2016 HG PERFORMANCE TESTING AT THE DESERT VIEW POWER, MECCA PLANT

PREPARED BY:

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FOR SUBMITTAL TO:

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
21865 COPLEY DRIVE
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PROJECT NUMBER: **PROJ102011**

PRODUCTION DATE: **JULY 27, 2016**

REPORT NUMBER: **R1414036**

Delta
Air Quality Services, Incorporated

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REPORT REVIEW AND CERTIFICATION

I certify that all work performed in the preparation and production of this report were performed by me or under my supervision and that all data presented are authentic.

Dave Wonderly
Project Manager

7/27/16
Date

I certify that I have reviewed this report, both in form and content, and that all data, calculations, and presentations are authentic, accurate, and complete.

Arlene Bell
Vice President, Analytical Services

7/27/16
Date

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1.0 INTRODUCTION

Delta Air Quality Services (Delta), an affiliate of Montrose Air Quality Services, LLC (Montrose), was contracted by Desert View Power, to conduct performance emissions testing at the Desert View Power Project located in Mecca, California. Testing was conducted on May 10 and 11, 2016. The Delta test team consisted of Dave Wonderly, Arlene Bell, Rik Dupont and Mike Miller. Craig Bressan of Greenleaf Power LLC coordinated the test program, plant operations during testing, fuel sampling and analysis and data retrieval during the test program. The South Coast Air Quality Management District (SCAQMD) was notified of the test date, Mike Wickson of SCAQMD came on site to observe the testing.

The emissions tests included measurements on Unit 1 and Unit 2 for Mercury (Hg), exhaust flow rate and moisture. Fuel sample collection and analysis was performed in conjunction with the emissions testing.

Delta conducted testing to demonstrate compliance with U.S. Environmental Protection Agency 40 CFR Part 63 Subpart DDDDD the Boiler MACT. This report documents the results of that testing, a description of the sample locations and a summary of quality assurance procedures.

Emissions tests were performed on each Biomass fired boiler as specified in the Boiler MACT regulation for:

- Mercury (Hg) Using EPA Method 29
- Method 19 F-Factor Using ASTM D6323a and ASTM E711 for Fuel BTU/lb
- Mercury (Hg) Concentration in Fuel Using EPA SWA-846-7471Ba
- Volumetric Flow Rate
- Oxygen and Carbon Dioxide concentration
- Flue gas moisture content

Tables 1-1 and 1-2 summarize the results of the emissions tests for Unit 1 and Unit 2.

TABLE 1-2
MERCURY TEST RESULTS
DESERT VIEW POWER UNIT 1
MAY 11, 2016

Test Number	4-HG-Unit 1	5-HG-Unit 1	6-HG-Unit 1	**Average**	Limit
Date	05/11/16	05/11/16	05/11/16		
Start/Stop Time	815/1125	1155/1459	1529/1839		
Stack Flow Rate, dscfm[1]	84,519	84,219	83,403	83,811	
Sample Volume, dscf	127.756	131.702	127.309	129.506	
O_2, %	8.71	8.67	8.65	8.66	
CO_2, %	11.78	11.83	11.86	11.84	
Sample Fractions	µg/fraction	µg/fraction	µg/fraction		
Front 1/2	0.1	0.1	0.1		
HCL	0.036	0.093	0.055		
Back	26	42	7.8		
Empty	0.12	0.074	0.15		
KMnO4	0.59	0.43	0.6		
µg/sample	26.85	42.70	8.71	25.70	
µg/dscm	7.420	11.447	2.414	6.931	
lb/hr (as HG)	0.002347	0.0036	0.0008	0.0022	
MMBtu/Hr	370	370	370	370	
lb/MMBtu	6.344×10^{-6}	9.752×10^{-6}	2.037×10^{-6}	6.044×10^{-6}	5.700×10^{-6}

TABLE 1-2
MERCURY TEST RESULTS
DESERT VIEW POWER UNIT 2
MAY 10, 2016

Test Number	1-HG-Unit 2	2-HG-Unit 2	3-HG-Unit 2	**Average**	Limit
Date	05/10/16	05/10/16	05/10/16		
Start/Stop Time	830/1150	1231/1309	1615/1933		
Stack Flow Rate, dscfm[1]	88,267	87,906	88,063	87,984	
Sample Volume, dscf	137.495	136.706	139.367	138.037	
O_2, %	8.91	8.66	8.67	8.66	
CO_2, %	11.54	11.79	11.78	11.78	
Sample Fractions	µg/fraction	µg/fraction	µg/fraction		
Front 1/2	0.1	0.1	0.1		
HCL	0.027	0.39	0.13		
Back	54	51	51		
Empty	0.22	2	0.2		
KMnO4	0.58	0.64	0.52		
µg/sample	54.93	54.13	51.95	53.04	
µg/dscm	14.106	13.981	13.162	13.572	
lb/hr (as HG)	0.0047	0.0046	0.0043	0.0045	
MMBtu/Hr	360	360	360	360	
Lb/MMBtu	1.294×10^{-5}	1.278×10^{-5}	1.205×10^{-5}	1.259×10^{-5}	5.700×10^{-6}

2.0 UNIT DESCRIPTION

The Desert View Power Plant consists of two 297 MMBtu/hour, circulating bed, biomass-fired boilers, and combined unit are designed to produce 47 MW of net electrical output. Each unit is equipped with the following pollution control systems:

1. An ammonia injection system for control of NO_x emissions;
2. Cyclonic mixing of injected ammonia with flue gas to provide for a minimum amount of ammonia slip (emission);
3. A reverse air baghouse to restrict opacity, control emissions of sulfates and particulate to very low levels.

2.1 TEST CONDITIONS

The tests were conducted at or normal steady state unit load conditions. Limestone injection rate, fuel combustion rate, ammonia injection rate, ash handling operations, excess air level, combustion air distribution, and combustor temperature were set to maintain stable unit operation. Pertinent operating conditions were recorded by Desert View Power personnel during the tests as presented in Table 2-1.

The tests were conducted at or normal steady state unit load conditions. Limestone injection rate, hydrated lime injection rate, fuel combustion rate, ammonia injection rate, ash handling operations, excess air level, combustion air distribution, and combustion temperature were all set to maintain stable unit operation.

TABLE 2-1
AVERAGE DAILY UNIT DATA
DESERT VIEW POWER
MAY 2016

Date	Unit No.	Net MW	Boiler Input MMBtu/hr
4/11/2016	1	22.6	370
4/10/2016	2	22.6	360

2.2 SAMPLE LOCATIONS

Samples were collected at the exhaust ducts to the stack. Desert View Power previously conducted three dimensional flow testing and stratification testing on the baghouse exhaust ducts on each unit. This testing was performed in accordance to SCAQMD Chapter X, Section 1 and 13 and was presented in the report titled "Stack Gas Stratification and Absence of Flow Disturbance Testing at Desert View Power" (R106E622.T) submitted to SCAQMD in October of 1994. A copy of the sample location certification report can be found in the appendices. The sample locations meet the requirements. All testing for both Unit 1 and 2 was conducted at the sample location presented in Figure 2-1.

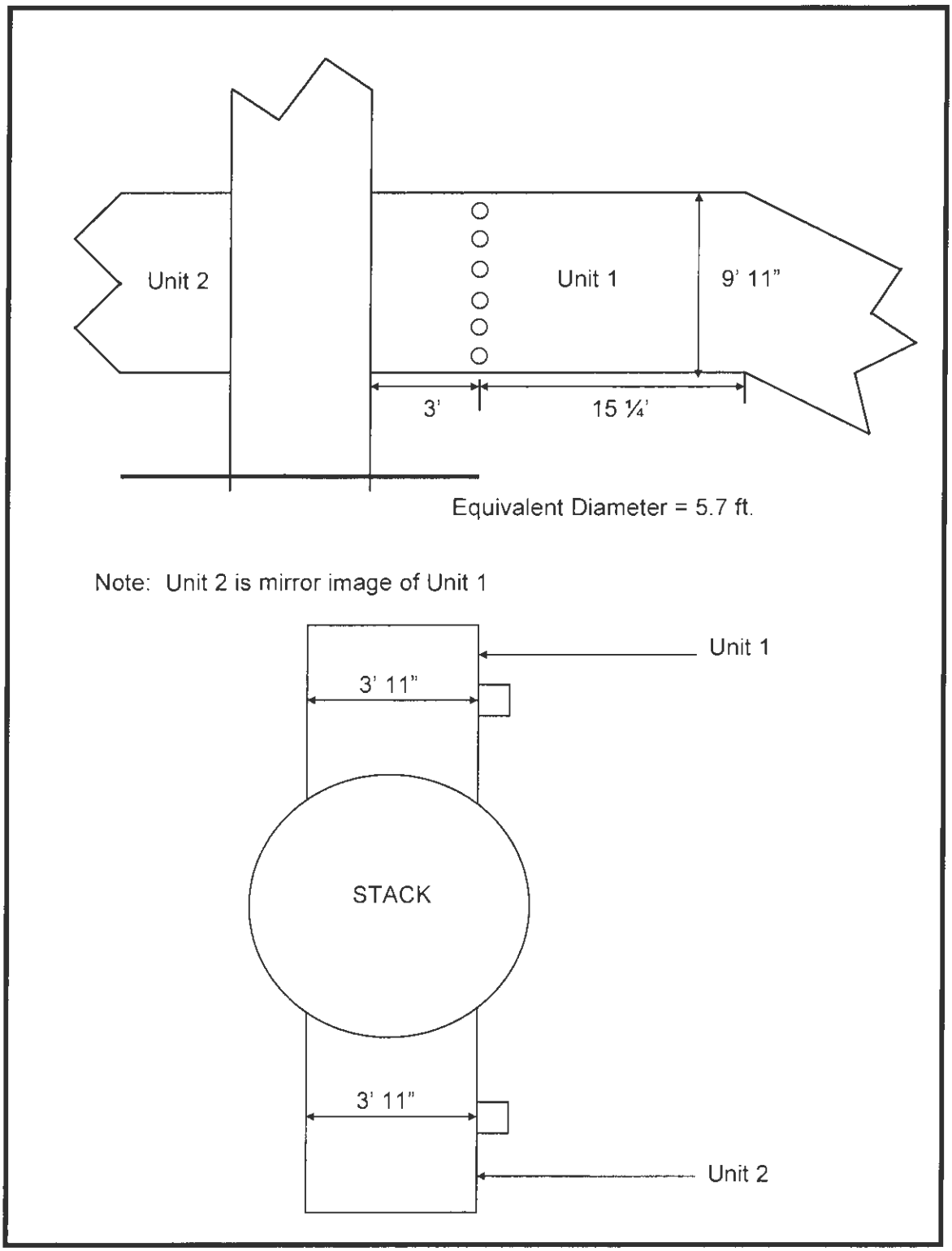

Figure 2-1. Schematic of the Desert View Power, Sample Location

3.0 TEST DESCRIPTIONS

The test procedures that were used are listed in Table 3-1.

TABLE 3-1
TEST MATRIX
FOR DESERT VIEW POWER MECCA PROJECT

Parameter	No. of Tests	Measurement Principle	Reference Method	Duration per Test
O_2/CO_2	3	Instrumental	EPA 3A	In conjunction with HG tests
Hg	3	CVAAS	EPA 29	180 minutes, minimum of 3 DSCM of sample volume
Fuel Sampling	Daily		ASTM D6323	Composite hourly samples
Fuel BTu/lb	Daily		ASTM D5865a	Composite hourly samples
Fuel Moisture	Daily		ASTM D871-82	Composite hourly samples
Fuel Mercury	Daily		EPA Sw-846-7471Ba	Composite hourly samples
Stack Gas Flow Rate	--	S-Type Pitot Traverse	EPA 2	--
Moisture	--	Condensation/Gravimetric	EPA 4	--

3.1 O_2 AND CO_2

O_2 and CO_2 were measured according to EPA reference methods using Delta's continuous emissions monitoring system (CEM). O_2 and CO_2 concentrations were determined using Delta's mobile emission measurement laboratory. The laboratory is housed in a truck outfitted to provide a clean, quiet, environmentally controlled base for the testing operations. The laboratory has lighting, electrical distribution, air conditioning and heating to support the test instruments and provide for optimal test performance.

Concentrations of these gaseous species were measured using an extractive sampling system consisting of a stainless steel probe to minimize reactions, a heat traced Teflon sample line connected to a thermo-electrically cooled sample dryer. Following the dryer, the sample is drawn into a Teflon lined pump where it is pressurized and then filtered for delivery to the gas analysis portion of the system. Gaseous samples were collected at a single point in conjunction with the Hg tests.

Oxygen concentration was determined using an AMI electro-chemical cell analyzer (model #201). The analyzer full scale range was 20%. The cell contains an electrolytic fluid that reacts with oxygen to generate an electrical signal proportional to the concentration.

CO_2 was measured using a non-dispersive infrared analyzer manufactured by Horiba (model #PIR 2000). The analyzer full scale range was 20%.

The analyzers and sampling system were subjected to a variety of calibration and quality assurance procedures including leak checks, linearity and calibration error determinations before sampling, and system bias and drift determinations as part of each test run. Data are corrected for any observed bias or drift in accordance with the reference methods.

3.2 MERCURY MEASUREMENTS

Triplicate samples were collected for mercury using the procedure in EPA Method 29. These samples will be analyzed mercury only.

This procedure isokinetically withdraws flue gas through the sample train described below:

1. The probe and nozzle are glass to prevent metal contamination of the sample.
2. The filter is quartz to minimize interferences.
3. The first two impingers contain 5% nitric acid and 10% hydrogen peroxide to collect any volatile metals which pass through the filter.
4. The third impinger is empty to prevent carry over of the HNO_3/H_2O_2 solution into the permanganate solution.
5. The fourth and fifth impingers contain acidified potassium permanganate solution to collect any mercury that is not collected in the HNO_3/H_2O_2 impingers.
6. The sixth impinger contains silica gel.

Sampling reagents and media are trace metals quality with lot analyses of specific heavy metals available. The sampling train is pre-cleaned with DI water, nitric acid, and hydrochloric acid before testing and sealed with parafilm.

One field blank and two reagent blanks were collected and analyzed for this sampling program.

Sample recovery consisted of recovering the following sample fractions:

1. Probe, nozzle and front filter holder rinse - 0.1N HNO_3 and brushing.
2. Filter - returned to pre-numbered petri dish and sealed.
3. Nitric acid/peroxide impinger, back half of filter holder and sample line 0.1N HNO_3 acid rinse.
4. Empty impinger 0 0.1N HNO_3 rinse.
5. Permanganate impingers - 4% $KMnO_4$/10% H_2SO_4 rinse followed by DI water rinse.
6. 8N hydrochloric acid rinse of permanganate impingers to remove residual manganese dioxide adhering to the impinger walls.

All sample fractions are stored in acid washed sample bottles.

Mercury was analyzed by cold vapor atomic absorption. Decomposition of each sample fraction was as per the Method 29. For these samples, the decomposed

filter/probe wash portions were combined proportionally with the decomposed impinger portion for analysis to obtain lower detection limits expected to be needed for these samples. Five mercury analyses were performed per sample train: the combined filter/probe wash, nitric acid/peroxide impinger catch, the empty impinger rinse, the potassium permanganate impinger catch, and the hydrochloric acid rinse of the permanganate impingers.

Table 3-3 summarizes the analytical methods and detection limits that were performed for mercury. The reagent blank, the field blank and a laboratory preparation blank will be analyzed for mercury. One duplicate analysis will be performed for each metal on each sample fraction. Spike recoveries and duplicate analyses are reported with the sample results in the laboratory report.

3.3 VELOCITY AND MOISTURE

Stack gas velocity and moisture content were determined by EPA Methods 2 and 4 during the Hg testing.

3.4 FUEL ANALYSIS

Daily fuel samples were collected by Desert View Power personnel. Hourly samples were taken and composited by the lab prior to analysis. Sampling was consistent with ASTM D6323 sample collection methodology. Desert View Power sent the samples out to be analyzed for higher heating value for heat rate calculations, for BTU/lb for calculating the HG emissions in lb/MMBtu using ASTM E711, for moisture content using ASTM D3173 and for chlorine content using ASTM E776. Copies of the analysis will be included with the final report.

4.0 RESULTS

This section presents the results of the performance tests conducted at Desert View Power, during March of 2016. Test results are presented in the following sections:

4.1 Hg Performance Tests and Results

4.2 Fuel Analysis Results

The test plan that was submitted is contained in Appendix A and quality assurance information in Appendix B. All supporting data sheets and plant data are included in Appendix C. Emissions calculations are presented in Appendix D. Laboratory reports are contained in Appendix E, and Delta instrument strip charts are in Appendix F. Chain of custody records are included in Appendix G.

4.1 HG PERFORMANCE TEST RESULTS

Total Hg emissions for Unit 1 were 6.044 x 10^{-6} lb/MMBtu. The results are presented in Table 4-1. This is greater than the permit limit of 5.700E-06 lb/MMBtu.

Total Hg emissions for Unit 2 were 1.259 x 10^{-5} lb/MMBtu. The results are presented in Table 4-2. This is greater than the permit limit of 5.700E-06 lb/MMBtu.

TABLE 4-1
MERCURY TEST RESULTS
DESERT VIEW POWER UNIT 1
MAY 11, 2016

Client:	Desert View Power	Parameter:	Full Load
Location:	Mecca	Fuel:	Biomass
Unit:	1	Data By:	DW

Test Number:	4-HG-Unit 1	5-HG-Unit 1	6-HG-Unit 1	Average
Reference Temperature, °F	68	68	68	
Test Date	5/11/2016	5/11/2016	5/11/2016	
Sample Train	5-WCS	5-WCS	5-WCS	-
Pitot Factor	0.840	0.840	0.840	-
Meter Calibration Factor	0.997	1/0/1900	1/0/1900	-
Stack Area (ft^2)	38.84	38.84	38.84	-
Sample Time (Min)	180	180	180	180
Barometric Pressure (in Hg)	30.01	30.01	30.01	30.01
Nozzle Diameter (inches)	0.245	0.249	0.245	0.246
Start/Stop Time	815/1125	1155/1459	1529/1839	-
Stack Pressure (iwg)	0.74	0.74	0.74	0.74
Delta P (iwg)	0.829	0.8348	0.8412	0.8350
Meter Pressure (iwg)	1.760	1.867	1.798	1.808
Stack Temperature (°F)	344.2	343.5	357.6	348.5
Meter Temperature (°F)	102.0	109.3	113.0	108.1
Meter Volume (acf)	135.430	141.378	137.585	138.131
Liquid Volume (ml)	397.2	438.8	442.7	426.2
Stack O_2 (%)	8.71	8.67	8.65	8.7
Stack CO_2 (%)	11.78	11.83	11.86	11.8
Standard Sample Volume (SCF)	127.756	131.702	127.309	128.922
Moisture Fraction	0.128	0.136	0.141	0.135
Molecular Weight (wet)	28.67	28.58	28.52	28.59
Stack Gas Velocity (ft/sec)	63.06	63.36	64.22	63.55
Stack Flow Rate (wacfm)	146,966	147,658	149,670	148,098
Stack Flow Rate (dscfm)	84,519	84,219	83,403	84,047
Isokinetic Ratio (%)	99.59	99.75	100.57	99.97

TABLE 4-2
MERCURY TEST RESULTS
DESERT VIEW POWER UNIT 2
MAY 10, 2016

Client:	Desert View Power	Parameter:	Full Load
Location:	Mecca	Fuel:	Biomass
Unit:	2	Data By:	DW

Test Number:	1-HG-Unit 2	2-HG-Unit 2	3-HG-Unit 2	Average
Reference Temperature, °F	68	68	68	
Test Date	5/10/2016	5/10/2016	5/10/2016	
Sample Train	5-WCS	5-WCS	5-WCS	-
Pitot Factor	0.840	0.840	0.840	-
Meter Calibration Factor	0.997	1/0/1900	1/0/1900	-
Stack Area (ft^2)	38.84	38.84	38.84	-
Sample Time (Min)	180	180	180	180
Barometric Pressure (in Hg)	29.97	29.97	29.97	29.97
Nozzle Diameter (inches)	0.249	0.245	0.249	0.248
Start/Stop Time	830/1150	1231/1309	1615/1933	-
Stack Pressure (iwg)	0.82	0.82	0.82	0.82
Delta P (iwg)	0.916	0.9347	0.9305	0.9271
Meter Pressure (iwg)	2.020	2.047	2.150	2.072
Stack Temperature (°F)	346.6	360.1	351.9	352.9
Meter Temperature (°F)	94.7	105.1	109.4	103.0
Meter Volume (acf)	143.952	145.792	149.719	146.488
Liquid Volume (ml)	448.6	467.7	481.1	465.8
Stack O_2 (%)	8.91	8.66	8.67	8.7
Stack CO_2 (%)	11.54	11.79	11.78	11.7
Standard Sample Volume (SCF)	137.495	136.706	139.367	137.856
Moisture Fraction	0.133	0.139	0.140	0.138
Molecular Weight (wet)	28.57	28.53	28.52	28.54
Stack Gas Velocity (ft/sec)	66.54	67.82	67.35	67.24
Stack Flow Rate (wacfm)	155,077	158,053	156,948	156,693
Stack Flow Rate (dscfm)	88,267	87,906	88,063	88,078
Isokinetic Ratio (%)	99.36	102.46	100.95	100.92

4.2 FUEL ANALYSIS

Composite daily fuel sample analysis results are presented in Tables 4-27 and 4-28.

TABLE 4-3
COMPOSITE BIOMASS FUEL SAMPLE ANAYLSIS
DESERT VIEW POWER UNIT 2
MAY 10, 2016

Sample Date:	4-10-2016 Wood
Proximate (%):	
Moisture Total	31.12
Ash	4.24
Volatile	53.8
Fixed C	10.84
Sulfur	0.072
BTU/lb (HHV)	5567
BTU/lb (LHV)	4869
MMF BTU/lb	5717
Ultimate (%)	
Moisture	28.8
Carbon	36.42
Hydrogen	4.32
Nitrogen	0.43
Sulfur	0.07
Ash	4.01
Oxygen	25.95
Chloride	0.129
Mercury mg/kg	0.03
F factor, dscf/MMBtu @ 0% O_2:	10,824

TABLE 4-4
COMPOSITE BIOMASS FUEL SAMPLE ANAYLSIS
DESERT VIEW POWER UNIT 1
MAY 11, 2016

Sample Date:	4-11-2016 Wood
Proximate (%):	
Moisture Total	28.80
Ash	4.01
Volatile	55.69
Fixed C	11.5
Sulfur	0.077
BTU/lb (HHV)	5244
BTU/lb (LHV)	4546
MMF BTU/lb	5494
Ultimate (%)	
Moisture	31.12
Carbon	34.9
Hydrogen	4.07
Nitrogen	0.48
Sulfur	0.08
Ash	4.24
Oxygen	25.11
Chloride	0.124
Mercury mg/kg	0.01
F factor, dscf/MMBtu @ 0% O_2:	10,712

APPENDIX A TEST PLAN

TEST PLAN FOR EMISSIONS PERFORMANCE TESTING AT THE DESERT VIEW POWER PLANT

PREPARED FOR:

DESERT VIEW POWER
62-300 GENE WELMAS DR.
MECCA, CA. 92254-0758

FOR SUBMITTAL TO:

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PRODUCTION DATE: **MARCH 11, 2016**

DOCUMENT NUMBER: **R1413298**

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1.0 INTRODUCTION

Delta Air Quality Services, Incorporated (Delta), an affiliate of Montrose Air Quality Services, LLC (Montrose), has been contracted by Desert View Power to conduct Mercury (Hg) emissions compliance testing on two Fluid Bed Boilers at the Desert View Power Plant located in Mecca, California. Delta will conduct testing to comply with U.S. Environmental Protection Agency 40 CFR Part 63 Subpart DDDDD the Boiler MACT. This test plan presents the testing procedures, a description of the sample locations and a summary of quality assurance procedures.

Emissions tests will be performed on each Biomass fired boiler as specified in the Boiler MACT regulation for:

- Mercury (Hg) Using EPA Method 29
- Method 19 F-Factor Using ASTM D6323a and ASTM E711 for Fuel BTU/lb
- Mercury (Hg) Concentration in Fuel Using EPA SWA-846-7471Ba
- Volumetric Flow Rate
- Oxygen and Carbon Dioxide concentration
- Flue gas moisture content

2.0 UNIT DESCRIPTION

The Desert View Power Plant consists of two 297 MMBtu/hour, circulating bed, biomass-fired boilers, and combined unit are designed to produce 47 MW of net electrical output. Each unit is equipped with the following pollution control systems:

1. An ammonia injection system for control of NO_x emissions;
2. Cyclonic mixing of injected ammonia with flue gas to provide for a minimum amount of ammonia slip (emission);
3. A reverse air baghouse to restrict opacity, control emissions of sulfates and particulate to very low levels.

2.1 SAMPLE LOCATIONS

Samples will be collected from the transition ducts to the stack. Carnot Technical Services, Inc. conducted three dimensional flow testing and stratification testing on the transition exhaust ducts on each unit. This testing was conducted in accordance to SCAQMD chapter X section 1 and 13 and is presented in the report titled "Stack Gas Stratification and Absence of Flow Disturbance Testing at Colmac Mecca Project" (R106E622.T) submitted to SCAQMD in October of 1994. The sample locations met all the requirements. Copies of the results from that report can be found in Appendix B .All testing for both Unit 1 and 2 will be done at the sample location presented in Figure 2-1.

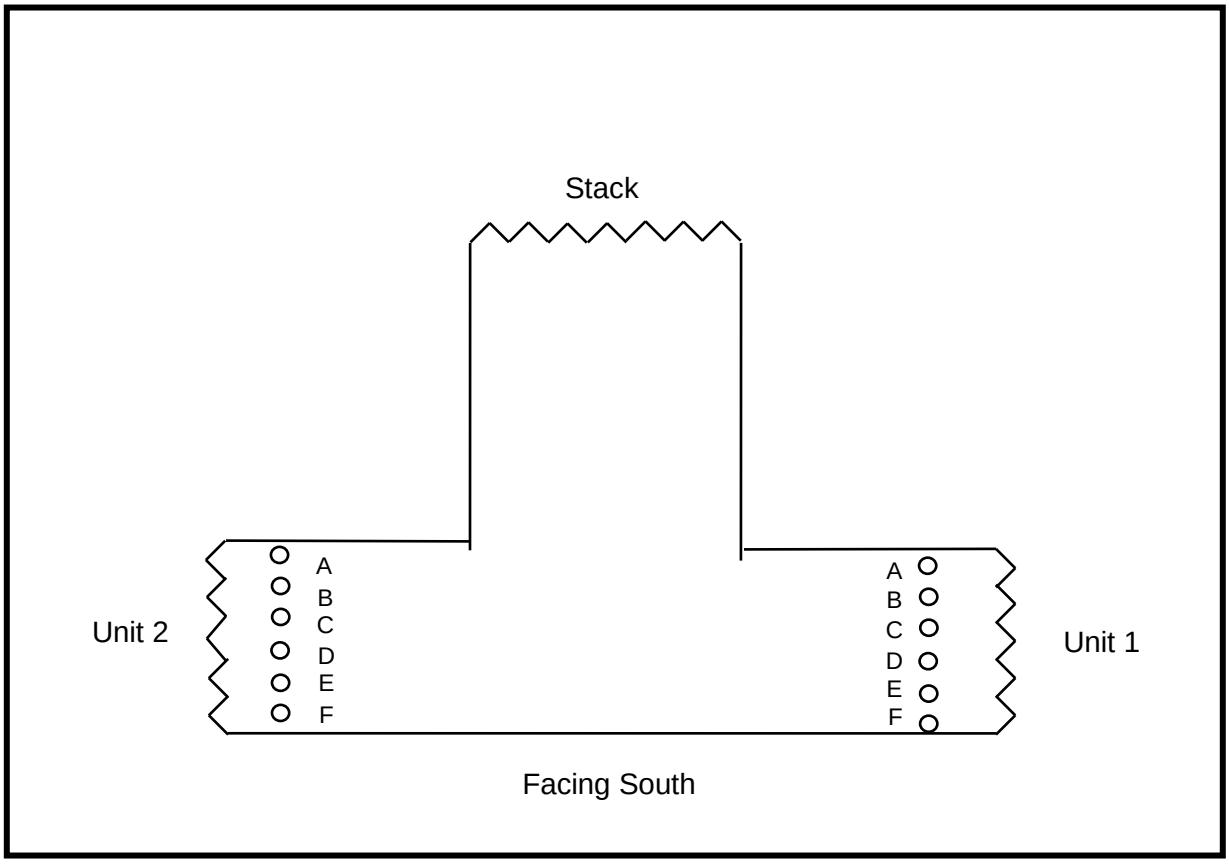

Figure 2-1 Desert View Power Sample Location

2.2 UNIT OPERATION

The tests will be conducted at or near maximum steady state unit load conditions. Limestone injection rate, hydrated lime injection rate, fuel combustion rate, ammonia injection rate, ash handling operations, excess air level, combustion air distribution, and combustion temperature will all be set to maintain stable unit operation. Pertinent operating conditions will be recorded by Desert View Power personnel during the tests. Full load will be defined as greater than 90% of the permitted 300 MMBtu/hr or 270 MMBtu/hr of total (biomass only) heat input to the boiler.

3.0 TEST PROCEDURES

The test procedures to be used are listed in Table 3-1.

TABLE 3-1
PROPOSED TEST MATRIX PER UNIT
FOR DESERT VIEW POWER MECCA PROJECT

Parameter	No. of Tests	Measurement Principle	Reference Method	Duration per Test
O_2/CO_2	3	Instrumental	EPA 3A	In conjunction with HG tests
HG	3	CVAAS	EPA 29	180 minutes, minimum of 3 DSCM of sample volume
Fuel Sampling	Daily		ASTM D6323	Composite hourly samples
Fuel BTu/lb	Daily		ASTM D5865a	Composite hourly samples
Fuel Moisture	Daily		ASTM D871-82	Composite hourly samples
Fuel Mercury	Daily		EPA Sw-846-7471Ba	Composite hourly samples
Stack Gas Flow Rate	--	S-Type Pitot Traverse	EPA 2	--
Moisture	--	Condensation/Gravimetric	EPA 4	--

3.1 CONTINUOUS GASEOUS MEASUREMENTS

O_2 and CO_2 will be measured according to EPA reference methods using Delta's continuous emissions monitoring system (CEM). O_2 and CO_2 concentrations will be determined using Delta's mobile emission measurement laboratory. The laboratory is housed in an 18 foot trailer outfitted to provide a clean, quiet, environmentally controlled base for the testing operations. The laboratory has lighting, electrical distribution, air conditioning and heating to support the test instruments and provide for optimal test performance.

Concentrations of these gaseous species are measured using an extractive sampling system consisting of a heated stainless steel probe to minimize reactions, a heat traced Teflon sample line connected to a thermo-electrically cooled sample dryer. Following the dryer, the sample is drawn into a Teflon lined pump where it is pressurized and then filtered for delivery to the gas analysis portion of the system. Gaseous samples will be collected at a single point. O_2 and CO_2 will be measured in conjunction with each HG test.

Oxygen concentration is determined using a AMI electro-chemical cell analyzer (model # 201). The analyzer has three full scale ranges; 0-5%, 10%, and 25%. The cell contains an electrolytic fluid that reacts with oxygen to generate an electrical signal proportional to the concentration.

The analyzers and sampling system are subjected to a variety of calibration and quality assurance procedures including leak checks, linearity and calibration error determinations before sampling, and system bias and drift determinations as part of each test run. Data are corrected for any observed bias or drift in accordance with the reference methods.

3.2 MERCURY MEASUREMENTS

Triplicate samples will be collected for mercury using the procedure in EPA Method 29. These samples will be analyzed mercury only.

This procedure isokinetically withdraws flue gas through the sample train described below:

1. The probe and nozzle are glass to prevent metal contamination of the sample.
2. The filter is quartz to minimize interferences.
3. The first two impingers contain 5% nitric acid and 10% hydrogen peroxide to collect any volatile metals which pass through the filter.
4. The third impinger is empty to prevent carry over of the HNO_3/H_2O_2 solution into the permanganate solution.

5. The fourth and fifth impingers contain acidified potassium permanganate solution to collect any mercury that is not collected in the HNO_3/H_2O_2 impingers.

6. The sixth impinger contains silica gel.

Sampling reagents and media are trace metals quality with lot analyses of specific heavy metals available. The sampling train is pre-cleaned with DI water, nitric acid, and hydrochloric acid before testing and sealed with parafilm.

One field blank and two reagent blanks will be collected and analyzed for this sampling program.

Sample recovery consists of recovering the following sample fractions:

1. Probe, nozzle and front filter holder rinse - 0.1N HNO_3 and brushing.
2. Filter - returned to pre-numbered petri dish and sealed.
3. Nitric acid/peroxide impinger, back half of filter holder and sample line 0.1N HNO_3 acid rinse.
4. Empty impinger 0 0.1N HNO_3 rinse.
5. Permanganate impingers - 4% $KMnO_4$/10% H_2SO_4 rinse followed by DI water rinse.
6. 8N hydrochloric acid rinse of permanganate impingers to remove residual manganese dioxide adhering to the impinger walls.

All sample fractions are stored in acid washed sample bottles.

Mercury will be analyzed by cold vapor atomic absorption. Decomposition of each sample fraction will be as per the Method 29. For these samples, the decomposed filter/probe wash portions will be combined proportionally with the decomposed impinger portion for analysis to obtain lower detection limits expected to be needed for these samples. Five mercury analyses will be performed per sample train: the combined filter/probe wash, nitric acid/peroxide impinger catch, the empty impinger rinse, the potassium permanganate impinger catch, and the hydrochloric acid rinse of the permanganate impingers.

Table 3-3 summarizes the analytical methods and detection limits that will be performed for mercury. The reagent blank, the field blank and a laboratory preparation blank will be analyzed for mercury. One duplicate analysis will be performed for each metal on each sample fraction. Spike recoveries and duplicate analyses are reported with the sample results in the laboratory report.

3.3 VELOCITY AND MOISTURE

Stack gas velocity and moisture content will be determined by EPA Methods 2 and 4 during the HG tests.

3.4 FUEL ANALYSIS

Daily fuel samples will be collected by Desert View Power personnel. Hourly samples will be taken and composited by the lab prior to analysis. Sampling will be consistent with ASTM D6323 sample collection methodology. Delta Air Quality Services will send the samples out to be analyzed for higher heating value for heat rate calculations, for BTU/lb for calculating the HG emissions in lb/MMBtu using ASTM E711, for moisture content using ASTM D3173 and for chlorine content using ASTM E776. Copies of the analysis will be included with the final report.

3.5 TEST SCHEDULE

The anticipated test schedule will tentatively be May 10 and 11, 2016.

TABLE 3-3
ON-SITE TEST SCHEDULE
DESERT VIEW POWER

Date	Unit No.	Test No.	Type of Test
Day 1	1	--	Set-up
Day 2	1	1, 2 and 3 HG-U1	HG by EPA Method 29
Day 3	2	1, 2 and 3 HG-U1	HG by EPA Method 29

4.0 REPORTING

Delta will prepare a comprehensive emissions report that includes all raw data and calculations for the test program. The test format is presented in Table 4-1. The test report will be submitted within 45 days from completion of testing.

TABLE 4-1
REPORT FORMAT

Title page
Report Title
Prepared For
For Submittal To:
Author and reviewer names
Test Dates and Report Issue Date
Report Number

Review Page
Signatures of person who prepared the report and signature of person who reviewed the report

Table of Contents

Introduction and Summary
Identifies the client, source, reason for the test, test date(s), test personnel, client/source personnel, regulatory observers
Summarizes the results of the test, indicates applicable rules and pass/fail criteria and makes a statement regarding the test results
Outlines the organization of remainder of the report.
Table of analysis results

Unit Description
Describes the process which was tested
Describes any applicable control equipment
Test conditions

Test Description
Test methods, replicates, duration, calculations
Test locations
Test critique

Results
Re-states the results of the test and makes a statement regarding compliance with applicable regulations
Results tables with more detail on individual test runs and supporting data

Appendices
A. Measurement Procedures
B. Quality Assurance Data
   1. Certification
   2. Equipment Calibration
   3. Calibration Gas Certificate
C. Process Operating Data
D. Test and Laboratory Data
   1. Test Location
   2. Test Data (by type)
E. Calculations
F. Chain of Custody
G. Instrument Strip Charts

APPENDIX A QUALITY ASSURANCE AND CERTIFICATIONS

QUALITY ASSURANCE PROGRAM

Delta's operations include four major areas of focus which include sampling, sample analysis, equipment maintenance, calibration, data reduction, and reporting. Procedures are in place to ensure that work performed in each one of these areas is performed in a manner consistent with providing emissions test data that is of known quality and is legally defensible. This section provides details on the procedures that are followed to accomplish this assurance of data quality.

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

Standard methods of assessing data quality such as precision, accuracy and completeness are used. Criteria for acceptable data are generally contained in the reference methods, however, for some projects other criteria are defined. Standard statistical techniques can be applied to assess the data as requested for specific programs. Statistical analysis is not generally included when reporting source test data unless the number of samples and sampling conditions are planned to provide meaningful statistical results.

Delta's quality assurance objectives for precision and accuracy are based on the Reference Methods or published precision and accuracy data.

Completeness is defined as the percentage of measurements which are judged to be valid as compared to the total number of measurements made. Delta's objective is to generate only valid data. For compliance tests, Delta's completeness goal is 100%. For this initial copy of the QAP, the methods which are listed in Delta's capabilities provide results which are available while still on the job site. It is expected that if all quality assurance requirements for a test are not satisfied, the test will be invalidated and repeated and the test program will remain 100% complete.

REPRESENTATIVENESS AND COMPARABILITY

The usefulness and validity of all data is contingent upon 1) the results being representative of the source being tested and 2) comparable with other results generated by Delta or another organization. Delta has adopted the objective is that all measurements be representative and comparable. These objectives will be met by performing tests while the process is operating under known and documented conditions, following published reference methods, using standard data reduction techniques and reporting formats, and proper training of personnel.

TRAINING

Training is an on-going process for all Delta personnel. Personnel completing any task will be properly trained before undertaking any task or be under the direct observation and supervision of someone properly trained. There are certain skills which all technical personnel are expected to acquire.

All source test personnel must review the applicable portions of the following technical documents before being involved in any capacity in any test program.

a) 40 CFR Part 60

b) Delta Quality Assurance Plan

d) EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III.

PROCEDURE SPECIFIC TRAINING

In addition to the general awareness training discussed previously, each person responsible for the performance of a test procedure is required to demonstrate proficiency in the method involved. This demonstration will be accomplished through 1) reading of the method, 2) reading of the manuals for the equipment being used, and 3) satisfactorily completing an oral or written exam regarding the above material. Information related to training for specific methods is provided below.

Continuous Monitoring of Emissions: EPA Methods 3A, 6C, 7E, 10, 20, Understanding of the CEMS schematic drawing
Understanding of the sampling system
Leak check
Analyzer calibrations and adjustments
Sample system bias calibration check
Strip chart recorder operation and documentation
Stratification check
Corrections for sample system bias and analyzer drift

Sample Locations: EPA Method 1,
Identify sample locations
Determination of upstream and downstream diameters
Stack area calculations
Determine number and location of sample points
Perform cyclonic flow check and determine sample location acceptability.

Stack Gas Velocity and Volumetric Flow Rate: EPA Method 26A,

Assemble pitot tube/thermocouple
Perform leak check
Record differential pressure
Record stack temperature
Record static pressure
Record barometric pressure
Calculate stack gas velocity and volumetric flow rate

Stack Gas Moisture Content: EPA Method 4,

Assemble sample train (probe, sample line, impingers, U-tube, gooseneck, vacuum line, meter, pump, etc.)
Record preliminary data: barometric pressure, reference temperature, ambient temperature.
Pre- and post-test leak check: < 0.02 cfm

Read and record: sample volume, delta H, meter temperatures (in/out), vacuum, impinger outlet temperature
Weigh impingers
Calculate % moisture

SAMPLING PROCEDURES

Delta maintains complete copies of federal, state, and local regulatory agency source test methods which serve as the final authority on sampling procedures. This Quality Assurance Plan does not attempt to re-state the source test methods which are available. Delta strives to follow the appropriate source test methods whenever possible. Source test methods are listed in all test plans for review by both clients and regulatory agencies.

The following steps are taken to ensure that the sampling procedures of the source test methods are followed:

Training of personnel, as discussed in Section 5,
Copies of reference methods are available to all personnel and are taken to every job site,
Appropriate selection of project managers
Quality assurance reviews of test programs

Occasionally, due to the sample location limitations or other factors, variations from the standard methods will be necessary. Any variations from the methods will be assessed to determine the effect which the variation will have on data quality. Whenever possible, variations will be included in the test plan and receive approval prior to implementation of the program. Any variations will be clearly documented in the source test report.

CHAIN-OF-CUSTODY PROCEDURES

DATA SHEET CHAIN-OF-CUSTODY

The program manager for each program is responsible for collection of data sheets from sampling personnel as they are completed. The program manager maintains possession of the data sheets or keeps them in locked storage. Upon return to the office, a copy of all field data sheets is made and placed in a locked file. The original field data sheets are used for report preparation and are kept with the final report. Data sheets, test plans, and reports are kept in files, organized by client and project.

A chain-of-custody form is kept at the project file location to log check-out and return of any data sheets or files.

Sample and Reagent Chain of Custody

Chain of Custody procedures begin prior to testing with the preparation of reagents and filters to be used in field testing. Delta personnel who have prepared the filters and reagents complete and sign a reagent chain of custody form which is transferred with the reagents to the field testing team. The field team member receiving the reagents records the transfer on this form. The reagent chain of custody form is included in the final source test report.

At the test site all samples collected are recorded on a chain of custody form as they are taken. This chain of custody form also includes the date, time, test number and a description of the samples and sample fractions. This form is signed by the field team member serving as the sample custodian. This form is left with the sample at all times; it is used to record transfer of the samples to Delta's in-house laboratory or to outside laboratories. Intermediate transfers to shipping agents are also recorded here. Transfers of test equipment between field team members are recorded on the sampling train data sheet.

CALIBRATION PROCEDURES AND FREQUENCY

All of Delta's major equipment components are calibrated according to the procedures established by EPA, CARB, and SCAQMD. When regulations differ, the stricter of the regulations will be followed. Table 9 summarizes the calibration procedures and intervals for the major equipment components.

DATA REDUCTION, VALIDATION, AND REPORTING

DATA REDUCTION

Data reduction generally occurs in two phases: First, preliminary data reduction occurs on the job site. On-site data reduction may be performed by sampling technicians or the project manager. Preliminary calculations may include velocity, moisture, stack flow, and continuous gaseous measurements. Draft test results are normally available prior to leaving the job site. Calculations are performed manually, with a calculator, or with a portable computer. Whenever possible, standard spreadsheets are used to reduce the data.

The second phase of data reduction occurs after the test team has left the job site. Final results are generated after the project manager has reviewed the data entry, calculations, and reporting units.

The standard calculations are available in the test methods

TABLE 1
MAJOR SAMPLING EQUIPMENT CALIBRATION REQUIREMENTS

Sampling Equipment	Calibration Frequency	Calibration Procedure	Acceptable Calibration Criteria
Continuous Analyzers	Before and After Each Test Day	3-point calibration error test	< 2% of analyzer range
Continuous Analyzers	Before and After Each Test Run	2-point sample system bias check	< 5% of analyzer range
Continuous Analyzers	After Each Test Run	2-point analyzer drift determination	< 3% of analyzer range
CEMS System	Beginning of Each Day	leak check	< 1 in. Hg decrease in 5 min. at > 20 in. Hg
Continuous Analyzers	Semi-Annually	3-point linearity	< 1% of analyzer range
NO_x Analyzer	Daily	NO_2 -> NO converter efficiency	> 90%
Differential Pressure Gauges (except for manometers)	Semi-Annually	Correction factor based on 5-point comparison to standard	+/- 5%
Differential Pressure Gauges (except for manometers)	Bi-Monthly	3-point comparison to standard, no correction factor	+/- 5%
Barometer	Semi-Annually	Adjusted to mercury-in-glass or National Weather Service Station	+/- 0.1 inches Hg
Dry Gas Meter	Semi-Annually	Calibration check at 4 flow rates using a NIST traceable standard	+/- 2%
Dry Gas Meter	Bi-Monthly	Calibration check at 2 flow rates using a NIST traceable standard	+/- 2% of semi-annual factor
Dry Gas Meter Orifice	Annually	4-point calibration for $\Delta H@$	--
Temperature Sensors	Semi-Annually	3-point calibration vs. NIST traceable standard	+/- 1.5%

DATA VALIDATION

All data, data entry, and calculations are double-checked by the originator and reviewed by a second person. Reviews can include re-calculation of results, data entry checks, and calculation of known and accepted data sets using the existing spreadsheet.

REPORTING

Delta promotes the use of a standard reporting format, when possible.

INTERNAL QUALITY ASSESSMENTS

INTEGRATED WET CHEMICAL SAMPLING EQUIPMENT QUALITY CONTROL

Major equipment maintenance schedules are provided. Additional quality control measures are performed on sampling equipment which includes:

wind-tunnel calibration of pitot tubes
3-point thermocouple/readout calibrations
bi-monthly meter calibration checks
pre- and post-test leak checks of sample systems

CONTINUOUS EMISSION MONITORING SYSTEM (CEMS) EQUIPMENT QUALITY CONTROL

Delta uses EPA Protocol gases to perform all QA/QC checks of the analyzers when available. On-site checks include 3-point calibration error (+/- 2% of span), 2-point sample system bias (+/- 5% of span), analyzer drift (+/- 3% of span). Semi-annual checks include analyzer linearity (+/- 1% of span) and NO_2 converter efficiency (> 90%).

PERFORMANCE AND SYSTEM AUDITS

The appropriate regulatory agency is notified of all Delta compliance tests. The regulatory agency is allowed the opportunity to perform side-by-side tests and/or observe the Delta setup and sampling. Delta cooperates fully in any pre-arranged regulatory agency audit.

Delta's approval under the South Coast Air Quality Management District (SCAQMD) Laboratory Approval Program (LAP) includes a review of quality assurance procedures, equipment type, maintenance, responsibilities, a laboratory audit, and an external audit of the sampling system which involves analysis and reporting of unknown samples.

EQUIPMENT MAINTENANCE

Delta performs routine and preventative maintenance on all major sampling equipment. These procedures are in addition to method specific requirements which are summarized earlier in this QAP. Table 2 summarizes the equipment maintenance schedule. This preventative maintenance schedule should minimize equipment failures and downtime in the field. On the occasion where equipment does break down in the field, Delta personnel have the necessary experience to perform on-site repairs of most problems.

TABLE 2
EQUIPMENT MAINTENANCE SCHEDULE

Equipment	Performance Requirement	Maintenance Interval	Corrective Action
Continuous Analyzers	1. Proper response to zero, span gas 2. Absence of malfunction	As required by the manufacturer	As recommended by the manufacturer
Mobile Laboratory Sample System	1. Absence of leaks 2. Pass system bias test	Dependent on sources sampled and use intervals	1. Change filters 2. Repair/change gas dryer 3. Check for contamination 4. Leak check
Pumps	1. Absence of leaks 2. Generates manufacturers required pressure, vacuum, and flow	Every 500 hours of operation or 6 months	1. Visual inspection 2. Clean 3. Replace worn parts 4. Leak check
Sample Lines	1. Pass system bias test	After each test series	1. Flush with dry gas

SPECIFIC PROCEDURES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

The QA/QC procedures outlined in the previous sections of this document are provided to ensure data precision, accuracy, and completeness. It is the responsibility of each project team member to 1) complete all pertinent sections of the data sheets, 2) make comments, where appropriate, 3) notify project managers of sampling difficulties which may lead to invalid data, and 4) follow chain-of-custody procedures for all samples, data sheets, and documents.

Each test report is reviewed before release by one of Delta's designated Quality Assurance team members. Procedures, results, and data are reviewed to verify adherence to method requirements, that proper recording procedures are followed, and

that calculations are performed properly. These reviews are conducted independently from any project related data reduction and reporting activities.

QUALITY ASSURANCE REPORTS TO MANAGEMENT AND CORRECTIVE ACTIONS

A "Quality Assurance Incident Report" is completed when an incident occurs which may result in the generation of invalid data. The report originator will provide the report to the program manager upon completion to allow for immediate corrective action to maintain program completion. Following completion of the on-site portion of the program, the form is routed to the Quality Assurance Officer for review. Appropriate action to be taken may include, discussions with test personnel, modifications of QA/QC procedures, or additional training. Incidents reports are then filed in the client file and included with the source test report, if appropriate.

Original Quality Assurance records are maintained on-file. Periodic reviews are performed by the QA Officer to ensure that the records are up-to-date, complete, and maintained.

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

January 28, 2016

Mr. James Ritchey
Delta Air Quality Services, Inc.
An Affiliate of Montrose Air Quality Services, Inc.
1631 E. Saint Andrew Place
Santa Ana, CA 92705

Subject: LAP Approval Notice
Reference # 96LA1220

Dear Mr. Ritchey:

We completed our review of the renewal application you submitted for approval under the South Coast Air Quality Management District's Laboratory Approval Program (SCAQMD LAP). We are pleased to inform you that your firm is approved for the period beginning January 31, 2016, and ending January 31, 2017 for the following methods, subject to the requirements in the LAP Conditions For Approval Agreement and conditions listed in the attachment to this letter:

SCAQMD Methods 1-4
SCAQMD Method 100.1
SCAQMD Methods 25.1 and 25.3 (Sampling)
SCAQMD Methods 5.1, 5.2, 5.3, and 6.1
SCAQMD Rule 1420/ 1420.1 – (Lead) Ambient Sampling
USEPA CTM-030 and ASTM D6522-00

Thank you for participating in the SCAQMD LAP. Your cooperation helps us to achieve the goal of the LAP: to maintain high standards of quality in the sampling and analysis of source emissions. You may direct any questions or information to LAP Coordinator, Glenn Kasai. He may be reached by telephone at (909) 396-2271, or via e-mail at gkasai@aqmd.gov.

Sincerely,

Rudy Eden, Senior Manager
Laboratory Services &
Source Test Engineering

RE:GK/gk
Attachment

cc: Dipankar Sarkar

160128 LapRenewal.doc

Cleaning the air that we breathe...™

State of California

Air Resources Board

Approved Independent Contractor

Delta Air Quality Services, Incorporated

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to California Code of Regulations, title 17, section 91207, until June 30, 2016, for those test methods listed below:

ARB Source Test Methods:
1, 2, 3, 4, 5, 6, 8, 17, 20, 501
100 (CO, CO_2, NO_x, O_2, SO_2)

Dr. Michael T. Benjamin, Chief
Monitoring and Laboratory Division

MONTROSE AIR QUALITY SERVICES

Delta Air Quality Services, Incorporated

State of California

Air Resources Board

Approved Independent Contractor

Delta Air Quality Services, Incorporated

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to California Code of Regulations, title 17, section 91207, until June 30, 2016, for those test methods listed below:

U.S. EPA Source Test Methods 201A and 202
Visible Emissions Evaluation

Dr. Michael T. Benjamin, Chief
Monitoring and Laboratory Division

MONTROSE AIR QUALITY SERVICES

Delta Air Quality Services, Incorporated

APPENDIX B SAMPLE LOCATION VERIFICATION DATA

REVIEW AND CERTIFICATION

All work, calculations, and other activities and tasks performed and documented in this report were carried out under my direction and supervision.

Date 10/14/94

Edward J. Filadelfia
Senior Engineer

I have reviewed, technically and editorially, details, calculations, results, conclusions and other appropriate written material contained herein, and hereby certify that the presented material is authentic and accurate.

Date 10/14/94

Edward J. Filadelfia
Senior Engineer

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SECTION 1.0

INTRODUCTION

Carnot was contracted by UC Operating Service (UCOS) to determine the suitability of the alternate sample location accessible from the stack inlet duct. Tests were conducted to determine the level of stack gas stratification and flow disturbance. The tests were performed at this location to satisfy the requirements of alternate sample location CFR 40 Appendix A Method 1. The tests were performed using the standard methods in Chapter X of the SCAQMD's Source Test Manual.

The flow disturbance and gaseous stratification tests were performed on June 27-28, 1994. The test program was coordinated by Greg Deedon of UCOS and Edward Filadelfia of Carnot. The Carnot test team consisted of Edward Filadelfia, Dave Wonderly, and Chris Hone. Unit operation was established and maintained by UCOS personnel.

The results of the tests are summarized in Tables 1-1 and 1-2. These results show that the sample location meets the requirements of the SCAQMD and EPA by demonstrating that the stack gas stratification is less than 10% and the average resultant flow angle is less than 20 degrees with a standard deviation of less than 10 degrees.

A description of the unit is presented in Section 2.0. Test procedures and locations are presented in Section 3.0. Test results are presented in Section 4.0. Tests procedure descriptions, field data sheets, calculations, and control room data are included in the Appendices.

TABLE 1-1
SUMMARY OF GASEOUS STRATIFICATION
COLMAC ENERGY PROJECT
JULY 1994

Parameter	Unit 1 % Stratification	Unit 2 % Stratification	SCAQMD Limit, %
O_2, %	0.4%	1.0%	≤10

TABLE 1-2
SUMMARY OF FLOW DISTURBANCE MEASUREMENTS
COLMAC ENERGY PROJECT
JULY 1994

Parameter	Unit 1 Measured	Unit 2 Measured	SCAQMD Limit, %	EPA Limit, %
Average Resultant Angle, Degrees	5.6°	5.9°	≤20	≤20
Standard Deviation, Degrees	3.3°	4.0°	≤10	N/A

SECTION 2.0

UNIT DESCRIPTION

The Colmac Energy Plant consists of two 297 MMBtu/hour, circulating bed boilers, the combined units are designed to produce 47 MW of net electrical output. Each unit is equipped with the following pollution control systems:

1. An ammonia injection system for control of NO_x emissions.

2. Cyclonic mixing of injected ammonia with flue gas to provide for a minimum amount of ammonia slip (emission).

3. A limestone injection system to limit emissions of SO_2.

4. A reverse air baghouse to restrict opacity and emissions of sulfates and particulate to very low levels.

SECTION 3.0

TEST DESCRIPTION

3.1 TEST CONDITIONS

All tests were performed with the unit operating at full load. Tests were conducted while the unit was firing bio mass and operating under normal conditions. Unit operations were established by UCOS operators.

3.2 SAMPLE LOCATION

Measurements were made from Units 1 and 2 inlet ducts to the stack. A schematic of the Sample location is shown in Figure 3-1. Chapter X sampling consisted of 40 point traverse for stratification, and a 42 point traverse for flow disturbances.

3.3 TEST PROCEDURES

Tests were performed using methods from the SCAQMD's Source Test Manual. These methods are contained in Chapter X - Section 1 for disturbed flow and Section 13 for gaseous stratification. Table 3-1 presents the test methods used in this program. O_2 concentrations were measured using Carnot's mobile emission monitoring system. Flow angles were measured using a United Sensor 3D probe. A description of the Carnot's Continuous Emissions Monitoring System and the standard measurement procedures are presented in Appendix A. A summary of the procedures used for gaseous stratification and disturbed flow are presented below.

3.3.1 Gaseous Stratification

Chapter X (Non-Standard Methods and Techniques), Chapter 13 of the SCAQMD Source Test Manual defines gaseous stratification as the presence of a difference, in excess of 10 percent, between any two points in the same cross sectional plane. Stratification can be determined for either pollutant gases (e.g., NO_x) or diluent gases (e.g., O_2, CO_2) in units of concentration. For this test program, the O_2 concentration was used to measure the level of stack gas stratification.

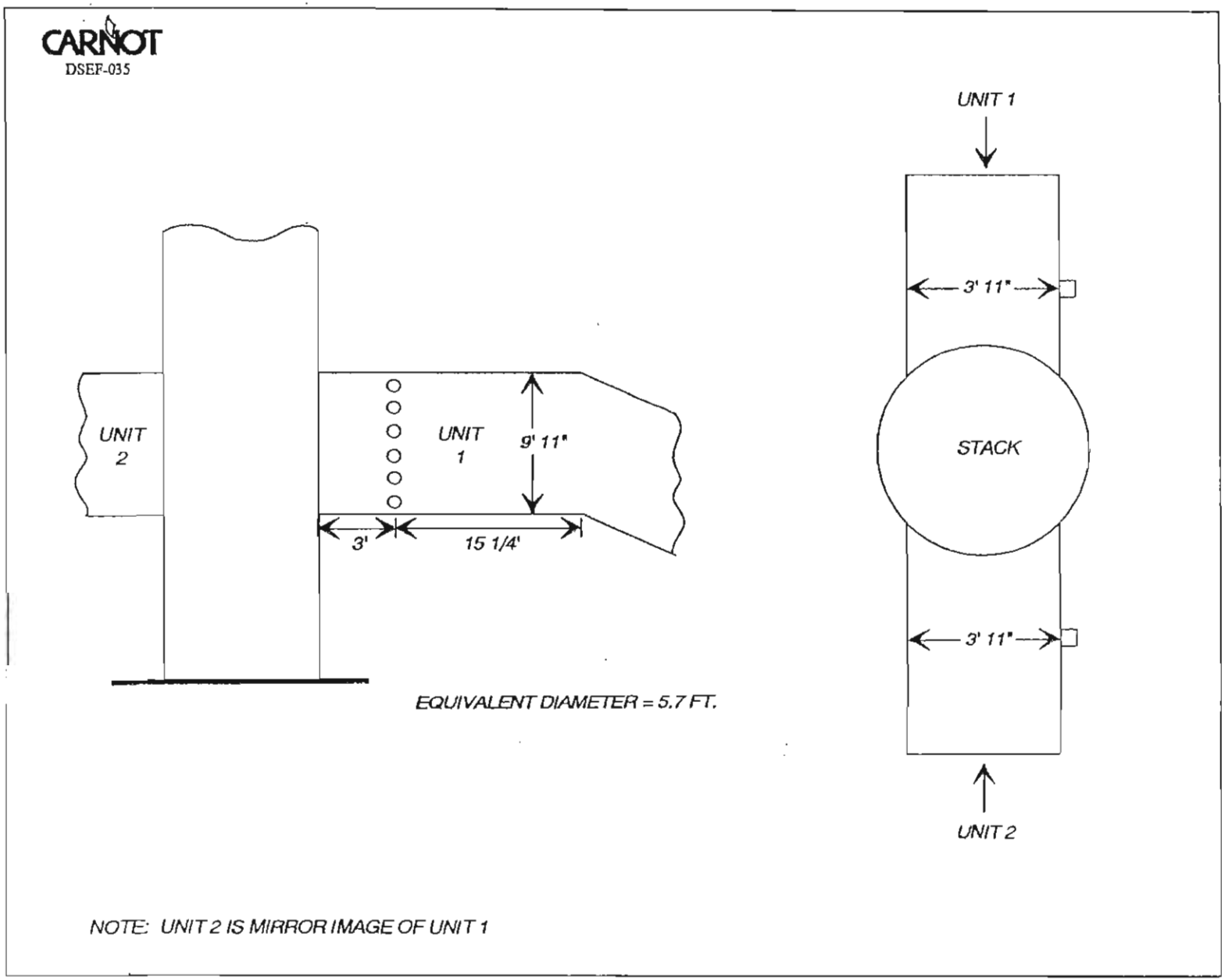


Figure 3-1. UCOS - Duct Sample Locations

Due to variations in process O_2 concentrations, two O_2 analyzers were used. The first O_2 analyzer was used as a reference point and located at the center of the duct. The second was located at 40 traverse points during the test. Gases were monitored for three minutes at each traverse point.

TABLE 3-1
TEST PROCEDURES
COLMAC ENERGY PROJECT
JULY 1994

Parameter	Units	Measurement Principle	Reference Method	Comments
O_2	%	Electrochemical Call	EPA 3A	40 point traverse for gaseous stratification according to Chapter X, Section 13
Flow Angle	Degrees	3D probe for pitch and yaw	1.1	42 point traverse for disturbed flow according to Chapter X, Section 1

SECTION 4.0

RESULTS

4.1 GASEOUS STRATIFICATION

The results of the gaseous stratification tests are summarized in Table 4-1. The results show that the O_2 concentration stratification levels for both sample locations were below the limit of 10%.

TABLE 4-1
GASEOUS STRATIFICATION
COLMAC ENERGY PROJECT
JULY 1994

Parameter	Percent Stratification
Unit 1 O_2, %	0.4%
Unit 2 O_2, %	1.0%

4.2 FLOW DISTURBANCE

The results of the flow disturbance measurements made with the 3-dimensional velocity probe are presented in Table 4-2. The results of these tests show that the average resultant flow angle was below the limit of 20 degrees with a standard deviation of less than 10 degrees for both sample locations.

TABLE 4-2
FLOW DISTURBANCE RESULTS
COLMAC ENERGY PROJECT
JULY 1994

Parameter	Unit 1 3D Probe	Unit 2 3D Probe
Avg. Yaw Angle, degrees	2.0	4.4
Avg. Pitch Angle, degrees	-0.4	-1.0
Avg. Resultant Angle, degrees	5.6	5.9
Standard Deviation, degrees	3.3	4.0

APPENDIX A

MEASUREMENT PROCEDURES

Continuous Emissions Monitoring System

Oxygen (O_2) by Continuous Analyzer

Three-Dimensional Velocity Testing

Continuous Emissions Monitoring System

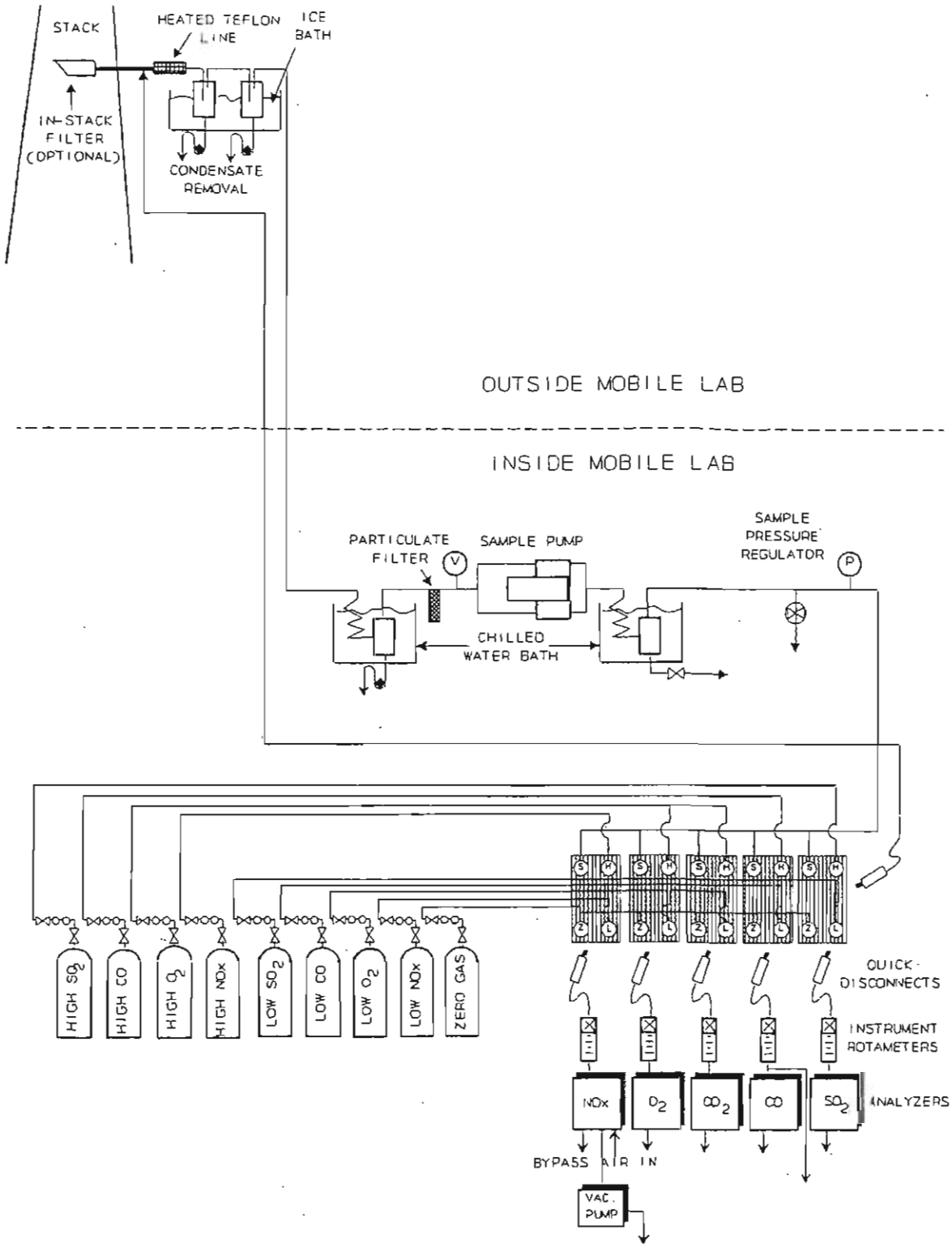
O_2, CO, CO_2, NO, NO_x and SO_2 are measured using an extractive continuous emissions monitoring (CEM) package, shown in the following figure. This package is comprised of three basic subsystems. They are: (1) the sample acquisition and conditioning system, (2) the calibration gas system, and (3) the analyzers themselves. This section presents a description of the sampling and calibration systems. Descriptions of the analyzers used in this program and the corresponding reference test methods follow. Information regarding quality assurance information on the system, including calibration routines and system performance data follows.

The sample acquisition and conditioning system contains components to extract a representative sample from the stack or flue, transport the sample to the analyzers, and remove moisture and particulate material from the sample. In addition to performing the tasks above, the system must preserve the measured species and deliver the sample for analysis intact. The sample acquisition system extracts the sample through a stainless steel probe. The probe is insulated or heated as necessary to avoid condensation. If the particulate loading in the stack is high, a sintered stainless steel filter is used on the end of the probe.

Where water soluble NO_2 and/or SO_2 are to be measured, the sample is drawn from the probe through a heated teflon sample line into an on-stack cooled (approximately 35-40°F) water removal trap. The trap consists of stainless steel flasks in a bath of ice and water. This design removes the water vapor by condensation. The contact between the sample and liquid water is minimized and the soluble NO_2 and SO_2 are conserved. This system meets the requirements of EPA Method 20. The sample is then drawn through a teflon transport line, particulate filter, secondary water removal and into the sample pump. The pump is a dual head, diaphragm pump. All sample-wetted components of the pump are stainless steel or teflon. The pressurized sample leaving the pump flows through a third condensate trap in a refrigerated water bath (≈38°F) for final moisture removal. A drain line and valve are provided to constantly expel any condensed moisture from the dryer at this point. After the dryer, the sample is directed into a distribution manifold. Excess sample is vented through a back-pressure regulator, maintaining a constant pressure of 5-6 psig to the analyzer rotameters.

The calibration system is comprised of two parts: the analyzer calibration, and the system bias check (dynamic calibration). The analyzer calibration equipment includes pressurized cylinders of certified span gas. The gases used are, as a minimum, certified to 1% by the manufacturer. Where necessary to comply with reference method requirements EPA Protocol 1 gases are used. The cylinders are equipped with pressure regulators which supply the calibration gas to the analyzers at the same pressure and flow rate as the sample. The selection of zero, span, or sample gas directed to each analyzer is accomplished by operation of the sample/calibration selector fittings.

The system bias check is accomplished by transporting the same gases used to zero and span the analyzers to the sample system as close as practical to the probe inlet. This is done either by attaching the calibration gas supply line to the probe top with flexible tubing or by actuation of a solenoid valve located at the sample conditioner inlet (probe exit). The span gas is exposed to the same elements as the sample and the system response is documented. The analyzer indications for the system calibration check must agree within 5% of the analyzer calibration. Values are adjusted and changes/repairs are made to the system to compensate for any difference in analyzer readings. Specific information on the analytical equipment and test methods used is provided in the following pages.



Schematic of CEM System

Method:	**Oxygen (O_2) by Continuous Analyzer**
Applicable Reference Methods:	EPA 3A, EPA 20, ARB 100, BA ST-14, SCAQMD 100.1
Principle:	A sample is continuously drawn from the flue gas stream, conditioned, and conveyed to the instrument for direct readout of O_2 concentration.
Analyzer:	Teledyne Model 326A
Measurement Principle:	Electrochemical cell
Ranges:	0-5, 0-10, 0-25 % O_2
Accuracy:	1 % of full scale
Output:	0-100 mV, linear
Interferences:	Halogens and halogenated compounds will cause a positive interference. Acid gases will consume the fuel cell and cause a slow calibration drift.
Response Time:	90% <7 seconds
Sampling Procedure:	A representative flue gas sample is collected and conditioned using the CEM system described previously. If Method 20 is used, that method's specific procedures for selecting sample points are used. Otherwise, stratification checks are performed at the start of a test program to select single or multiple-point sample locations.
Analytical Procedure:	An electrochemical cell is used to measure O_2 concentration. Oxygen in the flue gas diffuses through a Teflon membrane and is reduced on the surface of the cathode. A corresponding oxidation occurs at the anode internally, and an electric current is produced that is proportional to the concentration of oxygen. This current is measured and conditioned by the instrument's electronic circuitry to give an output in percent O_2 by volume.
Special Calibration Procedure:	The measurement cells used with the O_2 instrument have to be replaced on a regular basis. After extended use, the cell tend to produce a nonlinear response. Therefore, a three-point calibration is performed at the start of each test day to check for linearity. If the response is not linear ($\pm$ 2% of scale), the cell is replaced.

Method:	**Three-Dimensional Velocity Testing**
Applicable Ref. Method:	EPA Method 1, ANSI ASME PTC 11 - 1984
Applicability of Method:	When a sample location to be used for velocity or particulate tests does not meet the traditional Method 1 criteria of being at least two duct diameters downstream and one-half diameter upstream of any flow disturbance, this alternate method is used to evaluate the suitability of the location. A three-dimensional velocity probe is used to measure pitch and yaw angle at a minimum of 40 traverse points for round ducts and 42 points for rectangular ducts. If the average resultant angle is less than 20° and the standard deviation is less than 10°, the sample location is deemed acceptable. Velocity and particulate traverses are then performed at the same traverse points using standard Method 2 and 5 equipment and procedures.
Principle:	The instrument measures yaw and pitch angles of fluid flow, as well as total and static pressures.
Analyzer:	United Sensor Three-Dimensional Directional Probe
Sampling Procedure:	Each probe has five measuring holes in its tip. A centrally located pressure hole measures pressure P1, while two lateral pressure holes measure pressures P2 and P3. If the probe is rotated manually until P2 and P3 are identical as a readout on the manometer, the yaw angle of flow is then indicated by the number of degrees rotated. When the yaw angle has been determined, an additional differential pressure P4 - P5 is measured by pressure holes located above and below the total pressure (P1) hole. Pitch angle is determined by calculating (P4 - P5)/(P1 - P2) and using the calibration data for the individual probe and interpolating between the bracketing data. At any particular pitch angle, the velocity pressure coefficient (Pt - Ps)/(P1 -P2) can also be interpolated from the calibration data and Pt - Ps and Ps calculated. Note that this probe also allows for very accurate gas flow measurements, in addition to the EPA Method 1 procedures that allow it to be used for determination of flow angle.

Definitions:

P_1 = Total Pressure
P_2 = Static Pressure
P_3 = Static Pressure
P_4 = Pitch Pressure
P_5 = Pitch Pressure

$P_1 - P_2$ = Velocity Head Pressure

$\frac{P_4 - P_5}{P_1 - P_2}$ = Pitch angle calculated on calibration curve

Calculations:

Velocity (fps) in direction of flow

$$V_s = 2.90\ C_P\sqrt{\Delta P\ T_s}\ \sqrt{\left(\frac{29.92}{P_S}\right)\left(\frac{28.95}{MW_{wet}}\right)}$$

where:
C_P = Pitot Calibration factor
ΔP = Average velocity, head, iwg $(\overline{\sqrt{\Delta P}})^2$
T_S = Stack Temperature, °R
P_S = Stack Pressure (iwg)
MW_{wet} = Molecular weight, wet

Resultant angle:

$$R = \left| \frac{\cos^{-1}\ (\cos\phi_{Y,R}\ \cos\phi_{P,R})}{0.0175} \right|$$

where:
$\phi_{Y,R}$ = Yaw Angle in Radians
$\phi_{P,R}$ = Pitch Angle in Radians
R = Resultant Angle in Degrees

Pitch Angle Curve Fit Equation (Degrees)

$$\phi_P = A_1\left(\frac{P_4-P_5}{P_1-P_2}\right) + A_2\left(\frac{P_4-P_5}{P_1-P_2}\right)^2 - A_3\left(\frac{P_4-P_5}{P_1-P_2}\right)^3 - A_4\left(\frac{P_4-P_5}{P_1-P_2}\right)^4 + A_5\left(\frac{P_4-P_3}{P_1-P_2}\right)^5 + A_6\left(\frac{P_4-P_5}{P_1-P_2}\right)^6$$

Pitot coefficient curve fit equation (used to calculate corrected axial velocities)

$$\frac{P_t-P_s}{P_1-P_2} = B_1 + B_2\ \phi_P + B_3 + \phi_P + B_4\ \phi_P^3 + B_5\ \phi_P^4 + B_6\ \phi_P^5 + B_7\ \phi_P^6$$

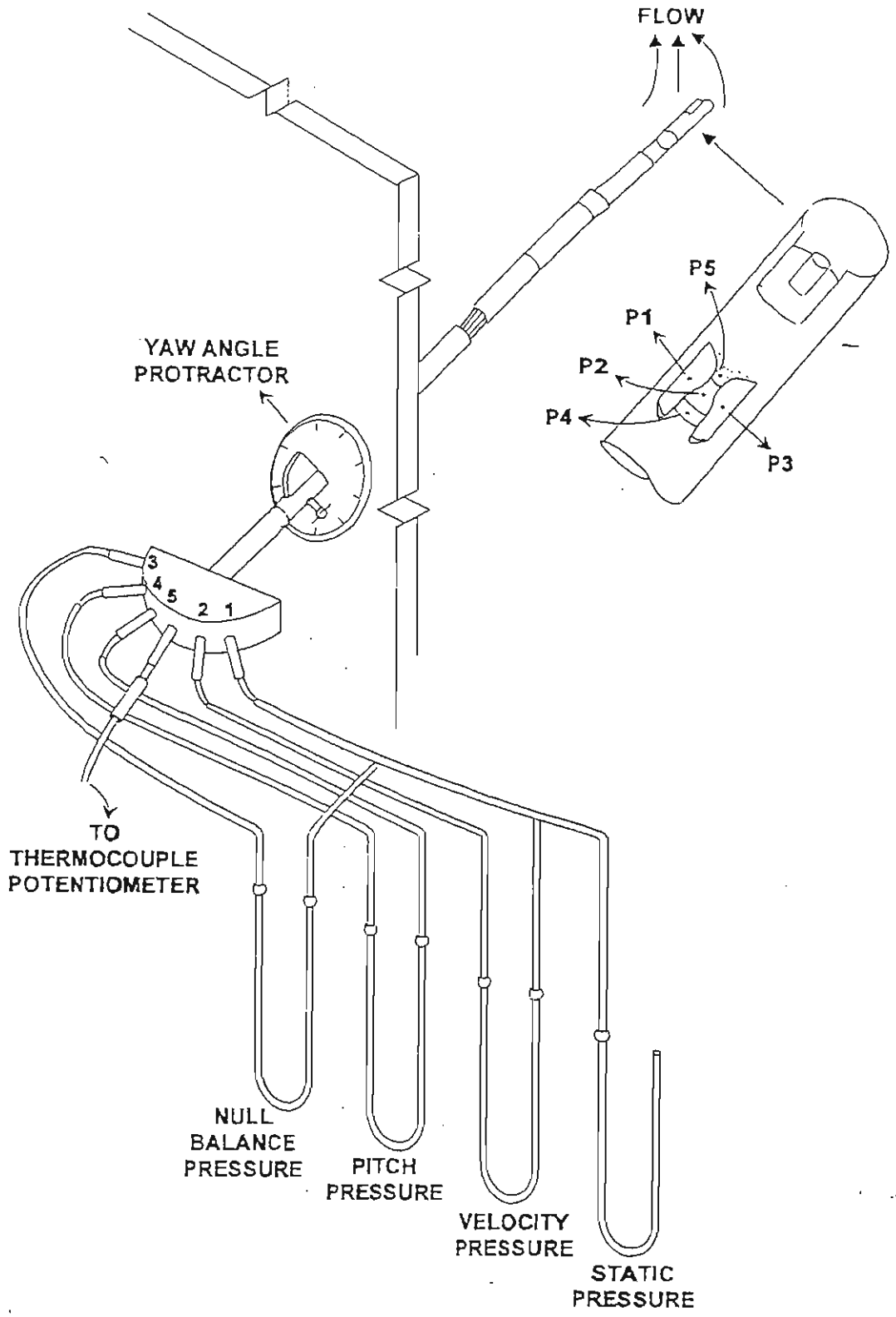


Figure Five Hole Probe

3-DIMENSIONAL VELOCITY PROBE CALIBRATION FACTORS

Probe	B-2455
A_1	63.09
A_2	23.69
A_3	24.505
A_4	33.312
A_5	7.5203
A_6	11.669
B_1	0.997
B_2	7×10^{-3}
B_3	3×10^{-5}
B_4	8×10^{-7}
B_5	1×10^{-9}
B_6	3×10^{-10}
B_7	3×10^{-2}

APPENDIX B
QUALITY ASSURANCE

Appendix B.1

Quality Assurance Program Summary

QUALITY ASSURANCE PROGRAM SUMMARY AND ARB CERTIFICATION

Carnot ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance (QA) program. The program is developed and administered by an internal QA Officer and encompasses seven major areas:

1. Development and use of an internal QA manual.
2. QA reviews of reports, laboratory work, and field testing.
3. Equipment calibration and maintenance.
4. Chain of custody.
5. Training.
6. Knowledge of current test methods.
7. Agency certification.

Each of these areas is discussed individually below.

Quality Assurance Manual. Carnot has prepared a QA Manual according to EPA guidelines. The manual serves to document and formalize all of Carnot's QA efforts. The manual is constantly updated, and each member of the Source Test Division is required to read and understand its contents. The manual includes details on the other six QA areas discussed below.

QA Reviews. Carnot's review procedure includes review of each source test report by the QA Officer, and spot check reviews of laboratory and field work.

The most important review is the one that takes place before a test program begins. The QA Officer works closely with Source Test Division personnel to prepare and review test protocols. Test protocol review includes selection of appropriate test procedures, evaluation of any interferences or other restrictions that might preclude use of standard test procedures, and evaluation and/or development of alternate procedures.

Equipment Calibration and Maintenance. The equipment used to conduct the emissions measurements is maintained according to the manufacturer's instructions to ensure proper operation. In addition to the maintenance program, calibrations are carried out on each measurement device according to the schedule outlined by the California Air Resources Board (CARB). The schedule for maintenance and calibrations are given in Tables B-1 and B-2. Quality control checks are also conducted in the field for each test program. The following is a partial list of checks made as part of each CEM system test series.

- Sample acquisition and conditioning system leak check.
- 2-point analyzer calibrations (all analyzers)
- 3-point analyzer calibrations (analyzers with potential for linearity errors).
- Complete system calibration check ("dynamic calibration" through entire sample system).

- Periodic analyzer calibration checks (once per hour) are conducted at the start and end of each test run. Any change between pre- and post-test readings are recorded.

- All calibrations are conducted using gases certified by the manufacturer to be + 1% of label value (NBS traceable).

Calibration and CEM performance data are fully documented, and are included in each source test report.

Chain of Custody. Carnot maintains full chain of custody documentation on all samples and data sheets. In addition to normal documentation of changes between field sample custodians, laboratory personnel, and field test personnel, Carnot documents every individual who handles any test component in the field (e.g., probe wash, impinger loading and recovery, filter loading and recovery, etc.).

Samples are stored in a locked area to which only Source Test Division personnel have access. Neither other Carnot employees nor cleaning crews have keys to this area.

Data sheets are copied immediately upon return from the field, and this first generation copy is placed in locked storage. Any notes made on original sheets are initialed and dated.

Training. Personnel training is essential to ensure quality testing. Carnot has formal and informal training programs which include:

1. Attendance at EPA-sponsored training courses.
2. Enrollment in EPA correspondence courses.
3. A requirement for all technicians to read and understand Carnot's QA Manual.
4. In-house training and QA meetings on a regular basis.
5. Maintenance of training records.

Knowledge of Current Test Methods. With the constant updating of standard test methods and the wide variety of emerging test methods, it is essential that any qualified source tester keep abreast of new developments. Carnot subscribes to services which provide updates on EPA and CARB reference methods, and on EPA, CARB and SCAQMD rules and regulations. Additionally, source test personnel regularly attend and present papers at testing and emission-related seminars and conferences. Carnot personnel maintain membership in the Air and Waste Management Association, the Source Evaluation Society, and the ASME Environmental Control Division.

AGENCY CERTIFICATION

Carnot is certified by the CARB as an independent source test contractor for gaseous and particulate measurements. Carnot is certified by the SCAQMD as an independent source test contractor for gaseous and particulate measurements using SCAQMD Methods 1, 2, 3, 4, 5, 6, 7 and 100.1. Carnot also participates in EPA QA audit programs for Methods 5, 6 and 7.

TABLE B-1
SAMPLING INSTRUMENTS AND EQUIPMENT CALIBRATION SCHEDULE
As Specified by the CARB

Instrument Type	Frequency of Calibration	Standard of Comparison or Method of Calibration	Acceptance Limits
Orifice Meter (large)	12 months	Calibrated dry test meter	± 2% of volume measured
Dry Gas Meter	12 months or when repaired	Calibrated dry test meter	± 2% of volume measured
S-Type Pitot (for use with EPA-type sampling train	6 months	EPA Method 2	Cp constant (+5%) over working range; difference between average Cp for each leg must be less than 2%
Vacuum Gauges Pressure Gauges	6 months	Manometer	± 3%
Field Barometer	6 months	Mercury barometer	± 0.2" Hg
Temperature Measurement	6 months	NBS mercury thermometer or NBS calibrated platinum RTD	± 4°F for <400°F ± 1.5% for >400°F
Temperature Readout Devices	6 months	Precision potentiometer	± 2% full scale reading
Analytical Balance	12 months (cbeck prior to each use)	Should be performed by manufacturer or qualified laboratory	± 0.3 mg of stated weight
Probe Nozzles	12 Months	Nozzle diameter check micrometer	Range < ± 0.10 mm for three measurements
Continuous Analyzers	Depends upon use, frequency and performance	As specified by manufacturers operating manuals, EPA NBS gases and/or reference methods	Satisfy all limits specified in operating specifications

TABLE B-2
EQUIPMENT MAINTENANCE SCHEDULE
Based on Manufacturer's Specifications and Carnot Experience

Equipment	Performance Requirement	Maintenance Interval	Corrective Action
Pumps	1. Absence of leaks 2. Ability to draw manufacturer required vacuum and flow	Every 500 hours of operation or 6 months, whichever is less	1. Visual inspection 2. Clean 3. Replace worn parts 4. Leak check
Flow Measuring Device	1. Free mechanical movement 2. Absence of malfunction	Every 500 hours of operation or 6 months, whichever is less After each test, if used in H_2S sampling or other corrosive atmospheres	1. Visual inspection 2. Clean 3. Calibrate
Sampling Instruments	1. Absence of malfunction 2. Proper response to zero, span gas	As required by the manufacturer	As recommended by manufacturer
Integrated Sampling Tanks	Absence of leaks	Depends on nature of use	1. Steam clean 2. Leak check
Mobile Van Sampling Systems	Absence of leaks	Depends on nature of use	1. Change filters 2. Change gas dryer 3. Leak check 4. Check for system contamination
Sampling Lines	Sample degradation less than 2%	After each test or test series	Blow filtered air through line until dry

Appendix B.2

ARB Certification

State of California
AIR RESOURCES BOARD

Executive Order G-94-028

Approval to Carnot
To Conduct Testing as an Independent Contractor

WHEREAS, the Air Resources Board (ARB), pursuant to Section 41512 of the California Health and Safety Code, has established the procedures contained in Section 91200-91220, Title 17, California Code of Regulations, to allow the use of independent testers for compliance tests required by the ARB; and

WHEREAS, pursuant to Sections 91200-91220, Title 17, California Code of Regulations, the Executive Officer has determined that Carnot meets the requirements of the ARB for conducting ARB Test Methods 1, 2, 3, 4, 5, 6, 8, 10, and 100 (NOx, O2) when the following conditions are met:

1. Carnot conducts ARB Test Method 100 for O2 using a Teledyne 326 analyzer with either a A5 or a B1 sensor, or a paramagnetic analyzer.

NOW, THEREFORE, BE IT ORDERED that Carnot is granted an approval, from the date of execution of this order, until June 30, 1995 to conduct the tests listed above, subject to compliance with Section 91200-91220, Title 17, California Code of Regulations.

BE IT FURTHER ORDERED that during the approved period the Executive Officer or his or her authorized representative may field audit one or more tests conducted pursuant to this order for each type of testing listed above.

Executed this 29TH day of JUNE 1994, at Sacramento, California.

James J. Morgester, Chief
Compliance Division

STATE OF CALIFORNIA

AIR RESOURCES BOARD
2020 L STREET
P.O. BOX 2815
SACRAMENTO, CA 95812

RECEIVED
JUL 13 1994
CARNOT

PETE WILSON, Governor

July 8, 1994

Mr. Michael L. Schmitt
Carnot
15991 Red Hill Avenue, Suite 110
Tustin, California 92680

Dear Mr. Schmitt:

Testing Approval

We are pleased to inform you that we have renewed your approval to conduct the types of testing listed in the enclosed Executive Order. This approval is valid until June 30, 1995 during which time a field audit of your company's testing ability may be conducted. We have also enclosed a certificate of approval.

Should you have any questions or need further assistance, please contact Ms. Kathryn Gugeler at (916) 327-1521 or Mr. David Tribble at (916) 323-2217. All correspondence should be addressed to me at the post office box above.

Sincerely,

James J. Morgester, Chief
Compliance Division

Enclosures

cc: Mr. Ed Jeung
Department of Health Services
Air and Industrial Hygiene Laboratory
2151 Berkeley Way
Berkeley, California 94704

State of California

Air Resources Board

Approved Independent Contractor

Carnot

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to Section 91207, Title 17, California Code of Regulations, until June 30, 1995, for those test methods listed below:

ARB Source Test Methods:
1, 2, 3, 4, 5, 6, 8, 10, 100(NOx, O2)

James J. Morgester, Chief
Compliance Division

Laura McKinney, Manager
Certification and Investigation Section

Appendix B.3

Calibration Data

CARNOT
SPAN GAS RECORD

CLIENT/LOCATION: UCOS - Colmac DATE: 6/27/98

BY: GS

GAS	SPAN CYLINDER		AUX. SPAN CYLINDER	
	CYLINDER NO.	CONCENTRATION	CYLINDER NO.	CONCENTRATION
ZERO		99.999 %		
NOx	AAL3583	88.54	AAL12400	47.51
O_2	ALM045927	6.937	ALM05739	12.45
CO				
CO_2	ALM045927	22.43	ALM05739	15.16
SO_2				

CARNOT
INSTRUMENT LINEARITY

	ANALYZER				
	O_2	CO_2	CO	NOx	SO_2
ANALYZER RANGE	0-25	—	—	0-100	—
SET TO HIGH STD (80-90% OF RANGE)	20.9	—	—	88.5	—
ACTUAL VALUE OF LOW STD	12.45	—	—	47.51	—
AS-FOUND LOW STD (50-60% OF RANGE)	12.33	—	—	48.9	—
DIFFERENCE IN % OF FULL SCALE	0.5	—	—	+1.3	—

% ERROR CALCULATION:

$$\frac{\text{(AS FOUND - ACTUAL VALUE OF SPAN)}}{\text{RANGE}} \times 100$$

ALLOWABLE DEVIATION IS 2% OF FULL SCALE (2 SQUARES ON STRIP CHART).

CARNOT

PMF-009

CARNOT
SPAN GAS RECORD

CLIENT/LOCATION: UCOS Colmac DATE: 6-28-94

BY: D.W.

