification	Sample Type	EPA Method 5 Particulate (grams)[1]
9871-01	T1R1	Probe Wash Acetone	0.0487
9871-02	T1R2	Probe Wash Acetone	0.0731
9871-03	T1R3	Probe Wash Acetone	0.0523
9871-04	T1R1	Condensible Back Half	0.0227
9871-05	T1R2	Condensible Back Half	0.3583
9871-06	T1R3	Condensible Back Half	0.2330
9871-07	T1R1	Marcoux Probe Wash Acetone	0.0219
9871-08	T1R2	Marcoux Probe Wash Acetone	0.0181
9871-09	T1R3	Marcoux Probe Wash Acetone	0.0178
9871-10	T1R1	Marcoux Condensible Back Half	0.1095
9871-11	T1R2	Marcoux Condensible Back Half	0.0956
9871-12	T1R3	Marcoux Condensible Back Half	0.0820
9871-13	T1R0	Acetone Blank	0.0002
9871-14	T1R0	Water Blank	0.0003

Interpoll Laboratories, Inc.
Laboratory Report #9871
Nova Environmental Services, Inc.

September 20, 1993

Laboratory Log No.	Sample Identification	Sample Type	Moisture (%)[2]
9871-15	T1R1M	Aggregate	5.48
9871-16	T1R2M	Aggregate	5.39
9871-17	T1R3M	Aggregate	4.02
9871-18	T1R1W	Aggregate	2.55
9871-19	T1R2W	Aggregate	2.66
9871-20	T1R3W	Aggregate	2.76

Interpoll Laboratories, Inc.
Laboratory Report #9871
Nova Environmental Services, Inc.

September 20, 1993
Page 3 of 4

Sample Identification: T1R1M
Sample Type: Used Oil
Laboratory Log Number: 9871-21

Parameter	Units	Method	Target Detection Limit	
Lead	%	SW-846, 6010	0.0003	0.008
Total fluorine	% w/w	SW-846, 9056	0.0002	0.0036
Total chlorine	% w/w	SW-846, 9056	0.001	0.026
Total bromine	% w/w	SW-846, 9056	0.0003	< 0.0003
Total PCB	mg/Kg	SW-846, 8080	1.1	< 1.1
Gross heating value	BTU/LB	ASTM D2419	5	18368
Sulfur	%	ASTM D1552	0.05	0.56
Ash	%	ASTM D874	0.01	0.84
Flashpoint	°F	ASTM D93	2	139
Specific gravity	60/60°F	ASTM D1298	0.0005	0.8937
Acidity		ASTM D1093	0.01	7.15

Interpoll Laboratories, Inc.
Laboratory Report #9871
Nova Environmental Services, Inc.

September 20, 1993

Sample Identification: T1R1(W)
Sample Type: Used Oil
Laboratory Log Number: 9871-22

Parameter	Units	Method	Target Detection Limit	
Lead	%	SW-846, 6010	0.0003	0.003
Total fluorine	% w/w	SW-846, 9056	0.0002	0.0029
Total chlorine	% w/w	SW-846, 9056	0.001	0.019
Total bromine	% w/w	SW-846, 9056	0.0003	< 0.0003
Total PCB	mg/Kg	SW-846, 8080	1.1	< 1.1
Gross heating value	BTU/LB	ASTM D2419	5	18630
Sulfur	%	ASTM D1552	0.05	0.55
Ash	%	ASTM D874	0.01	0.75
Flashpoint	°F	ASTM D93	2	138
Specific gravity	60/60°F	ASTM D1298	0.0005	0.8891
Acidity		ASTM D1093	0.01	7.54

Respectfully submitted,

Gregg W. Holman,
Laboratory Director

GWH/cg
< = less than
Invoice Enclosed

[1]Analysis performed by EPA Method 5.
[2]Analysis performed by ASTM Method D3174.

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

Nova
Environmental Services, Inc.

E.P.A. METHOD 3 ANALYSIS

JOB# M93-742 DATE OF ANALYSIS 8-24-93
SOURCE PORTABLE ASPHALT PLANT LEAK CHECK PERFORMED YES
SITE BAGHOUSE OUTLET TECHNICIAN DWAYNE A. SMITH
CITY/STATE MARCOUX CORNERS, MN. TYPE OF FUEL USED OIL

TEST/ RUN	READING NO.	BURET READING			CONCENTRATION (%v/v,dry)		F_o
		ZERO POINT	AFTER CO 2	AFTER O 2	CO_2	O_2	
AMBIENT AIR		0.00	99.97	79.07	0.03	20.90	0.0000
1/1	1	0.00	94.48	81.00	5.52	13.48	1.3442
	2	0.00	94.48	81.00	5.52	13.48	1.3442
	3	0.00	94.48	81.00	5.52	13.48	1.3442
1/2	1	0.00	94.40	81.05	5.60	13.35	1.3482
	2	0.00	94.40	81.05	5.60	13.35	1.3482
	3	0.00	94.40	81.05	5.60	13.35	1.3482
1/3	1	0.00	94.38	80.95	5.62	13.43	1.3292
	2	0.00	94.38	80.95	5.62	13.43	1.3292
	3	0.00	94.38	80.95	5.62	13.43	1.3292

CO_2	O_2	F_o
AVERAGE RUN 1 5.52	AVERAGE RUN 1 13.48	AVERAGE RUN 1 1.3442
AVERAGE RUN 2 5.60	AVERAGE RUN 2 13.35	AVERAGE RUN 2 1.3482
AVERAGE RUN 3 5.62	AVERAGE RUN 3 13.43	AVERAGE RUN 3 1.3292

Nova Environmental Services, Inc.

