INTEGRATED DRY NO_x/SO_2 EMISSIONS CONTROL SYSTEM

ENVIRONMENTAL MONITORING REPORT

Low-NOx Combustion System Retrofit Test Period:
August 3, 1992 through October 29, 1992

Baseline Air Toxics Test Period:
November 17, 1992 through November 19, 1992

CONTENTS

ABBREVIATIONS

ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
Btu	British Thermal Unit
CARB	California Air Resources Board
CEM	Continuous Emissions Monitor
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CVAA	Cold Vapor Atomic Absorptions
DSF	Dry Standard Cubic Feet, 68°F and 1 atm
DSCFM	Dry Standard Cubic Feet per Minute
EMP	Environmental Monitoring Plan
EPA	Environmental Protection Agency
F	Fahrenheit
FFDC	Fabric Filter Dust Collector
GC/MS	Gas Chromatography/Mass Spectroscopy
GFAA	Graphite Furnace Atomic Absorption
gr	Grains
HHV	Higher Heating Value
IC	Ion Chromatography
ICP	Inductively Coupled Plasma
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
INAA	Instrumental Neutron Activation Analysis
ISE	Ion Specific Electrode
lb	pound (mass)
kg	kilogram
m^3	cubic meter
mg	milligram
MMBtu	Million Btu
MS	Mass Spectrometry
MWe	Megawatt-electric
NO	Nitric Oxide
NO_x	Oxides of Nitrogen
O_2	Oxygen
PAH	Polycyclic Aromatic Hydrocarbons
pCi	Pico-Curie
PID	Photoionization Detector
PM_{10}	Particulate Matter less than 10 microns
ppm	parts per million
PSCC	Public Service Company of Colorado
PTC	Power Test Code
QA	Quality Assurance
SO_2	Sulfur Dioxide
SO_3	Sulfur Trioxide
VOC	Volatile Organic Compounds

I. Project Status

A. Test Summary

The new low-NOx combustion system was tested from August 3, 1993 through October 29, 1993 at the Arapahoe 4 electric-generating steam station. This test had two phases: (1) Adjust the new burners and overfire air ports to maximize NOx reduction and minimize the emissions of unburned carbons. (2) Conduct a series of detailed tests with the optimized system to assess the performance as various boiler operating parameters are modified. Nearly 200 parametric tests were completed over this period.

The combustion system operated better than originally expected. Figure 1 shows a plot of the NOx emissions of the modified boiler compared to the original baseline emissions.

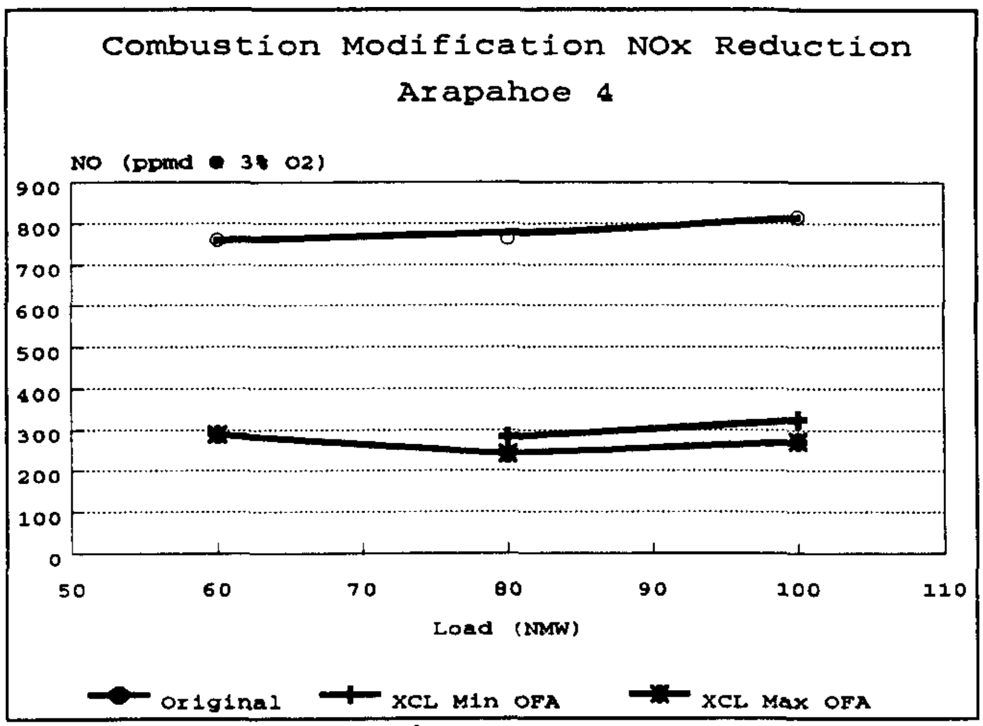

Figure 1 - NO_x Comparison

Depending on operating conditions, NOx emissions were reduced from 62 to 69%. In addition, the boiler retrofit caused no increase in carbon monoxide emissions or in the content of unburned carbon in the flyash.

No operating problems developed and the system required no maintenance during the test program. The new combustion system had one effect on operating conditions. It decreased the temperature of the flue-gas entering the convective pass of the boiler approximately 150°F. The lower flue-gas temperature increases the difficulty of maintaining design steam temperature at design levels at lower boiler loads.

A baseline test of certain air toxics was completed as part of the combustion-system test program. This testing was conducted November 17, 1992 through November 19, 1992 after the combustion modifications were installed. The original purpose of this testing was to determine baseline emissions of at least twenty-three air toxics with the combustion retrofit in service. After finalizing this test plan, it was determined that 52 air toxics would be measured. Air toxics in six major groups were measured:

- Trace metals
- Acid-forming anions
- Volatile organic compounds
- Semi-volatile organic compounds
- Radionuclides
- Nitrogen compounds

An additional three phases of air toxics monitoring will be completed as part of this project. Results of the additional testing that will be conducted during urea injection, calcium-based injection, and sodium-based injection will be reported in future environmental monitor reports for these test series.

B. Summary of Environmental Monitoring

The purpose of this report is to document the environmental monitoring that was completed as part of the combustion test series. Monitoring was completed according the *Environmental Monitoring Plan for the Integrated Dry NO_x/SO_2 Emissions Control System*, dated February 1992 and the *Environmental Monitoring Plan Addendum for Air Toxics*, dated July 1993.

Generally, the testing went well and there were no significant environmental events during the test period. There were no excursions of any compliance monitoring except for opacity. Opacity was in compliance over 99.98% during the six-month period examined. The average opacity ranged from 3 to 4%.

A significant amount of supplemental monitoring was completed to define the emissions while operating and testing the combustion system retrofit. During this testing, it was found that the combustion retrofit produced a very positive environmental impact. Depending on operating conditions, NOx emissions were reduced by 62 to 69%. Also, this large reduction occurred without the negative impacts of high emissions of carbon monoxide or high content of unburned carbon in the flyash.

Particulate emissions were very low, on the order of 0.001 grains/dry standard cubic foot (gr/DSCF). While this emission is slightly higher than the baseline of the original combustion system, it is believed that this slight increase is due to normal variations in collection-efficiency and not due to a detrimental change of the combustion process.

PM_{10} emissions were tested during the combustion optimization, but a problem with the sample caused the loss of all condensable particle emissions. The non-condensable PM_{10} emissions were in the range of 0.00003 gr/DSCF and were approximately an order of magnitude lower than the baseline emissions. It is believed that the sample time may not have been sufficient to determine accurate PM_{10} emissions due to the very high collection-efficiency of the fabric-filter.

Data on 52 air toxics were collected during the baseline air toxics test. Although there were a few problems in the data collection and analysis which raise some questions, a significant amount of accurate data was collected on the unit. Results indicate that the fabric-filter is very effective at the removal of trace-metals emissions with an average removal rate of 97.1%. This large removal rate is possible as many of the trace-metals are associated with the particulate and fabric-filters are very effective at minimizing particulate emissions.

The emission of acid-forming anions was also low, due to the low content of these anions in the coal used on this unit. Emissions of polycyclic aromatic hydrocarbons (PAHs) and radionuclides were very low. None of the carcinogenic PAH compounds were measured above the detection limit.

II. Summary of Compliance Monitoring Results

A. Sulfur Dioxide Monitoring

Regulation 1, VI.A.3.a.(ii) of the State of Colorado states that the maximum emission of sulfur dioxide is 1.2 lb/MMBtu. An Altech 180 continuous emission monitoring (CEM) system was installed at Arapahoe 4 in June 1992. This monitor was used to collect emissions data during this test program. However, the monitor was not used for compliance monitoring during this test series.

Sulfur dioxide emissions for compliance monitoring were calculated from the amount of sulfur in the fuel. Emissions calculated to be above the regulatory limit of 1.2 lb/MMBtu are provided to the state on a quarterly basis. The test period covered two quarters: the third and fourth quarter of 1992. During the third quarter of 1992, the average SO_2 content of the coal was 0.803 lb/MMBtu. There were no violations during this quarter. During the fourth quarter of 1992, the average SO_2 content was 0.840 lb/MMBtu. There were also no violations during this quarter. See Appendix A for copies of the reports documenting this information to the Colorado Department of Health.

B. Opacity Monitoring

According to Regulation 1, II.A.1., Arapahoe 4 may not exceed 20% opacity due to any air pollutant. The unit uses a Lear Siegler RM41 continuous opacity-monitor to measure and record opacity.

During the third quarter of 1992, Arapahoe 4 had 28 opacity excursions of six minutes that exceeded the 20% opacity limit. However, none of these excursions occurred during the combustion retrofit testing and all but two of these were related to startup and shutdown of the unit.

During the fourth quarter of 1992, Arapahoe 4 had 16 opacity excursions of six minutes that exceeded the 20% limit. All of these excursions were related to a single problem that caused the fabric-filter-bypass duct to open. See Appendix A for copies of the reports documenting this information to the Colorado Department of Health.

Arapahoe 4 was in compliance 99.98% of the test period. The monthly average opacity during the test period ranged 3.7 to 4.1%.

C. Aqueous Stream Monitoring

Colorado Wastewater Discharge Permit No. CO-0001091 requires that Arapahoe 4 must sample and report on various aqueous discharges. Appendix B contains reports provided to the regulatory agency during the combustion test period for August, September, and October 1992. Note that the unit was in compliance 100.0% of the test period since there were no violations during either of the test periods.

III. Summary of Supplemental Monitoring Results

A. Gaseous Species Monitoring

Significant gas monitoring was done to determine the environmental effects of the Integrated SO_2/NO_x Emissions Control System and specifically the combustion system retrofit.

Appendix C contains a summary of all test data obtained during the baseline testing conducted August through October 1992. The test summary contains average emissions by test for the following gases:

- Oxygen (O_2)
- Carbon monoxide (CO)
- Nitric oxide (NO)
- Carbon dioxide (CO_2)
- Sulfur dioxide (SO_2)

Four separate tests were conducted to determine SO_3 emissions during the test period. SO_3 emissions were measured at the economizer exit using the controlled-condensation technique. SO_3 emissions were very low with the majority of emissions having less than 1 ppm SO_3. Triplicate samples were obtained. Table 1 summarizes the average results.

Table 1

Test Number	SO_3 ppm @ 3% O2
370	0.5
371	0.7
378	1.5
379	0.8

B. Particulate Monitoring

Three particulate tests were conducted during the combustion retrofit test period. These tests were conducted using EPA Method 5. Tests were conducted at both the inlet and the outlet of the fabric-filter dust-collector (FFDC). One test was conducted with the minimum amount of overfire air, approximately 15% of the total combustion air. The other two tests were conducted with the maximum amount of overfire air, approximately 25% of the total combustion air. All three tests were conducted at a nominal full load of 100 MWe. Table 2 summarizes the results of this testing.

Table 2

Test Condition	Inlet Loading (grain/DSCF)	Outlet Loading (grain/DSCF)	Collection Efficiency
Minimum OFA	2.81	.0016	99.943%
Maximum OFA	2.49	.0006	99.976%
Air Toxics, max OFA	2.83	.001	99.965%

The maximum overfire air data at the inlet and outlet and the air toxics tests are an average of three replicate tests. Three replicate tests were also attempted during the minimum overfire air testing. However, due to sample, load, and fuel-fired problems, the data for the minimum overfire air testing is a single sample point at both the inlet and outlet.

As part of the particulate testing, the distribution of particulate size at the fabric-filter inlet was measured for both minimum and maximum overfire air operation. This particle-size analysis was not completed as part of the air toxics test.

A University of Washington Pilat Mark V cascade impactor was used to determine particulate size at the inlet. The impactor has a maximum aerodynamic cutpoint of 15.9 microns. To obtain the size distribution above the maximum cutpoint, the data was extrapolated with a cubic-spline-fit program. The computer program pcCIDRS (written by J. McCain of Southern Research Institute) was used to perform these extrapolations. This recently released program is widely accepted as one of the better cubic-spline-fit programs available. At the inlet, particulate sizing showed that the mass mean-diameter of the ash particle with minimum overfire air was 26 microns. With maximum overfire air, it was 18 microns. Appendix D contains a graph of the particulate diameter versus the cumulative weight percent.

To determine the PM_{10} emissions, EPA Method 201A was used to measure the distribution of particulate emissions at the outlet of the fabric-filter. This testing was conducted with the maximum-overfire air at approximately 25% of the total-secondary-combustion air. Three replicate-tests lasting three-hours each were completed.

This three-hour sample time was 50% longer than the sample time used to complete the baseline-testing for PM_{10} emissions. The sample time was increased with the hope of obtaining more accurate and repeatable data. Measuring PM_{10} emissions is difficult due to the high collection-efficiency of the fabric-filter and, thus, the very low particulate-loading.

A problem developed during the testing of particulate-emissions at Arapahoe 4. EPA Method 201A includes "condensable" particulate emissions from the impinger washes. Under this method, these condensable emissions are recovered from the washes by drying the collected water and weighing the residue. Then, these additional condensable-emissions are added to the sub-10 micron solid-emissions from the impactor.

Unfortunately, during the analysis of all three samples of condensable-emissions at Arapahoe 4, the back-half (condensable) fraction could not be quantified due to the formation of a residual organic in the final wash. Thus, the final weights could not be achieved and the condensable-fraction could not be quantified. The average of the three replicate-tests at the fabric-filter-outlet for the non-condensable PM_{10} emissions was 0.0000341 grains/DSCF. This quantity consists of all the captured particles that were less than 10.541 microns in size.

Appendix D tabulates the PM_{10} test data and compares it to the baseline data. In general, the comparison shows that PM_{10} emissions are approximately an order of magnitude lower than the original baseline-emissions. It is NOT currently believed that the combustion modifications significantly reduced PM_{10} emissions but that sampling times may have been too short to obtain repeatable test data due to the very low PM_{10} emissions. It is believed that a sample time of eight hours would be required to increase the total particulate catch sufficient to obtain more meaningful data.

C. Aqueous Stream Monitoring

No supplemental monitoring of any aqueous streams was planned or conducted during the combustion system retrofit test program.

D. Solid-Stream Monitoring

Raw coal samples were obtained throughout the combustion system retrofit test program. Selected samples were submitted for proximate, ultimate and elemental ash analysis by an independent laboratory. Appendix E contains the results from these analyses. Generally, the individual coal samples were consistent, although some variance in sulfur content occurred. Two different sources of coal were used for the testing. The two coals were very similar in all respects except for sulfur content. The coal had an average higher-heating value (HHV) of 10,986 Btu/lb and an average carbon content of 61.86%. Three additional coal samples were analyzed during the air toxics test program. Appendix E also lists the results from this analysis.

A carbon analysis of the flyash was also completed during the baseline-testing. Since flyash carbon-content is a major variable that reflects combustion system operation, flyash carbon samples were completed on nearly every test. Three methods were used to analyze these samples: (1) on-site loss-on-ignition analysis, (2) PSCC laboratory loss-on-ignition analysis, and (3) independent laboratory carbon analysis. On-site analysis allowed the data to be turned around rapidly, within 20 minutes.

To ensure the accuracy of the on-site analysis, the PSCC laboratory analyzed many duplicate samples. There was very good agreement between the data from the two loss-on-ignition test methods. However, while loss-on-ignition analysis is fast, it measures more than the carbon content of a sample. Therefore, a group of samples was also sent to an independent laboratory to determine their elemental-carbon content. As expected, the carbon content was slightly less than that predicted by loss-on-ignition analysis. In general, loss-on-ignition analysis over predicted the absolute carbon content of the flyash by an absolute 1.3 to 1.7%. The carbon content of the flyash measured by loss-on-ignition analysis ranged from 1.6 to 13.7%, with an average value of 3 to 5%. Appendix C lists the on-site loss-on-ignition data. Also included in this appendix are two figures which compare the laboratory and on-site analysis and the elemental carbon verses loss-on-ignition data.

IV. Summary of Air Toxics Monitoring Results

A total of 52 potential air toxics were measured at Arapahoe 4 after the combustion modifications were installed and optimized. Table 3 lists the air toxics that were sampled during this baseline air toxics test program. Sampling of the air toxics occurred from November 17, 1992 through November 19, 1992. The unit was operated at a base load of a nominal 100 MWe during the testing. No sampling occurred during sootblowing operations.

Table 4 lists the average operating conditions of the unit during the sampling period. The recently optimized combustion modifications were operated at approximately 25% overfire air during the sampling period. Figure 2 shows a simplified diagram of the unit and shows the five different sample locations. Gaseous samples were obtained at the inlet and the outlet of the FFDC. Solid samples were obtain of unpulverized coal, bottom ash, and flyash. This report lists the results of the air toxics testing. For details on the methods used for sampling, analysis, and quality assurance see the *Environmental Monitoring Plan (EMP) Addendum for Air Toxics Monitoring*, dated July 1993.

