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REVISED

RESULTS OF THE JUNE 21 - 23, 1994 AIR EMISSION COMPLIANCE TESTS AT THE LOUISIANA PACIFIC STRANDBOARD PLANT IN CHILCO, IDAHO

Submitted to:

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SP/slp

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ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	dry standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^6BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/Nm^3	milligrams per dry standard cubic meter
ug/Nm^3	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	≤ (when following a number)

Standard conditions are defined as 68°F (20°C) and 29.92 IN. of mercury pressure.

g:\stack\wp\misc\abbrev.frm

1 INTRODUCTION

During the Period June 21 - 23, 1994 Interpoll Laboratories personnel conducted air emission compliance tests on the following sources at the Louisiana Pacific Corporation (LP) Strandboard Plant located in Chilco, Idaho.

Source	Parameters
RTO Press Inlet	PM,THC's
RTO Outlet	PM,CO,THC's,CH_2O,Phenol,MDI
Dryer RTO Inlet	PM,NO_x,THC's
Konus Stack	PM,NO_x,CO,THC's
RTO Panel Inlet	THC's
Lap Line RTO Inlet	THC's

On-site testing was performed by Duane Van Hoever, Ed Trowbrige, Mark Kaehler, Ken Nuessmeier, Jeff Scripter, Dave Vaaler, and Jon Johnson. Coordination between testing activities and plant operation was provided by Sue Somers of LP. The tests were witnessed by Tom Harman of the Idaho Department of Environmental Quality.

The thermal oil heater tested was built by Konus Kessel and installed in 1983. It is equipped with two variable-speed screw-auger type stokers and is fired with bark. The unit is also equipped with an economizer and has a designed heat input capacity of 28.6 10^6BTU/HR. Particulate emissions from the thermal oil heater are contolled by a multiclone manufactured by Konus in series with a fabric filter dust collector manufactured by C.E. Preheater. Cleaned flue gas is exhausted to the atmosphere by a 75 foot high radial steel stack which has a diamter of 42 inches.

The Wafer Dryer tested is a Model 1260 TNW/L dryer manufactured by MEC Company. It is equipped with a pneumatic injection system for firing wood fines and has a design heat input capacity of 40 10^6BTU/HR. Particulate emissions from the Wafer Dryer are controlled by an E-Tube wet electrostatic precipitator manufactured by Geoenergy, Inc. in series with a Regenerative Thermal Oxidizer (RTO) manufactured by Huntington.

Emissions from the press are also ducted to the RTO. Cleaned flue gas is emitted to the atmosphere by a 103-foot high radial steel stack which has a diameter of 96 inches.

Paint line drying systems tested include (2) lap line systems and (1) panel line system. The lap line system consists of two lines ducted into a single duct and routed to the RTO. Painted lap siding is dried by a series of three Eclipse gas burners rated at 1.2 MMBTU/HR on each line. The panel siding line uses one 1.6 MMBTU/HR Eclipse burner. Exhaust is ducted to the RTO.

Particulate evaluations were performed in accordance with EPA Methods 2-5, CFR Title 40, Part 60, Appendix A (revised July 1, 1993). A preliminary determination of the gas linear velocity profile was made at each test location before the first particulate determination to allow selection of the appropriate nozzle diameter for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to isokinetically extract particulate samples by means of a heated glass-lined probe. Wet catch samples were collected in the back half of the Method 5 sampling train and analyzed in accordance with EPA Method 202.

The oxides of nitrogen samples were collected at the Dryer RTO Inlet and the Konus Stack during the particulate determinations using an all-glass Method 7 sampling train. A heated stainless steel probe was used to extract the samples from the exhaust stream. A plug of glass-wool was used in the end of the probe to remove particulate material.

The NO_x samples were collected in volume-calibrated two-liter all-glass flasks. An aliquot of 25 cc of absorbing solution was added to each flask on-site; the flask was closed; inserted into the sampling train; and evacuated. The probe was then purged and the sample collected over a 15 second interval. The flask was then closed; the flask removed from the sampling train; shook for two minutes and then secured for transport to the laboratory.

Upon arrival at the laboratory, the NO_x samples are logged in, placed in a designated area and maintained at 72 °F for 24 hours to allow completion of the conversion of NO to NO_2 and absorption in the acidified peroxide reagent. The flasks are then shook to complete absorption; attached to a mercury manometer and the static pressure and temperature recorded. The samples are then recovered and analyzed by ion chromatography.

Oxides of Nitrogen (RTO Outlet ONLY) determinations were performed in accordance with Method 7E. A slip stream of sample gas was withdrawn from the exhaust gas stream using a heated stainless steel probe equipped with a filter to remove interfering particulate material. The particulate-free gas was transported to the analyzers by means of a heat-traced probe and filter assembly. After passing through the filter, the gas passed through a chilled condenser-type moisture removal system. The particulate-free dry gas was then transported to the analyzers with the excess exhausted to the atmosphere through a calibrated orifice which was used to ensure that the flow from the stack exceeds the requirements of the analyzers. A three-way valve on the probe was used to introduce standard gas for the "system bias check".

The analog response of the oxides of nitrogen analyzer was recorded with a strip chart recorder. The analyzer was calibrated with Scott Specialty, National Specialty, and Linde Gases (EPA Protocol 1) and Certified Master standard gases. The instrument was calibrated before and after each run as per EPA Method 7E. The sample probe was moved through a three-point traverse (1/6, 3/6, 5/6 of the stack diameter) to measure oxides of nitrogen concentrations.

Formaldehyde samples were collected using EPA Method 0011 (SW 846 3rd Ed.). The samples were collected isokinetically using a Method 5 sampling train with an aqueous acidic 2,4-dinitrophenylhydrazine absorbing solution and analyzed by high performance liquid chromatography.

Total gaseous hydrocarbon concentrations were determined instrumentally using a Ratfisch Model RS55 heated flame ionization detector (HFID) calibrated against propane in air standards. The THC concentration was continuously monitored by extracting a slipstream of exhaust gas by means of a heated probe and filter holder. A heat-traced teflon line was used to transport the sample gas from the filter holder outlet to the analyzer inlet.

Phenol concentrations were determined from the Press Vent using a Method 5 sampling train with neutral buffered absorbing reagent followed by extraction with methylene chloride and direct analysis by GC/MS with no concentration (EPA Method 8270). The samples were field spiked with 5.33 mg of phenol d6 and 59.8 mg of 2-fluorophenol.

The detection level without concentration exceeded the permit emission limit for phenol. Therefore, the samples were concentrated 10x and reanalyzed.

MDI concentrations were determined in accordance with the 1,2-PP Method as developed by Radian Corporation under contract to USEPA. This method employs collection of MDI with 1,2-PP in toluene reagent, with analysis by HPLC.

Integrated flue gas samples were extracted simultaneously with each of the above-referenced sampling trains at the dryer test site using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags housed in a protective aluminum container. After sampling was complete, the bags were sealed and returned to the laboratory for Orsat analysis. Prior to sampling, the Tedlar bags are leak checked at 15 IN.HG. vacuum with an in-line rotameter. Bags with any detectable inleakage are discarded. The integrated flue gas samples collected were analyzed for carbon monoxide in accordance with EPA Method 10 (NDIR).

Testing on the RTO Press Inlet was conducted from two test ports oriented at 90 degrees. These test ports are located > 2 stack diameters downstream and > 0.5 stack diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect the particulate samples. Each traverse point was sampled 2.5 minutes for a total of 60 minutes per run.

Testing on the RTO Dryer Inlet was conducted from two test ports oriented at 90 degrees. These test ports are located 7 diameters downstream and 15 diameters upstream of the nearest flow disturbances. A 16-point traverse was used to collect the particulate samples. Each traverse point was sampled 4 minutes for a total of 64 minutes per run.

Testing on the RTO Stack was conducted from four test ports oriented at 90 degrees on the stack. These test ports are located 4.5 stack diameters downstream of the nearest flow disturbance and > 2 stack diameters upstream of the stack exit. A 24-point traverse was used to collect the particulate, formaldehyde, and MDI samples. Each traverse point was sampled 2.5 minutes for a total of 60 minutes per run. A 3-point traverse was used to collect representative phenol samples.

Testing on the Konus Stack was conducted from two test ports oriented at 90 degrees on the stack. These test ports are located 7.6 diameters downstream and 2.8 diameters upstream of the nearest flow disturbances. A 16-point traverse was used to collect the particulate samples. Each point was sampled for 4 minutes for a total sampling time of 64 minutes per run. Visible emission determinations were performed on the Konus and RTO Stacks by Dave Vaaler, an EPA-certified observer.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

2 SUMMARY AND DISCUSSION

The results of the air emission compliance tests are summarized in Tables 1 - 10. An overview of the results is presented in the Table below:

PARAMETER		MEASURED
RTO Press Inlet		
Particulate		
	(GR/DSCF)	0.0121
	(LB/HR)	6.66
Total Hydrocarbons		
	(ppmC,w)	109
	(LB/HR)	13.7
RTO Stack		
*PM Removal Efficiency**	(%)	77
*THC Removal Efficiency**	(%)	97
Particulate		
	(GR/DSCF)	0.013
	(LB/HR)	11.8
Oxides of Nitrogen		
	(ppm,d)	10
	(LB/HR)	7.3
Opacity	(%)	0
Carbon Monoxide		
	(ppm,d)	7
	(LB/HR)	3.1
Total Hydrocarbons		
	(ppmC,w)	8
	(LB/HR)	1.8
Formaldehyde		
	(ppm,d)	0.52
	(LB/HR)	0.27
Phenol		
	(ppb)	< 37
	(10^{-3}LB/HR)	< 59
MDI		
	(ppm)	0.0018
	(LB/HR)	0.0075

*** Efficiency of total system (including E-Tube).***

PARAMETER	MEASURED
Dryer RTO Inlet	
Particulate	
. . . . (GR/DSCF)	0.196
. . . . (LB/HR)	45.7
Oxides of Nitrogen	
. . . . (ppm,d)	11
. . . . (LB/HR)	2.1
Total Hydrocarbons	
. . . . (ppmC,w)	553
. . . . (LB/HR)	35.8
Konus Stack	
Particulate	
. . . . (GR/DSCF)	0.0092
. . . . ($LB/10^6BTU$)	0.071
Oxides of Nitrogen	
. . . . (ppm,d)	50
. . . . ($LB/10^6BTU$)	0.329
Opacity . . . . (%)	0
Carbon Monoxide	
. . . . (ppm,d)	16
. . . . ($LB/10^6BTU$)	0.0647
Total Hydrocarbons	
. . . . (ppmC,w)	≤ 2
. . . . (LB/HR)	≤ 0.04
RTO Panel Inlet	
Total Hydrocarbons	
. . . . (ppmC,w)	5
. . . . (LB/HR)	0.02
Lap Line RTO Inlet	
Total Hydrocarbons	
. . . . (ppmC,w)	< 1
. . . . (LB/HR)	< 0.01

No difficulties were encountered in the field by Interpoll Labs or in the laboratory evaluation of the samples which were conducted by Interpoll Labs. On the basis of these facts and a complete review of the data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

Table 1a. Summary of the Results of the June 21, 1994 Particulate Emission Compliance Test of the RTO Press Inlet at the Louisiana Pacific Plant in Chilco, Idaho.

ITEM		Run 1	Run 2	Run 3	
Date of test		06-21-94	06-21-94	06-21-94	
Time runs were done	(HRS)	1645/1802	1905/2023	2145/2255	
Process rate					
Volumetric flow					
actual	(ACFM)	78550	78757	78879	78,729
standard	(DSCFM)	64242	64703	64462	64,469
Gas temperature	(DEG-F)	120	120	122	121
Moisture content	(%V/V)	2.20	1.83	1.95	1.993
Gas composition	(%V/V,dry)				
carbon dioxide		0.03	0.03	0.03	
oxygen		20.90	20.90	20.90	
nitrogen		79.07	79.07	79.07	
Isokinetic variation	(%)	99.8	99.8	99.9	
Particulate concentration					
actual	(GR/ACF)	.0120	.00793	.00967	AVG
standard	(GR/DSCF)	.0147	.00965	.0118	0.01205
Part. emission rate	(LB/HR)	8.08	5.35	6.54	6.66

Note: Dry + Method 202 Condensible Particulate Material

Table 1b Summary of the Results of the June 21, 1994 Particulate Emission Compliance Test of the Press RTO Inlet at the Louisiana Pacific Plant in Chilco, Idaho.

ITEM		Run 1	Run 2	Run 3
Date of test		06-21-94	06-21-94	06-21-94
Time runs were done	(HRS)	1645/1802	1905/2023	2145/2255
Process rate				
Volumetric flow				
actual	(ACFM)	78550	78757	78879
standard	(DSCFM)	64242	64703	64462
Gas temperature	(DEG-F)	120	120	122
Moisture content	(%V/V)	2.20	1.83	1.95
Gas composition	(%V/V,dry)			
carbon dioxide		0.03	0.03	0.03
oxygen		20.90	20.90	20.90
nitrogen		79.07	79.07	79.07
Isokinetic variation	(%)	99.8	99.8	99.9
Particulate concentration				
actual	(GR/ACF)	.00782	.00497	.00698
standard	(GR/DSCF)	.00957	.00605	.00855
Part. emission rate	(LB/HR)	5.27	3.35	4.72

Note: Dry Catch Only

Table 2a. Summary of the Results of the June 21, 1994 Particulate Emission Compliance Test on the Dryer RTO Inlet at the Louisiana Pacific Corporation Plant Located in Chilco, Idaho.

ITEM		Run 1	Run 2	Run 3
Date of test		06-21-94	06-21-94	06-21-94
Time runs were done	(HRS)	1645/1804	1905/2025	2145/2257
Process rate				
Volumetric flow				
actual	(ACFM)	47207	47777	47975
standard	(DSCFM)	27789	27442	26790
Gas temperature	(DEG-F)	198	195	205
Moisture content	(%V/V)	18.19	20.55	21.59
Gas composition	(%V/V,dry)			
carbon dioxide		3.10	2.90	3.00
oxygen		17.70	17.90	17.80
nitrogen		79.20	79.20	79.20
Isokinetic variation	(%)	97.9	100.7	92.1
Particulate concentration				
actual	(GR/ACF)	0.105	0.104	0.127
standard	(GR/DSCF)	0.178	0.181	0.228
Part. emission rate	(LB/HR)	42.41	42.66	52.28

Note: Dry + Method 202 Condensible Particulate Material

Table 2b. Summary of the Results of the June 21, 1994 Particulate Emission Compliance Test on the Dryer RTO Inlet at the Louisiana Pacific Corporation Plant Located in Chilco, Idaho.

ITEM		Run 1	Run 2	Run 3
Date of test		06-21-94	06-21-94	06-21-94
Time runs were done	(HRS)	1645/1804	1905/2025	2145/2257
Process rate				
Volumetric flow				
actual	(ACFM)	47207	47777	47975
standard	(DSCFM)	27789	27442	26790
Gas temperature	(DEG-F)	198	195	205
Moisture content	(%V/V)	18.19	20.55	21.59
Gas composition	(%V/V,dry)			
carbon dioxide		3.10	2.90	3.00
oxygen		17.70	17.90	17.80
nitrogen		79.20	79.20	79.20
Isokinetic variation	(%)	97.9	100.7	92.1
Particulate concentration				
actual	(GR/ACF)	.0798	.0823	.0939
standard	(GR/DSCF)	0.136	0.143	0.168
Part. emission rate	(LB/HR)	32.32	33.73	38.63

Note: Dry Catch Only

Table 3a. Summary of the Results of the June 21, 1994 Particulate Emission Compliance Test on the RTO Outlet at the Louisiana Pacific Corporation Plant Located in Chilco, Idaho.

ITEM		Run 1	Run 2	Run 3	
Date of test		06-21-94	06-21-94	06-21-94	
Time runs were done	(HRS)	1645/1801	1905/2022	2145/2257	
Process rate					
Volumetric flow					
actual	(ACFM)	167259	164774	164810	
standard	(DSCFM)	106983	105443	105039	
Gas temperature	(DEG-F)	236	237	233	
Moisture content	(%V/V)	8.51	8.41	9.22	
Gas composition	(%V/V,dry)				
carbon dioxide		1.00	1.10	1.20	
oxygen		19.80	19.80	19.60	
nitrogen		79.20	79.10	79.20	
Isokinetic variation	(%)	100.3	99.5	101.1	
Particulate concentration					
actual	(GR/ACF)	.0107	.00816	.00592	
standard	(GR/DSCF)	.0168	.0128	.00929	- .013
Part. emission rate	(LB/HR)	15.40	11.53	8.36	11.76 #/HR

Note: Dry + Method 202 Condensible Particulate Material

Point 14.4

Table 3b Summary of the Results of the June 21, 1994 Particulate Emission Compliance Test of the RTO Stack at the Louisiana Pacific Plant Located in Chilco, Idaho.

ITEM		Run 1	Run 2	Run 3	
Date of test		06-21-94	06-21-94	06-21-94	
Time runs were done	(HRS)	1645/1801	1905/2022	2145/2257	
Process rate					
Volumetric flow					
actual	(ACFM)	167259	164774	164810	
standard	(DSCFM)	106983	105443	105039	
Gas temperature	(DEG-F)	236	237	233	
Moisture content	(%V/V)	8.51	8.41	9.22	
Gas composition	(%V/V,dry)				
carbon dioxide		1.00	1.10	1.20	
oxygen		19.80	19.80	19.60	
nitrogen		79.20	79.10	79.20	
Isokinetic variation	(%)	100.3	99.5	101.1	
Particulate concentration					
actual	(GR/ACF)	.00539	.00611	.00324	
standard	(GR/DSCF)	.00843	.00955	.00509	
Part. emission rate	(LB/HR)	7.73	8.63	4.58	6.98

60%

Note: Dry Catch Only

Table 4a. Summary of the Results of the June 22, 1994 Particulate Emission Compliance Test of the Konus Stack at the Louisiana Pacific Plant Located in Chilco, Idaho.

ITEM		Run 1	Run 2	Run 3
Date of test		06-22-94	06-22-94	06-22-94
Time runs were done	(HRS)	1050/1202	1245/1504	1540/1821
Volumetric flow				
actual	(ACFM)	14899	14519	14412
standard	(DSCFM)	8269	8319	8654
Gas temperature	(DEG-F)	351	330	291
Moisture content	(%V/V)	7.57	7.11	7.38
Gas composition	(%V/V,dry)			
carbon dioxide		3.50	3.80	3.40
oxygen		17.30	17.00	17.50
nitrogen		79.20	79.20	79.10
Isokinetic variation	(%)	97.4	99.0	99.7
Particulate concentration				
actual	(GR/ACF)	.00710	.00619	.00236
standard	(GR/DSCF)	.0128	.0108	.00394
Part. emission rate	(LB/HR)	0.907	0.770	0.292
Emission factor	(LB/MMBTU)	0.102	0.079	0.033

Note: Dry + Method 202 Condensible Particulate Material

Table 4b Summary of the Results of the June 22, 1994 Particulate Emission Compliance Test of the Konus Stack at the Louisiana Pacific Plant Located in Chilco, Idaho.

ITEM		Run 1	Run 2	Run 3
Date of test		06-22-94	06-22-94	06-22-94
Time runs were done	(HRS)	1050/1202	1245/1504	1540/1821
Volumetric flow				
actual	(ACFM)	14899	14519	14412
standard	(DSCFM)	8269	8319	8654
Gas temperature	(DEG-F)	351	330	291
Moisture content	(%V/V)	7.57	7.11	7.38
Gas composition	(%V/V,dry)			
carbon dioxide		3.50	3.80	3.40
oxygen		17.30	17.00	17.50
nitrogen		79.20	79.20	79.10
Isokinetic variation	(%)	97.4	99.0	99.7
Particulate concentration				
actual	(GR/ACF)	.00538	.00439	.00146
standard	(GR/DSCF)	.00971	.00767	.00243
Part. emission rate	(LB/HR)	0.688	0.547	0.180
Emission factor	(LB/MMBTU)	0.077	0.056	0.020

Note: Dry Catch Only

Table 5a. Summary of the Results of the June 21, 1994 **Oxides of Nitrogen** Emission Compliance Tests at the Louisiana Pacific Plant in Chilco, Idaho.

Date	Time (HRS)	Concentration (ppm,d)	Emission Rate (LB/HR)
(Dryer RTO Inlet)			
6-21-94	1645-1804	6	1.2
6-21-94	1905-2025	14	2.8
6-21-94	2145-2257	13	2.5
Avg		11	2.1
(RTO Stack)			
6-21-94	1645-1801	11	8.4
6-21-94	1905-2022	10	7.6
6-21-94	2145-2257	8	6.0
Avg		10	7.3

Table 5b. Summary of the Results of the June 22, 1994 **Oxides of Nitrogen** Emission Compliance Test at the Louisiana Pacific Plant in Chilco, Idaho.

Date	Time (HRS)	Concentration (ppm,d)	Emission Rate (LB/HR)	Emission Factor (LB/10^6BTU)
(Konus Stack)				
6-22-94	1050-1202	40	2.37	0.266
6-22-94	1245-1504	52	3.10	0.319
6-22-94	1540-1821	57	3.53	0.402
Avg		50	3.00	0.329

Table 6a. Summary of the Results of the June 21, 1994 **Carbon Monoxide** Emission Compliance Test of the **RTO** at the Louisiana Pacific Plant in Chilco, Idaho.

Date	**Time** (HRS)	**Concentration** (ppm,d)	**Emission Rate** (LB/HR)
(RTO Stack)			
6-21-94	1645-1801	7	3.3
6-21-94	1905-2022	6	2.8
6-21-94	2145-2257	7	3.2
Avg.		7	3.1

Table 6b. Summary of the June 22, 1994 **Carbon Monoxide** Emission Compliance Test of the **Konus** at the Louisiana Pacific Plant in Chilco, Idaho.

Date	Time (HRS)	Concentration (ppm,d)	Emission Rate (LB/HR)	Emission Factor (LB/10^6BTU)
(Konus Stack)				
6-22-94	1050-1202	9	0.324	0.0364
6-22-94	1245-1504	9	0.326	0.0336
6-22-94	1540-1821	29	1.09	0.124
Avg.		16	0.582	0.0647

Table 7. Summary of the June 22, 1994 **Formaldehyde** Emission Compliance Test on the **RTO Stack** at the Louisiana Pacific Plant in Chilco, Idaho.

Date	Time (HRS)	Concentration (ppm,d)	Emission Rate (LB/HR)
(RTO Stack)			
6-22-94	1019-1125	0.71	0.37
6-22-94	1232-1428	0.50	0.26
6-22-94	1530-1714	0.36	0.19
Avg.		0.52	0.27

Table 8. Summary of the June 22, 1994 **MDI** Emission Compliance Test on the **RTO Stack** at the Louisiana Pacific Plant in Chilco, Idaho.

Date	Time (HRS)	Concentration (ppm,d)	Emission Rate (LB/HR)
(RTO Stack)			
6-22-94	1907-2013	0.002	0.0086
6-22-94	2053-2200	0.002	0.0081
6-22-94	2252-2358	0.0013	0.0058
Avg.		0.0018	0.0075

Table 9. Summary of the June 22, 1994 **Phenol** Emission Compliance Test on the **RTO Stack** at the Louisiana Pacific Plant in Chilco, Idaho.

Date	**Time** (HRS)	**Concentration** (ppb,d)	**Emission Rate** (10^{-3}LB/HR)
(RTO Stack)			
6-22-94	1019-1119	31	50
6-22-94	1232-1428	41	66
6-22-94	1530-1708	38	61
Avg		37	59

Table 10a. Summary of the June 22, 1994 **Total Hydrocarbon** Emission Compliance Tests at the Louisiana Pacific Plant in Chilco, Idaho.

Date	Time (HRS)	Concentration (ppmC,w)	Emission Rate (LB/HR)
(RTO Press Inlet)			
6-22-94	1208-1308	111	14.0
6-22-94	1752-1900	120	15.1
6-22-94	1912-2014	95	11.9
Avg.		109	13.7
(RTO Dryer Inlet)			
6-22-94	1208-1308	760	49.4
6-22-94	1752-1900	440	28.6
6-22-94	1912-2014	460	29.4
Avg.		553	35.8
(RTO Stack)			
6-22-94	1208-1308	17	3.7
6-22-94	1752-1900	3	0.7
6-22-94	1912-2014	5	1.0
Avg.		8	1.8

Table 10b. Summary of the June 23, 1994 **Total Hydrocarbon** Emission Compliance Tests at the Louisiana Pacific Plant in Chilco, Idaho.

Date	Time (HRS)	Concentration (ppmC,w)	Emission Rate (LB/HR)
(Lap Line RTO Inlet)			
6-23-94	0842-0942	< 1	< 0.01
6-23-94	0951-1051	< 1	< 0.01
6-23-94	1100-1200	< 1	< 0.01
Avg.		< 1	< 0.01
(Panel Siding RTO Inlet)			
6-23-94	0839-0939	8	0.02
6-23-94	0956-1059	6	0.02
6-23-94	1108-1208	2	0.01
Avg.		5	0.02
(Konus Stack)			
6-23-94	0839-0939	5	0.08
6-23-94	0956-1057	< 1	< 0.02
6-23-94	1108-1208	< 1	< 0.02
Avg.		≤ 2	≤ 0.04

Table 10c. Summary of the Results of the June 22, 1994 **Total Hydrocarbon Removal Efficiency Tests** on the **RTO** at the Louisiana Pacific Corporation Plant in Chilco, Idaho.

Date	Time (HRS)	THC Emission Rate (LB/HR) (Inlet)	(Stack)	Removal Efficiency (%)
(Dryer & Press RTO)				
6-22-94	1208-1308	63	3.6	94
6-22-94	1752-1900	44	0.7	98
6-22-94	1912-2014	41	1.0	98
Average		49	1.8	97

Table 11. Summary of the Results of the June 21, 1994 **Particulate Removal Efficiency Tests** on the **RTO** at the Louisiana Pacific Corporation Plant in Chilco, Idaho.

Date	Time (HRS)	PM Emission Rate (LB/HR) (Inlet)	(Stack)	Removal Efficiency (%)
(Dryer & Press RTO)				
6-21-94	1645-1804	50	15	70
6-21-94	1905-2025	48	12	75
6-21-94	2145-2257	59	8	86
Average		52	12	77

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition (orsat and moisture) are presented first followed by the computer printout of the particulate, oxides of nitrogen, opacity, carbon monoxide, formaldehyde, MDI, and phenol results. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The emission rates have been calculated using the product of the concentration times flow method.

3.1 Results of Orsat and Moisture Determinations

Test No. 1
RTO Press Inlet

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	06-21-94	06-21-94	06-21-94
Dry basis (orsat)			
carbon dioxide............	0.03	0.03	0.03
oxygen....................	20.90	20.90	20.90
nitrogen..................	79.07	79.07	79.07
Wet basis (orsat)			
carbon dioxide............	0.03	0.03	0.03
oxygen....................	20.44	20.52	20.49
nitrogen..................	77.33	77.63	77.53
water vapor...............	2.20	1.83	1.95
Dry molecular weight........	28.84	28.84	28.84
Wet molecular weight........	28.60	28.64	28.63
Specific gravity............	0.988	0.989	0.989
Water mass flow......(LB/HR)	4053	3376	3598

Test No. 3
Dryer RTO Inlet

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	06-21-94	06-21-94	06-21-94
Dry basis (orsat)			
carbon dioxide............	3.10	2.90	3.00
oxygen....................	17.70	17.90	17.80
nitrogen..................	79.20	79.20	79.20
Wet basis (orsat)			
carbon dioxide............	2.54	2.30	2.35
oxygen....................	14.48	14.22	13.96
nitrogen..................	64.79	62.92	62.10
water vapor...............	18.19	20.55	21.59
Dry molecular weight........	29.20	29.18	29.19
Wet molecular weight........	27.17	26.88	26.78
Specific gravity............	0.938	0.929	0.925
Water mass flow......(LB/HR)	17333	19916	20693
FO	1.032	1.034	1.033

Test No. 5
RTO Outlet

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	06-21-94	06-21-94	06-21-94
Dry basis (orsat)			
carbon dioxide............	1.00	1.10	1.20
oxygen....................	19.80	19.80	19.60
nitrogen..................	79.20	79.10	79.20
Wet basis (orsat)			
carbon dioxide............	0.91	1.01	1.09
oxygen....................	18.11	18.14	17.79
nitrogen..................	72.46	72.45	71.90
water vapor...............	8.51	8.41	9.22
Dry molecular weight........	28.95	28.97	28.98
Wet molecular weight........	28.02	28.05	27.96
Specific gravity............	0.968	0.969	0.966
Water mass flow......(LB/HR)	0.00	0.00	0.00
FO	1.100	1.000	1.000

Test No. 7
RTO Outlet

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	06-22-94	06-22-94	06-22-94
Dry basis (orsat)			
carbon dioxide............	1.20	1.20	1.00
oxygen....................	19.60	19.60	19.80
nitrogen..................	79.20	79.20	79.20
Wet basis (orsat)			
carbon dioxide............	1.10	1.10	0.93
oxygen....................	17.95	17.97	18.46
nitrogen..................	72.52	72.62	73.85
water vapor...............	8.43	8.31	6.75
Dry molecular weight........	28.98	28.98	28.95
Wet molecular weight........	28.05	28.06	28.21
Specific gravity............	0.969	0.969	0.975
Water mass flow......(LB/HR)	0.00	0.00	0.00
FO	1.083	1.083	1.100

Test No. 9
RTO Outlet

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	06-22-94	06-22-94	06-22-94
Dry basis (orsat)			
carbon dioxide............	1.20	1.20	1.00
oxygen...................	19.60	19.60	19.80
nitrogen.................	79.20	79.20	79.20
Wet basis (orsat)			
carbon dioxide............	1.11	1.07	0.90
oxygen...................	18.11	17.46	17.88
nitrogen.................	73.19	70.56	71.53
water vapor..............	7.59	10.90	9.69
Dry molecular weight........	28.98	28.98	28.95
Wet molecular weight........	28.14	27.78	27.89
Specific gravity............	0.972	0.960	0.963
Water mass flow......(LB/HR)	0.00	0.00	0.00
FO	1.083	1.083	1.100

Test No. 10
Konus Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	06-22-94	06-22-94	06-22-94
Dry basis (orsat)			
carbon dioxide............	3.50	3.80	3.40
oxygen....................	17.30	17.00	17.50
carbon monoxide...........	0.00	0.00	0.00
nitrogen..................	79.20	79.20	79.10
Wet basis (orsat)			
carbon dioxide............	3.24	3.55	3.15
oxygen....................	15.99	15.90	16.21
carbon monoxide...........	0.00	0.00	0.00
nitrogen..................	73.21	74.09	73.26
water vapor...............	7.57	6.45	7.38
Dry molecular weight........	29.25	29.29	29.24
Wet molecular weight........	28.40	28.56	28.41
Specific gravity............	0.981	0.987	0.981
Water mass flow......(LB/HR)	1899	1609	1935
FO	1.029	1.026	1.000

3.2 Results of Particulate Determinations

Test No. 1
RTO Press Inlet

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	06-21-94	06-21-94	06-21-94
Time run start/end.....(HRS)	1645/1802	1905/2023	2145/2255
Static pressure......(IN.WC)	-1.90	-1.90	0.00
Cross sectional area (SQ.FT)	19.63	19.63	19.63
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser.............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	4.0	4.0	4.0
desiccant..........(GRAMS)	14.0	11.0	12.0
total..............(GRAMS)	18.0	15.0	16.0
Total particulate material.. ....collected(grams)	0.0359	0.0238	0.0291
Gas meter coefficient.......	1.0069	1.0069	1.0069
Barometric pressure..(IN.HG)	27.63	27.63	27.63
Avg. orif.pres.drop..(IN.WC)	1.53	1.55	1.55
Avg. gas meter temp..(DEF-F)	100.8	101.2	102.2
Volume through gas meter....			
at meter conditions...(CF)	42.95	43.30	43.25
standard conditions.(DSCF)	37.74	38.02	37.91
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter..........(IN)	.188	.188	.188
Avg.stack gas temp ..(DEG-F)	120	120	122
Volumetric flow rate........			
actual..............(ACFM)	78550	78757	78879
dry standard.......(DSCFM)	64242	64703	64462
Isokinetic variation.....(%)	99.8	99.8	99.9
Particulate concentration...			
actual............(GR/ACF)	0.01199	0.00793	0.00967
dry standard.....(GR/DSCF)	0.01467	0.00965	0.01184
Particle mass rate...(LB/HR)	8.076	5.353	6.54

Test No. 3
Dryer RTO Inlet

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	06-21-94	06-21-94	06-21-94
Time run start/end.....(HRS)	1645/1804	1905/2025	2145/2257
Static pressure......(IN.WC)	-10.88	-10.88	-10.88
Cross sectional area (SQ.FT)	12.57	12.57	12.57
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser.............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	207.0	229.0	226.0
desiccant..........(GRAMS)	12.0	30.0	20.0
total..............(GRAMS)	219.0	259.0	246.0
Total particulate material.. ....collected(grams)	0.5359	0.5548	0.6215
Gas meter coefficient.......	0.9997	0.9997	0.9997
Barometric pressure..(IN.HG)	27.63	27.63	27.63
Avg. orif.pres.drop..(IN.WC)	1.94	2.06	1.94
Avg. gas meter temp..(DEF-F)	104.8	103.2	104.5
Volume through gas meter....			
at meter conditions...(CF)	53.55	54.26	48.55
standard conditions.(DSCF)	46.44	47.20	42.12
Total sampling time....(MIN)	64.00	64.00	64.00
Nozzle diameter..........(IN)	.248	.248	.248
Avg.stack gas temp ..(DEG-F)	198	195	205
Volumetric flow rate........			
actual..............(ACFM)	47207	47777	47975
dry standard.......(DSCFM)	27789	27442	26790
Isokinetic variation.....(%)	97.9	100.7	92.1
Particulate concentration...			
actual............(GR/ACF)	0.10477	0.10414	0.12709
dry standard.....(GR/DSCF)	0.17806	0.18138	0.22768
Particle mass rate...(LB/HR)	42.412	42.665	52.281

Test No. 5
RTO Outlet

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	06-21-94	06-21-94	06-21-94
Time run start/end.....(HRS)	1645/1801	1905/2022	2145/2257
Static pressure......(IN.WC)	-0.63	-0.63	0.00
Cross sectional area (SQ.FT)	50.53	50.53	50.53
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser.............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	71.0	66.0	73.0
desiccant..........(GRAMS)	16.0	18.0	21.0
total..............(GRAMS)	87.0	84.0	94.0
Total particulate material.. ....collected(grams)	0.0480	0.0357	0.0263
Gas meter coefficient.......	0.9983	0.9983	0.9983
Barometric pressure..(IN.HG)	27.63	27.63	27.63
Avg. orif.pres.drop..(IN.WC)	2.01	1.94	1.90
Avg. gas meter temp..(DEF-F)	103.6	106.8	86.4
Volume through gas meter....			
at meter conditions...(CF)	50.80	50.00	48.78
standard conditions.(DSCF)	44.09	43.14	43.66
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.........(IN)	.252	.252	.252
Avg.stack gas temp ..(DEG-F)	236	237	233
Volumetric flow rate........			
actual..............(ACFM)	167259	164774	164810
dry standard.......(DSCFM)	106983	105443	105039
Isokinetic variation.....(%)	100.3	99.5	101.1
Particulate concentration...			
actual............(GR/ACF)	0.01074	0.00816	0.00592
dry standard.....(GR/DSCF)	0.01679	0.01276	0.00929
Particle mass rate...(LB/HR)	15.398	11.534	8.36

Test No. 10
Konus Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	06-22-94	06-22-94	06-22-94
Time run start/end.....(HRS)	1050/1202	1245/1504	1540/1821
Static pressure......(IN.WC)	-0.10	-0.10	-0.10
Cross sectional area (SQ.FT)	9.62	9.62	9.62
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser.............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	49.0	48.0	45.0
desiccant..........(GRAMS)	20.0	18.0	27.0
total..............(GRAMS)	69.0	66.0	72.0
Total particulate material.. ....collected(grams)	0.0330	0.0285	0.0109
Gas meter coefficient.......	1.0069	1.0069	1.0069
Barometric pressure..(IN.HG)	27.61	27.61	27.61
Avg. orif.pres.drop..(IN.WC)	1.47	1.58	1.75
Avg. gas meter temp..(DEF-F)	87.5	103.4	109.2
Volume through gas meter....			
at meter conditions...(CF)	44.20	46.50	49.20
standard conditions.(DSCF)	39.75	40.65	42.59
Total sampling time....(MIN)	64.00	64.00	64.00
Nozzle diameter.........(IN)	.369	.369	.369
Avg.stack gas temp ..(DEG-F)	351	330	291
Volumetric flow rate........			
actual..............(ACFM)	14899	14519	14412
dry standard.......(DSCFM)	8269	8319	8654
Isokinetic variation.....(%)	97.4	99.0	99.7
Particulate concentration...			
actual............(GR/ACF)	0.00710	0.00619	0.00236
dry standard.....(GR/DSCF)	0.01280	0.01080	0.00394
Particle mass rate...(LB/HR)	0.907	0.770	0.292

3.3 Results of Oxides of Nitrogen Determinations

Test No. 3
Dryer RTO Inlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run................	06-21-94	06-21-94	06-21-94	06-21-94
Time of run............(HRS)	1411	1423	1521	1535
Flask number................	19	20	21	22
Volume of flask.........(ML)	2069	2060	2068	2031
Data: time of sampling				
flask temperature..(DEG-F)	95.00	95.00	95.00	95.00
bar. press.........(IN.HG)	27.63	27.63	27.63	27.63
flask vacuum.......(IN.HG)	25.50	25.50	25.60	25.40
flask abs. press...(IN.HG)	2.13	2.13	2.03	2.23
Data: Time of Flask Opening				
flask temperature..(DEG-F)	76.00	76.00	76.00	76.00
lab. bar. press....(IN.HG)	29.01	29.01	29.01	29.01
flask static press.(IN.HG)	-0.10	0.00	0.00	-2.30
flask abs. press...(IN.HG)	28.91	29.01	29.01	26.71
Volume gas sampled....(DSML)	1806	1805	1818	1621
Moisture content......(%V/V)	18.19	18.19	18.19	18.19
Nitrate in gas sample...(JG)	14.4	0.0	43.5	0.0
NO2 in gas sample.......(JG)	10.7	0.0	32.3	0.0
<u>NOx Concentration</u>				
(GR/DSCF).................	0.0026	0.0000	0.0078	0.0000
(MG/DSCM).................	6	0	18	0
(PPM-DRY).................	3	0	9	0
(PPM-WET).................	3	0	8	0
NOX Emission rate....(LB/HR)	0.62	0.00	1.85	0.00

Test No. 3
Dryer RTO Inlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run................	06-21-94	06-21-94	06-21-94	06-21-94
Time of run............(HRS)	1652	1705	1727	1750
Flask number................	23	24	31	32
Volume of flask.........(ML)	2056	2031	2009	2092
Data: time of sampling				
flask temperature..(DEG-F)	95.00	95.00	95.00	95.00
bar. press.........(IN.HG)	27.63	27.63	27.63	27.63
flask vacuum.......(IN.HG)	25.55	25.60	25.60	25.50
flask abs. press...(IN.HG)	2.08	2.03	2.03	2.13
Data: Time of Flask Opening				
flask temperature..(DEG-F)	76.00	76.00	76.00	76.00
lab. bar. press....(IN.HG)	29.01	29.01	29.01	29.01
flask static press.(IN.HG)	0.00	0.00	-2.50	-3.40
flask abs. press...(IN.HG)	29.01	29.01	26.51	25.61
Volume gas sampled....(DSML)	1804	1785	1603	1602
Moisture content......(%V/V)	20.55	20.55	20.55	20.55
Nitrate in gas sample...(JG)	0.0	0.0	54.5	63.5
NO2 in gas sample.......(JG)	0.0	0.0	40.4	47.1
NOx Concentration				
(GR/DSCF).................	0.0000	0.0000	0.0110	0.0129
(MG/DSCM).................	0	0	25	29
(PPM-DRY).................	0	0	13	15
(PPM-WET).................	0	0	10	12
NOX Emission rate....(LB/HR)	0.00	0.00	2.59	3.02

Test No. 3
Dryer RTO Inlet

Results of Oxides of Nitrogen (NOx) Determinations--------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run................	06-21-94	06-21-94	06-21-94	06-21-94
Time of run............(HRS)	1912	1930	1948	2010
Flask number................	33	35	36	83
Volume of flask.........(ML)	2088	2071	2127	2060
Data: time of sampling				
flask temperature..(DEG-F)	95.00	95.00	95.00	95.00
bar. press.........(IN.HG)	27.63	27.63	27.63	27.63
flask vacuum.......(IN.HG)	25.70	25.70	25.65	25.70
flask abs. press...(IN.HG)	1.93	1.93	1.98	1.93
Data: Time of Flask Opening				
flask temperature..(DEG-F)	76.00	76.00	76.00	76.00
lab. bar. press....(IN.HG)	29.01	29.01	29.01	29.01
flask static press.(IN.HG)	-1.00	-1.40	-5.60	-2.10
flask abs. press...(IN.HG)	28.01	27.61	23.41	26.91
Volume gas sampled....(DSML)	1775	1733	1487	1677
Moisture content......(%V/V)	21.59	21.59	21.59	21.59
Nitrate in gas sample...(JG)	68.4	55.8	44.8	57.3
NO2 in gas sample.......(JG)	50.8	41.4	33.2	42.5
<u>NOx Concentration</u>				
(GR/DSCF).................	0.0125	0.0104	0.0098	0.0111
(MG/DSCM).................	29	24	22	25
(PPM-DRY).................	15	12	12	13
(PPM-WET).................	12	10	9	10
NOX Emission rate....(LB/HR)	2.87	2.40	2.24	2.54

Test No. 10
Konus Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run................	06-22-94	06-22-94	06-22-94	06-22-94
Time of run............(HRS)	1050	1115	1130	1200
Flask number................	61	62	63	64
Volume of flask.........(ML)	2100	2079	2067	2087
Data: time of sampling				
flask temperature..(DEG-F)	80.00	82.00	82.00	85.00
bar. press.........(IN.HG)	27.61	27.61	27.61	27.61
flask vacuum.......(IN.HG)	25.98	25.78	26.18	26.13
flask abs. press...(IN.HG)	1.63	1.83	1.43	1.48
Data: Time of Flask Opening				
flask temperature..(DEG-F)	75.00	75.00	75.00	75.00
lab. bar. press....(IN.HG)	28.94	28.94	28.94	28.94
flask static press.(IN.HG)	-2.90	-2.60	-3.00	-1.00
flask abs. press...(IN.HG)	26.04	26.34	25.94	27.94
Volume gas sampled....(DSML)	1671	1661	1651	1800
Moisture content......(%V/V)	7.57	7.57	7.57	7.57
Oxygen content....(%V/V,DRY)	17.30	17.30	17.30	17.30
Nitrate in gas sample...(JG)	165.0	175.0	173.0	187.0
NO2 in gas sample.......(JG)	122.4	129.8	128.4	138.7
<u>NOx Concentration</u>				
(GR/DSCF).................	0.0320	0.0342	0.0340	0.0337
(MG/DSCM).................	73	78	78	77
(PPM-DRY).................	38	41	41	40
(PPM-WET).................	35	38	38	37
NOX Emission rate....(LB/HR)	2.27	2.42	2.41	2.39
NOx emission factor........ ....(LB/MMBTU)*	0.255	0.272	0.270	0.268

* F = 9600 DSCF/MMBTU

Test No. 10
Konus Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run................	06-22-94	06-22-94	06-22-94	06-22-94
Time of run............(HRS)	1545	1600	1620	1755
Flask number................	3	4	5	6
Volume of flask.........(ML)	2055	2116	2057	2100
Data: time of sampling				
flask temperature..(DEG-F)	90.00	90.00	87.00	85.00
bar. press.........(IN.HG)	27.61	27.61	27.61	27.61
flask vacuum.......(IN.HG)	25.64	25.69	25.61	25.74
flask abs. press...(IN.HG)	1.97	1.92	2.00	1.87
Data: Time of Flask Opening				
flask temperature..(DEG-F)	75.00	75.00	75.00	75.00
lab. bar. press....(IN.HG)	28.94	28.94	28.94	28.94
flask static press.(IN.HG)	-0.90	-4.40	0.40	-0.90
flask abs. press...(IN.HG)	28.04	24.54	29.34	28.04
Volume gas sampled....(DSML)	1748	1563	1834	1792
Moisture content......(%V/V)	7.38	7.38	7.38	7.38
Oxygen content....(%V/V,DRY)	17.50	17.50	17.50	17.50
Nitrate in gas sample...(JG)	207.0	248.0	294.0	274.0
NO2 in gas sample.......(JG)	153.6	184.0	218.1	203.3
<u>NOx Concentration</u>				
(GR/DSCF).................	0.0384	0.0515	0.0520	0.0496
(MG/DSCM).................	88	118	119	113
(PPM-DRY).................	46	62	62	59
(PPM-WET).................	43	57	58	55
NOX Emission rate....(LB/HR)	2.85	3.82	3.85	3.68
NOx emission factor........ ....(LB/MMBTU)*	0.324	0.434	0.438	0.418

* F = 9600 DSCF/MMBTU

3.4 Results of Opacity Observations

Test No. 51
RTO Outlet

Results of Opacity Observations ------------ EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	100.00
5	0.0223	0.00
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 0.00	Avg OD 0.0000	Time average

Observer: David Vaaler
Cert. Date: 04-06-94
Date of Observation: 06-21-94
Time of Observation: 1645/1745

Test No. 52
RTO Outlet

Results of Opacity Observations ------------ EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	100.00
5	0.0223	0.00
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 0.00	Avg OD 0.0000	Time average

Observer: David Vaaler
Cert. Date: 04-06-94
Date of Observation: 06-21-94
Time of Observation: 1905/2005

Interpoll Labs Report No. 4-3191
Louisiana Pacific Corporation
Chilco, Idaho

Test No. 53
RTO Outlet

Results of Opacity Observations ------------ EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	100.00
5	0.0223	0.00
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 0.00	Avg OD 0.0000	Time average

Observer: David Vaaler
Cert. Date: 04-06-94
Date of Observation: 06-21-94
Time of Observation: 2145/2245

Test No. 101
Konus Stack

Results of Opacity Observations ------------ EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	100.00
5	0.0223	0.00
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 0.00	Avg OD 0.0000	Time average

Observer: David Vaaler
Cert. Date: 04-06-94
Date of Observation: 06-22-94
Time of Observation: 1050/1202

Test No. 102
Konus Stack

Results of Opacity Observations ------------ EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	100.00
5	0.0223	0.00
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 0.00	Avg OD 0.0000	Time average

Observer: David Vaaler
Cert. Date: 04-06-94
Date of Observation: 06-22-94
Time of Observation: 1245/1500

Test No. 103
Konus Stack

Results of Opacity Observations ------------ EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	100.00
5	0.0223	0.00
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 0.00	Avg OD 0.0000	Time average

Observer: David Vaaler
Cert. Date: 04-06-94
Date of Observation: 06-22-94
Time of Observation: 1540/1645

3.5 Results of Carbon Monoxide Determinations

Test No. 5
RTO Outlet

Results of CO Determinations ---------------------Method 10

	Run 1	Run 2	Run 3
Date of run	06-21-94	06-21-94	06-21-94
Time run start/end.....(HRS)	1645-1801	1905-2022	2145-2257
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content......(%V/V)	8.51	8.41	9.22
O2 Concentration......(%V/V)	19.80	19.80	19.60
Volumetric flow rate (DSCFM)	106983	105443	105039
CO concentration............			
(GR/DSCF).................	0.0034	0.0031	0.0037
(MG/DSCM).................	7.69	7.11	8.39
(PPM-WET).................	6.04	5.59	6.54
(PPM-DRY).................	6.60	6.10	7.20
(PPM-DRY @ 7% O2).........	77.00	71.17	72.00
CO emission rate.....(LB/HR)	3.079	2.805	3.298

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 10
Konus Stack

Results of CO Determinations ---------------------Method 10

	Run 1	Run 2	Run 3
Date of run	06-22-94	06-22-94	06-22-94
Time run start/end.....(HRS)	1050/1202	1245/1504	1540/1821
Total sampling time....(MIN)	64.0	64.0	64.0
Moisture content......(%V/V)	7.57	7.11	7.38
O2 Concentration......(%V/V)	17.30	17.00	17.50
Volumetric flow rate (DSCFM)	8269	8319	8654
CO concentration............			
(GR/DSCF).................	0.0047	0.0046	0.0147
(MG/DSCM).................	10.83	10.60	33.67
(PPM-WET).................	8.60	8.45	26.77
(PPM-DRY).................	9.30	9.10	28.90
(PPM-DRY @ 7% O2).........	35.19	31.85	115.60
CO emission rate.....(LB/HR)	0.335	0.330	1.091

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

3.6 Results of Formaldehyde Determinations

Test No. 7
RTO Outlet

Results of Formaldehyde Tests -------------- EPA Method 0011

	Run 1	Run 2	Run 3
Date of run	06-22-94	06-22-94	06-22-94
Time run start/end.....(HRS)	1019/1125	1232/1428	1530/1714
Static pressure......(IN.WC)	-0.63	-0.63	-0.63
Cross sectional area (SQ.FT)	50.53	50.53	50.53
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser.............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	79.0	76.0	63.0
desiccant..........(GRAMS)	24.0	24.0	16.0
total..............(GRAMS)	103.0	100.0	79.0
Formaldehyde in sample..(uG)	1320	917	658
Gas meter coefficient.......	1.0005	1.0005	1.0005
Barometric pressure..(IN.HG)	27.61	27.61	27.61
Avg. orif.pres.drop..(IN.WC)	2.94	2.93	2.94
Avg. gas meter temp..(DEF-F)	80.6	92.8	107.9
Volume through gas meter....			
at meter conditions...(CF)	58.06	58.56	59.49
standard conditions.(DSCF)	52.74	52.02	51.44
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.........(IN)	.271	.271	.271
Avg.stack gas temp ..(DEG-F)	240	242	238
Volumetric flow rate........			
actual..............(ACFM)	174944	172483	169196
dry standard.......(DSCFM)	111356	109608	109968
Isokinetic variation.....(%)	99.6	99.8	98.4
CH2O concentration..........			
(GR/DSCF)................	0.0004	0.0003	0.0002
(MG/DSCM)................	0.89	0.63	0.46
(PPM-DRY)................	0.71	0.50	0.36
(PPM-WET)................	0.65	0.46	0.34
CH2O emission rate...(LB/HR)	0.37132	0.25742	0.18741

CH2O = Formaldehyde

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

3.7 Results of MDI Determinations

Test No. 9
RTO Outlet

Results of MDI Determinations..

	Run 1	Run 2	Run 3
Date of run	06-22-94	06-22-94	06-22-94
Time run start/end.....(HRS)	1907/2013	2053/2200	2252/2358
Static pressure......(IN.WC)	-0.63	-0.63	-0.63
Cross sectional area (SQ.FT)	50.53	50.53	50.53
Pitot tube coefficient......	.840	.840	.840
Water in sample gas			
condenser.............(ML)	0.0	0.0	0.0
impingers..........(GRAMS)	50.0	73.0	64.0
desiccant..........(GRAMS)	13.0	20.0	20.0
total..............(GRAMS)	63.0	93.0	84.0
MDI in sample...............(ug)	21.4	20.8	14.6
Gas meter coefficient.......	0.9983	0.9983	0.9983
Barometric pressure..(IN.HG)	27.61	27.61	27.61
Avg. orif.pres.drop..(IN.WC)	1.36	1.31	1.37
Avg. gas meter temp..(DEF-F)	109.7	100.3	90.5
Volume through gas meter....			
at meter conditions...(CF)	42.25	41.15	41.65
standard conditions.(DSCF)	36.19	35.83	36.92
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.........(IN)	.226	.226	.226
Avg.stack gas temp ..(DEG-F)	235	233	228
Volumetric flow rate........			
actual..............(ACFM)	169950	168503	173708
dry standard.......(DSCFM)	109883	105396	110894
Isokinetic variation.....(%)	99.6	102.8	100.7
MDI Concentration			
......................(mg/Nm^3)	0.021	0.020	0.014
.......................(ppm)	0.0020	0.0020	0.0013
MDI Emission Rate			
......................(LB/HR)	0.00859	0.00809	0.00580

3.8 Results of Phenol Determinations

Test No. 8
RTO Outlet

Results of Phenol Determinations ---------------------------

	Run 1	Run 2	Run 3
Date of run	06-22-94	06-22-94	06-22-94
Time run start/end.....(HRS)	1019/1119	1232/1428	1530/1708
Barometric pressure..(IN.HG)	27.61	27.61	27.61
Meter temperature....(DEG-F)	81.33	95.33	107.24
Meter correction coefficient	0.9983	0.9983	0.9983
Volume through gas meter....			
at meter conditions...(CF)	48.520	49.550	49.800
standard conditions (DSCF)	43.806	43.608	42.908
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content......(%V/V)	8.43	8.31	6.75
Volumetric flow rate (DSCFM)	111356	109608	109968
Phenol in sample........(uG)	150.00	200.00	180.00
Phenol concentration........			
($GR/10^3DSCF$)..............	0.0528	0.0708	0.0647
(uG/DSCM)..................	121.01	162.08	148.25
(PPB-DRY)..................	30.92	41.42	37.88
(PPB-WET)..................	28.32	37.98	35.33
Phenol emis. rate(10^{-3}LB/HR)	50.428	66.482	61.010

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Analysis performed according to NIOSH Method 3502

4 RESULTS OF FUEL ANALYSIS

INTERPOLL LABORATORIES, INC.
Fuel Laboratory
(612) 786-6020

7/06/94

Client:	LOUISIANA PACIFIC - CHILCO
Laboratory Log Number:	3191-76-7791
Sample Identification:	DRY FINES FUEL

4-3191R

Proximate and Ultimate Analysis WT %

Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			4.82
Ash		0.15	0.14
Volatile Matter	78.47	78.36	74.58
Fixed Carbon (calculation)	21.53	21.49	20.46
Sulfur	0.30	0.30	0.29
Heating Value, BTU/LB.	8732	8719	8299

Ultimate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			4.82
Ash		0.15	0.14
Carbon	52.85	52.77	50.23
Hydrogen	5.64	5.63	5.36
Nitrogen	0.39	0.39	0.37
Oxygen (calculated)	40.81	40.76	38.79
Sulfur	0.30	0.30	0.29

Respectfully submitted,

Jeannie F. O'Neil

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

9488

INTERPOLL LABORATORIES, INC.
Fuel Laboratory
(612) 786-6020

7/06/94

Client:	LOUISIANA PACIFIC - CHILCO
Laboratory Log Number:	3191-77-7792
Sample Identification:	BACK SAMPLE

Proximate and Ultimate Analysis WT %

Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			45.59
Ash		3.81	2.07
Volatile Matter	75.67	72.79	39.61
Fixed Carbon (calculation)	24.33	23.40	12.73
Sulfur	0.28	0.27	0.15
Heating Value, BTU/LB.	8999	8657	4710

Ultimate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			45.59
Ash		3.81	2.07
Carbon	60.05	57.77	31.43
Hydrogen	5.83	5.61	3.05
Nitrogen	0.46	0.44	0.24
Oxygen (calculated)	33.37	32.10	17.47
Sulfur	0.28	0.27	0.15

Respectfully submitted,

Jeannie F. O'Neil

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

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APPENDIX A

VOLUMETRIC FLOW RATE DETERMINATIONS

Test No. 1
RTO Press Inlet

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination............	06-21-94
Time of Determination.......(HRS)	815
Barometric pressure.......(IN.HG)	27.63
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	24
Shape of duct....................	Round
Stack diameter...............(IN)	60
Duct area.................(SQ.FT)	19.63
Direction of flow................	UP
Static pressure...........(IN.WC)	-1.9
Avg. gas temp.............(DEG-F)	101
Moisture content..........(% V/V)	2.18
Avg. linear velocity.....(FT/SEC)	66.0
Gas density..............(LB/ACF)	.06429
Molecular weight......(LB/LBMOLE)	28.84
Mass flow of gas..........(LB/HR)	300067
Volumetric flow rate.............	
actual...................(ACFM)	77788
dry standard............(DSCFM)	65857

Test No. 3
Dryer RTO Inlet

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination............	06-21-94
Time of Determination.......(HRS)	824
Barometric pressure.......(IN.HG)	27.63
Pitot tube coefficient..........	.84
Number of sampling ports.........	2
Total number of points...........	16
Shape of duct....................	Round
Stack diameter...............(IN)	48
Duct area.................(SQ.FT)	12.57
Direction of flow................	UP
Static pressure...........(IN.WC)	-10.88
Avg. gas temp.............(DEG-F)	197
Moisture content..........(% V/V)	18.19
Avg. linear velocity.....(FT/SEC)	58.7
Gas density..............(LB/ACF)	.05084
Molecular weight......(LB/LBMOLE)	29.20
Mass flow of gas..........(LB/HR)	135098
Volumetric flow rate.............	
actual...................(ACFM)	44289
dry standard............(DSCFM)	26111

Test No. 10
Konus Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination............	06-22-94
Time of Determination.......(HRS)	1030
Barometric pressure.......(IN.HG)	27.61
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	16
Shape of duct....................	Round
Stack diameter...............(IN)	42
Duct area.................(SQ.FT)	9.62
Direction of flow................	UP
Static pressure...........(IN.WC)	-.1
Avg. gas temp............(DEG-F)	338
Moisture content..........(% V/V)	7.57
Avg. linear velocity.....(FT/SEC)	25.2
Gas density..............(LB/ACF)	.04502
Molecular weight......(LB/LBMOLE)	29.25
Mass flow of gas..........(LB/HR)	39304
Volumetric flow rate.............	
actual...................(ACFM)	14551
dry standard............(DSCFM)	8210

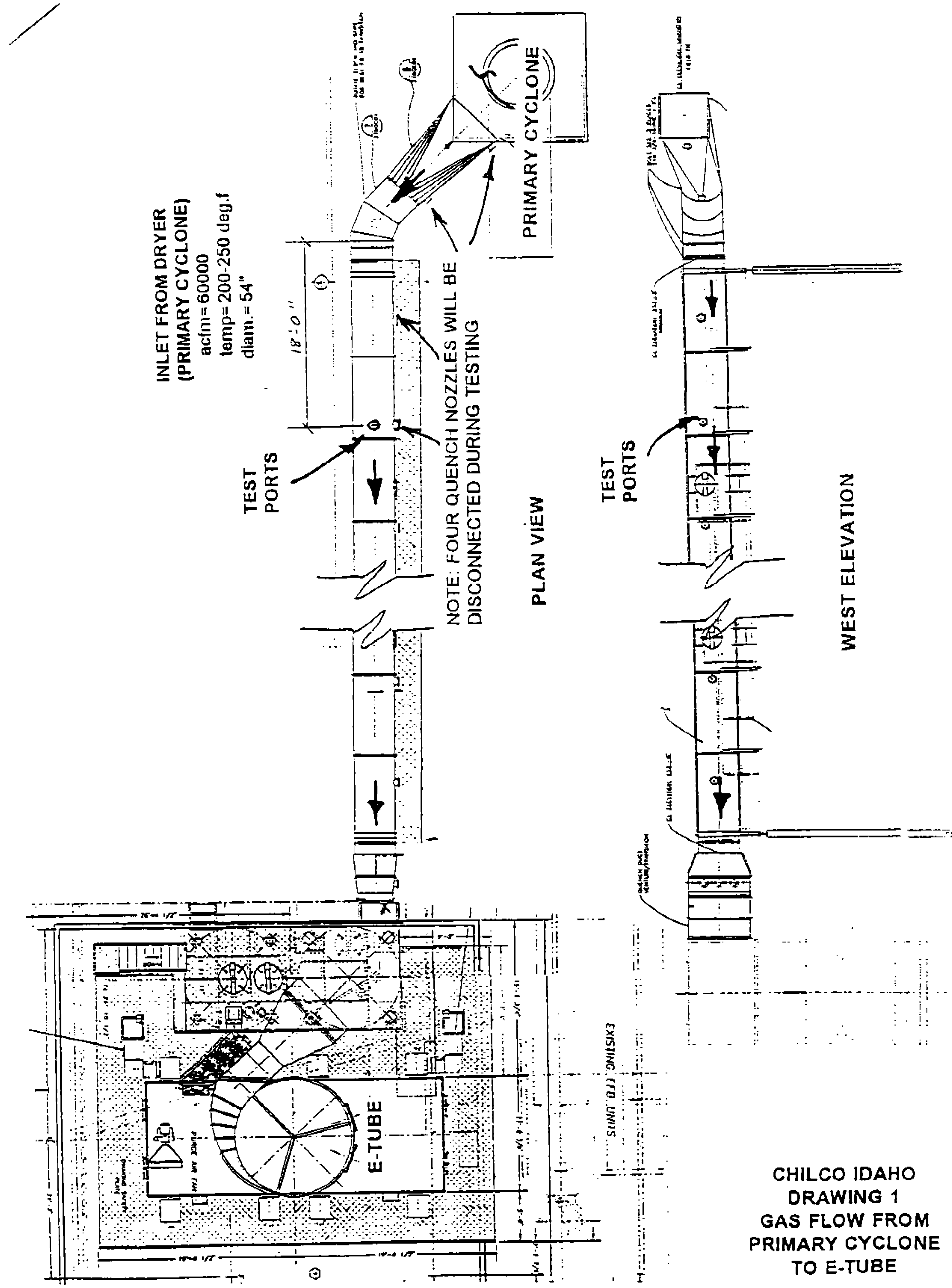
Test No. 12
RTO Panel Inlet

Results of Volumetric Flow Rate Determination-------Method 2

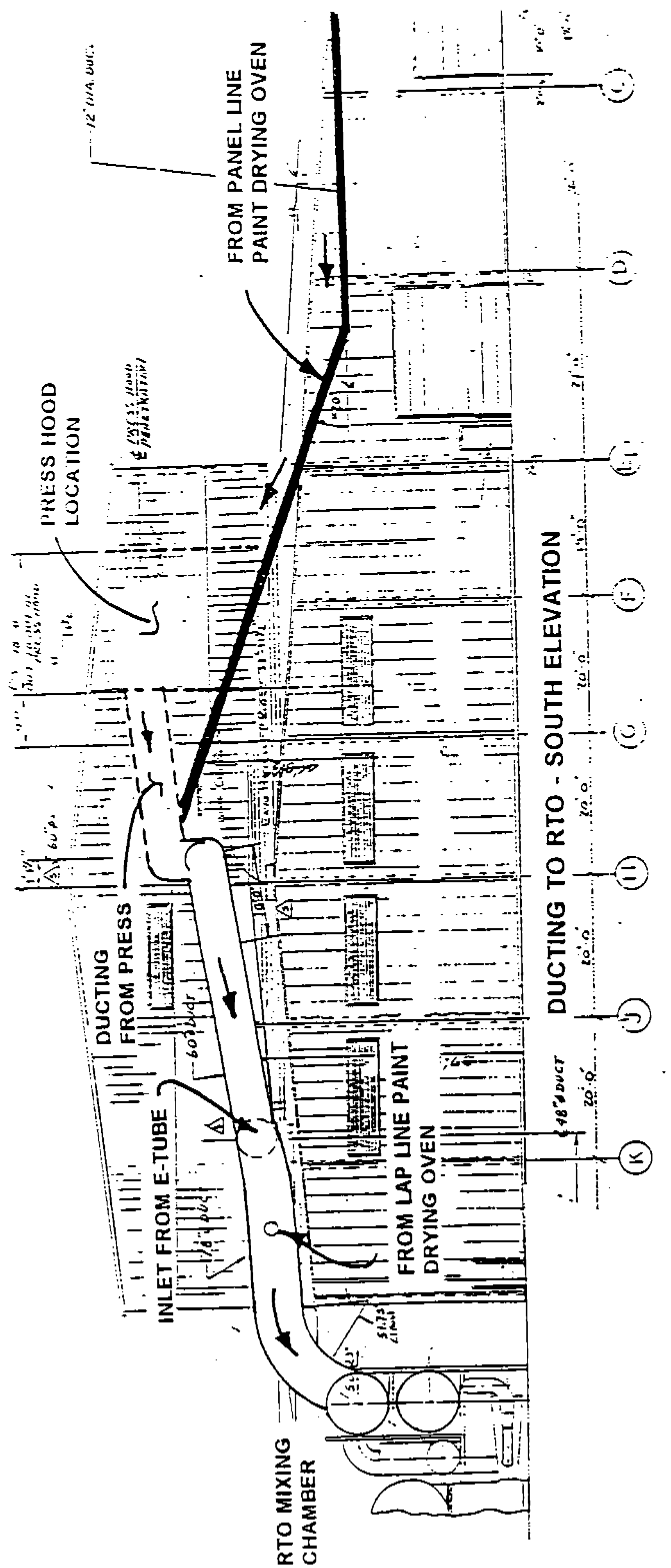
Date of Determination............	06-23-94
Time of Determination.......(HRS)	1107
Barometric pressure.......(IN.HG)	27.54
Pitot tube coefficient...........	.84
Number of sampling ports.........	2
Total number of points...........	16
Shape of duct....................	Round
Stack diameter...............(IN)	12
Duct area.................(SQ.FT)	0.79
Direction of flow................	UP
Static pressure...........(IN.WC)	-.73
Avg. gas temp.............(DEG-F)	184
Moisture content..........(% V/V)	0.46
Avg. linear velocity.....(FT/SEC)	45.7
Gas density..............(LB/ACF)	.05631
Molecular weight......(LB/LBMOLE)	28.84
Mass flow of gas..........(LB/HR)	7274
Volumetric flow rate.............	
actual...................(ACFM)	2153
dry standard............(DSCFM)	1614

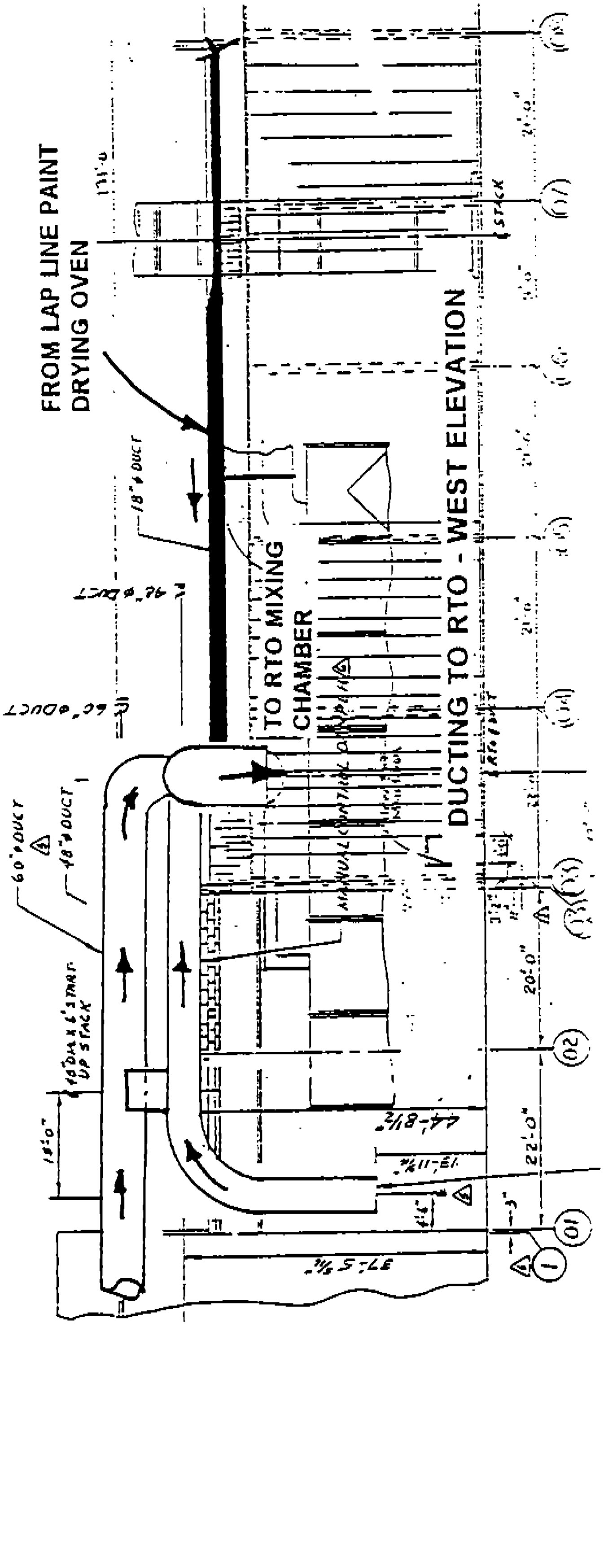
APPENDIX B

LOCATION OF TEST PORTS

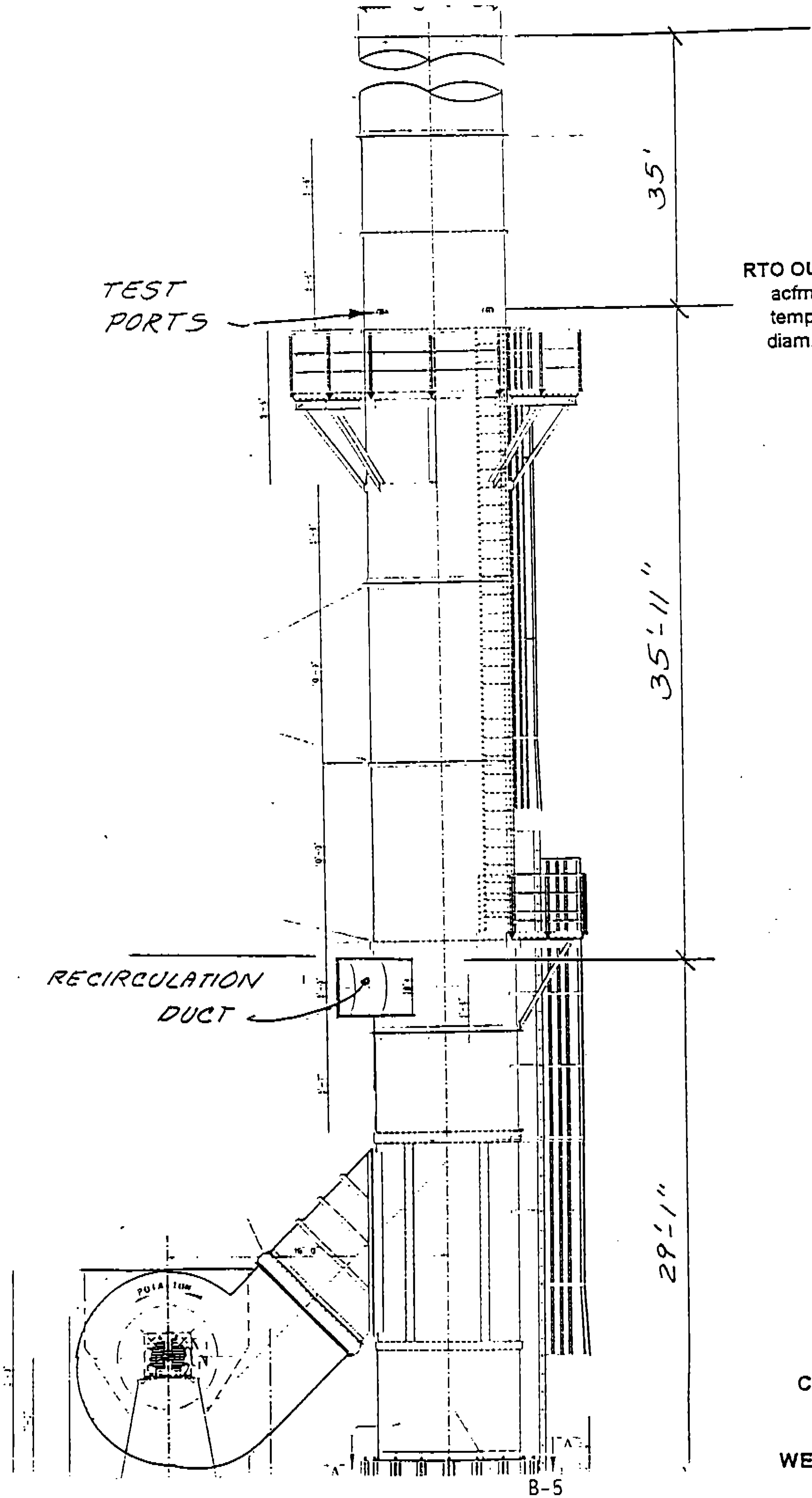


CHILCO IDAHO
DRAWING 1
GAS FLOW FROM
PRIMARY CYCLONE
TO E-TUBE





CHILCO IDAHO
DRAWING 3
GAS FLOW FROM
PRESS AN SIDING LINES
TO RTO
ELEVATIONS



CHILCO IDAHO
DRAWING 5
RTO STACK
WEST ELEVATION

APPENDIX C

RTO FIELD DATA SHEETS

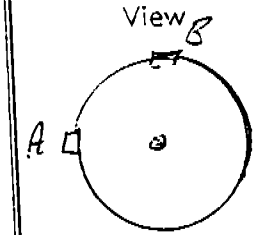
INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: Louisiana-Pacific Corp., Chilco, Idaho
Source: RTO Press Inlet
Test: 1 Run: 0 Date: 6-21-94
Stack Dimen.: 60.0 IN.
Dry Bulb: ____ °F Wet bulb: ____ °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 27.63 IN.HG
Static Pressure: -1.90 IN.WC
Operators: E. Trowbridge - K. Kiereschmidt
Pitot No.: ____ C_p: .84
DM 1202

Drawing of Test Site

Cross-section View | Elevation View



Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6 1/4 IN.		Time Start: 0815 HRS	
A 1	.021	1.26	7.51	1.20	
2	.067	4.02	10.27	1.10	
3	.118	7.08	13.33	.80	
4	.177	10.62	16.87	1.40	100
5	.250	15.0	21.25	1.30	
6	.356	21.36	27.61	1.20	
7	.644	38.64	44.89	1.30	
8	.750	45.0	51.25	1.40	
9	.823	49.38	55.63	1.40	
10	.882	52.92	59.17	1.30	
11	.933	55.98	62.23	1.40	
12	.979	58.74	64.99	1.50	
B 1				1.50	
2				1.30	
3				1.10	
4				1.40	
5				1.20	
6				1.10	101
7				1.05	
8				1.20	
9				1.10	
10				1.05	
11				.80	
12				.55	
				Time End: 0830 HRS	

Temp. Meas. Device & S/N: PDT-34

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/Athilco
Source RTO Press Inlet
Method 5 Filter holder: Teflon

Date 6-21-94 Test 1 Run 1
No. of traverse points 24
Filter type: 3.5 Pallflex

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: .0 cfm at 8 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:
1325

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: ET

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2	203	100	3
Impinger No. 3		0	
Condenser			
Desiccant	1329	1314	15
Total			18

Integrated Gas Sampling Data:

N/A

Bag Pump No. ______ Box No. ______ Bag No. ______
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: ______ cc/min at ______ in. Hg.
Time start: ______ (HRS) Time end: ______ (HRS)
Sampling rate: ______ cc/min Operator: ______

S/N of O_2 Analyzer used to monitor train outlet: ______

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INTERPOLL LABORATORIES ?A METHOD 5 FIELD DATA SHEET

Job LP/CHILCO
Source RTO PRESS INLET
Date 6-21-94 Test 1 Run 2

Operators ET-KN
Meter Box No. 18 ^H@ 1.80 IN WC
Gasmeter coeff. 1.0069

Pitot No. 22V-6 Cp .840
Bar. Press. 27.63 inHg H2O x
Nozzle No. 2-3 Nozzle Dia .188 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
							Temperatures (°F)						
	1405	689.80											
A 12	2.5	691.58	1.20	1.58	1.59	6	99			51	84	83	
11	5	693.46	1.30	1.70	3.45	6.5	99				85	83	
10	7.5	695.11	1.10	1.43	5.15	6	102			52	86	83	
9	10	696.74	1.05	1.37	6.82	6	102				88	83	
8	12.5	698.42	1.05	1.36	8.48	6	105			52	90	84	
7	15	700.30	1.30	1.69	0.34	7	104				92	84	
6	17.5	702.00	1.10	1.43	2.06	6	104			54	93	84	
5	20	703.71	1.10	1.44	3.77	6	104				94	84	
4	22.5	705.38	.98	1.28	5.40	6	103			54	94	84	
3	25	707.10	1.10	1.44	7.11	6	104				91	86	
2	27.5	709.00	1.30	1.69	8.97	7	106			55	93	87	
1	30	710.75	1.20	1.57	0.77	6	106				94	87	
B 12	32.5	712.55	1.20	1.57	2.56	6	105			56	97	88	
11	35	714.25	1.00	1.31	4.21	6	105				97	88	
10	37.5	716.10	1.30	1.66	6.06	7	120			56	100	88	
9	40	717.99	1.40	1.79	7.98	7	121				103	89	
8	42.5	719.88	1.30	1.68	9.85	7	119			57	105	89	
7	45	721.64	1.10	1.42	1.57	6.5	119				105	90	
6	47.5	723.40	1.20	1.55	5.37	6.5	118			58	105	90	
5	50	725.14	1.20	1.55	5.16	6.5	120				107	91	
4	52.5	727.17	1.40	1.81	7.11	7	119			57	108	91	
3	55	728.84	1.10	1.43	8.83	6	119				108	91	
2	57.5	730.55	1.10	1.43	0.56	6	118			57	108	91	
1	60	732.40	1.20	1.58	2.38	6	112				108	91	
	(1542)												
	θ = 60	Vm = 42.60		^H = 1.53							Avg. = 92.1		

STOP
START 1456

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/CHILCO
Source RTO PRESS INLET
Method 5 Filter holder: TEFLON
Date 6-21-94 Test 1 Run 2
No. of traverse points 24
Filter type: PALLFLEX

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 9 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

1327

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: ET

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2		100	4
Impinger No. 3		0	
Condenser			
Desiccant	1478	1464	14
Total			18

Integrated Gas Sampling Data:

N/A

Bag Pump No. ______ Box No. ______ Bag No. ______
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: ______ cc/min at ______ in. Hg.
Time start: ______ (HRS) Time end: ______ (HRS)
Sampling rate: ______ cc/min Operator: ______

S/N of O_2 Analyzer used to monitor train outlet: ______

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CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP/CHICO
Source KTD PRESS INLET
Date 6-21-94 Test 1 Run 2

Operators ET-KN
Meter Box No. 18 ^H@ 1.80 IN WC
Gasmeter coeff. 1.0069

Pitot No. 22V-6 Cp .840
Bar. Press. 27.13 inHg H2O X
Nozzle No. 7-3 Nozzle Dia .155 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
	1645	732.80											
A 12	2.5	734.57	1.20	1.55	4.58	6	118			52	96	94	
11	5	736.40	1.30	1.68	6.45	7	120				98	94	
10	7.5	738.12	1.10	1.43	8.17	6	120			52	99	94	
9	10	739.80	1.05	1.36	9.86	6	120				102	94	
8	12.5	741.60	1.10	1.44	1.59	6	119			55	104	94	
7	15	743.43	1.30	1.70	3.47	7.5	120				105	95	
6	17.5	745.30	1.20	1.56	5.28	7	122			55	106	95	
5	20	747.00	1.10	1.43	7.01	6	122				106	95	
4	22.5	748.62	1.00	1.30	8.66	6	122			56	106	95	
3	25	750.36	1.10	1.44	0.40	6	120				106	95	
2	27.5	752.20	1.20	1.57	2.21	6.5	119			56	107	95	
1	30	754.01	1.20	1.58	4.03	6.5	118				107	95	
B 12	32.5	755.79	1.10	1.44	5.77	6	121			55	107	95	
11	35	757.45	1.00	1.31	7.42	6	121				107	96	
10	37.5	759.30	1.20	1.57	9.23	6.5	122			57	107	96	
9	40	761.25	1.40	1.83	1.19	7	121				107	96	
8	42.5	763.10	1.30	1.70	3.08	7	122			55	107	96	
7	45	764.88	1.10	1.44	4.82	6	120				106	97	
6	47.5	766.40	1.20	1.58	6.63	7	119			56	108	97	
5	50	768.40	1.20	1.58	8.45	7	120				108	97	
4	52.5	770.40	1.40	1.83	0.41	7.5	122			55	110	98	
3	55	772.20	1.15	1.52	2.20	6.5	119				110	98	
2	57.5	773.97	1.10	1.45	3.95	6	118			55	111	99	
1	60	775.75	1.10	1.46	5.70	6	118				111	99	
	(1802)												
	θ = 60	Vm = 42.95		^H 1.53							Avg. = 100.8		

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job AP/CHILCO
Source RTO PRESS INLET
Method 5 Filter holder: TEFLON

Date 6-21-94 Test 1 Run 3
No. of traverse points 24
Filter type: PALLFLEX

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 9 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:
1294

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: ET

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2		100	4
Impinger No. 3		0	
Condenser			
Desiccant	1340	1329	11
Total			15

Integrated Gas Sampling Data:

N/A

Bag Pump No. ______ Box No. ______ Bag No. ______
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: ______ cc/min at ______ in. Hg.
Time start: ______ (HRS) Time end: ______ (HRS)
Sampling rate: ______ cc/min Operator: ______

S/N of O_2 Analyzer used to monitor train outlet: ______

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INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LAPHILCO Source RTO PRESS INLET Date 6-21-94 Test 1 Run 2

Operators ET-KN Meter Box No. 15 ^H@ 1.80 IN WC Gasmeter coeff. 1.0069

Pitot No. 22K6 Cp .84 Bar. Press. 27.63 inHg H2O x Nozzle No. 2-3 Nozzle Dia .18 IN.

Traverse Point No.		Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (%v/v)
		1905	776.30											
A	12	2.5	778.10	1.20	1.57	8.11	6	121			55	98	97	
	11	5	779.98	1.30	1.69	9.98	6	124				101	97	
	10	7.5	781.71	1.10	1.43	1.71	6	123			58	102	97	
	9	10	783.48	1.10	1.43	3.45	6	124				103	97	
	8	12.5	785.20	1.10	1.44	5.18	6	122			57	105	97	
	7	15	787.05	1.30	1.70	7.07	7	120				106	97	
	6	17.5	788.95	1.20	1.58	8.89	6.5	121			57	107	97	
	5	20	790.60	1.10	1.45	0.63	6	128				107	97	
	4	22.5	792.34	1.00	1.32	2.29	6	120			58	108	97	
	3	25	794.10	1.20	1.58	4.12	6.5	120				109	98	
	2	27.5	795.93	1.20	1.59	5.94	6.5	119			57	109	98	
	1	30	797.70	1.20	1.59	7.77	6.5	118				110	98	
B	12	32.5	799.61	1.20	1.58	9.60	6.5	121			55	104	98	
	11	35	801.30	1.10	1.45	1.34	6.0	120				105	98	
	10	37.5	803.10	1.20	1.54	3.16	6.5	117			56	108	98	
	9	40	805.10	1.40	1.86	5.14	8	117				108	98	
	8	42.5	807.00	1.30	1.72	7.04	7.5	119			57	108	98	
	7	45	808.72	1.10	1.45	8.79	6.5	119				108	98	
	6	47.5	810.55	1.10	1.46	0.54	6.5	118			58	108	99	
	5	50	812.40	1.20	1.59	2.37	7.0	119				108	99	
	4	52.5	814.40	1.40	1.85	4.34	8	120			58	109	99	
	3	55	816.09	1.10	1.46	6.09	6.5	117				109	99	
	2	57.5	817.88	1.10	1.46	7.89	6.5	116			58	109	99	
	1	60	819.10	1.10	1.46	9.60	6.5	116				110	100	
		(2023)												
		θ = 60	Vm 43.80		^H 1.55							Avg. = 101.2		

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/CHILCO
Source KTO PRESS INLET
Method 5 Filter holder: TEFLON

Date 6-21-94 Test 1 Run 4
No. of traverse points 24
Filter type: Pall Flex

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 9 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:
1326

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: ET

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2	204	100	4
Impinger No. 3		0	
Condenser			
Desiccant	1490	1478	12
Total			16

Integrated Gas Sampling Data:

N/A

Bag Pump No. ______
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: ______
Time start: ______
Sampling rate: ______

Box No. ______ Bag No. ______
Size: 44 L
cc/min at ______ in. Hg.
(HRS) Time end: ______ (HRS)
cc/min Operator: ______

S/N of O_2 Analyzer used to monitor train outlet: ______

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LF-...

INTERPOLL LABORATORIES "A" METHOD 5 FIELD DATA SHEET

Job LMC HILCO
Source RIO PRESS INLET
Date 6-21-94 Test 1 Run 4

Operators ET - KN
Meter Box No. 18 ^H@ 1.90 IN WC
Gasmeter coeff. 1.0069

Pitot No. 22V-6 Cp .84
Bar. Press. 22.63 inHg H2O ___ %
Nozzle No. 2-3 Nozzle Dia .188 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	2145	820.20											
A 12	2.5	822.44	1.15	1.53	1.99	6	117			56	97	96	
11	5	823.85	1.30	1.71	3.81	7	118				99	96	
10	7.5	825.70	1.20	1.57	5.68	6.5	120			56	100	96	
9	10	827.43	1.10	1.44	7.42	6	120				101	96	
8	12.5	829.16	1.10	1.44	9.15	6	123			58	102	96	
7	15	831.00	1.25	1.63	0.99	7	124				104	96	
6	17.5	832.80	1.20	1.57	2.81	6.5	124			58	105	96	
5	20	834.57	1.10	1.44	4.54	6	124				106	97	
4	22.5	836.25	1.00	1.31	6.20	6	124			58	106	97	
3	25	838.05	1.20	1.58	8.03	7	121				107	97	
2	27.5	839.82	1.20	1.58	9.85	7	121			57	108	97	
1	30	841.65	1.20	1.59	1.68	7	120				108	97	
B 12	32.5	843.49	1.20	1.58	3.50	7	123			56	104	97	
11	35	845.24	1.10	1.44	5.23	7	124				105	97	
10	37.5	847.04	1.20	1.57	7.05	7	126			58	106	98	
9	40	849.03	1.40	1.84	9.01	8	125				107	98	
8	42.5	850.87	1.30	1.71	0.90	8	124			58	107	98	
7	45	852.65	1.15	1.51	2.68	7	124				107	98	
6	47.5	854.43	1.10	1.45	4.43	7	122			56	107	98	
5	50	856.25	1.20	1.58	6.25	7	122				108	98	
4	52.5	858.13	1.30	1.72	8.15	8	121			57	108	98	
3	55	859.89	1.10	1.46	9.90	7	121				108	98	
2	57.5	861.68	1.10	1.46	1.66	7	120			58	109	99	
1	60	863.45	1.10	1.46	3.41	7	121				109	99	
	2255												
	θ = 60	Vm = 43.25		^H = 1.55							Avg. = 102.2		

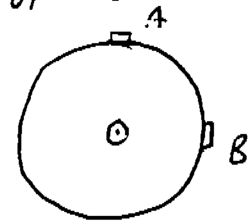
S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. / Chilco, ID
Source: Dryer RTO / Inlet
Test: 3 Run: 0 Date: 6-21-94
Stack Dimen.: 48 IN.
Dry Bulb: 197 °F Wet bulb: 136 °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 27.63 IN.HG
Static Pressure: -10.98 IN.WC
Operators: [illegible] + J. Scripter
Pitot No.: 29U-5 C_p: .84
PM/202/NOx

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 8.50 IN.		Time Start: 0924 HRS	
A-1	.032	1.54	10.04	.77	
2	.105	5.04	13.54	.84	
3	.194	9.31	17.81	.92	
4	.323	15.50	24.00	.85	
5	.677	32.50	41.00	.79	
6	.806	38.69	47.19	.82	
7	.895	42.96	51.46	.80	↑
8	.968	46.46	54.96	.72	
B-1				.67	197
2				.71	↓
3				.91	
4				.63	
5				.59	
6				.66	
7				.69	
8				.65	

Temp. Meas. Device & S/N: PDT-31 / TC — Time End: 0937 HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Chilco ID
Source Dryer R70 / Inlet
Method 5 Filter holder: Teflon
Sample Train Leak Check: + Glass

Date 6-21-94 Test 3 Run 1
No. of traverse points 16
Filter type: Glass + Pallflex

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: ≤ 0.02 cfm at 17 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:
1293
6196

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: M. Kuehler + S. Scripter

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	728	492	236
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1508	1476	32
Total			268

Integrated Gas Sampling Data:

Bag Pump No. 23B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1405 (HRS)
Sampling rate: 400 cc/min

Box No. 24 Bag No. 1
Size: 44 L
cc/min at 15 in. Hg.
Time end: 1544 (HRS)
Operator: M. Kuehler

S/N of O_2 Analyzer used to monitor train outlet: 3

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INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / Chilco, ID Operators M. Koehler / S. Snyder Pitot No. 294-5 Cp .84
Source Dryer RTO / Inlet Meter Box No. 5 ^H@ 1.75 IN WC Bar. Press. 27.63 inHg H2O 12.5 %
Date 6-21-94 Test 3 Run 1 Gasmeter coeff. .9997 Nozzle No. 2-4 Nozzle Dia .248 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Obs. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1405	584.60											
B-8	4	587.85	.83	1.94	7.89	11	192	235	240	47	86	86	17.4
7	8	591.27	.85	1.99	1.23	11.5	194	237	243	47	91	86	17.5
6	12	594.47	.80	1.89	4.50	11.5	195	234	242	47	93	86	16.3
5	16	598.00	.95	2.25	8.06	16	196	239	245	47	96	87	16.7
4	20	601.55	.93	2.21	1.59	12	196	244	250	48	93	91	16.8
3	24	605.14	.96	2.28	5.19	13	195	245	247	48	94	91	17.0
2	28	608.70	.93	2.22	8.74	13	195	243	245	48	97	91	17.0
1	32	611.63	.57	1.38	1.54	9	187	241	249	48	99	92	16.5
A-8	36	614.77	.72	1.72	4.67	10	198	240	246	49	103	93	17.8
7	40	617.78	.78	1.87	7.45	10.5	198	237	250	48	107	94	17.8
6	44	621.89	.81	1.94	1.29	11	200	235	253	49	110	96	17.1
5	48	624.93	.87	2.10	4.78	12	200	243	255	50	110	95	18.0
4	52	628.50	.92	2.21	8.35	13	201	247	252	50	111	97	17.7
3	56	631.96	.86	2.08	1.82	12	199	244	249	50	111	97	17.6
2	60	635.15	.80	1.94	5.17	11	197	242	245	50	111	98	17.7
1	64	638.74	.77	1.87	8.46	10.5	197	240	243	50	111	98	17.6
	1544												
	θ = 64	Vm = 54.14		^H 1.99							Avg. = 96.9		

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P./Chiles I.D. Date 6-21-94 Test 3 Run 2
Source Dryer R50 / Inlet No. of traverse points 16
Method 5 Filter holder: Glass Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: <0.02 cfm at 15 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used: 6189

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: M. Kaehler & J. Scrypter

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	701	494	207
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1520	1508	12
Total			219

Integrated Gas Sampling Data:

Bag Pump No. 23 B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1645 (HRS)
Sampling rate: 400 cc/min

Box No. 24 Bag No. 2
Size: 44 L
Time end: 1804 (HRS)
Operator: M. Kaehler

S/N of O_2 Analyzer used to monitor train outlet: 3

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CF-011

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P Chilco
Source DRYER RTO INLET
Date 6/21/94 Test 3 Run 2

Operators MK & J.S
Meter Box No. 5 ΔH@ 1.79 IN WC
Gasmeter coeff. .9997

Pitot No. 29V-5 Cp .94
Bar. Press. 27.63 inHg H2O 20 X
Nozzle No. 2-4 Nozzle Dia .248 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
	1645	639.30											
A-8	4	642.42	.76	1.73	2.44	9	197	243	250	44	97	96	17.1
7	8	645.75	.93	1.99	5.73	10.5	198	248	253	44	102	97	17.3
6	12	649.25	.90	2.05	9.16	11	200	245	254	45	106	97	16.9
5	16	652.73	.93	2.12	2.65	11	200	242	249	45	107	98	16.8
4	20	656.26	.92	2.10	6.14	11	201	240	252	45	109	99	17.2
3	24	659.67	.90	2.06	9.59	11	202	237	254	45	111	98	17.0
2	28	662.98	.85	1.95	2.95	11	202	234	251	45	111	99	16.9
1	32	666.00	.70	1.61	6.01	9	198	238	247	47	112	100	17.0
B-8	36	669.42	.80	1.86	9.30	10	195	241	250	47	106	100	17.2
7	40	672.71	.82	1.89	2.60	10	197	240	253	47	111	101	17.3
6	44	676.25	.97	2.24	6.21	12	198	238	251	48	114	101	17.6
5	48	679.95	.94	2.18	9.77	11.5	198	235	254	49	114	102	17.5
4	52	683.15	.80	1.85	3.06	11	198	240	253	49	115	102	17.6
3	56	686.54	.85	1.98	6.46	11.5	195	243	250	51	115	102	17.4
2	60	689.66	.73	1.70	9.61	11	195	247	244	52	114	103	17.4
1	64	692.85	.80	1.87	2.91	11	194	245	248	52	114	103	17.6
	1804												
	θ = 64	Vm = 53.55		ΔH = 1.94							Avg. = 104.8		

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Chilco, ID
Source Dryer R10 / Inlet
Method 5 Filter holder: Glass

Date 6-21-94 Test 3 Run 3
No. of traverse points 16
Filter type: 4" GF

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: <0.02 cfm at 14 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

6666

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: M. Kuchlin + S. Scripter

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	717	488	229
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1540	1510	30
Total			259

Integrated Gas Sampling Data:

Bag Pump No. 23B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1905
Sampling rate: 400

Box No. 24 Bag No. 3
Size: 44 L
cc/min at 15 in. Hg.
(HRS) Time end: 2015 (HRS)
cc/min Operator: M. Kuchlin

S/N of O_2 Analyzer used to monitor train outlet: 3

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$\frac{1.01}{2.42} = .03$ (?)

CF-D11

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. / Chilco, ID
Source Dryer RTO / Inlet
Date 6-21-94 Test 3 Run 3

Operators M. Kuehler + S. Scryftee
Meter Box No. 5 ^H@ 1.79 IN WC
Gasmeter coeff. .9997

Pitot No. 290-5 Cp .84
Bar. Press. 27.63 inHg H2O 18.2%
Nozzle No. 2-4 Nozzle Dia ~~.249~~ .248 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1905	693.50											
B-8	4	696.74	.83	1.99	6.70	9	195	243	250	48	97	97	17.1
7	8	700.10	.91	2.15	0.20	11	198	240	253	48	100	98	17.1
6	12	203.22	.88	2.08	3.66	11	198	248	257	48	100	97	17.1
5	16	707.18	.86	2.05	2.09	11	191	245	254	48	104	98	17.0
4	20	710.60	.84	2.01	0.49	11	193	251	257	48	108	98	17.0
3	24	713.69	.71	1.71	3.64	9.5	193	247	252	49	107	98	17.5
2	28	717.47	1.01	2.42	2.33	12.5	194	242	249	51	109	99	17.7
1	32	720.98	.90	2.16	0.91	11.5	194	241	245	51	111	99	17.9
A-8	36	724.15	.77	1.85	4.19	10	195	240	241	52	103	100	17.3
7	40	727.31	.83	1.99	2.41	10.5	195	241	243	52	107	100	17.6
6	44	730.80	.88	2.08	0.85	11	194	244	250	50	108	100	17.3
5	48	734.11	.89	2.08	4.31	11	196	248	248	47	110	101	17.4
4	52	737.12	.94	2.21	2.86	12	196	247	252	47	112	101	17.7
3	56	741.10	.97	2.28	1.47	12.5	195	244	251	47	113	101	17.5
2	60	744.00	.90	2.11	4.94	11	197	246	255	47	114	101	17.6
1	64	747.56	.64	1.51	2.88	9	194	241	250	47	113	101	17.5
	2025												
	θ = 64	Vm = 54.26		^H 2.06							Avg. = 103.2		

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Chilco, ID
Source Dryer RTO / Inlet
Method 5 Filter holder: ~~teflon~~
Sample Train Leak Check: Glass

Date 6-21-94 Test 3 Run 4
No. of traverse points 16
Filter type: /

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: <0.02 cfm at 14 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

6667

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: M. Koehler + T. Scripter

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	716	490	226
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1560	1540	20
Total			246

Integrated Gas Sampling Data:

Bag Pump No. 23B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 2145 (HRS)
Sampling rate: 4100 cc/min

Box No. 24 Bag No. 1 *
Size: 44 L
Time end: 2252 (HRS)
Operator: M. Koehler

S/N of O_2 Analyzer used to monitor train outlet: 3

* Evacuated bag 1 from Run 1

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INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. Chiko
Source DRYER RTO INLET
Date 6/21/94 Test 3 Run 4

Operators MK & J.S
Meter Box No. 5 ^H@ 4.29 IN WC
Gasmeter coeff. .9997

Pitot No. 29V-5 Cp .84
Bar. Press. 27.63 inHg H2O 20 %
Nozzle No. 2-4 Nozzle Dia .248 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgm Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	21.45	248.00											
8	4	251.21	.79	1.83	1.26	9	195	243	250	48	98	98	16.7
7	8	254.41	.77	1.79	4.48	9	195	247	248	49	102	98	16.8
6	12	252.60	.76	1.77	7.67	10	197	244	252	49	105	98	16.4
5	16	255.85	.79	1.83	5.92	10.5	200	250	255	49	107	99	16.3
4	20	259.14	.81	1.87	9.20	11	203	247	251	51	110	99	16.7
3	24	262.47	.83	1.92	2.52	11.5	203	242	250	51	111	99	16.6
2	28	265.79	.82	1.90	5.82	11.5	204	247	248	51	112	99	16.5
1	32	269.02	.80	1.85	9.08	10.5	204	243	252	51	112	99	17.0
8	36	272.44	.83	1.89	2.39	11	208	241	250	52	102	100	16.7
7	40	275.82	.85	1.95	5.73	11.5	210	237	248	52	111	100	17.3
6	44	279.10	.91	2.09	9.19	12	210	243	242	50	114	101	18.0
5	48	282.71	.97	2.24	2.76	12.5	209	240	244	50	114	101	17.8
4	52	286.24	1.00	2.31	6.39	13	207	239	245	48	113	101	17.1
3	56	289.81	.96	2.21	9.94	14	211	235	248	47	112	103	17.1
2	60	293.40	.93	2.14	3.43	14	211	238	244	47	112	102	17.2
1	64	296.55	.78	1.79	6.63	12	210	234	241	47	111	103	17.1
	2257												
	θ = 64	Vm = 48.55		^H 1.94							Avg. = 104.5		

S-0037R

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job L.P. /Chilco ID   Date 6-21-94   Bar. Pressure 27.63 IN.HG.
Test Location Dryer RTO Inlet   Fuel Type Wood Waste   Sample Train No. Green
Technician J. Scripter   Pump No. Cal

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	3/1/A	19	1411	25.50	95	☒ Yes ☐ No
2	3/1/B	20	1423	25.50	95	☒ Yes ☐ No
3	3/1/C	21	1521	25.60	95	☒ Yes ☐ No
4	3/1/D	22	1535	25.40	95	☒ Yes ☐ No
5	3/2/A	23	1652	25.55	95	☒ Yes ☐ No
6	3/2/B	24	1705	25.60	95	☒ Yes ☐ No
7	3/2/C	31	1727	25.60	95	☒ Yes ☐ No
8	3/2/D	32	1750	25.50	95	☒ Yes ☐ No
9	3/3/A	33	1912	25.70	95	☒ Yes ☐ No
10	3/3/B	35	1930	25.70	95	☒ Yes ☐ No
11	3/3/C	36	1949	25.65	95	☒ Yes ☐ No
12	3/3/D	93	2010	25.70	95	☒ Yes ☐ No
13						☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

S-263R

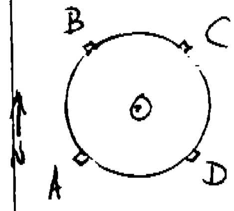
INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: LP-Chilco
Source: RTO-OUTLET
Test: 5 Run 1 Date: 6-21-94
Stack Dimen.: 96.25 IN.
Dry Bulb: ____ °F Wet bulb: ____ °F
Manometer: ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 27.63 IN.HG
Static Pressure: -.63 IN.WC
Operators: DVH ? DV ; TJ
Pitot No.: 124- C_p: .840

PM/202/NOx/CO

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25	IN.	Time Start:	HRS
A-1	.021	2.02	8.27		
2	.067	6.49	12.70		
3	.118	11.36	17.61		
4	.177	17.04	23.29		
5	.250	24.06	30.31		
6	.356	34.27	40.52		
B-1					
2					
3					
4					
5					
6					
C-1					
2					
3					
4					
5					
6					
D-1					
2					
3					
4					
5					
6					
Temp. Meas. Device & S/N:				Time End:	HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Chilco
Source RTO Stack
Method 5 Filter holder: glass
Sample Train Leak Check:

Date 6/21/94 Test 5 Run 1
No. of traverse points 24
Filter type: glass fiber

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 13 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

6711

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DWH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	272	200	72
Impinger No. 3			
Condenser			
Desiccant	1521	1503	18
Total			90

Integrated Gas Sampling Data:

Bag Pump No. 24A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1304 (HRS)
Sampling rate: 400 cc/min

Box No. 19 Bag No. 1
Size: 44 L
Time end: 1523 (HRS)
Operator: DWH

S/N of O_2 Analyzer used to monitor train outlet: ____________

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INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P./Chilco
Source RTO Stack
Date 6/21/94 Test 5 Run 1

Operators D.K.H + T.J + DV
Meter Box No. 3 ^H@ 1.80 IN WC
Gasmeter coeff. .9983

Pitot No. K24-4 Cp .84
Bar. Press. 27.63 inHg H2O 9 %
Nozzle No. 1-4 Nozzle Dia. .252 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Imp. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (%v/v)
	1300	523.90											
A 6	2.5	526.10	.76	2.16	6.05	11	242	246	251	49	87	87	005
5	5	528.30	.82	2.36	8.33	11	242				87	88	005
4	7.5	530.85	.92	2.69	0.75	11	232				91	92	
3	10	533.07	.86	2.49	3.09	11	242	253	254	56	92	91	
2	12.5	535.33	.75	2.18	5.29	10	242				93	91	
1	15	537.55	.76	2.21	7.49	10	242				94	91	
B 6	17.5	539.53	.66	1.92	9.55	9	242	257	256	57	94	93	
5	20	541.80	.77	2.25	1.79	10	239				96	93	
4	22.5	543.99	.74	2.17	3.98	10	240				97	94	
3	25	546.29	.77	2.27	6.22	10	237	256	257	56	98	94	
2	27.5	548.30	.56	1.65	8.14	8	237				99	94	
1	30	549.96	.49	1.46	9.95	8	230				99	95	
C 6	32.5	551.96	.57	1.68	1.88	8	237	256	258	57	98	96	
5	35	553.86	.56	1.63	3.79	8	247				100	96	
4	37.5	555.86	.58	1.71	5.75	8	239				101	96	
3	40	557.69	.54	1.60	7.64	8	238	259	257	56	101	96	
2	42.5	559.31	.40	1.19	9.27	6	236				102	96	
1	45	560.99	.42	1.24	0.94	6	241				103	97	
D 6	47.5	563.02	.64	1.89	3.00	8	241	260	257	57	102	98	
5	50	565.04	.62	1.85	5.03	8	235				103	98	
4	52.5	567.03	.67	2.0	7.15	8	235				107	99	
3	55	569.40	.73	2.18	9.37		236	257	256	58	108	100	
2	57.5	571.40	.57	1.71	1.33		236				108	101	
1	60	573.15	.49	1.47	3.15		236				108	101	
	1523												
	θ = 60	Vm = 49.25		^H = 1.91							Avg. = 96.7		

← St[illegible] 130[illegible] Rest[illegible] 140[illegible]

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Chilco
Source RTO Stack
Method 5 Filter holder: glass
Sample Train Leak Check:

Date 6/21/94 Test 5 Run 2
No. of traverse points 24
Filter type: glass fiber

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 14 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DLT

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	271	200	71
Impinger No. 3			
Condenser			
Desiccant	1404	1388	16
Total			87

Integrated Gas Sampling Data:

Bag Pump No. 24A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1650
Sampling rate: 400

Box No. 19 Bag No. 2
Size: 44 L
cc/min at 14 in. Hg.
(HRS) Time end: 1801 (HRS)
cc/min Operator: DLT

S/N of O_2 Analyzer used to monitor train outlet:

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INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. /Chilco
Source RTO STACK
Date 6/21/97 Test 5 Run 2

Operators DVH & JJ
Meter Box No. 3 ^H@ 1.80 IN WC
Gasmeter coeff. .9983

Pitot No. V24-4 Cp .84
Bar. Press. 27.13 inHg H2O 2 %
Nozzle No. 1-4 Nozzle Dia .252 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Obs. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
	1645	573.60											
D 6	2.5	575.61	.64	1.88	5.64	8	240	256	257	51	98	98	005
5	5	577.83	.72	2.12	7.82	9	241				98	97	
4	7.5	579.96	.66	1.96	9.91	9	235				98	98	
3	10	581.99	.65	1.93	1.98	9	234	255	254	52	99	98	
2	12.5	583.96	.57	1.71	3.94	8	230				120	98	
1	15	585.77	.46	1.38	5.69	7	231				102	99	
A 6	17.5	587.93	.70	2.10	7.86	9	231	261	256	53	102	100	
5	20	590.01	.74	2.21	0.81	9	234				104	100	
4	22.5	592.48	.85	2.55	2.48	10	233				104	100	
3	25	594.96	.88	2.63	4.91	10	235	260	258	55	104	100	
2	27.5	597.40	.94	2.81	7.42	10	235				103	101	
1	30	599.81	.80	2.39	9.13	9	235				104	101	
B 6	32.5	602.06	.80	2.39	2.05	9	235	260	257	56	104	101	
5	35	604.16	.64	1.91	4.13	9	235				104	101	
4	37.5	606.27	.70	2.08	6.29	9	239				107	103	
3	40	608.69	.77	2.30	8.57	9	239	258	256	54	108	103	
2	42.5	610.78	.72	2.16	0.78	9	237				109	104	
1	45	612.90	.58	1.74	2.77	8	240				110	104	
6	47.5	614.88	.59	1.77	4.77	8	240	260	258	54	109	105	
5	50	616.69	.54	1.62		8	238				111	106	
4	52.5	618.96	.61	1.84	8.73	8	238				112	107	
3	55	620.77	.55	1.66	0.68	8	239	258	260	55	113	107	
2	57.5	622.66	.54	1.63	2.61	8	238				113	107	
1	60	624.40	.46	1.39	4.39	7	238				113	108	
	(1801)												
	θ = 60	Vm = 50.80		^H = 2.01							Avg. = 103.6		

S-00…

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Chilco
Source RTO Stack
Method 5 Filter holder: glass

Date 6/21/94 Test 5 Run 3
No. of traverse points 24
Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☑
Post test: 0 cfm at 13 in. Hg. (vac) ☑

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☑ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DLH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	266	200	66
Impinger No. 3			
Condenser			
Desiccant	1539	1521	18
Total			84

Integrated Gas Sampling Data:

Bag Pump No. 24A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1910 (HRS)
Sampling rate: 400 cc/min

Box No. 19 Bag No. 3
Size: 44 L
Time end: 2022 (HRS)
Operator: DLH

S/N of O_2 Analyzer used to monitor train outlet: 095

123093-G:\STACK\WP\METHODS\S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. Chileo
Source RTO Stack
Date 6/21/94 Test 5 Run 3

Operators DVH & JJ
Meter Box No. 5 ^H@ 1.80 IN WC
Gasmeter coeff. .9983

Pitot No. K24-4 Cp .84
Bar. Press. 27.63 inHg H2O 9 %
Nozzle No. 1-4 Nozzle Dia .252 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgs. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (%v/v)
	1905	624.70											
C 6	2.5	626.66	.57	1.70	6.66	7	237	249	253	50	105	105	005
5	5	628.63	.58	1.74	8.64	7	235				108	107	
4	7.5	630.55	.51	1.53	0.51	6.5	238				110	107	
3	10	632.50	.57	1.71	2.49	7	240	256	253	50	110	107	
2	12.5	634.40	.51	1.53	4.35	6.5	240				111	107	
1	15	636.04	.40	1.21	6.02	5.5	233				112	107	
B 6	17.5	638.16	.65	1.97	8.14	7	233	258	256	50	111	106	
5	20	640.40	.72	2.17	0.36	8	238				112	107	
4	22.5	642.75	.76	2.28	2.64	8	240				112	108	
3	25	644.96	.77	2.33	4.94	10	237	261	256	51	112	107	
2	27.5	647.11	.65	1.97	7.06	8	235				112	107	
1	30	648.91	.40	1.21	8.73	6	235				111	107	
A 6	32.5	650.86	.58	1.76	0.73	8	235	260	257	51	109	105	
5	35	653.19	.84	2.52	3.12	10	238				111	106	
4	37.5	655.60	.88	2.63	5.56	10	241				111	106	
3	40	658.10	.91	2.72	8.05	12	241	258	256	51	110	105	
2	42.5	660.39	.93	2.79	0.56	12	237				102	102	
1	45	662.56	.63	1.88	2.62	8	235				104	103	
6	47.5	664.70	.63	1.89	4.69	8	235	261	260	53	103	102	
5	50	666.70	.65	1.94	6.78	8	235				105	102	
4	52.5	668.85	.67	2.0	8.90	8	239				106	102	
3	55	671.04	.66	1.98	1.01	8	236	266	261	53	107	102	
2	57.5	672.96	.52	1.57	2.90	7	233				107	102	
1	60	674.70	.47	1.41	4.68	6	235				107	102	
	2022												
	θ = 60	Vm = 50.00		^H = 1.94							Avg. = 106.8		

S-0037R

INTERPOLL LABORATORIES, INC
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P /Chilco
Source RTO STACK
Method 5 Filter holder: glass
Sample Train Leak Check: ✓

Date 6/21/94 Test 5 Run 4
No. of traverse points 24
Filter type: glass fiber

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 12 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: Dut

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	273	200	73
Impinger No. 3			
Condenser			
Desiccant	1425	1404	21
Total			94

Integrated Gas Sampling Data:

Bag Pump No. 24A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 2150
Sampling rate: 400

Box No. 1 Bag No. 1
Size: 44 L
cc/min at 14 in. Hg.
(HRS) Time end: 2256 (HRS)
cc/min Operator: Dult

S/N of O_2 Analyzer used to monitor train outlet: 005

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INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: L.P. Chilco
Source: RTO STACK
Date: 6/21/94 Test 5 Run 4

Operators: D.H. & T.J.
Meter Box No. 3 ΔH@ 1.80 IN WC
Gasmeter coeff. .9983

Pitot No. V24-4 Cp .84
Bar. Press. 27.63 inHg H2O 8.25%
Nozzle No. 1-4 Nozzle Dia .252 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgs. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (%v/v)
	2145	675.00											
D 6	2.5	677.62	.70	2.14	7.20	10	235	237	246	48	84	86	0.25
5	5	679.27	.67	1.97	9.27	12	233				86	86	
4	7.5	681.46	.66	1.94	1.33	12	235				86	86	
3	10	683.36	.56	1.65	3.23	8	235	249	256	50	86	86	
2	12.5	685.29	.60	1.77	5.20	8	233				87	86	
1	15	686.95	.46	1.35	6.92	7	237				88	86	
C 6	17.5	689.06	.72	2.12	9.07	9	237	253	257	50	87	85	
5	20	691.40	.81	2.40	1.36	10	231				89	86	
4	22.5	693.43	.72	2.13	3.52	10	232				89	86	
3	25	695.69	.78	2.31	5.77	10	232	254	253	51	87	86	
2	27.5	697.90	.68	2.01	7.87	10	233				89	86	
1	30	699.80	.54	1.60	9.74	7	233				89	86	
B 6	32.5	701.91	.70	2.07	1.87	10	233	255	252	53	86	85	
5	35	704.08	.70	2.07	4.0	10	231				87	86	
4	37.5	706.30	.74	2.18	6.18	10	236				88	85	
3	40	708.50	.76	2.24	8.39	10	235	254	253	54	88	85	
2	42.5	710.67	.72	2.12	0.54	10	235				87	85	
1	45	712.56	.63	1.87	2.56	9	232				89	85	
A 6	47.5	714.64	.70	2.07	4.69	10	232	256	257	53	84	86	
5	50	716.63	.55	1.62	6.58	9	232				87	84	
4	52.5	718.60	.59	1.75	8.53	9	230				88	84	
3	55	720.40	.50	1.48	0.33	7	233	257	257	53	88	84	
2	57.5	722.21	.52	1.54	2.16		233				88	84	
1	60	723.78	.40	1.18	3.77		233				89	85	
	(2257)												
	θ = 60	Vm = 48.78		ΔH = 1.90							Avg. = 86.4		

S-0037R

INTERPOLL LABORATORIES, INC.

(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P Chilco

Source: RTO STACK

Test: 7 Run__ Date: 6/22/94

Stack Dimen.: 96.25 IN.

Dry Bulb ____ °F Wet bulb ____ °F

Manometer ☒ Reg. ☐ Exp ☐ Elec.

Barometric Pressure: 27.61 IN.HG

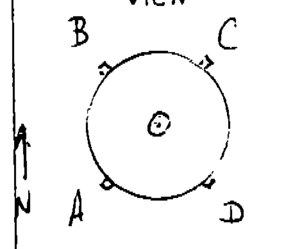
Static Pressure: -.63 IN.WC

Operators: D. Van Hoever & J. Johnson

Pitot No.: 4M5-8 C_p .84

CH_2O

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start: HRS	
A 1	.021	2.02	8.27		
2	.067	6.44	12.69		
3	.118	11.36	17.60		
4	.177	17.03	23.28		
5	.250	24.06	30.31		
6	.356	34.26	40.52		
7	.644	61.98	68.24		
8	.750	72.19	78.44		
9	.823	79.21	85.46		
10	.882	84.89	91.14		
11	.933	89.80	96.05		
12	.979	94.23	100.47		
B 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Temp. Meas. Device & S/N:				Time End: HRS	

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Chilco
Source RTO Stack
Method 0011 Filter holder: NA
Date 6/22/94 Test 7 Run 2
No. of traverse points 24
Filter type: NA

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☑
Post test: 0 cfm at 14 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☐acetone
☑other(s) MECL2 + DI H2O

No. of probe wash bottles: 1
Sample recovered by: DJH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	276	200	76
Impinger No. 3			
Condenser			
Desiccant	1510	1486	24
Total			100

Integrated Gas Sampling Data:

Bag Pump No. 24A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1235 (HRS)
Sampling rate: 400 cc/min
Box No. 17 Bag No. 2
Size: 44 L
cc/min at 14 in. Hg.
Time end: 1428 (HRS)
Operator: DJH

S/N of O_2 Analyzer used to monitor train outlet:

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INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job L.P. Chico
Source ETO Stack
Date 6/22/94 Test 7 Run 3

Operators Dust J.T.S
Meter Box No. 75 ^H@ 1.94 IN WC
Gasmeter coeff. 1.0005

Pitot No. 4MS-8 Cp .84
Bar. Press. 27.67 inHg H2O 2.5 %
Nozzle No. Glass Nozzle Dia .271 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Del. Vol. (cf)	VAC. inHg	Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1530	159.41											
B 12	2.5	161.90	.73	3.12	1.92	10	236	256	254	53	99	99	805
11	5	164.24	.60	2.59	4.24	9	236				105	99	
10	7.5	166.65	.68	2.95	6.71	10	237				106	100	
9	10	169.19	.74	3.21	9.29	10	238	257	256	53	108	100	
8	12.5	171.60	.60	2.60	1.62	10	239				109	100	
7	15	174.05	.65	2.83	4.04	10	235				111	101	
6	17.5	176.60	.64	2.79	6.46	10	239	258	257	53	111	101	
5	20	178.99	.68	2.96	8.94	10	240				112	102	
4	22.5	181.60	.74	3.22	1.53	11	240				112	105	
3	25	183.20	.64	2.80	3.96	11	237	257	256	53	113	103	
2	27.5	186.55	.71	3.12	6.51	11	235				114	103	
1	30	189.10	.68	2.99	9.01	11	235				115	104	
A 12	32.5	191.45	.63	2.78	1.43	11	235	258	257	54	115	104	
11	35	193.91	.63	2.78	3.84	11	235				117	105	
10	37.5	196.30	.57	2.51	6.14	10	237				115	106	
9	40	198.50	.60	2.64	8.50	10	237	261	257	55	118	108	
8	42.5	200.98	.66	2.91	0.98	10	235				118	108	
7	45	203.40	.62	2.72	3.38	10	242				118	105	
6	47.5	205.86	.67	2.93	5.86	11	242	264	258	56	117	106	
5	50	208.24	.60	2.65	8.23	10	257				118	106	
4	52.5	210.52	.70	3.07	0.77	10	240				108	106	
3	55	213.35	.84	3.47	3.47	12	238	261	256	57	111	107	
2	57.5	216.40	.90	3.94	6.34	12	238				111	107	
1	60	218.90	.69	3.02	8.86		240				113	108	
	1714												
	θ = 60	Vm = 59.49		^H = 2.94							Avg. = 107.9		

S-0037R

INTERPOLL LABORATORIES

EPA Method 4 and 6 Field Data Sheet — Phenol

Job: LP Chilco
Source: RTO Stack
Date: 6/22/94 Test: 8 Run: 1

Operator(s): D. Van Hoever
Meter Box No. 3 Gasmeter coef. .9983
^H@ 1.80 in.WC Bar. press 27.61 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0 cfm at 11 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F) Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1019	724.66								
	5	728.53	1.80	9	253	247	51	78	78	005
	10	732.42	1.80	9				76	74	
	15	736.30	1.80	9				78	75	
	20	740.55	1.80	9	256	254	51	81	76	
	25	744.10	1.80	9				82	75	
	30	744.63	1.80	9				84	79	
	35	752.76	1.80	9	254	253	52	86	80	-
	40	756.89	1.80	9				87	81	
	45	760.95	1.80	9				88	82	
	50	765.02	1.80	9	257	256	53	89	83	
	55	769.10	1.80	9				90	84	
	60	773.18	1.80	9				91	85	
	(1119)									
	θ=60	Vm=48.52	(^H)avg=1.80					(tm)avg.=81.33		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers	271	200	71
Condenser			
Desiccant	1449	1428	21
		Total	92

Preliminary results of SO_2 concentration determination
V_{std} = DSCF
Moisture = %v/v
SO_2, dry = ppm
SO_2, wet = ppm
LB/MMBtu =

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INTERPOLL LABORATORIES

EPA Method 4 and 6 Field Data Sheet

Job L.P Chilco
Source RTO STACK
Date 6/22/94 Test 8 Run 2

Operator(s) DWA
Meter Box No. 3 Gasmeter coef. .9983
^H@ 1.80 in.WC Bar. press 27.61 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0 cfm at 11 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F) Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1232	773.80								
	5	778.07	1.80	10	251	260	46	90	90	005
	10	782.19	1.80	10				92	90	
	15	786.29	1.80	10				94	91	
	20	790.44	1.80	10	257	259	48	96	92	
	25	794.60	1.80	10				98	93	
	30	798.70	1.80	10				100	94	
	35	802.80	1.80	10	256	258	50	90	90	-
	40	806.70	1.80	10				97	95	
	45	810.60	1.80	10				99	95	
	50	815.07	1.80	10	258	257	53	102	97	
	55	819.15	1.80	10				104	98	
	60	823.35	1.80	10				105	98	
	1428									
	θ= 60	V_m=49.55	$(\wedge H)_{ave}$=1.80					$(t_m)_{ave}$=95.33		

Stop [illegible] 1303 [illegible] 1400

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers	269	200	69
Condenser			
Desiccant	1382	1363	19
		Total	88

Preliminary results of SO_2 concentration determination
V_{std} = DSCF
Moisture = %v/v
SO_2, dry = ppm
SO_2, wet = ppm
LB/MMBtu =

INTERPOLL LABORATORIES

EPA Method 4 and 6 Field Data Sheet

Job L.P Chilco
Source RTO Stack
Date 6/22/94 Test 8 Run 3

Operator(s) Dutt
Meter Box No. #3 Gasmeter coef. .9983
^H@ 1.80 in.WC Bar. press 27.61 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in. Hg.
Posttest: 0 cfm at 11 in. Hg.

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Orif. Meter (inWC)	VAC. inHg	Temperatures (°F) Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1530	823.50								
	5	827.39	1.80	9	249	256	48	99	99	005
	10	831.47	1.80	9				102	100	
	15	835.68	1.80	9				104	100	
	20	839.92	1.80	9	254	257	50	106	101	
	25	844.11	1.80	9				107	102	
	30	848.33	1.80	9				107	102	
	35	852.50	1.80	9	256	258	53	109	103	-
	40	856.63	1.80	9				110	104	
	45	860.78	1.80	9				110	104	
	50	864.94	1.80	9	258	260	53	112	106	
	55	869.13	1.80	9				112	106	
	60	873.30	1.80	9				112	107	
	1708									
	θ= 60	V_m= 49.80	$(^H)_{avg}$=1.80					$(t_m)_{avg}$ =107.24		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers	249	0	49
Condenser			
Desiccant	1468	1449	19
		Total	68

Preliminary results of SO_2 concentration determination
V_{std} = DSCF
Moisture = %v/v
SO_2, dry = ppm
SO_2, wet = ppm
LB/MMBtu =

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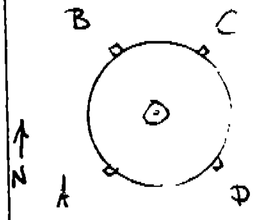
INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. Chilco
Source: RTO STACK
Test: 9 Run ___ Date 6/22/94
Stack Dimen.: 96.25 IN.
Dry Bulb ______ °F Wet bulb ______ °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 27.61 IN.HG
Static Pressure: -.63 IN.WC
Operators: D. Van Hoever & J. Johnson
Pitot No.: 4ms-8 C .84

Drawing of Test Site

Cross-section View	Elevation View
	

MDA MDI

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start:	HRS
A 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
B 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Temp. Meas. Device & S/N:				Time End:	HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/OHILCO
Source RTO STACK
Method ______ Filter holder: ______
Date 6-22-94 Test 9 Run 1
No. of traverse points 24
Filter type: N/A

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 8 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

______
______

Recovery solvent(s)

☐acetone ______
☐other(s) ______

No. of probe wash bottles: ______
Sample recovered by: ______

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	50 mls H₂O		50
Impinger No. 3			
Condenser			
Desiccant	1423	1410	13
Total			63

Integrated Gas Sampling Data:

Bag Pump No. ______
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: ______ cc/min at ______ in. Hg.
Time start: ______ (HRS) Time end: ______ (HRS)
Sampling rate: ______ cc/min Operator: ______
Box No. ______ Bag No. ______
Size: 44 L

S/N of O_2 Analyzer used to monitor train outlet: ______

123093-G:\STACK\WP\METHODS\S-0046RR

INTERPOLL LABORATORIES METHOD 5 FIELD DATA SHEET

Job L.P. Chilco
Source RTO STACK
Date 6/22/94 Test 9 Run 1

Operators DV+4 J.T
Meter Box No. 9 ^H@ 1.88 IN WC
Gasmeter coeff. .9983

Pitot No. 4M5.5 Cp .84
Bar. Press. 27.67 inHg H2O 8 %
Nozzle No. Glass Nozzle Dia .226 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgm Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (v/v)
	1907	874.90											
A 12	2.5	876.60	.68	1.30	6.59	7	240	256	248	45	106	106	005
11	5	878.26	.6	1.18	8.23	7	240				107	106	
10	7.5	879.99	.63	1.24	9.91	7	240				107	106	
9	10	881.56	.60	1.18	1.55	7	240	260	250	46	107	106	
8	12.5	883.15	.56	1.11	3.14	7	236				107	107	
7	15	884.90	.58	1.14	4.76	7	240				108	107	
6	17.5	886.70	.62	1.22	6.43	7	240	246	251	47	108	107	
5	20	888.35	.70	1.40	8.21	7	231				110	108	
4	22.5	890.05	.75	1.50	1.07	7	232	248	250	48	110	108	
3	25	892.00	.85	1.70	2.03	8	234				111	109	
2	27.5	893.90	.82	1.64	3.97	8	233	247	253	48	111	109	
1	30	895.75	.70	1.40	5.76	7	233				111	109	
B 12	32.5	897.52	.70	1.40	7.55	7	234	245	250	46	111	109	
11	35	899.25	.67	1.35	9.31	6	231				111	109	
10	37.5	900.87	.55	1.10	0.90	6	234	249	254	48	112	108	
9	40	902.55	.58	1.10	2.53	6	234				113	108	
8	42.5	904.25	.62	1.23	4.14	6	238	247	251	48	114	108	
7	45	906.05	.72	1.44	6.03	7	236				115	109	
6	47.5	907.84	.70	1.41	7.82	7	234	245	250	49	115	109	
5	50	909.55	.65	1.30	9.55	6	236				115	109	
4	52.5	911.42	.74	1.49	1.40	7	234	244	253	48	115	110	
3	55	913.22	.78	1.57	3.29	7	234				115	110	
2	57.5	915.20	.80	1.61	5.22	7	231	242	251	48	115	110	
1	60	917.15	.78	1.57	7.12	7	231				115	110	
	(2013)												
	θ = 60	Vm = 42.25		^H = 1.36							Avg. = 109.7		

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P Chilco
Source RTC STACK
Method 1-2 PF Filter holder: NA

Date 6/22/94 Test 9 Run 2
No. of traverse points 24
Filter type: NA

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 15 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☐acetone
☒other(s) Toluene & Acetonitrile

No. of probe wash bottles: 1
Sample recovered by: DLH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	73 mls H_2O		73
Impinger No. 3			
Condenser			
Desiccant	1402	1382	20
Total			93

Integrated Gas Sampling Data:

Bag Pump No. ____ Box No. ____ Bag No. ____
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: ____ cc/min at ____ in. Hg.
Time start: ____ (HRS) Time end: ____ (HRS)
Sampling rate: ____ cc/min Operator: ____

S/N of O_2 Analyzer used to monitor train outlet: ____

123093-G:\STACK\WP\METHODS\S-0046RR

INTERPOLL LABORATORIES A METHOD 5 FIELD DATA SHEET

Job LP/CHILCO
Source RTO STACK
Date 6-22-94 Test 9 Run 2

Operators DVH & TJ
Meter Box No. 5 ΔH@ 1.80 IN WC
Gasmeter coeff. .9983

Pitot No. 4/15-8 Cp .840
Bar. Press. 27.61 inHg H2O 8 %
Nozzle No. GLASS Nozzle Dia .226 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (%v/v)
	2053	912.50											
B 12	2.5	919.03	.60	1.19	9.15	6	237	256	258	50	100	94	00.5
11	5	920.68	.66	1.30	0.85	6	229				100	99	
10	7.5	922.49	.60	1.18	2.48	6	233				100	100	
9	10	924.06	.56	1.10	4.05	6	236	258	257	51	101	100	
8	12.5	925.63	.58	1.14	5.66	6	236				102	100	
7	15	927.20	.58	1.14	7.26	6	236				102	99	
6	17.5	928.88	.63	1.23	8.92	6	239	260	258	51	102	99	
5	20	930.62	.68	1.34	0.66	7	232				103	99	
4	22.5	932.56	.76	1.49	2.49	7	238				103	99	
3	25	934.20	.65	1.29	4.19	7	230	258	258	50	102	99	
2	27.5	935.80	.57	1.13	5.79	6	228				102	99	
1	30	937.31	.52	1.04	7.32	6	225	255	257	50	102	99	
A 12	32.5	938.95	.60	1.19	8.96	6	226				102	99	
11	35	940.55	.55	1.10	0.55	6	223	254	260	50	102	98	
10	37.5	942.22	.64	1.26	2.21	7	235				102	98	
9	40	944.03	.75	1.47	4.03	8	236	251	257	51	103	98	
8	42.5	945.91	.78	1.53	5.89	8	234				103	98	
7	45	947.60	.63	1.24	7.56	7	234	250	255	51	103	98	
6	47.5	949.37	.70	1.38	9.32	8	233				103	98	
5	50	951.20	.76	1.49	1.15	8	235	252	256	52	103	98	
4	52.5	953.10	.84	1.66	3.08	8	230				103	98	
3	55	955.00	.80	1.57	4.96	8	234	250	252	52	103	98	
2	57.5	956.80	.74	1.46	6.77	8	234				103	98	
1	60	958.65	.78	1.53	8.63	8	234	248	252	50	103	98	
	2200												
	θ = 60	Vm = 46.15		ΔH = 1.31							Avg. = 100.3		

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP Chilco
Source RTC STACK
Method 1-2 PP Filter holder: NA

Date 6/22/94 Test 9 Run 3
No. of traverse points 24
Filter type: NA

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 14 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☐ acetone
☒ other(s) Toluene & Acetonitrile

No. of probe wash bottles: 1
Sample recovered by: Duit

Condensate Data:

Item	Weight (g)		
	Final.	Tare	Difference
Impinger No. 1			
Impinger No. 2	64	mls H_2O	64
Impinger No. 3			
Condenser			
Desiccant	1430	1410	20
Total			84

Integrated Gas Sampling Data:

Bag Pump No. ______
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: ______
Time start: ______
Sampling rate: ______

Box No. ______ Bag No. ______
Size: 44 L
cc/min at ______ in. Hg.
(HRS) Time end: ______ (HRS)
cc/min Operator: ______

S/N of O_2 Analyzer used to monitor train outlet: ______

123093-G:\STACK\WP\METHODS\S-0046RR

INTERPOLL LABORATORIES A METHOD 5 FIELD DATA SHEET

Job: L.P Chilco
Source: RTO Stack
Date: 6/22/94 Test 4 Run 3

Operators: Dyle J.T.
Meter Box No.: 3 KHB 1.30 IN WC
Gasmeter coeff.: .9983

Pitot No.: 4ms-8 Cp .84
Bar. Press.: 27.67 inHg H2O 9 %
Nozzle No.: Glass Nozzle Dia .266 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Gas Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
	2252	958.90											005
A 12	2.5	960.62	.71	1.37	0.65	7	235	257	256	50	88	87	
11	5	962.29	.67	1.26	2.32	7	235				87	87	
10	7.5	964.07	.69	1.31	4.01	7	229	258	254	50	87	87	
9	10	965.89	.69	1.32	5.72	7	225				87	87	
8	12.5	967.25	.60	1.15	7.31	7	222	260	255	48	90	87	
7	15	969.20	.67	1.29	8.99	7	222				91	87	
6	17.5	970.76	.69	1.32	0.70	6	224	259	257	47	91	88	
5	20	972.57	.83	1.58	2.57	8	230				93	88	
4	22.5	974.45	.87	1.67	4.49	9	225	255	260	49	93	88	
3	25	976.30	.79	1.51	6.32	9	229				93	88	
2	27.5	978.28	.86	1.65	8.23	9	225	259	261	50	94	88	
1	30	980.05	.78	1.50	0.05	9	224				94	88	
B 12	32.5	981.68	.61	1.17	1.66	7	229	261	261	51	91	87	
11	35	983.37	.68	1.29	3.35	7	230				93	88	
10	37.5	985.03	.63	1.20	4.98	7	231	259	260	49	94	88	
9	40	986.67	.65	1.25	6.64	7	225				95	89	
8	42.5	988.38	.69	1.34	8.36	8	221	262	257	51	95	89	
7	45	990.08	.68	1.30	0.06	8	230				95	89	
6	47.5	991.73	.57	1.09	1.62	7	228	258	255	48	96	89	
5	50	993.41	.71	1.35	3.35	7	233				96	89	
4	52.5	995.14	.74	1.41	5.12	7	232	257	256	49	96	90	
3	55	996.92	.78	1.49	6.94	8	231				97	90	
2	57.5	998.75	.77	1.48	8.75	8	231	258	253	51	97	90	
1	60	1000.55	.76	1.46	0.56	8	229				97	90	
	2358												
	θ = 60	Vm = 41.65		^H = 1.37							Avg. = 90.5		

S-0037R

INTERPOLL LABORATORIES, INC.

(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. Chilco

Source: Lap Line RTO INLET

Test: 13 Run__ Date: 6/23/94

Stack Dimen.: 17.25 IN.

Dry Bulb: 199 °F Wet bulb: 90 °F

Manometer ☐ Reg. ☐ Exp ☐ Elec.

Barometric Pressure: 27.54 IN.HG

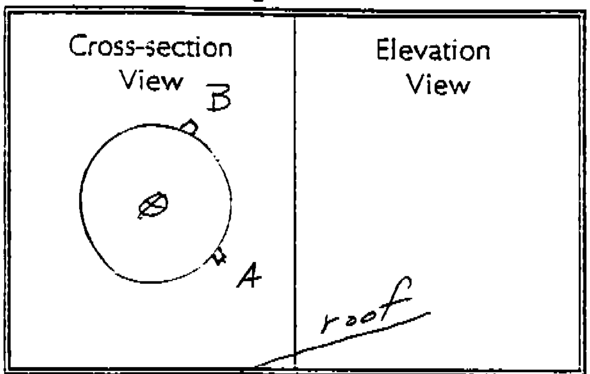
Static Pressure: -2.9 IN.WC

Operators: D. Van Hoever + K. Nuessmeier

Pitot No.: P24-2.5 C_p .84

ambient

Drawing of Test Site



Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 8.25 IN.		Time Start: 1115 HRS	
A 1				1.20	
2				1.25	
3				1.30	199
4				1.50	
5				1.40	
6				1.35	
B 1				1.20	
2				1.30	
3				1.30	
4				1.30	
5				1.30	
6				1.20	

Temp. Meas. Device & S/N: POT #36

Time End: 1123 HRS

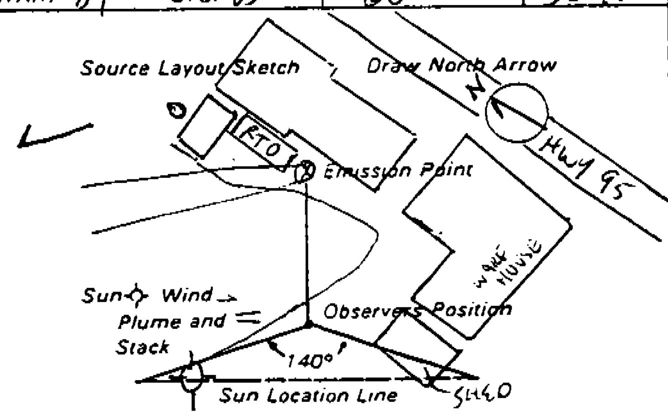
R or nothing = reg. manometer; S = expanded; E = electronic

032594-G:\STACK\WP\FORMS\S-392.1

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

SOURCE NAME	LP Chilco Run No. 2
OBSERVATION DATE	6-21-94
START TIME	16:45
STOP TIME	17:45
ADDRESS	
CITY	Chilco
STATE	Idaho
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	DRYER & PRESS
OPERATING MODE	100%
CONTROL EQUIPMENT	WET ESP & RTO
OPERATING MODE	100%
DESCRIBE EMISSION POINT	START RTO STACK - SILVER, LARGEST DIA STACK STOP SAME
HEIGHT ABOVE GROUND LEVEL	START 90' STOP SAME
HEIGHT RELATIVE TO OBSERVER	START 90' STOP SAME
DISTANCE FROM OBSERVER	START 520' STOP SAME
DIRECTION FROM OBSERVER	START NE STOP SAME
DESCRIBE EMISSIONS	START N/A STOP N/A
EMISSION COLOR	START N/A STOP N/A
PLUME TYPE	CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☒ YES ☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	START 2' Above STACK STOP SAME
DESCRIBE BACKGROUND	START SKY STOP SAME
BACKGROUND COLOR	START BLUE STOP SAME
SKY CONDITIONS	START CLEAR STOP SAME
WIND SPEED	START 0-5 STOP SAME
WIND DIRECTION	START SE STOP SAME
AMBIENT TEMP.	START 84° STOP 85°
WET BULB TEMP	66°F
RH, percent	36%



MIN \ SEC	0	15	30	45	MIN \ SEC	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

AVERAGE OPACITY FOR HIGHEST PERIOD	
NUMBER OF READINGS ABOVE % WERE	
RANGE OF OPACITY READINGS MINIMUM	
MAXIMUM	
OBSERVER'S NAME (PRINT)	DAVID VAALER
OBSERVER'S SIGNATURE	David Vaaler
DATE	6-21-94
ORGANIZATION	INTERPOLL LABS
CERTIFIED BY	ETA
DATE	4-6-94
VERIFIED BY	
DATE	
COMMENTS	
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	
TITLE	
DATE	

S-0079R

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

SOURCE NAME: LP - Chilco RUN No. 3

OBSERVATION DATE: 6-21-94 | START TIME: 19:05 | STOP TIME: 20:05

ADDRESS:

CITY: Chilco | STATE: Idaho | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: DRYER : PRESS | OPERATING MODE: 100%

CONTROL EQUIPMENT: WET ESP & RTO | OPERATING MODE: 100%

DESCRIBE EMISSION POINT
START RTO STACK SILVER STACK LARGEST DIA. STACK STOP SAME

HEIGHT ABOVE GROUND LEVEL: START 90' STOP SAME | HEIGHT RELATIVE TO OBSERVER: START STOP

DISTANCE FROM OBSERVER: START 300' STOP SAME | DIRECTION FROM OBSERVER: START E STOP SAME

DESCRIBE EMISSIONS
START N/A STOP SAME

EMISSION COLOR: START N/A STOP SAME | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☒ YES ☐ | IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED
START 2' above STACK STOP SAME

DESCRIBE BACKGROUND
START SKY STOP SAME

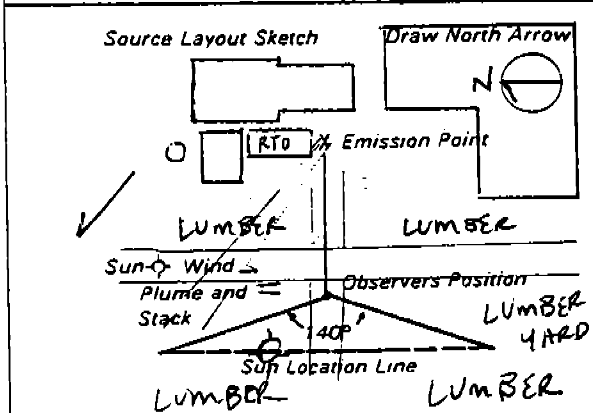
BACKGROUND COLOR: START BLUE STOP SAME | SKY CONDITIONS: START CLEAR STOP

WIND SPEED: START 0 STOP | WIND DIRECTION: START N/A STOP

AMBIENT TEMP: START 75° STOP SAME | WET BULB TEMP: 59°F | RH.percent: 38%

MIN \ SEC	0	15	30	45	MIN \ SEC	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

HWY 95



AVERAGE OPACITY FOR HIGHEST PERIOD: | NUMBER OF READINGS ABOVE % WERE:

RANGE OF OPACITY READINGS: MINIMUM MAXIMUM

OBSERVER'S NAME (PRINT): DAVID VAALER

OBSERVER'S SIGNATURE: [signature] | DATE: 6-21-94

ORGANIZATION: INTERPOLL LABS

CERTIFIED BY: ETA | DATE: 4-6-94

VERIFIED BY: | DATE:

COMMENTS

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

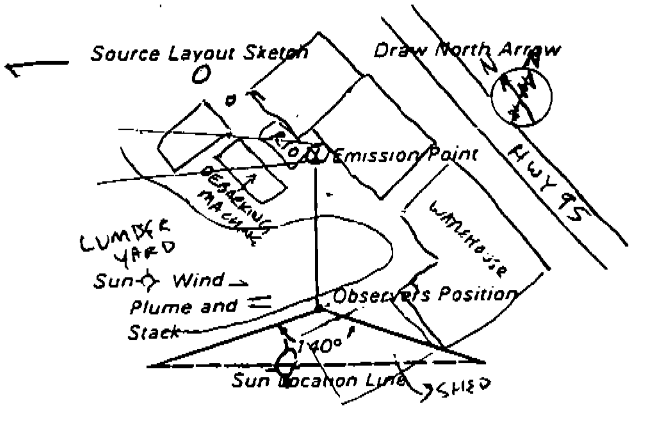
S-0079R

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

SOURCE NAME	LP- Chilco - run #4
OBSERVATION DATE	6-21-94
START TIME	2145
STOP TIME	2245
ADDRESS	
CITY	Chilco
STATE	Idaho
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Dryers & Press
OPERATING MODE	100%
CONTROL EQUIPMENT	wet ESB & RTO
OPERATING MODE	100%
DESCRIBE EMISSION POINT	START RTO stack - Silver largest O.D. stack STOP Same
HEIGHT ABOVE GROUND LEVEL	START 90' STOP Same
HEIGHT RELATIVE TO OBSERVER	START 80' STOP Same
DISTANCE FROM OBSERVER	START 500' STOP
DIRECTION FROM OBSERVER	START NNE STOP Same
DESCRIBE EMISSIONS	START N/A STOP N/A
EMISSION COLOR	START None STOP Same
PLUME TYPE	CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO☒ YES☐
IF WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	START 2' above stack STOP Same
DESCRIBE BACKGROUND	START SKY STOP SAME
BACKGROUND COLOR	START BLUE STOP Same
SKY CONDITIONS	START CLEAR STOP
WIND SPEED	START 0-5 STOP Same
WIND DIRECTION	START ~~SSE~~ SSE STOP Same
AMBIENT TEMP	START 74° STOP 78°
WET BULB TEMP	56°F
RH.percent	34%

MIN \ SEC	0	15	30	45	MIN \ SEC	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



AVERAGE OPACITY FOR HIGHEST PERIOD	
NUMBER OF READINGS ABOVE % WERE	
RANGE OF OPACITY READINGS	MINIMUM MAXIMUM
OBSERVER'S NAME (PRINT)	DAVID VAAGER
OBSERVER'S SIGNATURE	[signature]
DATE	6-21-94
ORGANIZATION	INTERPOLL LABS
CERTIFIED BY	ETA
DATE	4-6-94
VERIFIED BY	
DATE	

COMMENTS
NO VISIBLE EMISSIONS OBSERVED.