GAS	SPAN CYLINDER		AUX. SPAN CYLINDER	
	CYLINDER NO.	CONCENTRATION	CYLINDER NO.	CONCENTRATION
ZERO				
NOx	AAL3583	88.54	AAL12400	47.51
O_2	ALM-045927	8.937	ALM-739	12.45
CO				
CO_2				
SO_2				

CARNOT
INSTRUMENT LINEARITY

	ANALYZER				
	O_2	CO_2	CO	NOx	SO_2
ANALYZER RANGE	0-25			0-100	
SET TO HIGH STD (80-90% OF RANGE)	20.74			88.5	
ACTUAL VALUE OF LOW STD	12.45			47.51	
AS-FOUND LOW STD (50-60% OF RANGE)	12.55			47.00	
DIFFERENCE IN % OF FULL SCALE	.5%			.5%	

% ERROR CALCULATION:

$$\frac{(\text{AS FOUND} - \text{ACTUAL VALUE OF SPAN})}{\text{RANGE}} \times 100$$

ALLOWABLE DEVIATION IS 2% OF FULL SCALE (2 SQUARES ON STRIP CHART).

CARNOT

CARNOT
CEM PERFORMANCE DATA

CLIENT/LOCATION: UCOS-Colmer DATE: 6/28/94

BY: SJ

SYSTEM CONFIGURATION F600				
ANALYZERS IN SERVICE				
ANALYZERS:	O_2	CO_2	CO	NOx
MODEL:	Teledyne	PIR 2000	48	10S
SERIAL NO.:				

PROBE	main	stack
LENGTH:	6'	4'
LINER MATERIAL:	SS	SS
HEATED PROBE (Y/N):	no	no
HEATED LINE (Y/N):	yes	yes

SAMPLE CONDITIONER	
CONDENSER-VACUUM SIDE (CHECK FLOW):	✓
CONDENSER-PRESSURE SIDE (CHECK FLOW):	✓
CONDENSER TEMPERATURE:	40
FILTER CONDITION (COND. OR DATE LAST CHANGED):	5/24/94

SAMPLE LINE		
LENGTH:	50'	50'
LINER MATERIAL:	teflon	teflon
SYSTEM BIAS LINE:	teflon	teflon

SYSTEM LEAK CHECK	main	stack
PRE-TEST (cfh):	0.0	0.0
POST-TEST (cfh):		

LEAK RATE (%) = $\frac{\text{POST-TEST (cfh)}}{\text{SYSTEM FLOW RATE (cfm) x 60}}$ x 100 = _____ %

ON-STACK CONDITIONER	
IN SERVICE (Y/N):	yes
KNOCK-OUT CONDITION (CHECK FLOW):	✓
COOLANT:	ICE

NOx CONVERSION EFFICIENCY	
HIGH CAL NOx	
HIGH CAL NO (AS FOUND)	1
LOW CAL NOx	
LOW CAL NO (AS FOUND)	1

OPERATING CONDITIONS	
SAMPLE PRESSURE:	SYSTEM RESPONSE TIME CHECK
SAMPLE VACUUM:	UPSCALE: _____ sec.
NOx VACUUM:	DOWNSCALE: _____ sec.

CARNOT

PMF-011

Scott Specialty Gases, Inc.

2600 CAJON BOULEVARD, SAN BERNARDINO, CA 92411 (909) 887-2571 FAX: (909) 887-0549

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
CARNOT
RICK MADRIGAL
15991 RED HILL AVE
TUSTIN, CA 92680

Assay Laboratory
Scott Specialty Gases
2600 Cajon Boulevard
San Bernardino, CA 92411

Purchase Order 1818
Project # 30380.003

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards; Procedure G1; September 1993.

Cylinder Number ALM045739 **Certification Date** 03-15-94 **Exp. Date** 03-15-97
Cylinder Pressure+ 2000 PSIG

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
(CARBON DIOXIDE)	15.16 %	± 1 % NIST Traceable
(OXYGEN)	12.45 %	
(Nitrogen)	Balance Gas	

+Do not use when cylinder pressure is below 150 psig.
*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type/Sample No.	Expiration Date	Cylinder Number	Concentration
GMIS	06-94	A018082	18.97 % CO2 IN N2
GMIS	06-94	A6513	12.45 % O2 IN N2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO2:Horiba / OPE-135C / 56553902	02-22-94	NDIR
O2:Horiba / OPE-335 / 850557042	02-25-94	Magnetopneumatic

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components — **First Triad Analysis** — **Second Triad Analysis** — **Calibration Curve**

Carbon Dioxide

First Triad Analysis			Second Triad Analysis			Calibration Curve
Date: 03-15-94	Response Units: mv		Date:	Response Units: mv		Concentration= Ax^3+Bx^2+Cx+D
Z1= 0.00	R1= 97.0	T1= 85.9	Z1=	R1=	T1=	A =0.000007988
R2= 97.0	Z2= 0.00	T2= 85.8	R2=	Z2=	T2=	B =-0.0002062
Z3= 0.00	T3= 85.8	R3= 97.0	Z3=	T3=	R3=	C =0.1000
Avg. Conc. of Cust Cyl.		15.16 %	Avg. Conc. of Cust Cyl.			D =-0.0001333

Oxygen

First Triad Analysis			Second Triad Analysis			Calibration Curve
Date: 03-15-94	Response Units: mv		Date:	Response Units: mv		Concentration= Ax + B
Z1= 0.00	R1= 94.1	T1= 49.8	Z1=	R1=	T1=	A =0.2500
R2= 94.1	Z2= 0.00	T2= 49.8	R2=	Z2=	T2=	B =-0.004586
Z3= 0.00	T3= 49.8	R3= 94.1	Z3=	T3=	R3=	
Avg. Conc. of Cust Cyl.		12.45 %	Avg. Conc. of Cust Cyl.			

First Triad Analysis			Second Triad Analysis			Calibration Curve
Date:	Response Units: mv		Date:	Response Units: mv		Concentration=
Z1=	R1=	T1=	Z1=	R1=	T1=	
R2=	Z2=	T2=	R2=	Z2=	T2=	
Z3=	T3=	R3=	Z3=	T3=	R3=	
Avg. Conc. of Cust Cyl.			Avg. Conc. of Cust Cyl.			

Special Notes:

ANALYST

Scott Specialty Gases, Inc.

2600 CAJON BOULEVARD, SAN BERNARDINO, CA 92411 (909) 887-2571 FAX: (909) 887-0549

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
CARNOT
RICK MADRIGAL
15991 RED HILL AVE
SUITE 110
TUSTIN, CA 92680

Assay Laboratory
Scott Specialty Gases
2600 Cajon Boulevard
San Bernardino, CA 92411

Purchase Order 1914
Project # 30667.009

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards; Procedure G1; September 1993.

Cylinder Number ALM045927 **Certification Date** 03-30-94 **Exp. Date** 03-30-97
Cylinder Pressure+ 1900 PSIG

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
(CARBON DIOXIDE)	22.43 %	± 1 % NIST Traceable
(OXYGEN)	8.937 %	
(Nitrogen)	Balance Gas	

+Do not use when cylinder pressure is below 150 psig.
*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type/Sample No.	Expiration Date	Cylinder Number	Concentration
CRM1675	06-94	ALM001136	14.08 % CO2/N2
GMIS	06-94	A10868	9.520 % O2/N2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO2:PIR2000-ACUBLEND	03-24-94	NDIR
O2:Horiba / OPE-335 / 850557042	03-30-94	Magnetopneumatic

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components | **First Triad Analysis** | **Second Triad Analysis** | **Calibration Curve**

Carbon Dioxide

First Triad Analysis — Date: 03-30-94 Response Units: mv

Z1= 0.00	R1= 72.9	T1= 92.2
R2= 72.9	Z2= 0.00	T2= 92.2
Z3= 0.00	T3= 92.2	R3= 72.9

Avg. Conc. of Cust Cyl. 22.43 %

Second Triad Analysis — Date: Response Units: mv

Z1=	R1=	T1=
R2=	Z2=	T2=
Z3=	T3=	R3=

Avg. Conc. of Cust Cyl.

Calibration Curve — Concentration= $Ax^4+Bx^3+Cx^2+DX+E$

A =-0.0000001942
B =-0.00001975
C =0.001882
D =0.08535
E =0.002942

Oxygen

First Triad Analysis — Date: 03-30-94 Response Units: mv

Z1= 0.00	R1= 95.3	T1= 89.4
R2= 95.3	Z2= 0.00	T2= 89.4
Z3= 0.00	T3= 89.3	R3= 95.3

Avg. Conc. of Cust Cyl. 8.937 %

Second Triad Analysis — Date: Response Units: mv

Z1=	R1=	T1=
R2=	Z2=	T2=
Z3=	T3=	R3=

Avg. Conc. of Cust Cyl.

Calibration Curve — Concentration= Ax + B

A =0.09999
B =0.0004275

Date: Response Units: mv

Z1=	R1=	T1=
R2=	Z2=	T2=
Z3=	T3=	R3=

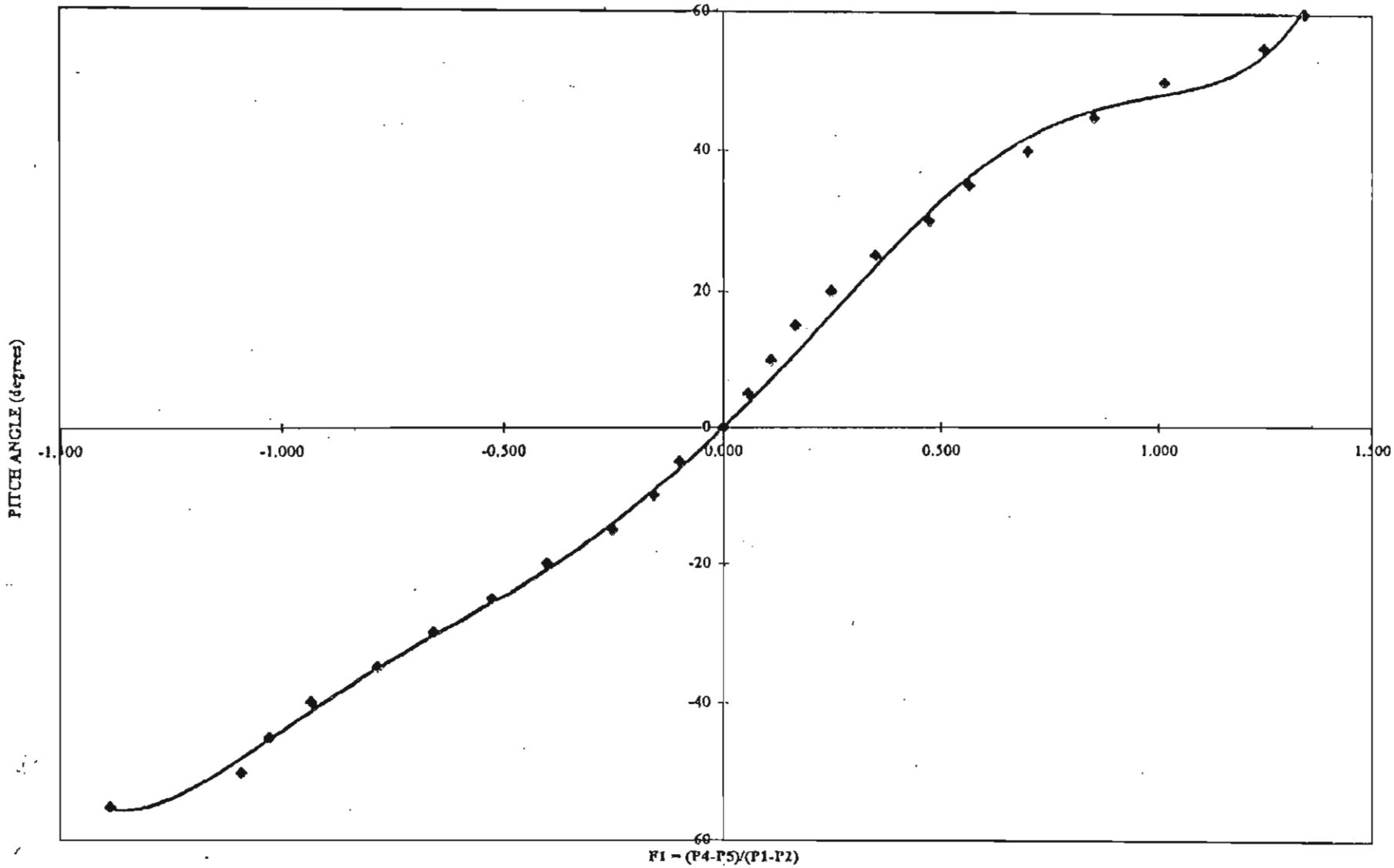
Second Triad Analysis — Date: Response Units: mv

Z1=	R1=	T1=
R2=	Z2=	T2=
Z3=	T3=	R3=

Concentration=

Analyst: [signature]

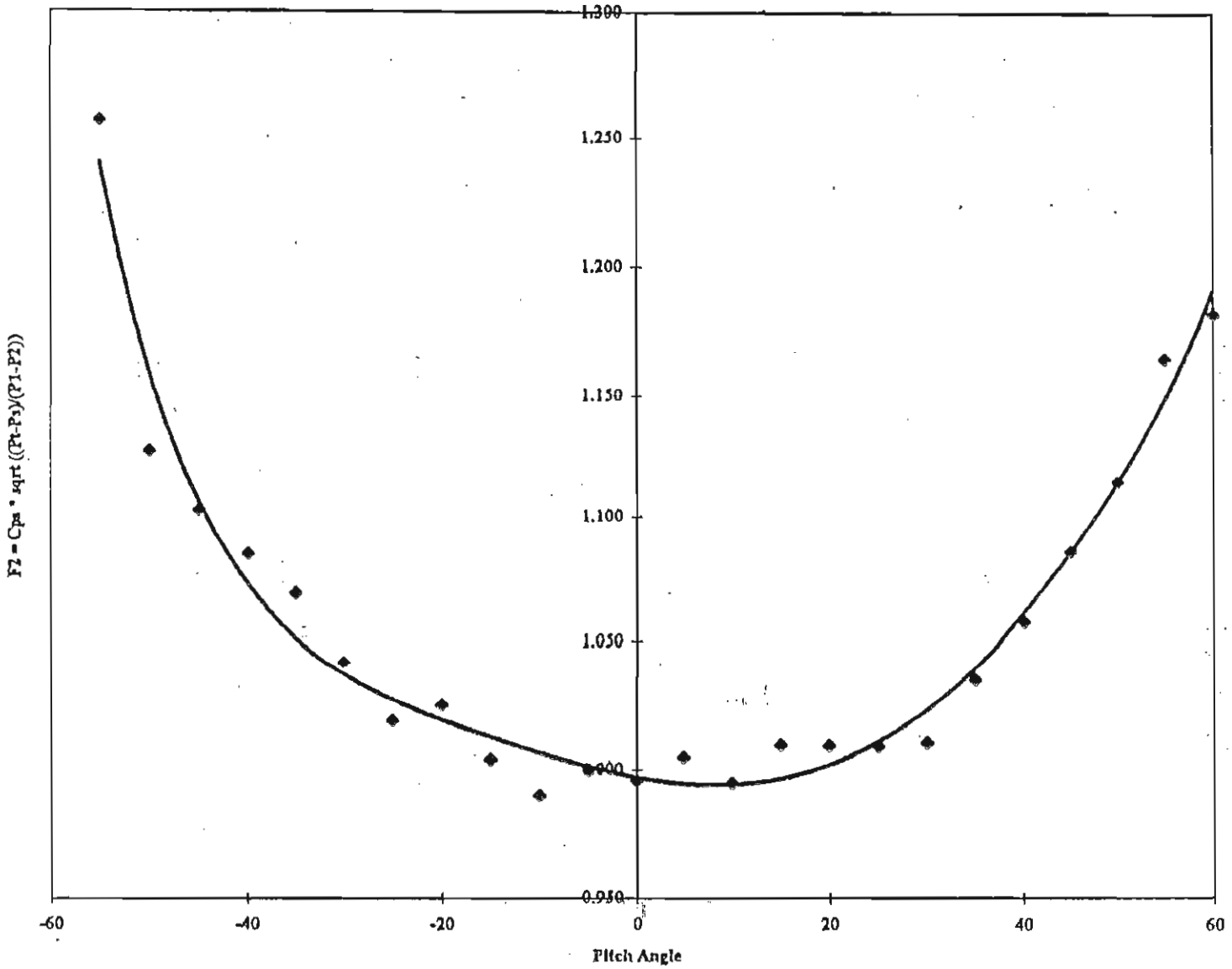
CARNOT
3-DIMENSIONAL VELOCITY PROBE CALIBRATION
PITCH ANGLE vs. F1
PROBE ID: B-2455



Pitch Angle = 63.09X + 23.69X^2 - 24.505X^3 - 33.312X^4 + 7.5203X^5 + 11.669X^6

Performed By: MM/RM
Date: 5/18/94

CARNOT
3-DIMENSIONAL VELOCITY PROBE CALIBRATION
F2 vs. PITCH ANGLE
PROBE ID: B-2455



$F2 = 0.997 - 0.0007X + 3E\text{-}5X^2 + 8E\text{-}7X^3 + 1E\text{-}9X^4 - 3E\text{-}10X^5 + 3E\text{-}12X^6$

Performed By: MM/RM
Date: 5/18/94

APPENDIX C

DATA SHEETS

Appendix C.1

Sample Locations

CARNOT

SAMPLING POINT LOCATION DATA - EPA METHOD 1

PLANT: Ucos - Colmac DATA BY: EF

DATE: 6/27/94

TEST LOCATION: Unit 2 Duct

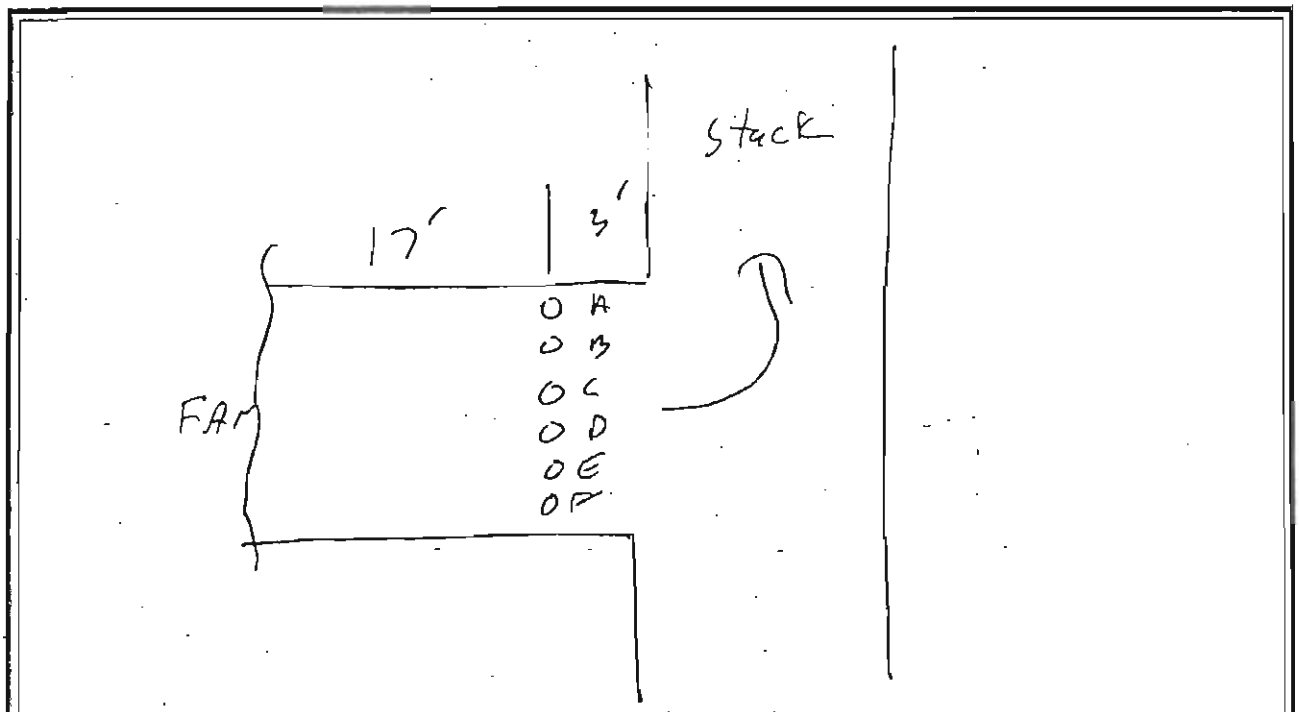


Diagram of Sampling Location

UPSTREAM DIST./DIA.: 17/

DOWNSTREAM DIST./DIA.: 3/

COUPLING LENGTH: 8"

NO. OF SAMPLING PTS.: 42

STACK DIMENSION: 47" x 119"

STACK AREA, FT²: 38.8

SAMPLE POINT	% OF DIAMETER	IN. FROM NEAR WALL	IN. FROM NOZZLE*
1		3.4	11.42
2		10.3	18.3
3		17.14	25.14
4		24.	32
5		30.86	38.86
6		37.7	45.71
7		44.5	52.57

*INCHES FROM WALL PLUS COUPLING LENGTH

CARNOT

PMF-002

Appendix C.2

CEM Data

CARNOT
CONTINUOUS EMISSIONS MEASUREMENTS

CLIENT: UCOS - Colmac
DATE: 6/28/99
OPERATOR: EP
TEST LOCATION: Unit 1 Outlet
TEST NUMBERS: 1-1- Stack

AMBIENT TEMP., DB/WB: ~115
BAROMETRIC PRESSURE: 29.80
DUCT STATIC PRESSURE: -0.7
FUEL: Bio Mass

TEST NO.	SAMPLE TIME	SAMPLE POINT/ CONDITION	DRY, UNCORRECTED							CORRECTED TO ___% ___, DRY		
			O_2	O_2	CO	NOx	NO	NO_2	SO_2	CO	NOx	SO_2
		Zero / Span	.3 / 12.2	.1 / 12.4								
1-1	1218 / 1221	A5	6.9	6.9								
	1221 / 1224	A4	7.2	7.1								
	1224 / 1227	A3	6.7	6.7								
	1227 / 1230	A2	7.0	7.2								
*	1230 / 1233	A1	7.1	8.0								
	1236 / 1239	B5	6.5	6.5								
	1239 / 1242	B4	6.7	6.7								
	1242 / 1245	B3	6.9	6.6								
	1245 / 1248	B2	6.3	6.2								
	1248 / 1251	B1	6.5	6.5								

COMMENTS:

CARNOT

PMF-013

CARNOT
CONTINUOUS EMISSIONS MEASUREMENTS

CLIENT: UCOS - Colmac

DATE: 6/28/94

OPERATOR: EP

TEST LOCATION: Unit 1

TEST NUMBERS: 1-1 - Start

AMBIENT TEMP., DB/WB:

BAROMETRIC PRESSURE:

DUCT STATIC PRESSURE:

FUEL: Bio Mass

TEST NO.	SAMPLE TIME	SAMPLE POINT/ CONDITION	Ref DRY, UNCORRECTED							CORRECTED TO ___% ___, DRY		
			O_2	O_2	CO	NOx	NO	NO_2	SO_2	CO	NOx	SO_2
	1254 / 1257	C5	6.6	6.5				-				
	1257 / 1300	C4	6.3	6.2								
	1300 / 1303	C3	6.4	6.4								
	1303 / 1306	C2	6.9	6.8								
	1306 / 1309	C1	6.7	6.7								
	1312 / 1315	D5	6.7	6.6								
	1315 / 1318	D4	6.9	6.8								
	1318 / 1321	D3	6.7	6.7								
	1321 / 1324	D2	6.6	6.6								
	1324 / 1327	D1	6.7	6.7								

COMMENTS:

PMF-013

CARNOT

(5)

CARNOT
CONTINUOUS EMISSIONS MEASUREMENTS

CLIENT: UCOS-Colmac

DATE: 6/28/94

OPERATOR: SS

TEST LOCATION: Unit 2 Outlet

TEST NUMBERS: 1-1- Stroo

AMBIENT TEMP., DB/WB:

BAROMETRIC PRESSURE:

DUCT STATIC PRESSURE:

FUEL:

TEST NO.	SAMPLE TIME	SAMPLE POINT/ CONDITION	Rel DRY, UNCORRECTED							CORRECTED TO ____% ____, DRY		
			O_2	O_2	CO	NOx	NO	NO_2	SO_2	CO	NOx	SO_2
1-1	1330/1333	E-5	7.0	6.9								
	1337/1330	E-4	6.6	6.6								
	1336/1339	E-3	6.6	6.6								
	1339/1342	E-2	6.9	6.8								
	1342/1345	E-1	6.9	6.6								
	1348/1351	F-5	6.5	6.5								
	1351/1354	F-4	6.2	6.2								
	1354/1357	F-3	6.8	6.8								
	1357/1400	F-2	6.8	6.8								
	1400/1403	F-1	6.8	6.8								
	1400/1409	A-1	6.5	6.5								
	SYS	Zero/SPAN	.34/12.1	.1/12.1								

COMMENTS:

CARNOT

PMF-013

CARNOT
CONTINUOUS EMISSIONS MEASUREMENTS

CLIENT: UCOS-Gilmore

DATE: 6/28/94

OPERATOR: EF

TEST LOCATION: 2-2-CEM

TEST NUMBERS:

AMBIENT TEMP., DB/WB:

BAROMETRIC PRESSURE:

DUCT STATIC PRESSURE:

FUEL:

TEST NO.	SAMPLE TIME	SAMPLE POINT/ CONDITION	DRY, UNCORRECTED							CORRECTED TO ____% ____, DRY		
			O_2	REF O_2	CO	NOx	NO	NO_2	SO_2	CO	NOx	SO_2
	SYS	zero / span	.3 / 12.2	.1 / 12.4								
	933 / 936	F5	7.0	7.0								
	936 / 939	F4	6.4	6.5								
	939 / 942	F3	7.3	7.4								
	942 / 945	F2	7.0	7.0								
	945 / 948	F1	6.7	6.7								
	951 / 954	E5	6.5	6.5								
	958 / 957	E-4	6.7	6.8								
	957 / 1000	E-3	7.1	7.1								
	1000 / 1003	E-2	6.9	7.0								
	1003 / 1006	E-1	6.7	6.8								

COMMENTS:

CARNOT

PMF-013

CARNOT
CONTINUOUS EMISSIONS MEASUREMENTS

CLIENT: UCOS - Colmac

DATE: 6/28/94

OPERATOR: EC

TEST LOCATION:

TEST NUMBERS:

AMBIENT TEMP., DB/WB:

BAROMETRIC PRESSURE:

DUCT STATIC PRESSURE:

FUEL:

TEST NO.	SAMPLE TIME	SAMPLE POINT/ CONDITION	DRY, UNCORRECTED							CORRECTED TO ____% ____, DRY		
			O_2	Ref O_2	CO	NOx	NO	NO_2	SO_2	CO	NOx	SO_2
2-2	1009/1012	D-5	6.9	7.0								
	1013/1015	D-4	6.3	6.4								
	1015/1018	D-3	7.2	7.2								
	1018/1021	D-2	7.7	7.7								
	1021/1024	D-1	7.0	7.0								
	1033/1036	C-5	6.5	6.4								
	1036/1039	C-4	6.6	6.6								
	1039/1042	C-3	6.5	6.6								
	1042/1045	C-2	6.4	6.4								
	1045/1048	C-1	7.4	7.5								

COMMENTS:

CARNOT

PMF-013

CARNOT
CONTINUOUS EMISSIONS MEASUREMENTS

CLIENT: VCOS - Colmac

DATE: 6/28/96

OPERATOR: GG

TEST LOCATION: outlet #2

TEST NUMBERS: 2-2-ST

AMBIENT TEMP., DB/WB: 105

BAROMETRIC PRESSURE: 29.92

DUCT STATIC PRESSURE:

FUEL: Bio Mass

TEST NO.	SAMPLE TIME	SAMPLE POINT/ CONDITION	DRY, UNCORRECTED							CORRECTED TO ____% ____, DRY		
			Ref O_2	O_2	CO	NOx	NO	NO_2	SO_2	CO	NOx	SO_2
	1051/1054	B-5	6.0	6.1				-				
	1054/1057	B-4	6.2	6.3								
	1057/1100	B-3	6.5	6.6								
	1100/1103	B-2	6.7	6.8								
	1103/1106	B-1	6.6	6.7								
	1109/1112	A-5	7.1	7.3								
	1112/1115	A-4	6.7	6.9								
	1115/1118	A-3	7.4	7.5								
	1118/1121	A-2	6.7	6.8								
	1121/1124	A-1	6.4	6.6								
	SYS	zero/span	.3/12.2	.1/12.4								

COMMENTS:

CARNOT

PMF-013

Appendix C.3

3D Flow Data

CARNOT

3-DIMENSIONAL VELOCITY DATA

Client/Location: UCOS Colmac

Date: 6-28-94

Sample Location: Unit 1 outlet

Data Taken By: Dave Worley

Unit No: 1

Test Description: 3-D traverse

Test No: 1-3-BD-traverse

Pitot I.D. No.:

Barometric Pressure (in Hg):

Pre-Test Leak Check: 0.4

Static Pressure in Stack (iwg):

Post-Test Leak Check: 0.4

Time	Port	Point	Yaw Angle (Degrees)	Velocity (P1-P2)	Pitch (P4-P5)	Temperature (F)
	D	7	-10	.45	0	413
		6	-6	.47	0	413
		5	-5	.43	+.01	414
1215		4	0	.40	+.01	414
		3	-1	.39	+.01	416
		2	0	.34	+0	416
		1	0	.31	+.01	415
	C	7	-10	.4	-.04	415
	C	6	-10	.35	-.02	416
		5	-5	.37	-0	416
		4	0	.35	0	417
		3	+5	.41	+.01	417
		2	+8	.4	+.02	417
		1	+10	.33	+.03	417
	B	7	-5	.58	0	416
		6	-10	.57	0	417
		5	-6	.48	0	417
		4	-8	.34	-.02	417
		3	0	.26	+.03	417
		2	+7	.26	+.03	417
		1	+8	.28	+.01	417

Note: Clockwise rotation of the probe corresponds to a positive yaw angle: > 0 or > 90 degrees.

CARNOT

3-DIMENSIONAL VELOCITY DATA

Client/Location: UCOS Colmac Date: 6-28

Sample Location: unit / outlet Data Taken By: Dave W.

Unit No: 1 Test Description: 3-D traverse

Test No: 1-7-3D-traverse Pitot I.D. No.:

Barometric Pressure (in Hg): 29.80 Pre-Test Leak Check

Static Pressure in Stack (iwg): Post-Test Leak Check:

Time	Port	Point	Yaw Angle (Degrees)	Velocity (P1-P2)	Pitch (P4-P5)	Temperature (F)
	A	7	-10	.59	-.03	415
		6	-8	.48	-.03	416
		5	-6	.48	-.03	418
		4	0	.5	-.05	418
		3	0	.57	-.04	419
		2	0	.6	-.05	419
		1	0	.6	-.07	419
	E	7	~~+5~~	.57	.0	419
		6	-8	.55	0	420
		5	0	.56	0	420
		4	0	.6	0	420
		3	-3	.58	0	420
		2	-2	.6	-.03	420
		1	-2	.58	.02	420
	F	7	-4	.5	-.01	418
		6	0	.6	-.03	418
		5	+2	.55	-.04	419
		4	0	.52	-.04	419
		3	0	.62	-.04	419
		2	0	.62	-.04	419
		1	0	.60	-.03	419

Note: Clockwise rotation of the probe corresponds to a positive yaw angle: > 0 or > 90 degrees.

CARNOT
3-DIMENSIONAL VELOCITY DATA

Client/Location: UCCS

Date: 8-28-94

Sample Location: Unit 2 outlet

Data Taken By: D. W

Unit No: 2

Test Description: 3-D

Test No: 2-2-3D

Pitot I.D. No.:

Barometric Pressure (in Hg):

Pre-Test Leak Check

Static Pressure in Stack (iwg): -0.75

Post-Test Leak Check:

Time	Port	Point	Yaw Angle (Degrees)	Velocity (P1-P2)	Pitch (P4-P5)	Temperature (F)
1035	A	7	-6	.55	-.05	439
		6	-9	.45	-.05	439
		5	-12	.45	-.05	439
		4	-3	.5	-.05	439
		3	-9	.6	-.04	439
		2	-8	.6	-.05	439
		1	-8	.55	-.00	440
	B	7	+5	.7	-.00	439
		6	-7	.65	0	439
		5	0	.57	0	439
		4	-1	.48	0	439
		3	-2	.72	0	439
		2	-3	.25	0	438
		1	-15	.27	-.02	438
	C	7	0	.41	-.01	437
		6	0	.42	-.02	436
		5	0	.37	-.01	437
		4	-2	.37	+.01	437
		3	-6	.36	+.02	437
		2	-3	.4	+.02	437
		1	-9	.36	+.02	437

Note: Clockwise rotation of the probe corresponds to a positive yaw angle: > 0 or > 90 degrees.

CARNOT

3-DIMENSIONAL VELOCITY DATA

Client/Location: UCOS Colmac

Date: 6-27-94

Sample Location: Outlet

Data Taken By: Dave Wonderly

Unit No: 2

Test Description: 3-D

Test No: 2-2-3D-Vel

Pitot I.D. No.:

Barometric Pressure (in Hg): 29.82

Pre-Test Leak Check: O.K.

Static Pressure in Stack (iwg):

Post-Test Leak Check: O.K

Time	Port	Point	Yaw Angle (Degrees)	Velocity (P1-P2)	Pitch (P4-P5)	Temperature (F)
	F 7		-7°	.55	-.05	
	6		-7°	.57	-.04	446
	5		-7°	.50	-.06	441
	4		-6°	.59	-.03	443
	3		-1	.66	-.03	441
	2		-8°	.60	0	442
	1		-10	.52	+.07	445
	E	7	-9°	.52	0	441
		6	-10°	.52	+.01	442
		5	-5°	.54	+.02	442
		4	-7°	.55	0	442
		3	-3°	.53	0	441
		2	-9°	.53	0	441
		1	-10°	.55	+.02	440
	D	7	0	.49	0	440
		6	+1	.45	+.02	438
		5	-2	.42	+.02	437
		4	0	.39	+.01	437
		3	0	.36	0	437
		2	-3°	.30	-.01	437
		1	+2	.25	0	437

Note: Clockwise rotation of the probe corresponds to a positive yaw angle: > 0 or > 90 degrees.

APPENDIX D
CALCULATIONS

3D VELOCITY - DATA AND WORKSHEET

Client:	UCOS COLMAC	Date:	
Unit:	# 1	Data By:	EF
Sample Location:	Outlet duct	Baro. Pressure, in Hg.:	29.90
Test No.:	1-1-3d	Static Pressure, in WG:	-0.78
Probe ID No.:	B-2131	Abs. Pressure, in Hg.:	29.84
Unit Load:		Average O2, % dry:	6.70
Test Date:	6/28/94	Average CO2, % dry:	12.00
Time (Start/Stop):	0950/1145	Moisture Content, %:	15.00
		Molecular Weight, wet:	28.36

Sample Point		Yaw Angle deg.	Pitch P4-P5 in WG	Total P1-P2 in WG	Stack Temp. F	P4-P5/ P1-P2 in WG	Pitch Angle deg.	Pt-Ps/ P1-P2 in WG	Pt-Ps in WG	Result Angle deg.	Velocity uncorr.* fps	Velocity Axial fps
A	7	-10	-0.03	0.58	415	-0.05	-3.2	1.00	0.58	10.5	66.1	65.0
A	6	-8	-0.03	0.48	416	-0.06	-3.8	1.00	0.48	8.9	60.2	59.4
A	5	-6	-0.03	0.48	418	-0.06	-3.8	1.00	0.48	7.1	60.2	59.8
A	4	0	-0.05	0.50	418	-0.10	-6.1	1.00	0.50	6.1	61.5	61.2
A	3	0	-0.04	0.57	419	-0.07	-4.3	1.00	0.57	4.3	65.7	65.5
A	2	0	-0.05	0.60	419	-0.08	-5.1	1.00	0.60	5.1	67.4	67.2
A	1	0	-0.03	0.60	419	-0.05	-3.1	1.00	0.60	3.1	67.4	67.3
E	7	-5	0.00	0.53	419	0.00	0.0	1.00	0.53	5.0	63.2	63.0
E	6	-8	0.00	0.55	420	0.00	0.0	1.00	0.55	8.0	64.4	63.8
E	5	0	0.00	0.56	420	0.00	0.0	1.00	0.56	0.0	65.0	65.0
E	4	0	0.00	0.60	420	0.00	0.0	1.00	0.60	0.0	67.3	67.3
E	3	-3	0.00	0.58	420	0.00	0.0	1.00	0.58	3.0	66.2	66.1
E	2	-2	0.03	0.60	420	0.05	3.2	1.00	0.60	3.8	67.2	67.1
E	1	-2	0.02	0.58	420	0.03	2.2	1.00	0.58	3.0	66.1	66.0
F	7	-4	-0.01	0.50	418	-0.02	-1.3	1.00	0.50	4.2	61.4	61.2
F	6	0	-0.03	0.60	418	-0.05	-3.1	1.00	0.60	3.1	67.3	67.2
F	5	2	-0.04	0.55	419	-0.07	-4.5	1.00	0.55	4.9	64.5	64.3
F	4	0	-0.04	0.52	419	-0.08	-4.7	1.00	0.52	4.7	62.8	62.5
F	3	0	-0.04	0.62	419	-0.06	-4.0	1.00	0.62	4.0	68.5	68.3
F	2	0	-0.04	0.62	419	-0.06	-4.0	1.00	0.62	4.0	68.5	68.3
F	1	0	-0.03	0.60	419	-0.05	-3.1	1.00	0.60	3.1	67.4	67.3
D	7	-10	0.00	0.45	413	0.00	0.0	1.00	0.45	10.0	58.1	57.2
D	6	-6	0.01	0.47	413	0.02	1.4	1.00	0.47	6.2	59.3	59.0
D	5	-5	0.01	0.43	414	0.02	1.5	1.00	0.43	5.2	56.8	56.5
D	4	0	0.01	0.40	414	0.03	1.6	1.00	0.40	1.6	54.7	54.7
D	3	1	0.01	0.39	416	0.03	1.6	1.00	0.39	1.9	54.1	54.1
D	2	0	0.00	0.34	416	0.00	0.0	1.00	0.34	0.0	50.6	50.6
D	1	0	0.01	0.31	415	0.03	2.1	1.00	0.31	2.1	48.2	48.2
C	7	-10	-0.04	0.40	415	-0.10	-6.1	1.00	0.40	11.7	54.9	53.8
C	6	-10	-0.02	0.35	416	-0.06	-3.5	1.00	0.35	10.6	51.4	50.5
C	5	-5	0.00	0.37	416	0.00	0.0	1.00	0.37	5.0	52.7	52.5
C	4	0	0.00	0.35	417	0.00	0.0	1.00	0.35	0.0	51.3	51.3
C	3	5	0.01	0.41	417	0.02	1.6	1.00	0.41	5.2	55.5	55.3
C	2	8	0.02	0.40	417	0.05	3.2	1.00	0.40	8.6	54.8	54.2
C	1	10	0.03	0.33	417	0.09	5.9	0.99	0.33	11.6	49.8	48.7
B	7	-9	0.00	0.58	416	0.00	0.0	1.00	0.58	9.0	66.0	65.2
B	6	-10	0.00	0.57	417	0.00	0.0	1.00	0.57	10.0	65.5	64.5
B	5	-6	0.00	0.48	417	0.00	0.0	1.00	0.48	6.0	60.1	59.8
B	4	-8	0.02	0.34	417	0.06	3.8	0.99	0.34	8.8	50.5	49.9
B	3	0	0.03	0.26	417	0.12	7.6	0.99	0.26	7.6	44.2	43.8
B	2	7	0.03	0.26	417	0.12	7.6	0.99	0.26	10.3	44.2	43.5
B	1	8	0.01	0.28	417	0.04	2.3	1.00	0.28	8.3	45.9	45.4

RESULTS

0.48

Yaw Angle:	2.0 degrees	Stack Temperature:	417 F
Pitch Angle:	-0.4 degrees	Velocity*:	59.45 fps (feet per sec.)
Resultant Angle:	5.6 degrees	Axial Velocity:	59.08 fps
Standard Deviation:	3.3 degrees		

*velocity in the direction of flow

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STRATIFICATION CHECK

Client: UCOS COLMAC
Project #: 1409-40950
Unit No: 1.0
Date: 6/28/94

Point	O_2 pt	Ref O_2	% Diff	Point	O_2 pt	Ref O_2	% Diff
A5	6.9	6.9	0.0%	D5	6.5	6.4	-1.6%
A4	7.2	7.1	-1.4%	D4	6.6	6.6	0.0%
A3	6.7	6.7	0.0%	D3	6.7	6.7	0.0%
A2	7.0	7.2	2.8%	D2	6.6	6.6	0.0%
A1	6.5	6.5	0.0%	D1	6.7	6.7	0.0%
B5	6.5	6.5	0.0%	E5	7.0	6.9	-1.4%
B4	6.7	6.7	0.0%	E4	6.6	6.6	0.0%
B3	6.7	6.6	-1.5%	E3	6.6	6.6	0.0%
B2	6.3	6.2	-1.6%	E2	6.9	6.8	-1.5%
B1	6.5	6.5	0.0%	E1	6.7	6.6	-1.5%
C5	6.6	6.5	-1.5%	F5	6.5	6.5	0.0%
C4	6.3	6.2	-1.6%	F4	6.2	6.2	0.0%
C3	6.4	6.4	0.0%	F3	6.8	6.8	0.0%
C2	6.9	6.8	-1.5%	F2	6.8	6.8	0.0%
C1	6.7	6.7	0.0%	F1	6.8	6.8	0.0%

O2 Stratification= -0.4%

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3D VELOCITY - DATA AND WORKSHEET

Client:	UCOS COLMAC	Date:	
Unit:	# 2	Data By:	EF
Sample Location:	Outlet duct	Baro. Pressure, in Hg.:	29.90
Test No.:	2-2-3d	Static Pressure, in WG:	-0.78
Probe ID No.:	B-2131	Abs. Pressure, in Hg.:	29.84
Unit Load:		Average O2, % dry:	6.70
Test Date:	6/28/94	Average CO2, % dry:	12.00
Time (Start/Stop):	0950/1145	Moisture Content, %:	15.00
		Molecular Weight, wet:	28.36

Sample Point		Yaw Angle deg.	Pitch P4-P5 in WG	Total P1-P2 in WG	Stack Temp. F	P4-P5/ P1-P2 in WG	Pitch Angle deg.	Pt-Ps/ P1-P2 in WG	Pt-Ps in WG	Result Angle deg.	Velocity uncorr.* fps	Velocity Axial fps
A	7	-6	-0.05	0.55	439	-0.09	-5.5	1.00	0.55	8.1	65.3	64.6
A	6	-9	-0.05	0.45	439	-0.11	-6.7	1.00	0.45	11.2	59.1	58.0
A	5	-12	-0.05	0.45	439	-0.11	-6.7	1.00	0.45	13.7	59.1	57.4
A	4	-3	-0.05	0.50	439	-0.10	-6.1	1.00	0.50	6.8	62.3	61.8
A	3	-9	-0.04	0.60	439	-0.07	-4.1	1.00	0.60	9.9	68.1	67.1
A	2	-8	-0.05	0.60	439	-0.08	-5.1	1.00	0.60	9.5	68.2	67.3
A	1	-8	0.00	0.55	440	0.00	0.0	1.00	0.55	8.0	65.2	64.5
B	7	5	0.00	0.70	439	0.00	0.0	1.00	0.70	5.0	73.5	73.2
B	6	-3	0.00	0.65	439	0.00	0.0	1.00	0.65	3.0	70.8	70.7
B	5	0	0.00	0.57	439	0.00	0.0	1.00	0.57	0.0	66.3	66.3
B	4	-1	0.00	0.48	439	0.00	0.0	1.00	0.48	1.0	60.9	60.8
B	3	-2	0.00	0.32	439	0.00	0.0	1.00	0.32	2.0	49.7	49.7
B	2	-3	0.00	0.25	438	0.00	0.0	1.00	0.25	3.0	43.9	43.8
B	1	-15	-0.02	0.27	438	-0.07	-4.5	1.00	0.27	15.7	45.7	44.0
C	7	0	-0.01	0.41	437	-0.02	-1.5	1.00	0.41	1.5	56.2	56.2
C	6	0	-0.02	0.42	436	-0.05	-2.9	1.00	0.42	2.9	56.9	56.8
C	5	0	-0.02	0.37	437	-0.05	-3.3	1.00	0.37	3.3	53.4	53.3
C	4	-2	-0.01	0.37	437	-0.03	-1.7	1.00	0.37	2.6	53.4	53.3
C	3	-6	0.02	0.36	437	0.06	3.6	0.99	0.36	7.0	52.6	52.2
C	2	-3	0.02	0.40	437	0.05	3.2	1.00	0.40	4.4	55.4	55.3
C	1	-9	0.02	0.36	437	0.06	3.6	0.99	0.36	9.7	52.6	51.8
F	7	-7	-0.05	0.55	440	-0.09	-5.5	1.00	0.55	8.9	65.3	64.5
F	6	-3	-0.04	0.53	440	-0.08	-4.6	1.00	0.53	5.5	64.1	63.8
F	5	-6	-0.06	0.50	441	-0.12	-7.2	1.00	0.50	9.4	62.4	61.5
F	4	-1	-0.03	0.59	443	-0.05	-3.1	1.00	0.59	3.3	67.7	67.6
F	3	-8	-0.03	0.66	441	-0.05	-2.8	1.00	0.66	8.5	71.5	70.7
F	2	-10	0.00	0.60	442	0.00	0.0	1.00	0.60	10.0	68.1	67.1
F	1	-9	0.07	0.52	445	0.13	8.9	0.99	0.52	12.6	63.4	61.9
E	7	-10	0.00	0.52	441	0.00	0.0	1.00	0.52	10.0	63.4	62.4
E	6	-5	0.01	0.52	442	0.02	1.2	1.00	0.52	5.1	63.4	63.2
E	5	-7	0.02	0.54	442	0.04	2.4	1.00	0.54	7.4	64.6	64.1
E	4	-3	0.00	0.55	441	0.00	0.0	1.00	0.55	3.0	65.2	65.1
E	3	-9	0.00	0.53	441	0.00	0.0	1.00	0.53	9.0	64.0	63.2
E	2	-10	0.00	0.53	441	0.00	0.0	1.00	0.53	10.0	64.0	63.0
E	1	0	0.02	0.55	440	0.04	2.3	1.00	0.55	2.3	65.1	65.1
D	7	1	0.00	0.49	440	0.00	0.0	1.00	0.49	1.0	61.5	61.5
D	6	-2	0.02	0.45	438	0.04	2.8	1.00	0.45	3.5	58.8	58.7
D	5	0	0.02	0.42	437	0.05	3.1	1.00	0.42	3.1	56.8	56.7
D	4	0	0.01	0.39	437	0.03	1.6	1.00	0.39	1.6	54.8	54.7
D	3	0	0.00	0.36	437	0.00	0.0	1.00	0.36	0.0	52.6	52.6
D	2	-3	-0.01	0.30	437	-0.03	-2.1	1.00	0.30	3.6	48.1	48.0
D	1	2	0.00	0.25	437	0.00	0.0	1.00	0.25	2.0	43.9	43.8

RESULTS

Yaw Angle:	4.4	degrees	Stack Temperature:	439	F
Pitch Angle:	-1.0	degrees	Velocity*:	60.18	fps (feet per sec.)
Resultant Angle:	5.9	degrees	Axial Velocity:	59.71	fps
Standard Deviation:	4.0	degrees			

*velocity in the direction of flow

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STRATIFICATION CHECK

Client: UCOS COLMAC
Project #: 1409-40985
Unit No: 2
Date: 6/28/94

Point	O_2 pt	Ref O_2	% Diff	Point	O_2 pt	Ref O_2	% Diff
F5	7.0	7.0	0.0%	C5	6.5	6.4	-1.6%
F4	6.4	6.5	1.5%	C4	6.6	6.6	0.0%
F3	7.3	7.4	1.4%	C3	6.5	6.6	1.5%
F2	7.0	7.0	0.0%	C2	6.4	6.4	0.0%
F1	6.7	6.7	0.0%	C1	7.4	7.5	1.3%
E5	6.5	6.5	0.0%	B5	6.0	6.1	1.6%
E4	6.7	6.8	1.5%	B4	6.2	6.3	1.6%
E3	7.1	7.1	0.0%	B3	6.5	6.6	1.5%
E2	6.9	7.0	1.4%	B2	6.7	6.8	1.5%
E1	6.7	6.8	1.5%	B1	6.6	6.7	1.5%
D5	6.9	7.0	1.4%	A5	7.1	7.3	2.7%
D4	6.3	6.4	1.6%	A4	6.7	6.9	2.9%
D3	7.2	7.2	0.0%	A3	7.4	7.5	1.3%
D2	7.7	7.7	0.0%	A2	6.7	6.8	1.5%
D1	7.0	7.0	0.0%	A1	6.4	6.6	3.0%

O2 Stratification= 1.0%

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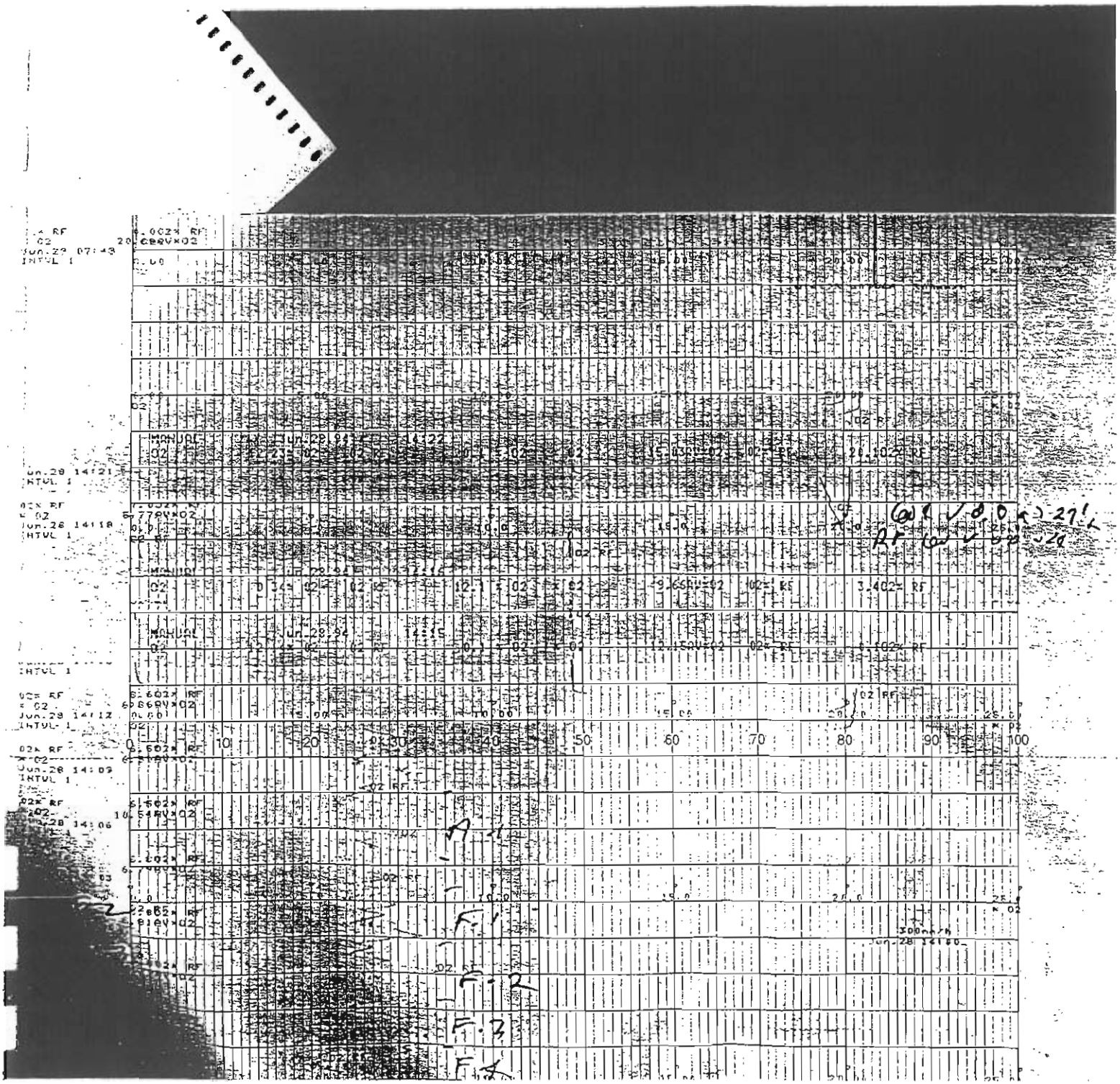
APPENDIX E

STRIP CHARTS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Jun.28 14:21
INTVL 1
Jun.28 14:18
INTVL 1
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INTVL 1
Jun.28 14:09
INTVL 1
Jun.28 14:06
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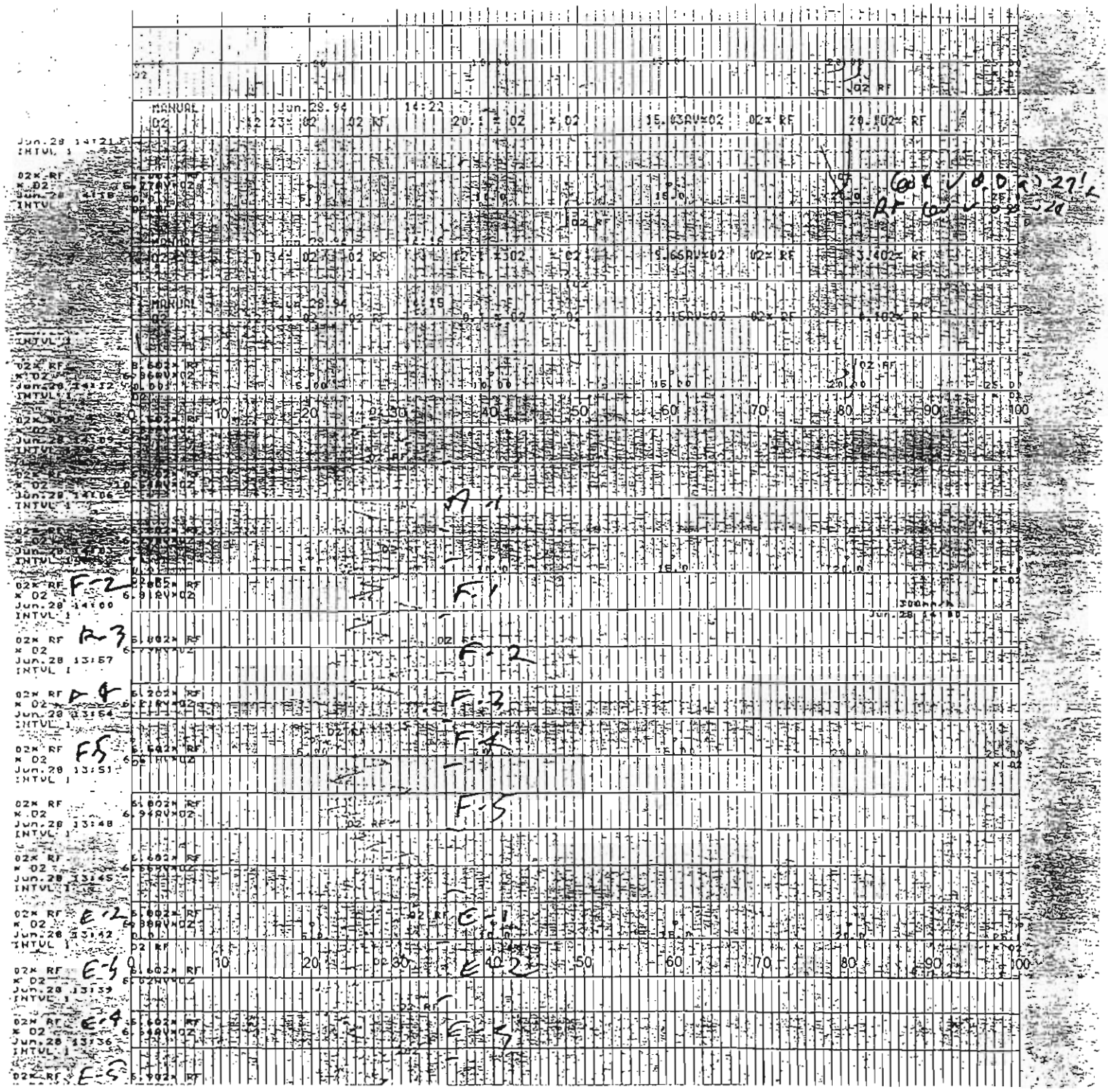
F.1
F.2
F.3
F.4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20.102× RF
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02× RF
× 02
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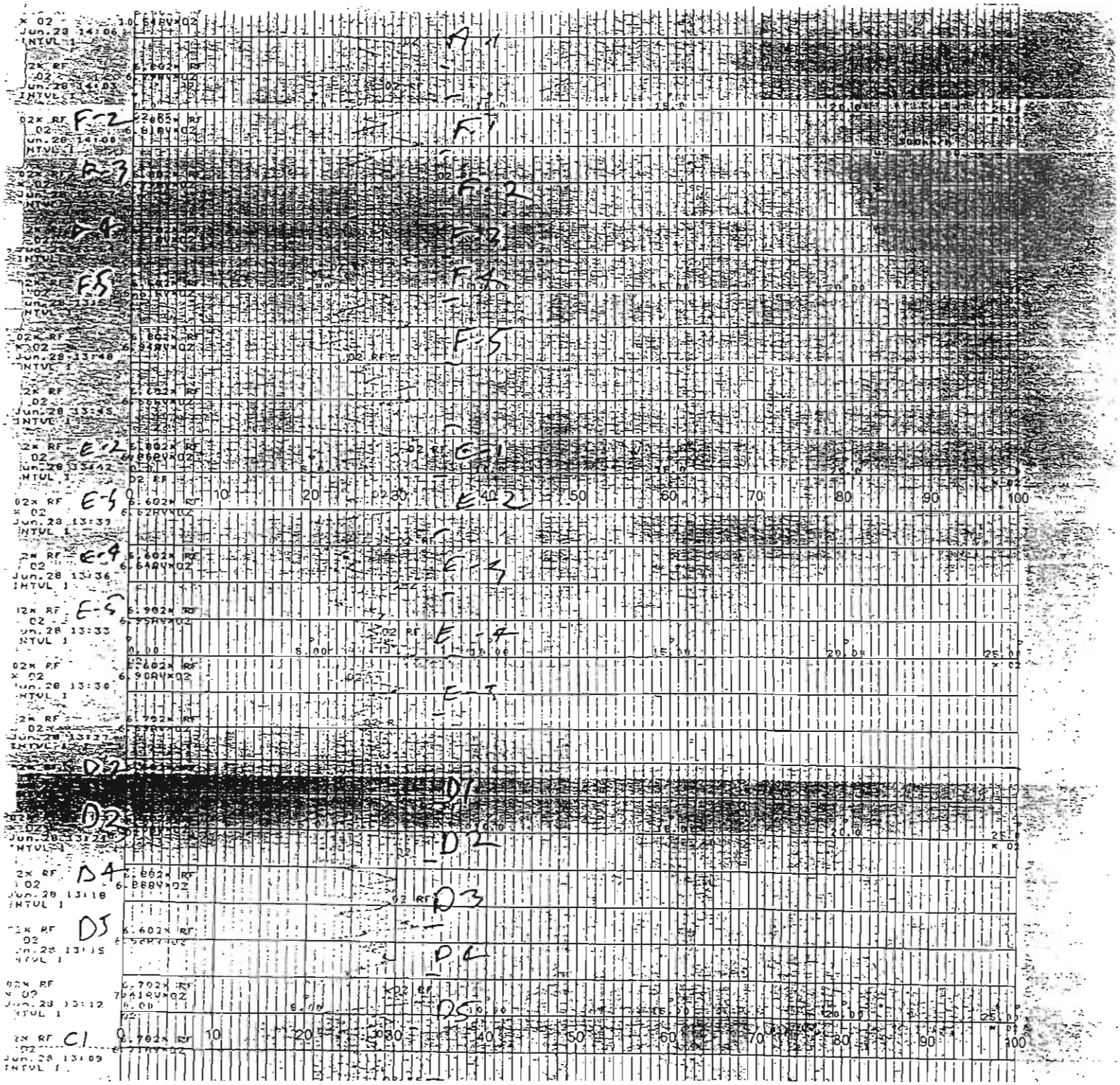
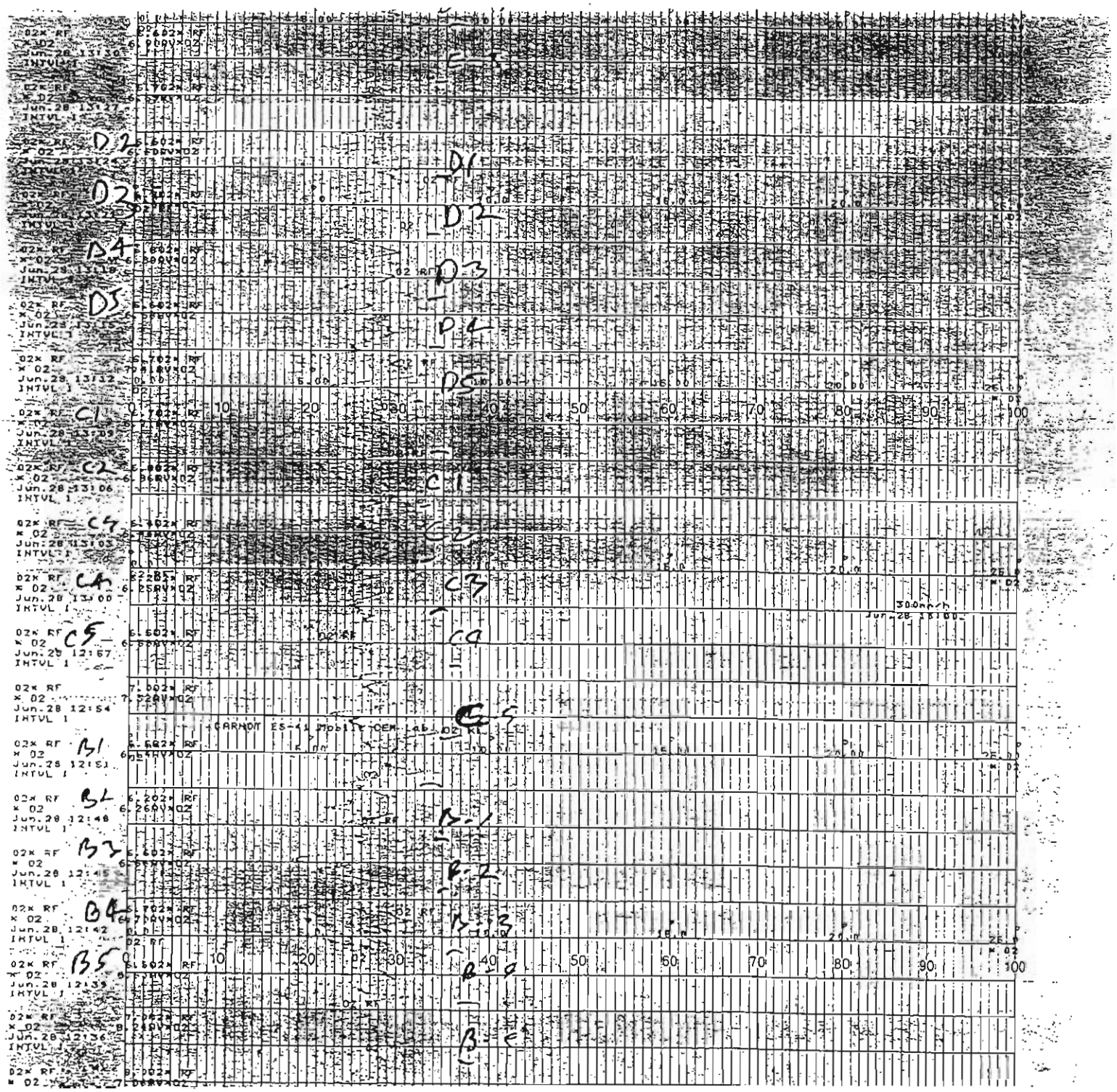
INTVL 1
MANUAL
Jun.28.94
12.15AV×02
02× RF
3.402× RF
Jun.28 14:12
INTVL 1
02× RF
× 02
Jun.28 14:09
INTVL 1
02× RF
× 02
Jun.28 14:06
INTVL 1
02× RF
× 02
Jun.28 14:03
INTVL 1
02× RF
× 02
Jun.28 14:00
INTVL 1
02× RF
× 02
Jun.28 13:57
INTVL 1
02× RF
× 02
Jun.28 13:54
INTVL 1
02× RF
× 02
Jun.28 13:51
INTVL 1
02× RF
× 02
Jun.28 13:48
INTVL 1
02× RF
× 02
Jun.28 13:45
INTVL 1
02× RF
× 02
Jun.28 13:42
INTVL 1
02× RF
× 02
Jun.28 13:39
INTVL 1
02× RF
× 02
Jun.28 13:36
INTVL 1
02× RF
F-2
R-3
F-4
F-5
E-2
E-3
E-4
E-5
A-1
F-1
F-2
F-3
F-4
F-5
E-1
E-2
E-3
0
10
20
30
40
50
60
70
80
90
100


A
F-1
F-2
F-3
F-4
F-5
E-1
E-2
E-3
E-4
E-5
D1
D2
D3
D4
D5
C1


D2
D3
D4
D5
C1
C2
C4
C5
B1
B2
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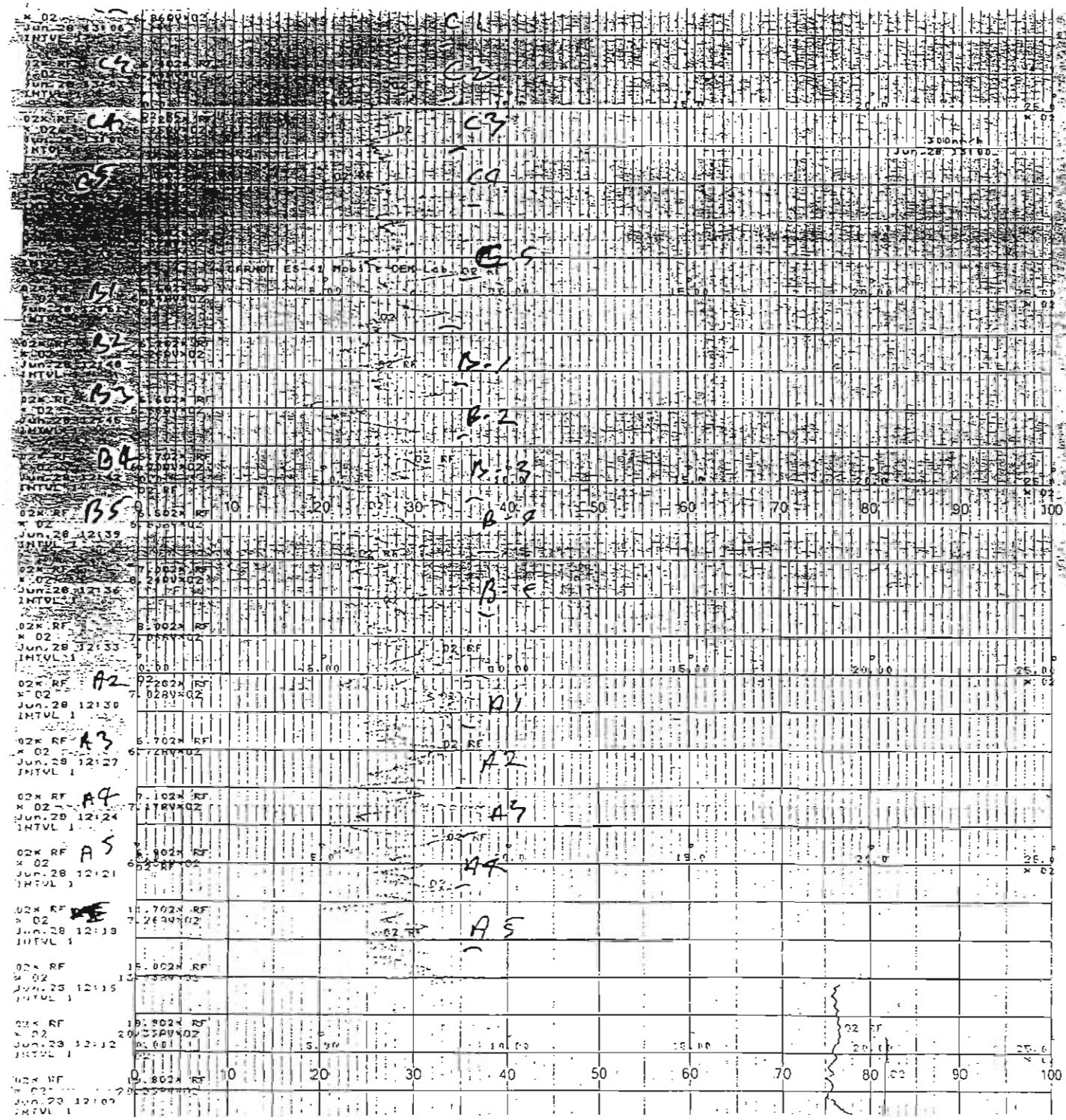
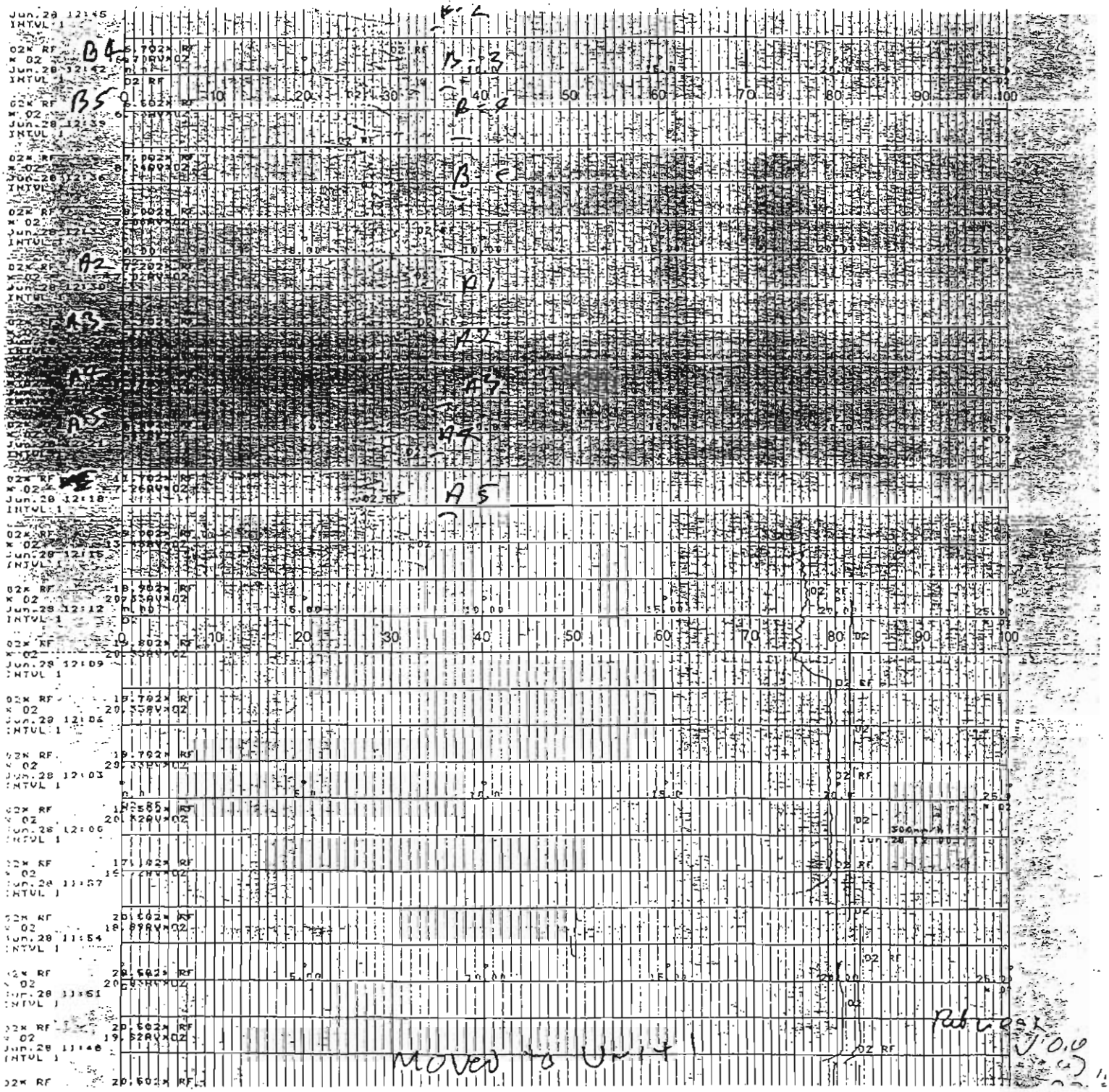
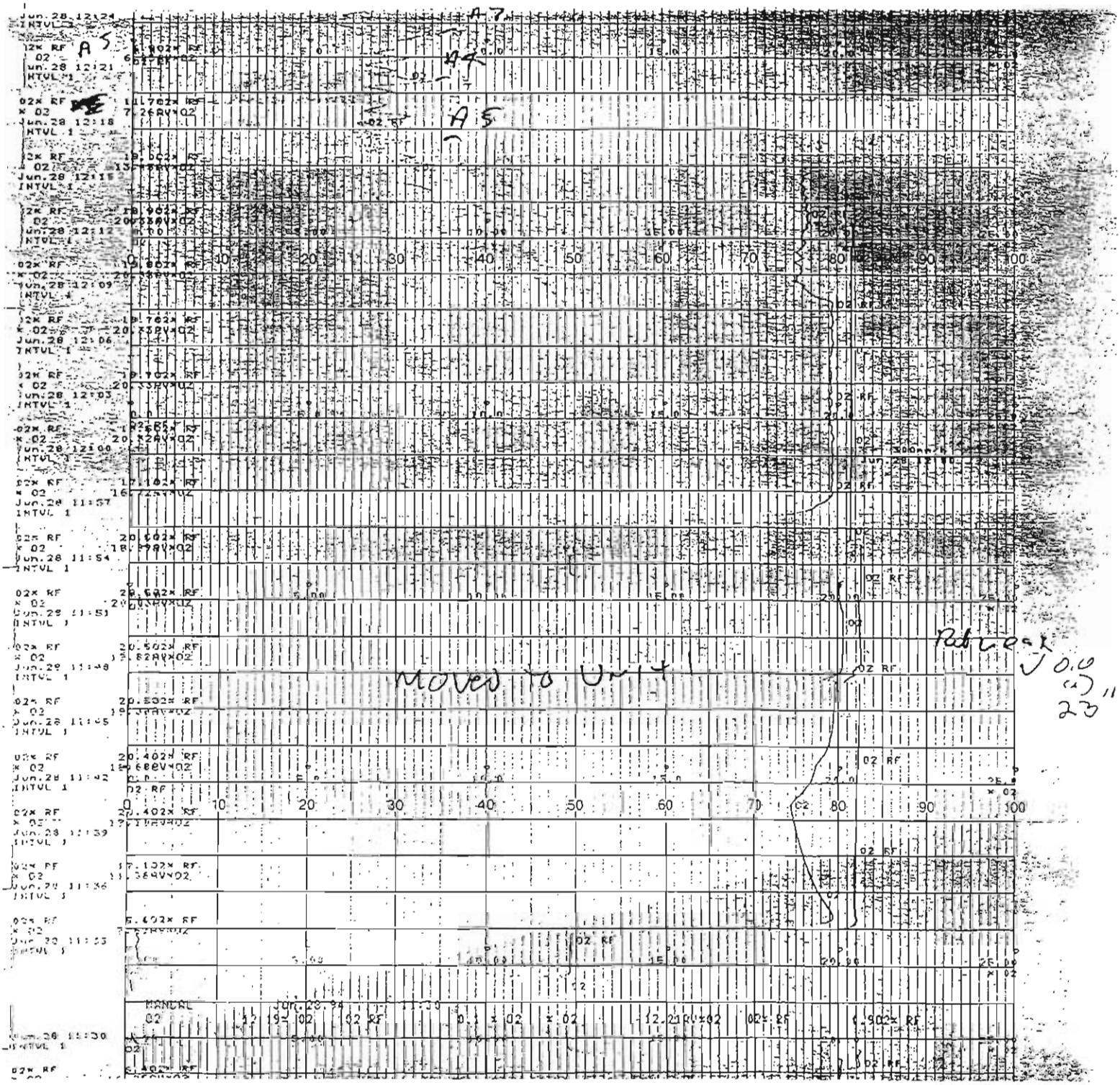
B4
B5
10
20
30
40
50
60
70
80
90
100


C1
C2
C3
C4
C5
B1
B2
B3
B4
B5
A1
A2
A3
A4
A5
CARNOT ES-41 Mobile OEM Lab
0
10
20
30
40
50
60
70
80
90
100


B4
B5
A2
A3
A4
A5
B-3
B-4
B-5
A1
A2
A3
A4
A5
Moved to Unit 1


A 7
A 5
A 4
A 5
Moved to Unit
Rebreak
0.0
23"
MANUAL
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Jun.28 12:24
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Jun.28 12:18
Jun.28 12:15
Jun.28 12:12
Jun.28 12:09
Jun.28 12:06
Jun.28 12:03
Jun.28 12:00
Jun.28 11:57
Jun.28 11:54
Jun.28 11:51
Jun.28 11:48
Jun.28 11:45
Jun.28 11:42
Jun.28 11:39
Jun.28 11:36
Jun.28 11:33
Jun.28 11:30
0
10
20
30
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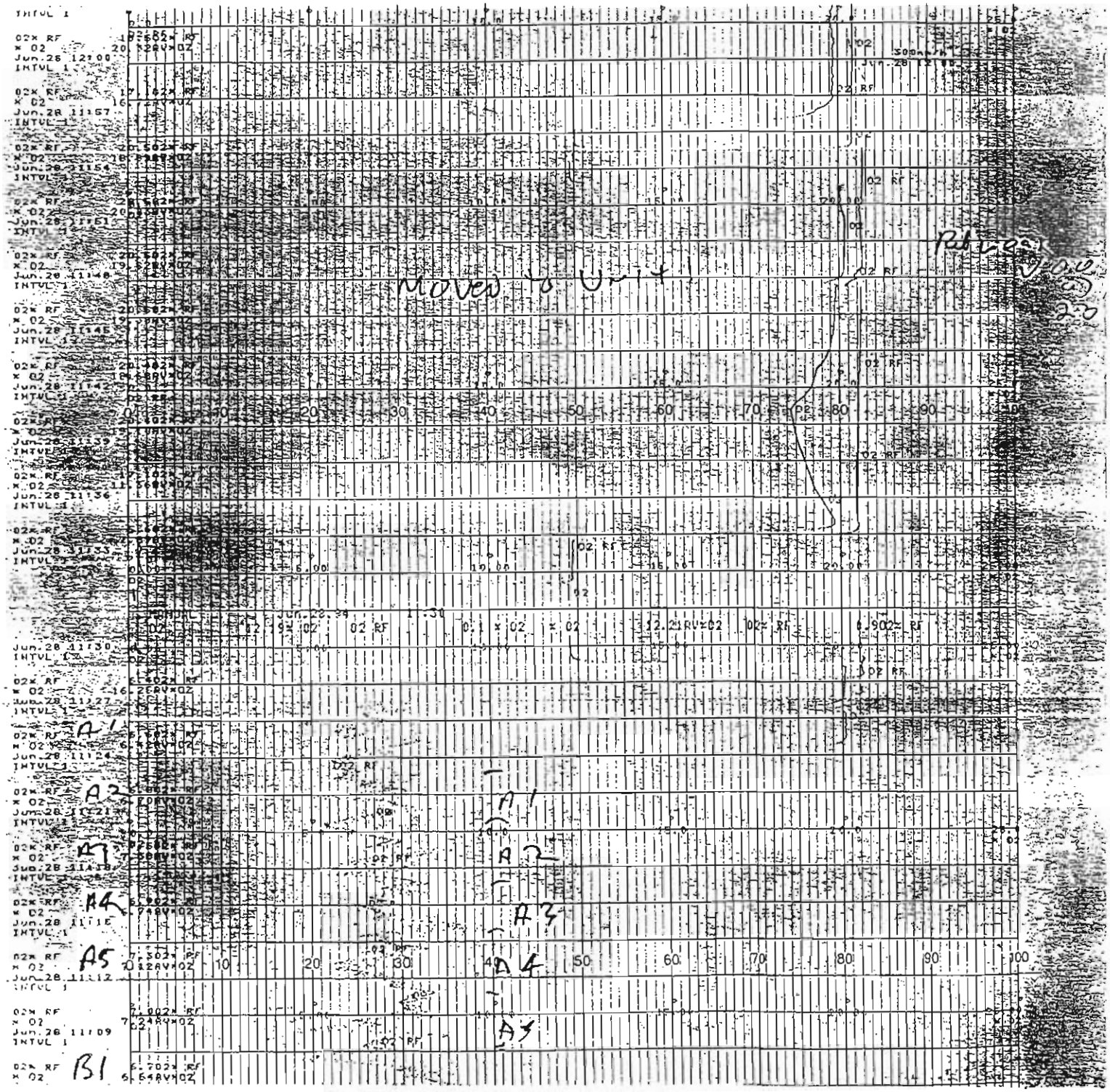
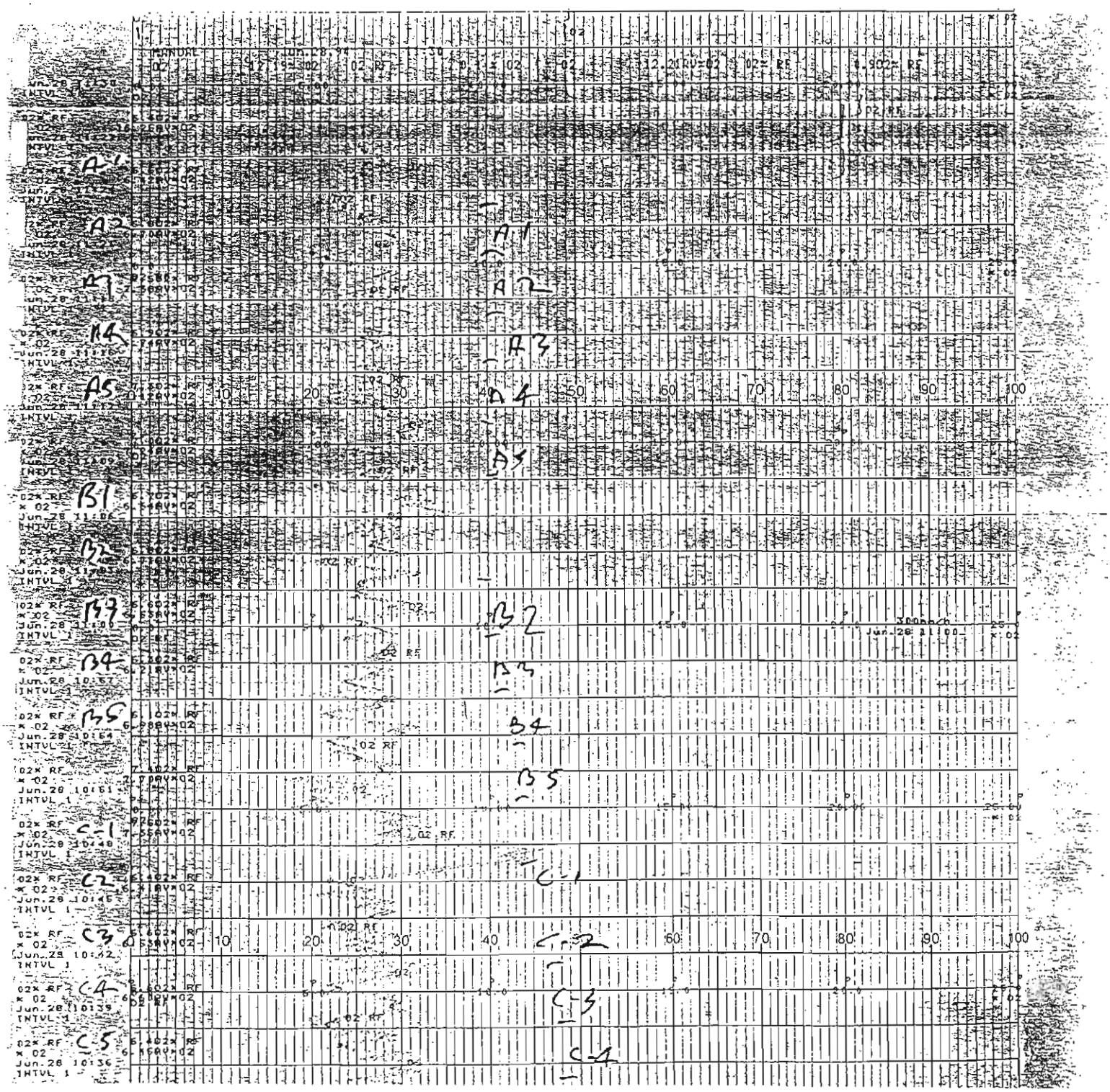
50
60
70
80
90
100


Moved to Unit
A1
A2
A3
A4
A5
B1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A-3
A-4
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B-2
B-3
B-4
B-5
C-1
C-2
C-3
C-4
C-5
10
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30
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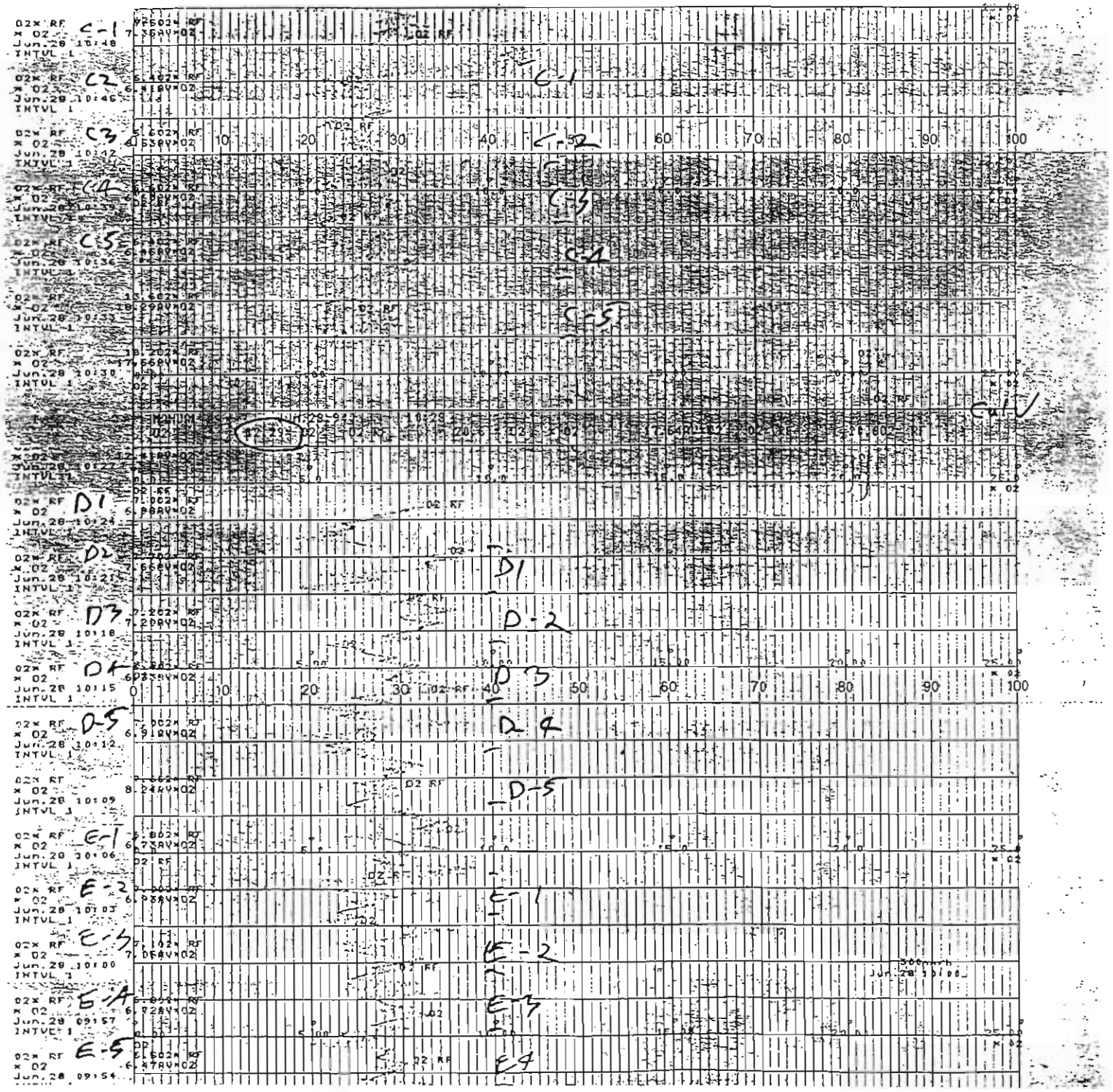
60
70
80
90
100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C2
C3
C4
C5
D1
D2
D3
D4
D5
E-1
E-2
E-3
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E-5
Cal
C-1
C-2
C-3
C-4
C-5
D1
D-2
D-3
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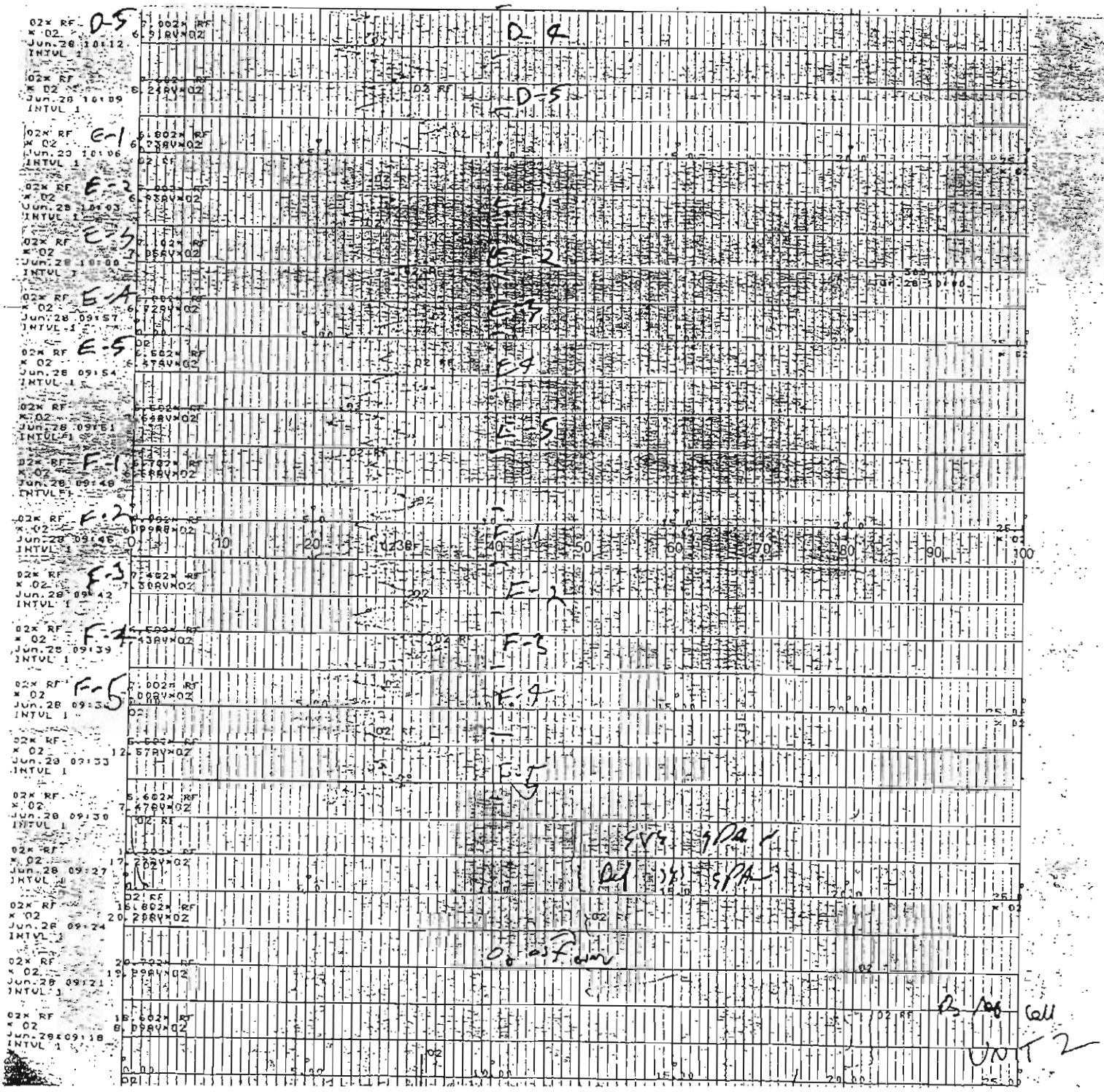
50
60
70
80
90
100


D-5
D-4
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E-2
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E-4
E-5
F-1
F-2
F-3
F-4
F-5
F-1
F-2
F-3
F-4
F-5
Cell
UNIT 2

END OF DOCUMENT

APPENDIX B QUALITY ASSURANCE

QUALITY ASSURANCE PROGRAM

Delta's operations include four major areas of focus which include sampling, sample analysis, equipment maintenance, calibration, data reduction, and reporting. Procedures are in place to ensure that work performed in each one of these areas is performed in a manner consistent with providing emissions test data that is of known quality and is legally defensible. This section provides details on the procedures that are followed to accomplish this assurance of data quality.

