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ENVIRONMENTAL CONTROL TECHNOLOGY CENTER

REPORT TO THE STEERING COMMITTEE

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TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	iv
SECTION I FACILITY STATUS.....	1
General.....	1
Pilot FGD System.....	1
SCR System.....	2
Auxiliary Systems.....	3
Financial Report.....	4
SECTION II PILOT AND MINI-PILOT TEST ACTIVITY.....	7
Pilot.....	7
APPENDIX A Test Schedules	24
APPENDIX B Pilot and Mini-Pilot data	28
ECTC COSPONSORS DISTRIBUTION	62

LIST OF FIGURES

Figure

i.	1995 Operation & Maintenance Costs.....	5
1.	Wet FGD Process Flow Diagram for TER Tests after 6/23.....	13
2.	EPRI ECTC Pilot Wet FGD Toxics Gas Path.....	14
3.	Method 29 Gas Sampling Train.....	15

LIST OF TABLES

Table

i.	Monthly Operating Costs By Task.....	4
1.	June Operating Summary.....	16
2.	Trace Element Removal Impinger Test Conditions.....	20
3.	Alternate Impinger Solutions Summary Results	21
4.	Phosphate vs. Peroxide as Impinger Solution.....	22
5.	Mercury removal Results from Standard Spiked Method 29 Trains with Ambient Air Sampling	23

LIST OF COMMON ABBREVIATIONS

A-S-H.....	Allen Sherman Hoff
BES	Bulk Entrainment Separator
CRG	Clean Raw Gas
CLS	Clear Liquor Scrubbing
DBA.....	Di-Basic Acid
DRG.....	Dirty Raw Gas
ECTC	Environmental Control Technology Center
EDR	Electrodialysis Reversal Membrane Unit
ESP.....	Electrostatic Precipator
FF.....	Fabric Filter
FGD	Flue Gas Desulfurization
FLRT	First Loop Reaction Tank
FRP	Fiberglass Reinforced Plastic
G/C.....	Gilbert/Commonwealth Inc.
GEESI	General Electric Environmental Services Inc.
HME.....	Horizontal Mist Eliminator
HSSD.....	High Sulfur Spray Dryer
HYPAS.....	Hybrid Pollution Abatement System
ID	Induced Draft
L/G	Liquid to Gas Ratio, (gal/1000ft ³)
MFT.....	Master Fuel Trip
MRT.....	Main Reaction Tank
NTU.....	Number of Transfer Units
NYSEG.....	New York State Gas & Electric
O&M	Operations & Maintenance
PJFF	Pulse Jet Fabric Filter
RTD	Resistance Temperature Detector
RWST.....	Recycle Water Storage Tank
SCBA.....	Scott Air Packs
SDA.....	Spray Dry Absorber
UMIST.....	Univ. of Manchester Inst. of Science & Technology
VME.....	Vertical Mist Eliminator
VSD	Variable Speed Drive
WDPF	Westinghouse Distributed Process Control System

EXECUTIVE SUMMARY

Operations and maintenance continued this month at the Electric Power Research Institute's Environmental Control Technology Center. Testing on the 4.0 MW Pilot Wet FGD unit continued this month with the Trace Element Removal (TER) test block, and a simultaneous testing of the Lime Forced Oxidation process with DBA addition (LDG). At the end of the month, a series of Duct Injection tests began in a study to determine the efficiencies of alkaline injection for removing trace elements (mercury).

On the Cold-Side Selective Catalytic Reduction (SCR) unit, low temperature performance testing continued this month as measurements were taken for NO_x removal efficiency, residual ammonia slip, and SO₃ generation across the catalysts installed in the SCR reactor.

Pilot Testing Highlights

The Pilot Trace Elements Removal (TER) test block and the Lime-DBA-Gypsum (LDG) test block continued in July. The results from the six-week LDG test program will be discussed in their entirety in the August monthly report. The results from the TER study to date are presented in this report.

The research ongoing in the TER test program is an integral part of EPRI's overall program to develop control technology options for trace element emissions. This experimental program investigates mercury removal efficiencies and mercury speciation across a wet scrubber under different operating conditions. In 1995, a six month test program is being performed on the 4.0 MW wet FGD pilot unit at EPRI's Environmental Control Technology Center (ECTC).

Background

Wet FGD systems have the ability to remove solid-phase and vapor-phase trace elements present in flue gas streams. With only a limited amount of test data to quantify mercury removal efficiencies across full-scale FGD systems, additional research is needed to better understand the removal mechanisms which may aid in the development of processes to increase the mercury removal efficiencies. Several test programs investigating trace elements removal have been conducted. The most important results from full-scale and pilot-scale testing for trace elements control by wet FGD systems are:

- Mercury is the primary vapor-phase trace element of interest to coal-fired power plants. Preliminary data indicate that the chemical form of the mercury can greatly affect the removal efficiency. Mercuric chloride is effectively removed by FGD systems, while elemental mercury is not.

- Mercury removal data collected at the ECTC and elsewhere are difficult to interpret because the currently available mercury speciation methods, especially when used at the FGD inlet location, do not yield successful speciation under all conditions.
- Solid-phase trace elements removal can be approximated by the bulk particulate removal efficiency for the FGD system as long as the mass of condensed sulfuric acid and scrubber carryover are considered.
- Measured bulk particulate removal efficiencies across full-scale FGD systems are generally greater than 50% and are usually greater than theoretical efficiencies. These higher-than-predicted removal efficiencies may be a result of an electrical charge on the inlet particles that causes an attraction to the slurry droplets, thereby improving particulate removal efficiency for the scrubber.

SECTION I FACILITY STATUS

GENERAL

The NYSEG Kintigh Station provided flue gas to the Center 84% of the time during this performance period. This month, the ECTC was off-line from 7/3 through 7/6, and from 7/25 through 7/27. These forced outages were due to outages at the NYSEG Kintigh Station to repair tube leaks in the boiler. As the Kintigh Station operated with a variety of coals this period, fluctuations in the Center's inlet SO₂ concentrations were experienced.

Safety training for the month was conducted by the Operations Supervisor, Maintenance Supervisor, and Shift Supervisors. "The Dangers of Home Appliances" was the topic of the month. Inspections of the ECTC facility and safety equipment (SCR air-packs, fire extinguishers, etc.) were completed and recorded this month. All systems were found to be in good condition. By continuing to emphasize safe work habits at the Center, we have raised the total number of days without a lost time injury to 1152 as of 7/31/95. This represents a period of over three years without a lost time injury.

The monthly safety meeting with the NYSEG Kintigh Station was held on July 28. The major topics of discussion this month were the NYSEG Fall '95 outage (targeted for 10/9/95), the scheduling of upcoming safety training and employee physicals, and the site-specific Fall Protection standard that NYSEG is creating at the Kintigh Station.

PILOT WET FGD SYSTEM

The equivalent and actual availabilities for the ECTC 4.0 MW Pilot Wet FGD System testing were 91% and 81% respectively during this period. The Pilot FGD System did not operate this month during the following periods:

- July 3 - 6 for 82 hours due to a NYSEG outage to repair a boiler tube leak.
- July 11 for 1 hour due to repairs to the CRG duct.
- July 17 for 15 hours due to a test configuration change.
- July 18 - 19 for 2 hours to repair a leak on the recirculation pump suction.
- July 19 - 21 for 51 hours to replace the CRG bypass duct.
- July 25 - 27 for 38 hours due to a NYSEG outage to repair a boiler tube leak.

Testing of the Lime Forced Oxidation process with DBA addition (LDG) continued this month with tests T-10 through T-18. The operational parameters for the Pilot

Wet Scrubber during this test block included: gas flows of 10,000 and 13,200 scfm; 2300 ppm inlet SO₂; recycle slurry flows of 351 and 470 gpm; reaction tank solids concentrations of 25%; a reaction tank level of 8 ft.; and an absorber inlet temperature of 315°F.

The Trace Element Removal (TER) tests also continued this month concurrently with the LDG testing. Flue gas sampling for mercury characterization, speciation, and control was conducted at several different sample points during tests T-10 through T-18. The operational parameters for the Pilot Wet Scrubber during this test block were the same as those used for the LDG testing.

A series of Duct Injection tests were initiated late this month with tests DI-1 and DI-2. For these tests, dilute slurries of Bellefonte lime and Beachville limestone were injected into the flue gas flow upstream of the ESP. The objective of this testing was to determine the effectiveness of this injection process for mercury emissions control. The operational parameters for this test block included: a gas flow rate of 10,000 scfm; an ESP inlet temperature of 225°F; a slurry feed rate of 0.81 gpm at 8.85% solids by weight; and the addition of temperature control water.

The following maintenance work was completed on the Pilot Wet Scrubber unit to support all of the testing conducted during this performance period:

- The flow meter for the duct injection system was replaced with FCV-12.
- A new duct injection nozzle was fabricated and installed.
- The recirculation pump suction piping was repaired for the Pilot wet scrubber.

COLD-SIDE SELECTIVE CATALYTIC REDUCTION SYSTEM (SCR)

The equivalent and actual availabilities for the ECTC SCR System testing were 84% and 64% respectively during this period. The Pilot SCR System did not operate this month during the following periods:

- July 3 for 105 hours due to a NYSEG outage to repair a boiler tube leak.
- July 15 - 19 for 92 hours due to a HPHE heater trip.
- July 25 - 28 for 72 hours due to a NYSEG outage to repair a boiler tube leak.

Catalyst performance testing continued this month on the SCR unit at baseline temperature conditions. This month, measurements were taken for NO_x removal efficiency, residual ammonia slip, and SO₃ generation across the catalysts installed in the SCR reactor. The operational parameters for the SCR unit during this testing included: a gas flow rate of 2000 scfm; a catalyst inlet gas temperature of 650° F; inlet NH₃ pressures of 50 psi; and NH₃/NO_x ratios of 0.7 to 1.0.

MISCELLANEOUS

The Ball Mill and Paste Slaker operations were normal this month during the preparation of Beachville limestone and Bellafonte lime. No major equipment problems were experienced this month during reagent preparation activities. The limestone grinds prepared for ECTC operations were 93% and 96% passing 325 mesh screen. The slaked lime slurry prepared this month for testing was at 25% solids by weight at 190°F. A portion of limestone and slaked lime reagent slurries were used this month in the duct injection testing upstream of the ECTC ESP.

A demonstration project began this month involving the ECTC, Watson Process Systems, and Environmental Systems Corporation (ESC). Through ESC, Watson Process Systems has loaned the ECTC a P-5A particulate monitor for the measurement of droplet carryover and entrained mist exiting the Pilot wet scrubber vertical mist eliminator (VME) section. The P-5A monitor has a proven record of measuring particulate emissions from the outlet of an ESP. However, this demonstration project will test the capabilities of the P-5A monitor to measure mist entrainment so that a quantitative relationship can be developed between the P-5A readings and the amount of liquid collected after the final mist eliminator. The process variables that influence mist carryover are also being investigated and compared with the P-5A data.

The following maintenance work was completed at the ECTC during this performance period:

- The CRG bypass ductwork was replaced with new carbon steel sections. A quote has been received for an FRP bypass duct.
- Scheduled maintenance was completed on the SO₂ tank enclosure and heaters
- Scheduled maintenance was completed on all ECTC systems and equipment.
- New instrument and power cables were installed for the SDA atomizer system.
- The ESP hot deck (rappers and insulators), compartments, and plenums were inspected. Repairs to these components and the ESP will be made during the Fall '95 outage.

FINANCIAL REPORT

The Financial Report for the four Operations and Maintenance contract tasks are summarized below for the month of July 1995, the year to date, and the contract total.

Task Definitions:

Task 100: Operations and Maintenance Labor

Task 200: Purchased Materials

Task 300: Engineering Support

Task 400: Training

Table i.
Monthly Operating Costs by Task

	July	Year to Date	Contract Total
Task 100	\$ 94,995	\$ 737,722	\$ 13,150,413
Task 200	\$ 22,243	\$ 347,932	\$ 7,765,707
Task 300	\$ 13,623	\$ 36,018	\$ 1,106,054
Task 400	\$ 281	\$ 12,998	\$ 47,802
TOTAL	131,142	\$ 1,134,670	\$ 22,069,976

Task Definitions:

Task 100: Operation & Maintenance Labor

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Task 300: Engineering Support

Task 400: Training

The attached graph illustrates the budgeted and actual expenses for ECTC O&M activities through July 1995.

Figure i.
1995 Operation & Maintenance Costs

SECTION II PILOT AND MINI-PILOT TEST ACTIVITY

PILOT

Overview

The Pilot Trace Elements Removal (TER) test block and the Lime-DBA-Gypsum (LDG) test block continued in July. The results from the six-week LDG test program will be discussed in their entirety in the August monthly report. The results from the TER study to date are presented in this report.

The research ongoing in the TER test program is an integral part of EPRI's overall program to develop control technology options for trace element emissions. This experimental program investigates mercury removal efficiencies and mercury speciation across a wet scrubber under different operating conditions. In 1995, a six month test program is being performed on the 4.0 MW wet FGD pilot unit at EPRI's Environmental Control Technology Center (ECTC).

Background

Wet FGD systems have the ability to remove solid-phase and vapor-phase trace elements present in flue gas streams. With only a limited amount of test data to quantify mercury removal efficiencies across full-scale FGD systems, additional research is needed to better understand the removal mechanisms which may aid in the development of processes to increase the mercury removal efficiencies. Several test programs investigating trace elements removal have been conducted. The most important results from full-scale and pilot-scale testing for trace elements control by wet FGD systems are:

- Mercury is the primary vapor-phase trace element of interest to coal-fired power plants. Preliminary data indicate that the chemical form of the mercury can greatly affect the removal efficiency. Mercuric chloride is effectively removed by FGD systems, while elemental mercury is not.
- Mercury removal data collected at the ECTC and elsewhere are difficult to interpret because the currently available mercury speciation methods, especially when used at the FGD inlet location, do not yield successful speciation under all conditions.
- Solid-phase trace elements removal can be approximated by the bulk particulate removal efficiency for the FGD system as long as the mass of condensed sulfuric acid and scrubber carryover are considered.

- Measured bulk particulate removal efficiencies across full-scale FGD systems are generally greater than 50% and are usually greater than theoretical efficiencies. These higher-than-predicted removal efficiencies may be a result of an electrical charge on the inlet particles that causes an attraction to the slurry droplets, thereby improving particulate removal efficiency for the scrubber.

Objectives

The 1995 Trace Elements Removal (TER) test block will focus on up to five research areas, depending on experimental results. These areas are:

- Mercury speciation methods;
- Effect of FGD system operating variables on mercury removal;
- Novel methods for elemental mercury control;
- Catalytic methods for converting elemental mercury to oxidized mercury; and
- Electrostatic charging of particulate material in the FGD inlet flue gas stream.

Testing in July focused on mercury speciation methods. Specifically, a number of different impinger solutions were tested to determine their ability to speciate mercury in the flue gas. The overall objective of the TER testing is to investigate the mercury speciation abilities of EPA method 29 and to test methods of improvement if possible. The overall objective will be satisfied by:

- Spiking elemental mercury (Hg^0) into the gas sampling train (intratrain spiking) to determine the percent spike recovery in the various impinger solutions
- Spiking the inlet flue gas with Hg^0 and HgCl_2 to determine the percent spike recovery in the various impinger solutions
- Using novel impinger solutions to investigate the effect of these solutions on speciation capabilities

Summary of Operations

A detailed summary of operations for July is presented in Table 1. A simplified process flow diagram for the test equipment, as configured for the trace element testing in July, is shown in Figure 1. Figure 2 shows the locations of the mercury spiking and gas sampling ports used during all of the TER test block. The final test completed in July involved spraying a lime slurry into the duct upstream of the ESP. This test will be discussed in the August progress report along with a limestone slurry test and a water injection test.

Summary of TER Results

In July, testing focussed on the speciation capabilities of alternate impinger solutions as compared to Method 29*. Method 29, as shown in Figure 3, includes two impingers containing a peroxide/nitric acid solution (peroxide impingers) followed by two impingers containing a permanganate/sulfuric acid solution (permanganate impingers). Method 29* is identical to Method 29 except two additional peroxide impingers are used upstream of the permanganate impingers. Method 29* can be further modified to include different solutions in the first two impingers, followed by the peroxide and permanganate impingers. Table 2 summarizes the test conditions and results of tests completed through July. A complete summary of the analytical data for all of the TER tests is appended to this report.

Alternate Impinger Solutions

One of the objectives of the TER test block is to determine the speciation capabilities of alternate impinger solutions. Three such impinger solutions were tested through July:

- Acetate buffer solution;
- Phosphate buffer solutions; and
- Tris(hydroxymethyl)aminomethane (Tris) solution.

Table 3 lists the concentrations and major observations from each of the impinger solutions tested to date. The following sections describe these results in detail.

Acetate Solution. As mentioned in last month's report, a number of problems occurred while using the acetate buffer solution because acetic acid vapors were carried through the peroxide and permanganate impingers. During test T9-E1, a 1.0 M sodium acetate and 0.05 M acetic acid solution was tested in the first two impingers of a Method 29* train. Assuming that there are 2 moles of protons for each mole of SO_2 , two impingers of this mixture should be able to scrub approximately 0.14 moles of SO_2 (or 2000 ppmv SO_2 laden flue gas for 60 ft³). This assumes that SO_2 is the only acid gas present and does not account for NO_x or CO_2 in the flue gas. This amount of acetate buffer was expected to keep the pH of the solution above 5 especially at the outlet and possibly at the CRG. However, the permanganate solutions were chemically reduced (resulting in color change from purple to clear), and acetate could be detected in the peroxide and permanganate impingers. Most likely, the CO_2 in the flue gas caused the pH to drop dramatically as it was scrubbed, causing a volatilization of the acetic acid. Due to these sampling and analytical problems, no further testing of this acetate buffer solution have been planned.

Phosphate Solutions. As a result of the problems with the acetate buffer solution, a less-volatile phosphate solution was tested beginning with T9-E2. The phosphate solution for this test was comprised of 0.3 M sodium hydrogen phosphate and 0.2 M potassium dihydrogen phosphate. However, during the first run of T9-E2, the pilot fan tripped and the gas flow stopped. During this brief time, a negative pressure from NYSEG pulled Hg^0 from the spiking location to the pre-spike location (CRG) for approximately 10 minutes. Because of these problems during the sampling, no reliable conclusions can be drawn from first run of this test. However, the second run of T9-E2 indicates that the elemental mercury spiked into the duct was not captured by the phosphate or peroxide impinger solutions. Instead, the elemental mercury spike was captured by the permanganate impinger solution at the wet scrubber inlet location. This result is expected only if the elemental mercury spike remains in the Hg^0 state. This result and the agreement of the spike amount with the amount of mercury captured by the permanganate impinger at the wet scrubber outlet location indicates that the phosphate solution speciates correctly, assuming that the "alternate" form of mercury does not exist (or is destroyed by the buffer solution). However, while the single data point from T9-E2 indicates that the phosphate solution speciates correctly, there are other problems associated with using the phosphate buffer solution that were discovered in subsequent tests—these tests will be discussed later in this report.

Test T10-N was performed at the same gas sampling conditions except without mercury spiking. The data from T10-N indicate that the phosphate captures the majority of the mercury at the CRG and the wet scrubber inlet. At the CRG, approximately 89% of the total mercury was captured in the phosphate impingers (versus 95% in M29*), 3% was captured in the peroxide impingers (vs. 3% in M29*), and 8% was captured in the permanganate impingers (vs. 2% in M29*). This indicates that the phosphate behaves as expected at baseline flue gas conditions, indicating that 89% of the mercury present in flue gas is in the oxidized form.