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

VISIBLE EMISSIONS EVALUATOR

This is to certify that

David Vaalen

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

Thomas Rose
President

243003
Certificate Number

William S. [illegible]
Vice President

Minneapolis
Location

David B. Savage, Jr.
Program Manager

April 6, 1994
Date of Issue

APPENDIX D

KONUS FIELD DATA SHEETS

INTERPOLL LABORATORIES, INC.

(612) 786-6020

EPA Method 2 Field Data Sheet

Job LP/CHILCO

Source KONUS STACK

Test 10 Run __ Date 6-22-94

Stack Dimen. 42 IN.

Dry Bulb ____ °F Wet bulb ____ °F

Manometer ☒ Reg. ☐ Exp ☐ Elec.

Barometric Pressure 27.41 IN.HG

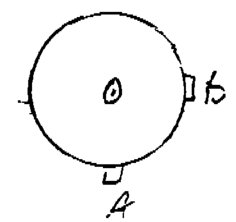
Static Pressure -.1 IN.WC

Operators E.TROWBRIDGE - R.NUESSMEIER

Pitot No. 52V-4 C_p .840

PM

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	5 IN.	Time Start: 1030 HRS	
A 1	.032	1.34	6.34	.11	
2	.105	4.41	9.41	.12	
3	.194	8.14	13.14	.14	338
4	.323	13.56	18.56	.15	
5	.677	28.43	33.43	.13	
6	.806	33.85	38.85	.12	
7	.895	37.59	42.59	.10	
8	.968	40.65	45.65	.10	
B 1				.09	
2				.10	
3				.11	
4				.12	338
5				.15	
6				.16	
7				.14	
8				.11	

Temp. Meas. Device & S/N: POT-34

Time End: 1042 HRS

R or nothing = reg. manometer; S = expanded; E = electronic

032594-C:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/OHICO
Source KON US
Method 5 Filter holder: 4" GLASS
Date 6-22-94 Test 10 Run 1
No. of traverse points 16
Filter type: 4" GLASS FIBER

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 6 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

6668

Recovery solvent(s)

☒acetone
☐other(s)

No. of probe wash bottles: 1
Sample recovered by: ET

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2	249	100	49
Impinger No. 3		0	
Condenser			
Desiccant	1370	1350	20
Total			69

Integrated Gas Sampling Data:

Bag Pump No. 24A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1051 (HRS)
Sampling rate: 400 cc/min
Box No. 1 Bag No. 1
Size: 44 L
Time end: 1201 (HRS)
Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 24B

123093-G:\STACK\WP\METHODS\S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP/CHILCO
Source KONUS STACK
Date 6-22-94 Test 10 Run 1

Operators ET-KN
Meter Box No. 10 ^H@ 1.90 IN WC
Gasmeter coeff. 1.0049

Pitot No. 221-4 Cp .84
Bar. Press. 27.87 inHg H2O x
Nozzle No. 2-7 Nozzle Dia .372 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1050	875.40											
A 8	4	877.85	.10	1.18	7.88	3.0	341	228	247	48	80	77	16.9
7	8	880.40	.11	1.27	0.44	3.5	345				82	77	17.1
6	12	883.02	.12	1.39	3.12	3.8	345	230	251	40	84	78	17.1
5	16	885.55	.13	1.50	5.91	4	350				84	78	17.0
4	20	888.80	.15	1.73	8.90	4.4	351	232	250	40	88	79	16.3
3	24	891.75	.14	1.62	1.80	4.3	353		2		90	79	16.5
2	28	894.55	.13	1.52	4.62	4.0	346	234	240	42	92	81	16.4
1	32	897.30	.12	1.41	7.33	4	344				93	81	16.5
B 8	36	900.07	.12	1.41	0.05	4	346	236	258	42	93	83	16.1
7	40	902.86	.14	1.65	2.99	4.2	346				96	84	15.6
6	44	906.05	.16	1.88	6.13	4.8	352	235	240	44	97	85	15.4
5	48	909.20	.16	1.88	9.27	4.8	352				98	85	15.8
4	52	912.01	.12	1.41	2.00	4	354	232	262	44	99	87	15.8
3	56	914.70	.12	1.40	4.72	4	362				100	88	16.3
2	60	917.80	.10	1.16	7.20	3.5	366	234	264	45	102	89	17.0
1	64	919.60	.09	1.05	9.56	3.2	367				103	89	16.7
	1202												
	θ = 64	Vm = 44.20		^H = 1.47							Avg. = 87.5		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/CHILCO
Source KONUS STACK
Method 5 Filter holder: 4" GLASS

Date 6-22-94 Test 10 Run 2
No. of traverse points 16
Filter type: 4" GLASS FIBER

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used: 6580

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: ET

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2	248	100	48
Impinger No. 3		0	
Condenser			
Desiccant	1460	1442	18
Total			66

Integrated Gas Sampling Data:

Bag Pump No. 24A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1246 (HRS)
Sampling rate: 400 cc/min

Box No. 1 Bag No. 2
Size: 44 L
cc/min at 15 in. Hg.
Time end: 1503 (HRS)
Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 248

123093-G:\STACK\WP\METHODS\S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job LP/CHILCO
Source KONUS STACK
Date 6-22-94 Test 10 Run 2

Operators ET-KN
Meter Box No. 18 ΔH@ 1.90 IN WC
Gasmeter coeff. 1.0069

Pitot No. 221-4 Cp .840
Bar. Press. 27.61 inHg H2O x
Nozzle No. 7-6 Nozzle Dia .365 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgc. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1245	919.80											
A 8	4	922.15	.08	.97	2.05	3	354	260	254	40	99	95	15.8
7	8	924.61	.10	1.22	4.60	3.9	363				101	96	15.0
6	12	927.40	.12	1.46	7.39	4.5	370	262	256	40	103	96	14.5
5	16	930.25	.13	1.59	0.31	4.7	366				103	97	15.8
4	20	933.43	.15	1.81	3.42	✓	374	260	250	40	106	98	15.1
3	24	936.52	.15	1.83	6.55	✓	372				109	98	15.9
2	28	939.45	.13	1.58	9.47	4.4	377	263	252	42	110	100	16.7
1	32	942.30	.12	1.46	2.28	4.0	375				104	102	15.4
B 8	36	945.27	.12	1.62	5.24	4.5	291	260	257	40	105	103	15.6
7	40	948.35	.14	1.89	8.43	5	292				105	103	15.6
6	44	951.70	.15	2.03	1.73	5.7	290	262	255	41	105	103	15.7
5	48	955.00	.15	2.03	5.04	5.7	290				106	103	15.6
4	52	958.05	.12	1.63	8.00	4.5	291	261	256	42	108	104	15.6
3	56	961.04	.12	1.63	0.97	4.5	293				110	104	16.7
2	60	963.75	.10	1.36	3.69	4	291	258	259	42	111	105	15.9
1	64	966.30	.09	1.23	6.28	4	280				112	105	16.0
	1504												
	θ = 64	Vm = 46.50		ΔH = 1.58							Avg. = 103.4		

S-0037R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job 4P/PHILCO Date 6-22-94 Test 10 Run 3
Source KONUS STACK No. of traverse points 16
Method ✓ Filter holder: 4" GLASS Filter type: 4" GLASS FIBER

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Post test: 0 cfm at 6 in. Hg. (vac) ☒

Particulate Catch Data:

No. of filters used:

6598

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: ET

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		100	
Impinger No. 2	245	100	45
Impinger No. 3		0	
Condenser			
Desiccant	1397	1370	27
Total			72

Integrated Gas Sampling Data:

Bag Pump No. 24A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0 cc/min at 15 in. Hg.
Time start: 1541 (HRS)
Sampling rate: 400 cc/min

Box No. 1 Bag No. 3
Size: 44 L
Time end: 1820 (HRS)
Operator: ET

S/N of O_2 Analyzer used to monitor train outlet: 248

123093-G:\STACK\WP\METHODS\S-0046RR

LF-011

INTERPOLL LABORATORIES   A METHOD 5 FIELD DATA SHEET

Job LP/CHILCO Source KONUS STACK Date 6-22-84 Test 10 Run 5

Operators ET-KN Meter Box No. 18 ΔH@ 1.90 IN WC Gasmeter coeff. 1.0069

Pitot No. 22K 4 Cp .84 Bar. Press. 27.61 inHg H2O ___ % Nozzle No. T-6 Nozzle Dia .364 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Obs. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1540	966.60											
A 8	4	969.30	.10	1.36	9.30	4	293	235	251	42	108	107	16.3
7	8	972.16	.11	1.51	2.17	4	292				112	107	15.7
6	12	975.10	.12	1.65	5.16	4	244	242	256	42	114	107	15.6
5	16	978.36	.14	1.92	8.40	5	295				115	107	16.2
4	20	981.65	.15	2.06	1.75	5	296	245	261	43	116	107	15.7
3	24	984.95	.14	1.92	4.99	5	296				117	108	16.0
2	28	988.00	.12	1.66	8.00	4	293	251	260	44	118	109	17.0
1	32	990.91	.11	1.53	0.90	4	290				119	110	16.5
B 8	36	993.90	.12	1.66	3.92	4	293	255	263	42	119	110	16.8
7	40	997.10	.14	1.94	7.18	5	295				120	111	17.0
6	44	1000.70	.16	2.22	0.67	5.5	295	257	260	42	121	111	16.6
5	48	1004.18	.16	2.22	4.16	5.5	295				102	100	18.2
4	52	1007.20	.13	1.77	7.24	4.9	289	252	249	40	103	100	18.1
3	56	1010.20	.12	1.64	0.21	4.1	285				103	101	18.1
2	60	1013.02	.11	1.52	3.01	4.0	280	250	253	42	105	101	17.9
1	64	1015.80	.10	1.38	5.80	4.0	280				107	101	17.9
	(1820)												
	θ = 64	Vm = 49.20		ΔH = 1.75							Avg. = 108.2		

S-0037R

D-7

1639 / DOWN / 1804

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job LP/CHILCO Date 6-22-94 Bar. Pressure 27.61 IN.HG.
Test Location STACK Fuel Type ______ Sample Train No. 1
HANUS Technician JC Pump No. 1

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	10-1	61	1050	1.63	90	☑ Yes ☐ No
2	10-1	62	1115	1.83	87	☑ Yes ☐ No
3	10-1	63	1130	1.43	82	☑ Yes ☐ No
4	10-1	64	1200	1.48	85	☑ Yes ☐ No
5	10-2	65	1250	1.81	87	☑ Yes ☐ No
6	10-2	66	1310	1.85	89	☑ Yes ☐ No
7	10-2	1	1440	1.84	92	☑ Yes ☐ No
8	10-2	2	1455	1.68	92	☑ Yes ☐ No
9	10-3	3	1545	1.97	90	☑ Yes ☐ No
10	10-3	4	1600	1.92	90	☑ Yes ☐ No
11	10-3	5	1620	2.00	87	☑ Yes ☐ No
12	10-3	6	1755	1.87	85	☑ Yes ☐ No
13						☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

S-263R

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

SOURCE NAME: LP-Chilco Run No. 1

OBSERVATION DATE: 6-22-94 | START TIME: 10:50 | STOP TIME: 12:02

ADDRESS:

CITY: Chilco | STATE: Idaho | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: Konus Thermal Oil Heater | OPERATING MODE: 100%

CONTROL EQUIPMENT: Cyclone: baghouse | OPERATING MODE: 100%

DESCRIBE EMISSION POINT
START: Northern most stack silver | STOP: Same

HEIGHT ABOVE GROUND LEVEL: START 100' STOP Same | HEIGHT RELATIVE TO OBSERVER: START 100' STOP Same

DISTANCE FROM OBSERVER: START STOP | DIRECTION FROM OBSERVER: START W STOP Same

DESCRIBE EMISSIONS
START: N/A | STOP: Same

EMISSION COLOR: START N/A STOP Same | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☒ YES ☐ | IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

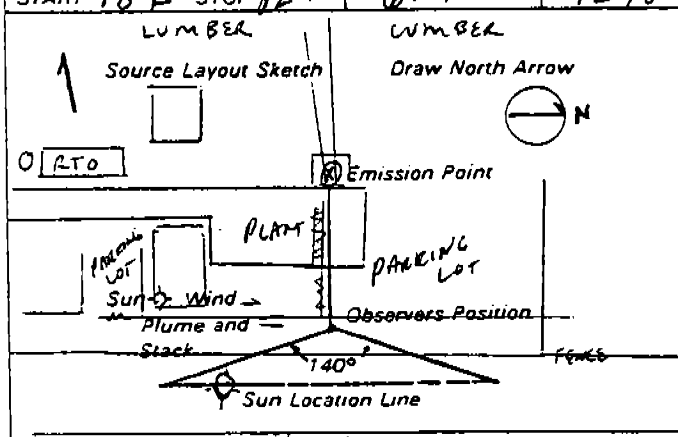
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED
START: 2' above stack | STOP: Same

DESCRIBE BACKGROUND
START: Clouds (sky) | STOP: Sky

BACKGROUND COLOR: START White STOP Blue | SKY CONDITIONS: START Cloudy STOP Same

WIND SPEED: START 0-5 STOP Same | WIND DIRECTION: START E STOP Same

AMBIENT TEMP: START 78°F STOP 82°F | WET BULB TEMP: 63°F | RH.percent: 42%



MIN \ SEC	0	15	30	45	MIN \ SEC	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

AVERAGE OPACITY FOR HIGHEST PERIOD: | NUMBER OF READINGS ABOVE % WERE:

RANGE OF OPACITY READINGS: MINIMUM MAXIMUM

OBSERVER'S NAME (PRINT): DAVID VAALER

OBSERVER'S SIGNATURE: David Vaaler | DATE: 6-22-94

ORGANIZATION: ~~EPA~~ Interpoll Labs

CERTIFIED BY: ETA | DATE: 4-6-94

VERIFIED BY: | DATE:

COMMENTS:

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE

TITLE | DATE

S-0079R

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

SOURCE NAME: LP Chilco Run No. 2

OBSERVATION DATE: ~~1245~~ 6-22-94 | START TIME: 12:45 | STOP TIME: 15:00

ADDRESS:

CITY: Chilco | STATE: Idaho | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: Konus Thermal Oil Heater | OPERATING MODE: 100%

CONTROL EQUIPMENT: Cyclone & Baghouse | OPERATING MODE: 100%

DESCRIBE EMISSION POINT: START Northern most stack silver | STOP Same

HEIGHT ABOVE GROUND LEVEL: START 100' STOP Same | HEIGHT RELATIVE TO OBSERVER: START 100' STOP Same

DISTANCE FROM OBSERVER: START 375' STOP Same | DIRECTION FROM OBSERVER: START W STOP Same

DESCRIBE EMISSIONS: START N/A STOP Same

EMISSION COLOR: START N/A STOP Same | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☒ YES ☐ | IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

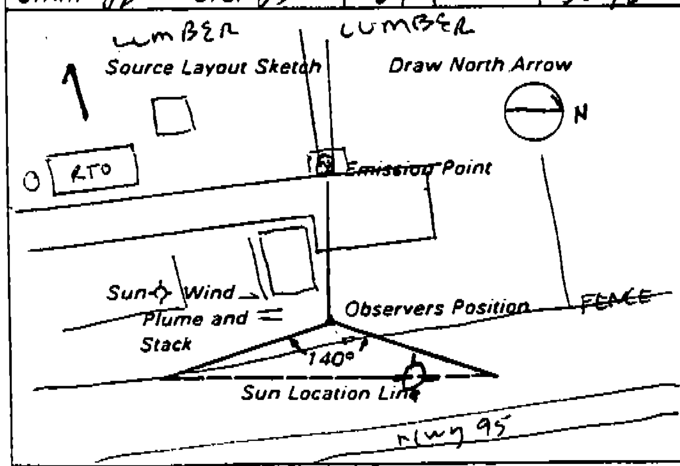
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START 2' above stack STOP ✓

DESCRIBE BACKGROUND: START Sky STOP Sky

BACKGROUND COLOR: START Blue STOP Blue | SKY CONDITIONS: START Scattered STOP Same

WIND SPEED: START 0-5 STOP Same | WIND DIRECTION: START NW STOP

AMBIENT TEMP.: START 82° STOP 85° | WET BULB TEMP.: 64°F | RH.percent: 36%



MIN \ SEC	0	15	30	45	MIN \ SEC	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

AVERAGE OPACITY FOR HIGHEST PERIOD: | NUMBER OF READINGS ABOVE % WERE:

RANGE OF OPACITY READINGS: MINIMUM MAXIMUM

OBSERVER'S NAME (PRINT): David Vaaler

OBSERVER'S SIGNATURE: David Vaaler | DATE: 6-22-94

ORGANIZATION: Interpoll Labs

COMMENTS: Plant shut down 13:15 !! Restart at 14:30!!

CERTIFIED BY: ETA | DATE: 4-6-94

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE

TITLE | DATE

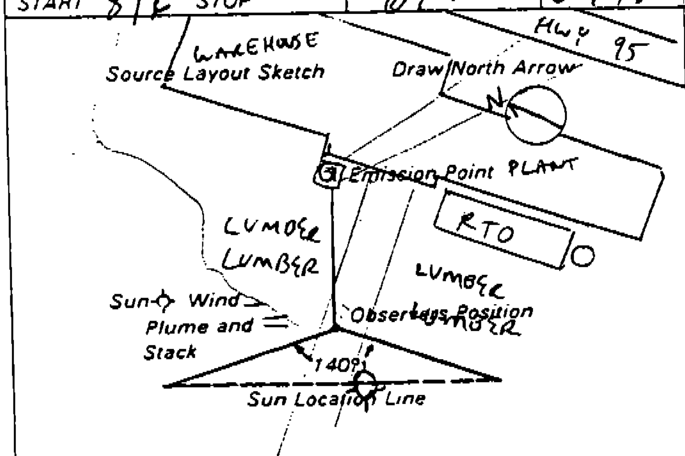
VERIFIED BY | DATE

S-0079R

Interpoll Laboratories
(612)786-6020

Visible Emissions Form

SOURCE NAME	CP Chilco Run No. 3
OBSERVATION DATE	6-27-94
START TIME	15:40
STOP TIME	16:45
ADDRESS	
CITY	Chilco
STATE	Idaho
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Konus Thermal oil Heater
OPERATING MODE	100%
CONTROL EQUIPMENT	Cyclone & baghouse
OPERATING MODE	100%
DESCRIBE EMISSION POINT	START Northern most stack silver color STOP Same
HEIGHT ABOVE GROUND LEVEL	START 90' STOP Same
HEIGHT RELATIVE TO OBSERVER	START 90' STOP Same
DISTANCE FROM OBSERVER	START 378' STOP Same
DIRECTION FROM OBSERVER	START E STOP Same
DESCRIBE EMISSIONS	START N/A STOP Same
EMISSION COLOR	START N/A STOP Same
PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT:	NO ☑ YES ☐
IF WATER DROPLET PLUME:	ATTACHED ☑ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	START 2' above stack STOP ✓
DESCRIBE BACKGROUND	START Sky STOP ✓
BACKGROUND COLOR	START Blue STOP
SKY CONDITIONS	START Clear STOP
WIND SPEED	START 0-5 STOP
WIND DIRECTION	START W STOP E
AMBIENT TEMP.	START 89°F STOP
WET BULB TEMP.	67°F
RH, percent	29%



MIN \ SEC	0	15	30	45	MIN \ SEC	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

AVERAGE OPACITY FOR HIGHEST PERIOD	
NUMBER OF READINGS ABOVE % WERE	
RANGE OF OPACITY READINGS MINIMUM	
MAXIMUM	
OBSERVER'S NAME (PRINT)	DAVID VAALER
OBSERVER'S SIGNATURE	David Vaaler
DATE	6-22-94
ORGANIZATION	INTERPOLL LABS
CERTIFIED BY	ETA
DATE	4-6-94
VERIFIED BY	
DATE	
COMMENTS	
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	
TITLE	
DATE	

S-0079R

APPENDIX E

INTERPOLL LABORATORIES ANALYTICAL DATA

TABLE OF CONTENTS

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. Chilco
Team Leader MK
Date Submitted 6-27-94
Test No. 3
Date of Analysis 6-27-94

Source Dryer RTO
Test Site Inlet
Date of Test 6-21-94
No. of Runs Completed 3
Technician C. Helgeson

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
3/1	3191-11	1	0.00	3.10	20.80	3.10	17.70	1.03
		2	0.00	3.10	20.80	3.10	17.70	1.03
	☑ B ☐ F	Avg				3.10	17.70	
3/2	-12	1	0.00	2.90	20.80	2.90	17.90	1.03
		2	0.00	2.90	20.80	2.90	17.90	1.03
	☑ B ☐ F	Avg				2.90	17.90	
3/3	-13	1	0.00	3.00	20.80	3.00	17.80	1.03
		2	0.00	3.00	20.80	3.00	17.80	1.03
	☑ B ☐ F	Avg				3.00	17.80	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
✓ Wood/Wood Bark	1.000-1.130

19,16

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job	L.P. Chilco	Source	RTO
Team Leader	DUH	Test Site	Stack
Date Submitted	6-27-94	Date of Test	6-21-94
Test No.	5	No. of Runs Completed	3
Date of Analysis	6-27-94	Technician	C. Helcesa

Test/Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
5/1	3191-18	1	0.00	1.20	20.80	1.20	19.60	1.08
		2	0.00	1.20	20.80	1.20	19.60	1.08
	☑ B ☐ F	Avg				1.20	19.60	
5/2	-19	1	0.00	1.00	20.80	1.00	19.80	1.10
		2	0.00	1.00	20.80	1.00	19.80	1.10
	☑ B ☐ F	Avg				1.00	19.80	
5/3	-20	1	0.00	1.10	20.90	1.10	19.80	1.00
		2	0.00	1.10	20.90	1.10	19.80	1.00
	☑ B ☐ F	Avg				1.10	19.80	
5/4	-21	1	0.00	1.20	20.80	1.20	19.60	1.08
		2	0.00	1.20	20.80	1.20	19.60	1.08
	☑ B ☐ F	Avg				1.20	19.60	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

LSC 04 BR

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. Chilco
Team Leader DUU
Date Submitted 6-27-94
Test No. 8
Date of Analysis 6-27-94

Source RTO
Test Site Stack
Date of Test 6-22-94
No. of Runs Completed 3
Technician C. Helgeson

Test/Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
8/1	3191-34	1	0.00	1.20	20.80	1.20	19.60	1.08
		2	0.00	1.20	20.80	1.20	19.60	1.08
	☑ B ☐ F	Avg				1.20	19.60	
8/2	-35	1	0.00	1.20	20.80	1.20	19.60	1.08
		2	0.00	1.20	20.80	1.20	19.60	1.08
	☑ B ☐ F	Avg				1.20	19.60	
8/3	-36	1	0.00	1.00	20.80	1.00	19.80	1.10
		2	0.00	1.00	20.80	1.00	19.80	1.10
	☑ B ☐ F	Avg				1.00	19.80	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L. P. Chilco
Team Leader E T
Date Submitted 6-27-94
Test No. 10
Date of Analysis 6-27-94

Source Konus
Test Site Stack
Date of Test 6-22-94
No. of Runs Completed 3
Technician C. Helgeson

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
10/1	3191-49	1	0.00	3.50	20.80	3.50	17.30	1.03
		2	0.00	3.50	20.80	3.50	17.30	1.03
	☑ B ☐ F	Avg				3.50	17.30	
10/2	-50	1	0.00	3.80	20.80	3.80	17.00	1.03
		2	0.00	3.80	20.80	3.80	17.00	1.03
	☑ B ☐ F	Avg				3.80	17.00	
10/3	-51	1	0.00	3.40	20.90	3.40	17.50	1.00
		2	0.00	3.40	20.90	3.40	17.50	1.00
	☑ B ☐ F	Avg				3.40	17.50	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

LSC-04-BP

Interpoll Laboratories
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EPA Method 5 Data Reporting Sheet
Impinger Catch/~~Wisconsin Protocol~~ M-202

Job L.P. ChiLco
Team Leader ET
Date Submitted 6-27-94
Test No. 1
Date of Analysis 7-12-94

Source RTO Press
Test Site Inlet
Date of Test 6-21-94
No. of Runs Completed 4
Technician C. Helgeson

		Solvent Phase	Aqueous Phase
0	Test 1 Run 0 Field Blank Log Number Comments	Dish No. 98 Dish Tare Wt. 47.2123 g Dish+Sample Wt. 47.2125 g Sample Wt. 0.0002 g	Dish No. 106 Dish Tare Wt. 43.0191 g Dish+Sample Wt. 43.0195 g Sample Wt. 0.0004 g
1	Test 1 Run 1 Log Number 3191-02 I Comments	Dish No. 50 Dish Tare Wt. 45.4637 g Dish+Sample Wt. 45.4748 g Sample Wt. 0.0111 g	Dish No. 27 Dish Tare Wt. 52.4454 g Dish+Sample Wt. 52.4480 g Sample Wt. 0.0026 g
2	Test 1 Run 2 Log Number -03 I Comments	Dish No. 53 Dish Tare Wt. 47.4041 g Dish+Sample Wt. 47.4158 g Sample Wt. 0.0117 g	Dish No. 520 Dish Tare Wt. 48.5281 g Dish+Sample Wt. 48.5301 g Sample Wt. 0.0020 g
3	Test 1 Run 3 Log Number -04 I Comments	Dish No. 54 Dish Tare Wt. 49.6669 g Dish+Sample Wt. 49.6742 g Sample Wt. 0.0073 g	Dish No. 524 Dish Tare Wt. 48.0411 g Dish+Sample Wt. 48.0439 g Sample Wt. 0.0028 g
4	Test 1 Run 4 Log Number -05 I Comments	Dish No. 56 Dish Tare Wt. 47.7541 g Dish+Sample Wt. 47.7613 g Sample Wt. 0.0072 g	Dish No. 619 Dish Tare Wt. 47.5581 g Dish+Sample Wt. 47.5552 g Sample Wt. 0.0021 g
5	Test Run Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

Results Solvent Phase: Blank Solvent Wt. 0.0002 g

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0109	0.0115	0.0071	0.0070	

Results Aqueous Phase:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0022	0.0016	0.0024	0.0017	

F-5

LSC-03WYR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job LP Chilco
Team Leader ET
Date Submitted ~~6-21-94~~ C.G. 6-27-94
Test No. 1
Date of Analysis 7-12-94
Transport Leakage ☒ None ☐ ______ ml

Source RTO Press
Test Site Inlet
Date of Test 6-21-94
No. of Runs Completed 4
Technician C. GIERKE
Solvent Acetone

0 Test 1 Run 0
Field Blank
Log Number ______
Vol. of Solvent 100 ml
*Solvent Residue 4.00 ug/ml
Dish No. 100
Dish Tare Wt. 45.9682 g
Dish+Sample Wt. 45.9686 g
Sample Wt. 0.0004 g

1 Test 1 Run 1
Vol. of Solvent 120 ml
Log Number 3191 - 02P
Comments ______
Dish No. 32
Dish Tare Wt. 57.8090 g
Dish+Sample Wt 57.8189 g
Sample Wt. 0.0099 g

2 Test 1 Run 2
Vol. of Solvent 120 ml
Log Number -03P
Comments ______
Dish No. 33
Dish Tare Wt. 47.9422 g
Dish+Sample Wt. 47.9543 g
Sample Wt. 0.0121 g

3 Test 1 Run 3
Vol. of Solvent 100 ml
Log Number -04P
Comments ______
Dish No. 35
Dish Tare Wt. 51.0962 g
Dish+Sample Wt. 51.1068 g
Sample Wt. 0.0106 g

4 Test 1 Run 4
Vol. of Solvent 170 ml
Log Number -05P
Comments ______
Dish No. 321
Dish Tare Wt. 42.4965 g
Dish+Sample Wt. 42.5071 g
Sample Wt. 0.0106 g

5 Test ______ Run ______
Vol. of Solvent ______ ml
Log Number ______
Comments ______
Dish No. ______
Dish Tare Wt. ______ g
Dish+Sample Wt. ______ g
Sample Wt. ______ g

*Solvent Residue 4.00 ug/ml = [(Sample Wt. 0.0004 g)(10^6)]/Vol. of Sol. 100 ml
EPA-MS Acetone Residue Blank Spec. ≤7.3 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0094	0.0116	0.0102 E-6	0.0099	

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L. P. Chilco
Team Leader ET
Date Submitted 6-27-94
Test No. 1
Date of Analysis 7- -94

Source RTO Press
Test Site Inlet
Date of Test 6-21-94
No. of Runs Completed 4
Technician C. Helgeson

0	Test 1 Run 0 Field Blank Log Number 3191-01F Comments	Filter No. 1290 Filter Type 3.52 Pallflex Filter Tare Wt. .3604 g Filter+Sample Wt. .3604 g Sample Wt. .0000 g
1	Test 1 Run 1 Log Number -02F Comments	Filter No. 1325 Filter Type 3.52 Pallflex Filter Tare Wt. .3570 g Filter+Sample Wt. .3703 g Sample Wt. 0.0133 g
2	Test 1 Run 2 Log Number -03F Comments	Filter No. 1327 Filter Type 3.52 Pallflex Filter Tare Wt. .3618 g Filter+Sample Wt. .3736 g Sample Wt. 0.0118 g
3	Test 1 Run 3 Log Number -04F Comments	Filter No. 1294 Filter Type 3.52 Pallflex Filter Tare Wt. .3621 g Filter+Sample Wt. .3668 g Sample Wt. 0.0047 g
4	Test 1 Run 4 Log Number -05F Comments	Filter No. 1326 Filter Type 3.52 Pallflex Filter Tare Wt. .3702 g Filter+Sample Wt. .3813 g Sample Wt. 0.0111 g
5	Test Run Log Number Comments	Filter No. Filter Type Filter Tare Wt. g Filter+Sample Wt. g Sample Wt. g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0133	0.0118	0.0047	0.0111	

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5

LSC-02PR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/~~Wisconsin Protocol~~ M-202

Job LP Chilco
Team Leader MK
Date Submitted 6-27-94
Test No. 3
Date of Analysis 7-12-94

Source Dryer RTO
Test Site Inlet
Date of Test 6-21-94
No. of Runs Completed 4
Technician C. Helgeson

		Solvent Phase	Aqueous Phase
0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 3 Run 1 Log Number 3191-07I Comments ____	Dish No. 62 Dish Tare Wt. 43.1529 g Dish+Sample Wt. 43.2814 g Sample Wt. 0.1285 g	Dish No. 23 Dish Tare Wt. 46.0851 g Dish+Sample Wt. 46.1564 g Sample Wt. 0.0713 g
2	Test 3 Run 2 Log Number -08I Comments ____	Dish No. 65 Dish Tare Wt. 44.6548 g Dish+Sample Wt. 44.7370 g Sample Wt. 0.0822 g	Dish No. 102 Dish Tare Wt. 44.3257 g Dish+Sample Wt. 44.3723 g Sample Wt. 0.0466 g
3	Test 3 Run 3 Log Number -09I Comments ____	Dish No. 69 Dish Tare Wt. 47.9862 g Dish+Sample Wt. 48.0593 g Sample Wt. ~~0.068~~ C.H. .0731 g	Dish No. 105 Dish Tare Wt. 47.8629 g Dish+Sample Wt. 47.9072 g Sample Wt. 0.0443 g
4	Test 3 Run 4 Log Number -10I Comments ____	Dish No. 81 Dish Tare Wt. 48.8505 g Dish+Sample Wt. 48.9363 g Sample Wt. 0.0858 g	Dish No. 119 Dish Tare Wt. 47.7649 g Dish+Sample Wt. 47.8426 g Sample Wt. 0.0777 g
5	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

Results Solvent Phase:

Blank Solvent Wt. 0.0002 g

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.1283	0.0820	0.0729	0.0856	

Results Aqueous Phase:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0709	0.0462	0.0439	0.0773	E-8

LSC-03WYR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job LP Chilco
Team Leader MC
Date Submitted 6-27-94
Test No. 3
Date of Analysis 7-12-94
Transport Leakage ☒ None ☐ ______ ml

Source Dryer RTO
Test Site Inlet
Date of Test 6-21-94
No. of Runs Completed 4
Technician C. Glerke
Solvent Acetone

0	Test ____ Run 0 Field Blank Log Number ______ Vol. of Solvent ____ ml *Solvent Residue 4.00 ug/ml	Dish No. ______ Dish Tare Wt. ______ g Dish+Sample Wt. ______ g Sample Wt. ______ g
1	Test 3 Run 1 Vol. of Solvent 250 ml Log Number 3191 -07P Comments ______	Dish No. 102 Dish Tare Wt. 47.2501 g Dish+Sample Wt. 47.4094 g Sample Wt. 0.1593 g
2	Test 3 Run 2 Vol. of Solvent 250 ml Log Number -08P Comments ______	Dish No. 506 Dish Tare Wt. 48.6377 g Dish+Sample Wt. 48.7365 g Sample Wt. 0.0988 g
3	Test 3 Run 3 Vol. of Solvent 170 ml Log Number -09P Comments ______	Dish No. 518 Dish Tare Wt. 49.1021 g Dish+Sample Wt. 48.1558 g Sample Wt. 0.0537 g
4	Test 3 Run 4 Vol. of Solvent 190 ml Log Number -10P Comments ______	Dish No. 521 Dish Tare Wt. 50.5968 g Dish+Sample Wt 50.6979 g Sample Wt. 0.1011 g
5	Test ____ Run ____ Vol. of Solvent ____ ml Log Number ______ Comments ______	Dish No. ______ Dish Tare Wt. ______ g Dish+Sample Wt. ______ g Sample Wt. ______ g

*Solvent Residue ___ ug/ml=[(Sample Wt. ____ g)(10^6)]/Vol. of Sol. ____ ml
EPA-M5 Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.1583	0.0978	0.0530	0.1003	E-9

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L.P. Chilco
Team Leader MK
Date Submitted 6-27-94
Test No. 3
Date of Analysis 7-11-94

Source Dryer RTO
Test Site Inlet
Date of Test 6-21-94
No. of Runs Completed 4
Technician C. Gierke

0
Test 3 Run 0
Field Blank
Log Number 3191-06F
Comments

Filter No. 1292
Filter Type 3.52 Pallflex
Filter Tare Wt. .3590 g
Filter+Sample Wt. .3590 g
Sample Wt. 0.0000 g

1
Test 3 Run 1
Log Number -07F
Comments 1of2

Filter No. 1293
Filter Type 3.52 Pallflex
Filter Tare Wt. .3616 g
Filter+Sample Wt. .5132 g
Sample Wt. 0.1516 g

2
Test 3 Run 2
Log Number -08F
Comments

Filter No. 6188
Filter Type 4" GF
Filter Tare Wt. .8722 g
Filter+Sample Wt. 1.1827 g
Sample Wt. 0.3105 g

3
Test 3 Run 3
Log Number -09F
Comments

Filter No. 6666
Filter Type 4" GF
Filter Tare Wt. .9329 g
Filter+Sample Wt. 1.3186 g
Sample Wt. 0.3857 g

4
Test 3 Run 4
Log Number -10F
Comments

Filter No. 6667
Filter Type 4" GF
Filter Tare Wt. .9309 g
Filter+Sample Wt. 1.2899 g
Sample Wt. 0.3590 g

5
Test Run
Log Number
Comments

Filter No.
Filter Type
Filter Tare Wt. g
Filter+Sample Wt. g
Sample Wt. g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.1516	0.3105	0.3857	0.3590	

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L.P. Chilco
Team Leader MK
Date Submitted 6-27-94
Test No. 3
Date of Analysis 7-11-94

Source Dryer RTO
Test Site Inlet
Date of Test 6-21-94
No. of Runs Completed 4
Technician C. GIERKE

0	Test ___ Run 0 Field Blank Log Number ___ Comments ___	Filter No. ___ Filter Type ___ Filter Tare Wt. ___ g Filter+Sample Wt. ___ g Sample Wt. ___ g
1	Test 3 Run 1 Log Number 3191-07F Comments 2 of 2	Filter No. 6186 Filter Type 4" GF Filter Tare Wt. .8781 g Filter+Sample Wt. 1.1120 g Sample Wt. 0.2339 g
2	Test ___ Run ___ Log Number ___ Comments ___	Filter No. ___ Filter Type ___ Filter Tare Wt. ___ g Filter+Sample Wt. ___ g Sample Wt. ___ g
3	Test ___ Run ___ Log Number ___ Comments ___	Filter No. ___ Filter Type ___ Filter Tare Wt. ___ g Filter+Sample Wt. ___ g Sample Wt. ___ g
4	Test ___ Run ___ Log Number ___ Comments ___	Filter No. ___ Filter Type ___ Filter Tare Wt. ___ g Filter+Sample Wt. ___ g Sample Wt. ___ g
5	Test ___ Run ___ Log Number ___ Comments ___	Filter No. ___ Filter Type ___ Filter Tare Wt. ___ g Filter+Sample Wt. ___ g Sample Wt. ___ g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.2339				

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5

LSC-02PR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/~~Wisconsin Protocol~~ M-202

Job L. P. Chilco
Team Leader DVH
Date Submitted 6-27-94
Test No. 5
Date of Analysis 7-12-94

Source RTO
Test Site Stack
Date of Test 6-21-94
No. of Runs Completed 4
Technician C. Helgeson

		Solvent Phase	Aqueous Phase
0	Test ___ Run 0 Field Blank Log Number ___ Comments ___	Dish No. ___ Dish Tare Wt. ___ g Dish+Sample Wt. ___ g Sample Wt. ___ g	Dish No. ___ Dish Tare Wt. ___ g Dish+Sample Wt. ___ g Sample Wt. ___ g
1	Test 5 Run 1 Log Number 3191-14I Comments ___	Dish No. 411 Dish Tare Wt. 46.6845 g Dish+Sample Wt. 46.6922 g Sample Wt. 0.0077 g	Dish No. 3 Dish Tare Wt. 52.1205 g Dish+Sample Wt. 52.1238 g Sample Wt. 0.0033 g
2	Test 5 Run 2 Log Number -15I Comments ___	Dish No. 508 Dish Tare Wt. 45.5032 g Dish+Sample Wt. 45.5232 g Sample Wt. 0.0200 g	Dish No. 4 Dish Tare Wt. 47.3803 g Dish+Sample Wt. 47.3854 g Sample Wt. 0.0051 g
3	Test 5 Run 3 Log Number -16I Comments ___	Dish No. 512 Dish Tare Wt. 49.3566 g Dish+Sample Wt. 49.3631 g Sample Wt. 0.0065 g	Dish No. 5 Dish Tare Wt. 50.6821 g Dish+Sample Wt. 50.6858 g Sample Wt. 0.0037 g
4	Test 5 Run 4 Log Number -17I Comments ___	Dish No. 519 Dish Tare Wt. 49.0536 g Dish+Sample Wt. 49.0623 g Sample Wt. 0.0087 g	Dish No. 6 Dish Tare Wt. 48.2710 g Dish+Sample Wt. 48.2754 g Sample Wt. 0.0044 g
5	Test ___ Run ___ Log Number ___ Comments ___	Dish No. ___ Dish Tare Wt. ___ g Dish+Sample Wt. ___ g Sample Wt. ___ g	Dish No. ___ Dish Tare Wt. ___ g Dish+Sample Wt. ___ g Sample Wt. ___ g

Results Solvent Phase: Blank Solvent Wt. 0.0002 g

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0075	0.0198	0.0063	0.0085	

Results Aqueous Phase:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0029	0.0047	0.0033	0.0040	

LSC-03WYR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job L.P. Chilco
Team Leader DVH
Date Submitted 6-27-94
Test No. 5
Date of Analysis 7-12-94
Transport Leakage ☒ None ☐ ______ ml

Source RTO
Test Site Stack
Date of Test 6-21-94
No. of Runs Completed 4
Technician C. Gierke
Solvent Acetone

0
Test ____ Run 0
Field Blank
Log Number ________
Vol. of Solvent ____ ml
*Solvent Residue 4.00 ug/ml

Dish No. ________
Dish Tare Wt. ________ g
Dish+Sample Wt. ________ g
Sample Wt. ________ g

1
Test 5 Run 1
Vol. of Solvent 90 ml
Log Number 3191-14P
Comments ________

Dish No. 405
Dish Tare Wt. 45.4898 g
Dish+Sample Wt. 45.5357 g
Sample Wt. 0.0459 g

2
Test 5 Run 2
Vol. of Solvent 120 ml
Log Number -15P
Comments ________

Dish No. 404
Dish Tare Wt. 46.1917 g
Dish+Sample Wt. 46.2142 g
Sample Wt. 0.0225 g

3
Test 5 Run 3
Vol. of Solvent 120 ml
Log Number -16P
Comments ________

Dish No. 410
Dish Tare Wt. 50.5581 g
Dish+Sample Wt. 50.5830 g
Sample Wt. 0.0249 g

4
Test 5 Run 4
Vol. of Solvent 150 ml
Log Number -17P
Comments ________

Dish No. 415
Dish Tare Wt. 45.0835 g
Dish+Sample Wt. 45.0975 g
Sample Wt. 0.0140 g

5
Test ____ Run ____
Vol. of Solvent ____ ml
Log Number ________
Comments ________

Dish No. ________
Dish Tare Wt. ________ g
Dish+Sample Wt. ________ g
Sample Wt. ________ g

*Solvent Residue ___ ug/ml = [(Sample Wt. ____ g)(10^6)]/Vol. of Sol. ____ ml
EPA-M5 Acetone Residue Blank Spec. ≤7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0455	0.0220	0.0244	0.0134	

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job L. P. Chilco	Source RTO
Team Leader DUH	Test Site Stack
Date Submitted 6-27-94	Date of Test 6-21-94
Test No. 5	No. of Runs Completed 4
Date of Analysis 7-11-94	Technician C. Helgeson

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g
1	Test 5 Run 1 Log Number 3191-14F Comments ____	Filter No. 6711 Filter Type 4" GF Filter Tare Wt. .9618 g Filter+Sample Wt. .9620 g Sample Wt. 0.0002 g
2	Test 5 Run 2 Log Number -15F Comments ____	Filter No. 6730 Filter Type 4" GF Filter Tare Wt. .9573 g Filter+Sample Wt. .9594 g Sample Wt. 0.0021 g
3	Test 5 Run 3 Log Number -16F Comments ____	Filter No. 6731 Filter Type 4" GF Filter Tare Wt. .9553 g Filter+Sample Wt. .9576 g Sample Wt. 0.0023 g
4	Test 5 Run 4 Log Number -17F Comments ____	Filter No. 6732 Filter Type 4" GF Filter Tare Wt. .9467 g Filter+Sample Wt. .9477 g Sample Wt. 0.0010 g
5	Test ____ Run ____ Log Number ____ Comments ____	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0002	0.0021	0.0023	0.0010	

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5

LSC-02PR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/~~Wisconsin Protocol~~ M-202

Job L. P. Chilco
Team Leader CT
Date Submitted 6-27-94
Test No. 10
Date of Analysis 7-12-94

Source Konus
Test Site Stack
Date of Test 6-22-94
No. of Runs Completed 3
Technician C. Helgeson

		Solvent Phase	Aqueous Phase
0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 10 Run 1 Log Number 3191-46I Comments ____	Dish No. 610 Dish Tare Wt. 48.4371 g Dish+Sample Wt. 48.4433 g Sample Wt. 0.0062 g	Dish No. 8 Dish Tare Wt. 46.9764 g Dish+Sample Wt. 46.9794 g Sample Wt. 0.0030 g
2	Test 10 Run 2 Log Number -47I Comments ____	Dish No. 611 Dish Tare Wt. 50.0089 g Dish+Sample Wt. 50.0143 g Sample Wt. 0.0054 g	Dish No. 9 Dish Tare Wt. 47.9757 g Dish+Sample Wt. 47.9798 g Sample Wt. 0.0041 g
3	Test 10 Run 3 Log Number -48I Comments ____	Dish No. 612 Dish Tare Wt. 49.6255 g Dish+Sample Wt. 49.6288 g Sample Wt. 0.0033 g	Dish No. 22 Dish Tare Wt. 51.3623 g Dish+Sample Wt. 51.3644 g Sample Wt. 0.0021 g
4	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

Results Solvent Phase: Blank Solvent Wt. 0.0002 g

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0060	0.0052	0.0031		

Results Aqueous Phase:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0026	0.0037	0.0017		

LSC-03WYR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job LP / Chilco
Team Leader ET
Date Submitted 6-27-94
Test No. 10
Date of Analysis 7-12-94
Transport Leakage ☒ None ☐ ______ ml

Source Konus
Test Site Stack
Date of Test 6-22-94
No. of Runs Completed 3
Technician C. Gierke
Solvent Acetone

0	Test ____ Run 0 Field Blank Log Number ____ Vol. of Solvent ____ ml *Solvent Residue 4.00 ug/ml	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 10 Run 1 Vol. of Solvent 150 ml Log Number 3191 - 46P Comments ____	Dish No. 13 Dish Tare Wt. 45.7193 g Dish+Sample Wt. 45.7445 g Sample Wt. 0.0252 g
2	Test 10 Run 2 Vol. of Solvent 140 ml Log Number -47P Comments ____	Dish No. 18 Dish Tare Wt. 49.9862 g Dish+Sample Wt. 50.0058 g Sample Wt. 0.0196 g
3	Test 10 Run 3 Vol. of Solvent 140 ml Log Number -48P Comments ____	Dish No. 25 Dish Tare Wt. 44.3469 g Dish+Sample Wt. 44.3515 g Sample Wt. 0.0046 g
4	Test ____ Run ____ Vol. of Solvent ____ ml Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Vol. of Solvent ____ ml Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

*Solvent Residue ___ ug/ml=[(Sample Wt. _____ g)(10⁶)]/Vol. of Sol. _____ ml
EPA-M5 Acetone Residue Blank Spec. ≤7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0246	0.0190	0.0040	E-16	

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job LP / Chilco
Source Konus
Team Leader ET
Test Site Stack
Date Submitted 6-27-94
Date of Test 6-22-94
Test No. 10
No. of Runs Completed 3
Date of Analysis 7-11-94
Technician C. Gierke

0 Test 10 Run 0
Field Blank
Log Number 3191-45F
Comments
Filter No. 6600
Filter Type 4" GF
Filter Tare Wt. .9261 g
Filter+Sample Wt. .9261 g
Sample Wt. 0.0000 g

1 Test 10 Run 1
Log Number -46F
Comments
Filter No. 6668
Filter Type 4" GF
Filter Tare Wt. .9290 g
Filter+Sample Wt. .9294 g
Sample Wt. 0.0004 g

2 Test 10 Run 2
Log Number -47F
Comments
Filter No. 6580
Filter Type 4" GF
Filter Tare Wt. .8927 g
Filter+Sample Wt. .8939 g
Sample Wt. 0.0012 g

3 Test 10 Run 3
Log Number -48F
Comments
Filter No. 6598
Filter Type 4" GF
Filter Tare Wt. .9338 g
Filter+Sample Wt. .9365 g
Sample Wt. 0.0027 g

4 Test Run
Log Number
Comments
Filter No.
Filter Type
Filter Tare Wt. g
Filter+Sample Wt. g
Sample Wt. g

5 Test Run
Log Number
Comments
Filter No.
Filter Type
Filter Tare Wt. g
Filter+Sample Wt. g
Sample Wt. g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0004	0.0012	0.0027		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5

LSC-02PR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: KZG Date of Analysis: 7-20-94

Job: LP/Chilco Source: RTO Press Site: ~~Stack~~ SP Inlet

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	~~12.5~~ 25 mM Sulfuric Acid
X	AS4A	2.0 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
RTO Press TIR1 INLET	3191-02	250	1	1.31	328	
TIR2	-03	250	1	0.653	163	
TIR3	-04	250	1	0.319	79.8	
TIR4	-05	250	1	0.281	70.3	

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

LSC-08RR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: KZG

Date of Analysis: 7-20-94

Job: LP/Chilco

Source: RTO Dryer

Site: inlet

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	~~12.5~~ 25 mM Sulfuric Acid
X	AS4A	2.0 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
RTO Dryer T3R1 inlet	3191-07	425	1	1.25	531	
T3R2	-08	390	1	0.965	376	
T3R3	-09	400	1	1.11	444	
T3R4	-10	400	1	1.57	628	

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

LSC-08RR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: KLJ　　　　Date of Analysis: 7-20-94

Job: LP/Chilco　　　　Source: RTO　　　　Site: Stack

Chromatography Conditions

Column		Flow Rate	Eluent	Flow Rate		Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min		~~12.5~~ 25 mM Sulfuric Acid
X	AS4A	2.0 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min		
	AS5	ml/min	100 mM NaOH	X	Isocratic	
		ml/min			Gradient(List program below)	

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
RTO Stack TSR1	3191-14	275	1	1.53	421	
TSR2	-15	275	1	0.388	107	
TSR3	-16	275	1	0.339	93.2	
TSR4	-17	290	1	0.311	90.2	

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

LSC-08RR

Interpoll Laboratories, Inc.
(612)786-6020

Ion Chromatography Laboratory

DIONEX MODEL 4000i WITH ANION MICRO MEMBRANE SUPRESSION

Analyst: KLJ

Date of Analysis: 7-20-94

Job: LP/Chilco

Source: Konus

Site: Stack

Chromatography Conditions

	Column	Flow Rate	Eluent	Flow Rate	Suppressor Acid
	AS3	ml/min	2.4 mM Na_2CO_3 & 3.0 mM $NaHCO_3$	10 ml/min	~~12.5~~ 25 mM Sulfuric Acid
X	AS4A	2.0 ml/min	1.8 mM Na_2CO_3 & 1.7 mM $NaHCO_3$	ml/min	
	AS5	ml/min	100 mM NaOH	X	Isocratic
		ml/min			Gradient(List program below)

Gradient Program	Time (Min.)									
Eluent	0.0									
% A										
% B										

Results of Sulfate Determination

Sample Name	Interpoll Log Number	Tot. Sample Volume (ml)	Dilution	Solution Conc.(ug/ml)	Total ug Sulfate	meq of Sulfate
Konus T10 R1 Stack	3191-46	250	10	0.573*	1430	
T10 R2	-47	250	10	0.886	2220	
T10 R3	-48	250	10	0.716	1790	

Total ug = (Sample Vol.) x (Dilution) x (Solution Conc.)
meq = Total ug / 48000

*Analyzed 7/20/94

LSC-08RR

EPA Method 202 Calculations

Report No. 4-3191

Job: **LOUISIANA PACIFIC - CHILCO**
Date: 21-Jun-94

RTO PRESS INLET

RUN	Vic (ml)	Sulfate (mg/ml)	Mc (mg)	Mr (mg)	Mi (mg)	Mo (mg)	Mb (mg)	CPM (mg)	ENTER IN COMPUTER (g)
1	250	6.53E-04	0.03	1.6	1.57	11.5	0.6	12.47	0.01247
2	250	3.19E-04	0.01	2.4	2.39	7.1	0.6	8.89	0.008885
3	250	2.81E-04	0.01	1.7	1.69	7	0.6	8.09	0.008087

EPA Method 201A/202 Totals

RUN	Probe (mg)	Filter (mg)	CPM (mg)	Total (mg)
1	11.6	11.8	12.47	35.86996
2	10.2	4.7	8.89	23.78533
3	9.9	11.1	8.09	29.08707

EPA Method 202 Calculations

Report No. 4-3191

Job: **LOUISIANA PACIFIC - CHILCO**
Date: 21-Jun-94

RTO DRYER INLET

RUN	Vic (ml)	Sulfate (mg/ml)	Mc (mg)	Mr (mg)	Mi (mg)	Mo (mg)	Mb (mg)	CPM (mg)	ENTER IN COMPUTER (g)
1	250	9.65E-04	0.04	46.2	46.16	82	0.6	127.56	0.127556
2	250	1.11E-03	0.05	43.9	43.85	72.9	0.6	116.15	0.116149
3	250	1.57E-03	0.07	77.3	77.23	85.6	0.6	162.23	0.162228

EPA Method 201A/202 Totals

RUN	Probe (mg)	Filter (mg)	CPM (mg)	Total (mg)
1	97.8	310.5	127.56	535.8556
2	53	385.7	116.15	554.8489
3	100.3	359	162.23	621.5278

EPA Method 202 Calculations

Report No. 4-3191

Job: **LOUISIANA PACIFIC - CHILCO**
Date: 21-Jun-94

RTO STACK

RUN	Vic (ml)	Sulfate (mg/ml)	Mc (mg)	Mr (mg)	Mi (mg)	Mo (mg)	Mb (mg)	CPM (mg)	ENTER IN COMPUTER (g)
1	250	3.88E-04	0.02	4.7	4.68	19.8	0.6	23.88	0.023882
2	250	3.39E-04	0.02	3.3	3.28	6.3	0.6	8.98	0.008984
3	250	3.11E-04	0.01	4	3.99	8.5	0.6	11.89	0.011886

EPA Method 201A/202 Totals

RUN	Probe (mg)	Filter (mg)	CPM (mg)	Total (mg)
1	22	2.1	23.88	47.98215
2	24.4	2.3	8.98	35.68441
3	13.4	1	11.89	26.28569

EPA Method 202 Calculations

Report No. 4-3191

Job: **LOUISIANA PACIFIC - CHILCO**
Date: 22-Jun-94

KONUS STACK

RUN	Vic (ml)	Sulfate (mg/ml)	Mc (mg)	Mr (mg)	Mi (mg)	Mo (mg)	Mb (mg)	CPM (mg)	**ENTER IN COMPUTER** (g)
1	250	5.73E-04	0.03	2.6	2.57	6	0.6	7.97	0.007974
2	250	8.86E-04	0.04	3.7	3.66	5.2	0.6	8.26	0.008259
3	250	7.16E-04	0.03	1.7	1.67	3.1	0.6	4.17	0.004167

EPA Method 201A/202 Totals

RUN	Probe (mg)	Filter (mg)	CPM (mg)	Total (mg)
1	24.6	0.4	7.97	32.97364
2	19	1.2	8.26	28.45924
3	4	2.7	4.17	10.86706

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EPA Method 7A Recovery and Analysis Data Sheet (1)

**************SOURCE*************	***************RECOVERY****************	*************ANALYTICAL************
Job LP/Chilco	Date of Recovery 7-7-94	Date of Analysis 7-8-94
Source Dryer RTO Inlet	Recovered by C. Gierke	Analyst KXJ
Date of Sampling 6-21-94	Recovery volume 500 ml	Eluent AS4A
Test No(s) 3	Barometric at time ~~28.935~~ 29.005 IN.HG.	Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$C_{RS} = DF(C_{DS})$ $\quad M_{NO_3} = (C_{RS} - \overline{C}_B)V_R$ $\quad \overline{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$

where: C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

S-340(1)

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EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	ΔP_g (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank ($C_{RS} - C_B$)	Total nitrate in Sample (ug) (M_{NO_3})
1	3191-64	8	3/1	76°		—	0.1		1	0.0288	0.0288	14.4
2	-65	44	3/1				empty		1	—	—	—
3	-66	80	3/1				No Pressure		1	0.0870	0.0870	43.5
4	-67	81	3/1			—	2.30		1	—	—	—
5	-68	82	3/2				empty		1	—	—	—
6	-69	84	3/2				empty		1	—	—	—
7	-70	63	3/2			—	2.50		1	0.1089	0.1089	54.5
8	-71	31	3/2			—	3.40		1	0.1269	0.1269	63.5
9	-72	32	3/3			—	1.00		1	0.1347	0.1347	68.4
10	-73	33	3/3			—	1.40		1	0.1116	0.1116	55.8
11	-74	35	3/3			—	5.60		1	0.0896	0.0896	44.8
12	-75	36	3/3			—	2.10		1	0.1146	0.1146	57.3
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14												
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17												
18												
19												
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22												
23												
24												
25												
26												
27												
Blank 1									1	CB1		
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = ______

S-340(2) R-9/85

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EPA Method 7A Recovery and Analysis Data Sheet (1)

**************SOURCE**************	**************RECOVERY****************	*************ANALYTICAL************
Job LP/Chilco	Date of Recovery 7-1-94	Date of Analysis 7-8-94
Source Konus Stack	Recovered by C. Gierke	Analyst KLO
Date of Sampling 6-22-94	Recovery volume 500 ml	Eluent ASIA
Test No(s) 10	Barometric at time 28.935 IN.HG.	Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$C_{RS} = DF(C_{DS})$ $\qquad M_{NO_3} = (C_{RS} - \overline{C}_B)V_R$ $\qquad \overline{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$

where: C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

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EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	Δ Pg (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank (C_{RS} - $\bar{C}_B$)	Total nitrate in Sample (ug) ($M_{NO_3^-}$)
1	3141-52	61	10/1	75°		—	2.90		1	0.3300	0.3300	165
2	-53	62	10/1			—	2.60		1	0.3495	0.3495	175
3	-54	63	10/1			—	3.00		1	0.3461	0.3466	173
4	-55	64	10/1			—	1.00		1	0.3744	0.3744	187
5	-56	65	10/2			—	2.40		1	0.4159	0.4159	208
6	-57	66	10/2			—	1.10		1	0.4688	0.4688	234
7	-58	1	10/2			—	1.20		1	0.5045	0.5045	252
8	-59	2	10/2			—	1.60		1	0.4757	0.4757	238
9	-60	3	10/3			—	0.90		1	0.4133	0.4133	207
10	-61	4	10/3			—	4.40		1	0.4962	0.4962	248
11	-62	5	10/3			—	0.40		1	0.5876	0.5876	294
12	-63	6	10/3			—	0.90		1	0.5489	0.5489	274
13												
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23												
24												
25												
26												
27												
Blank 1									1	CB1		
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = ______

S-340(2) R-9/85

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S-305RR
(9/90)

EPA Method 10 NDIR Analysis

Job Name L.P. Chilco
Source RTO Stack
Date of Analysis 6-21-94
Technician C. Helgeson

NDIR Analyzer: ☐ Fugi ACS Model 3300
☑ Mon. Lab Model 8310
☐ Dasibi Model 3003
Range: 0 - 210 ppm
Flow rate: 1000 cc/min

Pretest Calibration

	Conc.	Reading	Vendor	Cyl. Number
Zero gas:	0 ppm	0 ppm	Scott	AAL 17431
Upscale gas:	41.5 ppm	41.5 ppm	National	CC52502
Upscale gas:	204 ppm	205.7 ppm	National	CC 81624
Upscale gas:	ppm	ppm		

Post-test Calibration

	Conc.	Reading	Vendor	Cyl. Number
Zero gas:	0 ppm	0 ppm	Scott	AAL 17431
Upscale gas:	41.5 ppm	41.3 ppm	National	CC 52502
Upscale gas:	204 ppm	205.0 ppm	National	CC 51624
Upscale gas:	ppm	ppm		

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry) Dilution Factor	Reading	Actual ppm
5/1	3191-18	—	9.0	9.0
5/2	-19	—	6.6	6.6
5/3	-20	—	6.1	6.1
5/4	-21	—	7.2	7.2

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry) Dilution Factor	Reading	Actual ppm

Note 1: If sample dilution is requried the sample is diluted with CO-free gas prior to analysis.
Note 2: The Fugi ACS model 3300 has a rejection ratio for CO to CO_2 greater then 100,000: 1 and the Mon. Labs Model 8310 and Dasibi Model 3003 have rejection ratios greater then 200,000:1 and thus CO_2 removal prior to analysis is not required.
Note 3: The analyzer must be zeroed and spanned immediately before and after sample analysis. Additional checks may be performed between sample analyses if required.

EPA Method 10 NDIR Analysis

Job Name L.P. Chilco
Source Konus Stack
Date of Analysis 6-27-94
Technician C. Helgeson

NDIR Analyzer:
☐ Fugi ACS Model 3300
☐ Mon. Lab Model 8310
☑ Dasibi Model 3003
Range: 0 - 210 ppm
Flow rate: 1000 cc/min

Pretest Calibration

	Conc.	Reading	Vendor	Cyl. Number
Zero gas:	0 ppm	0 ppm	Scott	AAL 17431
Upscale gas:	41.5 ppm	41.5 ppm	National	CC 52502
Upscale gas:	204 ppm	205.1 ppm	National	CC 81624
Upscale gas:	ppm	ppm		

Post-test Calibration

	Conc.	Reading	Vendor	Cyl. Number
Zero gas:	0 ppm	0 ppm	Scott	AAL 17431
Upscale gas:	41.5 ppm	41.3 ppm	National	CC 52502
Upscale gas:	204 ppm	205.0 ppm	National	CC 81624
Upscale gas:	ppm	ppm		

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry) Dilution Factor	Reading	Actual ppm
10/1	3191-49	—	9.3	9.3
10/2	-50	—	9.1	9.1
10/3	-51	—	28.9	28.9

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry) Dilution Factor	Reading	Actual ppm

Note 1: If sample dilution is requried the sample is diluted with CO-free gas prior to analysis.
Note 2: The Fugi ACS model 3300 has a rejection ratio for CO to CO_2 greater then 100,000: 1 and the Mon. Labs Model 8310 and Dasibi Model 3003 have rejection ratios greater then 200,000:1 and thus CO_2 removal prior to analysis is not required.
Note 3: The analyzer must be zeroed and spanned immediately before and after sample analysis. Additional checks may be performed between sample analyses if required.

INTERPOLL LABORATORIES INC.

Phenol Result By EPA Method 8270
For Dept. 20/ LP Chilco, Collected 6/22/94

Item	Test 8			
	Run 0	Run 1	Run 2	Run 3
RTO				
Log #	3191-26/27	3191-28/29	3191-30/31	3191-32/33
Phenol*	< 840	< 840	< 840	< 840
2-Fluorophenol**	71.7	27.7	28.1	ND
D6-Phenol**	34.2	28.4	28.5	27.3
2,4,6-Tribromophenol***	47.7	57.7	50.6	50.1

* = Total mass of the specified compound in the sample in ug.
** = Percent recovery of the field surrogate. (59800 ug 2-Fluorophenol and 5330 ug Phenol-D6 was added to the impinger solution before sampling.)
*** = Percent recovery of the lab surrogates.
ND = Not detected

Reviewed By:
Gregg W. Holman

INTERPOLL LABORATORIES INC.

Re-analysis of Phenol by EPA Method 8270
For Dept. 20/ LP Chilco, Collected 6/22/94

Item	Test: 8			Source: RTO
	Run 0	Run 1	Run 2	Run 3
Log #	3191A-26/27	3191A-28/29	3191A-30/31	3191A-32/33
Phenol*	**< 84**	**150**	**200**	**180**
2-Fluorophenol**	71.7	27.7	28.1	ND
D6-Phenol**	34.2	28.4	28.5	27.3
2,4,6-Tribromophenol***	47.7	57.7	50.6	50.1

* = Total mass of the specified compound in the sample in ug after a 10 fold concentration.
** = Percent recovery of the field surrogate based on the original non-concentrated extract. (59800 ug 2-Fluorophenol and 5330 ug Phenol-D6 was added to the impinger solution before sampling.)
*** = Percent recovery of the lab surrogates on the original non-concentrated extract.
ND = Not detected

Reviewed By:
Gregg W. Holman
Gregg W. Holman

INTERPOLL LABORATORIES INC.

Revised Formaldehyde Results Using EPA Method 0011
For Dept. 20/LP Chilco, Collected 6/22/94

	Detection Limit	Test: 7			Source: RTO Stack
		Run 0	Run 1	Run 2	Run 3
Log #		(3191-22)	(3191-23)	(3191-24)	(3191-25)
Mass (ug)*	**0.05**	**6.74**	**1320**	**917**	**658**

* = Total Mass of formaldehyde in the sample in ug.

Reviewed By:

Gregg W. Holman

INTERPOLL LABORATORIES INC.

4,4-Methylenebis(phenyl isocyanate) Results
For Dept. 20/LP Chilco Collected 6/22/94

	Field Spike			Test: 9			Source: RTO Stack
Item	Actual	Found	% Rec.	Run 0	Run 1	Run 2	Run 3
EPA Draft Method 1,2-PP Impinger 1							
Log #		3191-44		3191-43	3191-37	3191-39	3191-41
Date Analyzed		7/22/94		7/22/94	7/22/94	7/22/94	7/22/94
Mass (ug)*	**296**	**255**	**86**	**< 2.5**	**21.4**	**20.8**	**14.6**
EPA Draft Method 1,2-PP Impinger 2							
Log #					3191-38	3191-40	3191-42
Date Analyzed					7/22/94	7/22/94	7/22/94
Mass (ug)*					**< 2.5**	**< 2.5**	**< 2.5**

* = Total Mass of MDI in the Sample in ug.

Reviewed By:
Gregg W. Holman
Gregg W. Holman

INTERPOLL LA   RATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job LP/CHILCO Source RTO PROSS Site INLET Log No. 3191
Field Engineer [signature] Date of Test 6-21-94 Test No. 1 No. of Runs 4

No. Items	Sample Type		Analysis		Sequence No.	Comments
4	**Probe Wash:** ☑ Acetone ☐ $MeCl_2$	☐ DI Water ☐ ____	☑ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☐ ____		
5	**Filter:** ☐ 4" Glass ☐ SS Thimble	☑ Pallflex ☐ 2.5" Glass	☑ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
4	**Impingers:** ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☐ ____	☐ MN Protocol ☐ WI Protocol ☑ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☐ ____		
0	**Integrated Gas:** ☐ Tedlar Bag	☐ ____	☐ EPA M-3 ☐ ____	☐ EPA M-10		
	Oxides of Nitrogen:		☐ EPA M-7A ☐ ____			
	Fuel Lab: ☐ Fuel Sample	☐ Aggregate	☐ Per S-0163			
	Particle Sizing:		☐ X-Ray Sdgraph ☐ ____	☐ Cascade Imp		
	Miscellaneous:	☐ ____	☐ ____			

Fuel Type: Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite Wood: ☐ Wood Waste ☐ Dust ☐ Bark Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6 Misc: ☐ Natural Gas ☐ RDF ☐ ____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
[signature] / Interpoll Labs	[signature]	6/27/94 0800

033094-GASTACK\WP\FORMS\S-278.2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job L.P. / Chilco, ID Source Dryer R50 Site Inlet Log No. 3191
Field Engineer M. Kuehnler Date of Test 6-21-94 Test No. 3 No. of Runs 4

No. Items	Sample Type		Analysis		Sequence No.	Comments
4	Probe Wash: ☒ Acetone ☐ $MeCl_2$	☐ DI Water ☐ ______	☒ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☐ ______		Do
3	Filter: ☒ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☒ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		Not
3	Impingers: ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☐ ______	☐ MN Protocol ☐ WI Protocol ☒ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☐ ______		Analyze
3	Integrated Gas: ☒ Tedlar Bag	☐ ______	☐ EPA M-3 ☐ ______	☐ EPA M-10		
12	Oxides of Nitrogen:		☐ EPA M-7A ☐ ______			First
—	Fuel Lab: ☐ Fuel Sample	☐ Aggregate	☐ Per S-0163			
—	Particle Sizing:		☐ X-Ray Sdgraph ☐ ______	☐ Cascade Imp		Run
—	Miscellaneous:	☐ ______	☐ ______			

Fuel Type: Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite Wood: ☒ Wood Waste ☐ Dust ☐ Bark Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6 Misc: ☐ Natural Gas ☐ RDF ☐ ______

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Mark Bachler / Interpoll Labs	[illegible signature]	6/27/94 0800

033094-G:\STACK\WP\FORMS\S-270.2

INTERPOLL LA[illegible]RATORIES, INC.
(612) 786 6020

Sample Chain of Custody

Job L.P. Chilco Source RTO Site Stack Log No.
Field Engineer DVH Date of Test 6/21/94 Test No. 5 No. of Runs 4

No. Items	Sample Type		Analysis		Sequence No.	Comments
5	**Probe Wash:** ☒ Acetone ☐ MeCl$_2$	☐ DI Water ☐ ____	☐ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☐ ____		
5	**Filter:** ☒ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☐ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
5	**Impingers:** ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☐ ____	☐ MN Protocol ☐ WI Protocol ☒ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☐ ____		
4	**Integrated Gas:** ☒ Tedlar Bag	☐ ____	☒ EPA M-3 ☐ ____	☒ EPA M-10		Co Also
	Oxides of Nitrogen:		☐ EPA M-7A ☐ ____			
	Fuel Lab: ☐ Fuel Sample	☐ Aggregate	☐ Per S-0163			
	Particle Sizing:		☐ X-Ray Sdgraph ☐ ____	☐ Cascade Imp		
	Miscellaneous:	☐ ____	☐ ____			

Fuel Type: Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite Wood: ☒ Wood Waste ☐ Dust ☐ Bark Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6 Misc: ☐ Natural Gas ☐ RDF ☐ ____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Duane Van Hoevey	[signature]	6/27/94 0800

033094-GASTACK\WP\FORMS\S-278.2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job L.P Chilo Source RTO Site Stack Log No. ____
Field Engineer DWH Date of Test 6/22/94 Test No. 7 No. of Runs 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
4	**Probe Wash:** ☐ Acetone ☒ $MeCl_2$	☐ DI Water ☐ ______	☐ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☒ .0011		
	Filter: ☐ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☐ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
4	**Impingers:** ☐ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☒ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☐ ______	☐ MN Protocol ☐ WI Protocol ☐ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☒ .0011		
3	**Integrated Gas:** ☒ Tedlar Bag	☐ ______	☒ EPA M-3 ☐ ______	☐ EPA M-10		
	Oxides of Nitrogen:		☐ EPA M-7A ☐ ______			
	Fuel Lab: ☐ Fuel Sample	☐ Aggregate	☐ Per S-0163			
	Particle Sizing:		☐ X-Ray Sdgraph ☐ ______	☐ Cascade Imp		
	Miscellaneous:	☐ ______	☐ ______			

Fuel Type: Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☐ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
Misc: ☐ Natural Gas ☐ RDF ☐ ______

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Duane Van Hovy	[signature]	6/27/94 0800

033094-GASTACK\WP\FORMS\S-278.2

INTERPOLL LA RATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job L.P. Chilco Source RTO Site Stack Log No. 3191
Field Engineer Dirk Date of Test 6/22/94 Test No. 8 No. of Runs 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
	Probe Wash: ☐ Acetone ☐ MeCl$_2$	☐DI Water ☐ ____	☐EPA M-5 ☐EPA M-29	☐EPA M-201A ☐ ____		
	Filter: ☐ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☐EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
4 pail	**Impingers:** ☐DI Water ☐3%H$_2$O$_2$ ☐1N NaOH ☐2,4-DNPH	☐H$_2$SO$_4$ ☐HNO$_3$/H$_2$O$_2$ ☐KMnO$_4$/H$_2$SO$_4$ ☒ A+B Neutral Buffer	☐MN Protocol ☐WI Protocol ☐EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☒ Phenol		
	Integrated Gas: ☐Tedlar Bag	☐ ____	☐EPA M-3 ☐ ____	☐EPA M-10		
	Oxides of Nitrogen:		☐EPA M-7A ☐ ____			
	Fuel Lab: ☐Fuel Sample	☐Aggregate	☐Per S-0163			
	Particle Sizing:		☐X-Ray Sdgraph ☐ ____	☐Cascade Imp		
	Miscellaneous:	☐ ____	☐ ____			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite Wood: ☐Wood Waste ☐Dust ☐Bark Oil: ☐Waste Oil ☐No. 2 ☐No. 6 Misc: ☐Natural Gas ☐RDF ☐ ____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Duane Van Hoene	[signature]	6/27/94 0800

033094-GASTACK\WP\FORMS\S-270.2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: L-P Chilco | Source: RTO | Site: Stack | Log No.: 3191
Field Engineer: Dirk | Date of Test: 6/22/94 | Test No.: 9 | No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
	Probe Wash: ☐ Acetone ☐ MeCl$_2$	☐DI Water ☐____	☐EPA M-5 ☐EPA M-29	☐EPA M-201A ☐____		
	Filter: ☐ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☐EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
5	Impingers: ☐DI Water ☐3%H_2O_2 ☐1N NaOH ☐2,4-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☒ 1-2 pp in toluene	☐MN Protocol ☐WI Protocol ☐EPA M-202 ☐EPA M6,8 ☒Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☒ MDI		1 Blank 1 Spike 3 1RST impinger 3 2ND impinger
	Integrated Gas: ☐Tedlar Bag	☐____	☐EPA M-3 ☐____	☐EPA M-10		
	Oxides of Nitrogen:		☐EPA M-7A ☐____			
	Fuel Lab: ☐Fuel Sample	☐Aggregate	☐Per S-0163			
	Particle Sizing:		☐X-Ray Sdgraph ☐____	☐Cascade Imp		
	Miscellaneous:	☐____	☐____			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite | Wood: ☐Wood Waste ☐Dust ☐Bark | Oil: ☐Waste Oil ☐No. 2 ☐No. 6 | Misc: ☐Natural Gas ☐RDF ☐____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Duane Van Hoven	[signature]	6/27/94 0800

033094-G:\STACK\WP\FORMS\S-270.2

INTERPOLL L   ORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: Uethico   Source: Konus   Site: Stack   Log No.: 3B1
Field Engineer: S Trowbridge   Date of Test: 6-22-94   Test No.: 10   No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
3	Probe Wash: ☒Acetone ☐ MeCl$_2$	☐DI Water ☐	☒EPA M-5 ☐EPA M-29	☐EPA M-201A ☐		
4	Filter: ☒ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☒EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
3	Impingers: ☒DI Water ☐3%H_2O_2 ☐1N NaOH ☐2,4-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☐	☐MN Protocol ☐WI Protocol ☒EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☐		
3	Integrated Gas: ☒Tedlar Bag	☐	☒EPA M-3 ☐	☒EPA M-10		
12	Oxides of Nitrogen:		☒EPA M-7A ☐			
	Fuel Lab: ☐Fuel Sample	☐Aggregate	☐Per S-0163			
	Particle Sizing:		☐X-Ray Sdgraph ☐	☐Cascade Imp		
	Miscellaneous:	☐	☐			

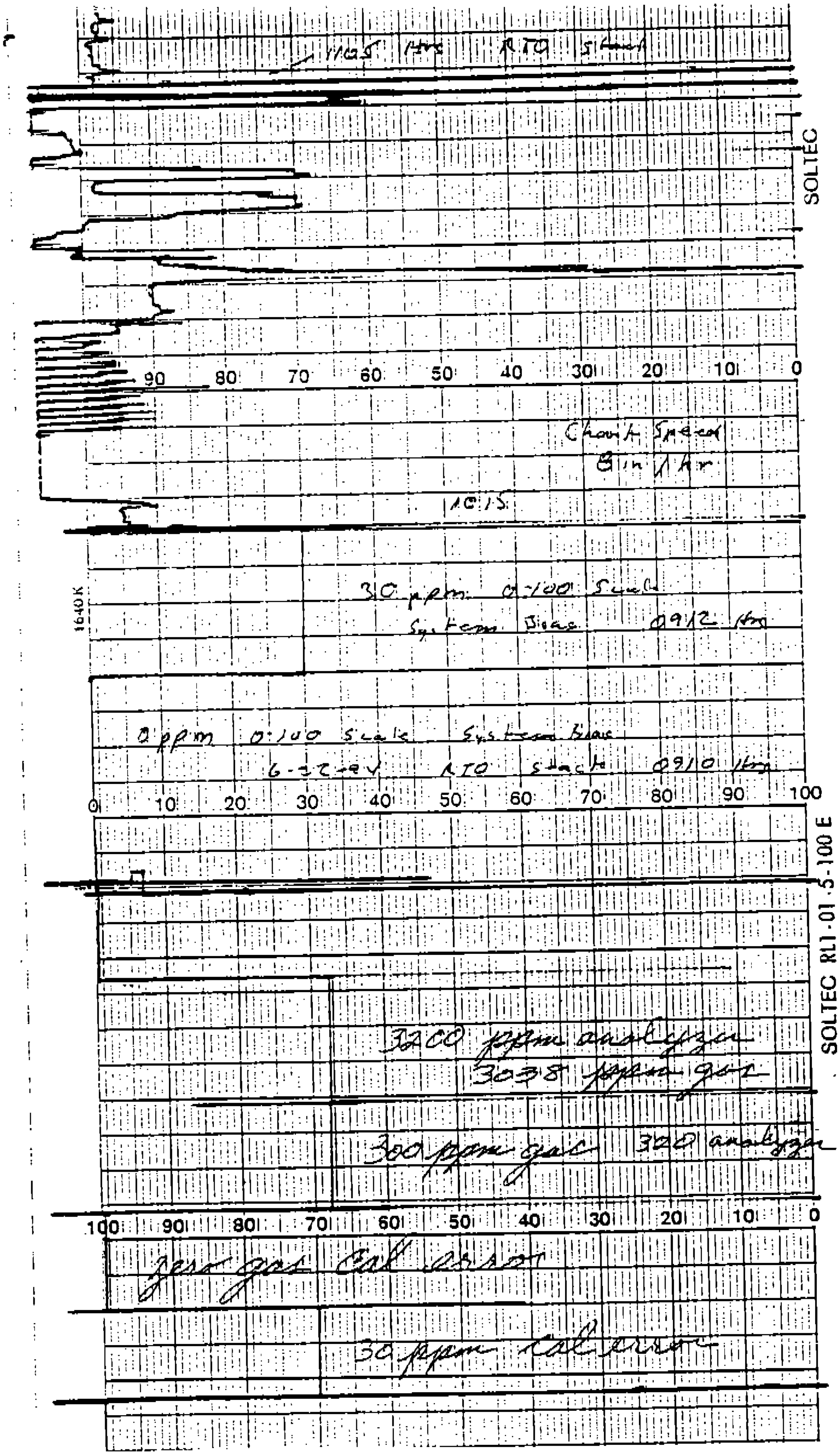
Fuel Type:
- Coal: ☐Bituminous ☐Anthracite ☐Lignite
- Wood: ☐Wood Waste ☐Dust ☐Bark
- Oil: ☐Waste Oil ☐No. 2 ☐No. 6
- Misc: ☐Natural Gas ☐RDF ☐

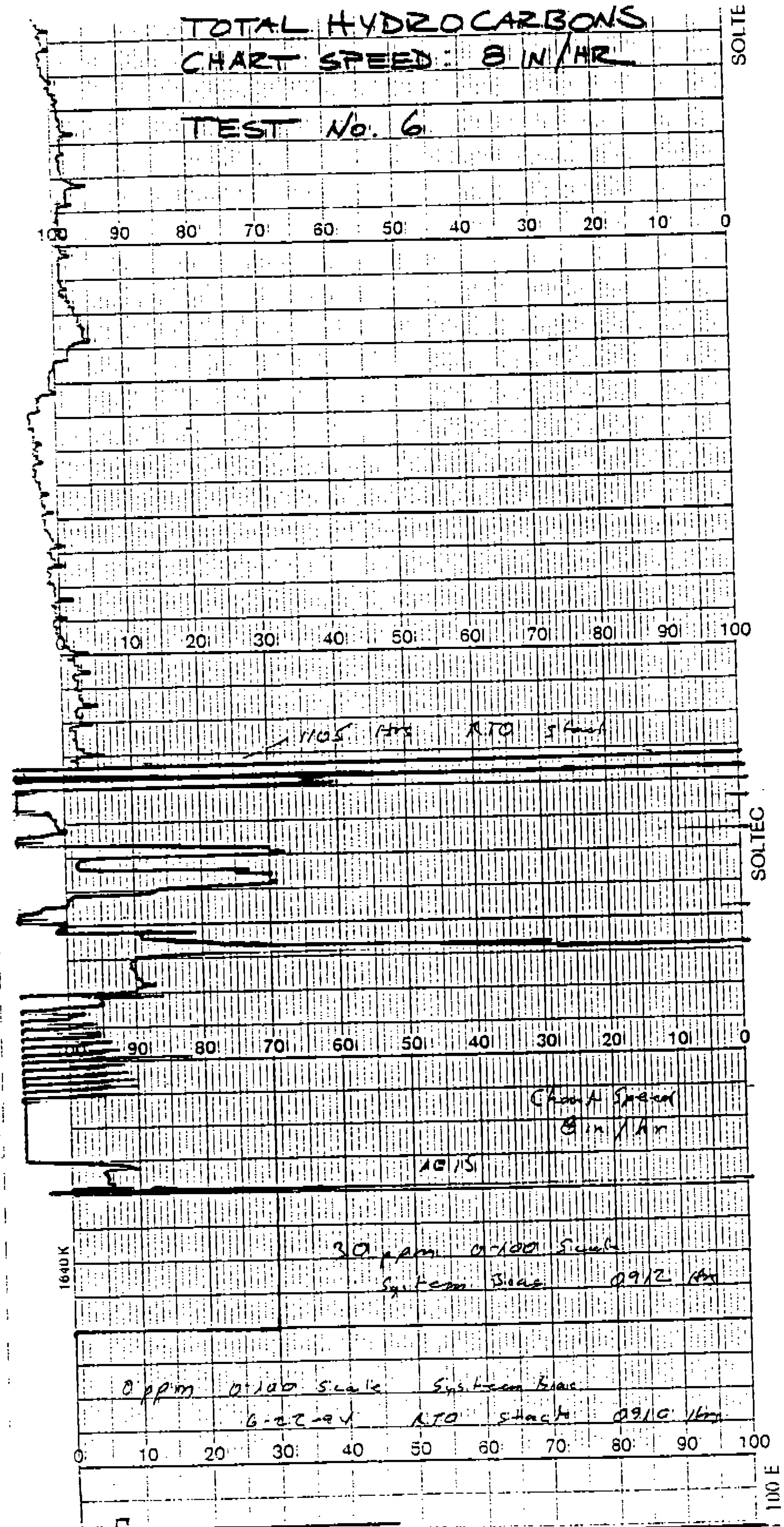
Relinquished by/Affiliation	Accepted by/Affiliation	Date
E Trowbridge / Interpoll Labs	[signature]	6/27/94 0800

033094-G:\STACK\WP\FORMS\S-278.2

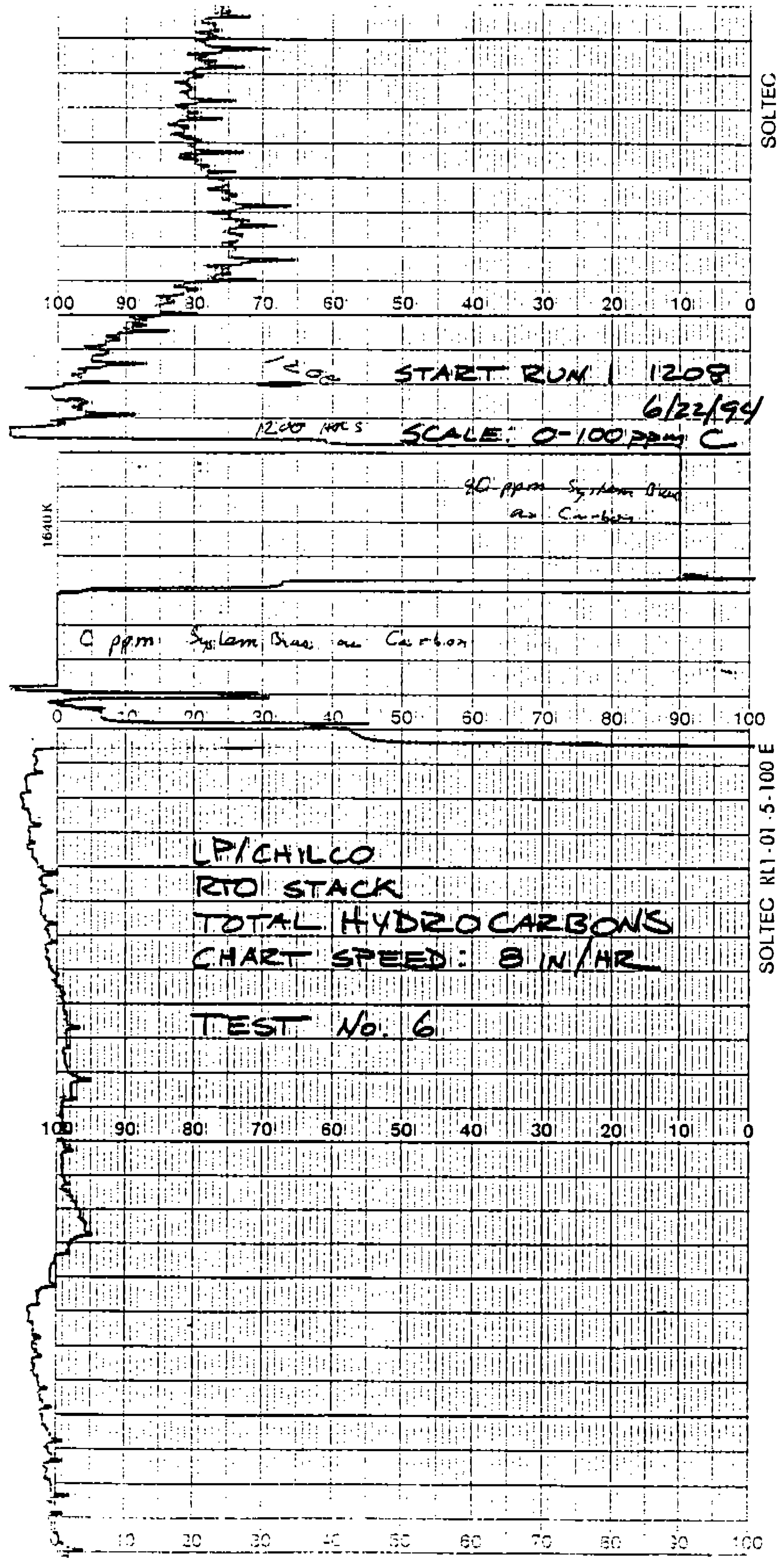
APPENDIX F

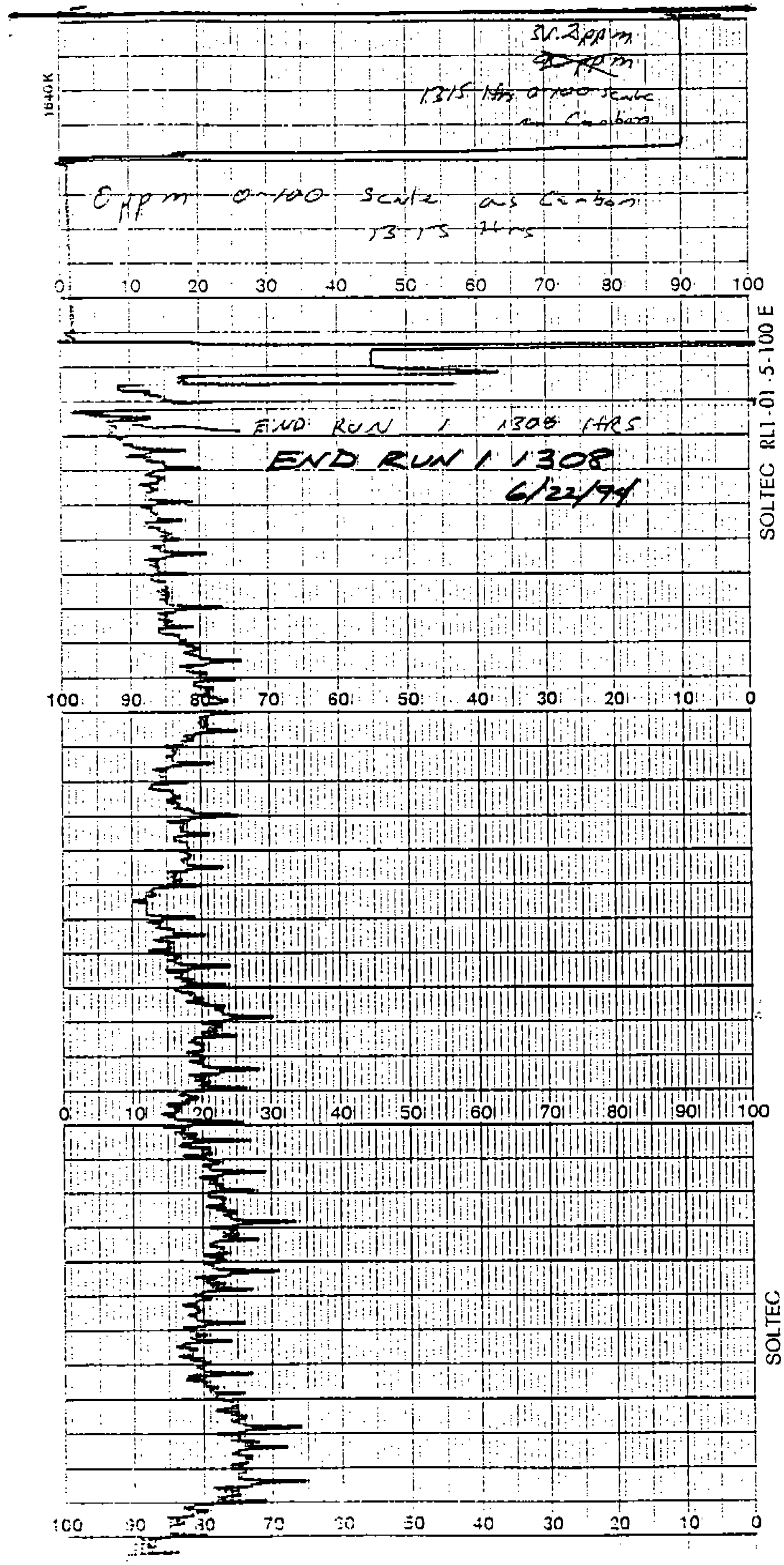
TOTAL HYDROCARBONS AND OXIDES OF NITROGEN STRIPCHARTS

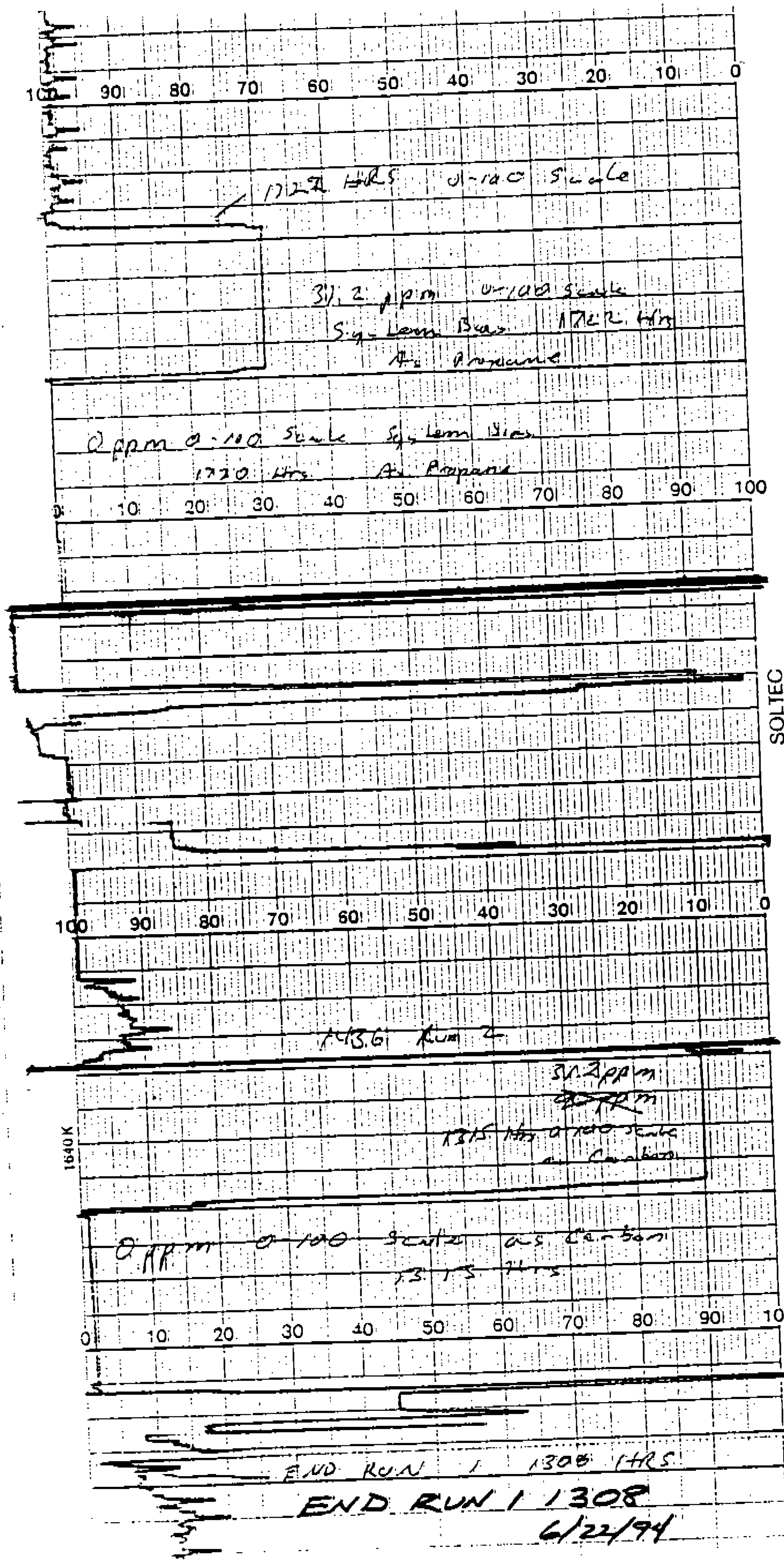

1105 Hrs RTO Stack
SOLTEC
90 80 70 60 50 40 30 20 10 0
Chart Speed 8 in/hr
10:15
1640 K
30 ppm 0-100 Scale
System Bias 0912 Hrs
0 ppm 0-100 Scale System Bias
6-22-9? RTO Stack 0910 Hrs
0 10 20 30 40 50 60 70 80 90 100
SOLTEC RL1-01-5-100 E
3200 ppm analyzer
3038 ppm gas
300 ppm gas 300 analyzer
100 90 80 70 60 50 40 30 20 10 0
zero gas Cal error
30 ppm cal error

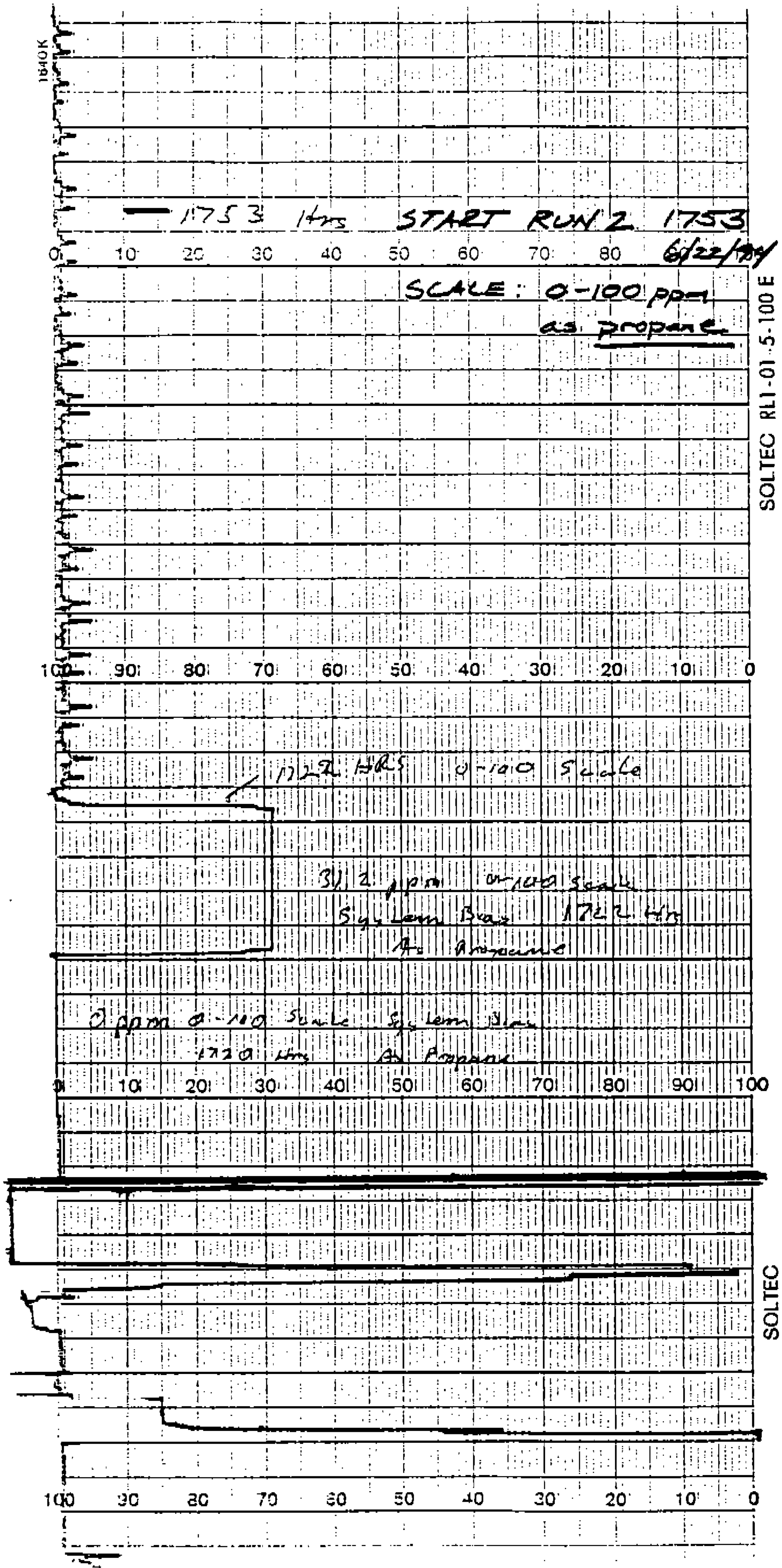


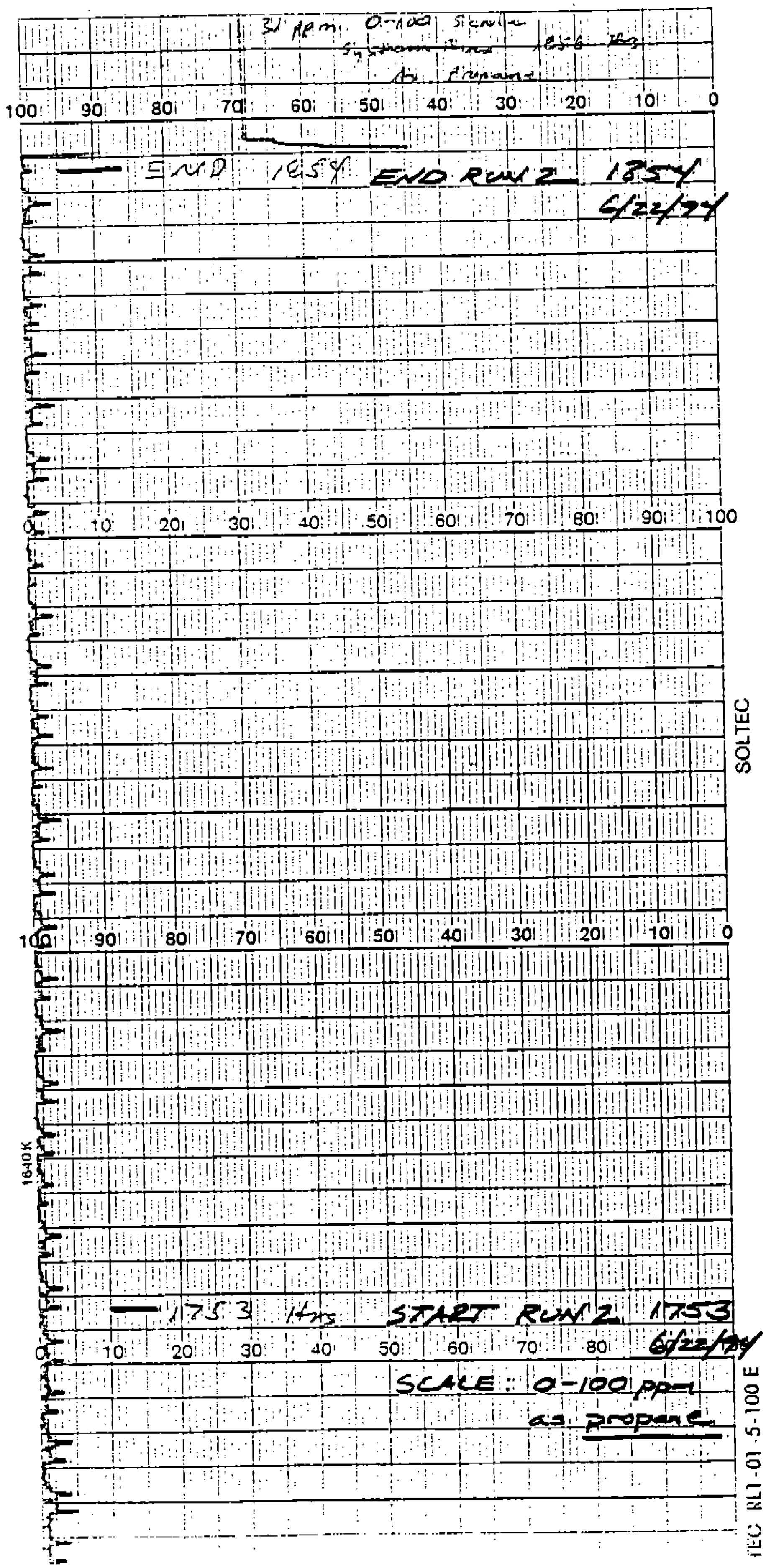
TOTAL HYDROCARBONS
CHART SPEED: 8 IN/HR
TEST No. 6
SOLTEC
1105 Hrs RTO Start
Chart Speed
8 in/hr
30 ppm 0-100 Scale
System Bias 0912 Hrs
0 ppm 0-100 Scale System Bias
6-22-94 RTO stack 0910 Hrs

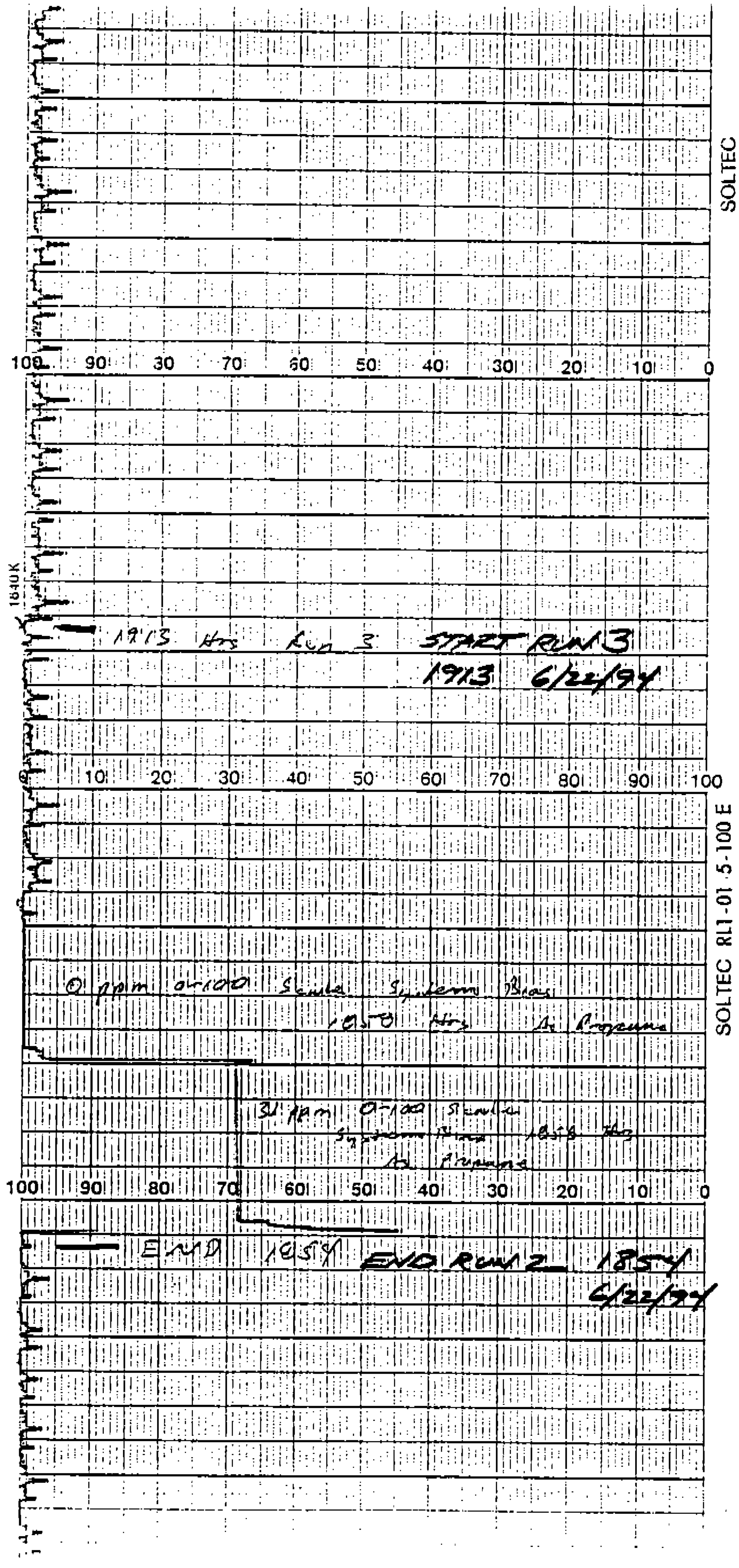

SOLTEC
100 90 80 70 60 50 40 30 20 10 0
1200 START RUN 1 1208
6/22/94
1200 HRS SCALE: 0-100 ppm C
90 ppm System Bias as Carbon
1640K
0 ppm System Bias as Carbon
0 10 20 30 40 50 60 70 80 90 100
SOLTEC RL1-01-5-100 E
LP/CHILCO
RTO STACK
TOTAL HYDROCARBONS
CHART SPEED: 8 IN/HR
TEST No. 6
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

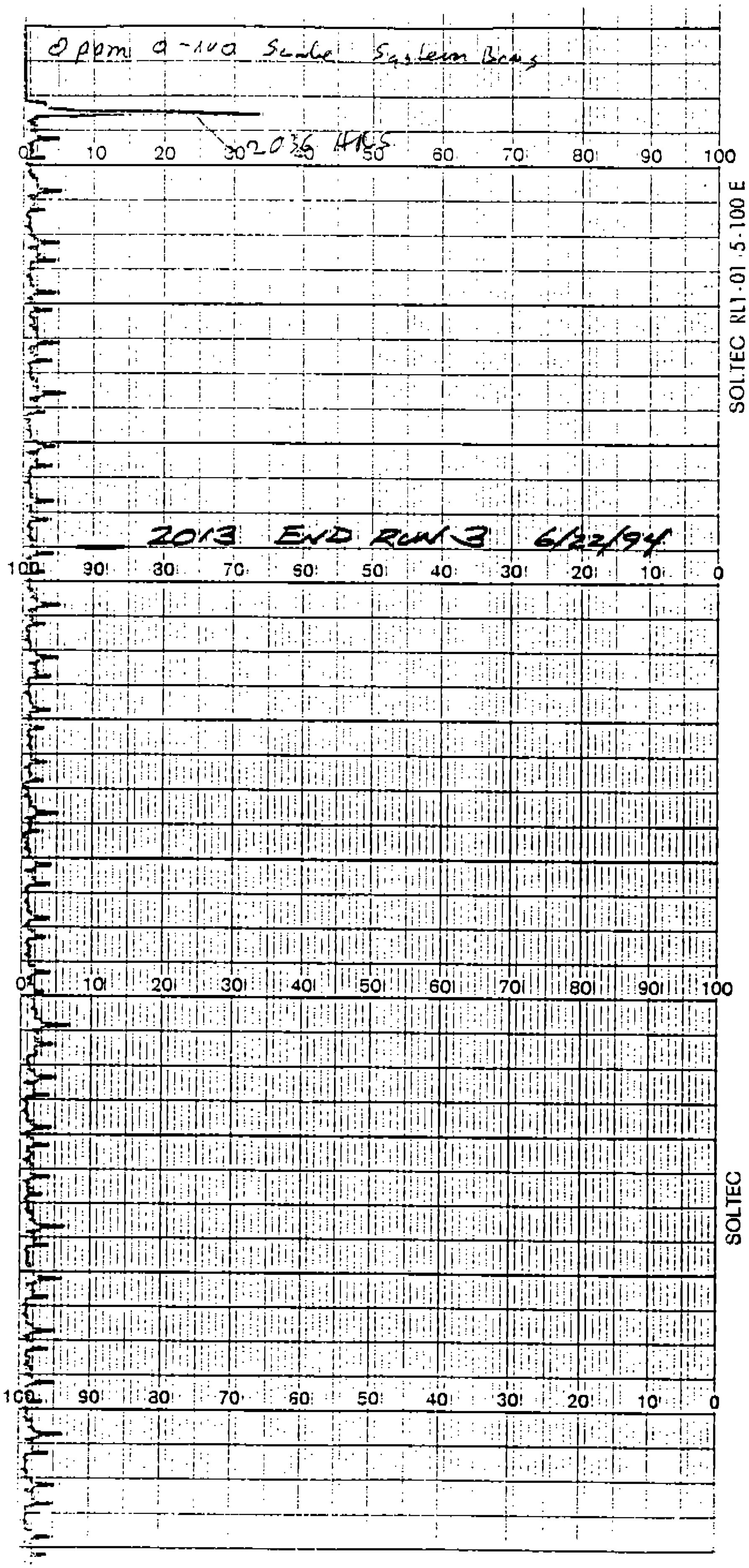

31.2 ppm
1315 Hrs 0-100 scale as Carbon
0 ppm 0-100 scale as Carbon
1315 Hrs
END RUN 1 1308 HRS
END RUN 1 1308
6/22/94
SOLTEC RL1-01-5-100 E
SOLTEC

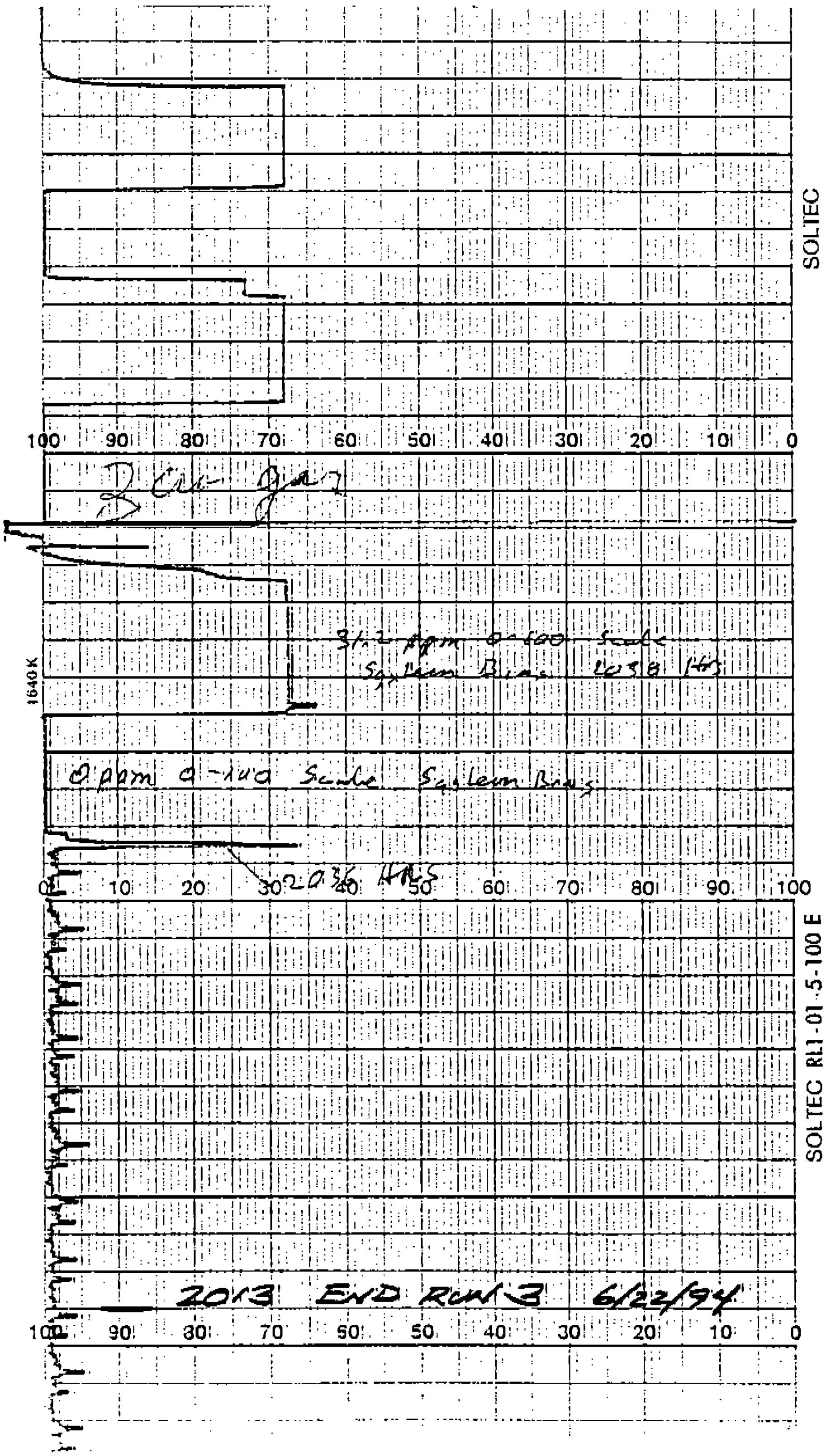

1722 HRS 0-100 Scale
31.2 ppm 0-100 Scale
Sys. Low Bias 1722 Hrs
As Propane
0 ppm 0-100 Scale Sys. Low Bias
1720 Hrs. As Propane
SOLTEC
1436 Run 2
31.2 ppm
~~90 ppm~~
1315 Hrs 0-100 Scale
as Carbon
1640K
0 ppm 0-100 Scale as Carbon
1315 Hrs
END RUN 1 1308 HRS
END RUN 1 1308
6/22/94
SOLTEC RL1-01.5-100 E

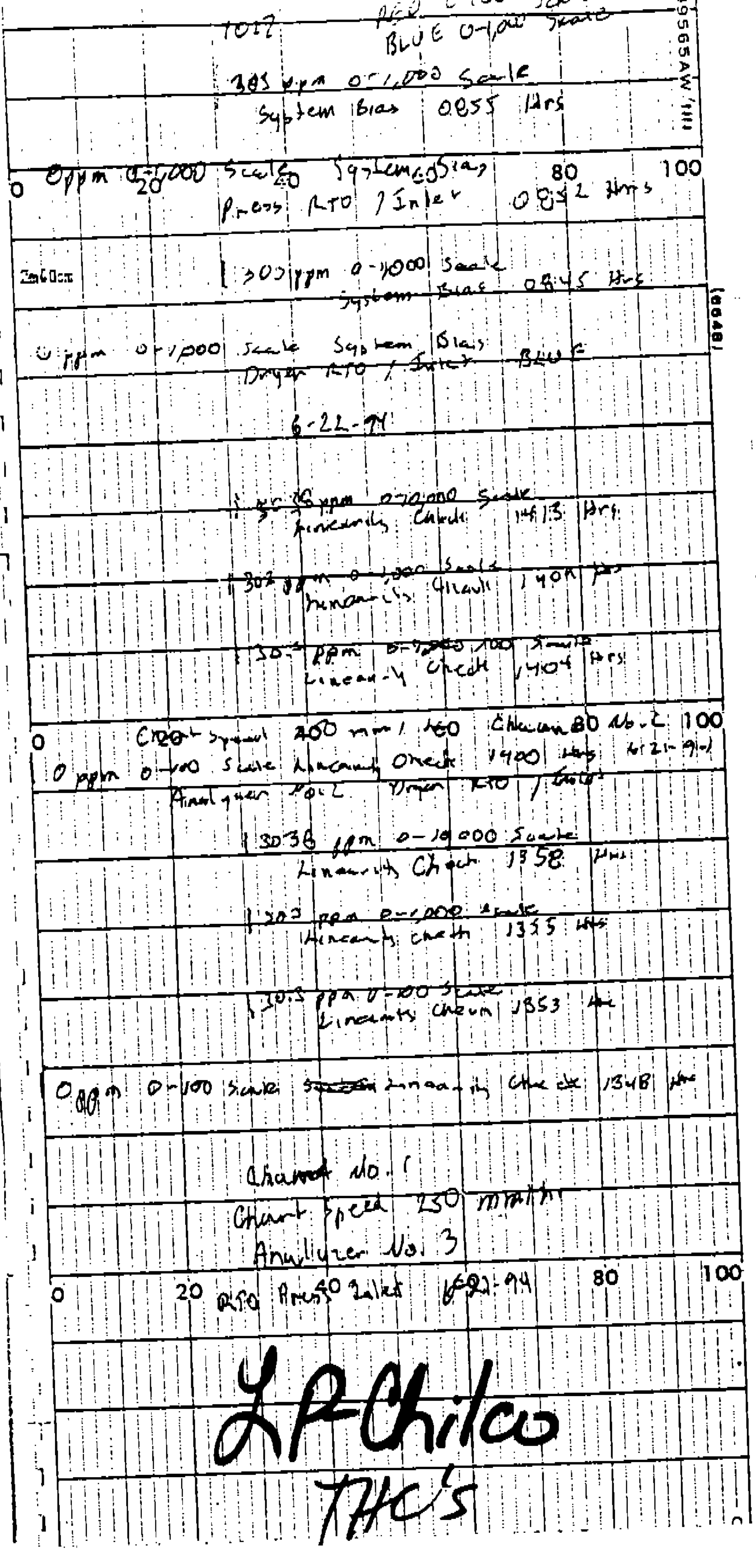

1753 Hrs START RUN 2 1753
SCALE: 0-100 ppm as propane
SOLTEC RL1-01-5-100 E
1722 HRS 0-100 Scale
31.2 ppm 0-100 Scale
System Bias 1722 Hrs
As Propane
0 ppm 0-100 Scale System Bias
1720 Hrs As Propane
SOLTEC

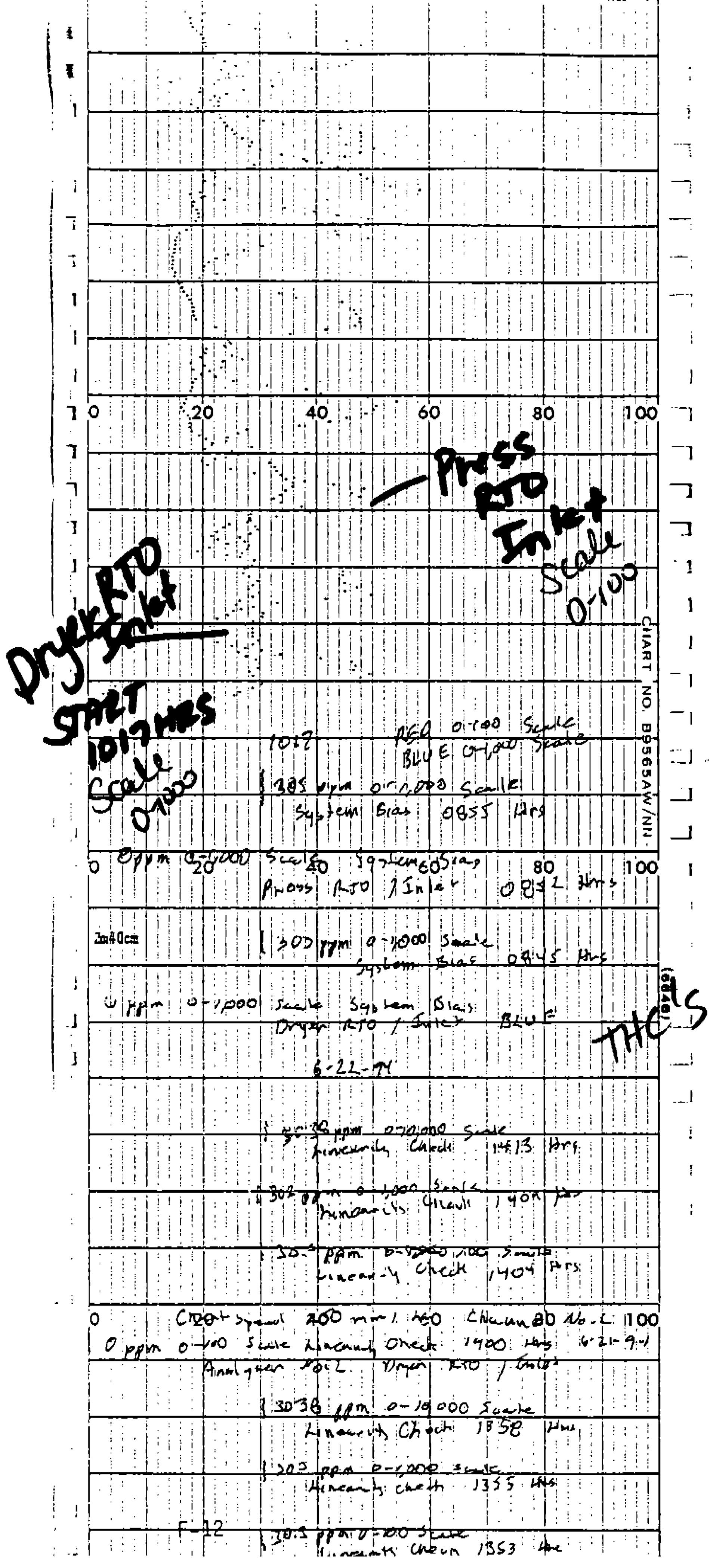

END 1854
END RUN 2 1854
6/22/94
SOLTEC
1753 Hrs
START RUN 2 1753
6/22/94
SCALE: 0-100 ppm
as propane

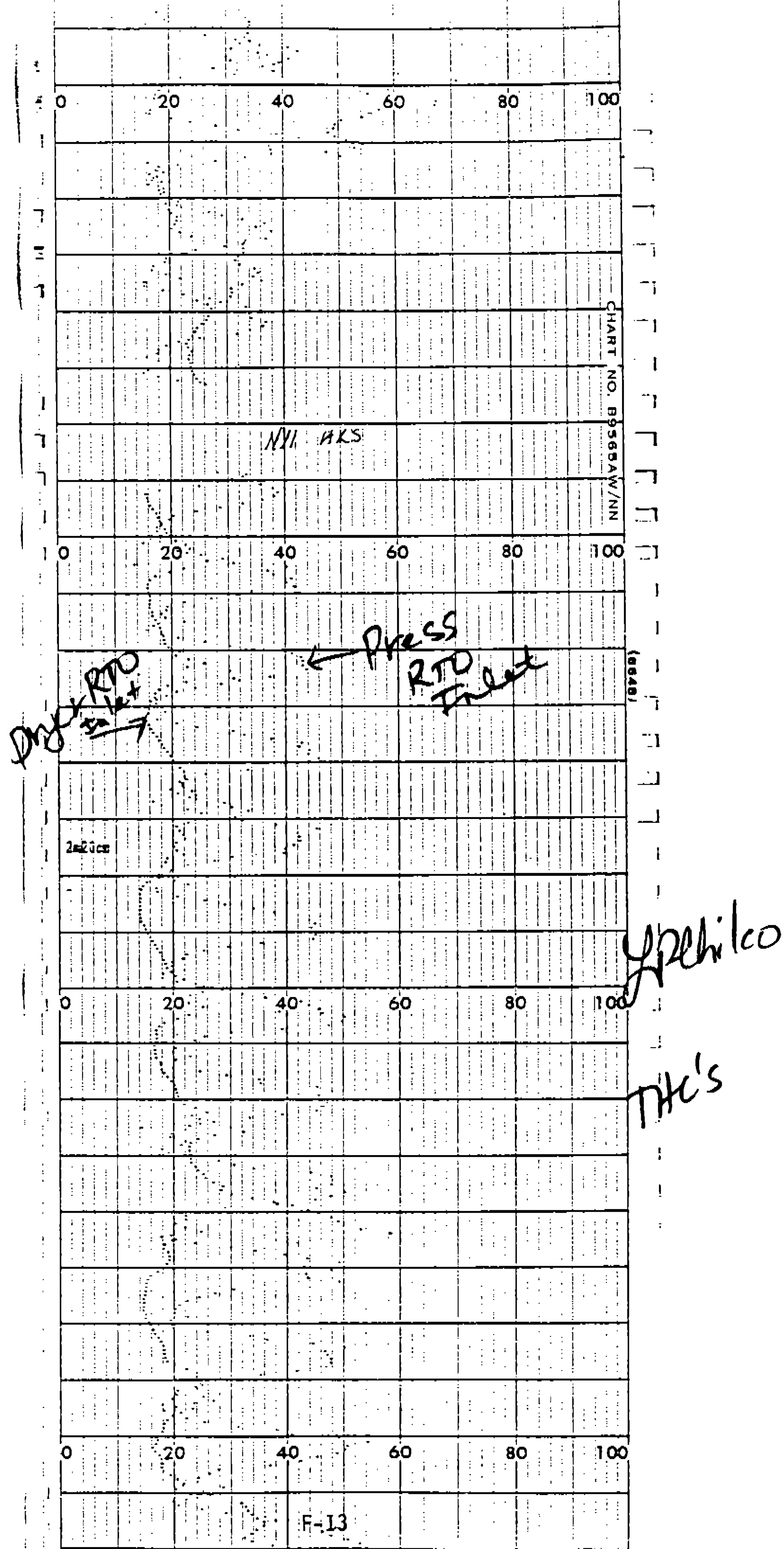

SOLTEC
100 90 30 70 60 50 40 30 20 10 0
1913 Hrs Run 3
START RUN 3
1913 6/22/94
0 10 20 30 40 50 60 70 80 90 100
SOLTEC RL1-01.5-100 E
0 ppm 0-100 Scale System Bias
1850 Hrs As Propane
100 90 80 70 60 50 40 30 20 10 0
END 1854
END RUN 2 1854
6/22/94


0 ppm 0-100 Scale System Bias
2036 HRS
2013 END RUN 3 6/22/94
SOLTEC RL1-01.5-100 E
SOLTEC


SOLTEC
100 90 80 70 60 50 40 30 20 10 0
1640K
Opam 0-100 Scale System Bias
0 10 20 30 40 50 60 70 80 90 100
2036 HRS
SOLTEC RL1-01-5-100 E
2013 END Run 3 6/22/94
100 90 80 70 60 50 40 30 20 10 0


BLUE 0-1,000 Scale
1017
303 ppm 0-1,000 Scale
System Bias 0855 Hrs
0 ppm 0-1,000 Scale System Bias
80
100
Press RTO / Inlet 0852 Hrs
1303 ppm 0-1,000 Scale
System Bias 0845 Hrs
0 ppm 0-1,000 Scale System Bias
Dryer RTO / Inlet BLUE
6-22-94
Linearity Check 1413 Hrs
1303 ppm 0-1,000 Scale
Linearity Check 1408 Hrs
30.5 ppm 0-100 Scale
Linearity Check 1404 Hrs
0
Chart Speed 300 mm / 150 Channel No. 2
100
0 ppm 0-100 Scale Linearity Check 1400 Hrs 6-21-94
Analyzer No. 2 Dryer RTO / Inlet
13036 ppm 0-10,000 Scale
Linearity Check 1358 Hrs
1303 ppm 0-1,000 Scale
Linearity Check 1355 Hrs
30.5 ppm 0-100 Scale
Linearity Check 1353 Hrs
0 ppm 0-100 Scale Linearity Check 1348 Hrs
Channel No. 1
Chart Speed 250 mm/hr
Analyzer No. 3
0
20
RTO Press 40 Inlet 6-22-94
80
100
L.P. Chilco
THC's


0 20 40 60 80 100
PRESS RTO Inlet
Scale 0-100
Dryer RTO Inlet
START 1017 HRS
Scale 0-1000
1017
RED 0-100 Scale
BLUE 0-1,000 Scale
305 ppm 0-1,000 Scale
System Bias 0855 Hrs
0 ppm 0-1000 Scale System Bias
Press RTO / Inlet 0852 Hrs
2m40cm
303 ppm 0-1000 Scale
System Bias 0845 Hrs
0 ppm 0-1,000 Scale System Bias
Dryer RTO / Inlet BLUE
THC's
6-22-94
3038 ppm 0-10,000 Scale
Linearity Check 1413 Hrs
302 ppm 0-1,000 Scale
Linearity Check 1408 Hrs
30.5 ppm 0-100 Scale
Linearity Check 1404 Hrs
Chart speed 200 mm / Hr Channel No. 2
0 ppm 0-100 Scale Linearity Check 1400 Hrs 6-21-94
Analyzer No. 2 Dryer RTO / Inlet
3038 ppm 0-10,000 Scale
Linearity Check 1358 Hrs
303 ppm 0-1,000 Scale
Linearity Check 1355 Hrs
30.5 ppm 0-100 Scale
Linearity Check 1353 Hrs
CHART NO. B9565AW/NI


0 20 40 60 80 100
CHART NO. B9565AW/NN
NYI AKS
Press RTO Inlet
Dry RTO Inlet
Philco
THC's

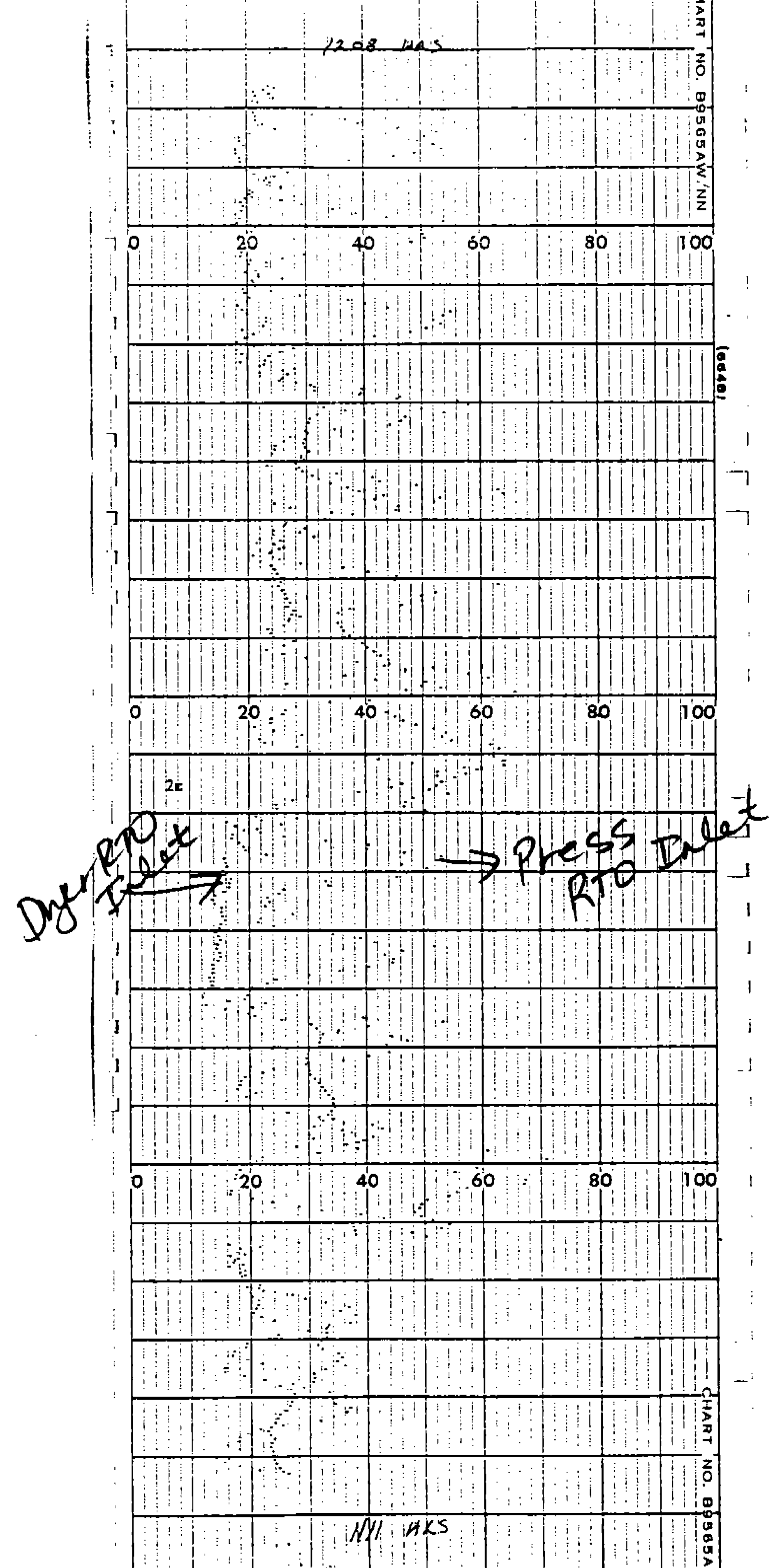
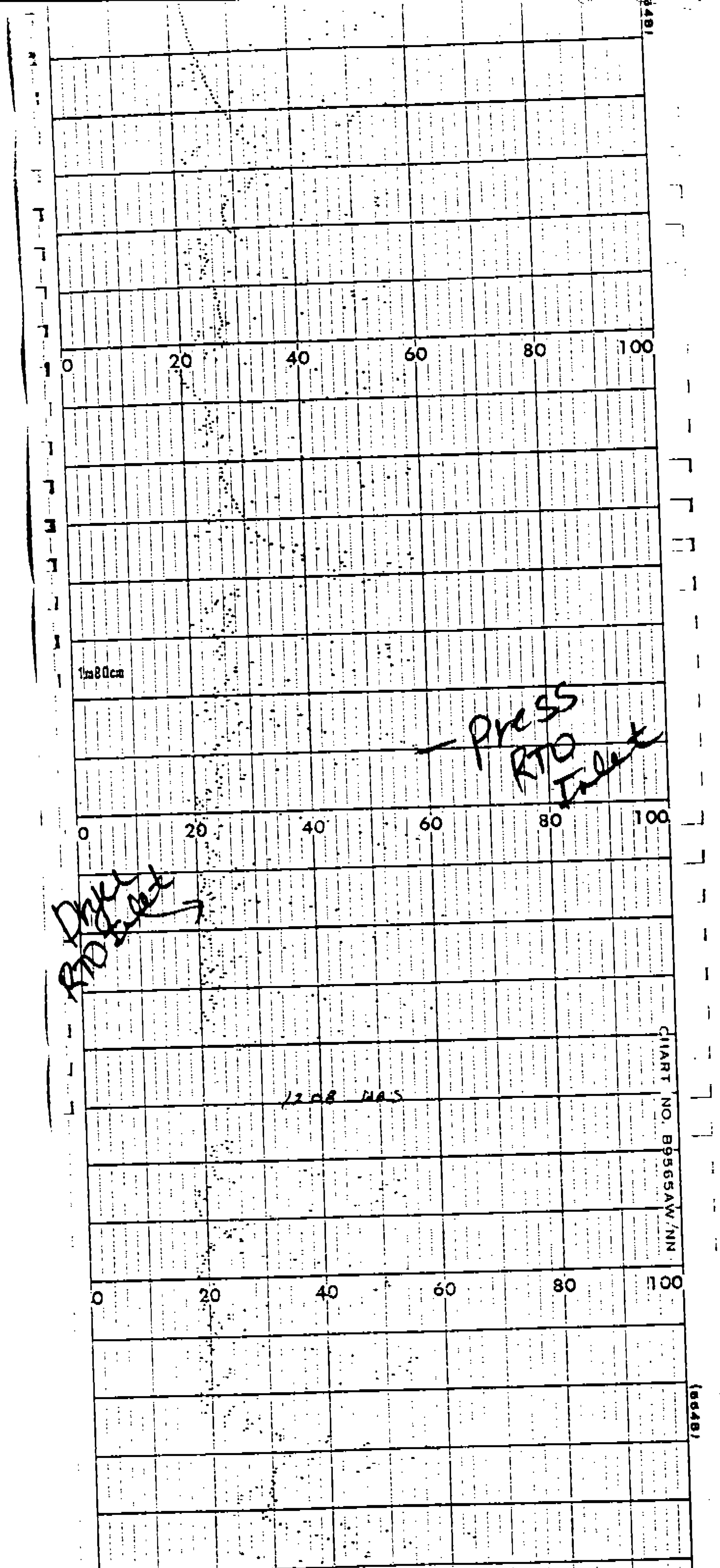
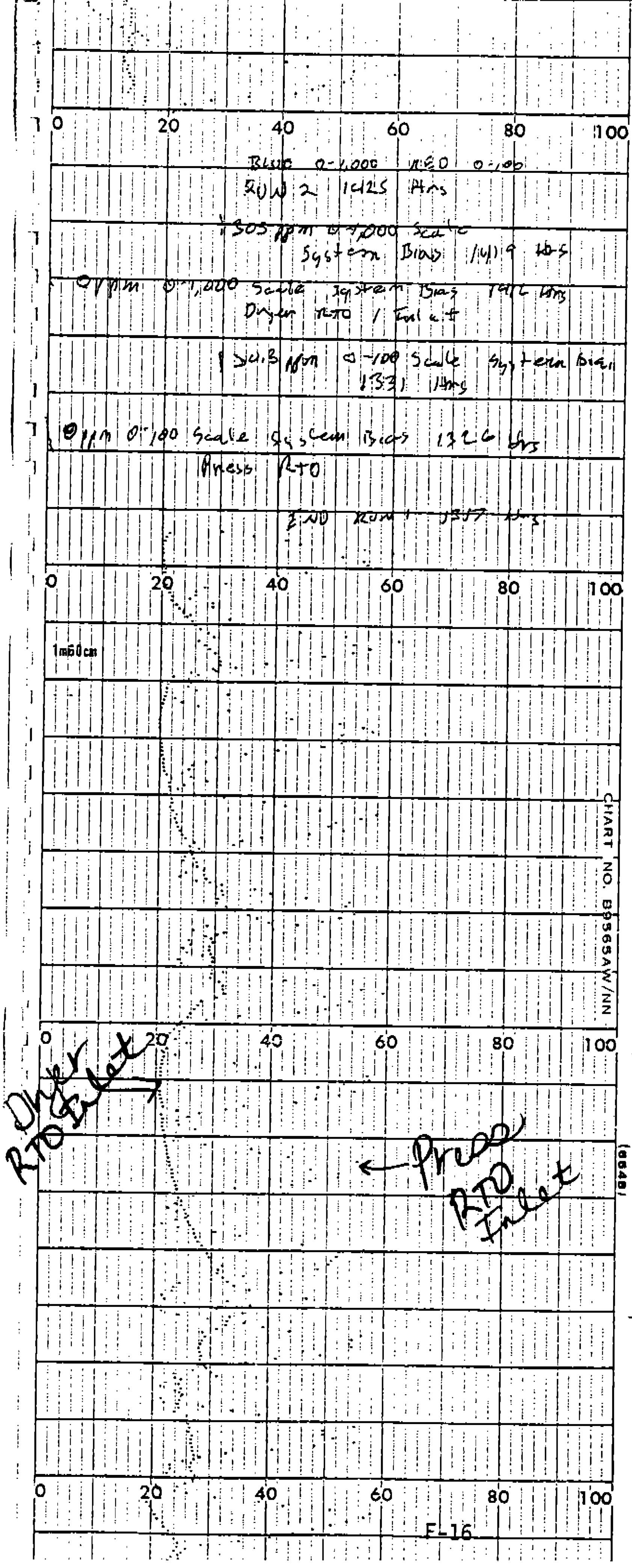
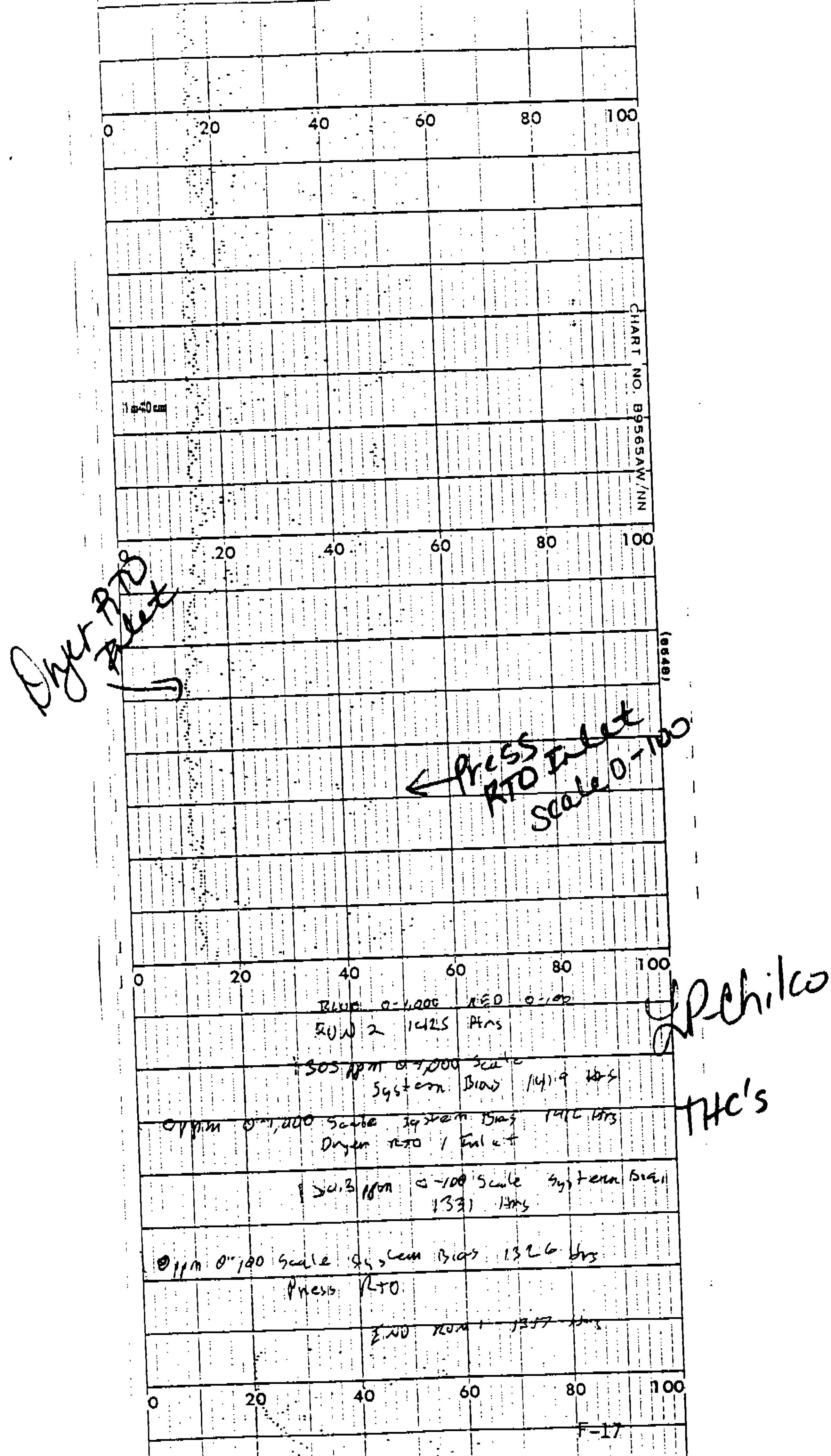