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

Standard methods of assessing data quality such as precision, accuracy and completeness are used. Criteria for acceptable data are generally contained in the reference methods, however, for some projects other criteria are defined. Standard statistical techniques can be applied to assess the data as requested for specific programs. Statistical analysis is not generally included when reporting source test data unless the number of samples and sampling conditions are planned to provide meaningful statistical results.

Delta's quality assurance objectives for precision and accuracy are based on the Reference Methods or published precision and accuracy data.

Completeness is defined as the percentage of measurements which are judged to be valid as compared to the total number of measurements made. Delta's objective is to generate only valid data. For compliance tests, Delta's completeness goal is 100%. For this initial copy of the QAP, the methods which are listed in Delta's capabilities provide results which are available while still on the job site. It is expected that if all quality assurance requirements for a test are not satisfied, the test will be invalidated and repeated and the test program will remain 100% complete.

REPRESENTATIVENESS AND COMPARABILITY

The usefulness and validity of all data is contingent upon 1) the results being representative of the source being tested and 2) comparable with other results generated by Delta or another organization. Delta has adopted the objective is that all measurements be representative and comparable. These objectives will be met by performing tests while the process is operating under known and documented conditions, following published reference methods, using standard data reduction techniques and reporting formats, and proper training of personnel.

TRAINING

Training is an on-going process for all Delta personnel. Personnel completing any task will be properly trained before undertaking any task or be under the direct observation and supervision of someone properly trained. There are certain skills which all technical personnel are expected to acquire.

All source test personnel must review the applicable portions of the following technical documents before being involved in any capacity in any test program.

a) 40 CFR Part 60

b) SCAQMD Source Test Manual

c) Delta Quality Assurance Plan

d) EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III.

PROCEDURE SPECIFIC TRAINING

In addition to the general awareness training discussed previously, each person responsible for the performance of a test procedure is required to demonstrate proficiency in the method involved. This demonstration will be accomplished through 1) reading of the method, 2) reading of the manuals for the equipment being used, and 3) satisfactorily completing an oral or written exam regarding the above material. Information related to training for specific methods is provided below.

A. Continuous Monitoring of Emissions: EPA Methods 3A, 6C, 7E, 10, 20, SCAQMD Method 100.1
   1. Understanding of the CEMS schematic drawing
   2. Understanding of the sampling system
   3. Leak check
   4. Analyzer calibrations and adjustments
   5. Sample system bias calibration check
   6. Strip chart recorder operation and documentation
   7. Stratification check
   8. Corrections for sample system bias and analyzer drift

B. Sample Locations: EPA Method 1, SCAQMD Method 1.1
   1. Identify sample locations
   2. Determination of upstream and downstream diameters
   3. Stack area calculations
   4. Determine number and location of sample points
   5. Perform cyclonic flow check and determine sample location acceptability.

C. Stack Gas Velocity and Volumetric Flow Rate: EPA Method 2, SCAQMD Method 2.1

   1. Assemble pitot tube/thermocouple
   2. Perform leak check
   3. Record differential pressure
   4. Record stack temperature
   5. Record static pressure
   6. Record barometric pressure
   7. Calculate stack gas velocity and volumetric flow rate

D. Stack Gas Moisture Content: EPA Method 4, SCAQMD Method 4.1

1. Assemble sample train (probe, sample line, impingers, U-tube, gooseneck, vacuum line, meter, pump, etc.)
2. Record preliminary data: barometric pressure, reference temperature, ambient temperature.
3. Pre- and post-test leak check: < 0.02 cfm
4. Read and record: sample volume, delta H, meter temperatures (in/out), vacuum, impinger outlet temperature
5. Weigh impingers
6. Calculate % moisture

SAMPLING PROCEDURES

Delta maintains complete copies of federal, state, and local regulatory agency source test methods which serve as the final authority on sampling procedures. This Quality Assurance Plan does not attempt to re-state the source test methods which are available. Delta strives to follow the appropriate source test methods whenever possible. Source test methods are listed in all test plans for review by both clients and regulatory agencies.

The following steps are taken to ensure that the sampling procedures of the source test methods are followed:

1. Training of personnel, as discussed in Section 5,
2. Copies of reference methods are available to all personnel and are taken to every job site,
3. Appropriate selection of project managers
4. Quality assurance reviews of test programs

Occasionally, due to the sample location limitations or other factors, variations from the standard methods will be necessary. Any variations from the methods will be assessed to determine the effect which the variation will have on data quality. Whenever possible, variations will be included in the test plan and receive approval prior to implementation of the program. Any variations will be clearly documented in the source test report.

CHAIN-OF-CUSTODY PROCEDURES

DATA SHEET CHAIN-OF-CUSTODY

The program manager for each program is responsible for collection of data sheets from sampling personnel as they are completed. The program manager maintains possession of the data sheets or keeps them in locked storage. Upon return to the office, a copy of all field data sheets is made and placed in a locked file. The original field data sheets are used for report preparation and are kept with the final report. Data sheets, test plans, and reports are kept in files, organized by client and project.

A chain-of-custody form is kept at the project file location to log check-out and return of any data sheets or files.

Sample and Reagent Chain of Custody

Chain of Custody procedures begin prior to testing with the preparation of reagents and filters to be used in field testing. Delta personnel who have prepared the filters and reagents complete and sign a reagent chain of custody form which is transferred with the reagents to the field testing team. The field team member receiving the reagents records the transfer on this form. The reagent chain of custody form is included in the final source test report.

At the test site all samples collected are recorded on a chain of custody form as they are taken. This chain of custody form also includes the date, time, test number and a description of the samples and sample fractions. This form is signed by the field team member serving as the sample custodian. This form is left with the sample at all times; it is used to record transfer of the samples to Delta's in-house laboratory or to outside laboratories. Intermediate transfers to shipping agents are also recorded here. Transfers of test equipment between field team members are recorded on the sampling train data sheet.

CALIBRATION PROCEDURES AND FREQUENCY

All of Delta's major equipment components are calibrated according to the procedures established by EPA, CARB, and SCAQMD. When regulations differ, the stricter of the regulations will be followed. Table 9 summarizes the calibration procedures and intervals for the major equipment components.

DATA REDUCTION, VALIDATION, AND REPORTING

DATA REDUCTION

Data reduction generally occurs in two phases: First, preliminary data reduction occurs on the job site. On-site data reduction may be performed by sampling technicians or the project manager. Preliminary calculations may include velocity, moisture, stack flow, and continuous gaseous measurements. Draft test results are normally available prior to leaving the job site. Calculations are performed manually, with a calculator, or with a portable computer. Whenever possible, standard spreadsheets are used to reduce the data.

The second phase of data reduction occurs after the test team has left the job site. Final results are generated after the project manager has reviewed the data entry, calculations, and reporting units.

The standard calculations are available in the test methods

TABLE 1
MAJOR SAMPLING EQUIPMENT CALIBRATION REQUIREMENTS

Sampling Equipment	Calibration Frequency	Calibration Procedure	Acceptable Calibration Criteria
Continuous Analyzers	Before and After Each Test Day	3-point calibration error test	< 2% of analyzer range
Continuous Analyzers	Before and After Each Test Run	2-point sample system bias check	< 5% of analyzer range
Continuous Analyzers	After Each Test Run	2-point analyzer drift determination	< 3% of analyzer range
CEMS System	Beginning of Each Day	leak check	< 1 in. Hg decrease in 5 min. at > 20 in. Hg
Continuous Analyzers	Semi-Annually	3-point linearity	< 1% of analyzer range
NO_x Analyzer	Daily	NO_2 -> NO converter efficiency	> 90%
Differential Pressure Gauges (except for manometers)	Semi-Annually	Correction factor based on 5-point comparison to standard	+/- 5%
Differential Pressure Gauges (except for manometers)	Bi-Monthly	3-point comparison to standard, no correction factor	+/- 5%
Barometer	Semi-Annually	Adjusted to mercury-in-glass or National Weather Service Station	+/- 0.1 inches Hg
Dry Gas Meter	Semi-Annually	Calibration check at 4 flow rates using a NIST traceable standard	+/- 2%
Dry Gas Meter	Bi-Monthly	Calibration check at 2 flow rates using a NIST traceable standard	+/- 2% of semi-annual factor
Dry Gas Meter Orifice	Annually	4-point calibration for $\Delta H@$	--
Temperature Sensors	Semi-Annually	3-point calibration vs. NIST traceable standard	+/- 1.5%

DATA VALIDATION

All data, data entry, and calculations are double-checked by the originator and reviewed by a second person. Reviews can include re-calculation of results, data entry checks, and calculation of known and accepted data sets using the existing spreadsheet.

REPORTING

Delta promotes the use of a standard reporting format, when possible.

INTERNAL QUALITY ASSESSMENTS

INTEGRATED WET CHEMICAL SAMPLING EQUIPMENT QUALITY CONTROL

Major equipment maintenance schedules are provided. Additional quality control measures are performed on sampling equipment which includes:

- wind-tunnel calibration of pitot tubes
- 3-point thermocouple/readout calibrations
- bi-monthly meter calibration checks
- pre- and post-test leak checks of sample systems

CONTINUOUS EMISSION MONITORING SYSTEM (CEMS) EQUIPMENT QUALITY CONTROL

Delta uses EPA Protocol gases to perform all QA/QC checks of the analyzers when available. On-site checks include 3-point calibration error (+/- 2% of span), 2-point sample system bias (+/- 5% of span), analyzer drift (+/- 3% of span). Semi-annual checks include analyzer linearity (+/- 1% of span) and NO_2 converter efficiency (> 90%).

PERFORMANCE AND SYSTEM AUDITS

The appropriate regulatory agency is notified of all Delta compliance tests. The regulatory agency is allowed the opportunity to perform side-by-side tests and/or observe the Delta setup and sampling. Delta cooperates fully in any pre-arranged regulatory agency audit.

Delta's approval under the South Coast Air Quality Management District (SCAQMD) Laboratory Approval Program (LAP) includes a review of quality assurance procedures, equipment type, maintenance, responsibilities, a laboratory audit, and an external audit of the sampling system which involves analysis and reporting of unknown samples.

EQUIPMENT MAINTENANCE

Delta performs routine and preventative maintenance on all major sampling equipment. These procedures are in addition to method specific requirements which are summarized earlier in this QAP. Table 2 summarizes the equipment maintenance schedule. This preventative maintenance schedule should minimize equipment failures and downtime in the field. On the occasion where equipment does break down in the field, Delta personnel have the necessary experience to perform on-site repairs of most problems.

TABLE 2
EQUIPMENT MAINTENANCE SCHEDULE

Equipment	Performance Requirement	Maintenance Interval	Corrective Action
Continuous Analyzers	1. Proper response to zero, span gas 2. Absence of malfunction	As required by the manufacturer	As recommended by the manufacturer
Mobile Laboratory Sample System	1. Absence of leaks 2. Pass system bias test	Dependent on sources sampled and use intervals	1. Change filters 2. Repair/change gas dryer 3. Check for contamination 4. Leak check
Pumps	1. Absence of leaks 2. Generates manufacturers required pressure, vacuum, and flow	Every 500 hours of operation or 6 months	1. Visual inspection 2. Clean 3. Replace worn parts 4. Leak check
Sample Lines	1. Pass system bias test	After each test series	1. Flush with dry gas

SPECIFIC PROCEDURES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

The QA/QC procedures outlined in the previous sections of this document are provided to ensure data precision, accuracy, and completeness. It is the responsibility of each project team member to 1) complete all pertinent sections of the data sheets, 2) make comments, where appropriate, 3) notify project managers of sampling difficulties which may lead to invalid data, and 4) follow chain-of-custody procedures for all samples, data sheets, and documents.

Each test report is reviewed before release by one of Delta's designated Quality Assurance team members. Procedures, results, and data are reviewed to verify adherence to method requirements, that proper recording procedures are followed, and that calculations are performed properly. These reviews are conducted independently from any project related data reduction and reporting activities.

QUALITY ASSURANCE REPORTS TO MANAGEMENT AND CORRECTIVE ACTIONS

A "Quality Assurance Incident Report" is completed when an incident occurs which may result in the generation of invalid data. The report originator will provide the report to the program manager upon completion to allow for immediate corrective action to maintain program completion. Following completion of the on-site portion of the program, the form is routed to the Quality Assurance Officer for review. Appropriate action to be taken may include, discussions with test personnel, modifications of QA/QC procedures, or additional training. Incidents reports are then filed in the client file and included with the source test report, if appropriate.

Original Quality Assurance records are maintained on-file. Periodic reviews are performed by the QA Officer to ensure that the records are up-to-date, complete, and maintained.

State of California

Air Resources Board

Approved Independent Contractor

Delta Air Quality Services, Incorporated

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to California Code of Regulations, title 17, section 91207, until June 30, 2018, for those test methods listed below:

ARB Source Test Methods:
1, 2, 3, 4, 5, 6, 8, 17, 20, 501
100 (CO, CO_2, NO_x, O_2, SO_2)

Dr. Michael T. Benjamin, Chief
Monitoring and Laboratory Division

State of California

Air Resources Board

Approved Independent Contractor

Delta Air Quality Services, Incorporated

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to California Code of Regulations, title 17, section 91207, until June 30, 2018, for those test methods listed below:

U.S. EPA Source Test Methods 201A and 202
Visible Emissions Evaluation

Dr. Michael T. Benjamin, Chief
Monitoring and Laboratory Division

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 · www.aqmd.gov

January 28, 2016

Mr. James Ritchey
Delta Air Quality Services, Inc.
An Affiliate of Montrose Air Quality Services, Inc.
1631 E. Saint Andrew Place
Santa Ana, CA 92705

Subject: LAP Approval Notice
Reference # 96LA1220

Dear Mr. Ritchey:

We completed our review of the renewal application you submitted for approval under the South Coast Air Quality Management District's Laboratory Approval Program (SCAQMD LAP). We are pleased to inform you that your firm is approved for the period beginning January 31, 2016, and ending January 31, 2017 for the following methods, subject to the requirements in the LAP Conditions For Approval Agreement and conditions listed in the attachment to this letter:

SCAQMD Methods 1-4
SCAQMD Method 100.1
SCAQMD Methods 25.1 and 25.3 (Sampling)
SCAQMD Methods 5.1, 5.2, 5.3, and 6.1
SCAQMD Rule 1420/ 1420.1 – (Lead) Ambient Sampling
USEPA CTM-030 and ASTM D6522-00

Thank you for participating in the SCAQMD LAP. Your cooperation helps us to achieve the goal of the LAP: to maintain high standards of quality in the sampling and analysis of source emissions. You may direct any questions or information to LAP Coordinator, Glenn Kasai. He may be reached by telephone at (909) 396-2271, or via e-mail at gkasai@aqmd.gov.

Sincerely,

Rudy Eden, Senior Manager
Laboratory Services &
Source Test Engineering

RE:GK/gk
Attachment

cc: Dipankar Sarkar

160128 LapRenewal.doc

SPAN GAS RECORD

CLIENT/LOCATION: Desert View Power Unit 2 DATE: 5/10/2016 BY: DW

	MID SPAN CYLINDER		HIGH SPAN CYLINDER	
	CYLINDER NO.	CONCENTRATION	CYLINDER NO.	CONCENTRATION
ZERO				
O_2	CC164221	10.83	CC179518	18.97
CO_2	CC164221	10.38	CC179518	18.62

PRE-TEST INSTRUMENT CALIBRATION ERROR

	ANALYZER					STATUS
	O_2	CO_2				
Analyzer Range	20	20				
Zero Gas Value	0.0	0.0				--
Analyzer Reads	0.06	0.05				--
Error (% of scale)	0.3%	0.3%				PASS
High Gas Value	18.97	18.62				--
Analyzer Reads	18.97	18.63				--
Error (% of scale)	0.0%	0.0%				PASS
Mid Gas Value	10.83	10.38				--
Analyzer Reads	10.84	10.35				--
Error (% of scale)	0.0%	-0.1%				PASS
Linearity at Mid Point	-0.1%	-0.3%				

POST-TEST INSTRUMENT CALIBRATION ERROR

	ANALYZER					STATUS
	O_2	CO_2				
Analyzer Range	20	20				
Zero Gas Value	0.0	0.0				--
Analyzer Reads	0.04	0.05				--
Error (% of scale)	0.2%	0.3%				PASS
High Gas Value	18.97	18.62				--
Analyzer Reads	18.90	18.52				--
Error (% of scale)	-0.3%	-0.5%				PASS
Mid Gas Value	10.83	10.38				--
Analyzer Reads	10.74	10.27				--
Error (% of scale)	-0.5%	-0.6%				PASS
Linearity at Mid Point	-0.4%	-0.4%				

% ERROR CALCULATION:
(AS FOUND - ACTUAL VALUE OF SPAN)/RANGE * 100%
ALLOWABLE DEVIATION IS 2% OF FULL SCALE (2 SQUARES ON STRIPCHART)

SPAN GAS RECORD

CLIENT/LOCATION: Desert View Power Unit 1 DATE: 5/11/2016 BY: DW

	MID SPAN CYLINDER		HIGH SPAN CYLINDER	
	CYLINDER NO.	CONCENTRATION	CYLINDER NO.	CONCENTRATION
ZERO				
O_2	CC164221	10.83	CC179518	18.97
CO_2	CC164221	10.38	CC179518	18.62

PRE-TEST INSTRUMENT CALIBRATION ERROR

	ANALYZER					STATUS
	O_2	CO_2				
Analyzer Range	20	20				
Zero Gas Value	0.0	0.0				--
Analyzer Reads	0.07	0.06				--
Error (% of scale)	0.3%	0.3%				PASS
High Gas Value	18.97	18.62				--
Analyzer Reads	18.98	18.67				--
Error (% of scale)	0.1%	0.3%				PASS
Mid Gas Value	10.83	10.38				--
Analyzer Reads	10.84	10.37				--
Error (% of scale)	0.1%	-0.1%				PASS
Linearity at Mid Point	-0.1%	-0.3%				

POST-TEST INSTRUMENT CALIBRATION ERROR

	ANALYZER					STATUS
	O_2	CO_2				
Analyzer Range	20	20				
Zero Gas Value	0.0	0.0				--
Analyzer Reads	0.04	0.05				--
Error (% of scale)	0.2%	0.2%				PASS
High Gas Value	18.97	18.62				--
Analyzer Reads	18.99	18.55				--
Error (% of scale)	0.1%	-0.3%				PASS
Mid Gas Value	10.83	10.38				--
Analyzer Reads	10.79	10.27				--
Error (% of scale)	-0.2%	-0.5%				PASS
Linearity at Mid Point	-0.3%	-0.5%				

% ERROR CALCULATION:
(AS FOUND - ACTUAL VALUE OF SPAN)/RANGE * 100%
ALLOWABLE DEVIATION IS 2% OF FULL SCALE (2 SQUARES ON STRIPCHART)

PRAXAIR

Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Tel: (323) 585-2154 Fax:(714) 542-6689
PGVPID: F22015

DocNumber: 000085323

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Delta Air Quality Services, Inc.
1631 E. St. Andrew Pl.
Santa Ana, CA 92705

Praxair Order Number 32690470
Customer P. O. Number 05765218
Customer Reference Number

Fill Date: 10/6/2015
Part Number: NI CD10 5O6E-AS
Lot Number: 109527904
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 149 cu ft

O2 10.83
CO2 10.38
CC164221
Exp 10/12/23
F22015

Certified Concentration:

Expiration Date:		10/12/2023	NIST Traceable
Cylinder Number:		CC164221	Analytical Uncertainty:
10.38	%	CARBON DIOXIDE	± 0.4 %
10.83	%	OXYGEN	± 0.3 %
	Balance	NITROGEN	

Certification Information: *Certification Date:* 10/12/2015 *Term:* 96 Months *Expiration Date:* 10/12/2023

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

O2 responses have been corrected for CO2 interference.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. **Component: CARBON DIOXIDE**

Requested Concentration: 10.5 %
Certified Concentration: 10.38 %
Instrument Used: Horiba VIA-510 S/N 2807014
Analytical Method: NDIR
Last Multipoint Calibration: 10/10/2015

Reference Standard Type: GMIS
Ref. Std. Cylinder #: SA17695
Ref. Std. Conc: 9.87%
Ref. Std. Traceable to SRM #: 1674b
SRM Sample #: 7-H-07
SRM Cylinder #: FF10631

First Analysis Data:							Date:	10/12/2015
Z:	0	R:	9.87	C:	10.38	Conc:	10.369	
R:	9.89	Z:	0	C:	10.39	Conc:	10.379	
Z:	0	C:	10.39	R:	9.88	Conc:	10.379	
UOM:	%			Mean Test Assay:			10.376 %	

Second Analysis Data:							Date:	
Z:	0	R:	0	C:	0	Conc:	0	
R:	0	Z:	0	C:	0	Conc:	0	
Z:	0	C:	0	R:	0	Conc:	0	
UOM:	%			Mean Test Assay:			0 %	

2. **Component: OXYGEN**

Requested Concentration: 10.5 %
Certified Concentration: 10.83 %
Instrument Used: OXYMAT 5E
Analytical Method: PARAMAGNETIC
Last Multipoint Calibration: 10/8/2015

Reference Standard Type: GMIS
Ref. Std. Cylinder #: CC243259
Ref. Std. Conc: 20.03%
Ref. Std. Traceable to SRM #: 2659a
SRM Sample #: 71-E-19
SRM Cylinder #: FF22331

First Analysis Data:							Date:	10/12/2015
Z:	0	R:	20.04	C:	10.83	Conc:	10.814	
R:	20.06	Z:	0	C:	10.85	Conc:	10.834	
Z:	0	C:	10.85	R:	20.08	Conc:	10.834	
UOM:	%			Mean Test Assay:			10.827 %	

Second Analysis Data:							Date:	
Z:	0	R:	0	C:	0	Conc:	0	
R:	0	Z:	0	C:	0	Conc:	0	
Z:	0	C:	0	R:	0	Conc:	0	
UOM:	%			Mean Test Assay:			0 %	

Analyzed by: Jacquelyne Fiero

Certified by: Jack Fu

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.

12-23-15

PRAXAIR

Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Tel: (323) 585-2154 Fax:(714) 542-6689
PGVPID: F22015

DocNumber: 000078105

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Delta Air Quality Services, Inc.
1631 E. St. Andrew Pl.
Santa Ana, CA 92705

Praxair Order Number: 30508359
Customer P. O. Number: 05417091
Customer Reference Number:

Fill Date: 3/11/2015
Part Number: NI CD19O2E-AS
Lot Number: 109507010
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

O2 18.97
CO2 18.62
CC179518
Exp 03/20/23
F22015

Certified Concentration:

Expiration Date:		3/20/2023	NIST Traceable
Cylinder Number:		CC179518	Analytical Uncertainty:
18.62	%	CARBON DIOXIDE	± 0.2 %
18.97	%	OXYGEN	± 0.3 %
	Balance	NITROGEN	

Certifcation Information: *Certification Date:* 3/20/2015 *Term:* 96 Months *Expiration Date:* 3/20/2023

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

O2 responses have been corrected for CO2 interference.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: CARBON DIOXIDE

Requested Concentration: 19 %
Certified Concentration: 18.62 %
Instrument Used: Horiba VIA-510 S/N 2807014
Analytical Method: NDIR
Last Multipoint Calibration: 2/27/2015

Reference Standard Type: GMIS
Ref. Std. Cylinder # : CC158146
Ref. Std. Conc: 19.79%
Ref. Std. Traceable to SRM # : 2745
SRM Sample # : 9-C-36
SRM Cylinder # : CAL016135

First Analysis Data:								Date:	3/20/2015
Z:	0	R:	19.71	C:	18.54	Conc:	18.609		
R:	19.72	Z:	0	C:	18.55	Conc:	18.619		
Z:	0	C:	18.55	R:	19.72	Conc:	18.619		
UOM:	%			Mean Test Assay:			18.616 %		

Second Analysis Data:								Date:	
Z:	0	R:	0	C:	0	Conc:	0		
R:	0	Z:	0	C:	0	Conc:	0		
Z:	0	C:	0	R:	0	Conc:	0		
UOM:	%			Mean Test Assay:			0 %		

2. Component: OXYGEN

Requested Concentration: 19 %
Certified Concentration: 18.97 %
Instrument Used: OXYMAT 5E
Analytical Method: PARAMAGNETIC
Last Multipoint Calibration: 3/2/2015

Reference Standard Type: GMIS
Ref. Std. Cylinder # : SA16022
Ref. Std. Conc: 19.90%
Ref. Std. Traceable to SRM # : 2659a
SRM Sample # : 71-E-19
SRM Cylinder # : FF22331

First Analysis Data:								Date:	3/20/2015
Z:	0	R:	19.9	C:	18.97	Conc:	18.976		
R:	19.88	Z:	0	C:	18.95	Conc:	18.956		
Z:	0	C:	18.97	R:	19.9	Conc:	18.976		
UOM:	%			Mean Test Assay:			18.97 %		

Second Analysis Data:								Date:	
Z:	0	R:	0	C:	0	Conc:	0		
R:	0	Z:	0	C:	0	Conc:	0		
Z:	0	C:	0	R:	0	Conc:	0		
UOM:	%			Mean Test Assay:			0 %		

Analyzed by: Xing Yu

Certified by: Jack Fu

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information con tained herein exceed the fee established for providing such information.

10-27-15 gb

MONTROSE

DIGITAL TEMPERATURE READOUT CALIBRATION

Digital Temperature Readout ID: 5-WCS
Readout Description: Control Box
Date: 7/1/16
Performed By: SD/DK/KS

Calibrated Thermocouple ID: 48
T1 Reference Thermometer ID: 301370
T2 Reference Thermometer ID: 805002803
T3 Reference Thermometer ID: 805002770

T/C I.D. 48	Readout I.D.	T/C - Readout °F Reading 1	Reading 2	Reading 3	Average	Reference Thermometer °F Reading 1	Reading 2	Reading 3	Average	Difference °F	%, (°R)	
T3 (OIL)	5-WCS	365	365	365	365	363	363	363	363	2.0	0.2%	Pass
T2 (Boiling H_2O)	5-WCS	214	214	214	214	212	212	212	212	2.0	0.3%	Pass
T1 (Ice/Water)	5-WCS	33	33	33	33	32	32	32	32	1.0	0.2%	Pass

1) Difference % (°R) = Difference (°F) / (Average Tref + 460)
2) Pass if all Differences are less than 1.5% (°R)

Thermocouple Source Readings

	T/C Source S/N	T/C - Readout °F Reading 1	Reading 2	Reading 3	Average	T/C Source °F Reading 1	Reading 2	Reading 3	Average	Difference °F	%, (°R)	
T4 (~650 F)	S/N 106970	655	655	658	656	650	650	650	650	6.0	0.5%	Pass
T3 (~370 F)	S/N 106970	373	373	373	373	370	370	370	370	3.0	0.4%	Pass
T2 (~212 F)	S/N 106970	212	212	212	212	212	212	212	212	0.0	0.0%	Pass
T1 (~32 F)	S/N 106970	32	32	32	32	32	32	32	32	0.0	0.0%	Pass

1) Difference % (°R) = Difference (°F) / (Average Tref + 460)
2) Pass if all Differences are less than 1.5% (°R)

TEMPERATURE SYSTEM CALIBRATION
S TYPE METHOD 5

#47

Reference Thermometer I.D.: T1 F95-195 T2 F95-195 T3 F95-195

T/C I.D. #47	Readout I.D.	T/C - Readout °F Reading 1	Reading 2	Reading 3	Average	Reference Thermometer °F Reading 1	Reading 2	Reading 3	Average	Difference °F	%, (°R)	
OIL	3WCS	360	360	360	360	360	360	360	360	0	0.0%	Pass
WATER	3WCS	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	3WCS	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	5WCS	357	357	357	357	360	360	360	360	3	0.4%	Pass
WATER	5WCS	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	5WCS	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	6WCS	358	358	358	358	360	360	360	360	2	0.2%	Pass
WATER	6WCS	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	6WCS	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	7WCS	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	7WCS	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	7WCS	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	12WCS	360	360	360	360	360	360	360	360	0	0.0%	Pass
WATER	12WCS	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	12WCS	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	14WCS	350	350	350	350	360	360	360	360	10	1.2%	Pass
WATER	14WCS	209	209	209	209	212	212	212	212	3	0.4%	Pass
ICE	14WCS	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	17WCS	351	351	351	351	360	360	360	360	9	1.1%	Pass
WATER	17WCS	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	17WCS	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	18WCS	350	350	350	350	360	360	360	360	10	1.2%	Pass
WATER	18WCS	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	18WCS	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	19WCS	362	362	362	362	360	360	360	360	2	0.2%	Pass
WATER	19WCS	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	19WCS	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-9	363	363	363	363	360	360	360	360	3	0.4%	Pass
WATER	PTC-9	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	PTC-9	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	PTC-10	364	364	364	364	360	360	360	360	4	0.5%	Pass
WATER	PTC-10	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-10	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	PTC-11	363	363	363	363	360	360	360	360	3	0.4%	Pass
WATER	PTC-11	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-11	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	PTC-12	363	363	363	363	360	360	360	360	3	0.4%	Pass
WATER	PTC-12	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-12	33	33	33	33	33	33	33	33	0	0.0%	Pass
OIL	PTC-13	360	360	360	360	360	360	360	360	0	0.0%	Pass
WATER	PTC-13	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	PTC-13	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	PTC-14	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	PTC-14	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	PTC-14	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	PTC-15	362	362	362	362	360	360	360	360	2	0.2%	Pass
WATER	PTC-15	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	PTC-15	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	PTC-16	364	364	364	364	360	360	360	360	4	0.5%	Pass
WATER	PTC-16	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	PTC-16	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-20	362	362	362	362	360	360	360	360	2	0.2%	Pass
WATER	PTC-20	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	PTC-20	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	PTC-21	361	361	361	361	360	360	360	360	1	0.1%	Pass
WATER	PTC-21	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-21	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	PTC-22	355	355	355	355	360	360	360	360	5	0.6%	Pass
WATER	PTC-22	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-22	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	PTC-23	358	358	358	358	360	360	360	360	2	0.2%	Pass
WATER	PTC-23	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-23	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-24	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	PTC-24	212	212	212	212	212	212	212	212	0	0.0%	Pass

TEMPERATURE SYSTEM CALIBRATION
S TYPE METHOD 5

#47

Reference Thermometer I.D.: T1 F95-195 T2 F95-195 T3 F95-195

T/C I.D. #47	Readout I.D.	T/C - Readout °F Reading 1	Reading 2	Reading 3	Average	Reference Thermometer °F Reading 1	Reading 2	Reading 3	Average	Difference °F	%, (°R)	
ICE	PTC-24	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	PTC-28	352	352	352	352	360	360	360	360	8	1.0%	Pass
WATER	PTC-28	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-28	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	PTC-30	355	355	355	355	360	360	360	360	5	0.6%	Pass
WATER	PTC-30	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	PTC-30	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	PTC-31	355	355	355	355	360	360	360	360	5	0.6%	Pass
WATER	PTC-31	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	PTC-31	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	PTC-32	355	355	355	355	360	360	360	360	5	0.6%	Pass
WATER	PTC-32	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	PTC-32	34	34	34	34	33	33	33	33	1	0.2%	Pass
OIL	PTC-33	363	363	363	363	360	360	360	360	3	0.4%	Pass
WATER	PTC-33	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	PTC-33	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	PTC-34	363	363	363	363	360	360	360	360	3	0.4%	Pass
WATER	PTC-34	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	PTC-34	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	PTC-35	363	363	363	363	360	360	360	360	3	0.4%	Pass
WATER	PTC-35	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	PTC-35	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	PTC-38	363	363	363	363	360	360	360	360	3	0.4%	Pass
WATER	PTC-38	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	PTC-38	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	TRO-1	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	TRO-1	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	TRO-1	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	TRO-3	354	354	354	354	360	360	360	360	6	0.7%	Pass
WATER	TRO-3	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	TRO-3	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	TRO-4	355	355	355	355	360	360	360	360	5	0.6%	Pass
WATER	TRO-4	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	TRO-4	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	TRO-5	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	TRO-5	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	TRO-5	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	TRO-6	358	358	358	358	360	360	360	360	2	0.2%	Pass
WATER	TRO-6	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	TRO-6	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	TRO-11	356	356	356	356	360	360	360	360	4	0.5%	Pass
WATER	TRO-11	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	TRO-11	33	33	33	33	33	33	33	33	0	0.0%	Pass
OIL	TRO-13	355	355	355	355	360	360	360	360	5	0.6%	Pass
WATER	TRO-13	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	TRO-13	34	34	34	34	33	33	33	33	1	0.2%	Pass
OIL	TRO-16	354	354	354	354	360	360	360	360	6	0.7%	Pass
WATER	TRO-16	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	TRO-16	33	33	33	33	33	33	33	33	0	0.0%	Pass
OIL	TRO-18	361	361	361	361	360	360	360	360	1	0.1%	Pass
WATER	TRO-18	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	TRO-18	34	34	34	34	33	33	33	33	1	0.2%	Pass
OIL	TRO-19	354	354	354	354	360	360	360	360	6	0.7%	Pass
WATER	TRO-19	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	TRO-19	33	33	33	33	33	33	33	33	0	0.0%	Pass

Calibrated by: Mike Miller, Sean Donovan, Danny Avila, Mike Edmonson
Date: 1/6/2016

TEMPERATURE SYSTEM CALIBRATION
S TYPE METHOD 5

#26

Reference Thermometer I.D.: T1 F95-195 T2 F95-195 T3 F95-195

T/C I.D. #26	Readout I.D.	T/C - Readout °F Reading 1	Reading 2	Reading 3	Average	Reference Thermometer °F Reading 1	Reading 2	Reading 3	Average	Difference °F	%, (°R)	
OIL	3WCS	361	361	361	361	360	360	360	360	1	0.1%	Pass
WATER	3WCS	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	3WCS	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	5WCS	356	356	356	356	360	360	360	360	4	0.5%	Pass
WATER	5WCS	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	5WCS	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	6WCS	355	355	355	355	360	360	360	360	5	0.6%	Pass
WATER	6WCS	209	209	209	209	212	212	212	212	3	0.4%	Pass
ICE	6WCS	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	7WCS	358	358	358	358	360	360	360	360	2	0.2%	Pass
WATER	7WCS	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	7WCS	33	33	33	33	33	33	33	33	0	0.0%	Pass
OIL	12WCS	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	12WCS	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	12WCS	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	14WCS	362	362	362	362	360	360	360	360	2	0.2%	Pass
WATER	14WCS	214	214	214	214	212	212	212	212	2	0.3%	Pass
ICE	14WCS	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	17WCS	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	17WCS	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	17WCS	33	33	33	33	33	33	33	33	0	0.0%	Pass
OIL	18WCS	355	355	355	355	360	360	360	360	5	0.6%	Pass
WATER	18WCS	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	18WCS	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	19WCS	361	361	361	361	360	360	360	360	1	0.1%	Pass
WATER	19WCS	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	19WCS	35	35	35	35	33	33	33	33	2	0.4%	Pass
OIL	PTC-9	364	364	364	364	360	360	360	360	4	0.5%	Pass
WATER	PTC-9	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	PTC-9	35	35	35	35	33	33	33	33	2	0.4%	Pass
OIL	PTC-10	355	355	355	355	360	360	360	360	5	0.6%	Pass
WATER	PTC-10	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	PTC-10	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-11	353	353	353	353	360	360	360	360	7	0.9%	Pass
WATER	PTC-11	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	PTC-11	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-12	352	352	352	352	360	360	360	360	8	1.0%	Pass
WATER	PTC-12	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	PTC-12	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	PTC-13	357	357	357	357	360	360	360	360	3	0.4%	Pass
WATER	PTC-13	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	PTC-13	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	PTC-14	358	358	358	358	360	360	360	360	2	0.2%	Pass
WATER	PTC-14	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-14	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-15	351	351	351	351	360	360	360	360	9	1.1%	Pass
WATER	PTC-15	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-15	34	34	34	34	33	33	33	33	1	0.2%	Pass
OIL	PTC-16	352	352	352	352	360	360	360	360	8	1.0%	Pass
WATER	PTC-16	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	PTC-16	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	PTC-20	356	356	356	356	360	360	360	360	4	0.5%	Pass
WATER	PTC-20	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	PTC-20	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	PTC-21	361	361	361	361	360	360	360	360	1	0.1%	Pass
WATER	PTC-21	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	PTC-21	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-22	360	360	360	360	360	360	360	360	0	0.0%	Pass
WATER	PTC-22	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	PTC-22	33	33	33	33	33	33	33	33	0	0.0%	Pass
OIL	PTC-23	366	366	366	366	360	360	360	360	6	0.7%	Pass
WATER	PTC-23	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	PTC-23	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-24	356	356	356	356	360	360	360	360	4	0.5%	Pass
WATER	PTC-24	210	210	210	210	212	212	212	212	2	0.3%	Pass

TEMPERATURE SYSTEM CALIBRATION
S TYPE METHOD 5

#26

Reference Thermometer I.D.: T1 F95-195 T2 F95-195 T3 F95-195

T/C I.D. #26	Readout I.D.	T/C - Readout °F Reading 1	Reading 2	Reading 3	Average	Reference Thermometer °F Reading 1	Reading 2	Reading 3	Average	Difference °F	%, (°R)	
ICE	PTC-24	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-28	361	361	361	361	360	360	360	360	1	0.1%	Pass
WATER	PTC-28	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	PTC-28	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-30	361	361	361	361	360	360	360	360	1	0.1%	Pass
WATER	PTC-30	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-30	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-31	361	361	361	361	360	360	360	360	1	0.1%	Pass
WATER	PTC-31	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	PTC-31	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	PTC-32	361	361	361	361	360	360	360	360	1	0.1%	Pass
WATER	PTC-32	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	PTC-32	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	PTC-33	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	PTC-33	209	209	209	209	212	212	212	212	3	0.4%	Pass
ICE	PTC-33	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	PTC-34	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	PTC-34	209	209	209	209	212	212	212	212	3	0.4%	Pass
ICE	PTC-34	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	PTC-35	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	PTC-35	209	209	209	209	212	212	212	212	3	0.4%	Pass
ICE	PTC-35	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	PTC-38	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	PTC-38	209	209	209	209	212	212	212	212	3	0.4%	Pass
ICE	PTC-38	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	TRO-1	362	362	362	362	360	360	360	360	2	0.2%	Pass
WATER	TRO-1	209	209	209	209	212	212	212	212	3	0.4%	Pass
ICE	TRO-1	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	TRO-3	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	TRO-3	212	212	212	212	212	212	212	212	0	0.0%	Pass
ICE	TRO-3	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	TRO-4	358	358	358	358	360	360	360	360	2	0.2%	Pass
WATER	TRO-4	211	211	211	211	212	212	212	212	1	0.1%	Pass
ICE	TRO-4	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	TRO-5	356	356	356	356	360	360	360	360	4	0.5%	Pass
WATER	TRO-5	210	210	210	210	212	212	212	212	2	0.3%	Pass
ICE	TRO-5	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	TRO-6	356	356	356	356	360	360	360	360	4	0.5%	Pass
WATER	TRO-6	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	TRO-6	32	32	32	32	33	33	33	33	1	0.2%	Pass
OIL	TRO-11	352	352	352	352	360	360	360	360	8	1.0%	Pass
WATER	TRO-11	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	TRO-11	30	30	30	30	33	33	33	33	3	0.6%	Pass
OIL	TRO-13	359	359	359	359	360	360	360	360	1	0.1%	Pass
WATER	TRO-13	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	TRO-13	29	29	29	29	33	33	33	33	4	0.8%	Pass
OIL	TRO-16	361	361	361	361	360	360	360	360	1	0.1%	Pass
WATER	TRO-16	215	215	215	215	212	212	212	212	3	0.4%	Pass
ICE	TRO-16	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	TRO-18	351	351	351	351	360	360	360	360	9	1.1%	Pass
WATER	TRO-18	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	TRO-18	31	31	31	31	33	33	33	33	2	0.4%	Pass
OIL	TRO-19	355	355	355	355	360	360	360	360	5	0.6%	Pass
WATER	TRO-19	213	213	213	213	212	212	212	212	1	0.1%	Pass
ICE	TRO-19	30	30	30	30	33	33	33	33	3	0.6%	Pass

Calibrated by: Mike Miller, Sean Donovan, Danny Avila, Mike Edmonson
Date: 1/6/2016

THERMOCOUPLE CALIBRATION

Thermocouple ID: 47
Probe Description: 6' S-type pitot tube
Date: 7/7/16
Performed By: SD/KS

Calibrated Digital Temperature Readout ID: 14-WCS
T1 Reference Thermometer ID: 301370
T2 Reference Thermometer ID: 805002803
T3 Reference Thermometer ID: 805002770

T/C I.D.	Readout I.D.	T/C - Readout °F				Reference Thermometer °F				Difference		
47		Reading 1	Reading 2	Reading 3	Average	Reading 1	Reading 2	Reading 3	Average	°F	%, (°R)	
T3 (OIL)	14-WCS	357	357	357	357	360	360	360	360	3.0	0.4%	Pass
T2 (Boiling H_2O)	14-WCS	212	212	212	212	212	212	212	212	0.0	0.0%	Pass
T1 (Ice/Water)	14-WCS	34	34	34	34	32	32	32	32	2.0	0.4%	Pass

1) Difference % (°R) = Difference (°F) / (Average Tref + 460)
2) Pass if all Differences are less than 1.5% (°R)

THERMOCOUPLE CALIBRATION

Thermocouple ID: 26
Probe Description: 6' S-type pitot tube
Date: 7/7/16
Performed By: SD/KS

Calibrated Digital Temperature Readout ID: 14-WCS
T1 Reference Thermometer ID: 301370
T2 Reference Thermometer ID: 805002803
T3 Reference Thermometer ID: 805002770

T/C I.D. 26	Readout I.D.	T/C - Readout °F Reading 1	Reading 2	Reading 3	Average	Reference Thermometer °F Reading 1	Reading 2	Reading 3	Average	Difference °F	%, (°R)	
T3 (OIL)	14-WCS	365	365	365	365	360	360	360	360	5.0	0.6%	Pass
T2 (Boiling H_2O)	14-WCS	216	216	216	216	212	212	212	212	4.0	0.6%	Pass
T1 (Ice/Water)	14-WCS	34	34	34	34	32	32	32	32	2.0	0.4%	Pass

1) Difference % (°R) = Difference (°F) / (Average Tref + 460)
2) Pass if all Differences are less than 1 5% (°R)

SEMI-ANNUAL DRY GAS METER/ORIFICE CALIBRATION

Orifice Method - Triplicate Runs/Four Calibration Points
English Meter Box Units, English K' Factor
Filename: C:\Users\Dave Wonderly\Information\Calibrations\Meters\5-wcs\2016\[Semi-Annual Meter Calibration 5-Wcs- 1-29-16 xls]WC
File Modified From: APEX 522 Series Meter box Calibration
Revised: 4/8/2005

Model #: 954628.00
ID #: 5 wcs
Date: 1/29/2016
Bar. Pressure: 30.03 (in. Hg)
Performed By: G> Bridge

DRY GAS METER READINGS									CRITICAL ORIFICE READINGS					
					Initial Temps.		Final Temps.					Ambient Temperature		
dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
0.13	26.00	772.400	777.760	5.360	60.0	68.0	70.0	68.0	33	0.1553	23.0	66.0	66.0	66.0
0.13	26.00	777.760	783.155	5.395	70.0	68.0	73.0	70.0	33	0.1553	23.0	66.0	66.0	66.0
0.13	26.00	783.155	788.569	5.414	73.0	70.0	74.0	71.0	33	0.1553	23.0	66.0	66.0	66.0
0.63	12.00	788.569	794.035	5.466	74.0	71.0	74.0	71.0	48	0.3465	19.0	66.0	66.0	66.0
0.63	12.00	794.035	799.485	5.450	74.0	71.0	75.0	71.0	48	0.3465	19.0	66.0	66.0	66.0
0.63	12.00	799.485	804.958	5.473	75.0	71.0	75.0	72.0	48	0.3465	19.0	66.0	66.0	66.0
1.90	7.00	804.958	810.435	5.477	75.0	72.0	76.0	72.0	63	0.5888	16.0	66.0	66.0	66.0
1.90	7.00	810.435	815.890	5.455	76.0	72.0	78.0	73.0	63	0.5888	16.0	66.0	66.0	66.0
1.90	7.00	815.890	821.354	5.464	76.0	73.0	78.0	73.0	63	0.5888	16.0	66.0	66.0	66.0
3.50	5.00	821.354	826.670	5.316	78.0	73.0	81.0	74.0	73	0.8202	14.0	66.0	66.0	66.0
3.50	5.00	826.670	832.015	5.345	81.0	74.0	83.0	74.0	73	0.8202	14.0	66.0	66.0	66.0
3.50	5.00	832.015	837.358	5.343	83.0	74.0	85.0	75.0	73	0.8202	14.0	66.0	66.0	66.0

DRY GAS METER		ORIFICE				DRY GAS METER CALIBRATION FACTOR	ORIFICE CALIBRATION FACTOR				
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)		Y Value (number)	dH@ Value (in H2O)	Individual Run 0.95 < Y < 1.05?	Individual Orifice Ymax - Ymin < 0.010?	Orifice Average 0.98 < Y/Yd < 1.02?	Orifice Average dH@ - dH@ av < 0.155?
5.395	152.8	5.287	149.7	5.250		0.980	1.775	Pass			
5.391	152.7	5.287	149.7	5.250		0.981	1.772	Pass			
5.393	152.7	5.287	149.7	5.250		0.980	1.767	Pass			
					Average	**0.980**	**1.771**		**Pass**	**Pass**	**Pass**
5.446	154.2	5.444	154.2	5.406		1.000	1.718	Pass			
5.427	153.7	5.444	154.2	5.406		1.003	1.718	Pass			
5.445	154.2	5.444	154.2	5.406		1.000	1.717	Pass			
					Average	**1.001**	**1.718**		**Pass**	**Pass**	**Pass**
5.461	154.7	5.397	152.8	5.359		0.988	1.791	Pass			
5.429	153.7	5.397	152.8	5.359		0.994	1.789	Pass			
5.430	153.8	5.397	152.8	5.359		0.994	1.788	Pass			
					Average	**0.992**	**1.789**		**Pass**	**Pass**	**Pass**
5.294	149.9	5.370	152.1	5.332		1.014	1.696	Pass			
5.308	150.3	5.370	152.1	5.332		1.012	1.694	Pass			
5.294	149.9	5.370	152.1	5.332		1.014	1.692	Pass			
					Average	**1.013**	**1.694**		**Pass**	**Pass**	**Pass**

Average Yd: 0.997 **dH@: 1.743**

Q @ dH = 1: 0.568

SIGNED: Signature on File

Date: 1/29/2016

SEMI-ANNUAL DRY GAS METER/ORIFICE CALIBRATION

Orifice Method - Triplicate Runs/Four Calibration Points
English Meter Box Units, English K' Factor
Filename: C:\Users\Dave Wonderly\Information\Calibrations\Meters\5-wcs\2016\[Bi-Monthly (Special 3-run) Meter Calibration 5-wcs 6-3-1
File Modified From. APEX 522 Series Meter box Calibration
Revised: 4/8/2005

Model #: C-5000
ID #: 5-WCS
Date: 6/3/2016
Bar. Pressure: 30.00 (in. Hg)
Performed By: M Miller

DRY GAS METER READINGS									CRITICAL ORIFICE READINGS					
					Initial Temps.		Final Temps.					Ambient Temperature		
dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
0.53	12.00	956.415	961.835	5.420	75.0	73.0	76.0	73.0	48	0.3465	21.5	75.0	75.0	75.0
0.53	12.00	961.835	967.235	5.400	76.0	73.0	77.0	74.0	48	0.3465	21.5	75.0	76.0	75.5
0.53	12.00	967.235	972.630	5.395	77.0	74.0	77.0	75.0	48	0.3465	21.5	76.0	76.0	76.0
1.70	7.00	940.220	945.620	5.400	73.0	71.0	74.0	72.0	63	0.5888	18.5	74.0	75.0	74.5
1.70	7.00	945.620	951.025	5.405	74.0	72.0	75.0	72.0	63	0.5888	18.5	75.0	75.0	75.0
1.70	7.00	951.025	956.415	5.390	75.0	72.0	76.0	73.0	63	0.5888	18.5	75.0	75.0	75.0
3.30	5.00	924.210	929.545	5.335	70.0	68.0	72.0	70.0	73	0.8202	16.0	74.0	74.0	74.0
3.30	5.00	929.545	934.885	5.340	72.0	70.0	73.0	71.0	73	0.8202	16.0	74.0	74.0	74.0
3.30	5.00	934.885	940.220	5.335	73.0	71.0	74.0	72.0	73	0.8202	16.0	74.0	74.0	74.0

DRY GAS METER		ORIFICE			DRY GAS METER CALIBRATION FACTOR	ORIFICE CALIBRATION FACTOR	Individual Run	Individual Orifice	Orifice Average	Orifice Average
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	Y Value (number)	dH@ Value (in H2O)	0.95 < Y < 1.05?	Ymax - Ymin < 0.010?	0.98 < Y/Yd < 1.02?	dH@ - dH@ av < 0.155?
5.376	152.2	5.393	152.7	5.452	1.003	1.466	**Pass**			
5.348	151.5	5.390	152.7	5.455	1.008	1.466	**Pass**			
5.336	151.1	5.388	152.6	5.457	1.010	1.465	**Pass**			
				Average	**1.007**	**1.466**		**Pass**	**Pass**	**Pass**
5.389	152.6	5.348	151.5	5.402	0.992	1.632	**Pass**			
5.386	152.5	5.346	151.4	5.404	0.992	1.632	**Pass**			
5.364	151.9	5.346	151.4	5.404	0.997	1.630	**Pass**			
				Average	**0.994**	**1.631**		**Pass**	**Pass**	**Pass**
5.370	152.1	5.324	150.8	5.372	0.991	1.638	**Pass**			
5.360	151.8	5.324	150.8	5.372	0.993	1.634	**Pass**			
5.345	151.4	5.324	150.8	5.372	0.996	1.631	**Pass**			
				Average	**0.994**	**1.634**		**Pass**	**Pass**	**Pass**

Average Yd: 0.998 **dH@: 1.577**

Q @ dH = 1: 0.597

SIGNED: Signature on file

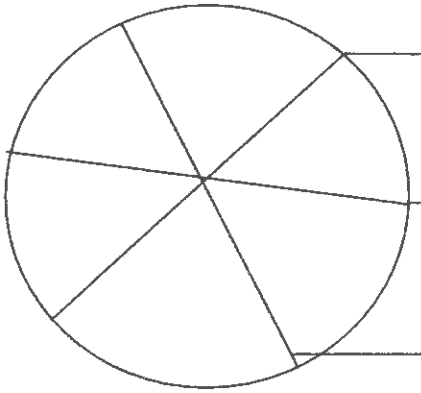
Date: 2/8/2010

Delta Air Quality Services, Incorporated

MONTROSE AIR QUALITY SERVICES

NOZZLE CALIBRATION DATA

Nozzle I.D. 1-HG-Glass 0.	Date 5-9-16
Material glass	By [illegible]
Configuration (L or Hook)	



D_1 = 0.249

D_2 = 0.249

D_3 = 0.250

Maximum Difference D_i - D_j = 0.001 (must be 0.004" or less)

Average Dn = 0.249

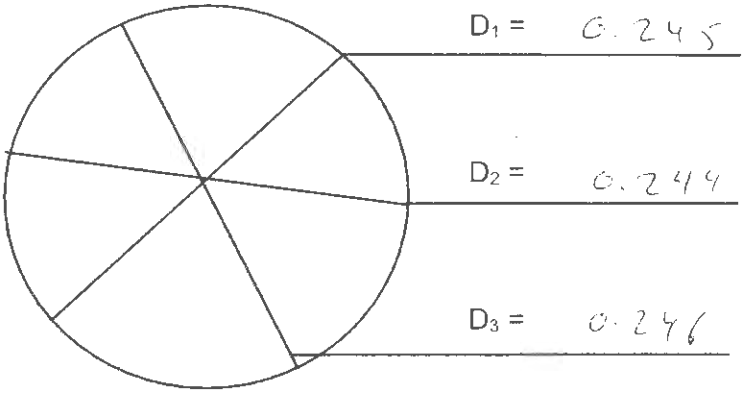
Note: Measure three diameters with micrometer

Delta Air Quality Services, Incorporated

MONTROSE AIR QUALITY SERVICES

NOZZLE CALIBRATION DATA

Nozzle I.D. 2-4a-	Date 5-10-16
Material Glass	By DCW
Configuration (L or Hook)	

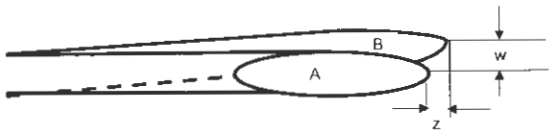


Maximum Difference D_i - D_j = .002 (must be 0.004" or less)

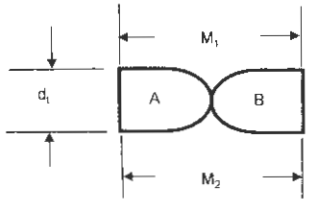
Average Dn = 0.245

Note: Measure three diameters with micrometer

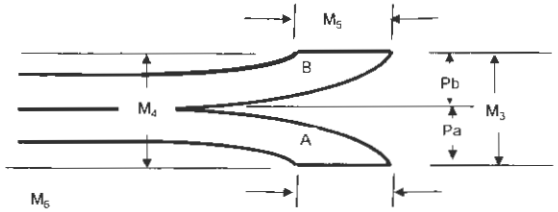
S Type Pitot Tube Dimensional Calibration Record



Side View



End View



Top View

Acceptability Criteria			z < 1/8"	w < 1/32"	Yes	"3/16" < Dt < 3/8"	n/a	n/a	n/a	n/a	n/a	n/a	10 degrees	5 degrees	1.05 Dt < P < 1.5 Dt	
Pitot ID	Date	Calibrated By	Side View, Impact openings Properly aligned, z < 1/8"	Side View, Impact openings Properly aligned, w < 1/32"	Pa = Pb	Tubing Diameter, dt	M1	M2	M3	M4	M5	M6	Average Face Opening Plane Angle, offset from perpendicular to transverse axis	Average Face Opening Plane Frontal Angle from parallel to Longitudinal Axis	Ratio of P/Dt	Status
026	1/5/16	SS	Y	Y	Y	0.375	0.870	0.876	0.883	0.872	0.444	0.410	-0.5	0.7	1.2	Pass
047	1/5/16	SS	Y	Y	Y	0.370	0.920	0.927	0.955	0.930	0.418	0.407	-0.5	1.7	1.2	Pass

Notes: Reference - Type-S Pitot Tube Calibration Study, Robert F. Vollaro, October 15, 1975
If tube is not visibly deformed, then average face angles to tube axes is presumed to represent each of the individual face angles to the axis

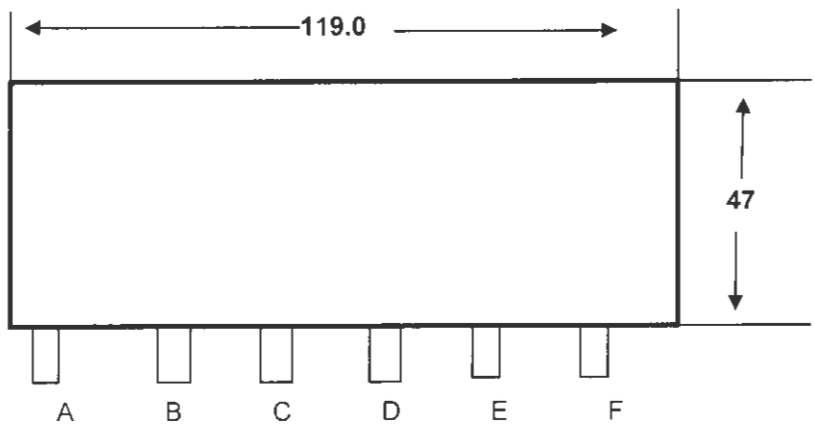
#36 removed from service 10/7/13

Reference "A Type-S Pitot Tube Calibration Study, Robert F. Vollaro, October 15, 1975
If tube is not visibly deformed it is assumed that Pa = Pb = .5 x avg. of M1 M2, and that average face opening plane angles represent individual angles to tube axis

APPENDIX C FIELD AND PLANT OPERATING DATA

Client: Desert View Power Date: 5/11/2016

Sample Location: Unit 1-2 Prepared By: Dave Wonderly



H (in.)	**119.0**
W (in.)	**47.0**
Nipple length	**13.0**
Distance between points	**9.40**
Stack Area (ft^2)	**38.84**

Point No.	Sample Point	
1	4.7	17.7
2	14.1	27.1
3	23.5	36.5
4	32.9	45.9
5	42.3	55.3

Delta Air Quality Services, Incorporated

4 -HG -U1 Page 1 of 1

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 1 Stack breaching
DATE: May 11 2016
RUN NO: 4-HG U1
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO: 5WCS
METER ΔH@: 1.743 @1 = 0.568
METER Yd: 0.997
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 6x30
ΔH= 2.0 X ΔP:
Probe Condition, pre/post test: ✓
Silica Gel Expanded, Y/N: ✓
Filter Condition after Test: ✓ - white
Check Weight: 294.8 / 295.0

AMBIENT TEMPERATURE: 75
BAROMETRIC PRESSURE: 30.01
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: #26 glass
PROBE LENGTH: 6'
NOZZLE ID NO/MATERIAL: 2-HC
NOZZLE DIAMETER: 0.245
FILTER NO/TYPE: S3UP-647 / quartz
PRE-TEST LEAK RATE: : <0.001 CFM@ 15 in. Hg.
POST-TEST LEAK RATE: : <0.001 CFM@ 10 in. Hg.
PITOT LEAK CHECK - PRE: ✓ POST: ✓
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test	Difference
1	HNO_3/H_2O_2	936.6	693.4	
2	HNO_3/H_2O_2	787.2	667.6	
3	Empty	613.0	610.1	
4	$KMNO_4/H_2SO_4$	603.4	602.1	
5	$KMNO_4/H_2SO_4$	595.2 ~~906.9~~	596.3	
6	Silica gel.	906.9	875.4	

Point	Time	Meter Volume, ft³	ΔP in. H_2O	ΔH in. H_2O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O_2 %	Pstatic in. H_2O
5	815	480.800	.80	1.6	341	256	253	58	80	78	5		+0.74
4	821	485.237	.65	1.3	341	253	255	56	83	74	5		
3	827	489.223	.70	1.4	341	251	257	54	94	84	5		
2	833	493.236	.80	1.7	341	255	253	53	98	87	5		
1	839	497.615	.87	1.8	341	257	255	52	102	90	6		
end	845	502.154											
5	847	502.154	.80	1.8	341	255	254	52	102	91	5		
4	853	506.893	.72	1.5	341	256	258	53	103	93	5		
3	859	510.952	.58	1.2	342	254	253	53	103	94	5		
2	905	514.943	.45	.95	342	257	255	53	104	95	4		
1	911	518.100	.45	.95	342	254	257	54	105	96	4		
end	917	521.538											
5	919	521.538	.75	1.6	342	251	258	54	105	96	5		
4	925	525.774	.75	1.6	342	256	255	54	106	97	5		
3	931	529.987	.67	1.4	343	253	256	54	107	98	5		
2	937	534.193	.77	1.6	343	252	252	55	109	99	5		
1	943	538.581	.80	1.7	344	254	257	55	110	100	5		
Average: end	949	542.915											

Comments:

C.1.2-2

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 1 Stack breaching
DATE: May 11 2016
RUN NO: 4-HG-01
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO:
METER ΔH@:
METER Yd:
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 6x30
ΔH= _____ X ΔP:
Probe Condition, pre/post test:
Silica Gel Expanded, Y/N:
Filter Condition after Test:
Check Weight:

AMBIENT TEMPERATURE:
BAROMETRIC PRESSURE:
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: glass
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL:
NOZZLE DIAMETER:
FILTER NO/TYPE:
PRE-TEST LEAK RATE: : _____ CFM@ _____ in. Hg.
POST-TEST LEAK RATE: : _____ CFM@ _____ in. Hg.
PITOT LEAK CHECK - PRE: _____ POST: _____
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test	Difference
1	HNO_3/H_2O_2			
2	HNO_3/H_2O_2			
3	Empty			
4	$KMNO_4/H_2SO_4$			
5	$KMNO_4/H_2SO_4$			
6	Silica gel.			

Point	Time	Meter Volume, ft³	ΔP in. H₂O	ΔH in. H₂O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O₂ %	Pstatic in. H₂O
5	951	542.915	1.0	2.1	345	256	251	55	109	101	7		
4	957	547.828	1.0	2.1	345	254	254	55	109	101	7		
3	1003	552.813	.80	1.7	345	257	256	55	110	102	6		
2	1009	557.329	.80	1.7	346	259	254	56	112	103	6		
1	1015	561.858	.80	1.7	346	254	252	56	113	104	6		
end	1021	566.401											
5	1023	566.401	1.0	2.1	346	257	255	56	113	104	7		
4	1029	571.305	1.0	2.1	346	254	251	56	113	104	7		
3	1035	576.202	1.0	2.1	347	256	254	56	112	104	7		
2	1041	581.109	1.0	2.1	347	258	253	56	112	105	7		
1	1047	586.013	1.0	2.1	347	254	257	56	111	105	7		
end	1053	590.923											
5	1055	590.923	1.1	2.3	347	251	258	56	111	105	8		
4	1101	596.295	1.1	2.3	348	256	255	57	112	105	8		
3	1107	601.397	1.0	2.1	348	254	253	57	113	105	7		
2	1113	606.328	1.0	2.1	348	255	255	57	114	106	7		
1	1119	611.272	1.0	2.1	349	252	254	57	115	106	7		
Average:	end 1125	616.230											

Comments:

C.1.2-3

Delta Air Quality Services, Incorporated

5-HG-U1 Page 1 of 2

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 1 Stack breaching
DATE: May 11 2016
RUN NO: 5-HG U1
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO: 5 WCS
METER ΔH@: 1.743 @1= 0.568
METER Yd: 0.997
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 6x30
ΔH= 2.2 X ΔP:
Probe Condition, pre/post test: ✓
Silica Gel Expanded, Y/N: N
Filter Condition after Test: white
Check Weight: 294.8 / 295.0

AMBIENT TEMPERATURE: 95
BAROMETRIC PRESSURE: 30.01
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: 47 glass
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL: #1-HC
NOZZLE DIAMETER: 0.219
FILTER NO/TYPE: 83UP-648 / quartz
PRE-TEST LEAK RATE: : <0.001 CFM@ 15 in. Hg.
POST-TEST LEAK RATE: : <0.001 CFM@ 12 in. Hg.
PITOT LEAK CHECK - PRE: ✓ POST: ✓
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test	Difference
1	HNO_3/H_2O_2	954.6	725.2	
2	HNO_3/H_2O_2	887.5	715.1	
3	Empty	611.2	606.6	
4	$KMNO_4/H_2SO_4$	726.5	727.1	
5	$KMNO_4/H_2SO_4$	718.6	717.0	
6	Silica gel.	839.6	808.2	

Point	Time	Meter Volume, ft³	ΔP in. H_2O	ΔH in. H_2O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O_2 %	Pstatic in. H_2O
5	1155	616.400	.80	1.8	352	253	248	59	109	104	7		+0.74
4	1201	621.387	.65	1.4	352	257	252	56	110	104	6		
3	1207	625.399	.65	1.4	352	259	256	54	111	104	6		
2	1213	629.788	.85	1.9	352	252	254	52	112	105	7		
1	1219	634.604	.85	1.9	352	255	257	52	113	105	7		
end	1225	639.441											
5	1227	639.441	.83	1.8	352	257	251	53	113	105	7		
4	1233	644.181	.70	1.5	352	252	253	53	112	105	6		
3	1239	648.313	.60	1.3	352	254	252	53	112	105	6		
2	1245	652.272	.45	1.0	352	255	254	54	111	105	5		
1	1251	655.743	.45	1.0	352	256	256	54	110	105	5		
end	1257	659.283											
5	1259	659.283	.75	1.7	352	251	253	54	110	105	7		
4	1305	663.802	.75	1.7	352	254	254	54	111	105	7		
3	1311	668.331	.75	1.7	353	257	251	55	112	105	7		
2	1317	672.865	.75	1.7	354	254	253	55	112	105	7		
1	1323	677.394	.80	1.8	355	255	257	55	113	105	7		
Average: end	1329	682.133											

Comments:

C.1.2-4

Data sheet Metals

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 1 Stack breaching
DATE: May 11 2016
RUN NO: 5-HG U1
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO:
METER ΔH@:
METER Yd:
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 6x30
ΔH= X ΔP:
Probe Condition, pre/post test:
Silica Gel Expanded, Y/N:
Filter Condition after Test:
Check Weight:

AMBIENT TEMPERATURE:
BAROMETRIC PRESSURE:
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: glass
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL:
NOZZLE DIAMETER:
FILTER NO/TYPE:
PRE-TEST LEAK RATE: : CFM@ in. Hg.
POST-TEST LEAK RATE: : CFM@ in. Hg.
PITOT LEAK CHECK - PRE: POST:
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test	Difference
1	HNO_3/H_2O_2			
2	HNO_3/H_2O_2			
3	Empty			
4	$KMNO_4/H_2SO_4$			
5	$KMNO_4/H_2SO_4$			
6	Silica gel.			

Point	Time	Meter Volume, ft³	ΔP in. H₂O	ΔH in. H₂O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O₂ %	Pstatic in. H₂O
5	1331	682.133	1.0	2.2	355	254	257	55	113	105	9		
4	1337	687.222	1.0	2.2	356	256	252	55	113	105	9		
3	1343	692.299	1.0	2.2	356	259	255	55	114	105	9		
2	1349	697.383	.80	1.8	356	254	253	56	114	106	7		
1	1355	701.996	.80	1.8	357	255	254	56	115	106	7		
end	1401	706.484											
5	1403	706.484	1.0	2.2	356	257	252	56	115	106	9		
4	1409	711.587	1.0	2.2	356	259	253	57	115	107	9		
3	1415	716.736	1.0	2.2	356	251	255	57	114	107	9		
2	1421	721.839	1.0	2.2	356	253	255	57	114	107	9		
1	1427	726.935	1.0	2.2	356	254	252	57	114	107	9		
end	1433	732.043											
5	1435	732.043	1.0	2.2	356	252	254	57	114	108	9		
4	1441	737.139	1.0	2.2	356	257	251	57	114	108	9		
3	1447	742.248	1.0	2.2	356	253	255	58	114	108	9		
2	1453	747.354	1.0	2.2	356	255	254	58	114	109	9		
1	1459	752.455	1.1	2.4	356	256	257	58	114	109	9		
Average end	1505	757.778											

Comments:

C-1.1-5

Delta Air Quality Services, Incorporated

6 -HG - 01 Page ____ of ____

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 1 Stack breaching
DATE: May 11 2016
RUN NO: 6-HG 01
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO:
METER ΔH@:
METER Yd:
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 6x30
ΔH= 2.1 X ΔP:
Probe Condition, pre/post test: ✓/✓
Silica Gel Expanded, Y/N:
Filter Condition after Test: White
Check Weight: 294.8/295.0

AMBIENT TEMPERATURE: 95
BAROMETRIC PRESSURE: 30.01
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: 47 glass
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL: 1-HG
NOZZLE DIAMETER: 0.249
FILTER NO/TYPE: 8310649 / quartz
PRE-TEST LEAK RATE: : <0.001 CFM@ 15 in. Hg.
POST-TEST LEAK RATE: : <0.001 CFM@ 12 in. Hg.
PITOT LEAK CHECK - PRE: ✓ POST: ✓
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test	Difference
1	HNO_3/H_2O_2	927.9	719.1	
2	HNO_3/H_2O_2	870.9	673.8	
3	Empty	534.1	529.8	
4	$KMNO_4/H_2SO_4$	723.1	720.7	
5	$KMNO_4/H_2SO_4$	768	766.0	
6	Silica gel.	921.4	892.1	

Point	Time	Meter Volume, ft³	ΔP in. H₂O	ΔH in. H₂O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O₂ %	Pstatic in. H₂O
5	1529	758.000	.80	1.7	355	253	255	58	112	107	7		+0.74
4	1535	762.529	.69	1.5	355	255	256	55	113	107	6		
3	1541	766.599	.70	1.5	355	257	252	54	115	108	6		
2	1547	770.661	.85	1.8	356	254	254	53	117	108	7		
1	1553	775.302	.85	1.8	356	251	251	53	118	109	7		
end	1559	779.928											
5	1601	779.928	.80	1.7	356	253	256	53	118	109	7		
4	1607	784.405	.70	1.5	356	257	257	53	118	109	7		
3	1613	788.643	.60	1.3	357	252	251	53	117	109	4		
2	1619	792.607	.60	1.3	357	254	253	54	117	110	4		
1	1625	796.581	.45	.95	358	255	255	54	117	110	4		
end	1631	800.013											
5	1633	800.013	.75	1.6	358	257	259	54	117	110	6		
4	1639	804.247	.75	1.6	358	254	257	54	117	110	6		
3	1645	808.523	.70	1.5	358	251	256	54	117	110	6		
2	1651	812.593	.75	1.6	358	253	251	54	118	111	6		
1	1657	816.981	.80	1.7	358	257	253	55	118	111	7		
Average:	end 1703	821.512											

Comments:

C.1.2-6

Delta Air Quality Services, Incorporated

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WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 1 Stack breaching
DATE: May 11 2016
RUN NO: 6 -HG 01
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO:
METER ΔH@:
METER Yd:
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 6x30
ΔH= ____ X ΔP:
Probe Condition, pre/post test:
Silica Gel Expanded, Y/N:
Filter Condition after Test:
Check Weight:

AMBIENT TEMPERATURE:
BAROMETRIC PRESSURE:
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: glass
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL:
NOZZLE DIAMETER:
FILTER NO/TYPE:
PRE-TEST LEAK RATE: : ____ CFM@ ____ in. Hg.
POST-TEST LEAK RATE: : ____ CFM@ ____ in. Hg.
PITOT LEAK CHECK - PRE: ____ POST: ____
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test	= Difference
1	HNO_3/H_2O_2			
2	HNO_3/H_2O_2			
3	Empty			
4	$KMNO_4/H_2SO_4$			
5	$KMNO_4/H_2SO_4$			
6	Silica gel.			