Intratrain Elemental Spiking With Phosphate Solution. In test T11-IY, elemental mercury was spiked into the phosphate train upstream of the first phosphate impinger. Of the approximately $14 \mu\text{g}/\text{Nm}^3$ elemental mercury spiked, only 6% of the spike was captured in the phosphate impingers, 6% in the peroxide, and 88% in the permanganate (Note that the first gas sample was excluded due to the unusually low mercury value detected in the phosphate impingers). These results compare very favorably with the peroxide impingers run during T4-IY where nearly 43% of the spike was detected in the first two impingers, 21% in the second two peroxide impingers, and only 35% of the spike was captured in the permanganate impinger. From these results, it appears that the phosphate impingers can effectively speciate the mercury with nearly 90% of the elemental mercury spike being captured in the permanganate impinger as might be expected. This would also suggest that the "alternate" form of mercury theorized in previous progress reports may actually be elemental mercury captured in the peroxide impingers during gas sampling. (Or the "alternate" species is destroyed but elemental mercury is reformed and not captured.)

Phosphate Versus Peroxide. Tests T12-EY through T16-EY compared sampling trains with phosphate solutions in the first two impingers to M29* trains by simultaneous gas sampling with both trains. Samples were collected with and without elemental mercury spiking in the duct. Results from these tests are presented in Table 4. Data from test T12-EY through T16-EY indicate that gas sampling trains using phosphate buffer solution predict a lower concentration of mercury in flue gas when compared to M29*. For all comparison tests, lower mercury concentrations of 2 to 4 µg/Nm³ were noticed for the phosphate trains.

While the phosphate buffer solutions appear to indicate some success in speciation, this problem with the overall recovery of the mercury cannot be overlooked. The lower amount of Hg in the phosphate trains is likely caused by either the recovery procedure or a slow loss of Hg while sitting on the shelf before analysis. During gas sampling, Hg should not pass through the permanganate solutions; so, the problem is not likely occurring in the collection of the sample. During sample recovery and storage prior to analysis, Hg⁰ in contact with sulfite at a low pH may result in the following reaction:

This reaction would cause a loss of mercury during sample storage and preparation for analysis.

Tris Solution. With the limited success of the phosphate buffer solutions, a solution of 1M tris (hydroxymethyl)aminomethane (Tris) solution was tested during the final test completed in July. Results from this test will be discussed in the August progress report.

Aqueous Mercury Intratrain Spiking Test

During a NYSEG outage on July 26, an aqueous mercury standard solution was spiked into the standard EPA Method 29 train for test T0-KA. The objective of this test was to verify results from Advanced Technology Systems (ATS) which showed that an oxidized mercury spike migrated through the Method 29 peroxide impingers while sampling ambient air.

In test T0-KA, two sets of gas samples were taken. In the first set, the first peroxide and first permanganate impinger of a Method 29 train were spiked with 3 µg and 4 µg of mercury, respectively, using an aqueous mercury standard. Approximately 100 dscf of ambient air were sampled through the spiked trains. A total of three sampling trains were run with the first set. In the second set, only the first peroxide impinger was spiked with 3 µg of mercury using an aqueous mercury standard. Again, 100 dscf of ambient was sampled using a total of two sampling trains.

Results from this test are presented in Table 5. The total mass of mercury recovered from each impinger, including the knockout, is listed in Table 5 along with the

recoveries of the initial mercury standard spiked to each impinger. Note that the values have been corrected for the mercury present in the blank impinger reagents. The average recoveries for each set of tests is given separately, and the overall average recoveries are listed with the coefficients of variation (CV) for each impinger. The results indicate that the mercury spiked into the peroxide and permanganate impingers remained in place during the sampling of ambient air. However, the CV results for this data indicate that mercury migrations of less than 10% may not have been statistically detectable.

Future Tests

The Trace Element Removal test block will continue in August. Testing will examine alternate impinger solutions as well as limestone and water injection upstream of the ESP. LDG tests will be completed in August with long-term consumption tests using DBA and sodium formate. Towards the end of the month, testing of dry carbon and lime injection upstream of the pulse jet fabric filter will continue with at least seven test conditions.

Figure 1. Wet FGD Process Flow Diagram for TER Tests After June 23.

Figure 2. EPRI ECTC Pilot Wet FGD Toxics Gas Path

Figure 3. Method 29 Sampling Train

Table 1
Operating Conditions

Date	Test Description	Process Summary	Gas Summary
Saturday July 1	T11 10000 scfm 1500 ppm Mg 5000 ppm Cl	Recycle water blowdown rate was increased to lower the chloride and the magnesium levels in the reaction tank for test T11.	
Monday July 3		NYSEG came off-line with a boiler tube leak. While the pilot unit was off-line, the absorber internals were examined, and a slight buildup of solids was discovered near the nozzles and spray header.	
Tuesday July 4	NYSEG off-line		
Thursday July 6	T11 10000 scfm pH = 5 5000 ppm Cl 1500 ppm Mg	Test started in the afternoon.	
Friday July 7			T11-IY Gas sampling at the pilot inlet comparing intratrain elemental mercury spiking with no spiking.
Saturday July 8		Chloride concentration still decreasing to equilibrium value.	
Sunday July 9		Final samples taken for T11.	
Monday July 10	T12 10000 scfm Low Cl, Mg O:SO ₂ = 8	WDPF not recognizing when the CEM goes into blowback. Ballmilling.	T12-EY Gas sampling comparing peroxide with phosphate impinger solutions. The first run with phosphate solution used an ambient air purge after sampling.
Tuesday July 11		Leak discovered on process side of bypass damper. Gas flow lowered to enable some repair. Recycle return water valve to ME tank was plugged as well as a length of inlet piping.	Mercury injection was shut off.

Table 1
Operating Conditions (cont.)

Date	Test Description	Process Summary	Gas Summary
Wednesday July 12		DBA tank has small leak.	T12-NY Baseline comparison at the FGD inlet. Acid rinse of phosphate impinger. Peroxide and nitric acid added to the recovered sample.
Thursday July 13	T13 13200 scfm L/G = 23 O:SO ₂ = 8	Ballmilling in morning. Running the ESP and Pilot fans to keep the CRG header slightly negative. When increased gas flow at start of T13, switched to feed flow control.	
Friday July 14		Removal dropped to 65% due to DBA flow problems. Replaced DBA flow tubing. Spiked DBA to make up concentration.	T13-NY Baseline comparison of phosphate versus peroxide impinger solutions at the FGD inlet. First three runs were 20 minutes in length, while the last run was 60 minutes.
Saturday July 15	T14 13200 scfm L/G = 30 9 ft rxn tank	Holes in CRG and bypass duct repaired.	
Sunday July 16		Ballmilling analysis showed 94.1% <325 mesh.	
Monday July 17		Unit down to put blanking plate into place so only one dirty raw gas duct is in use during duct injection tests. Holes patched in CRG and bypass duct.	
Tuesday July 18	T14a L/G = 30	QA/QC done on pilot gas flow, and liquid flows around the absorber system. Camlock on suction of recirculation pump caused the pilot to be shut down for repair. Gas flow could not be restarted at 13200 scfm because of gas leaks at bypass duct.	

Table 1
Operating Conditions (cont.)

Date	Test Description	Process Summary	Gas Summary
Wednesday July 19	T16 10000 scfm Util. = 95%	Pilot down to repair bypass duct. Ballmilling to finer grind achieved 95.2% <325 mesh.	T16-EY Gas sampling comparison with elemental mercury spiking of phosphate- peroxide impinger solution versus peroxide- nitric acid solution. A fourth run using bleach and phosphate in the first two impingers was performed.
Thursday July 20		Pilot absorber nozzles showed scaling and were cleaned. A nozzle on VME wash header was straightened to direct flow more accurately downwards.	
Friday July 21	T17 10000 scfm L/G = 40	Gas flow started to pilot.	
Saturday July 22		Replaced corroded camlock fitting at pH tree. Flushed all recycle water lines because of accumulation of fines causing plugging. Pressure increased in SO ₂ spiking cabinet.	
Sunday July 23		System upset when reagent feed was interrupted. pH dropped and foaming occurred inside the mini-MRT.	
Monday July 24		Finals taken for T17. Duct injection nozzle put into place with slurry and cooling hoses attached. Hydrocyclone liners replaced to help get finer grind limestone.	
Tuesday July 25	NYSEG off- line	After morning final sampling, the recycle water storage tank was drained and flushed. NYSEG Outage started in the evening.	
Wednesday July 26		NYSEG Outage. Replaced leaking camlock fitting on the downcomer to the MRT.	T0-KA Ambient air sampling using EPA Method 29. All impingers were recovered individually.

Table 1
Operating Conditions (cont.)

Date	Test Description	Process Summary	Gas Summary
Thursday July 27		Started pulling gas through duct. Setting conditions for first duct injection test. Ballmilling run produced 95.1% <325 mesh.	
Friday July 28	T18 fine grind limestone 10,000 scfm L/G = 40	Lime duct injection upstream of the ESP. Wet scrubber maintaining constant pH. 99% utilization.	T18L Lime slurry duct injection at the ESP inlet. 225_F gas temperature at the ESP inlet.
Saturday July 29		Liquid sulfite at 12.59 mM.	
Sunday July 30			
Monday July 31			Process running smoothly. Utilization at 97%. Liquid sulfite at 5.6 mM. Ballmilling achieved grind of 95.5% <325 mesh. Began injecting limestone slurry at ESP inlet for tomorrow's gas sampling.

Table 2
Trace Element Removal Impinger Test Conditions

Test ID	Test Description	Gas Sample Type	Spiking Conditions		Sampling Methods		
			Species Spiked	Spike Location	Method 29 Used?	Method 29* Used?	Sol'n of Extra Imp.
T1-NX	No spiking, method comparison.	CRG	NA	NA	Yes	Yes	Peroxide
T0-IA	Intratrain Hg(0) gas spike with air.	Air	Hg(0)	Before 1st imp.	No	Yes	Peroxide
T4-IY	Intratrain Hg(0) gas spike at inlet.	WS inlet	Hg(0)	Before 1st imp.	No	Yes	Peroxide
T5-IZ	Intratrain Hg(0) gas spike at outlet.	WS outlet	Hg(0)	Before 1st imp.	No	Yes	Peroxide
T6-JZ	Intratrain Hg(0) gas spike at outlet.	WS outlet	Hg(0)	After 2nd imp.	No	Yes	Peroxide
T6-JY	Intratrain Hg(0) gas spike at inlet.	WS inlet	Hg(0)	After 2nd imp.	No	Yes	Peroxide
T7-EY	Flue gas spiking, method comparison.	WS inlet	Hg(0)	Duct Injection	Yes	Yes	Peroxide
T8-E1	Flue gas spiking.	3 Locations	Hg(0)	Duct Injection	No	Yes	Peroxide
T8-E2	Flue gas spiking.	3 Locations	Hg(0)	Duct Injection	Yes	No	NA
T0-JA	Intratrain gas spike with ambient air.	Air	Hg(0)	After 2nd imp.	No	Yes	Peroxide
T9-IX*	CRG sample followed by intratrain gas spike with ambient air.	CRG/Air	Hg(0)	Before 1st imp.	No	Yes	Peroxide
T9-E1	Flue gas spiking with acetate impingers.	3 Locations	Hg(0)	Duct Injection	No	Yes	Acetate
T9-E2	Flue gas spiking with phosphate impingers.	3 Locations	Hg(0)	Duct Injection	No	Yes	Phosphate
T10-N	Baseline measurements with phosphate impingers.	3 Locations	NA	NA	No	Yes	Phosphate
T11-IY	Intratrain Hg(0) gas spike using phosphate impingers.	WS Inlet	Hg(0)	Before 1st imp.	No	Yes	Phosphate
T12-EY	Flue gas spiking, method comparison.	WS Inlet	Hg(0)	Duct Injection	No	Yes	Phosphate
T12-NY	Method comparison without flue gas spiking.	WS Inlet	NA	NA	No	Yes	Phosphate
T13-NY	Method comparison without flue gas spiking.	WS Inlet	NA	NA	No	Yes	Phosphate
T16-EY	Baseline measurements with phosphate impingers.	WS Inlet	Hg(0)	Duct Injection	No	Yes	Phosphate/ Peroxide
T0-KA	Aqueous Hg intratrain spike.	Air	Aq. Hg Std.	In 1st H ₂ O ₂ & KMnO ₄ imp.	Yes	No	NA
T18L-N	Lime slurry injection upstream of the ESP.	DRG,CRG	NA	NA	No	Yes	Tris

Table 3
Alternate Impinger Solutions Summary

Test ID	Alternate Impinger Solution	Solution Composition	Sampling Time (min)	Spiking Species Spiked	Conditions Spike Location	Sample Recovery	Observations
T9-E1	Acetate	1 M NaC ₂ H ₃ O ₂ , 0.05 M Acetic Acid	60	Hg(0)	Duct Injection	5 ft ³ of air through impingers with DI water rinse (standard peroxide impinger recovery method).	Migration of acetic acid vapor through the train consumed the permanganate in the final impingers.
T9-E2	Phosphate	0.3 M Na ₂ HPO ₄ , 0.2 M KH ₂ PO ₄	100	Hg(0)	Duct Injection	5 ft ³ of air through impingers with DI water rinse.	Pilot fan tripped during sampling causing the data to be questionable. The pH in impinger 1 fell below 2. Solids formed in second impinger.
T10-N	Phosphate	0.4 M Na ₂ HPO ₄ , 0.3 M KH ₂ PO ₄	100	NA	NA	5 ft ³ of air through impingers with DI water rinse.	The pH in impinger 1 fell below 2. Higher total phosphate was used. Solids formed in second impinger.
T11-IY	Phosphate	0.7 M Na ₂ HPO ₄ , 0.3 M KH ₂ PO ₄	60	Hg(0)	Before first impinger	5 ft ³ of air through impingers with DI water rinse and 15 mL peroxide.	1M total phosphate species used to increase pH. Solids formed in second impinger during gas sampling.
T12-EY	Phosphate	0.7 M Na ₂ HPO ₄ , 0.3 M KH ₂ PO ₄	60	Hg(0)	Duct Injection	5 ft ³ of air through impingers with DI water rinse and 15 mL peroxide.	The pH of the 1st impinger solution dropped below 2 after 1 hour of gas sampling. Solids found in second impinger.
T12-NY	Phosphate	0.5 M Na ₂ PO ₄ , 0.5 M K ₂ PO ₄	60	NA	NA	No air purge. 15 mL peroxide and 15 mL nitric added at location. 10% nitric impinger rinse.	Tribasic phosphate used to increase pH. The pH of the 1st impinger solution dropped below 2 after 1 hour of gas sampling. Solids found in second impinger.
T13-NY	Phosphate	0.5 M Na ₂ PO ₄ , 0.5 M K ₂ PO ₄	20	NA	NA	No air purge. 15 mL peroxide and 15 mL nitric added at location. 10% nitric impinger rinse.	The pH of the first impinger solution remained above 6.5 after only 20 minutes of gas sampling. Solids found in first impinger in some runs.
T13-NY	Phosphate	0.5 M Na ₂ PO ₄ , 0.5 M K ₂ PO ₄	60	NA	NA	No air purge. 15 mL peroxide and 15 mL nitric added at location. 10% nitric impinger rinse.	The pH of the first impinger solution was below 2 after 60 minutes of gas sampling. Solids found in second impinger.
T16-EY	Phosphate/ Peroxide	0.5 M Na ₂ PO ₄ , 0.5 M K ₂ PO ₄ , 5% peroxide	60	Hg(0)	Duct Injection	No air purge. 5 mL peroxide added. 5 mL nitric added.	Impinger solution very unstable. Peroxide decomposed over time. SO ₂ odor in the impingers after sampling.
T16-EY	Phosphate	0.4 M Na ₂ PO ₄ , 0.4 M K ₂ PO ₄ , 2.5% Bleach	60	Hg(0)	Duct Injection	No air purge. 5 mL peroxide added. 5 mL nitric added.	Could not analyze the impinger solutions, solids formed, offgassed fumes interfered with the FIMS.
T18L-N	Tris	1 M Tris	20	NA	NA	15 mL peroxide in first impinger. 5 mL peroxide in second impinger.	The pH of impinger 1 remained above 6.5. No solids formed.

Table 4
Phosphate vs. Peroxide as Impinger Solution

Test ID	Solution Composition	Sampling Time (min)	Species Spiked	Total Hg ($\mu\text{g}/\text{Nm}^3$)		Phosphate Recovery ($\mu\text{g}/\text{Nm}^3$)	Phosphate Recovery (%)
				Peroxide Train	Phosphate Train		
T12-EY	0.7 M Na_2HPO_4 , 0.3 M KH_2PO_4	60	Hg(0)	19.6	15.5	4.1	79.1
T12-NY	0.5 M Na_3PO_4 , 0.5 M K_3PO_4	60	NA	7.9	4.0	3.9	50.8
T13-NY	0.5 M Na_3PO_4 , 0.5 M K_3PO_4	20	NA	7.7	3.7	4.0	48.1
T13-NY	0.5 M Na_3PO_4 , 0.5 M K_3PO_4	60	NA	5.8	3.3	2.6	55.8
T16-EY	0.5 M Na_3PO_4 , 0.5 M K_3PO_4 , 5% peroxide	60	Hg(0)	18.6	16.4	2.2	88.2

Table 5
Mercury Recovery Results from Standard Spiked
Method 29 Trains with Ambient Air Sampling

Test	Recovered $\mu\text{g Hg}$		Recovery H_2O_2 (%)	Recovered $\mu\text{g Hg}$		Recovery KMnO_4 (%)	Recovered $\mu\text{g Hg}$ (knockout)
	H_2O_2	H_2O_2		KMnO_4	KMnO_4		
	#1	#2		#1	#2		
<i>Set #1: Mercury standard spike to both #1 H_2O_2 (3 μg) and #1 KMnO_4 (4 μg) impingers.</i>							
1-1	2.60	0.10	90	4.27	0.09	109	0.04
1-2	3.72	0.10	127	4.27	0.09	109	0.01
1-3	2.89	0.11	100	4.21	0.04	106	0.01
Set #1 Avg. :	3.07	0.10	106	4.25	0.07	108	0.02
<i>Set #2: Mercury standard spike to #1 H_2O_2 (3 μg) impinger only.</i>							
2-1	2.70	0.03	91	0.19	0.00	-	0.04
2-2	3.08	0.06	105	0.17	0.00	-	0.01
Set #2 Avg. :	2.89	0.05	98	0.18	0.00	5	0.03
Overall Avg:	3.00	0.08	103	4.25*	0.07*	108*	0.02
C.V.:	14.8	42.4	14.6	8.2*	39.4*	-	72.4

* Data from Set #1 only.