E.P.A. METHOD 3 ANALYSIS

JOB# M93-742 DATE OF ANALYSIS 8-24-93
SOURCE PORTABLE ASPHALT PLANT LEAK CHECK PERFORMED YES
SITE BAGHOUSE OUTLET TECHNICIAN DWAYNE A. SMITH
CITY/STATE WARROAD, MN. TYPE OF FUEL USED OIL

TEST/ RUN	READING NO.	BURET READING			CONCENTRATION (%v/v,dry)		F_o
		ZERO POINT	AFTER CO 2	AFTER O 2	CO_2	O_2	
AMBIENT AIR		0.00	99.97	79.07	0.03	20.90	0.0000
1/1	1	0.00	97.10	79.80	2.90	17.30	1.2414
	2	0.00	97.10	79.80	2.90	17.30	1.2414
	3	0.00	97.10	79.80	2.90	17.30	1.2414
1/2	1	0.00	97.28	79.60	2.72	17.68	1.1838
	2	0.00	97.28	79.60	2.72	17.68	1.1838
	3	0.00	97.28	79.60	2.72	17.68	1.1838
1/3	1	0.00	97.29	79.90	2.71	17.39	1.2952
	2	0.00	97.29	79.90	2.71	17.39	1.2952
	3	0.00	97.29	79.90	2.71	17.39	1.2952

CO_2	O_2	F_o
AVERAGE RUN 1 2.90	AVERAGE RUN 1 17.30	AVERAGE RUN 1 1.2414
AVERAGE RUN 2 2.72	AVERAGE RUN 2 17.68	AVERAGE RUN 2 1.1838
AVERAGE RUN 3 2.71	AVERAGE RUN 3 17.39	AVERAGE RUN 3 1.2952

Nomenclature

A	=	Cross-sectional area of duct
A_n	=	Cross-sectional area of nozzle
B_{ws}	=	Water vapor in gas stream, proportion by volume
C_a	=	Particulate Concentration, actual, wet basis - gr/acf
C_s	=	Particulate concentration at dry standard conditions - gr/dscf
%EA	=	Excess air, percent by volume
G_d	=	Specific gravity relative to air, dimensionless
I	=	Isokinetic variation, percent by volume
M_d	=	Molecular weight of flue gas, dry, lb/lb-mole
M_g	=	Mass flow of wet flue gas, lb/hr
M_n	=	Total particulate collected, grams
M_p	=	Particulate mass flow, lb/hr
M_s	=	Molecular weight of flue gas, wet, lb/lb-mole
P_b	=	Barometric pressure, uncompensated, inches of mercury
P_g	=	Static pressure of duct, inches of water
P_s	=	Absolute gas pressure of duct, inches of mercury
Q	=	Actual flue gas volumetric flow rate, acfm
Q_{sd}	=	Dry flue gas volumetric flow rate corrected to standard conditions, dscfm
T_m	=	Average dry gas meter temperature, °R
T_s	=	Average stack gas temperature, °R
ϕ	=	Total sampling time, minutes
V_{lc}	=	Total volume of liquid collected in impingers and desiccant, ml
V_m	=	Volume of gas sample measured by gas meter, cubic feet
V_{std}	=	Volume of gas sample corrected to standard conditions, dry standard cubic feet
V_w	=	Volume of water vapor in gas sample, corrected to standard conditions
V_s	=	Linear velocity of flue gas, feet per second
Y	=	Dry gas meter calibration factor
ΔH	=	Orifice meter differential pressure, inches of water
ΔP	=	Velocity pressure of flue gas, inches of water
p	=	Actual gas density, pounds per cubic feet

Calculation Equations

EPA Method 2

$$V_s = 85.49\ C_p\ (\Delta p_{(avg)})^{1/2} \left[\frac{Ts}{P_s M_s} \right]^{\frac{1}{2}}$$

$$Q = 60\ V_s A$$

$$Q = Q\ (1\text{-}B_{ws}) \left[\frac{528}{T_s} \right] \left[\frac{P_s}{29.92} \right]$$

$$M_g = \frac{4.995\ Q_{sd}\ G_d}{1\text{-}B_{ws}}$$

$$p = \frac{0.04585\ P_s M_s}{T_s}$$

Calculation Equations

EPA Method 3

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%0_2) + (0.28\ [\%N_2 + \%CO)])$$

$$M_s = M_d\ (1\text{-}B_{ws}) + 18\ B_{ws}$$

$$F_o = \frac{20.9 - \%0_2}{\%CO_2}$$

Calculation Equations

EPA Method 5

$$V_{std} = 17.647\ V_m\ Y \left[\frac{P_b + \blacktriangle H/13.6}{T_m} \right]$$