Table 4

Average Operating Conditions and Continuous Emissions Data	
Unit load	103.5 MW Gross
Steam flow	847 Mlb/hr
Stack oxygen	5.49% (wet)
Stack carbon monoxide	49 ppm (dry)
Stack nitrogen oxide	292 ppm (dry, 3% O_2)
Stack sulfur dioxide	393 ppm (dry, 3% O_2)

Public Service Company of Colorado contracted with Carnot, Inc of Tustin, California to complete the air toxics work at the Arapahoe 4 station. Fossil

TABLE 3
PSCC ARAPAHOE UNIT 4
TARGET COMPOUND LIST

TRACE METALS

Arsenic	Barium	Beryllium
Cadmium	Chromium	Cobalt
Copper	Lead	Manganese
Mercury	Molybdenum	Nickel
Selenium	Phosphorus	Vanadium

ACID-FORMING ANIONS OR PRECURSORS[1]

Chloride	Fluoride	Phosphate
	Sulfate	

VOLATILE ORGANIC COMPOUNDS

Benzene	Toluene	Formaldehyde

SEMI-VOLATILE ORGANIC COMPOUNDS

Polycyclic Aromatic Hydrocarbons

Acenaphthene	Acenaphthylene	Anthracene
Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene
Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene
Dibenzo(a,h)anthracene	Fluoranthene	Fluorene
Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene
Pyrene	2-Methylnaphthalene	3-Methylcholanthrene
	7,12-Dimethylbenz(a)anthracene	

RADIONUCLIDES

Ra^{226}	Th^{232}	U^{238}	Po^{210}
Ra^{228}	Th^{230}	U^{235}	Pb^{210}
	Th^{228}	U^{234}	

NITROGEN COMPOUNDS

Cyanide

[1] Elemental precursors of these anions measured in the fuel (Cl, F, S, P)

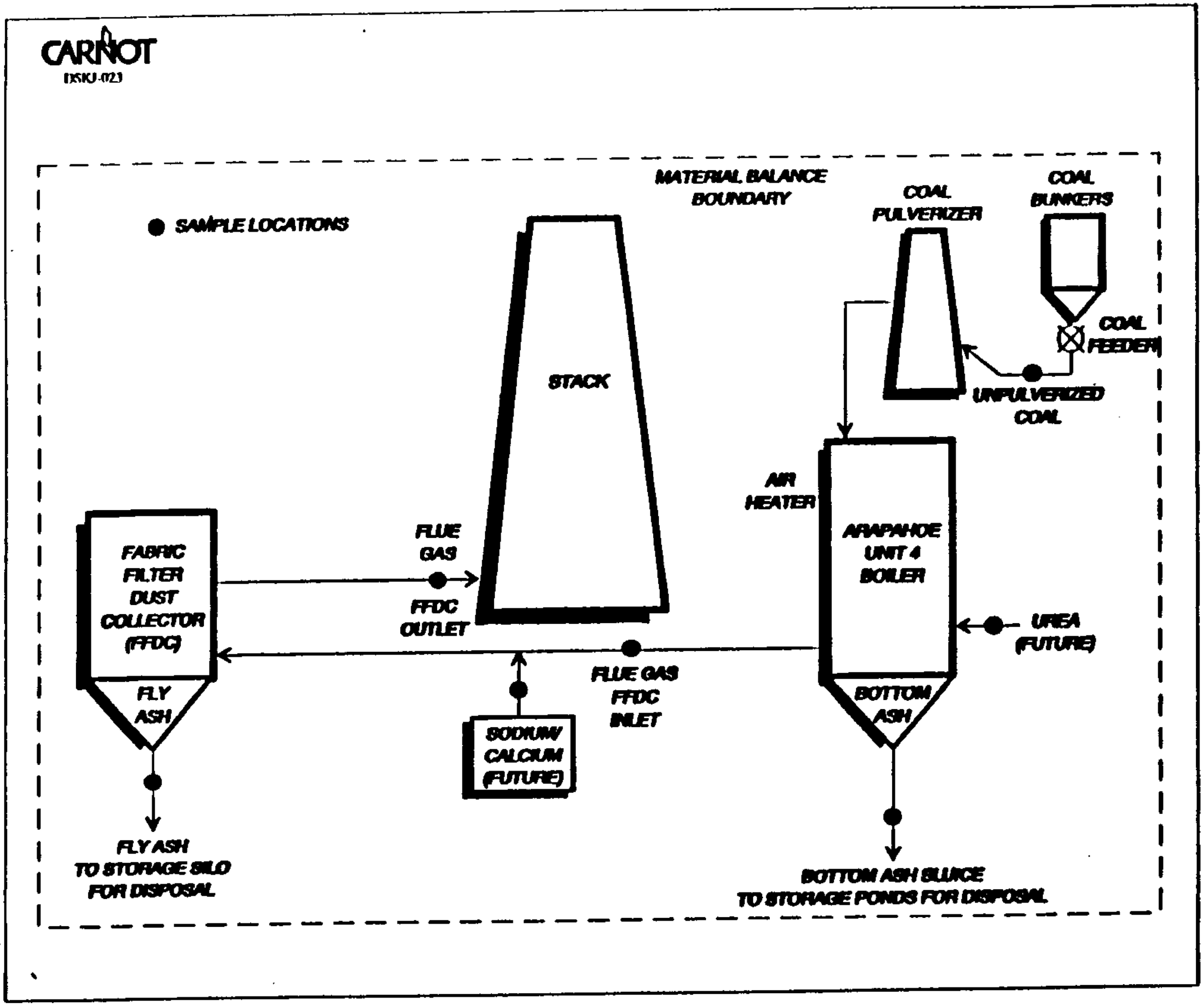

Figure 2. Sample Locations at PSCC Arapahoe Unit 4

Energy Research Corp of Laguna Hills, California provided some assistance at the site and with data collection. Table 5 lists the laboratories used to analyze the collected samples.

Table 5

Laboratories for Air Toxics Analyses		
Analysis	**Laboratory**	**Location**
Solid particulate	Carnot, Inc	Tustin, Ca.
Chloride (supplemental)	Carnot, Inc	Tustin, Ca.
Acid-forming anions	Curtis and Tompkins	Berkeley, Ca.
Trace metals	Curtis and Tompkins	Berkeley, Ca.
Volatile organic compounds	Atmosphere Assessment Associates	Chatsworth, Ca.
Semi-volatile organic compounds	Zenon Environmental Laboratories	Burlington, Ontario
Radionuclides	Accu-lab Research	Golden, Co.
Fuel analysis	Commercial Testing and Engineering	Denver, Co.
Neutron activation analysis	Massachusetts Institute of Technology	Cambridge, Ma.

A. Uncertainty Analysis

In the tables that follow, a value for uncertainty expressed as a percentage is provided for all data. The calculation method used is based upon ANSI/ASME PTC 19.1-1985, "Measurement of Uncertainty." The uncertainty is based on a 95% confidence interval for the mass emissions for the target species but is expressed as a percentage so that it may be applied to other units. A very important part of the method is assigning an estimated bias error for the major variables. The value presented represents only an approximation of the uncertainty as not all bias errors may be estimated. The uncertainty is also not a measure of long-term-trace-species emissions for this boiler, but only the uncertainty for the specific test period. It was assumed that the samples are a normal population distribution. Bias that were estimated as listed below:

1) For all non-detect data, a bias of one-half of the detection limit was used. No bias was assumed for analytical results reported above the detection limit.

2) A bias of 10% was assumed for the flue gas flow rate on both the inlet and outlet fabric filter ducts. Bias was estimated by comparing the calculated and measured flue gas flow rate.

3) A bias of 19% was assumed for the inlet particulate collection rate and 10% was assumed for the outlet particulate collection rate. The bias was estimated by examining the isokinetic sample rate for different flue gas flow rates.

4) A bias of 5% was assumed for the coal flow based on the difference of the calculated and measured coal flow rate.

5) A bias of 21% was calculated for the fly ash mass flow rate based upon the assumed biases for particulate collection and inlet flue gas flow rate.

6) A bias of 22% was calculated for the bottom ash mass flow based upon the assumed biases for particulate collection, inlet flue gas flow rate, and coal flow rate.

7) It was assumed that all other measurements were accurate and had a bias of 0%. While this scenario is not likely, insufficient data was available to make any reasonable assumptions.

B. Treatment of Non-Detectable Measurements

Many of the target species for which a measurement was attempted were not found using the specified sampling and analytical techniques. If a measurement was not possible, the value that could have been measured, i.e.

the detection limit, if the trace emissions were present are reported. The "non-detects" are shown as less than the detection limit. The difficulty occurs when averaging various samples of which some or all of the measurements are below the detection limit. The following summarizes the two cases:

1) All values below detection limit
   The arithmetic average of the detection limit is shown with a "<" sign to indicate that the trace species is less than the reported average detection limit. For example, if a species was not found and the method provided a detection limit of 0.45, the values is reported as <0.45.

2) Some, but not all, values below detection limit
   The value of all measurements above the detection limit are averaged with one-half of the detection limit. For example, if three measurements of 10, 8, and <6 are found, the average would be (10+8+6/2)/3 or 7. Note that no "<" sign is used in these reported averages even though some of the values are below the detection limit. If the average calculated with this method is less than the greatest detection limit; the largest detection limit is reported and a "<" symbol is used. For example, if values of 6, <4, and <2 were reported, the average would be reported as <4 and not (6+4/2+2/2)/3 or 3.

C. Treatment of Blank Values

Three different types of blanks were used as part of the air toxics test program quality assurance (QA) program. The QA program included field blanks, reagent blanks, and laboratory preparation blanks.

Field blanks are samples obtained by assembling a complete sample train at the test site using the same procedures as when obtaining the actual sample. The sample train is then leak checked and disassembled to recover and analyze the sample. Field blanks are not used to "correct" the data generally but the are used to provide an indication of the quality of the sample.

Reagent blanks consist of samples of the reagent and/or filters that are collected at the site. Analysis of these samples show if any of the results were caused by existing levels of the trace species in the material used to collect or recover the sample. If measurable values of the trace species are found, the data is usually corrected by subtracting the value measured in the reagent.

Laboratory reagent blanks consist of samples of the chemicals used during the measurement analysis. If measurable values of the trace species are found, the data is usually corrected by subtracting the value measured in the reagent. Any measurable values in the laboratory reagent may be caused by initial trace species in the chemicals or to the analytical procedures.

In the tables that follow the value of the field blank is shown for reference, but none of the data has been changed due to these measurements. If a measurement has a value near the field blank measurement, there may be some question as to the accuracy of the data and the reported value may NOT be source related. A separate column lists a blank correction percentage for all trace species that were corrected due to either a reagent or laboratory reagent blank. This is an average percentage calculated as follows:

$$\text{Blank Correct} = \frac{\text{SUM(blank value/sample value*100)}}{\text{number of samples}}$$

For example, if three samples contained 10, 5, and 4 mg/kg of a trace species and the reagent blank was 2 mg/kg, the blank correction would be (2/10+2/5+2/4)*100/3 or 37%. Thus on average, the actual value measured was 37% higher than the value reported in the table. If the blank correction is reported as 0%, no blank correction was calculated and the reported value was the measured value. Note that in most cases a high blank correction value does not mean that the data is inaccurate. If a sample was contaminated with a trace species due to a filter, and the filter was analyzed and the data corrected, it is likely that the data is meaningful.

D. Gaseous Species Monitoring

Table 6 lists the results of the gaseous air toxics monitoring at the inlet and outlet of the fabric-filter. Three replicate tests were completed for each air toxic species. Individual tests were averaged to determine the estimated air toxics emission. The uncertainty of the average as explained in section IV.A is also reported.

In general, trace metal emissions were very low at the FFDC outlet as the FFDC is very efficient for metals removal. The overall average removal rate of the trace metals for the fabric-filter measured during this test was 97.1%. Mercury and chromium are the metals of most interest due to their potential health impact. Mercury is the most difficult of the trace metals to remove as it may be present as a vapor rather than a solid particulate. The calculated removal rate for mercury of 78.2% assumes that the outlet mercury emissions existed at the detection limit. Additional methods are available to determine the speciation of these metals. The species of mercury are very important in the removal process as it is currently believed that ionic-mercury is much easier to remove than the other species. Chromium, especially hexavalent-chromium, is also gaining interest due to its potential toxicity. Additional baseline-testing is planned at a later date to determine speciation of these two important trace-metal emissions.

Outlet emissions of the semi-volatile organic compounds (polycyclic aromatic hydrocarbons, or PAH) were very low or non-existent. Of the 19 compounds measured, only naphthalene and 2-Methylnaphthalene were measured at average values above the detection limit at the outlet. For both of the PAH compounds, the field blank levels are actually higher than the reported outlet

Table 6 - Gaseous Air Toxics Emissions

	Fabric Filter Inlet							Fabric Filter Outlet						
	Test 1	Test 2	Test 3	Average	Uncert	Field Blank	Blank[1] Correct	Test 1	Test 2	Test 3	Average	Uncert	Field Blank	Blank[1] Correct
Trace Metals	μg/Nm³	μg/Nm³	μg/Nm³	μg/Nm³	%	μg/Nm³	%	μg/Nm³	μg/Nm³	μg/Nm³	μg/Nm³	%	μg/Nm³	%
Arsenic	33.5	19.4	37.0	30.0	81	1.28	0.0	0.47	1.8	0.65	0.97	183	0.82	0.0
Barium	237	88.4	588	305	210	3.39	2.5R	2.2	0.56	1.6	1.5	145	1.09	70.8R
Beryllium	6.7	14.4	14.1	11.7	95	<0.04	0.0	<0.03	<0.03	<0.03	<0.03	33	<0.03	0.0
Cadmium	2.5	2.7	3.7	3.0	60	0.15	0.0	0.28	0.14	<0.08	0.15	197	<0.08	0.0
Chromium	36.7	84.8	73.6	65.0	99	0.53	0.9R	0.72	0.70	1.1	0.85	72	0.19	31.8R
Cobalt	21.6	50.4	44.4	38.8	100	<0.38	0.0	<0.28	<0.28	<0.26	<0.27	33	<0.27	0.0
Copper	249	197	214	220	37	2.41	0.3R	1.6	1.6	1.0	1.4	63	<0.98	25.2R
Lead	147	36.3	65.0	82.9	174	0.15	2.7R	0.61	0.56	0.52	0.56	22	0.05	58.9R
Manganese	149	310	300	253	92	0.53	0.1R	1.3	1.9	0.65	1.3	119	0.22	16.4R
Mercury	2.4	1.5	1.3	1.7	91	0.32	9.4R	<0.28	<0.45	<0.39	<0.37	67	<0.38	0.0
Molybdenum	7.8	15.5	18.5	14.0	101	0.30	30.7R	0.22	0.22	0.21	0.22	17	0.22	94.0R
Nickel	19.4	50.4	48.1	39.3	112	1.13	0.0	19.5	2.5	1.3	1.9	400	<0.55	0.0
Selenium	23.5	34.1	29.6	29.1	51	<0.08	0.0	0.42	0.73	0.26	0.47	127	<0.05	0.0
Phosphorus	17900	19000	18900	18600	23	<1.88	0.0	8.1	8.7	9.2	8.6	20	<1.36	0.0
Vanadium	100	213	215	176	95	0.23	0.1R	0.36	0.17	0.39	0.31	98	0.16	36.7R

NOTE < indicates that the quantity measured was less than the detection limit thus the detection limit is shown

[1] R (Reagent Blank Correction) or L (Laboratory Blank Correction) indicate the type of blank correction.

Table 6 - Gaseous Air Toxics Emissions Continued

	Fabric Filter Inlet							Fabric Filter Outlet						
	Test 1	Test 2	Test 3	Average	Uncert	Field Blank	Blank[1] Correct	Test 1	Test 2	Test 3	Average	Uncert	Field Blank	Blank[1] Correct
Semi-Volatile Organic Compounds	µg/Nm³	µg/Nm³	µg/Nm³	µg/Nm³	%	µg/Nm³	%	µg/Nm³	µg/Nm³	µg/Nm³	µg/Nm³	%	µg/Nm³	%
Naphthalene	0.31	0.24	0.40	0.31	70	<0.36	54L	0.42	0.25	0.34	0.34	63	.55	48L
Acenaphthylene	<0.012	<0.011	<0.033	<0.019	170	<0.012	0	<0.011	<0.009	<0.008	<0.009	47	<.027	0
Acenaphthene	<0.014	<0.012	<0.012	<0.013	42	<0.016	0	<0.014	<0.009	<0.015	<0.013	65	<.022	0
Fluorene	0.015	0.013	0.015	0.014	29	0.009	0	0.014	0.011	<0.013	<0.013	44	<.013	0
Phenanthrene	<0.142	<0.140	<0.183	<0.155	53	<0.140	0	<0.134	<0.111	<0.141	<0.129	44	<.116	0
Anthracene	<0.019	<0.010	<0.019	<0.016	93	<0.007	0	0.012	<0.014	<0.006	<0.014	74	<.013	0
Fluoranthene	<0.030	<0.033	<0.030	<0.031	38	<0.029	0	<0.029	<0.024	<0.023	<0.025	43	<.025	0
Pyrene	<0.031	<0.034	<0.030	<0.032	39	<0.030	0	<0.029	<0.024	<0.023	<0.025	43	<.025	0
Benz(a)anthracene[2]	<0.019	<0.021	<0.040	<0.026	118	<0.019	0	<0.018	<0.016	<0.014	<0.016	45	<.016	0
Chrysene[2]	<0.019	<0.020	<0.037	<0.025	105	<0.019	0	<0.018	<0.015	<0.014	<0.016	47	<.016	0
Benzo(b)fluoranthene[2]	<0.011	<0.024	<0.030	<0.022	119	<0.009	0	<0.007	<0.008	<0.014	<0.010	105	<.013	0
Benzo(k)fluoranthene[2]	<0.021	<0.096	<0.069	<0.062	156	<0.012	0	<0.013	<0.011	<0.018	<0.014	71	<.010	0
Benzo(a)pyrene[2]	<0.056	<0.077	<0.011	<0.048	179	<0.011	0	<0.011	<0.026	<0.008	<0.015	162	<.010	0
Indeno(1,2,3-cd)pyrene[2]	<0.030	<0.029	<0.029	<0.029	36	<0.033	0	<0.033	<0.047	<0.039	<0.040	55	<.028	0
Dibenzo(a,h)anthracene[2]	<0.037	<0.037	<0.037	<0.037	36	<0.037	0	<0.039	<0.056	<0.045	<0.047	56	<.034	0
Benzo(g,h,i)perylene[2]	<0.037	<0.029	<0.029	<0.032	51	<0.032	0	<0.030	<0.038	<0.034	<0.034	45	<.027	0
2-Methylnaphthalene	0.041	0.026	0.015	0.027	119	0.016	0	0.063	0.020	0.022	0.035	175	.2	0
7,12-Dimethylbenz(a)anthracene	<0.025	<0.004	<0.047	<0.025	218	<0.007	0	<0.007	<0.006	<0.003	<0.005	109	<.007	0
3-Methylcholanthrene	<0.149	<0.007	<0.146	<0.101	204	<0.007	0	<0.007	<0.006	<0.006	<0.006	43	<.006	0

NOTE < indicates that the quantity measured was less than the detection limit thus the detection limit is shown

[1] R (Reagent Blank Correction) or L (Laboratory Blank Correction) indicate the type of blank correction.