CHART NO. B9565AW/NN
(6648)
0 20 40 60 80 100
0 20 40 60 80 100
2E
Dryer RTO Inlet
Press RTO Inlet
0 20 40 60 80 100
CHART NO. B9565AW/N


0
20
40
60
80
100
Press RTO Inlet
Dryer RTO Inlet
CHART NO. B9565AW/NN


0 20 40 60 80 100
Blue 0-1,000 RED 0-100
RUN 2 1425 Hrs
1305 ppm 0-1,000 Scale
System Bias 1419 Hrs
0 ppm 0-1,000 Scale System Bias 1416 Hrs
Dryer RTO / Inlet
124.3 ppm 0-100 Scale System Bias
1331 Hrs
0 ppm 0-100 Scale System Bias 1326 Hrs
Press RTO
END RUN 1 1317 Hrs
0 20 40 60 80 100
1m60cm
CHART NO. B9565AW/NN
0 20 40 60 80 100
Dryer RTO Inlet
Press RTO Inlet
0 20 40 60 80 100


0 20 40 60 80 100
CHART NO. B9565AW/NN
1 in 40 cm
Dryer RTO Inlet
Press RTO Inlet Scale 0-100
LP Chilco
THC's
Blue 0-1,000 RED 0-100
RUN 2 1425 Hrs
505 ppm 0-1,000 Scale System Bias 1419 Hrs
0 ppm 0-1,000 Scale System Bias 1416 Hrs Dryer RTO / Inlet
50.3 ppm 0-100 Scale System Bias 1331 Hrs
0 ppm 0-100 Scale System Bias 1326 Hrs Press RTO
END RUN 1 1357 Hrs

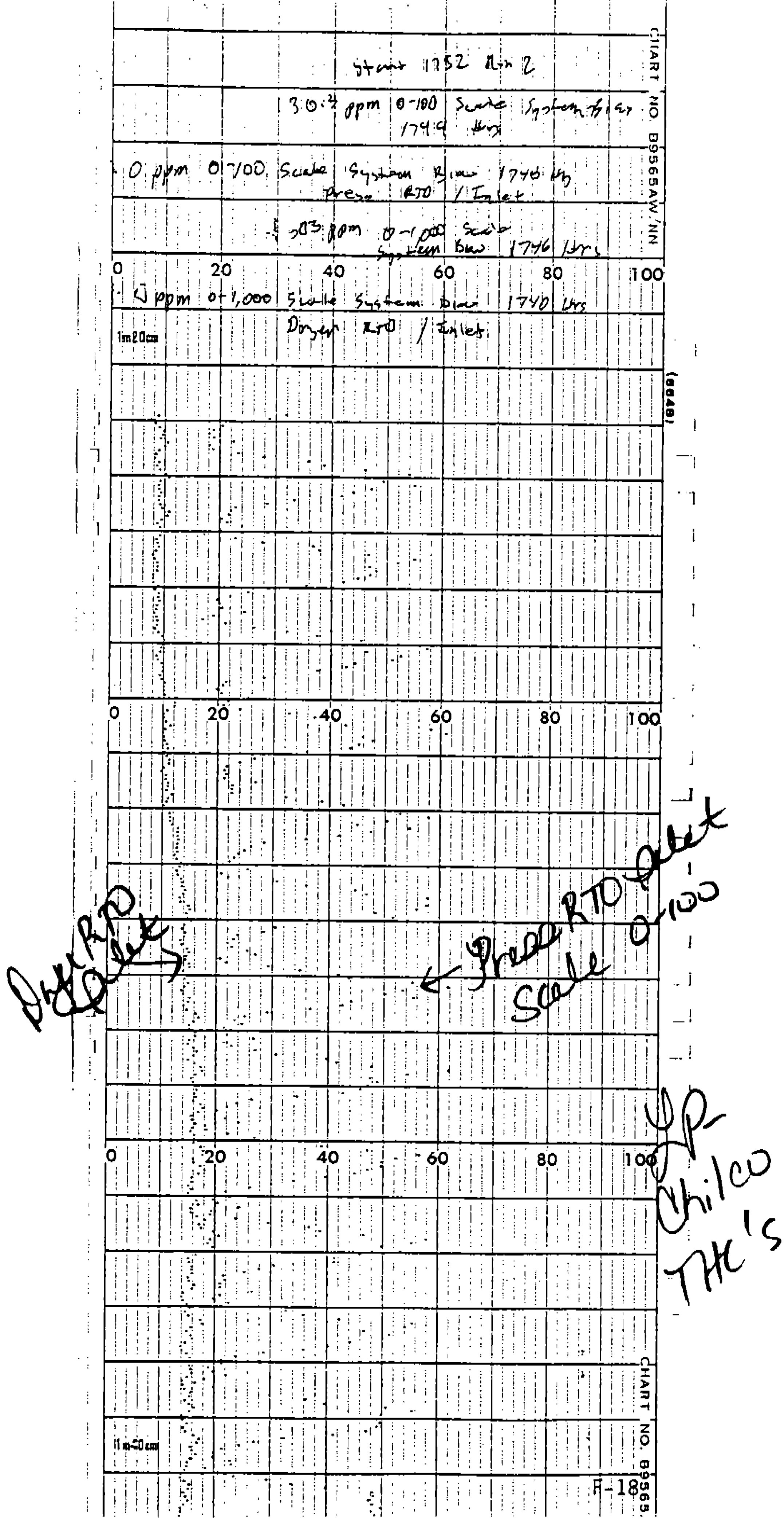


CHART NO. B9565AW/NN
Start 1752 Run 2
30.4 ppm 0-100 Scale System Bias 1749 Hrs
0 ppm 0-100 Scale System Bias 1746 Hrs
Press RTO / Inlet
503 ppm 0-1,000 Scale System Bias 1746 Hrs
0 20 40 60 80 100
0 ppm 0-1,000 Scale System Bias 1740 Hrs
Downst RTO / Inlet
1m20cm
(8848)
Downst RTO Outlet
Press RTO Outlet Scale 0-100
JP Chilco THC's
1m40cm
CHART NO. B9565

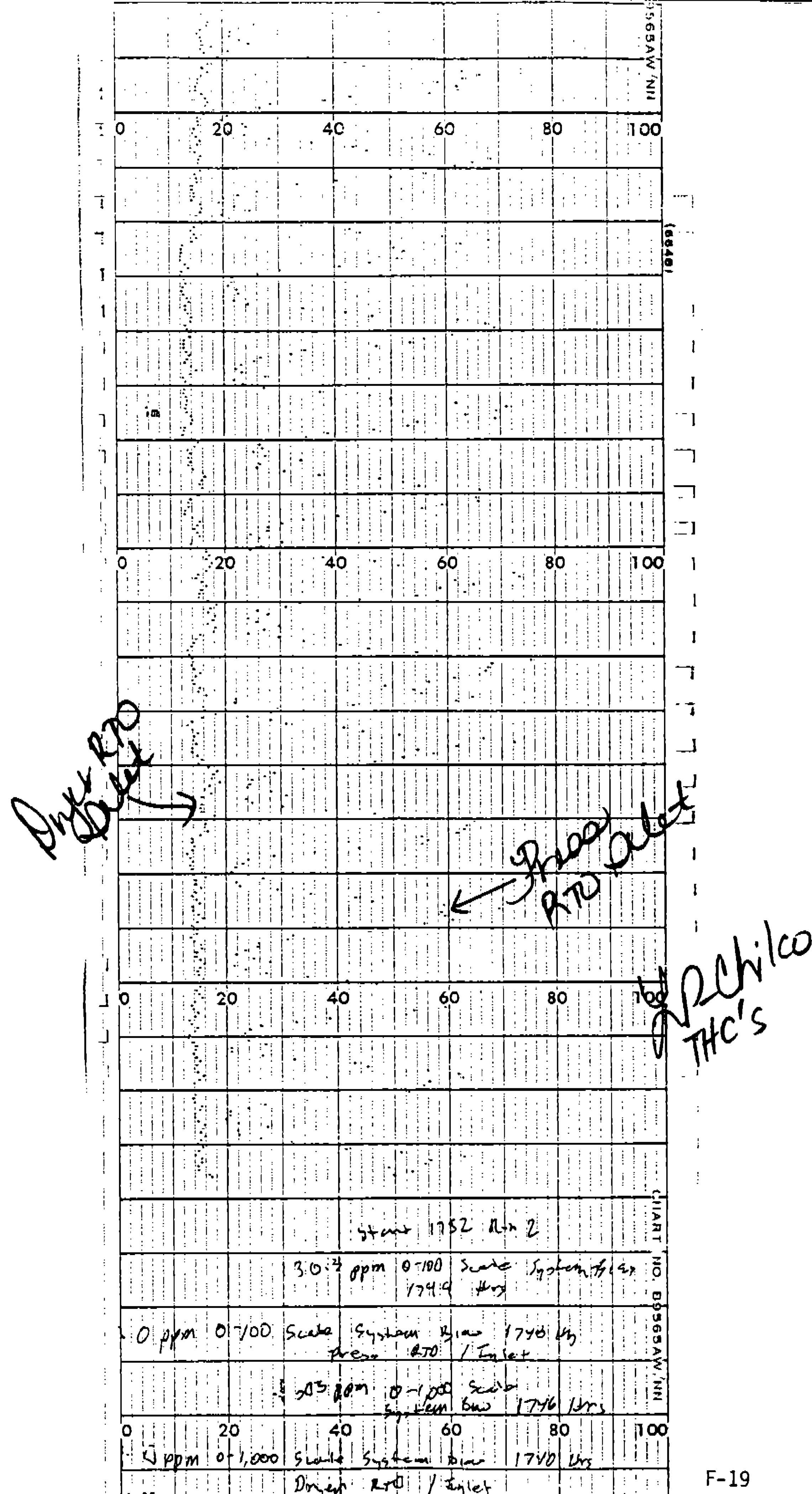
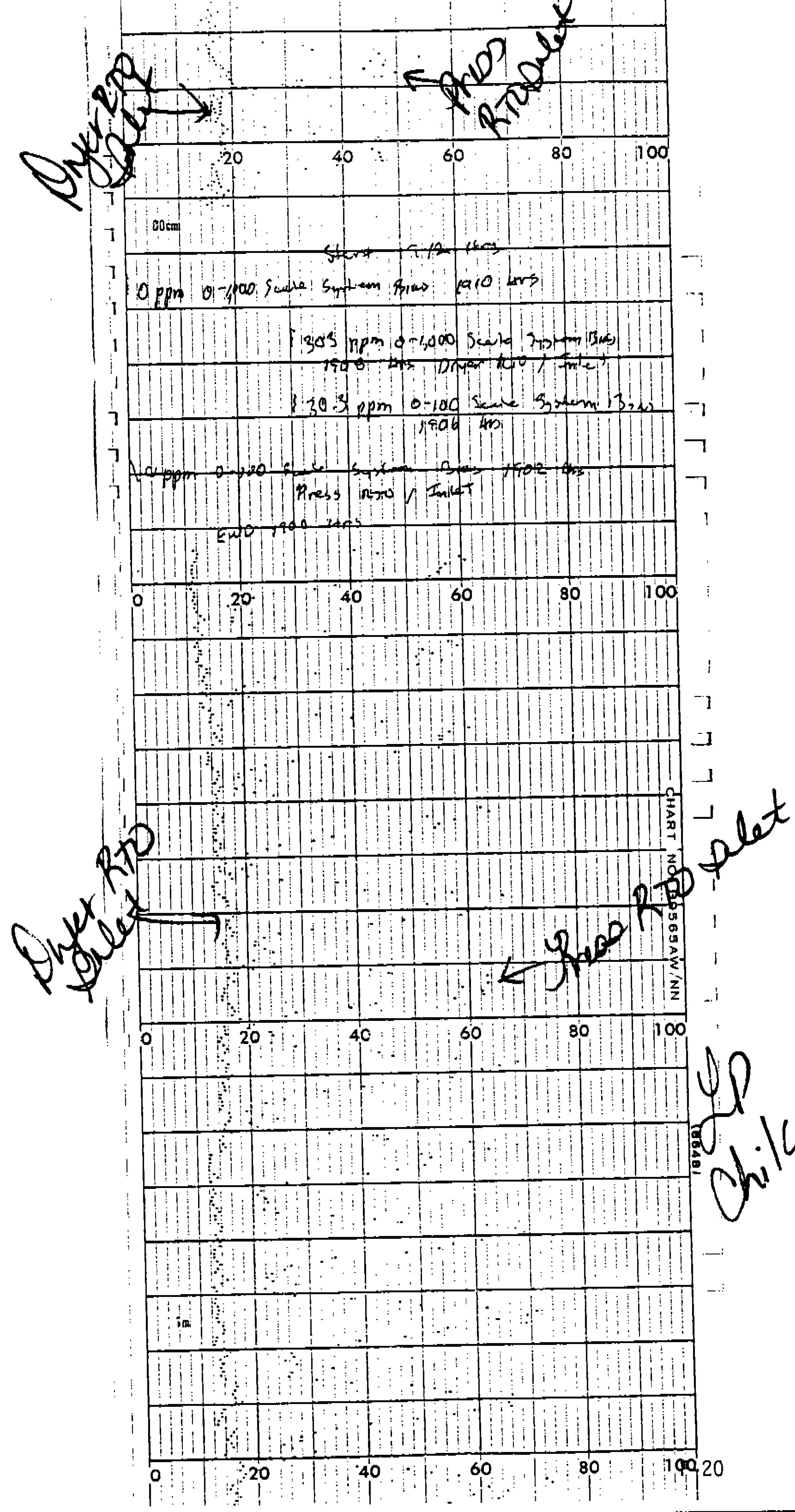
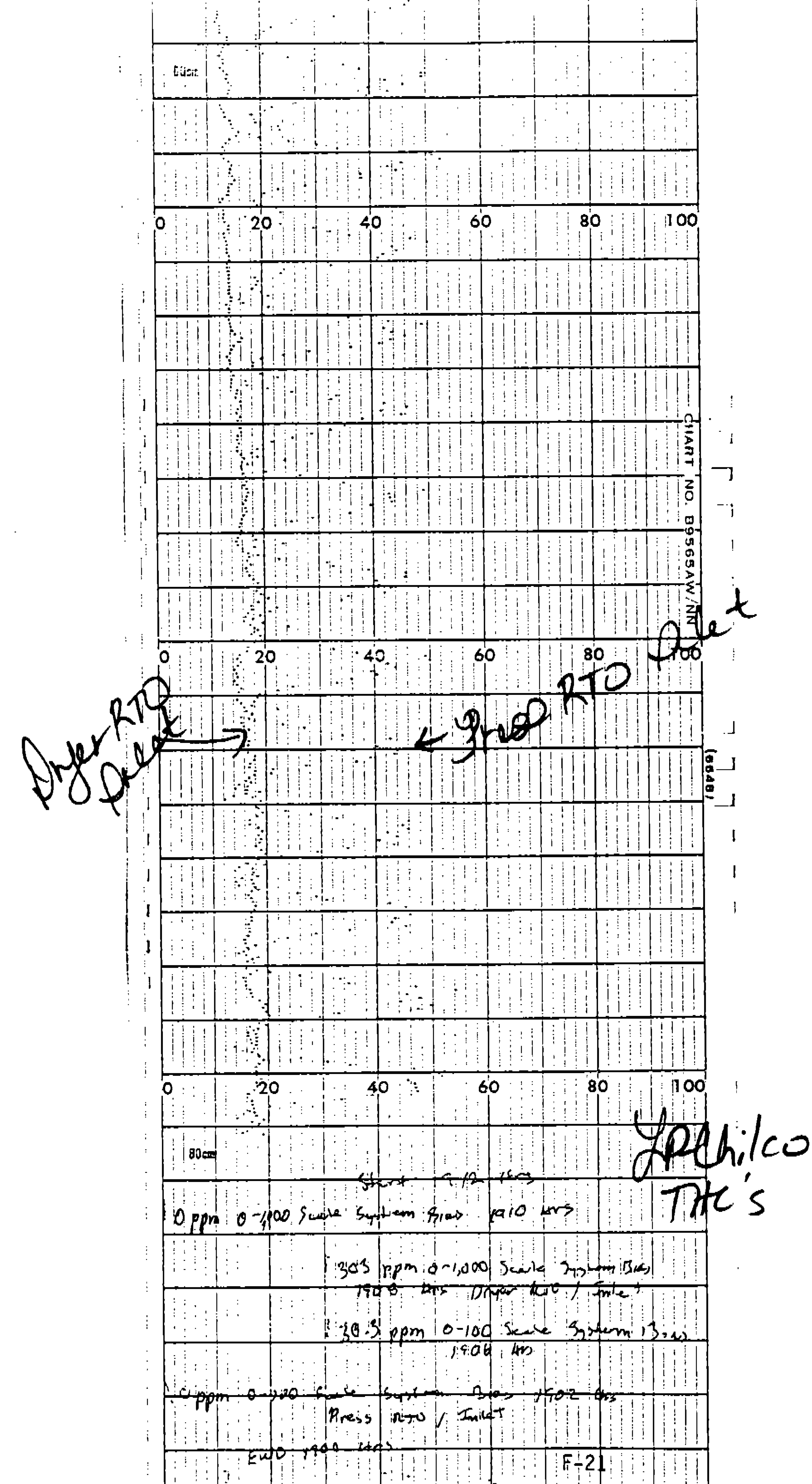


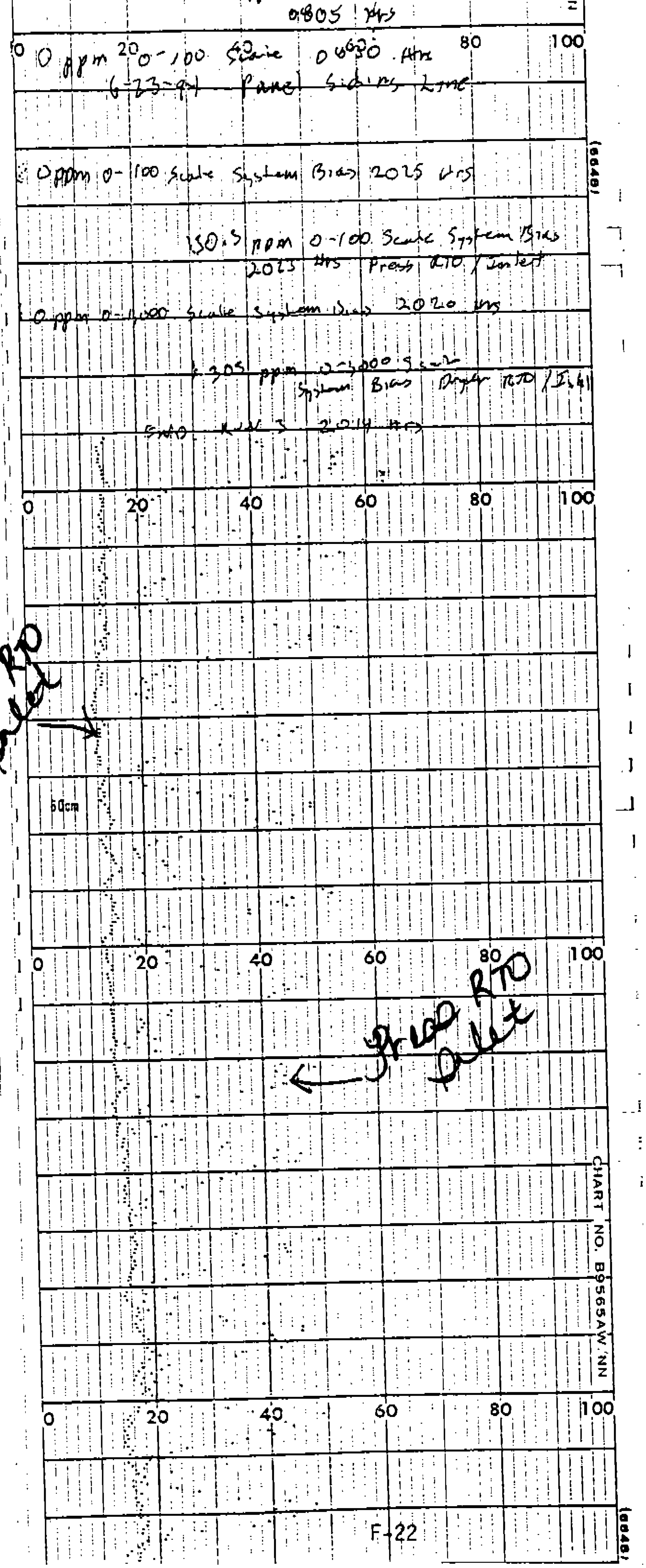
CHART NO. B9565AW/NN
0 20 40 60 80 100
Dryer RTO Outlet
Press RTO Outlet
Chilco THC's
Start 1752 Run 2
30.4 ppm 0-100 Scale System Span 1749 Hrs
0 ppm 0-100 Scale System Bias 1748 Hrs
Press RTO / Inlet
303 ppm 0-1000 Scale System Bias 1746 Hrs
0 ppm 0-1,000 Scale System Bias 1740 Hrs
Dryer RTO / Inlet

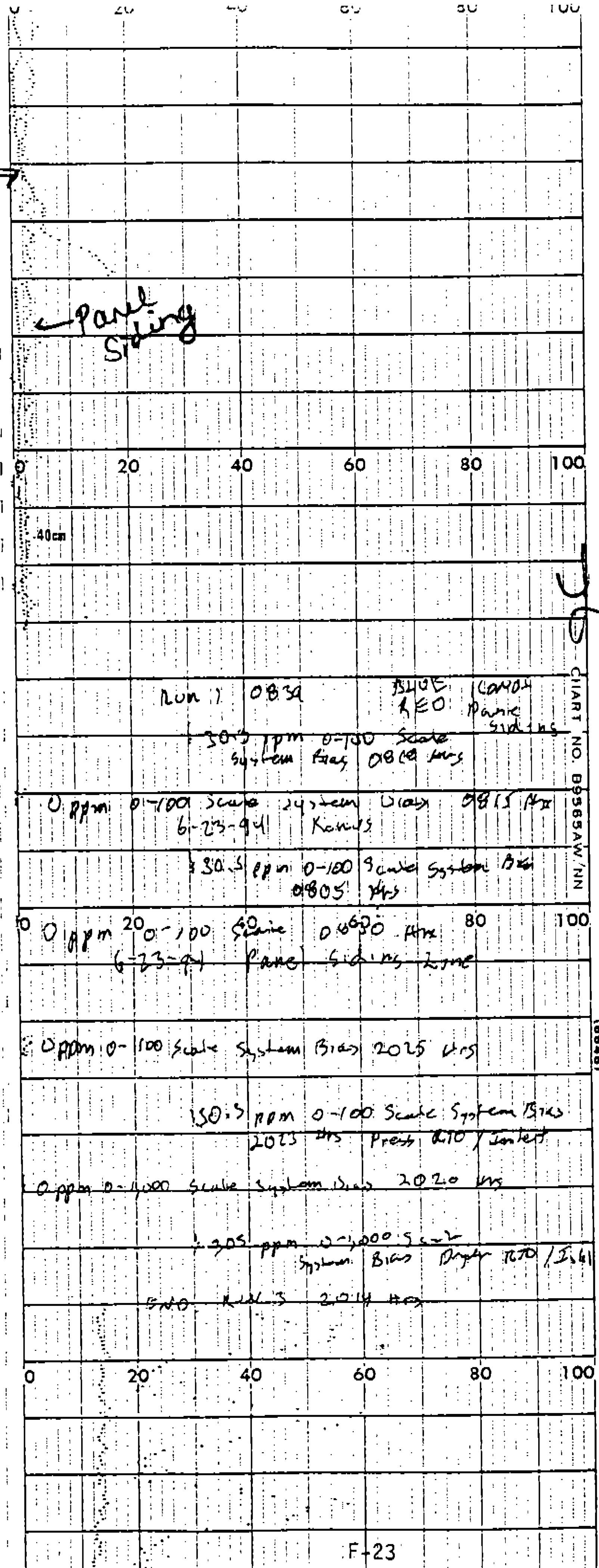


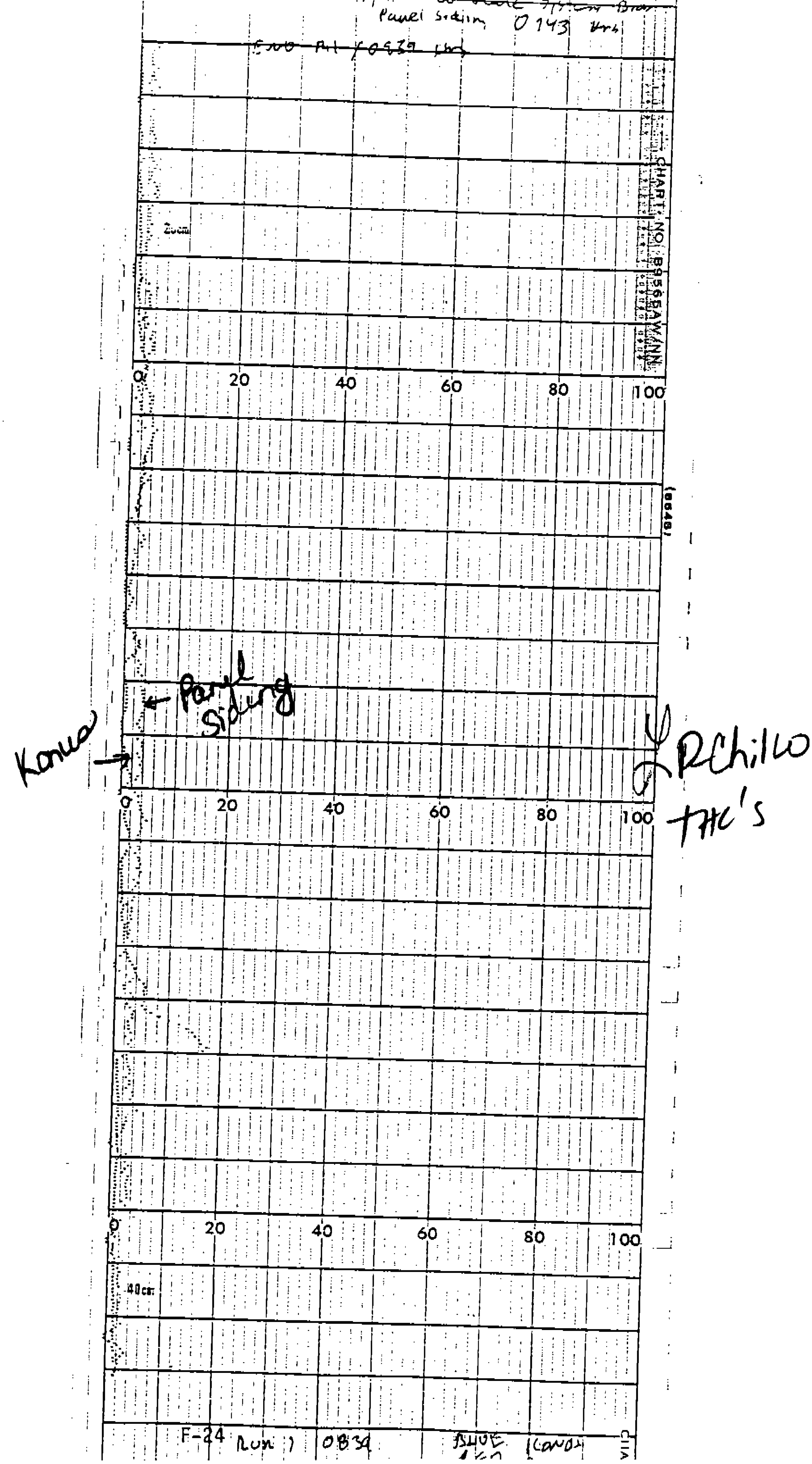
Dryer RTD Outlet
Press RTD Outlet
20
40
60
80
100
00cm
Start 1512 Hrs
0 ppm 0-100 Scale System Bias 1510 Hrs
303 ppm 0-1,000 Scale System Bias
1508 Hrs Dryer RTD / Inlet
30.3 ppm 0-100 Scale System Bias
1506 Hrs
0 ppm 0-100 Scale System Bias 1502 Hrs
Press RTD / Inlet
END 1500 Hrs
0
20
40
60
80
100
CHART NO. 565AW/NN
Dryer RTD Inlet
Press RTD Inlet
0
20
40
60
80
100
(8648)
LP
Chilco
0
20
40
60
80
100
20



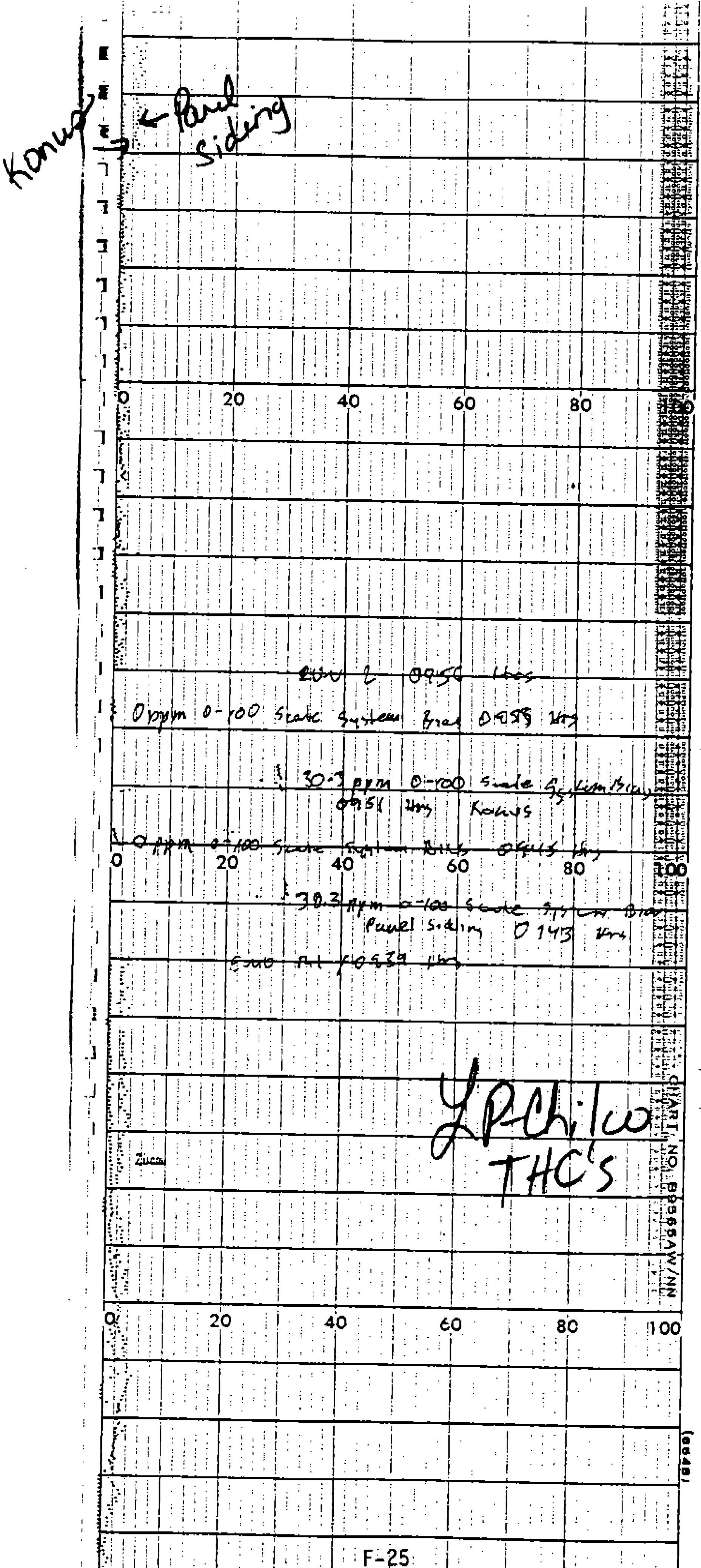
0 20 40 60 80 100
CHART NO. B9565AW/NN
(6548)
Dryer RTO Inlet
← Press RTO Inlet
80cm
LP Chilco
THC's
Start 1912 hrs
0 ppm 0-1,000 Scale System Bias 1910 hrs
303 ppm 0-1,000 Scale System Bias
1908 hrs Dryer RTO / Inlet
30.3 ppm 0-100 Scale System Bias
1906 hrs
0 ppm 0-100 Scale System Bias 1902 hrs
Press RTO / Inlet
END 1900 hrs


0805 Hrs
0 ppm 0-100 Scale 0630 Hrs
6-23-94 Panel Siding Line
0 ppm 0-100 Scale System Bias 2025 Hrs
150.3 ppm 0-100 Scale System Bias
2023 Hrs Press RTO / Inlet
0 ppm 0-1000 Scale System Bias 2020 Hrs
6305 ppm 0-3000 Scale
System Bias Dryer RTO / Inlet
End Run 3 2014 Hrs
0
20
40
60
80
100
Dryer RTO Inlet
Press RTO Inlet
CHART NO. B9565AW NN

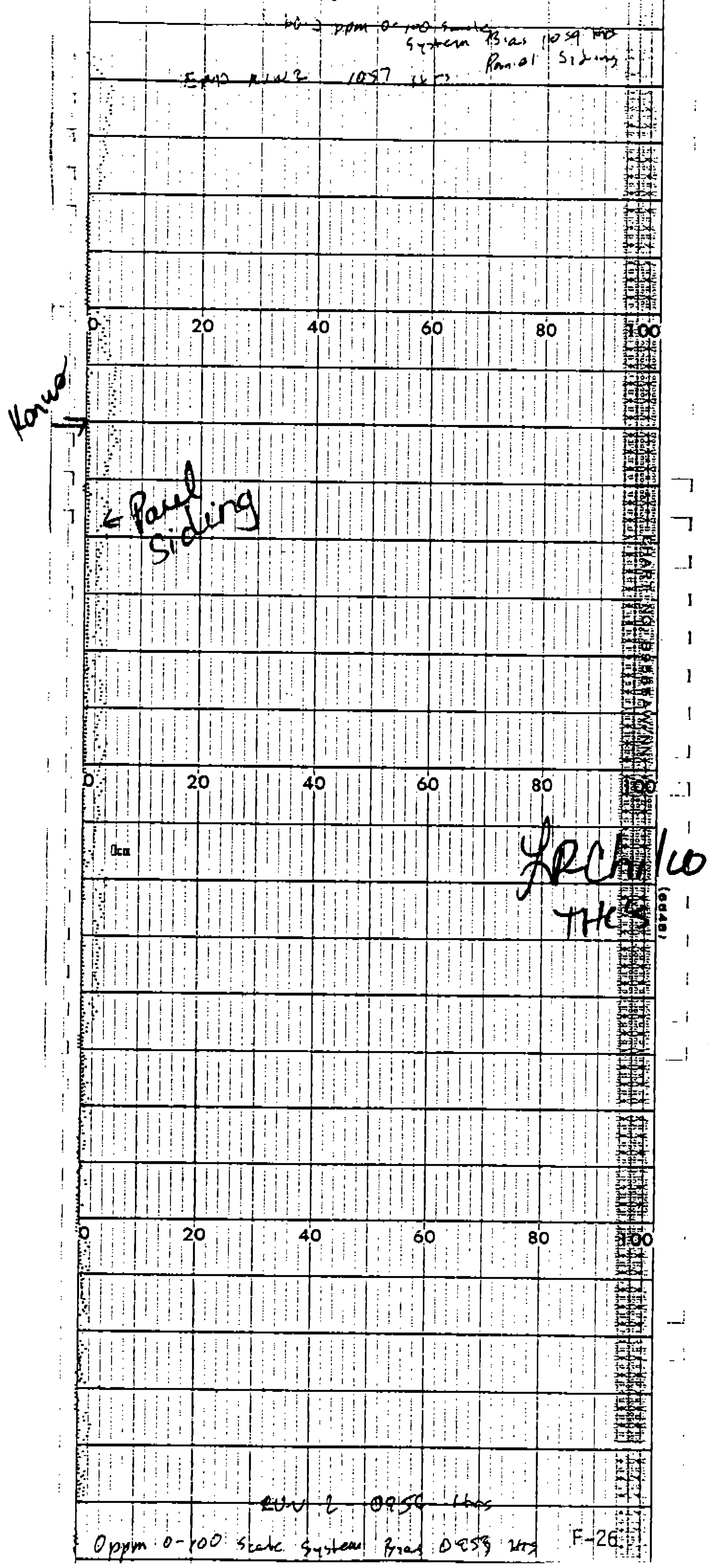

Upchilco THC's



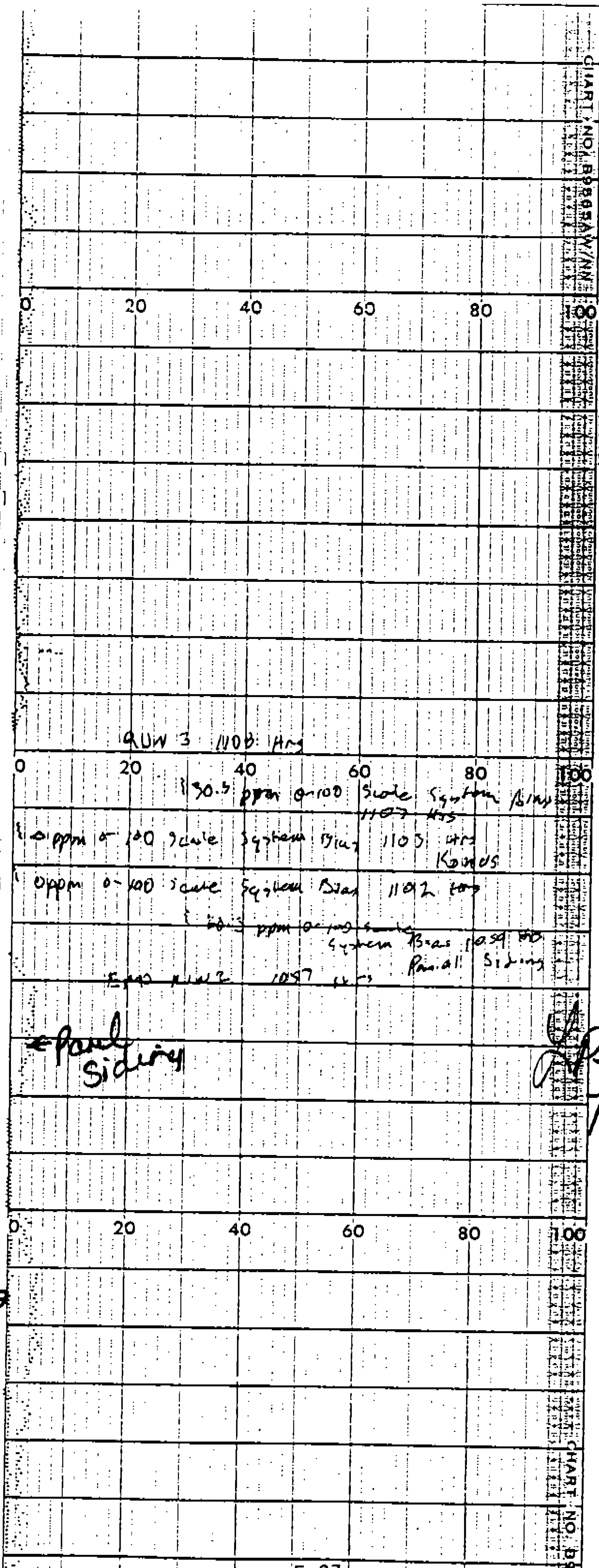
Panel Siding 0143 hrs
~~E300 Pt 10839 hrs~~
CHART NO. B9565AW/NN
20cm
0 20 40 60 80 100
← Panel Siding
Kona →
RChilco
THC's
0 20 40 60 80 100
0 20 40 60 80 100
40cm
F-24 Run 1 0834
BLUE
COND



Konus
← Panel Siding
0
20
40
60
80
100
~~Run 2 0950 Hrs~~
0 ppm 0-100 Scale System Bias 0958 Hrs
30.3 ppm 0-100 Scale System Bias
0951 Hrs Konus
~~0 ppm 0-100 Scale System Bias 0945 Hrs~~
~~30.3 ppm 0-100 Scale System Bias~~
Panel Siding 0943 Hrs
~~End Run 1 0939 Hrs~~
LP Chilco
THC's
CHART NO. BP565AW/NN

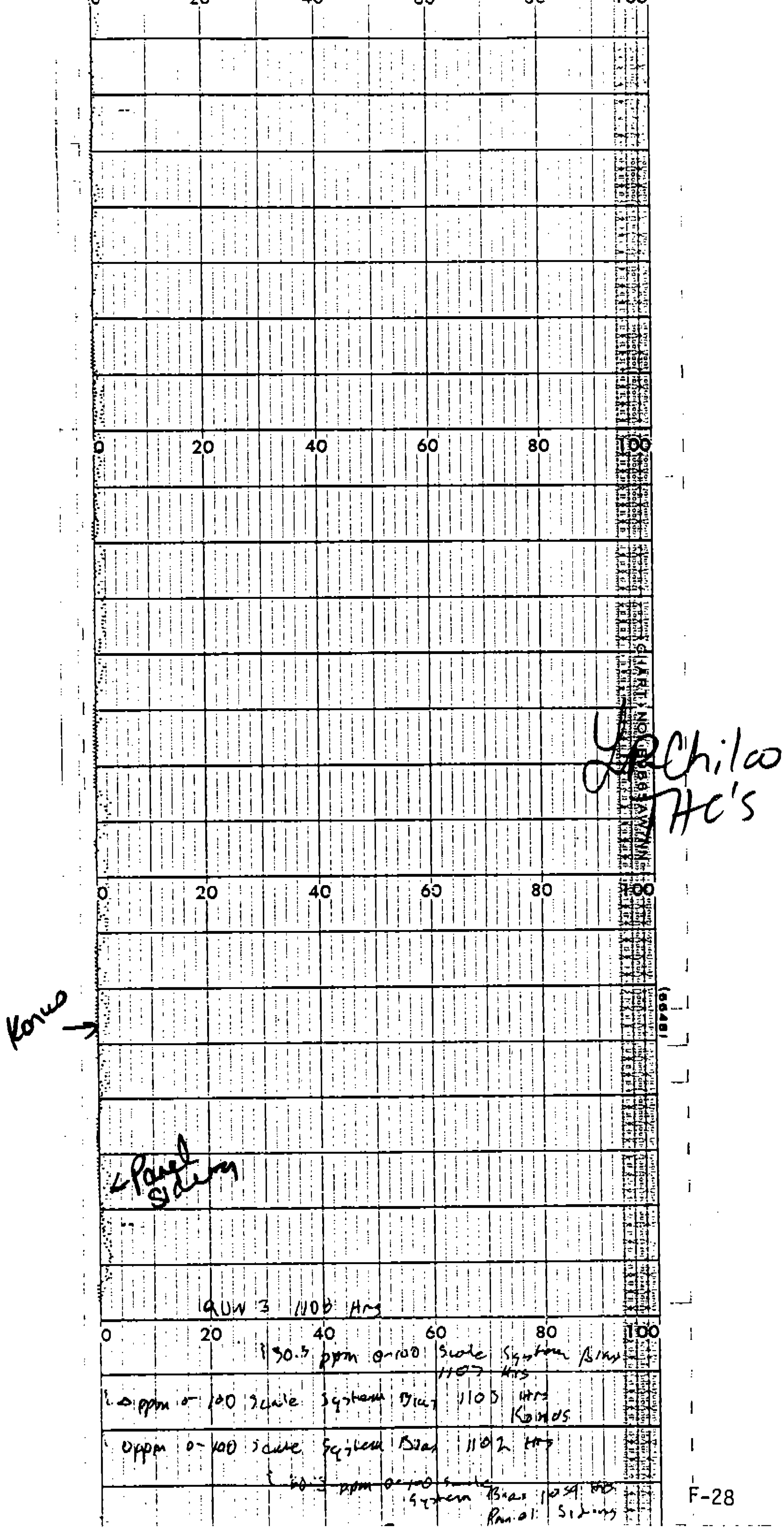

System Bias 1059 hrs
Panel Siding
End Run 2 1057 hrs
0
20
40
60
80
100
Kowa
← Panel Siding
LRChilco
THC
~~RUN 2 0956 hrs~~
0 ppm 0-100 Scale System Bias 0959 hrs

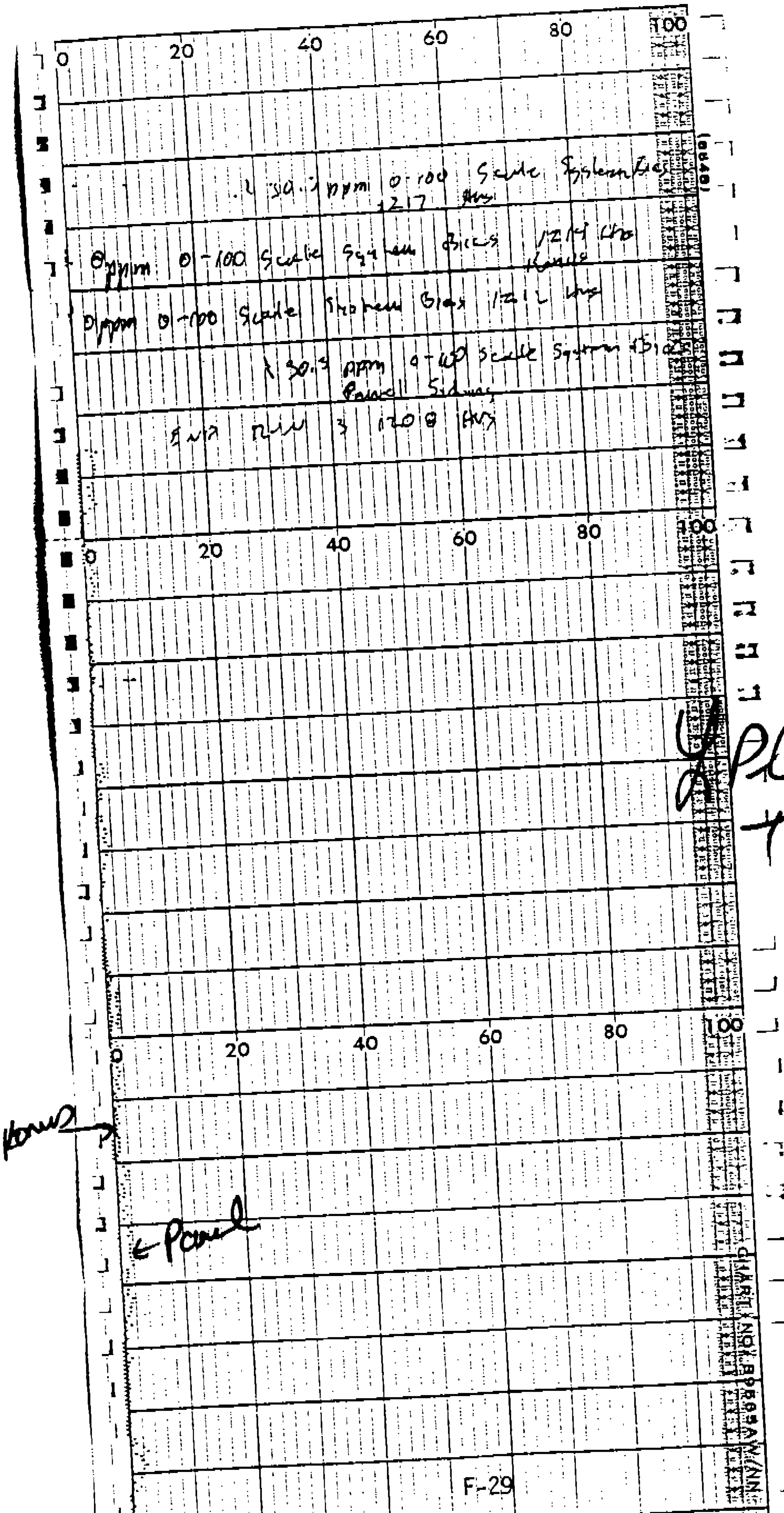
F-26



Chilco THC's

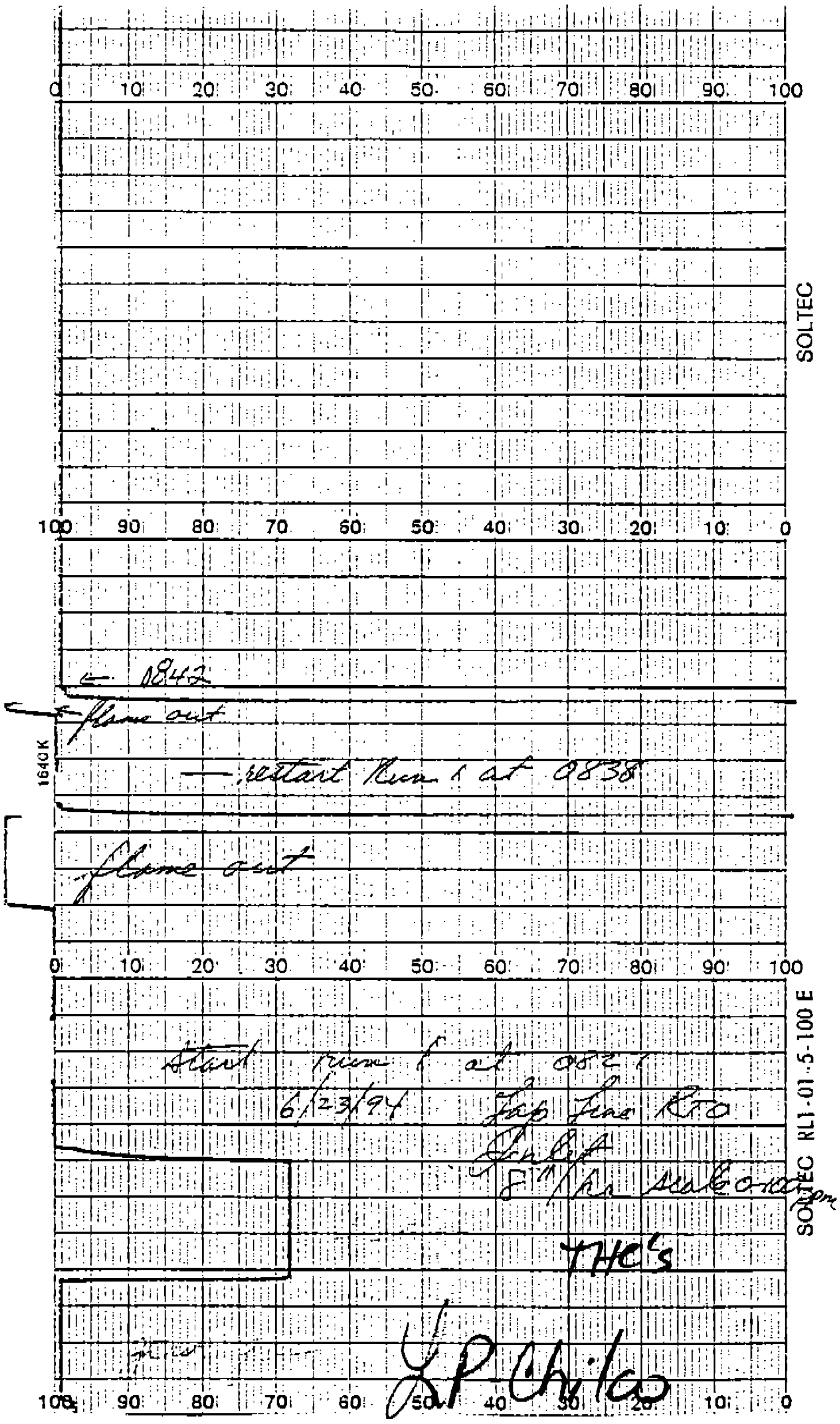
Konus →

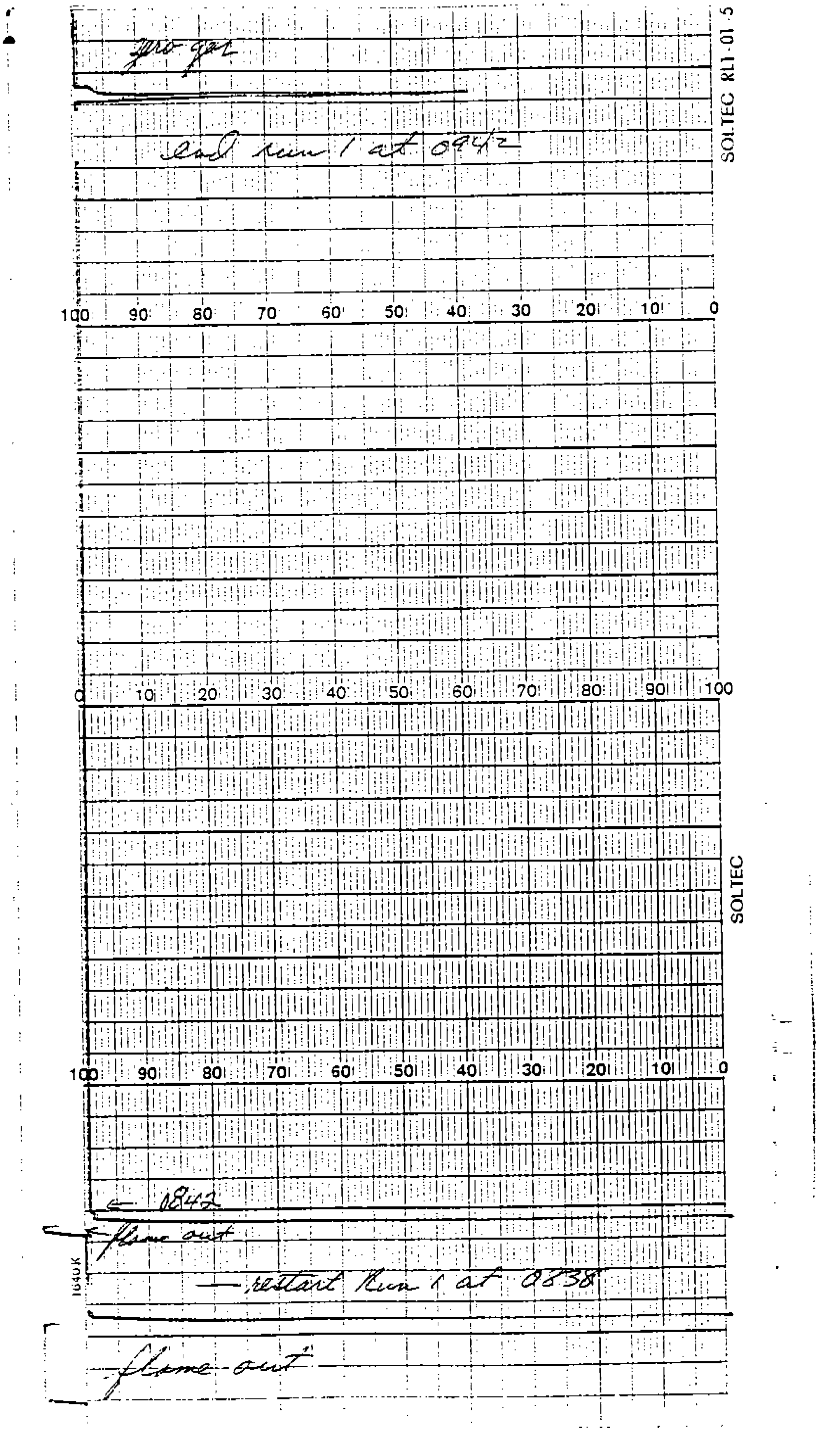

0 20 40 60 80 100
Chilco THC's
Korus
Panel Siding
QUW 3 1108 Hrs
30.5 ppm 0-100 Scale System Bias 1107 Hrs
0 ppm 0-100 Scale System Bias 1103 Hrs Kondos
0 ppm 0-100 Scale System Bias 1102 Hrs
60.3 ppm 0-100 Scale System Bias 1059 Hrs Panel Siding



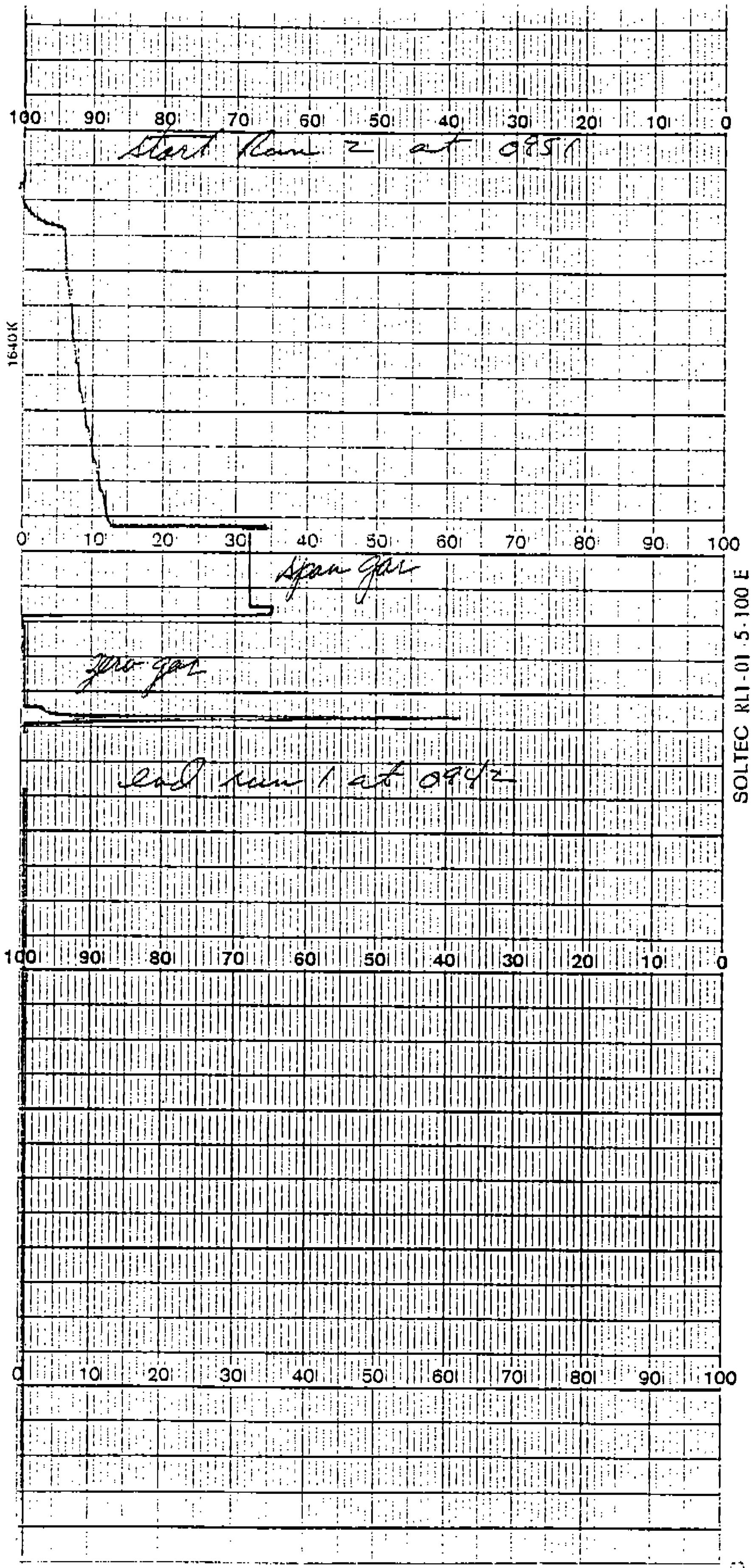
0 20 40 60 80 100
.2 30.1 ppm 0-100 Scale System Bias
1217 Hrs
0 ppm 0-100 Scale System Bias 1214 Hrs
Range
0 ppm 0-100 Scale System Bias 1211 Hrs
30.4 ppm 0-100 Scale System Bias
Powell Sidney
End Run 3 1208 Hrs
0 20 40 60 80 100
0 20 40 60 80 100
← Panel

P Chilo
THC's

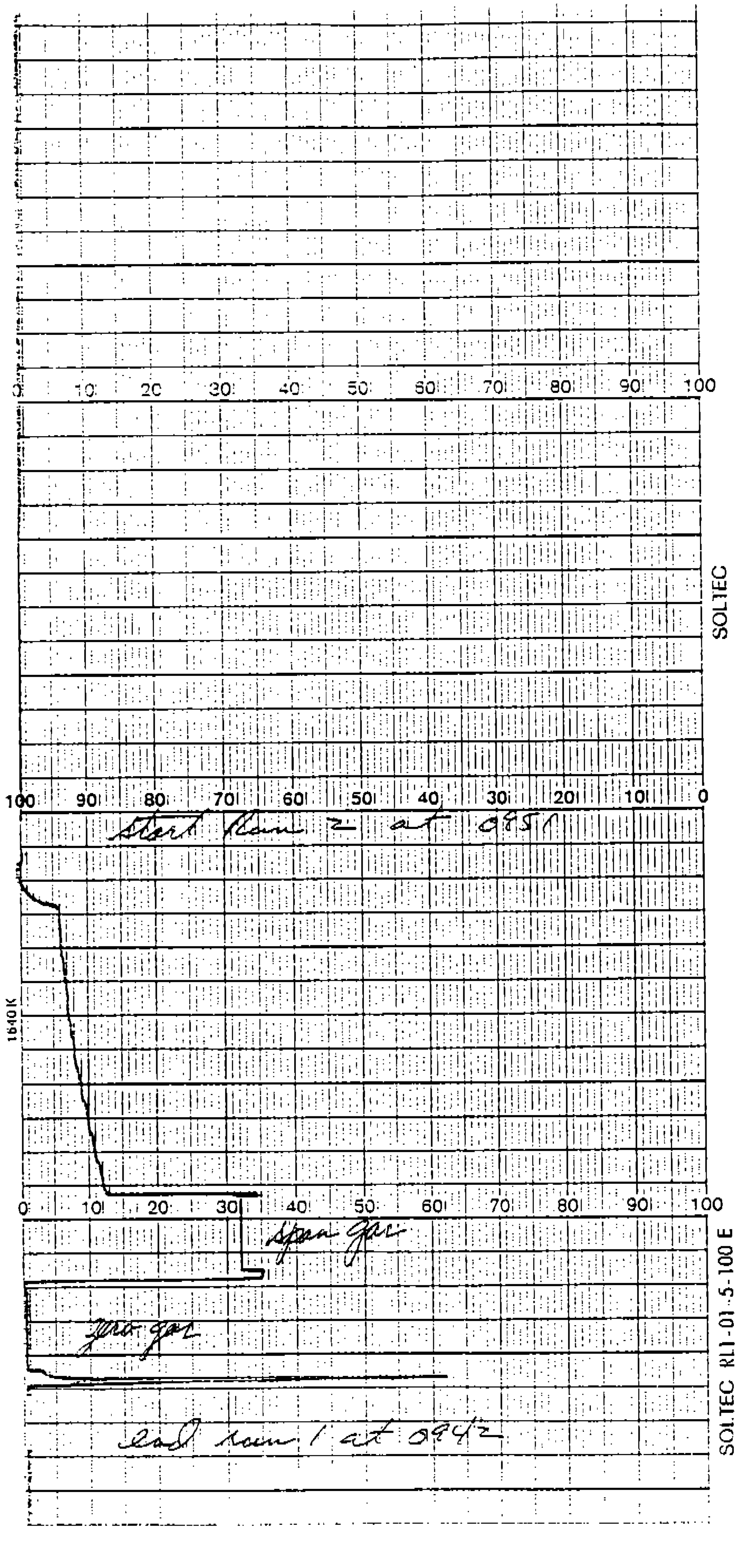

SOLTEC
1640K
0842
flame out
restart Run 1 at 0838
flame out
Start run 1 at
6/23/94
THC's
SOLTEC RL1-01-5-100 E



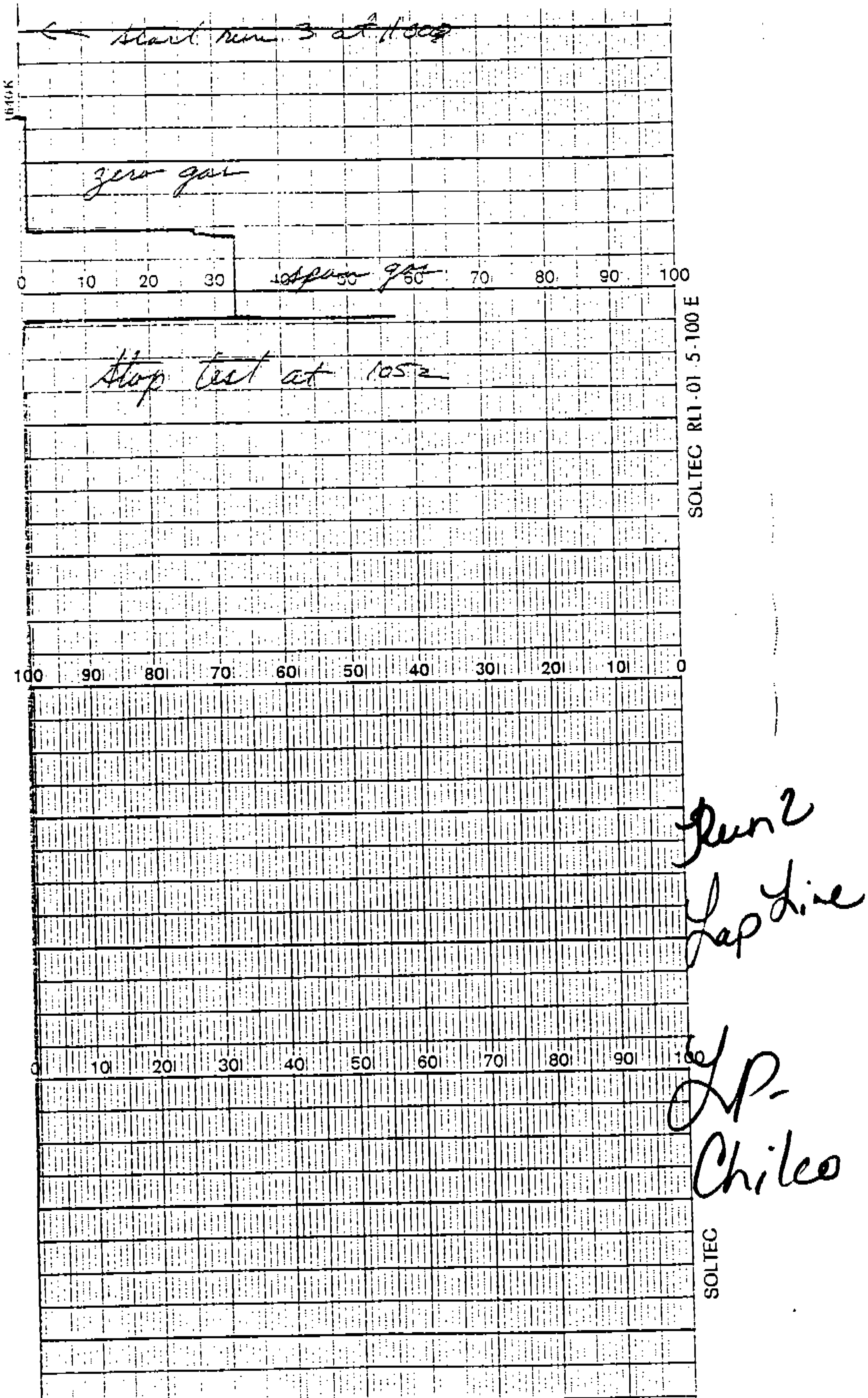
zero gas
end run 1 at 0942
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0
SOLTEC RL1-01.5
SOLTEC
0842
flame out
restart run 1 at 0838
flame out

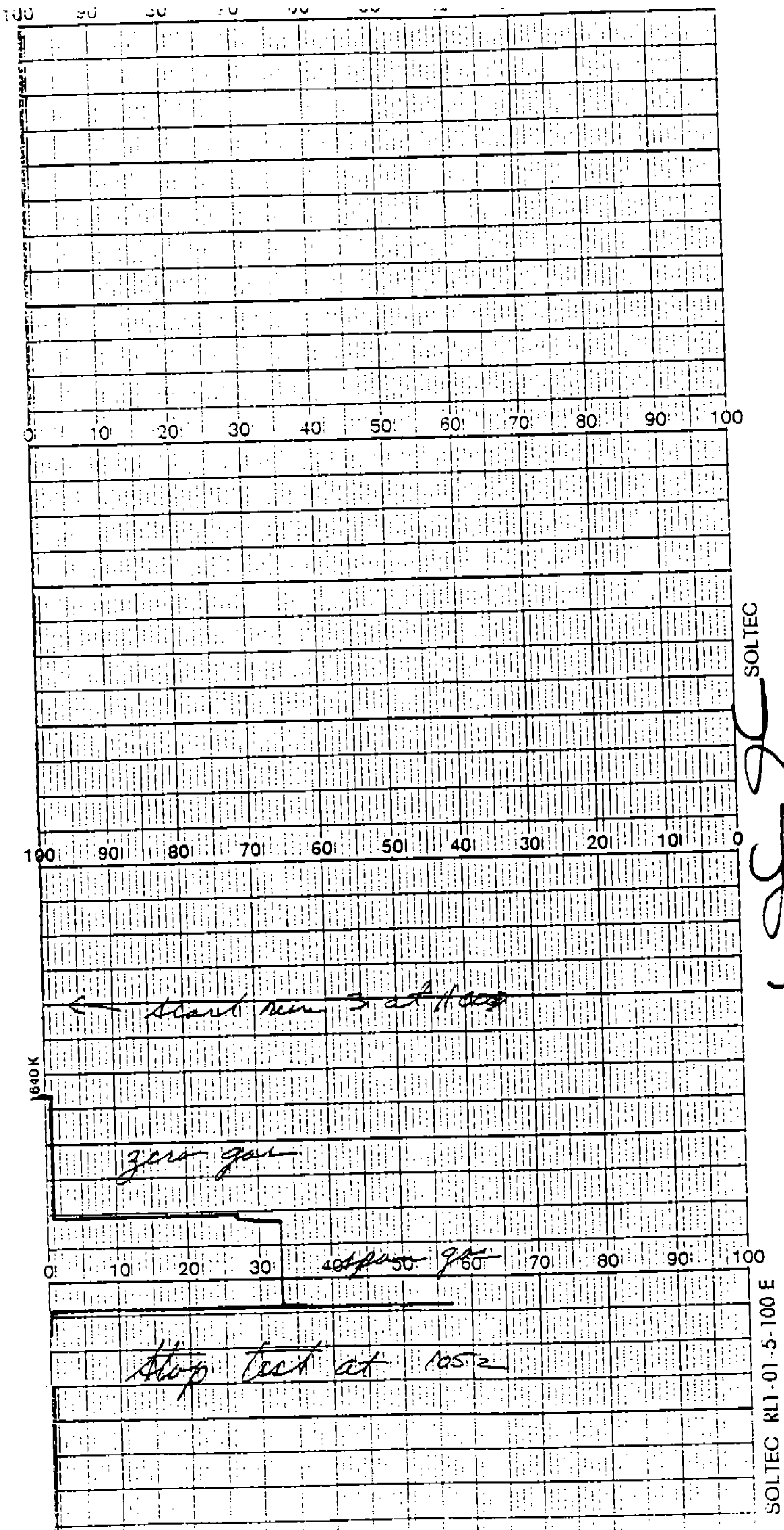


100 90 80 70 60 50 40 30 20 10 0
start Run 2 at 0851
1640K
0 10 20 30 40 50 60 70 80 90 100
Span gas
zero gas
end run 1 at 0942
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
SOLTEC RL1-01-5-100 E

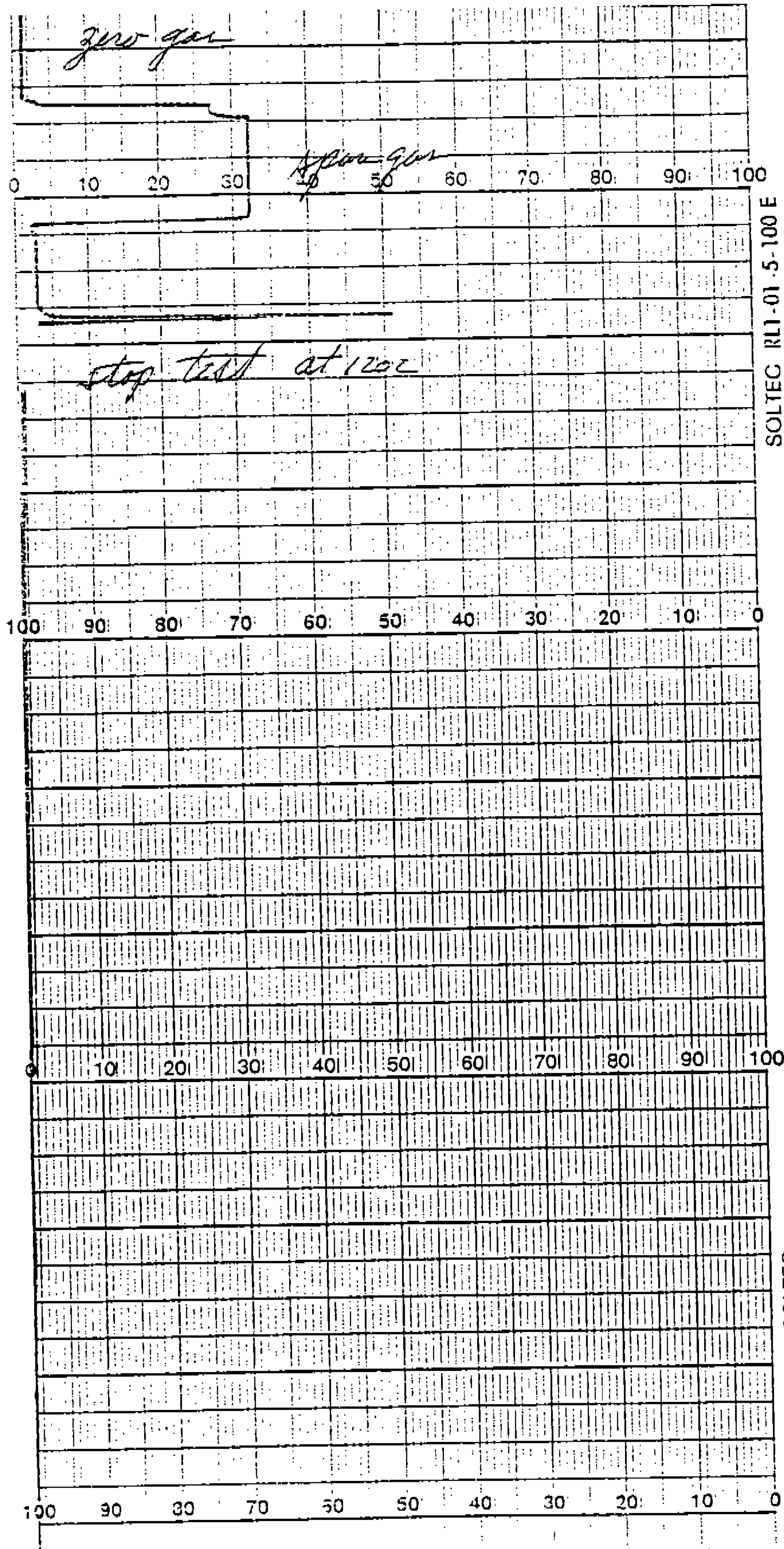


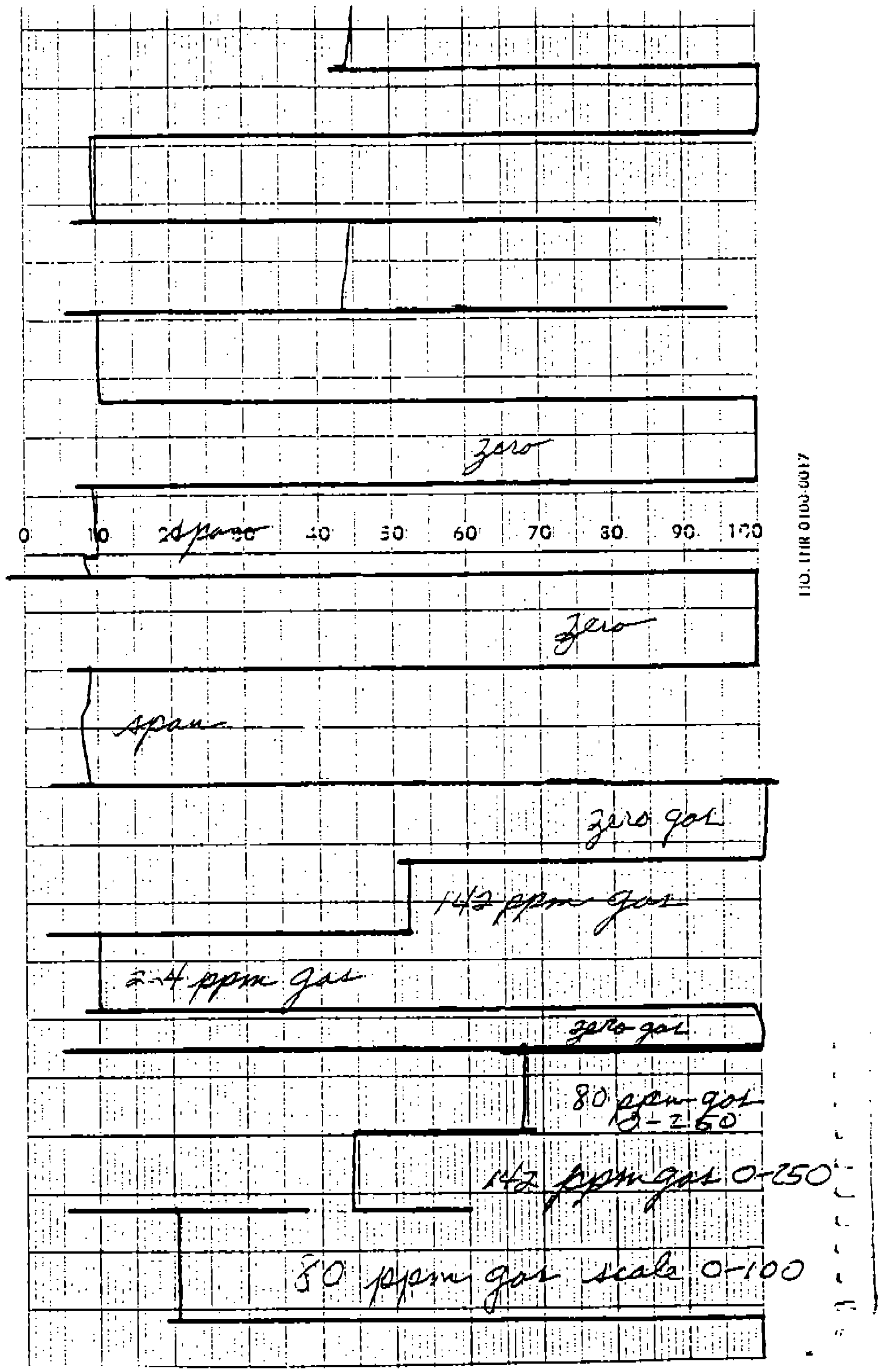
SOLTEC
Start Run 2 at 0951
1640K
Span Gas
Zero Gas
End Run 1 at 0942
SOLTEC RL1-01-5-100 E

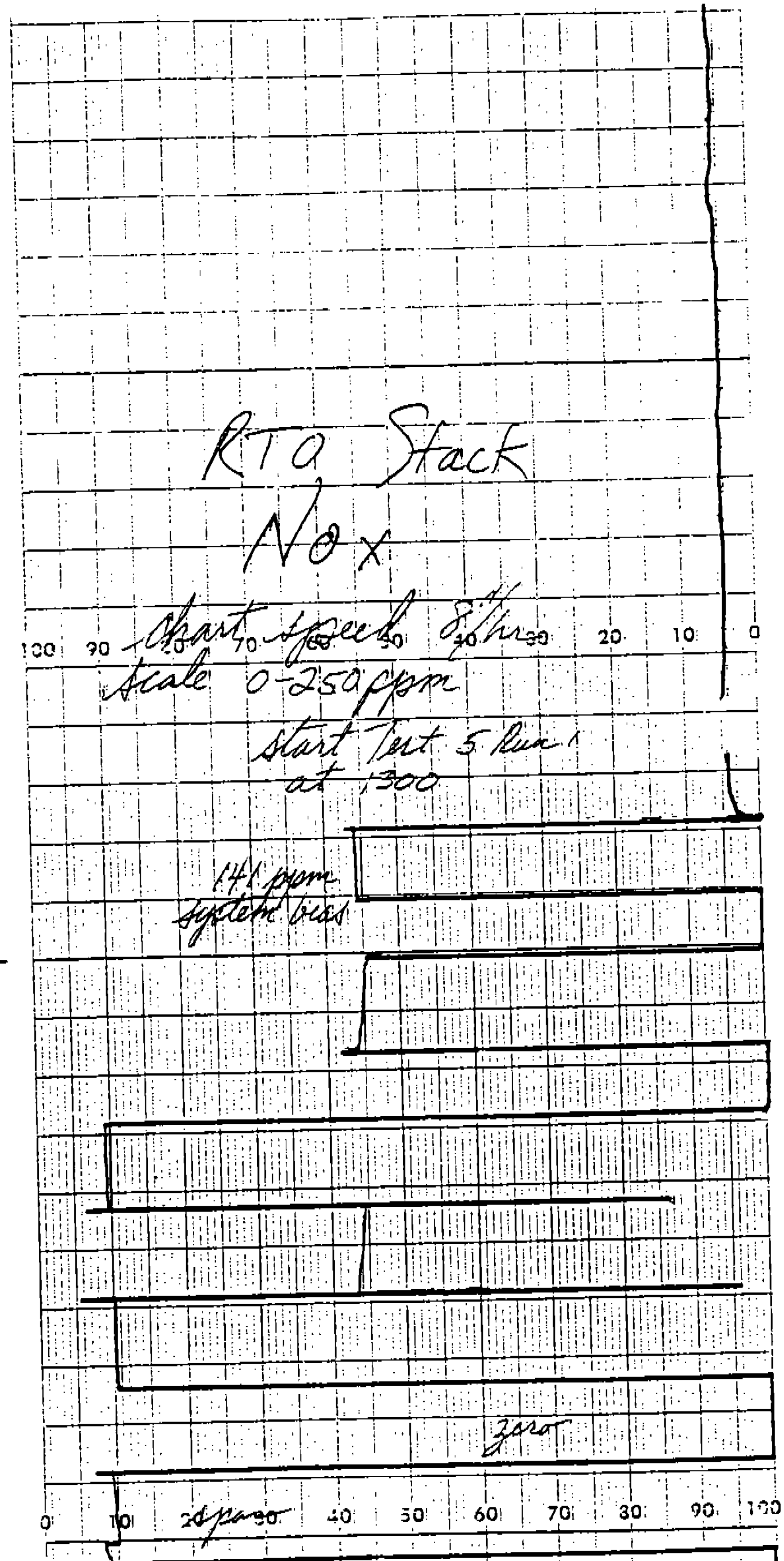

Start run 3 at 1100
zero gas
span gas
Stop test at 1052
SOLTEC RL1-01 5-100 E
Run 2
LapLine
LP-
Chileo
SOLTEC
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0

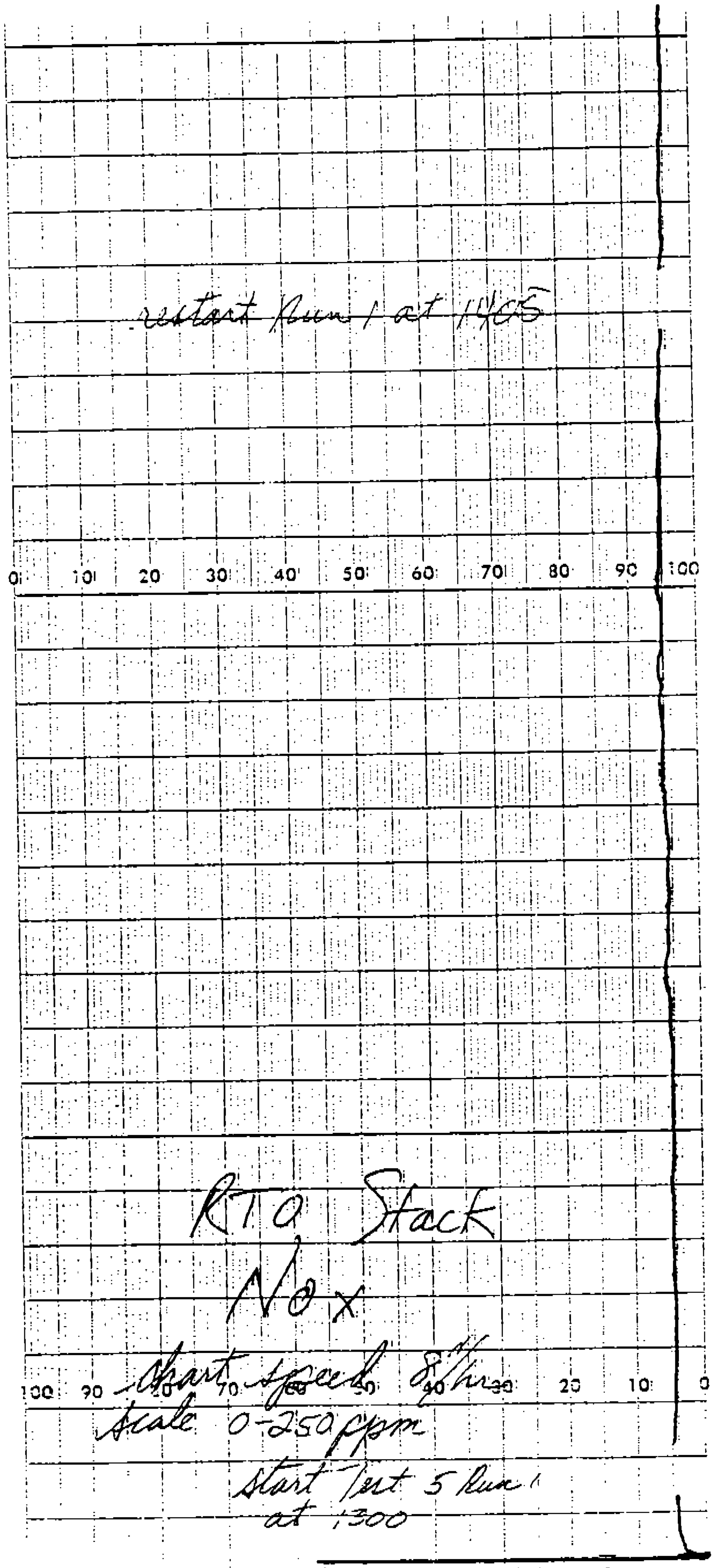


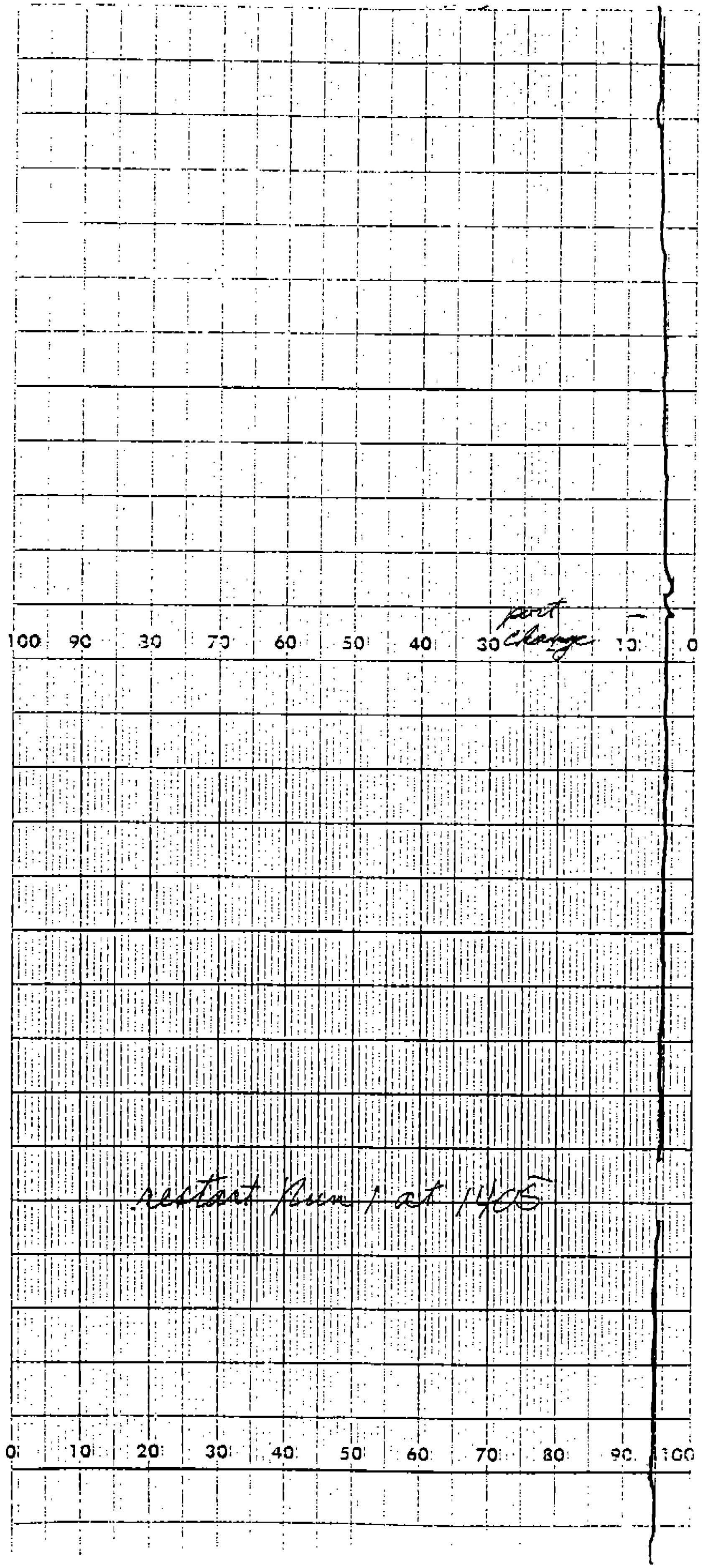
LPChilo
Lap Lire
THL's


zero gas
span gas
stop test at 1202
SOLTEC RL1-01-5-100 E
SOLTEC

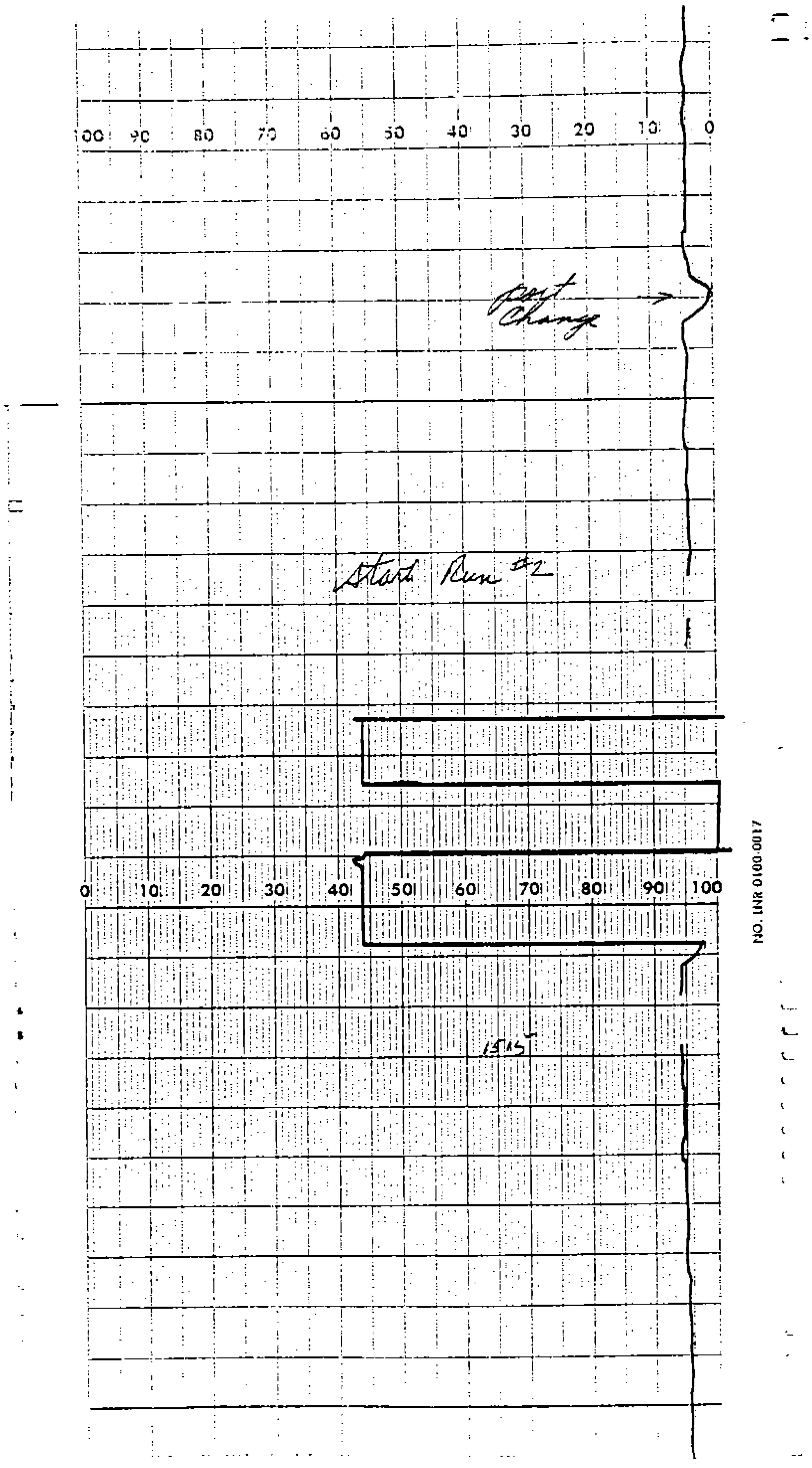

zero
0 10 20 30 40 50 60 70 80 90 100
span
zero
span
zero gas
142 ppm gas
2.4 ppm gas
zero gas
80 ppm gas 0-250
142 ppm gas 0-250
80 ppm gas scale 0-100

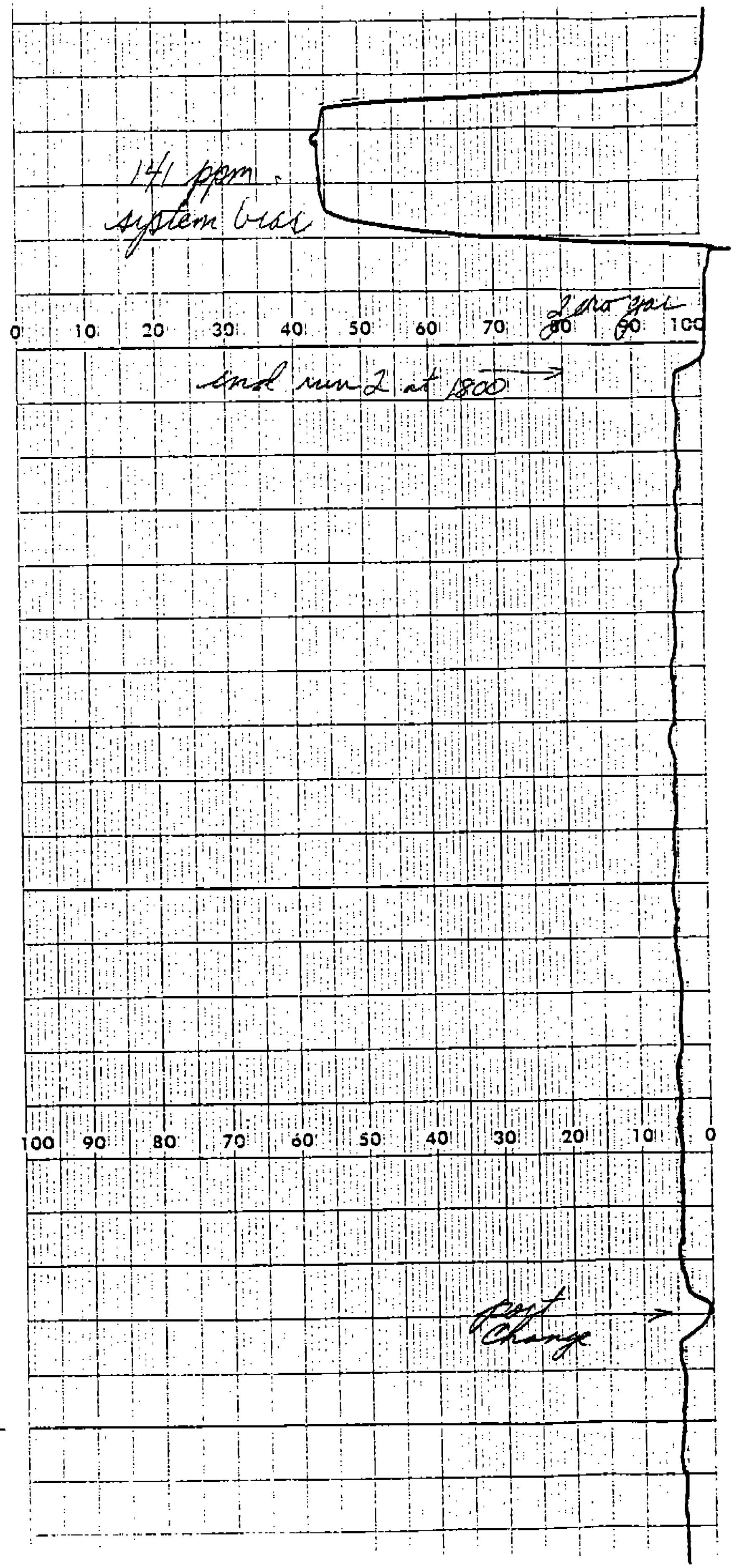

RTO Stack
NOx
chart speed 8"/hr
scale 0-250 ppm
start Test 5 Run 1
at 1300
141 ppm
system bias
zero
zero

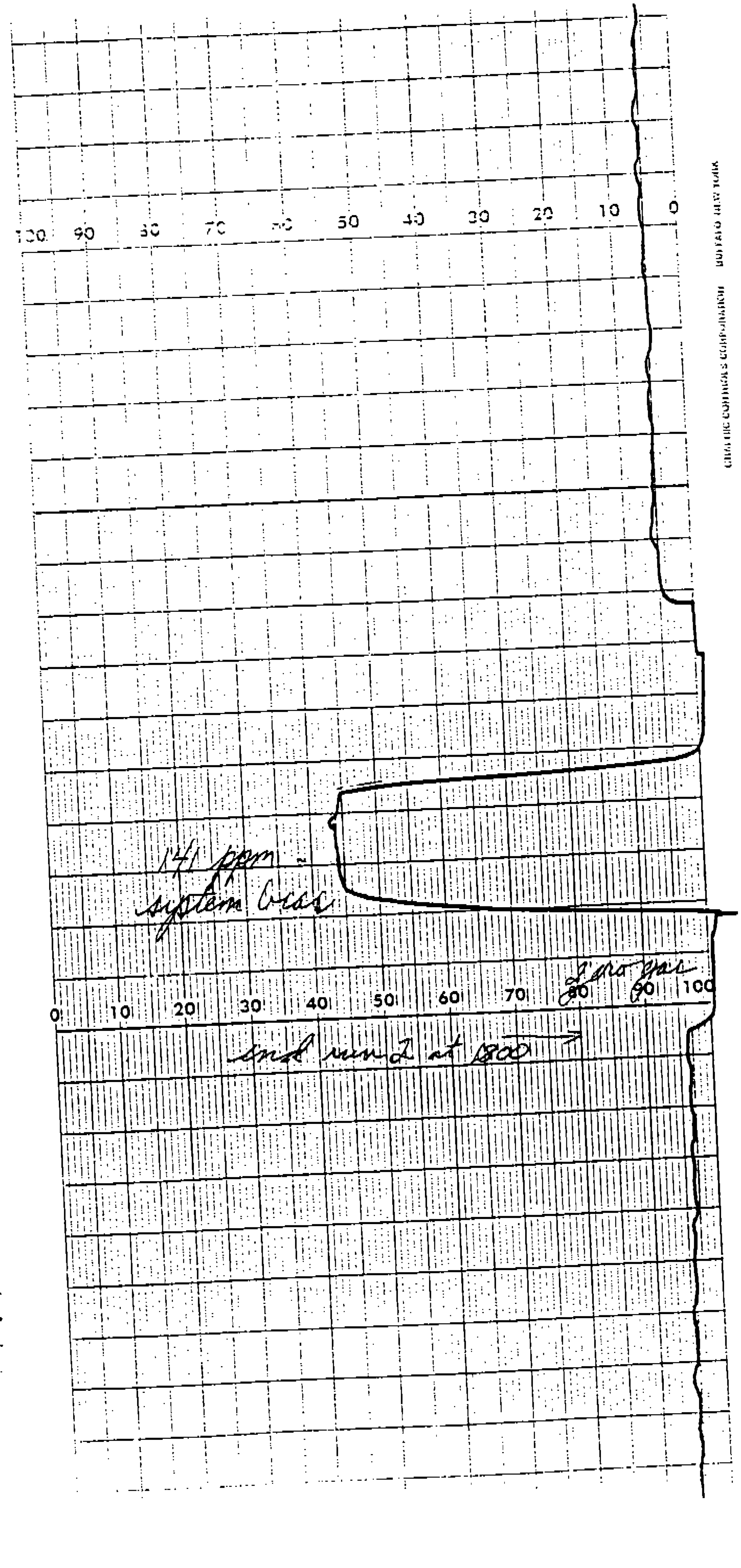

restart Run 1 at 1405
0 10 20 30 40 50 60 70 80 90 100
RTO Stack
NOx
start speed 8"/hr
scale 0-250 ppm
100 90 70 60 50 40 30 20 10 0
Start Test 5 Run 1
at 1300

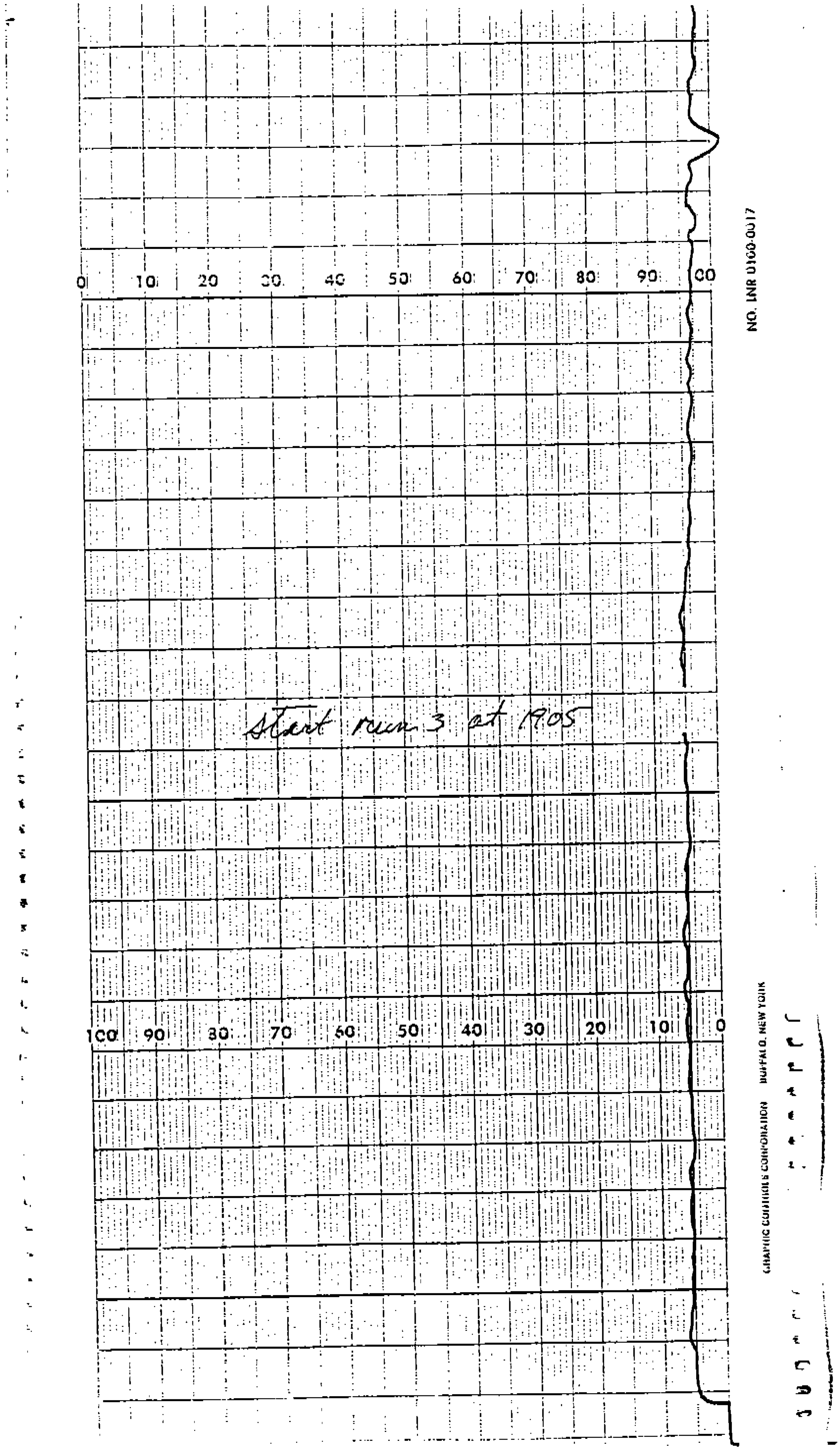


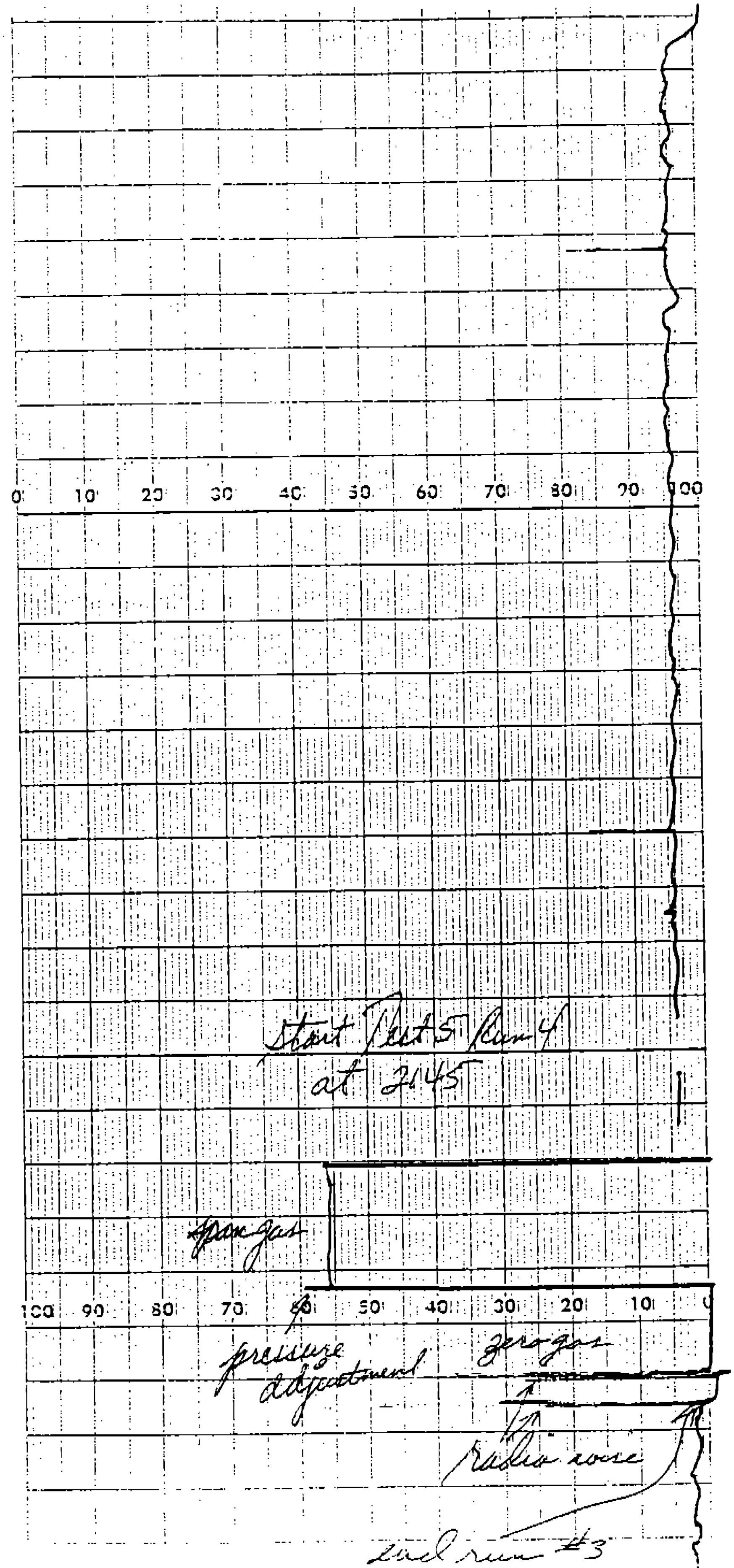
100 90 80 70 60 50 40 30 20 10 0
port change
restart Run 1 at 1405
0 10 20 30 40 50 60 70 80 90 100

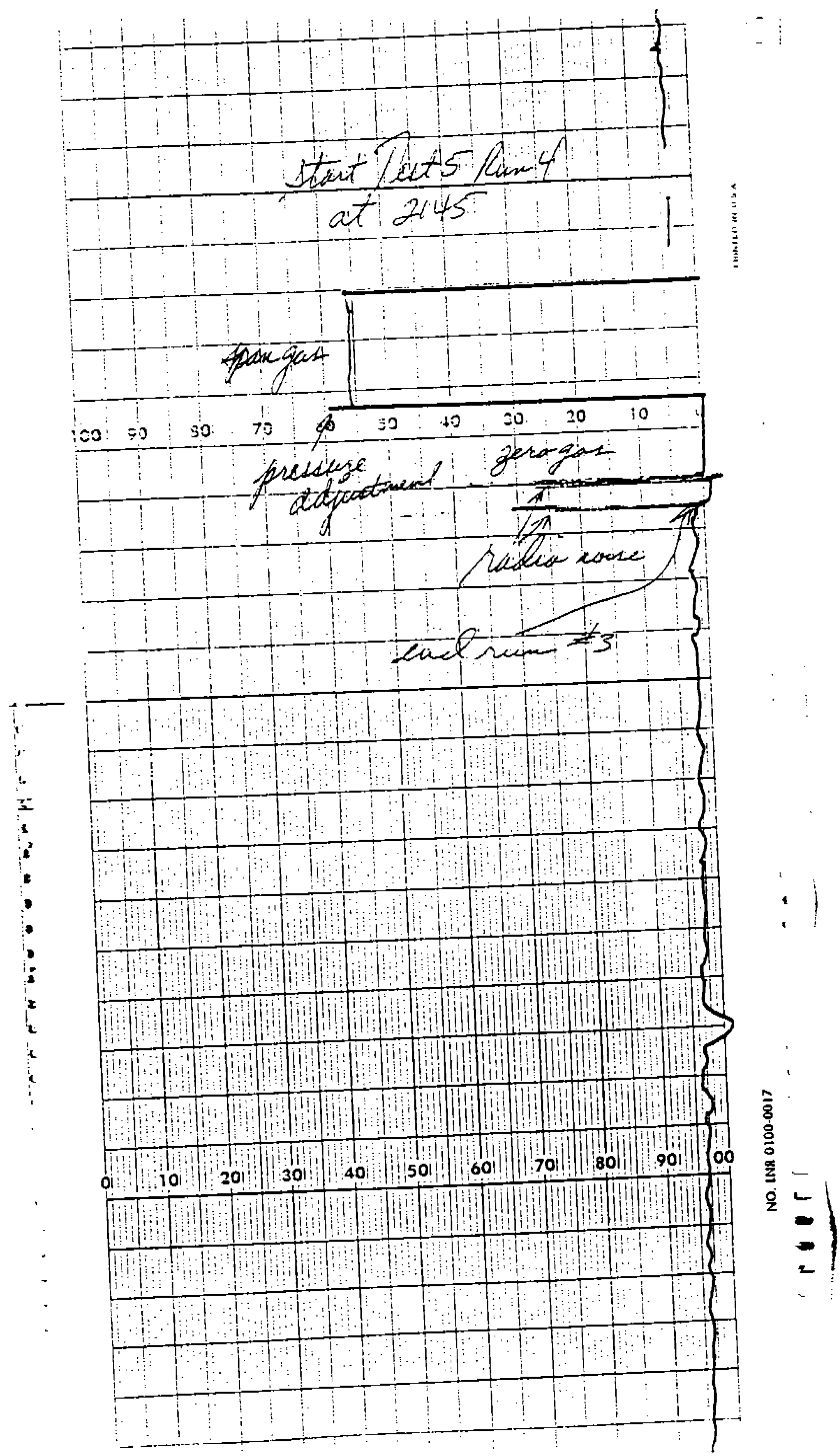

100 90 80 70 60 50 40 30 20 10 0
part Change
Start Run #2
0 10 20 30 40 50 60 70 80 90 100
1515
NO. LNR 0100-0017

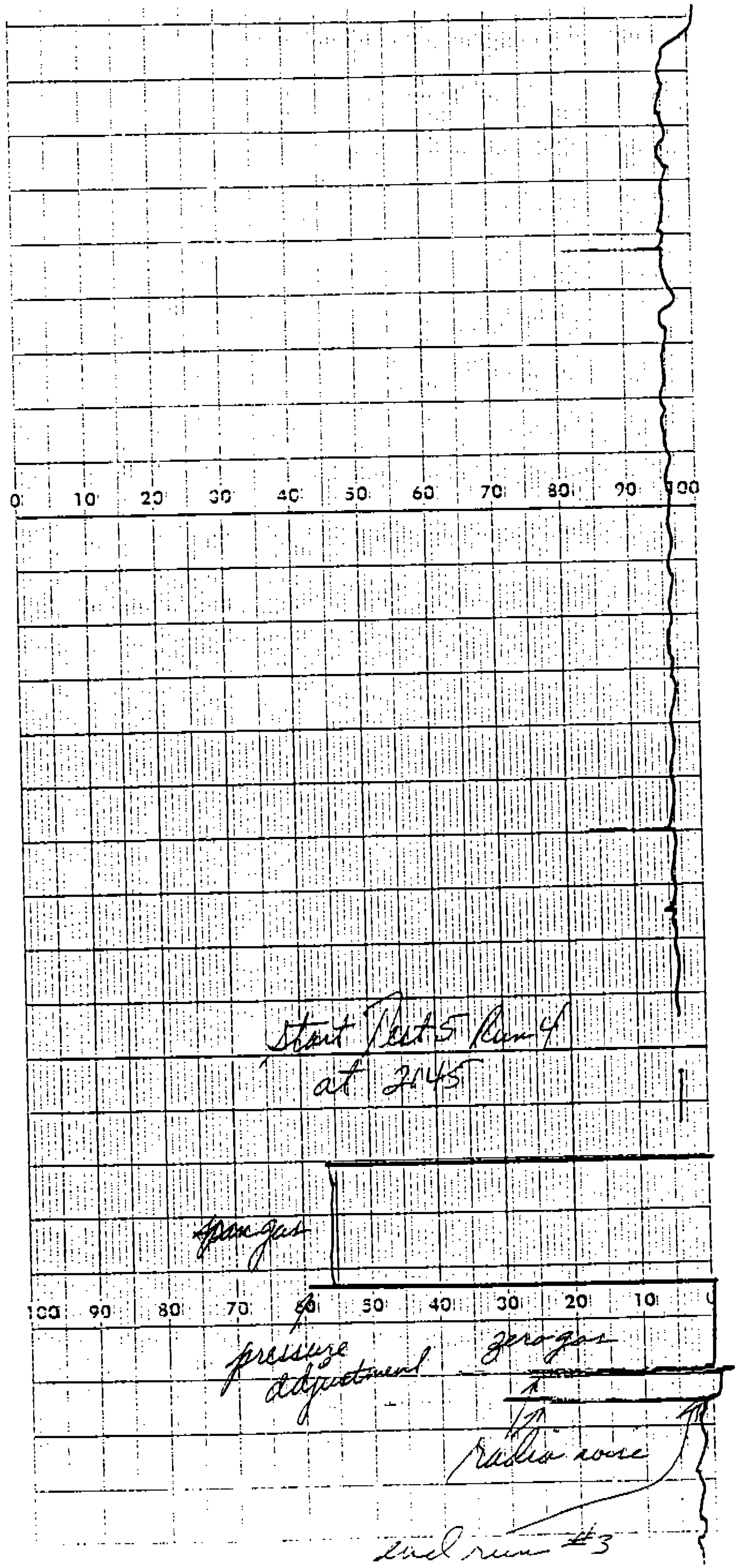

141 ppm
system bias
zero gas
0 10 20 30 40 50 60 70 80 90 100
End run 2 at 1800
100 90 80 70 60 50 40 30 20 10 0
Port change

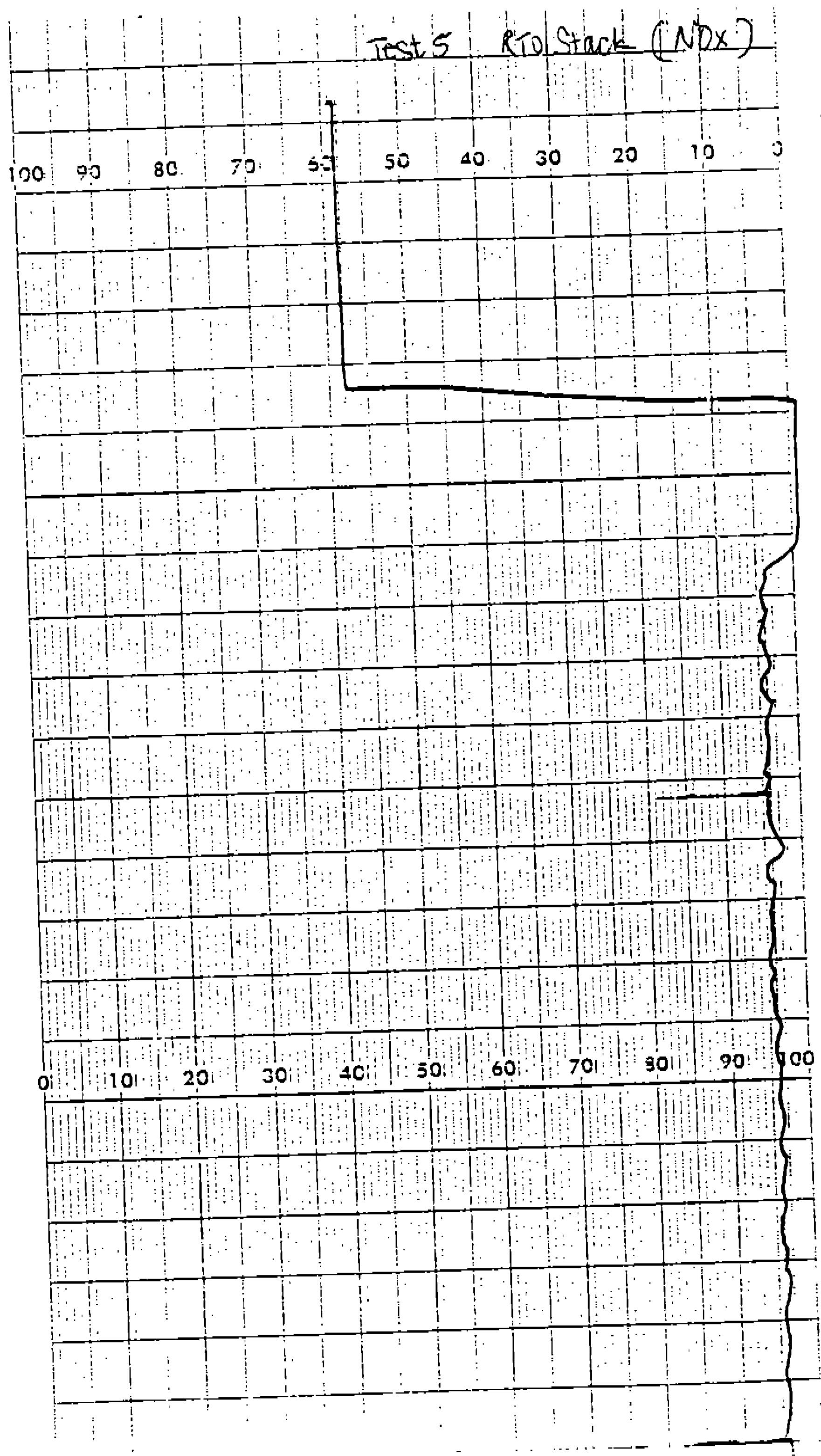

100 90 80 70 60 50 40 30 20 10 0
141 ppm -
system bias
zero gas
0 10 20 30 40 50 60 70 80 90 100
end run 2 at 1800


0 10 20 30 40 50 60 70 80 90 100
Start run 3 at 1905
100 90 80 70 60 50 40 30 20 10 0
NO. LNR 0160-0017
GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK


0 10 20 30 40 50 60 70 80 90 100
Start Test 5 Run 4
at 2145
span gas
100 90 80 70 60 50 40 30 20 10
pressure adjustment
zero gas
Radio noise
end run #3


Start Test 5 Run 4
at 2145
span gas
100 90 80 70 60 50 40 30 20 10
pressure adjustment
zero gas
radio noise
end run #3
0 10 20 30 40 50 60 70 80 90 100
NO. LNR 0100-0017


0 10 20 30 40 50 60 70 80 90 100
Start Test 5 Run 4
at 2145
span gas
100 90 80 70 60 50 40 30 20 10
pressure adjustment
zero gas
radio noise
end run #3


Test 5 RTO Stack (NOx)
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK

APPENDIX G

ANALYZER SPECIFICATIONS

Ratfisch INSTRUMENTE

TOTAL HYDROCARBON ANALYZER (FLAME IONIZATION
Model RS 55

TECHNICAL DATES

MAINS : 115V/60H
RECORDER OUTPUT : 0 - 5 V / 4-20mA

MODEL: X Manual switching
__ Solenoid valves
HOUSING: __ Case, __ 19"-Rack
MEASURING RANGES: 1 = 0 - 10 C_1-
2 = 0 - 100 C_1
3 = 0 - 1,000 C_1
4 = 0 - 10,000 C_1

SPECIAL OPTIONS:

Flame out alarm ....
1 Alarm ....
Sample line ....
....

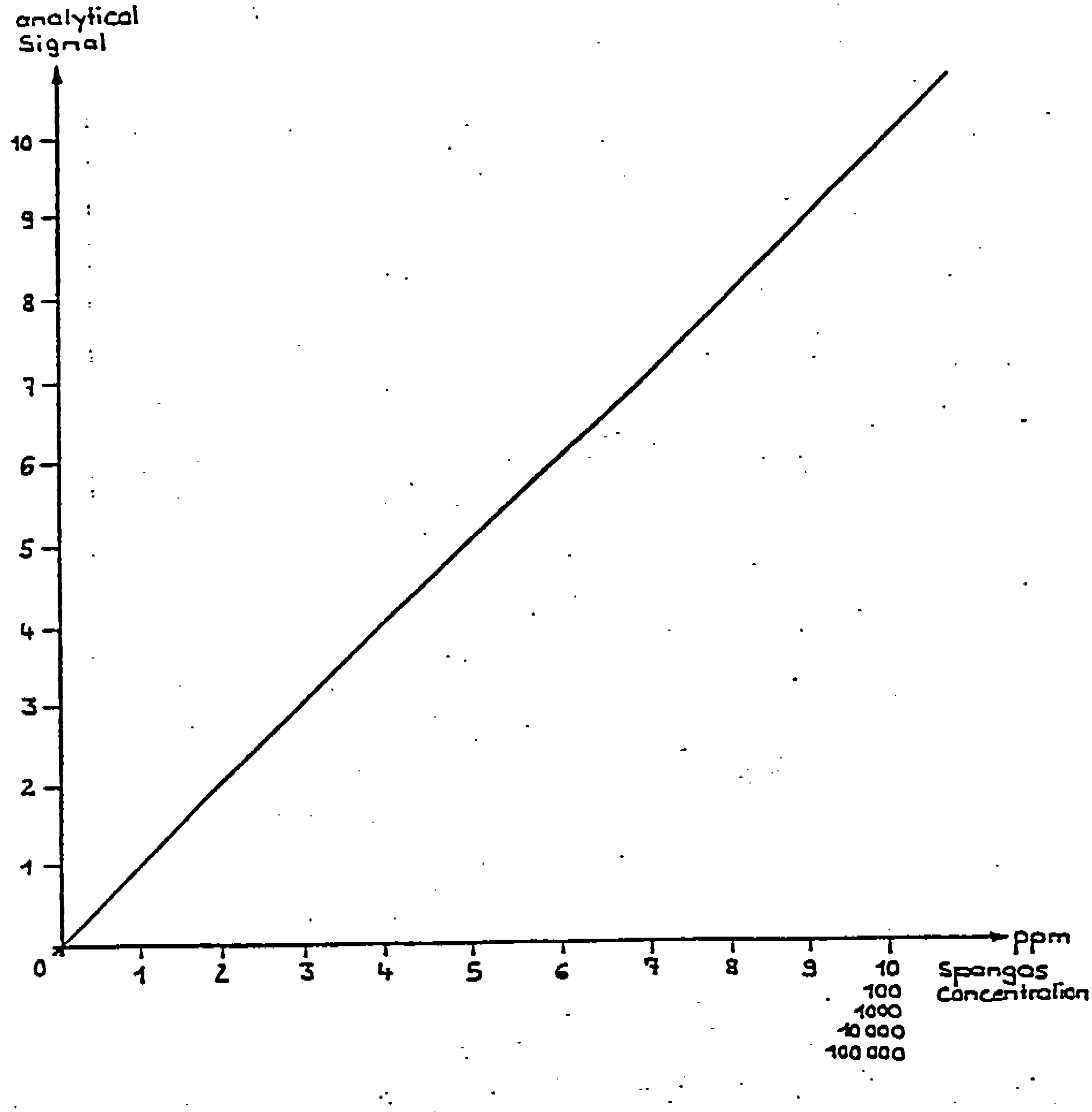
ANALYZER CONDITIONS:

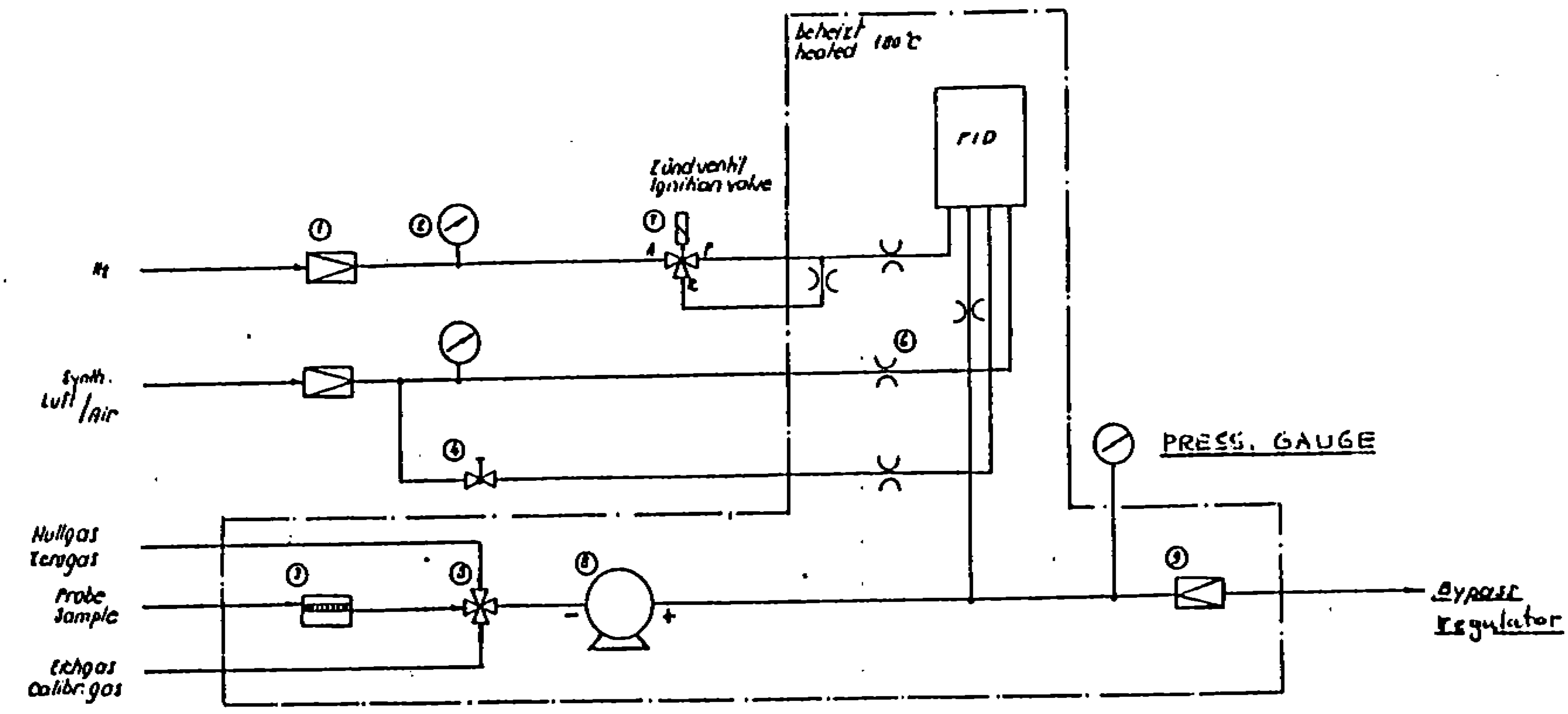
Temperature : ..160 °C

Zero Point : 3,90...
Gain : ....7,70...
Pressure Setting: Sample/Spangas/Zerogas: 200 mbar
Fuel: Hydrogen :.. ....0,35 bar
Combustion Air :..........0,80 bar

Span Gases : ..300 ppm C_1
24.000 ppm C_1

CALIBRATION DIAGRAMM





1 Druckregler
Pressure regulator
2 Manometer
Gauge
3 Filter
4 Nadelventil
Needle valve
5 3 Wege ventil
3 way valve
6 Kapillare
capillary
7 Magnet ventil
solenoid valve
8 Pumpe
pump
9 Rückdruckregler
Back pressure regulator

Zündventil
Ignition valve

P-A angezogen
energised

R-A stromlos
at rest

Handumschaltung
Manuel switching

Ratfisch INSTRUMENTE	FLAMMEN IONISATIONS DETEKTOR Flame Ionisation Detector	
	Fließplan Flowdiagram	RS 55 13.04.88

SPECIFICATIONS FOR MODEL 10A
ROCK MOUNTED CHEMILUMINESCENT
NO-NO_x GAS ANALYZER

Sensitivity	Each instrument is equipped with the following ranges: 0 - 2.5 ppm 0 - 10 ppm 0 - 25 ppm 0 - 100 ppm 0 - 250 ppm 0 - 1000 ppm 0 - 2500 ppm 0 - 10000 ppm
Accuracy	Derived from the NO or NO_2 calibration gas, ±1% of fullscale
Response time (0-90%) Typical	1.5 seconds - NO Mode 1.7 seconds - NO_x Mode
Output	0 - 10mV and 0 - 10V
Zero Drift	Negligible after 1/2-hour warm-up
Linearity	±1% of full scale
Input Power Requirements	115v/50Hz; 115v/60Hz

APPENDIX H

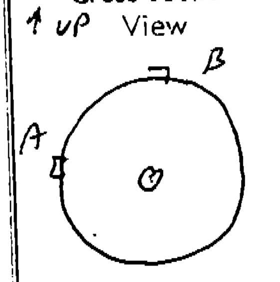
MEASUREMENT SYSTEMS PERFORMANCE SPECIFICATIONS

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. / Chilco ID
Source: Press RTO / Inlet
Test: 2 Run__ Date 6-22-94
Stack Dimen.: 60 IN.
Dry Bulb: 100 °F Wet bulb ______ °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 27.61 IN.HG
Static Pressure: -1.95 IN.WC
Operators: M. Kuehler + J
Pitot No.: Inst C_p .84

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start: 1415 HRS	
A-1	1/6	10.00	16.25		
2	3/6	30.00	36.25		
3	5/6	50.00	56.25		
A-1	.032	1.92	8.17	1.25	
2	.105	6.30	12.55	1.22	
3	.194	11.64	17.89	1.05	
4	.323	19.38	25.63	1.10	
5	.677	40.62	46.87	1.07	
6	.806	48.36	54.61	1.15	
7	.895	53.70	59.95	1.20	
8	.968	58.08	64.33	1.25	
B-1				1.09	
2				1.15	
3				1.29	
4				1.20	
5				1.22	
6				1.38	
7				1.27	
8				1.10	
Temp. Meas. Device & S/N: PDT-311 TC				Time End: 1423 HRS	

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.

(612) 786-6020

EPA Method 2 Field Data Sheet

Job L.P. / Chilco ID

Source Ronco / Stack

Test 11 Run ___ Date 6-23-94

Stack Dimen. 42 IN.

Dry Bulb 335 °F Wet bulb 126 °F

Manometer ☒ Reg. ☐ Exp ☐ Elec.