$$V_w = 0.047070\ V_{lc}$$

$$B_{ws} = \frac{V_w}{V_w + V_{std}}$$

$$C_s = 15.432 \left[\frac{M_n}{V_{std}} \right]$$

$$C_a = 272.22 \left[\frac{M_n\ P_s}{T_s\ V_w + V_{std}} \right]$$

$$M_p = 0.00857\ C_s\ Q_{sd}$$

$$I = 0.09450 \left[\frac{T_s\ V_m}{P_s\ V_s\ A_n\ \phi\ (1-B_{ws})} \right]$$

REPORT NOMENCLATURE

acfm	Actual cubic feet per minute
°C	Degrees Centigrade
C_1	Results reported as carbon
cc(ml)	Cubic centimeter (milliliter)
cfh	Cubic feet per hour
cu. ft.	Cubic feet
dscfm	Dry standard cubic feet per minute
°F	Degrees Fahrenheit
dia	Diameter
ft./sec.	Feet per second
gph	Gallons per hour
gpm	Gallons per minute
gr/acf	Grains per actual cubic foot
gr/dscf	Grains per dry standard cubic foot
gr/dscf @ 12% CO_2	Grains per dry standard cubic foot corrected to 12 percent carbon dioxide
gr/dscf @ 7% O_2	Grains per dry standard cubic foot corrected to 7 percent oxygen
g	Gram
hrs	Hours
in	Inches
in Hg	Inches of mercury
in H_2O	Inches of water
in WC	Inches of water column
Klb/hr	Thousand pounds per hour
lb	Pound
lb/dscf	Pounds per dry standard cubic foot
lb/hr	Pounds per hour
lb/MMBTU	Pounds per million British Thermal Units heat input
MW	Megawatt
mg	Milligram
mg/dscm	Milligrams per dry standard cubic meter
min	Minutes
ppm	Parts per million by volume
ppm w/w	Parts per million by weight
PSIA	Pounds per square inch - actual
PSIG	Pounds per square inch - gauge
°R	Degress Rankin
sec.	Seconds
sq. ft.	Square Feet
tph	Tons per hour
ug	Microgram
%v/v	percent by volume
%w/w	Percent by weight

NOZZLE CALIBRATION DATA SHEET

NOZZLE IDENTIFICATION NUMBER: NS1-8

FIELD TECHNICIAN: D. Smith

DATE OF CALIBRATION: on site

POSITION	DIAMETER (INCHES)
1	.241 IN.
2	.240 IN.
3	.240 IN.
AVERAGE:	.240 IN.

NOTE: Nozzle is rotated by 60 degree increments and diameter measured to the nearest 0.001 inch.

S-TYPE PITOT TUBE INSPECTION SHEET

PITOT NUMBER: PTB-4

DATE OF INSPECTION: 6/2/93

TECHNICIAN: D. Smith.

PITOT TUBE DIMENSIONS:

External tubing diameter (D_t)	____	IN.	(.1875≥.375)
Base to Side A opening plane (P_A)	____	IN.	(A=B)
Base to Side B opening plane (P_B)	____	IN.	(1.05D_t≥1.50D_t)
Side A to Side B opening plane (P)	____	IN.	(P_A + P_B)

ALIGNMENT:

a_1 ≤ 10°	Ø	degrees	
a_2 ≤ 10°	Ø	degrees	
B_1 ≤ 5°	Ø	degrees	
B_2 ≤ 5°	Ø	degrees	
Z ≤ .125"	Ø.1	IN.	
W ≤ .03125"	Ø	IN.	

DISTANCE FROM PITOT TO PROBE COMPONENTS:

Pitot to 0.500" nozzle	Ø.75	IN.	≥ .750
Pitot to probe sheath	3.00	IN.	≥ 3.00
Pitot to thermocouple (parallel to probe)	Ø.75	IN.	≥ .750
Pitot to thermocouple (perpendicular to probe)	2ØØ	IN.	≥ 2.00

GRASEBY
NUTECH-RTL

C A L I B R A T I O N S H E E T

Customer : NOVA Serial : 80672
Date : 4/5/93

CALCULATION DATA FOR RUN :	1	2	3
1. Barometric Pressure, P(B):	30.20	30.20	30.20
2. Orifice Setting, Delta H :	2.00	0.75	6.00
3. Finial Reading (Test) :	958.632	969.414	980.015
4. Initial Reading (Test) :	948.065	958.835	969.678
5. Volume, V(T) Cubic Feet :	10.567	10.579	10.337
6. Temp Initial T(T(I)) F :	68	68	69
7. Temp Finial T(T(F)) F :	68	69	69
8. Finial Reading (Box) :	86.090	97.026	107.659
9. Initial Reading (Box) :	75.400	86.300	97.302
10. Volume, V(B) Cubic Feet :	10.690	10.726	10.357
11. Temp Initial T(B(I)) F :	73	75	75
12. Temp Final T(B(F)) F :	77	75	82
13. Elapsed Time, Minutes :	14.0	22.0	8.0
Delta H(a) :	1.9202	1.7775	1.9603
Gamma :	0.9967	0.9966	1.0014

Calibration Performed By : Alexander F. Patterson

GRASEBY NUTECH-RTL
4022 STIRRUP CREEK DRIVE, SUITE 325, DURHAM, NC 27703-9000, USA
TEL: 919 544 5775 FAX: 919 544 5774

EPA METHOD 5 GAS METERING SYSTEM
QUALITY CONTROL CHECK DATA SHEET

PROJECT NAME THERSON/WARROAD TEST NO. 1 DATE 5-18-93

SOURCE BAGHOUSE OUTLET OPERATOR D. SMITH

BAR. PRESS. 29.80 IN. Hg τ = 10 $\Delta H@$ 1.89 IN. W.C.