[2] Carcinogenic PAH compounds

Table 6 - Gaseous Air Toxics Emissions Continued

	Fabric Filter Inlet							Fabric Filter Outlet						
	Test 1	Test 2	Test 3	Average	Uncert	Field Blank	Blank Correct	Test 1	Test 2	Test 3	Average	Uncert	Field Blank	Blank Correct
Acid-Forming Anions	ppm	ppm	ppm	ppm	%	ppm	%	ppm	ppm	ppm	ppm	%	ppm	%
Chlorine (Total)	0.64	0.69	0.62	0.65	30	N/A	0	0.67	0.60	0.27	0.51	121	N/A	0
(Gaseous)	0.61	0.49	0.60	0.57				0.65	0.57	0.26	0.49			
(Solid)	0.03	0.20	<0.04	0.08				<0.03	0.03	<0.03	0.02			
Fluorine (Total)	8.5	6.7	6.7	7.3	42	N/A	0	9.5	7.6	2.6	6.6	137	N/A	0
(Gaseous)	7.7	5.8	6.3	6.6				9.5	7.5	2.5	6.5			
(Solid)	0.77	0.87	0.44	0.70				0.06	0.06	0.06	0.06			
Phosphate (Total)	0.35	0.64	0.18	0.39	149	N/A	0	<0.58	<0.47	<0.15	<0.40	142	N/A	0
(Gaseous)	<0.62	0.58	0.13	0.34				<0.54	<0.43	<0.11	<0.36			
(Solid)	0.04	0.06	0.06	0.05				<0.04	<0.04	<0.04	<0.04			
Sulfate (Total)	350	320	300	320	30	N/A	29.02[1]	290	300	300	300	15	N/A	84.01[1]
(Gaseous)	340	310	290	320				290	300	300	300			
(Solid)	5.3	4.2	3.4	4.3				0.03	0.03	0.02	0.02			
Radionuclides (solids)	Inlet Not Measured							pCi/Nm^3	pCi/Nm^3	pCi/Nm^3	pCi/Nm^3	%	pCi/Nm^3	%
Uranium-233,-234								<0.06	<0.06	0.05	<0.06	28	N/A	0
Uranium-235								<0.06	<0.06	0.05	<0.06	28	N/A	0
Uranium-238								<0.06	<0.06	<0.05	<0.06	33	N/A	0
Radium-226								0.11	0.11	0.11	0.11	15	N/A	0
Radium-228								0.80	0.96	0.76	0.84	34	N/A	0
Lead-210								<0.75	<0.73	0.22	<0.75	104	N/A	0
Polonium-210								0.06	<0.06	<0.05	<0.06	28	N/A	0
Thorium-228								<0.23	<0.34	<0.16	<0.24	96	N/A	0
Thorium-230								<0.17	<0.06	<0.16	<0.13	128	N/A	0
Thorium-232								<0.06	<0.11	<0.11	<0.09	88	N/A	0

NOTE < indicates that the quantity measured was less than the detection limit thus the detection limit is shown

[1] Majority of blank correction is due to sulfate in filter

Table 6 - Gaseous Air Toxics Emissions Continued

	Fabric Filter Inlet							Fabric Filter Outlet						
	Test 1	Test 2	Test 3	Average	Uncert	Field Blank	Blank Correct	Test 1	Test 2	Test 3	Average	Uncert	Field Blank	Blank Correct
Volatile Organic Compounds	ppb	ppb	ppb	ppb	%	ppb	%	ppb	ppb	ppb	ppb	%	ppb	%
Benzene	0.60	<0.26	0.46	0.40	152	0.04	0	0.69	0.88	1.34	0.97	85	.04	0
Toluene	3.8	1.4	1.4	2.2	154	0.29	0	43.8	23.1	30.7	32.5	80	.29	0
Formaldehyde	13.0	13.9	17.0	14.6	38	35.2	0	10.8	24.9	12.6	16.1	119	15.7	0
Nitrogen Compounds	ppb	ppb	ppb	ppb	%	ppb	%	ppb	ppb	ppb	ppb	%	ppb	%
Cyanide (as HCN)	<8	<8	9	<8	30	N/A	0	7	<4	<8	<8	76	N/A	0

NOTE < indicates that the quantity measured was less than the detection limit thus the detection limit is shown emissions. It is believed that both these compounds may be an artifact of resin degradation and are not source related. This would explain similar emission levels in both the sample and the field blank. None of the carcinogenic PAH compounds were detected at either the inlet or the outlet of the FFDC. As all of the PAH compounds were measured near or below the detection limit or are not believed to be source related, it is impossible to determine if the FFDC removes any of the compounds.

An EPA Method 5 sampling train was used to sample anions. The sample train collected a solid sample in a particulate filter and a gaseous sample within a series of impinger baths. Table 6 shows three values for each anion: (1) total, (2) solid fraction, and (3) gaseous fraction. The results show that the majority of all anions exists in the gas phase. The fabric filter was effective in removal of the solid phase anions but removed only a small fraction of the gas phase anions. Gaseous phosphate at the inlet was only 0.34 ppm which represent only 3% of the total phosphorus measured with the multi-metals train. It would be expected that the two values would agree for both measurements, so the difference is likely caused by the two measurement methods. It is believed that the multi-metals train accurately measures phosphorus and that the data presented in the anion tables obtained with ion chromatography are not accurate. Gaseous sulfur emissions were approximately 320 ppm. This represents 90% of the sulfur present in the fuel. The total sulfate level at the outlet represents 83% of the coal sulfur. While the data indicates that some gaseous sulfur is removed across the fabric-filter, no removal is expected and the small difference is within the uncertainty of the data. The continuous emissions monitor averaged 334 ppm over the test period and thus agrees with the outlet sulfate emissions within the range of uncertainty of the data.

From the solids sample collected at the fabric-filter outlet by the EPA Method 5 sampling train, 11 types of radionuclide emissions were measured. Of the 11 potential radionuclides, only Radium-226 and Radium-228 had average values above the detection limit. No reagent blank corrections were made for the data as correcting in some cases would have reduced the data to below zero. The reagent blank for Radium-226 was 0.1 versus a reported value of 0.11 pCi/Nm^3 and for Radium-228 was 1.5 versus a reported value of 0.84 pCi/Nm^3. Thus, although values are reported for these two radionuclides, they are not believed to be source related and the reported values are likely due to the fiberglass filter used for particulate collection.

Three volatile-organic compounds (VOC) were measured during the testing: benzene, toluene, and formaldehyde. The data indicate that both benzene and toluene actually increased across the fabric-filter. It is suspected that the both VOCs at the inlet were actually higher than shown, but as VOC's such as toluene and benzene may be absorbed directly on particulates, a representative sample may have not obtained in the high-particulate/high-carbon inlet test location. An additional test is planned to determine VOC emissions and confirm these data. While the formaldehyde emissions are very low, the field blanks contained 35 ppb of formaldehyde at the inlet and 16 ppb of formaldehyde at the outlet. The field blank measurements were at or even higher than the gaseous sample. The sample viles for both the field blank and measurement samples were NOT stored in an air-tight nitrogen-purged desiccator. It is possible that the samples may have been contaminated with formaldehyde in the air that may have penetrated the sample seal. Future testing will use the air-tight sealing system with a nitrogen purge to eliminate this possible contamination point.

Finally, the emissions of nitrogen-based cyanide at both the inlet and outlet were below the detection limit.

Table 7 - Coal Air Toxics Analysis

	Base Test Method						Neutron Activation Analysis					
	Test 1	Test 2	Test 3	Average	Uncert	Blank[4] Correct	Test 1	Test 2	Test 3	Average	Uncert	Blank Correct
Trace Metals	mg/Kg	mg/Kg	mg/Kg	mg/Kg	%	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg	%	mg/Kg
Arsenic[2]	<0.5	<0.5	<0.5	<0.5	29	0.0	0.55	0.40	0.49	0.48	40	0
Barium[2]	0.6[1]	28	21	25	182	6.9L	350	525	383	419	55	0
Beryllium	0.21	0.24	0.23	0.22	18	1.3L						
Cadmium	0.09	<0.05	<0.05	<0.05	117	0.0	0.13	0.09	0.11	0.11	50	0
Chromium	0.8	1.3	1.1	1.1	58	7.1L	3.00	3.50	2.05	2.85	64	0
Cobalt	0.8	1.0	1.0	0.9	31	0.0	0.74	0.75	0.70	0.73	11	0
Copper	2.7	2.8	2.7	2.7	7	1.5L						
Lead	2.1	2.5	1.6	2.1	55	12.0L						
Manganese	3.4	5.9	3.4	4.2	85	13.0L						
Mercury[2]	<0.1	0.1	<0.1	<0.1	24	0.0	0.025	0.026	0.013	0.021	84	0
Molybdenum	<0.1	<0.1	0.2	0.1	217	0.0	0.89	1.20	0.95	1.01	41	0
Nickel	0.4	0.8	0.5	0.6	87	11.0L						
Selenium[2]	<0.05	<0.05	<0.05	<0.05	29	0.0	0.75	0.77	0.93	0.82	31	0
Phosphorus	510	350	370	410	53	0.0						
Vanadium	2.6	3.5	2.8	3.0	40	3.3L						
Acid-Forming Anions	mg/Kg	mg/Kg	mg/Kg	mg/Kg	%	%	mg/Kg	mg/Kg	mg/Kg	mg/Kg	%	%
Chloride as $Cl^{-(2)}$	600	<100[1]	600	600	8	0	19	22	26	22	39	0
Fluorine as F^-	79	89	85	84	16	0						
Phosphate[3]	1564	1073	1135	1300	53	0						
Sulfate	14100	13200	12300	13200	18	0						

NOTE < indicates that the quantity measured was less than the detection limit thus the detection limit is shown.
All values are reported on an as-received basis for the coal.
[1] Results from this sample inconsistent with other data and was not included in the average.
[2] Neutron activation analysis results was used for these trace species rather than the base method.
[3] Phosphate values are reported but are not believed accurate. Ion-chromatography many not be appropriate technique for measurment.
[4] R (Reagent Blank Correction) or L (Laboratory Blank Correction) indicate the type of blank correction.

Table 7 - Coal Air Toxics Analysis Continued

	Base Test Method						Neutron Activation Analysis					
	Test 1	Test 2	Test 3	Average	Uncert	Blank Correct	Test 1	Test 2	Test 3	Average	Uncert	Blank Correct
Radionuclides	pCi/g	pCi/g	pCi/g	pCi/g	%	%	Not Applicable					
Uranium-233,-234	0.16	0.13	0.11	0.13	47	0						
Uranium-235	<0.01	<0.01	0.02	0.01	217	0						
Uranium-238	0.12	0.05	0.11	0.09	101	0						
Radium-226	0.29	0.31	0.24	0.28	32	0						
Radium-228	0.35	0.20	0.16	0.24	105	0						
Lead-210 [1]	0.37	<0.69	0.77	0.50	122	0						
Polonium-210	0.10	<0.10	0.20	0.12	163	0						
Thorium-228	0.09	0.08	0.12	0.10	54	0						
Thorium-230	0.12	0.17	0.30	0.20	118	0						
Thorium-232	0.12	0.04	0.15	0.10	137	0						

NOTE < indicates that the quantity measured was less than the detection limit thus the detection limit is shown
All values are reported on a dry basis for the coal.
[1] The highest non-detect was not used for the average, dection limits varied by sample.

emissions were very low. Radionuclides were also near the detection limit in the testing of the inlet fuel. Small variations can cause a large variation in the mass balance. No known sampling or analytical problems were reported that would account for the varying closure. All duplicates, blanks, spikes, and other quality assurance checks were within acceptable ranges.

Table 9 also shows the percent removal for the metal and anions measured. The FFDC was very effective for metals removal with an overall 97.1% removal. The FFDC does appear to provide slight removal of the anions, however, the removals are within the uncertainty of the data and may not be significant.

Generally, the test program used the analytical methods specified in the EMP. However, some of the methods were changed in order to improve detection limits or confirm data that was measured using the analytical methods specified in the EMP. Table 10 lists the air toxics that were analyzed with a different method than specified in the EMP.

The EMP addendum for air toxics includes details on the method used to determine the total mass flow of the air toxics. In addition to the measured concentration of the toxic in the sample, mass flows of the solid and gas are required. Table 11 lists the mass flow rates of the flue gas and solids used to determine the mass flow of the toxics. Note that there are three different flue gas flow rates listed for metals, particulate matter and anions, and PAHs. The actual flue gas flow rate was used for each test as they were conducted at different times. The flue gas flow rate used for the VOC, formaldehyde and cyanide tests were from the concurrent major test that was being conducted. Coal flow was measured using the existing plant equipment. Flyash and stack ash flow was calculated using the measured particulate loading and flue gas flows. Bottom ash was calculated based on coal input and flyash flow.

Table 10

	EMP Specified Method	Method Used
FFDC Inlet		
Benzene	EPA TO-14 w/GC-PID	EPA TO-14 w/GC-MS
Toluene	EPA TO-14 w/GC-PID	EPA TO-14 w/GC-MS
Cadmium	EPA SW 846-7421 (GFAA)	EPA SW 846-6010 (ICP)
Chromium	EPA SW 846-7421 (GFAA)	EPA SW 846-6010 (ICP)
FFDC Outlet		
Benzene	EPA TO-14 w/GC-PID	EPA TO-14 w/GC-MS
Toluene	EPA TO-14 w/GC-PID	EPA TO-14 w/GC-MS
Cadmium	EPA SW 846-7421 (GFAA)	EPA SW 846-6010 (ICP)
Chromium	EPA SW 846-7421 (GFAA)	EPA SW 846-6010 (ICP)
Fuel		
Arsenic	EPA SW 846-7060(GFAA)	INAA
Barium	EPA SW 846-6010(ICP)	INAA
Chlorine	ASTM D-4208(ISE)	INAA
Mercury	EPA SW 846-7470(CVAA)	INAA
Selenium	EPA SW 846-7740(GFAA)	INAA
Cadmium	EPA SW 846-7131(ICP)	EPA SW846-6010(ICP-AES)
Chromium	EPA SW 846-7191(GFAA)	EPA SW846-6010(ICP-AES)
Lead	EPA SW 846-7421(GFAA)	EPA SW846-7420(GFAA)
Manganese	EPA SW 846-6010(ICP)	EPA SW846-6010(ICP-AES)
Bottom Ash		
Fluoride	EPA 300.0(IC)	EPA 340.2(ISE)
Lead	EPA SW 846-7421 (GFAA)	EPA SW 846-6010 (ICP)
Cadmium	EPA SW 846-7131(ICP)	EPA SW846-6010(ICP-AES)
Chromium	EPA SW 846-7191(GFAA)	EPA SW846-6010(ICP-AES)
Flyash		
Fluoride	EPA 300.0(IC)	EPA 340.2(ISE)
Lead	EPA SW 846-7421 (GFAA)	EPA SW 846-6010 (ICP)
Cadmium	EPA SW 846-7131(ICP)	EPA SW846-6010(ICP-AES)
Chromium	EPA SW 846-7191(GFAA)	EPA SW846-6010(ICP-AES)

Table 11

STREAM MASS FLOW DATA			
	Test 1	Test 2	Test 3
Flue gas flow, metals inlet (DSCFM)	247,200	252,100	261,800
Flue gas flow, metals outlet (DSCFM)	245,700	253,100	264,900
Flue gas flow, PM/Anions inlet (DSCFM)	245,800	250,200	255,900
Flue gas flow, PM/Anions outlet (DSCFM)	244,300	251,200	258,900
Flue gas flow, PAH inlet (DSCFM)	245,000	245,300	243,500
Flue gas flow, PAH outlet (DSCFM)	248,200	247,100	244,800
Coal flow (lb/hr)	86,800	88,900	88,800
Total ash flow (lb/hr)[1]	7,670	7,850	7,840
Bottom ash flow (lb/hr)	1,450	1,490	1,480
Flyash flow (lb/hr)[2]	6,610	6,840	6,790
Stack ash flow (lb/hr)[2]	0.56	4.1	1.9

[1]Total carbon-free ash flow calculated using coal flow and average ash content of fuel over the test period.

[2]Mass flow of ash calculated from measurement of ash concentration multiplied by calculated flow of flue gas.

INTEGRATED DRY NO_x/SO_2 EMISSIONS CONTROL SYSTEM

ENVIRONMENTAL MONITORING REPORT

Low-NOx Combustion System Retrofit Test Period:
August 3, 1992 through October 29, 1992

Baseline Air Toxics Test Period:
November 17, 1992 through November 19, 1992

Appendix A

State Emission Reports

Public Service®

Public Service
Company of Colorado
P.O. Box 840
Denver, CO 80201-0840

October 19, 1992

Mr. Roy Doyle
Air Pollution Control Division
Colorado Department of Health
4300 Cherry Creek Drive South
Denver, CO 80222-1530

RE: Third Quarter, 1992 Excess Emissions Report, Arapahoe Units #1-4

Dear Roy:

Attached is the excess emissions report for the third quarter, 1992, for the Public Service Company of Colorado Arapahoe Steam Electric Generating Station, Units #1-4.

Dates not reported on the attached emissions report are those in which the units were not running. The operating hours for Units #1-4 during the quarter were: Unit #1 - 694.5 hours, Unit #2 - 659.5 hours, Unit #3 - 770.9 hours and Unit #4 - 2,119.7 hours.

Feel free to contact me at 294-2810 with any questions in this regard.

Sincerely,

Peter J. Cohlmia

Peter J. Cohlmia
Chief Environmental Scientist

PJC:tc

Attachments

QUARTERLY EXCESS EMISSIONS REPORT (EER)

Fossil Fuel-Fired Steam Generators, Subpart D
Suggested Format for Sources in Region VIII*
Minimum Requirements Under Section 60.7 (see instructions)

Part 1 - This report includes all the required information under section 60.7 for

a. Quarterly emission reporting period ending:

March 31 June 30 (September 30) December 31

b. Reporting year: 1992

c. Reporting date: 10/9/92

d. Person completing report: Mark Spomer

e. Station name: Arapahoe Station

f. Plant location: 2601 South Platte River Drive

g. Person responsible for review and integrity of report: Peter J. Cohlmia

h. Mailing address for person in 1-g above:

P. O. Box 840, Denver, Colorado 80201

i. Phone number for 1-g above: 294-2810

Part 2 - Instrument information, complete for each instrument.

a.	Opacity Monitor:	Unit 1	Unit 2	Unit 3	Unit 4
b.	Manufacture:	Lear Siegler	L.S.	L.S.	L.S.
c.	Model No:	RM41	RM41	RM41	RM41
d.	Serial No:	568	1409	1369	997
e.	Installation:	1/77	6/79	6/79	7/79

Part 3 - Excess emissions (by pollutant)

Use Table I: Attach separate narrative per instructions.

Part 4 - Conversion factors

a. Zero and Cal values used, by instruments:

	Unit 1	Unit 2	Unit 3	Unit 4
Zero	0.0	0.0	0.0	0.0
Cal	52.5	51.7	58.0	48.5

Part 5 - Continuous Monitoring System operation failures

See Table II: Complete one sheet for each monitor attach separate narrative per instructions.

Part 6 - Certification of report integrity, by per in 1-g above:

THIS IS TO CERTIFY THAT TO THE BEST OF MY KNOWLEDGE, THE INFORMATION PROVIDED IN THE ABOVE REPORT IS COMPLETE AND ACCURATE.

NAME Peter J. Cohlmia

SIGNATURE Peter J. Cohlmia

Title Chief Environmental Scientist

Date 10/20/92

* Suggested Format for Subpart D sources in:

Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming

TABLE I

Excess Emissions

Date	Time* From – To	Pollutant	Magnitude* Ld/106 BTU

SO^2

No violations

Coal sampling and analysis during the quarter indicated an average SO2 content of 0.803 lbs/MMBtu.