Point	Time	Meter Volume, ft³	ΔP in. H₂O	ΔH in. H₂O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O₂ %	Pstatic in. H₂O
5	1705	821.512	1.0	2.1	358	253	254	55	118	111	8		
4	1711	826.453	1.0	2.1	358	256	256	55	118	111	8		
3	1717	831.414	.80	1.7	358	251	254	56	118	111	7		
2	1723	836.043	.80	1.7	359	252	251	56	117	110	7		
1	1729	840.879	.80	1.7	359	253	254	54	117	110	7		
end	1735	845.330											
5	1737	845.330	1.0	2.1	359	255	251	54	117	110	8		
4	1743	850.264	1.0	2.1	359	254	255	54	117	110	8		
3	1749	855.173	1.0	2.1	358	251	258	53	117	110	8		
2	1755	860.093	1.0	2.1	358	253	254	53	116	109	8		
1	1801	865.019	1.0	2.1	358	257	251	52	116	109	8		
end	1807	870.047											
5	1809	870.047	1.1	2.3	358	254	257	52	116	109	9		
4	1815	875.284	1.1	2.3	358	253	253	53	116	109	9		
3	1821	880.502	1.1	2.3	359	251	252	53	116	109	9		
2	1827	885.741	1.0	2.1	359	254	255	53	116	108	8		
1	1833	890.651	1.0	2.1	359	252	251	54	116	108	8		
Average: end	1839	895.585											

Comments:

C-12-7

4-HG-Unit 1						
	dP	(dP)^.5	dH	Ts	Tm	
5	0.800	0.894	1.60	341	80	78
4	0.650	0.806	1.30	341	83	74
3	0.700	0.837	1.40	341	94	84
2	0.800	0.894	1.70	341	98	87
1	0.870	0.933	1.80	341	102	90
5	0.800	0.894	1.80	341	102	91
4	0.720	0.849	1.50	341	103	93
3	0.580	0.762	1.20	342	103	94
2	0.450	0.671	0.95	342	104	95
1	0.450	0.671	0.95	342	105	96
5	0.750	0.866	1.60	342	105	96
4	0.750	0.866	1.60	342	106	97
3	0.670	0.819	1.40	343	107	98
2	0.770	0.877	1.60	343	109	99
1	0.800	0.894	1.70	344	110	100
5	1.000	1.000	2.10	345	109	101
4	1.000	1.000	2.10	345	109	101
3	0.800	0.894	1.70	345	110	102
2	0.800	0.894	1.70	346	112	103
1	0.800	0.894	1.70	346	113	104
5	1.000	1.000	2.10	346	113	104
4	1.000	1.000	2.10	346	113	104
3	1.000	1.000	2.10	347	112	104
2	1.000	1.000	2.10	347	112	105
1	1.000	1.000	2.10	347	111	105
5	1.100	1.049	2.30	347	111	105
4	1.100	1.049	2.30	348	112	105
3	1.000	1.000	2.10	348	113	105
2	1.000	1.000	2.10	348	114	106
1	1.000	1.000	2.10	349	115	106
Average		0.8290	1.760	344.2	102.0	

		Meter Vol	Imp	Imp	
Delta P (iwg)	0.829	480.800	936.6	693.4	243.2
Meter Pressure (iwg)	1.760	616.230	787.2	667.6	119.6
Stack Temperature (F)	344.233	135.430	613.0	610.1	2.9
Meter Temperature (F)	102.033		603.4	602.3	1.1
Meter Volume (acf)	135.430		595.2	596.3	-1.1
Liquid Volume (ml)	31.500		906.9	875.4	31.5
					397.2

5-HG-Unit 1						
	dP	(dP)^.5	dH	Ts	Tm	
5	0.80	0.894	1.80	352	109	104
4	0.65	0.806	1.40	352	110	104
3	0.65	0.806	1.40	352	111	104
2	0.85	0.922	1.90	352	112	105
1	0.85	0.922	1.90	352	113	105
5	0.83	0.911	1.80	352	113	105
4	0.70	0.837	1.50	352	112	105
3	0.60	0.775	1.30	352	112	105
2	0.45	0.671	1.00	352	111	105
1	0.45	0.671	1.00	352	110	105
5	0.75	0.866	1.70	352	110	105
4	0.75	0.866	1.70	352	111	105
3	0.75	0.866	1.70	353	112	105
2	0.75	0.866	1.70	354	112	105
1	0.80	0.894	1.80	355	113	105
5	1.00	1.000	2.20	35	113	105
4	1.00	1.000	2.20	356	113	105
3	1.00	1.000	2.20	356	114	105
2	0.80	0.894	1.80	356	114	106
1	0.80	0.894	1.80	357	115	106
5	1.00	1.000	2.20	356	115	106
4	1.00	1.000	2.20	356	115	107
3	1.00	1.000	2.20	356	114	107
2	1.00	1.000	2.20	356	114	107
1	1.00	1.000	2.20	356	114	107
5	1.00	1.000	2.20	356	114	108
4	1.00	1.000	2.20	356	114	108
3	1.00	1.000	2.20	356	114	108
2	1.00	1.000	2.20	356	114	109
1	1.10	1.049	2.40	356	114	109
Average		0.8348	1.867	343.5	109.3	

		Meter Vol	Imp	Imp	
Delta P (iwg)	0.835	616.4	954.6	725.2	229.4
Meter Pressure (iwg)	1.867	757.778	887.5	715.1	172.4
Stack Temperature (F	343.533	141.378	611.2	606.6	4.6
Meter Temperature (F)	109.283		726.5	727.1	-0.6
Meter Volume (acf)	141.378		718.6	717	1.6
Liquid Volume (ml)	31.400		839.6	808.2	31.4
					438.8

6-HG-Unit 1						
	dP	(dP)^.5	dH	Ts	Tm	
5	0.80	0.894	1.70	355	112	107
4	0.69	0.831	1.50	355	113	107
3	0.70	0.837	1.50	355	115	108
2	0.85	0.922	1.80	356	117	108
1	0.85	0.922	1.80	356	118	109
5	0.80	0.894	1.70	356	118	109
4	0.70	0.837	1.50	356	118	109
3	0.60	0.775	1.30	357	117	109
2	0.60	0.775	1.30	357	117	110
1	0.45	0.671	0.95	358	117	110
5	0.75	0.866	1.60	358	117	110
4	0.75	0.866	1.60	358	117	110
3	0.70	0.837	1.50	358	117	110
2	0.75	0.866	1.60	358	118	111
1	0.80	0.894	1.70	358	118	111
5	1.00	1.000	2.10	358	118	111
4	1.00	1.000	2.10	358	118	111
3	0.80	0.894	1.70	358	118	111
2	0.80	0.894	1.70	359	117	110
1	0.80	0.894	1.70	359	117	110
5	1.00	1.000	2.10	359	117	110
4	1.00	1.000	2.10	359	117	110
3	1.00	1.000	2.10	358	117	110
2	1.00	1.000	2.10	358	116	109
1	1.00	1.000	2.10	358	116	109
5	1.10	1.049	2.30	358	116	109
4	1.10	1.049	2.30	358	116	109
3	1.10	1.049	2.30	359	116	109
2	1.00	1.000	2.10	359	116	108
1	1.00	1.000	2.10	359	116	108
Average		0.8412	1.798	357.6	113.0	

		Meter Vo	Imp	Imp	
Delta P (iwg)	0.841	758	927.9	719.1	208.8
Meter Pressure (iwg)	1.798	895.585	870.9	673.8	197.1
Stack Temperature (F	357.600	137.585	534.1	529.8	4.3
Meter Temperature (F	113.033		723.1	720.7	2.4
Meter Volume (acf)	137.585		766.8	766	0.8
Liquid Volume (ml)	29.3		921.4	892.1	29.3
					442.7

Date	Time	O2 %	CO2 %	
5/11/2016	7:31	19.01	18.80	
5/11/2016	7:32	19.01	18.81	
5/11/2016	7:33	18.99	18.70	
5/11/2016	7:34	18.98	18.67	High
5/11/2016	7:35	12.67	12.13	
5/11/2016	7:36	10.85	10.37	
5/11/2016	7:37	10.84	10.37	Mid
5/11/2016	7:38	2.55	2.25	
5/11/2016	7:39	0.07	0.06	Zero
5/11/2016	7:40	5.09	7.41	
5/11/2016	7:41	9.27	11.00	
5/11/2016	7:42	9.00	11.40	
5/11/2016	7:43	8.75	11.57	
5/11/2016	7:44	9.17	11.12	
5/11/2016	7:45	9.38	11.11	
5/11/2016	7:46	10.73	10.32	
5/11/2016	7:47	10.74	10.31	O2 CO2 Bias
5/11/2016	7:48	3.92	3.21	
5/11/2016	7:49	0.07	0.06	Zero Bias
5/11/2016	7:50	3.65	5.47	
5/11/2016	7:51	8.70	11.60	
5/11/2016	7:52	9.20	11.05	
5/11/2016	7:53	9.39	10.91	
5/11/2016	7:54	9.14	11.22	
5/11/2016	7:55	8.43	11.91	
5/11/2016	7:56	8.56	11.69	
5/11/2016	7:57	9.17	11.16	
5/11/2016	7:58	8.58	11.79	
5/11/2016	7:59	8.44	11.85	
5/11/2016	8:00	8.75	11.57	
5/11/2016	8:01	8.88	11.48	
5/11/2016	8:02	7.74	12.61	
5/11/2016	8:03	8.26	12.04	
5/11/2016	8:04	8.93	11.43	
5/11/2016	8:05	9.18	11.11	
5/11/2016	8:06	9.44	10.86	
5/11/2016	8:07	9.37	11.03	
5/11/2016	8:08	8.68	11.66	
5/11/2016	8:09	8.26	12.07	
5/11/2016	8:10	8.89	11.44	
5/11/2016	8:11	8.18	12.14	
5/11/2016	8:12	8.80	11.52	
5/11/2016	8:13	8.89	11.41	
5/11/2016	8:14	8.76	11.56	
5/11/2016	8:15	8.43	11.89	
5/11/2016	8:16	8.51	11.79	

5/11/2016	8:17	8.06	12.30
5/11/2016	8:18	8.53	11.68
5/11/2016	8:19	9.00	11.32
5/11/2016	8:20	9.11	11.19
5/11/2016	8:21	8.95	11.36
5/11/2016	8:22	8.82	11.54
5/11/2016	8:23	8.51	11.83
5/11/2016	8:24	9.00	11.36
5/11/2016	8:25	8.31	11.99
5/11/2016	8:26	9.17	11.18
5/11/2016	8:27	8.52	11.91
5/11/2016	8:28	7.46	12.95
5/11/2016	8:29	7.88	12.44
5/11/2016	8:30	8.80	11.51
5/11/2016	8:31	9.65	10.70
5/11/2016	8:32	8.94	11.43
5/11/2016	8:33	9.07	11.33
5/11/2016	8:34	8.31	12.10
5/11/2016	8:35	8.56	11.79
5/11/2016	8:36	8.87	11.48
5/11/2016	8:37	9.02	11.35
5/11/2016	8:38	9.35	11.00
5/11/2016	8:39	9.39	11.02
5/11/2016	8:40	7.92	12.48
5/11/2016	8:41	8.11	12.28
5/11/2016	8:42	8.43	11.88
5/11/2016	8:43	9.11	11.24
5/11/2016	8:44	8.40	11.96
5/11/2016	8:45	8.98	11.33
5/11/2016	8:46	9.32	10.99
5/11/2016	8:47	8.80	11.56
5/11/2016	8:48	9.10	11.22
5/11/2016	8:49	8.44	11.95
5/11/2016	8:50	7.92	12.43
5/11/2016	8:51	8.14	12.18
5/11/2016	8:52	8.65	11.63
5/11/2016	8:53	8.79	11.57
5/11/2016	8:54	8.78	11.54
5/11/2016	8:55	8.81	11.58
5/11/2016	8:56	9.13	11.19
5/11/2016	8:57	9.09	11.19
5/11/2016	8:58	8.72	11.70
5/11/2016	8:59	8.24	12.15
5/11/2016	9:00	7.79	12.52
5/11/2016	9:01	8.99	11.29
5/11/2016	9:02	8.98	11.37
5/11/2016	9:03	8.87	11.48
5/11/2016	9:04	8.74	11.58
5/11/2016	9:05	8.38	11.99

5/11/2016	9:06	8.04	12.30
5/11/2016	9:07	8.43	11.89
5/11/2016	9:08	8.74	11.64
5/11/2016	9:09	8.75	11.52
5/11/2016	9:10	9.37	11.04
5/11/2016	9:11	8.64	11.71
5/11/2016	9:12	8.08	12.34
5/11/2016	9:13	7.85	12.52
5/11/2016	9:14	8.99	11.27
5/11/2016	9:15	9.07	11.29
5/11/2016	9:16	8.98	11.33
5/11/2016	9:17	8.51	11.86
5/11/2016	9:18	8.64	11.72
5/11/2016	9:19	8.09	12.26
5/11/2016	9:20	8.17	12.10
5/11/2016	9:21	8.64	11.70
5/11/2016	9:22	9.45	10.81
5/11/2016	9:23	9.06	11.31
5/11/2016	9:24	8.52	11.78
5/11/2016	9:25	8.58	11.78
5/11/2016	9:26	8.42	11.88
5/11/2016	9:27	8.87	11.46
5/11/2016	9:28	8.29	12.06
5/11/2016	9:29	8.71	11.55
5/11/2016	9:30	8.61	11.71
5/11/2016	9:31	8.56	11.77
5/11/2016	9:32	8.92	11.36
5/11/2016	9:33	8.33	12.04
5/11/2016	9:34	7.72	12.63
5/11/2016	9:35	8.22	12.03
5/11/2016	9:36	8.47	11.81
5/11/2016	9:37	8.92	11.37
5/11/2016	9:38	9.09	11.24
5/11/2016	9:39	8.82	11.51
5/11/2016	9:40	8.56	11.71
5/11/2016	9:41	8.94	11.37
5/11/2016	9:42	8.86	11.41
5/11/2016	9:43	8.72	11.59
5/11/2016	9:44	8.54	11.74
5/11/2016	9:45	8.46	11.83
5/11/2016	9:46	8.80	11.48
5/11/2016	9:47	8.68	11.57
5/11/2016	9:48	9.33	10.94
5/11/2016	9:49	9.22	11.08
5/11/2016	9:50	8.00	12.37
5/11/2016	9:51	8.17	12.05
5/11/2016	9:52	8.71	11.56
5/11/2016	9:53	8.55	11.72
5/11/2016	9:54	8.97	11.24

5/11/2016	9:55	9.28	11.02	
5/11/2016	9:56	8.95	11.35	
5/11/2016	9:57	8.22	12.10	
5/11/2016	9:58	7.65	12.61	
5/11/2016	9:59	8.71	11.52	
5/11/2016	10:00	9.06	11.21	
5/11/2016	10:01	8.89	11.39	
5/11/2016	10:02	8.96	11.34	
5/11/2016	10:03	8.55	11.76	
5/11/2016	10:04	8.18	12.14	
5/11/2016	10:05	8.38	11.89	
5/11/2016	10:06	9.23	11.03	
5/11/2016	10:07	9.23	11.07	
5/11/2016	10:08	9.45	10.88	
5/11/2016	10:09	8.16	12.23	
5/11/2016	10:10	7.46	12.83	
5/11/2016	10:11	8.71	11.48	
5/11/2016	10:12	8.70	11.61	
5/11/2016	10:13	8.12	12.19	
5/11/2016	10:14	8.35	11.90	
5/11/2016	10:15	8.04	12.23	
5/11/2016	10:16	9.18	11.05	
5/11/2016	10:17	9.31	10.98	
5/11/2016	10:18	9.02	11.24	
5/11/2016	10:19	8.97	11.27	
5/11/2016	10:20	9.19	11.13	
5/11/2016	10:21	8.12	12.20	
5/11/2016	10:22	8.47	11.75	
5/11/2016	10:23	8.63	11.66	
5/11/2016	10:24	9.05	11.23	
5/11/2016	10:25	9.38	10.87	
5/11/2016	10:26	8.56	11.79	
5/11/2016	10:27	8.11	12.26	
5-HCL-U1 O2 CO2 Averag		8.66	11.65	
5/11/2016	10:28	2.30	2.96	
5/11/2016	10:29	0.05	0.07	Zero Bias
5/11/2016	10:30	8.00	8.20	
5/11/2016	10:31	10.80	10.30	
5/11/2016	10:32	10.82	10.30	O2 CO2 Bias
5/11/2016	10:33	1.69	1.40	
5/11/2016	10:34	0.04	0.05	Zero
5/11/2016	10:35	9.02	8.84	
5/11/2016	10:36	10.83	10.34	
5/11/2016	10:37	10.84	10.34	Span
5/11/2016	10:38	9.90	10.84	
5/11/2016	10:39	8.45	11.96	
5/11/2016	10:40	8.79	11.53	
5/11/2016	10:41	8.91	11.46	

5/11/2016	10:42	8.57	11.87	
5/11/2016	10:43	8.38	11.96	
5/11/2016	10:44	8.46	11.87	
5/11/2016	10:45	9.08	11.25	
5/11/2016	10:46	8.36	12.04	
5/11/2016	10:47	8.57	11.75	
5/11/2016	10:48	8.69	11.70	
5/11/2016	10:49	8.67	11.65	
5/11/2016	10:50	9.05	11.25	
5/11/2016	10:51	9.20	11.20	
5/11/2016	10:52	8.74	11.64	
5/11/2016	10:53	8.51	11.85	
5/11/2016	10:54	8.24	12.09	
5/11/2016	10:55	7.81	12.56	
5/11/2016	10:56	8.22	12.08	
5/11/2016	10:57	8.69	11.61	
5/11/2016	10:58	8.58	11.77	
5/11/2016	10:59	9.20	11.09	
5/11/2016	11:00	9.10	11.27	
5/11/2016	11:01	8.52	11.86	
5/11/2016	11:02	8.15	12.19	
5/11/2016	11:03	8.60	11.71	
5/11/2016	11:04	8.80	11.46	
5/11/2016	11:05	8.97	11.45	
5/11/2016	11:06	8.63	11.75	
5/11/2016	11:07	8.33	11.96	
5/11/2016	11:08	8.41	11.92	
5/11/2016	11:09	8.52	11.83	
5/11/2016	11:10	8.70	11.65	
5/11/2016	11:11	8.33	12.00	
5/11/2016	11:12	8.35	11.98	
5/11/2016	11:13	8.98	11.32	
5/11/2016	11:14	8.75	11.58	
5/11/2016	11:15	8.37	11.93	
5/11/2016	11:16	8.86	11.48	
5/11/2016	11:17	9.18	11.14	
5/11/2016	11:18	9.18	11.18	
5/11/2016	11:19	8.54	11.77	
5/11/2016	11:20	8.70	11.69	
5/11/2016	11:21	8.45	11.87	
5/11/2016	11:22	8.43	11.90	
5/11/2016	11:23	8.38	11.91	
5/11/2016	11:24	8.85	11.50	
5/11/2016	11:25	8.68	11.59	
4-HG-U2 O2 CO2 Bias		8.66	11.67	
5/11/2016	11:26	8.52	11.84	
5/11/2016	11:27	8.69	11.61	
5/11/2016	11:28	2.91	3.29	
5/11/2016	11:29	0.05	0.07	Zero Bias

5/11/2016	11:30	5.13	5.50	
5/11/2016	11:31	10.77	10.26	O2 CO2 Bias
5/11/2016	11:32	2.84	2.45	
5/11/2016	11:33	0.04	0.05	Zero
5/11/2016	11:34	9.00	8.71	
5/11/2016	11:35	10.82	10.29	Span
5/11/2016	11:36	8.90	11.67	
5/11/2016	11:37	8.53	11.72	
5/11/2016	11:38	8.56	11.77	
5/11/2016	11:39	8.69	11.64	
5/11/2016	11:40	8.92	11.34	
5/11/2016	11:41	9.44	10.86	
5/11/2016	11:42	8.77	11.60	
5/11/2016	11:43	8.58	11.71	
5/11/2016	11:44	8.73	11.64	
5/11/2016	11:45	8.58	11.73	
5/11/2016	11:46	8.10	12.19	
5/11/2016	11:47	8.86	11.45	
5/11/2016	11:48	8.64	11.69	
5/11/2016	11:49	8.93	11.40	
5/11/2016	11:50	9.94	10.40	
5/11/2016	11:51	9.38	11.03	
5/11/2016	11:52	7.96	12.42	
5/11/2016	11:53	8.28	11.98	
5/11/2016	11:54	8.31	11.98	
5/11/2016	11:55	9.10	11.20	
5/11/2016	11:56	9.22	11.15	
5/11/2016	11:57	9.18	11.11	
5/11/2016	11:58	8.79	11.55	
5/11/2016	11:59	8.89	11.46	
5/11/2016	12:00	8.58	11.72	
5/11/2016	12:01	8.21	12.08	
5/11/2016	12:02	9.09	11.21	
5/11/2016	12:03	8.70	11.64	
5/11/2016	12:04	8.63	11.66	
5/11/2016	12:05	8.77	11.52	
5/11/2016	12:06	8.80	11.53	
5/11/2016	12:07	8.45	11.82	
5/11/2016	12:08	8.59	11.71	
5/11/2016	12:09	8.30	12.04	
5/11/2016	12:10	8.07	12.16	
5/11/2016	12:11	8.46	11.83	
5/11/2016	12:12	9.07	11.27	
5/11/2016	12:13	8.51	11.77	
5/11/2016	12:14	8.22	12.07	
5/11/2016	12:15	8.20	12.15	
5/11/2016	12:16	7.76	12.50	
5/11/2016	12:17	8.81	11.48	
5/11/2016	12:18	8.51	11.75	

5/11/2016	12:19	8.78	11.54	
5/11/2016	12:20	8.44	11.87	
5/11/2016	12:21	8.20	12.07	
5/11/2016	12:22	8.75	11.53	
5/11/2016	12:23	8.86	11.43	
5/11/2016	12:24	8.77	11.51	
5/11/2016	12:25	8.64	11.61	
5/11/2016	12:26	8.44	11.88	
5/11/2016	12:27	8.13	12.13	
5/11/2016	12:28	9.03	11.18	
5/11/2016	12:29	9.59	10.76	
5/11/2016	12:30	8.51	11.80	
5/11/2016	12:31	8.76	11.48	
5/11/2016	12:32	9.06	11.30	
5/11/2016	12:33	8.54	11.70	
5/11/2016	12:34	8.34	12.02	
5/11/2016	12:35	8.85	11.38	
5/11/2016	12:36	9.80	10.49	
5/11/2016	12:37	8.63	11.80	
5/11/2016	12:38	7.98	12.33	
5/11/2016	12:39	8.24	12.06	
5/11/2016	12:40	8.28	12.04	
5/11/2016	12:41	8.20	12.11	
5/11/2016	12:42	9.04	11.26	
5/11/2016	12:43	8.73	11.64	
5/11/2016	12:44	8.74	11.50	
5/11/2016	12:45	8.68	11.73	
5/11/2016	12:46	8.69	11.65	
5/11/2016	12:47	8.86	11.40	
5/11/2016	12:48	9.06	11.31	
5/11/2016	12:49	9.04	11.30	
5/11/2016	12:50	9.07	11.26	
5/11/2016	12:51	8.93	11.40	
6-HCL-U1 O2 CO2 Averag		8.67	11.65	
5/11/2016	12:52	9.70	10.89	
5/11/2016	12:53	10.79	10.30	O2 CO2 Bias
5/11/2016	12:54	7.45	6.54	
5/11/2016	12:55	0.09	0.07	
5/11/2016	12:56	0.04	0.06	Zero Bias
5/11/2016	12:57	8.77	8.70	
5/11/2016	12:58	10.79	10.31	Span
5/11/2016	12:59	2.01	1.73	
5/11/2016	13:00	0.04	0.05	Zero
5/11/2016	13:01	3.76	5.96	
5/11/2016	13:02	8.03	12.24	
5/11/2016	13:03	8.10	12.20	
5/11/2016	13:04	8.13	12.16	
5/11/2016	13:05	8.66	11.62	

5/11/2016	13:06	8.79	11.51
5/11/2016	13:07	8.52	11.81
5/11/2016	13:08	8.14	12.20
5/11/2016	13:09	8.38	11.93
5/11/2016	13:10	8.58	11.68
5/11/2016	13:11	8.73	11.54
5/11/2016	13:12	8.57	11.80
5/11/2016	13:13	8.56	11.73
5/11/2016	13:14	9.03	11.21
5/11/2016	13:15	8.41	11.94
5/11/2016	13:16	8.17	12.11
5/11/2016	13:17	8.70	11.55
5/11/2016	13:18	8.65	11.64
5/11/2016	13:19	7.93	12.39
5/11/2016	13:20	7.94	12.28
5/11/2016	13:21	9.28	10.94
5/11/2016	13:22	9.33	10.96
5/11/2016	13:23	8.27	12.07
5/11/2016	13:24	8.05	12.20
5/11/2016	13:25	8.67	11.57
5/11/2016	13:26	9.20	11.05
5/11/2016	13:27	9.23	10.98
5/11/2016	13:28	8.92	11.41
5/11/2016	13:29	8.58	11.71
5/11/2016	13:30	8.66	11.57
5/11/2016	13:31	8.87	11.39
5/11/2016	13:32	8.59	11.70
5/11/2016	13:33	8.16	12.12
5/11/2016	13:34	8.60	11.60
5/11/2016	13:35	9.26	11.02
5/11/2016	13:36	9.45	10.81
5/11/2016	13:37	8.67	11.64
5/11/2016	13:38	8.01	12.29
5/11/2016	13:39	8.13	12.07
5/11/2016	13:40	9.08	11.15
5/11/2016	13:41	8.85	11.46
5/11/2016	13:42	9.08	11.15
5/11/2016	13:43	8.79	11.47
5/11/2016	13:44	8.27	12.00
5/11/2016	13:45	8.74	11.50
5/11/2016	13:46	8.75	11.45
5/11/2016	13:47	8.50	11.79
5/11/2016	13:48	8.35	11.89
5/11/2016	13:49	8.30	11.93
5/11/2016	13:50	8.53	11.74
5/11/2016	13:51	8.19	12.03
5/11/2016	13:52	8.65	11.54
5/11/2016	13:53	9.14	11.15
5/11/2016	13:54	8.41	11.86

5/11/2016	13:55	8.97	11.26
5/11/2016	13:56	8.31	11.97
5/11/2016	13:57	8.62	11.59
5/11/2016	13:58	8.63	11.63
5/11/2016	13:59	8.66	11.56
5/11/2016	14:00	8.52	11.78
5/11/2016	14:01	9.02	11.22
5/11/2016	14:02	8.14	12.14
5/11/2016	14:03	7.90	12.37
5/11/2016	14:04	7.92	12.29
5/11/2016	14:05	9.61	10.55
5/11/2016	14:06	9.41	10.96
5/11/2016	14:07	7.89	12.40
5/11/2016	14:08	8.16	12.03
5/11/2016	14:09	8.44	11.85
5/11/2016	14:10	8.86	11.39
5/11/2016	14:11	8.22	12.04
5/11/2016	14:12	8.49	11.73
5/11/2016	14:13	8.40	11.86
5/11/2016	14:14	8.27	11.93
5/11/2016	14:15	8.39	11.88
5/11/2016	14:16	8.49	11.72
5/11/2016	14:17	8.44	11.82
5/11/2016	14:18	9.06	11.21
5/11/2016	14:19	8.63	11.63
5/11/2016	14:20	8.65	11.61
5/11/2016	14:21	8.41	11.81
5/11/2016	14:22	8.51	11.83
5/11/2016	14:23	8.31	11.92
5/11/2016	14:24	8.92	11.35
5/11/2016	14:25	8.87	11.34
5/11/2016	14:26	8.87	11.40
5/11/2016	14:27	9.11	11.14
5/11/2016	14:28	8.35	11.99
5/11/2016	14:29	8.70	11.52
5/11/2016	14:30	8.16	12.14
5/11/2016	14:31	8.60	11.64
5/11/2016	14:32	8.43	11.83
5/11/2016	14:33	8.83	11.40
5/11/2016	14:34	9.28	10.95
5/11/2016	14:35	8.70	11.57
5/11/2016	14:36	8.39	11.94
5/11/2016	14:37	7.71	12.56
5/11/2016	14:38	7.59	12.70
5/11/2016	14:39	8.34	11.90
5/11/2016	14:40	9.30	10.90
5/11/2016	14:41	9.24	11.06
5/11/2016	14:42	8.77	11.49
5/11/2016	14:43	8.73	11.55

5/11/2016	14:44	7.98	12.32	
5/11/2016	14:45	8.18	12.05	
5/11/2016	14:46	8.39	11.84	
5/11/2016	14:47	8.16	12.10	
5/11/2016	14:48	8.37	11.86	
5/11/2016	14:49	8.17	12.09	
5/11/2016	14:50	8.36	11.89	
5/11/2016	14:51	8.18	12.01	
5/11/2016	14:52	9.42	10.77	
5/11/2016	14:53	8.81	11.48	
5/11/2016	14:54	7.67	12.58	
5/11/2016	14:55	8.71	11.46	
5/11/2016	14:56	7.87	12.43	
5/11/2016	14:57	7.90	12.29	
5/11/2016	14:58	8.32	11.93	
5/11/2016	14:59	8.39	11.78	
5-HG-U2 O2 CO2 Bias		8.59	11.69	
5/11/2016	15:00	9.04	11.19	
5/11/2016	15:01	10.66	10.27	
5/11/2016	15:02	10.67	10.26	O2 CO2 Bias
5/11/2016	15:03	3.54	2.91	
5/11/2016	15:04	0.05	0.06	Zero Bias
5/11/2016	15:05	9.35	9.28	
5/11/2016	15:06	10.69	10.26	Span
5/11/2016	15:07	1.99	1.72	
5/11/2016	15:08	0.04	0.05	Zero
5/11/2016	15:09	6.68	9.64	
5/11/2016	15:10	8.94	11.19	
5/11/2016	15:11	8.17	12.03	
5/11/2016	15:12	8.67	11.51	
5/11/2016	15:13	8.68	11.46	
5/11/2016	15:14	8.55	11.64	
5/11/2016	15:15	8.28	11.90	
5/11/2016	15:16	8.53	11.69	
5/11/2016	15:17	8.44	11.69	
5/11/2016	15:18	9.15	11.04	
5/11/2016	15:19	8.72	11.49	
5/11/2016	15:20	8.67	11.54	
5/11/2016	15:21	9.01	11.16	
5/11/2016	15:22	9.07	11.14	
5/11/2016	15:23	8.49	11.76	
5/11/2016	15:24	8.94	11.21	
5/11/2016	15:25	8.36	11.92	
5/11/2016	15:26	8.59	11.59	
5/11/2016	15:27	8.31	11.90	
5/11/2016	15:28	8.60	11.59	
5/11/2016	15:29	8.91	11.27	
5/11/2016	15:30	8.46	11.78	

5/11/2016	15:31	8.16	12.02
5/11/2016	15:32	8.34	11.87
5/11/2016	15:33	8.79	11.34
5/11/2016	15:34	8.58	11.64
5/11/2016	15:35	8.82	11.36
5/11/2016	15:36	8.40	11.79
5/11/2016	15:37	8.61	11.57
5/11/2016	15:38	8.52	11.66
5/11/2016	15:39	8.91	11.30
5/11/2016	15:40	8.40	11.75
5/11/2016	15:41	8.66	11.53
5/11/2016	15:42	8.96	11.17
5/11/2016	15:43	8.89	11.30
5/11/2016	15:44	8.73	11.47
5/11/2016	15:45	8.34	11.80
5/11/2016	15:46	7.94	12.33
5/11/2016	15:47	7.44	12.74
5/11/2016	15:48	8.25	11.86
5/11/2016	15:49	9.26	10.93
5/11/2016	15:50	8.52	11.66
5/11/2016	15:51	8.06	12.13
5/11/2016	15:52	8.08	12.10
5/11/2016	15:53	8.63	11.51
5/11/2016	15:54	9.12	11.04
5/11/2016	15:55	9.55	10.59
5/11/2016	15:56	8.62	11.62
5/11/2016	15:57	8.16	12.00
5/11/2016	15:58	8.49	11.64
5/11/2016	15:59	8.91	11.26
5/11/2016	16:00	8.59	11.55
5/11/2016	16:01	9.09	11.06
5/11/2016	16:02	8.11	12.08
5/11/2016	16:03	8.33	11.80
5/11/2016	16:04	8.22	11.93
5/11/2016	16:05	8.16	11.98
5/11/2016	16:06	9.08	11.03
5/11/2016	16:07	8.73	11.40
5/11/2016	16:08	8.72	11.50
5/11/2016	16:09	8.28	11.84
5/11/2016	16:10	8.32	11.88
5/11/2016	16:11	8.39	11.74
5/11/2016	16:12	7.99	12.17
5/11/2016	16:13	8.50	11.61
5/11/2016	16:14	8.51	11.72
5/11/2016	16:15	8.56	11.48
5/11/2016	16:16	9.13	11.08
5/11/2016	16:17	8.70	11.42
5/11/2016	16:18	8.01	12.18
5/11/2016	16:19	7.86	12.28

5/11/2016	16:20	7.86	12.30	
5/11/2016	16:21	9.06	11.05	
5/11/2016	16:22	8.84	11.27	
5/11/2016	16:23	9.15	11.00	
5/11/2016	16:24	8.47	11.71	
5/11/2016	16:25	8.13	12.06	
7-HCL-U1 O2 CO2 Averag		8.54	11.67	
5/11/2016	16:26	1.60	1.88	
5/11/2016	16:27	0.04	0.06	Zero Bias
5/11/2016	16:28	8.43	8.70	
5/11/2016	16:29	10.67	10.27	O2 CO2 Bias
5/11/2016	16:30	1.64	1.47	
5/11/2016	16:31	0.04	0.05	Zero
5/11/2016	16:32	8.85	8.64	
5/11/2016	16:33	10.79	10.30	Span
5/11/2016	16:34	9.40	11.13	
5/11/2016	16:35	8.66	11.67	
5/11/2016	16:36	8.14	12.15	
5/11/2016	16:37	8.00	12.30	
5/11/2016	16:38	9.48	10.79	
5/11/2016	16:39	9.43	10.85	
5/11/2016	16:40	8.94	11.38	
5/11/2016	16:41	9.37	10.98	
5/11/2016	16:42	8.23	12.12	
5/11/2016	16:43	8.21	12.11	
5/11/2016	16:44	8.09	12.23	
5/11/2016	16:45	8.21	12.11	
5/11/2016	16:46	8.92	11.34	
5/11/2016	16:47	9.19	11.18	
5/11/2016	16:48	8.03	12.35	
5/11/2016	16:49	8.22	12.08	
5/11/2016	16:50	9.08	11.22	
5/11/2016	16:51	9.37	10.96	
5/11/2016	16:52	9.23	11.12	
5/11/2016	16:53	8.69	11.67	
5/11/2016	16:54	8.34	12.04	
5/11/2016	16:55	7.96	12.35	
5/11/2016	16:56	8.98	11.32	
5/11/2016	16:57	8.92	11.43	
5/11/2016	16:58	8.60	11.79	
5/11/2016	16:59	8.22	12.15	
5/11/2016	17:00	8.41	11.89	
5/11/2016	17:01	9.17	11.18	
5/11/2016	17:02	8.77	11.57	
5/11/2016	17:03	9.36	10.98	
5/11/2016	17:04	8.88	11.49	
5/11/2016	17:05	8.12	12.26	
5/11/2016	17:06	7.84	12.51	

5/11/2016	17:07	8.28	12.09
5/11/2016	17:08	9.55	10.80
5/11/2016	17:09	9.01	11.37
5/11/2016	17:10	9.05	11.38
5/11/2016	17:11	8.17	12.24
5/11/2016	17:12	8.15	12.23
5/11/2016	17:13	8.05	12.35
5/11/2016	17:14	8.56	11.79
5/11/2016	17:15	8.66	11.73
5/11/2016	17:16	8.25	12.13
5/11/2016	17:17	7.82	12.54
5/11/2016	17:18	8.33	11.99
5/11/2016	17:19	8.33	12.02
5/11/2016	17:20	8.35	11.98
5/11/2016	17:21	8.82	11.51
5/11/2016	17:22	8.14	12.22
5/11/2016	17:23	7.99	12.33
5/11/2016	17:24	8.70	11.60
5/11/2016	17:25	9.19	11.13
5/11/2016	17:26	8.42	11.94
5/11/2016	17:27	8.08	12.28
5/11/2016	17:28	8.02	12.27
5/11/2016	17:29	9.33	10.95
5/11/2016	17:30	9.26	11.07
5/11/2016	17:31	8.77	11.55
5/11/2016	17:32	8.96	11.38
5/11/2016	17:33	8.46	11.86
5/11/2016	17:34	8.03	12.29
5/11/2016	17:35	8.12	12.17
5/11/2016	17:36	8.43	11.87
5/11/2016	17:37	8.44	11.84
5/11/2016	17:38	8.57	11.71
5/11/2016	17:39	9.10	11.19
5/11/2016	17:40	9.48	10.85
5/11/2016	17:41	8.33	11.96
5/11/2016	17:42	8.83	11.50
5/11/2016	17:43	7.97	12.36
5/11/2016	17:44	8.31	11.98
5/11/2016	17:45	8.74	11.57
5/11/2016	17:46	8.77	11.55
5/11/2016	17:47	8.34	11.98
5/11/2016	17:48	8.52	11.78
5/11/2016	17:49	8.57	11.75
5/11/2016	17:50	7.71	12.63
5/11/2016	17:51	7.88	12.42
5/11/2016	17:52	8.80	11.44
5/11/2016	17:53	8.92	11.39
5/11/2016	17:54	8.54	11.78
5/11/2016	17:55	8.34	11.97

5/11/2016	17:56	8.45	11.82	
5/11/2016	17:57	8.76	11.55	
5/11/2016	17:58	8.68	11.64	
5/11/2016	17:59	8.23	12.12	
5/11/2016	18:00	8.14	12.12	
5/11/2016	18:01	8.92	11.38	
5/11/2016	18:02	9.46	10.85	
5/11/2016	18:03	8.99	11.34	
5/11/2016	18:04	8.52	11.80	
5/11/2016	18:05	8.28	12.05	
5/11/2016	18:06	8.38	11.91	
5/11/2016	18:07	8.27	12.01	
5/11/2016	18:08	8.49	11.79	
5/11/2016	18:09	8.79	11.54	
5/11/2016	18:10	8.24	12.08	
5/11/2016	18:11	8.63	11.66	
5/11/2016	18:12	8.56	11.73	
5/11/2016	18:13	8.57	11.76	
5/11/2016	18:14	8.66	11.61	
5/11/2016	18:15	8.65	11.64	
5/11/2016	18:16	8.82	11.42	
5/11/2016	18:17	8.61	11.73	
5/11/2016	18:18	8.24	12.07	
5/11/2016	18:19	8.46	11.80	
5/11/2016	18:20	8.46	11.82	
5/11/2016	18:21	8.60	11.64	
5/11/2016	18:22	8.10	12.24	
5/11/2016	18:23	9.10	11.15	
5/11/2016	18:24	9.26	11.04	
5/11/2016	18:25	9.16	11.12	
5/11/2016	18:26	8.69	11.62	
5/11/2016	18:27	7.59	12.75	
5/11/2016	18:28	7.60	12.64	
5/11/2016	18:29	9.15	11.05	
5/11/2016	18:30	9.11	11.19	
5/11/2016	18:31	8.75	11.55	
5/11/2016	18:32	9.16	11.09	
5/11/2016	18:33	8.49	11.81	
5/11/2016	18:34	8.62	11.66	
5/11/2016	18:35	8.94	11.32	
5/11/2016	18:36	8.50	11.77	
5/11/2016	18:37	8.33	12.00	
5/11/2016	18:38	8.38	11.88	
5/11/2016	18:39	8.48	11.80	
6-HG-U2 O2 CO2 Bias		8.56	11.71	
5/11/2016	18:40	1.87	1.92	
5/11/2016	18:41	0.04	0.06	Zero Bias
5/11/2016	18:42	7.58	7.66	
5/11/2016	18:43	10.75	10.25	O2 CO2 Bias

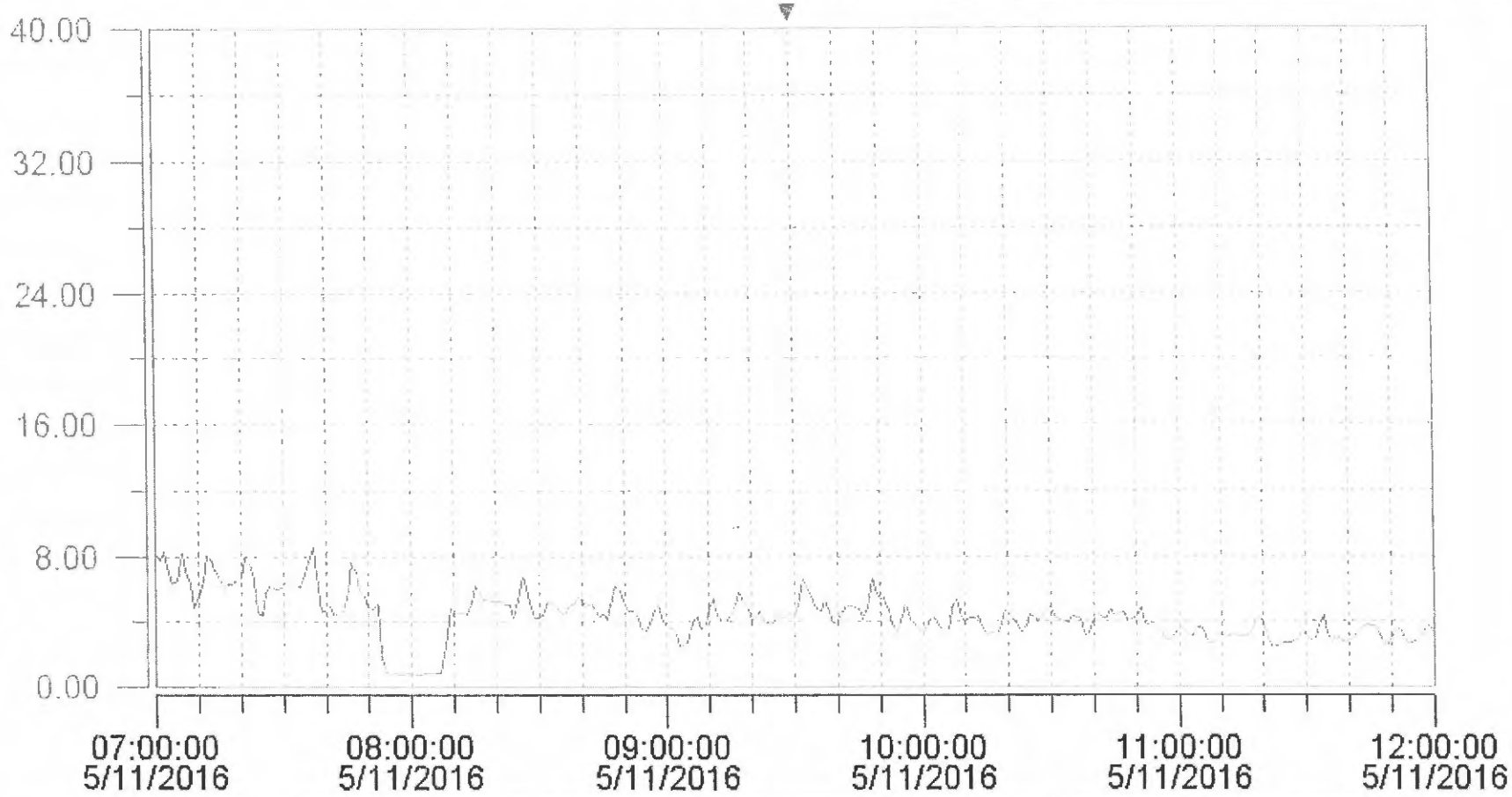
5/11/2016	18:44	1.62	1.45	
5/11/2016	18:45	0.04	0.05	Zero
5/11/2016	18:46	2.05	2.20	
5/11/2016	18:47	10.74	10.26	
5/11/2016	18:48	10.79	10.27	Span
5/11/2016	18:49	17.32	16.57	
5/11/2016	18:50	18.99	18.55	High

BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	4.37 x	7.	AVG	FIC-1753.C_APV	***
4.	AVG	SI-1345.C_APV	***	8.	AVG	FI-1753.C_APV	***

Time at arrow: 09:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 44 of 169

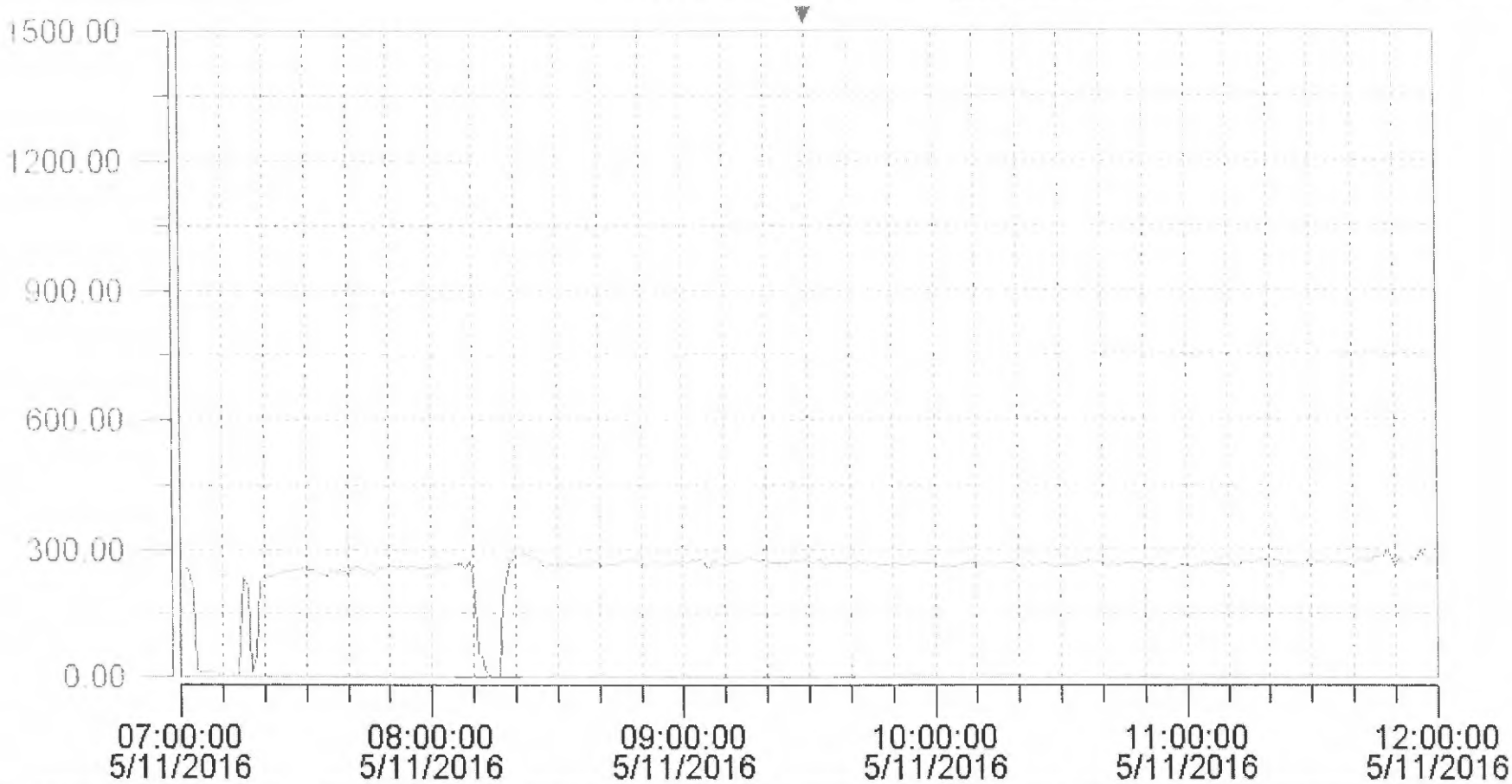
BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***		5.	AVG	FIC-1753.C_AOUTP~	***	
2.	AVG	AIC-8010.C_ASP	***		6.	AVG	FIC-1753.C_ASP	***	
3.	AVG	AIC-8010.C_APV	***		7.	AVG	FIC-1753.C_APV	***	
4.	AVG	SI-1345.C_APV	271.64 x		8.	AVG	FI-1753.C_APV	***	

LIMESTONE FEEDRATE

Time at arrow: 09:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 43 of 169

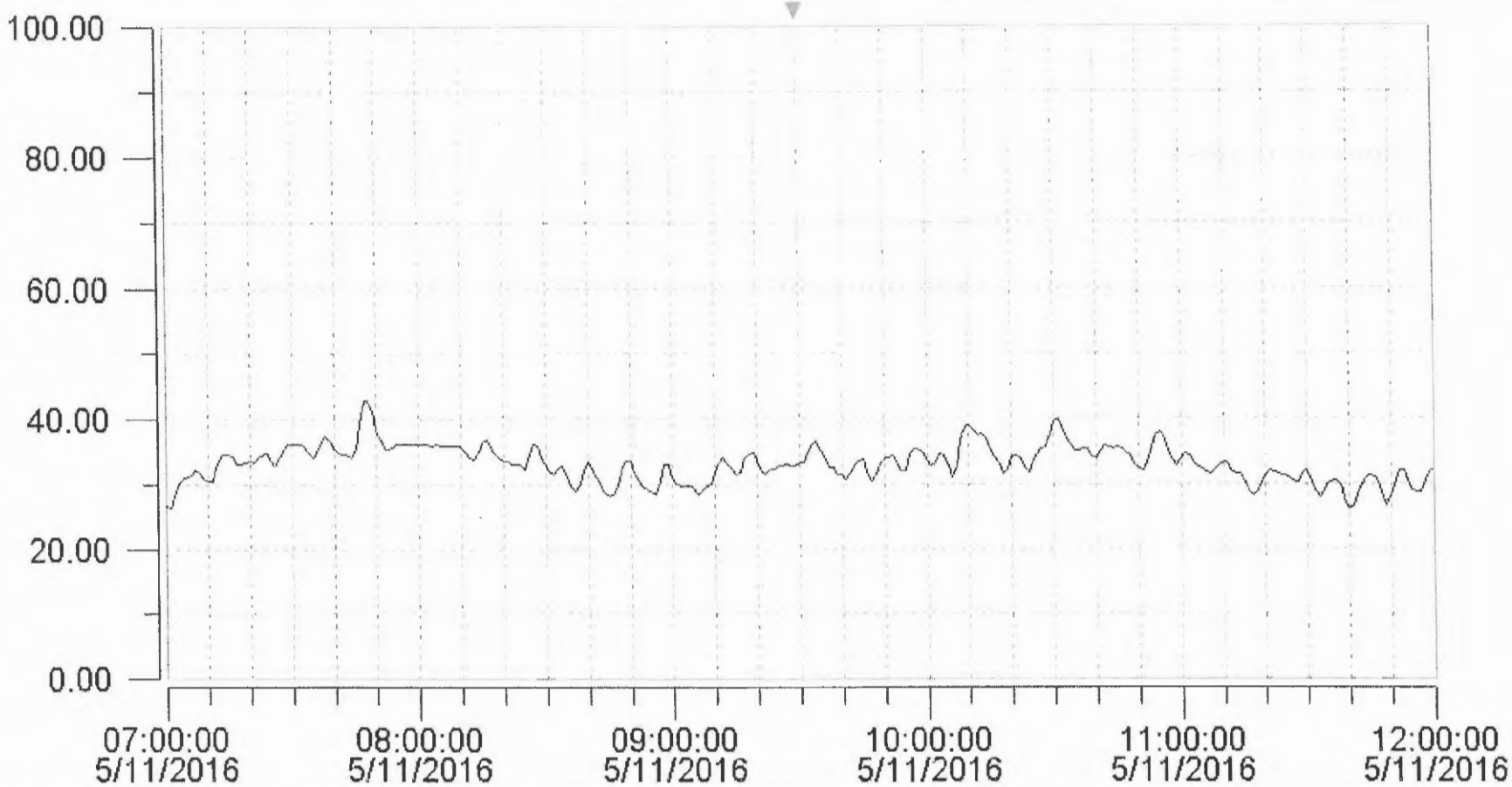
BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	***	7.	AVG	FIC-1753.C_APV	***
4.	AVG	SI-1345.C_APV	***	8.	AVG	FI-1753.C_APV	33.28 x

✳ AMMONIA INJECTION FLOW

Time at arrow: 09:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 44 of 169

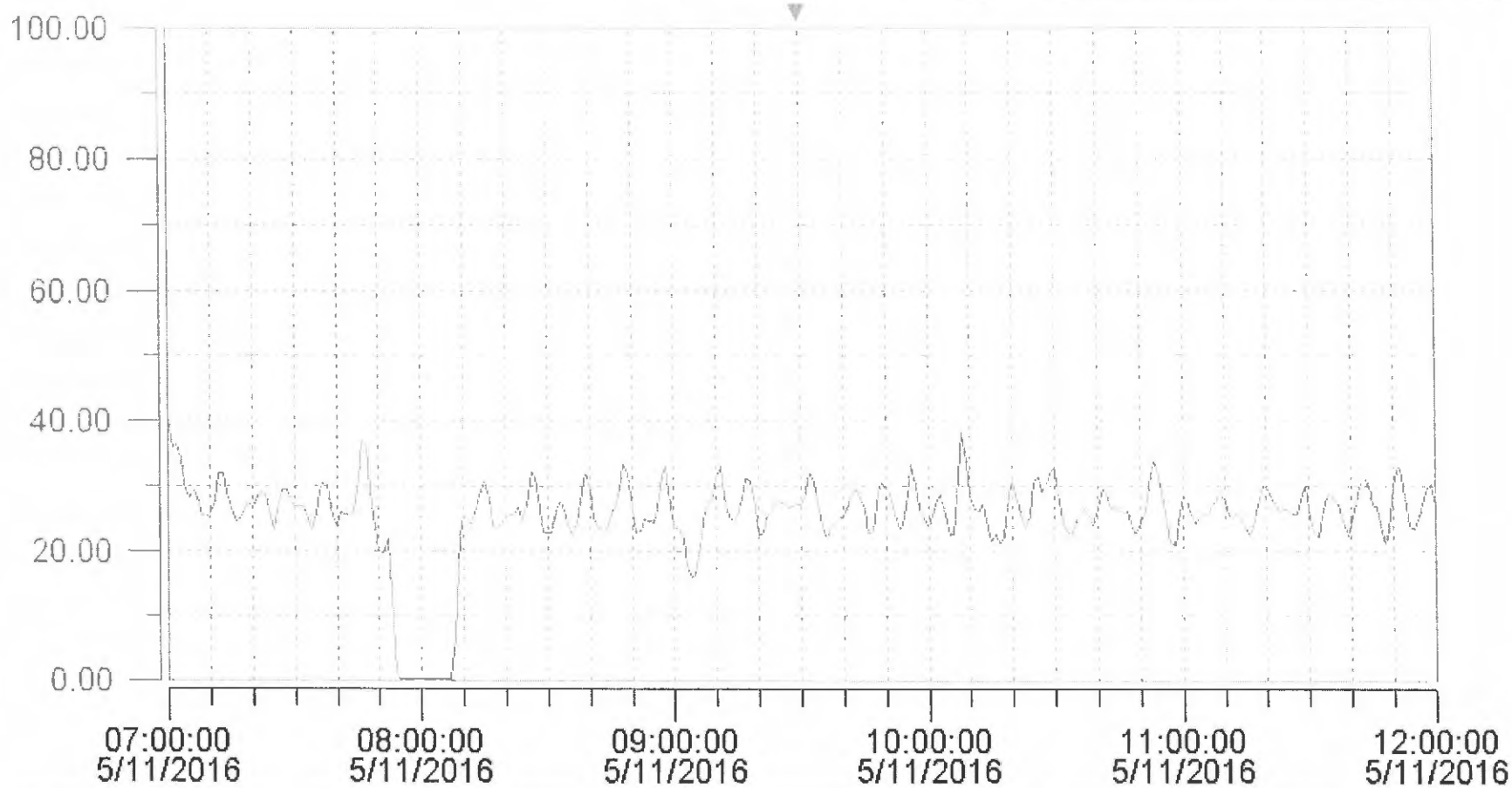
BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	***	7.	AVG	FIC-1753.C_APV	26.83 x
4.	AVG	SI-1345.C_APV	***	8.	AVG	FI-1753.C_APV	***

✳ NOX LB/HR

Time at arrow: 09:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 44 of 169

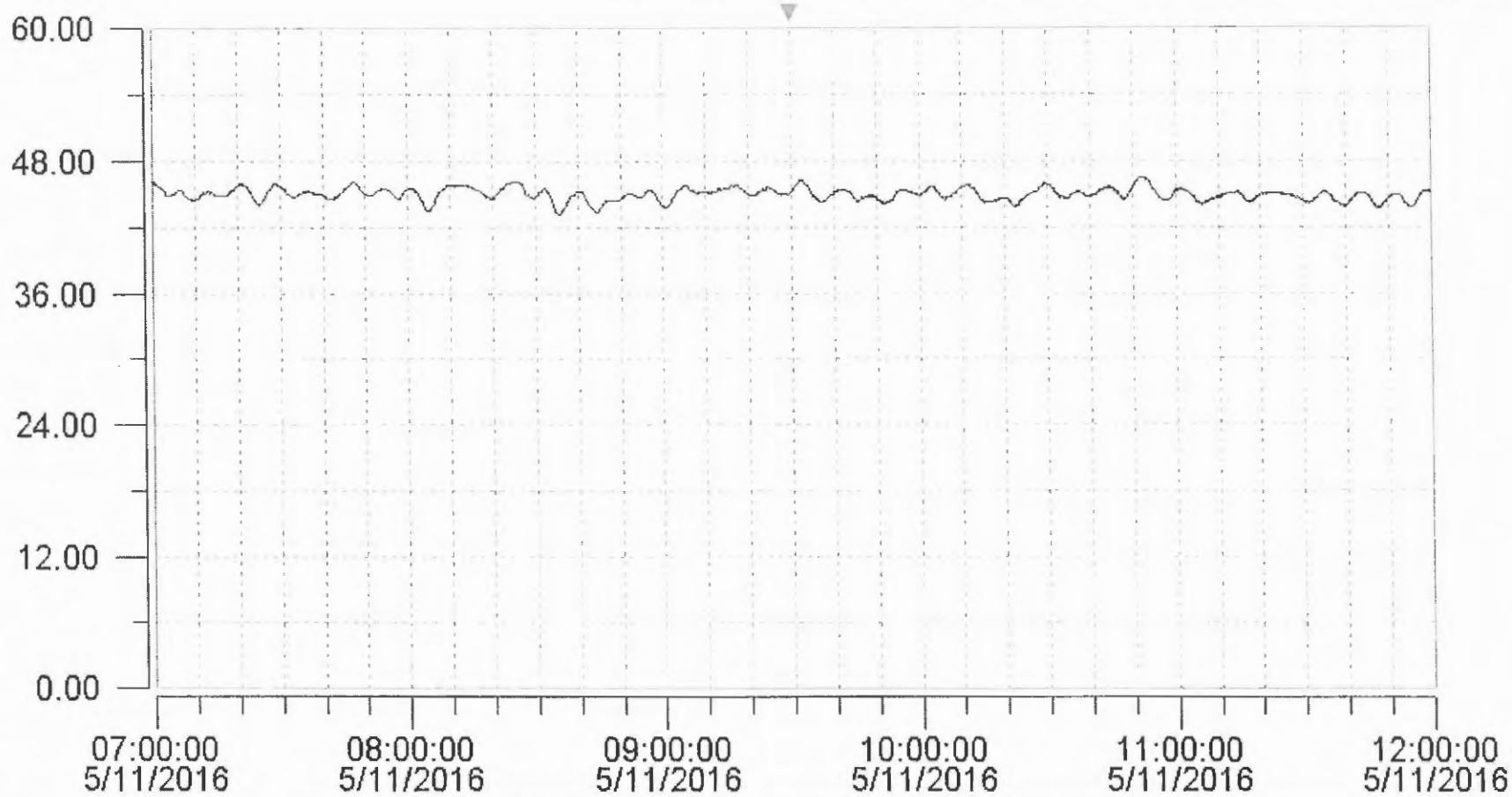
STM FDW TG VALVE 4

Hist | Info

1.	AVG	FI-2040.C_APV	***	5.	AVG	EX-MW.C_APV	***
2.	AVG	FI-2001.C_APV	***	6.	AVG	AI-GOV4.C_APV	***
3.	AVG	FDI-2001.C_APV	***	7.	AVG	FDI-2001.C_APV	***
4.	AVG	FI-2006.C_APV	***	8.	AVG	EX-NMW.C_APV	45.28 x

✳NET MW

Time at arrow: 09:30:00 5/11/2016



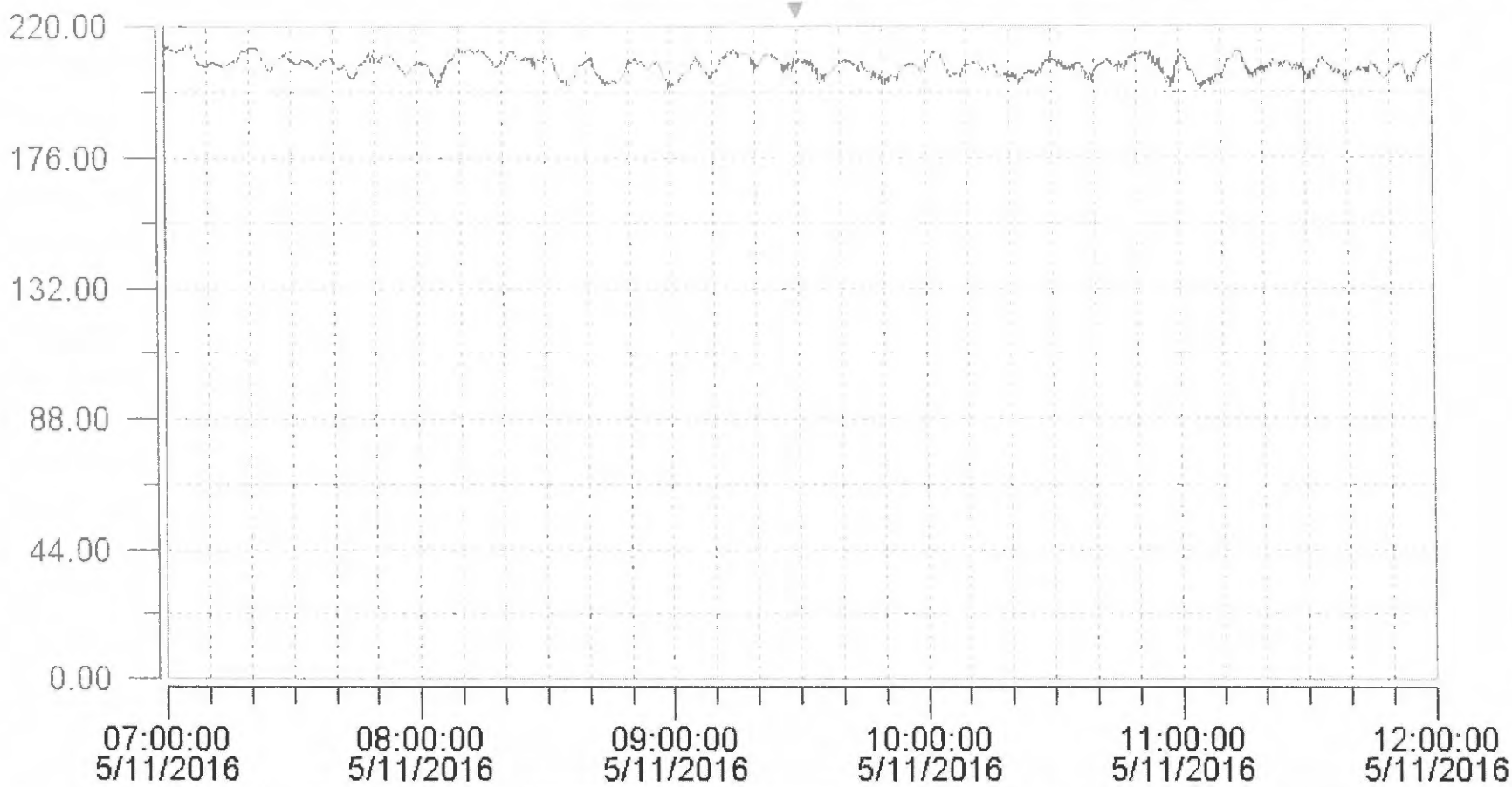
1: 1.00 | Zoom | Reset | Resume | S. 43 of 169

STM FDW TG VALVE 4

Hist | Info

1.	AVG		FI-2040.C_APV	207.78 x	5.	AVG		EX-MW.C_APV	***
2.	AVG		FI-2001.C_APV	***	6.	AVG		AI-GOV4.C_APV	***
3.	AVG		FDI-2001.C_APV	***	7.	AVG		FDI-2001.C_APV	***
4.	AVG		FI-2006.C_APV	***	8.	AVG		EX-NMW.C_APV	***

Time at arrow: 09:30:00 5/11/2016



1: 1.00 | Zoom | Reset | Resume | S. 43 of 169

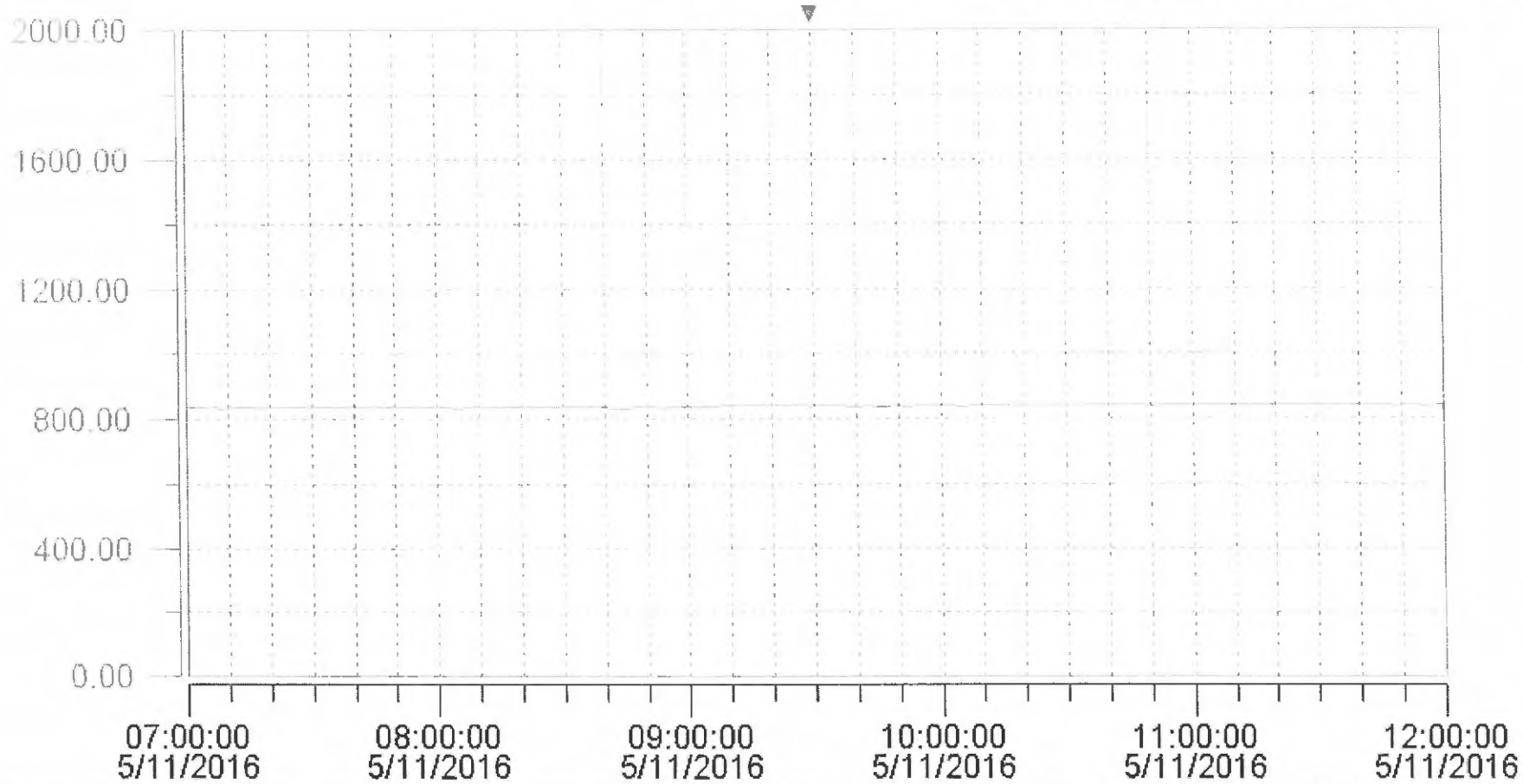
UNIT #1 TEMPERATURES

Hist | Info

1.	AVG		TI-1405.C_APV	***	5.	AVG		TI-1123.C_APV	***
2.	AVG		TI-1419.C_APV	***	6.	AVG		TI-1427.C_APV	***
3.	AVG		TI-1421.C_APV	***	7.	AVG		FI-1753.C_APV	***
4.	AVG		TI-1126.C_APV	840.03 x	8.	AVG		HIC-1000.C_APV	***

*BACKPASS

Time at arrow: 09:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 45 of 171

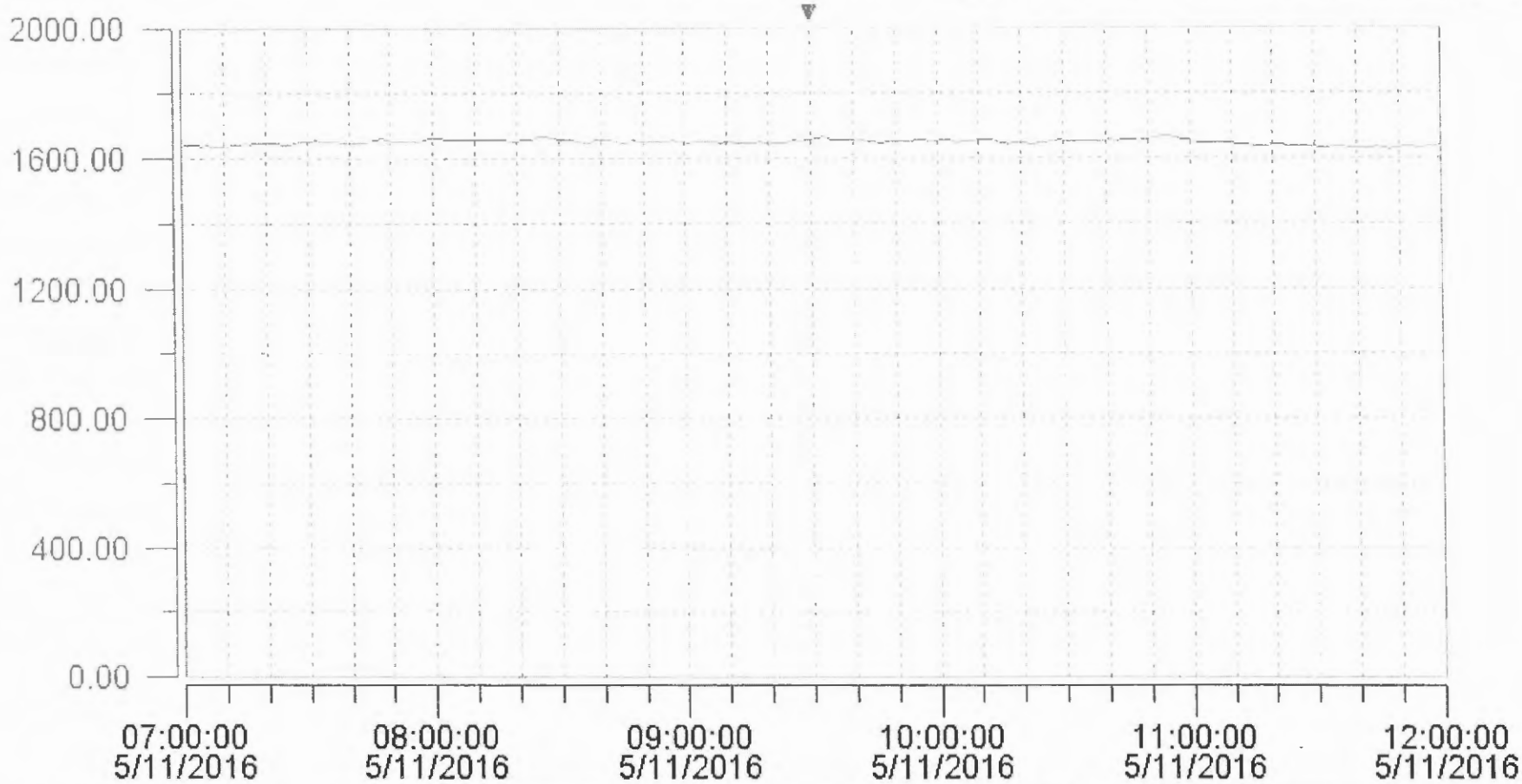
UNIT #1 TEMPERATURES

Hist | Info

1.	AVG		TI-1405.C_APV	1655.43 x	5.	AVG		TI-1123.C_APV	***
2.	AVG		TI-1419.C_APV	***	6.	AVG		TI-1427.C_APV	***
3.	AVG		TI-1421.C_APV	***	7.	AVG		FI-1753.C_APV	***
4.	AVG		TI-1126.C_APV	***	8.	AVG		HIC-1000.C_APV	***

*MID COMBUSTOR

Time at arrow: 09:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 44 of 170

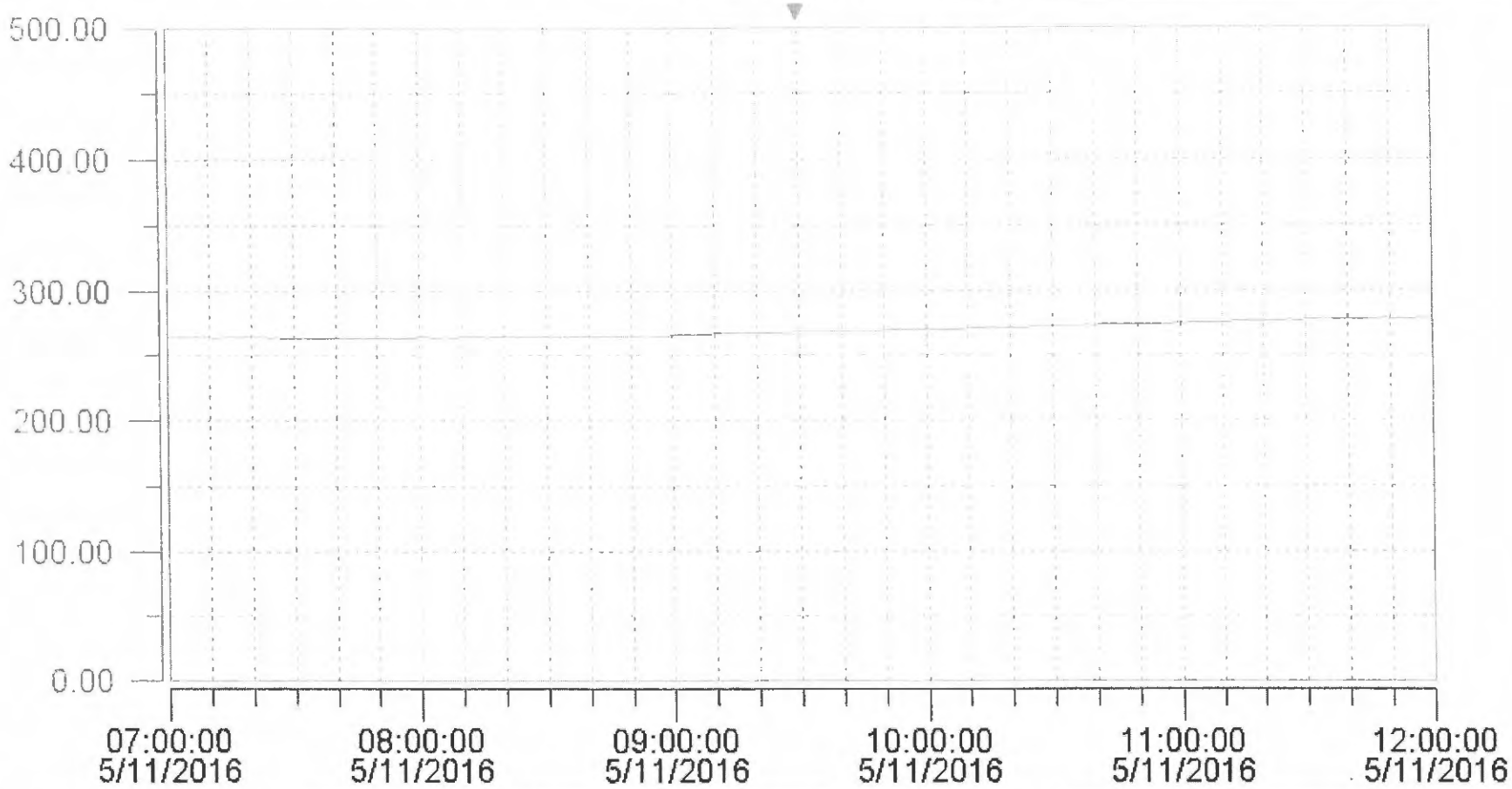
UNIT #1 TEMPERATURES

Hist | Info

1.	AVG		TI-1405.C_APV	***	5.	AVG		TI-1123.C_APV	268.09 x
2.	AVG		TI-1419.C_APV	***	6.	AVG		TI-1427.C_APV	***
3.	AVG		TI-1421.C_APV	***	7.	AVG		FI-1753.C_APV	***
4.	AVG		TI-1126.C_APV	***	8.	AVG		HIC-1000.C_APV	***

✳ BAGHOUSE INLET

Time at arrow: 09:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 45 of 171

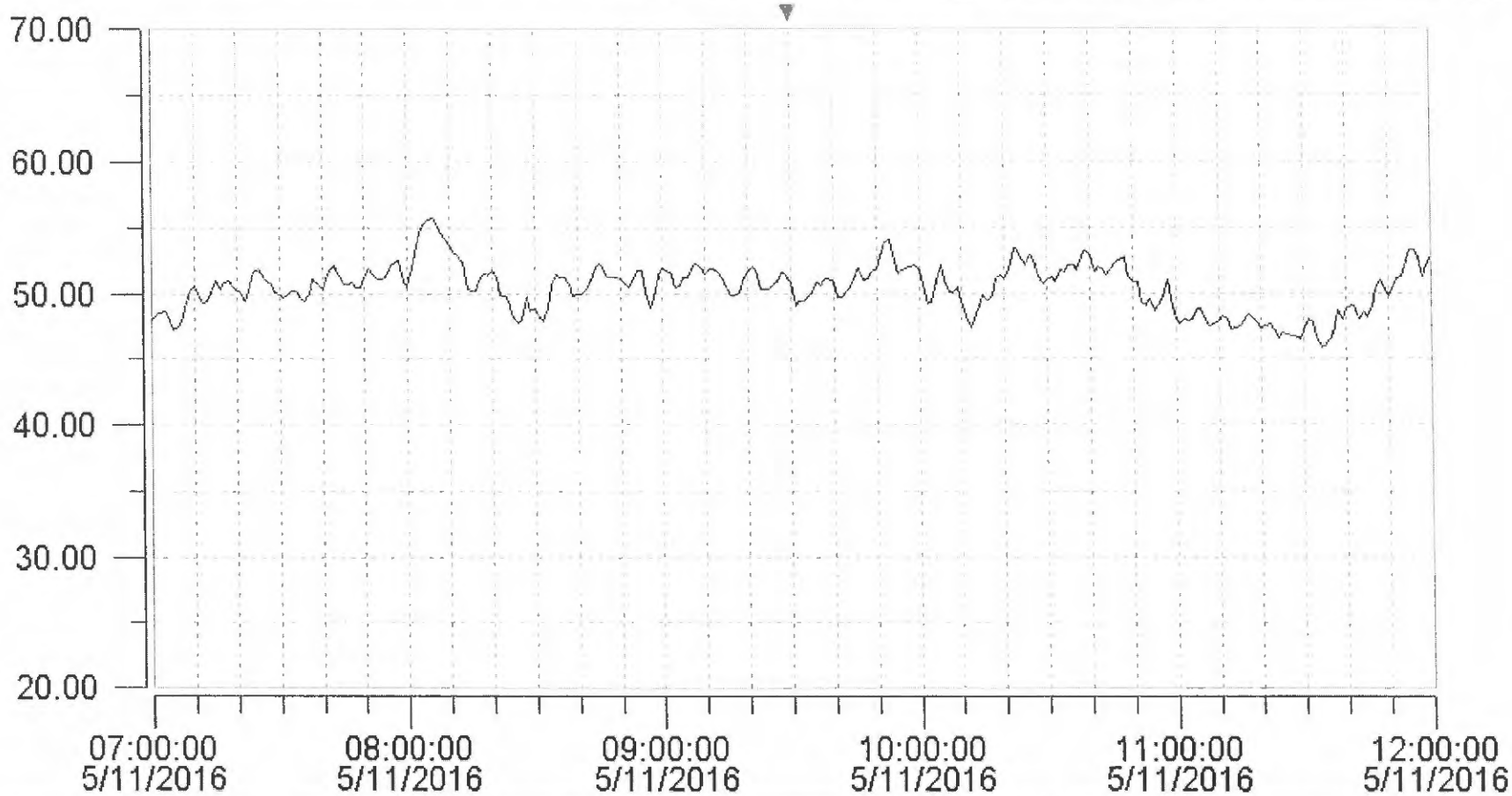
RECLAIMERS

Hist | Info

1.	AVG	FIC-6103.C_AOUTP~	***	5.	AVG	FI2-6105.C_APV	***
2.	AVG	FIC-6102.C_AOUTP~	***	6.	AVG	FI2-6120.C_APV	***
3.	AVG	II-6102.C_APV	***	7.	AVG	FI2-6120-1.C_APV	***
4.	AVG	ZI-6121.C_APV	***	8.	AVG	FI2-6103.C_APV	50.89 x

✳BOILER WOOD FLOW

Time at arrow: 09:30:00 5/11/2016



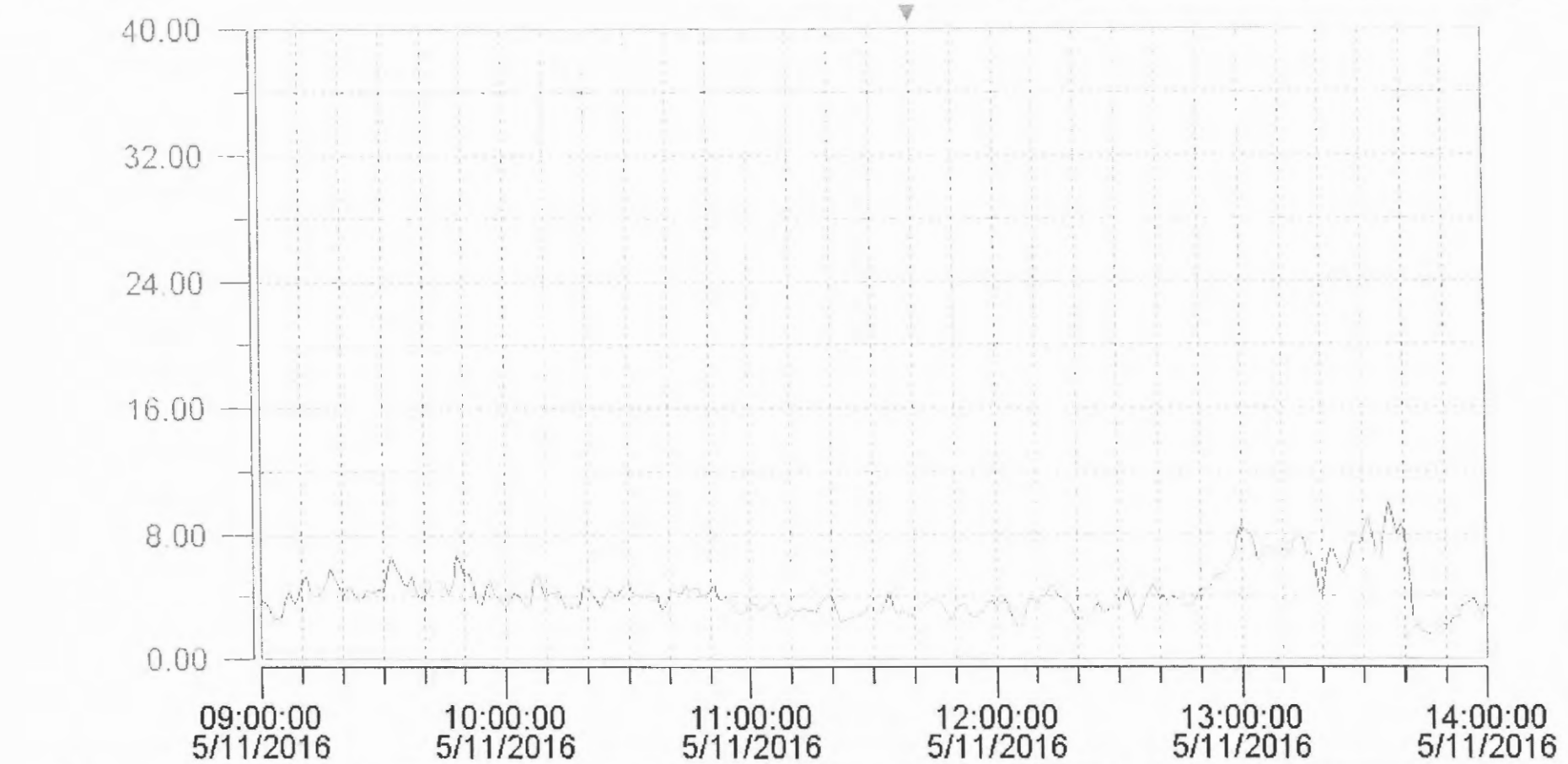
1: 5.00 | Zoom | Reset | Resume | S. 43 of 169

BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	2.89 x	7.	AVG	FIC-1753.C_APV	***
4.	AVG	SI-1345.C_APV	***	8.	AVG	FI-1753.C_APV	***

Time at arrow: 11:40:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 45 of 169

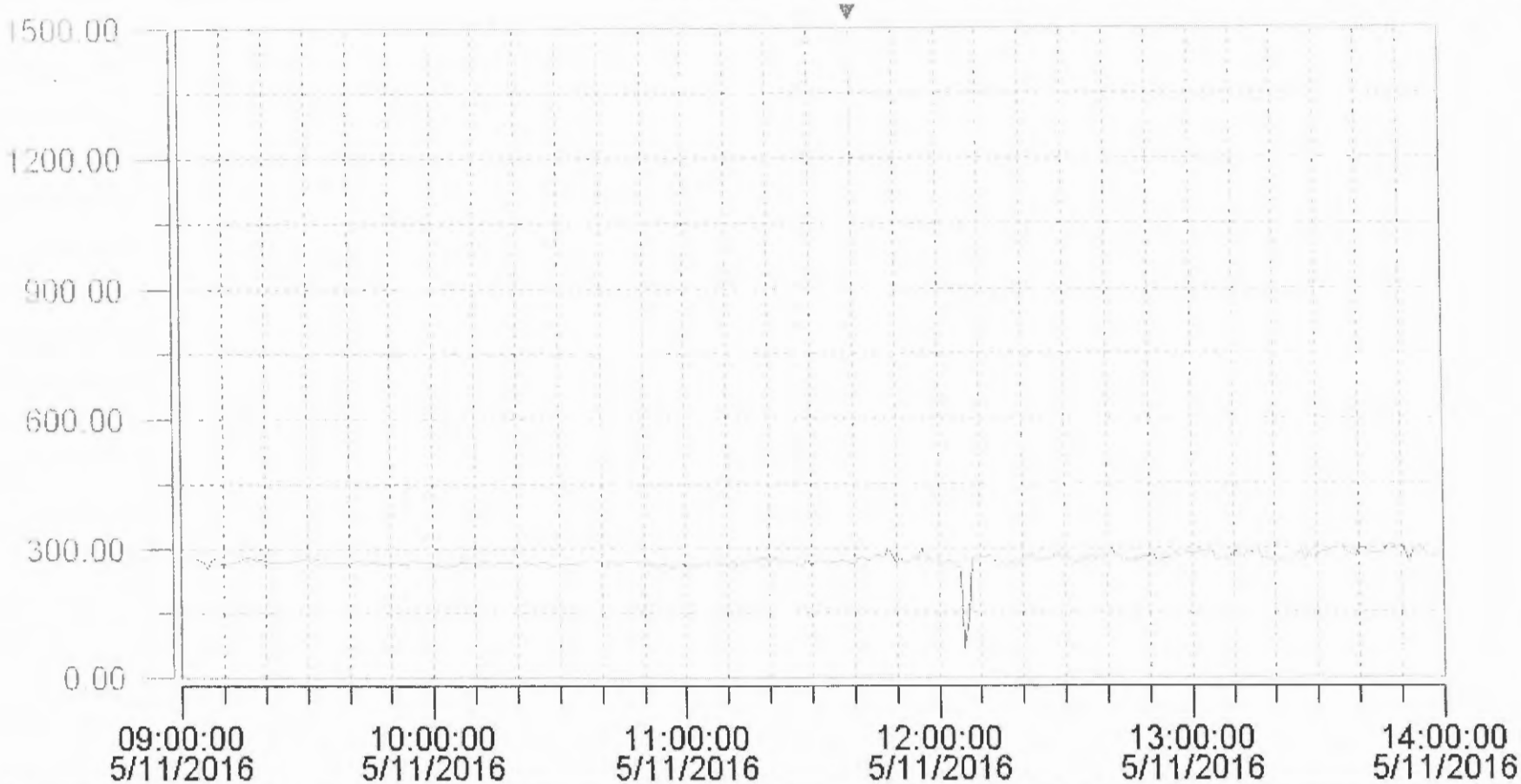
BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	***	7.	AVG	FIC-1753.C_APV	***
4.	AVG	SI-1345.C_APV	262.25 x	8.	AVG	FI-1753.C_APV	***

✳LIMESTONE FEEDRATE

Time at arrow: 11:40:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 45 of 169

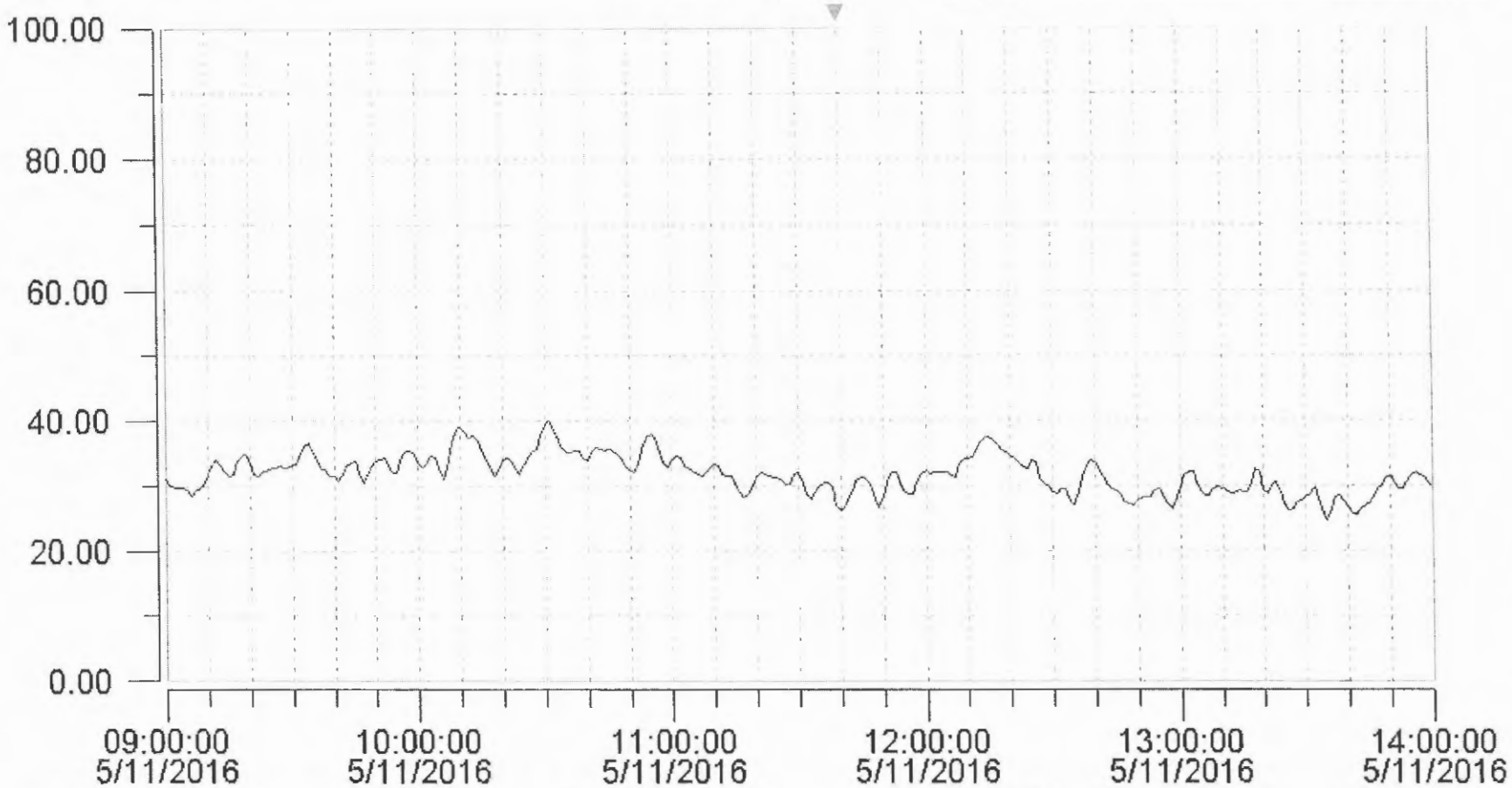
BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	***	7.	AVG	FIC-1753.C_APV	***
4.	AVG	SI-1345.C_APV	***	8.	AVG	FI-1753.C_APV	26.17 x

✳AMMONIA INJECTION FLOW

Time at arrow: 11:40:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 46 of 169

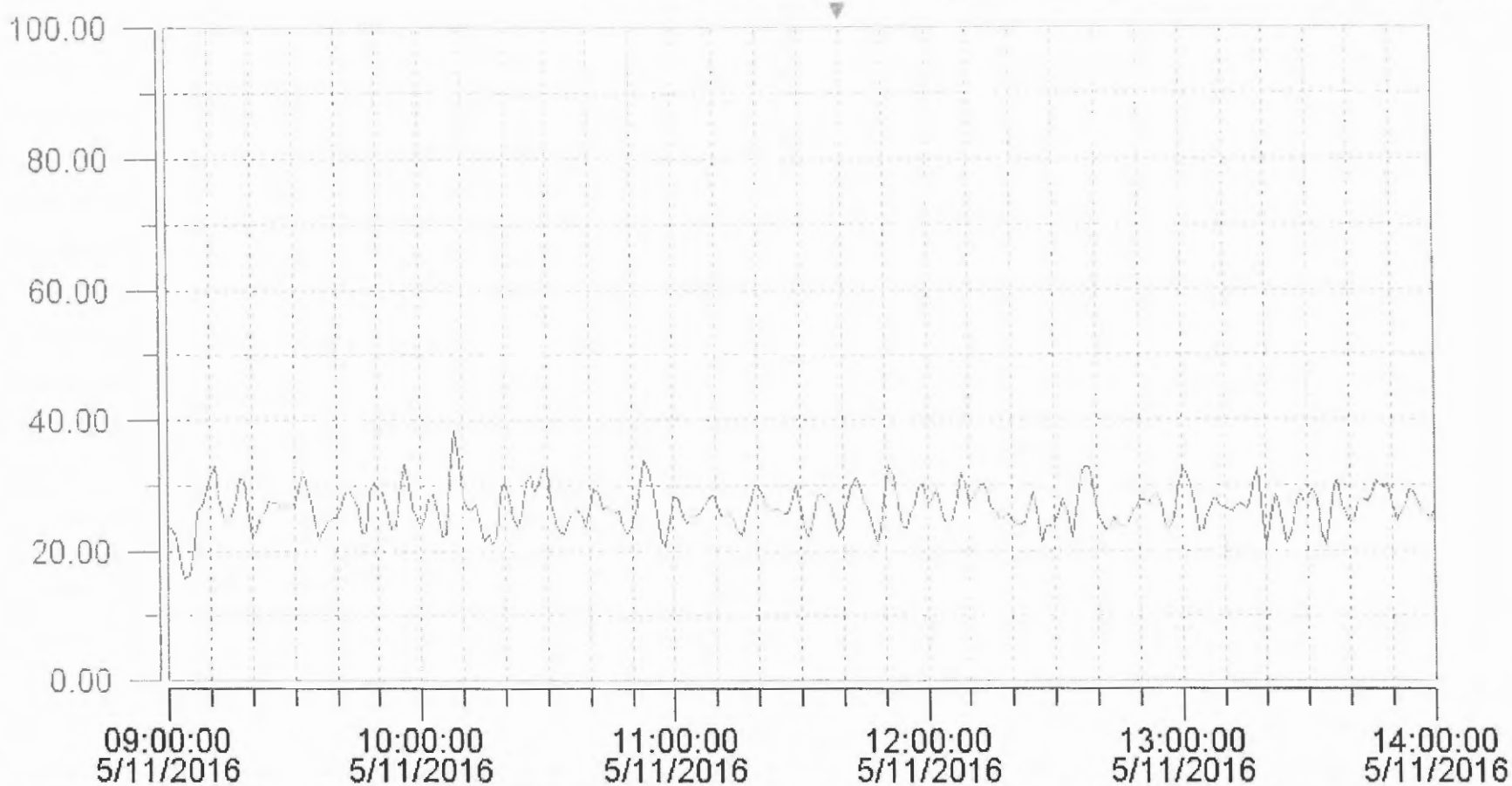
BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	***	7.	AVG	FIC-1753.C_APV	24.13 x
4.	AVG	SI-1345.C_APV	***	8.	AVG	FI-1753.C_APV	***

✳ NOX LB/HR

Time at arrow: 11:40:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 46 of 169