TIME (MIN.)	VOLUME (CF)	METER TEMP. (° F)	
		INLET	OUTLET
	(436.30)	66	63
2.5	438.16	65	61
5.0	440.01	66	61
7.5	441.88	68	62
10	443.73	69	62
	Vm = 7.43	(AVG t_m) = 64.3	°F

$$Yc = \frac{10}{Vm}\left[\frac{0.0319\ (\ T_m + 460\ )}{P\ bar}\right]^{0.5}$$

$$Yc = \frac{10}{(\quad)}\left[\frac{0.0319((\quad) + 460)}{(\quad)}\right]^{0.5}$$

Yc = _____ (MUST BE 0.97 – 1.03)

EPA METHOD 5 GAS METERING SYSTEM
QUALITY CONTROL CHECK DATA SHEET

PROJECT NAME THOESON/MARCOLE TEST NO. 1 DATE 8-19-93

SOURCE BAGHOUSE OUTLET OPERATOR DWAYNE A. SMITH

BAR. PRESS. 29.88 IN. Hg γ = 1.0 $\Delta H@$ 1.89 IN. W.C.

TIME (MIN.)	VOLUME (CF)	METER TEMP. (° F)	
		INLET	OUTLET
	(493.50)	65	64
2.5	495.38	65	61
5.0	497.25	65	61
7.5	499.17	66	61
10	501.05	67	61
	Vm = 7.55	(AVG t_m) =	63.4 °F

$$Yc = \frac{10}{Vm}\left[\frac{0.0319\ (\ T_m\ +\ 460\ )}{P\ bar}\right]^{0.5}$$

$$Yc = \frac{10}{(\quad)}\left[\frac{0.0319((\quad)\ +\ 460)}{(\quad)}\right]^{0.5}$$

Yc = _____ (MUST BE 0.97 – 1.03)

Nova
Environmental Services, Inc.

Minneapolis Office ☒
1107 Hazeltine Blvd, Ste. 420
Chaska, MN 55318
(612) 448-9393
Fax # 612-448-9572

Chicago Office ☐
O'Hare Atrium Office Plaza, Ste 170
2860 River Road
Des Plaines, Il 60018
(312) 803-4510
Fax # 312-803-0780

Chain of Custody Record

M93742

Name of Project

Project Number

Project Manager: TRN

Laboratory: Interpoll

Special Instructions

Sample No.	Date	No. & Vol. of Containers	Sample Location	Requested Analysis: EPA Met 5 probe wash	EPA Met 5 Condensible					Sample Description / Remarks
TIR1	8/24	1 Jar		X						W probe wash Acetone
TIR2	↓	↓		X						
TIR3				X						
TIR1					X					W condensible both half.
TIR2					X					
TIR3	↓	↓			X					

Sampler (Signature)	Relinquished By	Affiliation	Date	Time	Received By	Affiliation	Date	Time
J. Robert Nelson					Monty	420	8/24	9:40
Affiliation: Nova								
Date: 8/23/93	Time: 1700							

Nova
Environmental Services, Inc.

Minneapolis Office ☒
1107 Hazeltine Blvd. Ste. 420
Chaska, MN 55318
(612) 448-9393
Fax # 612-448-9572

Chain of Custody Record

Chicago Office ☐
O'Hare Atrium Office Plaza, Ste 170
2860 River Road
Des Plaines, Il 60018
(312) 803-4510
Fax # 312-803-0780

Name of Project

Project Number 1193 742

Project Manager

Laboratory
Interpoll

Special Instructions

Sample No.	Date	No. & Vol. of Containers	Sample Location	Requested Analysis: EPA Met. 5 Probe wash	EPA Met. 5 Organics					Sample Description / Remarks
TIP1	8/24	1 Jar	Probe wash	X						Marcoux probe wash Acetone
TIR2	↓	1 Jar	↓	X						
TIR3	↓	1 Jar	↓	X						
TIF1		2 Jars	Condensibles		X					
TIF2		2 Jars	↓		X					Marcoux Back half Condensible
TIF3		2 Jars	↓		X					organics
TIC0			Blanks							Acetone Blank
TIR0	↓		↓							Water Blank

Sampler (Signature)	Relinquished By	Affiliation	Date	Time	Received By,	Affiliation	Date	Time
Michael Nelson	Michael Nelson	Nova	8/23/93	1630	Matt Lyon	RR	8/24	9:40
Affiliation: Nova								
Date: 8/23/93								
Time: 1630								

Nova Environmental Services, Inc.