Opacity

Attached is additional information for excesses occurring during the Third Quarter

• As defined in the instructions form the applicable section of the Federal Register; attached narrative of causes, etc.

TABLE II

Continuous Monitoring System Operation Failures

Date	Time* From – To	Instrument	Effect on Instrument Output
7/01/92	0000 to 7/07 1315	#1,2,3,4 RM41	Connecting wiring to WDPF
7/13/92	1045 to 7/13 1550	#1 RM41	Calibration and Audit
7/14/92	0640 to 7/14 1410	#2 RM41	Calibration and Audit

OPACITY MONTHLY DATA REPORT

POWER PLANT: ARAPAHOE
UNIT: 4 SOURCE CURRENT
REPORT START TIME: QUARTER = 3 7/1992

DAY	A 20-25%	B 25-30%	C 30-35%	D 35-45%	E OVER 45%	WEIGHT FACTOR	AVERAGE OPACITY %
	VIOLATION CATEGORY						
7/01	0	0	0	0	0	24	3.9
7/02	4	3	1	1	4	24	6.0
7/03	0	0	2	0	0	24	4.5
7/04	0	0	0	0	0	24	4.0
7/05	0	0	0	0	0	24	3.8
7/06	0	1	2	3	7	24	4.0
7/07	0	0	0	0	0	24	3.8
7/08	0	0	0	0	0	24	4.0
7/09	0	0	0	0	0	24	3.6
7/10	0	0	0	0	0	24	4.1
7/11	0	0	0	0	0	24	4.1
7/12	0	0	0	0	0	24	4.3
7/13	0	0	0	0	0	24	3.8
7/14	0	0	0	0	0	24	4.3
7/15	0	0	0	0	0	24	4.4
7/16	0	0	0	0	0	24	3.9
7/17	0	0	0	0	0	24	3.7
7/18	0	0	0	0	0	24	4.0
7/19	0	0	0	0	0	24	4.2
7/20	0	0	0	0	0	24	4.0
7/21	0	0	0	0	0	24	3.8
7/22	0	0	0	0	0	24	4.1
7/23	0	0	0	0	0	24	4.0
7/24	0	0	0	0	0	24	4.3
7/25	0	0	0	0	0	24	4.1
7/26	0	0	0	0	0	24	3.9
7/27	0	0	0	0	0	24	4.0
7/28	0	0	0	0	0	24	4.3
7/29	0	0	0	0	0	24	4.3
7/30	0	0	0	0	0	24	3.8
7/31	0	0	0	0	0	24	4.2
MONTHLY TOTALS	4	4	5	4	11	744	4.0

:PORT COMPLETE

OPACITY MONTHLY DATA REPORT

POWER PLANT: ARAPAHOE
UNIT: 4 SOURCE = CURRENT
REPORT START TIME: QUARTER = 3 8/1992

DAY	VIOLATION CATEGORY A 20-25%	B 25-30%	C 30-35%	D 35-45%	E OVER 45%	WEIGHT FACTOR	AVERAGE OPACITY %
8/01	0	0	0	0	0	24	3.9
8/02	0	0	0	0	0	24	4.0
8/03	0	0	0	0	0	24	3.9
8/04	0	0	0	0	0	24	3.9
8/05	0	0	0	0	0	24	4.4
8/06	0	0	0	0	0	24	3.9
8/07	0	0	0	0	0	24	4.4
8/08	0	0	0	0	0	24	4.5
8/09	0	0	0	0	0	24	4.3
8/10	0	0	0	0	0	24	4.4
8/11	0	0	0	0	0	24	3.8
8/12	0	0	0	0	0	24	4.1
8/13	0	0	0	0	0	24	3.6
8/14	0	0	0	0	0	24	4.0
8/15	0	0	0	0	0	24	3.9
8/16	0	0	0	0	0	24	4.5
8/17	0	0	0	0	0	24	4.1
8/18	0	0	0	0	0	24	3.6
8/19	0	0	0	0	0	24	4.0
8/20	0	0	0	0	0	24	4.5
8/21	0	0	0	0	0	24	4.2
8/22	0	0	0	0	0	24	4.3
8/23	0	0	0	0	0	24	4.1
8/24	0	0	0	0	0	24	4.2
8/25	0	0	0	0	0	24	3.7
8/26	0	0	0	0	0	24	3.8
8/27	0	0	0	0	0	24	4.5
8/28	0	0	0	0	0	24	4.6
8/29	0	0	0	0	0	24	4.5
8/30	0	0	0	0	0	24	4.0
8/31	0	0	0	0	0	24	3.7
MONTHLY TOTALS	0	0	0	0	0	744	4.1

EPORT COMPLETE

****

OPACITY MONTHLY DATA REPORT

****

POWER PLANT: ARAPAHOE
UNIT: 4 SOURCE = CURRENT
REPORT START TIME: QUARTER = 3 9/1992

DAY	VIOLATION CATEGORY A 20-25%	B 25-30%	C 30-35%	D 35-45%	E OVER 45%	WEIGHT FACTOR	AVERAGE OPACITY %
9/01	0	0	0	0	0	24	3.9
9/02	0	0	0	0	0	24	4.0
9/03	0	0	0	0	0	24	4.4
9/04	0	0	0	0	0	24	4.6
9/05	0	0	0	0	0	24	4.2
9/06	0	0	0	0	0	24	4.4
9/07	0	0	0	0	0	24	4.1
9/08	0	0	0	0	0	24	4.3
9/09	0	0	0	0	0	24	4.3
9/10	0	0	0	0	0	24	4.5
9/11	0	0	0	0	0	24	4.5
9/12	0	0	0	0	0	24	4.4
9/13	0	0	0	0	0	24	4.1
9/14	0	0	0	0	0	24	4.5
9/15	0	0	0	0	0	24	4.3
9/16	0	0	0	0	0	24	4.4
9/17	0	0	0	0	0	24	3.9
9/18	0	0	0	0	0	24	3.4
9/19	0	0	0	0	0	24	3.4
9/20	0	0	0	0	0	24	3.2
9/21	0	0	0	0	0	24	3.7
9/22	0	0	0	0	0	24	3.7
9/23	0	0	0	0	0	24	3.4
9/24	0	0	0	0	0	24	5.5
9/25	0	0	0	0	0	24	4.7
9/26	0	0	0	0	0	24	3.2
9/27	0	0	0	0	0	24	3.2
9/28	0	0	0	0	0	24	3.3
9/29	0	0	0	0	0	24	3.3
9/30	0	0	0	0	0	24	3.3
MONTHLY TOTALS	0	0	0	0	0	720	4.0

REPORT COMPLETE

OPACITY Violation Report

POWER PLANT: ARAPAHOE
Unit: 4 Source = CURRENT
Report Period: Quarter = 3 1992

REASON CODES FOR:
HOURLY EXCLUSIONS = none
UPSET EXCLUSIONS = none

START DATE-TIME	END DATE-TIME	MIN-%	MAX-%	AVG-%	TYPE	VIOLATION REAS
7/2/92	13 EXCESSES		UNIT STARTUPS & SHUTDOWNS			
7/3/92	2 EXCESSES		REASON UNKNOWN			
7/6/92	13 EXCESSES		UNIT STARTUP			

TOTAL VIOLATIONS = 28

Public Service

Public Service
Company of Colorado
P.O. Box 840
Denver, CO 80201-0840

January 29, 1993

Mr. Roy Doyle
Air Pollution Control Division
Colorado Department of Health
4300 Cherry Creek Drive South
Denver, CO 80222-1530

RE: Fourth Quarter, 1992 Excess Emissions Report, Arapahoe Units #1-4

Dear Roy:

Attached is the excess emissions report for the fourth quarter, 1992, for the Public Service Company of Colorado Arapahoe Steam Electric Generating Station, Units #1-4.

Dates not reported on the attached emissions report are those in which the units were not running. The operating hours for Units #1-4 during the quarter were: Unit #1 - 1,661.9 hours, Unit #2 - 1,163.6 hours, Unit #3 - 1,731.4 hours and Unit #4 - 2,205.3 hours.

Feel free to contact me at 294-2810 with any questions in this regard.

Sincerely,

Peter J. Cohlmia
Chief Environmental Scientist

PJC:tc

Attachments

QUARTERLY EXCESS EMISSIONS REPORT (EER)

Fossil Fuel-Fired Steam Generators, Subpart D
Suggested Format for Sources in Region VIII*
Minimum Requirements Under Section 60.7 (see instructions)

Part 1 - *This report includes all the required information under section 60.7 for*

a. Quarterly emission reporting period ending:

March 31 June 30 September 30 (December 31)

b. Reporting year: 1993

c. Reporting date: 01/12/93

d. Person completing report: Mark Spomer

e. Station name: Arapahoe Station

f. Plant location: 2601 South Platte River Drive

g. Person responsible for review and integrity of report: Peter J. Cohlmia

h. Mailing address for person in 1-g above:

P. O. Box 840, Denver, Colorado 80201

i. Phone number for 1-g above: 294-2810

Part 2 - Instrument information, complete for each instrument.

a.	*Opacity Monitor:*	*Unit 1*	*Unit 2*	*Unit 3*	*Unit 4*
b.	Manufacture:	Lear Siegler	L.S.	L.S.	L.S.
c.	Model No:	RM41	RM41	RM41	RM41
d.	Serial No:	568	1409	1369	997
e.	Installation:	1/77	6/79	6/79	7/79

Part 3 - Excess emissions (by pollutant)

Use Table I: Attach separate narrative per instructions.

Part 4 - Conversion factors

a. Zero and Cal values used, by instruments:

	Unit 1	Unit 2	Unit 3	Unit 4
Zero	0.0	0.0	0.0	0.0
Cal	52.5	51.7	58.0	48.5

Part 5 - Continuous Monitoring System operation failures

See Table II: Complete one sheet for each monitor attach separate narrative per instructions.

Part 6 - Certification of report integrity, by per in 1-g above:

THIS IS TO CERTIFY THAT TO THE BEST OF MY KNOWLEDGE, THE INFORMATION PROVIDED IN THE ABOVE REPORT IS COMPLETE AND ACCURATE.

NAME Peter J. Cohlmia

SIGNATURE Peter J. Cohlmia

Title Chief Environmental Scientist

Date 1/29/93

* Suggested Format for Subpart D sources in:

Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming

TABLE I

Excess Emissions

Date	Time* From – To	Pollutant	Magnitude* Lb/106 BTU

SO^2

No violations

Avg SO2 .840 lb/MMBTU (Not included in report, data obtained from Marilyn Thompson 9/16/93)

Opacity

Attached is additional information for excesses occurring during the Fourth [redacted] Quarter

* As defined in the instructions form the applicable section of the Federal Register; attached narrative of causes, etc.

Continuous Monitoring System Operation Failures

Date	Time* From -- To	Instrument	Effect on Instrument Output

FORM (B) 292-12-1994

OPACITY MONTHLY DATA REPORT

[illegible]

REPORT START TIME: QUARTER = 4 10/1992

DAY	VIOLATION CATEGORY A 20-25%	B 25-30%	C 30-35%	D 35-45%	E OVER 45%	WEIGHT FACTOR	AVERAGE OPACITY %
10/01	0	0	0	0	0	24	3.4
10/02	0	0	0	0	0	24	3.3
10/03	0	0	0	0	0	24	3.3
10/04	0	0	0	0	0	24	3.[illegible]
10/05	0	0	0	0	0	24	3.4
10/06	0	0	0	0	0	24	3.4
10/07	0	0	0	0	0	24	3.5
10/08	0	0	0	0	0	24	3.[illegible]
10/09	0	0	0	0	0	24	3.4
10/10	0	0	0	0	0	24	3.[illegible]
10/11	0	0	0	0	0	24	3.4
10/12	0	0	0	0	0	24	3.[illegible]
10/13	0	0	0	0	0	24	3.[illegible]
10/14	0	0	0	0	0	24	3.6
10/15	0	0	0	0	0	24	3.5
10/16	0	0	0	0	0	24	3.[illegible]
10/17	0	0	0	0	0	24	3.[illegible]
10/18	0	0	0	0	0	24	3.[illegible]
10/19	0	0	0	0	0	24	3.4
10/20	0	0	0	0	0	24	3.5
10/21	0	0	0	0	0	24	3.[illegible]
10/22	0	0	0	0	0	24	3.[illegible]
10/23	0	0	0	0	0	24	3.[illegible]
10/24	0	0	0	0	0	24	3.[illegible]
10/25	0	0	0	0	0	25	3.5
10/26	0	0	0	0	0	24	3.[illegible]
10/27	0	0	0	0	0	24	3.6
10/28	0	0	0	0	0	24	3.[illegible]
10/29	3	2	3	1	7	24	8.0
10/30	0	0	0	0	0	24	3.6
10/31	0	0	0	0	0	24	3.[illegible]
MONTHLY TOTALS	3	2	3	1	7	745	3.[illegible]

REPORT COMPLETE

FORM (B) 282-12-1994

OPACITY MONTHLY DATA REPORT

[redacted]

REPORT START TIME: QUARTER = 4 11/1992

DAY	A 20-25%	B 25-30%	C 30-35%	D 35-45%	E OVER 45%	WEIGHT FACTOR	AVERAG OPACIT %
	VIOLATION CATEGORY						
11/01	0	0	0	0	0	24	3.
11/02	0	0	0	0	0	24	3.
11/03	0	0	0	0	0	24	3.
11/04	0	0	0	0	0	24	3.
11/05	0	0	0	0	0	24	3.
11/06	0	0	0	0	0	24	3.
11/07	0	0	0	0	0	24	3.
11/08	0	0	0	0	0	24	3.
11/09	0	0	0	0	0	24	3.
11/10	0	0	0	0	0	24	3.
11/11	0	0	0	0	0	24	3.
11/12	0	0	0	0	0	24	3.
11/13	0	0	0	0	0	24	3.
11/14	0	0	0	0	0	24	3.
11/15	0	0	0	0	0	24	4.
11/16	0	0	0	0	0	24	4.
11/17	0	0	0	0	0	24	3.
11/18	0	0	0	0	0	24	4.
11/19	0	0	0	0	0	24	3.
11/20	0	0	0	0	0	24	3.
11/21	0	0	0	0	0	24	3.
11/22	0	0	0	0	0	24	3.
11/23	0	0	0	0	0	24	3.
11/24	0	0	0	0	0	24	3.
11/25	0	0	0	0	0	24	4.
11/26	0	0	0	0	0	24	4.
11/27	0	0	0	0	0	24	4.
11/28	0	0	0	0	0	24	3.
11/29	0	0	0	0	0	24	3.
11/30	0	0	0	0	0	24	3.
MONTHLY TOTALS	0	0	0	0	0	720	3.

REPORT COMPLETE

FORM (B) 292-12-1994

OPACITY MONTHLY DATA REPORT

[illegible]

REPORT START TIME: QUARTER = 4 12/1992

DAY	VIOLATION CATEGORY A 20-25%	B 25-30%	C 30-35%	D 35-45%	E OVER 45%	WEIGHT FACTOR	AVERAGE OPACITY %
12/01	0	0	0	0	0	24	3.
12/02	0	0	0	0	0	24	4.
12/03	0	0	0	0	0	24	3.
12/04	0	0	0	0	0	24	3.
12/05	0	0	0	0	0	24	3.
12/06	0	0	0	0	0	24	3.
12/07	0	0	0	0	0	24	4.
12/08	0	0	0	0	0	24	3.
12/09	0	0	0	0	0	24	3.
12/10	0	0	0	0	0	24	3.
12/11	0	0	0	0	0	24	3.
12/12	0	0	0	0	0	24	3.
12/13	0	0	0	0	0	24	3.
12/14	0	0	0	0	0	24	4.
12/15	0	0	0	0	0	24	3.
12/16	0	0	0	0	0	24	3.
12/17	0	0	0	0	0	24	3.
12/18	0	0	0	0	0	24	3.
12/19	0	0	0	0	0	24	3.
12/20	0	0	0	0	0	24	3.
12/21	0	0	0	0	0	24	3.
12/22	0	0	0	0	0	24	3.
12/23	0	0	0	0	0	24	3.
12/24	0	0	0	0	0	24	3.
12/25	0	0	0	0	0	24	3.
12/26	0	0	0	0	0	24	3.
12/27	0	0	0	0	0	24	3.
12/28	0	0	0	0	0	24	3.
12/29	0	0	0	0	0	24	3.
12/30	0	0	0	0	0	24	3.
12/31	0	0	0	0	0	24	3.
MONTHLY TOTALS	0	0	0	0	0	744	3.

REPORT COMPLETE

FORM (B) 292-12-1994

OPACITY Violation Report

[redacted]

Report Period: Quarter = 4 1992

REASON CODES FOR:
HOURLY EXCLUSIONS = none
UPSET EXCLUSIONS = none

START DATE-TIME	END DATE-TIME	MIN-%	MAX-%	AVG-%	TYPE	VIOLATION REASON
10/29/1992 07:48	10/29/1992 08:23	74.0	94.3	86.4	VIO	BAGHOUSE BYPASS OPE
10/29/1992 08:30	10/29/1992 09:11	24.7	63.6	[illegible]	VIO	~~UNSPECIFIED~~ BAGHOUSE
10/29/1992 09:18	10/29/1992 09:23	20.2	20.2	20.2	VIO	BAGHOUSE BYPASS OPE
10/29/1992 10:06	10/29/1992 10:17	21.2	25.8	[illegible]	VIO	BAGHOUSE BYPASS OPE

VIOLATIONS, RANGE (A = 3) (B = 2) (C = 3) (D = 1) (E = 7)

GRAND TOTAL 6-MINUTE VIOLATION PERIODS = 16

TOTAL 6-MINUTE PERIODS EVALUATED = 22090

TOTAL UNIT ONLINE PERIODS = 22071

REPORT IS FINISHED

INTEGRATED DRY NO_x/SO_2 EMISSIONS CONTROL SYSTEM

ENVIRONMENTAL MONITORING REPORT

Low-NOx Combustion System Retrofit Test Period:
August 3, 1992 through October 29, 1992

Baseline Air Toxics Test Period:
November 17, 1992 through November 19, 1992

Appendix B

Aqueous Stream Compliance Data

Public Service®

Public Service
Company of Colorado
P.O. Box 840
Denver, CO 80201-0840
(303) 294-8500
FAX (303) 294-8815

James R. McCotter
Senior Vice President
General Counsel and
Corporate Secretary

September 24, 1992

Colorado Department of Health
Colorado Water Quality Control Division
Monitoring & Enforcement Section
4210 East 11th Avenue
Denver, CO 80220

RE: Discharge Permits: CO-0000027 Cameo
CO-0000612 Comanche
CO-0001139 Zuni
CO-0001104 Cherokee
CO-0001091 Arapahoe
CO-0001112 Valmont
CO-0001121 Fort St. Vrain

Dear Sir:

Pursuant to the discharge permits issued on the above Public Service Company of Colorado plants, the attached NPDES Discharge Monitoring Reports for the month of August, 1992 are hereby transmitted.