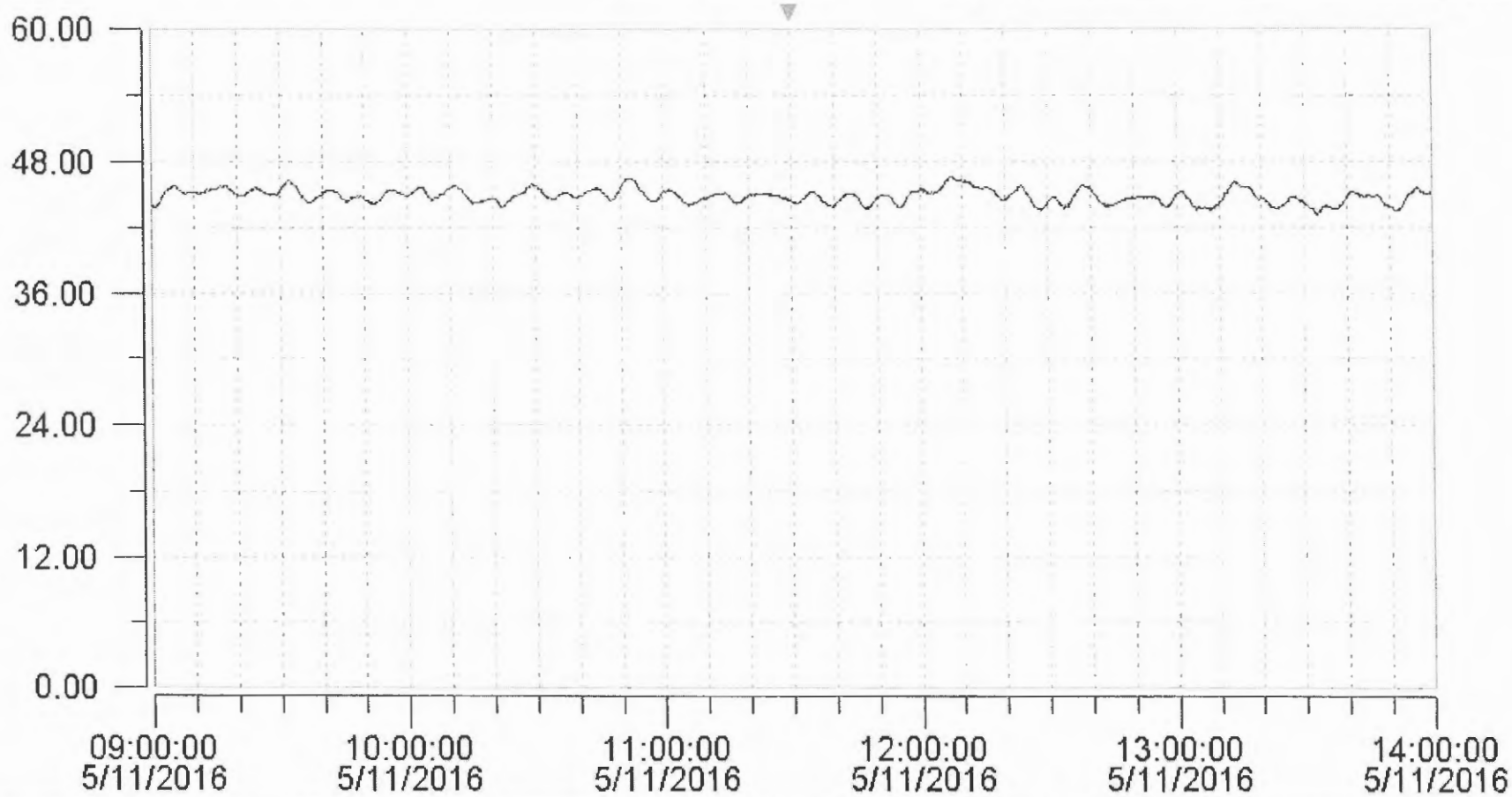
STM FDW TG VALVE 4

Hist | Info

1.	AVG	FI-2040.C_APV	***	5.	AVG	EX-MW.C_APV	***
2.	AVG	FI-2001.C_APV	***	6.	AVG	AI-GOV4.C_APV	***
3.	AVG	FDI-2001.C_APV	***	7.	AVG	FDI-2001.C_APV	***
4.	AVG	FI-2006.C_APV	***	8.	AVG	EX-NMW.C_APV	44.42 x

✳NET MW

Time at arrow: 11:30:00 5/11/2016



1: 1.00 | Zoom | Reset | Resume | S. 45 of 169

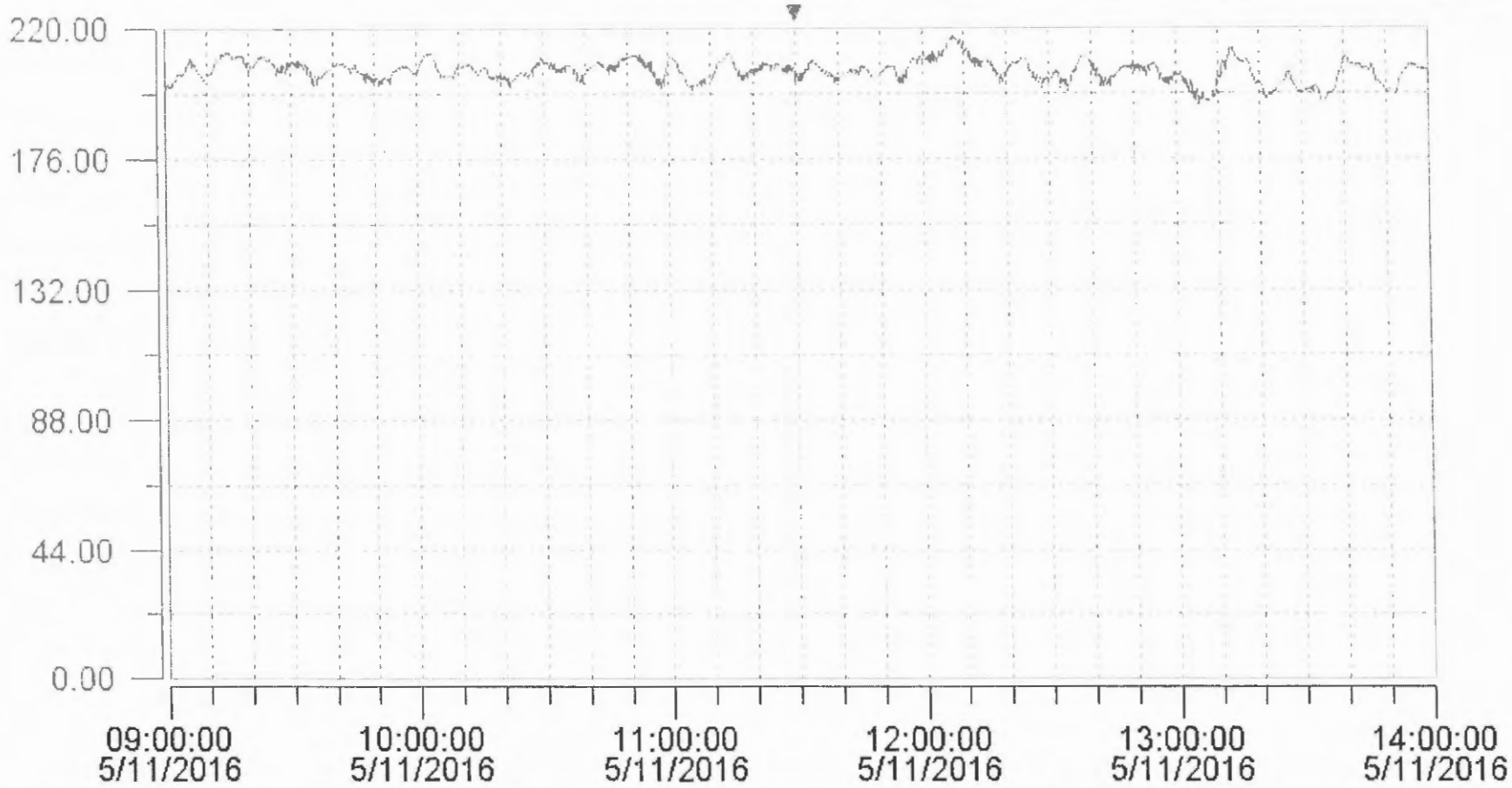
STM FDW TG VALVE 4

Hist | Info

1.	AVG		FI-2040.C_APV	202.94 x	5.	AVG		EX-MW.C_APV	***
2.	AVG		FI-2001.C_APV	***	6.	AVG		AI-GOV4.C_APV	***
3.	AVG		FDI-2001.C_APV	***	7.	AVG		FDI-2001.C_APV	***
4.	AVG		FI-2006.C_APV	***	8.	AVG		EX-NMW.C_APV	***

*STM FLW

Time at arrow: 11:30:00 5/11/2016



1: 1.00 | Zoom | Reset | Resume | S. 45 of 169

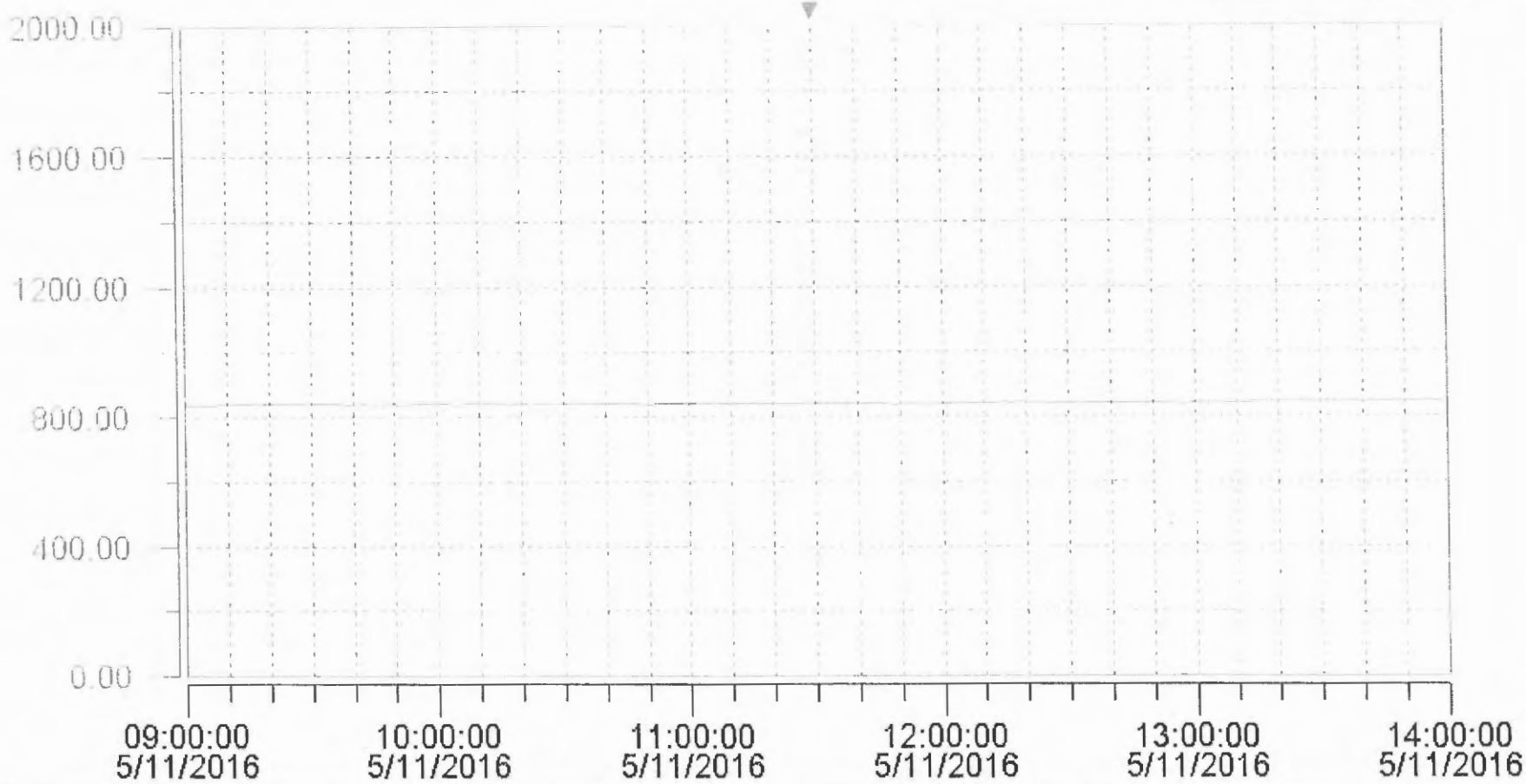
UNIT #1 TEMPERATURES

Hist | Info

1.	AVG		TI-1405.C_APV	***	5.	AVG		TI-1123.C_APV	***
2.	AVG		TI-1419.C_APV	***	6.	AVG		TI-1427.C_APV	***
3.	AVG		TI-1421.C_APV	***	7.	AVG		FI-1753.C_APV	***
4.	AVG		TI-1126.C_APV	841.66 x	8.	AVG		HIC-1000.C_APV	***

✳BACKPASS

Time at arrow: 11:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 47 of 171

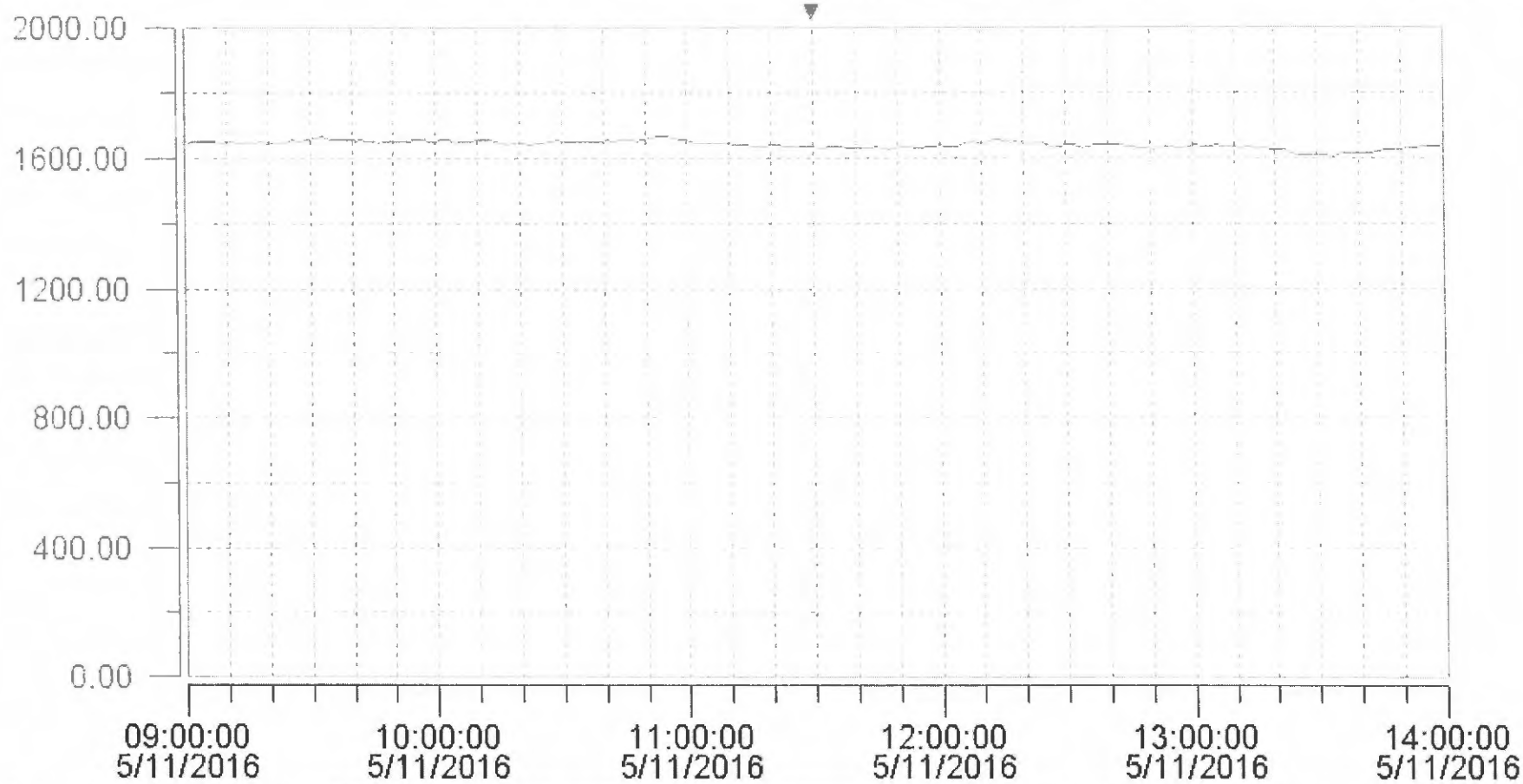
UNIT #1 TEMPERATURES

Hist | Info

1.	AVG		TI-1405.C_APV	1635.90 x	5.	AVG		TI-1123.C_APV	***
2.	AVG		TI-1419.C_APV	***	6.	AVG		TI-1427.C_APV	***
3.	AVG		TI-1421.C_APV	***	7.	AVG		FI-1753.C_APV	***
4.	AVG		TI-1126.C_APV	***	8.	AVG		HIC-1000.C_APV	***

*MID COMBUSTOR

Time at arrow: 11:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 46 of 170

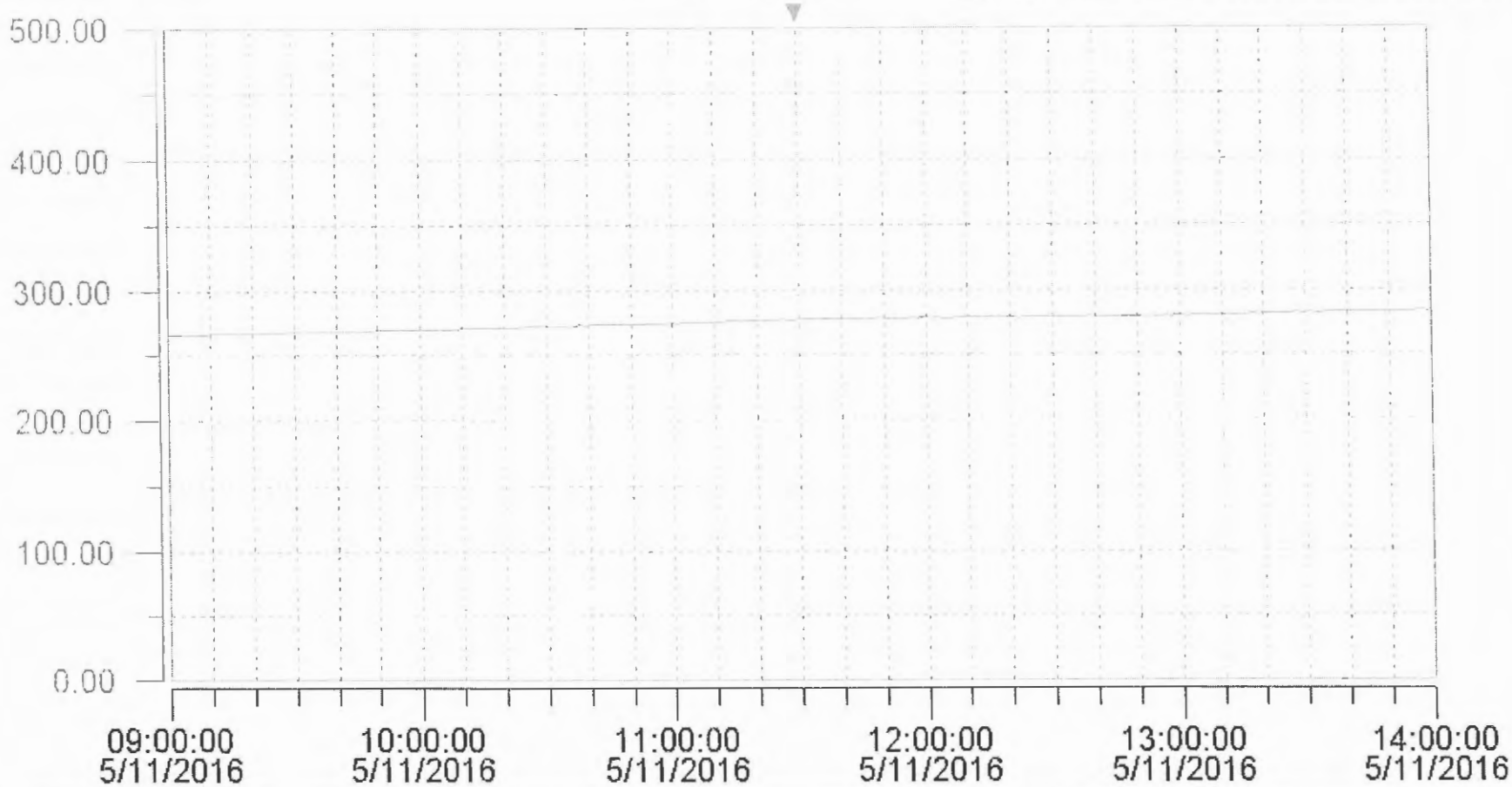
UNIT #1 TEMPERATURES

Hist | Info

1.	AVG		TI-1405.C_APV	***	5.	AVG		TI-1123.C_APV	276.94 x
2.	AVG		TI-1419.C_APV	***	6.	AVG		TI-1427.C_APV	***
3.	AVG		TI-1421.C_APV	***	7.	AVG		FI-1753.C_APV	***
4.	AVG		TI-1126.C_APV	***	8.	AVG		HIC-1000.C_APV	***

*BAGHOUSE INLET

Time at arrow: 11:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 47 of 171

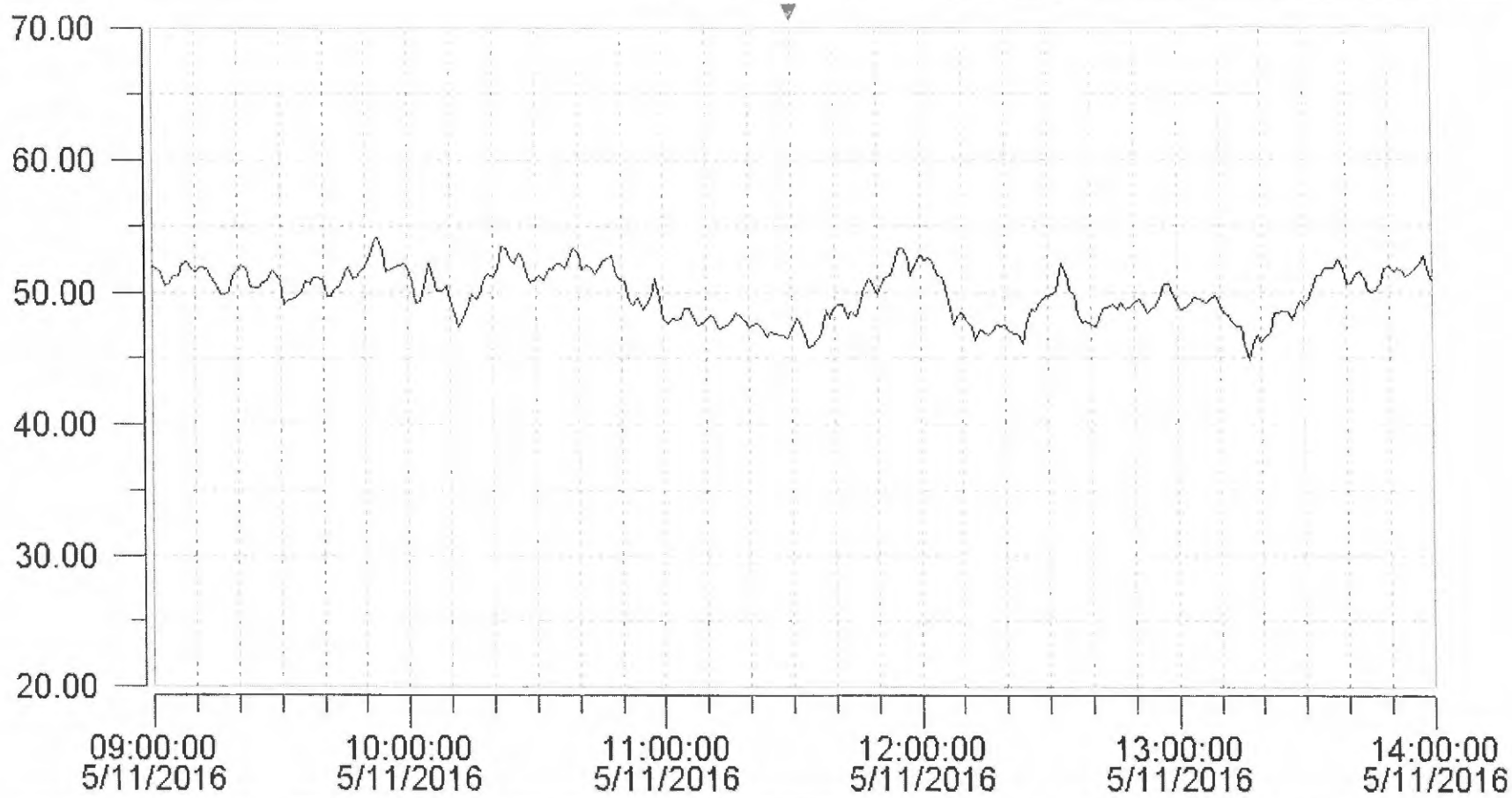
RECLAIMERS

Hist | Info

1.	AVG	FIC-6103.C_AOUTP~	***	5.	AVG	FI2-6105.C_APV	***
2.	AVG	FIC-6102.C_AOUTP~	***	6.	AVG	FI2-6120.C_APV	***
3.	AVG	II-6102.C_APV	***	7.	AVG	FI2-6120-1.C_APV	***
4.	AVG	ZI-6121.C_APV	***	8.	AVG	FI2-6103.C_APV	47.06 x

*BOILER WOOD FLOW

Time at arrow: 11:30:00 5/11/2016



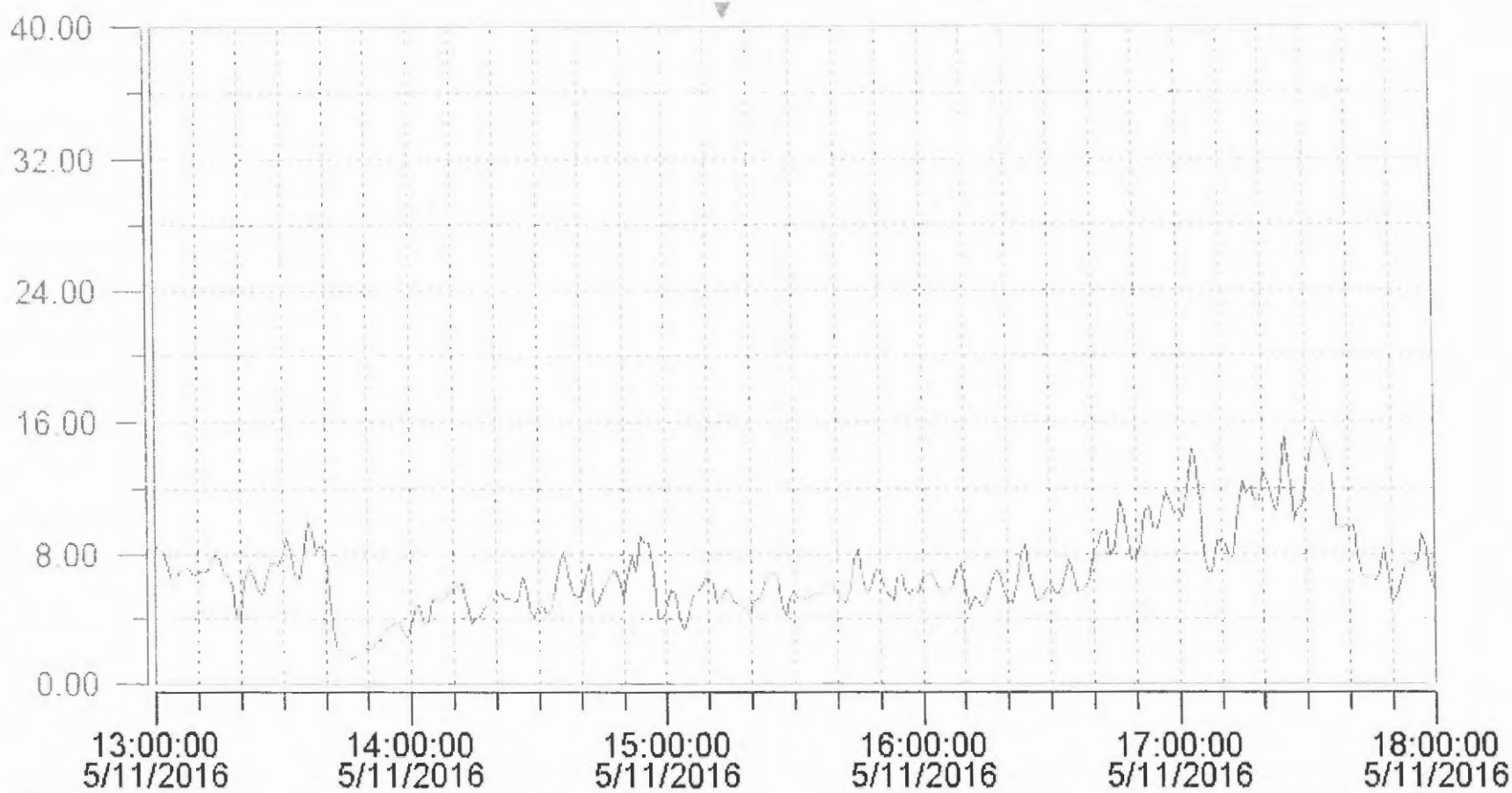
1: 5.00 | Zoom | Reset | Resume | S. 45 of 169

BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	5.63 x	7.	AVG	FIC-1753.C_APV	***
4.	AVG	SI-1345.C_APV	***	8.	AVG	FI-1753.C_APV	***

Time at arrow: 15:15:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 49 of 169

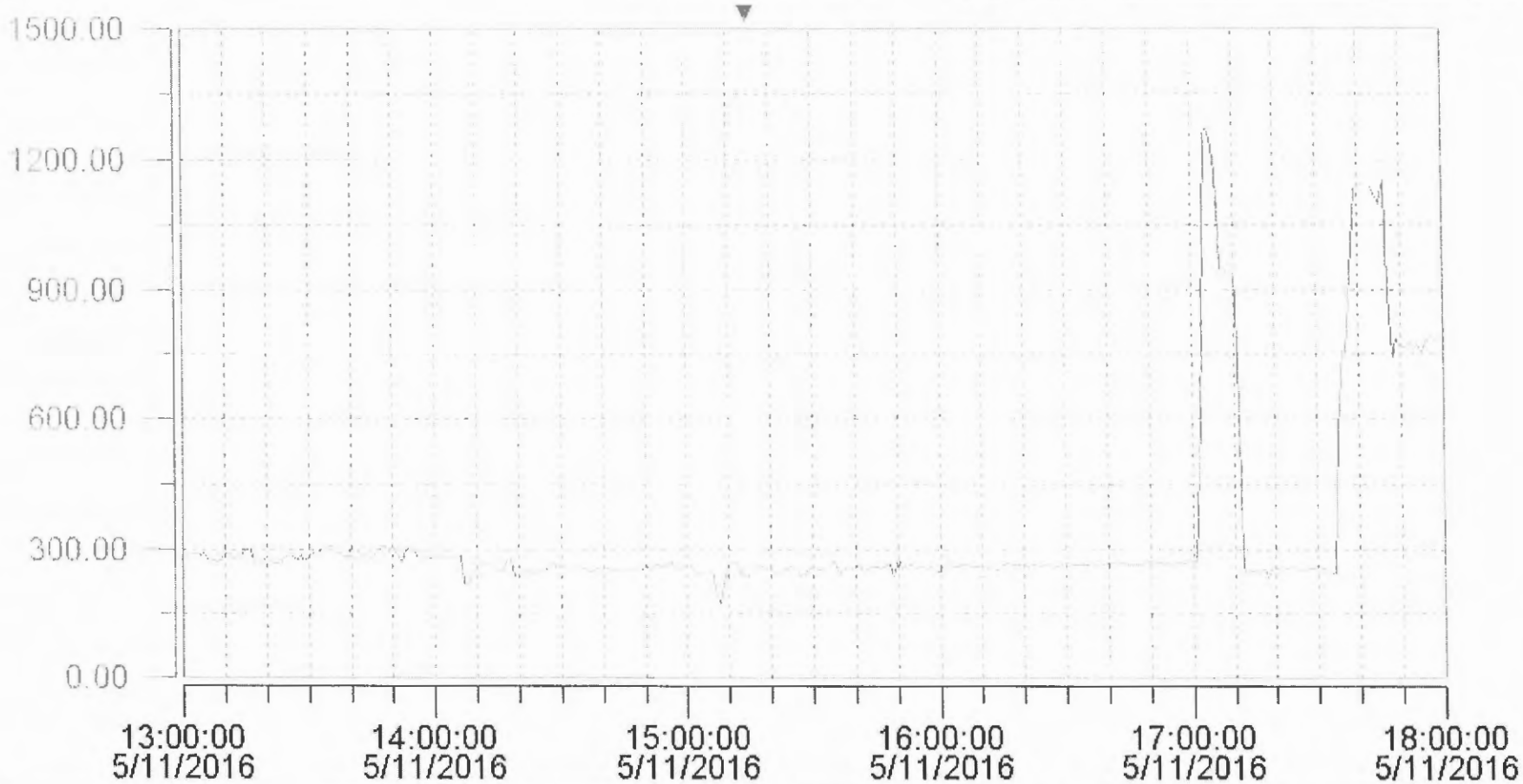
BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	***	7.	AVG	FIC-1753.C_APV	***
4.	AVG	SI-1345.C_APV	245.14 x	8.	AVG	FI-1753.C_APV	***

*LIMESTONE FEEDRATE

Time at arrow: 15:15:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 49 of 169

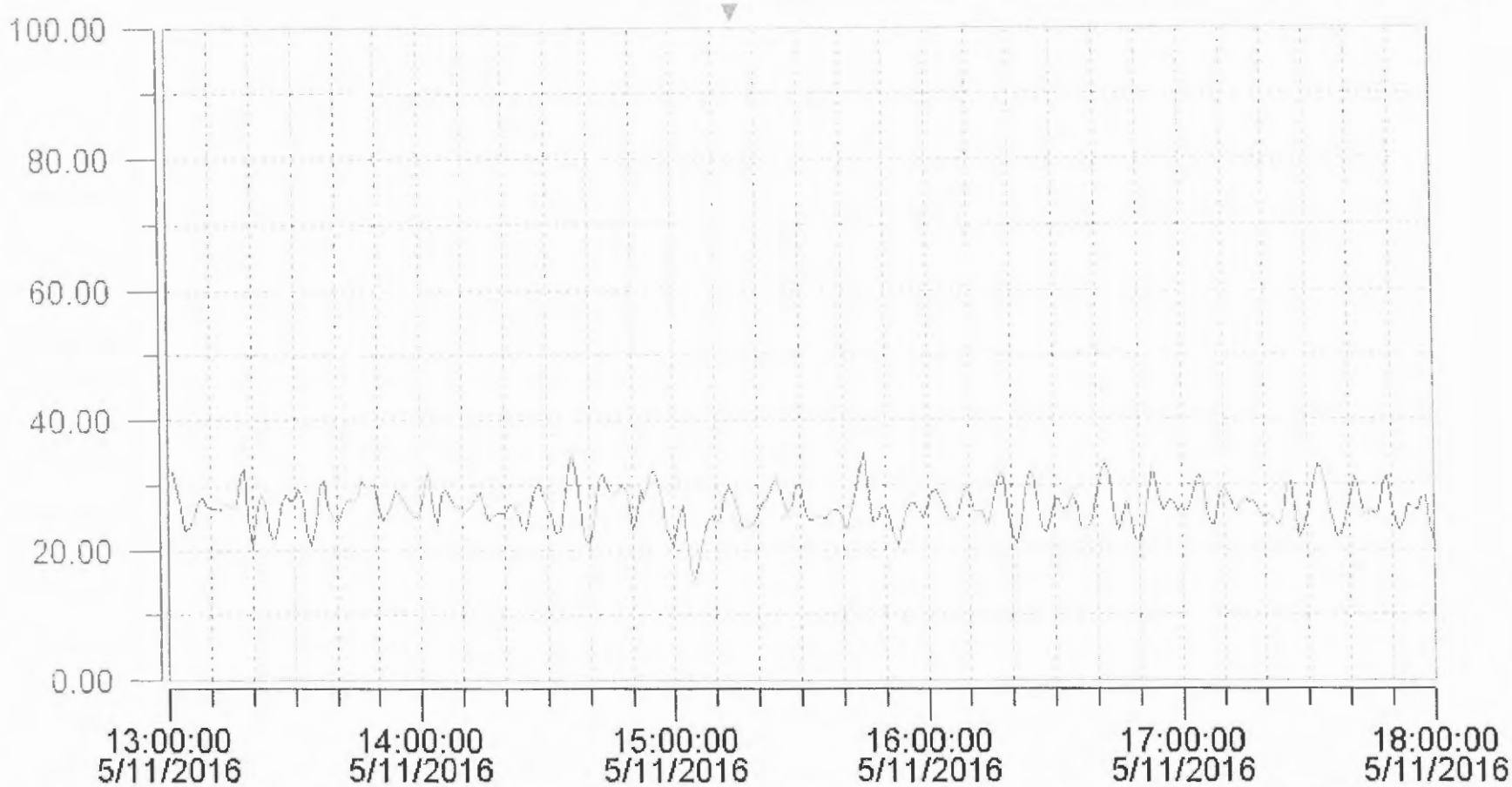
BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	***	7.	AVG	FIC-1753.C_APV	26.60 x
4.	AVG	SI-1345.C_APV	***	8.	AVG	FI-1753.C_APV	***

*NOX LB/HR

Time at arrow: 15:15:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 49 of 169

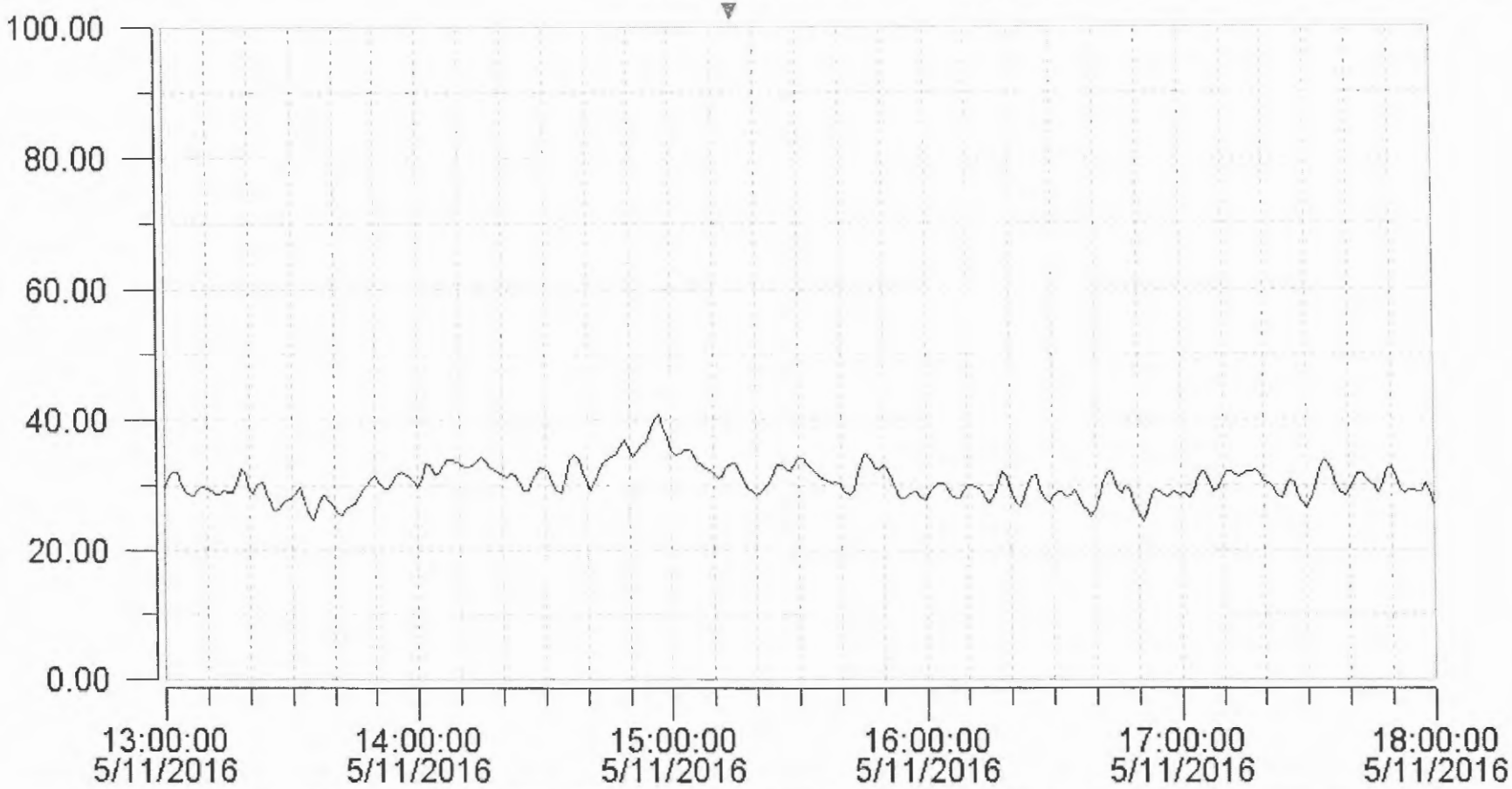
BLR #1 SO2 & NOX

Hist | Info

1.	AVG	AIC-8010.C_AOUTP~	***	5.	AVG	FIC-1753.C_AOUTP~	***
2.	AVG	AIC-8010.C_ASP	***	6.	AVG	FIC-1753.C_ASP	***
3.	AVG	AIC-8010.C_APV	***	7.	AVG	FIC-1753.C_APV	***
4.	AVG	SI-1345.C_APV	***	8.	AVG	FI-1753.C_APV	33.43 x

*AMMONIA INJECTION FLOW

Time at arrow: 15:15:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 49 of 169

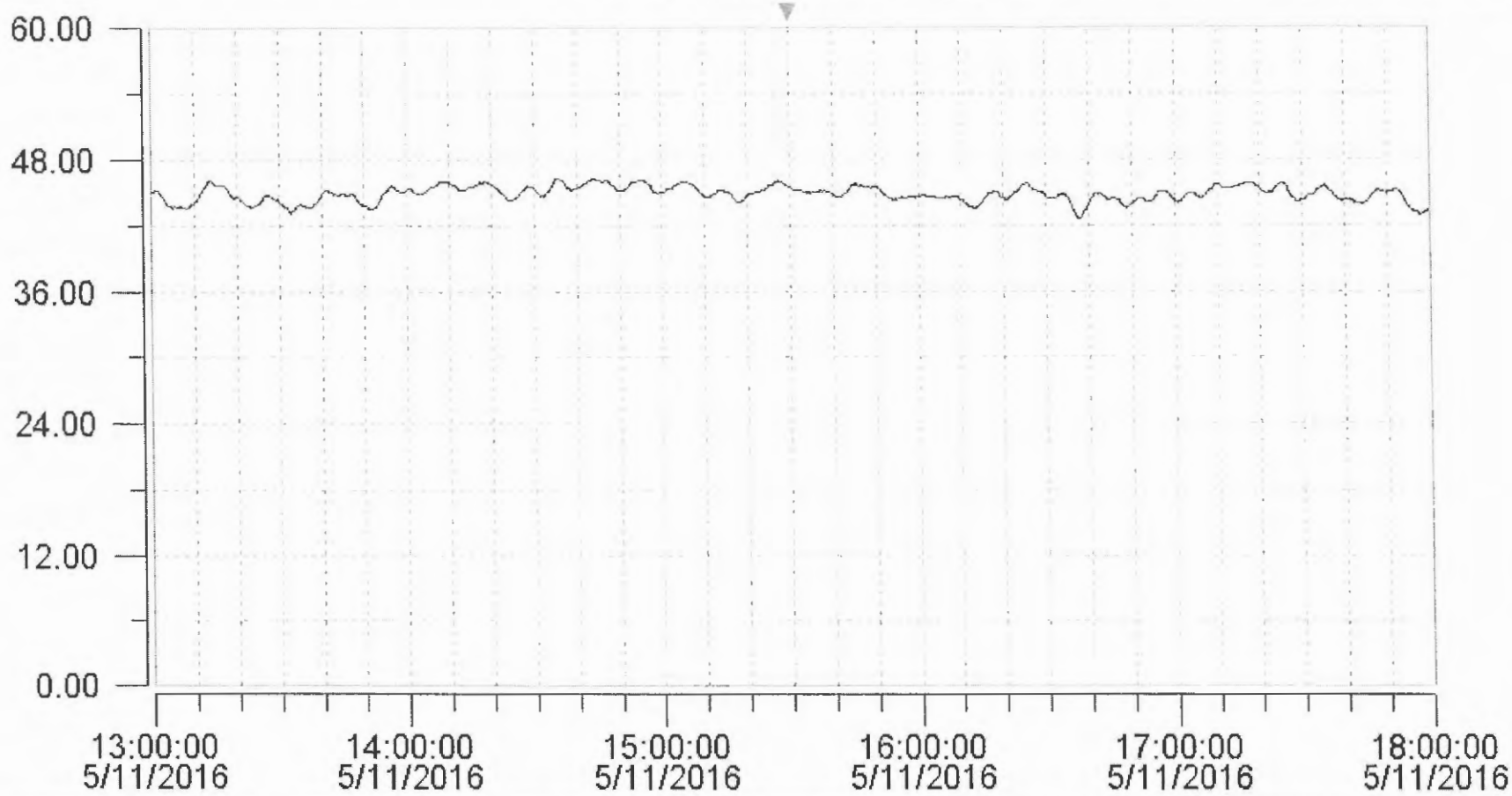
STM FDW TG VALVE 4

Hist | Info

1.	AVG	FI-2040.C_APV	***	5.	AVG	EX-MW.C_APV	***
2.	AVG	FI-2001.C_APV	***	6.	AVG	AI-GOV4.C_APV	***
3.	AVG	FDI-2001.C_APV	***	7.	AVG	FDI-2001.C_APV	***
4.	AVG	FI-2006.C_APV	***	8.	AVG	EX-NMW.C_APV	45.47 x

✳NET MW

Time at arrow: 15:30:00 5/11/2016



1: 1.00 | Zoom | Reset | Resume | S. 49 of 169

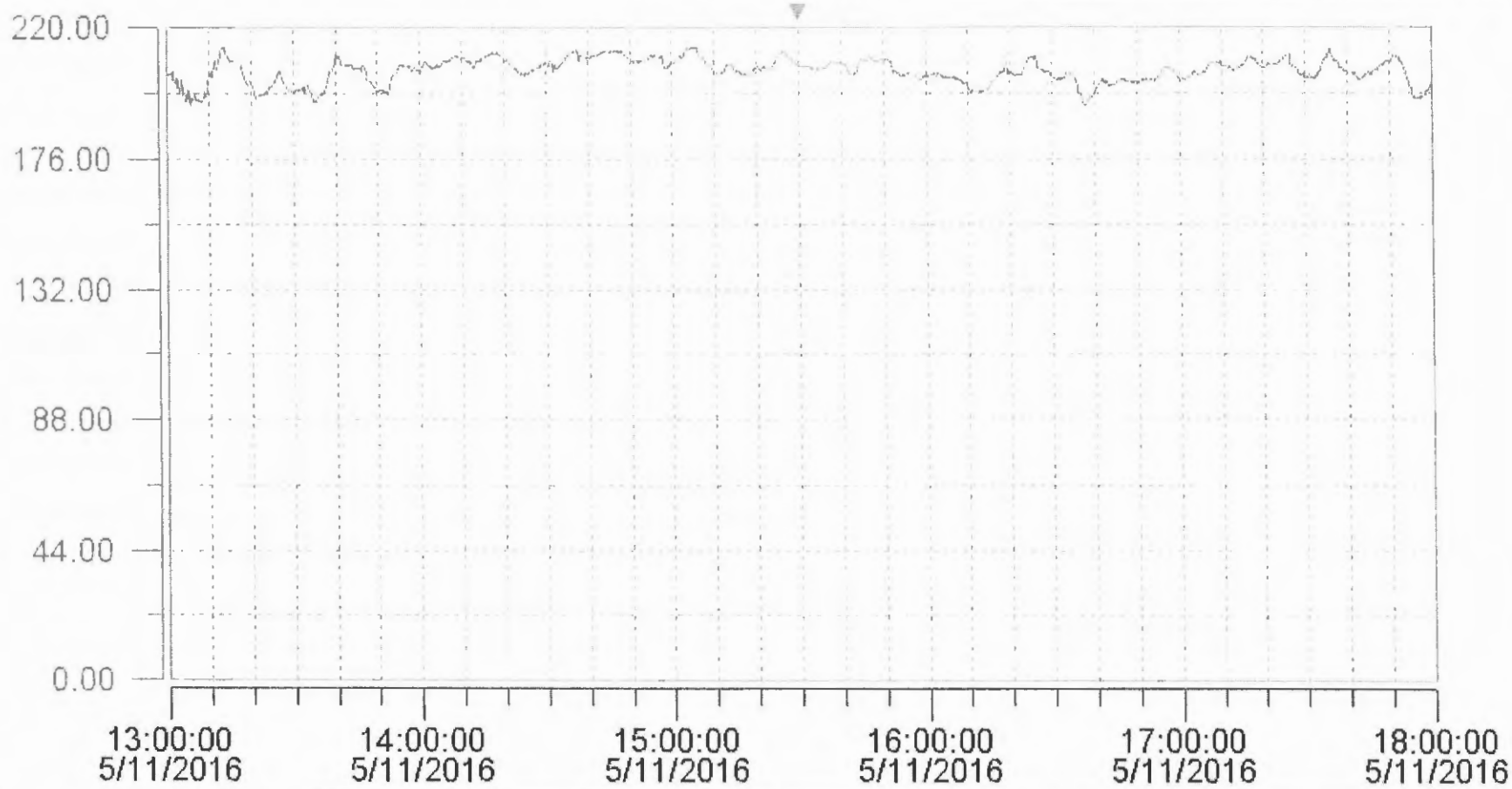
STM FDW TG VALVE 4

Hist | Info

1.	AVG		FI-2040.C_APV	206.67 x	5.	AVG		EX-MW.C_APV	***
2.	AVG		FI-2001.C_APV	***	6.	AVG		AI-GOV4.C_APV	***
3.	AVG		FDI-2001.C_APV	***	7.	AVG		FDI-2001.C_APV	***
4.	AVG		FI-2006.C_APV	***	8.	AVG		EX-NMW.C_APV	***

STM FLW

Time at arrow: 15:30:00 5/11/2016



1: 1.00 | Zoom | Reset | Resume | S. 49 of 169

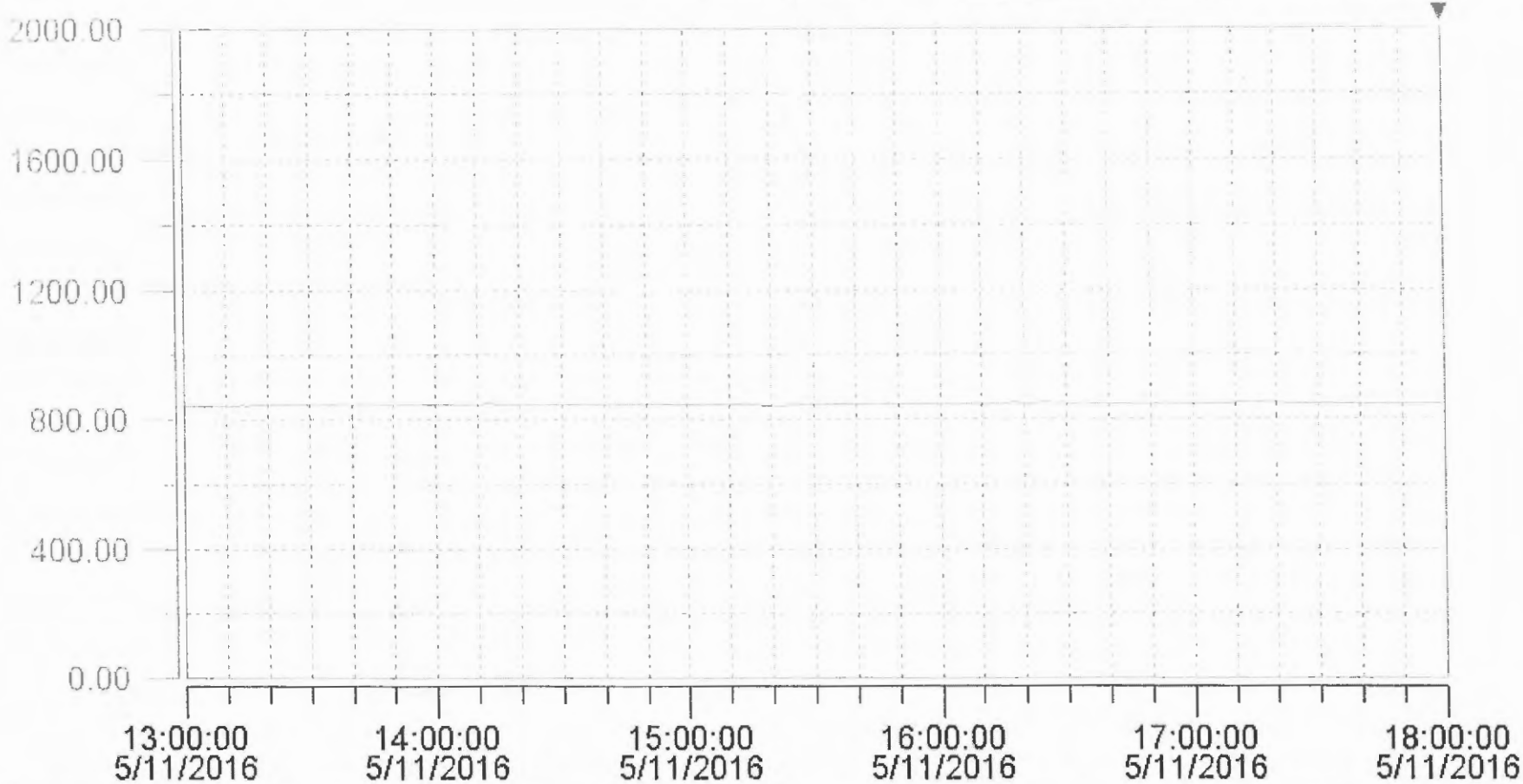
UNIT #1 TEMPERATURES

Hist | Info

1.	AVG		TI-1405.C_APV	***	5.	AVG		TI-1123.C_APV	***
2.	AVG		TI-1419.C_APV	***	6.	AVG		TI-1427.C_APV	***
3.	AVG		TI-1421.C_APV	***	7.	AVG		FI-1753.C_APV	***
4.	AVG		TI-1126.C_APV	845.87 x	8.	AVG		HIC-1000.C_APV	***

*BACKPASS

Time at arrow: 18:00:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 54 of 171

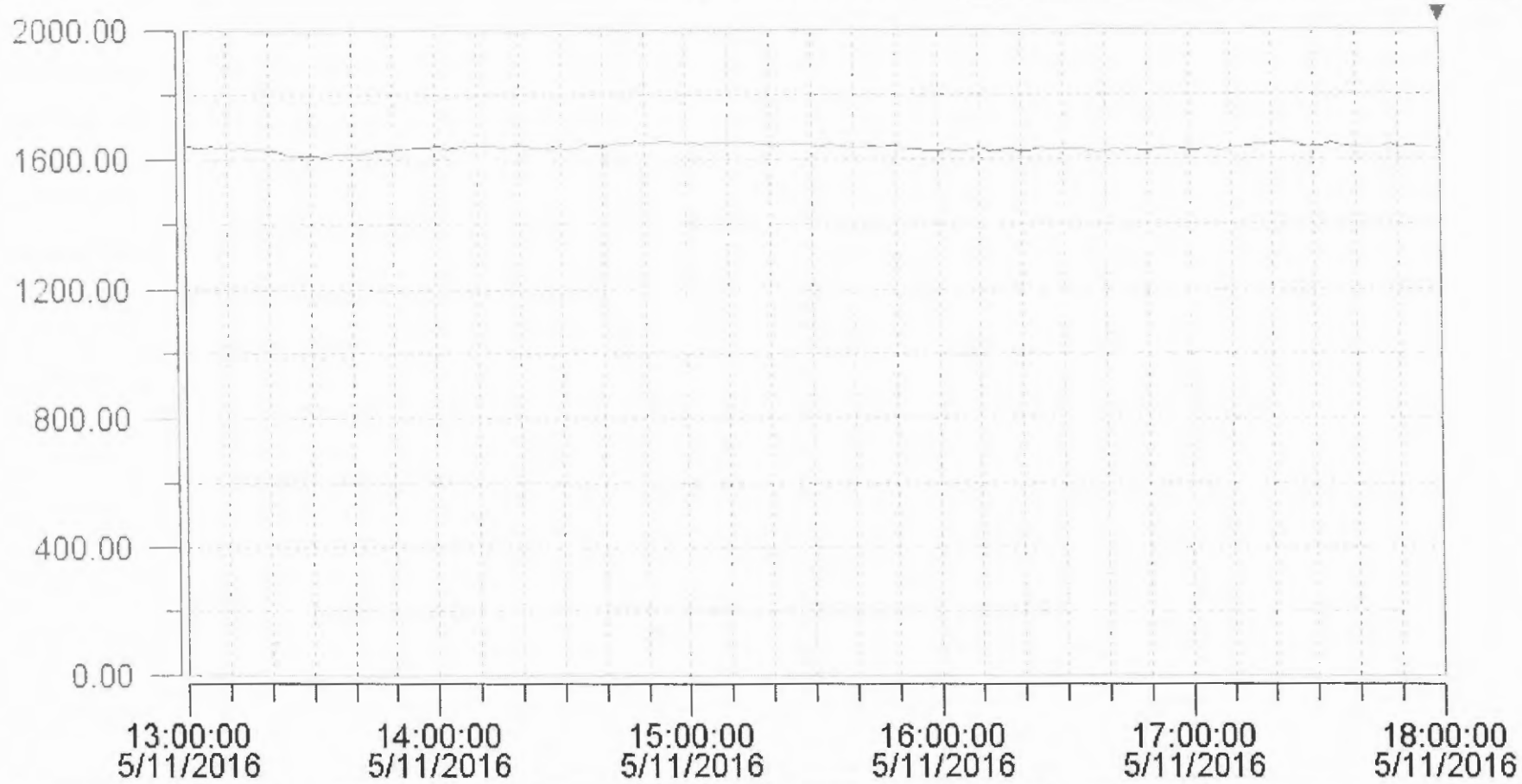
UNIT #1 TEMPERATURES

Hist | Info

1.	AVG		TI-1405.C_APV	1630.79 x	5.	AVG		TI-1123.C_APV	***
2.	AVG		TI-1419.C_APV	***	6.	AVG		TI-1427.C_APV	***
3.	AVG		TI-1421.C_APV	***	7.	AVG		FI-1753.C_APV	***
4.	AVG		TI-1126.C_APV	***	8.	AVG		HIC-1000.C_APV	***

*MID COMBUSTOR

Time at arrow: 18:00:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 54 of 171

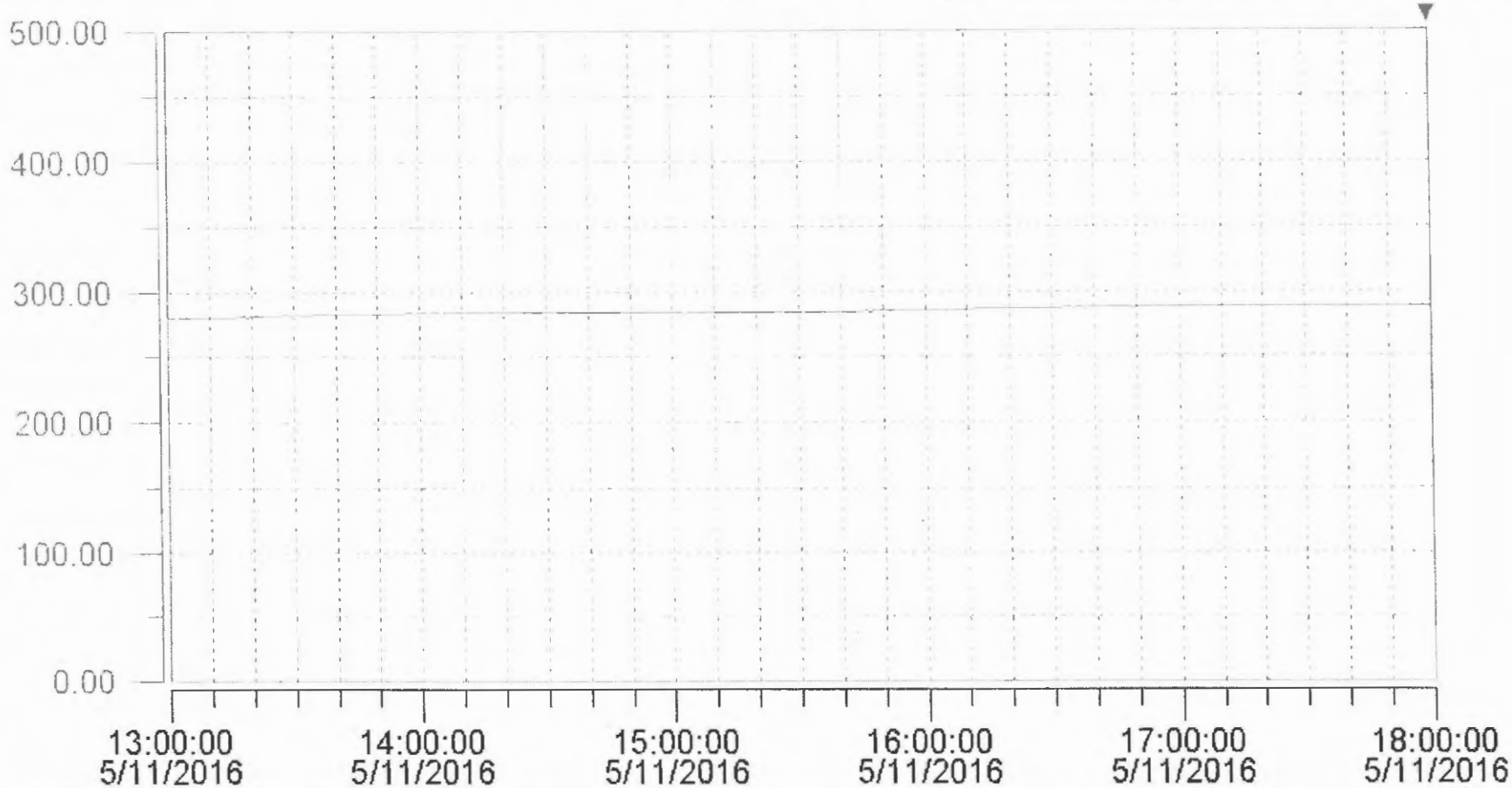
UNIT #1 TEMPERATURES

Hist | Info

1.	AVG		TI-1405.C_APV	***	5.	AVG		TI-1123.C_APV	287.45 x
2.	AVG		TI-1419.C_APV	***	6.	AVG		TI-1427.C_APV	***
3.	AVG		TI-1421.C_APV	***	7.	AVG		FI-1753.C_APV	***
4.	AVG		TI-1126.C_APV	***	8.	AVG		HIC-1000.C_APV	***

*BAGHOUSE INLET

Time at arrow: 18:00:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 54 of 171

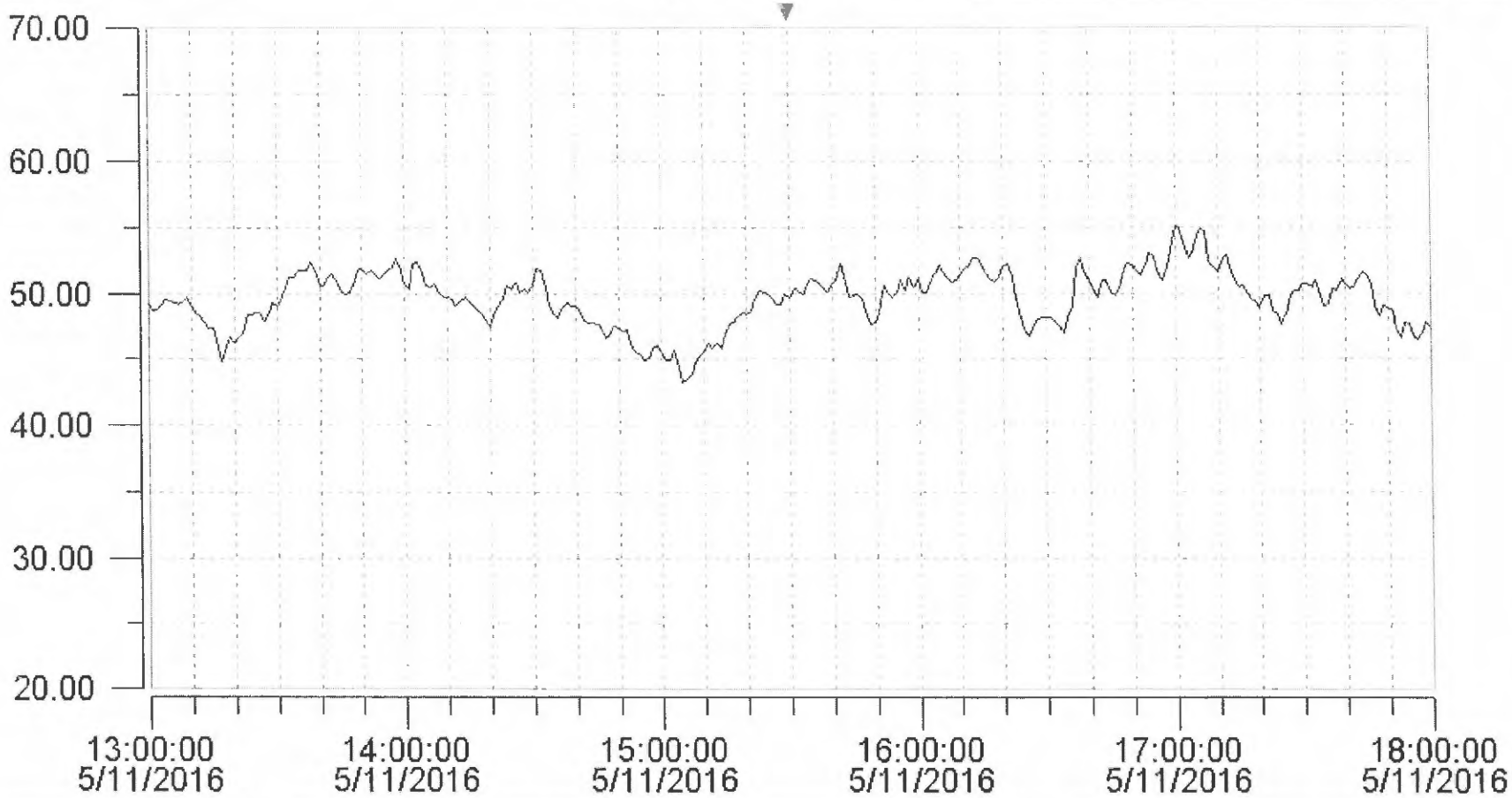
RECLAIMERS

Hist | Info

1.	AVG	FIC-6103.C_AOUTP~	***	5.	AVG	FI2-6105.C_APV	***
2.	AVG	FIC-6102.C_AOUTP~	***	6.	AVG	FI2-6120.C_APV	***
3.	AVG	II-6102.C_APV	***	7.	AVG	FI2-6120-1.C_APV	***
4.	AVG	ZI-6121.C_APV	***	8.	AVG	FI2-6103.C_APV	49.72 x

*BOILER WOOD FLOW

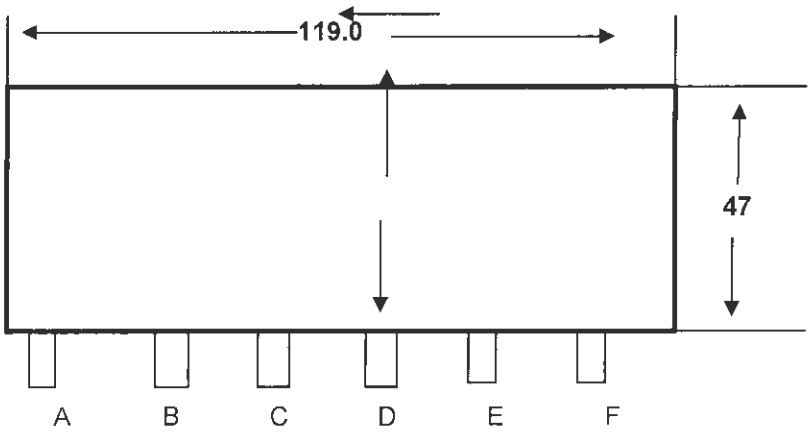
Time at arrow: 15:30:00 5/11/2016



1: 5.00 | Zoom | Reset | Resume | S. 49 of 169

Client: Desert View Power Date: 3/1/2016

Sample Location: Unit 1-2 Prepared By: Dave Wonderly



		Point No.	Sample Point	
H (in.)	**119.0**			
		1	4.7	17.7
W (in.)	**47.0**	2	14.1	27.1
		3	23.5	36.5
Nipple length	**13.0**	4	32.9	45.9
		5	42.3	55.3
Distance between points	**9.40**			
Stack Area (ft^2)	**38.84**			

1- ~~Metals~~ HCl - U2

Delta Air Quality Services, Incorporated

1 ~~Metals~~ HCl U2 Page 1 of 2

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 2 Stack breaching
DATE: May 10 2016
RUN NO: 1 ~~Metals~~ HCl - U2
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO: 5WCS
METER ΔH@: 1.743 @1 = 0.568
METER Yd: 0.997
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: ~~8~~x30 + 6
ΔH= 2.0 X ΔP: 2.2
Probe Condition, pre/post test: ✓/✓
Silica Gel Expanded, Y/N: N
Filter Condition after Test: Good - light brown ringe
Check Weight: 294.8 / 295.0

AMBIENT TEMPERATURE: 76
BAROMETRIC PRESSURE: 29.97
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: 47 glass
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL: 1-HCl Slass
NOZZLE DIAMETER: 0.249
FILTER NO/TYPE: 83-UP652 / Quartz
PRE-TEST LEAK RATE: : <0.001 CFM@ 13 in. Hg.
POST-TEST LEAK RATE: : CFM@ in. Hg.
PITOT LEAK CHECK - PRE: ✓ POST:
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test - Pre-Test = Difference
1	HNO_3/H_2O_2	967.5 724.3
2	HNO_3/H_2O_2	888.5 715.8
3	Empty	612.4 608.1
4	$KMNO_4/H_2SO_4$	749.6 750.7
5	$KMNO_4/H_2SO_4$	750.4 749.6
6	Silica gel.	864.0 835.3

Point	Time	Meter Volume, ft³	ΔP in. H_2O	ΔH in. H_2O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O_2 %	Pstatic in. H_2O
5	0830	37.800	.85	1.7	347	252	258	56	80	80	6		+0.82
4	836	42.485	.83	1.7	346	255	256	52	82	82	6		
3	842	46.938	.87	1.7	346	253	257	52	83	82	6		
2	848	49.984	.98	2.0	347	256	257	52	84	83	7		
1	854	56.062	1.0	2.0	348	255	256	53	85	83	7		
end	900	60.787											
5	904	60.787	1.3	2.6	349	251	254	53	87	85	8		
4	910	66.136	1.3	2.6	348	253	256	53	89	88	8		
3	916	71.568	1.1	2.2	348	254	255	53	90	87	7		
2	922	76.623	.75	1.7	348	255	253	54	92	90	7		
1	928	80.857	.60	1.3	349	256	254	54	94	92	6		
end	934	84.951											
5	938	84.951	.70	1.5	349	255	257	55	94	92	5		
4	944	89.017	.69	1.5	348	254	258	55	94	92	5		
3	950	93.092	.70	1.5	348	256	257	55	95	92	5		
2	956	97.194	.80	1.8	347	252	258	56	95	92	6		
1	1002	101.592	.83	1.8	342	253	255	55	96	93	6		
Average end	1008	106.115											

Comments:

1 OF 2

C.2.2-2

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 2 Stack breaching
DATE: May 10 2016
RUN NO: / -Metals -02
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO: 5WCS
METER ΔH@:
METER Yd:
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 8x30
ΔH= 2.3 X ΔP:
Probe Condition, pre/post test:
Silica Gel Expanded, Y/N:
Filter Condition after Test:
Check Weight:

AMBIENT TEMPERATURE:
BAROMETRIC PRESSURE:
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: glass
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL: See page 1
NOZZLE DIAMETER:
FILTER NO/TYPE:
PRE-TEST LEAK RATE: : CFM@ in. Hg.
POST-TEST LEAK RATE: : <0.001 CFM@ 13 in. Hg.
PITOT LEAK CHECK - PRE: POST:
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test = Difference
1	HNO_3/H_2O_2		
2	HNO_3/H_2O_2		
3	Empty		
4	$KMNO_4/H_2SO_4$		
5	$KMNO_4/H_2SO_4$		
6	Silica gel.		

Point	Time	Meter Volume, ft³	ΔP in. H₂O	ΔH in. H₂O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O₂ %	Pstatic in. H₂O
5	1012	106.115	1.0	2.2	342	254	255	58	98	93	7		
4	1018	111.212	.96	2.2	342	252	257	57	101	93	7		
3	1024	116.316	.85	2.0	343	256	258	57	104	93	6		
2	1030	121.166	.80	1.8	343	255	257	57	104	93	6		
1	1036	125.905	.70	1.6	343	259	258	58	105	97	6		
end	1042	130.187											
5	1046	130.187	1.1	2.5	344	258	255	58	105	98	8		
4	1052	134.853	1.0	2.3	345	256	252	58	106	99	7		
3	1058	140.154	1.0	2.3	346	255	254	58	105	99	7		
2	1104	145.471	1.0	2.3	346	253	253	58	104	99	7		
1	1110	150.779	1.0	2.3	347	251	252	56	103	99	7		
end	1116	156.076											
5	1120	156.076	1.0	2.3	347	253	254	56	103	99	7		
4	1126	161.208	1.0	2.3	347	254	253	56	104	100	7		
3	1132	166.347	1.0	2.3	348	257	254	56	105	101	7		
2	1138	171.472	1.0	2.3	352	254	252	57	107	102	7		
1	1144	176.611	1.0	2.3	352	256	251	57	108	102	7		
Average end	1150	181.752											

Comments:

2 of 2

C.2.2.3

Delta Air Quality Services, Incorporated

2 -~~Metals~~ HG U2 Page 1 of 2

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 2 Stack breaching
DATE: May 10 2016
RUN NO: 2 -~~Metals~~ HG U2
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO: 5WCS
METER ΔH@: 1.743 @1=0.568
METER Yd: 0.997
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 6x30
ΔH= 2.15X ΔP:
Probe Condition, pre/post test: ✓/✓
Silica Gel Expanded, Y/N: N
Filter Condition after Test: ✓ - light brown ring
Check Weight: 294.8 / 295

AMBIENT TEMPERATURE: 86
BAROMETRIC PRESSURE: 29.97
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: #26 glass
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL: 16 glass
NOZZLE DIAMETER: 0.245
FILTER NO/TYPE: 83-UP653 Quartz
PRE-TEST LEAK RATE: : <0.001 CFM@ 15 in. Hg.
POST-TEST LEAK RATE: : <0.001 CFM@ 12 in. Hg.
PITOT LEAK CHECK - PRE: ✓ POST: ✓
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test	= Difference
1	HNO_3/H_2O_2	941.4	706.2	
2	HNO_3/H_2O_2	858.2	663.8	
3	Empty	612.8	609.9	
4	$KMNO_4/H_2SO_4$	594.7	593.5	
5	$KMNO_4/H_2SO_4$	600.6	600.9	
6	Silica gel.	916.9	882.6	

Point	Time	Meter Volume, ft³	ΔP in. H₂O	ΔH in. H₂O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O₂ %	Pstatic in. H₂O
5	1231	183.200	1.0	2.2	357	253	247	58	104	100	7		+0.82
4	1237	188.626	1.0	2.2	356	252	251	58	106	100	7		
3	1243	193.321	1.0	2.2	356	253	254	57	107	101	7		
2	1249	198.421	1.0	2.2	357	252	252	57	109	101	7		
1	1255	203.472	1.1	2.4	357	253	250	58	109	101	8		
end	1301	208.704											
5	1304	208.704	1.5	3.2	358	257	255	58	107	102	9		
4	1310	214.695	1.3	2.8	358	258	256	58	107	102	8		
3	1316	220.571	1.1	2.4	358	258	255	58	108	102	8		
2	1322	225.971	.75	1.8	359	257	256	56	108	102	6		
1	1328	230.443	.63	1.4	359	256	255	55	108	102	5		
end	1334	234.540											
5	1338	234.540	.70	1.5	359	257	253	55	108	102	5		
4	1344	238.613	.70	1.5	359	255	254	56	108	102	5		
3	1350	242.835	.70	1.5	359	252	257	56	108	103	5		
2	1356	247.156	.80	1.7	359	254	252	57	109	103	6		
1	1402	251.416	.85	1.8	359	256	254	57	109	103	6		
Average, end	1408	255.941											

Comments:

C.2.2.4

Delta Air Quality Services, Incorporated

2 -~~Metals~~ HG U2 Page 2 of 2

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 2 Stack breaching
DATE: May 10 2016
RUN NO: 2-Metals U2
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO: 5WCS
METER ΔH@:
METER Yd:
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 6x30
ΔH= 2.15 X ΔP:
Probe Condition, pre/post test:
Silica Gel Expanded, Y/N:
Filter Condition after Test:
Check Weight:

AMBIENT TEMPERATURE:
BAROMETRIC PRESSURE:
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: glass
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL: See Page 1
NOZZLE DIAMETER:
FILTER NO/TYPE:
PRE-TEST LEAK RATE: : CFM@ in. Hg.
POST-TEST LEAK RATE: : CFM@ in. Hg.
PITOT LEAK CHECK - PRE: POST:
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test	Difference
1	HNO_3/H_2O_2			
2	HNO_3/H_2O_2			
3	Empty			
4	$KMNO_4/H_2SO_4$			
5	$KMNO_4/H_2SO_4$			
6	Silica gel.			

Point	Time	Meter Volume, ft³	ΔP in. H₂O	ΔH in. H₂O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O₂ %	Pstatic in. H₂O
5	1412	255.941	1.0	2.2	360	257	254	57	106	103	7		
4	1418	260.973	1.0	2.2	360	252	257	57	106	103	7		
3	1424	266.044	.87	1.9	361	254	255	57	107	103	7		
2	1430	270.805	.85	1.8	361	256	253	58	107	103	6		
1	1436	275.563	.70	1.5	362	252	256	58	108	103	6		
end	1442	279.635											
5	1446	279.635	1.0	2.2	362	257	254	58	108	103	7		
4	1452	284.687	1.0	2.2	363	255	256	55	108	103	7		
3	1458	289.727	1.0	2.2	363	253	255	55	109	102	7		
2	1504	294.791	1.1	2.4	363	255	257	54	109	102	8		
1	1508	300.203	1.1	2.4	363	255	257	54	109	102	8		
end	1512	305.811											
5	1516	305.811	.85	1.8	363	254	255	54	108	102	7		
4	1522	310.255	.85	1.8	363	256	252	54	107	103	7		
3	1528	314.729	.85	1.8	363	255	256	55	108	103	7		
2	1534	319.183	1.0	2.2	363	254	255	55	109	103	7		
1	1540	324.296	1.0	2.2	363	252	257	55	110	103	7		
Average:	end 1546	328.992											

Comments:

C.2.2-5

Delta Air Quality Services, Incorporated

3-HG 02 Page 1 of 2

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 2 Stack breaching
DATE: May 10 2016
RUN NO: 3 -HG 02
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO: 5WCS
METER ΔH@: 1.743 @ I 0.568
METER Yd: 0.997
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 6x30
ΔH= 2.15 X ΔP: 2.3
Probe Condition, pre/post test: ✓/✓
Silica Gel Expanded, Y/N: N
Filter Condition after Test: ✓ - Light brown ring
Check Weight: 294.8/295.0

AMBIENT TEMPERATURE: 89
BAROMETRIC PRESSURE: 29.97
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: glass #47
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL: 1-HG glass
NOZZLE DIAMETER: 0.249
FILTER NO/TYPE: 8310P6476/glass
PRE-TEST LEAK RATE: : <0.001 CFM@ 15 in. Hg.
POST-TEST LEAK RATE: : <0.001 CFM@ 13 in. Hg.
PITOT LEAK CHECK - PRE: ✓ POST: ✓
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test	Difference
1	HNO_3/H_2O_2	964.4	711.0	
2	HNO_3/H_2O_2	921.4	730.2	
3	Empty	611.3	606.7	
4	$KMNO_4/H_2SO_4$	740.1	741.6	
5	$KMNO_4/H_2SO_4$	720.0	717.6	
6	Silica gel.	836.6	805.6	

Point	Time	Meter Volume, ft³	ΔP in. H₂O	ΔH in. H₂O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O₂ %	Pstatic in. H₂O
5	1615	329.500	.86	2.0	361	252	251	58	105	103	5		+0.82
4	1621	334.268	.85	2.0	361	255	253	58	107	103	5		
3	1627	39.003	.87	2.0	362	256	257	56	108	104	5		
2	1633	343.805	1.0	2.3	363	254	255	54	110	104	7		
1	1639	349.117	1.0	2.3	363	257	251	53	111	105	7		
end	1645	354.503											
5	1649	354.503	1.3	3.0	363	254	254	53	112	105	9		
4	1655	360.405	1.3	3.0	363	253	255	53	113	106	9		
3	1701	366.318	1.3	3.0	363	257	256	53	114	107	9		
2	1707	372.232	.85	2.0	363	255	252	54	114	107	7		
1	1713	377.112	.61	1.4	363	254	255	54	114	107	6		
end	1719	381.297											
5	1723	381.297	.70	1.6	363	253	254	54	114	107	6		
4	1729	385.585	.71	1.6	362	254	256	55	115	107	6		
3	1735	389.873	.71	1.6	362	257	257	55	115	108	6		
2	1741	394.153	.80	1.8	362	253	253	55	115	108	6		
1	1747	398.869	.80	1.8	362	252	254	56	115	108	6		
Average: end	1753	403.563											

Comments:

C.2.2-6

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: Desert View Power
LOCATION: Unit 2 Stack breaching
DATE: May 10 2016
RUN NO: 3 -HG - 02
OPERATOR: Mike Miller/Rik Dupont
METER BOX NO: 5 WCS
METER ΔH@:
METER Yd:
STACK AREA, FT²: 38.8
TRAVERSE POINTS, MIN/POINT: 6x30
ΔH= _____ X ΔP:
Probe Condition, pre/post test:
Silica Gel Expanded, Y/N:
Filter Condition after Test:
Check Weight:

AMBIENT TEMPERATURE:
BAROMETRIC PRESSURE:
ASSUMED MOISTURE: 12.4
PITOT TUBE COEFF, Cp: 0.84
PROBE ID NO/MATERIAL: glass
PROBE LENGTH: 6'
NOZZLE ID NO/ MATERIAL: See Page 1
NOZZLE DIAMETER:
FILTER NO/TYPE:
PRE-TEST LEAK RATE: : _____ CFM@ _____ in. Hg.
POST-TEST LEAK RATE: : _____ CFM@ _____ in. Hg.
PITOT LEAK CHECK - PRE: _____ POST: _____
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents	Post-Test	Pre-Test	= Difference
1	HNO_3/H_2O_2			
2	HNO_3/H_2O_2			
3	Empty			
4	$KMNO_4/H_2SO_4$			
5	$KMNO_4/H_2SO_4$			
6	Silica gel.			