APPENDIX A
TEST SCHEDULES

EPRI ENVIRONMENTAL CONTROL TECHNOLOGY CENTER TEST CALENDAR

July 1995 (Updated August 25)

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1 Trace Element Rem. T10 10000 scfm, 30 L/G pH = 4.7, 25 wt%
2 Trace Element Rem. T11 5000 ppm Cl 1500 ppm Mg pH = 5.0	3 Trace Element Rem. NYSEG Outage	4 Trace Element Rem. NYSEG Outage	5 Trace Element Rem. NYSEG Outage	6 Trace Element Rem. T11 Process Restarted	7 Trace Element Rem. T11-EIY Intratrain spike two phosph. impingers FDG Inlet	8 Trace Element Rem. T11
9 Trace Element Rem. T11	10 Trace Element Rem. T12-EY Comparison phosph. vs. perox. Hg(0) spiking	11 Trace Element Rem. T12 O:SO2 = 8 1500 ppm Mg	12 Trace Element Rem. T12-NY Baseline comparison phosph. vs. peroxide FGD Inlet	13 Trace Element Rem. T13 O:SO2 = 6 1500 ppm Mg	14 Trace Element Rem. T13-NY Baseline Comparison Short time runs FDG Inlet	15 Trace Element Rem. T14
16 Trace Element Rem. T14	17 Trace Element Rem. Unit down to insert blanking plate for duct injection testing	18 Trace Element Rem. T15 11000 scfm pH = 4.9	19 Trace Element Rem. T16-EY Alternate impinger soln. Hg(0) spike before imp. #1; FDG inlet	20 Trace Element Rem. Unit down to install new bypass duct	21 Trace Element Rem. Pilot absorber brought on-line	22 Trace Element Rem. T17 10000 scfm L/G = 40 9 ft rxn tank
23 Trace Element Rem. T17	24 Trace Element Rem. T17	25 Trace Element Rem. T17	26 Trace Element Rem. T0-NA NYSEG OUTAGE	27 Trace Element Rem. T18 Higher grind limestone	28 Trace Element Rem. T18L Duct inject. with Lime Comparison sampling at CRG location	29 Trace Element Rem. T18
30 T18	31 T18					

EPRI ENVIRONMENTAL CONTROL TECHNOLOGY CENTER TEST CALENDAR

August 1995 (Updated August 25)

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1 Trace Element Rem. T18S-N Limestone slurry duct injection	2 Trace Element Rem.	3 Trace Element Rem. T18W-N Water duct injection	4 Trace Element Rem. T19-NY Formate additive Gas sampling at FGD Inlet; Tris comparison	5 Trace Element Rem. T19 10000 scfm pH = 5.0 25 wt%
6 Trace Element Rem. T19	7 Trace Element Rem. T19-EXY Tris comparison Hg(0) spike	8 Trace Element Rem. T19	9 Trace Element Rem. T19	10 Trace Element Rem. T20 DBA additive pH = 5.0	11 Trace Element Rem. T20-C Peroxide versus Tris solutions Mercuric chloride spike	12 Trace Element Rem. T20
13 Trace Element Rem. T20	14 Trace Element Rem. T20-EC Elemental and Mercuric chloride spiking	15 Trace Element Rem. Unit down to configure for carbon injection tests	16 Trace Element Rem.	17 Trace Element Rem. Unit down to configure for carbon injection tests	18 Carbon Inj. Phase II PJFF-6 325°F PJFF Inlet 0.86 lb/hr carbon	19 Carbon Inj. Phase II PJFF-7 275°F PJFF Inlet 0.9 lb/hr carbon
20 Carbon Inj. Phase II 275°F PJFF Inlet 0.90 lb/hr carbon	21 Carbon Inj. Phase II PJFF-8 275°F PJFF Inlet 0.90 lb/hr carbon 2:1 lime:carbon	22 Carbon Inj. Phase II PJFF-9 225°F PJFF Inlet 0.48 lb/hr carbon	23 Carbon Inj. Phase II PJFF-10 225°F PJFF Inlet 0.48 lb/hr carbon 2:1 lime:carbon	24 Carbon Inj. Phase II PJFF-11 225°F PJFF Inlet No carbon injection 0.96 lb/hr lime	25 Carbon Inj. Phase II PJFF-12 225°F PJFF Inlet Baseline No carbon nor lime inj.	26 Trace Element Rem. Preparation for Wet Scrubber Operation
27 Trace Element Rem. Preparation for Wet Scrubber Operation	28 Trace Element Rem. Preparation for Wet Scrubber Operation	29 Trace Element Rem. T21 8250 scfm 12 ft rxn tank 2000 Inlet SO ₂ ; pH = 6	30 Trace Element Rem. T21	31 Trace Element Rem. T21		

PILOT

MINI-PILOT

1 9 9 4											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
UNIT DOWN		SUNCOR	High Velocity Scrubbing	TECO High Vel. Packing	High Velocity Scrubbing (B&W tray testing)	Air Toxics Tests	Outage	Air Toxics Tests			
Limestone CLS Phase II (cont.)	Redox Sulfur testing	LCLS Phase II (cont.)	UNIT DOWN	SUNCOR II	UNIT DOWN						

PILOT

MINI-PILOT

1 9 9 5											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
High-Velocity FGD Testing	Lime/DBA Gypsum tests	Carbon injection	Wet FGD Toxics Testing			Lime/DBA Gypsum tests	Carbon injection	Wet FGD Toxics Testing- Pet coke	Outage	Carbon injection	High-Velocity FGD Testing
UNIT DOWN					Lime/DBA Gypsum tests	UNIT DOWN					

PILOT

1 9 9 6											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PRDA - Mercury and Toxics Control			High-Velocity FGD Testing		Wet FGD Toxics Testing				PRDA - Clear Liquor FGD Testing		

ECTC Pilot-scale Testing Schedule - ('94-'96)

APPENDIX B
PILOT AND MINI-PILOT DATA

T11-IY Process Summary Report
(7/07/95 08:00:00 to 7/07/95 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	87.0	87.2	86.9	0.1	5
SO2 Removal (NTU)	2.04	2.06	2.03	0.01	5
L/G Ratio (gal/macf)	29	29	29	0	5
Reaction Tank pH	5.00	5.01	4.99	0.00	5
Absorber pH	4.62	4.63	4.60	0.01	5
Flue Gas Flow Rate (scfm)	9999	10001	9998	1	5
Header 1 Flow (gpm)	351	351	351	0	5
Header 3 Flow (gpm)	0	0	0	0	5
Header 5 Flow (gpm)	0	0	0	0	5
Blowdown to Sump Rate (gpm)	0.62	0.62	0.62	0.00	5
Centrifuge Feed Rate (gpm)	3.90	3.99	3.64	0.13	5
Reagent Feed to FLRT (gpm)	1.71	1.75	1.69	0.02	5
Facility Inlet SO2 Conc. (ppm)	1438	1488	1390	40	5
Inlet SO2 Concentration (ppm)	2301	2306	2297	3	5
Outlet SO2 Concentration (ppm)	280	284	277	3	5
Inlet O2 Concentration (%)	9.04	9.34	8.72	0.24	5
Outlet O2 Concentration (%)	8.77	8.98	8.55	0.17	5
Absorber Gas Velocity (ft/sec)	10.16	10.18	10.15	0.01	5
Inlet Gas Temperature (F)	312	315	310	2	5
Outlet Gas Temperature (F)	123	124	123	0	5
SO2 Absorbed (mmole/L)	18.05	18.11	18.03	0.03	5
Solids Residence Time (hrs)	9.3	9.4	9.3	0.0	5
Slurry Residence Time (min)	4.81	4.81	4.81	0.00	5
Absorber Pressure Drop (in H2O)	3.45	3.45	3.44	0.01	5
Spray Zone Pressure Drop (in H2O)	1.46	1.69	1.07	0.27	5
Tray Pressure Drop (in H2O)	1.29	1.52	0.89	0.27	5
ME Pressure Drop (in H2O)	0.20	0.20	0.20	0.00	5
Oxidation Air to Rxn Tank (scfm)	550	551	549	0	5
DBA Addition Rate (mL/min)	114	115	114	0	5
Inlet HCl Concentration (ppm)	43	44	43	1	5
NYSEG Load (MW)	633	684	565	52	5

T12-EY Process Summary Report
(7/10/95 09:00:00 to 7/10/95 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	86.9	88.5	84.6	1.7	4
SO2 Removal (NTU)	2.04	2.16	1.87	0.13	4
L/G Ratio (gal/macf)	29	30	29	0	4
Reaction Tank pH	4.94	5.02	4.85	0.07	4
Absorber pH	4.69	4.74	4.62	0.05	4
Flue Gas Flow Rate (scfm)	10000	10002	9998	1	4
Header 1 Flow (gpm)	351	351	351	0	4
Header 3 Flow (gpm)	0	0	0	0	4
Header 5 Flow (gpm)	0	0	0	0	4
Blowdown to Sump Rate (gpm)	0.64	0.64	0.64	0.00	4
Centrifuge Feed Rate (gpm)	3.89	3.90	3.88	0.01	4
Reagent Feed to FLRT (gpm)	1.55	1.74	1.36	0.13	4
Facility Inlet SO2 Conc. (ppm)	1363	1397	1334	22	4
Inlet SO2 Concentration (ppm)	2300	2306	2296	3	4
Outlet SO2 Concentration (ppm)	283	334	249	36	4
Inlet O2 Concentration (%)	9.33	9.57	9.11	0.16	4
Outlet O2 Concentration (%)	8.96	9.18	8.80	0.14	4
Absorber Gas Velocity (ft/sec)	10.11	10.12	10.08	0.02	4
Inlet Gas Temperature (F)	300	304	296	3	4
Outlet Gas Temperature (F)	123	123	122	0	4
SO2 Absorbed (mmole/L)	18.03	18.34	17.54	0.33	4
Solids Residence Time (hrs)	9.2	9.4	9.0	0.2	4
Slurry Residence Time (min)	4.81	4.81	4.81	0.00	4
Absorber Pressure Drop (in H2O)	3.42	3.45	3.39	0.02	4
Spray Zone Pressure Drop (in H2O)	1.68	1.69	1.66	0.01	4
Tray Pressure Drop (in H2O)	1.50	1.52	1.49	0.01	4
ME Pressure Drop (in H2O)	0.21	0.21	0.21	0.00	4
Oxidation Air to Rxn Tank (scfm)	450	551	330	101	4
DBA Addition Rate (mL/min)	102	102	101	0	4
Inlet HCl Concentration (ppm)	42	44	39	2	4
NYSEG Load (MW)	552	589	520	29	4

T12-N Process Summary Report
(7/12/95 08:00:00 to 7/12/95 12:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	87.0	87.4	86.3	0.5	4
SO2 Removal (NTU)	2.04	2.07	1.99	0.04	4
L/G Ratio (gal/macf)	30	31	29	0	4
Reaction Tank pH	4.80	4.80	4.79	0.00	4
Absorber pH	4.53	4.53	4.52	0.00	4
Flue Gas Flow Rate (scfm)	9904	10000	9691	126	4
Header 1 Flow (gpm)	351	351	351	0	4
Header 3 Flow (gpm)	0	0	0	0	4
Header 5 Flow (gpm)	0	0	0	0	4
Blowdown to Sump Rate (gpm)	0.63	0.63	0.63	0.00	4
Centrifuge Feed Rate (gpm)	3.67	3.68	3.66	0.01	4
Reagent Feed to FLRT (gpm)	1.55	1.56	1.52	0.02	4
Facility Inlet SO2 Conc. (ppm)	1471	1647	1276	144	4
Inlet SO2 Concentration (ppm)	2303	2308	2297	4	4
Outlet SO2 Concentration (ppm)	282	297	273	10	4
Inlet O2 Concentration (%)	9.05	10.12	8.11	0.81	4
Outlet O2 Concentration (%)	8.78	9.55	8.06	0.60	4
Absorber Gas Velocity (ft/sec)	10.02	10.17	9.77	0.15	4
Inlet Gas Temperature (F)	302	310	296	6	4
Outlet Gas Temperature (F)	124	125	122	1	4
SO2 Absorbed (mmole/L)	17.88	18.06	17.57	0.19	4
Solids Residence Time (hrs)	9.4	9.6	9.3	0.1	4
Slurry Residence Time (min)	4.81	4.81	4.81	0.00	4
Absorber Pressure Drop (in H2O)	3.48	3.52	3.44	0.03	4
Spray Zone Pressure Drop (in H2O)	1.34	1.75	0.54	0.48	4
Tray Pressure Drop (in H2O)	1.16	1.57	0.35	0.48	4
ME Pressure Drop (in H2O)	0.26	0.29	0.24	0.02	4
Oxidation Air to Rxn Tank (scfm)	380	381	379	0	4
DBA Addition Rate (mL/min)	109	110	109	0	4
Inlet HCl Concentration (ppm)	41	44	37	3	4
NYSEG Load (MW)	568	680	417	108	4

T13-N Process Summary Report
(7/14/95 09:00:00 to 7/14/95 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	64.9	68.8	62.7	2.4	4
SO2 Removal (NTU)	1.05	1.16	0.99	0.07	4
L/G Ratio (gal/macf)	22	22	22	0	4
Reaction Tank pH	4.54	4.62	4.48	0.05	4
Absorber pH	4.43	4.48	4.36	0.05	4
Flue Gas Flow Rate (scfm)	13200	13202	13198	2	4
Header 1 Flow (gpm)	351	351	351	0	4
Header 3 Flow (gpm)	0	0	0	0	4
Header 5 Flow (gpm)	0	0	0	0	4
Blowdown to Sump Rate (gpm)	0.80	0.81	0.80	0.00	4
Centrifuge Feed Rate (gpm)	4.43	4.45	4.41	0.02	4
Reagent Feed to FLRT (gpm)	1.92	2.08	1.85	0.09	4
Facility Inlet SO2 Conc. (ppm)	1524	1555	1495	27	4
Inlet SO2 Concentration (ppm)	2299	2302	2293	3	4
Outlet SO2 Concentration (ppm)	761	808	678	51	4
Inlet O2 Concentration (%)	6.85	6.95	6.78	0.07	4
Outlet O2 Concentration (%)	6.68	6.76	6.60	0.07	4
Absorber Gas Velocity (ft/sec)	13.37	13.40	13.33	0.02	4
Inlet Gas Temperature (F)	304	309	299	4	4
Outlet Gas Temperature (F)	127	128	127	0	4
SO2 Absorbed (mmole/L)	17.76	18.84	17.16	0.66	4
Solids Residence Time (hrs)	9.5	9.8	8.9	0.3	4
Slurry Residence Time (min)	4.81	4.81	4.81	0.00	4
Absorber Pressure Drop (in H2O)	5.71	5.71	5.70	0.01	4
Spray Zone Pressure Drop (in H2O)	2.60	2.60	2.59	0.00	4
Tray Pressure Drop (in H2O)	2.32	2.33	2.32	0.00	4
ME Pressure Drop (in H2O)	0.49	0.51	0.46	0.02	4
Oxidation Air to Rxn Tank (scfm)	572	598	509	37	4
DBA Addition Rate (mL/min)	175	177	174	1	4
Inlet HCl Concentration (ppm)	48	50	45	2	4
NYSEG Load (MW)	689	690	688	1	4

T17-N Process Summary Report
(7/24/95 08:00:00 to 7/24/95 10:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	92.8	92.9	92.8	0.1	2
SO2 Removal (NTU)	2.64	2.65	2.63	0.01	2
L/G Ratio (gal/macf)	40	40	40	0	2
Reaction Tank pH	4.95	4.96	4.95	0.01	2
Absorber pH	4.72	4.72	4.72	0.00	2
Flue Gas Flow Rate (scfm)	10000	10000	10000	0	2
Header 1 Flow (gpm)	470	470	470	0	2
Header 3 Flow (gpm)	0	0	0	0	2
Header 5 Flow (gpm)	0	0	0	0	2
Blowdown to Sump Rate (gpm)	0.71	0.71	0.71	0.00	2
Centrifuge Feed Rate (gpm)	0.00	0.00	0.00	0.00	2
Reagent Feed to FLRT (gpm)	1.76	1.76	1.76	0.00	2
Facility Inlet SO2 Conc. (ppm)	1302	1302	1301	0	2
Inlet SO2 Concentration (ppm)	2300	2301	2299	1	2
Outlet SO2 Concentration (ppm)	157	159	156	2	2
Inlet O2 Concentration (%)	8.54	8.57	8.50	0.03	2
Outlet O2 Concentration (%)	8.50	8.51	8.49	0.01	2
Absorber Gas Velocity (ft/sec)	9.96	9.96	9.96	0.00	2
Inlet Gas Temperature (F)	264	264	263	1	2
Outlet Gas Temperature (F)	123	123	123	0	2
SO2 Absorbed (mmole/L)	14.37	14.38	14.37	0.01	2
Solids Residence Time (hrs)	9.8	9.8	9.8	0.0	2
Slurry Residence Time (min)	4.04	4.04	4.04	0.00	2
Absorber Pressure Drop (in H2O)	4.47	4.47	4.46	0.01	2
Spray Zone Pressure Drop (in H2O)	2.50	2.51	2.50	0.01	2
Tray Pressure Drop (in H2O)	2.23	2.23	2.22	0.00	2
ME Pressure Drop (in H2O)	0.32	0.32	0.32	0.00	2
Oxidation Air to Rxn Tank (scfm)	550	550	549	0	2
DBA Addition Rate (mL/min)	106	106	106	0	2
Inlet HCl Concentration (ppm)	17	18	16	1	2
NYSEG Load (MW)	675	677	674	1	2

**ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Pre-Spiking Inlet Location
(CRG)**

Test ID	Date	Start Time	Imp. Cont.	Other ID	Gas Volume (dscf)	Moisture (% H ₂ O)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	KMnO ₄ Sample [Hg] (ng/ml)	Other Sample Mass (g)	Other Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	KMnO ₄ Sample Mass (g)	Other [Hg] In Gas (µg/Nm ³)	Other [Hg] In Gas (µg/Nm ³)	H ₂ O ₂ [Hg] In Gas (µg/Nm ³)	H ₂ O ₂ [Hg] In Gas (µg/Nm ³)	KMnO ₄ [Hg] In Gas (µg/Nm ³)	Total [Hg] In Gas (µg/Nm ³)
4,6 Imp. Comp., CRG, No Hg Spk																						
T1-NX	Tue-4/18	10:56	-	U1	51.64	6.09	-	-	-	20.30	0.77	-	-	-	459.5	434.6	-	-	-	6.84	0.25	7.09
T1-NX	Tue-4/18	10:56	H	U2	58.11	5.99	47.25	3.08	1.25	0.72	0.36	230.3	225.0	203.7	191.7	425.9	7.09	0.45	0.17	0.09	0.10	7.90
T1-NX	Tue-4/18	10:00	-	U3	64.42	5.92	-	-	-	26.15	0.99	-	-	-	441.2	428.9	-	-	-	6.78	0.25	7.03
T1-NX	Tue-4/18	13:00	H	U4	66.58	5.88	56.03	3.80	1.11	0.81	0.48	206.2	209.3	200.1	184.3	507.5	6.57	0.45	0.13	0.09	0.14	7.37
T1-NX	Tue-4/18	10:00	-	U5	102.33	5.68	-	-	-	40.45	1.09	-	-	-	481.1	443.2	-	-	-	7.20	0.18	7.38
T1-NX	Tue-4/18	12:00	H	U6	102.66	5.89	66.10	6.10	2.17	1.22	0.59	268.2	207.5	209.3	189.1	460.1	6.54	0.47	0.17	0.09	0.10	7.36
Averages																						
Line, DBA, FO, Hg Spk Intrastain																						
T1-1Y	Thu-4/20	09:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1-1Y	Thu-4/20	09:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1-1Y	Thu-4/20	11:13	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1-1Y	Thu-4/20	11:13	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1-1Y	Thu-4/20	13:22	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1-1Y	Thu-4/20	13:23	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																						
Ambient Air, Hg Spike Comp.																						
T0-1A	Tue-5/2	10:09	H	U13	34.09	1.53	0.07	<0.05	<0.05	<0.05	<0.05	191.9	205.5	180.4	198.4	441.9	0.01	<0.01	<0.01	<0.01	<0.02	0.07
T0-1A	Tue-5/2	10:09	H	U14	27.59	1.53	0.80	0.68	0.90	0.08	32.90	200.2	211.7	203.4	199.4	493.6	0.22	0.20	0.25	0.02	22.30	22.99
T0-1A	Tue-5/2	11:04	H	U15	42.79	0.89	0.10	0.13	<0.05	0.81	<0.05	212.9	211.4	184.0	197.0	457.2	0.02	0.02	<0.01	0.14	<0.02	0.21
T0-1A	Tue-5/2	11:04	H	U16	40.66	1.06	0.08	0.08	<0.05	<0.05	32.05	198.5	203.7	186.6	190.1	489.2	0.02	0.02	<0.01	<0.01	14.61	14.66
T0-1A	Tue-5/2	12:08	H	U17	40.02	0.96	0.02	0.02	<0.05	<0.05	<0.05	208.9	193.2	201.3	189.6	432.1	0.00	0.00	<0.01	<0.01	<0.02	0.05
T0-1A	Tue-5/2	12:00	H	U18	40.26	1.04	0.71	0.71	0.73	0.67	27.40	208.4	208.6	185.2	190.1	453.2	0.14	0.14	0.13	0.12	11.69	12.21
Averages																						
Line, DBA, FO, Hg Spk Intrastain																						
T4-1Y	Wed-5/24	08:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4-1Y	Wed-5/24	08:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4-1Y	Wed-5/24	09:55	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4-1Y	Wed-5/24	10:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4-1Y	Wed-5/24	11:08	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T4-1Y	Wed-5/24	11:08	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																						
Line, DBA, FO, Hg Spk Intrastain																						
T5-1Z	Fri-5/26	06:50	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5-1Z	Fri-5/26	06:52	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5-1Z	Fri-5/26	09:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5-1Z	Fri-5/26	09:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5-1Z	Fri-5/26	10:58	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5-1Z	Fri-5/26	10:56	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																						