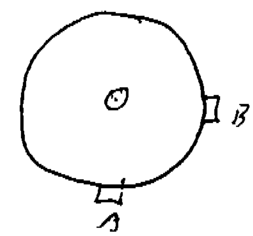
Barometric Pressure 27.54 IN.HG

Static Pressure -.10 IN.WC

Operators M. Kachelman & K. Nussmeier

Pitot No. IWCT C_p NA

Drawing of Test Site

Cross-section MW View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	5 IN.	Time Start: 1117 HRS	
A-1	1/6	7.00	12.00		
2	3/6	21.00	26.00		
3	5/6	35.00	40.00		
A-1	.032	1.34	6.34	.12	
2	.105	4.41	9.41	.11	
3	.194	8.14	13.14	.15	
4	.323	13.58	18.58	.16	
5	.677	28.43	33.43	.14	
6	.806	33.85	38.85	.11	
7	.895	37.59	42.59	.10	
8	.968	40.65	45.65	.09	331
B-1				.11	
2				.12	
3				.11	
4				.13	
5				.14	
6				.17	
7				.14	
8				.13	

Temp. Meas. Device & S/N: PDT-31 / TC

Time End: 1125 HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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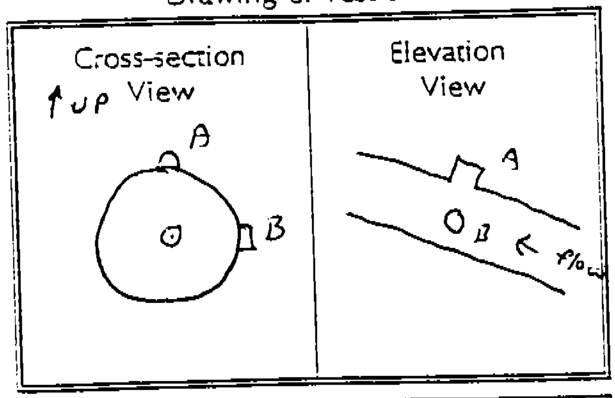
INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Drawing of Test Site



-b L.P. / Chilco ID
ource Panel Siding / Vent
Test 1R Run __ Date 6-23-94
ack Dimen. 12 IN.
ry Bulb 194 °F Wet bulb 83 °F
Manometer ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 27.54 IN.HG
atic Pressure -.73 IN.WC
Operators M. Kastelic & J. Scripter
Pitot No. 23U-4 C_p .84

ambient

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	8 IN.	Time Start: 1107 ~~[illegible]~~ HRS	
B-1	1/6	2.00	10.00		
2	3/6	6.00	14.00		
3	5/6	10.00	18.00		
A-1	.032	.38 / .50	9.38 / 8.50	.45	
2	.105	1.26	9.26	.55	
3	.194	2.33	10.33	.53	
4	.323	3.88	11.88	.51	
5	.677	8.12	16.12	.42	
6	.806	9.67	17.67	.49	A
7	.895	10.74	18.74	.47	184
8	.968	11.62 / 11.50	19.62 / 19.50	.50	
B-1				.48	
2				.55	
3				.52	
4				.50	
5				.53	
6				.54	
7				.48	
8				.45	
Temp. Meas. Device & S/N:		PDT-31 / TR		Time End: 1117 HRS	

R or nothing = reg. manometer; S = expanded; E = electronic

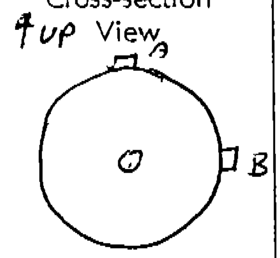
INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. / Chilco, ID
Source: Dryer RTO / Inlet
Test ______ Run 0 Date 6-22-94
Stack Dimen. 48 IN.
Dry Bulb 200 °F Wet bulb 139 °F
Manometer ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 27.61 IN.HG
Static Pressure -10.89 IN.WC
Operators Mikaehlert
Pitot No. INST C_p NA

Drawing of Test Site

Cross-section View | Elevation View



Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 8.5 IN.		Time Start: 1753 ~~314~~ HRS	
B-1	1/6	8.00	16.50		
2	3/6	24.00	32.50		
3	5/6	40.00	48.50		
A-1	.032	1.54	10.04	.80	
2	.105	5.04	13.54	.83	
3	.194	9.31	17.81	.94	
4	.323	15.50	24.00	.82	
5	.677	32.50	41.00	.78	
6	.806	38.69	47.19	.83	
7	.895	42.96	51.46	.95	
8	.969	46.46	54.96	.77	
B-1				.65	
2				.68	
3				.75	
4				.77	
5				.69	
6				.63	
7				.67	
8				.65	
				.68	

Temp. Meas. Device & S/N: PDT-31 / TC

Time End: 1759 HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES
(612) 786-6020

THC System Bias Check

Job L.P Chilco Source RTO Stack
Test Run Date 6/21/94 Site
Operator D. Van Hoever

Run	Time (HRS)	***	Cylinder Value (ppm)	Analyzer Resp (ppm) Cal Err	Sys Bias	Diff. CE-SB (ppm)	Span Val (PPM)	% of span
0	1000	Zero gas	0	0			250	2
		Upscale	142	145	140	5		
1	1510	Zero gas	0	0	0	0	250	0
		Upscale	142	145	140	5	250	2
2	1806	Zero gas	0	0	0	0	250	0
		Upscale	142	145	140	5	250	2
3	2010	Zero gas	0	0	0	0	250	0
		Upscale	142	145	140	5	250	2
4	2250	Zero gas	0	0	0	0	250	0
		Upscale	142	145	141.5	2.5	250	1
6		Zero gas	0					
		Upscale						
7		Zero gas	0					
		Upscale						
8		Zero gas	0					
		Upscale						
9		Zero gas	0					
		Upscale						
10		Zero gas	0					
		Upscale						
11		Zero gas	0					
		Upscale						
12		Zero gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

S420-11R

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC System Bias Check

Job: L.P. / Chilco, ID
Source: ~~Dryer~~ Press RTO
Test: 2 Run: 1,2,3 Date: 6 22 94
Site: Inlet
Operator: M. Koehler
Channel 1

Run	Time (HRS)	*** BLUE	Cylinder Value (PPM)	Analyzer Resp (PPM) Cal. Err.	Analyzer Resp (PPM) Sys. Bias	Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
1	0843	Zero Gas	0	0	0	0	1,000	0
		Upscale	303	307	305	2	1,000	.2
2	1412	Zero Gas	0	0	0	0	1,000	0
		Upscale	303	307	296	11	1,000	1.1
3	1740	Zero Gas	0	0	2	~~0~~ 2	1,000	.2
		Upscale	303	307	296	11	1,000	1.1
4	1907	Zero Gas	0	0	1	1	1,000	.1
		Upscale	303	307	301	6	1,000	.6
5	2017	Zero Gas	0	0	3	3	1,000	.3
		Upscale	303	307	303	4	1,000	.4
6		Zero Gas	0					
		Upscale		Konvs		6-23-94		
7	0813	Zero Gas	0	0	0	0	100	0
		Upscale	30.3	30	30	0	100	0
8	0942	Zero Gas	0	0	1	~~0~~ 1	100	1
		Upscale	30.3	30	30	0	100	0
9	~~0951~~	~~Zero Gas~~	~~0~~	~~0~~	~~0~~	~~0~~	~~100~~	~~0~~
		~~Upscale~~	~~30.3~~	~~30~~	~~29~~	~~1~~	~~100~~	~~1~~
10	1103	Zero Gas	0	0	1	1	100	1
		Upscale	30.3	30	29	1	100	1
11	1214	Zero Gas	0	0	0	0	100	0
		Upscale	30.3	30	29	1	100	1
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

033194-C:\STACK\WP\FORMS\S-420-11

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC System Bias Check

Job: L.P. Chilco — Source: RTO
Test: 6713 Run: 1,2,3,4 Date: 6/22/94 — Site: STACK
Operator: MK + DVH — All Bias Results as Carbon

Run	Time (HRS)	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Cal. Err.	Analyzer Resp (PPM) Sys. Bias	Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
1	1100	Zero Gas	0	0	0	0	100	0
		Upscale	3[illegible].2	30x3	90	0	100	0
2	1313	Zero Gas	0	0	1	1	100	1
		Upscale	31.2	30x3	91	1	100	1
3	1856	Zero Gas	0	0	0	0	100	0
		Upscale	31.2	30	31	1	100	1
4	2037	Zero Gas	0	0	1	1	100	1
		Upscale	31.2	30	32	2	100	2
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0	[illegible] line [illegible] - RTO INLET				
		Upscale		6/23/94				
8	0750	Zero Gas	0	0	0	0	100	0
		Upscale	31.2	30	32	2	100	2
9	0948	Zero Gas	0	0	0	0	100	0
		Upscale	31.2	30	32	2	100	2
10	1057	Zero Gas	0	0	1	1	100	1
		Upscale	31.2	30	33	3	100	3
11	1205	Zero Gas	0	0	1	1	100	1
		Upscale	31.2	30	32	2	100	2
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

033194-C:\STACK\WP\FORMS\S-420-11

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC System Bias Check

Job L.P. / Chilco, ID Source Press RTO
Test ____ Run 1,2,3 Date 6-22-94 Site Inlet
Operator M. Kachler Channel 2

Run	Time (HRS)	*** RED	Cylinder Value (PPM)	Analyzer Resp (PPM) Cal. Err.	Analyzer Resp (PPM) Sys. Bias	Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
1	0852	Zero Gas	0	0	0	0	1,000	0
		Upscale	303	296	306	10	1,000	1
2	1326	Zero Gas	0	0	0	0	100	0
		Upscale	30.3	30	30	0	100	0
3	1748	Zero Gas	0	0	0	0	100	0
		Upscale	30.3	30	30	0	100	0
4	1902	Zero Gas	0	0	1	1	100	1
		Upscale	30.3	30	30	0	100	0
5	2021	Zero Gas	0	0	1	1	100	1
		Upscale	30.3	30	30	0	100	0
6		Zero Gas	0					
		Upscale		Panel Sideing Line				6-23-94
7	0303	Zero Gas	0	0	0	0	100	0
		Upscale	30.3	30	30	0	100	0
8	0951	Zero Gas	0	0	0	0	100	0
		Upscale	30.3	30	29	1	100	1
9	1058	Zero Gas	0	0	1	1	100	1
		Upscale	30.3	30	30	0	100	0
10	1209	Zero Gas	0	0	0	0	100	0
		Upscale	30.3	30	31	1	100	1
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

033194-G:\STACK\WP\FORMS\S-420-11

INTERPOLL LABORATORIES
EPA Method ~~[illegible]~~ 7E
Calibration Error Check & Drift Determination

Job L.P Chilco

Test ______ Run ______ Date 6/21/94
Operator D. VanHoever

THC Calibration (Low Range): Time(HRS) ________

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0				
Low level					
Mid level					
High level					

THC Calibration (High Range): Time(HRS) ________

***	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	Percent of Span
Zero gas	0				
Span					

NO_x Calibration: Time(HRS) 1000

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent of Span
Zero gas	0	0	0	250	0
Mid level	142	145	3	250	1.2
High level	224	225	1	250	.4

CO_2 Calibration: Time(HRS) ________

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent of Span
Zero gas	0				
Mid level					
High level					

Must be within 2% of the span for each calibration gas

S-420-14

INTERPOLL LABORATORIES, INC
(612) 786-6020

EPA Method 25 A
Calibration Error Check & Drift Determination

Job L.P. / Chilco
Test ______ Run 0 Date 6-21-94
Operator mikoehler

THC Calibration (Low Range): RED **Time (HRS)** 1400

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent Of Span
Zero Gas	0	0	0	100	0
Low Level	30.3	30	.3	100	.3
Mid Level	303	296	7	1000	.7
High Level	3038	3097	59	10,000	.59

THC Calibration (High Range): **Time (HRS)**

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent Of Span
Zero Gas	0				
Span					

O_2 Calibration: **Time (HRS)**

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent * Of Span
Zero Gas	0				
Mid Level					
High Level					

CO_2 Calibration: **Time: (HRS)**

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent Of Span
Zero Gas	0				
Mid Level					
High Level					

Must be within 2% of the span for each calibration gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

EPA Method 25 A
Calibration Error Check & Drift Determination

Job L.P. / Chilco, ID
Test 2 Run ______ Date 6-21-94
Operator M. Kuehler

THC Calibration (Low Range): BLUE Time (HRS) 1348 6-2

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent Of Span
Zero Gas	0	0	0	100	0
Low Level	30.3	30	.3	100	.3
Mid Level	303	307	4	1000	.4
High Level	3038	3065	37	10,000	.37

THC Calibration (High Range): Time (HRS) ______

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent Of Span
Zero Gas	0				
Span					

O_2 Calibration: Time (HRS) ______

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent Of Span
Zero Gas	0				
Mid Level					
High Level					

CO_2 Calibration: Time: (HRS) ______

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent Of Span
Zero Gas	0				
Mid Level					
High Level					

Must be within 2% of the span for each calibration gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

EPA Method 25 A
Calibration Error Check & Drift Determination

Job L.P. Chilco
Test 6 Run 0 Date 6/22/94
Operator D.V.H

THC Calibration (Low Range): Time (HRS)

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent Of Span
Zero Gas	0	0	0	100	0
Low Level	31.2	30	1.2	100	1.2
Mid Level	300	320	20	1000	.2
High Level	3038	3200	162	10000	.16

THC Calibration (High Range): Time (HRS)

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent Of Span
Zero Gas	0				
Span					

O_2 Calibration: Time (HRS)

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent Of Span
Zero Gas	0				
Mid Level					
High Level					

CO_2 Calibration: Time: (HRS)

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent Of Span
Zero Gas	0				
Mid Level					
High Level					

Must be within 2% of the span for each calibration gas.

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APPENDIX I

CALIBRATION GAS CERTIFICATION SHEETS

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919)544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-29868 CYLINDER #:CC100138 CYL. PRESSURE:2000PSIG
EXPIRATION DATE:3/8/97 LAST ANALYSIS DATE:3/8/94
CUSTOMER:TWIN CITY OXYGEN P.O.# 9082

METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1

STANDARD:
SRM #: 1667B
CYL #: CLM5293
CONC.: 47.3PPM

INSTRUMENT:BECKMAN THC
MODEL #:400
SERIAL #:1003052
LAST CAL.:3/1/94

COMPONENT:PROPANE
MEAN CONC:30.3PPM
REPLICATE CONC.
DATE:3/8/94 DATE:
30.2PPM
30.3PPM
30.3PPM

COMPONENT:
MEAN CONC:
REPLICATE CONC.
DATE: DATE:

COMPONENT:
MEAN CONC:
REPLICATE CONC.
DATE: DATE:

BALANCE GAS:AIR

REPLICATE DATA

DATE: 3/8/94

Z	0	R	286.3	C	182.8
R	286.3	Z	0	C	183.4
Z	0	C	183.4	R	286.3

COMPONENT:PROPANE

DATE:

Z	R	C
R	Z	C
Z	C	R

REPLICATE DATA

DATE:

Z	R	C
R	Z	C
Z	C	R

COMPONENT:

DATE:

Z	R	C
R	Z	C
Z	C	R

REPLICATE DATA

DATE:

Z	R	C
R	Z	C
Z	C	R

COMPONENT:

DATE:

Z	R	C
R	Z	C
Z	C	R

Z=ZERO C=CANDIDATE R=REFERENCE

ANALYST: Richard Sykes APPROVED BY:

"THIS REPORT STATED ACCURATELY THE RESULTS OF THE INVESTIGATION MADE UPON THE MATERIAL SUBMITTED TO THE ANALYTICAL LABORATORY. EVERY EFFORT HAS BEEN MADE TO DETERMINE OBJECTIVELY, THE INFORMATION REQUESTED; HOWEVER, IN CONNECTION WITH ITS RENDERING OF THIS REPORT, NATIONAL SPECIALTY GASES SHALL HAVE NO LIABILITY IN EXCESS OF ITS ESTABLISHED CHARGE FOR THE SERVICE."

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-26690 CYLINDER #:CC112056 CYL. PRESSURE:2000PSIG

EXPIRATION DATE: 9/15/96 LAST ANALYSIS DATE:9/15/93

CUSTOMER:TWIN CITY OXYGEN P.O.# 6422

METHOD: EPA PROTOCOL # 1 3.0.4. G-1

STANDARD:

SRM #:1667B

CYL #:CLM5046

CONC.:47.3PPM

INSTRUMENT:

COMPONENT: BECKMAN THC

MODEL #: 400

SERIAL #: 1003052

LAST CAL.: 9/1/93

COMPONENT: PROPANE
MEAN CONC: 31.2PPM

REPLICATE CONC.
DATE: 9/15/93 DATE:
31.3PPM
31.1PPM
31.3PPM

COMPONENT:
MEAN CONC:

REPLICATE CONC.
DATE: DATE:

COMPONENT:
MEAN CONC:

REPLICATE CONC.
DATE: DATE:

BALANCE GAS:AIR

Scott Specialty Gases Scott Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Shipped From :

Our Project # : 59

Your P.O. # : 6033MN

Expiration Date : 8-6-93

Cylinder Number : BLM-001645

Cylinder Pressure 1665 psig

1 OF 1 COMPONENTS

Customer :
BENEX
2455 CLEVELAND AVENUE N.
ROSEVILLE, MN. 55113

**** CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES ****
PERFORMED ACCORDING TO SECTION 2.0.7.
Certified Per Traceability Procedure # G2
Protocol # 2
File # PO-2184
Certified Accuracy 2% ANALYTICAL UNCERTAINTY

ANALYZED CYLINDER

COMPONENT	CERTIFIED CONC.
PROPANE	3038 PPM

BALANCE GAS : AIR

REFERENCE STD

SRM # (CRM #)	CYLINDER NUMBER	CONC.
1669B	CLM-000702	466.0 PPM
1668B	CLM-000694	95.00 PPM

INSTRUMENTATION

INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
BECKMAN 400 1002059	1-23-92	FLAME IONIZATION DETECTOR

ANALYSIS

DATE : 2-6-92

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
0.00	65.60	303.8	466.0 PPM	100.00	466.0
0.00	65.60	303.8		100.00	466.0
0.00	65.60	303.8		100.00	466.0

CALCULATED RESULTS 303.8
303.8
303.8

AVERAGE : 303.8 PPM

SAMPLE GAS SPLIT @ 10% OF FULL CONC.
303.8 PPM DIVIDED BY 10% = 3038 PPM.

CALIBRATION CURVE 2 nd DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
1669B	466.0	100	100.00	466.0	0.00
	315.8	68	68.10	315.6	-0.08
	199.9	43	43.30	199.7	-0.10
1668B	95.00	20	20.80	95.45	0.47
	0.0000	0	0.00	0.0000	0.00
		0		0.0000	0.00
		0		0.00	0.00
1668B	95.00	LOW	20.80	95.45	0.47
1669B	466.0	HIGH	100.00	466.0	0.00

Analyst : [signature] Approved By : J. Shapiro

* SMIS - GAS MANUFACTURER'S INTERNAL STANDARD

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

I-3

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-26556 CYLINDER #:CC63681 CYL. PRESSURE:2000PSIG

EXPIRATION DATE: 9/9/95 LAST ANALYSIS DATE:9/9/93

CUSTOMER:TWIN CITY OXYGEN P.O.# 6232
METHOD: EPA PROTOCOL # 1 3.0.4. G-1

STANDARD:

SRM #:1685B

CYL #:CLM4908

CONC.:244.4PPM

INSTRUMENT:

COMPONENT: BECKMAN CHEMILUMINESCENT

MODEL #: 951A

SERIAL #: 0101572

LAST CAL.: 9/1/93

		REPLICATE CONC.	
COMPONENT:	NO	DATE: 9/2/93	DATE: 9/9/93
MEAN CONC:	142PPM	141PPM	142PPM
		142PPM	141PPM
		143PPM	142PPM

		REPLICATE CONC.	
COMPONENT:	NO2	DATE:	DATE:
MEAN CONC:	1.07PPM		

		REPLICATE CONC.	
COMPONENT:		DATE:	DATE:
MEAN CONC:			

BALANCE GAS:N2

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-29403
EXPIRATION DATE: 2/8/96
CUSTOMER:TWIN CITY OXYGEN

CYLINDER #:CC117636 CYL. PRESSURE:2000PSIG
LAST ANALYSIS DATE:2/8/94
P.O.# 8550
METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1

STANDARD:
SRM #:1661A

CYL #:FF28445

CONC.:487PPM

INSTRUMENT:
BECKMAN
COMPONENT: CHEMILUMINESCENT

MODEL #: 951A

SERIAL #: 0101572

LAST CAL.: 1/3/94

COMPONENT: NO
MEAN CONC: 225PPM

REPLICATE CONC.

DATE: 2/1/94	DATE: 2/8/94
224PPM	224PPM
225PPM	226PPM
226PPM	225PPM

COMPONENT: NO2
MEAN CONC: 2.24PPM

REPLICATE CONC.
DATE: DATE:

COMPONENT:
MEAN CONC:

REPLICATE CONC.
DATE: DATE:

BALANCE GAS:N2

APPENDIX J

PROCESS RATE INFORMATION

CHILCO TESTING 6-21-94 THROUGH 6-23-94 PROCESS DATA

CONTENTS

PAGE

CHILCO TESTING 6-21-94 THROUGH 6-23-94
TEST SCHEDULE

CHILCO RTO TESTING 6-21-94

DATE	POLLUTANT	RUN #1		RUN #2	RUN #3	RUN #4
6-21	PM,CO,NOx	1405-1542	inlets	1645-1802	1905-2023	2145-2255
		1300-1303	outlet			
		1405-1523				

four runs of tsp were performed, run 1 was not simultaneous
note: RTO inlet testing was performed for PM only

CHILCO RTO OUTLET TESTING 6-22-94

DATE	POLLUTANT	RUN #1	RUN #2	RUN #3
6-22	HCHO	1019-1125	1232-1303	1530-1625
			1358-1428	1703-1714
6-22	PHENOL	1019-1119	1232-1303	1530-1625
			1358-1428	1703-1708
6-22	VOC	1208-1308	1753-1854	1913-2013
6-22	MDI	1907-2013	2053-2200	2252-2358

CHILCO THERMAL OIL HEATER TESTING 6-22-94

DATE	POLLUTANT	RUN #1	RUN #2	RUN #3
6-22	PM, NOX, CO	1020-1202	1245-1315	1540-1630
			1430-1504	1804-1821

CHILCO THERMAL OIL HEATER TESTING 6-23-94

DATE	POLLUTANT		RUN #1	RUN #2	RUN #3
6-23	VOC	LAP	0827-0927	0951-1051	1109-1209
6-23	VOC	PANEL	0840-0940	0956-1056	1108-1208
6-23	VOC	kONUS	0840-0940	0956-1056	1108-1208

CHILCO TESTING 6-21-94 THROUGH 6-23-94

PROCESS DATA SUMMARY

CHILCO RTO TESTING 6-21-94 pm

12.4 =Plant production rate in TONS per HOUR
1.41 =estimated tons of dry fuel burned based on fuel measurement
26926 =average lb per hour (bone dry) dryer throughput estimation
28755 =average lb per hour (dry moisture) dryer throughput estimation
814 =average dryer inlet temperature in deg. f.
35.7% =moisture content of incoming wood
6.4% =moisture content of wood after drying
843 =MDI resin usage in LBS per hour
3.40% =MDI resin usage as % of finshed product
342 =wax usage in LBS per hour (100% solids)
0.66% =wax usage as % of finshed product (100% solids)
360 =total paint usage in lbs. per hour

CHILCO RTO TESTING 6-22-94 formaldehyde and phenol

12.52 =Plant production rate in TONS per HOUR
1.53 =estimated tons of dry fuel burned based on fuel measurement
27561 =average lb per hour (bone dry) dryer throughput estimation
29321 =average lb per hour (dry moisture) dryer throughput estimation
805 =average dryer inlet temperature in deg. f.
37.1% =moisture content of incoming wood
6.0% =moisture content of wood after drying
947 =MDI resin usage in LBS per hour
3.78% =MDI resin usage as % of finished product
396 =wax usage in LBS per hour (100% solids)
0.76% =wax usage as % of finshed product (100% solids)
1497 =total paint usage in lbs. per hour

CHILCO RTO TESTING 6-22-94 VOC

12.54 =Plant production rate in TONS per HOUR
1.45 =estimated tons of dry fuel burned based on fuel measurement
26806 =average lb per hour (bone dry) dryer throughput estimation
28456 =average lb per hour (dry moisture) dryer throughput estimation
813 =average dryer inlet temperature in deg. f.
31.5% =moisture content of incoming wood
5.8% =moisture content of wood after drying
944 =MDI resin usage in LBS per hour
3.76% =MDI resin usage as % of finished product
417 =wax usage in LBS per hour
0.80% =wax usage as % of finshed product
384 =total paint usage in lbs. per hour

07/26/94 JUNPRODA.WK4

CHILCO TESTING 6-21-94 THROUGH 6-23-94

PROCESS DATA SUMMARY

CHILCO RTO TESTING 6-22-94 MDI

12.35 =Plant production rate in TONS per HOUR
950 =MDI resin usage in LBS per hour
3.85% =MDI resin usage as % of finshed product
440 =wax usage in LBS per hour
0.86% =wax usage as % of finshed product

CHILCO THERMAL OIL HEATER TESTING 6-22-94 PM,CO,NOX

12.34 =Plant production rate in TONS per HOUR
0.82 =estimated TONS of bark fuel fuel burned based on fuel measurement
14.82 =estimated mm BTU per hour fuel input based on fuel measurement

CHILCO THERMAL OIL HEATER TESTING 6-23-94 VOC

12.57 =Plant production rate in TONS per HOUR
0.94 =estimated TONS of bark fuel fuel burned based on fuel measurement
16.89 =estimated mm BTU per hour fuel input based on fuel measurement

CHILCO SIDING LINE TESTING 6-23-94 VOC

PANEL LINE
19913 =average square feet (3/8") siding production per hour during test
320 =average paint usage per hour during test
LAP LINE
16727 =average square feet (3/8") siding production per hour during test
280 =average paint usage per hour during test

07/26/94 JUNPRODA.WK4

3A

CHILCO RTO TESTING 6-21-94 PM, CO, NOX

DATA TIME: START= 14:00 END= 23:00 HOURS= 9.00

BOARD WEIGHTS - LBS
weight of approximately every 25th untrimmed board

203	203	208
205	211	206
201	210	204
197	210	210
190	201	207
200	207	202
204	202	207
203	212	207
211	209	210
204	203	211
198	206	216
212	202	215
217	212	206
210	211	205
209	206	204
217	208	

206.64 lb = average untrimmed mat weight

192.38 lb = average finished board weight (8'x16') (untrimmed mat weight-weight of trim)

6.9% = TRIM

41.22 lb = average density

PLANT PRODUCTION RATE

9.00 =hours during testing
145 =pressloads
1160 =No. of (8' X 16') boards produced (no. of pressloads x 8 boards per load)
223161 =Lbs. finished product (no. of boards x weight of finished board)
24796 =Lbs. finished product produced per hour (lbs. of finished product / testing hours)
12.40 =Tons finished product per hour (lbs. of finished product per hour / 2000 lb)

DRYER PRODUCTION RATE:

25045 =lb per hour (bone dry) dryer throughput calibration on 6-16-94
29465 =lb per hour (bone dry) dryer throughput calibration on 6-23-94
29465 =estimated lb per hour (bone dry) dryer throughput calibration
note average calibration was not used. Use of the average would not mass balance.
999 =feed rate during calibration
913 =average feed rate during testing
26926 =average lb per hour (bone dry) material through dryer per hour
28755 =average lb per hour (dry moisture) material through dryer per hour

35.7% =moisture content of incoming wood
6.4% =moisture content of wood after drying

814 =average dryer inlet temperature during testing

DRYER FUEL BURNING RATE

5.625 =fuel calibration on lbs. per count
4497 =total counts during testing
9.00 =hours during testing
25296 =total lbs. of fuel burned during testing (calibration x total counts)
2811 =lbs of fuel burned per hour (total lbs fuel burned / testing hours)
1.41 = Tons of fuel burned per hour (lbs of fuel burned per hour / 2000 lbs.)
8600 =estimated BTU content per lb. of wood fuel
24.2 =estimated mmbtu input per hour (BTU content per lb. x lb. per hour)

07/26/94 JUNPRODA.WK4

4

CHILCO RTO TESTING 6-21-94 PM, CO, NOX

DATA TIME: START= 14:00 END= 23:00 HOURS= 9.00

RESIN AND WAX USAGE

223161	=Lbs. finished product (no. of boards x weight of finished board) during testing
7588	=lbs of MDI resin used during testing
843	=lbs of MDI resin used per hour
3.40%	= MDI resin used as % of finished product
3082	=lbs of wax used during testing at 48% solids
342	=lbs of wax used per hour at 48% solids
1479	=lbs of wax used during testing at 100% solids
164	=lbs of wax used per hour at 100% solids
0.66%	=wax used as % of finished product at 100% solids

SIDING LINE PAINT USAGE

10	=data hours during testing
	PANEL LINE
35	=total units painted during testing (1330-2330)
104545	=square feet (3/8" basis)
10455	=average square feet (3/8") siding production per hour during test
250908	=equivalent daily siding production in square feet (3/8")
5	=inches of paint used
300.2	= paint calibration (lbs per inch)
1501	=total paint usage during testing - lbs
150	=average paint usage per hour during test
	LAP LINE
42	=total units painted during testing (1330-2330)
125454	=square feet (3/8" basis)
12545	=average square feet (3/8") siding production per hour during test
301090	=equivalent daily siding production in square feet (3/8")
7	=inches of paint used (81-74)
300.2	= paint calibration (lbs per inch)
2101	=total paint usage during testing - lbs
210	=average paint usage per hour during test

Bernie

DRYER DATA SHEET

DATE 6-21-94
BY Bernie
PAGE 1 OF Day 14 (Tues)
READINGS EVERY 10 MIN.

PLANT: CHILCO

FUEL CALIBRATION:

TIME	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	WET BIN LEVEL	DRY BIN LEVEL SUR.	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE OUT
0730	GAS 200	950	1091	201	-0-	3/4	1/2+	1/2-		
0740	GAS 200	969	1078	199	-0-	3/4	1/2	1/2		
0750	GAS 199	999	1017	196	-0-	3/4	1/2	1/2	25.6	
	GAS									5.0
0800	GAS 198	999	1081	199	-0-	3/4	1/2	1/2		
0810	GAS 197	999	1145	196	-0-	3/4	1/2	1/2-		5.2
0820	GAS 196	999	1085	192	-0-	3/4	2/3	1/2	28.0	
0830	GAS 197	999	1171	197	-0-	F	2/3	1/2+		
0840	GAS 197	999	1358	197	-0-	3/4	F	1/2		
0850	GAS 197	999	946	199	-0-	3/4	2/3	2/3		
0900	GAS 196	999	1152	196	-0-	F	3/4	2/3		5.2
0910	GAS 197	999	1297	198	-0-	F	F	F	38.6	
0920	GAS 197	859	1244	201	-0-	3/4	F	F		
0930	GAS 197	859	789	201	-0-	2/3	F	F		
0940	GAS 199	999	1176	197	-0-	1/2-	3/4	3/4		
0950	GAS 197	999	1158	193	-0-	1/2	3/4	3/4		
1000	GAS 198	999	1072	197	-0-	2/3	F	3/4		
1010	GAS 198	939	1294	197	-0-	2/3	F	F		7.0
1020	GAS 198	759	814	198	-0-	2/3	F	F		
1030	GAS	PRESS	DOWN	(PAPER)		3/4	F	F	35.2	
1040	GAS 233	829	653	208	-0-	2/3	3/4	3/4		
1050	GAS 209	999	980	205	-0-	1/2+	2/3	2/3		
1100	GAS 203	999	1012	204	-0-	2/3	3/4	1/2		
1110	GAS 200	999	1152	202	-0-	3/4	2/3	2/3		6.0
1120	GAS 199	999	1209	202	-0-	3/4	2/3	2/3	39.0	
1130	GAS 199	999	907	199	-0-	3/4	2/3	1/2+		
1140	GAS 199	999	1231	199	-0-	3/4	2/3	1/2		
1150	GAS 199	999	1183	197	-0-	3/4	1/2+	2/3		

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DRYER DATA SHEET

DATE 6-21-94
BY Bernie
PAGE 2 OF Day I 4 (Tues)
READINGS EVERY 10 MIN.

PLANT: CHILCO

FUEL CALIBRATION:

TIME	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	WET BIN LEVEL	DRY BIN LEVEL SUR.	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE OUT
1200	GAS 199	999	1312	199	-0-	F	2/3	1/2		
1210	GAS 199	999	1314	197	-0-	F	2/3	1/2		5.4
1220	GAS 199	999	1074	195	-0-	F	2/3	1/2+		
1230	GAS 199	999	1101	197	-0-	3/4	2/3	1/2+		
1240	GAS 199	999	1163	201	-0-	F	2/3	3/4	36.6	
1250	GAS 200	999	1245	202	-0-	3/4	F	3/4		
1300	GAS:WOOD 197	999	955	207	-0-	F	F	3/4		
1310	GAS:WOOD 196	999	1035	203	-0-	F	3/4	3/4		6.1
1320	GAS:WOOD 197	999	996	198	-0-	F	3/4	3/4		
1330	GAS:WOOD 197	809	697	195	-0-	3/4	F	F	44.7	
1340	GAS:WOOD 200	829	587	206	-0-	3/4	F	3/4		
1350	205	709	655	197	260	3/4	F	F		
1400	209	819	715	208	270=0	F	F	3/4		
1410	205	959	802	203	167	3/4	3/4	3/4		7.5
1420	204	979	843	203	249	F	3/4	3/4		
1430	206	979	1019	203	358	F	3/4	F	48.9	
1440	206	929	928	206	461	F	F	F		
1450	206	870	917	206	589	3/4	F	F		
1500	206	900	849	207	650=0	3/4	F	F		
1510	204	900	780	205	104	3/4	F	F		6.4
1520	200	900	672	201	167	1/2-	3/4	3/4		
1530	200	900	631	200	233	1/2-	F	3/4	28.5	
1540	200	929	659	200	295	1/2-	F	3/4		
1550	199	929	681	200	377	1/2	3/4	3/4		
1600	198	929	656	198	430=0	2/3	3/4	F		
1610	196	909	665	196	61	3/4	3/4	3/4		5.6
1620	194	909	640	193	127	F	3/4	3/4		
1630	194	909	762	193	204	F	3/4	3/4	33.2	
1640	194	909	766	193	293	F	3/4	2/3		
1650	194	929	811	193	365	F	2/3	F		

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DRYER DATA SHEET

DATE 6-21-94
BY BERNIE
PAGE 3 OF DAY 14 (TUES)
READINGS EVERY 10 MIN.

PLANT: CHILCO

FUEL CALIBRATION:

TIME	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	WET BIN LEVEL	DRY BIN LEVEL SUR.	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE OUT
1700	195	969	849	195	450-0	F	2/3	2/3		
1710	198	969	875	197	95	3/4	2/3	2/3		6.6
1720	198	969	841	198	165	3/4	3/4	3/4		
1730	198	909	775	200	247	F	F	3/4	22.7	
1740	198	850	684	199	312	3/4	F	F		
1750	198	850	719	198	387	3/4	F	F		
1800	198	850	704	198	462=0	2/3	F	F		
1810	198	850	762	197	79	1/2-	F	F		6.8
1820	199	850	790	199	163	1/2+	F	F		
1830	199	850	779	199	237	2/3	F	F	33.8	
1840	199	850	763	199	324	3/4	3/4	F		
1850	198	850	737	199	395	F	3/4	3/4		
1900	197	850	695	198	469=0	3/4	3/4	3/4		
1910	197	890	699	198	70	2/3	3/4	3/4		
1920	197	929	789	196	139	1/2+	2/3	2/3		
1930	197	929	773	198	221	1/2	F	1/2		5.2
1940	197	929	785	197	296	1/2	2/3	2/3		
1950	197	929	771	197	362	1/2+	2/3	2/3	27.4	
2000	197	929	812	196	441=0	3/4	2/3	2/3		6.9
2010	197	929	806	197	84	3/4	2/3	2/3		
2020	197	929	797	197	154	3/4	F	1/2	45.8	
2030	199	929	390	197	240	F	2/3	2/3		
2040	197	929	859	197	327	F	1/2	F		
2050	199	929	1000	198	432	3/4	F	1/2		
2100	200	929	1038	201	525=0	F	2/3	2/3		7.4
2110	200	929	951	200	96	F	2/3	2/3		
2120	200	929	926	201	184	F	2/3	3/4	49.4	
2130	198	929	912	199	279	F	3/4	2/3		
2140	201	929	1043	200	390	3/4	F	2/3		
2150	201	929	1018	201	477	3/4	2/3	3/4		

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DRYER DATA SHEET

DATE 6-21-94
BY BERNIE
PAGE 4 OF DAY 4 I (TUES
READINGS EVERY 10 MIN.

PLANT: CHILCO

FUEL CALIBRATION:

TIME	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	WET BIN LEVEL	DRY BIN LEVEL SUR.	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE OUT
2200	201	929	1014	201	565=0	F	F	2/3		
2210	203	929	989	203	100	3/4	2/3	F		6.2
2220	203	929	935	203	187	F	2/3	F		
2230	203	929	849	204	276	F	F	3/4	31.8	
2240	201	929	779	202	349	F	3/4	F		
2250	201	929	802	201	425	3/4	3/4	F		
2300	199	929	791	199	505=0	3/4	3/4	F		5.0
2310	199	929	771	200	72	3/4	3/4	F		
2320										

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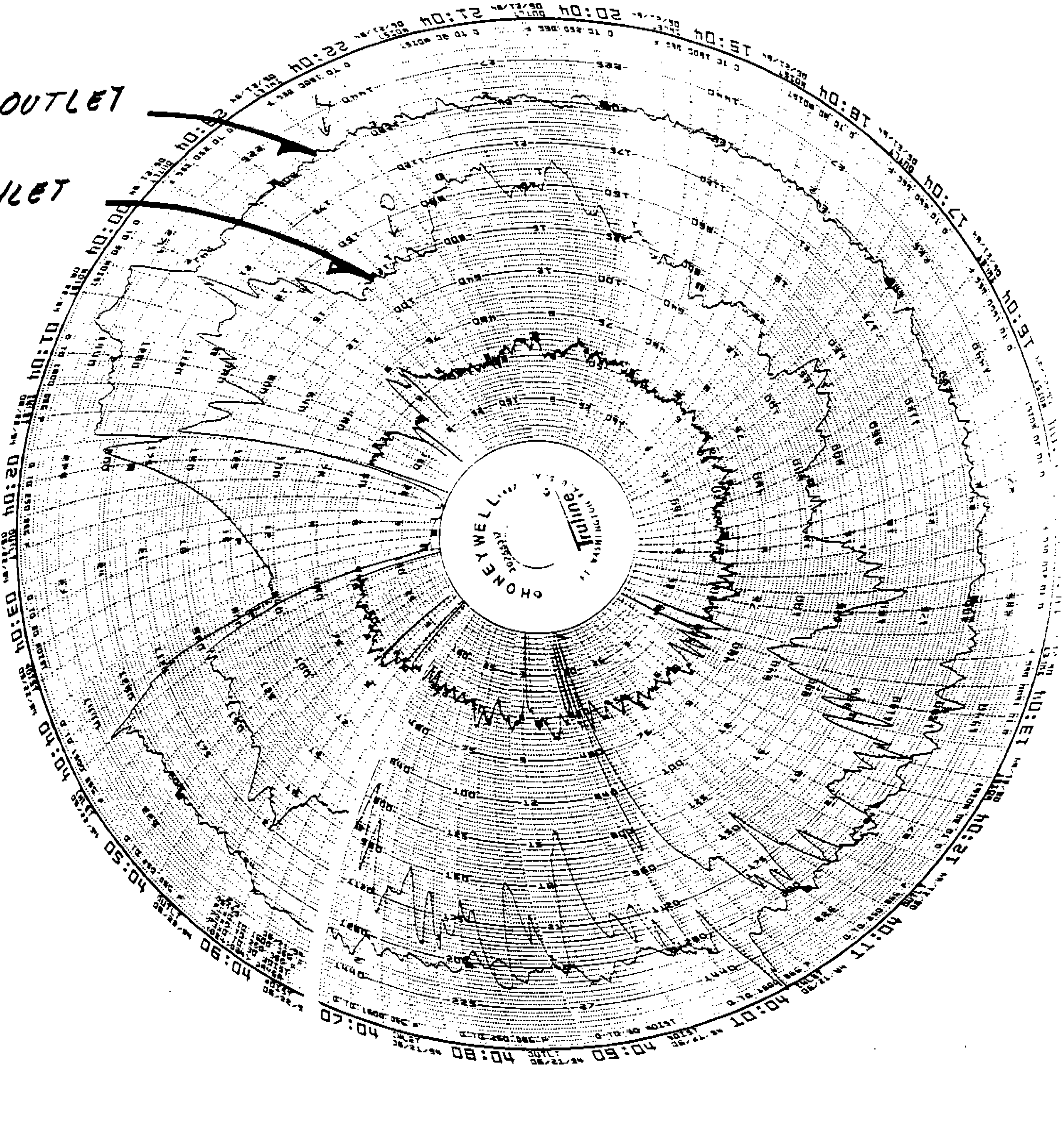
DRYER CHART
6-21-94
0700 - 0700

OUTLET

INLET



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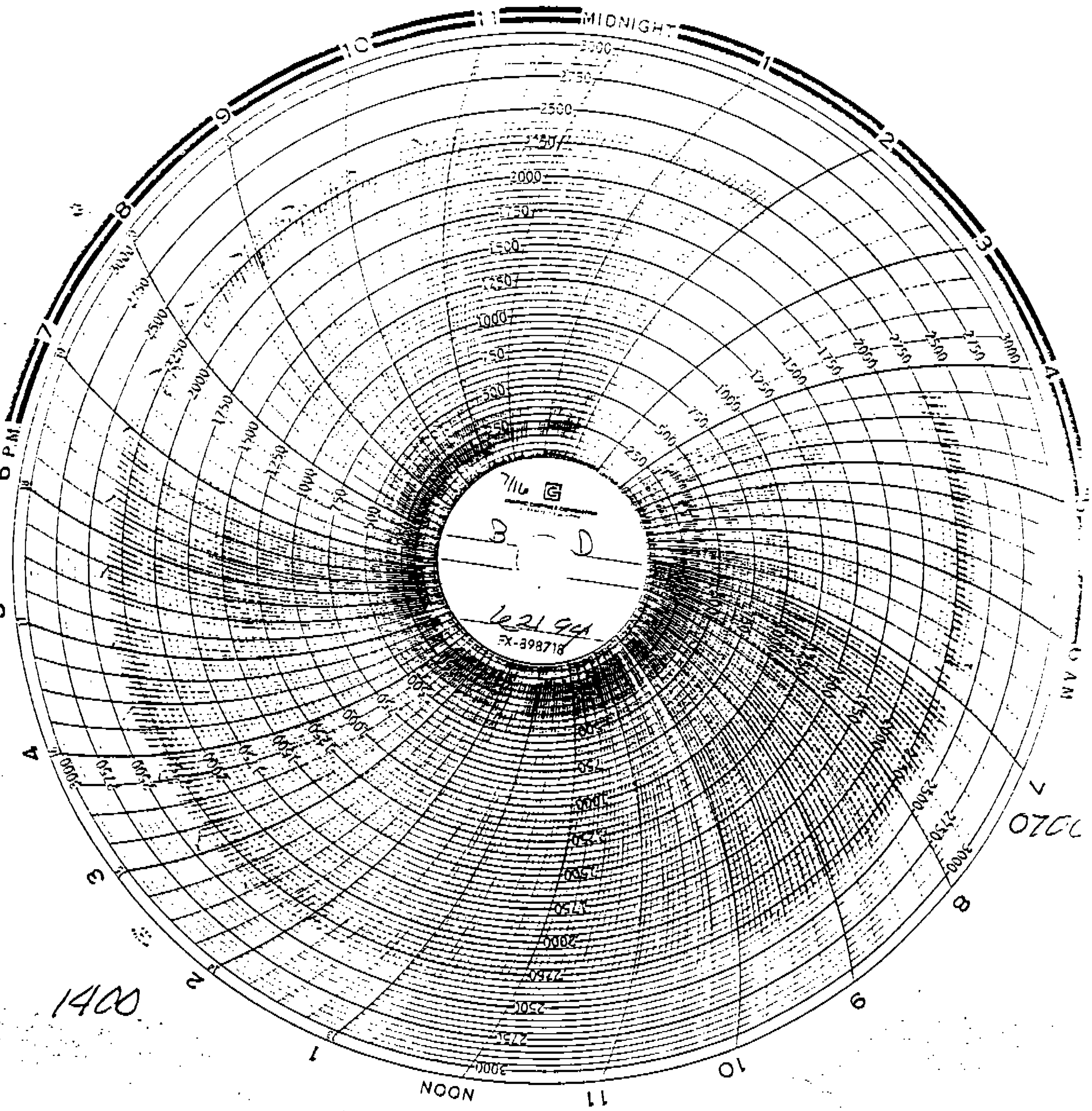
PRESS CHART
6-21-93

2300



1400

0700

11

PRESS REPORT
0700 - 1900
6-21-93

LOUISIANA-PACIFIC CORPORATION
CHILCO, IDAHO

OPERATOR G. LACY

THICKNESS 7/16

PRESS TEMP 210°

SHIFT DAY CREW B DATE 6-21-94

PRESS LOADS 184

TOTAL CAULS REJECTED 0

TOTAL FOOTAGE 219825

TOTAL DOWNTIME 18

FINES SETTING	LINE SPEED	FROM	TO
34	999 3744	67:00	8:10
32	890	8:10	9:23
34	999	9:23	12:10
32	890	12:10	1:00
34	999	1:00	7:00

PAPER COUNTS
1. 394
2. 394
3. 404
4.

PRESS LOADS PER HOUR			
7:00	16	1:00	14
8:00	14	2:00	16
9:00	17	3:00	16
10:00	12	4:00	16
11:00	16	5:00	15
12:00	15	6:00	17

167

PRESS TEMP = 210°C

FACE RESIN TOTALIZER

	DOWNTIME FROM	TO	MIN	REASON FOR DOWNTIME
	10:15	10:20	5	Paper - Knife stayed Digit meter ↓
	10:23	10:27	4	Paper Knife stayed Down
11	1:25	1:27	2	Paper Catch - Roll change
	1:40	1:42	2	Press stayed closed
14	1:45	1:46	1	Potentiometer - Problems
18	5:28	5:32	4	paper missed

CORE RESIN TOTALIZER

TIME TO POSITION (SECONDS)									
1	65	39	67	77	51	115	42	153	51
2	67	40	68	78	53	116	44	154	55
3	69	41	53	79	55	117	46	155	56
4	66	42	45	80	56	118	49	156	57
5	68	43	47	81	46	119	48	157	54
6	69	44	48	82	42	120	46	158	59
7	73	45	[illegible]	83	45	121	48	159	60
8	67	46	47	84	47	122	47	160	58
9	66	47	41	85	49	123	46	161	55
10	65	48	43	86	48	124	45	162	51
11	72	49	42	87	44	125	46	163	51
12	71	50	42	88	48	126	44	164	52
13	70	51	44	89	47	127	45	165	51
14	67	52	48	90	46	128	[illegible]	166	51
15	66	53	47	91	44	129	51	167	52
16	65	54	47	92	44	130	56	168	52
17	65	55	44	93	51	131	55	169	50
18	65	56	41	94	50	132	57	170	49
19	66	57	44	95	50	133	52	171	48
20	70	58	39	96	54	134	52	172	45
21	63	59	42	97	55	135	52	173	50
22	60	60	46	98	60	136	50	174	50
23	62	61	52	99	62	137	50	175	52
24	50	62	49	100	60	138	44	176	52
25	48	63	46	101	60	139	68	177	53
26	49	64	47	102	60	140	72	178	53
27	47	65	41	103	57	141	68	179	51
28	47	66	49	104	45	142	65	180	48
29	53	67	46	105	45	143	57	181	49
30	50	68	51	106	46	144	59	182	57
31	50	69	52	107	47	145	59	183	55
32	47	70	52	108	45	146	57	184	[illegible]
33	45	71	51	109	45	147	58	185	
34	49	72	53	110	44	148	57	186	
35	54	73	54	111	45	149	56	187	
36	55	74	52	112	46	150	54	188	
37	59	75	52	113	43	151	54	189	
38	64	76	51	114	43	152	53	190	

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PRESS REPORT
6-21-93
1900 - 0700

LOUISIANA-PACIFIC CORPORATION
CHILCO, IDAHO

OPERATOR Weiss

THICKNESS 7/16

PRESS TEMP 210°

SHIFT GRAVE CREW D DATE 6-21-94

PRESS LOADS 149

TOTAL CAULS REJECTED /

TOTAL FOOTAGE 178010

TOTAL DOWNTIME 163

FINES SETTING	LINE SPEED	FROM	TO
34	999 37ft	19:00	07:00

PAPER COUNTS
1. 389
2. ~~456~~
3. 457
4.

PRESS LOADS PER HOUR			
7:00	16	1:00	15
8:00	11	2:00	—
9:00	17	3:00	—
10:00	16	4:00	12
11:00	16	5:00	15
12:00	12	6:00	14

FACE RESIN TOTALIZER

CORE RESIN TOTALIZER

DOWNTIME FROM	TO	MIN	REASON FOR DOWNTIME
00:06		3	starting u.L.
00:30		11	stacker crash
01:54		136	Flying cc saw
04:18		2	Adj. u.L. cutter
04:25		2	stacker
04:35	155	1	"
06:25		3	#7 unloader clamp drop
06:31		2	jog A
06:45		3	bd. crash a crosscuts

TIME TO POSITION (SECONDS)

1	54	39	52	77	59	115	77	153
2	54	40	50	78	58	116	79	154
3	57	41	54	79	60	117	81	155
4	55	42	54	80	60	118	77	156
5	60	43	57	81	63	119	77	157
6	54	44	60	82	63	120	73	158
7	63	45	57	83	61	121	75	159
8	55	46	55	84	56	122	74	160
9	54	47	55	85	65	123	75	161
10	59	48	51	86	64	124	72	162
11	60	49	63	87	61	125	69	163
12	55	50	67	88	61	126	69	164
13	54	51	69	89	53	127	76	165
14	55	52	57	90	59	128	74	166
15	56	53	59	91	55	129	65	167
16	56	54	59	92	52	130	66	168
17	55	55	61	93	53	131	71	169
18	57	56	53	94	57	132	71	170
19	55	57	52	95	64	133	68	171
20	57	58	55	96	61	134	67	172
21	55	59	55	97	60	135	69	173
22	57	60	54	98	60	136	67	174
23	55	61	53	99	60	137	73	175
24	55	62	54	100	59	138	75	176
25	56	63	54	101	57	139	73	177
26	56	64	51	102	57	140	71	178
27	53	65	51	103	51	141	68	179
28	56	66	51	104	54	142	63	180
29	57	67	50	105	55	143	59	181
30	53	68	49	106	54	144	55	182
31	53	69	49	107	55	145	61	183
32	57	70	53	108	54	146	53	184
33	55	71	53	109	64	147	53	185
34	60	72	55	110	77	148	59	186
35	54	73	57	111	80	149	121	187
36	50	74	60	112	75	150		188
37	51	75	64	113	72	151		189
38	55	76	59	114	75	152		190

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Chilco OSB Stack Testing **Press Room Readings** **Date:** 6-21-94

Cumulative Pounds				Readings Every 10 Minutes		
				Recorder:		
Time	Core MDI	Surface MDI	Fines Resin	Core Wax	Face Wax	FINES WAX LB/HR
0730	152	278	77	40	78	
0740	200	362	101	63	118	
0750	249	450	114	85	159	13.54
0800	297	536	136	107	199	
0810	345	619	161	131	239	
0820	386	691	185	152	277	
0830	426	763	208	173	311	
0840	468	837	217	194	345	
0850	512	917	237	217	382	11.85
0900	548	984	253	237	413	
0910	588	1059	276	257	449	
0920	629	1135	299	278	485	
0930	680	1225	324	300	523	
0940	724	1302	345	318	557	
0950	775	1385	366	341	594	14.39
1000	824	1470	372	362	632	
1010	863	1525	372	378	656	
1020	908	1594	372	396	687	
1030	941	1655	372	409	713	
1040	988	1736	372	431	750	
1050	1040	1823	372	455	791	10.16
1100	1092	1913	372	479	833	
1110	1144	2001	372	503	875	
1120	1196	2691	372	527	917	
1130	1248	2181	372	552	958	
1140	1299	2266	372	575	998	
1150	1351	2355	372	600	1040	13.54

FINES WAX AVERAGED ≈ 12 LB PER HOUR
12 LB/HR USED TO ESTIMATE USAGE

Use Military Time

48%

14

Chilco OSB Stack Testing **Press Room Readings** **Date:** 6-21-94

Cumulative Pounds

Readings Every 10 Minutes

Recorder:

Time	Core MDI	Surface MDI	Fines Resin	Core Wax	Face Wax	FINES WAX
1200	1404	2444	372	624	1083	
1210	1455	2533	372	649	1125	
1220	1501	2613	372	673	1167	
1230	1546	2692	372	694	1205	
1240	1592	2770	372	717	1239	
1250	1636	2849	372	739	1272	12.69
1300	1681	2926	372	760	1305	
1310	1732	3015	372	782	1344	
1320	1788	3110	372	804	1385	
1330	1831	3164	372	818	1408	
1340	1887	3261	372	838	1439	
1350	1931	3321	372	852	1466	11.85
1400	1987	3397	372	874	1499	
1410	2043	3492	372	896	1541	
1420	2102	3586	372	918	1582	
1430	2160	3684	372	939	1623	
1440	2212	3769	372	961	1661	
1450	2266	3861	372	983	1699	13.54
1500	2324	3956	372	1006	1740	
1510	2382	4050	372	1028	1782	
1520	2440	4145	372	1050	1826	
1530	2496	4237	384	1072	1869	
1540	2543	4320	411	1094	1910	
1550	2590	4404	436	1115	1952	13.54
1600	2637	4490	462	1138	1995	
1610	2687	4578	488	1160	2038	
1620	2737	4666	515	1183	2083	
1630	2788	4757	542	1207	2129	
1640	2840	4847	569	1230	2176	
1650	2886	4931	591	1250	2218	13.54

Use Military Time

15

JOHN Loya

Chilco OSB Stack Testing **Press Room Readings** **Date:** 6-21-94

Cumulative Pounds				Readings Every 10 Minutes	
				Recorder:	

Time	Core MDI	Surface MDI	Fines Resin	Core Wax	Face Wax	Fines wa.
1700	2934	5012	615	1271	2261	
1710	2984	5101	642	1293	2306	
1720	3023	5167	662	1310	2340	
1730	3062	5233	683	1327	2373	
1740	3111	5318	708	1349	2416	
1750	3159	5403	731	1369	2459	12.69
1800	3208	5491	757	1391	2503	
1810	3257	5574	783	1411	2546	
1820	3315	5675	812	1435	2596	
1830	3356	5746	834	1454	2634	
1840	3408	5838	861	1476	2681	
1850	3458	5925	887	1496	2726	14.39
1900	3504	6007	911	1515	2768	
1910	3554	6094	932	1536	2814	
1920	3603	6181	958	1556	2858	
1930	3663	6286	985	1578	2912	
1940	3702	6355	1007	1595	2948	
1950	3755	6449	1034	1616	2996	13.54
2000	3800	6529	1058	1634	3036	
2010	3850	6616	1084	1654	3081	
2020	3900	6699	1114	1675	3123	
2030	3949	6790	1136	1693	3170	
2040	3998	6877	1162	1712	3215	
2050	4047	6964	1188	1732	3260	13.54
2100	4098	7052	1214	1753	3305	
2110	4147	7172	1241	1773	3352	
2120	4197	7229	1268	1794	3398	
2130	4247	7315	1293	1815	3441	
2140	4295	7399	7401	1836	3486	
2150	4349	7494	1346	1859	3535	14.39

Use Military Time

84625

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John Loyo

Chilco OSB Stack Testing **Press Room Readings** **Date:** 6-21-94

Cumulative Pounds

Readings Every 10 Minutes

Recorder:

Time	Core MDI	Surface MDI	Fines Resin	Core Wax	Face Wax	Fines Wax
2200	4394	7578	1370	1880	3578	
2210	4446	7664	1396	1901	3622	
2220	4494	7749	1421	1923	3666	
2230	4543	7836	1447	1944	3711	
2240	4596	7929	1475	1966	3759	
2250	4648	8023	1503	1988	3807	14.39
2300	4691	8098	1526	2008	3847	
2310	4742	8187	1552	2030	3893	
2315	4769	8235	1567	2042	3918	
						3.39
1400	1987	3397	372	874	1499	
2200	4396	7578	1370	1880	3578	
NET	2409	4181	998	1006	2079	96

Use Military Time

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READINGS EVERY 10 MIN.

E-TUBE DATA SHEET

DATE 6/21/94

BY Jerald Markley Geoenergy

page 1 of

PLANT: Chilco L.P. Corp.

TIME	QUENCH CHAMBER TEMP	SOUTH TR SET KV	MA	SPARK RATE	NORTH TR SET KV	MA	SPARK RATE	INDICATE TIME OF FLUSH CYCLE
AM 7:45	175/144	34	200	29.9	38	350	30	—
8:00	175/144	30	50	30.8	FLUSH	FLUSH	32.8	FLUSH 102
8:10	" / "	32	130	29.6	36	150	29.7	—
8:20	" / "	34	200	29.6	36	180	29.7	—
8:30	175/147	33	170	29.9	36	180	29.9	—
8:40	175/146	34	200	29.7	36	240	29.7	—
8:55	174/141	35	200	30.2	38	250	29.7	—
9:05	174/145	34	180	29.9	38	250	29.9	—
9:15	174/143	34	190	"	38	270	29.7	—
9:25	174/137	35	180	29.7	38	200	29.8	—
9:35	174/138	34	170	29.9	38	230	29.8	—
10:00	174/147	—	—	30.5	35	160	30.1	FLUSH 101
10:15	174/144	32	150	29.6	37	270	29.8	—
10:30	171/139	32	140	29.8	40	250	29.7	—
10:55	170/147	34	210	29.6	40	320	29.7	—
11:15	173/146	34	200	29.7	40	330	29.8	—
11:40	175/143	35	200	29.7	40	300	29.8	—
PM 12:10	174/147	35	210	29.4	34	160	30.6	
12:20	175/148	35	250	29.8	35	150	29.8	—
12:30	173/148	36	220	29.7	38	250	29.7	—
12:40	172/148	36	210	30.0	38	260	29.6	—
12:50	173/148	36	250	29.7	38	270	30	—
1:00	169/143	36	270	29.8	38	240	30	—
1:10	165/152	35	240	29.9	40	340	29.7	
1:20	165/147	35	220	30	38	310	29.7	—
1:35	163/140	35	180	29.8	38	280	30	—
1:45	157/136	35	225	29.8	38	280	30	
1:55	153/136	35	250	29.9	38	250	29.9	
2:05	156/142	—	—	31.4	36	160	30	FLUSH 101
2:15	154/144	32	120	31.1	39	320	29.5	

Should have flushed @ 12:00 ... Did flush but ...

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READINGS EVERY 10 MIN.

E-TUBE DATA SHEET

DATE 6/21/94

BY

page 2 of

PLANT: Chilco

[redacted]

TIME	QUENCH CHAMBER TEMP	SOUTH TR SET 101 KV	MA	SPARK RATE	NORTH TR SET 102 KV	MA	SPARK RATE	INDICATE TIME OF FLUSH CYCLE
PM 2:25	149/146	34	140	29.6	38	300	29.7	—
2:35	151/149	34	190	29.9	39	280	30	—
2:45	160/149	34	180	29.9	40	350	29.7	—
2:55	155/145	35	220	29.7	38	320	29.7	—
3:05	153/142	35	200	29.9	40	300	29.9	—
3:15	149/141	40	210	29.7	40	380	29.6	—
3:30	150/135	34	250	29.8	37	360	29.8	—
3:40	155/136	34	250	29.8	39	330	29.9	—
3:50	149/139	35	230	29.8	38	340	29.6	—
4:00	150/136	34	240	29.8	38	30	30	FLUSH 102
4:10	151/136	36	260	29.9	31	100	32.4	
4:20	150/137	36	260	29.7	34	150	29.6	
4:30	147/138	36	240	29.7	38	200	29.7	
4:40	147/140	36	300	29.6	38	200	29.5	
4:50	147/142	36	300	29.8	38	280	29.8	
5:00	151/143	38	300	29.6	38	280	29.8	
5:10	143/143	34	300	29.6	40	320	29.6	
5:20	141/143	35	300	29.8	39	300	29.7	
5:30	139/139	35	280	29.8	38	360	28.9	
5:40	141/136	36	350	29.8	40	350	29.5	
5:50	141/137	36	400	29.8	38	400	29.8	
6:00	148/136	38	380	28.9	40	350	29.8	
6:10	147/137	10	ø	31.8	36	280	30.4	FLUSHING 101
6:20	144/139	30	150	29.6	40	400	29.7	
6:30	145/140	32	200	29.9	40	400	29.9	
6:40	146/138	32	200	29.7	40	400	28.7	
6:50	145/135	34	200	29.6	40	440	28.4	
7:00	144/138	33	200	29.5	40	500	29.9	
7:10	139/138	32	300	29.8	40	520	29.8	
7:20	142/137	32	320	29.8	40	500	29.7	

(4:05

FLUSH BUT NOT NOTICED (TIME between

READINGS EVERY 10 MIN.

E-TUBE DATA SHEET

DATE 6/21/94

BY

PLANT: Chilco

page 3 of

TIME	QUENCH CHAMBER TEMP	SOUTH TR SET 101 KV	MA	SPARK RATE	NORTH TR SET 102 KV	MA	SPARK RATE	INDICATE TIME OF FLUSH CYCLE
7:30	145/138	35	280	29.9	40	550	29.0	—
7:40	143/140	35	320	29.2	40	500	29.0	
7:50	143/140	35	325	29.7	39	550	24.8	
8:00	156/141	35	330	29.8	40	550	24.6	1
8:10	142/140	35	75	30.9	35	75	29.9	FLUSH 1 min 20 sec 8:08 pm
8:20	142/141	35	200	29.6	37	275	29.7	
8:30	143/143	36	250	29.6	35	200	29.7	
8:40	141/143	34	300	29.7	36	250	29.8	
8:50	145/147	34	300	29.6	36	250	29.6	
~~9:00~~	143/140	34	300	29.6	35	275	29.8	
9:00	145/147	32	275	30.0	37	350	29.5	
9:10	139/145	32	350	29.9	36	300	29.4	
9:20	143/146	33	225	29.7	40	500	27.5	
9:30	—	—	—	—	—	—	—	—
9:40	142/142	32	350	29.5	35	500	29.6	
9:50	145/149	32	400	29.9	40	500	27.9	
10:00	143/142	30	300	29.8	35	325	29.3	101 FLUSH 2 min @ 10:08
10:10	135/143	20	~~5~~	32.1	33	200	29.5	
10:20	135/146	32	125	31.1	37	400	29.0	
10:30	133/142	33	150	29.7	40	500	27.9	
10:40	134/140	33	175	29.8	38	550	26.8	
10:50	134/142	32	200	29.8	40	450	28.2	
11:00	135/141	33	175	29.6	36	450	28.4	
11:10	135/139	33	200	29.7	38	350	27.7	

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RTO readings Plant: chilco readings evey 10 minutes by: D. P[illegible] date: [illegible] Page 1 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	B#2	B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used ½ HR.
07:40	308	259	279	271	226	221	259	311	2.1	1549	1550	1547	137	1577	213	2.53	1605
																re-checked temp.	
07:50	308	259	280	272	206	221	258	312	2.2	1544	1549	1540	137	1519	211	2.33	
08:00	307	260	281	270	226	222	253	311	2.0	1547	1517	1539	137	1573	223	2.59	1606
08:10	312	258	281	272	225	223	248	319	2.4	1552	1550	1559	138	1578	220	2.68	
08:20	313	258	282	271	226	225	248	319	2.2	1550	1550	1561	138	1581	220	2.58	
08:30	314	258	282	272	226	226	241	320	2.4	1551	1548	1554	140	1582	221	2.53	1606
08:40	310	260	283	272	225	225	251	312	1.8	1550	1548	1540	140	1580	215	2.41	
08:50	311	260	281	274	228	224	261	312	2.4	1541	1548	1544	139	1578	222	2.58	
09:00	315	260	281	276	227	225	257	316	2.2	1549	1547	1541	140	1580	226	2.17	1606
09:10	316	260	283	273	228	226	250	319	2.0	1551	1550	1558	140	1583	224	2.72	
09:20	314	260	284	272	229	226	253	319	2.2	1550	1550	1561	141	1582	225	2.57	
09:30	313	261	284	271	229	225	254	318	2.4	1550	1554	1564	140	1583	226	2.18	1607
09:40	313	261	282	272	229	2.41	261	311	2.4	1548	1548	1540	141	1582	227	2.54	
09:50	316	260	284	272	229	227	251	320	2.2	1551	1552	1559	141	1585	226	2.68	
[illegible]	313	261	284	275	229	225	261	313	2.2	1548	1550	1544	142	1575	228	2.16	1607
[illegible]	318	262	281	271	228	227	254	320	1.8	1552	1549	1555	143	1582	225	2.57	
[illegible]	318	262	284	271	230	229	252	322	2.5	1551	1549	1558	142	1582	228	2.63	
[illegible]	314	263	283	273	221	226	258	315	3.0	1550	1553	1550	140	1579	229	2.73	1608
[illegible]	317	261	283	275	224	226	252	320	2.2	1550	1551	1552	141	1585	225	2.51	
10:50	312	261	285	274	231	227	250	321	2.4	1550	1552	1560	143	1583	223	2.19	
[illegible]	318	261	286	274	230	229	252	322	2.0	1550	1550	1554	144	1580	228	2.23	1608
[illegible]	320	264	286	278	231	230	166	322	2.8	1551	1547	1550	145	1585	227	2.50	
[illegible]	318	263	287	275	232	229	262	315	2.8	1549	1548	1547	144	1580	232	2.54	
[illegible]	318	269	287	278	232	229	265	317	2.7	1548	1548	1539	144	1579	233	2.59	1608
11:40	319	264	289	276	232	230	257	319	2.1	1549	1550	1547	145	1542	232	2.31	
11:50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.0	1550	1549	1554	145	1558	231	2.39	

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RTO readings   Plant: chilco   readings evey 10 minutes   by: D. Palm   date: 6-21-94   Page 2 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	BURNERS B#2	BURNERS B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used
12:00	31.	31			[illegible]				1.1	1544	1..	[illegible]	146	15..	[illegible]	[illegible]	1609
12:10	321	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.9	[illegible]	1	[illegible]	[illegible]	1537	[illegible]	[illegible]	
[illegible]	320	[illegible]	288	279	234	229	266	316	2.4	1541	1541	1541	141	1548	233	2.66	
[illegible]	322	[illegible]	284	278	235	230	266	317	1.8	[illegible]	1551	1553	148	1545	233	2.24	1609
[illegible]	323	267	289	282	235	231	262	320	2.8	1520	1541	1541	147	1545	230	2.50	
12:45	322	261	291	278	236	232	259	323	2.1	[illegible]	[illegible]	[illegible]	148	1558	233	2.30	
[illegible]	325	[illegible]	290	280	[illegible]	[illegible]	258	325	2.5	1511	[illegible]	1551	148	1552	[illegible]	2.35	1609
[illegible]	325	271	292	281	236	234	257	326	2.5	[illegible]	1541	1551	149	1560	231	2.73	
[illegible]	323	267	292	[illegible]	236	232	258	322	2.1	1553	1533	1558	148	1557	233	[illegible]	
[illegible]	322	267	291	282	236	234	261	321	2.3	[illegible]	1549	1547	148	1542	[illegible]	2.11	1610
[illegible]	324	267	29.	279	236	233	257	316	2.2	1550	1549	1557	146	1557	[illegible]	2.75	
[illegible]	323	267	290	281	236	232	263	322	2.1	[illegible]	[illegible]	1541	145	1559	231	2.15	
[illegible]	322	268	290	281	236	231	265	319	2.2	1548	1548	1540	146	1542	232	2.21	16107
14:10	325	267	290	282	235	232	261	323	1.8	1549	1545	1544	147	1543	231	2.21	
14:20	322	269	290	281	236	232	268	319	2.8	1550	1549	1546	149	1548	230	2.33	
[illegible]	322	270	293	280	231	232	264	320	2.2	1550	1551	1556	149	1560	233	2.61	16110
[illegible]	321	269	293	282	237	235	261	325	2.4	1553	1550	1551	149	1552	233	1.97	
14:50	321	271	293	285	238	236	266	322	2.2	1549	1541	1544	150	1544	235	2.10	
15:00	328	271	293	285	238	237	264	324	2.6	1550	1548	1555	150	1543	232	2.51	16113
15:10	329	271	293	28.	234	237	265	322	2.8	1549	1548	1543	150	1541	236	2.42	
15:20	325	271	291	281	239	235	266	319	2.2	1551	1552	1551	147	1538	234	2.48	
15:30	324	271	295	281	239	236	265	320	2.8	1548	1544	1539	147	1546	233	2.40	16118
[illegible]	326	270	29.	281	238	235	257	326	2.6	1551	1553	1557	147	1553	234	2.19	
[illegible]	324	269	29.	280	238	235	257	324	2.8	1551	1553	1560	148	1552	233	2.29	
[illegible]	327	269	293	282	237	235	257	326	2.3	1551	1552	1560	148	1556	231	2.63	16132
16:10	326	268	295	281	238	235	256	325	2.4	1551	1554	1555	146	1557	[illegible]	2.34	
[illegible]	323	269	213	282	238	234	266	318	2.1	1549	1547	1541	147	1550	234	2.55	
16:30	323	270	294	280	238	234	264	318	2.4	1549	1541	1544	147	1555	231	2.41	16126
16:40	324	270	294	282	238	231	266	318	2.7	1548	1549	1545	148	1553	234	2.58	
16:50	329	269	294	283	237	237	258	325	2.3	1551	1548	1553	149	1550	331	2.55	

RTO readings   Plant: chilco   readings evey 10 minutes   by: D. Palm   date: 6-21-94   Page 3 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	B#2	B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used
17:00	325	270	294	284	238	235	267	319	2.4	1548	1549	1541	148	1543	236	23.2	16130
17:10	327	271	294	285	239	236	261	322	2.6	1551	1553	1559	149	1545	233	16.8	
17:20	327	271	294	285	238	236	264	323	2.0	1550	1548	1546	149	1545	236	2.04	
17:30	329	272	295	285	239	237	261	325	3.0	1550	1548	1543	149	1547	236	2.33	16133
17:40	328	272	294	285	239	236	264	324	2.0	1500	1548	1545	149	1544	236	2.19	
17:50	328	272	295	285	239	236	262	322	2.8	1541	1548	1548	148	1547	235	2.32	
18:00	328	272	294	285	239	236	262	324	2.6	1549	1547	1547	148	1547	234	2.27	16138
18:10	329	272	295	284	239	237	259	326	2.5	1551	1549	1552	148	1548	234	2.53	
18:20	324	272	295	282	240	235	266	319	2.8	1550	1551	1546	150	1555	235	2.49	
18:30	328	273	294	286	240	236	267	321	2.0	1519	1548	1543	149	1545	237	2.46	16141
18:40	328	272	296	282	240	237	259	325	2.2	1551	1553	1552	149	1560	236	2.50	
18:50	328	274	294	286	240	235	267	320	2.2	1518	1548	1540	148	1545	237	2.60	
19:00	328	272	296	282	240	236	258	327	2.8	1550	1548	1565	148	1567	233	2.51	16145
19:10	329	273	294	286	240	235	260	324	2.0	1550	1541	1543	148	1542	236	2.60	
19:20	328	272	295	282	240	236	269	326	2.0	1550	1550	1558	148	1560	234	2.07	
19:30	329	274	294	281	240	233	268	319	2.5	1519	1550	1547	148	1547	234	2.27	16148 ×
19:40	[illegible]	274	276	[illegible]	[illegible]	[illegible]	257	322	2.0	[illegible]	1545	1553	147	1580	231	22.5	
19:50	335	274	299	285	240	233	268	321	2.5	1548	1548	1544	147	1585	233	22.2	
20:00	326	272	276	282	239	234	258	326	2.6	1549	1551	1556	149	1579	235	20.0	1615? ×
20:10	32?	271	291	285	240	232	267	321	2.6	1550	1550	1550	147	1579	235	22.4	
20:20	324	272	295	280	235	232	[illegible]	325	2.5	1552	1550	1550	147	1580	232	21.0	
20:30	[illegible]	274	293	284	237	232	261	324	2.6	1550	1550	1550	147	1583	231	23.8	16157 ×
20:40	321	272	294	282	238	231	261	325	2.2	[illegible]	1551	1550	147	1577	233	[illegible]	
20:50	326	270	293	282	236	232	259	326	2.2	1550	1547	1558	147	1580	232	20.1	
21:00	322	272	293	282	237	231	266	320	2.6	1547	1549	1545	148	1548	234	16.7	16161 ×
21:10	322	271	293	283	237	231	263	321	2.6	1550	1553	1554	147	1581	232	17.0	
21:20	322	271	293	282	[illegible]	230	266	321	2.5	1547	1549	1542	147	1579	234	19.5	
21/30	[illegible]	270	291	279	[illegible]	232	[illegible]	324	2.5	1551	1554	1558	146	1581	232	22.0	16165 ×
21:40	323	271	292	283	236	230	261	324	2.7	1550	1547	1544	147	1584	233	20.5	
21:50	322	269	292	278	235	230	259	322	2.6	1557	1553	1555	147	1584	232	21.5	

(3') (k...)

RTO readings

Plant: chilco   readings evey 10 minutes   by:________   date: 6-21-94   Page 4 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	B#2	B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used
22:00	325	270	292	285	235	232	262	323	2.5	1550	1553	1542	146	1586	233	23.8	16168
22:10	321	272	273	282	235	230	2[illegible]	321	2.7	1549	1548	1542	145	1579	23[illegible]	19.8	
22:20	323	269	271	282	235	230	262	321	2.6	1548	[illegible]	[illegible]	145	1581	233	21.0	
22:30	320	267	271	279	236	228	264	319	2.2	1550	1551	1546	144	1579	231	19.0	16172
22:40	320	265	2[illegible]	271	231	229	250	32[illegible]	2.5	[illegible]	1559	155[illegible]	143	1580	230	21.5	
22:50	314	[illegible]	2[illegible]	[illegible]	2[illegible]	[illegible]	[illegible]	322	2.5	1550	15[illegible]	15[illegible]	1[illegible]	1579	227	21.5	
23:00	323	267	287	280	232	228	252	324	2.3	1551	1547	1545	142	1585	228	22.0	16176
23:10	3[illegible]	261	287	276	232	22[illegible]	260	3[illegible]	2.3	1549	155[illegible]	155[illegible]	141	1578	22[illegible]	19.0	
23:20																	
23:30																	
23:40																	
23:50																	
24:00																	

RTO readings   Plant: chilco   readings evey 10 minutes   by: D. Palm   date: 6-21-14   Page 1 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	BURNERS B#2	BURNERS B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used ½ HR.
01:40	308	259	279	274	226	221	259	311	2.4	1549	1550	1547	137	1577	223	2.63	1605
															recorded chamber temp.		of Shutdown 11H
07:50	308	259	280	272	226	221	258	312	2.2	1549	1549	1540	137	1579	222	2.33	
08:00	307	260	281	270	226	222	258	311	2.0	1547	1547	1539	137	1573	223	2.59	1606
08:10	312	258	281	272	225	223	248	319	2.4	1552	1550	1559	138	1578	220	2.68	
08:20	313	258	282	271	226	225	248	319	2.2	1550	1550	1561	138	1581	220	2.58	
08:30	314	258	283	272	226	226	249	320	2.4	1551	1548	1554	140	1582	221	2.58	1606
08:40	310	260	283	272	228	223	259	312	1.8	1550	1548	1540	140	1580	225	2.41	
08:50	311	260	281	274	228	223	261	313	2.4	1541	1548	1544	139	1578	225	2.58	
09:00	315	260	281	276	227	225	257	316	2.2	1549	1547	1541	140	1580	226	2.17	1606
09:10	316	260	283	273	228	226	250	319	2.0	1551	1550	1558	140	1583	224	2.72	
09:20	314	260	284	272	229	226	253	319	2.2	1550	1550	1561	141	1582	225	2.57	
09:30	313	261	284	271	229	225	254	318	2.4	1550	1551	1554	140	1583	226	2.18	1607
09:40	313	262	282	275	229	224	261	314	2.4	1548	1548	1540	141	1582	227	2.54	
09:50	316	260	284	272	229	227	251	320	2.2	1551	1552	1559	141	1585	226	2.68	
10:00	313	261	284	275	229	225	261	313	2.2	1548	1550	1544	142	1575	228	2.46	1607
10:10	318	262	281	271	228	227	254	320	1.8	1552	1549	1555	143	1582	225	2.57	
10:20	318	262	284	277	230	229	252	322	2.5	1551	1549	1558	142	1582	228	2.63	
10:30	314	263	285	273	231	226	258	315	3.0	1550	1553	1550	140	1579	229	2.73	1608
10:40	317	261	283	275	229	226	252	320	2.2	1550	1551	1552	141	1585	225	2.51	
10:50	312	261	285	274	229	227	250	321	2.4	1550	1552	1560	143	1583	228	2.19	
11:00	318	261	286	274	230	229	252	322	2.0	1550	1550	1559	144	1580	228	2.23	1608
11:10	320	264	286	278	231	230	256	322	2.8	1551	1547	1550	145	1585	227	2.50	
11:20	318	263	287	275	232	229	262	315	2.8	1549	1548	1547	144	1580	232	2.54	
11:30	318	265	287	278	232	229	265	317	2.7	1548	1548	1539	144	1579	233	2.59	1608
11:40	319	264	289	276	232	230	257	319	2.1	1549	1550	1547	145	1542	232	2.31	
11:50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.0	1550	1549	1554	145	1558	231	2.39	

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RTO readings Plant: chilco readings evey 10 minutes by: D. Palm date: 6-21-94 Page 2 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	BURNERS B#2	BURNERS B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used
12:00	314	266	[illegible]	[illegible]	233	[illegible]	[illegible]	[illegible]	1.9	1549	1552	[illegible]	146	[illegible]	[illegible]	[illegible]	1609
12:10	324	264	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.9	1550	1551	[illegible]	146	1557	[illegible]	[illegible]	
12:20	320	266	288	279	234	229	265	316	2.4	1549	1549	1544	147	1548	233	2.66	
12:30	320	267	289	278	235	230	265	317	1.8	1550	1552	1553	148	1545	233	2.29	1609
12:40	323	267	289	282	235	231	265	320	2.8	1550	1549	1541	147	1545	230	2.56	
12:50	322	267	291	278	236	232	259	323	2.4	1550	1552	1560	148	1558	233	2.30	
13:00	325	266	290	280	235	234	258	325	2.5	1549	1547	1551	148	1552	230	2.65	1609
13:10	325	267	292	281	236	234	257	326	2.5	1550	1549	1554	149	1560	231	2.73	
13:20	323	267	292	279	236	233	258	325	2.4	1553	1553	1558	148	1557	233	2.56	
13:30	325	267	291	282	236	233	261	324	2.3	1551	1549	1547	148	1542	231	2.11	1610
13:40	324	267	293	279	236	233	257	326	2.2	1550	1549	1557	146	1557	230	2.75	
13:50	323	267	290	281	236	232	263	322	2.4	1550	1548	1511	145	1539	231	2.15	
14:00	322	268	290	281	236	231	265	319	2.2	1548	1548	1540	146	1542	232	2.21	16107
14:10	325	267	290	282	235	232	261	323	1.8	1549	1545	1544	147	1543	231	2.21	
14:20	322	269	290	281	236	232	268	319	2.8	1550	1549	1546	149	1548	230	2.33	16110
14:30	322	270	293	280	237	233	264	320	2.2	1550	1551	1556	149	1560	233	2.61	
14:40	327	269	293	283	237	235	261	325	2.4	1553	1550	1558	149	1552	233	1.97	
14:50	327	271	293	285	238	236	266	322	2.2	1549	1547	1544	150	1544	235	2.10	
15:00	328	271	293	285	238	237	264	324	2.6	1550	1548	1555	150	1543	232	2.51	16113
15:10	329	271	293	285	239	237	265	322	2.8	1549	1548	1543	150	1541	236	2.42	
15:20	325	271	294	281	239	235	266	319	2.2	1551	1552	1551	147	1558	234	2.18	
15:30	324	271	295	281	239	236	265	320	2.8	1548	1549	1539	147	1546	233	2.40	16118
15:40	326	270	294	281	238	235	257	326	2.6	1551	1553	1557	147	1553	234	2.19	
15:50	324	268	295	280	238	235	257	324	2.8	1551	1553	1560	148	1552	233	2.29	
16:00	327	269	293	282	237	235	257	326	2.3	1551	1552	1560	148	1556	231	2.63	16122
16:10	326	268	295	281	238	235	256	325	2.1	1551	1554	1555	146	1557	233	2.34	
16:20	323	269	293	282	238	234	266	318	2.7	1549	1547	1541	147	1550	234	2.55	
16:30	323	270	294	280	238	234	264	318	2.4	1549	1549	1544	147	1555	234	2.47	16126
16:40	324	270	294	282	238	231	266	318	2.7	1548	1549	1545	148	1553	234	2.58	
16:50	329	269	294	283	237	237	258	325	2.3	1551	1548	1553	149	1550	231	2.53	

RTO readings Plant: chilco readings evey 10 minutes by: D. Palm date: 6-21-94 Page 3 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	B#2	B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used	
17:00	325	270	294	284	238	235	267	319	2.4	1548	1549	1541	148	1543	236	23.2	16130	
17:10	327	271	294	285	239	236	264	322	2.6	1551	1553	1559	149	1545	233	26.8		
17:20	327	271	294	282	238	236	264	323	2.0	1550	1548	1546	149	1545	236	2.24		
17:30	329	272	295	285	239	237	261	325	3.0	1550	1548	1548	149	1547	236	2.33	16133	
17:40	328	272	294	285	239	236	264	324	2.0	1550	1548	1545	149	1544	236	2.19		
17:50	328	272	295	285	239	236	262	325	2.8	1549	1548	1548	148	1547	235	2.32		
18:00	328	272	294	285	239	236	262	324	2.6	1549	1547	1547	148	1547	234	2.27	16138	
18:10	329	272	295	284	239	237	259	326	2.5	1551	1549	1552	148	1548	234	2.53		
18:20	324	272	295	282	240	235	266	319	2.8	1550	1551	1546	150	1555	235	2.49		
18:30	328	273	294	286	240	236	267	321	2.0	1549	1548	1545	149	1545	237	2.46	16141	
18:40	328	272	296	282	240	237	259	325	2.2	1551	1553	1557	149	1560	236	2.50		
18:50	328	274	294	286	240	235	267	320	2.2	1548	1548	1540	148	1545	237	2.60		
19:00	328	272	296	282	240	236	258	327	2.8	1550	1548	1565	148	1567	233	2.54	16145	
19:10	329	273	294	286	240	235	264	324	2.0	1550	1547	1543	148	1542	236	2.60		
19:20	328	272	295	282	240	236	259	326	2.0	1550	1550	1559	148	1560	234	2.27		
19:30	325	274	294	284	240	233	268	319	2.5	1549	1550	1547	148	1547	234	2.27	16148	x (51)
19:40	326	274	296	282	240	231	259	326	2.0	1530	1535	1553	149	1580	237	22.3		
19:50	325	274	294	285	240	233	268	321	2.5	1548	1548	1544	149	1585	233	22.2		
20:00	326	272	296	282	239	234	258	326	2.6	1549	1551	1556	149	1579	235	20.0	16153	x
20:10	325	274	294	285	240	232	267	321	2.6	1550	1550	1550	147	1579	235	22.7		
20:20	324	272	295	280	238	232	258	325	2.5	1550	1550	1550	147	1580	232	21.0		
20:30	326	272	293	284	237	232	261	324	2.6	1550	1550	1550	147	1583	231	20.8	16157	x
20:40	321	272	294	279	238	231	264	320	2.4	1545	1551	1550	147	1577	233	19.1		
20:50	326	270	293	282	236	232	257	326	2.3	1550	1547	1558	147	1580	230	20.1		
21:00	322	272	293	282	237	231	266	320	2.6	1547	1547	1545	148	1578	234	18.9	16161	x
21:10	322	271	294	280	237	231	263	321	2.6	1550	1553	1554	147	1581	233	19.0		
21:20	322	271	293	282	237	230	266	321	2.5	1549	1549	1549	147	1579	234	19.5		
21:30	322	270	294	279	[illegible]	232	258	324	2.5	1551	1554	1558	146	1581	232	23.0	16165	x
21:40	323	271	292	283	236	230	264	322	2.7	1530	1549	1544	147	1584	232	20.5		
21:50	324	269	293	278	235	230	259	322	2.6	1557	1553	1555	147	1584	232	21.5		

RTO readings

Plant: chilco readings evey 10 minutes by:________ date: 6-21-94 Page 4 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	B#2	B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used
22:00	325	270	292	283	235	232	262	323	2.5	1550	1550	1542	146	1586	233	23.8	16168
22:10	324	270	293	283	235	230	263	321	2.7	1549	1548	1542	145	1579	233	19.8	
22:20	323	269	291	282	235	230	262	321	2.6	1548	1549	1540	145	1581	233	21.0	
22:30	320	269	291	279	235	228	264	319	2.2	1550	1551	1546	144	1579	231	19.0	16172
22:40	320	268	292	277	231	229	257	322	2.5	1550	1554	1556	143	1580	230	21.5	
22:50	319	264	292	276	233	228	255	322	2.5	1550	1551	1560	142	1579	229	21.5	
23:00	323	267	289	280	232	228	256	324	2.3	1551	1549	1545	142	1585	228	22.0	16176
:10	318	264	289	276	232	225	260	319	2.3	1549	1552	1550	141	1508	228	19.0	
:20																	
:30																	
:40																	
:50																	
24:00																	

Panel line 6/21/94

Time	Units/hr	oven temp		Tank reading
0730	0	317		65
0830	2	294		64½
0930	3	314		64½
1030	6	299		65½
1130	[illegible]	301		66¾
1230	5	299		67 agitating
1330	4	314		67
1430	5	315		68
1530	5	311		69
1630	3	348		69½
1730	4	311		70
1830	4	346		71
1930	5	316		71½
2030	6	317		72
2130	1	307		73
2230	2	299		73
2330	5	177	25	73

Lop line 6/21/94

Time	Units/hr	Oven temp	Tank measurement	North tank Only
		A B C		
07:30		#1 249 294 245 2 274 275 275		
0830	5	1 275 276 275 2 249 295 275	72 ½	
0930	3	1 275 277 276 2 251 297 277	73	
1030	4	276 276 276 250 297 276	73½	
1130	0	275 274 275 250 294 275	73½	
1230	0	275 275 275 250 295 275	73½	
1330	1	276 276 275 250 295 274	74 FOAMY	
1430	6	276 275 276 250 295 275	75½	
1530	4	275 274 274 250 296 275	76½	
1630	2	275 276 275 251 298 275	77	
1730	5	276 275 276 250 295 275	77½	
1830	5	274 274 274 247 275 274	78½	
1930	5	#1 275 274 276 #2 252 298 275	78½	
2030	6	276 276 275 249 292 275	79	

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Lap Line

North Ov...

Time	Units/hr	Oven temp	Tank measure
		274 275 277	
2130	2	274 275 277 350 297 276	79
2230	5	276 275 274 249 273 275	79½
2330	2	276 276 275 252 296 276	81
2430			

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CHILCO RTO TESTING 6-22-94 FORMALDEHYDE AND PHENOL

DATA TIME:	START=		END=		HOURS=
		10:10		13:10	3.00
		14:00		16:20	2.33
		17:00		17:20	0.33
			TOTAL HOURS =		5.67

BOARD WEIGHTS - LBS

weight of approximately every 25th untrimmed board

206	214	214
210	212	212
205	220	214
206	218	
202	218	
194	202	
197	210	
199	224	
208	207	
216	215	
201	214	
209	203	
203	206	
214	206	
219	214	
203	212	

209.34 lb = average untrimmed mat weight

194.9 lb = average finished board weight (8'x16') (untrimmed mat weight-weight of trim)

6.9% = TRIM

41.76 lb = average density

PLANT PRODUCTION RATE

5.67 =hours during testing
91 =pressloads
728 =No. of (8' X 16') boards produced (no. of pressloads x 8 boards per load)
141887 =Lbs. finished product (no. of boards x weight of finished board)
25039 =Lbs. finished product produced per hour (lbs. of finished product / testing hours)
12.52 =Tons finished product per hour (lbs. of finished product per hour / 2000 lb)

DRYER PRODUCTION RATE:

25045 =lb per hour (bone dry) dryer throughput calibration on 6-16-94
29465 =lb per hour (bone dry) dryer throughput calibration on 6-23-94
29465 =estimated lb per hour (bone dry) dryer throughput calibration
note average calibration was not used. Use of the average would not mass balance.
999 =feed rate during calibration
934 =average feed rate during testing
27561 =average lb per hour (bone dry) dryer throughput calibration
29321 =average lb per hour (dry moisture) dryer throughput calibration

37.1% =moisture content of incoming wood
6.0% =moisture content of wood after drying

805 =average dryer inlet temperature during testing

DRYER FUEL BURNING RATE

5.625 =fuel calibration on lbs. per count
3075 =total counts during testing
5.67 =hours during testing
17297 =total lbs. of fuel burned during testing (calibration x total counts)
3052 =lbs of fuel burned per hour (total lbs fuel burned / testing hours)
1.53 = Tons of fuel burned per hour (lbs of fuel burned per hour / 2000 lbs.)
8600 =estimated BTU content per lb. of wood fuel
26.2 =estimated mmbtu input per hour (BTU content per lb. x lb. per hour)

CHILCO RTO TESTING 6-22-94 FORMALDEHYDE AND PHENOL

DATA TIME	START=	10:10	END=	13:10	HOURS=	3.00
		14:00		16:20		2.33
		17:00		17:20		0.33
			TOTAL HOURS =			5.67

RESIN AND WAX USAGE

141887 =Lbs. finished product (no. of boards x weight of finished board) during testing
5369 =lbs of MDI resin used during testing
947 =lbs of MDI resin used per hour
3.78% = MDI resin used as % of finished product

2245 =lbs of wax used during testing at 48% solids
396 =lbs of wax used per hour at 48% solids
1078 =lbs of wax used during testing at 100% solids
190 =lbs of wax used per hour at 100% solids
0.76% =wax used as % of finished product at 100% solids

SIDING LINE PAINT USAGE
7 =data hours during testing
PANEL LINE
37 =total units painted during testing (1030-1730)
110519 =square feet (3/8" basis)
15788 =average square feet (3/8") siding production per hour during test
378922 =equivalent daily siding production in square feet (3/8")
4.25 =inches of paint used
300.2 = paint calibration (lbs per inch)
1275.85 =total paint usage during testing - lbs
182 =average paint usage per hour during test - lb/hr

LAP LINE
31 =total units painted during testing (1030-1730)
92597 =square feet (3/8" basis)
13228 =average square feet (3/8") siding production per hour during test
317475 =equivalent daily siding production in square feet (3/8")
4.38 =inches of paint used (81-74)
300.2 = paint calibration (lbs per inch)
1314.876 =total paint usage during testing - lbs
188 =average paint usage per hour during test - lbs/hr

CHILCO RTO TESTING 6-22-94 VOC

DATA TIME:	START=	12:00	END=	13:10	HOURS=	1.17
		17:50		20:20		2.50
				TOTAL HOURS =		3.67

BOARD WEIGHTS - LBS
weight of approximately every 25th untrimmed board

206	214	214
210	212	212
205	220	214
206	218	
202	218	
194	202	
197	210	
199	224	
208	207	
216	215	
201	214	
209	203	
203	206	
214	206	
219	214	
203	212	

209.34 lb = average untrimmed mat weight

194.9 lb = average finished board weight (8'x16') (untrimmed mat weight-weight of trim)

6.9% = TRIM

41.76 lb = average density

PLANT PRODUCTION RATE

3.67 =hours during testing
59 =pressloads
472 =No. of (8' X 16') boards produced (no. of pressloads x 8 boards per load)
91993 =Lbs. finished product (no. of boards x weight of finished board)
25089 =Lbs. finished product produced per hour (lbs. of finished product / testing hours)
12.54 =Tons finished product per hour (lbs. of finished product per hour / 2000 lb)

DRYER PRODUCTION RATE:

25045 =lb per hour (bone dry) dryer throughput calibration on 6-16-94
29465 =lb per hour (bone dry) dryer throughput calibration on 6-23-94
29465 =estimated lb per hour (bone dry) dryer throughput calibration
note average calibration was not used. Use of the average would not mass balance.
999 =feed rate during calibration
909 =average feed rate during testing
26806 =average lb per hour (bone dry) dryer throughput calibration
28456 =average lb per hour (dry moisture) dryer throughput calibration

31.5% =moisture content of incoming wood
5.8% =moisture content of wood after drying

813 =average dryer inlet temperature during testing

DRYER FUEL BURNING RATE

5.625 =fuel calibration on lbs. per count
1886 =total counts during testing
3.67 =hours during testing
10609 =total lbs. of fuel burned during testing (calibration x total counts)
2893 =lbs of fuel burned per hour (total lbs fuel burned / testing hours)
1.45 = Tons of fuel burned per hour (lbs of fuel burned per hour / 2000 lbs.)
8600 =estimated BTU content per lb. of wood fuel
24.9 =estimated mmbtu input per hour (BTU content per lb. x lb. per hour)

CHILCO RTO TESTING 6-22-94 VOC

DATA TIME:	START=	12:00	END=	13:10	HOURS=	1.17
		17:50		20:20		2.50
				TOTAL HOURS =		3.67

RESIN AND WAX USAGE

91993 =Lbs. finished product (no. of boards x weight of finished board) during testing
3460 =lbs of MDI resin used during testing
944 =lbs of MDI resin used per hour
3.76% = MDI resin used as % of finished product

1530 =lbs of wax used during testing at 48% solids
417 =lbs of wax used per hour at 48% solids
734 =lbs of wax used during testing at 100% solids
200 =lbs of wax used per hour at 100% solids
0.80% =wax used as % of finished product at 100% solids

SIDING LINE PAINT USAGE
9 =data hours during testing
PANEL LINE
48 =total units painted during testing (1130-2030)
143376 =square feet (3/8" basis)
15931 =average square feet (3/8") siding production per hour during test
382336 =equivalent daily siding production in square feet (3/8")
7.12 =inches of paint used
300.2 = paint calibration (lbs per inch)
2137 =total paint usage during testing - lbs
237 =average paint usage per hour during test

LAP LINE
31 =total units painted during testing (1330-2230)
92597 =square feet (3/8" basis)
10289 =average square feet (3/8") siding production per hour during test
246925 =equivalent daily siding production in square feet (3/8")
4.38 =inches of paint used (81-74)
300.2 = paint calibration (lbs per inch)
1315 =total paint usage during testing - lbs
146 =average paint usage per hour during test

CHILCO RTO TESTING 6-22-94 MDI

DATA TIME: START= 19:00 END= 24:00 HOURS= 5.00

TOTAL HOURS = 5.00

BOARD WEIGHTS - LBS

weight of approximately every 25th untrimmed board

206	208
207	205
210	201
204	202
216	200
213	206
211	210
214	204
223	206
212	208
213	206
210	198
209	
200	
200	
202	

207.29 lb = average untrimmed mat weight

192.99 lb = average finished board weight (8'x16') (untrimmed mat weight-weight of trim)

6.9% = TRIM

41.36 lb = average density

PLANT PRODUCTION RATE

5.00 =hours during testing
80 =pressloads
640 =No. of (8' X 16') boards produced (no. of pressloads x 8 boards per load)
123514 =Lbs. finished product (no. of boards x weight of finished board)
24703 =Lbs. finished product produced per hour (lbs. of finished product / testing hours)
12.35 =Tons finished product per hour (lbs. of finished product per hour / 2000 lb)

CHILCO RTO TESTING 6-22-94 MDI

DATA TIME: START= 14:00 END= 23:00 HOURS= 9.00

RESIN AND WAX USAGE

123514	=Lbs. finished product (no. of boards x weight of finished board) during testing
4751	=lbs of MDI resin used during testing
950	=lbs of MDI resin used per hour
3.85%	= MDI resin used as % of finished product
2201	=lbs of wax used during testing at 48% solids
440	=lbs of wax used per hour at 48% solids
1056	=lbs of wax used during testing at 100% solids
211	=lbs of wax used per hour at 100% solids
0.86%	=wax used as % of finished product at 100% solids

DRYER DATA SHEET

DATE 6-22-94
BY BERNIE
PAGE 1 OF DAY II (WEND)
READINGS EVERY 10 MIN.

ANT: CHILCO

FUEL CALIBRATION:

TIME	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	WET BIN LEVEL	DRY BIN LEVEL SUR.	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE OUT → CONT
0720	210	860	887	209	170	F	3/4	3/4		
0730	210	860	910	210	264	F	F	3/4		6.6
0740	211	860	921	211	358	F	F	3/4		
0750	211	860	875	212	479	F	2/3	2/3	36.6	
0800	211	900	889	211	540=0	3/4	F	2/3		
0810	210	900	893	209	96	F	3/4	2/3		
0820	210	900	801	212	173	2/3	3/4	2/3		5.7
0830	210	800	683	210	243	1/2 -	3/4	3/4		
0840	210	730	657	212	316	1/2 -	F	F	20.9	
0850	210	810	606	209	376	1/2 -	3/4	3/4		
0900	210	860	730	208	490=0	1/2 +	3/4	3/4		
0910	211	520	622	214	50	2/3	2/3	2/3		
0920	DRYER DOWN		(E-TUBE)		61	F	2/3	1/2 +		6.2
0930	"	"	"	"		F	1/2	1/2 +		
0940	210	930	895	211	151	F	1/2 -	1/2	47.4	
0950	209	999	1040	207	249	F	1/2	1/3 +		
1000	209	999	1048	209	340=0	F	1/2	1/2		
1010	208	999	989	208	102	F	1/2 +	1/2 +		6.0
1020	208	999	936	210	196	3/4	1/2 +	1/2 +		
1030	207	999	884	202	301	F	2/3	1/2 +	30.3	
1040	206	999	854	207	383	3/4	2/3	2/3		
1050	205	999	868	204	482	3/4	2/3	2/3		
1100	205	999	874	204	580=0	2/3	1/2 +	2/3		
1110	205	999	936	205	100	1/2 -	2/3	2/3		6.8
1120	206	969	829	203	222	1/2 -	3/4	1/2		
1130	206	999	748	208	283	1/3 -	3/4	1/2	32.7	
1140	205	999	723	205	357	1/3 -	1/2 +	1/2 -		
1150	202	999	760	202	437	1/3	1/2	1/2		

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DRYER DATA SHEET

DATE 6-22-94
BY Bernie
PAGE 2 OF Day II (W END)
READINGS EVERY 10 MIN.

PLANT: CHILCO

FUEL CALIBRATION:

TIME	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	WET BIN LEVEL	DRY BIN LEVEL SUR.	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE OUT → core
1200	201	999	792	202	530=0	1/3+	1/2-	1/2-		
1210	203	999	910	201	99	1/2	1/2-	1/2-		60
1220	203	999	863	204	184	1/2+	1/2-	1/3+		
1230	202	999	800	203	262	1/2+	1/2-	1/2-		
1240	201	999	942	200	366	1/3+	1/3-	1/2-	38.2	
1250	201	999	867	201	432	1/2-	1/3+	1/3+		
1300	201	999	856	201	520=0	1/3	1/2-	1/3+		
1310	201	999	829	201	100	1/2-	1/3+	1/3+		60
1320	202	999	835	202	167	1/2-	1/3+	1/3+		
1330	202	999	863	201	258	2/3	1/2+	1/2+	47.8	
1340	202	999	808	203	350	3/4	F	2/3		
1350	202	999	834	202	439	3/4	F	F		
1400	202	999	875	202	525=0	F	F	F		
1410	202	929	834	203	85	F	F	F		62
1420	202	859	719	203	166	F	F	F		
1430	202	839	753	202	242	F	F	F	47.2	
1440	202	829	715	202	311	F	F	F		
1450	202	829	779	202	376	F	F	F		
1500	202	829	779	202	455=0	3/4	F	F		
1510	202	829	809	202	80	3/4	F	F		60
1520	201	829	729	203	160	1/2+	F	F		
1530	200	829	708	200	235	1/2-	F	F	24.8	
1540	199	829	699	199	296	1/2	F	F		
1550	198	829	679	198	363	1/2+	F	F		
1600	197	829	662	198	427=0	2/3	F	F		
1610	196	850	649	196	75	3/4	F	F		50
1620	194	880	720	194	150	F	3/4	3/4		
1630	194	750	640	195	204	F	F	F		
1640	DRY DOWN		(PRESS TROUBLE)		229	F	F	F	49.0	
1650	220	679	290	218	240	F	F	F		

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DRYER DATA SHEET

DATE 6-22-94
BY BERNIE
PAGE 3 OF DAY II (WEND)
READINGS EVERY 10 MIN.

ANT: CHILCO

FUEL CALIBRATION:

TIME	OUTLET SET POINT	FEED RATE	DRYER INLET TEMP	DRYER OUTLET TEMP	FUEL COUNT	WET BIN LEVEL	DRY BIN LEVEL SUR.	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE OUT
1700	205	859	766	209	310=0	F	3/4	F		
1710	196	939	812	195	94	F	3/4	3/4	49.5	
1720	196	939	836	196	167	3/4	F	1/2+		
1730	196	939	876	195	239	3/4	3/4	2/3		65
1740	197	939	857	198	319	F	3/4	2/3		
1750	197	920	922	197	397	3/4	3/4	3/4		
1800	197	920	858	198	480=0	F	3/4	3/4		
1810	197	920	[illegible]	197	85	3/4	3/4	3/4		
1820	197	920	[illegible]	198	174	F	3/4	F		
1830	[illegible]	860	838	198	246	3/4	3/4	F	22.7	6.8
1840	195	860	759	196	312	F	F	3/4		
1850	198	840	780	198	389	3/4	F	F		
1900	199	840	803	199	456=0	3/4	F	3/4		
1910	199	840	751	199	77	F	F	F		52
1920	199	840	758	200	141	F	F	F		
1930	199	840	767	199	218	3/4	F	F		
1940	199	840	737	200	283	F	3/4	3/4	33.7	
1950	199	840	717	199	352	3/4	2/3	F		
2000	199	840	708	199	420=0	3/4	F	2/3		50
2010	199	840	710	199	74	3/4	3/4	3/4		
2020	199	880	726	199	146	3/4	3/4	3/4		
2030	199	880	711	199	215	F	3/4	3/4		
2040										
2050										
2100										
2110										
2120										
2130										
2140										
2150										

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KONUS DATA

LANT: CHILCO

DATE 6-22-94

BY Bernie

PAGE 4 OF Day II (Wend)

OIL SETPOINTS

left fuel calibration

right fuel calibration

READINGS EVERY 10 MINUTES

(NOTE ANY CHANGES IN SETPOINTS)

TIME	PRIMARY AIR LEFT	I.D. FAN	PRIMARY AIR RIGHT	OIL IN deg. C	OIL OUT deg. F	FUEL COUNT LT	FUEL COUNT RT	FEED RATE SETTING LT	FEED RATE SETTING RT	EVERY HOUR BAG H. PRESS.	EVERY HOUR BARK MOISTURE
2205	280	-1.4	280	–	503.1	164	192	200	230	1.6	48.4
2215	280	-1.4	280	–	504.6	172	201	200	230		
2225	280	-1.4	290	–	503.6	179	208	200	230		
2235	280	-1.4	290	–	503.4	188	218	200	230		
2245	280	-1.4	290	–	507.4	194	226	200	230		
2255	280	-1.4	290	–	507.0	204	235	200	230		
2305	280	-1.4	290	–	500.3	210	242	200	200	1.6	
2315	280	-1.4	290	–	494.2	219	251	220	230		
2325	280	-1.4	290	–	488.8	227	259	220	230		
2335	280	-1.4									
2345											
2355											

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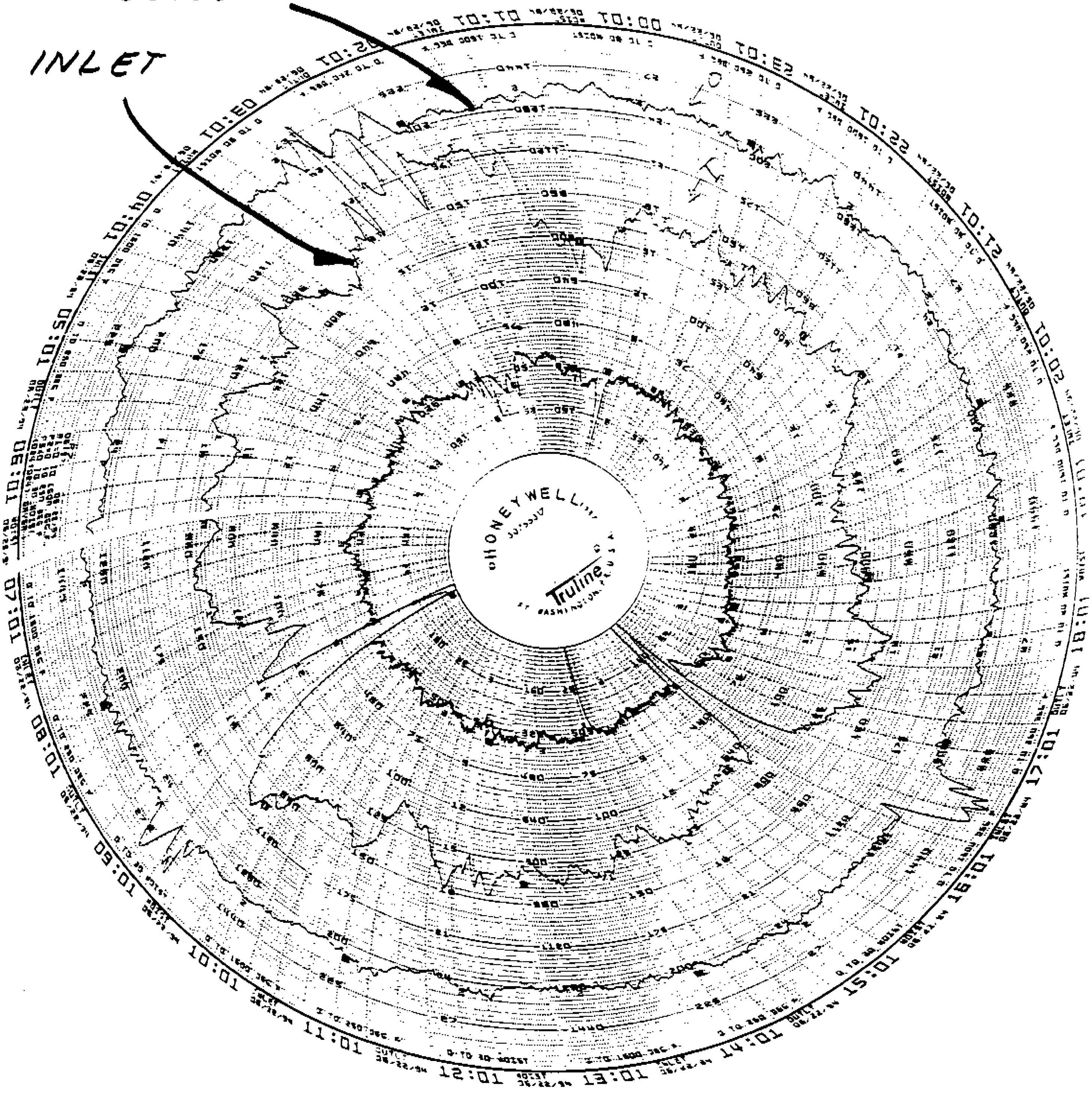
DRYER CHART
6-22-94

OUTLET

INLET



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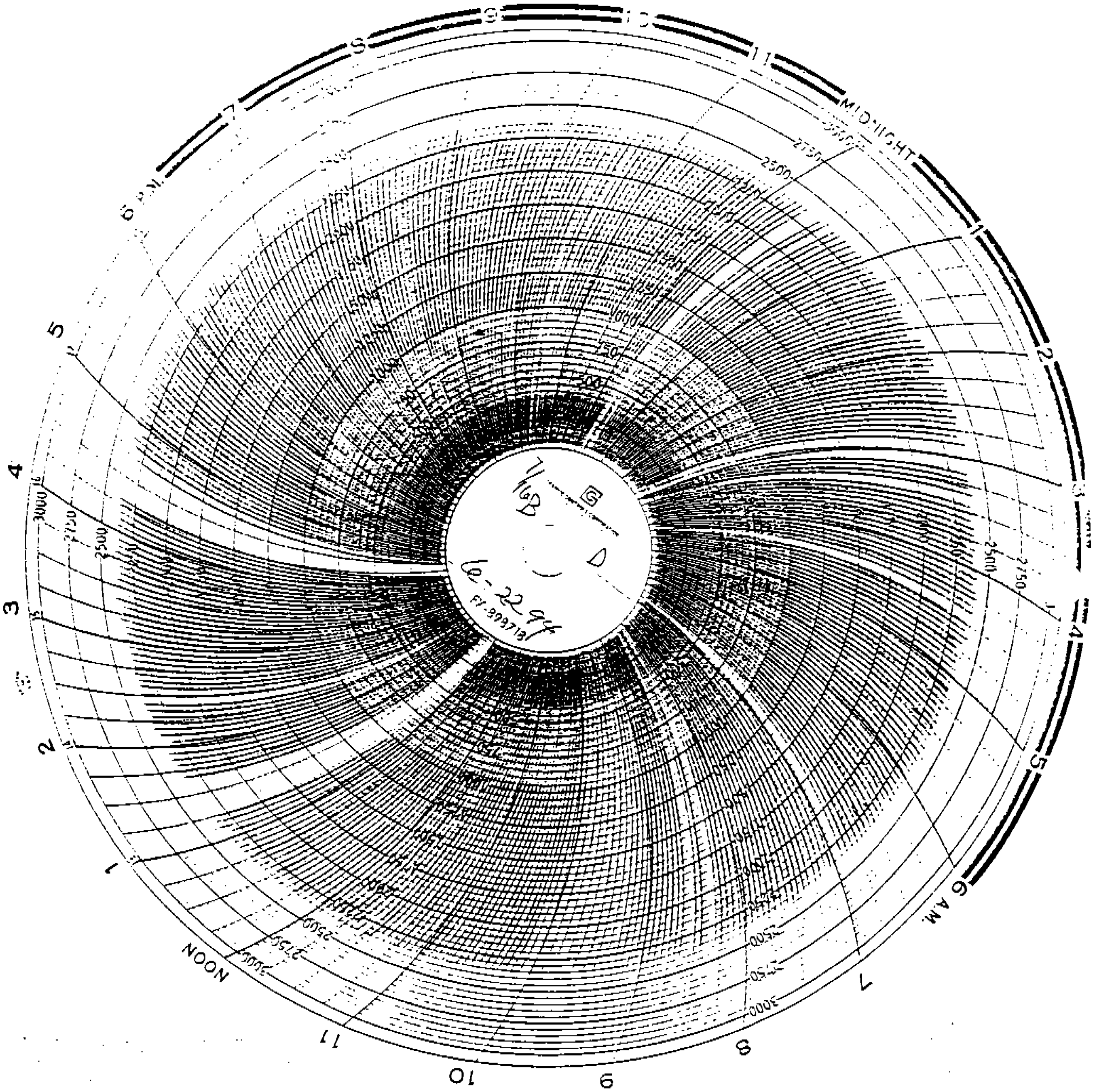
ORESS CHART
6-22-94



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PRESS REPORT
6-22-94
0700-1900

LOUISIANA-PACIFIC CORPORATION
CHILCO, IDAHO

OPERATOR G. LACY

THICKNESS 7/16

PRESS TEMP 210°

SHIFT DAY CREW B DATE 6-22-94

PRESS LOADS 175

TOTAL CAULS REJECTED 0

TOTAL FOOTAGE 209073

TOTAL DOWNTIME 54 min.

FINES SETTING	LINE SPEED	FROM	TO
34	999	7:00	9:10
32	890	9:10	9:15
24	665	9:15	10:05
34	999	10:05	7:00

PAPER COUNTS
1. 233
2. 290
3. 393
4.

PRESS LOADS PER HOUR				
7:00	16	1:00	10	
8:00	14	2:00	15	
9:00	12	3:00	17	
10:00	5	4:00	10	142
11:00	17	5:00	16	158
12:00	16	6:00	17	

FACE RESIN TOTALIZER

CORE RESIN TOTALIZER

	DOWNTIME FROM	TO	MIN	REASON FOR DOWNTIME
	8:18	8:21	3	STACKER CRASH
	8:21	8:23	2	FLIPPED HEADBAR on #6 incline
9	8:31	8:35	4	UNDERLAY Roll Damaged
31	1:15	1:37	22	material
34	2:27	2:30	3	Paper Piled up at cutter
54	4:20	4:40	20	B.S. FORMER TROUGHING cylinder ram came unbolted

TIME TO POSITION (SECONDS)

1	61	39	58	77	54	115	60	153	54
2	62	40	60	78	56	116	60	154	49
3	64	41	55	79	57	117	62	155	61
4	61	42	56	80	60	118	65	156	60
5	53	43	57	81	62	119	68	157	60
6	57	44	56	82	62	120	70	158	57
7	56	45	51	83	65	121	67	159	58
8	56	46	53	84	63	122	58	160	60
9	55	47	57	85	76	123	59	161	64
10	53	48	60	86	74	124	56	162	63
11	53	49	55	87	70	125	55	163	62
12	49	50	56	88	56	126	61	164	66
13	48	51	55	89	64	127	57	165	67
14	51	52	49	90	76	128	53	166	65
15	51	53	49	91	64	129	54	167	65
16	53	54	50	92	65	130	57	168	66
17	54	55	55	93	64	131	55	169	62
18	57	56	51	94	64	132	51	170	57
19	58	57	44	95	62	133	54	171	57
20	59	58	48	96	61	134	53	172	54
21	55	59	45	97	59	135	53	173	56
22	56	60	50	98	58	136	51	174	48
23	56	61	51	99	60	137	51	175	51
24	56	62	55	100	56	138	55	176	
25	55	63	55	101	57	139	55	177	
26	55	64	56	102	60	140	[illegible]	178	
27	53	65	60	103	62	141	[illegible]	179	
28	51	66	62	104	65	142	67	180	
29	51	67	66	105	67	143	63	181	
30	52	68	71	106	[illegible]	144	64	182	
31	52	69	74	107	61	145	[illegible]	183	
32	50	70	75	108	62	146	[illegible]	184	
33	49	71	51	109	61	147	[illegible]	185	
34	49	72	65	110	57	148	[illegible]	186	
35	48	73	60	111	57	149	[illegible]	187	
36	50	74	60	112	52	150	[illegible]	188	
37	54	75	55	113	59	151	60	189	
38	56	76	49	114	56	152	57	190	

PRESS REPORT
6-22-94
1900 - 0700

LOUISIANA-PACIFIC CORPORATION
CHILCO, IDAHO

OPERATOR Weiss

THICKNESS 7/16 L.S.

PRESS TEMP 210

SHIFT N. CREW D DATE 62294

PRESS LOADS 186

TOTAL CAULS REJECTED /

TOTAL FOOTAGE 222214

TOTAL DOWNTIME 27

FINES SETTING	LINE SPEED	FROM	TO
34	1999 37	19:00	07:00

PAPER COUNTS
1. 427
2. 438
3. 395
4. 376

250

PRESS LOADS PER HOUR			
7:00	16	1:00	16
8:00	16	2:00	15
9:00	16	3:00	14
10:00	15	4:00	15
11:00	17	5:00	16
12:00	14	6:00	16

FACE RESIN TOTALIZER

CORE RESIN TOTALIZER

DOWNTIME FROM	TO	MIN	REASON FOR DOWNTIME
22:30		3	Feeder chain rip saws
22:38		2	R.C. miss cut
00:18		3	start u.L.
00:24		3	Matt pull off caul
00 34		2	#6 incline
02:55		4	Matt pull off caul
03:03	21	4	" " "
03:20		3	paper hang-up
04:25		3	" " "

TIME TO POSITION (SECONDS)

1	45	39	55	77	64	115	71	153	56
2	45	40	50	78	60	116	62	154	60
3	46	41	51	79	60	117	63	155	61
4	50	42	51	80	59	118	67	156	58
5	47	43	50	81	59	119	63	157	60
6	45	44	50	82	57	120	58	158	79
7	55	45	48	83	57	121	57	159	80
8	55	46	49	84	55	122	57	160	74
9	50	47	50	85	56	123	57	161	73
10	55	48	56	86	57	124	55	162	73
11	57	49	57	87	49	125	57	163	73
12	55	50	58	88	57	126	60	164	67
13	61	51	59	89	54	127	57	165	63
14	63	52	57	90	57	128	57	166	62
15	63	53	54	91	54	129	59	167	63
16	60	54	54	92	56	130	63	168	103
17	64	55	55	93	61	131	60	169	[illegible]
18	64	56	54	94	62	132	57	170	62
19	64	57	54	95	57	133	72	171	62
20	65	58	53	96	58	134	76	172	62
21	55	59	53	97	60	135	77	173	63
22	55	60	54	98	60	136	54	174	61
23	63	61	54	99	63	137	78	175	63
24	73	62	55	100	60	138	75	176	59
25	72	63	52	101	58	139	77	177	59
26	55	64	57	102	60	140	77	178	58
27	56	65	57	103	61	141	80	179	59
28	55	66	64	104	62	142	76	180	60
29	55	67	67	105	64	143	77	181	62
30	53	68	66	106	66	144	75	182	72
31	57	69	71	107	71	145	74	183	60
32	57	70	69	108	65	146	61	184	63
33	54	71	69	109	69	147	61	185	64
34	53	72	63	110	70	148	61	186	64
35	54	73	62	111	79	149	60	187	
36	55	74	65	112	79	150	59	188	
37	55	75	62	113	77	151	59	189	
38	58	76	62	114	73	152	61	190	

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JOHN [illegible]

Chilco OSB Stack Testing **Press Room Readings** **Date:** 6-22-94

Cumulative Pounds			Readings Every 10 Minutes	
			Recorder:	

Time	Core MDI	Surface MDI	Fines Resin	Core Wax	Face Wax	FINES WAX LB PER HOUR *
0730	6464	11104	2396	2366	5341	
0740	6499	11168	2415	2395	5372	13.54
0750	6557	11274	2445	2916	5422	
0900	6599	11346	2467	2940	5462	
5A → 0810	6652	11441	2495	2968	5509	
0820	44	80	22	24	40	
0830	72	121	35	35	60	
0840	103	173	51	51	86	11.85
0850	154	263	77	78	133	
0900	207	346	102	103	174	
0910	251	456	129	130	222	
0920	293	506	150	151	258	
0930	330	546	163	169	283	
0940	367	595	166	182	313	10.16
0950	403	638	177	206	338	
1000	440	693	195	223	37[illegible]	
1010	489	755	216	249	411	
1020	531	845	242	275	[illegible]	
1030	587	943	270	302	492	
1040	630	1019	292	323	528	12.69
1050	679	1107	316	348	570	
1100	729	1195	329	373	612	
1110	779	1234	356	400	652	
1120	828	1369	381	425	691	
1130	878	1458	407	452	730	
1140	928	1545	434	479	768	14.39
1150	976	1629	459	503	806	

FINES WAX AVERAGED ≈12 LB PER HOUR
12 LBS/HR WILL BE USED TO ESTIMATE USAGE
Use Military Time

42

JOHN LOY

Chilco OSB Stack Testing **Press Room Readings** **Date:** 6-22-94

Cumulative Pounds				Readings Every 10 Minutes	
				Recorder:	

Time	Core MDI	Surface MDI	Fines Resin	Core Wax	Face Wax	Fines Wax
1200	1025	1717	485	531	844	
1210	1070	1805	501	538	897	
1220	1125	1893	537	586	923	
1230	1172	1976	562	612	963	
1240	1225	2072	591	642	1006	
1250	1271	2151	598	667	1043	13-54
1300	1319	2230	619	693	1078	
1310	1370	2314	645	720	1115	
1320	1412	2384	663	742	1146	
1330	1415	2384	663	742	1146	
1340	1419	2384	665	742	1146	
1350	1465	2456	691	760	1174	8-46
1400	1513	2542	717	785	1214	
1410	1571	2642	746	811	1258	
1420	1613	2715	768	834	1293	
1430	1659	2794	787	855	1326	
1440	1699	2851	811	875	1354	
1450	1748	2938	837	900	1392	12-69
1500	1797	3016	862	923	1426	
1510	1847	3102	888	948	1464	
1520	1896	3189	914	972	1504	
1530	1944	3270	939	997	1541	
[illegible]	1966	3360	966	1022	1582	
[illegible]	2047	3448	984	1046	1622	14-39
[illegible]	2092	3525	1006	1069	1661	
[illegible]	2139	3611	1031	1093	1707	
[illegible]	2199	3708	1058	1122	1750	
[illegible]	2201	3708	1058	1122	1750	
[illegible]40	2204	3708	1058	1122	1750	
1650	2235	3756	1077	1137	1774	8-46

Use Military Time

43

Chilco OSB Stack Testing **Press Room Readings** **Date:** 6-22-94

Cumulative Pounds				Readings Every 10 Minutes		
				Recorder:		
Time	Core MDI	Surface MDI	Fines Resin	Core Wax	Face Wax	Fines WAX
1700	2288	3840	1103	1162	1819	
1710	2330	3922	1126	1187	.258	
1720	2379	4007	1152	1211	1898	
1730	2435	4099	1178	1238	1941	
1740	2473	4154	1182	1260	1969	13.54
1750	2521	4240	1208	1283	2012	
1800	2569	4325	1226	1308	2055	
1810	2616	4407	1249	1331	2096	
1820	2663	4491	1274	1355	2138	
1830	2711	4577	1300	1380	2182	
1840	2760	4665	1319	1405	2226	14.39
1850	2808	4750	1339	1430	2269	
1900	2556	4835	1359	1455	2312	
1910	2910	4930	1388	1482	2360	
1920	2957	5016	1414	1506	2404	
1930	3004	5101	1439	1531	2447	
1940	3049	5181	1463	1554	2488	13.54
1950	3102	5274	1492	1582	2536	
2000	3148	5356	1517	1606	2578	
2010	3193	5436	1541	1629	2619	
2020	3242	5523	1562	1654	2667	
2030	3295	5619	1591	1681	2722	
2040	3340	5799	1616	1705	2768	13.54
2050	3401	5809	1649	1732	2831	
2100	3441	5879	1670	1757	2870	
2110	3486	5959	1694	1780	2916	
2120	3530	6039	1718	1803	2960	
2130	3581	6129	1745	1829	3011	
2140	3633	6221	1773	1856	3063	13.54
2150	3678	6302	1795	1880	3109	

Use Military Time

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John Loya

Chilco OSB Stack Testing **Press Room Readings** **Date:** 6-22-94

Cumulative Pounds				Readings Every 10 Minutes	
				Recorder:	

Time	Core MDI	Surface MDI	Fines Resin	Core Wax	Face Wax	Fines Wax
2200	3730	6395	1823	1907	3161	
2210	3774	6474	1846	1930	3205	
2220	3818	6552	1869	1953	3249	
2230	3863	6630	1890	1975	3293	
2240	3909	6709	1911	1996	3337	
2250	3956	6792	1937	2021	3381	12.69
2300	4008	6886	1964	2048	3433	
2310	4048	6955	1986	2069	3471	
2320	4101	7046	2014	2096	3521	
2330	4148	7130	2040	2120	3568	
2340	4198	7218	2067	2145	3618	
2350	4247	7302	2093	2170	3667	14.39
2400	4293	7390	2118	2194	3714	
1010	489	755	216	249	411	
1310	1370	2314	695	720	1115	
1400	1513	2542	717	785	1214	
1620	2199	3708	1058	1122	1750	
1700	2288	3840	1103	1162	1818	
1720	2379	4007	1152	1211	1898	
1200	1025	1717	485	531	844	
1310	1370	2314	645	720	1115	
1750	2521	4240	1208	1283	2012	
2020	3292	5523	1562	1654	2667	
1900	2856	4835	1359	1455	2312	
2400	4293	7390	2118	2194	3714	

Use Military Time

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READINGS EVERY 10 MIN.

E-TUBE DATA SHEET

LANT: Chilco

DATE 5-22-94
BY Alan Smith
page 1 of 1

TIME	QUENCH CHAMBER TEMP	SOUTH TR SET KV	SOUTH TR SET MA	SOUTH TR SET SPARK RATE	NORTH TR SET KV	NORTH TR SET MA	NORTH TR SET SPARK RATE	INDICATE TIME OF FLUSH CYCLE
07:25	170/144	32	250	29.9	37	260	29.7	
07:35	170/145	31	300	29.4	37	270	29.5	
07:45	141/144	32	270	29.8	35	310	30.0	
07:55	150/143	31	250	29.8	35	310	29.8	
08:05	164/144	32	290	29.7	36	270	29.8	
08:15	169/143	32	310	29.6	36	290	29.9	
08:25	147/136	20	30	30.5	33	190	30.1	08:24 (101)
08:35	140/183	30	110	32.5	38	350	29.5	
08:45	139/185	32	200	29.6	38	340	29.7	
08:55	137/187	34	260	29.5	40	370	29.6	
09:05	159/188	36	300	29.8	40	390	29.9	
09:15	154/186	32	130	30.1	36	110	30.3	
09:25	119/196	32	50	30.0	36	80	30.1	
09:35	126/130	34	330	29.2	40	500	29.0	
09:45	136/145	37	360	28.6	40	560	15.7	
09:55	146/152	34	490	28.9	42	560	13.6	
10:05	171/150	38	510	28.5	42	570	13.7	
10:15	173/149	38	520	26.1	42	560	20.4	
10:25	172/148	38	370	30.0	42	490	29.3	
10:35	164/146	40	390	29.8	43	460	30.1	
10:45	167/146	28	410	309	24	30	31.2	10:43 (102)
10:55	170/151	34	250	29.5	34	200	31.3	
11:05	173/184	40	490	29.3	42	550	29.7	
11:15	166/189	40	440	27.7	42	560	21.7	
11:25	168/191	40	380	29.9	42	550	25.5	
11:35	171/192	40	340	30.1	42	430	30.3	
11:45	164/189	40	300	29.5	42	450	29.8	
11:55	160/188	40	340	29.9	42	390	29.9	
12:05	165/144	40	520	28.2	43	560	23.3	
12:15	150/145	40	540	4.6	40	560	2.8	

Clogged Intake Recycle Pump Not During Testing

Seemingly Another Clog In Recycle Intake

READINGS EVERY 10 MIN.

E-TUBE DATA SHEET

DATE 6-22-94
BY Alan Smith
page 2 of 4

PLANT: Chilco

TIME	QUENCH CHAMBER TEMP	SOUTH TR SET #101 KV	MA	SPARK RATE	NORTH TR SET #102 KV	MA	SPARK RATE	INDICATE TIME OF FLUSH CYCLE
12:25	180/141	40	530	4.0	40	550	4.7	
12:35	178/146	36	530	.7	40	555	1	
12:45	179/144	22	5	4.9	39	325	.9	12:45 Flush 101
12:55	180/143	28	135	31.6	39	555	7.4	
13:05	179/142	30	170	29.6	40	560	0.9	
13:15	176/142	31	250	29.6	40	560	1.5	
13:25	177/143	33	330	29.5	40	560	2.5	
13:35	176/143	36	420	29.7	41	560	3.0	
13:45	177/142	36	480	29.8	41	560	5.9	
13:55	169/144	38	520	26.2	40	560	2.6	
14:05	174/144	37	530	23.5	41	560	2.3	
14:15	176/142	40	540	18.3	42	560	8.7	
14:25	175/141	40	530	20.4	42	560	16.2	
14:35	178/139	38	530	10.9	40	560	2.6	
14:45	178/140	38	530	9.6	40	560	3.9	14:46 Flush 102
14:55	178/142	38	520	8.9	34	260	29.7	
15:05	176/141	38	520	8.4	34	240	30.0	
15:15	177/142	38	520	8.7	34	360	29.7	
15:25	174/140	38	520	4.8	34	340	29.7	
15:35	172/139	38	520	4.8	36	440	29.8	
15:45	173/137	38	520	6.6	38	500	29.7	
15:55	172/138	38	520	7.2	38	410	29.7	
16:05	172/135	38	520	10.2	40	530	29.9	
16:15	172/136	38	540	12.0	40	510	29.1	
16:25	169/137	38	540	10.1	40	510	26.4	
16:35	172/129	38	500	13.7	35	430	29.3	
16:45	166/106	32	320	30.4	35	350	29.9	
16:55	156/133	38	530	26.8	40	570	28.4	16:59
17:05	169/140	30	80	27.1	38	390	27.0	
17:15	146/142	30	120	29.7	40	520	26.2	

READINGS EVERY 10 MIN.

E-TUBE DATA SHEET

DATE 6-22-94

BY Alan Smith

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PLANT: Chilco

TIME	QUENCH CHAMBER TEMP	SOUTH TR SET KV	MA	SPARK RATE	NORTH TR SET KV	MA	SPARK RATE	INDICATE TIME OF FLUSH CYCLE
17:25	155/142	30	150	29.7	40	560	18.3	
17:35	154/144	32	240	29.6	40	560	17.5	
17:45	152/145	32	210	29.9	40	560	16.1	
17:55	155/145	32	270	29.7	40	560	12.5	
18:05	156/145	35	450	29.2	40	560	8.3	
18:15	155/146	36	510	29.5	40	560	7.3	
18:25	147/146	36	450	28.3	40	560	8.5	
18:35	143/141	36	520	21.0	39	560	6.2	
[illegible]	138/141	36	530	21.4	40	560	5.2	
[illegible] 55	149/141	36	570	20.5	40	560	7.0	19:00
[illegible]	147/140	32	280	29.3	29	[illegible]	19.5	
[illegible]	150/140	34	430	27.4	32	160	29.7	
[illegible]:25	145/140	34	520	20.6	33	200	29.6	
[illegible]	143/137	34	350	22.8	35	300	29.7	
[illegible]	148/133	36	400	25.0	37	390	29.8	
[illegible]	154/138	34	450	24.8	34	300	29.8	
20:05	143/137	35	500	23.3	33	450	29.3	
20:15	147/138	34	450	24.9	34	400	29.6	
20:25	155/138	36	500	27.3	34	250	29.6	
20:35	153/138	32	300	23.3	40	400	29.5	
20:45	153/142	30	300	29.2	36	350	29.8	
20:55	154/144	10	0	31.6	30	140	29.7	21:00 Flush [illegible]
21:05	157/145	30	90	33	40	430	29.5	
[illegible]	144/147	30	100	29.7	38	450	29.7	
[illegible] 25	144/145	30	200	29.5	38	~~5~~ 440	29.9	
[illegible]	152/147	30	220	29.6	38	460	29.8	
21:45	142/144	32	240	29.7	40	480	29.8	
[illegible]	150/143	30	250	29.6	40	[illegible]	29.1	
22:05	145/145	30	290	29.8	38	400	29.5	
22:15	140/145	32	300	29.7	37	320	29.0	

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READINGS EVERY 10 MIN.