Point	Time	Meter Volume, ft³	ΔP in. H₂O	ΔH in. H₂O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O₂ %	Pstatic in. H₂O
5	1757	403.563	1.0	2.3	363	255	256	52	112	109	7		
4	1803	408.715	1.0	2.3	363	256	254	52	113	109	7		
3	1809	413.816	1.0	2.3	363	257	252	52	113	109	7		
2	1815	418.954	.70	1.6	363	255	256	53	114	109	6		
1	1821	423.465	.70	1.6	363	258	256	53	115	109	6		
end	1827	427.987											
5	1831	427.987	1.0	2.3	363	256	257	53	115	109	7		
4	1837	433.146	1.0	2.3	363	254	259	54	114	108	7		
3	1843	438.271	1.0	2.3	363	257	256	54	113	107	7		
2	1849	443.464	1.0	2.3	363	254	254	55	112	106	7		
1	1855	448.623	1.1	2.5	363	259	255	56	111	106	8		
end	1901	453.936											
5	1903	453.936	1.0	2.3	363	257	254	56	111	106	7		
4	1909	459.079	1.0	2.3	363	255	257	57	110	105	7		
3	1915	464.241	1.0	2.3	363	258	253	57	110	105	7		
2	1921	469.423	1.0	2.3	364	255	256	57	110	105	7		
1	1927	474.565	1.0	2.3	365	257	255	58	111	105	7		
Average: end	1933	479.219											

Comments:

C.2.2.7

Delta Air Quality Services, Incorporated

FB - Metals

WET CHEMICAL SAMPLING SYSTEM DATA AND WORKSHEET

CLIENT: DVP
LOCATION: 01
DATE: 5/11/16
RUN NO: FB-Metals
OPERATOR: DW
METER BOX NO: NA
METER ΔH@: ✓
METER Yd: ✓
STACK AREA, FT²:
TRAVERSE POINTS, MIN/POINT: NA
ΔH= NA X ΔP:
Probe Condition, pre/post test: ✓/✓
Silica Gel Expanded, Y/N: N/A
Filter Condition after Test: ✓
Check Weight: 294.8 / 295.0

AMBIENT TEMPERATURE: 75
BAROMETRIC PRESSURE: NA
ASSUMED MOISTURE: ✓
PITOT TUBE COEFF, Cp:
PROBE ID NO/MATERIAL: #47 / Glass
PROBE LENGTH: 6 ft
NOZZLE ID NO/ MATERIAL: 0.249 / glass
NOZZLE DIAMETER: 0.249
FILTER NO/TYPE: 83-UP654 / quartz
PRE-TEST LEAK RATE: : ✓ CFM@ ✓ in. Hg.
POST-TEST LEAK RATE: : ✓ CFM@ NA in. Hg.
PITOT LEAK CHECK - PRE: NA POST: NA
CHAIN OF CUSTODY: SAMPLE CUSTODIAN DW
SAMPLER MM
SAMPLE CUSTODIAN DW

Imp. #	Contents		Post-Test - Pre-Test = Difference
1	HNO_3/H_2O_2	✓	720.5
2	HNO_3/H_2O_2	✓	685.6
3	Gel	✓	527.7
4	$KMnO_4/H_2SO_4$	✓	714.7
5	$KMnO_4/H_2SO_4$	✓	757.5
6	SG	✓	892.0
Total:			

Point	Time	Meter Volume, ft³	ΔP in. H_2O	ΔH in. H_2O	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F	Imp. Out Temp, °F	Meter Temp, °F In	Meter Temp, °F Out	Vacuum in. Hg.	O_2 %	P. static in. H_2O
	7-10												
Average:													

Comments:

C.2.2.8

DS834049

Date of last revision 11/24/08

Master Document Storage\Forms\Datasheets\Field Datasheets

1-HG-Unit 2						
	dP	(dP)^.5	dH	Ts	Tm	
5	0.850	0.922	1.70	347	80	80
4	0.830	0.911	1.70	346	82	82
3	0.870	0.933	1.70	346	83	82
2	0.980	0.990	2.00	347	84	83
1	1.000	1.000	2.00	348	85	83
5	1.300	1.140	2.60	349	87	85
4	1.300	1.140	2.60	348	89	88
3	1.100	1.049	2.20	348	90	87
2	0.750	0.866	1.70	348	92	90
1	0.600	0.775	1.30	349	94	92
5	0.700	0.837	1.50	349	94	92
4	0.690	0.831	1.50	348	94	92
3	0.700	0.837	1.50	348	95	92
2	0.800	0.894	1.80	347	95	92
1	0.830	0.911	1.80	342	96	93
5	1.000	1.000	2.20	342	98	93
4	0.960	0.980	2.20	342	101	93
3	0.850	0.922	2.00	343	104	93
2	0.800	0.894	1.80	343	104	93
1	0.700	0.837	1.60	343	105	97
5	1.100	1.049	2.50	344	105	98
4	1.000	1.000	2.30	345	106	99
3	1.000	1.000	2.30	346	105	99
2	1.000	1.000	2.30	346	104	99
1	1.000	1.000	2.30	347	103	99
5	1.000	1.000	2.30	347	103	99
4	1.000	1.000	2.30	347	104	100
3	1.000	1.000	2.30	348	105	101
2	1.000	1.000	2.30	352	107	102
1	1.000	1.000	2.30	352	108	102
Average		0.9163	2.020	346.6	94.7	
			Meter Vol	Imp	Imp	
Delta P (iwg)		0.916	37.800	967.5	724.3	243.2
Meter Pressure (iwg)		2.020	181.752	888.5	715.8	172.7
Stack Temperature (F)		346.567	143.952	612.4	608.1	4.3
Meter Temperature (F)		94.700		749.6	750.7	-1.1
Meter Volume (acf)		143.952		750.4	749.6	0.8
Liquid Volume (ml)		28.700		864.0	835.3	28.7
						448.6

2-HG-Unit 2						
	dP	(dP)^.5	dH	Ts	Tm	
5	1.00	1.000	2.20	357	104	100
4	1.00	1.000	2.20	356	106	100
3	1.00	1.000	2.20	356	107	101
2	1.00	1.000	2.20	357	109	101
1	1.10	1.049	2.40	357	109	104
5	1.50	1.225	3.20	358	107	102
4	1.30	1.140	2.80	358	107	102
3	1.10	1.049	2.40	358	108	102
2	0.75	0.866	1.60	359	108	102
1	0.63	0.794	1.40	359	108	102
5	0.70	0.837	1.50	359	108	102
4	0.70	0.837	1.50	359	108	102
3	0.70	0.837	1.50	359	108	103
2	0.80	0.894	1.70	359	109	103
1	0.85	0.922	1.80	359	109	103
5	1.00	1.000	2.20	360	106	103
4	1.00	1.000	2.20	360	106	103
3	0.87	0.933	1.90	361	107	103
2	0.85	0.922	1.80	361	107	103
1	0.70	0.837	1.50	362	108	103
5	1.00	1.000	2.20	362	108	103
4	1.00	1.000	2.20	363	108	103
3	1.00	1.000	2.20	363	109	102
2	1.10	1.049	2.40	363	109	102
1	1.10	1.049	2.40	363	109	102
5	0.85	0.922	1.80	363	108	102
4	0.85	0.922	1.80	363	107	103
3	0.85	0.922	1.80	363	108	103
2	1.00	1.000	2.20	363	109	103
1	1.00	1.000	2.20	363	110	103
Average		0.9347	2.047	360.1	105.1	
			Meter Vol	Imp	Imp	
Delta P (iwg)		0.935	183.2	941.4	706.2	235.2
Meter Pressure (iwg)		2.047	328.992	858.2	663.8	194.4
Stack Temperature (F		360.100	145.792	612.8	609.9	2.9
Meter Temperature (F)		105.067		594.7	593.5	1.2
Meter Volume (acf)		145.792		600.6	600.9	-0.3
Liquid Volume (ml)		34.300		916.9	882.6	34.3
						467.7

3-HG-Unit 2						
	dP	(dP)^.5	dH	Ts	Tm	
5	0.86	0.927	2.00	361	105	103
4	0.85	0.922	2.00	361	107	103
3	0.87	0.933	2.00	362	108	104
2	1.00	1.000	2.30	363	110	104
1	1.00	1.000	2.30	363	111	105
5	1.30	1.140	3.00	363	112	105
4	1.30	1.140	3.00	363	113	106
3	1.30	1.140	3.00	363	114	107
2	0.85	0.922	2.00	363	114	107
1	0.61	0.781	1.40	363	114	107
5	0.70	0.837	1.60	363	114	107
4	0.71	0.843	1.60	362	115	107
3	0.71	0.843	1.60	362	115	108
2	0.80	0.894	1.80	362	115	108
1	0.80	0.894	1.80	362	115	108
5	1.00	1.000	2.30	363	112	109
4	1.00	1.000	2.30	363	113	109
3	1.00	1.000	2.30	363	113	109
2	0.70	0.837	1.60	363	114	109
1	0.70	0.837	1.60	363	115	109
5	1.00	1.000	2.30	363	115	109
4	1.00	1.000	2.30	363	114	108
3	1.00	1.000	2.30	363	113	107
2	1.00	1.000	2.30	363	112	106
1	1.10	1.049	2.30	363	111	106
5	1.00	1.000	2.30	363	111	106
4	1.00	1.000	2.30	363	110	105
3	1.00	1.000	2.30	36	110	105
2	1.00	1.000	2.30	364	110	105
1	1.00	1.000	2.30	365	110	105
Average		0.9305	2.150	351.9	109.4	
			Meter Vo	Imp	Imp	
Delta P (iwg)		0.930	329.5	964.4	711	253.4
Meter Pressure (iwg)		2.150	479.219	921.4	730.2	191.2
Stack Temperature (F		351.900	149.719	611.3	606.7	4.6
Meter Temperature (F		109.350		740.1	741.6	-1.5
Meter Volume (acf)		149.719		720.0	717.6	2.4
Liquid Volume (ml)		31.0		836.6	805.6	31.0
						481.1

Date	Time	O2 %	CO2 %	
5/10/2016	7:28	18.99	18.62	
5/10/2016	7:29	18.97	18.63	High
5/10/2016	7:30	15.56	14.78	
5/10/2016	7:31	10.87	10.35	
5/10/2016	7:32	10.84	10.36	
5/10/2016	7:33	10.84	10.35	Mid
5/10/2016	7:34	3.93	3.35	
5/10/2016	7:35	0.07	0.06	
5/10/2016	7:36	0.06	0.05	Zero
5/10/2016	7:37	5.96	9.66	
5/10/2016	7:38	8.32	11.96	
5/10/2016	7:39	8.65	11.65	
5/10/2016	7:40	8.82	11.46	
5/10/2016	7:41	8.75	11.58	
5/10/2016	7:42	8.93	11.34	
5/10/2016	7:43	8.57	11.74	
5/10/2016	7:44	8.36	11.92	
5/10/2016	7:45	9.22	11.05	
5/10/2016	7:46	9.01	11.33	
5/10/2016	7:47	8.36	11.96	
5/10/2016	7:48	7.74	12.60	
5/10/2016	7:49	10.07	10.71	
5/10/2016	7:50	10.74	10.32	O2 CO2 Bias
5/10/2016	7:51	1.43	0.83	
5/10/2016	7:52	0.06	0.06	Zero Bias
5/10/2016	7:53	2.19	3.53	
5/10/2016	7:54	8.39	11.81	
5/10/2016	7:55	8.41	11.88	
5/10/2016	7:56	9.10	11.16	
5/10/2016	7:57	8.54	11.76	
5/10/2016	7:58	8.80	11.48	
5/10/2016	7:59	9.09	11.13	
5/10/2016	8:00	9.20	11.21	
5/10/2016	8:01	8.37	11.90	
5/10/2016	8:02	8.39	11.94	
5/10/2016	8:03	8.61	11.63	
5/10/2016	8:04	9.38	10.87	
5/10/2016	8:05	8.92	11.40	
5/10/2016	8:06	9.12	11.16	
5/10/2016	8:07	8.39	11.93	
5/10/2016	8:08	8.50	11.78	
5/10/2016	8:09	8.57	11.72	
5/10/2016	8:10	8.67	11.59	
5/10/2016	8:11	9.51	10.79	
5/10/2016	8:12	7.99	12.37	
5/10/2016	8:13	8.21	12.04	

5/10/2016	8:14	8.82	11.48
5/10/2016	8:15	8.36	11.96
5/10/2016	8:16	8.37	11.85
5/10/2016	8:17	8.45	11.89
5/10/2016	8:18	9.08	11.12
5/10/2016	8:19	9.72	10.65
5/10/2016	8:20	9.30	11.00
5/10/2016	8:21	9.14	11.20
5/10/2016	8:22	7.93	12.40
5/10/2016	8:23	8.96	11.30
5/10/2016	8:24	8.63	11.69
5/10/2016	8:25	9.48	10.79
5/10/2016	8:26	9.41	10.92
5/10/2016	8:27	8.40	11.91
5/10/2016	8:28	8.26	12.00
5/10/2016	8:29	8.92	11.36
5/10/2016	8:30	8.87	11.39
5/10/2016	8:31	9.28	11.03
5/10/2016	8:32	8.67	11.64
5/10/2016	8:33	8.17	12.11
5/10/2016	8:34	8.87	11.40
5/10/2016	8:35	8.97	11.30
5/10/2016	8:36	8.99	11.28
5/10/2016	8:37	9.41	10.89
5/10/2016	8:38	8.54	11.78
5/10/2016	8:39	8.48	11.78
5/10/2016	8:40	8.83	11.48
5/10/2016	8:41	9.03	11.32
5/10/2016	8:42	8.74	11.53
5/10/2016	8:43	8.52	11.83
5/10/2016	8:44	8.36	11.92
5/10/2016	8:45	8.41	11.91
5/10/2016	8:46	8.15	12.14
5/10/2016	8:47	8.34	11.95
5/10/2016	8:48	8.84	11.45
5/10/2016	8:49	9.47	10.82
5/10/2016	8:50	9.05	11.34
5/10/2016	8:51	8.56	11.73
5/10/2016	8:52	8.08	12.24
5/10/2016	8:53	8.15	12.11
5/10/2016	8:54	8.63	11.66
5/10/2016	8:55	8.41	11.87
5/10/2016	8:56	8.76	11.50
5/10/2016	8:57	8.28	12.01
5/10/2016	8:58	8.87	11.37
5/10/2016	8:59	8.76	11.56
5/10/2016	9:00	9.23	11.04
5/10/2016	9:01	9.04	11.27
5/10/2016	9:02	8.56	11.77

5/10/2016	9:03	8.32	11.94
5/10/2016	9:04	8.50	11.75
5/10/2016	9:05	8.91	11.36
5/10/2016	9:06	9.25	11.02
5/10/2016	9:07	8.77	11.55
5/10/2016	9:08	8.74	11.53
5/10/2016	9:09	8.43	11.85
5/10/2016	9:10	9.35	10.93
5/10/2016	9:11	9.03	11.28
5/10/2016	9:12	9.10	11.16
5/10/2016	9:13	9.60	10.64
5/10/2016	9:14	8.96	11.36
5/10/2016	9:15	9.22	11.11
5/10/2016	9:16	8.33	11.94
5/10/2016	9:17	8.45	11.84
5/10/2016	9:18	8.49	11.72
5/10/2016	9:19	8.94	11.32
5/10/2016	9:20	9.11	11.17
5/10/2016	9:21	8.75	11.54
5/10/2016	9:22	8.34	11.93
5/10/2016	9:23	8.98	11.22
5/10/2016	9:24	8.47	11.83
5/10/2016	9:25	8.64	11.60
5/10/2016	9:26	8.30	11.97
5/10/2016	9:27	8.46	11.79
5/10/2016	9:28	8.52	11.72
5/10/2016	9:29	8.39	11.82
5/10/2016	9:30	8.84	11.43
5/10/2016	9:31	9.10	11.13
5/10/2016	9:32	8.88	11.35
5/10/2016	9:33	8.83	11.44
5/10/2016	9:34	8.26	12.01
5/10/2016	9:35	8.68	11.53
5/10/2016	9:36	8.55	11.69
5/10/2016	9:37	8.65	11.65
5/10/2016	9:38	8.21	12.02
5/10/2016	9:39	8.44	11.81
5/10/2016	9:40	8.65	11.59
5/10/2016	9:41	8.44	11.82
5/10/2016	9:42	8.63	11.60
5/10/2016	9:43	8.76	11.53
5/10/2016	9:44	8.40	11.79
5/10/2016	9:45	8.83	11.47
5/10/2016	9:46	8.68	11.53
5/10/2016	9:47	8.48	11.79
5/10/2016	9:48	8.63	11.60
5/10/2016	9:49	8.39	11.87
5/10/2016	9:50	8.38	11.83
5/10/2016	9:51	8.71	11.53

5/10/2016	9:52	9.49	10.73
5/10/2016	9:53	9.74	10.51
5/10/2016	9:54	10.24	10.03
5/10/2016	9:55	10.82	9.42
5/10/2016	9:56	11.98	8.34
5/10/2016	9:57	11.32	9.04
5/10/2016	9:58	11.59	8.74
5/10/2016	9:59	11.13	9.20
5/10/2016	10:00	11.02	9.32
5/10/2016	10:01	10.70	9.66
5/10/2016	10:02	10.63	9.71
5/10/2016	10:03	10.50	9.86
5/10/2016	10:04	10.32	9.97
5/10/2016	10:05	9.87	10.38
5/10/2016	10:06	9.69	10.61
5/10/2016	10:07	9.44	10.81
5/10/2016	10:08	9.17	11.05
5/10/2016	10:09	9.29	10.98
5/10/2016	10:10	9.23	10.98
5/10/2016	10:11	9.04	11.18
5/10/2016	10:12	9.21	11.00
5/10/2016	10:13	9.06	11.17
5/10/2016	10:14	8.45	11.82
5/10/2016	10:15	7.91	12.28
5/10/2016	10:16	8.37	11.84
5/10/2016	10:17	8.15	12.09
5/10/2016	10:18	8.96	11.22
5/10/2016	10:19	8.69	11.52
5/10/2016	10:20	8.93	11.28
5/10/2016	10:21	8.91	11.34
5/10/2016	10:22	8.49	11.73
5/10/2016	10:23	8.35	11.84
5/10/2016	10:24	8.72	11.49
5/10/2016	10:25	8.45	11.75
5/10/2016	10:26	8.56	11.67
5/10/2016	10:27	8.62	11.56
5/10/2016	10:28	9.32	10.95
5/10/2016	10:29	8.38	11.81
5/10/2016	10:30	8.47	11.74
5/10/2016	10:31	9.13	11.04
5/10/2016	10:32	9.08	11.18
5/10/2016	10:33	9.15	11.12
5/10/2016	10:34	7.80	12.48
5/10/2016	10:35	7.50	12.72
5/10/2016	10:36	8.53	11.63
5/10/2016	10:37	8.42	11.81
5/10/2016	10:38	8.40	11.84
5/10/2016	10:39	8.61	11.61
5/10/2016	10:40	8.48	11.73

5/10/2016	10:41	9.18	11.01	
5/10/2016	10:42	9.40	10.87	
5/10/2016	10:43	8.68	11.50	
1-HCL U2 O2 CO2 Averag		8.92	11.35	
5/10/2016	10:44	2.63	2.61	
5/10/2016	10:45	0.05	0.06	Zero Bias
5/10/2016	10:46	6.35	6.67	
5/10/2016	10:47	10.66	10.25	O2 CO2 Bias
5/10/2016	10:48	2.75	2.28	
5/10/2016	10:49	0.04	0.05	Zero
5/10/2016	10:50	8.58	8.36	
5/10/2016	10:51	10.72	10.28	Span
5/10/2016	10:52	8.98	11.55	
5/10/2016	10:53	8.33	11.96	
5/10/2016	10:54	8.25	12.04	
5/10/2016	10:55	8.61	11.70	
5/10/2016	10:56	8.79	11.49	
5/10/2016	10:57	8.85	11.44	
5/10/2016	10:58	9.05	11.23	
5/10/2016	10:59	8.80	11.53	
5/10/2016	11:00	8.93	11.37	
5/10/2016	11:01	8.37	11.96	
5/10/2016	11:02	8.19	12.11	
5/10/2016	11:03	8.86	11.44	
5/10/2016	11:04	8.80	11.53	
5/10/2016	11:05	8.73	11.56	
5/10/2016	11:06	8.69	11.64	
5/10/2016	11:07	8.52	11.79	
5/10/2016	11:08	8.79	11.52	
5/10/2016	11:09	9.62	10.70	
5/10/2016	11:10	9.04	11.33	
5/10/2016	11:11	8.73	11.58	
5/10/2016	11:12	9.26	11.09	
5/10/2016	11:13	8.72	11.55	
5/10/2016	11:14	8.66	11.66	
5/10/2016	11:15	8.53	11.80	
5/10/2016	11:16	8.46	11.83	
5/10/2016	11:17	8.39	11.91	
5/10/2016	11:18	8.01	12.30	
5/10/2016	11:19	8.78	11.48	
5/10/2016	11:20	8.55	11.75	
5/10/2016	11:21	8.60	11.70	
5/10/2016	11:22	8.29	12.04	
5/10/2016	11:23	8.68	11.54	
5/10/2016	11:24	8.93	11.36	
5/10/2016	11:25	8.52	11.80	
5/10/2016	11:26	8.13	12.18	
5/10/2016	11:27	8.23	12.02	

5/10/2016	11:28	8.67	11.61
5/10/2016	11:29	8.97	11.29
5/10/2016	11:30	9.09	11.18
5/10/2016	11:31	8.91	11.42
5/10/2016	11:32	8.92	11.33
5/10/2016	11:33	8.93	11.40
5/10/2016	11:34	8.49	11.82
5/10/2016	11:35	9.20	11.03
5/10/2016	11:36	8.73	11.60
5/10/2016	11:37	9.15	11.13
5/10/2016	11:38	8.93	11.36
5/10/2016	11:39	8.30	12.02
5/10/2016	11:40	8.53	11.74
5/10/2016	11:41	8.38	11.93
5/10/2016	11:42	8.03	12.23
5/10/2016	11:43	8.51	11.78
5/10/2016	11:44	8.31	11.96
5/10/2016	11:45	8.78	11.51
5/10/2016	11:46	9.03	11.23
5/10/2016	11:47	8.80	11.51
5/10/2016	11:48	8.28	12.01
5/10/2016	11:49	8.54	11.75
5/10/2016	11:50	9.28	10.98
1-HG-U2 O2 CO2 Average		8.84	11.43
5/10/2016	11:51	9.20	11.12
5/10/2016	11:52	8.66	11.66
5/10/2016	11:53	8.63	11.63
5/10/2016	11:54	8.55	11.74
5/10/2016	11:55	8.57	11.72
5/10/2016	11:56	9.31	10.95
5/10/2016	11:57	8.75	11.58
5/10/2016	11:58	8.11	12.19
5/10/2016	11:59	8.88	11.40
5/10/2016	12:00	8.51	11.83
5/10/2016	12:01	8.12	12.20
5/10/2016	12:02	8.19	12.03
5/10/2016	12:03	9.18	11.10
5/10/2016	12:04	9.30	11.02
5/10/2016	12:05	9.21	11.10
5/10/2016	12:06	9.00	11.29
5/10/2016	12:07	9.02	11.30
5/10/2016	12:08	9.34	10.97
5/10/2016	12:09	9.25	11.01
5/10/2016	12:10	8.77	11.58
5/10/2016	12:11	8.25	12.03
5/10/2016	12:12	8.51	11.78
5/10/2016	12:13	7.94	12.36
5/10/2016	12:14	8.36	11.85
5/10/2016	12:15	8.91	11.39

5/10/2016	12:16	8.77	11.53
5/10/2016	12:17	7.85	12.48
5/10/2016	12:18	8.14	12.08
5/10/2016	12:19	8.54	11.77
5/10/2016	12:20	8.84	11.37
5/10/2016	12:21	8.72	11.58
5/10/2016	12:22	8.86	11.42
5/10/2016	12:23	8.97	11.31
5/10/2016	12:24	8.05	12.23
5/10/2016	12:25	8.32	11.90
5/10/2016	12:26	8.75	11.53
5/10/2016	12:27	9.02	11.22
5/10/2016	12:28	8.52	11.73
5/10/2016	12:29	8.63	11.63
5/10/2016	12:30	8.69	11.57
5/10/2016	12:31	7.90	12.37
5/10/2016	12:32	8.26	11.99
5/10/2016	12:33	8.21	11.99
5/10/2016	12:34	8.36	11.88
5/10/2016	12:35	9.48	10.76
5/10/2016	12:36	9.07	11.19
5/10/2016	12:37	9.02	11.22
5/10/2016	12:38	9.10	11.18
5/10/2016	12:39	8.68	11.53
5/10/2016	12:40	9.05	11.19
5/10/2016	12:41	9.11	11.14
5/10/2016	12:42	8.62	11.65
5/10/2016	12:43	8.28	11.99
5/10/2016	12:44	8.27	11.97
5/10/2016	12:45	8.56	11.70
5/10/2016	12:46	8.75	11.46
5/10/2016	12:47	9.07	11.19
5/10/2016	12:48	8.76	11.53
5/10/2016	12:49	9.40	10.86
5/10/2016	12:50	8.53	11.79
5/10/2016	12:51	8.12	12.10
5/10/2016	12:52	7.85	12.42
5/10/2016	12:53	7.87	12.36
5/10/2016	12:54	7.81	12.43
5/10/2016	12:55	8.12	12.08
5/10/2016	12:56	8.52	11.69
5/10/2016	12:57	8.11	12.14
5/10/2016	12:58	8.05	12.16
5/10/2016	12:59	8.72	11.47
5/10/2016	13:00	9.02	11.20
5/10/2016	13:01	8.49	11.72
5/10/2016	13:02	8.46	11.80
5/10/2016	13:03	7.95	12.27
5/10/2016	13:04	8.07	12.09

5/10/2016	13:05	8.85	11.35	
5/10/2016	13:06	9.13	11.05	
5/10/2016	13:07	8.99	11.28	
5/10/2016	13:08	7.91	12.32	
5/10/2016	13:09	7.86	12.33	
2-HCL O2 CO2 Average		8.63	11.64	
5/10/2016	13:10	9.28	11.15	
5/10/2016	13:11	10.74	10.26	
5/10/2016	13:12	10.74	10.25	O2 CO2 Bias
5/10/2016	13:13	2.47	1.84	
5/10/2016	13:14	0.06	0.07	Zero Bias
5/10/2016	13:15	8.66	8.51	
5/10/2016	13:16	10.76	10.27	Span
5/10/2016	13:17	1.87	1.59	
5/10/2016	13:18	0.04	0.05	Zero
5/10/2016	13:19	5.93	9.87	
5/10/2016	13:20	7.87	12.25	
5/10/2016	13:21	8.48	11.74	
5/10/2016	13:22	9.21	10.98	
5/10/2016	13:23	8.14	12.15	
5/10/2016	13:24	7.91	12.30	
5/10/2016	13:25	8.40	11.81	
5/10/2016	13:26	8.29	11.87	
5/10/2016	13:27	8.24	11.98	
5/10/2016	13:28	9.15	11.00	
5/10/2016	13:29	9.25	11.01	
5/10/2016	13:30	8.93	11.29	
5/10/2016	13:31	8.95	11.28	
5/10/2016	13:32	8.70	11.55	
5/10/2016	13:33	8.75	11.49	
5/10/2016	13:34	8.66	11.56	
5/10/2016	13:35	8.57	11.68	
5/10/2016	13:36	8.51	11.70	
5/10/2016	13:37	8.68	11.50	
5/10/2016	13:38	9.13	11.11	
5/10/2016	13:39	8.58	11.66	
5/10/2016	13:40	9.15	11.10	
5/10/2016	13:41	8.11	12.15	
5/10/2016	13:42	8.24	11.99	
5/10/2016	13:43	8.09	12.12	
5/10/2016	13:44	8.51	11.69	
5/10/2016	13:45	8.46	11.76	
5/10/2016	13:46	8.41	11.78	
5/10/2016	13:47	8.64	11.61	
5/10/2016	13:48	8.39	11.79	
5/10/2016	13:49	8.59	11.62	
5/10/2016	13:50	7.90	12.34	
5/10/2016	13:51	8.53	11.61	

5/10/2016	13:52	8.96	11.23
5/10/2016	13:53	9.31	10.96
5/10/2016	13:54	8.21	12.02
5/10/2016	13:55	8.90	11.35
5/10/2016	13:56	8.92	11.31
5/10/2016	13:57	8.24	11.95
5/10/2016	13:58	8.54	11.69
5/10/2016	13:59	7.81	12.42
5/10/2016	14:00	8.13	12.04
5/10/2016	14:01	8.86	11.33
5/10/2016	14:02	9.01	11.15
5/10/2016	14:03	8.54	11.69
5/10/2016	14:04	8.28	11.88
5/10/2016	14:05	8.37	11.87
5/10/2016	14:06	8.48	11.67
5/10/2016	14:07	9.21	10.97
5/10/2016	14:08	9.46	10.75
5/10/2016	14:09	9.13	11.14
5/10/2016	14:10	8.37	11.82
5/10/2016	14:11	7.85	12.43
5/10/2016	14:12	7.96	12.17
5/10/2016	14:13	9.08	11.10
5/10/2016	14:14	8.73	11.46
5/10/2016	14:15	8.60	11.67
5/10/2016	14:16	8.19	11.97
5/10/2016	14:17	9.35	10.85
5/10/2016	14:18	8.54	11.72
5/10/2016	14:19	8.67	11.56
5/10/2016	14:20	8.20	12.06
5/10/2016	14:21	7.80	12.42
5/10/2016	14:22	8.47	11.65
5/10/2016	14:23	8.32	11.95
5/10/2016	14:24	8.27	11.97
5/10/2016	14:25	8.57	11.63
5/10/2016	14:26	8.96	11.32
5/10/2016	14:27	8.59	11.61
5/10/2016	14:28	8.81	11.41
5/10/2016	14:29	8.43	11.80
5/10/2016	14:30	9.02	11.12
5/10/2016	14:31	8.70	11.57
5/10/2016	14:32	8.79	11.42
5/10/2016	14:33	8.52	11.73
5/10/2016	14:34	8.20	12.01
5/10/2016	14:35	8.52	11.74
5/10/2016	14:36	8.64	11.58
5/10/2016	14:37	8.20	11.98
5/10/2016	14:38	7.82	12.44
5/10/2016	14:39	7.93	12.34
5/10/2016	14:40	7.41	12.78

5/10/2016	14:41	8.20	11.96
5/10/2016	14:42	8.58	11.62
5/10/2016	14:43	8.81	11.37
5/10/2016	14:44	9.39	10.85
5/10/2016	14:45	8.77	11.50
5/10/2016	14:46	8.74	11.43
5/10/2016	14:47	9.14	11.07
5/10/2016	14:48	8.84	11.45
5/10/2016	14:49	8.57	11.58
5/10/2016	14:50	8.36	11.84
5/10/2016	14:51	8.97	11.18
5/10/2016	14:52	9.22	11.02
5/10/2016	14:53	8.71	11.53
5/10/2016	14:54	7.97	12.21
5/10/2016	14:55	8.16	12.06
5/10/2016	14:56	8.60	11.56
5/10/2016	14:57	8.61	11.56
5/10/2016	14:58	8.72	11.50
5/10/2016	14:59	8.55	11.62
5/10/2016	15:00	8.51	11.63
5/10/2016	15:01	8.55	11.63
5/10/2016	15:02	8.55	11.63
5/10/2016	15:03	9.05	11.11
5/10/2016	15:04	8.62	11.58
5/10/2016	15:05	8.65	11.46
5/10/2016	15:06	8.31	11.87
5/10/2016	15:07	8.01	12.18
5/10/2016	15:08	7.79	12.37
5/10/2016	15:09	8.50	11.60
5/10/2016	15:10	8.64	11.52
5/10/2016	15:11	8.61	11.55
5/10/2016	15:12	8.77	11.37
5/10/2016	15:13	8.91	11.23
5/10/2016	15:14	9.17	10.97
5/10/2016	15:15	8.67	11.50
5/10/2016	15:16	8.55	11.58
5/10/2016	15:17	9.11	11.07
5/10/2016	15:18	8.73	11.43
5/10/2016	15:19	8.90	11.24
5/10/2016	15:20	8.68	11.47
5/10/2016	15:21	8.68	11.48
5/10/2016	15:22	8.86	11.29
5/10/2016	15:23	9.17	11.03
5/10/2016	15:24	9.07	11.09
5/10/2016	15:25	8.86	11.36
5/10/2016	15:26	9.33	10.75
5/10/2016	15:27	9.71	10.52
5/10/2016	15:28	8.02	12.29
5/10/2016	15:29	7.04	13.12

5/10/2016	15:30	8.05	12.04	
5/10/2016	15:31	8.24	11.97	
5/10/2016	15:32	8.11	12.05	
5/10/2016	15:33	8.70	11.42	
5/10/2016	15:34	9.48	10.75	
5/10/2016	15:35	8.46	11.78	
5/10/2016	15:36	8.00	12.18	
5/10/2016	15:37	8.19	11.96	
5/10/2016	15:38	8.70	11.50	
5/10/2016	15:39	8.67	11.49	
5/10/2016	15:40	8.20	12.08	
3-HCL O2 CO2 Average		8.58	11.62	
5/10/2016	15:41	8.68	11.51	
5/10/2016	15:42	8.83	11.36	
5/10/2016	15:43	8.26	11.94	
5/10/2016	15:44	8.14	12.00	
5/10/2016	15:45	9.11	11.08	
5/10/2016	15:46	8.46	11.79	
2-HG-O2 CO2 Average		8.57	11.64	
5/10/2016	15:47	7.70	12.50	
5/10/2016	15:48	8.86	11.30	
5/10/2016	15:49	10.65	10.27	
5/10/2016	15:50	10.67	10.26	O2 CO2 Bias
5/10/2016	15:51	5.72	4.88	
5/10/2016	15:52	0.07	0.07	Zero Bias
5/10/2016	15:53	8.41	8.36	
5/10/2016	15:54	10.72	10.31	Span
5/10/2016	15:55	2.43	1.12	
5/10/2016	15:56	0.04	0.05	Zero
5/10/2016	15:57	4.22	6.63	
5/10/2016	15:58	9.19	10.95	
5/10/2016	15:59	7.99	12.27	
5/10/2016	16:00	8.53	11.60	
5/10/2016	16:01	10.55	9.63	
5/10/2016	16:02	12.27	8.06	
5/10/2016	16:03	12.66	7.73	
5/10/2016	16:04	12.57	7.83	
5/10/2016	16:05	12.12	8.28	
5/10/2016	16:06	10.71	9.69	
5/10/2016	16:07	8.94	11.44	
5/10/2016	16:08	8.01	12.27	
5/10/2016	16:09	7.81	12.42	
5/10/2016	16:10	7.32	12.91	
5/10/2016	16:11	7.93	12.21	
5/10/2016	16:12	8.69	11.44	
5/10/2016	16:13	10.26	9.94	
5/10/2016	16:14	10.13	10.08	
5/10/2016	16:15	9.64	10.60	

5/10/2016	16:16	8.96	11.25
5/10/2016	16:17	8.87	11.33
5/10/2016	16:18	8.64	11.54
5/10/2016	16:19	8.92	11.25
5/10/2016	16:20	8.82	11.38
5/10/2016	16:21	8.83	11.34
5/10/2016	16:22	8.79	11.34
5/10/2016	16:23	8.51	11.67
5/10/2016	16:24	8.11	12.09
5/10/2016	16:25	7.99	12.17
5/10/2016	16:26	8.14	12.01
5/10/2016	16:27	8.48	11.69
5/10/2016	16:28	9.09	11.06
5/10/2016	16:29	8.68	11.53
5/10/2016	16:30	8.31	11.86
5/10/2016	16:31	9.56	10.63
5/10/2016	16:32	8.90	11.31
5/10/2016	16:33	8.67	11.45
5/10/2016	16:34	8.73	11.48
5/10/2016	16:35	9.01	11.15
5/10/2016	16:36	8.97	11.21
5/10/2016	16:37	8.41	11.83
5/10/2016	16:38	8.52	11.59
5/10/2016	16:39	8.75	11.47
5/10/2016	16:40	8.37	11.78
5/10/2016	16:41	8.65	11.52
5/10/2016	16:42	8.37	11.79
5/10/2016	16:43	7.74	12.46
5/10/2016	16:44	8.52	11.63
5/10/2016	16:45	8.70	11.42
5/10/2016	16:46	9.34	10.85
5/10/2016	16:47	8.92	11.27
5/10/2016	16:48	8.79	11.37
5/10/2016	16:49	8.55	11.62
5/10/2016	16:50	8.33	11.83
5/10/2016	16:51	8.36	11.80
5/10/2016	16:52	8.20	11.98
5/10/2016	16:53	8.08	12.06
5/10/2016	16:54	8.44	11.67
5/10/2016	16:55	9.23	10.95
5/10/2016	16:56	8.29	11.91
5/10/2016	16:57	7.56	12.57
5/10/2016	16:58	7.72	12.38
5/10/2016	16:59	8.68	11.45
5/10/2016	17:00	8.27	11.91
5/10/2016	17:01	8.95	11.17
5/10/2016	17:02	9.30	10.85
5/10/2016	17:03	8.46	11.72
5/10/2016	17:04	8.59	11.58

5/10/2016	17:05	8.49	11.65
5/10/2016	17:06	8.78	11.32
5/10/2016	17:07	8.37	11.84
5/10/2016	17:08	8.14	11.96
5/10/2016	17:09	8.56	11.64
5/10/2016	17:10	7.88	12.26
5/10/2016	17:11	8.85	11.24
5/10/2016	17:12	8.62	11.56
5/10/2016	17:13	9.07	11.02
5/10/2016	17:14	9.62	10.56
5/10/2016	17:15	8.09	12.15
5/10/2016	17:16	7.42	12.73
5/10/2016	17:17	7.96	12.14
5/10/2016	17:18	8.51	11.60
5/10/2016	17:19	8.52	11.57
5/10/2016	17:20	9.55	10.57
5/10/2016	17:21	9.48	10.70
5/10/2016	17:22	8.96	11.21
5/10/2016	17:23	8.62	11.49
5/10/2016	17:24	9.07	11.06
5/10/2016	17:25	8.54	11.63
5/10/2016	17:26	8.38	11.74
5/10/2016	17:27	8.25	11.91
5/10/2016	17:28	8.49	11.59
5/10/2016	17:29	8.75	11.40
5/10/2016	17:30	8.72	11.41
5/10/2016	17:31	7.84	12.32
5/10/2016	17:32	7.73	12.35
5/10/2016	17:33	7.97	12.22
5/10/2016	17:34	8.55	11.52
5/10/2016	17:35	9.41	10.76
5/10/2016	17:36	8.42	11.73
5/10/2016	17:37	8.32	11.79
5/10/2016	17:38	8.60	11.56
5/10/2016	17:39	8.48	11.62
5/10/2016	17:40	8.23	11.94
5/10/2016	17:41	8.28	11.87
5/10/2016	17:42	8.33	11.82
5/10/2016	17:43	8.49	11.58
5/10/2016	17:44	8.99	11.18
5/10/2016	17:45	8.66	11.51
5/10/2016	17:46	8.01	12.15
5/10/2016	17:47	7.78	12.39
5/10/2016	17:48	7.81	12.27
5/10/2016	17:49	8.28	11.87
5/10/2016	17:50	8.62	11.49
5/10/2016	17:51	9.15	10.99
5/10/2016	17:52	8.85	11.30
5/10/2016	17:53	9.24	10.86

5/10/2016	17:54	9.05	11.07
5/10/2016	17:55	8.42	11.76
5/10/2016	17:56	8.15	11.97
5/10/2016	17:57	8.01	12.12
5/10/2016	17:58	8.19	11.91
5/10/2016	17:59	9.10	10.97
5/10/2016	18:00	9.16	11.03
5/10/2016	18:01	8.53	11.59
5/10/2016	18:02	8.53	11.60
5/10/2016	18:03	8.01	12.17
5/10/2016	18:04	8.02	12.06
5/10/2016	18:05	8.43	11.69
5/10/2016	18:06	7.97	12.16
5/10/2016	18:07	8.91	11.17
5/10/2016	18:08	9.47	10.68
5/10/2016	18:09	8.80	11.35
5/10/2016	18:10	8.42	11.72
5/10/2016	18:11	8.18	11.98
5/10/2016	18:12	8.39	11.73
5/10/2016	18:13	8.61	11.54
5/10/2016	18:14	8.45	11.71
5/10/2016	18:15	8.56	11.55
5/10/2016	18:16	8.80	11.35
5/10/2016	18:17	8.10	12.07
5/10/2016	18:18	8.63	11.51
5/10/2016	18:19	8.74	11.39
5/10/2016	18:20	8.95	11.20
5/10/2016	18:21	8.17	11.95
5/10/2016	18:22	8.80	11.32
5/10/2016	18:23	9.18	10.93
5/10/2016	18:24	9.01	11.15
5/10/2016	18:25	8.58	11.56
4-HCL O2 CO2 Average		8.57	11.58
5/10/2016	18:26	8.34	11.77
5/10/2016	18:27	8.98	11.10
5/10/2016	18:28	9.28	10.91
5/10/2016	18:29	8.77	11.34
5/10/2016	18:30	8.77	11.35
5/10/2016	18:31	8.36	11.83
5/10/2016	18:32	7.77	12.33
5/10/2016	18:33	8.61	11.50
5/10/2016	18:34	8.80	11.34
5/10/2016	18:35	8.43	11.68
5/10/2016	18:36	8.71	11.44
5/10/2016	18:37	8.18	11.95
5/10/2016	18:38	8.26	11.87
5/10/2016	18:39	8.28	11.87
5/10/2016	18:40	9.44	10.65
5/10/2016	18:41	9.49	10.67

5/10/2016	18:42	9.20	10.99
5/10/2016	18:43	8.07	12.14
5/10/2016	18:44	8.40	11.73
5/10/2016	18:45	8.41	11.72
5/10/2016	18:46	8.71	11.40
5/10/2016	18:47	8.95	11.22
5/10/2016	18:48	8.07	12.13
5/10/2016	18:49	7.91	12.23
5/10/2016	18:50	8.44	11.68
5/10/2016	18:51	8.70	11.44
5/10/2016	18:52	8.42	11.74
5/10/2016	18:53	8.33	11.82
5/10/2016	18:54	8.31	11.75
5/10/2016	18:55	8.93	11.26
5/10/2016	18:56	8.34	11.79
5/10/2016	18:57	8.56	11.56
5/10/2016	18:58	8.21	11.92
5/10/2016	18:59	8.53	11.57
5/10/2016	19:00	8.63	11.46
5/10/2016	19:01	8.94	11.18
5/10/2016	19:02	8.28	11.83
5/10/2016	19:03	9.23	10.90
5/10/2016	19:04	8.61	11.52
5/10/2016	19:05	8.61	11.54
5/10/2016	19:06	8.62	11.47
5/10/2016	19:07	8.52	11.66
5/10/2016	19:08	8.19	11.99
5/10/2016	19:09	7.71	12.42
5/10/2016	19:10	7.97	12.15
5/10/2016	19:11	8.93	11.19
5/10/2016	19:12	9.01	11.19
5/10/2016	19:13	8.20	11.92
5/10/2016	19:14	8.27	11.94
5/10/2016	19:15	8.37	11.72
5/10/2016	19:16	8.27	11.93
5/10/2016	19:17	8.02	12.18
5/10/2016	19:18	7.55	12.56
5/10/2016	19:19	8.49	11.64
5/10/2016	19:20	9.05	11.12
5/10/2016	19:21	8.58	11.57
5/10/2016	19:22	8.81	11.34
5/10/2016	19:23	8.59	11.62
5/10/2016	19:24	8.35	11.76
5/10/2016	19:25	8.95	11.19
5/10/2016	19:26	8.74	11.42
5/10/2016	19:27	8.63	11.55
5/10/2016	19:28	8.07	12.01
5/10/2016	19:29	8.96	11.20
5/10/2016	19:30	8.97	11.19

5/10/2016	19:31	8.71	11.40	
5/10/2016	19:32	8.23	11.94	
5/10/2016	19:33	7.63	12.54	
3-HG-O2 CO2 Average		8.55	11.60	
5/10/2016	19:34	7.76	12.34	
5/10/2016	19:35	10.21	10.38	
5/10/2016	19:36	10.67	10.20	O2 CO2 Bias
5/10/2016	19:37	2.97	2.33	
5/10/2016	19:38	0.05	0.06	Zero Bias
5/10/2016	19:39	0.04	0.05	Zero
5/10/2016	19:40	9.28	8.76	
5/10/2016	19:41	10.74	10.27	Span
5/10/2016	19:42	17.85	17.22	
5/10/2016	19:43	18.90	18.52	High
5/10/2016	19:44	18.90	18.52	

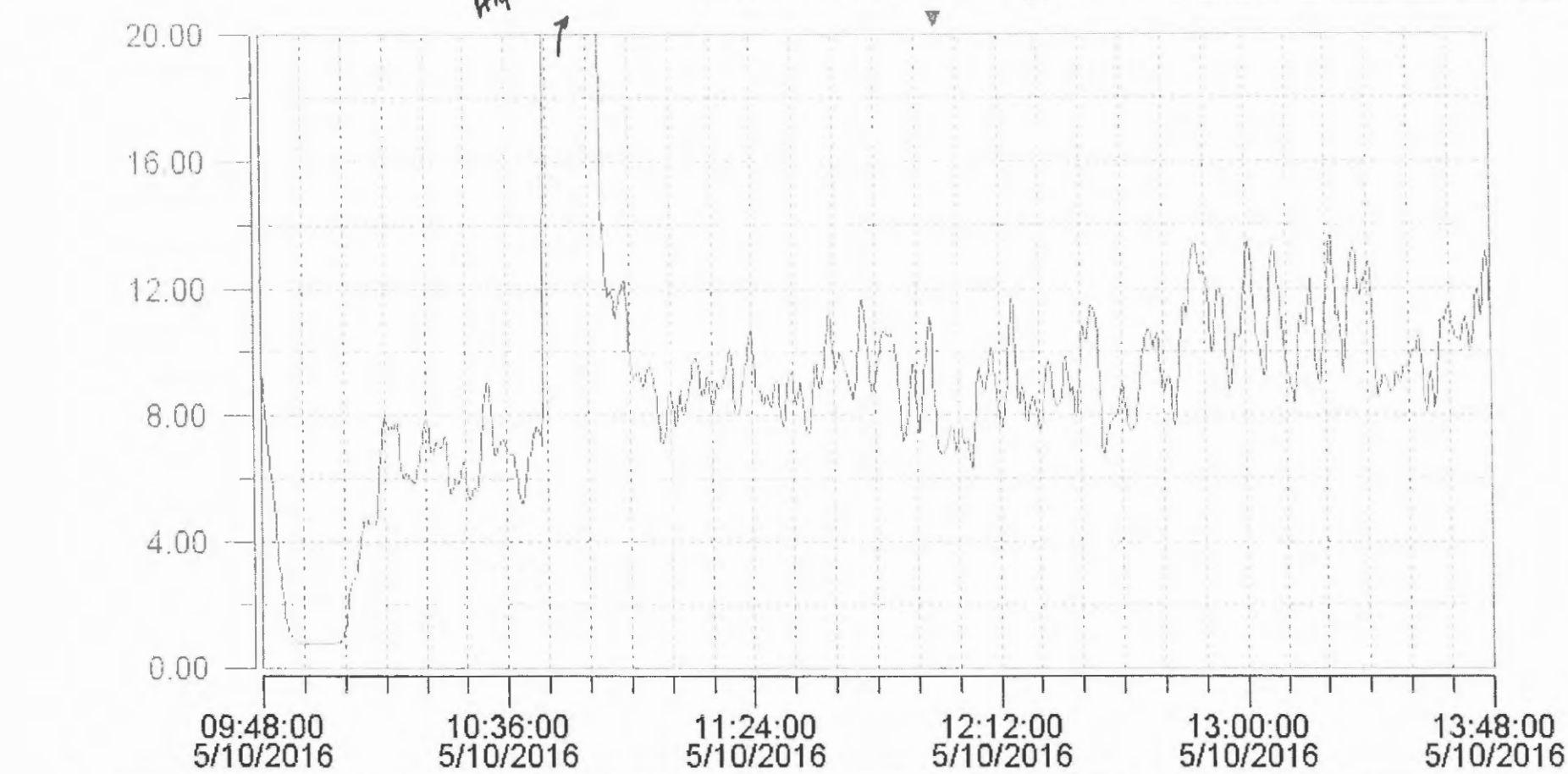
BLR #2 SO2 & NOX

Hist | Info

1.	AVG	AIC-8011.C_AOUTP~	***	5.	AVG	FIC-2753.C_AOUTP~	***
2.	AVG	AIC-8011.C_ASP	***	6.	AVG	FIC-2753.C_ASP	***
3.	AVG	AIC-8011.C_APV	7.14 x	7.	AVG	FIC-2753.C_APV	***
4.	AVG	SI-2345.C_APV	***	8.	AVG	FI-2753.C_APV	***

High cal @ 7 lb/hr

Time at arrow: 12:00:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 30 of 212

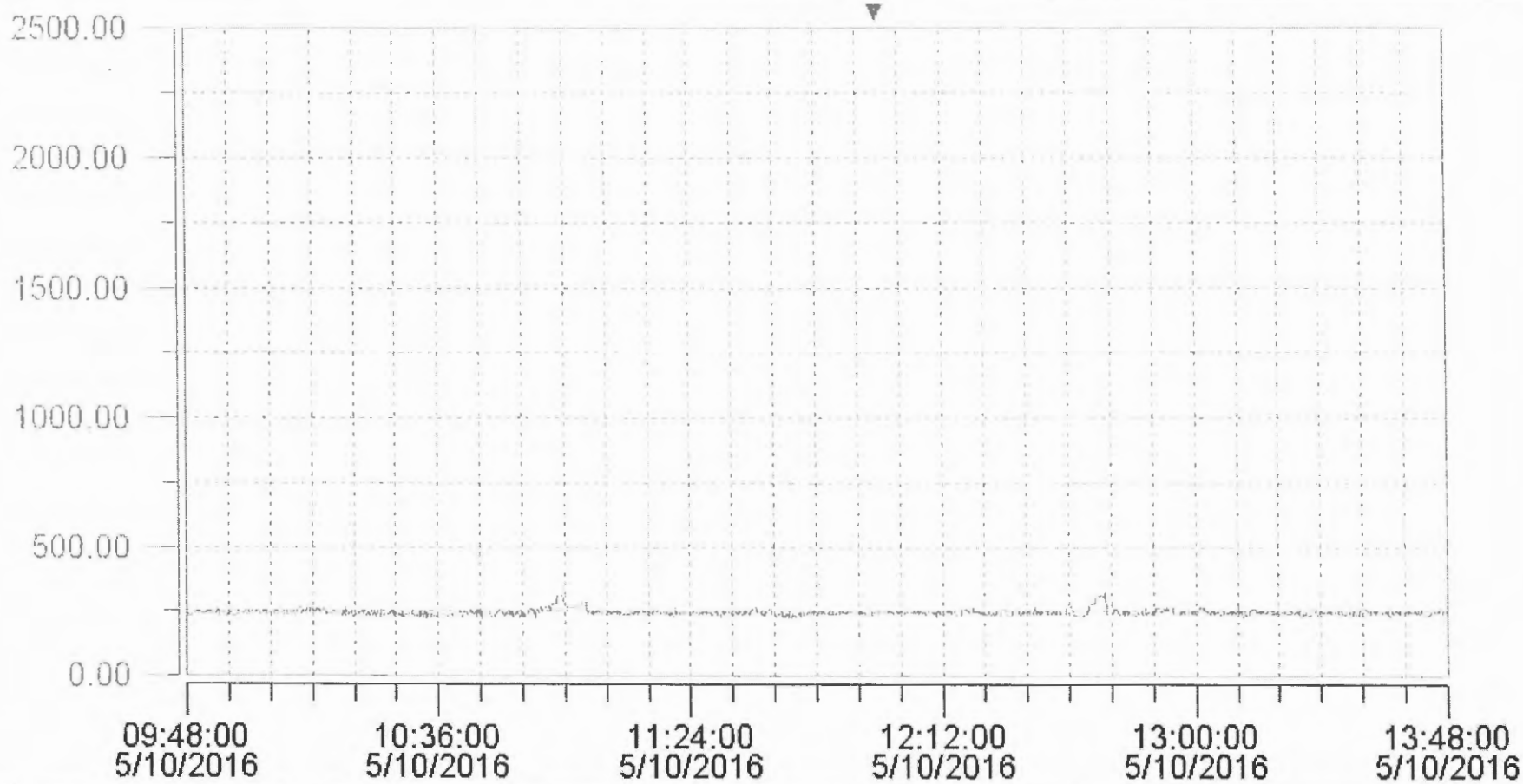
BLR #2 SO2 & NOX

Hist | Info

1.	AVG	AIC-8011.C_AOUTP~	***	5.	AVG	FIC-2753.C_AOUTP~	***
2.	AVG	AIC-8011.C_ASP	***	6.	AVG	FIC-2753.C_ASP	***
3.	AVG	AIC-8011.C_APV	***	7.	AVG	FIC-2753.C_APV	***
4.	AVG	SI-2345.C_APV	249.12 x	8.	AVG	FI-2753.C_APV	***

* LIMESTONE FEEDRATE

Time at arrow: 12:00:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 33 of 215

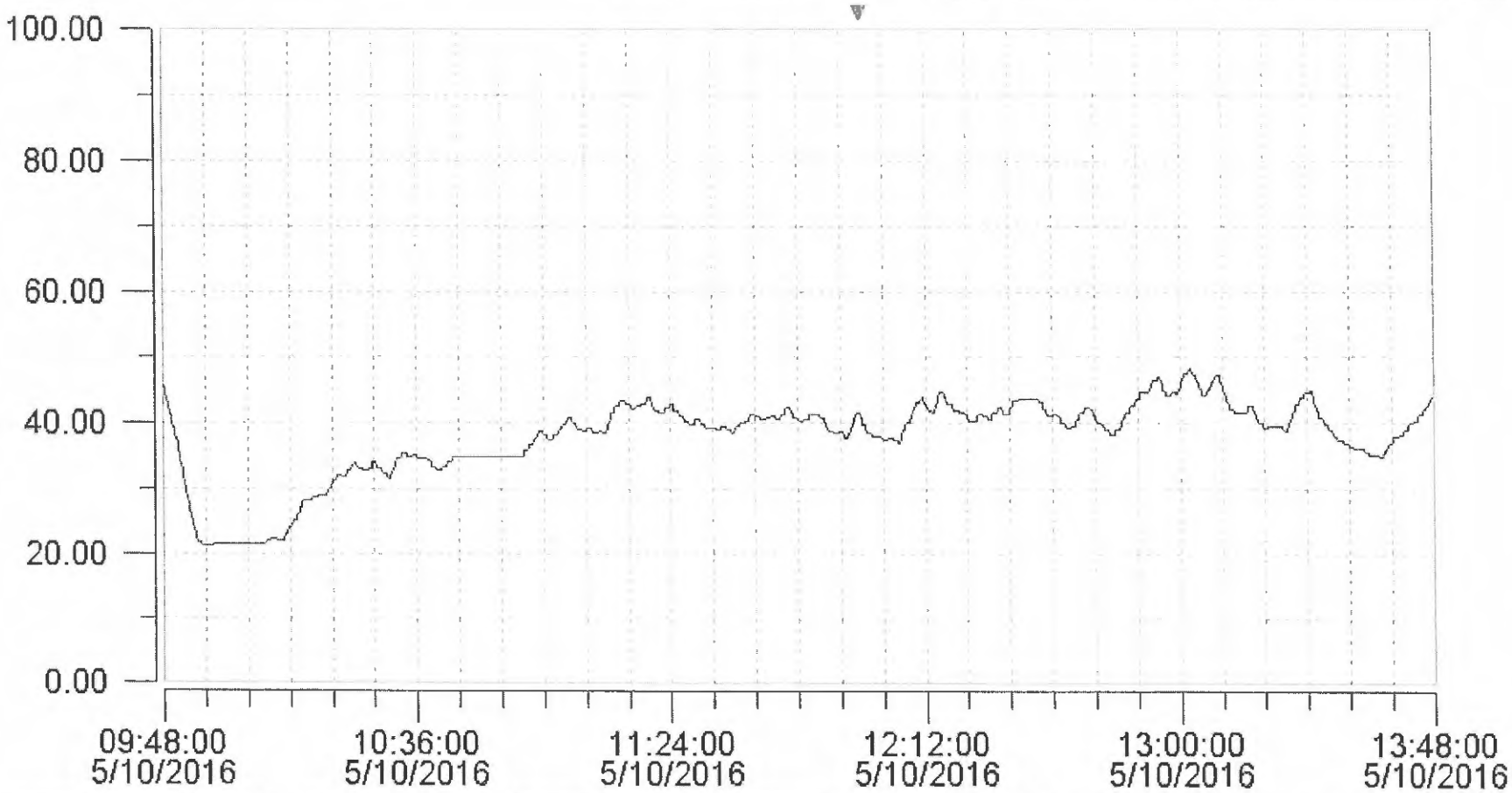
BLR #2 SO2 & NOX

Hist | Info

1.	AVG	AIC-8011.C_AOUTP~	***	5.	AVG	FIC-2753.C_AOUTP~	***
2.	AVG	AIC-8011.C_ASP	***	6.	AVG	FIC-2753.C_ASP	***
3.	AVG	AIC-8011.C_APV	***	7.	AVG	FIC-2753.C_APV	***
4.	AVG	SI-2345.C_APV	***	8.	AVG	FI-2753.C_APV	40.70 x

✳ AMMONIA INJECTION FLOW

Time at arrow: 12:00:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 29 of 211

BLR #2 SO2 & NOX

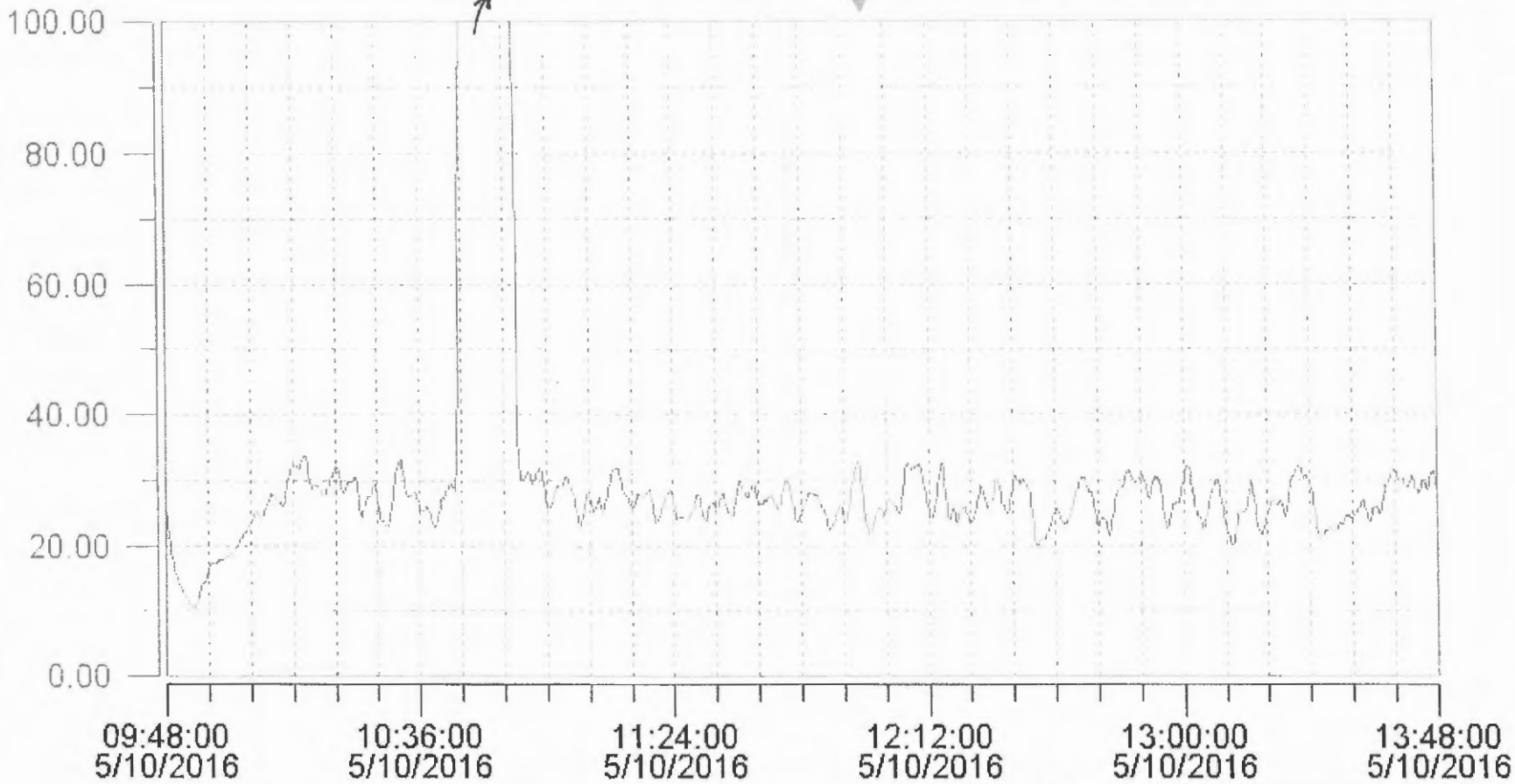
Hist | Info

1.	AVG	AIC-8011.C_AOUTP~	***	5.	AVG	FIC-2753.C_AOUTP~	***
2.	AVG	AIC-8011.C_ASP	***	6.	AVG	FIC-2753.C_ASP	***
3.	AVG	AIC-8011.C_APV	***	7.	AVG	FIC-2753.C_APV	24.52 x
4.	AVG	SI-2345.C_APV	***	8.	AVG	FI-2753.C_APV	***

High Cal @ 158 lb/hr

*NOX LB/HR

Time at arrow: 12:00:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 29 of 211

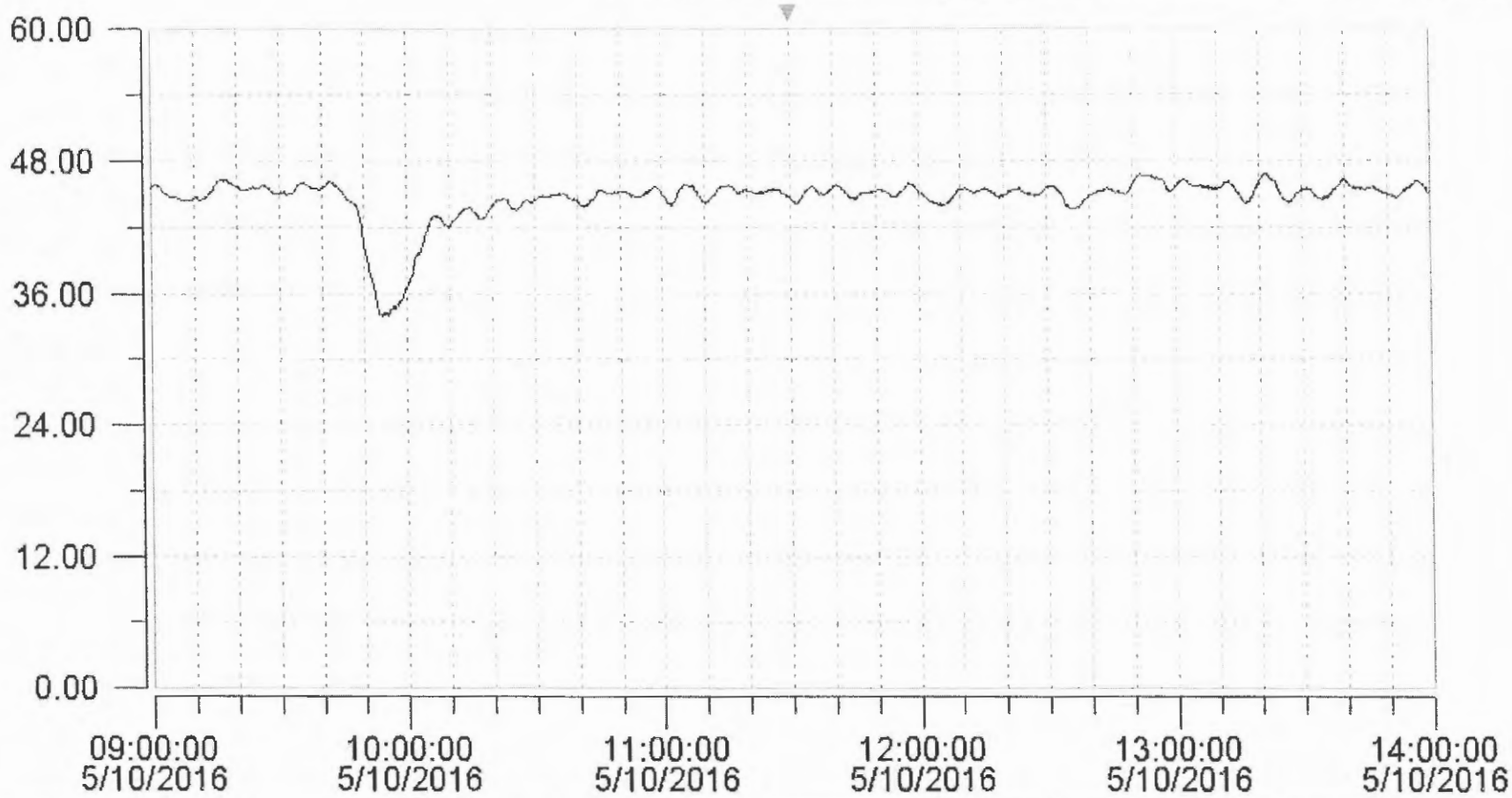
STM FDW TG VALVE 4

Hist | Info

1.	AVG	FI-2040.C_APV	***	5.	AVG	EX-MW.C_APV	***
2.	AVG	FI-2001.C_APV	***	6.	AVG	AI-GOV4.C_APV	***
3.	AVG	FDI-2001.C_APV	***	7.	AVG	FDI-2001.C_APV	***
4.	AVG	FI-2006.C_APV	***	8.	AVG	EX-NMW.C_APV	44.56 x

✳NET MW

Time at arrow: 11:30:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 23 of 169

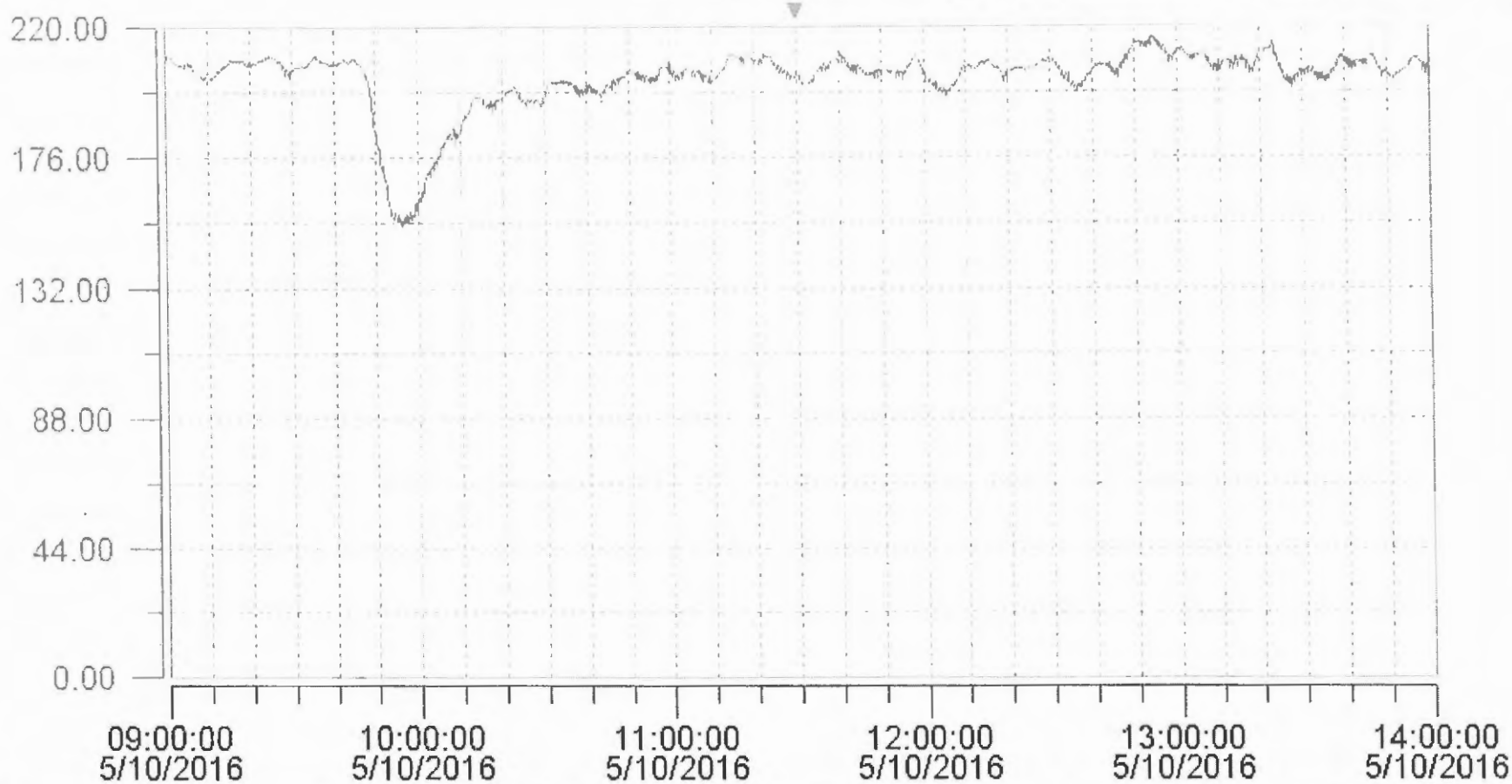
STM FDW TG VALVE 4

Hist | Info

1.	AVG		FI-2040.C_APV	203.64 x	5.	AVG		EX-MW.C_APV	***
2.	AVG		FI-2001.C_APV	***	6.	AVG		AI-GOV4.C_APV	***
3.	AVG		FDI-2001.C_APV	***	7.	AVG		FDI-2001.C_APV	***
4.	AVG		FI-2006.C_APV	***	8.	AVG		EX-NMW.C_APV	***

✳ STM FLW

Time at arrow: 11:30:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 23 of 169

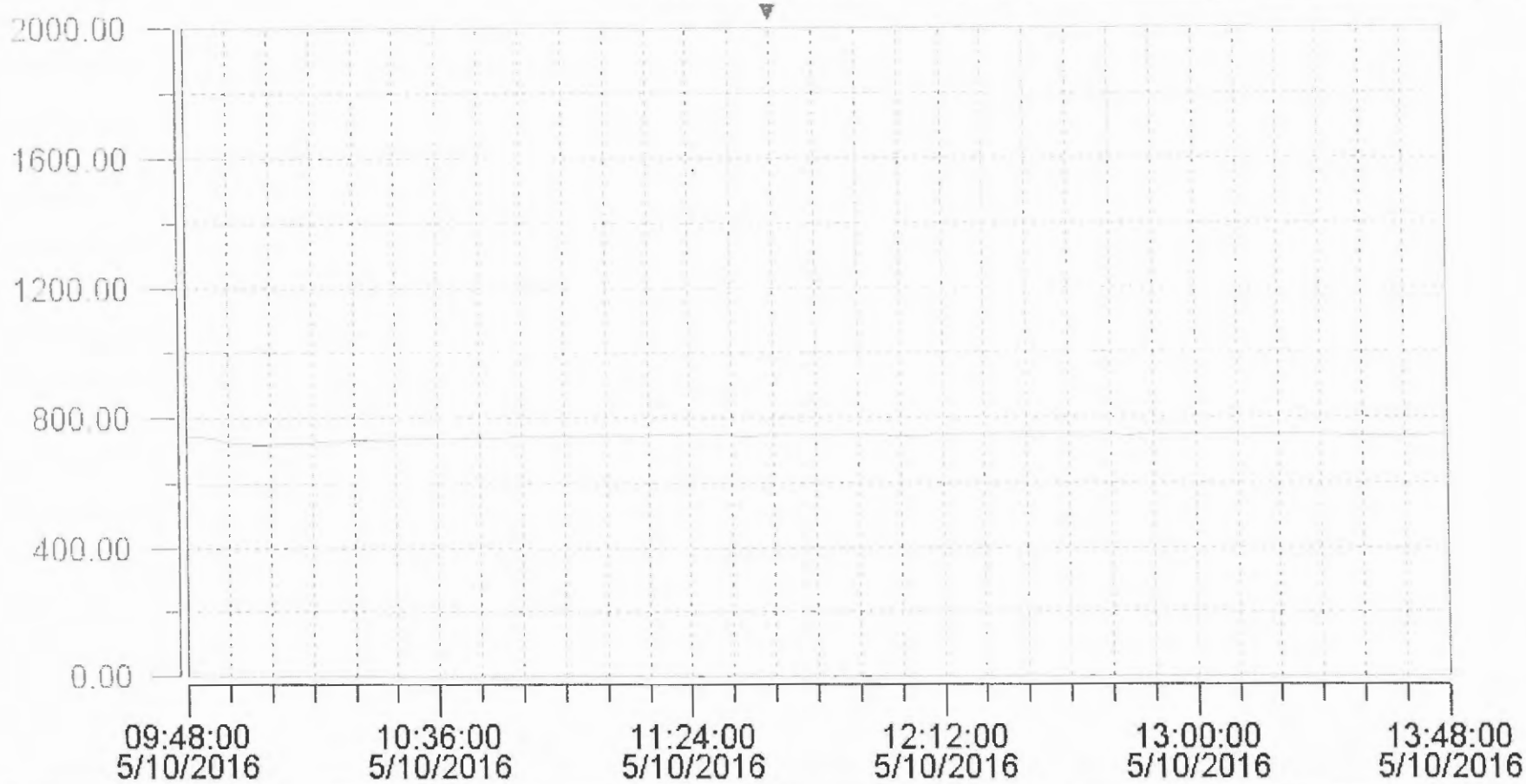
UNIT #2 TEMPERATURES

Hist | Info

1.	AVG		TI-2405.C_APV	***	5.	AVG		TI-2123.C_APV	***
2.	AVG		TI-2419.C_APV	***	6.	AVG		TI-2427.C_APV	***
3.	AVG		TI-2421.C_APV	***	7.	AVG		FI-2753.C_APV	***
4.	AVG		TI-2126.C_APV	747.33 x	8.	AVG		HIC-2000.C_APV	***

* BACKPASS

Time at arrow: 11:40:00 5/10/2016



1: 2.00 | Zoom | Reset | Resume | S. 32 of 214

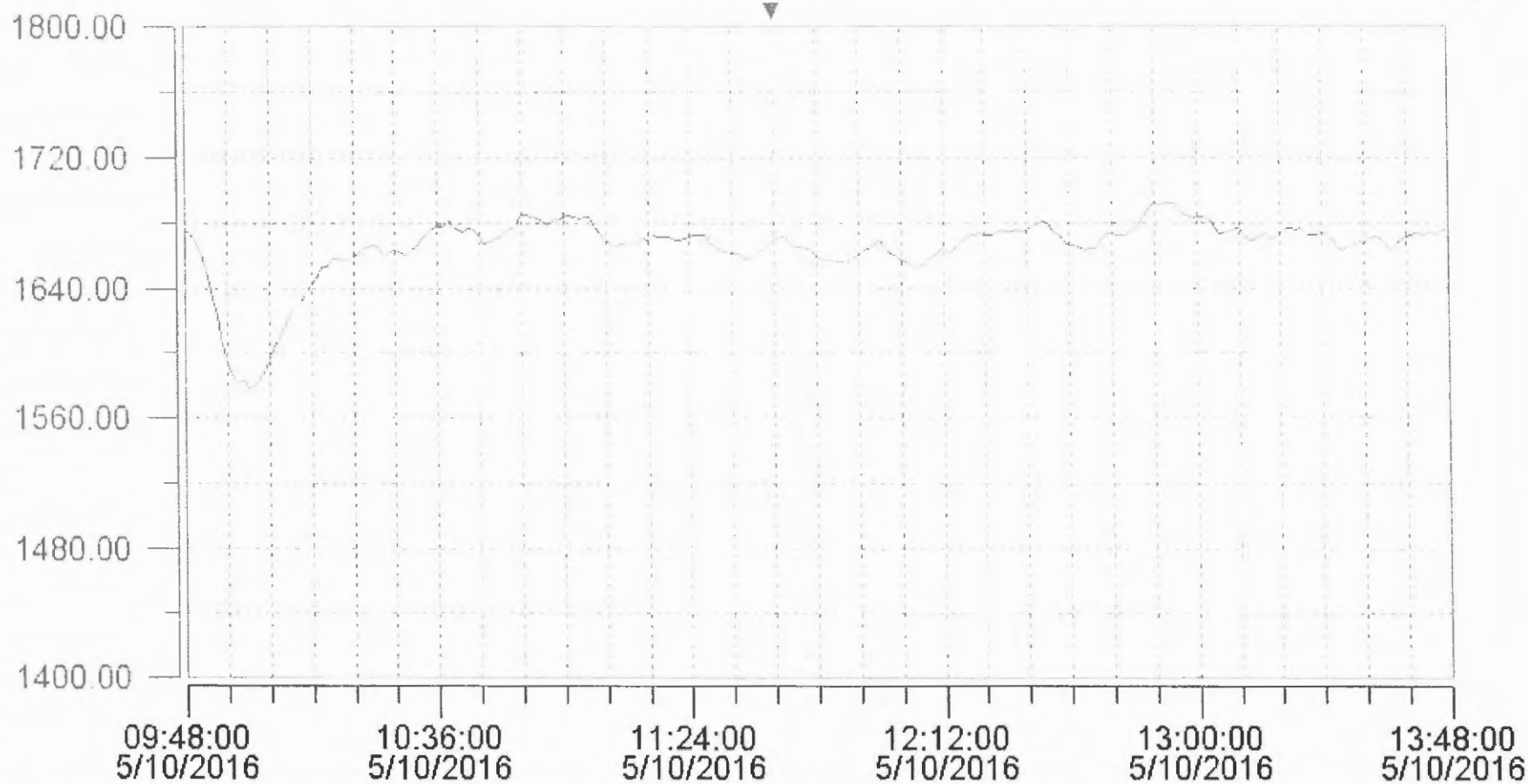
UNIT #2 TEMPERATURES

Hist | Info

1.	AVG		TI-2405.C_APV	1669.25 x	5.	AVG		TI-2123.C_APV	***
2.	AVG		TI-2419.C_APV	***	6.	AVG		TI-2427.C_APV	***
3.	AVG		TI-2421.C_APV	***	7.	AVG		FI-2753.C_APV	***
4.	AVG		TI-2126.C_APV	***	8.	AVG		HIC-2000.C_APV	***

✳MID COMBUSTOR

Time at arrow: 11:40:00 5/10/2016



1: 2.00 | Zoom | Reset | Resume | S. 32 of 214

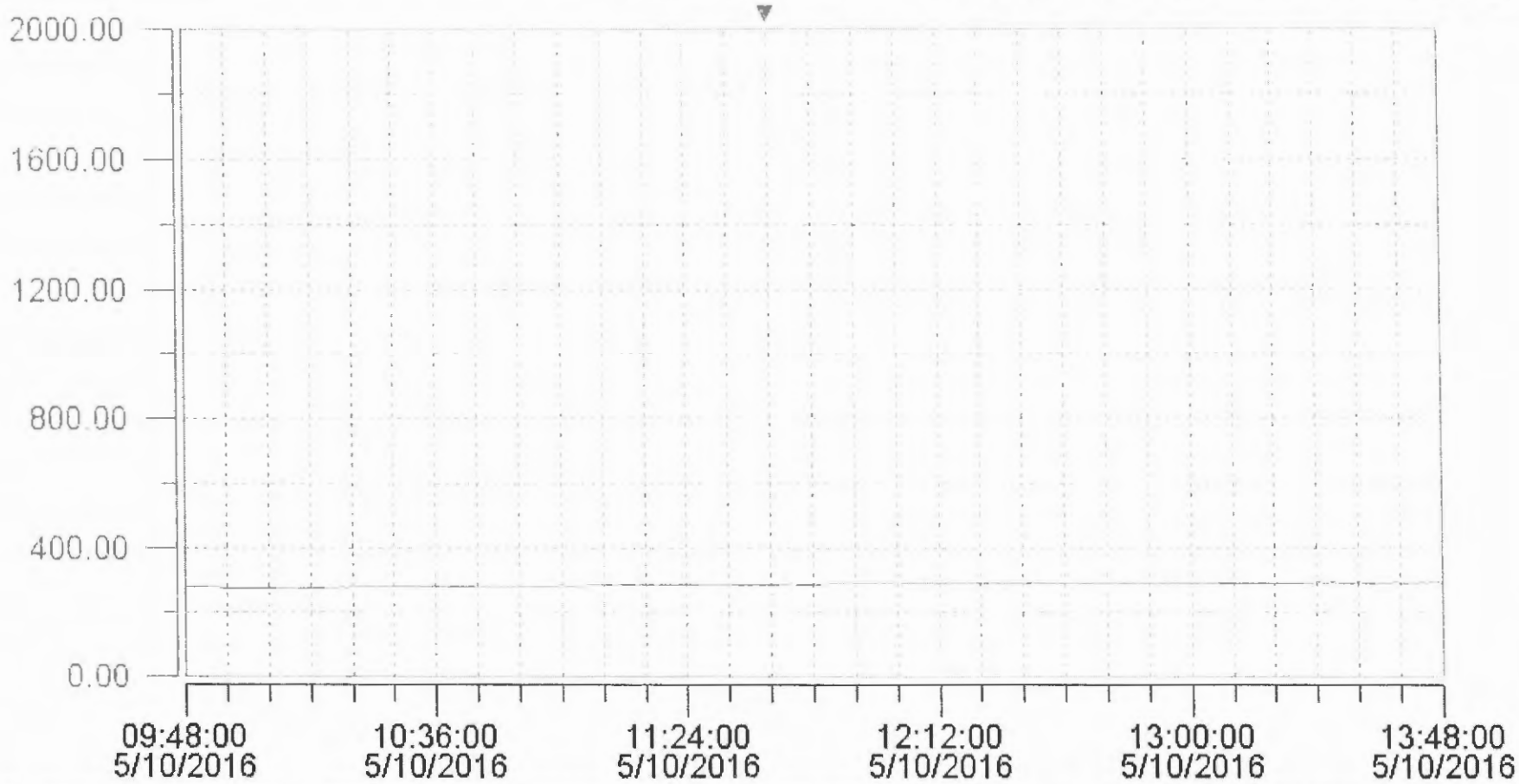
UNIT #2 TEMPERATURES

Hist | Info

1.	AVG		TI-2405.C_APV	***	5.	AVG		TI-2123.C_APV	286.67 x
2.	AVG		TI-2419.C_APV	***	6.	AVG		TI-2427.C_APV	***
3.	AVG		TI-2421.C_APV	***	7.	AVG		FI-2753.C_APV	***
4.	AVG		TI-2126.C_APV	***	8.	AVG		HIC-2000.C_APV	***

*BAGHOUSE INLET

Time at arrow: 11:40:00 5/10/2016



1: 2.00 | Zoom | Reset | Resume | S. 30 of 212

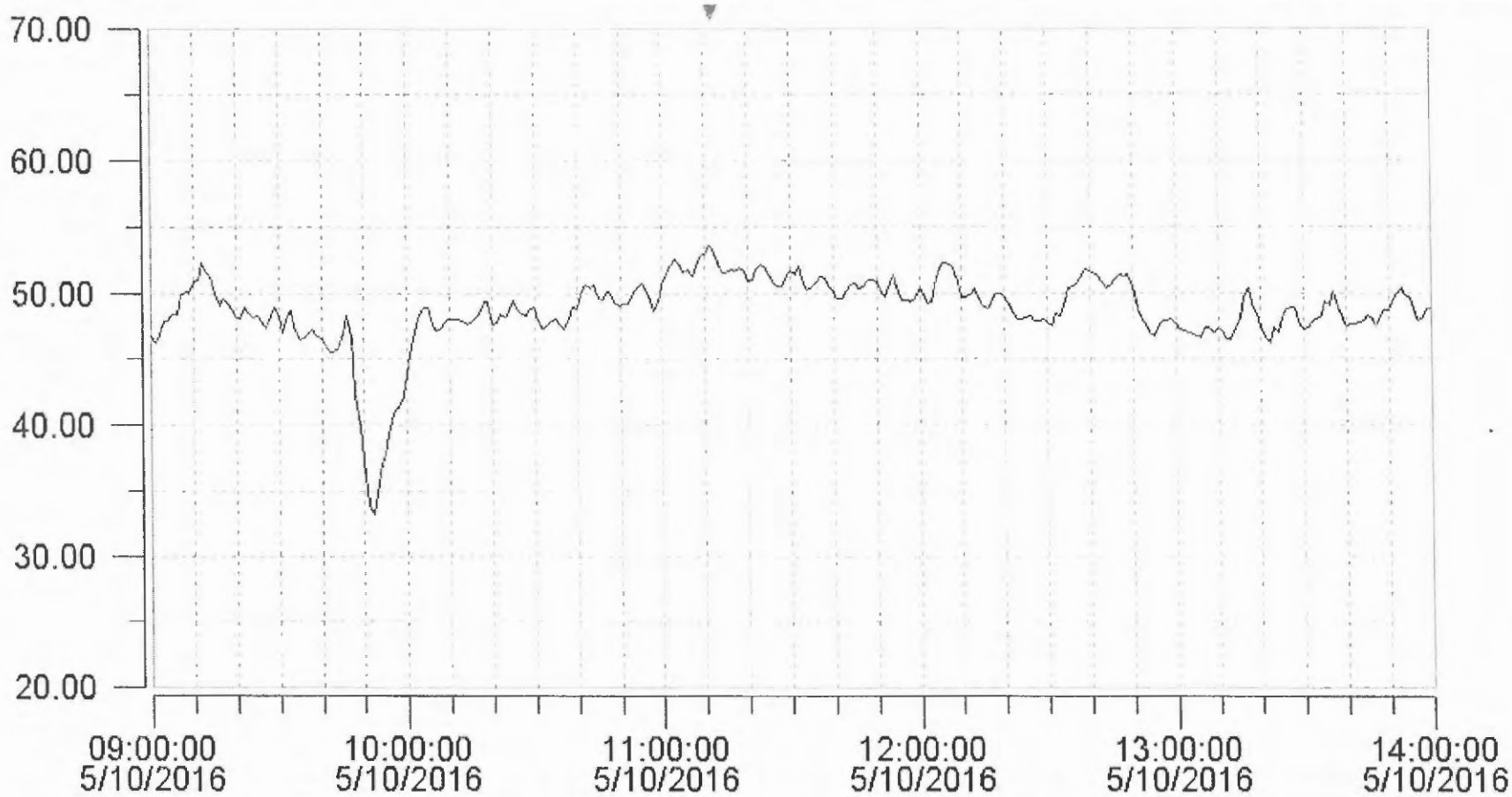
RECLAIMERS

Hist | Info

1.	AVG	FIC-6103.C_AOUTP~	***	5.	AVG	FI2-6105.C_APV	***
2.	AVG	FIC-6102.C_AOUTP~	***	6.	AVG	FI2-6120.C_APV	***
3.	AVG	II-6102.C_APV	***	7.	AVG	FI2-6120-1.C_APV	***
4.	AVG	ZI-6121.C_APV	***	8.	AVG	FI2-6103.C_APV	53.23 x

✳ BOILER WOOD FLOW

Time at arrow: 11:12:00 5/10/2016



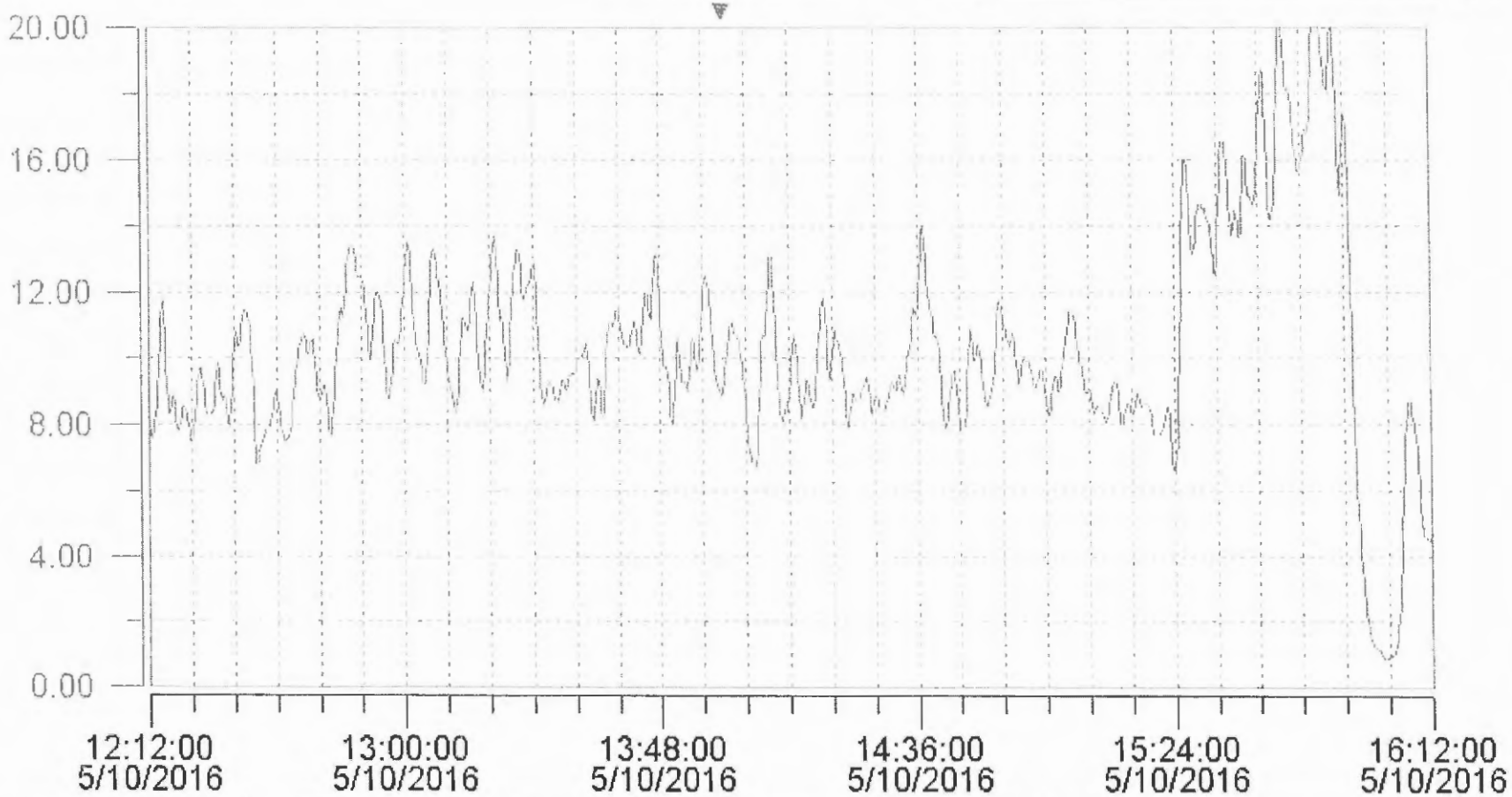
1: 5.00 | Zoom | Reset | Resume | S. 23 of 169

BLR #2 SO2 & NOX

Hist | Info

1.	AVG	AIC-8011.C_AOUTP~	***	5.	AVG	FIC-2753.C_AOUTP~	***
2.	AVG	AIC-8011.C_ASP	***	6.	AVG	FIC-2753.C_ASP	***
3.	AVG	AIC-8011.C_APV	9.60 x	7.	AVG	FIC-2753.C_APV	***
4.	AVG	SI-2345.C_APV	***	8.	AVG	FI-2753.C_APV	***

Time at arrow: 14:00:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 31 of 211