Sincerely,

James R. McCotter
Senior Vice President
General Counsel and
Corporate Secretary

Attachments

cc: U.S. E.P.A. Region VIII
ATTN: Enforcement-Permit Program
Denver Place - Suite 500
999 - 18th Street 8WM-C
Denver, CO 80202-2405

DRESS P. O. BOX 840
DENVER, COLORADO 80201

ILITY ARAPAHOE
ATION

CO-0001091	001A
PERMIT NUMBER	DISCHARGE NUMBER

FINAL

Expires 3-31-88

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	92	08	01	TO	92	08	31
	(20 21)	(22-23)	(24 25)		(26-27)	(28-29)	(30 31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		QUANTITY OR LOADING (3 Card Only) AVERAGE (46-53)	MAXIMUM (54-61)	UNITS	QUALITY OR CONCENTRATION (4 Card Only) MINIMUM (38-45)	AVERAGE (46-53)	MAXIMUM (54-61)	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
EMPERATURE ATER DEG FAHRENHEIT	SAMPLE MEASUREMENT						78.000	(15) DEGF	0	20/31	
0011 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT						86.000 Daily Max.			5/7	INSIT
H	SAMPLE MEASUREMENT				7.620		8.940	(12) SU	0	20/31	
0400 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT				6.500 Minimum		9.000 Maximum			5/7	GR
OLIDS, TOTAL TSS USPENDED	SAMPLE MEASUREMENT					23.300	31.400	(19) MG/L	0	4 /31	
0530 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT					30.000 30-day avg.	100.000 Daily Max.			1/7	8HR COMP
IL AND GREASE REON EXTR-GRAV METH	SAMPLE MEASUREMENT				CONTINGENT			(19) MG/L	0	4 /31	
0556 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT					15.000 30-day avg.	20.000 Daily Max.			1/7	GR
INC, TOTAL AS ZN)	SAMPLE MEASUREMENT					0.027	0.027	(19) MG/L	0	1 /31	
1092 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT					0.880	0.880			1/30	GR
LOW, IN CONDUIT OR HRU TREATMENT PLANT	SAMPLE MEASUREMENT	0.104	0.187	(03) MGD					0	43/31	
0050 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT	1.000 30-day avg.								30/30	INST
HLORINE TOTAL ESIDUAL	SAMPLE MEASUREMENT						<0.05	(19) MG/L	0	4 /31	
0060 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT						0.110 Daily Max.			1/7	GR

ME/TITLE PRINCIPAL EXECUTIVE OFFICER

COTTER, JAMES R.
. VICE PRESIDENT

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
303	2948500	92	09	21
AREA CODE	NUMBER	YEAR	MO	DAY

MENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

DRESS P. O. BOX 840
DENVER, COLORADO 80201

CILITY ARAPAHOE
CATION

CO-0001091
PERMIT NUMBER

001A
DISCHARGE NUMBER

FINAL

Expires 3-31-88

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	92	08	01	TO	92	08	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
L AND GREASE SUAL	SAMPLE MEASUREMENT		0	1=YES 0=NO					0	4 /31	
0066 1 0 0 FLUENT GROSS VALUE	PERMIT REQUIREMENT		Inst. Max.							1/7	VIS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

ME/TITLE PRINCIPAL EXECUTIVE OFFICER

COTTER, JAMES R.
. VICE PRESIDENT

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
103	2948500	92	09	21
AREA CODE	NUMBER	YEAR	MO	DAY

IMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

OMB No. 2040-0004
Expires 3-31-88

NAME PUBLIC SERVICE COMPANY OF COLORADO
ADDRESS P. O. BOX 840
DENVER, COLORADO 80201

FACILITY ARAPAHOE
LOCATION

(2-16) CO-0001091 PERMIT NUMBER

(17-19) 002A DISCHARGE NUMBER

FINAL

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
FROM	92	08	01	TO	92	08	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
TEMPERATURE WATER DEG FAHRENHEIT	SAMPLE MEASUREMENT	NO DISCHARGE									
00011 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT										
PH	SAMPLE MEASUREMENT	NO DISCHARGE									
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT										
SOLIDS, TOTAL TSS SUSPENDED	SAMPLE MEASUREMENT	NO DISCHARGE									
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT										
OIL AND GREASE FREON EXTR-GRAV METH	SAMPLE MEASUREMENT	NO DISCHARGE									
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT										
ZINC, TOTAL (AS ZN)	SAMPLE MEASUREMENT	NO DISCHARGE									
01092 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT										
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	NO DISCHARGE									
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT										
CHLORINE TOTAL RESIDUAL	SAMPLE MEASUREMENT	NO DISCHARGE									
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
MCCOTTER, JAMES R.
SR. VICE PRESIDENT
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. *(Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)*

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
303	2948500	92	09	21
AREA CODE	NUMBER	YEAR	MO	DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

ODRESS P. O. BOX 840
DENVER, COLORADO 80201

ACILITY ARAPAHOE
OCATION

CO-0001091 PERMIT NUMBER

002A DISCHARGE NUMBER

FINAL

Expires 3-31-88

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	92	08	01	TO	92	08	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
IL AND GREASE ISUAL 4066 1 0 0 FFLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
CCOTTER, JAMES R.
R. VICE PRESIDENT
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
303	2948500	92	09	21
AREA CODE	NUMBER	YEAR	MO	DAY

OMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

Public Service®

Public Service
Company of Colorado
P.O. Box 840
Denver, CO 80201-0840
(303) 294-8500
FAX (303) 294-8815

James R. McCotter
Senior Vice President
General Counsel and
Corporate Secretary

October 24, 1992

Colorado Department of Health
Water Quality Control Division
Monitoring & Enforcement Section
4300 Cherry Creek Drive South
Denver, CO 80222-1530

RE: Discharge Permits: CO-0000027 Cameo
CO-0000612 Comanche
CO-0001139 Zuni
CO-0001104 Cherokee
CO-0001091 Arapahoe
CO-0001112 Valmont
CO-0001121 Fort St. Vrain
CO-0000523 Hayden

Dear Sir:

Pursuant to the discharge permits issued on the above Public Service Company of Colorado plants, the attached NPDES Discharge Monitoring Reports for the month of September, 1992 are hereby transmitted.

Sincerely,

James R. McCotter

Attachments

cc: U.S. E.P.A. Region VIII
ATTN: Enforcement-Permit Program
Denver Place - Suite 500
999 - 18th Street 8WM-C
Denver, CO 80202-2405

ADDRESS P. O. BOX 840
DENVER, COLORADO 80201

FACILITY ARAPAHOE
LOCATION

CO-0001091
PERMIT NUMBER

001A
DISCHARGE NUMBER

FINAL

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
FROM	92	09	01	TO	92	09	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
TEMPERATURE WATER DEG FAHRENHEIT	SAMPLE MEASUREMENT						75.800		0	15/30	
00011 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT						86.000 Daily Max.	(15) DEGF		5/7	INSIT
PH	SAMPLE MEASUREMENT				6.820		8.580		0	15/30	
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT				6.500 Minimum		9.000 Maximum	(12) SU		5/7	GR
SOLIDS, TOTAL TSS SUSPENDED	SAMPLE MEASUREMENT					20.600	24.400		0	3 /30	
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT					30.000 30-day avg.	100.000 Daily max.	(19) MG/L		1/7	8HR CO
OIL AND GREASE FREON EXTR-GRAV METH	SAMPLE MEASUREMENT				CONTINGENT				0	3 /30	
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT					15.000 30-day avg.	20.000 Daily Max.	(19) MG/L		1/7	GR
ZINC, TOTAL (AS ZN)	SAMPLE MEASUREMENT					0.019	0.019		0	1 /30	
01092 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT					0.880	0.880	(19) MG/L		1/30	GR
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	0.297	0.901						0	23/30	
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	1.000 30-day avg.		(03) MGD						30/30	INST
CHLORINE TOTAL RESIDUAL	SAMPLE MEASUREMENT						(0.05		0	3 /30	
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT						0.110 Daily Max.	(19) MG/L		1/7	GR

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

MCCOTTER, JAMES R.
SR. VICE PRESIDENT

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
303	2948500	92	10	21
AREA CODE	NUMBER	YEAR	MO	DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

ADDRESS P. O. BOX 840
DENVER, COLORADO 80201

FACILITY ARAPAHOE
LOCATION

CO-0001091
PERMIT NUMBER

001A
DISCHARGE NUMBER

FINAL

MONITORING PERIOD							
	YEAR	MO	DAY		YEAR	MO	DAY
FROM	92	09	01	TO	92	09	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

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PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT		0	1=YES 0=NO					0	3 /30	
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT		Inst. Max.							1/7	VIS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
MCCOTTER, JAMES R.
SR. VICE PRESIDENT
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 *(Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years)*

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TELEPHONE		DATE		
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AREA CODE	NUMBER	YEAR	MO	DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

NAME PUBLIC SERVICE COMPANY OF COLORADO
ADDRESS P. O. BOX 840
DENVER, COLORADO 80201

FACILITY ARAPAHOE
LOCATION

(2-16) CO-0001091 PERMIT NUMBER

(17-19) 002A DISCHARGE NUMBER

FINAL

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
FROM	92	09	01	TO	92	09	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

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TEMPERATURE WATER DEG FAHRENHEIT 00011 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
PH 00400 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
SOLIDS, TOTAL TSS SUSPENDED 00530 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
OIL AND GREASE FREON EXTR-GRAV METH 00556 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
ZINC, TOTAL (AS ZN) 01092 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
FLOW, IN CONDUIT OR THRU TREATMENT PLANT 50050 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
CHLORINE TOTAL RESIDUAL 50060 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

MCCOTTER, JAMES R.
SR. VICE PRESIDENT

TYPED OR PRINTED

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TELEPHONE		DATE		
303	2948500	92	10	21
AREA CODE	NUMBER	YEAR	MO	DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

NAME PUBLIC SERVICE COMPANY OF COLORADO
ADDRESS P. O. BOX 840
DENVER, COLORADO 80201

FACILITY ARAPAHOE
LOCATION

(2-16) PERMIT NUMBER	(17-19) DISCHARGE NUMBER
CO-0001091	002A

FINAL

MONITORING PERIOD

	YEAR (20-21)	MO (22-23)	DAY (24-25)		YEAR (26-27)	MO (28-29)	DAY (30-31)
FROM	92	09	01	TO	92	09	30

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
OIL AND GREASE VISUAL 84066 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
MCCOTTER, JAMES R.
SR. VICE PRESIDENT
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE AREA CODE	NUMBER	DATE YEAR	MO	DAY
303	2948500	92	10	21

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

Public Service®

Public Service
Company of Colorado
P.O. Box 840
Denver, CO 80201-0840
(303) 294-8500
FAX (303) 294-8815

James R. McCotter
Senior Vice President
General Counsel and
Corporate Secretary

November 24, 1992

Colorado Department of Health
Water Quality Control Division
Monitoring & Enforcement Section
4300 Cherry Creek Drive South
Denver, CO 80222-1530

RE: Discharge Permits: CO-0000027 Cameo
CO-0000612 Comanche
CO-0001139 Zuni
CO-0001104 Cherokee
CO-0001091 Arapahoe
CO-0001112 Valmont
CO-0001121 Fort St. Vrain

Dear Sir:

Pursuant to the discharge permits issued on the above Public Service Company of Colorado plants, the attached NPDES Discharge Monitoring Reports for the month of **October**, 1992 are hereby transmitted.

Sincerely,

James R. McCotter

Attachments

cc: U.S. E.P.A. Region VIII
ATTN: Enforcement-Permit Program
Denver Place - Suite 500
999 - 18th Street 8WM-C
Denver, CO 80202-2405

Form Approved
OMB No. 2040-0004
Expires 3-31-88

DISCHARGE MONITORING REPORT (DMR)

...E PUBLIC SERVICE COMPANY OF COLORADO
...RESS P. O. BOX 840
DENVER, COLORADO 80201

...ILITY ARAPAHOE
...ATION

(2-16) CO-0001091 PERMIT NUMBER

(17-19) 001A DISCHARGE NUMBER

FINAL

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	92	10	01	TO	92	10	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
...MPERATURE ...TER DEG FAHRENHEIT	SAMPLE MEASUREMENT						67.000	(15)	0	20/31	
...011 1 0 0 ...FLUENT GROSS VALUE	PERMIT REQUIREMENT						86.000 Daily Max	DEGF		5/7	INSIT
	SAMPLE MEASUREMENT				7.730		8.670	(12)	0	20/31	
...400 1 0 0 ...FLUENT GROSS VALUE	PERMIT REQUIREMENT				6.500 Minimum		9.000 Maximum	SU		5/7	GR
...LIDS, TOTAL TSS ...SPENDED	SAMPLE MEASUREMENT					14.400	17.600	(19)	0	4 /31	
...530 1 0 0 ...FLUENT GROSS VALUE	PERMIT REQUIREMENT					30.000 30-day avg.	100.000 Daily Max.	MG/L		1/7	BHR COM...
...L AND GREASE ...EON EXTR-GRAV METH	SAMPLE MEASUREMENT				CONTINGENT			(19)	0	4 /31	
...556 1 0 0 ...FLUENT GROSS VALUE	PERMIT REQUIREMENT					15.000 30-day avg.	20.000 Daily Max.	MG/L		1/7	GR
...NC, TOTAL ...S ZN)	SAMPLE MEASUREMENT					0.010	0.010	(19)	0	1 /31	
...092 1 0 0 ...FLUENT GROSS VALUE	PERMIT REQUIREMENT					0.880	0.880	MG/L		1/30	GR
...OW, IN CONDUIT OR ...RU TREATMENT PLANT	SAMPLE MEASUREMENT	0.397	0.901	(03)					0	43/31	
...050 1 0 0 ...FLUENT GROSS VALUE	PERMIT REQUIREMENT	1.000 30-day avg.		MGD						30/30	INST
...LORINE TOTAL ...SIDUAL	SAMPLE MEASUREMENT						<0.05	(19)	0	4 /31	
...060 1 0 0 ...FLUENT GROSS VALUE	PERMIT REQUIREMENT						0.110 Daily Max	MG/L		1/7	GR

...ME/TITLE PRINCIPAL EXECUTIVE OFFICER

COTTER, JAMES R.
... VICE PRESIDENT

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years)

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
303	2948500	92	11	23
AREA CODE	NUMBER	YEAR	MO	DAY

...MENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004
Expires 3-31-88

...y Name/Location if different)
NAME PUBLIC SERVICE COMPANY OF COLORADO
ADDRESS P. O. BOX 840
DENVER, COLORADO 80201

FACILITY ARAPAHOE
LOCATION

(2-16) CO-0001091 PERMIT NUMBER

(17-19) 001A DISCHARGE NUMBER

FINAL

	MONITORING PERIOD						
	YEAR	MO	DAY		YEAR	MO	DAY
FROM	92	10	01	TO	92	10	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
OIL AND GREASE VISUAL 84066 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT		0	1=YES 0=NO					0	4 /31	
	PERMIT REQUIREMENT		Inst. Max.							1/7	VIS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
COTTER, JAMES R.
SR. VICE PRESIDENT
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years)

X [signature]
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
303	2948500	92	11	23
AREA CODE	NUMBER	YEAR	MO	DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

Form Approved
OMB No. 2040-0004
Expires 3-31-88

DISCHARGE MONITORING REPORT (DMR)

ME PUBLIC SERVICE COMPANY OF COLORADO
DRESS P. O. BOX 840
DENVER, COLORADO 80201

ILITY ARAPAHOE
CATION

PERMIT NUMBER (2-16): CO-0001091
DISCHARGE NUMBER (17-19): 002A

FINAL

MONITORING PERIOD	YEAR	MO	DAY
FROM	92 (20-21)	10 (22-23)	01 (24-25)
TO	92 (26-27)	10 (28-29)	31 (30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		QUANTITY OR LOADING (3 Card Only) AVERAGE (46-53)	MAXIMUM (54-61)	UNITS	QUALITY OR CONCENTRATION (4 Card Only) MINIMUM (38-45)	AVERAGE (46-53)	MAXIMUM (54-61)	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
MPERATURE TER DEG FAHRENHEIT 011 1 0 0 FLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
0400 1 0 0 FLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
LIDS, TOTAL TSS SPENDED 0530 1 0 0 FLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
L AND GREASE EON EXTR-GRAV METH 0556 1 0 0 FLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
NC, TOTAL S ZN) 092 1 0 0 FLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
OW, IN CONDUIT OR RU TREATMENT PLANT 050 1 0 0 LUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
LORINE TOTAL IDUAL 060 1 0 0 LUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										

ME/TITLE PRINCIPAL EXECUTIVE OFFICER

COTTER, JAMES R.
, VICE PRESIDENT

TYPED OR PRINTED

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
303	2948500	92	11	23
AREA CODE	NUMBER	YEAR	MO	DAY

MENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

OMB No. 2040-0004
Expires 3-31-88

DISCHARGE MONITORING REPORT (DMR)

...E PUBLIC SERVICE COMPANY OF COLORADO
...RESS P. O. BOX 840
DENVER, COLORADO 80201

...LITY ARAPAHOE
...ATION

(2-16) PERMIT NUMBER	(17-19) DISCHARGE NUMBER	
CO-0001091	002A	FINAL

MONITORING PERIOD

	YEAR (20-21)	MO (22-23)	DAY (24-25)		YEAR (26-27)	MO (28-29)	DAY (30-31)
FROM	92	10	01	TO	92	10	31

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
...L AND GREASE ...SUAL ...066 1 0 0 ...FLUENT GROSS VALUE	SAMPLE MEASUREMENT	NO DISCHARGE									
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

...E/TITLE PRINCIPAL EXECUTIVE OFFICER

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... VICE PRESIDENT

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SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
303	2948500	92	11	23
AREA CODE	NUMBER	YEAR	MO	DAY

...MENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

INTEGRATED DRY NO_x/SO_2 EMISSIONS CONTROL SYSTEM

ENVIRONMENTAL MONITORING REPORT

Low-NOx Combustion System Retrofit Test Period:
August 3, 1992 through October 29, 1992