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetone, P=Perchloric, W=Water, H=Hydrogen Peroxide, PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing Mercury Gas Sampling Results Pilot Pre-Spiking Inlet Location (CRG)

					Gas	Moisture	Other Sample	Other Sample	H2O2 Sample	H2O2 Sample	KMnO4 Sample	Other Sample	Other Sample	H2O2 Sample	H2O2 Sample	KMnO4 Sample	Other [Hg]	Other [Hg]	H2O2 [Hg]	H2O2 [Hg]	KMnO4 [Hg]	Total [Hg]
Test ID	Date	Start Time	Imp. Cont.	ID	Volume (dscf)	(% H2O)	[Hg] (ng/ml)	[Hg] (ng/ml)	[Hg] (ng/ml)	[Hg] (ng/ml)	[Hg] (ng/ml)	Mass (g)	Mass (g)	Mass (g)	Mass (g)	Mass (g)	In Gas (µg/Nm3)	In Gas (µg/Nm3)	In Gas (µg/Nm3)	In Gas (µg/Nm3)	In Gas (µg/Nm3)	In Gas (µg/Nm3)
Hg Spk Intratrains after Imp#2																						
T6-JZ	Wed-5/31	08:32	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JZ	Wed-5/31	08:32	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JZ	Wed-5/31	10:36	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JZ	Wed-5/31	10:36	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JZ	Wed-5/31	13:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JZ	Wed-5/31	13:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																						
Hg Spk Intratrains after Imp#2																						
T6-JY	Fri-6/2	08:21	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JY	Fri-6/2	08:21	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JY	Fri-6/2	09:35	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JY	Fri-6/2	09:35	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JY	Fri-6/2	10:41	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JY	Fri-6/2	10:41	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																						

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetone, P=Perchloric, W=Water, H=Hydrogen Peroxide, PII=Phosphate.

**ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Pre-Spiking Inlet Location
(CRG)**

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H ₂ O)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H2O2 Sample [Hg] (ng/ml)	H2O2 Sample [Hg] (ng/ml)	KMnO4 Sample [Hg] (ng/ml)	Other Sample Mass (g)	Other Sample Mass (g)	H2O2 Sample Mass (g)	H2O2 Sample Mass (g)	KMnO4 Sample Mass (g)	Other [Hg] In Gas (µg/Nm ³)	Other [Hg] In Gas (µg/Nm ³)	H2O2 [Hg] In Gas (µg/Nm ³)	H2O2 [Hg] In Gas (µg/Nm ³)	KMnO4 [Hg] In Gas (µg/Nm ³)	Total [Hg] In Gas (µg/Nm ³)
<i>4,6 imp. comp, Hg Spk, Limestone, FO, Adip</i>																						
T7-EY	Mon-6/5	08:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7-EY	Mon-6/5	08:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7-EY	Mon-6/5	10:08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7-EY	Mon-6/5	10:06	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7-EY	Mon-6/5	11:27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7-EY	Mon-6/5	11:21	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																						
<i>Limestone, Adip, FO, Hg Spk</i>																						
T8-E	Wed-6/7	09:30	H	U49	48.99	8.81	33.45	2.25	0.77	0.21	0.66	271.3	254.1	243.9	247.7	518.2	7.02	0.44	0.14	0.04	0.26	7.91
T8-E	Wed-6/7	10:30	H	U52	50.29	8.49	35.55	3.17	1.22	0.69	0.62	253.1	264.0	247.1	259.8	554.8	6.78	0.63	0.23	0.13	0.26	8.03
Averages																	6.90	0.54	0.19	0.09	0.26	7.97
<i>Limestone, Adip, FO, Hg Spk</i>																						
T8-E	Thu-6/8	07:00	-	U55	55.84	7.21	-	-	-	18.10	0.88	-	-	-	553.7	545.2	-	-	-	6.80	0.33	7.13
T8-E	Thu-6/8	08:30	-	U58	57.40	5.97	-	-	-	18.10	1.05	-	-	-	512.4	491.7	-	-	-	6.12	0.34	6.46
Averages																	-	-	-	6.46	0.33	6.79
<i>Air, Hg Spike, 0.23 M SO₄</i>																						
T0-JA	Mon-6/12	08:40	H	U61	76.38	1.62	-	0.06	<0.05	<0.05	0.09	-	506.8	285.5	224.7	485.7	-	0.01	<0.01	<0.01	0.02	0.05
T0-JA	Mon-6/12	08:40	H	U62	69.54	1.23	-	<0.05	3.08	3.48	101.50	-	578.2	232.1	224.5	552.9	-	<0.02	0.39	0.43	30.57	31.40
T0-JA	Mon-6/12	10:20	H	U63	76.62	1.29	-	<0.05	<0.05	<0.05	0.06	-	414.0	202.0	202.0	494.9	-	<0.01	<0.00	<0.00	0.02	0.04
T0-JA	Mon-6/12	10:20	H	U64	70.77	1.21	-	<0.05	4.19	3.70	123.50	-	423.3	210.3	213.1	482.6	-	<0.01	0.47	0.42	31.91	32.81
T0-JA	Mon-6/12	11:54	H	U65	79.56	1.33	-	<0.05	<0.05	<0.05	0.26	-	432.8	217.5	213.3	463.6	-	<0.01	<0.01	<0.01	0.06	0.08
T0-JA	Mon-6/12	11:54	H	U66	72.78	1.26	-	<0.05	1.88	2.90	129.00	-	414.2	194.9	199.8	445.5	-	<0.01	0.19	0.30	29.91	30.42
Averages																						
<i>CRG, Hg spike after in Ambient</i>																						
T9-IX*	Fri-6/23	08:25	H	U67	42.71	7.94	21.80	1.74	0.26	<0.05	0.13	268.2	244.8	232.9	213.2	472.1	5.19	0.38	0.05	<0.01	0.06	5.68
T9-IX*	Fri-6/23	08:25	H	U68	49.57	7.75	37.60	12.35	9.32	7.39	20.30	271.5	228.8	225.9	195.2	474.4	7.80	2.16	1.61	1.10	7.36	20.03
T9-IX*	Fri-6/23	10:05	H	U69	32.68	8.17	16.70	1.30	0.28	<0.05	0.14	260.5	217.4	215.3	199.1	444.2	5.04	0.33	0.07	<0.01	0.07	5.53
T9-IX*	Fri-6/23	10:05	H	U70	35.63	8.40	31.40	11.35	7.98	6.59	23.55	248.4	232.8	213.1	205.4	492.3	8.29	2.81	1.81	1.44	12.33	26.67
T9-IX*	Fri-6/23	11:30	H	U71	64.58	8.25	28.15	2.38	0.32	<0.05	0.26	282.3	217.2	221.5	209.6	470.8	4.66	0.30	0.04	<0.01	0.07	5.08
T9-IX*	Fri-6/23	11:30	H	U72	77.57	7.59	45.00	15.35	10.50	8.11	16.95	294.2	231.1	220.9	206.6	470.9	6.47	1.73	1.13	0.82	3.90	14.05
Averages																						
<i>LS, FO, Hg Spk</i>																						
T9-E1	Mon-6/26	10:00	A	U73	61.72	7.71	-	12.93	-	0.35	1.31	-	542.1	-	468.0	502.4	-	4.90	-	0.10	0.40	4.81
T9-E1	Mon-6/26	12:15	A	U76	42.22	8.44	-	15.13	-	0.08	0.93	-	463.5	-	470.4	512.9	-	6.29	-	0.03	0.43	6.75
Averages																	-	5.30	-	0.07	0.41	5.78
<i>LS, FO, Hg Spk (Process Upset)</i>																						
T9-E2	Wed-6/28	09:10	PH	U79	60.78	7.55	-	19.47	-	0.38	16.92	-	512.4	-	420.9	450.2	-	4.63	-	0.20	4.75	9.57
T9-E2	Wed-6/28	10:30	PH	U82	53.82	6.91	-	14.61	-	0.74	1.44	-	479.5	-	429.9	470.0	-	4.93	-	0.22	0.48	5.63
Averages																	-	-	-	-	-	-

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric, W=Water, H=Hydrogen Peroxide, PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing Mercury Gas Sampling Results Pilot Pre-Spiking Inlet Location (CRG)

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H ₂ O)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	KMnO ₄ Sample [Hg] (ng/ml)	Other Sample Mass (g)	Other Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	KMnO ₄ Sample Mass (g)	Other In Gas [Hg] (µg/Nm ³)	Other In Gas [Hg] (µg/Nm ³)	H ₂ O ₂ In Gas [Hg] (µg/Nm ³)	H ₂ O ₂ In Gas [Hg] (µg/Nm ³)	KMnO ₄ In Gas [Hg] (µg/Nm ³)	Total In Gas [Hg] (µg/Nm ³)
<i>LS, FO, Baseline</i>																						
T10-N	Fri-6/30	08:00	PH	U85	63.28	7.05	-	13.00	-	0.68	1.35	-	558.7	-	453.6	479.5	-	4.35	-	0.19	0.39	4.92
T10-N	Fri-6/30	09:30	PH	U88	50.72	7.75	-	10.68	-	0.37	0.95	-	549.3	-	425.7	501.4	-	4.38	-	0.12	0.36	4.85
Averages																	-	4.36	-	0.15	0.37	4.89

* Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric, W=Water, H=Hydrogen Peroxide, PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Pre-Spiking Inlet Location
(CRG)

Test ID		Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Molsture (% H2O)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H2O2 Sample [Hg] (ng/ml)	H2O2 Sample [Hg] (ng/ml)	KMnO4 Sample [Hg] (ng/ml)	Other Sample Mass (g)	Other Sample Mass (g)	H2O2 Sample Mass (g)	H2O2 Sample Mass (g)	KMnO4 Sample Mass (g)	Other [Hg] In Gas (ug/Nm3)	Other [Hg] In Gas (ug/Nm3)	H2O2 [Hg] In Gas (ug/Nm3)	H2O2 [Hg] In Gas (ug/Nm3)	KMnO4 [Hg] In Gas (ug/Nm3)	Total [Hg] In Gas (ug/Nm3)
LS,FO,Hg Spk-Intratrains																							
T11-IV		Fri-7/7	08:45	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T11-IV		Fri-7/7	08:45	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T11-IV		Fri-7/7	10:05	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T11-IV		Fri-7/7	10:05	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T11-IV		Fri-7/7	11:20	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T11-IV		Fri-7/7	11:20	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																							
LS,FO,Hg Spk,Comp@WS In																							
T12-EY		Mon-7/10	08:10	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12-EY		Mon-7/10	08:10	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12-EY		Mon-7/10	10:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12-EY		Mon-7/10	10:00	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12-EY		Mon-7/10	11:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12-EY		Mon-7/10	11:15	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																							
LS,FO,Comp@WS In																							
T12-NY		Wed-7/12	08:05	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12-NY		Wed-7/12	08:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12-NY		Wed-7/12	10:40	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12-NY		Wed-7/12	10:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12-NY		Wed-7/12	11:50	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12-NY		Wed-7/12	11:50	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																							
LS,FO,Comp@WS In																							
T13-NY		Fri-7/14	08:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13-NY		Fri-7/14	08:05	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13-NY		Fri-7/14	09:30	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13-NY		Fri-7/14	09:30	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13-NY		Fri-7/14	10:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13-NY		Fri-7/14	10:05	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13-NY		Fri-7/14	10:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13-NY		Fri-7/14	10:45	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																							

*Shaded areas indicates problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric Acid, W=Water, H=Hydrogen Peroxide, PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Pre-Spiking Inlet Location
(CRG)

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H2O)	Other	Other	H2O2	H2O2	KMnO4	Other	Other	H2O2	H2O2	KMnO4	Other	Other	H2O2	H2O2	KMnO4	Total
							Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)
LS,FO,Hg Spk,Comp@WS In																						
T16-EY	Wed-7/19	08:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	08:15	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	09:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	09:40	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	11:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	11:00	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	13:30	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																						
Ambient Air,Aqueous Hg spk.							H2O2	H2O2	KO	KMnO4	KMnO4	H2O2	H2O2	KO	KMnO4	KMnO4	H2O2	H2O2	KO	KMnO4	KMnO4	Total
T0-NA	Wed-7/26	09:15	-	U124	99.03	2.64	10.39	0.43	0.37	17.60	0.41	250.3	223.6	111.4	242.6	227.6	0.99	0.04	0.02	1.63	0.04	2.72
T0-NA	Wed-7/26	09:30	-	U125	96.91	2.69	16.00	0.54	0.19	17.50	0.36	232.2	189.5	53.5	244.1	254.1	1.45	0.04	0.00	1.67	0.04	3.20
T0-NA	Wed-7/26	09:30	-	U126	95.99	2.76	12.60	0.46	0.13	17.40	0.18	229.3	226.9	75.4	242.1	231.8	1.14	0.04	0.00	1.66	0.02	2.86
T0-NA	Wed-7/26	12:40	-	U127	101.93	2.80	10.50	0.16	0.32	0.75	< 0.05	257.0	194.7	74.4	250.1	239.0	1.00	0.01	0.01	0.07	< 0.00	1.10
T0-NA	Wed-7/26	12:40	-	U128	92.88	2.78	11.70	0.26	0.13	0.64	< 0.05	263.6	219.9	85.9	264.8	243.1	1.26	0.02	0.00	0.07	< 0.00	1.36
Averages																	1.17	0.03	0.01	-	-	-
Line Inj,DRG,CRG,CRG comp																						
T18L-N	Fri-7/28	08:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18L-N	Fri-7/28	08:20	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18L-N	Fri-7/28	09:50	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18L-N	Fri-7/28	09:55	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Shaded areas indicates problems with sampling. Boldized values indicate mercury values below the low standard. A=Acetate, P=Perchloric Acid, W=Water, H=Peroxide, PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Post-Spiking Inlet Location
(WS Inlet)

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H ₂ O)	Inlet O ₂ (%)	Solid Hg Sample [Hg] (ppm)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	KMnO ₄ Sample [Hg] (ng/ml)	Solid Hg Sample Mass (g)	Other Sample Mass (g)	Other Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	KMnO ₄ Sample Mass (g)	Solid Hg [Hg] In Gas (ug/Nm ³)	Other [Hg] In Gas (ug/Nm ³)	Other [Hg] In Gas (ug/Nm ³)	H ₂ O ₂ [Hg] In Gas (ug/Nm ³)	H ₂ O ₂ [Hg] In Gas (ug/Nm ³)	KMnO ₄ [Hg] In Gas (ug/Nm ³)	Total [Hg] In Gas (ug/Nm ³)
4.6 Imp. Comp., CRG, No Hg Spk																										
T1-NX	Tue-4/18	10:56	-	-	-	-	9.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1-NX	Tue-4/18	10:56	H	-	-	-	9.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1-NX	Tue-4/18	10:00	-	-	-	-	9.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1-NX	Tue-4/18	13:00	H	-	-	-	9.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1-NX	Tue-4/18	10:00	-	-	-	-	9.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T1-NX	Tue-4/18	12:00	H	-	-	-	9.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																										
Lime, DBA, FO, Hg Spk Intratrail																										
T1-1Y	Thu-4/20	09:40	H	U7	76.40	6.23	8.71	-	74.05	9.39	2.36	1.47	0.74	-	255.6	224.0	205.4	197.6	424.3	-	9.42	1.04	0.26	0.14	0.16	11.02
T1-1Y	Thu-4/20	09:40	H	U8	78.49	6.01	8.71	-	114.75	17.25	8.54	4.86	4.70	-	256.3	210.1	198.0	187.3	432.8	-	14.19	1.80	0.84	0.44	0.98	18.23
T1-1Y	Thu-4/20	11:15	H	U9	93.71	3.92	8.71	-	66.35	7.98	1.72	0.88	0.51	-	269.3	221.7	210.5	193.3	442.4	-	7.23	0.71	0.15	0.07	0.09	8.27
T1-1Y	Thu-4/20	11:15	H	U10	98.39	3.84	8.71	-	82.35	14.03	6.99	4.41	4.43	-	267.1	218.0	194.4	204.0	446.0	-	8.43	1.18	0.32	0.33	0.74	11.22
T1-1Y	Thu-4/20	13:23	H	U11	77.91	6.36	8.71	-	65.05	6.56	1.74	0.91	0.36	-	257.4	212.2	189.2	178.7	415.4	-	8.14	0.68	0.16	0.08	0.07	9.13
T1-1Y	Thu-4/20	15:25	H	U12	80.68	6.36	8.71	-	72.70	13.75	8.08	4.99	4.78	-	257.3	223.1	191.2	183.3	468.2	-	8.78	1.44	0.72	0.43	1.03	12.43
Averages																										
Ambient Air, Hg Spike Comp.																										
T0-1A	Tue-5/2	10:09	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T0-1A	Tue-5/2	10:09	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T0-1A	Tue-5/2	11:04	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T0-1A	Tue-5/2	11:04	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T0-1A	Tue-5/2	12:08	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T0-1A	Tue-5/2	12:00	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																										
Lime, DBA, FO, Hg Spk Intratrail																										
T4-1Y	Wed-5/24	08:45	H	U19	52.98	8.77	7.07	-	26.35	2.57	0.87	0.46	0.59	-	288.8	251.9	219.2	275.4	605.7	-	5.44	0.46	0.14	0.09	0.25	6.38
T4-1Y	Wed-5/24	08:45	H	U20	53.99	7.96	7.07	-	40.65	10.10	5.87	4.11	6.11	-	273.3	240.9	278.1	239.0	595.9	-	7.80	1.71	1.15	0.69	2.55	13.89
T4-1Y	Wed-5/24	09:55	H	U21	53.72	7.86	7.07	-	27.85	2.76	0.91	0.38	0.50	-	271.7	230.9	294.1	280.6	608.8	-	5.34	0.45	0.19	0.08	0.21	6.26
T4-1Y	Wed-5/24	10:00	H	U22	55.33	8.06	7.07	-	36.25	11.75	7.46	5.54	8.21	-	303.0	260.9	256.3	243.5	574.4	-	7.52	2.10	1.31	0.92	3.23	15.08
T4-1Y	Wed-5/24	11:08	H	U23	32.40	8.27	7.07	-	17.98	1.41	0.50	0.28	0.28	-	254.2	262.1	250.8	271.9	605.9	-	5.35	0.43	0.15	0.09	0.20	6.21
T4-1Y	Wed-5/24	11:08	H	U24	38.63	8.21	7.07	-	41.75	17.93	12.30	7.52	15.85	-	252.4	258.4	243.0	270.7	604.7	-	10.33	4.54	2.93	2.00	9.40	29.20
Averages																										
Lime, DBA, FO, Hg Spk Intratrail																										
T5-1Z	Fri-5/26	06:50	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5-1Z	Fri-5/26	06:52	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5-1Z	Fri-5/26	09:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5-1Z	Fri-5/26	09:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5-1Z	Fri-5/26	10:58	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5-1Z	Fri-5/26	10:56	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																										