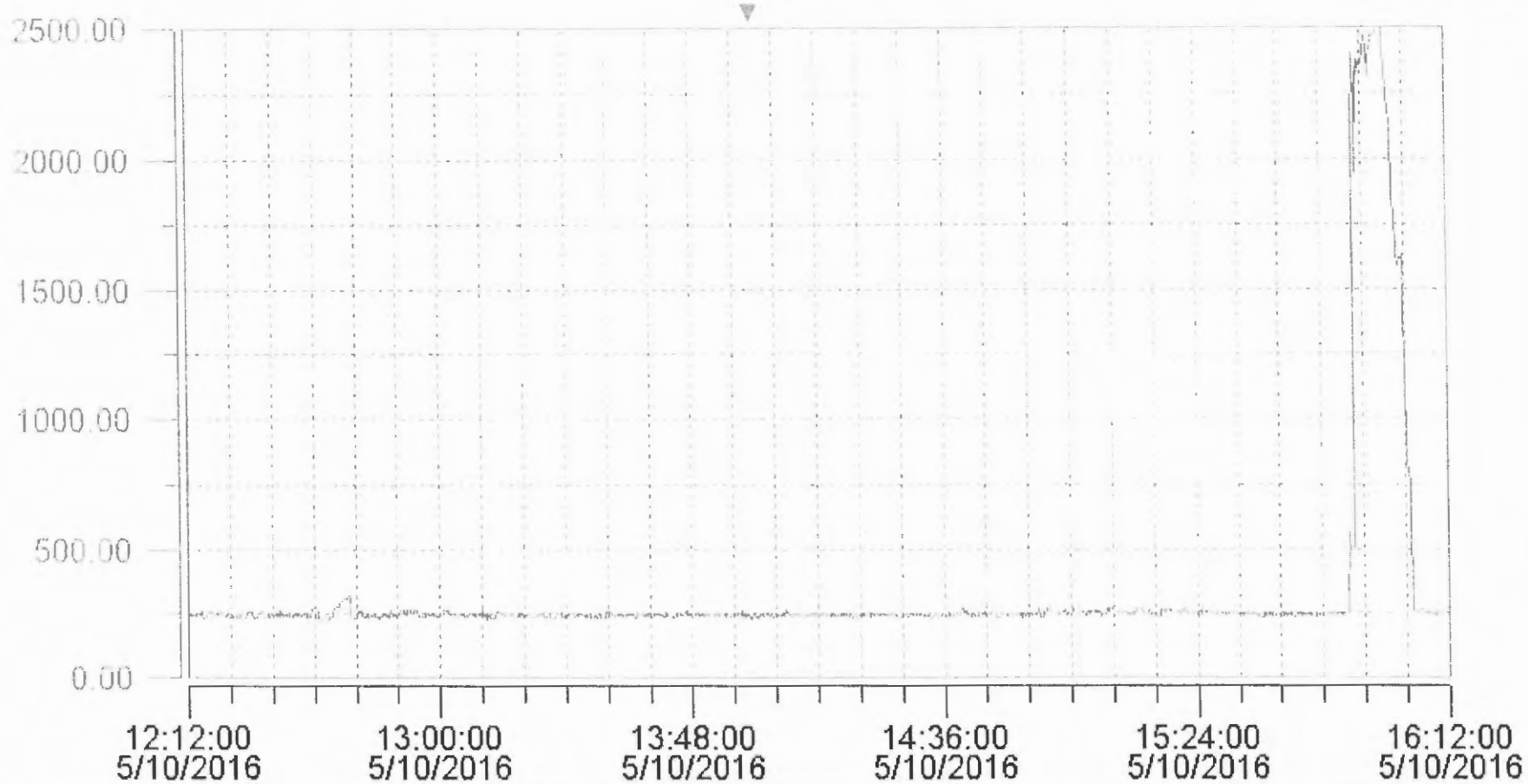
BLR #2 SO2 & NOX

Hist | Info

1.	AVG	AIC-8011.C_AOUTP~	***	5.	AVG	FIC-2753.C_AOUTP~	***
2.	AVG	AIC-8011.C_ASP	***	6.	AVG	FIC-2753.C_ASP	***
3.	AVG	AIC-8011.C_APV	***	7.	AVG	FIC-2753.C_APV	***
4.	AVG	SI-2345.C_APV	248.19 x	8.	AVG	FI-2753.C_APV	***

* LIMESTONE FEEDRATE

Time at arrow: 14:00:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 31 of 211

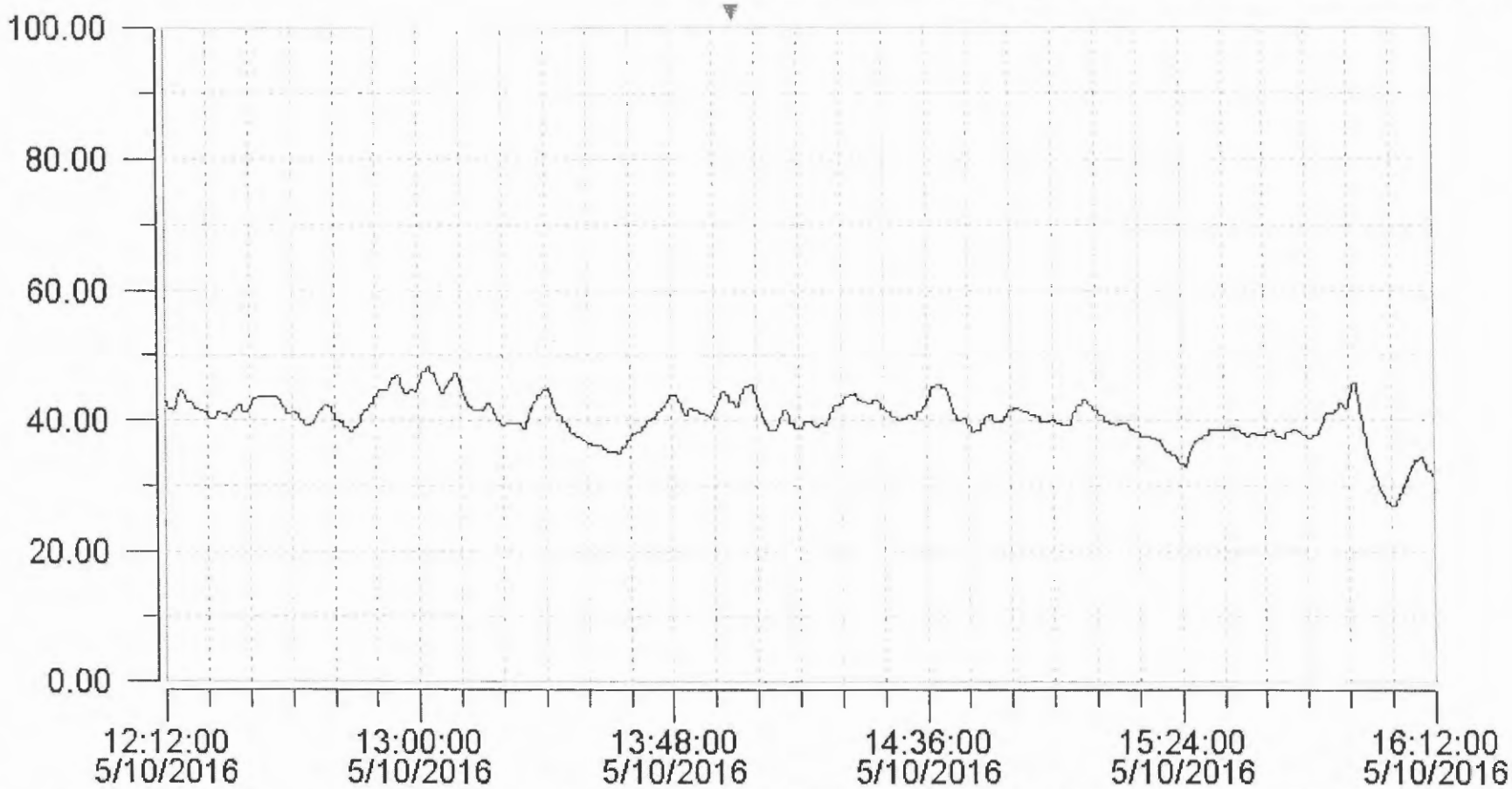
BLR #2 SO2 & NOX

Hist | Info

1.	AVG	AIC-8011.C_AOUTP~	***	5.	AVG	FIC-2753.C_AOUTP~	***
2.	AVG	AIC-8011.C_ASP	***	6.	AVG	FIC-2753.C_ASP	***
3.	AVG	AIC-8011.C_APV	***	7.	AVG	FIC-2753.C_APV	***
4.	AVG	SI-2345.C_APV	***	8.	AVG	FI-2753.C_APV	42.18 x

✳ AMMONIA INJECTION FLOW

Time at arrow: 14:00:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 31 of 211

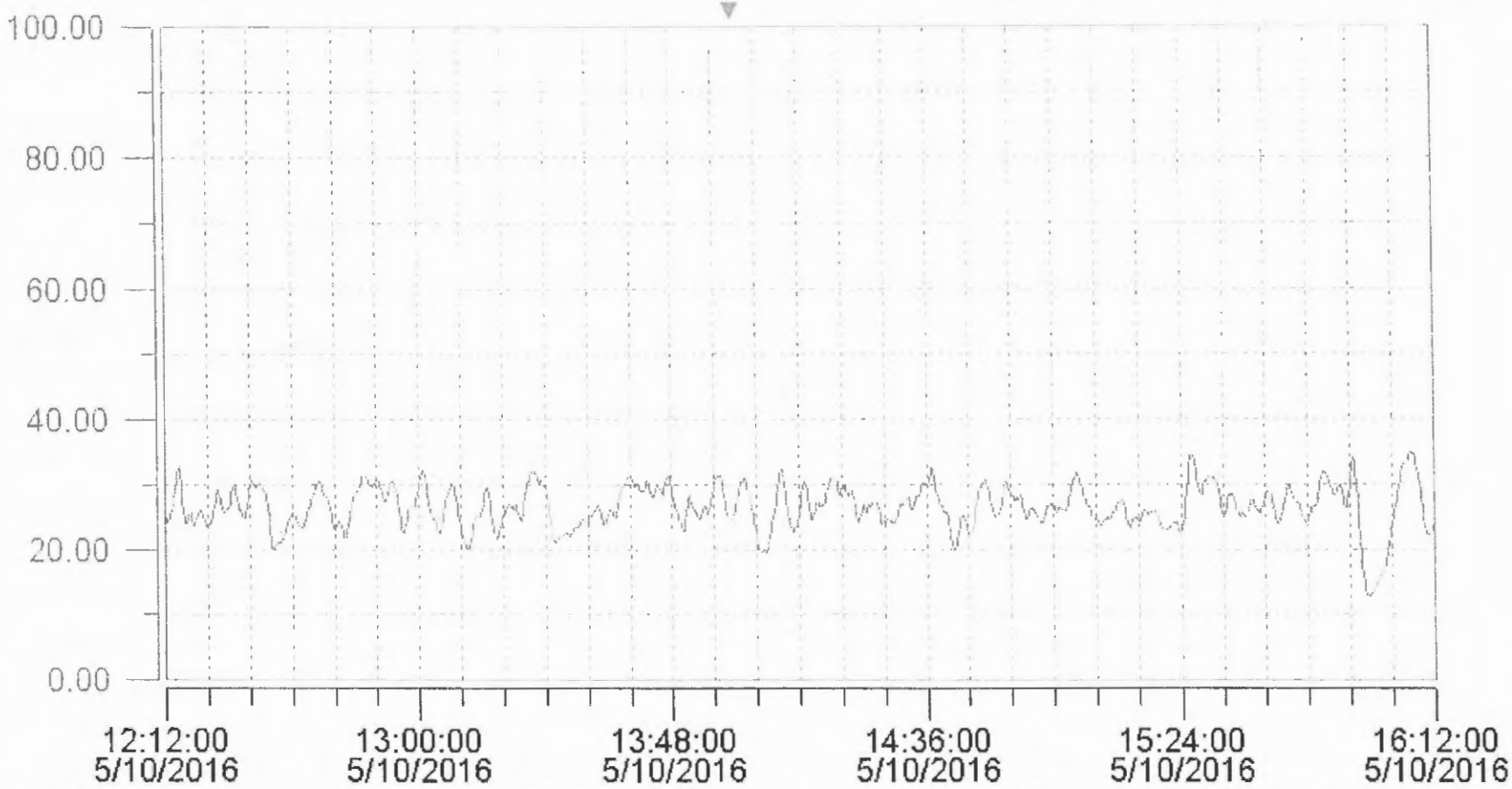
BLR #2 SO2 & NOX

Hist | Info

1.	AVG	AIC-8011.C_AOUTP~	***	5.	AVG	FIC-2753.C_AOUTP~	***
2.	AVG	AIC-8011.C_ASP	***	6.	AVG	FIC-2753.C_ASP	***
3.	AVG	AIC-8011.C_APV	***	7.	AVG	FIC-2753.C_APV	26.80 x
4.	AVG	SI-2345.C_APV	***	8.	AVG	FI-2753.C_APV	***

✳ NOX LB/HR

Time at arrow: 14:00:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 31 of 211

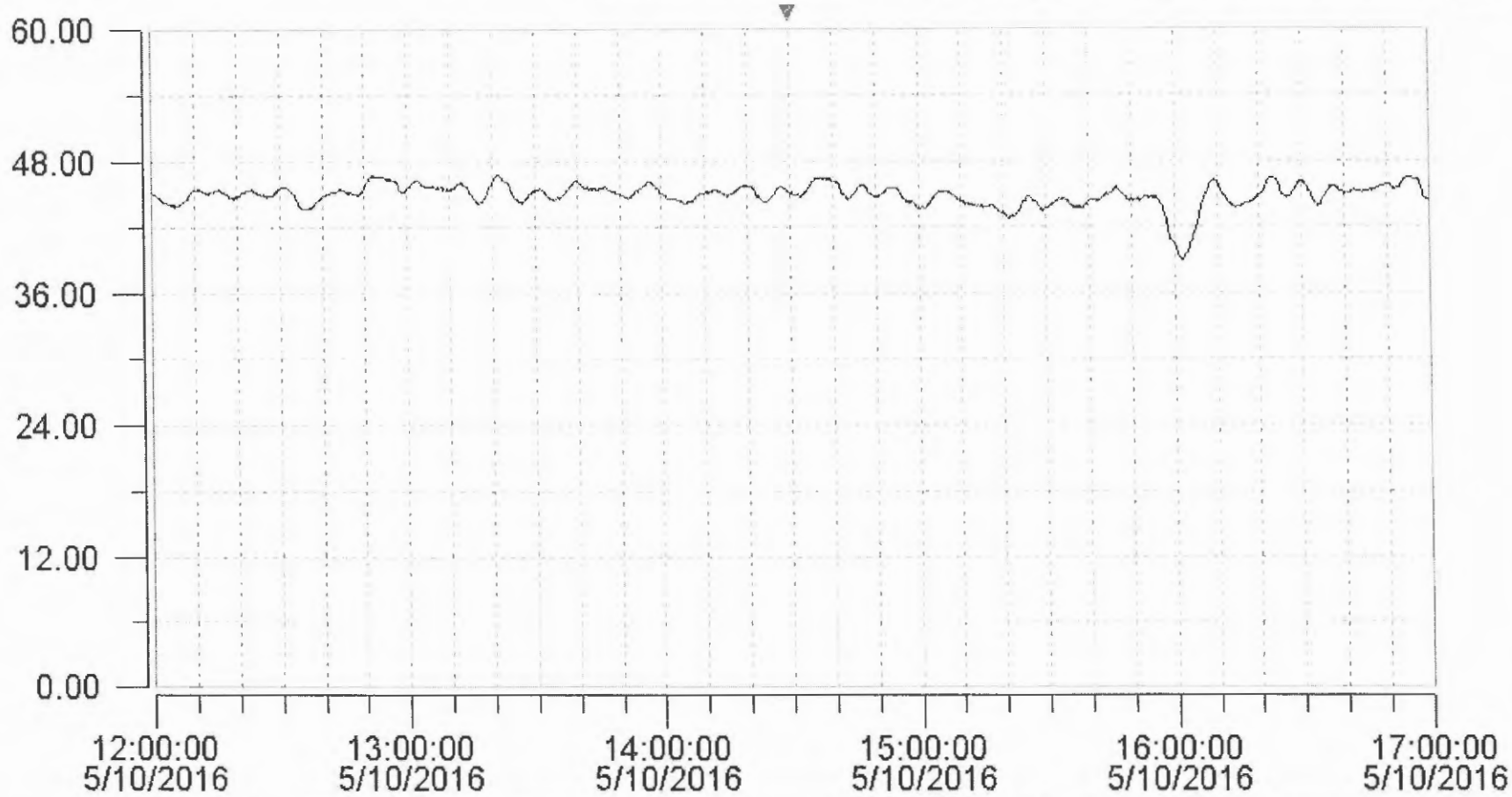
STM FDW TG VALVE 4

Hist | Info

1.	AVG	FI-2040.C_APV	***	5.	AVG	EX-MW.C_APV	***
2.	AVG	FI-2001.C_APV	***	6.	AVG	AI-GOV4.C_APV	***
3.	AVG	FDI-2001.C_APV	***	7.	AVG	FDI-2001.C_APV	***
4.	AVG	FI-2006.C_APV	***	8.	AVG	EX-NMW.C_APV	45.03 x

*NET MW

Time at arrow: 14:30:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 25 of 169

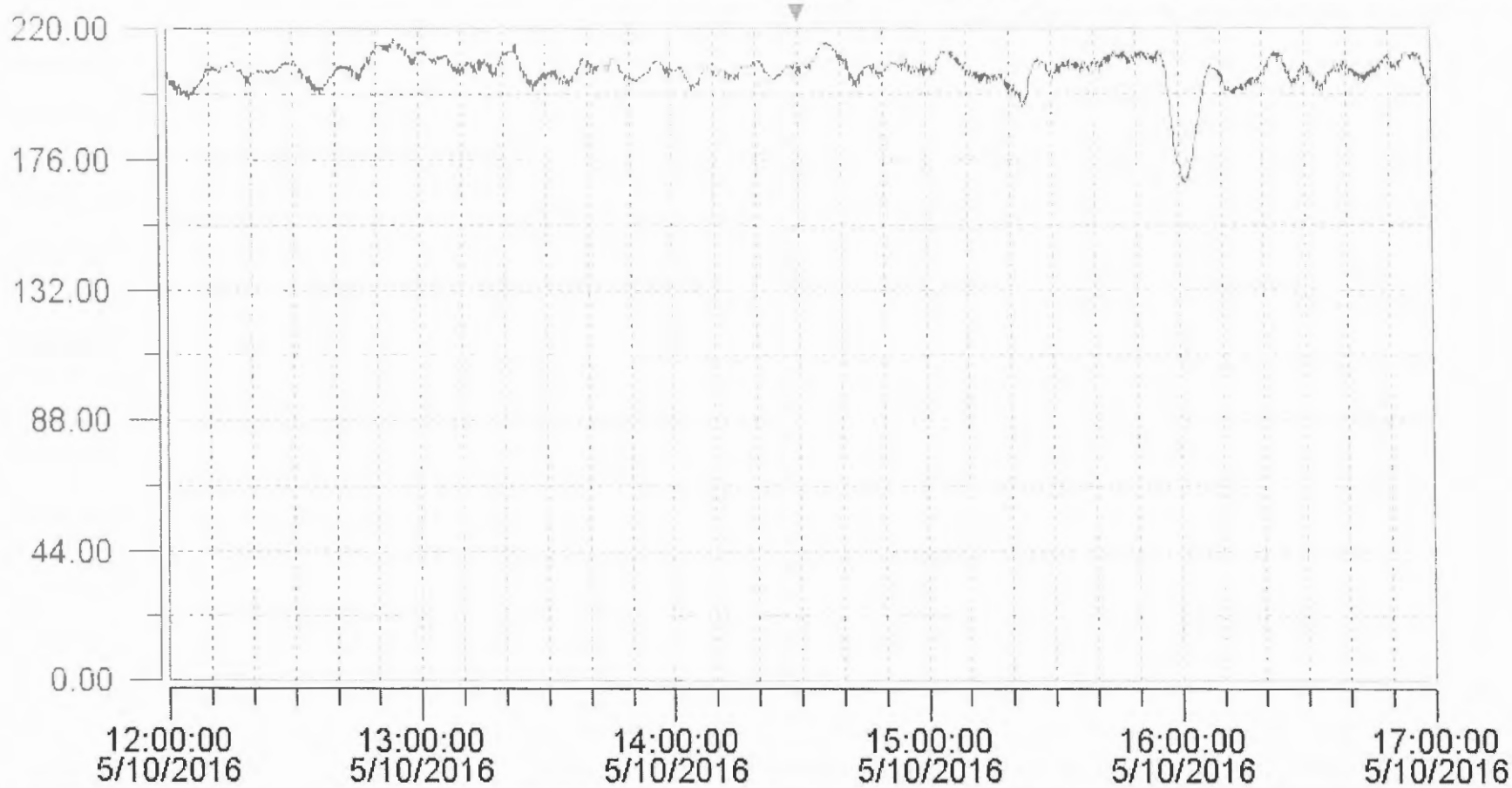
STM FDW TG VALVE 4

Hist | Info

1.	AVG		FI-2040.C_APV	207.39 x	5.	AVG		EX-MW.C_APV	***
2.	AVG		FI-2001.C_APV	***	6.	AVG		AI-GOV4.C_APV	***
3.	AVG		FDI-2001.C_APV	***	7.	AVG		FDI-2001.C_APV	***
4.	AVG		FI-2006.C_APV	***	8.	AVG		EX-NMW.C_APV	***

STM FLW

Time at arrow: 14:30:00 5/10/2016



1: 1.00 | Zoom | Reset | Resume | S. 25 of 169

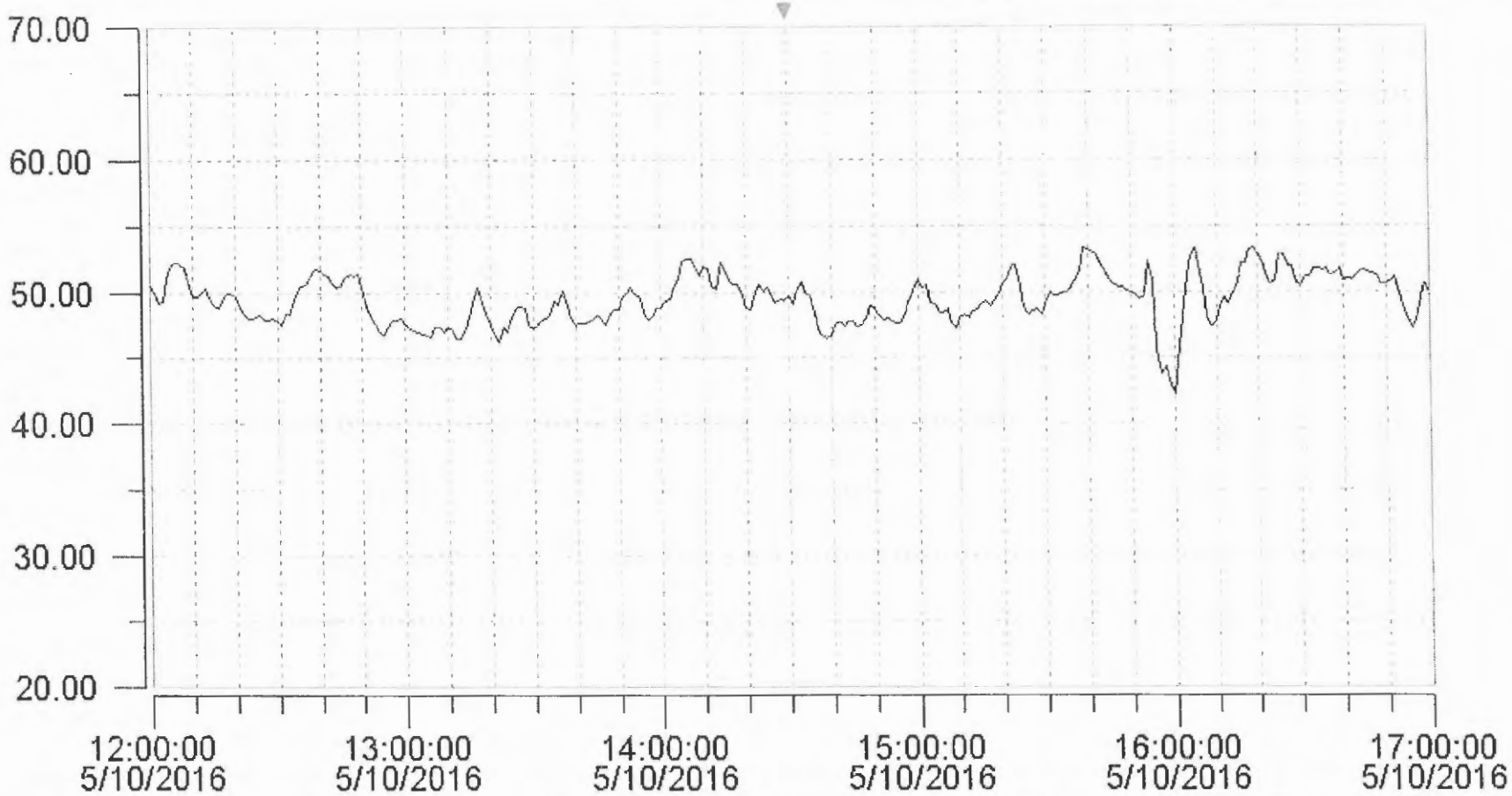
RECLAIMERS

Hist | Info

1.	AVG	FIC-6103.C_AOUTP~	***	5.	AVG	FI2-6105.C_APV	***
2.	AVG	FIC-6102.C_AOUTP~	***	6.	AVG	FI2-6120.C_APV	***
3.	AVG	II-6102.C_APV	***	7.	AVG	FI2-6120-1.C_APV	***
4.	AVG	ZI-6121.C_APV	***	8.	AVG	FI2-6103.C_APV	49.68 x

* BOILER WOOD FLOW

Time at arrow: 14:30:00 5/10/2016



1: 5.00 | Zoom | Reset | Resume | S. 25 of 169

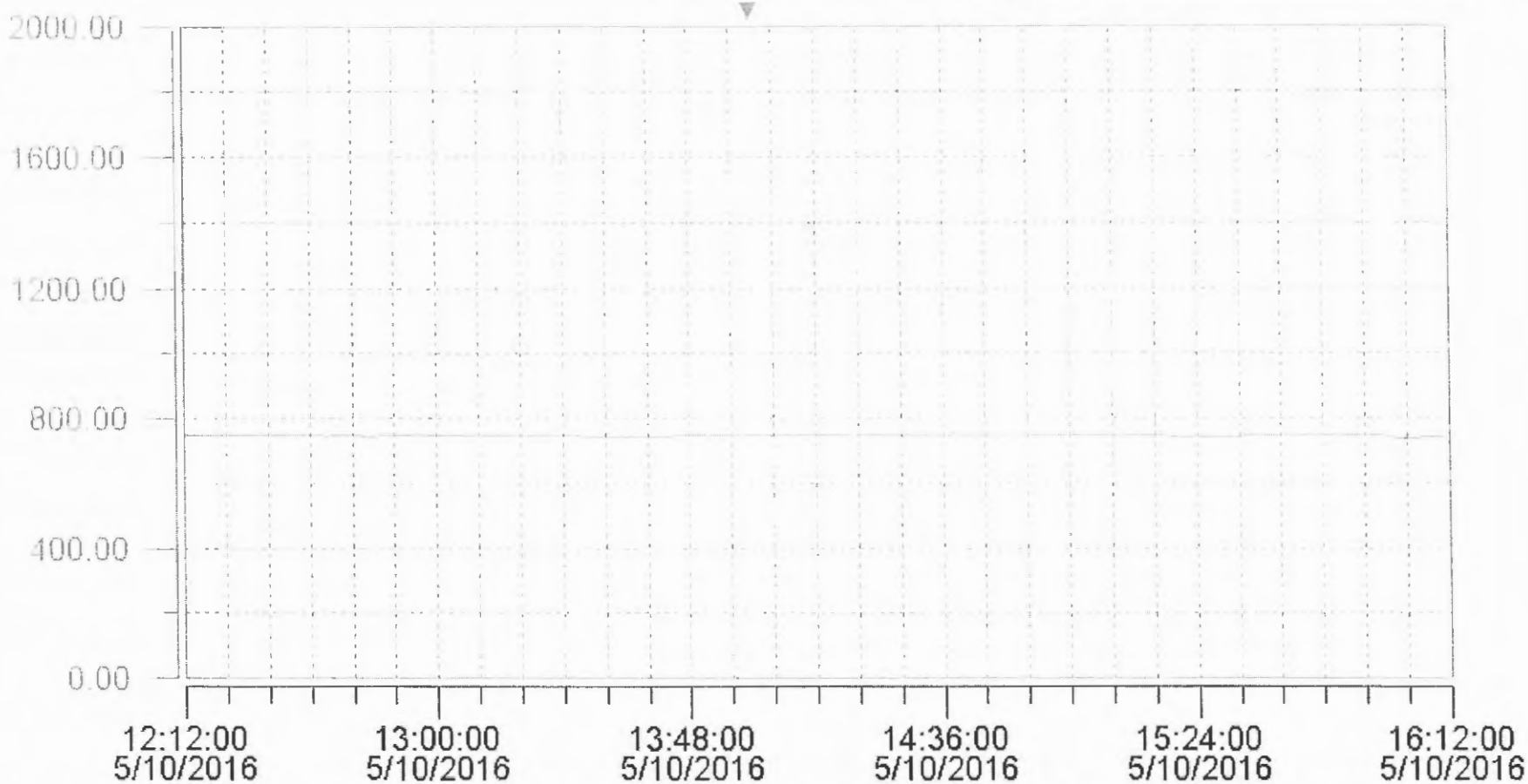
UNIT #2 TEMPERATURES

Hist | Info

1.	AVG	TI-2405.C_APV	***	5.	AVG	TI-2123.C_APV	***
2.	AVG	TI-2419.C_APV	***	6.	AVG	TI-2427.C_APV	***
3.	AVG	TI-2421.C_APV	***	7.	AVG	FI-2753.C_APV	***
4.	AVG	TI-2126.C_APV	748.19 x	8.	AVG	HIC-2000.C_APV	***

✳ BACKPASS

Time at arrow: 14:00:00 5/10/2016



1: 2.00 | Zoom | Reset | Resume | S. 32 of 212

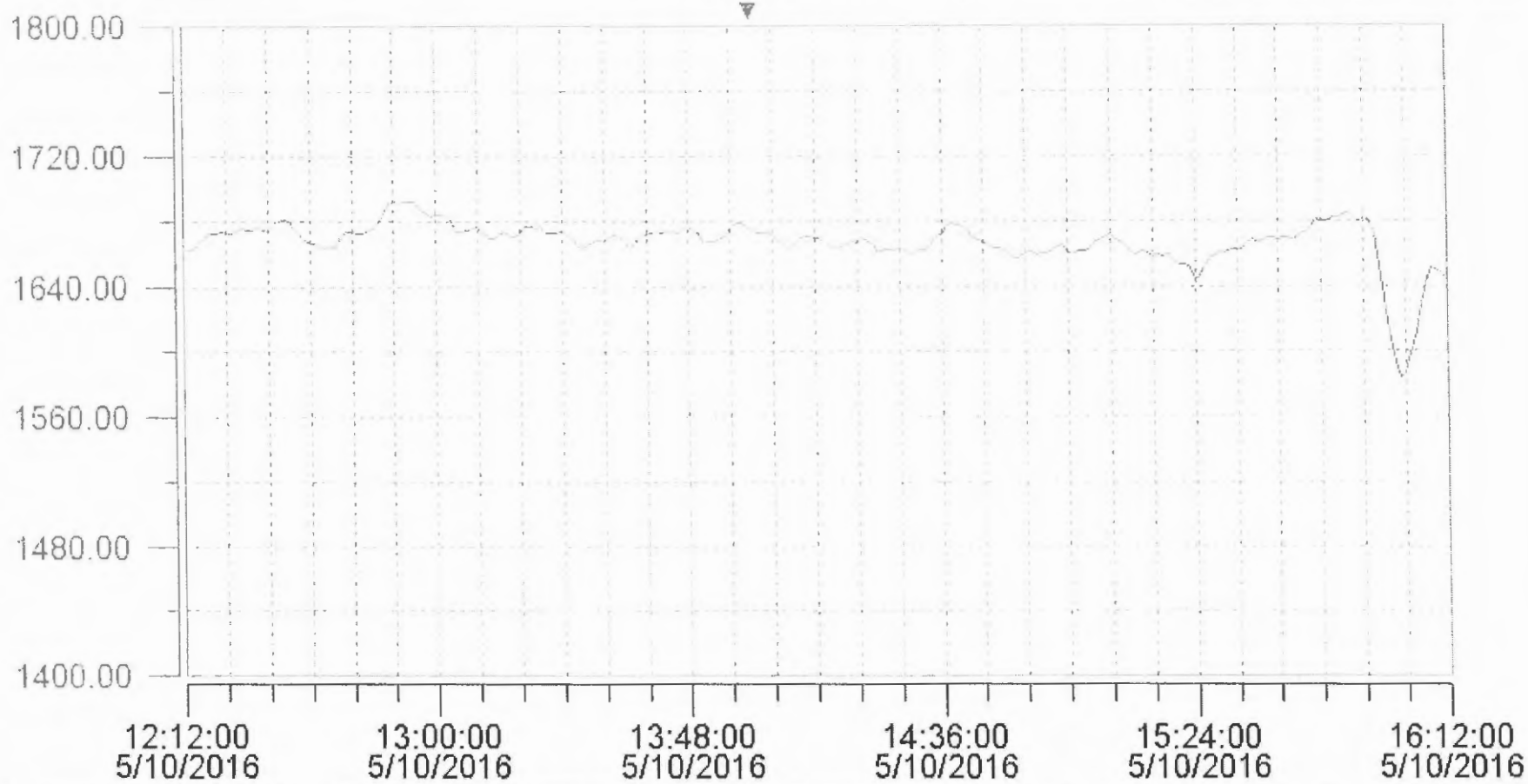
UNIT #2 TEMPERATURES

Hist | Info

1.	AVG		TI-2405.C_APV	1674.43 x	5.	AVG		TI-2123.C_APV	***
2.	AVG		TI-2419.C_APV	***	6.	AVG		TI-2427.C_APV	***
3.	AVG		TI-2421.C_APV	***	7.	AVG		FI-2753.C_APV	***
4.	AVG		TI-2126.C_APV	***	8.	AVG		HIC-2000.C_APV	***

✳ MID COMBUSTOR

Time at arrow: 14:00:00 5/10/2016



1: 2.00 | Zoom | Reset | Resume | S. 32 of 212

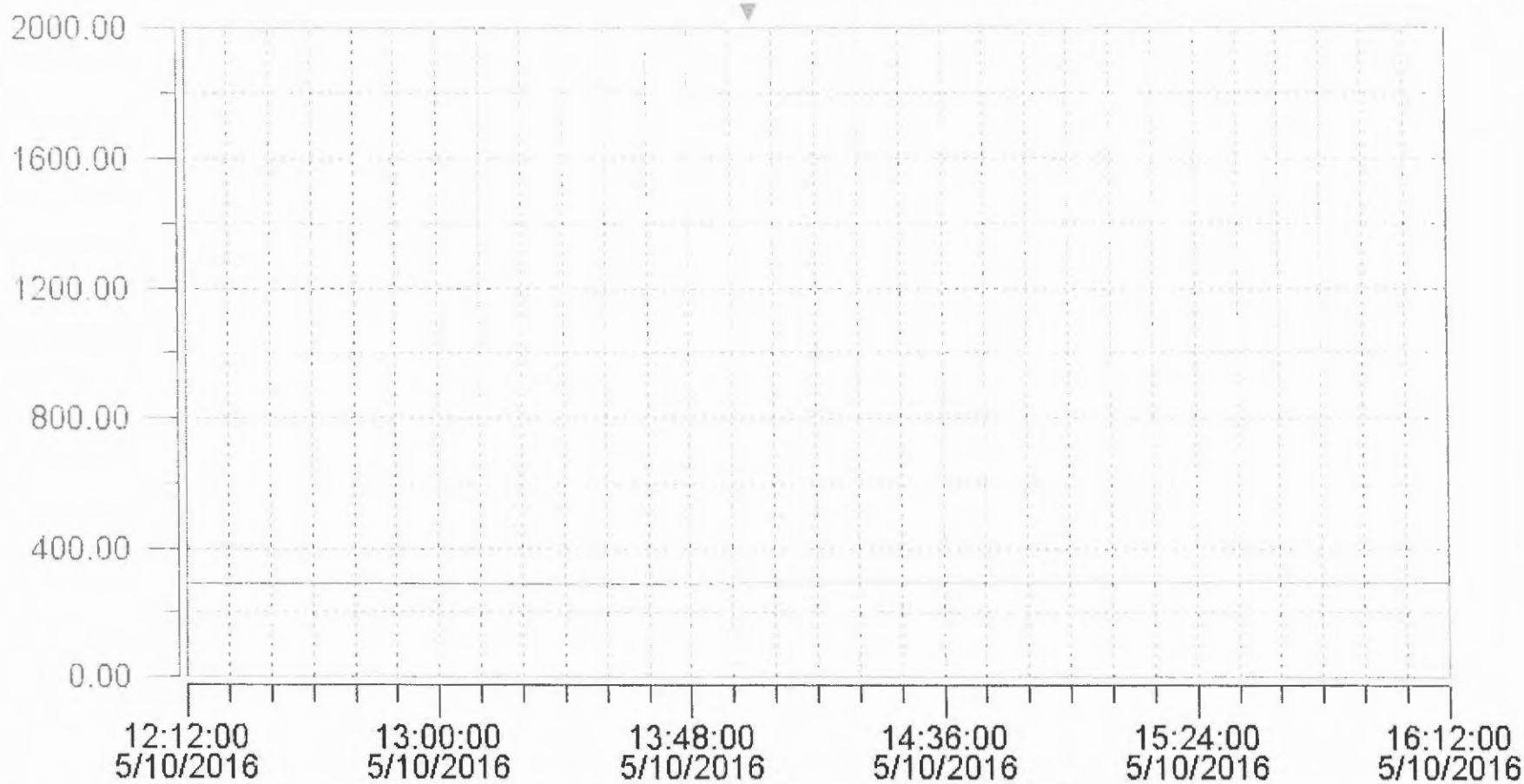
UNIT #2 TEMPERATURES

Hist | Info

1.	AVG		TI-2405.C_APV	***	5.	AVG		TI-2123.C_APV	292.54 x
2.	AVG		TI-2419.C_APV	***	6.	AVG		TI-2427.C_APV	***
3.	AVG		TI-2421.C_APV	***	7.	AVG		FI-2753.C_APV	***
4.	AVG		TI-2126.C_APV	***	8.	AVG		HIC-2000.C_APV	***

✳ BAGHOUSE INLET

Time at arrow: 14:00:00 5/10/2016



1: 2.00 | Zoom | Reset | Resume | S. 33 of 213

APPENDIX D CALCULATIONS

GENERAL EMISSION CALCULATIONS

I. Stack Gas Velocity

A. Stack gas molecular weight, lb/lb-mole

$$MW_{dry} = 0.44 * \%CO_2 + 0.32 * \%O_2 + 0.28 * \%N_2$$

$$MW_{wet} = MW_{dry} * (1-B_{wo}) + 18 * B_{wo}$$

B. Absolute stack pressure, iwg

$$Ps = Pbar + \frac{Psg}{13.6}$$

C. Stack gas velocity, ft/sec

$$V_s = 2.9 * C_p * \sqrt{\Delta P} * \sqrt{T_s} * \sqrt{\frac{29.92 * 28.95}{P_s * MW_{wet}}}$$

II. Moisture

A. Sample gas volume, dscf

$$V_{mstd} = 0.03342 * V_m * (P_{bar} + \frac{\Delta H}{13.6}) * \frac{T_{ref}}{T_m} * Y_d$$

B. Water vapor volume, scf

$$V_{wstd} = 0.0472 * V_{lc} * \frac{T_{ref}}{528\ ^oR}$$

C. Moisture content, dimensionless

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

III. Stack gas volumetric flow rate

A. Actual stack gas volumetric flow rate, wacfm

$$Q = V_s * A_s * 60$$

B. Standard stack gas flow rate, dscfm

$$Q_{sd} = Q * (1-B_{wo}) * \frac{T_{ref}}{T_s} * \frac{P_s}{29.92}$$

IV. Gaseous Mass Emission Rates, lb/hr

$$M = \frac{ppm * MW_i * Q_{sd} * 60}{SV * 10^6}$$

V. Emission Rates, lb/MMBtu

$$\frac{lb}{MMBtu} = \frac{ppm * MW_i * F}{SV * 10^6} * \frac{20.9}{20.9 - \%O_2}$$

6. Percent Isokinetic

$$I = \frac{17.32\ x\ T_s\ (V_m\ std)}{(1 - Bwo)0\ x\ V_s\ x\ Ps\ x\ Dn^2}\ x\ \frac{528 \circ R}{T_{ref}}$$

7. Particulate emissions

a) Grain loading, gr/dscf

$C = 0.01543\ (M_n/V_{m\ std})$

b) Grain loading at 3% O_2, gr/dscf

$C_{3\%}\ O_2 = C\ (12/\%\ CO_2)$

c) Mass emissions, lb/hr

M = C x Qsd x (60 min/hr)/(7000 gr/lb)

d) Particulate emission factor

$$lb / 10^6\ Btu = C\ x\ \frac{1\ lb}{7000gr}\ x\ F\ x\ \frac{20..9}{20.9 - \%O_2}$$

Nomenclature:

A_s	= stack area, ft^2
B_{wo}	= flue gas moisture content, dimensionless
$C_{12\%CO2}$	= particulate grain loading, gr/dscf corrected to 3% O_2
C	= particulate grain loading, gr/dscf
C_p	= pitot calibration factor, dimensionless
Dn	= nozzle diameter, in.
F	= fuel F-Factor, dscf/MMBtu @ 0% O_2
H	= orifice differential pressure, iwg
I	= % isokinetics
M_n	= mass of collected particulate, mg
M_i	= mass emission rate of specie i, lb/hr
MW	= molecular weight of flue gas, lb/lb-mole
M_{wi}	= molecular weight of specie i:
	SO_2: 64
	NO_x: 46
	CO: 28
	HC: 16
0	= sample time, min.
ΔP	= average velocity head, iwg = $(\sqrt{\Delta P})^2$
P_{bar}	= barometric pressure, inches Hg
P_s	= stack absolute pressure, inches Hg
P_{sg}	= stack static pressure, iwb
Q	= wet stack flow rate at actual conditions, wacfm
Q_{sd}	= dry standard stack flow rate, dscfm
SV	= specific molar volume of an ideal gas at standard conditions, ft^3/lb-mole
T_m	= meter temperature, °R
T_{ref}	= reference temperature, °R
T_s	= stack temperature, °R
V_s	= stack gas velocity, ft/sec
V_{lc}	= volume of liquid collected in impingers, ml
V_m	= uncorrected dry meter volume, dcf
V_{mstd}	= dry meter volume at standard conditions, dscf
V_{wstd}	= volume of water vapor at standard conditions, scf
Y_d	= meter calibration coefficient

EPA METHOD 29 SOURCE TEST

DATA AND WORKSHEET

Client	Desert View Power Parameter			Full Load
Location	Mecca	Fuel		Biomass
Unit	1	Data By		DW
Test Number	4-HG-Unit 1	5-HG-Unit 1	6-HG-Unit 1	Average
Reference Temperature, F	68	68	68	
Test Date	5/11/2016	5/11/2016	5/11/2016	
Sample Train	5-WCS	5-WCS	5-WCS	-
Pitot Factor	0.840	0.840	0.840	-
Meter Calibration Factor	0.997	1/0/1900	1/0/1900	-
Stack Area (sq ft)	38.84	38.84	38.84	-
Sample Time (Min)	180	180	180	180
Barometric Pressure (in Hg)	30.01	30.01	30.01	30.01
Nozzle Diam (in)	0.245	0.249	0.245	0.246
Start/Stop Time	815/1125	1155/1459	1529/1839	-
Stack Pressure (iwg)	0.74	0.74	0.74	0.74
Delta P (iwg)	0.829	0.8348	0.8412	0.8350
Meter Pressure (iwg)	1.760	1.867	1.798	1.808
Stack Temperature (F)	344.2	343.5	357.6	348.5
Meter Temperature (F)	102.0	109.3	113.0	108.1
Meter Volume (acf)	135.430	141.378	137.585	138.131
Liquid Volume (ml)	397.2	438.8	442.7	426.2
Stack O2 (%)	8.71	8.67	8.65	8.7
Stack CO2 (%)	11.78	11.83	11.86	11.8
Standard Sample Volume (SCF	127.756	131.702	127.309	128.922
Moisture Fraction	0.128	0.136	0.141	0.135
Molecular Weight (wet)	28.67	28.58	28.52	28.59
Stack Gas Velocity (ft/sec)	63.06	63.36	64.22	63.55
Stack Flow Rate (wacfm)	146,966	147,658	149,670	148,098
Stack Flow Rate (dscfm)	84,519	84,219	83,403	84,047
Isokinetic Ratio (%)	99.59	99.75	100.57	99.97

MERCURY TEST RESULTS
DESERT VIEW POWER UNIT 1
May 11, 2016

Test Number	4-HG-Unit 1	5-HG-Unit 1	6-HG-Unit 1	**Average**	Limit
Date	05/11/16	05/11/16	05/11/16		
Start/Stop Time	815/1125	1155/1459	1529/1839		
Stack Flow Rate, dscfm[1]	84,519	84,219	83,403	83,811	
Sample Volume, dscf	127.756	131.702	127.309	129.506	
O_2, %	8.71	8.67	8.65	8.66	
CO_2, %	11.78	11.83	11.86	11.84	
Sample Fractions	ug/fraction	ug/fraction	ug/fraction		
Front 1/2	0.1	0.1	0.1		
HCL	0.036	0.093	0.055		
Back	26	42	7.8		
Empty	0.12	0.074	0.15		
KMnO4	0.59	0.43	0.6		
ug/sample	26.85	42.70	8.71	25.70	
ug/dscm	7.420	11.447	2.414	6.931	
lb/hr (as HG)	0.002347	0.0036	0.0008	0.0022	
MMBtu/Hr	370	370	370	370	
Lb/MMBtu	6.344E-06	9.752E-06	2.037E-06	6.044E-06	########

MOBILE EMISSION LABORATORY
CONTINUOUS GASEOUS MEASUREMENTS SUMMARY

Client: Desert View Power
Unit: 2
Location: Mecca

Condition: ----
Load: > 90%
Date 5/11/2016

	O2%	CO2%				
Analyzer Range:	18.97	18.62				
Span Value:	10.83	10.38				
	O2%	CO2%				
As Found	10.841	10.366				
Linearity	0.1%	-0.1%			<2%	**Pass**
5/11/2016	O2%	CO2%				
4-HG-Unit 1						
Analyzer Range:	18.97	18.62				
Span Value:	10.83	10.38				
Pre test Direct Zero	0.07	0.06				
Pre test Direct Span	10.84	10.37				
System Zero	0.07	0.06				
System Span	10.74	10.31				
Average	8.66	11.67				
System Zero	0.05	0.07				
System Span	10.77	10.26				
Post test Direct Zero	0.04	0.05				
Post test Direct Span	10.82	10.29				
Corrected Conc.	8.71	11.78				
System Bias Check						
Zero Pre-test	0.36%	0.34%			< 5%	**PASS**
Zero Post-test	0.28%	0.35%			< 5%	**PASS**
Span Pre-test	-0.46%	-0.36%			< 5%	**PASS**
Span Post-test	-0.33%	-0.64%			<5%	**PASS**

5/11/2016	O2%	CO2%				
5-HG-Unit 1						
Analyzer Range:	18.97	18.62				
Span Value:	10.83	10.38				
Pre test Direct Zero	0.04	0.05				
Pre test Direct Span	10.82	10.29				
System Zero	0.05	0.07				
System Span	10.77	10.26				
Raw concentration	8.59	11.69				
System Zero	0.05	0.06				
System Span	10.67	10.26				
Post test Direct Zero	0.04	0.05				
Post test Direct Span	10.69	10.26				
Corrected Conc.	8.67	11.83				
System Bias Check						
Zero Pre-test	0.28%	0.35%			< 5%	**PASS**
Zero Post-test	0.28%	0.33%			< 5%	**PASS**
Span Pre-test	-0.33%	-0.64%			< 5%	**PASS**
Span Post-test	-0.85%	-0.64%			<5%	**PASS**
3/10/2015	O2%	CO2%				
6-HG-Unit 1						
Analyzer Range:	18.97	18.62				
Span Value:	10.83	10.38				
Pre test Direct Zero	0.04	0.05				
Pre test Direct Span	10.69	10.26				
System Zero	0.05	0.06				
System Span	10.67	10.26				
Raw concentration	8.56	11.71				
System Zero	0.04	0.06				
System Span	10.75	10.25				
Post test Direct Zero	0.04	0.05				
Post test Direct Span	10.79	10.27				
Corrected Conc.	8.65	11.86				
System Bias Check						
Zero Pre-test	0.28%	0.33%			< 5%	**PASS**
Zero Post-test	0.23%	0.34%			< 5%	**PASS**
Span Pre-test	-0.85%	-0.64%			< 5%	**PASS**
Span Post-test	-0.44%	-0.69%			<5%	**PASS**

ATTACHMENT A

BOILER HEAT INPUT CALCULATION

2015 AVERAGE

MAY 10 & 11 2016 REPRESENTATIVE

2015 Annual Average MMBtu/Hr Calculation

Period Hours	17568		
Boiler #1 Operating Hours	7630		
Boiler #2 Operating Hours	7551		
Total Operating Hours	15181		
Gross Generation	376901		
Net Generation	323076		
Hazen Fuel Analysis	7370	HHV Btu	
Hazen Fuel Analysis	6864	LHV Btu	
2015 Fuel Records	351634	tons purchased	
	3504	System loss	
	-9950	Increase in Inventory	
	338181	tons consumed	
	0.90	tons/MWh	Gross
	1.05	tons/MWh	Net
	676361240	pounds consumed	
	4984782338800	Btu wood	HHV
	4642543551360	Btu wood	LHV
	4984782	MMBtu wood	HHV
	4642544	MMBtu wood	LHV
	52111	MMBtu gas	1.11%
	15181	operating hours	
	332	MMBtu/hr	HHV
	309	MMBtu/hr	LHV

May 10th 2016 Average MMBtu/Hr Calculation

2-15 burn rate	1.05		
Period Hours	24		
Boiler #1 Operating Hours	24		
Boiler #2 Operating Hours	24		
Net Generation	1085		
Hazen Fuel Analysis	7613	HHV Btu	5/10/2016
Hazen Fuel Analysis	7065	LHV Btu	5/10/2016
Fuel Used on 5/10/2016	1136	tons consumed total	
Fuel Used on 5/10/2016 Boiler # 2	568	tons consumed total	
	8646285797	Btu wood	HHV
	8023907678	Btu wood	LHV
	8646	MMBtu wood	HHV
	8024	MMBtu wood	LHV
	0	MMBtu gas	1.11%
	24	operating hours	
	360	**MMBtu/hr**	**HHV**
	334	**MMBtu/hr**	**LHV**

May 11th 2016 Average MMBtu/Hr Calculation

2-15 burn rate	1.05		
Period Hours	24		
Boiler #1 Operating Hours	24		
Boiler #2 Operating Hours	24		
Net Generation	1085	from flash report	
Hazen Fuel Analysis	7818	HHV Btu	5/11/2016
Hazen Fuel Analysis	7255	LHV Btu	5/11/2016
Fuel Used on 5/11/2016	1136	tons consumed total	
Fuel Used on 5/11/2016 Boiler # 1	568	tons consumed total	
	8879109728	Btu wood	HHV
	8239695712	Btu wood	LHV
	8879	MMBtu wood	HHV
	8240	MMBtu wood	LHV
	0	MMBtu gas	1.11%
	24	operating hours	
	370	**MMBtu/hr**	**HHV**
	343	**MMBtu/hr**	**LHV**

May 10th 2016 Average MMBtu/Hr Calculation

2-15 burn rate	1.05		
Period Hours	24		
Boiler #1 Operating Hours	24		
Boiler #2 Operating Hours	24		
Net Generation	1085		
Hazen Fuel Analysis	7613	HHV Btu	5/10/2016
Hazen Fuel Analysis	7065	LHV Btu	5/10/2016
Fuel Used on 5/10/2016	1136	tons consumed total	
Fuel Used on 5/10/2016 Boiler # 2	568	tons consumed total	
	8646285797	Btu wood	HHV
	8023907678	Btu wood	LHV
	8646	MMBtu wood	HHV
	8024	MMBtu wood	LHV
	0	MMBtu gas	1.11%
	24	operating hours	
	360	**MMBtu/hr**	**HHV**
	334	**MMBtu/hr**	**LHV**

Delta Air Quality Services, Incorporated

EPA METHOD 29 SOURCE TEST

DATA AND WORKSHEET

Client	Desert View Power Parameter			Full Load
Location	Mecca	Fuel		Biomass
Unit	2	Data By		DW
Test Number	1-HG-Unit 2	2-HG-Unit 2	3-HG-Unit 2	Average
Reference Temperature, F	68	68	68	
Test Date	5/10/2016	5/10/2016	5/10/2016	
Sample Train	5-WCS	5-WCS	5-WCS	-
Pitot Factor	0.840	0.840	0.840	-
Meter Calibration Factor	0.997	0.997	0.997	-
Stack Area (sq ft)	38.84	38.84	38.84	-
Sample Time (Min)	180	180	180	180
Barometric Pressure (in Hg)	29.97	29.97	29.97	29.97
Nozzle Diam (in)	0.249	0.245	0.249	0.248
Start/Stop Time	830/1150	1231/1309	1615/1933	-
Stack Pressure (iwg)	0.82	0.82	0.82	0.82
Delta P (iwg)	0.916	0.9347	0.9305	0.9271
Meter Pressure (iwg)	2.020	2.047	2.150	2.072
Stack Temperature (F)	346.6	360.1	351.9	352.9
Meter Temperature (F)	94.7	105.1	109.4	103.0
Meter Volume (acf)	143.952	145.792	149.719	146.488
Liquid Volume (ml)	448.6	467.7	481.1	465.8
Stack O2 (%)	8.91	8.66	8.67	8.7
Stack CO2 (%)	11.54	11.79	11.78	11.7
Standard Sample Volume (SCF	137.495	136.706	139.367	137.856
Moisture Fraction	0.133	0.139	0.140	0.138
Molecular Weight (wet)	28.57	28.53	28.52	28.54
Stack Gas Velocity (ft/sec)	66.54	67.82	67.35	67.24
Stack Flow Rate (wacfm)	155,077	158,053	156,948	156,693
Stack Flow Rate (dscfm)	88,267	87,906	88,063	88,078
Isokinetic Ratio (%)	99.36	102.46	100.95	100.92

MERCURY TEST RESULTS
DESERT VIEW POWER UNIT 2
May 10, 2016

Test Number	1-HG-Unit 2	2-HG-Unit 2	3-HG-Unit 2	**Average**	Limit
Date	05/10/16	05/10/16	05/10/16		
Start/Stop Time	830/1150	1231/1309	1615/1933		
Stack Flow Rate, dscfm[1]	88,267	87,906	88,063	87,984	
Sample Volume, dscf	137.495	136.706	139.367	138.037	
O_2, %	8.91	8.66	8.67	8.66	
CO_2, %	11.54	11.79	11.78	11.78	
Sample Fractions	ug/fraction	ug/fraction	ug/fraction		
Front 1/2	0.1	0.1	0.1		
HCL	0.027	0.39	0.13		
Back	54	51	51		
Empty	0.22	2	0.2		
KMnO4	0.58	0.64	0.52		
ug/sample	54.93	54.13	51.95	53.04	
ug/dscm	14.106	13.981	13.162	13.572	
lb/hr (as HG)	0.0047	0.0046	0.0043	0.0045	
MMBtu/Hr	360	360	360	360	
Lb/MMBtu	1.294E-05	1.278E-05	1.205E-05	1.259E-05	########

MOBILE EMISSION LABORATORY
CONTINUOUS GASEOUS MEASUREMENTS SUMMARY

Client: Desert View Power
Unit: 2
Location: Mecca

Condition: ----
Load: > 90%
Date 5/10/2016

	O2%	CO2%				
Analyzer Range:	18.97	18.62				
Span Value:	10.83	10.38				
	O2%	CO2%				
As Found	10.84	10.354				
Linearity	0.1%	-0.1%			<2%	**Pass**
5/10/2016	O2%	CO2%				
1-HG-Unit 2						
Analyzer Range:	18.97	18.62				
Span Value:	10.83	10.38				
Pre test Direct Zero	0.06	0.05				
Pre test Direct Span	10.84	10.35				
System Zero	0.06	0.06				
System Span	10.74	10.32				
Average	8.84	11.43				
System Zero	0.06	0.07				
System Span	10.74	10.25				
Post test Direct Zero	0.04	0.05				
Post test Direct Span	10.76	10.27				
Corrected Conc.	8.91	11.54				
System Bias Check						
Zero Pre-test	0.30%	0.32%			< 5%	**PASS**
Zero Post-test	0.29%	0.35%			< 5%	**PASS**
Span Pre-test	-0.46%	-0.33%			< 5%	**PASS**
Span Post-test	-0.46%	-0.69%			<5%	**PASS**

2-HG-Unit 2						
Analyzer Range:	18.97	18.62				
Span Value:	10.83	10.38				
Pre test Direct Zero	0.04	0.05				
Pre test Direct Span	10.76	10.27				
System Zero	0.06	0.07				
System Span	10.74	10.25				
Raw concentration	8.57	11.64				
System Zero	0.07	0.07				
System Span	10.67	10.26				
Post test Direct Zero	0.04	0.05				
Post test Direct Span	10.72	10.31				
Corrected Conc.	8.66	11.79				
System Bias Check						
Zero Pre-test	0.29%	0.35%			< 5%	**PASS**
Zero Post-test	0.35%	0.36%			< 5%	**PASS**
Span Pre-test	-0.46%	-0.69%			< 5%	**PASS**
Span Post-test	-0.86%	-0.67%			<5%	**PASS**
3/10/2015	O2%	CO2%				
3-HG-Unit 2						
Analyzer Range:	18.97	18.62				
Span Value:	10.83	10.38				
Pre test Direct Zero	0.04	0.05				
Pre test Direct Span	10.72	10.31				
System Zero	0.07	0.07				
System Span	10.67	10.26				
Raw concentration	8.55	11.60				
System Zero	0.05	0.06				
System Span	10.67	10.20				
Post test Direct Zero	0.04	0.05				
Post test Direct Span	10.74	10.27				
Corrected Conc.	8.67	11.78				
System Bias Check						
Zero Pre-test	0.35%	0.36%			< 5%	**PASS**
Zero Post-test	0.27%	0.34%			< 5%	**PASS**
Span Pre-test	-0.86%	-0.67%			< 5%	**PASS**
Span Post-test	-0.86%	-0.97%			<5%	**PASS**

ATTACHMENT A

BOILER HEAT INPUT CALCULATION

2015 AVERAGE

MAY 10 & 11 2016 REPRESENTATIVE

2015 Annual Average MMBtu/Hr Calculation

Period Hours	17568		
Boiler #1 Operating Hours	7630		
Boiler #2 Operating Hours	7551		
Total Operating Hours	15181		
Gross Generation	376901		
Net Generation	323076		
Hazen Fuel Analysis	7370	HHV Btu	
Hazen Fuel Analysis	6864	LHV Btu	
2015 Fuel Records	351634	tons purchased	
	3504	System loss	
	-9950	Increase in Inventory	
	338181	tons consumed	
	0.90	tons/MWh	Gross
	1.05	tons/MWh	Net
	676361240	pounds consumed	
	4984782338800	Btu wood	HHV
	4642543551360	Btu wood	LHV
	4984782	MMBtu wood	HHV
	4642544	MMBtu wood	LHV
	52111	MMBtu gas	1.11%
	15181	operating hours	
	332	MMBtu/hr	HHV
	309	MMBtu/hr	LHV

May 10th 2016 Average MMBtu/Hr Calculation

2-15 burn rate	1.05		
Period Hours	24		
Boiler #1 Operating Hours	24		
Boiler #2 Operating Hours	24		
Net Generation	1085		
Hazen Fuel Analysis	7613	HHV Btu	5/10/2016
Hazen Fuel Analysis	7065	LHV Btu	5/10/2016
Fuel Used on 5/10/2016	1136	tons consumed total	
Fuel Used on 5/10/2016 Boiler # 2	568	tons consumed total	
	8646285797	Btu wood	HHV
	8023907678	Btu wood	LHV
	8646	MMBtu wood	HHV
	8024	MMBtu wood	LHV
	0	MMBtu gas	1.11%
	24	operating hours	
	360	MMBtu/hr	HHV
	334	MMBtu/hr	LHV

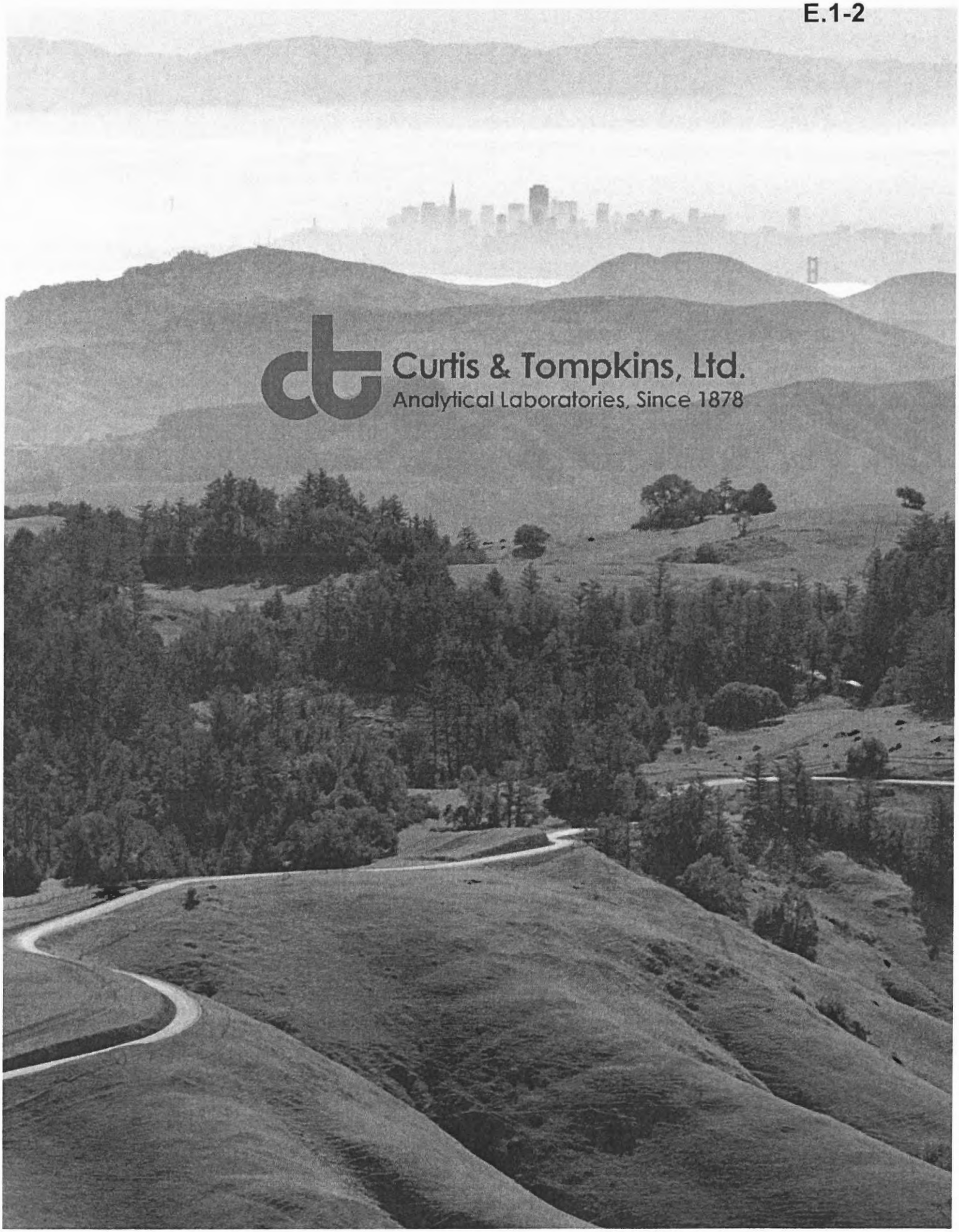
May 11th 2016 Average MMBtu/Hr Calculation

2-15 burn rate	1.05		
Period Hours	24		
Boiler #1 Operating Hours	24		
Boiler #2 Operating Hours	24		
Net Generation	1085	from flash report	
Hazen Fuel Analysis	7818	HHV Btu	5/11/2016
Hazen Fuel Analysis	7255	LHV Btu	5/11/2016
Fuel Used on 5/11/2016	1136	tons consumed total	
Fuel Used on 5/11/2016 Boiler # 1	568	tons consumed total	
	8879109728	Btu wood	HHV
	8239695712	Btu wood	LHV
	8879	MMBtu wood	HHV
	8240	MMBtu wood	LHV
	0	MMBtu gas	1.11%
	24	operating hours	
	370	MMBtu/hr	HHV
	343	MMBtu/hr	LHV

May 10th 2016 Average MMBtu/Hr Calculation

2-15 burn rate	1.05		
Period Hours	24		
Boiler #1 Operating Hours	24		
Boiler #2 Operating Hours	24		
Net Generation	1085		
Hazen Fuel Analysis	7613	HHV Btu	5/10/2016
Hazen Fuel Analysis	7065	LHV Btu	5/10/2016
Fuel Used on 5/10/2016	1136	tons consumed total	
Fuel Used on 5/10/2016 Boiler # 2	568	tons consumed total	
	8646285797	Btu wood	HHV
	8023907678	Btu wood	LHV
	8646	MMBtu wood	HHV
	8024	MMBtu wood	LHV
	0	MMBtu gas	1.11%
	24	operating hours	
	360	**MMBtu/hr**	**HHV**
	334	**MMBtu/hr**	**LHV**

APPENDIX E LABORATORY REPORTS


Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 276962
ANALYTICAL REPORT

Delta Air Quality Services	Project : STANDARD
1631 East St Andrews Place	Location : Desert View Power Unit 1 & 2
Santa Ana, CA 92705	Level : II

Sample ID	Lab ID
1-HG-U2	276962-001
2-HG-U2	276962-002
3-HG-U2	276962-003
4-HG-U1	276962-004
5-HG-U1	276962-005
6-HG-U1	276962-006
FIELD BLANK	276962-007
RB	276962-008

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: _____ Date: 06/15/2016

John Goyette
Laboratory Director
goyette@ctberk.com
(510) 204-2233

CA ELAP# 2896, NELAP# 4044-001

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**276962**
Client:	**Delta Air Quality Services**
Location:	**Desert View Power Unit 1 & 2**
Request Date:	**05/18/16**
Samples Received:	**05/18/16**

This data package contains sample and QC results for eight air samples, requested for the above referenced project on 05/18/16. The samples were received on ice and intact.

Metals (EPA 7470A):

Low recoveries were observed for mercury in the matrix spikes of 1-HG-U2 (lab # 276962-001); the BS/BSDs were within limits. No other analytical problems were encountered.

276962

CHAIN OF CUSTODY FORM

CLIENT: Desert View Power
Unit: Unit 1 and 2
SAMPLE LOCATION: Stack Breaching
TEST METHOD(S): EPA 29 For HG
OUTSIDE LAB REQUIRED: YES

TEST DATE(S): 5/10 and 5/11/2016
SAMPLER(S): Rik Dupont
PROJECT MANAGER: Dave Wonderly
DATE DUE: 6/1/2016
COMPLIANCE TEST: Yes

	DATE	TIME	TEST #	SAMPLE DESCRIPTION	CONTAINERS	SAMPLER	COMMENTS
1.	5/10/2016	830/1150	1-HG-U2	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
	5/10/2016	830/1150	1-HG-U2	B 1/2 - HNO3 Portion	1	RIK DUPONT	
	5/10/2016	830/1150	1-HG-U2	Empty impinger	1	RIK DUPONT	
	5/10/2016	830/1150	1-HG-U2	KMNO4 Portion	1	RIK DUPONT	
	5/10/2016	830/1150	1-HG-U2	HCL Rinse	1	RIK DUPONT	
	5/10/2016	830/1150	1-HG-U2	Filter # 83-UP-652	1	RIK DUPONT	
2.	5/10/2016	1231/1546	2-HG-U2	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
	5/10/2016	1231/1546	2-HG-U2	B 1/2 - HNO3 Portion	1	RIK DUPONT	
	5/10/2016	1231/1546	2-HG-U2	Empty impinger	1	RIK DUPONT	
	5/10/2016	1231/1546	2-HG-U2	KMNO4 Portion	1	RIK DUPONT	
	5/10/2016	1231/1546	2-HG-U2	HCL Rinse	1	RIK DUPONT	
	5/10/2016	1231/1546	2-HG-U2	Filter # 83-UP-653	1	RIK DUPONT	

RELEASED BY	DATE/TIME	RECEIVED BY	DATE/TIME
[illegible]	5-16-2016 1030	[illegible]	05/17/16
		[illegible]	5/18/16 @ 1311

ANALYSIS REQUIRED: Analyze for HG by EPA 29 Do composed from ½, Back ½ and the Empty impinger for analysis. Use QA in EPA 29. Samples are labeled a metals

Delta Air Quality Services, Incorporated

276962

CHAIN OF CUSTODY FORM

CLIENT: Desert View Power
Unit: Unit 1 and 2
SAMPLE LOCATION: Stack Breaching
TEST METHOD(S): EPA 29 For HG
OUTSIDE LAB REQUIRED: YES

TEST DATE(S): 5/10 and 5/11/2016
SAMPLER(S): Rik Dupont
PROJECT MANAGER: Dave Wonderly
DATE DUE: 6/1/2016
COMPLIANCE TEST: Yes

	DATE	TIME	TEST #	SAMPLE DESCRIPTION	CONTAINERS	SAMPLER	COMMENTS
3.	5/10/2016	1615/1933	3-HG-U2	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
	5/10/2016	1615/1933	3-HG-U2	B 1/2 - HNO3 Portion	1	RIK DUPONT	
	5/10/2016	1615/1933	3-HG-U2	Empty impinger	1	RIK DUPONT	
	5/10/2016	1615/1933	3-HG-U2	KMNO4 Portion	1	RIK DUPONT	
	5/10/2016	1615/1933	3-HG-U2	HCL Rinse	1	RIK DUPONT	
	5/10/2016	1615/1933	3-HG-U2	Filter # 83-UP-646	1	RIK DUPONT	
4.	5/11/2016	815/1125	4-HG-U1	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
	5/11/2016	815/1125	4-HG-U1	B 1/2 - HNO3 Portion	1	RIK DUPONT	
	5/11/2016	815/1125	4-HG-U1	Empty impinger	1	RIK DUPONT	
	5/11/2016	815/1125	4-HG-U1	KMNO4 Portion	1	RIK DUPONT	
	5/11/2016	815/1125	4-HG-U1	HCL Rinse	1	RIK DUPONT	
	5/11/2016	815/1125	4-HG-U1	Filter # 83-UP-647	1	RIK DUPONT	

RELEASED BY	DATE/TIME	RECEIVED BY	DATE/TIME
		[illegible]	5/18/16 @ 1311

ANALYSIS REQUIRED: See page one

Delta Air Quality Services, Incorporated

276962

CHAIN OF CUSTODY FORM

CLIENT: Desert View Power
Unit: Unit 1 and 2
SAMPLE LOCATION: Stack Breaching
TEST METHOD(S): EPA 29 For HG
OUTSIDE LAB REQUIRED: YES

TEST DATE(S): 5/10 and 5/11/2016
SAMPLER(S): Rik Dupont
PROJECT MANAGER: Dave Wonderly
DATE DUE: 6/1/2016
COMPLIANCE TEST: Yes

	DATE	TIME	TEST #	SAMPLE DESCRIPTION	CONTAINERS	SAMPLER	COMMENTS
5.	5/11/2016	1155/1505	5-HG-U1	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
	5/11/2016	1155/1505	5-HG-U1	B 1/2 - HNO3 Portion	1	RIK DUPONT	
	5/11/2016	1155/1505	5-HG-U1	Empty impinger	1	RIK DUPONT	
	5/11/2016	1155/1505	5-HG-U1	KMNO4 Portion	1	RIK DUPONT	
	5/11/2016	1155/1505	5-HG-U1	HCL Rinse	1	RIK DUPONT	
	5/11/2016	1155/1505	5-HG-U1	Filter # 83-UP-648	1	RIK DUPONT	
6.	5/11/2016	1529/1839	6-HG-U1	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
	5/11/2016	1529/1839	6-HG-U1	B 1/2 - HNO3 Portion	1	RIK DUPONT	
	5/11/2016	1529/1839	6-HG-U1	Empty impinger	1	RIK DUPONT	
	5/11/2016	1529/1839	6-HG-U1	KMNO4 Portion	1	RIK DUPONT	
	5/11/2016	1529/1839	6-HG-U1	HCL Rinse	1	RIK DUPONT	
	5/11/2016	1529/1839	6-HG-U1	Filter # 83-UP-649	1	RIK DUPONT	

RELEASED BY	DATE/TIME	RECEIVED BY	DATE/TIME
		[illegible]	5/18/16 @ 1311

ANALYSIS REQUIRED: See page one

Delta Air Quality Services, Incorporated

276962

CHAIN OF CUSTODY FORM

CLIENT: Desert View Power
Unit: Unit 1 and 2
SAMPLE LOCATION: Stack Breaching
TEST METHOD(S): EPA 29 For HG
OUTSIDE LAB REQUIRED: YES

TEST DATE(S): 5/10 and 5/11/2016
SAMPLER(S): Rik Dupont
PROJECT MANAGER: Dave Wonderly
DATE DUE: 6/1/2016
COMPLIANCE TEST: Yes

	DATE	TIME	TEST #	SAMPLE DESCRIPTION	CONTAINERS	SAMPLER	COMMENTS
7.	5/10/2016	700/1000	Field Blank	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
	5/10/2016	700/1000	Field Blank	B 1/2 - HNO3 Portion	1	RIK DUPONT	
	5/10/2016	700/1000	Field Blank	Empty impinger	1	RIK DUPONT	
	5/10/2016	700/1000	Field Blank	KMNO4 Portion	1	RIK DUPONT	
	5/10/2016	700/1000	Field Blank	HCL Rinse	1	RIK DUPONT	
	5/10/2016	700/1000	Field Blank	Filter # 83-UP-654	1	RIK DUPONT	
8.	5/10/2016	1100	RB	300 ml 0.1 N HNO3	1	AB	
	5/10/2016	1100	RB	200 ml 5% HNO3/30% H2O2	1	AB	
	5/10/2016	1100	RB	100 ml 10% H2SO4/KMNO4	1	AB	
	5/10/2016	1100	RB	100 ml DI H2O	1	AB	
	5/10/2016	1100	RB	25ml 8N HCL in 200ml H2O	1	AB	
	5/10/2016	1100	RB	Filters # 83-UP-655, 656, 657	1	AB	

RELEASED BY	DATE/TIME	RECEIVED BY	DATE/TIME
		[illegible]	5/18/16 @ 1311

ANALYSIS REQUIRED: See page one

Delta Air Quality Services, Incorporated

COOLER RECEIPT CHECKLIST

Curtis & Tompkins, Ltd.

Login # 276962 Date Received 5/18/16 Number of coolers 1
Client DELTA Project Desert View Power Unit 1 & 2

Date Opened 5/18 By (print) SC (sign) [illegible]
Date Logged in [illegible] By (print) [illegible] (sign) [illegible]

1. Did cooler come with a shipping slip (airbill, etc) GSO YES NO
   Shipping info 094702A

2A. Were custody seals present? .... ☐ YES (circle) on cooler on samples ☒ NO
   How many _____ Name _____ Date _____
2B. Were custody seals intact upon arrival? _____ YES NO N/A
3. Were custody papers dry and intact when received? _____ YES NO
4. Were custody papers filled out properly (ink, signed, etc)? _____ YES NO
5. Is the project identifiable from custody papers? (If so fill out top of form) ___ YES NO
6. Indicate the packing in cooler: (if other, describe) _____

☒ Bubble Wrap ☐ Foam blocks ☒ Bags ☐ None
☐ Cloth material ☐ Cardboard ☐ Styrofoam ☐ Paper towels

7. Temperature documentation: * Notify PM if temperature exceeds 6°C

Type of ice used: ☐ Wet ☒ Blue Gel ☐ None Temp(°C) 11.1°

☐ Temperature blank(s) included? ☐ Thermometer# _____ ☒ IR Gun# B

☐ Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? _____ YES NO
   If YES, what time were they transferred to freezer? _____
9. Did all bottles arrive unbroken/unopened? _____ YES NO
10. Are there any missing / extra samples? _____ YES NO
11. Are samples in the appropriate containers for indicated tests? _____ YES NO
12. Are sample labels present, in good condition and complete? _____ YES NO
13. Do the sample labels agree with custody papers? _____ YES NO
14. Was sufficient amount of sample sent for tests requested? _____ YES NO
15. Are the samples appropriately preserved? _____ YES NO N/A
16. Did you check preservatives for all bottles for each sample? _____ YES NO N/A
17. Did you document your preservative check? (pH strip lot# _____) YES NO N/A
18. Did you change the hold time in LIMS for unpreserved VOAs? _____ YES NO N/A
19. Did you change the hold time in LIMS for preserved terracores? _____ YES NO N/A
20. Are bubbles > 6mm absent in VOA samples? _____ YES NO N/A
21. Was the client contacted concerning this sample delivery? _____ YES NO
   If YES, Who was called? _____ By _____ Date: _____

COMMENTS

_____

Curtis & Tompkins, Ltd.

Detections Summary for 276962

Results for any subcontracted analyses are not included in this summary.

Client : Delta Air Quality Services
Project : STANDARD
Location : Desert View Power Unit 1 & 2

Client Sample ID : 1-HG-U2 Laboratory Sample ID : 276962-001

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Mercury	54		7.5	ug/s	As Recd	5.000	EPA 7470A	METHOD
Mercury	0.22		0.010	ug/s	As Recd	1.000	EPA 7470A	METHOD

Client Sample ID : 2-HG-U2 Laboratory Sample ID : 276962-002

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Mercury	0.39		0.026	ug/s	As Recd	1.000	EPA 7470A	METHOD
Mercury	51		7.9	ug/s	As Recd	5.000	EPA 7470A	METHOD
Mercury	2.0		0.15	ug/s	As Recd	1.000	EPA 7470A	METHOD

Client Sample ID : 3-HG-U2 Laboratory Sample ID : 276962-003

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Mercury	0.13		0.021	ug/s	As Recd	1.000	EPA 7470A	METHOD
Mercury	51		7.9	ug/s	As Recd	5.000	EPA 7470A	METHOD
Mercury	0.20		0.010	ug/s	As Recd	1.000	EPA 7470A	METHOD

Client Sample ID : 4-HG-U1 Laboratory Sample ID : 276962-004

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Mercury	0.036		0.025	ug/s	As Recd	1.000	EPA 7470A	METHOD
Mercury	26		7.4	ug/s	As Recd	5.000	EPA 7470A	METHOD
Mercury	0.12		0.011	ug/s	As Recd	1.000	EPA 7470A	METHOD

Client Sample ID : 5-HG-U1 Laboratory Sample ID : 276962-005

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Mercury	0.093		0.024	ug/s	As Recd	1.000	EPA 7470A	METHOD
Mercury	42		7.6	ug/s	As Recd	5.000	EPA 7470A	METHOD
Mercury	0.074		0.0080	ug/s	As Recd	1.000	EPA 7470A	METHOD

Client Sample ID : 6-HG-U1 Laboratory Sample ID : 276962-006

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Mercury	0.055		0.018	ug/s	As Recd	1.000	EPA 7470A	METHOD
Mercury	0.15		0.011	ug/s	As Recd	1.000	EPA 7470A	METHOD

Curtis & Tompkins, Ltd.

Client Sample ID : FIELD BLANK Laboratory Sample ID : 276962-007

No Detections

Client Sample ID : RB Laboratory Sample ID : 276962-008

No Detections

Curtis & Tompkins, Ltd.

Metals Analytical Report

Lab #:	276962	Location:	Desert View Power Unit 1 & 2
Client:	Delta Air Quality Services	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7470A
Matrix:	Air	Prepared:	06/10/16
Units:	ug/s	Analyzed:	06/10/16
Received:	05/18/16		

Field ID: 1-HG-U2 Lab ID: 276962-001
Type: SAMPLE Sampled: 05/10/16

Analyte	Result	RL	Diln Fac	Batch#
Mercury (Front)	ND	0.10	1.000	235959
Mercury (HCl)	ND	0.027	1.000	235964
Mercury (Back)	54	7.5	5.000	235962
Mercury (Empty)	0.22	0.010	1.000	235966
Mercury (KMnO4)	ND	0.58	10.00	235963

Field ID: 2-HG-U2 Lab ID: 276962-002
Type: SAMPLE Sampled: 05/10/16

Analyte	Result	RL	Diln Fac	Batch#
Mercury (Front)	ND	0.10	1.000	235959
Mercury (HCl)	0.39	0.026	1.000	235964
Mercury (Back)	51	7.9	5.000	235962
Mercury (Empty)	2.0	0.15	1.000	235966
Mercury (KMnO4)	ND	0.64	10.00	235963

Field ID: 3-HG-U2 Lab ID: 276962-003
Type: SAMPLE Sampled: 05/10/16

Analyte	Result	RL	Diln Fac	Batch#
Mercury (Front)	ND	0.10	1.000	235959
Mercury (HCl)	0.13	0.021	1.000	235964
Mercury (Back)	51	7.9	5.000	235962
Mercury (Empty)	0.20	0.010	1.000	235966
Mercury (KMnO4)	ND	0.52	10.00	235963

Field ID: 4-HG-U1 Lab ID: 276962-004
Type: SAMPLE Sampled: 05/11/16

Analyte	Result	RL	Diln Fac	Batch#
Mercury (Front)	ND	0.10	1.000	235959
Mercury (HCl)	0.036	0.025	1.000	235964
Mercury (Back)	26	7.4	5.000	235962
Mercury (Empty)	0.12	0.011	1.000	235966
Mercury (KMnO4)	ND	0.59	10.00	235963

ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

29.1

Curtis & Tompkins, Ltd.

Metals Analytical Report

Lab #:	276962	Location:	Desert View Power Unit 1 & 2
Client:	Delta Air Quality Services	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7470A
Matrix:	Air	Prepared:	06/10/16
Units:	ug/s	Analyzed:	06/10/16
Received:	05/18/16		

Field ID: 5-HG-U1 Lab ID: 276962-005
Type: SAMPLE Sampled: 05/11/16

Analyte	Result	RL	Diln Fac	Batch#
Mercury (Front)	ND	0.10	1.000	235959
Mercury (HCl)	0.093	0.024	1.000	235964
Mercury (Back)	42	7.6	5.000	235962
Mercury (Empty)	0.074	0.0080	1.000	235966
Mercury (KMnO4)	ND	0.43	10.00	235963

Field ID: 6-HG-U1 Lab ID: 276962-006
Type: SAMPLE Sampled: 05/11/16

Analyte	Result	RL	Diln Fac	Batch#
Mercury (Front)	ND	0.10	1.000	235959
Mercury (HCl)	0.055	0.018	1.000	235964
Mercury (Back)	ND	7.8	5.000	235962
Mercury (Empty)	0.15	0.011	1.000	235966
Mercury (KMnO4)	ND	0.60	10.00	235963

Field ID: FIELD BLANK Lab ID: 276962-007
Type: SAMPLE Sampled: 05/10/16

Analyte	Result	RL	Diln Fac	Batch#
Mercury (Front)	ND	0.10	1.000	235959
Mercury (HCl)	ND	0.022	1.000	235964
Mercury (Back)	ND	3.9	5.000	235962
Mercury (Empty)	ND	0.016	1.000	235966
Mercury (KMnO4)	ND	0.53	10.00	235963

Field ID: RB Lab ID: 276962-008
Type: SAMPLE Sampled: 05/10/16

Analyte	Result	RL	Diln Fac	Batch#
Mercury (Front)	ND	0.10	1.000	235959
Mercury (HCl)	ND	0.043	1.000	235964
Mercury (Back)	ND	2.0	5.000	235962
Mercury (Empty)	ND	0.0090	1.000	235966
Mercury (KMnO4)	ND	0.17	10.00	235963

ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

29.1

Curtis & Tompkins, Ltd.

Metals Analytical Report

Lab #:	276962	Location:	Desert View Power Unit 1 & 2
Client:	Delta Air Quality Services	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7470A
Matrix:	Air	Prepared:	06/10/16
Units:	ug/s	Analyzed:	06/10/16
Received:	05/18/16		

Type: BLANK Diln Fac: 1.000
Lab ID: QC838962 Batch#: 235959

Analyte	Result	RL
Mercury (Front)	ND	0.00020

Type: BLANK Diln Fac: 1.000
Lab ID: QC838974 Batch#: 235962

Analyte	Result	RL
Mercury (Back)	ND	0.00020

Type: BLANK Diln Fac: 1.000
Lab ID: QC838978 Batch#: 235963

Analyte	Result	RL
Mercury (KMnO4)	ND	0.040

Type: BLANK Diln Fac: 1.000
Lab ID: QC838982 Batch#: 235964

Analyte	Result	RL
Mercury (HCl)	ND	0.040

Type: BLANK Diln Fac: 1.000
Lab ID: QC838989 Batch#: 235966

Analyte	Result	RL
Mercury (Empty)	ND	0.00020

ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

29.1

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	276962	Location:	Desert View Power Unit 1 & 2
Client:	Delta Air Quality Services	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7470A
Matrix:	Air	Received:	05/18/16
Units:	ug/s	Prepared:	06/10/16
Sampled:	05/10/16	Analyzed:	06/10/16

Field ID: 1-HG-U2 Lab ID: QC838965
Type: SSPIKE Diln Fac: 1.000
MSS Lab ID: 276962-001 Batch#: 235959

Analyte	MSS Result	Spiked	Result	%REC	Limits
Mercury (Front)	<0.02000	1.250	1.357	109	80-130

Field ID: 1-HG-U2 Lab ID: QC839031
Type: SDUP Diln Fac: 1.000
MSS Lab ID: 276962-001 Batch#: 235959

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.1000	ND	0.1000	NC	34

Type: BS Diln Fac: 1.000
Lab ID: QC838975 Batch#: 235962

Analyte	Spiked	Result	%REC	Limits
Mercury (Back)	0.002500	0.002789	112	75-129

Type: BSD Diln Fac: 1.000
Lab ID: QC838976 Batch#: 235962

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Mercury (Back)	0.002500	0.002774	111	75-129	1	40

Field ID: 1-HG-U2 Lab ID: QC838977
Type: SSPIKE Diln Fac: 5.000
MSS Lab ID: 276962-001 Batch#: 235962

Analyte	MSS Result	Spiked	Result	%REC	Limits
Mercury (Back)	54.25	18.66	46.97	-39 *	80-130

*= Value outside of QC limits; see narrative
NC= Not Calculated
ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	276962	Location:	Desert View Power Unit 1 & 2
Client:	Delta Air Quality Services	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7470A
Matrix:	Air	Received:	05/18/16
Units:	ug/s	Prepared:	06/10/16
Sampled:	05/10/16	Analyzed:	06/10/16

Field ID: 1-HG-U2 Lab ID: QC839032
Type: SDUP Diln Fac: 5.000
MSS Lab ID: 276962-001 Batch#: 235962

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	54.25	53.69	7.463	1	34

Type: BS Diln Fac: 1.000
Lab ID: QC838979 Batch#: 235963

Analyte	Spiked	Result	%REC	Limits
Mercury (KMnO4)	0.002500	0.002466	99	75-129

Type: BSD Diln Fac: 1.000
Lab ID: QC838980 Batch#: 235963

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Mercury (KMnO4)	0.002500	0.002744	110	75-129	11	40

Field ID: 1-HG-U2 Lab ID: QC838981
Type: SSPIKE Diln Fac: 10.00
MSS Lab ID: 276962-001 Batch#: 235963

Analyte	MSS Result	Spiked	Result	%REC	Limits
Mercury (KMnO4)	<0.1160	0.7251	0.5625	78 *	80-130

Field ID: 1-HG-U2 Lab ID: QC839029
Type: SDUP Diln Fac: 10.00
MSS Lab ID: 276962-001 Batch#: 235963

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	<0.5800	ND	0.5800	NC	34

*= Value outside of QC limits; see narrative
NC= Not Calculated
ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	276962	Location:	Desert View Power Unit 1 & 2
Client:	Delta Air Quality Services	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7470A
Matrix:	Air	Received:	05/18/16
Units:	ug/s	Prepared:	06/10/16
Sampled:	05/10/16	Analyzed:	06/10/16

Type: BS Diln Fac: 1.000
Lab ID: QC838983 Batch#: 235964

Analyte	Spiked	Result	%REC	Limits
Mercury (HCl)	0.002500	0.002721	109	75-129

Type: BSD Diln Fac: 1.000
Lab ID: QC838984 Batch#: 235964

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Mercury (HCl)	0.002500	0.002444	98	75-129	11	40

Field ID: 1-HG-U2 Lab ID: QC838985
Type: SSPIKE Diln Fac: 1.000
MSS Lab ID: 276962-001 Batch#: 235964

Analyte	MSS Result	Spiked	Result	%REC	Limits
Mercury (HCl)	0.01606	0.3376	0.1963	53 *	80-130

Field ID: 1-HG-U2 Lab ID: QC839028
Type: SDUP Diln Fac: 1.000
MSS Lab ID: 276962-001 Batch#: 235964

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	<0.02701	ND	0.02701	NC	34

Type: BS Diln Fac: 1.000
Lab ID: QC838990 Batch#: 235966

Analyte	Spiked	Result	%REC	Limits
Mercury (Empty)	0.002500	0.002699	108	75-129

*= Value outside of QC limits; see narrative
NC= Not Calculated
ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4- KMnO4

31.1

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	276962	Location:	Desert View Power Unit 1 & 2
Client:	Delta Air Quality Services	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7470A
Matrix:	Air	Received:	05/18/16
Units:	ug/s	Prepared:	06/10/16
Sampled:	05/10/16	Analyzed:	06/10/16

Type:	BSD	Diln Fac:	1.000
Lab ID:	QC838991	Batch#:	235966

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Mercury (Empty)	0.002500	0.002834	113	75-129	5	40

Field ID:	RB	Lab ID:	QC838992
Type:	SSPIKE	Diln Fac:	1.000
MSS Lab ID:	276962-008	Batch#:	235966

Analyte	MSS Result	Spiked	Result	%REC	Limits
Mercury (Empty)	<0.001802	2.354	2.633	112	80-130

Field ID:	RB	Lab ID:	QC839027
Type:	SDUP	Diln Fac:	1.000
MSS Lab ID:	276962-008	Batch#:	235966

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	<0.009009	ND	0.009009	NC	34

*= Value outside of QC limits; see narrative
NC= Not Calculated
ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

31.1

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

Date: July 21, 2016
Project # 009-457
Control # F222/16
Received: 06/29/16

Desert View Power, Greenleaf Power, LLC
Benjamin Gates
62-300 Gene Welmas Dr.
Mecca, CA 92254-0758

Sample Number: F222/16	-1	-2	-3
Sample Identification:	5-10-16	5-11-16	Andre's
Air Dry Loss, %	13.90	21.23	13.84
Ash (Air Dry Basis), %			10.40
Ash (As Received Basis), %			8.96
BTU/lb (Air Dry Basis)			7275
BTU/lb (As Rec'd Basis)			6268
Chlorine (Air Dry Basis), %			0.211
Chlorine (As Received Basis), %			0.182
Mercury (Air Dry Basis), mg/kg	0.03	0.01	
Mercury (As Received Basis), mg/kg	0.026	0.008	

By:
Mark A Pugh
Fuel Laboratory Manager

Note: BTU/lb values are not corrected for sulfur.