E-TUBE DATA SHEET

PLANT: Chilco

DATE 6/22/94

BY

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TIME	QUENCH CHAMBER TEMP	SOUTH TR SET KV	MA	SPARK RATE	NORTH TR SET KV	MA	SPARK RATE	INDICATE TIME OF FLUSH CYCLE
22:25	144/146	32	270	30	36	280	29.8	
22:35	148/145	30	280	29.7	38	350	29.6	
22:45	145/143	30	300	29.4	38	370	29.7	
22:55	148/144	32	270	29.5	40	400	29.9	
23:05	147/145	—	0	30.4	/	0	28.6	FLUSHING 102 + CYCLIN
23:15	148/144	30	150	29.5	32	170	30.3	
23:25	147/144	30	170	29.6	32	180	29.7	
23:35	146/144	31	220	29.6	32	220	29.9	
23:45	148/145	30	300	29.8	34	260	29.9	
23:55	150/145	32	400	29.7	36	350	29.8	
24:05								

RTO readings

Plant: chilco readings evey 10 minutes by: Alan Smith date: 6-22-94 Page 1 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	B#2	B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used
07:30	309	256	277	270	222	220	254	312	2.4	1549	1546	1552	136	1560	218	266	16242
07:40	309	255	280	266	223	221	247	316	2.4	1550	1554	1554	136	1550	222	255	
07:50	309	256	278	270	224	220	253	312	2.2	1549	1547	1543	137	1547	221	277	
08:00	309	256	280	262	224	220	246	316	2.4	1550	1552	1557	137	1553	222	215	16246
08:10	307	257	279	269	224	219	257	309	2.6	1547	1548	1542	137	1539	224	260	
08:20	311	256	280	268	223	221	246	317	2.8	1551	1549	1559	137	1558	222	267	16250
08:30	308	258	279	270	224	219	256	[illegible]	2.8	1548	1549	1542	136	1540	225	2.21	
08:40	312	258	280	270	225	222	247	319	2.6	1551	1550	1559	138	1559	222	2.17	
08:50	310	259	280	272	226	220	259	312	2.8	1547	1550	1540	139	1537	226	2.51	16254
09:00	314	259	282	271	226	224	248	321	2.6	1552	1549	1558	141	1557	224	2.52	
09:10	316	260	284	279	228	226	250	322	2.4	1552	1551	1556	143	1557	225	2.62	
09:20	318	261	285	274	229	227	251	323	2.8	1551	1548	1557	142	1556	226	2.53	16258
09:30	314	263	284	275	230	224	262	316	2.8	1547	1547	1542	142	1540	230	2.57	
09:40	317	261	286	273	229	226	249	323	2.8	1551	1550	1561	140	1561	225	2.47	
09:50	313	262	284	274	229	224	261	315	2.6	1550	1549	1539	144	1540	229	2.48	16262
10:00	319	261	288	275	230	226	252	324	2.6	1552	1551	1558	146	1558	228	2.66	
10:10	318	264	287	277	232	228	264	319	2.6	1548	1548	1540	147	1541	232	2.61	
10:20	321	264	290	276	233	230	257	324	2.4	1551	1555	1557	148	1554	231	[illegible]	16266
10:30	322	266	290	281	234	231	264	322	2.2	1549	1547	1541	148	1544	234	2.03	
10:40	322	267	292	272	235	233	258	325	2.6	1547	1552	1557	150	1553	234	2.56	
10:50	323	268	290	282	235	232	264	323	2.4	1549	1547	1544	145	1541	235	2.00	16270
11:00	320	266	291	277	235	230	258	324	2.6	1551	1553	1557	146	1554	233	2.?8	
11:10	325	264	290	281	234	232	258	326	1.8	1552	1548	1554	149	1557	231	2.59	
11:20	321	268	292	278	236	231	266	322	2.0	1549	1551	1548	150	1543	236	2.66	16274
11:30	327	268	293	281	235	234	257	329	2.8	1552	1553	1557	150	1555	236	2.10	
11:40	324	270	293	282	237	233	269	324	2.8	1548	1548	1542	151	1545	238	2.46	
11:50	326	269	295	280	238	236	260	329	2.4	1552	1553	1554	152	1552	237	2.34	16278
12:00	327	270	294	284	239	235	269	326	2.4	1547	1548	1557	152	1541	239	2.52	
12:10	326	270	296	280	239	235	262	329	2.4	1549	1552	1556	150	1555	237	2.10	
12:20	326	269	296	280	239	235	264	326	2.8	1550	1552	1553	150	1551	236	2.50	

J-55

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RTO readings

Plant: chilco   readings evey 10 minutes   by: Alan Smith   date: 6-22-94   Page 2 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	B#2	B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used
12:30	325	270	295	279	238	234	255	325	2.8	1548	1549	1543	149	1554	236	2.35	16282
12:40	[illegible]	269	293	[illegible]	[illegible]	234	[illegible]	[illegible]	2.7	1548	1548	1551	148	1549	234	[illegible]	
12:50	326	[illegible]	293	[illegible]	237	233	257	[illegible]	2.0	1549	1551	1534	147	1541	236	2.45	
13:00	327	267	294	279	236	234	257	328	2.7	1562	1552	1563	147	1561	234	2.43	16285
13:10	327	268	291	283	236	232	264	323	2.4	1550	1548	1547	146	1550	235	2.64	
13:20	324	268	293	278	237	232	264	322	2.2	1549	1551	1550	148	1549	235	2.76	
13:30	330	268	293	282	236	235	260	328	2.4	1552	1549	1554	150	1557	234	2.63	16289
13:40	325	269	294	282	239	234	268	322	3.0	1550	1551	1542	149	1541	238	2.72	
13:50	328	268	295	280	238	235	260	329	2.6	1550	1552	1556	149	1555	236	2.40	
14:00	329	268	293	284	237	235	264	326	2.6	1549	1548	1546	149	1549	235	2.39	16293
14:10	325	269	295	280	239	234	266	323	2.2	1550	1550	1548	149	1545	237	2.54	
14:20	330	269	294	282	238	236	260	330	2.8	1551	1550	1556	149	1558	234	2.56	
14:30	327	270	293	283	239	234	268	324	2.6	1548	1550	1538	149	1540	238	2.57	16297
14:40	326	269	295	279	239	235	261	327	3.0	1550	1553	1556	148	1555	236	2.60	
14:50	321	270	293	283	239	234	267	325	2.3	1544	1547	1544	147	1543	237	2.48	
15:00	329	269	293	282	237	235	259	327	2.0	1551	1549	1553	148	1557	231	2.54	16302
15:10	325	268	292	280	237	232	266	321	3.0	1546	1547	1545	147	1544	235	2.52	
15:20	330	269	292	283	237	234	265	324	2.4	1549	1546	1546	148	1551	236	2.30	
15:30	326	269	294	280	238	233	265	322	2.0	1548	1551	1546	148	1544	236	2.52	16305
15:40	330	268	294	281	237	234	258	329	3.0	1552	1550	1555	147	1558	233	2.57	
15:50	325	269	293	281	238	232	268	322	2.6	1548	1549	1541	148	1541	236	2.55	
16:00	327	268	294	279	238	234	259	328	2.8	1551	1553	1558	147	1557	235	2.24	16309
16:10	329	269	293	282	238	234	261	328	2.2	1551	1548	1547	147	1552	233	2.55	
16:20	324	269	292	280	238	232	267	321	3.0	1548	1548	1542	147	1540	236	2.58	
16:30	329	268	293	281	237	234	260	328	2.0	1550	1548	1550	147	1554	233	2.50	16313
16:40	326	269	292	282	238	233	266	323	3.0	1549	1548	1542	144	1541	236	2.30	
16:50	324	267	293	276	237	231	257	324	2.8	1549	1552	1553	141	1550	233	2.52	
17:00	326	266	293	278	236	232	255	326	2.4	1551	1552	1559	145	1559	233	2.70	16317
17:10	324	267	292	278	236	231	265	320	2.8	1549	1550	1541	146	1540	236	2.62	
17:20	327	267	294	278	236	233	257	327	2.6	1550	1552	1558	147	1558	234	2.38	

pressure drop → RTO inlet pressure

RTO readings   Plant: chilco   readings evey 10 minutes   by: Allan Smith   date: 6-22-99   Page 3 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	BURNERS B#2	BURNERS B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used
17:30	328	268	292	282	236	233	263	323	2.8	1551	1548	1549	148	1552	233	20	16321
17:40	326	269	294	279	236	231	253	323	2.9	1550	1550	1550	149	1557	237	20.5	
17:50	331	269	295	281	238	235	257	329	2.8	1550	1549	1551	150	1561	235	21	
18:00	326	271	294	282	239	233	269	323	2.9	1548	1550	1542	150	1540	239	21	16324
18:10	327	271	296	280	239	233	262	325	2.8	1551	1552	1555	150	1554	237	20.5	
18:20	330	271	295	284	239	235	263	328	2.4	1551	1549	1545	149	1553	237	20	
18:30	327	272	295	283	240	233	269	323	3.0	1548	1548	1552	150	1542	238	19.5	16328
18:40	329	271	296	280	239	234	260	328	2.4	1550	1555	1558	149	1556	236	19.0	
18:50	330	271	294	284	238	234	263	326	2.4	1550	1548	1547	148	1549	235	18.5	
19:00	331	271	295	279	237	232	265	323	2.8	1549	1548	1541	149	1542	238	20.0	16332
19:10	329	270	296	280	238	233	258	329	2.6	1550	1552	1559	148	1559	236	21.0	
19:20	326	271	294	281	237	232	266	323	2.2	1549	1549	1539	148	1537	237	20.0	
19:30	325	272	295	279	238	231	265	332	2.3	1550	1552	1550	148	1560	237	18.5	16336
19:40	324	272	294	282	238	231	263	323	2.2	1549	1547	1546	148	1547	233	20	
19:50	329	271	290	283	237	232	264	325	2.6	[illegible]	1547	1541	148	1547	237	21	
20:00	329	271	296	280	237	231	258	330	2.4	1551	1551	1562	148	1551	235	20	16340
20:10	330	271	296	282	237	233	260	328	2.5	[illegible]	[illegible]	1543	148	1551	[illegible]	22.5	
20:20	330	271	294	283	237	233	261	328	2.5	[illegible]	[illegible]	1546	148	1548	234	22.0	
20:30	328	272	293	283	236	[illegible]	268	[illegible]	2.7	[illegible]	[illegible]	1543	148	1543	236	18.5	16344
20:40	326	272	294	281	236	231	267	321	2.1	[illegible]	1550	1541	148	1544	234	20	
20:50	327	271	296	279	237	232	263	302	2.1	1551	1553	1536	147	1590	[illegible]	20.5	
21:00	329	272	294	283	237	233	261	330	2.2	1551	1548	1548	147	[illegible]	231	21	16349
21:10	330	270	293	[illegible]	[illegible]	234	258	321	2.7	[illegible]	1549	1552	147	1585	232	18.5	
21:20	326	271	295	274	237	[illegible]	251	321	[illegible]	1552	1552	1536	147	1572	234	21	
21:30	327	270	296	279	236	232	267	330	2.6	1551	1549	1558	147	1587	232	20.0	16352
21:40	321	272	299	279	236	230	265	322	2.3	1550	1554	1553	147	1584	233	19.0	
21:50	329	270	294	280	235	233	256	329	2.15	1550	1552	1557	146	1581	233	19.5	
22:00	324	271	292	282	236	229	267	322	2.1	1549	1549	1549	146	1577	234	20.0	16357
22:10	327	271	291	283	234	230	262	324	2.18	1552	1549	1549	146	1585	231	21.5	
22:20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	327	2.71	1553	1551	1558	146	1586	229	20.0	

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RTO readings   Plant: chilco   readings evey 10 minutes   by:________   date:________   Page 4 of 4

TIME	#1	#2	#3	#4	#5	#6	#7	#8	INLET PRESS. w.c.	BURNERS B#1	B#2	B#3	INLET TEMP.	COMBUST. CHAMBER TEMP.	EXHAUST TEMP.	pressure drop	Gas Used
22:30	326	269	291	279	233	230	255	328	2.4	1552	1550	1559	144	1585	228	20	16360
22:40	322	270	287	277	233	227	263	319	2.5	1548	1550	1541	142	1577	231	18	
22:50	319	269	289	280	232	227	264	319	2.5	1549	1550	1540	142	1581	230	22	
23:00	322	269	288	279	232	225	263	319	2.6	1548	1547	1541	142	1578	230	18	16364
23:10	323	269	288	279	232	226	261	320	2.5	1549	1547	1546	142	1582	229	22	
23:20	323	269	288	279	231	225	262	319	2.3	1550	1549	1542	141	1581	230	20	
23:30	324	267	288	278	230	227	254	325	2.2	1551	1549	1552	142	1585	227	21	16369
23:40	320	269	288	277	231	226	262	318	2.1	1550	1552	1549	143	1580	230	18	
23:50	324	268	288	279	231	227	260	321	2.7	1549	1548	1543	143	1582	230	19	
24:00	324	267	289	278	231	228	253	325	2.3	1551	1548	1556	143	1584	227	20	
00:10																	
00:20																	
00:30																	
00:40																	
00:50																	
01:00																	

Tank Reading
300.2 LB/inch

Lap

6/22/94

Dave Bullock
313

Time	Units/hr	Tank Reading	Oven temp (F) A.	B.	C.
07:30	Ø	84½"	275 / 250	277 / 295	273 / 274
08:30	Ø	84½"	276 / 250	276 / 296	275 / 275
09:30	Ø	84½"	275 / 250	276 / 296	276 / 275
Start up 9:49					
10:30	4	87"	275 / 250	275 / 293	276 / 275
11:30	6	88½"	274 / 250	275 / 294	275 / 275
12:30	5	89¼"	250 / 250	250 / 271	250 / 250
13:30	4	89½"	251 / 250	249 / 273	250 / 250
14:30	3	90"	249 / 251	249 / 271	249 / 250
15:30	5	90⅞"	250 / 250	252 / 270	250 / 250
16:30	5	91¼"	250 / 251	250 / 255	251 / 250
17:30	3	91⅜"	250 / 251	252 / 273	250 / 250
18:30	1	92¼"	250 / 251	251 / 276	250 / 250
19:30	3	93¾"	250 / 252	249 / 271	251 / 251
20:30	2	94⅛"	250 / 251	250 / 274	250 / 250
21:30	Ø	93⅞"	250 / 250	251 / 273	249 / 251
22:30	1	94⅝"	250 / 250	249 / 275	250 / 249

B LINE OFF 20:10
A LINE 20:15 OFF

A LINE ON 22:16
B LINE ON 22:41

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LAP

Time	units/hr	Tank Reading	Oven Temp (F) A	B	C
23:30	3	95"	250 251	251 273	251 250
0:30					
	$\overline{24}$	95-90 5"			

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Panel 6/22/94

Time	Units/hr	Tank Reading	Oven Temp (F)
07:30	Ø	80½"	301°
08:30	Ø	80½"	331°
09:30	Ø	80½"	341°
start up 9:51			
10:30	3	80¾"	304°
11:30	5	81"	304°
12:30	5	82¼	303°
13:30	4	82⅞"	304°
14:30	4 +1 shop	83¼"	314°
15:30	5 + 1 shop	84"	309°
16:30	6 +1 shop	84¼	316°
17:30	5	85"	324°
18:30	6	85¾	317°
19:30	6	87⅞	316°
20:30	2 +2 SHOP	88⅛"	307°
21:30	5	88⅛"	346°
22:30	Ø	88¾"	144°

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Panel

Time	units/hr	Tank Reading	Oven Temp (F)
23:30	$\varnothing$	88 7/8"	94°
		- 83 1/4	
0:30	44	5 5/8	

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CHILCO THERMAL OIL HEATER TESTING 6-22-94 PM, CO, NOx

DATA TIME:	START=		END=		HOURS=	
		10:10		13:10		3.00
		14:30		18:30		4.00
				TOTAL HOURS =		7.00

BOARD WEIGHTS - LBS
weight of approximately every 25th untrimmed board

206	214	192
210	218	210
205	218	214
206	202	211
202	210	217
194	224	
197	207	
199	215	
208	214	
216	203	
201	206	
209	206	
203	214	
214	212	
219	214	
203	216	

208.89 lb = average untrimmed mat weight

194.48 lb = average finished board weight (untrimmed mat weight-weight of trim)

6.9% = TRIM

PLANT PRODUCTION RATE

7 =hours during testing
111 =pressloads
888 =No. of (8' X 16') boards produced (no. of pressloads x 8 boards per load)
172698 =Lbs. finished product (no. of boards x weight of finished board)
24671 =Lbs. finished product produced per hour (lbs. of finished product / testing hours)
12.34 =Tons finished product per hour (lbs. of finished product per hour / 2000 lb)

FUEL INPUT

24.75 =RIGHT SIDE FUEL CALIBRATION IN LB/COUNT
338 =RIGHT SIDE COUNTS DURING TESTING HOURS
8366 =RIGHT SIDE - LB. OF WET FUEL BURNED DURING TESTING

28.625 =LEFT SIDE FUEL CALIBRATION IN LB/COUNT
376 =LEFT SIDE COUNTS DURING TESTING HOURS
10763 =LEFT SIDE - LB. OF WET FUEL BURNED DURING TESTING

7.00 =HOURS DURING TESTING
19129 =TOTAL LB. OF WET FUEL BURNED DURING TESTING
39.7% =AVERAGE MOISTURE CONTENT OF FUEL
11529 =TOTAL LB. OF DRY FUEL BURNED DURING TESTING (LB WET FUEL X (1- % MOISTURE)
1647 =LB. OF DRY FUEL BURNED PER HOUR (TOTAL LB OF DRY FUEL BURNED / TESTING HOURS
0.82 =TONS OF DRY FUEL BURNED PER HOUR (TOTAL LB OF DRY FUEL BURNED PER HOUR / 2000 LB)
9000 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)
14.82 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

input to be verified by f factor

			DATE	6-22-94	
			BY	Bernie	
			PAGE	1	OF Day II (Wend)

KONUS DATA

PLANT: CHILCO

OIL SETPOINTS

left fuel calibration

right fuel calibration

READINGS EVERY 10 MINUTES

(NOTE ANY CHANGES IN SETPOINTS)

TIME	PRIMARY AIR LEFT	I.D. FAN	PRIMARY AIR RIGHT	OIL IN deg. C	OIL OUT deg. F	FUEL COUNT		FEED RATE SETTIN		EVERY HOUR	
						LT	RT	LT	RT	BAG H. PRESS.	BARK MOISTURE
0725	270	-1.3	270	-	516.9	34	34	220	220	5.3	
0735	270	-1.3	270	-	513.9	42	42	200	200		
0745	270	-1.2	270	-	510.0	50	50	200	200		41.4
0755	270	-1.3	270	-	504.1	56	57	200	200		
0805	270	-1.3	270	-	497.5	64	65	200	200	5.3	
0815	270	-1.3	270	-	488.9	73	74	220	220		
0825	270	-1.4	270	-	487.3	81	82	240	240		
0835	270	-1.4	270	-	491.5	90	91	220	220		
0845	270	-1.3	270	-	497.0	98	99	220	220		44.3
0855	270	-1.3	270	-	496.7	107	108	220	220		
0905	270	-1.3	270	-	490.4	117	118	220	220	5.3	
0915	270	-1.3	270	-	485.5	123	125	220	220		
0925	270	-1.3	270	-	482.8	132	133	200	200		
0935	270	-1.3	270	-	481.8	140	141	200	200		
0945	270	-1.4	270	-	483.0	146	148	200	200		41.5
0955	270	-1.4	270	-	482.1	154	156	200	200		
1005	270	-1.4	260	-	487.1	161	163	200	200	5.4	
1015	270	-1.4	260	-	487.1	170	171	200	200		
1025	270	-1.3	260	-	484.7	177	179	200	200		
1035	270	-1.4	260	-	476.4	185	187	200	200		
1045	270	-1.4	260	-	473.2	193	196	200	200		32.8
1055	270	-1.4	260	-	474.5	200	203	200	230		
1105	270	-1.4	260	-	471.9	207	212	220	240	5.5	
1115	270	-1.4	270	-	471.2	218	223	250	280		
1125	280	-1.4	280	-	471.6	225	231	250	280		
1135	280	-1.4	280	-	472.5	230	243	250	280		42.6
1145	280	-1.3	280	-	474.3	246	254	250	280		
1155	280	-1.3	280	-	474.4	254	264	250	280		

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DATE 6-22-94
BY BERNIE
PAGE 2 OF DAY II (WEND)

ONUS DATA

LANT: CHILCO

READINGS EVERY 10 MINUTES

OIL SETPOINTS

left fuel calibration

right fuel calibration

(NOTE ANY CHANGES IN SETPOINTS)

TIME	PRIMARY AIR LEFT	I.D. FAN	PRIMARY AIR RIGHT	OIL * IN deg. C	OIL OUT deg. F	FUEL COUNT LT	FUEL COUNT RT	FEED RATE SETTIN LT	FEED RATE SETTIN RT	EVERY HOUR BAG H. PRESS.	EVERY HOUR BARK MOISTURE
1205	280	-1.3	280	—	476.9	265	276	250	280	55	
1215	280	-1.3	280	—	479.2	274	286	250	280		
1225	280	-1.2	280	—	480.3	284	297	250	280		
1235	280	-1.2	280	—	483.1	292	306	250	280		
1245	280	-1.2	280	—	486.6	302	318	230	260		37.1
1255	280	-1.4	280	—	489.0	313	330	210	240		
1305	280	-1.4	280	—	493.6	320	337	170	200	1.0	
1315	280	-1.4	280	—	493.4	325	344	170	200		
1325	280	-1.4	280	—	495.6	330	349	100	100		
1335	280	-14	280	—	510.0	334	354	100	100		
1345	off	-2.5	off	—	525.7	336	355	off	off		39.3
355	280	-1.2	280	-	514.4	338	357	200	250		
1405	280	-1.3	280	—	501.2	344	366	170	220	1.3	
1415	280	-1.3	280	-	491.5	352	375	200	250		
1425	280	-1.4	280	-	484.9	362	388	230	280		
1435	280	-1.4	280	—	485.4	371	399	230	280		
1445	280	-1.4	280	-	485.5	378	408	230	280		41.4
1455	280	-1.4	280	—	483.2	384	415	230	280		
1505	280	-1.4	280	-	482.9	394	428	230	280	1.2	
1515	280	-1.4	280	—	478.8	401	436	230	280		
1525	280	-1.4	280	—	481.9	410	448	230	280		
1535	280	-1.4	280	-	481.4	418	458	230	280		
1545	280	-1.4	280	-	482.5	427	468	230	280		49.5
1555	280	-1.4	280	—	488.9	437	480	230	280		
1605	280	-1.4	280	-	490.2	445	491	230	280	1.4	
1615	280	-1.4	280	-	490.6	454	502	236	280		
1625	280	-1.4	280	-	493.3	461	511	230	280		
1635	280	-1.3	280	-	498.9	464	515	130	180		28.8
1645	280	-1.3	280	—	501.2	464	515	off	off		
1655	250	-1.4	280	—	491.3	465	516	230	280		

326 lb. Ash @ Purge 12:00 hr

* no reading available

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KONUS DATA
PLANT: CHILCO

DATE 6-22-94
BY Bernie
PAGE 3 OF Day II (Wena)

OIL SETPOINTS

left fuel calibration
right fuel calibration

READINGS EVERY 10 MINUTES

(NOTE ANY CHANGES IN SETPOINTS)

TIME	PRIMARY AIR LEFT	I.D. FAN	PRIMARY AIR RIGHT	OIL IN deg. C	OIL OUT deg. F	FUEL COUNT LT	FUEL COUNT RT	FEED RATE SETTIN LT	FEED RATE SETTIN RT	EVERY HOUR BAG H. PRESS.	EVERY HOUR BARK MOISTURE
1705	280	-1.4	280	—	475.6	473	525	230	280	1.3	
1715	280	-1.4	280	—	470.5	484	538	270	310		
1725	280	-1.4	280	—	472.7	493	548	270	310		
1735	280	-1.4	280	—	475.4	502	560	230	270		
1745	280	-1.4	280	—	477.9	510	569	200	250		45.9
1755	280	-1.4	280	—	476.5	518	579	200	250		
1805	280	-1.4	280	—	473.9	527	590	220	270	1.4	
1815	280	-1.4	280	—	474.3	535	599	220	270		
1825	280	-1.4	280	—	472.2	543	610	230	280		
1835	280	-1.4	280	—	473.5	552	620	220	270		
1845	280	-1.4	280	—	472.2	562	633	240	290		39.8
1855	280	-1.4	280	—	477.8	570	642	240	290		
1905	280	-1.4	280	—	479.4	10	11	240	290	1.4	
1915	280	-1.3	280	—	480.6	19	22	240	290		
1925	280	-1.4	280	—	483.1	28	33	240	290		46.0
1935	280	-1.4	280	—	485.8	37	44	240	290		
1945	280	-1.4	280	—	486.2	46	55	240	290		
1955	280	-1.4	280	—	485.9	55	65	240	290		
2005	280	-1.4	280	—	483.1	64	76	240	290	1.5	
2015	280	-1.4	280	—	487.1	74	88	240	290		
2025	280	-1.4	280	—	489.2	83	98	240	290		47.2
2035	280	-1.3	280	—	500.0	93	110	220	260		
2045	280	-1.4	280	—	501.2	102	121	220	260		
2055	280	-1.4	280	—	503.8	110	130	220	260		
2105	280	-1.4	280	—	508.0	118	140	200	230	1.5	
2115	280	-1.4	280	—	507.4	126	148	200	230		
2125	280	-1.4	280	—	505.1	134	157	200	230		41.0
2135	280	-1.4	280	—	500.6	142	166	200	230		
2145	280	-1.4	280	—	500.1	148	173	200	230		
2155	280	-1.4	280	—	502.9	157	183	200	230		

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CHILCO THERMAL OIL HEATER TESTING 6-23-94 VOC

DATA TIME: START= 08:30 END= 12:10 HOURS= 3.67

TOTAL HOURS = 3.67

BOARD WEIGHTS - LBS

weight of approximately every 25th untrimmed board

207	208
210	212
207	206
206	202
205	
203	
209	
203	
209	
208	
201	
203	
206	
207	
207	
206	

206.25 lb = average untrimmed mat weight

192.02 lb = average finished board weight (untrimmed mat weight-weight of trim)

6.9% = TRIM

PLANT PRODUCTION RATE

3.67 =hours during testing
60 =pressloads
480 =No. of (8' X 16') boards produced (no. of pressloads x 8 boards per load)
92170 =Lbs. finished product (no. of boards x weight of finished board)
25137 =Lbs. finished product produced per hour (lbs. of finished product / testing hours)
12.57 =Tons finished product per hour (lbs. of finished product per hour / 2000 lb)

FUEL INPUT

24.75 =RIGHT SIDE FUEL CALIBRATION IN LB/COUNT
175 =RIGHT SIDE COUNTS DURING TESTING HOURS
4331 =RIGHT SIDE - LB. OF WET FUEL BURNED DURING TESTING

28.625 =LEFT SIDE FUEL CALIBRATION IN LB/COUNT
216 =LEFT SIDE COUNTS DURING TESTING HOURS
6183 =LEFT SIDE - LB. OF WET FUEL BURNED DURING TESTING

3.67 =HOURS DURING TESTING
10514 =TOTAL LB. OF WET FUEL BURNED DURING TESTING
34.6% =AVERAGE MOISTURE CONTENT OF FUEL
6882 =TOTAL LB. OF DRY FUEL BURNED DURING TESTING (LB WET FUEL X (1- % MOISTURE)
1877 =LB. OF DRY FUEL BURNED PER HOUR (TOTAL LB OF DRY FUEL BURNED / TESTING HOURS
0.94 =TONS OF DRY FUEL BURNED PER HOUR (TOTAL LB OF DRY FUEL BURNED PER HOUR / 2000 LB)
9000 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)
16.89 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

input to be verified by f factor

KONUS DATA

PLANT: CHILCO

DATE 6-23-94

BY ROB GOTTAS

PAGE OF

OIL SETPOINTS

left fuel calibration

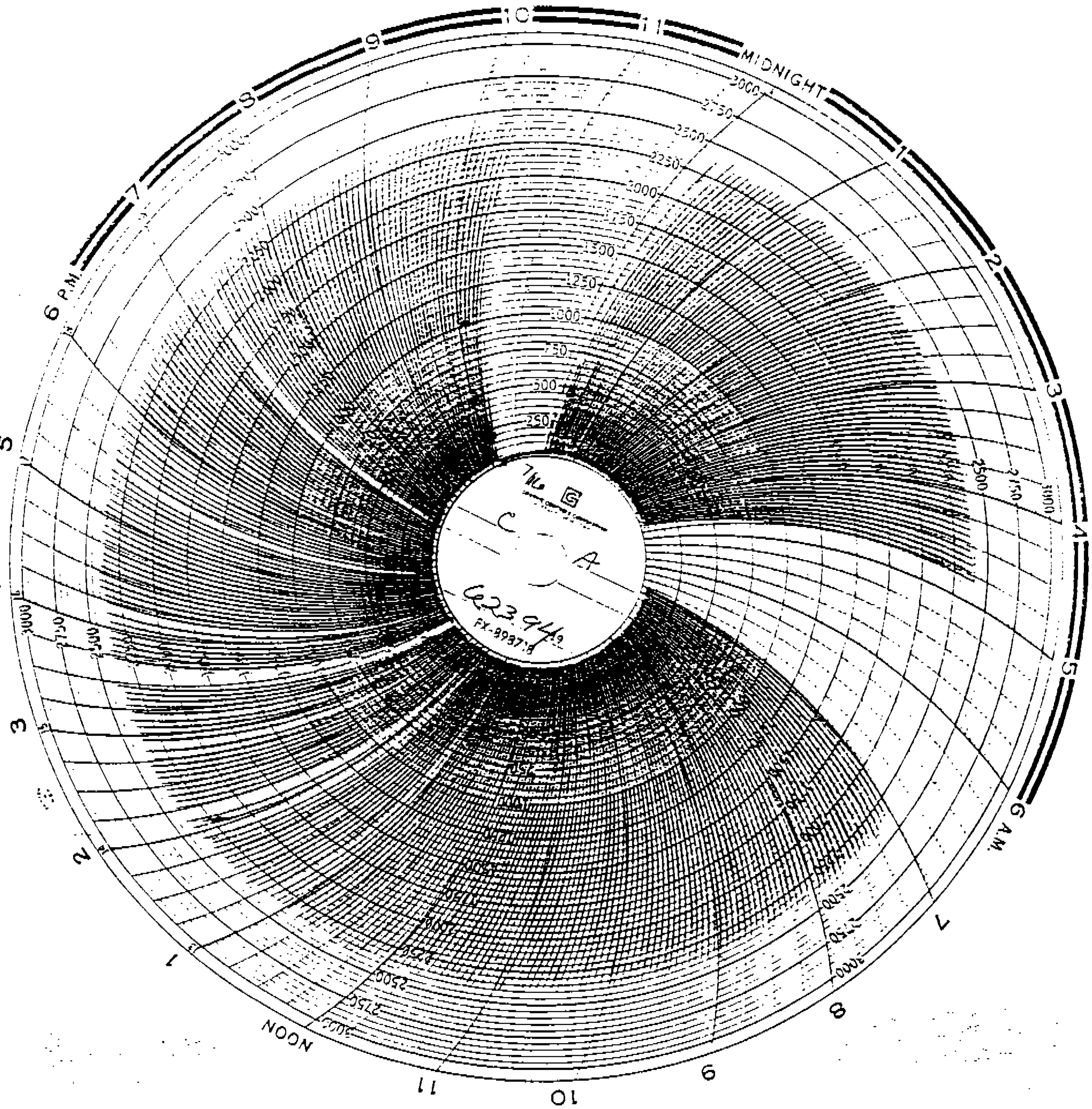
right fuel calibration

READINGS EVERY 10 MINUTES

(NOTE ANY CHANGES IN SETPOINTS)

TIME	PRIMARY AIR LEFT	I.D. FAN	PRIMARY AIR RIGHT	OIL IN deg. C	OIL OUT deg. F	FUEL COUNT LT	FUEL COUNT RT	FEED RATE SETTING LT	FEED RATE SETTING RT	EVERY HOUR BAG H. PRESS.	EVERY HOUR BARK MOISTURE
08:20	280	-1.0	280	—	—	83	104	180	230	319	41.8
08:30	280	-1.2	280	/	/	94	117	180	230		
08:40	280	-1.2	280	/	/	100	125	180	230		
08:50	280	-1.2	280	/	/	107	134	180	230		
09:00	280	-1.2	280	/	/	115	143	180	230		
09:10	280	-1.2	280	/	/	122	152	180	230		
09:20*	280	-1.2	280	/	/	129	161	180	230	319	21.0
09:30	280	-1.2	280	/	/	136	170	200	250		
09:40	280	-1.4	280	/	/	144	180	200	250		
09:50	280	-1.4	280	/	/	155	193	210	260		
10:00	280	-1.4	280	/		160	199	210	260		
10:10	280	-1.4	280	/		169	208	210	260		
10:20*	280	-1.4	280	/	/	172	219	210	260	320	32.2
10:30	280	-1.4	280	/	/	185	230	220	270		
10:40	280	-1.4	280			193	240	220	270		
10:50	280	-1.4	280	/	/	204	253	220	270		
11:00	280	-1.4	260	/	/	210	260	220	270		
11:10	280	-1.4	260	/	/	220	272	220	270		
11:20*	280	-1.4	260	/	/	227	281	220	270	320	43.2
11:30	280	-1.2	280	/	/	236	293	220	270		
11:40	280	-1.2	280	/	/	244	302	220	270		
11:50	280	-1.2	280	/	/	252	312	220	270		
12:00	280	-1.2	260	/	/	260	322	220	270		
12:10	280	-1.2	260	/	/	269	333	220	270		
12:20*											
12:30											
12:40											
12:50											
13:00											

PRESS CHART
6-23-94



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PRESS REPORT
6-23-94
0700 - 1900

LOUISIANA-PACIFIC CORPORATION
CHILCO, IDAHO

OPERATOR Don

THICKNESS 7/16

PRESS TEMP 210

SHIFT Days CREW C DATE 6-23-94

PRESS LOADS 7/16 = 184 =

TOTAL CAULS REJECTED

TOTAL FOOTAGE 219825

TOTAL DOWNTIME 38

FINES SETTING	LINE SPEED	FROM	TO
34	999	7:00	7:00

PAPER COUNTS
1. 79
2. 300
3. 375
4. 384

PRESS LOADS PER HOUR			
7:00	16	1:00	15
8:00	16	2:00	14
9:00	17	3:00	12
10:00	16	4:00	15
11:00	16	5:00	15
12:00	16	6:00	16

FACE RESIN TOTALIZER

CORE RESIN TOTALIZER

DOWNTIME FROM	TO	MIN	REASON FOR DOWNTIME
7:55	I	1	cut underlayment off
1:15	I	2	Saws Down
200	I	3	Saws Down Square Board
2:10	I	5	Saws Down
2:50	II	4	" " "
3:10	I	2	" " "
23 3:30	I	11	" " "
4:00	I	1	Hook up underlayment
4:10	I	2	Changing saws to lap
5:30	I	3	Sq Boards
5:50	I	2	Hooking up under lay
38 6:15	I	2	Saws Down

TIME TO POSITION (SECONDS)

1	65	39	59	77	62	115	67	153	47
2	62	40	60	78	52	116	70	154	55
3	65	41	60	79	50	117	71	155	45
4	68	42	59	80	50	118	74	156	44
5	70	43	58	81	47	119	77	157	35
6	69	44	58	82	46	120	65	158	38
7	70	45	61	83	44	121	69	159	38
8	71	46	59	84	45	122	69	160	41
9	69	47	57	85	43	123	68	161	77
10	69	48	58	86	44	124	65	162	39
11	69	49	58	87	44	125	74	163	41
12	70	50	56	88	48	126	76	164	46
13	72	51	56	89	50	127	67	165	42
14	71	52	57	90	49	128	62	166	53
15	74	53	58	91	53	129	63	167	55
16	72	54	55	92	54	130	60	168	63
17	63	55	51	93	55	131	61	169	62
18	58	56	58	94	60	132	60	170	63
19	62	57	53	95	63	133	59	171	62
20	63	58	55	96	65	134	58	172	67
21	62	59	56	97	62	135	52	173	62
22	60	60	55	98	65	136	57	174	65
23	59	61	57	99	57	137	56	175	65
24	62	62	57	100	58	138	57	176	69
25	63	63	57	101	56	139	52	177	65
26	64	64	56	102	55	140	58	178	62
27	63	65	57	103	52	141	56	179	62
28	62	66	66	104	53	142	57	180	63
29	65	67	60	105	57	143	58	181	62
30	71	68	62	106	57	144	51	182	62
31	75	69	65	107	58	145	50	183	64
32	63	70	58	108	60	146	50	184	63
33	62	71	58	109	61	147	50	185	
34	62	72	60	110	63	148	52	186	
35	63	73	62	111	[illegible]	149	54	187	
36	61	74	58	112	63	150	49	188	
37	63	75	62	113	61	151	[illegible]	189	
38	65	76	58	114	60	152	[illegible]	190	

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LOUISIANA PACIFIC
CHILCO OSB

DATE 6-23-94

~~E-TUBE SOLIDS~~ TEST
SWECO WASTE

$$\frac{\text{DRY SAMPLE WT.-WT. OF CUP}}{\text{WET SAMPLE WT.- WT. OF CUP}} = \text{\% SOLIDS}$$

PERCENTAGE OF SOLIDS: 31.8 %

10.9 CUP WT.
64.40 WET WT.

WET → $\underline{64.40 - 10.9} = 53.5$

DRY → $\underline{27.94 - 10.9}$ 17.04

$$\frac{17.04}{53.5} = 31.8$$

1 71

6-23-94

E-Tube Sludge Fed into the Konus

Time Start: 1700
Time Stop: 1730
Amount: Four shovels every 5 min.
approximately 1/3 to 1/2 yrd. added.

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CHILCO SIDING LINE TESTING 6-23-94 VOC

DATA TIME	START=	08:30	END=	12:15	HOURS=	3.75

SIDING LINE PAINT USAGE

3.75 =data hours during testing

PANEL LINE

25 =total units painted during testing (0830-1215)
74675 =square feet (3/8" basis)
19913 =average square feet (3/8") siding production per hour during test
477920 =equivalent daily siding production in square feet (3/8")
4 =inches of paint used
300.2 = paint calibration (lbs per inch)
1200.8 =total paint usage during testing - lbs
320 =average paint usage per hour during test

LAP LINE

21 =total units painted during testing (0830-1215)
62727 =square feet (3/8" basis)
16727 =average square feet (3/8") siding production per hour during test
401453 =equivalent daily siding production in square feet (3/8")
3.5 =inches of paint used (81-74)
300.2 = paint calibration (lbs per inch)
1051 =total paint usage during testing - lbs
280 =average paint usage per hour during test

10:20 6-23

LAP

300.2 LB/inch

Time	Units/hr.	Tank Readings	Oven Temp. A.	B.	C.	
07:30	Ø	98" AG. 8:00 ~~77~~	250	249	250	
			250	274	249	
8:30	1	99"	A. 249	B. 249	C. 249	1
			248	272	249	2
9:30	6	100"	251	250	250	A
			250	270	250	B
10:30	6	100"	249	248	249	A
			249	250	250	B
11:30	5	101"	249	249	250	A
			250	250	249	B
12:15	4	102½"	250	250	251	A
			249	271	250	B

note: this information can be correlated to the pounds per unit usage estimate

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6-23

300.2 LB/inch

Panel

Time	Units / hr	Tank Reading	Oven Temp
7:30	Ø	89"	211°
8:30	2	89"	[illegible]
9:30	6	91"	307
10:30	8	92"	303
11:30	7	92½"	308
12:15	4	93"	306

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Chilco OSB -Stack Testing-
June 21-23, 1994

Trim Loss

Panel (7/16)

	Gross Weight (lbs)	Trimmed Weight (lbs)	% loss
#1	203	189	6.9
#2	200	186	7.0
#3	202	187	7.4
		Average	7.1

Lap (7/16)

	Gross Weight (lbs)	Trimmed Weight (lbs)	% loss
#1	200	186	7.0
#2	201	188	6.5
#3	201	188	6.5
#4	205	191	6.8
		Average	6.7

TRIM AVERAGE = 6.9%

Paper Overlay Weight

#1 6.75 lbs
#2 6.668 lbs
#3 6.938 lbs

Average 6.792 lbs

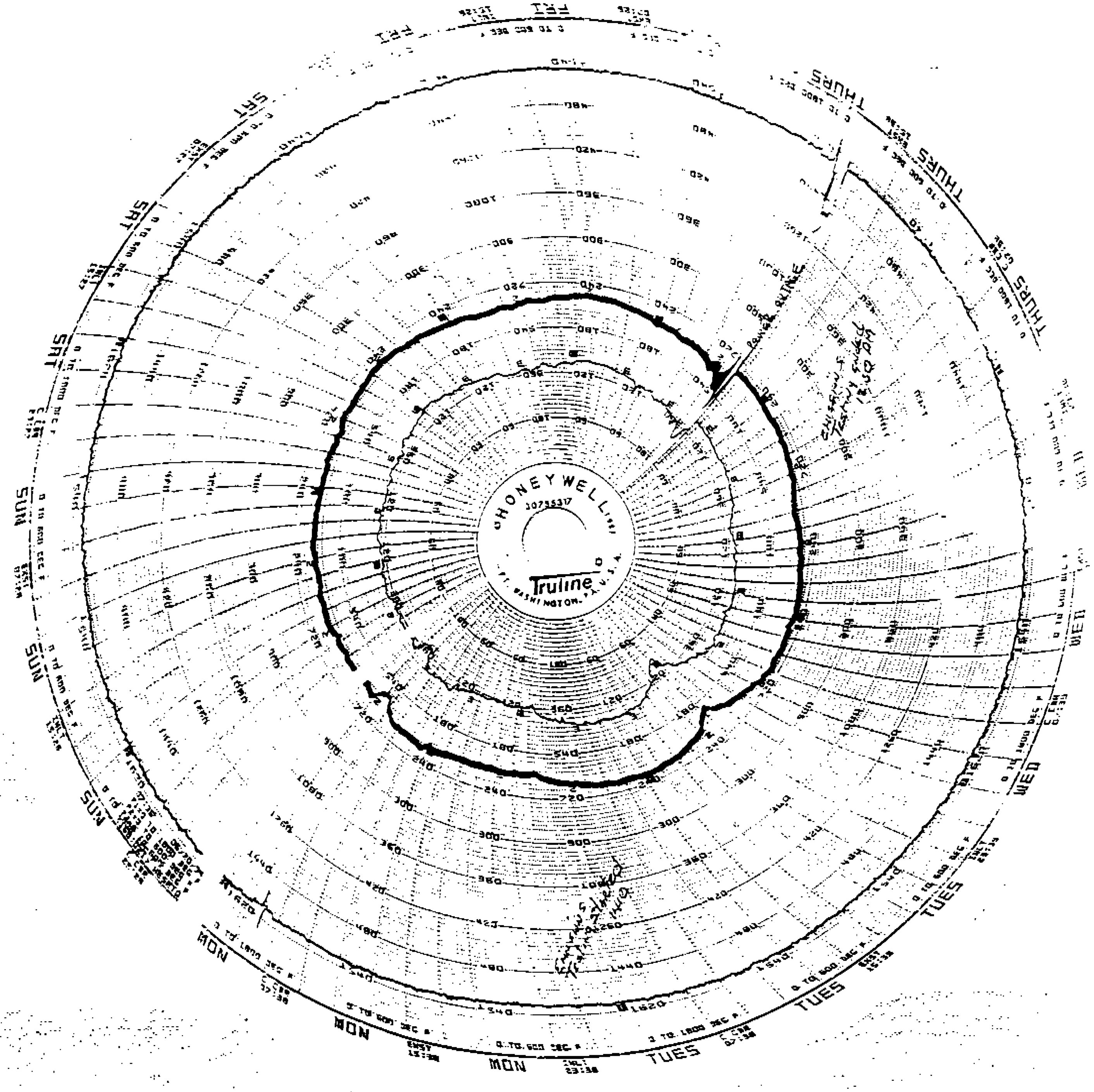
Edge Seal

	TTL Unit	TTL Paint Usage (lbs)	Paint (lbs)/Unit
8" Lap	353	15910.6	45.073
Panel 4oc	109	7505.0	68.853

Dave Bullock
Technical Director

Mike Hermanson
Environmental Manager

RTO CHART



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LOUISIANA PACIFIC
CHILCO OSB

THROUGH PUT TEST RESULTS

TEST 1		TEST 2	
DATE 6-16-94	TIME 10:40 am	DATE	TIME
TARE 34,780	MOISTURE	TARE	MOISTURE
GROSS 39,220	1. 6.3	GROSS	1.
NET 4,440	2. 5.7	NET	2.
	3. 4.4		3.
	4. 6.4		4.
TEST INTERVAL 10.02	5. 5.2	TEST INTERVAL	5.
	6. 6.3		6.
	7. 6.0		7.
	8. 6.0		8.
	9. 4.6		9.
1.00 − %M =	10. 6.3	1.00 − %M =	10.
.942 DRY STATE X	AVERAGE	DRY STATE X	AVERAGE
#/HR 26,587	5.84 %	#/HR	%
= 25045 FURNISH/HR		= FURNISH/HR	
NOTE: TARGET 33,000 # OR LESS		NOTE: TARGET 33,000 # OR LESS	
FEED RATE 999		FEED RATE	
HERTZ 69.9		HERTZ	

COMMENTS: TEST 1

Baghouse #1 off running fires outside

COMMENTS: TEST 2

SIGNATURES

TEST SUPERVISOR [signature]

INFORMATION TAKEN BY [signature]

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Post-it® Fax Note 7671	Date	# of pages ▶ 1
To SUE SOMMERS	From STEVE WARREN	
Co./Dept. THE TEST	Co.	
Phone # RESULTS YOU	Phone #	
Fax # WANTED!	Fax #	

LOUISIANA PACIFIC
CHILCO OSB

THROUGH PUT TEST RESULTS

TEST 1

DATE 6-23-94 TIME 13:45

TARE 37,640

GROSS 42,880

NET 5240

TEST INTERVAL 1003

MOISTURE	
1.	5.6
2.	5.0
3.	5.4
4.	6.0
5.	6.0
6.	6.2
7.	6.8
8.	5.6
9.	5.5
10.	7.4

100 − %M =

.940 DRY STATE X

#/HR 31346

= 29,465 FURNISH/HR

AVERAGE 6.0 %

NOTE: TARGET 33,000 # OR LESS

FEED RATE 999

HERTZ 69.9

TEST 2

DATE ______ TIME ______

TARE ______

GROSS ______

NET ______

TEST INTERVAL ______

MOISTURE	
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

100 − %M =

______ DRY STATE X

#/HR ______

= ______ FURNISH/HR

AVERAGE ______ %

NOTE: TARGET 33,000 # OR LESS

FEED RATE ______

HERTZ ______

COMMENTS: TEST 1

#1 Baghouse off fines Outside Used the average of the two scale readings for test results

COMMENTS: TEST 2

SIGNATURES

Steve L. Warren
TEST SUPERVISOR

Todd Lowe
INFORMATION TAKEN BY

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FUEL CALIBRATION REPORT

CHILCO

DATE of CALIBRATION: 6-17-94 BY: Dave B

CALIBRATION TO BE USED FOR MONTHS: July August September 94

SOURCE: Right Konus

SAMPLE TAKEN AT: Right stoker

COUNTS RECORDED AT: Konus Room

FUEL BIN LEVEL: Half

200 Feed Rate

SAMPLE NUMBER	(A) COUNTS per SAMPLE	(B) GROSS WEIGHT	(C) CONTAINER WEIGHT	(D) NET WEIGHT (B - C)	(E) WEIGHT per COUNT (D ./. A)	(F) MOISTURE PERCENTAGE
1	1	26.5	0	26.5	26.5	42.8
2	1	29.5	0	29.5	29.5	39.7
3	1	20.25	0	20.25	20.25	40.1
4	1	22.75	0	22.75	22.75	42.5

"A" TTL: 4 "D" TTL: 99 MOISTURE AVE: 41.275 %

CALIBRATION = 24.75 (TTL "A" ./. TTL "D")

FUEL CALIBRATION REPORT

DATE of CALIBRATION: 6-17-94 BY:

CALIBRATION TO BE USED FOR MONTHS:

SOURCE: Left Konus

SAMPLE TAKEN AT: Left Stoker

COUNTS RECORDED AT: Konus room

FUEL BIN LEVEL: Half

200 Feed Rate

SAMPLE NUMBER	(A) COUNTS per SAMPLE	(B) GROSS WEIGHT	(C) CONTAINER WEIGHT	(D) NET WEIGHT (B - C)	(E) WEIGHT per COUNT (D ./. A)	(F) MOISTURE PERCENTAGE
1	1	28.25	0	28.25	28.25	41.3
2	1	30.5	0	30.5	30.5	38.6
3	1	26.0	0	26.0	26.0	37.0
4	1	29.75	0	29.75	29.75	42.7

"A" TTL: 4 "D" TTL: 114.5 MOISTURE AVE: 39.9 %

CALIBRATION = 28.625 (TTL "A" ./. TTL "D")

FILE: 123: \FORMS\ENV\FUEL-CAL.WK1

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FUEL CALIBRATION REPORT

DATE of CALIBRATION: 6-17-94 BY: Dave Bullock

CALIBRATION TO BE USED FOR MONTHS: July, August, September 94

SOURCE: Dry Fuel Calibration

SAMPLE TAKEN AT: Dry Fuel Bin

COUNTS RECORDED AT: Dryer Control

FUEL BIN LEVEL: ½ −

SAMPLE NUMBER	(A) COUNTS per SAMPLE	(B) GROSS WEIGHT	(C) CONTAINER WEIGHT	(D) NET WEIGHT (B − C)	(E) WEIGHT per COUNT (D ⁄ A)	(F) MOISTURE PERCENTAGE
1	1	7.25	1	6.25	6.25	3.0
2	1	5.75	1	4.75	4.75	2.9
3	1	7.5	1	6.5	6.5	3.3
4	1	6.0	1	5.0	5.0	2.8

"A" TTL: 4 "D" TTL: 22.5 MOISTURE AVE: 3.0%

CALIBRATION = 5.625 (TTL "A" ⁄ TTL "D")

FUEL CALIBRATION REPORT

DATE of CALIBRATION: ____ BY: ____

CALIBRATION TO BE USED FOR MONTHS: ____

SOURCE: ____

SAMPLE TAKEN AT: ____

COUNTS RECORDED AT: ____

FUEL BIN LEVEL: ____

SAMPLE NUMBER	(A) COUNTS per SAMPLE	(B) GROSS WEIGHT	(C) CONTAINER WEIGHT	(D) NET WEIGHT (B − C)	(E) WEIGHT per COUNT (D ⁄ A)	(F) MOISTURE PERCENTAGE

"A" TTL: ____ "D" TTL: ____ MOISTURE AVE: ____

CALIBRATION = (TTL "A" ⁄ TTL "D")

FILE: 123: \FORMS\ENV\FUEL-CAL.WK1

PAINT

MATERIAL SAFETY DATA SHEET 06/06/94
GREY EDGE PRIMER(PF-4012-01)

Prepared: 05/24/94

SECTION I - PRODUCT IDENTIFICATION

Manufacturer: Associated Chemists, Inc.
4401 S. E. Johnson Creek Blvd.
Portland OR 97222

Telephone : (503) 659-1708
Emergency Tel. : (800) 535-5053

Hazard Ratings: none -> extreme 0 ---> 4
Health - 1
Fire - 1
Reactivity - 0
Personal Protection - E
UN #: NONE

Product Use : WATERBASE PAINT
Product Name : GREY EDGE PRIMER
MSDS Code : PF-4012-01
C.A.S. Number: NONE
TDG Classification: NA
TDG Shipping Name: NA
Packing Group: NA
Other Names : NONE
WHMIS Class(es) : D2B
Molecular Wt: NA

SECTION II - HAZARDOUS INGREDIENTS

Ingredients	CAS #	Weight %	LD50 mg/kg	LC50 4 hr	Exposure Limits ACGIH/TLV	OSHA/PEL

*** ALL Ingredients in this product are listed in the T.S.C.A. Inventory.
(No hazardous ingredients known at this time.)

SECTION III - PHYSICAL DATA

F ling Range: 212 F
E .p. Rate: Unavailable
Volatile vol %: NONE Wgt %: NONE
Vapour Pr. mm Hg: 17
Freeze Pt : <32 F
pH : 8.75
Odour : MILD
Appearance : THIN GREY LIQUID, MILD ODOR
V.O.C. :NONE

Vapour Density: Non Volatile
Odour Threshold: N/AV
Sp.Gravity: 1.20
Coef. Water/Oil: N/AV
Physical State : LIQUID

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: NONE LEL (vol. %) : NONE UEL (vol %): NONE
Flammability Class: IIIB
Auto-ignition Pt (Deg C): NA
-EXTINGUISHING MEDIA
Extinguishing media: Product is non-combustible.
-SPECIAL FIREFIGHTING PROCEDURES:
Use self-contained breathing apparatus with full facepiece.
-UNUSUAL FIRE & EXPLOSION HAZARDS:
None

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SECTION V - HEALTH HAZARD DATA

-PERMISSIBLE EXPOSURE LEVEL:
None established for product. (Current industrial experience Suggests 10 mg/m^3 as a nuisance mist.)

PRIMARY ROUTES OF ENTRY: Ingestion and/or Inhalation.

This product does not contain any substance(s) listed as a Carcinogen by NTP, IARC, or OSHA.

-EFFECTS OF OVEREXPOSURE:

A. (ACUTE/SHORT TERM): For Product-
EYES: Causes slight irritation.
SKIN: No Particular Discomfort Expected.
BREATHING: Causes slight irritation to nose and throat.
SWALLOWING: Ingestion may cause nausea, vomiting, diarrhea.

B. (CHRONIC/LONG TERM): For Product Or Components-
Prolonged or repeated breathing of sprays, mists, or dusts in excess of the suggested TLV may cause nasal and respiratory irritations.

-FIRST AID:
IF IN EYES: Immediately flush eyes with plenty of water for at least 15 minutes. If irritation continues, see a physician.
IF ON SKIN: Flush skin with water.
IF SWALLOWED: Induce vomiting. Call a physician immediately. Give large amounts of water or milk. Never give anything by mouth to an unconscious or convulsing person.
IF BREATHED: Remove person to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

SECTION VI - REACTIVITY DATA

STABLITY: [ ] Unstable [x] Stable

- INCOMPATABILITY:
None

-CONDITIONS TO AVOID:
Acids, strong oxidizing agents

- HAZARDOUS DECOMPOSITION PRODUCTS
Thermal decomposition or burning may produce carbon monoxide and/or carbon dioxide.

SECTION VII - SPILL OR LEAK PROCEDURES

-STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
SMALL SPILLS: Contain spill immediately. Use inert material to absorb spilled material. Place absorbed spill into secure container for removal.

LARGE SPILLS: Use caution, spilled material may be extremely slippery. Contain spill immediately and prevent

(cont.)

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SECTION VII - SPILL OR LEAK PROCEDURES (cont.)

- (cont.)

from entering the sewer system. Use an inert material to absorb spilled product.

NOTE: Rinsing this material down a sanitary sewer system can cause negative impact on monitoring systems. Contact local sewer authorities before attempting any discharges.

-WASTE DISPOSAL METHOD:

Product must be disposed of properly under federal/state regulations for industrial waste. Disposal to a landfil may be permitted pending compliance with 40 CFR 264.314 & 265.314. This product when spilled or disposed of is a non-hazardous waste as defined in RCRA regulations (40 CFR 261).

SECTION VIII - SPECIAL PROTECTION INFORMATION:

-RESPIRATORY PROTECTION:

Use an approved MSHA or NIOSH respirator for nuisance mists, dusts, or sprays.

-VENTILATION:

Use adequate ventilation to keep airborne concentrations below the exposure standard listed in Section II and/or Section V.

-PROTECTIVE GLOVES:

None normally required. Use is advisable.

-EYE PROTECTION:

Wear approved splashproof chemical goggles.

- HER PROTECTIVE EQUIPMENT:

Avoid contact with clothing, dried product may be irremovable.

SECTION IX - SECTION IX - SPECIAL PRECAUTIONS

-PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

PROTECT FROM FREEZING. Store above 40 deg. f. Frozen product may be irreversibly damaged.
Keep container closed when not using. Agitate before using.

-OTHER PRECAUTIONS:

Do not dilute or mix with other materials unless advised by supplier.

SECTION X - ADDITIONAL REGULATORY INFORMATION

-SARA TITLE III SECTION 313:

This product does NOT contain toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and of 40 CFR 372:

CAS#	Chemical Name	Percent by Weight
	None	

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SECTION X - ADDITIONAL REGULATORY INFORMATION (cont.)

PROP 65 (CARCINOGEN):
This product does NOT contain a chemical known to the state of California to cause cancer.

CAS#	Chemical Name
	None

PROP 65 (TERATOGENIC)
This product does NOT contain a chemical known to the state of California to cause birth defects or other reproductive harm.

CAS#	Chemical Name
	None

PROP 65 (BOTH CARCINOGEN AND TERATOGENIC):
This product does NOT contain a chemical known to the state of California to cause cancer or birth defects or other reproductive harm.

CAS#	Chemical Name
	None

SECTION XI - SECTION XI

SECTION XI SUBSECTION 1

MATERIAL SAFETY DATA SHEET

SIMPSON TIMBER CO.
OREGON OVERLAY DIVISION
2301 N. Columbia Blvd.
Portland, Oregon, 97217

Date issued: 10/27/93

EMERGENCY NUMBER: (503) 289-1111 ex 644 Scott Briggs

Additional information: (206) 426-3381 ex 8319 J. Soehnlein

H.M.I.S. RATINGS
HEALTH - 1
FLAMMABILITY - 0
REACTIVITY - 0

Section I: Material Identification

SIMPSON TIMBER CO. product name: TFD 100

Trade names and synonyms: Light Weight OSB Backer.

DOT Proper Shipping Name: Not a regulated material

Section II: Ingredients and Hazards

Product description: Kraft paper impregnated with a proprietary mixture of curable low molecular weight phenol formaldehyde resins.

Hazards:
Product contains partially cured phenol-formaldehyde resins which release formaldehyde and water during further heat cure. During curing process low molecular condensates of phenol and formaldehyde may be released. Release of these volatiles may exceed allowable concentrations in air in areas of insufficient ventilation during open (unwrapped) storage and/or during the curing process at elevated temperatures. Combined potential release under all conditions of cure below 350F of formaldehyde, phenol, and volatile phenol-formaldehyde condensates does not exceed stated "volatile" property of product. Volatiles include water.

Hazardous ingredients:
Free formaldehyde: <.1 %; Exposure limits: ACGIH, 1 ppm 8-HR TWA; OSHA 29-CFR-1910, 1 ppm 8-HR TWA, 2 ppm 15 minute STEL.
CAS# 50-00-0
Free phenol <.5 %; Exposure limits: ACGIH and OSHA 29-CFR-1910.1000 5 ppm (Skin)
CAS# 108-95-2
* This material is subject to reporting under SARA TITLE III, Sec. 313. Both formaldehyde and phenolic compounds present in the product may lead to allergic reactions in some people on handling the solid paper product.

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Section III: Physical Data

Product is a solid containing resins which become semiliquid during the curing process.
Specific gravity: Approx 1.1
Percent volatile: Approx. 5% at 220F
Solubility in water: Approx 10%
Appearance and Odor: Dark Gray paper product, very slight aromatic odor.
....

Section IV: Fire and Explosion Hazard Data

Flashpoint: N.A.*
Autoignition Temperature: variable (typically >440F)
Extinguishing Media: Water Spray, Carbon Dioxide foam or Dry Chemical as determined by surrounding fire.
Special fire fighting procedures: Self contained breathing apparatus is required.
Unusual Fire and Explosion Hazards: None
....

Section V: Reactivity Data

Stability: Stable, hazardous polymerization will not occur.
Incompatibility: avoid contact with strong oxidizers.
Decomposition products may include: CO, CO2, aldehydes, (including formaldehyde) water, and phenolic resin fragments.
....

Section VI: Health Hazards

TLV: None.
Effects of over exposure:
Regular handling:
Long term exposure may cause skin rash in sensitized persons. Symptoms: skin rash on hands and face.
During cure, such as hot pressing, in areas of inadequate ventilation.
Eye irritation (weeping), irritation of nose and throat, skin rash. Fumes will aggravate asthma.
Formaldehyde: Formaldehyde is classified as a "Suspected Carcinogen". It may cause upper respiratory and eye irritation.

Emergency and First Aid procedures:
Eyes.........Flush with water.
Inhalation...Remove to fresh air.
Ingestion....Not applicablle.

In all cases if irritation persists, obtain qualified medical advice.

Section VII: Spill or Leak Procedures.

Steps to be taken in case material is released or spilled:
Pick up and dispose of properly.
Waste Disposal Method: Scrap can be disposed of in an approved industrial landfill (Oregon). Incineration in suitable incinerators only in accordance with local, state and federal regulations.

....

Section VIII: Special Protection Information

Respiratory Protection: None under normal use conditions. When entering areas where thermal decomposition products are present in excess, because of a fire or due to improper venting of decomposition products released during cure; self-contained breathing units or masks with organic vapor canisters are to be used.
Ventilation: Local exhaust to control decomposition products during hot pressing operation to levels required by OSHA, state or local regulations.
Protective Gloves: Butyl, neoprene or nitrile rubber gloves.
Eye Protection: Safty glasses recommended, to protect against paper cuts.
Preventative Hygienic Practices: Wash exposed areas of skin with mild soap and cool water.

....

Section IX: Special Precautions

Precautions to be taken in Handling and Storing: Store in a cool, dry and vented space with packaging left intact until use. Failure to do so may result in the accumulation of formaldehyde and reduce the useful life of the product.
Other precautions: None

....

IMPORTANT: The information and data herein are believed to be accurate and have been compiled from sources believed reliable. Although reasonable care has been taken in preparation of this information, Simpson Timber Co makes no warranty of any kind, expressed or implied, concerning the accuracy or completeness of this information or data, and assumes no responsibility for its application to purchaser's intended purposes. Normally recommended industrial hygiene, engineering practices and safe handling procedures should be employed at all times.

MDI 5225

002289
MSDS Reference Number

ADDENDUM TO MSDS

PRODUCT NAME: RUBINATE MF-184C

Section 313 Supplier Notification

This product contains the following toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372:

CAS Number	Chemical Name	Percent by Weight
101-68-8	Methylene bis (phenylisocyanate)(MBI)	50%

THIS NOTIFICATION MUST NOT BE DETACHED FROM THE MSDS AND ANY COPYING AND REDISTRIBUTION OF THE MSDS MUST INCLUDE COPYING AND REDISTRIBUTION OF THE NOTIFICATION ATTACHED TO COPIES OF THE MSDS SUBSEQUENTLY REDISTRIBUTED.

ICI Americas Inc., Wilmington, Delaware 19897

JAN 19, 1989

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MATERIAL SAFETY DATA SHEET

ICI Polyurethanes Group

West Deptford, New Jersey 08066
Phone, 24 hours: (302) 886-3000
Medical inquiries: (800) 327-8633
Chemtrec: (800) 424-9300

Issue Date: 12/16/92

MSDS#: 2289
Rev.: F

SECTION 1 NAME & HAZARD SUMMARY

***Material name: RUBINATE 1840 (formerly RUBINATE MF-184)

Hazard summary (as defined by OSHA Hazard Comm. Std., 29 CFR 1910.1200):
Physical hazards: None (see Section 5)
Health hazards: Based on MDI - irritant (eye, skin, respiratory passages, skin sensitizer), inhalation (TLV), harmful (respiratory sensitizer, lung injury).

Read the entire MSDS for a more thorough evaluation of the hazards.

SECTION 2 INGREDIENTS

SECTION 2 INGREDIENTS	%	OSHA PEL
***Isocyanic acid, polymethylene polyphenylene ester ("polymeric" MDI; CAS 9016-87-9)	100	Not listed
CONTAINS:		
4,4'-Diphenylmethane diisocyanate (4,4'-MDI; CAS 101-68-8)		0.02 ppm, ceiling
Other MDI isomers and oligomers		Not listed

Ingredients not precisely identified are proprietary or nonhazardous.
Values are not product specifications.

SECTION 3 PHYSICAL DATA

*** Appearance and odor: Dark brown viscous liquid
Boiling point: Decomposes at 646°F, 341.1°C
Vapor pressure (mm Hg at 20°C): <0.0001
*** Vapor density (air = 1): 8.5
Solubility in water: Reacts
pH: No data
Specific gravity: 1.2
% Volatile by volume: No data

SECTION 4 FIRE AND EXPLOSION HAZARD DATA

Flash point: 425°F, 218°C (COC)
Autoignition temperature: No data
Flammable limits (STP): No data

Extinguishing media:
Dry chemical, foam, carbon dioxide, halogenated agents. If water is used, use very large quantities. The reaction between water and hot isocyanate may be vigorous.

ICI Polyurethanes Group is a division of ICI Americas Inc.

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SECTION 6 HEALTH HAZARD ASSESSMENT (continued)

Skin absorption:

Systemically toxic concentrations of this product will probably not be absorbed through human skin.

Inhalation:

Vapors and aerosols can irritate eyes, nose and respiratory passages. Severe overexposure may lead to pulmonary edema. MDI can induce respiratory sensitization with asthma-like symptoms similar to those induced by TDI (toluene diisocyanate). Symptoms include chronic cough, tightness of chest with difficulty in breathing. These symptoms may be immediate or delayed up to several hours after exposure. There are reports that chronic exposures may result in permanent decreases in lung function.

Other effects of overexposure:

Recently, a study was completed where groups of rats were exposed for 6 hours/day, 5 days/week for a lifetime to atmospheres of respirable polymeric MDI aerosol. Overall, the tumor incidence, both benign and malignant, and the number of animals with tumors were not different from controls. However, at the top level only (6 mg/m^3), there was a significant incidence of a benign tumor of the lung (adenoma) and one malignant tumor (adenocarcinoma). There were no lung tumors at 1 mg/m^3 and no effects at 0.2 mg/m^3. The increased incidence of lung tumors is associated with prolonged respiratory irritation and the concurrent accumulation of yellow material in the lung which occurred throughout the study. In the absence of prolonged exposure to high concentrations leading to chronic irritation and lung damage, it is highly unlikely that tumor formation will occur.

First aid procedures:

Skin: Wash material off of the skin with plenty of soap and water. If redness, itching, or a burning sensation develops, get medical attention.
Eyes: Immediately flush with plenty of water for at least 15 minutes. If redness, itching, or a burning sensation develops, have eyes examined and treated by medical personnel.
Ingestion: Give 1 or 2 glasses of water to drink. If gastrointestinal symptoms develop, consult medical personnel. (Never give anything by mouth to an unconscious person.)
Inhalation: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is labored, give oxygen. Consult medical personnel.

SECTION 7 SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled:

Wear skin, eye, and respiratory protection during cleanup. Soak up material with absorbent and shovel into a chemical waste container. Cover container, but do not seal, and remove from work area. Prepare a decontamination solution of 0.2-0.5% liquid detergent and 3-8% concentrated ammonium hydroxide in water (5-10% sodium carbonate may be substituted for the ammonium hydroxide). Follow the precautions on the supplier's material safety data sheets. All operations should be performed by trained personnel familiar with the hazards of the chemicals used. Treat the spill area with the decontamination solution, using about 10 parts of solution for each part of the spill, and allow it to react for at least 10 minutes. Carbon dioxide will be evolved, leaving insoluble polyureas. For major spills, call CHEMTREC (Chemical Transportation Emergency Center) at 800-424-9300.

SECTION 8 SPECIAL PROTECTION INFORMATION (continued)

Protective clothing (continued):

Testing of some commercially available protective clothing indicates that clothing constructed of butyl rubber, nitrile rubber, Saranex® coated Tyvek® and some neoprene garments have excellent resistance to permeation by MDI. Clothing constructed of neoprene/latex rubber and some PVC garments exhibited limited resistance to permeation by MDI. Clothing constructed of polyethylene, latex rubber, PVC or polylaminated Tyvek® showed little resistance to permeation by MDI. Protective clothing should be selected and used in accordance with "Guidelines for the Selection of Chemical Protective Clothing" published by ACGIH.

Eye protection:

Chemical tight goggles; full faceshield in addition if splashing is possible.

Other protective equipment:

Eyewash station and safety shower in work area.

SECTION 9 SPECIAL PRECAUTIONS OR OTHER COMMENTS

Special precautions or other comments:

Prevent skin and eye contact. Observe TLV limitations. Avoid breathing vapors or aerosols. Workers should shower and change to fresh clothing after each shift. A sensitized individual should not be exposed to the product which caused the sensitization. Store in tightly sealed containers to protect from atmospheric moisture. Store in a cool area. Individuals with existing respiratory disease such as chronic bronchitis, emphysema or asthma should not be exposed to isocyanates. These individuals should be identified through baseline and annual evaluation and removed from further exposure. Medical examination should include medical history, vital capacity, and forced expiratory volume at one second.

SECTION 10 REGULATORY INFORMATION

TSCA (Toxic Substances Control Act) Regulations, 40 CFR 710:

All ingredients are on the TSCA Chemical Substance Inventory.

*** CEPA (Canadian Environmental Protection Act):

All ingredients are on the DSL (Domestic Substances List).

CERCLA and SARA Regulations (40 CFR 355, 370, and 372):

Section 313 Supplier Notification. This product contains the following toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372:

50% MDI, listed as Methylenebis(phenylisocyanate), MBI (CAS 101-68-8)

Prepared by: "Polyurethanes SHE" Telephone: (609) 423-8518

The information herein is given in good faith but no warranty, expressed or implied, is made.

Prepared/Reviewed: 12/16/92
CCDB: C11021
CIDS: 23019

***This line or section contains revisions or new statements since the last issue date.

APPENDIX III

TOXICITY OF MDI

1. Overview

In common with the other commercial isocyanates the majority of toxicity data on MDI relates to exposure by inhalation. Experience of humans has shown that the main hazard from MDI is due to inhalation of vapor, aerosol or dust. A severe irritation may result from overexposure. Susceptible subjects may develop an allergic response.

At ambient temperatures and with adequate ventilation the exposure to hazardous concentrations of MDI vapor is unlikely due to its low vapor pressure. Inhalation of air-borne droplets resulting from spray application of MDI is however possible and can present a real hazard.

2. Acute and Subacute Toxicity

2.1 Oral LD_{50} (rat): >15,000 mg/kg (1)

See Errata

2.2 The LC_{50} 4 h (rat) has been determined using an MDI aerosol to be 370 mg/m^3 (2). This is more than 50 times the concentration of the saturated vapor at 20°C. The LC_{50} 2 h (rat) has been determined on MDI dust to be above 400 mg/m^3 (3).

2.3 Inhalation studies on rats exposed for 1 h to the saturated vapor of MDI containing various amounts of phenylisocyanate showed no effects attributable to phenylisocyanate in concentrations up to 0.05% in MDI (4).

No effects were observed on rats exposed repeatedly (6 h per day, 5 days per week) for 3 weeks to the saturated vapor of polymeric MDI containing up to 0.015% of phenylisocyanate (4).

3. Irritation and Sensitization

3.1 *Skin and eye.* MDI has been shown to be a mild to moderate irritant to skin and eyes in animal studies.

Prolonged or repeated skin contact with MDI will result in irritation and sensitization may occur in some individuals. MDI will irritate the eye of humans.

3.2 *Lungs.* Inhalation of MDI either in vapor, aerosol or dust form will produce an irritation reaction in the nose, throat and lungs. This reaction may be experienced as dryness in the throat, tightness of the chest and possible difficulty in breathing. Sensitization may occur in susceptible individuals.

4. Long-term Hazards

The only longer term health effect known to be associated with MDI exposure is due to its effects on the respiratory organs following inhalation. Permanent reduction in various vital lung parameters can occur if exposure to MDI is sufficiently severe or prolonged. Skin sensitization also can be a long term irreversible effect.

REFERENCES

1) G. Steinhoff, Bayer AG, Institute for Toxicology, unpublished.
2) W. Bunge, H. Ehrlicher, G. Kimmerle: Medical aspects of work with surface coating systems using the spraying technique, Verlag für Medizin, Dr. E. Fischer, Heidelberg (1976).
3) H. G. Frank, Zahn-Med. Inaug. Diss. Würzburg (1964), unpublished.
4) ICI Central Toxicology Laboratory (CTL): Interim data of I.I.I. sponsored research.

NOTES

A. American Conference of Governmetal Industrial Hygienists: TLVs Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1982.

B. American Conference of Governmental Industrial Hygienists: Documentation of the Threshold Limit Values for Substances in Workroom Air. Third Edition '71. 3rd Printing 1976. Methylene Bisphenylisocyanate (MDI) page 170.

C. Deutsche Forschungsgemeinschaft – Kommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe: Maximale Arbeitsplatzkonzentrationen 1982.

D. Deutsche Forschungsgemeinschaft – Kommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe: Toxikologische arbeitsmedizinische Begründungen von MAK-Werten. 4. Lieferung 1975, Verlag Chemie

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E. Duprat, P., Gradiski, D. and Marignac, B.: Pouvoir irritant et allergisant de deux isocyanates: TDI, MDI. Europ. J. of Tox. 9/141–58 (1976).

F. Reinl, W. and Schnellbächer, F.: Über die unterschiedlichen Reaktionen auf Isocyanate. Kasuistische Beiträge und arbeitsmedizinische Untersucnungen. Zb. Arbeitsmed. 1974/4; 106.

G. Tanser, A. R., Bourke, M. P. and Blandford, A. G.: Isocyanate asthma: Respiratory Symptoms caused by Diphenylmethanediisocyanate, Thorax 28:596 (1973).

H. Hassman, P. The Health Status of Workers with Diphenylmethane-4,4'-Diisocyanate. Prac. Lek. 29(6) 242 (1973).

I. Fiche Toxicologique N 129 I.N.R.S. 4,4'-Diisocyanate de Diphenylmethane Note N 1065-87-77.

ERRATUM

PLEASE REPLACE PARA 2.2 ON PAGE 14 BY THE FOLLOWING TEXT:

2.2 The LC_{50} 4 h (rat) has been determined using an aerosol of polymeric MDI to be 370 mg/m³ (2). This concentration is more than three orders of magnitude higher than the concentration of the saturated vapor of monomeric MDI at ambient temperature. The LC_{50} 2 h (rat) has been determined on dust of monomeric MDI to be above 400 mg/m³ (3).

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WAX

MATERIAL SAFETY DATA SHEET

Borden, Inc.
Packaging and Industrial Products Division
180 EAST BROAD STREET, COLUMBUS, OHIO 43215

IF ITS BORDEN-ITS GOT TO BE GOOD

Emergency Telephone
(614) 431-6600

THE OSHA HAZARD COMMUNICATION STANDARD 29 CFR 1910.1200 REQUIRES THAT THE INFORMATION CONTAINED ON THESE SHEETS BE MADE AVAILABLE TO YOUR WORKERS. INSTRUCT YOUR WORKERS TO HANDLE THIS PRODUCT PROPERLY.
FOR INDUSTRIAL USE ONLY

LOUISIANA-PACIFIC CORP
ATTN: MELODY
CHILCO WAFERBOARD PLANT
NORTH 21125 HIGHWAY 95
ATHOL, ID 83801

NON-EMERGENCY TELEPHONE
(503) 746-8461

CUR ISS 10-FEB-94

DESCRIPTION: CASCOWAX EW-403LV
PRODUCT TYPE: WAX EMULSION
APPLICATION: WAX EMULSION FOR PARTICLEBOARD SIZING

SIGNAL WORD
CAUTION!

This material presents possible health hazards as determined when reviewed according to the requirements of the Occupational Safety and Health Administration 29 CFR Part 1910.1200 "Hazard Communication" Standard.

CHEMICAL HAZARD RATING
HEALTH=1(slight)
FIRE=0(least)
REACTIVITY=0(least)
CHRONIC=*

29CFR1910.1200 HAZARDOUS INGREDIENTS/REPORTED HEALTH EFFECTS
CAS/REGISTRY NO. MATERIAL DESCRIPTION

The ingredients listed below have been associated with one or more of the listed immediate and/or delayed(*) health hazards. Risk of damage and effects depends upon duration and level of exposure. BEFORE USING OR HANDLING, READ AND UNDERSTAND THE MSDS.

50-00-0 *FORMALDEHYDE
POTENTIAL CANCER HAZARD.
Rats chronically exposed to 14 ppm formaldehyde contracted nasal cancers. Based on animal data and limited epidemiological evidence, NTP and IARC have listed formaldehyde as a probable human carcinogen. OSHA regulates formaldehyde as a potential human carcinogen.

May cause allergic skin reaction. Some reports suggest that formaldehyde may cause respiratory sensitization, such as asthma, and that pre-existing respiratory and skin disorders may be aggravated by exposure.

OSHA has identified 0.5 ppm as the "Action Level",

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MATERIAL SAFETY DATA SHEET

IF ITS BORDEN—ITS GOT TO BE GOOD

Borden, Inc.

Packaging and Industrial Products Division

180 EAST BROAD STREET, COLUMBUS, OHIO 43215

Emergency Telephone
(614) 431-6600

DESCRIPTION: CASCOWAX EW-403LV
PRODUCT TYPE: WAX EMULSION
APPLICATION: WAX EMULSION FOR PARTICLEBOARD SIZING

29CFR1910.1200 HAZARDOUS INGREDIENTS/REPORTED HEALTH EFFECTS
CAS/REGISTRY NO. MATERIAL DESCRIPTION

29CFR 1910.1048. Please refer to the OSHA Standard for guidance applicable to your specific operations.

OSHA has stated that a concentration of 100 ppm is immediately dangerous to life and health and that the odor threshold for formaldehyde is 0.8-1 ppm, OSHA Occupational Exposure to Formaldehyde, 59 Fed. Reg. 22290, et seq.
ACGIH TLV: 0.3 ppm (0.37 mg/m3) Ceiling
OSHA PEL: 0.75 ppm(0.9 mg/m3) TWA; 2 ppm(2.5mg/m3)15min STEL
NIOSH DOCUMENT NUMBER: 77-126

PHYSICAL DATA

STG. LIFE	2 MONTHS @ 25C (77F)
PH @ 25C	~7.6 @ 25C
APPEARANCE	OPAQUE LIQUID
COLOR	CREAM/LIGHT BROWN
ODOR	LITTLE OR NONE
FLASH POINT	NOT APPLICABLE
AUTOIGNITION TEMPERATURE	NOT APPLICABLE
LOWER EXPLOSION LIMIT	NOT APPLICABLE
SPECIFIC GRAVITY	~0.98
UPPER EXPLOSION LIMIT	NOT APPLICABLE

IMMEDIATE HEALTH HAZARD DATA

SKIN ABSORPTION: No hazards known to Borden.
INGESTION: Not expected to be harmful under normal conditions of use.
INHALATION: Not expected to be harmful under normal conditions of use. However, if allowed to become airborne, may cause irritation of nose, throat and lungs.
SKIN: May cause irritation on prolonged or repeated contact.
EYES: May cause irritation on prolonged or repeated contact.

HANDLING PRECAUTIONS

INHALATION: Avoid prolonged or repeated breathing of vapor.
SKIN: Avoid prolonged or repeated contact with skin.
EYES: Avoid prolonged or repeated contact with eyes.
Handle in accordance with good industrial hygiene and

READ NEXT PAGE

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MATERIAL SAFETY DATA SHEET
Borden, Inc.
Packaging and Industrial Products Division
180 EAST BROAD STREET, COLUMBUS, OHIO 43215

IF IT'S BORDEN—IT'S GOT TO BE GOOD

Emergency Telephone
(614) 431-6600

SPILL OR LEAK PROCEDURES

Large quantities: Enclose with diking material to prevent seepage into natural bodies of water, then consult Borden, Inc.
Small quantities: Soak up with absorbent material and remove to a chemical disposal area.

WASTE DISPOSAL

Recover free liquid. Absorb residue and dispose of according to local, state/provincial, and federal requirements.

STORAGE PRECAUTIONS

Harmed by freezing. Cannot be made usable after freezing.
Storage life is 2-4 months at 70 F, less at higher temperatures.

TRANSPORT INFORMATION

REFER TO YOUR BILL OF LADING FOR PROPER DOT DESCRIPTION

IF IT'S BORDEN—IT'S GOT TO BE GOOD

MATERIAL SAFETY DATA SHEET

Borden, Inc.

Packaging and Industrial Products Division

180 EAST BROAD STREET, COLUMBUS, OHIO 43215

Emergency Telephone
(614) 431-6600

SARA TITLE III SECTION 313
AND 40 CFR Part 372
TOXIC CHEMICAL NOTIFICATION SHEET

CASCOWAX EW-403LV

This product contains the following toxic chemical(s) subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986, and Subpart C-Supplier Notification Requirement of 40 CFR Part 372.

CAS Registry Number	Chemical Name	Pct. By Weight

None required per SARA TITLE III SECTION 313

This Toxic Chemical Notification Sheet must not be detached from the Material Safety Data Sheet (MSDS). Any copying and redistribution of the MSDS shall include copying and redistribution of this notification sheet attached to copies of the MSDS subsequently redistributed.

040 23-403LV-. PRINT DATE: 17-Feb-94 10:58 A

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DISCLAIMER-SEE REVERSE SIDE

MATERIAL SAFETY DATA SHEET

SIMPSON TIMBER CO.
OREGON OVERLAY DIVISION
2301 N. Columbia Blvd.
Portland, Oregon, 97217

Date issued: 07/26/93

EMERGENCY NUMBER: (503) 289-1111 ex 443 Scott Briggs

Additional information: (206) 426-3381 ex 8521 J. Soehnlein

H.M.I.S. RATINGS
HEALTH - 1
FLAMMABILITY - 0
REACTIVITY - 0

Section I: Material Identification

SIMPSON TIMBER CO. product name: TFD 414

Trade names and synonyms: 414, Primed MDO for Embossed Waferboard Overlay.

DOT Proper Shipping Name: Not a regulated material

Section II: Ingredients and Hazards

Product description: Kraft paper impregnated with a proprietary mixture of curable low molecular weight phenol formaldehyde resins.

Hazards:

Product contains partially cured phenol-formaldehyde resins which release formaldehyde and water during further heat cure. During curing process low molecular condensates of phenol and formaldehyde may be released. Release of these volatiles may exceed allowable concentrations in air in areas of insufficient ventilation during open (unwrapped) storage and/or during the curing process at elevated temperatures. Combined potential release under all conditions of cure below 350F of formaldehyde, phenol, and volatile phenol-formaldehyde condensates does not exceed stated "volatile" property of product. Volatiles include water.

Hazardous ingredients:

* Free formaldehyde: presently not available but less than .1 %; Exposure limits: ACGIH, 1 ppm 8-HR TWA; OSHA 29-CFR-1910, 1 ppm 8-HR TWA, 2 ppm 15 minute STEL. CAS# 50-00-0
* Free phenol: presently not available but less than .5 %; Exposure limits: ACGIH and OSHA 29-CFR-1910.1000 5 ppm (Skin)ÜCAS# 108-95-2¶

* This material is subject to reporting under SARA TITLE III, Sec. 313.

[illegible]

Section III: Physical Data

Product is a solid containing resins which become semiliquid during the curing process.
Specific gravity: Approx 1.1
Percent volatile: Approx. 2% at 220F
Solubility in water: Approx. 10%
Appearance and Odor: Gray paper product, very slight aromatic odor.

....

Section IV: Fire and Explosion Hazard Data

Flashpoint: N.A.
Autoignition Temperature: variable (typically >440F)
Extinguishing Media: Water Spray, Carbon Dioxide foam or Dry Chemical as determined by surrounding fire.
Special fire fighting procedures: Self contained breathing apparatus is required.
Unusual Fire and Explosion Hazards: None

....

Section V: Reactivity Data

Stability: Stable, hazardous polymerization will not occur.
Incompatibility: avoid contact with strong oxidizers.
Decomposition products may include: CO, CO_2, aldehydes, (including formaldehyde) water, and phenolic resin fragments.

....

Section VI: Health Hazards

TLV: None.
Effects of over exposure:
Regular handling:
Long term exposure may cause skin rash in sensitized persons. Symptoms: skin rash on hands and face.
During cure, such as hot pressing, in areas of inadequate ventilation:

Eye irritation (weeping), irritation of nose and throat, skin rash. Fumes will aggravate asthma.
Formaldehyde: Formaldehyde is classified as a "Suspected Carcinogen". It may cause upper respiratory and eye irritation.

Emergency and First Aid procedures:

Eyes.........Flush with water.
Inhalation...Remove to fresh air.
Ingestion....Not applicable.

In all cases if irritation persists, obtain qualified medical advice.

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Section VII: Spill or Leak Procedures.

Steps to be taken in case material is released or spilled:
Pick up and dispose of properly.
Waste Disposal Method: Scrap can be disposed of in an approved industrial landfill (Oregon). Incineration in suitable incinerators only in accordance with local, state and federal regulations.

....

Section VIII: Special Protection Information

Respiratory Protection: None under normal use conditions. When entering areas where thermal decomposition products are present in excess, because of a fire or due to improper venting of decomposition products released during cure; self-contained breathing units or masks with organic vapor canisters are to be used.
Ventilation: Local exhaust to control decomposition products during hot pressing operation to levels required by OSHA, state or local regulations.
Protective Gloves: Butyl, neoprene or nitrile rubber gloves.
Eye Protection: Safty glasses recommended, to protact against paper cuts.
Preventative Hygienic Practices: Wash exposed areas of skin with mild soap and cool water.

....

Section IX: Special Precautions

Precautions to be taken in Handling and Storing: Store in a cool, dry and vented space with packaging left intact until use. Failure to do so may result in the accumulation of formaldehyde and reduce the useful life of the product.
Other precautions: None

....

IMPORTANT: The information and data herein are believed to be accurate and have been compiled from sources believed reliable. Although reasonable care has been taken in preparation of this information, Simpson Timber Co makes no warranty of any kind, expressed or implied, concerning the accuracy or completeness of this information or data, and assumes no responsibility for its application to purchaser's intended purposes. Normally recommended industrial hygiene, engineering practices and safe handling procedures should be employed at all times.

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APPENDIX K

PROCEDURES

Particulate Loading and Emission Rates

The particulate emission rates were determined per EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). In this procedure a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

The sampling train consists of a heated glass-lined sampling probe equipped with a Type S pitot and a thermocouple. The probe is attached to a sampling module which houses the all-glass in line filter holder in a temperature controlled oven. The sampling module also houses the impinger case and a Drierite filled column. The sampling module is connected by means of an umbilical cord to the control module. The control module houses the dry test gas meter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

Particulate samples are collected as follows: The sample gas is drawn through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter where particulates are removed. The sample gas is then passed through an ice-cooled impinger train and a desiccant-packed column which absorbs remaining moisture. The sample gas then passes through a vacuum pump followed by a dry test gas meter. The gas meter integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides real time flow rate data.

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each test point maintaining isokinetic sampling conditions. Nomographs are used for rapid determination of the sampling rate.

Particulate Loading and Emission Rates

After sampling is complete, the filter is removed and placed in a clean container. The nozzle and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and then the rinse is quantitatively transferred to a tared 120 cc porcelain evaporating dish and the acetone evaporated off at 97-105 °F. This temperature is used to prevent condensation of atmospheric moisture due to the cooling effect induced by the evaporation of acetone. The acetone-free sample is then transferred to an oven and dried at 105 °C for 30 minutes, cooled in a desiccator over Drierite, and then weighed to the nearest .01 mg. The filter sample is quantitatively transferred to a 6-inch watch glass and dried in an oven at 105 °C for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest .01 mg. All weighings are performed in a balance room where the relative humidity is hydrostatted to less than 50% relative humidity. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse is corrected for the acetone blank. The Drierite column is weighed on-site and the water collected by Drierite is added to the condensate so that the total amount of absorbed water may be ascertained.

Integrated flue gas samples for Orsat analysis were collected simultaneously with each pollutant sample. The samples were collected in 15-liter gas sampling bags at a constant flow rate throughout each particulate run. The bags were at a constant flow rate throughout each particulate run. The bags were then returned to the laboratory and analyzed by Orsat analysis. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

030894-C:\STACK\WP\PROCEDURES\PM3aP2(6)

Condensible Organic Compounds Analysis

Method II-8672

Equipment: Separatory funnel - 500 cc with Teflon stopcock

Powder funnel - 75 mm ID with a 17 mm stem

Evaporating dish (es) - 200 cc or 250 cc beaker

Reagents: Diethyl ether - reagent grade

Chloroform - reagent grade

Sodium sulfate - (ACS) granular anhydrous

Toluene - (if 3% hydrogen peroxide is used to collect the samples)

Glass wool (Pyrex microfiber)

PREPARATION

1. Place 1 kg of granular anhydrous sodium sulfate in a shallow tray and heat to 200°C for at least four hours. Store in a tightly sealed glass container.

2. Place a plug of clean glass wool in the stem of the powder funnel. The plug must be of sufficient size so that it is held snugly in place by its own pressure. Add a one-inch layer of dry sodium sulfate.

SAMPLING

An all-glass impinger assembly is used in the back half of the EPA Method 5 sampling train when an organic wet catch is to be collected. The impinger assembly consists of a modified impinger, a Greenburg Smith impinger followed by another modified impinger. The third impinger should have a temperature measuring device at the outlet upstream of a final impinger or desiccant column to monitor the temperature of the outlet gas stream. Prior to the start of the test, each of the first two impingers should be charged with 100 g of Class I water. The method 5 train should be operated as provided for in EPA method 5. Ice should be added to the impinger batch to keep the temperature of the gas at the outlet at or less than 68°F. After the post test leak check, the impinger train is removed and impinger contents poured into a tared all-glass sample bottle and closed with a Teflon-lined cap. The sample bottle is then weighed and the total condensate calculated by subtraction of the bottle tare weight and the weight of initial water added to the impingers (200 g). A label is affixed and the sample is returned to the laboratory for analysis. The sample should be stored at 4°C if the analysis is not conducted within 48 hours.

I. ORGANICS

Caution! Work in vented hood!!!

A. Organic Blank Determination

1. Pour 125 ml of ethyl ether and 125 ml of chloroform into a tared beaker.

2. Evaporate solvent in hood at 70°F or less until no solvent remains.

3. Desiccate the sample in dish for two hours.

4. Weigh the sample to nearest 0.1 mg, record and report on Form LSC-03G.

B. Organic Sample Determination

1. Test for peroxide in sample ether using KI strips. (If KI strip shows positive, contact your supervisor before proceeding.)

2. Transfer the sample solution quantitatively to a 500 ml separatory funnel. Use the first of three 25 ml chloroform aliquots to rinse the sample container.

3. Extract with three 25 ml portions of chloroform. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Bottom layer is chloroform.) Draw off the bottom layer, transferring the solvent with a funnel containing a plug of sodium sulfate into a tared beaker. (Do not draw off any of the aqueous layer.)

4. After the three chloroform extractions, use two 25 ml portions of chloroform to rinse the sodium sulfate, collecting the rinses in the same tared beaker as the extracts.

5. Next extract the sample three times with 25 ml aliquots of ethyl ether. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Top layer is ethyl ether.) Draw off the bottom layer (aqueous) into another separatory funnel taking less than 1 ml of the ethyl ether layer with. Decant the ethyl ether, passing it through sodium sulfate and collecting the ethyl ether in the same tared dish as the chloroform.

6. After the three ethyl ether extractions, take two 25 ml portions of ethyl ether and rinse the sodium sulfate collecting the rinses in the same tared beaker as the extracts.

7. Evaporate the solvents (chloroform and ethyl ether) in the tared beaker in the hood at 70°F or less until no solvent remains. (Use no heat and have no sources of ignition in the hood when doing this procedure.) Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point of water, otherwise, water will be condensed out in the container.

8. Desiccate to constant weight (two hours). Record and report the final weight to the nearest 0.1 mg on Form LSC-03G.

II. INORGANICS

If inorganic residue information is required, the following procedure should be conducted:

A. Inorganic Blank Determination

1. Vent the remaining aqueous phase from the organic extraction in the hood to remove residual organic solvents (usually overnight).

2. Decant the impinger catch into a tared evaporating dish.

3. Evaporate all of the water in the sample in an oven at 100°C. Take care not to boil to prevent bumping and loss of sample.

4. Cool the dried sample in the desiccator and desiccate until a constant weight is obtained.

5. Report the results to the nearest 0.1 mg on Form LSC-03G.

B. Inorganic Sample Determination

Follow steps 1-5 in Section A above.

NOTES

1. For the organics determination, in the rare event that the impinger catch resulted from a Modified Method 6 determination (SO_2), whereby the solution contains dilute hydrogen peroxide ($\geq$ 3%), do <u>not</u> use ether as an extraction solvent. <u>Substitute toluene</u> for ethyl ether in Section I. (Ether in the presence of peroxide forms explosive hydroperoxide.)

2. In the organics determination, more than three extractions may be required to extract all of the organics. Additional extractions should be performed if the aqueous phase is still cloudy.

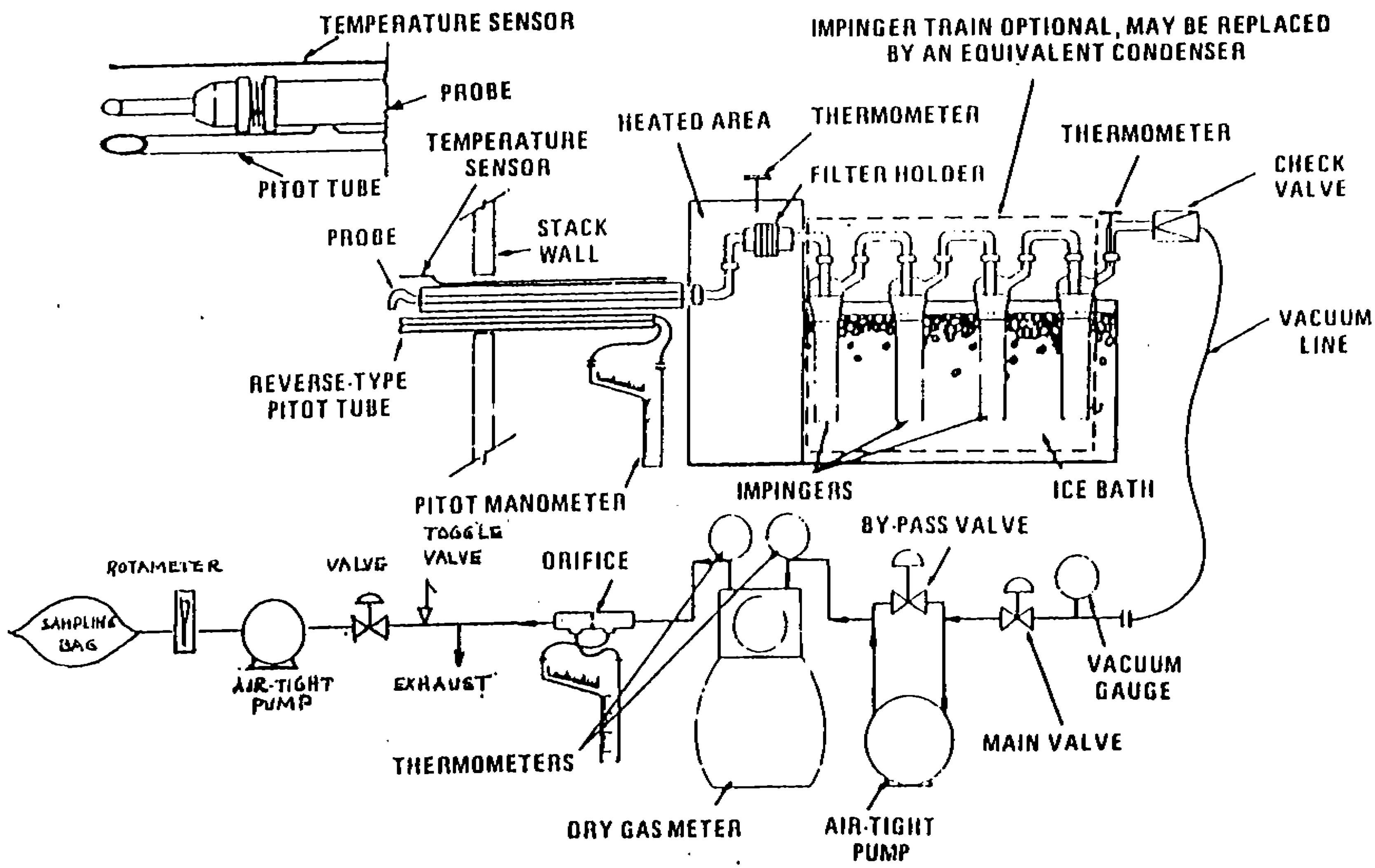
3. Special state requirements:
<u>Michigan</u> - Total sample evaporated in tared evaporating dish on steam bath.
<u>Iowa</u> - Organics and inorganics separately, as required.
<u>Wisconsin</u> - Use Method II-8672-WI.
<u>Rest of states</u> - Organics only.

REFERENCES

Proposed standards of Performance for New Stationary Sources, Federal Register 36(159) Part II, August 1, 1979.

Minnesota Pollution Control Agency, Exhibit C.

030894-G:\STACK\WP\METHODS\II-8672



Particulate-sampling train.

Flow

Flow determinations were carried out in accordance with EPA Method 2, CFR Title 40, Part 60, Appendix A (Revised July 1, 1987). A type S pitot was used to sense velocity pressure and an inclined manometer was used to measure velocity pressures. Gas temperatures were measured using a calibrated Type K thermocouple and digital temperature meter. Gas density (i.e. molecular weight) was calculated from the composition of the gas which was determined by Orsat.

Gas Flow Density

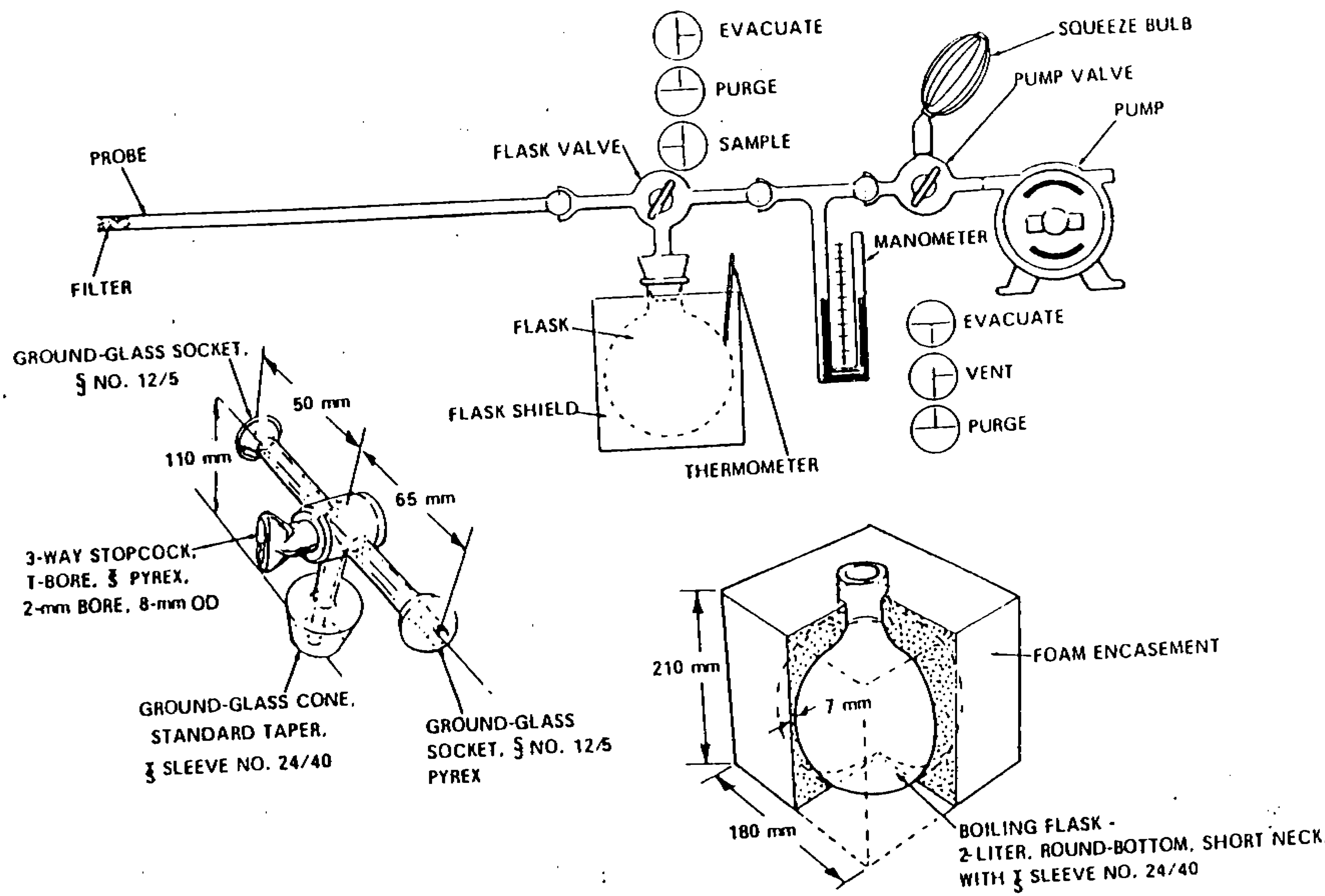
Gas compositions were determined as per Method 3 by Orsat analysis of an integrated gas sample collected from the stack during the oxides of nitrogen determinations. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

Oxides of Nitrogen

Oxides of nitrogen concentrations were collected in accordance with EPA Method 7 (see above-cited reference) with a specially designed all glass manifold and valving assembly and a heated stainless steel-lined probe. Samples were collected in two-liter evacuated insulated flasks which contained 25 cc of acidified peroxide solution (Method 7 reagent). Nine sets or more of three samples each were collected over a period of 4.5 to 5 hours.

The sampling train was leak checked through the probe at the beginning and end of the test and, in addition, the system leak checked at the time of evacuation of each flask. Before the samples were collected, the probe was purged to eliminate dead volume effects and to raise the temperature of the probe outlet and manifold assembly to minimize condensation of moisture. A plug of microfiber glass wool inserted in the probe inlet was used to prevent particulate material from entering into the flask. The temperature of the flask, vacuum in the flask and barometric pressure at the time of sampling was recorded for each flask. After sampling was complete, as evidenced by the in-line vacuum gauge, the flask valve was closed, the flask assembly disconnected from the manifold/valve assembly and the flask shook for several minutes to promote oxidation and absorption. The recovered oxides of nitrogen samples were returned to the laboratory and analyzed immediately by ion chromatography as per EPA 7A.

The internal volume of each numbered flask assembly has been measured prior to initial use by filling with water, weighing before and after and then converting the weight of water to volume by means of the density of water at room temperature. Flask volumes are stored in the computer and recalled automatically in the computer calculation.



Sampling train, flask valve, and flask.

4.2 Performance Evaluation Tests. The owner of a lidar system shall subject such a lidar system to the performance verification tests described in Section 3, prior to first use of this method. The annual calibration shall be performed for three separate, complete runs and the results of each should be recorded. The requirements of Section 3.3.1 must be fulfilled for each of the three runs.

Once the conditions of the annual calibration are fulfilled the lidar shall be subjected to the routine verification for three separate complete runs. The requirements of Section 3.3.2 must be fulfilled for each of the three runs and the results should be recorded. The Administrator may request that the results of the performance evaluation be submitted for review.

5. *References*

5.1 The Use of Lidar for Emissions Source Opacity Determination, U.S. Environmental Protection Agency, National Enforcement Investigations Center, Denver, CO. EPA-330/1-79-003-R, Arthur W. Dybdahl, current edition [NTIS No. PB81-246662].

5.2 Field Evaluation of Mobile Lidar for the Measurement of Smoke Plume Opacity, U.S. Environmental Protection Agency, National Enforcement Investigations Center, Denver, CO. EPA/NEIC-TS-128, February 1976.

5.3 Remote Measurement of Smoke Plume Transmittance Using Lidar, C. S. Cook, G. W. Bethke, W. D. Conner (EPA/RTP). Applied Optics 11, pg 1742, August 1972.

5.4 Lidar Studies of Stack Plumes in Rural and Urban Environments, EPA-650/4-73-002, October 1973.

5.5 American National Standard for the Safe Use of Lasers ANSI Z 136.1-176, March 8, 1976.

5.6 U.S. Army Technical Manual TB MED 279, Control of Hazards to Health from Laser Radiation, February 1969.

5.7 Laser Institute of America Laser Safety Manual, 4th Edition.

5.8 U.S. Department of Health, Education and Welfare, Regulations for the Administration and Enforcement of the Radiation Control for Health and Safety Act of 1968, January 1976.

5.9 Laser Safety Handbook, Alex Mallow, Leon Chabot, Van Nostrand Reinhold Co., 1978.

METHOD 10—DETERMINATION OF CARBON MONOXIDE EMISSIONS FROM STATIONARY SOURCES

1. *Principle and Applicability*

1.1 Principle. An integrated or continuous gas sample is extracted from a sampling point and analyzed for carbon monoxide (CO) content using a Luft-type nondispersive infrared analyzer (NDIR) or equivalent.

1.2 Applicability. This method is applicable for the determination of carbon monoxide emissions from stationary sources only when specified by the test procedures for determining compliance with new source performance standards. The test procedure will indicate whether a continuous or an integrated sample is to be used.

2. *Range and Sensitivity*

2.1 Range. 0 to 1,000 ppm.

2.2 Sensitivity. Minimum detectable concentration is 20 ppm for a 0 to 1,000 ppm span.

3. *Interferences*

Any substance having a strong absorption of infrared energy will interfere to some extent. For example, discrimination ratios for water (H_2O) and carbon dioxide (CO_2) are 3.5 percent H_2O per 7 ppm CO and 10 percent CO_2 per 10 ppm CO, respectively, for devices measuring in the 1,500 to 3,000 ppm range. For devices measuring in the 0 to 100 ppm range, interference ratios can be as high as 3.5 percent H_2O per 25 ppm CO and 10 percent CO_2 per 50 ppm CO. The use of silica gel and ascarite traps will alleviate the major interference problems. The measured gas volume must be corrected if these traps are used.

4. *Precision and Accuracy*

4.1 Precision. The precision of most NDIR analyzers is approximately ±2 percent of span.

4.2 Accuracy. The accuracy of most NDIR analyzers is approximately ±5 percent of span after calibration.

5. *Apparatus*

5.1 Continuous Sample (Figure 10-1).

5.1.1 Probe. Stainless steel or sheathed Pyrex[1] glass, equipped with a filter to remove particulate matter.

5.1.2 Air-Cooled Condenser or Equivalent. To remove any excess moisture.

5.2 Integrated Sample (Figure 10-2).

5.2.1 Probe. Stainless steel or sheathed Pyrex glass, equipped with a filter to remove particulate matter.

5.2.2 Air-Cooled Condenser or Equivalent. To remove any excess moisture.

5.2.3 Valve. Needle valve, or equivalent, to to adjust flow rate.

5.2.4 Pump. Leak-free diaphragm type, or equivalent, to transport gas.

5.2.5 Rate Meter. Rotameter, or equivalent, to measure a flow range from 0 to 1.0 liter per min (0.035 cfm).

[1] Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

5.2.6 Flexible Bag. Tedlar, or equivalent, with a capacity of 60 to 90 liters (2 to 3 ft^3). Leak-test the bag in the laboratory before using by evacuating bag with a pump followed by a dry gas meter. When evacuation is complete, there should be no flow through the meter.

5.2.7 Pitot Tube. Type S, or equivalent, attached to the probe so that the sampling rate can be regulated proportional to the stack gas velocity when velocity is varying with the time or a sample traverse is conducted.

5.3 Analysis (Figure 10-3).

5.3.1 Carbon Monoxide Analyzer. Nondispersive infrared spectrometer, or equivalent. This instrument should be demonstrated, preferably by the manufacturer, to meet or exceed manufacturer's specifications and those described in this method.

5.3.2 Drying Tube. To contain approximately 200 g of silica gel.

5.3.3 Calibration Gas. Refer to section 6.1.

5.3.4 Filter. As recommended by NDIR manufacturer.

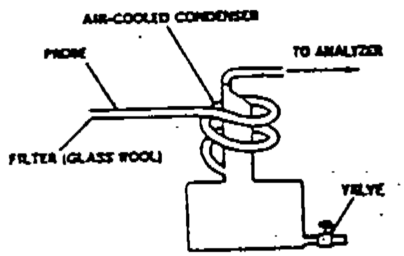


Figure 10-1. Continuous sampling train.

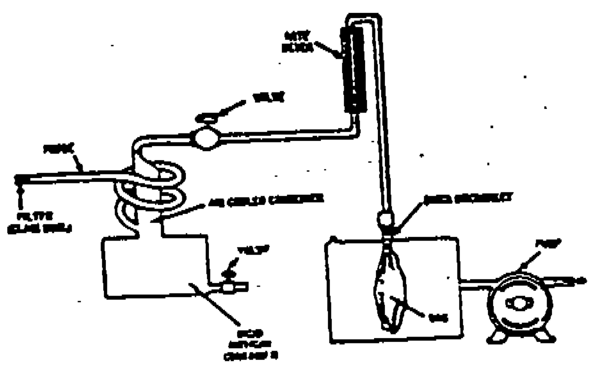


Figure 10-2. Integrated gas sampling train.

5.3.5 CO_2 Removal Tube. To contain approximately 500 g of ascarite.

5.3.6 Ice Water Bath. For ascarite and silica gel tubes.

5.3.7 Valve. Needle valve, or equivalent, to adjust flow rate

5.3.8 Rate Meter. Rotameter or equivalent to measure gas flow rate of 0 to 1.0 liter per min (0.035 cfm) through NDIR.

5.3.9 Recorder (*optional*). To provide permanent record of NDIR readings.

6. *Reagents*

6.1 Calibration Gases. Known concentration of CO in nitrogen (N_2) for instrument span, prepurified grade of N_2 for zero, and two additional concentrations corresponding approximately to 60 percent and 30 percent span. The span concentration shall not exceed 1.5 times the applicable source performance standard. The calibration gases shall be certified by the manufacturer to be within ±2 percent of the specified concentration.

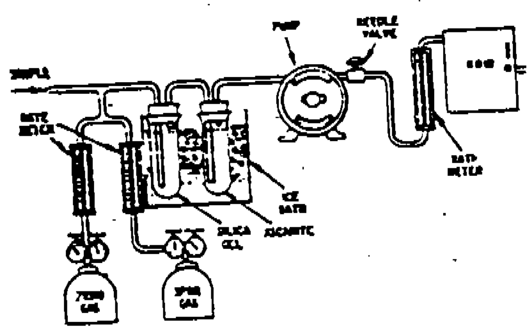


Figure 10-3. Analytical equipment.

6.2 Silica Gel. Indicating type, 6 to 16 mesh, dried at 175° C (347° F) for 2 hours.

6.3 Ascarite. Commercially available.

7. *Procedure*

7.1 Sampling.

7.1.1 Continuous Sampling. Set up the equipment as shown in Figure 10-1 making sure all connections are leak free. Place the probe in the stack at a sampling point and purge the sampling line. Connect the analyzer and begin drawing sample into the analyzer. Allow 5 minutes for the system to stabilize, then record the analyzer reading as required by the test procedure. (See section 7.2 and 8). CO_2 content of the gas may be determined by using the Method 3 integrated sample procedure, or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.1.2 Integrated Sampling. Evacuate the flexible bag. Set up the equipment as shown in Figure 10-2 with the bag disconnected. Place the probe in the stack and purge the sampling line. Connect the bag, making sure that all connections are leak free. Sample at a rate proportional to the stack velocity. CO_2 content of the gas may be determined by using the Method 3 integrated sample procedures, or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.2 CO Analysis. Assemble the apparatus as shown in Figure 10-3, calibrate the instrument, and perform other required operations as described in section 8. Purge analyzer with N_2 prior to introduction of each sample. Direct the sample stream through the instrument for the test period, recording the readings. Check the zero and span again after the test to assure that any drift or malfunction is detected. Record the sample data on Table 10-1.

8. *Calibration*

Assemble the apparatus according to Figure 10-3. Generally an instrument requires a warm-up period before stability is obtained. Follow the manufacturer's instructions for specific procedure. Allow a minimum time of 1 hour for warm-up. During this time check the sample conditioning apparatus, i.e., filter, condenser, drying tube, and CO_2 removal tube, to ensure that each component is in good operating condition. Zero and calibrate the instrument according to the manufacturer's procedures using, respectively, nitrogen and the calibration gases.

TABLE 10-1—FIELD DATA

	Comments
Location........	
Test........	
Date........	
Operator........	

Clock time	Rotameter setting, liters per minute (cubic feet per minute)

9. *Calculation*

Calculate the concentration of carbon monoxide in the stack using Equation 10-1.

$$C_{CO\ stack} = C_{CO\ NDIR}(1 - F_{CO_2})$$

Eq. 10-1

Where:

$C_{CO\ stack}$ = Concentration of CO in stack, ppm by volume (dry basis).

$C_{CO\ NDIR}$ = Concentration of CO measured by NDIR analyzer, ppm by volume (dry basis).

F_{CO_2} = Volume fraction of CO_2 in sample, i.e., percent CO_2 from Orsat analysis divided by 100.

10. Alternative Procedures

10.1 Interference Trap. The sample conditioning system described in Method 10A sections 2.1.2 and 4.2, may be used as an alternative to the silica gel and ascarite traps.

11. *Bibliography*

1. McElroy, Frank, The Intertech NDIR-CO Analyzer, Presented at 11th Methods Conference on Air Pollution, University of California, Berkeley, CA. April 1, 1970.
2. Jacobs, M. B., et al., Continuous Determination of Carbon Monoxide and Hydrocarbons in Air by a Modified Infrared Analyzer, J. Air Pollution Control Association, *9*(2): 110–114. August 1959.
3. MSA LIRA Infrared Gas and Liquid Analyzer Instruction Book, Mine Safety Appliances Co., Technical Products Division, Pittsburgh, PA.
4. Models 215A, 315A, and 415A Infrared Analyzers, Beckman Instruments, Inc., Beckman Instructions 1635-B, Fullerton, CA. October 1967.
5. Continuous CO Monitoring System, Model A5611, Intertech Corp., Princeton, NJ.
6. UNOR Infrared Gas Analyzers, Bendix Corp., Ronceverte, WV

ADDENDA

A. PERFORMANCE SPECIFICATIONS FOR NDIR CARBON MONOXIDE ANALYZERS

Range (minimum)	0–1000 ppm.
Output (minimum)	0–10mV.
Minimum detectable sensitivity.	20 ppm.
Rise time, 90 percent (maximum).	30 seconds.
Fall time, 90 percent (maximum).	30 seconds.
Zero drift (maximum)	10% in 8 hours.
Span drift (maximum)	10% in 8 hours.
Precision (minimum)	±2% of full scale.
Noise (maximum)	±1% of full scale.
Linearity (maximum deviation)	2% of full scale.
Interference rejection ratio	CO_2—1000 to 1, H_2O—500 to 1.

B. *Definitions of Performance Specifications.*

Range—The minimum and maximum measurement limits.

Output—Electrical signal which is proportional to the measurement; intended for connection to readout or data processing devices. Usually expressed as millivolts or milliamps full scale at a given impedance.

Full scale—The maximum measuring limit for a given range.

Minimum detectable sensitivity—The smallest amount of input concentration that can be detected as the concentration approaches zero.

METHOD 25A—DETERMINATION OF TOTAL GASEOUS ORGANIC CONCENTRATION USING A FLAME IONIZATION ANALYZER

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.2 Principle. A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

2. *Definitions*

2.1 Measurement System. The total equipment required for the determination of the gas concentration. The system consists of the following major subsystems:

2.1.1 Sample Interface. That portion of the system that is used for one or more of the following: sample acquisition, sample transportation, sample conditioning, or protection of the analyzer from the effects of the stack effluent.

2.1.2 Organic Analyzer. That portion of the system that senses organic concentration and generates an output proportional to the gas concentration.

2.2 Span Value. The upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable part of the regulations. The span value is established in the applicable regulation and is usually 1.5 to 2.5 times the applicable emission limit. If no span value is provided, use a span value equivalent to 1.5 to 2.5 times the expected concentration. For convenience, the span value should correspond to 100 percent of the recorder scale.

2.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

2.4 Zero Drift. The difference in the measurement system response to a zero level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

2.5 Calibration Drift. The difference in the measurement system response to a mid-level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair or adjustment took place.

2.6 Response Time. The time interval from a step change in pollutant concentration at the inlet to the emission measurement system to the time at which 95 percent of the corresponding final value is reached as displayed on the recorder.

2.7 Calibration Error. The difference between the gas concentration indicated by the measurement system and the known concentration of the calibration gas.

3. *Apparatus*

A schematic of an acceptable measurement system is shown in Figure 25A-1. The essential components of the measurement system are described below:

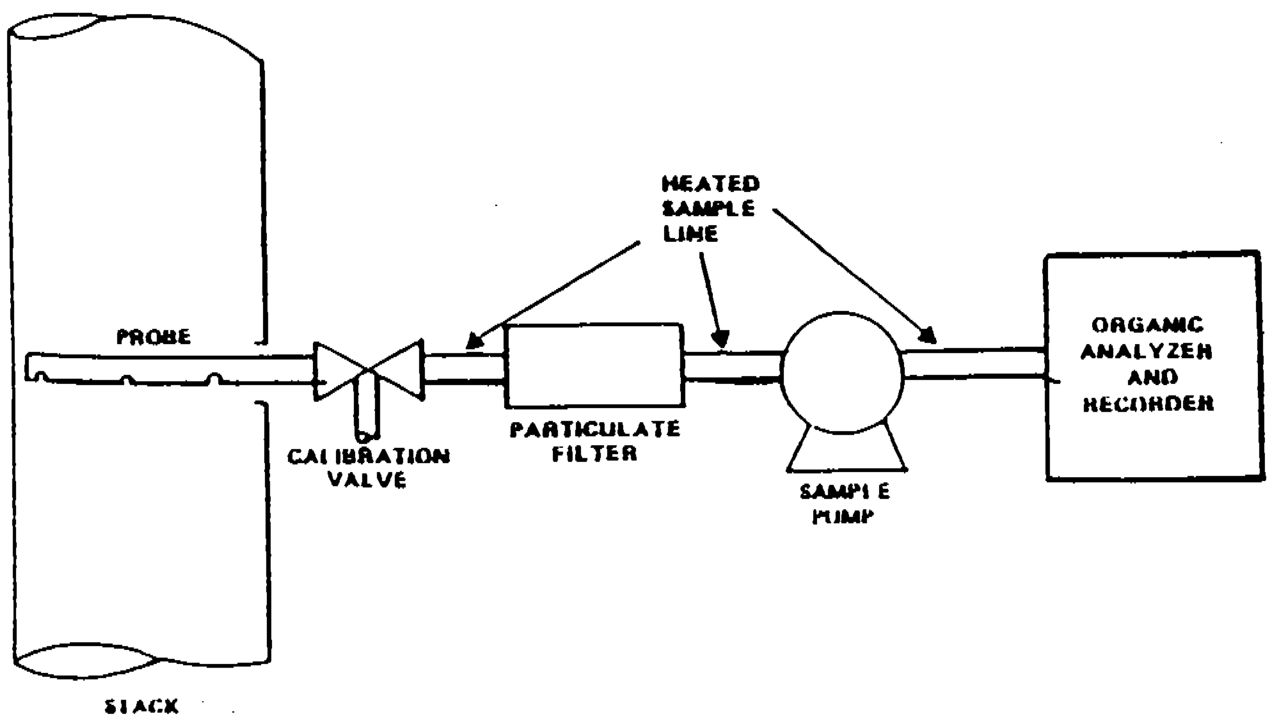


Figure 25A-1. Organic Concentration Measurement System.

3.1 Organic Concentration Analyzer. A flame ionization analyzer (FIA) capable of meeting or exceeding the specifications in this method.

3.2 Sample Probe. Stainless steel, or equivalent, three-hole rake type. Sample holes shall be 4 mm in diameter or smaller and located at 16.7, 50, and 83.3 percent of the equivalent stack diameter. Alternatively, a single opening probe may be used so that a gas sample is collected from the centrally located 10 percent area of the stack cross-section.

3.3 Sample Line. Stainless steel or Teflon* tubing to transport the sample gas to the analyzer. The sample line should be heated, if necessary, to prevent condensation in the line.

3.4 Calibration Valve Assembly. A three-way valve assembly to direct the zero and calibration gases to the analyzers is recommended. Other methods, such as quick-connect lines, to route calibration gas to the analyzers are applicable.

3.5 Particulate Filter. An in-stack or an out-of-stack glass fiber filter is recommended if exhaust gas particulate loading is significant. An out-of-stack filter should be heated to prevent any condensation.

3.6 Recorder. A strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute. Note: This method is often applied in highly explosive areas. Caution and care should be exercised in choice of equipment and installation.

4. *Calibration and Other Gases*

Gases used for calibrations, fuel, and combustion air (if required) are contained in compressed gas cylinders. Preparation of calibration gases shall be done according to the procedure in Protocol No. 1, listed in Reference 9.2. Additionally, the manufacturer of the cylinder should provide a recommended shelf life for each calibration gas cylinder over which the concentration does not change more than ±2 percent from the certified value. For calibration gas values not generally available (i.e., organics between 1 and 10 percent by volume), alternative methods for preparing calibration gas mixtures, such as dilution systems, may be used with prior approval of the Administrator.

Calibration gases usually consist of propane in air or nitrogen and are determined in terms of the span value. Organic compounds other than propane can be used following the above guidelines and making the appropriate corrections for response factor.

4.1 Fuel. A 40 percent H_2/60 percent He or 40 percent H_2/60 percent N_2 gas mixture is recommended to avoid an oxygen synergism effect that reportedly occurs when oxygen concentration varies significantly from a mean value.

4.2 Zero Gas. High purity air with less than 0.1 parts per million by volume (ppmv) of organic material (propane or carbon equivalent) or less than 0.1 percent of the span value, whichever is greater.

4.3 Low-level Calibration Gas. An organic calibration gas with a concentration equivalent to 25 to 35 percent of the applicable span value.

4.4 Mid-level Calibration Gas. An organic calibration gas with a concentration equivalent to 45 to 55 percent of the applicable span value.

4.5 High-level Calibration Gas. An organic calibration gas with a concentration equivalent to 80 to 90 percent of the applicable span value.

5. *Measurement System Performance Specifications*

5.1 Zero Drift. Less than ±3 percent of the span value.

5.2 Calibration Drift. Less than ±3 percent of span value.

5.3 Calibration Error. Less than ±5 percent of the calibration gas value.

6. *Pretest Preparations*

6.1 Selection of Sampling Site. The location of the sampling site is generally specified by the applicable regulation or purpose of the test; i.e., exhaust stack, inlet line, etc. The sample port shall be located at least 1.5 meters or 2 equivalent diameters upstream of the gas discharge to the atmosphere.

6.2 Location of Sample Probe. Install the sample probe so that the probe is centrally located in the stack, pipe, or duct and is sealed tightly at the stack port connection.

6.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

FIA equipment can be calibrated for almost any range of total organics concentrations. For high concentrations of organics (>1.0 percent by volume as propane) modifications to most commonly available analyzers are necessary. One accepted method of equipment modification is to decrease the size of the sample to the analyzer through the use of a smaller diameter sample capillary. Direct and continuous measurement of organic concentration is a necessary consideration when determining any modification design.

6.4 Calibration Error Test. Immediately prior to the test series, (within 2 hours of the start of the test) introduce zero gas and

* Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Calculate the predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level responses. Then introduce low-level and mid-level calibration gases successively to the measurement system. Record the analyzer responses for low-level and mid-level calibration gases and determine the differences between the measurement system responses and the predicted responses. These differences must be less than 5 percent of the respective calibration gas value. If not, the measurement system is not acceptable and must be replaced or repaired prior to testing. No adjustments to the measurement system shall be conducted after the calibration and before the drift check (Section 7.3). If adjustments are necessary before the completion of the test series, perform the drift checks prior to the required adjustments and repeat the calibration following the adjustments. If multiple electronic ranges are to be used, each additional range must be checked with a mid-level calibration gas to verify the multiplication factor.

6.5 Response Time Test. Introduce zero gas into the measurement system at the calibration valve assembly. When the system output has stabilized, switch quickly to the high-level calibration gas. Record the time from the concentration change to the measurement system response equivalent to 95 percent of the step change. Repeat the test three times and average the results.

7. *Emission Measurement Test Procedure*

7.1 Organic Measurement. Begin sampling at the start of the test period, recording time and any required process information as appropriate. In particular, note on the recording chart periods of process interruption or cyclic operation.

7.2 Drift Determination. Immediately following the completion of the test period and hourly during the test period, reintroduce the zero and mid-level calibration gases, one at a time, to the measurement system at the calibration valve assembly. (Make no adjustments to the measurement system until after both the zero and calibration drift checks are made.) Record the analyzer response. If the drift values exceed the specified limits, invalidate the test results preceding the check and repeat the test following corrections to the measurement system. Alternatively, recalibrate the test measurement system as in Section 6.4 and report the results using both sets of calibration data (i.e., data determined prior to the test period and data determined following the test period).

8. *Organic Concentration Calculations*

Determine the average organic concentration in terms of ppmv as propane or other calibration gas. The average shall be determined by the integration of the output recording over the period specified in the applicable regulation.

If results are required in terms of ppmv as carbon, adjust measured concentrations using Equation 25A-1.

$$C_c = K\,C_{meas} \qquad \text{Eq. 25A-1}$$

Where:

C_c=Organic concentration as carbon, ppmv.

C_{meas}=Organic concentration as measured, ppmv.

K=Carbon equivalent correction factor.

K=2 for ethane.

K=3 for propane.

K=4 for butane.

K=Appropriate response factor for other organic calibration gases.

9. *Bibliography*

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SAMPLING FOR FORMALDEHYDE EMISSIONS FROM STATIONARY SOURCES

1.0 SCOPE AND APPLICATION

1.1 This method is applicable to the determination of Destruction and Removal Efficiency (DRE) of formaldehyde, CAS Registry number 50-00-0, and possibly other aldehydes and ketones from stationary sources as specified in the regulations. The methodology has been applied specifically to formaldehyde; however, many laboratories have extended the application to other aldehydes and ketones. Compounds derivatized with 2,4-dinitrophenylhydrazine can be detected as low as 6.4×10^{-8} lbs/cu ft (1.8 ppbv) in stack gas over a 1 h sampling period, sampling approximately 45 cu ft.

2.0 SUMMARY OF METHOD

2.1 Gaseous and particulate pollutants are withdrawn isokinetically from an emission source and are collected in aqueous acidic 2,4-dinitrophenylhydrazine. Formaldehyde present in the emissions reacts with the 2,4-dinitrophenylhydrazine to form the formaldehyde dinitrophenylhydrazone derivative. The dinitrophenylhydrazone derivative is extracted, solvent-exchanged, concentrated, and then analyzed by high performance liquid chromatography.

3.0 INTERFERENCES

3.1 A decomposition product of 2,4-dinitrophenylhydrazine, 2,4-dinitroaniline, can be an analytical interferent if concentrations are high. 2,4-dinitroaniline can coelute with the 2,4-dinitrophenylhydrazone of formaldehyde under high performance liquid chromatography conditions which may be used for the analysis. High concentrations of highly oxygenated compounds, especially acetone, that have the same retention time or nearly the same retention time as the dinitrophenylhydrazone of formaldehyde and that also absorb at 360 nm will interfere with the analysis.

Formaldehyde, acetone, and 2,4-dinitroaniline contamination of the aqueous acidic 2,4-dinitrophenylhydrazine (DNPH) reagent is frequently encountered. The reagent must be prepared within five days of use in the field and must be stored in an uncontaminated environment both before and after sampling in order to minimize blank problems. Some level of acetone contamination is unavoidable, because acetone is ubiquitous in laboratory and field operations. However, the acetone contamination must be minimized.

4.0 APPARATUS AND MATERIALS

4.1 A schematic of the sampling train is shown in Figure 1. This sampling train configuration is adapted from EPA Method 5 procedures. The sampling train consists of the following components: Probe Nozzle, Pitot Tube, Differential Pressure Gauge, Metering System, Barometer, and Gas Density Determination Equipment.

4.1.1 Probe Nozzle: Quartz or glass with sharp, tapered (30° angle) leading edge. The taper shall be on the outside to preserve a constant inner diameter. The nozzle shall be buttonhook or elbow design. A range of nozzle sizes suitable for isokinetic sampling should be available in increments of 0.16 cm (1/16 in), e.g., 0.32 to 1.27 cm (1/8 to 1/2 in), or larger if higher volume sampling trains are used. Each nozzle shall be calibrated according to the procedures outlined in Section 8.1.

4.1.2 Probe Liner: Borosilicate glass or quartz shall be used for the probe liner. The tester should not allow the temperature in the probe to exceed 120 ± 14°C (248 ± 25°F).

4.1.3 Pitot Tube: The Pitot tube shall be Type S, as described in Section 2.1 of EPA Method 2, or any other appropriate device. The pitot tube shall be attached to the probe to allow constant monitoring of the stack gas velocity. The impact (high pressure) opening plane of the pitot tube shall be even with or above the nozzle entry plane (see EPA Method 2, Figure 2-6b) during sampling. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in Section 4 of EPA Method 2.

4.1.4 Differential Pressure Gauge: The differential pressure gauge shall be an inclined manometer or equivalent device as described in Section 2.2 of EPA Method 2. One manometer shall be used for velocity-head readings and the other for orifice differential pressure readings.

4.1.5 Impingers: The sampling train requires a minimum of four impingers, connected as shown in Figure 1, with ground glass (or equivalent) vacuum-tight fittings. For the first, third, and fourth impingers, use the Greenburg-Smith design, modified by replacing the tip with a 1.3-cm inside diameter (1/2 in) glass tube extending to 1.3 cm (1/2 in) from the bottom of the flask. For the second impinger, use a Greenburg-Smith impinger with the standard tip. Place a thermometer capable of measuring temperature to within 1°C (2°F) at the outlet of the fourth impinger for monitoring purposes.

4.1.6 Metering System: The necessary components are a vacuum gauge, leak-free pump, thermometers capable of measuring temperature within 3°C (5.4°F), dry-gas meter capable of measuring volume to within 1%, and related equipment as shown in Figure 1. At a minimum, the pump should be capable of 4 cfm free flow, and the dry gas meter should have a recording capacity of 0-999.9 cu ft with a resolution of 0.005 cu ft. Other metering systems may be used which are capable of maintaining sampling rates within 10% of isokinetic collection and of determining sample volumes to within 2%. The metering system may be used in conjunction with a pitot tube to enable checks of isokinetic sampling rates.

4.1.7 Barometer: The barometer may be mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in Hg). In many cases, the barometric reading may be obtained from a nearby National Weather Service Station, in which case the station value (which is the absolute barometric pressure) is requested and an adjustment for elevation differences between the weather station and sampling point is applied at a rate of minus 2.5 mm Hg (0.1 in Hg) per 30 m (100 ft) elevation increase (vice versa for elevation decrease).

4.1.8 Gas Density Determination Equipment: Temperature sensor and pressure gauge (as described in Sections 2.3 and 2.4 of EPA Method 2), and gas analyzer, if necessary (as described in EPA Method 3). The temperature sensor ideally should be permanently attached to the pitot tube or sampling probe in a fixed configuration such that the tip of the sensor extends beyond the leading edge of the probe sheath and does not touch any metal. Alternatively, the sensor may be attached just prior to use in the field. Note, however, that if the temperature sensor is attached in the field, the sensor must be placed in an interference-free arrangement with respect to the Type S pitot tube openings (see EPA Method 2, Figure 2-7). As a second alternative, if a difference of no more than 1% in the average velocity measurement is to be introduced, the temperature gauge need not be attached to the probe or pitot tube.

4.2 Sample Recovery

4.2.1 Probe Liner: Probe nozzle and brushes; Teflon® bristle brushes with stainless steel wire handles are required. The probe brush shall have extensions of stainless steel, Teflon®, or inert material at least as long as the probe. The brushes shall be properly sized and shaped to brush out the probe liner, the probe nozzle, and the impingers.

4.2.2 Wash Bottles: Three wash bottles are required. Teflon® or glass wash bottles are recommended; polyethylene wash bottles should not be used because organic contaminants may be extracted by exposure to organic solvents used for sample recovery.

4.2.3 Graduated Cylinder and/or Balance: A graduated cylinder or balance is required to measure condensed water to the nearest 1 mL or 1 g. Graduated cylinders shall have divisions not >2 mL. Laboratory balances capable of weighing to ±0.5 g are required.

4.2.4 Amber Glass Storage Containers: One-liter wide-mouth amber flint glass bottles with Teflon®-lined caps are required to store impinger water samples. The bottles must be sealed with Teflon® tape.

4.2.5 Rubber Policeman and Funnel: A rubber policeman and funnel are required to aid in the transfer of materials into and out of containers in the field.

5.0 REAGENTS

Reagent grade chemicals or better grades shall be used in all tests. Unless otherwise indicated, all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.

5.1 Water: HPLC-grade water is used in preparation of DNPH reagent and in all other applications in the sampling train.

5.2 Silica Gel: Silica gel shall be indicating type, 6-16 mesh. If the silica gel has been used previously, dry at 175°C (350°F) for 2 h before using. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used.

5.3 Crushed Ice: Quantities ranging from 10-50 lb may be necessary during a sampling run, depending upon ambient temperature. Samples which have been taken must be stored and shipped cold; sufficient ice for this purpose must be allowed.

5.4 2,4-Dinitrophenylhydrazine Reagent: The 2,4-dinitrophenylhydrazine reagent must be prepared in the laboratory within five days of sampling use in the field. Preparation of DNPH can also be done in the field, with consideration of appropriate procedures required for safe handling of solvent in the field. When a container of prepared DNPH reagent is opened in the field, the contents of the opened container should be used within 48 hours. All laboratory glassware must be washed with detergent and water and rinsed with water, methanol, and methylene chloride prior to use.

NOTE: The glassware must not be rinsed with acetone or unacceptable levels of acetone contamination will be introduced. If field preparation of DNPH is performed, caution must be exercised in avoiding acetone contamination.

Reagent bottles for storage of cleaned DNPH derivatizing solution must be rinsed with acetonitrile and dried before use. Baked glassware is not essential for preparation of DNPH reagent.

NOTE: DNPH crystals or DNPH solution should be handled with plastic gloves at all times, with prompt and extensive use of running water in case of skin exposure.

5.4.1 Preparation of Aqueous Acidic DNPH: The following materials and reagents are required for preparation of the reagent.

5.4.1.1 Bottles/Caps: amber 1- or 4 L bottles with Teflon®-lined caps are required for storing cleaned DNPH solution. Additional 4-L bottles are required to collect waste organic solvents.

5.4.1.2 Large Glass Container: at least one large glass container (8 to 16 L) is required for mixing the aqueous acidic DNPH solution.

5.4.1.3 Stir Plate/Large Stir Bars/Stir Bar Retriever: a magnetic stir plate and large stir bar are required for the mixing of the aqueous acidic DNPH solution. A stir bar retriever is needed for removing the stir bar from the large container holding the DNPH solution.

5.4.1.4 Buchner Filter/Filter Flask/Filter Paper: a large filter flask (2-4 L) with a buchner filter, appropriate rubber stopper, filter paper, and connecting tubing are required for filtering the aqueous acidic DNPH solution prior to cleaning.

5.4.1.5 Separatory Funnels: at least one large separatory funnel (2 L) is required for cleaning the DNPH prior to use.

5.4.1.6 Beakers: beakers (150 mL, 250 mL, and 400 mL) are useful for holding/measuring organic liquids when cleaning the aqueous acidic DNPH solution and for weighing DNPH crystals.

5.4.1.7 Funnels: at least one large funnel is needed for pouring the aqueous acidic DNPH into the separatory funnel.

5.4.1.8 Graduated Cylinders: at least one large graduated cylinder (1 to 2 L) is required for measuring HPLC-grade water and acid when preparing the DNPH solution.

5.4.1.9 Top-Loading Balance: a one-place top loading balance is needed for weighing out the DNPH crystals used to prepare the aqueous acidic DNPH solution.

5.4.1.10 Spatulas: spatulas are needed for weighing out DNPH when preparing the aqueous DNPH solution.

5.4.1.11 HPLC-Grade Water: water (HPLC-grade) is required to mix the aqueous DNPH solution.

5.4.1.12 Hydrochloric Acid: reagent grade hydrochloric acid (approximately 12N) is required for acidifying the aqueous DNPH solution.

5.4.1.13 2,4-Dinitrophenylhydrazine: a supply of moist solid 2,4-dinitrophenylhydrazine (DNPH) is required for preparation of aqueous acidic DNPH solution. The quantity of water may vary from 10 to 30%. Reagent grade or equivalent is required.

5.4.1.14 Methylene Chloride: methylene chloride (suitable for residue and pesticide analysis, GC/MS, HPLC, GC, Spectrophotometry or equivalent) is required for cleaning the aqueous acidic DNPH solution, rinsing glassware, and recovery of sample trains.

5.4.1.15 Cyclohexane: cyclohexane (HPLC grade) is required for cleaning the aqueous acidic DNPH solution.

NOTE: Do not use spectroanalyzed grades of cyclohexane if this sampling methodology is extended to aldehydes and ketones with four or more carbon atoms.

5.4.1.16 Methanol: methanol (HPLC grade or equivalent) is required for rinsing glassware.

5.4.1.17 Acetonitrile: acetonitrile (HPLC grade or equivalent) is required for rinsing glassware.

5.4.1.18 Formaldehyde: Analytical grade or equivalent formaldehyde is required for preparation of standards. If other aldehydes or ketones are used, analytical grade or equivalent is required.

5.4.2 Preparation of Aqueous Acidic DNPH Derivatizing Reagent: Each batch of DNPH reagent should be prepared and purified within five days of sampling, according to the procedure described below.

5.4.2.1 Place an 8-L container under a fume hood on a magnetic stirrer. Add a large stir bar and fill the container half full of HPLC-grade water. Save the empty bottle from HPLC-grade water. Start the stirring bar and adjust the stir rate to be as fast as possible. Using a graduated cylinder, measure 1.4 mL of concentrated hydrochloric acid. Slowly pour the acid into the stirring water. Fumes may be generated and the water may become warm. Weigh the DNPH crystals on a one-place balance (see Table 1 for approximate amounts) and add to the stirring acid solution. Fill the 8 L container to the 8 L mark with HPLC water and stir overnight. If all of the DNPH crystals have dissolved overnight, add additional DNPH and stir for two more hours. Continue the process of adding DNPH with additional stirring until a saturated solution has been formed. Filter the DNPH solution using vacuum filtration. Gravity filtration may be used, but a much longer time is required. Store the filtered solution in an amber bottle at room temperature.

TABLE 1. APPROXIMATE AMOUNT OF CRYSTALLINE DNPH USED TO PREPARE A SATURATED SOLUTION

Amount of Moisture in DNPH	Weight Required per 8 L of Solution
10 weight percent	31 g
15 weight percent	33 g
30 weight percent	40 g

Within five days of proposed use, place about 1.6 L of the DNPH reagent in a 2 L separatory funnel. Add approximately 200 mL of methylene chloride and stopper the funnel. Wrap the stopper of the funnel with paper towels to absorb any leakage. Invert and vent the funnel. Then shake vigorously for 3 minutes. Initially, the funnel should be vented frequently (every 10 - 15 sec). After the layers have separated, discard the lower (organic) layer.

Extract the DNPH a second time with methylene chloride and finally with cyclohexane. When the cyclohexane layer has separated from the DNPH reagent, the cyclohexane layer will be the top layer in the separatory funnel. Drain the lower layer (the cleaned extracted DNPH reagent solution) into an amber bottle that has been rinsed with acetonitrile and allowed to dry.

5.4.3 <u>Quality Control</u>: Take two aliquots of the extracted DNPH reagent. The size of the aliquots is dependent upon the exact sampling procedure used, but 100 mL is reasonably representative. To ensure that the background in the reagent is acceptable for field use, analyze one aliquot of the reagent according to the procedure of EPA Draft Method 8315. Save the other aliquot of aqueous acidic DNPH for use as a method blank when the analysis is performed.

5.4.4 <u>Shipment to the Field</u>: Tightly cap the bottle containing extracted DNPH reagent using a Teflon®-lined cap. Seal the bottle with Teflon® tape. After the bottle is labeled, the bottle may be placed in a friction-top can (paint can or equivalent) containing a 1 -2 inch layer of granulated charcoal and stored at ambient temperature until use.

If the DNPH reagent has passed the Quality Control criteria, the reagent may be packaged to meet necessary shipping requirements and sent to the sampling area. If the Quality Control criteria are not met, the reagent solution may be re-extracted or the solution may be re-prepared and the extraction sequence repeated.

If the DNPH reagent is not used in the field within five days of extraction, an aliquot may be taken and analyzed as described Draft Method 8315. If the reagent meets the Quality Control requirements, the reagent may be used. If the reagent does not meet Quality Control requirements, the reagent must be discarded and new reagent must be prepared and tested.

5.4.5 Calculation of Acceptable Levels of Impurities in DNPH Reagent: The acceptable impurity level (AIL, µg/mL) is calculated from the expected analyte level in the sampled gas (EAL, ppbv), the volume of air that will be sampled at standard conditions (SVOL, L), the formula weight of the analyte (FW, g/mol), and the volume of DNPH reagent that will be used in the impingers (RVOL, mL):

$$AIL = 0.1 \times [EAL \times SVOL \times FW/22.4 \times (FW + 180)/FW]/(RVOL \times 1000).$$

where 0.1 is the acceptable contaminant level, 22.4 is a factor relating ppbv to g/L, 180 is a factor relating the underivatized analyte to the derivatized analyte, and 1000 is a unit conversion factor.

5.4.6 Disposal of Excess DNPH Reagent: Excess DNPH reagent may be returned to the laboratory and recycled or treated as aqueous waste for disposal purposes. 2,4-Dinitrophenylhydrazine is a flammable solid when dry so water should not be evaporated from the solution of the reagent.

5.5 Field Spike Standard Preparation: To prepare a formaldehyde field spiking standard at 4.01 mg/mL, use a 500µL syringe to transfer 0.5 mL of 37% by weight of formaldehyde (401 mg/mL) to a 50 mL volumetric flask containing approximately 40 mL of methanol. Dilute to 50 mL with methanol.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 Because of the complexity of this method, field personnel should be trained in and experienced with the test procedures in order to obtain reliable results.

6.2 Laboratory Preparation:

6.2.1 All the components shall be maintained and calibrated according to the procedure described in APTD-0576, unless otherwise specified.

6.2.2 Weigh several 200- to 300-g portions of silica gel in airtight containers to the nearest 0.5 g. Record on each container the total weight of the silica gel plus containers. As an alternative to preweighing the silica gel, it may instead be weighed directly in the impinger or sampling holder just prior to train assembly.

6.3 Preliminary Field Determinations:

6.3.1 Select the sampling site and the minimum number of sampling points according to EPA Method 1 or other relevant criteria. Determine the stack pressure, temperature, and range of velocity heads using EPA Method 2. A leak-check of the pitot lines according to EPA Method 2, Section 3.1, must be performed. Determine the stack gas moisture content using EPA Approximation Method 4 or its alternatives to establish estimates of isokinetic sampling-rate settings. Determine the stack gas dry molecular weight, as described in EPA Method 2, Section 3.6. If integrated EPA Method 3 sampling is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the sample run.

6.3.2 Select a nozzle size based on the range of velocity heads so that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates below 28 L/min (1.0 cfm). During the run, do not change the nozzle.

Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see Section 2.2 of EPA Method 2).

6.3.3 Select a suitable probe liner and probe length so that all traverse points can be sampled. For large stacks, to reduce the length of the probe, consider sampling from opposite sides of the stack.

6.3.4 A minimum of 45 ft^3 of sample volume is required for the determination of the Destruction and Removal Efficiency (DRE) of formaldehyde from incineration systems (45ft^3 is equivalent to one hour of sampling at 0.75 dscf). Additional sample volume shall be collected as ecessitated by the capacity of the DNPH reagent and analytical detection limit constraints. To determine the minimum sample volume required, refer to sample calculations in Section 10.

6.3.5 Determine the total length of sampling time needed to obtain the identified minimum volume by comparing the anticipated average sampling rate with the volume requirement. Allocate the same time to all traverse points defined by EPA Method 1. To avoid timekeeping errors, the length of time sampled at each traverse point should be an integer or an integer plus 0.5 min.

6.3.6 In some circumstances (e.g., batch cycles) it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas-volume samples. In these cases, careful documentation must be maintained in order to allow accurate calculation of concentrations.

6.4 Preparation of Collection Train:

6.4.1 During preparation and assembly of the sampling train, keep all openings where contamination can occur covered with Teflon® film or aluminum foil until just prior to assembly or until sampling is about to begin.

6.4.2 Place 100 mL of cleaned DNPH solution in each of the first two impingers, and leave the third impinger empty. If additional capacity is required for high expected concentrations of formaldehyde in the stack gas, 200 mL of DNPH per impinger may be used or additional impingers may be used for sampling. Transfer approximately 200 to 300 g of pre-weighed silica gel from its container to the fourth impinger. Care should be taken to ensure that the silica gel is not entrained and carried out from the impinger during sampling. Place the silica gel container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

6.4.3 With a glass or quartz liner, install the selected nozzle using a Viton-A O-ring when stack temperatures are <260°C (500°F) and a woven glass-fiber gasket when temperatures are higher. See APTD-0576 (Rom, 1972) for details. Other connecting systems utilizing either 316 stainless steel or Teflon® ferrules may be used. Mark the probe with heat-resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

6.4.4 Assemble the train as shown in Figure 1. During assembly, do not use any silicone grease on ground-glass joints upstream of the impingers. Use Teflon® tape, if required. A very light coating of silicone grease may be used on ground-glass joints downstream of the impingers, but the silicone grease should be limited to the outer portion (see APTD-0576) of the ground-glass joints to minimize silicone grease contamination. If necessary, Teflon® tape may be used to seal leaks. Connect all temperature sensors to an appropriate potentiometer/display unit. Check all temperature sensors at ambient temperature.

6.4.5 Place crushed ice all around the impingers.

6.4.6 Turn on and set the probe heating system at the desired operating temperature. Allow time for the temperature to stabilize.

6.5 Leak-Check Procedures:

6.5.1 Pre-test Leak Check:

6.5.1.1 After the sampling train has been assembled, turn on and set the probe heating system at the desired operating temperature. Allow time for the temperature to stabilize. If a Viton-A O-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak-check the train at the sampling site by plugging the nozzle and pulling a 381-mm Hg (15 in Hg) vacuum.

NOTE: A lower vacuum may be used, provided that the lower vacuum is not exceeded during the test.

6.5.1.2 If an asbestos string is used, do not connect the probe to the train during the leak check. Instead, leak-check the train by first attaching a carbon-filled leak check impinger to the inlet and then plugging the inlet and pulling a 381-mm Hg (15 in Hg) vacuum. (A lower vacuum may be used if this lower vacuum is not exceeded during the test.) Then connect the probe to the train and leak-check at about 25 mm Hg (1 in Hg) vacuum. Alternatively, leak-check the probe with the rest of the sampling train in one step at 381 mm Hg (15 in Hg) vacuum. Leakage rates in excess of 4% of the average sampling rate or >0.00057 m^3/min (0.02 cfm), whichever is less, are acceptable.

6.5.1.3 The following leak check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with the fine-adjust valve fully open and coarse-adjust valve completely closed. Partially open the coarse-adjust valve and slowly close the fine-adjust valve until the desired vacuum is reached. Do not reverse direction of the fine-adjust valve, as liquid will back up into the train. If the desired vacuum is exceeded, either perform the leak check at this higher vacuum or end the leak check, as shown below, and start over.

6.5.1.4 When the leak check is completed, first slowly remove the plug from the inlet to the probe. When the vacuum drops to 127 mm (5 in) Hg or less, immediately close the coarse-adjust valve. Switch off the pumping system and reopen the fine-adjust valve. Do not reopen the fine-adjust valve until the coarse-adjust valve has been closed to prevent the liquid in the impingers from being forced backward into the sampling line and silica gel from being entrained backward into the third impinger.

6.5.2 Leak Checks During Sampling Runs:

6.5.2.1 If, during the sampling run, a component change (i.e., impinger) becomes necessary, a leak check shall be conducted immediately after the interruption of sampling and before the change is made. The leak check shall be done according to the procedure described in Section 6.5.1, except that it shall be done at a vacuum greater than or equal to the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable. If a higher leakage rate is obtained, the tester must void the sampling run.

NOTE: Any correction of the sample volume by calculation reduces the integrity of the pollutant concentration data generated and must be avoided.

6.5.2.2 Immediately after a component change and before sampling is re-initiated, a leak check similar to a pre-test leak check must also be conducted.

6.5.3 Post-test Leak Check:

6.5.3.1 A leak check is mandatory at the conclusion of each sampling run. The leak check shall be done with the same procedures as the pre-test leak check, except that the post-test leak check shall be conducted at a vacuum greater than or equal to the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable. If, however, a higher leakage rate is obtained, the tester shall record the leakage rate and void the sampling run.

6.6 Sampling Train Operation:

6.6.1 During the sampling run, maintain an isokinetic sampling rate to within 10% of true isokinetic, below 28 L/min (1.0 cfm). Maintain a temperature around the probe of 120° ± 14°C (248° ± 25°F).

6.6.2 For each run, record the data on a data sheet such as the one shown in Figure 2. Be sure to record the initial dry-gas meter reading. Record the dry-gas meter readings at the beginning and end of each sampling time increment, when changes in flow rates are made, before and after each leak check, and when sampling is halted. Take other readings required by Figure 2 at least once at each sample point during each time increment and additional readings when significant adjustments (20% variation in velocity head readings) necessitate additional adjustments in flow rate. Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

6.6.3 Clean the stack access ports prior to the test run to eliminate the chance of sampling deposited material. To begin sampling, remove the nozzle cap, verify that the filter and probe heating systems are at the specified temperature, and verify that the pitot tube and probe are properly positioned. Position the nozzle at the first traverse point, with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs, which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations, are available. These nomographs are designed for use when the Type S pitot tube coefficient is 0.84 ± 0.02 and the stack gas equivalent density (dry molecular weight) is equal to 29 ± 4. APTD-0576 details the procedure for using the nomographs. If the stack gas molecular weight and the pitot tube coefficient are outside the above ranges, do not use the nomographs unless appropriate steps are taken to compensate for the deviations.

6.6.4 When the stack is under significant negative pressure (equivalent to the height of the impinger stem), take care to close the coarse-adjust valve before inserting the probe into the stack in order to prevent liquid from backing up through the train. If necessary, the pump may be turned on with the coarse-adjust valve closed.

6.6.5 When the probe is in position, block off the openings around the probe and stack access port to prevent unrepresentative dilution of the gas stream.

6.6.6 Traverse the stack cross section, as required by EPA Method 1, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe through the access port, in order to minimize the chance of extracting deposited material.

6.6.7 During the test run, make periodic adjustments to keep the temperature around the probe at the proper levels. Add more ice and, if necessary, salt, to maintain a temperature of <20°C (68°F) at the silica gel outlet. Also, periodically check the level and zero of the manometer.

6.6.8 A single train shall be used for the entire sampling run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or in cases where equipment failure necessitates a change of trains. An additional train or additional trains may also be used for sampling when the capacity of a single train is exceeded.

6.6.9 When two or more trains are used, separate analyses of components from each train shall be performed. If multiple trains have been used because the capacity of a single train would be exceeded, first impingers from each train may be combined, and second impingers from each train may be combined.

6.6.10 At the end of the sampling run, turn off the coarse-adjust valve, remove the probe and nozzle from the stack, turn off the pump, record the final dry gas meter reading, and conduct a post-test leak check. Also, leak check the pitot lines as described in EPA Method 2. The lines must pass this leak check in order to validate the velocity-head data.

6.6.11 Calculate percent isokineticity (see Method 2) to determine whether the run was valid or another test should be made.

7.0 SAMPLE RECOVERY

7.1 Preparation:

7.1.1 Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool. When the probe can be handled safely, wipe off all external particulate matter near the tip of the probe nozzle and place a cap over the tip to prevent losing or gaining particulate matter. Do not cap the probe tip tightly while the sampling train is cooling because a vacuum will be created, drawing liquid from the impingers back through the sampling train.

7.1.2 Before moving the sampling train to the cleanup site, remove the probe from the sampling train and cap the open outlet, being careful not to lose any condensate that might be present. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used, let any condensed water or liquid drain into the impingers. Cap off any open impinger inlets and outlets. Ground glass stoppers, Teflon® caps, or caps of other inert materials may be used to seal all openings.

7.1.3 Transfer the probe and impinger assembly to an area that is clean and protected from wind so that the chances of contaminating or losing the sample are minimized.

7.1.4 Inspect the train before and during disassembly, and note any abnormal conditions.

7.1.5 Save a portion of all washing solutions (methylene chloride, water) used for cleanup as a blank. Transfer 200 mL of each solution directly from the wash bottle being used and place each in a separate, pre-labeled sample container.

7.2 Sample Containers:

7.2.1 Container 1: Probe and Impinger Catches. Using a graduated cylinder, measure to the nearest mL, and record the volume of the solution in the first three impingers. Alternatively, the solution may be weighed to the nearest 0.5 g. Include any condensate in the probe in this determination. Transfer the impinger solution from the graduated cylinder into the amber flint glass bottle. Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, clean all surfaces to which the sample is exposed (including the probe nozzle, probe fitting, probe liner, first impinger, and impinger connector) with methylene chloride. Use less than 500 mL for the entire wash (250 mL would be better, if possible). Add the washings to the sample container.

7.2.1.1 Carefully remove the probe nozzle and rinse the inside surface with methylene chloride from a wash bottle. Brush with a Teflon® bristle brush, and rinse until the rinse shows no visible particles or yellow color, after which make a final rinse of the inside surface. Brush and rinse the inside parts of the Swagelok® fitting with methylene chloride in a similar way.

7.2.1.2 Rinse the probe liner with methylene chloride. While squirting the methylene chloride into the upper end of the probe, tilt and rotate the probe so that all inside surfaces will be wetted with methylene chloride. Let the methylene chloride drain from the lower end into the sample container. The tester may use a funnel (glass or polyethylene) to aid in transferring the liquid washes to the container. Follow the rinse with a Teflon® brush. Hold the probe in an inclined position, and squirt methylene chloride into the upper end as the probe brush is being pushed with a twisting action through the probe. Hold the sample container underneath the lower end of the probe, and catch any methylene chloride, water, and particulate matter that is brushed from the probe. Run the brush through the probe three times or more. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since there may be small crevices in which particulate matter can be entrapped. Rinse the brush with methylene chloride or water, and quantitatively collect these washings in the sample container. After the brushings, make a final rinse of the probe as described above.

NOTE: Two people should clean the probe in order to minimize sample losses. Between sampling runs, brushes must be kept clean and free from contamination.

7.2.1.3 Rinse the inside surface of each of the first three impingers (and connecting tubing) three separate times. Use a small portion of methylene chloride for each rinse, and brush each surface to which sample is exposed with a Teflon® bristle brush to ensure recovery of fine particulate matter. Water will be required for the recovery of the impingers in addition to the specified quantity of methylene chloride. There will be at least two phases in the impingers. This two-phase mixture does not pour well, and a significant amount of the impinger catch will be left on the walls. The use of water as a rinse makes the recovery quantitative. Make a final rinse of each surface and of the brush, using both methylene chloride and water.

7.2.1.4 After all methylene chloride and water washings and particulate matter have been collected in the sample container, tighten the lid so that solvent, water, and DNPH reagent will not leak out when the container is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Seal the container with Teflon® tape. Label the container clearly to identify its contents.

7.2.1.5 If the first two impingers are to be analyzed separately to check for breakthrough, separate the contents and rinses of the two impingers into individual containers. Care must be taken to avoid physical carryover from the first impinger to the second. The formaldehyde hydrazone is a solid which floats and froths on top of the impinger solution. Any physical carryover of collected moisture into the second impinger will invalidate a breakthrough assessment.

7.2.2 Container 2: Sample Blank. Prepare a blank by using an amber flint glass container and adding a volume of DNPH reagent and methylene chloride equal to the total volume in Container 1. Process the blank in the same manner as Container 1.

7.2.3 Container 3: Silica Gel. Note the color of the indicating silica gel to determine whether it has been completely spent and make a notation of its condition. The impinger containing the silica gel may be used as a sample transport container with both ends sealed with tightly fitting caps or plugs. Ground-glass stoppers or Teflon® caps may be used. The silica gel impinger should then be labeled, covered with aluminum foil, and packaged on ice for transport to the laboratory. If the silica gel is removed from the impinger, the tester may use a funnel to pour the silica gel and a rubber policeman to remove the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use water or other liquids to transfer the silica gel. If a balance is available in the field, the spent silica gel (or silica gel plus impinger) may be weighed to the nearest 0.5 g.

7.2.4 Sample containers should be placed in a cooler, cooled by although not in contact with ice. Sample containers must be placed vertically and, since they are glass, protected from breakage curing shipment. Samples should be cooled during shipment so they will be received cold at the laboratory.

8.0 CALIBRATION

8.1 Probe Nozzle: Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the inside diameter of the nozzle to the nearest 0.025 mm (0.001 in). Make measurements at three separate places across the diameter and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in). When the nozzles become nicked or corroded, they shall be replaced and calibrated before use. Each nozzle must be permanently and uniquely identified.

8.2 Pitot tube: The Type S pitot tube assembly shall be calibrated according to the procedure outlined in Section 4 of EPA Method 2, or assigned a nominal coefficient of 0.84 if it is not visibly nicked or corroded and if it meets design and intercomponent spacing specifications.

8.3 Metering system:

8.3.1 Before its initial use in the field, the metering system shall be calibrated according to the procedure outlined in APTD-0576. Instead of physically adjusting the dry-gas meter dial readings to correspond to the wet-test meter readings, calibration factors may be used to correct the gas meter dial readings mathematically to the proper values. Before calibrating the metering system, it is suggested that a leak check be conducted. For metering systems having diaphragm pumps, the normal leak check procedure will not detect leakages within the pump. For these cases, the following leak check procedure will apply: make a ten-minute calibration run at 0.00057 m^3/min (0.02 cfm). At the end of the run, take the difference of the measured wet-test and dry-gas meter volumes and divide the difference by 10 to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.02 cfm).