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate. P=Perchloric. W=Water. H=Peroxide. PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Post-Spiking Inlet Location
(WS Inlet)

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Inlet Moisture (% H2O)	Inlet O2 (%)	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Total		
								Sample [Hg] (ppm)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)	[Hg] In Gas (µg/Nm3)		
Hg Spk intratrain after Imp#2																												
T6-JZ	Wed-5/31	08:32	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T6-JZ	Wed-5/31	08:32	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T6-JZ	Wed-5/31	10:36	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T6-JZ	Wed-5/31	10:36	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T6-JZ	Wed-5/31	13:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T6-JZ	Wed-5/31	13:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Averages																												
Hg Spk intratrain after Imp#2																												
T6-JY	Fri-6/2	08:21	H	U37	56.41	8.17	7.65	-	-	22.70	0.95	0.84	0.83	-	-	499.0	208.6	206.9	463.7	-	-	7.61	0.13	0.12	0.26	8.12		
T6-JY	Fri-6/2	08:21	H	U38	56.36	7.95	7.65	-	-	21.75	22.55	14.35	24.55	-	-	497.3	221.3	222.0	473.7	-	-	7.27	3.35	2.14	7.82	20.58		
T6-JY	Fri-6/2	09:35	H	U39	51.53	8.31	7.63	-	-	18.85	0.91	0.39	0.72	-	-	508.5	230.0	192.0	457.8	-	-	7.05	0.15	0.05	0.24	7.50		
T6-JY	Fri-6/2	09:35	H	U40	53.16	8.25	7.63	-	-	20.15	22.00	15.25	27.75	-	-	512.1	217.6	203.2	466.2	-	-	7.35	3.41	2.21	9.22	22.19		
T6-JY	Fri-6/2	10:41	H	U41	56.41	8.17	7.81	-	-	21.20	1.31	0.52	0.79	-	-	513.2	224.8	215.6	478.1	-	-	7.31	0.20	0.08	0.25	7.84		
T6-JY	Fri-6/2	10:41	H	U42	59.51	8.16	7.81	-	-	23.45	24.70	16.80	24.55	-	-	480.4	201.3	190.4	466.9	-	-	7.17	3.17	2.04	7.30	19.67		
Averages																												

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate. P=Perchloric. W=Water. H=Peroxide. PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Post-Spiking Inlet Location
(WS Inlet)

Test ID		Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H2O)	Inlet O2 (%)	Solid Hg Sample [Hg] (ppm)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H2O2 Sample [Hg] (ng/ml)	H2O2 Sample [Hg] (ng/ml)	KMnO4 Sample [Hg] (ng/ml)	Solid Hg Sample Mass (g)	Other Sample Mass (g)	Other Sample Mass (g)	H2O2 Sample Mass (g)	H2O2 Sample Mass (g)	KMnO4 Sample Mass (g)	Solid Hg In Gas [Hg] (ug/Nm3)	Other In Gas [Hg] (ug/Nm3)	Other In Gas [Hg] (ug/Nm3)	H2O2 In Gas [Hg] (ug/Nm3)	H2O2 In Gas [Hg] (ug/Nm3)	KMnO4 In Gas [Hg] (ug/Nm3)	Total In Gas [Hg] (ug/Nm3)
4,6 imp. comp, Hg Spk, Limestone, FO,																											
T7-EY		Mon-6/5	08:40	-	U43	56.68	6.87	8.27	-	-	-	-	36.40	18.37	-	-	-	-	478.4	479.9	-	-	-	-	11.64	5.89	17.53
T7-EY		Mon-6/5	08:40	H	U44	53.49	8.24	8.27	-	55.10	18.25	12.40	6.70	9.79	-	241.8	208.8	199.6	219.8	476.5	-	9.44	2.70	1.75	1.04	3.30	18.23
T7-EY		Mon-6/5	10:08	-	U45	56.57	7.30	7.60	-	-	-	-	37.60	18.20	-	-	-	-	498.8	519.4	-	-	-	-	12.56	6.33	18.89
T7-EY		Mon-6/5	10:06	H	U46	57.29	7.25	7.60	-	57.30	19.30	12.60	8.11	9.59	-	260.8	223.6	219.0	205.0	490.7	-	9.88	2.85	1.82	1.10	3.11	18.77
T7-EY		Mon-6/5	11:27	-	U47	59.62	6.88	7.43	-	-	-	-	41.60	20.00	-	-	-	-	462.2	443.0	-	-	-	-	12.22	5.63	17.85
T7-EY		Mon-6/5	11:21	H	U48	62.56	6.89	7.43	-	60.70	21.50	15.18	8.95	11.28	-	257.7	218.3	202.1	203.8	448.4	-	9.47	2.84	1.86	1.10	3.06	18.34
Averages																											
Limestone, Adip, FO, Hg Spk																											
T8-E		Wed-6/7	09:30	H	U50	43.03	8.98	7.33	-	37.85	12.45	8.80	4.94	5.27	-	303.0	242.9	232.7	223.0	496.7	-	10.10	2.66	1.80	0.97	2.30	17.83
T8-E		Wed-6/7	10:30	H	U53	50.75	8.55	7.49	-	47.55	12.10	9.04	5.74	9.20	-	278.3	245.5	231.2	231.5	516.0	-	9.88	2.22	1.56	0.99	3.54	18.19
Averages																											
Limestone, Adip, FO, Hg Spk																											
T8-E		Thu-6/8	07:00	-	U56	54.36	7.57	7.24	-	-	-	-	21.15	18.35	-	-	-	-	787.8	544.3	-	-	-	-	11.61	6.96	18.57
T8-E		Thu-6/8	08:30	-	U59	60.84	6.27	8.46	-	-	-	-	37.75	19.85	-	-	-	-	501.9	540.0	-	-	-	-	11.80	6.67	18.47
Averages																											
Alr, Hg Spike, 0.23 M SO4																											
T0-JA		Mon-6/12	08:40	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T0-JA		Mon-6/12	08:40	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T0-JA		Mon-6/12	10:20	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T0-JA		Mon-6/12	10:20	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T0-JA		Mon-6/12	11:54	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T0-JA		Mon-6/12	11:54	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																											
CRG, Hg spike after in Ambient																											
T9-IX*		Fri-6/23	08:25	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T9-IX*		Fri-6/23	08:25	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T9-IX*		Fri-6/23	10:05	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T9-IX*		Fri-6/23	10:05	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T9-IX*		Fri-6/23	11:30	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T9-IX*		Fri-6/23	11:30	H	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																											
LS, FO, Hg Spk																											
T9-EI		Mon-6/26	10:00	A	U74	63.09	8.88	8.51	-	-	13.47	-	56.10	23.85	-	-	455.7	-	669.3	537.9	-	-	3.68	-	14.51	7.70	25.89
T9-EI		Mon-6/26	12:15	A	U77	56.71	8.44	8.08	-	-	7.70	-	18.50	11.10	-	-	359.9	-	419.2	533.9	-	-	2.70	-	8.00	6.12	16.82
Averages																											
LS, FO, Hg Spk (Process Upset)																											
T9-E2		Wed-6/28	09:30	PH	U80	68.78	7.59	10.30	-	-	7.32	-	7.31	36.33	-	-	527.6	-	423.1	475.6	-	-	2.18	-	0.58	9.57	12.34
T9-E2		Wed-6/28	10:30	PH	U83	59.27	7.13	8.93	-	-	13.50	-	1.95	33.60	-	-	517.6	-	428.6	451.0	-	-	4.47	-	0.53	9.69	14.69
Averages																											

*Shaded areas indicate problems with sampling. Boldfaced values indicate mercury values below the low standard. A=Acetate, P=Perchloric, W=Water, H=Peroxide, PH=Phosphate.

**ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Post-Spiking Inlet Location
(WS Inlet)**

					Gas		Inlet	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Total	
Test		Start	Other		Volume	Moisture	O2	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	
ID	Date	Time	Imp.	ID	(dscf)	(% H2O)	(%)	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	Mass	Mass	Mass	Mass	Mass	In Gas	In Gas	In Gas	In Gas	In Gas	In Gas	In Gas	
					(% H2O)	(% H2O)	(%)	(ppm)	(ng/ml)	(ng/ml)	(ng/ml)	(ng/ml)	(ng/ml)	(ng/ml)	(g)	(g)	(g)	(g)	(g)	(ug/Nm3)	(ug/Nm3)	(ug/Nm3)	(ug/Nm3)	(ug/Nm3)	(ug/Nm3)	(ug/Nm3)	
LS, FO, Baseline																											
T10-N	Fri-6/30	08:00	PH	U86	62.79	7.52	8.00	-	-	14.78	-	0.78	1.13	-	-	547.8	-	471.7	501.5	-	-	4.88	-	0.22	0.34	5.44	
T10-N	Fri-6/30	09:30	PH	U89	58.09	8.05	8.00	-	-	14.85	-	0.84	0.91	-	-	528.9	-	447.9	456.0	-	-	5.12	-	0.25	0.27	5.64	
Averages																											

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric, W=Water, H=Hydroxide, PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Post-Spiking Inlet Location
(WS Inlet)

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H ₂ O)	Inlet O ₂ (%)	Solid Hg Sample [Hg] (ppm)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	KMnO ₄ Sample [Hg] (ng/ml)	Solid Hg Sample Mass (g)	Other Sample Mass (g)	Other Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	KMnO ₄ Sample Mass (g)	Solid Hg In Gas [Hg] (μg/Nm ³)	Other In Gas [Hg] (μg/Nm ³)	Other In Gas [Hg] (μg/Nm ³)	H ₂ O ₂ In Gas [Hg] (μg/Nm ³)	H ₂ O ₂ In Gas [Hg] (μg/Nm ³)	KMnO ₄ In Gas [Hg] (μg/Nm ³)	Total In Gas [Hg] (μg/Nm ³)
LS,FO,Hg Spk-Instrutrain																										
T11-IY	Fri-7/7	08:45	PH	U91	62.25	7.47	9.32	-	-	13.50	-	0.74	2.09	-	-	576.4	-	444.3	516.1	-	-	4.74	-	0.20	0.65	5.59
T11-IY	Fri-7/7	08:45	PH	U92	60.59	7.25	9.32	-	-	13.65	-	4.28	28.93	-	-	450.6	-	564.5	482.5	-	-	3.85	-	1.51	8.73	14.08
T11-IY	Fri-7/7	10:05	PH	U93	61.81	7.51	8.90	-	-	14.15	-	0.33	1.51	-	-	536.6	-	448.1	507.8	-	-	4.65	-	0.09	0.47	5.21
T11-IY	Fri-7/7	10:05	PH	U94	59.46	7.35	8.90	-	-	16.80	-	3.46	41.88	-	-	534.1	-	428.1	514.8	-	-	5.72	-	0.94	13.73	20.40
T11-IY	Fri-7/7	11:20	PH	U95	63.71	7.65	8.94	-	-	14.10	-	0.47	1.60	-	-	576.5	-	438.3	515.5	-	-	4.83	-	0.12	0.49	5.45
T11-IY	Fri-7/7	11:20	PH	U96	60.54	7.47	8.94	-	-	15.50	-	3.78	37.25	-	-	564.9	-	447.2	515.1	-	-	5.48	-	1.06	12.01	18.54
Averages																										
LS,FO,Hg Spk,Comp@WS In																										
T12-EY	Mon-7/10	08:10	H	U97	59.58	7.46	9.60	-	44.00	15.40	11.55	8.39	21.30	-	286.9	237.5	208.1	204.2	457.1	-	8.03	2.33	1.53	1.09	6.19	19.16
T12-EY	Mon-7/10	08:10	PH	U98	53.77	6.76	9.60	-	11.40	1.54	1.01	0.69	30.70	-	291.7	244.3	221.8	212.1	568.6	-	2.34	0.27	0.16	0.10	12.30	15.17
T12-EY	Mon-7/10	10:00	H	U99	61.71	7.56	9.29	-	49.45	15.90	11.95	7.48	22.15	-	273.6	239.2	223.1	218.2	455.6	-	8.31	2.33	1.64	1.00	6.19	19.47
T12-EY	Mon-7/10	10:00	PH	U100	55.88	7.97	9.29	-	19.45	1.19	0.29	0.30	36.40	-	294.0	267.5	218.0	213.1	475.4	-	3.88	0.21	0.04	0.04	11.73	15.91
T12-EY	Mon-7/10	11:15	H	U101	52.41	7.54	9.12	-	48.60	16.20	9.50	6.98	17.45	-	264.2	224.3	213.9	204.4	454.5	-	9.28	2.63	1.47	1.03	5.73	20.14
T12-EY	Mon-7/10	11:15	PH	U102	49.21	7.67	9.12	-	17.35	0.63	0.39	0.17	32.95	-	273.0	230.6	202.4	199.7	456.2	-	3.65	0.11	0.06	0.03	11.57	15.42
Averages																										
LS,FO,Comp@WS In																										
T12-NY	Wed-7/12	08:05	PH	U103	60.42	7.69	9.71	-	10.30	<0.05	0.09	0.09	2.76	-	377.3	310.9	218.9	211.2	491.5	-	2.44	<0.01	0.01	0.01	0.85	3.32
T12-NY	Wed-7/12	08:05	H	U104	55.38	6.47	9.71	-	30.08	5.03	3.81	3.25	2.60	-	271.5	267.8	206.2	210.1	485.5	-	5.59	0.92	0.54	0.47	0.86	8.37
T12-NY	Wed-7/12	10:40	PH	U105	60.71	7.37	9.12	-	12.70	<0.05	0.03	<0.05	2.06	-	367.8	393.8	232.7	215.9	531.4	-	2.91	<0.01	0.00	<0.01	0.68	3.62
T12-NY	Wed-7/12	10:40	H	U106	56.42	7.88	9.12	-	29.05	3.71	1.62	1.56	2.38	-	273.6	235.7	219.6	217.1	534.3	-	5.34	0.59	0.24	0.23	0.85	7.24
T12-NY	Wed-7/12	11:50	PH	U107	57.75	8.57	8.11	-	18.55	<0.05	0.17	0.12	1.85	-	363.4	305.4	218.4	233.7	490.2	-	4.42	<0.01	0.02	0.02	0.59	5.07
T12-NY	Wed-7/12	11:50	H	U108	57.45	7.83	8.11	-	31.20	5.99	2.89	1.52	2.63	-	277.5	223.3	206.7	225.3	480.7	-	5.71	0.88	0.39	0.23	0.83	8.04
Averages																										
LS,FO,Comp@WS In																										
T13-NY	Fri-7/14	08:05	H	U109	22.38	9.38	7.06	-	17.43	1.37	0.81	0.57	0.91	-	233.6	235.2	243.3	210.1	503.6	-	6.89	0.54	0.33	0.20	0.78	8.74
T13-NY	Fri-7/14	08:05	PH	U110	28.71	7.41	7.06	-	3.98	<0.05	0.30	0.39	0.60	-	278.8	211.7	230.4	232.5	493.9	-	1.46	<0.01	0.09	0.12	0.39	2.08
T13-NY	Fri-7/14	09:30	H	U111	21.53	9.52	6.79	-	12.70	1.52	1.26	0.41	0.90	-	264.7	228.7	228.0	215.2	490.8	-	5.92	0.61	0.51	0.15	0.78	7.96
T13-NY	Fri-7/14	09:30	PH	U112	21.37	10.02	6.79	-	6.33	<0.05	0.25	0.20	0.93	-	299.5	303.9	220.9	217.8	510.5	-	3.36	<0.03	0.10	0.08	0.84	4.41
T13-NY	Fri-7/14	10:05	H	U113	21.45	9.28	6.78	-	12.95	1.37	0.62	0.38	0.78	-	223.9	208.1	214.9	206.6	491.6	-	5.12	0.50	0.24	0.14	0.68	6.68
T13-NY	Fri-7/14	10:05	PH	U114	19.46	9.94	6.78	-	6.67	<0.05	0.16	0.13	0.64	-	295.8	245.6	222.5	208.0	504.0	-	3.84	<0.02	0.07	0.05	0.63	4.61
T13-NY	Fri-7/14	10:45	H	U115	68.70	9.16	6.95	-	26.55	3.10	1.55	1.24	2.94	-	295.8	242.6	212.3	207.7	473.4	-	4.33	0.41	0.18	0.14	0.77	5.84
T13-NY	Fri-7/14	10:45	PH	U116	64.28	NA	6.95	-	12.25	0.88	0.56	0.27	3.16	-	283.7	280.7	225.8	225.8	515.6	-	2.05	0.15	0.07	0.04	0.96	3.26
Averages																										

*Shaded areas indicates problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric Acid, W=Water, H=Peroxide, PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Post-Spiking Inlet Location
(WS Inlet)

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H ₂ O)	Inlet O ₂ (%)	Solid Hg Sample [Hg] (ppm)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	KMnO ₄ Sample [Hg] (ng/ml)	Solid Hg Sample Mass (g)	Other Sample Mass (g)	Other Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	KMnO ₄ Sample Mass (g)	Solid Hg In Gas [Hg] (µg/Nm ³)	Other In Gas [Hg] (µg/Nm ³)	Other In Gas [Hg] (µg/Nm ³)	H ₂ O ₂ In Gas [Hg] (µg/Nm ³)	H ₂ O ₂ In Gas [Hg] (µg/Nm ³)	KMnO ₄ In Gas [Hg] (µg/Nm ³)	Total In Gas [Hg] (µg/Nm ³)
LS,FO,Hg Spk,Comp @ WS In																										
T16-EY	Wed-7/19	08:15	H	U117	56.09	8.16	9.22	-	40.50	14.20	9.63	7.45	12.77	-	284.0	230.8	210.6	202.0	455.6	-	7.77	2.21	1.37	1.02	3.93	16.30
T16-EY	Wed-7/19	08:15	PH	U118	57.10	8.25	9.22	-	3.05	<0.05	0.74	0.55	25.00	-	291.2	269.9	216.4	213.5	472.5	-	0.59	<0.01	0.11	0.08	7.84	8.62
T16-EY	Wed-7/19	09:40	H	U119	58.56	8.25	8.64	-	44.30	17.10	9.32	6.18	24.40	-	276.2	216.8	209.2	216.6	492.3	-	7.92	2.40	1.26	0.87	7.77	20.21
T16-EY	Wed-7/19	09:40	PH	U120	52.65	8.36	8.64	-	13.30	0.98	0.69	0.53	41.60	-	310.0	319.8	222.8	220.3	476.9	-	2.97	0.23	0.11	0.08	14.28	17.66
T16-EY	Wed-7/19	11:00	H	U121	55.69	8.16	8.86	-	39.80	14.10	8.98	6.59	21.70	-	273.1	242.0	243.4	226.1	472.9	-	7.39	2.32	1.49	1.01	6.98	19.20
T16-EY	Wed-7/19	11:00	PH	U122	51.56	8.34	8.86	-	4.30	<0.05	0.78	0.44	35.90	-	337.4	309.3	201.4	224.7	524.4	-	1.07	<0.01	0.12	0.07	13.83	15.10
T16-EY	Wed-7/19	13:30	DM	U123	55.89	8.76	-	-	NA	NA	13.50	9.39	10.40	-	372.6	368.7	210.9	208.5	495.6	-	NA	NA	2.22	1.33	3.49	NA
Averages																										
Ambient Air, Aqueous Hg spk.																										
TO-NA	Wed-7/26	09:15	-	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TO-NA	Wed-7/26	09:30	-	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TO-NA	Wed-7/26	09:30	-	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TO-NA	Wed-7/26	12:40	-	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TO-NA	Wed-7/26	12:40	-	-	-	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																										
Line Inj, DRG, CRG, CRG comp																										
T18L-N	Fri-7/28	08:15	H	U129	46.35	8.70	4.99	0.60	8.76	0.64	0.23	0.24	0.61	8.85	252.6	229.9	193.2	198.3	544.7	4.36	1.81	0.12	0.04	0.04	0.27	6.63
T18L-N	Fri-7/28	08:20	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18L-N	Fri-7/28	09:50	H	U132	42.55	9.03	5.39	0.60	6.63	0.87	0.30	0.22	0.50	9.43	282.8	216.9	211.0	210.7	518.4	5.05	1.67	0.17	0.06	0.04	0.23	7.22
T18L-N	Fri-7/28	09:55	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Shaded areas indicates problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric Acid, W=Water, H=Peroxide, PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Outlet Location
(WS Outlet)