Minneapolis Office ☒
1107 Hazeltine Blvd. Ste. 420
Chaska, MN 55318
(612) 448-9393
Fax # 612-448-9572

Chicago Office ☐
O'Hare Atrium Office Plaza, Ste 170
2860 River Road
Des Plaines, Il 60018
(312) 803-4510
Fax # 312-803-0780

Chain of Custody Record

Name of Project

Project Number 1113 742

Project Manager TRN

Laboratory Interpoll

Special Instructions

Sample No.	Date	No. & Vol. of Containers	Sample Location	Requested Analysis: Sulfur % weight (ASTM D1552)	Ash % weight (ASTM D274)	Gross heating value (ASTM D240)	Spec. Gravity (ASTM D1298)	Lead % weight (ASTM D3788)	PCB (ppm) weight (EPA 600/4-91-059)	Halogens (ASTM D 1317)	Water weight (ASTM D 95)	Acidity (ASTM D 908)	Flash Point (ASTM D93)	Sample Description / Remarks
T1119	8/24	1 Jar		X	→	→	→	→	→	→	→	→	→	Used Oil Fuel Asphalt Plant
T1120	8/24	1 Jar		X	→	→	→	→	→	→	→	→	→	Used Oil Fuel Asphalt Plant

Sampler (Signature)	Relinquished By	Affiliation	Date	Time	Received By	Affiliation	Date	Time
[signature]	[signature]	[illegible]	8/24/93	9:30	[signature]	ADOR	8/24	9:40
Affiliation: Nova								
Date: 8/23/93	Time: 15:00							

Nova Environmental Services, Inc.

Minneapolis Office ☒
1107 Hazeltine Blvd. Ste. 420
Chaska, MN 55318
(612) 448-9393
Fax # 612-448-9572

Chain of Custody Record

Chicago Office ☐
O'Hare Atrium Office Plaza, Ste 170
2860 River Road
Des Plaines, Il 60018
(312) 803-4510
Fax # 312-803-0780

M93-742

Name of Project | Project Number | Project Manager: TKN

Laboratory: Interpoll

Special Instructions

Sample No.	Date	No. & Vol. of Containers	Sample Location	Requested Analysis: Moisture ASTM						Sample Description / Remarks
T1R1M	8/24	1 Jar		X						Aggregate } Mineux
T1R2M	↓	↓		X						
T1R3M	↓	↓		X						
T1R1U	8/24	1 Jar		X						Aggregate } U
T1R2U	↓	↓		X						
T1R3U	↓	↓		X						

Sampler (Signature)	Relinquished By	Affiliation	Date	Time	Received By	Affiliation	Date	Time
Richard Nelson	[illegible]				Marty Zdo	RR	8/24	9:40
Affiliation: Nova								
Date: 8/23/93	Time: 1600							

Asphalt Plant Operating Conditions During Stack Testing

Rev/YH/93

Test Date(s) 8-19-93

Plant Mfr. & Model Boeing Portable

Type (circle one): Drum Mix | Conventional

Other (list): _____

Pollution Control Equipment: Baghouse Venturi Scrubber wet scrubber cyclone multiclone
(circle one)

List model: Dust-Eater

If wet scrubbing: _____% scrubber water recycled

Normal pressure drop across control equipment: _____ inches water

Air flow through control equipment: _____ acfm at _____ F

Was control equipment operating normally during testing? _____

Date & procedures of last maintenance/cleaning of control equipment NEW

Fuel:

Itemize all fuels and materials added to the combustion process during the test period. List fuel type used during testing (if oil, specify grade) _____. If other units of measure are used, specify and calculate appropriate heat input.

Test No.___	Fuel Input (Gal/hr)	BTU/GAL (as received)	Heat Input (BTU/HR)	%Moisture (as received in aggregate) Virgin	recycle	combined
Run 1				5.5/4.4	3.9	
Run 2				5.4	3.9	
Run 3						

Is the above fuel substantially the highest sulfur containing fuel normally burned? _____

Production specific fuel usage: (circle one) measured or calculated: _____ cubic foot/ ton hot mix

_____ gal/ton hot mix

No. of Burners: _____ Burner(s) rating: _____ MMBTU/HR = 100% setting

Operation:

	time 15 min. intervals	burner setting %	aggregate tons per hour	recycle tons per hour	asphalt tons per hour	Drum Mix temp. F	dust collector pressure drop inches water	scrubber water flow rate gpm	Other (list)	
1	11:10	4	320	75	18.5	260	5.7			393.5
2	11:25	4	319	73	18.6	261	5.8			409.6
3	11:40	3.75	315	72	18.4	270	5.6			406.4
4	11:55	4	317	74	18.2	270	5.6			409.2
5	12:10	3.75	320	76	19.0	265	5.6			416
	12:14	3.5	324	75	18.9	257	5.2			417.9
										408.4
	1:15	4	319	78	19.4	260	5.8			415.4
	1:30	3.5	314	75	17.3	262	5.7			408.3
	1:45	3.5	317	76	18.5	265	5.6			411.5
	2:00	3.5	316	74	18.3	260	5.7			410.3
	2:15	3.5	320	74	18.5	270	5.6			412.9
	2:30	3.5	317	73	18.3	265	5.6			408.3
										411.1

Plant Operator's Certification: I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By: Kim D. Lebreton, Phone: (318) 757-2335

Position: Foreman

Note: All information required must be completed and submitted as part of the performance test. Failure to submit the required information will result in an incomplete performance test report.