Baseline Air Toxics Test Period:
November 17, 1992 through November 19, 1992

Appendix C

Combustion Retrofit Data Summary

Arapahoe 4 Retrofit Burn. Data Summary

Test	Date & Time		Description	Load MWe	Mills OOS	Burner Spin Vanes Inner/outer	OFA Dmprs %Open West/East	CR O2 % wet	Total Air kpph	OFA Flow %	O2 %	CO ppm	NOx ppm@ 3% O2	CO2 %	SO2c ppm@ 3% O2	Airhtr O2 %	Stack O2 %	LOI FERCo %	Acoustic FEGT °F
200	08/06/92	15:08	80-90 MW dispatch, As Found			45°/45°	100/100	5.22	629		4.70	125	303	13.4	367				
202	08/07/92	11:41	100-116 MW dispatch, As Found			45°/45°	100/100	3.89	949		5.45	165	290	12.9	377			11.3	
203	08/10/92	08:28	As Found	100		45°/45°	100/100	4.05	862	23	5.35	57	288	12.9	370	5.20	5.40	7.3	
204	08/10/92	14:38	OFA Dampers to 40%	100		45°/45°	40/40	3.99	898	14	5.60	42	310	12.9	375	5.40	5.60	5.7	
205	08/11/92	08:23	As Found	100		45°/45°	100/100	3.96	875	22	5.10	48	277	13.2	374				
206	08/11/92	10:00	Secondaries to light-off	100		45°/45°	100/100	3.96	892	27	5.20	27	290	13.1	374				
207	08/11/92	14:40	Secondaries @ light-off, Reduced OFA	99		45°/45°	50/53	3.97	890	21	5.15	40	285	13.0	372				
208	08/12/92	14:00	Repeat 207 Next Day	100		45°/45°	52/52	3.89	928	20	5.30	103	288	13.1	372				
209	08/12/92	15:05	B Group Secondaries to Normal	100		45°/45°	52/52	4.12	911	21	5.00	322	269	13.2	371				
210	08/12/92	16:12	C Group Secondaries to Normal	100		45°/45°	52/52	3.95	916	20	5.30	62	291	13.0	376				
211	08/13/92	09:58	104 MW As Found, Aborted due to Dispatch	104		45°/45°	100/100		899	22	5.30	64	288	13.1	371				
212	08/13/92	10:38	110 MW, As Found	110		45°/45°	100/100	4.03	970	22	5.20	39	302	13.2	368				
213	08/13/92	14:15	110 MW, Balanced Secondary Air Flows	110		45°/45°	100/100	3.95	965	23	5.00	19	298	13.2	369				
214	08/14/92	09:13	A Mill OOS, AS Found	101	A	45°/45°	100/100	3.93	888	25	4.80	152	270	12.9	377			10.8	
215	08/14/92	12:06	A Mill OOS, OFA Flow Biased to East	101	A	45°/45°	55/100	3.99	928	23	5.60	112	296	12.2	383			10.5	
216	08/14/92	14:10	A Mill OOS, OFA Dampers @ 40%	101	A	45°/45°	40/40	3.96	894	15	5.70	271	298	12.1	382				
217	08/14/92	16:30	A Mill OOS, OFA @ 100%, inners @ 45°-2	101	A	30°/45°	100/100	4.10	920	26	5.30	342	268	12.1	378				
218	08/14/92	18:30	All Mills, OFA @ 100%, inners @ 45°-2	101		30°/45°	100/100	3.97	859	23	4.90	54	239	12.9	378				
219	08/17/92	10:36	PSCC VWO Heat Rate Test	113		30°/45°	100/100	4.00	980	24	4.15	60	287	13.6	377	5.90	5.40		1891
220	08/18/92	08:45	OFA @ 100%, inners@45°-2, Outers@45°	100		30°/45°	100/100	4.04	871	24	4.85	74	246	13.4	368	4.85	5.25	9.1	1834
221	08/18/92	13:31	As 220 with Balanced Burner Secondaries	100		30°/45°	100/100	4.10	878	27	4.55	55	243	13.7	390	4.65	6.00	7.7	
222	08/18/92	15:38	As 221 with outers to 45°-2	100		30°/30°	100/100	4.02	869	30	4.70	36	271	13.5	400	4.75	6.10	5.1	
223	08/18/92	17:25	As 222 with Secondaries at normal position	100		30°/30°	100/100	4.00	886	27	5.15	38	279	13.0	406				
224	08/19/92	08:59	Repeat 223 next day	100		30°/30°	100/100	4.06	856	28	4.83	56	256	13.3	410	4.80	5.90	7.3	1829
225	08/19/92	11:04	Repeat 220	100		30°/45°	100/100	4.02	845	23	4.53	47	248	13.7	417	4.60	5.65	7.9	1874
226	08/19/92	14:33	OFA @ 100%, inners@45°-3, Outers@45°	100		22°/45°	100/100	4.02	840	24	4.70	88	244	13.6	419	4.60	5.65	7.7	1832
227	08/20/92	08:48	Repeat 226 next day	100		22°/45°	100/100	4.03	853	24	4.63	81	235	13.4	411	4.80	5.65	9.4	1797
228	08/20/92	11:02	inners to 45°	100		45°/45°	100/100	4.01	848	21	4.58	140	238	13.2	411	4.65	5.65	7.1	1808
229	08/21/92	08:43	C Mill OOS, Innr@45°-2, otrs@45°,lowO2	100	C	30°/45°	100/100	3.24	823	27	4.35	216	261	14.6	420			10.3	1789
230	08/21/92	10:36	As 229 with normal O2	100	C	30°/45°	100/100	4.02	862	27	4.90	38	283	14.2	490			6.9	1834
231	08/24/92	10:23	OFA @ 100%, inners@45°-2, Outers@45°	100		30°/45°	100/100	3.99	841	25	4.75	253	235	13.9	538	4.90	6.65	8.2	1896
232	08/24/92	15:21	Repeat 231 (LOI Problems)	100		30°/45°	100/100	4.00	866	24	4.85	229	242	14.0	549			9.9	
233	08/25/92	07:55	100 MW, 100% OFA, 4.0% CR O2	100		30°/45°	100/100	3.96	865	24	4.97	121	240	14.1	550	4.95	6.95	4.7	1845
234	08/25/92	10:23	As 233 with W/E OFA Dampers @ 45/42%	100		30°/45°	45/42	3.85	886	16	5.43	122	276	13.8	532	5.25	7.20	3.4	1838
235	08/25/92	12:46	As 233 with W/E OFA Dampers @ 35/32%	100		30°/45°	35/32	4.14	911	12	5.50	58	298	13.4	490	5.45	7.35	3.9	1880
236	08/25/92	15:01	As 233 with W/E OFA Dampers @ 55/58%	100		30°/45°	55/58	4.15	898	20	5.18	76	263	13.7	449	5.00	7.60	5.0	1882
237	08/26/92	09:06	80 MW, 100% OFA, 4.9% CR O2	80		30°/45°	100/100	4.91	686	23	5.70	65	219	13.2	423	5.55	7.45	5.5	1710
238	08/26/92	11:46	As 237 with W/E OFA Dampers @ 30/34%	80		30°/45°	30/34	4.86	724	10	6.38	22	275	12.7	415	6.20	7.75	2.8	1732
239	08/26/92	13:58	As 237 with W/E OFA Dampers @ 45/44%	80		30°/45°	45/44	4.91	697	16	6.05	94	247	12.8	415	5.65	7.65	4.5	1749
240	08/28/92	08:33	80 MW, 100% OFA, 5.7% CR O2	80		30°/45°	100/100	5.69	769	23	6.70	19	247	12.4	408	6.65	7.70	3.6	1669
241	08/28/92	10:40	As 240 with W/E OFA Dampers @ 40/42%	80		30°/45°	40/42	5.76	776	14	7.02	9	285	12.1	405	6.80	7.70	2.1	1716
242	08/28/92	14:27	As 240 with W/E OFA Dampers @ 25/29%	80		30°/45°	25/29	5.70	791	8	7.13	6	314	11.9	403	6.95	7.15	1.7	1760
243	08/28/92	16:36	As 242 with avg O2 reduced to same as 240	80		30°/45°	25/29	5.13	731	8	6.78	8	287	12.3	406	6.50	6.65	2.4	1755
244	08/29/92	08:09	60 MW, 100% OFA, 7.0% CR O2	60	C	30°/45°	100/100	6.94	629	25	7.98	11	304	11.4	412	7.90	8.20	2.1	1538
245	08/29/92	10:13	As 244 with W/E OFA Dampers @ 42/39%	60	C	30°/45°	42/39	6.99	657	16	8.33	14	310	11.2	423	8.25	8.40	3.0	1570
246	08/29/92	12:05	As 244 with W/E OFA Dampers @ 25/20%	60	C	30°/45°	25/20	6.94	679	9	8.50	9	337	11.2	476	8.45	8.60	2.2	1580

Arapahoe 4 Retrofit Bu. . Data Summary

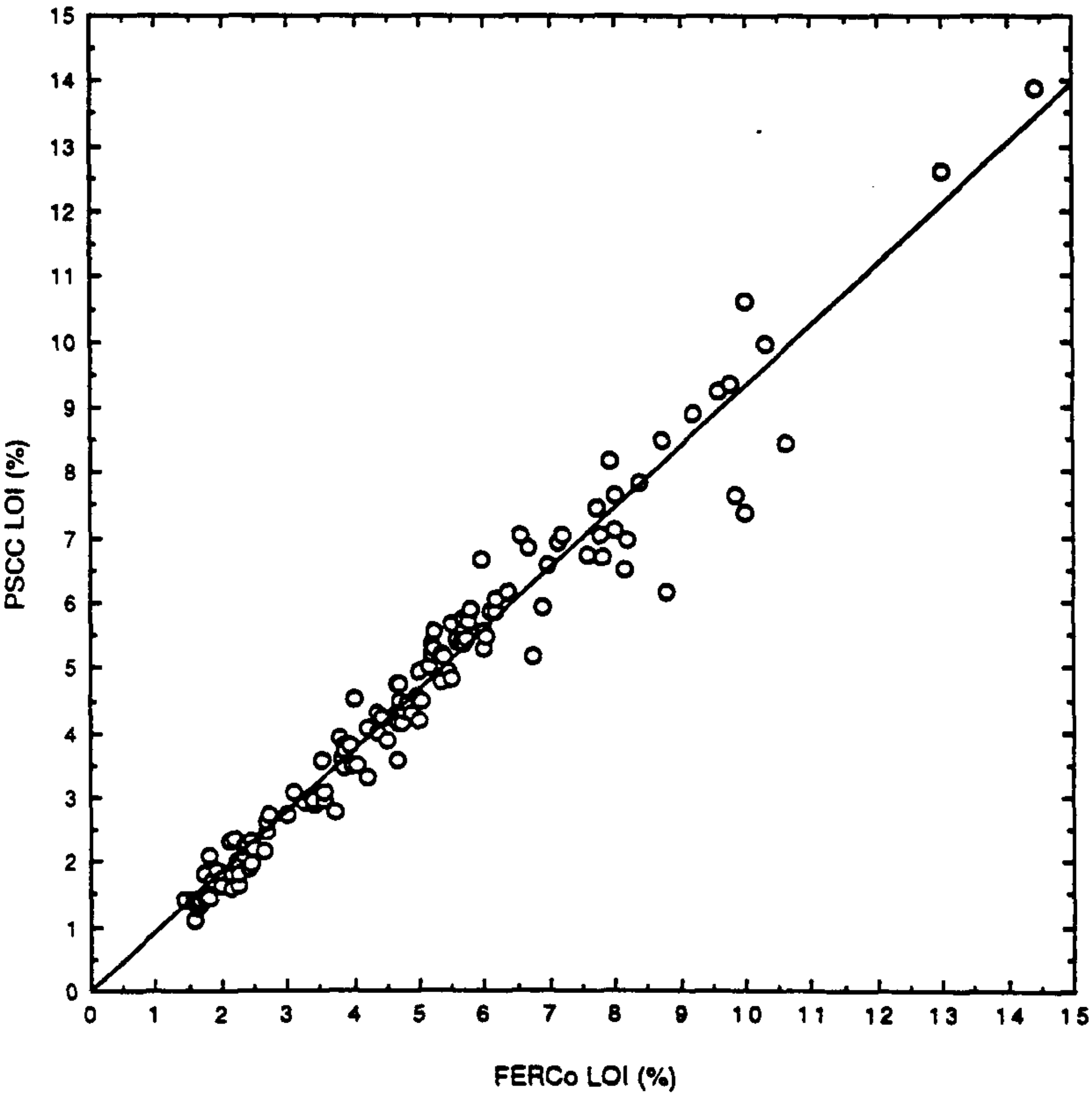
Test	Date & Time		Description	Load MWe	Mills OOS	Burner Spin Vanes Inner/outer	OFA Dmprs % Open West/East	CR O2 % wet	Total Air kpph	OFA Flow %	O2 %	CO ppm	NOc ppm@ 3% O2	CO2 %	SO2c ppm@ 3% O2	Airhtr O2 %	Stack O2 %	LOI FERCo %	Acoustic FEGT °F
247	08/29/92	14:08	As 246 with avg O2 reduced to same as 244	60	C	30°/45°	25/20	6.42	646	9	8.05	10	308	11.4	512	7.90	8.25	2.2	1589
248	08/30/92	08:32	60 MW, 100% OFA, 6.2% CR O2	60	B	30°/45°	100/100	6.23	591	26	7.70	11	256	11.5	529	7.40	7.70	2.0	1620
249	08/30/92	10:15	As 248 with W/E OFA Dampers @ 42/39%	60	B	30°/45°	42/39	6.24	596	16	8.07	18	268	11.3	519	7.65	7.95	2.9	1585
250	08/30/92	12:05	As 248 with W/E OFA Dampers @ 16/15%	60	B	30°/45°	16/15	6.27	613	6	8.23	28	294	11.1	543	7.80	8.20	3.1	1596
251	08/30/92	13:51	As 250 with avg O2 reduced	60	B	30°/45°	16/15	6.12	589	5	7.95	38	284	11.4	553	7.65	7.95	3.4	1612
252	08/30/92	15:28	As 250 with avg O2 reduced to same as 248	60	B	30°/45°	16/15	5.91	573	5	7.62	57	269	11.7	553	7.35	7.70	3.5	1616
253	08/31/92	08:22	80 MW, 100% OFA, 4.7% CR O2, Rpt 237	80		30°/45°	100/100	4.71	714	23	5.75	51	220	13.2	552	5.55	6.10	3.5	1758
254	08/31/92	10:49	As 248 with Dmprs @ 31/29%, Rpt 238	80		30°/45°	31/29	4.82	732	10	6.28	23	271	12.7	555	6.05	6.70	1.6	1751
255	08/31/92	12:41	As 254 with O2 Bias at -0.25%	80		30°/45°	31/29	4.50	712	10	6.00	30	256	13.1	554	5.70	6.40	1.9	1776
256	08/31/92	15:23	As 254 with O2 Bias at -0.70%	80		30°/45°	31/29	4.03	709	10	5.82	75	251	13.1	557	5.60	6.20	2.0	1794
257	09/01/92	08:21	100 MW, 100% OFA, 4.5% CR O2	100		30°/45°	100/100	4.43	893	24	5.47	20	261	13.4	557	5.25	5.90	2.6	1912
258	09/01/92	10:16	As 257 with OFA Dampers @ 50/50%	100		30°/45°	50/50	4.51	905	18	5.63	23	282	13.3	553	5.65	6.25	2.6	1917
259	09/01/92	12:18	As 257 with OFA Dampers @ 35/35%	100		30°/45°	35/35	4.49	931	12	5.90	12	314	13.0	557	5.80	6.30	2.4	1914
260	09/02/92	08:42	100 MW, 100% OFA, 3.5% CR O2	100		30°/45°	100/100	3.52	822	23	4.27	212	221	14.4	525	4.20	4.75	8.0	1915
261	09/02/92	11:14	As 260 with OFA Dampers @ 50/50%	100		30°/45°	50/50	3.55	865	18	4.95	251	257	13.7	496	4.20	4.95	5.9	1901
262	09/02/92	13:18	As 260 with Dmprs @ 43/44%, Aborted	105		30°/45°	43/44	3.28	906	16	4.90	285	281	14.2	453			7.6	1887
263	09/02/92	14:49	As 260 with OFA Dampers @ 43/44%	100		30°/45°	43/44	3.36	854	15	4.90	246	275	13.7	436	4.50	4.80	6.7	
264	09/03/92	08:55	100 MW, 100% OFA, 5.0% CR O2	100		30°/45°	100/100	4.88	878	24	5.60	27	275	13.2	416	5.50	6.00	5.8	1859
265	09/03/92	10:49	As 264 with OFA Dampers @ 49/50%	100		30°/45°	49/50	5.05	924	18	5.93	21	312	12.9	411	5.85	6.15	5.2	1833
266	09/03/92	15:25	As 264 with OFA Dampers @ 33/35%	100		30°/45°	33/35	4.88	957	12	6.50	12	364	12.5	411	6.15	6.60	4.3	1802
267	09/03/92	08:08	80 MW, 100% OFA, 5.7% CR O2	80		30°/45°	100/100	5.71	757	23	6.48	20	257	12.4	407			3.6	1685
268	09/03/92	10:18	As 267 with OFA Dampers @ 42/40%	80		30°/45°	42/40	5.80	792	14	7.10	9	306	11.9	410	6.85	7.20	2.5	1718
269	09/03/92	12:01	As 267 with OFA Dampers @ 26/28%	80		30°/45°	26/28	5.76	804	8	7.15	3	333	11.7	407	6.90	7.30	1.8	1738
270	09/17/92	09:02	100MW, Dmprs @ 50/50%, 4.0% CR O2	100		30°/45°	50/50	4.13	891	18	5.55	139	293	13.2	409	5.20	5.35	6.7	1825
271	09/17/92	11:22	As 270 w/ Nox Port Spin Vanes Wide Open	100		30°/45°	48/50	4.39	897	18	5.55	25	311	13.4	407	5.45	5.40	4.9	1848
272	09/17/92	14:39	As 270 w/ Nox Port Spin Vanes Closed	100		30°/45°	55/61	4.10	909	18	5.58	16	323	13.4	405	5.35	5.40	5.2	1810
273	09/18/92	08:49	100MW, 18% OFA, 4.0% CR O2, Rpt 270	100		30°/45°	49/46	4.00	868	18	5.35	170	282	13.6	416	4.90	5.40	5.9	1826
274	09/18/92	11:03	As 273 w/ Nox Port Spin Vanes Closed	100		30°/45°	58/56	4.18	871	18	5.35	27	288	13.7	415	5.15	5.60	3.9	1812
275	09/18/92	14:10	As 274 w/ NOx Port Centers Balanced	100		30°/45°	59/57	3.96	895	18	5.50	48	304	13.4	407	5.10	5.70	5.7	1791
276	09/18/92	16:25	Quick Repeat of 274	100		30°/45°	57/57	4.18	869	18	5.35	20	293	13.5	406				
277	09/19/92	08:19	100MW, Port Vanes Closed ,Centers Open, Max OFA (19%), 4.0% CR O2, 45/45	100		45/45	98/100	4.10	885	19	5.45	80	289	13.9	409			5.2	1836
278	09/19/92	10:01	As 277 with inners/outers @ 45-2n/45	100		30°/45°	70/70	4.20	888	20	5.38	23	287	13.8	410			3.8	1847
279	09/19/92	11:57	As 277 with inners/outers @ 45-3n/45	100		30°/45°	60/65	4.19	885	19	5.43	19	295	13.8	405			4.0	1843
280	09/19/92	14:57	As 277 with inners & outers @ 45-2n	100		30°/30°	48/49	4.04	905	19	5.60	31	298	13.5	402			5.2	1811
281	09/20/92	08:12	Repeat 277	100		45°/45°	100/100	4.03	896	19	5.48	50	303	13.8	411			4.6	1837
282	09/20/92	09:39	As 281 with inners/outers @ 45-1n/45	100		37°/45°	100/100	4.27	889	20	5.38	37	297	13.8	409			4.4	1857
283	09/20/92	11:00	As 281 with inners/outers @ 45-2n/45	100		30°/45°	65/80	4.18	895	19	5.50	19	306	13.6	407			4.7	1860
284	09/20/92	14:19	A 283 with NOx Port Centers Balanced	100		30°/45°	80/100	3.57	901	19	5.53	164	305	13.5	403			4.4	1890
285	09/21/92	08:30	110MW, Max OFA, 3.0% CR O2	110		30°/45°	100/100	3.01	920	18	4.85	198	291	14.0	420	4.45	4.75	6.4	1899
286	09/21/92	10:35	110MW, Max OFA, 4.0% CR O2	110		30°/45°	100/100	3.97	970	21	5.65	36	336	13.3	419	5.55	5.60	4.2	1921
287	09/21/92	13:42	110MW, Max OFA, 4.8% CR O2	110		30°/45°	100/100	4.78	990	21	5.97	20	343	12.9	413	5.95	6.10	4.4	1900
288	09/21/92	15:14	Rpt 285, Abort Half-Way Through	110		30°/45°	100/100	3.03	927	21	4.93	390	307	13.3	398			9.8	1862
289	09/22/92	08:34	110MW, Min OFA, 3.7% CR O2	110		30°/45°	25/17	3.69	1011	8	5.90	123	377	13.6	412	5.65	5.95	5.7	1881
290	09/22/92	10:34	110MW, Min OFA, 4.0% CR O2	110		30°/45°	21/19	3.96	1015	8	5.95	128	377	13.6	409	5.85	5.95	6.2	1881
291	09/22/92	14:17	As 290 w/ Mills Biased to Balance CR O2	110		30°/45°	21/19	3.91	975	8	5.70	220	353	13.6	405	5.40			