		Other						Solid Hg		Other		H2O2		H2O2		KMnO4		Solid Hg		Other		Other		H2O2		H2O2		KMnO4		Total	
Test		Start	Imp.			Gas	Out	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	
ID	Date	Time	Cont.	ID		Volume	O2	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	In Gas	In Gas	In Gas	In Gas	In Gas	In Gas	[Hg]	In Gas	In Gas	In Gas	In Gas	In Gas	In Gas	
						(dscf)	(%)	(ppm)	(ng/ml)	(ng/ml)	(ng/ml)	(ng/ml)	(ng/ml)	(ng/ml)	(g)	(g)	(g)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)		
4.6 Imp. Comp.,CRO,No Hg Spk																															
T1-NX	Tue-4/18	10:56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1-NX	Tue-4/18	10:56	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1-NX	Tue-4/18	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1-NX	Tue-4/18	13:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1-NX	Tue-4/18	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1-NX	Tue-4/18	12:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																															
Lime, DBA, FO, Hg Spk Intratrail																															
T1-IY	Thu-4/20	09:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1-IY	Thu-4/20	09:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1-IY	Thu-4/20	11:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1-IY	Thu-4/20	11:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1-IY	Thu-4/20	13:23	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1-IY	Thu-4/20	13:23	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																															
Ambient Air, Hg Spike Comp.																															
T0-1A	Tue-5/2	10:09	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T0-1A	Tue-5/2	10:09	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T0-1A	Tue-5/2	11:04	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T0-1A	Tue-5/2	11:04	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T0-1A	Tue-5/2	12:08	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T0-1A	Tue-5/2	12:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																															
Lime, DBA, FO, Hg Spk Intratrail																															
T4-IY	Wed-5/24	08:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4-IY	Wed-5/24	08:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4-IY	Wed-5/24	09:55	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4-IY	Wed-5/24	10:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4-IY	Wed-5/24	11:08	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4-IY	Wed-5/24	11:08	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																															
Lime, DBA, FO, Hg Spk Intratrail																															
T5-IZ	Fri-5/26	06:50	H	U25	103.76	12.88	8.70	-	2.83	1.03	0.83	0.65	2.72	-	325.2	404.9	214.1	198.7	454.8	-	0.34	0.15	0.06	0.05	0.45	1.05					
T5-IZ	Fri-5/26	06:52	H	U26	106.88	12.60	8.70	-	6.53	4.59	2.38	1.73	36.10	-	304.2	412.8	201.5	197.0	460.3	-	0.70	0.67	0.17	0.12	5.89	7.55					
T5-IZ	Fri-5/26	09:00	H	U27	95.27	13.03	8.70	-	1.45	1.32	1.32	0.57	2.73	-	294.6	374.4	216.7	199.4	448.6	-	0.17	0.20	0.11	0.04	0.49	1.01					
T5-IZ	Fri-5/26	09:00	H	U28	100.67	12.63	8.70	-	14.40	7.91	4.00	2.17	56.75	-	289.8	377.3	198.0	203.1	481.0	-	1.57	1.12	0.30	0.17	10.27	13.43					
T5-IZ	Fri-5/26	10:58	H	U29	31.36	13.24	8.70	-	1.11	0.54	0.46	0.18	0.86	-	281.9	208.7	197.6	202.1	482.3	-	0.38	0.13	0.11	0.04	0.50	1.16					
T5-IZ	Fri-5/26	10:56	H	U30	32.56	8.61	8.70	-	11.20	5.08	2.84	1.19	56.05	-	289.6	221.1	204.1	198.9	473.4	-	3.77	1.31	0.67	0.28	30.88	36.90					
Averages																															

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetic. P=Perchloric. W=Water. H=Hydroxide. PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Outlet Location
(WS Outlet)

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H ₂ O)	Out O ₂ (%)	Solid Hg Sample (ppm)	Other Sample (ng/ml)	Other Sample (ng/ml)	H ₂ O ₂ Sample (ng/ml)	H ₂ O ₂ Sample (ng/ml)	KMnO ₄ Sample (ng/ml)	Solid Hg Sample (g)	Other Sample (g)	Other Sample (g)	H ₂ O ₂ Sample (g)	H ₂ O ₂ Sample (g)	KMnO ₄ Sample (g)	Solid Hg In Gas (µg/Nm ³)	Other In Gas (µg/Nm ³)	Other In Gas (µg/Nm ³)	H ₂ O ₂ In Gas (µg/Nm ³)	H ₂ O ₂ In Gas (µg/Nm ³)	KMnO ₄ In Gas (µg/Nm ³)	Total In Gas (µg/Nm ³)
<i>Hg Spk Intratrain after Insp#2</i>																										
T6-JZ	Wed-5/31	08:32	H	U31	101.49	14.09	7.98	-	-	1.66	1.15	0.47	3.51	-	-	772.2	387.0	245.7	536.1	-	-	0.48	0.17	0.04	0.70	1.39
T6-JZ	Wed-5/31	08:32	H	U32	101.44	13.92	7.98	-	-	1.68	3.12	1.53	36.50	-	-	778.6	377.4	237.8	478.0	-	-	0.49	0.44	0.14	6.52	7.58
T6-JZ	Wed-5/31	10:36	H	U33	57.35	13.71	7.98	-	-	1.50	0.73	0.52	1.72	-	-	840.3	297.3	256.1	523.2	-	-	0.83	0.14	0.09	0.59	1.66
T6-JZ	Wed-5/31	10:36	H	U34	100.67	12.63	7.98	-	-	2.13	4.20	3.39	36.85	-	-	756.1	504.9	253.1	563.9	-	-	0.60	0.80	0.32	7.82	9.54
T6-JZ	Wed-5/31	13:05	H	U35	31.36	13.24	7.98	-	-	0.81	0.53	0.40	0.91	-	-	781.2	392.3	281.4	532.7	-	-	0.77	0.25	0.13	0.59	1.74
T6-JZ	Wed-5/31	13:05	H	U36	32.56	8.61	7.98	-	-	1.33	6.84	2.76	53.35	-	-	834.7	320.6	259.4	592.0	-	-	1.29	2.55	0.83	36.75	41.42
Averages																										
<i>Hg Spk Intratrain after Insp#2</i>																										
T6-JY	Fri-6/2	08:21	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JY	Fri-6/2	08:21	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JY	Fri-6/2	09:35	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JY	Fri-6/2	09:35	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JY	Fri-6/2	10:41	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6-JY	Fri-6/2	10:41	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																										

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric, W=Water, H=Hydrogen Peroxide, PH=Phosphate.

[illegible]

* Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric, W=Water, H=Peroxide, PII=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Outlet Location
(WS Outlet)

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H2O)	Out O2 (%)	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Total
								Sample [Hg] (ppm)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)
LS, FO, Baseline																										
T10-N	Fri-6/30	08:00	PH	U87	105.90	13.29	8.00	-	-	0.30	-	0.15	2.12	-	-	818.9	-	504.0	459.0	-	-	0.09	-	0.03	0.35	0.46
T10-N	Fri-6/30	09:30	PH	U90	97.62	13.81	8.00	-	-	<0.05	-	0.12	1.80	-	-	797.6	-	473.9	506.3	-	-	<0.02	-	0.02	0.35	0.39
Averages																										

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchlorate, W=Water, H=Peroxide, PH=Phosphate.

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Outlet Location
(WS Outlet)

				Solid Hg Other Other H2O2 H2O2 KMnO4 Solid Hg Other Other H2O2 H2O2 KMnO4																Solid Hg Other Other H2O2 H2O2 KMnO4				Total			
Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H2O)	Out O2 (%)	Sample [Hg] (ppm)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	[Hg] In Gas (ug/Nm3)	[Hg] In Gas (ug/Nm3)	[Hg] In Gas (ug/Nm3)	[Hg] In Gas (ug/Nm3)	[Hg] In Gas (ug/Nm3)	[Hg] In Gas (ug/Nm3)	[Hg] In Gas (ug/Nm3)		
LS, FO, Hg Spk, Comp @ WS In																											
T16-EY	Wed-7/19	08:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T16-EY	Wed-7/19	08:15	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T16-EY	Wed-7/19	09:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T16-EY	Wed-7/19	09:40	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T16-EY	Wed-7/19	11:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T16-EY	Wed-7/19	11:00	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T16-EY	Wed-7/19	13:30	BPH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Averages																											
Ambient Air, Aqueous Hg spk.																											
T0-NA	Wed-7/26	09:15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T0-NA	Wed-7/26	09:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T0-NA	Wed-7/26	09:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T0-NA	Wed-7/26	12:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T0-NA	Wed-7/26	12:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Averages																											
Line Inj, DRG, CRG, CRG comp				CRG	CRG	CRG	CRG												CRG	CRG	CRG	CRG	CRG	CRG	CRG		
T18L-N	Fri-7/28	08:15	H	U130	62.38	8.02	8.51	<0.12	7.71	0.69	0.59	0.47	0.73	0.1	255.3	229.7	211.7	205.7	530.3	<0.01	1.19	0.10	0.08	0.06	0.24	1.67	
T18L-N	Fri-7/28	08:20	Tris	U131	19.46	9.37	8.51	-	0.88	<0.05	0.09	0.17	0.50	-	299.1	317.6	210.2	219.0	559.7	-	0.51	0.03	0.04	0.07	0.54	1.19	
T18L-N	Fri-7/28	09:50	H	U133	57.04	8.32	8.58	-	6.11	0.64	0.35	0.24	0.57	-	286.9	231.3	207.1	212.1	555.5	-	1.17	0.10	0.05	0.03	0.21	1.56	
T18L-N	Fri-7/28	09:55	Tris	U134	19.85	10.72	8.58	-	0.90	<0.05	0.08	0.20	0.54	-	311.9	203.8	211.9	228.5	551.0	-	0.54	0.02	0.03	0.09	0.56	1.24	

* Shaded areas indicates problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric Acid, W=Water, H=Hydrogen Peroxide, PH=Phosphate.

ECTC Pilot Trace Elements Testing
Mercury Gas Sampling Results
Removal Summary
 (Normalized to 5% O₂)

		Other							H2O2					KMnO4					Total Vapor					
Test ID	Date	Start Time	Other Imp. Cont.	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Total Hg Spiked	Hg Removal	
				(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)
4,6 Imp. Comp., CRG, No Hg Spk																								
T1-NX		Tue-4/18		-	-	-	-	-	9.71	-	-	-	-	0.35	-	-	-	-	10.06	-	-	-	-	-
T1-NX		Tue-4/18	10:56	H	10.70	-	-	-	0.36	-	-	-	-	0.14	-	-	-	-	11.21	-	-	-	-	-
T1-NX		Tue-4/18	10:00	-	-	-	-	-	9.62	-	-	-	-	0.35	-	-	-	-	9.98	-	-	-	-	-
T1-NX		Tue-4/18	13:00	H	9.97	-	-	-	0.30	-	-	-	-	0.20	-	-	-	-	10.46	-	-	-	-	-
T1-NX		Tue-4/18	10:00	-	-	-	-	-	10.22	-	-	-	-	0.25	-	-	-	-	10.47	-	-	-	-	-
T1-NX		Tue-4/18	12:00	H	9.94	-	-	-	0.36	-	-	-	-	0.14	-	-	-	-	10.44	-	-	-	-	-
Averages																			10.44					
Line, DBA, FO, Hg Spk Intratrail																								
T1-IV		Thu-4/20	09:40	H	-	13.62	-	-	-	0.53	-	-	-	-	0.20	-	-	-	-	14.35	-	-	-	-
T1-IV		Thu-4/20	09:40	H	-	20.82	-	7.20	-	1.63	-	1.11	-	-	1.28	-	1.08	-	-	23.74	-	-	9.39	-
T1-IV		Thu-4/20	11:13	H	-	10.36	-	-	-	0.28	-	-	-	-	0.12	-	-	-	-	10.76	-	-	-	-
T1-IV		Thu-4/20	11:13	H	-	12.53	-	2.17	-	1.11	-	0.83	-	-	0.97	-	0.83	-	-	14.61	-	-	3.85	-
T1-IV		Thu-4/20	13:23	H	-	11.48	-	-	-	0.31	-	-	-	-	0.09	-	-	-	-	11.89	-	-	-	-
T1-IV		Thu-4/20	13:23	H	-	13.31	-	1.83	-	1.50	-	1.19	-	-	1.37	-	1.27	-	-	16.18	-	-	4.30	-
Averages																								
Ambient Air, Hg Spike Comp.																								
T0-1A		Tue-5/2	10:09	H	0.03	-	-	-	0.02	-	-	-	-	<0.02	-	-	-	-	0.07	-	-	-	-	-
T0-1A		Tue-5/2	10:09	H	0.42	-	-	0.39	-	0.27	-	-	0.25	-	22.30	-	-	22.27	-	22.99	-	-	22.92	-
T0-1A		Tue-5/2	11:04	H	0.04	-	-	-	0.15	-	-	-	-	<0.02	-	-	-	-	0.21	-	-	-	-	-
T0-1A		Tue-5/2	11:04	H	0.03	-	-	-0.01	-	0.02	-	-	-0.13	-	14.61	-	-	14.59	-	14.66	-	-	14.44	-
T0-1A		Tue-5/2	12:08	H	0.01	-	-	-	0.02	-	-	-	-	<0.02	-	-	-	-	0.05	-	-	-	-	-
T0-1A		Tue-5/2	12:00	H	0.28	-	-	0.27	-	0.25	-	-	0.23	-	11.69	-	-	11.67	-	12.21	-	-	12.16	-
Averages																								
Line, DBA, FO, Hg Spk Intratrail																								
T4-1Y		Wed-5/24	08:45	H	-	6.78	-	-	-	0.26	-	-	-	-	0.29	-	-	-	-	7.33	-	-	-	-
T4-1Y		Wed-5/24	08:45	H	-	10.91	-	4.13	-	2.11	-	1.85	-	-	2.93	-	2.64	-	-	15.96	-	-	8.62	-
T4-1Y		Wed-5/24	09:55	H	-	6.64	-	-	-	0.30	-	-	-	-	0.25	-	-	-	-	7.20	-	-	-	-
T4-1Y		Wed-5/24	10:00	H	-	11.05	-	4.40	-	2.56	-	2.26	-	-	3.71	-	3.46	-	-	17.32	-	-	10.12	-
T4-1Y		Wed-5/24	11:08	H	-	6.63	-	-	-	0.27	-	-	-	-	0.23	-	-	-	-	7.13	-	-	-	-
T4-1Y		Wed-5/24	11:08	H	-	17.09	-	10.45	-	5.66	-	5.39	-	-	10.80	-	10.57	-	-	33.54	-	-	26.41	-
Averages																								
Line, DBA, FO, Hg Spk Intratrail																								
T5-1Z		Fri-5/26	06:50	H	-	-	0.63	-	-	0.15	-	-	-	-	0.59	-	-	-	-	-	1.37	-	-	-
T5-1Z		Fri-5/26	06:52	H	-	-	1.79	1.15	-	0.38	0.23	-	-	-	7.66	7.07	-	-	-	9.83	8.46	-	-	-
T5-1Z		Fri-5/26	09:00	H	-	-	0.48	-	-	0.21	-	-	-	-	0.63	-	-	-	-	1.32	-	-	-	-
T5-1Z		Fri-5/26	09:00	H	-	-	3.50	3.03	-	0.60	0.40	-	-	-	13.36	12.73	-	-	-	17.47	16.15	-	-	-
T5-1Z		Fri-5/26	10:58	H	-	-	0.66	-	-	0.20	-	-	-	-	0.65	-	-	-	-	1.51	-	-	-	-
T5-1Z		Fri-5/26	10:56	H	-	-	6.61	5.94	-	-	1.23	1.04	-	-	-	40.16	39.51	-	-	-	48.01	46.49	-	-
Averages																								

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetone, P=Perchloric, W=Water, H=Hydrogen Peroxide, PH=Phosphate.