8.3.2 After each field use, check the calibration of the metering system by performing three calibration runs at a single intermediate orifice setting (based on the previous field test). Set the vacuum at the maximum value reached during the test series. To adjust the vacuum, insert a valve between the wet-test meter and the inlet of the metering system. Calculate the average value of the calibration factor. If the calibration has changed by more than 5%, recalibrate the meter over the full range of orifice settings, as outlined in APTD-0576.

8.3.3 Leak check of metering system: The portion of the sampling train from the pump to the orifice meter (see Figure 1) should be leak-checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. Use the following procedure: Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing attached into the orifice exhaust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13 - 18 cm (5 - 7 in) water column by blowing into the rubber tubing. Pinch off the tubing and observe the manometer for 1 min. A loss of pressure on the manometer indicates a leak in the meter box. Leaks must be corrected.

NOTE: If the dry-gas-meter coefficient values obtained before and after a test series differ by >5%, either the test series must be voided or calculations for test series must be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

8.4 Probe heater: The probe heating system must be calibrated before its initial use in the field according to the procedure outlined in APTD-0576. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used.

8.5 Temperature gauges: Each thermocouple must be permanently and uniquely marked on the casting. All mercury-in-glass reference thermometers must conform to ASTM E-1 63C or 63F specifications. Thermocouples should be calibrated in the laboratory with and without the use of extension leads. If extension leads are used in the field, the thermocouple readings at ambient air temperatures, with and without the extension lead, must be noted and recorded. Correction is necessary if the use of an extension lead produces a change >1.5%.

8.5.1 Impinger and dry-gas meter thermocouples: For the thermocouples used to measure the temperature of the gas leaving the impinger train, three-point calibration at ice water, room air, and boiling water temperatures is necessary. Accept the thermocouples only if the readings at all three temperatures agree to ±2°C (3.6°F) with those of the absolute value of the reference thermometer.

8.5.2 Probe and stack thermocouple: For the thermocouples used to indicate the probe and stack temperatures, a three-point calibration at ice water, boiling water, and hot oil bath temperatures must be performed. Use of a point at room air temperature is recommended. The thermometer and thermocouple must agree to within 1.5% at each of the calibration points. A calibration curve (equation) may be constructed (calculated) and the data extrapolated to cover the entire temperature range suggested by the manufacturer.

8.6 Barometer: Adjust the barometer initially and before each test series to agree to within ±2.5 mm Hg (0.1 in Hg) of the mercury barometer or the corrected barometric pressure value reported by a nearby National Weather Service Station (same altitude above sea level).

8.7 Triple-beam balance: Calibrate the triple-beam balance before each test series, using Class S standard weights. The weights must be within ±0.5% of the standards, or the balance must be adjusted to meet these limits.

9.0 CALCULATIONS

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

9.1 Calculation of Total Formaldehyde:

To determine the total formaldehyde in mg, use the following equation:

Total mg formaldehyde = $C_d \times V \times DF \times$

$([\text{g/mole aldehyde}]/[\text{g/mole DNPH derivative}]) \times$

10^{-3} mg/µg

where:

C_d = measured concentration of DNPH-formaldehyde derivative, µg/mL

V = organic extract volume, mL

DF = dilution factor

9.2 Formaldehyde concentration in stack gas:

Determine the formaldehyde concentration in the stack gas using the following equation:

$$C_f = K \text{ [total formaldehyde, mg] } / V_{m(std)}$$

where:

K = 35.31 ft^3/m^3 if $V_{m(std)}$ is expressed in English units

= 1.00 m^3/m^3 if $V_{m(std)}$ is expressed in metric units

$V_{m(std)}$ = volume of gas sample as measured by dry gas meter, corrected to standard conditions, dscm (dscf)

9.3 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop are obtained from the data sheet.

9.4 Dry Gas Volume: Calculate $V_{m(std)}$ and adjust for leakage, if necessary, using the equation in Section 6.3 of EPA Method 5.

9.5 Volume of Water Vapor and Moisture Content: Calculate the volume of water vapor and moisture content from equations 5-2 and 5-3 of EPA Method 5.

10.0 DETERMINATION OF VOLUME TO BE SAMPLED

To determine the minimum sample volume to be collected, use the following sequence of equations.

10.1 From prior analysis of the waste feed, the concentration of formaldehyde (FORM) introduced into the combustion system can be calculated. The degree of destruction and removal efficiency that is required is used to determine the maximum amount of FORM allowed to be present in the effluent. This amount may be expressed as:

Max $FORM_i$ Mass =

$$[(WF) (FORM_i \text{ conc}) (100 - \%DRE)] / 100$$

where:

WF = mass flow rate of waste feed per h, g/h (lb/h)

$FORM_i$ = concentration of FORM (wt %) introduced into the combustion process

DRE = percent Destruction and Removal Efficiency required

Max FORM = mass flow rate (g/h [lb/h]) of FORM emitted from the combustion source

10.2 The average discharge concentration of the FORM in the effluent gas is determined by comparing the Max FORM with the volumetric flow rate being exhausted from the source. Volumetric flow rate data are available as a result of preliminary EPA Method 1 - 4 determinations:

$$\text{Max } FORM_i \text{ conc} = [\text{Max } FORM_i \text{ Mass}] / DV_{eff(std)}$$

where:

$DV_{eff(std)}$ = volumetric flow rate of exhaust gas, dscm (dscf)

$FORM_i$ conc = anticipated concentration of the FORM in the exhaust gas stream, g/dscm (lb/dscf)

10.3 In making this calculation, it is recommended that a safety margin of at least ten be included.

$$[LDL_{FORM} \times 10] / [FORM_{i\ conc}] = V_{tbc}$$

where:

LDL_{FORM} = detectable amount of FORM in entire sampling train

V_{tbc} = minimum dry standard volume to be collected at dry-gas meter

10.4 The following analytical detection limits and DNPH Reagent Capacity (based on a total volume of 200 mL in two impingers) must also be considered in determining a volume to be sampled.

Table 2. Instrument Detection Limits and Reagent Capacity for Formaldehyde Analysis[1]

Analyte	Detection Limit, ppbv[2]	Reagent Capacity, ppmv
formaldehyde	1.8	66
acetaldehyde	1.7	70
acrolein	1.5	75
acetone/propionaldehyde	1.5	75
butyraldehyde	1.5	79
methyl ethyl ketone	1.5	79
valeraldehyde	1.5	84
isovaleraldehyde	1.4	84
hexaldehyde	1.3	88
benzaldehyde	1.4	84
o-/m-/p-tolualdehyde	1.3	89
dimethylbenzaldehyde	1.2	93

[1] Oxygenated compounds in addition to formaldehyde are included for comparison with formaldehyde; extension of the methodology to other compounds is possible.

[2] Detection limits are determined in solvent. These values therefore represent the optimum capability of the methodology.

11.0 QUALITY CONTROL

11.1 Sampling: See EPA Manual 600/4-77-027b for Method 5 quality control.

11.2 Analysis: The quality assurance program required for this method includes the analysis of field and method blanks, procedure validations, and analysis of field spikes. The assessment of combustion data and positive identification and quantitation of formaldehyde are dependent on the integrity of the samples received and the precision and accuracy of the analytical methodology. Quality Assurance procedures for this method are designed to monitor the performance of the analytical methodology and to provide the required information to take corrective action if problems are observed in laboratory operations or in field sampling activities.

11.2.1 Field Blanks: Field blanks must be submitted with the samples collected at each sampling site. The field blanks include the sample bottles containing aliquots of sample recovery solvents, methylene chloride and water, and unused DNPH reagent. At a minimum, one complete sampling train will be assembled in the field staging area, taken to the sampling area, and leak-checked at the beginning and end of the testing (or for the same total number of times as the actual sampling train). The probe of the blank train must be heated during the sample test. The train will be recovered as if it were an actual test sample. No gaseous sample will be passed through the Blank sampling train.

11.2.2 Method Blanks: A method blank must be prepared for each set of analytical operations, to evaluate contamination and artifacts that can be derived from glassware, reagents, and sample handling in the laboratory.

11.2.3 Field Spike: A field spike is performed by introducing 200 µL of the Field Spike Standard into an impinger containing 200 mL of DNPH solution. Standard impinger recovery procedures are followed and the field spike sample is returned to the laboratory for analysis. The field spike is used as a check on field handling and recovery procedures. An aliquot of the field spike standard is retained in the laboratory for derivatization and comparative analysis.

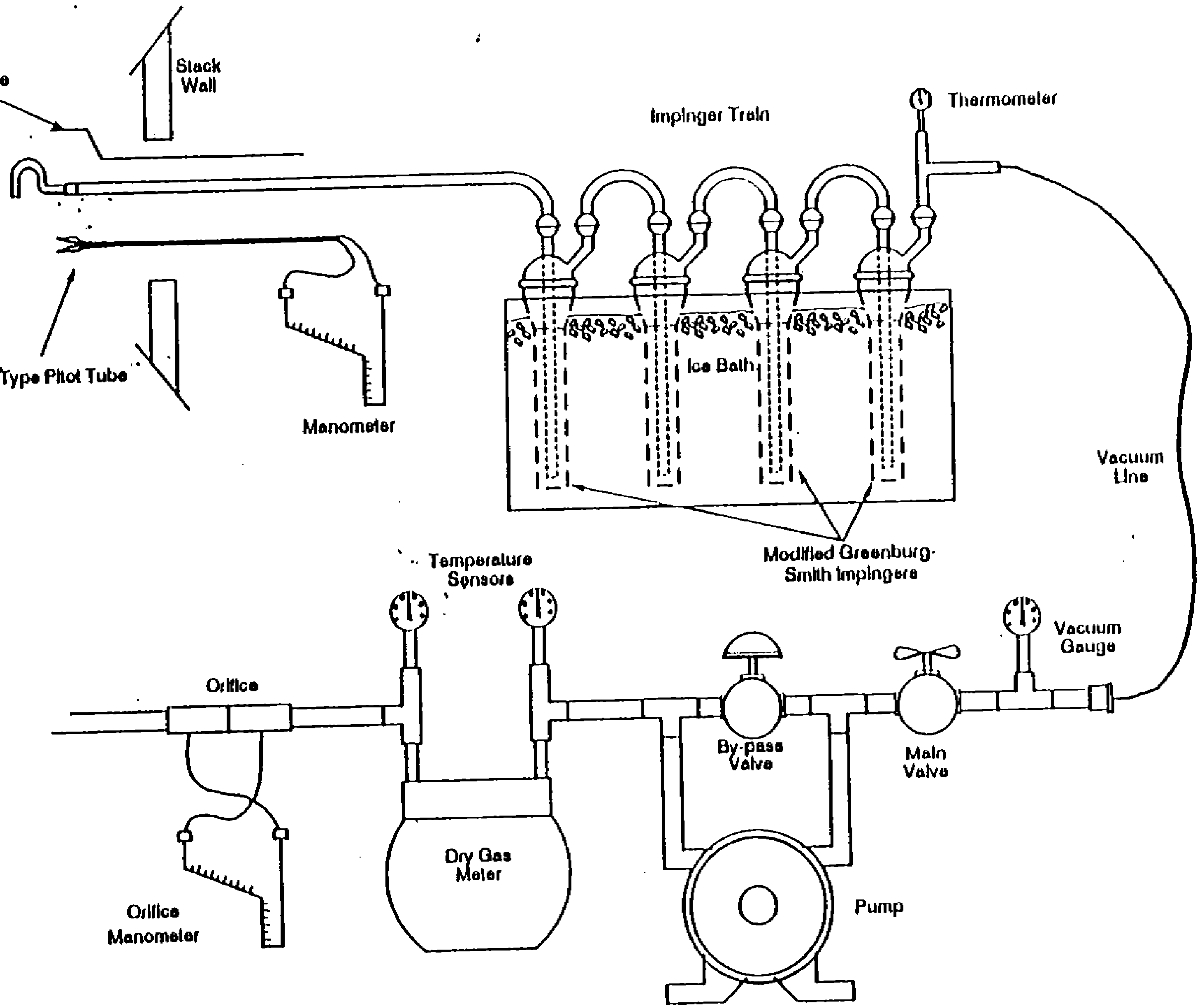
12.0 METHOD PERFORMANCE

12.1 Method performance evaluation: The following expected method performance parameters for precision, accuracy, and detection limits are provided in Table 3.

Table 3. Expected Method Performance for Formaldehyde

Parameter	Precision	[1]Accuracy[2]	Detection Limit[3]
Matrix: Dual trains	±15% RPD	±20%	1.5×10^{-7} lb/ft^3 (1.8 ppbv)

[1] Relative percent difference limit for dual trains.
[2] Limit for field spike recoveries.
[3] The lower reporting limit having less than 1% probability of false positive detection.



Formaldehyde Sampling Train

Plant ______________________

Location ______________________

Operator ______________________

Date ______________________

Run No. ______________________

Sample Box No. ______________________

Meter Box No. ______________________

Meter H@ ______________________

C Factor ______________________

Pitot Tube Coefficient C_p ______________________

Schematic of Stack Cross Section

Ambient Temperature ______________________

Barometric Pressure ______________________

Assumed Moisture % ______________________

Probe Length, m(ft) ______________________

Nozzle Identification No. ______________________

Average Calibrated Nozzle Diameter, cm (in) ______________________

Probe Heating Setting ______________________

Leak Rate, m^3/min. (cfm) ______________________

Probe Liner Material ______________________

Static Pressure, mm Hg (in. Hg) ______________________

Filter No. ______________________

Traverse Point Number	Sampling Time (0) Min.	Vacuum mm Hg (in. Hg)	Stack Temperature (T_s) °C (°F)	Velocity Head (P_s) mm (in) H_2O	Pressure Differential Across Orifice Meter mm (H_2O) (in H_2O)	Gas Sample Volume m^3 (ft^3)	Gas Sample Temp. at Dry Gas Meter		Filter Holder Temperature °C(°F)	Temperature of Gas Leaving Last Impinger °C(°F)
							Inlet °C(°F)	Outlet °C(°F)		
Total							Avg.	Avg.		
Average										

Figure 2. Field Data Sheet

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This document is a preliminary draft. It has not been formally released by EPA and should not at this stage be construed to represent Agency policy. It is being circulated for comment on its technical accuracy and policy implications.

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FIELD TEST OF A GENERIC METHOD FOR SAMPLING AND ANALYSIS OF ISOCYANATES

Interim Report
(Work Assignment 55)

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This document is a preliminary draft. It has not been formally released by EPA and should not at this stage be construed to represent Agency policy. It is being circulated for comment on its technical accuracy and policy implications.

DISCLAIMER

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EXECUTIVE SUMMARY

Isocyanates are used extensively in the production of polyurethane materials such as flexible foam, enamel wire coatings, paint formulations and in binders for the pressed board industry. Because of their widespread use and known adverse physiological effects, several isocyanates have been listed in Title III of the Clean Air Act Amendments of 1990. The isocyanates of interest are: 2,4-toluene diisocyanate (TDI), methylene diphenyl diisocyanate (MDI), 1,6-hexamethylene diisocyanate (HDI) and methyl isocyanate (MI). Previously, no validated sampling and analytical methodology for these compounds relative to stationary sources existed.

The field validation study presented in this report is a culmination of laboratory investigations, performed under previous work assignments, which were designed to develop and evaluate a viable approach for the determination of isocyanate emissions from stationary sources. After the successful completion of the laboratory studies, the sampling and analysis approach was formulated and a field validation test was initiated. At the direction of the EPA, TDI was selected as the primary analyte.

The test site selected was a flexible foam manufacturing facility in High Point, North Carolina, which used TDI in the manufacturing process. The approximate level of TDI in the emission stream was determined by the analysis of samples collected during a presurvey. A sampling scheme was then designed to ensure the collection of sufficient samples to yield statistically valid data. Following the EPA Method 301 protocol, quadruplicate trains (QUAD) were operated simultaneously with four co-located probes. Two of the trains were spiked with TDI and two were unspiked. Samples from eight QUAD runs (minimum of six valid runs required by Method 301) were returned to the laboratory and analyzed according to the analytical procedure developed in laboratory studies. These data were statistically evaluated following Method 301 protocol to determine the performance of the method relative to bias and precision. These results are summarized in the following table. The precision for both the spiked and unspiked trains was less than 5% RSD, which is well within the precision criteria (% RSD <50)

Method Validation Statistical Summary

Precision[a]	
% RSD for Spiked Samples % RSD for Unspiked Samples	3.55[b] 4.72[b]
Accuracy[a]	
Bias: Significant? Correction Factor	-295 μg No 1.0[c]
Recovery[a]	
Amount Spiked (as TDI) Average Percent Recovered	7828 μg 95

[a]Results are based on the average of seven QUAD runs (14 spiked trains and 14 unspiked trains). TDI was present in the stack emissions and was therefore collected as background in the unspiked trains as well as in the spiked trains.

[b]EPA Method 301 requires the precision to be <50% RSD for the method to be acceptable.

[c]EPA Method 301 requires the calculated Correction Factor to be between 0.7 and 1.3 for the method to be acceptable.

for an acceptable method as tested. Using the data from all eight runs, the bias was found to be significant at the 95% level of confidence thus requiring the use of a correction factor of 1.053. Using the data from only seven runs (eliminating run number eight due to a questionable leak check for one of the trains) the bias was not significant and therefore did not require the calculation of a correction factor. In either case, the method was well within the bias acceptance criteria (correction factor between 0.7 and 1.3) for an acceptable method as tested.

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1.0 INTRODUCTION

Sampling and analytical methods for a particular analyte or group of analytes can be evaluated and validated by demonstrating their performance in field tests, thereby establishing the precision and bias of the methods experimentally. Few methods have been fully validated for sampling and analyzing the organic compounds listed in Title III of the Clean Air Act Amendments of 1990. For some analytes, methods have been validated for sample analysis, but not for sample collection. Full validation for both sampling and analytical methods, for both field and laboratory operations, is available for fewer than 10 percent of the analytes listed in Title III of the Clean Air Act Amendments at any source category. Field validation may be performed by side-by-side comparison of a candidate method to a validated method to establish comparable performance for the same analytes in the same matrix (same source category). Another procedure for validation of a method is to spike known quantities of analytes into the collection apparatus in the field so that the precision and bias of the method can be demonstrated from sample collection through analysis.

EPA, under the authority of Title III of the Clean Air Act Amendments (CAAA) of 1990, requires the identification and validation of sampling and analytical methods for the isocyanate compounds which are listed among the 189 hazardous air pollutants identified in Title III. These isocyanate compounds are listed in Table 1-1. Development of sampling and analytical methods for these four compounds was accomplished under Work Assignments 11, 21, and 40 on EPA Contract No. 68-D1-0010. At the direction of EPA, initial efforts were directed to the measurement of 2,4-toluene diisocyanate (TDI) emissions.

The objective of this work assignment was to validate the isocyanate sampling and analytical test method through field testing at an operating stationary source. The method was validated by collecting flue gas samples for the analysis of 2,4-TDI, and evaluating the data for bias and precision. EPA Method 301, "Field Validation of Pollutant Measurement Methods from Various Waste Media," was used as

Table 1-1

Isocyanates Listed in the Clean Air Act Amendments of 1990

Hexamethylene-1,6-diisocyanate (HDI)
2,4-Toluene diisocyanate (TDI)[a]
Methylene diphenyl diiocyanate (MDI)
Methyl isocyanate (MI)

[a]The 2,6 TDI isomer may also be present but is not listed in the CAAA.

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a model for the validation protocol. Analyte spiking was used with quadruplicate ampling trains to generate the required data. The field validation was performed at an industrial facility which manufactures flexible foam products. Only two of the quadruplicate trains were spiked for each run. The two unspiked trains were used to establish the background level of target compound in the stack gas.

The sampling method utilizes a Method 5-type sampling train, which operates with a solution of 1-(2-pyridyl) piperazine and toluene in the impingers. Stack gas is extracted from the source through a heated probe and drawn through the impingers. TDI present in the stack gas reacts with the piperazine to form an isocyanate derivative. The quantity of isocyanate is determined by solvent exchange of the toluene solution with acetonitrile followed by high pressure liquid chromatographic (HPLC) analysis.

This report discusses the details of the field validation study. Section 2.0, Conclusions and Recommendations, summarizes the results and provides recommendations for future work. Sections 3.0 and 4.0 provide details of the sampling and analysis procedures respectively. Section 5.0 is a detailed discussion of the procedures, calculations and quality control.

2.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results presented in Section 6.0 of this report, the following conclusions can be made concerning the validity of the method as tested under the conditions described in this report:

- The calculated values for precision (%RSD) for both the spiked and unspiked trains, 3.55 and 4.72 respectively, are both well within the acceptance criteria of less than 50% RSD found in Section 6.3 of the EPA Method 301. Therefore, the method as tested at the source category described meets the precision requirements;

- The method bias, at the concentration levels tested, was found to be significantly different from zero at the 95% level of confidence when the data from all eight runs (minimum of six runs required) were used in the calculations. A correction factor of 1.053 would be required if all eight runs are included in the bias calculation. Good technical reasons exist for excluding one of eight QUAD runs. If this run is eliminated, no bias correction is required. In either case the correction factor is well within the acceptance criteria of 0.7 to 1.3 found in Section 1.2 of the EPA Method 301. Therefore, the method as tested at the source category described meets the bias and correction factor requirements; and

- The method as tested is sufficiently robust to allow testing at sources similar to the source tested in this study where the stack gas moisture is less than 1% by volume, the stack temperature is less than 30 degrees C and the presence of other compounds that may interfere with the analysis are minimal.

Recommendations for future testing and validation of the method for the sampling and analysis of isocyanates include the following:

- Identify a source for testing that has more than one isocyanate present in the stack gas;

- Spike as many of the four CAAA target isocyanates as possible into the train before sampling in order to gain as much information as possible from the field test; and

- Design the condenser between the first and second impinger of the train to more efficiently reduce the loss of toluene from the first impinger and minimize compound breakthrough due entrained aerosols.

3.0 FIELD TEST

The objective of this program was to perform a field test to establish the bias and precision of a sampling and analytical method for isocyanate compounds listed in Title III of the Clean Air Act Amendments of 1990. The method evaluation in this test series resulted from extensive literature reviews, industry consultation and laboratory development. To achieve the test objective, an industrial source with known emissions of TDI was selected as a field test site. Factors in the site selection were easy access, ample space for the quadruple sampling trains and proximity to Radian's office and laboratory in Research Triangle Park, North Carolina.

3.1 Site Description

The field validation test was performed at a flexible foam production plant located in High Point, North Carolina. In the manufacturing process starting materials (TDI, water, a polyether resin, methylene chloride, an amine catalyst, and coloring additives) are blended and continuously fed onto a conveyer belt. The TDI reacts with water and releases CO_2, which causes foaming in the resin material. Dichloromethane (DCM) can be added as a supplemental "blowing" or foaming agent. The heat from the reaction of TDI and water causes the DCM to vaporize, resulting in increased foaming. The density of the foam is controlled by the amount of TDI, water and DCM added. The foaming action continues as the material proceeds down the conveyer belt. Finished product is then allowed to cure and degas for 24 to 48 hours.

3.2 Sampling Location

Figure 3-1 presents a schematic view of the sampling location. Three induced draft (ID) fans are used to exhaust TDI and DCM vapors from the production process through three separate uninsulated sheet metal ducts that extend through the roof. Two of the ducts are connected by a 30-foot horizontal duct, 34 inches in diameter, which then extends vertically to a height of 25 feet above the roof top. A 6 inch

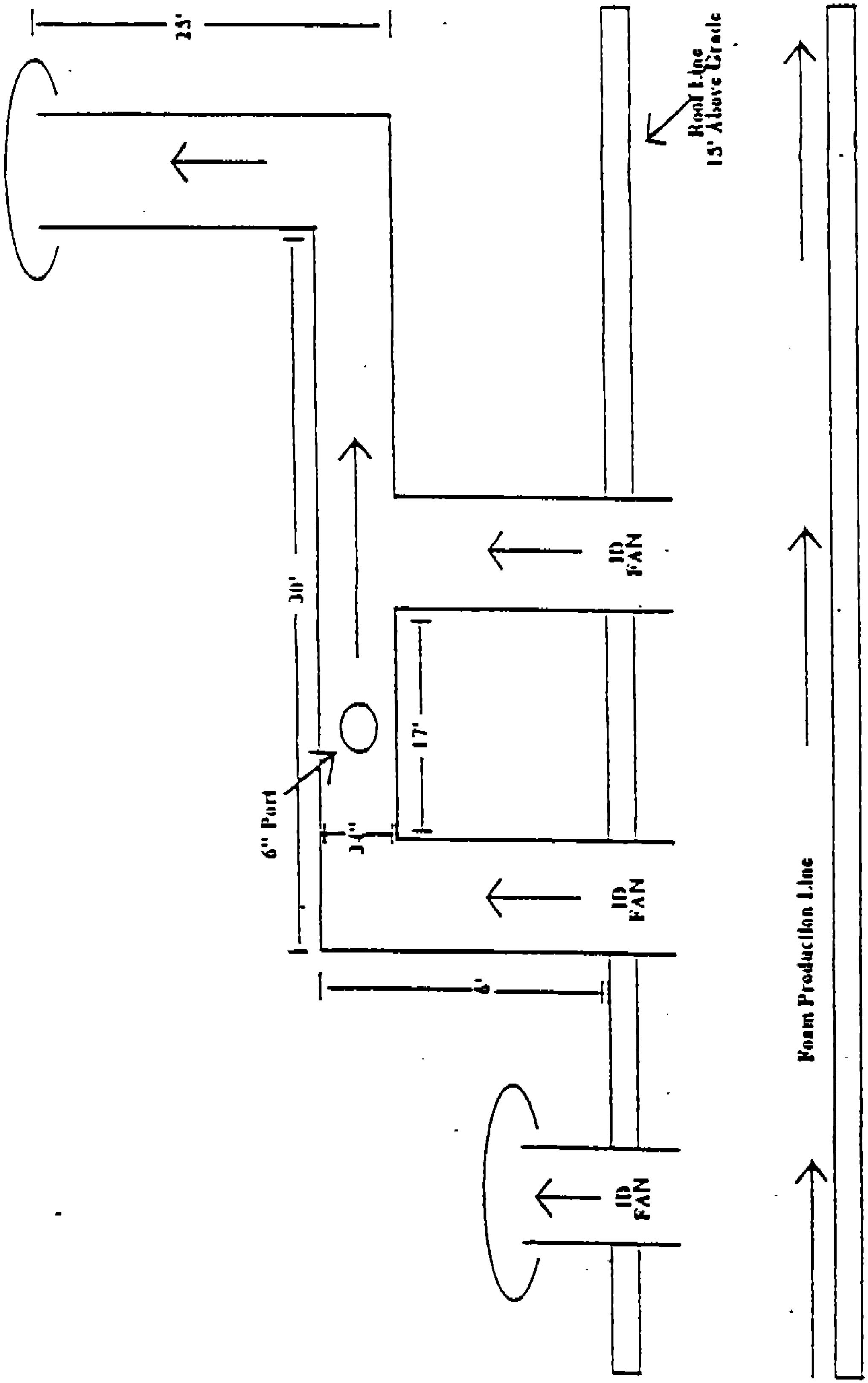


Figure 3-1. Sample Location

diameter sampling port is located in the horizontal duct midway between vertical ducts number 2 and 3, approximately 5 feet above the roof level. The roof level is approximately 15 feet above the ground.

A recovery trailer was located on the ground immediately in front of the sampling area, allowing easy communication between the sampling crew and recovery area. Two-way radio communication between the facility production personnel and the sampling crew allowed coordination between production startup and the start of each sampling run.

3.3 Test Schedule

The recovery trailer and test equipment were mobilized on Saturday, February 20, 1993. Equipment setup took place Saturday afternoon and Sunday, and testing began Monday morning.

The sampling schedule is shown in Table 3-1. Eight runs were completed, which included two extra runs above the required minimum of six.

3.4 Sample Collection

3.4.1 Quad Probe

Sampling was performed by withdrawing stack gas from a single port in the stack through a quad probe, then directing the sampled gas simultaneously to four independently operated sampling trains. The quad probe contains four similar heated sampling probes that were inserted into the stack as one unit, as shown in Figure 3-2. The front end of the quad probe was positioned in the center of the stack and remained

Table 3-1

Test Schedule

Run	Date	Start Time	Stop Time
1	2-22-93	1215	1300
2	2-22-93	1330	1410
3	2-23-93	0945	1085
4	2-23-93	1335	1415
5	2-24-93	1010	1110
6	2-24-93	1335	1420
7	2-25-93	1215	1255
8	2-25-93	1315	1355

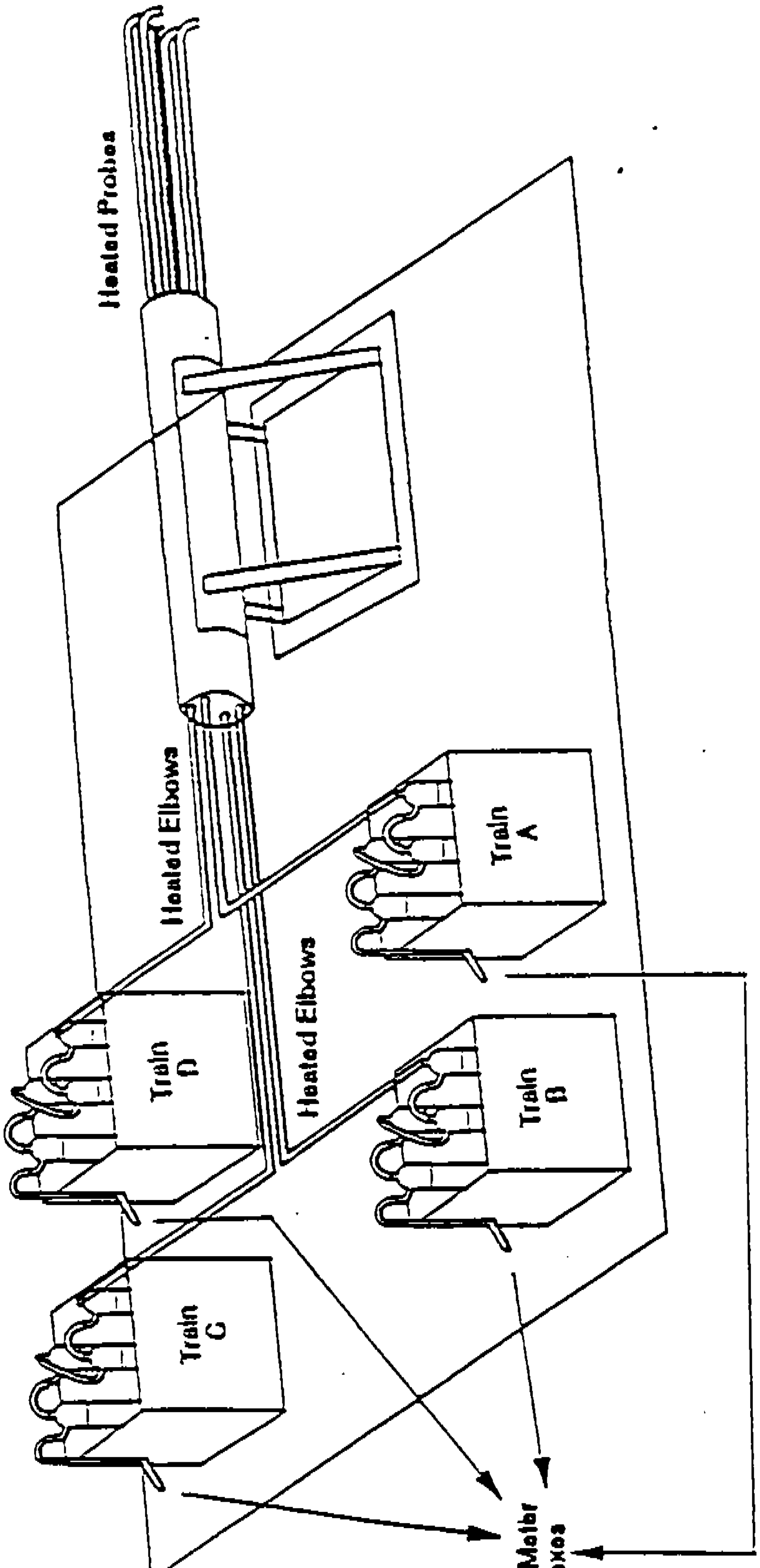


Figure 3-2. Schematic of Quad Train Setup

in that location during each test. The stack was not traversed nor were stack gas velocity measurements made, because determination of the true concentration and emission rate of the target compound in the stack gas was not required to meet the objectives of this program.

Method 301 of 40 CFR Part 63 describes field validation procedures and details the criteria for the quadruple sampling probe tip arrangement. This method requires the inside edge of sampling probe tips to be situated in a 6.0 cm x 6.0 cm square area. The area encompassed by the probe tip arrangement should occupy less than 5% of the stack cross-sectional area. The cross-sectional area of the probe tip arrangement used in this test was 5.8 square inches as measured from the probe/nozzle centerlines. This area is less than 1% of the stack cross-sectional area of 908 square inches, which satisfies the Method 301 criterion.

3.4.2 Quad-Train Assembly

Four independent sampling trains made up the quad-train assembly. Although four meter boxes were required, the velocity head (ΔP) was determined using only one set of pitot tubes. The sampling trains were identified as Train A, B, C, and D. Two of the four trains were spiked before each run. The spiking compound was added to the first impinger of these trains in the field for bias determination. The sampling train test matrix is given in Table 3-2.

3.5 Sampling Preparation

3.5.1 Glassware Preparation

All glassware used for sampling was thoroughly cleaned prior to use. This included the probe, impingers, all sample bottles and all utensils used during sample recovery. All glassware was washed with hot soapy water, rinsed with hot tap water, rinsed with distilled water and baked in a oven at 300 °C for four hours. The glassware

Table 3-2

Sampling Train Test Matrix

	Train Designation	
Run #	Spiked	Unspiked
1	A, B	C, D
2	C, D	A, B
3	A, B	C, D
4	C, D	A, B
5	A, B	C, D
6	C, D	A, B
7	A, B	C, D
8	C, D	A, B

was then triple-rinsed with HPLC grade acetonitrile, followed by triple-rinsing with HPLC grade toluene. Open ends of glassware were covered with aluminum foil to minimize potential contamination during transportation and set-up.

3.5.2 Preparation of Impinger Absorbing Solution

Historical data available from the host test site facility and data resulting from the collection of preliminary samples by Radian indicated that the concentration of TDI in the process exhaust was 1 ppm or less, depending on the density of foam being produced on any given day. At this concentration, a 30 cubic foot sample size would result in the collection of approximately 7 mg of TDI. Using the reaction stoichiometry of two moles of 1,2-PP per mole of TDI, the piperazine in toluene solution was then prepared at a concentration level three times the calculated minimum needed, or 133 μg/mL. This would provide a total of approximately 40 mg of 1,2-PP in 300 mL of impinger solution in the first impinger available for reaction with TDI. At this concentration, approximately 22 mg of TDI could be collected in the first impinger before the reagent was exhausted. This solution was prepared in the laboratory just prior to use in the field, and was used within 10 days of preparation.

3.5.3 Preparation of TDI Spiking Solution

The TDI spiking solution was prepared at a concentration of 1.5 mg of the derivatized TDI per 1 mL of acetonitrile. Fifteen mL of this spiking solution was spiked into the first impinger of two of the four trains prior to each QUAD run. This spiking scheme resulted in a total spike amount of derivatized TDI of 22.5 mg, which is equivalent to 7.83 mg of underivatized TDI. This is an amount equivalent to the amount of TDI expected to be collected in the train from the stack gas based on presurvey samples. Therefore, the amount present in the two spiked trains was designed to be at least twice the amount present in the two unspiked trains.

3.5.4 Sampling Equipment Preparation

Final sampling train preparations included calibration and leak checking of all the train equipment, including meter boxes, thermocouples, nozzles, pitot tubes, and umbilicals. Reference calibration procedures were followed when available, and the results were properly documented and archived. If a referenced calibration technique for a particular piece of apparatus was not available, then a state-of-the-art technique was used. A discussion of the techniques used to calibrate this equipment is presented below.

S-Type Pitot Tube Calibration

The EPA has specified guidelines concerning the construction and geometry of an acceptable S-Type pitot tube. If the specified design and construction guidelines are met, a pitot tube coefficient of 0.84 can be used. Information pertaining to the design and construction of the Type-S pitot tube is presented in detail in Section 4.1.1 of EPA Document 600/4-77027b. Only S-Type pitot tubes meeting the required EPA specifications were used. Pitot tubes were inspected and documented as meeting EPA specifications prior to field sampling.

Sampling Nozzle Calibration

Glass nozzles were used for sampling. All nozzles were thoroughly cleaned, visually inspected for damage , and calibrated according to the procedure outlined in Section 4.4.2 of EPA Document 600/4-77-027b.

Dry Gas Meter Calibration

Dry gas meters (DGMs) were used in the sample trains to measure the sample volume and sampling rate. All DGMs were calibrated to document the volume correction factor prior to the departure of the equipment to the field. Post-test calibration checks were performed after the equipment was returned to Radian's laboratory. Pre- and post-test calibrations agreed to within 5 percent.

Prior to calibration, a positive pressure leak check of the system was performed using the procedure outlined in Section 4.3.2 of EPA Document 600/4-77-23b. The system was placed under approximately 10 inches of water pressure and an oil manometer was used to determine if the pressure decreased over a one-minute period.

After the sampling console was assembled and leak checked, the pump was allowed to run for 15 minutes to allow the pump and DGM to warm up. The valve was then adjusted to obtain the desired flow rate. For the pre-test calibrations, data were collected at the orifice manometer settings (ΔH) of 0.5, 1.0, 1.5, 2.0, 3.0, and 4.0 inches of water. Gas volumes of 5 ft^3 were used for the two lower orifice settings, and volumes of 10 ft^3 were used for the higher settings. The individual gas meter correction factors (γi) were calculated for each orifice setting and averaged. The method requires that each of the individual correction factors fall within $\pm 2\%$ of the average correction factor or the meter must be cleaned, adjusted, and recalibrated. In addition, Radian requires that the average correction factor be 1.00 ± 1 percent. For the post-test calibration, the meter was calibrated three times at the average orifice setting and vacuum which were used during the actual test.

Dry gas meter calibrations were performed at Radian's laboratory using an American® wet test meter as an intermediate standard. The intermediate standard is calibrated every six months against the EPA spirometer at EPA's Emission Measurement Laboratory in Research Triangle Park (RTP), North Carolina.

3.5.5 Sampling Operations

Vent gas samples were collected isokinetically from a single sampling point located in the center of the duct. Preliminary information about the stack gas velocity useful in selecting nozzle size and calculating the K-factor was obtained during the pre-site survey. Prior to testing, a leak check of pitot lines was performed according to EPA Method 2. Oxygen (O_2) and carbon dioxide (CO_2) concentrations were ambient levels as determined by EPA Method 3. The stack gas moisture data was measured by the host facility as the relative humidity.

Preparation of Sampling Train

The four sampling trains for each QUAD run were charged and assembled in the recovery trailer. The impinger buckets were marked as Train A, B, C, or D. Tared impingers were used. Approximately 300 mL of the absorbing reagent was transferred to the first impinger and 200 mL to the second impinger. The first impinger of each train was of a Greenburg-Smith design and all remaining impingers were of the modified Greenburg-Smith design. The third impinger was empty, 200 to 300 g of silica gel was placed in the fourth impinger and 400 g of charcoal was placed in the fifth impinger. A water jacketed condenser was placed between the outlet of the first impinger and the inlet to the second impinger to promote cooling and minimize evaporative loses of toluene from the first impinger. Fifteen (15) mL of the spiking solution was pipetted into the first impinger of Trains A and B. Openings were covered with Teflon® film or aluminum foil after the assembly of the trains.

Final assembly of the sampling trains occurred at the sampling location. The complete train configuration is shown in Figure 3-3. Thermocouples were attached to measure the stack temperature and probe outlet and impinger outlet temperatures. Crushed ice was added to each impinger bucket, and the probe heaters were turned on and allowed to stabilize at 120° ± 12°C (248° ± 25°F).

The isocyanate trains were leak checked before and after each sampling run, as required in EPA Method 5. To leak check the assembled train, the nozzle end was capped off and the sampling train evacuated to a vacuum of 15 inches of Hg. After the system was evacuated and the pump isolated from the train, the volume of gas flowing through the system was timed for 60 seconds. The leak rate is required to be

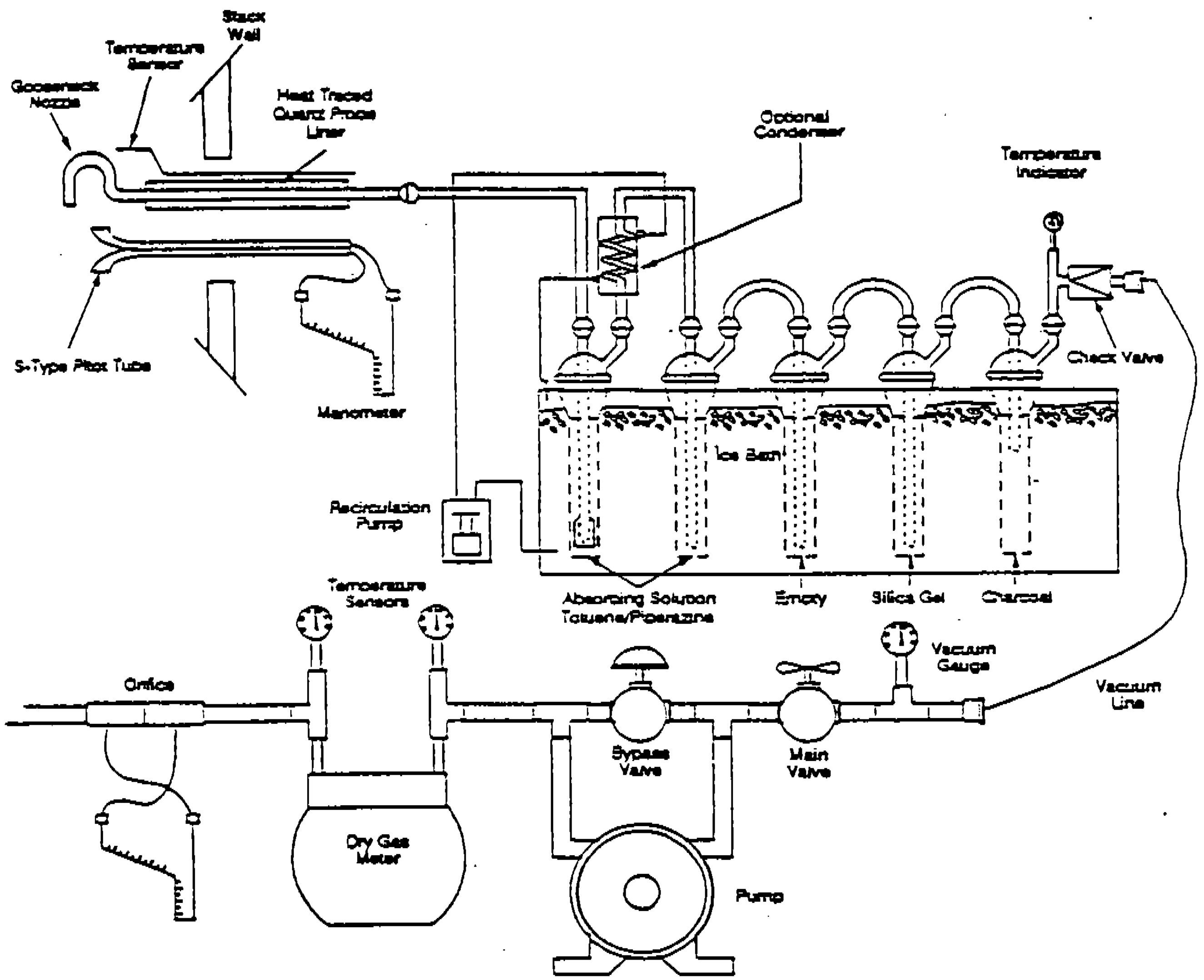


Figure 3-3. Sampling Train for Isocyanate

less than 0.02 acfm or 4% of the average sampling rate, whichever is less. After the leak rate was determined, the cap was slowly removed from the nozzle end until the vacuum in the train returned to atmospheric pressure and then the pump was turned off.

The leak rates and sampling start and stop times were recorded on the sampling task log. Also, any other events that occur during sampling were recorded on the task log (such as pitot cleaning, thermocouple malfunctions, heater malfunctions, and any other unusual occurrences). A nominal sample size of 30 cubic feet was collected in all sampling train. This was accomplished by sampling at a flowrate of 0.5 cubic feet per minute for 60 minutes. The sample volumes for each train by QUAD run are presented in Table 3-3.

3.5.6 Sample Recovery

The sample bottles containing the probe and nozzle washings and the impinger portion of the sampling trains were moved to the recovery trailer.

Each impinger was carefully removed from the impinger bucket, the outside was wiped dry, and the final impinger weight was determined and recorded to calculate stack moisture. The isocyanate sample was then collected in the following two fractions:

- First impinger contents, toluene rinses from the nozzle/probe liner and toluene/acetonitrile rinses of the first impinger and connecting glassware; and
- Contents and toluene/acetonitrile rinses from the second and third impingers and the condenser.

Recovery procedures are detailed in this section. All recovery bottles were wide mouth amber glass with Teflon® lined lids.

Table 3-3.

Quad Train Sample Volumes

Date	Run Number	Train A Vm @ 68° (ft^3)	Train B Vm @ 68° (ft^3)	Train C Vm @ 68° (ft^3)	Train D Vm @ 68° (ft^3)
2/22/93	1	33.42	33.89	33.02	33.04
2/22/93	2	29.07	29.65	28.67	28.40
2/23/93	3	34.24	35.15	33.75	33.01
2/23/93	4	30.60	31.17	30.35	29.54
2/24/93	5	34.14	34.70	34.46	32.59
2/24/93	6	35.10	35.17	34.49	33.78
2/25/93	7	31.11	31.94	30.14	29.91
2/25/93	8	30.89	29.73	30.49	31.95

Container 1 - Probe and First Impinger Contents

The contents and rinses of each of the first impingers and first impinger connectors were combined with the corresponding probe/nozzle washing solution. The entire contents of the first impinger were recovered as a single sample, even if two phases were present. The first impinger and connecting tubing were rinsed three times with 15 mL aliquots of toluene. A final rinse of the impinger with acetonitrile was also necessary to remove any water left on the impinger wall and to recover any remaining derivatized TDI.

Container 2 - Second and Third Impinger Contents/Condenser Rinse

The contents and toluene/acetonitrile rinses of the second and third impingers and the condenser of each train were collected in the same manner used for the first impinger described above. The contents of these impingers were analyzed separately from the contents collected in the first impinger to check for breakthrough; therefore, care was taken to avoid physical carryover from the first impinger to the second. The contents of the fourth and fifth impingers were weighed as previously described and then discarded.

Field Blanks

Four field blanks were prepared and recovered during the test, one on each day of testing. The four field blanks were prepared using Trains A, B, C, and D from the two sets of glassware used during the testing. A sampling train was assembled in the staging area, taken to the sampling location, and leak-checked. The probe of the blank train was heated during the generation of the field blank, but no gas sample was passed through the sampling train. The sampling train for the field blank was recovered with the same procedure described for authentic source samples..

Reagent Blank(s)

Aliquots of each lot of toluene, acetonitrile and absorbing reagent were collected daily to be analyzed as reagent blanks.

Sample Storage and Shipping

Sample containers were checked to ensure that complete labels had been affixed. The labels identified Trains A, B, C, or D, as appropriate. Teflon® lids were tightened and secured with Teflon® tape. The sample bottles were stored in a cooler packed with ice and were returned to Radian's laboratory in these coolers at the end of the field test.

3.6 Quality Control

The following quality control measures were implemented during the field testing phase of this program:

- All dry gas meters were calibrated. Calibration procedures were followed for the pitot tube/probe assembly and all thermocouple readout devices.
- Temperatures of the sampling train were maintained at the specified setting (120± 12°C) during each sampling run at levels prescribed in the test plan.
- Sampling trains were leak-checked both prior to and after sampling.
- All glassware was washed and oven-baked following appropriate method protocol, given in the test plan.
- All recovery solvents were HPLC grade and an aliquot of each was collected daily as reagent blanks.
- One field blank was collected for every two sampling runs.

- Chain of Custody forms and log books were filled in at the completion of each day of sampling.

4.0 ANALYTICAL PROCEDURES

4.1 Sample Preparation

The samples were received in the laboratory in screw-capped glass bottles with Teflon®-lined caps, sealed with Teflon® tape and stored in coolers packed with ice. Samples were logged into the laboratory sample tracking system and stored in a secure, refrigerated (4°C) sample storage area prior to analysis. Samples were prepared for analysis within 30 days of collection and analyzed within 30 days of preparation.

All labware was washed with detergent and water and rinsed with hot tap water, rinsed with deionized water, baked at 300°C, rinsed with acetonitrile and toluene prior to use. Solvents used were HPLC grade or equivalent.

Each of the two recovered samples from each train was transferred along with rinses to separate 500 mL round bottom flasks and then evaporated to dryness under vacuum in a 65°C water bath. Each round-bottom flask was then rinsed three times with separate two (2) mL aliquots of acetonitrile (ACN) and the rinses transferred to a 10-mL volumetric flask. The sample was then brought to volume with ACN and transferred to a 15-mL vial and sealed with a Teflon®-lined lid. The vial was stored in a refrigerated sample storage area at 4°C until analysis.

4.2 Chromatographic Analyses

The procedures for the HPLC analyses of the samples are described in the following sections.

4.2.1 Standard Preparation

A 300 μg/mL stock solution of TDI piperazine urea derivative was prepared by dissolving 7.5 mg of the purified crystals of the derivatized TDI in 25 mL of

ACN. [The derivatized TDI was previously prepared by adding 1 g of the neat TDI to a solution of 1-(2-pyridyl) piperazine in ACN, evaporating to dryness and recrystallizing the urea derivative three times from ACN.] Working standards for the calibration curve were made from this stock at six concentration levels in ACN ranging from 0 to 50 μg/mL. This concentration range covered the amount of TDI expected to be collected at the host facility. This stock solution was also used to prepare the field spiking solution. A check standard was prepared from a separately prepared stock solution. This check standard fell in the middle of the calibration curve.

4.2.2 Analysis

HPLC System

The HPLC system operating parameters for analysis of standards and samples were as follows:

Instrument:	RAININ HPXL Delivery System Waters 710B WISP autosampler
Data System:	Nelson 2600 (1 volt)
Column:	Zorbax ODS (4.6 mm ID x 25 cm)
Mobile Phase:	Acetonitrile/0.1M Ammonium Acetate Buffer
Gradient:	25:75 ACN/0.1 m ammonium acetate buffer, pH 6.2, hold 2 minutes, then to 60:40 by 19.5 minutes.
Detector:	RAININ Dynamax Dual-Wavelength, Ultraviolet at 254 nm
Flow Rate:	2 mL/min
Injector Volume:	50 μL
Retention Time:	2,4-TDI, 10.2 min.; 2,6-TDI 8.5 min.

Instrument Calibration

Calibration standards were prepared at seven levels as described in Section 4.2.1. Each calibration standard was injected in duplicate. Linear regression analysis of peak area response versus concentrations of TDI was used to prepare a calibration curve. Linearity of the calibration curve was confirmed by visual inspection and verified by a correlation coefficient of 0.9995. After an initial calibration curve was obtained, the calibration check standard described in Section 4.2.1 was analyzed. This standard was injected after every 3 samples, and was used for daily calibration. This check standard consistently agreed to within 10% of the true value.

All samples were analyzed in triplicate on the HPLC. An acetonitrile blank was analyzed once per day to ensure that the system was not contaminated. A check standard was analyzed prior to sample analysis, after every 3 samples, and at the end of the sample analysis each day.

4.3 Qualitative Identification

Analytes were identified by retention time. The retention time for 2,4-TDI was 10.2 min and 8.5 min for 2,6-TDI. Figures 4-1 and 4-2 show chromatograms from the analysis of first impinger contents from QUAD run number 4 for the unspiked and spiked trains respectively. As seen in the chromatograms, the TDI peaks are well separated from the peak for unreacted 1-2 PP. The peak at 17.5 min. was not identified.

4.4 Calculations

4.4.1 Calculation of the Amount of Isocyanate Collected

A least squares linear regression analysis of the calibration data was used to calculate a correlation coefficient, slope, and intercept. Concentration was used as the independent or X-variable and response was used as the dependent or Y-variable.

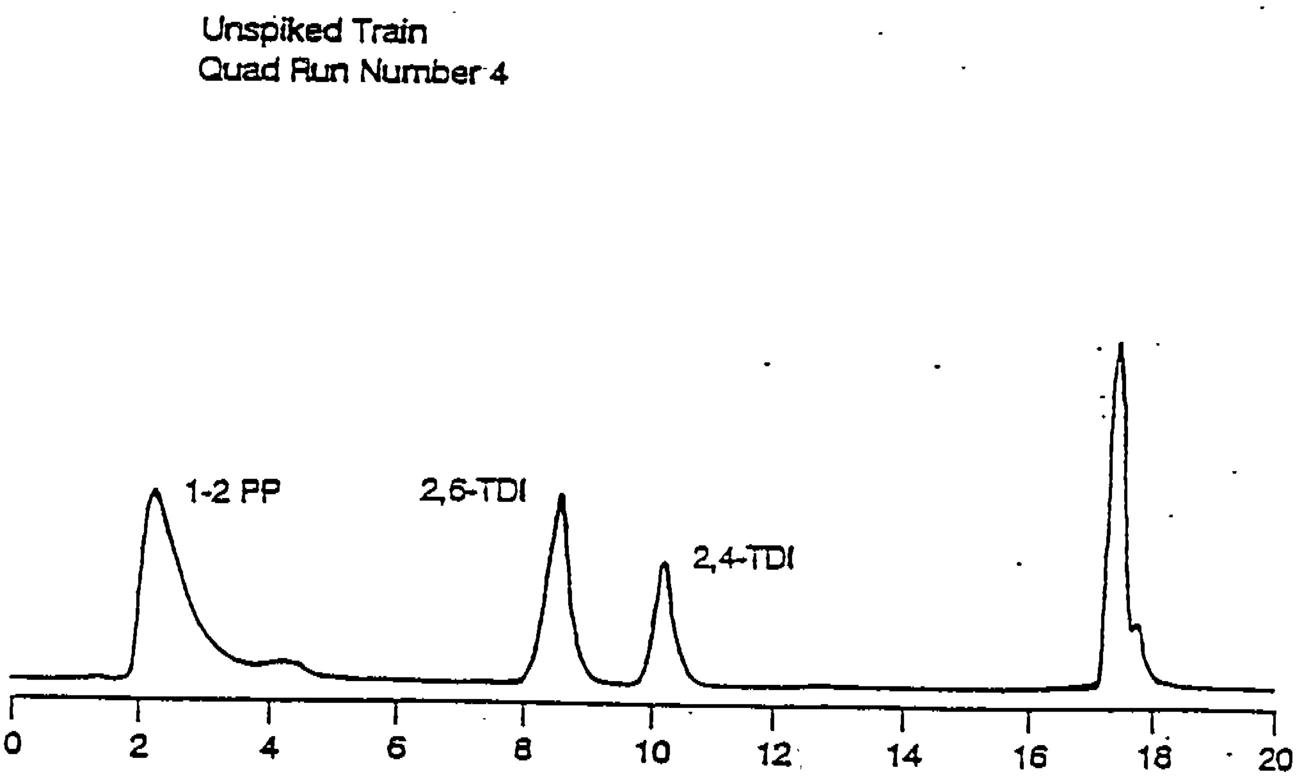


Figure 4-1. Chromatogram of Unspiked Train

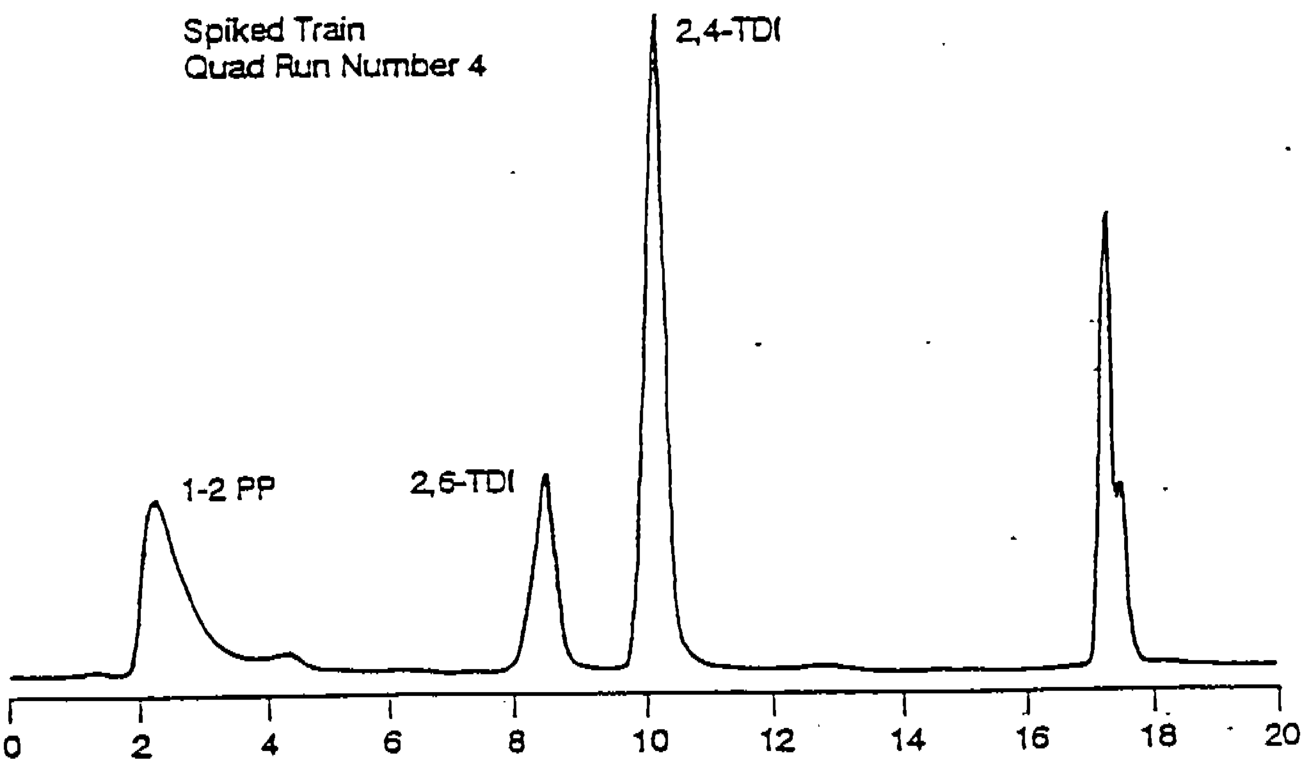


Figure 4-2. Chromatogram of Spiked Train

The concentration of isocyanate (as the derivative) in the concentrated samples was then calculated as follows:

$$\text{Concentration} = \frac{(\text{Sample Response} - \text{Intercept})}{\text{Slope}} \qquad 4\text{-}1$$

The total amount (μg) collected in a sample was then calculated by multiplying the concentration (μg/mL) times the final volume (10 mL) of ACN used to redissolve the concentrated sample.

$$\text{Amount TDI derivative} = \text{Concentration } (\mu g/mL) \times \text{Final Volume } (10\ mL) \qquad 4\text{-}2$$

The equivalent amount of TDI required to generate this much derivative was calculated by multiplying the ratio of the molecular weights of TDI (174) and the TDI derivative (501) times the amount of TDI derivative (determined by using equation 4-2).

The total amount of 2,4-TDI (underivatized) collected in the unspiked and spiked trains is given in Table 4-1 and Table 4-2 respectively.

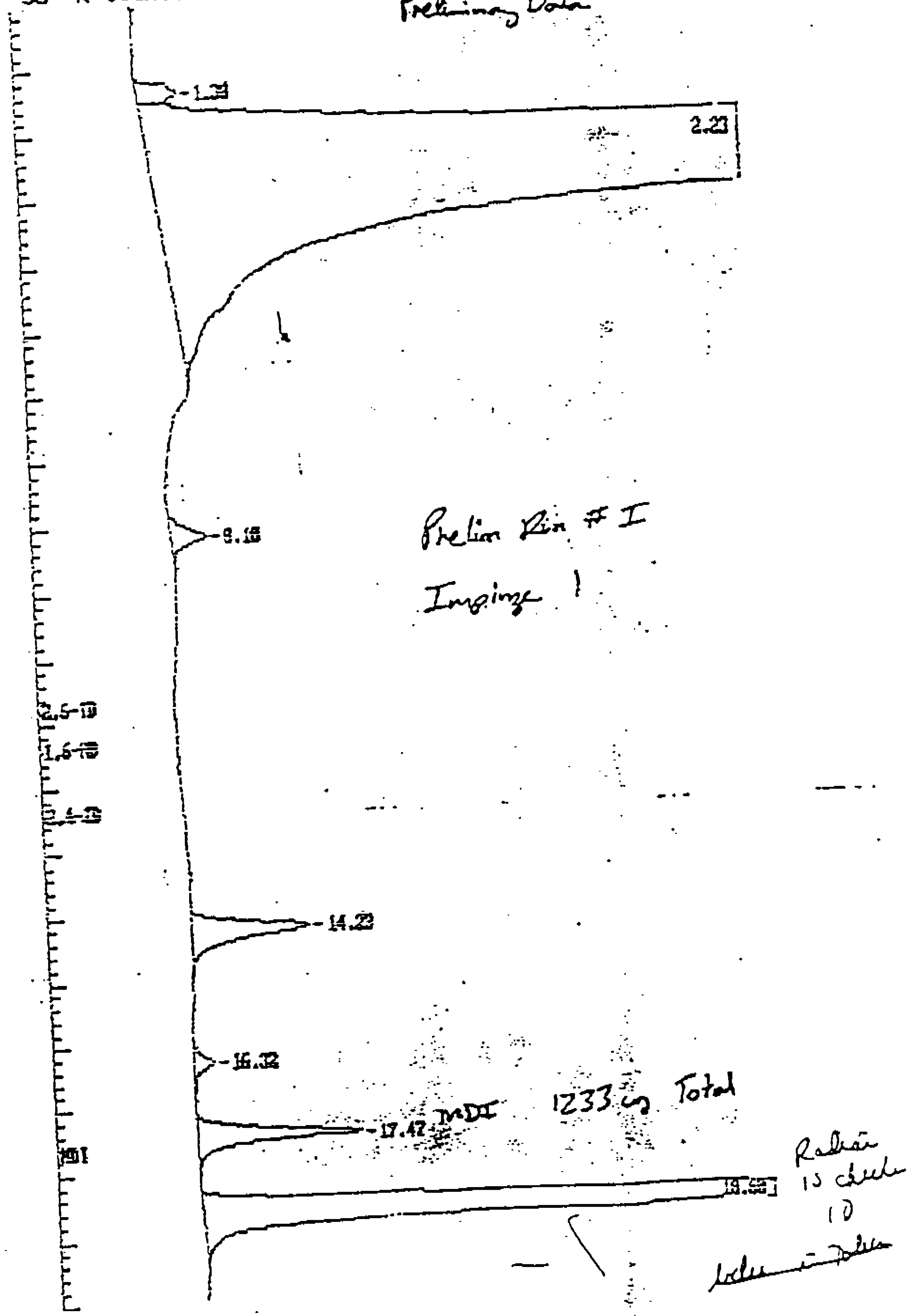
4.4.2 Normalization of the Amount of Isocyanate Collected

In order to simplify the comparison of the analytical results of the four trains in each QUAD run for subsequent calculations of bias and precision, the test plan called for the collected of 30 ft^3 of sample in each train. Due to operational variabilities inherent to each train, accurate but slightly differing sample volumes resulted as shown in Table 3-3. Therefore, it was necessary to normalize the data presented in Tables 4-1 and 4-2 to a common sample volume. The sample volume to which all data were normalized was selected to be 35.31 ft^3 which is equivalent to 1m^3. The following stepwise calculations were used to normalize the data. The data from QUAD run number 1 are used as an example.

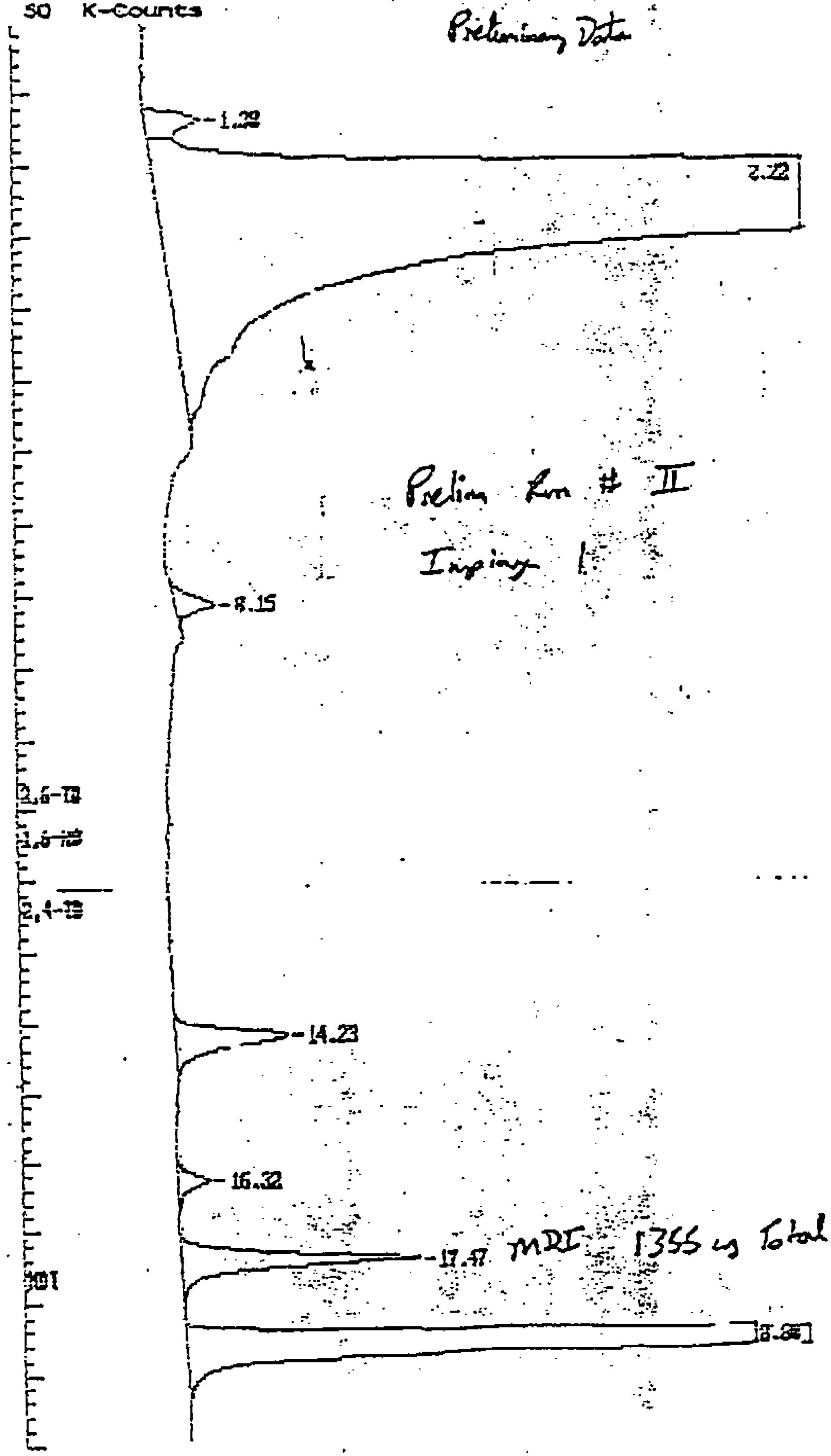
SENT BY:

Data File = E:\S3253F6.PTS Printed on 09-10-1993 at 12:29:41 Offset: 0 cts
Start time: 0.00 min. Stop time: 20.00 min.
Full Range: 50 K-Counts

Preliminary Data



Areas, times, and heights stored in: E:\S3253F7.ATB
Data File = E:\S3253F7.PTS Printed on 09-10-1993 at 13:01:05
Start time: 0.00 min. Stop time: 20.00 min. Offset: 0 cts
Full Range: 50 K-Counts

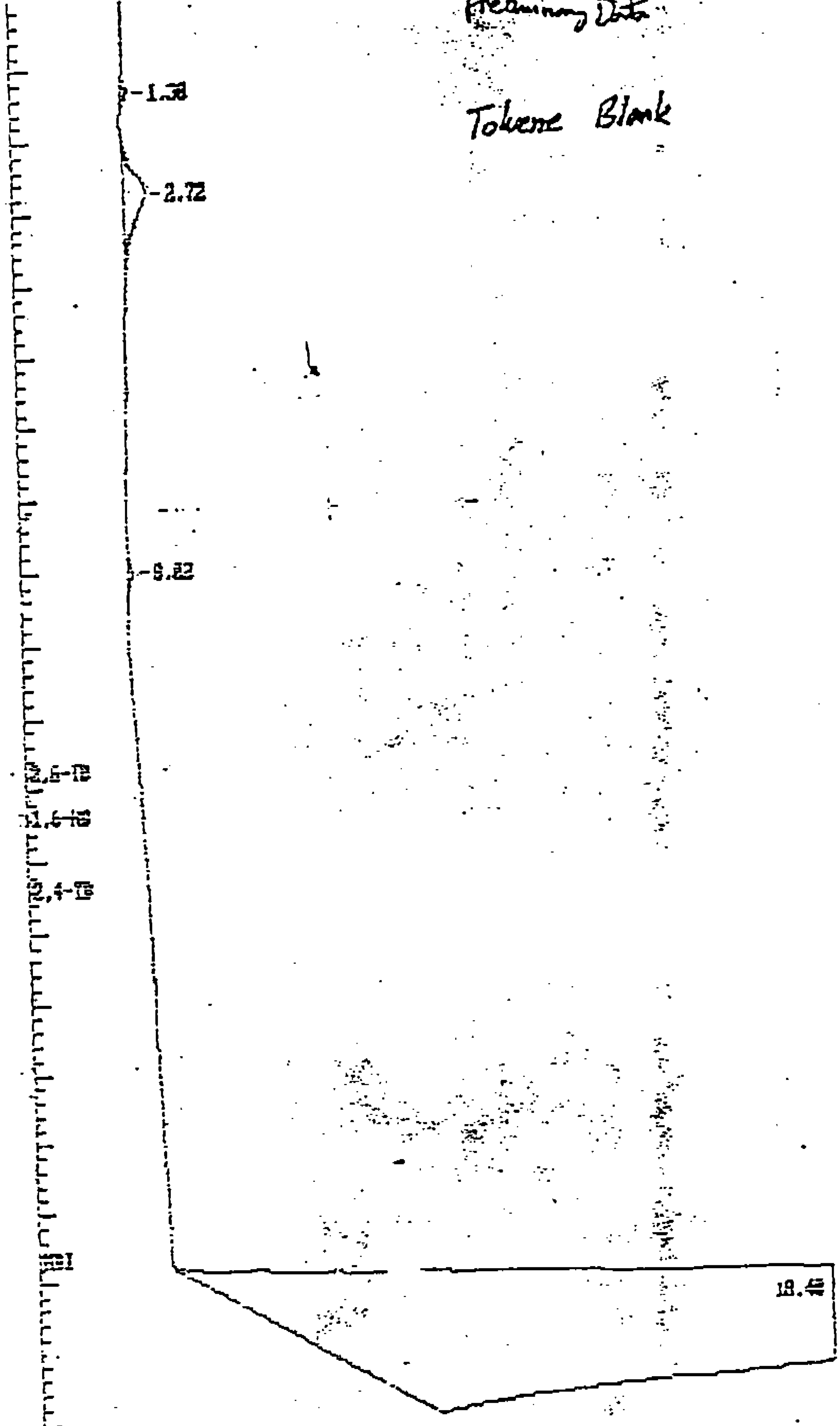


SENT BY:

Data File = E:\S3256F7.PTS   Printed on 09-13-1993 at 14:43:58
Start time: 0.00 min.   Stop time: 20.00 min.   Offset: 0 cts
Full Range: 50 K-Counts

Preliminary Data

Toluene Blank



Unknown Impurity

SENT BY:
Data File: ...
Start time: 0.00 min. Stop time: 20.00 min. Offset: 0 cts
Full Range: 50 K-Counts

Preliminary Data

Quantitative Standard
23ug each

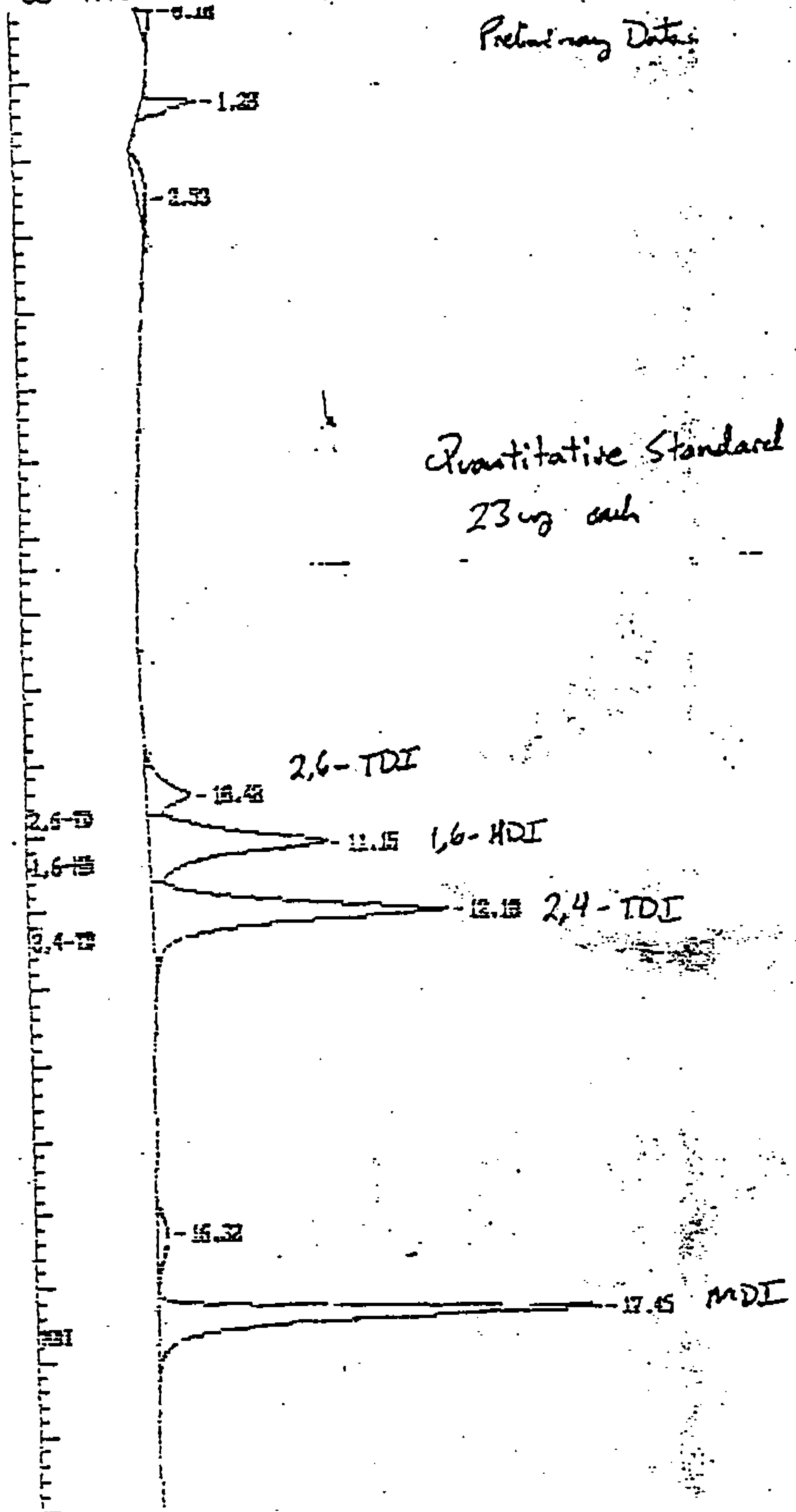


Table 4-1

2,4-TDI Detected in Unspiked Trains, μg

Train[1]	QUAD Run No.											
	1			2			3			4		
	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total
A	--	--	--	5114	61	5175	--	--	--	1832	16	1848
B	--	--	--	5224	40	5264	--	--	--	1864	24	1888
C	4409[2]	18	4427	--	--	--	3281	32	3313	--	--	--
D	4416	85	4501	--	--	--	2928	33	2960	--	--	--

[1]The unspiked trains alternated from run to run, C and D then A and B.
[2]All values are in micrograms of underivatized TDI.

Table 4-1 (Continued)

Train[1]	QUAD Run No.											
	5			6			7			8		
	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total
A	--	--	--	7880	105	7993	--	--	--	3521	53	3574
B	--	--	--	7488	89	7577	--	--	--	3805	50	3855
C	4810	17	4827	--	--	--	2160	23	2183	--	--	--
D	5054	42	5096	--	--	--	2180	36	2216	--	--	--

[1]The unspiked trains alternated from run to run, C and D then A and B.
[2]All values are in micrograms of underivatized TDI.

Table 4-2

2,4-TDI Detected in Spiked Trains, μg

Train[1]	QUAD Run No.											
	1			2			3			4		
	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total
A	11943[2]	64	12007	--	--	--	11488	36	11524	--	--	--
B	11301	28	11329	--	--	--	12024	38	12062	--	--	--
C	--	--	--	12045	35	12080	--	--	--	9329	58	9387
D	--	--	--	12454	49	12503	--	--	--	9429	26	9455

[1] The spiked trains alternated from run to run, A and B then C and D.
[2] All values are in micrograms of underivatized TDI.

Table 4-2 (Continued)

Train[1]	QUAD Run No.											
	5			6			7			8		
	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total
A	12014	45	12059	--	--	--	10094	46	10140	--	--	--
B	12588	37	12625	--	--	--	9003	40	9043	--	--	--
C	--	--	--	15201	88	15289	--	--	--	10561	45	10606
D	--	--	--	15173	96	15269	--	--	--	10315	44	10359

[1]The spiked trains alternated from run to run, A and B then C and D.
[2]All values are in micrograms of underivatized TDI.

Step 1 Normalize unspiked Trains C and D first impinger amounts (μg) to the sample volume collected (cubic feet) in spiked Train A;

$$\text{Train C} \quad \frac{33.42\ ft^3}{33.02\ ft^3} X\ 4409\ \mu g = 4462\ \mu g \qquad \text{4-3A}$$

$$\text{Train D} \quad \frac{33.42\ ft^3}{33.04\ ft^3} X\ 4416\ \mu g = 4467\ \mu g \qquad \text{4-3B}$$

Step 2 Average the normalized, unspiked train amounts from step 1 above. Assuming the collection efficiency of all trains to be the same, this value would also be the amount of TDI that would be collected by Train A due to sampling the stack gas;

$$\frac{4462\ \mu g + 4467 \mu g}{2} = 4465\ \mu g \qquad \text{4-4}$$

Step 3 Subtract the average value (step 2) from the uncorrected amount (sampled amount plus spike) for spiked Train A, first impinger, to get recovered spike amount;

$$11943\ \mu g - 4465\ \mu g = 7478\ \mu g \qquad \text{4-5}$$

Step 4 Normalize the amount collected in spiked Train A, first impinger to 35.31 ft^3 using the sample volume for Train A and the value obtained in step 2;

$$\frac{35.31\ ft^3}{33.42\ ft^3} X\ 4465\ \mu g = 4718\ \mu g \qquad \text{4-6}$$

Step 5 Normalize the amount collected in the second impinger of spiked Train A to 35.31 ft^3 using the sample volume for Train A and the amount determined by HPLC;

$$\frac{35.31\ ft^3}{33.42\ ft^3} X\ 63.9\ \mu g = 67.5\ \mu g \qquad 4\text{-}7$$

Step 6 Sum the values determined from steps 3, 4 and 5 to get the total amount of TDI found in spiked Train A, normalized to 35.31 ft^3;

$$7478\ \mu g + 4718\ \mu g + 67.5 \mu g = 12264\ \mu g \qquad 4\text{-}8$$

Steps 1-6 can be repeated for similar calculations for spiked Train B. The total amount of TDI collected in each of the unspiked trains can be determined by first normalizing the amounts found in the two impingers of each train to $1m^3$ and then summing the two values. The raw and normalized data for all analysis results are presented in Appendix A. The resulting normalized values are summarized in Tables 4-3 and 4-4.

4.5 Quality Control

Quality control procedures that were implemented for this program include:

- Adhering to applicable sampling and analysis protocols;
- Collecting and analyzing field blanks, trip blanks, reagent blanks, and laboratory blanks;
- Tracking samples from collection to analysis;
- Calibrating all analytical equipment prior to use:
- Maintaining accurate and complete written documentation;
- If any changes were made to the analytical system (i.e., column changed, column maintenance), a calibration check was performed to verify the validity of the calibration curve. If the calibration check did not meet acceptance criteria, the analytical system was recalibrated.

Table 4-3

Normalized Amount of 2,4-TDI Detected in Unspiked Trains, μg

Train[1]	QUAD Run No.							
	1	2	3	4	5	6	7	8
A	--	6287	--	2132	--	8042	--	4086
B	--	6270	--	2139	--	7608	--	4579
C	4735[2]	--	3466	--	4947	--	2557	--
D	4811	--	3166	--	5522	--	2616	--

[1]The unspiked trains alternated from run to run, C and D then A and B.
[2]All values are in micrograms of underivatized TDI, normalized to a sample volume of 35.31 ft^3 ($1 m^3$).

Table 4-4

Normalized Amount of 2,4-TDI Detected in Spiked Trains, μg

Train[1]	QUAD Run No.							
	1	2	3	4	5	6	7	8
A	12264[2]	--	11625	--	12233	--	10450	--
B	11520	--	12078	--	12717	--	9290	--
C	--	13258	--	9694	--	15471	--	11197
D	--	13733	--	9805	--	15610	--	10947

[1]The spiked trains alternated from run to run, A and B then C and D.
[2]All values are in micrograms of underivatized TDI, normalized to a sample volume of 35.31 ft^3 ($1m^3$).

- Analysis of field spiked QC samples; and
- Analysis of check standards every 3 samples.

5.0 RESULTS AND DISCUSSION

This section presents the results of the eight sampling runs relative to the criteria for method precision and bias. Fractional results are also presented to show the amount of isocyanate breakthrough occurring in the impinger train. All sample fractions were prepared and analyzed for toluene diisocyanate at Radian's Research Triangle Park laboratory.

5.1 Bias and Precision

Table 5-1 is a summary table which presents the results of the statistical evaluation of the test data following the EPA Method 301 criteria showing the method precision and bias for 2-4 TDI. Method 301 requires valid data from a minimum of six QUAD runs. Table 5-1 presents data from all eight runs. Precision is shown as the percent relative standard deviation of the measured amounts of TDI in the samples. Results for precision of both the spiked and unspiked samples were less than 5 percent RSD, which is well within the limits of acceptable precision (upper limit of 50%) given in EPA Method 301.

Using the data from all eight QUAD runs, method bias was measured at -395 micrograms. This value was determined to be statistically significant at the 95% confidence level, using the t statistic calculated for the analytical data. A correction factor of 1.053 was calculated for use with the method to compensate for the bias should the method be used to measure TDI emissions from similar sources.

Using the data from only seven QUAD runs (eliminating run 8 because this run had the lowest average % recovery and the final leak check for one of the trains was questionable), the method bias was -295 micrograms. This bias was not statistically significant and therefore no correction factor was calculated. In either case, the criteria for an acceptable method were met (i.e., a correction factor between 0.7 and 1.3).

Table 5-1

Summary of Method 301 Statistical Calculations

Parameter	Spiked Trains		Unspiked Trains	
	7 Runs	8 Runs	7 Runs	8 Runs
Spiked Amount[1]	7828	7828	–	–
RSD, %	3.6	3.4	4.7	5.2
Average Bias[1]	-295	-395	–	–
Bias Significant?	No	Yes	–	–
Correction Factor	1.0	1.053	–	–

[1]Values are presented as μg of underivatized TDI

5.2 Breakthrough and Recovery

This section presents details of the breakthrough and recovery results for the field samples, as well as recovery information for the spiked compound (2,4-TDI).

5.2.1 Breakthrough

Tables 4-1 and 4-2 provide a summary of the combined total mass of 2,4-TDI collected in the probe/first impinger and second/third impinger samples for the unspiked and spiked trains, respectively. These totals are used as a basis for calculating breakthrough of the TDI from the first impinger to the second impinger. The mass of compound found in the probe/first impinger fraction and in the second impinger fraction were each divided by the total mass of TDI for that train and then multiplied by 100 to yield the percent of the total TDI found in the separate train sections. The results are presented in Table 5-2 and 5-3 for the spiked and unspiked trains respectively.

The average breakthrough for the spiked trains was 1.5% and for the unspiked trains 1.1%. More than 98% of the TDI was collected in the first impinger under the sampling conditions used in this study.

The amount of the toluene contained in the first impingers of each of the trains was reduced by approximately 25% (by weight) during the sampling run due to evaporation. The second impingers showed, on the average, a net gain of approximately 5%. The remainder was collected in the silica gel and the charcoal, both of which showed net weight gains. The total weight gained in the train components following the first impinger more than compensate for loses from the first impinger, probably due to the collection of a small amount of moisture. The loss of toluene from the first impinger was minimized by keeping the impingers in an ice bath and placing a water cooled condenser between the outlet of the first impinger and the inlet of the second impinger.

Table 5-2

Distribution of 2,4-TDI Within the Spiked Trains

Train[1]	Impinger No.	QUAD Run No. 1	2	3	4	5	6	7	8
A	1	98.5[2]	--	99.0	--	99.0	--	98.0	--
	2	1.5	--	1.0	--	1.0	--	2.0	--
B	1	99.2	--	99.1	--	99.2	--	97.0	--
	2	0.8	--	0.9	--	0.8	--	3.0	--
C	1	--	99.2	--	96.4	--	98.8	--	98.4
	2	--	0.8	--	3.6	--	1.2	--	1.6
D	1	--	99.0	--	98.5	--	98.7	--	98.4
	2	--	1.0	--	1.5	--	1.3	--	1.6
Average/ % RSD	1	98.5/0.81							
	2	1.5/54.4							

[1]Spiked Trains alternate from run to run, A and B, then C and D.
[2]Values are a percentage of the total amount of 2-4 TDI determined to be in each train.

Table 5-3

Distribution of 2,4-TDI Within the Unspiked Trains

Train[1]	Impinger No.	QUAD Run No.							
		1	2	3	4	5	6	7	8
A	1	--	98.8	--	99.1	--	98.7	--	98.5
	2	--	1.2	--	0.9	--	1.3	--	1.5
B	1	--	99.2	--	98.8	--	98.8	--	98.7
	2	--	0.8	--	1.2	--	1.2	--	1.3
C	1	99.6[2]	--	99.0	--	99.6	--	99.0	--
	2	0.4	--	1.0	--	0.4	--	1.0	--
D	1	99.1	--	98.9	--	99.2	--	98.4	--
	2	1.9	--	1.1	--	0.8	--	1.6	--
Average/ % RSD	1	98.9/0.41							
	2	1.1/37.1							

[1]Unspiked Trains alternate from run to run, C and D, then A and B.
[2]Values are a percentage of the total amount of 2,4-TDI determined to be in each train.

5.2.2 Recovery

One of the objectives of this test program was to obtain bias and precision data to validate the proposed test method for isocyanates. Samples from two of the four trains of each quad assembly were spiked with TDI before each sampling run. The estimation of method bias is based on the percentage of the TDI spikes recovered. Analytical results used for this calculation are the averages of the triplicate analysis results for each spiked sample. A summary of the spiked TDI recovery percentages is presented in Table 5-4.

The percent recovery was calculated for each spiked train for each run following the calculation procedures outlined in steps 1-3 of Section 5.0. The value obtained at step 3, the amount of spike recovered, is divided by the actual amount of TDI spiked, 7827 μg, multiplied by 100. An average recovery was determined by averaging the 16 individual run recoveries.

The recovery for TDI ranged between 83 and 112 percent and averaged 95 percent with a %RSD of 8.2.

5.3 Quality Assurance/Quality Control

As a part of the testing for Work Assignment No. 55, Radian designed and implemented a quality assurance/quality control (QA/QC) effort tailored to meet the specific needs of this project. The testing was conducted in accordance with QA/QC procedures described in the Quality Assurance Project Plan (QAPP). The results of the QA/QC effort demonstrate that the data are reliable and meet project objectives for completeness and representativeness. The data met the QA objectives for precision and accuracy and there are no data quality issues that effect conclusions regarding the objectives of this project.

Table 5-4

Percent Recovery of the Spiked 2,4-TDI

Train[1]	QUAD Run No.							
	1	2	3	4	5	6	7	8
A	96[2]	--	106	--	89	--	100	--
B	86	--	112	--	96	--	86	--
C	--	89	--	97	--	98	--	88
D	--	95	--	98	--	99	--	83
Average	95							
% RSD	8.2							

[1]Spiked Trains alternated from run to run, A and B, then C and D.
[2]Values are a percentage based upon a spiked amount of 7827.8 μg as 2,4-TDI.

The primary objectives of the QA/QC effort were to control, assess, and document data quality. In order to accomplish these objectives, the QA/QC approach consisted of the following key elements:

- Definition of data quality objectives that reflect the overall technical objectives of the project;
- Design of a sampling, analytical, QA/QC, and data analysis system to meet these objectives; and
- Initiation of corrective action when measurement system performance did not meet the specifications.

These elements include the use of selected standard sampling and analytical procedures as components of the overall approach in addition to, specified calibration requirements, QC checks, data reduction and validation procedures, and sample tracking.

A summary of analysis results for QA/QC samples, which includes measures of precision and accuracy and limitations in the use of these data is presented in this section.

5.3.1 Overview of Data Quality

The QAPjP established specific QA objectives for precision (15% RSD), accuracy (±30%), and completeness (100%) for the determination of TDI emissions. The statistical results presented in Table 5-1 and the % recovery values given in Table 5-4 show that the objectives were met. The data quality acceptance criteria and the experimental results are summarized in Table 5-5. Results for spike/spike duplicates and triplicate analyses were compared with the criteria. In all cases the criteria were met. Other data quality indicators for each type of analysis are also presented throughout the remainder of Section 5.3.

There are no cases where data quality issues impair the study's conclusions with respect to the validity of the sampling and analytical test method procedures. With

Table 5-5

Data Quality Acceptance Criteria and Results

Parameter	Criteria	Results
TDI Spike Recovery	70 - 130%	83 - 112%
TDI Analysis Results QUAD Train, % RSD	15%	5%
Individual DGM Correction Factor Agreement	±2% of Avg	<2%
Analytical Balance	≤0.1 g of Class S Weights	<0.1 g
HPLC Linearity Correlation Coeff.	>0.995	0.9995
HPLC Retention Time Variation	±15%	±10%
HPLC Calibration Check	±10% of Curve	±9%
HPLC System Blank	<0.1% Analyte level	<0.1%
HPLC Replicate Analyses	±10% of 1st injection	±2%
HPLC Method Spikes	±20% of theoretical	±5%

exception of a limited number of samples, the quality of measurement data generated for the test parameters fully meets the data quality objectives outlined in the QAPjP.

5.3.2 Sampling Quality Control

Quality control activities associated with the field sampling are described in the QAPjP. These activities include adherence to accepted reference method protocols, use of standardized data recording sheets, equipment calibration, and collection of field blanks.

Stack sampling QC data, including sampling rates, sample volume collected, maximum recorded leak rate, and maximum allowable leak rate, are summarized in Table 5-6 for each run. All of the data quality indicators are within acceptable limits, with the exception of a slightly high leak rate value for Train C Run 8. However, this train was leak checked at a vacuum of 7 inches of mercury which was almost twice that achieved during sampling and the leak would therefore have very little, if any, effect on the data. The leak rate criterion is <4% of the average sampling rate or 0.02 dscf, whichever is less.

5.3.3 Sample Storage and Holding Time

Sample hold times specified in the QAPP were met for all samples. All samples were prepared within 30 days of collection and analyzed within 30 days of preparation.

5.3.4 Analytical Quality Control

Results for method spikes, field spikes, field blanks, reagent blanks and method blanks are summarized in Table 5-7. These samples served the dual purpose of controlling and assessing measurement data quality, and providing the basis for precision and accuracy estimates. The QC acceptance criteria for each of these types of samples

Table 5-6

Sampling Train Leak Summary

Run Number	Std. Metered Volume (dscf)	Average Sampling Rate (dscfm)	Maximum Leak Check (dscf@ in Hg)	4% Sample Rate (dscfm)	Acceptable[a] Leak Rate?
1A	33.42	0.743	0.010 @ 10	0.030	Yes
1B	33.89	0.753	0.010 @ 15	0.030	Yes
1C	33.02	0.734	0.010 @ 8	0.029	Yes
1D	33.04	0.734	0.020 @ 10	0.029	Yes
2A	29.07	0.727	0.016 @ 8	0.029	Yes
2B	29.65	0.741	0.009 @ 8	0.030	Yes
2C	28.67	0.717	0.010 @ 7	0.029	Yes
2D	28.40	0.710	0.010 @ 8	0.028	Yes
3A	34.24	0.571	0.012 @ 10	0.023	Yes
3B	35.15	0.586	0.010 @ 8	0.023	Yes
3C	33.75	0.563	0.009 @ 8	0.023	Yes
3D	33.01	0.550	0.020 @ 5	0.022	Yes
4A	30.60	0.765	0.012 @ 8	0.031	Yes
4B	31.17	0.779	0.012 @ 7	0.031	Yes
4C	30.35	0.759	0.008 @ 7	0.030	Yes
4D	29.54	0.739	0.015 @ 10	0.030	Yes
5A	34.14	0.569	0.014 @ 10	0.023	Yes
5B	34.70	0.578	0.012 @ 8	0.023	Yes
5C	34.46	0.574	0.012 @ 8	0.023	Yes
5D	32.59	0.543	0.016 @ 7	0.022	Yes
6A	35.10	0.780	0.007 @ 7	0.031	Yes
6B	35.17	0.782	0.010 @ 8	0.031	Yes
6C	34.49	0.766	0.008 @ 7	0.031	Yes
6D	33.78	0.751	0.008 @ 10	0.030	Yes
7A	31.11	0.778	0.015 @ 9	0.031	Yes
7B	31.94	0.799	0.011 @ 8	0.032	Yes
7C	30.14	0.754	0.009 @ 7	0.030	Yes
7D	29.91	0.748	0.014 @ 10	0.030	Yes
8A	30.89	0.772	0.009 @ 10	0.031	Yes
8B	29.73	0.743	0.011 @ 8	0.030	Yes
8C	30.49	0.762	0.021 @ 7	0.030	No
8D	31.95	0.799	0.018 @ 8	0.032	Yes

[a]The maximum acceptable leak rate is the lesser of 0.020 dscfm or 4% of the average sampling rate.

Table 5-7

Summary of Analytical Quality Control Results

Sample ID	Total Detected µg	Theoretical µg	Percent Error %
Field Blank A	2.5	NA[4]	NA
Field Blank B	8.3	NA	NA
Field Blank C	6.4	NA	NA
Field Spike 1	7570	7828	96.7
Field Spike 2	7686	7828	98.2
Method Spike 1	8120	7828	104
Method Spike 2	7838	7828	100
Method Spike 3	7890	7828	101
Method Spike 4	7945	7828	101
Toluene Reagent Blank[1]	0.5	NA	NA
ACN Reagent Blank[2]	0.4	NA	NA
Method Blank[3]	10.2	NA	NA

[1]Average of four, ranging from 0.1 to 1.2 µg
[2]Average of four, ranging from 0.1 to 0.8 µg
[3]Average of three, ranging from 0.3 to 20.7 µg
[4]NA, Not Applicable

were met as shown in Table 5-5. Field blanks were collected by assembling a sampling train as if to collect a sample, transporting to the sampling location, leak checking and returning the train to the onsite laboratory for recovery. Field spikes and method spikes were prepared by spiking approximately 300 mL of the toluene 1,2-PP solution with 15 mL of the field spiking solution. Method and reagent blanks were prepared by evaporating approximately 300 mL of solvent to dryness and dissolving any residue with 10 mL of ACN. All spikes and blanks met the data acceptance criteria listed in Table 5-5.

No blank contamination problems were identified during the analysis of field and laboratory blanks and no blank corrections were performed for the reported data. All blank analysis data are presented along with other QC and field sample results in Appendix A.

APPENDIX A

Analytical Data for Samples, Blanks, Spikes and Quality Control Samples

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ISO-SCF-32293-4	1263013	5.90	5.40641	9%										
ISO-SCF-32293-4	1253783	5.86	5.40641	8%										
ISO-SCF-32293-4	1249399	5.84	5.40641	8%										
ARL-1	1277072	5.97			2000	11931.6	11942.9	33.42	1.05669	12196.0	12263.5	7827.81	95.69%	1-A-1
ARL-1	1276918	5.97			2000	11930.1								
ARL-1	1280852	5.98			2000	11966.8								
ARL-2	135291	0.64			100	64.1	63.9	33.42	1.05669	67.5				1-A-2
ARL-2	135913	0.64			100	64.4								
ARL-2	133152	0.63			100	63.1								
ARL-3	1196354	5.59			2000	11178.7	11300.8	33.89	1.04204	11491.1	11520.1	7827.81	86.19%	1-B-1
ARL-3	1214532	5.67			2000	11348.3								
ARL-3	1217429	5.69			2000	11375.3								
ARL-4	59159	0.29			100	28.6	27.8	33.89	1.04204	29.0				1-B-2
ARL-4	57134	0.28			100	27.7								
ARL-4	56201	0.27			100	27.2								
ISO-SCF-32293-4	1255771	5.87	5.40641	9%										
ISO-SCF-32293-4	1251918	5.85	5.40641	8%										
ISO-SCF-32293-4	1242330	5.80	5.40641	7%										
ARL-5	471546	2.21			2000	4418.4	4409.3	33.02	1.06949	4715.7	4735.0			1-C-1
ARL-5	470785	2.21			2000	4411.3								
ARL-5	469380	2.20			2000	4398.2								
ARL-6	35898	0.18			100	17.8	18.1	33.02	1.06949	19.3				1-C-2
ARL-6	37029	0.18			100	18.3								
ARL-6	36906	0.18			100	18.2								
ARL-7	469526	2.20			2000	4399.5	4416.1	33.04	1.06885	4720.1	4811.1			1-D-1
ARL-7	461467	2.16			2000	4324.4								
ARL-7	482909	2.26			2000	4524.4								
ARL-8	180144	0.85			100	85.0	85.1	33.04	1.06885	90.9				1-D-2
ARL-8	179633	0.85			100	84.8								
ARL-8	181047	0.85			100	85.4								
ISO-SCF-32293-4	1238919	5.79	5.40641	7%										
ISO-SCF-32293-4	1245039	5.82	5.40641	8%										
ISO-SCF-32293-4	1235673	5.77	5.40641	7%										

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-9	544346	2.55			2000	5097.4	5114.2	29.07	1.21481	6212.9	6287.4			2-A-1
ARL-9	548157	2.57			2000	5132.9								
ARL-9	545954	2.56			2000	5112.4								
ARL-10	130306	0.62			100	61.8	61.4	29.07	1.21481	74.6				2-A-2
ARL-10	130940	0.62			100	62.1								
ARL-10	127140	0.60			100	60.3								
ARL-11	567669	2.66			2000	5314.9	5224.4	29.65	1.19105	6222.5	6269.9			2-B-1
ARL-11	563460	2.64			2000	5275.7								
ARL-11	542754	2.54			2000	5082.6								
ARL-12	83414	0.40			100	39.9	39.8	29.65	1.19105	47.4				2-B-2
ARL-12	83620	0.40			100	40.0								
ARL-12	82237	0.39			100	39.4								
ISO-SCF-32293-4	1220899	5.70	5.40641	6%	1	5.7								
ISO-SCF-32293-4	1232005	5.76	5.40641	6%	1	5.8								
ISO-SCF-32293-4	1230936	5.75	5.40641	6%	1	5.8								
ARL-13	1287864	6.02			2000	12032.2	12045.3	28.67	1.23176	13215.1	13258.2	7827.81	89.16%	2-C-1
ARL-13	1288870	6.02			2000	12041.6								
ARL-13	1291043	6.03			2000	12061.9								
ARL-14	71522	0.34			100	34.4	35.0	28.67	1.23176	43.1				2-C-2
ARL-14	73423	0.35			100	35.3								
ARL-14	73513	0.35			100	35.3								
ARL-15	1335291	6.24			2000	12474.6	12454.1	28.40	1.24347	13671.5	13732.6	7827.81	95.22%	2-D-1
ARL-15	1334709	6.23			2000	12469.2								
ARL-15	1329284	6.21			2000	12418.6								
ARL-16	103190	0.49			100	49.1	49.1	28.40	1.24347	61.1				2-D-2
ARL-16	103848	0.49			100	49.4								
ARL-16	102349	0.49			100	48.7								
ISO-SCF-32293-4	1246426	5.82	5.40641	8%	1	5.8								
ISO-SCF-32293-4	1237852	5.78	5.40641	7%	1	5.8								
ISO-SCF-32293-4	1239959	5.79	5.40641	7%	1	5.8								

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-17	1229990	5.75			2000	11492.4	11487.9	34.24	1.03139	11587.8	11624.8	7827.81	106.14%	3-A-1
ARL-17	1214060	5.67			2000	11343.9								
ARL-17	1244450	5.81			2000	11627.3								
ARL-18	75825	0.36			100	36.4	35.9	34.24	1.03139	37.0				3-A-2
ARL-18	74917	0.36			100	36.0								
ARL-18	73672	0.35			100	35.4								
ARL-19	1282836	5.99			2000	11985.3	12024.4	35.15	1.00468	12039.7	12077.7	7827.81	111.93%	3-B-1
ARL-19	1289518	6.02			2000	12047.7								
ARL-19	1288725	6.02			2000	12040.3								
ARL-20	79007	0.38			100	37.9	37.8	35.15	1.00468	38.0				3-B-2
ARL-20	78713	0.38			100	37.7								
ARL-20	79021	0.38			100	37.9								
ISO-SCF-32293-4	1263449	5.90	5.40641	9%	1	5.9								
ISO-SCF-32293-4	1253499	5.86	5.40641	8%	1	5.9								
ISO-SCF-32293-4	1260480	5.89	5.40641	9%	1	5.9								
ARL-21	351376	1.65			2000	3297.6	3281.0	33.75	1.04636	3433.1	3466.4			3-C-1
ARL-21	343323	1.61			2000	3222.4								
ARL-21	354099	1.66			2000	3323.0								
ARL-22	65492	0.32			100	31.6	31.8	33.75	1.04636	33.3				3-C-2
ARL-22	66002	0.32			100	31.8								
ARL-22	66601	0.32			100	32.1								
ARL-23	319713	1.50			2000	3002.2	2927.6	33.01	1.06982	3132.0	3165.7			3-D-1
ARL-23	310818	1.46			2000	2919.3								
ARL-23	304609	1.43			2000	2861.4								
ARL-24	65115	0.31			100	31.4	31.5	33.01	1.06982	33.7				3-D-2
ARL-24	66054	0.32			100	31.8								
ARL-24	64767	0.31			100	31.2								
ISO-SCF-32293-4	1223529	5.72	5.40641	6%	1	5.7								
ISO-SCF-32293-4	1220297	5.70	5.40641	5%	1	5.7								
ISO-SCF-32293-4	1183133	5.70	5.40641	5%										

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Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-25	198810	0.94			2000	1874.6	1831.7	30.60	1.15407	2113.9	2132.1			4-A-1
ARL-25	195931	0.92			2000	1847.7								
ARL-25	187888	0.89			2000	1772.7								
ARL-26	33336	0.17			100	16.6	15.8	30.60	1.15407	18.3				4-A-2
ARL-26	32875	0.16			100	16.3								
ARL-26	29079	0.15			100	14.6								
ARL-27	200805	0.95			2000	1893.2	1864.2	31.17	1.13297	2112.1	2138.7			4-B-1
ARL-27	200538	0.95			2000	1890.7								
ARL-27	191767	0.90			2000	1808.9								
ARL-28	48281	0.24			100	23.5	23.5	31.17	1.13297	26.6				4-B-2
ARL-28	49506	0.24			100	24.1								
ARL-28	46705	0.23			100	22.8								
ISO-SCF-32293-4	1202635	5.62	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1219147	5.70	5.40641	5%	1	5.7								
ARL-29	1001159	4.68			2000	9358.1	9329.4	30.35	1.16358	9626.4	9693.9	7827.81	96.56%	4-C-1
ARL-29	987039	4.61			2000	9226.4								
ARL-29	1006035	4.70			2000	9101.6								
ARL-30	124507	0.59			100	59.1	58.0	30.35	1.16358	67.5				4-C-2
ARL-30	122754	0.58			100	58.3								
ARL-30	119182	0.57			100	56.6								
ARL-31	1004933	4.70			2000	9393.3	9428.7	29.54	1.19549	9774.2	9804.7	7827.81	97.97%	4-D-1
ARL-31	1018359	4.76			2000	9518.5								
ARL-31	1002870	4.69			2000	9374.1								
ARL-32	53598	0.26			100	26.0	25.5	29.54	1.19549	30.5				4-D-2
ARL-32	53113	0.26			100	25.8								
ARL-32	50832	0.25			100	24.7								
ISO-SCF-32293-4	1200453	5.61	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1204115	5.63	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1189454	5.56	5.40641	3%	1	5.6								

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-33	1309769	6.12			2000	12236.5	12014.2	34.14	1.03441	12187.3	12233.3	7827.81	89.41%	5-A-1
ARL-33	1323802	6.18			2000	12367.4								
ARL-33	1224229	5.72			2000	11438.7								
ARL-34	103486	0.49			100	49.3	44.5	34.14	1.03441	46.1				5-B-1
ARL-34	103836	0.49			100	49.4								
ARL-34	72585	0.35			100	34.9								
ARL-35	1369996	6.40			2000	12798.3	12588.1	34.70	1.01771	12678.6	12716.7	7827.81	95.59%	5-B-1
ARL-35	1382908	6.46			2000	12918.7								
ARL-35	1289467	6.02			2000	12047.2								
ARL-36	84360	0.40			100	40.4	37.4	34.70	1.01771	38.0				5-B-2
ARL-36	85164	0.41			100	40.7								
ARL-38	64462	0.31			100	31.1								
ISO-SCF-32293-4	1198549	5.60	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1178529	5.51	5.40641	2%	1	5.5								
ARL-37	511915	2.40			2000	4794.9	4809.8	34.46	1.02480	4929.1	4946.9			5-C-1
ARL-37	520867	2.44			2000	4876.5								
ARL-37	507945	2.38			2000	4757.9								
ARL-38	36452	0.18			100	18.0	17.4	34.46	1.02480	17.8				5-C-2
ARL-38	36462	0.18			100	18.0								
ARL-38	32321	0.16			100	16.1								
ARL-39	532851	2.50			2000	4990.2	5054.0	32.59	1.08360	5476.5	5521.9			5-D-1
ARL-39	544154	2.55			2000	5095.6								
ARL-39	542068	2.54			2000	5076.1								
ARL-40	90692	0.43			100	43.3	41.9	32.59	1.08360	45.4				5-D-2
ARL-40	82975	0.40			100	39.7								
ARL-40	89248	0.43			100	42.6								
ISO-SCF-32293-4	1187611	5.55	5.40641	3%	1	5.5								
ISO-SCF-32293-4	1199464	5.60	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1183133	5.53	5.40641	2%	1	5.5								

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-41	861252	4.03			2000	8053.2	7887.9	35.10	1.00612	7936.1	8041.6			6-A-1
ARL-41	860232	4.02			2000	8043.7								
ARL-41	809094	3.78			2000	7566.7								
ARL-42	227095	1.07			100	106.9	104.8	35.10	1.00612	105.4				6-A-2
ARL-42	228142	1.07			100	107.4								
ARL-42	212430	1.00			100	100.1								
ARL-43	815730	3.81			2000	7628.6	7488.0	35.17	1.00411	7518.8	7607.6			6-B-1
ARL-43	825689	3.86			2000	7721.5								
ARL-43	760533	3.56			2000	7113.8								
ARL-44	193894	0.91			100	91.4	88.5	35.17	1.00411	88.8				6-B-2
ARL-44	197908	0.93			100	93.3								
ARL-44	170746	0.81			100	80.6								
ISO-SCF-32293-4	1189088	5.56	5.40641	3%	1	5.6								
ISO-SCF-32293-4	1190921	5.56	5.40641	3%	1	5.6								
ARL-45	1656820	7.74			2000	15473.5	15201.1	34.49	1.02391	15381.5	15471.2	7827.81	97.69%	6-C-1
ARL-45	1652121	7.71			2000	15429.7								
ARL-45	1573883	7.35			2000	14700.0								
ARL-46	187832	0.89			100	88.6	87.6	34.49	1.02391	89.7				6-C-2
ARL-46	195647	0.92			100	92.3								
ARL-46	173379	0.82			100	81.9								
ARL-47	1649873	7.70			2000	15408.7	15173.2	33.78	1.04543	15509.0	15609.8	7827.81	99.46%	6-D-1
ARL-47	1634325	7.63			2000	15263.7								
ARL-47	1589878	7.42			2000	14847.3								
ARL-48	220417	1.04			100	103.8	96.3	33.78	1.04543	100.7				6-D-2
ARL-48	206802	0.97			100	97.5								
ARL-48	186023	0.88			100	87.8								
ISO-SCF-32293-4	1205054	5.63	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1195876	5.59	5.40641	3%	1	5.6								
ISO-SCF-32293-4	1183664	5.53	5.40641	2%	1	5.5								

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-49	1081312	5.05			2000	10105.7	10094.4	31.11	1.13515	10398.3	10450.0	7827.81	100.45%	7-A-1
ARL-49	1074952	5.02			2000	10016.4								
ARL-49	1084020	5.07			2000	10131.0								
ARL-50	98427	0.47			100	46.9	45.6	31.11	1.13515	51.8				7-A-2
ARL-50	96270	0.46			100	45.9								
ARL-50	92145	0.44			100	44.0								
ARL-51	963252	4.50			2000	9004.6	9002.6	31.94	1.10566	9246.5	9290.2	7827.81	85.63%	7-B-1
ARL-51	970463	4.54			2000	9071.8								
ARL-51	955412	4.47			2000	8931.4								
ARL-52	83965	0.40			100	40.2	39.5	31.94	1.10566	43.6				7-B-2
ARL-52	83998	0.40			100	40.2								
ARL-52	79455	0.38			100	38.1								
ISO-SCF-32293-4	1194001	5.58	5.40641	3%	1	5.6								
ISO-SCF-32293-4	1201282	5.61	5.40641	4%	1	5.6								
ARL-53	230346	1.08			2000	2168.7	2159.8	30.14	1.17169	2530.6	2557.9			7-C-1
ARL-53	232911	1.10			2000	2192.6								
ARL-53	224911	1.06			2000	2118.0								
ARL-54	49290	0.24			100	24.0	23.3	30.14	1.17169	27.3				7-C-2
ARL-54	49749	0.24			100	24.2								
ARL-54	44409	0.22			100	21.8								
ARL-55	237247	1.12			2000	2233.1	2180.2	29.91	1.18070	2574.2	2616.4			7-D-1
ARL-55	228829	1.08			2000	2154.5								
ARL-55	228680	1.08			2000	2153.0								
ARL-56	75486	0.36			100	36.2	35.8	29.91	1.18070	42.3				7-D-2
ARL-56	75034	0.36			100	36.0								
ARL-56	73273	0.35			100	35.2								
ISO-SCF-32293-4	1201622	5.61	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1192039	5.57	5.40641	3%	1	5.6								
ISO-SCF-32293-4	1184261	5.53	5.40641	2%	1	5.5								

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-57	374801	1.76			2000	3516.0	3520.7	30.89	1.14324	4025.0	4086.0			8-A-1
ARL-57	377410	1.77			2000	3540.4								
ARL-57	373681	1.75			2000	3505.6								
ARL-58	111353	0.53			100	52.9	53.4	30.89	1.14324	61.0				8-A-2
ARL-58	112493	0.53			100	53.5								
ARL-58	113066	0.54			100	53.7								
ARL-59	406883	1.91			2000	3815.3	3805.4	29.73	1.18785	4520.2	4579.2			8-B-1
ARL-59	401024	1.88			2000	3769.0								
ARL-59	408657	1.92			2000	3831.8								
ARL-60	105005	0.50			100	50.0	49.7	29.73	1.18785	59.0				8-B-2
ARL-60	104950	0.50			100	50.0								
ARL-60	102971	0.49			100	49.0								
ISO-SCF-32293-4	1197542	5.59	5.40641	3%	1	5.6								
ISO-SCF-32293-4	1200068	5.61	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1190471	5.56	5.40641	3%	1	5.6								
ARL-61	1137017	5.31			2000	10625.3	10561.2	30.49	1.15824	11144.9	11197.4	7827.81	88.46%	8-C-1
ARL-61	1120569	5.24			2000	10471.9								
ARL-61	1132853	5.29			2000	10586.4								
ARL-62	94847	0.45			100	45.2	45.3	30.49	1.15824	52.5				8-C-2
ARL-62	95891	0.46			100	45.8								
ARL-62	94335	0.45			100	45.0								
ARL-63	1108755	5.18			2000	10361.7	10314.5	31.95	1.10531	10721.6	10770.2	7827.81	83.01%	8-D-1
ARL-63	1096270	5.12			2000	10245.2								
ARL-63	1106072	5.17			2000	10336.7								
ARL-64	92259	0.44			100	44.0	44.0	31.95	1.10531	48.6				8-D-2
ARL-64	92558	0.44			100	44.2								
ARL-64	91687	0.44			100	43.8								
ISO-SCF-32293-4	1186551	5.54	5.40641	3%	1	5.5								
ISO-SCF-32293-4	1187157	5.55	5.40641	3%	1	5.5								
ISO-SCF-32293-4	1196473	5.59	5.40641	3%	1	5.6								

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Sample Name	FILE	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample	Avg Amt Sample	Amount Spiked	Spike Recovery	Train ID
ISO-SCF-32293-4	S3083F4	1263013	5.90	5.41	9%	1	5.9	5.9			QC
ISO-SCF-32293-4	S3083F5	1253783	5.86	5.41	8%	1	5.9				
ISO-SCF-32293-4	S3083F6	1249399	5.84	5.41	8%	1	5.8				
ARL-81	S3083F19	30452	0.15			10	1.5	1.6			FBA
ARL-81	S3083F20	31446	0.16			10	1.6				
ARL-81	S3083F21	33523	0.17			10	1.7				
ARL-104	S3083F22	809699	3.79			2000	7572.4	7569.9	7827.81	97%	FS-1
ARL-104	S3083F23	808659	3.78			2000	7562.7				
ARL-104	S3083F24	809952	3.79			2000	7574.7				
ISO-SCF-32293-4	S3083F25	1255771	5.87	5.41	9%	1	5.9	5.8			QC
ISO-SCF-32293-4	S3083F26	1251918	5.85	5.41	8%	1	5.8				
ISO-SCF-32293-4	S3083F27	1242330	5.80	5.41	7%	1	5.8				
ARL-82	S3083F40	16055	0.08			10	0.8	0.9			FBA
ARL-82	S3083F41	16597	0.09			10	0.9				
ARL-82	S3083F42	16113	0.09			10	0.9				
ARL-105	S3083F43	832058	3.89			2000	7780.9	7686.3	7827.81	98%	FS-2
ARL-105	S3083F44	822507	3.85			2000	7691.8				
ARL-105	S3083F45	811167	3.79			2000	7586.1				
ISO-SCF-32293-4	S3083F46	1238919	5.79	5.41	7%	1	5.8	5.8			QC
ISO-SCF-32293-4	S3083F47	1245039	5.82	5.41	8%	1	5.8				
ISO-SCF-32293-4	S3083F48	1235673	5.77	5.41	7%	1	5.8				
ARL-83	S3084F13	163746	0.77			10	7.7	7.7			FBB
ARL-83	S3084F14	162706	0.77			10	7.7				
ARL-83	S3084F15	164806	0.78			10	7.8				
ARL-106	S3084F16	869707	4.07			2000	8132.1	8120.1	7827.81	104%	MS-1
ARL-106	S3084F17	867360	4.06			2000	8110.2				
ARL-106	S3084F18	868206	4.06			2000	8118.1				
ISO-SCF-32293-4	S3084F19	1220899	5.70	5.41	6%	1	5.7	5.7			QC
ISO-SCF-32293-4	S3084F20	1232005	5.76	5.41	6%	1	5.8				
ISO-SCF-32293-4	S3084F21	1230936	5.75	5.41	6%	1	5.8				
ARL-84	S3084F34	33054	0.16			10	1.6	1.6			FBB
ARL-84	S3084F35	32381	0.16			10	1.6				
ARL-84	S3084F36	32300	0.16			10	1.6				

Sample Name	FILE	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample	Avg Amt Sample	Amount Spiked	Spike Recovery	Train ID
ARL-107	S3084F37	829745	3.88			2000	7759.3	7837.5	7827.81	100%	MS-2
ARL-107	S3084F38	838117	3.92			2000	7837.4				
ARL-107	S3084F39	846508	3.96			2000	7915.7				
ISO-SCF-32293-4	S3084F40	1246426	5.82	5.41	8%	1	5.8	5.8			QC
ISO-SCF-32293-4	S3084F41	1237852	5.78	5.41	7%	1	5.8				
ISO-SCF-32293-4	S3084F42	1239959	5.79	5.41	7%	1	5.8				
ARL-85	S3085F19	75475	0.36			10	3.6	3.6			FBC
ARL-85	S3085F20	75608	0.36			10	3.6				
ARL-85	S3085F21	72681	0.35			10	3.5				
ARL-108	S3085F22	847084	3.96			2000	7921.1	7890.2	7827.81	101%	MS-3
ARL-108	S3085F23	836897	3.91			2000	7826.0				
ARL-108	S3085F24	847337	3.96			2000	7923.4				
ISO-SCF-32293-4	S3085F25	1263449	5.90	5.41	9%	1	5.9	5.9			QC
ISO-SCF-32293-4	S3085F26	1253499	5.86	5.41	8%	1	5.9				
ISO-SCF-32293-4	S3085F27	1260480	5.89	5.41	9%	1	5.9				
ARL-86	S3085F40	59577	0.29			10	2.9	2.8			FBC
ARL-86	S3085F41	56343	0.27			10	2.7				
ARL-86	S3085F42	59626	0.29			10	2.9				
ARL-109	S3085F43	851309	3.98			2000	7960.5	7944.8	7827.81	101%	MS-4
ARL-109	S3085F44	850793	3.98			2000	7955.6				
ARL-109	S3085F45	846800	3.96			2000	7918.4				
ISO-SCF-32293-4	S3085F46	1245663	5.82	5.41	8%	1	5.8	4.0			QC
ISO-SCF-32293-4	S3085F47	0	0.01	5.41	-100%	1	0.0				
ISO-SCF-32293-4	S3085F48	1296988	6.06	5.41	12%	1	6.1				
ISO-SCF-32293-4	S3098F1	1158548	5.41	5.41	0%	1	5.4				
ARL-89	S3098F2	0	0.01			10	0.1	0.1			T-RB1
ARL-89	S3098F3	0	0.01			10	0.1				
ARL-89	S3098F4	0	0.01			10	0.1				
ARL-90	S3098F5	0	0.01			10	0.1	0.3			T-RB2
ARL-90	S3098F6	5758.5	0.04			10	0.4				
ARL-90	S3098F7	5887.5	0.04			10	0.4				
ARL-91	S3098F8	0	0.01			10	0.1	0.2			T-RB3
ARL-91	S3098F9	3273	0.03			10	0.3				
ARL-91	S3098F10	0	0.01			10	0.1				

Sample Name	FILE	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample	Avg Amt Sample	Amount Spiked	Spike Recovery	Train ID
ARL-92	S3098F11	26246	0.13			10	1.3	1.2			T-RB4
ARL-92	S3098F12	22909.08	0.12			10	1.2				
ARL-92	S3098F13	22154	0.11			10	1.1				
ISO-SCF-32203-4	S3098F14	1202488	5.62	5.41	4%	1	5.6	5.7			QC
ISO-SCF-32203-4	S3098F15	1212015	5.66	5.41	5%	1	5.7				
ISO-SCF-32203-4	S3098F16	1220989	5.70	5.41	6%	1	5.7				
ARL-94	S3098F17	0	0.01			10	0.1	0.2			A-RB1
ARL-94	S3098F18	5431	0.04			10	0.4				
ARL-94	S3098F19	0	0.01			10	0.1				
ARL-95	S3098F20	0	0.01			10	0.1	0.1			A-RB2
ARL-95	S3098F21	0	0.01			10	0.1				
ARL-95	S3098F22	0	0.01			10	0.1				
ARL-96	S3098F23	8352.5	0.04			10	0.4	0.4			A-RB3
ARL-96	S3098F24	8436	0.04			10	0.4				
ARL-96	S3098F25	5886	0.04			10	0.4				
ARL-97	S3098F26	25806	0.13			10	1.3	0.8			A-RB4
ARL-97	S3098F27	21934	0.11			10	1.1				
ARL-97	S3098F28	0	0.01			10	0.1				
ISO-SCF-32293-4	S3098F29	1164624	5.44	5.41	1%	1	5.4	5.4			QC
ISO-SCF-32293-4	S3098F30	1159319	5.42	5.41	0%	1	5.4				
ISO-SCF-32293-4	S3098F31	1149310	5.37	5.41	-1%	1	5.4				
ARL-99	S3098F32	0	0.01			10	0.1	0.1			ABS-RB
ARL-99	S3098F33	0	0.01			10	0.1				
ARL-99	S3098F34	0	0.01			10	0.1				
ARL-100	S3098F35	0	0.01			10	0.1	0.1			ABS-RB
ARL-100	S3098F36	0	0.01			10	0.1				
ARL-100	S3098F37	0	0.01			10	0.1				
ARL-101	S3098F38	15010.13	0.08			10	0.8	0.9			ABS-RB
ARL-101	S3098F39	15823	0.08			10	0.8				
ARL-101	S3098F40	23127	0.12			10	1.2				
ARL-102	S3098F41	0	0.01			10	0.1	0.1			ABS-RB
ARL-102	S3098F42	0	0.01			10	0.1				
ARL-102	S3098F43	0	0.01			10	0.1				

K-114

Sample Name	FILE	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample	Avg Amt Sample	Amount Spiked	Spike Recovery	Train ID
ISO-SCF-32293-4	S3098F44	1187727	5.55	5.41	3%	1	5.5	5.6			QC
ISO-SCF-32293-4	S3098F45	1199251	5.60	5.41	4%	1	5.6				
ISO-SCF-32293-4	S3098F46	1206006	5.63	5.41	4%	1	5.6				
ARL-117	S3098F47	4701	0.03			10	0.3	0.3			MB-1
ARL-117	S3098F48	4680.5	0.03			10	0.3				
ARL-117	S3098F49	5001	0.03			10	0.3				
ARL-118	S3098F50	204000	0.96			10	9.6	9.7			MB-2
ARL-118	S3098F51	207157	0.98			10	9.8				
ARL-118	S3098F52	207481	0.98			10	9.8				
ARL-119	S3098F53	446217.5	2.09			10	20.9	20.7			MB-3
ARL-119	S3098F54	427833.1	2.01			10	20.1				
ARL-119	S3098F55	452112	2.12			10	21.2				
ISO-SCF-4893-1	S3098F56	1164164	5.44	5.41	1%	1	5.4	5.5			QC
ISO-SCF-4893-1	S3098F57	1176245	5.50	5.41	2%	1	5.5				
ISO-SCF-4893-3	S3098F58	1160212	5.42	5.41	0%	1	5.4				

K-115

2,4-TDI Summary Information

Amount of 2,4-TDI Spiked into the trains: 7627.81 ug

Percent Recovery for Spiked Quad Trains

Quad No.	1		2		3		4		5		6		7		8			
Train ID	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	Average	RSD
% Recovery	95.69%	86.19%	89.18%	95.22%	108.14%	111.83%	96.56%	97.97%	89.41%	95.59%	97.69%	99.46%	100.45%	85.63%	88.46%	83.01%	95%	8%
Total ug	12263	11520	13258	13733	11625	12078	9694	8805	12233	12717	15471	15810	10450	9290	11197	10770	11962	16%

Amount Collected in Unspiked Quad Trains

Quad No.	1		2		3		4		5		6		7		8			
Train ID	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	Average	RSD
Total ug	4735	4811	6287	6270	3468	3166	2132	2139	4947	5522	8042	7608	2558	2618	4088	4579	4560	41%

Percent Carry over from 1st Impinger in Spiked Quad Trains

Quad No.	1		2		3		4		5		6		7		8			
Train ID	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	Average	RSD
1st Impinger	98.48%	99.21%	99.21%	98.97%	99.02%	99.11%	96.38%	98.46%	98.95%	99.22%	98.83%	98.71%	98.03%	97.02%	98.44%	98.35%	98.52%	0.81%
2nd Impinger	1.52%	0.79%	0.79%	1.03%	0.98%	0.89%	3.62%	1.54%	1.05%	0.78%	1.17%	1.29%	1.97%	2.98%	1.56%	1.65%	1.48%	54.38%

Percent Carry over from 1st Impinger in Unspiked Quad Trains

Quad No.	1		2		3		4		5		6		7		8			
Train ID	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	Average	RSD
1st Impinger	99.59%	98.11%	98.81%	99.24%	99.04%	98.94%	99.14%	98.76%	99.64%	99.18%	98.69%	98.83%	98.93%	98.38%	98.51%	98.71%	98.91%	0.41%
2nd Impinger	0.41%	1.89%	1.19%	0.76%	0.96%	1.06%	0.86%	1.24%	0.36%	0.82%	1.31%	1.17%	1.07%	1.62%	1.49%	1.29%	1.09%	37.05%

AREAL WA 55 -- Method 301 Results

Using Modified Data

Run	Train				Amount	Precision of UNSpiked Samples			
#	A	B	C	D	Spiked	Diff	STDu	STDm	RSD
1	12263.0	11520.0	4735.0	4811.0	7827.81	-76.00	216.596	30.942	4.721
2	6287.0	6270.0	13258.0	13733.0	7827.81	17.00			
3	11625.0	12078.0	3466.0	3166.0	7827.81	300.00			
4	2132.0	2139.0	9694.0	9805.0	7827.81	-7.00			
5	12233.0	12717.0	4947.0	5522.0	7827.81	-575.00			
6	8084.0	7608.0	15471.0	15610.0	7827.81	476.00			
7	10450.0	9290.0	2557.0	2616.0	7827.81	-59.00			

AREAL WA 55 -- Method 301 Results

Using Modified Data

Run	Train				Amount	Precision of Spiked Samples				Bias				
#	A	B	C	D	Spiked	Diff	SDs	SDm	RSD	Run	Compound	SD	t Test	CF
1	12263.0	11520.0	4735.0	4811.0	7827.81	743.00	430.48	162.71	3.55	-709.31	-295.41	481.90	-1.622	N/A
2	6287.0	6270.0	13258.0	13733.0	7827.81	-475.00				-610.81			^	
3	11625.0	12078.0	3466.0	3166.0	7827.81	-453.00				707.69			|	
4	2132.0	2139.0	9694.0	9805.0	7827.81	-111.00				-213.81			critical Value	
5	12233.0	12717.0	4947.0	5522.0	7827.81	-484.00				-587.31			is 2.160	
6	8084.0	7608.0	15471.0	15610.0	7827.81	-139.00				-133.31				
7	10450.0	9290.0	2557.0	2616.0	7827.81	1160.00				-544.31				

AREAL WA 55 -- Method 301 Results

Using Modified Data

Run	Train				Amount	Precision of UNSpiked Samples			
#	A	B	C	D	Spiked	Diff	STDu	STDm	RSD
1	12263.0	11520.0	4735.0	4811.0	7827.81	-76.00	237.150	29.644	5.205
2	6287.0	6270.0	13258.0	13733.0	7827.81	17.00			
3	11625.0	12078.0	3466.0	3166.0	7827.81	300.00			
4	2132.0	2139.0	9694.0	9805.0	7827.81	-7.00			
5	12233.0	12717.0	4947.0	5522.0	7827.81	-575.00			
6	8084.0	7608.0	15471.0	15610.0	7827.81	476.00			
7	10450.0	9290.0	2557.0	2616.0	7827.81	-59.00			
8	4086.0	4579.0	11197.0	10947.0	7827.81	-493.00			

REAL WA 55 -- Method 301 Results

Using Modified Data

un	Train				Amount	Precision of Spiked Samples				Bias				
#	A	B	C	D	Spiked	Diff	SDs	SDm	RSD	Run	Compound	SD	t Test	CF
1	12263.0	11520.0	4735.0	4811.0	7827.81	743.00	407.50	144.07	3.40	-709.31	-394.53	471.48	-2.367	1.053
2	6287.0	6270.0	13258.0	13733.0	7827.81	-475.00				-610.81			^	
3	11625.0	12078.0	3466.0	3166.0	7827.81	-453.00				707.69			|	
4	2132.0	2139.0	9694.0	9805.0	7827.81	-111.00				-213.81			critical Value	
5	12233.0	12717.0	4947.0	5522.0	7827.81	-484.00				-587.31			is 2.131	
6	8084.0	7608.0	15471.0	15610.0	7827.81	-139.00				-133.31				
7	10450.0	9290.0	2557.0	2616.0	7827.81	1160.00				-544.31				
8	4086.0	4579.0	11197.0	10947.0	7827.81	250.00				-1088.31				

PHENOL

Phenol samples were collected using a Method 5 sampling train at 0.75 CFM using neutral-buffered absorbing reagent. The first impinger in each sampling was spiked with isotopically-labeled phenol (phenol-d_5) and 2-fluorophenol for sampling and recovery efficiency surrogates. The recovered samples were extracted and the extracts analyzed by GC/MS for phenol, phenol-d_5 and 2-fluorophenol as per EPA Method 8270. The recoveries of phenol-d_5 and 2-fluorophenol were used to adjust the measured phenol concentrations.

APPENDIX L

CALCULATION EQUATIONS

METHOD 2
CALCULATION EQUATIONS

$$\overline{V_s} = 85.49\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,\ d} = 60\ (1\ - B_{ws})\ \overline{V_s}\ A\ (\frac{528}{T_{s\ (avg)}})\ (\frac{P_s}{29.92})$$

$$Q_a = 60\ \overline{V_s}\ A$$

$$\dot{m}_g = \frac{4.995\ Q_{s,\ d}\ G_d}{1\ -\ B_{ws}}$$

$$RH^* = 100\ (vp_{twb} - 0.0003641\ P_s\ (T_{db} - T_{wb}))/vp_{tdb}$$

$$B_{ws}^* = RH(vp_{tdb})/P_s$$

$$\rho = \frac{4.585\ x\ 10^{-2}\ P_s M_s}{T_s\ (avg)}$$

*Alternate equations for calculating moisture content from wet bulb and dry bulb data.

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METHOD 3
CALCULATION EQUATIONS

$$\%EA = \frac{100(\%O_2 - 0.5\% \; CO)}{0.264\% \; N_2 - \%O_2 + 0.5\% \; CO}$$

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

$$M_s = M_d \; (I - B_{ws}) + 0.18 \; B_{ws}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

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METHOD 5
CALCULATION EQUATIONS

$$V_{m(std)} = 17.65\ V_m\ \gamma\ \left(\frac{P_{bar} + \overline{\Delta H}/13.6}{T_{m(avg)}}\right)$$

$$V_{w(std)} = 0.0472\ V_{ls}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (I - B_{ws})}\right)$$

$$C_s = \frac{15.43\ M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3\ M_p\ P_s}{T_{s(avg)}\ (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_1 = 8.5714\ x\ 10^{-3}\ C_s\ Q_{s,\ d}$$

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$$(\dot{m}_p)_2 = \frac{1.3228 \ x \ 10^{-1} \ M_p \ A}{\theta \ A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

CALCULATION EQUATIONS

METHOD 7

$$V_{m(std)} = 17.64\ (V_f - 25)\ [\frac{P_f}{T_f} - \frac{P_i}{T_i}]$$

$$C_s = 6.243\ x\ 10^{-5}\ \frac{M}{V_{m(std)}}$$

$$E = \frac{2090\ C_s F}{20.9 - \overline{B}'_{O_2}}$$

$$C_s\ (GR/DSCF) = 7000\ C_s$$

$$C_s\ (MG/DSCM) = 1.60186\ x\ 10^7\ C_s$$

$$C_s\ (ppm\text{-}dry) = 8.37552\ x\ 10^6\ C_s$$

$$C_s\ (ppm\text{-}3\%\ O_2) = 8.37552\ x\ 10^6\ C_s\ \{1 + [\frac{\overline{B}'_{O_2} - 3}{20.9 - B'_{O_2}}]\}$$

$$C_s\ (ppm\text{-}wet) = 8.37552\ x\ 10^6\ C_s\ (1 - \frac{MC}{100})$$

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SYMBOLS

$\bar{B}\ O_2$	=	Average oxygen content in flue gas, % v/v
C_s	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, LB/DSCF
C_s (GR/DSCF)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, GR/DSCF
C_s (MG/DSCM)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, MG/DSCM
E	=	Emission factor, LB/10^6BTU
F	=	F-Factor for given fuel type, DSCF/10^6BTU
M	=	Mass of nitrogen oxides as nitrogen dioxide in gas sample, ug
MC	=	Moisture content of flue gas, %
P_f	=	Final absolute pressure in flask, IN. HG
P_i	=	Initial absolute pressure in flask, IN. HG
C_s (ppm-dry)	=	Concentration of nitrogen oxides in flue gas, dry basis, (v/v), ppm
C_s (ppm-3% O_2)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to 3% O_2, (v/v) ppm
C_s (ppm-wet)	=	Concentration of nitrogen oxides in flue gas, wet basis, (v/v), ppm
T_f	=	Final absolute temperature in flask, °R
T_i	=	Initial absolute temperature in flask, °R
V_f	=	Volume of flask and valve, cc
$V_{m(std)}$	=	Sample volume at standard conditions, dry basis, cc

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CALCULATION EQUATIONS

METHOD 10

$$CO{\cdot}PPM{\cdot}DRY = CO_{CO_2} - free, dry, avg \ (1 - CO_2, d/100)$$

$$CO{\cdot}PPM{\cdot}WET = CO{\cdot}PPM{\cdot}DRY \ (1 - MC/100)$$

$$GR/DSCF = 5.0885 \ X \ 10^{-4} \ (CO{\cdot}PPM{\cdot}DRY)$$

$$mg/dscm = 1.165 \ (CO{\cdot}PPM{\cdot}DRY)$$

$$\dot{m} = 8.5714 \ x \ 10^{-3} \ (GR/DSCF) \ (Q_{s,d})$$

$$E = \frac{2.9857 \ x \ 10^{-3} \ F_d \ (GR/DSCF)}{20.9 - O_{2,\,d}}$$

where:

CO_{CO_2} - *free, dry, avg*

= average of two determinations of carbon monoxide on a dry, CO_2 - free integrated flue gas sample reported in ppm by volume

$CO_{2,\,d}$ = carbon dioxide concentration of flue gas on a dry percent by volume basis

$O_{2,\,d}$ = oxygen concentration of flue gas on a dry percent by volume basis

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MC	=	moisture content of flue gas on a percent by volume basis
CO·PPM·DRY	=	carbon monoxide concentration in ppm by volume on a dry basis
CO·PPM·WET	=	carbon monoxide concentration in ppm by volume on a wet or actual basis
GR/DSCF	=	concentration of carbon monoxide in flue gas on a grains per dry standard cubic foot basis (68 °F, 29.92 IN. HG.)
mg/dscm	=	concentration of carbon monoxide in flue gas on a milligrams per dry standard cubic meter basis (60 °F, 29.92 IN. HG.)
$\dot{m}$	=	emissions or mass rate of carbon monoxide on a LB/HR basis
$Q_{s,d}$	=	volumetric flow rate of flue gas in dry standard cubic feet per minute
E	=	emission factor of carbon monoxide in pounds of carbon monoxide emitted per million BTU heat input (LB/MMBTU)
F_d	=	F-Factor of respective fuel in dry standard cubic feet of exhaust gas at 0% oxygen per million BTU of heat input (DSCF/MMBTU)

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METHOD 25A

Total Gaseous Organics Calculation Equation

80 x 10^{-4} (ppm, w)

180 x 10^{-4} (ppm, w)/(1-MC/100)

.5714 x 10^{-3} (GR/DSCF) (DSCFM)

grains of total gaseous organics as carbon per actual (wet) standard cubic foot

ga :ous organics as carbon per dry standard cubic foot

bous organics as carbon emitted per hour

(68 °F,

FM)

55 Heated FID Analyzer as normally operated with a heated

ated detector oven gives ppm, w.

= 3(ppm propane)

Gas Chroma og

$$\text{PPM·DRY} = \frac{9.03 \times 10^{-3}\ m_t}{V_{std}}$$

PP·WET = PPM·DRY (1-MC/100)

GR/DSCF = 1.709×10^{-3} (PPM·DRY)

mg/dscm = 3.913 (PPM·DRY)

$\dot{m}$ = 8.5714×10^{-3} (GR/DSCF) ($Q_{s,}$

where:

PPM·DRY = concentration of phenol in gas in

PPM·WET = concentration of phenol in gas in p..n. pe

MC = moisture content of gas on a percent by volume

GR/DSCF = concentration of phenol in gas on a grains per dry standard c 29.92 IN. HG.)

$\dot{m}$ = emission or mass rate of phenol in pounds per hour (LB/H

$Q_{s,d}$ = volumetric flow rate of stack gas in dry standard cubic et (DS

GR C/SCF = 2.

GR C/DSCF = 2.