Arapahoe 4 Retrofit B. r Data Summary

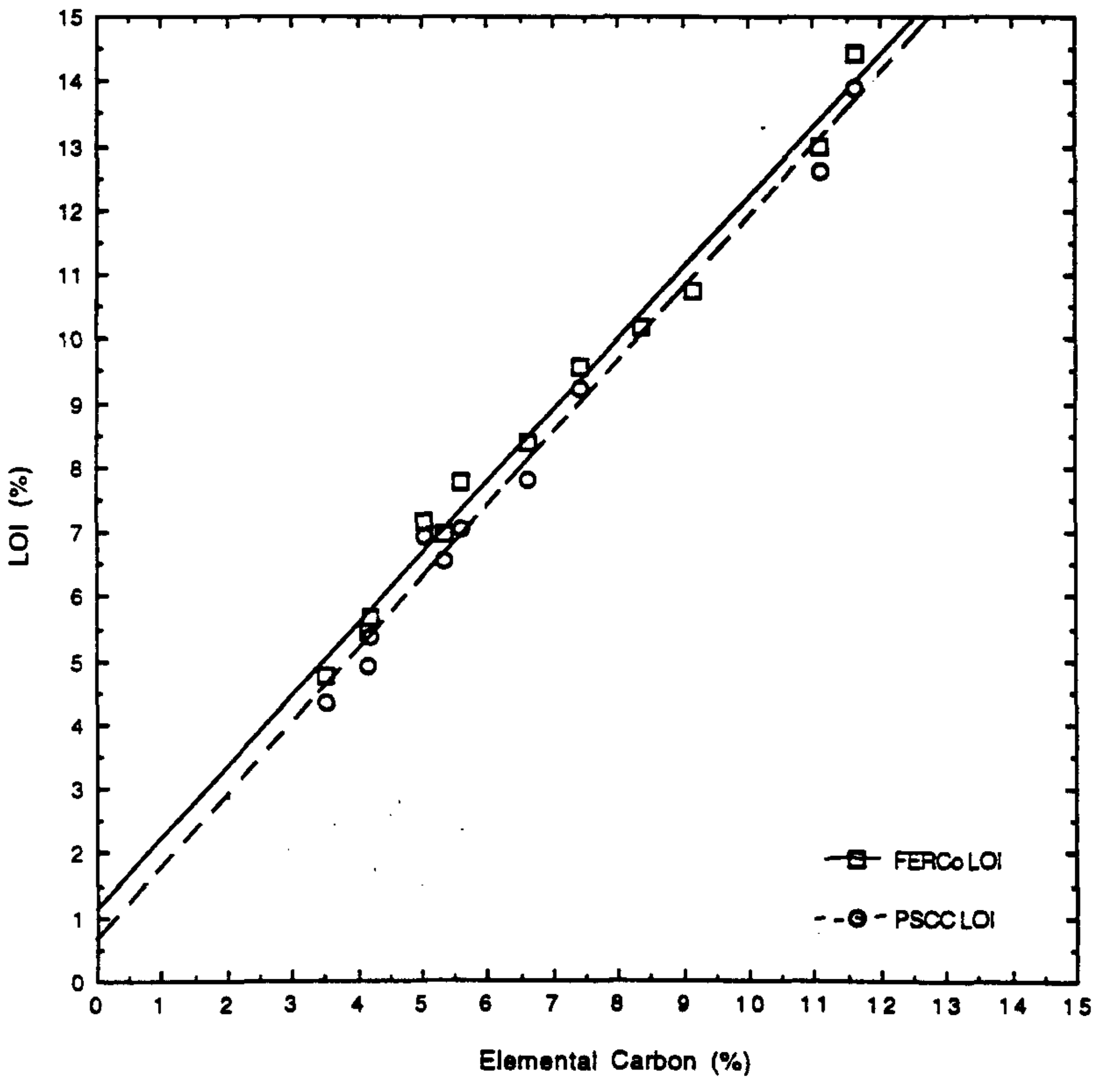
Test	Date & Time		Description	Load MWe	Mills OOS	Burner Spin Vanes Inner/outer	OFA Dmprs % Open West/East	CR O2 % wet	Total Air kpph	OFA Flow %	O2 %	CO ppm	NOc ppm@ 3% O2	CO2 %	SO2c ppm@ 3% O2	Airhtr O2 %	Stack O2 %	LOI FERCo %	Acoustic FEGT °F
292	09/23/92	10:50	110MW, 15% OFA, 4.0% CR O2	110		30°/45°	39/42	3.82	1018	15	6.12	73	375	13.1	393	5.90	6.10	6.7	1831
293	09/23/92	13:34	As 292 w/ Mills Biased to Balance CR O2	110		30°/45°	39/42	3.85	1002	14	5.85	182	364	13.2	392	5.60	5.80	9.2	1843
294	09/24/92	08:22	110MW, 21% OFA, 3.8% CR O2	110		30°/45°	100/100	3.81	981	21	5.43	80	338	14.5	407	5.05	5.45	5.8	1866
295	09/24/92	12:05	As 294 w/ Mills Biased to Balance CR O2	110		30°/45°	100/100	3.71	931	21	5.33	49	336	14.6	404			7.2	1876
296	09/25/92	08:13	110MW, 21% OFA, 3.8% CR O2, Rpt 294	110		30°/45°	100/100	3.73	975	21	5.30	37	339	14.1	423			6.1	1840
297	09/25/92	09:42	As 296 w/ 10% OFA Bias to East, 20% OFA	110		30°/45°	100/60	3.81	961	20	5.33	27	338	13.9	417			5.7	1840
298	09/25/92	11:17	As 296 w/ 20% OFA Bias to East, 19% OFA	110		30°/45°	100/50	3.73	974	19	5.40	24	352	13.7	409			5.6	1853
299	09/25/92	13:04	As 298 (19% OFA) w/ E&W OFA Balanced	110		30°/45°	58/62	3.80	991	19	5.38	32	337	13.9	415			6.0	1844
300	09/28/92	10:58	100MW, 20% OFA, 3.85% CR O2	100		30°/45°	100/100	3.77	862	20	5.23	110	283	14.0	417	5.05	5.20	5.5	1759
301	09/28/92	12:48	100MW, 20% OFA, 4.4% CR O2	100		30°/45°	100/100	4.37	882	21	5.78	25	309	13.4	414	5.35	5.75	3.4	1785
302	09/28/92	14:24	100MW, 20% OFA, 4.9% CR O2	100		30°/45°	100/100	4.90	934	21	6.35	11	333	12.9	407	6.10	6.25	2.7	1793
303	09/29/92	10:03	HVT Tests, 111MW, 21% OFA, 4.0% CR O2	111		30°/45°	100/100	3.94	958	21	5.45	75	322	14.2	419				1838
304	09/30/92	08:43	100MW, 10% OFA, 3.8% CR O2	100		30°/45°	30/24	3.81	888	10	5.65	140	320	13.8	419	5.45	5.75	6.5	1804
305	09/30/92	10:21	100MW, 10% OFA, 4.4% CR O2	100		30°/45°	30/30	4.41	897	10	6.25	44	349	13.1	416	6.00	6.15	4.0	1831
306	09/30/92	11:38	100MW, 10% OFA, 5.0% CR O2	100		30°/45°	30/30	4.89	946	10	6.70	12	376	12.8	411	6.35	6.80	3.9	1829
307	09/30/92	13:34	100MW, 15% OFA, 5.0% CR O2	100		30°/45°	44/47	4.93	911	15	6.58	18	352	13.0	413	6.35	6.45	4.0	1809
308	09/30/92	15:00	100MW, 15% OFA, 4.4% CR O2	100		30°/45°	44/47	4.39	888	15	6.13	32	333	13.5	414	6.00	6.15	4.5	1813
309	09/30/92	16:18	100MW, 15% OFA, 3.8% CR O2	100		30°/45°	44/47	3.84	853	15	5.48	145	310	13.8	405	5.40	5.70	5.2	1834
310	10/01/92	09:38	100MW, 24% OFA, 4.9% CR O2, Old Ports	100		30°/45°	100/100	4.95	883	24	5.50	33	289	13.7	409	5.45	5.60	6.7	1807
311	10/01/92	11:31	100MW, 24% OFA, 4.4% CR O2, Old Ports	100		30°/45°	100/100	4.45	856	24	5.00	53	268	14.0	410	5.10	5.25	5.2	1840
312	10/01/92	13:37	100MW, 24% OFA, 4.0% CR O2, Old Ports	100		30°/45°	100/100	4.04	831	23	4.38	220	246	14.4	404	4.45	4.75	6.0	1859
313	10/01/92	15:25	100MW, 20% OFA, 4.0% CR O2, New Ports	100		30°/45°	100/100	4.02	830	21	4.85	65	280	14.2	408				
314	10/01/92	15:51	100MW, 20% OFA, 4.4% CR O2, New Ports	100		30°/45°	100/100	4.40	846	20	5.20	35	298	13.9	407				
315	10/02/92	09:01	100MW, 15% OFA, 4.9% CR O2, Old Ports	100		30°/45°	42/37	4.84	935	15	6.13	135	321	12.9	403	5.65	5.85	8.0	
316	10/02/92	11:03	100MW, 15% OFA, 5.6% CR O2, Old Ports	100		30°/45°	41/41	5.55	968	15	6.63	47	339	12.5	401	6.30	6.65	4.1	
317	10/02/92	12:33	100MW, 20% OFA, 6.0% CR O2, Old Ports	100		30°/45°	52/58	6.01	958	20	6.48	17	323	12.7	401	6.40	6.60	3.8	
318	10/02/92	13:58	100MW, 20% OFA, 4.9% CR O2, Old Ports	100		30°/45°	52/58	4.99	883	19	5.38	103	279	13.5	400	5.25	5.40	5.9	
319	10/02/92	15:17	100MW, 20% OFA, 5.2% CR O2, Old Ports	100		30°/45°	52/58	5.21	923	20	6.00	36	304	13.1	400	5.85	6.10	4.4	
320	10/02/92	16:37	Recheck Test # 318	100		30°/45°	52/58	4.98	913	19	5.90	45	302	13.1	398				
321	10/03/92	09:24	100MW,24%OFA,4.9%CRO2,Old,Rpt#310	100		30°/45°	100/100	4.90	854	24	4.95	89	270	13.9	406	5.05	5.20	6.6	
322	10/03/92	10:49	100MW, 24% OFA, 4.9% CRO2, Wide Open	100		30°/45°	100/100	4.98	868	25	5.10	18	292	13.7	404	5.15	5.50	4.7	
323	10/03/92	12:17	100MW, 24% OFA, 4.4% CRO2, Wide Open	100		30°/45°	100/100	4.43	849	24	4.68	37	271	14.1	408	4.55	4.80	5.2	
324	10/03/92	13:28	100MW, 24% OFA, 3.8% CRO2, Wide Open	100		30°/45°	100/100	3.79	793	24	4.03	115	249	14.7	402	3.95	4.20	6.7	
325	10/04/92	08:33	60MW, B Mill OOS, 28% OFA, 7.6% CRO2	60	B	30°/45°	100/100	7.55	633	28	8.53	7	323	10.9	388	8.25	8.50	1.7	1564
326	10/04/92	09:48	60MW, B Mill OOS, 28% OFA, 7.0% CRO2	60	B	30°/45°	100/100	7.00	600	28	8.05	10	300	11.3	391	7.75	8.05	1.8	
327	10/04/92	11:04	60MW, B Mill OOS, 28% OFA, 6.5% CRO2	60	B	30°/45°	100/100	6.47	585	27	7.73	13	289	11.6	390	7.50	7.60	2.8	
328	10/04/92	12:42	60MW, C Mill OOS, 28% OFA, 7.6% CRO2	60	C	30°/45°	100/100	7.57	613	27	8.08	11	305	11.3	383	7.95	8.15	2.2	
329	10/04/92	13:54	60MW, C Mill OOS, 28% OFA, 7.0% CRO2	60	C	30°/45°	100/100	6.98	587	26	7.68	15	292	11.8	385	7.50	7.75	3.1	
330	10/04/92	15:05	60MW, C Mill OOS, 28% OFA, 6.5% CRO2	60	C	30°/45°	100/100	6.49	557	26	7.20	21	277	12.0	384	6.95	7.25	3.2	
331	10/05/92	08:05	80MW, 25% OFA, 6.2% CRO2	80		30°/45°	100/100	6.14	767	25	7.08	6	303	12.4	392	6.80	6.95	2.4	
332	10/05/92	09:16	80MW, 25% OFA, 5.5% CRO2	80		30°/45°	100/100	5.52	731	25	6.45	5	287	12.7	386				
333	10/05/92	09:50	80MW, 25% OFA, 5.0% CRO2	80		30°/45°	100/100	5.14	696	24	6.10	7	272	13.1	389				
334	10/05/92	10:25	80MW, 25% OFA, 4.5% CRO2	80		30°/45°	100/100	4.49	648	24	5.43	21	240	13.6	395	5.15	5.30	3.3	
335	10/05/92	12:08	80MW, 15% OFA, 4.5% CRO2	80		30°/45°	42/38	4.43	672	15	5.70	180	262	13.4	390	5.45	5.65	4.2	
336	10/05/92	13:32	80MW, 15% OFA, 5.0% CRO2	80		30°/45°	42/38	5.06	692	15	6.15	97	282	13.0	387	6.05	6.10	3.0	
337	10/06/92	08:51	100MW, 20% OFA, 3.8% CRO2	100		30°/45°	59/55	3.79	840	20	4.75	237	270	14.3	409	4.70	4.90	8.3	