**ECTC Pilot Trace Elements Testing
Mercury Gas Sampling Results
Removal Summary
(Normalized to 5% O₂)**

				Other					H2O2					KMnO4					Total Vapor				
Test ID	Date	Start Time	Other Imp. Cont.	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Total Hg Spiked	Hg Removal
				(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)
Hg Spk Intratrains after Imp#2																							
T6-JZ	Wed-5/31	08:32	H	-	-	0.59	-	-	-	-	0.26	-	-	-	-	0.86	-	-	-	-	1.71	-	-
T6-JZ	Wed-5/31	08:32	H	-	-	0.60	0.01	-	-	-	0.71	0.45	-	-	-	8.01	7.14	-	-	-	9.31	7.61	-
T6-JZ	Wed-5/31	10:36	H	-	-	1.02	-	-	-	-	0.29	-	-	-	-	0.73	-	-	-	-	2.04	-	-
T6-JZ	Wed-5/31	10:36	H	-	-	0.74	-0.28	-	-	-	1.38	1.09	-	-	-	9.61	8.88	-	-	-	11.73	9.69	-
T6-JZ	Wed-5/31	13:05	H	-	-	0.94	-	-	-	-	0.47	-	-	-	-	0.72	-	-	-	-	2.13	-	-
T6-JZ	Wed-5/31	13:05	H	-	-	1.58	0.64	-	-	-	4.16	3.69	-	-	-	45.16	44.44	-	-	-	50.90	48.77	-
Averages																							
Hg Spk Intratrains after Imp#2																							
T6-JY	Fri-6/2	08:21	H	-	9.12	-	-	-	-	0.30	-	-	-	-	0.31	-	-	-	-	9.73	-	-	-
T6-JY	Fri-6/2	08:21	H	-	8.71	-	-0.40	-	-	6.59	-	6.29	-	-	9.37	-	9.06	-	-	24.67	-	15.34	-
T6-JY	Fri-6/2	09:35	H	-	8.43	-	-	-	-	0.25	-	-	-	-	0.29	-	-	-	-	8.97	-	-	-
T6-JY	Fri-6/2	09:35	H	-	8.80	-	0.37	-	-	6.73	-	6.47	-	-	11.03	-	10.74	-	-	26.56	-	17.22	-
T6-JY	Fri-6/2	10:41	H	-	8.86	-	-	-	-	0.33	-	-	-	-	0.31	-	-	-	-	9.50	-	-	-
T6-JY	Fri-6/2	10:41	H	-	8.70	-	-0.16	-	-	6.31	-	5.98	-	-	8.85	-	8.54	-	-	23.86	-	14.52	-
Averages																							

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ECTC Pilot Trace Elements Testing
Mercury Gas Sampling Results
Removal Summary
(Normalized to 5% O2)

				Other					H2O2					KMnO4					Total Vapor					
Test ID	Date	Start Time	Other Imp. Cont.	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal (%)	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal (%)	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal (%)	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Total Hg Spiked	Hg Removal (%)	
				(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)
4,6 imp. comp, Hg Spk, Limestone, FO																								
T7-EY	Mon-6/5	08:40	-	-	-	-	-	-	-	14.63	-	-	-	-	7.40	-	-	-	-	22.03	-	-	-	-
T7-EY	Mon-6/5	08:40	H	-	15.25	-	-	-	-	3.51	-	-	-	-	4.15	-	-	-	-	22.92	-	-	-	-
T7-EY	Mon-6/5	10:08	-	-	-	-	-	-	-	15.00	-	-	-	-	7.56	-	-	-	-	22.55	-	-	-	-
T7-EY	Mon-6/5	10:06	H	-	15.21	-	-	-	-	3.49	-	-	-	-	3.72	-	-	-	-	22.41	-	-	-	-
T7-EY	Mon-6/5	11:27	-	-	-	-	-	-	-	14.41	-	-	-	-	6.64	-	-	-	-	21.04	-	-	-	-
T7-EY	Mon-6/5	11:21	H	-	14.52	-	-	-	-	3.49	-	-	-	-	3.61	-	-	-	-	21.62	-	-	-	-
Averages																				22.10				
Limestone, Adip, FO, Hg Spk																								
T8-E	Wed-6/7	09:30	H	8.73	14.93	3.34	6.20	77.6	0.22	3.24	1.36	3.03	58.0	0.31	2.70	7.75	2.39	-187.6	9.25	20.87	12.46	11.62	40.3	
T8-E	Wed-6/7	10:30	H	8.77	14.32	3.77	5.55	73.7	0.43	3.02	1.65	2.59	45.5	0.31	4.20	7.30	3.89	-74.0	9.51	21.54	12.72	12.03	41.0	
Averages				8.75	14.63	3.55	5.88	75.66	0.32	3.13	1.50	2.81	51.77	0.31	3.45	7.53	3.14	-130.80	9.38	21.21	12.59	11.83	40.64	
Limestone, Adip, FO, Hg Spk																								
T8-E	Thu-6/8	07:00	-	-	-	-	-	-	7.91	13.50	3.79	5.59	71.9	0.38	8.09	10.62	7.71	-31.2	8.29	21.59	14.41	13.31	33.3	
T8-E	Thu-6/8	08:30	-	-	-	-	-	-	7.81	15.05	4.17	7.24	72.3	0.43	8.52	11.12	8.08	-30.5	8.24	23.57	15.29	15.33	35.1	
Averages				-	-	-	-	-	7.86	14.28	3.98	6.42	72.09	0.41	8.30	10.87	7.90	-30.84	8.26	22.58	14.85	14.32	34.20	
Air, Hg Spike, 0.23 M SO4																								
T0-1A	Mon-6/12	08:40	H	0.01	-	-	-	-	<0.01	-	-	-	-	0.02	-	-	-	-	0.05	-	-	-	-	
T0-1A	Mon-6/12	08:40	H	<0.02	-	-	0.00	-	0.81	-	-	0.80	-	30.57	-	-	30.55	-	31.40	-	-	31.35	-	
T0-1A	Mon-6/12	10:20	H	<0.01	-	-	-	-	<0.01	-	-	-	-	0.02	-	-	-	-	0.04	-	-	-	-	
T0-1A	Mon-6/12	10:20	H	<0.01	-	-	0.00	-	0.89	-	-	0.88	-	31.91	-	-	31.89	-	32.81	-	-	32.78	-	
T0-1A	Mon-6/12	11:54	H	<0.01	-	-	-	-	<0.01	-	-	-	-	0.06	-	-	-	-	0.08	-	-	-	-	
T0-1A	Mon-6/12	11:54	H	<0.01	-	-	0.00	-	0.49	-	-	0.48	-	29.91	-	-	29.86	-	30.42	-	-	30.34	-	
Averages																								
CRG, Hg spike after in Ambient																								
T9-IX*	Fri-6/23	08:25	H	5.56	-	-	-	-	0.06	-	-	-	-	0.06	-	-	-	-	5.68	-	-	-	-	
T9-IX*	Fri-6/23	08:25	H	9.96	-	-	4.40	-	2.71	-	-	2.65	-	7.36	-	-	7.30	-	20.03	-	-	14.35	-	
T9-IX*	Fri-6/23	10:05	H	5.37	-	-	-	-	0.08	-	-	-	-	0.07	-	-	-	-	5.53	-	-	-	-	
T9-IX*	Fri-6/23	10:05	H	11.10	-	-	5.73	-	3.25	-	-	3.16	-	12.33	-	-	12.25	-	26.67	-	-	21.15	-	
T9-IX*	Fri-6/23	11:30	H	4.97	-	-	-	-	0.05	-	-	-	-	0.07	-	-	-	-	5.08	-	-	-	-	
T9-IX*	Fri-6/23	11:30	H	8.20	-	-	3.23	-	1.95	-	-	1.90	-	3.90	-	-	3.83	-	14.05	-	-	8.96	-	
Averages																								
LS, FO, Hg Spk																								
T9-E1	Mon-6/26	10:00	A	5.51	4.72	0.12	-0.79	97.5	0.13	18.58	0.35	18.45	98.1	0.52	9.87	4.46	9.35	54.8	6.16	13.17	4.93	27.02	85.1	
T9-E1	Mon-6/26	12:35	A	7.79	3.34	0.07	-4.45	98.0	0.04	9.91	0.22	9.87	97.7	0.53	7.57	10.75	7.04	-41.9	8.36	20.83	11.04	12.46	47.0	
Averages				6.65	4.03	0.09	-2.62	97.8	0.08	14.25	0.29	14.16	97.9	0.52	8.72	7.60	8.20	6.4	7.26	27.00	7.98	19.74	66.1	
LS, FO, Hg Spk (Process Upset)																								
T9-E2	Wed-6/28	09:30	PH	6.91	1.27	0.08	-1.61	97.6	0.31	0.87	0.07	-0.51	92.4	1.10	14.32	13.90	7.22	-2.9	14.31	18.46	14.05	4.14	23.9	
T9-E2	Wed-6/28	10:30	PH	6.54	5.92	0.07	-0.62	98.8	0.30	0.71	0.06	0.41	92.0	0.63	12.84	12.96	12.21	-0.9	7.47	19.47	13.09	12.00	32.8	
Averages																								

*Shaded areas indicate problems with sampling. Boldized values indicate mercury values below the low standard. A=Acetate, P=Perchloric, W=Water, H=Hydroxide, PH=Phosphate.

ECTC Pilot Trace Elements Testing
Mercury Gas Sampling Results
Removal Summary
 (Normalized to 5% O2)

Test ID	Date	Start Time	Other Imp. Cont.	Other					H2O2					KMnO4					Total Vapor				
				Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Total Hg Spiked	Hg Removal
				(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)
<i>LS, FO, Baseline</i>																							
T10-N	Fri-6/30	08:00	PH	5.35	6.01	0.11	0.66	98.2	0.23	0.27	0.03	0.04	88.1	0.48	0.42	0.43	-0.06	-2.3	6.06	6.70	0.57	0.64	91.5
T10-N	Fri-6/30	09:30	PH	5.39	6.30	<0.02	0.91	99.7	0.14	0.30	0.03	0.16	91.2	0.44	0.33	0.44	-0.11	-31.2	5.97	6.94	0.48	0.97	93.1
Averages				5.37	6.16	0.06	0.79	98.96	0.19	0.29	0.03	0.10	89.63	0.46	0.38	0.43	-0.08	-16.74	6.01	6.82	0.52	0.81	92.30

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric, W=Water, H=Hydrogen Peroxide, PH=Phosphate

ECTC Pilot Trace Elements Testing
Mercury Gas Sampling Results
Removal Summary
(Normalized to 5% O2)

				Other					H2O2					KMnO4					Total Vapor					
Test ID	Date	Start Time	Other Imp. Cont.	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Total Hg Spiked	Hg Removal	
				(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)
LS,FO,Hg Spk-Intravain																								
T11-IY	Fri-7/7	08:45	PH	-	6.49	-	-	-	-	0.27	-	-	-	-	0.90	-	-	-	-	7.66	-	-	-	-
T11-IY	Fri-7/7	08:45	PH	-	5.27	-	-1.22	-	-	2.07	-	1.80	-	-	11.95	-	11.06	-	-	19.29	-	-	11.63	-
T11-IY	Fri-7/7	10:05	PH	-	6.15	-	-	-	-	0.12	-	-	-	-	0.62	-	-	-	-	6.89	-	-	-	-
T11-IY	Fri-7/7	10:05	PH	-	7.56	-	1.41	-	-	1.25	-	1.13	-	-	18.16	-	17.54	-	-	26.97	-	-	20.08	-
T11-IY	Fri-7/7	11:20	PH	-	6.41	-	-	-	-	0.16	-	-	-	-	0.65	-	-	-	-	7.22	-	-	-	-
T11-IY	Fri-7/7	11:20	PH	-	7.27	-	0.86	-	-	1.40	-	1.24	-	-	15.93	-	15.28	-	-	24.60	-	-	17.38	-
Averages																								
LS,FO,Hg Spk,Comp@WS In																								
T12-EY	Mon-7/10	08:10	H	-	14.53	-	-	-	-	3.67	-	-	-	-	8.69	-	-	-	-	26.89	-	-	-	-
T12-EY	Mon-7/10	08:10	PH	-	3.66	-	-	-	-	0.37	-	-	-	-	17.26	-	-	-	-	21.29	-	-	-	-
T12-EY	Mon-7/10	10:00	H	-	14.54	-	-	-	-	3.60	-	-	-	-	8.46	-	-	-	-	26.61	-	-	-	-
T12-EY	Mon-7/10	10:00	PH	-	5.59	-	-	-	-	0.12	-	-	-	-	16.03	-	-	-	-	21.74	-	-	-	-
T12-EY	Mon-7/10	11:15	H	-	16.04	-	-	-	-	3.37	-	-	-	-	7.72	-	-	-	-	27.12	-	-	-	-
T12-EY	Mon-7/10	11:15	PH	-	5.06	-	-	-	-	0.12	-	-	-	-	15.58	-	-	-	-	20.76	-	-	-	-
Averages																								
LS,FO,Comp@WS In																								
T12-NY	Wed-7/12	08:05	PH	-	3.47	-	-	-	-	0.03	-	-	-	-	1.20	-	-	-	-	4.70	-	-	-	-
T12-NY	Wed-7/12	08:05	H	-	9.22	-	-	-	-	1.42	-	-	-	-	1.22	-	-	-	-	11.87	-	-	-	-
T12-NY	Wed-7/12	10:40	PH	-	3.94	-	-	-	-	0.02	-	-	-	-	0.92	-	-	-	-	4.88	-	-	-	-
T12-NY	Wed-7/12	10:40	H	-	7.98	-	-	-	-	0.63	-	-	-	-	1.15	-	-	-	-	9.75	-	-	-	-
T12-NY	Wed-7/12	11:50	PH	-	5.50	-	-	-	-	0.05	-	-	-	-	0.74	-	-	-	-	6.29	-	-	-	-
T12-NY	Wed-7/12	11:50	H	-	8.18	-	-	-	-	0.77	-	-	-	-	1.03	-	-	-	-	9.98	-	-	-	-
Averages																								
LS,FO,Comp@WS In																								
T13-NY	Fri-7/14	08:05	H	-	8.53	-	-	-	-	0.61	-	-	-	-	0.89	-	-	-	-	10.04	-	-	-	-
T13-NY	Fri-7/14	08:05	PH	-	1.70	-	-	-	-	0.24	-	-	-	-	0.45	-	-	-	-	2.39	-	-	-	-
T13-NY	Fri-7/14	09:30	H	-	7.35	-	-	-	-	0.74	-	-	-	-	0.88	-	-	-	-	8.97	-	-	-	-
T13-NY	Fri-7/14	09:30	PH	-	3.81	-	-	-	-	0.20	-	-	-	-	0.95	-	-	-	-	4.96	-	-	-	-
T13-NY	Fri-7/14	10:05	H	-	6.33	-	-	-	-	0.42	-	-	-	-	0.77	-	-	-	-	7.52	-	-	-	-
T13-NY	Fri-7/14	10:05	PH	-	4.35	-	-	-	-	0.14	-	-	-	-	0.71	-	-	-	-	5.19	-	-	-	-
T13-NY	Fri-7/14	10:45	H	-	5.40	-	-	-	-	0.37	-	-	-	-	0.87	-	-	-	-	6.65	-	-	-	-
T13-NY	Fri-7/14	10:45	PH	-	2.50	-	-	-	-	0.13	-	-	-	-	1.09	-	-	-	-	3.72	-	-	-	-
Averages																								

*Shaded areas indicates problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric Acid, W=Water, H=Hydrogen Peroxide, PH=Phosphate.

ECTC Pilot Trace Elements Testing
Mercury Gas Sampling Results
Removal Summary
 (Normalized to 5% O₂)

		Other							H2O2						KMnO4						Total Vapor					
Test ID	Date	Start Time	Other Imp. Cont.	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Hg Spiked (µg/Nm3)	Hg Removal (%)	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Hg Spiked (µg/Nm3)	Hg Removal (%)	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Hg Spiked (µg/Nm3)	Hg Removal (%)	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Total Hg Spiked (µg/Nm3)	Hg Removal (%)			
LS, FO, Hg Spk, Comp @ WS In																										
T16-EY	Wed-7/19	08:15	H	-	13.56	-	-	-	-	3.24	-	-	-	-	5.34	-	-	-	-	22.13	-	-	-	-		
T16-EY	Wed-7/19	08:15	PH	-	0.81	-	-	-	-	0.25	-	-	-	-	10.64	-	-	-	-	11.71	-	-	-	-		
T16-EY	Wed-7/19	09:40	H	-	13.35	-	-	-	-	2.75	-	-	-	-	10.06	-	-	-	-	26.16	-	-	-	-		
T16-EY	Wed-7/19	09:40	PH	-	4.13	-	-	-	-	0.25	-	-	-	-	18.48	-	-	-	-	22.86	-	-	-	-		
T16-EY	Wed-7/19	11:00	H	-	12.80	-	-	-	-	3.30	-	-	-	-	9.20	-	-	-	-	25.30	-	-	-	-		
T16-EY	Wed-7/19	11:00	PH	-	1.42	-	-	-	-	0.25	-	-	-	-	18.23	-	-	-	-	19.90	-	-	-	-		
T16-EY	Wed-7/19	13:30	BPH	-	NA	-	-	-	-	4.63	-	-	-	-	4.57	-	-	-	-	9.20	-	-	-	-		
Averages				Total H2O2					Total KO					Total KMnO4					Includes particulate							
Ambient Air, Aqueous Hg spk.				Theo Spike Rec					Theo Spike Rec					Theo Spike Rec												
TO-NA	Wed-7/26	09:15	-	1.03	-	-	1.15	89.9	0.02	-	-	0.00	-	1.67	-	-	1.53	109.1	2.72	-	-	2.68	-			
TO-NA	Wed-7/26	09:30	-	1.49	-	-	1.17	127.3	0.00	-	-	0.00	-	1.71	-	-	1.56	109.1	3.20	-	-	2.74	-			
TO-NA	Wed-7/26	09:30	-	1.18	-	-	1.18	99.8	0.00	-	-	0.00	-	1.68	-	-	1.58	106.4	2.86	-	-	2.76	-			
TO-NA	Wed-7/26	12:40	-	1.01	-	-	1.12	91.0	0.01	-	-	0.00	-	0.07	-	-	0.00	-	1.10	-	-	1.12	-			
TO-NA	Wed-7/26	12:40	-	1.28	-	-	1.22	104.7	0.00	-	-	0.00	-	0.07	-	-	0.00	-	1.36	-	-	1.22	-			
Averages				1.20					102.5					-												
Line In, DRG, CRG, CRG comp				DRG CRG					DRG CRG					DRG CRG												
T18L-N	Fri-7/28	08:15	H	-	1.93	1.63	-	-	-	0.07	0.17	-	-	-	0.27	0.30	-	-	-	6.63	2.13	-	-			
T18L-N	Fri-7/28	08:20	Tris	-	-	0.70	-	-	-	-	0.14	-	-	-	-	0.69	-	-	-	-	1.52	-	-			
T18L-N	Fri-7/28	09:50	H	-	1.88	1.63	-	-	-	0.10	0.10	-	-	-	0.23	0.27	-	-	-	7.40	2.01	-	-			
T18L-N	Fri-7/28	09:55	Tris	-	-	0.71	-	-	-	-	0.15	-	-	-	-	0.73	-	-	-	-	1.59	-	-			

*Shaded areas indicates problems with sampling. *Italicized values* indicate mercury values below the low standard. A=Acetate, P=Perchloric Acid, W=Water, H=Peroxide, PH=Phosphate.