Marcoux

Asphalt Plant Operating Conditions During Stack Testing

Rev/YH/93

Test Date(s) 8-19-93

Plant Mfr. & Model Boeing Portable

Type (circle one): | Drum Mix | Conventional

Other (list): _____

Pollution Control Equipment: Baghouse Venturi Scrubber wet scrubber cyclone multiclone

(circle one)

If wet scrubbing: _____% scrubber water recycled

List model: Dust-Eater

Normal pressure drop across control equipment: _____ inches water

Air flow through control equipment: _____ acfm at _____ F

Was control equipment operating normally during testing? yes

Date & procedures of last maintenance/cleaning of control equipment New

Fuel:

Itemize all fuels and materials added to the combustion process during the test period. List fuel type used during testing (if oil, specify grade) _____. If other units of measure are used, specify and calculate appropriate heat input

Test No.___	Fuel Input (Gal/hr)	BTU/GAL (as received)	Heat Input (BTU/HR)	%Moisture (as received in aggregate) Virgin	recycle	combined
Run 1				~~4.6~~	~~4.0~~	
Run 2				~~4.6~~	~~4.0~~	
Run 3				4.6	4.0	

Is the above fuel substantially the highest sulfur containing fuel normally burned? _____

Production specific fuel usage: (circle one) measured or calculated: _____ cubic foot/ ton hot mix

_____ gal/ton hot mix

No. of Burners: _____ Burner(s) rating: _____ MMBTU/HR = 100% setting

Operation:

time 15 min. intervals	burner setting %	aggregate tons per hour	recycle tons per hour	asphalt tons per hour	Drum Mix temp. F	dust collector pressure drop inches water	scrubber water flow rate gpm	Other (list)
7:00	3.75	318	74	18.7	270	5.8		410.7
7:15	4.00	321	74	19.3	260	5.7		413.3
7:30	3.75	318	72	18.5	260	5.6		408.9
7:45	3.75	317	72	18.6	260	5.7		407.6 410.0
8:00								
8:15								
8:30	3.75	315	75	18.7	260	6.2		
8:45	3.50	315	73	18.2	260	5.1		
9:00	3.50	318	76	18.4	255	5.6		
9:15	3.50	315	76	18.4	255	5.8		

Plant Operator's Certification: I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By: Kirk D. Schneider Phone: (218)-749-2335

Position: Foreman

Note: All information required must be completed and submitted as part of the performance test. Failure to submit the required information will result in an incomplete performance test report.

Warroad

Asphalt Plant Operating Conditions During Stack Testing

Rev/YH/93

Test Date(s) 8-20-93

Plant Mfr. & Model Boeing 600

Type (circle one): Drum Mix Conventional

Other (list):

Pollution Control Equipment: (circle one) Baghouse Venturi Scrubber wet scrubber cyclone multiclone

If wet scrubbing: ____% scrubber water recycled

List model: P-70-1008

Normal pressure drop across control equipment: 4-6 inches water

Air flow through control equipment: 20000 acfm at 250° F

Was control equipment operating normally during testing? yes

Date & procedures of last maintenance/cleaning of control equipment

Fuel:

Itemize all fuels and materials added to the combustion process during the test period. List fuel type used during testing (if oil, specify grade) _____. If other units of measure are used, specify and calculate appropriate heat input.

Test No.___	Fuel Input (Gal/hr)	BTU/GAL (as received)	Heat Input (BTU/HR)	%Moisture (as received in aggregate) Virgin	recycle	combined
Run 1						
Run 2						
Run 3						

Is the above fuel substantially the highest sulfur containing fuel normally burned? _____

For production specific fuel usage: (circle one) measured or calculated: _____cubic foot/ ton hot mix

_____gal/ton hot mix

No. of Burners: _____ Burner(s) rating: _____ MMBTU/HR = 100% setting

Operation:

time 15 min. intervals	burner setting %	aggregate tons per hour	recycle tons per hour	asphalt tons per hour	Drum Mix temp. F	dust collector pressure drop inches water	scrubber water flow rate gpm	Other (list)
8:05	19	295	—	16.4	275°	6.2	—	—
8:20	19	296		16.4	275	6.2	—	—
8:35	19	295	—	16.4	275	6.2	—	—
8:50	19	295	—	16.4	275	6.2		
11:10	22	297		16.8	275	6.2	—	—
11:25	22	297		16.8	275	6.2	—	—
11:40	20	298		16.8	275	6.2	—	—
11:55	20	297		16.8	275	6.2	—	—
12:10	20	297		16.8	275	6.2	—	—
1:20	20	299		16.7	275	6.0	—	—
1:35	20	299		16.7	275	6.0	—	—
1:50	20	299		16.7	275	6.0	—	—
2:05	20	299		16.7	275	6.0	—	—

Plant Operator's Certification: I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By: [signature] , Phone: (218) 751-5413

Position: Plant Operator

Note: All information required must be completed and submitted as part of the performance test. Failure to [illegible]

Thorson, Inc.