Desert View Power
Boiler Heat Input

ATTACHMENT B

FUEL ANALYSIS

MAY 10 & 11 2016 REPRESENTATIVE

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

DATE May 20, 2016
PROJ. # 008-457
CTRL # E126/16
REC'D 05/17/16

Desert View Power
Ben Gates
PO Box 758
Mecca, CA 92254-0758

Sample Number: E126/16 Sample Identification:	1 05/10/16	2 05/11/16
Sodium in Ash as Na2O, %	3.07	3.40
Potassium in Ash as K2O, %	9.46	9.70
Chlorine in Ash, %	1.04	1.88
Carbon Dioxide in Ash, %	2.77	1.66

By:
Mark A. Pugh
Fuel Laboratory Manager

The sample was ashed at 600 degrees celsius prior to analysis.

An Employee-Owned Company

Delta Air Quality Services Incorporated

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

DATE	May 20, 2016
PROJ. #	009-457
CTRL #	E126/16
REC'D	05/17/16

Desert View Power
Ben Gates
PO Box 758
Mecca, CA 92254-0758

Sample Number: E126/16	1	2
Sample Identification:	05/10/16	05/11/16
pH of a 30% Mixture	6.47	6.38

By:

Mark A. Pugh
Fuel Laboratory Manager

An Employee-Owned Company

Delta Air Quality Services, Incorporated

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

Date May 20 2016
HRI Project 009-457
HRI Series No. E126/16-1
Date Rec'd. 05/17/16
Cust. P.O.#

Desert View Power
Ben Gates
PO Box 758
Mecca, CA 92254-0758

Sample Identification
5/10/16

Reporting Basis >	As Rec'd	Dry	Air Dry
Proximate (%)			
Moisture	31.12	0.00	3.13
Ash	4.24	6.15	5.96
Volatile	53.80	78.10	75.66
Fixed C	10.84	15.75	15.25
Total	100.00	100.00	100.00
Sulfur	0.077	0.111	0.108
Btu/lb (HHV)	5244	7613	7374
Btu/lb (LHV)	4546	7065	
MMF Btu/lb	5494	8154	
MAF Btu/lb		8112	
Ultimate (%)			
Moisture	31.12	0.00	3.13
Carbon	34.90	50.67	49.08
Hydrogen	4.07	5.90	5.72
Nitrogen	0.48	0.70	0.68
Sulfur	0.08	0.11	0.11
Ash	4.24	6.15	5.96
Oxygen*	25.11	36.47	35.32
Total	100.00	100.00	100.00
Chlorine**	0.124	0.181	0.175

Air Dry Loss (%) 28.89

Forms of Sulfur, as S, (%)

Sulfate		
Pyritic		
Organic	———	———
Total	0.08	0.11

Water Soluble Alkalies (%)

Na2O	0.070	0.102
K2O	0.278	0.404

Lb. Alkali Oxide/MM Btu=
Lb. Ash/MM Btu= 8.08
Lb. SO2/MM Btu= 0.29
Lb. Cl/MM Btu= 0.24
As Rec'd. Sp.Gr.=
Free Swelling Index=
F-Factor(dry), DSCF/MM Btu= 10,824

Report Prepared By:

Mark A. Pugh
Fuel Laboratory Manager

* Oxygen by Difference.
** Not usually reported as part of the ultimate analysis.

An Employee-Owned Company

Delta Air Quality Services, Incorporated

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

Date May 20 2016
HRI Project 009-457
HRI Series No. E126/16-2
Date Rec'd. 05/17/16
Cust. P.O.#

Desert View Power
Ben Gates
PO Box 758
Mecca, CA 92254-0758

Sample Identification
5/11/16

Reporting Basis >	As Rec'd	Dry	Air Dry
Proximate (%)			
Moisture	28.80	0.00	3.11
Ash	4.01	5.64	5.46
Volatile	55.69	78.21	75.78
Fixed C	11.50	16.15	15.65
Total	100.00	100.00	100.00
Sulfur	0.072	0.101	0.098
Btu/lb (HHV)	5567	7818	7575
Btu/lb (LHV)	4869	7255	
MMF Btu/lb	5817	8324	
MAF Btu/lb		8285	
Ultimate (%)			
Moisture	28.80	0.00	3.11
Carbon	36.42	51.15	49.56
Hydrogen	4.32	6.07	5.88
Nitrogen	0.43	0.61	0.59
Sulfur	0.07	0.10	0.10
Ash	4.01	5.64	5.46
Oxygen*	25.95	36.43	35.30
Total	100.00	100.00	100.00
Chlorine**	0.129	0.182	0.176

Air Dry Loss (%) 26.51

Forms of Sulfur, as S, (%)

Sulfate		
Pyritic		
Organic		
Total	0.07	0.10

Water Soluble Alkalies (%)

Na2O	0.072	0.101
K2O	0.309	0.435

Lb. Alkali Oxide/MM Btu=
Lb. Ash/MM Btu= 7.21
Lb. SO2/MM Btu= 0.26
Lb. Cl/MM Btu= 0.23
As Rec'd. Sp.Gr.=
Free Swelling Index=
F-Factor(dry), DSCF/MM Btu= 10,712

Report Prepared By:

Mark A. Pugh
Fuel Laboratory/Manager

* Oxygen by Difference.
** Not usually reported as part of the ultimate analysis.

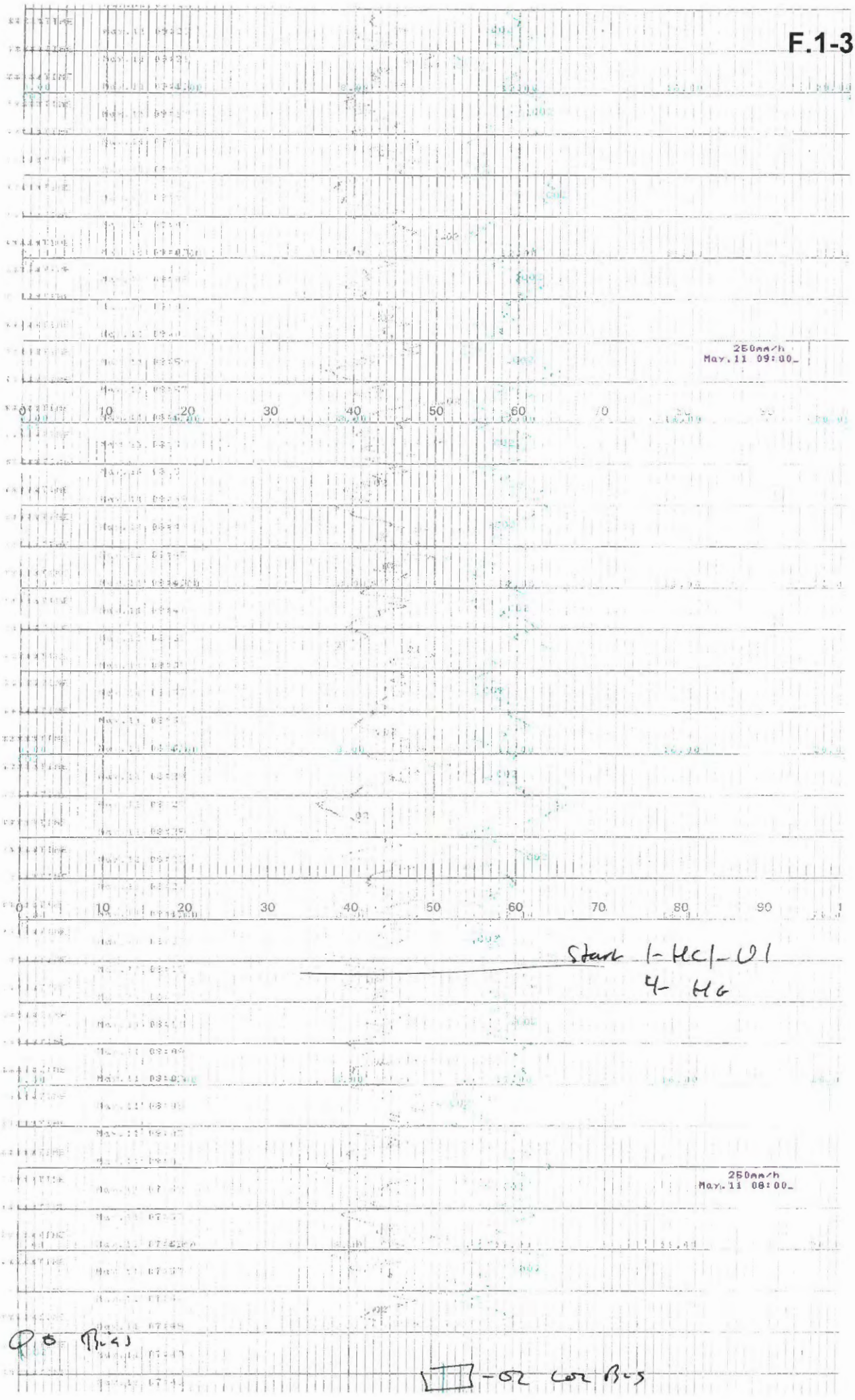
An Employee-Owned Company

Delta Air Quality Services, Incorporated

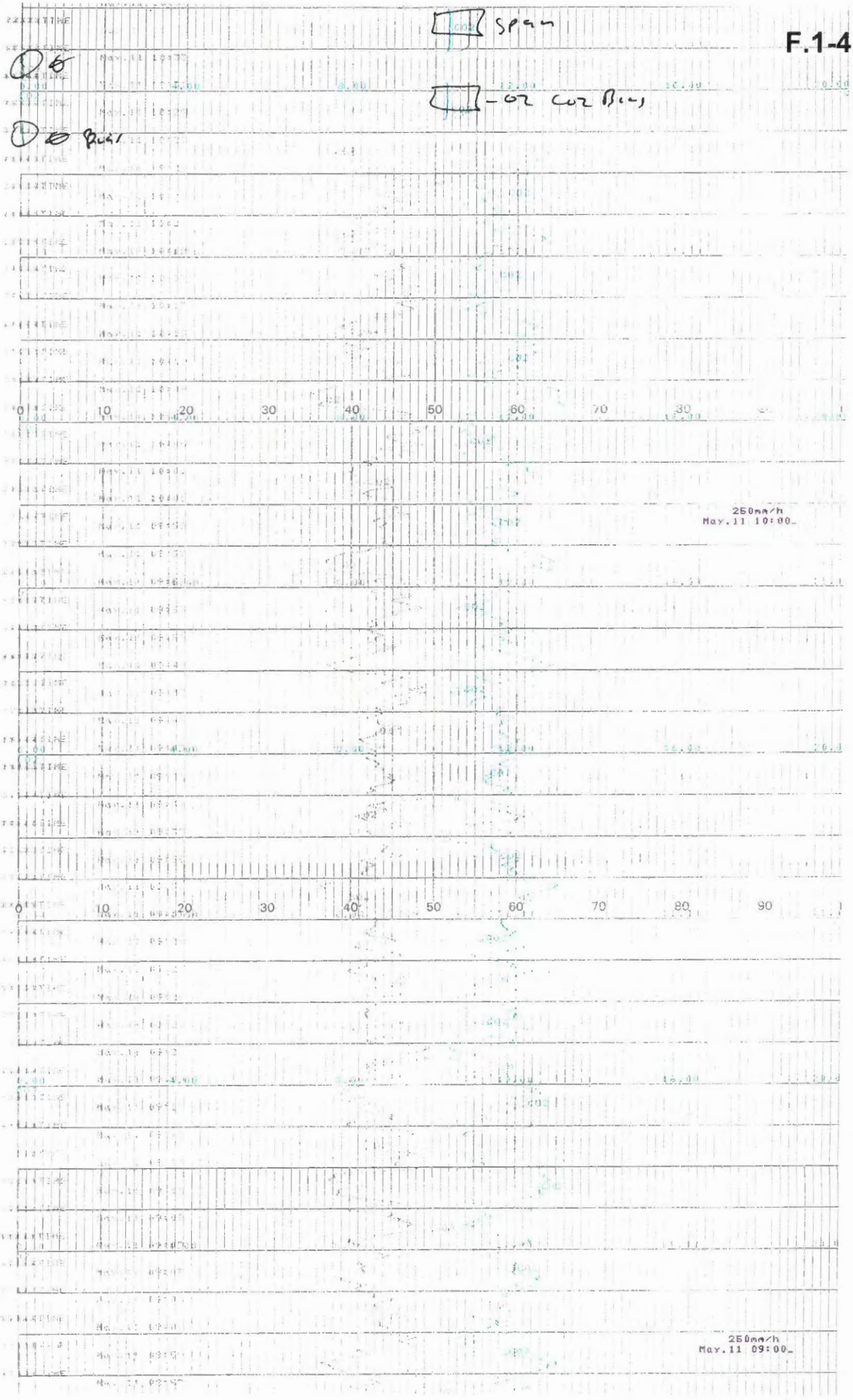
APPENDIX F INSTRUMENT STRIP CHARTS

F.1-2
Start 1-HCl-Ul
4- HG
250mm/h
May.11 08:00
Bias
-O2 Cor Bias
Mid
High
Unit 1
19:47 07:29 250mm/h

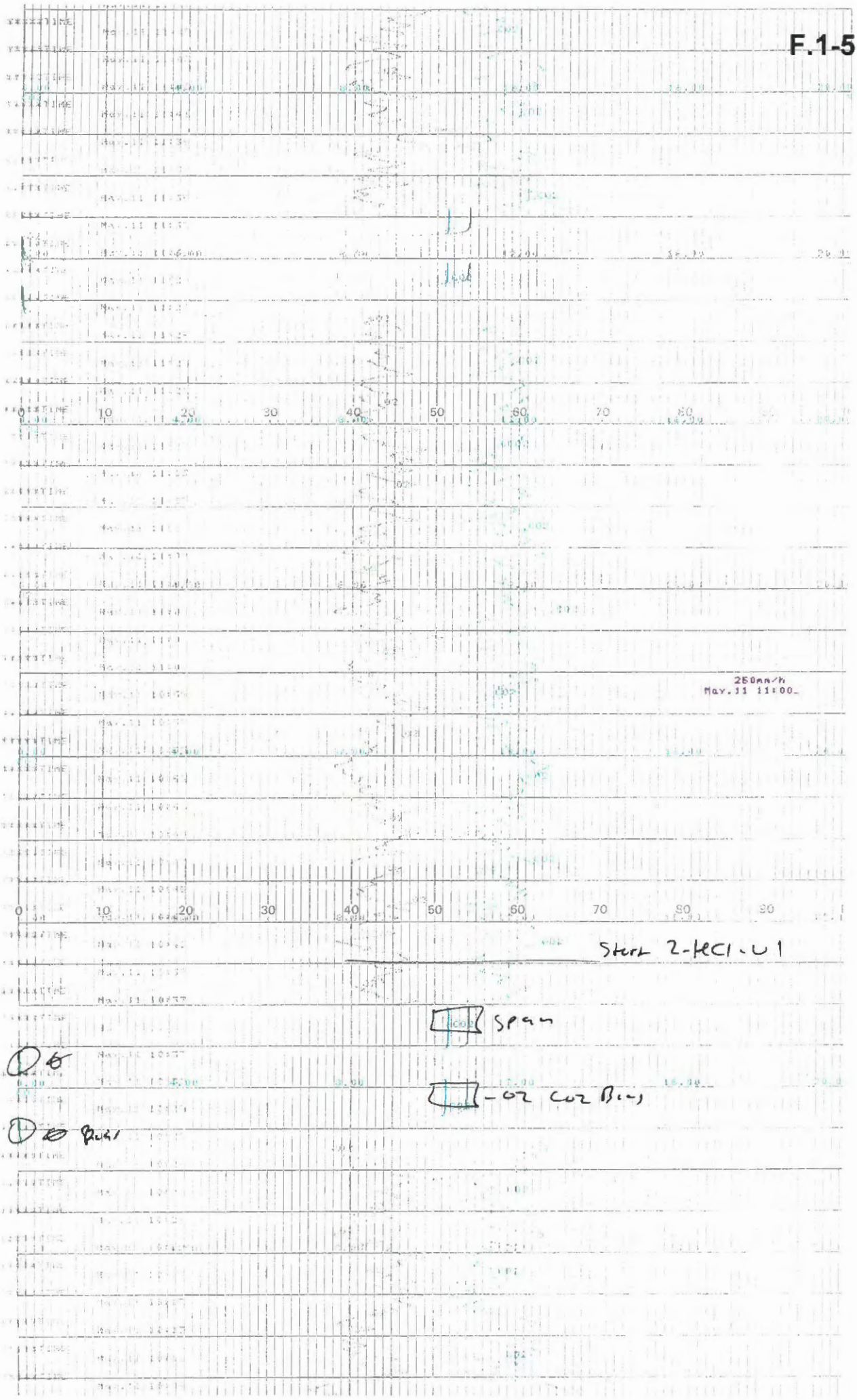
F.1-3

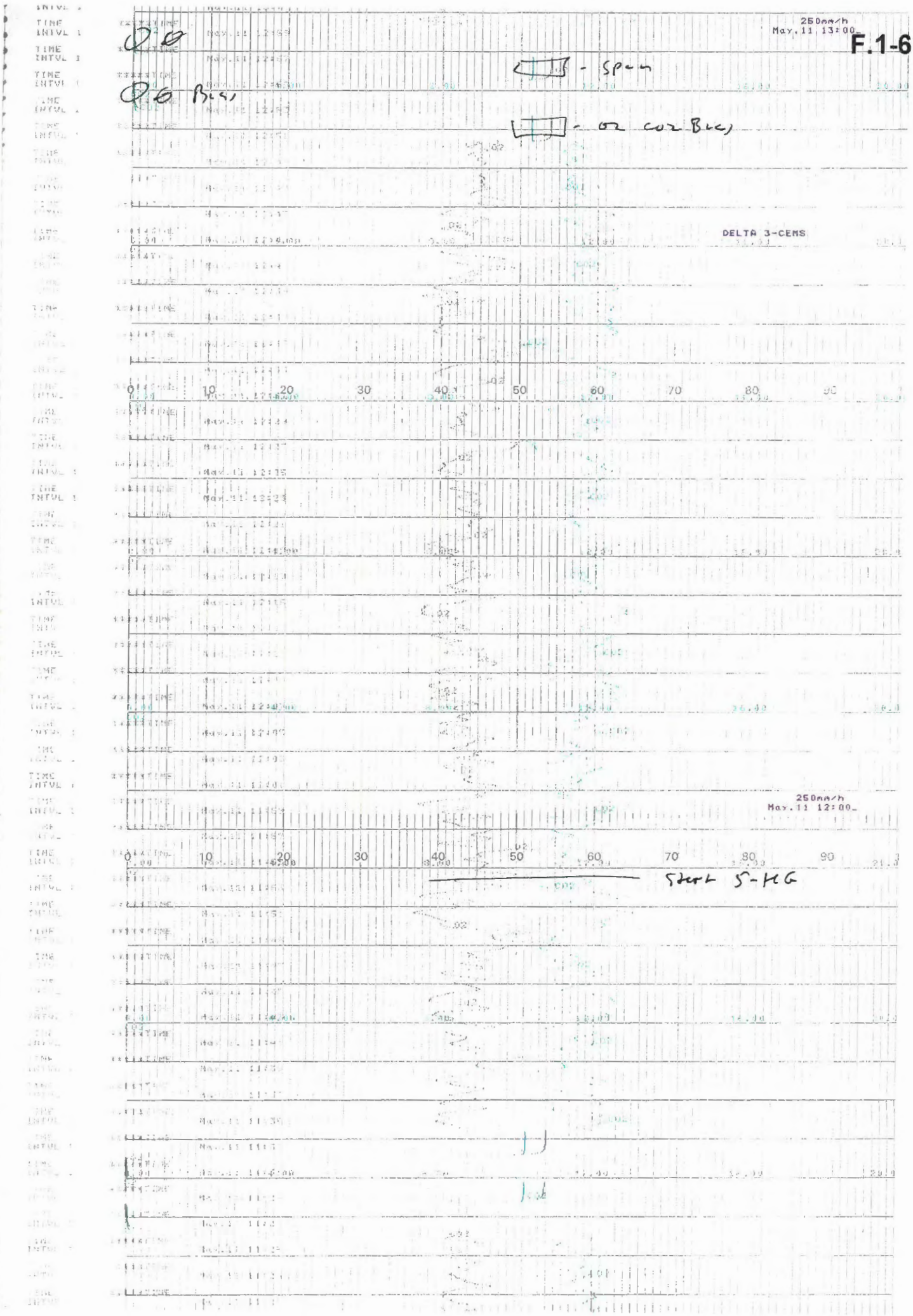


250mm/h
May.11 09:00
0 10 20 30 40 50 60 70
0 10 20 30 40 50 60 70 80 90
Start 1-HCl-U1
4- HG
250mm/h
May.11 08:00
Q0 Bias
-O2 Cor Bias

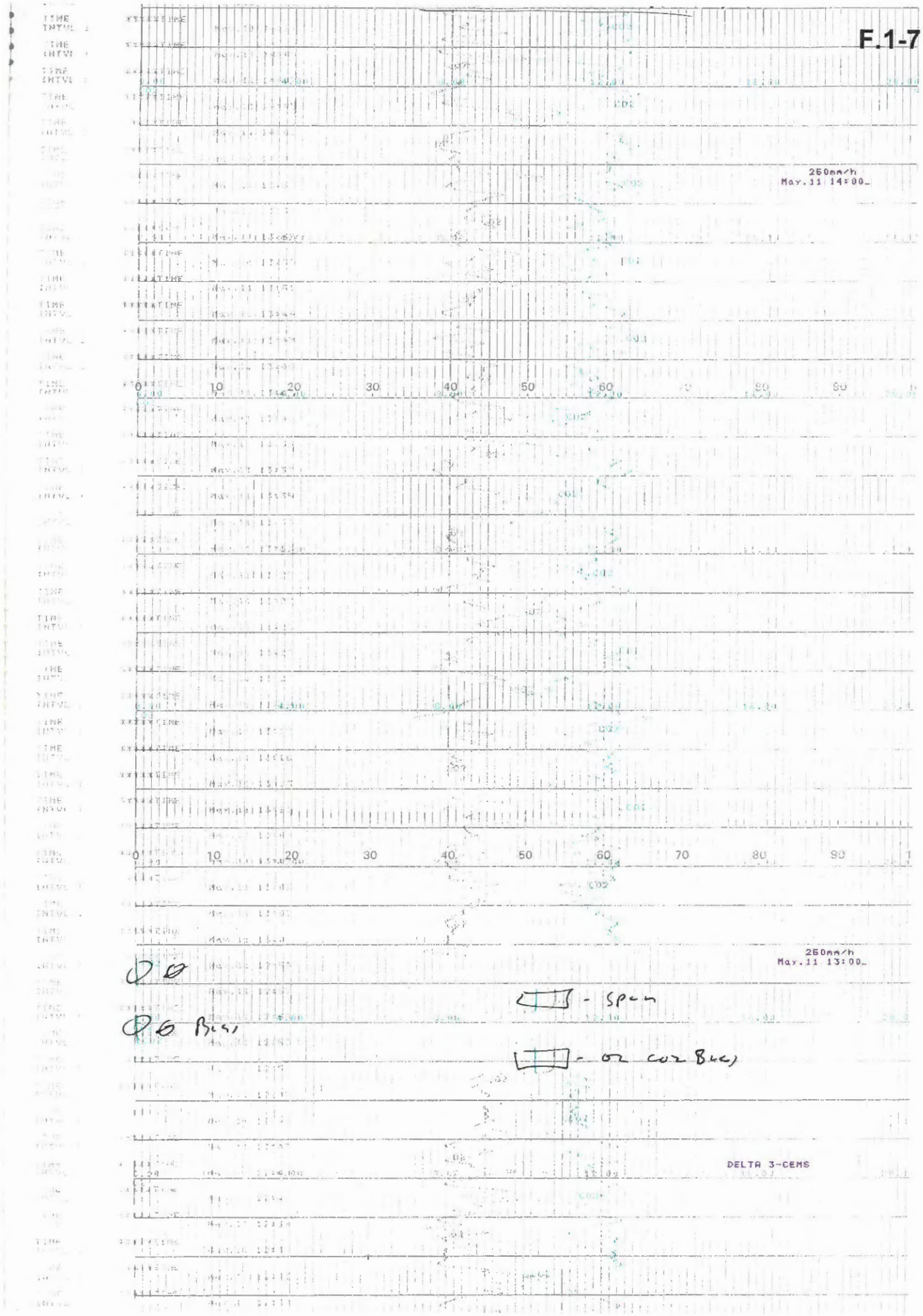


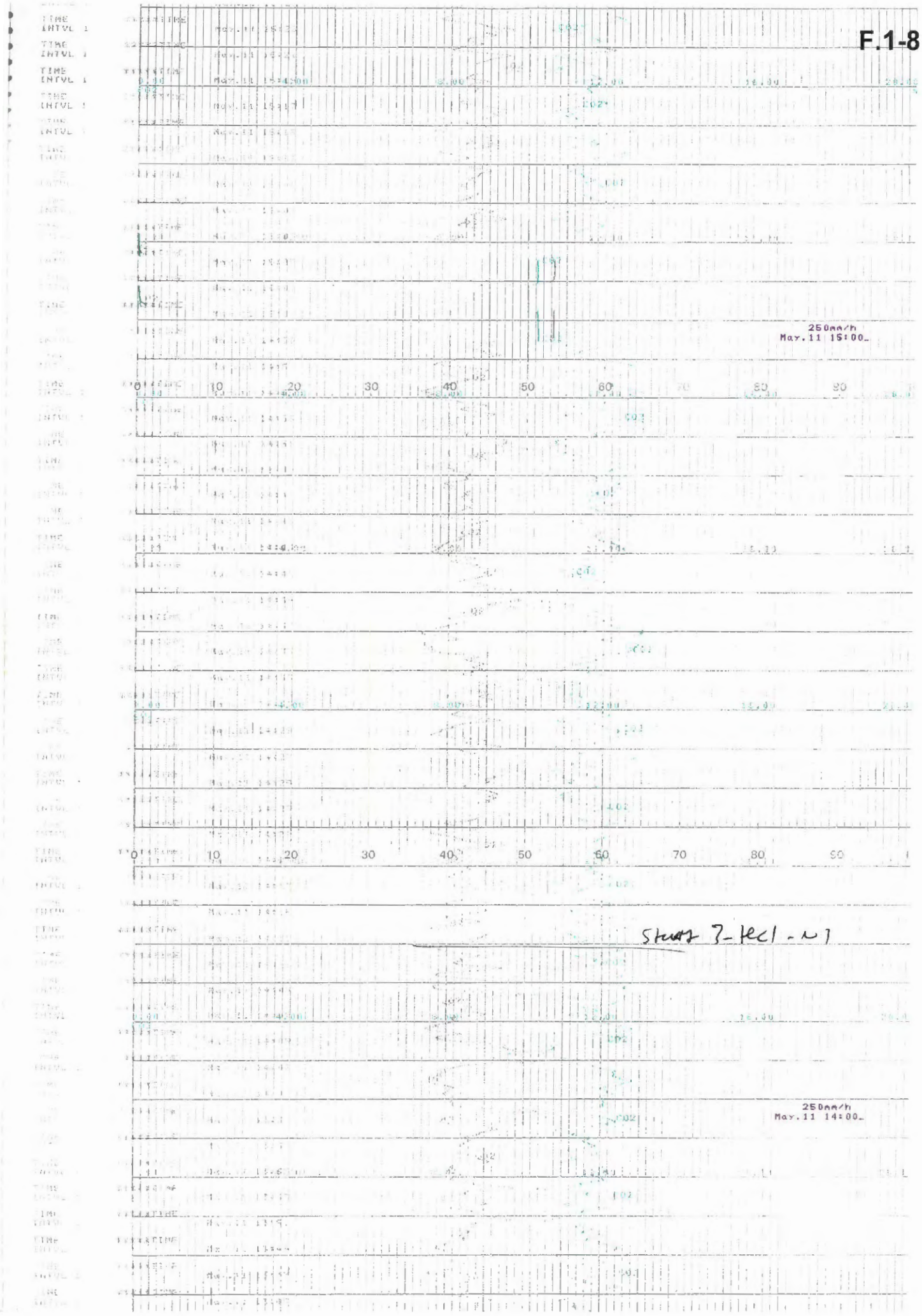
F.1-4
Span
-O2 CO2 Bias
Bias
0
10
20
30
40
50
60
70
80
90
250mm/h
May.11 10:00
250mm/h
May.11 09:00

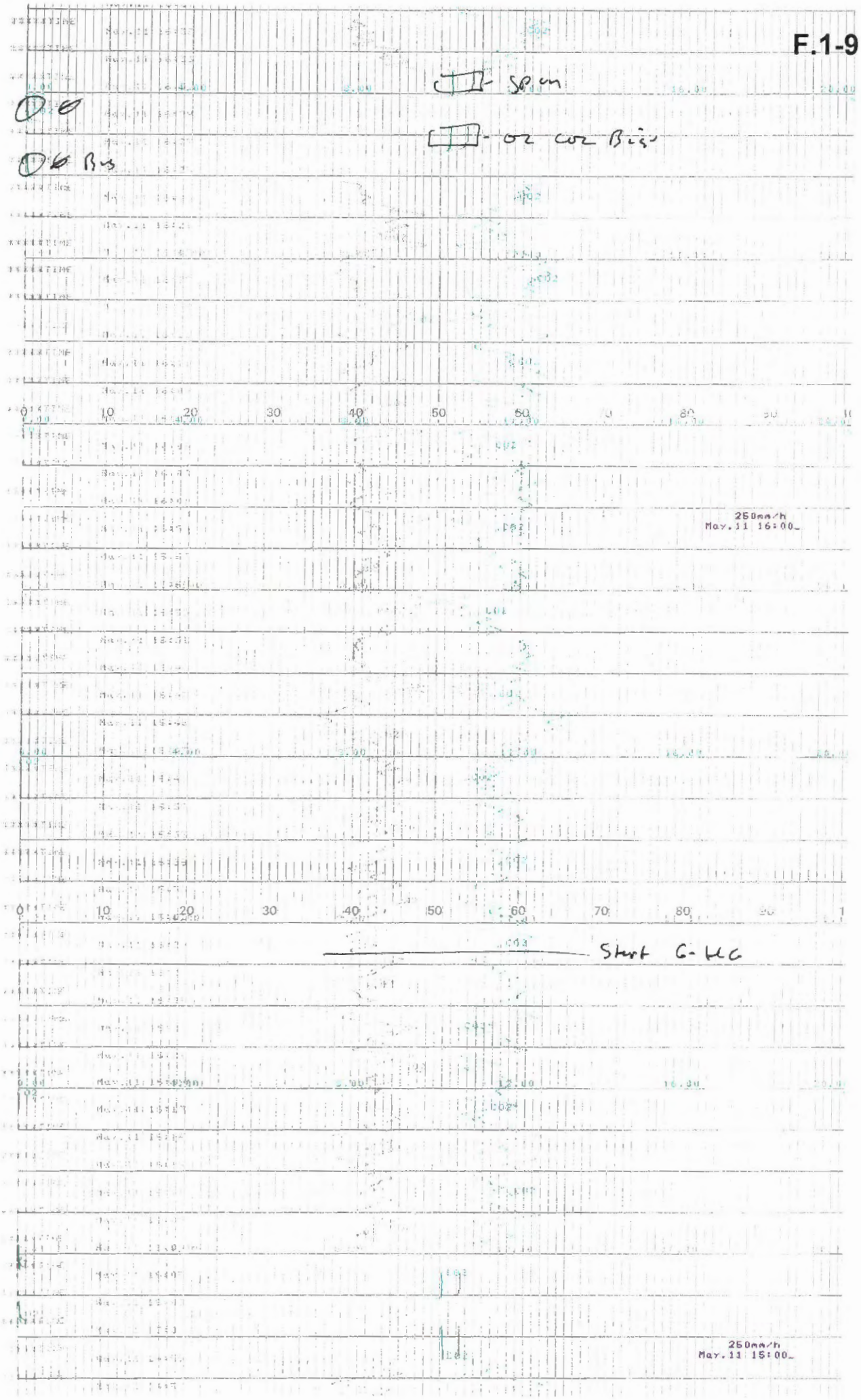

0
10
20
30
40
50
60
70
80
90
250mm/h
May.11 11:00
Start 2-HCl-U1
span
-02 CO2 Bias
Bias



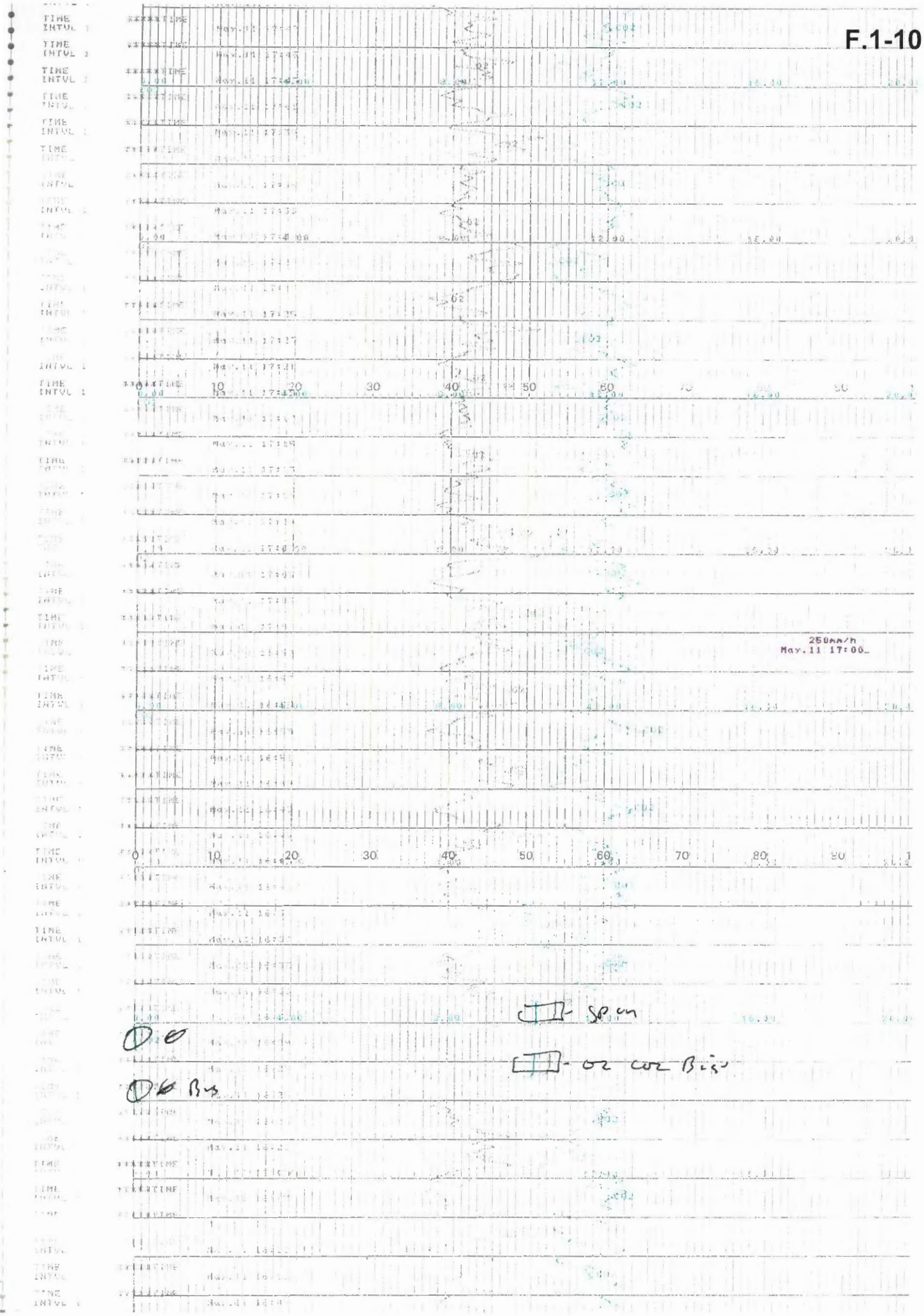
F.1-6
250mm/h
May.11 13:00
- Span
- O2 CO2 Bias
DELTA 3-CEMS
0 10 20 30 40 50 60 70 80 90
250mm/h
May.11 12:00
Start 5-HG


F.1-7
250mm/h
May.11 14:00
0 10 20 30 40 50 60 70 80 90
0 10 20 30 40 50 60 70 80 90
250mm/h
May.11 13:00
- Span
- O2 CO2 Bias
DELTA 3-CEMS

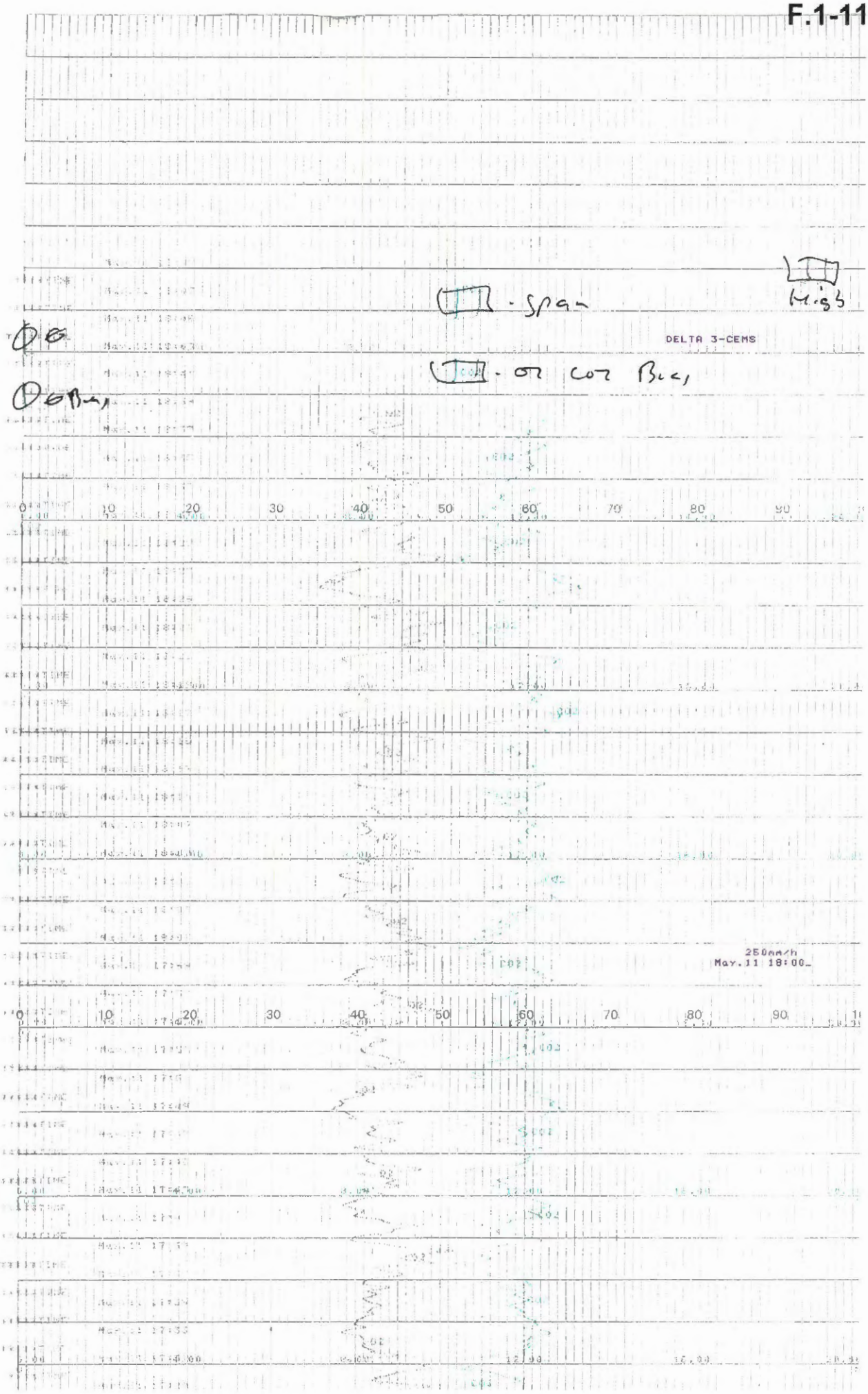

F.1-8
250mm/h
May.11 15:00
0
10
20
30
40
50
60
70
80
90
Start 3-tec1-N1
250mm/h
May.11 14:00

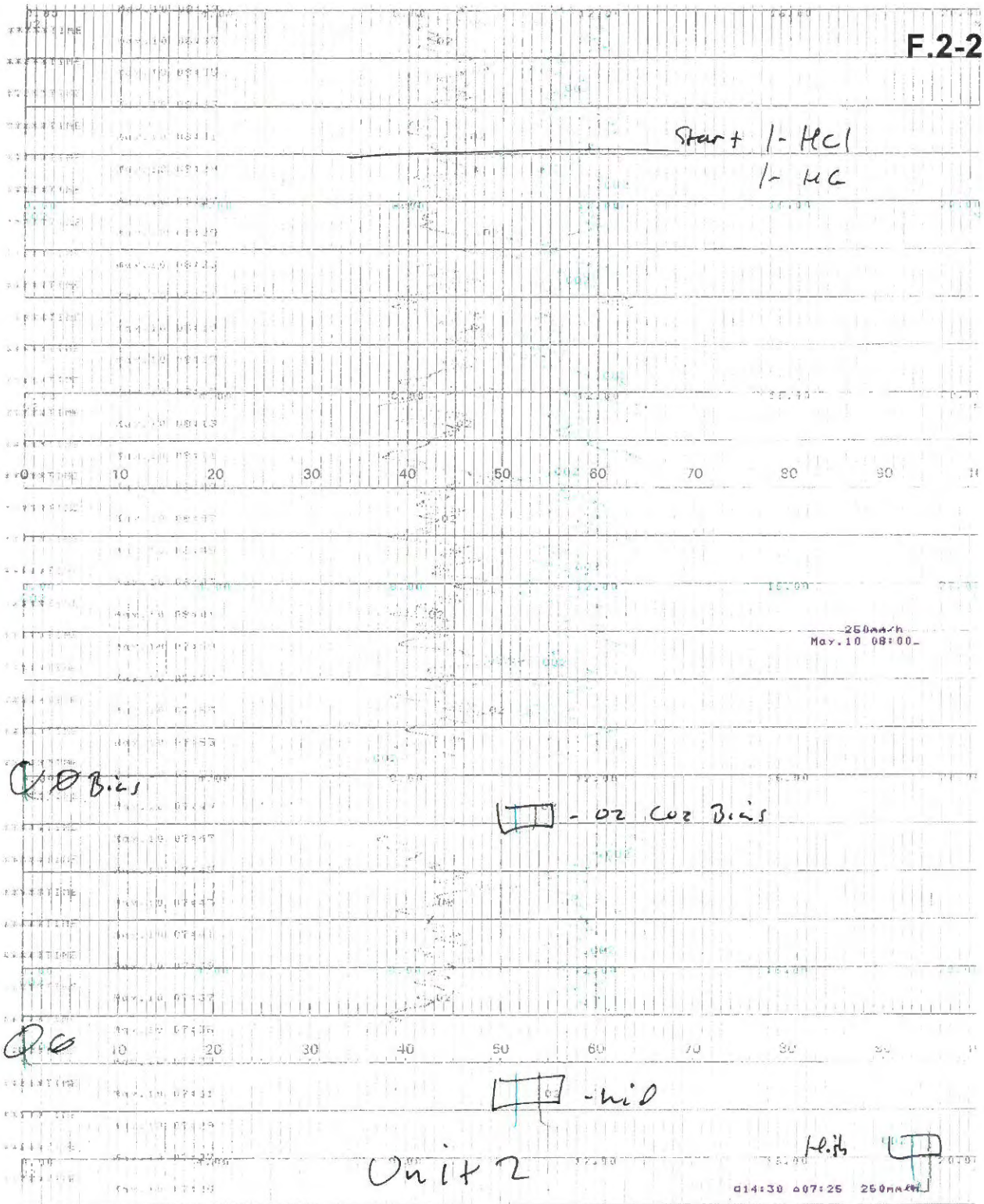

F.1-9
- Spcm
- O2 CO2 Bias
Bus
250mm/h
May.11 16:00
Start G-HC
250mm/h
May.11 15:00

F.1-10



TIME INTVL
0
10
20
30
40
50
60
70
80
90
250mm/h
May.11 17:00
Span
O2 CO2 Bias
Bias


DELTA 3-CEMS
- span
- or cor Bias
High
250mm/h
May.11 18:00
0
10
20
30
40
50
60
70
80
90



Desert View power HCl + HG testing

O2 - 0-20% CO2. 0-20%

O2 10.83 - CC164221 O2 18.97

CO2 10.78 CO2 18.62 - CC179518

F.2-3

250mm/h
May.10 09:00

0 10 20 30 40 50 60 70 80

Start 1- HCl
1- HC

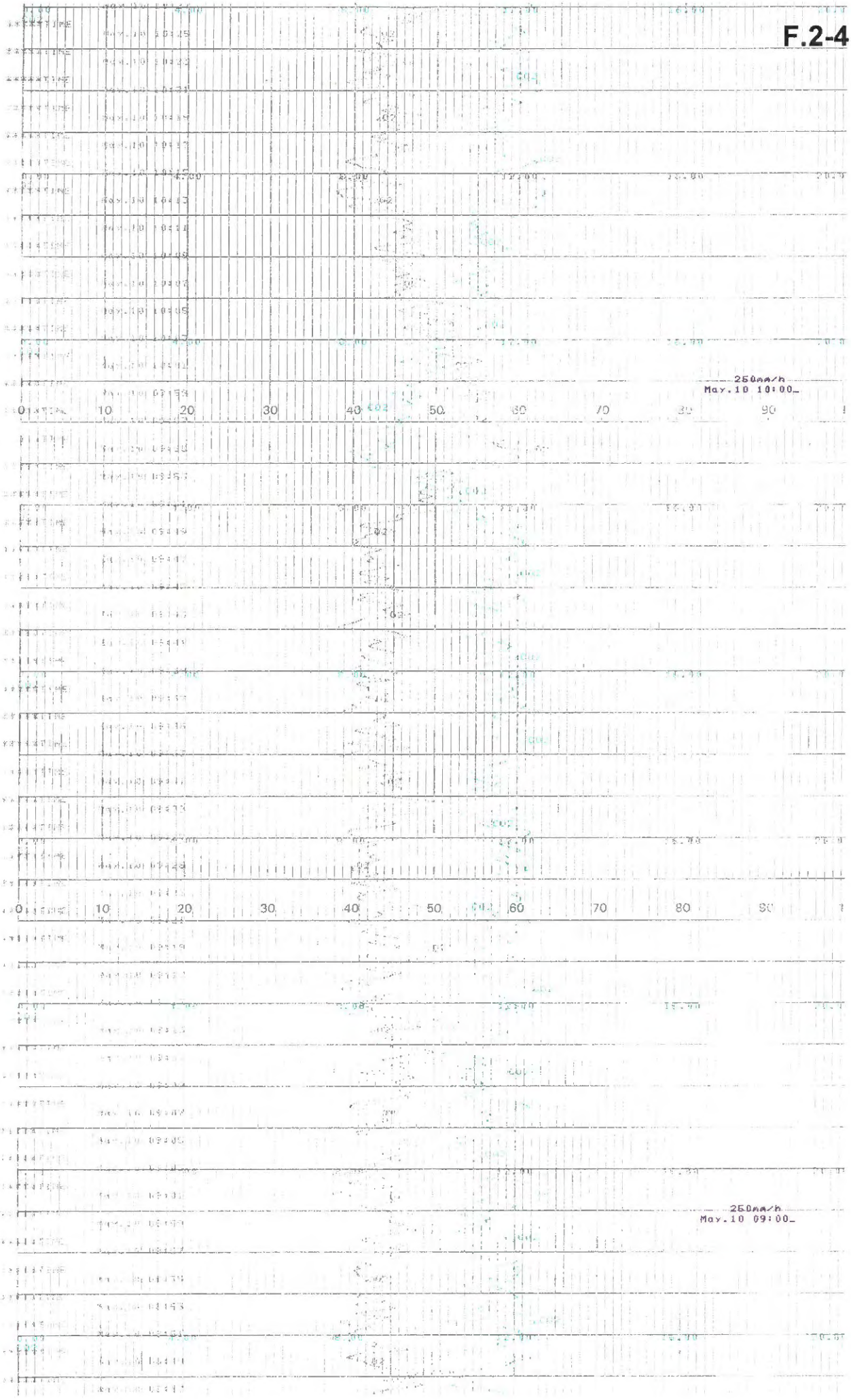
0 10 20 30 40 50 60 70 80

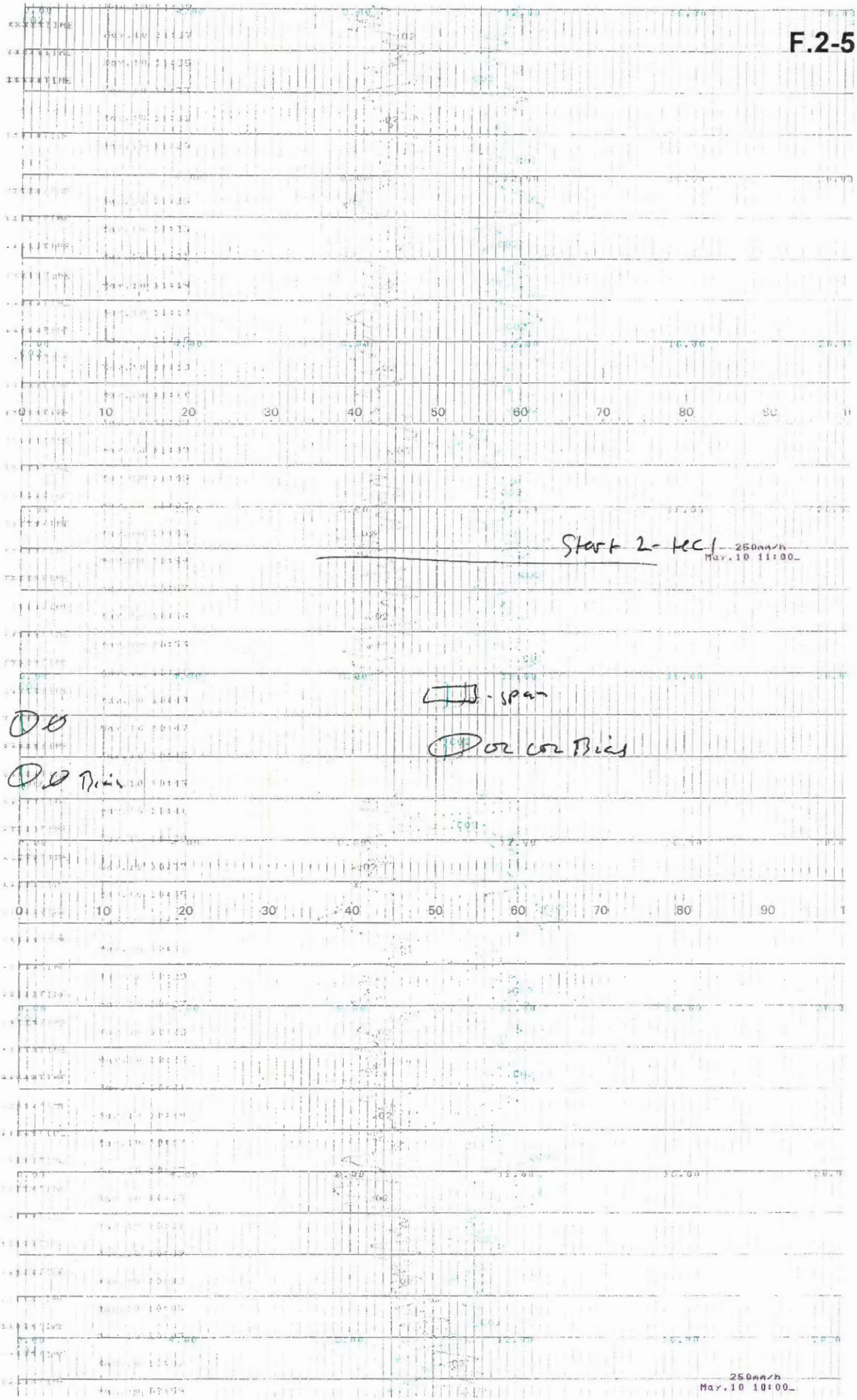
250mm/h
May.10 08:00

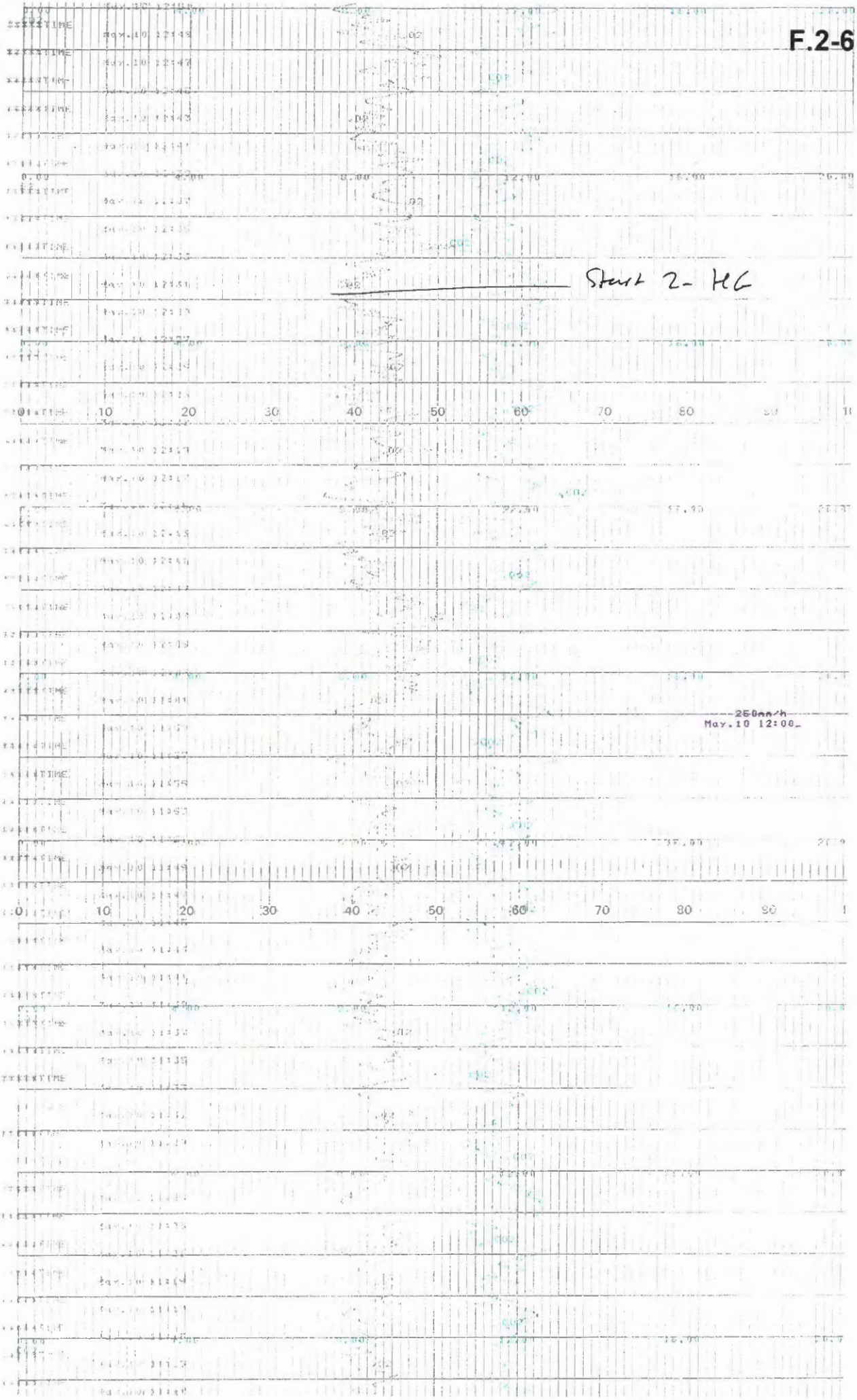
0 Bias

- O2 CO2 Bias

F.2-4




F.2-5
Start 2-HCl
250mm/h
May.10 11:00
span
or cor Bias
Bias
250mm/h
May.10 10:00


Start 2- HG
10
20
30
40
50
60
70
80
90
250mm/h
May.10 12:00

F.2-7

250mm/h
May.10 14:00

10 20 30 40 50 60 70 80 90

Start 3-HCl

Span

O2 CO2 Bias

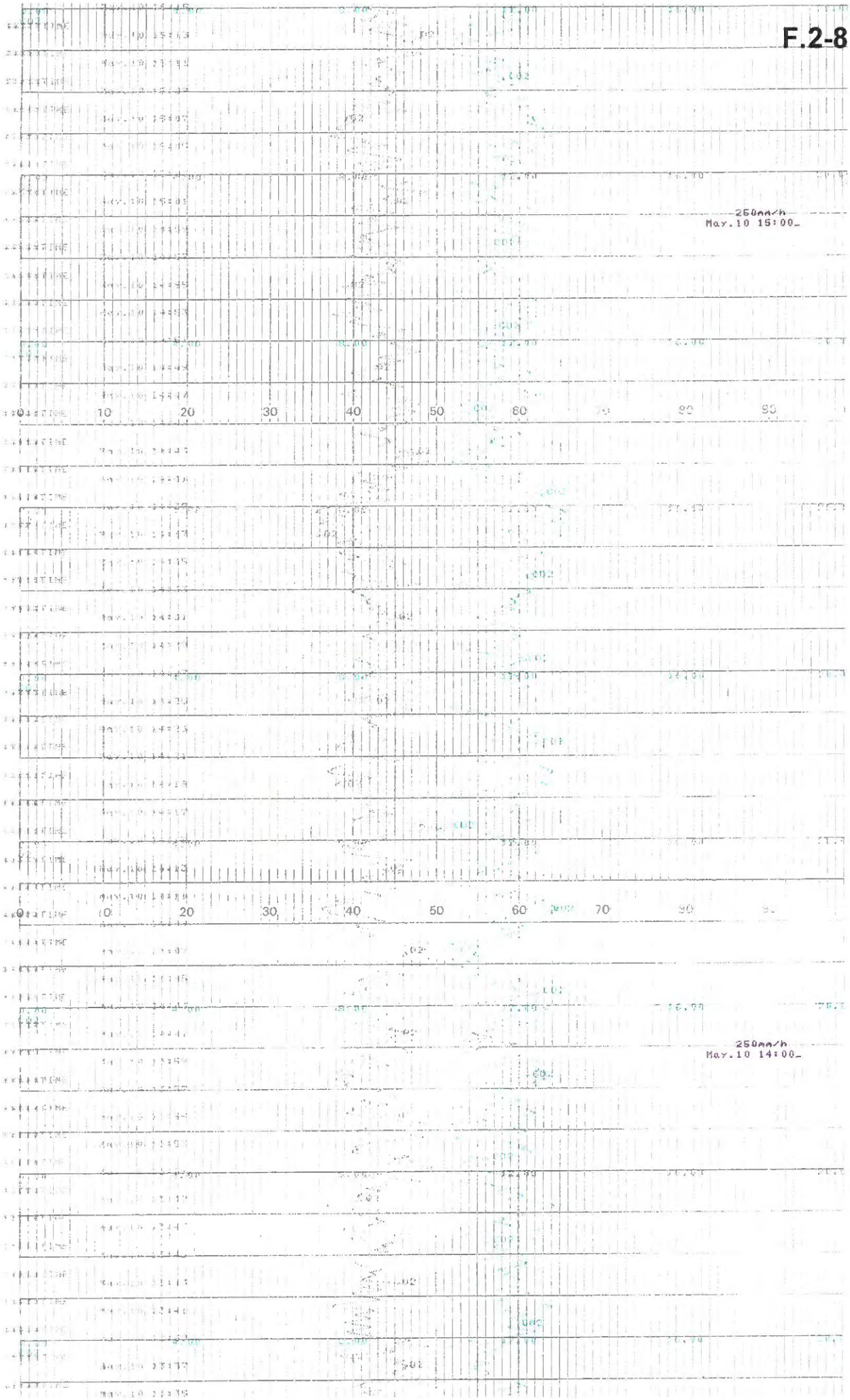
DELTA 3-CEMS

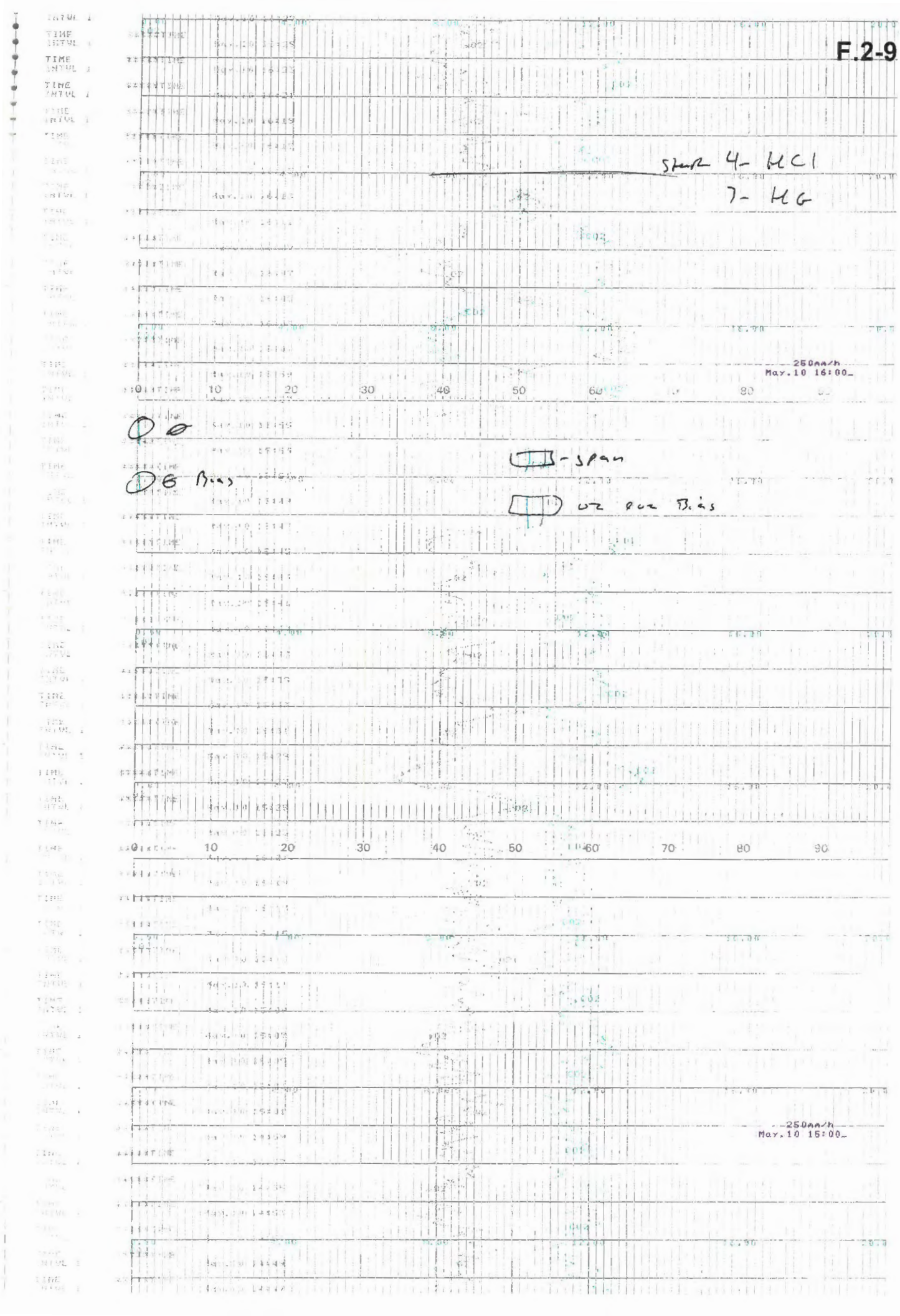
250mm/h
May.10 13:00

10 20 30 40 50 60 70 80 90

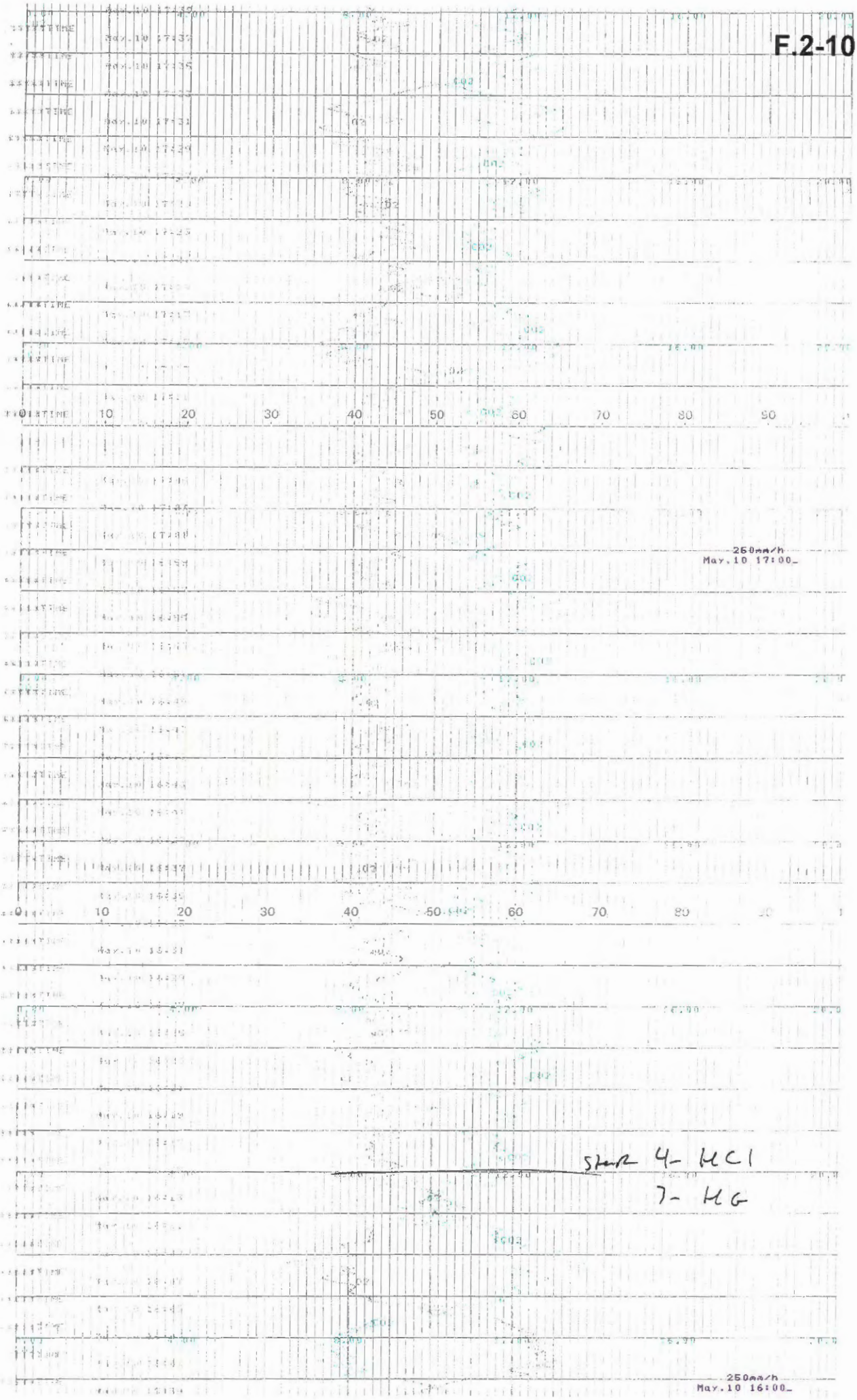
Start 2-HCl

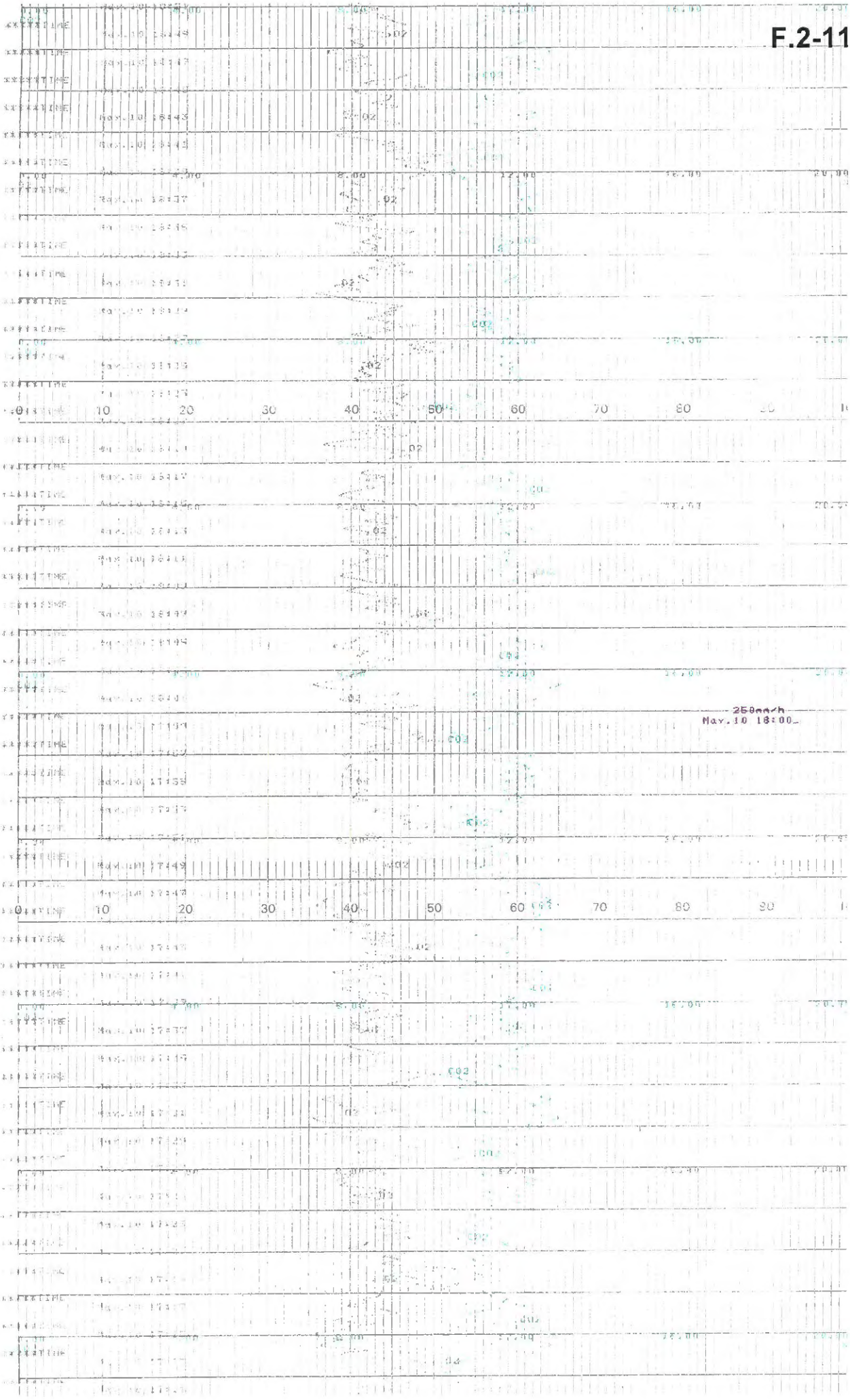
F.2-8

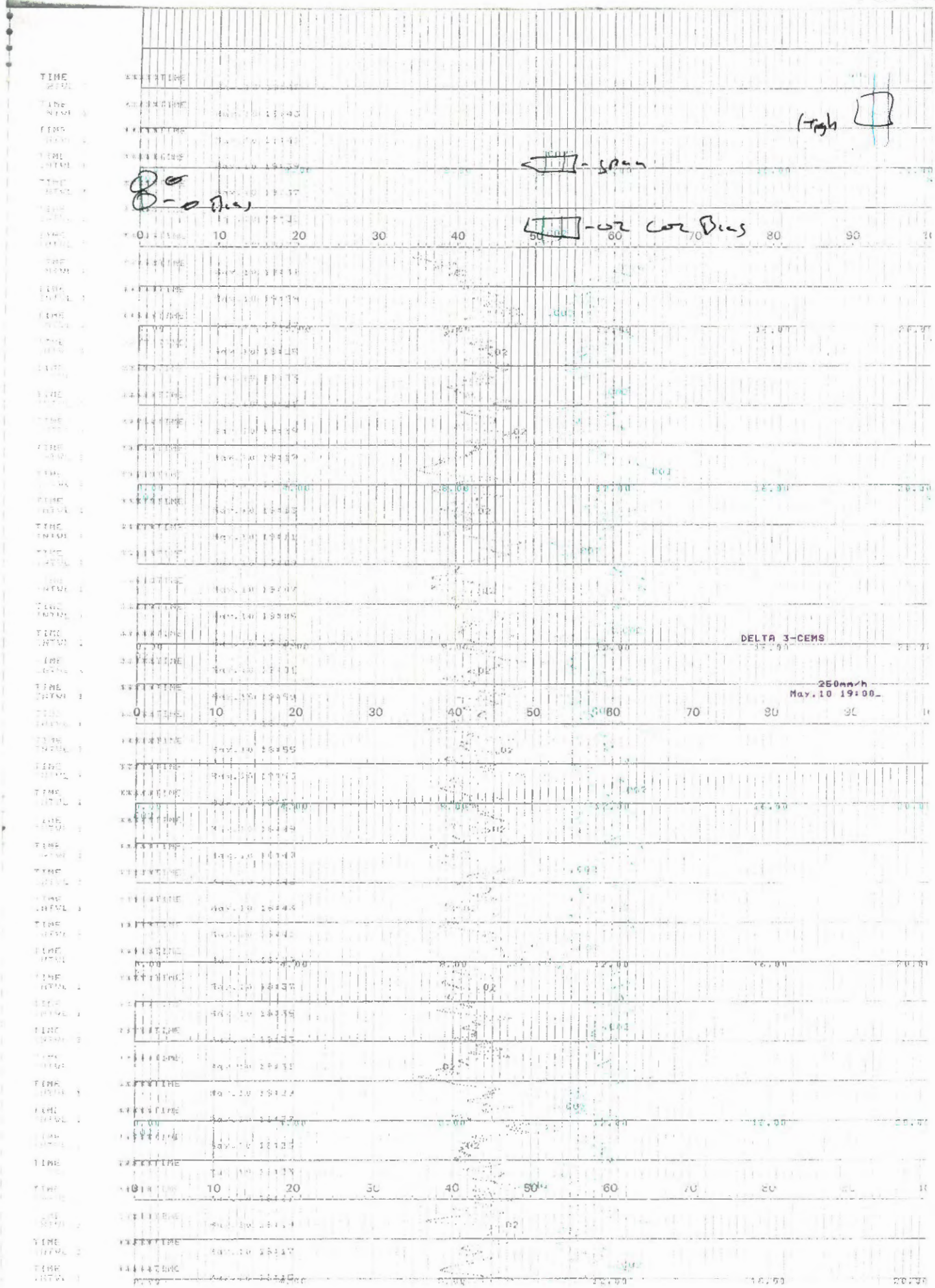

250mm/h
May.10 15:00
10
20
30
40
50
60
70
80
90
250mm/h
May.10 14:00
10
20
30
40
50
60
70
80


F.2-9
Start 4- HCl
7- HG
250mm/h
May.10 16:00
0 10 20 30 40 50 60 80
- span
6 Bias
02 Bias
0 10 20 30 40 50 60 70 80 90
250mm/h
May.10 15:00

F.2-10


TIME
10
20
30
40
50
60
70
80
90
250mm/h
May.10 17:00
250mm/h
May.10 16:00
start 4- HCl
7- HG


10
20
30
40
50
60
70
80
250mm/h
May.10 18:00


(High
- span
- O2 CO2 Bias
DELTA 3-CEMS
250mm/h
May.10 19:00

APPENDIX G CHAIN OF CUSTODY

CHAIN OF CUSTODY FORM

CLIENT: Desert View Power
Unit: Unit 1 and 2
SAMPLE LOCATION: Stack Breaching
TEST METHOD(S): EPA 29 For HG
OUTSIDE LAB REQUIRED: YES

TEST DATE(S): 5/10 and 5/11/2016
SAMPLER(S): Rik Dupont
PROJECT MANAGER: Dave Wonderly
DATE DUE: 6/1/2016
COMPLIANCE TEST: Yes

DATE	TIME	TEST #	SAMPLE DESCRIPTION	CONTAINERS	SAMPLER	COMMENTS
5/10/2016	830/1150	1-HG-U2	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
5/10/2016	830/1150	1-HG-U2	B 1/2 - HNO3 Portion	1	RIK DUPONT	
5/10/2016	830/1150	1-HG-U2	Empty impinger	1	RIK DUPONT	
5/10/2016	830/1150	1-HG-U2	KMNO4 Portion	1	RIK DUPONT	
5/10/2016	830/1150	1-HG-U2	HCL Rinse	1	RIK DUPONT	
5/10/2016	830/1150	1-HG-U2	Filter # 83-UP-652	1	RIK DUPONT	
5/10/2016	1231/1546	2-HG-U2	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
5/10/2016	1231/1546	2-HG-U2	B 1/2 - HNO3 Portion	1	RIK DUPONT	
5/10/2016	1231/1546	2-HG-U2	Empty impinger	1	RIK DUPONT	
5/10/2016	1231/1546	2-HG-U2	KMNO4 Portion	1	RIK DUPONT	
5/10/2016	1231/1546	2-HG-U2	HCL Rinse	1	RIK DUPONT	
5/10/2016	1231/1546	2-HG-U2	Filter # 83-UP-653	1	RIK DUPONT	

RELEASED BY	DATE/TIME	RECEIVED BY	DATE/TIME
[illegible]	5-16-2016 1030	[illegible]	

ANALYSIS REQUIRED: Analyze for HG by EPA 29 Do combined, front ½, Back ½ and the Empty Impinger for analysis, Use QA in EPA 29. Samples are labeled a "metals"

Delta
Air Quality Services, Incorporated

CHAIN OF CUSTODY FORM

CLIENT: Desert View Power
Unit: Unit 1 and 2
SAMPLE LOCATION: Stack Breaching
TEST METHOD(S): EPA 29 For HG
OUTSIDE LAB REQUIRED: YES

TEST DATE(S): 5/10 and 5/11/2016
SAMPLER(S): Rik Dupont
PROJECT MANAGER: Dave Wonderly
DATE DUE: 6/1/2016
COMPLIANCE TEST: Yes

DATE	TIME	TEST #	SAMPLE DESCRIPTION	CONTAINERS	SAMPLER	COMMENTS
5/10/2016	1615/1933	3-HG-U2	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
5/10/2016	1615/1933	3-HG-U2	B 1/2 - HNO3 Portion	1	RIK DUPONT	
5/10/2016	1615/1933	3-HG-U2	Empty impinger	1	RIK DUPONT	
5/10/2016	1615/1933	3-HG-U2	KMNO4 Portion	1	RIK DUPONT	
5/10/2016	1615/1933	3-HG-U2	HCL Rinse	1	RIK DUPONT	
5/10/2016	1615/1933	3-HG-U2	Filter # 83-UP-646	1	RIK DUPONT	
5/11/2016	815/1125	4-HG-U1	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
5/11/2016	815/1125	4-HG-U1	B 1/2 - HNO3 Portion	1	RIK DUPONT	
5/11/2016	815/1125	4-HG-U1	Empty impinger	1	RIK DUPONT	
5/11/2016	815/1125	4-HG-U1	KMNO4 Portion	1	RIK DUPONT	
5/11/2016	815/1125	4-HG-U1	HCL Rinse	1	RIK DUPONT	
5/11/2016	815/1125	4-HG-U1	Filter # 83-UP-647	1	RIK DUPONT	

RELEASED BY	DATE/TIME	RECEIVED BY	DATE/TIME

ANALYSIS REQUIRED: See page one

Delta
Air Quality Services, Incorporated

CHAIN OF CUSTODY FORM

CLIENT: Desert View Power
Unit: Unit 1 and 2
SAMPLE LOCATION: Stack Breaching
TEST METHOD(S): EPA 29 For HG
OUTSIDE LAB REQUIRED: YES

TEST DATE(S): 5/10 and 5/11/2016
SAMPLER(S): Rik Dupont
PROJECT MANAGER: Dave Wonderly
DATE DUE: 6/1/2016
COMPLIANCE TEST: Yes

DATE	TIME	TEST #	SAMPLE DESCRIPTION	CONTAINERS	SAMPLER	COMMENTS
5/11/2016	1155/1505	5-HG-U1	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
5/11/2016	1155/1505	5-HG-U1	B 1/2 - HNO3 Portion	1	RIK DUPONT	
5/11/2016	1155/1505	5-HG-U1	Empty impinger	1	RIK DUPONT	
5/11/2016	1155/1505	5-HG-U1	KMNO4 Portion	1	RIK DUPONT	
5/11/2016	1155/1505	5-HG-U1	HCL Rinse	1	RIK DUPONT	
5/11/2016	1155/1505	5-HG-U1	Filter # 83-UP-648	1	RIK DUPONT	
5/11/2016	1529/1839	6-HG-U1	F1/2-Probe, Nozzle rinse-0.1N HNO3	1	RIK DUPONT	
5/11/2016	1529/1839	6-HG-U1	B 1/2 - HNO3 Portion	1	RIK DUPONT	
5/11/2016	1529/1839	6-HG-U1	Empty impinger	1	RIK DUPONT	
5/11/2016	1529/1839	6-HG-U1	KMNO4 Portion	1	RIK DUPONT	
5/11/2016	1529/1839	6-HG-U1	HCL Rinse	1	RIK DUPONT	
5/11/2016	1529/1839	6-HG-U1	Filter # 83-UP-649	1	RIK DUPONT	

RELEASED BY	DATE/TIME	RECEIVED BY	DATE/TIME

ANALYSIS REQUIRED: See page one

Delta
Air Quality Services, Incorporated

APPENDIX H BOILER HEAT INPUT CALCULATION PROCEDURE

Desert View Power, Inc. an affiliate of Greenleaf POWER	Boiler Heat Input Calculation	
Reference Organization: GLP	Desert View Power	
Reference Standard Name: Boiler MMBtu per Hour Calculation		
Approved for Use by: *Craig Bressan*	Current Issue: Original -1	Issue Date: 6/3/2016

1. INTRODUCTION

Both regulations and permits applicable to Desert View Power (DVP) require the source to express emissions in a pounds per million BTU (lbs./MMBtu). The difficulty of direct measurement of MMBtu/Hr, for biomass boilers, is well known. The variability and difficulty in direct measurement of fuel quality and feed rate has necessitated the development of alternative monitoring systems.

DVP utilizes a methodology that is consistent with systems used to certify and verify CO2 emissions under California's GHG program. This system relies on the annual fuel and generation to set a representative burn rate for the boilers. This representative burn rate can be used to accurately estimate the heat input to the boiler based on the Megawatts generated.

Purpose:
This document is in place to detail the methodology used to calculate the Boiler Heat input based on the Megawatts, an annual calculated fuel burn rate and the Higher Heating Value (HHV) established through laboratory testing.

Record the settings and procedures of capturing truck auto tares from the DVP Log Inventory Management Software (LIMS)

Responsibilities:
Procedure Review and Approval: The Plan Manager is responsible for the review and approval of this procedure.

Procedure Implementation: The Fuel Manager is responsible for implementing the Lims system to track all fuel purchases and ensuring representative fuel analysis. Additionally,

the Fuel Manager will be responsible for tracking the annual estimated burn rate of the boilers.

Procedure Compliance: Plant Administrator and Fuel Director are both responsible for reviewing auto tare weights each pay period and certifying to this with signature on the fuel close prior to payment.

2. REQUIREMENTS

R1. LIMs will generate a weigh receipts on each and every truck delivery to DVP.

R1. On an annual basis DVP will survey the on-site fuel

R1. LIMs will generate an auto tare for individual trucks weighing on the DVP scale when the truck has more than 50 actual tare weights in the LIMs data base. The auto tare will be calculated by averaging the most recent 50 actual tare weights.

R2. If R1 is met each truck will be randomly required to weigh in 1 in 10 times, the other 9 times the LIMs software will generate an auto tare upon weigh in and notify the truck driver a tare weight is not needed. Auto tares will be recorded in LIMs data base as an **A**, computer captured weights are recorded as a **C**, manually entered weights by a DVP scale house employee are recorded as **M**.

R3. If R1is met and a 1 in 10 tare weight varies more than 2% of the auto tare the truck will be prompted to weigh back in upon its next delivery. This function will add protection in the event a truck is physically modified and its tare weight changes more than 2% of the mean or auto tare. This function will continus until the weight is within 2% of the mean or auto tare.

3. REGIONAL DIFFERENCES

None indicated.

4. BOILER HEAT INPUT CALCULATION

The specific calculations are attached in Attachment A. The attached calculations detail the 2015 calculation of the effective burn rate and the annual average Boiler Heat Input for DVP. The attachment further estimates the Boiler Heat Input during the emissions test utilizing the calculated annual average burn rate. The fuel analysis supporting the short term Boiler Heat Input is included as Attachment B.

The effective annual burn rate is calculated using the summary of estimated fuel consumption data, annual summary fuel purchases, an annual physical inventory of fuel, net megawatt production and fuel analysis. This data provided a representative effective burn rate for the system (Ton of Fuel per Net MW).

Desert View Power
Boiler Heat Input

Latest Revision Approval:

Written By: Craig Bressan Date: June 8, 2016

Approved By: Craig Bressan Date:

REVISION HISTORY LOG				
Rev.	Date	Description	By Initials	Approval Initials

APPENDIX I 1994 CARNOT SAMPLE LOCATION CERTIFICATION REPORT

This information is located in the Test Plan in Appendix A

END OF DOCUMENT