LB C/HR = 8

where:

GR C/SCF =

GR C/DSCF n a

as

030 SIS-E

CALCULATION EQUATIONS

Chromotropic Acid Method for Formaldehyde

$$m_t = \frac{m_a\ V_{soln}}{V_{aliq}}$$

where:

m_t	=	mass of formaldehyde in total sample in ug
m_a	=	mass of formaldehyde in aliquot in ug
V_{soln}	=	volume of total sample in cc (500 cc normally)
V_{aliq}	=	volume of aliquot taken for analysis in cc
PPM·DRY	=	$\frac{0.0283\ m_t}{V_{std}}$
PPM·WET	=	PPM.DRY (1-MC/100)
GR/DSCF	=	5.45×10^{-4} (PPM·DRY)
mg/dscm	=	1.249 (PPM·DRY)
$\dot{m}$	=	8.5714×10^{-3} (GR/DSCF) ($Q_{s,d}$)

where:

PPM·DRY	=	concentration of formaldehyde in parts per million by volume on a dry basis
PPM·WET	=	concentration of formaldehyde in parts per million by volume on an actual or wet basis
MC	=	moisture content of gas on a percent by volume basis
GR/DSCF	=	concentration of formaldehyde in gas on a grains per dry standard cubic foot basis (68 °F, 29.92 IN. HG.)
$\dot{m}$	=	emission or mass rate of formaldehyde in pounds per hour (LB/HR)
V_{std}	=	dry gas volume as measured by the dry gas meter, corrected to standard conditions (at 68 °F and 1 atmosphere) DSCF

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Report No. 4-3191

LOUISIANA PACIFIC - CHILCO

Total HydroCarbons Calculations

RTO PRESS INLET

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)		(GR/DSCF)
2	1	2	111	65940	13.96				0.0246918
	2	2	120	65940	15.09				0.0266939
	3	2	95	65940	11.94				0.0211327
						108.66667	13.66241		

RTO DRYER INLET

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)		(GR/DSCF)
4	1	20	760	27800	49.35				0.2071
	2	20	440	27800	28.57				0.1199
	3	20	460	27400	29.44				0.12535
						553.33333	35.78614		

RTO STACK

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)		(GR/DSCF)
6	1	9	17	105500	3.68				0.0040725
	2	9	3	107000	0.66				0.0007187
	3	9	4.5	105400	0.97				0.001078
						8.1666667	1.77192		

LAP LINE RTO INLET

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)	(GR/DSCF)
12	1	1.2	1	5280	0.01			0.0002206
	2	1.2	1	5280	0.01			0.0002206
	3	1.2	1	5280	0.01			0.0002206
						1	0.009986	

PANEL SIDING RTO INLET

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)	(GR/DSCF)
13	1	0.46	8	1610	0.02			0.0017521
	2	0.46	6	1610	0.02			0.001314
	3	0.46	2	1610	0.01			0.000438
						5.3333333	0.016119	

KONUS STACK

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)	(GR/DSCF)
11	1	7.2	5	8400	0.08			0.0011746
	2	7.2	1	8400	0.02			0.0002349
	3	7.2	1	8400	0.02			0.0002349
						2.3333333	0.039465	

		LOUISIANA PACIFIC		Report No. 4-3191					
		Chilco, Idaho							
dmh									
RTO Press Inlet		**Oxides of Nitrogen**							
		LB/HR Calculations			KONUS STACK		LB/HR Calculations		
RUN	NOx ppm	Flow	LB/DSCF	LB/HR	RUN	NOx ppm	Flow	LB/DSCF	LB/HR
1	6	27790	7.16E-07	1.194485	1	40	8269	4.78E-06	2.369484
2	14	27440	1.67E-06	2.752029	2	52	8319	6.21E-06	3.098955
3	13	26790	1.55E-06	2.494922	3	57	8654	6.81E-06	3.533724
Avg	**11**			**2.147145**	Avg	**50**			**3.000721**
RTO Stack		**Oxides of Nitrogen**							
		LB/HR Calculations							
RUN	NOx ppm	Flow	LB/DSCF	LB/HR					
1	11	106980	1.31E-06	8.430166					
2	10	105440	1.19E-06	7.553465					
3	8	105040	9.55E-07	6.019848					
Avg	**10**			**7.334493**					
		Carbon Monoxide							
RTO Stack		LB/HR Calculations			**KONUS STACK**		LB/HR Calculations		
RUN	CO ppm	Flow	LB/DSCF	LB/HR	RUN	CO ppm	Flow	LB/DSCF	LB/HR
1	7	106980	5.09E-07	3.26473	1	9	8269	6.54E-07	0.324446
2	6	105440	4.36E-07	2.758057	2	9	8319	6.54E-07	0.326408
3	7	105040	5.09E-07	3.205527	3	29	8654	2.11E-06	1.094111
Avg	**7**			**3.076105**	Avg	**16**			**0.581655**

		Louisiana Pacific			Report No. 4-3191	
		Chilco, Idaho				
		EMISSION FACTOR CALCULATIONS				
			(F-Factor Method)			
Konus Stack			NOx			**Emission**
		F-Factor		**Concentr**	**Oxygen**	**Factor**
	Run #	DSCF/MMBTU	M	(ppm,d)	(%v/v,d)	LB/MMBTU
	1	9600	46.01	40	17.3	0.2662
	2	9600	46.01	52	17	0.3194
	3	9600	46.01	57	17.5	0.4016
				50		**0.3291**
						Emission
Konus Stack			CO	**Concentr**	**Oxygen**	**Factor**
		F-Factor				
	Run #	DSCF/MMBTU	M	(ppm,d)	(%v/v,d)	LB/MMBTU
	1	9600	28	9	17.3	0.0364
	2	9600	28	9	17	0.0336
	3	9600	28	29	17.5	0.1244
				16		**0.0648**

E= ***5.424E-8*M*Fd*C(ppm,d)*** / ***(20.9-02)***

Param.	M
NOx	46.01
HCL	36.458
SO2	64.06
CO	28
CO2	44
CH4	16
Ammonia	17.031

			Louisiana Pacific			Report No. 4-3191	
			Chilco, Idaho				
RTO Stack							
				MDI CALCULATIONS			
6/22/94							
	TIME	**Vstd**	**Mass**	**Flow**	**Conc**	**Conc**	**Mass Rate**
RUN #	(HRS)	(DSCF)	(ug)	DSCFM	(mg/Nm3)	ppm	(LB/HR)
1	1907-2013	36.19	21.4	109880	0.021	0.0020	0.008594
2	2053-2200	35.83	20.8	105400	0.020	0.0020	0.008093
3	2252-2358	36.92	14.6	110890	0.014	0.0013	0.005800

APPENDIX M

SAMPLING TRAIN CALIBRATION DATA

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job AllCHILCO Date 6-20-94

Operator [illegible] Module No. 18

Instructions: Operate the control module at a flow rate equal to ΔH@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 27.59 in. Hg. γ = 1.0069 ΔH@ 1.90 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F) Inlet	Meter Temp. (°F) Outlet
[redacted]	(882.00)	[redacted]	
2.5	883.94	84	82
5.0	885.62	86	82
7.5	887.77	89	82
10	889.79	90	82
[redacted]	V_m= 7.79	Avg(t_m)= 84.6 °F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\gamma \, V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(1.0069)(7.79)}\left[\frac{(84.6) + 460}{(27.59)}\right]^{0.5}$$ 4.4428

Y_{cn} = 1.0116

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job L.P. / Chilco, ID Date 6-21-94

Operator M. Kuehler Module No. 5

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 27.63 in. Hg. γ = .9997 ^H@ 1.79 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	(576.10)		
2.5	578.15	93	93
5.0	580.20	85	93
7.5	582.24	88	91
10	584.25	91	91
	V_m = 8.15	Avg(t_m) = 84.38 °F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\gamma\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(.9997)(8.15)}\left[\frac{(84.38) + 460}{(27.63)}\right]^{0.5}$$

Y_{cn} = .973

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job L.P - Chiles　　　　Date 6-21-94

Operator DVH　　　　Module No. 3

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 27.52 in. Hg. γ = .9983 ^H@ 1.80 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	(516.00)		
2.5	518.03	91	89
5.0	520.04	93	90
7.5	522.06	95	90
10	524.08	96	90
	V_m = 8.08	Avg(t_m) = 91.75 °F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\gamma\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(.9983)(8.08)}\left[\frac{(91.75) + 460}{(27.52)}\right]^{0.5}$$

Y_{cn} = 0.99

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job LP/CHILCO Date 6-22-94

Operator [illegible] Module No. 18

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 27.61 in. Hg. τ = 1.0069 ^H@ 1.90 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
	(867.50)		
2.5	869.45	78	75
5.0	871.40	79	75
7.5	873.30	81	75
10	875.20	82	75
	V_m= 7.7	Avg(t_m)= 77.5 °F	

Calculate Y_{on} as follows:

$$Y_{on} = \frac{1.786}{\tau\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{on} = \frac{1.786}{(1.0069)(7.7)}\left[\frac{(77.5) + 460}{(27.61)}\right]^{0.5}$$ 4.4122

Y_{on} = 1.0163

If Y_{on} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: July 20, 1994

Meter Box No. : 3 (Rockwell Dry Test Meter Serial No. 949231)

Date of Last Calibration: April 21, 1994
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
April 26, 1994	4-2738	322.70	421.10	98.4	98.4
May 24, 1994	4-2971	458.20	933.28	475.08	573.48
June 02, 1994	4-3022	941.81	1216.25	274.44	847.92
June 09, 1994	4-3097	1216.62	1354.67	138.05	985.97
June 15, 1994	4-3120	1365.10	1510.94	145.84	1131.81
June 21, 1994	4-3191	1523.90	1873.30	349.40	1481.21

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: July 5, 1994

Meter Box No.: 5 (Rockwell Dry Test Meter Serial No. 949230)

Date of Last Calibration: May 31, 1994
Calibration Technician: E. Trowbridge
Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
June 02, 1994	4-3024	137.00	276.53	139.53	139.53
June 14, 1994	4-3123	316.30	464.30	148.00	287.53
June 16, 1994	4-3124	474.40	575.95	101.55	389.08
June 21, 1994	4-3191	584.60	796.55	211.95	601.03

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: July 5, 1994

Meter Box No. : 15 (Rockwell Dry Test Meter Serial No. 1334122)

Date of Last Calibration: January 12, 1994
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
June 22, 1994	4-3191	42.10	218.90	176.80	176.80

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: July 5, 1994

Meter Box No. : 18 (Rockwell Dry Test Meter Serial No. 1334117)

Date of Last Calibration: April 25, 1994
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
June 21, 1994	4-3191	689.80	1015.80	326.00	326.00

* Total volume through meter since last calibration.

Date 4-21-94

Bar. Press. 29.32 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 3

Serial No. DTM 949231

Wet Test Meter No. AL-20

Technician E. Trautwein

ΔH (in. WC) nominal	ΔH (in. WC) actual	Gas Volume Wet Test Meter (ft³)	* Cal. Index (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft³) V_{di}	Gas Volume Dry test meter (ft³) V_{df}	Gas temperatures Wet Test t_w (°F)	Gas temperatures Dry Test t_{di} (°F)	Gas temperatures Dry Test t_{do} (°F)	Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
0.5	.5	2	99.85	0.01	240.000	242.029	68.5	79	73	4/56	.9969	1.72	
1.2	1.2	3	99.91	0.025	286.500	289.533	68.5	77	71	4/50	.9954	1.76	
2.0	2.0	3	99.93	0.055	292.500	295.541	68.5	84	74	3/49	1.0002	1.82	
3.3	3.3	5	100.00	0.09	296.000	301.081	68.5	88	76	4/56	1.0006	1.79	
4.7	4.7	5	100.02	0.12	301.500	306.599	68.5	91	78	4/16	.9984	1.89	
											.9983	1.80	

Positive leak check performed by ET
Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by [signature] Date 4/22/94

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 11/91

Date 5-31-94

Bar. Press. 29.12 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 5

Serial No. DTM 949230

Wet Test Meter No. AL-20

Technician E Traxler

ΔH (in. WC) nominal	ΔH (in. WC) actual	Gas Volume Wet Test Meter (ft³)	* Cal. Index φ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft³) V_{di}	Gas Volume Dry test meter (ft³) V_{df}	Gas temperatures Wet Test t_w (°F)	Gas temperatures Dry Test t_{di} (°F)	Gas temperatures Dry Test t_{do} (°F)	Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
0.6	0.5	2	99.85	0.01	123.000	125.046	69	92	74	4/55	1.0035	1.70	
1.2	1.2	3	99.91	0.025	116.000	119.075	69	87	72	4/49	.9910	1.75	
2.0	2.0	3	99.93	0.055	119.500	122.572	69	94	74	3/50	.9983	1.83	
3.3	3.3	5	100.00	0.09	125.500	130.599	69	99	76	5/00	1.0062	1.84	
4.7	4.7	5	100.02	0.12	131.000	136.	69	103	77	4/13	.9994	1.85	
	1	2	3	4	5	6	7	8	9	10	11/12		
											.9997	1.79	

Positive leak check performed by EI

Meter was in tolerance ☒

Meter was not in tolerance ☐; readjusted linkage

Meter was not in tolerance ☐; changed dry test meters

Approved by [signature] Date 6/6/94

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S010. 11/91

Date 1-12-94

Bar. Press. 29.02 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 15
Serial No. DTM 1334122
Wet Test Meter No. AL-20
Technician E TROWBRIDGE

ΔH (in. WC)		Gas Volume Wet Test Meter (ft³)	* Cal. Index φ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft³)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
nominal	actual				V_{di}	V_{df}	Wet Test t_w (°F)	Dry Test t_{di} (°F)	Dry Test t_{do} (°F)				
0.5	.5	2	99.85	0.01	24.500	26.540	66.5	81	71	5/05	.9952	1.83	
1.2	1.2	3	99.91	0.025	21.000	24.050	66.5	79	71	5/05	.9954	1.95	
2.0	2.0	3	99.93	0.055	27.000	30.054	66.5	87	72	3/58	1.0006	1.96	
3.3	3.3	5	100.00	0.09	30.500	35.564	66.5	91	72	5/11	1.0057	1.98	
4.7	4.7	6	100.02	0.12	36.000	41.067	66.5	93	73	4/22	1.0056	1.99	
											1.0005	1.94	
	2	3	4	5	6	7	8	9	10	11/13			

Positive leak check performed by ET
Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by [signature] Date 1/14/94

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 11/91

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Date 1-25-94

Bar. Press. 28.66 in. Hg

Control Module No. 28
Serial No. DTM 1334117
Wet Test Meter No. AL-20
Technician [illegible]

ΔH (in. WC) nominal	ΔH (in. WC) actual	Gas Volume Wet Test Meter (ft³)	* Cal. Index (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft³) V_{di}	Gas Volume Dry test meter (ft³) V_{df}	Gas temperatures Wet Test t_w (°F)	Gas temperatures Dry Test t_{di} (°F)	Gas temperatures Dry Test t_{do} (°F)	Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
0.5	.5	2	99.85	0.01	655,700	657.710	71	84	76	5/01	1.0090	1.82	
1.2	1.2	3	99.91	0.025	652.500	655.524	71	82	76	4/56	1.0029	1.88	
2.0	2.0	3	99.93	0.055	658.000	661.030	71	87	72	3/53	1.0046	1.93	
3.3	3.3	5	100.00	0.09	661.400	666.441	71	92	78	5/04	1.0092	1.94	
4.7	4.7	6	100.02	0.12	667.000	672044	71	94	80	4/16	1.0088	1.95	
	2	3	4	5	6	7	8	9	10	11/12	1.0069	1.90	

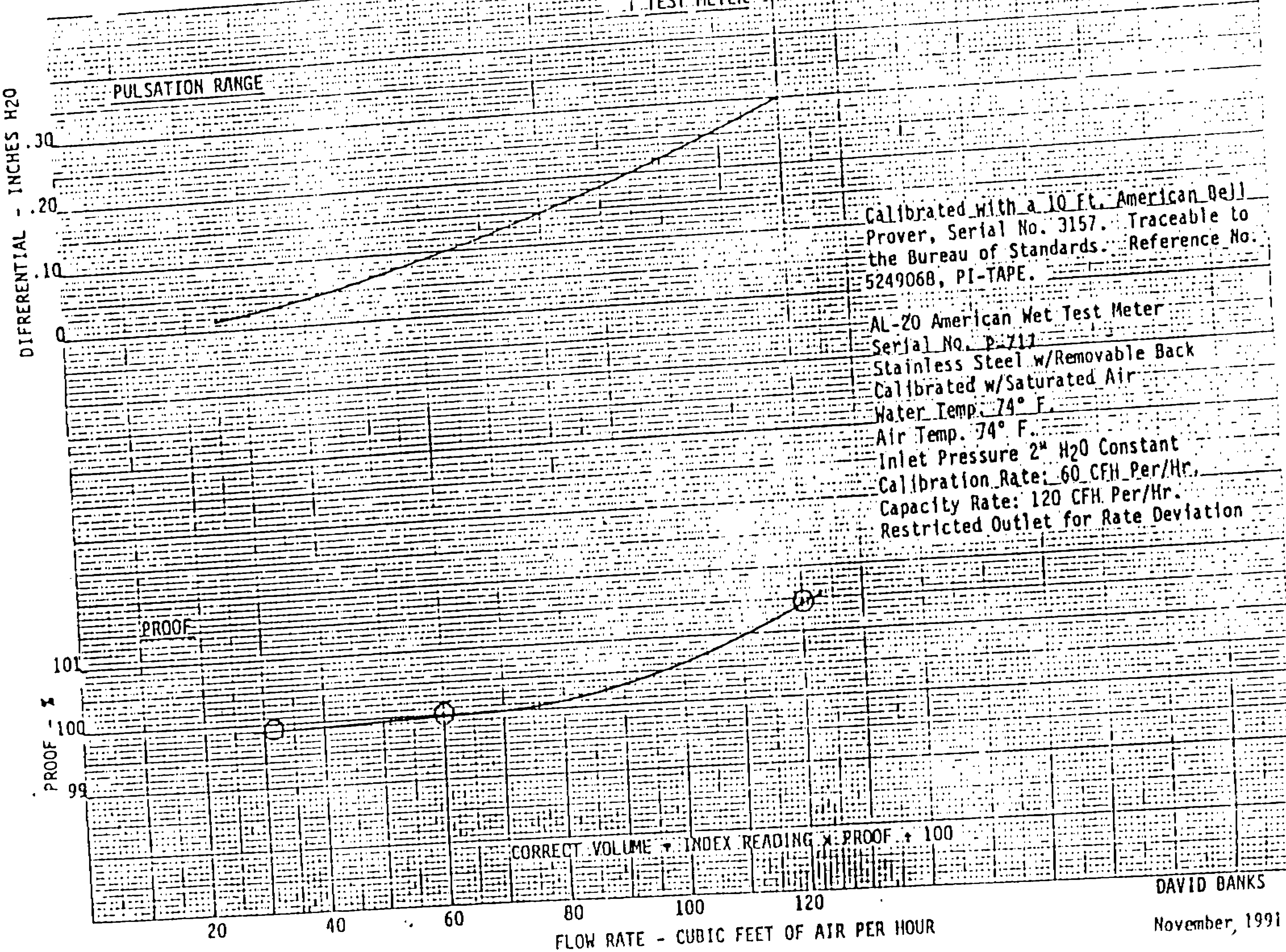
Positive leak check performed by GT
Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by [signature] Date 5/2/94

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102R. .1/91

DIFFERENTIAL PRES E A ROO CALIBRATION CURVES
TEST METER



Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 06-21-94 Nozzle Number 1-4
Technician: Duane Van Hoever

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.251
2	.252
3	.253
Average:	.252

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 06-21-94 Nozzle Number 7-3

Technician: Ed Trowbridge

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.188
2	.188
3	.187
Average:	.188

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 06-22-94 Nozzle Number 7-4
Technician: Mark Kaehler

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.247
2	.248
3	.249
Average:	.248

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 06-22-94 Nozzle Number 7-7

Technician: Ed Trowbridge

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.369
2	.369
3	.369
Average:	.369

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 06-22-94 Nozzle Number Glass
Technician: Duane Van Hoever

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.226
2	.226
3	.226
Average:	.226

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 06-22-94 | Nozzle Number Glass

Technician: Duane Van Hoever

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.271
2	.271
3	.272
Average:	.271

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:

Vendor Omega

Model HH 81 | Serial Number 73JX1495

Range 0 - 2100 °F | Thermocouple Type K

Date of Calibration 4-8-94 | Technician Mark Kaehler

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	0	-1	1	.22
100	100	100	0	0
200	200	201	1	.15
300	300	300	0	0
400	400	399	1	.12
500	500	499	1	.10
600	600	601	1	.09
700	700	700	0	0
800	800	802	2	.16
900	900	901	1	.07
1000	1000	1001	1	.07
1100	1100	1100	0	0
1200	1200	1202	2	.12
1300	1300	1300	0	0
1400	1400	1402	2	.11
1500	1500	1500	0	0
1600	1600	1603	3	.15
1700	1700	1701	1	.05
1800	1800	1803	3	.13
1900	1900	1901	1	.04
2000	2000	2001	1	.04
2100	2100	2099	1	.04
		Averages:	1.05	.08

OF = off scale response by unit under test (°F)

% dev = 100 Δt / (460 + t)

☒ Unit in tolerance

☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

S-433

Interpoll Laboratories, Inc.

E.T. 's

Temperature Measurement Device
Calibration Sheet

Unit under test:

#34

Vendor OMEGA

Model HH81

Range 0-2000 ^{0}F

Date of Calibration 4-21-94

Serial Number 74TX6343

Thermocouple Type K

Technician E TROUBRIDGE

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 ^{0}F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (^{0}F) Nominal	Temperature of Standard or Simulated Temp (^{0}F)	Response of Unit Under Test (^{0}F)	Deviation	
			Δt (^{0}F)	(%)
0	0	-1.9	-1.9	.41
100	100	97.5	-2.5	.45
200	200	199.7	-.3	.05
300	300	297.5	-2.5	.33
400	400	397	-3	.35
500	500	498	-2	.20
600	600	600	—	0
700	700	699	-1	.08
800	800	801	+1	.08
900	900	900	—	0
1000	1000	1001	+1	.07
1100	1100	1098	-2	.13
1200	1200	1201	+1	.06
1300	1300	1299	-1	.05
1400	1400	1402	+2	.11
1500	1500	1500	—	0
1600	1600	1603	+3	.14
1700	1700	1701	+1	.05
1800	1800	1804	+4	.18
1900	1900	1901	+1	.04
2000	2000	2001	+1	.04
2100	2100	2099	-1	
		Averages:	1.46	.128

OF = off scale response by unit under test (^{0}F)

% dev = 100 Δt / (460 + t)

☒ Unit in tolerance

☐ Unit was not in tolerance; recalibrated - See new calibration sheet.

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

#36

Unit under test:
Vendor OMEGA
Model HH 81
Range -199°F – 2100°F °F
Date of Calibration 4-22-94

Serial Number 745X0344
Thermocouple Type K
Technician K Rosenthal

Method of Calibration:

☒ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0	0	-3.5	3.5	.76
100	100	97	3	.54
200	200	198	2	.30
300	300	297	3	.39
400	400	397	3	.35
500	500	497	3	.31
600	600	599	1	.09
700	700	698	2	.17
800	800	800	0	.0
900	900	900	0	0
1000	1000	999	1	.07
1100	1100	1098	2	.13
1200	1200	1200	0	0
1300	1300	1298	2	.11
1400	1400	1401	1	.05
1500	1500	1500	0	0
1600	1600	1602	2	.09
1700	1700	1701	1	.05
1800	1800	1803	3	.13
1900	1900	1901	1	.04
2000	2000	2001	1	.04
2100	2100	2099	1	.04
		Averages:		.172

OF = off scale response by unit under test (°F)
% dev = 100 Δt / (460 + t)

☒ Unit in tolerance
☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

S-433

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 23-4

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .0
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .758 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _______

Date of Inspection: 4-8-94

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 24-2 1/2

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .0
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = ______

Date of Inspection: 1-8-94

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 29-5

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .02
9. W <.0625" .01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = ______

Date of Inspection: 1-7-94

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 4MS-8

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0
6. B_1 < 5° 0
7. B_2 < 5° 0
8. Z <.125" 0
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = ______

Date of Inspection: 4-7-93

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

4-7-93 G:\STACK\WP\FORMS\S-348

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 5-13-93

Technician Mark Koehler

Mercury Column Barometer No. LAB-1

Aneroid Barometer No. 560815

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
28.770	72	.114	28.656	28.760	.104

Has this barometer shown any consistent problems with calibration? Yes/No If yes, explain. ______

Has problem been alleviated? Yes/No. How? ______

*Note

Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

S-312

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

ET'S

Date 5-31-94

Technician E Trzpuchiko

Mercury Column Barometer No. LAB 1

Aneroid Barometer No. ultimeter model 12 SN-0100208

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.230	72	.115	29.115	29.12	.005

Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain. zero

Has problem been alleviated? Yes/No. How?

*Note

Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

S-312

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 2/16/94

Technician D. Van Hoever

Mercury Column Barometer No. 1

Aneroid Barometer No.

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.23	76	.124	29.11	29.10	.01

Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain.

Has problem been alleviated? Yes/No. How?

*Note

Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

S-312

Interpoll Laboratories, Inc.
4500 Ball Road NE
Circle Pines, Minnesota 55014

TEL: (612)786-6020
FAX: (612)786-7854

Data Package for the MDI Samples Collected at the LP/Chilco Plant on June 22, 1994 using the EPA Draft 1,2-PP Method

Interpoll Laboratories Report No. 4-3191

Prepared by:

Gregg Holman on 8/19/94

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PREFACE

On June 22, 1994 Interpoll Laboratories collected MDI samples from the Louisiana Pacific (LP) Chilco plant. The MDI was collected in a series of two impingers containing 1-(2-pyridyl)piperazine(1,2-PP) in toluene (EPA Draft Method 1,2-PP). The contents of each impinger was solvent exchanged to acetonitrile before analysis.

The samples were analyzed on a Waters Model 600MS High Performance Liquid Chromatograph equipped with a Waters Model 991 photodiodearray UV detector using a Zorbax ODS 250mm x 4.6mm dia. column. The mobile phase used was acetonitrile and the flow rate of the system was set at 2.0 mL/min to increase the separation efficiency of the column. The system was calibrated by derivitizing a stock solution of MDI (Kodak) with 1,2-pp and then making five different standards by diluting different volumes of the derivitized MDI. Calibration check standards were made in the same manner but with a different lot of MDI (supplied by ICI).

On August 8, 1994 Susan Somers of Louisiana Pacific Corporation contacted us to perform a reanalysis of the samples which are included in this data package.

The data package is divided into twelve main parts. The <u>first part</u> is the final reported masses of MDI for the first analysis. The <u>second part</u> is the sample prep sheet. The <u>third part</u> is the method parameters by which the samples were analyzed. The <u>fourth part</u> is the calibration data from the external standards for the first analysis. The <u>fifth part</u> is the calibration curve used to quantitate the samples for the first analysis. The <u>sixth part</u> is the continuing calibration response factors for the first analysis. The <u>seventh part</u> is the calculation of the number of theoretical plates. The <u>eighth part</u> is the sample analytical data for each of the three RTO stack samples plus the field spike and sampling train biased field blank. This data consists of the chromatogram of the 254nm acquisition of the photodiodearray detector and the quantitation report. The <u>ninth part</u> is the method parameters by which the samples were reanalyzed. The <u>tenth part</u> is the calibration data from the external standards used in the reanalysis of the samples. The <u>eleventh part</u> is the calibration curves used to quantitate the samples in the reanalysis of the samples. The <u>twelfth part</u> is the sample analytical data from the reanalysis for each of the RTO stack samples plus the field spike and sampling train biased field blank. This data consists of the chromatogram of the 254nm acquisitions of the photodiodearray detector, the quantitation report and the full photodiodearray spectrum from 190nm to 440nm.

FINAL RESULTS

INTERPOLL LABORATORIES INC.

Results of the Initial and Re-analysis for 4,4-Methylenebis(phenyl isocyanate)
For Dept. 20/LP Chilco Collected 6/22/94

	Field Spike			Test: 9			Source: RTO Stack
Item	Actual	Found	% Rec.	Run 0	Run 1	Run 2	Run 3
EPA Draft Method 1,2-PP Impinger 1							
Log #		3191-44		3191-43	3191-37	3191-39	3191-41
Date Analyzed		7/22/94		7/22/94	7/22/94	7/22/94	7/22/94
Mass (ug)*	**296**	**255**	**86**	< 2.5	21.4	20.8	14.6
EPA Draft Method 1,2-PP Impinger 2							
Log #					3191-38	3191-40	3191-42
Date Analyzed					7/22/94	7/22/94	7/22/94
Mass (ug)*					< 2.5	< 2.5	< 2.5

	Field Spike			Test: 9			Source: RTO Stack
Item	Actual	Found	% Rec.	Run 0	Run 1	Run 2	Run 3
EPA Draft Method 1,2-PP Impinger 1							
Log #		3191-44R		3191-43R	3191-37R	3191-39R	3191-41R
Date Analyzed		7/22/94		7/22/94	7/22/94	7/22/94	7/22/94
Mass (ug)*	**296**	**260**	**86**	**3.9**	**25.9**	**21.9**	**16.8**
EPA Draft Method 1,2-PP Impinger 2							
Log #					3191-38	3191-40	3191-42
Date Analyzed					7/22/94	7/22/94	7/22/94
Mass (ug)*					**< 2.5**	**< 2.5**	**< 2.5**

R = Results of the re-analysis
*** = Total Mass of MDI in the Sample in ug.**

Reviewed By:

Gregg W. Holman

Gregg W. Holman
Laboratory Director

3191MDI.LPC

SAMPLE PREPARATION SHEETS

Interpoll Laboratories
(612)786-6020

Organics - General Prep
Sample Prep Worksheet

Batch #:
Project #:
Client: Dept 020 / LP Chilco

Sample Type

___ Clean Water
___ Dirty Water
___ Waste Water
___ Soil
___ Sludge
___ Charcoal
✓ Stack, Parts
Impinger Catch in Toluene

___ Other

Prep

Samples were evaporated to dryness ǂ in a round bottom flask ǂ using a rotovaporator ★ BATH Temp 80°C ★ RPm 100-120 ★ The residues were taken up in 50 ml ACN ★

Cleanup

None

Final Solvent

ACN

Sample Sequence	g or mL of Sample	Extract Volume	Aliquot Used	Final Volume	Instrument Dilution Factor
3191 Blank	All			50ml	
3191 Spk 1					
3191 Spk 2					
3191-37					
-38					
-39					
-40					
-41					
-42					
-43					
-44					

Comments, Prep: ǂ Spiked 10ml of MDI Stock at 25.9 µg/ml to 200ml of Dry Toluene Date: 7/21/94 Initials: MJ/MOG
Spiked 250µl of MDA Stock at ~~5.270~~ 5.271 mg/ml

Comments, Analysis: Chromatograms need to be in order. Slight difficulty in Millennium reporting. Date: 7/21/94 Initials: MJ/MOG

★ Water present in sample

LOA-01RR

FIRST ANALYSIS

METHOD PARAMETERS

Instrument Method: ISOCYAN_INST

Millennium v2.00

Date Printed: 2:55:08 pm, August 19, 1994

Method Name: ISOCYAN_INST
Date Created: 19-JUL-94 11:34.17

Channel Information

Channel: 991M
- Channel Type 2D
- Channel Name 991M
- Units AU
- Description

Instrument Information

Instrument Type W717

Instrument Type	W717
On	On
Use Temp	No
Setpoint	25

Instrument Type W600

Instrument Type	W600
On	On
Chan Name	600 PRESS
Description	
Use Chan	Off
Monitor	PRESS
Chart	%A
Pump Type	600E
Pump Mode	Gradient
Flow	2.00
Percent A	75.0
Percent B	0.0
Percent C	25.0
Percent D	0.0
High Press Limit	6000.0
Low Press Limit	0.0
Sparge Rate	100
Sparge Rate A	On
Sparge Rate B	Off
Sparge Rate C	On
Sparge Rate D	Off
Temp Setpoint	0.0
High Temp Limit	25.0
Switch 1	Off
Switch 2	Off
Switch 3	Off
Switch 4	Off
Use Events	Off
Head Volume	100
MS Optimize % A	100.0
MS Optimize % B	0.0
MS Optimize % C	0.0
Optimizing Mass	194.0
Silk	Off
Vacuum Degas	Off

Table 'W600 Event Table' contains no data.

W600 Gradient Table

#	Time	Flow	%A	%B	%C	%D	Curve
1	0.00	2.00	75.0	0.0	25.0	0.0	0
2	2.00	2.00	75.0	0.0	25.0	0.0	6
3	19.50	2.00	40.0	0.0	60.0	0.0	6

W600 Gradient Table

#	Time	Flow	%A	%B	%C	%D	Curve
4	24.90	2.00	40.0	0.0	60.0	0.0	6
5	25.00	2.00	75.0	0.0	25.0	0.0	6
6	35.00	2.00	75.0	0.0	25.0	0.0	6

Instrument Type W991M

Instrument Type	991M
On	On
Start Wavelength	200.0
End Wavelength	440.0
Spec Resolution	1.3
Autoexposure	On
Exposure Time	21.0
Interpolate 656	Yes
Sample Rate	1.0
Lamp On	Yes
Spectral Filter	none
Use Analog One	Off
Use Analog Two	Off
Use Events	Off
Ch1 Output Mode	Off
Ch1 Offset	0.000
Ch1 Output WL	254.0
Ch1 Output BWN	5.2
Ch1 Ratio WL	254.0
Ch1 Ratio TH	0.001
Ch1 Low Ratio	0.001
Ch1 High Ratio	100.000
Ch1 Filter Type	Hamming
Ch1 Filt Resp	none
Ch2 Output Mode	Off
Ch2 Offset	0.000
Ch2 Output WL	254.0
Ch2 Output BW	4.3
Ch2 Output BWN	5.2
Ch2 Ratio WL	254.0
Ch2 Ratio TH	0.001
Ch2 Low Ratio	0.001
Ch2 High Ratio	100.000
Ch2 Filter Type	Hamming
Ch2 Filt Resp	none

Table '991 Event Table' contains no data.

CALIBRATION STANDARDS

INTERPOLL LABORATORIES
RESULTS REPORT

M i l l e n n i u m   S a m p l e   I n f o r m a t i o n

Client Name: Dept 020/LP Chilco

Project Name: ISOCYANATES

Log Number: 3191

Sample Name: Standard5

Date Acquired: 07/20/94 06:55 PM

Vial: 1

Injection: 1

Channel: 991M

Channel Name: UV_254

Acq Meth Set: 3191_MSET

Processing Method: ISOCYANM_PROC

Sample Type: Standard

Injection Volume (uL): 50.00

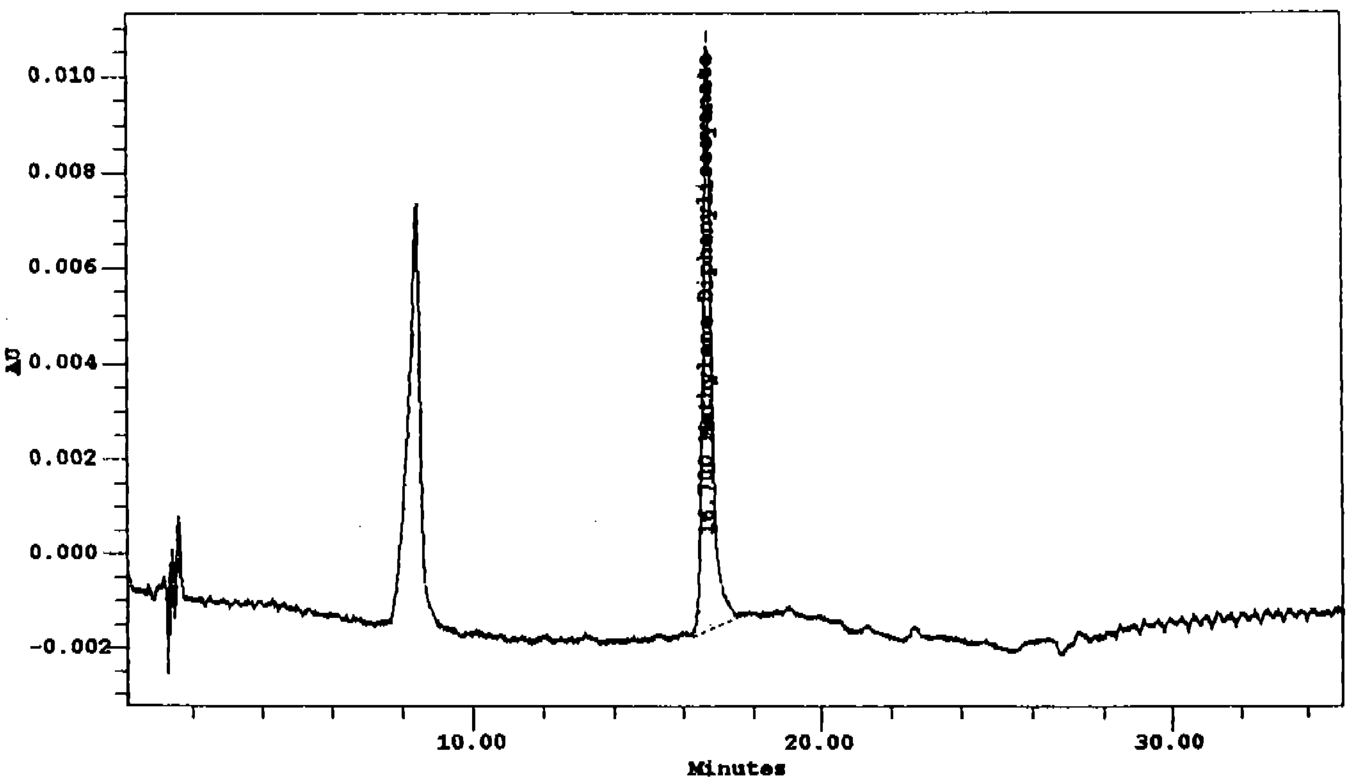
Run Time: 35.0 min

Date Processed: 08/19/94 02:08 PM

Dilution: 1.00000

Date Due:

Set Name: 3191STDS



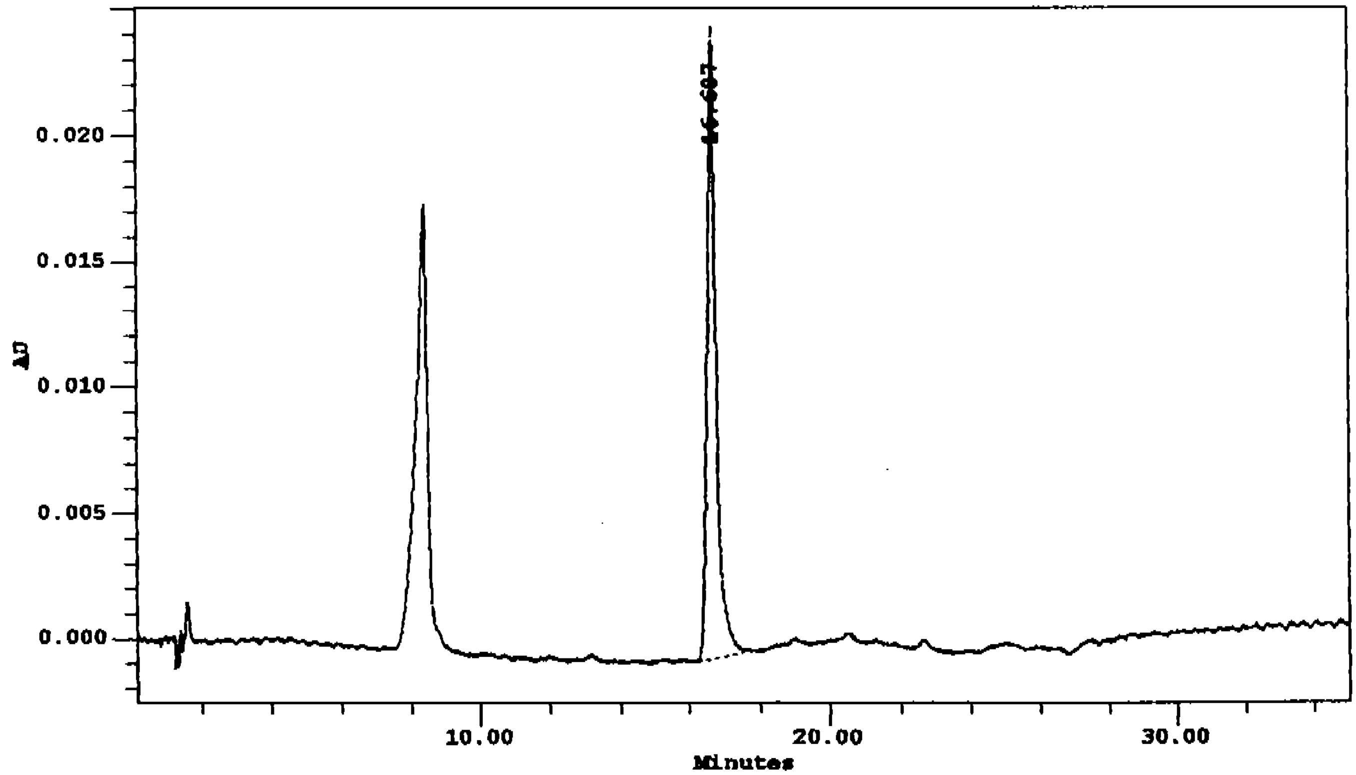
Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.700	214385	12281	0.505	BB

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Standard
Sample Name:	Standard4	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/20/94 07:31 PM	Date Processed:	08/19/94 02:07 PM
Vial:	2	Dilution:	1.00000
Injection:	1	Date Due:	
Channel:	991M	Set Name:	3191STDS
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



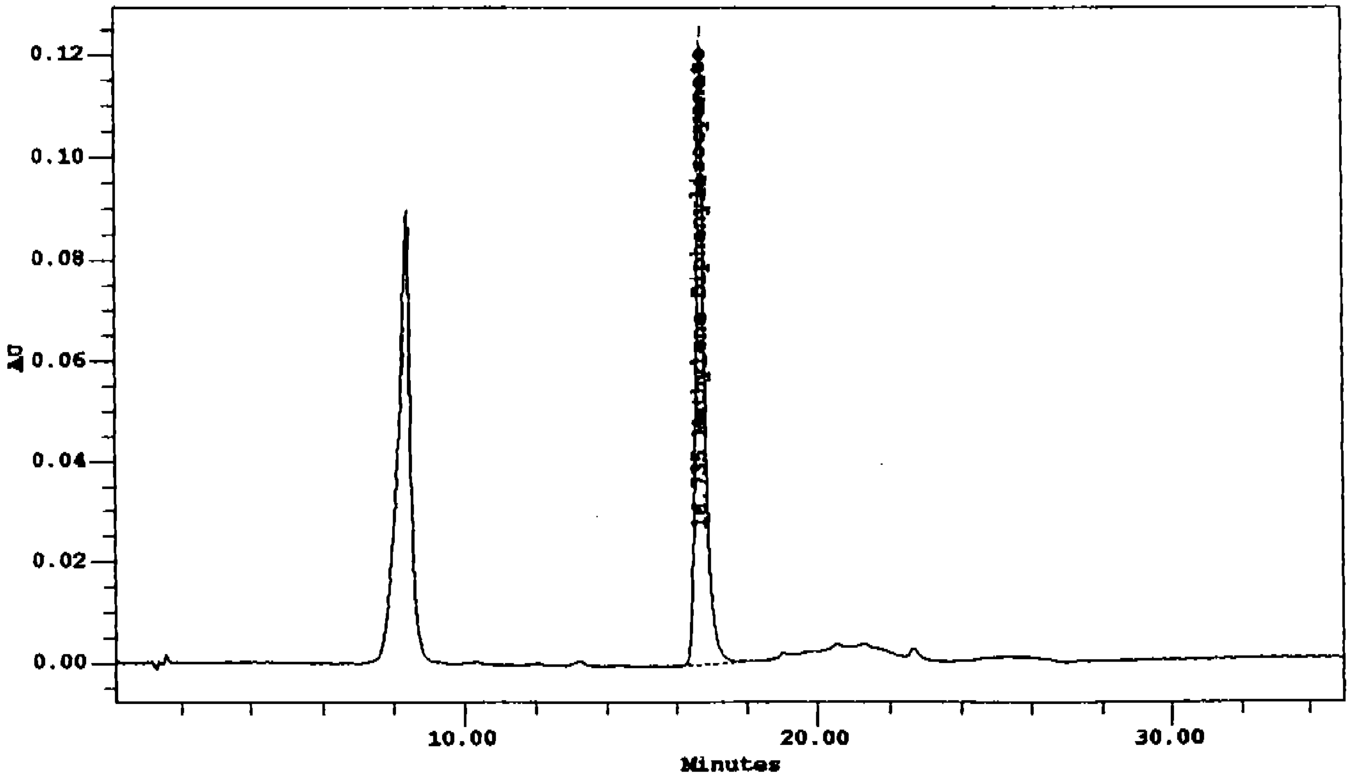
Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1		16.687	419837	24577		BB

INTERPOLL LABORATORIES
RESULTS REPORT

M i l l e n n i u m   S a m p l e   I n f o r m a t i o n

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Standard
Sample Name:	Standard3	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/20/94 08:08 PM	Date Processed:	08/19/94 02:07 PM
Vial:	3	Dilution:	1.00000
Injection:	1	Date Due:	
Channel:	991M	Set Name:	3191STDS
Channel Name	UV_254		
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



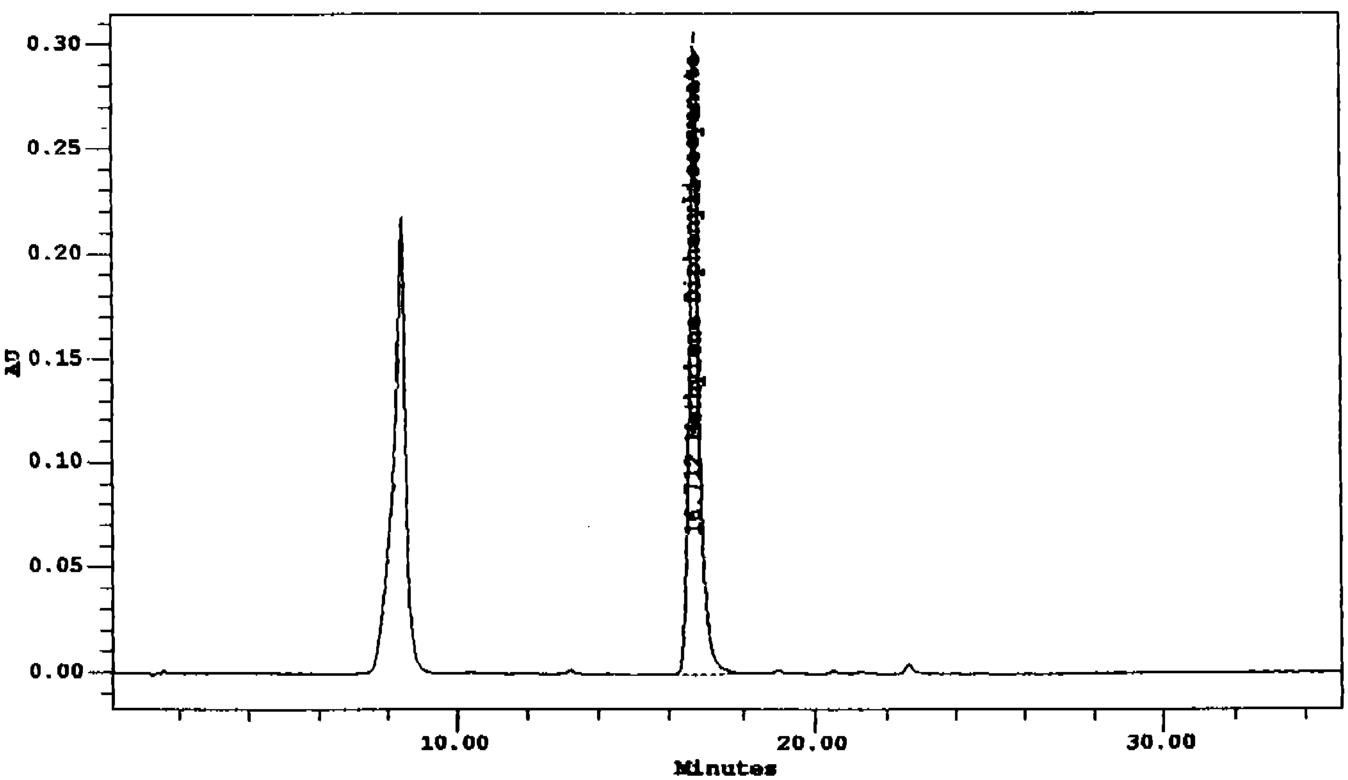
Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.735	2132034	123463	5.050	MM

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Standard
Sample Name:	Standard2	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/20/94 08:44 PM	Date Processed:	08/19/94 02:05 PM
Vial:	4	Dilution:	1.00000
Injection:	1	Date Due:	
Channel:	991M	Set Name:	3191STDS
Channel Name	UV_254		
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



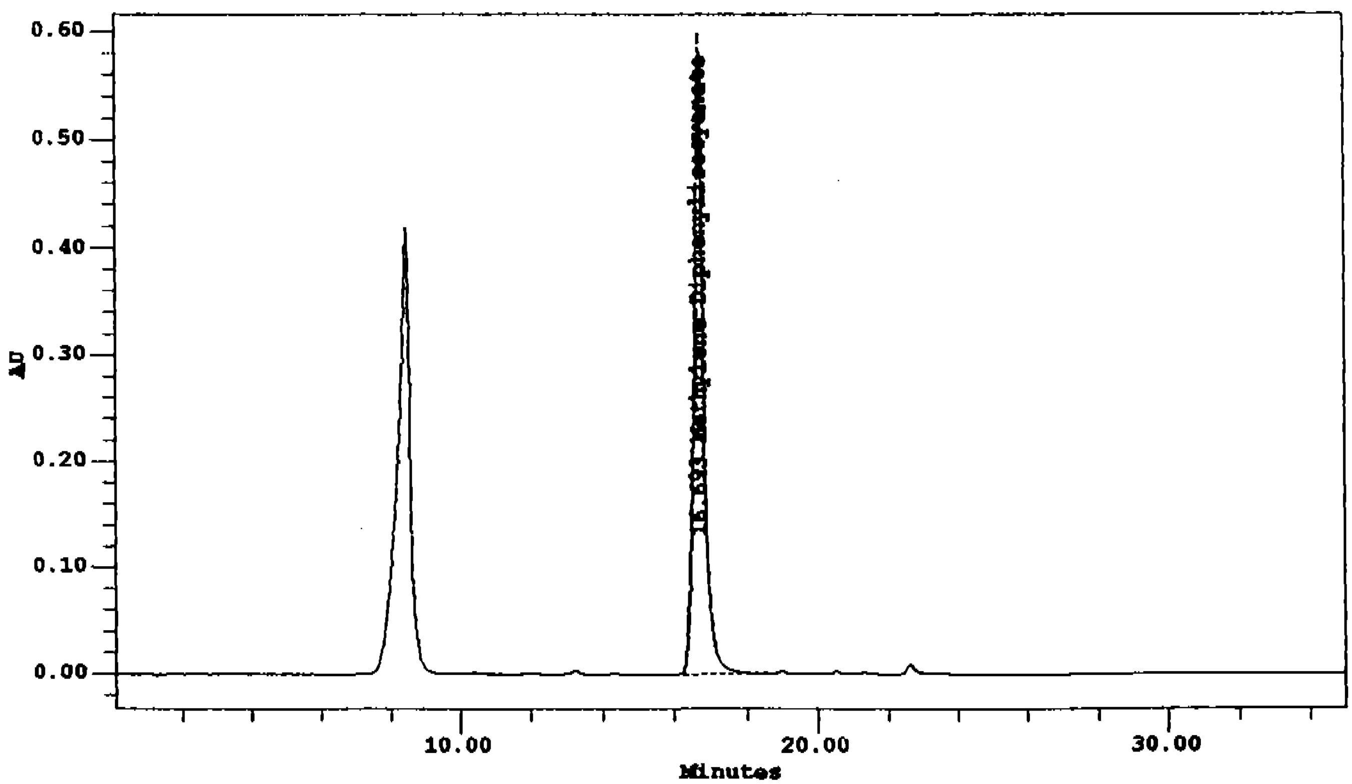
Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.712	5327792	300212	12.620	BM

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Standard
Sample Name:	Standard1	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/20/94 09:21 PM	Date Processed:	08/19/94 02:03 PM
Vial:	5	Dilution:	1.00000
Injection:	1	Date Due:	
Channel:	991M	Set Name:	3191STDS
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		

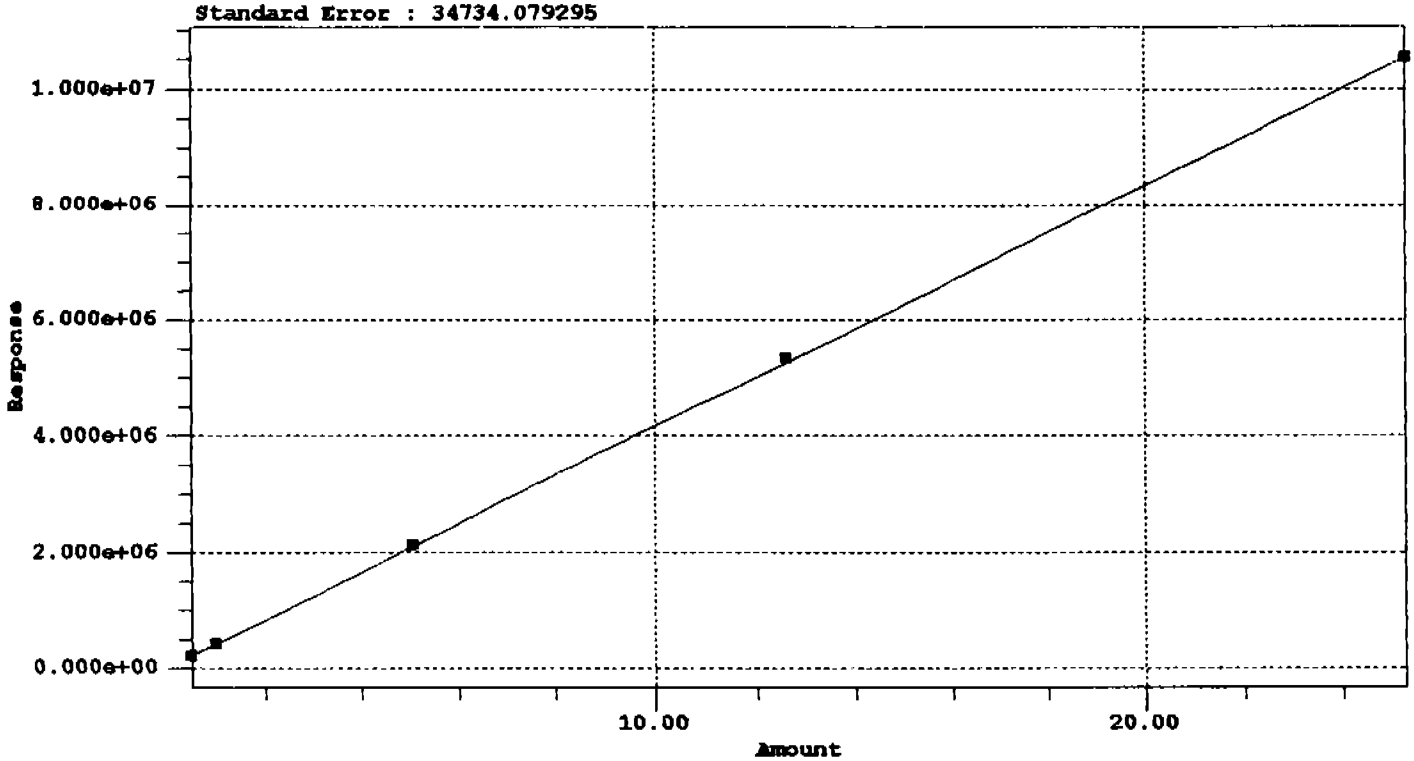


Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.693	10519813	586394	25.250	BM

CALIBRATION CURVE

Processing Method : ISOCYANM_PROC System : 991M_PDA
Channel : UV_254 Date : 19-AUG-94 Type : LC
Name : Methylene Diphenylisocyanate Retention Time : 16.700
Order : 1 A : 17570.053513 B : 416923.845572
C : 0.000000 D : 0.000000 E : 0.000000
F : 0.000000 R : 0.999976 R^2 : 0.999951
Standard Error : 34734.079295



Point Table

#	Amount	Response	Manual	Ignore?
1	0.505000	214385.093750	No	No
2	1.010000	419836.781250	No	No
3	5.050000	2132034.000000	No	No
4	12.620000	5327792.500000	No	No
5	25.250000	10519813.000000	No	No

CONTINUING CALIBRATION RESPONSE FACTORS

INTERPOLL LABS

1,2-PP/MDI Standard Response Versus Time
(2.0 mL/min flow rate)

Retent Time	Std Conc. (ug/mL)	Area of Standard	Injection Volume (uL)	Response Area/ng	Calibration Average Response	Acquisition Date	ILI Log #'s	Sampling Event	Instrament
	25.6	10900000	50	8516		12/9/93	1777	Intra-laboratory round robin	Waters
	12.8	5620000	50	8781		12/9/93	1777	Intra-laboratory round robin	Waters
	1.28	559500	50	8742	8680	12/9/93	1777	Intra-laboratory round robin	Waters
	21.96	9180000	50	8361		12/10/93	1777	Intra-laboratory round robin	Waters
	10.98	4670000	50	8506		12/10/93	1777	Intra-laboratory round robin	Waters
	5.49	2370000	50	8634		12/10/93	1777	Intra-laboratory round robin	Waters
	1.098	483000	50	8798		12/10/93	1777	Intra-laboratory round robin	Waters
	0.549	242000	50	8816	8623	12/10/93	1777	Intra-laboratory round robin	Waters
	23.4	9730000	50	8316		12/13/93	1777	Intra-laboratory round robin	Waters
	11.7	4950000	50	8462		12/13/93	1777	Intra-laboratory round robin	Waters
	5.86	2490000	50	8498		12/13/93	1777	Intra-laboratory round robin	Waters
	1.17	534000	50	9128		12/13/93	1777	Intra-laboratory round robin	Waters
	0.586	250000	50	8532	8587	12/13/93	1777	Intra-laboratory round robin	Waters
	25.9	10800000	50	8340		12/14/93	1777	Intra-laboratory round robin	Waters
	23.44	10250000	50	8746		1/4/94	1906	Dungannon/Dec93	Waters
19.12	0.518	210600	50	8131		4/24/94	2558	LP/Montrose	Waters
19.11	1.036	449900	50	8685		4/24/94	2558	LP/Montrose	Waters
19.08	5.18	2205000	50	8514		4/24/94	2558	LP/Montrose	Waters
19.04	12.95	5522000	50	8528		4/24/94	2558	LP/Montrose	Waters
19.08	25.9	10880000	50	8402	8452	4/24/94	2558	LP/Montrose	Waters
19.23	0.518	226300	50	8737		7/5/94	3097	LP/Hayward	Waters
19.21	1.036	436200	50	8421		7/5/94	3097	LP/Hayward	Waters
19.20	5.18	2223000	50	8583		7/5/94	3097	LP/Hayward	Waters
19.18	12.95	5591000	50	8635		7/5/94	3097	LP/Hayward	Waters
19.09	25.9	10600000	50	8185	8512	7/5/94	3097	LP/Hayward	Waters
16.70	0.505	214400	50	8491		7/21/94	3191	LP/Chilco	Waters2
16.69	1.01	419800	50	8313		7/21/94	3191	LP/Chilco	Waters2
16.73	5.05	2132000	50	8444		7/21/94	3191	LP/Chilco	Waters2
16.71	12.62	5328000	50	8444		7/21/94	3191	LP/Chilco	Waters2
16.69	25.25	10520000	50	8333	8405	7/21/94	3191	LP/Chilco	Waters2
			Average:	8560					

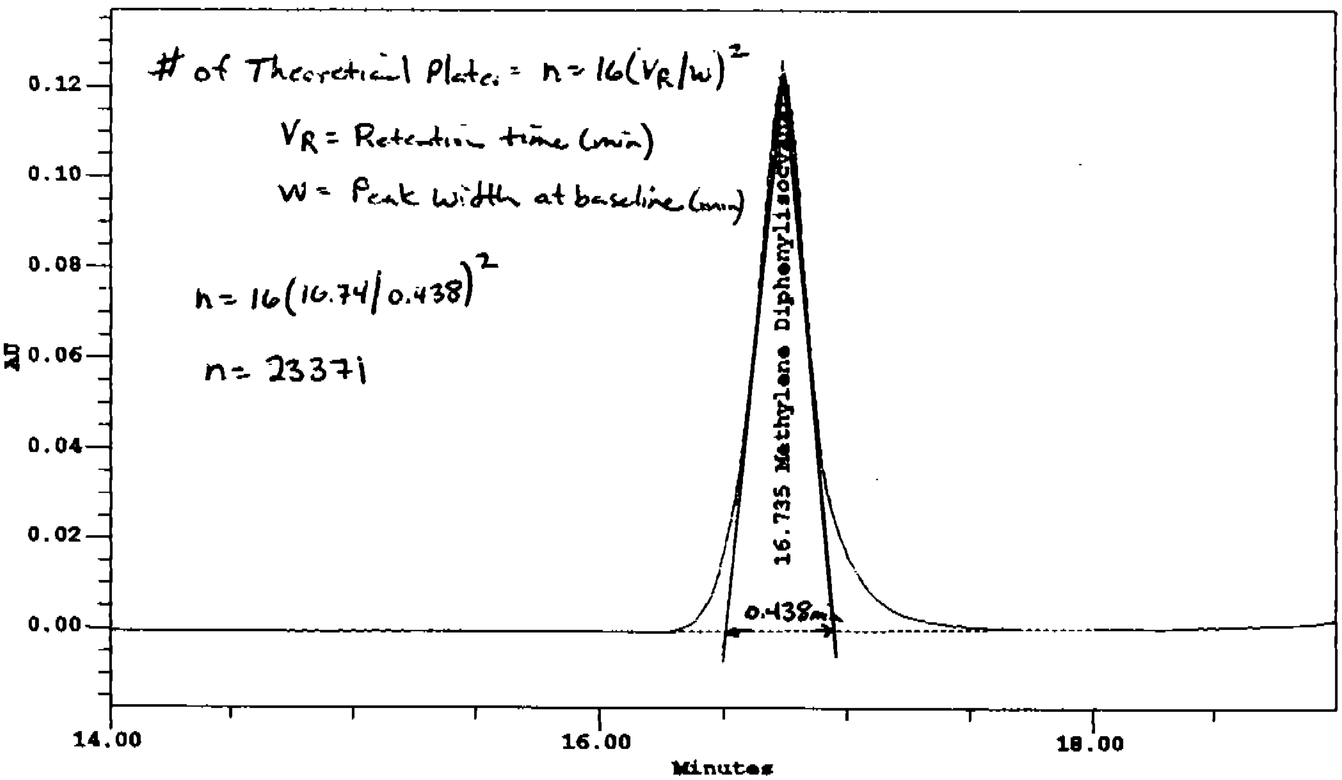
CALCULATION OF THEORETICAL PLATES

INTERPOLL LABORATORIES

RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Standard
Sample Name:	Standard3	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/20/94 08:06 PM	Date Processed:	08/19/94 02:07 PM
Vial:	3	Dilution:	1.00000
Injection:	1	Date Due:	
Channel:	991M	Set Name:	3191STDS
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
.	Methylene Diphenylisocyan	16.735	2132034	123463	5.050	MM

SAMPLE ANALYSIS

INTERPOLL LABORATORIES
RESULTS REPORT

M i l l e n n i u m   S a m p l e   I n f o r m a t i o n

Client Name: Dept 020/LP Chilco

Project Name: ISOCYANATES

Log Number: 3191

Sample Name: Iso Check

Date Acquired: 07/22/94 12:48 AM

Vial: 1

Injection: 1

Channel: 991M

Channel Name UV_254

Acq Meth Set: 3191_MSET

Processing Method: ISOCYANM_PROC

Sample Type: Unknown

Injection Volume (uL): 50.00

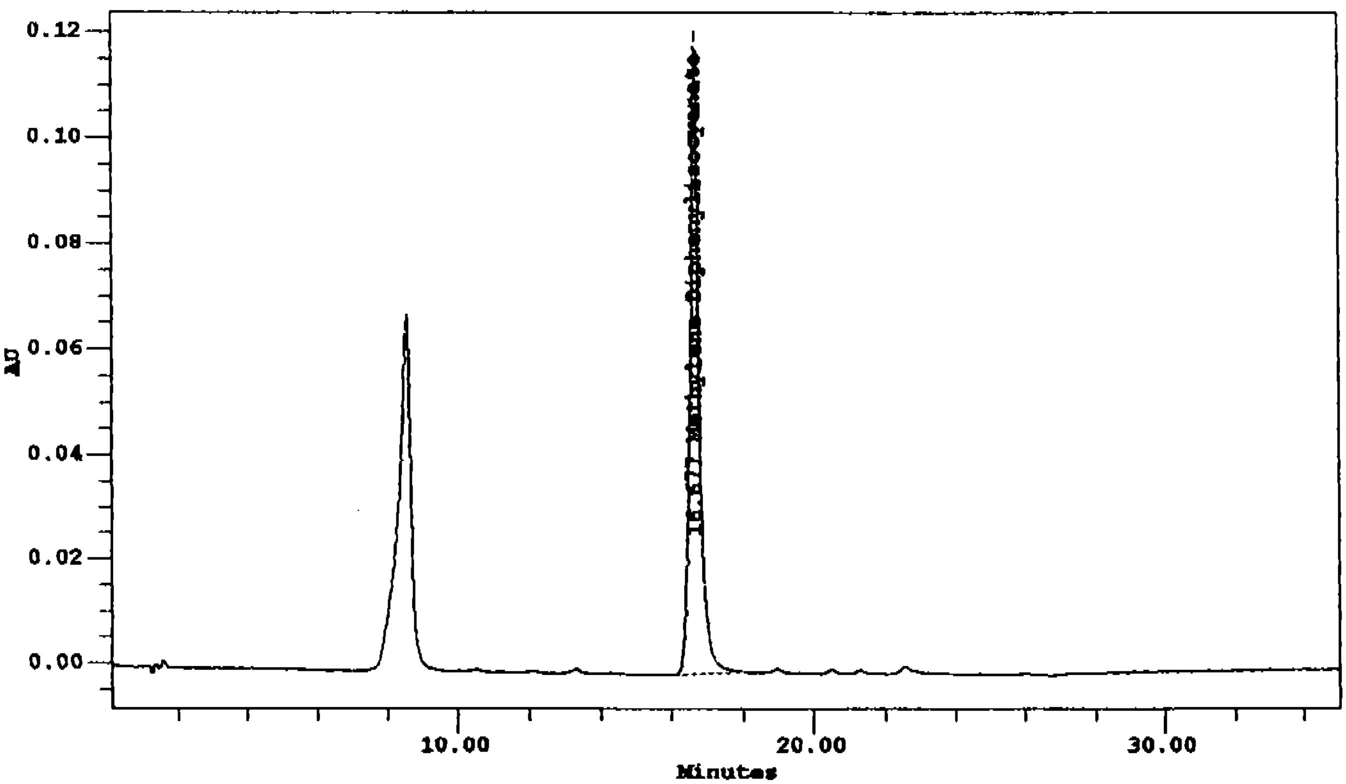
Run Time: 35.0 min

Date Processed: 08/19/94 02:28 PM

Dilution: 1.00000

Date Due: 071094

Set Name: 3191



Peak Results

	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.677	2199148	119613	5.233	BB

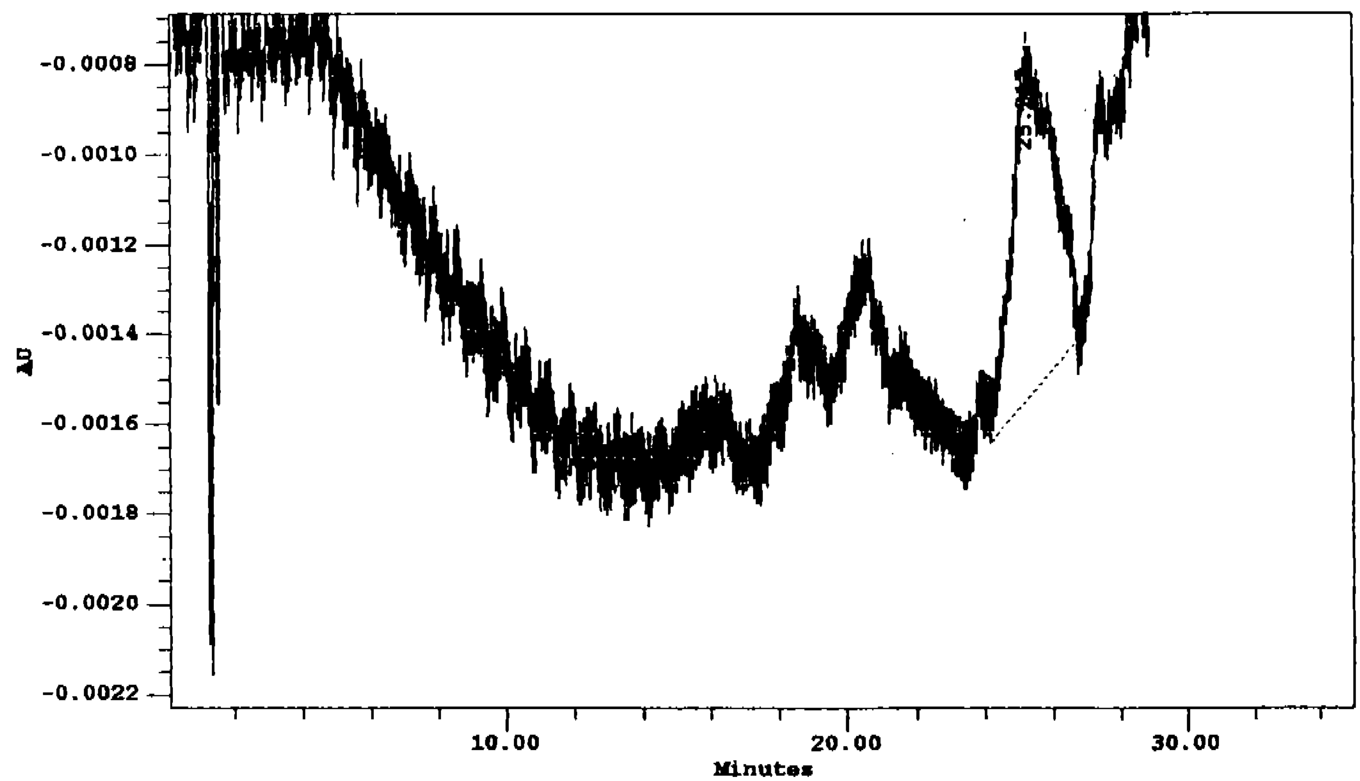
MOI ⇒ $5.23 / 4.90 \times 100\% = 107\%$

INTERPOLL LABORATORIES

RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Unknown
Sample Name:	ACN Blank	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/22/94 01:24 AM	Date Processed:	08/19/94 02:26 PM
Vial:	2	Dilution:	1.00000
Injection:	1	Date Due:	071094
Channel:	991M	Set Name:	3191
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.700				Missing
2		25.217	64088	785		MM

60L

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name Dept 020/LP Chilco

Project Name: ISOCYANATES

Log Number 3191

Sample Name: 3191 Blank

Date Acquired: 07/22/94 02:01 AM

Vial: 3

Injection: 1

Channel: 991M

Channel Name UV_254

Acq Meth Set: 3191_MSET

Processing Method: ISOCYANM_PROC

Sample Type: Unknown

Injection Volume (uL): 50.00

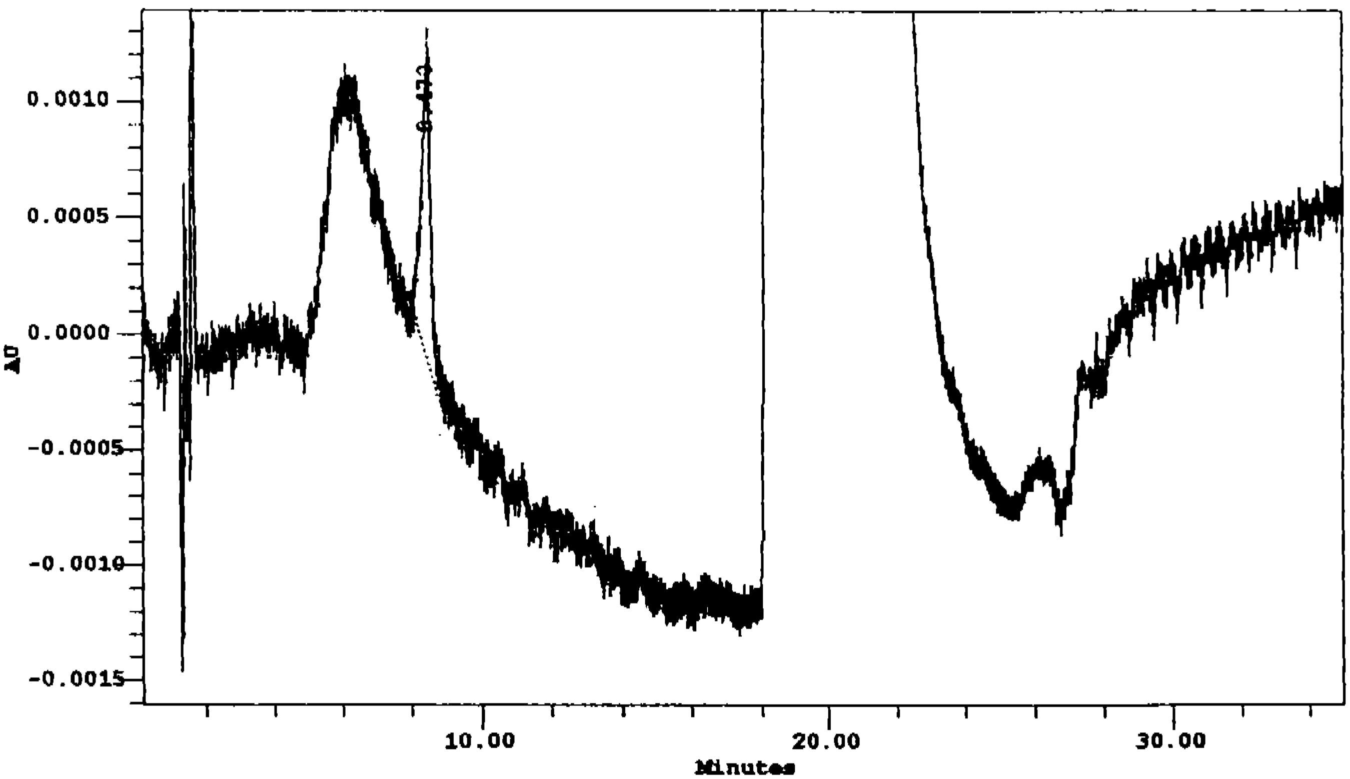
Run Time: 35.0 min

Date Processed: 08/19/94 02:16 PM

Dilution: 1.00000

Date Due: 071094

Set Name: 3191



Peak Results

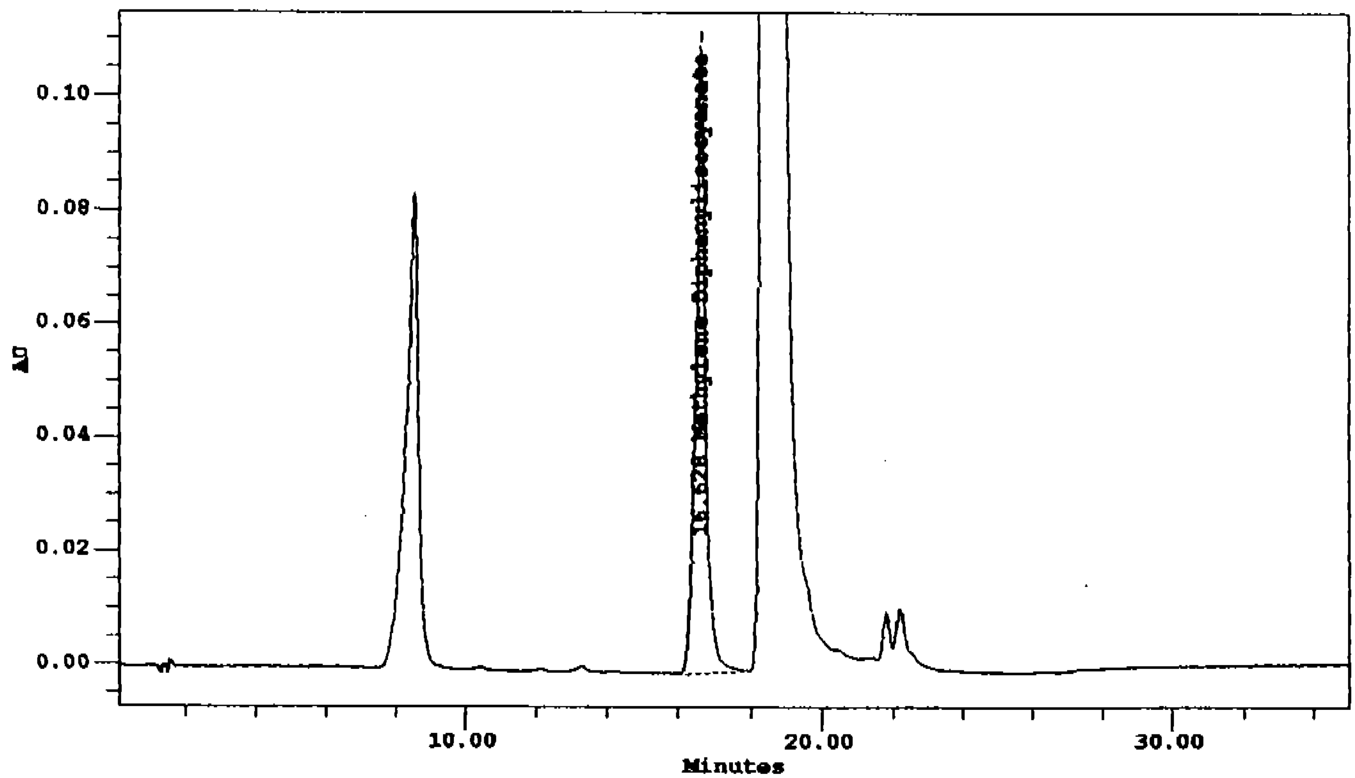
#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1		8.470	24233	1365		MM
2	Methylene Diphenylisocyan	16.700				Missing

BOL

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Unknown
Sample Name:	3191Spike 1	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/22/94 02:37 AM	Date Processed:	08/19/94 02:25 PM
Vial:	4	Dilution:	1.00000
Injection:	1	Date Due:	071094
Channel:	991M	Set Name:	3191
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.628	2085694	110437	4.960	BB

μg/ml ⇒ MDI ⇒ (4.960 - BDL)/5.18 ×100% = 95.8%

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name Dept 020/LP Chilco

Project Name: ISOCYANATES

Log Number 3191

Sample Name: 3191Spike 2

Date Acquired: 07/22/94 03:14 AM

Vial: 5

Injection: 1

Channel: 991M

Channel Name UV_254

Acq Meth Set: 3191_MSET

Processing Method: ISOCYANM_PROC

Sample Type: Unknown

Injection Volume (uL): 50.00

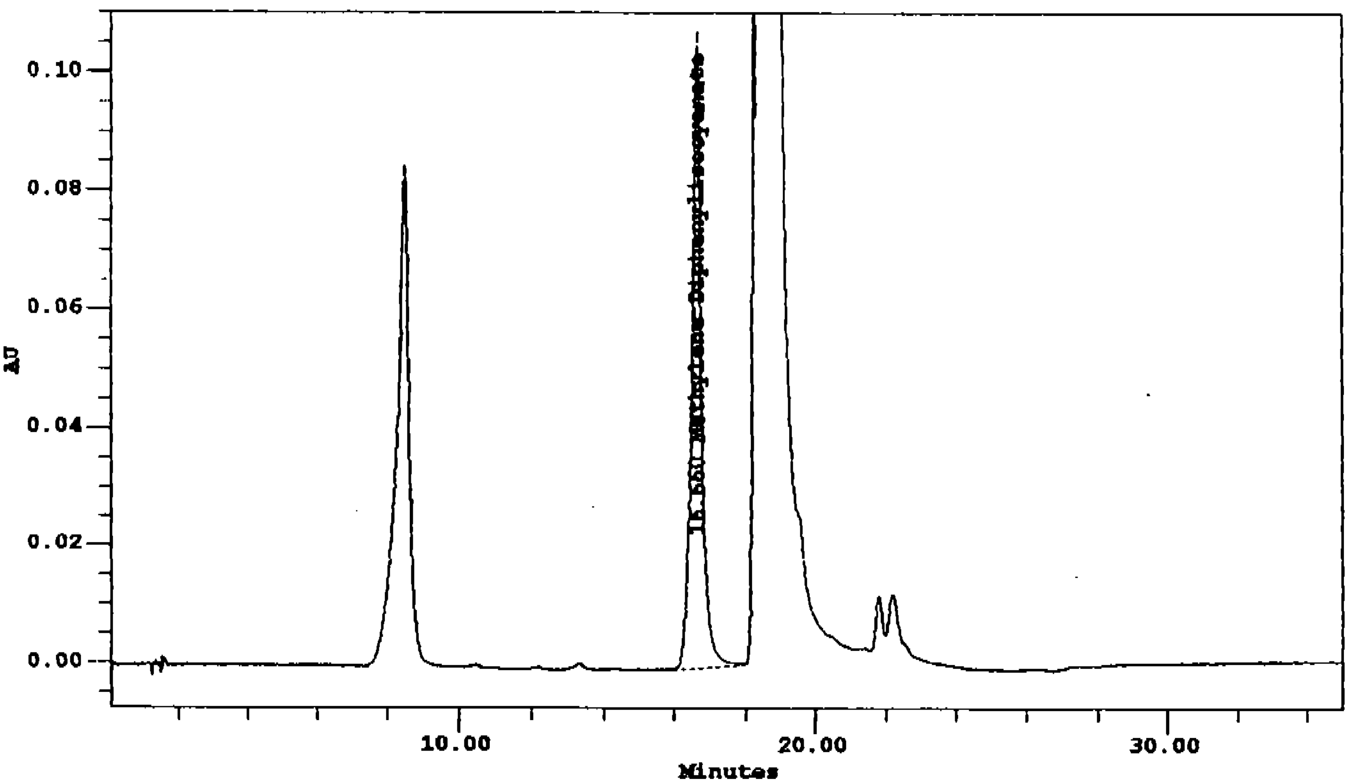
Run Time: 35.0 min

Date Processed: 08/19/94 02:26 PM

Dilution: 1.00000

Date Due: 071094

Set Name: 3191



Peak Results

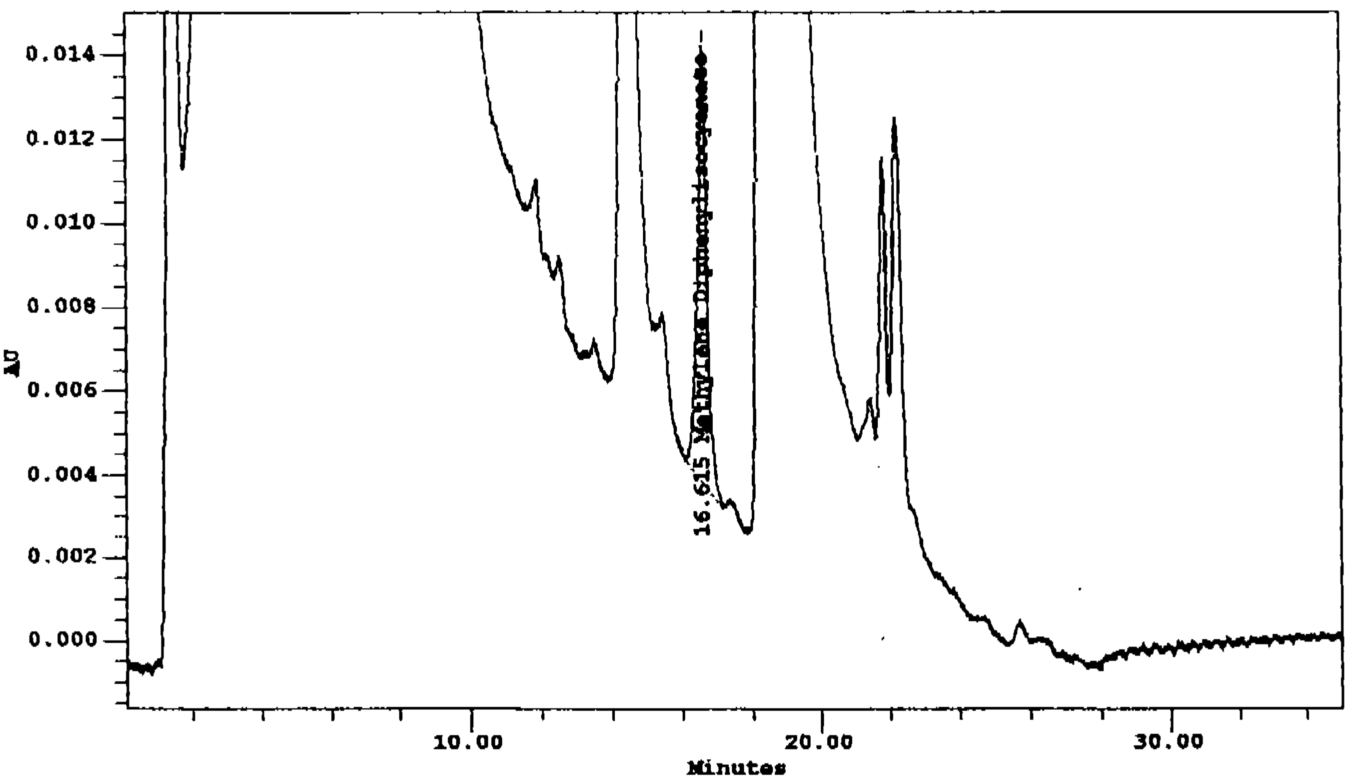
	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.660	1997139	105583	4.748	BB

$\mu g/ml \Rightarrow MDI \Rightarrow 4.75/5.18 \times 100\% = 91.7\%$

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Unknown
Sample Name:	3191-37	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/22/94 03:50 AM	Date Processed:	08/19/94 02:17 PM
Vial:	6	Dilution:	1.00000
Injection:	1	Date Due:	071094
Channel:	991M	Set Name:	3191
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.615	195610	10440	0.427	BB

μg ⇒ MDI ⇒ 0.427 μg/ml × 50 ml = 21.4 μg

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name Dept 020/LP Chilco

Project Name: ISOCYANATES

Log Number 3191

Sample Name: 3191-38

Date Acquired: 07/22/94 04:26 AM

Vial: 7

Injection: 1

Channel: 991M

Channel Name UV_254

Acq Meth Set: 3191_MSET

Processing Method: ISOCYANM_PROC

Sample Type: Unknown

Injection Volume (uL): 50.00

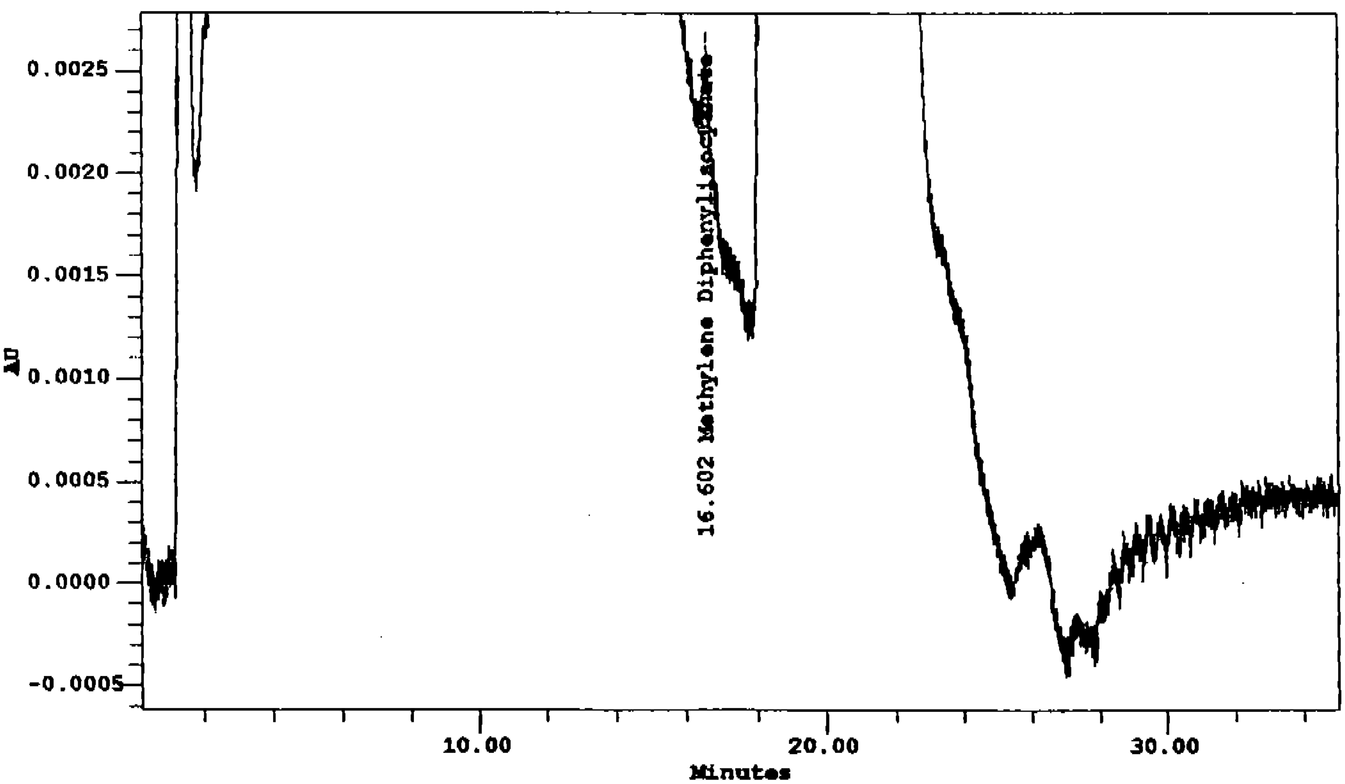
Run Time: 35.0 min

Date Processed: 08/19/94 02:18 PM

Dilution: 1.00000

Date Due: 071094

Set Name: 3191



Peak Results

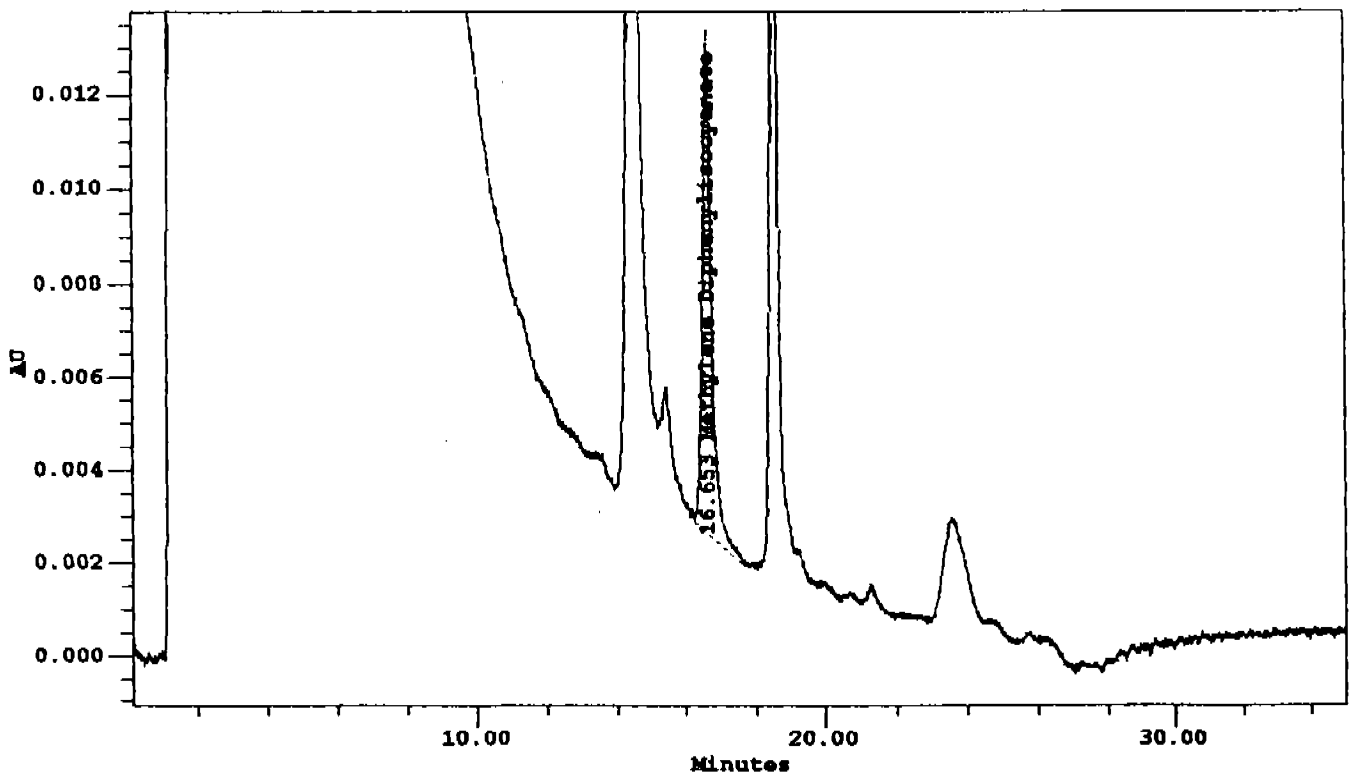
	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.602	5481	520		MM

BOL

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Unknown
Sample Name:	3191-39	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/22/94 05:03 AM	Date Processed:	08/19/94 02:19 PM
Vial:	8	Dilution:	1.00000
Injection:	1	Date Due:	071094
Channel:	991M	Set Name:	3191
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

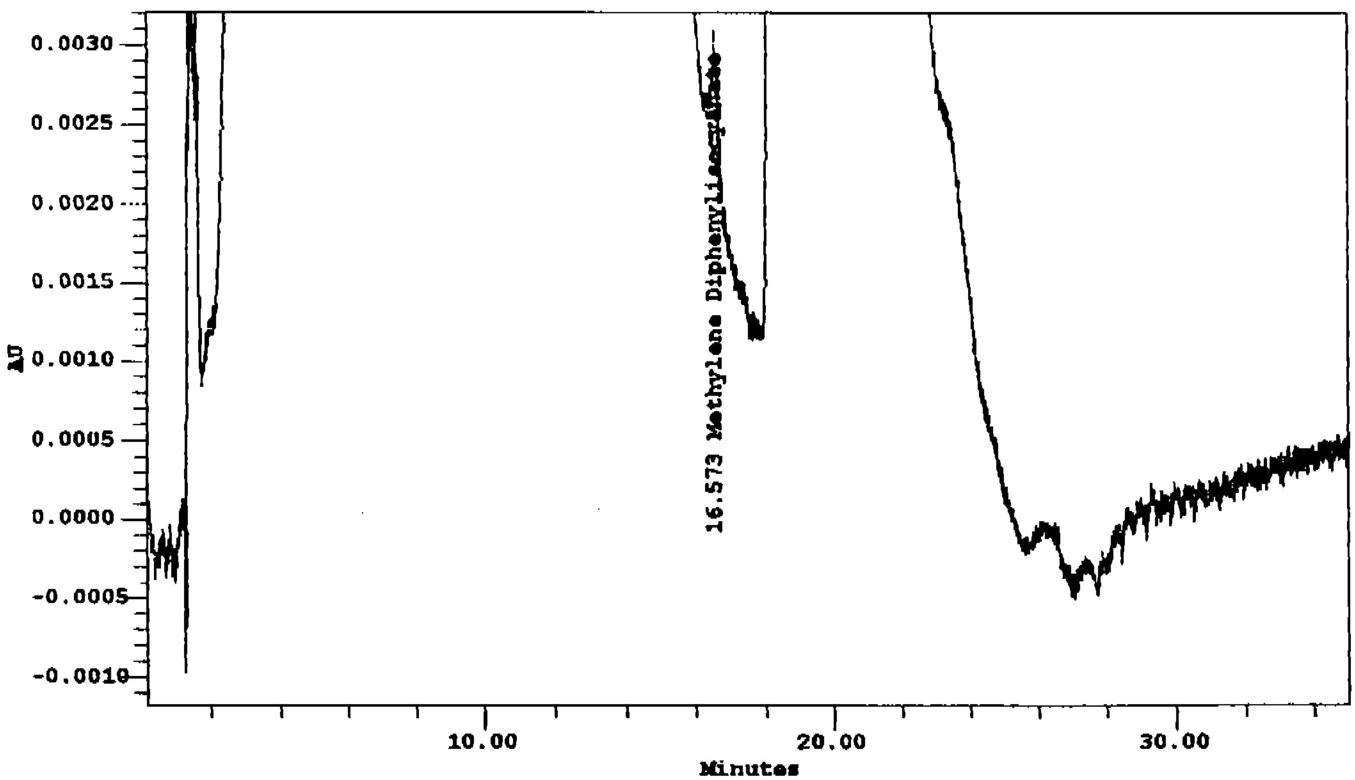
#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.653	190690	10465	0.415	BB

μg ⇒ MDI ⇒ 0.415 μg/ml × 50 ml = 20.8 μg

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Unknown
Sample Name:	3191-40	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/22/94 05:39 AM	Date Processed:	08/19/94 02:19 PM
Vial:	9	Dilution:	1.00000
Injection:	1	Date Due:	071094
Channel:	991M	Set Name:	3191
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

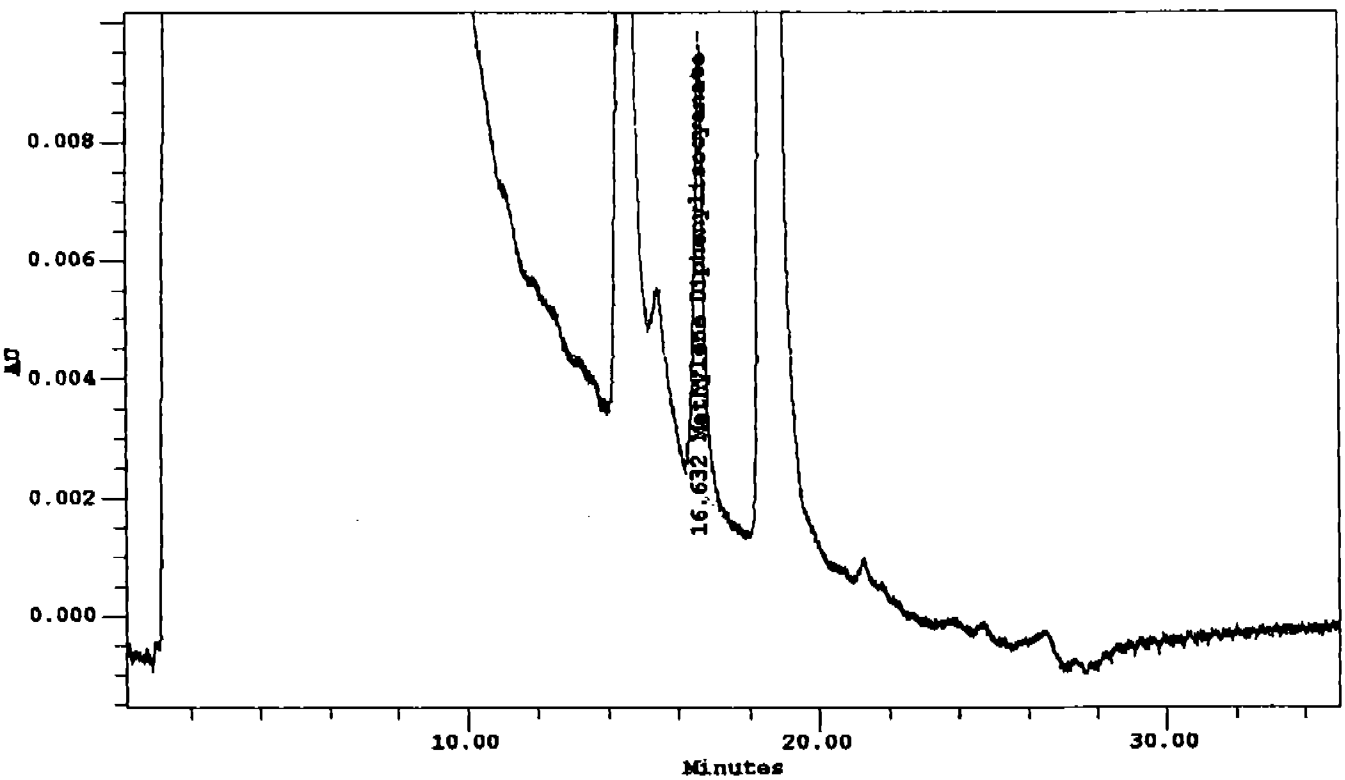
	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.573	9243	710		MM

BOL

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Unknown
Sample Name:	3191-41	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/22/94 06:16 AM	Date Processed:	08/19/94 02:21 PM
Vial:	10	Dilution:	1.00000
Injection:	1	Date Due:	071094
Channel:	991M	Set Name:	3191
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

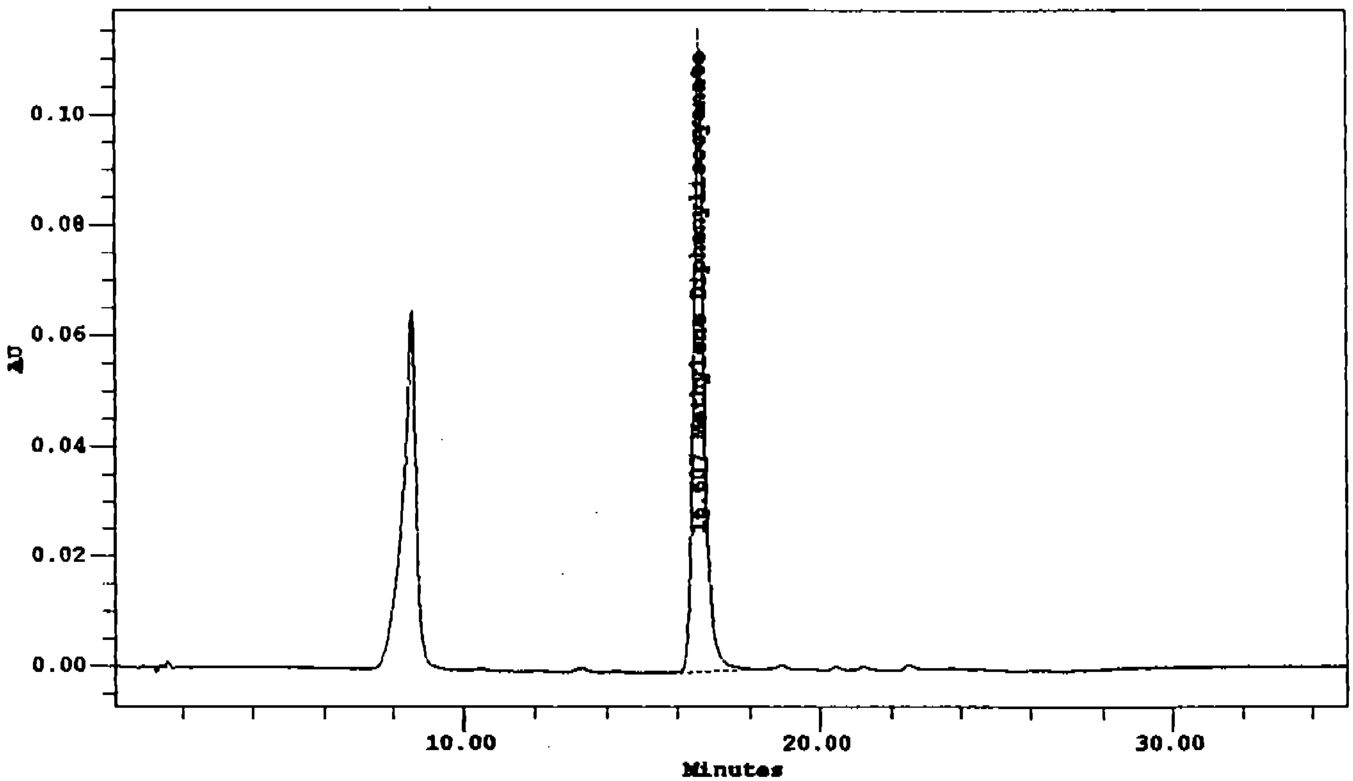
#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.632	139084	7482	0.291	MB

μg ⇒ MDI ⇒ 0.291 μg/ml x 50 ml = 14.6 μg

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Unknown
Sample Name:	Iso Check 2	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/22/94 06:52 AM	Date Processed:	08/19/94 02:29 PM
Vial:	1	Dilution:	1.00000
Injection:	1	Date Due:	071094
Channel:	991M	Set Name:	3191
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.607	2201701	113898	5.239	BB

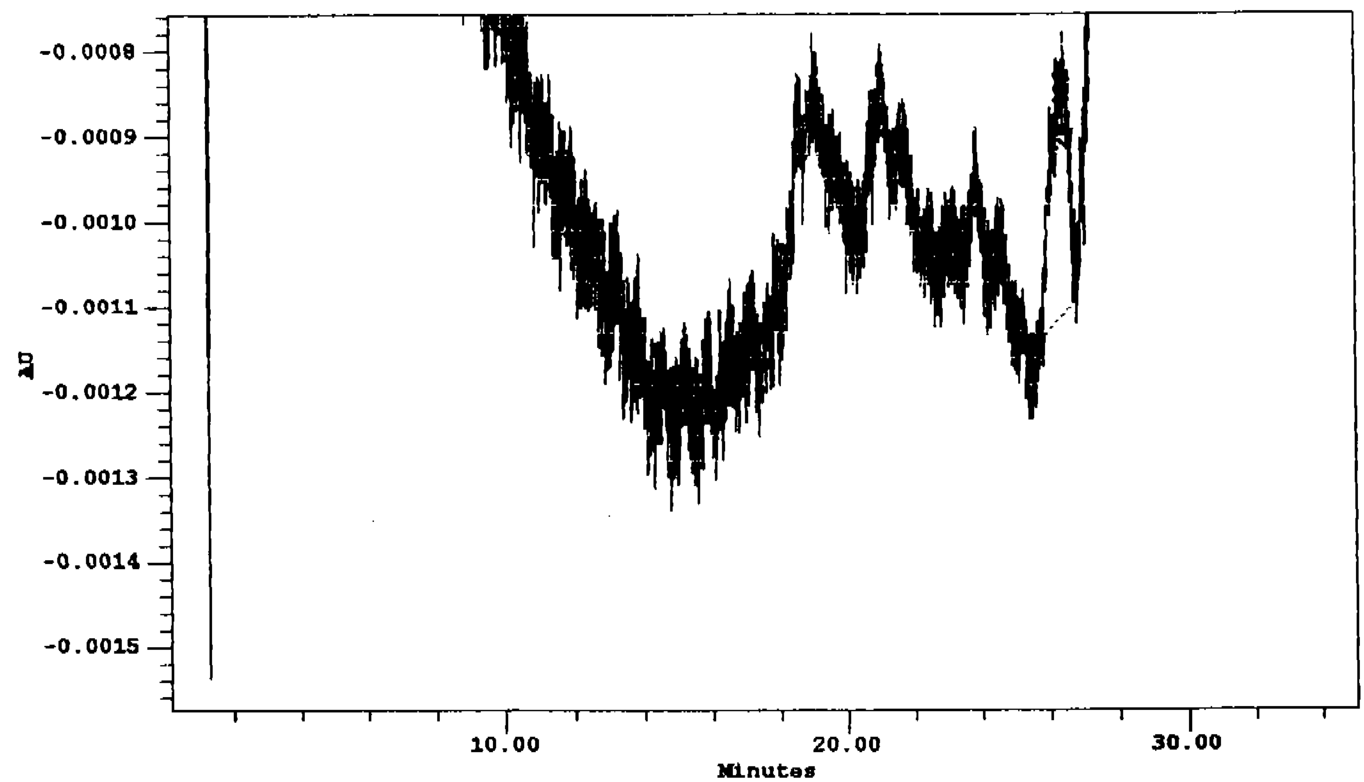
MDI ⇒ 5.24 µg/ml / 4.90 µg/ml × 100% = 107%

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name: Dept 020/LP Chilco
Project Name: ISOCYANATES
Log Number: 3191
Sample Name: ACN Blank 2
Date Acquired: 07/22/94 07:28 AM
Vial: 2
Injection: 1
Channel: 991M
Channel Name: UV_254
Acq Meth Set: 3191_MSET
Processing Method: ISOCYANM_PROC

Sample Type: Unknown
Injection Volume (uL): 50.00
Run Time: 35.0 min
Date Processed: 08/19/94 02:27 PM
Dilution: 1.00000
Date Due: 071094
Set Name: 3191



Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.700				Missing
2		26.422	11161	314		MM

BOL

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name Dept 020/LP Chilco

Project Name: ISOCYANATES

Log Number 3191

Sample Name: 3191-42

Date Acquired: 07/22/94 08:05 AM

Vial: 11

Injection: 1

Channel: 991M

Channel Name UV_254

Acq Meth Set: 3191_MSET

Processing Method: ISOCYANM_PROC

Sample Type: Unknown

Injection Volume (uL): 50.00

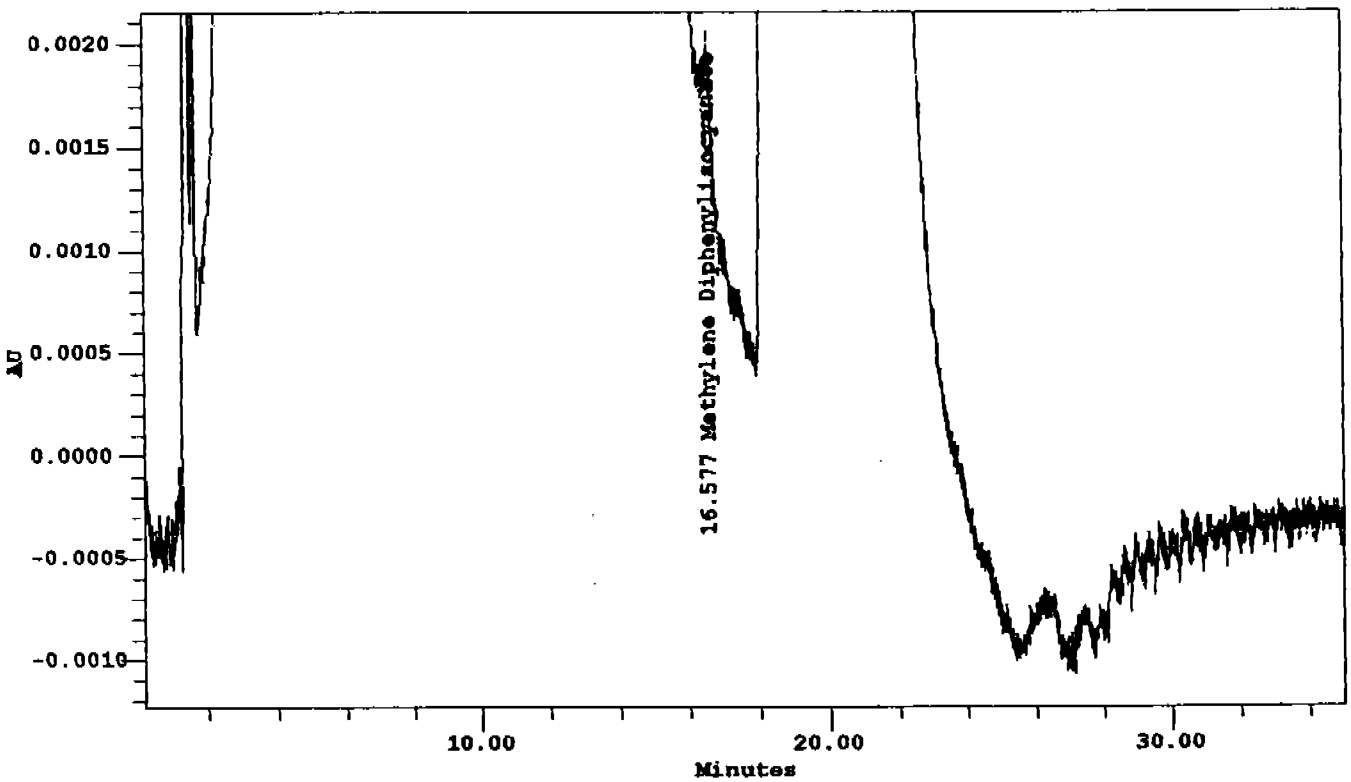
Run Time: 35.0 min

Date Processed: 08/19/94 02:23 PM

Dilution: 1.00000

Date Due: 071094

Set Name: 3191



Peak Results

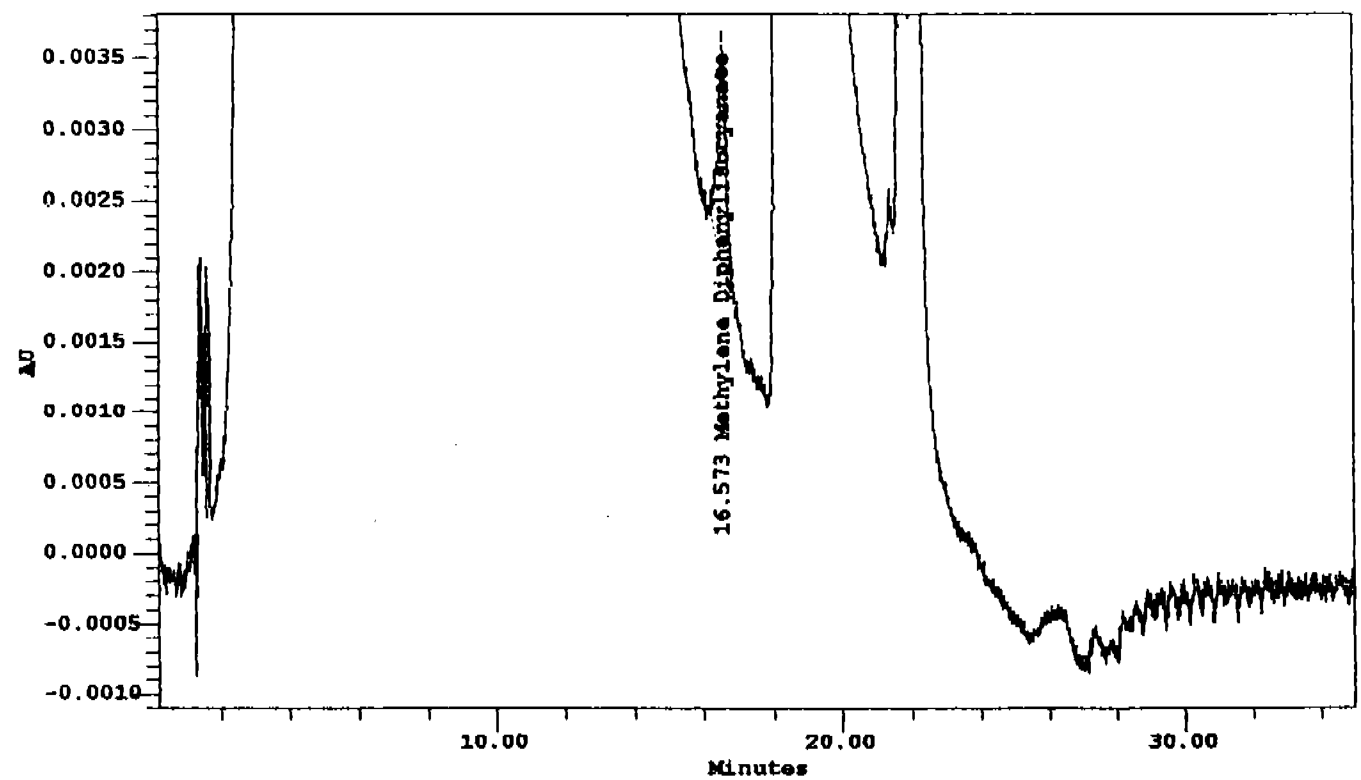
#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.577	7833	541		MM

BOL

INTERPOLL LABORATORIES
RESULTS REPORT

M i l l e n n i u m   S a m p l e   I n f o r m a t i o n

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Unknown
Sample Name:	3191-43	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/22/94 08:41 AM	Date Processed:	08/19/94 02:24 PM
Vial:	12	Dilution:	1.00000
Injection:	1	Date Due:	071094
Channel:	991M	Set Name:	3191
Channel Name	UV_254		
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

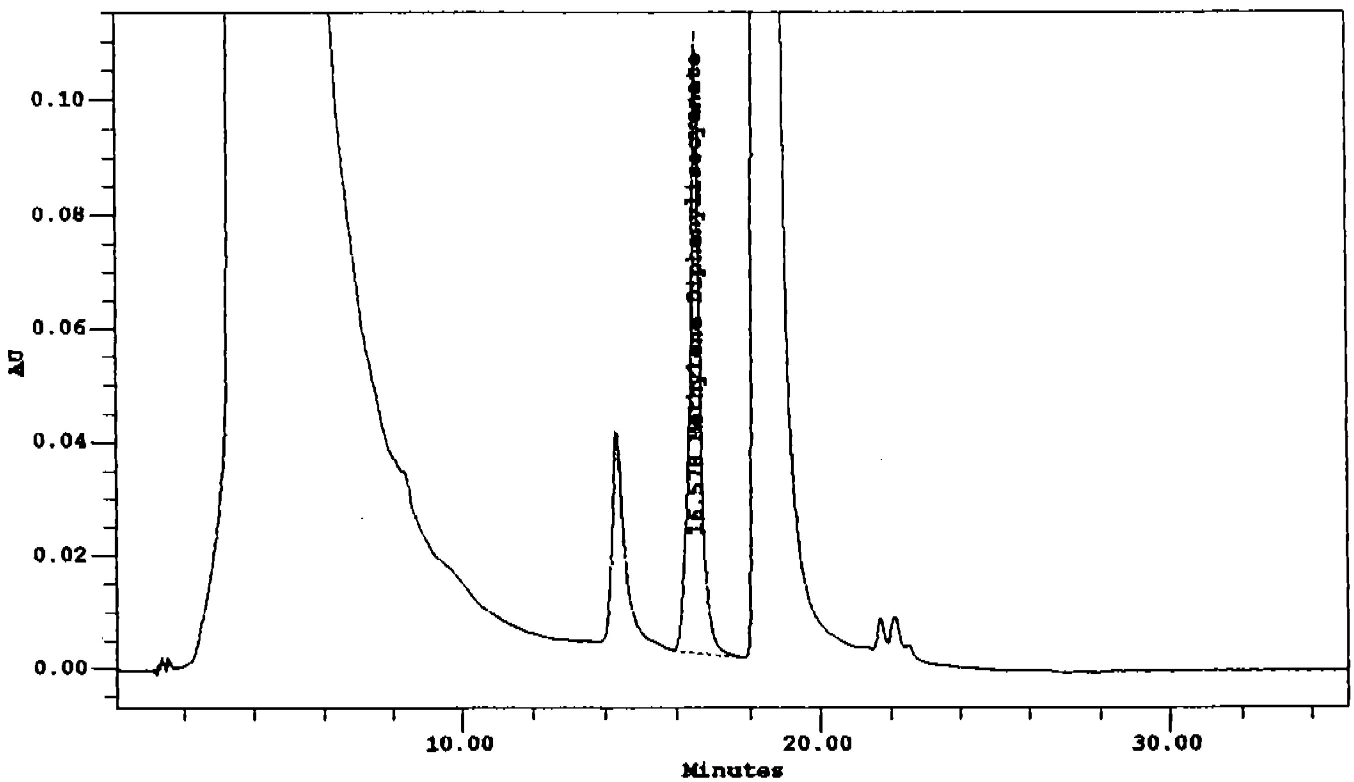
#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.573	24286	1509	~~0.016~~ BDL	MM

Det. Limit 0.050 µg/ml

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Unknown
Sample Name:	3191-44	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/22/94 09:17 AM	Date Processed:	08/19/94 02:25 PM
Vial:	13	Dilution:	1.00000
Injection:	1	Date Due:	071094
Channel:	991M	Set Name:	3191
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

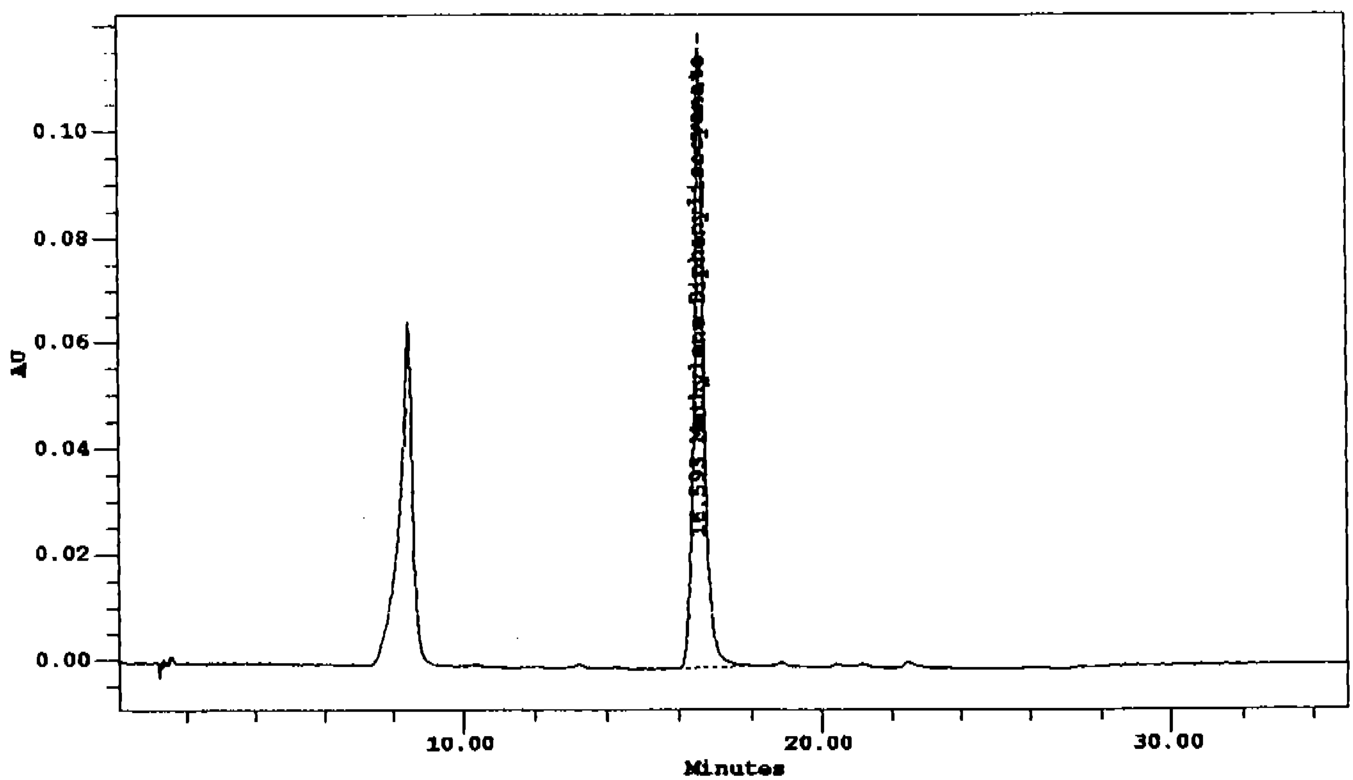
#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.578	2144106	106984	5.101	BB

μg ⇒ MDI ⇒ 5.10 μg/ml x 50 ml = 255 μg   % Rec = (255 - BOL) / 296 x100% =

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name	Dept 020/LP Chilco		
Project Name:	ISOCYANATES		
Log Number	3191	Sample Type:	Unknown
Sample Name:	Iso Check 3	Injection Volume (uL):	50.00
		Run Time:	35.0 min
Date Acquired:	07/22/94 09:54 AM	Date Processed:	08/19/94 02:30 PM
Vial:	1	Dilution:	1.00000
Injection:	1	Date Due:	071094
Channel:	991M	Set Name:	3191
Channel Name UV_254			
Acq Meth Set:	3191_MSET		
Processing Method:	ISOCYANM_PROC		



Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.593	2204577	117393	5.246	BB

% Rec ⇒ MOI ⇒ $5.25/4.90 \times 100\% = 107\%$

INTERPOLL LABORATORIES
RESULTS REPORT

Millennium Sample Information

Client Name Dept 020/LP Chilco

Project Name: ISOCYANATES

Log Number 3191

Sample Name: ACN Blank 3

Date Acquired: 07/22/94 10:30 AM

Vial: 2

Injection: 1

Channel: 991M

Channel Name UV_254

Acq Meth Set: 3191_MSET

Processing Method: ISOCYANM_PROC

Sample Type: Unknown

Injection Volume (uL): 50.00

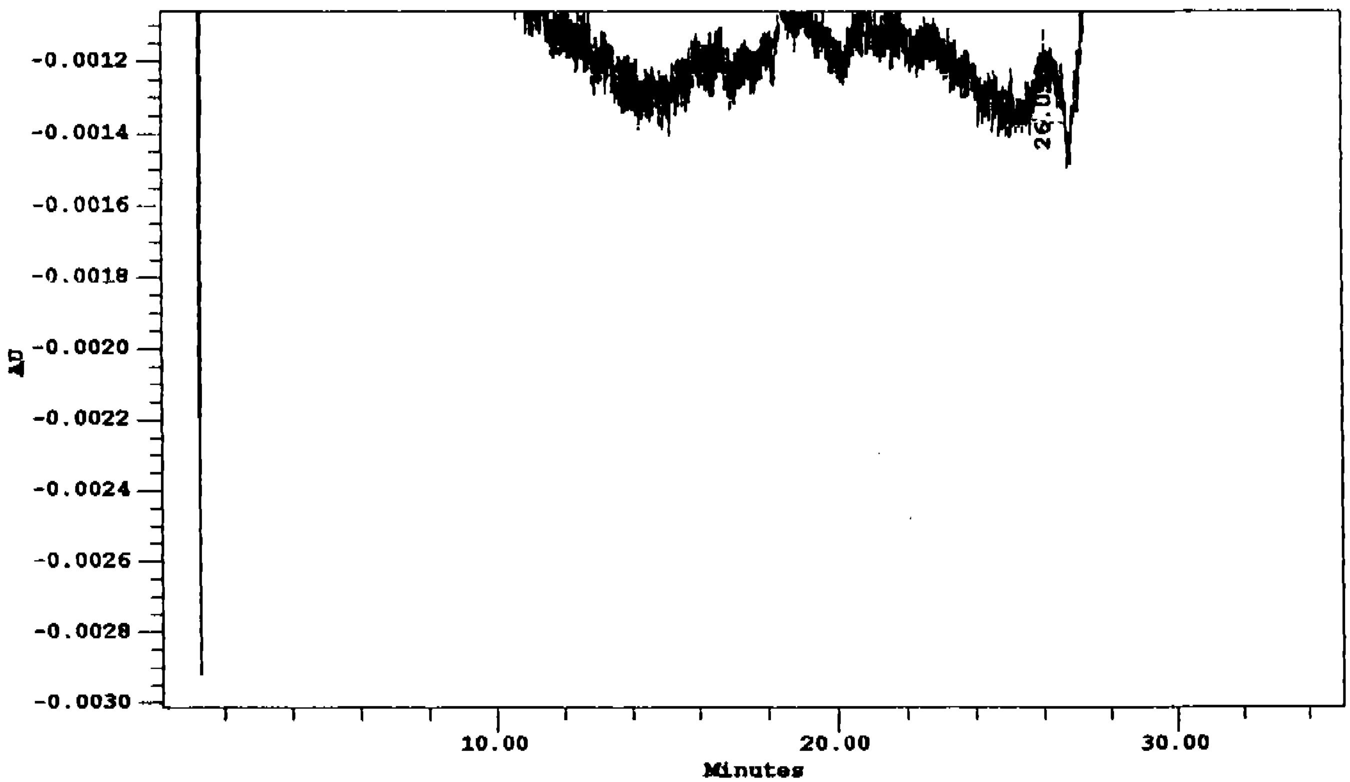
Run Time: 35.0 min

Date Processed: 08/19/94 02:27 PM

Dilution: 1.00000

Date Due: 071094

Set Name: 3191



Peak Results

#	Name	Ret Time (min)	Area (uV*sec)	Height (uV)	Amount in ug/ml	Int Type
1	Methylene Diphenylisocyan	16.700				Missing
2		26.058	7397	215		MM

BDL

REANALYSIS

MAXIMA 820 METHOD REPORT

Printed: 11-AUG-1994 11:03

3191 RUN3

Operating Conditions Liquid Chromatography

Operator ID:	MJG		
Injection Method:	AUTOMATIC	Sample Size:	50 uL
Solvent Flow:	Gradient	Flow Rate:	2.0ml/min

Composition: 0.0% 0.1M AMMONIUM ACETATE
0.0%
100.0% ACETONITRILE

Column 1

Name:	ZORBAX ODS		
Length:	25 cm	Packing Name:	ODS
Diameter:	4.6 mm	Packing Type:	C18
Void Volume:		Functionality:	SILANE
Particle Size:	5 um		

Detectors

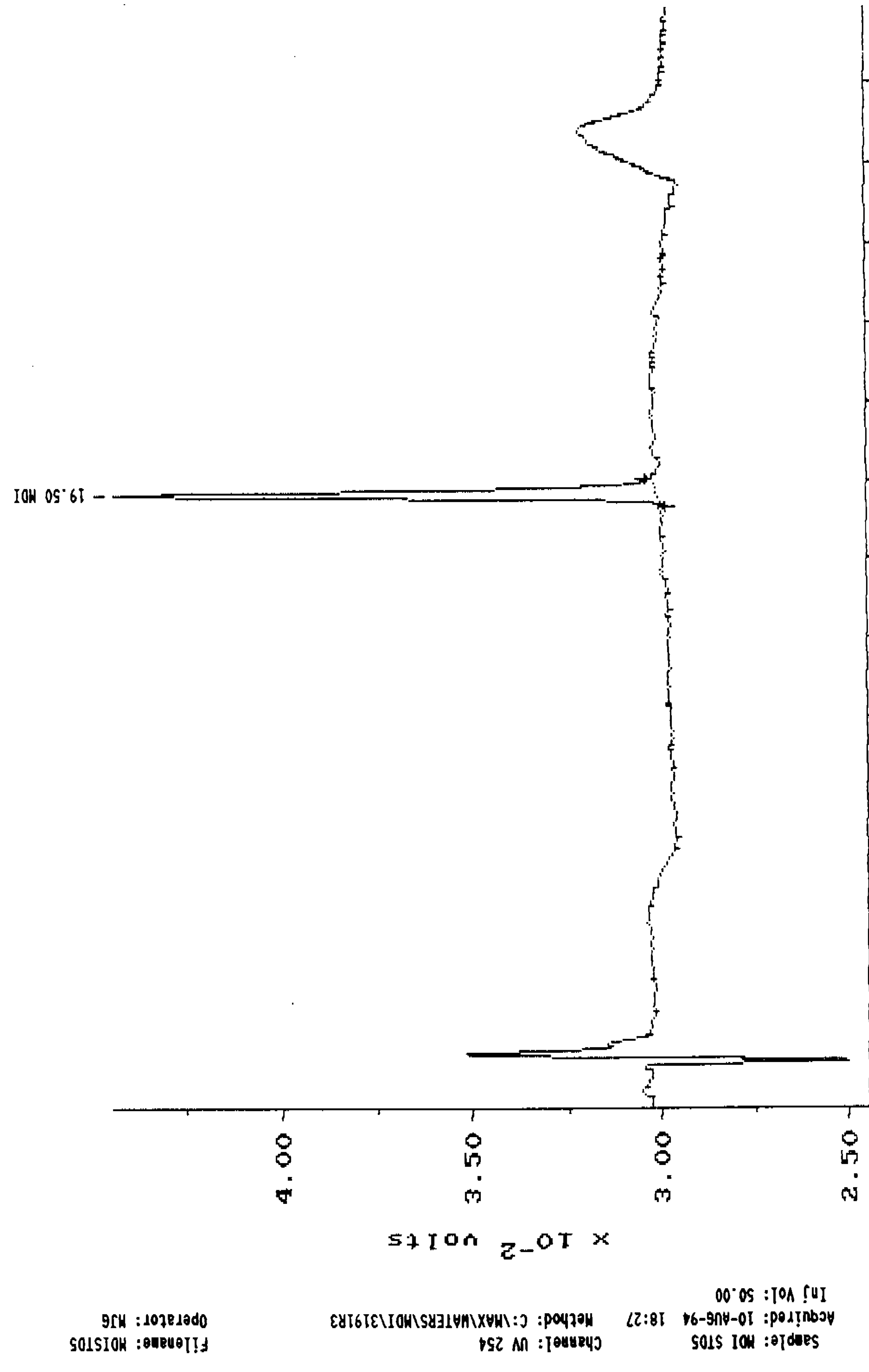
Detector #	Name	Type	Sensitivity	Comment
1	UV 254	PDA		190nm TO 440nm ACQUIRED

Comments

A: 0.1M AMMONIUM ACETATE C: ACN; FLOW RATE 2.0ml/min;
TIME 0.0 MIN 75:25 A:C; 2.0 MIN 75:25 A:C; 19.5 MIN 40:60 A:C;
24.9 MIN 40:60 A:C; 25.0 MIN 75:25 A:C; 35.0 MIN 75:25 A:C.