P.O. Box 40
4101 Bemidji Avenue No.
Bemidji, MN 56601
218-751-5413

September 8, 1993

Timothy Nelson
Nova Environmental Services, Inc.
Suite 400, Hazeltine Gates
1107 Hazeltine Blvd
Chaska, Mn 55318

Dear Timothy,

Enclosed are the information sheets for each plant you tested for us, you will need them to complete the test reports.

Also, I will be in touch with you next week in regard to the testing the week of the 20th of September.

Please call me if you need any additional information.

Sincerely,

THORSON, INC.

Thomas J. Downs
Office Manager

TJD/kn

Enclosure

Asphalt Plant Information Sheet

Manufacturer and Model No. of the Plant: *Boeing PSI 425*

Owner and Operator of the Plant: *Thorson, Inc.*

Location of Plant at time of Test (State County and Address): *Minnesota, Red Lake County*

TH 32 & TH 2 intersection

Estimated Total Time of the Plant at this Site (from when to when): *7-23-93 to 9-23-93*

Type of Pollution Control Equipment (wet scrubber, mechanical collector, baghouse, etc.: *Baghouse*

Model No. of Pollution Control Equipment: *P-70-1008*

If wet scrubber, provide the following information:

Percent recycle of scrubber water _____ %

Flow of water to scrubber _____ GPM

Manufacturer recommended pressure drop across venturi _____ IN.WC.

Rated Capacity of Asphalt Plant: *600* TON/HR

at an aggregate moisture content of: *4-6* %

Type of Fuel Used to Fire Plant:

____	Natural Gas	____	Propane
____	No. 2 Fuel Oil	_X_	Other *Waste Oil*
____	No. 5 Fuel Oil		

Normal Production Rate of Plant: *400-425* TONS/HR

at an aggregate moisture content of: *4-6* %

NOTE: Attach drawings of plant and pollution control equipment.

Name of Individual Supply Information: *John Leseman*

Date: *9-2-93*

REQUIRED DATA
for
COMBUSTION SOURCES

Company Name *Thorson, Inc.*

C. Fuel Input

1. Itemize all fuels and materials that are added to the combustion process during the test period. Attach ultimate analysis of the fuel.

FUEL DESCRIPTION Coal:State, City, Mine Oil: Specify Grade	INPUT (LBS/HR) (GAL/HR)	& MOISTURE As Rec'd	As Rec'd (BTU/LB) (BTU/GAL)	HEAT INPUT (BTU/HR)
No. 1 *Waste Oil*				
No. 2 *Waste Oil*				
No. 3 *Waste Oil*				

TOTAL _____

2. Are the above fuels substantially the same as those normally burned? *yes*. If not, explain _____.

3. Are the above fuels normally burned in the proportions shown above? *yes*. If not, explain _____.

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months.

None.

D. Equipment & Operating Data

1. Furnace No. _____.

2. Furnace Mfg. _____.

3. Type of Firing _____.

4. Furnace operating under normal operating conditions: No _____;

Yes _____.

5. Specify normal soot blowing frequency:

   a) source operating time blowing soot: _____ minutes/shift

   b) number of shifts per day _____

6. Specify soot blowing time during the test: start _____ end _____. When was the last time before the test that you blew soot: (date & time) _____.

7. Specify normal ash pulling frequency:

   a) source operating time pulling ashes: _____ minutes/shift

   b) number of shifts per day _____

8. Specify ash pulling time during the test: start _____ end _____. When was the last time before the test that you pulled ashes: (date & time) _____.

9. Date and procedures of last maintenance/cleaning of the boiler (please attach) _____.

E. Instrument Data

1. Include a copy of chart records during test for the combustion efficiency indices (CO, O_2, CO_2, combustibles, steam flow, air flow, etc.)

F. Air Pollution Control Equipment

1. Type/model control equipment *Baghouse Dusteater P-70-1003*.

2. Air pressure drop across the control equipment *1-10*.

3. Air flow through the control equipment *70,000*.

4. Was the control equipment operating normally? *yes*.

5. Date and procedures of last maintenance/cleaning of control equipment.

New Equipment

Plant Operator's Certification

I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By *John Leseman*, Position *Foreman*

John Leseman

REQUIRED DATA
for
PROCESS EMISSIONS

Company Name *Thorson, Inc.*

C. Equipment & Operating Data

1. Process Equipment No./Ident. *Boeing Asphalt Plant #2*.

2. Process Equipment Description *Boeing Drum Mix Asphalt Plant*

3. Process equipment operating under normal operating conditions?

   No _____. Yes *X*. Process rate during the test *395-405*.
   (raw materials or finished product)

D. Instrument Data on Process Equipment

1. Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, lbs. per hour, pressure, air flow, etc.