Arapahoe 4 Retrofit B ; Data Summary

Test	Date & Time		Description	Load MWe	Mills OOS	Burner Spin Vanes Inner/outer	OFA Dmprs % Open West/East	CR O2 % wet	Total Air kpph	OFA Flow %	O2 %	CO ppm	NOc ppm@ 3% O2	CO2 %	SO2c ppm@ 3% O2	Airhtr O2 %	Stack O2 %	LOI FERCo %	Acoustic FEGT °F
338	10/06/92	10:12	100MW, 20% OFA, 4.4% CRO2	100		30°/45°	59/55	4.32	862	20	5.25	109	288	13.8	411	4.90	5.10	4.5	
339	10/06/92	11:32	100MW, 20% OFA, 5.0% CRO2	100		30°/45°	59/55	4.89	865	22	5.78	40	306	13.3	408	5.80	5.90	3.1	
340	10/06/92	13:18	100MW, 15% OFA, 5.0% CRO2	100		30°/45°	39/35	4.99	898	15	6.35	21	351	12.7	408	6.15	6.50	3.0	
341	10/06/92	14:44	100MW, 15% OFA, 4.4% CRO2	100		30°/45°	39/35	4.45	852	15	5.75	69	324	13.3	402	5.35	5.65	5.5	
342	10/06/92	16:02	100MW, 15% OFA, 3.8% CRO2	100		30°/45°	39/35	3.79	832	15	5.28	132	303	13.5	405	5.10	5.45	4.9	
343	10/07/92	09:10	100MW, C Mill OOS, 28% OFA, 5.0% CRO2	100	C	30°/45°	100/100	4.95	923	28	6.23	128	308	12.8	408	6.00	6.25	11.4	
344	10/07/92	10:48	100MW, C Mill OOS, 28% OFA, 4.5% CRO2	100	C	30°/45°	100/100	4.46	898	27	5.45	293	281	13.4	405	5.60	5.90	13.7	
345	10/07/92	13:09	100MW, C Mill OOS, 28% OFA, 6.1% CRO2	100	C	30°/45°	100/100	6.19	990	27	7.18	78	340	12.2	403	7.05	7.45	9.5	
346	10/13/92	07:55	110MW, 24% OFA, 4.2% CRO2	110		30°/45°	100/100	4.17	970	24	5.25	22	304	14.0	537	4.85	5.25	4.0	
347	10/13/92	09:53	110MW, 24% OFA, 3.5% CRO2	110		30°/45°	100/100	3.46	924	25	4.58	56	278	14.5	536	4.45	4.65	5.2	
348	10/13/92	11:23	110MW, 24% OFA, 2.8% CRO2	110		30°/45°	100/100	2.86	893	24	3.98	111	249	14.9	530	3.85	4.05	7.8	
349	10/13/92	13:53	110MW, 15% OFA, 3.5% CRO2	110		30°/45°	40/40	3.48	1001	15	5.30	99	332	13.7	501	7.00		6.2	
350	10/13/92	15:08	110MW, 15% OFA, 4.2% CRO2	110		30°/45°	40/40	4.17	1008	15	6.03	46	357	13.1	505	5.65	5.90	4.7	
351	10/14/92	07:58	80MW, C Mill OOS, 27% OFA, 5.9% CR O2	80	C	30°/45°	100/100	5.93	779	27	7.38	17	332	12.0	421	7.30	7.60	4.5	
352	10/14/92	09:06	80MW, C Mill OOS, 27% OFA, 4.9% CR O2	80	C	30°/45°	100/100	4.99	707	27	6.23	39	287	12.9	416	6.05	6.30	7.3	
353	10/14/92	10:33	80MW, C Mill OOS, 27% OFA, 4.4% CR O2	80	C	30°/45°	100/100	4.47	688	27	5.80	88	266	13.3	417	5.55	5.85	8.4	
354	10/14/92	12:04	80MW, B Mill OOS, 27% OFA, 4.4% CR O2	80	B	30°/45°	100/100	4.40	702	27	6.00	62	259	13.2	419	5.90	6.10	8.0	
355	10/14/92	13:12	80MW, B Mill OOS, 27% OFA, 4.9% CR O2	80	B	30°/45°	100/100	4.90	731	28	6.40	40	274	12.9	416	6.30	6.40	6.2	
356	10/14/92	15:03	80MW, B Mill OOS, 27% OFA, 5.7% CR O2	80	B	30°/45°	100/100	5.73	778	27	7.05	31	298	12.1	409	7.00	7.15	5.5	
357	10/15/92	08:03	80MW, D Mill OOS, 27% OFA, 5.8% CR O2	80	D	30°/45°	100/100	5.77	791	27	7.38	24	325	12.3	411	7.25	7.35	5.8	
358	10/15/92	09:33	80MW, D Mill OOS, 27% OFA, 4.7% CR O2	80	D	30°/45°	100/100	4.64	732	27	6.30	78	274	13.2	410	6.15	6.25	8.2	
359	10/15/92	10:48	80MW, D Mill OOS, 27% OFA, 6.3% CR O2	80	D	30°/45°	100/100	6.26	813	27	7.60	27	333	12.1	411	7.45	7.60	6.2	
360	10/15/92	12:23	80MW, A Mill OOS, 27% OFA, 6.3% CR O2	80	A	30°/45°	100/100	6.26	778	27	7.08	13	335	12.5	411	6.95	7.25	4.5	
361	10/15/92	13:32	80MW, A Mill OOS, 27% OFA, 5.8% CR O2	80	A	30°/45°	100/100	5.79	762	26	6.75	16	317	12.7	408	6.60	6.80	5.0	
362	10/15/92	14:46	80MW, A Mill OOS, 27% OFA, 5.2% CR O2	80	A	30°/45°	100/100	5.18	723	26	6.35	28	300	13.0	405	6.15	6.50	6.2	
363	10/16/92	07:48	100MW, B Mill OOS, 28%OFA, 5.0% CRO2	100	B	30°/45°	100/100	4.98	924	28	6.43	43	350	13.3	409	6.40	6.60	8.6	
364	10/16/92	09:13	100MW, B Mill OOS, 28%OFA, 4.4% CRO2	100	B	30°/45°	100/100	4.34	885	28	5.90	79	332	13.5	406	5.75	5.90	9.7	
365	10/16/92	10:59	100MW, B Mill OOS, 28%OFA, 3.6% CRO2	100	B	30°/45°	100/100	3.61	851	27	5.03	212	299	14.1	398	5.05	5.15	12.4	
366	10/20/92	11:26	100MW, GAS FIRE, 26% OFA, 2.1% CRO2	100		30°/45°	100/100	2.13	777	26	2.80	166	197	10.4	0				
367	10/20/92	12:18	100MW, GAS FIRE, 26% OFA, 3.4% CRO2	100		30°/45°	100/100	3.46	854	26	4.90	35	336	9.5	0				
368	10/20/92	13:06	100MW, GAS FIRE, 26% OFA, 2.6% CRO2	100		30°/45°	100/100	2.52	793	26	3.80	53	231	10.1	0				
369	10/20/92	13:33	100MW, GAS FIRE, 8% OFA, 2.6% CRO2	100		30°/45°	30/30	2.50	821	8	4.40	15	795	9.8	0				
370	10/21/92	09:11	TRC Tests, 100MW, 24% OFA, 3.7% CRO2	100		30°/45°	100/100	3.70	830	24	4.87	35	253	14.4	402				1886
371	10/22/92	08:12	TRC Tests, 100MW, 24% OFA, 3.7% CRO2	100		30°/45°	100/100	3.73	839	24	4.84	94	251	14.7	417		5.10		1882
372	10/22/92	13:47	TRC Tests, 100MW, 24% OFA, 4.2% CRO2	100		30°/45°	100/100	4.18	855	24	5.30	78	268	14.2	407		5.25		1854
373	10/23/92	07:56	TRC Tests, 100MW, 24% OFA, 4.3% CRO2	100		30°/45°	100/100	4.29	852	24	5.34	66	270	14.2	402		5.80		
374	10/24/92	08:04	50MW, A&DMillsOOS, 32%OFA,8.4%CRO2	50	A&D	30°/45°	100/100	8.33	592	32	9.75	25	355	10.6	408	9.80	9.60	5.9	1430
375	10/24/92	09:56	60MW, A&DMillsOOS, 31%OFA,7.6%CRO2	60	A&D	30°/45°	100/100	7.67	658	31	8.80	26	360	11.3	405	10.00	8.70	5.4	1500
376	10/25/92	07:17	HVT Tests, 60MW, 26% OFA, 7.3% CRO2	60	C	30°/45°	100/100	7.37	646	26	8.70	8	312	11.1	527				
377	10/25/92	12:04	HVT Tests, 80MW, 24% OFA, 5.2% CRO2	80		30°/45°	100/100	5.10	728	24	6.55	12	262		542				
378	10/26/92	09:18	TRC Tests, 100MW, 15% OFA, 4.5% CRO2	100		30°/45°	40/40	4.54	917	15	5.99	31	310	13.8	573		5.75		1846
379	10/27/92	08:40	TRC Tests, 100MW, 15% OFA, 4.6% CRO2	100		30°/45°	40/40	4.55	900	15	5.89	21	303	14.0	466		5.95		1822
380	10/29/92	08:22	100MW GAS FIRE, 8% OFA, 3.0% CRO2	100		30°/45°	25/15	2.82	795	8	4.35	5	663	9.3	0	7.60	7.10		
381	10/29/92	09:36	100MW GAS FIRE, 8% OFA, 2.2% CRO2	100		30°/45°	25/15	2.19	774	9	3.70	35	565	9.6	4	7.00	6.60		
382	10/29/92	10:03	100MW GAS FIRE, 8% OFA, 3.5% CRO2	100		30°/45°	25/15	3.54	839	9	5.20	2	743	8.8	3				
383	10/29/92	11:01	100MW GAS FIRE, 20% OFA, 3.8% CRO2	100		30°/45°	7/?	3.82	811	20	4.70	27	436	9.1	4				



Crossplot of PSCC and FERCo LOI Analysis Results



Crossplot of LOI and Elemental Carbon Analysis Results

INTEGRATED DRY NO_x/SO_2 EMISSIONS CONTROL SYSTEM

ENVIRONMENTAL MONITORING REPORT

Low-NOx Combustion System Retrofit Test Period:
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Baseline Air Toxics Test Period:
November 17, 1992 through November 19, 1992

Appendix D

Particulate Data Analysis

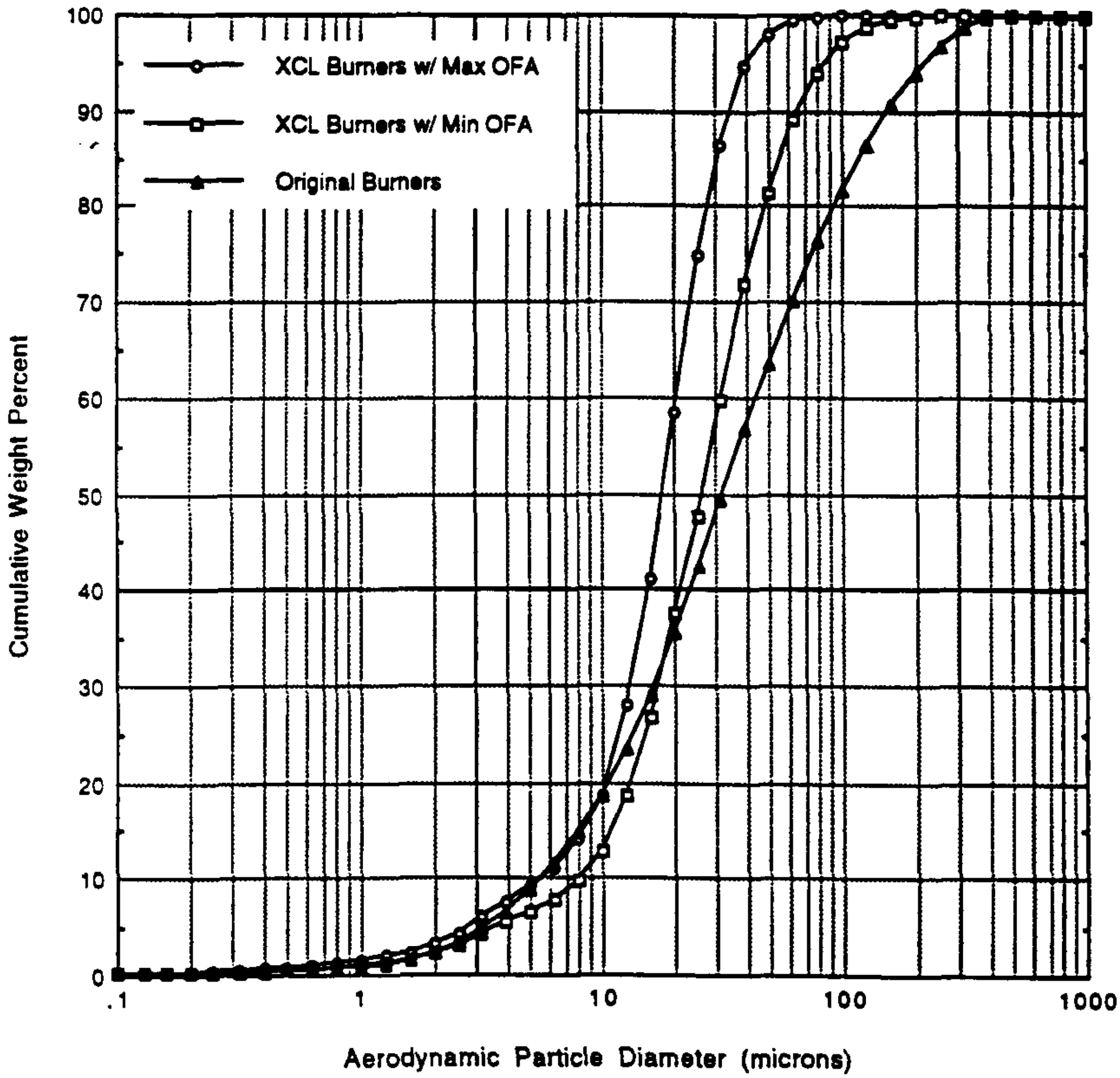

Figure 5-35. Pre- and Post-Retrofit Baghouse Inlet Cumulative Particle Size Distributions at 100 MWe

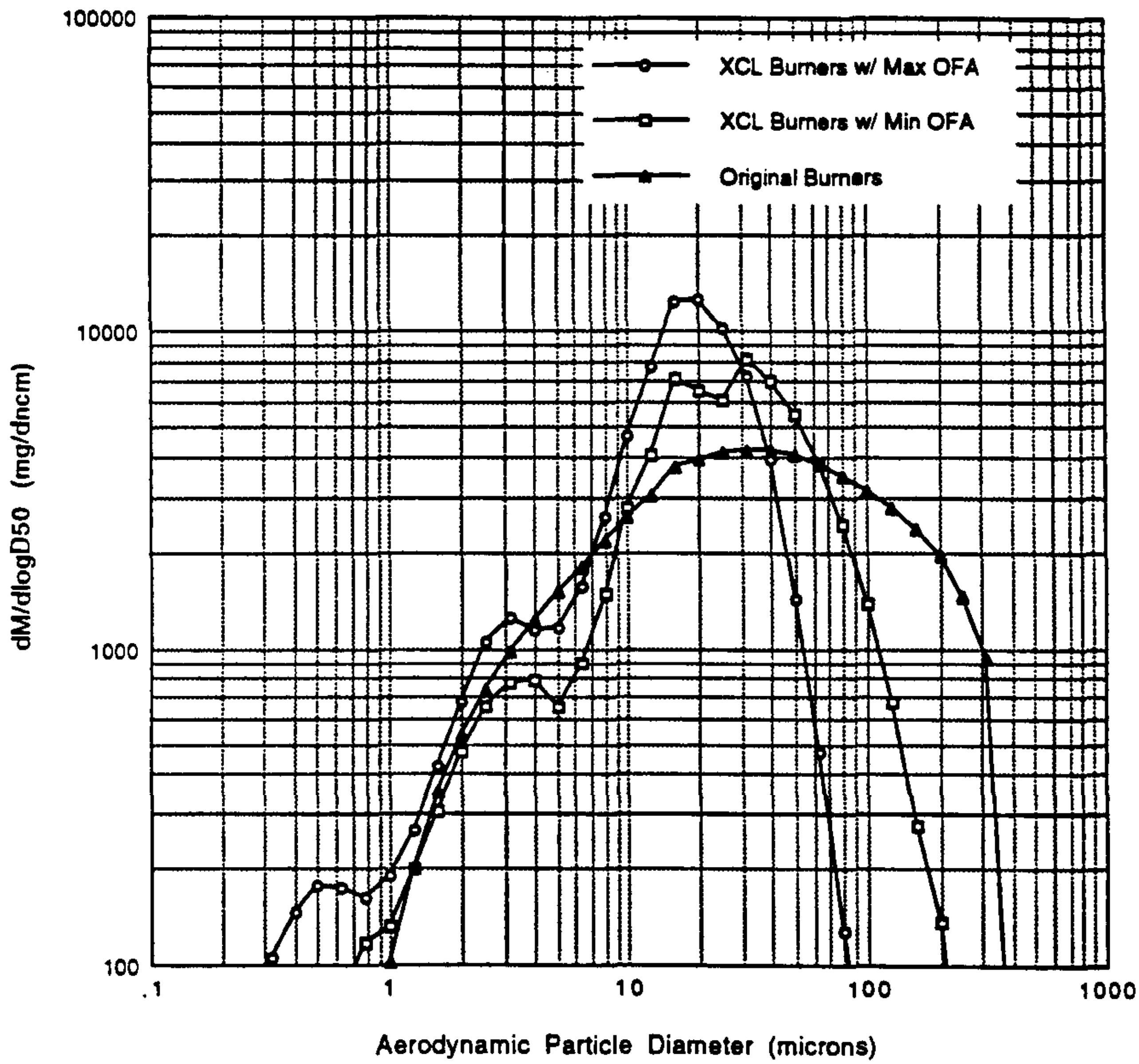

Figure 5-34. Pre- and Post-Retrofit Baghouse Inlet Differential Particle Size Distributions at 100 MWe

Table 5-7

Summary of Pre- and Post-Retrofit Baghouse Outlet PM_{10} Results at 100 MWe

BASELINE BURNERS		Test 1	Test 2	Average
Temperature (°F)		268.0	253.0	260.5
Sample Volume (DSCF)		60.81	60.29	60.55
Gas Velocity (ft/sec)		42.87	40.41	44.42
Volumetric Flow Rate (ACFM)		473,576	461,168	467,372
Volumetric Flow (DSCFM)		254,180	255,547	254,864
Stage	Cutpoint	Mass Collected (milligrams)		
1	15.927 micron	2.72	0.73	1.73
2	9.438 micron	0.06	0.15	0.11
3	3.519 micron	0.17	0.14	0.16
4	1.824 micron	0.04	0.12	0.08
5	1.012 micron	0.00	0.10	0.05
6	0.469 micron	0.07	0.08	0.08
7	0.151 micron	0.62	0.88	0.75
Non-Condensible (NC) Fraction (In-stack)				
Mass Collected (mg)		3.68	2.20	2.94
Mass Collected (mg) < 10 micron		0.96	1.47	1.22
Percent < or = 10 micron		26.09%	66.82%	46.45%
Total Impactor (< 15.927 micron)				
NC PM_{10} Conc. (g/DSCF)		6.05E-05	3.53E-05	4.79E-05
NC PM_{10} Conc. (gr/DSCF)		9.34E-04	5.45E-05	4.94E-04
NC PM_{10} Emission Rate (lbs/hr)		2.0339	1.2186	1.6263
From Impactor Stage 2 (< 9.438 micron)				
NC PM_{10} Conc. (g/DSCF)		1.58E-05	2.34E-05	1.96E-05
NC PM_{10} Conc. (gr/DSCF)		2.44E-04	3.61E-04	3.03E-04
NC PM_{10} Emission Rate (lbs/hr)		0.5308	0.7906	0.6070

XCL BURNERS W/25% OFA		Test 1	Test 2	Test 3	Average
Temperature (°F)		270.3	255.1	258.0	273.0
Sample Volume (DSCF)		75.883	79.124	76.723	77.243
Gas Velocity (ft/sec)		41.37	40.41	42.44	44.42
Volumetric Flow Rate (ACFM)		456,681	446,087	468,522	454,705
Volumetric Flow (DSCFM)		258,465	260,872	271,867	251,248
Stage	Cutpoint	Mass Collected (milligrams)			
1	16.617 micron	1.39	0.42	1.04	0.950
2	10.541 micron	0.13	0.07	0.14	0.113
3	3.949 micron	0.00	0.02	0.12	0.047
4	2.106 micron	0.00	0.00	0.03	0.01
5	1.199 micron	0.00	0.00	0.00	0.00
6	0.577 micron	0.00	0.00	0.00	0.00
7	0.204 micron	0.00	0.00	0.00	0.00
Non-condensible (NC) Fraction (In-stack)					
Mass Collected (mg)		1.52	0.51	1.33	1.12
Mass Collected (mg) < 10 micron		0.13	0.09	0.29	0.17
Percent < or = 10 micron		8.55%	17.65%	21.80%	15.80%
Total Impactor (< 16.617 micron)					
NC PM_{10} Conc. (g/DSCF)		2.00E-05	6.45E-06	1.73E-05	1.46E-05
NC PM_{10} Conc. (gr/DSCF)		3.09E-04	9.95E-05	2.25E-04	2.25E-04
NC PM_{10} Emission Rate (lbs/hr)		0.6584	0.2225	0.6245	0.5108
From Impactor Stage 2 (< 10.541 micron)					
NC PM_{10} Conc. (g/DSCF)		1.17E-06	1.14E-06	3.78E-06	2.21E-06
NC PM_{10} Conc. (gr/DSCF)		2.65E-05	1.76E-05	5.83E-05	3.41E-05
NC PM_{10} Emission Rate (lbs/hr)		0.0586	0.0393	0.1360	0.0779

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Appendix E

Coal/Ash Analysis