Stripchart Comment

CALIBRATION STANDARDS


Sample: MDI STD5
Acquired: 10-AUG-94 18:27
Inj Vol: 50.00
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Filename: MDISTD5
Operator: MJG
x 10^-2 volts
x 10^1 minutes
19.50 MDI
2.50
3.00
3.50
4.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00

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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:04:40

SAMPLE: MDI STD5
#1 in Method: 3191 RUN3
Acquired: 10-AUG-1994 18:27
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

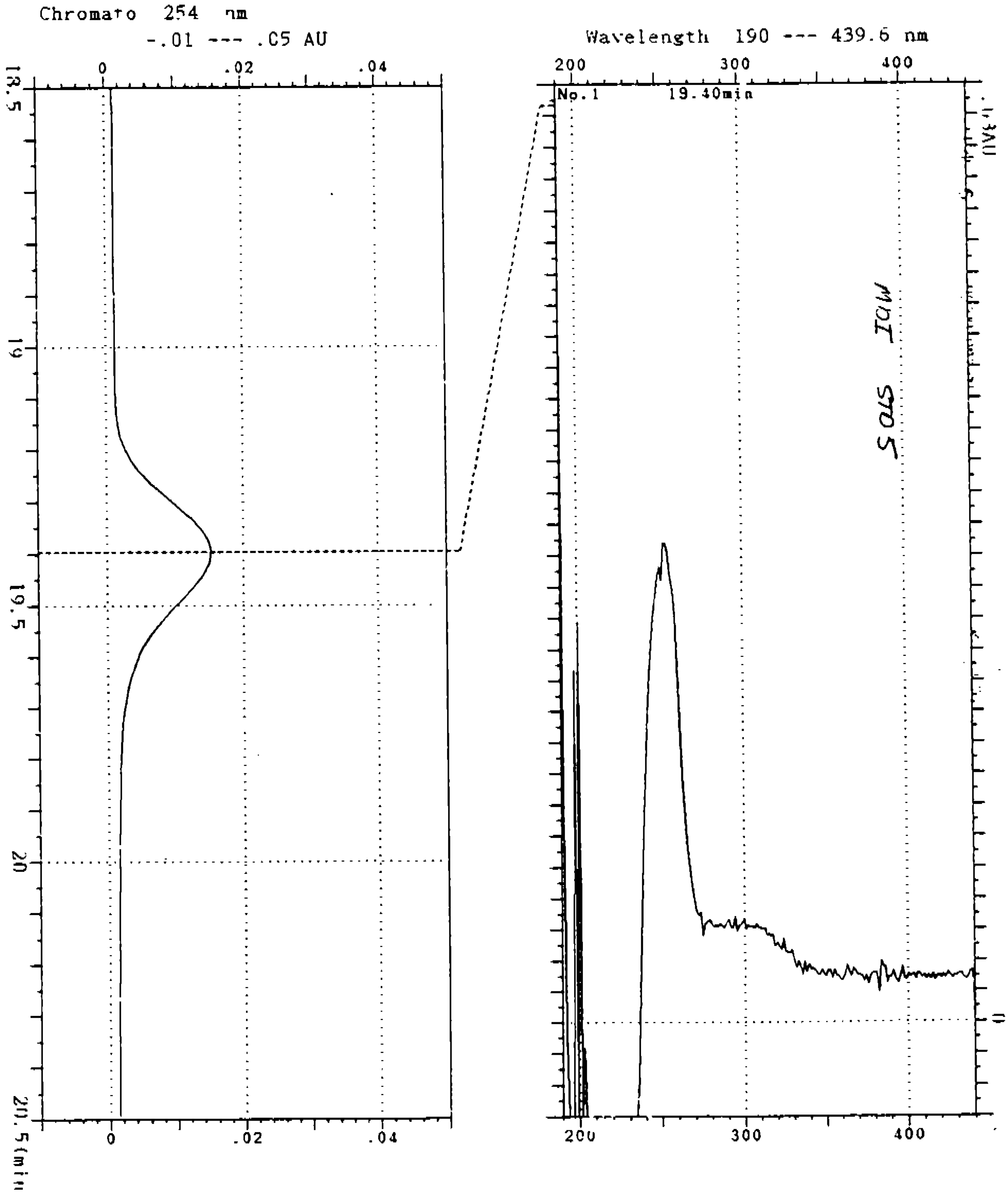
Type: STND
Instrument: WATERS
Filename: MDISTD5
Index: Disk
Injection Volume: 50.0

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.500	MDI	0.51800	0.51800	225768	14304	0.00011472	BB
TOTAL			0.51800	0.51800	225768	14304		

M991 Spectrum index plot (peak)

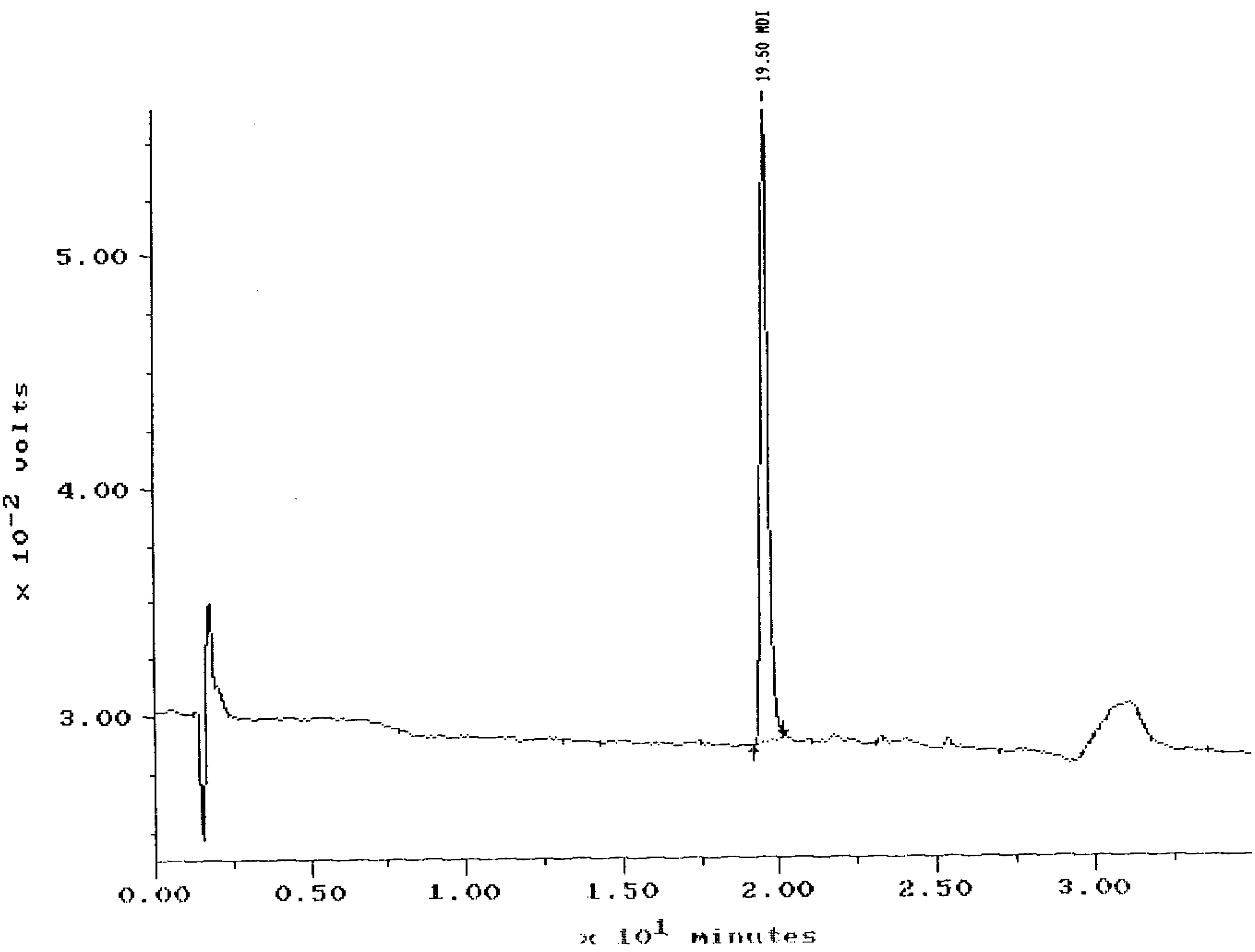
3191R31.DT3	08-10-1994 18:20:08	Sample name	3191R3 1
Y-scale	.06 AU/FS	Paper speed	93.63 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	0 --- 8 min	Pressure	
< 1 AUX >		< 2 AUX >	
Y-scale	1 AU /FS		
Time offset	0 min		(Disabled)
[470FLOURESCE]		< 4 AUX >	
< 3 AUX >			
	(Disabled)		(Disabled)



Sample: MDI STD4
Acquired: 10-AUG-94 19:04
Inj Vol: 50.00

Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3

Filename: MDISTD4
Operator: MJ6



MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:04:51

SAMPLE: MDI STD4
#2 in Method: 3191 RUN3
Acquired: 10-AUG-1994 19:04
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

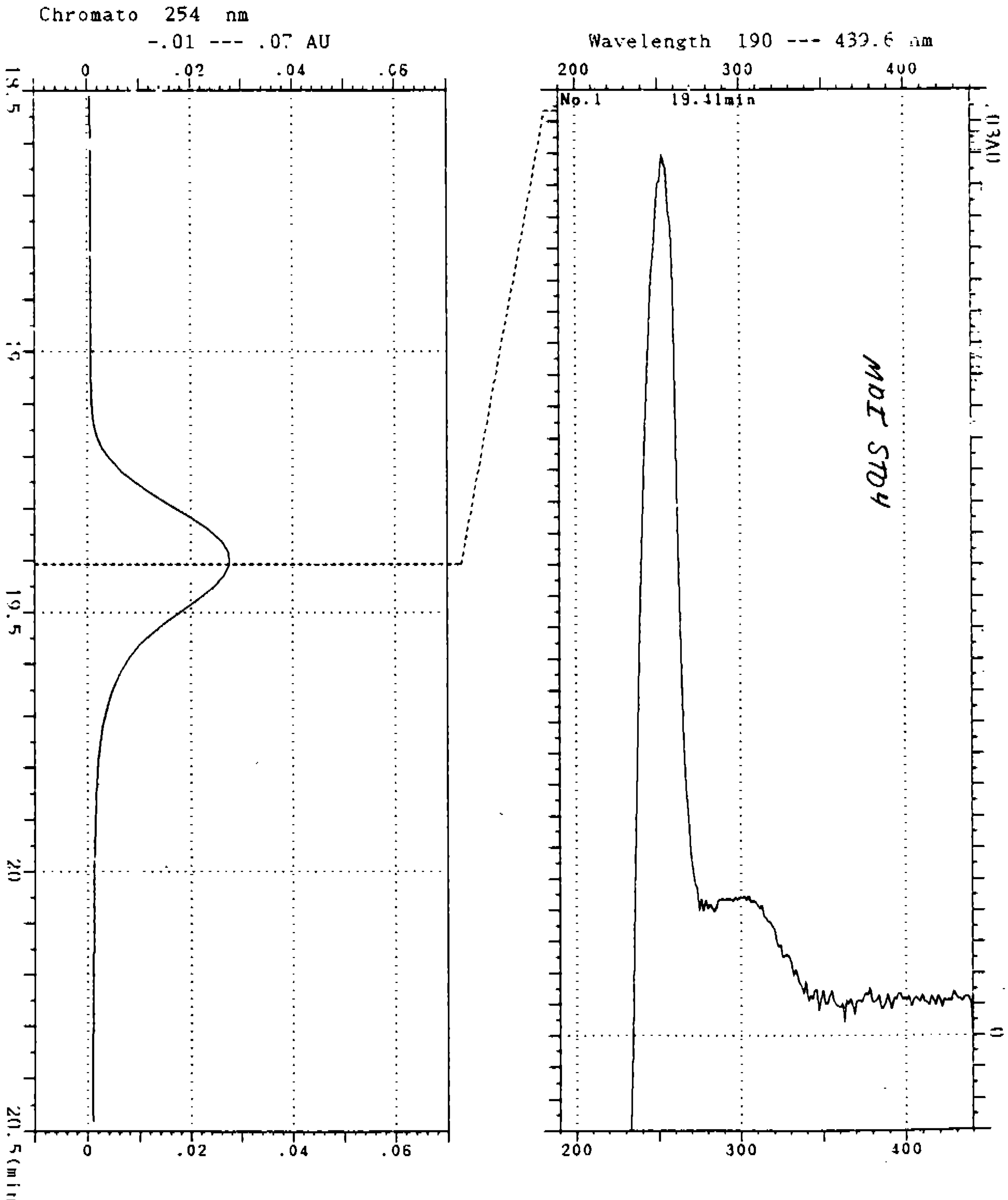
Type: STND
Instrument: WATERS
Filename: MDISTD4
Index: Disk
Injection Volume: 50.0

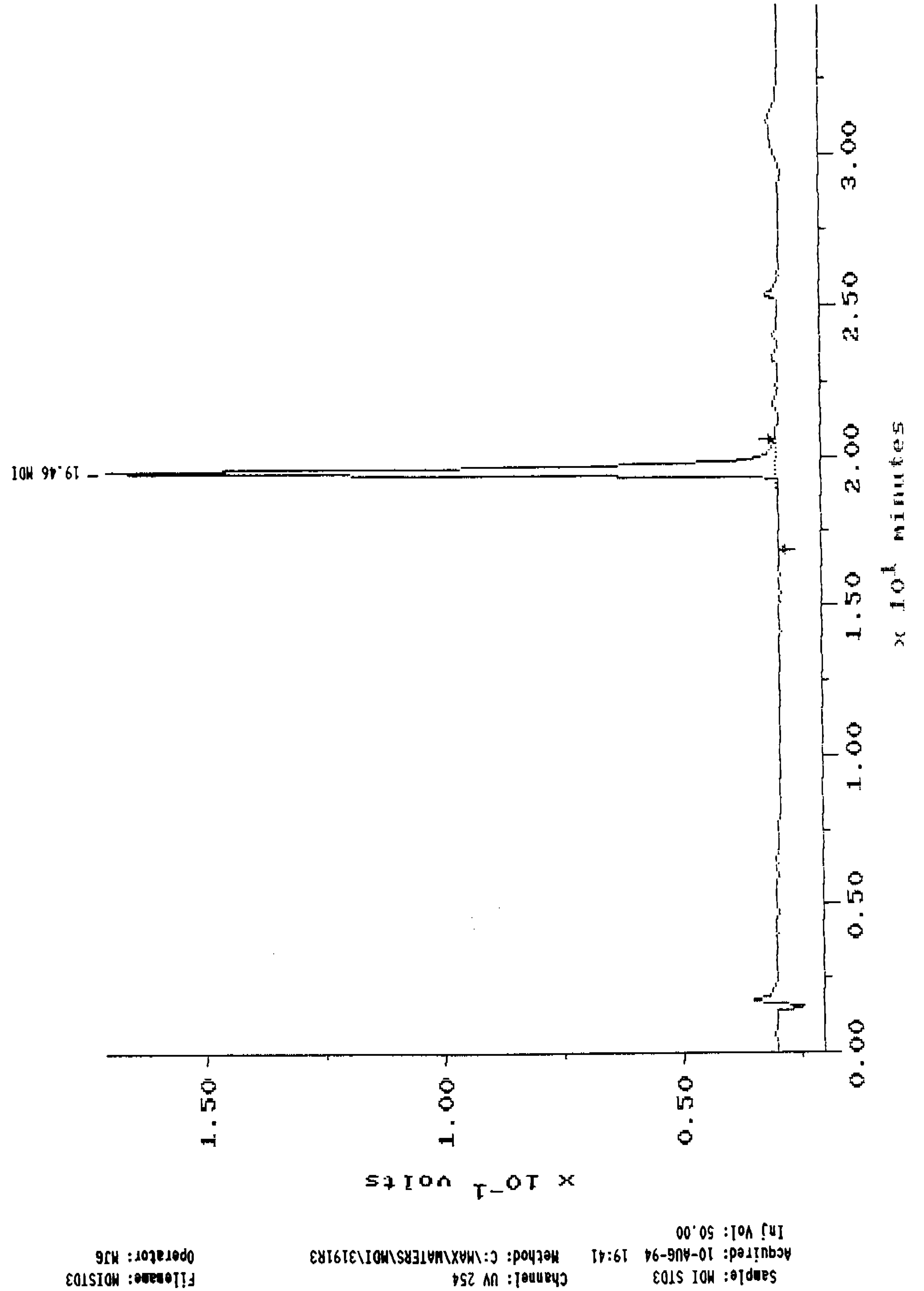
DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.500	MDI	1.03600	1.03600	451249	27536	0.00011479	BB
TOTAL			1.03600	1.03600	451249	27536		

M991 Spectrum index plot (peak)

3191R32.DT3	08-10-1994 18:57:12	Sample name	3191R3 2
Y-scale	.08 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	0 --- 8 min	Pressure	
< 1 AUX >		< 2 AUX >	
Y-scale	1 AU /FS		
Time offset	0 min		(Disabled)
[470FLOURESCE]			
< 3 AUX >		< 4 AUX >	
	(Disabled)		(Disabled)





Sample: MDI STD3
Acquired: 10-AUG-94 19:41
Inj Vol: 50.00
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Filename: MDISTD3
Operator: MJG
19.46 MDI
x 10^-1 volts
x 10^1 minutes

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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:05:02

SAMPLE: MDI STD3
#3 in Method: 3191 RUN3
Acquired: 10-AUG-1994 19:41
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: STND
Instrument: WATERS
Filename: MDISTD3
Index: Disk
Injection Volume: 50.0

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.458	MDI	5.18000	5.18000	2298865	141521	0.00011266	BB
TOTAL			5.18000	5.18000	2298865	141521		

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MAXIMA 820 CUSTOM REPORT

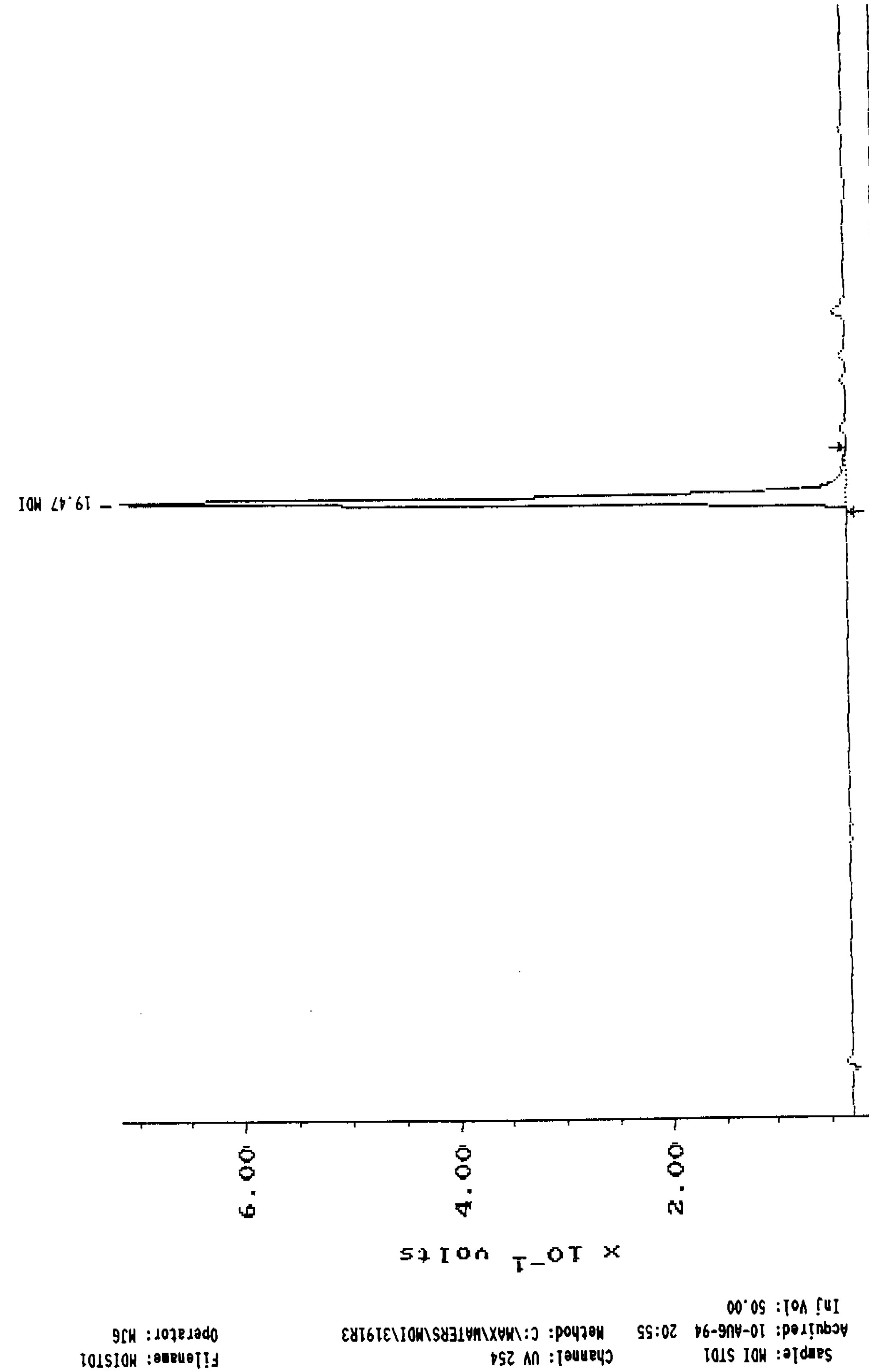
Printed: 11-AUG-1994 11:05:14

SAMPLE: MDI STD2
#4 in Method: 3191 RUN3
Acquired: 10-AUG-1994 20:18
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: STND
Instrument: WATERS
Filename: MDISTD2
Index: Disk
Injection Volume: 50.0

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
0.787	17.075				13935	810		BB
0.897	19.467	MDI	12.95000	12.95000	5695704	345383	0.00011368	BB
1.000	21.700				31320	2310		BB
TOTAL			12.95000	12.95000	5740958	348503		


19.47 MDI
0.00
0.50
1.00
1.50
2.00
2.50
3.00
x 10^1 minutes
2.00
4.00
6.00
x 10^-1 volts
Sample: MDI STD1
Acquired: 10-AUG-94 20:55
Inj Vol: 50.00
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Filename: MDIST01
Operator: MJG

MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:05:26

SAMPLE: MDI STD1

#5 in Method: 3191 RUN3
Acquired: 10-AUG-1994 20:55
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

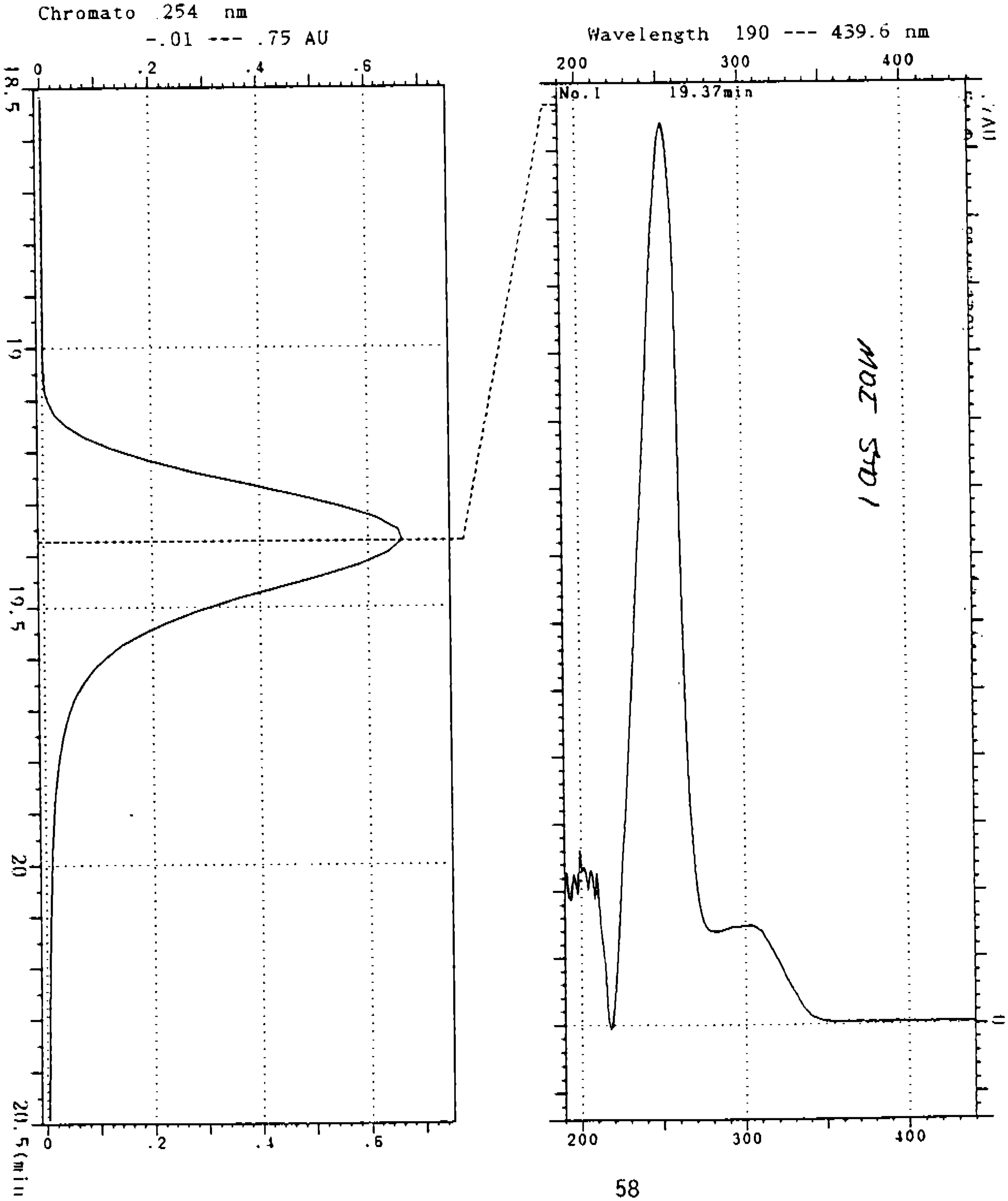
Type: STND
Instrument: WATERS
Filename: MDISTD1
Index: Disk
Injection Volume: 50.0

DETECTOR: UV 254

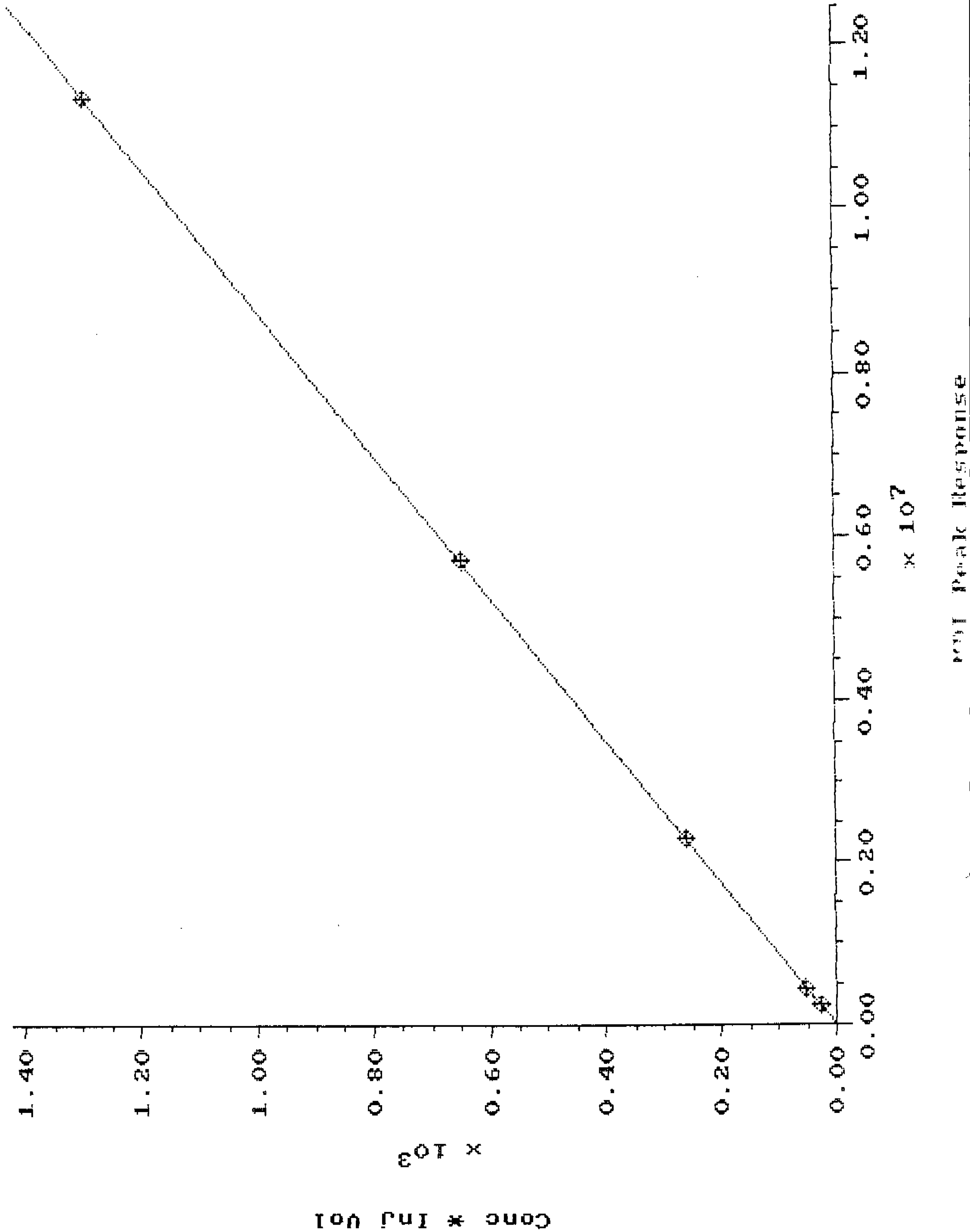
Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.467	MDI	25.90000	25.90000	11364549	681579	0.00011395	BB
TOTAL			25.90000	25.90000	11364549	681579		

M991 Spectrum index plot (peak)

3191R35.DT3	08-10-1994 20:48:43	Sample name	3191R3 5
Y-scale	.76 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	0 --- 8 min	Pressure	
< 1 AUX >		< 2 AUX >	
Y-scale	1 AU /FS		(Disabled)
Time offset	0 min		
[470FLOURESCE]			
< 3 AUX >		< 4 AUX >	
	(Disabled)		(Disabled)



CALIBRATION CURVE


Conc * Inj Vol
x 10^3
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Peak Response
x 10^7
0.00
0.20
0.40
0.60
0.80
1.00
1.20

MDI Calibration Report

Printed: 11-AUG-1994 11:05:30

Quant Basis: Area
Curve Type: Linear
Y-axis Label: Concentration

Rejection Tolerance: None
Weighting: None

Internal Standard: None
Forced Through Origin: Yes

Equation: Conc*(Inj Vol) = 1.138593E-04 * R

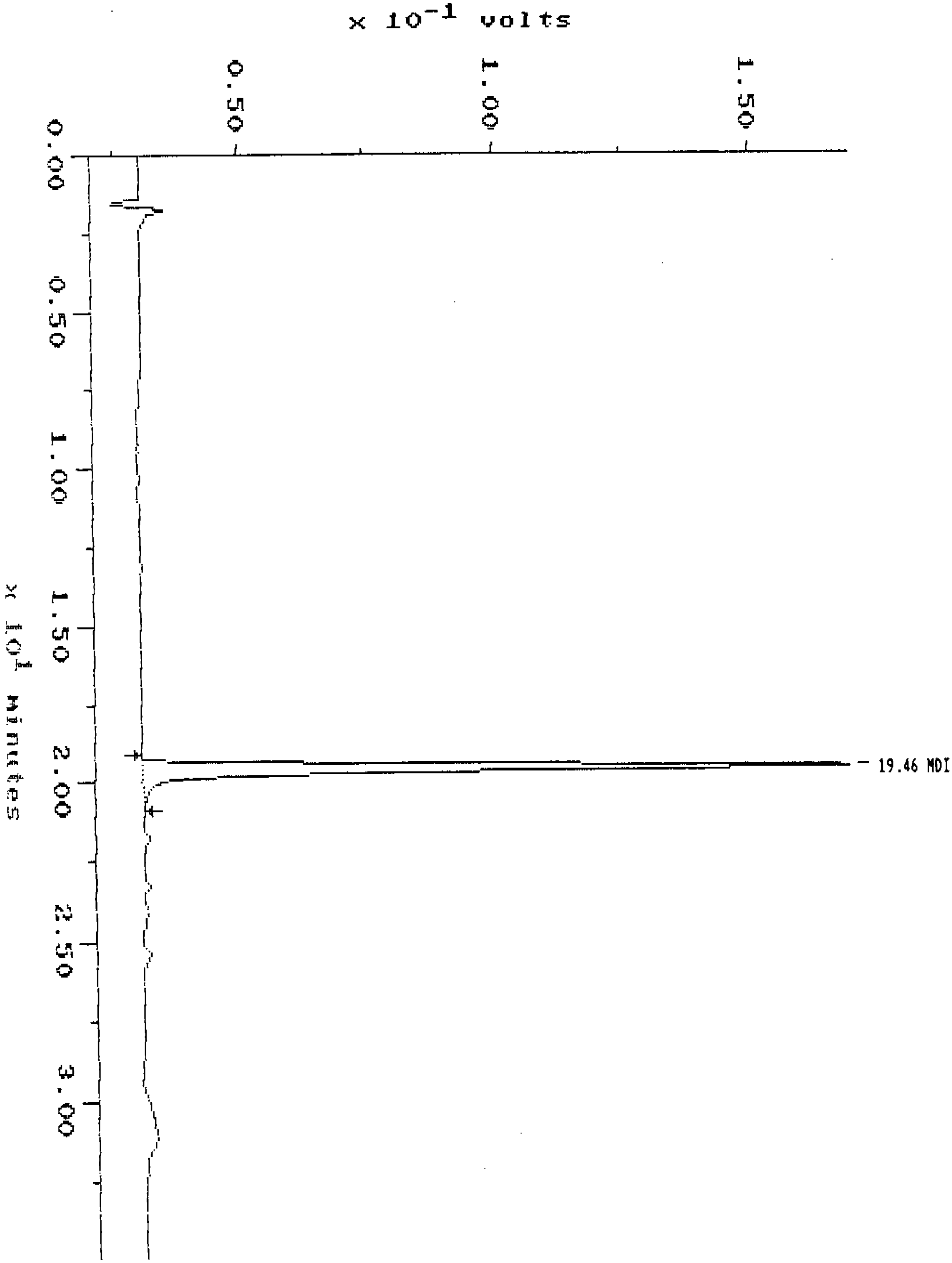
Sample	File Name	Valid	Concentration	Response	Calc'd Concentration	% Deviation	Response Factor
MDI STD5	MDISTD5	Y	5.180000E-01	2.2576766E+05	5.141148E-01	7.56E-01	1.147197E-04
MDI STD4	MDISTD4	Y	1.036000E+00	4.5124866E+05	1.027577E+00	8.20E-01	1.147926E-04
MDI STD3	MDISTD3	Y	5.180000E+00	2.2988647E+06	5.234942E+00	-1.05E+00	1.126643E-04
MDI STD2	MDISTD2	Y	1.295000E+01	5.6957035E+06	1.297017E+01	-1.56E-01	1.136822E-04
MDI STD1	MDISTD1	Y	2.590000E+01	1.1364549E+07	2.587919E+01	8.04E-02	1.139508E-04

SAMPLE REANALYSIS

Sample: MDI CHECK
Acquired: 10-AUG-94 21:33
Dilution: 1 : 1.000

Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000

Filename: CHECK
Operator: MJG
Inj Vol: 50.00



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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:06:02

SAMPLE: MDI CHECK
#6 in Method: 3191 RUN3
Acquired: 10-AUG-1994 21:33
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: CHECK
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.458	MDI	5.22683	5.22683	2295304	138909	0.00011386	BB
TOTAL			5.22683	5.22683	2295304	138909		

% Rec

$\frac{5.23}{4.90} \times 100\% = 107\%$

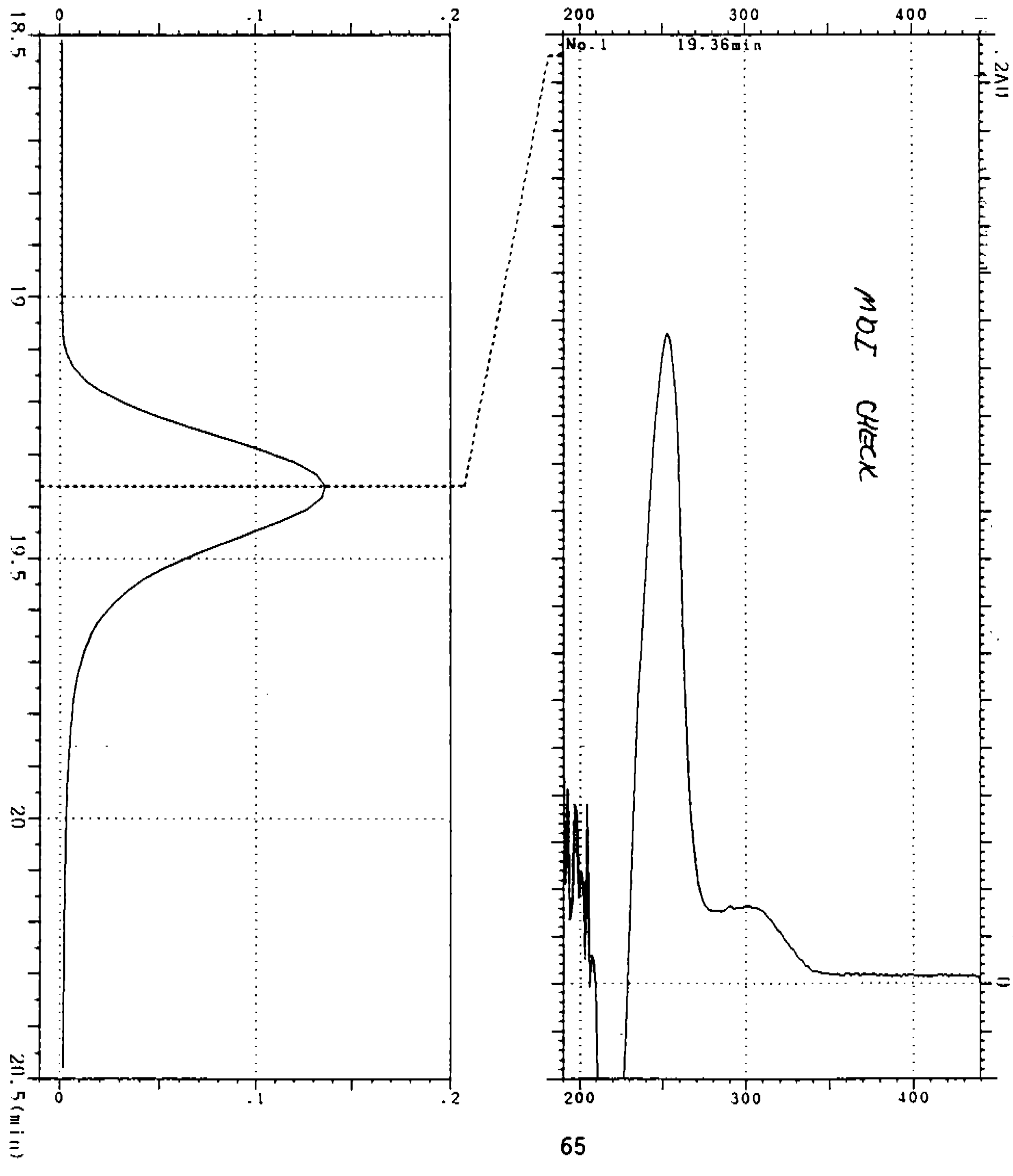
M991 Spectrum index plot (peak)

3191R36.DT3	08-10-1994 21:25:55	Sample name	3191R3 6
Y-scale	.21 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	0 --- 8 min	Pressure	
< 1 AUX >		< 2 AUX >	
Y-scale	1 AU /FS		
Time offset	0 min		(Disabled)
[470FLOURESCE]			
< 3 AUX >		< 4 AUX >	
	(Disabled)		(Disabled)

Chromato 254 nm

-.01 --- .2 AU

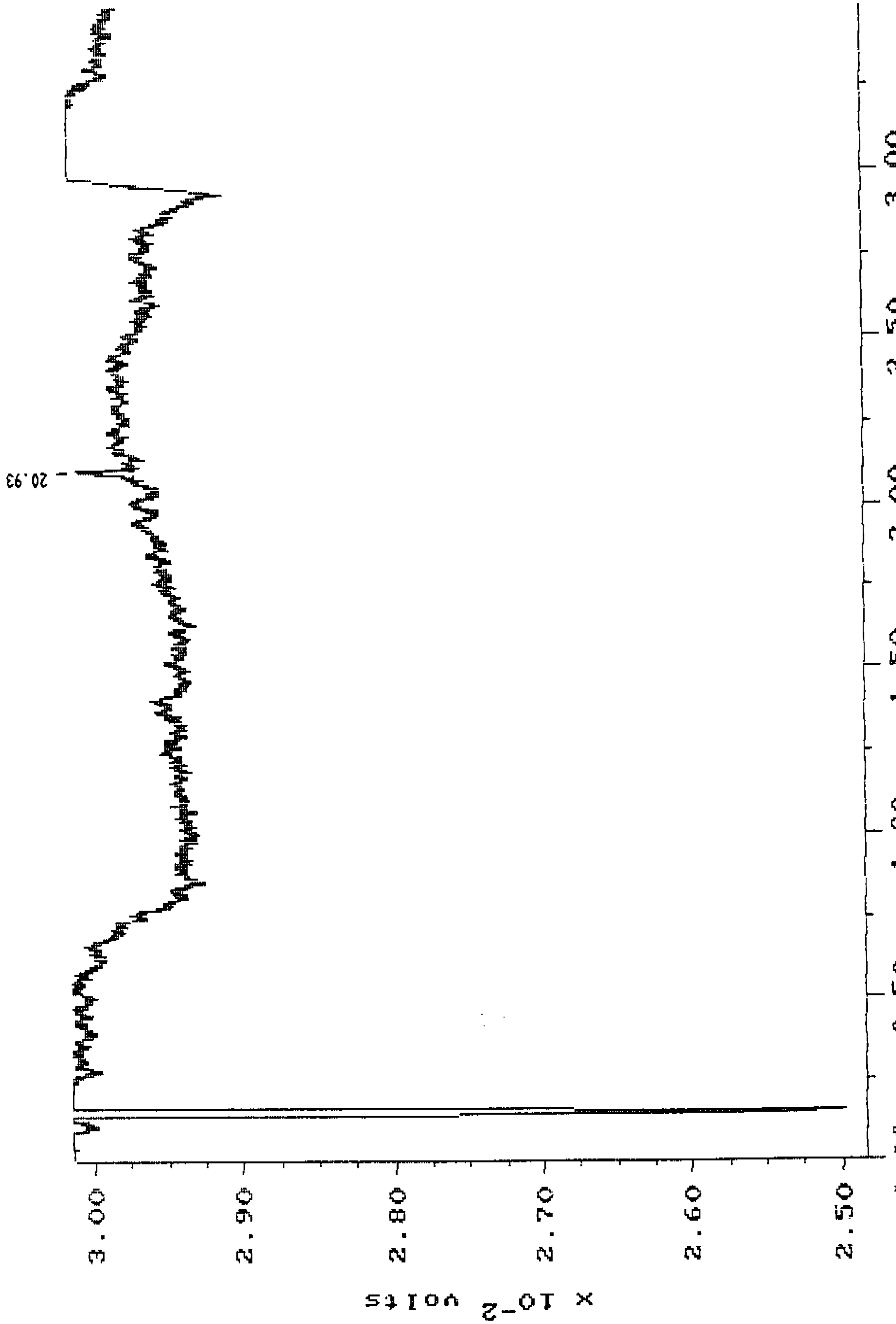
Wavelength 190 --- 439.6 nm



Sample: ACN BLANK
Acquired: 10-AUG-94 22:10
Dilution: 1 : 1.000

Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000

Filename: ACNBLK
Operator: MJ6
Inj Vol: 50.00



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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:06:15

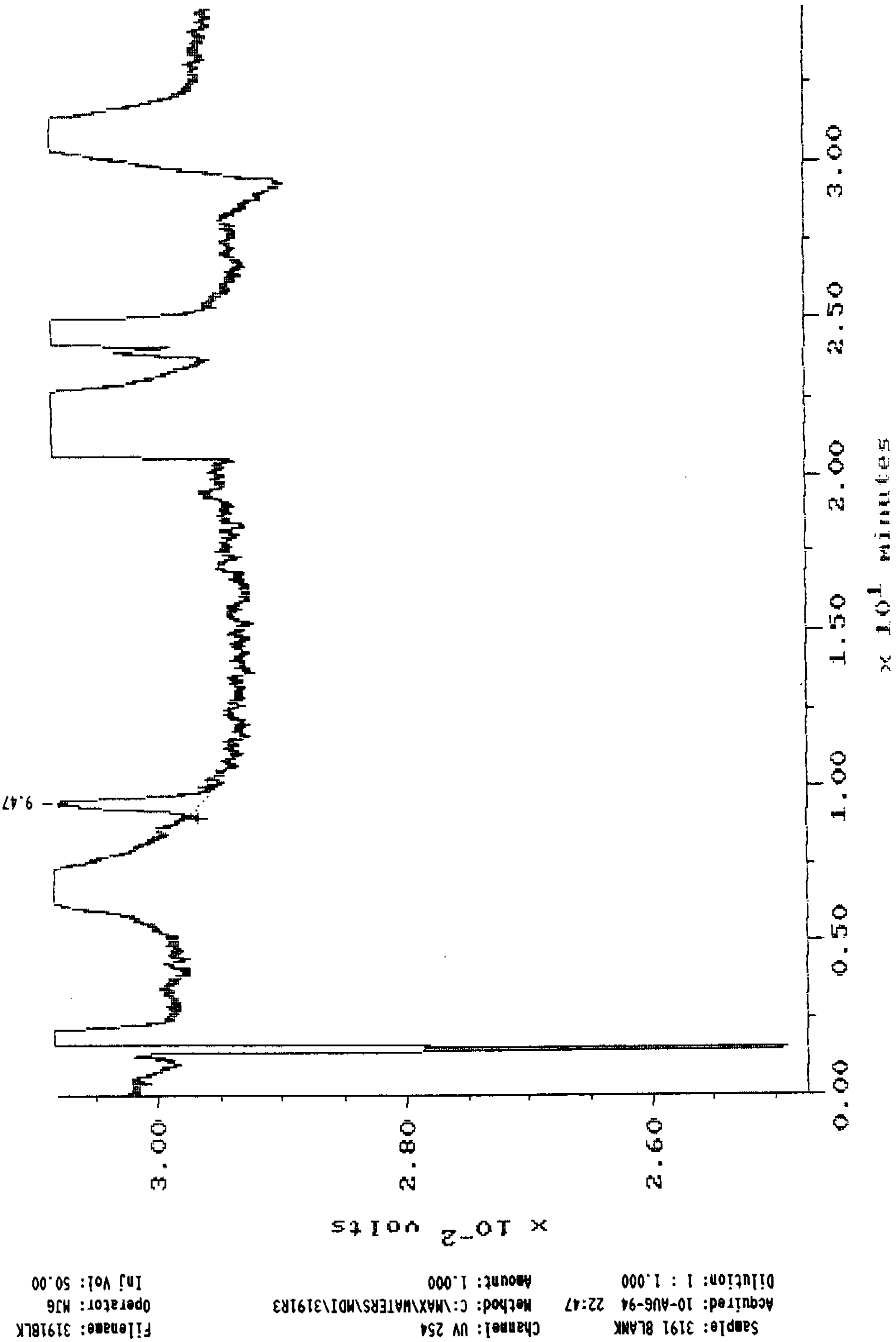
SAMPLE: ACN BLANK
#7 in Method: 3191 RUN3
Acquired: 10-AUG-1994 22:10
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: ACNBLK
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	20.933				3948	380		BB
TOTAL			0.00000	0.00000	3948	380		

BOL


Sample: 3191 BLANK
Acquired: 10-AUG-94 22:47
Dilution: 1 : 1.000
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000
Filename: 3191BLK
Operator: MJG
Inj Vol: 50.00
x 10^-2 volts
3.00
2.80
2.60
x 10^1 minutes
0.00
0.50
1.00
1.50
2.00
2.50
3.00
9.47

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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:06:26

SAMPLE: 3191 BLANK
#8 in Method: 3191 RUN3
Acquired: 10-AUG-1994 22:47
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: 3191BLK
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

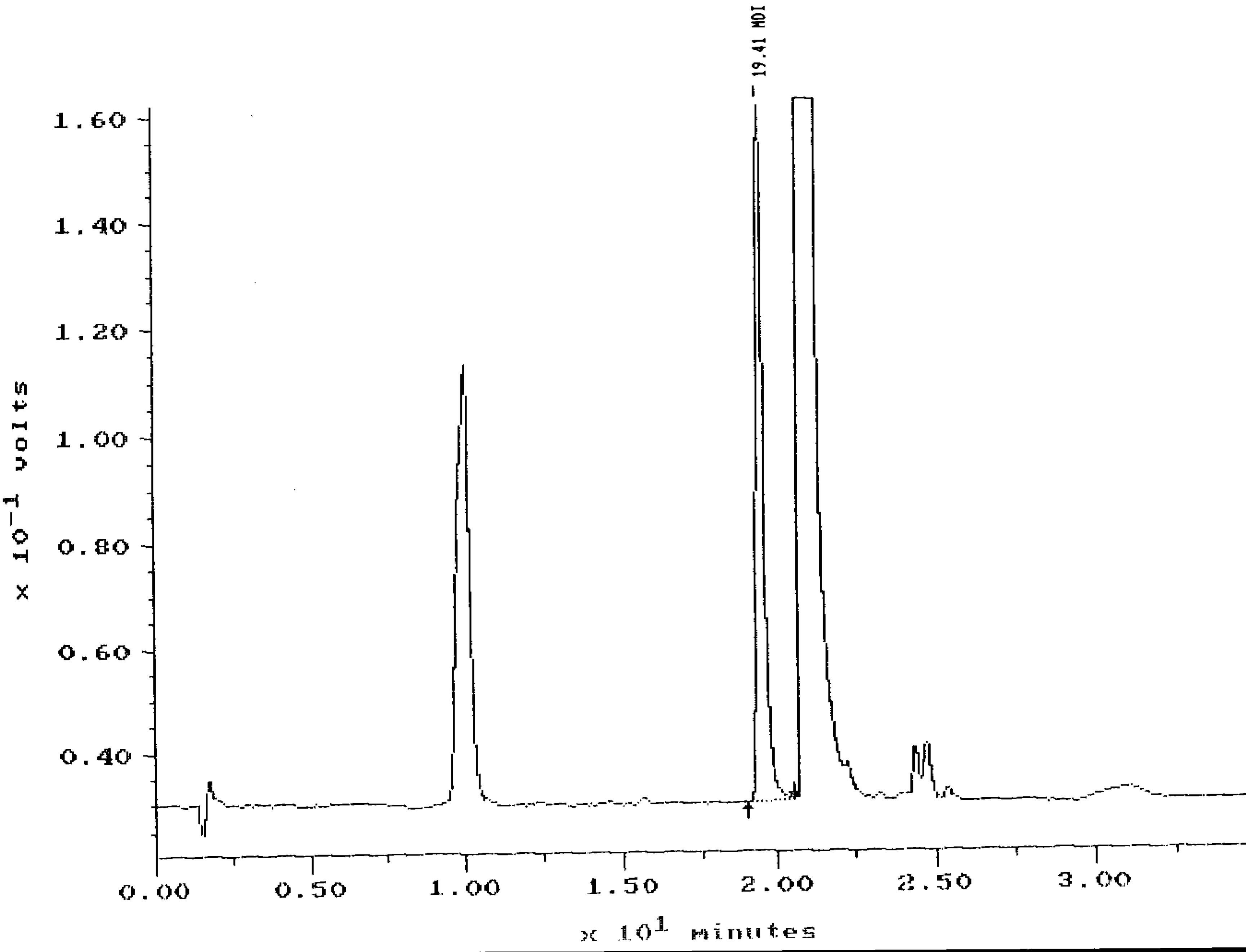
Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	9.467				28071	1147		BB
TAL			0.00000	0.00000	28071	1147		

BDL

Sample: 3191 SPIKE1
Acquired: 10-AUG-94 23:24
Dilution: 1 : 1.000

Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000

Filename: 3191SPK1
Operator: MJG
Inj Vol: 50.00



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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:06:38

SAMPLE: 3191 SPIKE1
#9 in Method: 3191 RUN3
Acquired: 10-AUG-1994 23:24
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: 3191SPK1
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.408	MDI	4.99835	4.99835	2194967	131342	0.00011386	BB
TOTAL			4.99835	4.99835	2194967	131342		

$\underline{\mu g}$

5.00 μg/ml x 50 ml = 250 μg

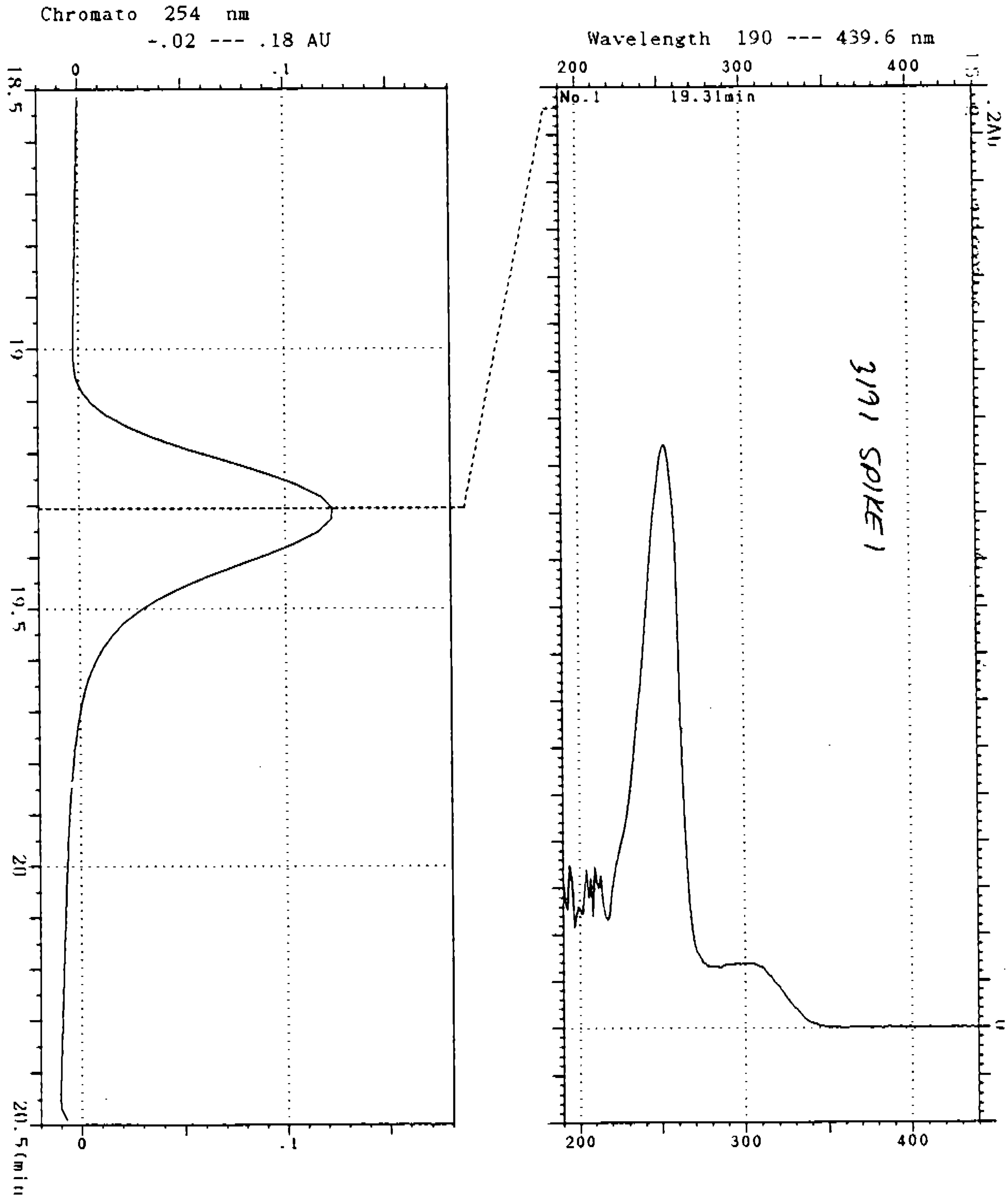
$\underline{\%\ Rec}$

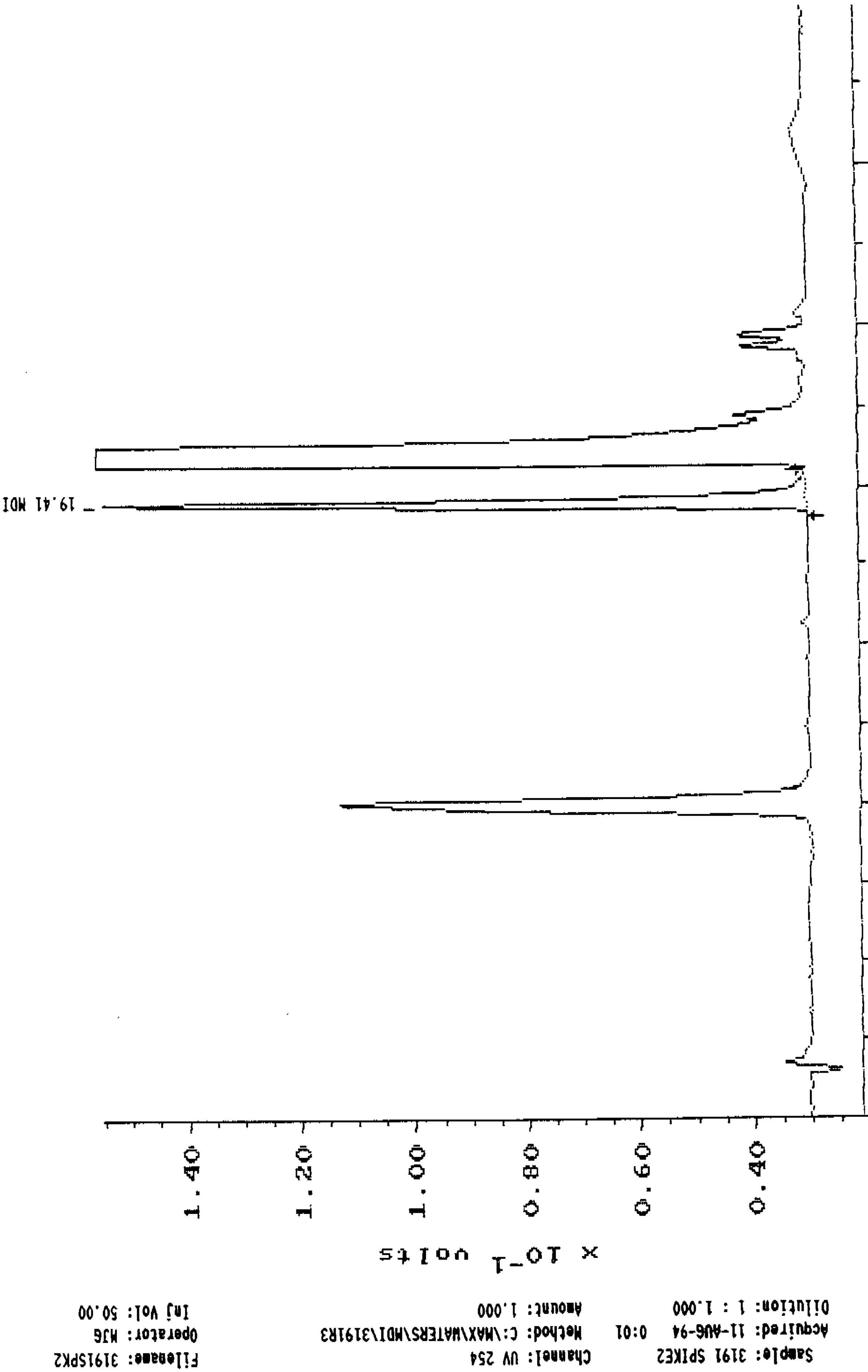
(250 - BDL) / 259 x 100% = 96.5%

SPIKE LEVEL ⇒ 10 ml x 25.9 μg/ml = 259 μg

M991 Spectrum index plot (peak)

3191R39.DT3	08-10-1994 23:17:27	Sample name	3191R3 9
Y-scale	.2 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	18.5 --- 20.5 min	Pressure	
< 1 AUX >		< 2 AUX >	
Y-scale	1 AU /FS		
Time offset	0 min		(Disabled)
470FLOURESCE]			
< 3 AUX >		< 4 AUX >	
	(Disabled)		(Disabled)





Sample: 3191 SPIKE2
Acquired: 11-AUG-94 0:01
Dilution: 1 : 1.000
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000
Filename: 3191SPK2
Operator: MJG
Inj Vol: 50.00
19.41 MDI
x 10^-1 volts
1.40
1.20
1.00
0.80
0.60
0.40
0.00
0.50
1.00
1.50
2.00
2.50
3.00
x 10^1 minutes

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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:06:50

SAMPLE: 3191 SPIKE2
#10 in Method: 3191 RUN3
Acquired: 11-AUG-1994 0:01
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: 3191SPK2
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.408	MDI	4.72751	4.72751	2076032	124331	0.00011386	BB
TOTAL			4.72751	4.72751	2076032	124331		

µg

4.73 µg/ml x 50ml = 236 µg

% Rec

(236 - BDL)/255 x 100% = 91.1%

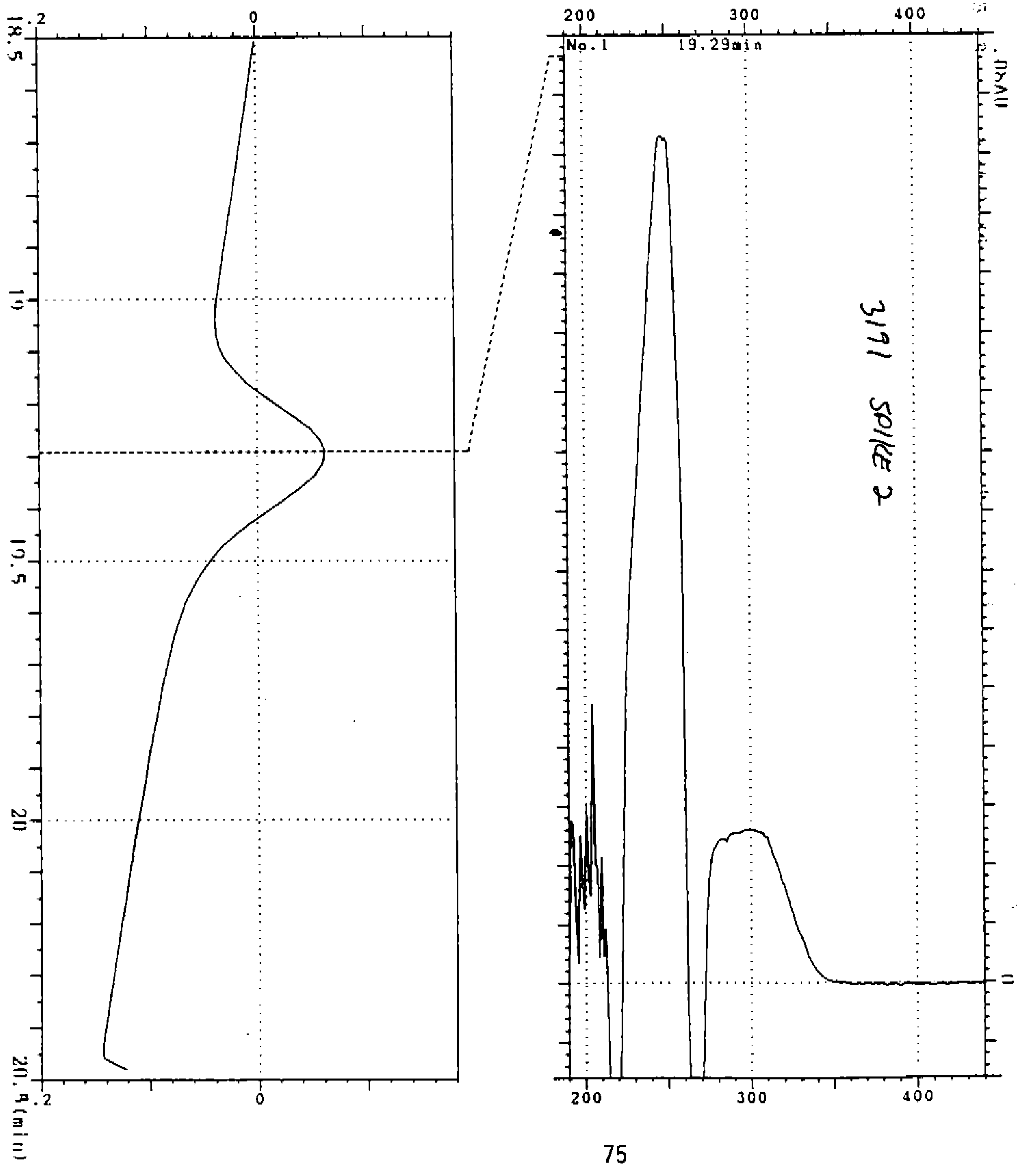
M991 Spectrum index plot (peak)

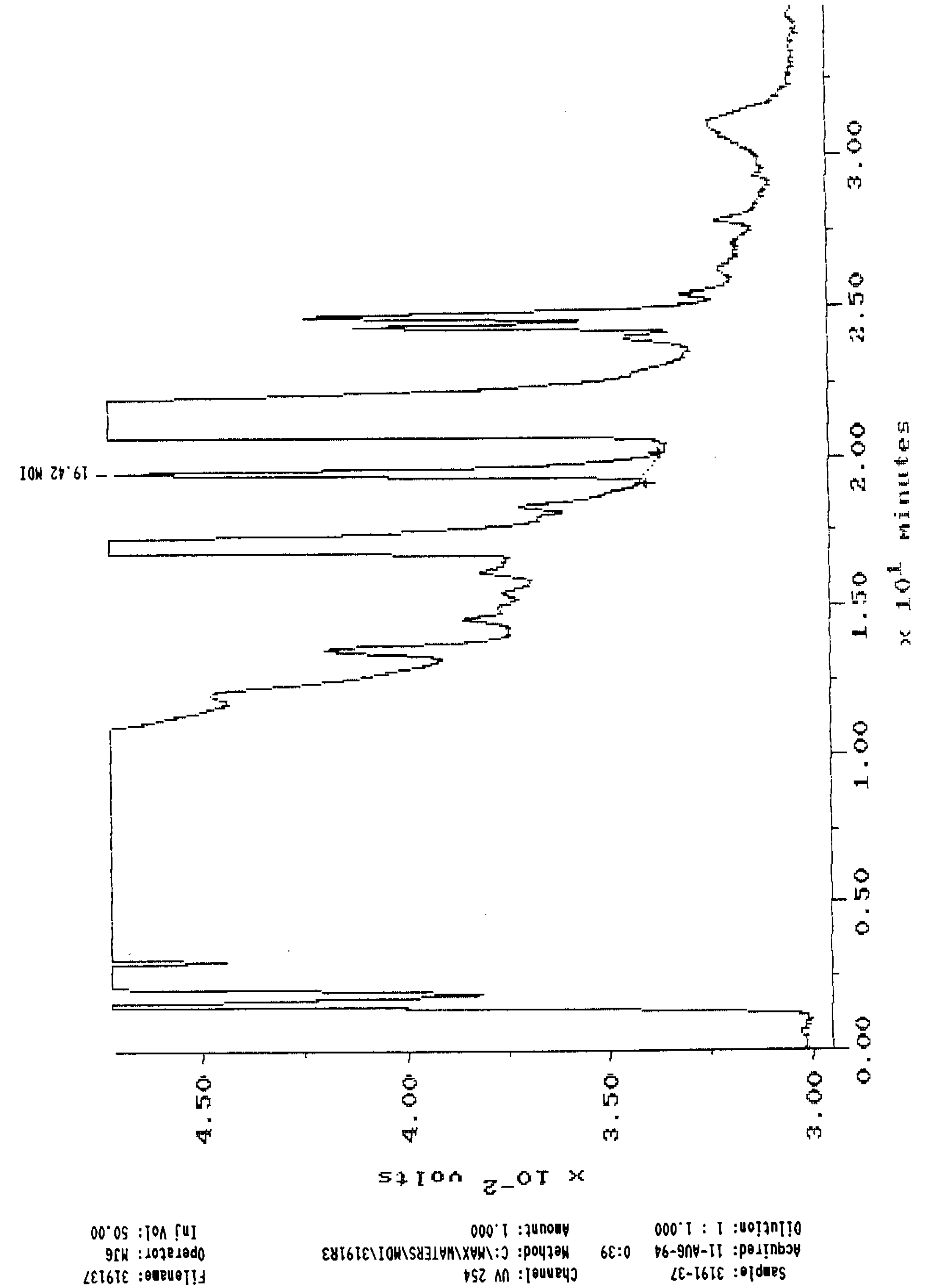
3191R310.DT3	08-10-1994 23:54:38	Sample name	3191R310
Y-scale	.38 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	18.5 --- 20.5 min	Pressure	

< 1 AUX >
Y-scale 1 AU /FS
Time offset 0 min
[470FLOURESCE]
< 3 AUX >
(Disabled)

< 2 AUX >
(Disabled)

< 4 AUX >
(Disabled)




Sample: 3191-37
Acquired: 11-AUG-94 0:39
Dilution: 1 : 1.000
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000
Filename: 319137
Operator: MJG
Inj Vol: 50.00
x 10^-2 volts
x 10^1 minutes
19.42 MDI
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50

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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:07:01

SAMPLE: 3191-37
#11 in Method: 3191 RUN3
Acquired: 11-AUG-1994 0:39
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: 319137
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

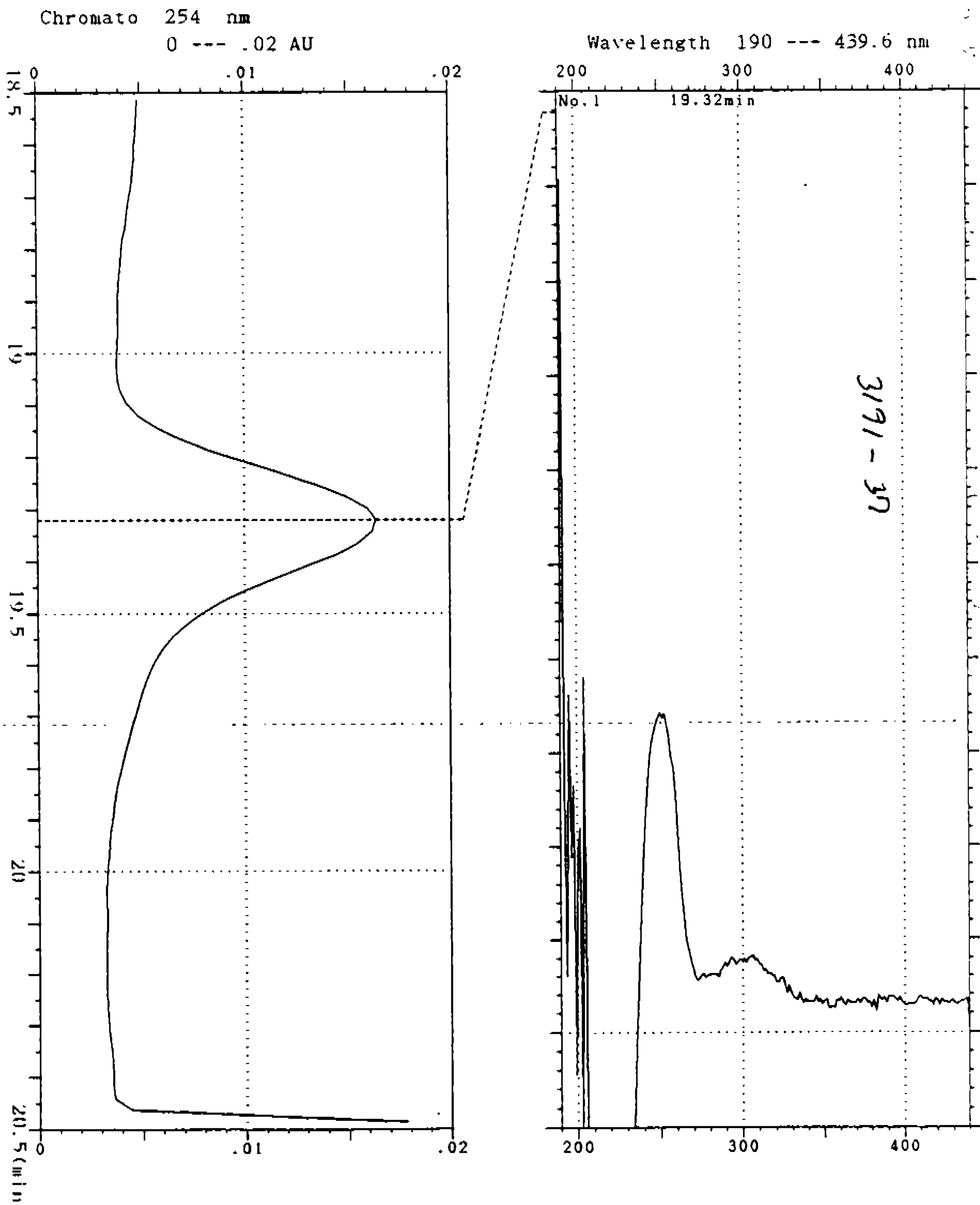
Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.417	MOI	0.51815	0.51815	227540	13085	0.00011386	BB
TOTAL			0.51815	0.51815	227540	13085		

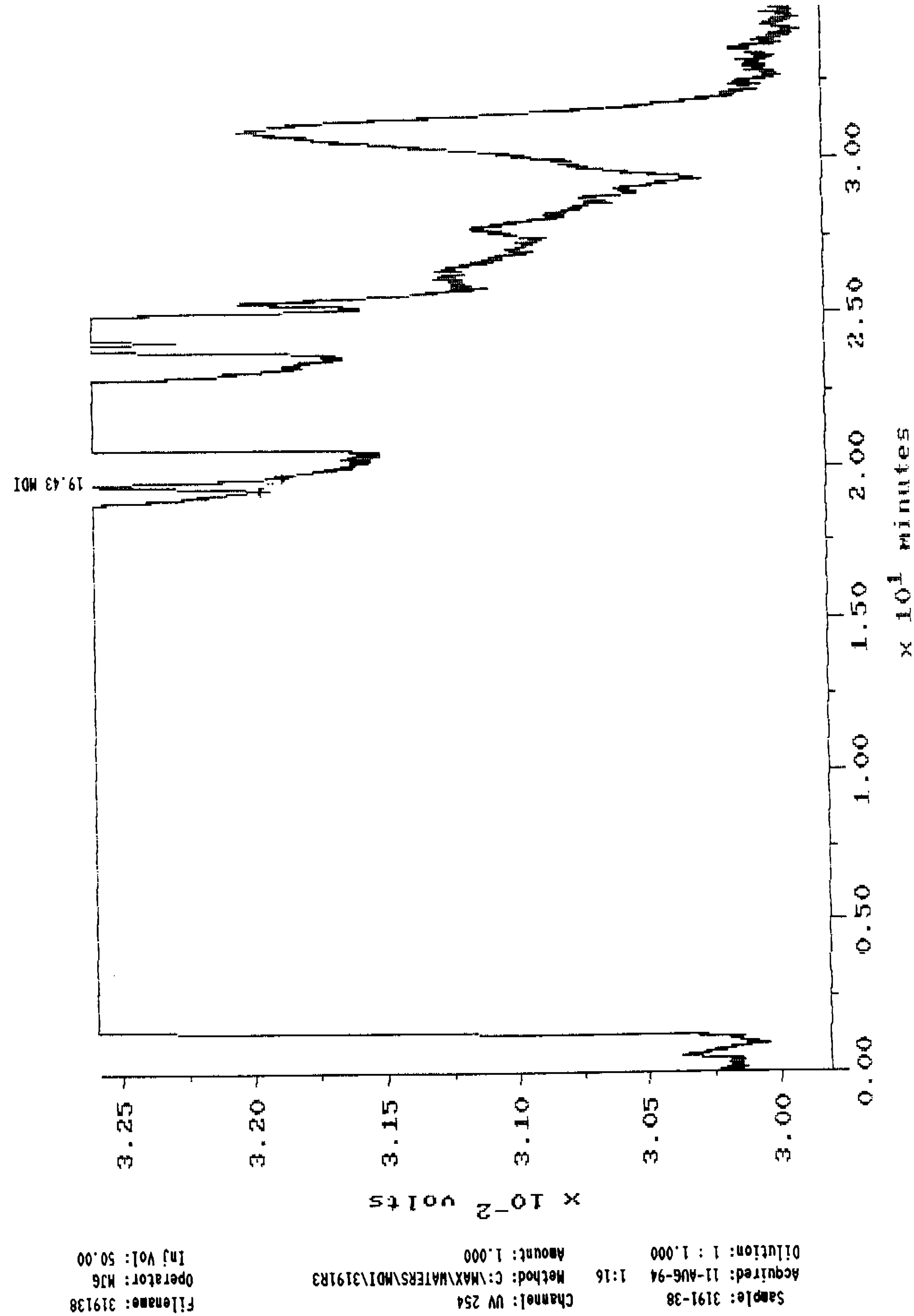
μg

0.518 μg/ml × 50 ml = 25.9 μg

M991 Spectrum index plot (peak)

3191R311.DT3	08-11-1994 00:31:49	Sample name	3191R311
Y-scale	.02 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	OFF	Pressure	
< 1 AUX >		< 2 AUX >	
Y-scale	1 AU /FS		(Disabled)
Time offset	0 min		
[470FLOURESCE]			
< 3 AUX >		< 4 AUX >	
	(Disabled)		(Disabled)




Sample: 3191-38
Acquired: 11-AUG-94 1:16
Dilution: 1 : 1.000
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000
Filename: 319138
Operator: MJG
Inj Vol: 50.00
x 10^-2 volts
3.25
3.20
3.15
3.10
3.05
3.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
x 10^1 minutes
19.43 MDI

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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:07:13

SAMPLE: 3191-38
#12 in Method: 3191 RUN3
Acquired: 11-AUG-1994 1:16
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: 319138
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.433	MDI	0.01846	0.01846	8105	640	0.00011386	BB
TOTAL			0.01846	0.01846	8105	640		

ND

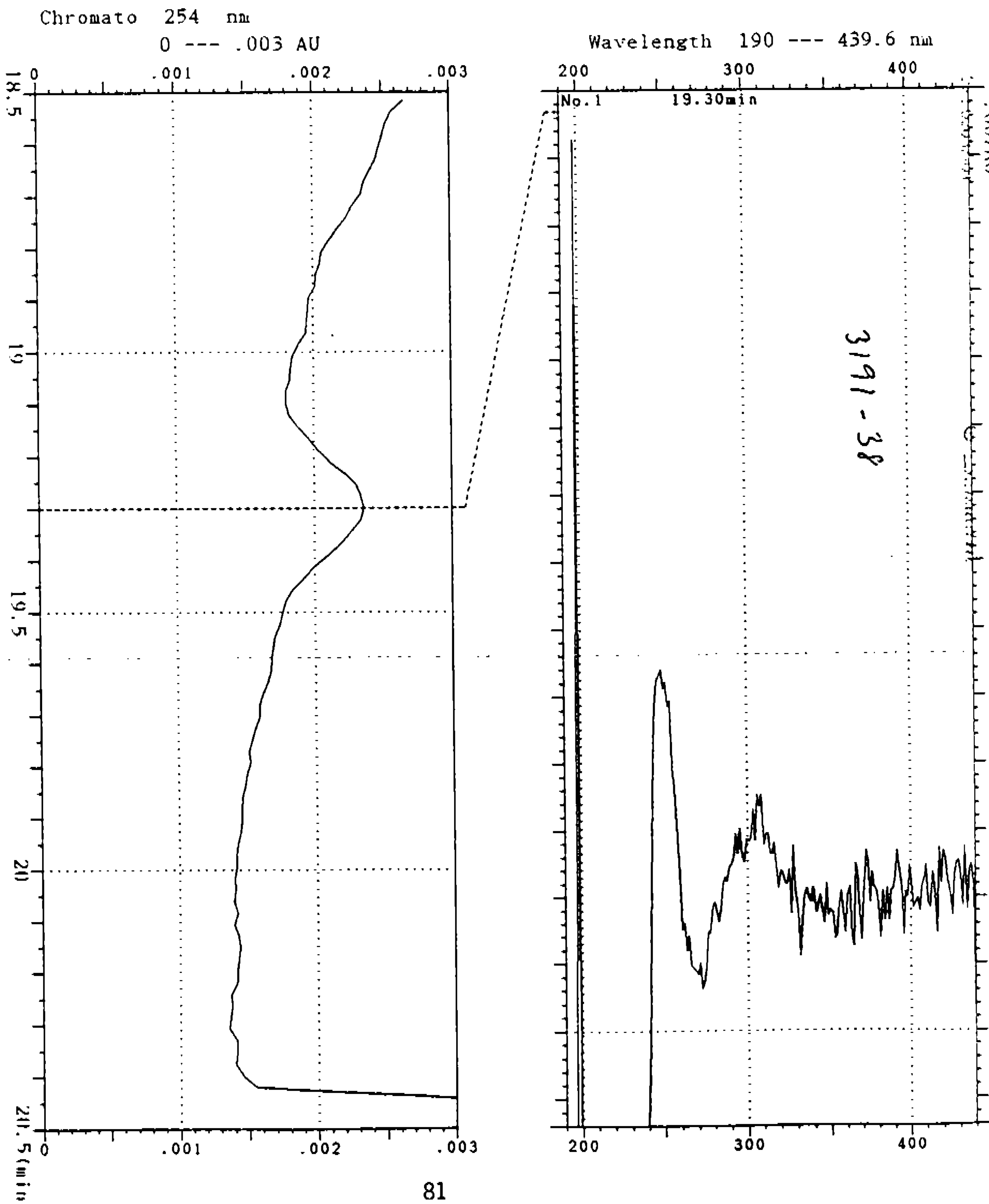
BDL

Det. Limit

0.050 µg/ml x 50 ml = 2.5 µg

M991 Spectrum index plot (peak)

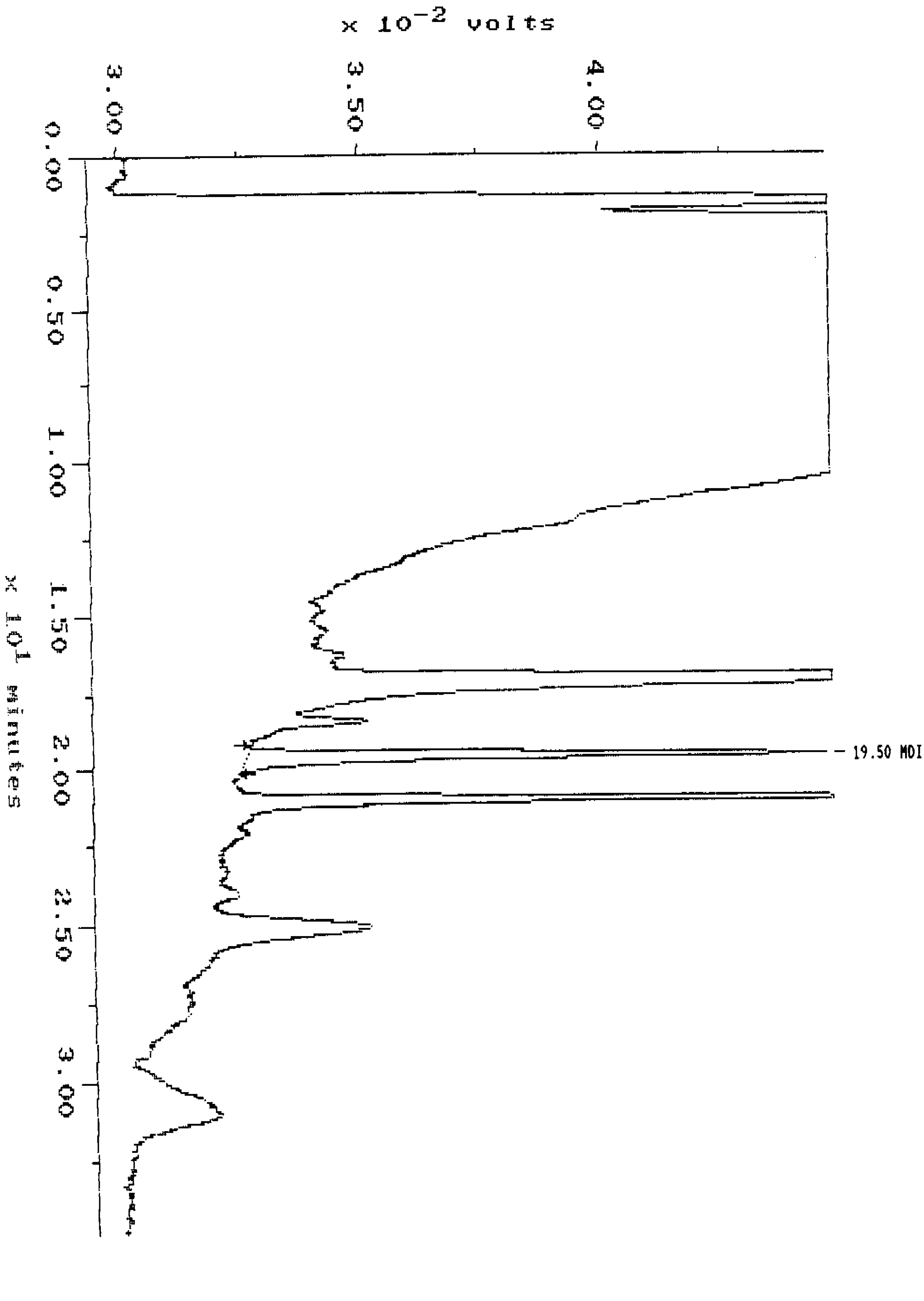
3191R312.DT3	08-11-1994 01:08:59	Sample name	3191R312
Y-scale	.003 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	OFF	Pressure	
< 1 AUX >		< 2 AUX >	
Y-scale	1 AU /FS		(Disabled)
Time offset	0 min		
[470FLOURESCE]			
< 3 AUX >		< 4 AUX >	
	(Disabled)		(Disabled)



Sample: 3191-39
Acquired: 11-AUG-94 1:53
Dilution: 1 : 1.000

Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000

Filename: 319139
Operator: MJG
Inj Vol: 50.00



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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:07:25

SAMPLE: 3191-39
#13 in Method: 3191 RUN3
Acquired: 11-AUG-1994 1:53
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: 319139
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

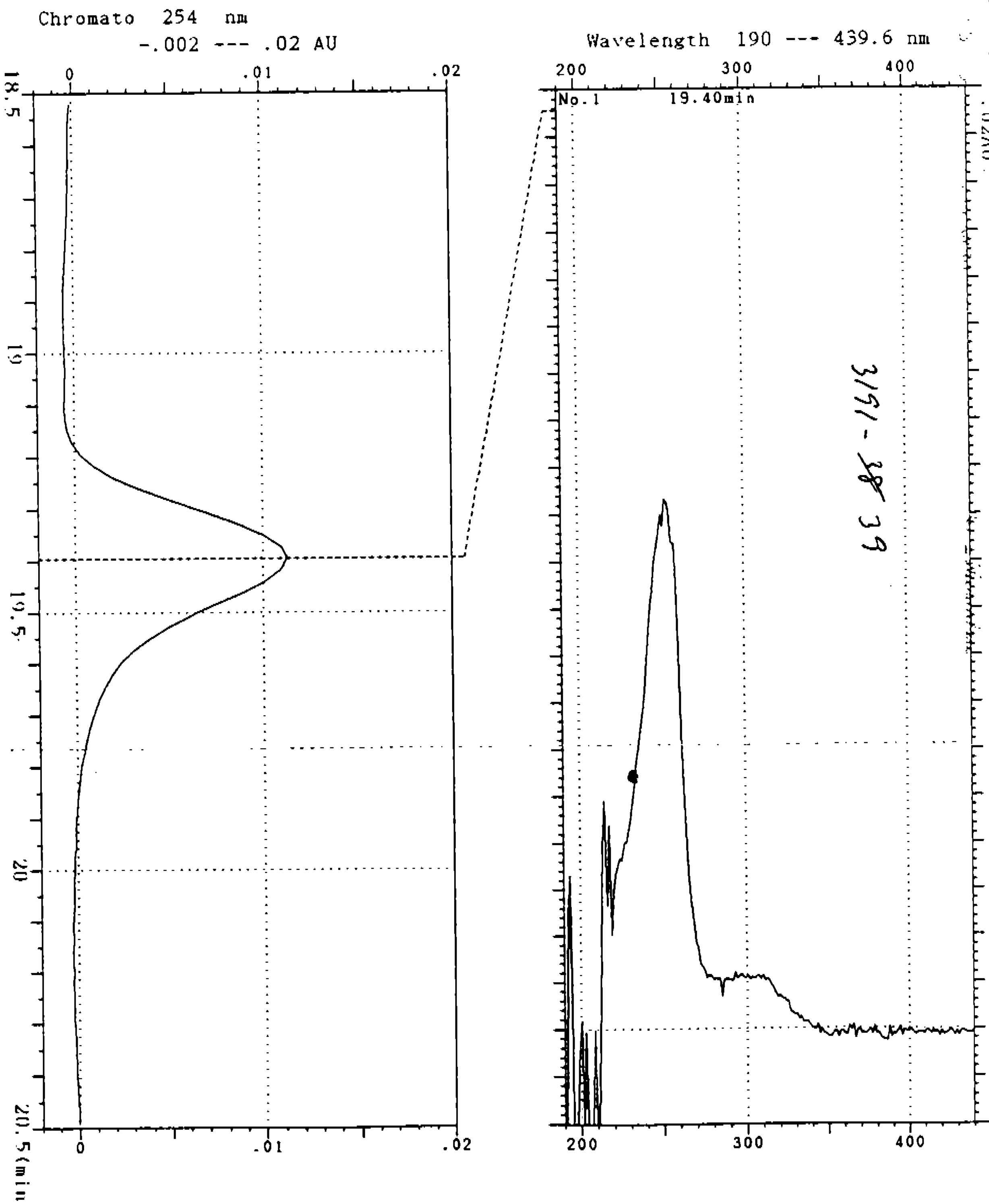
Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.500	MDI	0.43792	0.43792	192308	12022	0.00011386	BB
TOTAL			0.43792	0.43792	192308	12022		

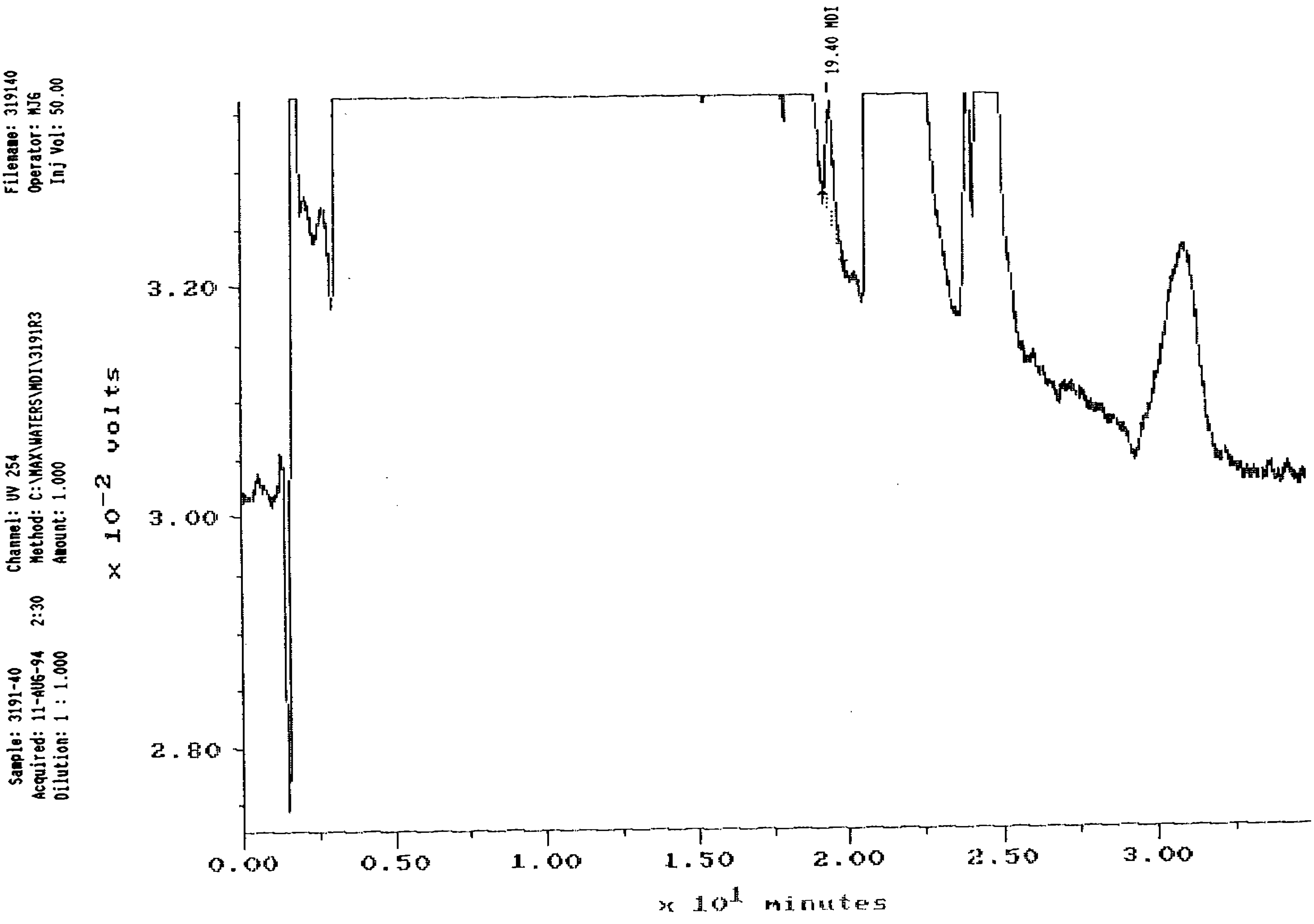
μg

0.438 μg/ml x 50ml = 21.9μg

M991 Spectrum index plot (peak)

3191R313.DT3	08-11-1994 01:46:09	Sample name	3191R313
Y-scale	.022 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	18.5 --- 20.5 min	Pressure	
< 1 AUX >		< 2 AUX >	
Y-scale	1 AU /FS		(Disabled)
Time offset	0 min		
[470FLOURESCE]			
< 3 AUX >		< 4 AUX >	
	(Disabled)		(Disabled)




Sample: 3191-40
Acquired: 11-AUG-94 2:30
Dilution: 1 : 1.000
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000
Filename: 319140
Operator: MJG
Inj Vol: 50.00
19.40 MDI
3.20
3.00
2.80
x 10^-2 volts
0.00
0.50
1.00
1.50
2.00
2.50
3.00
x 10^1 minutes

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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:07:36

SAMPLE: 3191-40
#14 in Method: 3191 RUN3
Acquired: 11-AUG-1994 2:30
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: 319140
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

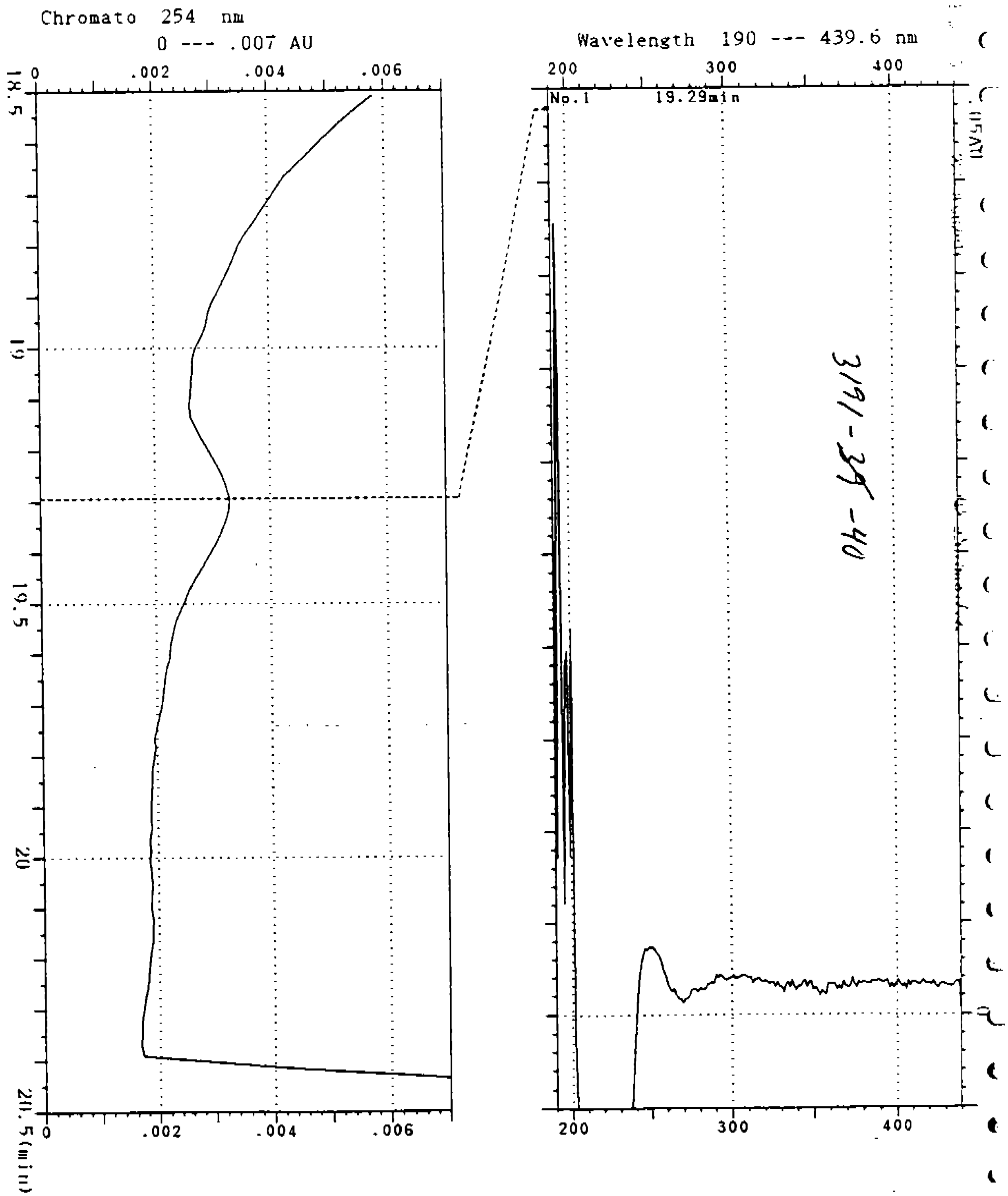
DETECTOR: UV 254

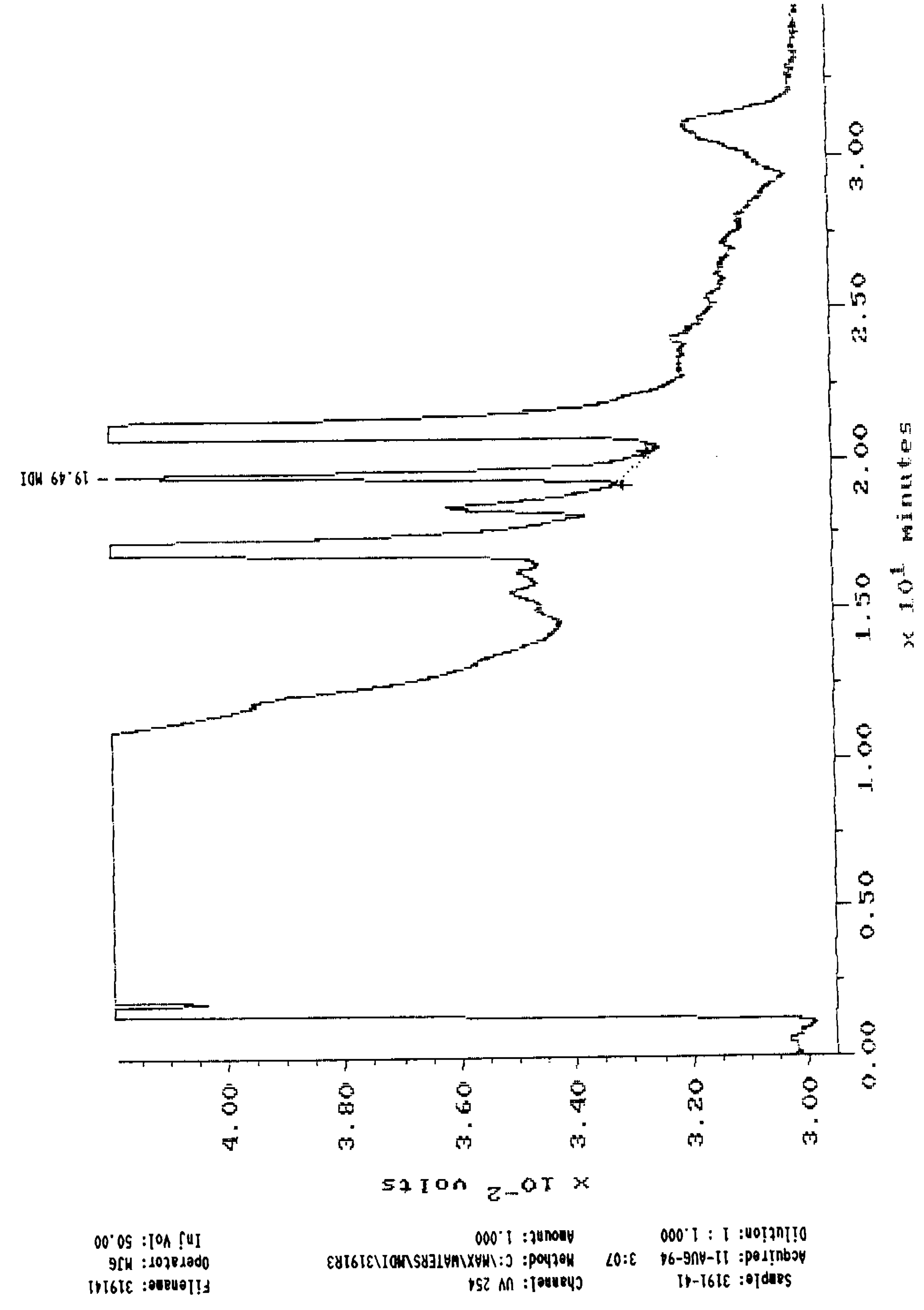
Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.400	MDI	0.03190	0.03190	14007	933	0.00011386	88
TOTAL			0.03190	0.03190	14007	933		

BDL

M991 Spectrum index plot (peak)

3191R314.DT3	08-11-1994 02:23:21	Sample name	3191R314
Y-scale	.007 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	OFF	Pressure	
< 1 AUX >		< 2 AUX >	
Y-scale	1 AU /FS		(Disabled)
Time offset	0 min		
[470FLOURESCE]		< 4 AUX >	
< 3 AUX >			
	(Disabled)		(Disabled)




Sample: 3191-41
Acquired: 11-AUG-94 3:07
Dilution: 1 : 1.000
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000
Filename: 319141
Operator: MJG
Inj Vol: 50.00
19.49 MDI
x 10^-2 volts
x 10^1 minutes

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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:07:48

SAMPLE: 3191-41
#15 in Method: 3191 RUN3
Acquired: 11-AUG-1994 3:07
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: 319141
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.492	MDI	0.33675	0.33675	147882	8773	0.00011386	BB
TOTAL			0.33675	0.33675	147882	8773		

~~μg~~

0.337 μg/ml x 50ml = 16.8 μg

M991 Spectrum index plot (peak)

3191R315.DT3 08-11-1994 03:00:32
Y-scale .02 AU/FS
Slope .001 AU/min
Sampling time 21 msec *32
Sense high 7
Resolution 1.3 nm
Time range 18.5 --- 20.5 min
Interval 1.34 sec
Baseline OFF
< 1 AUX >
Y-scale 1 AU /FS
Time offset 0 min
[470FLOURESCE]
< 3 AUX >

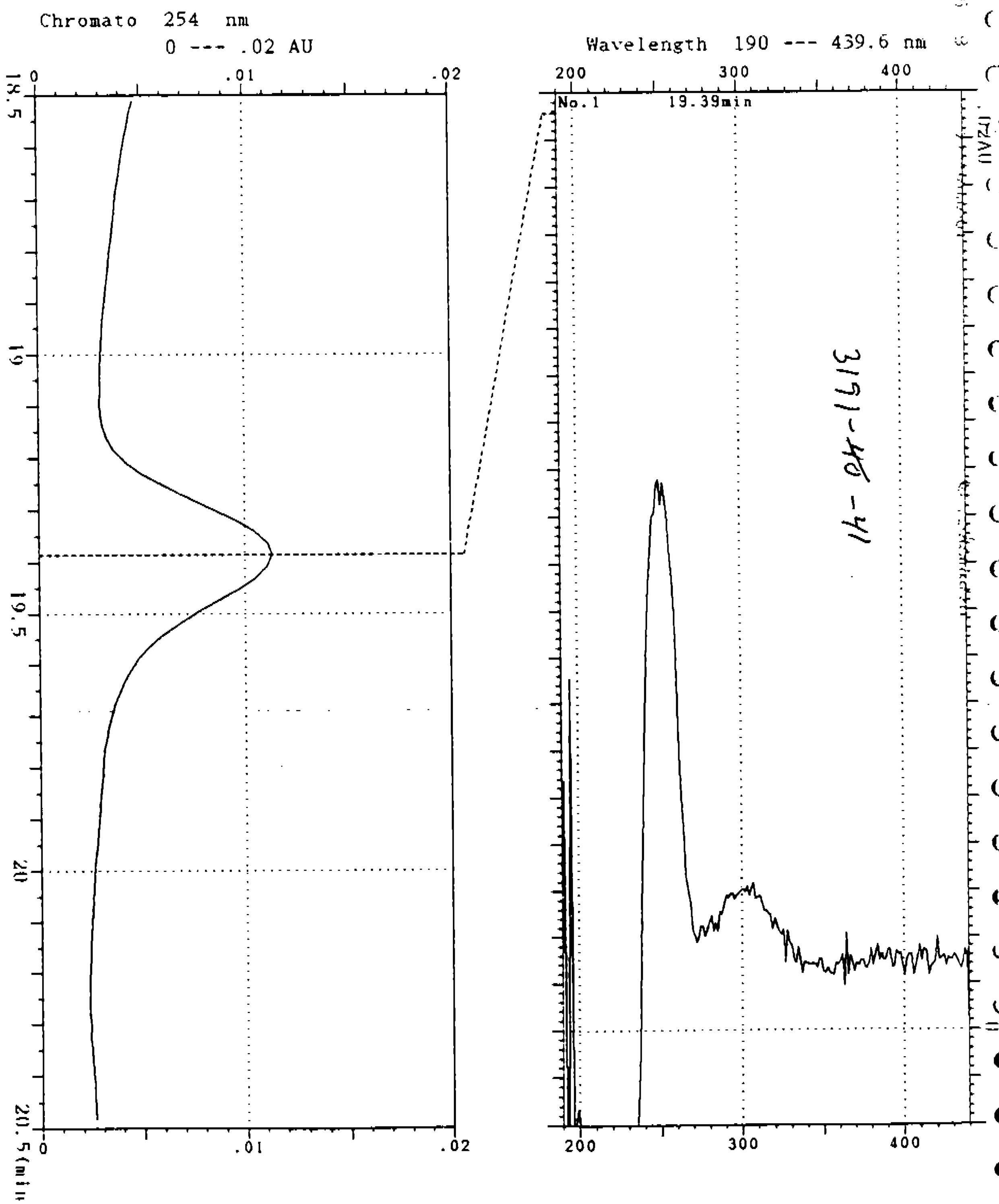
(Disabled)

Sample name 3191R315
Paper speed 93.68 mm/min
Wavelength 190 --- 439.6 nm
Auto gain OFF
Column mm ID * mm
Packing material
Mobile phase
Flow rate ml/min
Pressure
< 2 AUX >

(Disabled)

< 4 AUX >

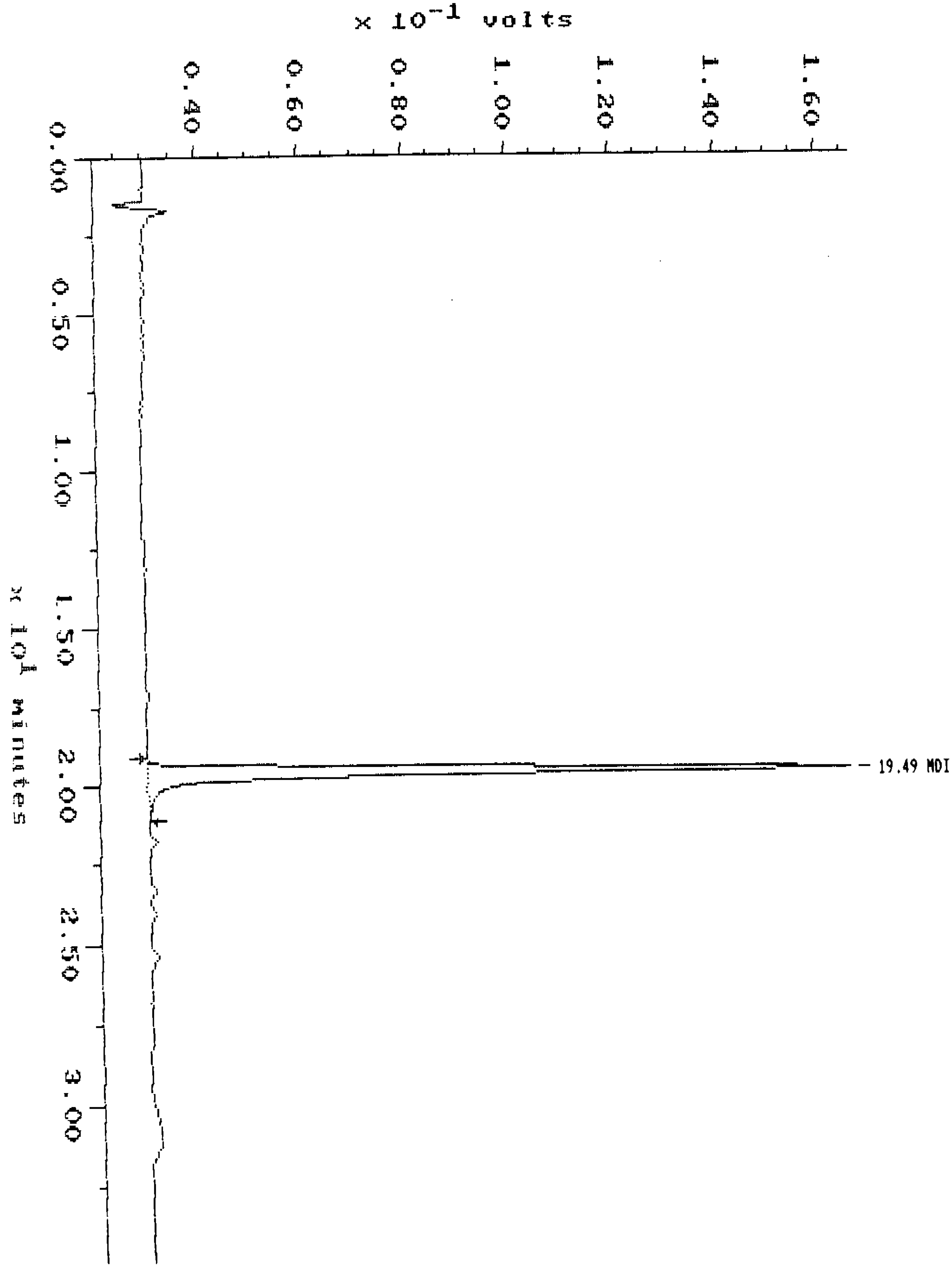
(Disabled)



Sample: CHECK RUN2
Acquired: 11-AUG-94 3:45
Dilution: 1 : 1.000

Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000

Filename: CHECKR2
Operator: MJG
Inj Vol: 50.00



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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:08:00

SAMPLE: CHECK RUN2
#16 in Method: 3191 RUN3
Acquired: 11-AUG-1994 3:45
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: CHECKR2
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

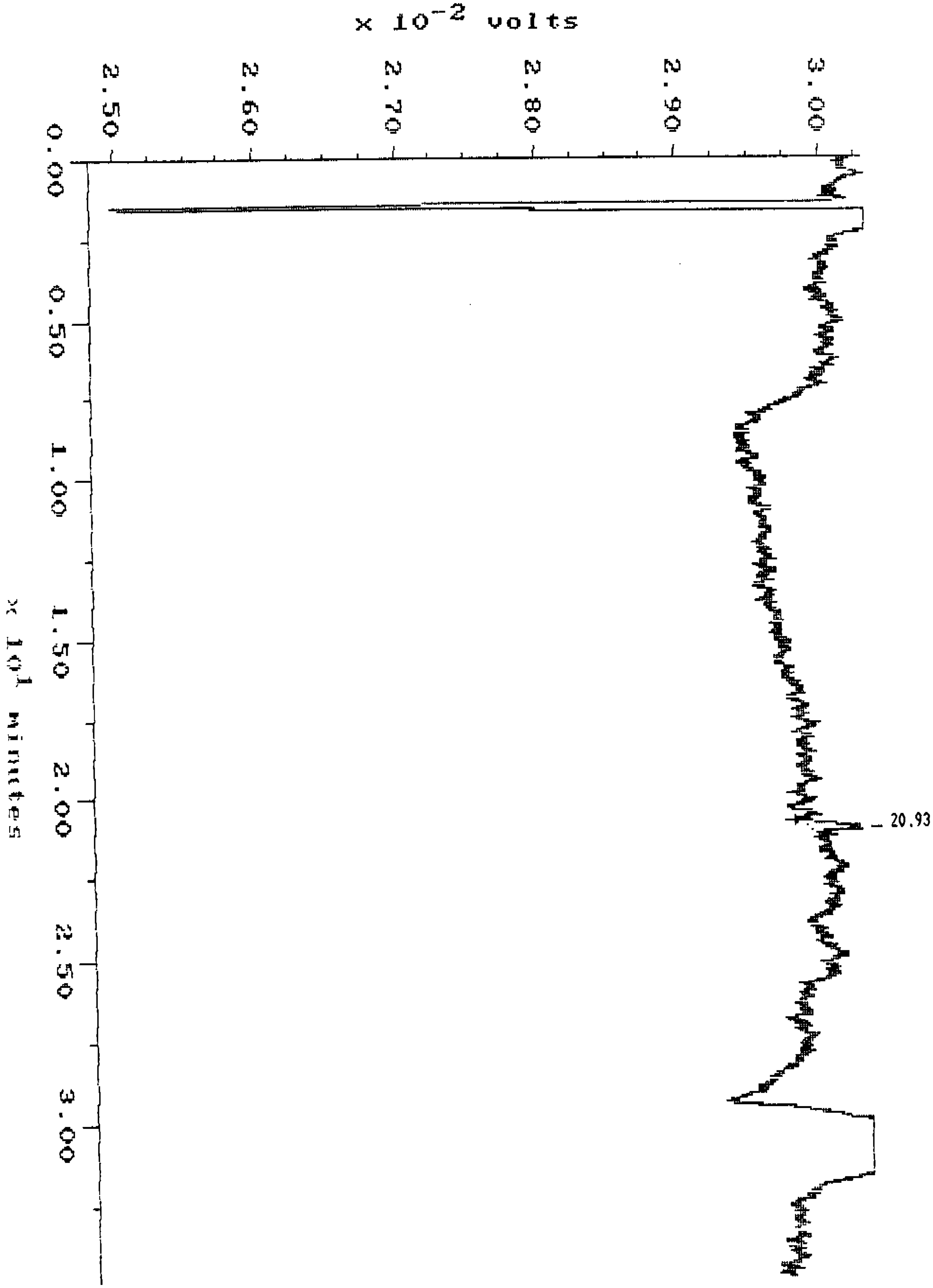
DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.492	MDI	5.22308	5.22308	2293658	135502	0.00011386	88
TOTAL			5.22308	5.22308	2293658	135502		

%Rec

$5.22/4.96 \times 100\% = 107\%$

Sample: ACN BLANK2 Channel: UV 254 Filename: ACNBLK2
Acquired: 11-AUG-94 4:22 Method: C:\MAX\WATERS\MDI\3191R3 Operator: MJG
Dilution: 1 : 1.000 Amount: 1.000 Inj Vol: 50.00



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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:08:11

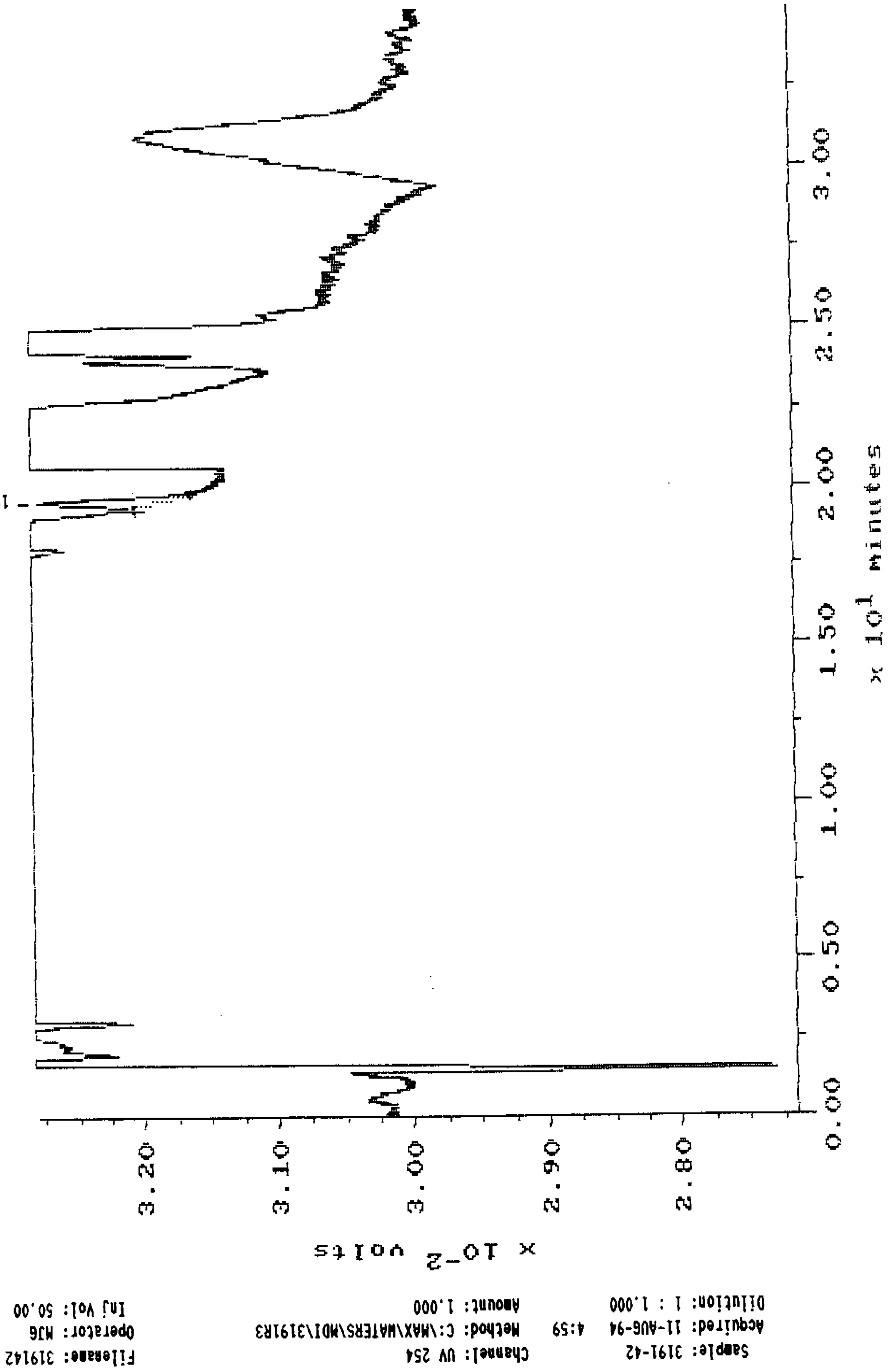
SAMPLE: ACN BLANK2
#17 in Method: 3191 RUN3
Acquired: 11-AUG-1994 4:22
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: ACNBLK2
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	20.933				5045	346		BB
TOTAL			0.00000	0.00000	5045	346		

BDL


Sample: 3191-42
Acquired: 11-AUG-94 4:59
Dilution: 1 : 1.000
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000
Filename: 319142
Operator: MJG
Inj Vol: 50.00
x 10^-2 volts
2.80
2.90
3.00
3.10
3.20
x 10^1 minutes
0.00
0.50
1.00
1.50
2.00
2.50
3.00
19.44 MDI

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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:08:23

SAMPLE: 3191-42
#18 in Method: 3191 RUN3
Acquired: 11-AUG-1994 4:59
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: 319142
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.442	MDI	0.02524	0.02524	11083	829	0.00011386	BB
TOTAL			0.02524	0.02524	11083	829		

BDL

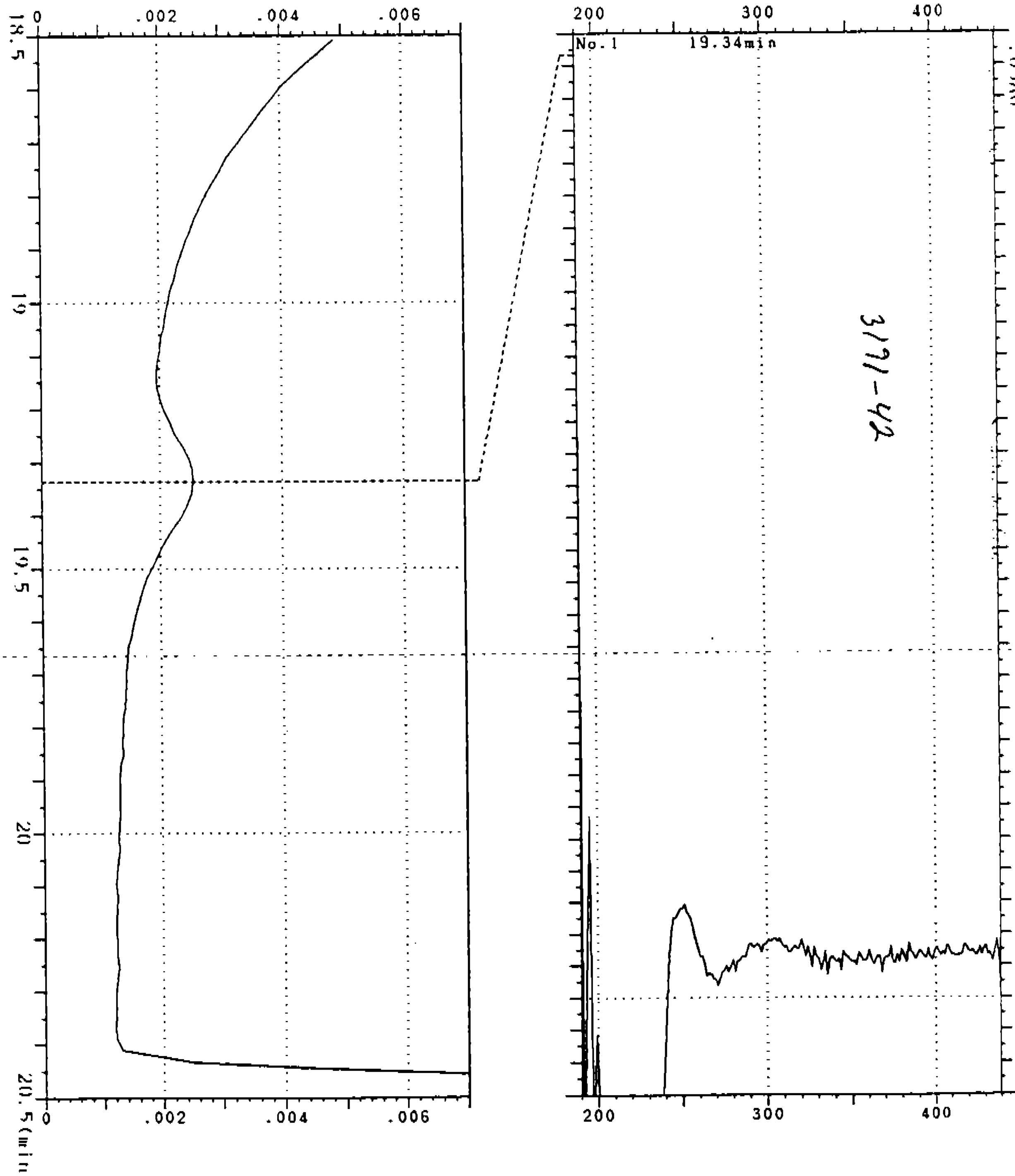
M991 Spectrum index plot (peak)

3191R318.DT3	08-11-1994 04:52:03	Sample name	3191R318
Y-scale	.007 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	OFF	Pressure	
< 1 AUX >		< 2 AUX >	
Y-scale	1 AU /FS		(Disabled)
Time offset	0 min		
[470FLOURESCE]			
< 3 AUX >		< 4 AUX >	
	(Disabled)		(Disabled)

Chromato 254 nm

0 --- .007 AU

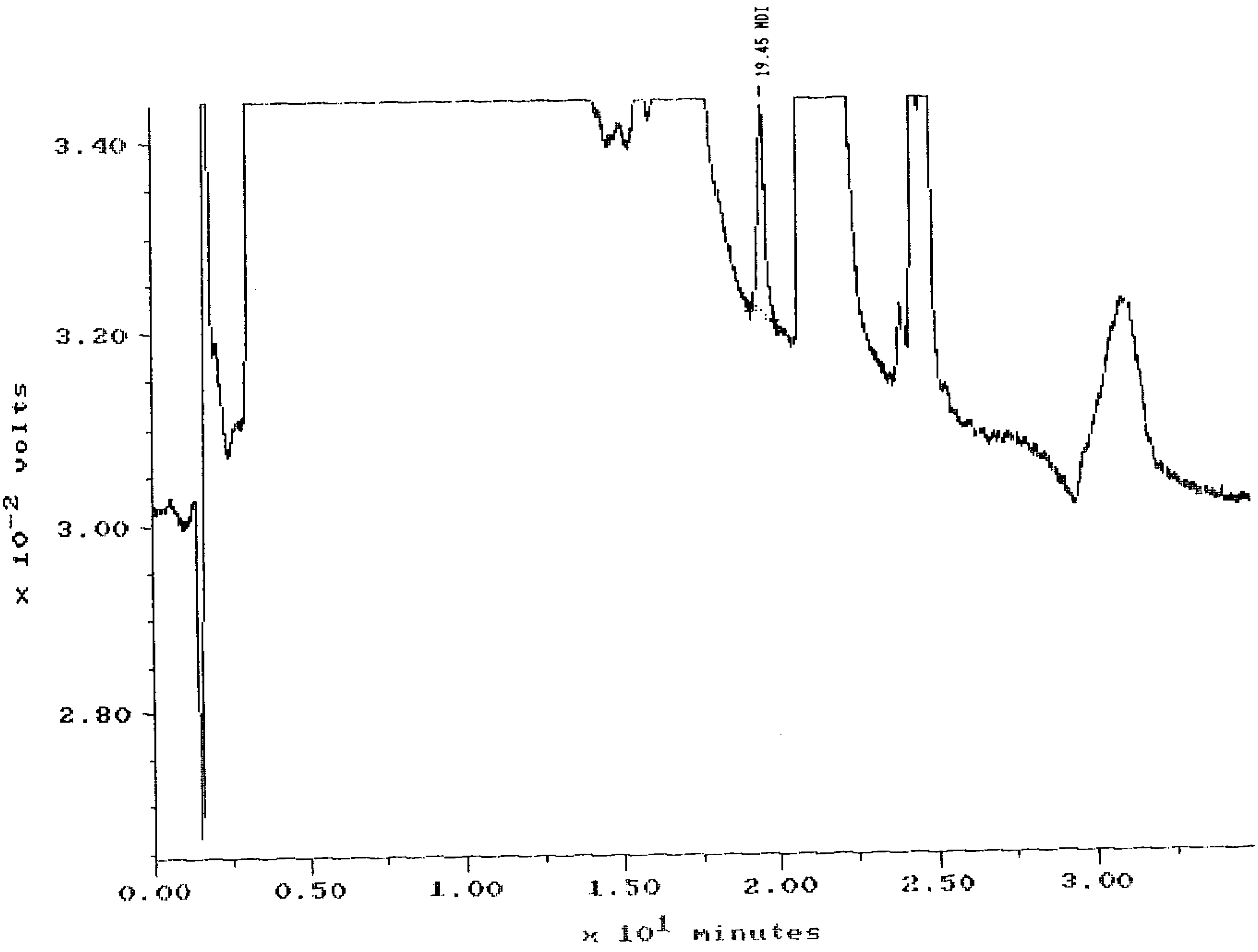
Wavelength 190 --- 439.6 nm



Sample: 3191-43
Acquired: 11-AUG-94 5:36
Dilution: 1 : 1.000

Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000

Filename: 319143
Operator: MJG
Inj Vol: 50.00



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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:08:35

SAMPLE: 3191-43
#19 in Method: 3191 RUN3
Acquired: 11-AUG-1994 5:36
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: 319143
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.450	MDI	0.07797	0.07797	34242	2171	0.00011386	88
TOTAL			0.07797	0.07797	34242	2171		

μg

0.0780 μg/ml × 50ml = 3.9 μg

M991 Spectrum index plot (peak)

3191R319.DT3	08-11-1994 05:29:15	Sample name	3191R319
Y-scale	.007 AU/FS	Paper speed	93.68 mm/min
Slope	.001 AU/min	Wavelength	190 --- 439.6 nm
Sampling time	21 msec *32	Auto gain	OFF
Sense	high 7	Column	mm ID * mm
Resolution	1.3 nm	Packing material	
Time range	18.5 --- 20.5 min	Mobile phase	
Interval	1.34 sec	Flow rate	ml/min
Baseline	OFF	Pressure	

< 1 AUX >

Y-scale 1 AU /FS

Time offset 0 min

[470FLOURESCE]

< 2 AUX >

(Disabled)

< 3 AUX >

(Disabled)

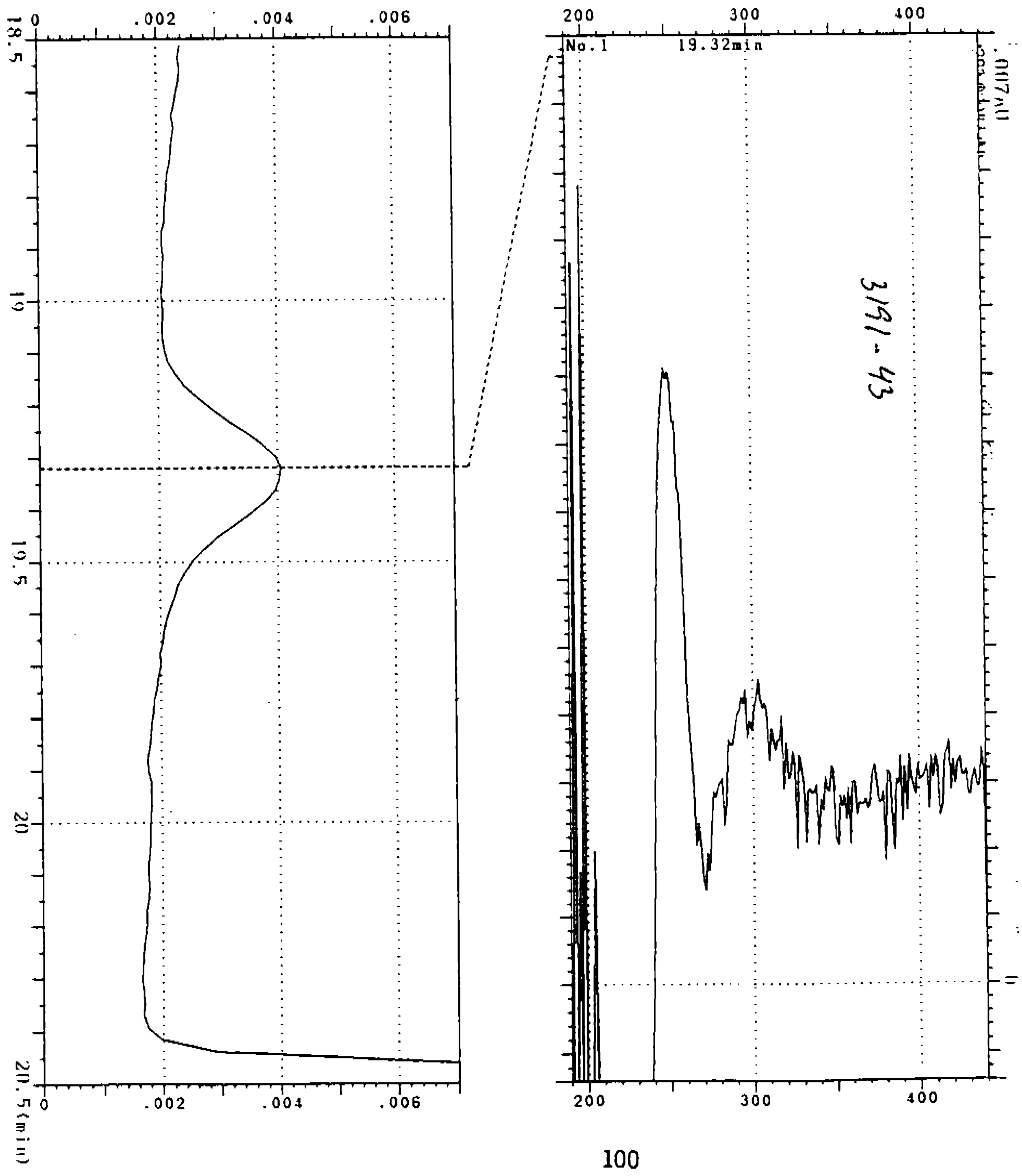
< 4 AUX >

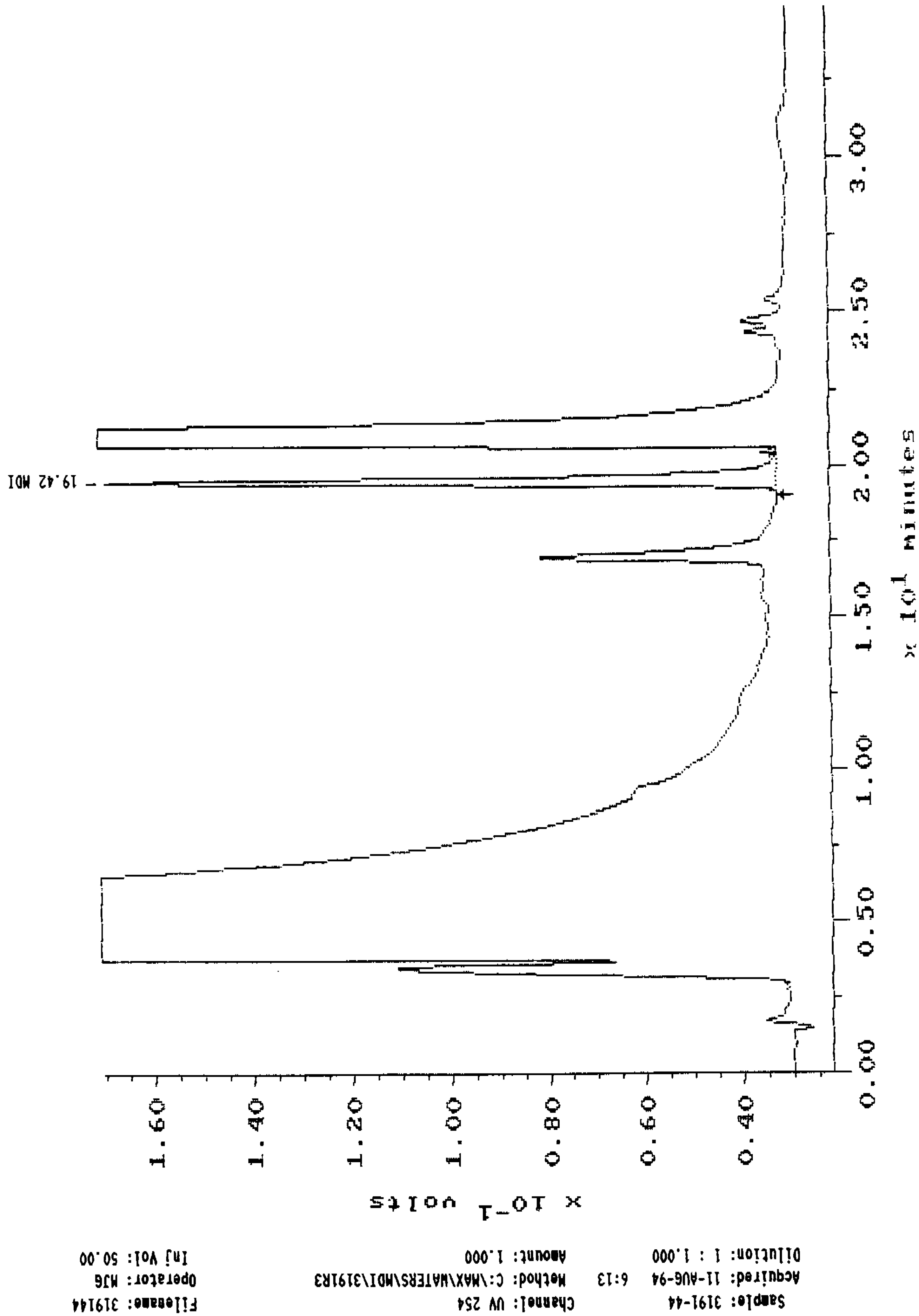
(Disabled)

Chromato 254 nm

0 --- .007 AU

Wavelength 190 --- 439.6 nm




Sample: 3191-44
Acquired: 11-AUG-94 6:13
Dilution: 1 : 1.000
Channel: UV 254
Method: C:\MAX\WATERS\MDI\3191R3
Amount: 1.000
Filename: 319144
Operator: MJG
Inj Vol: 50.00
19.42 MDI
x 10^-1 volts
x 10^1 minutes
0.40
0.60
0.80
1.00
1.20
1.40
1.60
0.00
0.50
1.00
1.50
2.00
2.50
3.00

M991 Spectrum index plot (peak)

3191R320.DT3 08-11-1994 06:06:26

Y-scale	.2 AU/FS	Sample name	3191R320
Slope	.001 AU/min	Paper speed	93.68 mm/min
Sampling time	21 msec *32	Wavelength	190 --- 439.6 nm
Sense	high 7	Auto gain	OFF
Resolution	1.3 nm	Column	mm ID * mm
Time range	18.5 --- 20.5 min	Packing material	
Interval	1.34 sec	Mobile phase	
Baseline	OFF	Flow rate	ml/min
		Pressure	

< 1 AUX >

Y-scale 1 AU /FS

Time offset 0 min

[470FLOURESCE]

< 2 AUX >

(Disabled)

< 3 AUX >

(Disabled)

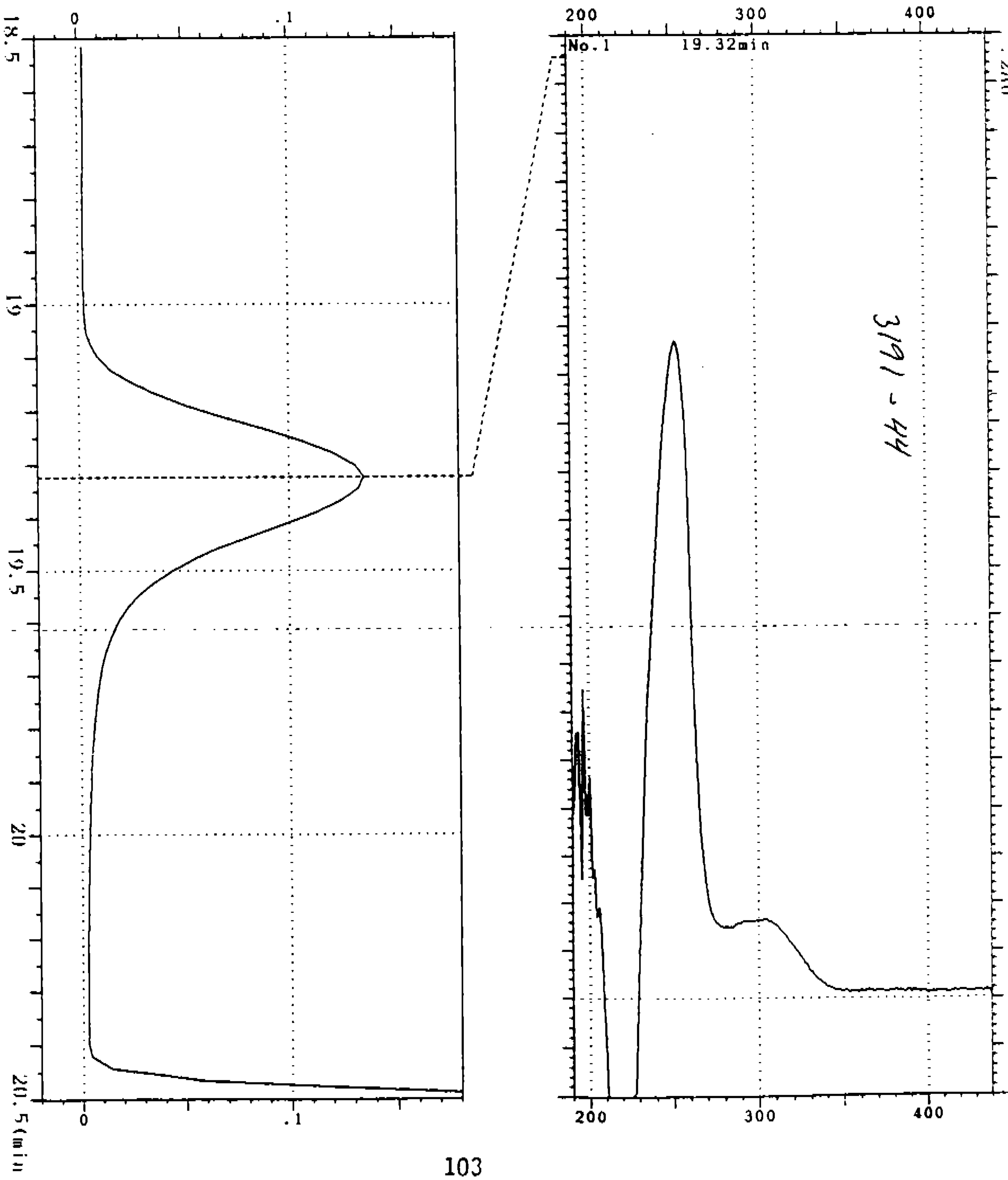
< 4 AUX >

(Disabled)

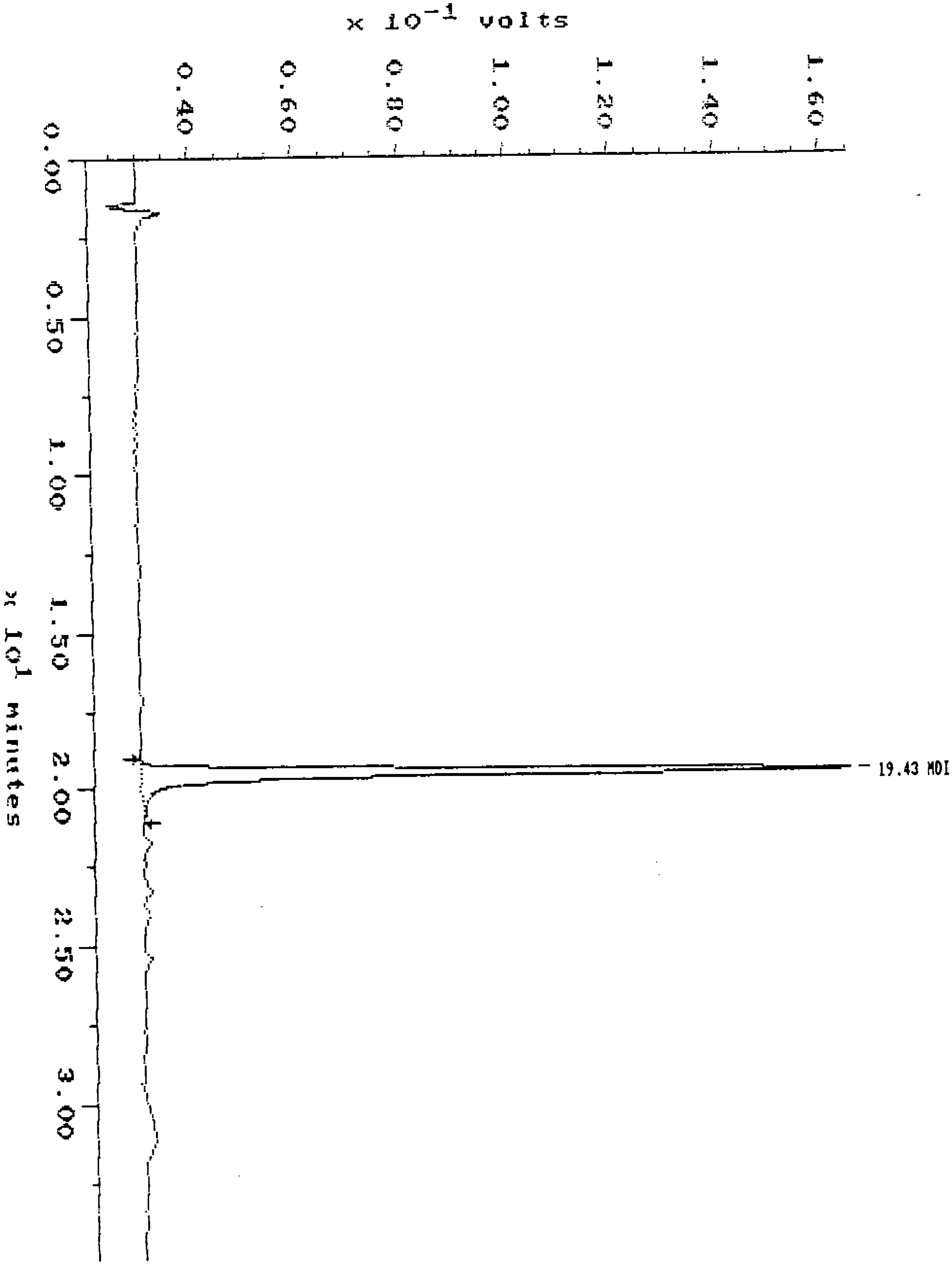
Chromato 254 nm

-.02 --- .18 AU

Wavelength 190 --- 439.6 nm



Sample: CHECK RUN3 Channel: UV 254 Filename: CHECKR3
Acquired: 11-AUG-94 6:51 Method: C:\MAX\WATERS\MDI\3191R3 Operator: MJG
Dilution: 1 : 1.000 Amount: 1.000 Inj Vol: 50.00



MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:08:58

SAMPLE: CHECK RUN3
#21 in Method: 3191 RUN3
Acquired: 11-AUG-1994 6:51
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: CHECKR3
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

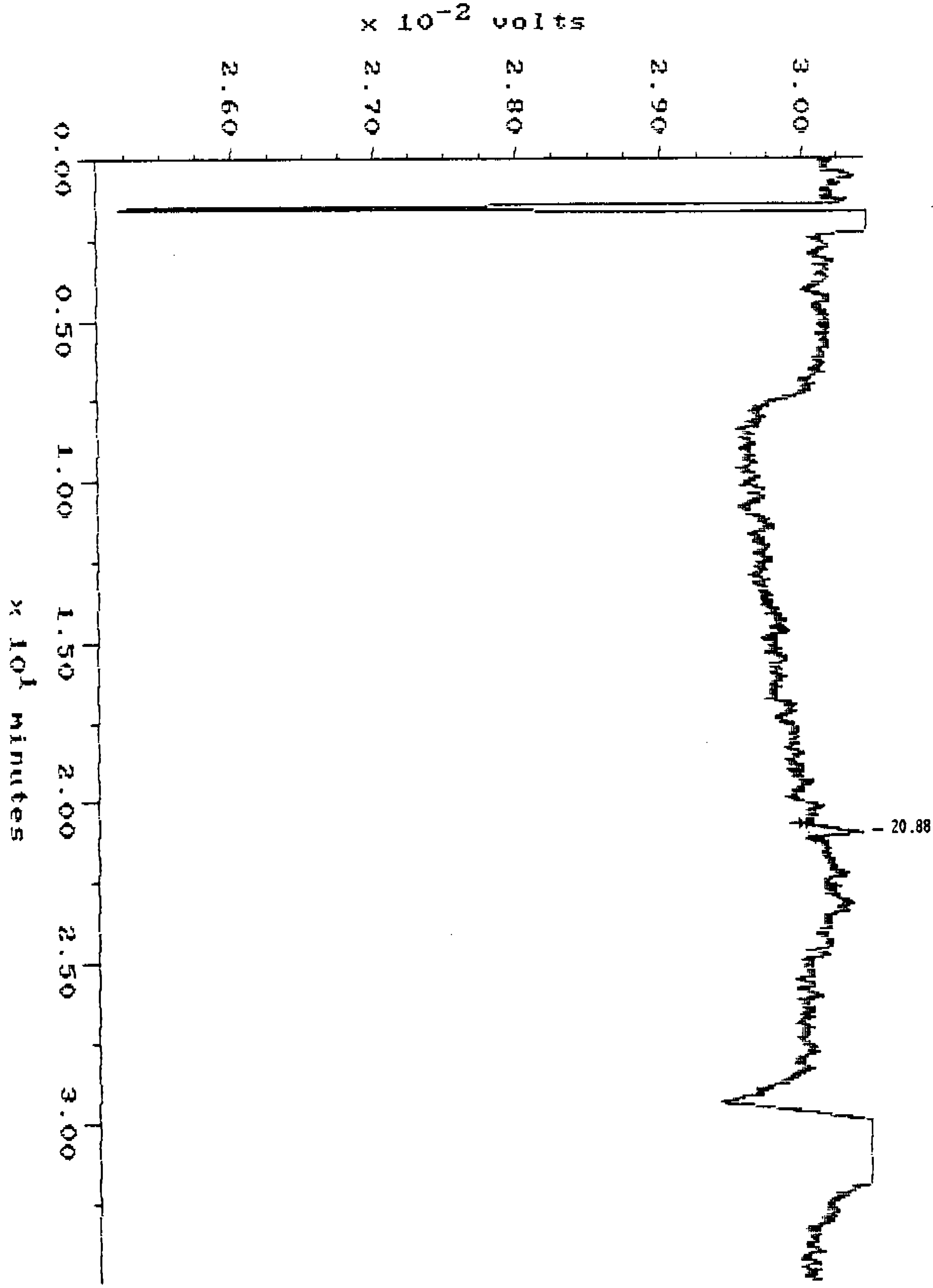
DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	19.425	MDI	5.23254	5.23254	2297810	134279	0.00011386	BB
TOTAL			5.23254	5.23254	2297810	134279		

% Rec

$5.23 / 4.90 \times 100\% = 107\%$

Sample: ACN BLANK3 | Channel: UV 254 | Filename: ACNBLK3
Acquired: 11-AUG-94 7:28 | Method: C:\MAX\WATERS\MDI\3191R3 | Operator: MJG
Dilution: 1 : 1.000 | Amount: 1.000 | Inj Vol: 50.00



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MAXIMA 820 CUSTOM REPORT

Printed: 11-AUG-1994 11:09:10

SAMPLE: ACN BLANK3
#22 in Method: 3191 RUN3
Acquired: 11-AUG-1994 7:28
Rate: 2.0 points/sec
Duration: 35.000 minutes
Operator: MJG

Type: UNKN
Instrument: WATERS
Filename: ACNBLK3
Index: Disk
Injection Volume: 50.0
Dilution: 1.000
Amount: 1.000

DETECTOR: UV 254

Relative Time	Retention Time (minutes)	Component Name	Original Conc (ug/ml)	Solution Conc (ug/ml)	Peak Area	Peak Height	Response Factor	Type
1.000	20.883				4381	367		BB
TOTAL			0.00000	0.00000	4381	367		

BDL