E. Air Pollution Control Equipment

1. Type/model of control equipment *Baghouse Dust Eater P-70-1008*.

2. Air pressure drop across the control equipment *1-10*.

3. Air flow through the control equipment *70,000*.

4. Was the control equipment operating normally? *yes*.

5. Data of last major maintenance/cleaning of control equipment _____

   New Equipment.

F. Plant Manager's Certification

I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By *John Leseman*, Position *Foreman*.

John Leseman

lmb1770

Asphalt Plant Information Sheet

Manufacturer and Model No. of the Plant: *Boeing PSI 425*

Owner and Operator of the Plant: *Thorson, Inc.*

Location of Plant at time of Test (State County and Address): *Minnesota, Roseau County*
Warroad Airport, Warroad, Minnesota

Estimated Total Time of the Plant at this Site (from when to when): *9-22-92 to 9-07-93*

Type of Pollution Control Equipment (wet scrubber, mechanical collector, baghouse, etc.: *Baghouse*

Model No. of Pollution Control Equipment: *P-70-1008*

If wet scrubber, provide the following information:

Percent recycle of scrubber water _____ %

Flow of water to scrubber _____ GPM

Manufacturer recommended pressure drop across venturi _____ IN.WC.

Rated Capacity of Asphalt Plant _____ TON/HR

at an aggregate moisture content of _____ %

Type of Fuel Used to Fire Plant:

____ Natural Gas
____ Propane
____ No. 2 Fuel Oil
X Other *Waste Oil*
____ No. 5 Fuel Oil

Normal Production Rate of Plant: *275-325* TONS/HR

at an aggregate moisture content of: *4 - 5* %

NOTE: Attach drawings of plant and pollution control equipment.

Name of Individual Supply Information: *John Leseman*

Date: *9-02-93*

REQUIRED DATA
for
COMBUSTION SOURCES

Company Name *Thorson, Inc.*

C. Fuel Input

1. Itemize all fuels and materials that are added to the combustion process during the test period. Attach ultimate analysis of the fuel.

FUEL DESCRIPTION Coal:State, City, Mine Oil: Specify Grade	INPUT (LBS/HR) (GAL/HR)	& MOISTURE As Rec'd	As Rec'd (BTU/LB) (BTU/GAL)	HEAT INPUT (BTU/HR)
No. 1 *Waste Oil*	*947 gals/hr*			
No. 2 *Waste Oil*	*947 gals/hr*			
No. 3 *Waste Oil*	*947 gals/hr*			

TOTAL _____

2. Are the above fuels substantially the same as those normally burned? *yes*. If not, explain _____.

3. Are the above fuels normally burned in the proportions shown above? *No*. If not, explain *The burner fuel burned on the test day was not good fuel, we had to increase % fuel for tons dried*.

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months.

D. Equipment & Operating Data

1. Furnace No. _____.

2. Furnace Mfg. _____.

3. Type of Firing _____.

4. Furnace operating under normal operating conditions: No _____;

Yes _____.

5. Specify normal soot blowing frequency:

   a) source operating time blowing soot: _____ minutes/shift

   b) number of shifts per day _____

6. Specify soot blowing time during the test: start _____ end _____. When was the last time before the test that you blew soot: (date & time) _____.

7. Specify normal ash pulling frequency:

   a) source operating time pulling ashes: _____ minutes/shift

   b) number of shifts per day _____

8. Specify ash pulling time during the test: start _____ end _____. When was the last time before the test that you pulled ashes: (date & time) _____.

9. Date and procedures of last maintenance/cleaning of the boiler (please attach) _____.

E. Instrument Data

1. Include a copy of chart records during test for the combustion efficiency indices (CO, O_2, CO_2, combustibles, steam flow, air flow, etc.)

F. Air Pollution Control Equipment

1. Type/model control equipment *Baghouse Dusteater P-70-1008*.

2. Air pressure drop across the control equipment *1-10*.

3. Air flow through the control equipment *70,000*.

4. Was the control equipment operating normally? *yes*.

5. Date and procedures of last maintenance/cleaning of control equipment.

New Equipment

Plant Operator's Certification

I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By *John Leseman by DJ Stern*, Position *Foreman*

John Leseman

REQUIRED DATA
for
PROCESS EMISSIONS

Company Name *Thorson, Inc.*

C. Equipment & Operating Data

1. Process Equipment No./Ident. *Boeing Asphalt Plant #5*.

2. Process Equipment Description *Boeing Drum Mix Asphalt Plant*.

3. Process equipment operating under normal operating conditions?

No _____. Yes *X*. Process rate during the test *295-300*.
(raw materials or finished product)

D. Instrument Data on Process Equipment

1. Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, lbs. per hour, pressure, air flow, etc.

E. Air Pollution Control Equipment

1. Type/model of control equipment *Baghouse Dusteater P-70-1008*.

2. Air pressure drop across the control equipment *1-10*.

3. Air flow through the control equipment *70,000*.

4. Was the control equipment operating normally? *yes*.

5. Data of last major maintenance/cleaning of control equipment _____
New Equipment.

F. Plant Manager's Certification

I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By *John Leseman*, Position *Foreman*.
John Leseman

lmb1770