Test ID		Date		Start Time		Other Imp. Cont.		Spike Recovery		Spike Capture (By Impinger)				Removal Efficiency (By Impinger)		Total Hg Capture (CRG)				Total Hg Capture (WS Inlet)				Total Hg Capture (WS Outlet)			
								Actual Spiked Theo Hg		Percent Spike Rec.		Other H2O2 H2O2 KMnO4		[H2] [H2] [H2] [H2]		Other H2O2 H2O2		Other H2O2 H2O2 KMnO4		Other H2O2 H2O2		Other H2O2 H2O2 KMnO4		Other H2O2 H2O2 KMnO4		Other H2O2 H2O2 KMnO4	
								(ug/Nm3)	(ug/Nm3)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
4/6 Imp. Comp. CRG, No Hg Spk																											
T1-NX		Tue-4/18		10:56		-		-		-		-		-		-		-		-		-		-			
T1-NX		Tue-4/18		10:56		H		-		-		-		-		89.8		5.7		2.1		1.1		1.3			
T1-NX		Tue-4/18		10:00		-		-		-		-		-		-		-		-		-		-			
T1-NX		Tue-4/18		13:00		H		-		-		-		-		89.1		6.1		1.7		1.2		1.9			
T1-NX		Tue-4/18		10:00		-		-		-		-		-		-		-		-		-		-			
T1-NX		Tue-4/18		12:00		H		-		-		-		-		88.9		6.3		2.3		1.2		1.4			
Averages																											
Line, DBA, FO, Hg Spk Intrain																											
T1-1Y		Thu-4/20		09:40		H		7.21		6.77		106.6		66.2		10.5		7.7		4.1		11.5		66.2			
T1-1Y		Thu-4/20		09:40		H		-		-		-		-		-		-		-		-		-			
T1-1Y		Thu-4/20		11:11		H		2.94		1.26		56.3		40.8		15.6		12.7		8.9		22.0		40.8			
T1-1Y		Thu-4/20		11:11		H		-		-		-		-		-		-		-		-		-			
T1-1Y		Thu-4/20		13:21		H		5.30		6.81		48.4		19.5		21.2		17.8		10.6		29.7		19.5			
T1-1Y		Thu-4/20		13:21		H		-		-		-		-		-		-		-		-		-			
Averages																											
Ambient Air, Hg Spike Comp.																											
T0-1A		Tue-5/2		10:09		H		22.92		21.21		98.7		0.9		0.8		1.1		0.1		0.1		97.0			
T0-1A		Tue-5/2		10:09		H		-		-		-		-		-		-		-		-		-			
T0-1A		Tue-5/2		11:04		H		-		-		-		-		-		-		-		-		-			
T0-1A		Tue-5/2		11:04		H		14.44		15.14		95.4		0.0		-0.1		0.0		-0.9		0.1		99.7			
T0-1A		Tue-5/2		12:08		H		-		-		-		-		-		-		-		-		-			
T0-1A		Tue-5/2		12:00		H		12.16		14.36		84.7		1.1		1.1		1.0		0.9		1.1		95.7			
Averages																											
Line, DBA, FO, Hg Spk Intrain																											
T4-1Y		Wed-5/24		08:45		H		-		-		-		-		-		-		-		-		-			
T4-1Y		Wed-5/24		08:45		H		7.51		10.52		71.3		31.4		16.6		13.4		8.0		30.7		31.4			
T4-1Y		Wed-5/24		09:55		H		-		-		-		-		-		-		-		-		-			
T4-1Y		Wed-5/24		10:00		H		8.81		10.11		87.2		24.8		18.7		12.7		9.6		34.2		24.8			
T4-1Y		Wed-5/24		11:08		H		-		-		-		-		-		-		-		-		-			
T4-1Y		Wed-5/24		11:08		H		23.00		21.46		107.2		21.7		17.9		12.1		8.3		40.0		21.7			
Averages																											
Line, DBA, FO, Hg Spk Intrain																											
T5-1Z		Fri-5/26		06:50		H		-		-		-		-		-		-		-		-		-			
T5-1Z		Fri-5/26		06:52		H		6.50		5.32		122.4		5.7		8.0		1.6		1.1		83.6		5.7			
T5-1Z		Fri-5/26		09:00		H		-		-		-		-		-		-		-		-		-			
T5-1Z		Fri-5/26		09:00		H		12.42		11.11		111.8		11.3		7.5		1.5		1.0		78.8		11.3			
T5-1Z		Fri-5/26		10:58		H		-		-		-		-		-		-		-		-		-			
T5-1Z		Fri-5/26		10:56		H		35.74		25.46		140.4		9.5		3.3		1.6		0.7		85.0		9.5			
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Test ID	Date	Start Time	Other Imp. Cont.	Spike Recovery			Spike Capture (By Impinger)					Spiked Mercury Removal Efficiency (By Impinger)				Total Hg Capture (CRG) (By Impinger)					Total Hg Capture (WS Inlet) (By Impinger)					Total Hg Capture (WS Outlet) (By Impinger)				
				Actual Spiked (µg/Nm3)	Spiked Theo Hg (µg/Nm3)	Percent Spike Rec (%)	Other [Hg] (%)	Other [Hg] (%)	H2O2 [Hg] (%)	H2O2 [Hg] (%)	KMnO4 [Hg] (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)
Hg Spk Intratrains after Imp#2							(Spike calc'd from Impingers after #2)																							
T6-JZ	Wed-5/31	08:32	H	-	-	-	(Spike calc'd from Impingers after #2)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	34.4	11.9	3.1	50.6	
T6-JZ	Wed-5/31	08:32	H	6.18	4.53	136.3	-	-	4.4	1.5	94.1	-	-	4.4	1.6	-	-	-	-	-	-	-	-	-	-	6.4	5.8	1.8	86.0	
T6-JZ	Wed-5/31	10:36	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50.2	8.7	5.3	35.8	
T6-JZ	Wed-5/31	10:36	H	8.11	5.80	139.9	-	-	8.1	2.9	89.1	-	-	8.1	3.1	-	-	-	-	-	-	-	-	-	-	6.3	8.4	3.4	81.9	
T6-JZ	Wed-5/31	13:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44.2	14.3	7.7	33.7	
T6-JZ	Wed-5/31	13:05	H	39.17	32.34	121.1	-	-	5.9	1.8	92.3	-	-	5.9	1.9	-	-	-	-	-	-	-	-	-	-	3.1	6.2	2.0	88.7	
Averages						132.4			6.1	2.1	91.8			6.1	2.2															
Hg Spk Intratrains after Imp#2							(Spike calc'd from Impingers after #2)																							
T6-JY	Fri-6/2	08:21	H	-	-	-	(Spike calc'd from Impingers after #2)					-	-	-	-	-	-	-	-	-	-	93.7	1.6	1.4	3.2	-	-	-	-	-
T6-JY	Fri-6/2	08:21	H	12.80	7.74	165.4	-	-	25.2	15.8	59.0	-	-	25.2	21.1	-	-	-	-	-	-	35.3	16.3	10.4	38.0	-	-	-	-	-
T6-JY	Fri-6/2	09:35	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	94.0	2.1	0.7	3.2	-	-	-	-	-
T6-JY	Fri-6/2	09:35	H	14.39	10.35	139.0	-	-	22.6	15.0	62.4	-	-	22.6	19.3	-	-	-	-	-	-	33.1	15.4	10.0	41.5	-	-	-	-	-
T6-JY	Fri-6/2	10:41	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93.3	2.5	1.0	3.2	-	-	-	-	-
T6-JY	Fri-6/2	10:41	H	11.97	10.33	115.9	-	-	24.8	16.4	58.8	-	-	24.8	21.8	-	-	-	-	-	-	36.5	16.1	10.4	37.1	-	-	-	-	-
Averages				13.05	9.47	140.1			24.2	15.7	60.1			24.2	20.7															

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetone P=Perchloric, W=Water, H=Hydrogen Peroxide, PII=Phosphate.

				Spike Recovery				Spike Capture (By Impinger)					Spiked Mercury Removal Efficiency (By Impinger)					Total Hg Capture (CRG)					Total Hg Capture (WS Inlet)					Total Hg Capture (WS Outlet)																																
Test ID	Date	Start Time	Other Imp. Cont.	Actual	Spiked	Percent	Other	Other	H2O2	H2O2	KMnO4	Other	Other	H2O2	H2O2	Other	Other	H2O2	H2O2	KMnO4	Other	Other	H2O2	H2O2	KMnO4	Other	Other	H2O2	H2O2	KMnO4																														
				(µg/Nm3)	(µg/Nm3)	(%)	(Hg)	(Hg)	(Hg)	(Hg)	(Hg)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)																												
4,6 imp. comp. Hg Spk, Limestone, FO																																																												
T7-EY	Mon-6/5	08:40	-	-	11.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66.4	33.6	-	-	-	-	-																													
T7-EY	Mon-6/5	08:40	H	-	11.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51.8	14.8	9.6	5.7	18.1	-	-	-	-	-																														
T7-EY	Mon-6/5	10:08	-	-	11.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66.5	33.5	-	-	-	-	-																														
T7-EY	Mon-6/5	10:06	H	-	11.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52.6	15.2	9.7	5.9	16.6	-	-	-	-	-																														
T7-EY	Mon-6/5	11:27	-	-	11.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68.5	31.5	-	-	-	-	-																														
T7-EY	Mon-6/5	11:21	H	-	11.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51.7	15.5	10.1	6.0	16.7	-	-	-	-	-																														
Averages																																																												
Limestone, Adip, FO, Hg Spk																																																												
T8-E	Wed-6/7	09:30	H	9.93	11.68	85.0	31.0	22.4	16.7	9.4	20.6	31.0	32.4	35.8	31.3	88.8	5.6	1.8	0.5	3.3	56.6	14.9	10.1	5.4	12.9	15.1	11.7	6.8	4.2	62.3																														
T8-E	Wed-6/7	10:30	H	10.16	11.68	87.0	30.5	15.6	13.1	8.4	32.3	30.5	22.5	24.4	20.7	84.4	7.9	2.8	1.7	3.2	54.3	12.2	8.6	5.4	19.5	15.4	14.3	7.2	5.7	57.4																														
Averages																																																												
Limestone, Adip, FO, Hg Spk																																																												
T8-E	Thu-6/8	07:00	-	11.45	11.68	98.0	-	-	-	42.0	58.0	-	-	-	42.0	-	-	-	95.4	4.6	-	-	-	62.5	37.5	-	-	-	26.3	73.7																														
T8-E	Thu-6/8	08:30	-	12.01	11.68	102.8	-	-	-	47.3	52.7	-	-	-	47.3	-	-	-	94.7	5.3	-	-	-	63.9	36.1	-	-	-	27.3	72.7																														
Averages																																																												
Air, Hg Spike, 0.23 M SO4																																																												
T0-JA	Mon-6/12	08:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																														
T0-JA	Mon-6/12	08:40	H	31.35	9.43	332.3	-	0.0	1.2	1.3	97.4	-	-	1.2	1.4	-	0.1	1.2	1.4	97.4	-	-	-	-	-	-	-	-	-	-																														
T0-JA	Mon-6/12	10:20	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																														
T0-JA	Mon-6/12	10:20	H	32.78	11.60	282.6	-	0.0	1.4	1.3	97.3	-	-	1.4	1.3	-	0.0	1.4	1.3	97.2	-	-	-	-	-	-	-	-	-	-																														
T0-JA	Mon-6/12	11:54	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																														
T0-JA	Mon-6/12	11:54	H	30.34	13.20	229.9	-	0.0	0.6	1.0	98.4	-	-	0.6	1.0	-	0.0	0.6	1.0	98.3	-	-	-	-	-	-	-	-	-	-																														
Averages																																																												
CRG, Hg spike after in Ambient																																																												
T9-IX*	Fri-6/23	08:25	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																														
T9-IX*	Fri-6/23	08:25	H	14.35	15.85	90.6	18.2	12.4	10.8	7.6	50.9	18.2	15.2	15.6	13.0	38.9	10.8	8.0	5.5	36.7	-	-	-	-	-	-	-	-	-	-																														
T9-IX*	Fri-6/23	10:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																														
T9-IX*	Fri-6/23	10:05	H	21.15	24.81	85.2	15.4	11.7	8.2	6.7	57.9	15.4	13.9	11.3	10.4	31.1	10.5	6.8	5.4	46.2	-	-	-	-	-	-	-	-	-	-																														
T9-IX*	Fri-6/23	11:30	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																														
T9-IX*	Fri-6/23	11:30	H	8.96	11.70	76.6	20.1	15.9	12.2	9.1	42.7	20.1	20.0	19.0	17.5	46.0	12.3	8.1	5.8	27.8	-	-	-	-	-	-	-	-	-	-																														
Averages																																																												
LS, FO, Hg Spk																																																												
T9-EI	Mon-6/26	10:00	A	21.09	11.68	180.6	-	-2.9	-	68.3	34.6	-	-2.9	-	66.4	-	89.5	-	2.1	8.4	-	14.2	-	56.0	29.7	-	2.4	-	7.1	90.5																														
T9-EI	Mon-6/26	12:35	A	10.07	11.68	86.2	-	-35.7	-	79.2	54.5	-	-35.7	-	58.4	-	93.2	-	0.5	6.3	-	18.0	-	47.6	36.4	-	0.6	-	2.0	97.4																														
Averages																																																												
LS, FO, Hg Spk (Process Upset)																																																												
T9-E2	Wed-6/28	09:30	PH	2.77	11.68	23.7	-	-87.9	-	13.7	124.2	-	-87.9	-	7.3	-	48.3	-	2.1	49.6	-	17.7	-	4.7	77.4	-	0.6	-	0.5	99.0																														
T9-E2	Wed-6/28	10:30	PH	9.05	11.68	77.5	-	-5.1	-	3.4	101.7	-	-5.1	-	3.3	-	87.6	-	4.0	8.5	-	30.4	-	3.6	66.0	-	0.6	-	0.4	99.0																														
Averages																																																												

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric, W=Water, H=Hydroxide, PH=Phosphate.

Test ID		Date	Other Start Time	Other Imp. Cont.	Spike Recovery		Spike Capture (By Impinger)					Spiked Mercury Removal Efficiency (By Impinger)					Total Hg Capture (CRG) (By Impinger)					Total Hg Capture (WS Inlet) (By Impinger)					Total Hg Capture (WS Outlet) (By Impinger)					
					Actual Spiked	Spiked Theo Hg	Percent Spike Rec.	Other (Hg)	Other (Hg)	H2O2 (Hg)	H2O2 (Hg)	KMnO4 (Hg)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)
					(µg/Nm3)	(µg/Nm3)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
LS, FO, Baseline																																
T10-N		Fri-6/30	08:00	PH	0.52	0.00	-	-	-	-	-	-	-	-	-	88.3	-	3.8	7.9	-	89.7	-	4.1	6.3	-	18.8	-	5.7	75.5			
T10-N		Fri-6/30	09:30	PH	0.79	0.00	-	-	-	-	-	-	-	-	-	90.3	-	2.4	7.3	-	90.8	-	4.4	4.8	-	4.0	-	5.6	90.5			
Averages					0.65	0.00	-	-	-	-	-	-	-	-	-	89.3	-	3.1	7.6	-	90.3	-	4.2	5.5	-	11.4	-	5.6	83.0			

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Per/Noric, W=Water, H=Peroxide, PH=Phosphate.

Test ID	Date	Start Time	Other Imp. Cont.	Spike Recovery			Spike Capture (By Impinger)					Spiked Mercury Removal Efficiency (By Impinger)				Total Hg Capture (CRG) (By Impinger)					Total Hg Capture (WS Inlet) (By Impinger)					Total Hg Capture (WS Outlet) (By Impinger)					
				Actual Spiked	Spiked Theo Hg	Percent Spike Rec.	Other [Hg]	Other [Hg]	H2O2 [Hg]	H2O2 [Hg]	KMnO4 [Hg]	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	
				(ug/Nm3)	(ug/Nm3)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	
LS,FO,Hg Spk-Intrain																															
T11-IY	Fri-7/7	08:45	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	84.7	-	3.6	11.7	-	-	-	-	-	
T11-IY	Fri-7/7	08:45	PH	8.49	7.35	112.5	-	-10.5	-	15.4	95.0	-	-10.5	-	14.0	-	-	-	-	-	-	27.3	-	10.7	62.0	-	-	-	-	-	
T11-IY	Fri-7/7	10:05	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	89.3	-	1.7	9.0	-	-	-	-	-		
T11-IY	Fri-7/7	10:05	PH	15.18	7.19	211.1	-	7.0	-	5.6	87.4	-	7.0	-	6.1	-	-	-	-	-	-	28.0	-	4.6	67.3	-	-	-	-	-	
T11-IY	Fri-7/7	11:20	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	88.8	-	2.2	9.0	-	-	-	-	-		
T11-IY	Fri-7/7	11:20	PH	13.10	8.45	155.0	-	4.9	-	7.1	87.9	-	4.9	-	7.5	-	-	-	-	-	29.5	-	5.7	64.7	-	-	-	-	-		
Averages							-	0.5	-	9.4	90.1	-	0.5	-	9.2																
LS,FO,Hg Spk,Comp@WS In																															
T12-EY	Mon-7/10	08:10	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41.9	12.1	8.0	5.7	32.3	-	-	-	-	-	
T12-EY	Mon-7/10	08:10	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.4	1.7	1.0	0.7	81.1	-	-	-	-	-	
T12-EY	Mon-7/10	10:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42.7	12.0	8.4	5.1	31.8	-	-	-	-	-	
T12-EY	Mon-7/10	10:00	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.4	1.4	0.3	0.3	73.7	-	-	-	-	-	
T12-EY	Mon-7/10	11:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46.1	13.0	7.3	5.1	28.5	-	-	-	-	-	
T12-EY	Mon-7/10	11:15	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.7	0.7	0.4	0.2	75.1	-	-	-	-	-	
Averages																															
LS,FO,Comp@WS In																															
T12-NY	Wed-7/12	08:05	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73.4	0.3	0.4	0.4	25.6	-	-	-	-	-	
T12-NY	Wed-7/12	08:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66.7	11.0	6.4	5.6	10.3	-	-	-	-	-	
T12-NY	Wed-7/12	10:40	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80.5	0.3	0.1	0.2	18.9	-	-	-	-	-	
T12-NY	Wed-7/12	10:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73.7	8.1	3.3	3.1	11.8	-	-	-	-	-	
T12-NY	Wed-7/12	11:50	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	87.2	0.2	0.5	0.3	11.7	-	-	-	-	-	
T12-NY	Wed-7/12	11:50	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	71.0	11.0	4.9	2.8	10.4	-	-	-	-	-	
Averages																															
LS,FO,Comp@WS In																															
T13-NY	Fri-7/14	08:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78.8	6.2	3.8	2.3	8.9	-	-	-	-	-	
T13-NY	Fri-7/14	08:05	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70.4	0.7	4.4	5.8	18.7	-	-	-	-	-	
T13-NY	Fri-7/14	09:30	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74.3	7.7	6.3	1.9	9.8	-	-	-	-	-	
T13-NY	Fri-7/14	09:30	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76.3	0.6	2.3	1.7	19.1	-	-	-	-	-	
T13-NY	Fri-7/14	10:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76.7	7.5	3.5	2.1	10.2	-	-	-	-	-	
T13-NY	Fri-7/14	10:05	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	83.3	0.5	1.5	1.1	13.6	-	-	-	-	-	
T13-NY	Fri-7/14	10:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74.2	7.1	3.1	2.4	13.2	-	-	-	-	-	
T13-NY	Fri-7/14	10:45	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	62.8	4.4	2.3	1.1	29.4	-	-	-	-	-	
Averages																															

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			Spike Recovery			Spike Capture (By Impinger)					Spiked Mercury Removal Efficiency (By Impinger)					Total Hg Capture (CRG) (By Impinger)					Total Hg Capture (WS Inlet) (By Impinger)					Total Hg Capture (WS Outlet) (By Impinger)					
Test ID	Date	Start Time	Other Imp. Cont.	Actual Spiked (ug/Nm3)	Spiked Theo Hg (ug/Nm3)	Percent Spike Rec (%)	Other [Hg] (%)	Other [Hg] (%)	H2O2 [Hg] (%)	H2O2 [Hg] (%)	KMnO4 [Hg] (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)
LS,FO,Hg Spk,Comp@WS In																															
T16-EY	Wed-7/19	08:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	08:15	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	09:40	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	09:40	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	11:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	11:00	PH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T16-EY	Wed-7/19	13:30	BPH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																															
Ambient Air,Aqueous Hg spk.																															
T0-NA	Wed-7/26	09:15	-	2.72	2.68	101.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T0-NA	Wed-7/26	09:30	-	3.20	2.74	117.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T0-NA	Wed-7/26	09:30	-	2.86	2.76	103.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T0-NA	Wed-7/26	12:40	-	1.10	1.12	98.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T0-NA	Wed-7/26	12:40	-	1.36	1.22	111.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																															
Line Inj,DRG,CRG,CRG comp																															
T18L-N	Fri-7/28	08:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DRG	DRG	DRG	DRG	DRG	CRG	CRG	CRG	CRG	CRG
T18L-N	Fri-7/28	08:20	Trls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27.3	1.8	0.5	0.6	4.1	71.7	5.7	4.5	3.5	14.1
T18L-N	Fri-7/28	09:50	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18L-N	Fri-7/28	09:55	Trls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.1	2.3	0.8	0.6	3.2	74.8	6.4	3.1	2.2	13.6
T18L-N	Fri-7/28	09:55	Trls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Shaded areas indicate problems with sampling. Italicized values indicate mercury values below the low standard. A=Acetate, P=Perchloric Acid, W=Water, H=Peroxide, PH=Phosphate.

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